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ALLEN AERODERIVATIVE COMBUSTION TURBINE PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Shelby County, Tennessee

EISX-455-00-000-1730803146

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COVER SHEET

Allen Aeroderivative Combustion Turbine Project

Proposed action:	The Tennessee Valley Authority proposed to construct and operate six aeroderivative combustion turbine (CT) units (GE LM2500s), generating approximately 200 MW of power, and associated support facilities at the Allen CT Plant in Memphis, Tennessee.
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Comments due date:	April 28, 2025
Abstract:	TVA prepared this Environmental Impact Statement (EIS) to assess the environmental impacts associated with construction and operation of six new aeroderivative CT units at the Allen Combustion Turbine (ACT) Plant located in Memphis, Tennessee. This action would provide new, dispatchable generation to support the continued system load growth experienced in the TVA power service area and increase the flexibility and reliability of the TVA power system by improving TVA's transmission system stability in western Tennessee. The EIS evaluated information relevant to the assessment of potential impacts associated with the No Action Alternative and Allen Aeroderivative CT Project Alternative.

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SUMMARY

Introduction

The Tennessee Valley Authority (TVA) prepared this Draft Environmental Impact Statement (EIS) to assess the environmental impacts associated with the proposed action to construct and operate six new aeroderivative combustion turbine units (aero CTs) at the Allen Combustion Turbine (ACT) Plant, located in Memphis, Tennessee. The new aero CTs would generate approximately 200 Megawatts (MW) of dispatchable power to help meet the growing system demand. The new aero CT units (GE LM2500s) would support fast start dispatching and have synchronous condensing capabilities to improve grid stability.

In June 2019, TVA published the 2019 Integrated Resource Plan (IRP) and associated Environmental Impact Statement (EIS), which were developed with input from stakeholder groups and the public and provide direction on how best to meet future electricity demand over the next 20 years (TVA 2019a, 2019b). The IRP evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential resource additions and retirements throughout the TVA power service area. TVA's asset strategy incorporated the strategic direction from the 2019 IRP and supports affordable, reliable, and cleaner energy for the customers TVA serves. Since the completion of the 2019 IRP, TVA has seen a marked increase in electric demand. The need for the inclusion of natural gas-fired CTs and combined-cycle (CC) turbines in the Target Power Supply Mix is driven by the demand for reliable electricity, the increased amount of solar generation within the system, dispatchable capacity requirements, commodity prices, costs relative to alternative resource options, and transmission system reliability (TVA 2019a).

TVA operates 101 natural gas- and fuel oil-fired generators at 17 sites, including nine in Tennessee, five in Mississippi, one in Alabama, and two in Kentucky. While similar to TVA's existing simple-cycle CTs, aero CT units operate like a jet engine by which the compressor draws air into the unit, where it is compressed, mixed with fuel, and ignited. As combustion occurs, gas expands through turbine blades connected to a generator to produce electricity. Aero CTs, unlike simple-cycle CTs, provide high cycling capability and fast startup. TVA's generation network is best when integrating resources that enhance system flexibility, including the option for emergency black-start[1] capabilities, which aid in system restoration following a significant event that disrupts the power supply or creates a disturbance to the bulk electric system. Aero CTs with emergency black-start capabilities allow the aero CT units to be manually started and connected to the grid to help start other generating units and rapidly restore electricity to the grid in the event of a widespread power outage.

Purpose and Need for Action

TVA is proposing the addition of six new natural gas-fired aero CT units at the ACT Plant to generate approximately 200 MW of dispatchable power to help meet the growing system demand and load growth experienced in the TVA power service area over the past few years. The proposal would also increase the flexibility and reliability of the TVA power system by

[1] "Black-start capable" units are units to which power can be restored without the need to rely on inputs from the external electric power transmission system.

improving TVA's transmission system stability in western Tennessee. These improvements would help TVA expand and integrate renewable energy resources onto its transmission grid.

As set forth in TVA's 2019 IRP, TVA needs flexible, dispatchable power to meet required year-round generation and maximum capacity system demands and planning reserve margin targets. Dispatchable power is also necessary to successfully integrate increasing amounts of renewable energy sources. Dispatchable synchronous condensing capabilities are known to address vulnerabilities to voltage instability that may result from increased renewable generation in the region. The reliability of the system would also be improved by generation sources with black start capabilities that can support system restoration in the event of a system failure.

Alternatives

Alternative A – The No-Action Alternative

Under the No Action Alternative, TVA would not construct six new aero CT units or the associated support facilities to provide generation of approximately 200 MW at the ACT Plant. TVA would continue to operate two existing units (units 19 and 20) at the ACT Plant on a limited basis, consistent with the 2021 Paradise and Colbert Combustion Turbine EA. While this alternative is environmentally preferable, it does not meet the purpose and need of TVA's proposed action; however, consistent with the requirements of NEPA, it is included in this evaluation as it represents current baseline conditions against which the Action Alternative would be compared.

Alternative B – Allen Aeroderivative Project

Under Alternative B, the preferred alternative, TVA would construct and operate six aero CT units (GE LM2500s) generating approximately 200 MW of power and associated support facilities. At least four of the new aero CT units would have black-start capability, meaning the ability to restore power without needing to rely upon inputs from the external electric power transmission system. The new units would support fast startup dispatching and synchronous condensing for transmission system stability in western Tennessee and would improve TVA's ability to further expand renewable energy. TVA would install control systems to minimize and monitor air emissions of the new aero CT units; reduction of emissions from each aero CT unit would be achieved through a dry-low emissions combustion system and a selective catalytic reduction system. TVA would use potable water obtained from the existing public supply for inlet air evaporative cooling in summer ambient temperatures.

The overall ACT project area (project area) consists of approximately 60 acres of mostly heavily disturbed land located within the retired Allen Fossil Plant (ALF) and existing ACT and Allen Combined Cycle (ACC) Plant footprints. The entirety of this project area would not be affected by project activities; however, final locations for the laydown yard, parking, construction trailers, etc., are dependent upon final design. Construction of the aero CTs and associated support facilities is expected to begin in late 2025 (estimated). Commercial operation would begin in 2027 (estimated).

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, tracked cranes, and bulldozers. Low ground-pressure-type equipment (for example, tracked vehicles) would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts per TVA best management practices (BMPs). TVA estimates a maximum of 200 workers would be employed on site at the peak of the approximately 15-month construction period.

Air Quality

Affected Environment
The ACT Plant is located in Shelby County, Tennessee. Air quality in Shelby County is designated as unclassifiable/attainment for all National Ambient Air Quality Standards (NAAQS) criteria pollutants (EPA 2024b).

Environmental Consequences
There would be temporary minor construction impacts associated with emissions from on-site vehicles and equipment as well as generation of fugitive dust. Operation of the aero CTs would result in an incremental increase in criteria pollutant emissions as measured against the current baseline. Operational air quality emissions are moderate because they are noticeable but are not destabilizing. These emissions would be monitored and would comply with permit limits and maintain regional air quality.

Climate Change and Greenhouse Gas

Affected Environment
The Earth's natural warming process is known as the "greenhouse effect." The Earth's atmosphere consists of a variety of gases that regulate the Earth's temperature by trapping solar energy. These gases—including CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride—are cumulatively referred to as greenhouse gases (GHGs) because they trap heat like the glass of a greenhouse. Anthropogenic activities, which include the burning of fossil fuels to produce energy and deforestation, have contributed to elevated concentrations of GHGs in the atmosphere since the Industrial Revolution. The release of GHGs into the atmosphere as a result of human activity has caused an increase in the average global temperature. While the increase in global temperature is known as global warming, the resulting change in a range of global weather patterns is known as "climate change."

In 2024, the U.S. Environmental Protection Agency (EPA) released the Final Rule: New Source Performance Standard (NSPS) for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-fired Electric Generating Stations (40 CFR 60 Subpart TTTTa), under the Clean Air Act (CAA). The rule regulates GHG new carbon pollution standards for existing coal- and new gas-fired power plants. The construction and operation of the ACT would be consistent with the Final Rule (40 CFR 60 Subpart TTTTa).

Environmental Consequences
Construction of the Proposed Action would result in approximately 15,153 tons of CO_2e over the 15-month construction period. Even with conservative assumptions, when compared to GHG emissions in Tennessee (112.1 million metric tons CO_2e in 2019 [TDEC 2024a]), and Shelby County (17 million metric tons of CO_2e in 2019 [Memphis and Shelby County Division of Planning and Development 2022]) construction-related GHG emissions would be negligible.

Each aero CT unit would have a generation restriction of 115,000 megawatts per hour per year. TVA estimates that the predicted operational capacity factor of 11.1 percent and maximum operational capacity factor of 40 percent would result in approximately 107,268 to 401,800 tons of CO_2e per year. Operation of the proposed aero CTs would result in a social cost of greenhouse gases (SC-GHG) estimated to range from approximately $425,531 to $2,978,714 annually. The overall increase in GHG emissions, at the maximum capacity factor of 40 percent, is a minor increase (0.82 percent) in the overall system GHG emissions. These contributions are negligible relative to global GHG levels and potential effects on climate change. As such, impacts from Alternative B on climate change and GHG emissions would be minor.

Groundwater

Affected Environment
The Memphis aquifer serves as the primary drinking water aquifer for the area, including the City of Memphis (Carmichael et al. 2018). Water quality sampling results indicate that coal combustion residuals (CCR) constituents such as arsenic (and, to a lesser extent, fluoride and lead) have been detected at elevated levels in groundwater samples collected from the alluvial aquifer underlying the East Ash Pond Complex. Additionally, elevated pH values in groundwater generally greater than 7.5 standard units have also been observed. Groundwater sampling results do not indicate adverse impacts to the Memphis Sand aquifer or the public drinking water supply (Stantec 2019a).

Environmental Consequences
Construction and operation of the Proposed Action would result in negligible alteration of groundwater hydrology from pile driving. The potential effects of accidental spills or releases that may affect groundwater would be minimized through BMPs. As such, impacts on groundwater would be minor.

Surface Water

Affected Environment
The ACT Plant is located adjacent to the Mississippi River, approximately 5 miles southwest of downtown Memphis, within both the Horn Lake-Nonconnah River watershed (Hydrologic Unit Code [HUC] 08010211) and the Lower Mississippi-Memphis watershed (HUC 08010100) (TDEC 2024b). The ACT Plant is a previously developed site located adjacent to McKellar Lake to the north and is entirely within the McKellar Lake surface water system. There are several existing wastewater streams at the Allen Reservation that are permitted for discharge under the jurisdiction of National Pollutant Discharge Elimination System (NPDES) Permit No. TN0005355. These include Outfall 001 (East Ash Pond Complex to McKellar Lake), Outfall 001A (Emergency Overflow to Horn Lake Cutoff), Outfall 002 (West Ash Pond to the Mississippi River), Outfall 003 (Condenser Cooling Water to Mississippi River), Internal Monitoring Point (IMP) 006 (via Outfall 003 to Mississippi River), and Outfall 010 (intake screen backwash to McKellar Lake). Various waste streams are authorized to discharge through Discharge Point 1 and 2 to the publicly owned treatment works through Permit No. S-NO1-266. The Allen Reservation also maintains six permitted stormwater outfalls (F4 through F9) under the jurisdiction of NPDES Multi-Sector General Permit No. TNR053184, of which all but one discharges to McKellar Lake.

There are water quality concerns in many of the stream segments of both the Lower Mississippi-Memphis and Horn Lake-Nonconnah River watersheds. The segments of the Mississippi and Lower Nonconnah, as well as McKellar Lake, are all known to contain chemical pollutants such as chlordane, dioxins, and polychlorinated biphenyls (PCBs), among others (TDEC 2024c).

Environmental Consequences
During construction activities, temporary, minor impacts to surface waters associated with sedimentation from stormwater runoff would occur. Implementing BMPs designed to reduce

erosion during construction and operation would minimize impacts. No direct or indirect impacts to surface water would be anticipated from the operations associated with the Proposed Action. Because of TVA's continued compliance with permit requirements and the minor alterations in wastewater and stormwater discharges from construction of the Proposed Action, impacts to water resources during operation are negligible.

Wildlife

Affected Environment
The project area has been heavily impacted and altered by previous construction and operations of ACT Units 1 through 18 and continued operation of Units 19 and 20. The ACT Plant provides limited suitable habitat for common wildlife, although it could provide roosting areas for killdeer (*Charadrius vociferus*), rock dove (*Columba livia*), swallow and swift species. The mowed grass area could provide limited foraging habitat for common birds such as field sparrow (*Spizella pusilla*), indigo bunting (*Passerina cyanea*), northern cardinal (*Cardinalis cardinalis*), rock dove, and Carolina chickadee (*Poecile carolinensis*) (National Geographic 2002). Mammals, such as eastern mole (*Scalopus aquaticus*), golden mouse (*Ochrotomys nuttalli*), ground hog (*Marmota monax*), and white-tailed deer (*Odocoileus virginianus*), also may use habitat like this in this region (Whitaker 1996). Reptiles that may use these habitats in this region include black racer (*Coluber constrictor*), eastern kingsnake (*Lampropeltis getula*), gray rat snake (*Pantherophis spiloides*), and red milksnake (*Lampropeltis Triangulum*) (Gibbons and Dorcas 2005). Review of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool in December 2024 identified 16 migratory bird species of conservation concern that have the potential to occur within the vicinity of the project area: American golden-plover (*Pluvialis dominica*), bald eagle (*Haliaeetus leucocephalus*), cerulean warbler (*Setophaga cerulea*), chimney swift (*Chaetura pelagica*), Kentucky warbler (*Geothlypis formosa*), Le Conte's sparrow (*Ammospiza leconteii),* least tern *(Sternula antillarum antillarum),* lesser yellowlegs (*Tringa flavipes*), little blue heron (*Egretta caerulea*), pectoral sandpiper (*Calidris melanotos*), prairie warbler (*Setophaga discolor*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), semipalmated sandpiper (*Calidris pusilla*), and wood thrush (*Hylocichla mustelina*).

Environmental Consequences
Minor impacts to heavily-disturbed, low-quality habitat would occur.

Threatened and Endangered Species

Affected Environment
Review of the TVA Regional Natural Heritage Database on October 3, 2023, resulted in records of several special status species within 3 miles of the project area: three species of state conservation concern, lark sparrow (*Chondestes grammacus)*, osprey (*Pandion haliaetus)*, and Mississippi kite (*Ictinia mississippiensis)*; one species federally threatened in Tennessee, piping plover (*Charadrius melodus)*; and two federally delisted and monitored species, interior least tern (*Sterna antillarum athalassos)* and bald eagle (*Haliaeetus leucocephalus)*. A search for federally listed species within Shelby County, Tennessee, identified one proposed threatened species (alligator snapping turtle [*Macrochelys temminckii]*) and one proposed endangered species (tricolored bat [*Perimyotis subflavus]*). Additional review of the USFWS IPaC tool on December 13, 2024, identified the monarch butterfly (proposed threatened) as a species that has the potential to occur within the project area.

Environmental Consequences
Project activities would occur on heavily disturbed land; therefore, there is no suitable habitat for the lark sparrow, Mississippi kite, and piping plover. Additionally, TVA has made a no-effect determination for the alligator snapping turtle. For selected species (bat species, bald eagle, osprey, and the interior least tern) TVA has committed to conservation measures to avoid and minimize impacts, as such impacts would be minor. Potential habitat for least tern and interior least tern is located within the project area, and coordination with U.S. Fish and Wildlife Services would occur as necessary to ensure compliance under federal law if this species is encountered during construction.

Managed and Natural Areas

Affected Environment
A review of TVA's Natural Heritage Database identified six managed/natural areas within a 3-mile radius of the ACT Plant: the Ensley Bottoms Complex, T.O. Fuller State Park, Chucalissa Tree Trail Arboretum and Village Archaeological Area, Conservation Easement Properties, and the Presidents Island Wildlife Management Area.

Environmental Consequences
Because project activities would occur within the boundaries of previously disturbed TVA lands, impacts from disruptive noise, fugitive dust, and heavy machinery, to managed natural areas would be minor.

Transportation

Affected Environment
The ACT Plant is located in the Frank C. Pidgeon Industrial Park, which is served by highway, railway, and waterway modes of transportation. Major traffic generators include Nucor Steel, xAI, TVA's ALF and ACC plants, TVA ALF ash pond closure activities, and the CSX intermodal facility. These facilities and activities generate traffic that generally comprises of a mix of cars and light-duty trucks (such as a residential delivery truck), medium-duty trucks (larger delivery trucks), and heavy-duty trucks (semi-tractor trailers).

Principal access to the ACT Plant from Interstate 55 (I-55) is West Mallory Avenue (a single-point urban interchange) to Paul R. Lowry Road (referred to as Riverport Road) to Plant Road. Riverport Road varies from two to four lanes in the vicinity of the ACT.

The ALF was served by a rail line operated by Canadian Railroad. This line ran east from ALF, parallel to the north of Riverport Road for approximately 2 miles, where it crosses the south of the road. The ALF plant has a barge unloading area located on McKellar Lake, which has direct access to the Mississippi River.

Environmental Consequences
There would be temporary, minor impacts associated with increased traffic on area roadways during construction activities. However, there would be no change in Level of Service (LOS) as a result of construction-related traffic and only short delays at intersections within the vicinity of the ACT Plant. Operations-related traffic would be negligible

Noise

Affected Environment

Ambient noise in the area is characterized by operations at the ACT Plant, the ACC Plant, removal of CCR at the ALF, and other industrial operations in the Frank C. Pidgeon Industrial Park. The existing ACT Plant generates localized noise through operation of CTs, generators, and other ancillary equipment. Sensitive noise receptors would include recreationists using T.O. Fuller State Park, which is located approximately 0.7 miles southeast of the ACT Plant, on the opposite side of Riverport Road. The northwest corner of the park, closest to the project area, is primarily undeveloped woodland separated from the main body of the park by a railroad spur. The next closest receptor is a residential property located approximately 1.5 miles southeast of the ACT Plant, separated from the proposed project area by densely forested areas of T.O. Fuller State Park.

Environmental Consequences

Temporary, minor adverse impact associated with increased noise during construction activities would occur. Noise impacts from operation would be minor. If necessary, TVA would use noise abatement technology to ensure that noise levels would not exceed 55 dBA at off-site noise receptors.

Solid and Hazardous Waste

Affected Environment

The unique solid waste concerns for gas- and oil-fired plants are the byproducts from emission controls. The solid waste produced from these controls is dependent upon the specific control technology implemented and is not anticipated to be considerable (Brown et al. 2017). Other hazardous wastes currently generated at these sites include waste paint, waste paint solvents, paper insulated lead cable, debris from sandblasting and scraping paint chips, solvent rags used to clean equipment, and liquid-filled fuses (TVA 2019f). TVA has ensured these wastes will be managed with all other hazardous materials generated at the ACT Plant and will be shipped off-site and properly disposed.

Environmental Consequences

There would be a minor impact as solid and hazardous wastes generated during construction and operation of the aero CT units would be managed in accordance with established procedures and applicable federal, state, and local laws and regulations.

Socioeconomics

Affected Environment

For the socioeconomic analysis, the study area was defined as any census block group that falls within a 10-mile radius of the ACT Plant, which includes parts of Shelby County, Tennessee, Crittenden County, Arkansas, and DeSoto County, Mississippi. The population of the study area is 282,264 (USCB 2022a). The block group that contains the project area and the temporary laydown area primarily consists of industrial properties and has no residential population. Since 2010, the population of the study area has declined by 4.6 percent.

Minority populations represent the primary component of the study area population. Specifically, Black or African Americans represent 68.2 percent of the population within the study area. In contrast, whites account for 25.1 percent of the population within the study area. Other minority racial and ethnic groups make up a small proportion of the total population in the study area but are at or below comparative rates for the referenced counties and states.

The study area block groups have a higher percentage of people living below the poverty level compared to all the representative geographies. The unemployment rate is noted to be higher relative to the unemployment rates of all the reference counties and states. Shelby County contains a total employed labor force of 429,064 workers (Table 3-9). Business sectors that provide the greatest employment opportunities include educational services. The unemployment rate within the study area block groups is noted to be higher relative to the unemployment rates of all the reference counties and states.

Community facilities and services available to the communities within the study area include over 500 churches, 173 schools, 25 fire stations, 20 medical centers, 17 police stations, and 7 community centers (USGS 2024). Additionally, no community facilities are located in the immediate vicinity (within 0.5 miles) of the ACT Plant.

Environmental Consequences
Construction activities associated with the aero CTs would entail a temporary increase in employment and associated payrolls, which would result in a minor short-term direct positive impact to employment in the region. Indirect impacts related to the purchases of materials and supplies and the multiplier effect of increased spending in the local economy would be beneficial but minor, given the short construction period. Following construction, permanent staffing associated with the operation of the ACT Plant is expected to require approximately five personnel. Due to the small number of new staff that would be integrated into the existing workforce, long-term impacts to employment would be minimal.

Communities closest to the project area are most likely to experience adverse effects. Additionally, communities that are predominately minority or low-income would be more likely to be affected by the proposed action. However, impacts on communities would be minor overall. Construction-related impacts such as traffic and noise would be minor and short term. Long-term adverse impacts from air emissions would be minimized through adherence to NAAQS standards, which protect human health with an adequate margin of safety for sensitive subgroups of the population, including populations with higher frequency of preexisting health conditions.

Utilities

Affected Environment
Several utilities and service systems are in place at the ACT Plant, as a result of previous construction and operation of ACT CT units (Units 1 through 20). These utilities and service systems include water and wastewater, electrical, fuel oil, and natural gas.

Environmental Consequences
There would be no impacts to usage of potable water and natural gas. Operational activities would result in a potential for improved system reliability and flexibility to integrate renewable energy sources.

Public Health and Safety

Affected Environment

There is access to many emergency services nearby, including hospitals, urgent care, law enforcement, and fire protection services. The closest urgent care is Baptist Urgent Care-Horn Lake, located 14.4 miles from the ACT Plant. The closest hospital is Methodist South Hospital, which is 10.8 miles away from the ACT Plant. Police services are managed by the Memphis police department from their Westwood location. They are located 9.2 miles from the site. Fire protection services are run by the Memphis Fire Station #37, which is located 8.9 miles from the ACT Plant (USGS 2024).

Existing health hazards are associated with emissions and discharges from the ACT Plant and accidental spills/releases at the plant or along the pipelines. An emergency response plan developed to address these potential discharges is discussed with local emergency management agencies.

Environmental Consequences

The operation of the ACT Plant would adhere to TVA guidance and be consistent with standards established by OSHA and applicable state requirements. Therefore, worker and public health and safety during project operation would be maintained and impacts would be minimal.

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Symbols, Acronyms, Abbreviations, and Glossary of Terms

AADT	Annual daily traffic
ACC	Allen Combined Cycle plant
ACS	American community survey
ACT	Allen Combustion Turbine plant
ALF	Allen Fossil plant
Aero	Aeroderivative
BACT	Best available control technology
BMP	Best management practices
C	Celsius
CAA	Clean Air Act
CC	Combined cycle
CCR	Coal combustion residuals
CDC	Community development corporation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CT	Combustion turbine
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibel
EA	Environmental assessment
EIS	Environmental impact statement
EO	Executive order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
GAI	Geographic Area of Interest
GE	General Electric
GHG	Greenhouse gas
HAP	Hazardous air pollutant
HUC	Hydrologic unit code

HUD	U.S. Department of Housing and Urban Development
IMP	Internal monitoring point
IPaC	Information for Planning and Consultation
IRA	Inflation Reduction Act
IRP	Integrated resource plan
IWG	Interagency Working Group
LAER	Lowest achievable emission rate
lb	Pound
Ldn	Day-night sound level
LEP	Limited English proficiency
LOS	Level of service
MLGW	Memphis Light, Gas and Water Division
mmBtu	Metric million British thermal units per hour
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	Nitrogen dioxide
NOI	Notice of Intent
NOx	Oxides of nitrogen
N_2O	Nitrous oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSPS	New Source Performance Standards
NSR	New Source Review
Pb	Lead
PCB	Polychlorinated biphenyl
PM	Particulate matter
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
ROD	Record of Decision
SCC	Social cost of carbon
SC-GHG	Social cost of greenhouse gases
SO2	Sulfur dioxide
SRC	Selective catalytic reduction
SWPPP	Stormwater pollution prevention plan
TDEC	Tennessee Department of Environment and Conservation

TMDL	Total maximum daily limit
tpy	Tons per year
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USC	U.S. Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile organic compound
WMA	Wildlife Management Area
WWTP	Wastewater Treatment Plant

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1. Introduction

The Tennessee Valley Authority (TVA) proposes to construct and operate six new aeroderivative combustion turbine units (Aero CTs) at the Allen Combustion Turbine site (ACT), located in Memphis, Tennessee. The new Aero CTs would generate approximately 200 Megawatts (MW) of dispatchable power to help meet the growing system demand. The new Aero CT units (General Electric [GE] LM2500s) would support fast start dispatching and have synchronous condensing capabilities to improve grid stability. Four of the Aero CT units would have black start capabilities. Under the proposal, TVA would implement the best available control technologies to mitigate air emissions of the new units. Construction would occur over a one-year timeframe (approximately) with construction activities taking place within previously disturbed areas at ACT and adjacent properties. Commercial operations for the new units would begin in 2027.

The new Aero CTs would increase the flexibility and reliability of the TVA power system by improving TVA's transmission system stability in western Tennessee and providing new generation to support the continued system load growth experienced in the TVA power service area over the past few years. The proposal would also facilitate the integration of renewable energy generation onto the TVA bulk transmission system, consistent with TVA's 2019 Integrated Resource Plan (IRP).

TVA has prepared an Environmental Impact Statement (EIS) to analyze the impacts to the human environment, consistent with the requirements of the National Environmental Policy Act (NEPA).

1.2. Background

TVA produces or obtains electricity from a diverse portfolio of energy sources, such as solar, hydroelectric, wind, biomass, fossil fuel, and nuclear. In June 2019, TVA published the 2019 IRP and associated EIS, which were developed with input from stakeholder groups and the public that provides direction on how to best meet future electricity demand (TVA 2019a, 2019b). The IRP is a comprehensive study that provides direction on how to best meet future electricity demand over the next 20 years (TVA 2019a). The IRP evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential resource additions and retirements throughout the TVA power service area. This area encompasses approximately 80,000 square miles covering most of Tennessee and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia. Through the 2019 IRP, the TVA Board adopted the Target Power Supply Mix, which identifies the addition of up to 5,200 MW of simple-cycle gas capacity by 2028 to facilitate the integration of solar onto the TVA bulk power system.

TVA's asset strategy incorporated the strategic direction from the 2019 IRP and supports affordable, reliable, and cleaner energy for the customers TVA serves. The proposed action to be studied in this EIS is one part of the overall asset strategy, which also includes:

- Maintaining the existing low-cost, carbon-free nuclear and hydro fleets
- Retiring aging coal units as they reach the end of their useful life

- Adding up to 10,000 MW of solar by 2035 to meet customer and system needs, complemented with storage
- Using natural gas to enable needed coal retirements and solar expansion as other technologies develop
- Leveraging demand-side options, in partnership with local power companies
- Developing new carbon-free technologies for decarbonization

Using least-cost planning in the development of asset strategy, TVA provides electricity at the lowest feasible rate for customers. Outlined in the asset strategy and formalized in TVA's Strategic Intent and Guiding Principles document (TVA 2021a), approved by the TVA Board of Directors in May 2021, TVA has a plan for 70 percent carbon reduction by 2030, a path to approximately 80 percent carbon reduction by 2035, and aspires to net-zero carbon emissions by 2050, using a 2005 baseline.

TVA anticipates adding about 10,000 MW of solar by 2035, with nearly 3,200 MW already committed, pending environmental review (TVA 2023). TVA is challenged to integrate greater renewable generation onto its system. Solar resources are typically only available on average about 20 to 25 percent of the year, and their availability can vary significantly during daylight hours as cloud cover and precipitation events occur. Given these constraints, solar power must be paired with dispatchable power or battery storage to meet year-round capacity needs. However, battery storage is constrained in that batteries are energy limited (typically providing a 4-hour duration) and are net consumers of electricity. Consequently, while pairing solar resources with the appropriate level of battery storage can compensate for the limited availability of solar power, it adds cost and introduces transmission instability and reliability issues that then must be addressed with transmission system improvements (TVA 2019a).

Since the completion of the 2019 IRP, TVA has seen a strong increase in electric demand. Population has increased in the TVA power service area by 1.5 percent since 2019, and TVA expects continued strong growth in annual electric demand through the middle of this decade. Current system modeling shows that with increased residential migration and commercial development, TVA must add capacity to the system to maintain adequate operating reserves. Peaking units, such as natural gas-fired combustion turbines (CTs), are valuable in meeting electricity demand for shorter periods of high demand on summer and winter peak days, and their flexibility also plays a key role in successfully integrating renewable resources, which have variable and unpredictable generation patterns.

The need for inclusion of natural gas-fired CTs and combined-cycle (CC) turbines in the Target Power Supply Mix is driven by the demand for reliable electricity, the increased amount of solar generation within the system, dispatchable capacity requirements, commodity prices, costs relative to alternative resource options, and transmission system reliability (TVA 2019a). Natural gas-fired CT or CC units can be operated year-round to meet the fluctuating demand on the power system. The inclusion of dispatchable power generation from natural gas-fired CTs and CCs effectively enables systemwide integration of solar while providing critical transmission-related benefits to ensure reliability and power quality (TVA 2019a).

TVA operates 101 natural gas- and fuel oil-fired generators at 17 sites, including nine in Tennessee, five in Mississippi, one in Alabama, and two in Kentucky. Together, these generators have a generation capacity of over 12,000 MW (TVA 2024a). These include 21 natural gas-fueled CC units at eight sites and 87 natural gas-fueled simple-cycle CT units at nine sites (TVA 2019b). Eighty of the simple-cycle CT units are capable of using fuel oil and 60 are capable of fast start up (TVA 2021b). An additional 10 natural gas-fired aero CT units are being constructed at the Johnsonville Reservation (TVA 2022a).

Aeroderivative Combustion Turbines:

Aeroderivative (aero) CT units are highly efficient peaking units that can ramp up very quickly to provide capacity and grid support when needed. Peaking units are essential for maintaining system reliability requirements, as they can startup quickly to meet sudden changes in either demand or supply.

The aero CTs would enhance the reliability of TVA's peaking fleet and promote system flexibility to integrate renewable resources which have variable generation patterns.

While similar to TVA's existing simple-cycle CTs, aero CT units operate like a jet engine where the compressor draws air into the unit, where it is compressed, mixed with fuel, and ignited. As combustion occurs, gas expands through turbine blades connected to a generator to produce electricity. Aero CTs, unlike simple-cycle CTs, provide high cycling capability and fast startup. Additionally, as TVA increases the use of intermittent renewable resources, aero CTs provide excellent control response for better grid support.

TVA's generation network is best when integrating resources that enhance system flexibility, including the option for emergency black-start[2] capabilities, which aid in system restoration following a significant event or disturbance to the bulk electric system. Aero CTs with emergency black-start capabilities allow the aero CT units to be manually started and connected to the grid to help start other generating units and restore electricity to the grid in the event of a widespread power outage. Aero CTs enhance system flexibility, integrate increasing renewable capacity, and provide dispatchable capacity, as they are highly efficient peaking units with fast startup and little startup penalty. The units can quickly achieve full generating capacity from a cold start and allow for multiple daily starts; because of this capability, they improve the system's ability to effectively integrate generation from variable resources, such as solar and wind. Further, aero CTs provide the ability to run in synchronous condensing[3] mode, which can efficiently support local voltage stability near load centers.

In 2019, TVA completed a CT Modernization Study to evaluate the condition of its existing CT units and form recommendations for investments to ensure a reliable and flexible peaking fleet into the future. The results of the study identified the ACT plant's CT units as the "most challenged" based on their age and material condition and recommended that they be replaced. The CT Modernization Study also recommended adding new aero CTs to enhance system flexibility, integrate increasing renewable capacity, and provide dispatchable capacity.

Investments in adding Aero CTs to the peaking fleet aligns with the direction in the IRP, which recommends enhancing system flexibility to integrate renewables and distributed resources, with substantial solar additions over the next two decades. As the amount of solar generation in the TVA generation portfolio continues to increase, flexibility of the remainder of the fleet becomes even more important. For instance, irregular cloud patterns that temporarily block the

[2] "Black-start capable" units are units to which power can be restored without the need to rely on the external electric power transmission system.

[3] Keeping power flowing steadily across the grid requires inertia, or a resistance to fast changes in the amount of power being generated. TVA needs this inertia during a disturbance like a lightning strike or at other times when fluctuations in generation occur. The inertia is created by large spinning turbines and generators. As TVA retires some of its large spinning assets and replaces them with non-spinning generation sources such as solar, the inertia can be retained by adding synchronous condenser capabilities. Essentially, synchronous condensers spin similarly to an operating generator, but instead of producing actual power, they spin to create the inertia needed for grid stability. After their initial start, there are no emissions during this mode of operation.

sun and reduce solar generation require other generating units to respond to continue to reliably supply power to customers. Aero CTs are inherently well-suited to provide flexibility, enabling the remainder of the system to better integrate renewables.

In June 2021, TVA issued an environmental assessment (EA) addressing the retirement of most of the CT units at Allen. TVA's Paradise and Colbert Combustion Turbine EA and an associated finding of no significant impact addressed the retirement of CT units at its Allen and Johnsonville plants and the replacement of capacity lost with new CT units at TVA's Paradise and Colbert plants. TVA concluded that implementing retirement of CT units at Allen and Johnsonville and construction of new CT units at Paradise and Colbert would not be a major federal action significantly affecting the environment. TVA stated in the EA that it would continue to operate a few CT units at Allen for the foreseeable future for limited purposes. In December 2022, during Winter Storm Elliott, 16 of the CT units at Allen failed to start, impacting the TVA system grid availability by 240 MW. Since this event, the CT units at Allen have ceased operations. Only two units (units 19 and 20) are operable at this time; these units are operated on a limited basis.

In September 2023, TVA completed an environmental review of the demolition and removal of 16 existing CT units at the ACT site. The determination that the units should be demolished and removed originated under the development of the Paradise and Colbert Combustion Turbine EA in 2021. TVA has determined that removal of the units had independent utility and was necessary regardless of future actions or use of the site. The demolition and removal of the units are considered as a cumulative action relevant to the environmental review of this proposed action.

1.3. Purpose and Need

TVA is proposing the addition of six new natural gas-fired aero CT units at the ACT Plant to generate approximately 200 MW of dispatchable power to help meet the growing system demand and load growth experienced in the TVA power service area over the past few years. The proposal would also increase the flexibility and reliability of the TVA power system by improving TVA's transmission system stability in western Tennessee. These improvements would help TVA to expand and integrate renewable energy resources onto its transmission grid.

As set forth in TVA's 2019 Integrated Resource Plan, TVA needs flexible, dispatchable power to meet required year-round generation and maximum capacity system demands and planning reserve margin targets. Dispatchable power is also needed to successfully integrate increasing amounts of renewable energy sources. Dispatchable synchronous condensing capabilities are known to address vulnerabilities to voltage instability that may result from increased renewable generation in the region. Reliability of the system would also be improved by generation sources with black start capabilities that can support system restoration in the event of a system failure.

1.4. Decision to be Made

This EIS has been prepared to inform TVA decision-makers and the public about the environmental consequences of the proposed action. The decision TVA must make is whether to construct and operate aero CTs at the ACT Plant. TVA will use this EIS to support the decision-making process. TVA's decision will consider factors such as potential environmental impacts, economic issues, and TVA's long-term goals.

1.5. Related Environmental Reviews

TVA has been operating at or within the vicinity of the ACT Plant for decades. Currently, TVA operates the Allen Combined Cycle (ACC) Plant on a property south of the ACT Plant and is conducting extensive decontamination and deconstruction activities on the site of the former Allen Fossil Plant (ALF), adjacent to the ACT Plant. Management of the coal combustion residuals (CCR) on nearby lands is ongoing. These activities have been the subject of several environmental reviews over the past decade.

Related environmental documents and material concerning this EIS were reviewed and are listed below. The contents of these documents helped to support the proposed action or describe the affected environment and are incorporated by reference as appropriate.

- TVA Integrated Resource Plan and Environmental Impact Statement (June 2019). As noted above, in June 2019, TVA released its IRP, which evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential resource additions and retirements throughout the TVA power service area. In the final IRP, TVA identified a Target Power Supply Mix that was adopted by the TVA Board in August 2019. The Target Power Supply Mix included the addition of up to 5,200 MW of CTs by 2028, and up to 8,600 MW of CTs by 2038 (TVA 2019a, 2019b).[4] The proposed actions evaluated in this EIS support TVA's Preferred Alternative and the Target Power Supply Mix, as described in the IRP and accompanying EIS.

- Paradise and Colbert Combustion Turbine Environmental Assessment (EA) (June 2021). TVA issued this EA addressing the retirement of CT units at ACT and Johnsonville Plants and the replacement of the capacity lost with new CT units at its Paradise and Colbert plants (TVA 2021b).

- Allen Fossil Plant Ash Impoundment Closure Final Environmental Impact Statement (EIS) (March 2020). This EIS addressed TVA's closure of the surface impoundments at ALF and how to dispose of CCR removed from the impoundments under the "closure-by-removal" option. This project supports TVA's goals to eliminate all wet CCR storage at its coal plants by closing CCR surface impoundments across the TVA system and to assist TVA in complying with the CCR Rule of the U.S. Environmental Protection Agency (EPA). Under both closure alternatives analyzed in the EIS, TVA would transport CCR to an off-site existing, permitted landfill and would transport borrow materials to ALF from an existing, permitted off-site source for site restoration. A Record of Decision (ROD) was released on April 21, 2020 (TVA 2020).

- Allen Fossil Plant Decontamination and Deconstruction Final Environmental Assessment (EA) (October 2019). This EA evaluates the disposition of the buildings and structures at ALF that are no longer needed for their original purpose of power generation. TVA's proposal addressed in this EA was the full demolition to grade, resulting in a brownfield site. Implementation of this alternative addressed the purpose and need of the project to

[4] TVA is in the process of developing a new IRP. TVA's past practice has been to evaluate its IRPs every 4 to 5 years. Accordingly, in May 2023, TVA published a Notice of Intent in the Federal Register announcing its plans to prepare an EIS associated with the implementation of the 2025 IRP. The draft 2025 IRP and EIS was published by TVA in September 2024, and a final 2025 IRP and EIS is expected in 2025. TVA has reviewed the 2019 IRP and associated EIS and determined that it remains valid and guides future generation planning consistent with least-cost planning principles.

enhance future economic development in the area and avoids the potential environmental and public safety impacts associated with leaving the ALF in the “as-is” condition (TVA 2019c).

- Final Ash Impoundment Closure Programmatic Environmental Impact Statement (June 2016). The Programmatic EIS was prepared to address the closure of CCR impoundments at all of TVA’s coal-fired power plants. The report consists of two parts: Part I – Programmatic NEPA Review and Part II – Site-Specific NEPA Review. In Part I, TVA programmatically considers environmental effects of closure of ash impoundments using two closure methods: (1) closure-by-removal and (2) closure-in-place (TVA 2016a). Part II includes a site-specific NEPA review of closure of the West Ash Pond at the ALF by closing the ash pond in-place (TVA 2016b).

- Allen Fossil Plant Emission Control Project Environmental Assessment (August 2014). This EA evaluates the impacts of reducing sulfur dioxide emissions at the ALF by retiring the coal units and constructing a natural gas-fired power plant (the ACC). The reduction in sulfur dioxide emissions at the plant helped TVA comply with the EPA Clean Air Agreements consistent with TVA’s mission to provide reliable and affordable power (TVA 2014).

- Categorical Exclusion Checklist #50077 (September 2023). TVA completed a categorical exclusion environmental review of the demolition and removal of 16 CT units at the ACT Plant. The determination that the units should be demolished and removed originated under the development of the Paradise and Colbert Combustion Turbine EA in 2021. TVA has determined that removal of the units had independent utility and was necessary regardless of future actions and use of the area.

1.6. Scoping and Public Involvement

1.6.1. Scope of the Environmental Impact Statement and Summary of the Proposed Action

This EIS evaluates the potential environmental and socioeconomic impacts of the proposed construction and operation of aero CTs at the ACT Plant. A detailed description of the proposed action and alternatives considered are provided in Chapter 2.

The impacts associated with the retirement and decommissioning of CT units at the ACT Plant were analyzed in the 2021 Paradise and Colbert Combustion Turbine Plants Final EA and are incorporated by reference into the current EIS. As long-term actions related to the demolition of those units are under development, the demolition will be addressed as a reasonably foreseeable cumulative action considered during the environmental review of this proposed action.

The scope of this EIS focuses on the impacts related to construction and operation of aero CT units. Consistent with NEPA, TVA has considered the effects of its proposed action and all reasonable alternatives that are technically and economically feasible and meet the purpose and need of the proposed action. TVA determined that potential effects to the environmental resources listed below were relevant to the decision to be made:

- Air Quality
- Climate Change and Greenhouse Gases
- Groundwater
- Surface Water
- Wildlife
- Threatened and Endangered Species
- Transportation
- Natural Areas
- Noise
- Solid and Hazardous Waste
- Socioeconomics
- Utilities
- Public Health and Safety

TVA's preliminary analysis identified the following resources as not being affected by the proposed action. These resources are therefore eliminated from further review in this EIS.

- Land use – Proposed activities would occur on previously disturbed land located within the existing ALF, ACT Plant, and ACC Plant. Therefore, no changes in land use are anticipated as a result of implementation of the proposed action, and this resource is not evaluated any further in this EIS.

- Prime Farmland – There are no prime farmland soils mapped within the permanent and temporary use areas within the existing ALF, ACT Plant, and ACC Plant. Therefore, there would be no impacts to prime farmland soils, and this resource is not evaluated any further in this EIS. Accordingly, completion of Form AD 1006 and consultation on prime farmland is not required (Farmland Protection Policy Act, 7 U.S. Code [USC] 4201).

- Geology and Soils – The ACT Plant and surrounding areas are underlain by artificial fill and Quaternary age alluvial deposits (Stantec 2019a). According to the Natural Resources Conservation Service (NRCS) web soil survey (USDA NRCS 2024), most soils within the existing ALF, ACT Plant, and ACC Plant are mapped as filled land. Depth of excavation from construction is approximately 5 feet below ground, with pile driving to not exceed 75 feet below ground. Therefore, there is no impact to geology and soils from the proposed action, and this resource is not evaluated any further in this EIS.

- Vegetation – The plants and surrounding areas comprise the disturbed land located within the existing ALF, ACT Plant, and ACC Plant. Due to the history of infrastructure development and industrial use of the site, any vegetation is anticipated to be low quality and routinely disturbed. Therefore, no impacts or changes to vegetation are anticipated as a result of the proposed action, and this resource is not evaluated any further in this EIS.

- Wetlands – Based on a review of the National Wetlands Inventory mapping and recent aerial photography from April 2023 along with field surveys conducted in February 2024, the proposed project area (defined in Section 2.2.2) within the existing ALF, ACT Plant, and ACC Plant does not contain any wetlands as it has previously been heavily disturbed and developed. Therefore, no changes to wetlands are anticipated as a result of the proposed action, the proposed action is consistent with EO 11990, and this resource is not evaluated any further in this EIS.

- Floodplains – The ACT is located on the southern shore of McKellar Lake between McKellar Lake miles 1.4 and 2.1. According to Profile 75P of the 2013 Shelby County Flood Insurance Study, the 100-year flood elevation on McKellar Lake would be 225.0 feet above mean sea level and the 500-year flood elevation would be 230.5 feet above mean sea level (TVA

2014). Based on Shelby County, Tennessee, FEMA Flood Insurance Rate Map Panel 47157C0385F, effective 9/28/2007, the permanent and temporary use area within the existing ALF and ACT Plant north of Riverport Road are identified as being located outside the 100-year floodplain of McKellar Lake and outside the boundary of the Ensley Levee. The permanent and temporary use areas within the existing ACC Plant are also located outside of the 100-year floodplain but within an area with reduced flood risk due to the Ensley Levee. Therefore, TVA's Proposed Action would result in no direct impact to floodplains and would therefore be consistent with Executive Order (EO) 11988, Floodplain Management, and this resource is not evaluated any further in this EIS.

- Aquatic Ecology – Through planning and siting efforts, TVA has been able to site the proposed temporary and permanent use areas in previously developed and disturbed locations within the existing ALF, ACT Plant, and ACC Plant site areas to avoid impacts to aquatic ecology. Impacts to aquatic biota associated with the proposed action are not anticipated, and therefore this resource is not evaluated any further in this EIS.

- Visual Resources – As detailed in previous NEPA documents (see Section 1.4), there are no sensitive viewing receptors within the foreground (i.e., within 0.5 mile) of the ACT Plant. Additionally, the nearest residence is located over 1.0 mile southeast. Views of the ACT Plant are generally limited to employees, contractors, and visitors to the plant. The forested bluff line and terrain are anticipated to limit the visibility of the proposed action by residents southeast of the ACT Plant. Additionally, existing CT units are located within ACT Plant; therefore, no new permanent visual discord is added as a result of the proposed action, and this resource is not evaluated any further in this EIS.

- Cultural and Historic Resources – Nearly the entirety of the permanent and temporary use areas within the existing ALF, ACT Plant, and ACC Plant are covered with asphalt, concrete, or buildings, making it impossible to investigate using conventional survey techniques. Previous cultural and historic resources investigations have occurred at the ALF, ACT Plant, and ACC Plant, and no archaeological sites have been identified. Additionally, ALF has been deemed ineligible for inclusion on the National Register of Historic Places (NRHP). Therefore, there is no effect to cultural and historic resources, and this resource is not evaluated any further in this EIS. TVA consulted with the Tennessee State Historic Preservation Officer (SHPO) and federally recognized Indian tribes on these findings. In May 2024, the Tennessee SHPO and one Indian tribe provided concurrence with TVA's determination that no historic properties eligible for listing in the NRHP would be affected by the proposal (see Appendix B).

- Recreation – There are no local parks or developed recreation facilities within the permanent and temporary use areas; therefore, there would be no direct impacts from construction or operations of the proposed action. Given the temporary nature of construction activities and the fact that operational activities are contained within the Allen Reservation, indirect impacts from these activities are expected to be negligible. Therefore, there would be no direct impact to parks or developed recreational areas, and this resource is not evaluated any further in this EIS.

1.6.2. Scoping and Public and Interagency Involvement

Prior to the Allen Aeros CT project, TVA has had extensive community involvement in the areas near the ACT Plant through public outreach associated with the decommissioning and demolition of the ALF and the associated ash impoundment closure. Over more than 6 years, TVA has held over 300 public engagements in the area that range from public information sessions; open house meetings; meetings with elected leaders, community stakeholders, non-governmental organization (NGO) representatives, and business leaders; hosting tours of the Allen Fossil Plant site under restoration; attending and participating at neighborhood association meetings; hosting booths at community festivals and events; supporting community-led events such as local school drives and various service days for local churches and organizations; and partnering with a neighborhood association's adopt-a-highway program. Through these ongoing outreach efforts, TVA has built relationships with local organizers and community development corporations (CDCs) and gained insight into the concerns of local residents. This ongoing outreach informs the outreach for the Allen Aeros CT project.

On October 12, 2023, TVA published a Notice of Intent (NOI) announcing plans to conduct an environmental study to assess the potential environmental effects associated with the proposed construction and operation of six new aero CT units at the ACT Plant near Memphis, Tennessee. Publication of the NOI initiated a 30-day public scoping period. TVA solicited public input on the scope of the NEPA review, alternatives that should be considered, and environmental issues that should be reviewed in detail in the study. In addition to public input, TVA invited members of the public as well as federal, state, and local agencies and federally recognized Tribes to comment on the scope of the NEPA review.

TVA sent notification of the NOI via email to federal, state, and local government entities and other stakeholders. TVA published notices regarding the NOI in *The Daily Memphian* and *Tri-State Defender* newspapers. TVA also created a web page with information about this project and opportunity for public input at https://www.tva.com/allenct. The website included the NOI, information about two public events planned by TVA, and an online comment form that the public could use to submit input.

On October 24, 2023, TVA held an in-person scoping open house at the Mount Vernon Baptist Church in Memphis. Approximately 35 people attended the open house, including representatives from NGOs (Protect Our Aquifer, Tennessee Interfaith Power and Light, Respect the Haven CDC, and the Westwood-Indian Hills and Neighboring Developments CDC), State Senator London Lamar (Tennessee, District 33), and staff from the offices of both U.S. Senators representing Tennessee (Senators Blackburn and Hagerty). TVA provided information on the proposed action in handouts and displayed on poster boards placed throughout the meeting room, while TVA staff were present to answer questions from the public. Two written comments were provided to TVA at this event.

On November 2, 2023, TVA hosted a virtual public meeting/webinar that included a presentation about the proposed action and a question-and-answer session during which attendees could submit questions to the TVA panel. The webinar was attended by 14 members of the public and representatives of NGOs.

On November 11, 2023, prior to the end of the public scoping period, TVA partnered with the Westwood-Indian Hills and Neighboring Developments CDC (WIND Memphis) to host a community event to raise awareness about the project and public comment period and to answer questions from community members. Approximately 100 people attended the community event.

During the scoping period, TVA received comments from three Federal agencies, one State of Tennessee agency, six NGOs, and almost 200 members of the public. Comments were related to the purpose and need, the no action alternative, renewable energy alternatives, Inflation Reduction Act incentives, and potential adverse effects to air quality, public health, water resources, greenhouse gas emissions, socioeconomics, transportation, and noise. In December 2024, TVA published a Scoping Report that summarizes the input received during the public scoping period. The report was posted on the project webpage and is included in this EIS in Appendix A.

In its NOI, TVA described the scope of the environmental review to include the continued operation of existing Allen CT units 19 and 20. During the scoping period and through additional internal project screening, TVA determined that the continued operations of the units are adequately addressed in its previous EA (TVA 2021b). Therefore, the EIS will address the operations of units 19 and 20 as activities relevant to the cumulative impact analysis.

1.7. Necessary Permits, Licenses, and Consultations

TVA will obtain all necessary permits, licenses, and approvals required for the alternative selected. TVA anticipates the following may be required for implementing the proposed alternatives:

- Air Construction Permit and Title V operating Permit via Prevention of Significant Deterioration (PSD) review under the CAA.
- Permits associated with disposal of sewage and sanitary wastewater into the Memphis Municipal Waste System.
- Aboveground storage tank registrations and permit updates provided the tanks are modified.
- Oil Spill Prevention, Control, and Countermeasure Plan or Integrated Pollution Prevention and Spill Response Plan modifications to reflect new aero CTs at the ACT Plant.
- Stormwater best management practices (BMPs) and Tennessee Department of Environment and Conservation (TDEC) National Pollutant Discharge Elimination System (NPDES) permit application and/or modification for all stormwater discharges associated with construction activity that disturbs more than one acre of land.
- TDEC NPDES permit application or modification of the existing City of Memphis Industrial Wastewater Discharge Permit for discharges from the operation of new proposed aero CTs at the ACT Plant.

CHAPTER 2 - ALTERNATIVES

This chapter describes the alternatives analyzed in this EIS, summarizes the environmental impacts associated with each alternative, identifies potential mitigation measures, and presents the Proposed Action.

2.1. Description of Alternatives

2.1.1. Generation Type

As described in Chapter 1, the 2019 IRP Target Power Supply Mix includes the addition of new natural gas-fired CTs and CCs to enhance system flexibility and integrate renewables and distributed resources, particularly solar generation. Aero CTs with black-start capabilities and dispatchable synchronous condensing capabilities address vulnerabilities to voltage instability that may result from increased renewable generation in the TVA power system. These recommendations would lessen the burden on the remainder of the system as renewable energy resources, such as solar, are integrated.

Currently, the combination of renewable energy and storage technologies cannot provide the same magnitude of reliable and cost-effective energy year-round as is possible with CTs in combination with renewables. While solar prices are becoming competitive, solar does not address the daily winter peak demand, which typically occurs just before sunrise. Therefore, solar requires dispatchable resources, such as peaking gas generation, to support the winter peak. Wind resources do contribute to both summer and winter peak capacity (less than one-third of nameplate or maximum rated output), but they are typically more expensive due to low regional wind speeds or high transmission costs. TVA recognizes the value that both short- and long-duration storage technologies will play in the future and is monitoring the technology costs and working to gain operational experience with battery storage technology.

2.1.2. Location

During initial project planning, TVA considered a range of alternatives and specific screening criteria with respect to the proposed action. Candidate sites were identified based on a desktop review of land parcels located in proximity to existing transmission facilities and near existing natural gas supply. Initial site screening results were further evaluated using the criteria summarized in Table 2-1.

Table 2-1. Summary of Criteria Evaluated to Determine the Location of the Aero Combustion Turbines

Transmission	Site Considerations	Operational Considerations
• System upgrades needed • Locational value	• TVA-owned vs. non-TVA-owned sites • Site availability (available for purchase) • Land cost • Access to water	• Supply chain considerations • Staffing
Fuel Supply	**Environmental Considerations**	**Financial and Planning Considerations**
• Cost • Availability • Reliability • Operational considerations	• Environmental regulations • Sensitive environmental/cultural resources present	• Long-range financial planning • Integrated resource plan

Based on evaluation of the screening criteria and the 2019 IRP, TVA proposed to construct new aero CTs at the ACT Plant. This location offers several advantages to alternative locations:

- The construction footprint for the new units would allow the aero CTs to be built on previously disturbed land within existing TVA property, as opposed to requiring the purchase or use of greenfield property to locate the new units.
- The existing natural gas infrastructure on the ACT that support the existing CT units could be used to support the additional proposed aero CT units.
- Regional need for black-start dispatchable generation to support continued system load growth, especially in improving TVA's system transmission stability in western Tennessee.
- Proximity of the ACT to load centers in Memphis make this site increasingly attractive for aero CTs, which offer synchronous condensing capabilities for area grid support.
- Throughout the operational history of ACT and adjacent ALF, extensive environmental reviews have been conducted, which provide a level of confidence, for initial screening purposes, that there is a low potential for impacting sensitive environmental resources.

2.2. Description of the Alternatives

2.2.1. Alternative A – The No Action Alternative

Under the No Action Alternative, TVA would not construct six new aero CT units or the associated support facilities to provide generation of approximately 200 MW at the ACT Plant. TVA would continue to operate two existing units (units 19 and 20) at the ACT Plant on a limited basis, consistent with the 2021 Paradise and Colbert Combustion Turbine EA. This alternative does not meet the purpose and need of TVA's proposed action. Without the additional generation capacity, TVA would be obligated to meet generation demand by acquiring the power from other generation sources. Consistent with the requirements of NEPA, the No Action

Alternative is included in this evaluation as it represents current baseline conditions against which the Action Alternative would be compared.

2.2.2. Alternative B – Allen Aeroderivative Project

Under Alternative B, TVA's Proposed Action, TVA would construct and operate six aero CT units (GE LM2500s) generating approximately 200 MW of power and associated support facilities. At least four of the new aero CT units would have black-start capability, meaning the ability to restore power without needing to rely on the external electric power transmission system. The new units would support fast startup dispatching and synchronous condensing for transmission system stability in western Tennessee and would improve TVA's ability to further expand renewable energy.

The overall ACT project area (project area) consists of approximately 60 acres of mostly heavily disturbed land located within the retired ALF and existing ACT and ACC Plant footprints (Figure 2-1). The entirety of this project area would not be affected by project activities; however, final locations for laydown yard, parking, construction trailers, etc., are dependent upon final design. Construction of the aero CTs and associated support facilities are expected to begin in 2025 and would take approximately 15 months. Commercial operation would begin in 2027. Actions associated with implementation of this alternative are described below.

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, tracked cranes, and bulldozers. Low ground-pressure-type equipment (for example, tracked vehicles) would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts per TVA BMPs. TVA estimates a maximum of 200 workers would be employed on site at the peak of the approximately 15-month construction period.

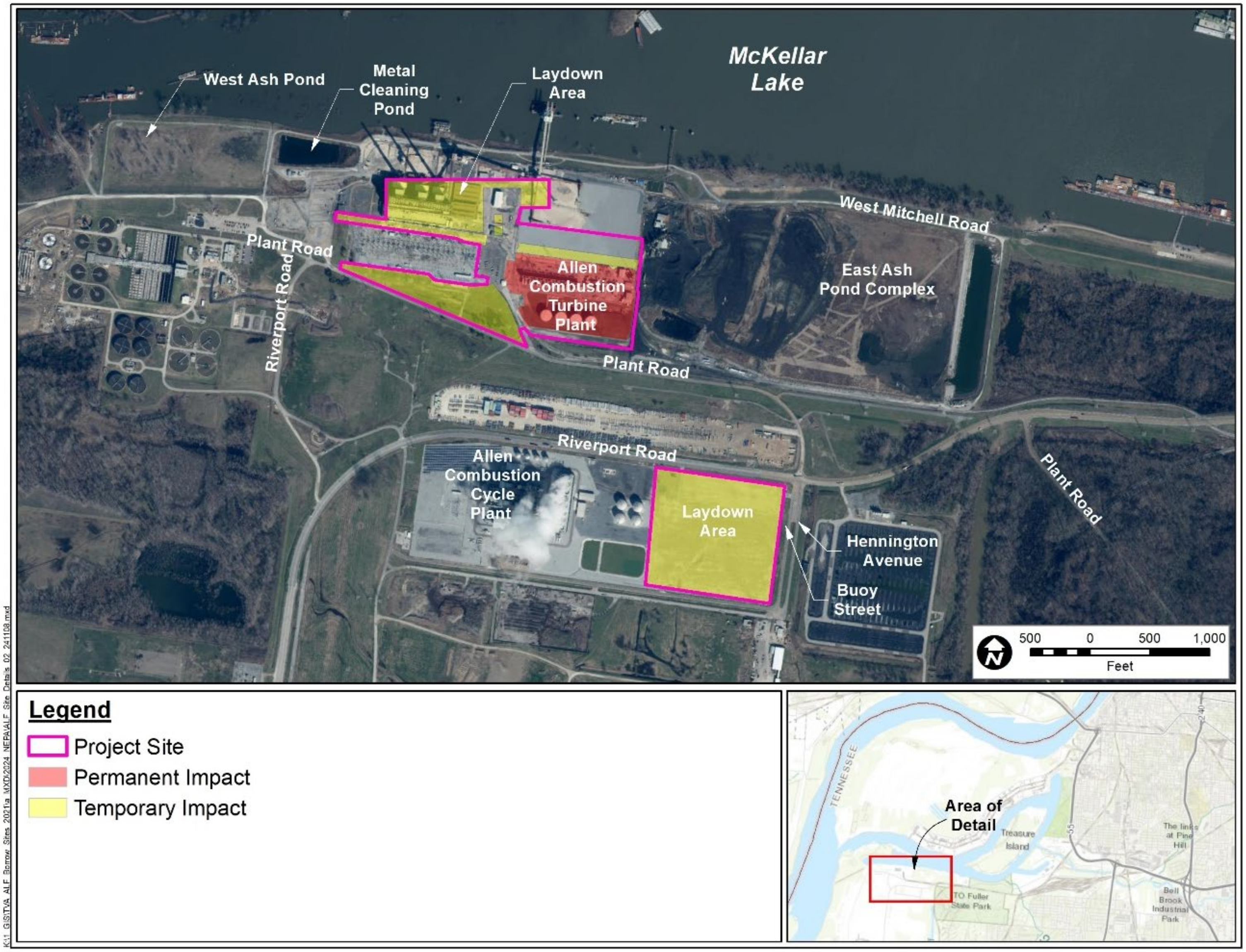

Figure 2-1. Map of Allen Aeroderivative Project

2.2.2.1. Construction of Aero CTs

TVA would construct six new aero CTs (Figure 2-2) with inlet evaporative cooling within the boundaries of the ACT Plant as shown in Figure 2-1. Subsurface piles would be driven to a depth of 75 feet to support foundations for plant components, as required. Shallow excavation up to 5 feet in depth is expected in the form of trenching and excavation. In addition to these major equipment systems, the ACT Plant would include plant equipment and systems, such as natural gas metering and handling systems; instrumentation and control systems; transformers; and administration and warehouse/maintenance buildings. At full buildout, the aero CTs would occupy approximately 14 acres of the 60-acre project area.

2.2.2.2. Construction of Supporting Facilities

Alternative B would also include a number of activities to support the construction and operation of the new aero CT units, including, but not limited to:

- The creation of a laydown area for construction support actions (e.g., storage, parking, material management) adjacent to ACT Plant.
- Estimated need of approximately 8,000 cubic yards of borrow material (to be obtained from existing developed permitted borrow sites within a 30-mile radius of the ACT Plant).
- Installation of two ultra-low sulfur diesel (USLD) generators in support of the four black-start units.
- Upgrades to existing natural gas infrastructure to improve gas regulation and shutoff.
- Installation of new compressed air skid.
- Installation of new ammonia unloading, storage, and delivery system.
- Replacement of station service transformers.
- Improvements to the existing physical security at the site.

In addition to the major equipment systems, the proposed action may include other minor improvements to plant equipment and systems necessary to operate the new units and continue operation of the two existing units.

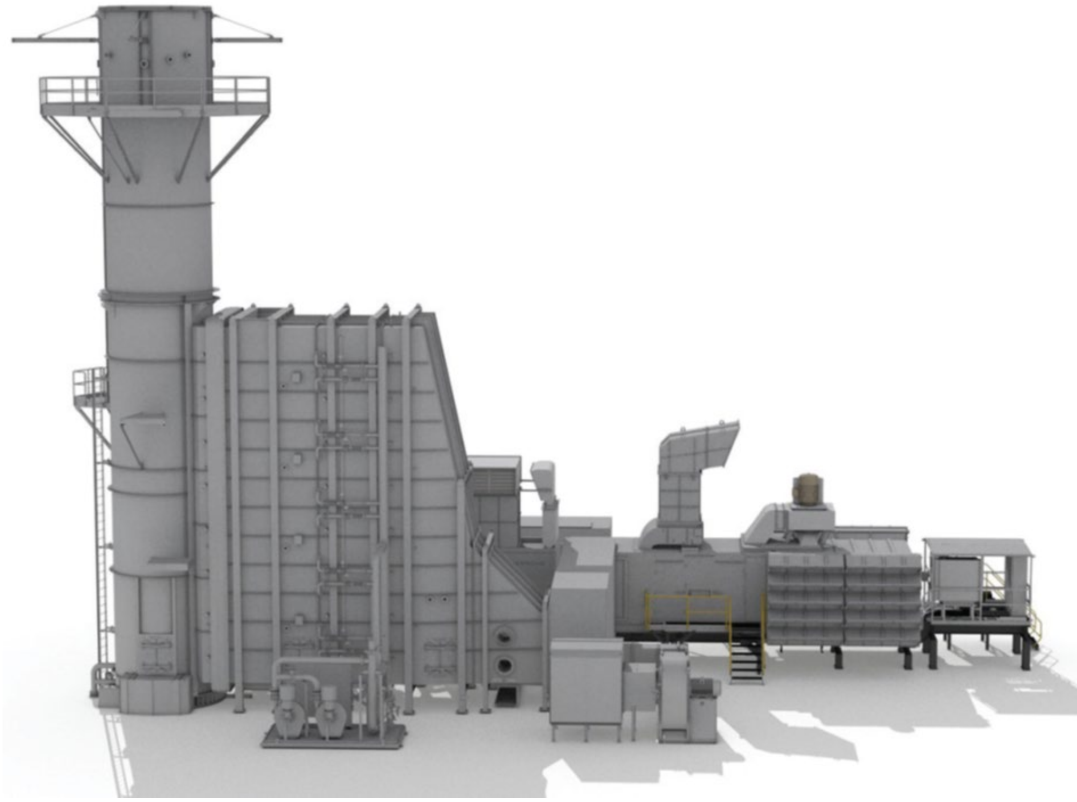

Figure 2-2. Aeroderivative Combustion Turbine

2.2.2.3. Operation of the Aero Combustion Turbines

The following activities are associated with the long-term operations of the CT units:

- *Air Emission Controls and Monitoring:* Alternative B would require installation of control systems to minimize and monitor air emissions of the new aero CT units. Operating the aero CTs would require emission monitoring and controls. Reduction of emissions of oxides of nitrogen (NOx) from each aero CT would be achieved through a dry-low emissions combustion system and a selective catalytic reduction (SCR) system. SCR uses aqueous ammonia and requires TVA to install an independent storage/receiving system. Reduction of carbon monoxide (CO) and volatile organic compounds (VOCs) would be achieved using a separate catalyst layer. Exhaust stacks would be equipped with continuous emissions monitoring systems. TVA's Title V/PSD permit application, which is required under local and federal regulations and submitted separately, would be completed prior to the beginning of construction.
- *Potable Water*: The operation of the ACT Plant would require approximately 58 gallons per minute of potable water, which would be obtained from the existing public supply, to be used for inlet air evaporative cooling in summer ambient temperatures. Some water treatment may be required to support the ACT Plant. The process water would be pre-treated as required and will discharge to a permitted publicly owned treatment works outfall.
- *Natural Gas Supply*: The ACT Plant would continue to be fueled by the existing supply of natural gas. The proposed aero CTs would use an existing gas line currently located at the ACT Plant.

- *Fuel Oil*: Petroleum fuel would be used to operate the proposed black-start diesel generators during a blackout to provide the necessary power to reactivate the power grid. To reduce air emissions, petroleum fuel would not be used to operate the six proposed aero CT units.
- *Transmission:* TVA completed a system impact study to determine that no new transmission corridors or transmission infrastructure upgrades would be required. Minor telecommunications modifications may be required. The study also confirmed that non-TVA systems would not be affected.

2.2.3. Alternatives Considered but Eliminated from Further Discussion

To meet the purpose and need of the project, generation alternatives must be capable of providing year-round peak capacity as well as serving energy needs and, therefore, must be mature, proven technologies. As described above in Chapter 1, the 2019 IRP recommended that TVA add new aero CTs to the fleet in the near term to enhance system flexibility, integrate increasing renewable capacity, and provide dispatchable capacity, which would lessen the burden on the remainder of the system as renewable energy resources, such as solar, are integrated.

TVA plans to add up to 10,000 MW of solar generation in place by 2035 to meet customer demands and system needs and is currently in the process of reviewing numerous solar generation projects in the southwest region of its power service area. Integrating this number of intermittent resources requires a flexible generation fleet that is capable of ramping up and down quickly to cover gaps in renewable generation.

Currently, the combination of renewable energy and storage cannot provide the same magnitude of reliable and cost-effective energy year-round as is possible with CTs in combination with renewables. While solar prices are becoming competitive, solar does not contribute to meeting the winter peak, which typically occurs just before sunrise. Therefore, solar requires dispatchable resources, such as peaking gas generation, to support the winter peak. Wind resources do contribute to both summer and winter peak capacity (less than one-third of nameplate or maximum rated output), but they are typically more expensive due to low regional wind speeds or high transmission costs. TVA recognizes the value that both short- and long-duration storage technologies will play in the future and is monitoring the technology costs and working to gain operational experience with battery storage technology. Table 2-2 discusses the resources options TVA considered to meet the need for generation alternatives.

Table 2-2. Alternative Generation Resource Evaluations

Resource Option	Considerations
Utility and/or Distributed Scale PV Solar	Not dispatchable, and generation is intermittent; therefore, must be paired with dispatchable resources such as storage or gas. Does not meet the purpose and need of the proposed action; however, TVA is pursuing this option under other TVA programs, including in areas near the project area.
Demand Response	Well positioned to play a role in absorbing load growth resulting from increased electrification of the economy and allows TVA to offset physical capacity needs; however, they are limited in the number of calls available and would not meet the purpose and need of this project.
Energy Efficiency	Well positioned to play a role in absorbing load growth resulting from increased electrification of the economy; however, energy efficiency programs take time to scale and market, increasing costs at the high penetration levels required to meet the needs of this action. This alternative is currently being studied by TVA for further evaluation and potential future deployment.
In and/or Out of Valley Wind	Can provide dependable capacity in both summer and winter, though not dispatchable, and generation is intermittent; therefore, it must be paired with dispatchable resources such as storage or gas. Was not selected due to low wind speeds in Tennessee Valley and higher transmission costs for out-of-valley wind, both of which increase relative costs.
Small Modular Reactors	Potential to serve cost-effective baseload or load following needs in the future with low fuel costs, carbon-free generation, advanced passive safety systems, and anticipated cost reductions achieved by assembling components in a factory setting; however, longer deployment timeline and first-of-a-kind deployment risks are incompatible with the purpose and need for this project. This alternative is currently being studied by TVA for further evaluation and potential future deployment.
Hydro Pumped Storage	Long-duration storage that is currently being studied by TVA for further evaluation and potential deployment in the 2030s. Longer timelines to meet environmental requirements and for construction are incompatible with purpose and need for this project.
BESS	Provides dispatchable generation if combined with solar or other generation to meet load growth. While BESS/solar combinations are being pursued under other TVA programs, they are incompatible with the purpose and need for this project.
Distributed Energy Resources	Does not meet the need for firm dispatchable generation identified in the Power Supply Plan. Considered in the 2019 IRP as part of TVA's overall strategy but would not meet the needs of this project because the cost for distributed generation is generally higher than utility-scale generation for the same type of resource.

Key: BESS = battery energy storage system; PV = photovoltaic

TVA considered these renewable technologies in the 2019 IRP, which recommended enhancing system flexibility to integrate renewables and distributed resources. In the 2019 IRP, TVA identified the natural gas fleet (including CTs) as playing a critical role in providing the flexibility needed to integrate renewable energy generation and promote distributed energy resources.

TVA is balancing the pace of its clean energy transition with the obligation to provide low-cost, reliable, and resilient power. TVA's asset strategy incorporates the strategic direction from the 2019 IRP and continues to support low-cost, reliable, and cleaner energy for the customers TVA serves. The Action Alternative studied as part of this EIS is one piece of the overall asset strategy, which also includes:

- Maintaining the existing low-cost, carbon-free nuclear and hydro fleets.
- Retiring aging coal units as they reach the end of their useful life, expected by 2035.
- Adding up to 10,000 MW of solar by 2035 to meet customer and system needs, complemented with storage.
- Using natural gas to enable needed coal retirements and solar expansion as other technologies develop.
- Leveraging demand-side options, in partnership with local power companies.
- Partnering to develop new carbon-free technologies for deeper decarbonization.

The investments to modernize the natural gas fleet, including the addition of aero CTs at Allen, enables the retirements of older coal-fired units with higher carbon intensity, enables greater levels of renewables on the system, and provides reliability support as TVA integrates intermittent renewable generation to the system. Reduction in carbon emissions is a key beneficial result of TVA's overall asset strategy.

The IRA of 2022 (Public Law 117–169) may improve the cost and availability of renewable and storage resources in the long term. Short-term effects immediately following the IRA resulted in increased demand, higher prices, and a limited supply of resources needed for renewable technologies. While the IRA incentivizes the transition of the solar supply chain, it may take 3 to 5 years for the domestic supply chain to mature and ease the current constraints on the solar industry. Even with the incentives of the IRA, there remain many challenges with the development of solar facilities in the near term; mainly the availability of labor and high-voltage equipment would continue to limit buildout through 2025 (SEIA 2024). While the provisions of the IRA provide substantial incentives for various forms of clean energy, TVA's generation decisions are driven by a number of factors and timing constraints. TVA is optimistic that the IRA will enable faster adoption of renewable resources in the long term and is continuing in its efforts to implement up to 10,000 MW of solar by 2035; however, enactment of the IRA does not alleviate the need for dispatchable power or alleviate the transmission-related time constraints for solar generation and energy storage facilities.

2.3. Comparison of Alternatives

The environmental impacts of each of the alternatives under consideration are summarized in Table 2-3. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

Table 2-3. Summary and Comparison of Alternatives by Resource Area

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
Air Quality	No air emissions associated with construction and operation of new aero CT units at Allen.	Temporary minor construction impacts associated with emissions from on-site vehicles and equipment as well as generation of fugitive dust. Operation of the aero CTs would result in an incremental increase in criteria pollutant emissions as measured against the current baseline. Emissions are

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
		minimized using state-of-the-art emission control technology. Operational air quality emissions are moderate because they are noticeable but are not destabilizing. These emissions would be monitored and would comply with permit limits and maintain regional air quality.
Climate Change and GHGs	No GHG emissions associated with construction and operation of new aero CT units at Allen.	Temporary negligible GHG emissions during construction activities. Operation of the ACT Plant would result in a predicted direct increase of 107,268 metric tons of carbon dioxide equivalents per year and a maximum direct increase of 401,800 metric tons of carbon dioxide equivalents per year. The proposal would result in a social cost of GHGs (SC-GHG) estimated to range from $425,531 to $2,978,714 annually. Relative to global GHG levels and potential effects on climate change, these contributions are negligible. As such, impacts from Alternative B on climate change and GHG emissions would be minor. Implementation of the Proposed Action Alternative would allow for future system flexibility which would allow for successful integration of renewables
Groundwater	No impact	Minor impacts to groundwater minimized with the use of BMPs.
Surface Water Resources	No impact	Temporary, minor impacts to surface waters associated with sedimentation from stormwater runoff during construction activities. Impacts would be minimized through implementation of BMPs designed to minimize erosion during construction and operation. Operation of the aero CTs would result in a point source discharge of process water which would be monitored and would comply with permit limits.
Wildlife	No impact	Minor impact to heavily disturbed low-quality habitat.
Threatened and Endangered Species	No impact	Project activities would occur on heavily disturbed land; therefore, there is no suitable habitat for the lark sparrow, Mississippi kite, and piping plover. Additionally, TVA has made a no-effect determination for the alligator snapping turtle. For selected species (bat species, bald eagle, osprey, and the interior least tern) TVA has committed to conservation measures to avoid and minimize impacts, as such impacts would be minor. Coordination with U.S. Fish and Wildlife Service (USFWS) would occur as necessary to ensure

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
		compliance under federal law if species encountered during construction.
Managed Natural Areas	No impact	Project activities would occur within the boundaries of previously disturbed TVA lands, as such impacts to managed natural areas would be minor.
Transportation	No impact	Temporary, minor impacts associated with increased traffic on area roadways during construction activities. Operations related traffic would be negligible.
Noise	No impact	Temporary, minor adverse impact associated with increased noise during construction activities. Noise impacts from operation would be minor. TVA would use noise abatement technology, if necessary, to ensure that noise levels would not exceed 55 dBA at off-site noise receptors.
Solid and Hazardous Waste	No impact	Minor impact as solid and hazardous wastes generated during construction and operation of the aero CT units would be managed in accordance with established procedures and applicable federal, state, and local laws and regulations.
Socioeconomics	No impact	Beneficial minor short-term economic impacts during construction. Communities close to the project site would more likely be affected by project activities; most of these communities are predominately minority and low-income populations. However, construction-related impacts such as traffic and noise would be minor and short term. Long-term adverse impacts from air emissions would be minimized through adherence to NAAQS standards, which protect human health with an adequate margin of safety for sensitive subgroups of the population, including communities with higher frequency of preexisting health conditions.
Utilities	TVA would purchase power on the market, of which a portion is likely to be from natural gas generation. Over the long term, TVA would continue to need new peaking generation sources.	No impacts to usage of potable water and natural gas. Operations (including of units with synchronous condensing and black start capabilities) would result in improved system reliability and flexibility to integrate renewable energy sources.
Public Health and Safety	No impact	The operation of the ACT Plant would adhere to TVA guidance and be consistent with standards established by OSHA and

Resource Area	Impacts From No Action Alternative	Impacts From Proposed Action Alternative
		applicable state requirements. Therefore, worker and public health and safety during project operation would be maintained and impacts would be minimal.

Key: ACT = Allen Combustion Turbine; Aero = aeroderivative; BMP = best management practice; CT = combustion turbine; dBA = A-weighted decibel; GHG = greenhouse gas; NAAQS = National Ambient Air Quality Standards; OSHA = Occupational Safety and Health Administration

2.4. Identification of Mitigation Measures

2.4.1. Standard Practices and Routine Measures

BMPs, mitigation measures, and commitments identified in Chapters 2 and 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. Additional project-specific BMPs may be applied as appropriate on a site-specific basis to enable efficient maintenance of construction projects and further reduce potential impacts on environmental resources including air, surface water, and groundwater and are summarized below.

- Fugitive dust produced from construction activities would be controlled by BMPs (e.g., wet suppression), as provided in the TVA's fugitive dust control plans required under existing CAA Title V operating permits.

- BMPs described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* Revision 4 (TVA 2022b) and in specific state regulatory sediment and erosion control handbooks would be outlined in the project-specific Stormwater Pollution Prevention Plan (SWPPP), and BMP plan, as required, that would be implemented to minimize erosion during site preparation. Appropriate BMPs would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained and the introduction of pollution materials to the receiving waters minimized. Areas where soil disturbance could occur would be stabilized and vegetated with native or non-native, non-invasive grasses and mulched.

- Equipment washing and dust control discharges would be handled in accordance with BMPs described in the SWPPP for water-only cleaning, and/or NPDES Permit TN 100000 to minimize construction impacts to surface waters.

2.4.2. Non-Routine Mitigation Measures

In association with the potential construction of an Action Alternative, TVA would employ standard practices and specific routine measures to avoid and minimize impacts to resources. Other mitigative measures would be considered by TVA for each environmental resource based upon potential adverse impacts as identified in the EIS.

Mitigation measures include:

- Coordination with U.S. Fish and Wildlife Services (USFWS) as necessary to ensure compliance under federal law if least tern is encountered during construction.

- Using noise abatement technology, as necessary, to ensure that noise emissions would not exceed 55 A-weighted decibels (dBA) at sensitive off-site noise receptors.

2.5. Environmentally Preferable Alternative

The environmentally preferable alternative is Alternative A – No Action. The environmentally preferable alternative is the alternative that will best promote the national environmental policy as expressed in section 101 of NEPA. As summarized in Table 2-3, taking no action would result in fewer direct, indirect, and cumulative effects on the human environment than implementing Alternative B, TVA's Proposed Action. However, Alternative A does not meet the purpose and need for the project.

2.6. TVA's Preferred Alternative

TVA has identified Alternative B as its Preferred Alternative. Under Alternative B, TVA would construct six natural gas-fired aero CTs generating approximately 200 MW and support systems at the ACT Plant. This aligns with the 2019 IRP recommendation to enhance system flexibility.

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CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the baseline environmental conditions (affected environment) of environmental resources in the project area and the anticipated environmental consequences (or impacts) that would occur from implementation of the alternatives described in Chapter 2. Within this chapter, the environmental impacts analyzed may be beneficial or adverse. Impact severity is dependent upon the relative magnitude and intensity and resource sensitivity. In this document, four descriptors are used to characterize the level of impacts as follows:

- No Impact – resource not present or affected by project alternatives under consideration.
- Minor (or Small) – environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.
- Moderate – environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- Large – environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

3.1. Air Quality

3.1.1. Affected Environment

3.1.1.1. Air Quality

The CAA (as amended) is the comprehensive law that protects air quality by regulating emissions of air pollutants from stationary sources (e.g., power plants) and mobile sources (e.g., automobiles). It requires the EPA to establish National Ambient Air Quality Standards (NAAQS) and directs the states to develop state implementation plans to achieve these standards. This is primarily accomplished through permitting programs that establish limits for emissions of air pollutants. The CAA also requires EPA to set standards for emissions of hazardous air pollutants (HAPs).

NAAQS have been established to protect the public health and welfare with respect to six criteria air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, particulate matter (PM), sulfur dioxide (SO_2), and lead (Pb). Primary standards protect public health, while secondary standards protect public welfare (e.g., visibility, crops, forests, soils, and materials) (EPA 2024a).

In accordance with the CAA Amendments of 1990, all counties are designated with respect to compliance, or degree of noncompliance, with NAAQS. These designations include:

- Attainment – any area where air quality achieves the NAAQS.
- Nonattainment – any area with air quality worse than the NAAQS.
- Unclassified – not enough data to determine attainment status.

The ACT Plant is located in Shelby County, Tennessee. Shelby County is designated as unclassifiable/attainment for all criteria pollutants (EPA 2024b).

The existing ACT Plant has a Title V/major source permit under the requirements of Title V of the CAA and the federal regulations promulgated in 40 CFR Part 70. The permit was issued in accordance with City of Memphis Code Section 16-77, which adopts by reference Rule 1200-3-9-.02(11) of the Tennessee Air Pollution Control Regulations. The construction of aero CTs is a major modification under the referenced City of Memphis Code, federal Title V regulations (40 CFR § 70) and the federal PSD regulations (40 CFR § 52.21).

The proposed project would be subject to local, state, and federal regulations that impose permitting requirements and specific standards for expected air emissions.

3.1.1.2. Pollutants and Air Quality Concerns

Nitrogen oxides (NOx) are a group of highly reactive gases that contain varying amounts of nitrogen and oxygen (e.g., NO, NO2). NOx emissions contribute to ground-level ozone, fine particulate matter, regional haze, acid deposition, and nitrogen saturation. Natural sources of NOx include lightning, forest fires, and microbial activity; major sources of human-produced NOx emissions include motor vehicles, electric utilities, industrial boilers, nitrogen fertilizers, and agricultural burning (EPA 1999).

Sulfur oxides are compounds of sulfur and oxygen molecules. The predominant form found in the atmosphere is SO_2. Most SO_2 is produced from the burning of fossil fuels (coal and oil), as well as petroleum refining, cement manufacturing, and metals processing. In addition, geothermic activity, such as volcanoes and hot springs, can be a significant natural source of SO_2 emissions (World Bank Group 1998).

HAPs, commonly referred to as air toxics, are pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects. The CAA identifies 188 pollutants as HAPs (EPA 2023a). Most HAPs are emitted by human activities, including mobile sources (motor vehicles), stationary sources (factories, refineries, and power plants), and indoor sources (building materials and activities such as dry cleaning).

States are required to establish an air operating program under Title V of the CAA. Regulations to implement this operating program, 40 CFR Part 70, require each major source of air pollutant emissions to obtain an operating permit, typically issued by the state environmental agency, that consolidates all of the air pollution control requirements into a single, comprehensive document covering all aspects of air pollution activities at a facility. In attainment/unclassified areas, Title V major source thresholds, the level of potential emissions that require sources to obtain a Title V permit, are 100 tons per year (tpy) for each criteria pollutant, 10 tpy for each individual HAP and 25 tpy for total HAPs.

Sources that emit less than 10 tpy of a single HAP or less than 25 tpy of a combination of HAPs are referred to as area sources (EPA 2024c), as opposed to major sources. Emissions from individual area sources are relatively small. However, if occurring in heavily populated areas that contain a number of area sources, emissions can be of concern.

3.1.1.3. Characterization of Existing Site Operations

As noted above the current ACT Plant is operating under a Title V/major source permit. The ACT Plant includes the following sources:

- CT electric generating plant.

- Four 847.2 metric million British thermal units per hour (MMBtu/hr) simple-cycle turbines (CT Units 17-20), of which only Units 19 and 20 would be operated on a limited basis.
- Two black-start diesel engines for CTs.
- Two heat recovery steam generators.
- One reheat, condensing steam turbine generator.
- One natural gas-fired/biogas-fired auxiliary boiler.
- Three natural gas-fired dewpoint gas heaters.
- One diesel engine-driven fire-suppression water pump.
- One diesel storage tank.
- One multiple cell cooling tower.

3.1.2. Environmental Consequences

3.1.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct six new aero CT units or the associated support facilities to provide generation of approximately 200 MW at the ACT Plant. TVA would continue to operate two existing units at ACT Plant on a limited basis (consistent with the 2021 Paradise and Colbert Combustion Turbine EA). As such, there would be no change to air quality under the No Action Alternative. However, the No Action Alternative would not align with IRP recommendations.

Without the additional generation capacity, TVA would be obligated to meet generation demand by acquiring the power from other generation sources. It is anticipated that the other generation sources would be through purchase agreements on the market, a portion of which would likely be derived from natural gas generation outside the TVA power system. The purchase of power, then, would result in an incremental increase of air emissions to some extent. Long-term power needs would require new peaking generation sources.

3.1.2.2. Alternative B – Allen Aeroderivative Project

Under Alternative B, TVA would construct and operate six aero CT units (GE LM2500s) generating approximately 200 MW of power and associated support facilities. At least four of the new aero CT units would have black-start capability. To support black-start operations, two USLD black-start generators would be installed to manage ancillary, transient house loads.

3.1.2.2.1. Construction Impacts

On-site construction activities associated with the aero CTs would result in emissions from the operation of construction equipment and workforce commuting, and fugitive dust from clearing, grading, and other activities on unpaved areas. Fugitive dust produced from construction activities would be temporary and controlled by BMPs (e.g., wet suppression) as stated in the TVA's fugitive dust control plans required under existing CAA Title V operating permits.

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment (for example, tracked vehicles) would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts per TVA BMPs. Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of CO, carbon dioxide (CO_2), ozone, NO_x, PM, SO_2, and VOCs. However, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions, and it is expected that all vehicles and equipment would be properly maintained and employ the use of diesel emission controls and cleaner fuel, which also would reduce emissions. Air quality impacts from construction activities would depend on both human-caused factors (intensity of activity, control measures, etc.) and natural factors such as wind speed and direction, soil moisture and other factors. However, even under unusually adverse conditions, these emissions would have at most, a minor transient impact on off-site air quality that is well below the applicable ambient air quality standard.

As proposed construction activities would primarily occur on previously disturbed areas associated with the ALF, ACT Plant, and ACC Plant, dust emissions would be minimized due to existing paved roads and other infrastructure present at the project site. Emissions would only affect the immediate project area and would have limited effects to off-site areas. In addition, dust control actions, including application of wetting agents or soil stabilization products on exposed soils and unpaved roads, and travel areas, would be implemented to reduce fugitive dust and particulate emissions. Overall, effects to air quality from construction-associated activities would be minor, temporary, and localized.

3.1.2.2.2. Operational Impacts

3.1.2.2.2.1. Regulatory Air Permit Requirements New Source Review / Prevention of Significant Deterioration

Construction of aero CTs and supporting facilities are subject to permitting programs that regulate the construction of new stationary sources of air pollution, typically referred to as New Source Review (NSR). Major NSR is applicable to sources under PSD which have 250 tpy of potential emissions of any criteria pollutant or 100 tpy for specifically listed source categories. There are two NSR permitting programs, based on the attainment status of the area in which the proposed project is located. In attainment areas, PSD is the applicable permitting program. In nonattainment areas, the applicable permitting program is nonattainment NSR. As the ACT Plant is located in an attainment/unclassified area, any significant emission increases from the proposed project would be subject to PSD pre-construction review to ensure air quality in the area is protected and attainment status is maintained.

PSD review is required if the project by itself is a major source or if the facility is already a major source (the existing ACT Plant is a major source) and the project would constitute a major modification (i.e., any physical change or change in the method of operation of a major stationary source that would result in a significant emissions increase of a regulated pollutant and a significant net emissions increase of that pollutant from the major stationary source). Significant emission increase levels, for purposes of PSD, were established as allowable increases in air pollutants over a baseline level that would not have a detrimental impact to air quality.

For new emission units, increases are calculated using the “actual to potential” test, meaning that emissions from new emission units must be evaluated for the potential emission/worst-case scenario, which may far exceed anticipated actual emissions from normal operation. Net emission increases for the project are defined as the potential increase in emissions from the new emission units and any other increases and decreases in baseline actual emissions at the major stationary source that are contemporaneous with the change and otherwise creditable.

3.1.2.2.2.2. Title V and Other Regulatory Requirements

The ACT Plant has an existing Title V permit, which is required for facilities that have emissions exceeding the major source thresholds for criteria pollutants, HAPs, and in certain cases, GHGs. The existing ACT Plant's Title V permit includes emission limits (as established by local/state/federal regulation) as well as the data tracking, recordkeeping, and reporting measures to verify compliance. Based on the draft Title V/PSD permit and evaluation documentation, the current facility is not a major source with regard to HAPs. The addition of the new equipment would not be anticipated to cause the facility to become a major source with regard to HAP emissions.

Construction of the aero CTs and support facilities would require significant modification of the Title V permit. Permit modifications would incorporate limitations from applicable local, state, and federal regulations, including the following:

- 40 CFR 60, Subpart KKKK, is applicable to all stationary gas CT units with a heat input at peak load equal to or greater than 10 MMBtu/hr for which construction or modification is commenced after February 18, 2005. This subpart regulates NO_x and SO_2 emissions. There are options for compliance with the SO_2 limit, one of which is a sulfur content in fuel limit of 0.06 pounds (lbs) SO_2/MMBtu heat input. Based on the adoption of the lowest achievable emission rate (LAER), the NO_X standard of this subpart would be met.

- 40 CFR 60, Subpart TTTTa is applicable to CT electrical generating units commencing construction after May 23, 2023. Pursuant to Subpart TTTTa, each unit would satisfy the requirements of an "intermediate load" CT of 1,170 lbs. CO_2 per megawatt hour (MWh) and an annual capacity factor of <40%.

- 40 CFR 60, Subpart IIII is applicable to the black-start generators with requirements, including the use of ULSD, that would be met, as well as certification of engines to appropriate standards and recordkeeping requirements.

Emissions from Alternative B would meet these applicable standards, as well as any additional requirements established by state and local regulations.

3.1.2.2.3. Operational Emissions

The new Aero CT units would incorporate state-of-the-art emission control technology. Table 3-1 provides a summary of the maximum preliminary annual emission estimates for the proposed action, at the permitted capacity factor of 40 percent, for determination of PSD applicability. Potential emissions from the modification would exceed PSD significance thresholds, as shown in Table 3-1. As such, the proposed action is subject to PSD review

Table 3-1. Maximum Project Annual Emission (40% Capacity Factor) Estimates and Prevention of Significant Deterioration Significant Emission Rates

	Emissions (tons/year)		
Pollutant	**Project Emission Increases**	**Significant Emission Rates**	**PSD Triggered**
CO	56	100	No
NOx	47	40	Yes
SO_2	2	40	No
Filterable PM	24.5	25	No
PM10	34	15	Yes
PM2.5	34	10	Yes
VOC	11	40	No
Pb	<0.01	0.6	No
Sulfuric Acid Mist	<0.05	7	No
CO_2e	401,800	75,000	Yes

Key: CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NOx = nitrogen dioxide; Pb = lead; PM = particulate matter; PM2.5 = particulate matter less than 10 microns in diameter; PM10 = particulate matter less than 10 microns in diameter; PSD = Prevention of Significant Deterioration; SO_2 = sulfur dioxide; VOC = volatile organic compound

The estimates in Table 3-1 are noted to reflect the six GE LM2500 units operating 3,260 hours per CT-year with 350 startup/shutdown events per CT-year and two black-start generators operating 100 hours/unit year. No creditable increases or decreases of emissions in the contemporaneous period were noted (e.g., other new sources or shut down of other permitted sources).

While TVA has requested that ACT be permitted up to 40 percent, TVA estimates that the actual capacity factor of the new units would be similar to those of other gas turbines operated nationally. TVA therefore is also analyzing a capacity factor of 11.1 percent, which is the value that corresponds to the U.S. Energy Information Administration (EIA) 10-year average (2014-2023) capacity factory for natural gas turbines across the U.S (EIA, 2024). The project emission increases at the 11.1-percent predicted actual operational capacity factor are presented in Table 3-2. These values only reflect reduction in capacity factor associated with the baseload of the six GE LM2500 units; the values do not account for reduction adjustments for startup/shutdown events or the two black-start generators.

Table 3-2. Predicted Project Annual Emission (11.1 % Capacity Factor) Estimates and Prevention of Significant Deterioration Significant Emission Rates

Pollutant	Emissions (tons/year) Project Emission Increases	Emissions (tons/year) Significant Emission Rates	PSD Triggered
CO	28	100	No
NOx	24	40	No
SO_2	1	40	No
Filterable PM	7	25	No
PM10	11	15	No
PM2.5	11	10	Yes
VOC	3	40	No
Pb	<0.01	0.6	No
Sulfuric Acid Mist	<0.05	7	No
CO_2e	107,268	75,000	Yes

Key: CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NOx = nitrogen dioxide; Pb = lead; PM = particulate matter; PM2.5 = particulate matter less than 10 microns in diameter; PM10 = particulate matter less than 10 microns in diameter; PSD = Prevention of Significant Deterioration; SO_2 = sulfur dioxide; VOC = volatile organic compound

Based on the higher bounding 40% capacity factor analysis summarized in Table 3-1, the best available control technology (BACT) would be applied to particulates and carbon dioxide equivalents (CO_2e); LAER would be adopted for NOx. The BACT for particulate matter is use of clean fuels (e.g., natural gas) and good combustion practices. The BACT for GHG is using low carbon fuels (e.g., natural gas) and implementing energy efficiency measures. In contrast, the 11.1% capacity factor analysis summarized in Table 3-2 (baseload only) would yield application of BACT to particulates (i.e., PM2.5 only) and CO2e; NOx emissions would not exceed the corresponding significant emission rate.

LAER for NOx is achieved through combustion zone mitigation and post-combustion SCR. Peak flame-zone temperatures in the proposed units would be reduced via dry combustion controls—low-NOx emission combustors, which enhance air-fuel mixing. An SCR system would be used in each turbine exhaust. By installing these technologies, noted to be used by other sources that have achieved LAER, the NOx emission rate would be 2.5 parts per million volume dry NOx at 15 percent O_2 during steady-state operations.

PSD does not prevent sources from increasing emissions, but instead it preserves and protects air quality and ensures economic growth will occur in a manner consistent with preserving clean air resources. It also ensures any increase in air pollution to which PSD applies is made only after careful evaluation of all consequences of such a decision and after adequate procedural opportunities for informed public participation are provided (EPA 2024d).

PSD review requires installation of BACT, an air quality analysis, additional impact analysis, and public involvement. Further detail on each of these requirements is provided below.

- BACT is an emission limitation based on the maximum achievable degree of control. BACT is determined on a case-by-case basis and considers the energy, environmental, and economic impact of the proposed limitation. BACT can be an add-on pollution control device or a modification of the production process or method or, in some cases, a design, equipment, work practice, or operational standard, if an emission standard is infeasible.

- An air quality analysis is performed to demonstrate that the new emissions from a proposed modification, in conjunction with other applicable emissions increases and decreases from existing sources, would not cause or contribute to a violation of any applicable NAAQS or PSD increment. The analysis includes an assessment of existing air quality, which may include ambient monitoring and air dispersion modeling, as well as dispersion modeling predictions of ambient concentrations resulting from the proposed project and future growth associated with the project.

- Additional impact analyses evaluate the other impacts caused by an increase in emissions, such as ground and water pollution impacts on soils, decreases in visibility caused by the emissions and associated growth. Associated growth is growth in the area due to the proposed modification, including industrial, commercial, and residential growth.

- Public participation allows the public to review and comment on the permit before it is issued.

TVA has begun the process of complying with PSD requirements with the submission of modeling protocols and a PSD permit application to Shelby County in December 2024. The PSD program provides extra protection for large pristine areas of the United States, such as national parks, forests, and wildlife refuges, referred to as Class I areas. Class II areas are those that are in attainment or noted to be unclassifiable. Based on the location of the ACT Plant, both Class I and Class II areas are potentially impacted; therefore, the modeling protocol addresses both areas.

Table 3-1 and Table 3-2 illustrates the localized increases in emissions at the 40 percent and 11.1 percent capacity factor; however, emissions would not exceed permit limits or air quality standards. Compliance with Title V/PSD operating permit requirements discussed earlier are protective of ambient air quality and would ensure no impact on air quality or change of attainment status would occur as a result of implementing these projects. Therefore, the impacts of Alternative B on regional air quality would be moderate as they are noticeable but not be destabilizing and would not result in an exceedance of applicable air quality standards.

3.2. Climate Change and Greenhouse Gas

3.2.1. Affected Environment

The Earth's natural warming process is known as the greenhouse effect. The Earth's atmosphere consists of a variety of gases that regulate the Earth's temperature by trapping solar energy. These gases—including CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride—are cumulatively referred to as GHGs because they trap heat like the glass of a greenhouse. Anthropogenic activities, which include the burning of fossil fuels to produce energy and deforestation, have contributed to elevated concentration of GHGs in the atmosphere since the Industrial Revolution. The release of GHGs to the atmosphere as a result of human activity has caused an increase in the average global temperature. While the increase in global temperature is known as global warming, the resulting change in a range of global weather patterns is known as climate change. The EPA defines climate change as "significant changes in average conditions—such as temperature, precipitation, wind patterns, and other aspects of climate—

that occur over years, decades, centuries, or longer" (EPA 2024e). In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. These changes are influenced by a number of factors including oceanic processes, variations in solar radiation, plate tectonics, volcanic eruptions, and anthropogenic activities.

Different GHGs can have different effects on the Earth's warming. Two key ways in which GHGs differ from each other are their ability to absorb energy (i.e., their radiative efficiency), and how long they remain in the atmosphere (i.e., their lifetime). Global Warming Potential is a measure of how effectively a specific GHG traps heat in the atmosphere compared to CO_2 and was developed to allow comparisons of the global warming impacts of different gases. The larger the global warming potential, the more that a given gas has the potential to contribute to increasing atmospheric temperatures relative to CO_2 over the same time period. Because the global warming potential that each GHG has varies, the common metric of CO_2e (carbon dioxide equivalent) is used to report a combined impact from all of the GHGs. This metric scales the global warming potential of each GHG to that of CO_2 with applicable global warming potentials applied pursuant to 40 CFR Part 98.

As described in TVA's 2019 IRP, TVA has one of the largest, most diverse, and cleanest energy-generating systems in the nation. In fiscal year 2023, 55 percent of TVA's electricity was generated from carbon-free sources, such as nuclear power and renewable resources including hydropower (TVA 2024b). TVA continues to invest in assets to reduce reliance on coal, modernize the transmission system, and add new renewable energy resources to ensure safe, reliable, and cleaner energy consistent with the implementation of the 2019 IRP recommendations. As of the end of calendar year 2023, TVA has achieved a 53 percent reduction in its mass carbon emissions as compared to 2005 baseline standards (TVA 2024b). This decrease is mainly due to the retirement of coal plants, which emit larger quantities of CO_2 relative to other types of electrical generation and the replacement of these plants with nuclear and natural gas-fueled generation. Nuclear generation does not result in emissions of CO_2, and the CO_2 output rate from natural gas-fueled electricity generation is approximately half that of coal (TVA 2021a). As a power generation fleet, TVA has demonstrated a commitment to continued reduction and management of GHG emissions while also maintaining a balanced generation portfolio.

3.2.1.1. Regulatory Requirements

Although there have been a series of recent administrative changes, no clear GHG emission reduction requirements have been established to date at the federal level for fossil-fired power plants. The national emissions reduction requirements established in the EPA's Clean Power Plan Rule were repealed on July 8, 2019 (84 FR 32250), and the targets in the Paris Climate Accord were withdrawn in November of 2020. The emission reduction requirements established by EPA in the Affordable Clean Energy Rule, which replaced the Clean Power Plan Rule, were ultimately repealed through the final 2024 GHG Rule.

In 2024, the Council on Environmental Quality updated its NEPA implementing regulations and required that agencies analyze, where applicable, climate change-related effects, including quantification of greenhouse gas emissions from the proposed action and alternatives. On January 20, 2025, President Trump issued a series of Presential Actions related to climate change and greenhouse gas. Executive Order 14148, *Initial Recension of Harmful Executive Orders,* revoked EOs 13990 and 14008. Additionally, EO 14154, *Unleashing American Energy,* directed CEQ to propose rescinding its NEPA implementing regulations. On February 25, 2025, CEQ published an Interim Final Rule to remove its NEPA regulations from the code of federal regulations; the rule becomes effective on April 11, 2025.

EO 14154 also disbanded the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG), which was established pursuant to EO 13990, as well as any guidance, instruction, recommendation, and documents issued by the IWG. EO 14154 directs the Administrator of the EPA to issue guidance to address the Social Cost of Carbon, including consideration of eliminating the calculation from any Federal permitting or regulatory decision. Prior to further guidance issued by the EPA, EO 14154 directs agencies to *"…ensure estimates to assess the value of changes in greenhouse gas emissions resulting from agency actions, including with respect to the consideration of domestic versus international effects and evaluating appropriate discount rates, are, to the extent permitted by law, consistent with the guidance contained in OMB Circular A-4 of September 17, 2003 (Regulatory Analysis)."*

On May 9, 2024, the EPA released the Final Rule: NSPS for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-fired Electric Generating Stations. The rule establishes new carbon pollution standards for coal- and new gas-fired power plants. The construction and operation of the ACT would be subject to 40 CFR 60 Subpart TTTTa, which comprises the May 2024 Final Rule.

40 CFR 60 Subpart TTTTa created three subcategories defined by an annual capacity factor Each subcategory has a distinct best system of emission reduction (BSER) and standard of performance:

- Low load combustion turbine (annual capacity factor less than or equal to 20%) BSER is the use of lower emitting fuels with standard of performance ranging from 120 lbs. CO2/MMBtu to 160 lbs. CO2/MMBtu

- Intermediate load combustion turbine (annual capacity factor greater than 20% and less than or equal to 40%) BSER is the use of highly efficient simple cycle generation that can achieve a standard of performance ranging from 1,170 to 1,560 lbs. CO_2/MWh (gross)

- Base load combustion turbine (annual capacity factor greater than 40%) BSER would be applied in phases. Phase 1 requires highly efficient combined cycle generation achieving a standard of 800 to 1,250 lbs. CO_2/MWh (gross) and beginning by the date the rule was effective. Phase 2 requires CCS installation by January 1, 2032, and a standard of performance ranging from 100 to 150 lbs. CO_2/MWh (gross).

Of the three, only the intermediate load and the low load subcategories are relevant here.

3.2.1.2. TVA Carbon Strategic Intent

At its May 6, 2021, meeting, the TVA Board adopted the TVA Strategic Intent and Guiding Principles, which focus on energy supply and decarbonization initiatives (TVA 2021a). These guiding principles commit TVA to delivering safe, low-cost, reliable power while providing responsible stewardship by caring for the region's natural resources, consistent with recommendations of the 2019 IRP.

To implement the TVA Strategic Intent and Guiding Principles and TVA's asset strategy, additional peaking units are needed to operate infrequently during short-duration, high-demand periods. These peaking units are essential for maintaining system reliability requirements, as they can startup as well as ramp down quickly to meet sudden changes in either demand or supply resulting from short-term changes in weather that can significantly increase power demand when intermittent renewable resources may not be available.

3.2.1.3. Social Cost of Greenhouse Gases

The social cost of greenhouse gases (SC-GHG) is an estimate of monetized damages (or benefits) associated with incremental increases (or decreases) in CO_2 emissions, such as human health effects, property damage from increased flood risk, and the value of ecosystem services. While governmental and nongovernmental stakeholders have an interest in the costs and impacts of carbon emissions resulting from decisions, there is much uncertainty and controversy surrounding the use of any specific SC-GHG price and associated escalation. The most significant points of controversy include the discount rate that should be used when accounting for future impacts and if global impacts, as opposed to only domestic, should be included. TVA has included a discussion of GHG emissions and their significance for the Proposed Action and the No Action Alternative in Section 3.2.2, Environmental Consequences, consistent with the guidance contained in OMB Circular A-4 of September 17, 2003 (Regulatory Analysis), per the recent Executive Order 14154, *Unleashing American Energy*.[5]

This EIS calculates GHG emissions directly attributable to the proposed project's construction and operation, evaluates the net change in GHG emission brought about by the proposed project, and discusses the SC-GHG as it applies to the proposed project.

3.2.2. Environmental Consequences

The analysis of GHG emissions and climate change is fundamentally different in approach to the analysis of air quality (refer to Section 3.1, Air Quality). While air quality is linked to the geographical location and physical features within a particular airshed, GHG emissions have potential effects on a global scale. Within the global context of climate change, it is important to consider whether GHG emissions represent new emissions or are replacing or relocating existing GHG emissions from one location to another.

GHG emissions can include the release of stored GHGs from existing carbon stocks, such as consumption of oil reserves or removal of forests. Because the Proposed Action would not release GHGs from carbon stocks, the release of these types of emissions are not included in the analysis. There would be no natural sources of emissions and no measurable amount of carbon sequestration. This analysis focuses on the reasonable measurable emissions from fossil fuel consumption that could occur under each alternative.

To provide meaningful context, consistent with the EO 14154, *Unleashing American Energy,* as well as OMB Circular A-4, TVA is considering the social costs associated with GHGs in this analysis. OMB Circular A-4 states that analysis *"should focus on benefits and costs that accrue to citizens and residents of the United States."* Therefore, the analysis of SC-GHG is evaluated from a domestic perspective rather than a global perspective. Regarding discount rates, OMB Circular A-4 states that analysis *"should provide estimates of net benefits using both 3 percent and 7 percent."* (These discount rates have been previously calculated and used by the EPA in

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[5] Prior to issuance of EO 14154, *Unleashing American Energy,* TVA had calculated the SC-GHG using guidance published by the IWG ("*Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under EO 13990")* and by the EPA ("*Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, 'Standards of Performance for New, Reconstruction, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review'").* The results of these calculations are provided in Appendix C.

its regulatory impact analyses for the 2019 rulemaking that repealed the Clean Power Plan and replaced it with the Affordable Clean Energy Rule; see Table 3-3.)

Table 3-3. SC-GHG 2015-2050 (per metric ton)

Year	Discount Rate	
	3% Average	7% Average
2020	$7	$1
2025	$7	$1
2030	$8	$1
2035	$9	$2
2040	$9	$2
2045	$10	$2
2050	$11	$2

Notes: These SC-GHG values are stated in $/metric ton CO2 and rounded to the nearest dollar.
Sources: U.S. Government Accountability Office 2020; EPA 2019a.

3.2.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT, and there would be no short-term, temporary construction-related GHG emissions or GHG emissions associated with the operation of the new units. TVA would continue to operate two existing units at ACT on a limited basis. System benefits associated with the operations of the new aero CT units would not be realized (e.g., black start and synchronous condensing capabilities, improved capabilities to integrate renewable energy resources). The impact of Alternative A on global climate change is minor.

Without the additional generation capacity, TVA would continue to need power, particularly during periods of peak demands, and would acquire the power from other generation sources. In the short-term, TVA anticipates that the power would likely be obtained through power purchase agreements on the market, a portion of which would likely be derived from natural gas power plants outside the TVA power system. When such power originates from natural gas resources, there would generally be similar—if not greater—GHG emissions as Alternative B, as the existing power technology is likely not as efficient as the proposed aero CTs. In the long-term, TVA would continue to need new peaking generation sources, and as such, implementation of the No Action Alternative would not meet the purpose and need of TVA's Proposed Action.

3.2.2.2. Alternative B – Allen Aeroderivative Project

3.2.2.2.1. Construction

Similar to criteria air pollutant emissions described in Section 3.1, construction activities would result in temporary GHG emissions.

GHG emissions would result from mobilization, staging, and construction support activities. Construction traffic, including transport of borrow materials, delivery of materials, and construction worker commutes, would increase the number of vehicles transiting on local and regional roadways, and temporarily result in additional GHG emissions. The use of heavy construction equipment for construction activities would also generate short-term increases in GHG emissions. It is estimated that construction activities would result in approximately 14,283 tons of CO_2e over the 15-month construction period. The GHG emissions of construction is captured in the upstream emissions analysis (Table 3-4), as upstream emissions are primarily associated with activities required for construction and commissioning of a new power generating asset (TVA 2024e). GHG emissions associated with heavy construction equipment would be similar to those found in most common construction activities.

Heavy construction equipment currently operating within the airshed may be redistributed from other projects to support the proposed construction activities. As such, these GHG emissions may not necessarily constitute new sources of emissions. Even with conservative assumptions (e.g., all heavy equipment in operation for 8 hour per day, 5 days per week, 12 months per year), when compared to GHG emissions in Tennessee (112.1 million metric tons CO_2e in 2019 [TDEC 2024a]), and Shelby County (17 million metric tons of CO_2e in 2019 [Memphis and Shelby County Division of Planning and Development 2022]) construction-related GHG emissions would be negligible.

3.2.2.2.2. Operations

TVA would operate six GE LM2500 units operating up to 3,260 hours per CT-year with 350 startup/shutdown events per CT-year and two black-start generators operating 100 hours/unit year. LM2500 operations are regulated by 40 CFR Part 60, Subpart TTTTa. Each LM2500 would have a generation restriction of 115,000 megawatts per hour per year. TVA estimates that the maximum operational capacity factor of 40 percent would result in approximately 401,800 tons of CO_2e per year (Table 3-4). In 2023, TVA recorded 49 million tons of GHG emissions from its systems; the proposed aero CTs, at the maximum 40 percent operational capacity factor, would result in an increase of GHG emissions of approximately 0.82 percent.

Because TVA expects to operate each CT less than the maximum capacity factor allowed in Subpart TTTTa for the intermediate subcategory, annual CO_2e emissions would be less than the maximum operational capacity amounts presented. TVA planners estimate that the predicted operation of the aero CT units would be comparable to the national average of capacity factors (between 2014 and 2023) for natural gas combusting gas turbines, which is 11.1 percent (EIA 2024). Thus, TVA estimates that the Proposed Action would result in a predicted actual direct increase of 107,268 metric tons of CO_2e per year (Table 3-4). As stated above in 2023 TVA recorded 49 million tons of GHG emissions from its systems; the proposed aero CTs, at the predicted 11.1 percent operational capacity factor, would result in an increase of GHG emissions of approximately 0.22 percent.

In addition to the forecasted direct combustion CO_2 emissions described above, all power generating resources include additional life cycle GHG emissions associated with their construction, ongoing operations, and their decommissioning at the end of their useful life. TVA has worked with the National Renewable Energy Laboratory (NREL) to develop life cycle GHG emissions forecasts, which also include upstream, ongoing non-combustion, and downstream GHG emissions, for the portfolio of power generated resources evaluated in the draft EIS for the 2025 IRP (TVA 2024e).

This GHG analysis incorporates a GHG life cycle analysis in its evaluation to help quantify a full accounting of cradle-to-grave environmental impacts. Table 3-4 identifies emission factors that were used by the NREL and the associated calculations to estimate GHG emissions associated with upstream, ongoing non-combustion, and downstream activities associated with the proposed aero CTs.

Table 3-4. GHG Life Cycle Analysis Emissions

	Emission Factors (g/kW)[1]	Emission Factors (tons/MW)	Resource - Proposed Aero CTs	Total MT CO_2e Proposed Aero CTs
One-Time Upstream GHG (CO_2 equivalent)	64,790 g/kW	110.23 tons/MW	200 MW	14,283.75 MT CO_2e
Ongoing Annual Non-Combustion GHG (CO_2 equivalent)	70.00 g/kW-hr	0.077 tons/MW-hr	115,000 MW-hr	8,873.60 MT CO_2e
One-Time Downstream GHG (CO_2 equivalent)	2,600 g/kW	110.23 tons/MW	200 MW	573.20 MT CO_2e

Note: On-going combustion emissions – approximately 401,800 tons of CO_2e per year (maximum) and 107,268 metric tons of CO_2e per year (predicted) – have been calculated individually for the Proposed Action and are summarized in Table 3-4.

Source: 1. TVA 2024e.

The SC-GHG associated with the Proposed Action would range from approximately $425,531 to $2.98 million annually under the maximum operational capacity factory (40 percent) and $130,999 to $916,990 annually under the predicted actual operational capacity factor (11.1 percent) (Table 3-5).

Table 3-5. Estimated Annualized Social Cost of Carbon Associated with the Proposed Action

	Emissions (Co_2e) (tons/ year)	**SC-GHG 7%**	**SC-GHG 3%**
Maximum Operations (Capacity Factor of 40 Percent)	401,800	$401,800	$2,812,600
Predicted Operations (Capacity Factor of 11.1 Percent)	107,268	$107,268	$750,876
GHG Life Cycle Analysis Emissions	23,730.551	$23,731	$166,114
Total (Maximum)	**425,530.551**	**$425,531**	**$2,978,714**
Total (Predicted)	**130,998.551**	**$130,999**	**$916,990**

Key: CH_4 = methane; CO_2 = carbon dioxide; GHG = greenhouse gas; SC-GHG = social cost of greenhouse gases

The overall increase in GHG emissions, at the maximum capacity factor of 40 percent, is a minor increase (0.82 percent) in the overall TVA system GHG emissions. Additionally, as previously described, TVA is expecting for an operational capacity factor to be closer to 11.1 percent, which would lower the overall contribution (0.22 percent) to system GHG emission and the total SC-GHG. Relative to global GHG levels and potential effects on climate change, these contributions are negligible. As such, impacts from Alternative B on climate change and GHG emissions would be minor. Operation of the proposed aero CTs, as a reliable and flexible peaking fleet, would contribute to TVA's overall ability to achieve the regional emissions goals of the 2019 IRP (see Section 3.2.1.2, TVA Carbon Strategic Intent).

3.3. Groundwater

3.3.1. Affected Environment

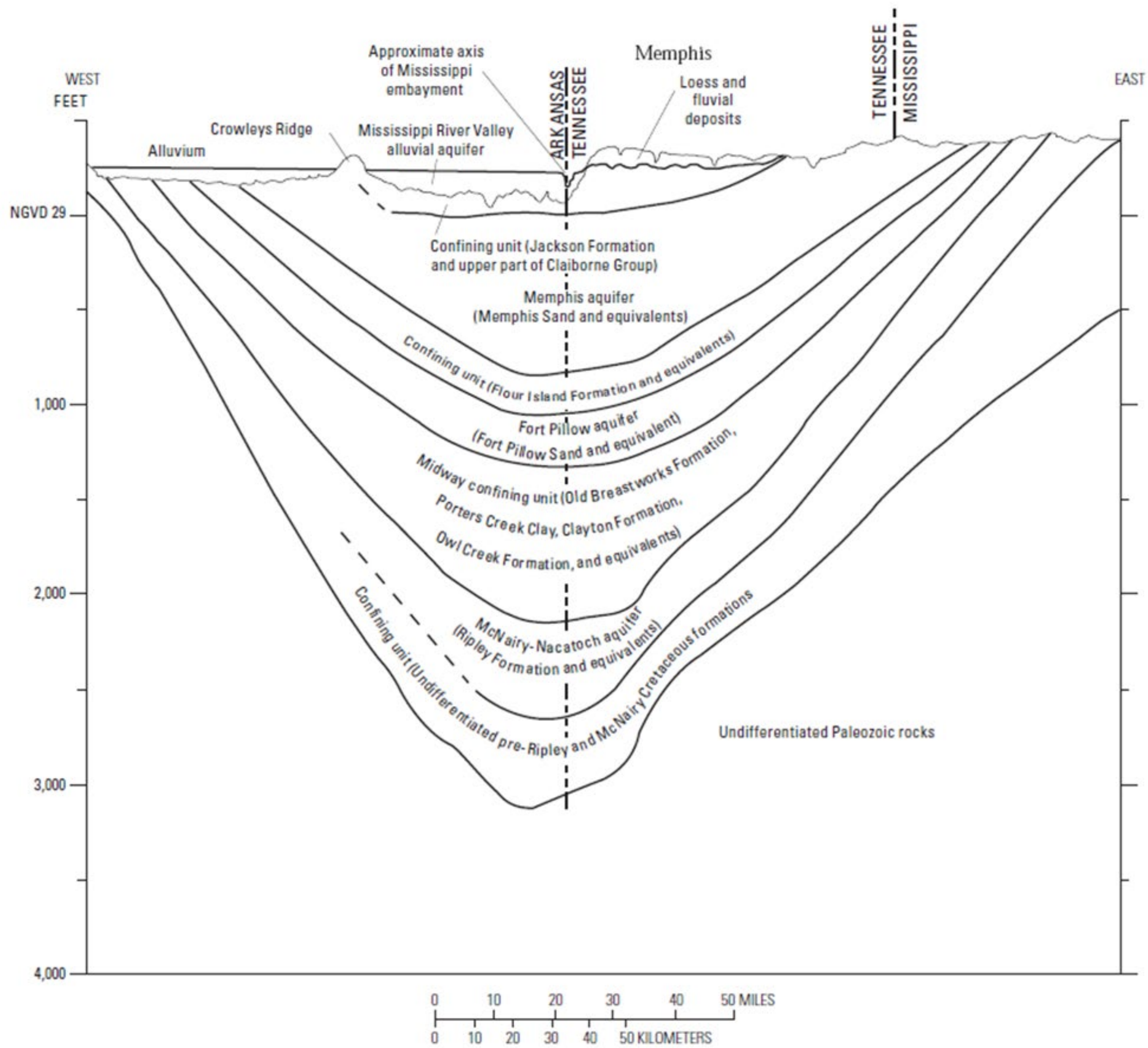
3.3.1.1. Regional Aquifers

The ACT Plant is situated in southwestern Tennessee approximately 1.5 miles east of the Mississippi River. It lies atop the Mississippi embayment, within the Mississippi Alluvial Plain section of the Gulf Coast Coastal Plain (TVA 2020). The Mississippi embayment is a geologic basin comprised of Cretaceous to recent age sediments deposited primarily in a Coastal Plain setting and dominated by unconsolidated sand, silt, and clay. The principal aquifers of the region are (in descending order) the Mississippi River Valley alluvial aquifer, the Memphis Sand, and the Fort Pillow Sand (Figure 3-1) (Carmichael et al. 2018).

Several geotechnical and site investigations were previously conducted at the ALF ash pond complexes. The site characteristics and results identified in those studies are considered representative of the ACT Plant. The materials constituting the Mississippi River Valley aquifer range in size from coarse gravel to clay. They commonly grade downward from fine sand, silt, and clay at the top to coarse sand or gravel at the base. Alluvium is approximately 110 to 245 feet thick at the ACT Plant (Stantec 2019a).

The Mississippi River Valley alluvial aquifer sediments are underlain by a low permeability confining unit composed of the Jackson Formation and upper Claiborne Group (Brahana and Broshears 2001) (Figure 3-1). Overall thickness varies from 0 to 370 feet regionally within the Jackson Formation and upper Claiborne Group (Brahana and Broshears 2001). Both the Jackson Formation and upper Claiborne Group act as a confining layer referred to as the upper Claiborne confining unit (Carmichael et al. 2018). The upper Claiborne confining unit is a low permeability, clayey layer that defines the bottom of the alluvial aquifer and has a thickness of approximately 30 to 70 feet near the ACT Plant (Stantec 2019a). Where present, the upper Claiborne confining unit can limit vertical movement of groundwater. Additionally, where present, the upper Claiborne confining unit separates the Memphis Sand aquifer from the Mississippi River Valley alluvial aquifer sediments. The Memphis Sand is characterized by predominantly very fine to very coarse-grained sand with lenses of fine-grained material and is referred to as the Memphis aquifer (Brahana and Broshears 2001; Stantec 2019a). The top of the Memphis Sand aquifer is approximately 190 to 255 feet below ground surface near the ACT Plant.

Monitoring wells installed around the East Ash Pond Complex and near the West Ash Pond indicate groundwater movement in the alluvial aquifer immediately beneath the site is generally northward toward McKellar Lake adjacent to the site. Depth to groundwater is generally 15 to 40 feet below ground surface and seasonally fluctuates with lake levels (Stantec 2019a). McKellar Lake can rise and fall by almost 40 feet, which can affect the groundwater flow direction in the alluvial aquifer. Groundwater can temporarily flow to the south, away from the lake, when the lake level is high (Stantec 2019a).



Source: Carmichael et al. 2018

Figure 3-1. Schematic Cross Section Showing the Hydrostratigraphy of the Northern Mississippi Embayment East and West of Memphis, Tennessee

3.3.1.2. Groundwater Use

The Memphis and Fort Pillow aquifers are the primary drinking water sources for the surrounding area, including portions of eastern Arkansas and northern Mississippi (Carmichael et al. 2018). The Memphis aquifer serves as the primary drinking water aquifer for the area, including the City of Memphis (Carmichael et al. 2018). The Memphis aquifer is the most productive aquifer in the region, providing approximately 98 percent of the total water pumped to the City of Memphis in 1980, and it remains the primary supply of drinking water in the area (Brahana and Broshears 2001). The Fort Pillow aquifer is not widely used in the Memphis region because of the availability of shallower groundwater resources (Brahana and Broshears 2001).

The Davis Well Field is the closest wellfield near the ACT Plant and is approximately 2 miles south of the ACT Plant. Other well fields are more than 5 miles east of ACT. Additionally, based on the water well search (Stantec 2019a), there are no known public water supply wells completed in the alluvial aquifer within at least 1 mile of the ACT Plant.

3.3.1.3. Groundwater Quality

Groundwater has been monitored at the Allen Reservation since 1988. Groundwater monitoring data for ALF was collected from the East Ash Pond Complex monitoring well network and former West Ash Pond Area (TVA 2016c). Closure by removal activities were completed in November 2023 at the West Ash Pond Area. Water quality sampling results indicate that CCR constituents such as arsenic (and to a lesser extent fluoride and lead) have been detected at elevated levels in groundwater samples collected from the alluvial aquifer underlying the East Ash Pond Complex. Additionally, elevated pH values in groundwater generally greater than 7.5 standard units have also been observed. The area of impact from these primary constituents of concern is localized and generally limited to the shallow portion of the alluvial aquifer.

Groundwater sampling results do not indicate adverse impacts to the Memphis Sand aquifer or the public drinking water supply (Stantec 2019a). Under the CCR Rule and TDEC Commissioner's Order, TVA would continue to work with TDEC to evaluate groundwater monitoring trends and develop and implement appropriate long-term corrective measures to address groundwater quality.

TVA, in cooperation with TDEC, implemented an Interim Response Action that is designed to control and address groundwater contamination. The Interim Response Action is a groundwater extraction system to control and treat groundwater with elevated concentrations of arsenic that began in 2020 (Stantec 2018a). Groundwater monitoring reports for 2023 identify arsenic and molybdenum as in exceedance of groundwater protection standards. TVA would continue to monitor and assess groundwater testing results and take the steps necessary to preserve and protect the quality of the environment and surrounding community (TVA 2024c).

3.3.2. Environmental Consequences

3.3.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT. TVA would continue to operate two existing units at ACT on a limited basis. Subsequently, there would be no change to groundwater conditions at the ACT Plant. TVA would continue to monitor the groundwater at the Allen Reservation and the East Ash Pond Complex and West Ash Pond Area in accordance with federal and state requirements. As such, the impact of the Alternative A on groundwater is minor.

3.3.2.2. Alternative B – Allen Aeroderivative Project

Construction of the aero CTs and associated support systems would require below ground construction activities that may encounter groundwater. Shallow excavation up to 5 feet in depth is expected in the form of trenching and excavation for foundations, roadways, site drainage, and upgrades. Construction of aero CTs at the ACT Plant would require the installation of new foundational piles with maximum depths of 75 feet. Piles have the potential to influence the groundwater flow in the zone disturbed by pile-driving through conduit formation along the interface between the pile and surrounding soil as well as from groundwater flow through the pile material itself (Satyamurthy 2005). Impacts to groundwater due to the construction of foundational piles would be negligible due to minimal groundwater displacement within the alluvial aquifer. Additionally, impermeable materials, such as steel or concrete, would be used for pile construction, further decreasing any impacts to groundwater flow throughout the aquifer. If groundwater is encountered during any construction activities, dewatering processes would be used to control groundwater infiltration into the excavation site and all state and federal requirements relating to groundwater protection would be followed. Because such activities and their impacts to groundwater flow patterns and availability are localized and generally limited to the construction phase, impacts to groundwater from construction are expected to be minor.

During construction and operation, accidental spills or releases of fluids (gasoline, diesel fuel, hydraulic lubricants, etc.) have the potential to contaminate groundwater. BMPs, such as those described in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022b) and a spill prevention, control, and countermeasure plan would be used to avoid contamination of groundwater from project activities. The use of such BMPs would reduce the possibility of any on-site spills or hazardous materials from reaching the groundwater during construction and operation.

The ACT Plant currently uses potable-grade water supplied by the Memphis Light, Gas and Water Division (MLGW) for operations and would continue to use potable water from the existing public supply during operations of the proposed aero CT units. The ACT Plant would not require any use of groundwater.

Because Alternative B would result in negligible alteration of groundwater hydrology from pile driving and would minimize potential effects of accidental spills or releases that may affect groundwater, impacts to groundwater would be minor.

3.4. Surface Water Resources

3.4.1. Affected Environment

The ACT Plant is located adjacent to the Mississippi River, approximately 5 miles southwest of downtown Memphis, Tennessee, within both the Horn Lake-Nonconnah River watershed (Hydrologic Unit Code [HUC] 08010211) and the Lower Mississippi-Memphis watershed (HUC 08010100) (TDEC 2024b). The Lower Mississippi-Memphis watershed covers approximately 590 square miles on the western edge of Tennessee and includes parts of Lake, Dyer, Lauderdale, Tipton, and Shelby Counties. The Horn Lake-Nonconnah River watershed covers approximately 184 square miles in the southwestern corner of Tennessee and includes parts of Shelby and Fayette Counties. Approximately 99 percent of the watershed is contained within Shelby County (TDEC 2002, 2008a). Both watersheds ultimately drain to the Mississippi River.

3.4.1.1. Surface Water Features

The ACT Plant is a previously developed site that is located adjacent to McKellar Lake to the north (Figure 3-2) and is located entirely within the McKellar Lake surface water system. McKellar Lake is an artificial cutoff meander of the Mississippi River and is the only major surface water feature in the vicinity of the site. The Mississippi River is approximately 1.5 miles west of the ACT Plant. No surface water features occur within the project area.

McKellar Lake was formed in 1948 by the U.S. Army Corps of Engineers to support flood control and navigation on the Mississippi River, and industrial development on Presidents Island, after Congress passed a Flood Control Appropriation Bill in 1946 (Memphis Business 1947; Congress 1952). McKellar Lake was created by the construction of an earthen dam adjacent to

Presidents Island on the north side of the Tennessee Chute (the Mississippi River side channel flowing around the eastern side of Presidents Island). A deep-water harbor was then dredged on the downstream side of the dam. The dam supports Jack Carley Causeway, which provides access to the industrial development on the island. A small island, Treasure Island, is located within McKellar Lake and is used as an upland disposal site for dredged sediment from the McKellar Lake Harbor (USACE 2018). McKellar Lake is a 6.6-mile-long, 1,550-acre water body (excluding Treasure Island) and has designated uses that include industrial water supply, fish and aquatic life, recreation, and navigation (TVA 2020; TDEC 2024c).

3.4.1.2. Existing Wastewater Streams

As shown on Figure 3-2, there are several existing wastewater streams at the Allen Reservation that are permitted for discharge under the jurisdiction of NPDES Permit No. TN0005355. These include Outfall 001 (East Ash Pond Complex to McKellar Lake), Outfall 001A (Emergency Overflow to Horn Lake Cutoff), Outfall 002 (West Ash Pond to the Mississippi River), Outfall 003 (Condenser Cooling Water to Mississippi River), Internal Monitoring Point (IMP) 006 (via Outfall 003 to Mississippi River), and Outfall 010 (intake screen backwash to McKellar Lake). The Allen Reservation also maintains six permitted stormwater outfalls (F4 through F9) under the jurisdiction of NPDES Multi-Sector General Permit (TMSP) No. TNR053184, of which all but one discharges to McKellar Lake.

In 2020, TVA began the closure of both the East and West Ash Pond Complexes. While still required to meet the rules set forth in wastewater Permit No. TN0005355 and stormwater Permit No. TNR053184, TVA obtained an individual construction stormwater permit, No. TN0082228, for the work associated with closure of the ash ponds. This permit became effective in 2020 and allows stormwater runoff associated with construction activities from Outfalls 3 through 7, as shown on Figure 3-2. Construction stormwater outfalls SW6 and SW7 correspond to the TMSP outfalls F07 and F08 respectively. CCR construction-related stormwater is routed through an on-site water treatment system prior to discharge to wastewater Outfall 002. Wastewater Outfalls 001 and 001A were plugged during initial stages of construction and closed; Outfall 8 was also removed during construction. IMP 006 and Outfall 003 have not had discharges since the cessation of coal-fired power generation and the intake at Outfall 010 is no longer in use.

ALF is permitted to discharge treated groundwater and various low volume wastes to T.E. Maxson Treatment Plant under the jurisdiction of the Industrial Wastewater Discharge Permit No. S-NO1-266, administered through the City of Memphis’s Industrial Monitoring and Pretreatment Program. Discharge Point 1 consists of low volume wastes and groundwater extraction discharges encountered during the demolition of the powerhouse. Discharge 2 consists of treated groundwater from the closure of the ash pond.

Water used in operation of existing units at ACT Plant is obtained from MLGW for evaporative cooling purposes. Surface water runoff from the CT tank area, yard, and equipment drainage is treated as a potential oily waste and is routed to the oil-water separator that is discharged to stormwater Outfall F6 or routed to the on-site water treatment system prior to discharge at Outfall 002 (Stantec 2019b).

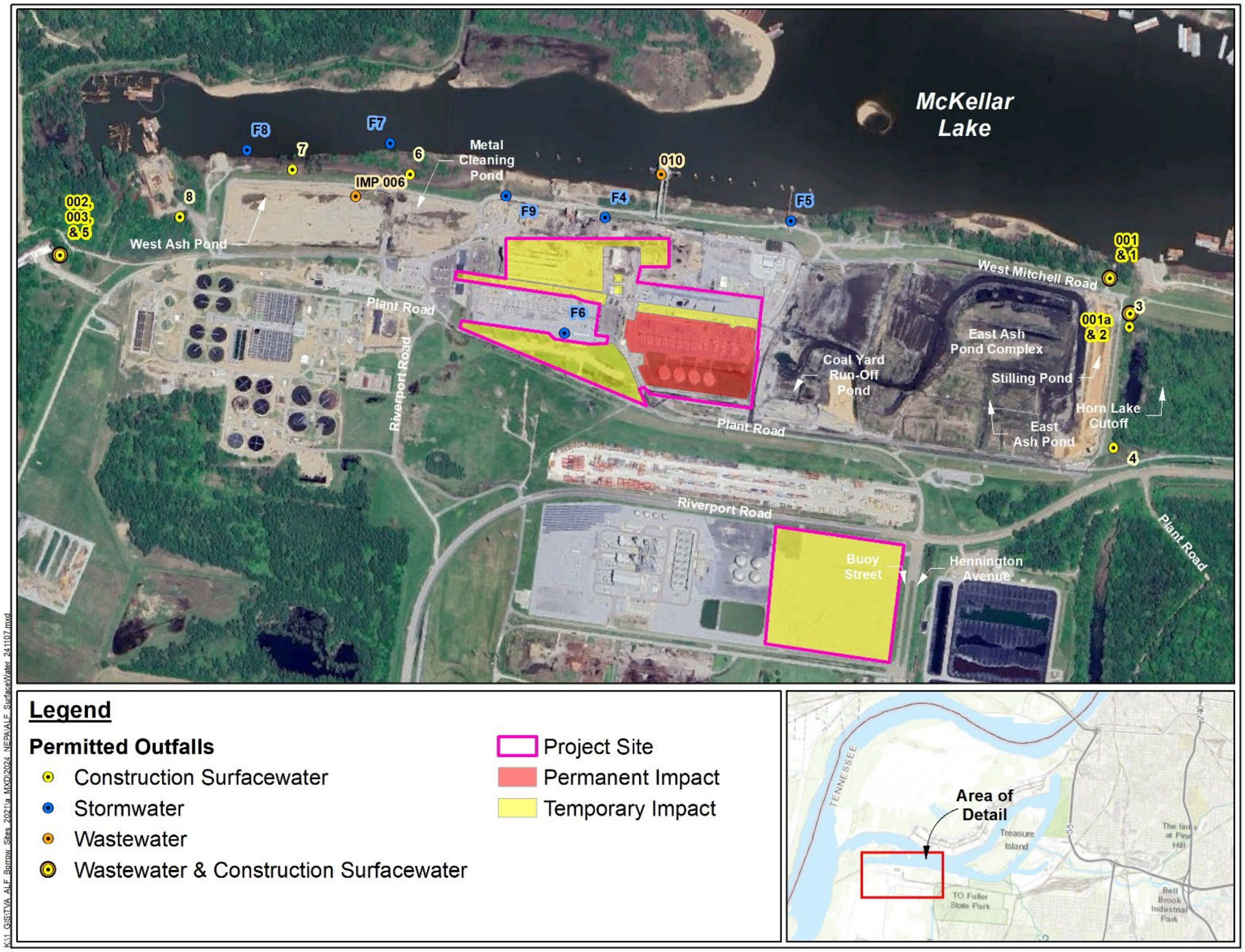


Figure 3-2. Surface Water Resources and Outfalls Near the Allen Combustion Turbine Plant

3.4.1.3. Surface Water Quality

There are water quality concerns in many of the stream segments of both the Lower Mississippi-Memphis and Horn Lake-Nonconnah River watersheds. The segments of the Mississippi and Lower Nonconnah, as well as McKellar Lake, are all known to contain chemical pollutants such as chlordane, dioxins, and polychlorinated biphenyls (PCBs), among others (TDEC 2024c). Water quality conditions within McKellar Lake are influenced by its hydrodynamics, which can control mixing and flushing. The hydrodynamic conditions within the lake are complex and are influenced by watershed runoff inflow and river stage changes.

The CWA requires states to identify all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards and to establish priorities for the development of limits based on the severity of the pollution and the sensitivity of the established uses of those waters. States are required to submit reports containing this information to the EPA. Section 303(d) of the CWA require states to evaluate all available water quality-related data and information to develop a list of waters that do not meet established water quality standards (impaired) and those that currently meet water quality standards but may exceed it in the next reporting cycle (threatened). The term “303(d) list” refers to the list of impaired and threatened streams and water bodies identified by the state which is to be submitted to the EPA for approval every 2 years. States must develop a total maximum daily limit (TMDL) for every pollutant/waterbody combination on the 303(d) list which includes the calculation of the maximum amount of the pollutant that can occur in a waterbody and still meet water quality standards. States allocate loading capacity of pollutants between point and non-point sources. Permits for point sources are issued through the EPA’s NPDES, which is managed under TDEC’s Division of Water Resources in Tennessee (EPA 2024f).

McKellar Lake has been negatively impacted by the surrounding industrial and urbanized land uses. McKellar Lake is listed on the TDEC 303(d) list for chlordane, dioxin, and PCBs due to contaminated sediments; dissolved oxygen, E. coli, nutrients, and sediment from high-density urbanization; mercury from atmospheric deposition; and sediment from dredging (TDEC 2024d). The nearby Mississippi River and the lower Nonconnah Creek are generally listed for similar pollutants from similar sources. All pollutants on the 303(d) list for McKellar Lake are listed as having a low priority for TMDL determination (TDEC 2024d). Low priority TMDLs are developed over 5 or more years (TDEC 2015b). The EPA has approved TMDLs for arsenic, chlordane, dioxins, PCBs, and E. coli in the Horn Lake-Nonconnah Creek Watershed (HUC 08010211) and TMDLs for chlordane, dioxins, and PCBs in the Lower Mississippi-Memphis Watershed (HUC 08010100) (TDEC 2008b, 2009, 2011, 2014).

Water quality management for the ash pond closure and demolition and deconstruction of the ALF are maintained through various NPDES permits and management systems. Wastewater limits and regulatory requirements for Outfalls 001, 001A, 002, and 003 are detailed in TDEC NPDES Permit No. TN0005355, which was issued in 2007 and administratively continued after its original expiration in 2010. In addition to wastewater limits and monitoring, TVA is required to inspect ash pond dikes and toe areas at least quarterly for seepage and take appropriate remedial actions if seeps are present (TDEC 2007).

In 2019, TVA developed a Drawdown and Dewatering Plan with Addendum (Stantec 2019b) that established calculated effluent concentrations, proposed effluent limitations, and proposed monitoring requirements for Outfall 002 during the drawdown and dewatering activities associated with the East Ash Pond closure. Except for radium, the identified constituents are a combination of those regulated in permit No. TN0005355 for Outfall 002, CCR Appendix III and IV, and metals from TN Rule 0400-11-01-.04 Appendix 1 (Stantec 2018b).

Treated groundwater and low volume waste that occur through Discharge Points 1 and 2 are authorized by the City of Memphis Industrial Wastewater Discharge Permit. Though these discharges do not directly discharge to Waters of the United States, they are subject to pretreatment effluent limitations and monitoring requirements (City of Memphis 2023).

Stormwater discharges that occur at Outfalls F4 through F9 are authorized by the Tennessee Multi-Sector General Permit No. TNR053184 (TVA 2019e) for applicable Sector O: Stormwater Discharges Associated with Industrial Activity from Steam Electric Power Generating Facilities, Including Coal Handling Areas and Section L: Stormwater Discharges Associated with Industrial Activity from Landfills and Land Application Sites. (TDEC 2015a). Each of these sectors maintain effluent limitations that permittees must report annually to TDEC.

Construction stormwater discharges that occur at Outfalls 3 through 7 under the authorization of NPDES Construction Stormwater Permit TN0082228 are also subject to effluent limitations and monitoring requirements (TDEC 2020).

3.4.2. Environmental Consequences

3.4.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT. TVA would continue to operate two existing units at ACT on a limited basis. As such, no project-related impacts to surface water resources would occur. Site runoff would continue to drain to the oil-water separator and all current permit requirements would continue to be met. Therefore, impacts to water resources associated with Alternative A would be minor.

3.4.2.2. Alternative B – Allen Aeroderivative Project

3.4.2.2.1. Construction

Construction activities associated with Alternative B that may impact surface water quality include:

- Soil disturbances related to the installation of new equipment, the replacement of existing equipment, and utilization of a laydown area for construction support activities (e.g., storage, parking, material management).
- The handling and storage of construction-related materials and wastes.
- The operation and maintenance of construction-related equipment.

Activities such as soil disturbances, equipment washing, construction vehicle operation, and construction material storage often involve soil erosion and the direct or indirect transport of sediments, which can negatively affect receiving water bodies. Increases in turbidity from sediment may interfere with life functions of aquatic life, and sediments may contain pollutants such as metals, pesticides, or nutrients. An NPDES Construction Stormwater Permit would be required as the proposed action would disturb more than 1 acre of land. The issuance of an NPDES Construction Stormwater permit requires the implementation of a SWPPP and stormwater BMPs prior to the start of construction. The *Tennessee Erosion and Sediment Control Handbook* would be referenced to ensure that the appropriate BMPs are used (TDEC

2012). TVA would ensure a SWPPP is complete and BMPs installed prior to construction, and the SWPPP and all BMPs would be maintained in accordance with permit requirements. Areas where soil disturbances could occur would be stabilized per the requirements of the permit and TVA's standard construction BMPs (TVA 2022b).

The handling and storage of construction-related materials and wastes involves potential surface water impacts from accidental spills and potential runoff. Contaminants may include sediment, sanitary wastes, debris, or construction-related chemicals. The operation and maintenance of construction equipment may potentially impact surface water from sediment transport, vehicle washdown areas, equipment maintenance, and the storage and handling of chemicals related to the operation and maintenance of construction equipment. Contaminants may include sediment and equipment related chemicals such as fuel, oil, coolants, or hydraulic fluid. TVA would comply with all local, state, and federal requirements regarding waste and chemical handling, storage, and disposal during construction activities. BMPs, such as those described in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022b) and a spill prevention, control, and countermeasure plan would be used to avoid contamination of surface waters from the handling and storage of construction-related materials and wastes. Due to increased on-site workforce, temporary toilet facilities would be provided by a licensed vendor, and sanitary wastewater would be disposed of at an approved facility.

All proposed construction activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to receiving waters through accidental spills or releases would be minimized. As there are no surface water features within the project area, no surface water resources would be directly impacted by construction associated with Alternative B. With the proper implementation and maintenance of BMPs, only minor, temporary impacts to local surface waters would be expected during the construction of Alternative B.

3.4.2.2.2. Operation

The operation of the proposed aero CT units associated with Alternative B would include the use of potable water obtained from MLGW. Up to 58.3 gallons per minute would be required for inlet air evaporative cooling in summer ambient temperatures. The existing water system would be modified to serve the new aero CT combustion inlet air evaporative coolers. The existing wastewater and stormwater systems would be modified to include new area drains. Oil-contaminated drains would be directed to the existing oil-water separator, whereas stormwater would be directed to the existing stormwater collection system. Wastewater from offline water wash would be collected in totes and disposed per TVA procedures. Operations under Alternative B would continue to comply with regulations set forth in all wastewater and stormwater NPDES permits. No direct or indirect impacts to surface water would be anticipated from the operations associated with Alternative B. Due to continued compliance with permit requirements and minor alterations in wastewater and stormwater discharges, impacts to water resources during operation are negligible.

3.5. Wildlife

3.5.1. Affected Environment

As detailed in Chapter 1, the project area has been heavily impacted and altered due to the previous construction and operation of Units 1 through 18 and continued operation of Units 19 and 20. Small areas of herbaceous vegetation currently exist in the project area. Most of this vegetation occurs in areas identified for temporary impacts. The ACT Plant provides limited suitable habitat for common wildlife, although it could provide roosting areas for killdeer (*Charadrius vociferus*), rock dove (*Columba livia*), swallow species, and swifts. The mowed grass area could provide limited foraging habitat for common birds such as field sparrow (*Spizella pusilla*), indigo bunting (*Passerina cyanea*), northern cardinal (*Cardinalis cardinalis*), rock dove, and Carolina chickadee (*Poecile carolinensis*) (National Geographic 2002). Mammals, such as eastern mole (*Scalopus aquaticus*), golden mouse (*Ochrotomys nuttalli*), ground hog (*Marmota monax*), and white-tailed deer (*Odocoileus virginianus*), also may use habitat like this in this region (Whitaker 1996). Reptiles that may use these habitats in this region include black racer (*Coluber constrictor*), eastern kingsnake (*Lampropeltis getula*), gray rat snake (*Pantherophis spiloides*), and red milksnake (*Lampropeltis Triangulum*) (Gibbons and Dorcas 2005).

Review of the TVA Regional Natural Heritage database resulted in no records of caves or any other unique terrestrial habitat within 3 miles of the project area.

Review of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool in December 2024, identified 16 migratory bird species of conservation concern that have the potential to occur within vicinity of the project area: American golden-plover (*Pluvialis dominica*), bald eagle (*Haliaeetus leucocephalus*), cerulean warbler (*Setophaga cerulea*), chimney swift (*Chaetura pelagica*), Kentucky warbler (*Geothlypis formosa*), Le Conte's sparrow (*Ammospiza leconteii),* least tern *(Sternula antillarum antillarum),* lesser yellowlegs (*Tringa flavipes*), little blue heron (*Egretta caerulea*), pectoral sandpiper (*Calidris melanotos*), prairie warbler (*Setophaga discolor*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), semipalmated sandpiper (*Calidris pusilla*), and wood thrush (*Hylocichla mustelina*).

American golden-plover are a migrant species through the state on their annual journey between breeding grounds in the arctic and winter habitat in South America (National Geographic 2002). The migratory habitat for this species is prairie, pastures, farmland, and shorelines (Johnson, Connors, and Pyle 2021). Cerulean warbler are vibrant blue warblers usually found in mature hardwood forests. This bird is a summer resident of Tennessee, arriving in mid-April and departing by early September (Nicholson 1997). Chimney swift are summer residents in Tennessee and use chimneys in more urban areas as nesting sites and communal roosts (Nicholson 1997). Kentucky warbler are a small warbler that breeds in dense forest understories (Nicholson 1997). Le Conte's sparrow inhabit damp meadows and shallow marshes and winter in the southeastern U.S. (Audubon 2024a). Least tern in the interior U.S. nest along rivers with broad exposed sandbars (Audubon 2024b). Lesser yellowlegs are a migrant shorebird in Tennessee. This species uses brackish and fresh wetlands, marshes, and ponds (Tibbitts and Moskoff 2020). Little blue heron is a migrant in Tennessee that nests occasionally in the state. This species prefers to nest within thickets of hardwoods (Nicholson 1997). Pectoral sandpiper breed in the arctic and migrate through Tennessee, foraging in marshy edges and wet meadows (Cornell Lab of Ornithology 2024a). Prairie warbler are summer residents in Tennessee. This species can be found in shrubby second growth forests with dense ground cover (Nicholson 1997). The prothonotary warbler is a small yellow warbler that nests in cavities in bottomland forests and wetlands (Nicholson 1997). Red-headed woodpeckers use a variety of treed habitats but show preference for forested areas exhibiting more openness and a high number of tree snags available. Rusty blackbirds are a winter migrant that is not currently known to nest within Tennessee. This species uses flooded, or bottomland hardwood forests (National Geographic 2002). Semipalmated sandpipers breed in the arctic and migrate through Tennessee, foraging in mudflats, wet and plowed agricultural fields, river margins and sewage ponds (Cornell Lab of Ornithology 2024b). Wood thrush are summer residents in Tennessee that are associated with larger tracts of mature mixed-deciduous forests with open forest floors (Evans et al. 2020).

No suitable woodlots, large cavity nesting trees, mud flats, bottomland hardwood forests, or early successional areas exist that would provide habitat for these species. Some marginal migration stopover habitat is present for American golden plover in the mowed grass areas of the project footprint. Least terns have nested in ash ponds and graveled areas on site. See Section 3.6, Threatened and Endangered Species, for discussion on least terns and bald eagles.

3.5.2. Environmental Consequences

3.5.2.1. Alternative A – No Action Alternative

Under Alternative A, the No Action Alternative, TVA would not install new aero CT units at the ACT Plant. TVA would continue to operate two existing units at the ACT Plant on a limited basis. As such, there would be no impact to terrestrial wildlife or their habitats.

3.5.2.2. Alternative B – Allen Aeroderivative Project

Alternative B would evaluate the installation and operation of six new aero CT units (GE LM2500s) generating approximately 200 MW of power.

Much of the project area is heavily disturbed, with several areas already paved or graveled or covered with maintained vegetation. Herbaceous areas located within the ACT Plant and associated project areas are typically mowed vegetation that do not offer suitable habitat for rare wildlife species but can be used by common species.

During construction, displacement of primarily common, habituated wildlife species would be minimal because the project area is a heavily developed and disturbed area. Direct effects to some individuals could occur if those individuals are immobile during the time of construction activities (e.g., during breeding/nesting or hibernation seasons). However, mobile wildlife would disperse into surrounding areas in attempts to find new food resources, shelter, and to reestablish territories. Due to the lack of suitable undeveloped habitat within the project area, populations of common wildlife species likely would not be impacted by the proposed action.

Review of the USFWS IPaC tool in December 2024, identified 16 migratory bird species of conservation concern that have the potential to occur within the project area. No suitable habitat for cerulean warbler, chimney swift, Kentucky warbler, Le Conte’s sparrow, prairie warbler, prothonotary warbler, red-headed woodpecker, or wood thrush is present. Additionally, no mud flats or low wetland areas are present that would provide habitat for little blue heron, lesser yellowlegs, pectoral sandpiper, rusty blackbird, and semipalmated sandpiper. While American golden-plover could use the mowed grass areas as stopover sites during migration, this species does not breed within Tennessee and would be expected to flush if disturbed. Therefore, impacts to wildlife resources associated with Alternative B would be minor. See Section 3.6, Threatened and Endangered Species, for discussion on least terns and bald eagles.

3.6. Threatened and Endangered Species

3.6.1. Affected Environment

Review of the TVA Regional Natural Heritage Database on October 3, 2023, resulted in records of several special status species within 3 miles of the project area as summarized in Table 3-6: three species of state conservation concern, lark sparrow, osprey, and Mississippi kite; one species federally threatened in Tennessee, piping plover; and two federally delisted and monitored species, interior least tern and bald eagle. A search for federally listed species within Shelby County, Tennessee, identified one proposed threatened species (alligator snapping turtle) and one proposed endangered species (tricolored bat). Additional review of the USFWS IPaC tool on November 3, 2023, identified one proposed threatened species (monarch butterfly) as species that have the potential to occur within the project area. No federal or state listed plant species or designated critical habitats for plant species have been documented within a 5-mile vicinity of the project area. Table 3-6 contains a list of species of conservation concern (state-listed or state ranked S1-S3) within 3 miles of the project area, federally listed species within Shelby County, and USFWS IPaC species results for the project area. Species-specific information and habitat suitability within the project area for each of these species are discussed below.

Table 3-6. Federally Listed Terrestrial Animal Species Reported from Shelby County, Tennessee and Other Species of Conservation Concern Documented Within 3 Miles of the ACT Plant

Common Name	Scientific Name	Status[a] Federal	Status[a] State (Rank)[b]
Birds			
Bald eagle	*Haliaeetus leucocephalus*	DL	D(S3)
Interior least tern	*Sterna antillarum athalassos*	DL	E(S2S3B)
Lark sparrow	*Chondestes grammacus*	-	-(S1B)
Osprey	*Pandion haliaetus*	-	-(S3)
Mississippi kite	*Ictinia mississippiensis*	-	-(S2S3)
Piping plover	*Charadrius melodus*	E, T	-
Invertebrates			
Monarch butterfly[(c),(d)]	*Danaus plexippus*	PT	-(S4)
Mammals			
Tricolored bat[(e)]	*Perimyotis subflavus*	PE	T(S2S3)
Reptiles			
Alligator snapping turtle[(e)]	*Macrochelys temminckii*	PT	T(S2S3)

Source: TVA Regional Natural Heritage Database, extracted 11/3/2023 and USFWS Information for Planning and Consultation (IPaC) resource list (https://ecos.fws.gov/ipac/), accessed 12/13/2024.

Notes:

(a) Status Codes: C = Candidate species; D = Deemed in Need of Management; DL = Delisted; E = Endangered; PE = Proposed Endangered; PT = Proposed Threatened; T = Threatened

(b) State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure

(c) Historically this species has not been tracked by state or federal heritage programs.

(d) USFWS has determined that this species could occur within the project area.

(e) Species known from Shelby County, Tennessee but not from within 3 miles of the project area.

Bald eagles are protected under the Bald and Golden Eagle Protection Act (16 USC 668-668d). This species is associated with large, mature trees capable of supporting their nests that can weigh several hundred pounds and are typically built near larger waterways where eagles forage primarily for fish (USFWS 2007). Bald eagles are most reproductively successful in areas where human disturbance is minimized (Wilson et al. 2018). Three bald eagle nests have been recorded within Shelby County, Tennessee. The nearest known bald eagle nest record is approximately 1.38 miles from the project area. Foraging habitat is not present within the project area but is available approximately 300 feet away over McKellar Lake.

Interior least terns use areas near rivers and reservoirs with open, sparsely vegetated sand and gravel beaches, sandbars, islands, and salt flats as loafing and colony nesting areas. This species is highly adapted to nesting in disturbed areas, using ash disposal areas, gravel pits, and reservoir shorelines. They forage in the shallow waters of lakes, ponds, and rivers near nest sites (Thompson et al. 2020). Interior least terns have been observed in previous years immediately east of the ACT Plant where an ash settling pond used to occur and south of the ACT Plant in a gravel lot associated with the ACC Plant. The ash pond east of the ACT Plant has been dewatered and no longer provides large areas of standing water attractive for nesting/foraging. The gravel lot will be used as a laydown area for this project. No interior least terns have been observed nesting in the gravel lot since 2019 based on weekly surveys by ACT Plant staff.

The project commits to the following conservation measures to avoid impacts to interior least terns:

- Weekly observations of potential nesting sites within the project area would begin in mid-May and end in mid-August of any given year (for the duration of the project) to identify any terns that return to the area.

- If terns return to project area and are seen nesting, no activities would be permitted within 300 feet of the nests.

These commitments were implemented with USFWS concurrence during the Allen Fossil Plant Demolition and Deconstruction Project of 2019 and have continued until present. With continuance of these commitments during proposed actions, no impacts are anticipated. If any of these measures cannot be met, TVA would coordinate actions with USFWS.

Lark sparrows are found in open habitats such as roadsides, farmlands, pastures, and grasslands (Martin and Parrish 2020). The closest record of this species is 30 years old, from President's Island approximately 2.9 miles away. No suitable habitat for this species exists in the action area given the heavy anthropogenic disturbance at this site.

Ospreys use similar nesting and foraging criteria to bald eagles; however, ospreys nest more readily on man-made structures (Bierregaard et al. 2020). The closest nests were recorded approximately 400 and 800 feet from the northern laydown area from 2019 through 2021, but the infrastructure in McKellar Lake supporting these nests has been removed. ACT Plant staff perform weekly osprey inspections during the active nesting season (March 1 to July 31) and will continue through the completion of this project. If an active osprey nest (with eggs or fledglings) is observed within 300 feet (600-foot-diameter circle) of project actions, TVA will stop work and coordinate further actions with U.S. Department of Agriculture (USDA) Wildlife Services.

In the Southeast, Mississippi kite nests are most commonly found in mature, undisturbed stands of lowland and floodplain forests and along major rivers. Most nests are placed in non-conifers near woodland edge (Parker 2020). These raptors prefer to forage over open and edge habitats and require open areas near nesting sites for foraging. The nearest known record for this species is approximately 0.92 mile from the ACT Plant. No nesting or foraging habitats for Mississippi kite are present in the project area.

The piping plover is a rare migrant species typically found in the region from mid-July through early September. There is no documentation of them nesting in the state. Outside of breeding season, they are most abundant on heterogeneous expansive sandflats, sandy mudflats, and sandy beaches in proximity to the Mississippi River (Elliott-Smith and Haig 2020). The nearest record of piping plover is approximately 0.43 mile from the ACT Plant in a coal pond that has since been dewatered, as part of the Ash Pond Closure project, and no longer provides large areas of standing water for foraging. No suitable habitat for piping plover exists in the project area.

The monarch butterfly is a highly migratory species, with eastern U.S. populations overwintering in Mexico. Monarch populations typically return to the eastern United States in April (Davis and Howard 2005). Summer breeding habitat requires milkweed plant species, on which adults exclusively lay eggs for larvae to develop and feed on. Adults drink nectar from other blooming wildflowers when milkweeds are not in bloom (NatureServe 2022). Suitable habitat or flowering plants used by this species are not present in the project area. Though this species has not been historically tracked by state or federal heritage programs, the USFWS IPaC tool determined that this species could occur within the vicinity of the project area. However, given the highly disturbed nature of the ACT and associated laydown areas, no suitable habitat is present within the project site.

Tricolored bats hibernate in caves or man-made structures such as culverts or bridges (Fujita and Kunz 1984; Newman et al. 2021). During the summer, tricolored bats roost in clumps of tree foliage, often in oak and hickory trees (Veilleux et al. 2003; O’Keefe et al. 2009; Schaefer 2017; Thames 2020). Foraging studies of tricolored bats are lacking, but it is believed they typically forage near their roost trees in forested areas and riparian corridors. The closest known record in Shelby County is approximately 33.08 miles from the project area.

No caves are known within 3 miles of the project area. There are no trees or structures proposed for removal that would provide roosting habitat for tricolored bats. Aquatic foraging habitat is not present within the project area but is available over the Mississippi River and McKellar Lake, approximately 300 feet from the project area.

Alligator snapping turtle is a proposed threatened, highly aquatic reptile that emerges from water only for nesting, rarely for basking (USFWS 2021). This species is restricted to river and stream drainages which flow into the Gulf of Mexico. These turtles are found in floodplain swamps and oxbow lakes associated with large rivers but do not occur in isolated wetlands and ponds. Most nesting occurs May through July. There are no large wetlands or bodies of water present in the project area. The closest known record is approximately 11.79 miles from the action area. The northern laydown area is approximately 300 feet from McKellar Lake but the site is highly disturbed and suitable habitat for this species does not exist within the action area.

3.6.2. Environmental Consequences

3.6.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT Plant. TVA would continue to operate two existing units at the ACT Plant on a limited basis. As such, there would be no impact to threatened and endangered species.

3.6.2.2. Alternative B – Allen Aeroderivative Project

The Action Alternative would evaluate the installation and operation of six new aero CT units (GE LM2500s) generating approximately 200 MW of power.

Construction would occur over a 15-month time frame (approximately) beginning in 2025, with construction activities (including laydown actions) taking place within the project area which encompasses previously disturbed areas associated with the retired ALF and existing ACT and ACC Plants.

Because of the distance between known nests and the project area (approximately 1.36 miles for bald eagle and 900 feet for osprey nest), and because of the ongoing monitoring within the project area, no bald eagle or osprey nests would be impacted by the proposed action. Construction and operation of aero CTs would follow the National Bald Eagle Management Guidelines. Bald eagle and osprey would not be impacted by Alternative B.

Interior least tern has been documented within the project area. Based on TVA's commitment to conservation measures to avoid impacts to interior least terns, no adverse effects to the interior least tern are anticipated as a result of Alternative B.

Due to the lack of habitat in the project area and distance from known records TVA has made a no-effect determination for lark sparrow, Mississippi kite, and piping plover.

Suitable habitat and flowering plants used by monarch butterflies are not present in the project area. Therefore, impacts to the monarch butterfly are not anticipated as a result of Alternative B.

The tricolored bat has the potential to occur within the project area. No caves or other hibernacula for tricolored bats are known within the project area or within 3 miles of the project area. No suitable summer roosting or foraging habitat exist within the project area for tricolored bats. No demolition is proposed that could provide roosting areas for these species.

A number of activities associated with Alternative B were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) and completed in April 2018 and updated in May 2023 and November 2024. For those activities with the potential to affect bats, TVA committed to implementing specific conservation measures. These activities and associated conservation measures are identified on in Table 4 of the TVA Bat Strategy Project Screening Form (Appendix D) and would be reviewed and implemented prior to project construction and operation. Considering the scope of the proposed actions, distance to known bat records, and implementation of conservation measures, TVA has determined that Alternative B would not jeopardize the continued existence of the tricolored bat as it is currently listed as a proposed endangered species. In anticipation of the expected listing of the tricolored bat as endangered under the ESA, TVA has also evaluated the potential to impact the species at the individual level. Due to the absence of suitable habitat, TVA has determined that the proposed actions would not affect the tricolored bat upon its formal listing as endangered.

No habitat exists in the project area for alligator snapping turtle. TVA has made a no-effect determination for alligator snapping turtle.

In summary, habitat for most sensitive species is lacking within the project area. Additionally, for selected species (bat species, bald eagle, osprey, and the interior least tern) TVA has committed to conservation measures to avoid and minimize impacts. Therefore, overall impacts on threatened and endangered species would be minor.

3.7. Managed and Natural Areas

3.7.1. Affected Environment

Natural areas refer to ecologically significant sites, national or state forests, wilderness areas, scenic areas, Wildlife Management Areas (WMAs), recreational areas, greenways, trails, Nationwide Rivers Inventory streams, and wild and scenic rivers. Managed areas include lands held in public ownership that are managed by an entity (e.g., TVA, USDA, United States Forest

Service, State of Tennessee) to protect and maintain certain ecological and/or recreational features. Ecologically significant sites are either tracts of privately owned land that are recognized by resource biologists as having significant environmental resources or identified tracts on TVA lands that are ecologically significant but not specifically managed by TVA's Natural Areas program. Nationwide Rivers Inventory streams are free-flowing segments of rivers recognized by the National Park Service as possessing remarkable natural or cultural values.

A review of TVA's Natural Heritage Database identified six managed/natural areas within a 3-mile radius of the ACT Plant, totaling 8,623 acres (Table 3-7). All areas identified in the Natural Heritage Database review are more than 0.5 mile from ACT Plant.

There are no managed or natural areas present within the project area, with the exception of the Ensley Bottoms Complex, an ecologically significant site. The Ensley Complex, which is part of the Mississippi Alluvial Valley Important Bird Area, encompasses the entirety of the project area and adjacent properties. The Tennessee Wildlife Resources Agency (TWRA), partnered with the National Audubon Society's Audubon Important Bird Area program, designates Important Bird Areas in Tennessee. These areas are identified as important for the conservation of bird populations.

Table 3-7. Managed and Natural Areas within 3 Miles of the Project Area

Natural Areas, Parks, or Recreational Facilities	Acres	Approximate Distance from the Project Area at its Closest Location
Chucalissa Village Archaeological Area	867	0.7 mile east
Ensley Bottoms Complex	1,059	0.0 mile
Wetlands Reserve Program	939	2.2 miles southwest
T.O. Fuller State Park & Chucalissa Tree Trail Arboretum	1,004	0.7 mile east
Presidents Island Wildlife Management Area	5,669	0.9 mile north
Land Trust for Tennessee – Conservation Easement	144	1.1 miles southeast
Total	**9,682**	

Source: TVA's Regional Natural Heritage Database 2024

3.7.1.1. Managed Natural Areas

Managed and natural areas within 3 miles of the project area are described below.

- **The Ensley Bottoms Complex.** The Ensley Bottoms Complex includes the ALF ash impoundments, McKellar Lake, Presidents Island north of McKellar Lake, T. O. Fuller State Park, the Maxson Wastewater Treatment Plant (WWTP), and other public and private lands in the vicinity of ALF. According to the Tennessee Important Bird Area program website, the Ensley Bottoms Complex is the most important shorebird site in Tennessee and one of the most important inland shorebird sites in the southeast (TN IBA 2018).

- **T.O. Fuller State Park, Chucalissa Tree Trail Arboretum, and Village Archaeological Area.** T.O. Fuller State Park, which contains the Chucalissa Archaeological Site and Chucalissa Tree Trail Arboretum, is located approximately 0.7 mile east of the ACT Plant. Established in 1938, the 1,138-acre park was the first state park east of the Mississippi River that was open for use by African Americans and is the only state park located within the city limits of Memphis (Tennessee State Parks 2019). The park features hiking, camping, an arboretum trail, and a nature center. Recreation facilities at the park include a picnic area, campground, swimming pool, and tennis courts. The Chucalissa Village State Archaeological Area is comprised of 866.5 acres within T.O. Fuller State Park. This site was initially discovered in 1939 and set aside in 1994 to preserve one of the major prehistoric settlements in the southeast (Tennessee State Parks 2019).

- **Land Trust for Tennessee - Conservation Easement.** The Wetlands Reserve Program is a voluntary program that offers landowners the opportunity to protect, restore, and enhance wetlands on their property with technical and financial support from NRCS, in exchange for retiring eligible land from agriculture (USDA NRCS 2019). One of these properties comprises 939 acres and is located approximately 2 miles southwest of the ACT Plant. The other Conservation Easement Property is located approximately 1 mile southeast of the ACT Plant. This 144-acre site falls under a conservation easement by the Land Trust for Tennessee. Both areas are privately owned.

- **Presidents Island WMA.** Presidents Island WMA is located approximately 0.7 mile from the ACT Plant, on the opposite side of McKeller Lake. This 5,669-acre WMA is managed by the TWRA in cooperation with TVA and is a notable birding area. This WMA allows deer hunting with archery equipment during authorized times of the year (TWRA 2024).

3.7.2. Environmental Consequences

3.7.2.1. Alternative A – No Action

Under the No Action Alternative, TVA would not install new aero CT units at the ACT. TVA would continue to operate two existing units at ACT on a limited basis. There would be no change to the project area; therefore, there are no impacts to managed natural areas resulting from Alternative A.

3.7.2.2. Alternative B – Allen Aeroderivative Project

The ACT Plant is located within the boundaries of the Ensley Bottoms Complex. Project activities would likely result in a temporary displacement of birds in the immediate vicinity of the ACT Plant due to the disruptive noise, fugitive dust, and heavy machinery operation associated with construction. However, the project area is heavily developed, provides little to no suitable habitat for bird species, and is not an area where significant numbers of birds have been known to flock. The temporary laydown areas are also previously developed, and none contain ponds or wetland habitat where shorebird species are typically found. The Ensley Bottoms Complex Important Bird Area covers a large area, most of which would remain unaffected by proposed project activities. As the birds, and those who bird watch recreationally, would be able to relocate to other areas of the complex during construction activities and as the area impacted by construction and operation of the ACT Plant does not provide optimal habitat for shorebirds, direct impacts to the Ensley Bottoms Complex under Alternative B would be minor.

TVA's Natural Heritage Database identified six managed and natural areas within a 3-mile radius of the project area. Because of their distances from the site (0.7 to 2.0 miles), no direct impacts are anticipated. Furthermore, because the existing character of the project area would not change under this alternative, and because managed natural areas are greater than 0.5 mile from the project area, there would be no direct impacts from construction or operation. Therefore, no direct impacts to natural areas would be anticipated under this alternative.

Some areas of T.O. Fuller State Park, Chucalissa Village Archaeological Area, and Arboretum may experience temporary indirect impacts related to disruption of traffic patterns, potential delays in accessing the park, and an increase in noise and dust emissions during construction. However, as noted in Section 3.8, Transportation, the increase in traffic associated with construction activities is relatively small compared to existing traffic volumes. These impacts would be minor and would not impact the use or enjoyment of the park because construction activities are contained with the project area and because of the relatively short-term nature of this action. Potential impacts to natural and managed areas under this alternative would be minor, indirect, and temporary.

Effects to managed natural areas during base load operation of the proposed aero CT units would remain unchanged.

The Presidents Island WMA, Wetlands Reserve Program area, and the Land Trust for Tennessee properties are a sufficient distance from the project area that no direct impacts from construction or operation would be expected.

In summary, overall impacts to managed and natural areas as a result of construction and operation of Alternative B would be minor.

3.8. Transportation

3.8.1. Affected Environment

The ACT Plant is located in the Frank C. Pidgeon Industrial Park, which is served by highway, railway, and waterway modes of transportation. Figure 2-1 identifies the primary roadway network in the immediate project area. Major traffic generators include Nucor Steel, xAI, TVA's ALF and ACC plants, TVA ALF ash pond closure activities, and the CSX intermodal facility. These facilities and activities generate traffic that generally comprises of a mix of cars and light-duty trucks (such as a residential delivery truck), medium-duty trucks (larger delivery trucks), and heavy-duty trucks (semi-tractor trailers).

Principal access to the ACT Plant from Interstate 55 (I-55) is West Mallory Avenue (a single-point urban interchange) to Paul R. Lowry Road (hereinafter referred to as Riverport Road) to Plant Road. Riverport Road is a four-lane road within the vicinity of the ACT. Table 3-8 presents the 2023 Average Annual Daily Traffic (AADT) measured in vehicles per day counts for roadways in the vicinity of the ACT Plant and that serve the Frank C. Pidgeon Industrial Park. Primary routes to ALF are shown on Figure 2-1.

Table 3-8. Average Annual Daily Traffic Counts of Affected Roadways

Roadway Segment	2023 Average Daily Vehicle Use (veh/day)[1]
Plant Road	Not available
Riverport Road at West Mallory Avenue	6,040
West Mallory Avenue	5,974
Interstate 55	69,618

Source: TDOT 2023
Key: veh/day = vehicles per day

The traffic-carrying ability of a roadway is described by level of service (LOS). LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of service measures like speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. LOS is described accordingly:

- LOS A: free flow traffic conditions
- LOS B: free flow conditions although presence of other vehicles begins to be noticeable
- LOS C: increases in traffic density become noticeable but remain tolerable to the motorist
- LOS D: borders on unstable traffic flow; the ability to maneuver becomes restricted; delays are experienced
- LOS E: traffic operations are at capacity; travel speeds are reduced, ability to maneuver is not possible; travel delays are expected
- LOS F designates traffic flow breakdown where the traffic demand exceeds the capacity of the roadway; traffic can be at a standstill

Table 3-9 details the existing LOS on select intersections with the potential to be impacted by traffic from the proposed action. LOS at these intersections ranges from A to C. As described above LOS of A, B, or C denote that traffic conditions may become noticeable but remain tolerable.

3.8.1.1.1. Railroads

The ALF was served by a rail line operated by Canadian Railroad. This line ran east from ALF, parallel to the north of Riverport Road for approximately 2 miles, where it crosses the south of the road.

3.8.1.1.2. Barge

The ALF plant has a barge unloading area located on McKellar Lake, which has direct access to the Mississippi River.

3.8.2. Environmental Consequences

3.8.2.1. Alternative A – No Action Alternative

Under Alternative A, TVA would not install and operate six new aero CTs at the ACT Plant. TVA would continue to operate two existing CT units at the ACT Plant on a limited basis. Therefore, there would be no project-related impact to transportation, as there would be no changes at the ACT that would impact traffic or roadway conditions.

3.8.2.2. Alternative B – Allen Aeroderivative Project

Under Alternative B, vehicular traffic on public roads near the ACT Plant would increase because of the commuting of construction workers, delivery of materials and equipment, and transportation of borrow material. Construction activities would last approximately 15 months, with work primarily occurring during daytime hours, typically on weekdays, but potentially up to 7 days a week and limited nighttime hours if warranted to meet construction schedules.

The daily workforce during the construction phase is expected to be 200 workers per day. Traffic is expected to be distributed during a peak morning period (to the project area) and a peak evening period (away from the project area). Assuming one person per commuting vehicle, there would be a daily morning inbound traffic volume of 200 vehicles per day and a daily outbound traffic volume of 200 vehicles per day for a total of 400 trips per day. Construction traffic would access the site via River Road to Plant Road. Table 3-9 illustrates the impact from increased worker commutes on select intersections within the vicinity of the ACT Plant. As shown in Table 3-9, the increase of 400 trips per day on these roads would be minor and would not destabilize or impede existing traffic conditions.

Construction-related traffic on I-55 is expected to be minor. Traffic from commuters and transport of equipment and materials is anticipated to disperse throughout the larger transportation network via I-55. During the construction period, the increase of 400 trips from daily commuters represents approximately 0.6 percent of the 2023 AADT. Transportation of equipment, materials, and borrow materials are intermittent throughout the approximately 15-month construction period and are not anticipated to disrupt the transportation network.

Additional truck traffic would also occur in the area during the construction phase due to material and equipment deliveries. However, because this increase would primarily occur during the mobilization and demobilization phases, long-term impacts to the surrounding transportation network during the construction phase are not anticipated.

Table 3-9 details the impact from construction-related traffic and the associated LOS. As detailed in Table 3-9, there would be no change in LOS as a result of construction-related traffic and only short delays at intersections within the vicinity of the ACT Plant.

The transportation of borrow material would be obtained from a previously permitted borrow site located within 30-mile radius of the ACT Plant. Material obtained for borrow needs would likely be transported to the project area via I-55 to West Malloy Road, Riverport Road, and Plant Road. Approximately 8,000 cubic yards of borrow material would be needed to support the project. Conservatively, borrow trucks are estimated to hold 10 cubic yards of borrow material, resulting in 800 truckloads (1,600 truck trips) over the course of the 15-month construction period. Table 3-9 illustrates the impact from increased borrow material transport on select intersections within the vicinity of the ACT Plant. As shown in Table 3-9, the increase of 1,600 truck trips over the course of 15 months on these roads would be minor and would not destabilize or impede existing traffic conditions. Based on the intermittent nature of borrow transportation, impacts to traffic operations are expected to be minor and short term.

Increased traffic associated with construction of the proposed aero CTs would overlap with increased traffic associated with the CCR removal at ALF as part of the ALF Ash Impoundment Closure project. The maximum traffic associated with that project is 120 truckloads (240 truck trips) of CCR from ALF to an off-site landfill and 116 truckloads (132 truck trips) of borrow material per day. Overlap of the CCR removal and construction of the aero CTs, including construction workforce and borrow trucking, would not decrease existing LOS on any of the used roadways. This overlap results in a delay ranging from approximately 0 to 2 second on select intersections (Table 3-9). Therefore, the impact of construction of the aero CTs and overlapping CCR removal activities would have a minor impact on existing traffic conditions.

Table 3-9. Peak Hour Traffic Scenario Model Results

Intersection	Movement	Existing LOS	PM Peak LOS	PM Peak Delay (S)	PM Peak Delay Difference from Existing (S)	Impact
Riverport Road at West Mallory Avenue	Eastbound Right	A	A	3	1	Minor
	Northbound Left	C	C	26	0	Minor
West Mallory Avenue at Interstate 55 Ramps	Westbound Left	B	B	20	2	Minor
	Northbound Right	A	A	2	0	Minor
Riverport Road at North Rivergate Road	Southbound Left/Right	B	B	14	1	Minor
Riverport Road at Rivergate Road	Northbound Left	C	C	17	1	Minor
Riverport Road at Plant Road/Buoy Street	Southbound Left	B	B	12	1	Minor
Riverport Road at Plant Road East	Northbound Left	B	B	12	1	Minor

Key: LOS = level of service; S = seconds

Due to the high volume of I-55 traffic, ACT-related traffic is anticipated to be absorbed by the existing condition and would not noticeably impact the existing transportation network. On roads within the vicinity of the ACT Plant, construction-related traffic is anticipated to be minor and not destabilizing as the increase of 400 commuter trips per day and 1,600 borrow truck trips over the course of 15 months results in minor impacts to delays and no impact to LOS. Due to the small size of the operational workforce (5 permanent employees) long-term operation of the proposed project would not result in changes to the existing conditions on the surrounding roadways.

Overall, traffic-related impacts from construction and operation of the aero CTs including daily worker commutes, equipment delivery, and transport of borrow material would have a minor impact on roadways within the vicinity of the ACT Plant.

3.9. Noise

3.9.1. Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs. For instance, higher sensitivities to noise would be expected during the quieter overnight periods at noise-sensitive receptors such as residences. Other receptors include developed sites where frequent human use occurs, such as churches and schools.

Sound is measured in logarithmic units called decibels (dB). Given that the human ear cannot perceive all pitches or frequencies of sound, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel (dBA), which filters out sound in frequencies above and below human hearing. A noise level change of 3 dBA or less is barely perceptible to average human hearing. However, a 5-dBA change in noise level is clearly noticeable. The noise level associated with a 10-dBA change is perceived as being twice as loud; whereas the noise level associated with a 20-dBA change is considered to be four times as loud and would therefore represent a "dramatic change" in loudness.

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level. The equivalent sound level is the constant noise level that conveys the same noise energy as the actual varying instantaneous sounds over a given period. Fluctuating levels of continuous, background, and/or intermittent noise heard over a specific period are averaged as if they had been a steady sound. The day-night sound level (Ldn), expressed in dBA, is the 24-hour average noise level with a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m. to account for the increased sensitivity of people to noises that occur at night. Typical background day-night noise levels for rural areas are anticipated to range between an Ldn of 35 and 50 dB, whereas higher-density residential and urban areas background noise levels range from Ldn 43 dB to 72 dB (EPA 1974). Common indoor and outdoor noise levels are listed in Table 3-10.

There are no federal, state, or locally established quantitative noise level regulations specifying environmental noise limits in Shelby County, Tennessee. However, the EPA noise guideline recommends outdoor noise levels do not exceed Ldn of 55 dBA, which is sufficient to protect the public from the effect of broadband environmental noise in typical outdoor and residential areas. These levels are not regulatory goals but are "intentionally conservative to protect the most sensitive portion of the American population" with "an additional margin of safety" (EPA 1974). The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985).

Table 3-10. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band at 5 meters (16.4 feet)
Jet Flyover at 300 m (984.3 ft)		
	100	
		Inside Subway Train (New York)
Gas Lawn Mower at 1 m (3.3 ft)		
	90	
		Food Blender at 1 m (3.3 ft)
Diesel Truck at 15 m (49.2 ft)		Garbage Disposal at 1 m (3.3 ft)
	80	
		Shouting at 1 m (3.3 ft)
Gas Lawn Mower at 30 m (98.4 ft)	70	Vacuum Cleaner at 3 m (9.8 ft)
Commercial Area		Normal Speech at 1 m (3.3 ft)
	60	
		Large Business Office
	50	Dishwasher Next Room
Quiet Urban Daytime		
	40	Small Theater, Large Conference Room
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime		
	30	
		Bedroom at Night
Quiet Rural Nighttime		Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

Source: FHWA 2018

Key: dB = decibels; ft. = feet; m = meters

3.9.1.1. Sources of Noise

Ambient noise in the area is characterized by operations at the ACT Plant, the ACC Plant, removal of CCR at the ALF, and other industrial operations in the Frank C. Pidgeon Industrial Park. The existing ACT Plant generates localized noise through operation of CTs, generators, and other ancillary equipment.

Noise sources common to activities evaluated in this EIS include noise from construction activities, transportation noise, and operational noise. The level of construction noise depends on the nature and duration of the project. Construction activities for most large-scale projects would be expected to result in increased noise levels due to operation of construction equipment on site and the movement of construction-related vehicles (i.e., worker trips, and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities would increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles. Construction noise is generally temporary and intermittent in nature because it primarily occurs during daytime hours, typically on weekdays, minimizing the impact to receptors. However, construction could potentially occur up to 7 days a week and limited nighttime hours if warranted to meet construction schedules.

Transportation noise would primarily comprise noise associated with workers commutes and intermittent transport of equipment, materials, and borrow material. Three primary factors influence highway noise generation: traffic volume, traffic speed, and vehicle type. Generally, heavier traffic volumes, higher speeds, and greater numbers of trucks increase the sound level of highway traffic noise. Other factors that affect the sound level of traffic noise include a change in engine speed and power, such as at traffic lights, hills, and intersecting roads, as well as pavement type. Highway traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads (FHWA 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic volume would result in an approximately 3-dBA increase in noise level, which would normally not be a perceptible noise increase (FHWA 2011).

3.9.1.2. Noise Receptors

Sensitive noise receptors include residences or other developed sites where frequent human use occurs, such as churches, parks, and schools. Sensitive noise receptors would include recreationists using T.O. Fuller State Park, which is located approximately 0.7 mile southeast of the ACT Plant, on the opposite side of Riverport Road. The northwest corner of the park, closest to the project area, is primarily undeveloped woodland separated from the main body of the park by a railroad spur. This isolated portion of the park contains Plant Road, which provides access into to the park, but does not provide any park amenities. The next closest receptor is a residential property located approximately 1.5 miles southeast of the ACT Plant, separated from the proposed project area by densely forested areas of T.O. Fuller State Park.

3.9.2. Environmental Consequences

3.9.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT. TVA would continue to operate two existing units at ACT on a limited basis. Therefore, there would be no new impacts to noise receptors under this alternative, and ambient noise levels would remain similar to current conditions.

3.9.2.2. Alternative B – Allen Aeroderivative Project

Under Alternative B, on-site construction activities would result in increased noise levels on and adjacent to the construction site, from operation of construction equipment on site, and along roadways used by construction-related vehicles. Construction activities would last approximately 15 months, with work primarily occurring on weekdays during daytime hours. Weekend and night shift construction may occur should the schedule necessitate. During the construction phase, noise would be generated by a variety of construction equipment including trucks, truck-mounted augers and drills, excavators, tracked cranes, and bulldozers. Typical noise levels from this construction equipment are expected to be 85 dBA or less at a distance of 50 feet from the construction site (FHWA 2016).

Based on straight line noise attenuation, noise levels from construction-related activities, measured at the boundary of the ACT Plant, would likely attenuate to 47.52 dBA at the northwest corner of T.O. Fuller State Park. As previously noted, however, there are no amenities in this isolated portion of the park, and park users would only be in this area when entering or exiting the park via Plant Road. The closest park amenity, a hiking trail, is located approximately 4,604 feet from the ACT Plant and is also on a bluff, at a significantly higher elevation than the project area. Construction noise would be expected to attenuate to 45.72 dBA at the trail, lower than the EPA's Ldn guideline of 55, and the HUD's Ldn guideline of 65 dBA. The nearest residence is located approximately 1.5 miles southeast of the project area, where construction noise would attenuate to 16.65 dBA, below both the EPA and HUD recommended guidelines. Furthermore, the actual noise level would likely be lower in the field, where vegetation and topography would cause further noise attenuation. While construction would mainly occur on the ACT Plant, the project includes a temporary laydown area east of the ACC Plant. Construction noise would be expected to attenuate to 54.16 dBA at T.O. Fuller State Park, 52.93 dBA at the trail, and 46.76 dBA at the nearest residence. The noise attenuation from the laydown area is below both the EPA and HUD recommended guidelines. While the attenuation of construction noise is slightly higher at the laydown area near the ACC Plant than from the ACT Plant, both locations are below recommended guidelines. It is anticipated that most construction would be located on the ACT Plant. Given the temporary and intermittent nature of construction noise, and that noise levels at noise receptors would attenuate to levels near or below the EPA's Ldn guideline, the impact of noise generated from construction activities at the ACT Plant is expected to be minor.

There is also a potential for indirect noise impacts associated with an increase in traffic related to workforce vehicle traffic and borrow transport on surrounding roadways. Roadway traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads (FHWA 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic volume would result in an approximately 3 dBA increase in noise level, which would not normally be a perceptible noise increase (FHWA 2011). TVA estimates that the peak workforce needed during the estimated 15-month construction period would consist of approximately 200 personnel per day. Assuming one person per commuting vehicle, there would be a maximum daily morning inbound traffic volume of approximately 200 vehicles and a daily outbound traffic volume of approximately 200 vehicles each working day. Off-site borrow material would be obtained within a 30-mile radius from an existing borrow site. Borrow transport would be intermittent over the construction period, with approximately 800 trucks (1,600 truck trips) over the course of the construction period. As noted in Section 3.8, Transportation, the increase in traffic associated with construction activities is relatively small compared to existing traffic volumes. Therefore, the increase in current noise levels is estimated to be less than 3 dBA, and as such, traffic noise is not anticipated to increase perceptibly.

During base load operation of the proposed aero CTs, noise levels for each piece of equipment would not exceed 85 dBA at a distance of 3 feet. Operation of all six aero CTs would result in a compounded noise level of approximately 92.8 dBA. Based on straight line noise attenuation, it is estimated that noise levels from the aero CTs equipment would attenuate to 30.88 dBA at T.O. Fuller State Park and 24.45 dBA at the nearest residence, well under the recommended EPA noise guideline of 55 dBA. Based on straight line noise attenuation, noise from the ACT Plant would have to be considerable (i.e., greater than 117 dBA at a distance of 3 feet from the equipment) in order to produce noise levels of 55 dBA or higher at the closest sensitive receptors. Because TVA would ensure that typical operational noise emissions would not result in noise levels that exceed 55 dBA at off-site noise receptors (utilizing noise abatement technologies if required), noise impacts from operation of the ACT Plant would be minor.

3.10. Solid and Hazardous Waste

3.10.1. Affected Environment

Hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment when released into the environment. Hazardous materials are regulated by several federal laws. This includes Occupational Safety and Health Administration (OSHA) standards, Emergency Planning and Community Right to Know Act, the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and the Toxic Substances Control Act.

The EPA has instituted a “cradle to grave” system in which RCRA has created regulations on hazardous waste from its creation, where it travels to, how it is used or stored, and how it is disposed. RCRA also defines what constitutes waste as being hazardous and explains key differences in types of waste (EPA 2023b). Universal wastes include batteries, pesticides, mercury-containing equipment, lamps, and aerosol cans (EPA 2024g). These wastes have less stringent regulations but are still managed in accordance with RCRA requirements for hazardous wastes or by special, less-stringent provisions.

Solid waste encompasses a large variety of waste products. The EPA defines solid waste as, waste materials such as garbage or refuse. This is not limited to wastes that are in solid form but also includes liquids and contained gaseous substances. Solid wastes are also non-hazardous sludge from any wastewater facility, nonhazardous air pollution control wastes, and other materials such as sanitary wastes, contaminated environmental media, and scrap metals (EPA 2024h). Solid wastes are regulated in accordance with the RCRA Subtitle D and EPA requirements. States are responsible for enforcing federal regulations and may choose to create more strict requirements to ensure that these laws are followed.

Special waste is a solid waste that requires special handling and management to protect public health and the environment. The EPA defines special wastes as wastes that are either too large or dangerous to dispose of, including sludges, bulky wastes, waste from pesticides, medical waste, industrial waste, liquid waste, friable asbestos waste, and waste associated with combustion (EPA 2024h). There are also some special and hazardous wastes that are exempt from special waste requirements. The RCRA Subtitle C explains that these wastes must be logged in a registry and that special attention should be made for these hazardous materials. All special waste, if generated, must be disposed as required by state and federal laws and regulations.

The unique solid waste concerns for gas- and oil-fired plants are the byproducts from emission controls. The solid waste produced from these controls is dependent upon the specific control technology implemented and is not anticipated to be considerable (Brown et al. 2017). Other hazardous wastes currently generated at these sites include waste paint, waste paint solvents, paper insulated lead cable, debris from sandblasting and scraping paint chips, solvent rags used to clean equipment, and liquid-filled fuses (TVA 2019f). TVA has insured these wastes will be managed with all other hazardous materials generated at the ACT Plant and will be shipped off-site and properly disposed.

3.10.2. Environmental Consequences

3.10.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install six new aero CT units at the ACT Plant. TVA would continue to operate two existing units at the ACT Plant on a limited basis. TVA would continue to generate solid and hazardous wastes as a part of its continued operations. These wastes would continue to be managed in accordance with current TVA procedures and federal and state laws and regulation. Thus, there would be no additional impacts to solid and hazardous waste generation under this alternative.

3.10.2.2. Alternative B – Allen Aeroderivative Project

Under Alternative B, TVA would install six new aero CTs and support facilities at the ACT Plant. Construction of the aero CTs and supporting infrastructure would generate both solid and hazardous wastes. Types of solid wastes include concrete, vegetative debris, metals, plastic, wood, packing materials, scrap metals, and nonhazardous used oils and lubricants. All nonhazardous wastes from construction activities would be disposed of in accordance with applicable federal, state, and local laws and regulation and TVA procedure, which includes recycling where possible.

Hazardous wastes such as waste paintings, coating and adhesive wastes, and spent solvents could be produced during construction. These wastes would be temporarily stored in properly managed hazardous waste storage areas on site. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public and the environment. A permitted hazardous waste disposal facility would be used for ultimate disposal of the wastes.

Construction of aero CTs and supporting infrastructure including the compressed air skid, fuel oil loading/unloading facility, and repairs to existing fuel oil tanks would all occur in previously developed paved or gravel sites within the ACT Plant. Minor quantities of solid and hazardous waste associated with the construction and repairs to these structures would be handled in accordance with established federal and state laws and regulations. As noted above, appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to prevent and contain accidental spills of any material and to ensure that inadvertent spills of fuels, lubricants, coolants, or solvents are contained, cleaned up, and disposed of in an appropriate manner.

Aero CTs produce very small quantities of solid waste during normal operation. Operation of new supporting facilities, including diesel generators, compressed air skid, and an ammonia unloading, storage, and delivery system would be in compliance with measures identified in

TVA's spill prevention and response procedures to prevent and contain accidental spills of any material and to ensure that inadvertent spills are contained, cleaned up, and disposed of in an appropriate manner.

Solid and hazardous wastes generated during construction and operation of the aero CTs would be properly contained, transported, and disposed of in accordance with established procedures and applicable federal, state, and local laws and regulations. Therefore, impacts associated with the generation of wastes from the proposed action would be minor.

3.11. Socioeconomics

3.11.1. Affected Environment

For the socioeconomic analysis, TVA defines the study area as any census block group that falls within a 10-mile radius of the ACT Plant. Most project-related impacts (e.g., changes in noise level, dust, and traffic) are likely to be greater in proximity to ACT Plant and are expected to dissipate relatively quickly. However, a 10-mile radius was selected to conservatively bound the area where resources could be affected and to be consistent with previous environmental reviews at the Allen Reservation.

The study area includes parts of the city of Memphis, one of the region's largest cities, as well as areas within Shelby County, Tennessee, Crittenden County, Arkansas, and DeSoto County, Mississippi. Included as secondary geographic areas of reference are Shelby County, Crittenden County, DeSoto County, and Tennessee, Arkansas, and Mississippi. Comparisons at multiple spatial scales provide a more detailed picture of populations that may be affected by the proposed actions. Demographic and economic characteristics of populations within the study area were assessed using the 2018-2022 American Community Survey (ACS) 5-year estimates provided by the U.S. Census Bureau (USCB) (USCB 2022a).

3.11.1.1. Demographics

Demographic and economic characteristics of the study area and of the secondary reference geographies are summarized in Table 3-11. The population of the study area is 282,264 (USCB 2022a). The block group that contains the project area and the temporary laydown area primarily consists of industrial properties and has no residential population. Since 2010, the study area population has declined by 4.6 percent.

Minority populations represent the primary component of the population of the study area. Specifically, Black or African Americans represent 68.2 percent of the population within the study area (Table 3-11). In contrast, whites account for 25.1 percent of the population within the study area. Other minority racial and ethnic groups make up a small proportion of the total population in the study area but are at or below comparative rates for the referenced counties and states.

Table 3-11. Demographic Characteristics of the ACT Study Area and Secondary Reference Geographies

	10-mile Radius	Crittenden County, Arkansas	DeSoto County, Mississippi	Shelby County, Tennessee	Arkansas	Mississippi	Tennessee
Population[1,2]							
Population, 2022 estimate	282,264	47,945	186,214	926,440	3,018,669	2,958,846	6,923,772
Population, 2010	295,966	50,902	161,252	927,644	2,915,918	2,967,297	6,346,105
Percent Change 2010-2022	-4.6%	-5.8%	15.5%	-0.1%	3.5%	-0.3%	9.1%
Persons under 18 years, 2022	22.6%	27.1%	25.2%	25.0%	23.1%	23.4%	22.0%
Persons 65 years and over, 2022	15.2%	14.6%	13.1%	14.2%	17.2%	16.5%	16.7%
Racial Characteristics[1]							
Not Hispanic or Latino							
White alone, 2022[(a)]	25.1%	40.2%	59.8%	34.5%	69.7%	55.9%	72.6%
Black or African American, 2022[(a)]	68.2%	50.1%	30.8%	53.6%	15.1%	37.1%	16.1%
American Indian and Alaska Native, 2022[(a)]	0.1%	0.1%	0.1%	0.1%	0.4%	0.4%	0.1%
Asian, 2022[(a)]	1.0%	0.8%	1.3%	2.9%	1.5%	1.0%	1.8%
Native Hawaiian and Other Pacific Islander, 2022[(a)]	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%
Some Other Race alone, 2022[(a)]	0.1%	0.0%	0.2%	0.3%	0.2%	0.3%	0.3%
Two or More Races, 2022	2.2%	5.8%	2.7%	1.9%	4.6%	2.1%	3.0%
Hispanic or Latino, 2022	3.3%	3.0%	5.2%	6.8%	8.1%	3.3%	6.0%
Housing and Income[1]							
Housing units, 2022	136,247	21,335	72,572	401,041	1,371,709	1,324,992	3,050,850
Median household income, 2018-2022	48,625	51,860	79,666	59,621	56,335	52,985	64,035
Persons below poverty level, 2018-2022	25.5%	19.7%	9.8%	18.1%	16.2%	19.2%	14.0%
Persons below low-income threshold, 2018-2022 [(b)]	50.1%	45.2%	25.8%	38.0%	38.2%	40.7%	32.6%

Source: 1.USCB 2022a, 2. USCB2011

Notes:

(a) Includes persons reporting only one race.

(b) Low-income threshold is defined as two times the poverty level

Within the socioeconomics study area, there are 255 census block groups. Among the 255 census block groups, in 199 block groups minority populations make up more than half of the population. In three additional block groups, minority populations are meaningfully greater (greater than or equal to 20 percentage points) than the minority population percentage of the general population. Thus, 202 of 255 census blocks (79.2%) within the study area have minority populations that make up more than half of the entire population or have a meaningfully greater proportion of minorities than the general population. See Figure 3-3 below.

The nearest census block with a minority population that exceeds 50% of the population is within close proximity to the Allen CT site: Block Group 2, Census Tract 222.10 (Shelby County, TN), is located about 0.8 miles southeast of the site. Note that both census block groups encompassing and directly north of the TVA Allen Reservation have no resident population (Block Group 1; Census Tract 9803 and Block Group 1; Census Tract 9802, respectively).

The nationwide poverty level is determined annually by the USCB and varies by the size of family and number of related children under 18 years of age. The 2022 USCB Poverty Threshold for an individual under the age of 65 is an annual income of $15,225, and for a family of four with two children, it is an annual income of $26,678 (USCB 2022b). The average median household income of the block groups that comprise the study area is $48,625, which is less than the median household incomes in the reference counties and states (Table 3-11). Approximately 25.5 percent of the population within the study area has an annual household income below the nationwide poverty level, compared to 18.1 percent for Shelby County, 19.7 percent for Crittenden County, 9.8 percent for DeSoto County, 14 percent for Tennessee, 16.2 percent for Arkansas, and 19.2 percent for Mississippi. Thus, the study area block groups have a higher percentage of people living below the poverty level compared to all the representative geographies.

Among the 255 census blocks that make up the socioeconomic study area, there are 160 census blocks (62.7% of blocks in the study area) with “low-income” populations that exceed 50 percent of the total population.[6] For the purpose of this assessment, low-income individuals are generally defined by TVA as those whose annual household income is less than two times the poverty level; a census block would be considered to be low-income if either the low-income population exceeds 50 percent of the total population or the ratio of low-income population significantly exceeds (i.e., by greater than or equal to 20 percentage points) that of the general population or other appropriate geographic areas of analysis.

In the study area, 152 of the 255 census block groups (or 59.6% of block groups) are indicative of both minority and low-income communities. Figure 3-3 identifies the census block groups within the study area that have minority and low-income populations that make up a majority of the population. The census block with a majority low-income population that is nearest the project area (about 0.8 miles) is the same census block noted above as having a sizeable minority population (Block Group 2; Census Tract 222.10, in Shelby County, TN).

Appendix E provides the percentage of each race and ethnicity classification and the percentage of low-income residents for each census block group, as well as those of the reference geographies.

[6] More encompassing than the base poverty level, this low-income threshold is a reasonable measure for consideration because current poverty thresholds are often too low to adequately capture the populations adversely affected by low levels of income, especially in high-cost areas (EPA 2019b).

According to the EPA, the effects of income on baseline health and other aspects of susceptibility are not limited to those below the poverty thresholds. For example, populations that have an income level from one to two times the poverty level also have worse health overall than those with higher incomes (U.S. Centers for Disease Control and Prevention 2011). Appendix F provides a characterization of the communities within the 10-mile study area and identifies communities as disadvantaged based on the following eight categories of potential burdens: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development.

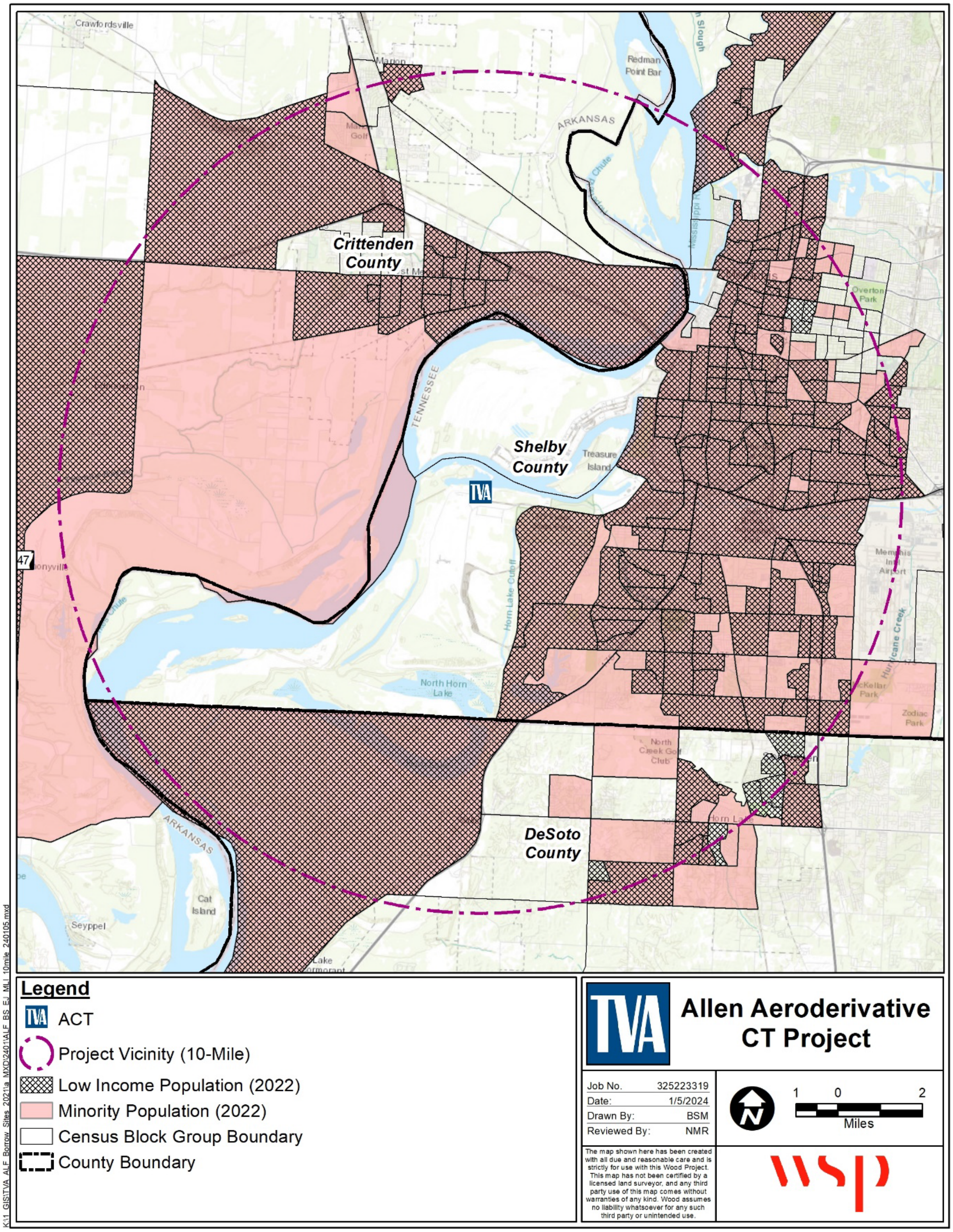


Figure 3-3. Minority and Low-Income Communities within a 10-mile Study Area

Twenty-three of the census block groups within the socioeconomic study area have populations with limited English proficiency. The proportion of persons in each block group who have limited English proficiency (LEP) is also relevant to a socioeconomic analysis because it can be used to inform public outreach efforts and engagement opportunities. For this analysis, a person with limited English proficiency is defined as a person aged 5 or older who self-identifies as speaking English “less than very well” based on USCB 2018-2022 ACS estimates. LEP census block groups are defined as those in which the percentage of the block group’s population (aged 5 or older) that speak English “less than very well” exceeds 5 percent, or the number of persons (aged 5 or older) that speak English “less than very well” exceeds 1,000.

Figure 3-4 illustrates the primary languages[7] spoken in LEP census block groups within the study area. The most common language spoken among individuals in this area who report LEP is Spanish, but there are small pockets of a variety of language categories throughout the study area. Appendix E provides the percentage of residents reporting LEP for each census block group and reference geography, as well as the primary languages spoken in each of the identified LEP census block groups.

[7] Primary languages are languages spoken by 20 or more people within a census block group who speak English “less than very well.”

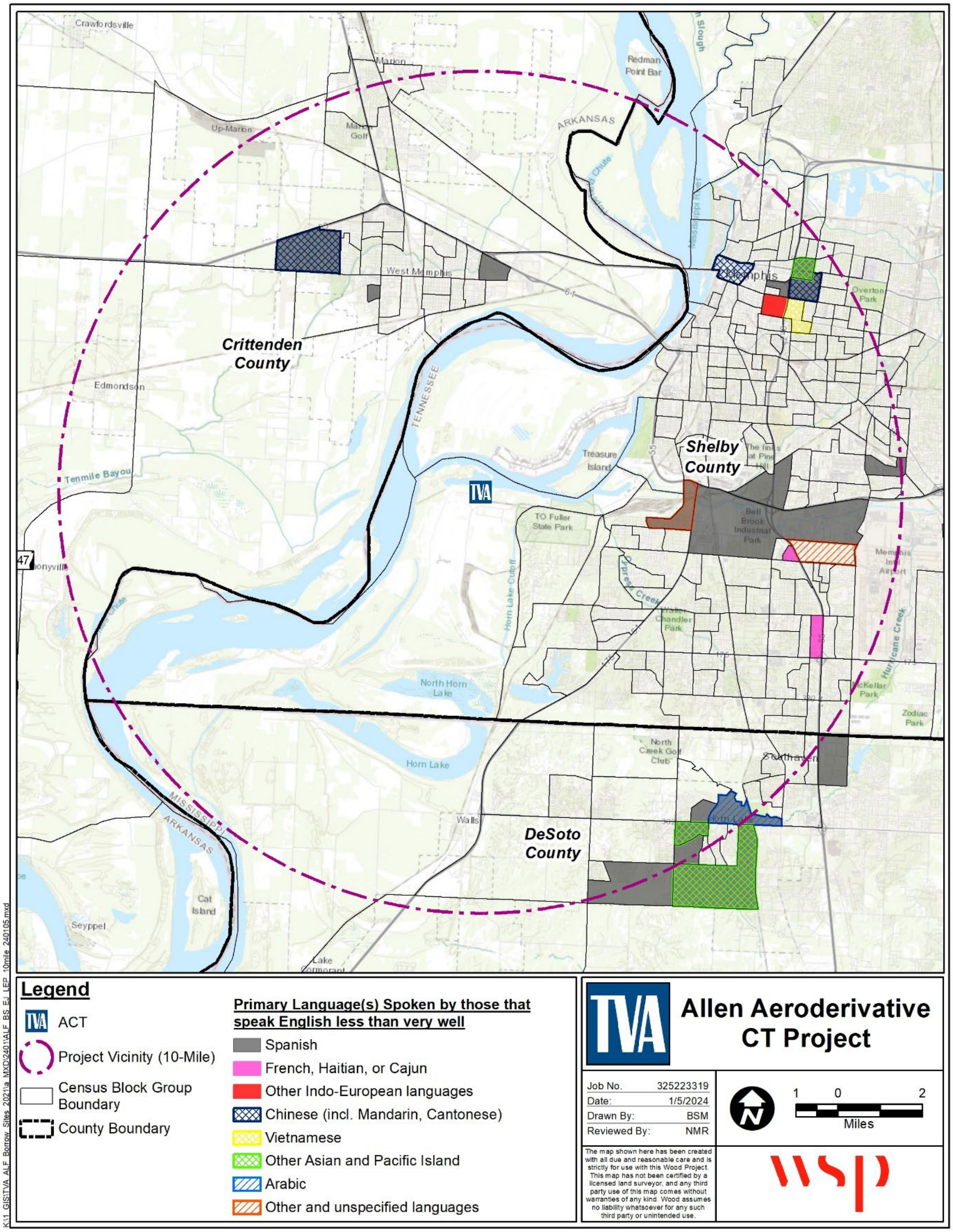


Figure 3-4. Communities with Limited English Proficiency within a 10-mile Study Area

3.11.1.2. Economic Conditions

Shelby County contains a total employed labor force of 429,064 workers (Table 3-12). Business sectors providing the greatest employment include educational services, health care and social assistance (22.7 percent); transportation, warehousing, and utilities (14 percent); professional, scientific, management, and administrative and waste management services (10.9 percent); retail trade (10.4 percent); manufacturing (9.3 percent); arts, entertainment, and recreation, and accommodation and food services (8.7 percent).

Table 3-12. Employers by Sector Within the Reference Counties

Sector	Number of Employees Crittenden County	Percent	Number of Employees DeSoto County	Percent	Number of Employees Shelby County	Percent
Agriculture, forestry, fishing and hunting, and mining	532	2.6%	889	1.0%	1,053	0.2%
Construction	1,055	5.2%	5,219	5.6%	20,645	4.8%
Manufacturing	2,071	5.1%	3,605	3.9%	39,784	9.3%
Wholesale trade	1,041	12.8%	10,349	11.1%	11,684	2.7%
Retail trade	2,606	10.7%	13,814	14.8%	44,636	10.4%
Transportation and warehousing, and utilities	2,175	1.6%	715	0.8%	60,412	14.0%
Information	335	3.6%	4,132	4.4%	4,811	1.1%
Finance and insurance, and real estate and rental and leasing	735	6.7%	7,788	8.3%	23,415	5.5%
Professional, scientific, and management, and administrative and waste management services	1,372	23.1%	19,852	21.2%	46,709	10.9%
Educational services, and health care and social assistance	4,704	9.5%	8,088	8.7%	97,434	22.7%
Arts, entertainment, and recreation, and accommodation and food services	1,941	4.6%	4,270	4.6%	37,207	8.7%
Other services, except public administration	933	4.2%	3,795	4.1%	21,415	5.0%
Public administration	855	2.6%	889	1.0%	19,859	4.6%
Total	**20,355**	**100%**	**93,433**	**100%**	**429,064**	**100%**

Source: USCB 2022a

The total employed civilian population within the block groups that make up the study area is 121,971, with the unemployment rate at 14,962 people, or 10.9 percent of the civilian labor force. This unemployment rate is noted to be higher relative to the unemployment rates of all the reference counties and states (Table 3-13).

Table 3-13. Employment Characteristics of the Resident Labor Force

Employment Status	Population						
	10-mile Radius (Shelby County)	Crittenden County, AR	DeSoto County, MI	Shelby County, TN	AR	MI	TN
Population >16 years	225,556	36,397	145,064	721,643	2,402,462	2,349,512	5,576,402
Civilian Labor Force	136,933	22,727	97,753	463,039	1,391,084	1,331,419	3,430,845
Employed	121,971	20,355	93,433	429,064	1,319,483	1,245,900	3,258,016
Unemployed	14,962	2,372	4,320	33,975	71,601	85,519	172,829
Unemployment							
% of Total Population > 16 years	6.6%	6.5%	3.0%	4.7%	3.0%	3.6%	3.1%
% of Civilian Labor Force	10.9%	10.4%	4.4%	7.3%	5.1%	6.4%	5.0%

Source: USCB 2022a

Key: AR = Arkansas; MI = Mississippi; TN = Tennessee

3.11.1.3. Community Facilities and Services

Community facilities and services are public or publicly funded facilities such as police protection, fire protection, schools, hospitals and other health care facilities, libraries, daycare centers, churches, and community centers. When applicable, the study area for the evaluation of impacts to community services is the service area of various providers; otherwise, a secondary study area defined for the purposes of a socioeconomic analysis may be defined. In this case, the study area for community impacts is identified as the service area within a 10-mile radius of the ACT Plant.

Community facilities and services available to the communities within the study area include over 500 churches, 173 schools, 25 fire stations, 20 medical centers, 17 police stations, and 7 community centers (USGS 2024). Additionally, there are no community facilities located in the immediate vicinity (within 0.5 mile) of the ACT Plant. The closest facilities are the Macedonia Missionary Baptist Church and the Apple and Cookies Enrichment Center daycare facility, both located near the intersection of Boxtown Road and Fields Road, approximately 1.7 miles southeast of the ACT Plant.

3.11.2. Environmental Consequences

3.11.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT. TVA would continue to operate two existing units at ACT on a limited basis. Therefore, there would be no change in local demographics, economic conditions, or community services or new effects to nearby communities.

3.11.2.2. Alternative B – Allen Aeroderivative Project

3.11.2.2.1. Demographic Impacts

Although most census block groups that comprise the study area are considered low-income and/or minority communities, the nearest residential and commercial areas to the project site are located more than a mile to the southeast of the ACT Plant. The project site is located in an area reserved for heavy industry, in a block group that has no residential population. For the closest block group with a residential population, just east of the TVA Allen Reservation, T.O. Fuller State Park serves as a buffer between the residential neighborhoods and the project site. The communities closest to the project area, which have predominately low-income and minority populations, would be minimally impacted by noise, fugitive dust, and visual impacts associated with on-site project activities.

As discussed in Section 3.8.2, construction-related vehicles, including the commuting construction workforce, delivery of materials and equipment, and transport of borrow material, would increase traffic on local roads, resulting in noise, exposure to fugitive dust, and exhaust emissions located along the transportation routes. However, traffic would be most concentrated on the roadways providing access to Allen via I-55 (Riverport Road and West Mallory Avenue), which are located in industrial, rather than residential areas. Once on I-55, traffic would disperse throughout the city's large transportation network and would not result in notable effects. Borrow material would be obtained from an existing, permitted borrow site within a 30-mile radius of the ACT Plant. Specific locations have not been determined; therefore, it is possible that borrow transport may require use of residential roadways through communities, including those with predominately low-income and minority populations. Based on the intermittent nature of borrow transportation and the relatively low volume (800 truckloads over a 15-month period) of trucks, however, traffic-related impacts to affected communities are expected to be minor and short term.

As a general matter, changes to the environment such as decreased air quality would be more likely to affect members of communities who may be more sensitive to changes due to a higher frequency of preexisting health conditions and/or a decreased ability to take actions to limit exposure. Appendix F provides a characterization of the communities within the 10-mile study area that have historically been burdened by climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. Many of the communities within the study area are identified as meeting the threshold for health burdens, indicating that the population is at or above the 90th percentile for asthma, diabetes, heart disease, and/or low life expectancy. The population in these communities is also at or above the 65th percentile for low-income. Note, this community characterization is analyzed at the census tract level, a geographical unit one step larger than the census block group used in the rest of this analysis.

Low-income and minority communities within the study area may be more sensitive to operation-related emissions due to a higher frequency of preexisting health conditions, such as asthma and/or a decreased ability to take mitigating actions. However, as detailed in Section 3.1, the increase in emission of criteria air pollutants is not expected to contribute to the exceedance of NAAQS or PSD requirements. As required by the CAA (40 CFR part 50), the NAAQS primary standards are developed to protect human health with an adequate margin of safety for sensitive subgroups of the population. These sensitive subgroups are children, older adults, people with heart or lung conditions, communities of color, and low economic status populations. NAAQS primary standards are based on reference concentrations that represent continuous inhalation that is likely to be without appreciable risk of deleterious effects during a lifetime of exposure for these sensitive subgroups. Reference concentrations also include a 10-fold safety factor to address uncertainty. The NAAQS standards specifically protect the sensitive subgroups of the surrounding minority and low-income overburdened communities during lifetime exposures. Therefore, operation of the new Aero CT units would not harm sensitive individuals in the surrounding communities because emissions would not be expected to contribute to an exceedance of the primary NAAQS standards, which were developed specifically to protect those individuals.

Those communities nearest to the project area are most likely to be affected. Low-income and minority communities would be more likely than other populations to be affected by environmental impacts associated with the proposed action due to the prevalence of these populations in the study area. However, construction-related impacts, such as traffic and noise, would be minor and short term. Long-term adverse impacts from air emissions would be minimized through adherence to NAAQS standards, which protect human health with an adequate margin of safety for sensitive subgroups of the population, including communities of concern that have a higher frequency of preexisting health conditions. As such, there would be minor impacts to these low-income and minority communities under Alternative B.

TVA has conducted public outreach designed to keep the public informed and encourage public input regarding the proposed activities at its Allen Reservation. TVA would continue to reach out to the public to address community and neighborhood concerns throughout implementation of the proposed project. TVA did not identify notable concentrations of residents with LEP in the communities closest to the Allen Reservation or via previous outreach with community partners but would consider requests for materials to be provided in alternate languages, as appropriate.

3.11.2.2.2. Economic Impacts

Construction of the aero CTs would require a workforce of approximately 200 personnel over the approximate 15-month construction period. The workforce necessary for the project is expected to be a combination of TVA workforce supplemented with local laborers. Specialized workforce laborers may be required to relocate temporarily to the affected or nearby areas while general laborers are anticipated to come from the local workforce. Given that the maximum number of workers needed for construction (200) would equate to less than one percent of the unemployed civilian workforce in Shelby County (33,975), it is likely that most of the workers could be drawn from the existing labor force. This, in combination with the short construction time frame, indicates that construction activities would not result in any permanent population increase in the region.

Construction activities associated with the aero CTs would entail a temporary increase in employment and associated payrolls, which would result in a minor short-term direct positive impact to employment in the region. Indirect impacts related to the purchases of materials and supplies and the multiplier effect of increased spending in the local economy would be beneficial, but minor, given the short construction period.

Following construction, permanent staffing associated with the operation of the ACT Plant is expected to require approximately five personnel. Due to the small number of new staff that would be integrated into the existing workforce, long-term impacts to employment would be minimal.

3.11.2.2.3. Community Facilities and Services

Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Construction of the proposed aero CTs would be limited to the retired ALF, existing ACT Plant, and ACC Plant and would not result in the displacement of any community facilities nor impede access to any facilities. Therefore, there would be no direct impacts to community facilities or services under Alternative B.

Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services or affect the delivery of such services. In the event of an emergency at the ACT Plant, local law enforcement, fire, and emergency medical service response would likely be required. However, given TVA’s adherence to stringent workplace health and safety regulations, implementation of Alternative B would not result in appreciable increases in emergency incidents and thus would not have a notable impact on the demand for emergency services in the area. Additionally, as construction and operation of the plant would not result in notable impacts to local demographics, increased demands for services such as schools, churches, and healthcare facilities are not anticipated.

3.12. Utilities

3.12.1. Affected Environment

Several utilities and service systems are in place at the ACT Plant as a result of construction and operation of the existing CT units (Units 1 through 20). These utilities and service systems include water and wastewater, electrical, fuel oil, and natural gas.

3.12.1.1. Fuel Oil Storage and Delivery System

The existing fuel oil storage and delivery system at the ACT Plant includes the following:

- Two operational fuel oil tanks, which hold a combined 3.47 million gallons
- Fuel oil piping from tanks to the skids
- Forwarding skids to units 19 and 20
- Fuel oil transferring system
- Fire protection system, which is provided by a common foam system housed in a block building on site.

3.12.1.2. Natural Gas Supply

Natural gas is distributed by MLGW via underground piping. TVA has installed an emergency shutdown valve at the MLGW/TVA custody transfer point to ensure safety when using the MLGW natural gas supply.

3.12.1.3. Water and Sewer Systems

Water is supplied to the ACT Plant by MLGW and is used for fire protection, service water, and building plumbing. There are no wastewater process facilities at the ACT Plant. Surface water runoff is routed via site runoff drains to the wastewater collection system to remove waste oils from the wastewater. Wastewater is discharged to stormwater Outfall F6 or routed to the on-site water treatment system prior to discharge at Outfall 002.

3.12.1.4. Transformers

The existing transformer network consists of two main transformers, three station service transformers, and one standby station service transformer. The station service transformers and standby transformer are not reusable due to incompatibility with the voltage needs of the current project. The main transformers are over 50 years old and, despite not showing any major signs of abnormality, are past the end of life.

3.12.2. Environmental Consequences

3.12.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT. TVA would continue to operate two existing units at ACT on a limited basis. The existing utilities and services would be maintained and replaced as needed and as necessary for safety purposes. Thus, there would be no additional impacts to utilities under this alternative.

However, there would be no added dispatchable generation capacity to ensure that TVA can reliably meet required year-round generation. Without the additional generation capacity, TVA would continue to need power to meet energy demands and would acquire the power from other generation sources. In the short term, TVA anticipates that the power would likely be obtained through power purchase agreements on the market, a portion of which is likely to derive from natural gas generation outside of TVA's system. In the long term, TVA would continue to need new peaking generation sources.

3.12.2.2. Alternative B – Allen Aeroderivative Project

Under Alternative B, TVA would install and operate six new aero CT units and supporting facilities. Construction of the new aero CT units require upgrades and installation of new support systems and utility infrastructure. Proposed upgrades and new supporting facilities are described in Section 2.2.2.2, Construction of Supporting Facilities, and include:

- Installation of two ULSD generators (in support of the black-start units)
- Upgrades to existing natural gas infrastructure to improve gas regulation and shutoff
- Installation of new compressed air skid
- Installation of new ammonia unloading, storage, and delivery system
- Replacement of station service transformers

Construction would occur over an approximately 15-month time frame, with construction activities (including laydown areas) taking place within previously disturbed areas at the retired ALF, existing ACT Plant, and ACC Plant. TVA would coordinate with existing electricity, natural gas, and water and wastewater utilities prior to starting plant construction to minimize or avoid impacts and disruptions to utilities. Prior to construction, existing utility lines would be located and marked to prevent accidental damage during upgrade and installation activities. Therefore, impacts to existing utilities are anticipated to be minor and not impact the greater utility systems in the surrounding area.

The ACT Plant would continue to be fueled by natural gas. The new proposed diesel generators would operate using fuel oil reserves that would be stored in existing tanks; the proposed action does not call for the construction of new storage tanks or fuel oil tanks. Appropriate safety measures and guidelines would be developed and followed to reduce exposure or potential releases of hazardous materials and chemicals. Additionally, fire protection systems and safety measures would be developed in response to a potential emergency event. Therefore, there would be minimal impact to potential human health hazards from upgrades to utilities and service systems.

Operation of the aero CT units would require approximately 58 gallons per minute of potable water for inlet air evaporative cooling during summer temperatures, which represents the maximum value of water needed during peak demand during high temperatures. Typical operations of the aero CT units would require approximately 25 gallons per minute of potable water. Additionally, during winter months potable water for inlet air evaporative cooling is not needed, reducing potable water consumption. Potable water would also be required for fire protection, potable use, and plumbing. All potable water would be obtained from MLGW.

TVA completed a system impact study which determined that no new transmission corridors or transmission infrastructure upgrades would be required. Transformers on the existing station would be replaced when they are at end of life.

The addition of the proposed six new aero CT units would increase reliability and provide a cost-effective energy system. Additionally, at least four of the six proposed aero CT units would have black-start capability, which would increase system flexibility by allowing the grid to restore power without needing to rely on external electric power transmission systems. The new aero CT units support fast startup dispatching and synchronous condensing to support transmission system stability in western Tennessee and support TVA's goals to further expand renewable energy. Because the units can quickly achieve full generating capacity from a cold start and allow for multiple daily starts, Alternative B would improve TVA's ability to effectively integrate generation from variable resources, such as solar and wind. The availability of additional resources with synchronous condensing capabilities would efficiently support local voltage stability as well.

The increased flexibility and reliability of the TVA power system resulting from implementing Alternative B would beneficially affect western Tennessee. Potable water and natural gas are supplied by MLGW and would have a small impact on availability of these natural resources. The ACT Plant would be improved through upgrades and replacement of the existing utilities and service systems to support the proposed aero CT units which would support the continued functionality of the plant. Overall, impacts to utilities and service systems associated with Alternative B are small and beneficial to the largest western Tennessee power system.

3.13. Public Health and Safety

3.13.1. Affected Environment

The ACT Plant is located on the Mississippi River, 5 miles southwest of downtown Memphis, Tennessee (TVA 2024d). The ACT Plant is located in an area that supports industrial land use, with the closest residence located approximately 1.5 miles southeast of the ACT Plant. The closest public entities to the site are the T.O. Fuller State Park. There is direct truck and automobile access to the ACT Plant through Plant Road via Riverport Road.

There is access to many emergency services nearby, including hospitals, urgent care, law enforcement, and fire protection services. The closest urgent care is Baptist Urgent Care-Horn Lake, located 14.4 miles from the ACT Plant. The closest hospital is Methodist South Hospital, which is 10.8 miles away from the ACT Plant. Police services are managed by the Memphis police department from their Westwood location. They are located 9.2 miles from the site. Fire protection services are run by the Memphis Fire Station #37, which is located 8.9 miles from the ACT Plant (USGS 2024).

Workplace health and safety regulations and laws are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may comprise both federal and state statutes. The Tennessee Emergency Management Agency is responsible for maintaining protection of the public, through their regulations on hazardous wastes and materials. The Occupational Safety and Health (OSH) Act of 1970 is the main statue protecting the health and safety of workers in the workplace by protecting workers from hazardous work environments, including risk of injury or illness. TVA has a robust, safety-conscious culture that focuses on awareness and understanding of workplace hazards, prevention, intervention, and integration of BMPs to avoid or minimize hazards. Activities performed at TVA facilities or TVA-owned land are consistent with OSHA regulations, state standards and requirements, and specific TVA guidance. TVA personnel (including TVA authorized contractors) are conscientious about health and safety, having addressed and managed operations to reduce or eliminate occupational hazards through implementation of safety practices, training, and control measures.

Health hazards are also associated with emissions and discharges from the ACT Plant and accidental spills/releases at the plant or along the pipelines. An emergency response plan developed to address these potential discharges is discussed with local emergency management agencies. The implementation of proper engineering and equipment design and administrative controls, including employee training and compliance with regulatory requirements related to health and safety, help ensure that the risks associated with work at TVA facilities remain low. These mitigative measures are used to ensure protection of human health which includes the workplace, public, and the environment.

Transmission lines generate both electric and magnetic fields. The voltage on the conductors of a transmission line generates an electric field that encompasses spaces between conductors and other conducting objects. The magnetic field generated by the current in the conductors and most of the energy dissipates on the transmission line. TVA has taken measures to minimize the potential for shocks by maintaining clearance between the lines and objects on the ground. TVA would ground other objects that have the potential to be conductors, such as metal fences, guardrails, and pipelines, to avoid any electrical shocks to workers or others.

3.13.2. Environmental Consequences

3.13.2.1. Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not install new aero CT units at the ACT. TVA would continue to operate two existing CT units at ACT on a limited basis. TVA would continue to apply a safety-conscious culture, and any activities performed at the site would be in accordance with applicable standard and specific TVA guidance. Public health and occupational hazards will continue to be monitored and directed through the execution of safety practices, control measures and training. Through adherence to these safety programs and TVA's culture of safety-minded employees, impacts to public health and safety under Alternative A would be minor.

3.13.2.2. Alternative B – Allen Aeroderivative Project

Under Alternative B, TVA would install six new aero CTs and support facilities at the ACT Plant. Although construction work has known hazards, it is TVA's policy that contractors establish and maintain site-specific health and safety plans in compliance with OSHA regulations, which minimize risks to health and safety. The contractor site-specific health and safety plans address hazards and controls, as well as coordination for various construction tasks. TVA would emphasize BMPs for site safety management to minimize potential risks to workers. These BMPs could include employee safety orientations, work procedures and programs for on-site activities, personal protective equipment, emergency shut down procedures, lockout procedures, protective equipment guards, site housekeeping, regular safety inspections, and preventative plans and procedures to mitigate hazards.

Public health and safety hazards could result from increased traffic on roadways during construction. Residential and public use areas along roadways used by the construction traffic to access the project area may experience delays due to increased traffic. However, as noted in Section 3.8, Transportation, intersections near the ACT Plant will experience minimal delays during the construction phase. To minimize the adverse impact of traffic, establishment of traffic procedures to minimize potential safety concerns would be addressed in the health and safety plans followed by construction contractor(s).

As stated above, the ACT Plant is located in an existing industrial complex, adjacent to other industrial and manufacturing facilities. Additionally, the closest residence is located approximately 1.5 miles southeast of the ACT Plant. As such, the potential for public safety concerns is reduced due to the project setting and distance from residential areas.

Potential sources of waste generation include solid wastes, hazardous wastes, liquid wastes, discharges, and air emissions. Debris and wastes streams associated with construction activities would be managed in accordance with federal, state, and local laws and regulations. An emergency response plan would be developed to address potential accidental spills on site and discussed with local emergency management agencies. Emergency response for the project area would be provided by the local, regional, and state law enforcement, fire, and emergency responders, as described above.

Through TVA guidance and regulations, operation of the aero CTs would adhere to standards established by OSHA and applicable state requirements. TVA's commitment to the implementation of health and safety practices would reduce occupational and public health hazards. TVA fosters a culture of safety-mindedness that ensures that safety measures and programs are adhered to and limits the impacts of public health and safety concerns.

Existing transmission lines create an electromagnetic field and are a potential hazard to occupational and public health and safety. Exposure to such electromagnetic fields by the public would be minimal because the proposed transmission lines would be within the ACT Plant and restricted from public use. Thus, worker exposure would not deviate from existing conditions. TVA's Standardized Programs and Processes related to maintaining safety would be strictly adhered to during operation of the proposed action. The overall impacts of Alternative B on public health and safety would be minor.

3.14. Cumulative Effects

3.14.1. Geographic Area of Analysis

The cumulative effects analysis is based on an assessment of potential aggregate effects for each resource within the geographic area in which potential adverse effects from site-specific activities have the potential to alter (degrade) the quality of the regional environmental resources. The appropriate geographic area over which past, present, and reasonably foreseeable future actions could contribute to cumulative effects is variable and dependent on the resource evaluated. The cumulative effects analysis is based on the resources of potential concern and the geographic area in which potential adverse effects from site-specific activities have the potential to alter (or degrade) the quality of the regional environmental resources. The geographic area of analysis is defined as the area where other actions occur that could potentially have impacts within the resource impact area. Therefore, the geographic area of interest (GAI) may be different for each resource.

The proposed action would occur mostly on land that was previously disturbed and is currently used for industrial purposes. The surrounding landscape is already subject to environmental stressors associated with continuing industrial operations. Consequently, as described in prior subsections of this EIS, the existing quality of environmental resources with the potential to be directly or indirectly affected by the project activities is generally low. Additionally, borrow material would be obtained from a previously permitted site. The analysis of cumulative effects for the appropriate geographic area is generally limited to the project area and surrounding areas; however, for groundwater, the GAI was determined to be the Memphis aquifer, and for socioeconomics, the GAI is the 10-mile radius around the project area, as identified above in Section 3.11, Socioeconomics. Additionally, for air quality and greenhouse gas emissions, the geographic area is Shelby County.

3.14.2. Identification of Other Actions

Past, present, and reasonably foreseeable future actions that are appropriate for consideration for cumulative effects are listed in Table 3-14. These actions were identified within the geographic area of analysis as having the potential to, in aggregate, result in larger and potentially adverse impacts to the resources of concern. Projects planned elsewhere in the region are not likely to have a cumulative effect on the Proposed Action as they would be a considerable distance from the project area.

Table 3-14. Summary of Present, and Reasonably Foreseeable Future Actions in the Vicinity of the ACT Project Area

Action	Description	Timing and Reasonable Foreseeability
Retirement of ALF	In March 2018, the three ALF coal units were retired.	Past
ALF Decontamination and Deconstruction	Demolition and deconstruction of the ALF fossil plant and restoration of the site to support future economic development. Decontamination, deconstruction and site restoration actions are to be completed in 2025.	Present
ALF Ash Impoundment Closure	TVA released a Record of Decision (ROD) on April 14, 2020, describing that TVA would be closing the ash impoundments at the ALF. The closure includes the closure of the metal cleaning pond, closure-by-removal of the East Ash Pond Complex and the West Ash Pond through disposal of coal combustion residuals in an off-site landfill location. Closure activities are anticipated to continue for the foreseeable future.	Past, Present, Reasonably Foreseeable Future
ALF Groundwater Remediation	TVA is currently engaged in a Remedial Investigation for the ALF East Ash Pond Complex under the direction of TDEC. Groundwater monitoring and remediation is anticipated to continue for an additional 10 to 15 years.	Past, Present, Reasonably Foreseeable Future
Operations of TVA ACC Plant and adjacent industrial facilities	Continued operations of the ACC Plant and other industrial facilities within the Frank C. Pidgeon Industrial Park and Port of Memphis, including xAI facility.	Past, Present, Reasonably Foreseeable Future
Continued Operation of ACT Units 19 and 20	Continued operation of ACT Units 19 and 20 on a limited basis.	Past, Present, Reasonably Foreseeable Future
Allen Combustion Turbine Plant Decommission and Deconstruction of Units 1-16	In September 2023, TVA completed an environmental review of the demolition and removal of 16 existing units at the ACT Plant. TVA determined that removal of the units had independent utility and was necessary regardless of future actions and/or use of the area.	Reasonably Foreseeable Future

Action	Description	Timing and Reasonable Foreseeability
Solar Farm for Greywater Facility	The EDGE for Memphis and Shelby County board approved plans for a solar panel system adjacent to T.E. Maxson WWTP, which is expected to open in 2026.	Reasonably Foreseeable Future
New Development in the Pidgeon Industrial Park	Future development at the Pidgeon Industrial Park.	Reasonably Foreseeable Future
Greywater Facility	xAI is working with MLGW and the City of Memphis to plan and develop a new greywater facility to supply cooling water for the xAI facility and for further industrial and commercial users.	Reasonably Foreseeable Future
South Cypress Creek Watershed and West Junction Neighborhood Redevelopment	Restoration within the South Cypress Creek watershed and redevelopment in the West Junction neighborhood.	Reasonably Foreseeable Future
Future Development of ALF site	Industrial development of the existing ALF Site.	Reasonably Foreseeable Future

Key: ACC = Allen Combined Cycle; ALF = Allen Fossil Plant; EDGE = Economic Development Growth Engine; MLGW = Memphis Light, Gas and Water Division; ROD = Record of Decision; TDEC = Tennessee Department of Environment and Conservation; TVA = Tennessee Valley Authority; WWTP = Wastewater Treatment Plant

3.14.2.1. Retirement of the Allen Fossil Plant

The three ALF coal units were retired in June 2018. Primary operational measures that were discontinued include daily coal barge operations, coal pile management, pumping and use of water from McKellar Lake for condenser cooling, and thermal discharges to the Mississippi River. The plant has discontinued the discharge of fly ash and bottom ash to designated wet impoundment areas. Routine plant deliveries have also been discontinued. The existing switchyard is being maintained for use in operations associated with the ACC facility. The coal plant is currently subject to basic care and maintenance measures (TVA 2019c).

3.14.2.2. Allen Fossil Plant Decontamination and Deconstruction

After the retirement of ALF, TVA evaluated in an EA (October 2019) the deconstruction and demolition of ALF and the restoration of the site to support future economic development. Demolition and deconstruction of the site included decontamination of all buildings, sumps, and structures associated with plant operations to remove hazardous materials and the demolition of the powerhouse and all associated structures to 3 feet below final grade resulting in a brownfield site (TVA 2019c). Decontamination, deconstruction, and site restoration will be complete in 2025.

3.14.2.3. Allen Fossil Plant Ash Impoundment Closure

TVA released a ROD on April 14, 2020, in which it stated that the ALF ash impoundments would be closed. The closure includes the closure of the metal cleaning pond, closure-by-removal of the East Ash Pond Complex and the West Ash Pond through disposal of CCR in an off-site landfill location (TVA 2020). Activities to close the ALF ash impoundment are ongoing and anticipated to continue for the foreseeable future.

3.14.2.4. Allen Fossil Plant Groundwater Remediation

TVA is currently engaged in a remedial investigation for the ALF East Ash Pond Complex under the direction of TDEC.

During routine groundwater monitoring around the East Ash Disposal Area in 2017, TVA detected arsenic, lead, and fluoride (constituents of concern) in groundwater at elevated concentrations above EPA maximum contaminant levels. Elevated pH values in groundwater were also observed. In May 2017, TVA voluntarily initiated an investigation to evaluate groundwater conditions on the north and south sides of the East Ash Disposal Area where contaminants of concern had been detected. TVA subsequently received a letter in July 2017 from TDEC initiating a remedial investigation (RI). TVA prepared an RI report to present the results of the investigation conducted from 2017 to 2018 (TVA 2019d).

After publishing the RI report in March 2018, TVA developed a supplemental scope of work. Concurrently with the supplemental RI work plan, TVA submitted two additional documents to TDEC: the Pre-Design Services Work Plan (July 20, 2018) and the Initial Remedial Design – Interim Response Action (July 20, 2018). Both documents focus on controlling and beginning to treat arsenic-impacted groundwater north and south of the East Ash Disposal Area (TVA 2019d).

The most recent groundwater monitoring data is identified in Section 3.3, Groundwater. Groundwater monitoring and remediation is anticipated to continue for an additional 10 to 15 years.

3.14.2.5. Operations of TVA Allen Combined Cycle Plant and Adjacent Industrial Facilities

The ACC Plant will continue operations at this site. The ACC Plant became operational in April 2018 and comprises three individual combustion turbine units, two of which operate on natural gas with a generating capacity of 330 MW each. The remaining unit is a combustion steam turbine with a capacity to produce 420 MW (TVA 2019c).

The TVA Allen Reservation is located within the Frank C. Pidgeon Industrial Park. This area is a zoned industrial park bounded on the north by McKeller Lake, on the west by the Mississippi River, and on the east by the Canadian National Railroad, and the Mississippi State line on the south. The industrial park contains a number of developed uses including the ALF, the Maxson WWTP, the ACC, Nucor Steel, the City of Memphis Earth Complex, the CN/CSX intermodal facility, and other zoned industrial sites (Moon Inc. 2008).

The City of Memphis owns and operates the T.E. Maxson WWTP, located on lands immediately west of ALF. The WWTP currently treats an average of 70 million gallons per day of wastewater, serving the city since its commissioning in 1975. Treated wastewater is discharged into the Mississippi River, while the primary and waste activated sludge is sent to a covered lagoon system for anaerobic digestion (TVA 2020). The City of Memphis is current developing a Wastewater Treatment Facilities Process and Biosolid Upgrades Program. This program would upgrade the existing facilities to comply with new NPDES permit requirements for effluent disinfection and overall reduction in treated total suspended solids and biological oxygen demand in the effluent. Additionally, the program includes several projects to upgrade the wastewater treatment plant including renovation to lagoons and replacement of other existing infrastructure to improve effluent water quality and loading to the Mississippi River (EPA 2024i).

The commercial Port of Memphis is located across McKellar Lake immediately north of ALF. Past and present port operations impose a variety of continuing stressors on the ecosystem of McKellar Lake and the adjoining Mississippi River ecosystem associated with barge movement and activities. These stressors typically include physical forces (i.e., shear, pressure), wave induced shoreline erosion, drawdowns, entrainment mortality of planktonic life forms, and sediment resuspension (TVA 2016c).

The former Electrolux manufacturing facility, located in the Pidgeon Industrial Park, is now home to operations of xAI. The xAI facility is a supercomputer site that aids in powering artificial intelligence technology. MLGW provides water, natural gas, and electricality to xAI facilities. Up to 1 million gallons per day of water will be provided by MLGW from an existing water main serving the area. Natural gas will be provided via contracts from third parties for operation that will flow from MLGW gas main to the xAI facility. The xAI facility is currently served by an adjacent substation, which after improvements provides 50 MW of power. Additionally, xAI and MLGW are anticipating installation and operation of more than 50 MW of utility-scale battery storage in the MLGW system starting in 2024 (MLGW 2024).

3.14.2.6. Allen Combustion Turbine Plant Decommission and Deconstruction of Units 1 through 16

In September 2023, TVA completed an environmental review of the demolition and removal of 16 existing units at the ACT. TVA determined that removal of the units had independent utility and was necessary regardless of future actions and/or use of the area.

3.14.2.7. Greywater Facility

xAI, MLGW, and the City of Memphis are partnering to develop a new greywater facility to supply cooling water for the xAI facility and for future industrial and commercial users. The greywater treatment facility would be connected to MLGW's T.E. Maxson WWTP. Construction of the greywater facility has the potential to reduce daily draw from the aquifer up to 10 million gallons per day (Commercial Appeal 2024). As of January 2025, construction and operational schedules are not available.

3.14.2.8. Solar Farm for Greywater Facility

In July 2024, the Economic Development Growth Engine for Memphis and Shelby County board approved plans for a 21-acre solar panel system adjacent to T.E. Maxson WWTP. The solar panel farm will generate approximately 7.5 to 9 MW and supply power to the T.E. Maxson WWTP and is expected to open in 2026 (Commercial Appeal 2024).

3.14.2.9. South Cypress Creek Stream Restoration and Landscape Improvements

In 2019 Shelby County submitted for funds under a HUD National Disaster Resiliency Grant for the South Cypress Creek Watershed and West Junction Neighborhood Redevelopment. Cypress Creek and the West Junction Neighborhood are located approximately 3 miles east of the ACT Plant. This project includes watershed restoration within the South Cypress Creek Basin and Redevelopment in the West Junction Neighborhood. Project restoration and redevelopment efforts include creek restoration, wetland creation and restoration, construction of raingardens, and other stormwater BMPs, creation of park areas, construction of trails, voluntary buyout of properties at risk within the floodplain, identification of properties for infill development and/or side lot acquisition, and creation of open fields (Resilient Shelby 2024).

3.14.2.10. Future Development and Redevelopment of Allen Fossil Plant Site

A new master plan for the Port of Memphis has been completed that identifies short-, middle- and long-range goals for future development on Presidents Island and within the Frank C. Pidgeon Industrial Park. Ninety-five percent of the industrial land on Presidents Island is occupied and supports approximately 200 companies with 4,000 employees, while the Frank C. Pidgeon Industrial Park supports 2,300 acres of under-developed industrial land, including the ALF site. The plan identifies constraints and opportunities for growth and offers recommendations for facility expansions and property redevelopment that include the ALF site. In addition, the plan identifies potential target industries for both Presidents Island and the Frank C. Pidgeon Industrial Park (International Port of Memphis 2018, 2019).

Redevelopment of the land formerly used for the ALF site has become of interest to stakeholders who want to use the land for the expansion of Pidgeon Industrial Park. While the Strategic Plan for the Port of Memphis is conceptual, and no particular development has been presented. The decontamination and demolition of the ALF will make the closure area land available for future economic development projects in the greater Memphis area. Redevelopment is of particular interest at this site due to its location within the Frank C. Pidgeon Industrial Park as well as its access to the Port of Memphis via McKellar Lake. Therefore, it is reasonably foreseeable that this site would be developed for another use that conforms to the current surrounding land uses and zoning.

3.14.3. Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the proposed project area was considered in conjunction with the environmental impacts presented in

Chapter 3. Accordingly, the potential cumulative effects of past, present, and the future actions associated with existing facilities or uses are also integrated in the affected environment described for each resource.

Although TVA evaluated a full range of environmental resource issues for inclusion in the cumulative effects analysis, it is noted that the proposed action would occur mostly within lands that have been previously disturbed and are used for industrial purposes. Additionally, the surrounding landscape outside of the project area is already subject to environmental stressors associated with continuing industrial operations. Consequently, as described in prior subsections of this EIS, the existing quality of environmental resources with the potential to be directly or indirectly affected by the project activities is generally low.

This cumulative impact analysis is limited to those resource issues potentially adversely affected by the proposed action. Accordingly, surface water, wildlife, threatened and endangered species, managed natural areas, transportation, noise, solid and hazardous waste, utilities, and public health and safety are not included in this analysis as these resources are either not adversely affected, or the effects are considered to be temporary or negligible. Therefore, impacts from the proposed project would not result in greater cumulative effects to these resources, in combination with the past, present, and reasonably foreseeable future actions described above.

Analysis of potential cumulative effects for air quality, GHG emissions, groundwater, and socioeconomics is provided below.

3.14.3.1. Air Quality

The GAI for air quality is defined as Shelby County as this is the location of the ACT Plant and proposed action. It is expected that emissions would continue from local vehicles in Shelby County, and from air emissions associated with other reasonably foreseeable future actions in Shelby County, such as the demolition and deconstruction of the ACT Plant CT Units 1 through 16, continued operation of units 19 and 20, construction of the greywater facility, the solar farm construction, South Cypress and West Junction project, and redevelopment of the ALF. The construction of the aero CTs together with construction of the reasonably foreseeable future actions identified above would result in a potential temporary increase in local emissions and fugitive dust. However, construction periods are anticipated to be temporary, and emissions are not anticipated to appreciably change levels of criteria pollutants. Emissions and fugitive dusts can be mitigated through the use of BMPs. Exceedances of applicable ambient air quality standards in Shelby County during construction are not expected.

Operation of the Proposed Action would result in increases in local emissions; however, they would not exceed permit limits or air quality standards. Existing operations including operation of the ACC Plant, are accounted for in the affected environmental discussion of Air Quality (Section 3.1.1). As such, the cumulative impact of continued operations of the ACC are considered baseline conditions reflecting the present environment. Operation of reasonably foreseeable future actions listed in Table 3-14, including the xAI facility, which contains temporary diesel fuel generators and proposed natural gas turbines, and other actions, have the potential to result in increases in emissions within Shelby County. However, air quality in Shelby County is managed by the Shelby County Air Pollution Control Branch, which is also responsible for permitting, performing facility inspections and air pollution testing, and enforcement (Shelby County Health Department 2024). As discussed in Subsection 3.1.1, Air Quality, Shelby County is designated as unclassifiable/attainment for all criteria pollutants. These designations of air quality reflect the aggregate (cumulative impact) of all present actions in Table 3-14 that contribute to air quality. As stated above all present actions are inherent in the baseline determination of the affected environment and the current Shelby County designations. Therefore, the cumulative effect of Alternative B, including the present actions and reasonably foreseeable future actions, on regional air quality would be minor. As summarized in Section 3.1.2, the ACT Plant would comply with Title V/PSD operating permit requirements that are protective of ambient air quality and will ensure no impact on air quality or change of attainment status would occur as a result of implementing these projects.

Therefore, by adherence to Shelby County regulations and permit requirements, cumulative impacts from the additional increases in emissions due to the operation of the aero CTs in combination with the other reasonably foreseeable future actions are moderate because they are noticeable but are not destabilizing. And would not result in an exceedance of applicable air quality standards.

3.14.3.2. Greenhouse Gases

As described in Section 3.2, Climate Change and Greenhouse Gas, overall concerns about GHG emissions are driven by associated worldwide increases in GHG concentrations within the atmosphere, associated increases in global temperature, and potential changes in a range of global weather patterns. Therefore, the GAI for GHG emissions and associated climate change effects is the globe. Given that climate change is the result of the increased global accumulation of GHGs climate effects analysis is inherently cumulative in nature.

GHG emissions associated with the construction and operation of aero CTs at the ACT Plant are identified in Section 3.2 Climate Change and Greenhouse Gas. While the past, present, and reasonably foreseeable future actions presented in Table 3-14 are expected to produce GHG emissions, the impacts of GHGs are experienced on a global scale and are typically not considered to result in regional impacts. As such, cumulative impacts to GHG emissions would be primarily driven by global changes in GHG emission rates within a global geography, rather than at an individual project level. TVA has quantified the potential GHG emissions of its proposal and provided a SC-GHG analysis to provide important context. The analysis in Section 3.2 represents TVA's analysis and disclosure of cumulative GHG effects.

The 2019 IRP programmatically evaluated future decisions related to the IRP and determined that the implementation of the target portfolio adopted by TVA through the 2019 IRP would result in an overall reduction in annual GHG emissions over time. The IRP also noted that the reduction in CO_2 emissions would have small but beneficial impacts on the potential for associated climate change. The installation of the new aero CTs is part of the implementation of the 2019 IRP and has the potential to enable renewable energy generation within the TVA power system as identified in the IRP. As noted in Section 3.2, during operation of the proposed aero CTs GHG emissions at the maximum capacity factor account for 0.82 percent of GHG emissions of TVA's overall system. The relative contributions at the predicted capacity factor are even less (0.22 percent). Relative to global GHG levels and potential effects on climate change, these contributions are negligible. As such, the cumulative impacts from Alternative B on climate change and GHG emissions would be minor.

3.14.3.3. Groundwater

The GAI for groundwater is the Memphis Sands aquifer, as it is the most productive aquifer in the region and underlies the ACT Plant. Construction activities associated with the proposed aero CTs include shallow excavation to a depth of 5 feet and pile-driving to a depth of 75 feet. These activities are expected to be negligible due to lack of groundwater displacement, and adherence to all state and federal requirements related to groundwater protection. In the long term, all potential environmental contamination sources would be monitored in accordance with federal and state laws and regulations and would institute corrective actions if needed.

Construction activities associated with most other reasonably foreseeable future actions in Table 3-14 have the potential to release constituents that may impact groundwater. However, these activities would be conducted in accordance with any applicable environmental and safety regulations, minimizing the potential for a release of contaminants.

Notably, the proposed Greywater Facility, could reduce groundwater withdrawals by 10 million gallons per day by diverting and processing 10 million gallons of greywater per day for industrial uses. Development of this facility has potential to provide an alternate source of industrial water for users in the vicinity of the project area and reduce overall demand on the Memphis Sands aquifer. Therefore, the cumulative effects of the ACT Plant in combination with all other actions identified in Table 3-14 would be minor would not result in incrementally greater cumulative effects to groundwater quality or quantity and may result in a net benefit to groundwater by reducing withdrawals.

3.14.3.4. Socioeconomics

As noted in Section 3.11, most of the census block groups that comprise the socioeconomics study area of the TVA Allen Reservation are considered low-income and/or minority communities. Given the proximity of these communities to the project site, there is a potential that these communities would be indirectly impacted due to an increase in noise, exposure to fugitive dust, and exhaust emissions from construction-related traffic (commuting of construction workers, delivery of materials and equipment, and transport of borrow material). Some of these communities are likely to be along routes used for the transport of wastes and debris associated with the deconstruction and demolition of ALF, transport of CCR or borrow material associated with the ALF Impoundment Closure, or other planned construction projects within the study area. Because these short-term actions are potentially concurrent, potential cumulative effects may be expected to occur on a local basis, particularly in communities located along the routes between ALF and the landfill and borrow areas. Most of these roads are suitable for the truck traffic from ALF; however, the portions of the route nearer to residences could experience more impacts. Therefore, the cumulative effects of the present and reasonably foreseeable actions identified in Table 3-14 may result in moderate to large but short-term impacts in communities where a large number of truck trips are used on a daily basis. This may be particularly evident on low volume residential roadways if these activities occur concurrently with other construction activities in the geographic area. However, based on the intermittent nature of borrow transportation and the relatively low volume (800 truckloads over a 15-month period) of trucks associated with construction of the ACT Plant, the effects of the proposed action on traffic-related impacts to these communities are expected to be minor and short term.

TVA has conducted public outreach designed to keep the public informed and encourage public input regarding proposed activities at Allen. TVA will continue to reach out to the public to understand and address neighborhood concerns throughout implementation of proposed activities.

Additionally, operation of the aero CTs, in combination with operation of reasonably foreseeable future actions in Table 3-14, such as future development in the Pidgeon Industrial Park, have the potential to result in increases in air emissions within Shelby County; however, as described in Subsection 3.14.3.1, Air Quality, it is anticipated that these actions would be conducted in compliance with applicable regulations and permits. One such set of regulations includes

NAAQS primary standards, which have been developed to protect human health with an adequate margin of safety for sensitive subgroups of the population, including children, older adults, people with heart or lung conditions, communities of color, and low economic status populations. Thus, the cumulative impacts on air quality from ACT and other emission sources within Shelby County on communities within the study area would be minor.

During construction activities short-term, temporary, localized GHG emissions are anticipated to occur. However, as noted in Section 3.2, these emissions are similar to other typical construction activities and are not anticipated to adversely impact communities within the study area. During operation of the proposed aero CTs GHG emissions at the maximum capacity factor account for 0.82 percent of GHG emissions of TVA's overall system. The relative contributions at the predicted capacity factor are even less (0.22 percent). As GHG emissions incrementally contribute to global CO_2e levels, the contributory effects on impacts related to climate change on communities within the study area, including vulnerable areas, is considered to be negligible. Therefore, the GHG emissions associated with the aero CTs and in combination with other foreseeable future actions would be minor and are not anticipated to have a cumulative adverse impact to regional GHG emissions or climate change.

3.15. Unavoidable Adverse Environmental Impacts

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPs are typically implemented to reduce a potential impact to a level below significance. Impacts associated with the construction and operation of the proposed action have the potential to cause unavoidable adverse effects to natural and human environmental resources. TVA has reduced the potential for adverse effects during the planning process. In addition, TVA would implement mitigation measures (see Section 2.4) to further reduce potential adverse effects to certain environmental resources.

Temporary impacts to surface water quality from runoff during construction could impact nearby receiving water bodies. The construction of the aero CTs also has the potential for minor impacts to groundwater flow patterns and groundwater quality. Impacts to water quality would be reduced with application of appropriate BMPs.

The ACT Plant currently operates under a Title V operating permit. TVA has begun the process of complying with PSD requirements with the submission of Class I and Class II modeling protocols and a PSD permit application to Shelby County in December 2024. Because the ACT would operate within the parameters of the PSD/Title V permit requirements, the overall unavoidable adverse impacts to air quality would be moderate as they are noticeable but not destabilizing and would not result in an exceedance of applicable air quality standards.

Unavoidable localized increases in air and noise emissions could also occur during construction activities. Activities associated with the use of construction equipment may result in varying amounts of fugitive dust, air emissions, and noise that could impact nearby sensitive receptors. Emissions from construction activities and equipment are minimized through implementation of BMPs including proper maintenance of construction equipment and vehicles.

Minority and/or low income communities would be exposed to environmental impacts associated with the proposed action due to the prevalence of these communities in the study area. However, construction-related impacts would be minor and short term. Long-term adverse impacts from air emissions would be minimized through adherence to NAAQS standards, which protect human health with an adequate margin of safety for sensitive subgroups of the population with higher frequency of preexisting health conditions.

In the context of the availability of regional resources that are similar to those unavoidably adversely affected by the proposed project, coupled with the applicable of appropriate BMPs and adherence to permit requirements, unavoidable adverse effects would be moderate as they are noticeable but not destabilizing.

3.16. Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EIS focuses on the analyses of environmental impacts associated with the construction and operation of the proposed action and associated support systems. These activities are considered short-term uses of the environment for the purposes of this section. In contrast, the long-term productivity is considered to be that which occurs beyond the conclusion of decommissioning the ACT Plant.

Construction of the aero CTs would occur on previously disturbed areas, resulting in minor, temporary, and localized effects to existing air quality during construction. These impacts would be mitigated through implementation of BMPs to reduce emissions from construction phase equipment and to minimize emissions of fugitive dust. Operational impacts to air quality would be noticeable but not destabilizing and therefore, moderate. These impacts would be minimized by implementing appropriate emission controls included within the aero CT plant infrastructure to allow the plant to operate under Title V permit conditions. As such, regional air quality and attainment status within Shelby County would be unchanged by the proposed project. Furthermore, operational impacts to climate change would not be noticeable on a regional, national, or global scale. Therefore, there would be no effect on the enhancement of long-term productivity related to air quality or climate change following decommissioning.

While the acreage disturbed during construction of the aero CTs is larger than that required for the actual permanent structures and associated features once the site is operational, due to the need for vehicle and equipment parking, materials storage, laydown, and other temporary use areas, most of the disturbance areas are located on previously developed lands associated with the ALF, ACT Plant, and ACC Plant. Noise from construction activities may displace some wildlife. Once the new facilities are completed, the areas not needed for operations would be returned to preexisting conditions.

Construction of the six new aero CT units at the ACT Plant would reduce the long-term productivity of the land for other purposes while these facilities are in operation. However, after decommissioning, the lands could be reused and made available for other uses.

3.17. Irreversible and Irretrievable Commitments of Resources

The term “irreversible and irretrievable commitments of resources” describes environmental resources that are potentially changed by the construction or operation of the proposed project that could not be restored to their prior state by practical means at some later time. Irreversible commitments occur to nonrenewable resources such as minerals or cultural resources and to those resources that are renewable only over long timespans, such as soil productivity. A resource commitment is considered irretrievable when the use or consumption is neither renewable nor recoverable for use until reclamation is successfully applied. Irretrievable commitments apply to the loss of production, harvest, or other natural resources and are not necessarily irreversible.

The land used for the proposed aero CT plant is not irreversibly committed because once the plant ceases operations and the facility is decommissioned, the land supporting the facility could be returned to other industrial or nonindustrial uses.

The need for borrow material to support the project could be both an irreversible and irretrievable commitment of resources. Although borrow material would be obtained from a previously permitted borrow site, the loss of soil (which requires a very long time to generate) would constitute an irreversible and irretrievable resource commitment.

The resources required by construction activities, including fossil fuels and construction materials, would be irretrievably lost. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. In addition, the materials used for the proposed site's construction would be committed for the life of the facilities. Additionally, the operation of the aero CTs would result in the irretrievable loss of natural gas, which would be used to fuel the aero CTs. However, these fossil fuels and building materials are not in short supply and their use would not have an adverse effect upon continued availability of these resources.

CHAPTER 4 – LITERATURE CITED

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APPENDIX A – SCOPING REPORT

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Project Name: Allen Aeroderivative CT Project
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Allen Aeroderivative Combustion Turbine Project Environmental Impact Statement

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Scoping Report

DECEMBER 2024

TENNESSEE VALLEY AUTHORITY

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Appendix A – *Federal Register* Notice of Intent
Appendix B – Public and Agency Scoping Comments

List of Acronyms

ACEEE	American Council for an Energy-Efficient Economy
ACC	Allen Combined Cycle Plant
ACT	Allen Combustion Turbine Plant
ALF	Allen Fossil Plant
BMP	Best Management Practice
CC	Combined Cycle Combustion Turbine
CCR	Coal Combustion Residuals
CCS	Carbon Capture and Storage
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CT	Combustion Turbine
CWA	Clean Water Act
EA	Environmental Assessment
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EO	Executive Order
GAO	Government Accountability Office
GHG	Greenhouse Gas
IRA	Inflation Reduction Act
IRP	Integrated Resource Plan
MW	Megawatt
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NOx	Nitric Oxide
NPDES	National Pollutant Discharge Elimination System
ROD	Record of Decision
SC-GHG	Social Costs of Greenhouse Gases
SCR	Selective Catalytic Reduction
SELC	Southern Environmental Law Center
SF6	Sulfur Hexafluoride
TDEC	Tennessee Department of Environment and Conservation
TVA	Tennessee Valley Authority
ULSD	Ultra Low Sulphur Diesel
USEPA	U.S. Environmental Protection Agency

1 Introduction

The Tennessee Valley Authority (TVA) is preparing an environmental impact statement (EIS) to address the potential environmental effects associated with the proposed installation and operation of six new aeroderivative combustion turbine (CT) units at the Allen Combustion Turbine (ACT) plant, located in Memphis, Tennessee. The new aeroderivative CT units (Aero CTs) would generate approximately 200 Megawatts (MW) of power to help meet the growing system demand. The new Aero CT units would support fast start dispatching and have synchronous condensing capabilities to improve grid stability. Four of the Aero CT units would have black start capabilities. Under the proposal, TVA would implement the best available control technologies to mitigate air emissions of the new units.

Construction would occur over a one-year period (approximately) beginning in 2025 or 2026, with construction activities taking place within previously disturbed areas at the ACT and adjacent properties. Commercial operations would begin in 2026 or 2027.

The operation of these units would facilitate the integration of renewable generation onto the TVA bulk transmission system and improve flexibility and dispatchability of transmission grid support, consistent with TVA's 2019 Integrated Resource Plan (IRP). In June 2019, TVA released the IRP, which was developed with input from stakeholder groups and the general public. The 2019 IRP evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential resource additions and retirements throughout the TVA power service area, which encompasses approximately 80,000 square miles covering most of Tennessee and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia. The IRP target power supply mix adopted by the TVA Board in August 2019 includes the addition of up to 5,200 MW of CTs by 2028, and up to 8,600-MW of CTs by 2038.

The National Environmental Policy Act (NEPA) requires Federal agencies to consider the potential environmental consequences of proposed actions. The NEPA review process is intended to help federal agencies make decisions based on an understanding of the impacts of the proposed action and alternatives, and, if necessary, to take steps that protect, restore, and enhance the environment. The NEPA process also provides opportunities for public involvement in federal agency decision making. One of those opportunities is through the public scoping process.

TVA initiated a 30-day public scoping period beginning on October 12, 2023, when it published a Notice of Intent (NOI) in the Federal Register announcing its plan to prepare an environmental study to analyze the potential environmental impacts associated with the proposed Allen Aeroderivative CT project. In its notice to the public, TVA stated that it proposes to evaluate the No Action Alternative and an Action Alternative. The No Action Alternative provides a baseline for comparing impacts against the Action Alternative. Under the No Action Alternative, TVA would not construct and operate the Aero CTs at ACT.

During the scoping period, TVA invited the public's input to identify issues of concern and to help lay the foundation for development of the NEPA study. TVA also requested comments on other reasonable alternatives that should be assessed in the NEPA review. During the scoping period, TVA received comments from three Federal agencies, one State of Tennessee agency, six non-governmental organizations, and 199 (11 individuals and 188 signatories of the Sierra Club form letter) members of the public. Comments about the proposed project were related to the purpose and need, no action alternative, renewable energy alternatives, alternatives and consideration of Inflation Reduction Act incentives, potential environmental effects to air quality, public health, water resources, greenhouse gas (GHG) emissions, socioeconomic and environmental justice, development of new Integrated Resource Plan, transportation effects, noise impacts, and cumulative effects.

This scoping report describes the alternatives to be evaluated, relevant laws, regulations, and executive orders (EOs), and environmental resources to be analyzed in detail. It also summarizes the scoping comments.

1.1 Background

TVA is a wholly owned corporate agency of the United States (U.S.) that serves a region that consists of parts of seven southeastern states. As a public power entity, TVA has no shareholders and receives no Federal appropriations. Under the TVA Act of 1933, Congress charged TVA with advancing the social and economic well-being of the residents of the Tennessee Valley region.

TVA produces or obtains electricity from a diverse portfolio of energy sources, including solar, hydroelectric, wind, biomass, fossil fuel, and nuclear. As noted above, the IRP target supply mix adopted by the TVA Board in August 2019 includes the addition of simple cycle capacity by 2028. Investments in adding aeroderivative combustion turbines (CTs) to the peaking fleet aligns with the direction in the IRP, which recommended enhancing system flexibility to integrate renewables and distributed resources, with substantial solar additions over the next two decades. As the amount of solar generation on the TVA generation portfolio continues to increase, flexibility of the remainder of the fleet becomes even more important. For instance, cloud patterns that temporarily block the sun and reduce solar generation require other generating units to respond to continue to reliably supply power to customers. Aeroderivative CTs are inherently well-suited to provide flexibility, enabling the remainder of the system to better integrate renewables.

Since the completion of the IRP, TVA has seen a strong increase in electric demand. Population has increased in the TVA service region by 1.5 percent since 2019. TVA expects continued strong growth in annual electric demand through the middle of this decade. Current system modeling shows that with increased residential migration and commercial development, TVA must add capacity to the system to maintain adequate reserves.

In 2019, TVA also completed a CT Modernization Study to evaluate the condition of its existing CT units and form recommendations for investments to ensure a reliable and flexible peaking fleet into the future. The results of the study identified the Allen Combustion Turbine Plant (ACT) units as the “most challenged” based on their age and material condition and recommended that they be replaced.

In June 2021, TVA issued an environmental assessment (EA), the Paradise and Colbert Combustion Turbine EA, addressing the retirement of the CT units at ACT among other actions (TVA 2021). At that time, TVA also issued an associated finding of no significant impact, in which TVA addressed the retirement of CT units at its Allen and Johnsonville plants and the replacement of the capacity lost with new CT units at its Paradise and Colbert plants (TVA 2021).

Scoping Report

Figure 1. Location of Allen Combustion Turbine Plant and Surrounding Area

2 Purpose and Need

TVA's asset strategy incorporates the strategic direction from the 2019 IRP and continues to support affordable, reliable, and cleaner energy for the customers TVA serves. The proposed Allen Aeroderivative project that will be studied during this environmental review is one piece of TVA's overall asset strategy, which also includes:

- Maintaining the existing low-cost, carbon-free nuclear and hydro fleets.
- Retiring aging coal units as they reach the end of their useful life, with the entirety of the coal fleet expected to be retired by 2035.
- Adding up to 10,000 MW of solar, complemented with storage, by 2035 to meet customer demands and system needs.
- Using natural gas to facilitate needed coal retirements and integrate solar expansion as other technologies develop.
- Leveraging demand-side options, in partnership with local power companies.
- Partnering to develop new carbon-free technologies for deeper decarbonization.

TVA utilizes least-cost planning in the development of its asset strategy to provide electricity at the lowest feasible rate for our customers. The target power supply mix in the 2019 IRP that was adopted by the TVA Board represents least cost planning.

2.1 Project Purpose and Need

The purpose of the proposed action is to provide new, dispatchable generation to support the continued system load growth experienced in the TVA power service area over the past few years and increase the flexibility and reliability of the TVA power system by improving TVA's transmission system stability in western Tennessee. These improvements would help TVA to expand and integrate renewable energy resources onto its transmission grid, which would allow TVA to advance its decarbonization goals.

As set forth in TVA's 2019 Integrated Resource Plan, TVA needs flexible, dispatchable power to meet required year-round generation and maximum capacity system demands and planning reserve margin targets. Dispatchable power is also needed to successfully integrate increasing amounts of renewable energy sources. Dispatchable synchronous condensing capabilities are known to address vulnerabilities to voltage instability that may result from increased renewable generation in the region. Reliability of the system would also be improved by generation sources with black start capabilities that can support system restoration in the event of a system failure.

2.2 Other Environmental Reviews and Consultation Requirements

2.2.1 Other Environmental Reviews

TVA has been operating at or within the vicinity of the ACT plant for decades. Currently, TVA operates the Allen Combined Cycle (ACC) Plant on a property south of the ACT and is conducting extensive decontamination and deconstruction activities on the site of the former Allen Fossil Plant (ALF), adjacent to the ACT. Management of the coal combustion residuals (CCR) on nearby lands is ongoing. These activities have been the subject of several environmental reviews over the past decade.

Paradise and Colbert Combustion Turbine EA (June 2021). As noted in Section 1 above, TVA issued this EA and an associated finding of no significant impact addressing the retirement of CT units at ACT and its Johnsonville plant and the replacement of the capacity lost with new CT units at its Paradise and Colbert plants (TVA 2021).

Allen Fossil Plant Ash Impoundment Closure Final Environmental Impact Statement (EIS) (March 2020). This EIS addressed TVA's closure of the surface impoundments at the ALF and how to dispose of CCR removed from the impoundments under the "closure-by-removal" option. The project supports TVA's goals to eliminate all wet CCR storage at its coal plants by closing CCR surface impoundments across the TVA system and to assist TVA in complying with the Environmental Protection Agency's CCR Rule. Under both closure alternatives analyzed in the EIS, TVA would transport CCR to an off-site existing, permitted landfill and would transport borrow materials to ALF from an existing, permitted off-site source for site restoration. A Record of Decision was released on April 21, 2020 (TVA 2020).

Allen Fossil Plant Decontamination and Deconstruction Final Environmental Assessment (EA) (October 2019). This Environmental Assessment evaluates the disposition of the buildings and structures at ALF that are no longer needed for their original purpose of power generation. TVA's preferred alternative is full demolition to grade resulting in a brownfield site. Implementation of this alternative addressed the purpose and need of the project to enhance future economic development in the area and avoids the potential environmental and public safety impacts associated with leaving the ALF in the "as-is" condition (TVA 2019).

Final Ash Impoundment Closure Programmatic Environmental Impact Statement (June 2016). The PEIS was prepared to address the closure of CCR impoundments at all of TVA's coal-fired power plants. The report consists of two parts: Part I – Programmatic National Environmental Policy Act (NEPA) Review and Part II – Site-Specific NEPA Review. In Part I, TVA programmatically considered environmental effects of closure of ash impoundments using two closure methods: (1) Closure-by-Removal and (2) Closure-in-Place. Part II included a site-specific NEPA review of closure of the West Ash Pond at the ALF (TVA 2016c) by closing the ash pond in-place. A Record of Decision (ROD) was released in July of 2016 that would allow future environmental reviews of CCR impoundment closures to tier from the Programmatic EIS (TVA 2016).

Allen Fossil Plant Emission Control Project Environmental Assessment (August 2014). This EA evaluates the impacts of reducing sulfur dioxide emissions at the ALF by retiring the coal units and constructing a natural gas-fired power plant (the ACC). The reduction in sulfur dioxide emissions at the plant helped TVA comply with the EPA Clean Air Agreements consistent with TVA's mission to provide reliable and affordable power (TVA 2014).

TVA Integrated Resource Plan and Environmental Impact Statement (TVA 2019). As noted above, in June 2019, TVA released its IRP, which evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential resource additions and retirements throughout the TVA power service area. In the final IRP, TVA identified a target power supply mix that was adopted by the TVA Board in August 2019. The target power supply mix included the addition of up to 5,200 MW of CTs by 2028, and up to 8,600 MW of CTs by 2038.

3 Alternatives

This section describes the alternatives TVA intends to evaluate in the NEPA study. The description and analyses of these alternatives will inform decisionmakers, other agencies, and the public about the potential for environmental impact associated with the proposed aeroderivative units at ACT. During the scoping period, TVA solicited comments on whether there are other alternatives that should be addressed in the NEPA study. TVA also requested information that may be relevant to the project.

As a result of internal review and scoping comments, TVA has proposed the following alternatives to be evaluated in the NEPA study.

3.1 No Action Alternative

Under the No Action Alternative, TVA would not install new aeroderivative CT units at the ACT. During the environmental review process, the No Action alternative provides a baseline for comparing alternatives.

3.2 Action Alternative

Under the Action Alternative, TVA would evaluate the installation and operation of six new aeroderivative combustion turbine units (GE LM2500s) generating approximately 200 MW of power. Construction would occur over a one-year period (approximately) beginning in 2025 or 2026, with construction activities (including laydown actions) taking place within previously disturbed areas at ACT and adjacent properties. TVA estimates that about 200 workers would be employed onsite during peak construction activity. Commercial operation is tentatively planned to begin in 2026 or 2027.

Aeroderivative CT units are highly efficient peaking units that are dispatchable year-round and can ramp up very quickly to provide capacity and grid support. Aeroderivative CT units improve system reliability requirements because they can startup quickly to meet sudden changes in supply or demand and can meet capacity needs during short periods. At least four of the new aeroderivative units would have black start capability, meaning the ability to restore power without needing to rely on the external electric power transmission system. The new units would support fast start dispatching and synchronous condensing for transmission system stability in the Western Tennessee area and would improve TVA's ability to further expand renewable energy.

Under this alternative, TVA would conduct a number of activities related to preparing the site for construction and operations of the new CT units, including but not limited to:

- The creation of a laydown area for construction support actions (e.g., storage, parking, material management) adjacent to ACT
- Installation of two diesel generators in support of the four black start units
- Upgrades to existing natural gas infrastructure to improve gas regulation and shutoff
- Installation of new compressed air skid
- Installation of new ammonia unloading, storage, and delivery system
- Replacement of station service transformers

- Improvements to the existing physical security at the site

In addition to the major equipment systems, the proposed action may include other maintenance and minor improvements to plant equipment and systems necessary to operate the new units. Larger project equipment could be delivered to the project site by truck. Most delivered items would be placed in project laydown areas to await installation.

The following activities are associated with the long-term operations of the CT units:

Air Emission Controls and Monitoring: The Action Alternative would require installation of control systems to minimize and monitor air emissions of the new aeroderivative CT units. Operating the aeroderivative CTs would require emission monitoring and controls. Reduction of emissions of oxides of nitrogen (NOx) from each aeroderivative CT would be achieved through a dry-low emissions combustion system and a Selective Catalytic Reduction (SCR) system. SCR uses aqueous ammonia and requires TVA to install an independent storage/receiving system. Reduction of carbon monoxide (CO) and volatile organic compounds (VOC) would be achieved using a separate catalyst layer. Exhaust stacks would be equipped with continuous emissions monitoring systems. An air-quality analysis, which is required under local and Federal regulations and submitted separately, will be completed prior to the beginning of construction.

Borrow Material: TVA estimates that approximately 8,000 cubic yards of borrow material would be needed to support the project.

Potable Water: Some water treatment may be required to support the ACT. The operation of the ACT plant would require approximately 58 gallons per minute of potable water, which would be obtained from the existing public supply, to be used for inlet air evaporative cooling in summer ambient temperatures. The process water would be pre-treated as required and will discharge to a permitted publicly owned treatment works outfall.

Natural Gas Supply: The ACT would continue to be fueled by the existing supply of natural gas. The proposed ACT would use an existing gas line currently located at the site.

Fuel Oil: Petroleum fuel would be used to operate the two proposed black-start diesel generators during a blackout to provide the necessary power to reactivate the power grid. To reduce air emissions, petroleum fuel would not be used to operate the six proposed aeroderivative CT units.

Transmission: TVA does not anticipate that new transmission corridors would be required or that existing transmission infrastructure would need to be upgraded as a result of implementing the Action Alternative. A transmission system impact study is being performed to determine interconnection requirements and determine potential effects to non-TVA systems.

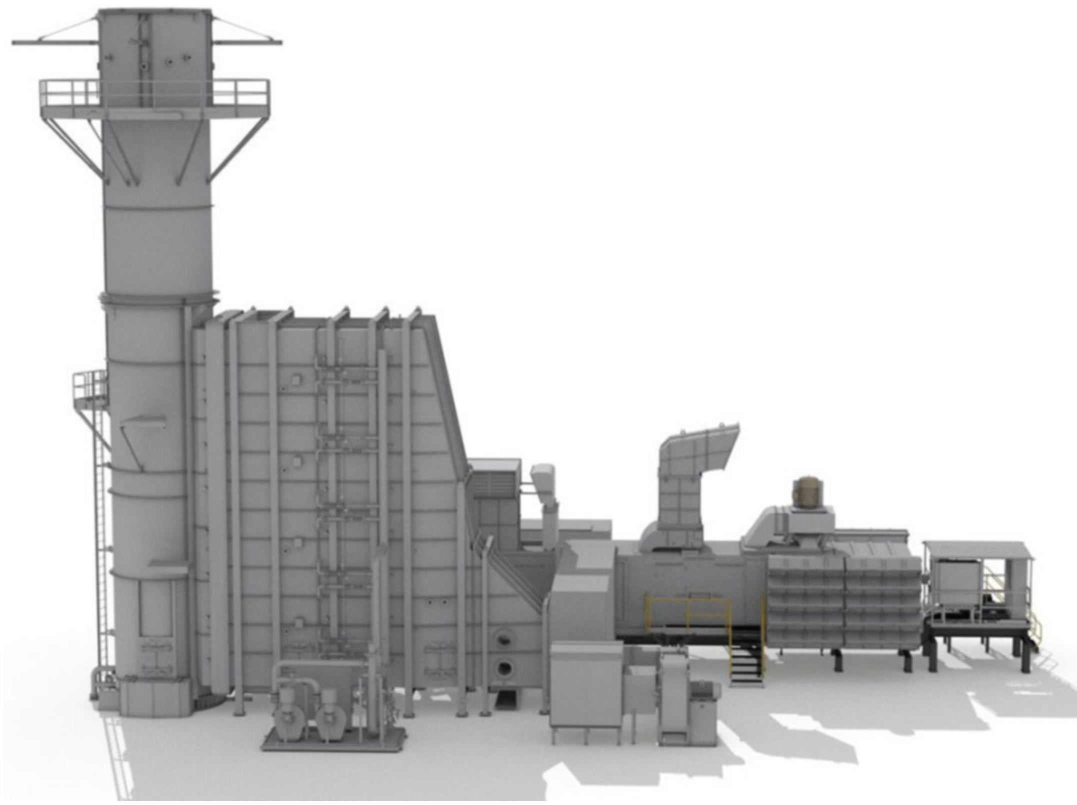

Figure 2. Aeroderivative Combustion Turbine with Post-Combustion Catalysts

In its Notice of Intent, TVA described the scope of the environmental review to include the continued operation of existing Allen CT units 19 and 20. During the scoping period and through additional internal review, TVA determined that the continued operations of the units are adequately addressed in a previous environmental analysis (the Paradise and Colbert Combustion Turbine EA, 2021). Therefore, the EIS will address the operations of units 19 and 20 as activities relevant to the cumulative impact analysis.

4 Environmental Review Process

NEPA requires federal agencies to consider and study the potential environmental consequences of proposed actions. Actions, in this context, can include new and continuing activities that are conducted, financed, assisted, regulated, or approved by federal agencies, as well as new or revised plans, policies, or procedures. The NEPA review process is intended to help federal agencies understand a proposed action's impacts and thereby ensure informed decision making (40 Code of Federal Regulations [CFR] 1500). The NEPA process also provides opportunities for public involvement in federal agency decision making.

TVA has initiated a NEPA review to assess the environmental impacts of its proposed action. TVA is using the input from the public scoping period, summarized below, in developing the Draft EIS. The Draft EIS will be distributed to interested individuals; groups; and federal, state, and local agencies for their review and comment. TVA also will submit the Draft EIS to the U.S. Environmental Protection Agency (USEPA), which will publish a notice of its availability in the *Federal Register*. Following the 45-day public comment period for the Draft EIS, TVA will respond to the comments received and incorporate any necessary changes into the Final EIS.

The completed Final EIS will be placed on TVA's website, and notices of its availability will be sent to those who received or submitted comments on the Draft EIS. TVA also will submit the Final EIS to the USEPA, which will publish a notice of its availability in the *Federal Register*. TVA will make a final decision regarding the Proposed Action no earlier than 30 days after the Final EIS is published. TVA will publish its decision in a Record of Decision that will address the decision, the rationale for the decision, alternatives that were considered, and associated mitigation measures, monitoring, and enforcement requirements. At this time, TVA plans to release the Draft EIS in early 2025 and the Final EIS in summer 2025, with a Record of Decision no earlier than 30 days after the Final EIS.

4.1 Applicable Federal Laws and Executive Orders

4.1.1 National Environmental Policy Act

This environmental review is being conducted by TVA in accordance with NEPA (42 U.S. Code §§ 4321 et seq.), regulations implementing NEPA analyses promulgated by the Council on Environmental Quality (40 CFR Parts 1500 to 1508), and TVA NEPA regulations and procedures (18 CFR Part 1318). For major federal actions with significant environmental impacts, NEPA requires that an EIS be prepared. The NEPA process provides opportunities for public involvement and the analysis of the environmental effects of the proposal, reasonable alternatives, and of not taking an action.

4.1.2 Other Laws and Executive Orders

Other laws and EOs that are relevant to the review of the Action Alternatives are shown in Table 1. These laws and orders may affect the construction and operation of the proposed new aeroderivative units at ACT. The Draft EIS will describe the regulatory setting for each resource in more detail.

Table 1. Laws and Executive Orders relevant to the Proposed Action.

Environmental Resource Area	Law / Executive Order
Water Resources	Administrative Code of Tennessee Department of Environment and Conservation (TDEC), Chapter 0400-04 Clean Water Act Sections 401, 402, and 404 EO 11988 – Floodplain Management EO 13690 – Federal Flood Risk Management Standard EO 11990 – Protection of Wetlands EO 13778 – Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the U.S." Rule Safe Drinking Water Act Resource Conservation and Recovery Act
Biological Resources	Administrative Code of TDEC, Chapter 0400 Bald and Golden Eagle Protection Act Endangered Species Act Section 7 EO 13112 – Invasive Species EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds Migratory Bird Treaty Act
Air Quality and Greenhouse Gas (GHG) Emissions Climate Change	Clean Air Act EO 14008 – Tackling the Climate Crisis at Home and Abroad EO 13990 – Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis Inflation Reduction Act of 2022
Cultural Resources	Administrative Code of TDEC, Chapter 0400 National Historic Preservation Act Section 106 (Consultation with State Historic Preservation Office and tribes) Native American Graves Protection and Repatriation Act
Waste Management	Administrative Code of TDEC, Chapter 0400 Comprehensive Environmental Response, Compensation, and Liability Act Emergency Planning and Community Right-to-Know Act Resource Conservation and Recovery Act Solid Waste Disposal Act Toxic Substances Control Act

Environmental Resource Area	Law / Executive Order
Public and Occupational Health and Safety	Occupational Safety and Health Act
Environmental Justice	EO 12898 – Federal Actions to Address Environmental Justice in Minority and Low-Income Populations EO 14008 – Tackling the Climate Crisis at Home and Abroad EO 13166 - Improving Access to Services for Persons with Limited English Proficiency

4.1.3 Agency Coordination and Consultations

TVA will provide notice to potentially interested state and federal agencies when the Draft EIS is available for review and comment through the *Federal Register* and via the TVA NEPA website.

Consistent with the National Historic Preservation Act (Section 106), TVA will consult with the State of Tennessee Historical Commission and federally recognized Indian tribes regarding the proposal. TVA will also consult with the U.S. Fish and Wildlife Service regarding the potential effects of the project on endangered or threatened species, consistent with the Endangered Species Act (Section 7).

TVA anticipates seeking required permits or authorizations, as appropriate. TVA's proposed action may require issuance of an air permit under the Clean Air Act; an Individual or Nationwide Permit under Section 404 of the Clean Water Act; Section 401 Water Quality Certification; conformance with relevant Executive Orders; and compliance with other applicable local, federal, and state regulations.

5 Public Outreach during Scoping Period

On October 12, 2023, TVA published a Notice of Intent (NOI) in the *Federal Register*, announcing plans to conduct an environmental study to assess the potential environmental effects associated with the proposed construction and operation of six new aeroderivative CT units at the ACT facility near Memphis, Tennessee. The NOI initiated a 30-day public scoping period. The NOI solicited public input on the scope of the NEPA review, alternatives that should be considered, and environmental issues that should be reviewed in detail in the study. The purpose of the scoping period was to present TVA's project objectives and initial alternatives for input from the public and interested stakeholders.

In addition to the NOI in the *Federal Register*, TVA invited members of the public as well as federal, state, and local agencies and federally recognized Indian tribes to comment on the scope of the NEPA review.

TVA sent notification of the NOI via email to federal, state, and local government entities and other stakeholders. TVA published notices regarding the NOI in The Daily Memphian and Tri-State Defender newspapers.

TVA also created a web page with information about this project and opportunity for public input at https://www.tva.com/allenct. The website included the NOI, information about two public events planned by TVA, and an online comment form that the public could use to submit input.

On October 24, 2023, TVA held an in-person scoping open house at the Mount Vernon Baptist Church in Memphis. Approximately 35 people attended the open house, including representatives from non-governmental organizations (Protect Our Aquifer, Tennessee Interfaith Power and Light, Respect the Haven Community Development Corporation (CDC), and the Westwood-Indian Hills and Neighboring Developments CDC), State Senator London Lamar (Tennessee, District 33), and staff from the offices of both U.S. Senators representing Tennessee (Senators Blackburn and Hagerty). TVA provided information on the proposal in handouts and displayed on poster boards placed through the meeting room, while TVA staff were present to answer questions from the public. Two written comments were provided to TVA at this event.

On November 2, 2023, TVA hosted a virtual public meeting/webinar that included a presentation about the proposal and a question-and-answer session in which attendees could submit questions to the TVA panel. The webinar was attended by 14 members of the public and representatives of non-governmental organizations.

On November 11, 2023, prior to the end of the public scoping period, TVA partnered with the Westwood-Indian Hills and Neighboring Developments CDC (WIND Memphis) to host a community event to raise awareness about the project and public comment period and to answer questions from community members. The community event was attended by approximately 100 people.

6 Summary of Public Scoping Comments

TVA received a wide variety of comments and opinions regarding the construction and operation of new aeroderivative CT units at the ACT and will consider this input in developing its Draft EIS.

During the 30-day scoping period, TVA received 19 comment submittals from 11 members of the general public, representatives of six non-governmental organizations, and officials from three federal agencies and one State of Tennessee department. Among the submittals was a form letter from the Sierra Club that was signed by 188 individuals and included personal statements from 80 individuals.

Non-governmental organizations submitting comments were Center for Biological Diversity, Southern Environmental Law Center, Protect Our Aquifer, Sierra Club, and Memphis Community Against Pollution. The U.S. Environmental Protection Agency, U.S. Geological Survey, U.S. Fish and Wildlife Service, and the State of Tennessee Department of Environment and Conservation, Division of Water Resources provided responses to TVA's scoping notice as well. All comment submissions are included in Appendix B and summarized in Section 6.1.

The submissions consisted of:

- Three submissions from federal agencies: U.S. Environmental Protection Agency, U.S. Geological Survey, and U.S. Fish and Wildlife Service
- One submission from a state agency: State of Tennessee Department of Environment and Conservation, Division of Water Resources
- Four submissions from organizations including the Center for Biological Diversity, the Southern Environmental Law Center (with Protect Our Aquifer, and Memphis Community Against Pollution), the Westwood-Indian Hills and Neighboring Developments CDC (WIND Memphis), and the Sierra Club (the Sierra Club submittal included a form letter signed by 188 individuals and included additional personal statements from 80 individuals)
- 11 submissions from members of the public unaffiliated with organizations

All comments submitted are included in Appendix B.

6.1 Scoping Commenters

TVA received a range of comments during the scoping period. Major categories of comments related to the alternatives that TVA should consider during the review and concern for adverse effects to human health, environmental resources, and nearby communities. The statements and recommendations submitted by the public, agencies, and organizations are summarized below.

6.1.1 General Public

<u>Alternatives</u>

- Pro Aeroderivative – General support of the new aeroderivative units at ACT as dependable and reliable energy sources and would allow for increased capacity.
- Renewable Energy Alternatives – Preferences for use of renewable energy alternatives and support for solar and other renewables as cheaper options instead of aeroderivative CTs.

- Evaluate Other Alternatives – Suggestion to develop closed-cycle pump hydroelectric facilities as a solution to fluctuating energy generation output and to evaluate other energy storage operations to create a balanced portfolio.

Resources

- Human Health Hazards – Concerns with emissions from new aeroderivative units and human health issues in relation to hydrogen sulfide, carbon monoxide, nitrogen oxides, and ozone.
- Noise Hazards – Concerns with the noise produced by new aeroderivative units and issuance of adequate hearing protection for workers and compliance with noise regulations.

6.1.2 Federal and State Agencies

U.S. Environmental Protection Agency

Alternatives

- Range of Alternatives and Consideration of Inflation Reduction Act – Concerns over the lack of alternatives; suggests that TVA consider a reasonable range of alternatives and take into consideration the forecast of higher natural gas prices, tax credits available for building qualifying new clean energy projects, and emerging technologies that are more economically advantageous.
- Renewable Energy Alternatives – Recommends the alternatives analysis reflect alternatives consistent with meeting net-zero emissions goals, reflects EO 14057 for carbon-pollution free energy by 2035, and net zero emissions by 2050. Additionally, recommends that TVA identify the timeline in which renewable buildout will occur and the connections between that buildout and the planned natural gas generation.

Purpose and Need

- Purpose and Need – Recommends that TVA explain their strategic portfolio development process and timeline in relation to the proposed CT units at ACT. Additionally, recommends that TVA explain the need for 200 MW expansion at ACT in addition to 5,000 MW of natural gas generation planned by TVA elsewhere.
- Economic Feasibility – Recommends TVA include costs of carbon mitigation measure in the cost analysis.

Resources

Air Quality and GHG

- Greenhouse Gas Emissions and Climate Change – Recommends TVA evaluate the potential cost implications of future air quality and greenhouse gas regulations on natural gas units and how climate change impacts may affect operations of alternatives considered. Further, recommends that TVA consider how alternatives may exacerbate climate change impact to surrounding areas and opportunities to mitigate those impacts.
- Social Cost of Carbon – Recommends using the best available Social Costs of Greenhouse Gases estimates in the EIS/EA and suggests that the climate damages should be presented for each GHG at discount rates of 2.5, 3.0 and 5.0 percent.

- Net Zero and Greenhouse Gas Emissions Reduction Policy and Goals – Recommends that the EIS/EA include discussion of whether the estimated GHG emissions from the alternatives are consistent with national GHG reduction targets. Recommends discussing the alignment with agency GHG reduction goals and policies and discussing any inconsistencies of the proposed action with other GHG reduction goals.

Environmental Justice

- Environmental Justice – Recommends TVA analyze the alternatives and their potential to exacerbate or mitigate impacts on environmental justice populations from climate change, exposure to air pollutants, and other harms related to electricity and fossil fuel production and transportation. Recommends that TVA meaningfully engage and collaborate with Environmental Justice communities and ensure consistency with EO 12898.

Mitigation

- Mitigation – Recommends that the EIS/EA consider plant designs with increased carbon capture and storage, hydrogen fuel blending technology, and other evolving technology and commercially available equipment as a means of mitigating emissions.

Other

- Other – Recommends that TVA consider comment letters that the EPA provided on the Cumberland and Kingston Retirement projects.

U.S. Fish and Wildlife Service

- Wildlife Habitat and Aquatic Resources – ACT site is open and developed, and rare species database does not indicate any federally listed species occurring at ACT.
- Other – No comments at this time.

U.S. Geological Survey

- Other – No comments at this time.

State of Tennessee Department of Environmental Concern – Division of Water Resources

- Permitting – A Section 404 CWA/NPDES permit would be required.

6.1.3 Non-Governmental Agencies

Westwood-Indian Hills and Neighboring Developments CDC (WIND Memphis)

- Request for More Information – Requests information on how the proposed project will benefit air quality and impact noise levels in relation to the surrounding community. Requests clarification on how the proposed project connects to future solar power usage, cost on customers, and impact on future development in zip code 38109.

Center for Biological Diversity

Alternatives

- Range of Alternatives and Consideration of Inflation Reduction Act – Recommends TVA consider clean energy incentives outlined in the IRA such as solar and battery storage.
- Renewable Energy Alternatives – Recommends that TVA include fossil fuel free alternatives such as distributed renewable energy and battery storage.

Purpose and Need

- Economic Feasibility – Concerns over cost of new aeroderivative units at ACT and suggests evaluating distributed renewable energy and battery storage as cost-effective alternatives.

Resources

Air Quality and GHG

- Greenhouse Gas Emissions and Climate Change – Recommends that TVA evaluate greenhouse gas emissions of the existing alternatives and one or more alternatives that chart a path to zero emissions in the context of the immediate surrounding region rather than global emissions.
- Net Zero and Greenhouse Gas Emissions Reduction Policy and Goals – Recommends TVA consider renewable energy alternatives to align with a path to zero emissions and provide cost savings associated with renewables.

Natural and Physical Resources

- Wildlife Habitat and Aquatic Resources – Concerns over surrounding water use from fossil fuels and disposal of coal ash, particularly to the Memphis Sand Aquifer.
- Human Health Hazards – Concerns that TVA's planned energy investment in gas projects and the lack of renewable energy alternatives contradicts the agency's mission to improve quality of life for its customers.

Environmental Justice

- Environmental Justice – Concerns over the lack of renewable energy alternatives and impact of the existing alternatives to environmental justice communities. Concern over economic burden to environmental justice communities in the event of outages, capacity disruptions and infrastructure damage from climate change.

Other

- Prepare an EIS – Suggestion for TVA to prepare an EIS and conduct a robust analysis of all the project's foreseeable impacts.

Sierra Club

Alternatives

- Range of Alternatives and Consideration of Inflation Reduction Act - Recommends that TVA choose renewable energy supported by the IRA.
- Renewable Energy Alternatives – Preferences for renewable energy alternatives and solar and battery storage as cheaper energy options, instead of aeroderivative combustion turbines.

Resources

Air Quality and GHG

- Greenhouse Gas Emissions and Climate Change – Concerns over historic use of fossil fuels and climate change in relation to the existing alternatives.
- Net Zero and Greenhouse Gas Emissions Reduction Policy and Goals – Concerns regarding the existing alternatives and their ability to meet net zero emissions goals.
- Air Pollution – Concerns over air pollution created by the new aeroderivative units at ACT and historic industrial pollution disproportionally affecting overburdened South Memphis communities.

Natural and Physical Resources

- Human Health Hazards – Concerns over the health and safety of residents impacted by the existing alternatives.

Environmental Justice

- Environmental Justice – Concerns over historic pollution from fossil fuels and impacts to the South Memphis communities which have been overburdened by the adverse environmental effects from industry and energy production.

Other

- Prepare an EIS – Recommends that TVA conduct a full EIS to examine the environmental, social, and justice aspects of the existing alternatives.
- General Opposition to the Project – Commentors oppose new aeroderivative units at ACT.

Southern Environmental Law Center (SELC), Sierra Club, Memphis Community Against Pollution, and Protect Out Aquifer

In addition to the comment letter SELC included 143 unique attachments to their comment letter. All attachments submitted are included in Appendix B.

Alternatives

- Range of Alternatives and Consideration of Inflation Reduction Act (IRA) – Recommends that TVA analyze a range of alternatives that leverage the full benefits of the IRA before investing in a new gas plant at ACT. Concerns that the 2019 IRP and CT Modernization study do not justify the alternatives selected. Recommends that TVA not make new investments in fossil generation without completing an updated IRP.

- Renewable Energy Alternatives – Recommends TVA select alternatives that will not exacerbate the climate crisis and consider a reasonable range of alternatives, including clean energy such as solar and battery storage options. Recommends TVA consider combinations of clean energy resources as alternatives. Concerns that TVA has stated a commitment to renewable energy in its Notice of Intent but fails to incorporate any project alternative that utilizes renewable energy.
- Evaluate Other Alternatives – Concerns that the Allen Gas Turbine Project will contribute to significant climate and environmental justice impacts and recommends that TVA consider a range of reasonable alternatives that would avoid and minimize those impacts. Concerns that TVA is too narrowly defining the project as a way to artificially foreclose all other alternatives. Recommends that TVA analyze how increased investment in energy efficiency may reduce peak load and energy burden and analyze allowing Memphis Light, Gas, and Water the ability to generate energy locally.
- No Action Alternative – Recommends that the relevant baseline against which to compare the impacts of the Allen Gas Turbine Project is a baseline of zero gas generation at the site and use the no action alternative's effects as the comparison point for determining significant impacts.

<u>Purpose and Need</u>

- Purpose and Need – Recommends TVA define the Allen Gas Turbine Project as a new gas plant, and not a "replacement" for evaluating the project's environmental impacts. Recommends TVA explain why it can justify investments in gas fired generation while not appearing to pursue the same renewable projects that the agency claims justify these decisions.
- Economic Feasibility – Concerns that the Allen Gas Turbine project will contribute to energy burden in southwest Memphis. Concerns that TVA has not explained whether or how the proposed $1.5 billion investment in energy efficiency and demand response could negate the need for the Allen Gas Turbine Project. Recommends TVA evaluate the cost competitiveness of each of the alternatives it considers. Recommends TVA consider and address the costs of solar and storage options as they are expected to change during the course of this NEPA study.

<u>Resources</u>

Air Quality and GHG

- Greenhouse Gas Emissions and Climate Change – Concerns that TVA is presenting this project as having "lower emissions" when the Allen Gas Turbine Project is an entirely new source of greenhouse gas emissions and is increasing those emissions relative to the zero-gas baseline. Recommends TVA analyze the impacts of the proposed action against emission-free alternatives and consider impacts of upstream methane gas emissions and climate change. Recommends that TVA analyze the cumulative impact of its 6,050 MW gas buildout. Recommends TVA provide GHG emissions estimates against various decarbonization pathways and discuss what those scenarios mean. Recommends the GHG analysis quantify the Allen Gas Turbine Project emissions as well as emissions for TVA's full gas buildout for a minimum 17-year life-cycle analysis. Recommends that the GHG analysis consider emissions from a total of eight operating aeroderivative units (six proposed CTs and existing Units [19 and 20]).

- Social Cost of Carbon – Recommends that TVA include a GHG analysis that acknowledges federal climate policy and is in accordance with EOs to prioritize decarbonizing the electricity sector by 2035.
- Net Zero and Greenhouse Gas Emissions Reduction Policy and Goals – Concerns that TVA is not meeting EOs related to remedying environmental injustice and decarbonizing the electric grid by 2035.
- Recommends TVA analyze the full climate impacts of building new methane gas plants.
- Recommends that TVA consider the conflict between its proposed Allen Gas Turbine Project and full gas buildout and the policies reflected in federal executive orders, Memphis's climate action plan, and even TVA's own targets.
- Air Pollution – Concerns over historic air pollution from TVA's fossil fuel plants and likelihood that the proposed project will cause significant air pollution impacts in southwest Memphis.

Natural and Physical Resources

- Wildlife Habitat and Aquatic Resources – Concerns over ACT coal ash pits and continued pollution leaching into ground and surface waters.
- Water Usage Impacts – Concerns over ACT consuming southwest Memphis' clean drinking water to operate. Recommends that TVA utilize reliable renewable power because gas plants, including TVA's Allen Gas Plant, extract enormous amounts of water from Memphis's drinking water aquifer. Recommends that TVA disclose and analyze the impact of the proposed action on MLGW's drinking water infrastructure and groundwater.
- Traffic Impacts – Concerns that the proposed project will have impacts associated with increased traffic on roads to and from the Allen Gas Turbine site. Recommends that the transportation analysis encompasses more than estimated truck trips or changes in average annual daily traffic.

Environmental Justice

- Environmental Justice – Concerns over ACT and historic and ongoing pollution and associated harms to overburdened southwest Memphis communities. Concerns that the ACT will significantly and disproportionately impact an overburdened Black and low-income community causing significant cumulative environmental justice impacts and impact TVA's own environmental justice goals. Concerns that TVA has not meaningfully mitigated or addressed past concerns from community groups.

Cumulative Impacts

- Cumulative Impacts – Concerns over the project's contribution to cumulative impacts in relation to air quality, climate change, transportation degradation, water usage, groundwater quality, socioeconomics and environmental justice communities. Recommends that TVA examine how the alternatives will add to cumulative impacts and explore alternatives that will avoid cumulative impacts. Additionally, recommends that TVA consider cumulative impacts including TVA's own past and ongoing actions in addition to other reasonably foreseeable future actions.

Other

- Prepare an EIS – Recommends TVA prepare an EIS of the proposed project, as Allen Gas Turbine Project will exacerbate the already dangerously polluted air in southwest Memphis and evaluate whether its contributions can be avoided through non-gas alternatives or otherwise mitigated.
- Integrated Resource Plan – Recommends TVA prepare a new IRP that reflects the changes in the electric utility section since 2019. Statement that TVA cannot properly evaluate the ACT project without this given the interconnectedness of the grid.

7 Issues to be Addressed

Based on TVA's internal scoping and input gathered from the public scoping process, TVA anticipates the major issues to be addressed in this NEPA review will include:

- Air Quality – Air Quality considerations include the ambient air quality, areas of attainment/nonattainment, identification of applicable federal and state requirements, and assessment of impacts to air quality associated with construction and operation of the proposed aeroderivative CT units. The description of impacts will identify any air quality permits that exist, that may be modified, or that may be required for the proposed actions.
- Greenhouse Gases and Climate Change – Greenhouse Gases and Climate Change considerations include calculating short-term, temporary construction-related GHG emissions resulting from the use of heavy equipment. The impact of GHG emissions from equipment used during the proposed construction and/or renovation activities will be evaluated, and localized and regional impacts to climate change associated with construction activities will be identified. The review will include an analysis of life cycle impacts and the social cost of greenhouse gases, consistent with the Council on Environmental Quality's interim guidance on climate change and greenhouse gas analysis.
- Environmental Justice – Analysis will include an evaluation of the potential for disproportional impacts in accordance with EOs 12898 and 14096. TVA will identify low-income, minority, and vulnerable communities in the project area that may be affected by construction and operation of the proposed project (air emissions, wastewater, noise, etc.) and evaluate the potential exposure to hazards or chemicals stored at ACT that may represent a disproportional human health risk or hazard associated with operations.
- Transportation – A traffic analysis will be conducted that evaluates the additional traffic associated with the proposed action. TVA's review will evaluate the existing roadway network in the vicinity of the ACT, including physical road characteristics (number of lanes, shoulders, and posted speed limit) and existing traffic characteristics. The effect of construction and operational traffic to the ACT will be evaluated, including the potential for improvements to site access from local highways.
- Socioeconomics – Demographic and community characteristics within the vicinity of the ACT will be evaluated. Economic effects associated with the proposed construction and operational workforce will also be evaluated.
- Hazardous Materials and Solid Waste – Current practices regarding hazardous materials and waste management on the ACT will be identified. In addition, TVA will identify any impacts from waste generation during construction and operation. Operational measures (waste management practices) will be incorporated into the assessment of impacts.
- Noise – Noise emissions and impacts associated with construction and plant operations will be assessed to determine the potential noise effects of each alternative on sensitive receptors.
- Surface Water and Water Quality – TVA will document and describe the characteristics and quality of surface water features in the vicinity of the site and will analyze the extent to which each alternative would affect water quality directly or indirectly.

- Groundwater – TVA will use data obtained from studies conducted by TVA to summarize the site groundwater conditions and develop a characterization of aquifer attributes, water use, water quality, and assess the potential impacts to groundwater of the alternatives.
- Safety – TVA will evaluate nonradiological public health and safety regulations and identify safety programs adopted by TVA to minimize accidents and safety hazards. Potential impacts on safety will be discussed.
- Biological Resources – Biological community types within the affected environment will be described. Significant natural features, including rare species habitat, important wildlife habitat, or locally uncommon natural community types, will be identified. TVA will evaluate the effect of each alternative on terrestrial and aquatic ecosystems.
- Threatened and Endangered Species – Federally or state-listed threatened or endangered plants and animals known to exist in the vicinity of the site will be identified. The effects of each alternative on endangered, threatened, and rare species in need of management will be evaluated.
- Utilities and Service Systems– Project construction and operation has potential to disrupt utility services at ACT. The effects of each alternative will be evaluated for the consideration of supplemental onsite systems and supplies from MLGW and for transmission interconnections.
- Managed and Natural Areas – Natural areas and other managed areas within the vicinity of the alternatives will be identified and potential impacts associated with the proposed alternatives will be addressed.

8 Potential Mitigation Measures

Most comments received during the scoping period did not identify specific mitigation measures for the Proposed Action. Minimization and mitigation measures were provided by the USEPA as recommendations regarding emissions and air quality. BMP guidance will be discussed in the EIS as mitigation for environmental impacts.

TVA's siting processes for generation and transmission facilities, as well as practices for modifying these facilities, are designed to avoid and/or minimize potential adverse environmental impacts. Potential impacts also are reduced through pollution prevention measures and environmental controls such as air pollution control systems. Other potentially adverse impacts can be mitigated by measures such as compensatory wetlands mitigation, in lieu fee stream mitigation programs and related conservation initiatives, enhanced management of other properties, documentation and recovery of cultural resources, and infrastructure improvement assistance to local communities.

TVA would implement minimization and mitigation measures in relation to resources potentially affected by the Project. These would be developed with consideration to BMPs, permit requirements, and adherence to erosion and sediment control plans. TVA would utilize standard BMPs to minimize erosion during construction, operation, and maintenance activities. These BMPs are described in *A Guide for Environmental Protection and BMPS for TVA Construction and Maintenance Activities – Revision 4 - 2022* (TVA's BMP Manual), the *Tennessee Erosion and Sediment Control Handbook, Fourth Edition,* and *the Tennessee Erosion and Sediment Control Handbook.*

In association with the potential construction of an action alternative, TVA would employ standard practices and specific routine measures to avoid and minimize impacts to resources. Other mitigative measures will be considered by TVA for each environmental resource based upon potential adverse impacts as identified in the EIS.

9 References

Tennessee Valley Authority (TVA). 2014 Allen Fossil Plant Emission Control Project Environmental Assessment. Tennessee Valley Authority, Knoxville, TN. Retrieved from https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/Allen-Fossil-Plant-Emission-Control-Project

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Appendix A – Federal Register *Notice of Intent*

12047 of March 27, 1978, the Foreign Affairs Reform and Restructuring Act of 1998 (112 Stat. 2681, *et seq.;* 22 U.S.C. 6501 note, *et seq.*), Delegation of Authority No. 234 of October 1, 1999, Delegation of Authority No. 236–3 of August 28, 2000, and Delegation of Authority No. 523 of December 22, 2021.

Nicole L. Elkon,

Deputy Assistant Secretary for Professional and Cultural Exchanges, Bureau of Educational and Cultural Affairs, Department of State.

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BILLING CODE 4710–05–P

TENNESSEE VALLEY AUTHORITY

Allen Aeroderivative Generation Project

AGENCY: Tennessee Valley Authority.

ACTION: Notice of Intent.

SUMMARY: The Tennessee Valley Authority (TVA) intends to prepare an environmental assessment (EA) or environmental impact statement (EIS) to address the potential environmental impacts associated with the proposed installation and operation of six new aeroderivative combustion turbine (CT) units at the Allen Combustion Turbine (ACT) site, located in Shelby County, Tennessee, southwest of the City of Memphis. The new aeroderivative units would generate approximately 200 Megawatts (MW) of power to help meet the growing system demand. The units would provide flexible and dispatchable transmission grid support and facilitate the integration of renewable generation onto the TVA bulk transmission system, consistent with TVA's 2019 Integrated Resource Plan (IRP). TVA is inviting public comment concerning the scope of the review, alternatives being considered, and environmental issues that should be addressed.

DATES: The public scoping period begins with the publication of this Notice of Intent in the **Federal Register**. To ensure consideration, comments must be postmarked, submitted online, or emailed no later than November 13, 2023. To facilitate the scoping process, TVA will hold an in-person public open house meeting; see *https://www.tva.gov/NEPA* for more information on the meeting.

ADDRESSES: Written comments should be submitted by email to *NEPA@tva.gov* or online at *https://www.tva.gov/NEPA*. Comments may also be mailed to Matthew Higdon, NEPA Specialist, 400 West Summit Hill Drive #WT11B, Knoxville, Tennessee 37902.

FOR FURTHER INFORMATION CONTACT: Matthew Higdon by email to *nepa@tva.gov,* by phone at (865) 632–8051, or by mail at the address above.

SUPPLEMENTARY INFORMATION: This notice is provided in accordance with the Council on Environmental Quality's Regulations (40 CFR parts 1500 to 1508) and TVA's procedures for implementing the National Environmental Policy Act (NEPA). TVA is an agency and instrumentality of the United States, established by an act of Congress in 1933, to foster the social and economic welfare of the people of the Tennessee Valley region and to promote the proper use and conservation of the region's natural resources. One component of this mission is the generation, transmission, and sale of reliable and affordable electric energy.

Preliminary Proposed Action and Alternatives

TVA anticipates that the scope of the EA or EIS will evaluate an Action Alternative and a No Action Alternative. Under the Action Alternative, TVA would install and operate six new aeroderivative combustion turbine units generating approximately 200 MW of power at ACT. TVA would also continue to operate two existing CT units which would provide an additional 120 MW of power. The new units would support fast-start dispatching and have synchronous condensing capabilities to improve grid stability. Four of the units would have black-start capabilities. Under the proposal, TVA would implement the best available control technologies to mitigate air emissions. Construction would occur over a one-year timeframe (approximately) beginning in 2025 or 2026, with construction activities taking place within previously disturbed areas at ACT and adjacent properties. Commercial operations would begin in 2025 or 2026.

Under the No Action Alternative, TVA would not install new aeroderivative CT units at the ACT, and TVA would retire all existing units. The No Action alternative provides a baseline for comparing against the Action Alternative.

Background

In the 2019 IRP, TVA evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those plausible futures) and identified a range of potential resource additions and retirements throughout the TVA power service area, which encompasses approximately 80,000 square miles. The target supply mix adopted by the TVA Board through the 2019 IRP included the addition of up to 5,200 MW of simple cycle capacity by 2028 to facilitate the integration of solar onto the TVA bulk power system.

Investments in adding aeroderivative CTs to the peaking fleet aligns with the direction in the IRP, which recommended enhancing system flexibility to integrate renewables and distributed resources, with substantial solar additions over the next two decades. As the amount of solar generation on the TVA generation portfolio continues to increase, flexibility of the remainder of the fleet becomes even more important. For instance, cloud patterns that temporarily block the sun and reduce solar generation require other generating units to respond to continue to reliably supply power to customers. Aeroderivative CTs are inherently well-suited to provide flexibility, enabling the remainder of the system to better integrate renewables.

Since the completion of the IRP, TVA has seen a strong increase in electric demand. Population has increased in the TVA service region by 1.5 percent since 2019. TVA expects continued strong growth in annual electric demand through the middle of this decade. Forecasted electric demand is expected to grow more than one percent per year on average between 2023–2026. Current system modeling shows that with increased residential migration and commercial development, TVA must add capacity to the system to maintain adequate operating reserves.

In 2019, TVA also completed a CT Modernization Study to evaluate the condition of its existing CT units and form recommendations for investments to ensure a reliable and flexible peaking fleet into the future. The results of the study identified the ACT units as the ''most challenged'' based on their age and material condition and recommended that they be replaced. The CT Modernization Study also recommended adding new aeroderivative CTs to enhance system flexibility, integrate increasing renewable capacity, and provide dispatchable capacity. The proposed action would also be consistent with the findings and recommendations of this study.

In June 2021, TVA issued an environmental assessment (EA) addressing the retirement of the CT units at Allen. At that time, TVA issued the Paradise and Colbert Combustion Turbine EA and an associated finding of no significant impact, in which TVA addressed the retirement of all 20 CT units at its Allen and Johnsonville plants and the replacement of the capacity lost with new CT units at its Paradise and Colbert plants. Under the current proposal, TVA is considering the continual operation of existing Units 19 and 20 at ACT, previously identified for retirement.

In December 2022, during Winter Storm Elliott, 16 of the units at ACT failed to start, impacting the TVA system position by 240 MWs. Since this event, these 16 units at Allen have ceased operations. Only two units at ACT (Units 19 and 20) are operable.

Project Purpose and Need

The purpose of the proposed action is to increase the flexibility and reliability of TVA power system by improving TVA's transmission system stability in western Tennessee and providing new, dispatchable generation to support the continued system load growth experienced in the TVA power service area over the past few years. These improvements would help TVA to expand and integrate renewable energy resources onto its transmission grid, which would allow TVA to advance its decarbonization goals.

TVA has identified the need to improve the stability of its transmission system in the western portion of Tennessee. In this area, additional resources are needed to ensure that adequate transmission voltages are maintained within the desired limits. In addition, as identified in the 2019 IRP, TVA needs flexible, dispatchable power that can successfully integrate increasing amounts of renewable energy sources while ensuring it can meet required year-round generation and maximum capacity system demands and planning reserve margin targets.

Anticipated Environmental Impacts

The EA or EIS will include an evaluation of the environmental, social, and economic impacts associated with implementing the proposed action. Because all ground disturbing activities associated with the proposal would occur within previously disturbed areas of TVA's Allen facility, TVA anticipates that the primary issues to be addressed in the EA or EIS will be impacts to air quality, climate change, environmental justice, and transportation. Other resource issues, including socioeconomics and surface water quality, will be addressed. Measures to avoid, minimize, and mitigate adverse effects will be identified and evaluated in the EA or EIS. TVA seeks input from the public during the scoping period on other relevant issues that should be considered and potential mitigation measures.

Anticipated Permits and Other Authorizations

TVA anticipates seeking required permits or authorizations, as appropriate. TVA's proposed action may require issuance of an air permit under the Clean Air Act; an Individual or Nationwide Permit under Section 404 of the Clean Water Act; Section 401 Water Quality Certification; conformance with Executive Orders on Environmental Justice (12898), Wetlands (11990), Floodplain Management (11988), Migratory Birds (13186), and Invasive Species (13112); and compliance with Section 106 of the National Historic Preservation Act, Section 7 of the Endangered Species Act, and other applicable Local, Federal, and State regulations.

Public Participation and Scoping Process

Scoping, which is integral to the process for implementing NEPA, provides an early and open process to ensure that issues are identified early and properly studied; issues of little significance do not consume substantial time and effort; the draft EA or EIS is thorough and balanced; and delays caused by an inadequate EA or EIS are avoided. TVA seeks comment and participation from all interested parties for identification of potential alternatives, information, and analyses relevant to the proposed action in this EA or EIS. Public comments received during the scoping period will assist TVA in determining the appropriate level of NEPA review.

Information about this project is available at *https://www.tva.gov/NEPA,* which includes a link to an online public comment page. Comments must be received or postmarked no later than November 13, 2023. Federal, state, local agencies, and Native American Tribes are also invited to provide comments. Please note that any comments received, including names and addresses, will become part of the project administrative record and will be available for public inspection. TVA plans to have an open house meeting during the scoping period. Visit *https://www.tva.gov/NEPA* to submit comments and obtain more information about the open house meeting.

EA or EIS Preparation and Schedule

TVA will consider comments received during the scoping period and develop a scoping report which will be published online. The scoping report will summarize public and agency comments that were received and identify the projected schedule for completing the environmental review process. TVA will post a draft EA or EIS for public review and comment on the project web page. TVA anticipates holding a public open house after releasing the draft EA or EIS. TVA expects to release the draft EA or EIS in Spring or Summer 2024 and a final EA or EIS in late 2024. If an EIS is prepared, TVA would publish a Record of Decision at least 30 days after the release of the final EIS.

Authority: 40 CFR 1501.9.

Rebecca Tolene,

Vice President, Environment and Sustainability.

[FR Doc. 2023–22517 Filed 10–11–23; 8:45 am]

BILLING CODE 8120–08–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

[Docket No. FAA–2023–0754; Summary Notice No. 2023–40]

Petition for Exemption; Summary of Petition Received; Global Aviation Technologies

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of petition for exemption received.

SUMMARY: This notice contains a summary of a petition seeking relief from specified requirements of Federal Aviation Regulations. The purpose of this notice is to improve the public's awareness of, and participation in, the FAA's exemption process. Neither publication of this notice nor the inclusion or omission of information in the summary is intended to affect the legal status of the petition or its final disposition.

DATES: Comments on this petition must identify the petition docket number and must be received on or before November 1, 2023.

ADDRESSES: Send comments identified by docket number FAA–2023–0754 using any of the following methods:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov* and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, M–30; U.S. Department of Transportation (DOT), 1200 New Jersey Avenue SE, Room W12–140, West Building Ground Floor, Washington, DC 20590–0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in

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Appendix B – Public and Agency Scoping Comments

From: Higdon, Matthew S.
Subject: Public Notice: TVA initiates review of Allen Aeroderivative CT Project (Shelby County, Tennessee)
Date: Thursday, October 12, 2023 3:00:12 PM

Today, TVA published a Notice of Intent (NOI) in the *Federal Register* to begin an environmental review of its proposal to install and operate six new natural gas-fired aeroderivative combustion turbines (Aero CTs) at its Allen CT facility near Memphis, Tennessee. The new units would generate approximately 200 megawatts of power. Under the proposal, TVA would also continue to operate two existing CT units at Allen, generating an additional 120 MW of power. The NOI can be found at this link: Federal Register :: Allen Aeroderivative Generation Project

During the public scoping period, we are seeking input from interested stakeholders, government partners, and citizens about the proposal and related environmental issues. Comments will be accepted through November 13, 2023. To engage with the public, TVA will hold an open-house meeting near the project location in Memphis on October 24th and a public virtual meeting/webinar on November 2nd. Information about the project, how to submit comments, and public involvement opportunities can be found on TVA's NEPA webpage at: https://www.tva.gov/nepa.

Please let me know if you or your organization has questions.

Regards,

Matthew Higdon
Senior NEPA Specialist
Environment & Sustainability

TENNESSEE
VALLEY
AUTHORITY

W. 865-632-8051
400 West Summit Hill Drive #WT11B, Knoxville, TN 37902

From:	Sarah Gladney
To:	nepa
Subject:	Aeroderivertives
Date:	Sunday, October 15, 2023 9:33:46 PM

You don't often get email from [redacted]. Learn why this is important

This is an EXTERNAL EMAIL from outside TVA. THINK BEFORE you CLICK links or OPEN attachments. If suspicious, please click the "Report Phishing" button located on the Outlook Toolbar at the top of your screen.

I live in the Boxtown Community, which is in close proximity to TVA. We have had to fight all of the toxic fumes and bad air quality coming from plants in the area for years. We have had to fight the Byhalia Pipeline company from taking possession of our land for installing crude oil pipelines in the Boxtown, Westwood, and Walker Homes communities.

TVA wishes to add new problems that could cause many people in the nearby area to have health issues.
I would like to know if any of these chemicals will be directed into the air, causing cancer, lung issues, and overall health problems?

1. Hydrogen Sulfide

2. Carbon Monoxide

3. Nitrogen Oxides

4. Ozone

5. Solvents

Sent from AT&T Yahoo Mail on Android

From:	Wufoo
To:	nepa
Subject:	NEPA Comments - Allen Aeroderivative CT [#4]
Date:	Monday, October 30, 2023 9:12:47 AM

Name	Hannah Province
City	Eads
State	TN
Organization	Consumer
Email	[redacted]
Please provide your comments by uploading a file or by entering them below. *	I am 100% against adding natural gas turbines to this project as are many people. You received a D grade on your goals to go renewable. If you truely wanted to go renewable you would choose solar. It is cheaper and more reliable than wind energy in TN. Also if you truely wanted to get a grade of A you would let people put solar on thier TVA easements then allow them to provide the grid with thier excess energy.

From:	Robert Phillips
To:	nepa
Cc:	Robert Phillips
Subject:	TVA Open House on Allen Aeroderivative CT Project
Date:	Tuesday, October 24, 2023 8:47:35 PM

I am a west Tennessee resident on the MLGW utility grid. I attended tonight's session.

I favor this project and would like to see the Allen site convert to this improved power generation technology. I believe west Tennessee and the Memphis area is in need of a more robust source of "24-hour-per-day" power and this technology offers the resilience and operational capability needed.

I learned that the plant will run on natural gas which is already available at the site and the plant is replacing an older generating plant. So, no significant addition in gas nor electrical infrastructure is needed. I understand the gas is clean burning and poses no new significant air quality concerns. The project's effect on water appears immaterial. Environmentally the project is sound.

Finally, the representatives of TVA who I talked with were knowledgeable, objective, and forthright in their discussion which I feel adds credibility to the project and to TVA.

Robert W. Phillips
Memphis, TN

From:	Wufoo
To:	nepa
Subject:	NEPA Comments - Allen Aeroderivative CT [#1]
Date:	Wednesday, October 18, 2023 10:50:33 AM

Name	Bruce A. Welch
City	Cordova
State	TN
Email	[redacted]
Phone Number	[redacted]

Please provide your comments by uploading a file or by entering them below. *

As a resident of Cordova, TN and a first responder, I support this project and the opportunity to increase capacity, especially as more volatile storms hit the Mid-South. We have to be able to have emergency generation that we can lean on during emergencies. This gives us a new option, based upon what my wife has shared. We have some major hospitals, emergency services, churches and other key organizations that will need to be able to function in the event of a major storm event. If this can help us keep those critical organizations online, I am in full support.

From:	Wufoo
To:	nepa
Subject:	NEPA Comments - Allen Aeroderivative CT [#6]
Date:	Monday, November 13, 2023 12:03:15 PM

Name	Joe Schiller
City	Clarksville
State	Tennessee
Organization	Brokenpoint Farm
Email	[redacted]
Phone Number	[redacted]
Please provide your comments by uploading a file or by entering them below. *	TVA already has more than enough gas generation to support more solar and storage. Lets build some solar!

From:	Wufoo
To:	nepa
Subject:	NEPA Comments - Allen Aeroderivative CT [#2]
Date:	Monday, October 23, 2023 8:21:54 PM

Name	Samantha Le Vine Schmidt
City	Germantown
State	TN
Email	[redacted]

Please provide your comments by uploading a file or by entering them below. *

According to Southern Environmental Law Center (SELC) Senior Attorney Amanda Garcia, TVA "is once again plowing ahead with plans to build expensive, unreliable, and outdated fossil fuel infrastructure." I agree completely with Ms. Garcia, when she was quoted in the Memphis Flyer:

"Families across the Tennessee Valley already felt the impacts of the federal utility's obsession with fossil fuels when TVA's coal and gas plants failed during last year's winter storm, causing rolling blackouts throughout the region," Garcia said in a statement. "Instead of putting all its eggs in the fossil fuel basket, TVA should invest in more diverse sources of energy — including renewables and energy efficiency — which can lower power bills while creating a more reliable grid."

From:	Wufoo
To:	nepa
Subject:	NEPA Comments - Allen Aeroderivative CT [#3]
Date:	Wednesday, October 25, 2023 9:40:56 AM

Name	Austin Harrison
City	Memphis
State	TN
Organization	Church of the River
Email	[redacted]
Phone Number	[redacted]

Please provide your comments by uploading a file or by entering them below. *

I echo the comments and sentiments shared by Memphis Community Against Pollution (MCAP). Please see below.

"Enough is enough," KeShaun Pearson, president of Memphis Community Against Pollution said in a statement. "Memphis families shouldn't be forced to foot the bill for TVA's fossil fuel spending spree. The utility should instead invest in cheaper energy options, like solar power and energy efficiency programs that meet our energy needs while lowering monthly bills."

I share MCAP's feeling that TVA should reconsider this current path and work with community to explore other options.

Thank you,

Austin Harrison

From: Lance Berryhill
To: nepa
Subject: Allen Aeroderivative Project
Date: Thursday, October 12, 2023 12:28:57 PM

To whom it may concern,

I am a customer and beneficiary of the electricity generated by TVA. Natural gas technology has drastically improved providing a dependable and reliable source of energy unlike wind and solar which also have negatives. Natural gas is abundant and turbines burn clean with substantially lower emissions than coal and are easily spooled up to produce the necessary megawatts of the demand incurred not just daily consumption but peak demand when drastic temperatures occur in both winter and summer.

Please move forward with the process to produce clean and efficient power such as the Aeroderivative Energy while
providing the valley with affordable electricity.

Sincerely,

J. Lance Berryhill

From:	nuzicanuz
To:	Higdon, Matthew S.
Subject:	Comment concerning natural gas power
Date:	Tuesday, October 17, 2023 6:18:37 AM

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Good to know TVA is looking at all tresources to over Tennessee.

Jomica Lasiter
[redacted]

Sent via the Samsung Galaxy S8 Active, an AT&T 5G Evolution capable smartphone

From:	Michael Ravnitzky
To:	nepa
Subject:	comments on the Allen Aeroderivative Generation Project
Date:	Thursday, October 12, 2023 4:29:45 PM
Attachments:	Comments on Allen Aeroderivative Project.pdf

You don't often get email from [redacted] Learn why this is important

This is an EXTERNAL EMAIL from outside TVA. THINK BEFORE you CLICK links or OPEN attachments. If suspicious, please click the "Report Phishing" button located on the Outlook Toolbar at the top of your screen.

Dear Mr. Higdon:

Enclosed are my comments on the Allen Aeroderivative Generation Project.

Sincerely,

Michael Ravnitzky
[redacted]

October 12, 2023

Comments on Allen Aeroderivative Generation Project

I am a private individual who is writing to express my views on the proposed Allen Aeroderivative Generation Project, which involves the construction and operation of two new natural gas-fired aeroderivative combustion turbine generators at the existing Allen Fossil Plant site in Memphis, Tennessee. While I appreciate the TVA's efforts to provide additional power generation capacity and reliability for its service area, as well as to reduce greenhouse gas emissions and water usage compared to the existing coal-fired units at the site, I would like to suggest that TVA should also make more use of energy storage such as closed cycle pumped hydroelectric facilities, because the underlying problem they are trying to address is fluctuating renewable generation output.

Renewable energy sources, such as solar and wind, have become more prevalent and important for the power sector, as they offer many environmental and economic benefits. However, they also pose some challenges for the power system operation and planning, as they are variable and uncertain in nature. This means that their output can change rapidly and unpredictably depending on the weather conditions and time of day, creating mismatches between supply and demand, as well as affecting the power quality and stability. Therefore, it is essential to have flexible and responsive resources that can balance the fluctuations of renewable energy sources and ensure the reliability, resiliency, and cost-effectiveness of the power system.

One of the solutions that TVA has proposed is to use aeroderivative combustion turbine generators, which are derived from jet engines and can operate at very high compression ratios. Aeroderivative combustion turbine generators have some advantages over other types of gas turbines, such as lower emissions, faster ramp rates and start times, and higher efficiencies and cost-effectiveness. They support fast-start dispatching and have synchronous condensing capabilities to improve grid stability. Some have black start capability. The use of intercoolers on aeroderivative combustion generators helps increase thermodynamic efficiency (and thus generating efficiency) by lowering the temperature of the compressed air.

However, these aviation derived generators also have some disadvantages, such as higher fuel costs than renewable energy sources, lower efficiencies than combined cycle gas turbines, and higher maintenance costs than combustion engines. Moreover, they still rely on fossil fuels, which contribute to climate change and air pollution. Additionally, they produce some noise, which can be potentially harmful for the workers at the site. Therefore, it is important to provide adequate hearing protection to safeguard the hearing of the workers at the Allen Combustion Turbine site, and to comply with applicable noise regulations. But the aeroderivative combustion turbines certainly do present improvements over the status quo peaking fleet. Furthermore, they can reduce the exposure to volatile fuel costs and provide more cost predictability and lower business risk for TVA, as they use low-cost or excess electricity to store energy and generate electricity when needed.

Another solution that I would like to recommend as a useful supplemental peaking source is to use energy storage such as closed cycle pumped hydroelectric facilities, which are one of the most mature and widely used forms of energy storage. Closed cycle pumped hydroelectric facilities use excess or low-cost electricity to pump water from a lower reservoir to a higher reservoir during periods of low demand or high renewable generation output. Then, they release the water from the higher reservoir to a lower reservoir through a turbine-generator during periods of high demand or low renewable generation output. This way, they can store large amounts of energy for long durations and have high round-trip efficiencies. Closed cycle pumped hydroelectric facilities have some advantages over other types of energy storage, such as lower costs per unit of energy stored, longer lifetimes, and lower environmental impacts. There are a number of planned and operating pumped storage facilities that demonstrate both the business case and technical feasibility of pumped storage.

Moreover, closed cycle pumped hydroelectric facilities can not only release energy with falling water, but can also modulate the grid power by adjusting the pumping volume, and thus such a system is quite flexible and capable. By varying the amount of water that is pumped or released, closed cycle pumped hydroelectric facilities can provide ancillary services such as frequency regulation, voltage control, spinning reserve, and load following, which are essential for maintaining the power system stability and security. Furthermore, hydro power can be built with important black start capabilities, which means that they can restart themselves or other generators without relying on external power sources in case of a blackout. This feature can enhance the resiliency and recovery of the power system in emergency situations.

However, closed cycle pumped hydroelectric facilities also face some challenges, such as high capital costs, long construction times, environmental impacts, and site-specific requirements. Therefore, it is important to consider the trade-offs between different types of energy storage technologies and their suitability for different applications and locations. TVA has several existing hydroelectric sites that may be suitable for pumped storage conversion or expansion, as well as some unpowered dams that may be potential sites for new pumped storage projects. However, these options may face challenging regulatory hurdles from federal and state agencies, as well as opposition from environmental groups and local stakeholders. Nevertheless, there appears to be a greater recognition of the importance of energy storage in fighting climate change and increasing grid resiliency, which may soon help reduce the regulatory barriers and facilitate the development of pumped storage projects.

I believe that no single solution is optimal; TVA needs to take advantage of both aeroderivative combustion turbine generators and energy storage, not to mention demand reduction, for the reliability, resiliency, and efficiency of its generating network. By using a combination of these resources, TVA can achieve a more balanced and diversified portfolio that can meet the power system needs and objectives in a more cost-effective and environmentally friendly way. Therefore, I urge TVA to increase its efforts to incorporate more energy storage such as pumped hydroelectric facilities into its planning process and decision making.

Michael Ravnitzky
Silver Spring, Maryland

From:	Kajumba, Ntale
To:	Higdon, Matthew S.
Cc:	White, Douglas; Buskey, Traci P.
Subject:	EPA Scoping Comments on Allen Aeroderivative Generation Project
Date:	Monday, November 13, 2023 9:04:36 PM
Attachments:	EPA Comments Allen Aeroderivative Generation Project Scoping.pdf

Good evening Matthew,

Attached are EPA's comments for TVA's Aeroderivative Generation Project NOI. Let us know if you have any questions.

Thanks,
Ntale

Ntale Kajumba
NEPA Manager
Strategic Programs Office
U.S. EPA Region 4
61 Forsyth Street, S.W.
Atlanta, Georgia 30303
Tel: (404) 562-9620

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW
ATLANTA, GEORGIA 30303-8960

November 13, 2023

Matthew Higdon
NEPA Compliance Specialist
Tennessee Valley Authority
400 West Summit Hill Dr. #WT11B
Knoxville, Tennessee 37902

Re: EPA Comments on the Notice of Intent to Prepare an Environmental Assessment or Environmental Impact Statement for the Allen Aeroderivative Generation Project, Shelby County, Tennessee

Dear Mr. Higdon:

The U.S. Environmental Protection Agency (EPA) reviewed the referenced document in accordance with Section 309 of the Clean Air Act (CAA) and Section 102(2)(C) of the National Environmental Policy Act (NEPA). The CAA Section 309 role is unique to the EPA. Among other things, CAA Section 309 requires the EPA to review and comment publicly on any proposed federal action subject to NEPA's environmental impact statement requirement.

According to the Notice of Intent (NOI), the Tennessee Valley Authority (TVA) intends to prepare an Environmental Impact Statement (EIS) or Environmental Assessment (EA) to assess the potential impacts associated with the proposed construction and operation of six new aeroderivative Combustion Turbine (CT) units at the Allen Combustion Turbine (ACT) site, located in Shelby County, TN. The new CT units would generate up to 200 Megawatts (MW) of power in addition to 120 MW generated by two existing CT units at ACT. The two existing CT units are the only units that would remain among ACT's 20 CT units that were originally planned for retirement, as addressed by TVA's Final EA for Paradise and Colbert Combustion Turbine Plants of June 2021. The new units would support fast-start dispatching and have synchronous condensing capabilities to improve grid stability. Four of the units would have black-start capabilities.

TVA states that the purpose of the proposed action is to help provide generation to support continued load growth in the Tennessee Valley and TVA's decarbonization goals. According to the NOI, TVA needs flexible, dispatchable power that can successfully integrate increasing amounts of renewable energy sources while ensuring reliability. TVA notes that the proposed action will facilitate the integration of solar power onto the electric grid and thereby advance TVA's decarbonization goals. According to the NOI, TVA has identified the need to improve the stability of its transmission system in the western portion of Tennessee. In this area, additional resources are needed to ensure that adequate transmission voltages are maintained within the desired limits.

According to TVA, the EIS or EA will address effects including environmental, social, and economic impacts associated with implementation of the proposed action. Based on our review of the scoping document, the EPA has the following comments:

Range of Alternatives and Consideration of Inflation Reduction Act (IRA) Incentives: The NOI notes that the EIS or EA will evaluate a No Action Alternative and one Action Alternative to develop ACT property for construction and operation of six aeroderivative CT units. On June, 2021, TVA released a Final EA for the retirement of the 20 CT units at ACT stating that "In order to replace the capacity lost as a result of retiring the Allen and Johnsonville CTs, TVA would construct and operate three new natural gas-fueled frame CT units (750 MW total) at Paradise and three natural gas-fueled frame CT units (750 MW total) at Colbert for a system total of 1,500 MW."I The EPA is concerned about TVA's piecemeal approach to continued investment in fossil fuel projects and recommends the EIS or EA explain the TVA's strategic portfolio development process and timeline in relation to the proposed CT units at ACT. The EPA understands that TVA's asset strategy depends on the flexibility provided by peaking technology to integrate renewable generating sources, including peaking power from battery storage, pumped storage, and CT units. TVA should explain the addition of newly proposed power from ACT to TVA's system following the decision to replace the generating power from ACT with new units at Paradise and Colbert, particularly as TVA has commenced the development of its next IRP update per TVA's NOI in the Federal Register on May 19, 2023.

There have been significant statutory, regulatory, and technology changes since the development of the non-binding 2019 IRP. In accordance with CEQ's NEPA regulations, TVA must consider a reasonable range of alternatives. Particularly in light of the IRA, forecasts of higher natural gas prices, and dramatic cost reductions to renewable energy, the EPA recommends that more than one Action Alternative be identified and considered. The EIS or EA should identify system flexibilities and constraints. Where practicable, renewable alternatives may warrant consideration and discussion given they could result in significantly lower greenhouse gas emissions and lock in smaller amounts of fossil fuel consumption. Reasonable alternatives include a combination of peak shaving, increased generation from other production units to include renewable energy sources, energy efficiency, and demand-management to meet capacity requirements and lower the need for this sizeable increase in peak generating capacity.[1]

The IRA and future policies may significantly impact aspects of the energy market, such as energy prices and demand and supply, as well as the underlying cost of technologies. The EPA notes that the Department of Energy has estimated the impacts of the IRA on clean energy and GHG emissions.[2] The EPA recommends that TVA consider the proposed regulations and guidance released by the IRS on June 14, 2023, about the Direct Pay tax credits under the IRA.[3] TVA is an applicable entity, and the new direct pay provision will let TVA receive a payment equal to the full value of tax credits for building qualifying clean energy projects. TVA should consider updated resources such as the U.S. Treasury Department's Final Rule on Section 45Q Credit Regulations, that provide clarity on how to use the credit for qualified carbon sequestration. We strongly encourage TVA to consider and incorporate new and emerging technologies that are more economically advantageous as a result of IRA to include carbon sequestration, hydrogen, etc. Similarly, the price of natural gas is projected by the Energy Information Administration (EIA) to be higher than estimated in the 2019 IRP. The analysis should also evaluate the potential cost implications of reasonably foreseeable future air quality and greenhouse gas

[1] For example, a recent article suggests that solar and wind generation may be used to reduce peak variability in summer and winter months (See https://www.sciencedirect.com/science/article/pii/S0306261921011119).
[2] See, e.g.,
https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf; https://www.energy.gov/policy/methodological-appendix.
[3] White House Guidance can be found at: https://www.whitehouse.gov/cleanenergy/directpay/. See also the proposed regulations from the IRA: https://public-inspection.federalregister.gov/2023-12798.pdf
https://www.irs.gov/pub/irs-drop/n-23-44.pdf

regulations on natural gas units, noting any uncertainties, as appropriate. Furthermore, U.S. natural gas exports have both substantially increased and changed in distribution, shifting to Europe to reflect changing underlying demand conditions.

For the development of the EIS or EA, the EPA recommends TVA consider the comment letters that the EPA previously provided to TVA on the Cumberland and Kingston Retirement projects. These letters provide more detailed comments and delineate substantive concerns with the EIS analyses conducted for those projects. In addition, while TVA is citing the implementation of the 2019 IRP, extensive renewable buildout is not occurring under the current IRP though the need for back-up generation is held up here as the catalyst for this peaking unit capacity. The 200 MW expansion here is in addition to 5,000 MW of natural gas generation planned by TVA elsewhere, which is well above the central forecasts of the 2019 IRP. Although the region has recently experienced high demand growth, it is not clear if this will continue. TVA's work on the 2024 IRP should incorporate anticipated growth in renewables as noted in our comments during scoping, dated July 3, 2023. The EPA recommends the EIS or EA identify the timeline in which renewable buildout will occur and the direct connections between that buildout and planned natural gas generation that TVA identifies as enabling of future renewable energy sources. These gas generation plants have been proposed without comparable renewable energy generation investment.

Social Cost of Greenhouse Gases: The EPA recommends that TVA use the best available Social Costs of Greenhouse Gases (SC-GHG) estimates in the EIS or EA. The Council on Environmental Quality (CEQ's) interim guidance on consideration of GHG emissions and climate change in NEPA analyses notes that agencies "should apply the best available estimates of the SC-GHG" to the GHG emissions from a proposed action and its alternatives.[4] The current best available SC-GHG estimates contain a range of discount rates to capture potential uncertainty. To reflect TVA's previous concerns with uncertainty (as reflected in the Kingston and Cumberland EISs), and to help the public understand the impacts, the climate damages should be presented for each GHG at discount rates of 2.5%, 3.0%, and 5.0%. CEQ's interim guidance on GHG emissions and climate change notes that "[w]here helpful to provide context, such as for proposed actions with relatively large GHG emissions or reductions or that will expand or perpetuate reliance on GHG-emitting energy sources, agencies should explain how the proposed action and alternatives would help meet or detract from achieving relevant climate action goals and commitments, including Federal goals, international agreements, state or regional goals, Tribal goals, agency-specific goals, or others as appropriate." The EPA recommends the EIS or EA include a discussion of whether and to what extent the estimated GHG emissions from the alternatives are consistent with TVA taking action to help achieve science-based national GHG reduction targets.

Net Zero/GHG Emissions Reduction Policy and Goals: Given the urgency of the climate crisis, the EPA recommends the alternatives analysis reflect alternatives consistent with meeting the science-based national mid-century and other net-zero emissions goals laid out by the Administration, TVA's own commitments, and the U.S. 2030 national reduction target in the Paris Agreement. Additionally, the analysis should reflect Executive Order 14057, which establishes a policy for the federal government to lead by example to achieve a carbon-pollution free electricity sector by 2035 and net-zero emissions economy-wide by no later than 2050.

[4] See the "Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990" released by the Interagency Working Group on Social Cost of Greenhouse Gases (IWG SC-GHG) in February 2021, which presents interim estimates of the social cost of carbon, methane, and nitrous oxide and represent the best available science and should be used to monetize the SC-GHG.

The EIS or EA should also discuss alignment with agency GHG reduction goals and policies, including TVA's 2021 Strategic Intent and Guiding Principles document. Additionally, per 40 CFR 1506.2(d), and consistent with CEQ's guidance, the EIS or EA should disclose and discuss any inconsistency of the proposed action with State, Tribal, or local plans or laws, including local GHG emissions reduction goals.[5]

Mitigation: The EIS or EA should consider plant designs with increased Carbon Capture and Storage (CCS) and hydrogen fuel blending technology incorporation as a means of mitigating emissions. The EPA recommends that plant designs incorporate and use mitigation technologies that can be implemented at initial plant start-up, while accommodating for developments in CCS and hydrogen fuel as these technologies mature.

If TVA intends to install carbon mitigation measures after plant start-up, these costs should be included in costs analysis. Many utilities are displacing some portion of their natural gas generation with these technologies in a comparable timeframe. For example, the Intermountain Power new natural gas generating units, which will begin operation in 2025, will be designed to utilize 30 percent hydrogen fuel at start-up, transitioning to 100 percent hydrogen fuel by 2045 as technology improves (see https://www.ipautah.com/ipp-renewed/). While smaller in scale, other utilities are displacing a portion of their natural gas use with hydrogen (seehttps://dailyenergyinsider.com/news/34040-florida-power-light-taps-cummins-for-its-green-hydrogen-facility/). Additionally, Competitive Power Ventures is constructing a CC natural gas generation facility using carbon capture technology (see https://cpv.com/2022/12/12/cpv-selects-doddridge-county-for-location-of-3-billion-carbon-capture-project-in-west-virginia/).

The lifecycle of Sulfur Hexafluoride (SF6), starting from manufacturing, produces significant SF6 emissions. The EPA has partnered with utilities to reduce and phase out the use of this pollutant, as have other countries. In addition, SF6 free switchgears are reported to have lower operation and maintenance costs and higher reliability. The EPA recommends that TVA consider the evolving technology and commercial availability of SF6-free switchgears and, where equipment availability and project requirements allow, use SF6-free switchgear in new construction and replacement installations.

Environmental Justice: The EPA recommends that TVA analyze the potential for alternatives to exacerbate or mitigate impacts on already overburdened and vulnerable communities from climate change,[4] exposure to criteria air pollutants, and other harms related to electricity production and fossil fuel production and transportation. The EPA also recommends that TVA meaningfully engage and collaborate with underserved and overburdened communities to identify and address the adverse conditions they experience and ensure they do not face additional disproportionate burdens under the proposed action. This would be consistent with Executive Order 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All*, which affirms the national policy to advance environmental justice for all and defines environmental justice as "the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environmental so that people are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards including those related to climate change, noise, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or

[5] See, e.g.,
https://www.knoxvilletn.gov/government/city_departments_offices/sustainability/climate_change#:~:text=Our%20new%20goal%20to%20reduce,which%20are%20outside%20City%20control

systemic barriers." (Section 2(b)(i)). Notably, section 3(a) provides analytic direction that should be incorporated within the scope of the environmental analysis.

In addition to the new executive order, the EIS or EA should ensure consistency with the Executive Order 12898 of February 11, 1994, *Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations* by identifying and mitigating disproportionate impacts on communities with EJ concerns. In accordance with the Executive Order, the EPA recommends that the environmental document identify and address any disproportionate impacts on minority and low-income populations. The Environmental Justice Interagency Working Group *Promising Practices for EJ Methodologies in NEPA Reviews* (*Promising Practices)*, dated March 2016, provides guiding principles agencies can consider in identifying disproportionately high and adverse impacts on minority and low-income populations.

Climate Adaptation and Resilience: The EPA recommends that the EIS or EA consider alternatives which are consistent with TVA's Adaptation Plan. TVA should evaluate how climate change impacts (such as increases in temperature, flooding, and drought events) may affect operations of alternatives considered. The EPA recommends that this analysis use climate projections specific to the study area rather than using national or global climate projections. This analysis should also consider that increased heavy precipitation and flooding could potentially expand the existing 100-year floodplain, which may affect appropriate siting and elevation of infrastructure. The EPA also recommends that in addition to the climate analysis on operations, TVA considers how alternatives may exacerbate climate change impacts to surrounding areas and consider opportunities to mitigate those impacts. For example, increased drought could reduce local water availability, heightening any impacts the alternatives have on water resources as well. For all the above, the EPA recommends that TVA consider adaptation measures to reduce impacts.

The EPA appreciates the opportunity to review the NOI and looks forward to continued participation with the Allen Aeroderivative Generation Project. To discuss our technical recommendations further, please contact Douglas White of my staff at White.Douglas@ epa.gov or (404) 562-8586.

Sincerely,

Ntale Kajumba
NEPA Section Manager

From:	Kopec, Brett A
To:	Brueggeman, Louis C; nepa
Cc:	Janowicz, Jon A
Subject:	Fw: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER23/0419 - NOI to prepare an EA or EIS, TVA, Allen Aeroderivative Generation Project, Shelby county, TN
Date:	Saturday, October 14, 2023 2:06:23 PM

Thanks.

Brett Kopec
USGS
Budget Analyst

From: Gordon, Alison D
Sent: Friday, October 13, 2023 5:30 PM
To: Kopec, Brett A
Cc: Janowicz, Jon A
Subject: Fw: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER23/0419 - NOI to prepare an EA or EIS, TVA, Allen Aeroderivative Generation Project, Shelby county, TN

The USGS has no comment at this time. Thank you.

From: oepchq@ios.doi.gov <oepchq@ios.doi.gov>
Sent: Thursday, October 12, 2023 10:44 AM
To: Brueggeman, Louis C; Alam, Shawn; Braegelmann, Carol; Kelly, Cheryl L; Cobbs, Molly R; ERs, FWS HQ; Runkel, Roxanne; Stedeford, Melissa; Rideout, Sterling J; Allen, Christine E; Gordon, Alison D; Janowicz, Jon A; oepchq@ios.doi.gov; Stanley, Joyce A
Subject: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER23/0419 - NOI to prepare an EA or EIS, TVA, Allen Aeroderivative Generation Project, Shelby county, TN

This e-mail alerts you to a Environmental Review (ER) request from the Office of Environmental Policy and Compliance (OEPC). This ER can be accessed here.
To access electronic ERs visit the Environmental Assignments website: https://ecl.doi.gov/ERs.cfm. For assistance, please contact the Environmental Review Team at

202-208-5464.

Comments due to Agency by: 11/13/23

From:	Tennessee ES, FWS
To:	ERs, FWS HQ; nepa
Cc:	Sykes, Robbie
Subject:	Re: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER23/0419 - NOI to prepare an EA or EIS, TVA, Allen Aeroderivative Generation Project, Shelby County, TN
Date:	Wednesday, November 15, 2023 9:54:14 AM

The USFWS Tennessee Ecological Services Field Office has no pertinent comments at this time regarding the TVA, Allen Aeroderivative Generation Project in Shelby County, TN. The site is open and developed, and our rare species database does not indicate any federally listed species occurring at the location. We will provide more pertinent comments once the draft EA or EIS is available for review and comment.

Sincerely,

Robbie Sykes

From: ERs, FWS HQ <FWS_HQ_ERs@fws.gov>
Sent: Friday, October 13, 2023 5:17 AM
To: Tennessee ES, FWS; Sykes, Robbie; Willis, Christine
Cc: Thatcher, Ben
Subject: Fw: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER23/0419 - NOI to prepare an EA or EIS, TVA, Allen Aeroderivative Generation Project, Shelby County, TN

Project Title: NOI to prepare an EA or EIS, TVA, Allen Aeroderivative Generation Project, ~~Shelby County~~, TN

FWS Directions:

FO - Comments due to TVA (NEPA@tva.gov) by 11/13/23.
Please provide a copy of comments to HQ Branch of Environmental Review (FWS_HQ_ERs@ fws.gov).

Thank you,

HQ Branch of Environmental Review*

*We check this inbox regularly. If you have time-sensitive questions, please contact:
Frankie Green
Fish and Wildlife Biologist

U.S. Fish and Wildlife Service
Branch of Environmental Review
5275 Leesburg Pike
Falls Church, VA 22041-3803
(703) 358-1884

From: oepchq@ios.doi.gov
Sent: Thursday, October 12, 2023 10:44 AM
To: Brueggeman, Louis C; Alam, Shawn K; Braegelmann, Carol; Kelly, Cheryl L; Cobbs, Molly R; ERs, FWS HQ; Runkel, Roxanne; Stedeford, Melissa; Rideout, Sterling J; Allen, Christine E; Gordon, Alison D; Janowicz, Jon A; oepchq@ios.doi.gov; Stanley, Joyce A
Subject: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER23/0419 - NOI to prepare an EA or EIS, TVA, Allen Aeroderivative Generation Project, Shelby county, TN

This e-mail alerts you to a Environmental Review (ER) request from the Office of Environmental Policy and Compliance (OEPC). This ER can be accessed here.
To access electronic ERs visit the Environmental Assignments website: https://ecl.doi.gov/ERs.cfm. For assistance, please contact the Environmental Review Team at 202-208-5464.
Comments due to Agency by: 11/13/23

From:	Tom Moss
To:	nepa
Cc:	Kyle Mabry
Subject:	Allen Aeroderivative CT Project comments
Date:	Tuesday, October 24, 2023 12:46:34 PM
Attachments:	image001.png Allen Aeroderivative CT Project 10-24-2023.pdf

Tom Moss, P.G.
Environmental Review Coordinator
Compliance and Enforcement Unit
Division of Water Resources
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, TN 37243-1102
(615) 917-4135

Please Send Environmental Review Requests to: **DWR.Environmentalreview@tn.gov**

TN Department of Environment & Conservation

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STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102

October 23, 2023

Mr. Matthew Higdon
TVA NEPA Specialist
400 West Summit Hill Drive, #WT11B
Knoxville, Tennessee 37902

re: Allen Aeroderivative CT Project - Scoping
Shelby County, TN

Sent via email to: nepa@tva.gov

Dear Mr. Higdon:

Staff within the Division of Water Resources have reviewed the scoping document published in the federal register regarding the construction of six new aeroderivative combustion turbines at the Allen facility in Shelby County, Tennessee. The Division is in agreement that a Section 404 CWA/NPDES permit will be required. It is expected that the area disturbed, including staging areas, will be more than an acre in size and require an NPDES construction stormwater permit. Even though the area has previously been disturbed, if the activities will expose the soil layer, a permit will be required. The Division encourages erosion control measures to be taken even where the land disturbance is less than one acre, where appropriate.

If you have any further questions, I will be glad to try to assist you. You may reach me at (615) 917-4135 or tom.moss@ tn.gov.

Sincerely,

Tom Moss

Tom Moss, P.G.
Environmental Review Coordinator
Compliance and Enforcement Unit

cc: Kyle Mabry, Manager, DWR Knoxville Environmental Field Office

We want your comments! If you have any issues, concerns, or questions related to the Allen Aeroderivative Combustion Turbine Project, please complete and submit this comment sheet at the public meeting to ensure your input is considered. You can also drop the comment sheet in the mail to the address on the reverse side of this sheet. Fold the comment sheet on the lines with the return address showing, tape it closed, affix a stamp, and mail. Please submit your comments by ***November 13, 2023***.

You may also submit comments at www.tva.com/allenct or by e-mail to nepa@tva.gov.

For your comments to be the most effective, TVA suggests the following guidelines:

- Keep your comments focused on the proposed project;
- Submit your comments on potential impacts and project alternatives; and
- Submit your comments within the timeframes announced.

Write your comments here:

Good information –
Q: How does this project benefit the air quality of the Surrounding Community.
Q: How is the proposed project connected to future Solar power usage.
Q: Would this have An impact on future Contractors interested in building in 38109.
Q: What is the Sound volume And would residents be negatively affected.
Q: Would this cost (project) fall on Customers.

Please provide your contact information.

Before including your address, phone number, e-mail address or any other personally identifying information in your comment, you should be aware that your entire comment – including personal identifying information - may be made publicly available at any time. While you may ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Name: Dedra Macklin Title: CEO / Founder

Organization: WIND Memphis

Mailing address: PO BOX 9321

City, State, Zipcode: Mphs TN 38190

From:	Wufoo
To:	nepa
Subject:	NEPA Comments - Allen Aeroderivative CT [#5]
Date:	Monday, November 13, 2023 10:47:01 AM

Name	Gaby Sarri-Tobar
City	Washington DC
State	District of Columbia
Organization	Center for Biological Diversity
Email	
Phone Number	
Please provide your comments by uploading a file or by entering them below. *	Comments uploaded.
Upload File #1	2023.11.13 center for biological diversity scoping comments to tva re allen aero combustion turbine project.pdf 4.46 MB · PDF

November 13, 2023

Via Submission to TVANepaComments.com and Electronic Mail

Mr. Matthew Higdon
NEPA Specialist
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville TN 37902
nepa@ tva.com
mshigdon@ tva.gov

Re: Scoping Comments for 2023 Allen Aeroderivative Combustion Turbine Project

Dear Mr. Higdon,

On behalf of the Center for Biological Diversity ("Center"), we submit these scoping comments on the Tennessee Valley Authority's ("TVA") Notice of Intent to prepare either an Environmental Assessment ("EA") or Environmental Impact Statement ("EIS") for the addition of six fossil-gas Aeroderivative Combustion Turbines ("Aero CT") at the Allen Combustion Turbine site ("Allen Plant"). We appreciate the opportunity to provide these comments on issues including the necessity for TVA to: (1) Complete a comprehensive EIS on the proposed action, and (2) Add a critical action alternative to the EIS for distributed energy resources ("DER"), storage, and energy efficiency improvements.

As a threshold matter, the climate emergency and growing energy inequity in the Tennessee Valley demand an expedited phasing out of fossil fuels. However, the only action alternative TVA is considering would instead cement the region's dependence on fossil fuels, burdening communities, particularly Black and low-wealth communities in Memphis, with increased air and water pollution, health hazards, and volatile prices that would aggravate existing energy burdens. Given the proposed project's serious health and environmental, socio-economic, and environmental justice impacts, it is critical that TVA conduct a robust analysis of all the project's foreseeable impacts in an EIS.

Furthermore, while TVA establishes that this new generation is essential to improve system reliability and support continued system load growth, TVA has failed to propose any other reasonable action alternatives that would not involve the construction of new polluting resources. The Allen Plant EIS must therefore fully and fairly consider alternatives for retiring all fossil gas units at the Allen Plant and relying on distributed renewable energy ("DER"), battery storage, demand response and energy efficiency technology, in order to comply with the National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4321, *et seq*. Importantly, such an alternative would help put TVA on track with addressing the most pressing issue today: the urgent need for a rapid transition away from all fossil fuels toward a renewable energy economy to avoid the worst impacts of the climate crisis and address the disproportionate harm experienced by environmental justice communities from the fossil fuel economy.

We look forward to reviewing TVA's Draft EIS addressing these issues.

DISCUSSION

I. TVA Must Examine Fossil Fuel-Free Alternatives to Meet New Energy Demand to Comply With The TVA Act and Achieve Rapid Greenhouse Gas Reductions That Are Critical To Addressing The Climate Emergency.

It is well established that the actions taken this decade are crucial to avoid the most devastating impacts of the climate crisis. Indeed, as detailed by the Intergovernmental Panel on Climate Change ("IPCC"), without prompt action across all sectors, the world is likely to *surpass* 1.5°C of warming — its most ambitions climate target — in less than a decade.[1] And recently, a new report warned that at our current emission rate we will surpass our carbon budget (in line with a 50% chance of limiting warming to 1.5°C) within six years.[2]

Persistent fossil fuel dependence will make it nearly impossible to preserve a livable planet. As United Nations Secretary General Antonio Guterres has made clear, "Fossil fuels are a dead end – for our planet, for humanity, and […] for economies. A prompt, well-managed transition to renewables is the only pathway to energy security, universal access and the green jobs our world needs."[3]

Despite this clear warning, TVA is moving in the opposite direction by *expanding* fossil fuels in the Valley. TVA has the *largest* planned gas buildout among all other utilities by 2030 —

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[1] Intergovernmental Panel on Climate Change, *Synthesis Report of the IPCC Sixth Assessment Report (AR6)* (2023), https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf.

[2] Lamboll, R.D., Nicholls, Z.R.J., Smith, C.J. *et al.* Assessing the size and uncertainty of remaining carbon budgets. *Nat. Clim. Chang.* (October 30, 2023). https://doi.org/10.1038/s41558-023-01848-5.

[3] *See* Secretary-General's video message to the Press Conference Launch of IPCC Report, (February 28, 2022), https://www.un.org/sg/en/content/sg/statement/2022-02-28/secretary-generals-video-message-the-press-conference-launch-of-ipcc-report-scroll-down-for-languages.

5.9 GW of new gas.[4] And, although TVA is currently updating its Integrated Resource Plan ("IRP"), under the most recent IRP the agency will not achieve full decarbonization until *sometime after 2080*.[5] Moreover, with increased reliance on gas, TVA currently forecasts that it will *generate more than 34 million tons of* CO_2 *each year in 2038*.[6] In fact, TVA's annual emissions — averaging over 38 million tons — put it within the top 15 amongst the 100 largest power providers in the country.[7]

The TVA Act mandates that, in managing its electric generation system, TVA protect "the economic, environmental, social, or physical well-being" of the customers it serves. 16 U.S.C. § 831a(g)(1)(K)(ii). Congress has also mandated that, in planning for new resources, TVA must "evaluate[ ] the *full range* of existing and incremental resources (including new power supplies, energy conservation and efficiency, and renewable energy resources)" that can be relied on to serve "electric customers of the Tennessee Valley Authority at the lowest system cost." *Id.* § 831m-1(b)(1)(emphasis added); *see also id*. § 831a(b)(5) (setting out TVA's mission to be "a national leader in technological innovation, low-cost power, and environmental stewardship").

Given the climate emergency, and the present and threatened impacts of climate change on TVA customers, the agency's plan to continue gas operations at the Allen Plant — instead of fully retiring all units and replacing them with distributed renewable energy — is in flat violation of the TVA Act. As the nation's largest power provider, with massive GHG emissions, TVA must abandon plans to expand fossil gas generation at the Allen Plant and instead center the replacement of the Aero CT units with non-fossil fuel resources, including renewable energy and energy efficiency.

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[4] Sierra Club, *The Dirty Truth About Utility Climate Pledges*, (October 2023), https://coal.sierraclub.org/sites/nat-coal/files/dirty_truth_report_2023.pdf?utm_source=sierraclub&utm_medium=web&utm_id=dirty-truth&utm_content=page.

[5] Southern Alliance for Clean Energy, *Tracking Decarbonization in the Southeast*, Generation and CO2 Emissions Report (June 2022), https://cleanenergy.org/wp-content/uploads/Tracking-Decarbonization-in-the-Southeast-Fourth-Annual-Report.pdf.

[6] TVA 2019 Environmental Impact Statement, Final EIS at 5-27.

[7] Christopher Van Atten, Amlan Saha, Luke Hellgren, and Ted Langlois, *Benchmarking Air Emissions Of the 100 Largest Electric Power Producers in the United States*, CERES, (September 2022), https://www.ceres.org/sites/default/files/reports/2022-09/BenchmarkingAirEmissions2022%20%281%29.pdf.

1. ***TVA must consider renewable energy alternatives aligned with a "path to zero emissions" that would also reduce energy demand and costs and improve system resilience.***

The purpose of NEPA is to identify reasonable alternatives to an agency's proposed action, and then expose and discuss the multitude of public health, environmental, socio-economic, wildlife, and other impacts of those alternatives. However, regardless of the ultimate decisions made, NEPA does not permit an agency to refuse to even *consider* reasonable alternatives.[8] Accordingly, here TVA may not rely on contract terms or simple economic considerations to refuse to consider alternative scenarios for its power mix in the coming decades, including DER and storage alternatives.

This is particularly true given that TVA acknowledges that its statutory mandate under the TVA Act requires that it be a "leader in technology innovation, low-cost power and environmental stewardship."[9] TVA therefore should be looking for opportunities to invest in the renewable energy technologies that will help reduce electricity prices and make those technologies even more cost-competitive in the coming years.

Ample research demonstrates that replacing fossil fuel resources with DER, storage, and energy efficiency could provide significant financial benefits. One analysis modeled the cost-effectiveness and impact of DERs and other clean energy resources on the electricity system. Under the examined scenarios, significant investment in DER would result in cumulative system-wide savings of $301 billion by 2050 compared to a business-as-usual energy system.[10]

More specifically to TVA, Synapse Energy Economics' *TVA Clean Energy Future Study* critically evaluates renewable energy alternatives and energy efficiency at TVA, demonstrating that the agency can reliably meet energy needs in the Valley without coal and new gas and by transitioning to 100% clean, renewable energy by 2035.[11] The report shows that such a transition

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8 *See, e.g.*, *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 235 F. Supp. 2d 1143, 1154 (W.D. Wash. 2002) ("An agency may not reject a reasonable alternative because it is not within the jurisdiction of the lead agency").

9 *See* Final 2019 TVA IRP at 5-1

10 Clack et al., *Technical Report: Why Local Solar For All Costs Less- A New Roadmap for the Lowest Cost Grid*, Vibrant Clean Energy (2020), https://www.vibrantcleanenergy.com/wp-content/uploads/2020/12/WhyDERs_TR_Final.pdf.

11 The full Study is attached to these scoping comments and available at the following URL, and is incorporated here by reference: https://www.biologicaldiversity.org/programs/energy-justice/pdfs/TVAs-Clean-Energy-Future.pdf. The accompanying Policy Brief is available here: https://www.biologicaldiversity.org/programs/energy-justice/pdfs/TVA-Clean-Energy-Roadmap_Policy-Brief.pdf. We expect that any decision by TVA not to follow this Study's recommendations in connection with this project

would save customers in the region over $255 billion over the next two decades, reduce energy burdens, create thousands of new jobs annually, and improve public health with reduced air pollution. Furthermore, the report points out, if TVA were to maximize distributed energy in the region, these costs savings could be greater with avoided costs for utility-scale solar and transmission.

These financial benefits should be augmented by the many clean energy incentives in the Inflation Reduction Act (IRA), which TVA is eligible for, including refundable clean energy tax credits which include solar and battery storage, building energy efficiency and electrification rebate programs, and the Energy Infrastructure Reinvestment Program. The IRA has the potential to make already cheap renewable energy even cheaper, and with that help bring down energy costs for TVA customers as they affordably transition to a safer, cleaner energy future. Indeed, as detailed in the Synapse Report, with the IRA there is new and even greater impetus for TVA to comprehensively evaluate these cheaper distributed and renewable energy technologies as replacements for fossil fuels, including gas and coal.

In addition to cost savings, DERs bring several additional benefits including grid management, demand response, and transmission benefits.[12] TVA has expressed concern that alternatives prioritizing renewables like solar are incapable of addressing peak demand. But as the Vibrant Clean Energy report demonstrates, DER can *minimize peak demand by about 17 percent* and effectively shift demand to meet variable supply rather than forcing supply to meet demand.[13]

The *TVA Clean Energy Future Study* similarly demonstrates that maximizing distributed energy and flexible load in the TVA region could help reduce demand in peak hours.[14] This is especially important in light of increased grid stresses from extreme weather, such as during Winter Storm Elliot where demand soared yet conventional energy sources failed to deliver reliable power. In effect, DERs and especially flexible load could provide system-wide benefits by displacing the need for expensive, volatile centralized energy sources, like gas plants.

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will address the entire Study, and detail the technical bases for any TVA disagreement with the Study's findings and recommendations.

[12] Armstrong et. al., Techno–Ecological Synergies of Solar Energy for Global Sustainability, 2 Nature Sustainability 560 (July 2019); Crystal, et. al., Rooftop Solar Justice (2023), https://www.biologicaldiversity.org/programs/energy-justice/pdfs/Rooftop-Solar-Justice-Report-March-2023.pdf.

[13] Vibrant Clean Energy Technical Report (2020) at 48 (emphasis added).

[14] *See* TVA Clean Energy Future Study at https://www.biologicaldiversity.org/programs/energy-justice/pdfs/TVAs-Clean-Energy-Future.pdf.

Distributed solar generation can provide further benefits to communities and ecosystems including reduced water use, reduced land use, and even improved wildlife habitat, which are critically important to TVA's customers.[15] Memphians have specifically raised concerns surrounding water use impacts from fossil fuels, including the disposal of hazardous coal ash in a South Memphis landfill as well as TVA's use of drinking water to operate existing gas units.[16] The Memphis Sand Aquifer is increasingly threatened by TVA's fossil fuel use in the region, which jeopardizes the community's access to clean and safe drinking water. These impacts should be evaluated in the EIS, especially in comparison to non-polluting alternatives like DERs.

TVA has often accentuated the associated land use impacts of utility-scale solar as a reason for not moving forward with such energy alternatives, as it has in recent NEPA analyses for new generation builds at Cumberland, Kingston, and Cheatham County. However, this concern is irrelevant to the kinds of DER, energy efficiency, and related initiatives we propose for the Allen Plant EIS, which could minimize land use impacts as well as reduce demand for large-scale energy projects like fossil gas that carry significant environmental, community, and public health hazards.[17]

Thus, TVA must consider a *full range of renewable energy alternatives*, including an alternative that largely or completely relies on DER, storage, and energy efficiency, and then must compare the environmental impacts of such alternatives with the other options — including not only the cost of potential expansion of gas, but also the social cost of carbon associated with keeping these units running for many years to come.

Furthermore, instead of investing in risky alternatives based on an assumption of increasing energy demand, TVA should lead the way in investing in climate-friendly, resilient, and just energy solutions, like distributed solar generation and energy efficiency, that would both reduce energy consumption and TVA's GHG emissions.

In short, to meet its purpose of providing safe, clean, and affordable electricity to all its customers, TVA must add a critical action alternative accounting for declining demand for

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[15] Techno-Ecological Synergies of Solar Energy for Global Sustainability (2019) at 563.

[16] Watson, Brady. "Gas Has Reliability Issues. Why Is the Tennessee Valley Authority Doubling Down on It?" *The Equation*, (October 12, 2023), https://blog.ucsusa.org/brady-watson/gas-has-reliability-issues-why-is-the-tennessee-valley-authority-doubling-down-on-it/. *See also* Hilles, Chloe. "Long burdened by a coal plant, South Memphis residents say no to coal ash in their backyard," *Energy News Network*, (August 22, 2022), https://energynews.us/2022/08/22/long-burdened-by-a-coal-plant-south-memphis-residents-say-no-to-coal-ash-in-their-backyard/.

[17] *See* Environmental Protection Agency, "Distributed Generation of Electricity and its Environmental Impacts", https://www.epa.gov/energy/distributed-generation-electricity-and-its-environmental-impacts.

centralized TVA generation, including offsetting TVA generation and meeting new energy demand with DERs, storage, and energy efficiency improvements.

2. TVA must meaningfully assess the impacts of greenhouse gas emissions by comparing impacts between the existing alternative and one or more alternatives that chart a path to zero emissions.

In other environmental reviews, TVA has refused to meaningfully consider its contributions to GHG emissions on the grounds that they are small relative to global emissions.[18] This approach violates NEPA.

It is well-established that NEPA requires a robust consideration of the impacts of a project's GHG emissions in terms of its relationship to climate change. Thus, although some "speculation is . . . implicit in NEPA," agencies may not "shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry."[19]

TVA must therefore not only add the necessary alternative discussed above that will advance its rapid transition to zero emissions, it must also fully consider — and inform the public about — the likely environmental outcomes under the different alternatives, including relative GHG emissions. Under the currently considered alternative, which proposes building 6 new Aero CT gas units and extending the lifespan of 2 CT units that were slated for retirement, TVA will continue to be one of the largest contributors to the GHGs that are fueling the climate crisis, and thus will continue to be responsible for the devastating impacts that are certain to come in the country and around the world as we continue to increase the concentrations of GHGs in the atmosphere.

Alternatively, under a renewable energy alternative that maximizes DER, storage, and energy efficiency, and which would reduce demand for centralized and fossil fuel TVA power, TVA would not only carry out its requisite part in phasing out fossil fuels and lowering GHG emissions, but also in addressing environmental justice concerns associated with a reliance on false solutions like fossil gas.

[18] *See, e.g.*, TVA 2019 Environmental Impact Statement, Final EIS at 5-28.

[19] *N. Plains Res. Council, Inc. v. Surface Transp. Bd.*, 668 F.3d 1067, 1079 (9th Cir. 2011) (citation omitted).

II. TVA's EIS Must Address the Devastating Impacts of Continued Fossil Fuel Dependence on The People It Is Charged to Serve, And Analyze Distributed, Renewable Energy Alternatives That Would Advance Energy Justice in The Region.

TVA's proposal to build new gas generation — and refusal to even consider renewable energy alternatives — at the Allen Plant is completely unacceptable and will only further harm communities of color and low wealth who continue to bear the brunt of the agency's reliance on fossil fuels. TVA's planned energy investment, as exemplified by the full swath of proposed gas projects including Cumberland, Cheatham County, Kingston, and now at the Allen Plant, contradicts the agency's mission to improve the quality of life of its customers. Rather, as TVA invests in new gas and slow-walks the transition away from existing fossil fuel resources to renewables, the agency is fueling the climate crisis and energy injustice which threaten people's quality of life.

First, just within the past year, communities in the Tennessee Valley have faced record-breaking tornadoes, floods, heat waves, winter storms, and even hazardous air quality from wildfires. One extreme weather event in particular, Winter Storm Elliot, put TVA's energy grid in peril and caused widespread coal and gas plant failures that resulted in the first rolling blackouts in TVA's history. Even more, TVA's system is increasingly vulnerable to these climate disasters. A U.S. Government Accountability Office (GAO) report found that TVA's system faces several climate-related risks that could cost customers billions of dollars in outages, capacity disruptions, and infrastructure damage.[20] The impact of these outages and associated costs will fall most heavily on environmental justice communities.

Second, fossil gas disproportionately harms low-income communities and people of color.[21] In addition to driving the climate crisis via especially potent methane emissions, gas generation produces over 60 hazardous air pollutants – including volatile organic compounds, carcinogens, and endocrine disrupting chemicals.[22] And gas generation exposes communities

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[20] *Tennessee Valley Authority: Additional Steps Are Needed to Better Manage Climate-Related Risks*, U.S. Government Accountability Office (Jan. 30, 2023), https://www.gao.gov/products/gao-23-105375.

[21] Greenpeace, *Fossil Fuel Racism: How Phasing Out Oil, Gas, and Coal Can Protect Communities* (2021), https://www.greenpeace.org/usa/wp-content/uploads/2021/04/Fossil-Fuel-Racism.pdf.

[22] *Id*. at 17.

within closer proximity to gas facilities to elevated ozone levels which, among other harms, can exacerbate asthma and other diseases.[23]

It is well-recognized that the fossil fuel economy particularly harms Black, Indigenous, and other communities of color.[24] Black Americans are exposed to 56% more polluted air than white Americans, on average, and more than one million Black Americans live within a half-mile of gas facilities, resulting in higher risks of cancer and other health problems.[25]

Third, TVA has a reputation of failing to do its due diligence to inform and engage the public surrounding energy decisions that will directly impact their health and safety. And as a result, environmental justice communities have been sacrificed to years of pollution and health hazards. More recently, TVA started trucking and dumping hazardous coal ash in South Memphis, a predominantly Black neighborhood.[26] Coal ash leads to chemicals leaching into the environment, such as waterways, poisoning communities who reside near fossil fuel plants and coal ash dump sites.[27] The community had little to no knowledge that TVA was moving forward with this plan, nor did they have opportunity to stop it.

The utility cannot risk burdening these communities with more pollution in the name of achieving increased reliability, when repeat climate disasters have shown these plants are increasingly unreliable. Instead, TVA should look at what it can do today to prioritize the closure of the Allen Plant and invest in non-polluting and resilient technology like DER, storage, demand response, and energy efficiency that will minimize health and safety risks.

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23 *Id.* at 17-18.

24 *See* NAACP *et al.* (2017), *Fumes Across the Fenceline*, http ://www.catf.us/wp-content/uploads/2017/11/CATF_Pub_FumesAcrossTheFenceLine.pdf; *see also* Mikati et al. (2018). *Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status*, American Public Health Association, https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2017.304297; *see also* Sarah Kaplan, "Climate Justice is a Racial Justice Problem," Washington Post, June 29, 2020.

25 Thompson, Andrea. "People of Color Breath More Than Their Share of Polluted Air." *Scientific American*, (Jun. 1, 2019), https://www.scientificamerican.com/article/minorities-breathe-more-than-their-share-of-polluted-air/; *see also* NAACP, *et. al* (2017); Bullard, Robert D., Paul Mohai, Robin Shaha, and Beverly Wright, *Toxic Wastes and Race at Twenty: 1987-2007*, March 2007, http://www.ejnet.org/ej/twart.pdf.

26 Fears, Darryl. "The TVA is dumping a mountain of coal ash in Black south Memphis." *Washington Post*, (Aug. 19, 2022), https://www.washingtonpost.com/climate-environment/2022/08/19/tennessee-valley-authority-memphis-coal/.

27 *See* Earthjustice (2021), *Mapping the Coal Ash Contamination*, https://earthjustice.org/features/coal-ash-contaminated-sites-map.

Finally, Memphians experience one of the highest energy burdens in the country — the national average is 3%, but for some Memphis families, it exceeds 25%.[28] Deepening the region's dependence on volatile gas would aggravate already high energy costs, especially for Black and low-wealth households who already pay significantly more for energy than their White and higher-wealth counterparts, respectively.[29] Just last month, TVA raised rates across the region for the first time in four years, in part to help finance new gas plants.

As previously stated, distributed renewable energy, demand response, and especially energy efficiency would go a long way in helping families bring down their monthly energy costs over time. A recent American Council for an Energy-Efficient Economy (ACEEE) Report demonstrates that investing in energy efficiency could reduce electricity produced by fossil fuels by up to 86% by mid-century. [30] Additionally, ACEEE projects savings of $10 to $19 billion annually by 2050 through avoided transmission and generation capacity costs. Despite TVA's emphasis on economic development and cost-effective energy investments, the agency's investments in energy efficiency (0.01% in 2021) fall well below the U.S. average (0.68%).

TVA must address the disproportionate harm experienced by environmental justice communities from the fossil fuel economy by exploring non-fossil fuel alternatives in the EIS, and fully examining the social, economic, and health impacts of all potential pathways for energy generation in Memphis.

Given all these impacts from this proposed project, it is also evident that TVA must prepare a full-blown Environmental Impact Statement ("EIS"), rather than simply relying on an Environmental Assessment. It is well recognized that an EIS is necessary whenever a project may have significant environmental impacts — including as a result of (a) the controversial or precedential nature of the project; (b) its uncertain impacts; (c) the risks it poses to the environment or other resources; or (d) the risks it poses to public health or safety. 40 C.F.R. § 1508.27(b). As the above discussion demonstrates, each of these factors is implicated here, and thus an EIS is necessary.

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[28] Southern Environmental Law Center, *Flawed Studies and Misleading Data Shouldn't Decide Future of Memphis' Power Supply*, (October 6, 2023), https://www.southernenvironment.org/news/flawed-studies-and-misleading-data-shouldnt-decide-future-of-memphis-power-supply/. *See also* Bryan, William D., Energy Insecurity in Memphis, Southeast Energy Efficiency Alliance, (April 20, 2023), https://storymaps.arcgis.com/stories/b46e354dbd2d4ffe81151b4880be607a.

[29] "Low-Income, Black, Hispanic, and Native American Households Face High Energy Burdens." *ACEEE*, https://www.aceee.org/energy-burden.

[30] Specian, Mike and Bell-Pasht, Aimee, "Energy Efficiency in a High Renewable Energy Future," *American Council for an Energy-Efficiency Economy*, (June 21, 2023), https://www.aceee.org/research-report/u2303.

* * *

The impacts of the climate crisis and worsening energy injustice for the communities that TVA serves are concrete, palpable, and are projected to worsen — and will certainly do so should TVA fail to consider and pursue non-fossil fuel alternatives. The proposed gas expansion at the Allen Plant is out of step with climate science, community demands, the TVA Act, and the Biden Administration's climate and clean energy targets. TVA has an opportunity to improve the quality of life of people in the region, and that starts with completing an EIS that examines DERs, storage, and energy efficiency improvements instead of expanding fossil gas operations.

We look forward to commenting on a Draft EIS for the Allen Plant that fully addresses these concerns. In the meantime, please contact us should there be any further information we can provide.

Sincerely,

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TVA's Clean Energy Future

Charting a course to decarbonization in the Tennessee Valley

Prepared for GridLab and Center for Biological Diversity

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Consumers in TVA's service territory can save $255 billion by switching away from fossil fuels.

EXECUTIVE SUMMARY

Tennessee Valley Authority (TVA), the largest provider of public power in the United States, is uniquely positioned to lead the way in the clean energy transition for Tennessee Valley. The U.S. Congress created TVA, originally conceived as a flood-control solution, as a federally owned electric utility in the 1930s to electrify the Tennessee Valley and bring economic benefits to the region. Today, TVA has the chance to continue this legacy through the 21st century with a shift to clean energy.

Our "100% Clean Energy" scenario shows that by completely switching away from fossil fuels in the electric sector by 2035, and by pursuing ambitious levels of electrification in the transportation, buildings, and industrial sectors, consumers in TVA's service territory can experience savings of $255 billion, compared to a status quo "TVA Baseline" scenario.

This clean energy transition will involve a major shift away from TVA's conventional emphasis on aging fossil technology towards new technology, including storage, solar, wind, and demand-side resources. Changes in the electric sector will accompany a shift away from burning dirty and inefficient fossil fuels in homes, businesses, and vehicles. This future electric sector leverages efficient electric-powered technology to meet expanded heating and mobility needs for the same customers that TVA is already serving. By taking advantage of new federal legislation, particularly the *Inflation Reduction Act of 2022*, TVA is poised to lead a transition that can produce benefits for local consumers such as improved air and water quality, as well as job creation.

Synapse was hired by GridLab, in partnership with Center for Biological Diversity, to better understand what it would take to achieve this clean energy transition. Using state-of-the-art electric sector and economic computer models, we examined TVA's electric system at a detailed level from the early 2020s through 2050. By conducting scenario analysis of several different visions of the future, we compared a scenario that accelerates a clean energy future using storage to balance solar and wind without fossil fuels to a scenario that adheres to TVA's status quo approach. We found that a clean energy future that reduces greenhouse gas emissions not only meets energy and capacity needs and provides electricity reliably, but also generates a wealth of economic development, public health, and energy justice benefits to Tennessee Valley consumers (on the order of hundreds of billions of dollars).

Table 1 illustrates the magnitude of this change in the electric sector. We modeled a shift from a current TVA that is dependent on fossil fuels for 40 percent of electricity generation (the "TVA Baseline" scenario) to a TVA that phases out fossil fuels entirely by 2035 (the "100% Clean Energy" scenario). By 2050, this future reduces emissions from all sectors of the Tennessee Valley's economy by over 90 percent.[1] Table 2 shows the estimated economic impacts. When compared to a status quo TVA approach, this clean energy future produces savings of $255 billion for consumers. Moreover, electricity is served reliably despite the system having more than double the current demand for electricity and exclusive reliance on non-emitting energy resources such as wind, solar, and battery storage.

Table 1. Primary electric-sector findings

	2020	2035		2050	
	Actual	*TVA Baseline*	*100% Clean Energy*	*TVA Baseline*	*100% Clean Energy*
CO_2 emissions reduction					
Electric sector reductions (target)	51%	84% (n/a)	100% (100%)	99% (n/a)	100% (100%)
All sector	-	26%	55%	41%	92%
Share of generation (%)					
Coal	12%	0%	0%	0%	0%
Gas	31%	24%	0%	2%	0%
Nuclear	38%	39%	30%	35%	17%
Hydro and other	16%	17%	22%	18%	19%
Renewable	3%	20%	48%	46%	64%
Wind	3%	4%	19%	22%	32%
Utility-scale & distributed solar	0%	16%	28%	23%	32%
Battery storage & demand response	-	-	-	-	-
Load (TWh)	164	169	192	179	327
Operating capacity (GW)					
Coal	7	0	0	0	0
Gas	15	13	1	6	0
Nuclear	8	8	8	8	8
Hydro and other	7	7	6	6	6
Renewable	2	22	72	60	191
Wind	1	2	14	13	41
Utility-scale & distributed solar	0	15	35	37	101
Battery storage & demand response	1	5	23	11	49

Notes: Electric sector emission reductions are given relative to 2005. All Sector emission reductions are given relative to 2020. Battery storage is shown as having no generation due to having net negative energy requirements. "Other" includes biomass and other miscellaneous sources.

[1] Throughout this report, "all sector emissions" include CO_2 emissions from the electric, motor vehicle, and building sectors, but not non-CO_2 GHG emissions, upstream emissions, or emissions from airplanes, agriculture, and other sectors of the economy.

Table 2. Single-year and cumulative net costs, 100% Clean Energy versus TVA Baseline (2021 $ billion)

	2035	2050	Cumulative
Electric system	-$1.2	-$4.6	-$53.9
Buildings	$0.0	$0.6	$9.2
Transportation	$8.1	$22.0	$277.2
Other	$0.1	$3.9	$23.0
Net savings	**$7.1**	**$21.8**	**$255.6**

Note: Positive numbers are savings while negative numbers are costs. "Electric system" includes wholesale energy costs, and programmatic and participant spending on energy efficiency and distributed generation resources. "Buildings" includes the costs and savings related to switching residential and commercial customers to efficient heat pumps and electrifying all remaining end uses, inclusive of avoided fossil fuel expenditures. "Transportation" includes the costs and savings related to consumers switching from conventional internal combustion engine vehicles to electric vehicles, including avoided fossil fuel expenditures, as well as the cost of building out charging infrastructure for EVs. "Other" includes fuel savings related to electrifying the industrial sector but does not include the costs of electrification itself. This list is non-exhaustive; see subsection "System costs" on page 23 for more.

Our analysis also found:

- **The 100% Clean Energy scenario produces economy-wide net savings of $255 billion over the study period throughout the Tennessee Valley.** Although wholesale electric sector system costs rise from about $5 billion today to $9 billion in 2050, these cost increases are more than offset by fuel savings outside the electric sector, including a reduction in transportation fossil fuel expenditures of $195 billion over 30 years. Electric sector cost increases are primarily driven by capacity additions needed to power newly electrified measures, and is not due to switching from fossil fuels to clean energy.

- **Through continued emphasis on energy efficiency, residential energy burdens fall from 7 percent today to 3 percent by 2050.** Residential energy burden is defined as the amount of money a household spends on energy, relative to its income. Through an emphasis on more efficient clean energy and away from less efficient and volatile fossil sources, households spend less on their energy needs in a clean energy future. This is in spite of a 13 percent increase in monthly electricity bills, which is more than offset by a marked decrease in household fossil fuel spending on gasoline and home heating fuels.

- **Both primary scenarios achieve (and sometimes exceed) their clean energy targets with no reliability issues.** With the level of temporal resolution we modeled (8 three-hour blocks per day in a typical week) we did not see any hours with unserved energy. In addition, the modeled scenarios met both summer and winter reserve requirements every year. We note that a full evaluation of reliability in an all-clean electric grid would require more detailed stochastic analysis.

- **The TVA Baseline scenario shows that electric-sector emissions in 2050 can be reduced by 99 percent with no increases in costs.** We observed electric system costs of about $5 billion in every year of the TVA Baseline case. This suggests that clean energy deployment is already a least-cost option for TVA, even without enforced decarbonization constraints.

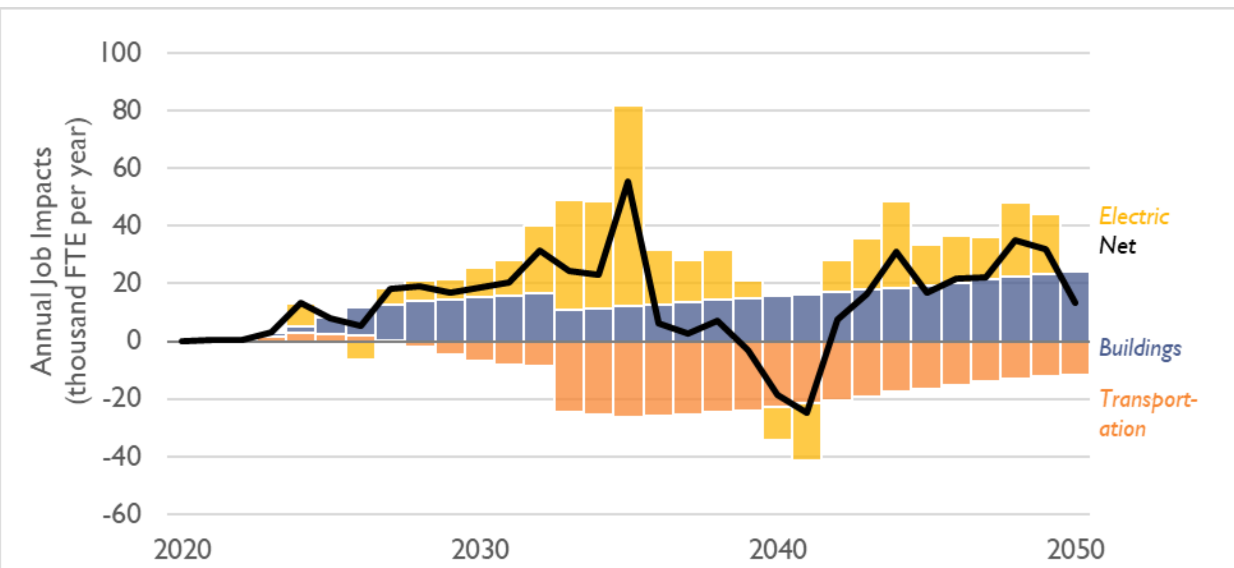
- **Ambitious building decarbonization in the 100% Clean Energy scenario adds no new net electricity demand.** Because many TVA customers currently heat with inefficient electric resistance heating, switching to more efficient heat pumps offsets any additional electricity demand created by switching from natural gas heating to heat-pump-driven electric heating. Instead, most load growth is due to transportation electrification and industrial electrification, each representing about half of the total increase in load by 2050. Moderate and reasonable increases in the deployment of conventional energy efficiency measures throughout the study period helps to defer load growth.

- **An emphasis on flexible demand resources can help minimize the construction of battery storage and utility-scale solar resources.** By better utilizing advanced demand response and distributed resources, TVA could avoid the construction of 2 GW of utility-scale solar and over 20 GW of battery storage. By analyzing increased levels of distributed resources in our "Ambitious DER" scenario, we found that TVA consumers could reduce wholesale electric sector costs by $1.5 billion in 2050 alone.

- **Both scenarios project a shift away from TVA-owned resources.** The TVA Baseline scenario models 45 TWh of wind power purchase agreements (PPA) with neighboring regions by 2050; the 100% Clean Energy scenario has 130 TWh of non-TVA wind PPAs (about one-third of TVA's total generation). This is largely due to the more favorable economics and better capacity factors of midwestern wind, even accounting for (a) TVA's new eligibility for federal clean energy tax credits under the IRA (2022) and (b) cost of transmission lines to neighboring regions to facilitate this wind. This is a marked shift away from TVA's approach to procuring power today, where only a small fraction of energy comes from out-of-Valley renewables.

- **A clean energy transition adds about 15,600 job-years to the economy in TVA's service territory.** Job additions are driven by the construction of new solar, storage, and heat pump resources, as well as savings on energy expenditures (see Figure 1).

Figure 1. Job impacts from the 100% Clean Energy scenario, relative to the TVA Baseline scenario



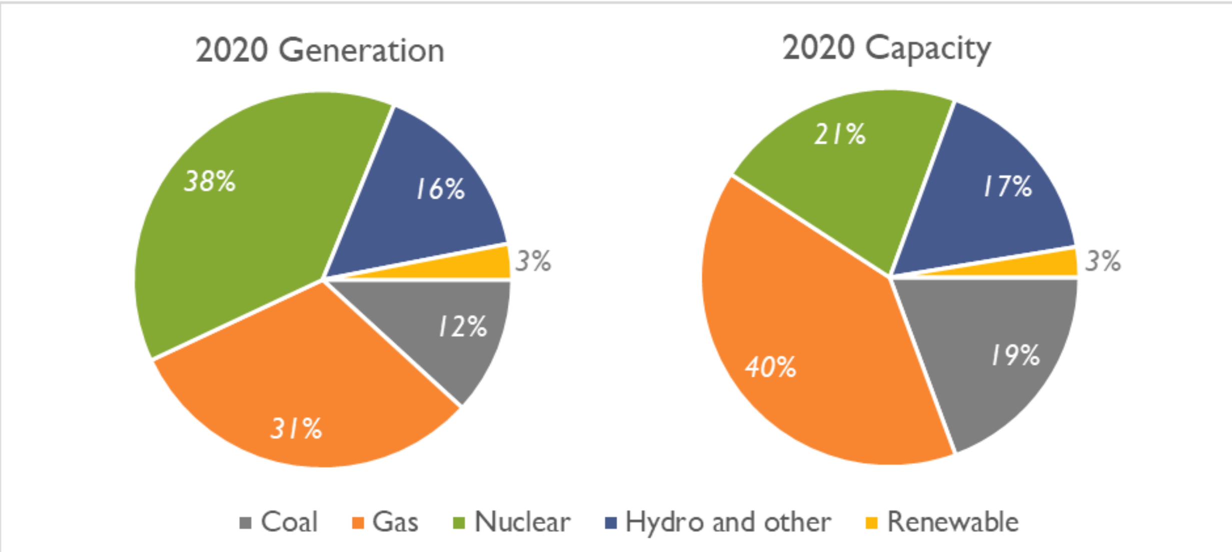
- **A clean energy transition creates vast amounts of public health and societal benefits.** The 100% Clean Energy scenario leads to $27 billion in nationwide public health benefits related to avoided heart attacks, respiratory illnesses, and premature death. It also provides $265 billion in cumulative societal benefits, based on the latest estimates of social cost of carbon from the U.S. Environmental Protection Agency (EPA). Both of these benefits are in addition to the benefits shown above in Table 2. Switching away from fossil fuels to clean energy sources eliminates the creation of coal ash and more than halves water consumption from power plants.
- **Land-use impacts in the Tennessee Valley can be minimized through an emphasis on distributed resources.** We found that to achieve the level of utility-scale solar in the 100% Clean Energy scenario, each county in TVA's service territory would need to build the equivalent of just 480 MW solar facilities, or roughly two large solar farms. Meanwhile, to achieve the level of distributed solar assumed in the 100% Clean Energy scenario, only 4 percent of rooftops in the Tennessee Valley would need to add solar. An increase in that portion of rooftop solar could minimize the utility-scale solar impacts on land use.

This report closes with recommendations for future modeling efforts. We view this analysis as a guide for future analytical efforts, including those performed by TVA in the integrated resource planning (IRP) process that we expect to begin in 2023.

1. TVA's Role in the Clean Energy Transition

Tennessee Valley Authority (TVA) is a federally owned electric utility and the largest provider of public power in the United States. U.S. Congress created TVA in 1933 to, "provide for the agricultural and industrial development" of the Tennessee River Valley.[2] Today, 90 years since its founding, TVA remains a critical source of power and economic development in the region. TVA's electric generation fleet is the sixth-largest in the country, with over 66 GW of generation capacity under its control.[3] Figure 2 shows the generation and capacity for TVA's service territory in 2020.

Figure 2. Recent generation and capacity in TVA's service territory



Note: This figure includes generation and operational capacity from all resources within TVA's service territory, including those resources not necessarily owned by TVA. "Hydro and other" includes hydro, biomass, and miscellaneous resources. "Renewable" includes solar, wind, and battery storage resources.

After working to electrify the Tennessee Valley through the 20th century, TVA now has an opportunity to make a new transformation. Like many of its peer utilities, TVA has publicly committed to take advantage of cost-effective, zero-carbon resources and reduce its carbon emissions from power generation. TVA's carbon commitment targets a 70 percent reduction of carbon dioxide (CO_2) by 2030, 80 percent by 2035, and net-zero aspiration by 2050. President Biden's ambition to completely decarbonize the United States' electric generation by 2035 adds even more urgency to TVA's zero-

[2] See https://www.tva.com/about-tva/our-history.

[3] For more information on TVA's climate goals, see its "Carbon Report" web page, available at https://www.tva.com/environment/environmental-stewardship/sustainability/carbon-report.

carbon commitment.[4] At a minimum, TVA's journey toward a zero-carbon grid will entail a transition away from TVA's legacy coal fleet and an ambitious deployment of zero-carbon technologies like solar, wind, and energy storage. Notably, TVA leadership has suggested that existing technology can get the utility to reduce carbon emissions by 80 percent by 2035, but that technology will need to evolve in order to achieve 100 percent decarbonization.[5]

TVA's decisions will impact future ratepayers as well as today's national decarbonization trends. As its aging coal fleet reaches the end of its useful life, TVA must decide whether to chart a course for clean energy development or continue with its legacy utilization of fossil resources. In January 2023, TVA indicated it would replace a retiring coal plant with a 1,450-MW gas generator.[6] Status quo decisions like this one will lock TVA into a future dependent on fossil fuels, and thereby burden the region with the associated detrimental impacts to consumer wallets, public health, and pollution.

As TVA and utilities across the country continue their transition toward less carbon-intensive energy sources, clean energy technologies are creating new options and pathways for serving the grid. Distributed energy resources promise to play a greater role than ever before. Rooftop solar and distributed energy storage technologies provide zero-carbon electricity directly at the point of use, which could avoid or defer capital-intensive investments in distribution and transmission infrastructure and also lead to increases in jobs within the Valley. Demand-side management programs also allow customers unprecedented control over their own usage so they can reduce their own bills while generating savings for the grid as a whole. Together, distributed energy resources provide a unique service to the grid and will be a critical source of flexibility as the power system integrates more variable renewable energy.[7]

As entrepreneurs, ratepayers, and policymakers contemplate transitioning from carbon-emitting technologies to clean energy across the entire Tennessee Valley economy, the electricity grid's role will be even more critical as a source of zero-carbon energy across an expanded set of sectors and end uses. Switching from fossil fuels to electricity across heating, transport, and heavy industry will also bring new benefits to the community. These benefits include less local pollution; less dependence on volatile fuel

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[4] The White House. April 22, 2021. *FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies*. Available at https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/.

[5] Tennessee Valley Authority (2021). TVA Charts Path to Clean Energy Future. Retrieved at: https://www.tva.com/newsroom/press-releases/tva-charts-path-to-clean-energy-future.

[6] "TVA Retiring Cumberland, Continues Transition to Clean Energy Future." Press Release. TVA. January 10, 2023. Available at https://www.tva.com/newsroom/press-releases/tva-retiring-cumberland-continues-transition-to-clean-energy-future; *A Clean Energy Portfolio Is Still the Best Option for TVA*. Synapse Energy Economics. January 2023. Available at https://www.synapse-energy.com/sites/default/files/Synapse%20Response%20to%20Concentric%20Report.pdf.

[7] Shen, B., Kahrl, F., & Satchwell, A. (2021). Facilitating Power Grid Decarbonization with Distributed Energy Resources: Lessons from the United States. Retrieved at: https://emp.lbl.gov/publications/facilitating-power-grid.

commodities; and local economic development in sectors that construct, install, and maintain new, electricity-powered equipment. This report describes cutting-edge modeling and analysis to envision an electrified Tennessee Valley and project its impacts on the economy and electric grid.

Economy-wide decarbonization and electrification inverts the conventional wisdom that electricity use will continue to grow at a low, stable rate. High-quality national decarbonization models project that, across the United States, total electricity demand could more than double between now and 2050.[8] Despite these authoritative projections, TVA's last long-term planning process (its 2019 integrated resource planning, or IRP, process--described below) did not include any meaningful consideration of electrification despite its potentially dramatic impact on how electricity is generated, transmitted, distributed and used. As TVA plans to decarbonize its energy supply, it must also plan for integrating increasing demand for zero-carbon electricity from other sectors.

Faced with a rapidly changing energy landscape, TVA should be developing a long-term plan for meeting the Tennessee Valley's energy needs reliably, affordably, and sustainably. TVA's planning choices will impact both TVA's own decarbonization pathway and the broader economy across the Tennessee Valley. Responsible energy planning should account not only for how TVA's energy portfolio serves the electric grid, but also its impacts on economic development and land and water resources. Ensuring that TVA is charting a pathway to decarbonization that is most beneficial for the Tennessee Valley requires even-handed consideration of each of these impacts.

1.1. Integrated resource planning: A roadmap for TVA's energy future

TVA updates its roadmap for energy resources every few years through the development of its IRP.[9] Integrated resource planning is the industry-standard method that utilities use to plan for the future: they assess future grid needs over the next 20 years; explore inventory supply- and demand-side resources available to meet those needs; and then make plans to build or procure energy resources to meet grid needs while also satisfying reliability, affordability, and environmental standards.

As a federally owned public entity, TVA's IRP process is unique. Most utilities submit draft IRPs to state regulators, who review the plan and make a judgment about whether the utility's plan is in the public interest and identify any needed revisions. In TVA's case, its IRPs proceed like many other federal agency decisions: TVA develops and issues a draft IRP and environmental impact statement (EIS), which initiates a period of public review, consultation, and comment. After the comment period, the presidentially

[8] Larson, E., C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala,R.Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley,E. Leslie, K.Paustian, and A. Swan, (2021, October). Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final report, Princeton University. Retrieved at: https://www.dropbox.com/s/ptp92f65lgds5n2/Princeton%20NZA%20FINAL%20REPORT%20%2829Oct2021%29.pdf?dl=0.

[9] TVA's statute does not have a requirement that IRPs be conducted on a set schedule. Previous IRP processes have been conducted in 2019, 2015, and 2011.

appointed TVA Board of Directors revises and adopts the IRP.[10] In addition to the goal of providing low-cost, reliable, and clean electricity, TVA's IRPs have a goal of identifying an energy resource plan that performs well under a variety of future conditions, taking into account cost risk, environmental stewardship, operational flexibility, and Valley economics.[11]

The Inflation Reduction Act and the Tennessee Valley Authority

Signed into law in August 2022, the *Inflation Reduction Act* (IRA) includes an ambitious set of climate and clean energy provisions that promise to further transform the energy landscape. The historic law, representing $369 billion in funding, targets cutting U.S. greenhouse gas emissions roughly 40 percent by 2030.[12] While TVA's identity as a publicly owned entity has historically excluded it from taking advantage of tax credits on clean energy investments, specific provisions of the IRA will unlock access to clean energy incentives for TVA. The IRA will have wide-ranging impacts on the U.S. energy economy, including in the Tennessee Valley. Taking advantage of the IRA's provisions in the short term should be a priority for energy resource planning in the Tennessee Valley and across the country. The following IRA programs present big opportunities for TVA's energy future (Appendix 1 details how we included these tax credits and investment subsidies in our modeling):

- **Refundable clean energy tax credits:** technology-neutral clean energy investment tax credits (for which standalone storage is newly eligible) and production tax credits (for which solar is newly eligible) with a 10-year lifespan; TVA is now eligible for direct refunds, which will enable it to monetize these credits.
- **Incentives for building energy efficiency and electrification:** two new major rebate programs to support home energy retrofits, through which the seven states served by TVA have been allocated $1.2 billion of funding altogether;[13] the IRA expanded and extended existing tax credits for residential and commercial building improvements.[14]
- **Accelerating transmission buildout:** $2 billion in funding for national-interest electric transmission facilities and $760 million for studying transmission impacts; this will complement the "Building a Better Grid" initiative, a program funded by the Infrastructure Investment and Jobs Act (IIJA) that aims to catalyze nationwide development of high-capacity transmission lines.
- **Energy Infrastructure Reinvestment Program:** $5 billion to guarantee up to $250 billion in loans to replace retired infrastructure or enable operating infrastructure to reduce emissions, e.g., by refinancing undepreciated assets.[15]
- **Electric vehicle funding:** individuals and businesses purchasing new or used electric vehicles are eligible for electric vehicle rebates, including a $7,500 rebate for new electric cars under $55,000.

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[10] IRP Record of Decision: https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/default-document-library/site-content/environment/environmental-stewardship/irp/irp_rod_published_9-17-19_in_fed_reg_201920104.pdf?sfvrsn=a53fe867_4.

[11] 2019 Integrated Resource Plan. Volume I – Final Resource Plan. TVA. June 2019. Available at https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/default-document-library/site-content/environment/environmental-stewardship/irp/2019-documents/tva-2019-integrated-resource-plan-volume-i-final-resource-plan.pdf?sfvrsn=44251e0a_4. See also TVA's statutory requirement for least-cost planning: U.S. Code 16 (2021), § 831m-1. www.govinfo.gov/app/details/USCODE-2021-title16/USCODE-2021-title16-chap12A-sec831m-1.

[12] Jenkins, J.D., Mayfield, E.N., Farbes, J., Jones, R., Patankar, N., Xu, Q., Schivley, G., "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022 ," REPEAT Project, Princeton, NJ, August 2022.

[13] Energy.gov, (2022). Biden-Harris Administration Announces State and Tribe Allocations for Home Energy Rebate Programs. Available at: https://www.energy.gov/articles/biden-harris-administration-announces-state-and-tribe-allocations-home-energy-rebate.

[14] Ungar, L., and S. Nadel. (2022). Home Energy Upgrade Incentives: *Programs in the Inflation Reduction Act and Other Recent Federal Laws*. Washington, DC: American Council for an Energy-Efficient Economy. www.aceee.org/policy-brief/2022/09/home-energy-upgrade-incentives-programs-inflation-reduction-act-and-other.

[15] O'Boyle, M., Solomon, M. (2022, August 24). "Inflation Reduction Act Benefits: Billions in Just Transition Funding for Coal Communities." *Forbes*. Available at: https://www.forbes.com/sites/energyinnovation/2022/08/24/inflation-reduction-act-benefits-billions-in-just-transition-funding-for-coal-communities/?sh=6e22963d6ebd.

While IRPs were initially adopted by the electric utility industry as a response to nuclear cost over-runs and fossil supply constraints, today they are used to plan for a whole new set of transitions in the energy sector.[16] An IRP's long time horizon (typically 20 years or more) brings medium- and long-term carbon emissions goals into focus, and the integration of electricity demand and supply provide an opportunity to synchronize electricity supply with electrification across the economy. In the context of economy-wide decarbonization, IRPs provide an opportunity to look at the big picture and plot a path forward. TVA's most recent IRP was finalized in September 2019, with a direction to update the IRP no later than 2024. TVA's next IRP will be the first one since TVA's announcement of an 80 percent reduction in carbon emissions by 2035 and net-zero emissions by 2050, and the first since President Biden's executive order to decarbonize the electricity supply by 2035. TVA's next IRP represents a critical opportunity to chart a pathway toward achieving those goals while supporting economy-wide decarbonization and continuing to deliver affordable, reliable power to TVA ratepayers.

1.2. Synapse's approach

In this report, Synapse Energy Economics explores several pathways for TVA's energy future. Synapse's approach is anchored by the EnCompass capacity expansion and production cost modeling software, which allows Synapse to model the TVA electricity system in detail and ensure that resource pathways optimize costs and maintain system reliability.[17] Synapse has developed robust forecasts of electricity demand in the context of increasing electrification and used up-to-date, industry-standard cost forecasts for new resources to ensure that Synapse's results are consistent with real-world outcomes.

In turn, we have assessed the impact of optimized resource portfolios generated by EnCompass on topics that are meaningful to TVA ratepayers, including impacts to rates and bills, energy burden, local economic development, public health, land use, and water use. These additional dimensions provide a fuller picture of what the energy transition will mean for the Valley, and the tradeoffs that might exist between different resources and pathways. Importantly, our analysis highlights that TVA's energy pathway has wide-ranging impacts across the people and economy of the Tennessee Valley.

In 2023, TVA will release its own draft IRP that charts its own proposed pathways for providing clean, affordable, and reliable power in the public interest. As TVA and interested stakeholders deliberate on their vision for TVA's energy portfolio, this study can provide an initial, independent assessment of potential energy futures for the TVA and the Tennessee Valley.

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[16] For more information on IRP history and best practices, see *Best Practices in Electric Utility Integrated Resource Planning.* Synapse Energy Economics. June 2013. Available at https://www.synapse-energy.com/sites/default/files/SynapseReport.2013-06.RAP_.Best-Practices-in-IRP.13-038.pdf.

[17] We note that in May 2022, Synapse published a report *Clean Portfolio Replacement at Tennessee Valley Authority* (available at https://www.synapse-energy.com/sites/default/files/TVA_Clean_Portfolio_Modeling_21-097_0.pdf). This analysis, while similar conceptually, differs from that previous work in several ways. Notably, it is inclusive of the effects of the Inflation Reduction Act (which did not exist at the time of the prior report's printing, conducts analysis through 2050 (rather than 2042), and envisions a future Tennessee Valley with more ambitious levels of electrification and decarbonization.

2. ANALYSIS

Synapse's exploration of a clean energy future for TVA relied on the comparison of several scenarios. These scenarios present several visions of the future, with different assumed values for electricity demand and electrification, availability of clean energy and demand-side resources, modifications to TVA's approach to reserve margins, and requirements for electric sector emission reductions. Within each scenario, we evaluated the least-cost approach for TVA to reliably meet its customers' electricity needs, and then we estimated the impact on the electric sector and other sectors of the economy.

2.1. Methodology

Our approach for analyzing the impacts of decarbonizing TVA and end uses in its service territory involved a number of tools (see Figure 3). At the heart of our analysis was the use of an electric-sector capacity expansion and production cost model, EnCompass. Developed by Anchor Power Solutions, EnCompass is a single, fully integrated power system platform that allows for utility-scale generation planning and operations analysis, and it is widely used by utilities across the country for IRP planning. Synapse populated the model using the EnCompass *National Database*, created by Horizons Energy, and supplemented this dataset with additional publicly available information to provide further detail on power plant characteristics, resource costs, and fuel prices. EnCompass was used to produce outputs related to generation, capacity, emissions, and system costs, based on least-cost optimization.

This analysis also relied on a number of other tools for developing metrics relevant to the transportation, buildings, and industrial sectors. Several of these metrics (such as avoided tailpipe emissions) are outputs in their own right; others become inputs into the EnCompass model or another analytical tool. Four such tools utilized in this project were Synapse's Electric Vehicle Regional Demand Impacts (EV-REDI) tool, Synapse's Building Decarbonization Calculator (BDC), U.S. EPA's Energy Savings and Impacts Scenario Tool (ESIST), developed by Synapse, and U.S. DOE's EVI-Pro Lite tool.[18]

Synapse used each of these tools to generate costs and cost deltas between scenarios. We combined data related to costs with job-per-million-dollar-spent factors generated from the IMPLAN model and other inputs to generate estimates of job changes over time.[19]

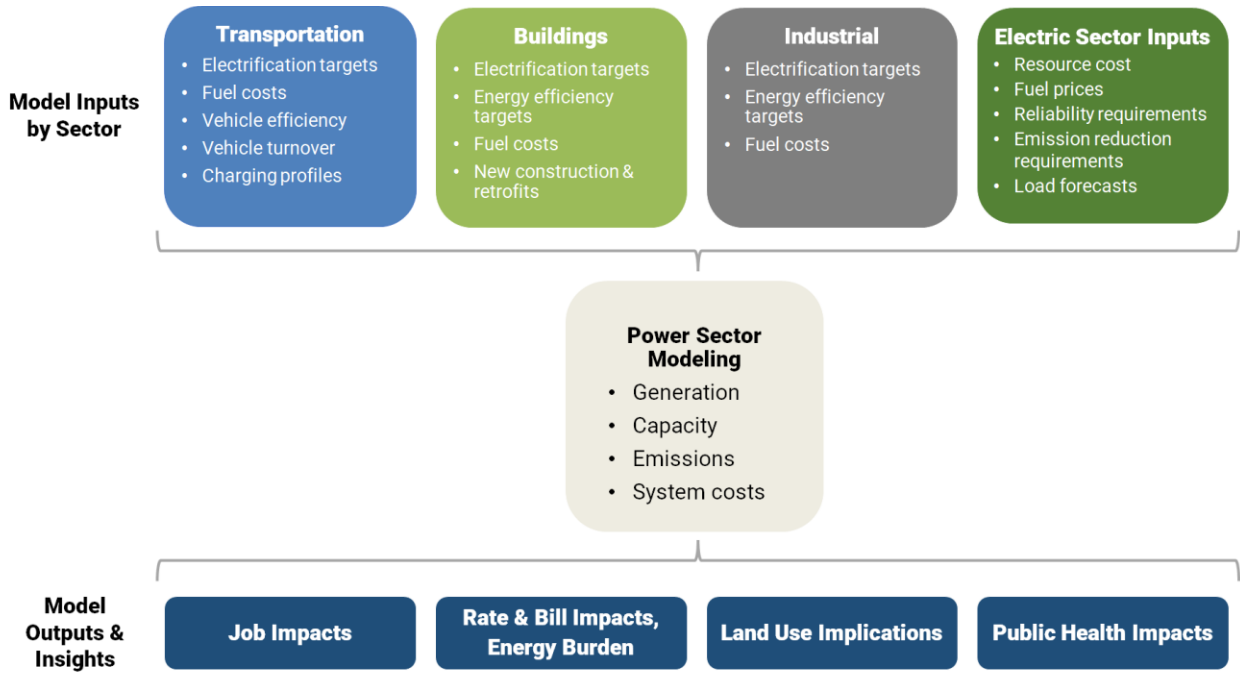
Many of these tools also generate changes to emissions of criteria pollutants that impact human health, including nitrogen oxide (NO_X), sulfur dioxide (SO_2), particulate matter ($PM_{2.5}$), volatile organic compounds (VOC), and ammonia (NH_3). Data on how emissions of these pollutants vary between

[18] For more information on EV-REDI and BDC, please see https://www.synapse-energy.com/tools/electric-vehicle-regional-emissions-demand-impacts-tool-ev-redi and https://www.synapse-energy.com/tools/building-decarbonization-calculator. For more information on ESIST, see https://www.epa.gov/statelocalenergy/energy-savings-and-impacts-scenario-tool-esist. For more information on EVI-Pro Lite, see https://afdc.energy.gov/evi-pro-lite.

[19] For more information on the IMPLAN model, see https://implan.com/.

scenarios was passed through U.S. EPA's CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA) to estimate how emission dispersion varies, and how this change could impact public health.[20]

Figure 3. Diagram of modeling tools



2.2. Modeled scenarios

Table 3 describes the scenarios modeled in this study, and the primary differences among them. Our three scenarios were:

- TVA Baseline: Models a status-quo approach to a future TVA. This is a scenario that builds on the "Current Outlook" modeling conducted by TVA in its 2019 IRP, but allows TVA to procure cost-effective renewables enabled, in part, by the passage of the Inflation Reduction Act of 2022.
- 100% Clean Energy: Requires a transition to 100 percent clean energy by 2035 and expands electrification and demand-side resources.
- Ambitious DER: Envisions even further demand-side resource options.

All three scenarios modeled in this analysis utilize the same set of assumptions, with only five main differences. The first is the required electric sector emission reductions: the 100% Clean Energy scenario and Ambitious DER scenario require electric-sector emissions to be reduced by 80 percent by 2030 and

[20] For more information on COBRA, see https://www.epa.gov/cobra.

100 percent by 2035 (relative to 2005 levels), whereas the TVA Baseline scenario has no such requirement. Second, the TVA Baseline case assumes low levels of energy efficiency and transformational electrification in line with the "Current" case of TVA's recent 2019 IRP.[21] Meanwhile, the 100% Clean Energy and Ambitious DER case assume that energy efficiency levels ramp up to those observed by leading neighboring states like Arkansas, reaching levels of 1.5 percent per year (as a percent of previous year retail electricity sales) by 2029. These two scenarios also assume high levels of electrification of the transportation, buildings, and industrial sectors. Specifically:

- For the transportation sector, we assumed that 100 percent of light-duty vehicle sales are electric vehicles (EV) by 2030. We also assumed that 60 percent of medium- and heavy-duty vehicle sales are EVs by 2030 and 100 percent of these vehicle sales are EVs by 2038. Vehicle sales trajectories follow a conventional S-curve for technological adoption; vehicle stock (and implied impacts on tailpipe emissions and electricity load) lag vehicle sales according to vehicle turnover. For more information on Synapse's methodology for modeling EVs, see https://www.synapse-energy.com/tools/electric-vehicle-regional-emissions-demand-impacts-tool-ev-redi. This analysis made no assumptions regarding the emissions impacts related to non-road vehicles (e.g., airplanes, boats, rail, etc.).

- For the residential and commercial buildings sector, we assumed that 100 percent of new sales of space heating, water heating, cooking, and drying equipment are electric by 2030. This is primarily achieved through the use of high-efficiency heat pumps. For more information on Synapse's methodology for modeling electrification in the building sector, see https://www.synapse-energy.com/tools/building-decarbonization-calculator. Importantly, because many customers in TVA's footprint currently heat their homes and business with inefficient electric resistance heating, a switch to more efficient heat pumps leads to a *reduction* in annual electricity requirements. When this phenomenon is coupled with the electrification impacts of switching fossil-fuel-powered end uses (such as natural gas-fired furnaces) out for heat pumps, we observe effectively no net change in annual electricity requirements.

- For the industrial sector, we assumed that 80 percent of end uses currently relying on fossil fuels are electrified by 2050, with the shift beginning in 2030. These adoptions follow the same S-curve for technological adoption described above. As of the time of this study, data on the amount of electricity required to decarbonize industrial end uses remains sparse. This analysis assumed that 230 TWh of wholesale electricity are required for every 1 quadrillion Btu of current fossil fuel end use.[22] This analysis also assumed that the amount of electricity required for direct use by industrial customers and other large customers remains constant throughout the study period.

[21] See TVA's 2019 IRP at https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/default-document-library/site-content/environment/environmental-stewardship/irp/2019-documents/tva-2019-integrated-resource-plan-volume-i-final-resource-plan.pdf?sfvrsn=44251e0a_4, Appendix E.

[22] This assumption is derived from data described in Energy Innovation's *NDC Pathway* scenario in their Energy Policy Simulator. More information is available at https://us.energypolicy.solutions/scenarios/home.

Third, the scenarios differ in terms of the assumed distributed energy resources. The TVA Baseline case assumes the same levels of distributed solar and distributed storage assumed in the "Base" case of TVA's 2019 IRP. The 100% Clean Energy scenario assumes levels in line with the "Medium" case, and the Ambitious DER scenario assumes levels in line with the "High" case. Fourth, the scenarios feature different levels of demand response and flexible load. All three scenarios include the amount of demand response assumed in the "Current" case of TVA's 2019 IRP. The Ambitious DER scenario also includes an additional quantity of "flexible load," meant to represent load-shifting of newly electrified end uses (see page 37 for more information).

Finally, the scenarios feature different reserve margin assumptions. The TVA Baseline scenario maintains TVA's current reserve margins throughout the study period. Meanwhile, the other two scenarios assume a change to winter reserve margins, such that TVA features a single year-round 17 percent reserve margin beginning in 2024.

Table 3. Differences between modeled scenarios

	TVA Baseline	100% Clean Energy	Ambitious DER
Required electric sector CO_2 emissions reductions	None	80% by 2030, 100% by 2035 *(relative to 2005)*	Same as 100% Clean Energy
Electrification and energy efficiency	Minimal electrification and energy efficiency according to 2019 TVA IRP	Ambitious electrification and energy efficiency aimed at economy-wide decarbonization by 2050	Same as 100% Clean Energy
Distributed energy	Follows "Base" case in 2019 IRP: DG PV: 1.2 GW (2030); 2.7 GW (2050) DG storage: None	Follows "Medium" case in 2019 IRP: DG PV: 1.7 GW (2030); 4.4 GW (2050) DG storage: 25 MW (2030); 270 MW (2050)	Follows "High" case in 2019 IRP: DG PV: 2.1 GW (2030); 6.3 GW (2050) DG storage: 180 MW (2030); 1.1 GW (2050)
Demand response and flexible load	Follows 2019 IRP: 1.9 GW conventional DR (2050)	Follows 2019 IRP: 1.9 GW conventional DR (2050)	1.9 GW conventional DR (2050) 32 GW flexible load (2050) (*Components of flexible load vary by duration and price paid*)
Changes to reserve margins	No changes to current TVA requirements (17% summer, 25% winter)	Assumes year-round 17% reserve margin beginning in 2024	Same as 100% Clean Energy

All other assumptions related to topology, modeling horizon, load forecasts, load shapes, resource costs and characteristics, transmission, and capacity contributions were the same in all scenarios. See Appendix A for more detail on assumptions.

2.3. Results

The following section describes the results of our scenario analysis, with a main focus on the TVA Baseline and 100% Clean Energy scenarios (page 37 provided detail on the Ambitious DER scenario).

CO_2 emissions

The TVA Baseline scenario, which features no CO_2 reduction requirements, nevertheless sees a marked decrease in electric sector CO_2 emissions. In the mid-2020s and early 2030s this is primarily driven by a decrease in coal generation linked to coal plant retirements. In the second half of the study period, this is largely driven by new wind and solar resources displacing generation from gas plants. By 2050, electric sector CO_2 emissions in the TVA Baseline scenario are 99 percent lower than 2005 emissions, indicating that this level of emissions reduction is achievable based on economics alone (see Figure 4).

The 100% Clean Energy scenario features a requirement for CO_2 reductions to fall by 80 percent by 2030 and 100 percent by 2035 and all later years, in line with TVA's own announced aspirational goals. This requirement proves to be binding in most year it is applied, with CO_2 emissions decreasing rapidly in the late 2020s through 2035. This is driven by new wind and solar resources entirely displacing existing coal and gas resources by 2035.

The two scenarios feature radically different trajectories for all-sector emissions in TVA's footprint (see Figure 5). By 2050, the TVA Baseline scenario reaches a 41 percent reduction in economy-wide emissions (relative to 2020 levels), reflecting the fact that while the electric sector is nearly decarbonized, emissions from other sectors have remained largely flat. In contrast, the 100% Clean Energy scenario reduces economy-wide emissions by 92 percent, demonstrating the results of an economy-wide decarbonization strategy.

Figure 4. Electric sector CO_2 emissions

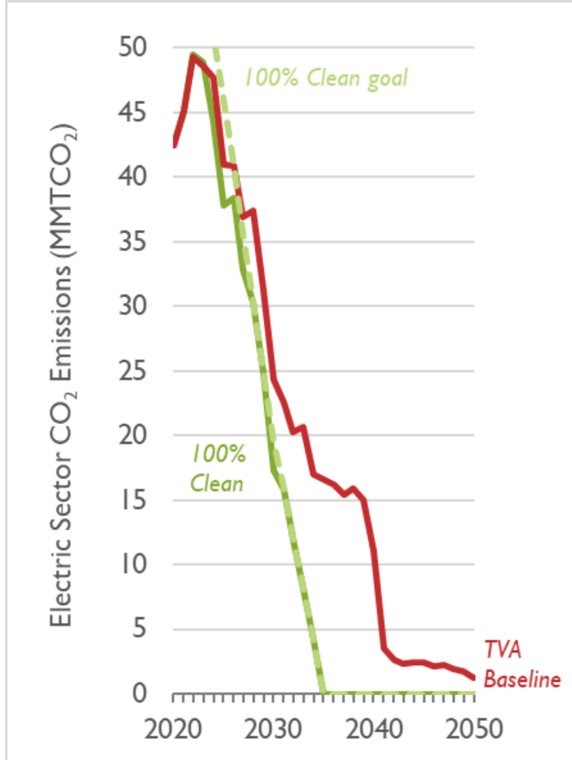
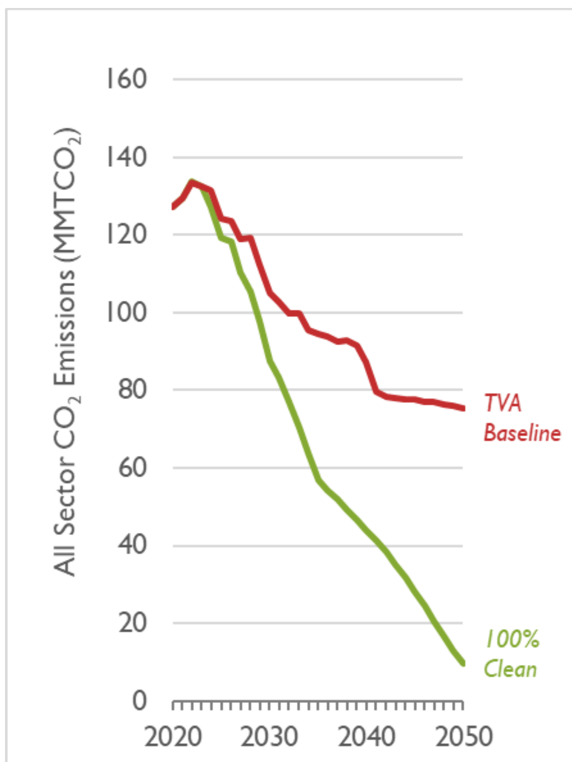


Figure 5. All sector CO_2 emissions



Annual load and generation

The TVA Baseline scenario is characterized by largely flat load over the study period, commensurate with a lack of planned electrification (see Figure 6). On the generation side, we observe coal generation decreasing during the mid-2020s, and falling to zero by 2035, in line with planned coal retirements. Generation from clean energy is relatively small until the mid-2030s, when new wind and solar plants are added to replace energy from retiring coal and gas plants. This clean energy continues to displace more and more existing fossil energy in every year. By the mid-2040s, over 95 percent of system generation is produced from non-fossil resources. By the end of the study period, about 12 percent of generation is dedicated to charging battery storage resources.

In contrast, the 100% Clean Energy scenario is characterized with relatively flat load through 2030, followed by rapidly increasing load in response to electrification (see Figure 7). By 2050, load (not inclusive of energy storage charging demands) is two times higher than present day. This increase in load is primarily met through increasing solar and wind generation, which arrives earlier (compared to the TVA Baseline scenario) in order to displace fossil fuels and meet the CO_2 reduction requirements modeled in this scenario. This solar and wind generation is balanced with substantial battery storage resources—by 2050, the charging requirements for these resources comprises 19 percent of system generation.

In the 100% Clean Energy scenario, the model relies solely on solar, wind, battery storage, hydro, and nuclear resources to successfully meet electricity demand for 16 modeled years.

Figure 6. TVA Baseline generation and load

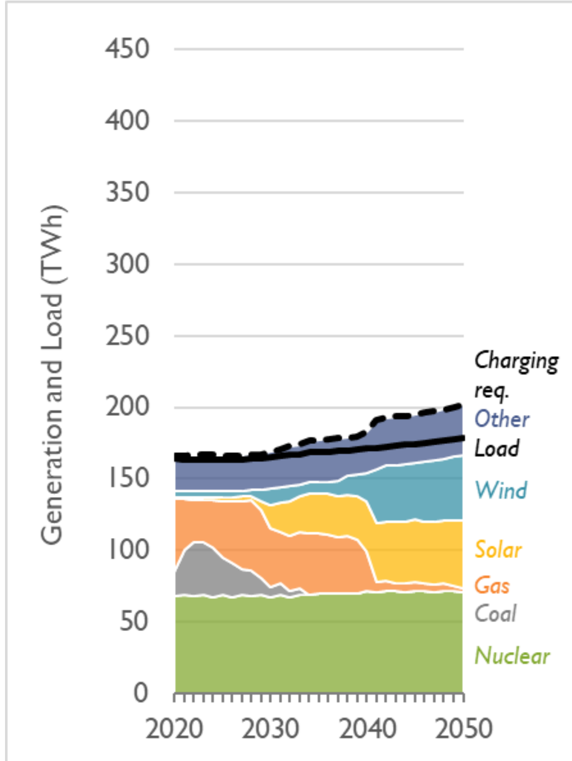
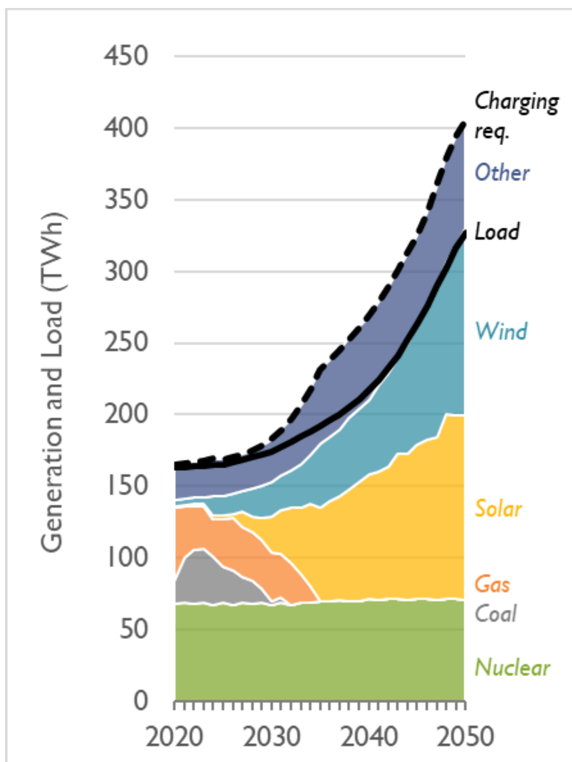


Figure 7. 100% Clean Energy generation and load



Capacity changes

In the TVA Baseline scenario, the period through the mid-2030s is marked by planned coal plant retirements, with some coal plants retiring one or two years ahead of schedule due to economic forces (see schedule of assumed coal retirement dates in Table 4). Additions of new clean energy are rare until the early 2030s, in part because of the assumed levels of low load growth. New clean energy is then added in several waves in the early 2030s, early 2040s, and late 2040s, typically occurring as renewable costs shift and these resources become more economic (see Figure 9). In the 2040s, these renewables begin to displace more and more generation from gas plants, causing those less-economic plants to retire as they are used less frequently. By 2050, 34 GW of solar is added, alongside 3 GW of distributed solar, 13 GW of wind, and 9 GW of battery storage.

The 100% Clean Energy scenario features a similar trend for coal retirements, but it has an accelerated trend for clean energy additions. Solar, wind, and battery storage are added rapidly beginning in the late 2020s, in response to this scenario's CO_2 reduction requirement (see Figure 8 and Figure 10). This same dynamic drives gas plant retirements, with all but 1 GW retired by 2035.

In all scenarios, we assumed a 5-GW maximum buildable amount independently for each new type of clean energy resource (wind, utility-scale solar, and utility-scale battery storage), meant to reflect limitations in in resource construction and supply chains. We found that

Table 4. Coal unit retirement assumptions

Unit Name	Nameplate Capacity (MW)	Assumed Retirement Date
Bull Run 1	870	December 2023
Cumberland 1	1239	December 2026
Cumberland 2	1231	December 2028
Kingston 1	132	December 2026
Kingston 2	132	December 2026
Kingston 3	132	December 2026
Kingston 4	132	December 2027
Kingston 5	174	December 2027
Kingston 6	174	December 2027
Kingston 7	174	December 2027
Kingston 8	174	December 2027
Kingston 9	174	December 2027
Gallatin 1	225	December 2031
Gallatin 2	225	December 2031
Gallatin 3	263	December 2031
Gallatin 4	263	December 2031
Shawnee 1	134	December 2033
Shawnee 2	134	December 2033
Shawnee 3	134	December 2033
Shawnee 4	134	December 2033
Shawnee 5	134	December 2033
Shawnee 6	134	December 2033
Shawnee 7	134	December 2033
Shawnee 8	134	December 2033
Shawnee 9	134	December 2033
Shawnee 10	124	December 2033
Paradise 3	971	Retired in 2020
Red Hills Generating Facility	440	December 2031

Notes: The assumed retirement dates of the Cumberland units are intended to reflect the uncertainty in TVA's retirement announcement known at the outset of this modeling project (i.e., the units would retire as early as 2026 and no later than 2030). The assumed retirement dates of the Kingston units also reflect the uncertainty of TVA's announcement (3 units as early as 2026, but no later than 2031, and the remaining 6 units as early as 2027, but no later than 2033). The Red Hills Generating Facility is a PPA which is assumed to expire in December 2031.

this assumed 5-GW cap is sometimes binding for wind in the 2040s. Wind capacity is added throughout the study period, reaching 41 GW in 2050. On average, 1.5 GW of wind is built per year. Just 6 percent of wind additions are in the TVA footprint, highlighting the advantages of procuring wind power from outside the Valley. This is in spite of accounting for the cost of new transmission lines outside the region (totaling $45 billion in the 100% Clean Energy scenario). Together, these new lines facilitate over 130 TWh of wind from outside of the Valley.

Solar capacity additions occur in every single year after 2025, with the 5-GW cap being frequently binding, and 4 GW built per year on average. Throughout the study period, 2 GW of battery storage is built per year for a total of 46 GW. One-quarter of this is 50-hour storage, which is almost all built after 2040.

Figure 8. Clean energy additions in the 100% Clean Energy scenario

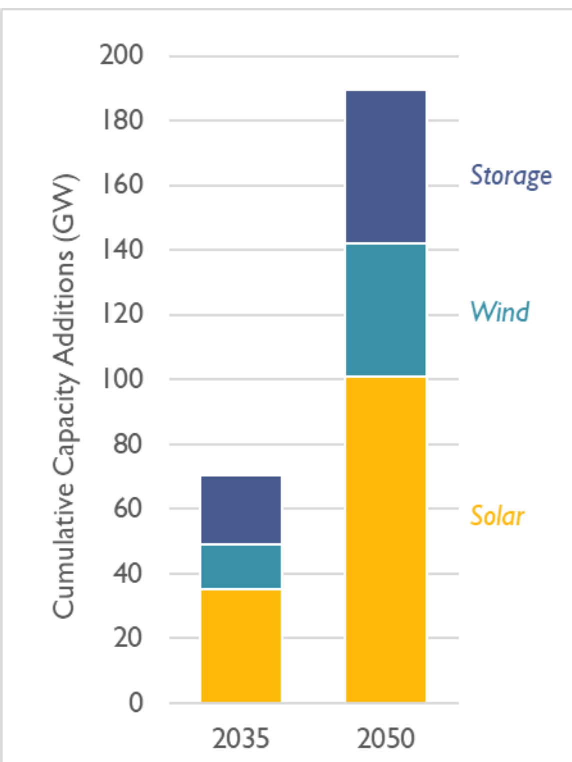


Figure 9. TVA Baseline additions and retirements

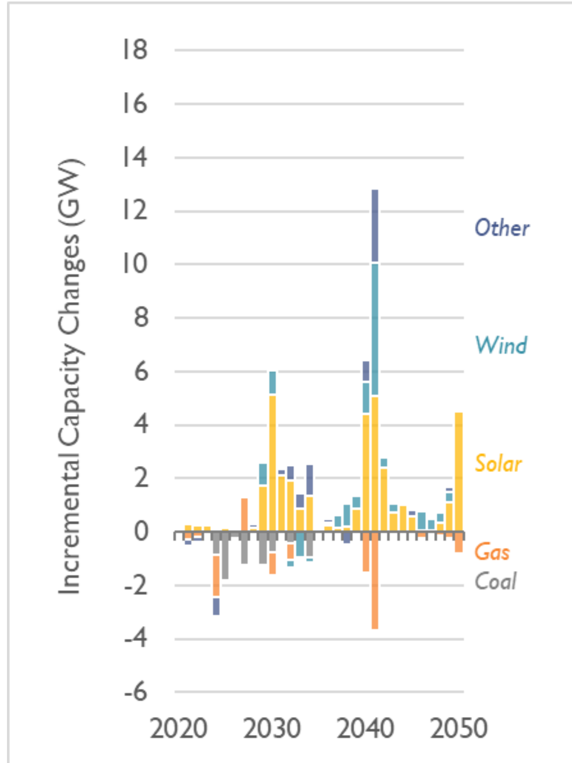
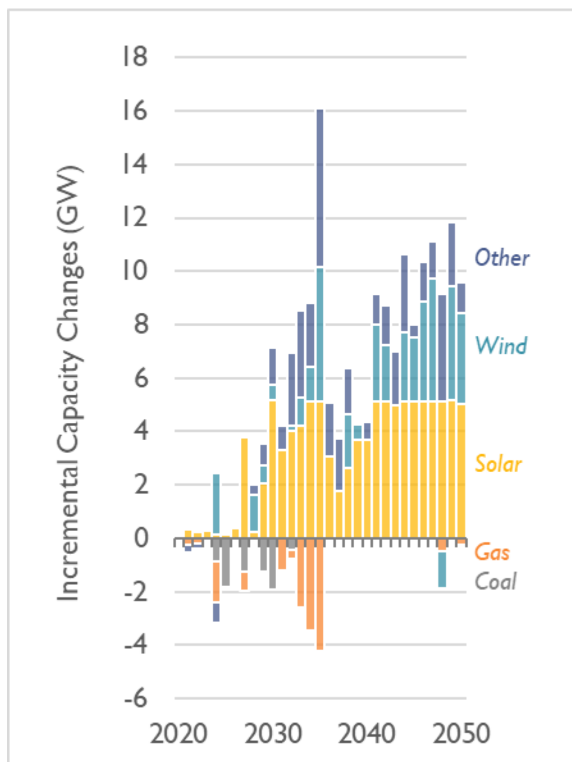


Figure 10. 100% Clean Energy additions and retirements



Firm capacity

The TVA Baseline assumes present-day TVA reserve margins remain static through 2050. In other words, this scenario assumes that today's 25 percent reserve margin for winter months and 17 percent reserve margin for summer months persists through the future.

In contrast, the 100% Clean Energy scenario assumes that TVA moves to a year-round reserve margin of 17 percent beginning in the winter of 2024/2025. In our view, TVA currently relies on an inflated winter reserve margin, as its own analysis suggests that it needs a greater energy reserve in the winter to meet potential winter demand issues. We believe that TVA's winter reserve margin is inflated because (1) winter heating is largely driven by inefficient electric resistance systems, which create large and immediate power draws and leave TVA susceptible to potential demand issues, and (2) TVA's thermal resources, like all thermal resources, are not 100 percent dependable in the winter. Winter conditions can cause supply issues related to fuel deliverability and further decrease the performance of coal and gas generators. To compensate, TVA requires a higher level of energy reserves in winter to meet potential winter demand.

Our 100% Clean Energy scenario shifts away from this paradigm. As we electrify demand-side resources, highly efficient electric heat pumps replace inefficient electric resistance heating, thereby reducing winter peak demand issues. Secondly, an increase in renewable resources increases grid reliability. Wind resources have high contributions in winter months, and solar often ramps up in the morning to meet midday peaks. Regardless, in order to be conservative, both scenarios assume the same set of today's assumptions for capacity contributions (see Appendix A for further detail about these assumptions).

We observe that both scenarios safely meet reserve margins in every year, for both seasons (see Figure 11 and Figure 12). In addition, we observe that the summer reserve margin constrains the model and drives resource additions from about 2025 through 2030 as coal plants retire. In the TVA Baseline scenario, from 2030 on, the winter reserve margin constrains the model. This occurs as solar becomes a dominant new type of resource addition and features only a very small winter capacity contribution of 1 percent, causing the model to build additional capacity (typically storage resources) to meet the firm capacity requirements.

Meanwhile, in the 100% Clean Energy scenario, after the mid-2030s both winter and summer requirements cease to constrain the model, meaning the importance of firm capacity (as the metric is designed today) fades. This occurs as the model builds more variable-dispatch wind and solar and more storage. During this period, the model is increasingly focused on complying with multi-day energy requirements, rather than a single seasonal peak. This highlights the increasing need to reconsider conventional approaches for planning for capacity requirements in light of an increasingly changing electricity system.

Figure 11. Winter firm capacity and reserve margins

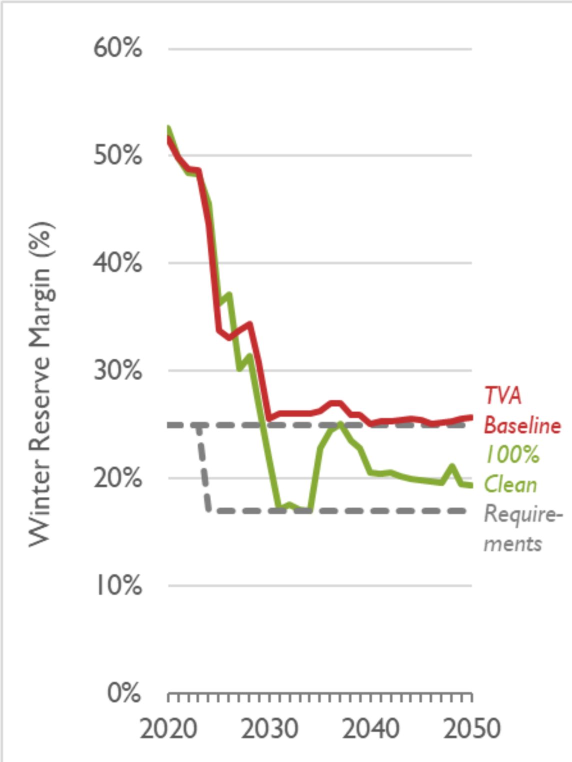
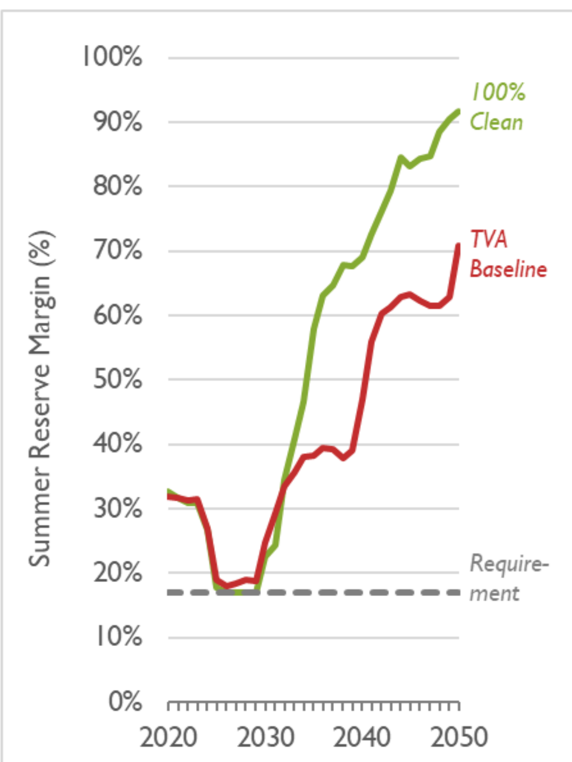


Figure 12. Summer firm capacity and reserve margins



Our analysis suggests the least-cost approach for TVA to both meet customer demand and decarbonize avoids the construction of new fossil resources. Contrary to this, TVA recently approved a proposal to replace the retiring Cumberland plant with a new, 1,450-MW gas plant. Coincidentally, our TVA Baseline scenario, a scenario which represents a future in which TVA does not adhere to its decarbonization targets, builds 2,100 MW of new gas in the 2026–2027 timeframe. While this does not explicitly represent the Cumberland replacement (or replacements of any other retiring coal facilities) this fossil addition acts as an interesting proxy for TVA's proposal. This scenario, which slows the deployment of clean energy resources in lieu of new gas-fired capacity, results in overall higher economy-wide costs, and delays critical years of new clean energy deployment.

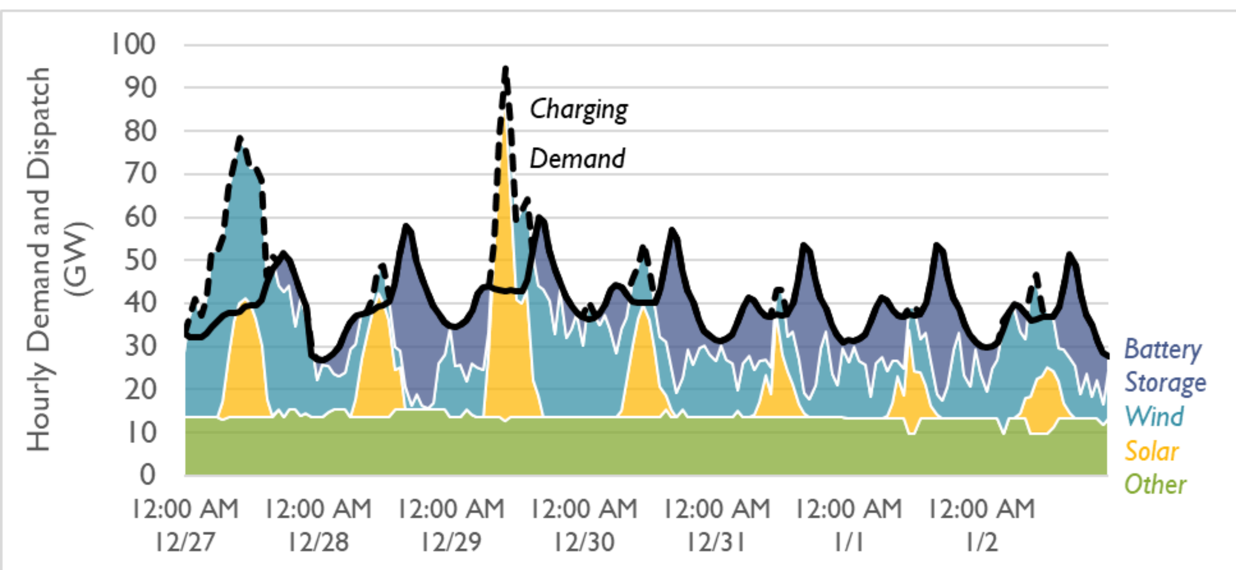
Reliability

For long-term economic planning, Synapse used a capacity expansion modeling approach that condenses each modeled month into a single week and models time in 3-hour slices. This approach accurately models dynamic grid conditions while managing total runtime and computing resource needs. For all modeled capacity expansion runs, modeled portfolios met total load across the entire time period, 2020–2050, with no unserved energy or loss of load events.

To confirm the reliability of the modeled portfolios, Synapse conducted more granular analysis of the performance of modeled scenarios in 2050 over 8,760 hours. While the modeled portfolios met planning reserve margin requirements in all periods, the 2050 supplemental analyses identified a limited number of potential loss-of-load events in the 100% Clean Energy scenario in 0.02 percent of all load-hours. To provide additional resource adequacy, Synapse added an additional 1.5 GW of long-duration energy storage resources, which were sufficient to avoid any unserved energy identified by the supplemental modeling. This report reflects these supplemental storage resources in cost and capacity results throughout. Figure 13 shows hourly dispatch of renewables, energy storage, and other resources in a severe winter week in 2050 with high demand and low renewable generation. Energy storage resources charge during high-renewables periods and discharge to meet load in every hour of the week. Notably, energy storage resources also rely on stored energy accumulated before this week, which is replenished in later weeks with less net load.

Synapse modeling showed that a combination of zero-emissions resources can provide affordable and reliable service, but conventional reserve margin approaches alone might not be well suited to the reliability challenges of the future. Future IRPs should include a comprehensive view of system reliability, including correlated outages, weather patterns, and regional capacity sharing.

Figure 13. Hourly generation by resource, 100% Clean Energy Scenario, December 27, 2050–January 3, 2051



Notes: "Other" includes generation from nuclear, hydro, demand response, and other miscellaneous resources.

System costs

Wholesale electric system revenue requirements for both scenarios remain similar until the late 2030s at about $5 billion. (Costs are higher in the early 2020s due to assumed high gas prices in the near term.)

The TVA Baseline scenario features mostly stable electric system costs. This is despite a shift away from generation sourced from fossil fuels and towards a future that relies on non-emitting sources for almost 100 percent of electricity generation by 2050. After an initial period of high gas prices, costs per MWh remain relatively flat at about $30 per MWh, and gradually decline as more clean energy is added.

In contrast, the 100% Clean Energy scenario features electric system costs that gradually trend upward to about $9 billion per year by 2050, or 73 percent higher than costs in the TVA Baseline scenario. These higher costs are driven by increased electrification, which necessarily requires the construction and operation of new grid resources. Importantly, these increases are *not* born out in cost-per-MWh terms, with this scenario's cost of providing electricity on a per-MWh basis being similar to or even lower than the TVA Baseline scenario. This is not unexpected given the relative similarity of new resource types being added to the grid in both scenarios.

Critically, "revenue requirements" defined here are only inclusive of fuel, variable, and fixed costs, as well as property taxes, book depreciation, allowed return, and other miscellaneous costs. They do not include other costs or savings related to decarbonization, many of which contribute to lower expenditures outside the electricity sector.

Figure 14. Wholesale electric system revenue requirements

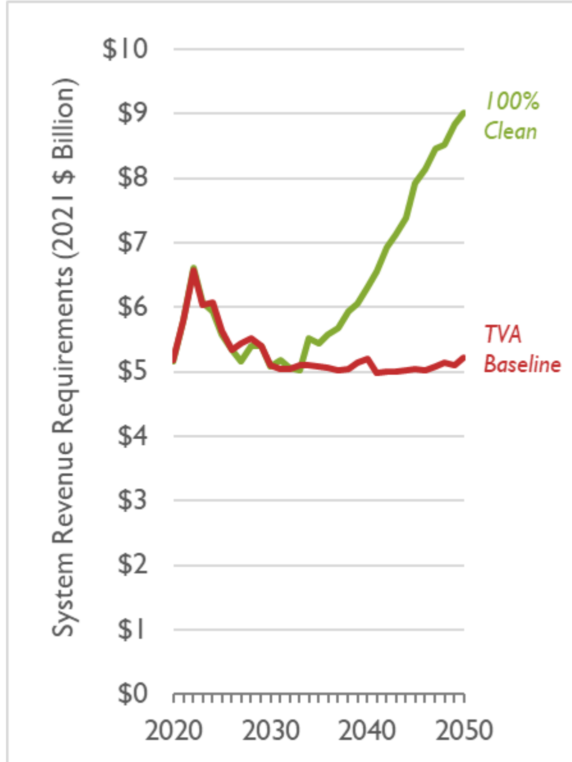


Figure 15. Wholesale electric system revenue requirements per MWh

While electricity system costs are projected to rise in the 100% Clean Energy scenario, these cost increases must be assessed within the context of the wider economy. Table 5 displays the cost differences between the 100% Clean Energy and TVA Baseline cases, with particular focus on 2035, 2050, and all differences accumulating over study period.

Table 5. Single-year and cumulative net costs, 100% Clean Energy versus TVA Baseline (2021 $ billion)

	2035	2050	Cumulative
Electric system	-$1.2	-$4.6	-$53.9
Buildings	$0.0	$0.6	$9.2
Transportation	$8.1	$22.0	$277.2
Other	$0.1	$3.9	$23.0
Net savings	**$7.1**	**$21.8**	**$255.6**

Note: Positive numbers are savings while negative numbers are costs. "Electric system" includes wholesale energy costs, and programmatic and participant spending on energy efficiency and distributed generation resources. "Buildings" includes the costs and savings related to switching residential and commercial to efficient heat pumps and electrifying all remaining end uses, inclusive of avoided fossil fuel expenditures. "Transportation" includes the costs and savings related to consumers switching from conventional internal combustion engine vehicles to EVs, including avoided fossil fuel expenditures, as well as the cost of building out charging infrastructure for EVs. "Other" includes fuel savings related to electrifying the industrial sector but does not include the costs of electrification itself.

We observe that while electric system costs are substantial, these are more than offset by savings from the clean energy transition outside the electric sector. For example, non-electric fuel savings tally almost $240 billion over the study period. These savings are over seven times larger than the additional costs resulting from ambitious electrification and clean energy deployment. These non-electric fuel savings are largely related to a reduced reliance on fossil fuels for heating and transportation, with lower motor gasoline and diesel demand driving about 80 percent of these savings.

Other aspects of the clean energy transition impose their own costs or produce their own rewards. For example:

- An increased reliance on demand-side resources, including energy efficiency and distributed generation, adds about $21 billion in cumulative costs.[23] However, these resources avoid increased reliance on utility-scale resources, playing a critical role in decreasing land-use impacts and diversifying TVA's resource portfolio.
- Outside of motor gasoline and diesel savings, the switch to EVs is projected to save $82 billion cumulatively. This is because, while EVs are assumed to be more expensive than internal combustion engine (ICE) vehicles initially (not including tax credits), starting in about 2035 EVs are assumed to be lower in upfront cost. Most EVs are deployed after 2035, leading to decreased costs overall. In addition, throughout the study period, EVs are assumed to have lower operating and maintenance costs than ICE vehicles, producing further savings. Finally, we assumed that almost 470,000 EV chargers are

[23] This is inclusive of both participant and programmatic costs for both energy efficiency and distributed generation.

built by 2050 to accommodate the millions of new EVs in TVA's service territory. Using the National Renewable Energy Laboratory's (NREL) EVI-Pro Lite model, we estimated the cost of these chargers to be about $3.4 billion, cumulatively. However, these costs are more than offset by cheaper vehicles and lower operating and maintenance costs, leading to lower motor vehicle costs overall.

- We estimated that building electrification poses a small increase in costs, largely due to heat pumps being assumed to be more expensive than conventional HVAC equipment. This takes into consideration tax credits for heat pumps through the early 2030s as a result of the IRA but assumes that these tax credits disappear and that heat pump equipment remains more expensive than conventional HVAC equipment throughout the remainder of the study period.

When all of these factors are taken into account, the electric system costs of a clean energy transition are dwarfed by the potential economy-wide savings. TVA's service territory stands to save over $255 billion over the study period if it were to follow a trajectory like that shown in the 100% Clean Energy scenario. While our net cost calculation did not account for other transition costs such as the cost of new transmission or distribution within TVA and the cost (and savings) of industrial electrification, these unaccounted-for costs would need to exceed $255 billion in order for the 100% Clean Energy scenario to be uneconomic.

Finally, the net savings shown here do not include savings due to improved public health or savings associated with the social cost of carbon (see page 30).

Rate impacts, bill impacts, and energy burden

In a clean energy future, electricity customers will likely experience a change in electricity rates and bills due to several factors:

- Many customers will consume more electricity as they shift away from fossil fuels for heating or transportation purposes, and increasingly rely on electricity for all energy purposes. This increase in electricity consumption may be lessened by the presence of energy efficiency measures or more efficient electric appliances.

- Both clean energy requirements and increased electricity demand due to electrification will contribute to an increased buildout of clean energy resources. This will increase the cost of running the electricity system relative to a scenario where no such resources are needed due to flat electricity consumption). However, increased consumption of electricity does not necessarily mean customers' electricity rates will increase in tandem. Electricity rates even have the potential to decrease if electrification results in a switch to less expensive resources or better utilization of electricity infrastructure.

- It will be important for TVA and local power companies to closely evaluate the drivers of these costs and allocate the costs accordingly in order to avoid cost-shifting among customers.

For this study, we evaluated the increase in system costs (relative to today) in each scenario. We then allocated the increase in costs to the residential, commercial, and industrial sectors in line with each sectors' increase in electricity consumption. In the 100% Clean Energy scenario, we observe that residential and commercial customers experience an increase in electricity consumption of about 60 percent per customer, whereas industrial customers experience an increase in electricity consumption of about 175 percent per customer.[24] Importantly, the cost of increases in electricity consumption are offset by decreases in the end-use consumption of fossil fuels, and all costs related to this (see Table 5, above).

As a result of costs and usage increasing at nearly the same rate, we observe that overall electricity rates remain relatively consistent across time and between the two scenarios. Table 6 demonstrates the modeled electricity rates in 2020, 2035, and 2050. On a simplified, dollar-per-kWh basis, we observe that electricity rates in the 100% Clean Energy scenario either remain flat or slightly decrease over time. We note that this is in line with TVA's priority to reduce electricity rates.

Table 6. Modeled electricity rates, bills, and energy burden

	2020	2035		2050	
	Actual	*TVA Baseline*	*100% Clean Energy*	*TVA Baseline*	*100% Clean Energy*
Electricity rates (2021 cents/kWh)					
Residential	11.4	10.7	9.0	9.7	8.0
Commercial	10.9	10.6	9.8	10.4	7.7
Industrial	4.4	4.3	4.4	4.2	3.3
Monthly electric bill (2021 $/customer)					
Residential	$131	$131	$141	$129	$149
Energy burden (% of household income)					
Residential	7%	7%	5%	6%	3%

Notes: "Actual" electricity rates for 2020 are based on data reported to EIA Form 861 (available at https://www.eia.gov/electricity/data/eia861/) for TVA and all local power companies in TVA's service territory. For the purposes of this analysis, rates are analyzed in a highly simplified way—in reality, rates and rate structures for customers across TVA's service territory may differ widely, with some customers utilizing rates that include fixed costs, demand costs, or other more complex rate approaches.

However, Table 6 shows that for residential customers, 2050 monthly bills in the 100% Clean Energy scenario increase by 13 percent.[25] Although the electricity system is used more efficiently, and costs are allocated according to increases in electricity consumption, an overall increase in electricity consumption leads to increased bills.

[24] In this analysis, we assumed that residential and commercial customer counts also increase at the same pace as electrification. We assumed that the number of industrial customers remains constant.

[25] Rate increases for residential customers could be tempered by local power companies deploying rate structures that align consumption with grid needs (e.g., time-of-use rates). Electricity bills are not calculated for customers in the commercial and industrial sectors due to the fact that electricity consumption by customers in these sectors can differ substantially.

Critically, electricity bills are just one part of the equation. At the same time, as residential customers begin to pay more for their higher electricity consumption, they also reduce their spending on fossil fuels. Avoiding spending on inefficient fossil fuels for home heating, water heating, and transportation leads to an overall reduction in household energy costs. Energy burden is a common metric used to assess how much typical households spend on their energy costs as a share of their household income. Per U.S. Census' American Community Survey (ACS), the typical household in TVA's service territory has a median income of about $56,100 per year.[26] If we assume this median household income remains unchanged through 2050, Table 6 shows that energy burdens decrease over time in the 100% Clean Energy scenario, from about 7 percent today to merely 3 percent in 2050.[27] This halving in energy burden is in large part due to a switch away from inefficient spending on fossil fuels, including motor gasoline. Furthermore, a reduction on fossil fuel use (and associated spending) will lead to more money staying in the Tennessee Valley rather than going to companies involved in fossil fuel extraction outside the Valley. We quantify these impacts, as well as other job impacts, in the following section.

Job impacts

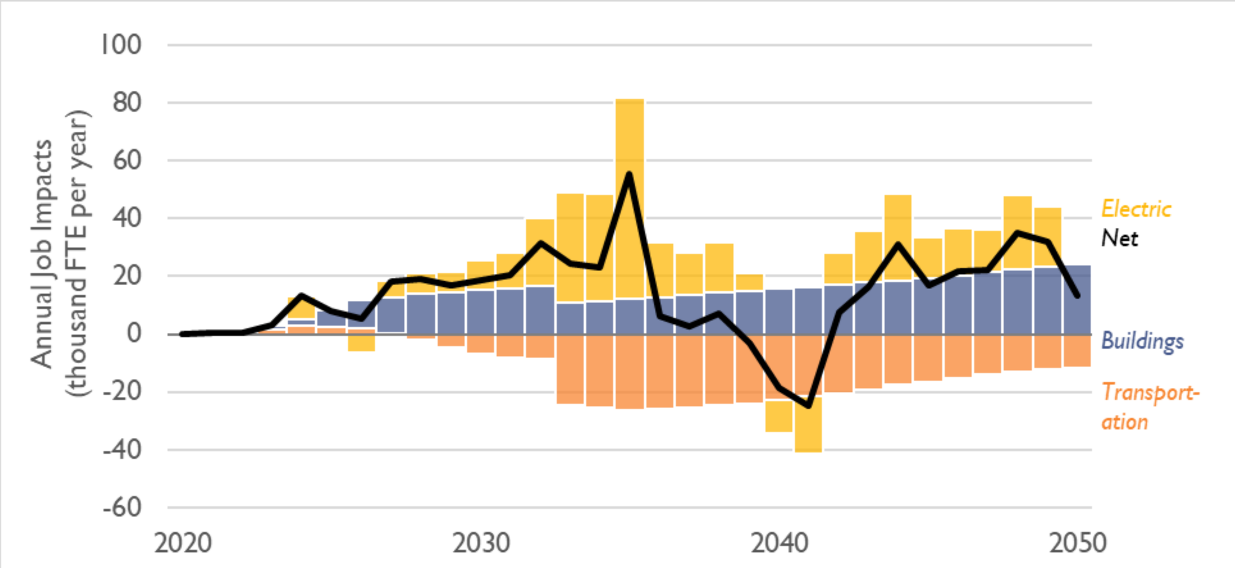
A transition to clean energy is poised to create thousands of jobs in the Tennessee Valley, echoing one of the original purposes of TVA. Using data from the IMPLAN model, we estimated the annual impacts on jobs resulting from the 100% Clean Energy scenario, relative to the TVA Baseline scenario.[28] Figure 16 shows that over the study period, TVA's service territory stands to gain an average of 15,600 full-time-equivalent (FTE) jobs in each year. Job impact estimates include those related to initial construction; ongoing fueling, operation, and maintenance (O&M); and respending.

[26] County-level household income data from the 2020 5-Year ACS estimate is available at https://data.census.gov/cedsci/table?t=Income%20%28Households,%20Families,%20Individuals%29&g=0100000US%240500000&tid=ACSST5Y2020.S2503.

[27] This calculation of energy burden is inclusive of electricity expenditures, fossil fuel expenditures, and energy efficiency and distributed generation participation costs. Per energy burden convention, it is not inclusive of expenditures on new end-use equipment, such as new (or avoided) HVAC equipment or vehicles.

[28] For more information on the IMPLAN model, see https://implan.com/.

Figure 16. Job impacts from the 100% Clean Energy scenario, relative to the TVA Baseline scenario



We calculated job impacts based on two primary inputs: the amount of money spent on a particular activity in a given year, and the jobs associated with spending money on that activity (a "job factor"). Each modeled sector sees different drivers for job impacts. In the electric sector, we projected an additional 14,700 full-time positions on average in each year. Large increases in employment in individual years are linked to in-region construction of solar, battery storage, and energy efficiency resources, as well as transmission construction needed to facilitate out-of-region wind purchases.[29] The IRA also plays a role in lowering the cost of many renewable resources, thereby creating jobs at a higher rate per million dollars spent by TVA residents. Still, a small number of jobs are lost due to a transition away from fossil fuels—these jobs are few in number, in part because modern gas plants employ relatively few people, and because large, older coal plants are assumed to retire in both scenarios. Jobs also decrease as a result of increased spending—consumers are likely to spend more money on electricity in a clean energy future (and less on other fuels), reducing their opportunities to use that money for other purposes and stimulate job growth. These job decreases are included in the "Electric" component of Figure 16.

In the buildings sector, we observe an additional 15,800 job-years per year. This is because we assumed that heat pumps are more labor-intensive to install than conventional HVAC systems (in other words, for every $1,000 spent on a heating system, more of that money will go to on-site labor for a heat pump installation, relative to a conventional fossil-fuel-powered furnace). Our calculations account for the total cost of a heat pump installation. For example, our employment results reflect the increased labor associated with installing higher capacity electric panels for houses that transition to electric heating. Avoided fuels are also a large job generator—every dollar not spent on purchasing natural gas or other

[29] Several years that appear to have zero or negative job additions under the electric sector are due to the TVA Baseline scenario having similar or slightly larger job additions than the 100% Clean Energy scenario.

fossil fuels for heating means more money in the pockets of consumers, who then stimulate job growth with increased spending in the wider economy.

The transportation sector is the only sector where our analysis found consistent job losses. This is due to two reasons: first, EVs require fewer expenditures on maintenance and operation compared to conventional gasoline- and diesel-powered vehicles, leading to a decrease in jobs. Second, relying on the latest data from Argonne National Laboratory, we estimated that the typical EV will be cheaper than the typical ICE vehicle starting around 2030 (not accounting the impacts of tax credits in the IRA).[30] Most EVs sold in the study period are sold after this date, leading to an overall reduction in the amount of money spent on new vehicles in the 100% Clean Energy scenario. This reduced spending on vehicles, combined with an assumption that a greater share of EV parts are made outside of TVA than are conventional vehicle parts, leads to an overall reduction in transportation-sector jobs. This is in spite of reduced spending on motor gasoline and diesel, which results in more money for consumers. As with the buildings sector, much of this money is then re-spent in the wider economy, creating new jobs. This trend is amplified by tax credits available under the IRA, which are assumed to put more money in consumers' pockets through 2032.

According to data from the Bureau of Labor Statistics, TVA's service territory has about 4.7 million jobs.[31] An increase in full-time employment of 15,600 positions represents an increase of about 0.3 percent.

Caveats to job impacts

The above job impacts are predicated on an assumed methodology and set of inputs.

- All job factors used in this analysis are static snapshots of Tennessee's economy as it existed in the recent past.[32] These may change in the future, with corresponding impacts on jobs. For example, should Tennessee and other parts of the Tennessee Valley become hubs of EV manufacturing (as is planned by TVA and others, for example), net impacts to jobs could be even more positive than are currently calculated.[33]

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[30] Burnham, A. et al. *Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains*. Argonne National Laboratory. April 2021. Available at https://publications.anl.gov/anlpubs/2021/05/167399.pdf.

[31] U.S. Bureau of Labor Statistics. *Local Area Unemployment Statistics*. Accessed December 2022. Available at https://data.bls.gov/timeseries/LASST470000000000005?amp%253bdata_tool=XGtable&output_view=data&include_graphs=true.

[32] IMPLAN is typically run for individual states. For this analysis, we assume that job factors in Tennessee are representative of job factors in the wider TVA service territory.

[33] "Ford aims to create 5,700 jobs with new factory, battery plant near Memphis" *The Tennessean*. September 27, 2021. Available at https://www.tennessean.com/story/money/business/development/2021/09/27/ford-electric-vehicles-memphis-regional-megasite-new-jobs/5884664001/; "TVA Accelerates Nation's Decarbonization Efforts, Fuels a Clean Energy Economy." Press Release. TVA. May 11, 2022. Available at https://www.tva.com/newsroom/press-releases/tva-accelerates-nation-s-decarbonization-efforts-fuels-a-clean-energy-economy.

- Our analysis included calculations of direct, indirect, and induced jobs. In other words, our analysis included job impacts at the resources or facilities themselves, upstream impacts related to development of components for the resources or facilities, and other ripple effects in the economy related to respending energy bill savings and other effects.
- Our analysis focused on impacts in TVA's service territory only. It did not account for positive or negative impacts that accrue outside of TVA. For example, construction jobs associated with building out-of-region wind that provides electricity to TVA were not included.
- Our analysis did not account for industrial job impacts due to a lack of available cost information and job vectors. Because this activity is likely to require a large amount of local capital investment, we expect that it would produce net positive jobs.

Other impacts

A transition to clean energy in TVA's service territory has many other benefits beyond the purely economic. This section describes benefits related to public health, social cost of carbon, water use, and coal ash. This section also includes a discussion of potential land-use impacts related to a clean energy transition.

Public health and social cost of greenhouse gases

Burning fossil fuels produces hazardous air pollution. The combustion of fossil fuels (including coal, gas, gasoline, diesel, among others) and biomass results in the formation of pollutants like SO_2, NO_X, PM, VOCs, and NH_3. These pollutants are released into the atmosphere from a power plant's smokestack, a car's tailpipe, or a home or business' chimney. These pollutants may then be dispersed over a wide area, or stay locally. Eventually, they may find their way into a person's respiratory system where they may cause health impacts related to asthma, heart conditions, or even premature death.

Using the COBRA created by U.S. Environmental Protection Agency, we calculated the health impacts of phasing out fossil fuels in the 100% Clean Energy scenario, relative to the TVA Baseline scenario.[34] Table 7 summarizes these results. We see that over the entire study period, phasing out fossil fuels leads to over $27 billion in public health benefits realized nationwide. About 90 percent of benefits are due to reductions in criteria air pollutants outside the electric sector (e.g., from cleaner cars, buildings, and industry). Within the electric sector, both the 100% Clean Energy and TVA Baseline scenarios are very similar in terms of criteria pollutant emissions—both feature coal retirements that occur on about the same schedule, and both scenarios reach zero emissions at some point in the study period. In other words, even without substantial electrification, by switching to clean energy TVA can reduce its impact on the health of those living in its service territory. But by planning for a high electrification future, these public health benefits stand to be much greater.

[34] More information on COBRA can be found at https://www.epa.gov/cobra.

Table 7. Public health benefits related to phasing out fossil fuels

	2035	2050	Cumulative (2020–2050)
Benefits (2021 $ B)	$0.6	$2.4	$26.6

Next, Table 8 summarizes the benefits related to the social cost of carbon. The social cost of greenhouse gas is a “damages” calculation that describes the amount of harm avoided from reducing the emissions of greenhouse gases, as these gases contribute to catastrophic climate change. We found that over the study period an accelerated clean energy future avoids over $265 billion in damages related to greenhouse gas emissions.

Table 8. Social cost of greenhouse gas benefits related to phasing out fossil fuels

	2035	2050	Cumulative (2020–2050)
Benefits (2021 $ B)	$9.8	$21.1	$265.2

Water use

As a result of fossil plant retirements, water use in TVA’s service territory drops by about one-third. In particular, water withdrawals fall from about 3.2 trillion gallons in 2020 to about 2 trillion gallons in the early 2030s, when the last coal plants retire.[35] Water withdrawals hold at about 2 trillion gallons through 2050, as a result of nuclear plant operation. Meanwhile, water consumption (i.e., water that is withdrawn and not returned to the water source) falls by about one-half: after fossil and coal generation cease in 2035, we estimate an ongoing annual water consumption of about 11 billion gallons from the nuclear plants in every year from 2035 to 2050.

Coal ash

According to data from EIA, almost 90 percent of ash produced in TVA’s service territory comes from just two coal plants: Cumberland and Red Hills Generating Station (a plant located in Choctaw County, Mississippi, with which TVA has a PPA). About 80 percent of this coal ash is used for productive purposes; the plants dispose of the other 20 percent. The modeling assumed that Cumberland retires in 2026 and the Red Hills PPA ends in 2031. As a result, by 2032, coal ash production for all of TVA’s service territory falls by 90 percent, relative to today. Some ash production continues (at rate of about 9 thousand tons per year) from biomass facilities until these plants retire. By 2035, the requirement for TVA to procure electricity only from non-emitting facilities causes the production of coal ash to cease entirely.

[35] We note that there are some differences in the reported historical values for water use and coal ash in this report, relative to the historical values reported in the 2019 TVA IRP. All values reported in this analysis are based on publicly available data from EIA. Values in the 2019 TVA IRP may include water use and coal ash data for some plants that do not have data reported to EIA.

Land use

TVA's service territory encompasses an area of roughly 60 million acres, of which 293,000 acres are directly managed by TVA.[36] This does not include additional land area that currently hosts TVA's fossil-fired and nuclear power plants. In the 100% Clean Energy scenario, we estimated an increase in the demand for land needed to host the required solar, wind, and storage generating plants. Table 9 describes the distribution of capacity for the scenario, by resource type and region.

Table 9. Geographical distribution of renewable capacity, 100% Clean Energy scenario

	2035	2050
Wind	**14.0**	**41.2**
In TVA	*1.8*	*2.3*
Outside TVA	*12.2*	*38.9*
Solar	**35.0**	**101.0**
In TVA, distributed	*2.4*	*4.4*
In TVA, utility-scale	*32.6*	*96.6*
Outside TVA, utility-scale	*0.0*	*0.0*

Figure 17 compares the size of TVA's service territory to that of a number of existing land uses, alongside the land-use requirements of in-Valley resources, in a clean energy future.[37] We note the following:

- In-region wind land use is very small, relative to TVA's service territory.[38] This is due to the fact that the 100% Clean Energy scenario estimates only a small amount of in-region wind to be cost-effective, coupled with the fact that wind turbines need only impact a small amount of land immediately around the turbine footprint. The remainder of the land under the span of the turbine blades (and between turbines) can remain productive for other uses, such as livestock raising or agricultural. Land impacts associated with out-of-region wind are not shown. These would likely be 17 times larger than those shown for in-region wind but would be located in areas of the Midwest that already have a long history of installing wind turbines alongside existing agricultural uses.

[36] More information on TVA's managed area is available at https://www.tva.com/environment/environmental-stewardship/land-management/reservoir-land-management-plans.

[37] The design of this figure was inspired by Figure 30 in Denholm, Paul, Patrick Brown, Wesley Cole, et al. 2022. *Examining Supply-Side Options to Achieve100% Clean Electricity by 2035*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A40-81644. https://www.nrel.gov/docs/fy22osti/81644.pdf

[38] Land-use requirements for onshore wind are based on *Land-Use Requirements of Modern Wind Power Plants in the United States*. National Renewable Energy Laboratory. 2009. Available at https://www.nrel.gov/docs/fy09osti/45834.pdf, with an assumed factor of with an assumed factor of 333 MW_{AC} buildable per acre. This value includes direct land use impacts only (e.g., from turbine pylons and access roads).

- At 4 GW in 2050, distributed solar is projected to occupy just 4 percent of the estimated residential, commercial, and industrial rooftops available in TVA's service territory.[39] In other words, if only 4 percent of the rooftops in TVA's service territory were the site of future solar installations that would be enough to accommodate the distributed solar assumed in the 100% Clean Energy scenario. In the Ambitious DER scenario (described more below on page 37) an increased level of distributed solar (6 GW) would occupy 6 percent of rooftops.

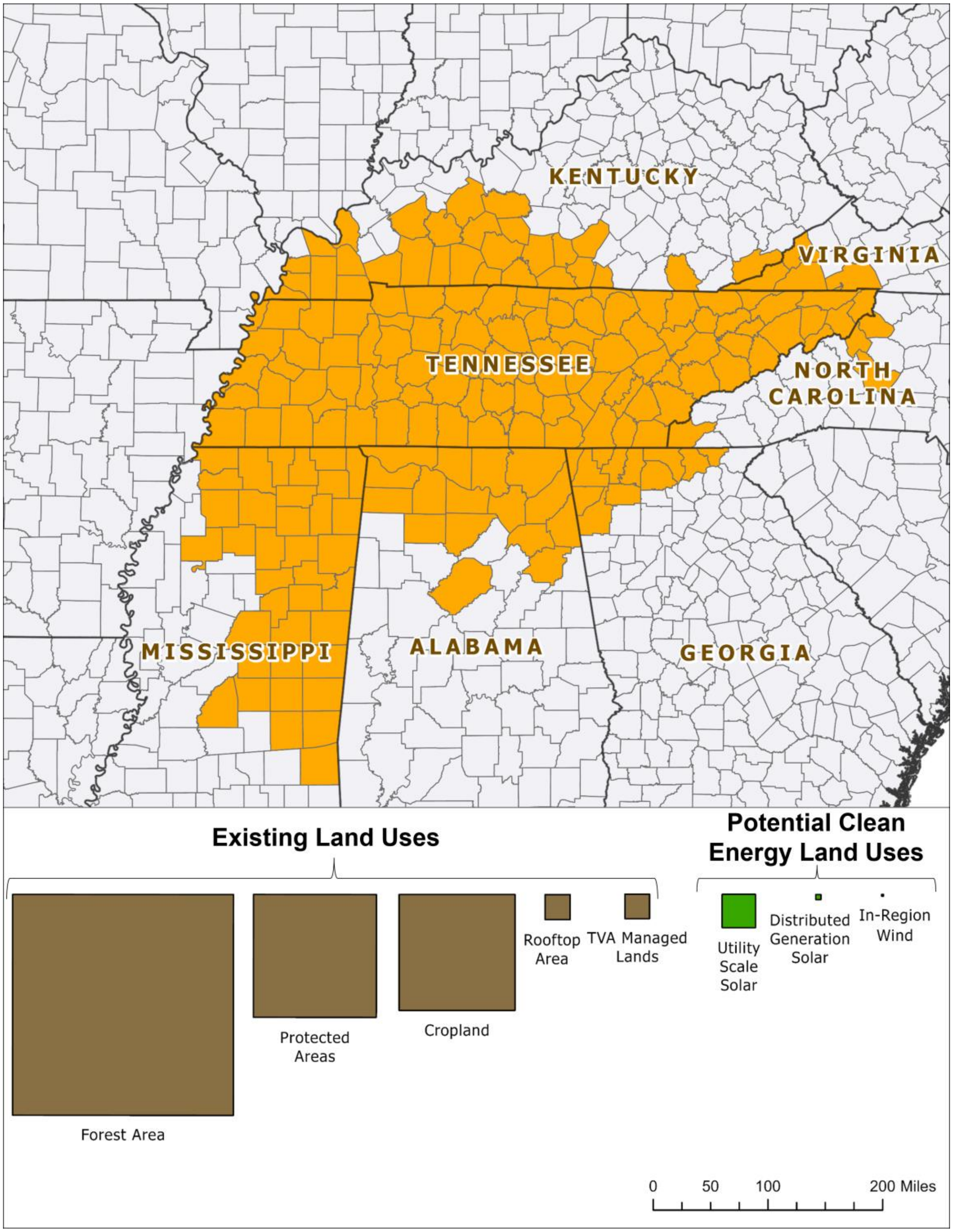
- The land requirements for utility-scale solar are the largest future land use associated with clean energy production, with about 540,000 acres being needed for utility-scale solar in 2050 in the 100% Clean Energy scenario, or about 1 percent of the entire service territory area of TVA.[40] If the 540,000 acres of utility-scale solar were allocated equally across the almost 200 counties served by TVA, each county would require 2,700 acres dedicated to solar (or about 1 percent of each county). This would also translate to about 480 MW built in each county, about 18 MW built in each county in each year from 2024 to 2050, or about two projects on the scale of the Muscle Shoals solar project in Muscle Shoals, AL built in each county over the study period. This land area impact could be mitigated by shifting a greater share of this to rooftop solar, or by prioritizing landfills, brownfields, or other locations of less-than-prime agriculture or biological diversity value. TVA could also study the areas in its service territory that are likely to harbor lower quantities of embedded CO_2 in forests and other biomes, in order to prioritize the types of land most suitable for future solar development.

- Land-use impacts for battery storage are not shown. Siting storage tends to be less controversial than solar, wind, or conventional resources because of the relatively low impact these facilities have on their surroundings (i.e., in terms of environment or aesthetics) and the less stringent siting requirements for these facilities compared to other resources (i.e., they need not occupy one large area or be located in an area with particular physical characteristics (e.g., locations that are particularly sunny or windy).

[39] Land-use requirements for distributed solar are based on *Rooftop Solar Photovoltaic Technical Potential in the United States*. National Renewable Energy Laboratory. 2016. Available at https://www.nrel.gov/docs/fy16osti/65298.pdf, with an assumed factor of with an assumed factor of 85 MW_{AC} buildable per acre.

[40] Land-use requirements for utility-scale solar are based on M. Bolinger and G. Bolinger, "Land Requirements for Utility-Scale PV: An Empirical Update on Power and Energy Density," in *IEEE Journal of Photovoltaics*, vol. 12, no. 2, pp. 589-594, March 2022, doi: 10.1109/JPHOTOV.2021.3136805. See Figure 3 and Section IV, with an assumed factor of 69 MW_{AC} buildable per acre.

Figure 17. Map of land-use requirements in the 100% Clean Energy scenario, compared with land-use requirements for existing uses



Note: Counties in yellow are counties where at least some electricity is supplied by TVA.

3. RECOMMENDATIONS FOR FUTURE MODELING EFFORTS

The 100% Clean Energy scenario modeled in this analysis is just one possible future of many. Historically, TVA's planning has not encompassed futures that are consistent with its newly stated clean energy and carbon-reduction aspirations. As this analysis shows, the transition to a clean energy future poses some challenges and results in an electric system that is very different than TVA's current system. But the benefits of such a transition stand large, indicating that TVA should make the effort to investigate this transition in its forthcoming modeling processes.

This chapter includes a sampling of questions that stakeholders may wish to ask about TVA's future modeling efforts, as well as an overview of the important issues related to clean energy planning that TVA and others should consider in these future modeling efforts.

3.1. TVA should consider its decarbonization targets in resource planning

First, any future modeling efforts by TVA should at least be inclusive of TVA's own goal of reducing greenhouse gas emissions by 70 percent by 2030, 80 percent by 2035, and reaching net zero carbon emissions by 2050.[41] These targets are in alignment with science-based goals aimed at averting the impacts of catastrophic climate change and current federal policy as set forth in the Biden Administration's executive orders. TVA planning should account for the fact that some options available to it today are at odds with its medium- and long-term goals. Building fossil plants have expected operating lifetimes of more than 25 years (such as the proposed 1,450-MW gas place replacement for the Cumberland coal plant) in the mid-2020s may preclude achievement of TVA's midcentury emission goals. As our analysis showed, even more ambitious levels of carbon reductions are possible, and with net benefits to consumers in TVA's service territory.

3.2. TVA should increase cost-effective energy efficiency investments

TVA has historically planned for only a very small amount of energy efficiency. This analysis considered a future where TVA looks to neighboring states and increases the level of energy efficiency deployed. TVA has historically been resistant to plan for increased levels of energy efficiency, with its consultants citing issues related to costs and potential pertaining to states that have been leading the charge on energy efficiency for years, rather than a region such as TVA that is still only in the nascent stages of energy efficiency deployment.[42]

[41] For more information on TVA's climate goals, see its "Carbon Report" web page, available at https://www.tva.com/environment/environmental-stewardship/sustainability/carbon-report.

[42] Concentric Energy Advisors. *Assessment of the Draft Environmental Impact Study and Response to Certain Reports*. 2022. Available at: https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-

3.3. TVA must consider electrification trends and the IRA to prepare for economy-wide decarbonization and increased demand

TVA's past modeling effort in its 2019 IRP contemplated very low levels of electrification. Next time, TVA should consider more ambitious levels of transportation and building electrification that at least reflect the adoption likely to occur with the incentives proscribed in the IRA. These include a $7,500 personal tax credit for many light-duty vehicles consumers are likely to buy, tax credits for medium- and heavy-duty vehicles that range from $7,500 to $40,000, tax credits for charging infrastructure, and tax credits for installing efficient heat pump equipment. These tax credits are likely to accelerate the current market trends that even without the IRA point to a much more ambitious level of electrification than assumed by TVA in past modeling.

In addition to modeling the likely effects of the IRA, TVA should model levels of electrification in the non-electric sectors that are consistent with its own carbon reduction goals for the electric sector. In other words, it would be most realistic for TVA to assume a zero-carbon emissions future in the electric sector happens alongside a future in which other sectors of the Tennessee Valley decarbonize (and are likely electrified).

Future electrification analyses should also examine the load shapes likely to result from this new electrification. For example, our analysis found that, on an annual basis, full electrification of the Tennessee Valley's residential and commercial sectors through efficient heat pumps is likely to produce net energy *savings* compared to a business-as-usual alternative. In other words, TVA could rely on deployment of heat pumps as an energy efficiency measure that reduces reliance on electric resistance heating, making winter peaks easier to manage.[43] This approach would yield near-term benefits, in addition to longer-term benefits related to emission reductions and associated impacts. Likewise, future modeling efforts should contemplate a range of load shapes related to vehicle electrification. As explored in the section below titled *Takeaways from the Ambitious DER scenario*, flexible loads can help to reduce electricity demand during periods of grid stress. Future technologies, such as vehicle-to-grid integration, may even go a step further by allowing EVs to act as mobile batteries that provide additional grid resources on the parts of the grid where they are most needed.

Finally, given the relatively large size of industrial energy consumption (and associated emissions) in the Tennessee Valley, we recommend that more work be done to better understand the likely trajectory that electrification might take for this sector. In this analysis, we utilized a set of assumptions that envision relatively rapid electrification to better understand impacts on the electric grid. We recommend that future modeling efforts take a closer look at individual industries or facilities and

source/environment/cumberland-fossil-plant-retirement-final-eis4eeac6f0-b6bf-4843-9881-75d19ccf8ede.pdf?sfvrsn=d61f6b6f_7.

[43] We note that future TVA analyses of electrification impacts could rely on NREL's ResStock and ComStock models (see https://www.nrel.gov/buildings/resstock.html and https://www.nrel.gov/buildings/comstock.html), which can provide even more granular data on county-level energy use.

develop a finer-grained plan of how these industries might pursue electrification, and what the associated impacts and costs are likely to be.

3.4. TVA planning processes should evaluate demand-side resources as options to mitigate grid investment and reduce total system costs

TVA's 2019 IRP envisions several different trajectories for distributed storage and solar. We recognize that the distributed solar trajectory described by TVA as "moderate" (which was used in the 100% Clean Energy scenario) is rather ambitious: 1.7 GW by 2030, and projected out to 4.4 GW by 2050 by Synapse. On the other hand, TVA could model the assumed distributed storage trajectories more realistically: the trajectory described by TVA as "moderate" (and assumed in the 100% Clean Energy scenario) has 25 MW by 2030, which has been projected out to 270 MW by 2050 by Synapse. A 2022 NREL study observes that in 2020, 960 MW of behind-the-meter storage was installed nationwide, and that this number was projected to be about 7,300 MW by 2025.[44] If 1 percent of this were installed in TVA's service territory (about equal to the TVA service territory's fraction of the nation's population) this implies 73 MW by 2025, or the level of behind-the-meter storage that TVA does not project existing until 2036. We recommend that TVA continue to review the literature on these quickly advancing technologies and model appropriate levels of distributed solar and storage in future efforts.

Takeaways from the Ambitious DER scenario

In addition to the 100% Clean Energy scenario, we modeled an "Ambitious DER" scenario to understand the possible future benefits of increased emphasis on demand-side resources. The inputs to this scenario closely resembled those used in the 100% Clean Energy scenario, with two primary differences:[45]

- **More distributed solar and distributed storage:** This scenario follows the "High" case described in TVA's 2019 IRP, rather than the "Medium" case assumed in the 100% Clean Energy scenario. This leads to an additional 1.9 GW of distributed solar and an additional 0.8 GW of distributed storage by 2050.
- **Inclusion of "flexible load" resources:** This scenario contemplates a future where newly electrified end uses are capable of flexible load-shifting. In other words, we assumed that some fraction of new end uses are able to defer load for some number of hours until it is more economically efficient for that load to be served by available generation.

[44] Cook, Jeffrey J., Kaifeng Xu, Sushmita Jena, Minahil Sana Qasim, and Jenna Harmon. 2022. *Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-83045. https://www.nrel.gov/docs/fy22osti/83045.pdf.

[45] For more detail about the assumptions used in these scenarios, see Table 3 on page 13.

The increased levels of storage and distributed storage lead to reduced levels of utility-scale versions of the same resources. But it is the inclusion of the flexible load resources that leads to the largest differences in results.

In our analysis, we assumed flexible load potential and parameters using a 2020 study from NREL.[46] Using this study, we estimated the share of newly electrified end uses that could have flexible load attributes. Specifically, we assumed that about half of the modeled flexible load is associated with EV charging, where load can be shifted by up to eight hours. One-third of the flexible load is associated with space heating and cooling, where load can be shifted by up to 1 hour. The remaining flexible load associated with transportation, industrial end uses, and non-space heating and cooling end uses in residential and commercial buildings is shiftable by between 1 and 8 hours. This scenario assumes the dispatch costs of this resource is $0/MWh, and that there are no incremental capital costs associated with implementing this flexible load. We assumed that all flexible load has only a 50 percent capacity contribution. This means that while there is 32 GW of flexible load available to be dispatched at any one time, only 16 GW may contribute to the capacity requirement. Finally, we assumed that this flexible load resource phases on over the study period consistent with the deployment of newly electrified end uses.

With these parameters, we found that flexible load acts as nearly a one-to-one replacement for the energy service from batteries, and a two-for-one replacement for the capacity contribution that batteries otherwise supply. In other words, we found that the model replaces about 16 GW of 8-hour battery storage that it otherwise builds in the 100% Clean Energy scenario. By 2050, this flexible load resource dispatches about 45 TWh, enabling the model to shift energy from periods when excess generation is occurring to periods when load is higher and generation is lower. We observed electric system savings of about $1.5 billion in 2050, relative to the 100% Clean Energy scenario. This implies dispatch payments on the order of about $30 per MWh or about $50 per kW-year. In this analysis, we decided not to assign a dispatch cost to the flexible load resource. However, in a future electric system that is highly responsive to load, grid operators would likely pay demand-side users to shift or otherwise reduce load at certain hours. Our analysis suggests that the flexible load resources reduce a substantial amount of battery storage that would otherwise be necessary to meet reliability. These savings, when translated into per-MWh figures, suggest that the “cost” of flexible load dispatch is close to $30/MWh. Further detailed analysis is required to evaluate the potential of this resource in the Tennessee Valley and the effective dispatch cost.

We recommend that TVA consider the impact of flexible load resources such as the ones described above in future modeling endeavors, as they appear to be able to substantially decrease capital-intensive resource construction and associated cost and supply chain impacts.

[46] Sun, Y. et al. Electrification Futures Study: Methodological Approaches for Assessing Long-Term Power System Impacts of End-Use Electrification. National Renewable Energy Laboratory (NREL). 2020. Available at https://www.nrel.gov/docs/fy20osti/73336.pdf.

3.5. TVA should evaluate renewables and conventional resources on equal footing

Any future modeling of the TVA service territory should place clean energy resources on equal footing with conventional resources. This includes using the latest, up-to-date information on current renewable energy costs as well as projections of future energy costs, such as those in industry-standard analyses like the *Annual Technology Baseline* published by NREL. TVA should modify these costs as necessary to reflect recent developments, such as newly passed tax credits or impacts to a resource's supply chain. TVA should apply these same considerations equally to both clean energy resources and conventional resources—for example, analyses should account for the latest data on fuel price projections and supply chain issues, some of which may lead to higher costs for these resources. These analyses should also consider realistic firm capacity contributions from existing and new fossil plants—if conventional fossil fuel plants do not have firm fuel sources, or have proven to be unreliable during recent extreme weather events, their firm capacity contributions should be decreased accordingly.

Our analysis found that when using the latest information on resource costs, inclusive of IRA impacts, the least-cost approach is invariably a switch from conventional fossil-fired resources to a future more dependent on solar, wind, and storage—even without a carbon emissions reduction requirement. This deployment is not without its challenges: our 100% Clean Energy scenario would require $45 billion of new capital investment on new inter-regional transmission lines in order to facilitate 39 GW of low-cost, high-capacity factor wind in TVA's neighboring territories.[47] However, even with these added costs, our modeling identified increased investment in these resources as key to a low-cost future for TVA.

Future modeling should also contemplate greater interconnection between TVA and neighboring regions. Prior TVA analyses have included resources in these regions, but with out-of-date information on current costs and tax credits, as well as unrealistic assumptions lacking future cost declines. Our analysis finds that when these resources are modeled with up-to-date cost information, our model seeks to build out-of-region wind resources, analyzing the high-capacity factor, low-cost, zero-emissions wind to be a perfect complement to in-region solar and storage resources. In its future modeling efforts, TVA would be well-served to look at other potential benefits of greater regional interaction among TVA and its neighboring balancing authorities. Higher levels of regional integration could help address issues related to resource curtailments or capacity shortfalls due to weather issues. We found that in the 100% Clean Energy scenario, curtailments in 2050 total almost 100 TWh, or about one-fifth of all generation. This level of curtailment is consistent with those observed in other deep decarbonization projections but could be lessened through greater regional integration or an increased reliance on flexible load resources (see section above titled *Takeaways from the Ambitious DER scenario*).

[47] All assumptions related to inter-regional transmission line costs are based on data from Denholm, Paul, Patrick Brown, Wesley Cole, et al. 2022. *Examining Supply-Side Options to Achieve100% Clean Electricity by 2035*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A40-81644. https://www.nrel.gov/docs/fy22osti/81644.pdf. We note that the level of transmission build modeled between TVA and neighboring regions in our analysis resembles the level of transmission build modeled in this NREL analysis. All transmission lines are assumed to be 500 kv AC.

Enhancing these interconnections has additional reliability benefits. During Winter Storm Elliot in December 2022, the neighboring MISO region scheduled more than 1 GW of electricity imports for a multi-day period.[48]

3.6. TVA should improve reserve margin modeling and appropriately evaluate the reliability contributions of renewables

TVA currently relies on a firm capacity construct that uses different seasonal values for summer and winter, and assumes that each resource type contributes a static portion of its capacity in each seasonal period. In our analysis, we observed that a switch to increased levels of low-cost, zero-emissions wind, solar, and storage render the current resource adequacy framing irrelevant. Rather than facing constraints at single high-demand hours, future reliability issues are likely to develop over the course of several days, when the grid is facing periods of high demand but relatively lower levels of renewable generation. As a result, future reserve margin and firm capacity requirements will likely need to be revised or overhauled entirely to reflect this new changing paradigm. For the purposes of this report, we continued to assume TVA's current approach to reserve margins and firm capacity, although we recommend that future analyses evaluate other strategies.

As described above in the *Reliability* section of *2.3 Results*, our own 8,760 hourly analysis of 2050 identified that with the assumed load and renewable load shapes, the model only faced one very short period of unserved energy (constituting 75 GWh, or about 0.02 percent of all load hours). We presume that there will be numerous tools to avoid potential unserved energy in 2050, including battery storage, flexible load resources, and regional integration. This type of analysis requires detailed, unit-specific stochastic reliability modeling beyond the scope of this analysis. While our analysis is technically rigorous and evaluates appropriate operating standards, because of the uncertainty out to 2050, further reliability analysis is required to evaluate other potential reliability issues.

Regardless of this fact, uncertainty of the technical limitations of operating a 100 percent clean energy system in 2050 should not be reason to limit today's deployment of critical solar, wind, and storage resources, particularly when wind and solar currently constitute less than 5 percent of TVA's operational capacity. Future IRPs should include a comprehensive view of system reliability, including correlated outages, weather patterns, and regional capacity sharing.[49]

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[48] *Overview of Winter Storm Elliott December 23, Maximum Generation Event*. MISO Reliability Subcommittee. January 17, 2023. Available at https://cdn.misoenergy.org/20230117%20RSC%20Item%2005%20Winter%20Storm%20Elliott%20Preliminary%20Report627535.pdf. Page 6.

[49] For more information on future alternatives to resource adequacy, we recommend *Redefining Resource Adequacy for Modern Power Systems*. ESIG. 2021. Available at https://www.esig.energy/wp-content/uploads/2022/12/ESIG-Redefining-Resource-Adequacy-2021-b.pdf.

3.7. TVA should account for non-electric benefits of a clean energy transition

As with this analysis, TVA's 2019 IRP includes estimates for impacts related to waste, water use, jobs, and land use. We recommend that future modeling endeavors go further and also quantify impacts related to public health, the social cost of carbon, and fuel savings outside of the electric sector; our analysis shows these are likely to be substantial in a future featuring levels of electrification consistent with TVA's electric-sector carbon-reduction goals.

4. Conclusion

Our 100% Clean Energy scenario shows that by completely switching away from fossil fuels in the electric sector in 2035, and by pursuing ambitious levels of electrification in the transportation, buildings, and industrial sectors, consumers in TVA's service territory can save $255 billion compared to a status quo "TVA Baseline" scenario. By pursuing a clean energy future, TVA can realize numerous benefits related to energy burden, job impacts, and public health while providing clean, reliable electricity to residents of the Tennessee Valley.

Appendix A. Key Scenario Inputs

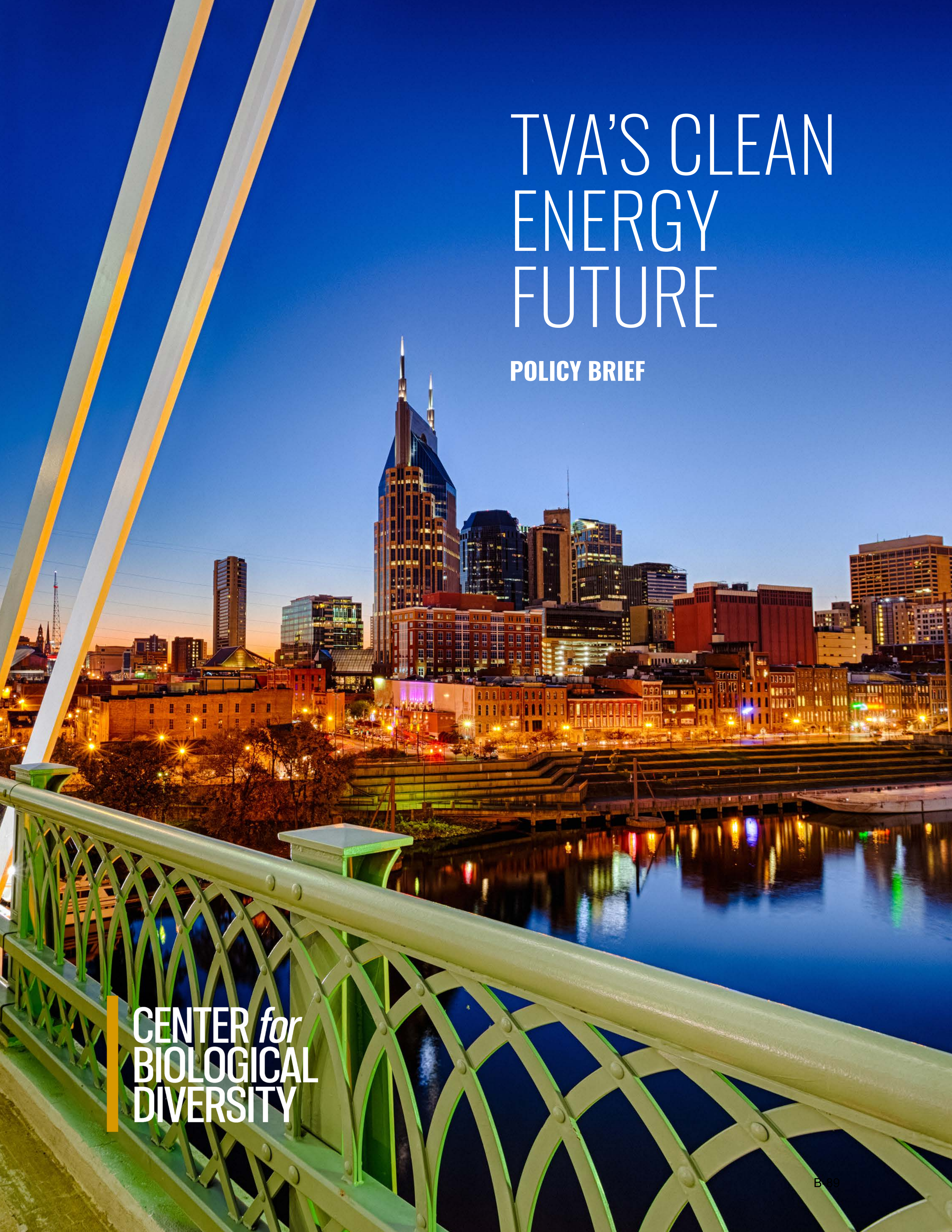
Table 10 describes the primary assumptions used in the three scenarios analyzed in this study.

Table 10. Primary input assumptions for analyzed scenarios

		TVA Baseline	100% Clean Energy	Ambitious DER
Modeling Parameters	Topology	All of TVA's balancing area, including plants not owned by TVA and end uses not currently met via electricity from TVA	Same as "TVA Baseline"	Same as "TVA Baseline"
	Modeling horizon	2020-2050	Same as "TVA Baseline"	Same as "TVA Baseline"
	Temporal detail	Typical weeks (12 per year), 8 intervals per day	Same as "TVA Baseline"	Same as "TVA Baseline"
	Optimization period	Full-period optimization ("perfect foresight")	Same as "TVA Baseline"	Same as "TVA Baseline"
Load	Conventional end uses	Follows 2019 TVA IRP trajectory	Same as "TVA Baseline"	Same as "TVA Baseline"
	Energy efficiency	Follows 2019 TVA IRP trajectory	Ramps up to 1.5% annual savings as a % of sales	Same as "100% Clean Energy"
	LDV electrification	Follows 2019 IRP "1 Current" trajectory *(about 7 TWh by 2050.)*	Assumes that 99% of LDVs sold in 2030 are EVs *(About 50 TWh by 2050)*	Same as "100% Clean Energy"
	MDV/HDV electrification	Follows 2019 TVA IRP trajectory (none assumed)	Assumes that 60% of MDVs/HDVs sold in 2030 are EVs *(About 40 TWh by 2050)*	Same as "100% Clean Energy"
	Building electrification	Follows 2019 TVA IRP trajectory (none assumed)	Assumes that 100% of new equipment sold in 2030 are heat pumps *(By 2050 results in near-zero net-negative load addition due to baseboard heating replacement)*	Same as "100% Clean Energy"
	Industrial electrification	Follows 2019 TVA IRP trajectory (none assumed)	Non-electric demand electrifies according to MDV/HDV pathway (as this sector is similarly challenging to electrify). Based on 228 TWh/Quad assumption from EI's EPS analysis. *(About 112 TWh by 2050.)*	Same as "100% Clean Energy"
New conventional resources *(costs and tax credits, when allowed)*	Conventional gas	Allowed beginning in 2025, prices based on NREL's 2022 ATB	Same as "TVA Baseline"	Same as "TVA Baseline"
	Gas with CCS	Allowed beginning in 2025, prices based on NREL's 2022 ATB; includes 45Q tax credits	Same as "TVA Baseline"	Same as "TVA Baseline"
	Coal with CCS	Not currently modeled	Same as "TVA Baseline"	Same as "TVA Baseline"
	Adv. nuclear reactors / SMRs	Not currently modeled	Same as "TVA Baseline"	Same as "TVA Baseline"

		TVA Baseline	100% Clean Energy	Ambitious DER
New utility-scale clean energy resources *(costs and tax credits, when allowed)*	Utility-scale solar	Allowed beginning in 2024, prices based on NREL's 2022 ATB; includes options for both in-region PPAs and utility-owned solar; includes options for both PTC ($25/MWh) and ITC (30%); limited to 5 GW per year.	Same as "TVA Baseline"	Same as "TVA Baseline"
	Onshore wind	Allowed beginning in 2024, prices based on NREL's 2022 ATB; includes options for in-region PPAs, out-of-region PPAs, and utility-owned wind; includes PTC ($25/MWh); limited to 5 GW per year.	Same as "TVA Baseline"	Same as "TVA Baseline"
	Utility-scale battery storage	4- and 8-hour storage allowed beginning in 2024, prices based on NREL's 2022 ATB; Long-duration (50-hour) storage allowed beginning in 2030 according to 2021 LDES Council paper's "Conservative" central estimate: $2500/kW in 2025 declining to $1000/kW in 2040; includes ITC (30%); limited to 5 GW per year.	Same as "TVA Baseline"	Same as "TVA Baseline"
New distributed clean energy resources *(costs and tax credits, when allowed)*	Distributed solar	Follows "Base" case in 2019 IRP *(1.2 GW by 2030 and 2.7 GW by 2050)*	Follows "Medium" case in 2019 IRP *(1.7 GW by 2030 and 4.4 GW by 2050)*	Follows "High" case in 2019 IRP *(2.1 GW by 2030 and 6.3 GW by 2050)*
	Distributed battery storage	Follows "Base" case in 2019 IRP *(no additions)*	Follows "Medium" case in 2019 IRP *(25 MW by 2030 and 270 MW by 2050)*	Follows "High" case in 2019 IRP *(180 MW by 2030 and 1.1 GW by 2050)*
	Conventional demand response	Follows 2019 IRP: 1.9 GW by 2050	Same as "TVA Baseline"	Same as "TVA Baseline"
	Flexible load	None	Same as "TVA Baseline"	32 GW of flexible load by 2050, based on 2020 NREL potential study *(Components of flexible load vary by duration and price paid)*
Fuel costs	Gas	NYMEX in short term, AEO 2022 Reference case in mid- to long-term	Same as "TVA Baseline"	Same as "TVA Baseline"
	Coal	AEO 2022 Reference case	Same as "TVA Baseline"	Same as "TVA Baseline"

		TVA Baseline	100% Clean Energy	Ambitious DER
Existing fossil and nuclear and allowed retirements	Coal and gas	All plants currently listed as having an announced retirement retire no later than that date; plants are allowed to retire endogenously beginning in 2025	Same as "TVA Baseline"	Same as "TVA Baseline"
	Nuclear	Plants assumed to receive license extensions; IRA tax credits are assumed to prevent nuclear plants from retiring	Same as "TVA Baseline"	Same as "TVA Baseline"
Transmission	Within TVA	No internal constraints assumed; modeling TVA as a single electric region	Same as "TVA Baseline"	Same as "TVA Baseline"
	With regions adjacent to TVA	None assumed, except for PPAs *(From 2019-2021, average annual interchange was -1 TWh, or about 0.6% of total load)*	Same as "TVA Baseline"	Same as "TVA Baseline"
Reserve margins	Seasonal assumptions	17% summer (April-October), 25% winter (November-March)	17% year-round	Same as "100% Clean Energy"
Capacity contributions (ELCC)	Solar	1% winter, 50% summer (fixed systems) 1% winter, 68% summer (tracking systems)	Same as "TVA Baseline"	Same as "TVA Baseline"
	Wind	31% winter, 14% summer	Same as "TVA Baseline"	Same as "TVA Baseline"
	Other (nuclear, coal, gas, hydro, battery storage)	100% winter, 100% summer	Same as "TVA Baseline"	Same as "TVA Baseline"
	Flexible load	None present	None present	50% year-round



TVA'S CLEAN ENERGY FUTURE

POLICY BRIEF

CENTER *for* BIOLOGICAL DIVERSITY

Executive Summary

The Tennessee Valley Authority, our nation's largest public power provider, is uniquely positioned to bring clean electricity and its economic, social and health benefits to the 10 million customers in its seven-state region. The New Deal-era federal utility can serve as a national laboratory for accelerating the renewable energy transition and achieving President Biden's goal of achieving 100% clean electricity by 2035.

The Center for Biological Diversity, GridLab and Synapse Energy Economics have conducted a detailed technical analysis of the utility's energy system and outlined three scenarios comparing electricity consumption, generation and costs. That report, *TVA's Clean Energy Future: Charting a Path Toward Decarbonization in the Tennessee Valley*, shows that TVA can immediately begin retiring aging fossil fuel plants and replacing them with 100% carbon-free electricity.

Relying on 100% clean electricity and increasing electrification in other sectors of the economy — such as buildings, transportation and industry — will reduce household energy costs, create jobs and increase economic development in the region, curb harmful air pollution, improve public health, and mitigate harm from climate change.

This brief summarizes the key findings from our analysis of TVA's power system and the benefits to the Tennessee Valley region of transitioning to 100% clean electricity, including:

- Potential net energy savings of $255 billion by 2050.
- Adding 15,600 jobs a year.
- Reducing customers' "energy burden" — the percentage of a household budget dedicated to energy bills.
- Avoiding $27 billion in health costs from burning fossil fuels.

We also include policy recommendations outlining how TVA's leadership, the Biden administration, Congress, and local power providers can reap these benefits for today's customers while helping to preserve a livable planet for future generations.

Introduction

The Tennessee Valley Authority lags behind its peers on clean energy development and has the second-highest planned gas buildout of all major utilities in the United States.[1] Its 20-year energy-planning outlook projects the agency will generate 34 million tons of carbon emissions by 2038. On that abysmal trajectory, TVA will not achieve zero emissions until sometime after 2050.[2]

TVA customers have some of the highest energy burdens in the nation, often spending 20% to 30% of their income on energy.[3] Despite Biden's clean-energy pledge, this federal agency plans to develop more than 4,000 megawatts of new gas infrastructure and is making only modest progress deploying clean energy. TVA's electric grid is aging, and its fossil fuel infrastructure repeatedly fails key reliability challenges. Rolling blackouts in the winter of 2022 are just the latest example of its failure to keep the lights on for its millions of customers.

TVA has an obligation under federal law to provide reliable, low-cost, clean electricity. It has failed to do so. A new analysis from Energy Innovation shows that local wind and solar is cheaper than operating every coal plant in TVA's portfolio.[4]

TVA *must* shift from its heavy reliance on fossil fuels to 100% carbon-free energy to combat the climate emergency, meet the president's climate objectives, protect the health of millions of Tennessee Valley residents, and ensure their access to affordable, resilient, safe electricity.

KEY FINDINGS

- A 100% clean-energy scenario will produce economy-wide net savings of $255 billion by 2050 throughout the Tennessee Valley. Savings will be driven by trading expensive fossil fuels for cheaper renewable energy. While electricity use will increase to accommodate rising demand, this will be offset by fuel savings throughout the economy.
- A clean energy transition will add about 15,600 jobs a year to the economy in TVA's service territory, which includes Tennessee, Alabama, Mississippi, Kentucky, Georgia, North Carolina and Virginia. These new jobs will be driven by the construction of new solar, storage, and heat-pump resources, as well as household savings on energy expenditures that are spent in other sectors of the economy.
- Residential energy burden — the amount of money a household spends on energy as a share of its income — will fall from 7% today to 3% by 2050. By transitioning away from volatile fossil fuels to highly efficient heating and cooling sources, electric vehicles and low-cost renewable electricity, households will spend less of their budgets on energy needs. Average monthly savings for residential customers totals about $140 in 2050.
- Transitioning to 100% clean electricity, with a focus on distributed energy resources like rooftop and community solar, will accelerate the transition to net zero emissions and reduce costly infrastructure. TVA could avoid construction of 2 gigawatts of utility-scale solar and 16 gigawatts of battery storage. TVA consumers could reduce wholesale electric sector costs by $1.5 billion in 2050 alone.

Modeling Approach and Scenario Design

Synapse Energy Economics used state-of-the-art electric sector and economic modeling tools to evaluate how TVA can achieve 100% clean electricity along with increasing economy-wide electrification. While this analysis is centered on TVA's electricity demand and generation, the electricity sector is so deeply ingrained in other aspects of the economy that we must also evaluate changes to the building, transportation and industrial sectors. Synapse analyzed three scenarios to compare changes in electricity consumption, generation and costs.

1. **TVA Baseline**: In this scenario, TVA pursues least-cost resource planning with no clean energy or decarbonization requirements, largely based on its 2019 Integrated Resource Plan.
2. **100% Clean Energy**: In an alternate scenario, TVA reduces electric-sector carbon emissions 80% by 2030 and 100% by 2035, while emissions from the buildings, transportation and industrial sectors achieve near net-zero emissions by 2050.
3. **Ambitious DER:** In addition to eliminating carbon emissions under the 100% Clean Energy scenario, TVA deploys significant residential and community solar and storage resources and increases flexibility for a more responsive grid.

Detailed assumptions, data inputs and methodology can be found in the full technical report, *TVA's Clean Energy Future*.

Results

TVA can achieve 100% clean electricity by 2035 and near net zero emissions economy-wide by 2050, saving customers $255 billion.

The 100% Clean Energy scenario, if adopted, will save customers $255 billion through 2050 compared to TVA's current plan (the baseline). This will require TVA to achieve 100% clean electricity by 2035 while rapidly electrifying and reducing emissions from the building, transportation and industrial sectors within the region by 2050.

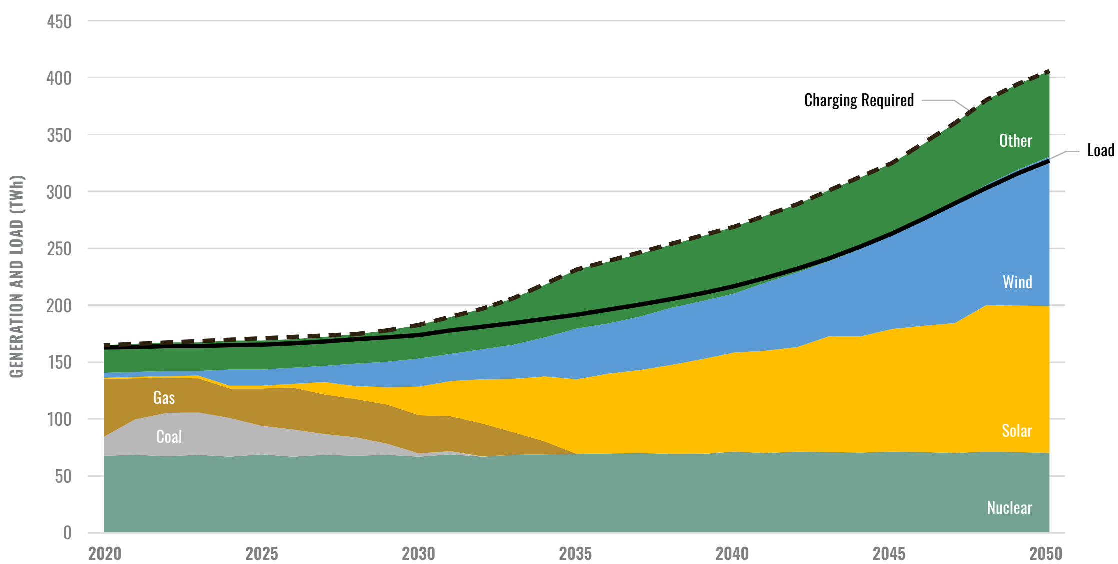


FIGURE 1. 100% Clean Energy generation and load.

Under the 100% Clean Energy scenario, the electricity load will increase as buildings, transportation and industry transition from fossil fuels to clean energy, with growing use of electric vehicles, heat pumps and water heaters. Fossil fuel-generating resources such as coal and gas will be retired over the next 10 to 15 years and replaced with substantial new investment in solar, wind and battery storage. When coupled with the existing nuclear and hydropower fleet, this approach will be able to meet the region's electricity demands through 2050.

DISTRIBUTED ENERGY SCENARIO OFFERS PEAK SAVINGS

Under the Ambitious DER scenario, TVA would pursue aggressive deployment of distributed rooftop and community solar, storage and other resources. Compared to the 100% Clean Energy scenario, the Ambitious DER scenario would avoid an additional $1.5 billion in costs by 2050, largely from decreased investments in battery storage and other grid investments.

Assumptions come from TVA's 2019 long-range plan, which includes trajectories of distributed solar and storage resources. The Ambitious DER scenario is based on the same assumptions as the 100% Clean Energy scenario, but includes a high deployment of DER based on TVA's long-range plan. It considers the benefits of flexible load, in which newly electric appliances like water heaters and heat pumps, plus electric vehicles, are relied on to reduce demand when transmission grids are stressed. Detailed assumptions are provided in Section 3.4 of the technical report.

The Ambitious DER scenario envisions a future where TVA encourages customer-sited resources and uses them to manage its electric system. This future would require dramatic changes in how the utility interacts with its customers and how the distribution system is integrated into electric planning. In this case, flexible load replaces more expensive battery storage.

Today TVA makes it difficult for customers to generate their own electricity by, among other things, levying a grid-access charge and shortchanging households that return excess energy to the grid. Distributed energy increases resilience and energy justice by letting customers generate their own electricity. People avoid costly electric bills and are better prepared for grid outages. Distributed energy can provide systemwide benefits, including to those who don't have rooftop solar. It also reduces the need for expensive, utility-owned infrastructure (for instance, power plants and transmission grids that require more land). In the Ambitious DER scenario, the deployment of 6 gigawatts of rooftop solar would amount to just 6% of rooftops in the region and would reduce some of the utility-scale solar deployment modeled in the 100% Clean Energy scenario.

The 100% Clean Energy scenario is characterized by significant new energy demand, which will require new generation and transmission investments. Total wholesale electricity costs will rise from approximately $5 billion in 2030 to $9 billion in 2050.

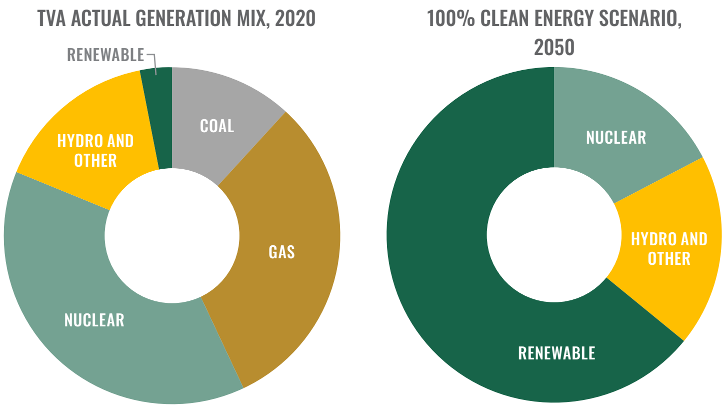


FIGURE 2. TVA's current generation mix (left) compared to the generation mix in 2050 under the 100% Clean Energy scenario (right).

Electricity costs are just one element of total system cost. Recent federal legislation, including the Infrastructure Investment and Jobs Act and the Inflation Reduction Act, provides significant incentives for people to switch from fossil fuel-based resources to electric ones, including electric vehicles, electric heat pumps, and rooftop solar and battery storage. This is an opportunity for TVA to further reduce ratepayer costs.

100% CLEAN ELECTRICITY AND ECONOMY-WIDE ELECTRIFICATION WOULD ADD 15,600 JOBS A YEAR.

Transitioning to 100% clean electricity by 2035 and towards net zero emissions by 2050 will create an average of 15,600 new jobs in the Tennessee Valley region each year, based on new economic activity and jobs associated with energy investments. While job losses are predicted in the fossil fuel sectors, those losses will be more than offset by increases in jobs in clean energy infrastructure.

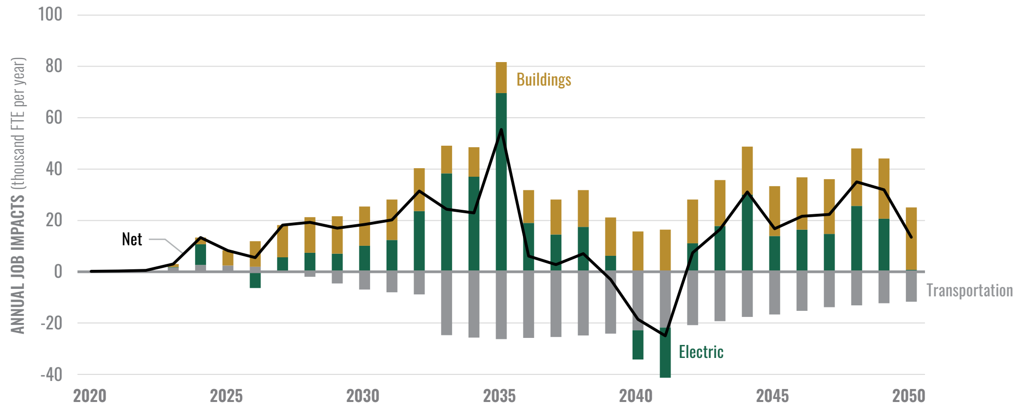


FIGURE 3. Job growth from 100% Clean Energy, relative to TVA Baseline.

As consumers spend less money on fossil fuels, household savings will be spent in other sectors of the economy. But as electric vehicles become cheaper to own and operate, more consumers will switch to EVs, resulting in decreased maintenance and manufacturing jobs. TVA will be able to mitigate this trend and spur economic development in the region by investing in clean energy and clean manufacturing. Importantly, because of the lower costs of owning and operating EVs, consumers will save additional money on transportation costs.

REDUCING RELIANCE ON FOSSIL FUELS REDUCES HOUSEHOLD ENERGY COSTS.

Transitioning to 100% clean electricity will lower electricity rates and reduce household energy spending. Household energy burdens — the percentage of income spent on electricity and fuel — will be cut by more than half. Under the 100% Clean Energy scenario, the average TVA household energy burden of 7% will fall to just 3% by 2050. Decreasing electricity rates will be a result of more efficient use of electricity and cost-effective clean energy. Monthly energy bills will rise because households will consume more electricity. But costs to heat homes and fuel vehicles with fossil fuels will largely disappear, resulting in overall reduction in household energy costs.

100% CLEAN ELECTRICITY WILL BENEFIT PUBLIC HEALTH.

The phaseout of fossil fuels will result in nearly $27 billion in public health benefits through 2050, including reduced asthma, heart attacks and premature death in the Tennessee Valley region. As a result of clean transportation, buildings, industry and electricity generation, air pollution will be reduced significantly, bringing better health and improved quality of life. The 100% Clean Energy scenario will provide an additional $265 billion in cumulative societal benefits, based on the latest estimates of the social cost of carbon from the U.S. Environmental Protection Agency.

Conclusion

This analysis shows TVA can rapidly transition to 100% clean electricity by 2035 while enabling the electrification of the transportation, building and industrial sectors to achieve near net-zero emissions economy-wide by 2050. This transition would bring immense benefits to human health and thousands of jobs to the Tennessee Valley, save consumers nearly $255 billion over the next 30 years, and help address the climate crisis.

POLICY ACTIONS

TVA has an opportunity to spearhead the nationwide energy transformation to a 100% clean and just energy future. Failure to do so would be a blemish on TVA's legacy and the federal government's ability to deliver bold climate action. It would also be a profound betrayal of the utility's own commitment to improve the quality of life of Tennessee Valley residents.

TVA's board of directors, the Biden administration, Congress, and the region's contracted local power companies can ensure this massive federal agency quickly and equitably transitions to 100% clean energy by 2035. Here are policy actions to get there.

THE TENNESSEE VALLEY AUTHORITY BOARD OF DIRECTORS SHOULD:

1. **Demand a concrete plan for TVA to achieve 100% clean, renewable energy by 2035.**

   The substantial financial incentives in the Inflation Reduction Act provide an enormous opportunity for TVA to make bold investments in solar, wind and energy efficiency and provide the region with an energy system that is just, equitable, affordable and renewable.[5]

2. **Maximize distributed energy resources and energy efficiency for TVA customers.**

   TVA has restrictive policies that limit local power companies, businesses and residential customers from accessing renewable energy. The board must:

   - Eliminate the discriminatory grid-access charge, which discourages distributed energy.[6]
   - Reinstate full retail net-metering for solar systems to encourage homeowners and businesses to make rooftop-solar investments.
   - Invest in and offer energy efficiency and distributed energy programs for all customers and prohibit local power companies from opting out.[7]
   - Conduct a market potential study for distributed energy, demand response and energy efficiency, as required in TVA's 2019 long-range plan.
   - Allow local power companies to embrace renewable energy by removing the restrictive 5% cap on self-generation in long-term power contracts.[8]

3. **Maximize beneficial and feasible interconnection with neighboring regions.**

   Regulatory transmission barriers have kept TVA customers from accessing more affordable clean energy. TVA should facilitate more solar and wind energy by undertaking comprehensive transmission planning with a focus on interconnection with neighboring regions.

4. **Stop investing in fossil fuel infrastructure and retire all coal plants by 2030.**

   The board should overrule TVA CEO Jeff Lyash's decision to replace the Cumberland coal plant with a fossil gas plant.[9] It should use renewable energy alternatives to replace Cumberland and all coal plant retirements, including the Kingston plant.[10]

5. **Incorporate economy-wide electrification into TVA planning.**

   TVA's planning should factor in non-electric benefits such as public health and vehicle fuel savings; more ambitious transportation and building electrification; up to date renewable energy costs and capacity contributions from fossil resources; and demand-side and flexible load resources. Under the TVA Act, the board can request technical assistance from federal agencies. The National Renewable Energy Laboratories can help the utility prepare a robust plan for economy-wide electrification.

6. **Protect environmental justice communities and workers.**

   The board must protect the health and livelihoods of all of its customers as it transitions away from fossil fuels by[11]:

   - Entering into agreements with frontline communities for all TVA plant retirements, coal-ash storage plans, and for new generation or site construction.
   - Storing all coal ash in high and dry landfills away from communities to minimize harm to surrounding communities.[12]
   - Requiring TVA and its contractors to follow safety procedures and screening, provide adequate personal protective equipment, provide worker training, and ensure whistleblower protections for workers handling toxic material like coal ash.

7. **Boost resilience and reliability.**

   TVA must prioritize resilience and reliability by incorporating climate risk management in its energy planning, developing an inventory of climate-vulnerable infrastructure, and analyzing the role renewable and distributed energy alternatives could play in mitigating future climate disasters.

PRESIDENT BIDEN AND FEDERAL AGENCIES SHOULD:

1. **Base board tenure on achieving 100% clean, renewable energy by 2035.**

   President Biden should require TVA board members to align the federal agency with the administration's clean energy plan. The president should exercise his authority by firing any board member who oppose that mission and nominating only those who will support it.

2. **Issue an executive order calling on TVA to achieve 100% clean, renewable energy by 2035.**

   Biden should leverage TVA as a national model for a zero emission, distributed energy public power system that the rest of the country should follow.

3. **The Department of Energy and National Laboratories should analyze TVA's energy pathways.**

   The federal agencies should work with TVA to develop plans, like Puerto Rico's renewable energy plan and the Hawaii Clean Energy Initiative, for maximizing distributed and decentralized energy resources.[13] This plan would serve TVA and all utilities as a model for how to maximize distributed renewable energy in a clean energy transition.

CONGRESS SHOULD:

1. **Hold TVA accountable through oversight hearings.**

   Senate oversight hearings should address, at minimum:

   - Climate risk and resilience, with a particular focus on Winter Storm Elliott and the coal and gas plant failures that resulted in rolling blackouts, as well as the role of distributed, renewable energy in future crises.
   - TVA's role in increased energy bills and customers' diminished access to affordable energy in the Tennessee Valley.[14]
   - Governance and transparency, to further examine whether TVA's business practices align with the TVA Act and encourage meaningful public participation.[15]

2. **Pass legislation to facilitate a transparent, equitable, clean energy transition in the TVA region**

   Congress can play an active role in breaking down barriers by:

   - **Expanding transmission access.** Congress should pass legislation to amend the Federal Power Act and open the TVA system to greater competition inside and outside its seven-state footprint.[16]
   - **Mandating transparency in TVA decision making.** Congress should require TVA to fully open its meetings, create an Office of Environmental Justice and develop a framework to reach environmental justice communities.[17] The Federal Energy Regulatory Commission's Office of Public Participation should serve as a model.[18]
   - **Require 100% clean, renewable energy by 2035.** Congress should pass legislation establishing a benchmark of 100% clean, renewable energy by 2035 so TVA is required to achieve its own clean energy commitments and President Biden's clean-energy pledge.

LOCAL POWER COMPANIES SHOULD:

1. **Revisit long-term power agreements with TVA.**

   Local power companies should demand changes to their long-term contracts with TVA that provide little to no flexibility to pursue cheap and clean renewable energy. In 2022 Memphis Light, Gas and Water decided not to sign a long-term contract with TVA, citing the tremendous cost savings and economic development opportunities of defecting.[19]

Endnotes

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5 *See* additional recommendations included in Center for Biological Diversity Report, "From Climate Laggard to Climate Leader: A Roadmap for the Tennessee Valley Authority's Board Members to Drive the Nation's Largest Public Power Provider to 100% Renewable Energy," (June 16, 2022), https://www.biologicaldiversity.org/programs/energy-justice/pdfs/Report-to-TVA-Board-2022-06-15.pdf. *See also* Center for Biological Diversity comments to TVA Board of Directors, (February 9, 2021), https://www.biologicaldiversity.org/programs/energy-justice/pdfs/2-8-21_TVA_Comment_Letter.pdf. See also Clean Up TVA Coalition Letter to TVA Board of Directors, "TVA Board Must Advance an Affordable, Resilient, and Fossil Fuel-Free Energy Future," (February 16, 2023), https://cleanuptva.org/uncategorized/letter-to-tva-board-february-16th-meeting/.

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7 Petition from 30+ environmental, climate, and energy justice organizations to Tennessee Valley Authority Board and President, "S. David Freeman Memorial Petition for TVA to Immediately Address Electric Utility Shut-Offs and Convene Public Hearings On the COVID-19, Climate, and Socioeconomic and Racial Inequality Crises Facing the Communities TVA Serves," (August 25, 2020), https://www.biologicaldiversity.org/programs/energy-justice/pdfs/Aug-25-2020-TVA-Petition-For-Utility-Shut-Off-Moratorium-And-Other-Actions.pdf.

8 Daniel Tait, "TVA cuts 'flexibility' promises to local power companies by 80%, enters into questionable contracts," *Energy and Policy Institute*, (May 29, 2020), https://www.energyandpolicy.org/tva-cuts-flexibility-promises-to-local-power-companies-by-80-enters-into-questionable-contracts/. *See* also Maggie Shober, "Customers Remain Without Options in TVA's Fence," *Southern Alliance for Clean Energy*, (October 22, 2021), https://cleanenergy.org/blog/customers-remain-without-options-in-tvas-fence/.

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11 *See* additional priorities from Energy Democracy Y'all, "Tennessee Valley Energy Democracy Movement," https://energydemocracyyall.org/tn/movement/.

12 Darryl Fears, "The TVA is dumping a mountain of coal ash in south Memphis," (August 19, 2022), https://www.washingtonpost.com/climate-environment/2022/08/19/tennessee-valley-authority-memphis-coal/.

13 *See* Center for Biological Diversity Letter, "Department of Energy and National Laboratories Develop Roadmap to 100% Renewable and Just Energy for Tennessee Valley Authority," (July 29, 2021), https://www.biologicaldiversity.org/programs/energy-justice/pdfs/2021-07-28_DOE-Study-for-100-percent-RE-TVA.pdf.

14 *See* Clean Energy Groups' Letter to House Energy and Commerce Committee, (February 3, 2022), https://cleanenergy.org/wp-content/uploads/2.3.22_Clean-Energy-Justice-Orgs-Letter-re-TVA-Response-to-EC_FINAL.pdf.

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16 Samuel Hardiman, "Congressman Steve Cohen, ardent TVA critic, files bill to eliminate its monopoly," (September 30, 2022), https://www.commercialappeal.com/story/news/politics/2022/09/30/steve-cohen-files-bill-end-tva-monopoly-power-memphis-southeast/69529783007/

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19 Dulce Torres Guzman, "Environmental groups urge MLGW to vote down new TVA contract," (November 2, 2022), https://tennesseelookout.com/2022/11/02/environmental-groups-urge-mglw-to-vote-down-new-tva-contract/. See also "In a win for Memphians utility board votes down restrictive, never-ending power contract," *Southern Environmental Law Center*, (December 22, 2022), https://www.southernenvironment.org/news/in-a-win-for-memphians-local-utility-board-votes-down-restrictive-never-ending-power-contract/.

From: Amy Kelly
To: Higdon, Matthew S.
Subject: NEPA - TVA Allen Aero Project
Date: Monday, November 13, 2023 5:07:31 PM
Attachments: Sierra Club TVA Allen Aero Scoping Comments.pdf

Hello Mr. Higdon,

The Sierra Club submits the attached 188 digital signatures including 80 personalized messages on the behalf of our members and supporters in response to the NOI for Scoping.

Thank you,

photo

Amy Kelly (she/her)
Field Organizing Strategist
Tennessee Valley Region
Sierra Club
amy.kelly@ sierraclub.org
(865) 995-8663 (cell)
Represented by the Progressive Workers' Union

From: Wufoo
To: nepa
Subject: NEPA Comments - Allen Aeroderivative CT [#7]
Date: Monday, November 13, 2023 5:00:09 PM

Name	Amy Kelly
City	Maryville
State	TN
Organization	Sierra Club
Email	
Phone Number	
Please provide your comments by uploading a file or by entering them below. *	The Sierra Club submits the attached 188 digital signatures including 80 personalized messages on the behalf of our members and supporters.
Upload File #1	sierra_club_tva_allen_aero_scoping_comments.pdf 413.48 KB · PDF

SIERRA CLUB

,

November 13, 2023

RE: Allen Aeroderivative Combustion Turbine Project

The Sierra Club submits the following 188 digital signatures including 80 personalized messages on the behalf of our members and supporters with the following petition language:

Dear TVA Board of Directors & CEO Lyash, and NEPA Specialist Matthew Higdon,

TVA continues to double down on the largest planned gas buildout in the nation by proposing aero CT's in Memphis. TVA has already retired most of the existing Allen CT's and replaced them at other locations. Adding new gas now would be an increased pollution burden in South Memphis which is already overburdened with more than their fair share of industrial pollution.

TVA should choose clean, renewable energy supported by national investments like the Inflation Reduction Act that directly apply to communities designated as "energy communities" like Memphis. TVA has already raised rates to build gas plants that will be stranded assets. Residents are already paying the price through fuel cost adjustments. We don't want more gas, and we need a cleaner grid that will encourage economic development.

TVA must conduct a full environmental impact study to fully examine the environmental, social, and justice aspects of this proposal. TVA should examine other alternatives like renewable energy and energy efficiency instead of only examining building gas.

Thank you for carefully considering my comments.

	Name	City	State	Postal Code	Personal Message
1	Joel Morris		-	37914	As someone who grew up in South Memphis, I am aware of the ongoing problems of industrial pollution there. It is time to clean up the pollution problems in this area, not add to the problem!
2	Ellen Faby	Clinton	TN	37716	Climate change is an existential threat to our planet. Technologies that are not based on fossil fuels are available and use of these technologies is expanding rapidly all over the world. As a nation that has polluted the world for generations by our consumption of fossil fuels, we have an obligation to switch as rapidly as possible to non-polluting electricity generation. TVA should be a leader in all aspects of combating climate change including promoting energy efficiency and installing non-polluting electricity generation as much as possible. TVA is abdicating it?s responsibilities and contributing to climate catastrophe as well as harming the local citizens in Memphis by proposing the the installation of a new gas plant in Memphis.
3		Chattanooga	TN	37412	Come on you know now body wants a gal line in their back yard and we do not need to keep using fossil fuels so why add more whe there are plenty of brownfield we can put in solar farms!
4	Barbara Devaney	Nashville	TN	37215	Do not approve the gas plant. We have too much pollution already
5	Shirley Brown	Maryville	TN	37803	Double down on clean, renewable energy!
6	Emily Graves	Memphis	TN	38104	Economically in the long term, renewables will provide higher profits. You know this. And the residents near the planned location have enough health issues. Do you want this by your house? I don?t. Propose to place this in 38120 or 38119, maybe Shady Grove Rd? we all know that?s a non-starter, and it?s not just because of land cost or zoning limitations. There are alternatives. Do it right or do it twice, and doing it twice always ALWAYS costs more.
7	Sharon Hart	Butler	TN	37640	Enough is enough. You must address these issues and safeguard the health of all Tennesseans.
8	Ginny Ayers	Maryville	TN	37803	Every one of you on the board knows we absolutely must end use of fossil fuels. This is not debatable. You are proposing not only continuing to promote this usage, but to do it in ways that harm the most susceptible and least wealthy communities. Come to your senses NOW and act responsibly. DO WHAT IS RIGHT.
9	Bill Thrasher	Joelton	TN	37080	Fossil fuel will kill a lot of people, down the road, millions.
10	Steve Riches	Crossville	TN	38555	Fossil fuels are killing Americans.

11		Nashville	TN	37205	I am a TN homeowner and entrepreneur who is urging you to stop investing in oil and gas for power. I urge you to replace and augment our aging and overburdened power grid when necessary with clean energy. I urge you to STOP taking "bonus's" (payoffs from oil and gas companies) and taking this moeny to pad your own bank accounts while stealing from us our tax dollars, money, health and wellbeing. THE WORLD IS WATCHING!
12	Ann Cover	Nashville	TN	37212	I am from Nashville and stand with my friends in Memphis asking for no more polluting from any source for of energy production or industrial processes. They have had too much already!
13	Tania Solnik		-	37215	I do not live in Memphis, but the entire state does not need any more gas plants! Our Tennessee environment, and our animals do not need any more of your gas plants! It is time to think outside the pipeline! There are many innovative ideas floating around. It is cheaper to buy solar batteries and solar panels for some household in the state as a bridge to the time, when renewables can be ramped up to meet the electricity needs of the future. It would be cheaper to retrofit many houses and insulate, then to build new gas plants. But maybe there are no bonuses afforded executives for these cost saving and effective alternatives. Please think of your children?s children in the world they will have to live in because of our choices now. Thank you, Tania Solnik
14	Connie Coleman	Waverly	TN	37185	I grew up in Memphis which was green, beautiful, and clean. I moved to middle Tennessee when we retired in 2016. I recently returned to attend the River Arts Festival and was appalled at the air quality. My eyes burned the entire time I was there. It was unbearable! I was hoping to be able to return to Memphis in a few years, but that dream is quickly fading. Worsening air quality directly affects my health and hopes of longevity. Your continued participation in destroying the climate is abhorrent. You are leaving a legacy of disease and death. Think about how this world will be for your progeny.
15	Jodi Jones	Kingsport	TN	37664	I have a daughter, son-in-law, and two grandsons who live in the Memphis Metro Area. We lived in Germantown for 15 years and raised our family there. Please do not add any more pollution to the air. Please use renewable sources for clean power for the people of western TN.
16	Lorella Howard	Ooltewah	TN	37363	I have chronic respiratory issues and have close friends living in the Memphis area.
17	Kim Myers	Tennessee Ridge	TN	37178	I have lung issues and breathing is difficult without more pollution, I won?t be able to breathe and I?m only 52 that?s not that old, I deserve to breathe. Thank you

18	Ann Logan		-	37064	I have never understood how any person--in business or otherwise--could knowingly contribute to the suffering and poor health of others. And yet, that is what TVA continues to do. Please reconsider your cruel policies.
19	Tom Jenkins	Chattanooga	TN	37405	I know TVA sees home rooftop solar as "competition" but what if it was part of the solution. With enough incentive for people to do home solar and batteries networking them (using AI)Could make more gas plants unnecessary (reducing demand for new plants AND providing more clean energy.. TVA needs to encourage rather than discourage homeowner and business' solar projects. This could be done by paying more for excess generation of electricity from these installations. Home batteries for night time power use linked to the grid.. . "How we've always done it" doesn't cut it in our climate of extreme heat and storms.
20	Gordon Myers	Arlington	TN	38002	I?m tired of people in Memphis getting sick and dying from the toxic results of your power plants
21		Ojai	CA	93023	I?ve lived in TN many years
22	Donald Potter	Sewanee	-	37383	I'd like to see retake some of the leadership recognition that it earned decades ago.
23	Karl Rehmer	Mt. Juliet	TN	37122	I'm a voter who believes in the importance of the environment and I hope you do too.
24	Cynthia Hernandez	Dickson	TN	37066	Invest in renewable non-fossil fuel energy alternatives that don't create toxic byproducts.
25	Sandra McCrea	Chattanooga	TN	37415	It is time to clean up the air in Memphis and TVA's plans for a new gas plant do not further that goal, in fact, it is a step backward. I support the Sierra Club and the TN Conservation Voters in their effort to stop this plan to build another gas plant.
26	Joann Tumey	Nashville	TN	37215	It is time to transition to renewable energy and stop investing in fossil fuels that are increasing global temperatures and polluting our air
27	Tamara Braithwaite	Millington	TN	38053	It?s past time to stop poisoning communities of color! Clean up your energy act!
28	Rita Harris	Olive Branch	MS	38654	Memphis and west Tennessee have suffered for decades living with the old Allen coal plant. In your mind so-called natural gas may be safer but it?s not. All fossil fuels TVA is looking to for energy production is not what the community needs. It is 2023 and we should be looking seriously and aggressively to find and use renewal energy sources that are safe to produce and to use. We are tired of small demo projects that are for show and not planned for substantive change.
29	Michael Bernard	Nashville	TN	37215	Memphis was my birthcity. Please don't make it any worse than it already is.
30	Diane Keeney	nashville	TN	37215	No more fossil energy-derived projects! Protect our health and the planet.

31	Jerry Brown	lewisburg	TN	37091	no more gas plants
32	Kurt Emmanuele	Chattanooga	TN	37405	No more gas plants in Memphis!
33	Jeanie Stephenson	Decherd	TN	37324	None of us needs more pollution from that! Get on board with sustainable energy sources. You work for all of us.
34	Anna McCurdy	Chattanooga	TN	37415	Please be a good human.
35	Barbara Gay	Nashville	TN	37204	Please choose clean energy!
36	Leslie Morales	Leslie	TN	37064	Please consider a renewable clean energy .
37	Kathleen Mack	Nashville	TN	37228	Please consider the future implications of your actions today.
38		Nashville	TN	37215	Please focus on renewable energy sources. Be a part of the solution, not the problem
39	Carole Whitten	Bristol	TN	37620	Please give us some solar power.
40	Wilfred Post	Powell	TN	37849	Please stop making coal ash and invest more in renewable forms of electrical generation.
41	Barbara Smith	Crossville	TN	38571	Please use renewable energy like solar, not polluting energy like gas.
42	Scott Morris	Millington	TN	38053	Profits today will mean nothing if the world burns tomorrow. Now more than ever, we need to focus our efforts on reducing our dependance on fossil fuels and instead towards clean, renewable energy. Climate change is an exponential process, and so if nothing is down now, then we could very quicky find ourselves at a point of no return. Needless to say, it will be very bad for the economy if multiple plant and animal species start going extinct...
43	Robin Woodruff	Knoxville	TN	37919	Progress is clean energy. Climate change is here
44		Morristown	TN	37814	Put the money into renewables! We need to stay in front of this changing world.
45	Jesse Gore	Nashville	TN	37206	Renewable energy has never been more affordable and the world needs more than ever so please don?t poison us by wasting money on more fossil fuel infrastructure that?s killing life on earth.
46	Mary Myers	Arlington	TN	38002	Save our environment and begin transitioning to green energy. Pipelines are not sustainable!
47	Deborah Mays	Memphis	TN	38104	SOLAR
48	Elizabeth Holton	Hampshire	TN	38461	Stop building new polluting plants and invest instead in renewable energy!
49	Mikhaila Markham	Memphis	TN	38117	Stop polluting our planet! Future generations deserve better than you. Do better.
50	Veronica Wright		-	37211	Tennessee's air needs protection from pollution in the ir!
51	Leslie Brusselsmith	Knoxville	TN	37923	The health of current and future children is most important. We need to choose to use more sustainable and healthy options for our energy needs.

52		Harrison	TN	37341	The legacy of fossil fuel use continues. TVA operates one dirty gas plant in Memphis already and is currently trucking millions of tons of toxic coal ash through South Memphis neighborhoods. It?s time for TVA to try something new. Try thinking with compassion for the people who live in this state and are paying your salary.
53			-	37882	The people of TN need the TVA to be advancing clean and renewable source of energy not continuing to bolster the fossil fuel industry resulting in unhealthy air for all of us.
54	Phyllis Gay	Memphis	TN	38117	The South Memphis area is already overburdened by the effects of dirty energy. It?s a true injustice to continue to build these kinds of plants in this area - and in other areas where the majority population consists of people of color. In addition, TVA needs to move into the 21st century and look to the the future in terms of energy production. While I don?t live in South Memphis, I am concerned about the health and wellbeing of my neighbors. Adverse effects of dirty energy on one group of people affects the whole community. Thank you again for paying attention.
55	David Ostermeier	Knoxville	TN	37919	There are alternatives to fossil fuels and we need investments in them.
56	Lisa Lundstrom		TN	37062	There are so many better options, please discontinue outdated dirty processes.
57	Leslie Page	Smithville	TN	37166	This gross overuse of gas needs to stop!
58	Joe Schrock	Johnson City	TN	37601	This state has an abundance of water, water and sun options that are both partially funded by the Federal Government and don?t poison our people and state. Why burden your citizens and multiple systems such as healthcare when you can create jobs and not poison our land, water and air?
59	Debra Dunson	Spring Hill	TN	37174	TVA believes that transitioning to natural gas from coal is going to help mitigate some of its greenhouse gas emissions. That approach is NOT sufficient to achieve the 2035 goal of zero emissions. False solutions like natural gas cannot achieve the level of carbon emission reductions that we need ? nor will they make our communities resilient in the face of climate change. For too long TVA has forced households to rely on dirty energy sources that perpetuate racial and ecological injustice. I hate that the energy used to power my household comes from the fossil fuels that are causing worldwide climate destruction. I hate that my energy use from TVA damages the health and neighborhoods of African American and economically disadvantaged Tennesseans. TVA must reconsider its priorities and shift investment into long-term, renewable and distributed energy solutions ? like rooftop solar and energy efficiency programs.
60	Susan Thomas	Chattanooga	TN	37421	TVA has lost its way-- now it's acting like a predatory big business.

61	Geneva Andrews	Dayton	TN	37321	TVA is supposed to provide the entire public with clean energy. I am disappointed with its attitude towards renewables.
62	Elaine Steele	Harriman	TN	37748	TVA needs to consider the safety of our children and grandchildren that will have to live with the consequences of this unwise decision just because it is easy now, but at the cost of the future.
63	Bill Kornrich	Bill	TN	37869	TVA should be a leader in providing all of us in its service area with clean renewable energy. By all means, do not contribute to the already unhealthy environment of South Memphis.
64	Tara Fredenburg	Memphis	TN	38103	We all know that climate change is already here and severely affecting local weather patterns, causing unpredictable storms and drought, flooding and tornadoes. We MUST move to using renewable energy sources and decarbonizing in all possible avenues. And placing cancer-causing pollutants so close to the homes of my South Memphis neighbors is completely unacceptable. If you don't listen to the people and place our basic human needs over profit, we will become so loud you can't ignore us!
65		Elizabethton	TN	37643	We all need to work together for clean air and renewable energy. TVA was started using renewable energy sources and it is time to return to that vision. Lives are at stake!
66		Kingston Springs	TN	37082	We do not need any more pollution. Go solar, wind, renewables. Cut polution.
67	Michael Lottman	Kingston Springs	TN	37082	We don't need another fossil fuel plant anyway. Methane is as polluting and heat-trapping ad CO2.
68	Lara Firrone	MEMPHIS	TN	38111	We have been ravaged by storms. We need reliable energy 24/7 and there is so much pollution and public health impact that we need cleaner options.
69	Julie Erwin	Nashville	TN	37215	We must take care of our water, air and land...pollution is not acceptable.
70	Donald Keyser	Johnson City	TN	37604	We need clean air, not increased pollution
71	Russ Manning	Knoxville	TN	37919	We need renewable energy, not more gas generation.
72	York Quillen	Knoxville	TN	37923	We need to get into the 21st century.
73	E Pyle	Nashville	TN	37201	We really do not need more fossil fueled generation.
74	Leo Arnoult	Memphis	TN	38103	We successfully stopped the Byhalia Pipeline recently because of its potential environmental impact on the same community this gas pipeline will adversely affect. Do not impose this degradation upon a majority black community which will also affect the broader West TN citizenry. Instead increase your sustainable energy sources. The IRA gives you the financial leverage to increase your investment in renewables.

75	Angela Mummaw	Knoxville	TN	37191	While I support TVA?s retirement of its remaining coal plants, TVA should replace this power generation with clean renewable energy, battery storage and energy efficiency. TVA should not be replacing one fossil fuel with another, planning methane gas plants and pipelines in "sacrifice zones" that place people in danger of pollution and deadly explosions while contributing to the climate crisis with a toxin that is eighty times more potent a greenhouse gas than carbon dioxide. As an end user of TVA?s power through my local power company, I am at risk of rising costs with gas price volatility and support a cleaner, safer and more reliable investment in renewable energy. Make a change that supports economic growth and local communities. One that is good for the environment and health of the people. A change that is sustainable and more permanent. Please make a change for good!
76	Peggy Burch		-	38103	Why are we not taking advantage of the Inflation Reduction Act to build smarter, nonpolluting energy sources? It sounds like appallingly poor leadership to choose to build a gas plant here. Please behave more responsibly!
77	Mary Ann Stanislowsky	Jonesborough	TN	37659	Why build another gas plant when people are finally moving towards hybrids and electric cars? This makes no sense!
78	Sara Oaks	Cordova	TN	38018	Why we are not greatly expanding cost effective sustainable energy instead, makes no sense. TVA , it is in the best interest of our region to eliminate gas and greatly increase renewable energy.
79	James Butler	East Ridge	TN	37412	Wind and solar are viable and RESPONSIBLE energy options. Invest in them instead!
80	Carolyn Nevin	Powell	TN	37849	Your actions have historically helped the people of Tennessee and surrounding states. Please do not destroy that legacy by refusing to take this opportunity to transition to renewables. Please don't just replace one fossil fuel with another.
81	Gaby Sarri-Tobar	Silver Spring	MD	20910	
82	william wright jr	MEMPHIS	-	38104	
83	Charlie Palmgren	Franklin	TN	37064	
84	Michael Serkownek	Maryville	TN	37801	
85	Valerie Crawford	Nashville	TN	37221	
86	Chris Dacus	BELL BUCKLE	TN	37020	
87	Thomas Cain	ANTIOCH	TN	37013	
88	Greg Larson	Knoxville	TN	37920	
89	Elizabeth Cunningham	Cleveland	-	37312	
90	Pamela Claybaker	Nashville	TN	37203	
91	Shelby Hood	Franklin	TN	37064	

92	Karen Mcconkey	Knoxville	TN	37918	
93	Catherine Gonzales	Cleveland	TN	37323	
94		Hendersonville	TN	37075	
95	Allan F. & Jimmie L. Ramsaur	Nashville	TN	37215	
96	Ruth Brucker	Memphis	TN	38112	
97	Mary Bristow	Brentwood	TN	37027	
98	Gerald Thornton	Farragut	TN	37934	
99	Charlie Hart	Memphis	TN	38120	
100		Gainesboro	TN	38562	
101	Dave Porfiri		-	37416	
102	Beth Stanton		TN	37814	
103	Sally Faulkner	Lookout Mtn	TN	37350	
104	Karen Chaffin	Rossville	TN	38066	
105	Leslie Bond	Loudon	TN	37774	
106	Ron Serino	memphis	TN	38111	
107	Richard Gillaspie	White Bluff	TN	37187	
108	Michael Dubrick	Knoxville	TN	37932	
109	Deb O'Dell	Knoxville	TN	37922	
110	Lauren Samuels	Memphis	TN	37221	
111	Joe Franklin	Johnson City	TN	37601	
112	Jean Johnston	Decatur	TN	37322	
113		Knoxville	-	37920	
114	Paula Simmons	Cookeville	TN	38501	
115	Kent Minault	Knoxville	TN	37917	
116	Lisa Gordon	Murfreesboro	TN	37128	
117	Frances M	Rogersville	TN	37857	
118		Rogersville	TN	37857	
119		Lenoir City	TN	37771	
120	Janet Leis	Nashville TN 37211 USA	TN	37211	
121	Laura Prestridge	Memphis	TN	38104	
122	Winifred Silvers	Knoxville	TN	37922	
123	Donna Duncan	Lebanon	TN	37087	
124	Hunter Oppenheimer	Memphis	TN	38104	
125	Patty Ibur	Summertown	TN	38483	
126	Kenneth Jobe	Nashville	TN	37219	
127	Robert Dornfeld	Athens	TN	37303	

128	Deborah Stull	Eidson, TN 37731	TN	37731	
129	Paul Bienhoff		-	37663	
130	Gary Bowers	Nashville	TN	37221	
131	Heidemarie Weidner	COOKEVILLE	TN	38506	
132	Bethany & Joshua Johnson	Nashville	TN	37215	
133		Nashville	TN	37207	
134	Joseph Hamilton	Nashville	TN	37215	
135	Hiedi Tan	Knoxville	TN	37934	
136	Crystal Headrick	Chuckey	TN	37641	
137	Tonda Bailey	Knoxville	TN	37931	
138	Al Hansen	Crossville	TN	38555	
139	Jan Hankins	Memphis	TN	38104	
140	Susan Ilgner	Lenoir city	TN	37771	
141	Loretta Modica	Jonesborough	TN	37659	
142	Cheryl Scutt	Antioch	TN	37013	
143	Lawrence Jasud	Memphis	TN	38111	
144		chattanooga	TN	37421	
145	Matt Cutts	greeneville	TN	37743	
146	Laura Rastl	Clarksville	TN	37042	
147	Barbara Snell	Barbara	TN	37066	
148	Margaret Davitt	Nashville	TN	37205	
149	John Marlin	White House	TN	37188	
150		Loretto	TN	38469	
151	Kathleen Rugel	Millington	TN	38053	
152		Memphis	TN	38117	
153		Kingston Springs	TN	37082	
154	Nancy Boatwright	Rossville	TN	38066	
155	Amanda Hawkins	Bartlett	TN	38133	
156	Rita Vorpahl	Clarksville	TN	37040	
157		Nashville	TN	37203	
158	Lelia Bloizzard	Monyeagle	TN	37356	
159		Louisville	TN	37777	
160	Dan Fernandez	Madison	TN	37115	
161	Duffy-Marie Arnoult	Memphis	TN	38112	
162	Elizabeth Garber	Nashville	TN	37215	
163	Charles Belenky	memphis	TN	38111	
164	JoAnn McIntosh	Clarksville	TN	37043	

165	Ellen James	Knoxville	TN	37921	
166	Gina Turner	Memphis	TN	38122	
167		Menphis	TN	38117	
168		New Market	TN	37820	
169		Nashville	TN	37215	
170		Franklin	TN	37069	
171	Scott Banbury	McMinnville	TN	37110	
172	Amanda Dobra	Nashville	TN	37221	
173	Robert Amerman	Bulls Gap	TN	37711	
174	Patrick Rakes	Knoxville	TN	37919	
175	Paulette Walton	Butler	TN	37640	
176	Elizabeth Schneider	Nashville	TN	37215	
177	John Rainey		TN	38231	
178	Carol Pastor	Knoxville	TN	37919	
179	Thomas Steffek	Memphis	TN	38119	
180	Neil Smith		-	37664	
181	Linda Leduke	Tiptonville	TN	38079	
182	Eric Robinson	Memphis	TN	38104	
183	Barbara Smith	Memphis	TN	38111	
184	Nora Reinke	Dunlap	TN	37327	
185	Lisa Burton	Germantown	TN	38138	
186	Alena Cook	Germantown	TN	38139	
187	Alexander Kown	Nashville	TN	37215	
188	Michele Villeneuve	Kingsport	TN	37660	

From:	Amanda Garcia
To:	nepa
Cc:	Sami Harrell; Delaney King; Amy Kelly; KeShaun Pearson; Sarah Houston
Subject:	Comments of SELC, Sierra Club, MCAP, and Protect Our Aquifer re: Allen Aeroderivative CT Project
Date:	Monday, November 13, 2023 5:53:14 PM
Attachments:	2023-11-13 Allen Gas Turbine Project Scoping Comments 2.pdf

Dear Mr. Higdon:

On behalf of Sierra Club, Memphis Community Against Pollution, and Protect Our Aquifer, please find attached comments regarding the scoping notice for the Allen Aeroderivative CT Project.

A series of emails containing the attachments to our comments will follow; however, I will not cc my colleagues on those attachments to avoid unnecessary clutter of inboxes.

Sincerely,
Amanda

Amanda Garcia (she/her/hers)
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November 13, 2023

Via email to NEPA@tva.gov

Matthew Higdon
NEPA Specialist
400 West Summit Hill Drive, WT 11B
Knoxville, TN 37902

RE: Tennessee Valley Authority (TVA)'s Notice of Intent re: Allen Aeroderivative Generation Project, Federal Register Docket 2023–22517

Dear Mr. Higdon:

On behalf of Memphis Community Against Pollution ("MCAP"), Sierra Club, and Protect Our Aquifer (collectively, "Community Groups"), Southern Environmental Law Center submits these comments in response to the scoping notice (Notice) published by TVA regarding the Allen Aeroderivative Generation Project ("Allen Gas Turbine Project" or "Project").[1]

TVA has proposed to build and operate the Allen Gas Turbine Project in southwest Memphis, near overburdened predominantly Black and low-income communities including Boxtown and Westwood. TVA has operated fossil fuel plants in this area for nearly sixty years, continually polluting the community's air and water. But rather than reckoning with this ongoing environmental injustice, TVA is proposing to double down by adding a new source of fossil fuel pollution in the community. As described in detail in the attached comments, the Project will contribute to significant cumulative air pollution, climate, transportation, water usage, socioeconomic and environmental justice impacts in southwest Memphis.

The Allen Gas Turbine Project will lock in decades of additional pollution and other harms in southwest Memphis, conflict with federal climate and environmental justice policy, risk leaving money on the table in Justice40 and Inflation Reduction Act ("IRA") disadvantaged communities, appears to ignore reasonable, cost-effective clean alternatives that would better address reliability and resiliency concerns, and puts ratepayers suffering high energy burden on the hook for an expensive new gas plant.

As a federal utility that has been statutorily directed "to promote the wider and *better* use of electric power for agricultural and domestic use,"[2] TVA can and *must do better* by the people of southwest Memphis. A series of executive orders require the "whole" of the federal government, including TVA, to lead by example in preventing and remedying environmental injustice, decarbonizing the electric grid by 2035, and implementing the nation's most significant climate legislation.[3] Programs implementing the climate legislation, known as the IRA, provide

[1] TVA, Allen Aeroderivative Generation Project Notice of Intent, 88 Fed. Reg. 70,693 (Oct. 12, 2023) [hereinafter Scoping Notice].
[2] 16 U.S.C. § 831i.
[3] *See, e.g.*, Exec. Order No. 14,096, Revitalizing Our Nation's Commitment to Environmental Justice for All, 88 Fed. Reg. 25,251, 25,251–53 (Apr. 26, 2023) ("It is the policy of my Administration to pursue a whole-of-

additional financial incentives, including tax credits monetizable by TVA and local municipal utilities, in energy communities historically burdened by coal plant pollution.[4] Parts of southwest Memphis—including the proposed site of the Project—have been identified as an energy community. TVA must analyze a range of alternatives that leverage the full benefits of the IRA before investing in a new gas plant in southwest Memphis.

TVA must prepare an EIS for the Allen Gas Turbine Project to fully examine how the Project will add to significant cumulative environmental impacts in southwest Memphis and to explore alternatives that will avoid those impacts. In order to adequately evaluate the asserted need for the Project and the resources available to satisfy that need, TVA must first prepare a new long-term energy plan, or IRP, that reflects the sweeping "statutory, regulatory, and technology" changes in the electric utility sector since 2019.[5] Given the interconnectedness of the grid and the potential for demand-side resources across TVA's territory to add value, TVA cannot properly evaluate the Allen Gas Turbine Project on a "piecemeal" basis.[6]

We strongly urge TVA to go back to the drawing board and come back to southwest Memphis communities with a *better* proposal that commits the utility to "investing in and supporting culturally vibrant, sustainable, and resilient communities in which every person has safe, clean, and affordable options for housing, energy, and transportation."[7]

Sincerely,

Amanda Garcia
Delaney King
Sami Harrell
Attorneys
Southern Environmental Law Center

Amy Kelly
Field Organizing Strategist
Tennessee Valley Region
Sierra Club

KeShaun Pearson
President
Memphis Community Against Pollution

Sarah Houston
Executive Director
Protect Our Aquifer

government approach to environmental justice."); *see id.* (collecting relevant executive orders); Exec. Order No. 14,057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, 86 Fed. Reg. 70,935–36 (Dec. 8, 2021) ("declares a policy for the federal government "to lead by example in order to achieve a carbon pollution-free electricity sector by 2035 and net-zero emissions economy-wide by no later than 2050."); Exec. Order No. 14,082, Implementation of the Energy and Infrastructure Provisions of the Inflation Reduction Act of 2022, 87 Fed. Reg. 56,861, 56,862 (Sept. 12, 2022) (directing federal agencies—including government-owned corporations like TVA—to "driv[e] progress to . . . achieve a carbon pollution-free electricity sector by 2035," and to "promot[e] construction of clean energy generation, storage, and transmission[.]")

[4] *Energy Community Tax Credit Bonus*, Interagency Working Group on Coal & Power Plant Communities & Economic Revitalization, https://energycommunities.gov/energy-community-tax-credit-bonus/, **Attachment 1**.

[5] Letter from Ntale Kajumba, NEPA Section Manager, EPA, to J. Taylor Johnson, NEPA Compliance Specialist, TVA, Re: EPA Comments on the Notice of Intent to Prepare an Environmental Impact Statement for the Cheatham County Generation Site, Cheatham County, Tennessee at 2 (July 7, 2023) [hereinafter EPA Comments on Cheatham County Generation], **Attachment 2**.

[6] *Id.*

[7] Exec. Order No. 14,096, 88 Fed. Reg. at 25,251–53.

I. The Allen Gas Turbine Project will significantly and disproportionately impact an overburdened predominantly Black and low-income community, causing significant cumulative environmental justice impacts.

TVA proposes to construct and operate the Allen Gas Turbine Project adjacent to both the retired Allen Coal Plant and the operating Allen Gas Plant in southwest Memphis. Southwest Memphis includes several predominantly Black, low-income neighborhoods, including Boxtown and Westwood.[8] Boxtown is a historic freedmen's community established by formerly enslaved people following the Emancipation Proclamation of 1863.[9]

The Environmental Protection Agency's ("EPA's") EJScreen 2.0 indicates that communities at both the three-mile and five-mile radius from the Allen Coal Plant (including Boxtown and Westwood) are more than 95 percent Black and majority low-income, with life expectancies among the lowest in the nation at the 94th and 96th percentile respectively.[10] Communities in southwest Memphis suffer high levels of asthma and heart disease and lack adequate access to health insurance.[11] EPA's EJ Index shows that residents in southwest Memphis are chronically exposed to high levels of dangerous air pollutants. At both the three-mile and five-mile radius, levels of PM2.5, ozone, and toxic releases to the air have EJ indexes above the 90th percentile at both the state and national levels.[12] The air toxics cancer risk and air toxics hazards index, when accounting for low-income and minority population, is also above the 90th percentile at both state and national levels.[13]

Southwest Memphis hosts significantly more than its fair share of industrial plants, including an oil refinery, a steel mill, a recently retired coal-fired power plant operated by TVA for more than fifty years, and a relatively new natural gas plant also operated by TVA. Within the five-mile radius of the proposed Allen Gas Turbine Project, there are sixty-six air pollution sources reporting to EPA and sixty-one industrial sources reporting to the Toxic Release Inventory.[14] South Memphis is also a transportation hub, hosting barge traffic on the Mississippi River, truck and autos on interstate highways, several local rail yards, and air traffic at Memphis International Airport, one of the busiest cargo airports in the world.[15]

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[8] TVA, ALLEN FOSSIL PLANT EMISSION CONTROL PROJECT FINAL ENVIRONMENTAL ASSESSMENT 116–18 (Aug. 2014), **Attachment 3** [hereinafter ALLEN POLLUTION CONTROL EA].

[9] Aubrey Ford, Phoebe Weinman & Walker Weinman, *Boxtown: The Land of Broken Promises*, Storyboard Memphis (Sept. 16, 2019), https://storyboardmemphis.org/neighborhood-board/boxtown/, **Attachment 4**.

[10] EPA, *3 Mile Ring Around the Area, TENNESSEE, EPA Region 4, – Allen Coal Plant*, S. ENV'T L. CTR. (last visited Nov. 8, 2023), [hereinafter EJ Screen 3-mile], **Attachment 5**; EPA, *5 Mile Ring Around the Area, TENNESSEE, EPA Region 4, – Allen Coal Plant*, S. ENV'T L. CTR. (last visited Nov. 8, 2023), [hereinafter EJ Screen 5-mile], **Attachment 6**.

[11] EJ Screen 3-mile; EJ Screen 5-mile.

[12] EJ Screen 3-mile; EJ Screen 5-mile.

[13] EJ Screen 3-mile; EJ Screen 5-mile.

[14] EJ Screen 5-mile.

[15] Chunrong Jia & Jeffrey Foran, *Air Toxics Concentrations, Source Identification, and Health Risks: An Air Pollution Hot Spot in Southwest Memphis, TN*, 81 ATMOSPHERIC ENV'T 112–16 (Dec. 2013), https://www.sciencedirect.com/science/article/abs/pii/S1352231013006948?via%3Dihub [hereinafter Jia & Foran

These industrial plants and transportation sources have burdened the predominantly Black, low-income communities of southwest Memphis with what may be some of the nation's worst air quality.[16]

TVA has operated fossil fuel plants in southwest Memphis for nearly sixty years, continually polluting the community's air and water.[17] TVA's Allen Coal Plant had the dubious distinction of being named Memphis's "biggest polluter" and spewed harmful pollutants including extremely high levels of particulate matter ("PM2.5") and ozone-forming nitrogen oxides ("NOx") into the air in southwest Memphis for decades.[18] Although TVA retired its coal plant rather than installing additional pollution controls in 2018, health effects from its air pollution are likely still being suffered by the community.[19] In addition, the plant's coal ash pits remains a pollution problem for the community due to high levels of arsenic and other coal ash contaminants leaching into groundwater and surface waters such as the Horn Lake Cutoff and McKellar Lake.[20] TVA also dismissed the community's environmental justice concerns in deciding to run hundreds of trucks through southwest Memphis for a decade while cleaning up the coal ash pits, further exacerbating air pollution and other impacts in southwest Memphis.[21]

TVA now operates the Allen Gas Plant next door to the coal plant. TVA's decision to construct and operate the Allen Gas Plant committed the utility to continue to pollute the air in southwest Memphis with PM2.5, NOx and other pollutants for decades into the future.[22] These pollutants contribute to a range of serious health impacts that are prevalent in southwest

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2013], **Attachment 7**; *Properties and Cargo*, MEMPHIS INT'L AIRPORT, https://flymemphis.com/properties-and-cargo/, **Attachment 8**.

[16] Jia & Foran, *Air Toxics Concentrations* at 112.

[17] TVA began leasing the 741 MW Allen Fossil Plant in 1964 and purchased the plant in 1984. TVA retired and replaced the Allen Fossil Plant with the roughly 1,000 MW Allen Gas Plant in 2018. *Allen Fossil Plant*, TVA, https://www.tva.com/Energy/Our-Power-System/Coal/Allen-Fossil-Plant, **Attachment 9**. In addition, TVA operated the 424 MW Allen Combustion Turbine Plant from 1971 to 2022. Scoping Notice at 70,694; Tenn. Valley Auth., Aging Fossil Unit Evaluation: Oldest Combustion Turbines, 11 (Aug. 2019) [hereinafter CT Modernization Study] **Attachment 10**. In 2021, TVA decided to retire and replace the Allen Combustion Turbine Plant with new combustion turbines at the Paradise and Colbert Plants. TVA, PARADISE AND COLBERT COMBUSTION TURBINE PLANTS FINAL ENVIRONMENTAL ASSESSMENT (June 2021), https://www.tva.com/docs/default-source/1-float/paradiseandcolbertcombustionturbineplants.pdf?sfvrsn=80483d53_14 [hereinafter PARADISE AND COLBERT FINAL EA], **Attachment 11**.

[18] ALLEN POLLUTION CONTROL EA; Tom Charlier, *Memphis' Largest Polluter, the TVA Allen Plant, Retires*, MEMPHIS COM. APPEAL (Apr. 26, 2018), https://www.commercialappeal.com/story/news/2018/04/26/memphis-larget-polluter-tva-allen-plant-retired/543676002/, **Attachment 12**.

[19] *See* Juciano Gasparotto & Kátia Da Boit Martinello, *Coal As an Energy Source and Its Impacts on Human Health*, 2 ENERGY GEOSCIENCE 113–20 (Apr. 2021), https://www.sciencedirect.com/science/article/pii/S2666759220300500 (detailing longitudinal health impacts of exposure to coal burning), **Attachment 13**.

[20] JOHN CARMICHAEL ET AL., PRELIMINARY EVALUATION OF THE HYDROGEOLOGY AND GROUNDWATER QUALITY OF THE MISSISSIPPI RIVER VALLEY ALLUVIAL AQUIFER AND MEMPHIS AQUIFER AT THE TENNESSEE VALLEY AUTHORITY ALLEN POWER PLANTS, MEMPHIS, SHELBY COUNTY, TENNESSEE, OPEN-FILE REPORT 2018-1097, U. S. GEOLOGICAL SURVEY, https://pubs.er.usgs.gov/publication/ofr20181097, **Attachment 14**.

[21] Darryl Fears, *The TVA is Dumping a Mountain of Coal Ash in Black South Memphis*, WASH. POST (Aug. 19, 2022), https://www.washingtonpost.com/climate-environment/2022/08/19/tennessee-valley-authority-memphis-coal/, **Attachment 15**.

[22] ALLEN POLLUTION CONTROL EA at 36.

Memphis, including asthma, decreased lung function, heart attacks and premature death.[23] The Allen Gas Plant also consumes an enormous amount of southwest Memphis's clean drinking water to operate and puts strain on the community's drinking water infrastructure.[24]

In addition to TVA's polluting fossil fuel plants, for decades the Valero Memphis Refinery has been emitting toxic air pollution into southwest Memphis.[25] In February 2021, the Valero Refinery polluted Nonconnah Creek with oil and the air with toxic hydrogen sulfide during a flare event.[26] In July 2023, Valero had another significant flare incident, releasing a plume of black smoke and sulfur dioxide into the community.[27] The site of the Valero Memphis Refinery is also a long-standing source of groundwater contamination, including benzene, that has been in remediation for decades.[28] Driven by toxic pollutants like benzene and formaldehyde, the cumulative cancer risk in southwest Memphis is four times higher than the national average.[29]

Climate change acts as a risk multiplier on communities already suffering unjust social, economic, and environmental vulnerabilities like southwest Memphis. This means that impacts like health effects related to air pollution and underinvestment in community health and infrastructure are expected to worsen as severe weather and other climate-related disasters occur with more frequency and intensity. Southwest Memphis has already felt these effects, with residents sometimes going for more than a week without access to electricity or clean water during severe winter and summer weather during the past two years. A recently published map

[23] *Health and Environmental Effects of Particulate Matter (PM)*, EPA (Aug. 23, 2023), https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm, **Attachment 16**; *Basic Information about NO_2*, U.S. EPA (July 25, 2023), https://www.epa.gov/no2-pollution/basic-information-about-no2, **Attachment 17**.

[24] Tom Charlier, *TVA Absorbing Higher Costs to Cool New Memphis Power Plant*, MEMPHIS COM. APPEAL (July 6, 2018), https://www.commercialappeal.com/story/news/2018/07/06/tva-mlgw-cooling-water/759124002/, **Attachment 18**; Samuel Hardiman, *TVA Cuts Capacity at Memphis Plant Due to Water Shortage; Assures the Lights will Stay on*, MEMPHIS COM. APPEAL (Feb. 19, 2021), https://www.commercialappeal.com/story/news/2021/02/19/tva-cuts-capacity-memphis-plant-due-water-shortage/4514345001/; **Attachment 19**.

[25] Sarah Macaraeg, *Byhalia pipeline: Toxic refinery pollution, monitoring blind spot in southwest Memphis*, MEMPHIS COM. APPEAL (Mar. 16, 2021), https://www.commercialappeal.com/in-depth/news/2021/03/17/takeaways-toxic-refinery-pollution-southwest-memphis/4718350001/, **Attachment 20**; PHMSA National Pipeline Mapping System, *NPMS Public Viewer*, https://pvnpms.phmsa.dot.gov/PublicViewer/ (choose Tennessee, then Shelby County, to view pipeline map in area) (accessed May 16, 2021), **Attachment 21**.

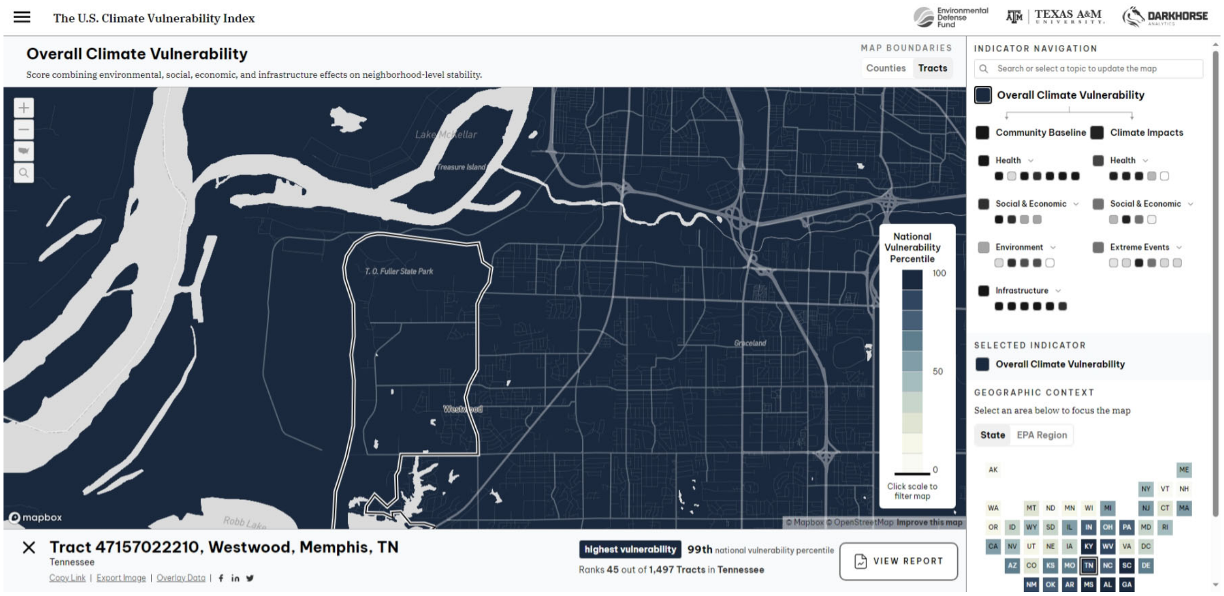
[26] Carrington J. Tatum, *Valero cleans up oil after Memphis refinery flare; excess toxic gas release*, MLK50 (Feb. 24, 2021), https://mlk50.com/2021/02/24/valero-cleans-up-oil-after-memphis-refinery-flare-excess-toxic-gas-release/, **Attachment 22**.

[27] Lydian Kennin, *Smoke plume from Valero refinery reportedly caused by MLGW power blink; SCHD monitoring*, ACTION NEWS 5 (July 25, 2023), https://www.actionnews5.com/2023/07/26/flare-valero-refinery-lights-up-sky-causes-concern/, **Attachment 23**; Letter from Eric Brown, Valero Refining Company-Tennessee, L.L.C., to City of Memphis Office of Emergency Mgmt. Re: Follow-up Notification (Aug. 11, 2023), https://shelbytnhealth.com/DocumentCenter/View/4903/Exceedance-Notifications-Dated-7-25-23, **Attachment 24**.

[28] EarthCon Consultants, Inc., *Valero Refining Company-Tennessee, LLC Semi-Annual Site Status Monitoring Report* (May 21, 2019), https://static1.squarespace.com/static/5b7b3e99d274cb770c84b404/t/5ed184032c0f245a2e211f48/1590789165192/Valero_OCTOBER+2018+%E2%80%93+MARCH+2019_small.pdf, **Attachment 25**.

[29] Jia & Foran, *Air Toxics Concentrations* at 112.

identifies southwest Memphis as among the most climate-vulnerable communities in the nation.[30]



The 2021 winter storm illustrates the point. In February 2021, cities across the South experienced an extreme winter weather event attributed to climate change.[31] In Memphis, as municipal and industrial infrastructure froze, residents lost access to clean water for several days. Memphis Light, Gas and Water ("MLGW") had to ask TVA to stop using its water to operate the Allen Gas Plant because it was putting too much strain on the well fields that provide drinking water for predominantly Black, low-income South Memphis communities.[32] And the Valero Memphis refinery released a hellish-looking flare that rained toxic pollution on these same communities.[33]

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[30] *See U.S. Climate Vulnerability Index: Overall Climate Vulnerability*, ENV'T DEF. FUND ET AL., https://map.climatevulnerabilityindex.org/map/cvi_overall/tract-47157022210-westwood-memphis-tn?mapBoundaries=Tract&mapFilter=0&reportBoundaries=Tract&geoContext=State (last visited Nov. 11, 2023), **Attachment 26**.

[31] Adam B. Smith, *2021 U.S. Billion-dollar Weather and Climate Disasters in Historical Context*, CLIMATE.GOV: BEYOND THE DATA (Jan. 24, 2022), https://www.climate.gov/news-features/blogs/beyond-data/2021-us-billion-dollar-weather-and-climate-disasters-historical, **Attachment 27**.

[32] Samuel Hardiman, *TVA Cuts Capacity at Memphis Plant Due to Water Shortage; Assures the Lights Will Stay On*, MEMPHIS COM. APPEAL (Feb. 19, 2021), https://www.commercialappeal.com/story/news/2021/02/19/tva-cuts-capacity-memphis-plant-due-water-shortage/4514345001/.

[33] Micaela A. Watts, *Evening Flare from Valero Refinery in South Memphis Triggers Confusion and Concern*, MEMPHIS COM. APPEAL (Feb. 16, 2021), https://www.commercialappeal.com/story/news/2021/02/16/valero-memphis-fire-flame-refinery-during-winter-sky/6762146002/, **Attachment 28**; Elisabeth D'Amore, *Winter Blast Sets 8 Weather Records*, FOX13MEMPHIS (Feb. 22, 2021), https://www.fox13memphis.com/news/local/winter-blast-sets-8-weather-records/CZERJV6U4FBHZL7GMZBTIJFPGM/, **Attachment 29**.

In summary, southwest Memphis is an overburdened community experiencing disproportionate environmental harms and risks,[34] many of which are attributable to or exacerbated by TVA's actions in the community. Multiple factors, including both environmental and socio-economic stressors, act cumulatively to affect health and the environment and contribute to persistent environmental health disparities in southwest Memphis.[35] Southwest Memphis includes communities identified as Justice40 disadvantaged communities and EPA IRA disadvantaged communities.[36]

The Council on Environmental Quality's ("CEQ's") 1997 guidance document, *Environmental Justice Guidance Under the National Environmental Policy Act*, recognizes that environmental justice concerns are inherently site-specific:

> Agencies should recognize that the question of whether agency action raises environmental justice issues *is highly sensitive to the history or circumstances of a particular community or population,* the particular type of environmental or human health impact, and the nature of the proposed action itself.[37]

Because of the site-specific nature of the inquiry, CEQ emphasizes the need for agencies to gather, disclose, and analyze site-specific data and information relevant to the individual impacts and cumulative burdens borne by the specific environmental justice communities that will be affected by an agency's proposed action.[38] The Council on Environmental Quality further emphasizes the need to meaningfully engage with the specific community that will be affected early and often throughout the NEPA process.[39]

As recently as November 2021, Community Groups alerted TVA to their concerns that TVA's activities were causing significant and disproportionate cumulative environmental justice impacts in southwest Memphis.[40] Without having meaningfully mitigated or addressed those

[34] OFF. OF ENV'T JUST., EPA, EPA-300-B-1-6004, EJ 2020 ACTION AGENDA: THE U.S. EPA'S ENVIRONMENTAL JUSTICE STRATEGIC PLAN FOR 2016-2020 55 (Oct. 2016) (available at https://www.epa.gov/sites/default/files/2016-05/documents/052216_ej_2020_strategic_plan_final_0.pdf), **Attachment 30**.
[35] *See id.*
[36] EJ Screen 3-mile; EJ Screen 5-mile
[37] Council on Env't Quality, *Environmental Justice Guidance Under the National Environmental Policy Act* 8 (1997) [hereinafter *1997 CEQ Environmental Justice Guidance Under NEPA*] (emphasis added), **Attachment 31**.
[38] *Id.* at 8–9.
[39] *Id.* at 8 ("Agencies should assure meaningful community representation in the process. Agencies should be aware of the diverse constituencies within any particular community when they seek community representation and should endeavor to have complete representation of the community as a whole. Agencies also should be aware that community participation must occur as early as possible if it is to be meaningful.").
[40] Community Groups Request that TVA supplement its NEPA analysis regarding environmental justice-related impacts and alternatives associated with the selection of the South Shelby Landfill in Memphis, Tennessee, for disposal of toxic coal ash.

concerns, TVA now proposes to build and operate yet another fossil fuel-fired power plant in this already overburdened community.[41]

TVA does not identify in the Notice whether it will prepare an EA or an EIS for the Allen Gas Turbine Project. Instead, TVA states that "[p]ublic comments received during the scoping period will assist TVA in determining the appropriate level of NEPA review."[42] While Community Groups appreciate the opportunity to provide input into the scope of TVA's environmental review for the Allen Gas Turbine Project, TVA already should be well aware that its proposal will cause cumulatively significant air pollution, climate, and other environmental justice impacts that require study in an EIS. In Section II, we identify a range of significant impacts contributing to cumulatively significant environmental justice impacts that must be included in the scope of TVA's environmental review.

II. TVA must prepare an EIS for the Allen Gas Turbine Project.

An environmental impact statement ("EIS") is required for "major Federal actions significantly affecting the quality of the human environment," where "human environment" means not only the natural and physical environment but its relationship to present and future generations.[43] "[A]n EIS must be prepared if substantial questions are raised as to whether a project may cause significant degradation of some human environmental factor."[44] A recent executive order underscores the importance of federal agencies' obligation to analyze the direct, indirect, and cumulative impact of the action on environmental justice communities.[45]

NEPA regulations define "effects or impacts" of an action to include foreseeable direct, indirect, and cumulative impacts.[46] "Cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."[47]

[41] The EPA defines an overburdened community as "[m]inority, low-income, tribal, or [I]ndigenous populations or geographic locations in the United States that potentially experience disproportionate environmental harms and risks. This disproportionality can be as a result of greater vulnerability to environmental hazards, lack of opportunity for public participation, or other factors. Increased vulnerability may be attributable to an accumulation of negative or lack of positive environmental, health, economic, or social conditions within these populations or places. The term describes situations where multiple factors, including both environmental and socio-economic stressors, may act cumulatively to affect health and the environment and contribute to persistent environmental health disparities." EJ 2020 Glossary, EPA, (July 31, 2023) https://www.epa.gov/environmentaljustice/ej-2020-glossary#:~:text=Overburdened%20Community%20%2D%20Minority%2C%20low%2D,disproportionate%20environmental%20harms%20and%20risks.
[42] Scoping Notice at 70,694.
[43] 42 U.S.C. § 4332(2)(C); 40 C.F.R. § 1508.1(m) (2022).
[44] *Ocean Advocs. v. U.S. Army Corps. of Eng'rs*, 402 F.3d 846, 865 (9th Cir. 2005) (quoting *Idaho Sporting Cong. v. Thomas*, 137 F.3d 1146, 1149 (9th Cir. 1998)).
[45] Exec. Order No. 14,096, 88 Fed. Reg. at 25,251; Exec Order No. 12,898, 59 Fed. Reg. 7,629 (Feb. 11, 1994).
[46] 40 C.F.R. § 1508.1(g) (2022).
[47] *Id.*

Beyond the extensive guidance already in effect to explain how TVA must properly analyze environmental impacts, their cumulative effects, and their subsequent impacts in the context of existing cumulative burdens, many of which are cited throughout these comments, CEQ is additionally finalizing regulations under NEPA. Much of the proposed rule reflects what is already longstanding practice for NEPA compliance.[48] We reference the proposed rule where useful in clarifying TVA's obligations under NEPA. For example, the proposed rule emphasizes that agencies analyze a proposed action's impacts on communities with environmental justice concerns, something agencies should already be doing under Executive Order 14,096 and longstanding NEPA guidance.[49] In addition, CEQ's proposed regulations may become final during the environmental review process for the Allen Gas Turbine Project.

Information already in TVA's possession[50] as well as information provided in these comments raise substantial questions regarding whether the Allen Aero CTs Project will cause significant environmental impacts, including cumulative impacts, in the southwest Memphis community.

A. TVA must accurately define the Allen Gas Turbine Project as a new gas plant, not a "replacement," for purposes of evaluating the Project's environmental impacts.

In order to accurately and adequately disclose and analyze the impacts of the Allen Gas Turbine Project, TVA must accurately characterize the No Action Alternative. TVA is required to include a no-action alternative in its analysis that will "represent the environmental status quo" and "provide the environmental baseline from which the proposed action and other alternatives can be assessed."[51] CEQ directs that, when an agency is studying a proposal for a specific project like the Allen Gas Turbine Project, "'[n]o action' in such cases would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward."[52]

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[48] NEPA Implementing Regulations Revisions Phase 2 Notice of Proposed Rulemaking, 88 Fed. Reg. 49,924, 49,924 (July 31, 2023) [hereinafter NEPA Implementing Regulations Phase 2] ("CEQ proposes these changes to better align the provisions with . . . longstanding Federal agency experience and practice . . . .").

[49] Exec. Order No. 14,096, 88 Fed. Reg. at 25,251; *see* NEPA Implementing Regulations Phase 2, 88 Fed. Reg. at 49,926–27 ("The E.O. charges each agency with making achieving environmental justice part of its mission . . . and requires each agency to submit . . . goals and pans for advancing environmental justice."); *1997 CEQ Environmental Justice Guidance Under NEPA*.

[50] *See* Protect Our Aquifer and Tennessee Chapter Sierra Club Comments Demanding EIS for Allen Fossil Plant Emission Control Project Nos. 2013-33 & 2015-28 (Feb. 21, 2018) [hereinafter Allen Pumping Plan EIS Comments], **Attachment 32**; Memphis Community Against Pollution, Protect Our Aquifer, and Tennessee Chapter Sierra Club Comments Demanding Supplemental EIS for Allen Fossil Plant Ash Impoundment Closure Project No. 2016-29 (Nov. 9, 2021) [hereinafter Allen Coal Ash SEIS Comments], **Attachment 33**.

[51] 18 C.F.R. § 1318.400(e) (2020); *see also id.* § 1318.302(b) (2020) (EA must include no-action alternative).

[52] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,027 (Mar. 23, 1981) ("*Forty Questions*").

Here, the status quo would mean zero gas plant units operating at the Allen Combustion Turbine Site. In 2021, TVA determined that it would retire twenty existing units at the Allen Combustion Turbine site and replace them, along with sixteen units at the Johnsonville site, with 1500 MW of new gas plants at the Colbert plant in Alabama and the Paradise plant in Kentucky.[53] Further, TVA makes clear in the Scoping Notice that at least sixteen units at Allen have been inoperable since they failed during Winter Storm Elliott in December 2022.[54]

In the Scoping Notice, TVA describes the No Action Alternative: "TVA would not install new aeroderivative CT units at the ACT, and TVA would retire all existing units."[55] This makes sense, since TVA already decided, in a separate action, to retire all of the existing units. However, in its public scoping meeting materials, TVA misleadingly characterizes the Allen Gas Turbine Project, including continuing to operate two old units and constructing six new units, as "modernizing and upgrading the Allen Combustion Turbine Plant."[56] "Modernizing" and "upgrading" suggests that the Allen Gas Turbine Project would be *replacing* the inoperable units onsite, but in fact TVA has already decided to replace that capacity and generation elsewhere, at Colbert and Paradise. Accordingly, the relevant baseline against which to compare the impacts of the Allen Gas Turbine Project is a baseline of *zero* gas generation at the site. TVA must study the no action alternative's effects and use those as the comparison point for determining whether the proposed course of action will have significant effects.[57]

This distinction is important. TVA's presentation at the scoping meeting described the Allen Gas Turbine Project as having "lower emissions,"[58] but in fact the Project is *increasing* local air pollution relative to the baseline of zero gas generation at the site. Similarly, because TVA already replaced the retiring Allen units with new units at Paradise and Colbert, the Allen Gas Turbine Project is an entirely new source of greenhouse gas emissions, *increasing* those emissions relative to the zero-gas baseline.

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[53] PARADISE AND COLBERT FINAL EA at 9; TVA, FINDING OF NO SIGNIFICANT IMPACT: PARADISE AND COLBERT COMBUSTION TURBINE PLANTS (July 2021), (adopting Alternative B to retire CT units 1–20 at Allen) pct-cct-ea-final-fonsi_6-29_2021_signedd129217f-05d6-4d99-ab98-466c2c884f8c.pdf (tva.com), **Attachment 34**. In the Paradise and Colbert Final EA, TVA states that it might retain a couple of units for black start, but TVA also states "they would only be used for emergency purposes and would not be considered part of TVA's normal operational system." *See* PARADISE AND COLBERT FINAL EA at 9.
[54] Scoping Notice at 70,694.
[55] *Id.* at 70,693.
[56] TVA, *Allen Aeroderivative Combustion Turbine Project: Welcome to our Community Open House* at slide 5 [hereinafter TVA Allen Presentation], https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/environment/environmental-stewardship/nepa-environmental-reviews/public-scoping-meeting-materials.pdf?sfvrsn=f6c3fc29_1, **Attachment 35**.
[57] 40 C.F.R. § 1502.14(c) (2020) (requiring but not explaining "no action alternative"); *see* NEPA Implementing Regulations Phase 2, 88 Fed. Reg. at 49,977 (to be codified at 40 C.F.R. pt. 1502) (explaining that "[t]he no action alternative should serve as the baseline" and requiring "[a]n analysis of the effects of the no action alternative").
[58] TVA Allen Presentation at slide 6.

B. TVA must consider how the Allen Gas Turbine Project will add to cumulative environmental impacts affecting southwest Memphis, including TVA's own past and ongoing pollution.

TVA's analysis of cumulative impacts must identify actions in addition to the Allen Gas Turbine Project "that have had or are expected to have impacts in the same area" as well as "the overall impact that can be expected if the individual impacts are allowed to accumulate."[59] CEQ has long advised that human exposure to multiple or cumulative hazardous sources, including historical exposures, should be part of an agency's analysis in an environmental context.[60] And EPA, which reviews federal agency EISs, including TVA's, under section 309 of the Clean Air Act, has identified that "appropriately broad" cumulative impact analyses "should sharpen consideration of alternatives and mitigation, enabling decision-makers to reckon more transparently with the cumulative nature of environmental injustice and inequity."[61] EPA observes that

> Disclosure and consideration of the effects of past, present, and reasonably foreseeable actions to account for baseline burdens on communities with environmental justice concerns and other underserved communities—grounded in meaningful input from those communities—allows agencies and the public to be more fully informed about the impacts from a proposed action, including the degree to which affected communities may be more susceptible to those impacts.[62]

Agencies must assess cumulative impacts during the initial environmental review stage regardless of their conclusion as to the impacts' significance.[63] This scoping phase "is the key to analyzing cumulative effects."[64] Scoping cumulative effects allows the agency to identify and share with the public whether its planned action "will have effects similar to other actions in the area" and whether nearby communities "have been historically affected by cumulative actions."[65]

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[59] *Grand Canyon Trust v. F.A.A.*, 290 F.3d 339, 345 (D.C. Cir. 2002).
[60] *1997 CEQ Environmental Justice Guidance Under NEPA* at 13.
[61] OFF. OF GEN. COUNSEL, EPA, LEGAL TOOLS TO ADVANCE ENVIRONMENTAL JUSTICE: CUMULATIVE IMPACTS ADDENDUM 40 (Jan. 2023), https://www.epa.gov/system/files/documents/2022-12/bh508-Cumulative%20Impacts%20Addendum%20Final%202022-11-28.pdf, **Attachment 36**.
[62] *Id.*
[63] *See* Memorandum from James L. Connaughton, CEQ Chairman, to the Heads of Federal Agencies, on Guidance on the Consideration of Past Actions in Cumulative Effects Analysis 3 (June 24, 2005) [hereinafter Implementing the Procedural Requirements of the NEPA], https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/Guidance_on_CE.pdf, **Attachment 37**.
[64] CEQ, *Considering Cumulative Effects Under the National Environmental Policy Act* at V (Jan. 1997) [hereinafter *Considering Cumulative Effects Under NEPA*], https://ceq.doe.gov/publications/cumulative_effects.html, **Attachment 38**.
[65] *Considering Cumulative Effects Under NEPA* at 12.

Without a proper cumulative effects analysis, an agency's review under NEPA will not be "truly informed" nor based on "a reasoned evaluation of the relevant factors" as required by law.[66]

"Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."[67] Therefore, a proper cumulative effects analysis effectively draws the agency's attention to the effects of its action "*when added to* the effects of other past, present, and reasonably foreseeable actions . . . ."[68] Agencies must consider the effects of past actions if the new proposal's effects "have a continuing, additive, and significant relationship to [past] effects."[69]

As described in Section I, above, the Allen Gas Turbine Project will add impacts to overburdened predominantly Black and low-income communities in southwest Memphis. CEQ's recent proposed rule update underscores that agencies must consider cumulative *impacts*, or "the aggregate effect of multiple stressors and exposures on a person, community, or population" in addition to the distinct, general mandate to analyze a project's cumulative effects.[70] Below is a non-exhaustive list of past, ongoing, and reasonably foreseeable projects that TVA must consider in its assessment of the cumulative impacts of the Allen Gas Turbine Project.

TVA's activities

- <u>Past activities</u>: Operation of the Allen Coal Plant for sixty years and the Allen Combustion Turbine Plant for more than fifty years, including air pollution, greenhouse gas and climate, socioeconomic and environmental justice impacts.

<u>Ongoing activities</u>:

- Operation of the Allen Combined Cycle Plant, including air pollution, greenhouse gas and climate, water usage, socioeconomic and environmental justice impacts;
- Allen Coal Plant Deconstruction and Decontamination Project, including air pollution, traffic, public safety, and environmental justice impacts;
- Allen Coal Ash Impoundment Closure Project, including air pollution, traffic, public safety, and environmental justice impacts; operation of TVA's existing coal and gas fleet, including greenhouse gas and climate impacts.

<u>Reasonably foreseeable projects</u>:

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66 *Utah Shared Access All. v. U.S. Forest Serv.*, 288 F.3d 1205, 1213 (10th Cir. 2002) (citing *Marsh v. Or. Nat. Res. Council*, 490 U.S. 360, 373–74, 377 (1989)).
67 40 C.F.R. § 1508.1(g)(3) (2022).
68 *Id.* (emphasis added); *see Sierra Club v. Marsh*, 769 F.2d 868, 881 (1st Cir. 1985) (rejecting agency's attempt to ignore secondary effects and collecting authorities)
69 Implementing the Procedural Requirements of the NEPA at 1 (offering guidance on the consideration of past actions in cumulative effects analysis). An agency's only excuse for leaving out information on past actions' effects would be where the information is unavailable. *See Kleppe v. Sierra Club*, 427 U.S. 390, 414 (1976).
70 *See* NEPA Implementing Regulations Phase 2, 88 Fed. Reg. at 49,961 (explaining updates to § 1508.1(k)).

- Operation of 6,050 MW of new gas plants, including plants at Paradise, Colbert, Johnsonville, Cumberland, Kingston, and Cheatham County, including greenhouse gas and climate impacts;
- Operation of any additional fossil fuel-fired plants not yet publicly proposed. For example, recent announcements of energy-intensive economic development like Ford's Blue Oval City raise concern about whether TVA will rely more heavily on its existing gas units at Allen or build more water-intensive gas plants in or near southwest Memphis, contributing more air pollution and putting more strain on the city's drinking water source, the Memphis Sand Aquifer. This is not an abstract concern. Protect Our Aquifer recently commented on TVA's proposal to construct a new substation to serve the Blue Oval City Megasite project.[71] TVA did not disclose what kind of power plant would supply the electricity, or where that plant's water would come from. To the extent TVA reasonably foresees adding a combined cycle function to the Allen Gas Turbine Project, or foresees adding any other gas plant in the Memphis region, TVA must analyze the air pollution, greenhouse gas and climate, water usage, socioeconomic and environmental justice impacts of such project.

Non-TVA projects

TVA must also account for the "baseline burdens" on southwest Memphis using readily available environmental mapping tools and studies, such as those cited in Section I of these comments.[72] TVA should particularly identify those ongoing and reasonably foreseeable projects with impacts that are similar to those of the Allen Gas Turbine Project, because the Allen Gas Turbine Project will "add" to those impacts. For example, the Valero Memphis Oil Refinery and the Nucor Steel Mill emit many of the same pollutants that are emitted by TVA's existing and planned gas plants in southwest Memphis, including PM 2.5 and NOx, as well as air toxics that may have cumulatively significant impacts on air quality and health outcomes. Pollution, traffic, and public safety impacts from transportation sources, including the railyards, highways, and airport in South Memphis, should also be included in the "baseline burdens" borne by the community. We have identified some of these projects in Section I above, but TVA must also work to obtain meaningful community

[71] Letter from Sarah Houston, Protect Our Aquifer, to Anita Masters, TVA, Re: TVA's Megasite Power Supply Draft Supplemental Environmental Assessment (May 26, 2022), https://www.protectouraquifer.org/blue-oval-city-ford-megasite (last visited Nov. 10, 2023), **Attachment 39**.

[72] *1997 CEQ Environmental Justice Guidance Under NEPA* at 13 ("Agencies should consider relevant public health data and industry data concerning the potential for multiple or cumulative exposure to human health or environmental hazards in the affected population and historical patterns of exposure to environmental hazards, to the extent such information is reasonably available. For example, data may suggest there are disproportionately high and adverse human health or environmental effects on a minority population, low-income population, or Indian tribe from the agency action. Agencies should consider these multiple, or cumulative effects, even if certain effects are not within the control or subject to the discretion of the agency proposing the action."); *cf.* Report of the Federal Interagency Working Group on Environmental Justice & NEPA Committee, *Promising Practices for EJ Methodologies in NEPA Reviews* 32 (2016), **Attachment 40**. ("[A]gencies may consider cumulative impacts that may result from chemical and non-chemical stressors, exposures from multiple routes or sources, and factors that differentially affect exposure or toxicity to communities. The cumulative ecological, aesthetic, historic, cultural, economic, social, or health effects of the proposed action can arise from and also include non-chemical stressors.").

input and conduct its own analysis of these projects. TVA must also include reasonably foreseeable non-TVA projects, such as the multimodal transport hub proposed by the Port of Memphis for the Allen Fossil Plant site.[73]

C. The Project is likely to cause significant air pollution impacts in southwest Memphis.

The Allen Gas Turbine Project will emit significant quantities of air pollutants that have no safe level of exposure, including PM 2.5 and formaldehyde.[74] The Project will also emit NOx, itself a harmful pollutant that contributes to the formation of ground-level ozone.[75] The CT Modernization Study indicates that aeroderivative combustion turbines like the Allen Gas Turbine Project will run at a capacity factor of 10-45 percent, but when asked at the virtual scoping meeting, a TVA representative could not explain whether the plant would run daily and for how long.[76] Although we do not yet have access to any dispersion modeling for the Allen Gas Turbine Project, we anticipate that some level of air pollutants from the Allen Gas Turbine Plant will contribute to pollution in southwest Memphis, including in Boxtown and Westwood.[77]

As discussed in Sections I and II.B, above, the southwest Memphis community bears the cumulative burdens associated with sixty years of TVA's burning of coal at the Allen Coal Plant, fifty years of burning gas at the Allen Combustion Turbine Plant, and TVA's ongoing operation of the Allen Gas Plant. In addition to emitting harmful criteria air pollutants including PM2.5 and NOx, these polluting fossil fuel plants have contributed to Southwest Memphis being recognized as a toxic air pollution hotspot.[78] TVA has also chosen to run hundreds of polluting trucks through South Memphis for a decade to move its toxic coal ash to the South Shelby Landfill,[79] and the borrow sites TVA is using to fill up the ash pits are accessed by truck routes primarily through Southwest Memphis neighborhoods that are also burdened by TVA's polluting fossil fuel

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[73] *Edge Continues to Express Interest in Former TVA Allen Fossil Plant Site*, INT'L PORT OF MEMPHIS (Feb. 13, 2023), https://portofmemphis.com/edge-continues-to-express-interest-in-former-tva-allen-fossil-plant-site/, **Attachment 41**.

[74] Decl. of Dr. Ranajit Sahu at 3, *Sierra Club v. Tenn. Valley Auth.*, No. 3:22-cv-1054, (M.D. Tenn. Apr. 14, 2023) **Attachment 42**. Dr. Sahu's declaration addresses the air pollutants associated with the Johnsonville Aero CTs Project. Although TVA is apparently planning to use a different model of aeroderivative combustion turbine at Allen, the types of air pollutants emitted will be the same.

[75] *Id.*

[76] CT Modernization Study at 10.

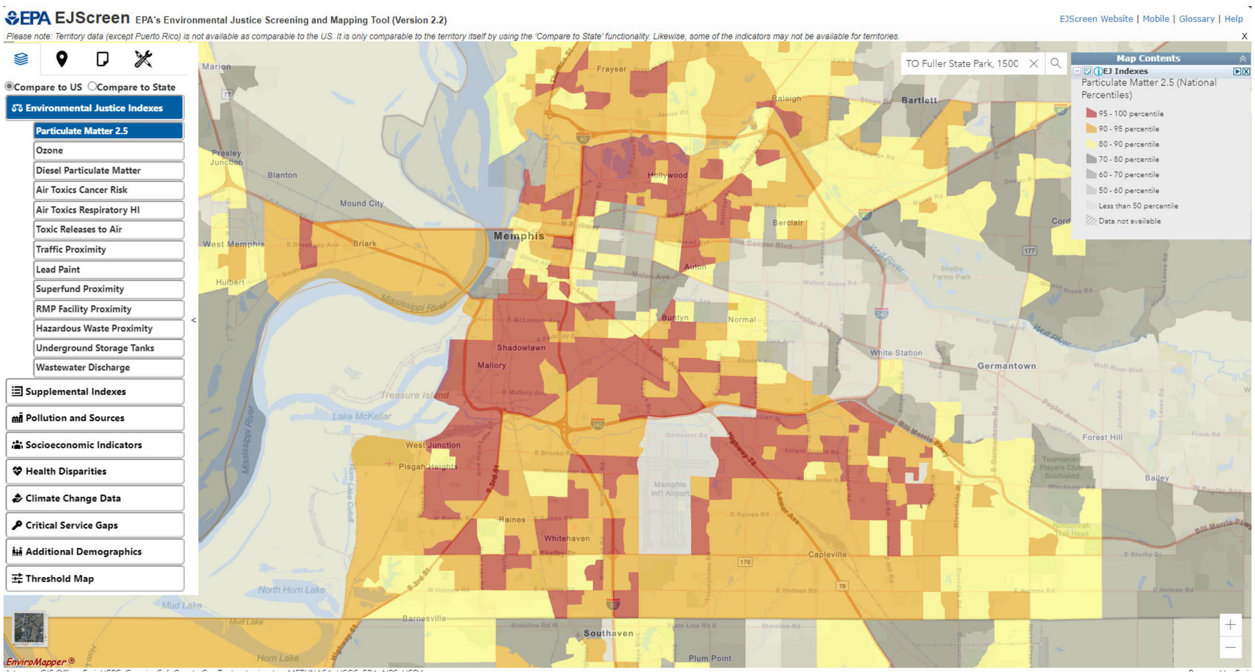
[77] *See* Decl. of Dr. Ranajit Sahu at 4, *Sierra Club v. Tenn. Valley Auth.*, No. 3:22-cv-1054, (M.D. Tenn. Apr. 14, 2023) ("[O]nce emitted into the air, the gaseous pollutants Nox and formaldehyde will spread in the surrounding area for considerable distances. Similarly, although PM2.5 is a particulate pollutant and not a gas, given its very fine size (*i.e.*, less than 2.5 microns, which is 20 to 40 times finer than human hair), PM2.5 can also disperse for considerable distances from the source, in effect behaving like a gaseous pollutant.")

[78] *See* Jia & Foran, *Air Toxics Concentrations* at 112; Al Shaw & Lylla Younes, *The Most Detailed Map of Cancer-Causing Industrial Air Pollution in the U.S.*, PROPUBLICA (Mar. 15, 2022), https://projects.propublica.org/toxmap/, **Attachment 43**.

[79] Justin J. Pearson, *Opinion: TVA's Coal Ash Disposal Plan Leaves South Memphis Neighborhoods in the Dark*, MEMPHIS COM. APPEAL (Dec. 9, 2021, 6:00 AM), https://www.commercialappeal.com/story/opinion/2021/12/09/tvas-coal-ash-disposal-neglects-south-memphis-community/6435199001/, **Attachment 44**.

plants.[80] These trucks are contributing to existing air pollution problems, including NOx and PM2.5.[81] Any new gas plant in southwest Memphis is likely to exacerbate the air pollution disparities that already exist due to decades of environmental injustice.

In addition to TVA's knowledge of its own contributions to the cumulative air pollution burden in southwest Memphis, numerous mapping tools, including EPA's EJScreen 2.0, identify much of southwest Memphis as above the 90th percentile nationally for exposure of low-income and minority populations to PM2.5 and ozone:



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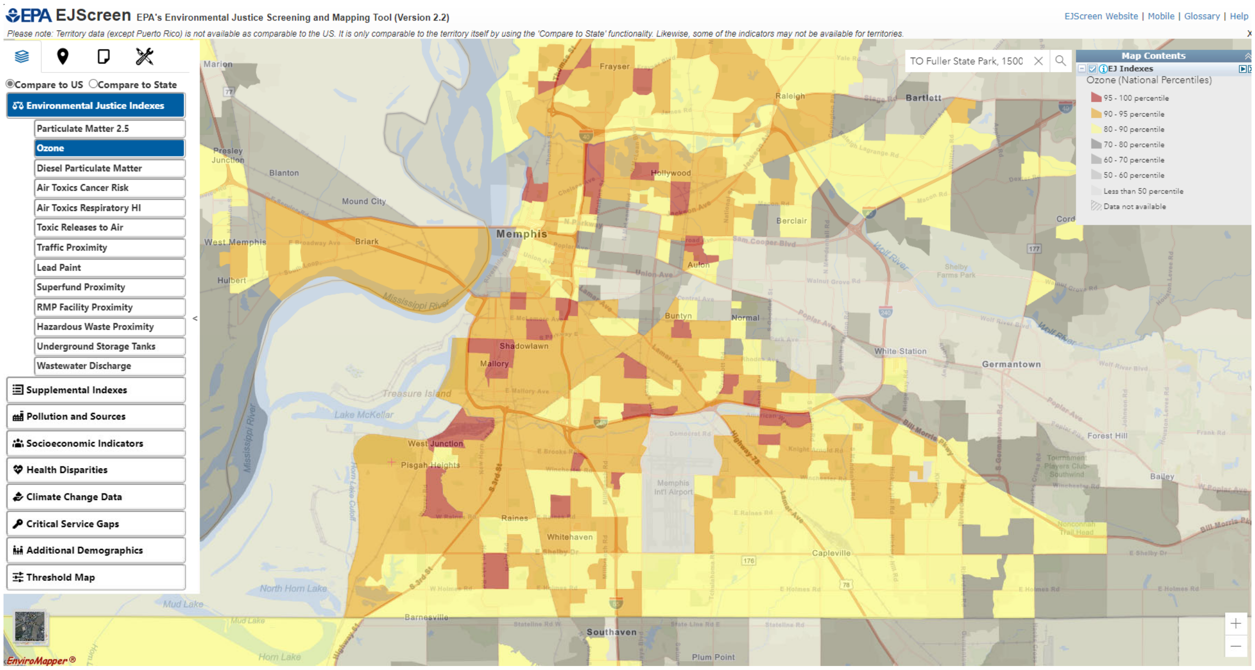
80 TVA, ALLEN FOSSIL PLANT ASH IMPOUNDMENT CLOSURE ENVIRONMENTAL IMPACT STATEMENT 34, 152 (Oct. 2019) [hereinafter ALLEN COAL ASH EIS], **Attachment 45**.

81 *See, e.g.*, Zander S. Venter et al., *COVID-19 lockdowns cause global air pollution declines*, 117 PROC. NAT'L ACAD. SCIS. 18,984–90 (Aug. 11, 2020), https://www.pnas.org/doi/epdf/10.1073/pnas.2006853117 (finding transportation sector linked directly to NO_2 emissions), **Attachment 46**.



And, as described in Section I and II.B above, there are many obvious additional sources of air pollutants contributing to this cumulative air pollution burden.

Data recently compiled into a presentation by the Tennessee Department of Environment and Conservation indicates that at least two sets of monitors in the Memphis/Shelby County MSA are indicating levels of ozone pollution in excess of the National Ambient Air Quality Standard 8-hour ozone standard.[82] And the same presentation indicates that levels of PM2.5 in Memphis are trending higher.[83] To our knowledge, there is no EPA-approved ambient air monitor for criteria pollutants in southwest Memphis, but given the number of sources of PM2.5 and NOx (an ozone precursor), trends in southwest Memphis are likely to be similar.

As illustrated in the map below, climate change is expected to exacerbate deaths from air pollution in southwest Memphis.[84] In particular, air pollution will become worse and cause worse health effects including death because Memphis is one of the top five U.S. cities expected to be in an extreme heat zone within the next 30 years.[85]

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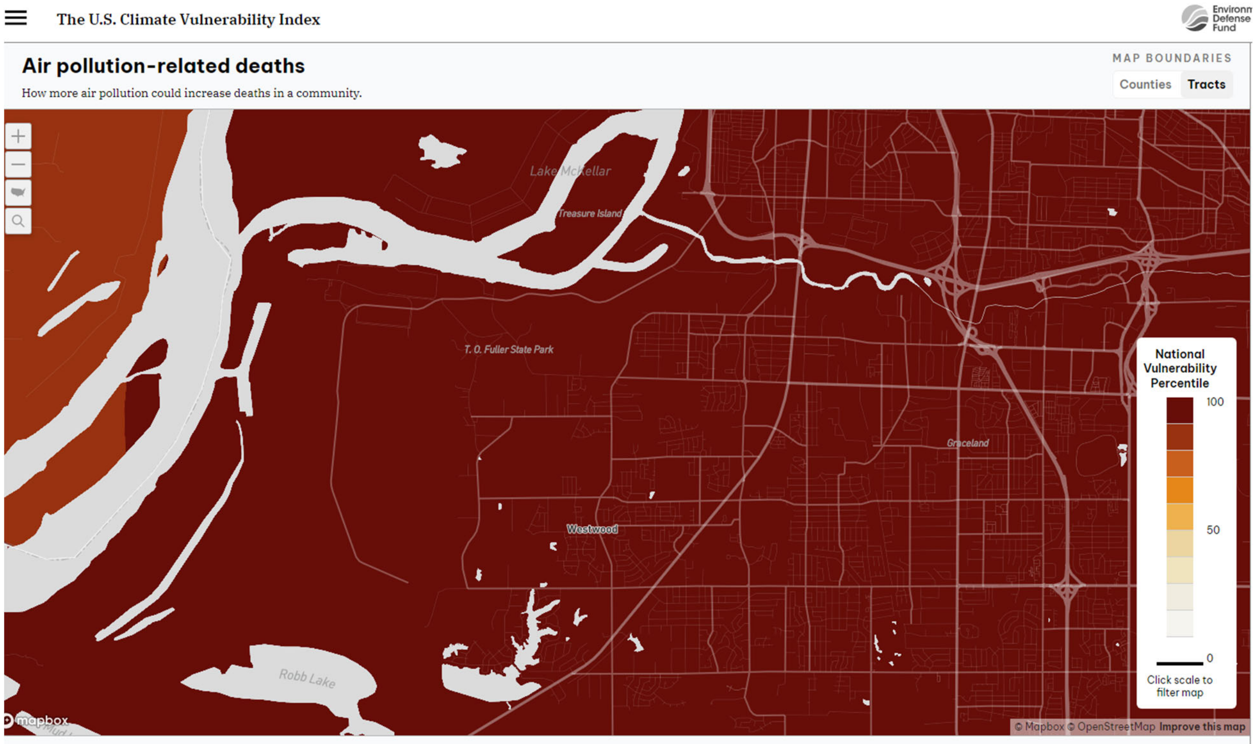
[82] Tenn. Dep't Env't & Conservation, Presentation, *Tennessee Air Quality and Division Update: Tennessee Environmental Conference* at slide 9 (Oct. 23–25, 2023), **Attachment 47**.
[83] *Id.* at slide 15.
[84] *See U.S. Climate Vulnerability Index: Air pollution-related deaths*, ENV'T DEF. FUND ET AL. (last visited Nov. 10, 2023), https://map.climatevulnerabilityindex.org/map/cc_health_air_pollution_related_deaths/usa?mapBoundaries=Tract&mapFilter=0&reportBoundaries=Tract&geoContext=State (last visited Nov. 10, 2023), **Attachment 48**.
[85] Mike Amodeo et al., *The 6th National Risk Assessment, Hazardous Heat*, FIRST ST. FOUND. (Aug. 15, 2022), full report downloadable at https://firststreet.org/research-lab/published-research/article-highlights-from-hazardous-heat/, **Attachment 49**.



TVA's own past, ongoing, and reasonably foreseeable future activities raise substantial questions regarding whether the Allen Gas Turbine Project will contribute to cumulatively significant air pollution impacts in southwest Memphis. When added to the community's "baseline burden" including other non-TVA sources of air pollution, there is no question that a new fossil fuel plant's emissions will cause cumulatively significant impacts. TVA must prepare an EIS to address how the Allen Gas Turbine Project will exacerbate the already dangerously polluted air in southwest Memphis, and whether its contributions can be avoided through non-gas alternatives or otherwise mitigated.

D. The Project is likely to cause significant traffic impacts in southwest Memphis.

TVA's proposed project will have foreseeable impacts associated with increased traffic on roads to and from the Allen Gas Turbine site, in addition to hundreds of daily existing truck trips for removing coal ash from the leaking coal ash pits at the Allen Coal Plant, bringing in borrow from locations in southwest Memphis to the Allen Coal Plant,[86] and other traffic impacts associated with the Allen Deconstruction and Decontamination project.[87] Traffic impacts will vary depending on the site's number of access points, frequency of service, and length of construction time.

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[86] ALLEN COAL ASH EIS at 150–59.
[87] TVA, ALLEN FOSSIL PLANT DECONTAMINATION AND DECONSTRUCTION FINAL ENVIRONMENTAL ASSESSMENT 71–75 (Oct. 2019).

TVA must again incorporate a cumulative effects analysis into its evaluation of traffic impacts, since the trucks servicing the new project will not be alone on the roads. Whether TVA plans to deliver any project materials via railroad, trucks, or both, it should analyze the environmental and climate justice impacts of these transportation decisions. An adequate transportation analysis does not end with estimated truck trips or changes in average annual daily traffic. Doing so would obscure the cumulatively significant effects of increased traffic through communities already battling impacts to their air quality.[88] *See* Sections I, II.B and II.C above.

E. The Project is likely to cause significant socioeconomic impacts in southwest Memphis by exacerbating energy burden.

Memphis already bears some of the highest energy burden in the state and the nation. Memphis ranks second in Tennessee counties and fourth among all cities measured nationwide for energy burden.[89] Energy burden is measured as the percentage of income a household pays toward their electricity and natural gas bill annually.[90] As the metric incorporates income it is more prevalent among low-income households. Still, income is not the only determinant; Black people, Indigenous people, people of color, and renters are all more likely to experience high and severe energy burden.[91]

Typically, energy burden includes gas and electricity—and yet in Memphis, the median energy burden considering electricity only is 6.3%. This 6.3% accounts for the largest part of the total median energy burden, 8.1%. Any household that spends 6% or more of their income on utility bills is considered to have a high energy burden. [92] When considering electricity costs alone, the median energy burden in the city is high. The numbers reflect this, as of 2022, nearly three-fourths of the city suffer from an energy burden greater than 6%.[93] Nearly 150,000 households in Memphis had high energy burden as measured in 2022.[94]

This energy burden is highest in the historically Black neighborhoods in Memphis.[95] High energy burden is tied to financial stress and is a leading reason for use of short-term lending services.[96] Short-term and small dollar loans have been cited as perpetuating the racial wealth gap as it is difficult for those who rely on them to save money and leave a cycle of debt.[97] High

[88] Ctr. for Env't Excellence, AASHTO, *Practitioner's Handbook 18: Addressing Air Quality Issues in the NEPA Process for Highway Projects* 8 (2017), https://environment.transportation.org/wp-content/uploads/2021/04/ph18-1-ol.pdf, **Attachment 50**.
[89] Samantha McDonald & Matt Cox, *Energy Burden & Efficiency Solutions for Households in Memphis*, *TN* 2–3 (2022) [hereinafter Greenlink Energy Burden Report], **Attachment 51**.
[90] *Id.* at 1.
[91] *Id.*
[92] *Id.* at 2.
[93] *See id.* at 3 ("In Memphis, 68% of households experience a high energy burden.").
[94] *Id.* at 4.
[95] *See id.* at 2 (highlighting the census tracts in Memphis with the highest overall energy burden); EJ 3-mile; EJ 5-mile.
[96] Greenlink Energy Burden Report at 2.
[97] *The CFPB Finds Payday and Deposit Advance Loans Can Trap Consumers in Debt,* CONSUMER FIN. PROT. BUREAU (Apr 24, 2013), https://www.consumerfinance.gov/about-us/newsroom/the-cfpb-finds-payday-and-deposit-advance-loans-can-trap-consumers-in-debt/, **Attachment 52**.

utility bills are also correlated with mental health issues and health risks.[98] Health risks such as asthma, stroke, diabetes and pulmonary diseases are all strongly correlated with high energy burdens.[99] This puts these households at even greater risk of suffering an unforeseen cost or medical bill, furthering the cycle of debt.

Despite Memphis already being among the most vulnerable in the country for residential energy cost, its burden is projected to worsen.[100] Environmental Defense Fund's U.S. climate vulnerability index highlights many neighborhoods in Memphis as having energy burden in the 90th percentile nationwide.[101] The same index predicts that the increase in costs to heat and cool homes in all of Memphis will be in the 80th percentile in the nation.[102] Memphis is expected to be in an extreme heat belt within the next 30 years.[103] As the climate becomes more extreme, the people of Memphis will have to spend more to maintain a comfortable living environment.

The Allen Gas Turbine Project will contribute to energy burden in southwest Memphis in a number of ways. First, by increasing greenhouse gas pollution, it will exacerbate extreme weather driving heating and cooling costs higher. Second, TVA has already begun to pass the cost of its gas buildout onto customers. TVA board recently unanimously approved a 4.5% rate increase, and its chief financial officer projects additional rate increases in the near future.[104] These rate increases are being imposed despite TVA's plan to freeze rate increases for a decade starting in 2019.[105] For those residents who are already struggling, the 4.5% rate increase pushes them closer toward the edge. MLGW has also proposed a 12% base rate increase over the next three years.[106] Third, further reliance on gas puts residential ratepayers at great risk. In the

[98] Greenlink Energy Burden Report at 2.
[99] *Id.* at 3.
[100] *See id.* at 2–3; *U.S. Climate Vulnerability Index: Residential Energy Cost Burden*, ENV'T DEF. FUND ET AL., https://map.climatevulnerabilityindex.org/map/residential_energy_cost_burden/usa?mapBoundaries=Tract&mapFilter=0&reportBoundaries=Tract&geoContext=State (last visited Oct. 23, 2023), **Attachment 53** (showing south and north Memphis in the highest vulnerability nationally).
[101] *Id.*
[102] *U.S. Climate Vulnerability Index: Residential Energy Expenditures*, ENV'T DEF. FUND ET AL., https://map.climatevulnerabilityindex.org/map/residential_energy_expenditures_percent_change/usa?mapBoundaries=Tract&mapFilter=8&reportBoundaries=Tract&geoContext=State (last visited Oct. 23, 2023), **Attachment 54**.
[103] Kelly Brewer, *Memphis to be part of 'extreme heat belt' within next 30 years*, DAILY MEMPHIAN (Aug. 29, 2022), https://dailymemphian.com/article/30470/memphis-one-hottest-cities-extreme-heat-belt-2053, **Attachment 55**.
[104] TVA Press Release, TVA Plans to Invest $15 Billion Over the Next Three Years to Meet Region's Growth (Aug. 24, 2023), https://www.tva.com/newsroom/press-releases/tva-plans-to-invest--15-billion-over-the-next-three-years-to-meet-region-s-growth, **Attachment 56**; Dave Flessner, *TVA faces rising cost pressure that likely will push up power rates*, CHATTANOOGA TIMES FREE PRESS (Nov. 10, 2023), https://www.timesfreepress.com/news/2023/nov/09/tva-faces-rising-cost-pressure-that-likely-will/, **Attachment 57**.
[105] Jim Gaines, *TVA Says Power Rates Will Freeze to Current Rate for 10 Years*, KNOX NEWS (Aug. 23, 2019), https://www.knoxnews.com/story/money/business/2019/08/23/tva-freeze-base-rate-increases-decade-jeff-lyash/2053714001/, **Attachment 58**.
[106] MLGW Bd. of Comm'rs, *2024 Budget and the Reliability & Resiliency Roadmap* at slide 33 (Oct. 18, 2023), *https*://www.mlgw.com/images/content/files/pdf/Board%20Presentation%2020231018%20v1_0_edited.pdf, **Attachment 59**.

summer of 2022, the volatility of gas prices and its effect on rate payers was demonstrated.[107] In June of last year, as the price of natural gas increased, customers in Memphis saw their bills increase up to $60 a month. TVA adds insult to injury of low-income Memphians as they increase prices to fund gas projects that contribute to climate change that will in turn increase the amount of energy needed to maintain a comfortable home.

Memphis already has one the highest energy burdens in the country among Black, low-income households.[108] The community simply can't afford to bankroll TVA's—or anyone else's—risky and unnecessary gas investments. TVA must consider the cumulatively significant energy burden impacts its gas buildout, including the Allen Gas Turbine Project, and MLGW's rate hike, will have on predominantly Black, low-income communities in southwest Memphis.

F. The Project is likely to contribute to cumulatively significant water usage impacts.

How TVA provides power affects the quantity and quality of water in the Memphis Sand Aquifer, Memphis's sole drinking water source. Community Groups have consistently advocated for TVA to maximize reliance on clean, reliable renewable power because gas plants, including TVA's Allen Gas Plant, extract enormous amounts of water from Memphis's drinking water aquifer. In fact, TVA's Allen Gas Plant is one of the most significant users of the Memphis Sand Aquifer and uses more than 1.5 billion gallons of Aquifer water per year.[109] As discussed in Section I, above, TVA's use of aquifer water, which it purchases from MLGW, puts strain on the southwest Memphis community's drinking water infrastructure. TVA must disclose and analyze the impact of this existing strain, including its impact on MLGW's drinking water infrastructure and ability to provide adequate access to drinking water during Winter Storm Elliott.

It appears that the Allen Gas Turbine Plant will add to that existing strain. TVA has confirmed that it will purchase water from MLGW for the Project, but it declined to state how much water it would purchase, instead stating "We will provide water use estimates in its draft environmental review."[110] The EA for a similar aeroderivative gas plant at Johnsonville indicated that it "would require up to 300 gpm of potable water and 300 gpm of demineralized water for

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[107] Zaria Oates, *A Breakdown of Surging MLGW Bills*, ABC24 (July 1, 2022, 7:45 PM), https://www.localmemphis.com/article/money/mlgw-tva-electric-local-nonprofit-memphis/522-396c46f3-fda2-4328-9291-24c305193ca7, **Attachment 60**.

[108] Ariel Drehobl & Lauren Ross, AM. COUNCIL FOR AN ENERGY EFFICIENT ECON., LIFTING THE HIGH ENERGY BURDEN IN AMERICA'S LARGEST CITIES: HOW ENERGY EFFICIENCY CAN IMPROVE LOW INCOME AND UNDERSERVED COMMUNITIES 19–20 tbl.4 (2016), https://www.aceee.org/sites/default/files/publications/researchreports/u1602.pdf, **Attachment 61** ("[L]ow-income households face the greatest energy burden in Memphis (13.2%), Birmingham (10.9%), and Atlanta (10.2%), and African-American households face the greatest energy burden in Memphis (9.7%), Pittsburgh (8.3%), and New Orleans (8.1%).").

[109] Samuel Hardiman, *Memphis' Largest Water Users Use Billions of Gallons Every Year. Here's Who Uses the Most*, MEMPHIS COM. APPEAL (Jan. 17, 2022, 9:00 PM), https://www.commercialappeal.com/story/news/2022/01/18/mlgws-top-water-customers-memphis-use-billions-gallons-every-year/9169674002/, **Attachment 62**.

[110] E-mail from Matthew Higdon, Senior NEPA Specialist, TVA, to Amanda Garcia, Senior Att'y, S. Env't L. Ctr. (Nov. 9, 2023), **Attachment 63**.

evaporative cooling and wet compression for power augmentation."[111] If the water usage level is similar to Johnsonville, water usage at the Allen Gas Turbine Project could be up to nearly a half million gallons per day. TVA must disclose and analyze the amount of water usage required by the Project and the extent to which evaporative cooling needs for the Project would likely increase over time due to extreme heat caused by climate change. *See* Sections II.G.4-5 below.

The Allen Gas Plant's strain on water usage and drinking water infrastructure is *already* a significant impact on southwest Memphis and, despite multiple requests by Community Groups, it has not been adequately studied in an EIS.[112] The Allen Gas Turbine Plant would add incrementally and cumulatively to this impact and must be studied in an EIS.

Further, TVA's ongoing purchase of water from MLGW, which induces the local utility to withdraw millions more gallons of water per day from less than three miles away from the Allen Coal Plant, threatens to pull coal ash-contaminated water from beneath the Coal Plant into the Memphis Sand Aquifer.[113] TVA has not analyzed the groundwater quality impacts associated with its decision to purchase water from MLGW for the Allen Gas Plant and must do so here because the action is cumulative to Allen Gas Turbine Project. TVA's increased use of MLGW water could also contribute to pulling contaminated groundwater from other industrial sources, including those TVA identified in its remedial investigation, such as the sewage sludge unit associated with the Maxson WWTP.[114] TVA's environmental analysis must also encompass this ongoing threat to groundwater quality in southwest Memphis.

G. The Project will contribute to cumulatively significant greenhouse gas and climate impacts, including climate justice impacts in southwest Memphis.

TVA's Allen Gas Turbine Project is one component of the federal utility's 6,050 MW gas buildout, which has been identified as the largest new investment in gas plants in the nation.[115] Because "[t]he harms associated with climate change are serious and well recognized,"[116] carefully considering a project's climate impacts is critical to NEPA review. TVA's proposal to build new fossil fuel plants conflicts with federal climate policy, and TVA fails to disclose the full climate impacts of building new methane gas plants. Commenting on another recent TVA gas plant proposal, EPA made clear that this decision is a critical opportunity for TVA to lead the response to the climate crisis:

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[111] TVA, JOHNSONVILLE AERODERIVATIVE COMBUSTION TURBINES PROJECT FINAL ENVIRONMENTAL ASSESSMENT 49 (July 2022), **Attachment 64**.
[112] Allen Pumping Plan EIS Comments at 1–41; Allen Coal Ash SEIS Comments at 3.
[113] Letter from Douglas J. Cosler, Principal Chemical Hydrogeologist, Adaptive Groundwater Solutions, to Amanda Garcia, S. Env't L. Ctr. on Proposed Plan to Address Environmental Conditions, Tennessee Valley Authority, Allen Fossil Plant, Memphis, Shelby County, Tennessee at 19–20 (Dec. 16, 2020) **Attachment 65**.
[114] Stantec Consulting Servs., TVA Allen Fossil Plant Remedial Investigation Report App. J at 3–9 (Oct. 26, 2017), **Attachment 66**.
[115] Carolyn Morrisroe, *Dirty Truth Report: TVA Worst in the Nation for Planned Methane Gas*, SIERRA CLUB (Oct. 10, 2023), https://www.sierraclub.org/press-releases/2023/10/dirty-truth-report-tva-worst-nation-planned-methane-gas, **Attachment 67**.
[116] *Massachusetts v. EPA*, 549 U.S. 497, 521 (2007).

> The EPA believes it is essential for TVA to improve the proposed action and EIS because of the urgency of the climate crisis. TVA's DEIS overlooked options to take meaningful, cost-effective action to reduce GHG emissions and help conform TVA's action to science-driven policy goals. The most recent scientific reports by the Intergovernmental Panel on Climate Change reinforce the urgent need to take action. TVA's proposal provides an important opportunity to do so.[117]

"Climate change poses a severe threat to the nation's security, economy, environment, and to the health of individual citizens."[118] While climate change is global, not all people suffer equally. Instead, climate change disproportionately harms communities of color, as well as low-income, rural, and Indigenous communities.[119] The Tennessee Valley and the Southeast are especially vulnerable.[120] For the Valley, 2018 through 2020 were the wettest years in 131 years of record keeping, and 2020 set the single-year record with rainfall 139 percent above normal.[121] There is broad scientific consensus that global anthropogenic greenhouse gas emissions must reach net zero within about 30 years to avoid the worst impacts of climate change.[122]

TVA must include a GHG analysis for the Allen Gas Turbine Project that is complete, accurate, and that acknowledges federal climate policy. CEQ's 2023 guidance on climate change in NEPA reviews addresses projects of exactly this kind. TVA must follow that guidance including, for example, by assessing "changes relating to the production or consumption" of gas that are indirect effects of projects using gas; by clearly identifying "the alternative with the lowest net GHG emissions or the greatest net climate benefits"; by explaining how the alternatives will "help meet climate change goals and commitments, or alternately, detract from them"; and by going beyond "a statement that emissions from a proposed Federal action or its alternatives represent only a small fraction of global or domestic emissions."[123] CEQ unambiguously instructs

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[117] Letter from Carol L. Kemker, Acting Deputy Reg'l Adm'r, to Chevy Williams, NEPA Specialist, TVA, Re: EPA Comments on the Draft Environmental Impact Statement for the Kingston Fossil Plant Retirement, Roane County, Tennessee; CEQ No.:20230067 at 10 (June 29, 2023) [hereinafter EPA Comments on Kingston Plant Retirement], **Attachment 68**.

[118] *Consideration of Greenhouse Gas Emissions in Natural Gas Infrastructure Project Reviews*, 178 FERC ¶ 61,108, ¶ 2 (2022).

[119] Kristie S. Gutierrez & Catherine E. LePrevost, *Climate Justice in Rural Southeastern United States*, 13 INT'L J. ENV'T RES. & PUB. HEALTH 189 (2016), https://pubmed.ncbi.nlm.nih.gov/26848673/, **Attachment 69**.

[120] *Id.*

[121] WBIR Staff, *TVA Calls 2020 the Wettest Year on Record for Tennessee Valley Authority*, WBIR (Jan. 5, 2021), https://www.wbir.com/article/weather/tva-calls-2020-the-wettest-year-on-record-for-tennessee-valley/51-4ec11426-feb4-4304-811e-45cd50714a57, **Attachment 70**.

[122] Myles Allen et al., *Summary for Policymakers*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE ("IPCC"), SPECIAL REPORT: GLOBAL WARMING OF 1.5ºC 1, 12 (2018), https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf [hereinafter SPECIAL REPORT: GLOBAL WARMING OF 1.5ºC] https://www.ipcc.ch/sr15/chapter/spm/, **Attachment 71**.

[123] CEQ, National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change, 88 Fed. Reg. 1,196, 1,204 (Jan. 9, 2023) [hereinafter CEQ NEPA Climate Guidance], **Attachment 72**.

that "such comparisons and fractions are not an appropriate method for characterizing the extent of a proposed action's and its alternatives' contributions to climate change."[124]

For this Project, as well as for the cumulative total of TVA's 6,050 MW gas buildout since February 2021, TVA must analyze the greenhouse gas emissions of new gas plants in the context of President Biden's executive orders directing all federal agencies to prioritize decarbonizing the electricity sector by 2035, as well as the climate goals reflected in the Memphis 3.0 climate action plan.[125] And TVA must address the significant cumulative climate justice impacts that the Allen Gas Turbine Project, together with the rest of TVA's gas buildout, will have on southwest Memphis, a community ranked in the 99th percentile for climate vulnerability.

1. **TVA must comprehensively and accurately quantify the greenhouse gas emissions directly or indirectly caused by the Allen Gas Turbine Project, as well as their contribution to the cumulative impact of TVA's full gas buildout.**

TVA must discuss the Allen Gas Turbine Project's individual and cumulative greenhouse impacts in a meaningful context. In commenting on another recent TVA gas plant proposal, EPA recommends that "TVA avoid expressing project-level GHG emissions as a percentage of national or state GHG emissions."[126] EPA has objected that "[t]his approach trivializes substantial project-scale GHG emissions" and is "misleading given the nature of the climate policy challenge to reduce GHG emissions from a multitude of sources, each making relatively small individual contributions to overall GHG emissions."[127] CEQ's interim guidance likewise makes clear that "[s]uch comparisons and fractions are not an appropriate method of characterizing the extent of a proposed action's and its alternatives' contributions to climate change. . . . because this approach does not reveal anything beyond the nature of climate change itself—the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large effect."[128]

EPA advises that "NEPA documents [should] instead discuss the conflict between GHG emissions and national, state, and local GHG reduction policies and goals, and—equally important—ways to avoid or address the policy conflict, that increases over time, created by projects that otherwise expand and lock-in fossil fuel consumption."[129] EPA emphasizes that "net GHG emissions should not be calculated solely against a 'business as usual' baseline, but also

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[124] *Id.* at 1,201.
[125] *See* Exec. Order No. 14,082, 87 Fed. Reg. at 56,861; MEMPHIS-SHELBY CO. OFF. OF SUSTAINABILITY & RESILIENCE, MEMPHIS AREA CLIMATE ACTION PLAN (2020), https://shelbycountytn.gov/DocumentCenter/View/37431/Memphis-Area-Climate-Action-Plan-2019-FINAL_4_JANUARY-2020, **Attachment 73**.
[126] TVA, KINGSTON FOSSIL PLANT RETIREMENT DRAFT ENVIRONMENTAL IMPACT STATEMENT App. P at 9 (May 2023) [hereinafter KINGSTON PLANT DEIS], https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/environment/environmental-stewardship/nepa-environmental-reviews/kingston-retirement/kif-deis-final-compiled-package_tva-site.pdf?sfvrsn=8a7e8c76_3, **Attachment 74**.
[127] Letter from Vicki Arroyo, EPA, to Fed. Energy Regul. Comm'n (Apr. 25, 2022) (discussing Draft GHG Policy Statement), **Attachment 75**.
[128] CEQ NEPA Climate Guidance at 1,201.
[129] *Id.*

against decarbonization pathways that are necessary to meet science-based targets for GHG reductions."[130]

In its recent climate guidance, CEQ has emphasized the need to analyze energy substitution:

> Some proposed actions, such as those increasing the supply of certain energy resources like oil, natural gas, or renewable energy generation, may result in changes to the resulting energy mix as energy resources substitute for one another on the domestic or global energy market. Different energy resources emit different amounts of GHGs and other air pollutants. For proposed actions involving such resource substitution considerations, where relevant, CEQ encourages agencies to conduct substitution analysis to provide more information on how a proposed action and its alternatives are projected to affect the resulting resource or energy mix, including resulting GHG emissions.[131]

To demonstrate the true climate impacts of its proposal, TVA must acknowledge and analyze the harmful effects of displacing emission-free alternatives. In a letter to TVA about the Cumberland gas-fired plant, EPA stressed the lock-in effect of investing in new fossil fuel infrastructure:

> [A] new natural gas-fired generating station could replace electricity generation from an existing coal-fired station in the near term, but lock in fossil fuel consumption for decades, forcing future trade-offs between now existing natural gas generation and future renewable energy generation.[132]

With "high confidence," the Intergovernmental Panel on Climate Change has warned of this same "lock-in" effect:

> Reducing GHG emissions across the full energy sector requires major transitions, including a substantial reduction in overall fossil fuel use, the deployment of low-emission energy sources, switching to alternative energy carriers, and energy efficiency and conservation. The continued installation of unabated fossil fuel infrastructure will 'lock-in' GHG emissions.[133]

TVA should analyze climate impacts for the project's lifetime, which includes the lifetime of the project's associated emissions. To comply with federal policy and achieve the agency's own climate goals, TVA's natural-gas equipment would need to be offline by 2050, requiring at

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[130] *Id.*
[131] *Id.* at 1,205 (citations omitted).
[132] Letter from Mark Fite, Dir. Strategic Programs Off., EPA, to Ashley Pilakowski, NEPA Specialist, TVA, Re: EPA Comments on the Draft Environmental Impact Statement for the Cumberland Fossil Plant Retirement, Stewart County, Tennessee; CEQ No:20220059 at 12 (June 30, 2022), **Attachment 76**.
[133] Jim Skea et al., *Summary for Policymakers*, *in* IPCC, CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE 1, 36 (Priyadarshi R. Shukla et al. eds., 2022), **Attachment 77**.

least a seventeen-year life-cycle analysis. However, the climate-warming pollutants these aeroderivative CTs will emit will certainly outlast the equipment's lifetime. CEQ has accounted for this in its guidance, recommending that projections reach as far out as "the expected life of the proposed action *and its effects*."[134]

TVA must also consider the impact of locking in additional decades of upstream methane gas emissions. Upstream methane leakage is an important, foreseeable, indirect impact of building and operating a new gas plant. Across the methane gas supply chain, from production through combustion, gas infrastructure leaks significant amounts of methane.[135] As a greenhouse gas, methane is more than eighty times as powerful as carbon dioxide in its first twenty years in the atmosphere.[136] Yet methane is shorter lived than carbon dioxide. That means "achieving significant reductions would have a rapid and significant effect on atmospheric warming potential."[137] Because of its potency as a greenhouse gas, methane emissions "significantly erode the potential climate benefits of natural gas use" relative to coal.[138]

Nearly a decade ago, scientists demonstrated that natural gas plants have net climate benefits relative to coal plants "as long as leakage in the natural gas system is less than 3.2% from well through delivery at a power plant."[139] Based on the latest report from the Intergovernmental Panel on Climate Change, that figure may be closer to 2.8 or 2.9%.[140] In a recent, large-scale study, researchers from Stanford University estimated a system-wide methane leakage rate of 9.4%.[141] That figure is more than six times a recent EPA estimate (1.4%)[142] and about three times the rate at which burning methane gas has net climate benefits relative to coal.

Methane leakage is a key variable in determining the precise climate impact of methane-fired generation, and the best available science strongly suggests that methane gas is actually *worse* than coal. NEPA requires agencies to "make use of reliable existing data and resources," and ensure

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134 CEQ NEPA Climate Guidance at 1,204 (emphasis added).
135 Ramon A. Alvarez et al., *Assessment of Methane Emissions from the U.S. Oil & Gas Supply Chain*, 361 SCIENCE 186 (2018), **Attachment 78**; Dan Charles, *A Satellite Finds Massive Methane Leaks from Gas Pipelines*, NAT'L PUB. RADIO (Feb. 3, 2022), https://www.npr.org/2022/02/03/1077392791/a-satellite-finds-massive-methane-leaks-from-gas-pipelines, **Attachment 79**.
136 Gunnar Myhre et al., *Anthropogenic and Radiative Forcing*, *in* IPCC, FIFTH ASSESSMENT REPORT 659, 714 tbl.8.7 (2013), https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf, **Attachment 80**.
137 EPA, *Importance of Methane*, https://www.epa.gov/gmi/importance-methane, **Attachment 81**.
138 Alvarez et al. at 5.
139 Ramon A. Alvarez et al., *Greater Focus Needed on Methane Leakage from Natural Gas Infrastructure*, 109 PROC. NAT'L ACAD. SCI. 6435, 6435–40 (Apr. 24, 2012), **Attachment 82**.
140 Maggie Astor, *Methane Leaks in New Mexico Far Exceed Current Estimates, Study Suggests*, N.Y. TIMES (Mar. 24, 2022), https://www.nytimes.com/2022/03/24/climate/methane-leaks-new-mexico.html, **Attachment 83**.
141 Yuanlei Chen et al., *Quantifying Regional Methane Emissions in the New Mexico Permian Basin with a Comprehensive Aerial Survey*, 56 ENV'T SCI. TECH. 4317, 4317–23 (March 23, 2022), **Attachment 84**. A 2018 study estimated supply-chain emissions at 2.3% of gross U.S. gas production, likewise substantially higher than EPA estimates. Alvarez et al.. The 2018 Alvarez study and 2022 Chen study underscore that EPA and industry substantially underestimate system-wide emissions, "likely because existing inventory methods miss emissions released during abnormal operating conditions." *Id.* at 2.
142 KINGSTON PLANT DEIS at 352.

the scientific integrity of its discussions and analysis.[143] TVA must take a hard look at the growing body of scientific evidence that shows that methane leakage is so high and so harmful that methane gas plants may be worse for the climate than coal plants.

TVA must also accurately evaluate the climate impacts of the Allen Gas Turbine Project's emissions. As a greenhouse gas, methane is more than eighty times as powerful as carbon dioxide in its first twenty years in the atmosphere. To account for differences between different greenhouse gases, experts calculate global warming potential for each gas compared to carbon dioxide to estimate the carbon dioxide equivalent ("CO_{2e}"). The International Panel on Climate Change estimates methane's 20-year global warming potential to be between 84 and 87 CO_{2e}.[144] Yet TVA has exclusively applied a much lower 100-year global warming potential for methane.[145] TVA must account for methane's much higher short-term potency, including by applying the 20-year global warming potential.

Since February 2021, TVA has proposed more than 6,050 megawatts of new gas generation across its fleet:

- Paradise, KY and Colbert, AL combustion turbine plants: 1,500 MW;[146]
- Johnsonville, TN combustion turbine plant: 550 MW;[147]
- Cumberland combined cycle plant: 1,450 MW;[148]
- Kingston combined cycle and combustion turbine plants: 1,450 MW;[149]
- Cheatham County combined cycle plant: 900 MW;[150]
- Allen combustion turbines: 200 MW (plus exempting 120 MW from previous decision to retire them).

All six of these projects have been proposed over a brief period of time, and all six involve new gas plants. Analysis of cumulative climate impacts is essential "to determine whether 'a small amount here, a small amount there, and still more at a third point could add up to something with a much greater impact.'"[151]

To date, TVA has refused to look at these projects in combination. Because greenhouse gas emissions have global impacts, the greenhouse gas emissions TVA has locked in with these

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[143] *See* 40 C.F.R. § 1502.23 (2020).
[144] *Methane and Climate Change*, INT'L ENERGY AGENCY, https://www.iea.org/reports/methane-tracker-2021/methane-and-climate-change, **Attachment 85**.
[145] *See, e.g.*, KINGSTON PLANT DEIS at 348.
[146] PARADISE AND COLBERT FINAL EA at 2.
[147] TVA, JOHNSONVILLE AERODERIVATIVE COMBUSTION TURBINE PROJECT FINDING OF NO SIGNIFICANT IMPACT 2 (July 12, 2022), https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/johnsonville-aeroderivative-combustion-turbine-project, **Attachment 86**.
[148] Cumberland Fossil Plant Retirement Environmental Impact Statement, 88 Fed. Reg. 3,767, 3,767 (Jan. 20, 2023).
[149] Environmental Impact Statement for Kingston Fossil Plant Retirement, 86 Fed. Reg. 31,780, 31,781 (June 15, 2021).
[150] Cheatham County Generation Site Environmental Impact Statement Notice of Intent, 88 Fed. Reg. 32,267, 32,268 (May 19, 2023).
[151] *WildEarth Guardians v. Bureau of Land Mgmt.*, 457 F. Supp. 3d 880, 894 (D. Mont. 2020) (quoting *Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 994 (9th Cir. 2004)).

projects have significant cumulative impacts. The six projects have largely overlapped in the last several years. Not only are the Cumberland and Kingston projects nearly identical—replacing decades-old coal plants with new gas plants—but TVA has handled them jointly. In a single action in November 2021, TVA's Board delegated authority to Mr. Lyash, to "evaluate, decide upon, and complete, if necessary, the retirements of the Cumberland and Kingston plants and replacement generation projects."[152] TVA published the draft EIS for Kingston the *same day* it published the scoping notice for the Cheatham County gas plant.[153] Each new fossil fuel plant is likely to emit decades of additional greenhouse gas, the accumulation of which drives climate change. Yet TVA has only looked at the greenhouse gas emissions of each plant in isolation. In its EIS, TVA must disclose and analyze the cumulative impacts of its 6,050 MW gas buildout.

2. TVA must estimate the cost of the greenhouse gas emissions of its Allen Gas Turbine Project and full gas buildout using the social cost of greenhouse gases.

New fossil-fuel infrastructure will have significant climate change-related effects on the environment. In its environmental review, TVA should assess these impacts using estimate values for the Social Cost of Carbon, Methane, and Nitrous Oxide ("SC-GHG") to monetize costs and benefits of the project and its alternatives.[154] New guidance from CEQ urges agencies to "provide additional context" for climate-related emissions, "including through the use of the best available social cost of GHG (SC-GHG) estimates, to translate climate impacts into the more accessible metric of dollars . . . ."[155] The Biden-Harris Administration has explicitly directed agencies to provide SC-GHG estimates—based on the Interagency Working Group's figures—in NEPA reviews.[156] As CEQ explains, "[a]nalyzing reasonably foreseeable climate effects in NEPA reviews helps ensure that decisions are based on the best available science and account for the urgency of the climate crisis."[157]

Using the SC-GHG, TVA must consider emissions from a total of eight operating aeroderivative units, since the No Action alternative would have retired Units 19 and 20 in addition to the sixteen slated for retirement in either scenario.[158] Furthermore, TVA should

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[152] TVA, ANNUAL REPORT PURSUANT TO SECTION 13, 15(D), OR 37 OF THE SECURITIES EXCHANGE ACT OF 1934 (FORM 10-K) 11–12 (Nov. 15, 2021), https://www.sec.gov/ix?doc=/Archives/edgar/data/0001376986/000137698621000028/tve-20210930.htm, **Attachment 87**.

[153] *See* Section I.D.

[154] *See* Interagency Working Group on the Social Cost of Greenhouse Gases, U.S. Gov't, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990* (Feb. 2021), https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf, **Attachment 88**.

[155] CEQ NEPA Climate Guidance at 1,198.

[156] The White House, *Fact Sheet: Biden-Harris Administration Announces New Actions to Reduce Greenhouse Gas Emissions and Combat the Climate Crisis* (Sept. 21, 2023) https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/21/fact-sheet-biden-harris-administration-announces-new-actions-to-reduce-greenhouse-gas-emissions-and-combat-the-climate-crisis/, **Attachment 89**.

[157] CEQ NEPA Climate Guidance at 1,197.

[158] Scoping Notice at 70,393–94.

quantify the impacts associated with burning gas on-site without recapture and leaking methane on-site and/or upstream.[159]

TVA should incorporate a twenty-year global warming potential ("GWP") to accurately assess the short-term climate impacts associated with methane gas. For short-lived, potent climate pollutants such as methane, a twenty-year GWP is more realistic than the 100-year GWP. Methane's GWP is seventy-two times greater than carbon dioxide in a twenty-year scenario; even when diluted across a 100-year time horizon, methane has a GWP twenty-five times greater than carbon dioxide's.[160] Methane's potency led the federal government to impose a waste emissions charge for methane emitted from certain qualifying facilities, the first direct charge the federal government has ever levied on GHG emissions.[161] Methane's significant climate impacts must therefore not only be analyzed but analyzed accurately using a twenty-year time horizon.

TVA has been reluctant to use accurate SC-GHG estimates when it has incorporated them, but the 2023 CEQ guidance notes the "best available estimates of the SC-GHG" are most useful for NEPA review.[162] Using outdated estimates parading as accurate SC-GHG values would conflict with NEPA's requirement that agencies "ensure the professional integrity, including *scientific integrity*, of the discussion and analysis in an environmental document."[163] The proposed updates to NEPA's implementing regulations specifically include "climate change-related effects" as "reasonably foreseeable effects" agencies must study, whether in an environmental assessment or environmental impact statement.[164]

3. TVA must consider the conflict between its proposed Allen Gas Turbine Project and full gas buildout and the policies reflected in federal executive orders, Memphis's climate action plan, and even TVA's own targets.

To address the climate crisis, President Biden ordered the entire federal government to take decisive, bold action—including swiftly decarbonizing the electricity sector. As a signatory to the Paris Agreement, the United States has committed to slowing global warming to "well below 2ºC above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5ºC above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change."[165] In Executive Order 14,008, Tackling the Climate Crisis at Home and Abroad, President Biden emphasized the urgency of the moment: "The United States and the world face a profound climate crisis. We have a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize the opportunity that tackling

[159] *See* Benjamin Storrow, *Methane Leaks Erase Some of the Climate Benefits of Natural Gas*, SCI. AM. (May 5, 2020), **Attachment 90**.
[160] JONATHAN L. RAMSEUR, CONG. RSCH. SERV., R47206, INFLATION REDUCTION ACT METHANE EMISSIONS CHARGE: IN BRIEF 2 (Aug. 29, 2022), **Attachment 91**.
[161] *Id.* at 1; *Inflation Reduction Act: Tackling Climate Pollution,* EPA (Sept. 28, 2023), https://www.epa.gov/inflation-reduction-act/tackling-climate-pollution, **Attachment 92**.
[162] CEQ NEPA Climate Guidance at 1,202 n.63.
[163] 42 U.S.C. § 4332(2)(D) (emphasis added).
[164] NEPA Implementing Regulations Phase 2, 88 Fed. Reg. at 49,951 (to be codified at 40 C.F.R. pt. 1502).
[165] Paris Agreement art. 2, § 1(a), Dec. 12, 2015, 3156 U.N.T.S. 54113.

climate change presents."[166] Consequently, Executive Order 14,008 calls for a "government-wide approach," as the "Federal Government must drive assessment, disclosure, and mitigation of climate pollution and climate-related risks in every sector of our economy, marshaling the creativity, courage, and capital necessary to make our Nation resilient in the face of this threat."[167] Executive Order 14,008 establishes the goals of "net-zero emissions, economy-wide, by no later than 2050" and "a carbon pollution-free electricity sector no later than 2035."[168] Executive Order 14,057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, declares a policy for the federal government "to lead by example in order to achieve a carbon pollution-free electricity sector by 2035 and net-zero emissions economy-wide by no later than 2050." To implement this policy, Executive Order 14,057 further directs that agencies—including government-owned corporations—"shall facilitate new carbon pollution-free electricity generation and energy storage capacity" on government-owned property.[169] In Executive Order 13,990, President Biden reestablished the Interagency Working Group on the Social Cost of Greenhouse Gases and instructed agencies "capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account."[170] Executive Order 14,082, implementing the IRA, directs federal agencies—including government-owned corporations like TVA—to "driv[e] progress to . . . achieve a carbon pollution-free electricity sector by 2035," and to "promot[e] construction of clean energy generation, storage, and transmission[.]"[171]

TVA "may not simply disregard an Executive Order. To the contrary, as an agency under the direction of the executive branch, it must implement the President's policy directives to the extent permitted by law."[172] The Administration has emphasized that a "100% carbon pollution-free electricity sector" is "an important foundation" for the United States' strategy to reach net-zero carbon emissions by 2050.[173]

The Executive Orders do not set a goal of merely "reducing emissions." The goal is a "carbon-pollution free electricity sector by 2035." The new Allen Gas Turbine Project would *begin* operation in 2025 or 2026.[174] Because the Allen Gas Turbine Plant and the full 6,050 MW of TVA's gas buildout would emit greenhouse gases for decades beyond the decarbonization deadlines

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[166] Exec. Order No. 14,008, Tackling the Climate Crisis at Home and Abroad, 86 Fed. Reg. 7,619, 7,619 (Jan. 27, 2021).
[167] *Id.* at 7,622.
[168] *Id.* at 7,622, 7,624.
[169] Exec. Order No. 14,057, 86 Fed. Reg. at 70,935–36.
[170] Exec. Order No. 13,990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, 86 Fed. Reg. 7,037, 7,040 (Jan. 20, 2021).
[171] Exec. Order No. 14,082, 87 Fed. Reg. at 56,862.
[172] *Sherley v. Sebelius*, 689 F.3d 776, 784 (D.C. Cir. 2012). The relevant requirements of Executive Orders 14,008 and 13,990 apply to all executive agencies. *See* Exec. Order No. 13,990, 86 Fed. Reg. at 7,040 (applying broadly to "agencies"); Exec. Order No. 14,008, 86 Fed. Reg. at 7,622 (calling for "government-wide" response to climate change). TVA is an agency bound by executive orders. *See, e.g.*, *TVA v. United States*, 13 Cl. Ct. 692, 701 (1987) (finding executive order applicable to TVA).
[173] U.S. DEP'T OF STATE, THE LONG-TERM STRATEGY OF THE UNITED STATES: PATHWAYS TO NET-ZERO GREENHOUSE GAS EMISSIONS BY 2050 26 (Nov. 2021) **Attachment 93**.
[174] Scoping Notice at 70,693.

ordered by President Biden, the Project and TVA's cumulative gas buildout conflicts with our national climate goals. In its environmental review, TVA must reconcile that conflict with federal law and evaluate the cumulative impact of its investments in new gas plants, including the Allen Gas Turbine Project.

The Allen Gas Turbine Project also conflicts with the climate policy of Memphis and Shelby County. The City of Memphis has signed on to the Global Covenant of Mayors for Climate and Energy (GCoM) – a formal commitment of city leaders across the world to tackle climate change by taking steps to reduce greenhouse gas (GHG) emissions and enhance resilience and adaptation in their communities. The City's Climate Action Plan was adopted as an addendum to Memphis 3.0.[175]

The City's Climate Action Plan describes its priorities for the power sector as centering on renewable energy and energy efficiency—not gas:

> Transforming our energy supply over the next 30 years will need to take an "all-of-the-above" approach, with actions ranging from partnering with TVA to increase renewables in their portfolio, to encouraging and constructing local sources of renewable generation (particularly solar), to exploring purchasing agreements with other third-party renewable energy generators. Along with efforts to reduce energy consumption, transitioning to cleaner, renewable sources of electricity will help fulfill our community goals around health, quality of life, and resilience.[176]

In Priority Action E.6: Decarbonize the Electric Grid with Renewable Energy, the City states that it will "advocate for TVA to increase the amount of renewable energy sources – particularly wind and solar" and "work with TVA and MLGW to explore changes to current contract terms that require all local power be purchased through TVA and explore the feasibility of purchasing renewable energy from other third party providers."[177] The Climate Action Plan also includes Priority Action E.2: Improve Low-Income Housing Energy Efficiency.[178] TVA must consider this the conflict with Memphis's climate policy as TVA evaluates the cumulative impact of its investments in new gas plants, including the Allen Gas Turbine Project.

TVA must also address how building 6,050 MW of new gas-burning assets with decades of useful life can square with even its own, separate emissions mitigation targets.[179]

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[175] *See* MEMPHIS AREA CLIMATE ACTION PLAN at 1.
[176] *Id.* at 64.
[177] *Id.* at 65.
[178] *Id.* at 40.
[179] *See* TVA, STRATEGIC INTENT AND GUIDING PRINCIPLES 7, 22 (May 2021), https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/about-tva/board-of-directors/may-6-2021/strategic-plan-documentc67079e2-d479-4f3d-a13b-1fa6fd714cde.pdf?sfvrsn=bc7bb2e8_7, **Attachment 94**.

4. TVA must disclose and analyze the climate impacts of the proposed Allen Gas Turbine Project and full gas buildout.

TVA must disclose the impacts of GHG emissions. Under NEPA, TVA must "quantify *and consider*" a project's greenhouse gas emissions, or explain why it cannot.[180] "The key requirement of NEPA . . . is that the agency consider and disclose the *actual environmental effects* in a manner that . . . brings those effects to bear on decisions to take particular actions that significantly affect the environment."[181] For climate change, "the agency should describe the affected environment for the proposed action based on the best available climate change reports, which often project at least two possible future emissions scenarios."[182]

An important part of climate change forecasting is accounting for a range of "tipping points." Each tipping point represents "a critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly."[183] Not only should TVA provide GHG emissions estimates against various decarbonization pathways (e.g., limiting global warming to 1.5º C, 2º C), but it should also clearly discuss what those various scenarios *mean*. That requires discussing actual effects, in the Tennessee Valley and more broadly, at various climate thresholds.[184]

TVA must assess climate impacts on its own system. First, TVA must look at more than just a 1.5º C warming scenario, which is increasingly unlikely.[185] Second, TVA cannot ignore the broader effects climate change will have on its power system. Under a "business as usual" scenario, TVA has projected "[n]ighttime, winter temperatures increasing more quickly than daytime, summer temperatures," "[w]etter winters/springs," and "[s]lightly lower annual peaks in [the] future, revert[ing] to summer peaking system before 2030."[186] Summer peaking by 2030—just several years after the methane gas plant would go online—means solar would better align with TVA's capacity needs. Milder, wetter winters mean lower peak demand and more energy from TVA's existing hydroelectric fleet. These climate effects substantially change the need and usefulness of generation assets across the TVA system, and TVA must address those impacts here.

In the wake of TVA's rolling CEQ NEPA Climate Guidance outs during Winter Storm Elliott, TVA must consider the impacts of extreme cold on gas infrastructure. On December 23 and 24 of 2022, demand for electricity skyrocketed as people tried to stay warm in the extreme cold. Approximately 30% of TVA's gas units failed, as did two of TVA's coal plants. Partly due to

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[180] *Sierra Club v. FERC*, 867 F.3d 1357, 1375 (D.C. Cir. 2017) (emphasis added).
[181] *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 96 (1983) (emphasis added); *see also* 40 C.F.R. § 1502.16(a)(1) (2020) (requiring examination of effects and their significance).
[182] CEQ NEPA Climate Guidance at 1,208.
[183] Vincent Möller, *Annex II: Glossary*, *in* IPCC, CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY 2897, 2925 (Hans-O. Pörtner et al. eds., 2022), **Attachment 95**.
[184] *See* Hans-O. Pörtner et al., *Summary for Policymakers*, *in* IPCC, CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY 1, 16–21 (Hans-O. Pörtner et al. eds., 2022), https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf (discussing impacts at various thresholds), **Attachment 96**.
[185] SPECIAL REPORT: GLOBAL WARMING OF 1.5ºC at 12 (finding a "50% probability of limiting warming to 1.5ºC").
[186] Brian Childers & Nathan Donahoe, TVA, Presentation, Climate Change Scenario (Jan. 24, 2020), **Attachment 97**.

constrained gas supply, neighboring utilities had no excess power to sell TVA.[187] Without enough supply to meet demand, TVA initiated rolling blackouts, leaving millions without power during the historic cold snap.

While gas fared poorly during the storm, solar, wind, storage, and demand response performed well. Solar experienced no outages, contributing power as expected during both blackout periods.[188] Across the region, wind turbines also performed well during the storm. Less than one percent of TVA's energy comes from wind, but its neighbors have considerably more. On December 23 and 24, neighboring energy markets—like the Midcontinent Independent System Operator and Southwestern Power Pool—had more wind than they could sell. While TVA was implementing blackouts on December 23, Southwestern Power Pool curtailed approximately 3,000 megawatts of wind.[189] Chattanooga EPB, one of TVA's largest distribution customers, kept the lights on through the first wave of TVA's rolling blackouts by using its battery storage.[190] At the first TVA Board meeting after the blackouts, TVA's Chief Executive Officer, Jeff Lyash, touted the importance of energy storage and demand response in improving resiliency during the storm. While continuing to ignore battery storage, Mr. Lyash extolled the value of energy storage at its Raccoon Mountain facility.[191] Mr. Lyash also announced that TVA had already made plans to add 1,000 megawatts of additional demand response within a year.[192] Winter Storm Elliott underscored the vulnerability of TVA's gas and coal infrastructure while highlighting the value of diverse, clean energy resources like solar, storage, wind, and demand response. TVA has not discussed or analyzed how resources would respond to extreme cold.

Not only did clean energy resources play an important role during Winter Storm Elliott, but they have also contributed to grid resiliency during extreme weather throughout the country. During an extreme heat wave in California last summer, demand response and battery storage were

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[187] TVA, AFTER ACTION REPORT: WINTER STORM ELLIOTT 11 (May 2023), **Attachment 98**.

[188] Silicon Ranch, *Solar's Undeterred Performance: Winter Storm Elliott* (2023), https://www.siliconranch.com/stories/solars-undeterred-performance-winter-storm-elliott/, **Attachment 99**; Robert Zullo, *How Did Renewables Fare During Winter Storm Elliott*, TENN. LOOKOUT (Jan. 31, 2023), https://tennesseelookout.com/2023/01/31/how-did-renewables-fare-during-winter-storm-elliott/, **Attachment 100**.

[189] Ashtin Massie & Sarah Toth, *Wasted Wind and Tenable Transmission During Winter Storm Elliott*, RMI (Feb. 16, 2023), https://rmi.org/wasted-wind-and-tenable-transmission-during-winter-storm-elliott/, **Attachment 101**.

[190] Dave Flessner, *Chattanooga Electricity Prices Rising Again Next Month*, CHATTANOOGA TIMES FREE PRESS (Jan. 20, 2023), https://www.timesfreepress.com/news/2023/jan/20/chattanooga-electricity-prices-rising-again-tfp/, **Attachment 102**.

[191] Anila Yoganathan, *TVA: We Fixed Some Weaknesses That Led to Rolling Blackouts*, KNOXVILLE NEWS SENTINEL (Mar. 6, 2023), https://www.knoxnews.com/story/news/local/tennessee/2023/03/06/how-tva-plans-to-avoid-a-repeat-of-rolling-blackouts-in-tennessee/69941974007/, **Attachment 103**.

[192] *See Streaming Video*, TVA (Feb. 16, 2023), https://www.tva.com/about-tva/our-leadership/board-of-directors/streaming-video (video of Board Meeting at timestamp 2:04:35–49) ("New efforts in demand response could provide as much as a thousand additional megawatts—new demand response—in the next year as customers continue to work with us to reduce or shift energy uses to help meet overall demand.").

broadly credited with keeping the lights on despite record demand.[193] During another heat wave this summer, solar helped Texas meet record demand.[194]

Within days of Winter Storm Elliott, the Government Accountability Office found that TVA needs to take additional measures to manage climate-related risks.[195] Those tasks remain incomplete.[196] TVA must analyze the impacts of climate change—extreme heat and cold in particular—on the Allen Gas Turbine Project and alternatives.

5. TVA must consider the climate justice impacts of its proposed Allen Gas Turbine Project and full gas buildout.

No matter where TVA's new gas plants are located, investing in more gas will disproportionately harm southwest Memphis and other predominantly Black, low-income communities by exacerbating climate change impacts. Though the impacts of climate change will be felt by everyone, frontline environmental justice communities like Southwest Memphis will be most affected.[197] Flooding, drought, and severe hot and cold weather are all climate change impacts that are more likely to adversely affect low-income communities and communities of color, in part because such communities often lack the resources to mitigate those impacts and are already burdened by nearby polluting facilities and a lack of infrastructure investment.[198] See Section I, above, for a detailed discussion of the climate vulnerability of southwest Memphis, including its ranking in the 99th percentile for overall climate vulnerability in the nation.

TVA must analyze the climate justice impacts of its decision to invest in more gas in southwest Memphis and across its service territory. In addition to the climate justice impacts already identified in Sections I and II, TVA must consider the disproportionate impacts of power outages caused by severe weather on predominantly Black and low-income communities like

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[193] Anna Blaustein, *How California Kept the Lights on During Monster Heat Wave*, SCI. AM. (Sept. 16, 2022), https://www.scientificamerican.com/article/how-california-kept-the-lights-on-during-monster-heat-wave/, **Attachment 104**.

[194] J. David Goodman, *Facing Brutal Heat, the Texas Electric Grid Has a New Ally: Solar Power*, N.Y. TIMES (June 23, 2023), https://www.nytimes.com/2023/06/23/us/texas-heat-solar-energy.html, **Attachment 105**.

[195] U.S. GOV'T ACCOUNTABILITY OFF., GAO-23-105375, TENNESSEE VALLEY AUTHORITY: ADDITIONAL STEPS ARE NEEDED TO BETTER MANAGE CLIMATE-RELATED RISKS 2 (Dec. 2022), https://www.gao.gov/assets/gao-23-105375.pdf, **Attachment 106**.

[196] *Id.*

[197] EPA, EPA-430-R-21-003, CLIMATE CHANGE AND SOCIAL VULNERABILITY IN THE UNITED STATES: A FOCUS ON SIX IMPACTS (2021), **Attachment 107**; *see also, e.g.*, Zack Colman & Daniel Cusick, *2 Hurricanes Lay Bare the Vulnerability of America's Poor*, SCI. AM. (Oct. 1, 2018), https://www.scientificamerican.com/article/2-hurricanes-lay-bare-the-vulnerability-of-americas-poor/, (describing the environmental justice challenges facing other frontline communities), **Attachment 108.**

[198] RACHEL MORELLO-FROSCH ET AL., THE CLIMATE GAP: INEQUALITIES IN HOW CLIMATE CHANGE HURTS AMERICANS & HOW TO CLOSE THE GAP 5–7 (2009), https://dornsife.usc.edu/assets/sites/242/docs/ClimateGapReport_full_report_web.pdf, **Attachment 109**; Susan Cutter, *The Geography of Social Vulnerability: Race, Class, and Catastrophe*, SOC. SCI. RSCH. COUNCIL (June 11, 2006), https://items.ssrc.org/understanding-katrina/the-geography-of-social-vulnerability-race-class-and-catastrophe/, **Attachment 110**.

southwest Memphis. The Memphis community has suffered 800,000 customer outages in eighteen months. This is the same number of outages the utility had in the previous *ten-year* period.[199] Power outages have been most frequent and most prolonged in predominantly Black communities in the city.[200] These power outages impose significant costs on people who can least afford it.[201] For example, low-income communities suffer health costs from being exposed to extreme heat and extreme cold in housing that lacks adequate weatherization and hunger costs from not being able to replace spoiled food.

It is no answer to invest in more gas in the name of grid resilience.[202] As discussed at length in this section, building new gas plants that emit more greenhouse gas pollution will exacerbate climate change, leading to more severe weather and putting additional strain on TVA's and MLGW's grid. Further, gas turbines, including those with purported black start capabilities like the Allen Gas Turbine Project, have failed when they were needed most.[203] TVA's end users experienced catastrophic electricity interruptions during Winter Storm Elliott in December 2022. TVA's own grid failures report noted failures at gas-fired sites during the freezing weather.[204] The failures included sixteen of the units at the Allen Combustion Turbine site, which TVA associates with the need for *more* gas-fired units under the current proposal.[205] But FERC and NERC found that gas turbines with purported black start capabilities were among the units that failed during Winter Storm Elliott.[206]

All generation sources are impacted to some degree by severe weather, but gas systems like TVA proposes here are particularly vulnerable. Indeed, an account detailing the grid impacts from winter storms in February 2021, which affected a large swath of the United States, showed that "gas generators accounted for the majority of outages."[207] One consistent takeaway is that

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[199] Michael Waddell, *800K Outages in 18 Months: MLGW Years Behind on Upkeep and Upgrades*, DAILY MEMPHIAN (July 22, 2023), https://dailymemphian.com/article/37458/memphis-light-gas-and-water-mlgw-power-outages-2023, **Attachment 111**.

[200] Kate Bieri, *Which Neighborhoods Lose Power the Most?*, FOX13 MEMPHIS (July 7, 2023), https://www.fox13memphis.com/news/which-neighborhoods-lose-power-the-most/article_c84df884-1d14-11ee-a80a-3fc7d779f742.html, **Attachment 112**.

[201] June Kim, *Increasing Power Outages Don't Hit Everyone Equally*, SCI. AM. (July 26, 2023), https://www.scientificamerican.com/article/increasing-power-outages-dont-hit-everyone-equally1/, **Attachment 113**.

[202] TVA, Presentation, Allen Aeroderivative Combustion Turbine Project at slide 6 (Oct. 24, 2023), https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/environment/environmental-stewardship/nepa-environmental-reviews/public-scoping-meeting-materials.pdf?sfvrsn=f6c3fc29_1.

[203] FERC, NERC, & REG'L ENTITY STAFF, WINTER STORM ELLIOTT REPORT: INQUIRY INTO BULK-POWER SYSTEM OPERATIONS DURING DECEMBER 2022 105–06 (Nov. 7, 2023), https://www.ferc.gov/media/winter-storm-elliott-report-inquiry-bulk-power-system-operations-during-december-2022, **Attachment 114**.

[204] TVA, AFTER ACTION REPORT: WINTER STORM ELLIOTT 12 (May 2023).

[205] *See* Scoping Notice at 70693–94.

[206] FERC, NERC, & REG'L ENTITY STAFF, WINTER STORM ELLIOTT REPORT: INQUIRY INTO BULK-POWER SYSTEM OPERATIONS DURING DECEMBER 2022 105 (Nov. 7, 2023), https://www.ferc.gov/media/winter-storm-elliott-report-inquiry-bulk-power-system-operations-during-december-2022.

[207] MICHAEL GOGGIN, GRID STRATEGIES, LLC, TRANSMISSION MAKES THE POWER SYSTEM RESILIENT TO EXTREME WEATHER 5 (July 2021), https://acore.org/wp-content/uploads/2021/07/GS_Resilient-Transmission_proof.pdf, **Attachment 115**.

natural gas production declines during extreme cold weather events.[208] Across 1,702 generating units FERC and NERC jointly studied, natural gas fuel issues caused 20% of all MW generation losses.[209]

If TVA is seeking "to rapidly respond to extreme weather-related events," it cannot justify selecting the Allen Gas Turbine Project primarily on the grounds that it would be more reliable than alternative generation sources.[210] Instead, as discussed in Section III below, TVA should select resources that will not exacerbate the climate crisis, will begin to mitigate decades of the utility's environmental injustice in southwest Memphis, and will provide clean, affordable, and resilient power for the community.

H. The Allen Gas Turbine Project will have significant impacts that require study in an EIS.

TVA must determine the proper level of review under NEPA for studying the Project's impacts. Since the decision to prepare an EIS hinges on whether a proposed action's impacts are significant,[211] the threshold inquiry rests on the proposed action's range of potential impacts and their significance. Notably, TVA's requirement to study cumulative impacts and assess alternatives exists regardless of whether it determines the significance threshold has been met.[212] But as described throughout these comments, the individual and cumulative impacts of the Allen Gast Turbine Project far exceed any significance threshold.

What determines significance? In an effort to clarify NEPA's requirements for the preparation of an EIS, CEQ has proposed to restore its longstanding explanation of "significance" using "both the context of an action and the intensity of the effects."[213]

First, TVA must analyze the significance of the Allen Gas Turbine Project in the context of its immediate area, "such as proximity to unique or sensitive resources or vulnerable communities," as well as in the broader context considering the project's "duration, including short- and long-term effects."[214] Agencies may not skirt NEPA's requirements by assuming that its assessment of impacts may be restricted to what changes will occur at the project site. TVA

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[208] Presentation, *FERC-NERC-Regional Entity Joint Inquiry into Winter Storm Elliott* at slide 4 (Sept. 21, 2023), https://www.ferc.gov/news-events/news/presentation-ferc-nerc-regional-entity-joint-inquiry-winter-storm-elliott, **Attachment 116**.
[209] *Id.* at slide 10.
[210] *See* Scoping Notice at 70,693 ("TVA must add capacity to the system to maintain adequate operating reserves.").
[211] 42 U.S.C. § 4332(2)(C); 40 C.F.R. § 1508.1(m) (2022).
[212] *See* Implementing the Procedural Requirements of the NEPA at 3.
[213] NEPA Implementing Regulations Phase 2, 88 Fed. Reg. at 49,969 (to be codified at 40 C.F.R. pt. 1501) (editing § 1501.3(d)).
[214] *Id.* (to be codified at 40 C.F.R. pt. 1501) (editing § 1501.3(d)(1)); *see also* 40 C.F.R. § 1508.1(g) (2022) (defining "effects or impacts" to include immediate impacts, geographically and temporally, as well as those "later in time or farther removed in distance").

must analyze on-site impacts and any off-site impacts "that would not be present in the no-action scenario" or risk violating NEPA.[215]

Second, TVA must analyze the *effects* of the Allen Gas Turbine Project and their intensity. Agencies have long used "intensity factors" to clarify what NEPA means by "significant effects," and TVA must study all of the relevant factors to determine an effect's significance. Moreover, TVA must prepare an EIS even if only one factor implies significance.[216] CEQ has recently offered clarity on the types of factors agencies must consistently analyze; although the rule has not been finalized, it reflects existing practice relied upon by courts reviewing NEPA compliance and agencies ensuring such compliance.[217] Several of CEQ's clarifying intensity factors will apply to the Allen Gas Turbine Project and signal the requirement to prepare an EIS. For example, CEQ urges agencies to understand the action's effects on public health, the human environment, other actions negatively impacting the relevant environment, and specifically on communities with environmental justice concerns.[218]

In determining the critical threshold of significance, TVA is required to "ensure the professional integrity, including scientific integrity" of its discussions and must "make use of reliable existing data and resources" in forming its conclusions.[219] Given that even *one* relevant factor's significance requires the preparation of an EIS, we urge TVA to adequately analyze the reasonably foreseeable impacts associated with the Allen Gas Turbine Project: impacts on air pollution, climate, transportation, water usage, and socioeconomic and environmental justice communities. In doing so, TVA must keep in mind that "general statements about 'possible' effects and 'some risk'" fail to satisfy NEPA's rigorous procedural standards.[220]

The data and resources provided in these comments and already in TVA's possession indicates TVA's Allen Gas Turbine Project will significantly affect the environment, requiring the preparation of an EIS. Over a baseline of *zero* gas generation, firing up 200 MW of new fossil fuel generation capacity is likely to have significant impacts on human and natural resources both now and for the project's lifetime.[221] The aggregate and cumulative effects of this project,

[215] *See S. Fork Band Council of W. Shoshone of Nev. v. U.S. Dep't of Interior*, 588 F.3d 718, 726 (9th Cir. 2009) (requiring Bureau of Land Management to properly analyze impacts to air quality from mine expansion and shipments despite agency alleging "no change in the rate" of operations).
[216] *See Nat'l Audubon Soc'y v. Hoffman*, 132 F.3d 7 (2d Cir. 1997) (finding NEPA violation where agency issued FONSI without properly reviewing all relevant factors); *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin*., 538 F. 3d 1172, 1220 (9th Cir. 2008) (discussing intensity factors and clarifying that "[a]n action may be 'significant' if one of these factors is met").
[217] *See, e.g.*, *Blue Mountains Biodiversity Proj. v. Blackwood*, 161 F.3d 1208, 1212 (9th Cir. 1998). Current regulations incorporate the legal requirement to analyze a factor's intensity using the term "degree," a characterization that nonetheless signals to TVA that it should prepare an EIS for the high degree of significance its project's effects will have. *See* 88 Fed. Reg. 49,942, 49,935 (July 31, 2023); 40 C.F.R. § 1501.3(b)(2) (2020).
[218] NEPA Implementing Regulations Phase 2, 88 Fed. Reg. at 49,969 (to be codified at 40 C.F.R. pt. 1501) (editing § 1501.3(d)(2)); *see also* 40 C.F.R. § 1501.3(b)(2) (2020).
[219] 40 C.F.R. § 1502.23 (2020) (applicable to every stage of NEPA review).
[220] *Neighbors of Cuddy Mountain v. U.S. Forest Serv.*, 137 F.3d 1372 (9th Cir. 1998).
[221] *See S. Fork Band Council of W. Shoshone of Nev.*, 588 F.3d at 725–726.

considered in the context the appropriate geographic and historical contexts, demand adequately detailed study through an EIS.

III. TVA must consider a reasonable range of alternatives, including clean energy alternatives, to the Allen Gas Turbine Project.

Whether TVA prepares an EA or an EIS, it must consider reasonable alternatives to the proposed Allen Gas Turbine Project. *See* 40 C.F.R. § 1501.5(c)(2) (2020) (EA); *id.* § 1502.14 (2020) (EIS); *Meister v. U.S. Dep't of Agric.*, 623 F.3d 363, 377 (6th Cir. 2010) (explaining scope of reasonable alternatives). This exercise sits at the heart of NEPA. *See, e.g.*, *Simmons v. U.S. Army Corps of Eng'rs*, 120 F.3d 664, 666 (7th Cir. 1997) ("No decision is more important than delimiting what these reasonable alternatives are. That choice, and the ensuing analysis, forms the heart of the environmental impact statement." (internal quotation marks omitted)). TVA has its own NEPA regulations making clear that its environmental review must discuss "reasonable alternatives" and "the no-action alternative." 18 C.F.R. § 1318.302(b) (EA); 18 C.F.R. § 1318.400(c) (EIS).

A. TVA must accurately and adequately explain the purpose and need for the Allen Gas Turbine Project.

The range of alternatives that an agency must consider under NEPA is measured against the agency's statement of the purpose and need for the action.[222] But since an agency could manipulate the NEPA process by "contriv[ing] a purpose so slender as to define competing 'reasonable alternatives' out of consideration (and even out of existence),"[223] an agency "may not 'define [a] project so narrowly that it foreclose[s] reasonable consideration of alternatives."[224] An agency's statement of purpose and need is unreasonably narrow "if the statement 'compels the selection of a particular alternative.'"[225]

The Scoping Notice describes the purpose and need for the Project in terms of *services* required to support load growth and reliability of the grid. [226] In particular, the Notice identifies the purpose of the Project as to increase flexibility and reliability of the grid, improve transmission system stability and provide new, dispatchable generation, and the need as to support load growth and add resources to support adequate transmission voltages.[227]

Despite this lengthy list of grid services, the Notice particularly emphasizes TVA's projected load growth and states that "TVA must add capacity to the system to maintain adequate

[222] *Little Traverse Lake Prop. Owners Ass'n v. Nat'l Park Serv.*, 883 F.3d 644, 655 (6th Cir. 2018).
[223] *Simmons v. U.S. Army Corps of Eng'rs*, 120 F.3d 664, 666 (7th Cir. 1997).
[224] *Little Traverse Lake*, 883 F.3d at 656 (quoting *Utah Env't Cong. v. Bosworth*, 439 F.3d 1184, 1195 (10th Cir. 2006).
[225] *Id.* (quoting *Theodore Roosevelt Conservation P'ship v. Salazar*, 661 F.3d 66, 73 (D.C. Cir. 2011)).
[226] Scoping Notice at 70,694.
[227] *Id.*

operating reserves."[228] In other words, TVA states that it needs the Allen Gas Turbine Project primarily to provide generation during periods of peak demand.

TVA must define the need for agency action broadly enough to consider alternatives that would *avoid* or *minimize* load growth rather than accepting it as a given. Avoiding or minimizing load growth would help avoid the need for investment in economically, socially, and environmentally costly new fossil fuel infrastructure. Further, defining the need for the Project broadly enough to include consideration of demand-side resources would be consistent with TVA's statutory mandate to "promote the wider and better use of electric power for agricultural and domestic use"[229] and to "treat demand and supply resources on a consistent and integrated basis."[230]

To the extent TVA asserts that the Project is needed to integrate renewable energy,[231] TVA has not sufficiently demonstrated that need. As EPA wrote in comments on another recent TVA gas proposal:

> The EPA recommends the EIS identify the timeline in which renewable buildout will occur and the direct connections between that buildout and planned natural gas generation that TVA identifies as enabling of future renewable energy resources. These gas generation plants have been proposed without comparable renewable energy generation investment.[232]

TVA cannot claim that the project is needed to integrate renewable resources without, at the very least, explaining what those resources are, where they would be located, and how they interact with the generation needs connected to this project. The Scoping Notice generally avers that "these improvements would help TVA to expand and integrate renewable resources onto its transmission grid, which would allow TVA to advance its decarbonization goals."[233] But materially identical justifications have propelled TVA through each step of what is now one of the largest investments in new fossil-fuel generation in the country. As noted above, since February 2021, TVA has proposed 6,050 megawatts of new gas generation across its fleet citing for each project the agency's need to integrate solar onto the grid. TVA must explain why, despite already committing to thousands of megawatts of new gas-fired generation, it can justify still greater investments in these resources while not appearing to pursue the same renewable projects that the agency claims justifies these decisions.[234]

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[228] *Id.* at 70,693.
[229] 16 U.S.C. § 831i.
[230] *Id.* § 831m-1.
[231] Scoping Notice at 70,693.
[232] EPA Comments on Cheatham County Generation at 3.
[233] Scoping Notice at 70,694.
[234] For its year ended September 30, 2022, TVA reported only 4% of its total power supply coming from renewable sources. *See* TVA, ANNUAL REPORT PURSUANT TO SECTION 13, 15(D), OR 37 OF THE SECURITIES EXCHANGE ACT OF

In any case, Sierra Club has previously provided TVA with analysis explaining that aeroderivative combustion turbines are not necessary to integrate renewable energy at the levels of penetration planned by TVA.[235]A report by the Center for Renewables Integration regarding TVA's Johnsonville aeroderivative CT project identified a range of operational options, including improved load forecasting, fast dispatch and larger balancing authority, reserves management and demand response, that would cost-effectively support renewables integration.[236] These options are also discussed in reports and resources available on the National Renewable Energy Lab website.[237]

TVA points to a need for increased capacity in response to an increase in population.[238] TVA states that the region's population has increased 1.5 percent since the IRP was completed in 2019.[239] The direct effects of the pollution from the proposed gas turbines fall onto the people of Memphis. However, Memphis is a shrinking city. For the third year in a row population in Shelby County has dropped.[240] If the new capacity is *not* serving Shelby County, TVA should explain why it has chosen to site the infrastructure there. The White House acknowledged that environmental justice concerns arose as a result of decisions and patterns made throughout history including "the placement of polluting industries" in "communities . . . with a significant proportion of people of color." [241] These behaviors have permitted some communities to prosper and thrive while others have been left behind.[242] TVA, therefore, must examine how placement of a new fossil-fueled power plant in a majority-Black community in Tennessee, to power the remainder of TVA territory— even as that county shrinks— will affect environmental justice goals.

1934 [FORM 10-K] 68 (Nov. 15, 2022), https://www.sec.gov/Archives/edgar/data/1376986/000137698622000023/0001376986-22-000023-index.html, **Attachment 117**.

[235] KERINIA CUSICK, CTR. FOR RENEWABLES INTEGRATION, ANALYSIS OF TVA'S JOHNSONVILLE ENVIRONMENTAL ASSESSMENT EVALUATION OF ALTERNATIVES 14–15 (Feb. 2022), **Attachment 118.**

[236] *Id.*

[237] L. BIRD ET AL., NAT'L RENEWABLE ENERGY LAB'Y, NREL/TP-6A20-60451, INTEGRATING VARIABLE RENEWABLE ENERGY: CHALLENGES AND SOLUTIONS 4–10 (Sep. 2013), **Attachment 119**. The National Renewable Energy Laboratory has many more recent publications and resources on this topic available on its website. *See, e.g.*, *Renewable Energy Integration*, NAT'L RENEWABLE ENERGY LAB'Y, https://www.nrel.gov/grid/renewable-energy-integration.html (last visited Nov. 13, 2023) (reporting on challenges and solutions to integrating variable renewable energy), **Attachment 120**.

[238] Scoping Notice at 70,693.

[239] *Id.* at 70, 693.

[240] Kate Bieri, *Shelby County Population Shrinks for Third Year in a Row (VIDEO)*, FOX13 (Sep. 18, 2023), https://www.fox13memphis.com/living/shelby-county-population-shrinks-for-third-year-in-a-row/article_d6714956-5677-11ee-a553-330e110325a7.html, **Attachment 121**.

[241] Exec. Order No. 14,096, 88 Fed. Reg. at 25,251.

[242] *Id.* at 25,251–52.

B. TVA must evaluate alternatives that will avoid and minimize the climate and environmental justice impacts of the Allen Gas Turbine Project.

CEQ has long counseled that environmental justice concerns, like those described in detail in Sections I and II above, should heighten an agency's attention to alternatives to the proposed action:

> The identification of such [a disproportionately high and adverse human health or environmental] effect should heighten agency attention to alternatives (including alternative sites), mitigation strategies, monitoring needs, and preferences expressed by the affected community or population.[243]

CEQ also counsels that an agency should engage environmental justice communities "to help develop and comment on possible alternatives to the proposed agency action as early as possible in the process."[244]

The proposed Phase 2 regulations codify the widely accepted guidance that "[t]he alternatives section is the heart of the environmental impact statement."[245] Phase 2 clarifies that NEPA requires reasonable alternatives to proposed actions "that will avoid or minimize adverse effects of these actions upon the quality of the human environment, *such as alternatives that will reduce climate change-related effects or address adverse health and environmental effects that disproportionately affect communities with environmental justice concerns*."[246]

The Scoping Notice states that TVA will consider only *one* Action Alternative: the Allen Gas Turbine Project.[247] As described in Sections I and II above, the Allen Gas Turbine Project will contribute to significant climate and environmental justice impacts. TVA must consider a range of reasonable alternatives that would avoid and minimize those impacts.

1. Neither the 2019 IRP nor the CT Modernization Study justify limiting the range of alternatives to a gas plant.

The Notice attempts to justify limiting its consideration to a single gas plant alternative by citing to TVA's non-binding and outdated 2019 Integrated Resource Plan and its CT Modernization Study, also prepared in 2019.[248] Neither document supports such an unreasonably narrow proposed range of alternatives. TVA is obligated by statute to ensure a broad review of resources:

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243 *1997 CEQ Environmental Justice Guidance Under NEPA* at 10.
244 *Id.* at 15.
245 NEPA Implementing Regulations Phase 2, 88 Fed. Reg. at 49,977 (to be codified at 40 C.F.R. pt. 1502).
246 *Id.* at 49,977 (to be codified at 40 C.F.R. pt. 1500) (emphasis added).
247 Scoping Notice at 70,693.
248 *Id.*

> [TVA] shall employ and implement a planning and selection process for new energy resources which evaluates the full range of existing and incremental resources (including new power supplies, energy conservation and efficiency, and renewable energy resources) in order to provide adequate and reliable service to electric customers of the Tennessee Valley Authority at the lowest system cost.[249]

In the Scoping Notice, TVA asserts that "[i]nvestments in adding aeroderivative CTs to the peaking fleet aligns with the direction in the IRP, which recommended enhancing system flexibility to integrate renewables and distributed resources…."[250]

Relying on the 2019 IRP to inform a decision to build a new gas plant in 2024 is irresponsible and arbitrary because neither that document nor the modeling exercise on which it is based reflect TVA's climate commitments, coal retirement plans, major climate legislation, and significant changes in the energy market. Among other things, the 2019 IRP does **not**:

- incorporate and model TVA's own commitment to an 80 percent greenhouse gas ("GHG") emissions reduction by 2035 from 2005 levels and to achieving net-zero emissions by 2050;[251]
- incorporate and model TVA's obligation to comply with federal decarbonization targets, including decarbonizing the electric grid by 2035, as set forth in a series of executive orders;[252]
- ground-truth its modeling assumptions through an all-resources Request for Proposals;[253]
- incorporate incentives from two recent groundbreaking pieces of legislation: the *Infrastructure Investment and Jobs Act ("IIJA") and the Inflation Reduction Act ("IRA"),* which are both expected to lower transmission, wind, solar, and storage investment costs;
- reflect the effect of recent price volatility, supply chain challenges, and winter reliability challenges; or
- consider resources that require new high voltage DC transmission (HVDC), including wind located in the Southwest Power Pool (SPP), Midcontinent Independent System Operator (MISO), and Electric Reliability Council of Texas (ERCOT) territories.

Based on a recent review of TVA's three prior IRPs, Applied Economics Clinic concluded that TVA's 2011, 2015, and 2019 IRPs generally failed to:

[249] 16 U.S.C. § 831m-1(b)(1).
[250] Scoping Notice at 70,693.
[251] CHIRAG T. LALA ET AL., APPLIED ECON. CLINIC, ASSESSING TVA'S IRP PLANNING PRACTICES 1 (June 2023) [hereinafter AEC IRP REPORT], **Attachment 122**; *see also* TVA, STRATEGIC INTENT AND GUIDING PRINCIPLES 20–21 (May 2021).
[252] AEC IRP REPORT at 1.
[253] *Id.* at 31.

- anticipate the size of coal retirements;
- limit the planned or actual growth of gas capacity; and
- plan adequately for a decarbonized system following 2019.[254]

Instead, TVA's IRPs, including the 2019 IRP, adopt broad planning ranges that deprive decisionmakers and the public of the ability to meaningfully assess the consistency of the utility's investments against its plans.[255] By deciding not to decide, TVA's 2019 IRP "may also result in ad hoc decision-making as TVA has no other benchmark for capacity additions beyond large ranges that can accommodate numerous conflicting possibilities, strategic investments (or lack thereof), and costs."[256]

Not only does the 2019 IRP fail to account for the dramatically changed world of 2023, but even on its own terms, it is so vague that it does not in any way justify TVA's proposal to build the Allen Gas Turbine Project.

Further, in the 2019 IRP, TVA also made several important commitments to expanding clean energy, including, importantly, to "add solar based on economics and to meet customer demand," on which it has made exceedingly slow progress.[257] In addition, TVA committed to developing a "market potential study for energy efficiency and demand response," as well as "development of Distribution Resource Planning for integration into TVA's planning process."[258] TVA has not published either, and it is unclear whether any significant progress made on these two important processes to date. TVA must disclose and incorporate into its environmental analysis for the Allen Gas Turbine Project the findings of these "near-term actions" the utility itself identified as providing "benefit across multiple futures."[259] Not considering these vital analyses will make the utility's analysis lopsided in favor of investing in new gas rather than a portfolio of clean energy resources. TVA should disclose and analyze the results of these "near-term actions" to inform its 2024 IRP[260] and the environmental review for the Allen Gas Turbine Project.

TVA must not make additional new investments in fossil generation assets like the Allen Gas Turbine Project without having first completed an updated IRP that remedies the significant deficiencies in its 2019 IRP and can meaningfully guide the agency's decisions in a changed world. Since February 2021, TVA has rushed to add 6,050 MW of new gas-fired power plants,

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[254] *Id.* at 16.
[255] *Id.*
[256] *Id.*
[257] TVA, 2019 Integrated Resource Plan Volume I – Final Resource Plan at ES-5 (2019), https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/default-document-library/site-content/environment/environmental-stewardship/irp/2019-documents/tva-2019-integrated-resource-plan-volume-i-final-resource-plan.pdf?sfvrsn=44251e0a_4 [hereinafter TVA 2019 IRP Volume I].
[258] *Id.*
[259] *Id.*
[260] TVA is already taking public input on the 2024 IRP. Integrated Resource Plan and Environmental Impact Statement Notice of Intent, 88 Fed. Reg. 32,265 (May 19, 2023).

despite mounting evidence that a clean energy portfolio is more cost effective. TVA has attempted to justify the massive gas buildout by pointing to its outdated IRP, which did not include Inflation Reduction Act pricing, President Biden's decarbonization targets, or even TVA's less ambitious decarbonization targets. Despite these targets and a pending EPA rule,[261] TVA has not accounted for the costs of mitigating the greenhouse gas emissions from its coal and gas plants. Nor has TVA accounted for increasing fuel cost volatility for its gas plants, despite the fact that end-use customers throughout the Valley ultimately foot the bill.

Without an up-to-date IRP, TVA has no basis to conclude that its massive investment in new gas plants contributes to a portfolio that achieves the lowest system cost. TVA should not make final decisions to invest in additional gas plants, including the Allen Gas Turbine Project, until after TVA has completed updated long-term resource planning. Further, because TVA has relied on flawed and outdated analysis, the proposed and under-construction gas plants should not be considered existing resources in the 2024 IRP but instead should be considered potential capacity additions that must compete with other resources, including wind, solar, energy efficiency, battery storage of various durations, and demand response. Locking in major new assets before completing the next IRP process undermines TVA's own ability to freely "determine[e] potential supply-side and demand-side energy resources options"—as TVA claims is the agency's aim in the IRP process—without the prior restraint of unrecoverable investments in specific resource options like the Allen Gas Turbine Project.

The same statutory, regulatory, legislative and market forces that render the 2019 IRP itself defunct also make it arbitrary for TVA to tier to or rely on the EIS for the 2019 IRP to support the environmental review for the Allen Gas Turbine Project. The EIS for the 2019 IRP did not disclose or evaluate alternatives that take into account TVA's or the federal government's GHG targets, coal retirements beyond the addition 2,200 MW that TVA has already exceeded, the IRA and IIJA, or any of the other factors discussed in this section.[262] Far from providing a "general discussion" of these matters, as is required in order to tier from a broader NEPA document,[263] the EIS for the 2019 IRP mentions none of them.

TVA also mischaracterizes the Allen Gas Turbine Project's relationship to the CT Modernization Study. In the Scoping Notice, TVA asserts that the Project is "consistent with the findings and recommendations of this [CT Modernization] study."[264] But in fact the Project is contrary to the CT Modernization Study. That study only called for 500 MW of

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[261] EPA, New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions from Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule, 88 Fed. Reg. 33,240 (May 23, 2023).

[262] TVA, 2019 Integrated Resource Plan Volume II – Final Environmental Policy Statement (2019), https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/default-document-library/site-content/environment/environmental-stewardship/irp/2019-documents/tva-2019-integrated-resource-plan-volume-ii-final-eis.pdf?sfvrsn=99a30a7d_4.

[263] 40 C.F.R. § 1508.1(ff) (2022).

[264] Scoping Notice at 70,693.

aeroderivative combustion turbines,[265] and TVA has already decided to build that capacity at Johnsonville. Thus, the CT Modernization Study contradicts rather than supports TVA's additional investment in the Allen Gas Turbine Project.

2. TVA must consider combinations of clean energy resources as alternatives that can provide the grid services TVA needs.

TVA must consider in the Draft EIS all reasonable alternatives, not only its preferred action and a no-action alternative. NEPA's implementing regulations and long-standing judicial precedent are clear that the Act in fact "prevents federal agencies from effectively reducing the discussion of environmentally sound alternatives to a binary choice between granting or denying an application."[266] When TVA only looked at two options to replace the Kingston coal plant, EPA recommended, "The analysis should assess a reasonable range of alternatives to the proposed action that meet a properly defined purpose and need, in order to include more meaningful consideration of options that would reduce emissions."[267] CEQ instructs agencies to "evaluate reasonable alternatives that may have lower GHG emissions, which include technically and economically feasible clean energy alternatives to proposed fossil fuel-related projects, and consider mitigation measures to reduce GHG emissions to the greatest extent possible."[268] Here, TVA cannot define the project in so narrow a way as to artificially foreclose every alternative aside from the one it prefers.[269] Simply reciting its unexplained assumption that the only solution is gas fails to demonstrate to the public (and reviewing courts) that TVA has in fact considered need in a way that complies with NEPA.

TVA must consider, as the statute requires, reasonable alternatives that would meet the project's needs. Here, reasonable alternatives include renewable power paired with storage technology, as well as hybrid alternatives that make use of demand response, energy efficiency, market purchases, interregional transmission investments, and other methods of meeting electricity demand and maintaining reliability without burning fossil fuels. By complementing solar with wind, storage, demand response, and energy efficiency, TVA can add new renewables

[265] CT Modernization Study at 12–13.
[266] *Save Our Cumberland Mountains v. Kempthorne*, 453 F.3d 334, 345 (6th Cir. 2006) (collecting cases); *see also* 40 C.F.R. § 1502.14 (2020) (directing agencies to valuate "reasonable alternatives to the proposed action," to discuss "each alternative considered in detail" and to explain, for alternatives eliminated from detailed study "the reasons for their elimination").
[267] EPA Comments on Kingston Plant Retirement at 3.
[268] CEQ NEPA Climate Guidance at 1,204.
[269] *Simmons v. U.S. Army Corps of Engineers*, 120 F.3d 664, 666 (7th Cir. 1997) ("One obvious way for an agency to slip past the strictures of NEPA is to contrive a purpose so slender as to define competing "reasonable alternatives" out of consideration (and even out of existence). . . . If the agency constricts the definition of the project's purpose and thereby excludes what truly are reasonable alternatives, the EIS cannot fulfill its role. Nor can the agency satisfy [NEPA]."); *Colorado Env't Coal. v. Dombeck*, 185 F.3d 1162, 1175 (10th Cir. 1999) (clarifying that agencies must "take responsibility for defining the objectives of an action and then provide legitimate consideration to alternatives that fall between the obvious extremes."); *Webster v. U.S. Dep't of Agric.*, 685 F.3d 411, 423 (4th Cir. 2012) (being satisfied that an agency defined purpose and need appropriately where it "conducted a searching, independent review of the stated purposes and needs . . . which demonstrates that it exercised a degree of skepticism in establishing them," even though "it is entirely appropriate for an agency to consider the applicant's needs and goals").

without adding *any* new gas.[270] TVA must evaluate whether storage, either alone or in combination with other zero-carbon resources such as energy efficiency and demand response, could *better* integrate 10,000 MW of solar. Storage is more flexible than gas and is uniquely capable of absorbing excess energy from solar, avoiding curtailment.

TVA is capable of installing solar-and-storage for its customers elsewhere in its system; in October 2023, TVA and Origis Energy announced a 550-megawatt combined solar energy project that will be accompanied by 150 MW of battery storage capacity in Lowndes County, Mississippi.[271] TVA has already sited renewable projects in Shelby County[272] and should consider doing the same for the Allen site. Memphis communities deserve the benefits clean energy can deliver. Instead, TVA indicates it will continue to site polluting facilities in overburdened communities and meet its renewable energy targets elsewhere.

Battery storage can allow for a reliable and flexible grid as well as, or better than, natural gas to accompany the integration of solar energy. TVA itself has acknowledged battery storage has "essentially equivalent ramp rates" as aeroderivative combustion turbines.[273] Further, battery storage—unlike aeroderivative CTs—can receive excess generation from renewables on the grid;[274] TVA should consider this benefit as it incorporates more renewable energy into its system. As discussed in Section III.A, TVA must also examine alternatives to integrate renewable energy, including, in addition to battery storage, a range of operational options, including improved load forecasting, fast dispatch and larger balancing authority, reserves management and demand response, that would cost-effectively support renewables integration.[275]

TVA has already proposed battery-storage solutions elsewhere within its system. For example, the Cheatham County Generation Site is slated to replace partial capacity from the Cumberland Fossil Plant and contains a planned 400-megawatt battery energy storage system, though paired with even more natural gas capacity.[276] TVA should explain why it could not propose even a battery-and-gas combination project for its western Tennessee end users.

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[270] *See* PAT KNIGHT ET AL., SYNAPSE ENERGY ECON., TVA'S CLEAN ENERGY FUTURE 9–20 (Mar. 2023).

[271] Press Release, *Origis Energy, TVA Announce Construction of MS Solar plus Storage Projects* (Oct. 11, 2023), https://www.wcbi.com/content/uploads/2023/10/h/a/Origis-TVA-Mississippi-Solar_FINAL.pdf, **Attachment 123.**

[272] The Graceland Solar Project in Shelby County will generate 150 MW to serve a Meta Platforms data operations center in Gallatin, Tennessee. TVA, *Graceland Solar Project* (last visited Oct. 19, 2023), https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/graceland-solar-draft-environment-assessment, **Attachment 124**; Press Release, RWE Renewables, RWE Partners with Facebook and TVA on 150 Megawatt Solar Project in the U.S. (May 19, 2021), https://americas.rwe.com/press/2021-05-19-rwe-partners-with-facebook-and-tva-on-150-megawatt-solar-project-in-the-us/, **Attachment 125.** The Allen Combined Cycle Plant, near the proposed project site, hosts operational solar panels generating less than one MW of solar energy. TVA, *Allen Combined Cycle Plant* (last visited Oct. 19, 2023), https://www.tva.com/energy/our-power-system/natural-gas/allen-combined-cycle-plant, **Attachment 126.**

[273] TVA 2019 IRP Volume I at D-11.

[274] CUSICK, ANALYSIS OF TVA'S JOHNSONVILLE ENVIRONMENTAL ASSESSMENT EVALUATION OF ALTERNATIVES at 13.

[275] *See* BIRD ET AL., NAT'L RENEWABLE ENERGY LAB'Y, INTEGRATING VARIABLE RENEWABLE ENERGY at 4–10.

[276] Cheatham County Generation Site EIS Notice of Intent, 88 Fed. Reg. at 32,268.

TVA itself has stated a commitment to renewable energy in its Notice of Intent but fails to incorporate any project alternative that utilizes renewable energy. The need for new generation may be achieved through alternative means, and TVA should include carbon-free alternatives, including alternatives that include a combination of renewables, battery storage, energy efficiency and demand response, in its analysis to understand the tradeoffs associated with locking in decades of additional fossil fuels in its system. Without an adequate environmental impacts analysis, TVA runs the risk of eschewing NEPA's legal requirements.[277]

TVA must also analyze how increased investment in energy efficiency may reduce peak load and energy burden. Demand-side opportunities can address system capacity in alignment with the project purpose and need. The TVA Act's least-cost planning program mandates that TVA work with its distributors to plan and implement energy efficiency.[278]

TVA already has some programs to address home inefficiency, including low-income weatherization and rebates for residential customers.[279] TVA must discuss its existing residential, commercial, and industrial energy efficiency programs and whether increasing investment in those programs, or adding new programs, could support an alternative that avoids or minimizes the need for the Project. According to TVA, participants in Home Uplift can expect an average savings of $500 a year.[280] These savings come as a result of an average $10,000 investment in energy efficiency upgrades for each household.[281] TVA has proposed a total investment of $1.5B in energy efficiency and demand response across TVA service area,[282] but has not explained whether or how either that investment or an increased investment could avoid the need for the Allen Gas Turbine Project.

TVA mentions its expected load growth, but demand increases can be offset with proper responses to non-essential energy users demanding energy at power-plant scales.[283] TVA has yet to release the study promised in its 2019 IRP detailing market potential for demand response (in addition to energy efficiency), though it does offer incentives to end users through a voluntary program.[284] The 2019 IRP forecasted anywhere from 0 to 500 megawatts in demand response

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[277] 42 U.S.C. § 4332(2)(C) (2023); *see* National Environmental Policy Act Implementing Regulations Revisions, 87 Fed. Reg 23,453, 23,454 (Apr. 20, 2022) (to be codified at 40 C.F.R. pts. 1502, 1507, 1508) ("The EIS process embodies the understanding that informed decisions are better decisions, and that environmental conditions will improve when decision makers understand and consider environmental impacts.").
[278] 16 U.S.C. § 831m-1.
[279] *Home Uplift,* TVA EnergyRight, https://energyright.com/residential/home-uplift/ (last visited Oct. 23, 2023); *Rebates*, TVA Energy Right, https://energyright.com/residential/rebates/ (last visited November 11, 2023).
[280] *Home Uplift,* TVA EnergyRight, https://energyright.com/residential/home-uplift/ (last visited Oct. 23, 2023).
[281] *Id.*
[282] TVA Press Release, TVA Plans to Invest $15 Billion Over the Next Three Years to Meet Region's Growth (Aug. 24, 2023), https://www.tva.com/newsroom/press-releases/tva-plans-to-invest--15-billion-over-the-next-three-years-to-meet-region-s-growth.
[283] S. Env't L. Ctr. et al., Scoping Notice for TVA 2024 Integrated Resource Plan and Environmental Impact Statement at 9 (July 3, 2023) (calculating total annual demand of crypto-mining facilities in TVA region at 665 megawatts), **Attachment 127**.
[284] *Demand Response*, TVA (last visited Oct. 23, 2023), https://energyright.com/business-industry/demand-response/, **Attachment 128**.

potential by 2028,[285] but after Winter Storm Elliott, TVA quickly "found" another 1,000 MW of demand response.[286] Demand response options provide an alternative that, like battery storage, provides for added grid reliability and flexibility without the associated climate-related damage.[287] TVA must include analysis of whether increasing investment in its existing demand response programs, or adding new programs such as residential demand response, could support an alternative that avoids or minimizes the need for the Project.

In response to its current, yet undisclosed load projections, TVA has announced its intentions to "invest in energy efficiency and demand response programs to help lower energy bills and offset more than 30% of new load growth in the next 10 years."[288] Given its new strategy and outlook, to the extent TVA relies on the 2019 IRP, TVA must evaluate shifting its strategy to include more elements of the 2019 IRP's "Promote DER" strategy. In Promote DER, energy efficiency, demand response, distributed generation, and battery storage are incentivized and low-income energy efficiency programs are promoted.[289] The 2019 IRP's results demonstrated that promoting DER would reduce system costs, increase economic development in the region, provide more clean energy, reduce financial risk, and improve and preserve the environmental quality of the Valley. Additionally, promoting DER would increase consumer freedom to manage their demand on the system, and expand market choice for ratepayers.[290] TVA must evaluate all of the resources available in Promote DER as an alternative to the proposed Allen gas plant.

As part of the Promote DER scenario, TVA should consider allowing MLGW the ability to generate energy locally. TVA allows nearly every other distributor to generate up to 5% of their own energy through the Flexibility program.[291] Because MLGW's Board unanimously voted to reject TVA's perpetual power supply contract,[292] TVA has not allowed MLGW to generate any power locally. Given the new load forecasts, and TVA's struggles to meet demand, TVA should reconsider. Allowing MLGW to access local solar generation—especially when paired with battery storage—would lower system costs and improve reliability for people in Memphis and throughout the TVA region.

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[285] TVA 2019 IRP Volume I at ES-4 (2019).
[286] *See Streaming Video*, TVA (Feb. 16, 2023), https://www.tva.com/about-tva/our-leadership/board-of-directors/streaming-video (video of Board Meeting at timestamp 2:04:35–49).
[287] *See* TVA 2019 IRP Volume I at ES-1.
[288] TVA Press Release, TVA Plans to Invest $15 Billion Over the Next Three Years to Meet Region's Growth (Aug. 24, 2023), https://www.tva.com/newsroom/press-releases/tva-plans-to-invest--15-billion-over-the-next-three-years-to-meet-region-s-growth.
[289] TVA 2019 IRP Volume I at 6-7.
[290] *See generally* S. Env't L. Ctr. et al. Comments on TVA's 2019 Draft Integrated Resource Plan and Draft Environmental Impact Statement (Apr. 7, 2019), **Attachment 129**.
[291] TVA Press Release, TVA Board Adopts Principles of Public Power Flexibility (Feb. 13, 2020), https://www.tva.com/newsroom/press-releases/tva-board-adopts-principles-of-public-power-flexibility, **Attachment 130**.
[292] Adrian Sanz, Associated Press, *Memphis Power Company Reject's TVA's Long-term Deal* (Dec. 7, 2022), https://apnews.com/article/business-memphis-fb4a788b22667f586d9cd8610dc37de0, **Attachment 131**.

TVA should also evaluate non-gas technologies for voltage control, such as synchronous condensers, to the extent such voltage control is actually needed.[293]

Particularly because Memphis sits on the border of TVA's service territory, TVA must also include market purchases as part of its portfolio. Market purchases include both long-term purchases from clean resources and short-term spot market purchases. They "are an essential tool for cost-effectively meeting reliability needs by taking advantage of mismatches in timing of peak needs among neighboring grid operators."[294] Given TVA's ties to MISO, using market purchases to access the supply and demand diversity across the expansive region is likely to be a low-cost source of dependable capacity.

For similar reasons, TVA should consider additional investment in interregional transmission. When the Southeastern Regional Transmission Planning organization studied a scenario in which MISO served MLGW's load (roughly 2600 MW), SERTP found that only $21.5 million of investment would be required to accommodate the bulk transfer.[295] Similarly, the Department of Energy found that substantial interregional transfer capability is required between TVA ("Southeast" region) and MISO South ("Gulf" region).[296] During Winter Storm Elliott, while TVA initiated rolling blackouts, the Southwest Power Pool—less than 300 miles from Memphis—curtailed roughly 3 GW of wind resources that could have been imported if there were sufficient interregional transfer capacity.[297] One report estimated that a 1 GW transmission line between TVA and MISO would have provided $79 million in value during Winter Storm Elliott alone.[298] Increased interregional transmission capacity between the Memphis and neighboring energy markets could serve Memphians with low-cost, reliable, resilient energy, while benefiting the TVA system overall.

The federal government has made clean energy technology deployment a top priority.[299] TVA, a federal utility, faces "a once-in-a-generation economic opportunity" to support the clean energy transition away from fossil fuels.[300] A recent report from the National Renewable Energy Laboratory estimated that the country's net-zero and carbon-free emissions goals require adding

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[293] *See, e.g.*, Giles Parkinson, *Cheap condensers to displace gas as renewable energy backup*, RENEW ECON. (May 22, 2018), https://reneweconomy.com.au/cheap-condensers-to-displace-gas-as-renewable-energy-back-up-29544/#google_vignette, **Attachment 132**.

[294] MICHAEL GOGGIN, GRID STRATEGIES, CRITIQUE OF TVA'S ALTERNATIVES ANALYSIS IN THE UTILITY'S "KINGSTON FOSSIL PLANT RETIREMENT, DRAFT ENVIRONMENTAL IMPACT STATEMENT" 47 (July 3, 2023).

[295] SE. REG'L TRANSMISSION PLANNING, 2023 ECONOMIC PLANNING STUDIES PRELIMINARY RESULTS 5–31 (2023), http://www.southeasternrtp.com/docs/general/2023/2023-SERTP-Prelim-Economic-Study-Results.pdf, **Attachment 133**.

[296] DEP'T OF ENERGY, NATIONAL TRANSMISSION NEEDS STUDY 58–59 (Oct. 2023), https://www.energy.gov/sites/default/files/2023-10/National_Transmission_Needs_Study_2023.pdf, **Attachment 134**.

[297] Ashtin Massie and Sarah Toth, RMI, *Wasted Wind and Tenable Transmission During Winter Storm Elliott* (Feb. 16, 2023), https://rmi.org/wasted-wind-and-tenable-transmission-during-winter-storm-elliott/.

[298] Michael Goggin & Zachary Zimmerman, Grid Strategies, *The Value of Transmission During Winter Storm Elliott* (Feb. 2023), https://acore.org/the-value-of-transmission-during-winter-storm-elliott/, **Attachment 135**.

[299] Exec. Order No. 13,990, 86 Fed. Reg. at 7,037, 7,624.

[300] Exec. Order No. 14,057, 86 Fed. Reg. at 70,935.

renewable energy infrastructure "at rates of three to six times recent levels."[301] Federal agencies must "lead by example" toward the national policy of "a carbon pollution-free electricity sector by 2035 . . . ."[302] TVA has stated its own goal of reaching 10,000 MW of solar energy in its system by 2035, more than tripling its current capacity.[303] To achieve this goal and the associated aim of "climate resilient infrastructure and operations,"[304] TVA should look carefully at the real risks associated with its overblown investment in natural gas at the expense of climate-safer alternatives.

3. TVA must fairly and transparently evaluate the cost competitiveness of each of the alternatives it considers.

TVA must address the cost competitiveness of its preferred alternative relative to more affordable renewable and climate pollution-free options. The Inflation Reduction Act increased the economic benefits of selecting renewable power instead of new fossil fuel assets. A study of 76 GW of new gas-burning power plants found that 93% were more expensive than clean energy in light of the IRA's tax credits.[305] The Allen Gas Turbine Project is located in a designated energy community, for which additional incentives are available to develop clean, renewable energy projects.[306] TVA must consider alternatives that maximize the benefits available under the IRA.

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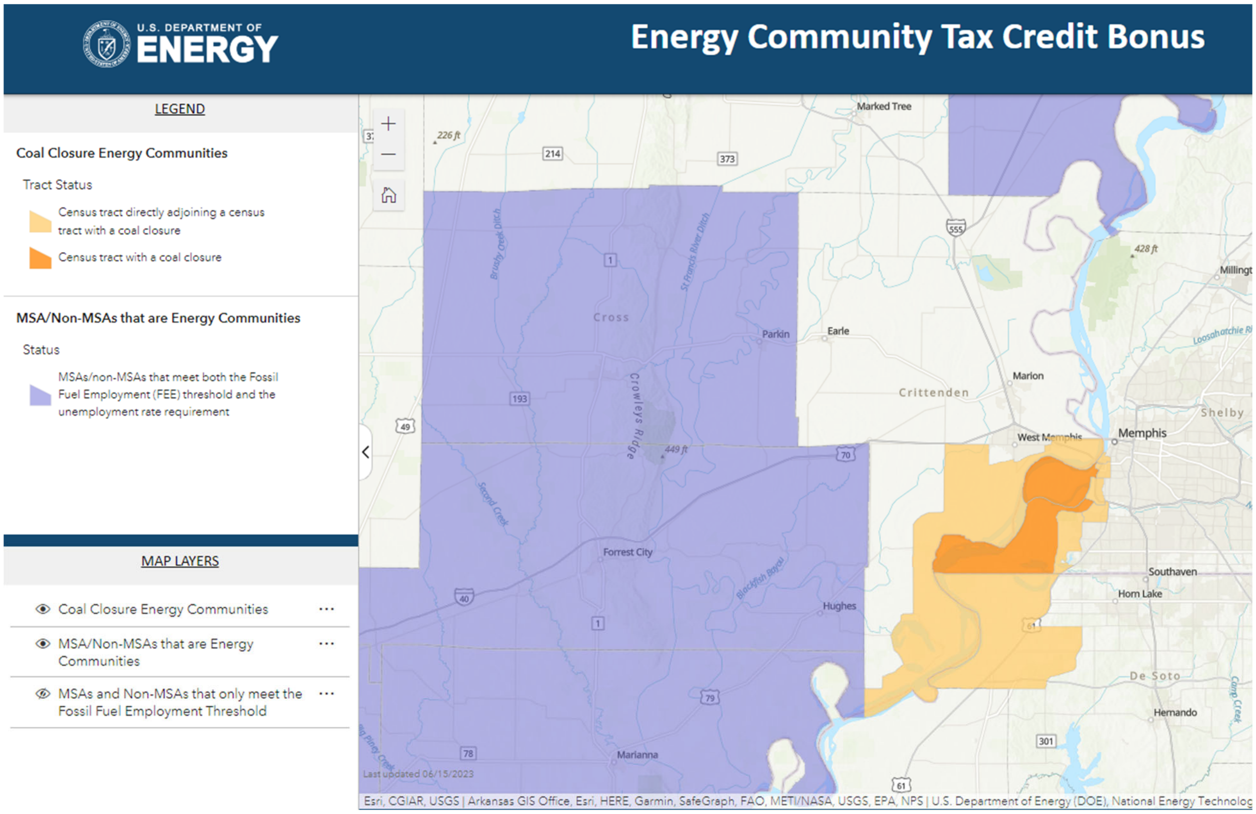
[301] PAUL DENHOLM ET AL., NAT'L RENEWABLE ENERGY LAB'Y, EXAMINING SUPPLY-SIDE OPTIONS TO ACHIEVE 100% CLEAN ELECTRICITY BY 2035 xix (2022), **Attachment 136**.
[302] Exec. Order No. 14,057, 86 Fed. Reg. at 70,935.
[303] Baillee Majors, *Public Comments for TVA Environmental Review of Tuscumbia Solar Project Ending October 19*, ALA. PUB. RADIO (Oct. 18, 2023), https://www.apr.org/news/2023-10-18/public-comment-for-tva-environmental-review-of-tuscumbia-solar-project-ending-october-19, **Attachment 137**.
[304] Exec. Order No. 14,057, 86 Fed. Reg. at 70,935–36.
[305] Lauren Shisberg, *The Business Case for New Gas is Shrinking*, RMI (Dec. 8, 2022), https://rmi.org/business-case-for-new-gas-is-shrinking/, **Attachment 138.**
[306] Interagency Working Grp. on Coal & Power Plant Cmtys. & Econ. Revitalization, *Energy Community Tax Credit Bonus*, https://energycommunities.gov/energy-community-tax-credit-bonus/ (last visited Nov. 11, 2023).



Battery storage, a key component of firming the intermittency of renewable generation resources, has declined in price over the past decade.[307] Although prices of lithium-ion batteries increased in the immediate aftermath of the pandemic, that trend is expected to reverse in 2024—before TVA reaches a final decision on this project—as supply chain issues resolve and new lithium production comes online.[308] TVA must consider and address in its environmental analysis the ways that the costs of a solar and storage option are expected to change by the time a final decision is reached.

TVA must also consider and disclose the costs of mitigating greenhouse gas emissions from the Allen Gas Turbine Project. EPA's proposed rule establishing more environmentally protective standards for fossil fuel burning power plants will impose compliance costs on the owners of those plants, increasing the economic attractiveness of renewables further still.[309] TVA

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[307] *Lithim-ion Battery Pack Prices Rise for First Time to an Average of $151/kWh*, BLOOMBERGNEF (Dec. 6, 2022), https://about.bnef.com/blog/lithium-ion-battery-pack-prices-rise-for-first-time-to-an-average-of-151-kwh/, **Attachment 139**.

[308] *Top 10 Energy Storage Trends in 2023*, BLOOMBERGNEF (Jan. 11, 2023), https://about.bnef.com/blog/top-10-energy-storage-trends-in-2023/ ("Energy storage system costs stay above $300/kWh for a turnkey four-hour duration system. In 2022, rising raw material and component prices led to the first increase in energy storage system costs since BNEF started its ESS cost survey in 2017. Costs are expected to remain high in 2023 before dropping in 2024."), **Attachment 140**.

[309] EPA, New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule, 88 Fed. Reg. 33240 (May 23, 2023).

must disclose and analyze the cost of complying with these updated power plant standards. Commenting on scoping for another recent gas plant proposal, EPA advised "[i]f TVA intends to install carbon mitigation measures after plant start-up, these costs should be included in costs analysis."[310] TVA is statutorily obligated to consider "environmental compliance" costs in its asset planning and selection.[311] And in addition, TVA must account for the volatility of gas prices—which has been extreme in recent years—as yet another significant financial burden that the agency could avoid by selecting renewable options to meet its generation needs.[312]

TVA lags behind its peer utilities when it comes to investment in clean energy generation. For the third year in a row, TVA received an "F" from the Sierra's Club's annual analysis.[313] TVA has planned the largest new gas buildout of seventy-seven peer companies instead of opting for the climate-friendly solutions demanded by its customers.

Even if some of TVA's past proposals presumed cost differences in order to eliminate clean energy alternatives to traditional fossil fuels, funding from the IRA creates unprecedented opportunities for TVA. The IRA specifically allows direct-pay tax credits to public utilities where previous renewable energy tax incentives were exclusive to private entities.[314]

When reviewing the environmental impacts associated with the Allen Gas Turbine Project, TVA must paint an accurate picture with its calculations. When explaining its decision-making process to the public as required by NEPA, TVA must be sure to include how tax credits on solar and storage projects located in an energy community like southwest Memphis would impact TVA's generation options—alternatively, TVA should explain to its ratepayers why it plans to leave federal funding on the table.

Since today's funding and technology landscape allows the delivery of clean energy at a dramatically lower cost to the climate, TVA must analyze why it believes a combination of solar, battery storage, and demand response, and similar alternatives, cannot provide reliable, cost-effective energy that serve a properly-defined purpose and need for this Project.

C. TVA must provide the public with information necessary to evaluate the Project and propose alternatives and mitigation.

In the Scoping Notice, TVA supports its proposal to construct the Allen Gas Turbine Project by referring to several studies and other resources that, to our knowledge, have not been provided to the public. These studies and resources include:

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310 EPA Comments on Cheatham County Generation at 4.
311 16 U.S.C. § 831m-1(b)(3).
312 Katy Fleury, *U.S. Natural Gas Price Saw Record Volatility in the First Quarter of 2022*, ENERGY INFORMATION ADMIN. (Aug. 24, 2022), https://www.eia.gov/todayinenergy/detail.php?id=53579, **Attachment 141.**
313 Cara Fogler & Noah Ver Beek, Sierra Club, *The Dirty Truth About Utility Climate Pledges* 11–13 (Oct. 2023), https://coal.sierraclub.org/sites/nat-coal/files/dirty_truth_report_2023.pdf, **Attachment 142.**
314 Caroline Eggers, *The Inflation Reduction Act Makes Renewables Cheaper. But TVA is Still Pushing Fossil Fuels*, WKMS (Aug. 18, 2023), https://www.wkms.org/energy/2023-08-18/the-inflation-reduction-act-makes-renewables-cheaper-but-tva-is-still-pushing-fossil-fuels, **Attachment 143.**

- Electric demand forecast ("expected to grow more than one percent per year on average between 2023-2026")
- Current system modeling ("with increased residential migration and commercial development, TVA must add capacity to the system to maintain adequate operating reserves")
- Transmission system studies showing "need to improve the stability" of the grid in western Tennessee ("In this area, additional resources are needed to ensure that adequate transmission voltages are maintained…")[315]

In order for the public to provide meaningful comments on TVA's draft environmental document, TVA must disclose these studies and resources. In addition, in these comments, Community Groups have identified several other categories of information that are necessary to adequately inform TVA's decisionmakers and the public of the impacts of the Project and to explore reasonable alternatives to the Project, including:

- Hourly load forecast to identify projected peak demand and identify alternatives that could reduce that demand;
- Energy efficiency and demand response potential study referred to in the 2019 IRP;
- Projected capacity factor for the Allen Gas Turbine Project specifically;
- Air pollutant dispersion modeling for all pollutants, including NOx, PM2.5, and formaldehyde;
- Projected water usage amounts for the Allen Gas Turbine Project;
- Project greenhouse gas emissions of the Project and the projected cumulative emissions from TVA's gas buildout, including upstream methane emissions, including both the rate and the total emissions over the life of the gas plants.
- An updated integrated resource plan that takes into account regulatory, economic, and technological changes that have occurred since the 2019 plan was adopted.

TVA must provide this information to the public in or alongside the draft environmental document in order to ensure that the public can integrate it into their comments on the Project.

Thank you for the opportunity to comment on this Scoping Notice.

[315] Scoping Notice at 70,693–94.

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TVA

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APPENDIX B – AGENCY CORRESPONDENCE

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TENNESSEE VALLEY AUTHORITY

400 West Summit Hill Drive, Knoxville, Tennessee 37902

April 30, 2024

Mr. E. Patrick McIntyre, Jr.
Executive Director
and State Historic Preservation Officer
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), ALLEN AERODERIVATIVE PROJECT, SHELBY COUNTY, TENNESSEE (TVA TRACKING NUMBER – CRMS 85773012561) (35.0720, -90.1450)

TVA proposes to construct and operate six new aeroderivative (Aero) combustion turbine (CT) units at the Allen Combustion Turbine site (ACT), located in Shelby County, Tennessee, southwest of the City of Memphis (Figure 1). CT units generate power much like a jet engine by combusting natural gas combined with compressed air. Aero CTs are a newer technology that is more efficient than traditional CT units such as those constructed at this site in 1971-72. The six Aero CT units would generate approximately 200 Megawatts (MW) of dispatchable power for TVA's system. TVA may also continue to operate two existing 60-MW CT units on the site. Construction would take place within previously disturbed areas at ACT and adjacent land (Figure 2). Commercial operations for the new units would begin in 2025 or 2026. Figure 3 shows the proposed project layout. The completed Aero CT plant would be largely similar in appearance to the existing CT plant, although it would include 50-foot exhaust stacks, which current units lack.

TVA has determined that the proposed project is an undertaking (as defined at 36 CFR § 800.16(y)) with potential to cause effects on historic properties listed in, or eligible for listing in, the National Register of Historic Places (NRHP). TVA proposes the undertaking's area of potential effects (APE) should be considered as the construction footprint (shown in Figure 2) and areas within one-half mile of the proposed Aero CT plant from which it would be visible. Given the level topography and lack of vegetation, the only feature of this landscape that could block views of the proposed plant is the built environment.

<u>Background</u>

Over the past several years TVA has seen a strong increase in electrical demand and this project would help meet that demand as quickly as possible. They would also provide flexible and dispatchable transmission grid support and facilitate the integration of renewable energy generation onto the TVA bulk transmission system, consistent with TVA's 2019 Integrated Resource Plan.

Archaeological sites

The Aero CT units would be installed at the same location as the 16 existing CT units that TVA plans to remove (we previously completed consultation with your office concerning the ACT demolition project). Surrounding paved surfaces, and parking areas to the west and north, would be used for laydowns and parking during construction. Prior to the retirement of the Allen Fossil Plant site (ALF) the area north of the ACT site was used for coal storage, but after 2018 the coal was removed and the area was covered in gravel. The entire footprint is within ALF. In 2019, TVA completed a Section 110 inventory of archaeological sites at ALF. The survey excluded the area within the ACT fence because this area is clearly developed. The survey identified no archaeological sites and indicated that this location lacks potential for intact Holocene soils. Your office agreed with this finding (letter dated 3/19/2020). We consulted with your office in August 2023 regarding TVA's proposal to demolish some or all of the existing Allen CT units and fuel oil tanks. Based on the previous survey and a desktop analysis that referenced other previous Section 106 reviews at the ALF site, TVA found that the Allen CT demolition would not affect archaeological sites. Your office agreed by letter dated August 11, 2023. The current project significantly overlaps the footprint for that project. This area as a whole has been profoundly disturbed by past construction of ALF and ACT and consists of construction fill with very low potential for intact archaeological sites.

Historic architectural properties

The APE consists of a late-20th century industrial landscape (Figures 4-6). All buildings, structures, and parking areas within the APE belong to one of five entities: ALF, ACT, the Allen Combined Cycle (ACC) plant, CMC Container Maintenance Corporation, and the TE Maxson Wastewater Treatment Facility (Figure 7). TVA has previously, separately, determined ALF (2014) and ACT (in 2022) are ineligible for listing in the NRHP, in consultation with your office. TVA retired ALF in 2018 and is in the process of completing the demolition. ACC was completed and went into operation in 2018. The CMC Container Maintenance facility went into operation in 2014, based on historic images in Google Earth. The wastewater treatment facility appears to have been under construction in 1971-1973, based on historic aerial photographs. TVA has not completed an NRHP assessment of that facility. However, were the wastewater facility to be determined eligible, the construction of the Aero CT plant on the site of the (soon to be demolished) ACT plant would not result in an adverse effect, as the new gas units would be largely similar in overall dimensions, materials, and appearance to the existing CT plant, resulting in only minor changes to integrity of setting.

Findings

As the proposed Aero CT units would be built in the same location as the existing CT units, TVA finds that the current undertaking also would not affect any archaeological sites that are listed in or eligible for listing in the NRHP. TVA finds further that the undertaking would cause no adverse effects to any NRHP-listed or -eligible historic architectural properties.

Closing

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding properties within the proposed project's APE that may be of religious and cultural significance to them and eligible for the NRHP.

Pursuant to 36 CFR Part 800.5(c) we are notifying you of TVA's finding of no adverse effect; providing the documentation specified in § 800.11(e); and inviting you to review the finding.

Please contact Steve Cole by email, sccole0@tva.gov with your comments.

Sincerely,

Brandon Hartline
Senior Manager
Cultural Compliance

SCC:ERB
Enclosures
cc (Enclosures):

Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

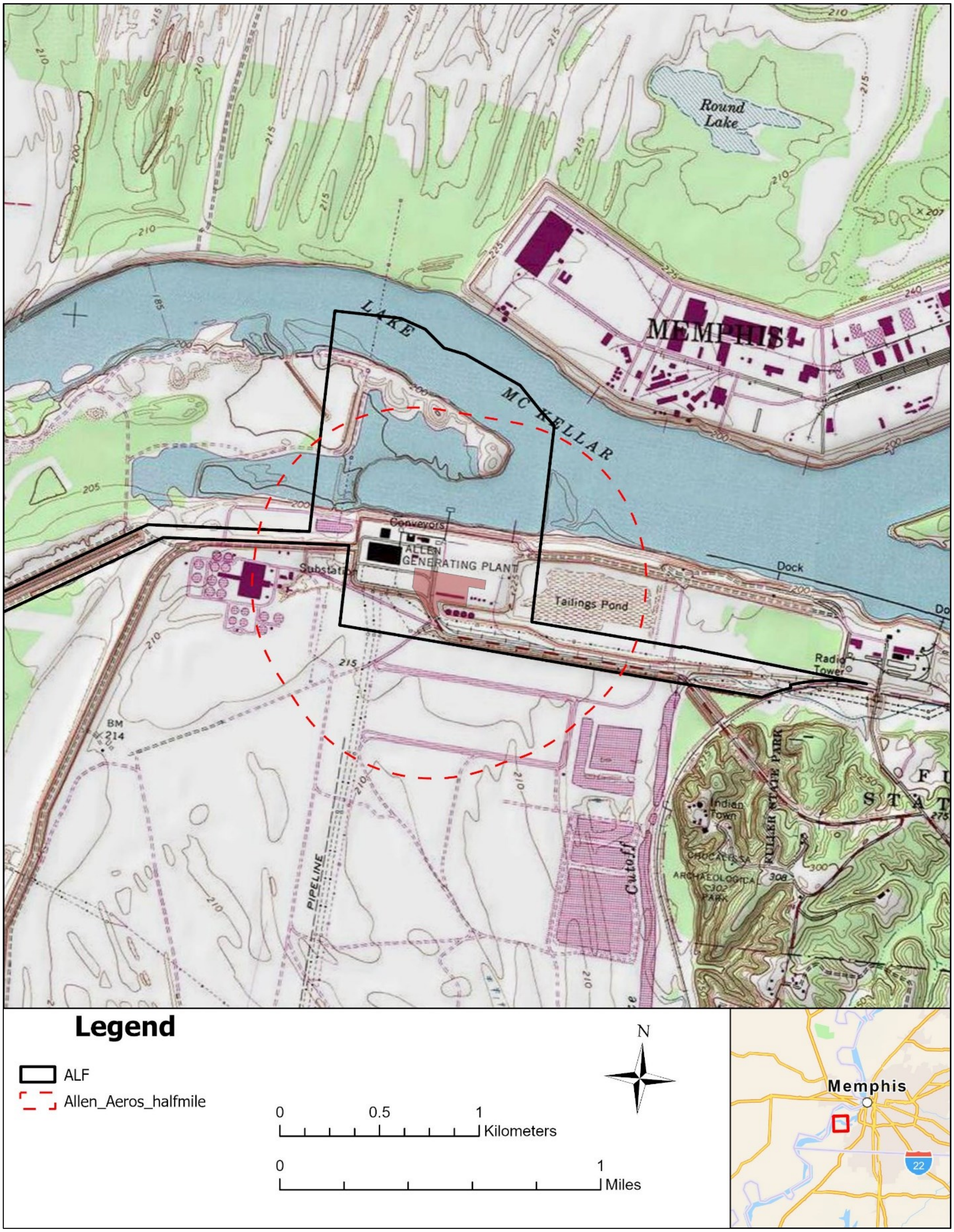

Figure 1. Project location (pink shading) and half-mile radius. Base map: USGS Fletcher Lake, TN 7.5-minute quadrangle.

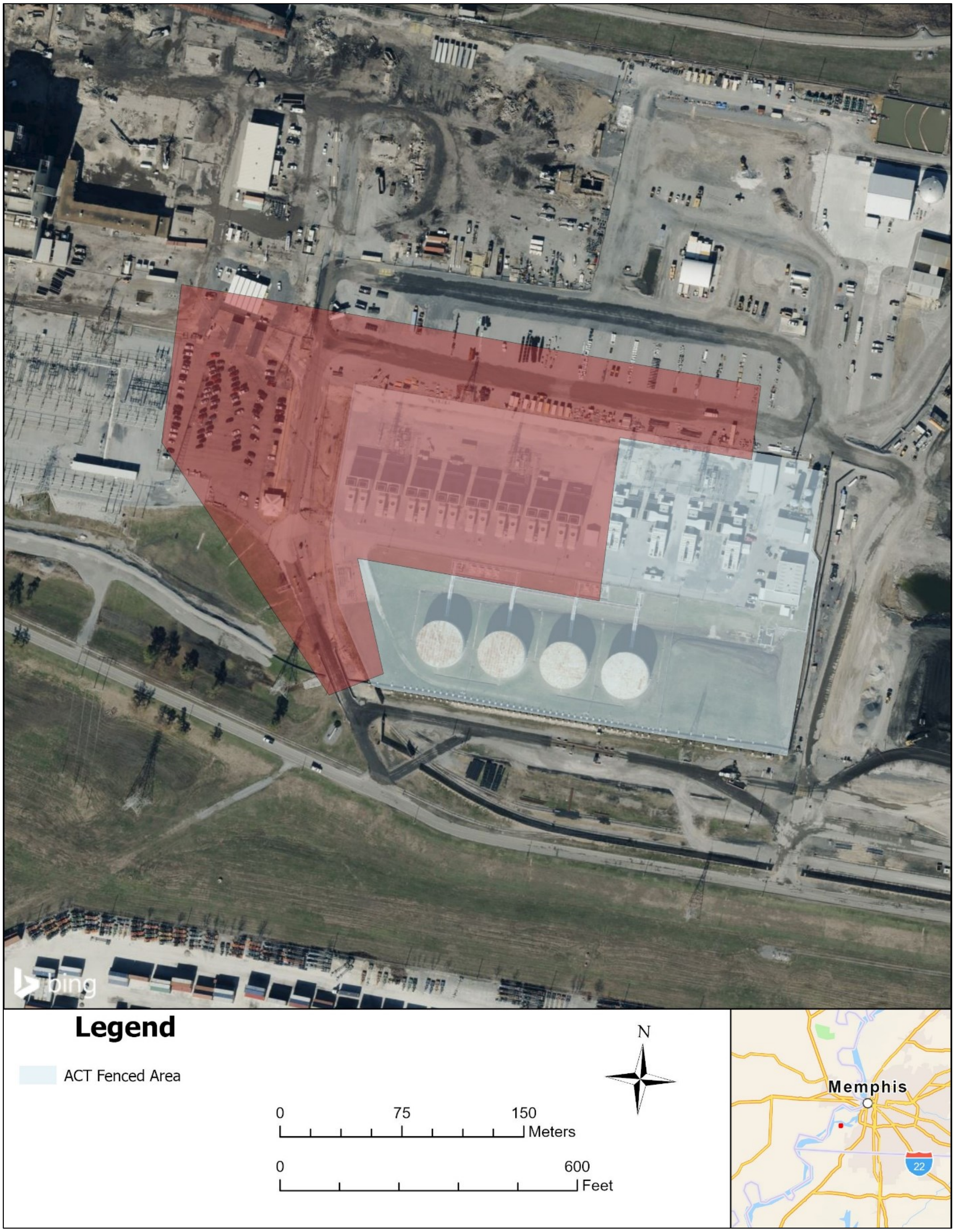

Figure 2. Project footprint. Imagery from Bing.

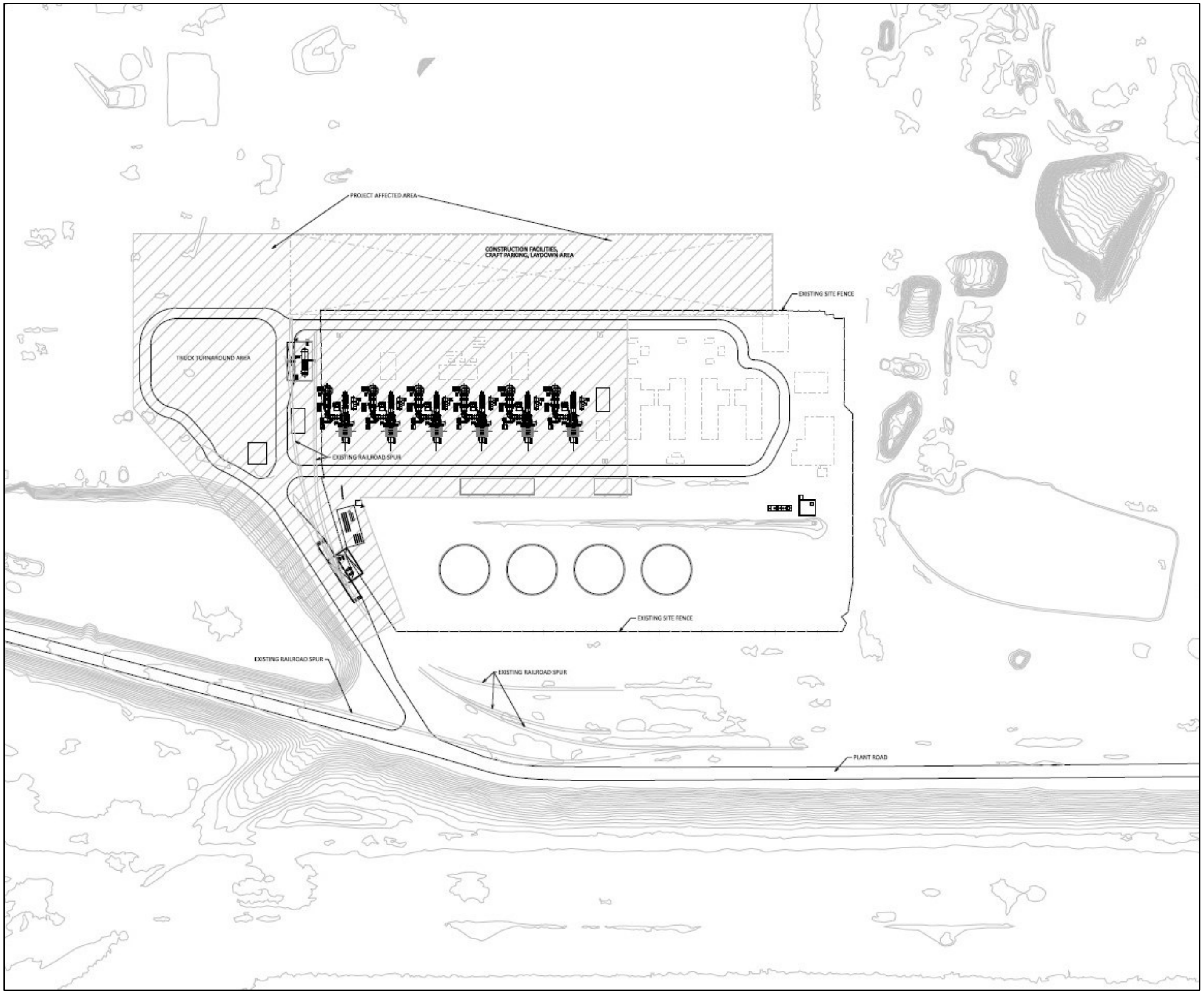

Figure 3. Proposed layout, superimposed over existing plant facilities. Current project footprint is the shaded area, which includes proposed locations of the six new Aero CT units (where existing CT units are located) and construction parking and laydown areas.

Figure 4. Oblique aerial photograph showing ACT (red polygon); view to southeast. Current project largely overlaps that area. Date of photo is unknown but it predates the removal of the coal pile in 2019/2020.

Figure 5. ACT, as seen from Plant Road. Google Street View; image dated July 2021.

Figure 6. ACC, as seen from Plant Road. Google Street View; image dated July 2021. Note CMC Container Maintenance facility in middle ground.

Figure 7. Existing facilities within the APE; imagery by ESRI.

From: TN Help
Sent: Thursday, May 2, 2024 11:47 AM
To: Beliles, Emily
Cc: Cole, Steve C; Hartline, Brandon Joseph
Subject: Allen Aeroderivative Project; CRMS 85773012561 - Project # SHPO0004937

TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON PIKE
NASHVILLE, TENNESSEE 37243-0442
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

05-02-2024 10:44:49 CDT

Mr. Brandon Hartline
Tennessee Valley Authority

RE: Tennessee Valley Authority (TVA), Allen Aeroderivative Project; CRMS 85773012561, Project#: SHPO0004937, , Shelby County, TN

Dear Mr. Brandon Hartline:

In response to your request, we have reviewed the cultural resources documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Considering the information provided, we find that no historic properties eligible for listing in the National Register of Historic Places will be affected by this undertaking. If project plans are changed or archaeological remains are discovered during project construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Please provide your Project # when submitting any additional information regarding this undertaking. Questions or comments may be directed to Jennifer Barnett, who drafted this response, at Jennifer.Barnett@tn.gov, +16156874780.

Sincerely,

E. Patrick McIntyre, Jr.

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

Ref:MSG13637542_Ed53jZuwceKkrk9zfXa

APPENDIX C – ADDITIONAL SOCIAL COST OF GHG ANALYSIS

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Prior to the issuance of Executive Order 14154, *Unleashing American Energy*, in January 2025, TVA had calculated the SC-GHG of Alternative B (the proposed project) using the Interagency Working Group (IWG) guidance published in its *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under EO 13990* and guidance published by EPA in *Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, "Standards of Performance for New, Reconstruction, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review.* These calculations are provided below.

In February 2021, the IWG published *Technical Support Document: "Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under EO 13990"* (IWG 2021). This document was an interim technical document that updated previous guidance from 2016. Table C-1 details the annualized estimated SC-GHG under the IWG Technical Support Document.

Table C-1. IWG Interim Estimated Annualized Social Cost of Carbon Associated with the Proposed Action

	Emissions (Co_2e) (tons/ year)	**SC-GHG 7%**	**SC-GHG 3%**
Maximum Operations (Capacity Factor of 40 Percent)	401,800	$6,830,600	$22,500,800
Predicted Operations (Capacity Factor of 11.1 Percent)	107,268	$1,823,556	$6,007,008
GHG Life Cycle Analysis Emissions	23,730.551	$403,419	$166,114
Total (Maximum)	**425,530.551**	**$7,234,019**	**$23,829,711**
Total (Predicted)	**130,998.551**	**$2,226,975**	**$7,335,919**

Key: CH_4 = methane; CO_2 = carbon dioxide; GHG = greenhouse gas; SC-GHG = social cost of greenhouse gases

In 2023, EPA released social cost values that used lower discount rates and higher dollars per ton for both carbon and methane (see Table C-2).

Table C-2. Comparison of Social Cost Values

	Feb. 2021 IWG Interim Estimates (2020 dollars at a 3% discount rate)	**Dec. 2023 EPA Report Estimates** (2020 dollars at a 2% discount rate)
Social Cost of Carbon	$51/ton	$190/ton
Social Cost of Methane	$1,500/ton	$1,600/ton

Source: Environmental & Energy Law Program Harvard Law School 2023.

The EPA guidance incorporated numerous methodological updates that addressed the near-term recommendations of the National Academies of Sciences, Engineering, and Medicine (the National Academies). This modular approach involved four components, or modules, of the SC-GHG estimation – socioeconomics and emissions, climate, damages, and discounting – and was developed by drawing on research and expertise from the scientific disciplines relevant to that component (EPA 2023c) and recommendations from the National Academies. The SC-GHG estimates presented below incorporate several limitations, as would be expected for any modeling exercise that covers such a broad scope of scientific and economic issues across a complex global landscape. There are still many categories of climate impacts and associated damages that are only partially—or not at all—reflected in these estimates and sources of uncertainty that have not been fully characterized due to data and modeling limitations.

Table C-3 details the annualized estimated SC-GHG under the EPA's *Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking.*

Table C-3. EPA Social Cost of Greenhouse Gases Application Annualized Values of All GHG Emission Changes (CO2, CH4, N2O) (millions, 2020$)

	Emissions (Co2e) (tons/ year)	**SC-GHG 2.5%**	**SC-GHG 2.0%**	**SC-GHG 1.5%**
Maximum Operations (Capacity Factor of 40 Percent)	401,800	$77.00	$118.50	$189.18
Predicted Operations (Capacity Factor of 11.1 Percent)	107,268	$20.56	$31.64	$50.51
GHG Life Cycle Analysis Emissions	23,730.551	$3.01	$4.93	$8.41
Total (Maximum)	**425,530.551**	**$80.01**	**$123.43**	**$197.59**
Total (Predicted)	**130,998.551**	**$23.57**	**$36.57**	**$58.92**

Key: CH_4 = methane; CO_2 = carbon dioxide; GHG = greenhouse gas; SC-GHG = social cost of greenhouse gases

Note: The EPA Social Cost of Greenhouse Gases Application requires emissions inputs year by year. Therefore, the SC-GHG for Life Cycle Analysis Emissions have been calculated as if they occur during a single year (2025).

While the life cycle emissions would occur over the entire life of the project, this assumption that all life cycle emissions occur during one single year still provides a reasonable estimation of total emissions over the life of the project

APPENDIX D – BAT STRATEGY PROJECT REVIEW FORM

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Project Review Form - TVA Bat Strategy *(06/2019)*

*This form should **only** be completed if project includes activities in Tables 2 or 3 (STEP 2 below). This form is not required if project activities are limited to Table 1 (STEP 2) or otherwise determined to have no effect on federally listed bats. If so, include the following statement in your environmental compliance document (e.g., add as a comment in the project CEC): "Project activities limited to Bat Strategy Table 1 or otherwise determined to have no effect on federally listed bats. Bat Strategy Project Review Form NOT required." This form is to assist in determining required conservation measures per TVA's ESA Section 7 programmatic consultation for routine actions and federally listed bats.*[1]

Project Name: Allen Aeros **Date:** Sep 12, 2023

Contact(s): Joe Santangelo **CEC#:** **Project ID:** 43448

Project Location (City, County, State): Shelby County, TN

Project Description:

The Tennessee Valley Authority (TVA) proposes to construct and operate six new aeroderivative combustion turbine (CT) units at the Allen Combustion Turbine site (ACT), located in Shelby County, Tennessee, southwest of the City of Memphis.

SECTION 1: PROJECT INFORMATION - ACTION AND ACTIVITIES

STEP 1) Select TVA Action. If none are applicable, contact environmental support staff, Environmental Project Lead, or Terrestrial Zoologist to discuss whether form (i.e., application of Bat Programmatic Consultation) is appropriate for project:

- ☐ 1 Manage Biological Resources for Biodiversity and Public Use on TVA Reservoir Lands
- ☐ 2 Protect Cultural Resources on TVA-Retained Land
- ☐ 3 Manage Land Use and Disposal of TVA-Retained Land
- ☐ 4 Manage Permitting under Section 26a of the TVA Act
- ☒ 5 Operate, Maintain, Retire, Expand, Construct Power Plants
- ☐ 6 Maintain Existing Electric Transmission Assets
- ☐ 7 Convey Property associated with Electric Transmission
- ☐ 8 Expand or Construct New Electric Transmission Assets
- ☐ 9 Promote Economic Development
- ☐ 10 Promote Mid-Scale Solar Generation

STEP 2) Select all activities from Tables 1, 2, and 3 below that are included in the proposed project.

TABLE 1. Activities with no effect to bats. Conservation measures & completion of bat strategy project review form NOT required.		
☐ 1. Loans and/or grant awards	☐ 8. Sale of TVA property	☐ 19. Site-specific enhancements in streams and reservoirs for aquatic animals
☐ 2. Purchase of property	☐ 9. Lease of TVA property	☐ 20. Nesting platforms
☐ 3. Purchase of equipment for industrial facilities	☐ 10. Deed modification associated with TVA rights or TVA property	☐ 41. Minor water-based structures (this does not include boat docks, boat slips or piers)
☐ 4. Environmental education	☐ 11. Abandonment of TVA retained rights	☐ 42. Internal renovation or internal expansion of an existing facility
☐ 5. Transfer of ROW easement and/or ROW equipment	☐ 12. Sufferance agreement	☐ 43. Replacement or removal of TL poles
☐ 6. Property and/or equipment transfer	☐ 13. Engineering or environmental planning or studies	☐ 44. Conductor and overhead ground wire installation and replacement
☐ 7. Easement on TVA property	☐ 14. Harbor limits delineation	☐ 49. Non-navigable houseboats

TABLE 2. Activities not likely to adversely affect bats with implementation of conservation measures. Conservation measures and completion of bat strategy project review form REQUIRED; review of bat records in proximity to project NOT required.		
■ 18. Erosion control, minor	☐ 57. Water intake - non-industrial	☐ 79. Swimming pools/associated equipment
☐ 24. Tree planting	☐ 58. Wastewater outfalls	☐ 81. Water intakes – industrial
☐ 30. Dredging and excavation; recessed harbor areas	☐ 59. Marine fueling facilities	■ 84. On-site/off-site public utility relocation or construction or extension
☐ 39. Berm development	☐ 60. Commercial water-use facilities (e.g., marinas)	☐ 85. Playground equipment - land-based
☐ 40. Closed loop heat exchangers (heat pumps)	☐ 61. Septic fields	■ 87. Aboveground storage tanks
☐ 45. Stream monitoring equipment - placement and use	☐ 66. Private, residential docks, piers, boathouses	☐ 88. Underground storage tanks
☐ 46. Floating boat slips within approved harbor limits	■ 67. Siting of temporary office trailers	☐ 90. Pond closure
■ 48. Laydown areas	☐ 68. Financing for speculative building construction	☐ 93. Standard License
☐ 50. Minor land based structures	☐ 72. Ferry landings/service operations	☐ 94. Special Use License
☐ 51. Signage installation	☐ 74. Recreational vehicle campsites	☐ 95. Recreation License
☐ 53. Mooring buoys or posts	■ 75. Utility lines/light poles	☐ 96. Land Use Permit
☐ 56. Culverts	☐ 76. Concrete sidewalks	

Table 3: Activities that may adversely affect federally listed bats. Conservation measures AND completion of bat strategy project review form REQUIRED; review of bat records in proximity of project REQUIRED by OSAR/Heritage eMap reviewer or Terrestrial Zoologist.		
☐ 15. Windshield and ground surveys for archaeological resources	☐ 34. Mechanical vegetation removal, includes trees or tree branches > 3 inches in diameter	■ 69. Renovation of existing structures
☐ 16. Drilling	☐ 35. Stabilization (major erosion control)	☐ 70. Lock maintenance/ construction
☐ 17. Mechanical vegetation removal, does not include trees or branches > 3" in diameter (in Table 3 due to potential for woody burn piles)	■ 36. Grading	☐ 71. Concrete dam modification
☐ 21. Herbicide use	☐ 37. Installation of soil improvements	☐ 73. Boat launching ramps
☐ 22. Grubbing	☐ 38. Drain installations for ponds	■ 77. Construction or expansion of land-based buildings
☐ 23. Prescribed burns	☐ 47. Conduit installation	☐ 78. Wastewater treatment plants
■ 25. Maintenance, improvement or construction of pedestrian or vehicular access corridors	☐ 52. Floating buildings	☐ 80. Barge fleeting areas
☐ 26. Maintenance/construction of access control measures	☐ 54. Maintenance of water control structures (dewatering units, spillways, levees)	☐ 82. Construction of dam/weirs/ levees
■ 27. Restoration of sites following human use and abuse	☐ 55. Solar panels	☐ 83. Submarine pipeline, directional boring operations
■ 28. Removal of debris (e.g., dump sites, hazardous material, unauthorized structures)	☐ 62. Blasting	☐ 86. Landfill construction
■ 29. Acquisition and use of fill/borrow material	☐ 63. Foundation installation for transmission support	☐ 89. Structure demolition
☐ 31. Stream/wetland crossings	☐ 64. Installation of steel structure, overhead bus, equipment, etc.	☐ 91. Bridge replacement
☐ 32. Clean-up following storm damage	☐ 65. Pole and/or tower installation and/or extension	☐ 92. Return of archaeological remains to former burial sites
☐ 33. Removal of hazardous trees/tree branches		

STEP 3) Project includes one or more activities in Table 3? ◉ **YES (Go to Step 4)** ○ **NO (Go to Step 13)**

STEP 4) Answer questions *a* through *e* below (applies to projects with activities from Table 3 ONLY)

a) Will project involve continuous noise (i.e., ≥ 24 hrs) that is greater than 75 decibels measured on the A scale (e.g., loud machinery)?

(●) **NO** (NV2 does not apply)
( ) **YES** (NV2 applies, subject to records review)

b) Will project involve entry into/survey of cave?

(●) **NO** (HP1/HP2 do not apply)
( ) **YES** (HP1/HP2 applies, subject to review of bat records)

c) If conducting **prescribed burning** (**activity 23**), estimated acreage**:** [ ] and timeframe(s) below; ■ **N/A**

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	☐ Oct 15 - Nov 14	☐ Nov 15 - Mar 31	☐ Apr 1 - May 31, Aug 1- Oct 14	☐ Jun 1 - Jul 31
VA	☐ Sep 16 - Nov 15	☐ Nov 16 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 15	☐ Jun 1 - Jul 31
AL	☐ Oct 15 - Nov 14	☐ Nov 15 - Mar 15	☐ Mar 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
NC	☐ Oct 15 - Nov 14	☐ Nov 15 - Apr 15	☐ Apr 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
MS	☐ Oct 1 - Nov 14	☐ Nov 15 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 30	☐ Jun 1 - Jul 31

d) Will the project involve vegetation piling/burning?

(●) **NO** (SSPC4/ SHF7/SHF8 do not apply)
( ) **YES** (SSPC4/SHF7/SHF8 applies, subject to review of bat records)

e) If **tree removal (activity 33 or 34)**, estimated amount: [ ] ( ) **ac** ( ) **trees** (●) **N/A**

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	☐ Oct 15 - Nov 14	☐ Nov 15 - Mar 31	☐ Apr 1 - May 31, Aug 1- Oct 14	☐ Jun 1 - Jul 31
VA	☐ Sep 16 - Nov 15	☐ Nov 16 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 15	☐ Jun 1 - Jul 31
AL	☐ Oct 15 - Nov 14	☐ Nov 15 - Mar 15	☐ Mar 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
NC	☐ Oct 15 - Nov 14	☐ Nov 15 - Apr 15	☐ Apr 16 - May 31, Aug 1 - Oct 14	☐ Jun 1 - Jul 31
MS	☐ Oct 1 - Nov 14	☐ Nov 15 - Apr 14	☐ Apr 15 - May 31, Aug 1 – Sept 30	☐ Jun 1 - Jul 31

If warranted, does project have flexibility for bat surveys (May 15-Aug 15): (●) **MAYBE** ( ) **YES** ( ) **NO**

**** For PROJECT LEADS whose projects will be reviewed by a Heritage Reviewer (Natural Resources Organization only), STOP HERE. Click File/ Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date", and submit with project information. Otherwise continue to Step 5. ****

SECTION 2: REVIEW OF BAT RECORDS (applies to projects with activities from Table 3 ONLY)

STEP 5) Review of bat/cave records conducted by Heritage/OSAR reviewer?

(●) **YES** ( ) **NO** (Go to Step 13)

Info below completed by:

☐ **Heritage Reviewer**	(name)		Date	
☐ **OSAR Reviewer**	(name)		Date	
■ **Terrestrial Zoologist**	(name)	Rob Stinson	Date	Oct 3, 2023

Gray bat records: ☒ None ☐ Within 3 miles* ☐ Within a cave* ☐ Within the County

Indiana bat records: ☒ None ☐ Within 10 miles* ☐ Within a cave* ☐ Capture/roost tree* ☐ Within the County

Northern long-eared bat records: ☒ None ☐ Within 5 miles* ☐ Within a cave* ☐ Capture/roost tree* ☐ Within the County

Virginia big-eared bat records: ☒ None ☐ Within 6 miles* ☐ Within the County

Caves: ☒ None within 3 mi ☐ Within 3 miles but > 0.5 mi ☐ Within 0.5 mi but > 0.25 mi* ☐ Within 0.25 mi but > 200 feet* ☐ Within 200 feet*

Bat Habitat Inspection Sheet completed? (●) **NO** ( ) **YES**

Amount of SUITABLE habitat to be removed/burned (may differ from STEP 4e): [ ] (( ) **ac** ( ) **trees**)* (●) **N/A**

STEP 6) Provide any additional notes resulting from Heritage Reviewer records review in Notes box below then . . . . Go to Step 13

Notes from Bat Records Review (e.g., historic record; bats not on landscape during action; DOT bridge survey with negative results):

STEPS 7-12 To be Completed by Terrestrial Zoologist (if warranted):

STEP 7) Project will involve:

- ☐ Removal of suitable trees within 0.5 mile of P1-P2 Indiana bat hibernacula or 0.25 mile of P3-P4 Indiana bat hibernacula or any NLEB hibernacula.
- ☐ Removal of suitable trees within 10 miles of documented Indiana bat (or within 5 miles of NLEB) hibernacula.
- ☐ Removal of suitable trees > 10 miles from documented Indiana bat (> 5 miles from NLEB) hibernacula.
- ☐ Removal of trees within 150 feet of a documented Indiana bat or northern long-eared bat maternity roost tree.
- ☐ Removal of suitable trees within 2.5 miles of Indiana bat roost trees or within 5 miles of Indiana bat capture sites.
- ☐ Removal of suitable trees > 2.5 miles from Indiana bat roost trees or > 5 miles from Indiana bat capture sites.
- ☐ Removal of documented Indiana bat or NLEB roost tree, if still suitable.
- ☒ N/A

STEP 8) Presence/absence surveys were/will be conducted: ○ **YES** ◉ **NO** ○ **TBD**

STEP 9) Presence/absence survey results, on ____ ○ **NEGATIVE** ○ **POSITIVE** ◉ **N/A**

STEP 10) Project ○ **WILL** ◉ **WILL NOT** require use of Incidental Take in the amount of ____ ○ **acres or** ○ **trees** proposed to be used during the ○ **WINTER** ○ **VOLANT SEASON** ○ **NON-VOLANT SEASON** ◉ **N/A**

STEP 11) Available Incidental Take (prior to accounting for this project) as of ____

TVA Action	Total 20-year	Winter	Volant Season	Non-Volant Season
5 Operate, Maintain, Retire, Expand, Construct Power Plants				

STEP 12) Amount contributed to TVA's Bat Conservation Fund upon activity completion: $ ____ OR ◉ **N/A**

TERRESTRIAL ZOOLOGISTS, after completing SECTION 2, review Table 4, modify as needed, and then complete section for Terrestrial Zoologists at end of form.

SECTION 3: REQUIRED CONSERVATION MEASURES

STEP 13) Review Conservation Measures in Table 4 and ensure those selected are relevant to the project. If not, manually override and uncheck irrelevant measures, and explain why in ADDITIONAL NOTES below Table 4.

Did review of Table 4 result in ANY remaining Conservation Measures in **RED**?

○ **NO** (Go to Step 14)

◉ **YES** (STOP HERE; Submit for Terrestrial Zoology Review. Click File/Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date", and submit with project information).

Table 4. TVA's ESA Section 7 Programmatic Bat Consultation Required Conservation Measures

The Conservation Measures in Table 4 are automatically selected based on your choices in Tables 2 and 3 but can be manually overridden, if necessary. To Manually override, press the button and enter your name.

Manual Override

Name: Rob Stinson

Check if Applies to Project	Activities Subject To Conservation Measure	Conservation Measure Description
		NV1 - Noise will be short-term, transient, and not significantly different from urban interface or natural events (i.e., thunderstorms) that bats are frequently exposed to when present on the landscape.
		SSPC1 (**Transmission only**) - Transmission actions and activities will continue to Implement A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities. This focuses on control of sediment and pollutants, including herbicides. Following are key measures: o BMPs minimize erosion and prevent/control water pollution in accordance with state-specific construction storm water permits. BMPS are designed to keep soil in place and aid in reducing risk of other pollutants reaching surface waters, wetlands and ground water. BMPs will undertake the following principles: • Plan clearing, grading, and construction to minimize area and duration of soil exposure. • Maintain existing vegetation wherever and whenever possible. • Minimize disturbance of natural contours and drains. • As much as practicable, operate on dry soils when they are least susceptible to structural damage and erosion. • Limit vehicular and equipment traffic in disturbed areas. Keep equipment paths dispersed or designate single traffic flow paths with appropriate road BMPs to manage runoff. • Divert runoff away from disturbed areas. • Provide for dispersal of surface flow that carries sediment into undisturbed surface zones with high infiltration capacity and ground cover conditions. • Prepare drainage ways and outlets to handle concentrated/increased runoff. • Minimize length and steepness of slopes. Interrupt long slopes frequently. • Keep runoff velocities low and/or check flows. • Trap sediment on-site. • Inspect/maintain control measures regularly & after significant rain. • Re-vegetate and mulch disturbed areas as soon as practical. o Specific guidelines regarding sensitive resources and buffer zones: • Extra precaution (wider buffers) within SMZs is taken to protect stream banks and water quality for streams, springs, sinkholes, and surrounding habitat. • BMPs are implemented to protect and enhance wetlands. Select use of equipment and seasonal clearing is conducted when needed for rare plants; construction activities are restricted in areas with identified rare plants. • Standard requirements exist to avoid adverse impacts to caves, protected animals, unique/ important habitat (e.g., cave buffers, restricted herbicide use, seasonal clearing of suitable habitat).

SSPC2 - Operations involving chemical/fuel storage or resupply and vehicle servicing will be handled outside of riparian zones (streamside management zones) in a manner to prevent these items from reaching a watercourse. Earthen berms or other effective means are installed to protect stream channel from direct surface runoff. Servicing will be done with care to avoid leakage, spillage, and subsequent stream, wetland, or ground water contamination. Oil waste, filters, other litter will be collected and disposed of properly. Equipment servicing and chemical/fuel storage will be limited to locations greater than 300-ft from sinkholes, fissures, or areas draining into known sinkholes, fissures, or other karst features.

SSPC3 (**Power Plants only**) - Power Plant actions and activities will continue to implement standard environmental practices. These include:

- Best Management Practices (BMPs) in accordance with regulations:
  - Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy
  - Maintain every site with well-equipped spill response kits, included in some heavy equipment
  - Conduct Quarterly Internal Environmental Field Assessments at each sight
  - Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant.
  - When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage
- Construction Site Protection Methods
  - Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites
  - Storm drain protection device
  - Check dam to help slow down silt flow
  - Silt fencing to reduce sediment movement
- Storm Water Pollution Prevention (SWPP) Pollution Control Strategies
  - Minimize storm water contact with disturbed soils at construction site
  - Protect disturbed soil areas from erosion
  - Minimize sediment in storm water before discharge
  - Prevent storm water contact with other pollutants
  - Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1ac)
- Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to
  - Minimize fuel and chemical use Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy
  - Maintain every site with well-equipped spill response kits, included in some heavy equipment
  - Conduct Quarterly Internal Environmental Field Assessments at each sight
  - Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant.
  - When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage
- Construction Site Protection Methods
  - Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites
  - Storm drain protection device
  - Check dam to help slow down silt flow
  - Silt fencing to reduce sediment movement
- Storm Water Pollution Prevention (SWPP) Pollution Control Strategies
  - Minimize storm water contact with disturbed soils at construction site
  - Protect disturbed soil areas from erosion
  - Minimize sediment in storm water before discharge
  - Prevent storm water contact with other pollutants
  - Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1ac)
- Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to minimize fuel and chemical use

L1 - Direct temporary lighting away from suitable habitat during the active season.

	L2 - Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution when installing new or replacing existing permanent lights by angling lights downward or via other light minimization measures (e.g., dimming, directed lighting, motion-sensitive lighting).

[1]Bats addressed in consultation (02/2018), which includes gray bat (listed in 1976), Indiana bat (listed in 1967), northern long-eared bat (listed in 2015), and Virginia big-eared bat (listed in 1979).

Hide All Unchecked Conservation Measures

- (●) HIDE
- ( ) UNHIDE

Hide Table 4 Columns 1 and 2 to Facilitate Clean Copy and Paste

- (●) HIDE
- ( ) UNHIDE

NOTES (additional info from field review, explanation of no impact or removal of conservation measures).

AR-1 AR-2 removed, no new demolition proposed.

STEP 14) Save completed form (Click File/Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date") in project environmental documentation (e.g. CEC, Appendix to EA) AND send a copy of form to batstrategy@tva.gov
Submission of this form indicates that Project Lead/Applicant:

Joe Santangelo (name) is (or will be made) aware of the requirements below.

- Implementation of conservation measures identified in Table 4 is required to comply with TVA's Endangered Species Act programmatic bat consultation.
- TVA may conduct post-project monitoring to determine if conservation measures were effective in minimizing or avoiding impacts to federally listed bats.

For Use by Terrestrial Zoologist Only

☒ Terrestrial Zoologist acknowledges that Project Lead/Contact (name) Joe Santangelo has been informed of any relevant conservation measures and/or provided a copy of this form.

☐ For projects that require use of Take and/or contribution to TVA's Bat Conservation Fund, Terrestrial Zoologist acknowledges that Project Lead/Contact has been informed that project will result in use of Incidental Take ____ ◯ ac ◯ trees and that use of Take will require $ ____ contribution to TVA's Conservation Fund upon completion of activity (amount entered should be $0 if cleared in winter).

For Terrestrial Zoology Use Only. Finalize and Print to Noneditable PDF.

APPENDIX E – RACE, ETHNICITY, POVERTY, AND LANGUAGE PROFICIENCY STATISTICS FOR CENSUS BLOCK GROUPS WITHIN A 10-MILE RADIUS

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Geography	Total Population	White Alone (not Hispanic or Latino)	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races	Hispanic or Latino	Total Minority[a]	Low Income[b]	Limited English Proficiency (LEP)[c]	Primary Language(s) Spoken in LEP Block Groups by those who speak English Less than Very Well[d]
Arkansas	**3,018,669**	**69.7%**	**15.1%**	**0.4%**	**1.5%**	**0.4%**	**0.2%**	**4.6%**	**8.1%**	**30.3%**	**38.2%**	**3.2%**	**NA**
Crittenden County	47,945	40.2%	50.1%	0.1%	0.8%	0.0%	0.0%	5.8%	3.0%	59.8%	45.2%	1.1%	NA
Block Group 1; Census Tract 301.01	935	4.6%	90.9%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	95.4%	63.0%	5.7%	Spanish
Block Group 2; Census Tract 301.01	1,227	2.3%	93.2%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	97.7%	80.1%	0.0%	NA
Block Group 1; Census Tract 301.02	659	1.8%	94.8%	0.0%	0.0%	0.0%	0.0%	3.3%	0.0%	98.2%	60.8%	0.0%	NA
Block Group 2; Census Tract 301.02	626	6.2%	77.2%	0.0%	0.0%	0.0%	0.0%	6.7%	9.9%	93.8%	54.0%	0.0%	NA
Block Group 3; Census Tract 301.02	1,412	8.0%	92.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	92.0%	66.5%	0.0%	NA
Block Group 1; Census Tract 302.01	1,504	39.2%	52.9%	0.0%	0.0%	0.0%	0.0%	1.2%	6.7%	60.8%	61.4%	0.0%	NA
Block Group 2; Census Tract 302.01	641	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.3%	0.0%	NA
Block Group 3; Census Tract 302.01	1,065	67.1%	28.2%	0.0%	0.0%	0.0%	0.0%	4.7%	0.0%	32.9%	39.0%	0.0%	NA
Block Group 4; Census Tract 302.01	1,089	81.6%	10.4%	0.0%	0.0%	0.0%	0.0%	2.8%	5.1%	18.4%	45.3%	0.0%	NA
Block Group 5; Census Tract 302.01	1,163	91.1%	0.0%	0.0%	0.0%	0.0%	0.0%	6.4%	2.4%	8.9%	38.9%	1.8%	NA
Block Group 1; Census Tract 302.02	960	86.8%	13.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.2%	21.7%	0.0%	NA
Block Group 2; Census Tract 302.02	1,766	58.7%	38.8%	0.0%	1.2%	0.0%	0.0%	1.3%	0.0%	41.3%	42.5%	1.4%	NA
Block Group 3; Census Tract 302.02	965	63.5%	21.5%	0.8%	4.0%	0.0%	0.0%	9.4%	0.7%	36.5%	26.1%	5.2%	Spanish, Chinese (incl. Mandarin, Cantonese)
Block Group 1; Census Tract 303.01	1,025	7.4%	87.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	92.6%	70.0%	5.2%	Spanish
Block Group 2; Census Tract 303.01	1,666	30.9%	68.5%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	69.1%	52.2%	0.0%	NA
Block Group 1; Census Tract 303.02	2,050	6.1%	92.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	93.9%	72.8%	0.0%	NA
Block Group 2; Census Tract 303.02	742	25.9%	68.3%	0.0%	0.0%	0.0%	0.0%	2.7%	3.1%	74.1%	46.9%	1.4%	NA
Block Group 1; Census Tract 305.03	698	3.4%	83.0%	0.0%	0.0%	0.0%	0.0%	4.2%	9.5%	96.6%	83.0%	0.0%	NA
Block Group 2; Census Tract 305.03	709	0.0%	90.7%	0.0%	0.7%	0.0%	0.0%	3.4%	5.2%	100.0%	50.8%	0.0%	NA
Block Group 1; Census Tract 306.01	584	28.3%	65.8%	0.0%	0.0%	0.0%	0.3%	5.3%	0.3%	71.7%	55.1%	0.0%	NA
Block Group 1; Census Tract 306.02	1,248	0.0%	97.9%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	100.0%	88.1%	0.0%	NA
Block Group 3; Census Tract 306.02	1,243	47.7%	45.0%	0.0%	7.3%	0.0%	0.0%	0.0%	0.0%	52.3%	40.0%	3.1%	NA
Block Group 1; Census Tract 307.03	1,138	51.5%	15.0%	0.0%	0.0%	0.0%	0.0%	17.5%	16.0%	48.5%	72.6%	2.8%	NA
Block Group 1; Census Tract 308.03	1,748	61.3%	28.9%	0.2%	0.0%	0.0%	0.0%	7.4%	2.1%	38.7%	16.9%	0.0%	NA
Block Group 1; Census Tract 308.04	3,569	27.3%	57.5%	0.2%	2.2%	0.0%	0.0%	8.0%	4.8%	72.7%	19.9%	3.7%	NA
Block Group 2; Census Tract 308.04	930	68.0%	22.4%	0.0%	0.0%	0.0%	0.0%	4.7%	4.9%	32.0%	45.5%	1.4%	NA
Block Group 1; Census Tract 308.05	1,763	35.7%	52.9%	0.0%	4.4%	0.0%	0.0%	6.9%	0.1%	64.3%	32.8%	1.4%	NA
Block Group 2; Census Tract 308.05	1,588	82.0%	9.3%	1.6%	0.1%	0.0%	0.0%	7.1%	0.0%	18.0%	22.9%	0.0%	NA
Block Group 1; Census Tract 308.06	2,287	69.2%	23.0%	0.0%	0.6%	0.0%	0.0%	3.6%	3.6%	30.8%	13.9%	0.0%	NA
Block Group 2; Census Tract 308.06	1,444	46.4%	33.4%	0.0%	0.8%	0.0%	0.0%	13.5%	5.8%	53.6%	51.9%	0.9%	NA

Geography	Total Population	White Alone (not Hispanic or Latino)	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races	Hispanic or Latino	Total Minority[a]	Low Income[b]	Limited English Proficiency (LEP)[c]	Primary Language(s) Spoken in LEP Block Groups by those who speak English Less than Very Well[d]
Block Group 1; Census Tract 310	543	61.1%	22.5%	0.0%	0.0%	0.0%	0.0%	16.4%	0.0%	38.9%	34.4%	0.0%	NA
Block Group 1; Census Tract 312	854	4.7%	65.6%	0.0%	2.7%	0.0%	0.0%	26.0%	1.1%	95.3%	75.1%	1.3%	NA
Block Group 2; Census Tract 312	782	3.8%	94.0%	1.3%	0.0%	0.0%	0.0%	0.6%	0.3%	96.2%	66.1%	0.0%	NA
Mississippi	**2,958,846**	**55.9%**	**37.1%**	**0.4%**	**1.0%**	**0.0%**	**0.3%**	**2.1%**	**3.3%**	**44.1%**	**40.7%**	**1.6%**	NA
DeSoto County	186,214	59.8%	30.8%	0.1%	1.3%	0.0%	0.2%	2.7%	5.2%	40.2%	25.8%	2.3%	NA
Block Group 1; Census Tract 701.01	1,429	69.0%	27.8%	0.0%	0.3%	0.0%	0.0%	0.1%	2.8%	31.0%	27.6%	0.9%	NA
Block Group 2; Census Tract 701.01	1,800	22.5%	68.7%	0.0%	2.3%	0.0%	0.0%	0.0%	6.5%	77.5%	61.3%	3.3%	NA
Block Group 1; Census Tract 701.02	1,743	63.3%	19.4%	0.4%	0.3%	0.0%	0.0%	0.2%	16.4%	36.7%	18.8%	3.7%	NA
Block Group 2; Census Tract 701.02	827	62.8%	31.3%	2.2%	3.3%	0.0%	0.0%	0.5%	0.0%	37.2%	20.8%	2.7%	NA
Block Group 3; Census Tract 701.02	1,500	45.3%	41.5%	0.1%	0.6%	0.0%	0.0%	6.5%	6.0%	54.7%	34.8%	1.2%	NA
Block Group 1; Census Tract 702.10	2,521	62.8%	27.9%	0.0%	0.0%	0.0%	0.0%	0.5%	8.8%	37.2%	12.3%	3.5%	NA
Block Group 2; Census Tract 702.10	2,027	23.1%	65.6%	0.0%	2.3%	0.0%	0.0%	0.5%	8.4%	76.9%	13.7%	3.0%	NA
Block Group 3; Census Tract 702.10	2,337	17.9%	81.6%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	82.1%	21.1%	0.0%	NA
Block Group 2; Census Tract 702.21	1,826	46.1%	26.3%	0.0%	0.0%	0.0%	0.0%	1.1%	26.6%	53.9%	56.0%	11.1%	Spanish
Block Group 3; Census Tract 702.21	521	81.6%	0.0%	0.0%	0.0%	0.0%	1.2%	15.7%	1.5%	18.4%	53.2%	0.0%	NA
Block Group 1; Census Tract 703.22	2,738	38.1%	51.1%	0.0%	2.3%	0.0%	0.0%	1.7%	6.7%	61.9%	44.4%	5.0%	Spanish, Other Asian and Pacific Island languages
Block Group 1; Census Tract 703.23	1,660	25.2%	51.4%	0.0%	0.3%	0.0%	0.0%	2.8%	20.3%	74.8%	25.3%	11.2%	Spanish, Arabic
Block Group 2; Census Tract 703.23	1,197	18.1%	53.3%	0.0%	3.2%	0.0%	0.0%	0.0%	25.4%	81.9%	26.7%	19.3%	Spanish
Block Group 3; Census Tract 703.23	2,022	25.2%	66.6%	3.1%	0.3%	0.0%	0.0%	1.2%	3.7%	74.8%	75.5%	1.1%	NA
Block Group 1; Census Tract 703.24	1,345	40.1%	52.5%	0.1%	0.0%	0.8%	0.0%	2.9%	3.6%	59.9%	53.2%	1.6%	NA
Block Group 2; Census Tract 703.24	1,532	42.4%	52.9%	0.0%	0.0%	0.0%	0.0%	0.5%	4.2%	57.6%	55.3%	5.8%	Spanish
Block Group 3; Census Tract 703.24	1,384	34.5%	50.9%	0.0%	5.4%	0.0%	0.0%	0.0%	9.2%	65.5%	54.4%	9.5%	Spanish, Other Asian and Pacific Island languages
Block Group 1; Census Tract 703.25	2,079	69.9%	19.7%	0.6%	0.0%	0.0%	0.0%	6.2%	3.7%	30.1%	54.5%	2.8%	NA
Block Group 2; Census Tract 703.25	1,338	43.0%	45.4%	0.0%	4.9%	0.0%	0.0%	0.3%	6.4%	57.0%	36.5%	2.3%	NA
Block Group 1; Census Tract 704.11	2,072	57.3%	36.7%	0.0%	0.1%	0.0%	0.0%	0.6%	5.3%	42.7%	52.0%	0.5%	NA
Block Group 1; Census Tract 704.12	1,833	29.5%	57.1%	0.0%	0.2%	0.0%	0.0%	8.4%	4.8%	70.5%	60.6%	1.4%	NA
Block Group 2; Census Tract 704.12	1,703	32.1%	65.1%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	67.9%	70.5%	0.0%	NA
Block Group 3; Census Tract 704.12	943	73.1%	15.7%	0.0%	0.0%	0.0%	0.0%	0.0%	11.2%	26.9%	19.8%	0.0%	NA
Block Group 1; Census Tract 704.21	2,362	56.6%	36.3%	0.0%	0.0%	0.0%	0.7%	0.0%	6.5%	43.4%	24.9%	0.0%	NA
Block Group 2; Census Tract 704.21	929	56.7%	28.3%	0.0%	0.0%	0.0%	0.0%	5.3%	9.7%	43.3%	60.9%	3.7%	NA
Block Group 1; Census Tract 704.22	909	57.8%	33.1%	0.0%	0.0%	0.0%	0.7%	7.0%	1.4%	42.2%	61.3%	0.3%	NA
Block Group 2; Census Tract 704.22	1,743	58.9%	29.0%	0.7%	0.3%	0.0%	0.0%	9.6%	1.4%	41.1%	55.8%	1.0%	NA

Geography	Total Population	White Alone (not Hispanic or Latino)	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races	Hispanic or Latino	Total Minority[a]	Low Income[b]	Limited English Proficiency (LEP)[c]	Primary Language(s) Spoken in LEP Block Groups by those who speak English Less than Very Well[d]
Block Group 2; Census Tract 705.21	888	55.7%	12.4%	0.0%	1.4%	0.0%	6.0%	0.0%	24.5%	44.3%	45.0%	16.9%	Spanish
Tennessee	**6,923,772**	**72.6%**	**16.1%**	**0.1%**	**1.8%**	**0.0%**	**0.3%**	**3.0%**	**6.0%**	**27.4%**	**32.6%**	**3.1%**	NA
Shelby County	926,440	34.5%	53.6%	0.1%	2.9%	0.0%	0.3%	1.9%	6.8%	65.5%	38.0%	3.7%	NA
Block Group 1; Census Tract 1	1,136	72.2%	12.7%	0.0%	10.7%	0.0%	0.0%	3.4%	1.0%	27.8%	18.2%	0.0%	NA
Block Group 2; Census Tract 1	2,064	59.4%	26.1%	0.5%	8.6%	0.0%	0.0%	3.4%	1.9%	40.6%	10.1%	1.1%	NA
Block Group 3; Census Tract 1	1,973	84.3%	3.2%	0.0%	7.5%	0.0%	0.0%	0.3%	4.7%	15.7%	16.8%	2.3%	NA
Block Group 1; Census Tract 2	1,211	0.0%	96.1%	0.8%	0.0%	0.0%	0.0%	2.6%	0.5%	100.0%	85.1%	0.0%	NA
Block Group 1; Census Tract 3	645	0.3%	99.5%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	99.7%	64.0%	0.0%	NA
Block Group 1; Census Tract 4	438	1.6%	98.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.4%	76.0%	0.0%	NA
Block Group 2; Census Tract 4	1,000	0.6%	97.4%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	99.4%	63.1%	0.0%	NA
Block Group 1; Census Tract 16	1,838	69.2%	16.3%	1.5%	3.6%	0.0%	0.0%	2.9%	6.5%	30.8%	12.4%	0.7%	NA
Block Group 1; Census Tract 17	1,851	51.4%	43.2%	0.0%	0.0%	0.0%	0.0%	3.1%	2.3%	48.6%	16.9%	0.2%	NA
Block Group 2; Census Tract 17	1,232	13.3%	84.7%	0.0%	0.6%	0.0%	0.0%	1.4%	0.0%	86.7%	30.7%	0.0%	NA
Block Group 3; Census Tract 17	949	50.8%	30.7%	0.0%	0.0%	0.0%	1.5%	16.0%	1.1%	49.2%	31.5%	1.0%	NA
Block Group 1; Census Tract 19	295	3.1%	96.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	96.9%	71.9%	0.0%	NA
Block Group 2; Census Tract 19	981	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	71.7%	0.0%	NA
Block Group 1; Census Tract 20	508	3.0%	97.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.0%	64.8%	0.0%	NA
Block Group 2; Census Tract 20	804	17.3%	73.9%	0.4%	5.1%	0.0%	0.0%	2.5%	0.9%	82.7%	45.9%	0.0%	NA
Block Group 1; Census Tract 21	1,443	8.2%	77.8%	0.0%	0.1%	0.0%	0.0%	1.0%	13.0%	91.8%	57.8%	1.4%	NA
Block Group 1; Census Tract 24	740	7.6%	85.9%	0.0%	0.0%	0.0%	0.0%	6.5%	0.0%	92.4%	34.3%	0.0%	NA
Block Group 2; Census Tract 24	833	13.4%	75.5%	0.0%	0.0%	0.0%	0.0%	4.8%	6.2%	86.6%	63.7%	6.7%	Spanish
Block Group 3; Census Tract 24	226	0.0%	92.5%	0.0%	0.0%	0.0%	0.0%	7.5%	0.0%	100.0%	89.8%	0.0%	NA
Block Group 1; Census Tract 25	997	27.6%	59.9%	0.0%	9.4%	0.0%	0.0%	0.0%	3.1%	72.4%	53.3%	8.0%	Spanish, Other Asian and Pacific Island languages
Block Group 2; Census Tract 25	1,714	48.5%	26.6%	0.0%	3.6%	0.0%	0.0%	4.1%	17.2%	51.5%	49.3%	16.0%	Spanish, Chinese (incl. Mandarin, Cantonese)
Block Group 1; Census Tract 26	1,640	74.8%	11.2%	0.0%	0.7%	0.0%	2.5%	1.3%	9.4%	25.2%	24.7%	0.0%	NA
Block Group 2; Census Tract 26	926	76.3%	5.5%	0.0%	2.8%	0.0%	0.0%	10.2%	5.2%	23.7%	13.3%	1.3%	NA
Block Group 1; Census Tract 31	961	52.0%	24.9%	0.1%	0.9%	0.0%	6.0%	4.4%	11.7%	48.0%	30.2%	0.1%	NA
Block Group 3; Census Tract 31	833	73.7%	18.1%	0.0%	0.0%	0.0%	0.0%	4.7%	3.5%	26.3%	25.7%	0.0%	NA
Block Group 4; Census Tract 31	969	71.9%	25.7%	0.0%	0.0%	0.0%	0.0%	0.8%	1.5%	28.1%	23.5%	0.8%	NA
Block Group 1; Census Tract 32	922	60.7%	31.2%	3.6%	2.4%	0.0%	0.0%	2.1%	0.0%	39.3%	34.4%	3.5%	NA
Block Group 2; Census Tract 32	1,140	41.8%	54.9%	0.0%	0.5%	0.0%	0.0%	0.9%	1.9%	58.2%	33.2%	0.8%	NA
Block Group 3; Census Tract 32	1,797	63.7%	27.9%	0.0%	2.2%	0.0%	0.0%	1.1%	5.1%	36.3%	35.1%	0.4%	NA

Geography	Total Population	White Alone (not Hispanic or Latino)	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races	Hispanic or Latino	Total Minority[a]	Low Income[b]	Limited English Proficiency (LEP)[c]	Primary Language(s) Spoken in LEP Block Groups by those who speak English Less than Very Well[d]
Block Group 1; Census Tract 33	1,126	97.5%	0.0%	0.0%	1.2%	0.0%	0.0%	0.7%	0.6%	2.5%	14.7%	1.2%	NA
Block Group 2; Census Tract 33	1,094	85.5%	1.6%	0.0%	5.4%	0.0%	0.0%	3.0%	4.6%	14.5%	13.6%	4.1%	NA
Block Group 1; Census Tract 34	1,188	75.4%	13.6%	0.0%	1.1%	0.0%	0.0%	7.6%	2.3%	24.6%	23.2%	0.0%	NA
Block Group 2; Census Tract 34	1,255	40.1%	49.1%	0.0%	5.6%	0.0%	0.0%	1.8%	3.5%	59.9%	36.5%	2.2%	NA
Block Group 1; Census Tract 35	891	81.6%	4.8%	0.0%	4.8%	0.0%	0.0%	3.1%	5.6%	18.4%	11.7%	0.0%	NA
Block Group 2; Census Tract 35	842	91.4%	2.4%	0.0%	3.3%	0.0%	0.0%	1.8%	1.1%	8.6%	12.1%	0.0%	NA
Block Group 3; Census Tract 35	1,636	49.7%	49.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	50.3%	38.0%	0.0%	NA
Block Group 1; Census Tract 36	499	88.2%	11.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.8%	56.5%	0.0%	NA
Block Group 2; Census Tract 36	1,043	54.0%	32.5%	0.0%	9.2%	0.0%	0.0%	3.4%	1.0%	46.0%	47.9%	5.9%	Vietnamese
Block Group 1; Census Tract 37	537	32.0%	35.4%	1.3%	13.2%	0.0%	0.0%	5.4%	12.7%	68.0%	37.4%	1.5%	NA
Block Group 2; Census Tract 37	666	19.7%	77.3%	0.0%	0.9%	0.0%	0.0%	0.0%	2.1%	80.3%	90.4%	0.9%	NA
Block Group 1; Census Tract 38	650	22.3%	67.4%	0.0%	8.8%	0.9%	0.0%	0.0%	0.6%	77.7%	58.2%	7.4%	Other Indo-European languages
Block Group 1; Census Tract 39	1,513	20.0%	76.1%	0.0%	1.9%	0.0%	0.0%	0.1%	1.9%	80.0%	56.5%	2.0%	NA
Block Group 1; Census Tract 42	794	60.1%	28.7%	0.0%	0.0%	0.0%	0.0%	5.4%	5.8%	39.9%	29.3%	4.3%	NA
Block Group 2; Census Tract 42	969	75.4%	16.7%	0.0%	4.5%	0.0%	0.0%	0.3%	3.0%	24.6%	0.0%	0.0%	NA
Block Group 3; Census Tract 42	1,300	62.0%	12.2%	0.0%	12.9%	0.0%	0.0%	11.3%	1.6%	38.0%	0.5%	0.0%	NA
Block Group 1; Census Tract 43	1,175	59.3%	19.3%	0.0%	0.9%	0.0%	0.0%	7.0%	13.5%	40.7%	19.5%	0.0%	NA
Block Group 2; Census Tract 43	2,000	49.3%	38.9%	0.0%	8.1%	0.0%	0.0%	3.4%	0.5%	50.8%	15.0%	0.8%	NA
Block Group 1; Census Tract 45	894	4.0%	96.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	96.0%	83.0%	0.0%	NA
Block Group 1; Census Tract 46	717	6.7%	91.6%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	93.3%	84.1%	0.0%	NA
Block Group 2; Census Tract 46	663	20.5%	77.2%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	79.5%	38.6%	0.0%	NA
Block Group 1; Census Tract 50	639	5.5%	94.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	94.5%	89.7%	0.0%	NA
Block Group 2; Census Tract 50	383	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	84.3%	0.0%	NA
Block Group 1; Census Tract 53	659	0.0%	92.0%	0.0%	0.0%	0.0%	0.0%	4.4%	3.6%	100.0%	73.9%	0.0%	NA
Block Group 2; Census Tract 53	627	0.0%	98.6%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	100.0%	73.5%	0.0%	NA
Block Group 3; Census Tract 53	1,848	0.0%	98.8%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	100.0%	69.4%	0.0%	NA
Block Group 1; Census Tract 55	1,340	1.0%	99.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.0%	89.1%	0.0%	NA
Block Group 2; Census Tract 55	65	32.3%	67.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	67.7%	60.0%	0.0%	NA
Block Group 3; Census Tract 55	739	2.4%	97.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.6%	83.1%	0.0%	NA
Block Group 1; Census Tract 56	1,676	0.0%	99.5%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	61.6%	0.0%	NA
Block Group 2; Census Tract 56	983	3.0%	97.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.0%	69.0%	0.0%	NA
Block Group 3; Census Tract 56	1,206	0.0%	99.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	100.0%	75.4%	0.0%	NA

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Block Group 1; Census Tract 57	881	6.9%	93.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.1%	61.9%	1.4%	NA
Block Group 2; Census Tract 57	1,324	0.0%	98.0%	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	100.0%	73.6%	0.0%	NA
Block Group 1; Census Tract 58	236	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	84.3%	0.0%	NA
Block Group 2; Census Tract 58	672	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	83.6%	0.0%	NA
Block Group 1; Census Tract 59	482	2.5%	84.9%	0.0%	0.0%	0.0%	0.0%	0.0%	12.7%	97.5%	77.0%	3.2%	NA
Block Group 2; Census Tract 59	579	0.0%	97.2%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	100.0%	92.7%	0.0%	NA
Block Group 3; Census Tract 59	1,062	2.9%	95.4%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	97.1%	96.2%	0.0%	NA
Block Group 1; Census Tract 60	1,065	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	46.3%	0.0%	NA
Block Group 2; Census Tract 60	715	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	64.3%	0.0%	NA
Block Group 1; Census Tract 62	753	15.0%	70.5%	0.0%	0.0%	0.0%	3.1%	0.0%	11.4%	85.0%	72.9%	1.7%	NA
Block Group 2; Census Tract 62	986	0.8%	89.9%	0.0%	0.0%	0.0%	3.8%	0.4%	5.2%	99.2%	48.1%	1.8%	NA
Block Group 1; Census Tract 63	952	85.2%	10.6%	0.0%	0.0%	0.0%	1.3%	1.7%	1.3%	14.8%	28.9%	2.1%	NA
Block Group 2; Census Tract 63	462	27.3%	72.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	72.7%	40.5%	0.0%	NA
Block Group 3; Census Tract 63	1,113	72.2%	19.9%	0.0%	1.3%	0.0%	0.0%	0.1%	6.5%	27.8%	27.9%	0.0%	NA
Block Group 1; Census Tract 64	1,775	12.1%	83.4%	0.0%	1.6%	0.0%	0.0%	0.7%	2.2%	87.9%	31.5%	0.3%	NA
Block Group 1; Census Tract 65	833	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	37.3%	0.0%	NA
Block Group 2; Census Tract 65	1,476	2.4%	92.6%	0.6%	0.4%	0.0%	0.0%	0.0%	3.9%	97.6%	72.6%	4.0%	NA
Block Group 1; Census Tract 66	1,088	40.8%	45.1%	1.8%	1.2%	0.0%	0.0%	7.3%	3.8%	59.2%	39.3%	0.0%	NA
Block Group 2; Census Tract 66	1,141	68.4%	19.9%	0.0%	3.8%	0.0%	0.0%	5.3%	2.7%	31.6%	28.4%	0.0%	NA
Block Group 1; Census Tract 67	595	8.4%	88.9%	1.5%	0.0%	0.0%	0.0%	0.0%	1.2%	91.6%	72.9%	0.0%	NA
Block Group 2; Census Tract 67	1,101	1.1%	98.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	98.9%	67.5%	0.0%	NA
Block Group 1; Census Tract 68	433	1.4%	97.2%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	98.6%	58.0%	0.0%	NA
Block Group 2; Census Tract 68	679	1.2%	98.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	98.8%	76.6%	0.0%	NA
Block Group 3; Census Tract 68	605	0.0%	99.3%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	100.0%	39.0%	0.0%	NA
Block Group 1; Census Tract 69	855	0.0%	98.7%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	100.0%	46.8%	0.0%	NA
Block Group 2; Census Tract 69	369	2.4%	95.9%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	97.6%	63.7%	0.0%	NA
Block Group 3; Census Tract 69	916	0.0%	99.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	100.0%	75.0%	0.0%	NA
Block Group 1; Census Tract 75	347	0.0%	98.6%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	100.0%	61.7%	0.0%	NA
Block Group 2; Census Tract 75	725	0.7%	98.5%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	99.3%	53.4%	0.7%	NA
Block Group 1; Census Tract 78.10	523	6.1%	93.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.9%	67.5%	0.0%	NA
Block Group 2; Census Tract 78.10	772	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	70.3%	0.0%	NA
Block Group 3; Census Tract 78.10	752	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	76.9%	0.0%	NA

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Block Group 1; Census Tract 78.21	1,576	0.9%	99.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.1%	47.0%	0.0%	NA
Block Group 2; Census Tract 78.21	497	15.7%	84.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	84.3%	36.8%	0.0%	NA
Block Group 3; Census Tract 78.21	468	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	72.0%	0.0%	NA
Block Group 4; Census Tract 78.21	1,319	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	46.1%	0.0%	NA
Block Group 5; Census Tract 78.21	478	1.5%	98.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.5%	98.7%	0.0%	NA
Block Group 1; Census Tract 78.22	1,279	5.0%	82.6%	0.0%	0.0%	0.0%	0.0%	0.0%	12.4%	95.0%	64.3%	7.8%	Spanish
Block Group 1; Census Tract 81.10	1,150	0.5%	77.3%	0.0%	0.0%	0.0%	0.0%	0.0%	22.2%	99.5%	47.7%	9.2%	Spanish
Block Group 2; Census Tract 81.10	659	1.1%	96.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	98.9%	88.7%	0.0%	NA
Block Group 3; Census Tract 81.10	185	0.0%	91.4%	0.0%	0.0%	0.0%	0.0%	3.8%	4.9%	100.0%	87.6%	0.0%	NA
Block Group 4; Census Tract 81.20	655	9.9%	90.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	90.1%	90.5%	0.0%	NA
Block Group 1; Census Tract 99.01	474	7.6%	70.3%	0.0%	0.0%	0.0%	0.0%	0.0%	22.2%	92.4%	56.4%	3.4%	NA
Block Group 1; Census Tract 99.02	810	19.9%	80.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	80.1%	81.9%	0.0%	NA
Block Group 1; Census Tract 112	191	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	79.1%	0.0%	NA
Block Group 2; Census Tract 112	519	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	89.2%	1.5%	NA
Block Group 3; Census Tract 112	233	1.3%	98.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.7%	35.6%	0.0%	NA
Block Group 1; Census Tract 113	519	6.0%	83.8%	0.0%	0.0%	0.0%	0.0%	3.7%	6.6%	94.0%	59.6%	0.0%	NA
Block Group 2; Census Tract 113	663	17.8%	68.5%	0.0%	12.1%	0.0%	0.0%	1.7%	0.0%	82.2%	47.1%	8.9%	Chinese (incl. Mandarin, Cantonese)
Block Group 1; Census Tract 114.01	82	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	51.2%	0.0%	NA
Block Group 2; Census Tract 114.01	682	38.9%	53.7%	0.0%	0.0%	0.0%	0.0%	7.5%	0.0%	61.1%	100.0%	0.0%	NA
Block Group 3; Census Tract 114.01	568	9.2%	84.9%	0.0%	0.0%	0.0%	0.0%	3.3%	2.6%	90.8%	55.8%	0.0%	NA
Block Group 1; Census Tract 114.02	822	0.0%	96.2%	0.0%	0.0%	0.0%	0.0%	3.8%	0.0%	100.0%	84.5%	0.0%	NA
Block Group 2; Census Tract 114.02	2,720	28.8%	65.3%	0.0%	0.0%	0.0%	0.0%	0.9%	5.0%	71.2%	47.5%	1.5%	NA
Block Group 1; Census Tract 115	608	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	34.0%	0.0%	NA
Block Group 2; Census Tract 115	761	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	91.9%	0.0%	NA
Block Group 3; Census Tract 115	467	18.0%	82.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	82.0%	89.1%	0.0%	NA
Block Group 4; Census Tract 115	378	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	65.6%	0.0%	NA
Block Group 1; Census Tract 116	828	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	72.1%	0.0%	NA
Block Group 2; Census Tract 116	360	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	60.2%	0.0%	NA
Block Group 3; Census Tract 116	178	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	72.5%	0.0%	NA
Block Group 4; Census Tract 116	1,066	5.3%	91.8%	0.0%	0.8%	0.0%	0.0%	0.0%	2.2%	94.7%	67.5%	0.0%	NA
Block Group 1; Census Tract 117	211	6.6%	93.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	93.4%	69.4%	0.0%	NA
Block Group 2; Census Tract 117	804	6.1%	90.8%	0.0%	0.0%	0.0%	0.0%	1.5%	1.6%	93.9%	58.3%	0.0%	NA

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Block Group 1; Census Tract 201.01	1,003	65.0%	15.3%	0.0%	0.0%	0.0%	0.0%	2.2%	17.5%	35.0%	24.5%	2.4%	NA
Block Group 4; Census Tract 219	2,152	1.1%	94.8%	0.0%	0.0%	0.0%	0.0%	0.4%	3.7%	98.9%	32.1%	2.4%	NA
Block Group 1; Census Tract 220.23	1,493	1.7%	95.5%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%	98.3%	33.6%	2.3%	NA
Block Group 2; Census Tract 220.23	260	6.9%	58.5%	0.0%	0.0%	0.0%	0.0%	34.6%	0.0%	93.1%	68.1%	30.6%	French, Haitian, or Cajun
Block Group 3; Census Tract 220.23	327	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	82.6%	0.0%	NA
Block Group 1; Census Tract 220.24	1,193	1.1%	98.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.9%	41.2%	0.0%	NA
Block Group 2; Census Tract 220.24	1,898	4.1%	95.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	95.9%	59.9%	0.0%	NA
Block Group 1; Census Tract 220.25	972	20.2%	79.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	79.8%	47.9%	1.4%	NA
Block Group 2; Census Tract 220.25	1,600	4.3%	94.4%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	95.7%	65.9%	1.5%	NA
Block Group 3; Census Tract 220.25	1,325	0.0%	98.6%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	100.0%	91.2%	0.0%	NA
Block Group 1; Census Tract 220.26	789	5.2%	90.7%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%	94.8%	92.1%	6.9%	Other and unspecified languages
Block Group 2; Census Tract 220.26	1,077	3.1%	89.9%	0.0%	0.0%	0.0%	0.0%	7.1%	0.0%	96.9%	32.6%	0.0%	NA
Block Group 1; Census Tract 221.11	1,494	1.1%	98.1%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	98.9%	57.2%	3.1%	NA
Block Group 2; Census Tract 221.11	1,546	4.1%	82.3%	0.0%	0.0%	0.0%	0.0%	0.0%	13.6%	95.9%	32.9%	0.0%	NA
Block Group 3; Census Tract 221.11	1,860	6.7%	89.6%	0.0%	0.0%	0.0%	3.1%	0.6%	0.0%	93.3%	69.6%	0.0%	NA
Block Group 1; Census Tract 221.21	1,251	1.9%	98.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	98.1%	37.6%	0.0%	NA
Block Group 2; Census Tract 221.21	1,799	1.0%	99.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.0%	62.7%	1.3%	NA
Block Group 3; Census Tract 221.21	1,814	4.4%	93.4%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	95.6%	34.7%	0.7%	NA
Block Group 1; Census Tract 221.22	583	8.6%	91.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	91.4%	45.6%	0.0%	NA
Block Group 2; Census Tract 221.22	1,151	1.0%	99.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.0%	76.1%	0.0%	NA
Block Group 3; Census Tract 221.22	2,329	4.5%	94.8%	0.0%	0.0%	0.0%	0.6%	0.0%	0.1%	95.5%	29.8%	0.1%	NA
Block Group 1; Census Tract 221.30	1,392	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	64.8%	0.0%	NA
Block Group 2; Census Tract 221.30	1,056	6.0%	94.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	94.0%	51.1%	0.0%	NA
Block Group 3; Census Tract 221.30	933	3.8%	96.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	96.2%	55.9%	0.0%	NA
Block Group 4; Census Tract 221.30	1,204	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	55.8%	2.1%	NA
Block Group 5; Census Tract 221.30	1,107	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	38.0%	0.0%	NA
Block Group 1; Census Tract 221.31	1,650	14.6%	84.7%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	85.4%	85.4%	15.3%	French, Haitian, or Cajun
Block Group 2; Census Tract 221.31	1,020	0.0%	94.7%	0.0%	0.0%	0.0%	0.0%	2.0%	3.3%	100.0%	76.2%	3.7%	NA
Block Group 1; Census Tract 221.32	1,086	7.2%	92.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	92.8%	29.9%	0.0%	NA
Block Group 2; Census Tract 221.32	1,218	3.6%	96.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	96.4%	56.6%	0.0%	NA
Block Group 1; Census Tract 222.10	3,134	1.6%	97.6%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	98.4%	50.1%	0.0%	NA
Block Group 2; Census Tract 222.10	769	2.1%	91.0%	0.0%	0.0%	0.0%	0.0%	6.9%	0.0%	97.9%	54.4%	0.0%	NA

Geography	Total Population	White Alone (not Hispanic or Latino)	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races	Hispanic or Latino	Total Minority[a]	Low Income[b]	Limited English Proficiency (LEP)[c]	Primary Language(s) Spoken in LEP Block Groups by those who speak English Less than Very Well[d]
Block Group 3; Census Tract 222.10	638	5.8%	92.6%	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	94.2%	45.1%	0.0%	NA
Block Group 1; Census Tract 222.20	716	16.1%	65.6%	3.4%	0.0%	0.0%	0.0%	1.3%	13.7%	83.9%	79.1%	11.8%	Spanish, Other and unspecified languages
Block Group 2; Census Tract 222.20	906	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	NA
Block Group 3; Census Tract 222.20	142	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	16.9%	0.0%	NA
Block Group 4; Census Tract 222.20	1,585	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	65.5%	0.0%	NA
Block Group 5; Census Tract 222.20	1,381	0.0%	94.3%	0.0%	0.0%	0.0%	0.0%	0.0%	5.7%	100.0%	65.0%	0.0%	NA
Block Group 1; Census Tract 223.10	1,632	0.0%	97.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%	100.0%	75.6%	1.8%	NA
Block Group 2; Census Tract 223.10	1,441	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	46.3%	0.0%	NA
Block Group 3; Census Tract 223.10	1,445	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	88.9%	0.0%	NA
Block Group 4; Census Tract 223.10	1,349	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	73.4%	0.0%	NA
Block Group 1; Census Tract 223.21	375	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	46.9%	0.0%	NA
Block Group 2; Census Tract 223.21	1,276	0.5%	99.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.5%	76.3%	0.0%	NA
Block Group 3; Census Tract 223.21	2,062	5.5%	89.1%	0.0%	0.0%	0.0%	0.0%	1.2%	4.1%	94.5%	57.8%	0.0%	NA
Block Group 1; Census Tract 223.22	1,365	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	37.3%	0.0%	NA
Block Group 2; Census Tract 223.22	815	1.0%	99.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.0%	23.3%	0.0%	NA
Block Group 3; Census Tract 223.22	1,030	0.0%	87.5%	0.0%	0.0%	0.0%	0.0%	12.5%	0.0%	100.0%	62.9%	0.0%	NA
Block Group 4; Census Tract 223.22	233	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	55.8%	0.0%	NA
Block Group 1; Census Tract 223.30	1,085	0.0%	94.9%	0.0%	0.0%	0.0%	0.0%	1.0%	4.1%	100.0%	71.5%	1.0%	NA
Block Group 2; Census Tract 223.30	1,775	1.8%	95.9%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	98.2%	57.7%	0.0%	NA
Block Group 3; Census Tract 223.30	2,379	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	61.0%	0.0%	NA
Block Group 1; Census Tract 224.10	549	7.5%	84.0%	0.0%	0.0%	0.0%	0.0%	2.9%	5.6%	92.5%	80.1%	0.0%	NA
Block Group 2; Census Tract 224.10	799	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	36.3%	0.0%	NA
Block Group 3; Census Tract 224.10	1,231	3.7%	86.5%	0.0%	0.0%	0.0%	0.0%	9.8%	0.0%	96.3%	61.6%	0.0%	NA
Block Group 4; Census Tract 224.10	2,228	5.4%	94.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	94.6%	17.5%	0.0%	NA
Block Group 5; Census Tract 224.10	738	20.3%	67.5%	0.0%	0.0%	0.0%	0.0%	8.5%	3.7%	79.7%	24.5%	0.0%	NA
Block Group 1; Census Tract 225	2,241	13.5%	59.4%	0.0%	0.0%	0.0%	0.0%	1.3%	25.7%	86.5%	53.9%	12.9%	Spanish
Block Group 2; Census Tract 225	539	0.9%	99.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.1%	81.4%	0.0%	NA
Block Group 3; Census Tract 225	1,208	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	39.6%	0.0%	NA
Block Group 4; Census Tract 225	829	17.9%	81.3%	0.6%	0.0%	0.0%	0.0%	0.2%	0.0%	82.1%	12.3%	0.0%	NA
Block Group 1; Census Tract 227	1,037	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	54.4%	0.0%	NA
Block Group 2; Census Tract 227	851	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	38.2%	0.0%	NA
Block Group 3; Census Tract 227	2,263	8.7%	84.0%	0.0%	0.0%	0.0%	0.0%	7.2%	0.0%	91.3%	81.3%	0.0%	NA

Geography	Total Population	White Alone (not Hispanic or Latino)	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Some other race alone	Two or more races	Hispanic or Latino	Total Minority[a]	Low Income[b]	Limited English Proficiency (LEP)[c]	Primary Language(s) Spoken in LEP Block Groups by those who speak English Less than Very Well[d]
Block Group 4; Census Tract 227	983	4.3%	95.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	95.7%	59.0%	0.0%	NA
Block Group 5; Census Tract 227	2,662	0.4%	99.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.6%	91.0%	1.8%	NA
Block Group 1; Census Tract 9801	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	NA
Block Group 1; Census Tract 9802	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	NA
Block Group 1; Census Tract 9803	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	NA

Source: USCB 2022b

a) Total Minority includes everyone other than persons who identified themselves as White, Not Hispanic or Latino. Census block groups meeting the criteria as a minority population are highlighted in red.
b) Residents below the low-income threshold, defined as two times the poverty level. Census block groups meeting the criteria as a low-income population are highlighted in red.
c) Residents who self-identify as speaking English “less than very well.” Census block groups meeting the criteria as an LEP population are highlighted in red.
d) Primary Languages are defined as those spoken by 20 or more people within a census block group who speak English “less than very well”.

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APPENDIX F – CHARACTERIZATION OF CENSUS TRACTS WITHIN A 10-MILE RADIUS

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The Council on Environmental Quality's Climate and Economic Justice Screening Tool (CEJST) uses a compilation of various government agency datasets as indicators of burdens. The burdens are organized into eight categories. A community is highlighted as disadvantaged on the CEJST map if it is in a census tract that is (1) at or above the threshold for one or more environmental, climate, or other burdens, and (2) at or above the threshold for an associated socioeconomic burden (CEQ 2023).

Communities are identified as disadvantaged if they are in census tracts that meet the criteria for any of the following burdens:

Climate Change

- ARE at or above the 90th percentile for:
  - expected agriculture loss rate
  - OR expected building loss rate
  - OR expected population loss rate
  - OR projected flood risk
  - OR projected wildfire risk
- AND are at or above the 65th percentile for low income.

Legacy Pollution

- Have at least one abandoned mine land OR Formerly Used Defense Sites OR are at or above the 90th percentile for:
  - proximity to hazardous waste facilities
  - OR proximity to Superfund sites (National Priorities List (NPL))
  - OR proximity to Risk Management Plan (RMP) facilities
- AND are at or above the 65th percentile for low income.

Health

- ARE at or above the 90th percentile for:
  - asthma
  - OR diabetes
  - OR heart disease
  - OR low life expectancy
- AND are at or above the 65th percentile for low income.

Housing

- Experienced historic underinvestment OR are at or above the 90th percentile for:
  - housing cost
  - OR lack of greenspace
  - OR lack of indoor plumbing
  - OR lead paint
- AND are at or above the 65th percentile for low income.

Energy

- ARE at or above the 90th percentile for:
  - energy cost
  - OR PM2.5 in the air
- AND are at or above the 65th percentile for low income

Transportation

- ARE at or above the 90th percentile for:
  - diesel particulate matter exposure
  - OR transportation barriers
  - OR traffic proximity and volume
- AND are at or above the 65th percentile for low income.

Water and Wastewater

- ARE at or above the 90th percentile for:
  - underground storage tanks and releases
  - OR wastewater discharge
- AND are at or above the 65th percentile for low income.

Workforce Development

- ARE at or above the 90th percentile for:
  - linguistic isolation
  - OR low median income
  - OR poverty
  - OR unemployment
- AND more than 10 percent of people ages 25 years or older whose education is less than a high school diploma.

Figure E-1 identifies the census tracts within the 10-mile socioeconomic study area that the CEJST identifies as disadvantaged based on the above criteria. Table F-1 identifies which, if any, of the eight burden categories met the criteria for each individual census tract in the study area.

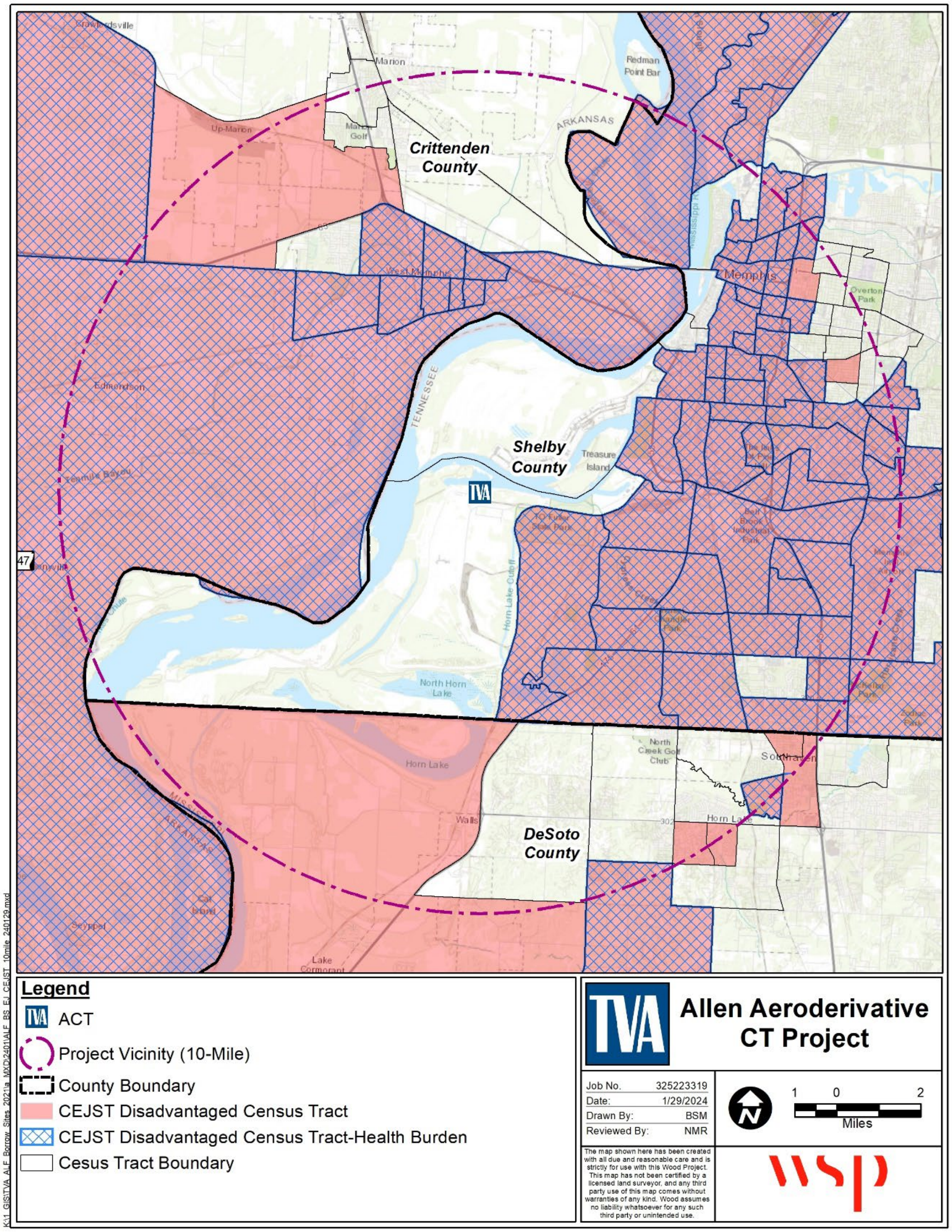

Figure E-1. Disadvantaged Census Tracts within a 10-mile Radius

Table F-1. Burden Criteria Met for Census Tracts within a 10-mile Radius

Geography	Burden Category							
	Climate Change	Legacy Pollution	Energy	Health	Housing	Transportation	Water and Wastewater	Workforce Development
Crittenden County, Arkansas								
Census Tract 301.01	YES	-	-	YES	YES	-	YES	YES
Census Tract 301.02	-	-	-	YES	-	-	-	-
Census Tract 302.01	-	-	-	YES	-	-	-	-
Census Tract 302.02	-	-	-	-	-	-	-	-
Census Tract 303.01	-	-	-	YES	YES	-	YES	YES
Census Tract 303.02	-	-	-	YES	YES	-	YES	YES
Census Tract 305.01	-	-	YES	YES	-	-	-	YES
Census Tract 305.02	-	-	YES	YES	YES	-	-	YES
Census Tract 306	YES	-	-	YES	YES	YES	-	YES
Census Tract 307.03	-	-	-	-	YES	-	-	YES
Census Tract 308.03	-	-	-	-	-	-	-	-
Census Tract 308.04	-	-	-	-	-	-	-	-
Census Tract 308.05	-	-	-	-	-	-	-	-
Census Tract 308.06	-	-	-	-	-	-	-	-
Census Tract 310	-	-	YES	YES	YES	-	-	-
Census Tract 312	-	-	YES	YES	-	-	-	YES
DeSoto County, Mississippi								
Census Tract 701.01	-	-	-	-	-	YES	-	-
Census Tract 701.02	-	-	-	-	-	-	-	-
Census Tract 702.10	-	-	-	-	-	-	-	-
Census Tract 702.21	-	-	-	YES	-	YES	-	-
Census Tract 703.22	-	-	-	-	-	-	-	-
Census Tract 703.23	-	-	-	-	-	-	-	-
Census Tract 703.24	-	-	-	-	-	YES	-	YES

	Burden Category							
Geography	**Climate Change**	**Legacy Pollution**	**Energy**	**Health**	**Housing**	**Transportation**	**Water and Wastewater**	**Workforce Development**
Census Tract 703.25	-	-	-	-	-	YES	-	YES
Census Tract 704.11	-	-	-	-	YES	-	YES	-
Census Tract 704.12	-	-	-	-	-	-	YES	-
Census Tract 704.21	-	-	-	-	-	-	-	-
Census Tract 704.22	-	-	-	YES	-	-	-	-
Census Tract 705.21	-	-	-	-	-	-	-	-
Shelby County, Tennessee								
Census Tract 1	-	-	-	-	-	-	-	-
Census Tract 2	-	-	YES	YES	YES	-	-	YES
Census Tract 3	-	-	YES	YES	YES	-	-	YES
Census Tract 4	YES	-	YES	YES	YES	YES	-	YES
Census Tract 16	-	-	-	-	-	-	-	-
Census Tract 17	-	-	-	-	-	-	-	-
Census Tract 19	-	-	YES	YES	YES	YES	-	YES
Census Tract 20	-	-	YES	YES	YES	-	-	YES
Census Tract 21	-	-	-	YES	YES	-	-	YES
Census Tract 24	-	-	-	YES	YES	YES	-	YES
Census Tract 25	-	-	-	-	YES	YES	-	-
Census Tract 26	-	-	-	-	-	-	-	-
Census Tract 31	-	-	-	-	-	-	-	-
Census Tract 32	-	-	-	-	-	-	-	-
Census Tract 33	-	-	-	-	-	-	-	-
Census Tract 34	-	-	-	-	-	-	-	-
Census Tract 35	-	-	-	-	-	-	-	-
Census Tract 36	-	-	-	YES	YES	YES	-	YES
Census Tract 37	-	-	-	YES	YES	YES	-	YES
Census Tract 38	-	YES	-	YES	YES	YES	-	YES

	Burden Category							
Geography	**Climate Change**	**Legacy Pollution**	**Energy**	**Health**	**Housing**	**Transportation**	**Water and Wastewater**	**Workforce Development**
Census Tract 39	-	YES	-	YES	YES	-	-	YES
Census Tract 42	-	-	-	-	-	-	-	-
Census Tract 43	-	-	-	-	-	-	-	-
Census Tract 45	-	-	YES	YES	YES	-	-	YES
Census Tract 46	-	-	-	YES	YES	YES	-	YES
Census Tract 50	-	-	YES	YES	YES	-	-	YES
Census Tract 53	-	YES	YES	YES	YES	-	-	YES
Census Tract 55	-	YES	YES	YES	YES	-	-	YES
Census Tract 56	-	YES	YES	YES	YES	-	-	YES
Census Tract 57	-	YES	YES	YES	YES	-	-	YES
Census Tract 58	-	-	YES	YES	YES	-	-	YES
Census Tract 59	-	-	YES	YES	YES	-	-	YES
Census Tract 60	-	YES	YES	YES	YES	-	-	YES
Census Tract 62	-	YES	YES	YES	YES	-	-	YES
Census Tract 63	-	YES	-	-	YES	-	-	-
Census Tract 64	-	-	-	-	-	-	-	-
Census Tract 65	-	YES	YES	YES	YES	-	-	YES
Census Tract 66	-	-	-	-	-	-	-	-
Census Tract 67	-	YES	YES	YES	YES	-	-	YES
Census Tract 68	-	YES	YES	YES	YES	-	-	YES
Census Tract 69	-	YES	YES	YES	YES	-	-	-
Census Tract 75	-	YES	YES	YES	YES	-	-	YES
Census Tract 78.10	-	YES	YES	YES	YES	-	-	YES
Census Tract 78.21	-	YES	YES	YES	-	YES	-	YES
Census Tract 78.22	YES	YES	YES	YES	-	YES	-	YES
Census Tract 81.10	-	YES	YES	YES	YES	-	-	YES
Census Tract 81.20	YES	YES	-	YES	-	-	-	YES
Census Tract 99.01	YES	-	-	YES	YES	-	-	YES

	Burden Category							
Geography	**Climate Change**	**Legacy Pollution**	**Energy**	**Health**	**Housing**	**Transportation**	**Water and Wastewater**	**Workforce Development**
Census Tract 99.02	-	-	YES	YES	YES	-	-	YES
Census Tract 112	YES	-	YES	YES	YES	YES	-	YES
Census Tract 113	-	-	-	YES	YES	YES	-	YES
Census Tract 114	-	-	-	YES	YES	-	-	YES
Census Tract 115	-	YES	YES	YES	YES	YES	-	YES
Census Tract 116	-	-	YES	YES	YES	-	-	YES
Census Tract 117	-	YES	YES	YES	YES	-	-	YES
Census Tract 201.01	YES	-	-	YES	-	-	-	YES
Census Tract 219	-	-	-	YES	-	-	-	-
Census Tract 220.22	YES	-	YES	YES	YES	-	-	YES
Census Tract 220.23	-	-	YES	YES	-	YES	-	YES
Census Tract 220.24	-	-	-	YES	-	-	-	-
Census Tract 221.11	-	-	-	YES	-	-	-	YES
Census Tract 221.12	-	-	-	YES	YES	YES	-	-
Census Tract 221.21	-	-	-	-	-	-	-	-
Census Tract 221.22	-	-	-	YES	-	-	-	-
Census Tract 221.30	-	-	-	YES	-	-	-	-
Census Tract 222.10	-	-	YES	YES	-	-	-	YES
Census Tract 222.20	YES	YES	YES	YES	-	-	-	YES
Census Tract 223.10	YES	-	YES	YES	YES	-	-	YES
Census Tract 223.21	-	-	-	YES	-	-	-	YES
Census Tract 223.22	YES	-	-	YES	-	-	-	-
Census Tract 223.30	-	-	-	YES	-	-	-	-
Census Tract 224.10	-	-	-	YES	-	-	-	-
Census Tract 225	YES	-	-	YES	YES	-	-	-
Census Tract 227	-	-	YES	YES	-	-	-	YES
Census Tract 9801	YES	-	-	YES	-	YES	-	YES
Census Tract 9802	-	-	-	-	-	-	-	-

	Burden Category							
Geography	**Climate Change**	**Legacy Pollution**	**Energy**	**Health**	**Housing**	**Transportation**	**Water and Wastewater**	**Workforce Development**
Census Tract 9803	-	-	-	-	-	-	-	-

Source: CEQ 2023

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APPENDIX G – LIST OF PREPARERS

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NEPA Project Management

Name:	**Matthew Higdon (TVA)**
Education:	M.S., Planning; B.A., History
Project Role:	TVA NEPA Project Manager, NEPA Compliance
Experience:	22 years of experience in environmental planning, NEPA compliance, and project management.

Name:	**Joe Santangelo (TVA)**
Education:	M.S. & B.S., Environmental Engineering
Project Role:	TVA Environmental Program Manager
Experience:	20 years of experience in environmental compliance

Name:	**Carol Freeman (TVA)**
Education:	M.S. Geological Sciences; M.S. Space Studies; B.S. Geology
Project Role:	NEPA Compliance
Experience:	16 years of experience in environmental and NEPA compliance and project management

Name:	**Bill Elzinga (WSP)**
Education:	M.S. and B.S., Biology
Project Role:	WSP Project Manager and Overall Technical Review
Experience	35 years of experience managing and performing NEPA analyses for electric utility industrial, and state/federal agencies; ESA compliance; CWA evaluations

Name:	**Erin Alsop (WSP)**
Education:	B.S., Environmental Science
Project Role:	WSP Deputy Project Manager, Overall Technical Review, Cumulative Impacts
Experience	7 years of experience in environmental planning, NEPA analysis and documentation, and preparation of technical documents

Other Contributors

TENNESSEE VALLEY AUTHORITY

Name:	**Steve Cole**
Education:	PhD, Anthropology; MA, Anthropology; and BA, Anthropology
Project Role:	Cultural Resources
Experience:	32 years in Archaeology and Cultural Resources Management

Name: **Fallon Parker Hutcheon**
Education: M.S., Environmental Studies; B.S., Biology
Project Role: Wetland Biologist
Experience: 3 years in wetland assessment, impact analysis, and compliance

Name: **Sara McLaughlin-Johnson**
Education: B.S. Wildlife & Fisheries Science
Project Role: Terrestrial Ecology (Animals), Terrestrial Threatened and Endangered Species
Experience: 9 years in terrestrial wildlife assessment, impact analysis, and NEPA compliance; 15 years of combined experience in wildlife management, conservation, and husbandry.

Name: **Craig Phillips**
Education: M.S. and B.S., Wildlife and Fisheries Science
Project Role: Aquatic Ecology and Threatened and Endangered Species
Experience: 7 years sampling and hydrologic determination for streams and wet-weather conveyances; 5 years in environmental reviews.

Name: **Chloe Sweda**
Education: B.S., Earth and Environmental Science
Project Role: Managed and Natural Areas
Experience: 5 years of experience in Natural Resource Management

Name: **Robert Stinson**
Education: B.S. Wildlife and Fisheries Science
Project Role: Terrestrial Zoology
Experience: 13 years of experience with wildlife biology and threatened and endangered species surveys, 4 years of experience with NEPA and ESA compliance.

Name: **Jesse Troxler**
Education: M.S. and B.S., Wildlife and Fisheries Science
Project Role: Terrestrial Zoology
Experience: 20 years working in wildlife research, surveying, and monitoring; 7 years in NEPA and ESA compliance

Name: **Carrie C. Williamson, P.E. (TN), CFM**
Education: M.S., Civil Engineering; B.S., Civil Engineering; Professional Engineer, Certified Floodplain Manager
Experience: 11 years in Floodplains and Flood Risk; 3 years in River Forecasting; 11 years in Compliance Monitoring
Involvement: Floodplains and Flood Risk

WSP, INC.

Name:	**Richard Bennett, PE, PTOE**
Education:	B.S., Civil Engineering
Project Role:	Transportation
Experience:	33 years of experience

Name:	**Karen Boulware**
Education:	M.S., Resource Planning and B.S., Geology
Project Role:	Overall Technical Review
Experience:	27 years of professional experience in NEPA.

Name:	**Bailey Hickey**
Education:	B.S., Environmental Engineering
Project Role:	Surface Water and Groundwater
Experience:	6 years of experience in NEPA analysis and documents and environmental consulting

Name:	**Andrea Johnston**
Education:	B.S., Environmental Science
Project Role:	Solid and Hazardous Waste, Public Health and Safety, Unavoidable Adverse Impacts, Relationship of Shot Term Uses to Long-Term Productivity, Irreversible and Irretrievable Commitments of Resources
Experience:	3 years of experience in NEPA analysis and document and scientific studies

Name:	**Richard Bennett, PE, PTOE**
Education:	B.S., Civil Engineering
Project Role:	Transportation
Experience:	33 years of experience

Name:	**Nick Meisinger**
Education:	B.S., Environmental Science
Project Role:	Climate Change and Greenhouse Gases
Experience:	10 years of experience in NEPA analysis and documentation

Name:	**Kim Pesenko**
Education:	B.S., Civil Engineering
Project Role:	Air Quality
Experience:	28 years of professional experience in environmental compliance and air quality

Name:	**Rebecca Porath**
Education:	M.S. and B.S., Wildlife and Fisheries Sciences

Project Role:	Overall Technical Review
Experience:	23 years of experience in NEPA analysis and documentation, ecological studies, and preparation of technical documents

Name:	**Natalie Reiss**
Education:	B.A., Biology
Project Role:	Socioeconomics
Experience:	10 years of experience in NEPA analysis and documentation

Name:	**Leah Stephens**
Education:	B.A., Environmental Studies
Project Role:	Socioeconomics, Noise
Experience:	5 years of experience in NEPA analysis and documentation

Name:	**David Tamsky**
Education:	B.A., Environmental Studies
Project Role:	Utilities and Services Systems
Experience:	1 year of experience in NEPA analysis