

TVA INNOVATION & RESEARCH

# A Strategic Roadmap

for Tennessee  
Valley Regional Grid  
Transformation

AUGUST 2022

ACKNOWLEDGMENTS

# Thank You

This strategic roadmap was developed by the Tennessee Valley Authority (TVA) in collaboration with its Local Power Company (LPC) partners as a part of the Regional Grid Transformation initiative. The vision for this initiative was developed through discussions and working sessions with LPC executives across TVA’s service region, as well as through input from industry subject matter experts.

TVA would like to thank the following people and organizations for their committed work to define and pursue implementation of grid transformation within the Tennessee Valley.



Their leadership will help the region build a resilient, flexible and integrated electric system that meets Valley customer needs of the future.

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# Glossary

## Automation

The creation and application of technology to perform services, produce and deliver results with minimal human interaction.

## Business case

Justification for a proposed technology strategy or project based on cost, benefits and risks.

## Decarbonization

The reduction or replacement of energy sources that produce carbon emissions, such as coal, oil and natural gas, with energy sources that emit less or no carbon, such as wind, solar and nuclear energy.

## Digitalization

Enabling or improving processes by leveraging digital technologies and digital data.

## Distributed energy resources (DER)

Small, modular, energy generation and storage technologies, such as solar panels and batteries, that provide electric capacity or energy where you need it.

## Electrification

The process of replacing technologies that use fossil fuels, such as coal, oil and natural gas, with technologies that use cleaner electric energy sources.

## Extreme weather events

Occurrences of unusually severe weather or climate conditions that cause devastating impacts on communities and natural ecosystems.

## Solar photovoltaics (PV)

Nonmechanical devices that convert sunlight directly into electricity, commonly referred to as a solar panel or solar system.

## Situational awareness

An understanding of the current conditions of grid operations and performance.

## Rapid technology advancement

The accelerating pace in development and adoption of new technologies, such as big data, artificial intelligence, renewable energy technologies and satellite and drone technologies.

## Regulatory changes

Updates of federal, state or local regulations and laws that affect an industry or business.

## Urbanization

The process of city growth and expansion due to an increasing percentage of people living in urban areas.

# Acronyms

## DOE

Department of Energy

## AMI

Automated metering infrastructure

## BIL

Bipartisan Infrastructure Law

## DE

Duke Energy

## DER

Distributed energy resources

## EPB

EPB, formerly Electric Power Board of Chattanooga

## EPRI

Electric Power Research Institute

## ESG

Environment, society and governance

## HU

Huntsville Utilities

## IIJA

Infrastructure Investment and Jobs Act

## IRP

Internal Review Process

## ISOP

Integrated System Operations Planning

## KUB

Knoxville Utilities Board

## LPC

Local Power Company

## NES

Nashville Electric Service

## ORNL

Oak Ridge National Laboratory

## PV

Photovoltaics

## TVA

Tennessee Valley Authority

## T&D

Transmission and distribution





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# Executive Summary

A variety of factors are impacting and influencing the energy sector: rapid technology advancement, automation, urbanization, digitalization, decarbonization, regulatory changes, electrification, cybersecurity threats, extreme weather events and more. These trends demonstrate the evolving customer expectations and rapid technology evolution in relation to dynamic global conditions affecting daily life. **This signals that business-as-usual planning and traditional power systems in existence today will not be sufficient for the demands of tomorrow.**

Developing a proactive and collaborative response to this change is the driving force behind Regional Grid Transformation (RGT), a partnership initiative between the Tennessee Valley Authority (TVA) and its Local Power Company (LPC) partners.

## The shared vision is to build a resilient, flexible and integrated electric system that meets customer needs of the future.

To accomplish this goal, TVA and LPCs will need to develop new or enhance existing capabilities that will foster integrated planning, enhance transmission and distribution operations, set regional guidelines, create exceptional end-user experiences and enable grid transformation.

Together, we will implement new interconnected, intelligent technologies and processes that optimize our resources, mitigate risks and open greater access to third-party funding opportunities.

**This partnership will maximize our value to our communities and drive shared value through preserving energy affordability, customer satisfaction, efficiency and reliability.**

This Regional Grid Transformation strategic roadmap is the next step for communicating how we will collectively respond to the coming changes. It will highlight the regional opportunities and capabilities needed — not as a prescriptive process but rather as a flexible and agile plan to meet LPCs where they are.

**There is a place for every Valley community** alongside the work of the Regional Grid Transformation initiative. With the help and leadership of our LPC working team, we will build a modern and sustainable infrastructure that powers our future.



## Working together as a region will get us there faster.

## SECTION 2

# Introduction

## Continuity in Action

When President Franklin D. Roosevelt signed the Tennessee Valley Authority Act in 1933, the country was reeling from the effects of the Great Depression. The creation of the Tennessee Valley Authority was a forward-thinking initiative to modernize the Southeastern United States by protecting the environment, spurring economic development and improving the quality of life for the people. FDR's bold vision brought opportunity, jobs and economic relief to the region.

As TVA's service region grew accustomed to this new initiative, local power companies partnered with TVA to bridge the gap between generation, transmission and distribution. The public power model offered reliable, low-cost electricity for the people and businesses in the region. This model allowed the ability for TVA and LPCs to work together to better serve customers by advancing technology and preparing for the future.

Even now, almost a century later, his vision is still at work. While the Tennessee Valley of today is quite different than in the 1930s — with over 10 million residents and a globalized economy — the need for TVA and LPCs to transform to better serve the people in the region is just as relevant today as it was then. With an integrated, resilient and intelligent electric system, TVA will maintain its legacy of providing reliable, clean and affordable energy to our customers and the people and businesses they serve.

## Business and Operations Disruptions

Within the energy sector, there are major trends happening across every aspect of power usage. In the home, millions of Americans are working remotely. With cloud computing and web-based conference calls, work and productivity technologies are everywhere. Homeowners and renters alike use smart devices to turn appliances on and

off, adjust the temperature and manage settings that make us comfortable and efficient.

From small, local mom and pop stores to large industrial facilities, businesses of all sizes and shapes are seeing rapid technology advancements and opportunities in the ways they use energy. Consumer and market demands for transparency and sustainable practices are increasing. Businesses are exploring distributed energy resources (DER), such as photovoltaic (PV) solar panels and battery storage, to meet new decarbonization goals and targets, while still using energy efficiency to reduce or manage energy usage costs in an increasingly electrified world.

Interest in adopting renewable energy, battery storage and electric vehicles is expanding in more communities. Neighborhoods are experiencing the effects of wildly competitive housing markets that take a toll on equity and affordability while making the impact of energy burden even greater for our most vulnerable populations.

Across every setting, new energy technologies and DER are augmenting and decentralizing our power supply system. Electric grids that were designed and built to accommodate one-way power flow must be reevaluated to accommodate two-way power flow on the system. These major trends are already having an impact on our region and will continue accelerating the need for innovation in the coming years.

2035

## Valley Vision

TVA has committed to engaging with stakeholder partners as we collectively navigate through market transformation and innovation. Valley Vision 2035 is an opportunity to deliver on these commitments and strengthen TVA's customer engagement. Working together, we will establish the foundation for the future of the public power model. Valley Vision 2035 is the platform through which we will ensure the people of the region enjoy the benefits of public power for decades to come.



## A Timely Opportunity

In 2021, the federal government allocated approximately \$74 billion to clean energy and power infrastructure — the largest investment in American history<sup>i</sup> — as part of the Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL). Within this legislation, \$27.65 billion has been designated to improve grid resiliency and reliability.<sup>ii</sup>

TVA and LPCs can preplan to capitalize on third-party investments now. By working together to create thoughtful, shovel-ready pilots, projects and programs, we can make the TVA service region a strong candidate for grid infrastructure and technology funding when it becomes available.



**The basis for this funding is the critical and urgent acknowledgment of the constraints of our aging infrastructure and the need to prepare for the future.**


## Guiding Principles

As the largest public power utility in the nation, this strategic roadmap for transforming the grid addresses both TVA and the 150+ LPCs it serves. The effort must be well-planned, inclusive and collaborative in approach to avoid the risk of advancing some communities while leaving others behind.

TVA's vision is action oriented. Anchored in collaboration and shared value, the defining objective is to bring everyone on the journey together, communities and all LPCs, regardless of their current level of progress. By innovating our planning and operations processes through holistic thinking about how the entire system operates, we will accelerate transformation and economic development.


**According to the Department of Energy (DOE) independent estimates indicate:<sup>iii</sup>**

### NOT MEETING NEED

  
**60%**  
of electricity transmission systems need to expand by 2030


and may need to triple by 2050.

### OLD INFRASTRUCTURE

  
**70%+**  
of the nation's grid transmission lines and power transformers are over 25 years old

creating vulnerability.

### EXTREME WEATHER

  
Recent weather events make it clear that America's existing energy infrastructure will not endure the continuing impacts of extreme weather events as a result of climate change.

Example: Dixie Wildfire, Hurricane Ida, 2021 Texas Freeze and the 2021 Western Kentucky tornado in the TVA territory.

### CLEAN ENERGY

  
The number of clean energy generation and storage projects expected to be added to the grid is growing

and with the investments from the BIL, even more clean energy sources will join the queue for grid integration.



# Regional Grid Transformation

## Responsive, Dynamic and Interactive

The strength of the partnership between TVA, LPCs and other stakeholders will be foundational in achieving an interconnected grid that **builds a resilient, flexible and integrated electric system that meets customer needs of the future.**

Flexibility allows the electric system to respond and adjust the power demand or generation to changing conditions. Additional flexibility from dynamic loads and conventional power plants will be needed during weather events when generation from wind and solar resources varies. Technology improvements, policy incentives and consumer choices will increase the role and impact of DER in the future so that an integrated electric system will allow

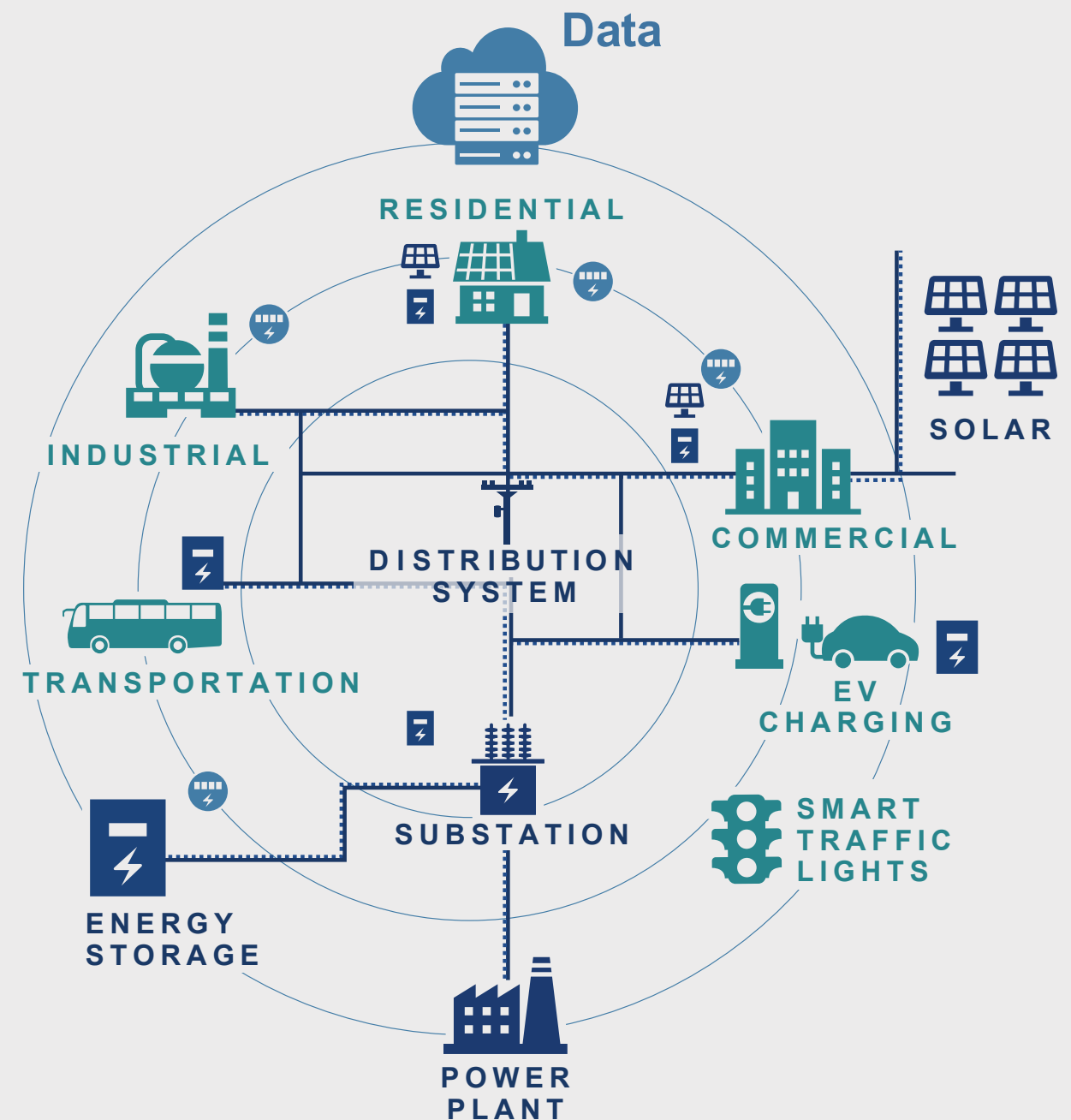
utilities to interact, monitor and manage DER. Integrating DER into the planning and operation of the electric system will help maximize their value while also maintaining quality and reliability to all customers.



**A resilient electric system is one that can withstand and reduce the severity and duration of disruptive events, such as extreme weather.**

## A DYNAMIC GRID SYSTEM

**Building a resilient, flexible and integrated electric system that meets Valley customer needs of the future.**





## Regional Grid Transformation Initiative

The Regional Grid Transformation initiative was developed in response to the changing region and the opportunities presented. By upgrading our region’s infrastructure, we protect against cybersecurity threats, replace aging assets, increase resilience, maintain reliability and keep costs affordable through shared investments and leveraged third-party dollars.

The RGT initiative focuses on the strategic deployment of advanced grid technologies and capabilities to achieve a modernized grid. This focus will result in benefits across generation, transmission, distribution and delivery to end-customers, subsequently adding new value for customers, communities and local economies.

**The Regional Grid Transformation initiative aligns with TVA’s founding principles as well as the future-focused Valley Vision 2035.**

## Collaborative Approach

This initiative will explore pathways for enhancing the collaboration that exists between TVA and LPCs to more fully integrate the planning and operation of the entire electric grid. The collaboration between TVA and LPCs on RGT will drive greater efficiencies, provide overall cost savings, manage risks appropriately and deliver broad value for TVA’s service region.

## Our Roadmap Forward

This roadmap accelerates a long-term plan for LPCs and TVA to evolve toward a more digital, distributed and decarbonized electric power system. This effort requires new operational-, planning- and customer-facing electric system capabilities. These are not one-time actions; they are on-going and long-term endeavors to plan and optimize new technologies, processes and skillsets. This roadmap sets the direction for how we will grow and adapt the power grid with our partners, stakeholders and end-use customers across all aspects of their lives.

This roadmap is meant for a regional context. It is flexible and customizable to the unique capabilities, transformation needs and readiness across all 150+ LPCs. There is not a specific order of tasks to accomplish. LPCs may apply the objectives of the roadmap to the areas where they already have planned capital investments. For other capabilities, the roadmap may augment the scope of near-term investments or influence long-range capital investment plans.



**While our individual paths and progress forward might be different, our high-level direction will be aligned with this roadmap as a first step to support investment planning and a common vision of the future grid.**

# Capabilities

## Value Proposition

TVA and LPCs have an opportunity to leverage data and technology to proactively prepare for more cost effective and efficient operations while supporting technology-, customer- and societal-needs.

In partnership with a working team of LPCs, the regional roadmap examines the electric power system holistically across generation, transmission and distribution. The process carefully views the grid through the lens of

the trends and pain points facing the energy industry. The recommended capabilities and grid transformation enabling strategies inform our multi-year grid transformation plan.

This work will create numerous pathways and options to realize the new benefits and reduced system costs that ultimately result in a comprehensive business case for investment.

## Navigating the Roadmap

By outlining the recommended capabilities and technologies, this roadmap details TVA’s overarching strategy for pursuing grid transformation. Regardless of the starting point, LPCs can review this roadmap to understand the capabilities needed for grid transformation and how to accelerate, expand and create new value throughout the process.

LPCs and communities can use the roadmap to understand the regional

priorities and to assess their current level of progress toward advancing the capabilities needed for regional grid transformation. LPCs can gauge their progress by evaluating where they are, what is planned for near-term investment and what might be on the horizon for long range planning. By partnering with TVA and aligning efforts with other regional stakeholders, LPCs can accelerate, expand or create capabilities that maximize value for the grid in their local communities.

### CUSTOMER BENEFITS

- ✓ Faster power restoration
- ✓ Clean energy
- ✓ Lower bills
- ✓ Tailored solutions with flexible rates

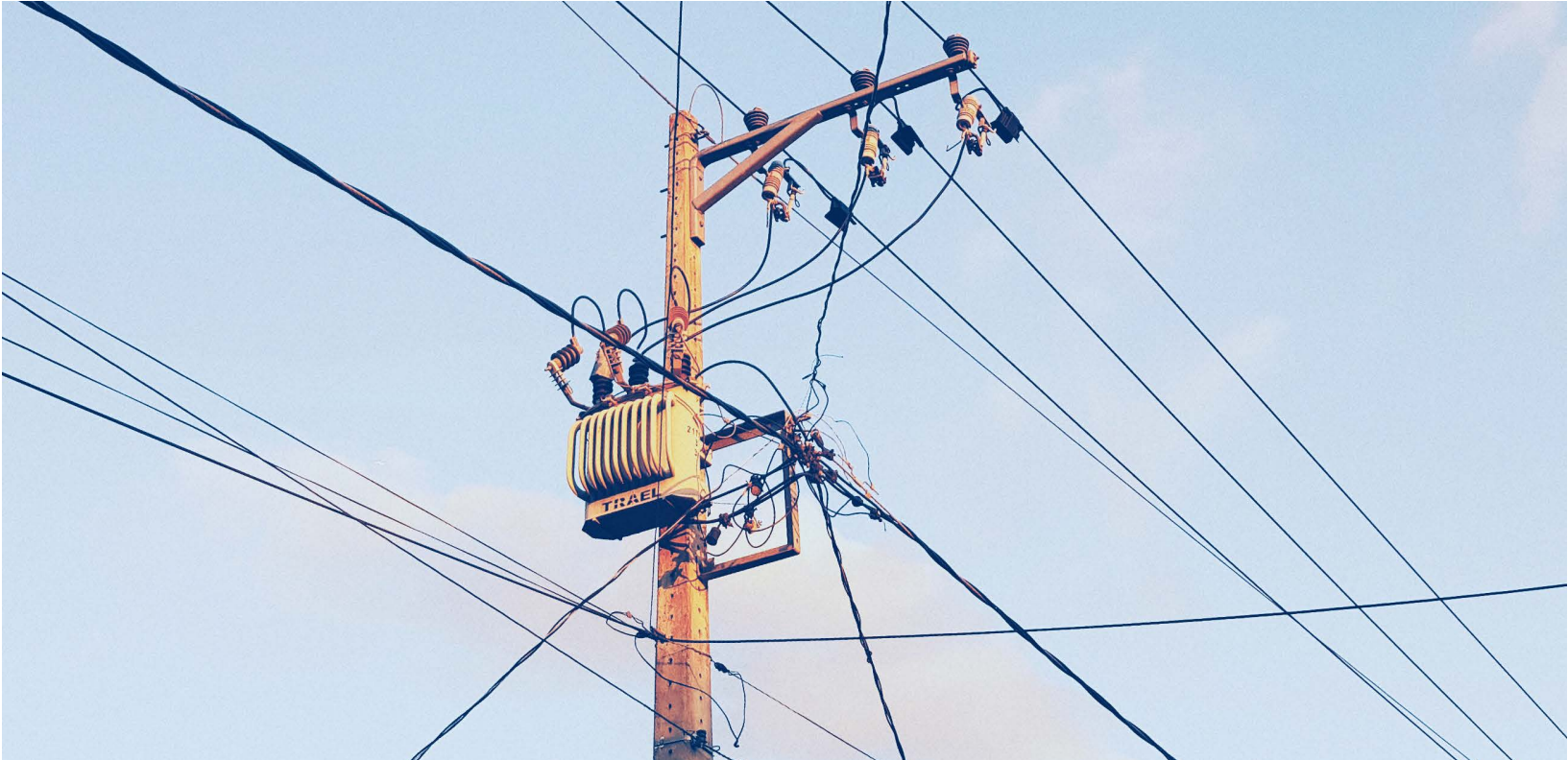
### LPC BENEFITS

- ✓ Shared learning and planning
- ✓ Cost-effective integration of new technology/resources
- ✓ Reduced outages
- ✓ Operational efficiency
- ✓ Workforce development

### REGIONAL BENEFITS

- ✓ Job creation
- ✓ New revenue
- ✓ Secure infrastructure
- ✓ Clean energy
- ✓ Equitable access
- ✓ Community vitality





## Capability Areas and Technologies

To optimize resources, TVA in partnership with multiple LPCs, has identified key capability areas to categorize the activities and technology needed for a modernized grid. Each capability area represents a set of processes, actions or technologies to support our collective vision for the future.

### Five Identified Capability Areas

**AREAS INCLUDE:**

- 1. Integrated Planning
- 2. Enhanced Transmission and Distribution Operations
- 3. Regional Guidelines
- 4. Exceptional End-User Experience
- 5. Grid Transformation Enabling

Each capability area above aligns with a series of values identified and agreed upon by Valley stakeholders.

### Primary Values

These values represent the highest-level benefits to TVA’s service region.



Resilience  
& Reliability



Carbon  
Reduction



Economic  
Development



Asset  
Optimization



Safety  
& Security



Energy  
Affordability

1.

# Integrated Planning

## PRIMARY VALUES

- ✓ Resilience & Reliability
- ✓ Carbon Reduction
- ✓ Economic Development
- ✓ Asset Optimization
- ✓ Safety & Security
- ✓ Energy Affordability

Valley-wide integrated planning is needed to determine best practices, manage valley-wide efforts and optimize investments. Capabilities and technologies needed to support planning efforts include:

### BUILDING AND MANAGING REGIONAL INTELLIGENCE

Utilizing continuous information collection and sharing, such as data analytics and cloud integration, can help all stakeholders further leverage their efforts.

### OPTIMIZING REGIONAL INVESTMENTS

Alignment and transparency in planning for generation and transmission investments by TVA and distribution investments by LPCs will advance all communities within TVA's service region. An example of optimizing these investments include the development of a holistic planning process between TVA and its LPCs that enables the iterative consideration of grid improvements and resource choices on the transmission and distribution system so that the overall regional investment is optimized, and the solution results in an overall least cost plan for TVA's service region.

## CASE STUDY

### Applying the Integrated Planning Capability

Duke Energy (DE) (Charlotte, NC) developed an Integrated System and Operations Planning (ISOP) framework to optimize capacity and energy resource investments across generation, transmission, customer delivery (distribution) and customer solutions. Utilizing a stakeholder engagement process that included information sharing and discussions, DE helped shape the development of ISOP modeling tools and analytical processes. This assisted in reaching a common understanding of key issues and assessing achievable, beneficial outcomes for customers and other stakeholders.<sup>iv</sup>



2.

# Enhanced Transmission & Distribution Operations

PRIMARY VALUES

- ✓ Resilience & Reliability
- ✓ Carbon Reduction
- ✓ Economic Development
- Asset Optimization
- ✓ Safety & Security
- ✓ Energy Affordability

This capability area utilizes situational awareness to provide Transmission and Distribution (T&D) operators with the ability to **operate the grid with coordination and resiliency**. Necessary capabilities and technologies for T&D coordination include:

GRID INTELLIGENCE

especially grid edge intelligence is necessary for developing and managing a distributed and resilient grid.

ADVANCED GRID MANAGEMENT

such as voltage optimization and automated circuit reconfiguration, allows T&D operators to optimize grid performance and resiliency through both normal and extreme weather conditions.

MONITORING AND CONTROL OF DER AND THIRD-PARTY DEVICES

enable a more fully integrated T&D operational environment.

CASE STUDY

## Applying the Enhanced Transmission and Distribution Operations Capability

EPB successfully used automated feeder switches to improve system-wide reliability and restoration time during a February 2014 extreme weather snowstorm. As a result of the automated feeder switches, EPB was able to restore power approximately 17 hours earlier than would have been possible without smart grid deployments and restored power instantly to 40,000 customers. EPB estimates it saved about \$1.4 million in overtime costs for field crews during this storm.<sup>v</sup>

3.

# Regional Guidelines

## PRIMARY VALUES

Resilience  
& Reliability

✓ Carbon  
Reduction

✓ Economic  
Development

✓ Asset  
Optimization

Safety  
& Security

Energy  
Affordability

To assist the advancement of the grid transformation process, regional guidelines should be used for facilitating partnership and collaboration around common standards, architecture, information sharing and stakeholder alignment. The following capabilities and subsequent technologies are necessary for establishing effective and applicable regional guidelines.

### ALIGNMENT ON STRATEGIC GOALS

such as interconnection standards for DER (energy storage and PV) can be realized through transparency in decision-making, stakeholder engagement and flexibility in approach.

### DRIVING ECONOMIC DEVELOPMENT

can be achieved through programs to promote and educate on grid-related opportunities, such as workforce development or pilot programs for communities or businesses

### TRANSFORMING POLICY AND REGULATORY DESIGN

is necessary to help support grid planning in TVA's service region. Measuring and communicating decarbonization and environment, society and governance (ESG) impacts of grid transformation can be used to lead policy and regulations to support further efforts in TVA's service region.

## CASE STUDY

### Applying the Regional Guidelines Capability

Due to the rising demand to interconnect DER into the distribution system, utilities are increasingly exploring opportunities to better manage their DER grid interconnection processes in ways that can more fully leverage technological advances, enable procedural transparency and recognize evolving technical standards. Electric Power Research Institute (EPRI) recently worked with 15 North American utilities, including TVA and LPCs, to develop situation-specific, least-risk/best-value interconnection strategies and tactics that address DER-related interconnection challenges. This work helped to inform utility staff about how to improve their DER interconnection application processing and technical review procedures.<sup>vi</sup>



4.

# Exceptional End-User Experience

## PRIMARY VALUES

- ✓ Resilience & Reliability
- ✓ Carbon Reduction
- ✓ Economic Development
- Asset Optimization
- ✓ Safety & Security
- ✓ Energy Affordability

Developing meaningful tools and service offerings with an intentional customer focus is another way to support the work of grid transformation. By establishing strong relationships with LPCs, we can help manage customer energy usage and costs and set up clear lines of communication for increased transparency and understanding. The capabilities and technologies needed to support exceptional end-user experience include:

**DRAWING INSIGHTS FROM END-USER DATA**

to help identify and prioritize opportunities, like the growing demand for solar and DER integration. Applying these insights will improve the customer experience and align stakeholder interests identifying untapped value for customers and providers.

**FACILITATING DIRECT AND PROACTIVE ENGAGEMENT**

to integrate customer preferences with our research and customize the end-user energy experience through programs and dynamic rates.

## CASE STUDY

### Applying the Exceptional End-User Experience Capability

TVA’s EV charging rates and action to advance charging infrastructure programs support customers by expanding the possibility of EV use across the region. Throughout the program design process, TVA engaged stakeholders to understand their needs to facilitate electric vehicle adoption in TVA’s service region. The EV rate structure was piloted before it was made available to all TVA customers. To improve charging infrastructure availability, a Charging Assessment Needs Report was created to evaluate current infrastructure and to strengthen charging options.<sup>vii</sup>

5.

# Grid Transformation Enabling

The grid transformation enabling capability area is the groundwork for this process as it outlines the foundational capabilities and technologies needed to implement grid transformation successfully. Capabilities needed in this area include:

**ADVANCED CUSTOMER METERING**

enables two-way communications such as reporting usage and outage information between customers and utilities.

**DATA ANALYTICS & GOVERNANCE**

including the collection, management and use of data from the grid to support decision making and investment optimization.

**COMMUNICATIONS**

including field-area-networking and fiber-to-substations.

A framework for **planning and managing transformation change** is also needed to ensure communication channels are in place for informing and involving stakeholders in the process and the timeline for implementing change is realistic.

**CYBERSECURITY**

to ensure emerging threats are appropriately addressed in all aspects of grid design and operation.

**WORKFORCE DEVELOPMENT**

to advance the skill sets and tools workers will need to plan and operate the power system.

PRIMARY VALUES

- ✓ Resilience & Reliability
- ✓ Carbon Reduction
- ✓ Economic Development
- ✓ Asset Optimization
- ✓ Safety & Security
- ✓ Energy Affordability

CASE STUDY

## Applying the Grid Transformation Enabling Capability

TVA began its Commercial Energy Solutions’ Customer Analytics program in 2018. Currently partnering with 15 LPCs, TVA receives and cleans internal AMI data. Starting with basic load shaping, the program has moved to perform cost and rate analysis, load planning and COVID-19 analysis. TVA is actively recruiting more LPCs across its service region and together are exploring ways to identify and rank future use cases.



# Planned Pilots & Next Steps



## PLANNED PILOT EXAMPLES

### Activating and Scaling Our Capabilities

Over the next year, TVA and LPCs will develop pilot projects to demonstrate innovative tools, processes and technologies. From these pilots, TVA will gather critical lessons-learned and synthesize specific courses of action into **tactical roadmaps and business cases**. The pilots and resulting resources will accelerate and scale the deployment

and impact of similar projects. LPCs and stakeholders will be able to evaluate the technologies and implement the right strategies for their systems and operations. These resources will reduce planning risks by informing capital planning needs and support investment prioritization and tradeoff analyses to maximize Valley dollars.



**Strategic, proactive planning today allows us to better manage change in the future. We can identify opportunities to optimize our resources instead of reacting to evolving changes and drivers.**

### Huntsville Utilities: Integrated Distribution-Transmission Planning

Huntsville Utilities (HU) is a municipal utility serving 200,000 electric customers in the town of Huntsville and surrounding Madison County in Alabama. The HU service territory has seen rapid economic growth and demand growth in recent years, putting pressure on HU's distribution infrastructure. HU is concerned with certain load pockets including the growing number of electric vehicles in its territory. Already a winter-peaking utility, HU would like to add more resiliency and capacity to its system to be ready for sub-zero weather events.

In addition, HU is receiving requests for large solar and DER interconnections. HU would like to take a driver's seat approach with respect to DER growth on its system, directing new projects to optimal locations, instead of simply reacting to customer pressures.

All these elements are driving HU's desire to better understand system constraints and proactively plan for where DER and capital upgrades would be most beneficial. On the transmission side, TVA would like to move to integrated T&D planning, using distribution system models to inform its local transmission plans. The capabilities derived from this pilot may include:

- Optimized DER planning on the distribution system
- Integrated transmission/distribution planning
- Forecasting of DER and load
- DER integration and operation

PLANNED PILOT EXAMPLES (CONT.)

### Nashville Electric Service (NES): Control Center Modernization

NES will renovate its existing control center and disaster response site and also is looking to enable state-of-the art outage restoration and grid control capabilities using data from advanced metering infrastructure (AMI), or smart meters. This pilot will augment NES’s Control Center Modernization plan with additional capabilities that also help meet regional grid transformation goals. The capabilities derived from this pilot may include:

- Near-real time interaction between distribution and transmission systems
- Updated communications protocols
- Cybersecurity to protect electric system assets
- DER monitoring and control
- Demand response

### LPC: Multi-Battery Pilot

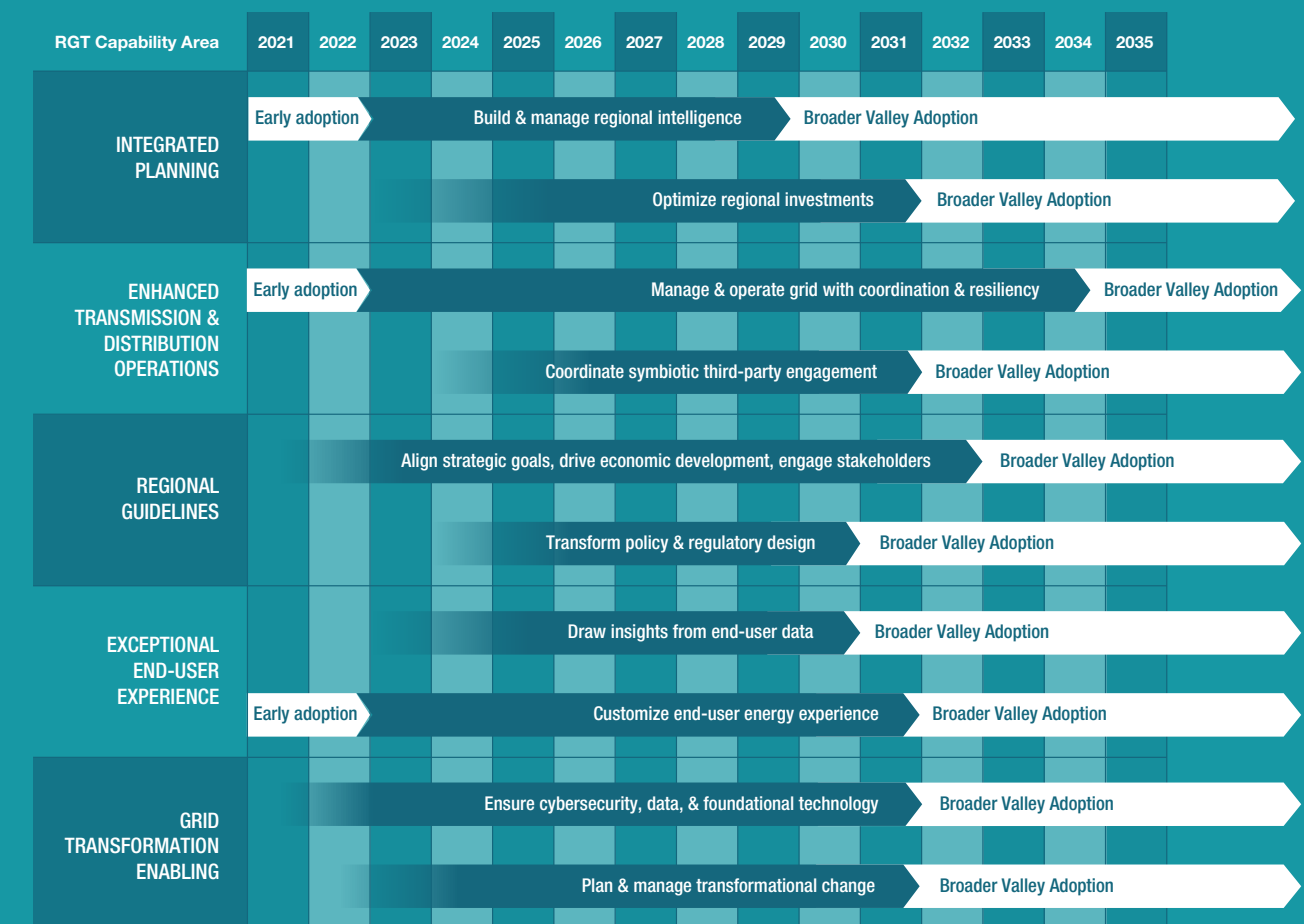
TVA wants to work together with an LPC to investigate the benefits of multiple batteries located on the distribution system. The batteries will address both local use cases and then aggregated to support TVA’s regional bulk power system. The pilot will help LPCs and TVA:

- Better understand energy storage use cases, storage sizing and location factors
- Prioritize locations to meet LPC and regional system objectives
- Identify and understand modeling requirements
- Understand benefits of jointly planning and operating energy storage systems
- Demonstrate analytical methods to determine how to value energy storage applications

## Our Capability Timeline

While the Regional Grid Transformation initiative officially began for TVA in 2021, the concept of grid modernization is not new to TVA or its LPCs. This initiative defines a model and iterative process for TVA and LPCs to use as a new way to operate. Because each LPC’s priorities, costs and timeframes vary, milestones are flexible

and based on high-level goal alignment. This long-term, evolving approach accommodates early and late adopters. It also allows for appropriate lead times for budget planning, procurement, equipment deployment and the foundational change management needed to update the region’s grid.





# Conclusion



## Where Change Starts

For the average customer, the power grid is an abstract concept. While each of us depend on its functionality, and expect its reliability, it operates quietly in the background of life. To make meaningful change and investments in the grid, we must shine a light on the role it plays in our daily lives — telling the stories of its dependability, the exciting possibilities of its growth and the urgency and importance of its optimization.

There are many reasons to update the grid, and regardless of where an LPC is in the process, there are benefits to participating with TVA's Regional Grid Transformation.

### COORDINATION WITH PEERS

Coordinated efforts expose us to new information about updated technologies, operational practices and load growth. It allows TVA and LPCs to optimize interconnection requests, DER integration and resources into Valley planning.

### SHARED LEARNINGS

With pain points like the supply chain severely impacting equipment orders and deployment timelines, proactive planning provides valuable time for sharing learnings toward our individual and regional long-term goals.

### IMPROVED PERFORMANCE

A transformed grid improves performance. With a smart, automated, self-healing system, LPCs will be able to reduce disturbances and decrease maintenance costs.

### LANDMARK FUNDING OPPORTUNITY

The Infrastructure Investment and Jobs Act funding for grid modernization is a tremendous opportunity. Leveraging third-party funds helps TVA and LPCs share costs, risks and learnings, and keep rates affordable for the communities we serve.

### CUSTOMER BENEFIT

A regional grid transformation will benefit all who live, work and play in TVA's seven-state service region. Together, we can reduce carbon emissions by optimizing distributed energy resource utilization and increase resilience and efficiency with streamlined services for our end-users.



**For the average customer, the power grid is an abstract concept.**





SECTION 7

# References

## Shared Vision and Next Steps

If you, your LPC or your community share the vision and goals of this roadmap and are interested in getting more engaged with this effort, **contact your TVA customer relations manager or the Regional Grid Transformation contacts below.** There is opportunity for everyone and benefits we can derive together as we prepare our communities for the future.

### REGIONAL GRID TRANSFORMATION CONTACTS

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### LEARN MORE

[www.tva.com/energy/technology-innovation/regional-grid-transformation](http://www.tva.com/energy/technology-innovation/regional-grid-transformation)

- <sup>i</sup> [https://www.whitehouse.gov/wp-content/uploads/2022/01/BUILDING-A-BETTER-AMERICA\\_FINAL.pdf](https://www.whitehouse.gov/wp-content/uploads/2022/01/BUILDING-A-BETTER-AMERICA_FINAL.pdf)
- <sup>ii</sup> <https://bipartisanpolicy.org/blog/the-grid-wins-big-in-the-iiija>
- <sup>iii</sup> <https://www.energy.gov/oe/articles/doe-launches-new-initiative-president-bidens-bipartisan-infrastructure-law-modernize>
- <sup>iv</sup> <https://www.duke-energy.com/our-company/isop>
- <sup>v</sup> [https://www.energy.gov/sites/prod/files/2016/11/f34/Distribution%20Automation%20Summary%20Report\\_09-29-16.pdf](https://www.energy.gov/sites/prod/files/2016/11/f34/Distribution%20Automation%20Summary%20Report_09-29-16.pdf)
- <sup>vi</sup> <https://www.epri.com/research/products/000000003002014069>; <https://www.epri.com/research/products/000000003002013852> (an EPRI membership is required to access these reports)
- <sup>vii</sup> <https://www.driveelectrictn.org/resources/#infrastructure>

