

Welcome!

The Meeting will begin at 9:00 AM Eastern



Regional Energy Resource Council

December 8, 2021

1st Meeting - Term 5

Virtual

Welcome



RERC Virtual Meeting

- This is the first meeting of the 5th term of the RERC.
- This meeting is being recorded. A link will be provided on the TVA RERC Website (tva.gov/rerc).
- We welcome members of the public attending and who are in listen only mode. For those that pre-registered to make public comments, the meeting host will unmute your line at that time. Written comments are always welcomed (tva.gov/rerc).

• **RERC Members are able to mute and unmute their own line.** Please keep yourself on mute until you wish to speak. RERC Members may use the raise hand function to be recognized for questions or comments.



Safety First!

- **Travel light.** If you're distracted, a bulky purse can be an easy target for pickpockets. Travel with only your most necessary credit card or cash. Keep all personal items, like your phone and keys, close to you in a tight pocket or small, zipped bag.
- **Be a picky parker.** Shopping during daylight hours if possible. To avoid making yourself a target during nighttime shopping, park your car in a well-lit area as close to the entrance as possible.
- Stay aware and walk with a purpose. Pay attention to your surroundings and have your keys ready. If you feel unsafe walking alone request a security guard to escort you.
- **Drive with caution.** Whether entering or exiting crowded parking lots, cars can pull out suddenly and people can appear from seemingly nowhere.
- Keep gifts out of sight. If possible, clear room in your trunk, and don't leave gifts or bags with valuables on your front seat.

Holiday Shopping Tips





Introductions

Name

Organization

Topics you'd like to learn about during this term



RERC Term 5* Members

Michael Butler Tennessee Wildlife Federation

Erin Gill City of Knoxville

Rebecca Goodman Commonwealth of Kentucky

Rodney Goodman Habitat for Humanity

Dana Jeanes Memphis Light, Gas, and Water

Candy Johnson Urban League of Greater Chattanooga

Jonathan Levenshus Sierra Club

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Dan Miller Oak Ridge National Laboratory

Sen. Steve Livingston State of Alabama

Pete Mattheis Tennessee Valley Industrial Committee

Jennifer Mundt** State of North Carolina

Doug Peters Tennessee Valley Public Power Association

Dr. Kari Babski-Reeves Mississippi State University

Patrice Robinson Memphis City Council **State of Georgia** TBD – Governor appointment

State of Mississippi TBD – Governor appointment

Alexa Voytek State of Tennessee

Clay Walker NETWORKS Sullivan Partnership

John Warren Commonwealth of Virginia

Lloyd Webb Olin Chlor Alkali

*August 1, 2021 – July 31, 2023 ** Council Chair



Agenda

RERC Meeting Dec. 8, 2021 All times are ET

9:00	Welcome – Chair Jennifer Mundt, Althea Jones and Designated Federal Officer Melanie Farrell
	Safety, Introductions, Agenda
9:30	Public Listening Session
10:00	5 th Term Overview
10:15	TVA Update
10:35	Transmission and Planning
11:15	Break
11:30	Resource Planning and Fuel Market Challenges & Rate Impacts
12:15	Pricing Fundamentals
12:50	Closing Remarks and Adjourn



Public Comment



This is a listening session; responses are typically not provided



Thank You



5th Term Overview

Althea Jones – Senior Manager, Stakeholder Relations

Jennifer Brundige – Attorney, Regulatory Law

December 8, 2021



RERC Roles & Responsibilities

TVA Designation Federal Officer

Melanie Farrell

 $presides \ over \ meeting, \ sets \ agenda, \ consults \ with \ committee \ chair,$

reports back to TVA board

TVA Committee Management Officer

Althea Jones

serves as backup to DFO, ensures GSA reporting, & provides oversight for $\mathsf{TVA}\xspace's$ FACs

TVA Public & Community Engagement Team

Ashley Farless, Cathy Coffey, Jo Anne Lavender, Lauren Turner

serves as core team in the planning, execution and facilitation of RERC engagements

TVA Office of General Counsel

Jennifer Brundige and Khurshid Mehta

provides legal advice to ensure compliance with Federal Advisory Committee Act and GSA regulations

RERC Chair

Jennifer Mundt

confirms agenda, attends all meetings, leads advice statement process

RERC Members

See slide 7 for full list of Term 5 members

attends all meetings, provide input and advice



Federal Advisory Act Meeting Requirements

Agenda

- Prepared and approved by the DFO, or alternate DFO, in consultation with Council Chair
- Distributed to Council and an outline is published in the Federal Register prior to each meeting
- Topics may be submitted for consideration to the DFO by any member of the Council, or non-members, including members of the public

Meeting Minutes

 DFO will ensure that minutes are prepared for each meeting, approved by the Chair, and made available to Council members and the public

Voting

- Any member of the Council may make a motion for a vote
- Quorum is a majority of the seated members of the Council as defined in the bylaws
- Advice requires an affirmative vote of majority of Council members present
- Advice may include minority or dissenting views

Membership

- Balanced Membership
- Professional or personal qualifications to achieve the mission of the Committee
- Broad range of diverse views and interests



RERC Meetings



Virtual Meeting

Informational Meeting with updates on the following projects:

- Extreme Weather
 Preparedness
- Long-Term Resource
 Planning
- Pricing Fundamentals

Planned In-person

Location: Oak Ridge, TN

Tour of Oak Ridge National Lab and advice requested on TVA's Five Energy of the Future Concepts

Planned In-person

Location: Chattanooga, TN

Tour of TVA System Operations Center and 2024 Integrated Resource Plan briefing

Planned In-person

Location: Nashville, TN

Joint Meeting with RRSC and advice requested on Environmental Justice

What to Expect in 2023

The next Integrated Resource Plan process could begin in late 2023 which will call for more frequent meetings of the RERC



TVA Update

Melanie Farrell, Designated Federal Officer

- November 2021 TVA Board of Directors Meeting Highlights
 - o Biodiversity Policy
 - o TVA FY21 Annual Report
 - o Pandemic Recovery Credit Renewal
 - o Banner Economic Development
 - o Preserving options at Cumberland and Kingston
- TVA Board Nominations
- FERC Filing



TVA Biodiversity Policy Statement

"TVA continues to recognize the importance of biodiversity to the quality of life of the region's residents and we work to proactively protect biodiversity through stewardship of public lands, management of the Tennessee River system, local and regional partnerships, and integration of species and habitat conservation in project planning."



Dtoddamacker.com | conservation visual





Pandemic Recovery Credit Renewal

Pandemic Recovery Credit

Public Power Benefit

 In FY21, TVA employees delivered positive results as the Valley continues to recover from the pandemic. This strong performance enables us to extend our support of the ongoing recovery and infrastructure needs in the Valley.

<u>FY 21</u>

- Wholesale non-fuel rate credit of 2.5%
- \$221M of Pandemic Relief Credits to customers

Wholesale non-fuel rate credit of 2.5%

FY 22

 Estimated \$220M of Pandemic Recovery Credit to customers

<u>FY 23</u>

- Wholesale non-fuel rate credit of 1.5%
- Estimated \$133M of Pandemic Recovery Credit to customers



Project Development Actions at Cumberland and Kingston

Began conducting end-of-life evaluations of the coal fleet following the publication of TVA's Integrated Resource Plan in 2019

Started the National Environmental Policy Act Environmental Impact Statement process last spring in accordance with TVA's 2021 Strategic Intent and Guiding Principles

Maintaining flexibility to evaluate reasonable alternatives

- Actions need to be taken now to develop and preserve the replacement generation options identified during the Environmental Impact Statement process for each plant.
- Will allow TVA to meet the earliest possible retirement dates being considered

TVA expects to publish the Draft Environmental Impact Statements for the Cumberland and Kingston projects for public review during the first half of CY 2022

Any actions taken prior to the completion of the National Environmental Policy Act process will not irreversibly and irretrievably commit TVA to a particular course of action prior to a final decision.



Economic Development: Jobs & Investments

80,900 **jobs**

created & retained record year for job creation

Attracted over

\$8.8 billion

capital investment third largest year for capital investment

- 3 projects exceeding \$1 billion announced in FY21 : GM, Ultium Cells, Oracle
- TVA named a Top Utility in Economic Development for the 16th consecutive year by Site Selection magazine
- 270 projects won 43% increase from last year
- Actively working 26 EV projects
- 73 Training and Development services provided
- 324 Technical Services offerings provided
- 463 Research requests fulfilled



Largest Capital Investment in TVA and TN History 5,800 jobs | \$5.6 billion capital investment





- TVA Board Nominations
- FERC Filing







Transmission Planning

Kristin Spearman - Vice President, Transmission Planning & Projects

December 8, 2021



Transmission Excellence





Keeping the lights on 24 / 7 / 365 and through extreme events Executing asset strategies to prepare for evolving industry dynamics Shaping the energy future of the Valley & building the Grid of Tomorrow



Keeping the Lights On: Winter 2021

TVA

Reserve margin process ensures summer and winter confidence

Integrated resource planning process ensures a diverse fleet

Strong winterization program is a requirement

Strong and numerous connections to other utilities

TVA Public Power model ensures reliability



Kept the Lights On and Rates Stable

Proved the Value of Our Model

ERCOT

Reserve confidence relies on pricing strategy

Market-based incentives drive investments

Market structure tried to provide incentive to winterize

Minimal connections to hedge power system risks

Deregulated market model relies on profit driven competition to incentivize reliability



\$50 Billion in Estimated Economic Losses

Entire Model in Question



Keeping the Lights On: FY22 Winter Outlook

- December is forecast to be the coldest month relative to normal while February is forecast to be the warmest
- The forecast winter peak is 30,457 MW at 14F system average (January 2022)
- This is compared to a February 2021 winter peak of 28,511 MW at 20F system average



• Economics and demographics have driven load growth, with direct-serve demand increasing due to pandemic recovery and additions



Keeping the Lights On: FY22 Winter Preparedness

Implemented lessons learned from the Winter 2021 ERCOT event

\$2.4M planned investment in gas fleet to build upon previous winterization efforts

Strengthened gas contracts and implemented coal conservation strategy for winter reliability

Implemented numerous employee-recommended process improvements

Increased operator training and customer education on emergency load curtailment program



Executing Asset Strategies: Evolving Drivers





Shaping the Energy Future of the Valley: The New SOC

New, secure System Operations Center located in Georgetown, Tennessee

Facility, substation, and Transmission Line substantially complete Spring 2023

Cutover to new state of the art Energy Management System expected Winter 2025

Will provide system operators cutting edge control and visibility of the power system





Shaping the Energy Future of the Valley: Strategic Fiber Provides Communications Backbone

Over 30 years of experience owning & operating a fiber network for operational needs:

- Connect and communicate between generating plants, substations, and control centers
- Operate Energy Management System & support remote monitoring of the power system
- Operate power system protective equipment

In 2017, TVA's Board approved the Strategic Fiber Initiative, adding 2,700 miles of new fiber necessary for future operational needs

Approximately 875 miles of optical ground wire installed to date & full program completion is scheduled for Fall 2027





Transmission Excellence





Keeping the lights on 24 / 7 / 365 and through extreme events Executing asset strategies to prepare for evolving industry dynamics Shaping the energy future of the Valley & building the Grid of Tomorrow









Welcome Back

Long-term Resource Planning

Eric Grau – Director, Resource Planning & Strategy

December 8, 2021


Planning is Grounded in Least-Cost Principles

In resource planning, TVA applies fundamental least-cost planning principles:



Additional considerations:

- · Load varies hourly and seasonally, with weather a large driver, and highest peak loads are typically of short duration
- Resources have a variety of operational and economic characteristics and constraints, with tradeoffs that contribute to the best portfolio fit overall
- Carbon reductions and renewable energy have favor with the general public and many large corporations



Planning Horizons and Uncertainty



Resource Planning Continuum



Planning is an iterative process, evolving with tactical experience and evolving signposts



Definitions of Capacity and Energy

Capacity is the maximum electric output an electricity generator can produce under specific conditions **Energy** (or generation) is the amount of electricity a generator produces over a specific period of time



Variations

- Nameplate Capacity Manufacturer-defined output under standard conditions
- Summer Net Dependable Capacity Expected unit output during specific summer conditions (e.g., temperature)



Variations

 Capacity Factor – Energy produced divided by total theoretical output for a given time period (tells you what percentage of hours it ran)



Winter and Summer Have Distinct Profiles





Fall and Spring Have Similar Load Profiles





Resource Options and Characteristics

To consider generating units, we need to know how they operate physically and economically.

ltem	Measure
Output (capacity)	MW (max dependable) MW (minimum)
Availability	Outage rates
Flexibility	Ramp rate
Duty Cycle	Base, intermediate, peaking
Dispatchability	Dispatchable, intermittent,
Fuel	Types of fuel, limits
Emissions	lbs./kWh
Other	Regulations, constraints

Physical

Economic

ltem	Measure				
Capital Cost	Installed cost (\$)				
Efficiency	Heat rate (Btu/kWh)				
Operating Cost	Fixed (\$) Variable (\$/kWh)				
Fuel Cost	\$/Btu				
Emissions Cost	\$/lb. (as applicable)				



Summary of Expansion Options

	Advanced Nuclear	Combined Cycle (CC)	Combustion Turbine (CT)	Solar	Wind	Storage	Demand Side Programs
Capacity Factor	90 - 95%	25 – 75%	0 – 15%	About 25%	About 40%	N/A	Varies by Program
Pow er Delivery	Ty pically baseload with low fuel cost; capable of flexible operations	Intermediate; designed to cycle weekly or daily as needed	Peaking; designed to start quickly and run for shorter periods	Intermediate; v ariable energy resource, matches up well with summer demand	Intermediate; v ariable energy resource, variable across all hours, ev en low loads	Peaking; stores energy at lower loads to meet peaks and manage intermittency	Energy Efficiency (EE) is reduced energy need; Demand Response (DR) is temporary reduction of load at peak times
Net Dependable Capacity	Summer: 100% Winter: 100%	Summer: 100% Winter: 100%	Summer: 100% Winter: 100%	Summer: 68% Winter: Near 0% Net Dependable Capacity declines as more is added	Summer: 14% Winter: 31%	Summer: 100% Winter: 100% Requires sufficient storage hours	EE: Varies by program DR: 100%
Outages	Flexible refueling, ty pically every 24 months (<20 days), Unplanned outage rate goal ~5%	Scheduled and start based maintenance; Unplanned outage rate av erages ~8%	Scheduled and start/run based maintenance; Unplanned outage rate av erages ~15%	Low lev el of planned maintenance required	Relatively low level of planned maintenance required	Relatively low level of planned maintenance required	DR calls dictated contractually and dependent on resource being online
Cost and Risk Profile	Low fuel and medium O&M cost, subject to NRC acceptance and ov ersight	Medium fuel and O&M cost, sensitive to fluctuations in gas price and av ailability	High fuel and O&M cost, sensitive to fluctuations in gas price and av ailability	Low O&M, requires management of intermittency and ramping requirements	Relatively low O&M, requires management of intermittency and ramping requirements	Relatively low O&M, requires augmentation to sustain output	DR pricing based on CT cost; EE programs can be economic but must consider cost shifting impacts



Selecting Appropriate Resource Types





Daily Load Shape and Resource Dispatch

Summer Day Load Shape





Load Dispatch on Typical Summer Day





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TVA Carries Reserves to Ensure Reliability

TVA carries a reserve margin for unplanned events related to weather, load forecast error, and system performance, targeting an industry best-practice of one loss of load event in 10 years.





Weather-driven variability

- · Temperatures / Load
- Hydrology
- · Solar and wind patterns
- Cold weather impact to unit performance

Forecast Error



Non-weather variability

- Economic cycles
- Customer mix
- Consumer behavior

Performance



System performance

- Planned outages
- Forced outages
- · Renewable generation
- · Import capability

TVA's current reserve margin planning targets are 18% Summer / 25% Winter



System Transition from Summer to Winter Focus

PAST

- Summer-peaking system
- Portfolio naturally has more capacity in winter (hydro and thermal)
- Planned for summer resource adequacy (winter was byproduct)

PRESENT

- Dual-peaking system in summer and winter
- System tight in both seasons until more solar comes online
- Using planning targets for summer and winter as system is in transition

FUTURE

- TVA system net of solar becomes clearly winter-peaking
- Portfolio naturally has more capacity in summer driven by solar additions
- Resource adequacy planning will focus on winter (summer will be byproduct)
- As other Southeast utilities adopt solar, they are also becoming winter-peaking



IRP Utilized a Rigorous Analytical Process



Stakeholder and public comments informed additional sensitivity analyses to test the impact of changes in key assumptions



IRP Portfolio Results



All portfolios point to a TVA power system that will be LOW-COST, RELIABLE, and CLEAN





Signpost Changes since the IRP



Demand for electricity

• Higher Valley in-migration driving residential growth paired with slightly higher industrial load



Natural gas prices

• Near-term COVID recovery-driven price volatility with lower fundamental prices over the longer-term



Customer expectations

· Acceleration of renewables due to customer demand



Regulatory requirements

• Biden policy shifts on climate change, pipeline challenges, Effluent Limitation Guidelines rule, etc.



Operating costs for existing units

• Better understanding of fleet investments needed, helping inform portfolio direction



Solar and wind costs

• Competitive solar RFP offers, with forecasts pointing to continued decline



Emerging and developmental technologies

• Continued advancements in storage; DOE and utility interest in advancing Small Modular Reactors



TVA's Asset Strategy Overview

TVA's asset strategy was developed based on 2019 IRP strategic direction, near-term actions, and key signposts, grounded in least-cost planning, and includes the following initiatives:



UTHORITY

Today's Resource Portfolio

FY21 Capacity 39,452 MW



Capacity aligns to FY21 10-K Net Summer Capability, adjusted to include demand response programs. Planning capacity islower, as it accounts for Hydro and Renewable expected generation at peak, fuel blend derates, and other factors.

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In addition to power supply sources included here, TVA offers energy efficiency programs that effectively reduced 2021 energy needs by about 2,300 GWh or 1.4% (Net Cumulative Realized at System basis, 2007 base year).



FY22 Budget: Diverse and Cleaner Energy Mix



FY22 and FY30 forecasts are based on the **FY22 Budget Power Supply Plan**. In addition to power supply sources included here, TVA offers energy nefficiency programs that will reduce 2022 energy needs by about 2,500 GWh or 1.6% (Net Cumulative Realized at Systembasis, 2007 base year).



Recent Fuel Market Challenges & Rate Impacts

Brian Child - Vice President, Enterprise Planning

December 8, 2021



Agenda

What caused industry-wide fuel impacts?

What are we doing?

What is the impact?

How is TVA positioned?

What are the talking points?



What caused industry-wide fuel impacts?

Industry-wide fuel supply impacts

Coal and gas price appreciation

TVA's current state: loads



Industry-wide Fuel Supply Impacts

2020: Demand loss led to record low gas prices resulting in coal industry disruption

2021: Demand spike led to pricing volatility and winter fuel supply concerns

Coal: Coal conservation efforts initiated to ensure winter readiness

Natural Gas: Geographic location, contracting strategies, and hedging reduce risk



Coal and Gas Price Appreciation

Significant fuel price increases over past two months

	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21
Natural Gas (HH \$MMBtu)	\$3.00	\$2.90	\$2.47	\$2.76	\$2.85	\$2.59	\$2.93	\$2.98	\$3.62	\$4.04	\$4.37	\$5.84
ILB Coal (\$/ton)	\$31.88	\$32.03	\$32.73	\$33.46	\$33.89	\$34.50	\$34.93	\$38.45	\$47.47	\$55.01	\$62.76	\$93.00
PRB Coal (\$/ton)	\$11.69	\$11.85	\$11.87	\$11.90	\$11.95	\$11.99	\$11.95	\$12.22	\$12.81	\$13.59	\$17.12	\$34.50

Natural Gas amounts shown are monthly settle price. Coal amounts are monthly average. Oct 21 as of 10/13/2021.



TVA's Current State: Loads

2021 had highest annual energy sales since 2008

~70K residential customers added June 2020-May 2021, ~75% above 2016-2020 average

Strong economic recovery driving higher commercial and industrial loads

Recent major economic development announcements driving near-term load growth



What are we doing?

System resiliency actions



System Resiliency Actions

Coordinating coal conservation efforts to ensure winter preparedness

- Curtailing coal generation to build coal inventories
- Monitoring actual performance against established targets

Proposing financial incentives to transportation providers to meet contracted coal needs Adding firm transport for simple cycle CT supply

Actively exploring all viable coal supply options including non-traditional sources Assessing feasibility of off-system energy and capacity purchase opportunities Utilizing industry peer network to explore benchmarking and synergies Leveraging longer-term natural gas products in lieu of daily if supply surety will benefit Fuel oil inventory at gas plants

- Maintaining higher than seasonal normal levels of fuel oil at key sites
- Evaluating topping off tanks for ~three to five days of run at maximum storage capacity



What is the impact?

Illustrative impact of fuel volatility



Illustrative Impact of Fuel Volatility

Gas price ranges of \$5-\$7/MMBtu result in wholesale rates 7%-10% higher than FY22P





How is TVA positioned?

Generation mix and percent hedged Movement in fuel prices Natural gas generation and retail rates



TVA Well Positioned

TVA's Portfolio Diversity

• 80% hedged

Natural Gas Hedging

- 100% of anticipated burn for winter season is volumetrically contracted
- 35-40% of anticipated burn for winter season is at a fixed price sub \$3/MMBtu

Natural Gas Price Forecast

- Backward-dated and collapses toward budget levels in the 2024-2025 timeframe which will directly impact fuel rate
- Financial hedging can reduce volatility risk in out years

Natural Gas Physical Supply

- Six major pipelines, plus the East Tennessee Gas pipeline, pass near or through TVA's service territory providing access to some of the largest, most liquid markets in the United States
- Storage allows TVA to shift dispatch options in order to conserve coal supply heading into winter



Generation Mix and Percent Hedged

FY22F

Fuel **Generation Mix Price Hedged** Hydro 7% 100% Nuclear 40% 100% Purchased Power 18% 89% Coal 13% 89% Natural Gas 22% 24% 80% Total/Weighted Average 100%



Movement in Fuel Prices



Volatility highlighted by price increases in the short- and mid-term on both natural gas and coal

Commodity curves in backwardation; stabilizing commodity costs and resulting fuel rates

Note: FY22 plan prices as of 04/06/2021 and FY22 forecast prices as of 10/05/2021. Powder River Basin Coal Price Curve is similar trend to the ILB Curve.



Natural Gas Generation and Retail Rates



^{*12-}month rolling average as of July 2021 Sources: FERC Form 1, ABB Hitachi Velocity Suite, EIA-861M, ESS



Talking Points

TVA and the utility industry are experiencing fuel-market challenges in the face of high natural gas and coal prices, winter fuel supply concerns, and an increase in electricity demand.

The combination of reductions in coal and gas production and increases in coal and gas demand and prices will result in TVA having a higher than budgeted total monthly fuel cost.

TVA has a resilient, diverse portfolio that provides numerous structural advantages in securing fuel supply and minimizing the impact of fuel price volatility.

TVA hedges a portion of its coal and natural gas needs to further insulate its customers from price volatility.

With its well-diversified portfolio and a fuel supply position that is among the most resilient in the industry, TVA currently has top quartile retail rates, and our rate competitiveness will remain strong as all utilities with natural gas or coal generation are dealing with similar challenges.






Pricing Fundamentals

Cass Larson - Vice President, Pricing & Contracts

December 8, 2021



Pricing Fundamentals

Background

• Board role

Overview

- Defining customers
- Rate components
- Defining costs

Considerations

- Guidelines
- Discussion of trade-offs
- Tension between marginal cost and average cost
- Evolution to goals



The TVA Act

- Authorizes the TVA Board to set rates for TVA power
- Rates must cover total costs of providing electric service plus a margin for reinvestment
- Must be set as "low as feasible"
- Should not be discriminatory between customers of the same class
- Primarily intended for rural and domestic consumers and sales to industry are a secondary purpose
- Can include in the wholesale power contracts the retail rates at which the power is to be resold

TENNESSEE VALLEY AUTHORITY ACT

AN ACT

To improve the navigability and to provide for the flood control of the Tennessee River; to provide for reforestation and the proper use of marginal lands in the Tennessee Valley; to provide for the agricultural and industrial development of said valley; to provide for the national defense by the creation of a corporation for the operation of Government properties at and near Muscle Shoals in the State of Alabama, and for other purposes.

Sec. 11. It is hereby declared to be the policy of the Government so far as practical to distribute and sell the surplus power generated at Muscle Shoals equitably among the States, counties, and municipalities within transmission distance. This policy is further declared to be that the projects herein provided for shall be considered primarily as for the benefit of the people of the section as a whole and particularly the domestic and rural consumers to whom the power can economically be made available, and accordingly that sale to and use by industry shall be a secondary purpose, to be utilized principally to secure a sufficiently high load factor and revenue returns which will permit domestic and rural use at the lowest possible rates and in such manner as to encourage increased domestic and rural use of electricity. It is further hereby declared to be the policy of the Government to utilize the Muscle Shoals properties so far as may be necessary to improve, increase, and cheapen the production of fertilizer ingredients by carrying out the provisions of this Act. [48 Stat. 65, 16 U.S.C. sec. 831j]



Rate Adjustment

A rate adjustment is an across-the-board adjustment in how much money TVA charges.

- Rate adjustments can increase or decrease the rates across all customer classes
- TVA Board approval is required to implement a rate adjustment

Rate adjustments are about overall requirements, not effective rate design changes.



Rate Change

A rate change is a fundamental change to how the rates are structured.

- A rate change is initiated by issuing a letter to notify customers of a need to change the structure
- TVA and Local Power Companies endeavor to reach agreement over a minimum of a 180-day negotiation period
- TVA Board approval is required to implement a rate change

Rate changes at wholesale should support changes at retail.



TVA Electric Service



Rate Components

Consumer Revenue

Expenditures





Consumer Load Shapes: 24-Hour Profiles

General Service (GS)



Manufacturing Service (MS)

Winter Demand Summer Demand



Winter Daily Load Comparison



LPC customer mix influences the load distribution.



TVA Key Pricing Components

Capacity

- To meet instantaneous demand across the Valley
- Costs are largely **fixed** in nature our assets

Energy

- To meet hourly energy requirements every hour of the day
- Costs are primarily fuel and purchased power, and are variable in nature



Rates: Getting to Design

STEP

3 STEP

STEP

STEP



What is the most effective way to collect those targeted revenue streams from the customers within those rate classes?

Revenue Allocation

How should that revenue be collected between classes of customers?

Cost of Service

Which classes cause the cost?

Revenue Requirements

How much money is required to run the business?



Total Monthly Fuel Cost



TVA has modified the TMFC over time to improve cost recovery based on cost causation



Rate Design: Industry Guiding Principles







Rates must track cost of service





- Rates must balance precision with simplicity
- 5. Rates must be stable



Rates must be competitive and affordable



Pricing Example



Electric $12_k = 0$ miles/yr. Gallons of gas



Gas **12**_k / **20** = **600** miles/yr. approx. MPG Gallons of gas

California Gas Tax = 39.5 (¢/g)

Contribution to Road Fund					
Electric	0 x 39.5(¢/g) = \$0.00 /yr.				
Gas	600 x 39.5(¢/g) = \$237.00 /yr.				



The Balance

The "best" rate structure balances the alignment of cost and customer acceptance from multiple perspectives; there are a range of reasonable answers.



ENNESSEE

VALLEY

Total Cost vs Marginal Cost



TVA Rate Changes: Evolution, Not Revolution

Industry Environment

Excess	
Capacity	

Growth Exceeding Supply; High Gas Price Distributed Energy Resources; Low Gas Price

Clean Energy Focus

TVA Focus

	Simplicity	Introduce	Introduce and Improve Pricing Signals		ate Alignment; dualism	Powerful Partnerships
Yea	r 1992	2011	2012 / 2013	2015	2018	2019
Desi	gn "End-Use Wholesale	Wholesal " Demand a Energy	e Introduce nd wholesale Time of Use (TO	Mandatory wholesale IU) TOU	y Adjust TOU introduce fixed cost reco	to Long-term partnerships and flexibility overy



Additional Product Offerings

Response Products

- Interruptible Power
- Instantaneous Response
- Two-Part Real-Time Pricing

Operational Flexibility

- Firm Standby Power
- Interruptible Standby Power
- Start-Up and Testing Power

Customer-Specific Credits

- Partnership Credit
- General Manufacturing Credit
- Low Density Credit
- Hydro Preference Credit
- Investment Credit



Key Takeaways

The Board is authorized through the TVA Act to set rates.

Energy usage looks different across customer groups, and pricing products aid in recovering the cost to serve various groups and individuals.

Pricing structure balances tensions, like average versus marginal costs, and alignment of cost versus customer acceptance.

We have evolved pricing to adapt to the environment and needs.







Closing Remarks



Up Next

Meeting in early June at Oak Ridge National Laboratory



