

MLGW POWER SUPPLY ADVISORY TEAM (PSAT)

ORIENTATION MEETING

APRIL 30, 2019



MLGW

SERVING YOU IS
WHAT WE DO

MLGW MISSION

(Why we exist)

To safely deliver services that create and sustain superior customer experiences.



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MGLW VISION

(Where we're headed)

To be the trusted provider of exceptional customer value in the communities we are privileged to serve.



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**COMPASSIONATE
SERVICE**

SAFETY

**THE
MLGW
WAY**

INCLUSION

INTEGRITY

OWNERSHIP



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Our Values – “The MLGW Way”

(Core principles that will guide us)

- **Safety** – We make working safely paramount...it is the most important thing we do. We seek to create and maintain a safe work environment for our people.
- **Integrity** – We seek to do the right things for the right reasons. We build trust among our people and with all of our stakeholders through honesty and ethical behavior.
- **Ownership** – We care about the MLGW enterprise and we act like owners. We treat the MLGW enterprise as we would our own and we operate with MLGW’s long-term success in mind. We pursue excellence and innovation and we are accountable for our decisions and behaviors.
- **Inclusion** – We serve customers who represent a variety of backgrounds. We are committed to including and developing a similar diversity among our teams and among those from whom we purchase products and services.
- **Compassionate Service** – We are committed to providing superior customer and people experiences. We do so with empathy, courtesy and efficiency and we serve our community with a similar passion.

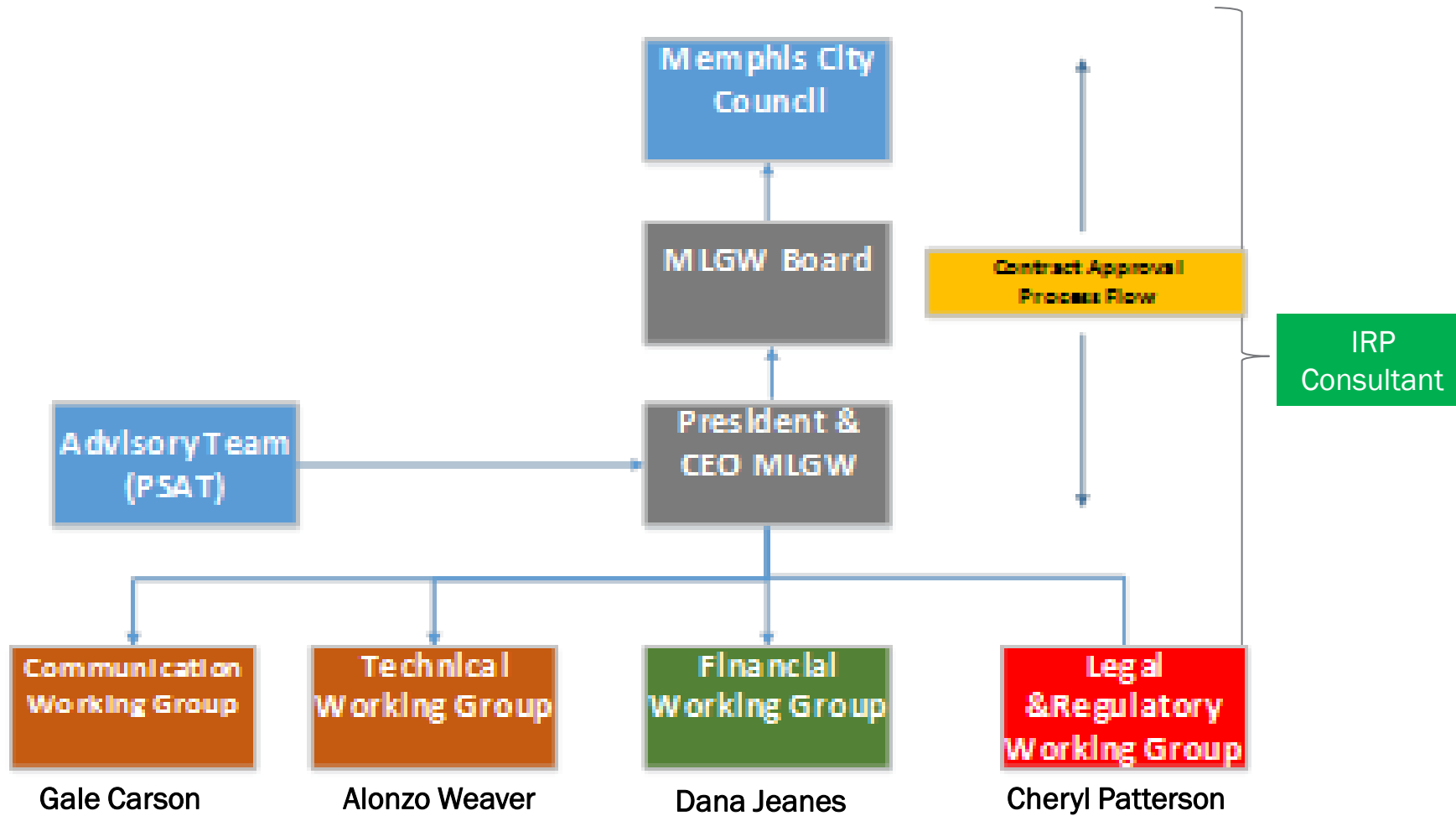


WHY ARE WE HERE?

- Provide input regarding the optimal power (electricity) supply options that meet the needs of MLGW customers for reliable electric energy...we are not the ultimate ‘deciders’
- Identify least cost, not lowest cost supply option
- Preferred supply arrangement is judged to be the most cost-effective resource mix after considering risk, supply reliability, uncertainty, and government energy resource policies
- We’re here for the duration of the process...no early exits



STRUCTURE OF POWER SUPPLY REVIEW



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CUSTOMER PERSPECTIVE

- Our customers value:
 - Reliability (certainty of supply)
 - Low/reasonable costs
 - Energy efficiency
 - Pricing options
 - Environmental stewardship



COMMUNITY PERSPECTIVE

- Our communities value:
 - Sustainability of supply & environmental stewardship
 - Economic and community development
 - Fairness
 - Partnerships and collaboration
 - Reliability & resilience of power supply (ability to withstand effects of storms and other adverse impacts)



PSAT PURPOSE

Roles/Responsibilities:

- Provide input into MLGW's Integrated Resource Plan (IRP) process from collaborative, diverse points of view
- Help MLGW consider various factors necessary to reach an optimal long-term power supply solution from the perspective of our customers and our community
- Input from this team will be used to facilitate the recommendation to MLGW's Board regarding optimal electricity resources for the next 20 years



PSAT MEETING PROTOCOLS

Expectations:

- Meeting locations will be held primarily at MLGW Administrative Building (Plans are in the works to secure other locations)
- The PSAT is expected to meet monthly for the remainder of 2019; the possibility of additional meetings in 2020
- The PSAT meetings will be working sessions and open to the general public; no public comments will be taken during the meetings



PSAT GROUND RULES

- Team members reserve the right to disagree with any position
- Only one person speak at a time; refrain from speaking or interrupting while someone is speaking
- Be succinct in your questioning so that everyone has the opportunity to speak
- “Rule of 20” – Over time, input is expected from the whole team...every team member should feel free to participate
- Focus on the topic(s) currently being discussed; limit side bar conversation



MLGW GOVERNANCE

- MLGW is a division of the City of Memphis established originally by private act of the Tennessee legislature in 1939 and amended by a Home Rule Amendment approved by the citizens of Memphis through a 1980 Referendum Ordinance
- MLGW's Charter appears as Article 65 of the Memphis City Charter and provides that the Division shall consist of a Board of Light, Gas & Water Commissioners and such subordinate officers and employees as may be selected by the Board
- MLGW's Board consists of:
 - Five (5) members nominated by the Mayor of the City of Memphis and elected by the Memphis City Council
 - Two (2) non-voting members nominated by the City Mayor, with the concurrence of the Mayors of other municipalities in the MLGW service territory
- Charter also provides for the President and CEO to be appointed by the Mayor and approved by the Memphis City Council



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MLGW GOVERNANCE (CONTINUED)

- Under the Charter, the Board of Light, Gas & Water Commissioners:
 - Has jurisdiction, control and management of energy systems . . . acquired by the City of Memphis for the manufacture, production, distribution or sale of all forms of energy including electricity. . .
 - Has the power and authority to purchase electric current from the Tennessee Valley Authority or from any other person, firm or corporation as in the judgment of said board of light, gas & water commissioners shall be proper and expedient and to enter into contracts necessary and incident to carry out this purpose, with the consent of the City Council
- At the conclusion of the IRP process a recommendation will be made by the President and CEO to the MLGW Board of Commissioners. Final decisions on the purchase of power will require approval by the MLGW Board and the consent of the City Council
- The information that you will provide as a part of the PSAT will be instrumental in assisting MLGW and the City Council in understanding the priorities of citizens in our community as it relates to various aspects of future electric service in Memphis
- The Board and Council will use the information that you provide to exercise their responsibilities under the Charter and other applicable law



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ELECTRICITY 101



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COMMON UTILITY TERMS

- **Watt** – electric unit of power of doing work (*like a step or the number of steps it takes to walk around a block*); approximately 746 watts equals one horsepower
- **Power** – rate at which energy is produced (*like how many steps it would take to walk around a block in a certain amount of time*)
- **Kilowatt (kW)** – 1,000 watts of electrical power
 - Megawatts (MW) – 1 Million watts
 - Gigawatts (GW) – 1 Billion watts
- **Kilowatt hour (kWh)** – unit used to measure energy (*like the amount of gasoline used in a car during a trip*)
- **Load** – amount of electricity delivered or required (*like the weight of clothes in a suitcase or washing machine*)
- **Voltage** – makes electric charges move; the “push” that causes charges to move in a wire (*like a hammer hitting a nail into a board*)



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COMMON UTILITY TERMS (CONTINUED)

- ***Load factor*** – ratio between average load and maximum load
- ***Capacity*** – maximum output achievable from a power plant
- ***Transformer*** – device that changes electricity from one voltage to another
- ***Power generation*** – process of generating electric power from sources of primary energy
- ***Substation*** – equipment that makes up the interface from transmission to distribution
- ***Distribution system*** – circuits that deliver power directly to customers; relatively low voltage



COMMON UTILITY TERMS (CONTINUED)

- **Transmission system** – transportation of electricity in bulk at high voltages; generally from generating unit to substation or for transfer between utility systems
- **Supply side** – choosing and orchestrating energy resources (i.e. coal, nuclear, renewables) in the most cost-effective configuration
- **Demand side** – strategies that cut back on how much electricity consumers use that helps avoid making large investments in building new power plants
- **Wholesale power** – buying and selling power between generator (i.e. TVA) and reseller (i.e. MLGW)
- **NERC** – North American Electric Reliability Corporation, a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid
- **SERC** – Southeast Electric Reliability Council, one of eight regional electric reliability councils under NERC



ELECTRICITY 101

Fuel generates energy

- Power generation starts with a source of fuel (coal, oil, natural gas, nuclear, wind, and sun) that can be harnessed to create energy

Wires move energy

- From the power plant, the energy travels through wires that can be used by factories, shopping malls, and homes

Homes and business use energy

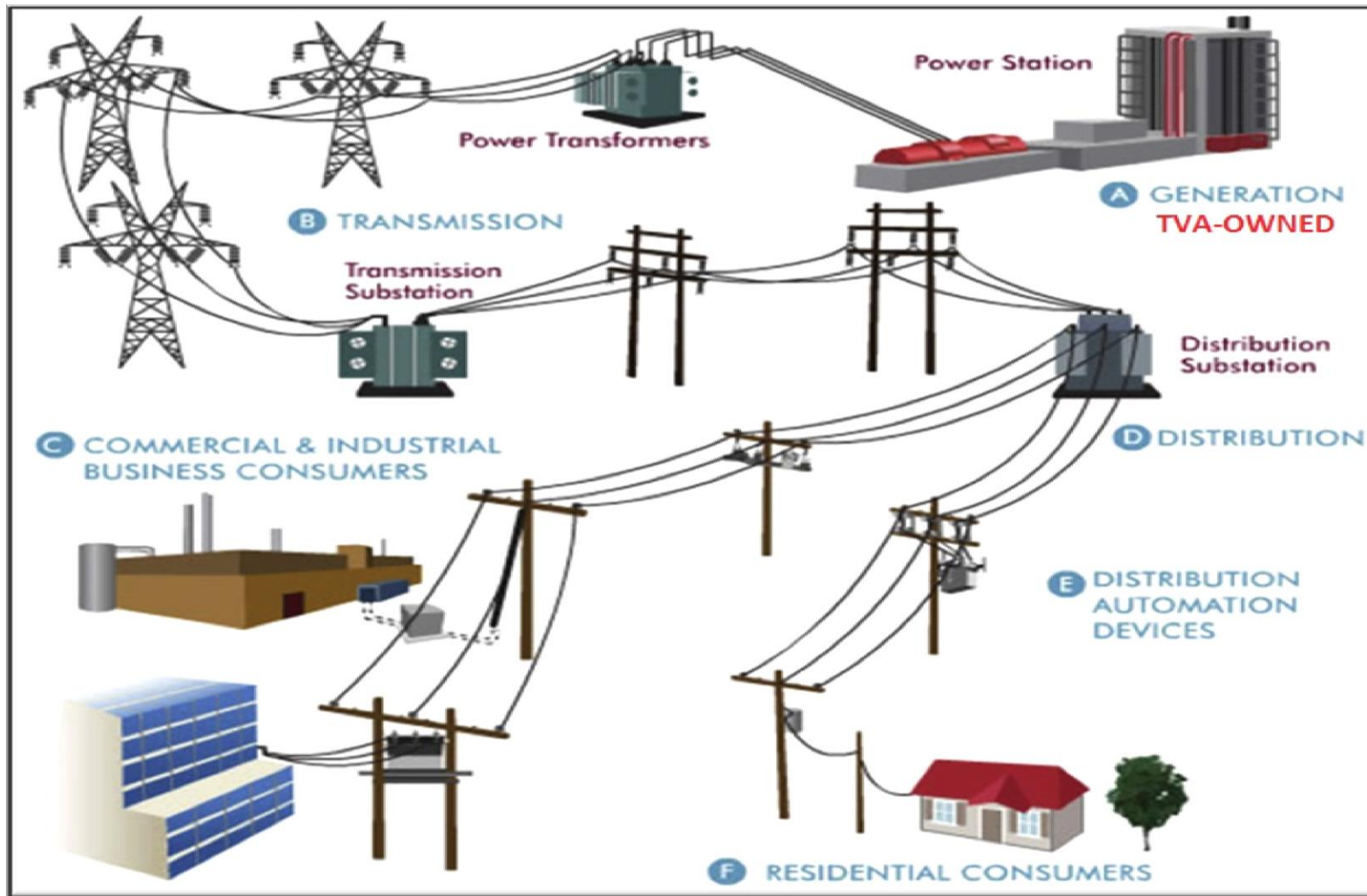
- Energy enters your business or home through a meter that measures the amount of energy you use to operate your appliances and lights



POWER GENERATION SOURCES

- Coal
- Nuclear
- Natural gas combined cycle
- Natural gas combustion turbine (CT)
- Distributed generation
- Hydro
- Renewables:
 - Solar
 - Wind
 - Biomass





MLGW ELECTRIC SYSTEM



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Power flows from the Generation Plant at 161,000 or 500,000 Volts on TVA owned transmission lines

MLGW flows power at 161,000 or 115,000 Volts on MLGW owned transmission lines to our substations

MLGW reduces the voltage at these delivery points to 161,000 or 115,000 Volts

MLGW Reduces Transmission Voltage to 12,740 or 23,000 at our Substations

12,470 or 23,000 Volts on your Street

The Voltage is reduced to 120/240 Volts for your home

IT STARTS AT THE GENERATION PLANT



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MLGW OVERVIEW



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MLGW BACKGROUND

- Nation's largest three-service municipal utility, serving more than 431,000 customers
- The Tennessee Valley Authority (TVA) has provided MLGW with wholesale electricity since 1939
- MLGW is TVA's largest customer, representing about 10 percent of TVA's total load
- MLGW owns no generation in its footprint, nor ties to other generation or transmission entities



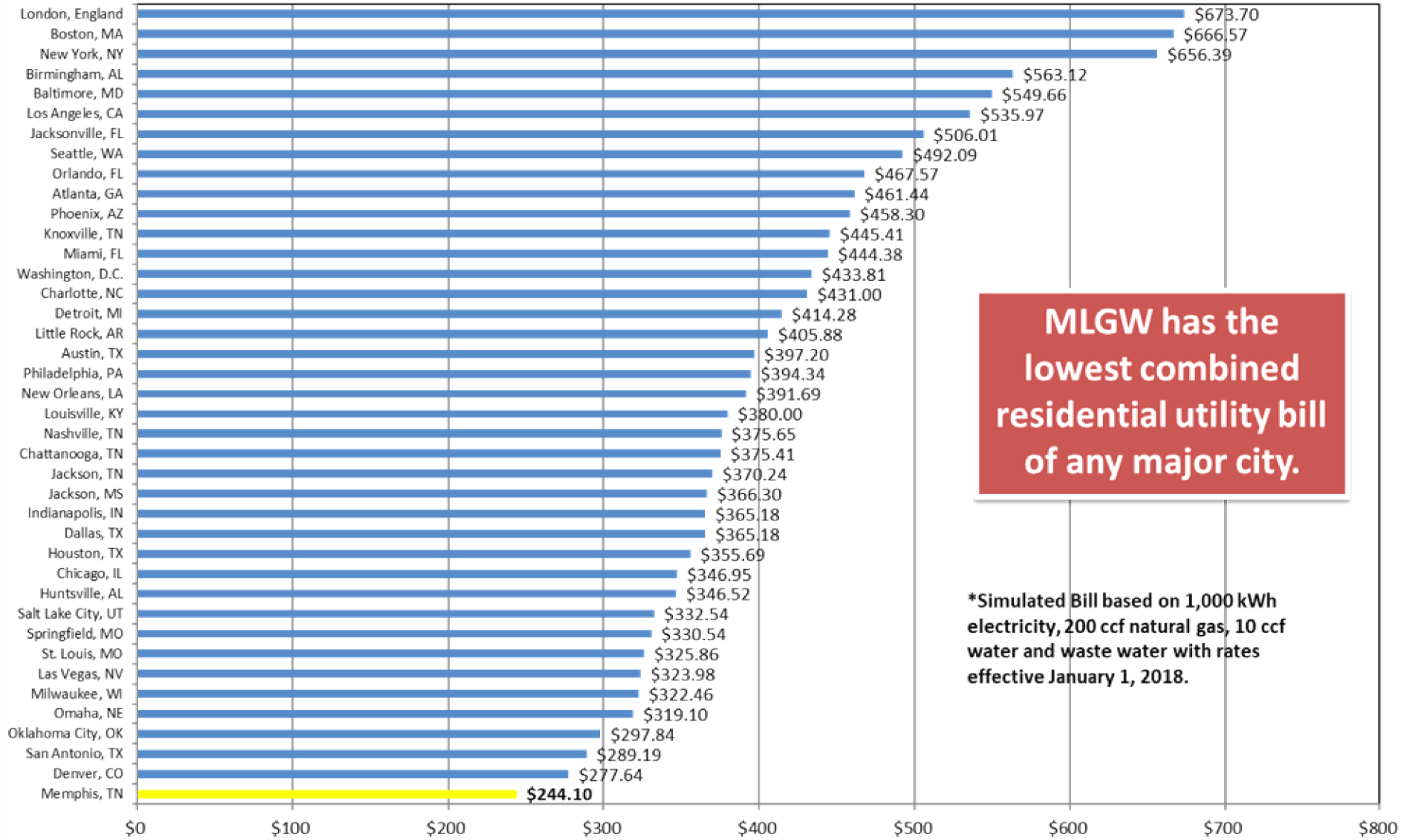
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MLGW EXISTING INFRASTRUCTURE

- Power (electricity) is received from TVA at four delivery points; six transmission level switching stations within MLGW's electric system
- MLGW owns and maintains approximately 68 miles of 115 kV and approximately 539 miles of 161 kV transmission lines with 65 substations stepping the voltage levels down to 23 kV and 12 kV
- Plus 18 miles of underground 115kV transmission
- Load reached 3,097 MW in the summer of 2018; peak load levels of 3,533 MW in the summer of 2007



National Residential Combined Bill Comparison*



MLGW has the lowest combined residential utility bill of any major city.

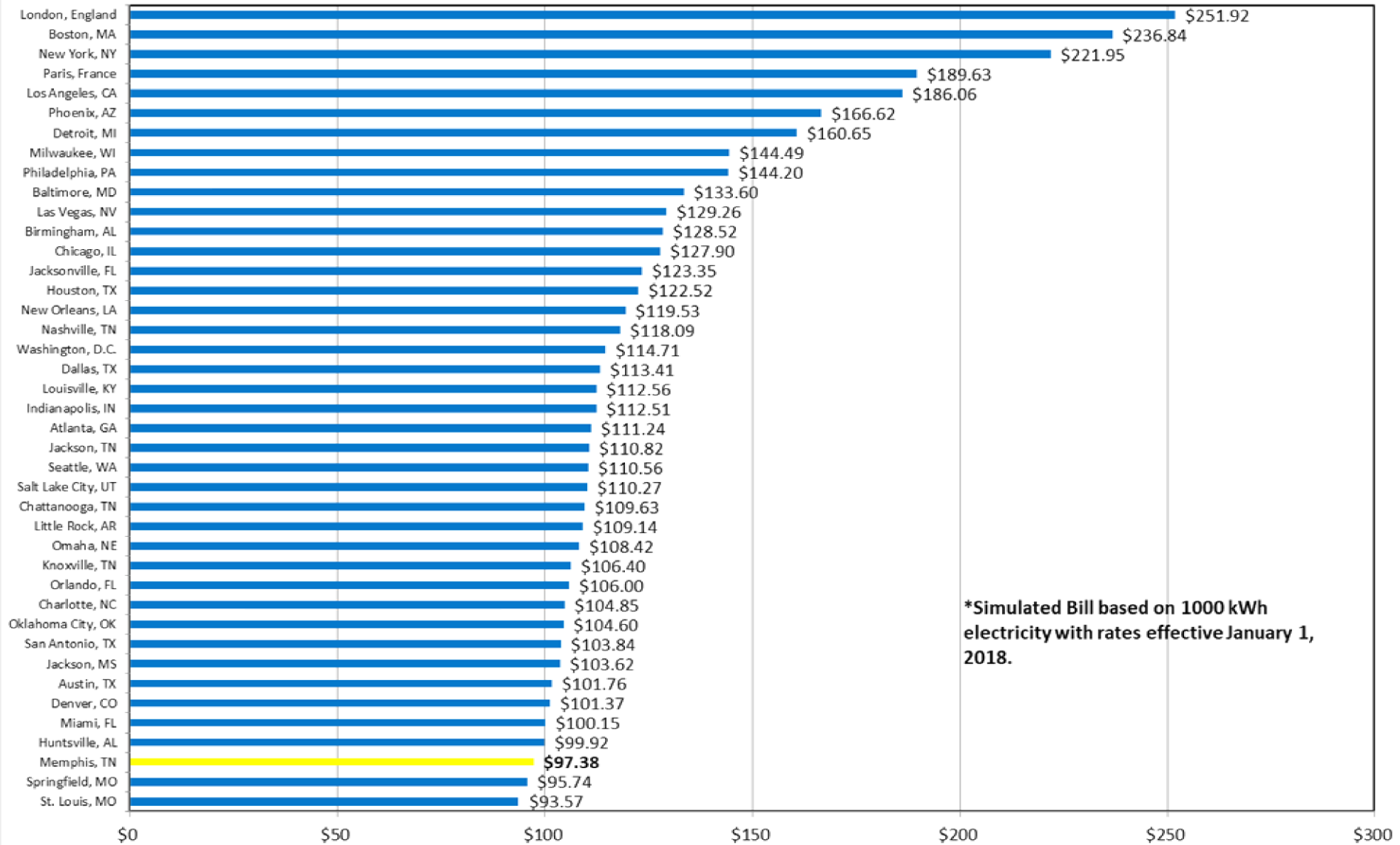
*Simulated Bill based on 1,000 kWh electricity, 200 ccf natural gas, 10 ccf water and waste water with rates effective January 1, 2018.

RESIDENTIAL BILL TOTAL



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National Residential Electric Bill Comparison*



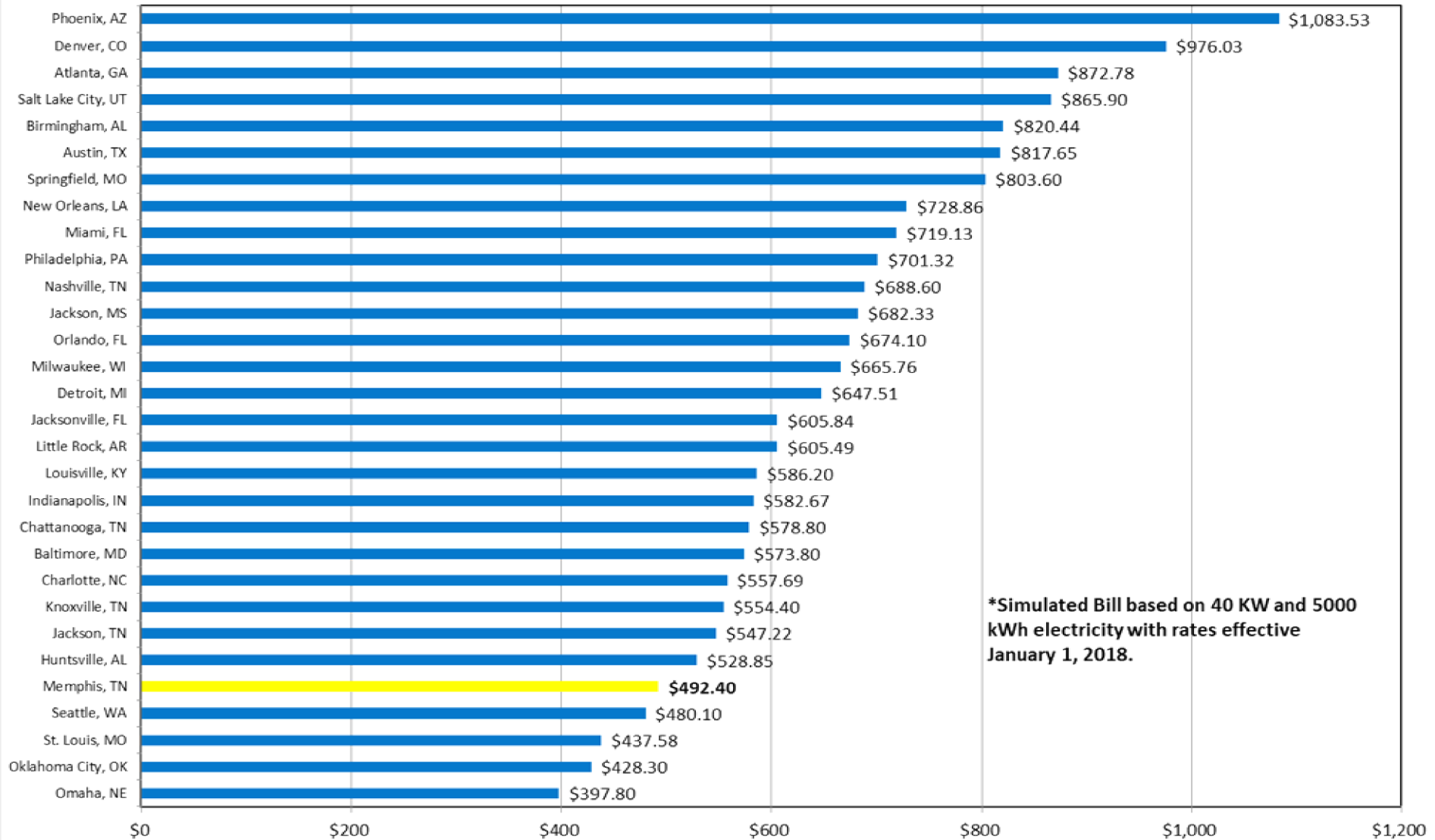
RESIDENTIAL ELECTRIC



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National Small Commercial Electric Bill Comparison*



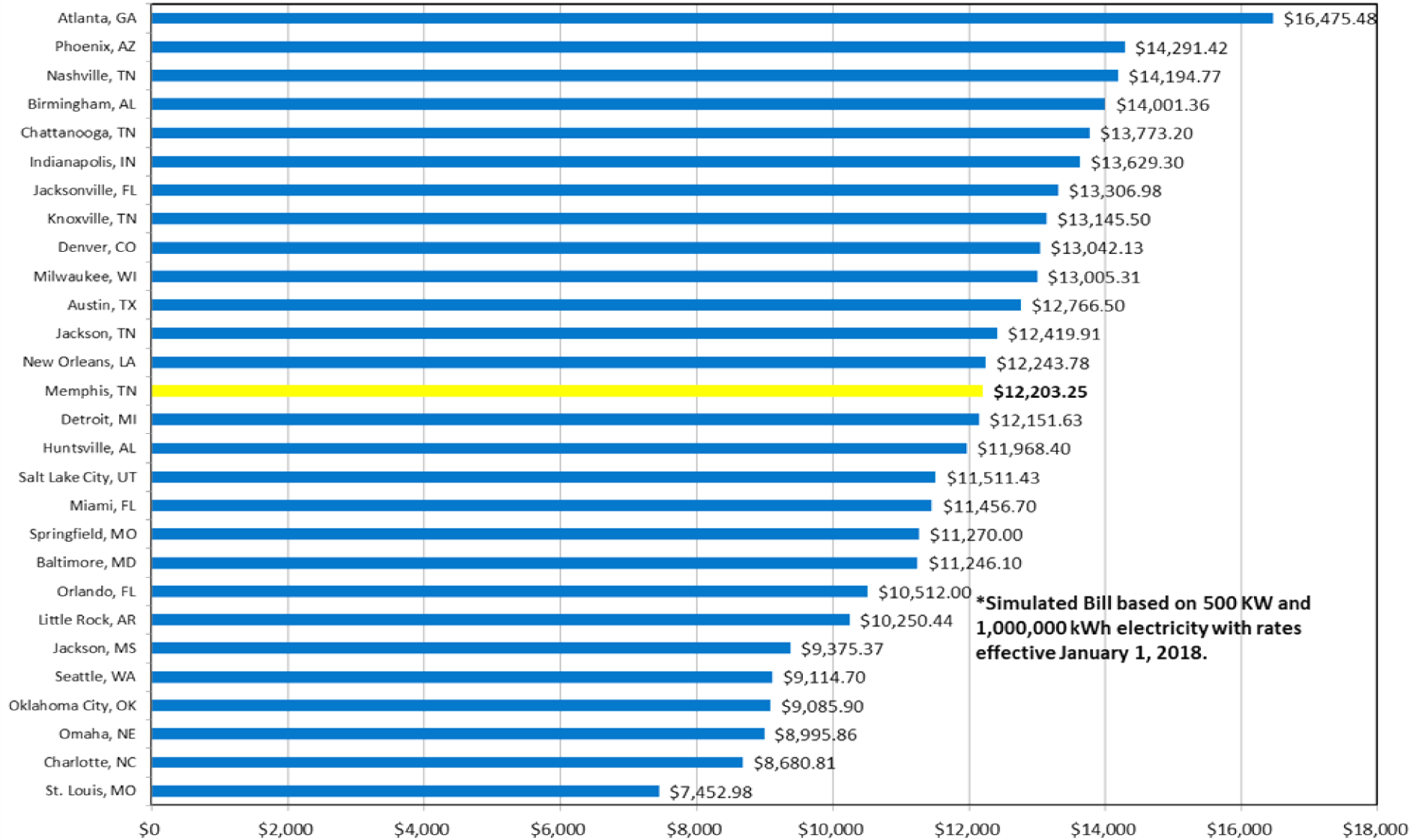
SMALL COMMERCIAL ELECTRIC



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National Large Commercial Electric Bill Comparison*



LARGE COMMERCIAL ELECTRIC



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MLGW/TVA OVERVIEW



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WHOLESALE POWER CONTRACT

- Current effective contract dates back to December 26th 1984
- Over 150 Contract Supplements to the original contract, Some Key Supplements are:
 - Supplement 17, May 1990, Transmission Credit
 - Supplement 80, August 2002, Retail Rate Authority, 5 Year Notice Provision, No Stranded Cost Recovery
 - Supplement 95, November 2003, Prepay Agreement



KEY POINTS ABOUT MLGW

- MLGW does not own or operate any generation facilities, nor are there any Generator Owners within the MLGW TOP area
- Likewise, MLGW has no blackstart resources (engines to crank up) or capacity; we are dependent upon TVA, our only neighboring Transmission Operators (TOP), for restoring any loss of Interconnection



MLGW'S RELATIONSHIP WITH TVA

- TVA will be here next month to provide more info and background
- TVA's planning studies include MLGW's territory
- MLGW relies on TVA to perform calculations of Capacity Benefit Margin (CBM), Transmission Reliability Margin (TRM), and Available Transfer Capability (ATC)
- TVA performs seasonal, next-day, and current day studies that include MLGW's transmission system



MLGW'S RELATIONSHIP WITH TVA

- MLGW's service territory is wholly within the SERC Reliability Corporation region and the metered boundaries of TVA
- We have a full-requirements power contract with TVA
- MLGW represents approximately 10% of TVA's system load
- Until MLGW registered with North American Electric Reliability Corporation (NERC) in 2010 and 2011, MLGW had been included under TVA's reporting umbrella
- In 2014, MLGW and TVA entered into a Coordinated Functional Registration (CFR) that sets forth shared responsibilities for MLGW's Transmission Operator functions



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MLGW'S RELATIONSHIP WITH TVA

Besides supplying MLGW's total power needs, TVA acts in several NERC defined important roles for MLGW, including:

- Reliability Coordinator
- Balancing Authority
- Planning Coordinator
- MLGW's only neighboring Transmission Operator (MLGW has no other ties to other neighboring operators such as MISO)



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WHOLESALE POWER COST

- MLGW spends about \$1 billion annually
- Transmission charge
 - Typically maximum demand based, \$/kW-month or \$/kW-year
- Demand charges (Capacity), \$/kW
- Variable energy charge, \$/kWh
- Fuel rate, \$/kWh
- Current TVA Wholesale Rates for Standard Service (below 5MW)

TVA Wholesale SS TOU		10/1/2018
Demand		Effective
Onpeak demand (summer)	8.26	Jun-Sep, Weekdays, 1pm-7pm
Onpeak demand (winter)	7.31	Dec-Mar, Weekdays, 4am-10am
Onpeak demand (transition)	7.31	Apr, May, Oct, 1pm-7pm , Nov 4am-10am
Maximum demand	3.04	Anytime maximum demand
Non-Fuel Energy		Effective
SummerOn	0.05754	Jun-Sep, Weekdays, 1pm-7pm
SummerOff	0.03554	Jun-Sep, all other hours
WinterOn	0.04719	Dec-Mar, Weekdays, 4am-10am
WinterOff	0.03719	Dec-Mar, all other hours
Transition	0.03782	all other months, all hours

Priority Information

CustomerConnections



May 2019 Total Monthly Fuel Cost Information

The May 2019 Total Monthly Fuel Cost information is now available at TVA's Online Connection. For billing periods beginning May 1, 2019, TVA's total monthly fuel cost will be 1.658 cents per kilowatt-hour for standard service classes, and 1.602 cents per kilowatt-hour for Large Manufacturing customers (with contract demands greater than 5 MW) and 1.610 cents per kilowatt-hour for Large General Service customers (with contract demands greater than 5 MW).



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TVA POWER INVOICE CATEGORIES (FY2018)

- Standard Service customers - electric demand is less than 5,000 kW (5MW)
- Non-Standard service - customers above 5,000 kW who have specially designed wholesale rates that are based on their flatter load shape
- Hydro credits are primarily residential. The TVA Act allocates the value of hydro to residential customers.
- The other credits are primarily geared toward manufacturing type customers
- Prepay Credit expired in November 2018

Standard Service	
Delivery Point Charges	\$1,122,000.00
On-Peak Demand	\$184,996,689.09
Max Demand	\$73,984,722.56
On-Peak Energy	\$118,896,478.30
Off-Peak Energy	\$345,800,101.57
TVA Fuel Cost Adjustment	\$227,298,786.59
Subtotal	\$952,098,778.11
Large General/Manufacturing Service	
TVA Administrative Fees	\$147,350.00
On-Peak Demand	\$34,145,657.64
Max Demand	\$6,735,782.88
On-Peak Energy	\$18,137,781.49
Off-Peak Energy	\$24,121,494.15
TVA Fuel Cost Adjustment	\$39,404,117.26
Subtotal	\$122,692,183.42
Other Charges and Credits	
Hydro Credit	-\$6,652,576.89
VII Credit	-\$11,944,401.21
Manufacturing Credit	-\$2,020,338.41
IP5 Credit	-\$384,205.65
Green Power/Generation Partners	-\$271,297.14
Prepay Credit	-\$18,238,518.10
Miscellaneous	\$618,147.50
Subtotal	-\$38,893,189.90
2018 Total	\$1,035,897,771.63



INTEGRATED RESOURCE PLAN (IRP) & TRANSMISSION ANALYSIS (TA)



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INTEGRATED RESOURCE PLAN (IRP)

History

- Borne out of financial crises in the 1970s and 1980s
- Utility companies investing in expensive power plants that were not needed:
 - Long Island Lighting Co. (New York), Shoreham Nuclear Plant begin construction in 1968
 - Completed 20 years later at 15 times the projected cost (\$350 M)
 - Plant never went into commercial operations
 - Sold to the state of New York for \$1 in 1989



INTEGRATED RESOURCE PLAN (IRP)

What is it?

- A comprehensive roadmap to meet forecasted energy demand using both supply and demand side resources to ensure reliable service to customers in the most cost-effective way
- Most commonly, 20 year planning horizon, with a detailed implementation plan for the first few years and a required update every two to three years
- Addresses risks and uncertainties inherent in utility industry
- 33 states - either by state statute or regulation - require utilities to file publicly available IRPs or their equivalent with their Public Utility Commission (PUC)



INTEGRATED RESOURCE PLAN (IRP)

Utility risks and uncertainties

- Electricity demand
- Market power prices
- Natural gas, coal, solar prices
- Storage prices
- Carbon emissions regulation
- Distributed generation penetration
- Energy efficiency adoption
- Economic outlook



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INTEGRATED RESOURCE PLAN (IRP)

Key processes

- Establish scope and objectives
- Develop demand forecast
- Investigate electric supply options and demand-side management options
- Prepare and evaluate supply plans and demand-side management plans
- Integrated supply and demand-side plans into a computer simulation model to generate multiple scenarios
- Select preferred plan (the *optimal* electric supply option)



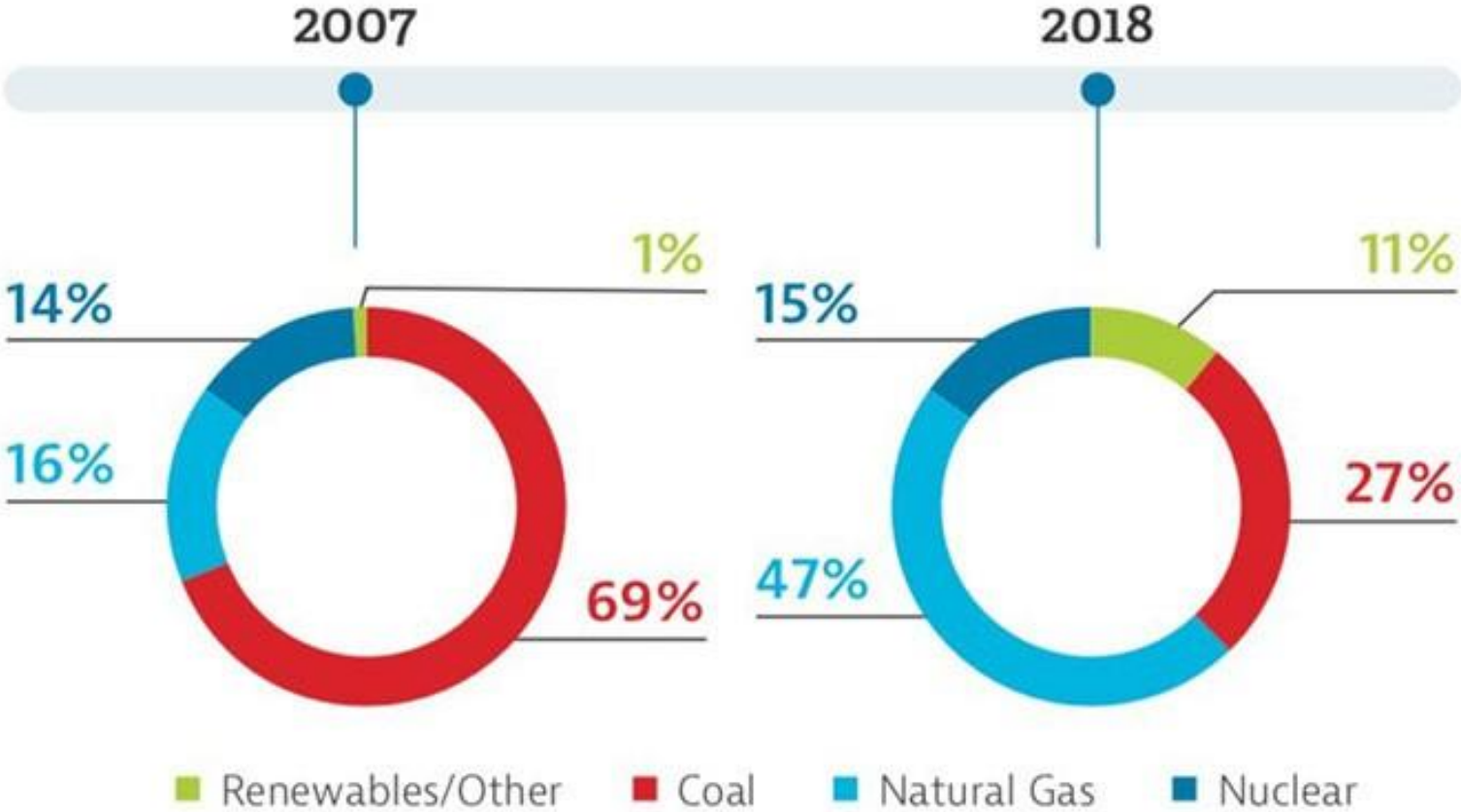
INTEGRATED RESOURCE PLAN (IRP)

Why now?

- To evaluate the current MLGW-TVA “All-Requirements” Wholesale Power Agreement versus that of entering into the Wholesale Power Market
- New technologies (i.e. distributed generation) and changing regulatory environments are transforming the current energy mix
- Resource planning is paramount to ensure utilities can provide least cost and reliable service to their customers



Energy Mix*



SOUTHERN COMPANY GENERATION MIX



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TRANSMISSION ANALYSIS (TA)

Transmission Analysis as part of an IRP

- Includes general upgrades/additions to the transmission system to provide reliable electric service at the lowest reasonable cost
- May assume some form of “de-integration” with TVA utilizing point-to-point transmission service and/or new construction
- Includes transmission costs to integrate new supply side resources into the MLGW system, either new-build generation or imports from other utilities



UTILITIES TO COMPLETE IRP IN THE PAST 5 YEARS

Alabama Power:

- Most recent IRP 2016
- IRP conducted every 3 years

Entergy Arkansas:

- Most recent IRP 2018
- IRP conducted every 3 years

Tennessee Valley Authority:

- Most recent IRP 2015
- 2019 IRP currently being conducted



POWER SUPPLY STUDIES



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ICF-NUCLEAR DEVELOPMENT STUDY

- Looks at Power Purchase Agreement for output of Bellefonte Nuclear Plant with MISO Integration
- 5 exit strategies were analyzed
- Partial transmission analysis included
- ***Most economic strategy:*** MLGW joins MISO and purchases Bellefonte 1 power using Physical Hedging to cover incremental power needs
- ***Net Savings:*** \$7.9 Billion over 20 years (2024-2043)
- ***Recommendation:*** no clear recommendation



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ACES POWER MARKETING

- Summary of potential savings for MLGW integrating into MISO
- 22 power supply portfolios were analyzed
- No transmission analysis included
- ***Most economic portfolio:***
 - 7% MISO
 - 51% 1,000 MW Market Purchase
 - 13% 900 MW Combined Cycle
 - 25 % 1,000 MW Solar + 500 MW Wind
 - 4% 650 MW Quick Start Peaking
- ***Identified savings:*** 9.2 Billion over 15 years (2024-2038)
- ***Recommendations:*** obtain a full cost-benefit analysis from MISO, and conduct a formal RFP for developers to provide baseload power to MLGW



GDS ASSOCIATES INC. (MLGW STUDY)

- Analysis of Power Purchase Agreement for output of Bellefonte Nuclear Plant with and without MLGW – MISO integration
- 4 scenarios analyzed
- No detailed transmission deliverability analysis
- ***Most economic scenario:*** MLGW is its own Balancing Authority pseudo-tied to MISO with MISO Purchases Only
- ***Identified Savings:*** \$417.8 MM for 1 year (2022)
- ***Recommendations:*** MLGW develops a complete Integrated Resource Plan (IRP)



THE BRATTLE GROUP (FRIENDS OF THE EARTH)

- Analysis of MLGW purchasing renewable portfolio with MISO Integration
- 6 alternatives analyzed – 3 short-term, 2 long-term
- No transmission analysis
- **Most economic alternative:** “Cost-Minimizing Local” – development of gas-fired combined-cycle and combustion turbine units, and development of locally available utility-scale and distributed solar PV resources
- **Identified Savings:** \$333 MM per year (2024)
- **Recommendations:** MLGW ends contract with TVA and constructs a portfolio of renewables, battery storage, and natural gas powered energy



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	<u>ICF</u>	<u>ACES</u>	<u>Brattle</u>	<u>GDS</u>	<u>IRP</u>
20 year load forecasting	No	No	No	No	Yes
Transmission analysis	Partial	No	No	No	Yes
20 year Present Value (PV) of revenue requirements	No	No	No	No	Yes
Risk evaluation (i.e. fuel price volatility, carbon taxes, electric demand)	No	No	No	No	Yes
Public involvement throughout process	No	No	No	No	Yes
Evaluate current and future staffing requirements	No	No	No	No	Yes
Business or special interest led analysis	Yes	Yes	Yes	Yes	No
Scenario and sensitivity analysis to ensure least-cost supply option	No	No	No	No	Yes

SUPPLY STUDIES VS. INTEGRATED RESOURCE PLAN



MLGW REQUEST FOR PROPOSAL (RFP) OVERVIEW



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RFP DELIVERABLES

- 20-year Present Value of Revenue Requirements (“PVRs”) for the cost of each supply option (including sensitivity and probabilistic analyses)
- An assessment of MLGW’s current staffing, skillset, SCADA upgrades and facilities with recommended changes based on Industry Best Practices
- Supply options and transmission analyses to include:
 - Business-as-usual Option
 - Self-build Option
 - MLGW-MISO Option
 - Combination Option (blend of Self-build and MLGW-MISO)



RFP TIMELINE – STANDARD SCHEDULE

- 05/17/19: RFP responses due to MLGW
- 05/31/19: Score Proposals
- 06/17/19: Notice of intent to award
- 07/09/19: Award date
- 07/15/19: Project kick-off meeting
- 11/08/19: Progress Report
- 01/17/20: Progress Report
- 03/27/20: Progress Report
- 06/01/20: Final IRP due to MLGW



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RFP TIMELINE – PREFERRED SCHEDULE

- 05/17/19: RFP responses due to MLGW
- 05/31/19: Score Proposals
- 06/17/19: Notice of intent to award
- 07/09/19: Award date
- 07/15/19: Project kick-off meeting
- 09/06/19: Progress Report
- 10/18/19: Progress Report
- 12/13/19: Final IRP due to MLGW



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NEXT STEPS



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COMMUNITY ENGAGEMENT MEETINGS

- MLGW contractor will facilitate community engagement meetings
- MLGW plans to host 3 to 4 meetings in Memphis and Shelby County
- All community meetings will be open to the public
- Community stakeholders are encouraged to give their input to the IRP process
- Public feedback will be factored into the final IRP analyses



NEXT MEETING TOPICS

- Review information from previous meeting
- Solicit PSAT team member input
- TVA Overview – Current & Future State



QUESTIONS



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