MLGW Integrated Resource Plan
Community Engagement Meeting
November 21, 2019
Agenda

- MLGW Opening Remarks / Safety brief
- IRP Schedule
- Recap of Past PSAT Meetings
- IRP Analysis Update
- Comments and Q&A
IRP Schedule

Where we are today

- Finalizing all input assumptions: Underway
- Finalized all Strategies and Scenarios: Will discuss today
- Generation Expansion Plan (MISO and Self Supply): Underway
- Modeling of other Strategies and Scenarios: Underway
- TVA is still responding to data requests: Still incomplete
- Transmission Analyses: Underway

What we plan to present in the next Community Engagement meeting on March 25 2020

- Completed Generation Expansion Results of all Strategies and all Scenarios
- Risk Analysis & Transmission Analysis results
- Recommendations, selected supply option (portfolio), Gap Analysis
Recap of past PSAT meetings
Recap of 10/17 PSAT Meeting

**PSAT members responded to questions on Demand Forecast, Gas / Supply, and LTCE Topics**

1. Demand Forecast feedback (*Siemens updated its load forecast with latest 2019 data*):
   - Load growth is expected to be generally flat, EE and small DG will offset population or EV growth.
   - Rooftop PV or EV adoption should be considered without incentives (adoption should be based on economics).

2. Gas and Supply Options feedback:
   - Combined Cycle plants should be considered as a viable option.
   - Small Modular Nuclear does not appear to be viable today due to the cost, but could become more attractive in the future if technology advanced significantly.
   - Bellefonte Nuclear should not be considered as a viable option in this study.

3. Generation Capacity Expansion Plan (LTCE) feedback
   - The Renewable Portfolio Standard (RPS) goal for Strategy 3 should be relatively low in the Reference Scenario (5%-15% considered).
   - An annual capital expenditure limit should be considered (i.e. 3 times annual payment to TVA, ~$3B).
   - Net market exports should be limited to minimize excess generation.
   - Purchase from MISO capacity market is an option to meet reserve margin.
Recap of 11/7 PSAT Meeting

- This meeting was mainly to allow ICF and Friends of Earth/Brattle to present their studies.
- Both groups recommended to drop TVA. TVA will respond to various studies and claims in a subsequent meeting.

ICF- Mr. Judah Rose

- Cases studied:
  - Case 1: Business As Usual case (Stay with TVA)
  - Case 2: Joining MISO with Bellefonte PPA and supplemented by MISO power providers
  - Case 3: Joining MISO with power from MISO

- Claimed cost savings:
  - Case 1 BAU cost: $1,154 M in 2024, and $46,776 M for 30 years starting 2024
  - Case 2: Cost savings $416 M in 2024, and $15,347 M for 30 years
  - Case 3: Cost savings $416 M in 2024, and $5,074 M for 30 years
Recap of 11/7 PSAT Meeting

- ICF recommended changes MLGW to make:
  - Apply for MISO membership and have MISO to serve as Balancing Authority
  - Have MISO engineers study the transmission requirements - now
  - Send out RFP to solicit power supplies, RFP organized by 3rd party
  - Transmission studies and RFP process can be completed within a few months
  - Claimed no obligation for MLGW after transmission studies and/or power supply side RFPs

Several questions were raised in the PSAT breakout session for ICF/Bellefonte developer:
- PSAT Committee decided not to consider the Bellefonte option further (considered too risky)
- Concern over current disputes over ownership, the age of the mothballed unit, completing project on cost and time
Recap of 11/7 PSAT Meeting

Friends of Earth/Brattle Group – Mr. David Freeman (ex TVA CEO)

- Claimed cost savings of $240-333 M in 2024, or one third lower than costs incurred under current TVA contract
- Claimed difference will increase as costs for renewable technologies keep decreasing
- By going to market, Memphis is “virtually guaranteed” lower prices, and leaves behind massive economic and environmental liabilities by TVA with “virtually guaranteed” rate increases
- Energy Efficiency program and renewable energy projects will generate hundreds of jobs
- Rich in renewable energy will help to keep and capture major companies committed to sustainability
- Will Meet Climate Action Plan goals

**Final recommendations:**

- Strongly supports city and utility in conducting independent IRP
- On the basis of IRP recommendations, encourage city leaders to provide TVA with five year notification
- Immediately seek alternative supply options in the market - prioritizing renewable energy, storage and efficiency
- Assure that alternate supply drives economic development in the city
- Initiate ambitious energy efficiency program to cut load and save ratepayers money
**Final Strategies and Scenarios**

**Strategy***
- Strategy 1: TVA (Full requirement contract)
- Strategy 2: Full MISO (Full market purchase from MISO)
- Strategy 3: MISO + Self Supply
  *Self Supply dropped

**Scenario**
- Scenario 1: Reference Scenario
- Scenario 2: High Regulation
- Scenario 3: High Technology
- Scenario 4: Climate Crisis
- Scenario 5: No Inflation

**Future state of the world**
**Details on Scenario assumptions included in Appendix

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**LTCE Case Nomenclature**

Strategy #  Scenario #

Total Planned LTCE Cases

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Strategy 1*</th>
<th>Strategy 2*</th>
<th>Strategy 3</th>
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<tbody>
<tr>
<td>Scenario 1</td>
<td>S1S1</td>
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<td>S3S1</td>
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<tr>
<td>Scenario 5</td>
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<td>S2S5</td>
<td>S3S5</td>
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</tbody>
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*Only one resource portfolio under full MISO or TVA Strategy, costs will vary among scenarios; Five resource portfolios under Strategy 3 due to variations from self-build
## Transmission Analysis (on-going)

- **Strategy 1**: TVA, BAU for transmission
- **Strategy 2**: MISO Market only: 2 options: Negotiate deal with TVA for full or partial access
- **Strategy 3**: MISO+Self Supply: 3 options: Deal, Middle-Ground, and No-Deal are all possible

<table>
<thead>
<tr>
<th>Wheeling Fee</th>
<th>Exit Fee</th>
<th>New Transmission</th>
<th>Reliability</th>
<th>Self-Supply</th>
<th>Total Transmission Cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deal</td>
<td>Full, high fee</td>
<td>High, one-time</td>
<td>Minimal connection required to join MISO, some new facilities required for interconnection of new resources</td>
<td>As is</td>
<td>Flexible, moderate</td>
</tr>
<tr>
<td>Middle-Ground</td>
<td>Partial, low fee</td>
<td>Medium, one-time</td>
<td>Strong connection, capacity to cover peak load less self supply. Duplicated facilities. Some interconnection.</td>
<td>Stronger, for both</td>
<td>Flexible, moderate</td>
</tr>
<tr>
<td>No-Deal</td>
<td>No fee</td>
<td>No</td>
<td>Strong connection, Strategy 2 likely infeasible, Strategy 3 likely feasible. Duplicate facilities raise costs. Some interconnection.</td>
<td>Compliant but reduced for both</td>
<td>Strong self-supply required</td>
</tr>
</tbody>
</table>

*Transmission costs are preliminary and subject to refinement*
Net Average Load Forecast

- Regression modeling suggests a reduction in average load in the near term (5 years).
- Net adjustments from EE and Distributed solar offset the EV growth.
- Updated the load forecast to reflect known development loads in downtown.
- Peak forecast reflects new development in downtown Memphis. Amazon and FedEx add significantly to the peak.

- New development and EV growth more than offset DS and EE reductions.
Questions
**Glossary**

- **All-in Capital Cost** = The capital costs for building a facility within the plant boundary, which includes equipment, installation labor, owners costs, allowance for funds used during construction, and interest during construction.
- **Appalachia Basin** = Marcellus Shale Play and Utica Shale Play.
- **Average Demand** = Average of the monthly demand in megawatts.
- **Average Heat Rate** = The amount of energy used by an electrical generator to generate one kilowatt hour (kWh) of electricity.
- **Baseload Heat Rate** = The amount of energy used by an electrical generator to generate one kilowatt hour (kWh) of electricity at baseload production. Baseload production is the production of a plant at an agreed level of standard environmental conditions.
- **Breakeven Cost** = Average price of gas required to cover capital spending (ideally adjusted to regional prices).
- **BAU** = Business As Usual
- **BTU** = British Thermal Unit = unit of energy used typically for fuels.
- **CF** = Capacity Factor. The output of a power generating asset divided by the maximum capacity of that asset over a period of time.
- **CC** = Combined Cycle
- **EE** = Energy Efficiency
- **CCS** = Carbon Capture and Sequestration
- **CT** = Combustion Turbine
- **DER** = Distributed Energy Resources, distributed generation, small scale decentralized power generation or storage technologies
- **DS** = Distributed Solar
- **Dth** = Dekatherm (equal to one million British Thermal Units or 1 MMBtu)
- **EFT** = Enhanced Firm Transportation (varies by pipeline but can include short- or no-notice changes to day-ahead nominations of fuel delivery
- **FID** = Final Investment Decision
- **FOM** = Fixed operations and maintenance costs
- **FT** = Firm Transportation. FT capacity on a natural gas pipeline is available 24/7 and is more expensive than interruptible transportation (IT) capacity but unused FT capacity can be sold on secondary market.
- **Futures** = Highly standardized contract. Natural gas futures here are traded on the New York Mercantile Exchange (NYMEX) or Chicago Mercantile Exchange (CME).
- **GT** = Gas Turbine
Glossary

- PPA = Power Purchase Agreement; contract to purchase the power from a generating asset
- IPP = Independent Power Producer
- IRP = Integrated Resource Plan
- LNG = Liquified natural gas
- LCOE = Levelized cost of energy
- LOLE = Loss of load expectation
- LOLH = Loss of load hours
- LTCE = Long Term Capacity Expansion Plan; optimization process to select generation
- MMBtu = million British Thermal Units, unit of energy usually used for fuels
- MWh = unit of energy usually electric power = 1 million watts x hour
- MW = unit of power = 1 million watts
- Peak Demand = The maximum demand in megawatts (MW) in a year.
- PV = Photovoltaic
- Reserve Margin = The amount of electric generating capacity divided by the peak demand.
- RPS = Renewable Portfolio Standard: a regulation that requires the increased production of energy from renewable energy sources
- SMR = Small Modular Reactor
- “Sweet Spot” Core Acreage = Areas within a natural gas play that offer the highest production at least cost.
- Utility Scale = large grid-connected power generation, could be solar, gas, diesel, etc.
- VOM = Variable operations and maintenance costs
- Wheeling = a transaction by which a generator injects power onto a third party transmission system for delivery to a client (load).