Integrated Resource Plan
Final Report and Recommendation

MLGW BOARD OF COMMISSIONERS
AUGUST 19, 2020
Presentation Agenda

• Now What?
• IRP Recap
• Summary of Findings
• Analysis of Portfolios
• MISO Membership Assessment
• Other Factors to Consider
• Recommendations
• Next Steps
THIS IS A VERY BIG DEAL...
NOW WHAT?
A power supply Requests for Proposals (RFP) will be undertaken by MLGW to confirm the savings before making a Board recommendation.

The IRP will be utilized to determine the general mix of assets and locations of interest in the RFP and the orders of magnitude of transmission required. Alternative proposals will be considered as well.

Of the eleven portfolios in the IRP, the characteristics of three of them (6, 9, and 10) appear optimal and will be included among the parameters of the scope of the RFP. Differences between these portfolios can be reassessed with bids provided by potential suppliers.

Options to manage fuel price risk will also be an element to be included in the RFP.
INTEGRATED RESOURCE PLAN Recap
Integrated Resource Planning

The IRP process was an independent, unbiased, fully-transparent approach to evaluate options for MLGW to supply its current and forecasted load while meeting key objectives including:

- Affordability / Least Cost / Rate Impact
- Reliability / Resource Adequacy
- Sustainability / CO2 / Water Use / RPS
- Stability / Price Risk Mitigation / Reliance on Market
- Economic Impact / Local Capital Investment
Strategies, Scenarios, Portfolios

- Strategies represent the available options to MLGW to supply its load
- Multiple Strategies were assessed:
  - Strategy 1: Full Requirements Contract with TVA
  - Strategy 2: Self-Supply
  - Strategy 3: MLGW-MISO combination
  - Strategy 4: All MISO
- Scenarios represent a range of plausible futures
- Strategies are combined with Scenarios and using a structured approach to identify Portfolios
- Portfolios represent the mix of generation and transmission resources

<table>
<thead>
<tr>
<th>State of the World</th>
<th>Scenarios</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1 Reference</td>
<td>S1S1</td>
<td>Strategy 1 (TVA)</td>
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<tr>
<td>Scenario 2 (High Load)</td>
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<td>Scenario 3 (Low Load)</td>
<td>S3S3</td>
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<tr>
<td>Scenario 4 (High Load/Low Gas)</td>
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<tr>
<td>Scenario 5 (High Transmission)</td>
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<tr>
<td>Scenario 6 (Promote BESS)</td>
<td>S3S6</td>
<td></td>
</tr>
<tr>
<td>Scenario 7 (Low Load/High Gas)</td>
<td>S3S7</td>
<td></td>
</tr>
</tbody>
</table>

1. Midcontinent Independent System Operator
INTEGRATED RESOURCE PLAN RECAP
POWER SUPPLY ADVISORY TEAM (PSAT)

- A diverse, 20-member team of local business and community leaders, governmental officials and MLGW Executives
- Collaborated to provide input into MLGW’s IRP objectives and metrics
- Helped MLGW consider various factors necessary to reach an optimal long-term power supply solution from the perspective of our customers and our community
IRP Community Engagement

PSAT Meetings (11)
• 4/30/19, MLGW Administration Building
• 5/16/19, Whitehaven Community Center
• 6/6/19, Benjamin L. Hooks Library
• 8/14/19, First Baptist Church-Broad Ave.
• 9/16/19, First Baptist Church-Broad Ave.
• 10/17/19, Benjamin Hooks Library
• 11/7/19, Benjamin Hooks Library
• 1/23/20, First Baptist Church-Broad Ave.
• 2/27/20, First Baptist Church-Broad Ave.
• 3/26/20, First Baptist Church-Broad Ave.
• 5/29/20, Virtual Meeting

IRP Community Meetings (3)
“Your Power, Your Voice”
• 8/20/19, Hollywood Community Center
• 11/21/19, Southwest Tennessee Community College, Whitehaven Campus
• 6/4/20, Virtual Meeting

Details from each Power Supply Advisory Team (PSAT) meeting and all IRP Community meetings are available online. Links to meeting notes, presentations, videos and stakeholder input can all be found at mlgw.com/powersupplyinfo.
# MLGW IRP Objectives and Metrics

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reliability</strong></td>
<td>Meets or exceeds NERC reliability requirements and manages intermittency. All Portfolios meet NERC Standards; thus, the metric is designed to assess the level by which NERC levels are exceeded. The ratio of the Capacity Import Limit (CIL) + Reliable Generation (Unforced Capacity UCAP) to Peak Load was selected. <strong>Higher the better.</strong></td>
</tr>
<tr>
<td><strong>Least Cost</strong> <em>(Affordability)</em></td>
<td>Net Present Value (NPV) of revenue requirements. This NPV includes all costs in addition to the generation capital and operating costs, i.e. cost of transmission, MISO Membership, TVA costs, PILOT (payments in lieu of taxes), etc. <strong>Lower the better.</strong></td>
</tr>
<tr>
<td><strong>Price Risk</strong> <em>(Minimization/Stability)</em></td>
<td>Measured as: (a) 95% confidence interval (e.g. Worst Plausible Outcome) and (b) Regret: i.e. the level by which MLGW would regret having chosen a Portfolio in case of an adverse future condition. <strong>Lower Worst Plausible Outcome and Minimum Regret or No Regret (always optimal no matter the future) is the goal.</strong></td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td>Measured as (a) carbon (proxy for total emissions), (b) water consumption and (c) RPS limit – percentage of the energy coming from renewable resources (nuclear and large hydro, although “clean” on emission, do not count). <strong>For “a” and “b” Lower the better, for “c” Higher the better.</strong></td>
</tr>
<tr>
<td><strong>Market Risk</strong></td>
<td>Energy Market Purchases or Sales as a percentage of load; Amount of Capacity Purchases. <strong>Lower the better.</strong></td>
</tr>
<tr>
<td><strong>Economic Growth</strong></td>
<td>Job creation; Capital Expenditures in Shelby County and number of plants as a proxy. <strong>Higher the better.</strong></td>
</tr>
<tr>
<td><strong>Resiliency</strong></td>
<td>Amount of load shed during extreme events. <strong>Lower the better.</strong></td>
</tr>
</tbody>
</table>
Transmission Analysis as part of the IRP

- Included general upgrades/additions to the transmission system to provide reliable electric service at the lowest reasonable cost
- Included transmission costs to integrate new supply-side resources into the MLGW system, either new-build generation or imports from other utilities
- IRP objectives and metrics supported a conservative approach to “wheeling” (e.g. Anti-Cherrypicking Amendment - Federal Power Act, Section 212)
SUMMARY OF FINDINGS
COMPONENTS OF LEVELIZED WHOLESALE COST/MWH (PORTFOLIO 9)

- MLGW pays an all-in price today that includes fixed costs, energy, transmission, and other elements
- Similarly, the IRP includes multiple elements
- A Power Supply RFP might not be inclusive of all the value we receive today

It's more than just power cost
Recognized that cost was not the sole basis for selecting Portfolios. The determination of the final Portfolios is a two-step process:

- **First**: a base capacity expansion is produced using the Long Term Capacity Expansion (LTCE) module of the optimization software (AURORA).
- **Next**: Expert judgement is used to adjust the initial expansion plan and the AURORA LTCE was re-run with these adjustments in place, resulting in a unique Portfolio that is better suited to manage risks, such as reduced dependence on remote resources.

### Summary of Final Portfolios (11 Total)

<table>
<thead>
<tr>
<th>Portfolio ID</th>
<th>Final Portfolio</th>
<th>Total Thermal 2039</th>
<th>Local Renew 2039</th>
<th>Battery 2039</th>
<th>Total Local Nameplate 2039</th>
<th>MISO Renew 2039</th>
<th>MISO Cap 2039</th>
<th>950 MW CC</th>
<th>450 MW CC</th>
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ANALYSIS OF PORTFOLIOS
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<th>TVA (LTP)</th>
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<th>Portfolio 10</th>
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<th>Portfolio 1</th>
<th>Portfolio 7</th>
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<td>3 CC + 1 CT</td>
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<td>3 CC + 6 CT</td>
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<td>16,020</td>
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<td>14,453</td>
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<td>14,465</td>
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<td>Levelized Cost of Energy</td>
<td>$ / MWh</td>
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<td>59.34</td>
<td>59.48</td>
<td>60.51</td>
<td>60.59</td>
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<td>NPV Savings with Respect of LTP (wrt LTP) 2020 - 2039</td>
<td>$ Millions</td>
<td>1,537.4</td>
<td>1,531.7</td>
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<td>1,249.3</td>
<td>1,238.5</td>
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<td>1,206.8</td>
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<td>Levelized Savings per Year (wrt LTP) 2025 - 2039</td>
<td>$ Millions</td>
<td>122.1</td>
<td>121.7</td>
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<td>Levelized Savings per Year (wrt Base) 2025 - 2039</td>
<td>$ Millions</td>
<td>153.2</td>
<td>152.8</td>
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<td>Min Risk</td>
<td>95th Percentile Value of NPVRR</td>
<td>$ millions</td>
<td>17,221</td>
<td>16,830</td>
<td>16,576</td>
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<td>16,003</td>
<td>16,046</td>
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<td>Min Err. Risk</td>
<td>CO₂ Emissions Mean 20-Year</td>
<td>Million Tons CO₂</td>
<td>3.8</td>
<td>3.8</td>
<td>2.37</td>
<td>2.37</td>
<td>3.44</td>
<td>3.04</td>
<td>3.04</td>
<td>3.44</td>
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<td>3.33</td>
<td>4.02</td>
<td>3.82</td>
<td>4.09</td>
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<td>Min Err. Risk</td>
<td>Energy from Renewable Sources 2039 (RPS)</td>
<td>% of Energy Consumed</td>
<td>6.5%</td>
<td>6.5%</td>
<td>75.3%</td>
<td>75.3%</td>
<td>52.7%</td>
<td>54.9%</td>
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<td>52.7%</td>
<td>58.8%</td>
<td>58.8%</td>
<td>47.3%</td>
<td>46.1%</td>
<td>40.7%</td>
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<td>Reliability</td>
<td>Energy from Zero Carbon Sources 2039</td>
<td>% of Energy Consumed</td>
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<td>55.6%</td>
<td>75.3%</td>
<td>75.3%</td>
<td>52.7%</td>
<td>54.9%</td>
<td>54.9%</td>
<td>52.7%</td>
<td>56.8%</td>
<td>56.8%</td>
<td>47.3%</td>
<td>46.1%</td>
<td>40.7%</td>
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<tr>
<td>Reliability</td>
<td>2025 Local Water Consumption</td>
<td>Million Gallons</td>
<td>3,103</td>
<td>3,103</td>
<td>3,961</td>
<td>3,782</td>
<td>4,899</td>
<td>4,782</td>
<td>4,789</td>
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<td>4,795</td>
<td>5,645</td>
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<tr>
<td>Reliability</td>
<td>2025 (UCAP+OIL)/PEAK</td>
<td>%</td>
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<td>133.7%</td>
<td>126.0%</td>
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<td>148.6%</td>
<td>126.6%</td>
<td>127.2%</td>
<td>115.4%</td>
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<td>126.7%</td>
<td>130.8%</td>
<td>137.3%</td>
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<tr>
<td>Reliability</td>
<td>Max Load Shed in 2025 under Extreme Event</td>
<td>MW</td>
<td>0</td>
<td>0</td>
<td>622.4</td>
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<tr>
<td>Min Lineload Risk</td>
<td>% Energy Purchased in Market</td>
<td>%</td>
<td>10.0%</td>
<td>10.0%</td>
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<td>Min Lineload Risk</td>
<td>% Energy Sold in Market</td>
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<td>10.6%</td>
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<tr>
<td>Economic Growth</td>
<td>Local T&amp;G CapEx</td>
<td>$ Millions</td>
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<td>2,894</td>
<td>2,984</td>
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<td>2,965</td>
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<td>3,138</td>
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## Reliability

### 2025 (UCAP+CIL)/PEAK

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<th>Portfolio</th>
<th>Reliability</th>
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<tbody>
<tr>
<td>TVA (Base)</td>
<td>133.7%</td>
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<tr>
<td>TVA (LTP)</td>
<td>133.7%</td>
</tr>
<tr>
<td>Portfolio 5</td>
<td>126.0%</td>
</tr>
<tr>
<td>Portfolio 9</td>
<td>127.8%</td>
</tr>
<tr>
<td>Portfolio 10*</td>
<td>148.6%</td>
</tr>
<tr>
<td>Portfolio 6</td>
<td>126.6%</td>
</tr>
</tbody>
</table>
Resiliency

Max Load Shed in 2025 under Extreme Event

- TVA (Base): 0
- TVA (LTP): 0
- Portfolio 5: 622
- Portfolio 9: 0
- Portfolio 10*: 0
- Portfolio 6: 8

- TVA (Base)
- TVA (LTP)
- Portfolio 5
- Portfolio 9
- Portfolio 10*
- Portfolio 6
SUSTAINABILITY METRIC (CO2 EMISSIONS)

CO2 Emissions Mean 20-Year (000 Ton)

- TVA (Base): 3,805.0
- TVA (LTP): 3,805.0
- Portfolio 5: 2,365.8
- Portfolio 9: 2,366.4
- Portfolio 10*: 3,442.1
- Portfolio 6: 3,037.7

Legend:
- Orange: CO2 Emissions Mean 20-Year (000 Ton)
- Green: Savings wrt TVA (LTP)
Local Water Consumption

2025 Local Water Consumption (million of gallons)

- TVA (Base): 3,103 million gallons
- TVA (LTP): 3,103 million gallons
- Portfolio 5: 3,961 million gallons
- Portfolio 9: 3,782 million gallons
- Portfolio 10*: 4,899 million gallons
- Portfolio 6: 4,782 million gallons

2025 Local Water Consumption (million of gallons)
Portfolio 6 Installed Capacity by Year

Installed Capacity (MW)

- Local Solar
- Combined Cycle
- Combustion Turbine
- MISO Solar
- MISO Wind

Years: 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039
PORTFOLIO 9 INSTALLED CAPACITY BY YEAR
PORTFOLIO 10 INSTALLED CAPACITY BY YEAR
MISO Membership Assessment Report
MISO Independent Review of IRP Objectives

- **Resource Adequacy:**
  - Is the capacity expansion plan sufficient to join MISO Local Resource Zone (LRZ) 8 or to be a standalone Local Resource Zone
  - What is the impact to the MISO Planning Reserve Margin (PRM)
  - Is there adequate capacity for MLGW to purchase starting in 2025

- **Transmission Interconnection:**
  - Is the transmission expansion proposal a reliable solution
  - What is the MLGW import capability
  - What is MISO’s estimate of the costs for transmission expansion, reliability upgrades, and generator interconnections

- **Market Impact:**
  - How will membership affect its Adjusted Production Costs (APC)
  - What are the impacts to MISO’s regional congestion patterns

- **MISO Cost:**
  - What are the annual costs to MLGW of MISO membership
# MISO Integration

<table>
<thead>
<tr>
<th>Category</th>
<th>MLGW connects to MISO with Local Generation&lt;sup&gt;1&lt;/sup&gt;</th>
<th>MLGW connects to MISO without Local Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources</td>
<td>CT - 237 MW; CC - 1,350 MW; Solar - 600 MW</td>
<td>Assumes no local generation in MLGW</td>
</tr>
<tr>
<td>Transmission Expansion&lt;sup&gt;2&lt;/sup&gt;</td>
<td>2 – 500 kV lines to AR; 1 – 230 kV to MS with a total cost of $736.2M</td>
<td>3 – 500 kV lines to AR; 1 – 230 kV line to MS with a total cost of $1,127M</td>
</tr>
</tbody>
</table>
| Resource Adequacy         | ✤ MLGW has adequate resources to participate in LRZ 8 or its own LRZ  
                          ✤ Participation in LRZ 8 is mutually beneficial to MLGW and MISO | ✤ PRM and LRR are nearly unchanged  
                          ✤ MISO is determining if the LRZ 8 CIL/CEL is adequate to incorporate MLGW with no additional resources |
| Transmission Reliability  | ✤ The generation / transmission proposal is reliable up to a 2,400 MW import transfer | ✤ A 3,200 MW import transfer was assessed and identified numerous thermal, voltage, and stability issues |
| Market Impact             | ✤ Production cost savings of $116M in 2024 going to $283M in 2034  
                          ✤ Increased savings are due to adding low-cost solar/gas to the portfolio | ✤ Production cost savings of $56M in 2024 going to $117M in 2034  
                          ✤ Savings are the result of MISO resources being cheaper than TVA’s |

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<sup>1</sup> Planning Reserve Margin (PRM)  
<sup>2</sup> Local Reliability Requirement (LRR)
FINANCIAL CONSIDERATIONS
NET PRESENT VALUE OF REVENUE REQUIREMENTS

NPV of Revenue Requirement ($ millions)

- TVA (Base): $16,388
- TVA (LTP): $15,996
- Portfolio 5: $14,459
- Portfolio 9: $14,465
- Portfolio 10*: $14,571
- Portfolio 6: $14,747

Legend:
- Stochastic Mean NPVRR 2020 - 2039
- NPV Savings with respect of LTP 2020 - 2039

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Levelized Savings per Year with Respect to the Long Term Partnership Agreement

Footnote:

Levelized Savings per Year (wrt LTP) 2025-2039
Levelized Savings per Year with Respect to the Current TVA Contract

Levelized 2025 to 2039 Savings ($ million) - Base Case as Reference

- Portfolio 5: 153
- Portfolio 9: 153
- Portfolio 10*: 144
- Portfolio 6: 130

Levelized Savings per Year (wrt Base) 2025-2039
Payments In-Lieu-Tax Implications

There are two PILOTs that are potentially impacted by the IRP decision:

- TVA PILOT payments to the State of Tennessee which are subsequently allocated to Memphis, Shelby County and the local municipalities. This totaled over $18 million in 2019.

- Local PILOT payments by MLGW’s Electric Division to Memphis, Shelby County, and the local municipalities which totaled to $45 million in 2019.

If MLGW leaves TVA, the allocated local share of the State PILOT payments to Memphis, Shelby County and the local municipalities would be eliminated ($18 million annually).

Local PILOT would increase due to the construction of transmission assets. ($24 million annually – this also assumes MLGW does not build and own any generation assets).
Additionally, the Local PILOT payment per State law is paid on construction work in progress activity. Therefore, MLGW would be required to make these phased-in payments immediately before realizing any of the potential power supply savings. This would require short-term rate increase unless other alternative remedies were achieved.

Based on a $700 million phased-in transmission cost scenario, it is estimated that the Local PILOT on transmission would be over $2 million in the first year of construction and rise to $24 million upon completion over five years.
Transmission Expansion – Potential Rate Impacts

- The capital outlay for the transmission expansion would be accomplished through the use of capitalized interest.
- Funds in excess of those required for the capital investment are borrowed.
- The surplus is invested and the subsequent return is used to pay interest on the total amount borrowed during the construction period.
- This will increase future revenue requirements for the portfolios, but should not have any rate impact during the construction period.
Next Steps
CONFIRM SAVINGS BEFORE MAKING A FINAL DETERMINATION

- A power supply Requests for Proposals (RFP) will be undertaken by MLGW to confirm the savings before making a final decision.
- The IRP will be utilized to determine the general mix of assets and locations of interest in the RFP and the orders of magnitude of transmission required. Alternative proposals will be considered as well.
- Differences between Portfolios 6, 9 and 10 can be reassessed with bids provided by potential suppliers.
- Options to manage fuel price risk will be an element to be included in the RFP.
**Power Supply Request for Proposal (RFP)**

- There are multiple firms who serve MISO members and are capable of managing the RFP process.
- Competition should yield best price and solution compared to a single-source contract award.
- Relationship with this consultant has the potential to be long-term.
- Seeking a consultant to manage the Power Supply RFP continues the open and transparent process we’ve strived for since the beginning.
# Engagement Schedule for Consultant to Manage the RFP Process

<table>
<thead>
<tr>
<th>Task/Activity Description</th>
<th>August 2020</th>
<th>September 2020</th>
<th>October 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFP Issue Date</td>
<td>8/21/2020</td>
<td>9/4/2020</td>
<td>10/5/2020</td>
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<tr>
<td>Intent to Bid Due*</td>
<td>8/26/2020</td>
<td>9/18/2020</td>
<td>10/6/2020</td>
</tr>
<tr>
<td>Questions due from Bidders</td>
<td>8/31/2020</td>
<td>9/21-22/20</td>
<td>10/7/2020</td>
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<tr>
<td>Responses from MLGW forwarded*</td>
<td></td>
<td>9/28/2020</td>
<td>10/20/2020</td>
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<tr>
<td>Supplier Diversity Review</td>
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<tr>
<td>Score Proposal</td>
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<tr>
<td>Notify Vendors of Presentation Date</td>
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<tr>
<td>Short List Presentation (Zoom Meeting; Top 3 Firms)</td>
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<tr>
<td>Notice of Intent to Award</td>
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<tr>
<td>Projected Date of Board Approval***</td>
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<tr>
<td>Projected Date of City Council Approval</td>
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<tr>
<td>Project Kickoff Meeting</td>
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</tbody>
</table>

*via email
**Electronic copy only
***Request Same Day Minutes
Other Factors to Consider

- Regulatory issues
- Environmental issues
- Land acquisition
- Siting and permitting processes
- Construction risk
- Public and Stakeholder input
- Incremental fuel risk due to a less diverse generation mix
- Relationship with local governments and large customers
In Conclusion

- MLGW has remained open and transparent throughout the IRP process
- We are committed to maintaining the integrity of the RFP process
- The Integrated Resource Planning process is the industry-accepted approach to determining new resource needs
- MLGW is a TVA customer today and will continue to engage with TVA on its proposal for additional value that was not available for consideration in the IRP