



MEMO

To: Amanda Garcia, Southern Environmental Law Center

From: Elizabeth A. Stanton, PhD, Joshua R. Castigliero, Myisha Majumder, Eliandro Tavares, Sachin Peddada

Date: September 28, 2022

Re: Review of MLGW RFP Update and Staff Power Supply Recommendation

I. Overview

Memphis Light, Gas and Water (MLGW) is currently in the process of choosing among supply options to best meet its electric customers' needs. This Applied Economics Clinic (AEC) memo reviews documents related to MLGW's power supply Request for Proposals (RFP) update and the MLGW Board consultant's related recommendations with the goal of assisting the Southern Environmental Law Center and its clients with the preparation of comments to the MLGW Board.

AEC's assessment of MLGW's 2020 Integrated Resource Plan (IRP), its June 2022 RFP Update, and its September 2022 RFP Update (along with numerous supporting documents) found multiple instances of biases in favor of gas resources and against renewables and batteries. It is in the context of these biases that MLGW's consultant GDS Associates and MLGW staff conclude that MLGW should enter into the Tennessee Valley Authority's (TVA) Long-Term Partnership (LTP) agreement. Our assessment finds that correction of the biases enumerated in this memo has the potential to change the findings on which GDS and MLGW staff base their recommendation and that these biases should therefore be addressed prior to the MLGW Board making a decision on the power supply alternatives.

II. MLGW is undercounting risk related to contract design

MLGW's 2020 IRP and 2022 RFP updates understate risks associated with entering into a perpetual contract for its energy supply. An IRP is a comprehensive plan created by a local distribution company to show how it plans to obtain an adequate supply of the resources needed to serve its customers—resources that are secured through contract agreements with owners of generation. The structure of these contracts—including the number of agreements, start date, and duration of each contract—directly affects the risk profile of the distribution company. A contract with a longer duration (whether it is 20 years instead of five, or a perpetual contract like TVA's LTP¹) may pose greater risks to MLGW and other electric distributors by limiting flexibility and the ability to make different decisions in the future with the potential result of higher costs to customers. Similarly, risks differ between a single contract that covers all supply and multiple contracts that add up to total supply and that have different start and end dates. Longer

¹ MLGW. July 2020. *Integrated Resource Plan Report*. Prepared by Siemens. Available at: <https://www.mlgw.com/about/IRPFinalDocument>. p. 39.



contracts and fewer contracts may both result in greater risk. This difference in risk among contract types is not accounted for in the MLGW 2020 IRP or the 2022 IRP updates.²

MLGW 2020 IRP describes the terms of TVA’s LTP, which in effect extends another 20-year duration with each new year of service:

MLGW currently purchases all its electric power needs from the Tennessee Valley Authority (TVA) under an All Requirements Contract. MLGW has the option of exiting its All Requirements Contract with TVA with 5 years of advance notice. TVA has the option of terminating the contract with 10 years of advance notice. As an alternative to the current contract, TVA has offered to MLGW (and all the Local Power Companies it serves) an option of extending the notice period to 20 years, in exchange for a 3.1% discount on the Standard Service non-fuel components of the wholesale rate. In addition, TVA is offering the flexibility to MLGW to provide up to 5% of its load with local generation solutions other than TVA. In addition to evaluating the two alternatives available from TVA, MLGW is evaluating the option of terminating its contractual relationship with TVA and developing its own resources and/or acquiring them from the neighboring Midcontinent Independent System Operator (MISO) market.³

MLGW, in its September 1 RFP Update, recommends TVA’s new LTP as an opportunity for cost reductions (see Table 1). This characterization, however, omits some of the key drawbacks of a perpetual, all-eggs-in-one-basket contract.

Table 1. TVA contract terms from MLGW IRP Update September 1, 2022 presentation

Key Contract Items	TVA Base	TVA LTP
1. Termination Notice	5 Years	20 Years
2. Base Rate Charge	n/a	3.1% Decrease
3. Acquire Renewables	n/a	Up to 5% of MLGW energy needs
4. Additional Benefits (can be fully realized via LTP)	1. \$100M for Community Revitalization Programs 2. Additional \$8.5M Home Energy Uplift Program	

Source: Reproduced from MLGW Board of Commissioners. September 1, 2022. MLGW Power Supply RFP Update & Management Recommendation [PowerPoint Slides]. Memphis Light, Gas and Water. Available at: <https://www.mlq.com/about/powersupply>. p. 20.

One of the negative consequences of longer and larger contracts is a diminished option value (that is, the value of having an option to do something in the future) for MLGW. TVA’s LTP takes away MLGW’s ability

² Ibid.

³ Ibid. p.1.

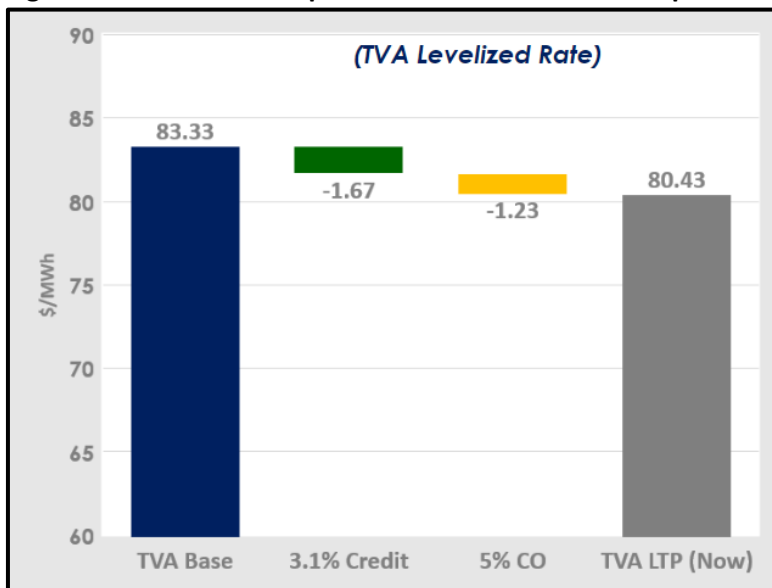
to make new decisions in the future. This loss can be viewed as an opportunity cost of giving up the option to change to a different source of supply.

In MLGW’s 2020 IRP, Siemens (the firm that developed MLGW’s IRP) points to both costs and benefits of the LTP:

Assess further the LTP option. On one hand there will be a reduction on the costs and the NPVRR with the LTP is approximately \$400 million lower than without it. On the other hand, MLGW will be locked for 20 years and unable to control or take advantage of developments in the electric power industry such as deeper drops in the cost of renewable generation and storage that could increase the economic savings for reconsidering exiting TVA and joining MISO at a later date...⁴

The September 1 RFP Update illustrates expected cost reductions associated with TVA’s LTP from its 3.1 percent rate base rate reduction and 5 percent energy carve-out benefit (see Figure 1).

Figure 1. 2018-2047 TVA power cost from MLGW IRP Update September 1, 2022 presentation



Source: Reproduced from MLGW Slides September 1, 2022. p. 14.

AEC’s research regarding ways in which opportunity costs could be monetized in IRP modeling found extensive options for and examples of monetizing risk in utility IRP processes but only a few examples directly related to the risks and potential costs of power purchasing arrangements. A Smart Electric Power Alliance report discussing the monetization of curtailment risks of renewable generation systems offers the most closely related example.⁵ Curtailment risk is the risk that a generation resource will have its power

⁴ Ibid. p. 248.

⁵ Sterling J., C. Stearn, T. Davidovich, P. Quinlan, J. Pang, C. Vlahoplus. (no date) *Proactive Solutions to Curtailment*



output reduced below its theoretical or claimed output level thereby affecting variable generation.⁶ Curtailment risk can be addressed in one of two ways: putting the entire onus on the developer (the independent power producer (IPP) approach) or placing all the risk on the utility purchasing power and its customers (the customer risk model). In the former approach, the utility can curtail power and expect the developer to pick up the cost of forgone sales; in the latter, the utility and customers pay for a given amount of output no matter if it is received or not—thereby paying a premium that factors in curtailment risk. In the former, the developer factors curtailment risk into its prices; in the latter, utilities and their customers pay a higher effective price as some purchased power goes undelivered.⁷

TVA's LTP introduces an analogous customer risk by placing all of the risk of its future investment strategy on a captive customer base. The LTP lowers risks for TVA (as discussed by TVA's Chief Financial Officer and Chief Executive Officer's in an August 2019 presentation to the TVA Board⁸) by placing risks on customers willing to sign the LTP contract.

MLGW's 2020 IRP examines cutting off the TVA contract in 5 years (the minimum "heads up" TVA requires) and joining MISO together with contracted supply, keeping the current 5 year contract, or taking TVA's LTP 20-year extension deal.⁹ Currently, MLGW purchases all its electric power needs from TVA under an "All Requirements" contract, also referred to as the "Wholesale Power Contract" (WPC). Under the WPC, MLGW has the option of exiting with 5 years of advance notice. The WPC is MLGW's status quo, or the "business-as-usual" strategy in which TVA exclusively supplies all of MLGW's transmission and generation needs.¹⁰ However, the MLGW 2020 IRP acknowledges that it has not assessed the risk associated with the LTP, and recommends that if MLGW is inclined to stay with TVA, MLGW should "assess further" whether to keep the current contract or sign the LTP.¹¹

GDS Associates' (the consulting firm that prepare MLGW's 2022 IRP update) Vice President Chris Dawson addressed but dismissed contractual risk as non-monetizable in his June 9, 2022 presentation:

That is true, right at the end of every contract. This is the way these things work, right? You take a risk about what the future is going to hold for you a lot of times, right, and try to anticipate prepare, manage, plan accordingly. For example, specifically with that when it is a risk, right, it could drop off, they may have a plan that may start to sell into the MISO market, we no longer want to sell it to you. that that would be mitigated and offset through contract negotiations, where you say, hey, we want an option at the end of year 17, to do something differently, or have a buyout provision so you can manage that. But

Risk: Identifying New Contract Structures For Utility-Scale Renewables. Smart Electric Power Alliance and ScottMadden Inc. Available at: <https://www.firstsolar.com/-/media/First-Solar/Documents/Grid-Evolution/Proactive-Solutions-to-Curtailment-Risk.ashx?la=en>.

⁶ Ibid, p. 12.

⁷ Ibid, p. 14.

⁸ TVA Board Meeting. August 22, 2019. *Financial Performance Update*.

⁹ MLGW IRP. July 2020. p. 29.

¹⁰ Ibid, p. 35.

¹¹ Ibid. p. 29



you're right. It's another one of those risks that you face that you can't exactly put dollar value on today.¹²

MLGW's IRP and RFP update do not attempt to set a monetary value on the high contractual risks introduced by TVA's LTP. The extent of risk that MLGW acknowledges and monetizes in its IRP and RFP update does not adequately account for the full scope of potential outcomes associated with a long-term contract with TVA, such as the effects of mitigating its own investment risks through a captive customer base. MLGW's IRP limits its exploration of risk and uncertainty to fuel prices, load, technology prices, and carbon dioxide (CO₂) prices, and then looks at the mean and 95 percentile values of results varying these parameters in a limited sensitivity analysis.¹³ Risks associated with contract length and type are not considered in the IRP or RFP updates, creating a bias that benefits portfolios with riskier contractual arrangements.

III. MLGW's RFP update methodology creates a bias for gas

MLGW's RFP update understates risks associated with a gas-reliant energy system by favoring gas (and introducing biases against renewables and battery storage) in its methodology. In 2022, MLGW hired GDS to update the results of its 2020 IRP and RFP to better reflect current prices and supply constraints. GDS' update methodology included issuing an RFP for new resource bids. According to MLGW's September 1, 2022 presentation:

Purpose of RFP was to "validate" potential savings identified in IRP. RFP acquired 'real-world' information for (1) new transmission facilities, (2) thermal generation, and (3) Local / MISO solar resources. Validation analysis replaces IRP assumptions for those three items BUT, analysis does rely on several IRP assumptions.¹⁴

In mid-summer 2022, GDS received updated RFP bids from potential vendors and recalculated the 2020 IRP and June 2022 RFP findings with those new bids. GDS did not, however, update IRP modeling: GDS' "updates" are post-modeling adjustments only and do not include re-optimization (i.e. re-running models to identify least-cost results).

The MLGW Board's September 1 presentation of GDS' update of IRP findings does not change fuel prices, capacity prices, interest and inflation rates, or PILOT (payments in lieu of taxes) costs from the values used in the 2020 IRP. GDS notes that, compared to 2020, natural gas price outlooks are higher, it has become more difficult to procure long-term capacity, and interest rates (modeled at 3.5 percent in the IRP) are much higher today.¹⁵ Bids for thermal resources gathered in the 2022 RFP update do not appear to include fuel prices; instead, the 2022 bids update only technology costs. The choice to not update fuel prices in line

¹² Quoted from GDS presentation to MLGW Board of Commissioners. June 9, 2022. *MLGW RFP Evaluation & Savings Validation*. Memphis Light, Gas and Water.

¹³ MLGW IRP. July 2020. p. 226.

¹⁴ MLGW Slides. September 1, 2022. p. 9 (original emphasis).

¹⁵ Ibid. p. 9-10.



with long-term forecasts, in particular, creates a bias for gas-reliant portfolios and against renewables-reliant portfolios.

GDS did not re-optimize the two-year old IRP portfolios given the updated cost information. Instead, GDS conducted partial updates to existing results without optimization.¹⁶ That means that the updated results are not chosen to minimize customer costs. All portfolios (both TVA and non-TVA) have substantial amounts of gas generation. Had the GDS update included re-optimization with more recent gas price forecasts, the balance of gas dispatch and build-out of new gas resources would likely be different than that of the 2020 IRP. Assuming the outdated IRP optimization results for generation dispatch and portfolio selection creates a bias for gas generation dispatch and portfolios that are gas-heavy.

Electric prices have also risen since the 2019 forecasts used in MLGW's 2020 IRP and these increases are not captured in the RFP update. Renewables, especially solar, would benefit from higher peak hour energy prices in new optimization modeling. This is an additional bias for gas-heavy portfolios and against renewables.

In addition, in MLGW's IRP Siemens emphasizes that its recommendations and selection of preferred portfolios is based not only on costs but also on several non-cost criteria:

The selection of the best portfolios for MLGW is not simply a cost-based decision. It factors in risk, sustainability, resilience, reliability, and economic impacts.¹⁷

In contrast, GDS' RFP update bases its recommendation to award TVA the MLGW contract on just one metric: cost. The substantial flaws in the cost methodology described throughout this memo raise concerns about GDS's approach.

IV. MLGW's RFP update uses the wrong renewable prices

In addition to creating a favorable bias for gas by omitting recent fuel price increases and in other ways described in Section III above, MLGW's September 2022 RFP update creates unreasonable barriers to renewable energy sources by overestimating their cost. The MLGW Board's RFP update shifts the IRP analysis to start in 2028¹⁸ and applies present-day price increases (based on the most recently updated RFP bids) to technology costs without updating other key factors. This is cherry picking. (MLGW's 2020 IRP uses a modeling period of 2020-2039; the June 2022 update uses 2028-2047 with bids received in December 2021¹⁹; the September 2022 update uses 2028-2047 with bids received in August 2022.²⁰) The September update illustrates rising current-day solar costs (see Figure 2), explaining that:

¹⁶ Ibid.

¹⁷ MLGW IRP. July 2020. p.247.

¹⁸ MLGW Slides. September 1, 2022.

¹⁹ MLGW Board of Commissioners. June 9, 2022. MLGW RFP Evaluation & Savings Validation [PowerPoint Slides]. Memphis Light, Gas and Water. Available at: <https://www.mlqw.com/about/powersupply>. p. 17.

²⁰ Ibid.



Solar PPA pricing has increased across the country (some regions more than others). Reasons for cost increases are inflation, supply constraints, higher materials cost, labor shortages, higher interest rates, etc.²¹

Figure 2. Renewable costs (2020-2022) from MLGW IRP Update September 1, 2022 presentation

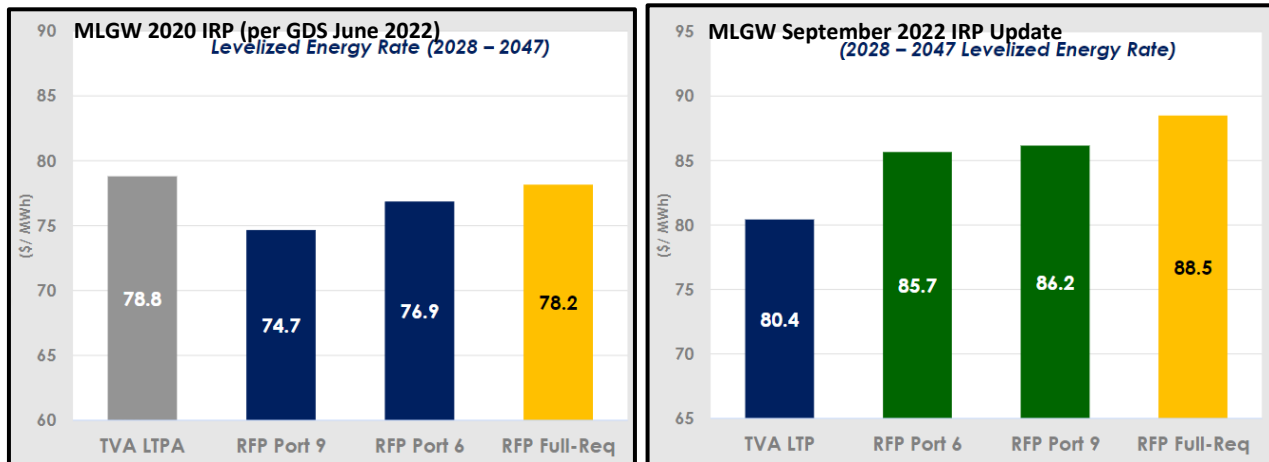


Source: Reproduced from MLGW Slides. September 1, 2022. p. 12.

As a consequence of this current-day cost increase, GDS assumes that future projections of leveled energy costs increase from their original values. In MLGW’s 2020 IRP and June 2022 RFP Update renewables-focused Portfolios 6 and 9—as well as GDS’ assessment of a “full requirements” comparison to meet all services provided by TVA—cost less than TVA’s LTP (see left panel in Figure 3) whereas GDS’ September 2022 RFP Update shows TVA’s LTP as the lowest cost option (see right panel).

²¹ Ibid. p. 12.

Figure 3. 20-year levelized costs comparison, June 2022 update versus September 2022 update



Source: MLGW Slides. June 9, 2022. p. 42; MLGW Slides. September 1, 2022. p. 17.

GDS' RFP update concludes:

Numerous changes in the electric industry (and nationwide) since MLGW's IRP was completed in 2020. Using real-world, current cost information for new transmission facilities, new thermal generation, and new renewable resources, the costs of the power supply alternatives are more expensive than TVA. TVA's LTP proposal is the most cost-effective power supply arrangement. MLGW can achieve immediate savings by executing the LTP.²²

GDS' assessment, however, relies on a faulty assumption. The current supply chain issues that are raising renewable and battery prices are not relevant to the September 2022 updated RFP results. MLGW's suppliers will not install solar until 2027 or 2028 (with a few outlying bids having earlier start dates).²³ Today's renewables prices (relevant to a period of severe supply constraint) should not be used to model installations in 2027-2028. Long-term projections need long-term forecasts, which National Renewable Energy Laboratory (NREL), among others, provides for renewables costs.²⁴ This modeling choice misrepresents and overestimates renewable and battery costs, creating a bias against renewables-heavy portfolios. While the September 2022 bids likely include cost increases related to today's supply constraints, NREL's forecast suggests that prices for solar contracted in future years will not.

GDS should not apply a cost premium to long-term forecasts based on today's conditions. Long-term forecasts have fallen since the 2019 vintage used in the IRP (see Figure 4 below). It is not appropriate to assume that there will be supply chain or inflation issues five or six years from now, nor does GDS provide any basis for that extraordinary assumption. This is the key assumption making the updated non-TVA

²² MLGW Slides September 1, 2022. p. 24.

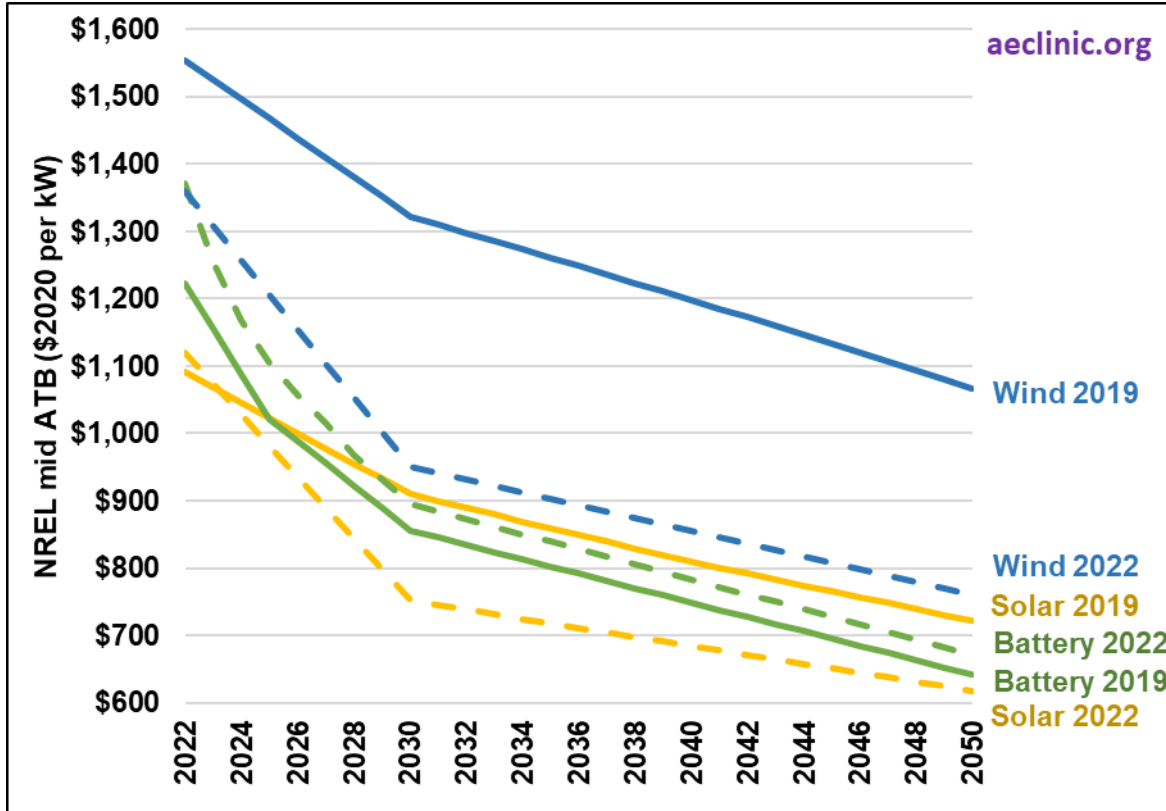
²³ Power Supply Alternatives. *Power Supply Proposals – Request for Proposals*. Presented September 1, 2022. <https://www.mlgw.com/about/powersupply>

²⁴ NREL. *Annual Technology Baseline (ATB), 2019 and 2022 versions* (available at: <https://atb.nrel.gov/electricity/2022/data> and <https://atb.nrel.gov/archive>). *Mid-case forecasts of capital expenditures. Dollars adjusted to \$2020 using the Consumer Price Index.*



portfolios more expensive than TVA's LTP. Inflated renewables costs bias the updated RFP results against renewables-heavy portfolios.

Figure 4. NREL ATB long-term renewables cost forecasts published in 2019 and 2022



Data source: National Renewable Energy Laboratory (NREL). Annual Technology Baseline (ATB), 2019 and 2022 versions (available at: <https://atb.nrel.gov/electricity/2022/data> and <https://atb.nrel.gov/archive>). Mid-case forecasts of capital expenditures. Dollars adjusted to \$2020 using the Consumer Price Index.

V. TVA fails to disclose that most of its renewable energy is spoken for by other cities and corporate customers

Contrary to claims made by GDS and TVA, some portion of TVA's renewable energy supplies are guaranteed to other entities and cannot be available to MLGW. In GDS' presentation before the MLGW Board, Vice President Chris Dawson repeatedly emphasized TVA's renewables and zero-carbon focus referencing a July RFP issued by TVA for 5,000 megawatts (MW) of carbon-free energy but otherwise without presenting specific evidence:



And if you look at TVA lately, they're on a quest to build out an enormous amount of solar resources over the next 10 years.²⁵

But I'm going to start first with TVA because that is the basis for comparison and everything that we are doing here. So we last talked about this in June, they showed some comparisons TVA's projected power cost over the 2028 to 47. Period. I know that TVA right is not immune to anything that's going on and they had challenges. Last, not last month, back in July, TVA announced and issued RFPs, where they are seeking up to 5,000 MW of carbon free generation. And they also went on to say that after they procure that 5,000 MW of carbon-free generation, which they hope to have in place by 2029. They're going to be procured another 10,000 MW of carbon-free generation that they hope to have in place by 2035-2036 timeframe. This is part as I understand it, what they've said publicly, their goal is to achieve a certain level of carbon reduction, I think by 70 percent by 2030, and 80 percent, maybe not 2035. So that announcement came out. And of course, you know, it's important to keep in mind, TVA is not immune or insulated from any of these other challenges we just talked about. Even 5,000 MW is just a small portion of TVA's overall portfolio.

... You know so, today, you know, TVA, and there's renewable energy, right, there's also a carbon-free energy, and you're probably well aware of the TVA's current resources. Nuclear and hydro alone provide more than 50 something percent of the clean carbon free energy here in MLGW, for its retail customers. You know, in addition, I think you're also aware that TVA has been adding a good bit of solar generation over the past five years and continues to add more solar generation. I don't know exactly how much that is or what they're going to have in place today versus tomorrow. But it is quickly approaching 60 percent of their total supply would be carbon free, because of those efforts and their existence.²⁶

In response to MLGW Commission Vice Chair Leon Dickson's question regarding TVA's renewables commitment in comparison to that of utilities of a similar size to Memphis, Mr. Dawson replied:

So, depending on where you're in the region of the country, and I know y'all appreciate this, but I do want to touch on this right? If I'm in the Northeast, right, it is very difficult to get carbon-free energy right, there's solar, wind generation, offshore wind just so they can get more carbon free. They have very little there but if I'm in the northwest of the country, right you think Bonneville Power...you think about all that hydro, the other nuclear in effect, they battle a lot of solar and wind. They're immensely right. It's like 80 percent, carbon free. I mean, they have a much different makeup. And if I moved to different

²⁵ Quoted from GDS presentation to MLGW Board of Commissioners. June 9, 2022. *MLGW RFP Evaluation & Savings Validation..* Memphis Light, Gas and Water.

²⁶ Quoted from GDS presentation to MLGW Board of Commissioners. September 1, 2022. *MLGW Power Supply RFP Update & Management Recommendation.* Memphis Light, Gas and Water.



regions of the country, and I'll come back down to the Southeast here, right, the Midwest used to be so much coal. And to be fair, the Midwest is still over 50 percent coal generation supplying the energy that is used to meet their needs. But if you come down to the Southeast, right, that's been changing. And so it's evolving, the Southeast is adding more solar generation. And it's building up its carbon-free footprint...Today, you are probably one of the leaders in the country in terms of carbon-free energy that TVA provides...So you are certainly a leader in this region when it comes to carbon-free.²⁷

As discussed below, however, TVA's claims to high shares of renewable generation may not be accurate. At the September 7, 2022 presentation to the MLGW Board, TVA's President and Chief Executive Officer Jeff Lyash also made claims regarding TVA's share of carbon-free energy and progress in developing renewable resources:

Let me talk a bit about the scale of TVA because it's important, we are the third largest generator of electricity in the country, the third largest one of the nation's largest transmission systems. Today, we are the leader in carbon reduction in the southeast and have in fact reduced carbon more than almost any utility in the country committed to that. We're also the Southeast's largest renewable energy provider. And we are committed to expanding renewable energy as a percentage of our mix over the coming years...One of the most diverse energy portfolios generating portfolios in the nation and at a scale that can make them cost effective.

TVA is committed to a clean energy system. Matter of fact, against the 2005 benchmark, TVA has reduced greenhouse gas about 60 percent. Already, that's not an aspiration, that's a delivered result. We are committed to reducing it by 70 percent by 2030, 80 percent by 2035. And again, that's a plan that's in execution and...we know we can do that without raising price. And without affecting reliability. We aspire to net zero by 2050. And we are focused on developing the technologies that are going to get us there...We are constructing 10,000 MW of solar power over the next decade. As a matter of fact, TVA, just a month or so ago, issued an RFP for 5,000 MW of clean energy. That's the largest clean energy RFP in the history of the industry. We will receive those proposals between now and the end of the year in a position to make some decisions on those in the first half of next year. This is all driven for maintaining reliable, resilient, affordable and evermore clean electricity.

Yeah, so, TVA is an exporter of renewables, which people typically define as wind and solar, I would add hydroelectric to that. I think it's the original renewable and still the best renewable, and we are working to expand and optimize our pilot, as well. But the problem we all face is climate change. Climate change is driven by greenhouse gas emissions. So the outcome we're trying to produce here is a carbon-free electricity supply that can be

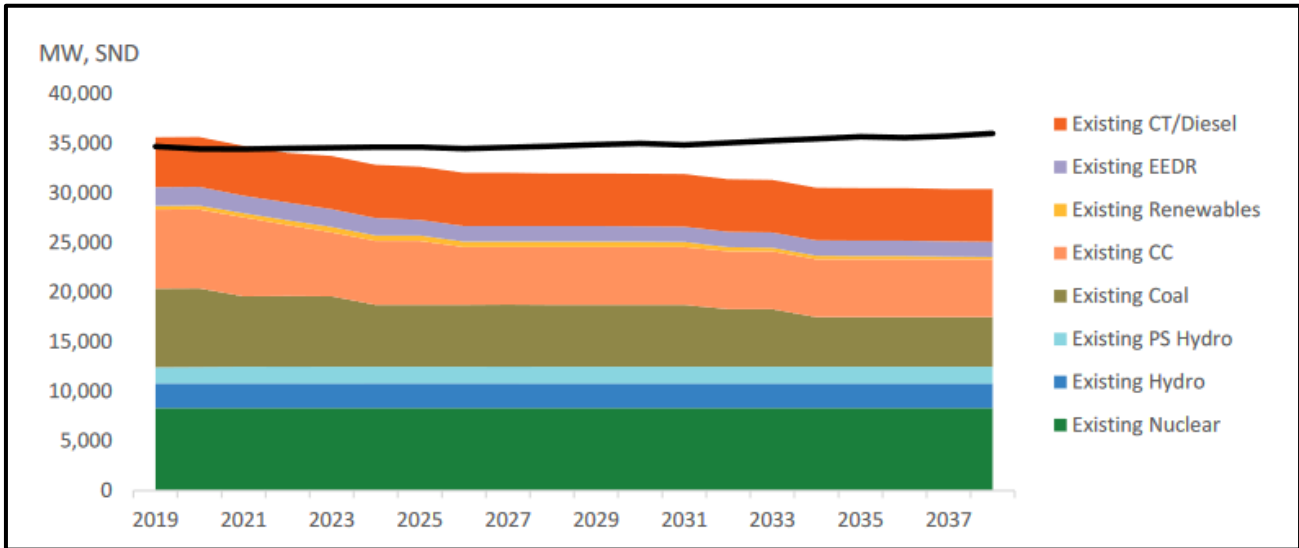
²⁷ Quoted from GDS presentation to MLGW Board of Commissioners. September 1, 2022. *MLGW Power Supply RFP Update & Management Recommendation*. Memphis Light, Gas and Water.



used to decarbonize other sectors of the economy through electrification. Renewables is a critical part of that. That's why we're actively in the process of building solar across the footprint, 10,000 MW. That's why we issued the RFP. But as we plan the system for the next 30 years, what you must do in this business, we cannot reach that outcome with just renewables. We need a portfolio of assets, a diverse portfolio, we need to preserve and extend our existing nuclear fleet. We're evaluating constructing, we need to build 10,000 MW of solar, as much as land use the supply chain and the system can integrate. But we also need to build on our assets to bring to the table what solar does not to give you the stability and reliability system. So you know, I want to be clear, we are renewable advocates, we are building significant amounts of solar, if we can build more, we will but it is not enough. If we're going to reach the outcome that we're all focused on, which is affordable, reliable, resilient, and zero-carbon energy.²⁸

TVA's existing capacity supply is approximately 36-42 percent carbon free including nuclear, hydro, other renewables and demand response (see Figure 5). TVA anticipates that its customer load may grow to as high as 43,000 MW (from 30,000 MW in 2019) by 2038 (see Figure 6).

Figure 5. TVA summer baseline firm capacity from TVA 2019 IRP

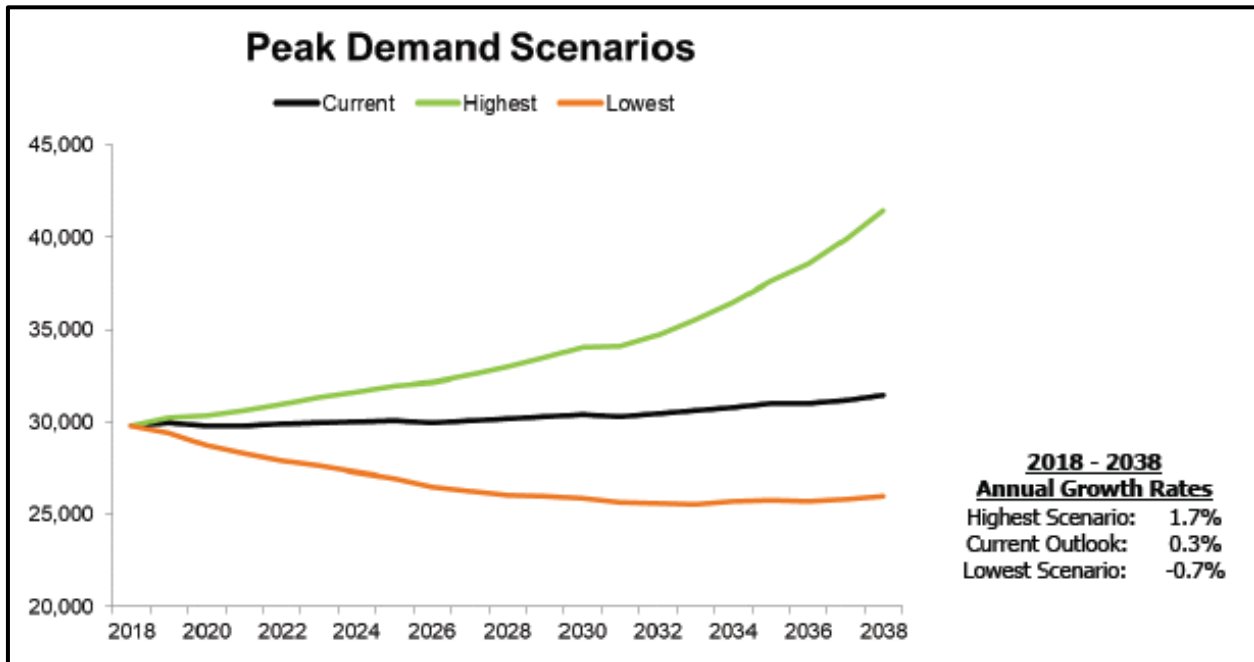


Source: Reproduced from Tennessee Valley Authority. 2019. *Integrated Resource Plan*. Tennessee Valley Authority. Available at: <https://www.tva.com/environment/environmental-stewardship/integrated-resource-plan>, p. 4-11.

²⁸ Quoted from GDS presentation to MLGW Board of Commissioners. September 7, 2022. *MLGW Power Supply Meeting*. Memphis Light, Gas and Water.



Figure 6. TVA peak demand forecast from TVA 2019 IRP



Source: Reproduced from TVA 2019 IRP. p. 4-6.

TVA's 2019 IRP recommends the following additions, which would greatly increase its share of renewables and bring its carbon-free generation above 50 percent in 2038:

Wind: Existing wind contracts expire in the early 2030s. Consider the addition of up to 1,800 MW of wind by 2028 and up to 4,200 MW by 2038 if cost-effective.

Storage: Add up to 2,400 MW of storage by 2028 and up to 5,300 MW by 2038. Additions may be a combination of utility and distributed scale. The trajectory and timing of additions will be highly dependent on the evolution of storage technologies.

Solar: Add between 1,500 and 8,000 MW of solar by 2028 and up to 14,000 MW by 2038 if a high level of load growth materializes. Additions may be a combination of utility and distributed scale. Future solar needs are driven by pricing, customer demand, and demand for electricity.²⁹

Mr. Lyash's presentation, however, fails to mention that its primary renewables program, "export" Green Invest, accepts payment from municipalities and private companies to retire the renewable energy certificates associated with TVA's renewable energy production. According to TVA's website:

Green Invest is a proven, award-winning model that offers business and industry an effective, timely, and cost-competitive solution to aggressively meet their sustainability goals. The program matches customer driven commitments for renewable energy with

²⁹ TVA 2019 IRP. p. ES-4.



new-to-the world, in-Valley renewable projects by leveraging a competitive procurement process. Businesses who partner with TVA are able to benefit from TVA's scale and negotiating expertise in attracting a wide variety of potential renewable projects at economic prices.³⁰

In essence, TVA is selling—and plans to sell more of—the rights to its renewable energy. If TVA's renewables are sold to other entities and their renewable energy certificates retired, these same renewable megawatt-hours cannot be available to MLGW or counted as part of MLGW's or Memphis's greenhouse gas emission reductions. If MLGW signs the LTP and wants to invest in renewable energy over and above the 3-5 percent cap in that contract, MLGW will likely have to purchase power at a premium from TVA through Green Invest.

VI. TVA supply does not meet MLGW renewables requirements

While MLGW's 2020 IRP lacks explicit language around its receipt of renewable energy from TVA, it seems evident that its two TVA portfolios do not meet MLGW's own renewables requirements. The MLGW IRP assumes that MLGW receives a proportional (8.5 percent) share of total TVA supply: It does not consider (1) proximity/adjacency of the resources; (2) any dedicated or contract-specific allocation; and (3) the impacts on renewable availability of TVA's Green Invest program.³¹ This lack of specificity is of special import when the 8.5 percent share assumption is applied to Memphis' receipt of renewable energy and its emissions and other environmental impacts. The only mention of this share of TVA supply in MLGW's IRP is in reference to how MLGW determined metrics of CO₂ emissions and water consumed by the entire TVA fleet, and then used the percentage of TVA energy delivered to MLGW to meet its renewable portfolio standard.³² Siemens has presented no evidence that MLGW will receive 8.5 percent of TVA's renewables and has not addressed the issue of the allocation of renewable supply among TVA's customers through Green Invest.

In addition, MLGW's IRP's TVA portfolios do not meet its renewables goals:

MLGW wanted to consider the cost associated with meeting Climate Action Plan goals rather than requiring they be met regardless of cost. A base Renewable Portfolio Standard (RPS) target of 5%-15% RPS from 2025-2039 was imposed as a floor, expecting that higher levels would be achieved. This percentage is expressed as a function of the energy consumed in a year.³³

Under all non-TVA supply portfolios, the base level of the RPS target was exceeded, with most producing 46 percent of load from renewables by the end of the forecast period.³⁴

³⁰ TVA website, <https://www.tva.com/energy/valley-renewable-energy/green-switch/green-invest>

³¹ MLGW IRP. July 2020. p. 215.

³² Ibid. p. 235.

³³ Ibid. p. 89.

³⁴ Ibid. p. 89.



MLGW's minimum renewables level (5-15 percent) was not applied to MLGW's TVA portfolios:

Considering only photovoltaic and wind generation, TVA fares poorly on an RPS measure. Even if large hydro were considered [which is not included in the RPS measure], this value would only increase to 16%.³⁵

The MLGW IRP's TVA portfolios' non-hydro (i.e., solar and wind) RPS percentage is 6.5 percent.³⁶ Our rough calculation of the RPS-eligible percentages across TVA's IRP portfolios is 8-11 percent by 2038. Siemens does not provide a clear account of how it calculated the 6.5 percent value for the TVA portfolios in the MLGW IRP. Using either the 6.5 percent renewables stated in the MLGW IRP's Exhibit 165 or the 8-11 percent inferred by AEC from the TVA's IRP, the TVA portfolios' RPS percentages are far below those of the Memphis IRP's non-TVA portfolios.

In Siemen's MLGW 2020 IRP scorecard analysis each portfolio receives a score based on the percentage of renewable sources offered (see Figure 7 below). The higher the percentage, the higher the score. The MLGW IRP scorecard figure does not report score values; rather, it reports the metric value (i.e., the percent of renewables, etc.) on which the score is based and uses a color-coding system (shades of green, yellow, and red) to display how each portfolio compares to the others. Meeting the 15 percent RPS floor for 2039 does not result in a maximum score (dark green); some portfolios have RPS percentages as high as 75.3 percent in 2039. All but the two TVA portfolios far exceed the 15 percent RPS minimum target.³⁷

³⁵ Ibid, p. 42.

³⁶ Ibid, p. 42.

³⁷ Ibid, p. 22.



Figure 7. MLGW 2020 IRP Exhibit 10. Scorecard results

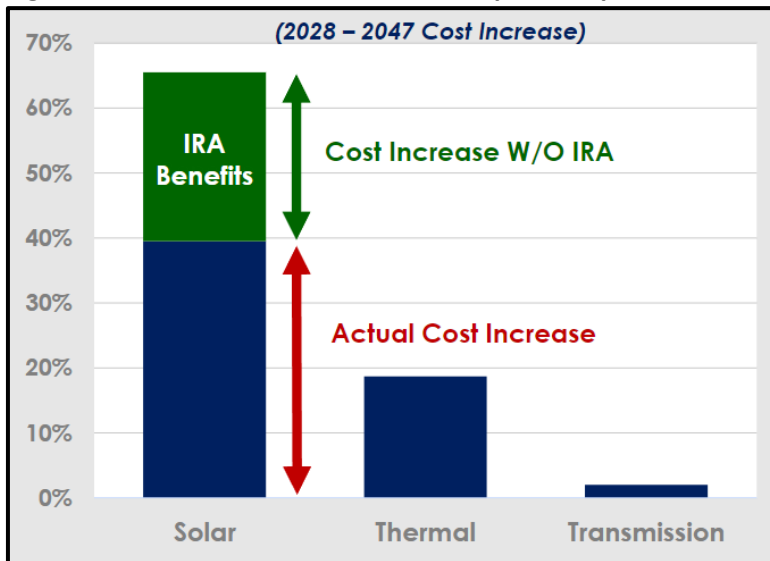
Objective	Measure	Unit	TVA (Base)	TVA (LTP)	Portfolio 5 1 CC + 4 CT	Portfolio 9 1 CC + 0 CT	Portfolio 10 ⁹ 2 CC + 1 CT	Portfolio 8 2 CC + 2 CT	All MISO 1 CC + 0 CT	Portfolio 1 2 CC + 1 CT	Portfolio 7 2 CC + 2 CT	Portfolio 4 3 CC + 1 CT	Portfolio 2 3 CC + 2 CT	Portfolio 3 3 CC + 0 CT
Least Cost	NPVRR 2020 - 2039	\$ Millions	10,411	10,020	14,463	14,304	14,014	14,027	14,522	14,490	14,503	14,511	14,088	14,709
	Stochastic Mean NPVRR 2020 - 2039	\$ millions	10,386	15,966	14,465	14,571	14,747	14,760	14,789	14,790	14,806	15,052	15,076	15,203
	Levelized Cost of Energy	\$/MWh	87.47	65.86	59.34	59.48	60.51	60.50	60.68	60.60	60.76	61.77	61.87	62.39
	NPV Savings with Respect of LTP (wrt LTP) 2020 - 2039	\$ Millions			1,537.4	1,425.9	1,249.3	1,230.5	1,207.8	1,206.8	1,188.0	944.7	920.2	793.0
Min Risk	Levelized Savings per Year (wrt LTP) 2025 - 2039	\$ Millions			122.1	121.7	99.2	97.8	96.0	95.9	94.4	75.0	73.1	63.0
	Levelized Savings per Year (wrt Base) 2025 - 2039	\$ Millions			153.2	162.8	130.3	128.8	127.0	127.0	125.5	106.1	104.2	94.1
Min Emv. Risk	95th Percentile Value of NPVRR	\$ millions	17,221	16,930	16,576	16,517	16,945	16,944	17,211	17,051	17,074	17,648	17,535	17,844
	CO ₂ Emissions Mean 20-Year	Milion Tons CO ₂	3.8	3.8	2.37	2.37	3.04	3.04	3.44	3.33	3.33	4.02	3.82	4.09
Reliable	Energy from Renewable Sources 2039 (RFS)	% of Energy Consumed	6.5%	6.5%	75.3%	75.3%	54.9%	54.9%	52.7%	56.8%	56.8%	47.3%	46.1%	40.7%
	Energy from Zero Carbon Sources 2039	% of Energy Consumed	58.6%	58.6%	75.3%	75.3%	54.9%	54.9%	52.7%	56.8%	56.8%	47.3%	46.1%	40.7%
Resilient	2025 Local Water Consumption	Milion Gallon	3,103	3,103	3,961	3,782	4,782	4,789	3,103	4,788	4,795	5,645	5,651	5,607
	2025 (UCAP+OUI)PEAK	%	133.7%	133.7%	125.0%	127.8%	126.6%	127.2%	115.4%	126.6%	127.2%	126.7%	130.6%	137.3%
Min Market Risk	Max Load Shed in 2025 under Extreme Event	MW	0	0	622.4	0.0	8.4	0.0	0.0	8.4	0.0	0.0	0.0	0.0
	% Energy Purchased in Market	%	10.8%	10.9%	31.2%	31.2%	17.4%	16.2%	23.0%	16.7%	15.0%	7.4%	7.0%	7.7%
Econ Grwth	% Energy Sold in Market	%	8.7%	8.7%	22.6%	17.0%	9.7%	9.7%	17.9%	10.5%	10.6%	7.6%	6.7%	5.6%
	Local T&G CapEx	\$ millions			2,969	2,854	2,845	2,965	1,014	2,911	2,932	3,138	3,299	3,404

Source: Reproduced from MLGWIRP. July 2020. Exhibit 10.

VII. MLGW’s misinterpretation of the IRA biases against renewables

MLGW updated its RFP pricing as a result of the 2022 Inflation Reduction Act³⁸ (IRA), noting that without the IRA, the cost of solar proposals would be 25 percent higher (see Figure 8). GDS’ IRA analysis, however, excludes key IRA provisions the absence of which creates a bias against renewables-heavy portfolios.

Figure 8. IRA benefits from MLGW IRP Update September 1, 2022 presentation



Source: Reproduced from MLGW Slides. September 1, 2022. p. 13.

According to GDS’ September 1, 2022 presentation the MLGW Board:

Solar proposal had largest price increase—cost would have been 25% higher WITHOUT benefits of the IRA. Multiple solar vendors stated that higher cost (sic) were the result of supply chain issues and higher cost associated with supplies & materials, financing cost, wage / labor, land lease, etc.³⁹

As a result, GDS’ RFP update forecasted cost increase from 2028-2047 is around 40 percent rather than the 65 percent identified in the new solar bids.⁴⁰ (The RFP bids themselves were submitted prior to the adoption of the IRA and, therefore, do not include its effects.)

GDS’s September 1 presentation makes no reference to two key IRA provisions capturing: (1) investment tax credits (ITC) for standalone batteries, and (2) production tax credit (PTC) extensions for wind and solar. (The RFP bids presented on September 1 were submitted in early August; the IRA was signed into law on August 16, 2022.) Short-listed Portfolios 6 and 9 have a large share of generation dedicated to MISO and Local Solar. Portfolio 9 has more MW for gas combustion turbines (CT), and Portfolio 6 has more MW for

³⁸ Inflation Reduction Act of 2022. H.R. 5376. Passed August 16, 2022. Available at: <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>

³⁹ MLGW Slides. September 1, 2022. p. 13.

⁴⁰ Ibid.



combined cycle gas turbine (CCGT) generation. As a result of the RFP update, Portfolio 6 costs were increased \$15/MWh due to higher costs for resources and transmission; similarly, Portfolio 9 were increased \$17/MWh.⁴¹ The inclusion of ITC and PTC benefits from the IRA would reduce the costs of, and increase the preference for, renewables- and battery-reliant portfolios.

VIII. MLGW's updated RFP bid aggregation is opaque

GDS' RFP bid aggregation method lacks transparency. GDS curates and combines bids such that RFP submissions are not discernible to stakeholders. At the same time, GDS' over-specification of the RFP into separate bidding categories by resource types damages the "all-resource" intent of the bidding process. MLGW will have received the bids as specified in the RFP, and not bids representing all resource solutions available in the marketplace.

Reliable and least-cost IRP results combine diverse sets of resources in a single assessment of distributor-wide resource needs and supplies, rather than requiring a separate planning process for each resource. MLGW has a single aggregate need for electric supply sufficient to meet its customers' needs. GDS' choice to issue three RFPs (one each for thermal, solar, and transmission resources) prevented the submission of any real-world mixed resource bids or bids designed to bundle resources together to meet MLGW's specific need. By over-specifying and constraining the RFP in this way, GDS has made it unlikely that the RFP resulted in truly "all-resource" bids, and instead taken creative license in assembling a discrete set of imaginary bundles bids. As MLGW President and CEO J.T. Young explained at the June 9 presentation to the Board:

So if you're if the question is will bidders be allowed to present their individual bids, so let me just back up a quick minute. The role the GDS had in this process was to aggregate the arrangements that would be beneficial to all customers. So if you have any individual bidder that they get and you add all of bids. Just to be clear. As is the case when we do contracts, bids, obviously will become public once we have an intent to award recommendations, that does not mean there will be a final decision at that point, as you saw there, there's still going to be time for comments and questions.⁴²

The other negative impact of structuring the RFP this way is that the individual bids received do not appear in the Board's September 1 update and recommendations. Instead, GDS uses the bids as ingredients that are mixed into bid-packages and thereby used to (partially) update the RFP findings. The result is a lack of transparency. Stakeholders can see the bids but cannot see the GDS-constructed bid-packages, or how these packages were used to update IRP findings with RFP data.

⁴¹ Ibid.

⁴² Quoted from GDS presentation to MLGW Board of Commissioners. June 9, 2022. *MLGW RFP Evaluation & Savings Validation*. Memphis Light, Gas and Water.

IX. MLGW future scenario selection introduces biases

MLGW’s IRP also evidences a lack of transparency in the model parameters uses to construct the future scenarios (or descriptions of future conditions) modeled. The distribution of parameter values under high/low load, high transmission, high gas prices, and low storage costs are not addressed in the MLGW IRP; only distributions under reference conditions are presented. If portfolios-scenario pairings assigned other-than-reference central values have been explored stochastically using the reference scenario parameter distributions, risk is being misrepresented and undercounted.

The IRP also fails to consider a full range of potential scenarios and as a consequence severely underexplores the extent of possible risks associated with each portfolio considered. The MLGW IRP model selectively pairs portfolios and scenarios, and does not model portfolios under a range of scenarios (the appropriate method). Again, risk is undercounted through modeler selection. In particular, the two TVA portfolios are only analyzed under reference conditions (and the reference distributions of parameter values) and not under any of the sensitivities to fuel prices, load, transmission, or technology costs, thereby misrepresenting and undercounting risk under TVA’s LTP. (The same can be said of Portfolios “All Miso”, 1, 2, 7, and 10.)

Rather than exploring all possible combinations of portfolios and scenarios, MLGW models only 13 portfolio-scenario pairings, at least five of these under reference case conditions and either most or all under reference case parameter distributions (see Figure 9). Without exploration of the different portfolios under sensitivity conditions, MLGW’s IRP fails to consider the scope of the potential risks to each portfolio.

Figure 9. Portfolio-scenario pairings modeled in MLGW 2020 IRP Update

Scenarios / Portfolios		Strategy		
		Strategy 1 (TVA)	Strategy 3 Self + MISO	Strategy 4 All MISO
State of the World	Scenario 1 Reference	S1S1	S3S1	S4S1
	Scenario 2 (High Load)		S3S2	
	Scenario 3 (Low Load)		S3S3	
	Scenario 4 (High Load/Low Gas)		S3S4	
	Scenario 5 (High Transmission)		S3S5	
	Scenario 6 (Promote BESS)		S3S6	
	Scenario 7 (Low Load/High Gas)		S3S7	

Source: Reproduced from MLGW. July 2020. Integrated Resource Plan. Memphis Light, Gas and Water Division. Available at: <https://www.mlqw.com/about/IRPFinalDocument>. p. 4.



X. MLGW introduces bias in its selection of portfolios

Siemens' portfolio selection introduces biases for gas-reliant portfolios and against battery-reliant portfolios. In standard IRP modeling, portfolios are selected by modelers, utility leadership, or stakeholder working groups. (Scenarios are also selected in this same way in an effort to explore a likely range of future conditions.) In MLGW's 2020 IRP, four "supply strategies" are identified—each of which is represented by a set of portfolios. The four strategies are as follows:

1. Strategy 1: All Requirements Contract with TVA (status quo), business as usual.
2. Strategy 2: Self-supply where MLGW self-serves all needs from local resources.
3. Strategy 3: Combination of self-supply (i.e. local supply) with procurement of resources in MISO market.
4. Strategy 4: Procure all resources from MISO.⁴³

According to MLGW's IRP:

Strategy 2 is simply not achievable. There is not enough land available in MLGW's service territory and its vicinity to economically acquire the needed renewable resources, nor would there be adequate backup generation capacity to meet the reliability and resource adequacy requirements, without major investments in generation resources. For these reasons, Siemens focused our attention on Strategies 1, 3 and 4.⁴⁴

Portfolio selection is an art, not a science, and there is always significant opportunity for IRP findings to be biased by portfolio selection. For example, if all portfolios selected for modeling are heavily fossil fuel dependent, optimization (or "least-cost") modeling will determine that one of the selected portfolios is the "preferred", but that determination should always be understood explicitly as "preferred among the portfolios subjected to modeling" and not as "preferred among all portfolios". Importantly, modelers always have the option to permit open optimization modeling in which portfolios are not pre-identified but instead the model itself identifies the portfolio. Any other form of optimization modeling should always be referred to as "constrained optimization" modeling.

Siemens' MLGW IRP modeling designates a truncated set of scenarios, optimizes some of these scenarios to identify portfolios, and then adapts most of these least-cost-under-a-given-scenario portfolios by adding or subtracting resources and by eliminating numerous portfolios. The portfolios selected and adapted in this manner are then subjected to constrained optimization. The result is a comparison of carefully curated options, and not a transparent investigation of a full range of potential least-cost resource portfolios.

Only a minority of the portfolios include batteries. The MLGW IRP forces the model to select gas CTs for reliability purposes, but a battery could serve the same function. While a majority of the portfolios do not include any added battery storage, Portfolios 5 and 9 consist of 100 MW each of planned battery storage

⁴³ MLGW IRP. July 2020. p. ES-1.

⁴⁴ MLGW IRP. July 2020. p. 2.



compared to one 450 MW CC and four 237 MW CTs each for planned gas.⁴⁵ With more recent battery cost forecasts and the IRA, batteries (including long-duration) are a viable capacity resource⁴⁶ that is ignored in the MLGW IRP because of the modelers' portfolio selection.

⁴⁵ Ibid. p. 8.

⁴⁶ National Renewable Energy Laboratory (NREL). September 2019. "Grid-Scale Battery Storage". Greening the Grid.

Available at: <https://www.nrel.gov/docs/fy19osti/74426.pdf>.