July 2, 2020

The Southern Alliance for Clean Energy (SACE) applauds Memphis Light, Gas and Water (MLGW) for commissioning a diligent, impartial process to explore long-term power supply options for serving its customers. In line with three other recent reports evaluating power supply options for MLGW, but with more conservative assumptions, the Siemens report makes clear that **Memphis can save hundreds of millions of dollars and receive cleaner energy by leaving TVA for an alternative power supply.** Against the current Tennessee Valley Authority (TVA) contract, preferred scenarios could generate savings between $130 to $153 million per year which would suggest savings of up to $2.295 billion over the next 20 years, savings that by law are required to be passed onto customers and could manifest in the form of energy efficiency programs to reduce high energy burdens in Shelby County

Having examined the draft Integrated Resource Plan (IRP) prepared by Siemens, SACE now offers the following comments to inform the process moving forward.

Key Excerpts:

- MLGW's lowest-cost options for power are also the cleanest.
- Each of the ten portfolios all include 1,000 MW of local renewable energy in or around Shelby County.
- SACE strongly agrees with the Siemens recommendation that "[a]n RFP should be undertaken by MLGW to confirm all estimated savings before making a final decision."
- SACE recommends three complementary procurement processes, with coordinated evaluation.
- Memphis has the power to deliver considerably more financial savings to its community through low cost energy efficiency, which is key to reversing unaffordable customer energy burdens that are historically the highest of any major metro area in the nation.

- Memphis has an opportunity to substantially increase energy efficiency investment and benefits for customers, possibly funded in part by a portion of the estimated $153 million per year in savings projected from an alternative power supply.
- Even with conservative assumptions throughout the modeling, portfolios with substantial amounts of renewable energy, far in excess of the TVA portfolio, emerged as the least cost and otherwise best options.
- TVA stands to gain by negotiating the sale or sharing of the Allen Fossil Plant, negotiating the sale or sharing of some transmission assets, and remaining at least partially connected to MLGW for reliability purposes

Table of Contents

A. Siemens and MISO make a strong case for MLGW to leave TVA

The draft Integrated Resource Plan (IRP) that Siemens prepared for Memphis Light, Gas, and Water (MLGW) shows **MLGW's lowest-cost options for power are also the cleanest.** Of the many scenarios that MLGW's contractor examined, the lowest-cost energy portfolios would provide MLGW up to 75% renewable energy, and cut carbon pollution by 50% compared to TVA levels, resulting in improved public health, cleaner air, and cleaner water.

Portfolios 5 and 9, in particular, project savings of $1.5 billion over the next 20 years compared to the option of remaining with TVA under the long-term partnership. This is computed on a Net Present Value of Revenue Requirements (NPVRR) basis (p. 17). On an annualized basis, this represents $122 million per year savings compared to the TVA long-term partnership or $153 MM per year (closer to $2 billion total savings) compared to the current TVA contract (p. 18-19). Additionally, both portfolios offer the economic opportunity presented by nearly $3 billion in capital investment (p. 162), which could provide jobs for many Shelby County residents and a significant source of revenue for local governments.

Each of the ten portfolios all include 1,000 MW of local renewable energy in or around Shelby County. In addition, Portfolios 5 and 9 both combine that local solar energy along with 3,050 MW of solar and 400 MW of wind from Arkansas. These portfolios also include fossil-gas resources: a 450 MW combined-cycle plant and 948 MW of combustion turbines. The only difference in the portfolios is the timing for when the combustion turbine resources are constructed: 2025 for Portfolio 9 or 2035, 2036 and 2038 for Portfolio 5. Each of these portfolios also includes 100 MW of battery energy storage. (p. 290, 329).

MLGW's remaining resource needs for Portfolios 5 and 9 are met with market-based transactions via MISO (the Midcontinent Independent System Operator). And each of the portfolios fulfill the NERC

(North American Electric Reliability Corporation) reliability requirements and deliver a comparable level of reliability to others in the MISO market (p. 37).

The Summary of Overall Results (p. 16) represents a balanced scorecard and illustrates the strong advantages of high penetrations of renewables, particularly Portfolios 5 and 9, relative to the TVA options.

Exhibit 9: Summary of Overall Results

Objective	Measure	Unit	TVA (Base)	TVA (LTP)	Portfolio 5	Portfolio 9	Portfolio 10	Portfolio 6	Portfolio 8	All MISO	Portfolio 1	Portfolio 7	Portfolio 4	Portfolio 2	Portfolio 3
					1 CC + 4 CT	1 CC + 4 CT	1 CC + 0 CT	2 CC + 1 CT	2 CC + 2 CT	1 CC + 0 CT	2 CC + 1 CT	2 CC + 2 CT	3 CC + 1 CT	3 CC + 2 CT	3 CC + 0 CT
Least Cost	NPVRR 2020 - 2039	$ Millions	16,411	16,020	14,504	14,453	14,304	14,614	14,627	14,522	14,490	14,503	14,511	14,668	14,709
	Stochastic Mean NPVRR 2020 - 2039	$ millions	16,388	15,998	14,459	14,465	14,571	14,747	14,766	14,789	14,790	14,808	15,052	15,076	15,203
	Levelized Cost of Energy	$ / MWh	67.47	65.86	59.32	59.34	59.48	60.51	60.59	60.68	60.69	60.76	61.77	61.87	62.39
	NPV Savings with respect of LTP (wrt LTP) 2020 -2039	$ Millions			**1,537.4**	**1,531.7**	**1,425.9**	**1,249.3**	**1,230.5**	**1,207.8**	**1,206.8**	**1,188.0**	**944.7**	**920.2**	**793.0**
	Levelized Savings per Year (wrt LTP) 2025 -2039	$ Millions			**122.1**	**121.7**	**113.3**	**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**	**152.8**	**144.4**	**130.3**	**128.8**	**127.0**	**127.0**	**125.5**	**106.1**	**104.2**	**94.1**
Min Risk	95th Percentile Value of NPVRR	$ millions	17,221	16,830	16,576	16,517	16,993	16,946	16,944	17,211	17,051	17,074	17,648	17,535	17,844
Min Envr. Risk	CO_2 Emissions Mean 20-Year	Million Tons CO_2	3.8	3.8	1.85	1.85	2.81	2.57	2.57	2.81	2.57	2.57	3.29	3.29	3.30
	Energy from Renewable Sources 2039 (RPS)	% of Energy Consumed	6.5%	6.5%	75.3%	75.3%	52.7%	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%	52.7%	54.9%	54.9%	52.7%	56.8%	56.8%	47.3%	46.1%	40.7%
	2025 Local Water Consumption	Million Gallon	3,103	3,103	3,961	3,782	4,899	4,782	4,789	3,103	4,788	4,795	5,845	5,551	5,607
Reliability	2025 (UCAP+CIL)/PEAK	%	133.7%	133.7%	126.0%	127.8%	148.6%	126.6%	127.2%	115.4%	126.6%	127.2%	126.7%	130.8%	137.3%
Resiliency	Max Load Shed in 2025 under Extreme Event	MW	0	0	622.4	0.0	0.0	8.4	0.0	0.0	8.4	0.0	0.0	0.0	0.0
Min Market Risk	% Energy Purchased in Market	%	10.9%	10.9%	31.2%	31.2%	23.0%	17.4%	16.2%	16.7%	16.7%	15.6%	7.4%	7.0%	7.7%
	% Energy Sold in Market	%	8.7%	8.7%	22.6%	22.6%	17.9%	9.7%	9.7%	10.5%	10.5%	10.6%	7.6%	6.7%	5.6%
Econ. Grwth	Local T&G CapEx	$ Millions			2,989	2,864	2,984	2,845	2,965	1,014	2,811	2,932	3,138	3,299	3,404

Source: Siemens

Renewable energy with TVA is projected to be just 6.5% by 2039. Even expanding the category to instead include additional zero-carbon resources, the Integrated Resource Plan (IRP) only anticipates 58.6% by 2039. Portfolios 5 and 9 each project 75.3% from renewable energy resources (solar and wind) for 2039. These options are fundamentally more aligned with the city and county's goals and vision of public interest articulated Memphis Area Climate Action Plan,[1] and may make meeting their adopted

[1] https://memphistn.gov/news/what_s_new/climate_action_plan

goals of 75% carbon-free electricity by 2035 and 100% carbon-free electricity by 2050 much more feasible to achieve.

Another key metric, CO_2 emissions, also favors leaving TVA. With TVA, the average emissions attributed to MLGW would be 3.8 million metric tons per year. With either portfolio 5 or 9, the MLGW IRP projects 1.85 million metric tons per year -- a 51% reduction.

The inability for TVA to be competitive with other available options is largely due to failures, shortcomings and general lack of vision in TVA's own Integrated Resources Plan. SACE and others provided extensive comments[2] on that plan which were largely ignored.

SACE strongly agrees with the Siemens recommendation that "[a]n RFP should be undertaken by MLGW to confirm all estimated savings before making a final decision." (p. 27) In fact, we contend there should be three complementary procurement processes and offer specific suggestions for those in the next section. Effective procurement processes are essential because many of the assumptions Siemens used in their analysis are overly conservative. A conservative approach was appropriate for evaluating the decision to leave MLGW. With a strong procurement process, MLGW will be able to identify market portfolios with even greater savings potential.

We further agree with the general transmission and MISO interconnection strategy suggested by Siemens in the draft IRP report. In particular, MLGW should seek to be added to LRZ-8 and undertake the other related recommendations identified by Siemens.

[2] https://cleanenergy.org/wp-content/uploads/SACE-Comments-on-2019-TVA-IRPEIA-_08april19.pdf

B. The MLGW Board should recommend (and the Mayor and City Council should approve) a set of complementary competitive bid procurement processes

1. There should be three (3) procurement processes

The draft IRP makes a compelling case to proceed with an RFP (Request for Proposal) to confirm estimated savings. MLGW should seek City Council's approval to initiate this process. **SACE recommends three complementary procurement processes**, with coordinated evaluation. MLGW will need to procure:

- Supply resources – likely consisting of a combination of solar, wind, gas, and battery storage systems
- Transmission and distribution resources – including both necessary upgrades as well as new transmission lines that can be evaluated for cost-effectiveness
- Energy-efficiency and other customer-sited resources – including solicitation of an energy efficiency vendor as well as other programs to promote microgrids and behind-the-meter generation and storage

MLGW should design the evaluation process in advance of soliciting bids, and provide an opportunity for outside parties – including potential bidders – to provide expert comments on the evaluation process to ensure that every opportunity is taken to identify the optimal mix of resources. An independent evaluator (see 2.E below) can support this phase of the process, as well.

2. Supply Resource Request for Proposal (RFP)

MLGW should undertake an all-source procurement process for supply resources, including generation and battery storage. Five best practices for this procurement are outlined below and discussed in detail

in SACE's recent report, *Making the Most of the Power Plant Market: Best Practices for All-Source Electric Generation Procurement*.[3]

a) The resource planning process should be used to determine the technology-neutral procurement need.

MLGW has already used the resource planning process to determine the technology-neutral procurement need. The draft IRP report clearly identifies that "an RFP should be undertaken by MLGW to confirm all estimated savings … The IRP can be utilized to determine the general mix of assets and locations of interest in the RFP …" (p. 27). We commend the approach in the draft IRP report of not identifying any specific resources that should or should not be selected – rather, the report identifies a general mix of assets across a number of portfolios and recommends further evaluation.

b) Conduct a competitive, all-source procurement process, with robust bid evaluation.

The draft IRP recommends that MLGW conduct a competitive, all-source procurement process. We agree with this recommendation and further recommend that MLGW ensure that the bid evaluation process is robust.

Already, the draft IRP evaluation provides a solid basis for a bid evaluation process that relies on a model to select an optimal portfolio of projects, rather than simply ranking qualified proposals based on a simplistic price or cost metric. It may make sense to rank very similar projects on a simplistic cost ($/MWh or $/MW) basis in order to exclude uncompetitive bids. Beyond that initial screening, it will be necessary to use a capacity planning model to optimally select combinations of wind, solar and other supply resources.

[3] https://cleanenergy.org/wp-content/uploads/All-Source-Utility-Electricity-Generation-Procurement-Best-Practices_EI_SACE.pdf

In addition to further specifying how the bid evaluation process will operate, there are several specific areas that require further attention, as discussed below. Furthermore, the process of evaluating supply resources needs to be coordinated with the evaluation of transmission and customer-sited resources, also discussed below.

c) Conduct advance review and approval of procurement assumptions and terms.

MLGW should continue and enhance the PSAT and public participation process to provide for advance review of the procurement assumptions and terms. For example, the draft IRP report included both a deterministic and a stochastic ranking of supply portfolios that significantly affected the results (see p. 216, for example). There will be a tradeoff between winnowing the bids and conducting more resource-intensive stochastic analysis of potential portfolios of bids. Including a stochastic analysis of bids is important because, as the draft IRP report suggests, MLGW should assess fuel price volatility as part of its assessment (p. 24).

The method by which the tradeoff between evaluating all bids and the resource-intensive stochastic analysis is resolved is one of many methods and assumptions that will determine whether MLGW makes an optimal choice. Bidders will of course want their projects to get the fullest possible evaluation, but MLGW will need to identify a relatively small number of potential bid portfolios for full evaluation.

Similarly, the terms on which winning projects will be contracted can also affect the outcome of the bid evaluation. If projects are required to be delivered for 20 years (no more and no less), then that could advantage certain types of projects. Similarly, if projects are required to include a purchase option after 5 years, that could advantage certain projects. MLGW's procurement methods, assumptions and terms should be evaluated in a transparent public process to ensure that the bid evaluation and project contracting process is fair and efficient.

d) Ensure that utility ownership of generation is not at odds with competitive bidding.

If MLGW considers self-build options, MLGW should ensure that the RFP process includes appropriate procedures to ensure the MLGW self-build team does not have access to information or evaluation models that are not also made available to competitors. The bid evaluation models also need to be scrutinized to ensure that assumptions (e.g., financial modeling) does not include implicit bias towards self-build bids.

e) Establish rules for fairness, objectivity and efficiency.

MLGW needs to also commit to establishing rules for fairness, objectivity and efficiency in its RFP process. One key practice is the use of an independent evaluator – this would be distinct from any assistance MLGW might obtain for modeling (e.g., from Siemens) and administration of the RFP (e.g., from ACES). The independent evaluator should have a range of duties typical of many utility RFPs, and we would urge MLGW to hire the independent evaluator early enough so that it could offer an independent opinion on the draft RFP, including the timelines for the RFP process, contract terms, and use of confidentiality to restrict sharing of bid evaluation process information with potential bidders.

3. Transmission and Distribution Resources

The draft IRP report identifies four components of the transmission and distribution system upgrades:

- Transmission expansion – This should be included in an RFP, as discussed below.
- Local reliability reinforcement – Some or all of these projects should also be included in an RFP, as discussed below.
- Generation interconnection – These projects will need to be identified and put out for bid after the results of the supply RFP are determined.

- Reimbursements to TVA related to its generation units – These projects are not discussed in our comments as the work is not the responsibility of MLGW.

These four components can be executed in three phases of transmission and distribution upgrade procurements: a major RFP covering the largest elements of the plan, follow-up RFPs for specific projects including generation interconnection, and the TVA generation projects.

As discussed in the draft IRP report, most of the transmission costs associated with MLGW departing TVA are likely to be three new interconnection and associated reliability reinforcements. Although the Siemens report provides a strong technical basis for identifying the necessary projects, MLGW should issue a more general RFP that allows for both projects specifically identified by Siemens but also for other project proposals that transmission developers may identify as responsive to MLGW's needs.

Those other project proposals could take many forms. As noted in the draft IRP report, there are a number of additional incremental transmission investment options that would further increase the import capability beyond the 2,568 MW level (p. 115). The additional import capability may be more cost-effective than marginal gas generation units. As noted in the draft IRP report, there can be a tradeoff between investments in transmission and configuration of gas-fueled power plants (pp. 12, 215-16).

It is also possible that significant new generation could be developed near MLGW territory but requiring additional transmission investment to deliver the energy to MLGW (p. 84). Coordinated RFP bids from a transmission developer and power plant developers could offer an alternative transmission solution that addresses MLGW reliability concerns and provides access to new generation resources. MLGW should

encourage creative submissions that might be more desirable than relying on resources located in more distant parts of MISO.

Furthermore, while Siemens offers persuasive analysis that the All MISO strategy is not in MLGW's best interests, if MLGW does wish to keep this option on the table, then the RFP could include the fourth interconnection project, and associated transmission upgrades, identified by Siemens (p. 119) or some similar option that a transmission developer may identify. Inviting these options specifically in the RFP will ensure that the MISO Only option (Strategy 4), along with Portfolio 10 which derived from that strategy, can be reevaluated with market proposals to ascertain cost savings.

It is less clear what projects are involved in the local reliability reinforcement and whether those projects are likely to be sensitive to the final generation and transmission plan. It is likely that some are likely to be known, such as upgrades of existing transmission to replace service currently provided by TVA's 500 kV system. Other projects are likely to be complementary to the final generation and transmission plans.

It could make sense to identify the larger needs and potential project concepts for the transmission RFP. These bids could replace the engineering estimates used by Siemens in its analysis as the overall plan is refined through the evaluation of the RFPs.

However, when evaluating the bids received for the supply and transmission RFPs, MLGW will continue to need cost estimates for the applicable remaining local reliability reinforcement projects as well as the generation interconnection projects. If these projects are not included in the transmission RFP, then MLGW will need to utilize engineering estimates to compare the full costs of various generation plus transmission portfolios.

4. Energy Efficiency and Other Customer-sited Resources

By essentially building a new generation utility, MLGW has a unique opportunity to avoid substantial investments through relying on energy efficiency and other customer-sited resources. As shown in Exhibit 329 for Portfolio 9, roughly two-thirds of MLGW's total cost is fixed cost – which appears to represent the fixed cost of generation, exclusive of all fixed transmission costs. If MLGW could acquire energy efficiency and customer-sited resources that would enable it to reduce load by 10-15%, this could reduce its fixed costs by $0.7 – 1.05 billion.

Accordingly, in addition to the supply and transmission RFPs (and follow-up reliability reinforcement and interconnection procurements), MLGW should also initiate an RFP for energy efficiency and other customer-sited resources. Similar to the other RFPs, this RFP should be fairly open and unconstrained. In addition to conventional energy efficiency and demand response programs, MLGW should be receptive to microgrids, customer-sited storage, and customer-sited solar generation. MLGW might also consider including electric transportation infrastructure projects in the RFP with the proviso that they must also offer a load management capability.

MLGW should move swiftly to issue this RFP so that a preliminary analysis of its results could be available in advance of the supply and transmission RFPs. Siemens estimates that average market purchases will cost in the range of $37-45 per MWh, and that overall portfolio costs will be in the range of $45-50 per MWh.

MLGW should issue the RFP seeking proposals to deliver energy efficiency and other customer-sited resources at a cost below that of its forecast portfolio costs. The RFP should specifically seek:

- A consultant to offer a comprehensive residential and small business energy efficiency program with an emphasis on low-income households and neighborhoods.
- One or more consultants to offer energy efficiency and load management (demand response) programs targeted at specific larger commercial and industrial markets.
- Creative proposals to build out microgrids, customer-sited energy storage, and customer-sited solar generation and storage.

We note that the draft IRP report specifically states that "if more local generation can be procured, this will only result in a reduced need to acquire MISO footprint generation" (p. 26). Consistent with this finding, MLGW should embrace customer-sited generation and other energy resources.

Siemens assumed distributed generation solar to reach just 22 MW by 2039 (p. 57). This would equate to less than 1.5% of the average load forecast for MLGW in 2039. Several utilities in the southeast have already (in 2019) exceeded 2% of their load with customer-sited renewables; examples, Duke Energy Progress, Duke Energy Carolinas and Dominion Energy South Carolina. This RFP for energy efficiency and customer-sited resources will enable creative exploration of these opportunities for MLGW.

In addition to obtaining firm pricing and resource delivery commitments from bidders, MLGW should also require bids to include detailed information regarding the impacts the programs would have on its system load shape. This information will be an essential input into the evaluation process for the supply and transmission RFP bids.

Finally, we also note that there is every reason for MLGW to begin implementation of these contracts well in advance of formal separation from the TVA system. Reducing system energy demand in year one of MLGW's reliance on self-supply will be critical to avoiding substantial fixed costs.

C. City Council should ensure a just and equitable energy supply for Memphis by committing to investing the savings in programs that will lower energy burdens

Pursuing an alternative power supply outside the TVA system is expected to yield significant financial savings for MLGW. The Mayor and City Council should make a commitment to invest these savings in creating a just and equitable energy supply for Memphis, including energy efficiency programs that will lower energy burdens for customers and offset the purported need for new fossil fuel generation in its service territory.

Siemens raises the possibility of MLGW building additional gas plants near two locations within its service territory: near the Chambers Chapel substation in Arlington and near the Collierville Gate substation in Collierville. These both appear to be EPA Superfund Redevelopment sites,[4] which are formerly hazardous / contaminated areas that have returned or are ready for productive use. Burning fossil fuels and operating natural gas infrastructure at these sites would *re*introduce risks to the health and safety of these communities - nitrogen oxides (NOx) produced by burning natural gas are linked to public health risks such as asthma, bronchitis, lung cancer, and heart disease.[5]

The absence of new gas plants in scenarios where MLGW remains in TVA should also not be interpreted as a better environmental justice outcome. TVA has minimized and delegitimized public health concerns from major hazards, such as the coal ash disaster at the Kingston Fossil Plant, where workers were poisoned by coal ash that TVA characterized as "safe"[6]. As noted earlier, Portfolios 5 and 9 in the draft IRP report offer high-renewables futures with about half of the carbon dioxide emissions of staying with

[4] U.S. Environmental Protection Agency (EPA), Superfund Sites in Reuse in Tennessee: www.epa.gov/superfund-redevelopment-initiative/superfund-sites-reuse-tennessee

[5] https://ww2.arb.ca.gov/our-work/topics/health

[6] Knoxville News Sentinel, "TVA's own tests revealed radium, heavy metals in coal ash before 2008 spill" https://www.knoxnews.com/story/news/local/tennessee/tvacoalash/2019/04/17/tva-internal-records-reveal-radium-heavy-metals-found-in-coal-ash/3275139002/

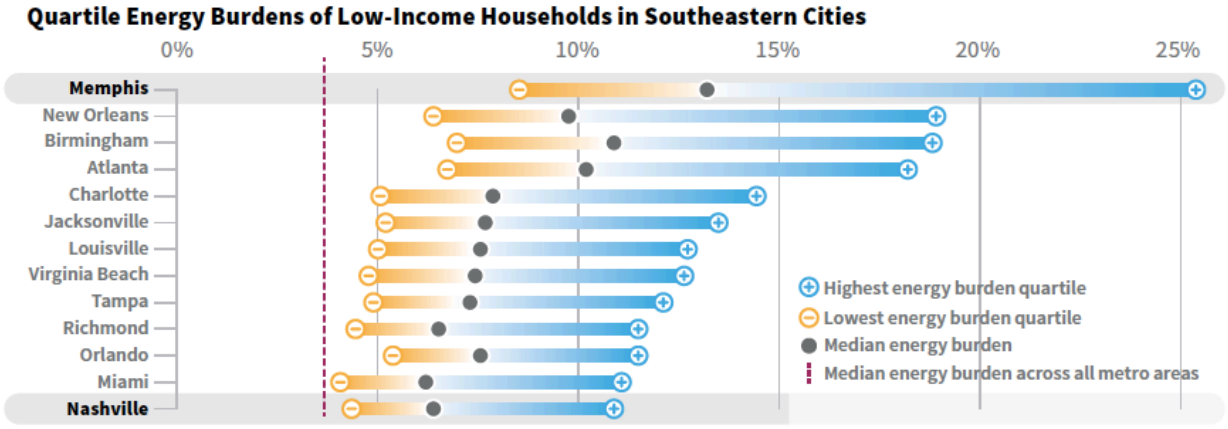
TVA. By remaining with TVA, MLGW will likely have more difficulty in achieving emissions reductions and little to no control over future risks that TVA may impose on its customers. The City Council should instead seek to meet the power supply goals of Memphis in a way that addresses existing inequalities, such as high energy burdens, and takes advantage of the newfound possibilities outside the TVA system.

By pursuing alternatives to its current arrangement with TVA, **Memphis has the power to deliver considerably more financial savings to its community through low cost energy efficiency, which is key to reversing unaffordable customer energy burdens that are historically the highest of any major metro area in the nation**.[7] While energy efficiency levels presented in the Siemens report are higher than what TVA used in its recent IRP, limiting energy saving to 0.5% of annual sales is still overly conservative and the cost assumptions per kWh of energy saved are far too high. When compared to regional peer utilities that have embraced energy efficiency, it is clear that Memphis can achieve far higher levels of efficiency savings than is currently presented in the Siemens report, thereby offsetting the need for more expensive power supply and further reducing costs to customers below current levels under TVA. These opportunities can be revealed through the expanded RFP process we recommend (see section B.5 above).

Electric bills in Tennessee are among the highest in the nation, and Memphians in particular pay too much. This issue is even more serious for low income customers, who are more likely to forego basic household necessities like food and medicine in order to keep the lights on. Historically, the Memphis metro area has ranked as having the worst energy burden of major metro areas in the nation, reflecting the cost of energy bills as a percentage of household income. The national average for energy burden is 3.5%, but according to the American Council for an Energy-Efficient Economy, low income households in

[7] ACEEE. *Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low-Income and Underserved Communities.* https://www.aceee.org/research-report/u1602

Memphis pay on average about 13% of their income - and more than a quarter of low-income families pay 25% of their income for energy.[8]



In addition to being one of the most impoverished cities in the nation, Memphis is home to an unusually high percentage of old housing stock, and has some of the nation's worst health disparities related to environmental toxins in homes, including asthma, infant mortality, and lead poisoning. The elderly and communities of color in particular are at higher risk of exposure to these health inequalities and are more likely to live in homes that lack energy efficiency. By contrast, energy-efficient homes help to mitigate these risks while increasing families' financial wellbeing with lower monthly energy costs.[9]

But in recent years, TVA has rapidly reduced investment in energy efficiency, effectively limiting opportunities for low-income, single resident, elderly, and fixed income customers to lower their bills by reducing energy waste in their homes. While efficiency was once an important component of TVA's IRP planning, in its most recent IRP, SACE estimates that TVA capped overall energy efficiency savings at 842

[8] *ACEEE, Tennessee Fact Sheet.* *https://www.aceee.org/sites/default/files/pdf/fact-sheet/ses-tennessee-100917.pdf*

[9] In 2018, Friends of the Earth and the Vermont Energy Investment Corporation proposed a large scale deployment of efficiency programs for low income households that included deployment of neighborhood style direct-install programs, deep efficiency weatherization for customers with high energy burdens, and on bill financing. The aim was to reach 50% of low income households with average savings of 15-25% on their electric, gas, and water bills. The report can be found at: https://1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/2019/06/Low-Income-Cookbook-8-to-FOE-Final-5-23-18-KLGV3-002.pdf. This is just one of an array of strategies that could be employed to reverse high energy burdens among MLGW customers.

GWh across its entire service territory through 2038 for all sectors. This is just 3% of the 20,676 GWh of economic potential estimated by the Electric Power Research Institute.[10] As noted above, if MLGW moves ahead its exploration of an alternative power supply, energy efficiency can be used to offset the need for future generation and reduce utility fixed costs. As discussed below, the amount of efficiency savings potential is significantly higher than currently included in the draft IRP.

TVA's already low energy efficiency funding levels have been cut by nearly two thirds since 2014, and all customer incentive programs have been eliminated. All that's left are educational workshops and minimal investment in low income efficiency programs. For Memphis, this was limited to $500,000 annually in 2017 and 2018 . By considering alternative power supply options, **Memphis has an opportunity to substantially increase energy efficiency investment and benefits for customers**, possibly funded in part by a portion of the estimated $153 million per year in savings projected from an alternative power supply.

From a resource availability and a public policy perspective, substantially more energy efficiency should be included in the final MLGW IRP than the highly conservative 0.5% annual savings limit currently included in the Siemens draft IRP report. Siemens explains the 0.5% annual savings figure as being derived from the average savings performance of five regional utility peers. No source data or source year(s) were indicated for our review, but averaging these utilities' past performance is simply not a reasonable proxy for energy efficiency potential from a resource optimization perspective. To evaluate whether higher levels of energy efficiency investment could reduce the need for and cost of acquiring additional supply resources (or compare against contracting power with TVA), either a more robust demand side management potential study is needed or the comparison should focus specifically on utilities that have more fully embraced pursuit of higher efficiency savings levels. Neither Entergy Mississippi nor City Utilities of Springfield present useful points of comparison from a resource

[10] State Level Electric Energy Efficiency Potential Estimates: EPRI, Palo Alto, CA: 2017. 3002009988.

optimization standpoint. Mississippi has still not implemented comprehensive energy efficiency rules and continues to run only quick start energy efficiency programs, resulting in substandard annual savings levels between 0.2% and 0.3%.[11] Since the state lacked rules for integrated resource planning until last year, it is a simple fact that efficiency in Mississippi has never been optimized from a resource planning perspective. City Utilities of Springfield savings are also close to 0.2%, clearly not a model for Memphis to follow.[12] A far better comparison can be found in Entergy Arkansas, which has exceeded 1.0% annual efficiency savings for each of the past five years,[13] and is expected to capture at least 1.2% for each of the next three years. Entergy New Orleans also presents a useful point of comparison, but one must look at multiple years, past and future, to draw meaningful insight. Since 2016, Entergy New Orleans has increased its annual savings by at least 0.2% each year from 0.34% in 2016 to 0.94% in 2019.[14] In the coming years, savings levels in New Orleans are scheduled to continue increasing to 1.2% in 2020, 1.5% in 2021, and 1.7% in 2022.[15] The final MLGW IRP should increase energy efficiency to levels comparable to Entergy New Orleans and Entergy Arkansas, with ramp rates that increase each year by at least 0.2% of the previous year's retail sales.

The final MLGW IRP should use a lower cost per kWh than presented in the Siemens report. The $0.10 cost per kWh that Siemens derived by averaging program delivery costs for the five utilities in its comparison group is far higher than the findings of numerous rigorous cost studies by the nation's leading authorities on the subject, including the Synapse report that Siemens cited. In their respective

[11] Calculated using Entergy Mississippi, Inc. annual energy efficiency reports to the Mississippi Public Service Commission from 2015-2018 in Docket 2014-UA-006, and retail sales data from EIA form 861.

[12] EIA form 861

[13] Entergy Arkansas, Inc., "Arkansas Energy Efficiency Program Portfolio Annual Report, 2019 Program Year." http://www.apscservices.info/EFilings/Docket_Search_Documents.asp?Docket=07-085-TF&DocNumVal=740

[14] Calculated using Entergy New Orleans, LLC annual energy efficiency reports to the New Orleans City Council in Dockets UD-08-02 and UD-17-03 and retail sales data from EIA form 861.

[15] New Orleans City Council Resolution No. R-20-51 re: Dockets UD-08-02 and UD-17-03

reports on the subject, the Lawrence Berkeley National Laboratory reported a $0.025 / kWh[16] program administrator cost of saved electricity,[17] the American Council for an Energy Efficient Economy reported median electricity program savings of $0.026 / kWh,[18] and the Synapse report cited by Siemens had median cost / kWh of lifetime savings at $0.024.[19] Moreover, these studies showed costs typically remaining flat or declining over time. Even after Siemens discounted its cost stream over the period of analysis down to $0.064 / kWh it is still over two and a half times higher. This means that not only is there significantly more cost-effective energy efficiency available as noted above, it is also less expensive and would therefore deliver even more financial benefit to customers than presented in Siemens draft IRP. It also suggests that additional cost-effective investment in energy efficiency could offset the need for even more fossil fuel power generation, leading to a cleaner generation fleet at a lower cost to customers.

D. The Siemens report gives every benefit of the doubt to TVA

Assumptions Siemens made for the draft IRP are intentionally conservative. While a conservative approach may be prudent for this initial screening, it is very likely to significantly and artificially underestimate the potential savings for MLGW.

[16] Lawrence Berkeley National Laboratory, " The Cost of Saving Electricity Through Energy Efficiency Programs Funded by Utility Customers 2009-2015." http://swenergy.org/Data/Sites/1/media/lbnl-cse-report-june-2018.pdf

[17] More recently, the Lawrence Berkeley National Laboratory found that the cost of energy saved for publicly owned utilities is $0.024 nationally and $0.025 for the Southern region. also found , " The Cost of Saving Electricity Through Energy Efficiency Programs Funded by Utility Customers 2009-2015." https://emp.lbl.gov/webinar/cost-saving-electricity-through-efficiency

[18] ACEEE, "The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs." https://www.aceee.org/research-report/u1402

[19] Synapse, "Estimating the Cost of Saved Energy." http://www.synapse-energy.com/sites/default/files/COSE-EIA-861-Database-66-017.pdf

Admittedly, "[t]his is not a traditional IRP." "[T]his report provides planning level estimates of prices and amounts of generation that can be procured for the Self-Supply plus MISO option and the cost of the TVA option so that all the relevant factors in the decision are properly considered." (p. 34)

And we strongly agree with the premise that "MLGW will need to verify the conclusions of this report through an RFP before a final recommendation can be made to the Board of Commissioners." Hence, our recommendations in Section B above which will allow reassessment of the most viable portfolios with actual bids to reflect the current market.

In addition to comments in section C (above) about the "highly conservative 0.5% annual savings limit currently included in the Siemens draft IRP report" SACE offers the following examples where the Siemens report gives every benefit of the doubt to TVA.

1. Solar costs are inflated by assumed land prices

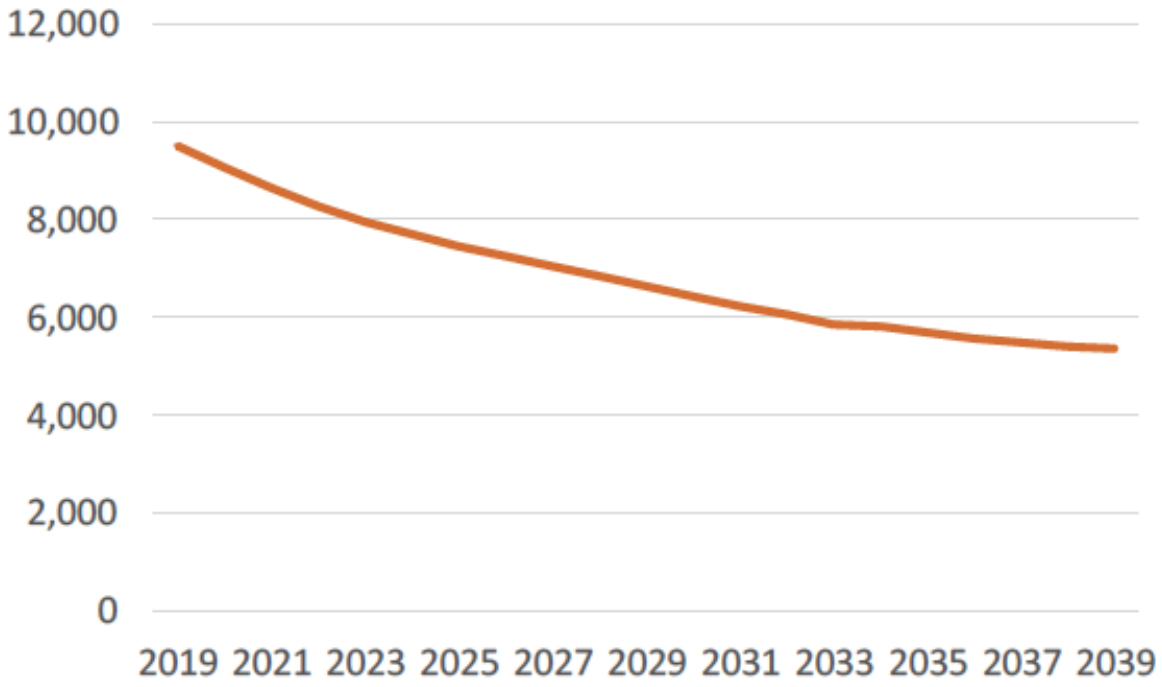
Land availability for solar in Shelby County is an example of Siemens' conservative assumptions. Assuming land prices in Shelby County at more than three times the national average resulted in a Levelized Cost of Solar for 2020 that is approximately 17% higher than estimated by the National Renewable Energy Laboratory (NREL). (p. 83)

Siemens also imposed a limit of 1,000 MW of solar based on presumed land availability. Yet, even with the higher cost of solar, the model selected the full 1,000 MW of local solar resources for every portfolio. "Local renewables are the least expensive option of all available resources for MLGW" (p. 2).

2. Nuclear (Small Modular Reactor) costs seem artificially low

On the other hand, Siemens' assumptions for the cost forecast of Small Modular Reactor (SMR) technology exhibit annual cost declines while SACE has witnessed the cost of other nuclear technologies to be increasing rather than decreasing. (p. 87)

Exhibit 62: Small Modular Reactor (SMR), All-In Capital Cost, 2018$/kW

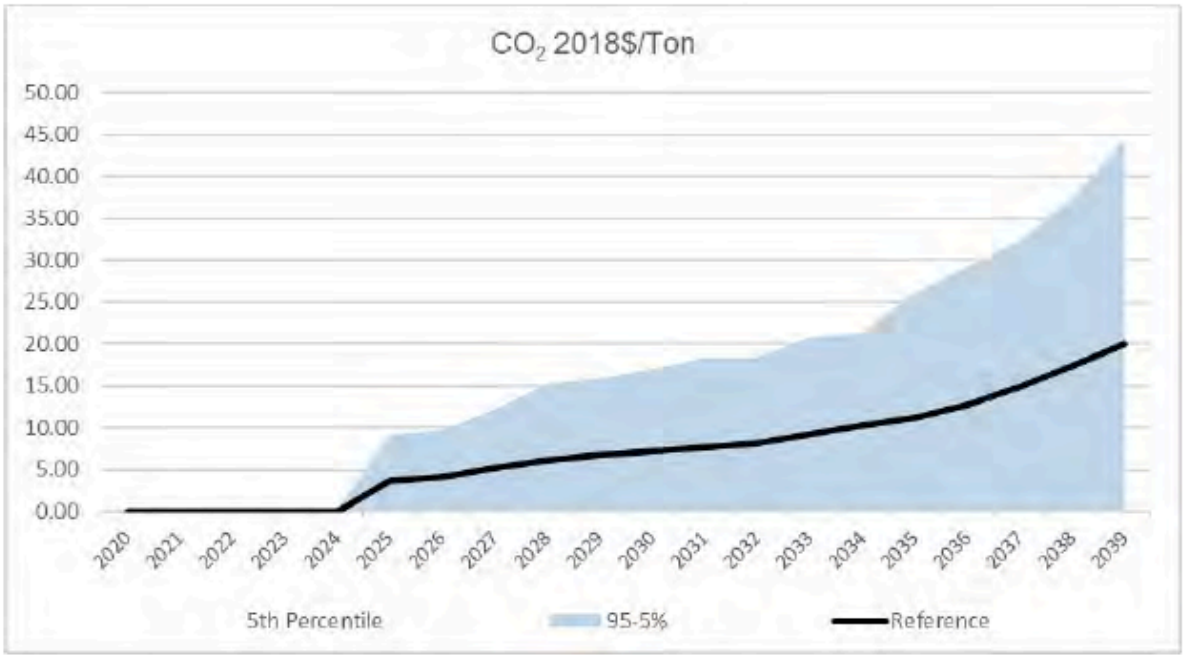


Source: Siemens

3. CO_2 pricing is low (and other GHG emissions are ignored completely)

SACE is pleased that Siemens enabled the modeling to include a CO_2 Emission Price (i.e., a cost for carbon). However, we contend that the values being modeled are very conservative. That price is presumed to start at $3/ton in 2025 and escalate to $20/ton over the next 15 years (in 2018$). Even the high end of the stochastic uncertainty distribution only reaches $45/ton by 2039 -- and the low end of that stochastic range reflects $0/ton (p. 144).

Exhibit 97: CO_2 Price Distribution (2018$/ton)



Source: Siemens

SACE would also like to point out that the Siemens analysis fails to factor in other GHG emissions impacts beyond simply CO_2 emissions pricing. Given the release and climate damaging intensity of methane in the course of gas production and use, it is unacceptable to conduct a sustainability review and fail to also consider the GHG emission impacts of methane. If incorporated, GHG emissions would have additional negative impact on the TVA and alternative scenarios which advantage gas.

4. Insufficient Battery Storage Evaluation

The draft IRP report states that Battery Energy Storage Systems (BESS) were not selected in any of the model runs, except for 100 MW in Portfolio 5 -- along with its derivative Portfolio 9 -- even when Siemens lowered the cost of BESS by "two standard deviations" (p. 7). This outcome is substantially different from many recent utility evaluations of BESS which often find substantial BESS are cost effective within the planning horizon.

In its Colorado Energy Plan (CEP), for example, Xcel Energy found 275 MW of battery storage to be cost-effective as it accelerates coal plant retirements.[20] According to recent research from Bloomberg New Energy Finance, it is "already cheaper to install new-build battery storage than peaking plants."[21]

One possible explanation for the conflicting outcome in the MLGW draft IRP is Siemens' modeling framework. It is our understanding that until recently, Aurora's logic engine was not very suitable for energy storage modeling – BESS had to be simulated as if it were a pumped hydro facility. Assuming that Siemens has taken advantage of the more recent capabilities, it is possible that model settings constrained the benefits from BESS. For example, if the expansion plan was not built using chronological hourly modeling of full 8760 hour time horizons, then the model may have difficulty in identifying the full dispatch of BESS.

Other aspects of the model may not have been configured to provide full value to BESS. For example, MISO doesn't currently offer a clear set of pricing products that monetize the ancillary benefits of storage. Forecasting the value of ancillary services is difficult but may be a significant value. Similarly, from the limited description in the report, it is unclear whether the benefit of reduced transmission congestion and line loss due to off-peak charging of BESS was fully recognized by the model in the same way that the benefits of local generation appear to have been recognized.

Even if BESS are allowed to compete against generation resources for capacity value in an all-source RFP for supply resources, MLGW needs to ensure that the modeling techniques it uses to evaluate the bids

[20] Xcel Energy, Colorado Energy Plan (CEP)

[21] https://www.energy-storage.news/news/bloombergnef-lcoe-of-battery-storage-has-fallen-faster-than-solar-or-wind-i

do not place BESS at a disadvantage. BESS could enable MLGW to avoid the construction of gas-fired peaking power plants that dominate the Memphis landscape and cause air pollution during the relatively rare periods of time when they are utilized.

5. Water consumption metric is misleading (yet reinforces the potential for win-win negotiations)

The draft IRP included local water consumption as an additional, subordinate metric of sustainability. The options of staying with TVA or leaving TVA completely (the All MISO portfolio) are the only ones that don't exhibit an increase in local water consumption (p. 205). This is really a product of the assumption that water consumption of the Allen Fossil Plant will remain the same regardless of MLGW's decision and the further presumption that "no deal" can be reached with TVA (p. 31).

Section E below explains the opportunity for MLGW and TVA to negotiate a mutually beneficial separation. Beyond the financial case for both parties, negotiating an ownership or supply agreement for the Allen Fossil Plant would also have a beneficial influence on the local water consumption metric.

6. Projections of TVA cost decreases conflicts with other projections of TVA costs increasing

Siemens describes the pro forma financial model it created to forecast TVA wholesale rates (Section 14 beginning on page 187). SACE notes that the Siemens computations are conservative even compared to TVA's own results.

Siemens computes a Net Present Value of Revenue Requirements (NPVRR) of $190 billion (in 2018 $) which yields a Levelized Cost of Energy (LCOE) from TVA of $67.88/MWh or 6.788 cents per kWh for the period 2020-2039 (p. 191). The comparable calculations from TVA reflect a NPVRR of $194.7 billion or a LCOE of $69.56/MWh or 6.956 cents per kWh (p. 192).

In either case, as Siemen's Project Director, Gary Vicinius, pointed out, these 20-year projections represent a slight decline in TVA's costs over time. The average rate MLGW paid in 2019 was $74.45/MWh in real 2019 $ (p. 194).

The main point is that Siemens' projections for TVA wholesale cost to decrease over time conflicts with other projections such as a report from Synapse (December 2019) that concluded TVA rates could increase "by approximately 6 percent to 21 percent in 2026 and approximately 9 percent to 34 percent in 2031 relative to the rates TVA's IRP base case would suggest."[22] SACE has not attempted to identify the source of the discrepancies between these economic analyses but rather includes them here are further illustration of the underlying conservative nature of the Siemens draft IRP.

Even with conservative assumptions throughout the modeling, portfolios with substantial amounts of renewable energy, far in excess of the TVA portfolio, emerged as the least cost and otherwise best options. The report states unequivocally that "[l]ocal renewables are the least expensive option of all available resources for MLGW." (p. 2)

While some of the assumptions made in the draft IRP report are conservative and may undercut the potential savings that could be achieved by MLGW leaving TVA, even the conservative $120-150 million in annual savings strongly justifies moving forward with pursuing an integrated set of Requests for Proposal (RFPs) to further evaluate the alternate energy supply opportunity.

[22] David White, PhD, et.al., *Memphis and Tennessee Valley Authority, Risk Analysis of Future TVA Rates for Memphis*, Synapse Energy Economics, Inc., December 2019

E. TVA and MLGW should prepare to negotiate a win-win departure

As a federal entity, not for profit, TVA should be focused on helping its customers and providing low-cost, reliable power, not profit. The Siemens report makes it clear that there are significant win-win opportunities for TVA and MLGW to negotiate an agreement that leaves TVA better off than a "no deal" plan for MLGW (pp. 31, 114). These are primarily in the areas of existing generation at the Allen Fossil Plant and existing transmission systems.

The draft IRP report notes that one of the no regret strategies for MLGW is to "Build *or secure* one combined cycle unit" (p. 26, emphasis added). This appears to be a clear allusion to purchasing or contracting for all or a portion of the existing two 330 MW combined cycle units at the Allen Fossil Plant. Similarly, the 420 MW peaking unit at the Allen Fossil Plant should also be considered for negotiation. As Siemens and MLGW are doubtless aware, it is common for utilities in the Southeast to jointly own power plants, with one partner serving as the operator. TVA has not historically participated in such arrangements, but there is no clear reason that it could not.

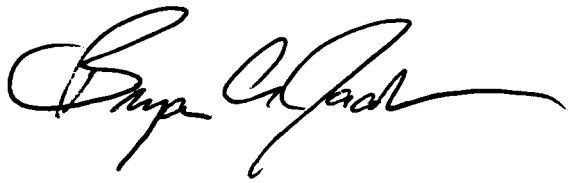
Similarly, during the PSAT presentation, Siemens staff were asked what cost savings opportunities might be available if TVA were to allow MLGW to purchase some transmission rights on its system. Siemens staff suggested that the duplication of the San Souci to Shelby 500 kV line might not be necessary.

SACE also notes that in past conversations with TVA transmission planners, the limited number of connections between TVA and MISO has been a concern for n-1 analysis of potential low-cost external resource contracts. If MLGW were to enhance the connections to MISO, and yet remain connected to

TVA to some extent, this would enhance TVA's overall system reliability due to the increased capability to rely on MISO for contingencies.

TVA faces a very real risk of having stranded assets in Shelby County. If MLGW officially gives notice of its exit to TVA, **TVA stands to gain by negotiating the sale or sharing of the Allen Fossil Plant, negotiating the sale or sharing of some transmission assets, and remaining at least partially connected to MLGW for reliability purposes.**

Thank you for the opportunity to submit these comments on behalf of SACE.



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