**STATE OF GEORGIA**

**BEFORE THE GEORGIA PUBLIC SERVICE COMMISSION**

**In Re:**

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| | ) | |
| **Georgia Power Company's 2022 Integrated** | **)** | |
| **Resource Plan and Application for The** | **)** | **DOCKET NOS. 44160 and 44161** |
| **Certification, Decertification, and Amended** | **)** | |
| **Demand-Side Management Plan** | **)** | |

# DIRECT TESTIMONY OF DR. MARILYN A. BROWN ON BEHALF OF SOUTHERN ALLIANCE FOR CLEAN ENERGY AND SOUTHFACE ENERGY INSTITUTE, INC.

**May 6, 2022**

## I. INTRODUCTION

**Q: PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS.**

A: My name is Dr. Marilyn A. Brown. I am a Regents' and Brook Byers Professor of Sustainable Systems in the School of Public Policy at Georgia Tech. My business address is 685 Cherry Street, Room 312, Atlanta, GA, 30313.

**Q: ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

A: I am testifying on behalf of Southern Alliance for Clean Energy ("SACE") and Southface Energy Institute, Inc. ("Southface").

**Q: PLEASE SUMMARIZE YOUR QUALIFICATIONS AND WORK EXPERIENCE.**

A: I earned a Bachelor of Arts degree in Political Science from Rutgers University, a Master in Regional Planning degree from the University of Massachusetts, a Doctor of Philosophy degree in Geography from Ohio State University, and a Certified Energy Manager from the Association of Energy Engineers. I am an elected member to both the National Academy of Sciences and the National Academy of Engineering.

Prior to joining the faculty at Georgia Tech, I had a distinguished career at the U.S. Department of Energy's Oak Ridge National Laboratory, where I managed the energy efficiency ("EE"), renewable energy, and electric grid program and was a leader in the analysis and interpretation of energy futures in the United States. I co-founded the Southeast Energy Efficiency Alliance and chaired its Board of Directors for several years.

I have served on the Boards of the American Council for an Energy-Efficient Economy and the Alliance to Save Energy and was a Board Commissioner with the Bipartisan Policy Center. I have also served on eight National Academies committees and am an Editor of *Energy Policy* and an Editorial Board member of *Energy Efficiency* and *Energy Research and Social Science*. I served two terms (2010-2017) as a Presidential appointee and regulator on the Board of Directors of the Tennessee Valley Authority ("TVA"), the nation's largest public power provider. During those eight years, I chaired TVA's Nuclear Oversight Committee that was responsible for bringing the nation's last nuclear unit online (Watts Bar Unit 2), and I helped to expand TVA's EE program offerings. From 2014-2018, I served on the U.S. Department of Energy's Electricity Advisory Committee, where I led the Smart Grid Subcommittee.

My research focuses on the design and impact of policies aimed at accelerating the development and deployment of sustainable energy technologies, with an emphasis on the electric utility industry; the integration of EE, demand response ("DR"), and solar resources; and ways of improving resiliency to disruptions. My books include *Empowering the Great Energy Transition: Policy for a Low-Carbon Future* (Columbia University Press, 2019), *Fact and Fiction in Global Energy Policy* (Johns Hopkins University Press, 2016), *Green Savings: How Policies and Markets Drive Energy Efficiency* (Praeger, 2015), and *Climate Change and Global Energy Security* (MIT Press, 2011). I have authored more than 250 publications.

My work has had significant visibility in the policy arena as evidenced by my briefings and testimonies before state legislative bodies and Committees of both the U.S. House of Representatives and Senate and governmental and professional meetings around the world.

**Q: HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE GEORGIA PUBLIC SERVICE COMMISSION ("GPSC" OR "THE COMMISSION")?**

A: No.

**Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

A: The purpose of my testimony is to offer and explain the following recommendations:

1. Georgia Power Company ("Georgia Power" or "The Company") should model Demand-Side Management ("DSM"), including both EE and DR, as a real-time asset that can compete head-to-head with traditional supply options within its integrated resource planning modeling platform;
2. The Commission should require Georgia Power to increase cost-effective DSM resources within its proposed plan to meet the many needs anticipated from market, climate, and resource changes, which could reduce overall system costs and increase system reliability and resilience;
3. The Commission should require Georgia Power to provide more data, improve DSM program evaluation criteria, publish program measure evaluation results publicly, and expand the Water Heater Controller DR Pilot Program; and

4. The Commission should order Georgia Power to reinstate the Renewable Non-Renewable ("RNR") monthly netting program to enable customer-sited resources to support system reliability and local economic development.

**Q: ARE YOU SUBMITTING EXHIBITS ALONG WITH YOUR TESTIMONY?**

A: Yes, I am submitting three (3) exhibits along with my testimony, as follows:

EXHIBIT-1: Curriculum Vitae of Dr. Marilyn A. Brown.

EXHIBIT-2: Research Article on the Demand Response Gap.

EXHIBIT-3: Report on Contextualizing the Rate Impacts of Distributed Solar.

## II. SUMMARY OF FINDINGS AND CONCLUSIONS

**Q: PLEASE SUMMARIZE THE RESULTS OF YOUR REVIEW OF GEORGIA POWER'S PROPOSED 2022 IRP AND DSM PLANS AND THE ANALYSIS YOU HAVE CONDUCTED.**

A: The results of my review and analysis of Georgia Power's 2022 IRP and DSM Application are as follows:

1. As described in the Georgia Power's 2022 IRP Main Document, the Company is facing considerable challenges in the 20 years studied within its proposed 2022 IRP.[1] DSM investments can provide cost-effective energy and capacity resources that deliver operating and reliability benefits to address these challenges. The Commission should direct the Company to increase investment in DSM – both EE and DR – in this proceeding and order

[1] *E.g., Georgia Power's 2022 Integrated Resource Plan*, Main Document, Page 11-72.

the Company to incorporate DSM resources within its expansion planning model as a selectable resource in future planning cycles.

2. To address the challenges facing the Company, DSM must be treated as a real-time resource that can compete on a level playing field against supply-side resources in Georgia Power's expansion planning model – something the Company does not currently do. Georgia Power should learn from experiences of its peer utilities – like TVA, Xcel, and Duke Energy – which all treat DSM as a selectable resource within their resource expansion plan modeling.
3. Georgia Power has significant untapped DR potential, which could address load issues while lowering utility costs.
    a. Georgia Power has opportunities to leverage its own, and others', experiences with DR.
    b. Peer utilities have successful track records and experience with DR that the Commission and the Company should use as models to expand investment in cost-effective DR resources.
    c. Best practices in DR may only be leveraged, however, when combined with robust expansion planning that treats DSM as a competitive resource.
4. In addition, Georgia Power should provide data for, and information on the evaluation of, the Water Heater Controller DR Pilot Program. The Commission should support its expansion if the program is found to be cost-effective.
5. I support Georgia Power's request that the Commission grant a waiver for the Thermostat DR program. Six of the nine peer utilities I evaluated in my review of the Company's

proposed plan have robust thermostat DR programs that the Commission and the Company should study as models for program enhancement and expansion.

6. There is tremendous untapped potential for rooftop solar in Georgia that will not be realized without the RNR monthly netting program. Investment in, and benefits from, customer-owned rooftop solar resources are not adequately considered within Georgia Power's proposed 2022 IRP.
    a. There are numerous benefits – both to customers and utilities – of distributed solar adoption and penetration.
    b. RNR monthly netting should be reinstated to deliver those benefits to the utility and customers.

Throughout my testimony, DSM refers to both EE and DR. While I highlight several examples of EE, I focus primarily on DR potential, programs, and best practices. EE and Georgia Power's DSM plan, more broadly, are discussed in the testimony of SACE/Southface witness Forest Bradley-Wright.

## III. TESTIMONY

**Q: HOW DOES GEORGIA POWER'S APPROACH TO RESOURCE PLANNING COMPARE WITH BEST PRACTICES?**

A: The quality of the Company's resource planning is limited because it does not allow DSM to compete head-to-head with other supply options to identify the most cost-effective combination. Georgia Power witness Francisco Valle described the process as follows during his testimony before the Commission on April 5, 2022:

> And one thing, Commissioners, you have to, I want to remind you, is that when we plan for the DSM programs in the planning process, we reduce the load forecast by the amount of energy and peak demand that are coming from this. So in that respect, [it] is treated as a priority resource, right. And is a savings on the peak demand that don't (sic) have to be served in the future. So, to that extent, they do capture that value in our planning (Tr. 756-757).

Georgia Power assumes an investment in DSM programs and decrements the forecasted load growth accordingly. After reducing the forecasted load growth, the model then proceeds to examine which combination of available supply resources to use to meet the remaining demand for electricity.

Using this approach, DSM is not valued as a real-time asset that can be optimized in tandem with energy supply options such as electricity generated by solar, natural gas and coal plants. As a result, it is not possible to know if the planned investment in DSM is too small or too large to produce a least-cost plan; however, based on my decades as a regulator and educator, I believe that a least-cost plan for Georgia Power would have more DSM.

The Commission's Order Adopting Stipulation as Amended issued on July 29, 2019, for Georgia Power's 2019 IRP DSM Plan (Docket No. 42310) required Georgia Power to conduct a competitive analysis of DSM and supply-side resources titled, *Supply-side Representation of Energy Efficiency Resources in the Georgia Power IRP Model* ("DSM White Paper").[2] The DSM White Paper was completed, but it was not adequately leveraged

[2] Georgia Power Company, April 30, 2021, *Supply-Side Representation of Energy Efficiency Resources in the Georgia Power IRP Model*, Docket No. 42311.

in Georgia Power's 2022 IRP. The DSM White paper also included a survey of utilities that rely on a supply-side approach for incorporating EE in resource planning, including TVA as a representative of the Southeast.

Many other utilities do treat DR as a "selectable resource" in their resource planning. These include five of the nine utility DR portfolios that I – and several Georgia Tech graduate students working under my supervision – examined for this testimony: TVA, Northern States Power Co. ("Xcel Energy"), Duke Energy Carolinas, Duke Energy Progress ("DEP"), and Idaho Power Company.

Additional utilities, such as Entergy New Orleans and the Northwest Power and Conservation Council, treat EE as a competitive resource in their power planning models.[3]

**Q: ARE THERE OPPORTUNITIES TO IMPROVE GEORGIA POWER'S APPROACH TO RESOURCE PLANNING?**

A. Yes. An approach to modeling DSM as a competitive resource was developed by TVA during my second term as a TVA Board of Director, and it was used to develop TVA's 2015 IRP.[4]

DSM was modeled using the concept of blocks of EE and DR. TVA characterized separate blocks for its residential, commercial, and industrial sectors. Blocks are grouped by sector based in part on the similarity of their load shapes. Each block was developed to be between

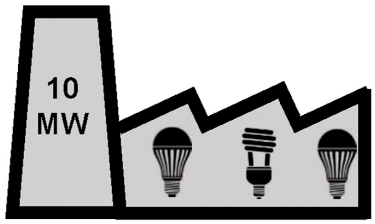
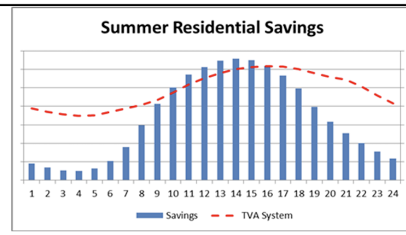
[3] Entergy New Orleans, LLC.'s 2018 Integrated Resource Plan, Docket No. UD-17-03.
[4] *Tennessee Valley Authority's 2015 Integrated Resource Plan*, Appendix E, Modeling Energy Efficiency, Pages 141-158.

50-72 GWh in size and to be 10 MW in capacity – in essence, creating a "virtual power plant."

This approach was developed – with my encouragement as a TVA Director – in 2014-2015 through a participatory process that engaged stakeholders across the Tennessee Valley. The approach was then used to create a range of scenarios for consideration in TVA's resource planning.

An illustrative block is shown in Figure 1; it uses the same dimensions that are used to evaluate supply options. Each block has an upfront capital cost (analogous to the capital cost of building a new power plant), costs to operate and administer the EE program (similar to O&M costs for power plants), the percent of time that the savings are delivered (like a capacity factor), an hourly fixed shape or load profile that reflects savings on- versus off-peak, performance over time (reflecting technology degradation), and risks associated with the resource, assessed similarly to supply-side risks.

**Figure 1. TVA's Block of Energy Efficiency or Virtual Power Plant**[5]

|   |   |
|---|---|
| Building Block Design | Additional Specifications: |
| Three pricing tiers: 1.16 ¢/kWh to 2.74 ¢/kWh | Limited number of total blocks for each tier |
| Maximum of 58 Blocks Annually: 32 Residential, 15 Commercial, 11 Industrial | No reserve credit |
| Service life defined by existing programs and industry standards | Growth rate maximum of 25% first five years, 20% next ten, 15% for remaining duration |
| Capacity factors: 65% Residential, 80% Industrial, 79% Commercial | Risk adjusted for LPC delivery risk: 10 % per years first five years, then declining 2% per year |
| Hourly fixed shape | Risk adjusted for program uncertainty 0% for first five years, 4% annually after year five, capped at 30% |

This modeling framework produced a robust set of results that demonstrated the value DSM brings to its portfolio. Following publication of the TVA 2015 IRP, investments in EE were expanded and new pilot programs were launched including the Extreme Energy Makeover Program that had an electric energy usage reduction target of 25% per home, an implementation cost of approximately $10.00 per square foot, and an annual savings of 1,000 Megawatt-hours.[6] In its resource planning process since 2015, TVA has modeled both EE and DR as selectable supply-side resources instead of load modifiers.[7]

[5] Brown, M.A., and Y. Wang, 2015, *Green Savings: How Policies and Markets Drive Energy Efficiency.* ABC-CLIO.
[6] Extreme Energy Makeover's Frequently Asked Questions, Available at: https://tva-azr-eastus-cdn-ep-tvawcm-prd.azureedge.net/cdn-tvawcma/docs/default-source/environment/epa-mitigation-projects/smart-communities/smart-communities-extreme-energy-makeovers-faqs.pdf?sfvrsn=7987c916_2.
[7] Georgia Power Company, April 30, 2021, *Supply-Side Representation of Energy Efficiency Resources in the Georgia Power IRP Model*, Docket No. 42311, April 30, 2021.

I recommend that stakeholders be similarly engaged in an effort to modernize the GPC's modeling approach to estimate the most cost-effective role DSM could play as selectable resources to address GPC's future challenges. DSM – both EE and DR – can provide energy and capacity resources, operating reserves, and reliability services. By advancing its modeling in this holistic way, GPC can value the role of DR as a "fast-burst" balancing and dispatchable resource.[8]

Georgia Power's 2022 IRP does not offer substantive DR investment or a robust suite of DR programs. Yet DR program advancement could significantly help to address the distinctive challenges documented in its 2022 IRP: large-scale coal retirements, increasing solar resources, forecasted load growth, seasonal shifts in peak demand, and ongoing North Georgia reliability issues. I am certain that if Georgia Power treated DSM as a "selectable resource" with multiple attributes, and not just a "load modifier", much more of it would be purchased.[9] And as a result, the proposed supply-side strategy (featuring power purchase agreements for a total of 2,356 MW of natural gas) would look significantly oversized.

Regarding North Georgia, Georgia Power should be encouraged to perform and publish a study investigating the role of geo-targeted DR and EE investments to address North Georgia reliability challenges. The spectrum of DR value streams – including generation

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[8] *Xcel Energy's 2020-2034 Upper Midwest Integrated Resource Plan*, Supplement, June 30, 2020, Docket No. E002/RP-19-368.

[9] Georgia Power witness Andy Phillips during his testimony before the Commission on April 5, 2022, stated, "Yes, that was one of the conclusions, along with a number of other conclusions that resulted from that particular study. An additional conclusion also noted that in modeling demand side resources in the supply side system, there are certain limitations and challenges. And the company concluded that the current methodology is the more appropriate way for evaluating and modeling demand side resources" (Tr. 654-656).

capacity avoidance, system peak related T&D deferral, and targeted distribution capacity deferral – align with the challenges facing the region. An assessment of emerging "load flexibility" programs can enable the deferral of geo-targeted distribution and grid balancing investments.[10]

**Q: WHY IS GEORGIA POWER SO WELL POSITIONED TO DEPLOY, LEVERAGE, AND BENEFIT FROM DR PROGRAMS?**

A: DR offers substantial benefits to Georgia Power for a variety of reasons. First, it is more flexible today than ever before. It is a resource that has been used for decades to provide peak shaving and load management. Now, with advanced metering infrastructure (AMI) and the advent of technologies such as smart thermostats, wifi-enabled appliances, heat pumps, heat pump water heaters, and electric vehicles, DR is undergoing a paradigm shift. It is evolving to provide dispatchable load flexibility that can cut costs and enhance reliability. These same technologies also enable the integration of EE and DR programs. In sum, DR can now be leveraged as an energy, capacity, and demand resource.

Second, Georgia Power faces an expanding number of real-time reliability challenges, including: (i) the large-scale retirement of coal generation; (ii) increasing renewable energy penetration; (iii) ongoing Northern Georgia reliability issues (regarding capacity,

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[10] *Xcel Energy's 2020-2034 Upper Midwest Integrated Resource Plan*, *Appendix G1: Demand Side Management*, Docket No. E002/RP-19-368. Available at: https://efiling.web.commerce.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId=%7B10FBAE6B-0000-C040-8C1D-CC55491FE76D%7D&documentTitle=20197-154051-03.

transmission, and distribution); (iv) seasonal shifts of intensity; and (v) the increased adoption of smart appliances and electric vehicles across its service territory.

**Q: IN WHAT WAY IS GEORGIA POWER UNIQUELY POSITIONED TO DEPLOY AND LEVERAGE DR PROGRAMS?**

A: Georgia Power has both new and existing assets to deploy and leverage DR. Specifically, it has completed its mission of upgrading all 2.4 million customers to smart meters, which enables expansion of DR through both incentive-based and rate-based DR programs.

**Q: HOW MUCH DR IS ACHIEVABLE IN GEORGIA BY 2030?**

A: Using the National Energy Modeling System, the Drawdown Georgia project estimated a DR potential equivalent to 365,000 Georgia households shifting 10% of their peak electricity use to off-peak. The resulting fuel costs and other costs would result in electricity rate and bill reductions to all customer classes, and to both participants and nonparticipants of DR programs.[11] Similar impacts could occur as the result of DR targeting the commercial and industrial sectors.

**Q: WHAT KINDS OF PROGRAMS ARE READY-TO-DELIVER DEMAND RESOURCE IN GEORGIA?**

A: Georgia Power is currently testing one promising DR water heater program as a pilot: the Water Heater Controller DR Program. Direct-control water heater DR programs have

[11] Brown, M.A. and O. Chapman, 2021, *The Size, Causes, and Equity Implications of the Demand-Response Gap*, Energy Policy, 158, 112533. https://doi.org/10.1016/j.enpol.2021.112533.

shown great promise in their deployment by other utilities, including DEP and the Minnesota cooperative Great River Energy.

For example, DEP's EnergyWise Home program enrolls grid-connected HVAC and water heaters to reduce demand during critical peak events. It offers participants an incentive of $25 for initial enrollment, followed by a $25 annual fee in the form of a credit to a customer's bill. Its implementation costs also include utility equipment and installation, program administration, marketing, and public engagement. To put these costs and benefits into perspective, consider the DEP's one water heater shedding event that occurred during the winter of 2017. Altogether, the utility managed the water heaters of 8,390 program participants, providing a total peak demand reduction of 3.49 MW.[12] At an estimated avoided cost of $1.88M/MW, DEP saved approximately $6.56 million from this one water heater shedding event.

Georgia Power's 2022 IRP and DSM Plan (Docket Nos. 44160 and 44161) mention the Water Heater Controller DR Program as a residential pilot initiative. It was implemented in September 2021 and is scheduled to end at the end of 2022. The annual utility cost in 2021 is estimated to be $186,792, and the projected annual utility cost in 2022 is estimated to be $161,000.[13] There are no participant costs. The goals of the pilot program are to assess controller effectiveness with DR events, compare controller communication technologies (Aquanta Wi-Fi enabled vs Shifted Energy cell service), assess customer satisfaction and the opportunity for water heater DR programs. The program is being implemented by three

[12] North Carolina Utilities Commission, *2018 Application of Duke Energy Progress, LLC. for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider. Docket No. E-2, Sub 1174*.

[13] *Georgia Power's 2022 Integrated Resource Plan*, Docket No. 44160, Responses to Data Request STF-GDS-1-20.

contractors: Aquanta, Shifted Energy/Apricity, and Illume.

Georgia Power's DSM Application (Docket No. 44161) notes that the Water Heater Controller DR Program is an active pilot program with 105 enrolled customers and a total of 200 projected participants (Table 1). An evaluation of the pilot program has not yet been completed, and a Total Resource Cost ("TRC") benefit/cost test is not yet available. The results of this evaluation should be published upon its completion in Q4 2022. Additionally, Georgia Power should provide performance information, survey instruments, and survey response data on the pilot program to the Demand-Side Management Working Group ("DSMWG"). If the pilot results are favorable over a sufficient time horizon, the program should be fully funded and should grow over time to provide an increasing share of the load flexibility and reliability services that will be needed to help manage the expansion of variable renewable resources in Georgia. This could be done by leveraging GPC's existing rebate for efficient electric water heaters offered by its Home Energy Improvement Program ("HEIP"). Specifically, HEIP offers a $250 rebate to replace water heaters.[14] This existing EE program could stimulate participation in the Water Heater Controller DR Program, by facilitating onboarding and providing additional operational benefits as part of a single integrated EE/DR program for onboarding and operational optimization.

[14] Georgia Power's Website for the HEIP Water Heater Rebate, Available at: https://www.georgiapower.com/residential/save-money-and-energy/products-programs/water-heater.html

**Table 1. Water Heater Controller Demand Response Pilot Program**[15]

| Target Market | Participants Enrolled | Projected Participants | Utility Cost per Participant | Marketing Plan | Evaluation Plan |
|---|---|---|---|---|---|
| GPC residential customers with electric resistance water heaters, no plans to move for pilot duration and a focus on Metro-Atlanta. | 105 | 200 | $1,835 | Email target customer segment to solicit interest in pilot and recruit the interested customers who qualify per criteria listed in Target Market section. | Evaluate responses from 11 online surveys, metering data and controller data to support pilot objectives. |

DEP and Great River Energy may be transitioning away from advanced metering infrastructure ("AMI") and radio frequency-controlled switches to "smart" Wi-Fi-enabled water heaters. Wi-Fi-enabled devices allow for a more sophisticated and precise control of temperature. The promise of even less noticeable service interruption would likely convince more customers to enroll.

**Q: WHAT OTHER KINDS OF DR PROGRAMS COULD DELIVER LOAD FLEXIBILITY AND LOAD-SHIFTING RESOURCES IN GEORGIA?**

A: In research conducted under my supervision at Georgia Tech, graduate students compared the DR programs of nine peer utilities with those of Georgia Power, to identify cost-effective programs that could deliver load flexibility and load-shifting resources in Georgia.[16] Georgia Power currently offers only three of these programs – two thermostat

[15] GPC 2022 IRP (Docket 44160/44161) *Responses to Data Request STF-GDS-5-9 Attachment*.

[16] Utilities for DR program assessment were shortlisted as "peers" on the following criteria, while prioritizing utilities within the Southeast region: high actual peak demand savings, high potential peak demand savings, significant numbers of customers enrolled, and a high ratio of actual/potential peak demand savings. Utilities with scarce DR program documentation in their IRP or a lack of informational resource availability were not selected for evaluation.

programs and a curtailable/interruptible commercial and industrial ("C&I") program. In addition, the Company is pilot testing two of these programs – a residential and a commercial timed smart water heater program.

Table 2 shows seven types of ***residential*** DR programs that have been implemented at full scale or as pilot programs by some of these same nine peer utilities. Our additional findings are as follows:

- Programs that benefit from the direct load control ("DLC") of heating, ventilation, and air conditioning ("HVAC") systems are implemented by all but two of the ten utilities examined. DLC HVAC is not offered in programs by TVA or Georgia Power.
- Six of the nine peer utilities that my students and I evaluated have robust thermostat DR programs, and TVA is considering implementation. A thermostat DR program is also offered by Georgia Power.
- Timed/smart water heater programs are being implemented by four of the nine peer utilities and are being pilot tested or studied by two other peer utilities. A residential water heater DR pilot program is being tested by Georgia Power.

Table 2 shows that 13 types of ***commercial*** DR programs have been implemented by one or more of the nine peer utilities.

- Interruptible/curtailable programs are the most common, with seven of the nine peer utilities offering them, as does Georgia Power.
- Smart thermostat programs are also common, with four peer utilities offering them, as does Georgia Power.

- All nine of the peer utilities have some type of DLC program, including interruptible DLC HVAC, DLC irrigation pump programs, and standby generator programs; however, Georgia Power does not have any of these programs.
- Auto-DR building control programs are operating in two of the nine utilities and are being planned in a third but are not operating or being planned by Georgia Power.

Based on the favorable experience of these peer utilities, DLC and building control programs should be considered for commercial sector implementation by Georgia Power, so that this sector can provide the flexible resources that will be increasingly needed.

**Table 2. Demand Response Programs Across Ten Utilities**

| Utility Name | Georgia Power Company | Tennesee Valley Authority | Duke Energy FL, LLC | Northern States Power Co. (Xcel Energy) | DTE Energy | Commonwealth Edison | Idaho Power Company | Duke Energy Carolinas, LLC | Duke Energy Progress, LCC | Alabama Power Company |
|---|---|---|---|---|---|---|---|---|---|---|
| State | GA | 7 States | FL | MN | MI | IL | ID | NC, SC | NC, SC | AL |
| BA Code | SOCO | TVA | FPC | MISO | MISO | PJM | IPCO | DUK | CPLE | SOCO |
| **Residential Programs** | | | | | | | | | | |
| DLC HVAC | | | X | X | X | X | X | X | X | X |
| DLC Pool Pump | | | X | | | | | | | |
| Building Controls (Auto DR) | | | | C | | | | | | |
| Smart Thermostat | X | C | X | X | X | X | | X | X | |
| Timed/Smart Water Heating | *X* | C | X | X | X | | | | X | *X* |
| EV Managed Charging | | | | C | *X* | | | | | |
| Interruptible / Curtailable Program(s) | | | | | | | | | | *X* |
| **Commercial/Industrial Programs** | | | | | | | | | | |
| DLC HVAC | | | | | | X | | X | X | |
| Standby Generator | | X | X | | | | | X | | X |
| DLC Irrigation Pumps | | | | | | | X | | | |
| Building Controls (Auto DR) | | | | C | X | | | | X | |
| Smart Thermostat | X | | | X | | X | | X | X | |
| Timed/Smart Water Heating | | | | X | | | | | | |
| Thermal Storage (Load Shifting) | | | | *X* | | | | | | |
| Metals and Electric Process Heat | | | | | X | | | | | |
| Battery Storage Solutions | | | | | C | | | | | |
| Solar Plus Battery Energy Storage System (BESS) | | | | | *X* | | | | | |
| Behind The Meter (BTM) Battery | | | | | C | | | | | |
| Flexible Load-Shedding (Designed to Customer Needs) | | | | *X* | | | | | | |
| Interruptible / Curtailable Program(s) | X | X | X | X | X | | | X | X | X |

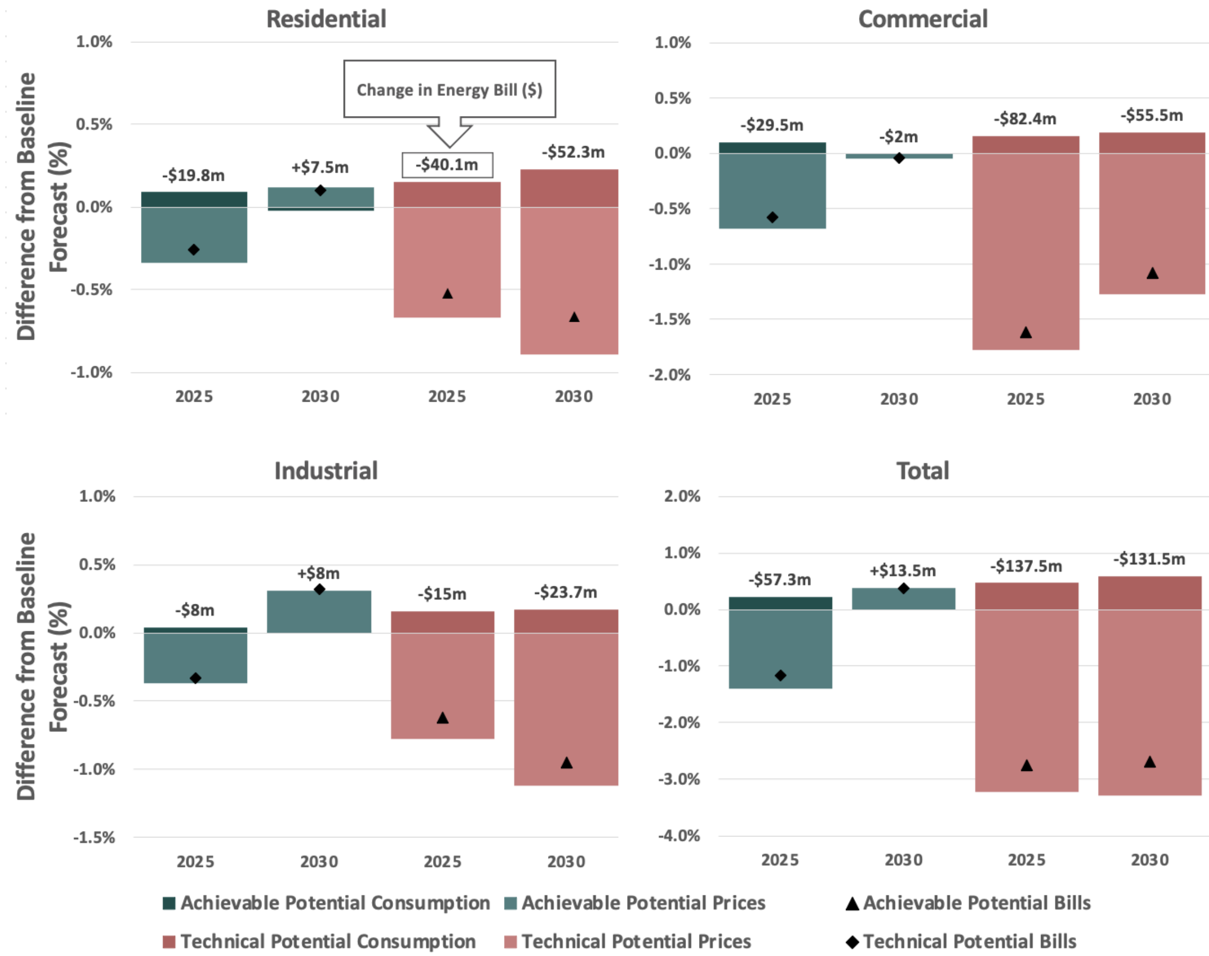
Green = Existing; Yellow = Pilot program or being developed; Blue = Being considered or modeled.

**Q: HOW MIGHT DR PROGRAMS IMPACT GEORGIA POWER ELECTRICITY RATES?**

A. Using the National Energy Modeling System ("NEMS"), my research has shown that a significant expansion of DR would lower electricity rates and bills across all four customer classes. We estimate an achievable potential for 365,000 households to shift 10% of their peak hours to off-peak hours. In this scenario, household utility bills on average would be 0.1% lower over the next decade, saving Georgia residents approximately $87 million.[17] Utility resource costs also are lower. NEMS also examines natural gas prices, and it estimates that they would experience no statistically significant changes from the baseline forecast.

[17] Brown, M.A. and O. Chapman, 2021, *The Size, Causes, and Equity Implications of the Demand-Response Gap*, Energy Policy, 158, 112533. https://doi.org/10.1016/j.enpol.2021.112533.

**Figure 2. Forecasted Impact of Demand Response on Electricity Consumption, Prices, and Bills in Georgia**[18]




**Q: HOW CAN DSM BE SOURCED MORE COMPETITIVELY?**

A: In competitive wholesale markets, DR and EE resources often participate alongside traditional supply-side resources on a level playing field, where DR and DSM resources provide dispatchable, deliverable capacity, energy, and operating reserves. In regulated markets like Georgia, that do not have wholesale competition, the prudent approach to

[18] *Id.*

encourage competition can be to include DR and DSM as eligible resources within all-source procurement processes, where they could be procured through PPAs. These competitive procurement approaches typically generate lower prices for resources. All source procurement competition, risk management, and best practices are discussed in the testimony of SACE/Southface witness Ron Binz, and I urge the Commission to consider DSM in the context of his remarks and recommendations. For example, DR is currently the third-largest capacity resource in the PJM competitive wholesale market today.[19]

**Q: WHAT ARE BEST PRACTICES FOR THE DESIGN OF FUTURE DR PROGRAMS?**

A: One best practice is to design DR programs with tariffs being built dynamically to maintain peak period flexibility.

DR programs offered by utilities can be classified into three main categories. (1) Incentive-based programs offer customers a variety of compensation, including upfront rebates for equipment and or enrollment-recurring rebates for program participation in bill credits and discounts. (2) Dynamic pricing tariffs include price-based programs that impact customers' bills depending on their time-based consumption profiles. (3) Finally, voluntary programs include programs that allow for customer enrollment but do not provide financial incentives and typically offer customers informational and educational resources.

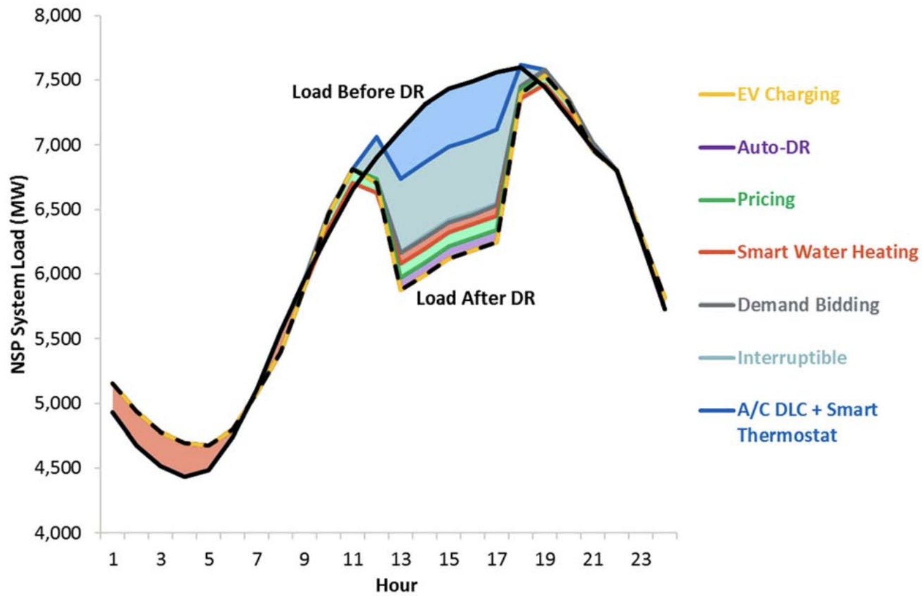
DR can cut costs and put downward pressure on rates by avoiding generation capacity, peak energy costs and peak transmission and distribution, and by delaying targeted

[19] See, generally, the latest results of PJM's capacity auction, available at: https://www.pjm.com/markets-and-operations/demand-response.

distribution, capacity, and reliability improvements. Ancillary services and valley filling can also cut program costs even with customer incentive payments. Public engagement is key to successful program marketing and promotion.

Figure 3 shows how load management and demand management can work together. It highlights the aggregate load reduction that can be achieved with multiple DR programs being called upon during critical events and control periods. It also shows the ability of DSM and flexibility by using smart thermostats for pre-event cooling during a heat wave. The coordinated DSM approach reduces the peak and then produces a post-event snapback shift in the timing of demand. The result is significant peak shaving of the electric load during five summer afternoon hours.

**Figure 3. Average Impact of the 2030 Demand Response Portfolio on NSP (Xcel Energy) System Load (High Sensitivity Case)**[20]




Note: Shown for cost-effective programs identified in 2030, accounting for portfolio overlap.

**Q: WHAT DO THESE FINDINGS SUGGEST ABOUT THE GEORGIA POWER RESIDENTIAL THERMOSTAT DR PROGRAM?**

A: The Commission should approve Georgia Power's Waiver Request of the TRC requirement for the continuation of the Residential Thermostat DR Program in this IRP cycle as it is a long-term DR investment with expected positive TRC results in 2031. The Company proposes to continue its Residential Thermostat DR program, and I heartily agree with this proposal.

[20] Hledik, R., A. Faruqui, P. Donohoo-Vallett, & T. Lee, 2019, *The Potential for Load Flexibility in Xcel Energy Northern States Power Service Territory*. p. 28. Boston, MA: The Brattle Group. Available at: https://www.brattle.com/insights-events/publications/brattle-economists-author-a-report-on-load-flexibility-for-xcel-energys-integrated-resource-plan-filing/

Smart thermostat programs can deliver significant load shaping and shedding attributes as illustrated in Figure 3. By managing thermostats, it is possible to optimize the operation of heating and cooling systems without having to install direct load controls.

As an example of how these new smart assets can deliver many benefits, consider how the "rush hour" of electricity demand was managed on August 1, 2021, when the U.S. experienced a total solar eclipse.[21] Owners of Nest thermostats could opt to pre-cool their homes to stay comfortable when solar power production came to a halt.

Consistent with the "best practice" of including DSM as competing resources in expansion planning and modeling, the Residential Thermostat DR program should be thoroughly evaluated for all of the attributes it can deliver including load, capacity, and demand resources.

**Q: HOW MUCH ROOFTOP SOLAR IS ACHIEVABLE IN GEORGIA BY 2030?**

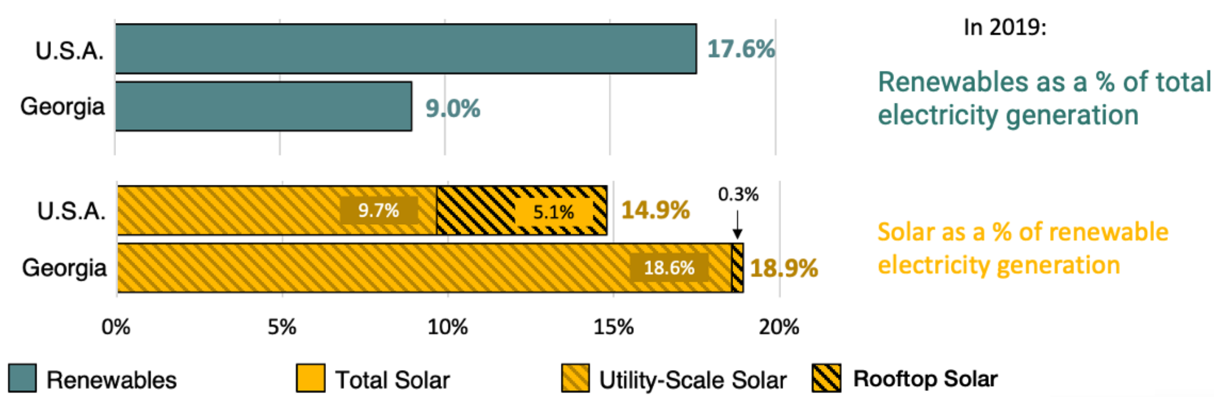
A: The Drawdown Georgia project estimates that Georgia has the achievable potential to install an additional 1,475 MW of rooftop solar – where "achievable" considers costs, benefits, and stakeholder acceptance.[22] This is more than *seven times* the "technical potential" IRP proposal of 200 MW of distributed solar and *46 times* the 32 MW of rooftop solar that the 200 MW includes from 5,000 customers. It is much less than the "technical

[21] More information is available at: https://www.smartnest.io/solar-eclipse-meet-the-nest-thermostat/.
[22] Brown, M.A., P. Dwivedi, S. Mani, D. Matisoff, J.E. Mohan, J. Mullen, M. Oxman, M. Rodgers, R. Simmons, B. Beasley, and L. Polepeddi, 2021, *A Framework for Localizing Global Climate Solutions and their Carbon Reduction Potential*, Proceedings of the National Academy of Sciences 118 (31): https://doi.org/10.1073/pnas.2100008118.

potential" of 24.3 GW of solar rooftop nameplate capacity, based on the rooftop square footage of existing flat and south-facing angled roofs located in Georgia.[23]

Georgia Power is a leader in utility-scale solar, but it does not lead in renewables overall, and it lags the rest of the nation in rooftop solar. The green bars in Figure 4 show that in Georgia, renewable resources generated only 9% of the state's electricity in 2019, while across the U.S., renewables constituted nearly twice that amount at 17.6%. The gold bars in Figure 4 show how solar generation is distributed between rooftop and utility-scale solar. In Georgia, distributed solar represented a mere 0.3% of Georgia's total solar generation in 2019, while distributed solar contributed a total of 5.1% of solar generation nationwide in the same year.

**Figure 4. Distributed Rooftop Solar as a Percent of Total Solar Generation in Georgia and the U.S., 2019[24]**



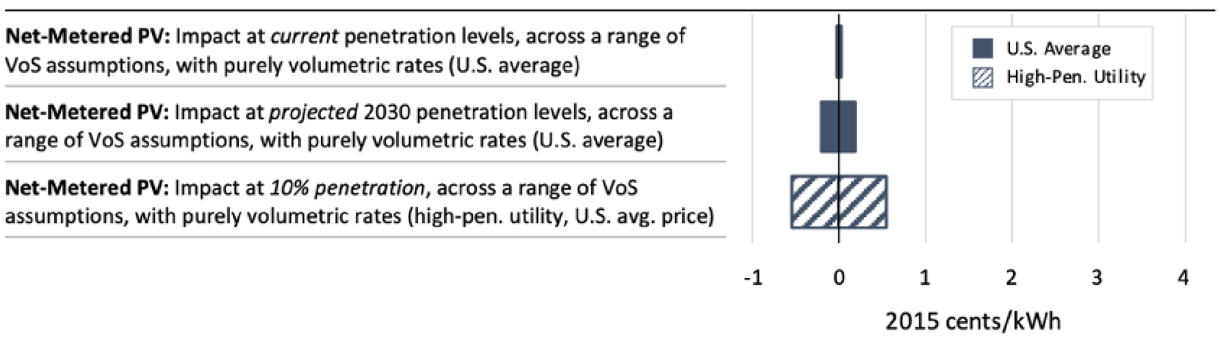

[23] Brown, M.A., J. Hubbs, X.V. Gu, and M.K. Cha, 2021, *Rooftop Solar for All: Closing the Gap Between the Technically Possible and the Achievable Potentials*, Energy Research and Social Science (80): https://doi.org/10.1016/j.erss.2021.102203.

[24] Brown, M.A., R. Tudawe, and H. Steimer, 2022, *Carbon Drawdown Potential of Utility-Scale Solar in the United States: Evidence from a Case Study of Georgia*, Renewable and Sustainable Energy Reviews (61): 112318.

**Q: SHOULD GEORGIA POWER REINSTATE NET METERING FOR ROOFTOP SOLAR?**

A: Yes, the Commission should order Georgia Power to reinstate RNR monthly netting. In the IRP Main Document, the Company lists four issues of greatest concern with respect to RNR monthly netting. First on its list is the "impact of cost shifting to non-participants" (p.14-115 from the IRP Main Document); however, the Company has not substantiated this concern with a study of the benefits and costs to serve solar customers.

**Figure 5. Effects of Net Metering on Average Retail Electricity Prices**[25]




A 2017 Lawrence Berkeley National Laboratory ("LBNL") report – *Putting the Potential Rate Impacts of Distributed Solar into Context* – suggests that rooftop solar has no predictable direction of influence on rates (positive or negative), when its penetration does not exceed 10%.[26] In this LBNL report, "Penetration level is expressed in terms of total

[25] *Id.*, p. 28.
[26] Barbose, G, 2017, *Putting the Potential Rate Impacts of Distributed Solar into Context*. Berkely, CA: Lawrence Berkeley National Laboratory. Available at: https://eta-publications.lbl.gov/sites/default/files/lbnl-1007060.pdf.

distributed solar generation as a percentage of total retail electricity sales."[27] Georgia Power's distributed solar meets only 0.3% of its total retail electricity sales. Georgia Power would have to increase its distributed solar more than 33 times to reach that 10% threshold, when issues of cost shifting to non-participants could arise.

**Q: DOES THIS CONCLUDE YOUR TESTIMONY?**

A: Yes.

[27] *Id.*, Page 8.