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Case Name (if known)	Virginia Electric and Power Company's Integrated Resource Plan filing pursuant to Va. Code § 56-597 et seq.
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August 8, 2023

VIA ELECTRONIC FILING

Mr. Bernard Logan, Clerk
c/o Document Control Center
State Corporation Commission
Tyler Building – First Floor
1300 East Main Street
Richmond, Virginia 23219

Re: Virginia Electric and Power Company's 2023 Integrated Resource Plan Filing Pursuant to § 56-597 et seq. of the *Code of Virginia*
Case No. PUR-2023-00066

Dear Mr. Logan:

Attached for filing in the above-referenced matter is the non-confidential Direct Testimony of Edward Burgess, which is being submitted on behalf of Advanced Energy United. This filing is being submitted electronically, pursuant to the Commission's Electronic Document Filing System.

Thank you for your kind assistance in filing this document in the appropriate manner. Please do not hesitate to contact me should you have any questions or need anything further..

Regards,

/s/ Jasdeep S. Khaira

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Enclosures

c: All Counsel of Record (via email)

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DATED: August 8, 2023

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COMMONWEALTH OF VIRGINIA
BEFORE THE
STATE CORPORATION COMMISSION

PETITION OF	)	
	)	
VIRGINIA ELECTRIC AND POWER COMPANY	)	
	)	CASE NO. PUR-2023-00066
In re: Virginia Electric and Power Company s Integrated Resource Plan filing pursuant to Va. Code § 56-597 et seq.	)	

TESTIMONY OF EDWARD BURGESS

ON BEHALF OF ADVANCED ENERGY UNITED

August 8, 2023

Summary of Direct Testimony of Edward Burgess

My testimony focuses on several major shortcomings in Virginia Electric and Power Company's ("Dominion" or "the Company") load forecast and demand-side plan that I believe are unreasonable and harm the Company's ability to comply with the Virginia Clean Economy Act ("VCEA"). Given these shortcomings, the State Corporation Commission ("Commission") should not approve this 2023 Integrated Resource Plan ("IRP") in its current form. The IRP contains several factors contributing to an exaggerated load forecast and thus an exaggerated need for new supply-side generation resource additions: (1) Dominion's load forecast adjustment for data center load is overly aggressive and does not consider factors likely to moderate data center load growth. (2) Dominion's usage-per-customer projections are at odds with recent commercial and industrial sector trends. (3) Dominion's resource modeling underestimates the role of energy efficiency ("EE") programs by failing to consider program additions beyond the minimum VCEA requirements. (4) Dominion's modeling underestimates the role of demand response ("DR") programs, leading to suboptimal resource portfolios. The IRP assumes no new DR programs, no ramp-up of the successful existing DR programs (beyond the next few years), and no improvements to underperforming DR programs. Thus, the Commission should require Dominion to update its load forecast to include a more limited forecast for data center load and electric vehicle ("EV") load that accounts for additional demand management programs and time-of-use rates. It should also require Dominion to revise its analysis to include a more robust EE scenario, which can help to avoid more costly future supply-side resource additions while assisting in meeting the VCEA goals. Additionally, this Commission should require a greater focus on EE and DR resources in Dominion's modeling to ensure they can adequately compete with supply-side resources. Finally, Dominion should be required to pursue incremental EE/DR resources each year following this IRP. These incremental efforts should consider higher levels of incentives, (including those newly available from the Inflation Reduction Act) as a means to increase program participation and savings levels.

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Exhibits:

Exhibit EB-1: Edward Burgess Resume

I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name and business address.

A. My name is Edward Burgess. My business address is Strategen Consulting (Strategen), 10265 Rockingham Dr., Suite #100-4061, Sacramento, CA 95827.

Q. By whom are you employed and in what capacity?

A. I am the Senior Director of Integrated Resource Planning with Strategen.

Q. Please describe your professional experience and educational background.

A. I am a leader on Strategen's consulting team and oversee much of the firm's utility-focused practice for governmental clients, non-governmental organizations, and trade associations. Strategen's team is globally recognized for its expertise in the electric and gas utility sectors on issues relating to resource planning, transmission planning, renewable energy, energy storage, rate design, cost of service, program design, and utility business models and strategy. During my time at Strategen, I have managed or supported projects for numerous client engagements related to these issues. Before joining Strategen in 2015, I worked as an independent consultant in Arizona and regularly appeared before the Arizona Corporation Commission. I also worked for Arizona State University, where I helped launch their Utility of the Future initiative as well as the Energy Policy Innovation Council. I have a Professional Science Master's degree in Solar Energy Engineering and Commercialization from Arizona State University as well as a Master of Science in Sustainability, also from Arizona State. I also have a Bachelor of Arts degree in Chemistry from Princeton University. A full resume is attached as Exhibit EB-1.

Q. On whose behalf are you submitting testimony?

A. I am testifying on behalf of Advanced Energy United.

Q. Have you previously submitted testimony before the Virginia State Corporation Commission (the "Commission")?

A. No. However, I did serve as the project lead in developing the 2019 Virginia Energy Storage Study on behalf of the Department of Mines Minerals and Energy.[1]

Q. Have you ever testified before any other state regulatory body?

A. Yes. I have testified before the California Public Utilities Commission (Docket Nos. A.19-08-002, A.20-08-002, R.20-11-003, A.21-08-004, A.21-10-010, and A.21-10-011), the Colorado Public Utilities Commission (Docket No. 22A-0085E), the Indiana Utility Regulatory Commission (Cause Nos. 38707 FAC 123 S1 and 38707 FAC 125), the Louisiana Public Service Commission (Docket No. U-36105), the Massachusetts Department of Public Utilities (D.P.U. 18-150 and D.P.U. 17-140), the Michigan Public Service Commission (Docket No. U-21090), the Nevada Public Utilities Commission (Docket Nos. 20-07023 and 22-09006), the North Carolina Utilities Commission (Docket Nos. E-2 Sub 1300, E-7 Sub 1276 and E-100 Sub 179), the Oregon Public Utilities Commission (Docket Nos. UE-375, UE-390, UE-420 and UG-435), the South Carolina Public Service Commission (Docket Nos. 2019-186-E, 2019-185-E, 2019-184-E, and 2021-88-E), and the Washington Utilities and Transportation Commission (Docket Nos. UE-200900 and in UE-220053/UG-220054, UE-220066/UG-220067). Additionally, I have represented numerous clients by drafting written comments, presenting oral comments and participating in technical workshops on a wide range of proceedings at utilities commissions in Arizona, California, District of Columbia, Maryland, Minnesota, Nevada, New Hampshire, New York, North Carolina, Ohio, Oregon, Pennsylvania, at the Federal Energy Regulatory Commission, and at the California Independent System Operator.

Q. What is the purpose of your direct testimony in this proceeding?

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[1] *Commonwealth of Virginia Energy Storage Study*, July 2019, https://static1.squarespace.com/static/5f8721831dd8c167b78e87b1/t/5ff10f3c143c0d28f21c25e4/1609633601749/Virginia%2BEnergy%2BStorage%2BStudy%2B-%2BFinal%2BReport%2B%2B2019.pdf, p. 1.

A. The purpose of my testimony is to provide an examination and critique of Dominion's IRP, specifically as it relates to the Company's load forecast and Demand Side Management projections.

Q. Can you summarize your findings regarding Dominion's load forecast and projected demand-side resources?

A. Yes. My overarching finding is that Dominion's IRP contains at least four factors that I believe are contributing to an exaggerated load forecast, and in turn an exaggerated need for new supply-side generation resource additions. Specifically, these factors are as follows:

1. In our analysis, Dominion's load forecast adjustment for data center load is overly aggressive and does not consider several factors that are likely to moderate data center load growth in Dominion's service territory within the next decade, including a) rising transmission costs, b) land use conflicts in northern Virginia, c) data center customer preferences for clean energy, and d) demand reduction opportunities being pursued by data center customers.
2. In our analysis Dominion's usage per customer projections are at odds with historical trends for the commercial and industrial sectors. Since usage per customer was not modeled for these sectors, like the Company did for residential, the projections are likely incorrect and overestimated.
3. In our analysis the Company's resource modeling underestimates the role of EE Programs by failing to consider program additions in future years beyond the bare minimum VCEA requirements, even if such additions are cost effective. This leads to suboptimal resource portfolios.
4. In our analysis the Company's modeling underestimates the role of DR Programs, thereby leading to suboptimal resource portfolios. This underestimate stems from no assumed inclusion of new DR programs, no assumed ramp up of the successful existing DR programs

(beyond the next few years), and no assumed improvements to underperforming DR programs.

Q. Do you have any recommendations for the Commission based on your findings?

A. Yes. First and foremost, the Commission should not approve the 2023 IRP in its current form. Instead, the Commission should instruct Dominion to provide a revised IRP to be filed in this proceeding with several modifications to its modeling assumptions. These modifications include changes to the load forecast and demand-side resource options as well as the supply-side resource options. My colleague, Dr. Maria Roumpani, provides testimony regarding recommended changes to the supply-side resource assumptions. Regarding changes to the load forecast and demand-side resource options, my recommendations are as follows:

1. The Commission should require Dominion to update the load forecast in its IRP to include:
   a. A more limited forecast for data center load that accounts for the limitations described in Section II.A, as well as expanded DR programs focused on data centers.
   b. A more limited forecast for EV load that fully accounts for EV TOU adoption and managed charging programs as described in Section II.A
   c. Usage per customer trends for commercial and industrial consistent with recent historical trends as described in Section II.B.
2. The Commission should require Dominion to revise its IRP analysis to include a scenario with an EE adjustment consistent with my alternative projection. This alternative projection should be included in the load forecast assumption used in PLEXOS. I believe this will show a substantially reduced overall capacity and energy need that can help to avoid future fossil generation additions, while assisting Virginia in meeting the requirements of the VCEA.

The Commission should also require Dominion to take certain actions going forward as it prepares for future IRPs, including:

a. In future IRPs, EE and DR resources should be modeled as a selectable resources in PLEXOS going forward. This will ensure that demand-side resources are able to compete on a level playing field with supply-side resources. At a minimum, a range of different EE and DR savings levels should be evaluated.

b. The Commission should also require Dominion to pursue incremental EE/DR resources in each subsequent year following its pending application. As part of the development of these programs, Dominion should be required to assess how the financial incentives from Inflation Reduction Act to increase program participation and lower participant costs.

c. As part of any market potential study conducted in relation to incremental EE/DR resources, not only should IRA incentives be considered, but utility incentive levels up to, or even exceeding, 100% (rather than just 75% or 50%) should also be considered.

d. The Commission should direct Dominion to pursue expanded DR opportunities consistent with my recommendations above in Section II.D.iv.

II. DOMINION'S LOAD FORECAST CONTAINS PROBLEMATIC ASSUMPTIONS THAT OVERSTATE ITS FUTURE CAPACITY NEEDS AND THE AMOUNT OF SUPPLY-SIDE ADDITIONS REQUIRED.

Q. How would you characterize the load forecast Dominion developed for its 2023 IRP?

A. In Dominion's 2023 IRP, the Company projects a very substantial and unprecedented amount of load growth over the next 15 years. This is a significant driving factor underpinning the

Company's finding that new capacity resources – including new fossil resources -- are needed in the coming years.

Q. Do you think the substantial level of load growth that Dominion has projected is likely to materialize?

A. No, at least not to the level that Dominion has projected. I do agree that there are a few novel factors -- such as new data centers and electric vehicle adoption – which may drive additional load growth beyond historical patterns. However, I also believe the Company did not consider key factors that could ultimately limit the impact of these growth sectors. Additionally, I also believe that Dominion's underlying load forecast fails to fully account for increases in end use efficiency – particularly in the commercial and industrial sectors – that will drive down energy usage per customer and peak demand per customer. Finally, the Company does not fully consider the role that both 1) EE programs[2] and 2) DR programs could play to mitigate growing energy and peak demand needs. In summary, Dominion's IRP contains four factors that I believe are contributing to an exaggerated load forecast – and in turn an exaggerated assumed need for new fossil resources. These four factors are:

1. An overly aggressive data center and EV load forecast.
2. An inaccurate forecast of usage per customer for the industrial and commercial sectors.
3. An underestimate of the energy and peak savings contributions from EE programs.
4. An underestimate of the peak savings contributions from DR programs.

I will address each of these factors in greater detail through my testimony below.

[2] EE is defined as permanent changes to electricity usage through the installation of or replacement with more efficient end-use devices or more effective operation of existing devices that reduce the quantity of energy needed to perform a desired function or service.

A. ***Dominion's load forecast adjustment for data center load is very aggressive and should be considered with extreme caution. Meanwhile, the EV load forecast includes only very minimal managed charging solutions relative to their potential.***

Q. What is the single biggest driver of Dominion's projected increase in load over the next 15 years?

A. Without a doubt, the biggest factor is the projected increase in data center load. According to the IRP, the company's total peak load is projected to increase by approximately 10,000 megawatts ("MW") between now and 2038, while its data center load is projected to increase by roughly the same amount. For comparison, the EV load is only projected to add about 1,600 MW over the same period. By 2038, the Company assumes that data center load will account for roughly half of its total kWh sales.

Q. What methodology does Dominion use for projecting data center peak demand?

A. The Company states that it "[s]tatistically models demand (MW) using three different approaches:

Approach 1: linear regression of demand

Approach 2: polynomial regression of demand

Approach 3: linear regression of sales to demand."[3]

These three approaches are not fundamentally different from one another in that they extrapolate recent trends out into the future, thereby assuming data center growth in Dominion's service territory will continue to grow at its current pace for the next 15 years.

Q. Do you think it is realistic to assume data center load will continue to grow at its current pace for the next 15 years?

[3] Virginia Electric and Power Company's Integrated Resource Plan Case No. PUR-2023-00066. May 1, 2023. Available at https://www.scc.virginia.gov/docketsearch/DOCS/7rwm01!.PDF, p. 56.

A. No. I do agree that there has been a significant and unprecedented growth in energy demand from data centers in recent years, particularly in Virginia, and that this may continue for some time. However, I think some caution should be applied when assuming that this trend will continue unabated for the next 15 years. There are three primary reasons for this:

1. First, as the market for data centers in Virginia continues to become saturated, there will be increasing upward pressure on transmission costs. If these costs become high enough, this may lead some prospective data center customers to seek sites elsewhere. In fact, there are signs that this is already happening. As indicated in Figure 4.1.5.1 of Dominion's IRP, the Company's data center load forecast for 2022 was actually higher than what materialized. This was in part due to transmission capacity constraints. Last year Dominion also reported that it may need to halt power delivery for new data center developments due to its inability to distribute power over high-voltage power lines.[4]
2. Second, land suitable for additional data center development may also become more difficult to secure. Already there have been some siting controversies over recent data center proposals in northern Virginia, and such trends would suggest these conflicts may become more prevalent.[5]
3. Third, Dominion's resource mix, which relies significantly on fossil fuels, may deter certain prospective data center customers who have their own clean energy commitments. Major cloud computing companies like Google, Microsoft, Meta, and Amazon all have

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[4] Judge, Peter. "Dominion Energy Admits It Can't Meet Data Center Power Demands in Virginia." *DCD*, 29 July 2022, https://www.datacenterdynamics.com/en/news/dominion-energy-admits-it-cant-meet-data-center-power-demands-in-virginia/. Accessed 3 Aug. 2023.

[5] Barakat, Matthew. "Backlash to Data Centers Prompts Political Upset in Northern Virginia." *Associated Press*, 22 June 2023, https://apnews.com/article/virginia-election-data-centers-prince-william-229cb44d34ccf4bd1cc4e9f0d0131649. Accessed 3 Aug. 2023.

robust clean energy commitments that may cause them to seek other grid locations with a cleaner energy mix.

4. Fourth, like other commercial and industrial customers, data centers operators are continuously seeking opportunities to increase the efficiency of their own operations through more efficient equipment, and also to reduce peak load through demand reduction opportunities. I discuss these opportunities later in my testimony.

Q. Does Dominion's data center load forecast account for any of these factors?

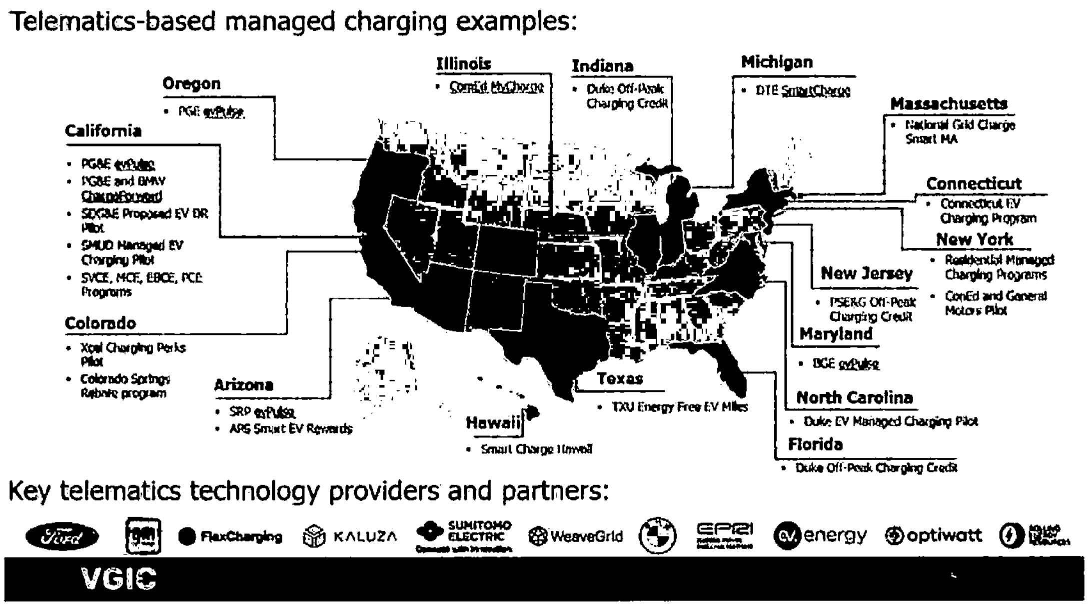
A. No. It is not reasonable in my judgment for Dominion to have omitted these mitigating factors. Instead, it appears that the Company may have conveniently overlooked them as a means to justify its preferred supply-side build-out.

Q. Does Dominion apply any adjustments to its data center and EV load forecasts to account for future DSM programs applied within these sectors?

A. Very minimally, and this is a major shortcoming in Dominion's forecast. I will discuss opportunities in both of these sectors, starting with EVs. For EVs in particular, there has been a proliferation of managed charging programs around the country that will serve to mitigate the peak demand impact of EV charging. Managed charging can be implemented in a variety of ways. For example, it can be in the form of simple EV-specific time of use (TOU) rates that incent customers to charge off-peak.[6] Dominion is well poised to provide such offerings at scale, particularly with its recent, wide-spread rollout of Advanced Metering Infrastructure (AMI). I have reviewed the EV load forecast analysis conducted by Guidehouse for Dominion.[7] However, I am not convinced that Dominion's IRP reflects a robust treatment of the potential for TOU rates to assist in managing EV charging load. Beyond TOU rates, managed charging can also be

[6] Time of use (TOU) rates are when the amount a customer pays for electricity is based on the time of day when energy is consumed and is aligned with the marginal cost of generating and delivering that electricity.
[7] Dominion's Response to Appalachian Voices, Set 2, Question 1, Attachment APV Set 02-01 (KS) CONF.

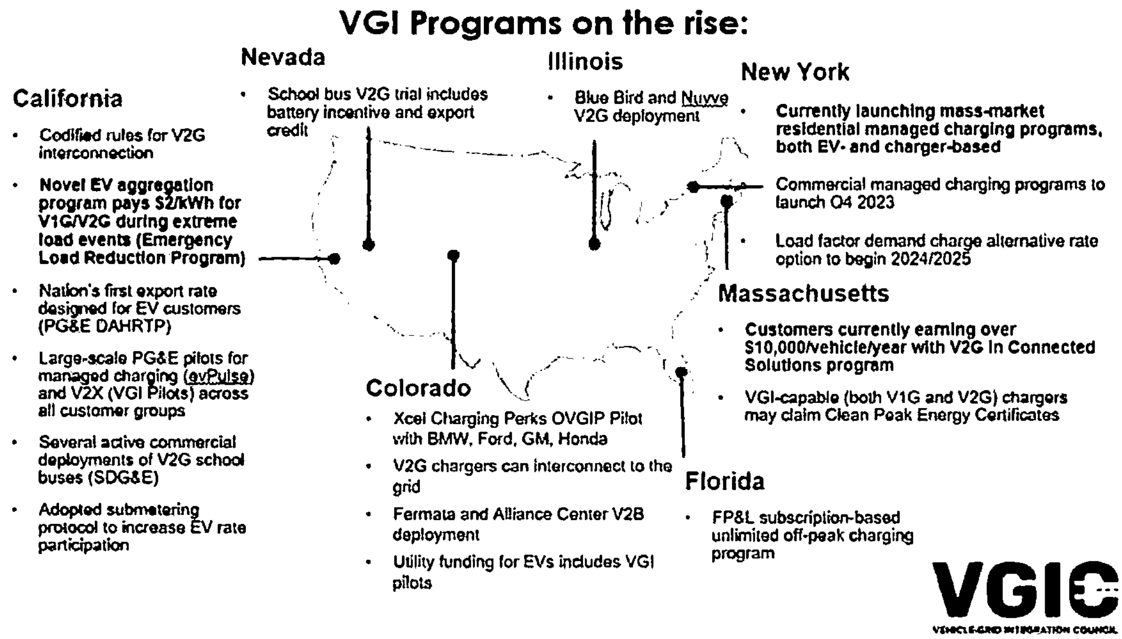
implemented through more advanced active management approaches that leverage the use of networked EV chargers or vehicle telematics. Below is an illustration of the proliferation of telematics-based programs around the country:[8]



In fact, Dominion recently proposed a new telematics-based EV charging pilot as part of its Phase XI demand-side management programs, with projected coincident peak savings of approximately 1 MW and 1,000 participants by 2026. However, Dominion did not include these Phase XI program savings in its load forecast. Moreover, even if the pilot program savings were included, Dominion's forecast suggests that this program will be rapidly phased out after 2026. In addition to telematics, there have been significant recent advances in vehicle-to-building and vehicle-to-grid technologies (also known as "V2X") that, if properly leveraged, could further mitigate the impact of EV's on Dominion's system. In fact, a successful V2G program could leverage EVs to serve as a grid resource during peak hours, rather than a load. Currently there are a variety of V2X capable vehicles and chargers on the market, with more expected to come in the near future.

8 Woogen, Zach. *Telematics-Based Managed Charging Market Context*, 24 July 2023, https://static1.squarespace.com/static/5dcde7af8ed96b403d8aeb70/t/64c7f13fb23b8035f5a7e4cf/1690825023973/2023-07-24+VGIC+Presentation+to+Telematics+Workshop.pdf, p. 5.

Similar to telematics, programs are also becoming more widely available. Below is a summary of vehicle-grid integration (VGI) programs across the U.S. that highlights several V2X offerings:[9]



Unfortunately, Dominion's IRP did not include a robust consideration of more advanced techniques for managing EV charging load such as telematics or V2X. Instead, the Company's only apparent consideration of managed charging was a minimal EV DR and EE program that achieves 1.67 MW of peak savings by 2038, compared to the projected EV peak load of over 1,656 MW. This is roughly equivalent to a 0.1% customer participation rate, which is unreasonably low in my judgment.

Q. Can you discuss opportunities for demand management related to Dominion's data-center load?

A. Yes. Data centers also have some limited ability to mitigate their peak load contribution. While they are generally high-load-factor facilities, some data centers may be able to shift computing

9 Provided courtesy of the Vehicle Grid Integration Council. https://www.vgicouncil.org/.

cycles to other locations for a limited time during peak hours. Some cloud computing companies like Google are already using this technique of shifting computing power to align with the grid's resources.[10] Dominion's load forecast does not include any contribution from this novel form of peak reduction from data centers. Dominion's EE adjustment does include a very minimal projected peak savings on the order of 1 MW from its existing Data Center and Server Room Program. However, this program is aimed at installing efficiency measures related to equipment in data centers, rather than active programs to manage demand by shifting computing power during peak hours. Moreover, the savings from this existing Data Center Program are not projected to increase at all after an initial ramp up through 2028, even though the Company projects many more data centers to come online in subsequent years, thus providing significantly more savings opportunities. This seems unreasonable in my opinion. At a minimum, the savings from this EE program should scale in tandem with the projected growth in data center load. All these possible sources of demand reduction should be considered and reflected in Dominion's load forecast. I recommend that the Commission require Dominion to develop a more realistic forecast for its data center and EV load that includes both demands side management measures, as well as natural limitations on data center load growth. I further recommend that this be incorporated into a revised IRP analysis.

B. Usage per customer projections in Dominion's underlying load forecast are at odds with historical trends for the commercial and industrial sectors

Q. Did Dominion develop its load forecast based on a "bottoms-up" approach that examined trends in usage per customer?

[10] Miller, Rich. "Google Moving Workloads Between Data Centers to Use Greener Energy." *Data Center Frontier,* 18 May 2021, https://www.datacenterfrontier.com/cloud/article/11428180/google-moving-workloads-between-data-centers-to-use-greener-energy. Accessed 3 Aug. 2023.

A. Not entirely. Dominion did develop a usage-per-customer model for its residential sector. However it did not do so for any other sector, including its commercial and industrial loads.

Q. Have you examined Dominion's implicit assumptions for usage per customer in the commercial and industrial sectors?

A. Yes. Using the data in Appendix 4D of Dominion's IRP, I calculated the historical trend in usage per customer as well as Dominion's projections going forward from 2023-2038. For the Commercial sector load, I also subtracted the data center load, for which Dominion has developed a separate forecast and requires special consideration. I discussed data center load separately in the previous section of my testimony.

Q. Do you find Dominion's projected trends in usage per customer to be reasonable?

A. For residential customers – which Dominion has more carefully modeled -- I found the trend to be reasonable. However, for commercial and industrial customers, I found that the usage per customer projections were significantly at odds with historical trends and did not find them to be reasonable. This is especially true in the case of the industrial load. The charts below, Figure 1 and Figure 2, demonstrate this for both customer classes. In each figure, the solid blue line represents historical use per customer, and the orange line represents Dominion's forecast going forward. The dashed blue line uses a linear regression technique (similar to Dominion's approach to forecasting data center load) to represent the trend in usage per customer based on historical sales.

Figure 1: Forecast of Industrial Sales per Customer

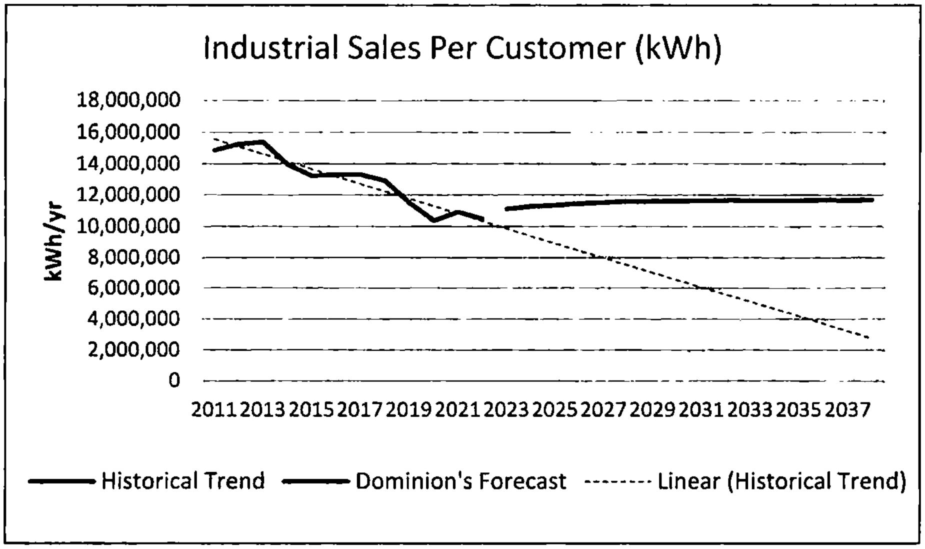
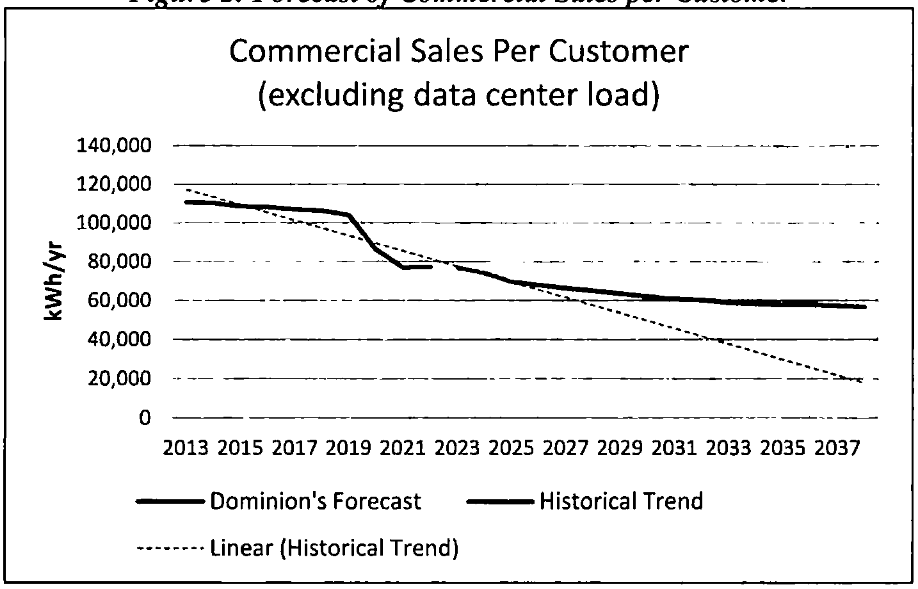


Figure 2: Forecast of Commercial Sales per Customer



Q. Can you elaborate on some of the discrepancies you observed between the historical trends and Dominion's projections?

A. Yes. Industrial usage per customer has sustained a substantial decline since 2011 at an average pace of approximately -3% each year, likely reflecting continual improvements in process efficiencies and end- use appliances. In contrast, Dominion projects that industrial usage per customer will begin to increase going forward, meaning the Company is assuming industrial processes in its territory become less efficient over time. Meanwhile, Commercial usage per customer (excluding data centers) has declined at an average annual rate of -4%/year since 2013. However, Dominion projects this rate of decline to slow to just -2%/year going forward.

Q. Has Dominion provided an adequate explanation for these shifts going forward?

A. No. In contrast, I expect these trends to continue for some time, especially in light of increasingly efficient building energy codes and national appliance standards. Moreover, as I will discuss in the next section of my testimony, the recently passed Inflation Reduction Act ("IRA") includes significant federal incentives for commercial customers to invest in EE. I am concerned that Dominion's lack of a usage per customer approach (similar to what the Company used for its residential forecast) is inflating the load forecast for commercial and industrial customers. I recommend that this be corrected and the resulting load forecast be incorporated into a revised IRP analysis.

C. The Company's analysis underestimates the role of EE Programs, thereby leading to suboptimal resource portfolios

i. Background on EE

Q. What is EE?

A. EE is defined as permanent changes to electricity usage through the installation of or replacement with more efficient end-use devices or more effective operation of existing devices that reduce the quantity of energy needed to perform a desired function or service. EE investments generally offer an equivalent energy-related service (e.g., space heating) but with lower energy input and thus should not be confused with energy conservation, whereby customers may voluntarily use less of a service. In the context of integrated resource planning, EE programs can be relied upon to provide reductions in both energy throughput (kWh) and peak demand (kW) that persist over time. These energy and peak savings can often be achieved at a lower cost than a comparable supply-side resource.

ii. Category 2 EE Program Savings

Q. Do you believe Dominion's IRP has included reasonable assumptions for the amount of energy and peak savings could be achieved from future EE programs?

A. No, I believe that Dominion underestimates the energy and peak savings that could be achieved from EE programs. Dominion explains that its load forecast includes adjustments for EE programs in two broad categories: Category 1 which includes savings from programs approved in the past that are continuing to produce savings, and Category 2 which represents "generic future undesignated EE programs." Thus, the latter category represents the amount of energy savings assumed from future EE programs.

Q. Was Dominion correct to assume some amount of future EE program savings under Category 2?

A. Yes. If Category 2 were not included that would be equivalent to assuming the Commission would never approve another EE program or program extension, including the pending Phase XI proposal. Thus, it was reasonable to include Category 2 since it is very likely the Commission will approve new EE programs or program extensions between now and 2038. That said, I do not believe the quantity of future savings assumed by Dominion for Category 2 is reasonable.

Q. How did the Company determine the level of savings from these Category 2 future programs?

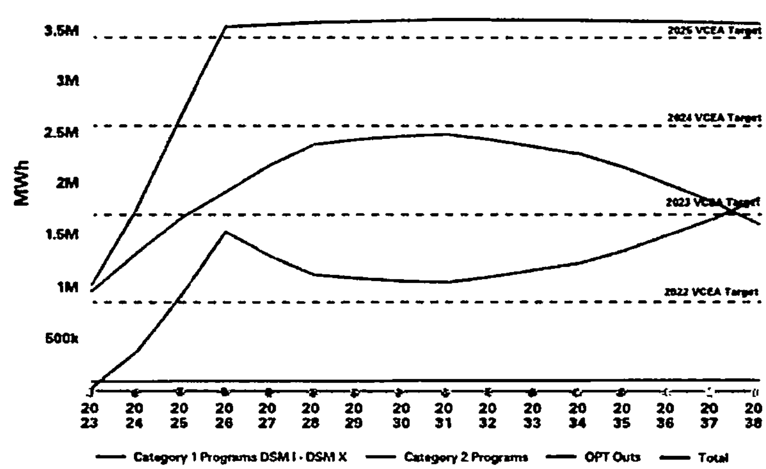
A. The level of savings Dominion assumes from future Category 2 programs doesn't appear to be based on any realistic proxy for future EE program savings.[11] Instead, the Category 2 savings simply "fill the gap" to meet the bare minimum requirements the Company is obligated to achieve under the VCEA. As Dominion confirmed, these savings were "calculated by subtracting

[11] As confirmed in Dominion's response, "Undesignated EE energy savings were not based upon a DSM potential study or any level of program incentive." *See* Dominion's Response to Advanced Energy United Set 2, Question 24.

the planned annual DSM program energy reductions from the annual VCEA targets."[12] This can be seen directly in Figure 4.1.3.1 of the IRP (reproduced below), which shows that the Category 2 program savings (green line) do not have a trajectory similar to the Category 1 savings, which is what I would have expected. That is, the Category 1 savings (blue line) has an arc-like shape as programs ramp up over time and then roll off at the end of their measure lives. Instead, the Category 2 savings levels (green line) seem to have been assumed to almost exactly match the minimum VCEA targets through 2025 and maintain the minimum 5% level thereafter. Thus, it does not appear that the Category 2 savings reflect a very thoroughly considered or realistic set of future programs. Additionally, by nearly exactly matching the VCEA target, Dominion essentially treats these requirements as a ceiling rather than a floor in terms of utilizing EE as a resource for meeting its energy and capacity needs. This is not a reasonable approach in my opinion since a greater level of EE program savings than what is required is likely to be a more cost-effective solution.

Figure 4.1.3.1 of the IRP: Forecast of Category 1 and Category 2 programs with VCEA target.

Figure 4.1.3.1: EE Energy Forecast Adjustment



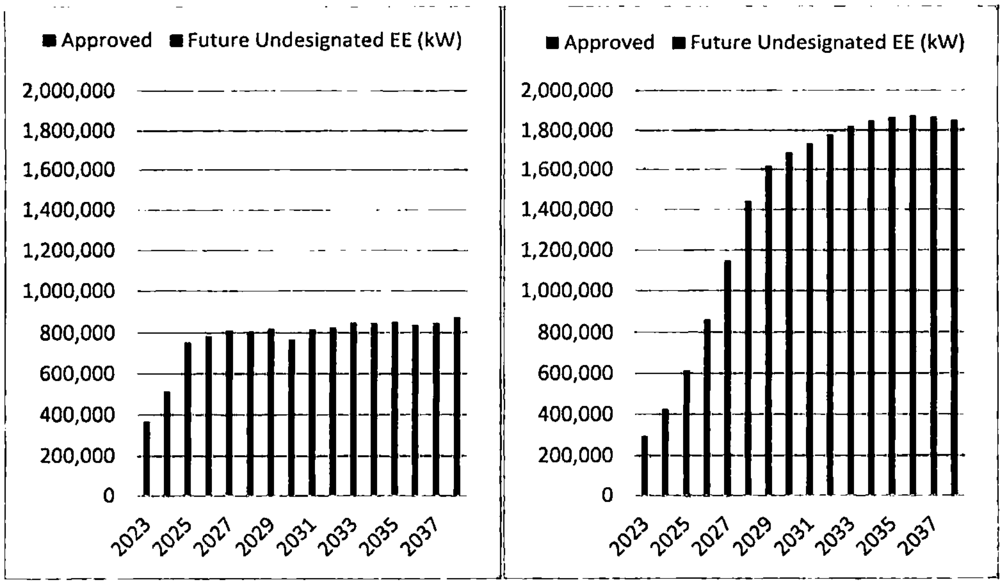
Note: All values shown are at the customer meter and do not include line losses

[12] Dominion's Response to Advanced Energy United Set 2, Question 24.

Q. Have you performed any analysis to show what a more realistic trajectory of future Category 2 program savings could look like – i.e., one that is not limited to the "bare minimum" VCEA requirements?

A. Yes. I based my analysis on Appendix 6G of Dominion's IRP, which includes a detailed numerical projection of the future energy savings that would be realized from the Company's most recently proposed set of DSM programs (Phase XI). These Phase XI savings reflect five new DSM programs (including one pilot) and four new program bundles for which the Company filed for SCC approval on December 13, 2022 (Case No. PUR-2022-00210, which is still pending). Notably, these Phase XI savings were not included in the Company's EE adjustment in Category 1 or Category 2. Since these savings are tied to specific programs that the Company has studied, or in some cases has implemented in the past, I believe they reflect more a realistic projection about what future program savings could look like. Using the data from Appendix 6G, I developed an alternative projection for Category 2 EE program savings. This alternate projection assumes a set of programs (or program extensions) similar to Phase XI are adopted in each subsequent year of the planning horizon. The results are shown in the figures below. The chart on the left shows the peak demand savings from EE programs under Dominion's projection while the chart on the right shows the peak demand savings under my alternative projection:

Figure 4: United/Strategen's Alternative Projection for Category 2 EE Program Savings (right) compared to Dominion's 2023 IRP projections for Category 2 EE Program Savings (left).



Q. How do the total energy and peak savings of your alternative projection compare to Dominion's?

A. If Dominion were to achieve energy and peak savings more aligned with my projection, then energy savings in year 2038 would increase from about 3,708 GWh to 5,318 GWh, and coincident peak savings in 2038 would increase from 875 MW to 1,851 MW. Notably, this increase in the level of peak savings (~975 MW) would be approximately enough equivalent capacity to avoid the new natural gas additions contemplated under Plans D and E in Dominion's IRP. Meanwhile, my projection likely underestimates savings in the early years (i.e., through 2025) since additional savings would be needed in those years to meet the VCEA's requirements.

Q. Are there any recent developments that will increase the economic potential of demand-side management measures, thereby making your projection more achievable?

A. Yes. The passage of the Inflation Reduction Act introduced many new federal incentives for energy efficiency measures, including the following:

- Nonbusiness Energy Property Credit (Sec 13301, 25C)
    - Increases credit for energy efficiency home improvements from 10% to 30% and extends them through 2032.

- Replaces lifetime cap on credits with a $1,200 annual credit limit, including $600 for windows and $500 for doors. Increases the limit to $2,000 for heat pumps.

- Section 50121 Home Energy Performance-Based, Whole-House Rebates
  - $4.3 billion through 2031 to DOE to help state energy offices implement a HOMES rebate program to provide rebates to homeowners and aggregators for whole-house energy saving retrofits.
  - Additional funding can be provided to low- and moderate-income individuals, who earn less than 80% of an area's median income.
- Energy Efficient Commercial Buildings Tax Deduction (Section 179D)
  - Sliding scale of $0.5/sqft for energy savings of 25% and up to $1/sqft for energy savings of 50% or greater.
  - Bonus deduction for wage and apprentice requirements: Sliding scale of $2.50/sqft for 25% and $5/sqft for 50%.
- Residential Clean Energy Credit (Section 13302, 25D)[13]
  - Increases tax credits from 26% to 30% for system installation.
  - Introduces a 30% tax credit for residential battery storage of at least 3 kWh.

Q. Are there other recent developments that should unlock novel opportunities for peak demand reduction through DSM programs?

A. Yes. Dominion is currently completing the rollout of AMI. One of the primary rationales for this investment is to enable new time-of-use rates and accompanying programs that will encourage customers to reduce their demand during peak periods. This means that there should also be greater opportunities going forward to implement more comprehensive load reduction programs.

[13] While not technically an Energy Efficiency measure, installing a clean energy system such as rooftop photovoltaics with battery storage will similarly reduce energy and peak demand.

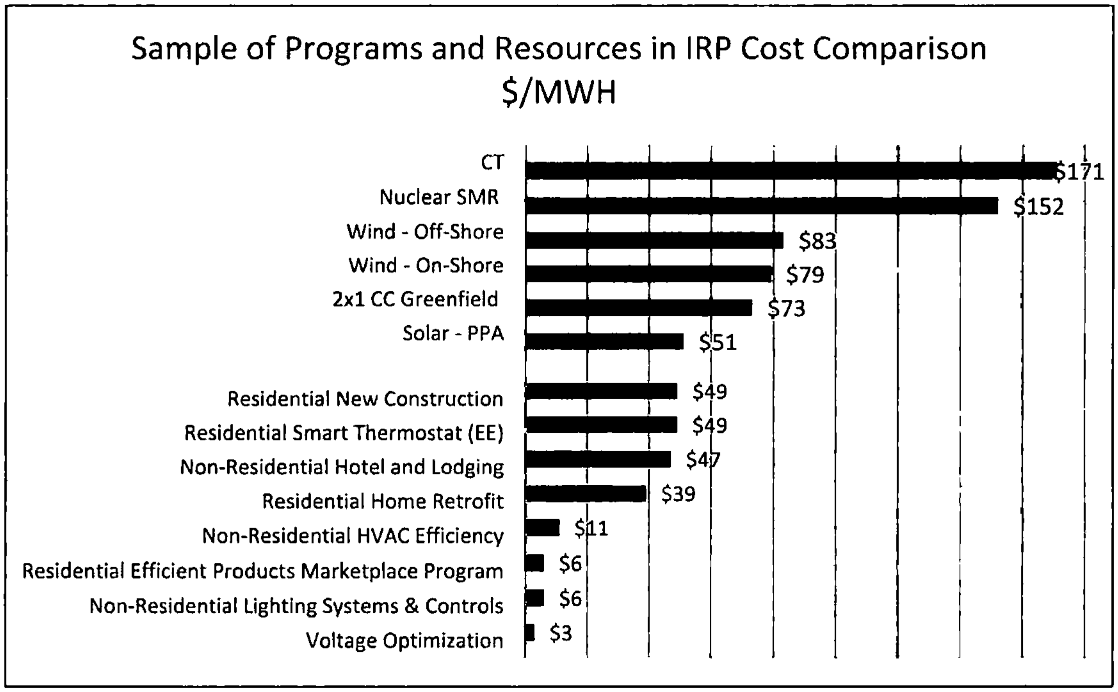
I discuss some of these opportunities elsewhere in my testimony with respect to EV managed charging opportunities.

iii. EE Costs and Resource Savings Potential

Q. Do you think there are opportunities to pursue an expanded level of EE savings that is greater than what Dominion has assumed and to do so cost effectively?

A. Yes. It is especially worth noting that many existing and proposed EE programs that Dominion is implementing are significantly less costly than comparable supply-side resources when compared on a $/MWh basis. For example, according to Appendix 6P of Dominion's IRP, there are at least 15 demand side programs that cost less than $50/MWh and are thus less expensive than any of the supply-side resource options considered by Dominion. Some of the larger programs, (e.g., Non-Residential Lighting Systems & Controls, Residential Efficient Products Marketplace) cost as little as $6/MWh. By comparison, a new combined cycle gas plant costs $72/MWh. This suggests that the incentive budgets for these EE programs could be expanded by a factor of 12 times -- thus resulting in substantially more savings -- and still be less costly on a $/MWh basis than a new natural gas-fired power plant. Even for more costly EE measures, such as those targeted at data centers, healthcare facilities, or residential smart thermostats, the incentive levels could more than triple and still be less costly than various supply-side alternatives. Figure 5 provides a cost comparison of several EE programs to supply side resources, ranked from lowest to highest costs. The demand-side programs are shown in blue, while the supply-side resources are shown in orange.

Figure 5: Cost Comparison for a Sample of Energy Efficiency Programs (blue) and Supply Side Resources (orange)



Q. Are there some limitations in the simple $/MWh resource comparison you provided?

A. Yes. In general, $/MWh is a very useful and indicative metric of overall cost-effectiveness and should not be dismissed. However, I recognize that it also does not capture all of a resource's attributes and performance (e.g., peak contribution). For this reason, I believe it is better, where possible, to model all resource options -- including demand-side options -- in the initial resource selection process (e.g., in PLEXOS).

Q. Does Dominion's modeling approach in PLEXOS sufficiently investigate the opportunity for an expanded EE portfolio to be selected if it is more cost-effective?

A. No. It is worth remembering that Dominion does not allow for EE programs to be selectable resources in PLEXOS and instead simply pre-selects the level of EE as an adjustment to its load forecast. From the simple $/MWh comparison above, it seems evident that a resource portfolio with an expanded level of EE could indeed be more cost effective, since it would displace other more costly supply-side resources selected by the model. However, even if an expanded level of EE were more cost-effective, Dominion's PLEXOS modeling is incapable of yielding that result.

As I described in my testimony earlier, the Company has not considered any level of EE beyond the bare minimum VCEA targets. Since Dominion has not sufficiently analyzed higher levels of EE, I strongly recommend the Commission require Dominion to do so going forward, and to consider this a viable alternative to some amount supply-side resource additions. For this proceeding, I recommend that the Company revise its IRP to include my alternative EE forecast, as described in my testimony above.

Q. Do Dominion's previous EE market potential studies adequately capture the opportunity for an expanded EE portfolio to be achieved?

A. No. Dominion's IRP explains that its most recent market potential study from 2020 considered only two measure incentive level scenarios: 50% incentives and 75% incentives. However, as explained above, the budget and corresponding level of incentives for some measures could be substantially increased – perhaps over 10x in some cases -- while still being less costly than supply-side alternatives. Moreover, the recent passage of the IRA introduces new federal incentives that can supplement those from utility-administered programs. Thus, going forward, Dominion's potential study should consider incentive levels at 100% or even higher for some of the lower-cost programs. Failing to do this means that Dominion will be leaving potential energy and peak demand savings opportunities on the table that could otherwise assist it in meeting its resource adequacy needs at a lower cost than what the Company has proposed.

D. The Company's analysis underestimates the role of DR Programs, thereby leading to suboptimal resource portfolios

i. Background on Demand Response

Q. What is demand response and what are the different types of demand response programs?

A. Demand response programs can be considered to fall under two broad categories: 1) time-based retail rates and 2) incentive-based programs, as summarized in Table 1.

Table 1: Summary of Demand Response Opportunities

Time-Based Retail Rates	**Incentive-Based Programs**
DR signal: Price Level	***DR signal: System State***
Time-of-Use (TOU)[12]	Disconnectable/Interruptible
Critical Peak Pricing (CPP)	Configurable
Day-Ahead Real-Time Pricing (DA-RTP)	Incentivized Behavioral
Real-Time Pricing (RT-RTP)	Non-Incentivized Behavioral
	Energy Bidding
	Capacity Bidding
	Ancillary Services Bidding[13]

These opportunities reflect the diversity of options available for providing a variety of grid services, ranging from resource adequacy capacity to regulating reserves. Recent modeling analysis has indicated that DR can provide most, if not all, of the same grid services as conventional thermal resources, thus enabling it to replace conventional supply-side resources even in systems with high penetrations of renewables.[14] By definition, DR is a mechanism through which an end-use's load profile is changed (by the user, a third party, or a utility) in response to system needs, often in return for economic compensation (e.g., payments or a different rate structure).[15] DR programs may utilize a variety of different control technologies, such as smart thermostats, direct load control switches, plug load controls, automated demand response (ADR) technologies, and/or behavior-based DR programs. DR is a time-dependent resource that targets the reduction of energy demand (kW) at certain times or shifts customers from their normal energy use patterns in response to changing electricity prices or grid reliability

[14] Balasubramanian, S., and P. Balachandra. "Effectiveness of Demand Response in Achieving Supply-Demand Matching in a Renewables Dominated Electricity System: A Modelling Approach." *Renewable and Sustainable Energy Reviews*, Sept. 2011, www.sciencedirect.com/science/article/abs/pii/S1364032121005323.

[15] Potter, J., and P. Cappers. Demand Response Advanced Controls Framework and Assessment of Enabling Technology Costs. *Lawrence Berkeley National Laboratory*, 2017, p. 58.

needs. It aims to quickly resolve the imbalance between electric supply and demand through the elasticity of electricity demand.[16] All forms of demand response anticipate that either the program provider will directly control end uses or the customer will manually or automatically alter their consumption of electricity over some time period based on a DR signal.

Q. What benefits can demand response programs provide to the utility, ratepayers, and the grid?

A. Demand response is a diverse demand-side resource that can potentially provide millions of dollars in customer savings through advanced load management. Demand response programs can and should be developed to address the needs of the grid to maximize benefits to utility customers. If DR programs are designed accordingly, they can decrease costly investments in the distribution system, transmission system and new supply-side generation resources. Recently, a "first of its kind" comprehensive study on DR potential was conducted in California through a collaboration between the Lawrence Berkeley National Laboratory, the local utilities (PG&E, SCE, and SDG&E), and the public utilities commission. A key finding of this study is that the value created by DR depends on the timescale of the response. As such, the study developed a taxonomy of potential DR resources that could be implemented, which included four core categories: **Shape**, **Shift**, **Shed** and **Shimmy**.[17]

- **Shape** can be thought of as TOU and CPP price signals, or EE. Shape was model as a peak capacity resource, which can provide 1 GW of service in CA, and also as a shift

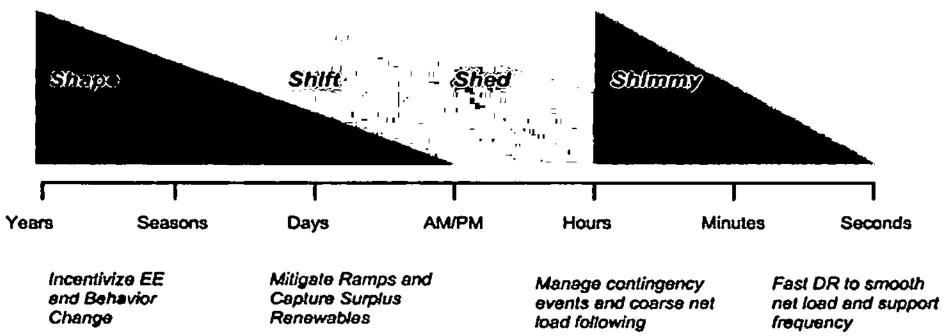
[16] Eto, J., Bernier C., Young P., Sheehan K.D., and Global B. (2009). Demand Response Spinning Reserve Demonstration–Phase 2 Findings from the Summer of 2008. *Lawrence Berkeley National Laboratory*, 2009, p. 129.

[17] Alstone, Peter, et al. "2025 California Demand Response Potential Study - Charting California's Demand Response Future: Final Report on Phase 2 Results." *2025 California Demand Response Potential Study - Charting California's Demand Response Future: Final Report on Phase 2 Results | Building Technology and Urban Systems*, Mar. 2017, https://eta-publications.lbl.gov/sites/default/files/lbnl-2001113.pdf, p. 1-1.

resource, where price-responsive loads could shift consumption from the evening hours to midday hours, effectively providing 1.8 GWh of service.

- **Shift** represents DR that encourages the shifting of energy consumption from hours of high demand to times of day when there is a surplus of renewable generation. There is 15-20 GWh of daily load shift that could provide upwards of $500 Million of value to CA ratepayers from a reduction in renewable curtailment or over-generation.
- **Shed** is known as conventional DR that reduces load for system-level capacity relief. There is value for shed (curtailable, dispatchable, interruptible) resources at the distribution and transmission levels and it largely depends on the granularity of the DR signal.
- **Shimmy** service type is the fastest DR service- providing service in 4 second and 5 minute, providing services such as ancillary services and frequency response.

Figure 6: Demand Response Taxonomy



While the quantitative results of the study are specific to California, the taxonomy presented in Figure 6 illustrates the temporal nature of DR grid services that is universally applicable. I believe this is also a useful framework for considering DR resources in the Virginia context. More specifically, it highlights the vast range of potential DR opportunities that could be pursued by Dominion but are not presently reflected in its IRP. Going forward, I recommend that the

Commission direct Dominion to identify DR opportunities corresponding to each of the categories identified above.

ii. DR Programs in Dominion's 2023 IRP

Q. Do you believe that Dominion has included reasonable assumptions for the amount of peak savings achievable from existing and future demand response programs?

A. No. In fact, Dominion's peak load forecast does not appear to consider any new DR programs being pursued in the future, or any significant expansion of existing DR programs after their initial ramp up over the next few years.

Q. What is the current state of Dominion's DR program portfolio?

A. Currently Dominion has a total of four active demand response programs, which are contributing approximately 42 MW of peak reduction, according to the most recent EM&V report completed by DNV. These programs include Residential Water Saving, Residential Smart Thermostat, Electric Vehicle Peak Shaving, and Non-residential Distributed Generation Programs. Dominion has also requested approval for an extension of its Peak Time Rebate program[18] with the goal of expanding enrollment from 25,000 customers in 2024, to 250,000 customers by 2028. However, according to the IRP, the Company plans to discontinue the Peak Time Rebate program after 2029. Of the existing programs, the bulk of projected peak load reductions are achieved through the Residential Smart Thermostat DR program and Residential Water Savings DR program. In both cases, Dominion projects peak savings to ramp up over the next 3-4 years but remain relatively static thereafter. Very little peak savings and participation are projected from the remaining programs, which suggests improvements to those program designs may be warranted.

[18] Virginia Electric and Power Company's 2021 DSM Update Case No. PUR-PUR-2021-00247. May 15, 2023. Available at https://www.scc.virginia.gov/docketsearch/DOCS/7syq01!.PDF, p. 113-118.

Q. Do you think greater peak reductions from DR could be achieved by Dominion and included in its IRP?

A. Yes. I think more DR could be achieved in three ways: a) adoption of new DR programs, b) greater ramp up of the successful smart thermostat and water saving DR programs, and c) improvements to existing but underperforming DR programs. Regarding the first approach, my earlier testimony highlighted a few potential options for new DR programs within the growing loads for EVs and data centers. Ramping up existing thermostat and water saving programs – beyond what is currently planned -- should also be examined through expanded program budgets. Regarding the underperforming DR programs, it is worth noting that the Company's Non-residential Distributed Generation program is not expected to exceed twelve participating customers over the next 10 years. On a similar note, Dominion explains that no customers in Virginia currently participate in its Standby Generation rate schedule.[19] This implies not only that there could be problems with current program designs that make them unattractive or unavailable to prospective participants, but also that the Company does not plan on improvements that could increase participation.[20] By contrast, other utilities across the country have successfully attracted significant numbers of participants to similar types of standby generation programs. For example, PGE currently has about 135 MW of customer load enrolled in a comparable program. For National Grid serving Rhode Island, Massachusetts, and New York, high system peaks drove National Grid to issue Pay for Performance contracts for from commercial and industrial customers. The Company sought to procure a total of 200 MW of interruptible DR in New York, 21 MW of DR in Massachusetts, and 7 MW of DR in Rhode

[19] Virginia Electric and Power Company's Integrated Resource Plan Case No. PUR-2023-00066. May 1, 2023. Available at https://www.scc.virginia.gov/docketsearch/DOCS/7rwn01!.PDF, p. 100

[20] For example, one limitation of this particular program is the fact that it targets non-coincident rather than coincident peak savings.

Island contracted through third parties. These examples illustrate that DR resources from commercial and industrial customers are being pursued by utilities across the US in much larger quantities than what Dominion is considering.

iii. Concerns with Dominion's approach to DR

Q. What are your concerns regarding Dominion's existing and planned demand response programs?

A. Dominion's IRP does not depict a utility that is eagerly looking for opportunities to reduce investments in generation facilities by examining alternative solutions that could meet the very acute hours of capacity shortfalls or ancillary service needs. Rather, it appears that Dominion is content with minimally subscribed non-coincident peak load shaving DR programs. For example, Dominion's IRP:

- Includes a very limited set of (primarily existing) DR incentive programs;
- All programs target only peak load savings, rather than other parts of the DR taxonomy I highlighted above;
- Very little growth is expected in new or existing DR program during the 15-year horizon, especially after year 2029;
- None of the DR programs target or accommodate newer technologies such as distributed batteries;
- Has no DR programs that offer alternative grid services (e.g., load shifting or ancillary; services).

Q. Are there additional opportunities for Dominion to mitigate expected load growth in the residential sector through demand response?

A. Yes. Since expected load growth in the residential sector is primarily due to electric vehicle adoption, a concerted effort to expand EV-focused DR programs is warranted and presents a significant opportunity for Dominion. These programs can provide price signals and incentives to customers that encourage them to adjust charging patterns to better match grid needs. Managed charging of EVs through DR programs can provide substantial benefits to the grid and can save millions of dollars in costly distribution system upgrades, investments in generation, and transmission infrastructure when compared to forecasts of unmanaged charging. Dominion currently has some EV-focused DR programs under way and has proposed a new pilot. However much more can and should be done to expand upon and scale up these offerings in the future. I elaborated on some of these options in my testimony above (see Section II.A), including:

- Encouraging robust adoption of EV TOU rates.
- Continuously expanding the existing EV DR program to scale with EV adoption and the Company's efforts to deploy charging infrastructure.
- Pursuing additional managed charging via vehicle telematics beyond the currently contemplated pilot phase.
- Pursuing bidirectional charging opportunities (i.e., V2X)

Q. Are there additional opportunities for Dominion to mitigate expected load growth in the commercial and industrial sectors through demand response?

A. Yes. As described above in Section D.ii, the Company currently offers only one commercial and industrial DR program, the Commercial Distributed Generation Program, whose participation is not projected to grow substantially. In fact, there are a variety of other opportunities to manage load through programs that allow either direct or indirect control over customer end-uses. The lack of other DR programs contemplated for these customer segments reflects a missed opportunity for the Company and I believe the Company should include additional DR programs into the commercial and industrial load forecast. This will reduce the overall capacity resources needed to meet commercial and industrial demand. For data centers specifically, I discussed some opportunities in Section II. A., such as shifting computing cycles to other locations for a limited time during peak hours. Additionally, for some data centers, there may be opportunities to create manual interruptible programs where the data center voluntarily reduces non-essential load in exchange for incentive payments. Recently in Texas, Bitcoin mining data centers were incentivized to manage peak loads and enroll in manual interruptible programs that decreased loads by paying the data centers to limit their demand by reducing some operations during peak load hours.[21] The program has benefitted both the grid operators, who realize the reductions in peak load and ramping, and also the Bitcoin data centers who receive incentive payments for their load reductions. Since Dominion projects a proliferation of data centers in its service territory, a similar type of demand response program -- whereby incentives are paid to data centers for curtailing demand during peak hours -- is likely warranted. This could help to delay or even eliminate the need for additional capacity resources, simply by managing the large loads during peak events.

iv. Recommendations for Demand Response

Q. Do you have any general recommendations regarding Dominion's approach to demand response?

A. Yes. I have four general recommendations for the development of DR programs and services that I think Dominion should consider going forward.

- In addition to pursuing specific DR programs as I discussed in this section, Dominion should simultaneously be investing in time-differentiated EE measures that can permanently shift demand patterns over time (i.e., reduce peak load). In fact, this should be considered the

21 Green, Jemma. "Why No One Saw The Success Of Demand Response Coming." *Forbes*, 27 Jan. 2023, https://www.forbes.com/sites/jemmagreen/2023/01/27/why-no-one-saw-the-success-of-demand-response-coming/?sh=6f2ba1583700. Accessed 3 Aug. 2023.

highest priority and is a necessary foundation for the development of long-term, effective DR initiatives.

- Existing peak reduction DR programs should be expanded to incorporate more controllable and interruptible load into the programs. Additionally, new DR programs should be introduced to provide other types of grid services (according to the DR taxonomy discussed above) that can provide an alternative to new supply-side resources.
- Developing new and expanded DR programs specifically for data centers should be a high priority focus in the near term to mitigate some of the significant demand growth Dominion is forecasting from data centers.
- Developing new and expanded DR programs specifically for EVs should also be a priority focus in the near term. This includes the development of permanent EV TOU rates, as well as long-term managed charging programs (e.g., via networked chargers or vehicle telematics) that move beyond the pilot stage.

III. SUMMARY OF FINDINGS AND RECOMMENDATIONS

Q. What are your conclusions regarding Dominion's load forecast and projected demand-side resources?

A. My overarching conclusions are that Dominion's IRP contains at least four factors that I believe are contributing to an exaggerated load forecast, and in turn an exaggerated need for new supply-side generation resource additions. Specifically, these factors are as follows:

1. In our analysis, Dominion's load forecast adjustment for data center load is overly aggressive and does not consider several factors that are likely to moderate data center load growth in Dominion's service territory within the next decade, including a) rising transmission costs, b) land use conflicts in northern Virginia, c) data center customer preferences for clean energy, and d) demand reduction opportunities being pursued by data center customers.

2. In our analysis Dominion's usage per customer projections are at odds with historical trends for the commercial and industrial sectors. Since usage per customer was not modeled for these sectors, like the Company did for residential, the projections are likely incorrect and overestimated.
3. In our analysis the Company's resource modeling underestimates the role of EE Programs by failing to consider program additions in future years beyond the bare minimum VCEA requirements, even if such additions are cost effective. This leads to suboptimal resource portfolios.
4. In our analysis the Company's modeling underestimates the role of DR Programs, thereby leading to suboptimal resource portfolios. This underestimate stems from, no assumed inclusion of new DR programs, no assumed ramp up of the successful existing DR programs (beyond the next few years), and no assumed improvements to underperforming DR programs.

Q. What are your recommendations for the Commission based on your findings?

A. As detailed above, this Commission should not approve the 2023 IRP in its current form. Instead, the Commission should instruct Dominion to provide a revised IRP to be filed in this proceeding with several modifications to its modeling assumptions. These modifications include changes to the load forecast and demand-side resource options as well as the supply-side resource options. My colleague Dr. Maria Roumpani provides testimony regarding recommended changes to the supply-side resource assumptions. Regarding changes to the load forecast and demand-side resource options, my recommendations are as follows:

1. The Commission should require Dominion to update the load forecast in its IRP to include:

   a. A more limited forecast for data center load that accounts for the limitations described in Section II.A, as well as expanded DR programs focused on data centers.
   b. A more limited forecast for EV load that fully accounts for EV TOU adoption and managed charging programs as described in Section II.A
   c. Usage per customer trends for commercial and industrial consistent with recent historical trends as described in Section II.B.

2. The Commission should require Dominion to revise its IRP analysis to include at least one Alternative Plan with an Energy Efficiency adjustment consistent with my alternative projection. This alternative projection should be included in the load forecast assumption used in PLEXOS. I believe this will show a substantially reduced overall capacity and energy need that can help to avoid future fossil generation additions, while assisting Virginia in meeting the requirements of the VCEA.

The Commission should also require Dominion to take certain actions going forward as it prepares for future IRPs, including:

1. In future IRPs, EE and DR resources should be modeled as a selectable resources in PLEXOS going forward. This will ensure that demand-side resources are able to compete on a level playing field with supply-side resources. At a minimum, a range of different EE and DR savings levels should be evaluated.
2. The Commission should also require Dominion to pursue incremental EE/DR resources in every subsequent year following its pending application. As part of the development of these programs, Dominion should be required to assess how the financial incentives from Inflation Reduction Act to increase program participation and lower participant costs.

3. As part of any market potential study conducted in relation to incremental EE/DR resources, not only should IRA incentives be considered, but utility incentive levels up to, or even exceeding, 100% (rather than just 75% or 50%) should also be considered.

4. The Commission should direct Dominion to pursue expanded DR opportunities consistent with my recommendations above in Section II.D.iv.

Q. What are your organization and client's overall recommendations for this Commission?

A. We recommend this Commission adopt the following recommendations based on my and Dr. Maria Roumpani's analysis that reflect the deficiencies in both the supply-side and demand-side of Dominion's current IRP.

Regarding changes to the supply-side resource options, the Company should develop a plan that:

- Meets VCEA requirements regarding the amount of solar, wind, and storage developed over the study period. PLEXOS should be required to meet the targets but should also be allowed to select the optimal timing for resources. It should also allow for selecting renewable resources above the VCEA development targets on a least-cost optimization basis.
- Does not include forced-in fossil fuel resources i.e., exogenous fossil fuel resources that are automatically added to the analysis without explanation or automatically necessitated by the modeling.
- Allows PLEXOS to select additional energy storage options in the short term: hybrid resources and storage of six and eight hours of duration.
- Allows PLEXOS to select from a more realistic set of resource options in the long term. These should at minimum, include long-duration storage or other clean peaking technology and increased limits for solar and wind.
- Allows coal units to endogenously retire (with the latest retirement date of 2045).

- Updates the storage cost assumptions to better align with public and widely used estimates.
- Complies with the Good Neighbor Plan.
- Assumes that Virginia remains in RGGI, and Dominion assumes the social cost of carbon in the resource selection and retirement step.

On the demand-side, the Company should develop a plan that includes the following:

- A more limited forecast for data center load that accounts for the limitations and expanded DR programs focused on data centers.
- A more limited forecast for EV load that fully accounts for EV TOU adoption and managed charging programs.
- Usage per customer trends for commercial and industrial consistent with recent historical trends.
- Include a scenario with an EE adjustment consistent with our alternative projections. This alternative projection should be included in the load forecast assumption used in PLEXOS.

Q. Does this conclude your direct testimony?

A. Yes.

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Exhibit EB-1

Resume of Edward Burgess

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STRATEGEN

Edward Burgess

Partner

Ed leads the integrated resource planning practice at Strategen. Ed has served clients including consumer advocates, public interest organizations, Fortune 500 companies, energy project developers, trade associations, utilities, government agencies, universities, and foundations. He has led or contributed to expert testimony, formal comments, technical analyses, and strategic grid planning efforts for clients in over 25 states. These have focused on a range of topics including resource planning and procurement, utility system operations, transmission planning, energy storage, electric vehicles, utility rates and rate design, demand-side management, and distributed energy resources.

Contact

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Berkeley, CA

Email
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Phone
+1 (941) 266-0017

Education

PSM
Solar Energy Engineering and Commercialization
Arizona State University
2012

MS
Sustainability
Arizona State University
2011

BA
Chemistry
Princeton
2007

STRATEGEN.COM

Work Experience

Partner

Strategen / Berkeley, CA / 2015 - Present

+ Focuses on energy system planning via economic analysis, technical regulatory support, integrated resource planning and procurement, utility rates, and policy & program design.
+ Supports clients such as trade associations, project developers, public interest nonprofits, government agencies, consumer advocates, utilities commissions and more.

Senior Policy Director

Vehicle-Grid Integration Council / Berkeley, CA / 2019 - Present

+ Leads advocacy and regulatory policy for a group representing major auto OEMs and EVSEs
+ Advances state level policies and programs to ensure the value from EV deployments and flexible EV charging and discharging is recognized and compensated
+ Leads all policy development, education, outreach, and research efforts

Consultant

Kris Mayes Law Firm / Phoenix, AZ / 2012 - 2015

+ Consulted on policy and regulatory issues related to the electricity sector in the Western U.S.

Consultant

Schlegel & Associates / Phoenix, AZ / 2012 - 2015

+ Conducted analysis and helping draft legal testimony in support of energy efficiency for a utility rate case.

Edward Burgess

Partner

STRATEGEN

[redacted] Publications

- [redacted] Long Island Fossil Peaker Replacement Study.
- [redacted] Renewable Energy Standard and Tariff: 2020 Progress Report.
- [redacted] Mines and Minerals, 2020. "Commonwealth of Virginia Energy Storage [redacted]
- [redacted] Coal Plant Valuation Study.
- [redacted] the RPS: Implementing a Clean Peak Standard."
- [redacted] California Energy Commission.,2018. Analysis Report of Wholesale Energy [redacted] Distributed Energy Resources (DERs) in California.

Domain Expertise

Vehicle Grid Integration

Distributed Energy Resources

Electric Vehicle Rates, Programs and Policies

Energy Resource Planning

Benefit Cost Analysis

Electricity Expert Testimony

Stakeholder Engagement

Energy Policy & Regulatory Strategy

Energy Product Development & Market Strategy

STRATEGEN.COM

Relevant Project Experience

Arizona Residential Utility Consumer Office (RUCO)

IRP Analysis and Impact Assessment / 2015 - 2018

+ Supported drafting of expert witness testimony on multiple rate cases regarding utility rate design, distributed solar PV, and energy efficiency.
+ Performed analytical assessments to advance consumer-oriented policy including rate design, resource procurement/planning, and distributed generation consumer protection.
+ Ed was the lead author on the white paper published by RUCO introducing the concept of a Clean Peak Standard.

Western Resource Advocates

Nevada Energy IRP Analysis / 2018 - 2019

+ Conducted a thorough technical analysis and report on the NV Energy IRP (Docket No. 18-06003)
+ Investigated resource mixes that included higher levels of demand side management, renewable energy, battery storage, and decreased reliance on existing and/or planned fossil fuel plants.

Massachusetts Office of the Attorney General

SMART Program / 2016 - 2017

+ Appeared as an expert witness and supported drafting of testimony on the implementation of the MA SMART program (D.P.U. 17-140), which is expected to deploy 1600 MW of solar PV (and PV + storage) resources over the next several years. Ed served as an expert consultant on multiple rate cases regarding utility rate design and implications for ratepayers and distributed energy resource deployment.

New Hampshire Office of Consumer Advocate

NEM Successor Tariff Design / 2016

+ Worked with the state's consumer advocate to develop expert testimony on a case reforming the state's market for distributed energy resources, developing a new methodology for designing retail electricity rates that is intended to support greater deployment of energy storage.

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STRATEGEN

Edward Burgess

Partner

Project Experience (con't)

Southwest Energy Efficiency Project

IRP Technical Analysis and Modeling / 2018 - 2020

+ Provided critical analysis and alternatives to the 2020 integrated resource plans (IRPs) of the state's major utilities, Arizona Public Service (APS) and Tucson Electric Power (TEP).
+ Provided analysis on Salt River Project's resource plan as part of its 2035 planning process.
+ Evaluated different levels of renewable energy and energy efficiency and identify any changes to the resources needed to meet these requirements and ensure reliability.
+ Worked with Strategen technical team on utilizing a sophisticated capacity expansion model to optimize the clean energy portfolio used in the analysis of the IRPs.

California Energy Storage Alliance

California Hybridization Assessment / 2018 - 2019

+ Managed a special initiative of this leading industry trade group to conduct technical analysis and stakeholder outreach on the value of hybridizing existing gas peaker plants with energy storage

Portland General Electric

Energy Storage Strategy / 2016

+ Provided education and strategic guidance to a major investor-owned utility on the potential role of energy storage in their planning process in response to state legislation (HB 2193).
+ Participated in public workshop before the Oregon Public Utilities Commission on behalf of PGE.
+ Supported development of a competitive solicitation process for storage technology solution providers.

Xcel Energy

Time-of-use Rates / 2017 - 2018

+ Conducted analysis supporting the design of a new residential time-of-use rate for Northern States Power (Xcel Energy) in Minnesota.

Sierra Club

PacifiCorp 2021 IRP Technical Support / 2020 - 2021

+ Provided technical support for Sierra Club in analyzing issues of interest duringPacificorp's IRP stakeholder input process.
+ Prepared analysis, technical comments, discovery requests in advance of drafting formal comments to be submitted before the Oregon Public Utility Commission.

North Carolina, Office of the Attorney General

Duke Energy 2020 IRP Technical Support / 2020 - 2021

+ Provided technical support and analysis to the state's consumer advocate on utility integrated resource plans and their implications for customers and public policy goals.
+ Presented original analysis at multiple IRP-related technical workshops hosted by the NCUC

University of Minnesota

Energy Storage Stakeholder Workshops / 2016 - 2017

+ Facilitated multiple stakeholder workshops to understand and advance the appropriate role of energy storage as part of Minnesota's energy resource portfolio.
+ Conducted study on the use of storage as an alternative to natural gas peaker.
+ Presented workshop and study findings before the Minnesota Public Utilities Commission.

Edward Burgess

Partner

STRATEGEN

Expert Testimony

California Public Utilities Commission
- Pacific Power 2020 Energy Cost Adjustment Clause (Docket No. A.19-08-002)
- Pacific Power 2021 Energy Cost Adjustment Clause (Docket No. A.20-08-002)
- Pacific Power 2022 Energy Cost Adjustment Clause (Docket No. A.21-08-004)
- Pacific Gas and Electric's Day-Ahead Real Time Rate and Pilot (Docket No. A.20-10-011)
- Pacific Gas and Electric's Electric Vehicle Charge 2 Application (Docket No. A.21-10-010)
- CPUC Rulemaking on Emergency Summer Reliability (Docket No. R.20-11-003)

Colorado Public Utilities Commission
- Tri-State Generation and Transmission Application for a CPCN (Docket No. 22A-0085E)

Indiana Utility Regulatory Commission
- Duke Energy Fuel Adjustment Clause (Cause No. 38707 FAC 125)
- Duke Energy Fuel Adjustment Clause – Sub-docket Investigation (Cause No. 38707 FAC 123 S1)

Louisiana Public Service Commission
- Entergy Certification to Deploy Natural Gas Distributed Generation (Docket No. U-36105)

Massachusetts Department of Public Utilities
- National Grid General Rate Case (D.P.U. 18-150)
- Eversource, National Grid, and Until SMART Tariff (D.P.U. 17-140)

Michigan Public Service Commission
- Consumers Energy 2021 Integrated Resource Plan (Docket No. U-21090)

Nevada Public Utilities Commission
- NV Energy's Integrated Resource Plan (Docket No. 20-07023)

North Carolina Utilities Commission
- Duke Energy Carbon Plan (Docket No. E-100, Sub 179)

Oregon Public Utilities Commission
- Pacific Power 2021 Transition Adjustment Mechanism (Docket No. UE-375)
- Pacific Power 2022 Transition Adjustment Mechanism (Docket No. UE-390)
- Northwest Natural 2022 General Rate Case (Docket No. UG-435)

Edward Burgess

Partner

STRATEGEN

Expert Testimony (con't)

South Carolina Public Service Commission

- Dominion Energy South Carolina 2019 Avoided Cost Methodologies (Docket No. 2019-184-E)
- Duke Energy Carolinas 2019 Avoided Cost Methodologies (Docket No. 2019-185-E)
- Dominion Energy Progress 2019 Avoided Cost Methodologies (Docket No. 2019-186-E)
- Dominion Energy South Carolina 2021 Avoided Cost Methodologies (Docket No. 2021-88-E)

Washington Utilities and Transportation Commission

- Avista Utilities 2020 General Rate Case (Docket No. UE-200900)
- Avista Utilities 2022 General Rate Case (Docket No. UE-220053/UG-220054)
- Puget Sound Energy 2022 General Rate Case (Docket No. UE-220066/UG-220067)