UNIVERSITY of VIRGINIA
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March 20, 2020

VIA ELECTRONIC FILING ONLY

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

RE: Petition of Virginia Electric and Power Company for approval of its 2019 DSM Update pursuant to § 56-585.1 A 5 of the Code of Virginia

Case No. PUR-2019-00201

Dear Mr. Peck:

Enclosed for filing in the above-captioned proceeding is the **Direct Testimony and Attachments of Mark James** on behalf of Respondent, the Virginia Energy Efficiency Council. This testimony is being filed in a public version only, and is being filed electronically on the Commission's Electronic Document Filing system. If you have any questions regarding this filing, please contact me at (434) 924-4776, or via email at cjaffe@law.virginia.edu.

Regards,

Cale Jaffe
Associate Professor of Law, General Faculty
Director, Environmental and Regulatory Law Clinic
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cc: Parties on Service List
Commission Staff

CERTIFICATE OF SERVICE

I hereby certify that the following have been served with a true and accurate copy of the **Direct Testimony of Mark James**, including thirty-one (31) pages of questions and answers and four (4) attachments, by electronic mail only:

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DATED: March 20, 2020

Cale Jaffe, Environmental and Regulatory Law Clinic
University of Virginia School of Law

COMMONWEALTH OF VIRGINIA
BEFORE THE STATE CORPORATION COMMISSION

RE:

Application of Virginia Electric and Power Company for approval of its 2019 DSM Update pursuant to § 56-585.1 A 5 of the Code of Virginia

Case No. PUR-2019-00201

Direct Testimony of
Mark James

on Behalf of the Virginia Energy Efficiency Council

March 20, 2020

Witness Direct Testimony Summary

Witness: Mark James

Title: Senior Research Fellow in the Institute for Energy and the Environment; Adjunct Professor at Vermont Law School

Summary:

The Virginia Energy Efficiency Council ("VAEEC") presents the testimony of expert witness Mark James, who provides an analysis of Dominion Energy's proposed demand-side management programs. Mark James is an Adjunct Professor and a Senior Research Fellow in the Institute for Energy and the Environment at Vermont Law School ("VLS").

In the overview of his testimony, Mr. James analyzes how Dominion's proposed DSM programs align with Virginia's energy efficiency goals and statutory mandates.

In the discussion portion of his testimony, Mr. James first reviews the Phase VIII portfolio proposed by Dominion Energy, as well as the Phase VII programs submitted for expedited review and approval, and recommends approval of Dominion's proposed DSM portfolio in its entirety.

Mr. James then offers more detailed comments explaining the value of Dominion's continued inclusion of A-line LED bulbs in DSM programs, and of the Residential Home Retrofit, Residential Energy Efficiency Kits, Residential and Non-Residential New Construction, Non-Residential Midstream Energy Efficiency Products, and House Bill 2789 Programs. Mr. James further explains why such programs should be approved as part of the Company's current application. Mr. James also evaluates how grid modernization and AMI implementation will contribute to efficiency gains.

Finally, Mr. James concludes his testimony by recommending new DSM programs that would supplement the efficiency gains from the Company's existing and proposed programs and would help both Dominion and Virginia meet energy efficiency mandates going forward.

I. INTRODUCTION AND QUALIFICATIONS

Q1. Please state your name, title, and employer.

A. My name is Mark James. I am Senior Research Fellow in the Institute for Energy and the Environment and adjunct professor at Vermont Law School ("VLS") located at 164 Chelsea St., South Royalton, Vermont 05068.

Q2. What is the Institute for Energy and the Environment?

A. The Institute for Energy and the Environment is home to the energy law and policy programs at VLS. The Institute hosts a nationally recognized energy law and policy program, with the largest selection of academic courses on clean energy in the country and a full-time energy law clinic. The Institute is also a center for cutting-edge research on the transition to a clean energy economy. The Institute has participated in research projects using data analytics to improve low-income energy efficiency programs, enabling the integration of home energy efficiency ratings into multiple listing services, and identifying the impact of energy poverty on low-income households.

Q3. Please summarize your professional and educational experience.

A. As I mentioned above, I am a Senior Research Fellow in the Institute for Energy and the Environment, and I hold an L.L.M. degree in Energy Law from VLS. I earned a B.Sc. in Ecology, with honors, from the University of Toronto and a J.D., with an environmental specialization, from the University of Ottawa.

In March 2019, I was one of several authors on a comprehensive report published by the North Carolina Clean Energy Technology Center and the Upper Coastal Plain Council of Governments, *Powering Energy Efficiency and Impacts: A Data-Driven Project Supporting Low-Income Households in Northeastern North Carolina.* In December 2019, I delivered a presentation to the National Association of State Energy Officials and National Association of Regulatory Utility Commissioners on energy assurance and resilience. I have written academic articles on renewable energy, net metering, and grid security, and completed work focused on low-income energy assistance programs. I have also completed numerous grant-funded projects, including leading a research team on a multi-year SunShot Plug-and-Play project to commercialize adhered solar PV panel technology, and I have developed and taught a course on energy efficiency at VLS.

Most of my current work explores cybersecurity for electric distribution utilities and stakeholder governance practices in wholesale electricity markets. I am the lead author on a major, two-phase report published by the Institute for Energy and the Environment and commissioned by Protect Our Power, *Improving the Cybersecurity of the Electric Distribution Grid* (Phase I published April 2019; Phase II published November 2019).

A copy of my C.V. is included as **Attachment MJ-1.**

Q4. On whose behalf are you testifying in this investigation?

A. I am testifying on behalf of the Virginia Energy Efficiency Council ("VAEEC"). Founded in 2012, VAEEC is a 501(c)(3) organization, headquartered in Richmond, Virginia, whose goal is to facilitate discussions and share resources to advance energy efficiency throughout the Commonwealth. The organization's diverse group of over 100 members includes Fortune 500 companies, nonprofits, local governments, state agencies, and more, working towards the shared vision of energy efficiency as an integral part of Virginia's economy and clean energy future.

Q5. Have you previously testified before the Virginia State Corporation Commission ("Commission")?

A. No.

Q6. Aside from your C.V., do you have any other attachments that you are sponsoring with your testimony?

A. Yes, I have included an analysis of the Company's existing and proposed energy efficiency programs against the energy efficiency targets established in the Virginia Clean Economy Act, which was prepared by the staff of VAEEC. This analysis and the accompanying graph is included as **Attachment MJ-2.**

I have also included the Company's responses to certain interrogatory responses as follows:

-- The Company's Response to Staff Interrogatory Set 4, Question 46, included as **Attachment MJ-3**; and

-- The Company's Response to VAEEC Interrogatory Set 2, Question 3, included as **Attachment MJ-4**.

II. OVERVIEW AND SUMMARY OF VIRGINIA'S ENERGY EFFICIENCY GOALS AND STATUTORY MANDATES

Q7. What is the purpose of your testimony?

The purpose of my testimony is to provide information for the Commission's consideration as it seeks to understand the costs and benefits of the proposed programs in the Virginia Electric and Power Company's ("the Company" or "Dominion") Application for approval of its 2019 DSM Update. I provide an analysis of the Company's proposed DSM portfolio and implementation approach, with a focus on best practices in the industry, and I make recommendations for the enhancement, targeting, and coordination of these programs for greater overall efficiency savings. My assessment evaluates the Company's proposed portfolio considering the current policy environment in Virginia, while also incorporating potential effects of future policy changes.

Q8. Why did VAEEC elect to intervene?

A. VAEEC's members include energy efficiency businesses, universities, nonprofits, local governments, and electric utilities who recognize the value that cost-effective energy efficiency programs can provide to all utility customers, including participants and non-participants alike. Their goal is to ensure that energy efficiency is properly recognized as an integral part of Virginia's economy and clean energy future.

Q9. Please describe the elements of the Company's application that you wish to address.

A. In preparing my testimony, I assessed the Company's application for how it advances demand-side program offerings to a wide array of Dominion's jurisdictional customers. I examined how the Company maximized the potential system-wide and customer benefits available in demand response and energy efficiency programs and how programs were designed for a variety of ratepayer classes. Specifically, I reviewed the direct testimonies of Nathan J. Frost, Michael T. Hubbard, Deanna R. Kesler, Jarvis E. Bates, and Elizabeth Lecky.

Q10. Based on your analysis of the Company's application, what is your recommendation?

A. I recommend approval of all the new Phase VIII energy efficiency programs and the expedited approval of the resubmitted Phase VII programs and continued approval of the existing energy efficiency programs. My review of the Company's filings indicates that

the proposed Phase VIII programs and the resubmitted Phase VII programs will produce net benefits for Dominion's customers in the form of energy savings and system-wide benefits. The Phase VIII programs are particularly beneficial as they expand the number of opportunities for energy savings for different end users and customer classes.

Q11. What are your overarching recommendations for best practices?

A. It is important to have a comprehensive portfolio. A comprehensive portfolio contains programs and measures that are targeted at key decision points and key decision makers, which increases the cost-effectiveness of programs and increases participation. A comprehensive portfolio of programs is a mix of downstream and midstream programs that can maximize the return on investment. A comprehensive portfolio also produces short-term and long-term savings, giving customers immediate bill relief and providing a high rate of return over the lifespan of each measure. Lastly, a comprehensive portfolio contains a blend of direct install programs and whole building energy efficiency programs, which maximizes the capture of available efficiency gains.

Q12. Do the Phase VIII programs follow these best practices?

A. To a large extent, yes. The Company's proposed portfolio demonstrates its responsiveness to prior recommendations about how to increase the diversity of the Company's DSM programs. Indeed, many of the suggestions for new programs presented by VAEEC in prior testimony in the 2018 DSM filing and in subsequent stakeholder meetings are captured in the proposed Phase VIII programs.

The Phase VIII portfolio contains programs targeting a variety of key decision makers: small business owners, builders of new residential construction, builders of new non-residential construction, home retrofit companies, owners of manufactured housing, owners of multifamily housing, and low-income customers. The diversity of offerings extends the reach of energy efficiency programs to multiple ratepayer classes. A "stacked" structure for program participation allows programs with wide distributions and low per-household costs to be used to encourage customers to participate in programs with greater energy savings potential. The Company's portfolio also includes a blend of downstream (customer-focused) and midstream (distributor- and contractor-focused) programs that maximize program impact by targeting key stages in the energy purchasing decision process. The portfolio additionally has programs targeted at new and existing

building stock, thus ensuring that energy efficiency considerations are integrated into new construction. Finally, the whole building performance analysis allows savings to be identified and captured from the interaction of building systems. Such savings would not be available from individual direct install measures.

Q13. Do you have any recommendations for improving the Phase VIII programs?

A. Yes. While the programs are cost-effective and should be approved as proposed, there are nevertheless opportunities for improvement. In the discussion portion of my testimony, I include strategies to improve the overall portfolio of programs, and I provide recommendations for improvement regarding specific programs within the proposed portfolio. I also highlight opportunities to maximize the effectiveness of the programs through grid modernization and AMI integration.

Specifically, I recommend the approval of the continued inclusion of A-line LED bulbs in existing and proposed programs, the approval of the combination of the Home Energy Welcome Kits and Home Energy Retrofit Program, the approval of the non-residential midstream products programs, and an expanded focus on whole building energy efficiency. I also discuss opportunities to streamline the administrative burdens of the Company's proposed low-income programs and make recommendations for ensuring that low-income customers can participate in the market-based Multifamily Housing and the Manufactured Housing Programs.

For the grid modernization and AMI integration, I recommend that the Company leverage AMI to assist in the development, deployment, and targeting of demand response and energy efficiency programs. AMI can also assist in the evaluation of program effectiveness, which can increase confidence in the use of demand response and energy efficiency as a long-term planning resource.

Q14. Have you analyzed the proposal in light of the requirements of existing Virginia law at the time the Company's Application was filed in December 2019?

A. Yes. Approval of the Phase VIII programs would increase the Company's overall spending on energy efficiency programs in compliance with the Grid Transformation and Security Act ("GTSA") of 2018. Under the GTSA, the Company has a commitment to propose no less than $870 million of projected costs to design, implement, and operate energy efficiency programs between July 1, 2018 and July 1, 2028.

Company Witness Lecky detailed in her testimony that the current revenue requirement for energy efficiency program spending is approximately $59.7 million. This represents a significant increase in annual spending. The Company's actual DSM program spending was $25.96 million in 2017[1] and $48.8 million in 2018.[2] Sustained and growing investment in DSM programs is necessary to meet the minimum levels of spending on proposed programs established by the GTSA and to create the foundation for meeting the minimum energy savings targets established by the Virginia Clean Economy Act, which will go into effect on July 1, 2020.

Q15. How does the Company's proposed DSM portfolio position it for compliance with the Virginia Clean Economy Act, enacted by the General Assembly in 2020?

A. The Virginia Clean Economy Act will establish total annual energy efficiency targets for the Company through 2025, with the Commission setting the goals in three-year increments thereafter. Under the Act, the Company will be required to achieve savings, in calendar year 2022, of at least 1.25% of its 2019 average annual energy jurisdictional retail sales. The amount of total annual energy savings that the Company must procure will increase every year through calendar year 2025, when the Company must save 5.0% of its 2019 average annual energy jurisdictional retail sales.

VAEEC's internal, staff analysis of Dominion's projected energy savings for the period of 2022 to 2025 is provided in **Attachment MJ-2**, with the supporting data detailed in **Attachment MJ-3**. The projections indicate that the Company is currently on track to meet its 2022 targets, and that meeting the 2023, 2024, and 2025 targets will require additional, achievable investments in energy saving programs. The current portfolio of existing and proposed programs will produce 74% of the 2023 energy savings target, 55% of the 2024 energy savings target, and 43% of the 2025 energy savings target.[3]

[1] Direct Testimony of Rachel Gold at Exhibit RG-4, Petition of Virginia Electric and Power Company (2019) (No. PUR-2018-00168).

[2] Direct Testimony of Elizabeth Lecky at 11, Application of Virginia Electric and Power Company (2019) (No. PUR-2019-00201).

[3] The estimated savings targets were calculated using the Company's DSM filings for its Phase VI, Phase VII, and Phase VIII programs. *See* **Attachment MJ-2.**

Q16. Can you summarize the Commonwealth's voluntary 10% energy savings goal?

A. Yes. The 2007 "Re-Regulation" legislation provided, "The Commonwealth shall have a stated goal of reducing the consumption of electric energy by retail customers through the implementation of such [demand side management, conservation, energy efficiency, and load management] programs by the year 2022 by an amount equal to ten percent of the amount of electric energy consumed by retail customers in 2006."[4]

Q17. Looking at approved Dominion programs to date, can you summarize the Commonwealth's progress toward meeting the 2007 goal?

A. Within Dominion's jurisdictional service territory, the Commonwealth is not on track to hit the 10% target over the next two years (by 2022), which may explain why the General Assembly determined that the new legislative approach contained in the Virginia Clean Economy Act was necessary.

Attachment MJ-4 to my testimony contains the Company's Response to VAEEC Interrogatory Set 2, Question 3, which followed up on the 10% energy savings goal. The Company notes as follows: "In calendar year 2006, the total amount of electric energy consumed by the Company's Virginia retail customers was estimated at 71,976,942,000 kWh." The Company's response further provides, "Since the inception of the DSM Phase I Programs in 2010, Dominion Energy has achieved 2,717,397,693 kWh of net cumulative, non-annualized energy savings in Virginia." Using those two numbers, I calculate that the Company has to date achieved savings equal to 3.8% of the electric energy consumed by its retail customers in 2006.

[4] *See* 2007 Va. Acts, Chapters 888 and 933, Enactment Clause 3.

III. DISCUSSION

1. Proposed Energy Efficiency Portfolio

Q18. It would be helpful to begin with your review of the Company's overall application. What is your position with respect to the Company's application for approval of new Phase VIII programs?

A. I recommend approval of the eleven new DSM programs as part of Phase VIII. The diversity of offerings provides multiple opportunities for customers to participate, and the portfolio includes comprehensive programs that will produce greater savings.

Q19. What is your position with respect to the Company's request to extend the AC Cycling Program and seek approval of the resubmitted Phase VII programs?

A. I support extension of the Company's existing Air Conditioner ("AC") Cycling Program, and I support expedited review and approval of three Phase VII Programs with updated parameters and cost-benefit results, as well as authorization for the continued use of A-line LED bulbs as a part of the Company's Phase VII Residential Efficient Marketplace and Residential Home Energy Assessment Programs. VAEEC's review has found that these programs will provide significant value to participants, ratepayers, and system operations.

Q20. What is your position with respect to the Company's request for a five-year implementation period?

A. Company witness Michael T. Hubbard notes on page 13 of his Direct Testimony that the Company requests a five-year implementation period to allow for a program to properly launch and gain acceptance without the potential risk of market disruption. VAEEC supports the Company's request, which has been discussed in stakeholder meetings. In general, longer implementation periods reduce administrative costs, thereby maximizing program effectiveness.

Q21. Do you have an opinion on synchronization of the launch of the Company's program offerings?

A. Yes. This change is supported by VAEEC and, again, emerged from the stakeholder process. Synchronization of programs means aligning the launch and conclusion of program offerings. Consistent starting and conclusion times will allow program operators to coordinate marketing and outreach, which will reduce customer acquisition costs. Synchronization also allows the Company to plan the transition between current and

future programs. Additionally, by starting all of the new programs at the beginning of the year, the first "year" of the program will be a full calendar year, which allows for easier planning for both contractors and the Company in terms of budgeting and project planning.

Q22. Do you have an opinion on bundling in the proposed Phase VIII programs?

A. Yes. I support this approach. First, bundling increases program participation while improving cost-effectiveness. Most of the Phase VIII programs bundle together multiple direct install measure options, from lighting to heating and cooling. Program bundling can increase cost-effectiveness for all programs included in the bundle because it reduces transaction costs, increases customer participation, provides customers with opportunities to leverage deeper savings, and simplifies program deployment.[5]

Second, bundling provides a variety of other benefits. Bundling can reduce transaction costs by allowing program operators to deploy multiple measures in a single customer engagement. Efficiencies can be brought to scale by standardizing delivery mechanisms. By bundling individual measures, program operators increase the likelihood that all or a portion of the program will be of interest to a customer, which simplifies customers' decision-making about whether to participate in any individual program.

Q23. Do you have an opinion on the more specific proposal of bundling energy efficiency with demand response programs?

A. Yes. I support the bundling of energy efficiency and demand response measures in the electric vehicle charger program. This would maximize potential savings while reducing administrative costs. Bundling both energy efficiency and demand response measures would allow for sharing of the costs for rolling out the programs and would encourage customers to participate in both programs as they learn about them together. The American Council for an Energy-Efficient Economy ("ACEEE") 2020 Utility Energy Efficiency Scorecard identified combination energy efficiency-demand response

[5] Matthew Socks, Phil Mosenthal, Donna DeCostanzo, & Ashok Gupta, *The Energy Efficiency Extra Value Menu: Streamlining Energy Efficiency Delivery* 7-2 (ACEEE 2016), https://www.aceee.org/files/proceedings/2016/data/papers/7_801.pdf.

programs for electric vehicles as an emerging area for utility programs and an opportunity to create customer and system benefits.[6]

Q24. The Company has also proposed "stacking" certain program measures. Can you explain the difference between "stacking" and "bundling"?

A. Yes. A simple way to think of it is that "bundling" brings multiple energy efficiency measures together *concurrently* to increase cost-effectiveness, while "stacking" brings those measures together *consecutively* to increase cost-effectiveness.

The idea behind stacking is first to use widely promoted, easily accessible, low-cost efficiency programs to introduce energy efficiency to customers. Customers who participate in the introductory measure such as the Welcome Kit are then more likely to participate in the other measures that are "stacked" on top of the initial offering, producing deeper energy savings.

Bundling is important as well, as it includes multiple energy efficiency measures within a single energy efficiency program. Customers can install multiple measures in a single visit from the program operators, which increases the value that a customer can procure from a single visit and reduces the per-customer administrative costs.

Q25. Is the Company's proposal for how it would stack programs together a cost-effective means of "stacking"?

A. Yes. Stacking programs uses the participation of a customer as an opportunity to create interest and confidence in other, broader energy efficiency program offerings, as the combination of the Welcome Kits and Home Energy Retrofits demonstrates. The savings and contacts created by introductory-style programs like the Welcome Kits are leveraged to improve uptake of more comprehensive programs like the Home Energy Retrofit Programs. Designing pathways between programs increases confidence in energy efficiency and encourages higher participation levels.

[6] ACEEE *2020 Utility Energy Efficiency Scorecard* 61 (Grace Relf et al. eds., 2020).

Q26. Is the Company's plan achievable as filed?

A. Yes. In fact, evidence from other states confirms that the levels of savings anticipated in the Company's application are eminently achievable. The American Council for an Energy Efficient Economy ("ACEEE") has produced its 2020 utility efficiency scorecard, which includes scores for net savings as a percentage of retail sales for the year 2018.[7] The scorecard reports that twenty-four utilities achieved incremental savings of greater than 1% in just one year. National Grid Massachusetts and Eversource Massachusetts actually achieved incremental savings of more than 3%, consistent with their performance in 2015, as reported by the ACEEE's previous 2017 scorecard.[8] Given these successes in other jurisdictions, I feel confident that the Company's estimates for savings can be met.

2. Specific Program Comments

Q27. To better understand your recommendation to approve the Company's application as proposed, it would be helpful to see how you analyzed individual programs in that application. Can you provide an example of how you have done this?

A. Yes. A good example is the Company's proposal on energy efficient lighting. On pages 13-14 of his Direct Testimony, Mr. Hubbard discusses the Company's decision to offer an A-line LED light bulb measure beyond 2019. I support Dominion's proposal to keep A-line LED bulbs within the Phase VII Residential Efficient Marketplace and Residential Home Energy Assessment Programs for economic and legal reasons.

The A-line LED bulbs provide significant savings potential over other less efficient options—incandescent, halogen, and compact fluorescent bulbs—and the savings differential will continue to widen. The cost of A-line LED bulbs has dropped and continues to decrease as their market share increases, which further enlarges the potential savings available to participating customers and augments system benefits created by reductions in energy and demand.

[7] *Id.* at 26.
[8] ACEEE, *2017 Utility Energy Efficiency Scorecard* 17 (Grace Relf et al. eds., 2017).

From a legal perspective, it is especially noteworthy that the U.S. Department of Energy issued a final rule that withdrew energy efficiency standards for light bulbs, which were set to take effect in January 2020.[9] Without those federal mandates, the need for a utility-sponsored program is even greater.[10]

Market penetration levels for A-line LED bulbs have not reached the point of market transformation. As stated in the Company's testimony, socket saturation for efficient lighting technology is approximately 45%, which is below the 80-90% goal for true market transformation.[11] The Company's proposal to continue offering A-line LED bulbs will allow it to capture the remaining potential in the transition to higher efficiency lighting technology.

Lastly, A-line LED lighting technology has on average longer lifespans and requires fewer replacements than other available A-line lighting technologies. This increases the energy savings and system benefits produced by the installation of each individual measure.

Q28. How should the Company manage the legal uncertainty of proposed regulations on light bulb energy efficiency standards?

A. The federal government has amended regulations allowing for the continued sale of less efficient A-line bulbs. However, multiple states have challenged the legality of the regulatory rollback, and the case is still proceeding.[12] Thus, it is prudent to continue to offer A-line LED bulbs in existing programs until there is a final determination on the status of the proposed regulatory changes.

[9] *See* U.S. Dep't of Energy, *Energy Conservation Program: Definition for General Service Lamps; Final rules; withdrawal*, Docket No. EERE-2018-BT-STD-0010-0450 (Sept. 5, 2019), https://www.regulations.gov/document?D=EERE-2018-BT-STD-0010-0450 (noting that "final rules published on January 19, 2017 (82 FR 7276 and 82 FR 7322) are withdrawn effective October 7, 2019").

[10] *See* ACEEE, *DOE's Light Bulb Standards Rollback Will Cost Americans $14 Billion Each Year* (Sept. 4, 2019), https://www.aceee.org/press/2019/09/doe-s-light-bulb-standards-rollback.

[11] Direct Testimony of Michael Hubbard at 14, Application of Virginia Electric and Power Company (2019) (No. PUR-2019-00201).

[12] Press Release, Nat. Res. Def. Council, Lighting Industry Sues to Block California's Jan. 1 Expanded Light Bulb Efficiency Standards (Dec. 19, 2019), https://www.nrdc.org/media/2019/191219.

Q29. On pages 17-18 of his Direct Testimony, Mr. Hubbard presents the Residential Energy Efficiency Kits Program and the Residential Home Retrofit Program. Do you have an opinion on the value of offering both of these programs?

A. Yes. Customer-focused energy efficiency programs should include a diversity of offerings that match customer interest and ability to participate. Offering multiple programs with different levels of participation is one way to ensure that customers can participate at a level that benefits them. Multiple points of customer contact can build trust in program offerings, and the "stacked" participation requirements of the two programs can contribute to this contact and trust-building.

The Residential Energy Efficiency Kits Program targets newly connected homes with welcome kits that combine a technology measure with information distribution. The low cost per home gives the service provider an opportunity to engage with the customer to inform them of other DSM programs and to gauge the value of the benefits that might be available to the customer. The Residential Home Retrofit Program is a more focused program, targeting customers willing to conduct a whole house diagnostic and energy assessment. The Program targets high-use customers and would have a higher cost per customer contact. More comprehensive retrofit programs benefit when customer acquisition costs are reduced. Introductory programs like the Welcome Kit can reduce acquisition costs by familiarizing customers with available programs in their area.

Q30. Mr. Hubbard also presents the Residential and the Non-Residential New Construction Programs. Do you have an opinion on the proposed programs and their focus on whole building systems?

A. Yes. I support the addition of the Residential and Non-Residential New Construction programs to the Company's energy efficiency portfolio. The programs focus on whole building systems and on enhancing energy efficiency by assessing how different building components act together.

Historically, energy efficiency programs have focused on individual building components and improving the efficiency of distinct components. Federal, state, and utility programs focused on individual building component standards and operating efficiency have produced significant gains in efficiency. However, some mechanical equipment and other building components are nearing economic and technological limitations on producing

additional efficiency gains.[13] As the Alliance to Save Energy wrote in a 2017 report, "combining highly efficient individual components will not always yield an efficient building."[14] The building envelope and the interaction of building components have significant impact on the overall efficiency of a building.

Additionally, the whole buildings focus generally produces longer lifespan energy savings than a purely measures-focused program. A building shell will have a lifespan in excess of fifty years, while installed measures in a home such as lighting or appliances may only have a lifespan of ten to fifteen years.

Q31. How does a whole building systems approach work?

A. The whole building systems approach looks at the interaction of components within and between various building systems. For example, the whole building systems approach looks at how a building design interacts with lighting needs or heating and cooling systems. The approach moves beyond individual component efficiency to consider how the systems interact with each other and where efficiencies can be gained by managing those interactions.

Q32. How is the whole building systems approach being applied in the Residential New Construction Program?

A. The Residential New Construction Program uses building energy simulation models to test bundles of measures—including lighting, cooling, heating, electric load management, and advanced controls—that would optimize building performance. The efficiency gains available from focusing on the combination of different measures will outstrip the gains available from focusing on the efficiency of individual measures, thus producing greater energy and system benefits at a lower cost to the customer and to the program.

[13] All. to Save Energy, *Going Beyond Zero: A Systems Efficiency Blueprint for Building Energy Optimization and Resilience* 5 (2017), https://www.ase.org/sites/ase.org/files/ase-sei_going_beyond_zero-digital-vf050317.pdf.

[14] All. to Save Energy, *Greater than the Sum of its Parts: The Case for a Systems Approach to Energy Efficiency* 13 (2017), https://www.ase.org/sites/ase.org/files/sum_of_its_parts_-_full_report_final_v3_-_111416.pdf.

Q33. What are the ENERGY STAR and the Home System Raters programs, and how are they used by the Residential New Construction Program?

A. The ENERGY STAR program is a national standard for energy efficient home construction of single-family dwellings, duplexes, townhouses, and low-rise multifamily buildings. ENERGY STAR certified homes "are at least 10% more efficient than a home built to code and achieve a 20% improvement on average."[15] Efficiency gains are achieved by designing a building to improve the interactions between the building thermal envelope, heating and cooling systems, water management, and lighting systems and appliances.[16] The program requirements are not static, thus they evolve in response to changes in building codes and building practices to ensure that every ENERGY STAR certified home remains more efficient than a non-certified home constructed at the same time.

ENERGY STAR certifications are provided via third-party certification which maintains the integrity of the system. The Residential New Home Construction program would use the Home Energy Raters System (HERS) network to verify ENERGY STAR certification. HERS is a measure tailored to specific regional conditions. Houses receiving a rating are compared against a model house built under existing codes and standards in that area.

Q34. Do you have an opinion on the Company's decision to use ENERGY STAR and HERS?

A. There are several home energy efficiency rating options, and VAEEC is agnostic to the Company's selection. Other rating options that might have been considered are the USGBC- LEED certification and the Viridiant-Earthcraft certification. However, since the Company has selected ENERGY STAR and HERS, I will assess those rating options.

The Residential New Construction program leverages ENERGY STAR and HERS. ENERGY STAR and HERS have established brand names in the construction and real estate industry which will create opportunities for the program operator to utilize existing marketing networks. Since its inception, the ENERGY STAR program has elevated home

[15] *About the ENERGY STAR New Residential Construction Program*, ENERGY STAR https://www.energystar.gov/partner_resources/residential_new/about (last visited Mar. 18, 2020).
[16] *Id.*

construction standards and created an identifiable and recognizable standard for energy efficiency.

Q35. Are there ancillary benefits to using energy efficiency rating systems?

A. Yes. In 2019, more than 240,000 U.S. homes received a HERS rating, bringing the total number of rated homes to more than 2.4 million.[17] As the Company acknowledged in its response to the Commission Staff Interrogatory Set 4, Question 46, homes in Maryland with a HERS rating spend less time on the open market and command a higher price premium. That interrogatory response is included with my testimony as **Attachment MJ-3**. This pattern of higher home prices is repeated in multiple other jurisdictions.[18]

And because homes have a quicker resale time and home buyers can procure a higher price for their ENERGY STAR certified home, use of the rating system can accelerate market penetration for the ENERGY STAR and HERS programs. This will produce greater cumulative energy savings and incentivize home builders and real estate agents to promote energy certification and rating programs.

Q36. Should the Residential New Construction Program focus on benchmarks instead of specifying installed measures?

A. Yes. The whole building systems approach to energy efficiency promoted by the ENERGY STAR program gives flexibility to builders and customers when making design choices during the construction of a home. Furthermore, because design choices are made at the beginning of the construction process, the cost to the home buyer to procure the energy efficiency savings is lower than for post-construction retrofits. Thus, incentives can have a greater impact at this point in the process. Additionally, the reduction in energy consumption provides annual savings, peak savings, and lifetime savings that can exceed those produced by individual measures.[19]

[17] Residential Energy Servs. Network, *Annual Report* (2019), https://www.resnet.us/wp-content/uploads/RES20823-2019-Annual-Report-Infographic-v6.jpg.

[18] Nicole Westfall, *New Research Shows the Myriad Benefits of Energy Efficient Homes*, Midwest Energy Efficiency All. (Jun. 7, 2018), https://www.mwalliance.org/blog/new-research-shows-myriad-benefits-energy-efficient-homes.

[19] All. to Save Energy, *Building Systems Efficiency*, Whole Building Design Guide: A Program of the National Institute of Building Sciences (July 7, 2018), https://www.wbdg.org/resources/building-systems-efficiency.

Q37. What are the benefits of using existing certification and rating systems?

A. The presence of an existing network of home builders and ratings is an opportunity that can be exploited to accelerate the spread of the Company's program while minimizing educational expenses. Home builders, raters, and real estate professionals are the parties with the greatest level of contact with the homeowner and thus are particularly well suited to promote the program. By providing the incentive to the home builder, the cost to construct a certified home is reduced, which makes it more affordable to a large swath of potential home purchasers.

Q38. What is your opinion on the eligibility criteria?

A. The proposed residential program is expansive, covering single family, detached homes, townhomes, two-over-two condos (similar to townhomes, but split into smaller units), and low-rise multifamily units.[20] Inclusivity is a key design trait as it offers benefits to a greater portion of new home buyers while expanding the number of home builders that can participate in the program.

Q39. How is the whole building systems approach being applied in the Non-Residential Construction Program?

A. The Non-Residential Construction program uses building energy simulation models to test bundles of measures for potential energy savings gains from interactive effects. As discussed above, the interaction between measures is a source of energy efficiency savings that is underdeveloped.

Q40. Let's transition to another category of programs in the Company's application: Non-residential Midstream Energy Efficiency Products Program. Can you explain the role midstream programs play in a balanced energy efficiency portfolio?

A. Yes. On page 20 of his Direct Testimony, Mr. Hubbard discusses the Non-residential Midstream Energy Efficiency Products Program. VAEEC supports approval of this program. As discussed above, a balanced energy efficiency portfolio contains a mix of downstream, midstream, and upstream programs that maximize the return on per-customer investment and optimize customer engagement opportunities.

[20] Direct Testimony of Michael Hubbard at 13, Application of Virginia Electric and Power Company (2019) (No. PUR-2019-00201).

Upstream programs target manufacturers while downstream programs target end-use customers. Meanwhile, a midstream program targets the distributors and contractors who provide the connection between the upstream and the midstream. Midstream programs focus on the parties who sell products to the end-use customers. Midstream programs reduce customer acquisition and marketing costs, which increases the cost-effectiveness of the programs.

Midstream programs are commonly used to increase sales of energy efficient products to residential and non-residential customers. In a midstream program, the primary points of market engagement are distributors and contractors, who are easier to reach than the end-use customer. Midstream programs leverage the concentrated nature of the distribution network and the importance of distributor and contractor advice on end-use product selection. The programs shift marketing from printed materials to person-to-person engagement which can be more persuasive.[21]

Q41. Do midstream programs have any additional benefits?

A. Yes. Midstream programs reduce financial barriers to participating in an energy efficiency program. First, midstream programs provide an incentive for distributors to carry energy efficient products. This is important because product availability is a factor that influences customer purchasing decisions. Equipment replacements by non-residential customers must often be performed quickly to prevent loss of business opportunities. Energy efficiency may be a lesser consideration or not considered at all when equipment must be replaced quickly.[22] Therefore, having an immediate price reduction can help sway customer purchasing decisions. Second, in a midstream program, all end-use customers purchasing a product approved for the program will receive a rebate. End-use customers are not required to submit a rebate request and to wait for the rebate to be issued, a process which can reduce participation and increase administrative

[21] Stephen Bickel et al., *Swimming to Midstream: New Residential HVAC Program Models and Tools* 7-6, (ACEEE 2016), https://www.aceee.org/files/proceedings/2016/data/papers/7_888.pdf.
[22] *Id.* at 7-7.

costs.[23] Instead, the price reduction is applied at the time of purchase and directly impacts customer decisions about which products to purchase.

Q42. Why does it make sense in some cases to provide the energy efficiency program incentive to the distributor as opposed to a property owner?

The expectation is that the incentive paid to distributors will be passed along to the end-use customer, in part or in whole, and a program can be designed to ensure that the distributor passes along the incentive in the form of a price reduction for the customer. Distributors are also able to aggregate multiple individual rebates into a single request for payment, which reduces administrative burdens for the distributor and the program operators.

Q43. Have you identified examples of other successful midstream programs?

A. Yes. There is considerable research available on the success of midstream programs. Midstream programs have been utilized in many other states to increase access to energy efficiency products and to accelerate market penetration of those products. Midstream programs in Maine, Vermont, and Connecticut offer rebates for heat pump water heaters, natural gas water heaters, and natural gas boilers. Roll out of these rebates has produced increases in program participation ranging between 234% to 1000%.[24]

Q44. Why is it necessary to collect point-of-sale data from midstream programs?

A. Collection of this data is essential for maintenance of a cost-effective program. The point-of-sale data allows the program operator and the utility to evaluate the performance of the program. The program operator can identify differences within the distributor network and better target marketing and outreach activities. The data can be fed back into the program's operation to fine-tune program activities while the program is still being offered.

[23] Amy Buege, Luke Scheidler, & Kevin Grabner, *Row, Row, Row your Commercial Lighting Program Simply Down the (Mid)-Stream?* 4-53, (ACEEE 2014), https://www.aceee.org/files/proceedings/2014/data/papers/4-436.pdf.

[24] *Astonishing Results: Examine Surges in Participation at Distributor-Focused Midstream Programs*, ENERGY STAR, https://www.energystar.gov/products/retailers/midstream_programs/astonishing_results (last visited Mar. 18, 2020).

Q45. Can midstream programs increase interest in other energy efficiency programs?

A. Yes. Each interaction with an energy efficiency program builds customer trust in energy efficiency and increases the likelihood of participation in other programs.

Q46. Do you have any concerns about the program?

A. The program design must consider how end-users make their purchasing decisions and who influences their purchasing decisions. Programs in other states have targeted their marketing at distributors and contractors because each of those parties interacts with the end-use customers. Many end-use customers may never know who the distributor of the product is, but they will have a strong relationship with the contractor who is installing the equipment. If there is an extra step between distributor and end-use customer, it must be considered in the program design or the program may suffer from reduced uptake of the energy-efficient products.

Q47. Let's move on to discuss the Company's proposal pursuant to HB 2789 from the 2019 General Assembly Session. Does the Company's proposed Heating and Cooling/Health and Safety Component program comply with the mandate to provide directed services to low-income, disabled, and elderly customers?

A. Yes. As it relates to this proceeding, HB 2789 from the 2019 General Assembly session focused on providing incentives to low-income, elderly, and disabled individuals to participate in energy conservation measures. Dominion witness Michael Hubbard discusses the Company's proposals pursuant to this legislation on page 21 of his direct testimony.

The proposed HB 2789 Program (Heating and Cooling/Health and Safety Component) increases the number of measures and services that are available to qualifying households under the existing Residential Income and Age Qualifying Home Improvement Program. A greater range of available measures increases the likelihood of participation and increases the potential energy savings that can be produced from participation.

Q48. How does the HB 2789 Program integrate participants' health into its offerings?

A. The program allows for health issues to be addressed, such as mold and mildew removal, in addition to improving the efficiency of appliances and the building envelope. Improvements to heating and cooling cannot be isolated from the physical conditions of the home. The home must be considered in its entirety. This means that health, safety,

moisture, durability, and structural issues needed to be addressed before energy efficiency improvements are made.[25] Failing to do so would limit the benefits generated by the program by allowing unhealthy conditions to remain in the home. The proposed HB 2789 program acknowledges the relationship between healthy living conditions and energy efficiency and will deliver multiple benefits to participating customers.

Q49. What is the need for low-income energy efficiency services in Virginia?

A. Nationwide, the need for energy efficiency services for low-income, disabled, and elderly customers is considerable. Low-income households pay twice as much to secure their energy needs than median income households.[26] The Home Energy Affordability Gap study found that Virginia households with incomes of below 50% of the Federal Poverty Level use 47% of their annual income to pay for their home energy bills.[27] Households with incomes up to 200% of the Federal Poverty Level have energy bills equal to 10% of their income. This energy burden places considerable economic stress on low-income households, which is magnified by the limited sources of dedicated funding. Maximizing the use of available funds to deliver services ensures that more eligible households can participate in weatherization programs. Reducing administrative costs and burdens is one of the simplest methods of increasing resources for program delivery.

Q50. Why is it important to have energy efficiency programs targeted at vulnerable populations in the Company's service area?

A. There are substantial barriers to providing energy efficiency services to low-income, elderly, and disabled individuals. Economic barriers exist in the form of upfront costs, sourcing application materials, and split incentives between landlords and renters. Social barriers exist in the form of lack of trust between marginalized communities and service providers (government or utility-funded), and language and literacy difficulties. Health and safety barriers also limit the ability of some to qualify for services or reduce the effectiveness of services. In combination, these barriers make it harder for these

[25] Rachel Cluett, Jennifer Amann, & Sodavy Ou, *Building Better Energy Efficiency Programs for Low-Income Households* 13, (ACEEE 2016), https://www.aceee.org/sites/default/files/publications/researchreports/a1601.pdf.
[26] Ariel Drehobl & Lauren Ross, *Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities* 9, (ACEEE 2016), https://www.aceee.org/sites/default/files/publications/researchreports/u1602.pdf.
[27] *Home Energy Affordability Gap*, Fisher, Sheehan & Colton (2019), http://www.homeenergyaffordabilitygap.com/.

communities to learn about services that are available and for the communities to access the services. Compounding these barriers is the history of unmet need for energy efficiency services that has created a gap between qualifying households and households receiving services.[28]

Q51. How could the Company improve its coordination with other low-income programs?

A. The Company operates its low-income programs through the existing weatherization service provider network. In fact, multiple sources of funding are often used in a single weatherization project. While this creates a larger pool of financial resources, it can create additional administrative burdens. Each source of funding can impose its own income verification and project approval processes in addition to post-completion reporting requirements.

The Company could seek to align its reporting requirements with those required for other revenue sources. Additionally, the Company should explore how it can share information and resources with existing weatherization service providers, which would assist those providers in identifying clients and expanding services that they offer to each client.

Lastly, the Company should also work to target individuals who are already receiving bill assistance from its ratepayer-funded bill assistance program and from the federal government-funded Low-Income Crisis Intervention Program. Coordinating across these efforts might prove to be especially helpful.

Q52. Can you explain how such coordination might work?

A. Yes. The Company should consider standardizing the process for qualifying low-income projects and post-construction reporting requirements across all of its low-income programs—both regulated and non-regulated. Additionally, the Company should consider aligning its process with the federal Weatherization Assistance Program ("WAP") as much as possible to help reduce administrative burdens to the WAP network. The ACEEE maintains a database that summarizes the guidelines for low-income energy

[28] Envtl. Def. Fund, *Low-Income Energy Efficiency: A Pathway to Clean, Affordable Energy for All* 4 (2018), https://www.edf.org/sites/default/files/documents/liee_national_summary.pdf.

efficiency programs, state-by-state that includes how states coordinate ratepayer-funded low-income programs with WAP services.[29] The ACEEE also produced a report in March 2016, which discusses these guidelines in greater detail.[30]

Q53. How does coordination assist low-income service providers and low-income households?

A. In combination, these actions can reduce the number of visits to a home to deliver services and evaluate effectiveness of programs. Coordination can reduce administrative barriers to program participation and expand the number of measures that an eligible home receives. Different utility programs have distinct limitations on how program funding can be spent to deliver services. For example, federally-funded weatherization programs cannot fund improvements to the building envelope, and homes cannot receive federal weatherization program funds if they have a structural issue. By coordinating delivery of program services, funds from different sources can ensure that a single customer receives a more complete delivery of needed services. Most importantly, the coordination can also reduce program administrative costs, thus allowing more funding to go into the provision of weatherization services rather than ancillary costs.

Q54. Do you have suggestions about how to improve low-income access to other efficiency programs?

A. Yes. The spending cap set in HB 2789, $25 million over three years, and the spending targets for the Company's ongoing Residential Income and Age Qualifying Home Improvement Program, make it unlikely that the low-income specific programs alone will be able to serve existing need. As a result, the Company might consider tweaking its market-based Phase VIII programs to eliminate the structural barriers that can reduce or prevent low-income customer participation.

[29] That database can be viewed online at: https://database.aceee.org/state/guidelines-low-income-programs.
[30] *See* Rachel Cluett, Jennifer Amann, & Sodavy Ou, *Building Better Energy Efficiency Programs for Low-Income Households* 16-20, (ACEEE 2016), https://www.aceee.org/sites/default/files/publications/researchreports/a1601.pdf.

Q55. Are there specific Phase VIII programs that should consider low-income customer access?

A. Yes. There are two programs that should directly address low-income customer access. The first program is the Residential Manufactured Housing Program, which will provide residential customers with educational assistance and an incentive to install energy efficiency measures.[31] According to the Manufactured Housing Institute, the median household income of those living in manufactured housing is just under $30,000.[32] Low-income households preferentially select manufactured housing because of its low cost. However, if economic barriers prevent those households from participating in efficiency programs, then these households will be subject to higher energy bills.

The second program is the Residential/Non-residential Multifamily Program. Specifically, the program should consider how to handle a possible split incentive between the property owner and the residents. According to the National Low Income Housing Coalition, 34% of Virginians live in rental housing.[33] Many of those rental units are in multifamily buildings. Thus, it makes sense for any multifamily energy efficiency program to address potential split incentive issues when the owner of the property is not the party responsible for paying the energy bills in the rental units.

The Company's Multifamily program is available to individually metered multifamily residential buildings in the Company's territory, but the marketing for the program is targeted at property owners. That is, property owners would decide whether to participate, even though they would not be responsible for the electricity bills. In individually metered multifamily rental properties, it is the tenants who are most likely to be responsible for their bills. The Company should identify whether a split incentive problem exists and, if it does, identify options for addressing the problem.

[31] Direct Testimony of Michael Hubbard at 11, Application of Virginia Electric and Power Company (2019) (No. PUR-2019-00201).

[32] Manufactured Housing Institute, *2018 Manufactured Housing Facts: Industry Overview,* (June 2018), https://www.manufacturedhousing.org/wp-content/uploads/2018/06/2018-MHI-Quick-Facts-updated-6-2018.pdf.

[33] *Out of Reach 2019: Virginia*, Nat'l Low Income Housing Coal., https://reports.nlihc.org/oor/virginia (last visited Mar. 18, 2020).

3. Grid Modernization and AMI Integration

Q56. How will AMI assist the Company with its demand-side management and energy efficiency programs?

A. AMI will increase the availability of more granular customer data. AMI can unlock advanced analytics that will allow utilities to aggregate customer data together to create local, regional, and system-wide analyses of current and future grid performance. AMI will also enable the use of disaggregated individual customer data to provide targeted services based on a customer's actual energy consumption profile.

Q57. Do you have suggestions on how the existing AMI technology could be leveraged to enhance the Phase VIII program offerings?

A. Yes. AMI data is helpful in designing programs for specific ratepayer classes and to accomplish specific purposes. In the Company's territory, 17% of customers have smart meters.[34] This represents an opportunity for the Company to use data collected from these customers to evaluate the effectiveness of different program offerings. Energy efficiency can reduce overall energy consumption, and with the advanced analytics made possible by data collected by AMI technology, energy efficiency can be targeted to reduce energy consumption at specific periods of the day, week, month, or season.

Full deployment of AMI technology will expand this potential in the future. But the Company can realize benefits from AMI technology now, before it reaches full deployment. The Company can use its existing resources to test the potential of energy efficiency to reduce peak load and to avoid or defer transmission, distribution, and generation resource investments. The power of aggregation allows the Company to bring together individual measures installed at individual homes into a single unit under coordinated management. The power of disaggregation allows the Company to identify and market to specific customers whose energy usage profiles indicate that they would benefit most from the deployment of specific energy efficiency offerings. Additionally, as discussed in an ACEEE report on AMI technology, disaggregation allows utilities to

[34] Direct Testimony of Nathan Frost at 7, Application of Virginia Electric and Power Company (2019) (No. PUR-2019-00201).

provide technical assistance on existing installed efficiency measures to maximize their energy savings potential.[35]

Q58. What is the Company's forecast for load growth?

A. The Company's 2018 IRP forecast[36] states that the Company is planning for the addition of over 440,000 residential, commercial, and industrial customers between 2020 and 2033 and a compound annual load growth rate between 2018 and 2033 will be 1.5%. Summer peak load growth is forecasted to have an annual compound growth rate of 1.4%, and the winter load growth is forecasted to have an annual compound growth rate of 1.6%.[37]

Q59. Are there other pressures that will increase the need for system flexibility and the use of AMI technology?

A. Yes, current trends in the energy sector demonstrate a move away from fossil fuels for transportation and heating and an increase in the use of electricity to provide these services. An increase in the number of electric vehicles in Company's service area will increase demand for electricity. Strategic electrification of heating and cooling will further increase overall and peak demand for electricity.

The transition away from fossil fuels will also require increased coordination between supply-side and demand-side resources. This coordination will need to happen in real-time and in long-term planning processes. Demand-side management resources should be the first resources deployed based on their significant economic advantages over supply-side investments.[38] The Company's energy efficiency and demand response programs will reduce the overall impact on the system, and AMI will further expand the Company's ability to predict and manage shifting load growth and demand peaks.

[35] Rachel Gold, Corri Waters, & Dan York, *Leveraging Advanced Metering Infrastructure To Save Energy* 3 (ACEEE 2020), https://www.aceee.org/sites/default/files/publications/researchreports/u2001.pdf.

[36] Dominion updated its IRP in a 2019 filing before the North Carolina Utilities Commission. I have opted to use the Company's 2018 IRP as it is the most recent IRP litigated before the Virginia State Corporation Commission.

[37] Virginia Electric and Power Company's Report of Its Integrated Resource Plan at 19, No. E-100, Sub 157 (Va. State Corp. Comm'n. and N.C. Utils. Comm'n. filed May 1, 2018). Note that these estimates do not include the impact of energy efficiency programs.

[38] Maggie Molina, *Renewables Are Getting Cheaper But Energy Efficiency, On Average, Still Costs Utilities Less*, ACEEE (Dec. 18, 2018), https://www.aceee.org/blog/2018/12/renewables-are-getting-cheaper-energy.

Q60. Why are demand-side management and energy efficiency programs valuable in deferring infrastructure investments, and how can AMI contribute to deferring infrastructure investments?

A. Energy efficiency programs are quicker to deploy than traditional infrastructure investments and quicker to scale up. Energy efficiency programs can be deployed to manage peak load and potentially defer investments in transmission and distribution upgrades. To deploy energy efficiency programs, a company must understand the load profile of its service area and the usage profile of proposed measures. AMI can provide the level of granularity necessary to design programs that produce energy savings and peak demand reductions. Thus, using AMI to enhance energy efficiency and demand response will produce system-wide benefits.

This is especially important going forward, as the recently enacted Virginia Clean Economy Act bars the construction of new carbon-emitting generation sources unless the Company meets its energy efficiency targets.

Q61. At what level of penetration do utilities start to deploy programs that maximize all potential uses of AMI technology?

A. Maximizing the full value of AMI requires hitting critical penetration levels that justify full investment and use of the data collection, data analysis, and communication capabilities of AMI. In the ACEEE's 2020 report, *Leveraging Advanced Metering Infrastructure to Save Energy*, only utilities with above 25% penetration of AMI were included in the potential use case study.[39] Although the Company currently sits below this penetration level, it will quickly hit it if its current deployment proposal is approved.

To be clear, there is no need to wait to use AMI to improve the Company's energy efficiency programs. Dominion could currently use its existing AMI systems to provide enhanced feedback to customers on their energy consumption and to provide suggestions on options for reducing overall consumption and peak demand. For example, focused regional or local programs could be implemented during the deployment of AMI

[39] Rachel Gold, Corri Waters, & Dan York, *Leveraging Advanced Metering Infrastructure To Save Energy* 10 (ACEEE 2020), https://www.aceee.org/sites/default/files/publications/researchreports/u2001.pdf.

technology once those regions or localities hit critical penetration levels, even if the system as a whole remains below the 25% level.

Q62. Do you have any recommendations for how the Company's DSM portfolio could use AMI to maximize system and regional benefits?

A. Yes. The Company could begin with an AMI-driven pilot program to test the accuracy of its planning tools and the effectiveness of its marketing strategies. Success on a smaller project would pave the way for larger, more complex projects. The Company could and should explore options for fully utilizing the potential of its AMI.

4. Proposed New Programs

Q63. Do you have any suggestions about additional DSM programs the Company should consider in the future?

A. Dominion has made considerable progress in expanding the breadth and depth of its demand-side programs. That said, I have identified a few areas where the Company could continue to develop new programs that would help it prepare for the changes coming via the Virginia Clean Economy Act. Those recommendations include: (1) expanding commercial and industrial offerings; (2) using AMI technology to aid in the geotargeting of efficiency programs; and (3) taking advantage of the growth in electric vehicle sales and other battery-driven technology to develop a "Bring Your Own Device" program.

Q.64. Please say more about your recommendations for commercial and industrial customers.

A. Dominion currently offers several programs for non-residential customers. As the exemption cap for Large General Service Customers rises to 1 MW of demand from a single meter, the Company should evaluate whether its current programs can be expanded to meet the needs of the new eligible customers. Options for new programs include commercial and industrial re-commissioning programs, technical assistance for multi-year planning, and strategic energy management.

Re-commissioning programs, for example, study the performance of existing buildings, identify operational deficiencies, and present low-cost tune-up measures that will produce operations and management savings. Re-commissioning programs can be designed for specific customer types, *e.g.*. agricultural users, large institutions, and data centers, or

they can focus on specific eligible technologies such as compressed air systems, lighting, and motors.

Technical assistance with multi-year planning allows a program operator to work with the customer over several years to create a customized plan for implementing operations and management changes and upgrading system components. Multi-year plans enable program operators and customers to focus on identifying short-term and long-term savings opportunities in operations and management practices and capital investments. Xcel Energy, for example, provides technical assistance to large customers over three distinct phases: identifying savings opportunities, scoping energy-efficiency potential, and implementing energy-efficiency improvements.[40] Each phase is customized to the customer's need and capabilities and the final plan includes a customized proposal for rebates, bonuses, and support.

Strategic energy management ("SEM") provides training to customers to enable them to identify and pursue opportunities for continuous improvement in operations and management practices. SEM supports the development of energy efficiency expertise and leadership within the participating organization. SEM programs move away from a single-project focus and toward continuous evaluation of energy savings opportunities.[41] SEM programs can include funding on-site energy managers and/or providing training and coaching resources.[42]

[40] *Process Efficiency*, Xcel Energy, https://www.xcelenergy.com/programs_and_rebates/business_programs_and_rebates/energy_audits_and_studies/process_efficiency (last visited Mar. 18, 2020).
[41] Neil Kolwey, *Utility Strategic Energy Management Programs* 1 (Sw. Energy Efficiency Project 2013), http://www.swenergy.org/data/sites/1/media/documents/publications/documents/Utility_SEM_programs_03-2013.pdf.
[42] *Id.* at 3-4.

Q65. Did you have a recommendation on geotargeting as well?

A. Yes. I recommend the Company develop a Geotargeting Pilot Program. Leveraging the benefits of AMI technology, geotargeting of demand-side management programs can focus energy and demand reductions in areas where they produce high customer and system benefits. I recommend that the Company develop a pilot project to deploy demand-side management programs in an area with AMI technology; where there is identified distribution or transmission-line congestion; and an identified need for transmission or distribution system upgrades. The pilot project would allow the Company to test the potential of demand-size management programs to reduce specific load and peak demand in congested areas, while collecting data that would inform the design of future programs.

Q66. Can you say more about how geotargeting might work?

A. There are generally two ways to think of how demand-side management and energy efficiency programs can avoid or defer investments in transmission and distribution infrastructure. Passive deferrals are when system-wide DSM programs, implemented without the intent to defer a specific transmission or distribution projects, nevertheless generate enough impact to defer the proposed investment. An active deferral is when DSM programs are geographically targeted to reduce peak or load in an area to defer a specific transmission or distribution project.[43]

Q67. Are there examples of utilities that have used geotargeting of energy efficiency and demand response programs to defer, avoid, or reduce infrastructure upgrades?

A. Yes. Oklahoma Gas & Electric used AMI technology to offer a pilot program that reduced load by 70 MW and incentivized the utility to expand the program with the goal of deferring investment in about 170 MW of generation capacity.[44] Consolidation Edison has used geotargeted DSM programs to defer significant substation upgrades.[45] Utilities

[43] Chris Neme & Jim Grevatt, *Energy Efficiency as a T&D Resource: Lesson from Recent U.S. Efforts to Use Geographically Targeted Efficiency Programs to Defer T&D Investments* 12 (Ne. Energy Efficiency P'ships 2015), https://neep.org/sites/default/files/products/EMV-Forum-Geo-Targeting_Final_2015-01-20.pdf.

[44] U.S. Dep't of Energy, *Advanced Metering Infrastructure and Customer Systems* 30-31 (2016), https://www.energy.gov/sites/prod/files/2016/12/f34/AMI%20Summary%20Report_09-26-16.pdf.

[45] Chris Neme & Jim Grevatt, *Energy Efficiency as a T&D Resource: Lesson from Recent U.S. Efforts to Use Geographically Targeted Efficiency Programs to Defer T&D Investments* 27 (Ne. Energy Efficiency P'ships 2015), https://neep.org/sites/default/files/products/EMV-Forum-Geo-Targeting_Final_2015-01-20.pdf.

in Washington, Oregon, Maine, and Vermont have all used geotargeted energy efficiency and demand response to avoid, delay, or reduce proposed investments in transmission infrastructure.[46]

Q68. Can you explain how a "Bring Your Own Device" Program would work?

A. A Bring Your Own Device ("BYOD") program provides either an upfront or monthly incentive to customers with home battery storage in return for allowing the Company to manage the charging and discharging of the battery during periods of peak demand. BYOD programs can include multiple devices such as batteries, electric vehicle chargers, and water heaters.

The Company has already proposed allowing customers to bring their own devices for other programs, such as the Residential Smart Thermostat Management and Residential Electric Vehicle Peak Shaving programs. These programs already allow customers to participate with an approved device.

A larger BYOD program would expand the number of customers who could participate in demand response and thus create a larger aggregated pool of available resources that could be called upon. The potential savings are significant. For example, in 2018 Green Mountain Power's BYOD program twice produced more than $500,000 in energy and demand savings in a single month because the utility was able to draw upon the stored energy in participating customers' devices.[47] In addition to peak demand savings, an expanded BYOD program would increase system resilience and facilitate the integration of renewable energy resources by providing grid services.[48]

Q69. Does this conclude your direct testimony?

A. Yes, it does.

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[46] *Id.* at 15-25.

[47] Kristin Kelly, *GMP Beats New Peak, Delivers Bigger Customer Savings with Growing Network of Stored Energy*, Green Mountain Energy (Aug. 14, 2018), https://greenmountainpower.com/news/gmp-beats-new-peak-delivers-bigger-customer-savings-with-growing-network-of-stored-energy/.

[48] Herman K. Trabish, *Renewables' Variability Sends Wary Utilities From Traditional DR to DER and Load Flexibility*, Utility Dive (Aug. 14, 2019), https://www.utilitydive.com/news/renewables-variability-sends-wary-utilities-from-traditional-dr-to-der-and/560669/.

ATTACHMENTS

Attachment MJ-1 (8 pages):
C.V. of Mark James

Attachment MJ-2 (2 pages):
Feasibility Analysis of Energy Efficiency Targets in the Virginia Clean Economy Act

Attachment MJ-3 (3 pages):
Company's Response to Staff Interrogatory Set 4, Question 46

Attachment MJ-4 (5 pages):
Company's Response to VAEEC Interrogatory Set 2, Question 3

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EXPERIENCE

Vermont Law School, South Royalton, VT, July 2019 – Present
Adjunct Professor and Senior Research Fellow, Institute for Energy and the Environment

- Teach online learning courses:
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- Develop curriculum and instruction for new online Energy Efficiency course.
- Serve as subject matter expert for online energy law courses.
- Lead researcher on regional transmission organization stakeholder governance project as part of a multi-school effort funded by the Sloan Foundation.
- Led Phase 2 Protect Our Power-funded student research team to enhance state-level efforts to increase distribution utility cybersecurity investments.

Vermont Law School, South Royalton, VT, 2016 – 2019
Assistant Professor and Senior Research Fellow, Institute for Energy and the Environment

- Taught residential courses
  - Energy Policy in a Carbon Constrained World
  - End-Use Energy Efficiency
- Taught online learning courses:
  - Energy Policy in a Carbon Constrained World
  - Energy Regulation & The Environment
  - Alternative Fuels and Renewable Energy
  - Communications, Advocacy, and Leadership
- Led Protect Our Power-funded project to enhance state-level efforts to increase distribution utility cybersecurity investment.
- Managed student research team for Department of Energy (DOE)-funded Northeast Energy Efficiency Partnership – Home Energy Labelling Information Exchange (NEEP-HELIX) data privacy project to develop data access protocols for a multi-state home energy efficiency score.
- Directed research on DOE-funded Powering Energy Efficiency Impacts Framework grant to facilitate access to and operation of low-income energy efficiency programming in five-county test pilot region in North Carolina.

- Led research on Maryland Climate Coalition project to compare proposed bills to increase Maryland's Renewable Portfolio Standard.
- Served as faculty supervisor to the National Energy and Sustainability Law Moot Court Team.
- Developed the grant proposal for the U.S. Department of Agriculture (USDA)-funded Farm and Energy Initiative.

Vermont Law School, South Royalton, VT, 2014 – 2016
Global Energy Fellow, Institute for Energy and the Environment

- Led research on DOE-funded Lawrence Berkeley National Laboratory (LBNL) PV AutoPop data privacy project seeking to integrate rooftop solar data into real estate multiple listing services.
- Analysed building codes and standards, utility tariffs, and government legislation.
- Drafted model code amendments for SunShot Plug and Play Solar PV for American Homes Project.
- Supervised Energy Clinic team in developing the *Guide to Community Solar* report.
- Facilitated executive training program, *Legal Essentials for Utility Executives.*

PUBLICATIONS

Articles

Kevin B. Jones, Mark James, and Heather Huebner, *Do You Know Who Owns Your Solar Energy? The Growing Practice of Separating Renewable Attributes from Renewable Energy Development and its Impact on Meeting Our Climate Goals*, 28 FORDHAM ENVTL. L. REV.197 (2017).

Mark James, Kelsey R. Bain & David E. Sloan, *Undamming the Federal Production Tax Credit: Creating Financial Incentives for Dam Trading and Dam Removal*, 53 IDAHO L. REV. 53 (2017).

Mark James, Ashleigh H. Krick & Kelsey R. Bain, *Planning for the Sun to Come Up: Examining the Root Causes and Future Impacts of California and Nevada's Divergent Approaches to Net Metering*, 8 SAN DIEGO J. OF ENERGY L. 1 (2016-17).

Kevin B. Jones, Mark James & Roxana-Andreea Mastor, *Securing our Energy Future: Three International Perspectives on Microgrids and Distributed Renewables as a Path Toward Resilient Communities*, 16 J. OF ENVTL. HAZARDS 99 (2016).

Reports

Mark James, Claire Valentine-Fossum, Adam McGovern, Austin Scarborough, Justin Somelofske & Kristin Zweifel, *Improving the Cybersecurity of the Electric Distribution Grid: Phase 2 Report – Pathways to Enhancing Grid Security* (Institute for Energy and the Environment, Vermont Law School, November 2019).

Mark James, Adam McGovern, Justin Somelofske, Claire Valentine-Fossum & Kristin Zweifel, *Improving the Cybersecurity of the Electric Distribution Grid: Phase 1 Report – Identifying Obstacles and Presenting Best Practices for Enhanced Grid Security* (Institute for Energy and the Environment, Vermont Law School, April 2019).

Anne Tazewell, Ron Townley, Tirence Horne, Laura Langham, Daniel Pate, Mark James, Joshua Randall, William S. Slocumb, Mark Griffin, Scott Ferguson, Daniel Kauffman, Alfred Ripley, and Ookie Ma, *Powering Energy Efficiency and Impacts: A Data-Driven Project Supporting Low-Income Households in Northeastern North Carolina* (North Carolina Clean Energy Technology Center and the Upper Coastal Plains Council of Governments, March 2019).

Mark James, Kevin B. Jones, Ashleigh H. Krick & Rikaela R. Greane, *How the RTO stakeholder process affects market efficiency* (R Street Institute, Oct. 2017).

Capturing the Sun: A Roadmap for Navigating Data-Access Challenges and Auto-Populating Solar Home Sales Listings, Lawrence Berkeley National Laboratory (2016), contributing author.

Book Chapters

Kevin B. Jones & Mark James, "Distributed renewables in the new economy: lessons from community solar in Vermont," *Law and Policy for a New Economy: Sustainable, Just, and Democratic* 189 (2017).

Online Articles and Blog Posts

Mark James and Richard Mroz, *Cyber-securing the grid: Best practices for state utility commissions*, UTILITY DIVE, (April 25, 2019), https://www.utilitydive.com/news/cyber securing-the-grid-best-practices-for-state-utility-commissions/553389/.

Scott Rowland and Mark James, *Vermont Law School Watch List 2018 – Solar Trade Tariffs*, VERMONT J. OF ENVTL. LAW, (Jan. 2018), http://vjel.vermontlaw.edu/topten/solar-trade-tariffs/.

Mark James and Kevin B. Jones, *Finding efficiencies: Updating RTO stakeholder governance to meet emerging challenges*, UTILITY DIVE, (Dec. 15, 2017) https://www.utilitydive.com/news/finding-efficiencies-updating-rto-stakeholder-governance-to-meet-emerging/513085/.

Documenting COP21 – Articles 13-15, July 1, 2016 (project documenting changes to Paris Agreement during course of negotiation sessions and identifying items left to future meetings to resolve), http://vlscop.vermontlaw.edu/4564-2/.

Vermont Law School Substantial & Sustained COP21 Observer Blog, http://vlscop.vermontlaw.edu/ (written as part of VLS COP21 Observer Delegation).

- *Paris Agreement and the Clean Air Act – New Tools for the EPA?* January 19, 2016
- *UNFCCC Negotiations – Coordinating the Dance*, December 4, 2015
- *Building Transparency and Accountability in a New Climate Agreement*, December 3, 2015
- *Understanding the Complex Organized Chaos of UNFCCC* Negotiations, December 2, 2015
- *Carbon Capture and Sequestration – A Cautionary Tale*, December 1, 2015
- *The Ying and the Yang of the Low Carbon Economy*, November 30, 2015
- *Carbon Tax – More of the Same or Energy Miracle*, October 22, 2015
- *New Government in Canada, New Direction on Climate Change*, October 20, 2015
- *Past as Prologue? Joint Implementation and the Future for Flexibility Mechanisms*, October 3, 2015

End of Coal Fired Generation in Ontario, Columbia Center for Climate Change Law Blog, January 22, 2014, http://blogs.law.columbia.edu/climatechange/2014/01/22/end-of-coal-fired-generation-in-ontario/.

PRESENTATIONS

Energy Assurance and Resilience: A Cross-Functional View, National Association of State Energy Officials and National Association of Regulatory Utility Commissioners Energy Security and Data Analysis Workshop, December 2, 2019.

Pathways to Improving Distribution Utility Cybersecurity, National Association of Regulatory Utility Commissioners – Electricity Committee, November 17, 2019.

Pathways to Improving Distribution Utility Cybersecurity, National Association of Regulatory Utility Commissioners – Critical Infrastructure Committee, November 16, 2019.

Cyber-Securing the Electric Grid: Barriers and Best Practices, Department of Homeland Security Region 1 and Federal Emergency Management Agency – NLE Cyber 2020 Workshop, May 30, 2019.

Research on the survey of state commission works on regulatory issues on ensuring resilience and cybersecurity investments, National Association of Regulatory Utility Commissioners – Electricity Committee, February 12, 2019.

Research on the survey of state commission works on regulatory issues on ensuring resilience and cybersecurity investments, National Association of Regulatory Utility Commissioners – Critical Infrastructure Committee, February 10, 2019.

Comparison and Analysis of Proposed Bills to Increase Maryland's RPS Commitments, Maryland Climate Coalition, September 20, 2018.

NEEP HELIX: Privacy Considerations When Sharing Home Energy Information, 2018 NEEP HELIX Regional Residential Labeling Meeting, June 26, 2018.

PEEIF: Facilitating Access to Confidential Information from Federally Funded Low-Income Energy Efficiency Programs, Webinar, June 19 and June 21, 2018.

PEEIF: Using Technology to Address Low-Income Energy Burdens: A North Carolina Pilot Project, 2018 National Environmental Justice Conference, April 27, 2018.

Creating Additionality in City-Driven Renewable Energy Pledges, 2018 AALS Natural Resources and Energy Law Panel, January 3, 2018.

NEEP HELIX: Database Access Protocols, NEEP HELIX Year 2 Virtual Summit, November 15, 2017.

Me and My Utility Data: Data Privacy in an Interconnected World, 2017 Vermont Journal of Environmental Law Symposium, October 20, 2017.

Privacy and Governance Issues in Energy Efficiency Databases, NEEP-HELIX Year One Summit¸ November 10, 2016.

Planning for the Sun to Come Up: Examining the Root Causes and Future Impacts of California and Nevada's Divergent Approaches to Net Metering, 8th Annual University of San Diego Climate & Energy Law Symposium, November 4, 2016.

Emerging Litigation in Water Law - Des Moines Water Works, 2015 Vermont Journal of Environmental Law Conference "TMDLs 2.0," October 23, 2015.

Public Utility Commissions and Public Interest Litigation: How Citizen Action Can Advance and Protect the Renewable Energy Economy, Public Interest Environmental Law Conference, Eugene OR, March 6, 2015.

OTHER MEDIA APPEARANCES

Grid Geeks: RTO Governance – Is It Broken and Can It Be Fixed? GOOD GRID (Oct. 17, 2017), http://www.goodgrid.net/blog/2017/10/17/grid-geeks-podcast-s2e4.

James Rundle, Wall Street Journal, *Utility Companies Prepare for AI-Powered Cyber Threats*, November 22, 2019, https://www.wsj.com/articles/utility-companies-prepare-for-ai-powered-cyber-threats-11574418600.

ACADEMIC GRANTS

Northeast Energy Efficiency Partnership - Home Energy Labelling Information Exchange, May 2016 – June 2019

- Created statement of work and negotiated final sub-contract on DOE funded project to integrate home energy efficiency scores into Multiple Listing Services.
- Consulted on the development of database housing and sharing home energy data from multiple states.

Upper Coastal Plains Council of Governments - City Leap, August 2017 – December 2018

- Drafted grant proposal with project partners to secure $477,000 in DOE-funding for two-year project using energy consumption data to target home energy efficiency programs in low-income neighborhoods in eastern North Carolina.

SunShot Plug & Play for American Homes, August 2014 – May 2016

- Managed multi-year contract as sub-grantee to Fraunhofer Center for Sustainable Energy DOE-funded SunShot grant. Developed statements of work, negotiated annual contract renewal, and drafted annual compliance reports.

Lawrence Berkeley National Laboratory PV AutoPop Project, April 2016 – November 2016

- Developed statement of work and sub-contracting documents on DOE-funded project evaluating data privacy issues arising from auto-population of rooftop solar system data into Multiple Listing Services.

CONTRACTED WORK

Maryland Climate Coalition RPS Bill Analysis, May 2018 – September 2018

- Negotiated and developed project framework to prepare an internal report for Maryland Climate Coalition on two proposed bills to increase Maryland's RPS obligations.
- Completed secondary negotiation to add an in-person presentation.

Protect Our Power – Distribution Utility Cybersecurity and Grid Resilience, June 2018 – December 2019

- Developed statement of work, objectives, and deliverables schedule for a project assessing how to increase utility investment in grid resilience.
- Executed multi-phase research program on distribution utility cybersecurity.

SERVICE

Vermont Law School Institute of Energy and the Environment Hiring Committee, member, 2015 – 2019

American Association of Law Schools (AALS) Faculty Representative, 2018 – 2019

AALS Natural Resources, Environment and Energy Section, board member, 2017 – 2019

EDUCATION

Vermont Law School, LL.M in Energy Law, 2016 *summa cum laude*

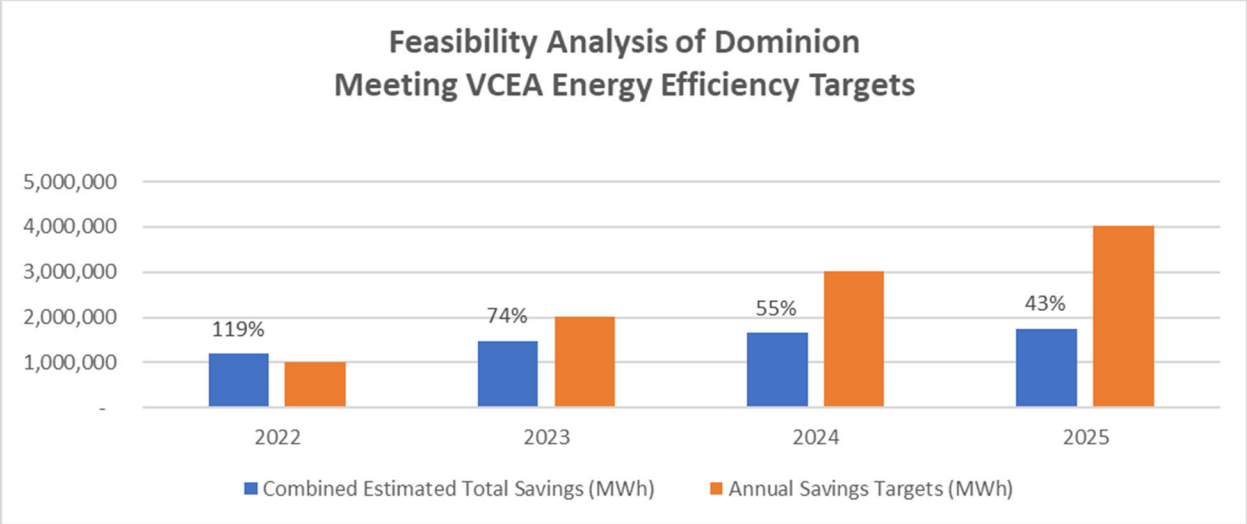
- *Global Energy LL.M Fellow*, Institute for Energy and the Environment
- *Team Leader*, SunShot Plug and Play Solar PV for American Homes Project Delegate, Vermont Law School 2015 Paris Conference of Parties Delegation
- *Member*, Vermont Law School COP 21 Working Group

University of Ottawa Faculty of Law, English Common Law J.D., 2014 *cum laude*

- *Co-founder,* Canadian Association of Environmental Law Societies (CAELS)
    - Chair, CAELS Conference – "Making Waves," 2014
    - Co-chair, CAELS Conference – "Thinking Big and Small," 2013
- *Research Associate,* Professors N. Chalifour, L. Collins, and H. MacLeod-Kilmurray, 2012 – 2014
    - Prepared memorandums on carbon pricing programs, environmental justice, and the Canadian Charter of Rights and Freedoms, and sustainable agricultural policies and legislation.
    - Updated *The Canadian Brownfields Manual*.
    - Wrote case studies for *The Canadian Law of Toxic Torts.*
- *Legal Intern*, Columbia Center for Climate Change, Columbia Law School, New York City, NY, January 2014
    - Wrote report on using securities laws to encourage public corporations to disclose climate change liabilities to potential investors.

University of Toronto, B.Sc. Ecology, 1999 *with distinction*

BAR ADMISSION: Vermont


Feasibility Analysis of Dominion
Meeting VCEA Energy Efficiency Targets
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
-
119%
74%
55%
43%
2022
2023
2024
2025
Combined Estimated Total Savings (MWh)
Annual Savings Targets (MWh)

Feasability Analysis of Energy Efficiency Targets in VCEA (supporting data)

	Projected MWh Savings by Year			
Program Name	**2022**	**2023**	**2024**	**2025**
Phase VI (2018) Total Savings (MWh)*	408,891	413,399	417,897	422,278
Phase VII (2019) Total Savings (MWh)**	645,197	864,035	971,389	981,742
Phase VIII (2020 Proposed) Total Savings (MWh	143,790	210,076	275,301	349,921
Combined Total Savings (MWh)	**1,197,878**	**1,487,510**	**1,664,587**	**1,753,941**
Estimated Dominion 2019 Retail Sales (MWh)^	80,686,000	80,686,000	80,686,000	80,686,000
Combined Total Savings (Percentage)	1.48%	1.84%	2.06%	2.17%
VCEA Savings Targets (Percentage)	1.25%	2.50%	3.75%	5.00%
VCEA Savings Targets (MWh)	1,008,575	2,017,150	3,025,725	4,034,300
Percentage of VCEA Targets	**119%**	**74%**	**55%**	**43%**

*Source: Dominion Energy's 2017 DSM Filing, DRK Schedule 7

**Source: Dominion Energy's 2018 DSM Filing, DRK Schedule 7

***Source: Dominion Energy's 2019 DSM Filing, DRK Schedule 2

^Source: Dominion Energy's 2019 IRP, page 35, Appendix 2B

Virginia Electric and Power Company
Case No. PUR-2019-00201
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 46 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on February 18, 2020 has been prepared under my supervision.

Michael T. Hubbard
Manager, Energy Conservation
Virginia Electric and Power Company

Question No. 46

Please refer to the Prefiled testimony of Michael T. Hubbard, Schedule 2 at page 13.

(a) What HERS rating would a home need to achieve in order to receive ENERGY STAR certification?

(b) What is the average HERS rating of a newly constructed home in the Company's service territory.

(c) Is the sale price of an ENERGY STAR certified home higher than a comparable non-ENERGY STAR certified home built by the same manufacturer?

Response:

The Program designer has provided the following responses.

(a) Most homes need to achieve a HERS rating between 63 and 70 to receive ENERGY STAR certification, but will vary per home plan, and variable inputs, such as number of bedrooms and finished square footage of the home. The ENERGY STAR website outlines eligibility requirements and the process for homes in Virginia to receive ENERGY STAR certification: https://www.energystar.gov/partner_resources/residential_new/homes_prog_reqs/virginia. As part of this certification process, ENERGY STAR sets a minimum HERS score that newly constructed homes in Virginia must achieve to receive certification. This minimum HERS score is based on a reference home. A reference home is a home of similar size and type built to the minimum code standards in Virginia.

(b) As discussed in our response to Staff Set 4-46 (a), HERS ratings of new construction homes are variable and based on home characteristics (number of bedrooms, square footage, etc.), and state and county codes and standards for new construction homes. While we are able to provide the HERS rating range most homes will need to achieve to be ENERGY STAR certified (that is, between 63 and 70 or lower), there is no average HERS rating of newly constructed home in the Company's service territory because it is not accurate to compare HERS ratings of homes with different characteristics to one another. Instead, homes are compared to a "reference home" (a new construction home built to minimum state and county codes, and with similar characteristics as the home being certified). Additionally, it is important to note that records of HERS ratings in Virginia will not reflect an average score for the Company's service territory due to self-selection bias (i.e., only builders who value energy efficiency pursue HERS ratings, while most builders do not pursue HERS ratings since they build homes to minimum codes and standards).

(c) The sale price of an ENERGY STAR certified home depends on various factors, such as the level of incentives offered by a utility to offset the increased cost of achieving ENERGY STAR certification and external market forces of supply and demand. In general, the following two main factors impact the sale price of an ENERGY STAR certified home:

1. **Market forces setting the price of homes**: In certain instances – whether due to geography, demographics, population density, and/or market competition – homebuyers value the ENERGY STAR label on homes and are willing to pay a premium for those homes as compared to similar non-ENERGY STAR certified homes built by the same manufacturer. A study commissioned by EmPOWER Maryland found 1) ENERGY STAR New Homes sold faster than non-certified counterparts; and 2) compared to non-certified homes, ENERGY STAR homes had a price premium ranging from 2.1% - 5.2% (variance by year). Please see Attachment Staff Set 4-46 (MTH) for the referenced study.

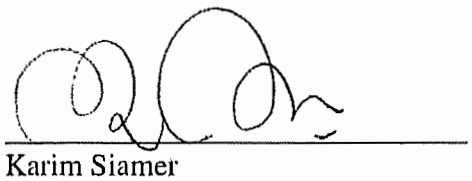
   It should be noted that while upfront costs can be higher for homebuyers, over time homebuyers recoup a portion of these costs through lower energy bills and consumption. According to the Department of Energy's "Cost and Savings Estimates: Energy Star Certified Homes, Version 3.1. (Rev. 09)" (published on December 20, 2018), a typical ENERGY STAR home in Climate Zone 4 (Virginia's climate zone) saves homeowners approximately $450 - $500 per year on energy costs.

2. **The total amount of incentives offered to builders to achieve ENERGY STAR certification**: Incentives for ENERGY STAR certification vary by state and utility. In some instances, utilities will incentivize builders' entire cost of achieving ENERGY STAR certification and builders pass those savings to homebuyers during the sale of the house. Other times, and more often, utilities will incentivize a portion of builders' costs to achieve ENERGY STAR certification. The non-incentivized costs of ENERGY

STAR certification are passed on to homebuyers. However, in our experience, incentives offered to builders are not the primary cause of the difference in sale price of ENERGY STAR vs. non-ENERGY STAR certified homes. Market forces play the biggest role.

Virginia Electric and Power Company
Case No. PUR-2019-00201
Virginia Energy Efficiency Council
Second Set

The following response to Question No. 3(a) of the Second Set of Interrogatories and Requests for Production of Documents Propounded by Virginia Energy Efficiency Council received on February 10, 2020 has been prepared under my supervision.



Karim Siamer
Lead Economist,
Load Research and Forecast
Dominion Energy Services, Inc.

Question No. 3:

Reference Page 3, Lines 4-6 of the Direct Testimony of Nathan Frost. Mr. Frost states, "In March 2007, a voluntary energy efficiency goal of 10% electricity savings was enacted by the Virginia General Assembly. To achieve this goal, Dominion Energy Virginia launched its DSM Programs, consisting of energy efficiency and peak shaving programs."

a) Please state the total amount of electric energy (in kilowatt-hours) consumed by the Company's retail customers in calendar year 2006.

Response:

In calendar year 2006, the total amount of electric energy consumed by the Company's Virginia retail customers was estimated at **71,976,942,000 kWh**.

Virginia Electric and Power Company
Case No. PUR-2019-00201
Virginia Energy Efficiency Council
Second Set

The following response to Question No. 3(b) of the Second Set of Interrogatories and Requests for Production of Documents Propounded by Virginia Energy Efficiency Council received on February 10, 2020 has been prepared under my supervision.

Dan Feng

Dan Feng
Senior Consultant
DNV GL

Question No. 3

Reference Page 3, Lines 4-6 of the Direct Testimony of Nathan Frost. Mr. Frost states, "In March 2007, a voluntary energy efficiency goal of 10% electricity savings was enacted by the Virginia General Assembly. To achieve this goal, Dominion Energy Virginia launched its DSM Programs, consisting of energy efficiency and peak shaving programs."

b) Please state the total amount of electric energy (in kilowatt-hours) saved through the Company's implementation of its DSM Programs since their introduction in 2009 (Phase I to the present). Please provide a citation to the Company's evaluation, measurement, and verification filings that confirm these total savings.

Response:

Since the inception of the DSM Phase I Programs in 2010, Dominion Energy has achieved 2,717,397,693 kWh of net cumulative, non-annualized energy savings in Virginia.

The table below shows the savings, by program, and cites the 2019 EM&V Report Appendix D sections for each program. This Report was filed May 1, 2019, in Case PUR-2017-00129.

Using the Income and Age Qualifying Program as an example (Appendix D.1), the net cumulative, non-annualized energy savings in Virginia are the sum of all the values in the Table 5, "Net Energy (kWh), VA IRP" column on page D-16. Please see the following calculation as an example.

Example calculation:

Income and Age Qualifying Home Improvement Net Cumulative, Non-Annualized Energy Savings =

$$= \sum_{2015}^{2018} Net\ Energy(kWh), VA\ IRP$$

$$= 112{,}372\ kWh + 1{,}972{,}230\ kWh + 4{,}768{,}339\ kWh + 5{,}650{,}929\ kWh$$

$$= 12{,}503{,}870\ kWh$$

Please note the rounding difference between the 12,503,870 kWh in this example and the 12,503,869 kWh value listed in the table below.

DSM Phase	Program Name	Virginia 2010 - 2018, Cumulative, Net Non-annualized Energy Savings Estimates (kWh)	Citations of Appendices and Tables from May 2019 EM&V Report (PUR-2017-00129)
1	Residential Low Income	40,155,665	D.11. Table 6, Net Energy (kWh), Sum of "VA"
	Residential Lighting	948,371,939	D.10. Table 6, Net Energy (kWh), Sum of "VA"
	Commercial Lighting	524,195,409	D.17. Table 6, Net Energy (kWh), Sum of "VA"
	Commercial HVAC	42,762,452	D.18. Table 6, Net Energy (kWh), Sum of "VA"
2	Residential Home Energy Check-up	119,350,297	D.15. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Residential Heat Pump Upgrade	63,779,598	D.12. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Residential Heat Pump Tune-up	73,948,455	D.13. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Residential Duct Sealing	2,675,572	D.14. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Non-residential Duct Testing and Sealing	238,541,794	D.19. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Non-residential Energy Audit	162,400,731	D.20. Table 5, Net Energy (kWh), Sum of "VA IRP"
3	Non-residential Lighting Systems & Controls	344,518,050	D.3. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Non-residential Heating and Cooling Efficiency	66,434,038	D.4. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Non-residential Window Film	16,111,846	D.5. Table 5, Net Energy (kWh), Sum of "VA IRP"
4	Residential Income and Age Qualifying Home Improvement	12,503,869	D.1. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Residential Appliance Recycling	27,543,494	D.16. Table 5, Net Energy (kWh), Sum of "VA IRP"

5	Non-residential Small Business Improvement	30,421,359	D.6. Table 5, Net Energy (kWh), Sum of "VA IRP"
6	Non-residential Prescriptive	3,683,124	D.7. Table 5, Net Energy (kWh), Sum of "VA IRP"
	Total	**2,717,397,693**	-