Pathways for Energy Efficiency in Virginia: Scenarios for Virginia Electric and Power Company to Achieve the Virginia Clean Economy Act Energy Efficiency Savings Goals

Exhibit JG-2

Pathways for Energy Efficiency in Virginia

Scenarios for Virginia Electric and Power Company to Achieve the Virginia Clean Economy Act Energy Efficiency Savings Goals

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About the Authors

Energy Futures Group (EFG) is a clean energy consulting firm based in Hinesburg, Vermont and with offices in Boston and New York. EFG specializes in the design, implementation and evaluation of programs and policies to promote investments in energy efficiency, renewable energy, other distributed resources, and strategic electrification. EFG staff have worked on these issues on behalf of energy regulators, other government agencies, utilities and advocacy organizations across the United States, Canada, Europe, and China.

Liz Bourguet is a Senior Analyst at Energy Futures Group in Hinesburg, Vermont. She joined EFG in 2020 after graduating from the Yale School of Forestry and Environmental Studies with a Master of Environmental Management, specializing in environmental policy analysis. Her capstone report, Opportunities and Challenges for Investor-Owned Utilities in a Changing Climate, prepared for the Natural Resources Defense Council, assessed grid modernization and utility financing in the face of increasing wildfires in California. Her professional experience includes work for National Wildlife Federation and Environmental Advocates of New York, where she organized environmental campaigns, drafted policy recommendations, advocated for environmental legislation through lobbying and public outreach, and conducted research on energy policy and transportation issues. Most recently she held an internship with the US Climate Alliance, where she provided research and recommendations on best practice climate policies to the coalition of states committed to the Paris Agreement.

Jim Grevatt has 30 years of experience in energy efficiency program planning and operations. At Energy Futures Group Jim has advised regulators, program implementers, and advocates in twenty-three states and provinces, and has provided expert witness testimony in fourteen of those jurisdictions. Jim has hands-on experience with industry-leading approaches to designing and managing energy efficiency programs, including multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs. His in-depth knowledge of program operations and clear understanding of strategic thinking and planning ensure that programs achieve their desired market impacts. In past leadership roles at Efficiency Vermont, the DCSEU, and Vermont Gas, Jim had overall responsibility both for program design and operations, assuring that programs were efficient and effective.

I. Executive Summary

Introduction and Purpose

This report was developed to explore whether, by effectively implementing a suite of energy efficiency programs similar to those currently implemented by other large utilities, Virginia Electric and Power Company ("Dominion" or "Company") can meet and exceed the savings requirements of the Virginia Clean Economy Act ("VCEA"). The report was requested by a group of clean energy non-profits in Virginia, including the National Housing Trust ("NHT"), The Nature Conservancy ("TNC"), the Virginia chapter of the Advanced Energy Economy ("Virginia AEE"), and the American Council for an Energy Efficient Economy ("ACEEE").[1]

To support our analysis we created a model that builds off the programs that have been approved for implementation by the State Commerce Commission ("SCC" or "Commission") prior to 2021.[2] The model incorporates reported costs and savings from a dozen large utility energy efficiency portfolios ("comparison utilities" or "comparison portfolios")[3] and allows comparison of the savings results of user-defined scenarios that describe different combinations of programs at varying penetration levels. We created four different sample scenarios that highlight different policy priorities while maintaining opportunities for all eligible customer sectors, in each case demonstrating compliance with VCEA savings requirements. ***Our work shows that meeting the 2022-2025 savings requirements is achievable without extraordinary or unusual efforts by simply implementing the kinds of energy efficiency programs that commonly provide the majority of energy savings for leading electric utilities.*** The Company can meet its savings requirements with longer lasting comprehensive savings for commercial and residential customers, lower cost but shorter-lived measures, or a reasonable balance of the two. In each case we find the Company can also meet the VCEA requirements for energy efficiency investments for low-income communities, however these expenditures must increase significantly as other programs ramp up if the Company is to meet this obligation. Dominion can continue to work with its stakeholders to identify program opportunities while also focusing on implementing and expanding the key programs that will drive savings results if it expects to meet its VCEA requirements.

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[1] In this report, we refer to ACEEE, NHT, TNC, and Virginia AEE as the "core project team".

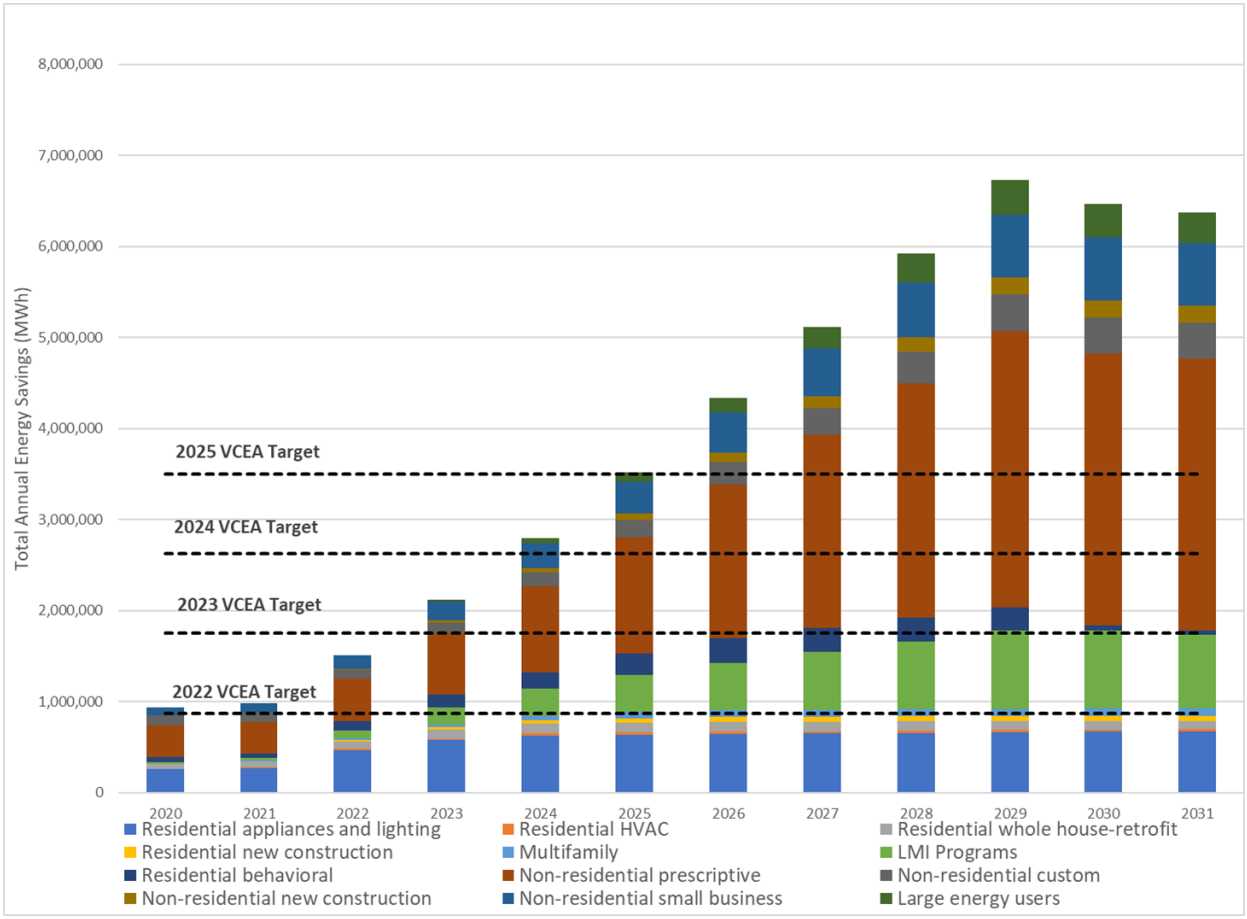
[2] These are programs that have been approved in Phase I through Phase VIII, referred to in Dominion's IRP as "Category 1" programs.

[3] To learn more about how we selected and utilized comparison utilities see Appendix A.

We further show that much of the savings achieved from programs geared towards meeting the 2022-2025 savings requirements are likely to persist through the decade – thus targets set by the Commission for 2026 and beyond should be achievable ***and*** should be established at considerably higher levels than the 5.0% total annual savings expected for 2025.

These points are illustrated below in Figure 1, which represents the expected results of the "Balanced Lower Cost"[4] scenario:

Figure 1: Example Scenario that Meets 2022-2025 VCEA Savings Targets



While the evidence provided by other large utilities gives us confidence that these results are reasonable and achievable, it is also clear that Dominion must act quickly to ramp up its program savings if it is to comply with the statute. We discuss this further below.

[4] The four scenarios are described in greater detail below.

Energy Efficiency Savings Requirements

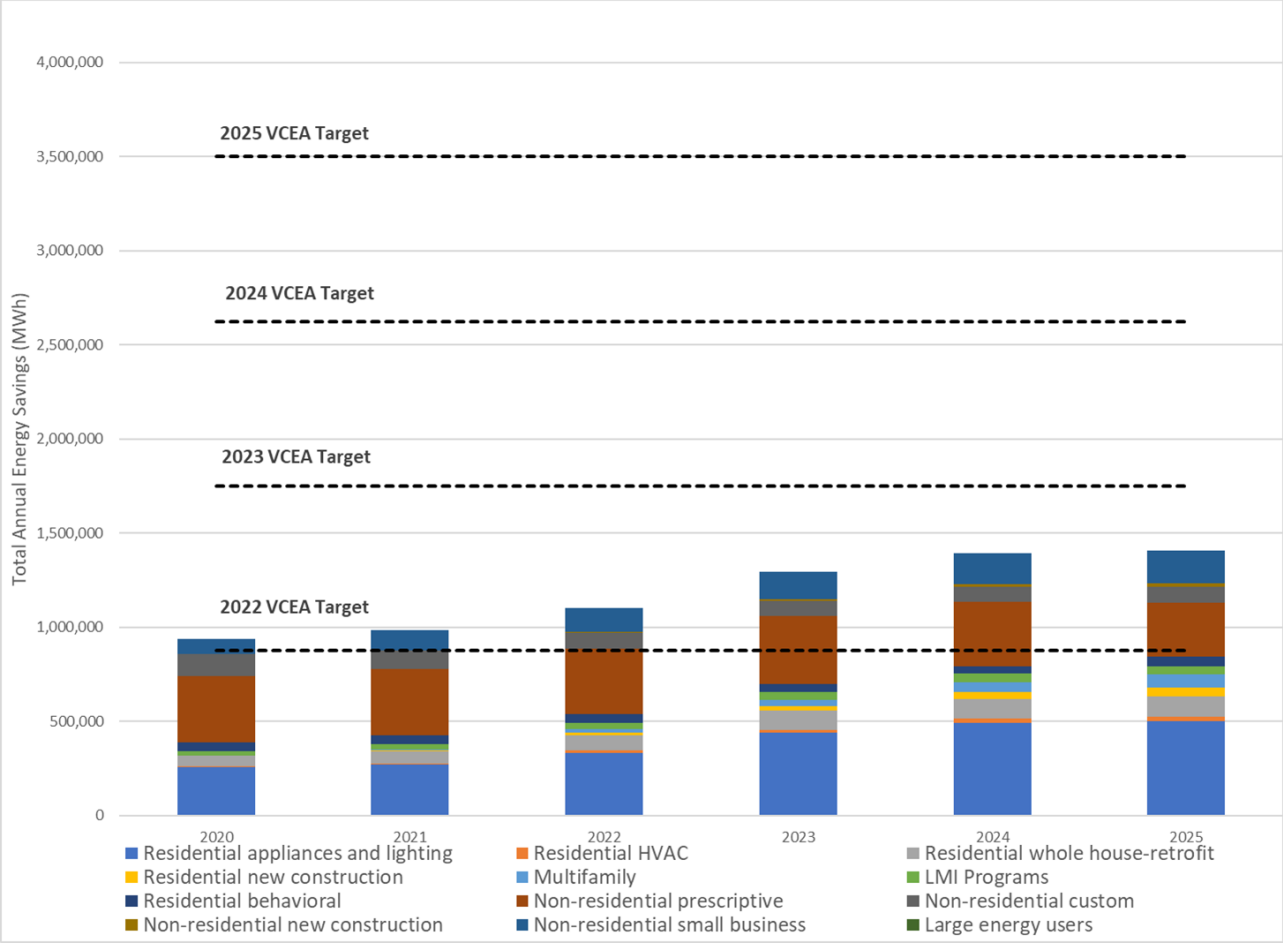
The VCEA, signed into law by Governor Northam in 2020, contains numerous provisions to accelerate Virginia's transition to clean energy, including a requirement that certain utilities achieve specified energy efficiency savings beginning in 2022. The law requires that in 2022 Dominion achieve total annual energy efficiency savings equal to at least 1.25% of its 2019 annual jurisdictional retail electric sales.[5] In 2023 the requirement doubles to 2.5%, then increases to 3.75% in 2024, and to 5.0% in 2025. Beginning in 2026, the law provides that the SCC shall establish new energy efficiency savings targets.

Figure 2 below is based on a scenario in which all new programs are set to "0" penetration so that only Dominion's programs that were approved prior to 2021 are modeled. It illustrates our analysis showing that if Dominion successfully implements its programs, it should achieve its 2022 VCEA saving requirement simply through the programs that were approved prior to 2021. However, it also shows that savings must be increased rapidly for the utility to achieve the savings requirement in 2023-2025. When compared with Dominion's modest portfolio of currently approved programs, achieving the VCEA requirements will demand significant increases in customer participation and a four-to-five-fold increase in incremental annual savings.[6] This will only occur through focused planning and skillful program implementation. Because many other utilities are already implementing successful, large-scale programs, we conclude it is reasonable that Dominion can also do what is required to meet the VCEA requirements.

[5] Total annual savings are the savings in a particular year from new measures installed in that year plus the savings still persisting from measures installed in prior years.

[6] Incremental annual savings are the savings in a particular year ***only*** from new measures installed in that year. Incremental annual savings do not include savings from measures installed in earlier years that are still active.

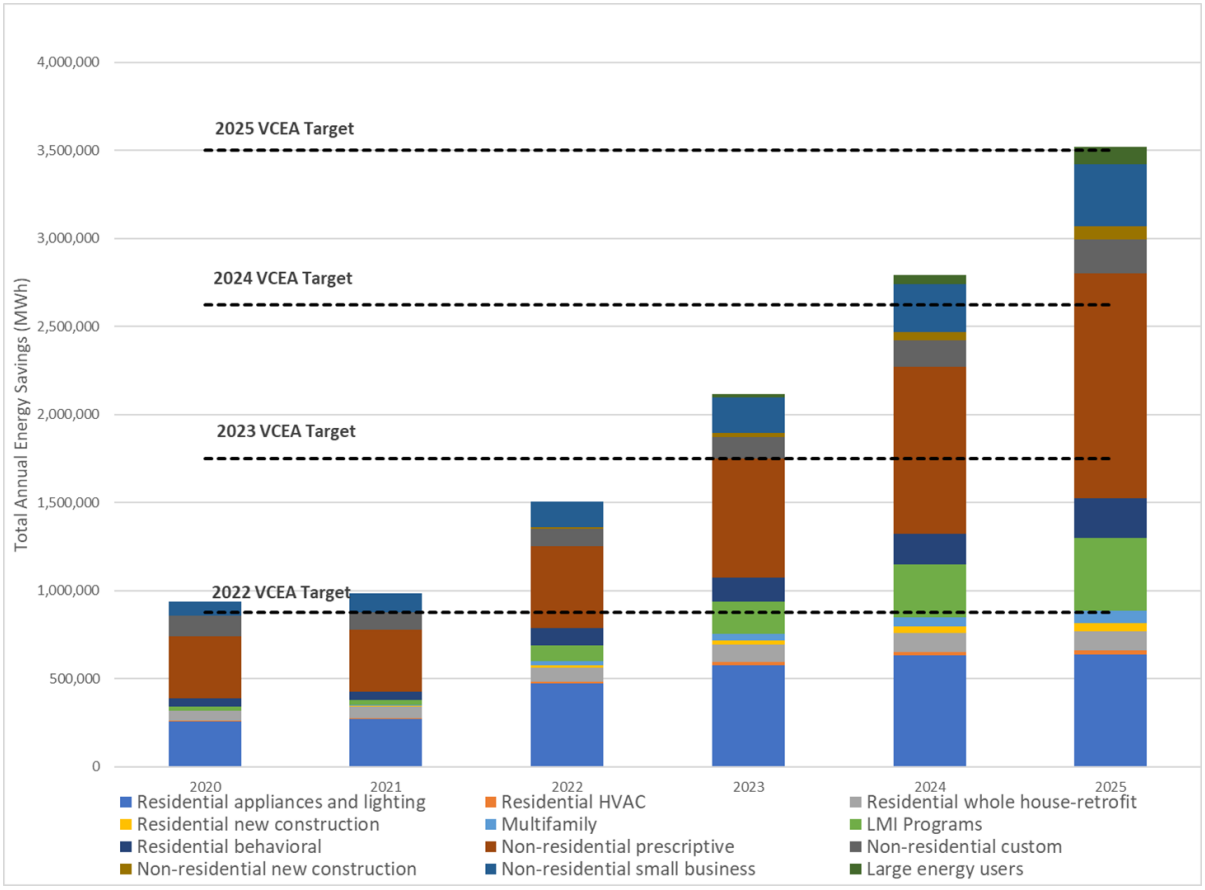
Figure 2: Savings from Dominion Programs Approved Prior to 2021



In Figure 3, we build programs up from the savings level illustrated in

Figure 2 to illustrate an example scenario in which the savings from programs approved by the SCC prior to 2021 are shown in 2020 and 2021 and then ramped up beginning in 2022 to achieve the VCEA savings requirements for 2023-2025. To ramp these programs up starting in 2022, we look to realistic program penetration rates achieved by other utilities.

Figure 3: Example Scenario that Meets 2022-2025 VCEA Savings



VCEA Requirements for Historically Underserved Customers

The VCEA further provides that at least 15% of the proposed costs of the Company's energy efficiency programs "shall be allocated to programs designed to benefit low-income, elderly, or disabled individuals or veterans"[7] ("LMI"). The Company will need to rapidly and effectively ramp up not only its residential and non-residential energy efficiency programs to meet the VCEA requirements, but it will also need to increase the scale of its proposed programs for low-income, elderly, or disabled individuals or veterans. Because the LMI requirement is framed as a percentage of total proposed portfolio spending and because it is evident that Dominion must increase overall spending to meet the VCEA savings requirements, the Company clearly will also need to propose increased LMI spending. The Pathways model checks whether the proposed LMI

[7] SB 851, lines 1866-1867.

programs meet the 15% portfolio spending requirement, and each of the four sample scenarios we created complies.

Expected Results from Currently Approved Programs

Our analysis of Dominion's currently approved (through Phase VIII) energy efficiency programs suggests that the Company could meet the VCEA savings requirement in 2022 if the approved programs achieve their intended results, but it will fall far short of meeting its obligations in 2023-2025 (as shown in Figure 2). It also appears that the approved program budgets will fall short of the 15% LMI requirement. In our analysis, the Company has proposed approximately $355 million in total portfolio spending from 2020-2025, and just under $39 million, or 11%, for total LMI programs in the same period.[8] Looking only at the programs that were approved prior to 2021, the Company appears poised to achieve roughly 6%-8% of its portfolio spending for LMI programs in 2022 and 2023, far short of the 15% requirement. While the LMI percent of portfolio spending increases to between 13%-15% for approved programs in 2024 and 2025, it is important to recognize that the implementation, and thus the spending, of many programs that were approved in earlier phases will be completed in those years. As a result, the overall budgets from only programs that were approved prior to 2021 are much lower than will be required to achieve the energy savings requirements. In other words, overall portfolio spending must increase to meet the savings requirements, thus LMI investments must also increase to comply with the 15% of proposed spending requirement.

II. Different Scenario Approaches and Results

Leading utilities typically rely on similar types of programs to achieve the majority of their energy efficiency savings simply because, despite regional differences in the predominance of certain savings opportunities, the electric technologies that we rely on are more similar than they are different across different utility service territories. Residential and commercial lighting and controls, industrial process and operational efficiency, heating and cooling equipment efficiency and building shell improvements, motors, refrigeration, and appliances – all of these tend to provide relevant and cost-effective savings opportunities in many parts of North America, even though the specific savings levels may vary regionally. However, while there are many similarities between utility energy efficiency approaches, individual utilities may emphasize certain program

[8] Program budgets through Phase VIII, assuming budget is allocated equally across five implementation years.

types over others based on the specific characteristics of their customer base and the policy priorities in their jurisdictions.

Dominion can meet its VCEA energy savings requirements through a variety of combinations of different program types, with each scenario reflecting differing priorities. In this report we highlight four example scenarios, but model users can explore additional scenarios in the Excel-based tool that we created. In the model, users can toggle each program between several different penetration levels and can determine ramp-up rates and start and stop years for program implementation to illustrate the multiple pathways available to Dominion to achieve its savings requirements.

The scenarios vary in emphasis and include energy efficiency portfolios focused on:

1) increased opportunities for historically underserved customers ("enhanced LMI"),
2) high residential savings ("high residential"),
3) small businesses ("high small business"), and
4) a "balanced" portfolio that seeks to provide some opportunities to all segments while minimizing program costs ("balanced lower cost").

Each scenario adheres to the requirements that Dominion meet its 2022-2025 VCEA savings targets as well as its 15% spending requirement on programs serving LMI customers established by the VCEA. ***The four example scenarios above illustrate that Dominion can achieve its 2022-2025 VCEA targets and its spending commitment to LMI customers. Importantly, we found that if program costs for Dominion are in line with the average program costs of the comparison utilities' portfolios, each of the four scenarios described below would also lead Dominion to comply with its Grid Transformation and Security Act (GTSA) requirement to propose at least $870 million in energy efficiency program investments between 2018-2028.***

Below are descriptions of the four example scenarios that we modeled to illustrate how Dominion can meet its energy savings requirement while emphasizing savings for different customer segments. We illustrate the results of each of these example scenarios in Appendix B. While each scenario has a different emphasis, each includes a balanced portfolio of programs that delivers energy efficiency to multiple customer segments. In each example scenario the bulk of new programs are modeled to launch in 2022 and ramp up over several years.

1. The **enhanced LMI scenario** emphasizes programs that maximize savings for historically underserved customers and exceeds the 15% LMI spending requirement. The LMI program

categories included are low-income multifamily, low-income single family, and low-income low cost, which includes programs such as LED or energy efficiency kits distributed through food banks and other avenues. This scenario is achieved through high levels of savings from each of the three LMI program categories. High levels of savings for this portfolio also come from non-residential prescriptive and small business programs. Moderate levels of savings come from each of the residential programs.[9]

2. The **high residential scenario** focuses on savings achieved from residential programs that provide significant savings to families and households. This includes high levels of savings from residential HVAC, whole house retrofits, new construction, market rate multifamily, and, to some extent, appliances, and lighting (reflecting changing standards and market maturity for screw-based LED lighting). This scenario also emphasizes LMI programs. This portfolio includes moderate levels of savings from non-residential prescriptive, small business, and large energy user programs.

3. The **high small business scenario** emphasizes energy savings for small business customers, while prioritizing non-residential prescriptive programs that could also benefit small businesses. In addition to its non-residential program focus, the scenario also achieves a moderate level of savings from residential LMI programs and residential appliances, near-term lighting, and behavioral programs.

4. The **balanced lower cost portfolio** is a portfolio of programs that reflect the lower end of potential program spending necessary for Dominion to meet VCEA targets through 2025 and its LMI spending requirement. It accomplishes this by balancing moderate levels of savings through residential energy efficiency programs with high-yield non-residential programs that provide the majority of the required savings. The residential programs include moderate levels of savings through residential behavioral, appliances and near-term retail lighting, and LMI programs. The non-residential programs include a high level of savings from the non-residential prescriptive program and moderate level of savings through non-residential small business and large energy users.

In

[9] Spending and savings targets for LMI energy efficiency programs are a starting point for measuring equity across utilities' efficiency portfolios. Utilities can also consider other metrics to ensure an equitable distribution of benefits across their portfolio. For example, researchers at the University of Michigan developed the Energy Efficiency Equity baseline (E3b) to examine differences in socioeconomic characteristics and policy approaches in each utility service territory and understand how these factors change over time. See their report to learn more: poverty.umich.edu/research-publications/policy-briefs/a-multi-state-analysis-of-equity-in-utility-sponsored-energy-efficiency-investments-for-residential-electric-customers/

Figure 4 below, we provide a comparison of the costs and savings for the comparison portfolios with the four example scenarios we created in our model in implementation year 2025. The example scenario costs are higher than the comparison portfolios for two primary reasons. First, in each of the example scenarios, residential lighting savings are dramatically reduced compared with the 2018 comparison portfolios due to the likelihood of federal standards being implemented. Second, the 15% LMI spending requirement results in greater LMI expenditures than we found with many of the comparison portfolios.

Figure 4: 2025 Program Scenarios and 2018 Comparison Utilities (Nominal 2018 $)

Portfolio totals	First year program costs	Total Incremental annual savings (MWh)	First year $/MWh	Weighted Average Measure Life	Incremental lifetime savings (MWh)	Levelized cost ($/MWh) in 2025
High Residential VCEA	$ 232,395,980	944,443	$ 246.07	10.24	9,671,806	$ 31.29
Balanced Lower Cost VCEA	$ 161,889,140	924,030	$ 175.20	9.70	8,962,107	$ 23.24
High Small Business VCEA	$ 193,592,982	999,061	$ 193.78	9.97	9,956,343	$ 25.16
Enhanced LMI VCEA	$ 227,414,935	1,055,232	$ 215.51	10.21	10,778,819	$ 27.45
Entergy Arkansas	$ 50,930,300	255,930	$ 199.00	14.74	3,772,407	$ 19.40
MidAmerican Energy	$ 63,804,277	322,760	$ 197.68	13.60	4,389,538	$ 20.38
Xcel Minnesota	$ 107,451,885	565,220	$ 190.11	12.80	7,234,811	$ 20.46
Baltimore Gas and Electric	$ 114,626,581	616,559	$ 185.91	10.10	6,227,249	$ 23.89
Consumers Energy	$ 117,838,710	641,648	$ 183.65	11.72	7,520,118	$ 21.08
Ameren Missouri	$ 66,483,135	364,080	$ 182.61	11.25	4,095,898	$ 21.61
Commonwealth Edison	$ 352,988,361	2,064,720	$ 170.96	9.90	20,440,728	$ 22.31
DTE Electric	$ 127,955,350	777,405	$ 164.59	12.60	9,795,299	$ 17.92
Duke Energy Carolinas	$ 128,422,575	858,096	$ 149.66	8.20	7,036,387	$ 22.69
AEP Ohio	$ 62,864,638	467,385	$ 134.50	12.02	5,617,973	$ 15.16
Duke Energy Ohio	$ 32,134,301	292,107	$ 110.01	9.31	2,719,521	$ 15.07
First Energy Ohio	$ 30,597,049	286,819	$ 106.68	11.25	3,226,709	$ 12.63

Each of the four scenarios illustrates a different approach that Dominion could use to meet its 2022-2025 energy savings targets within cost parameters that are consistent with comparison utilities.[10] Beyond 2025, the scenarios show the potential for Dominion to achieve significant continued savings through 2030.

III. Savings Opportunities Beyond 2025

The VCEA calls for the Commission to assign savings requirements for the utilities after the current 2022-2025 period that is prescribed in statute. Utility programs, including those of many

[10] Note that the 15% LMI spending requirement leads to higher overall portfolio costs than are representative of the comparison portfolios. The scenario modeling also reflects an end to retail efficient LED bulb promotions after 2023, based on assumed market maturity and implementation of federal lighting efficiency standards.

if not all of the comparison utilities, are operated on a multi-year basis, and energy savings opportunities will continue to exist for Dominion and its customers well beyond 2025. The model we developed allows the user to set start and end years for each base program, and we assumed that Dominion would ramp up energy efficiency programming at a rate necessary to meet the VCEA requirements – likely somewhere between 1.0%-1.5% incremental annual savings as a percent of sales on an ongoing basis. This level of savings is achievable, based on the accomplishments of the comparison utilities we used as the basis for our modeled results. Doing so would lead to significant bill savings for Virginians, improved economic conditions for customers, and would support reduced climate damage due to inefficient energy use.

By definition, maximizing the implementation of cost-effective energy efficiency reduces the Company's costs to meet its primary mandate: providing safe and reliable energy. Investments in energy efficiency can reduce the need for expensive infrastructure investments – costs which are ultimately borne by customers. When energy efficiency can make generation, transmission, and distribution investments unnecessary, or even when it can defer those investments for a period of time, it becomes a critical component of the Company's resource and investment management. For this reason, the VCEA calls for the Commission to determine future goals for Dominion. Our model suggests that there will continue to be ample opportunity for the Company to aggressively pursue energy efficiency goals, thus supporting its ability to meet its primary obligation at the lowest cost to customers.

IV.Conclusion

Our review of the program pathways used by a dozen comparably-sized utility energy efficiency providers, and the application of modeling based on their reported results, shows that Dominion can reasonably achieve the VCEA savings requirements with the timely, effective implementation of best-practice energy efficiency programs. Currently approved programs, should the Company achieve its planned savings, will only carry it towards its 2022 VCEA savings requirement. To meet savings requirements for 2023 and beyond, Dominion will need to aggressively increase its savings from energy efficiency programs. Dominion can pursue a variety of program and portfolio options, but it must act in the near term to begin ramping up such programs in order to meet its 2023-2025 savings obligations and maximize benefits for all Virginians. Dominion can continue to work with its stakeholders to identify program opportunities while also focusing on identifying and implementing expansion of the key programs that will drive savings results to meet its VCEA requirements.

Appendix A – Methodology

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In order to assess the implications of different combinations of programs and savings levels for Dominion to achieve its VCEA targets, we created an Excel-based modeling tool. The tool incorporates savings and costs from Dominion's currently proposed and approved programs (through Phase VIII), as well as data from comparison utilities used to ground the model in realistic savings opportunities. We developed four example scenarios with varying levels of emphasis on specific program categories to illustrate how Dominion can meet its energy savings targets. Model users can develop new scenarios to further explore program emphases that align with their priorities.

The first step in the process of developing the model was to identify the common energy efficiency program types from which program administrators achieve most of their portfolio savings. Without attempting to model detailed specific program designs, we use these "base programs" to illustrate where Dominion would most reasonably focus its efforts to achieve the majority of its savings in the proposed scenarios. After receiving feedback from the core project team and from experts at EFG, we identified 12 base program categories. For residential programs, the base programs were appliances and lighting, HVAC, whole house-retrofit, new construction, multifamily (cross-cutting residential and commercial), low-income, and behavioral. We further divided the low-income category into single-family, multi-family, and low-income low cost. Non-residential base program categories included non-residential prescriptive, custom, new construction, small business, and large energy users. Note that while the model includes an appliances and lighting base program, historically the vast majority of savings in these program types have come from the promotion of efficient lightbulbs at retail locations. Given the likelihood of federal lighting standards implementation, and the inevitability of transformation in screw-based standard lighting, we recommend that any future use of the model to develop additional scenarios assume a very limited implementation time frame for retail lighting – if any at all – consistent with the approach we used.

We then mapped Dominion's current and proposed programs to the base program categories. We consulted the core project team for this step. Dominion's current and proposed programs served as an input for savings through 2025 in the model – the last implementation year for which the programs are currently approved.

In order to develop realistic scenarios for Dominion to achieve its VCEA targets, the model needed to include savings, costs, and average measure life data from similar utilities. We selected 12 comparison utilities achieving at least one percent incremental annual savings in relatively similar geographies, including utilities located in the Southeast or Midwest. These include AEP

Ohio, Ameren Missouri, Baltimore Gas and Electric, Commonwealth Edison, Consumers Energy, Duke Energy Carolinas, DTE Electric, Duke Energy Ohio, Entergy Arkansas, MidAmerican Energy, First Energy Ohio, and Xcel Minnesota. Data for each utility come from their 2018 DSM annual reports.

We used the comparison portfolios to develop inputs for the model. First, we mapped each utility program to base program categories in order to easily create unified metrics. Programs that could not clearly be mapped to the base programs were not included, as our intent was not to represent all available program types, but rather to focus on the kinds of programs that large utilities have typically used to achieve high savings levels. Using reported program data available through the utilities' 2018 DSM annual reports, we determined savings, costs, and average useful measure life (when available) for each utility. We used sales data from the 2018 EIA Annual Electric Power Industry Report[11] to calculate savings as a percent of sector MWh sales for each base program for each utility. We used net savings where those were reported by the utilities and converted reported gross savings to net savings using the 83.1% default net to gross ratio that ACEEE calculated in its 2020 Utility Scorecard.[12] By dividing reported program costs by reported net annual MWh savings, we calculated costs per first year MWh saved. We also collected data from the comparison utilities' 2018 DSM annual reports for weighted average useful measure life ("EUL") by program for utilities that report this metric. Where EUL data were not specifically provided but lifecycle savings were reported in addition to annual savings, we used those data to calculate the EUL by program.

We then compiled the data from the comparison utilities and averaged them for each of the metrics (savings, costs, and average measure life) by base program to determine inputs for the model. We used the percentage of sectors sales for each base program as the input for penetration rates in the model scenarios. The average of percent sector sales across utilities served as the medium penetration rate for that base program. High penetration rate is the average of the three highest sector sales percentages, and the low penetration rate is the average of the three lowest. Costs for each base program are the average of all costs per MWh from the comparison utilities after we removed outliers from the calculation.[13] We calculated the average

[11] U.S. Energy Information Administration, *Annual Electric Power Industry Report*, *Form EIA-861 detailed data files*, accessed October 28, 2020, www.eia.gov/electricity/data/eia861/.

[12] ACEEE 2020 Utility Scorecard, p.10. www.aceee.org/research-report/u2004.

[13] Not all of the comparison utilities implemented programs that could be clearly mapped to our base program categories, and in some cases the range of program costs for the comparison utilities was large. Presumably, this

measure life for each base program by taking the average of all comparison utilities reporting this metric.

We created an Excel-based modeling tool that projects multi-year total portfolio energy savings by summing savings from the base programs and the savings from Dominion's approved and proposed programs. The model allows users to alter inputs for certain variables (penetration rate, ramp up period, and start/end date) that will change the level of savings achieved from the base programs (within given parameters) to calculate multi-year energy savings. We built protections into the model to limit users' ability to develop scenarios that are not grounded in the empirical evidence provided by the comparison portfolios. For example, a user cannot create a scenario with base programs above the high penetration rate – even though it might be possible for a utility to achieve that higher level of savings. High penetration rate is not meant to represent a maximum achievable scenario; rather, it is intended to represent a savings level for which there is a high level of confidence in its achievability, based on the performance of the three highest performing utilities in our comparison for each base program. The input table from the model is illustrated below in Figure 5:

is primarily because of differences in implementation strategies. To reduce the likelihood of using costs in the model that were skewed by less representative programs, the high and low outlier costs were not included in the determination of average.

Figure 5: Model Input Selection

Inputs - Start Here				
	Penetration rate	Ramp up years	Start year	End year
Residential appliances and lighting	MED	2	2022	2023
Residential HVAC	LOW	4	2022	2030
Residential whole house-retrofit	MED	4	2022	2030
Residential new construction	LOW	4	2024	2030
Multifamily	MED	4	2022	2030
Residential behavioral	MED	4	2022	2030
Non-residential prescriptive	HIGH	4	2022	2030
Non-residential custom	LOW	4	2022	2030
Non-residential new construction	LOW	4	2022	2030
Non-residential small business	MED	4	2022	2030
Large energy users	MED	4	2023	2030
LMI Programs:				
Low-income multifamily	MED	2	2022	2030
Low-income single family	MED	2	2022	2030
Low-income low-cost	MED	2	2022	2030

The modeling tool allows the user to change four variables for each base program to create new portfolio scenarios: penetration rate, ramp up period, year of program start, and end year of each program. Penetration rate is the level of uptake of a program, represented by a percent of Dominion's sector sales. The options for input for penetration rate are zero, low, medium, and high. Each option represents a specified level of savings as a percent of sector sales and reflects the range of program achievement by comparable utilities and program administrators. The ramp up period describes the period of time a program requires to reach its full incremental annual savings level. The ramp up of savings increases linearly, and the input can be between one to five years. The start year and end year of each program define a program's implementation life, indicating how long a new program will achieve incremental annual savings. New proposed programs will start in or after 2022 and their savings are added to those expected to occur as a result of Dominion's programs that were approved prior to 2021. The model will project new incremental annual and total annual savings through 2031, to incorporate 10 years of savings from 2022, when the first modeled programs are implemented.

Once the model reflected the inputs of both Dominion's Category 1 programs and the metrics from the comparison portfolios, we developed scenarios to illustrate pathways for Dominion to meet the VCEA targets. EFG consulted the core project team to create a list of scenarios most useful for Dominion and Virginia stakeholders. We developed the following scenarios: balanced

lower cost, enhanced LMI, high residential, and high small business. These scenarios reflect varying emphasis on specific base programs. The enhanced LMI scenario, for example, places an emphasis on low-income programs and results in a spending more than the required 15 percent on LMI programs. Through each of these scenarios, Dominion could achieve its VCEA targets and LMI spending requirement.

The model indicates whether the inputs reflect a scenario in which Dominion would achieve its 2022-2025 targets and illustrates incremental annual savings and total annual savings in future years through 2031. The model also includes costs output, a determination of whether Dominion would meet the 15 percent LMI spending requirement in the scenario, and a comparison of the levelized costs in program implementation year 2025 of the user-created scenario to the levelized costs of the four example scenarios and the comparison utilities' 2018 reported portfolio results.[14]

[14] Comparison utility data for the Cost Comparison tab were taken from ACEEE 2020 Utility Scorecard, Appendix B.

Table 1: Base Program $/ First Year MWh Saved. Pink cells denote outliers

	AEP Ohio	Ameren Missouri	Baltimore Gas and Electric (BGE)	Commonwealth Edison (ComEd)	Consumers Energy	Duke Energy Carolinas (DEC)	DTE Electric	Duke Energy Ohio	Entergy Arkansas	MidAmerican Energy	First Energy Ohio	Xcel Minnesota	Average	Average - outliers removed
Residential appliances and lighting	$ 136.49	$ 202.91	$ 146.39	$ 165.01	$ 148.77	$ 222.59	$ 124.78	$ 112.18	$ 215.86	$ 201.09	$ 106.62	$ 58.21	**$ 153.41**	**$ 151.17**
Residential HVAC		$ 233.06	$ 945.19	$ 735.04	$ 322.36	$ 1,030.96	$ 392.09		$ 188.08			$ 516.17	**$ 545.37**	**$ 538.28**
Residential whole house-retrofit			$ 681.35	$ 393.34	$ 665.94	$ 366.40	$ 356.60	$ 405.80	$ 314.29	$ 708.19		$ 1,901.08	**$ 643.67**	**$ 511.09**
Residential new construction	$ 504.28		$ 656.84	$ 1,685.63	$ 825.41		$ 570.26			$ 406.75		$ 268.15	**$ 702.47**	**$ 592.71**
Multifamily					$ 425.96	$ 168.70	$ 202.40		$ 111.91	$ 559.04		$ 357.78	**$ 304.30**	**$ 288.71**
Low-income multifamily			$ 2,782.80	$ 1,313.59	$ 474.03		$ 2,377.95					$ 2,878.35	**$ 1,965.34**	**$ 2,189.96**
Low-income single family			$ 6,834.55	$ 3,720.77	$ 407.62	$ 1,240.54	$ 1,141.91	$ 1,172.11				$ 858.95	**$ 2,196.64**	**$ 1,626.86**
Low-income low-cost				$ 118.42									**$ 118.42**	**$ 118.42**
Residential behavioral	$ 18.64		$ 31.97	$ 19.04	$ 31.32	$ 41.24	$ 76.80	$ 43.37		$ 50.76		$ 112.81	**$ 47.33**	**$ 42.07**
Non-residential prescriptive	$ 120.35	$ 136.30	$ 274.86	$ 138.78		$ 150.98	$ 82.54	$ 128.33	$ 172.01	$ 180.29	$ 106.31	$ 129.93	**$ 147.33**	**$ 140.36**
Non-residential custom	$ 103.43	$ 152.41	$ 429.07	$ 340.34	$ 180.47	$ 205.38	$ 159.48	$ 136.06	$ 326.48	$ 235.09		$ 133.22	**$ 218.31**	**$ 207.66**
Non-residential new construction	$ 160.33	$ 119.96		$ 340.26						$ 126.56		$ 227.55	**$ 194.93**	**$ 171.48**
Non-residential small business	$ 286.34	$ 225.51	$ 503.25	$ 267.72	$ 265.32	$ 200.22		$ 249.54	$ 267.11		$ 101.00		**$ 262.89**	**$ 251.68**
Large energy users	$ 128.89			$ 208.28								$ 121.06	**$ 152.74**	**$ 152.74**

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Table 2: Base Program Savings % of Sector Sales

	AEP Ohio	Ameren Missouri	Baltimore Gas and Electric (BGE)	Commonwealth Edison (ComEd)	Consumers Energy	Duke Energy Carolinas (DEC)	DTE Electric	Duke Energy Ohio	Entergy Arkansas	MidAmerican Energy	First Energy Ohio	Xcel Minnesota	Average	Average Highest 3	Average Lowest 3
Residential appliances and lighting	0.7728%	0.1046%	0.8594%	1.2952%	0.7664%	0.6773%	1.1614%	1.2657%	0.4491%	0.9451%	1.2988%	1.4526%	0.9207%	1.3489%	0.4104%
Residential HVAC		0.3459%	0.0642%	0.0357%	0.0692%	0.0228%	0.0824%		0.1425%			0.1613%	0.1155%	0.2166%	0.0409%
Residential whole house-retrofit			0.4440%	0.0857%	0.0415%	0.0261%	0.0232%	0.0357%	0.3850%	0.0678%		0.0039%	0.1237%	0.3049%	0.0177%
Residential new construction	0.0371%		0.0426%	0.0008%	0.0042%		0.0519%			0.0512%		0.0299%	0.0311%	0.0486%	0.0116%
Multifamily			0.0222%	0.0417%	0.0573%	0.0721%	0.0172%		0.0578%	0.1243%		0.0216%	0.0518%	0.0847%	0.0203%
Low-income multifamily			0.0028%	0.0314%	0.0287%		0.0072%					0.0042%	0.0149%	0.0225%	0.0048%
Low-income single family			0.0072%	0.0107%	0.0773%	0.0176%	0.0206%	0.0050%				0.0173%	0.0223%	0.0385%	0.0076%
Low-income low-cost				0.3434%									0.3434%		
Residential behavioral	0.4921%		1.4611%	0.9916%	0.3163%	1.0847%	0.3930%	1.1146%		0.5349%		0.1647%	0.7281%	1.2202%	0.2914%
Non-residential prescriptive	0.7950%	0.8773%	0.8074%	0.7887%		0.3603%	0.7618%	0.8252%	0.0933%	0.6985%	0.2979%	1.7637%	0.7336%	1.1554%	0.2505%
Non-residential custom	0.2461%	0.4372%	0.7142%	0.0757%	1.2369%	0.0655%	0.3530%	0.3165%	0.8756%	1.6953%		1.0480%	0.6422%	1.3268%	0.1291%
Non-residential new construction	0.1749%	0.0963%		0.0366%						0.7798%		0.4908%	0.3157%	0.6353%	0.0665%
Non-residential small business	0.0954%	0.0751%	0.1300%	0.3410%	0.2269%	0.1568%		0.1782%	0.1317%		0.4987%		0.2038%	0.3555%	0.1002%
Large energy users	0.1147%			0.0528%								0.3991%	0.1889%	0.3991%	0.0528%

Appendix B – Four Example Scenarios

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Figure 6: Enhanced LMI Scenario Inputs and Outputs

	Penetration rate	Ramp up years	Start year	End year		
Residential appliances and lighting	MED	2	2022	2023		
Residential HVAC	MED	4	2022	2030		
Residential whole house-retrofit	MED	4	2022	2030		
Residential new construction	MED	4	2024	2030		
Multifamily	MED	4	2022	2030		
Residential behavioral	MED	4	2022	2030		
Non-residential prescriptive	HIGH	4	2022	2030		
Non-residential custom	LOW	4	2022	2030		
Non-residential new construction	LOW	4	2022	2030		
Non-residential small business	HIGH	4	2022	2030		
Large energy users	MED	4	2023	2030		
LMI Programs:						
Low-income multifamily	HIGH	2	2022	2030		
Low-income single family	HIGH	2	2022	2030		
Low-income low-cost	HIGH	2	2022	2030		

Outputs	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Total Incremental annual savings	0.23%	0.07%	0.80%	1.05%	1.25%	1.42%
Total annual savings as a % of 2019 Retail Sales	1.34%	1.41%	2.21%	3.18%	4.29%	5.52%
VCEA Savings Targets	-	-	1.25%	2.50%	3.75%	5.00%
Target met?	-	-	Yes	Yes	Yes	Yes
LMI 15% cost requirement met?			Yes	Yes	Yes	Yes
LMI total annual savings as a % of total portfolio savings	2.21%	2.55%	6.03%	8.60%	10.54%	11.28%

Figure 7: Enhanced LMI Scenario Savings

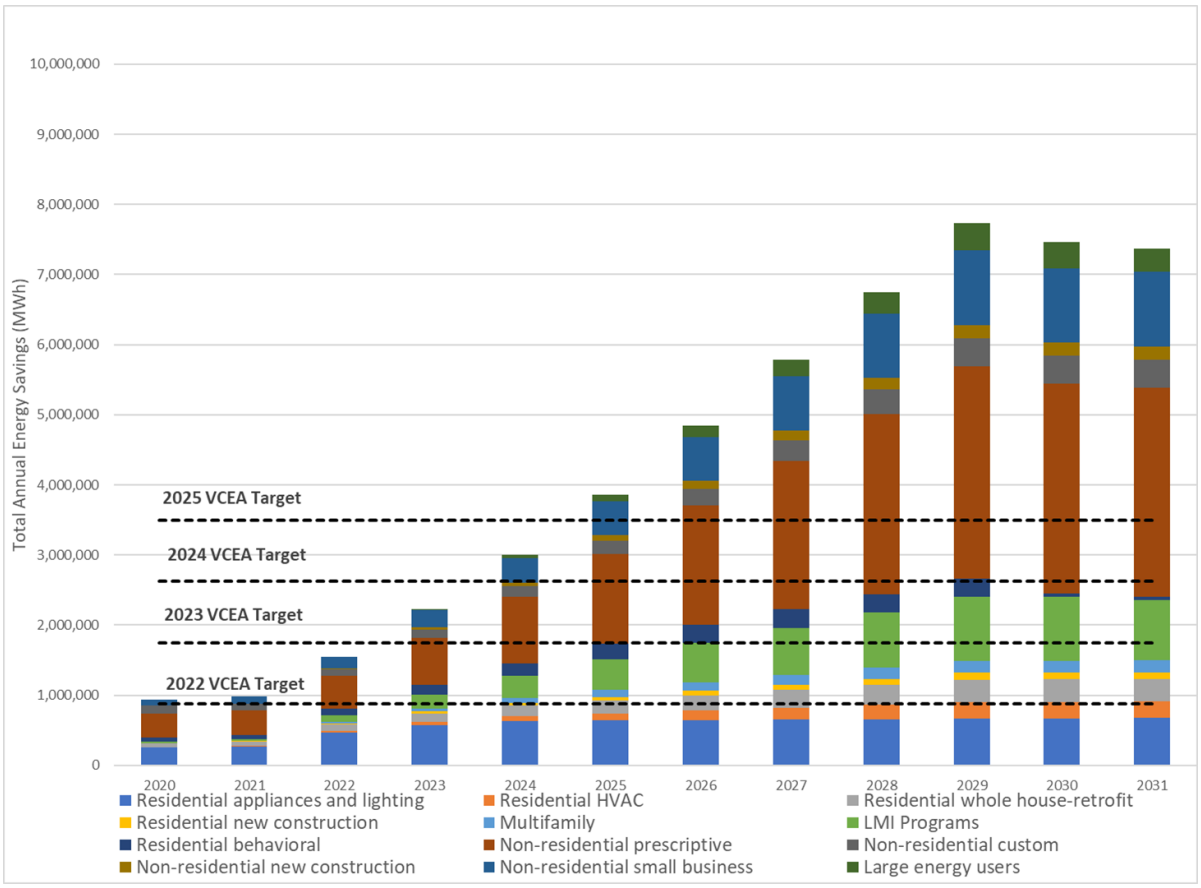

Figure 8: Enhanced LMI Scenario Costs through 2025

	2020	2021	2022	2023	2024	2025
Residential appliances and lighting	$ 9,820,000	$ 11,960,000	$ 32,718,380	$ 11,960,000	$ 2,140,000	$ 2,140,000
Residential HVAC	$ 33,820,000	$ 33,820,000	$ 6,036,061	$ 9,513,106	$ 11,590,152	$ 15,067,198
Residential whole house-retrofit	$ 4,680,000	$ 6,920,000	$ 11,632,796	$ 15,167,393	$ 14,021,990	$ 17,556,587
Residential new construction	$ -	$ 7,200,000	$ 7,200,000	$ 7,200,000	$ 8,574,806	$ 9,605,910
Multifamily	$ -	$ 2,920,000	$ 5,208,501	$ 6,924,877	$ 8,641,253	$ 10,357,629
LMI Programs	$ 9,300,000	$ 13,360,000	$ 26,801,255	$ 38,171,883	$ 49,542,511	$ 49,542,511
Residential behavioral	$ 1,860,000	$ 1,860,000	$ 4,144,476	$ 5,857,834	$ 7,571,191	$ 7,424,548
Non-residential prescriptive	$ 12,040,000	$ 14,140,000	$ 30,427,087	$ 35,442,403	$ 42,817,718	$ 55,033,033
Non-residential custom	$ -	$ -	$ 2,691,745	$ 4,710,554	$ 6,729,363	$ 8,748,172
Non-residential new construction	$ -	$ 3,020,000	$ 4,164,931	$ 5,023,629	$ 5,882,328	$ 6,741,026
Non-residential small business	$ 7,180,000	$ 11,240,000	$ 15,525,664	$ 22,264,912	$ 26,524,160	$ 33,263,408
Large energy users	$ -	$ -	$ -	$ 4,773,965	$ 8,354,440	$ 11,934,914
Total cost ($/year)	$ 78,700,000	$ 106,440,000	$ 146,550,897	$ 167,010,557	$ 192,389,911	$ 227,414,935

Figure 9: High Residential Scenario Inputs and Outputs

	Penetration rate	Ramp up years	Start year	End year		
Residential appliances and lighting	MED	2	2022	2023		
Residential HVAC	HIGH	4	2022	2030		
Residential whole house-retrofit	HIGH	4	2022	2030		
Residential new construction	HIGH	4	2024	2030		
Multifamily	HIGH	4	2022	2030		
Residential behavioral	MED	4	2022	2030		
Non-residential prescriptive	MED	4	2022	2030		
Non-residential custom	LOW	4	2022	2030		
Non-residential new construction	LOW	4	2022	2030		
Non-residential small business	MED	4	2022	2030		
Large energy users	MED	4	2023	2030		
LMI Programs:						
Low-income multifamily	MED	2	2022	2030		
Low-income single family	HIGH	2	2022	2030		
Low-income low-cost	MED	2	2022	2030		

Outputs	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Total Incremental annual savings	0.23%	0.07%	0.75%	0.96%	1.12%	1.26%
Total annual savings as a % of 2019 Retail Sales	1.34%	1.41%	2.16%	3.05%	4.03%	5.10%
VCEA Savings Targets	-	-	1.25%	2.50%	3.75%	5.00%
Target met?	-	-	Yes	Yes	Yes	Yes
LMI 15% cost requirement met?			Yes	Yes	Yes	Yes
LMI total annual savings as a % of total portfolio savings	2.21%	2.55%	6.10%	8.86%	11.04%	12.01%

Figure 10: High Residential Scenario Savings

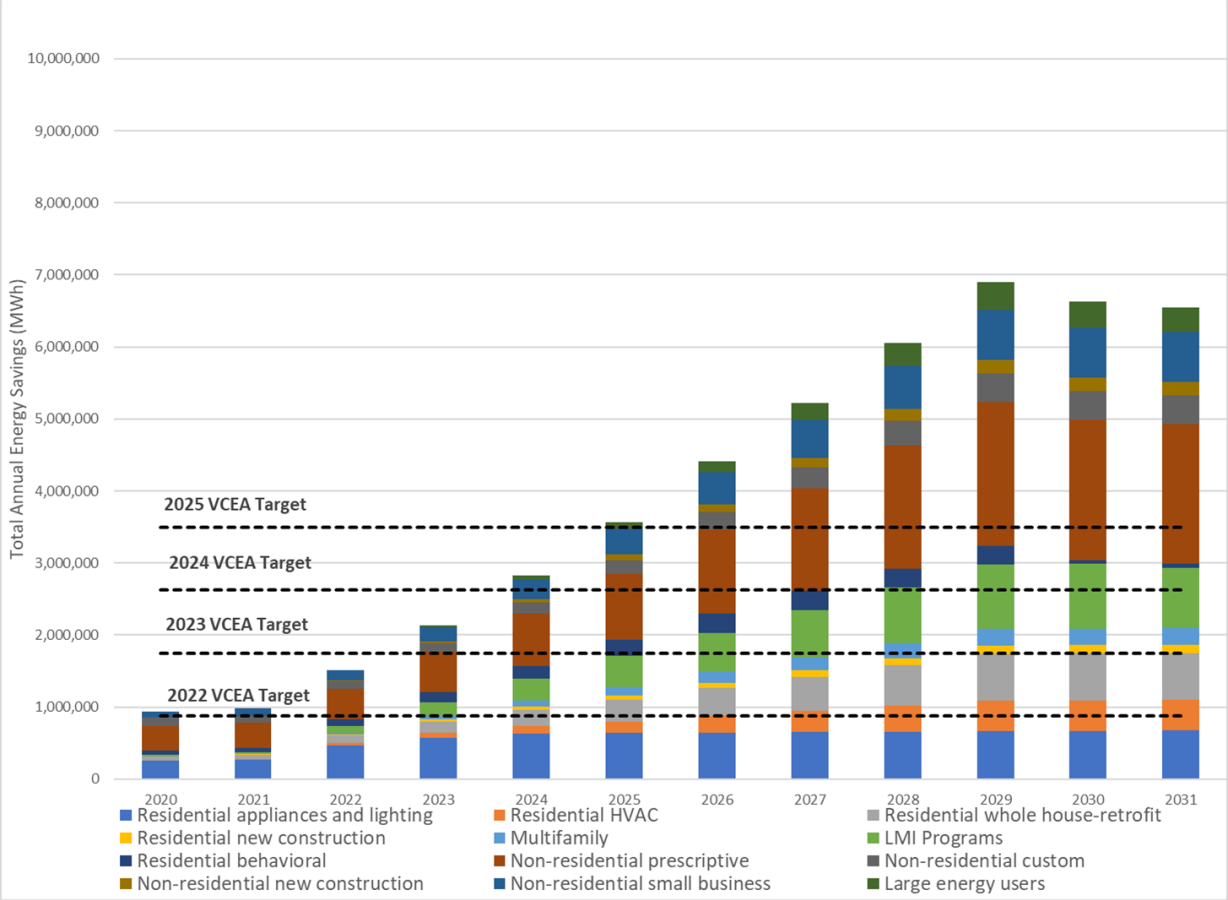

Figure 11: High Residential Scenario Costs through 2025

	2020	2021	2022	2023	2024	2025
Residential appliances and lighting	$ 9,820,000	$ 11,960,000	$ 32,718,380	$ 11,960,000	$ 2,140,000	$ 2,140,000
Residential HVAC	$ 33,820,000	$ 33,820,000	$ 10,093,604	$ 16,613,807	$ 21,734,010	$ 28,254,213
Residential whole house-retrofit	$ 4,680,000	$ 6,920,000	$ 18,540,453	$ 27,255,794	$ 31,291,134	$ 40,006,474
Residential new construction	$ -	$ 7,200,000	$ 7,200,000	$ 7,200,000	$ 9,346,151	$ 10,955,765
Multifamily	$ -	$ 2,920,000	$ 6,664,752	$ 9,473,315	$ 12,281,879	$ 15,090,443
LMI Programs	$ 9,300,000	$ 13,360,000	$ 24,327,924	$ 34,461,887	$ 44,595,849	$ 44,595,849
Residential behavioral	$ 1,860,000	$ 1,860,000	$ 4,144,476	$ 5,857,834	$ 7,571,191	$ 7,424,548
Non-residential prescriptive	$ 12,040,000	$ 14,140,000	$ 24,480,440	$ 25,035,769	$ 27,951,099	$ 35,706,429
Non-residential custom	$ -	$ -	$ 2,691,745	$ 4,710,554	$ 6,729,363	$ 8,748,172
Non-residential new construction	$ -	$ 3,020,000	$ 4,164,931	$ 5,023,629	$ 5,882,328	$ 6,741,026
Non-residential small business	$ 7,180,000	$ 11,240,000	$ 11,690,200	$ 15,552,849	$ 16,935,499	$ 20,798,149
Large energy users	$ -	$ -	$ -	$ 4,773,965	$ 8,354,440	$ 11,934,914
Total cost ($/year)	$ 78,700,000	$ 106,440,000	$ 146,716,905	$ 167,919,404	$ 194,812,942	$ 232,395,980

Figure 12: High Small Business Scenario Inputs and Outputs

	Penetration rate	Ramp up years	Start year	End year		
Residential appliances and lighting	MED	2	2022	2023		
Residential HVAC	LOW	4	2022	2030		
Residential whole house-retrofit	LOW	4	2022	2030		
Residential new construction	LOW	4	2024	2030		
Multifamily	LOW	4	2022	2030		
Residential behavioral	MED	4	2022	2030		
Non-residential prescriptive	HIGH	4	2022	2030		
Non-residential custom	LOW	4	2022	2030		
Non-residential new construction	LOW	4	2022	2030		
Non-residential small business	HIGH	4	2022	2030		
Large energy users	MED	4	2023	2030		
LMI Programs:						
Low-income multifamily	MED	2	2022	2030		
Low-income single family	HIGH	2	2022	2030		
Low-income low-cost	MED	2	2022	2030		

Outputs	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Total Incremental annual savings	0.23%	0.07%	0.78%	1.01%	1.18%	1.34%
Total annual savings as a % of 2019 Retail Sales	1.34%	1.41%	2.19%	3.12%	4.17%	5.31%
VCEA Savings Targets	-	-	1.25%	2.50%	3.75%	5.00%
Target met?	-	-	Yes	Yes	Yes	Yes
LMI 15% cost requirement met?			Yes	Yes	Yes	Yes
LMI total annual savings as a % of total portfolio savings	2.21%	2.55%	6.03%	8.66%	10.69%	11.53%

Figure 13: High Small Business Scenario Savings

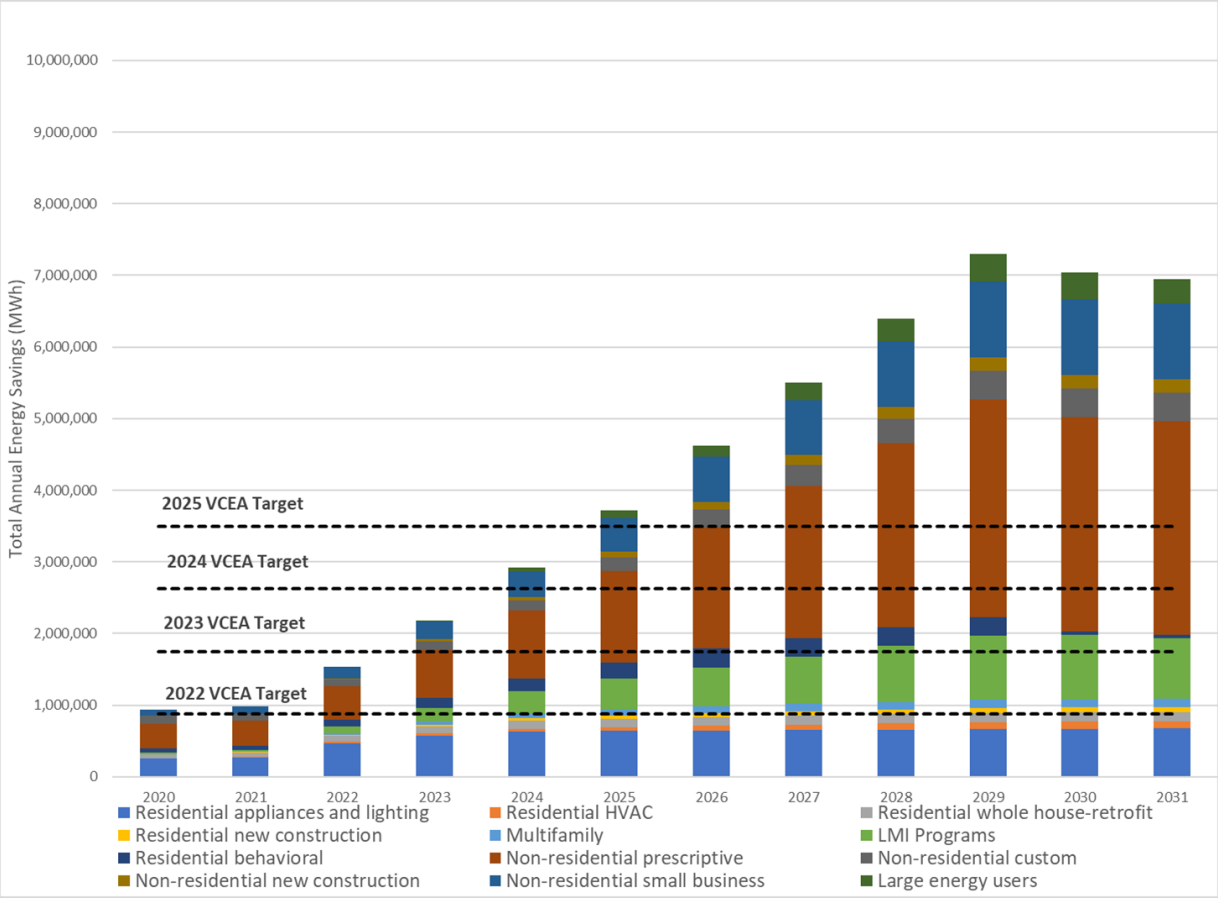

Figure 14: High Small Business Scenario Costs through 2025

	2020	2021	2022	2023	2024	2025
Residential appliances and lighting	$ 9,820,000	$ 11,960,000	$ 32,718,380	$ 11,960,000	$ 2,140,000	$ 2,140,000
Residential HVAC	$ 33,820,000	$ 33,820,000	$ 3,041,287	$ 4,272,252	$ 4,103,217	$ 5,334,182
Residential whole house-retrofit	$ 4,680,000	$ 6,920,000	$ 7,595,929	$ 8,102,876	$ 3,929,822	$ 4,436,769
Residential new construction	$ -	$ 7,200,000	$ 7,200,000	$ 7,200,000	$ 7,714,829	$ 8,100,951
Multifamily	$ -	$ 2,920,000	$ 3,818,502	$ 4,492,378	$ 5,166,254	$ 5,840,130
LMI Programs	$ 9,300,000	$ 13,360,000	$ 24,327,924	$ 34,461,887	$ 44,595,849	$ 44,595,849
Residential behavioral	$ 1,860,000	$ 1,860,000	$ 4,144,476	$ 5,857,834	$ 7,571,191	$ 7,424,548
Non-residential prescriptive	$ 12,040,000	$ 14,140,000	$ 30,427,087	$ 35,442,403	$ 42,817,718	$ 55,033,033
Non-residential custom	$ -	$ -	$ 2,691,745	$ 4,710,554	$ 6,729,363	$ 8,748,172
Non-residential new construction	$ -	$ 3,020,000	$ 4,164,931	$ 5,023,629	$ 5,882,328	$ 6,741,026
Non-residential small business	$ 7,180,000	$ 11,240,000	$ 15,525,664	$ 22,264,912	$ 26,524,160	$ 33,263,408
Large energy users	$ -	$ -	$ -	$ 4,773,965	$ 8,354,440	$ 11,934,914
Total cost ($/year)	$ 78,700,000	$ 106,440,000	$ 135,655,925	$ 148,562,689	$ 165,529,170	$ 193,592,982

Figure 15: Balanced Lower Cost Scenario Inputs and Outputs

	Penetration rate	Ramp up years	Start year	End year		
Residential appliances and lighting	MED	2	2022	2023		
Residential HVAC	ZERO	4	2022	2030		
Residential whole house-retrofit	ZERO	4	2022	2030		
Residential new construction	ZERO	4	2024	2030		
Multifamily	ZERO	4	2022	2030		
Residential behavioral	MED	4	2022	2030		
Non-residential prescriptive	HIGH	4	2022	2030		
Non-residential custom	LOW	4	2022	2030		
Non-residential new construction	LOW	4	2022	2030		
Non-residential small business	MED	4	2022	2030		
Large energy users	MED	4	2023	2030		
LMI Programs:						
Low-income multifamily	MED	2	2022	2030		
Low-income single family	MED	2	2022	2030		
Low-income low-cost	MED	2	2022	2030		

Outputs	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Total Incremental annual savings	0.23%	0.07%	0.75%	0.95%	1.10%	1.23%
Total annual savings as a % of 2019 Retail Sales	1.34%	1.41%	2.15%	3.03%	3.99%	5.03%
VCEA Savings Targets	-	-	1.25%	2.50%	3.75%	5.00%
Target met?	-	-	Yes	Yes	Yes	Yes
LMI 15% cost requirement met?			Yes	Yes	Yes	Yes
LMI total annual savings as a % of total portfolio savings	2.21%	2.55%	5.96%	8.63%	10.77%	11.73%

Figure 16: Balanced Lower Cost Scenario Savings

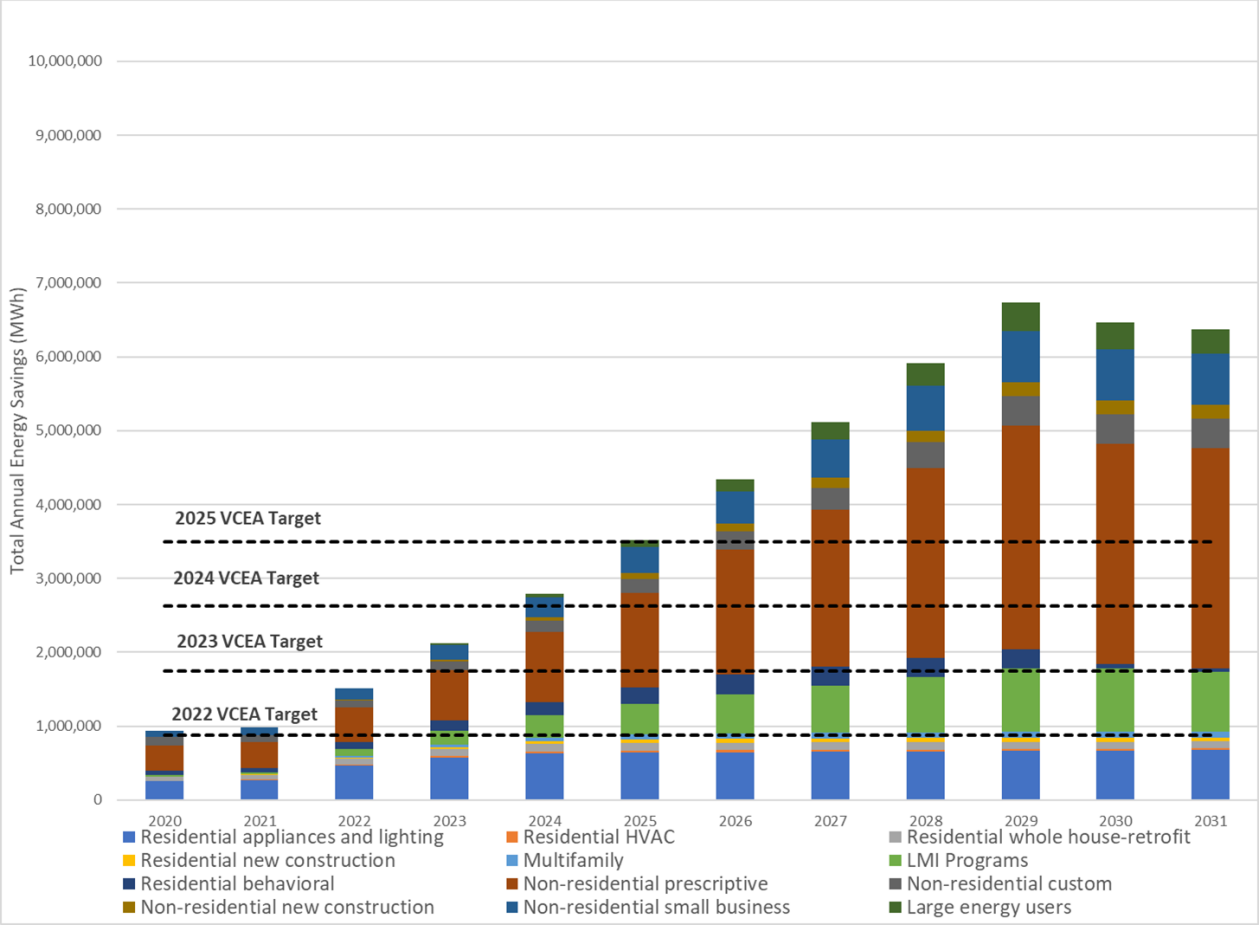

Figure 17: Balanced Lower Cost Scenario Costs through 2025

	2020	2021	2022	2023	2024	2025
Residential appliances and lighting	$ 9,820,000	$ 11,960,000	$ 32,718,380	$ 11,960,000	$ 2,140,000	$ 2,140,000
Residential HVAC	$ 33,820,000	$ 33,820,000	$ 1,400,000	$ 1,400,000	$ -	$ -
Residential whole house-retrofit	$ 4,680,000	$ 6,920,000	$ 6,920,000	$ 6,920,000	$ 2,240,000	$ 2,240,000
Residential new construction	$ -	$ 7,200,000	$ 7,200,000	$ 7,200,000	$ 7,200,000	$ 7,200,000
Multifamily	$ -	$ 2,920,000	$ 2,920,000	$ 2,920,000	$ 2,920,000	$ 2,920,000
LMI Programs	$ 9,300,000	$ 13,360,000	$ 20,384,649	$ 28,546,974	$ 36,709,298	$ 36,709,298
Residential behavioral	$ 1,860,000	$ 1,860,000	$ 4,144,476	$ 5,857,834	$ 7,571,191	$ 7,424,548
Non-residential prescriptive	$ 12,040,000	$ 14,140,000	$ 30,427,087	$ 35,442,403	$ 42,817,718	$ 55,033,033
Non-residential custom	$ -	$ -	$ 2,691,745	$ 4,710,554	$ 6,729,363	$ 8,748,172
Non-residential new construction	$ -	$ 3,020,000	$ 4,164,931	$ 5,023,629	$ 5,882,328	$ 6,741,026
Non-residential small business	$ 7,180,000	$ 11,240,000	$ 11,690,200	$ 15,552,849	$ 16,935,499	$ 20,798,149
Large energy users	$ -	$ -	$ -	$ 4,773,965	$ 8,354,440	$ 11,934,914
Total cost ($/year)	$ 78,700,000	$ 106,440,000	$ 124,661,468	$ 130,308,208	$ 139,499,837	$ 161,889,140

Appendix C – Data Sources: Dominion and Comparison Portfolios

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