COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

PREFILED STAFF TESTIMONY

VIRGINIA ELECTRIC AND POWER COMPANY

For approval to implement demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia

Public

VOLUME II of II

Case No. PUR-2018-00168

February 15, 2019

TABLE OF CONTENTS

David J. Dalton
DIVISION OF PUBLIC UTILITY REGULATION

Summary of the Testimony of David J. Dalton

My Testimony includes the following findings and recommendations:

1. On advice of counsel, Staff does not believe the Company's proposal to exempt Large General Service Customers from participating in or sharing cost responsibility for the Company's previously-approved Existing Programs is appropriate. Staff recommends that the Large General Service Customers be allowed to continue participation in the Company's Existing Programs and be required to pay for them through Rider C2A.

2. Should the Commission determine that the Company's exemption of Large General Service Customers from its Existing Programs is appropriate, Staff believes these programs are no longer those approved by the Commission and, as such, should be closed to further participation by all rate classes. The Company could re-apply for these programs as "new" programs with updated assumptions as appropriate.

3. Staff has identified several concerns regarding participation, savings estimates, and design of the proposed Phase VII programs. These concerns result in Staff lacking confidence that many of the proposed Phase VII programs, when utilizing more appropriate assumptions, would pass at least three of the four cost/benefit tests.

4. Staff recommends that, should the Commission determine that any of the proposed Phase VII programs are in the public interest, the Company be required to update its assumptions for purposes of the ongoing, going-forward cost/benefit tests with actual data, particularly as relates to participation in such programs, as soon as is practicable.

5. Should the Commission share Staff's uncertainty regarding the appropriateness of the Company's participation assumptions and resulting estimations of energy and demand savings, the Commission may wish to consider limiting approval of the proposed programs to a term of three years. This would allow the Company to gain experience in the administration of the programs and provide utility-specific data for future analysis. The Company could then, depending on the results of such programs, refine their assumptions and provide more reliable cost/benefit analyses in future applications for the programs.

6. A residential customer using 1,000 kilowatt-hours per month would see an increase of $0.61 in the Rider C1A/C2A charge for the 2019 Rate Year. The nine other RAC rate changes are consolidated by effective date and shown below.

February 1, 2019 Total Bill:	$117.64
Increase Effective 3/1/2019	$0.21
Increase Effective 4/1/2019	-$0.20
Riders C1A/C2A, Eff. 7/1/2019	$0.61
Increase Effective 9/1/2019	$0.31
Increase Effective 11/1/2019	$2.15
Rider Increase Subtotal:	$3.08
Total Bill:	$120.72

PRE-FILED TESTIMONY
OF
DAVID J. DALTON

PETITION OF
VIRGINIA ELECTRIC AND POWER COMPANY
CASE NO. PUR-2018-00168

Q1. PLEASE STATE YOUR NAME AND POSITION WITH THE STATE CORPORATION COMMISSION ("COMMISSION").

A1. My name is David J. Dalton and I am a Utilities Analyst in the Commission's Division of Public Utility Regulation.

Q2. WHAT ARE YOUR PRESENT RESPONSIBILITIES?

A2. My primary functions as a Utilities Analyst are to analyze demand-side management ("DSM") plans proposed by public utilities regulated by the Commission and to analyze public utility certificate and rate case applications with regard to cost of service, tariff revisions, and rate design. I am also responsible for presenting testimony as a Staff witness and making alternative proposals to the Commission when appropriate.

Q3. PLEASE BRIEFLY SUMMARIZE THE PETITION FILED IN THIS PROCEEDING.

A3. On October 3, 2018, Virginia Electric and Power Company d/b/a Dominion Energy Virginia ("Dominion" or "Company") filed a petition ("Petition") seeking approval of 11 new DSM programs (collectively, "proposed Phase VII Programs"), six for Residential customers and five for Non-residential customers, and for approval of two updated rate

adjustment clauses. In its Petition, Dominion proposes the following new Energy Efficiency ("EE") and Demand Response ("DR") programs:

Residential EE and DR Programs Proposed:

- Residential Appliance Recycling Program (EE);
- Residential Customer Engagement Program (EE);
- Residential Efficient Products Marketplace Program (EE) ("EPM Program");
- Residential Home Energy Assessment Program (EE);
- Residential Smart Thermostat Management Program (EE) ("Smart Thermostat (EE) Program");
- Residential Smart Thermostat Management Program (DR) ("Smart Thermostat (DR) Program")

Non-residential EE Programs Proposed:

- Non-residential Lighting Systems & Controls Program (EE);
- Non-residential Heating and Cooling Efficiency Program (EE);
- Non-residential Window Film Program (EE);
- Non-residential Small Manufacturing Program (EE); and
- Non-residential Office Program (EE).

The Company seeks approval of the proposed Phase VII Programs for a five-year period, from 2019 through 2023, subject to future extensions as requested by the Company and approved by the Commission. Dominion proposes a five-year spending cap of $225.8 million for the proposed Phase VII Programs and requests the ability to exceed this cap by no more than five percent.

In its Petition, Dominion is also requesting approval of an annual update to continue two rate adjustment clauses, Riders C1A and C2A, for the July 1, 2019, through June 30,

2020 rate year ("2019 Rate Year") for the recovery of: (i) 2019 Rate Year costs associated with the programs previously approved by the Commission in Case Nos. PUE-2011-00093 ("Phase II Programs")[1], PUE-2014-00071 (Phase III Programs")[2], PUE-2015-00089 ("Phase V Program")[3], PUE-2016-00111 ("Phase VI Program")[4], and PUR-2017-00129 ("Phase IV Program")[5, 6]; (ii) calendar year 2017 true-up costs associated with the Company's approved Phase II, Phase III, Phase IV, Phase V, and Phase VI Programs; (iii) calendar year 2017 true-up costs of the Company's previously-approved Electric Vehicle

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[1] *Application of Virginia Electric and Power Company, For approval to implement new demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2011-00093, 2012 S.C.C. Ann. Rept. 298, Order (Apr. 30, 2012) ("2012 Order"). The 2012 Order approved the following seven programs: Commercial Energy Audit Program, Commercial Duct Testing and Sealing Program, Commercial Distributed Generation Program, Residential Home Energy Check-up Program, Residential Duct Testing and Sealing Program, Residential Heat Pump Tune-up Program, and Residential Heat Pump Upgrade Program. Subsequently, Dominion replaced the term "commercial" with "non-residential" in naming its programs. The Non-residential Distributed Generation Program approved in this case was subsequently re-approved in Case No. PUE-2016-00111.

[2] *Petition of Virginia Electric and Power Company, For approval to implement new demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2013-00072, 2014 S.C.C. Ann. Rept. 289, Final Order (Apr. 29, 2014) ("2014 Order"). In the 2014 Order, the Commission approved three programs: the Non-residential Heating and Cooling Efficiency Program, the Non-residential Solar Window Film Program, and the Non-residential Lighting Systems and Controls Program.

[3] *Petition of Virginia Electric and Power Company, For approval to implement new demand-side management programs, for approval to continue a demand-side management program, and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2015-00089, 2016 S.C.C. Ann. Rept. 275, Final Order (Apr. 19, 2016).

[4] *Petition of Virginia Electric and Power Company, For approval to implement new demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2016-00111, Doc. Con. Cen. No. 170610052, Final Order (Jun. 1, 2017).

[5] *Petition of Virginia Electric and Power Company, For approval to continue an existing demand-side management program and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUR-2017-00129, Doc. Con. Cen. No. 180530060, Final Order (May 10, 2018).

[6] The Company's Phase IV Program was originally approved in *Petition of Virginia Electric and Power Company, For approval to implement new demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2014-00071, 2015 S.C.C. Ann. Rept. 230, Final Order (Apr. 24, 2015).

Pilot Program;[7] and (iv) 2019 Rate Year costs associated with the Company's proposed Phase VII Programs. The proposed total revenue requirement for Riders C1A and C2A for the 2019 Rate Year is $48,608,558.[8]

In addition to the proposed Phase VII Programs, Dominion provided going-forward cost/benefit test results for the Company's Phase I, II, III, IV, V, and VI Programs ("Existing Programs") as directed by the Commission's 2012 Order. These updated going-forward cost/benefit test results are attached hereto as Attachment No. DJD-1.[9]

Q4. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A4. My testimony:

- Discusses relevant changes to the Code of Virginia ("Code") governing the Commission's review and adjudication of DSM programs;
- Provides a brief history of the Commission's review and adjudication on previous DSM programs;
- Describes the proposed Phase VII Programs;
- Analyzes the cost-effectiveness of the proposed Phase VII Programs;
- Analyzes the cost/benefit test results for the Company's ongoing Phase II, III, IV, V, and VI Programs;
- Examines the Company's proposed jurisdictional and class revenue apportionment; and
- Examines the proposed rate design for Riders C1A and C2A.

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[7] *Application of Virginia Electric and Power Company, For approval to establish an electric vehicle pilot program pursuant to § 56-234 of the Code of Virginia*, Case No. PUE-2011-00014, 2011 S.C.C. Ann. Rept. 436, Order Granting Approval (July 11, 2011).

[8] Pre-filed Direct Testimony of Brett A. Crable ("Crable Direct") at 10.

[9] *See* Pre-filed Direct Testimony of Deanna R. Kesler ("Kesler Direct") Schedule 3.

STATUTORY UPDATE

Q5. HAVE THERE BEEN ANY CHANGES TO THE CODE SECTIONS RELEVANT TO THE COMPANY'S PETITION?

A5. Yes. During the 2018 legislative session, the Virginia General Assembly passed the Grid Transformation and Security Act of 2018 ("GTSA"), which amended several sections of the Code relevant to utility DSM programs and cost recovery thereof. The GTSA, among other things, amended the definition of "in the public interest" in Code § 56-576 as follows:

> "In the public interest," for purposes of assessing energy efficiency programs, describes an energy efficiency program if the Commission determines that the net present value of the benefits exceeds the net present value of the costs as determined by not less than any three of the following four tests: (i) the Total Resource Cost Test; (ii) the Utility Cost Test (also referred to as the Program Administrator Test); (iii) the Participant Test; and (iv) the Ratepayer Impact Measure Test. Such determination shall include an analysis of all four tests, and a program or portfolio of programs shall be approved if the net present value of the benefits exceeds the net present value of the costs as determined by not less than any three of the four tests. In addition, an energy efficiency program may be deemed to be "in the public interest" if the program provides measurable and verifiable energy savings to low-income customers or elderly customers.

The GTSA also amended Code § 56-585.1 A 5 c of the Code as follows:

> None of the costs of new energy efficiency programs of an electric utility, including recovery of revenue reductions, shall be assigned to any large general service customer. A large general service customer is a customer that has a verifiable history of having used more than 500 kilowatts of demand from a single meter of delivery. A utility shall not charge such large general service customer, as defined by the Commission, for the costs of installing energy efficiency equipment beyond what is required to provide electric service and meter such service on the customer's premises if the customer provides, at the customer's expense, equivalent energy efficiency equipment. In all relevant proceedings pursuant to this section, the Commission shall take into consideration the goals of economic development, energy efficiency and environmental protection in the Commonwealth[.]

Lastly, Enactment Clause 15 of the GTSA requires the following:

That each Phase I Utility and Phase II Utility, as such terms are defined in subdivision A 1 of § 56-585.1 of the Code of Virginia, shall develop a proposed program of energy conservation measures. Any program shall provide for the submission of a petition or petitions for approval to design, implement, and operate energy efficiency programs pursuant to subdivision A 5 c of § 56-585.1 of the Code of Virginia. At least five percent of such energy efficiency programs shall benefit low-income, elderly, and disabled individuals. The projected costs for the utility to design, implement, and operate such energy efficiency programs, including a margin to be recovered on operating expenses, shall be no less than an aggregate amount of $140 million for a Phase I Utility and $870 million for a Phase II Utility for the period beginning July 1, 2018, and ending July 1, 2028, including any existing approved energy efficiency programs. In developing such portfolio of energy efficiency programs, each utility shall utilize a stakeholder process, to be facilitated by an independent monitor compensated under the funding provided pursuant to subdivision E of § 56-592.1 of the Code of Virginia, to provide input and feedback on the development of such energy efficiency programs. Such stakeholder process shall include representatives from each utility, the State Corporation Commission, the office of Consumer Counsel of the Attorney General, the Department of Mines, Minerals and Energy, energy efficiency program implementers, energy efficiency providers, residential and small business customers, and any other interested stakeholder who the independent monitor deems appropriate for inclusion in such process. The utility shall report on the status of the energy efficiency program, including the petitions filed and the determination thereon, to the Governor, the State Corporation Commission, and the Chairmen of the House and Senate Commerce and Labor Committees on July 1, 2019, and annually thereafter through July 1, 2028.

Q6. ARE CUSTOMERS WHOSE DEMAND EXCEEDS 500 KILOWATTS ("LARGE GENERAL SERVICE CUSTOMERS") ELIGIBLE TO PARTICIPATE IN THE *EXISTING* DSM PROGRAMS GOING FORWARD UNDER THE COMPANY'S PROPOSAL?

A6. No, under the Company's proposal, Large General Service Customers are ineligible for participating in existing EE programs going forward. Company witness Crable states, in his Direct Testimony, that the Company interprets the amended language of Code § 56-

585.1 A 5 c to exempt all Large General Service Customers from participating in, or paying for, *any* of the Company's EE programs as of July 1, 2019.[10] Specifically, as stated in Company witness Crouch's Direct Testimony, the Company will exempt Large General Service Customers from both the newly proposed Phase VII Programs and Dominion's Existing Programs on a going-forward basis.[11]

Q7. DOES STAFF HAVE ANY COMMENTS RELATED TO THE COMPANY'S PROPOSAL TO EXEMPT LARGE GENERAL SERVICE CUSTOMERS FROM ITS PROPOSED *AND* EXISTING PROGRAMS?

A7. Yes. As previously stated, Code § 56-585.1 A 5 c states, in part, "None of the costs of *new* energy efficiency programs of an electric utility, including recovery of revenue reductions, shall be assigned to any large general service customer." (Emphasis added.) Thus, the GTSA appears to exempt these customers from the Company's proposed new Phase VII Programs. However, on advice of counsel, Staff believes the Company's Existing Programs previously approved by the Commission are not *new* EE programs. Therefore, Staff does not believe the GTSA exempts Large General Service Customers from continuing to participate in the Company's Existing Programs. On further advice of counsel, Staff believes that Large General Service Customers who were not exempt from, or who did not opt-out of participating in, the Company's Existing Programs, pursuant to the version of Code § 56-585.1 A 5 c that was in effect as of the date the Commission

[10] Crable Direct at 5.

[11] *See* Pre-filed Direct Testimony of J. Clayton Crouch ("Crouch Direct") at 17.

approved those DSM programs, are eligible to participate in and subject to cost recovery for the previously-approved, ongoing Existing Programs.[12]

Ultimately, whether or not Large General Service Customers are exempt from participation in and payment for the Company's Existing Programs is a legal question for the Commission's consideration.

Q8. ARE THERE ADDITIONAL CONCERNS ASSOCIATED WITH EXEMPTING LARGE GENERAL SERVICE CUSTOMERS FROM THE EXISTING PROGRAMS?

A8. Yes. The Phase VI Non-residential Prescriptive Program was approved based, in part, on the results of the relevant cost/benefit tests associated with the specific program. The underlying cost/benefit analysis used to support the Phase VI Non-residential Prescriptive Program assumed that Large General Service Customers would be eligible for the program for the entire period and included energy savings and cost projections that were based, in part, on the projected participation of Large General Service Customers for the entire period. If these customers are now excluded from the Phase VI Non-residential Prescriptive Program mid-stream, then the original and ongoing cost/benefit results used to support this program are no longer accurate or reliable. Indeed, in Staff's view, exempting these previously-eligible customers significantly changes the Phase VI Non-

[12] Staff notes that this position is consistent with that of Appalachian Power Company's ("APCo") interpretation of the amendment to Code Section § 56-585.1 A 5 c in Case No. PUR-2018-00118, currently pending before the Commission. *See Petition of Appalachian Power Company, For revision of a rate adjustment clause, the EE-RAC, pursuant to § 56-585 A 5 c of the Code of Virginia*, Case No. PUR-2018-00118 (filed Sep. 28, 2018). Specifically, APCo states, at 5, fn. 7, of its petition, "[APCo] notes that the blanket exemption for all of [APCo's] large general service customers that was established by the [GTSA], which became effective July 1, 2018, is applicable only to the costs of '*new* energy efficiency programs.'"

residential Prescriptive Program to the point that it is no longer the program that the Commission approved.

Should the Commission agree with Staff's concerns regarding the exemption of Large General Service Customers from the Company's Phase VI Non-residential Prescriptive Program, Staff recommends that the program be closed to all participants. The Company could then re-apply for this program as a "new" program that exempts the Large General Service Customers along with updated participation and savings estimates for evaluation.

Q9. HOW DOES THE COMPANY INTERPRET ENACTMENT CLAUSE 15 OF THE GTSA?

A9. Page 7 of the Petition states that, because the Commission-led stakeholder process is being developed, the Company relied on its existing stakeholder process to develop the proposed Phase VII Programs. On page 9 of his direct testimony, Company witness Crable states that the costs associated with the proposed Phase VII Programs, excluding the Smart Thermostat (DR) Program as it is not an EE program, count towards the aggregated $870 million target mandated by the GTSA's Enactment Clause 15.[13]

Q10. DOES STAFF AGREE WITH THE COMPANY'S INTERPRETATION OF THE GTSA'S ENACTMENT CLAUSE 15?

A10. This issue is a legal question for consideration by the Commission. Staff notes that the proposed Phase VII Programs were not developed through a Commission-led stakeholder

[13] Crable Direct at 9.

process as required by the GTSA's Enactment Clause 15. However, on advice of counsel, Staff takes no formal position regarding the appropriateness of including the costs associated with the proposed Phase VII EE programs, excluding the Smart Thermostat (DR) program, in the mandated $870 million target.

COST-EFFECTIVENESS OF THE PROPOSED PROGRAMS

Q11. HOW DID THE STAFF EVALUATE THE COST-EFFECTIVENESS OF DOMINION'S PROPOSED PHASE VII DSM PROGRAMS?

A11. Staff evaluated Dominion's proposed Phase VII Programs according to the definition of "in the public interest" as set forth in § 56-576 as cited above. A brief description and the associated formulae of each cost/benefit test can be found in Attachment No. DJD-2.

Q12. HOW MAY THE COST/BENEFIT TEST RESULTS BE EXPRESSED?

A12. The cost/benefit test results may be expressed directly in terms of net present values ("NPV") or as ratios. If a test result is to be expressed as a ratio, the total NPV benefits are divided by the total NPV costs. A test ratio greater than one indicates that the NPV benefits exceed the NPV costs. The NPVs are useful for summarizing and comparing programs.[14]

Q13. HOW DID STAFF EVALUATE THE COST/BENEFIT TEST RESULTS PROVIDED BY THE COMPANY?

[14] California Standard Practice Manual, July 2002, at 3-5. These pages are attached to this testimony as Attachment No. DJD-3.

A13. Staff investigated the program designs of the proposed new programs, analyzed and evaluated the assumptions and modeling of the Company's cost/benefit analysis, and assessed and interpreted the associated cost/benefit tests required by the Code.

Q14. PLEASE BRIEFLY SUMMARIZE DOMINION'S PROPOSED PHASE VII DSM PROGRAMS.

A14. As discussed previously, Dominion has proposed 10 new EE programs and one new DR program. Summaries of these programs, as provided by the Company, are detailed below.

Residential Appliance Recycling Program (EE)

This program will provide a $20 incentive to residential customers to recycle freezers and refrigerators that are at least ten years old and between 10 and 32 cubic feet in volume. Company witness Michael T. Hubbard states, on page 10 of his Direct Testimony, that these limitations are the ones deemed reasonable by the Commission in the Company's previously-operated Phase IV Program.[15] The Company expects that the program will be implemented through the use of one contractor responsible for the removal and disposal of qualifying appliances but notes that it is possible the primary contractor may use subcontractors to provide appliance pickup and transportation services.[16]

[15] *See* Pre-filed Direct Testimony of Michael T. Hubbard ("Hubbard Direct") at 10.

[16] *See* the Company's response to Staff Interrogatory No. 2-16, attached hereto as part of Attachment No. DJD-4.

Residential Customer Engagement Program (EE)

This program will provide educational insights into the customer's energy consumption via a home energy report, transmitted online and/or in a paper format. The home energy report is intended to provide periodic suggestions on how to save energy based upon an analysis of the customer's energy usage. Customers would be able to opt-out of participation at any time. The Company notes there is no direct financial incentive for this program.[17]

Residential Efficient Products Marketplace Program (EE)

This program will provide residential customers incentives to purchase specific energy-efficient appliances with a rebate through an online marketplace and through retail stores, including A-line lightbulbs purchased prior to 2020, reflector lightbulbs, decorative lightbulbs, globe lightbulbs, retrofit kits and lighting fixtures, freezers, refrigerators, dishwashers, clothes washers, clothes dryers, dehumidifiers, and air purifiers.[18] The Company states, in its response to Staff Interrogatory No. 2-18, that the online marketplace will be managed by the Company's implementation contractor and its subcontractor.[19] The Company's response to Staff Interrogatory No. 2-18 also indicates that the implementation contractor would be expected to use its existing relationships and, as needed, issue one or more "requests for proposals" to suppliers and retailers with a presence in the Company's

[17] Hubbard Direct, Schedule 1, page 2.

[18] Hubbard Direct at 11.

[19] *See* the Company's response to Staff Interrogatory No. 2-18, attached hereto as part of Attachment No. DJD-4.

service territory. At this time a specific entity has not been selected to provide the actual online marketplace component.

Residential Home Energy Assessment Program (EE)

This program would provide customers with incentives to install a variety of energy-efficient measures following completion of a walk-through home energy assessment. The proposed measures include replacement of existing light bulbs with LED bulbs prior to 2020, heat pump tune-ups, duct insulation and sealing, fan motor upgrades, installation of efficient faucet aerators and showerheads, water heater turndowns, replacement of hot water heaters with heat pump water heaters, heat pump upgrades, and water heater and pipe insulation.

Residential Smart Thermostat Management (EE) Program

This program will provide an incentive to customers to purchase and install a qualifying smart thermostat and/or enroll in a program which would help customers manage their daily heating and cooling energy usage by allowing remote optimization of their thermostat operation. The program will also provide specific recommendations via e-mail or hard-copy that customers can act on to realize additional savings ("Behavioral Portion"). The program will be open to several thermostat manufacturers, makes, and models that meet or exceed Energy Star requirements and have communicating technology. Rebates for the purchase of smart thermostats would be provided on a one-time basis while

incentives for participation in remote thermostat management would be provided annually.[20]

Residential Smart Thermostat Management (DR) Program

This program will provide an annual incentive to residential customers not currently participating in the Company's Phase I AC Cycling Program and who have a qualifying smart thermostat to allow remote thermostat management during specific DR events called by the Company. This remote adjustment of smart thermostats would be designed to achieve specific amounts of load reduction while maintaining reasonable customer comfort. Customers would be allowed to opt-out of events within limitations before a participant were to forfeit his or her annual incentive.[21]

Non-residential Lighting Systems & Controls Program (EE)

This program will provide incentives for customers to implement efficient lighting technologies. The technologies expected to be offered under this program include high-efficiency T8/T5 lamps and fixtures, LED lamps and fixtures, and occupancy sensors. The Company states that this program is an attempt to re-design the previously-offered Phase III Lighting Systems & Controls Program to reflect updates in technology and market conditions as well as addressing the new exemption of Large General Service Customers.[22]

[20] Hubbard Direct, Schedule 1, page 6.

[21] Hubbard Direct at 12.

[22] *Id.* at 13.

Non-residential Heating and Cooling Efficiency Program (EE)

This program would provide incentives for the installation of high-efficiency heating and cooling systems in non-residential facilities. The proposed measures include: air conditioner upgrades, heat pump upgrades, chiller upgrades, economizers, variable frequency drives, variable refrigerant flow, installation of or upgrades to unitary air conditioning systems, and mini splits. The program has been updated from the Company's previously-offered Phase III Heating and Cooling Efficiency Program to reflect current technology and the exemption of Large General Service Customers.[23]

Non-residential Window Film Program (EE)

This program will provide incentives to install solar reduction window film to lower cooling bills and improve occupant comfort. The proposed Phase VII Program updates the solar heat gain coefficient compared to the Company's previously-offered Phase III Window Film Program and addresses the new exemption of Large General Service Customers.[24]

Non-residential Small Manufacturing Program (EE)

The Non-residential Small Manufacturing program will provide incentives for the installation of EE improvements, including compressed air nozzles, leak repair, no-loss drains, addition of storage, heat of compression dryers, low pressure drop filters, variable speed drive compressors, cycling refrigerant dryers, dewpoint controls, pressure

[23] *Id.* at 13-14.

[24] *Id.* at 14.

reductions, and downsized compressors.[25] The Company, in its response to Staff Interrogatory No. 4-39, stated that "small manufacturing facility[y]", as used on page 14 of Company witness Hubbard's Direct Testimony, refers to, "...[A]ny non-residential customer utilizing compressed air equipment...that is not exempt based on exceeding the 500 kW demand threshold and meets this criteria for utilizing compressed air equipment..." as being eligible for the program.[26]

Non-residential Office Program (EE)

This program will provide incentives for the installation of EE improvements, including lighting scheduling, HVAC maintenance scheduling, temperature setbacks, condenser water resets, discharge air temp resets, static pressure resets, enthalpy economizer adjustments, and variable air volume box minimum adjustments.[27]

Q15. ARE ADDITIONAL DETAILS CONCERNING THE COMPANY'S PROGRAMS AVAILABLE?

A15. Yes. Schedule 11, pages 1-11, of Company witness Deanna R. Kesler's Direct Testimony contains the Company's assumptions for energy and demand savings, incremental costs, incentives, etc. that were modeled in the Company's cost/benefit analysis.

[25] *Id.* at 14-15.

[26] The Company's response to Staff Interrogatory No. 4-39 is attached hereto as part of Attachment No. DJD-4.

[27] Hubbard Direct at 15.

Additional descriptive details of the proposed programs are provided in the Company's responses to Staff interrogatories that are attached to this testimony as Attachment No. DJD-4.

Q16. PLEASE DESCRIBE THE SCREENING CRITERIA USED BY DOMINION FOR SELECTING PROGRAMS.

A16. Based on the testimony of Company witness Kesler, the Company examined all of the test ratios for the four previously-identified cost/benefit tests and the NPV results for each proposed Phase VII Program.

Q17. PLEASE SUMMARIZE THE RESULTS OF DOMINION'S COST/BENEFIT ANALYSIS FOR EACH OF THE PROPOSED PHASE VII PROGRAMS.

A17. Consistent with the Commission's Rules Governing Cost/Benefit Measures for Demand-Side Management Programs, 20 VAC 5-305-10 *et seq.*, Dominion conducted its cost/benefit analysis on an individual program and portfolio basis. The individual program analysis assesses the costs and benefits of a program when that program is considered individually against the Company's generation expansion plan. The portfolio program analysis assesses the costs and benefits of a program when all programs, proposed and current, are run against the generation expansion plan simultaneously.

The cost/benefit results calculated on an individual basis for the proposed Phase VII Programs are found in Schedule 2 of Company witness Kesler's Direct Testimony. The

NPV of net benefits and the test ratios for the proposed Phase VII Programs are presented in Table 1 below for convenience.[28]

Table 1

Dominion's Cost/Benefit Results, Individual Program Analysis ($000)				
	Participant Test	**Utility Cost Test**	**TRC Test**	**RIM Test**
	Residential Appliance Recycling Program (EE)			
Net Benefits NPV	$38,664	$1,872	$3,773	$(39,719)
Benefit/Cost Ratio	12.11	1.10	1.19	0.34
	Residential Customer Engagement Program (EE)			
Net Benefits NPV	$253,147	$259,417	$183,434	$(110,934)
Benefit/Cost Ratio	4.33	21.07	3.06	0.71
	Residential EPM (EE)			
Net Benefits NPV	$560,240	$182,723	$168,490	$(467,124)
Benefit/Cost Ratio	11.41	4.43	3.49	0.34
	Residential Home Energy Assessment (EE)			
Net Benefits NPV	$63,803	$13,265	$5,422	$(69,103)
Benefit/Cost Ratio	3.40	1.38	1.13	0.41
	Residential Smart Thermostat (EE)			
Net Benefits NPV	$57,465	$9,835	$16,370	$(49,056)
Benefit/Cost Ratio	12.32	1.47	2.15	0.38
	Residential Smart Thermostat (DR)			
Net Benefits NPV	$20,751	$192,428	$215,734	$192,432
Benefit/Cost Ratio	53.41	4.24	6.97	4.24
	Non-residential Lighting Systems & Controls (EE)			
Net Benefits NPV	$31,858	$15,378	$10,123	$(27,305)
Benefit/Cost Ratio	3.06	1.71	1.37	0.58
	Non-residential Heating and Cooling Efficiency (EE)			
Net Benefits NPV	$20,309	$22,813	$8,103	$(17,378)
Benefit/Cost Ratio	1.86	2.71	1.29	0.68
	Non-residential Window Film Program (EE)			
Net Benefits NPV	$6,090	$3,685	$2,357	$(4,767)
Benefit/Cost Ratio	3.63	1.87	1.42	0.62
	Non-residential Small Manufacturing Program (EE)			
Net Benefits NPV	$20,360	$1,084	$1,850	$(21,667)
Benefit/Cost Ratio	4.62	1.08	1.14	0.41
	Non-residential Office Program (EE)			
Net Benefits NPV	$12,070	$3,503	$2,745	$(11,365)
Benefit/Cost Ratio	3.11	1.37	1.27	0.53

[28] Attachment No. DJD-5 contains the full as-filed cost/benefit results for reference.

As can be seen above, all the proposed Phase VII Programs pass at least three of the four tests.

Q18. PLEASE DESCRIBE THE COMPANY'S METHODOLOGY FOR ASSESSING ITS PROPOSED PROGRAMS FOR COST-EFFECTIVENESS.

A18. Dominion relied upon program designs and assumptions from internal sources as well as numerous DSM implementation providers to assess the proposed Phase VII Programs for cost-effectiveness. The program designs include individual measures within a program and the incentive structures for given programs. The program assumptions include, among other things, participation and market saturation estimates, load shapes, and the associated energy and demand savings for individual measures, incremental costs, and measure lives.

The Company then incorporates the designs and assumptions of selected programs, with minor alterations, into its Strategist optimization model in order to assess the cost-effectiveness of a given program. The optimization modeling phase is a multi-step process.

Q19. DID DOMINION PERFORM A SENSITIVITY ANALYSIS AS REQUIRED BY THE COMMISSION'S RULES GOVERNING COST/BENEFIT MEASURES FOR DSM PROGRAMS?

A19. Yes. The Company performed sensitivity analyses of the individual programs for the cases of +/- 0.5 percent Load Growth, +/- 25 percent Fuel Price, and +/- 25 percent Transmission and Distribution Costs. The cost/benefit test ratios for these cases can be found in Schedule 9 of the Direct Testimony of Company witness Kesler.

Changes in the cost/benefit test ratios were relatively modest in all three cases. The variations in the ratios do not appear to substantially affect the overall cost/benefit results. All of the proposed Phase VII Programs pass at least three of the four tests under each sensitivity analysis performed by the Company.

Q20. DID STAFF REQUEST ANY ADDITIONAL SENSITIVITY ANALYSES FROM THE COMPANY?

A20. Yes. Company witness Kesler states that the Load Forecast utilized in analyzing the proposed Phase VII Programs was the same Load Forecast utilized in the Company's 2018 Integrated Resource Plan filing.[29, 30] In its December 7, 2018, Order in that case, the Commission directed the Company to correct and re-file its IRP subject to the Provisions in that Order. The Commission directed the Company, for purposes of its corrected 2018 IRP, to "...utilize the Dominion Zone PJM [Interconnection, LLC] coincident peak load forecast and energy sales forecast, scaled down to the Dominion load serving entity level, consistent with the methodology presented by Staff witness White..."[31] The Company's confidential response to Staff Interrogatory Nos. 4-44 and 4-45 and the referenced attachments provide the cost/benefit results of the proposed Phase VII Programs utilizing

[29] Kesler Direct at 3-4.

[30] *Commonwealth of Virginia ex rel. State Corporation Commission, In re: Virginia Electric and Power Company's Integrated Resource Plan filing pursuant to Va. Code § 56-597 et seq.*, Case No. PUR-2018-00065, Doc. Con. Cen. No. 180510034 (filed May 1, 2018).

[31] *Commonwealth of Virginia ex re. State Corporation Commission, In re: Virginia Electric and Power Company's Integrated Resource Plan filing pursuant to Va. Code § 56-597 et seq.*, Case No. PUR-2018-00065, Doc. Con. Cen. No. 181210172, Order at 8 (Dec. 7, 2018).

a peak load forecast which complies with the referenced Order.[32] The Company also stated, in its response to Staff Interrogatory No. 2-15, that the Company's Low Load sensitivity analysis utilized peak and energy values lower than the PJM Interconnection, LLC load forecast.[33]

Staff notes that, with the exception of the Smart Thermostat (DR) Program, changes in the cost/benefit test ratios were relatively modest and do not appear to substantially affect the overall cost/benefit results. The effects of the sensitivity analyses on the Smart Thermostat (DR) Program, while more pronounced, still resulted in the program passing at least three of the four cost/benefit tests in all cases.

Q21. HAS STAFF EVALUATED THE COMPANY'S ASSUMPTIONS AND PROGRAM DESIGNS OF THE PROPOSED PHASE VII PROGRAMS?

A21. Yes. Staff has examined the Company's program designs and assumptions such as participation levels, incremental costs, and load shapes that were developed by the numerous internal and external sources. These assumptions are the basis for the assumptions presented in the Direct Testimony of Company witness Kesler and used in the Strategist modeling. Staff's concerns with the Company's program designs and assumptions are detailed below.

[32] The Company's response to Staff Interrogatory Nos. 4-44 and 4-45 are attached hereto as part of Attachment No. DJD-4. Due to the voluminous nature of Confidential Attachments Staff Set 4-45 (DRK) (1) Diag 2 8 Proposed, 4-45 (DRK) (2) Diag 2 8 Going Forward, 4-45 (DRK) (3) Diag 2 8 Proposed Portfolio, and 4-45 (DRK) (4) Diag 2 8 Going Forward Portfolio, Staff is not attaching them hereto. Staff has maintained electronic copies of these confidential attachments and will provide them upon request.

[33] *See* the Company's response to Staff Interrogatory No. 2-15, attached hereto as part of Attachment No. DJD-4.

Q22. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND PROGRAM DESIGN OF THE PROPOSED PHASE VII RESIDENTIAL APPLIANCE RECYCLING PROGRAM?

A22. Staff has concerns regarding the adequacy of the Company's estimation of participation in the proposed Phase VII Residential Appliance Recycling Program. The Company's extraordinarily sensitive response to Staff Interrogatory No. 1-13, Attachment Staff Set 1-13 (13) (MTH), provides the Company's participation estimates, reproduced in Table 2 below for convenience.[34]

Table 2

Proposed Appliance Recycling Program Participation Estimates						
	2019	2020	2021	2022	2023	**Total**
Participants	5,500	10,000	10,000	10,000	10,000	45,500

As previously mentioned, the proposed Residential Appliance Recycling Program is similar to the Company's previously-operated Phase IV Residential Appliance Recycling Program. Based on the Company's 2018 Evaluation, Measurement, and Verification Report for Virginia Electric and Power Company (Dominion) ("2018 EM&V Report"), the Company's previous Phase IV offering achieved 14,072 total participants in its three years of operation.[35] The highest level of participation in the Phase IV Residential Appliance Recycling Program, its second year, achieved 7,735 participants.

[34] Due to the voluminous nature of the attachment, only an excerpt of the Company's extraordinarily sensitive response to Staff Interrogatory No. 1-13, Attachment Staff Set 1-13 (13) (MTH) is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the attachment and will provide it upon request.

[35] Evaluation, Measurement, and Verification Report for Virginia Electric and Power Company (Dominion), filed in Case No. PUR-2016-00111, May 1, 2018, page 124. Staff notes that the 2018 EM&V Report provides evaluation of the Company's programs through December 31, 2017.

In its 2018 EM&V Report, the Company reports that the rebate for per gross participant for Phase IV was **[BEGIN EXTRAORDINARILY SENSITIVE]** [redacted] **[END EXTRAORDINARILY SENSITIVE]**[36] In the proposed Phase VII Residential Appliance Recycling Program, the Company intends to offer an average incentive per participant of $20.[37] The Company's assumptions and program design mean that Dominion expects to achieve participation in excess of its previous iteration of this program while offering a significantly smaller incentive to participants. Staff is skeptical that such a significantly lower incentive as compared to Phase IV will produce the counter-intuitive result of a substantial increase in participation expected by the Company in its Phase VII Residential Appliance Recycling Program.

Staff believes that reductions in expected participation will likely result in lowering of the benefits in the cost/benefit tests substantially enough that the proposed Phase VII Residential Appliance Recycling Program may not pass either the TRC or Utility Cost Tests. Staff Interrogatory No. 12-88 requested that the Company re-run its cost/benefit analysis utilizing lower participation numbers more representative of the Company's actually-experienced participation in the previously-offered Phase IV Appliance Recycling Program. Due to the timing of Staff's data request and the deadlines for printing and filing this testimony, Staff Interrogatory No. 12-88 is still outstanding at the time of printing. While Staff is unable to quantify the effects of lower participation on the proposed program, Staff maintains its position that it would likely result in lower cost/benefit test

[36] 2018 EM&V Report, page 125.

[37] Kesler Direct, Schedule 11, page 4.

results. As such, Staff does not have confidence in the Company's cost/benefit results demonstrating that this program passes three of the four cost/benefit tests.

Q23. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND PROGRAM DESIGN OF THE COMPANY'S PROPOSED PHASE VII RESIDENTIAL CUSTOMER ENGAGEMENT PROGRAM?

A23. Staff has concerns regarding expected participation in the proposed Residential Customer Engagement Program. Specifically, the Company's confidential response to Staff Interrogatory No. 4-24, Attachment Staff Set 4-24 (2) CONF discusses **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**[38] The Company's response to Staff Interrogatory No. 7-70 (b) states that a study conducted by Opinion Dynamics on a program similar to the Company's proposed Customer Engagement Program carried out by Pacific Gas & Electric ("PG&E") found that, in aggregate, customers save approximately 1.5% of their total energy usage.[39] The Company's response to Staff Interrogatory No. 7-70 also included Attachment Staff Set 7-70, which contained further details regarding participant

[38] *See* the Company's confidential response to Staff Interrogatory No. 4-24, Attachment Staff Set 4-24 (2) CONF, page 15, attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the attachment and will provide it upon request.

[39] The Company's response to Staff Interrogatory No. 7-70 is attached hereto as part of Attachment No. DJD-4.

response to the PG&E program.[40] The referenced attachment found that approximately 19% of participants achieved savings through the program. However, the study also found that approximately 27% of participants increased their consumption following receipt of their energy usage reports and that approximately 53% of participants made no substantial change to their energy usage.[41] The Company's response to Staff Interrogatory No. 7-70, response (c) estimates that between 15% and 35% of participants will not experience any energy savings.

While Staff recognizes that, in aggregate, it appears that the PG&E program resulted in some energy savings, it also appears that the overwhelming majority of participants (approximately 80%) made no change to their energy consumption or, in fact, consumed more energy after receiving their energy usage reports. This non-response or even counterproductive response from such a large percentage of participants may mean that the implementation of the Company's proposed Customer Engagement Program may not be cost effective or appropriate.

Staff Interrogatory No. 12-89 requested that the Company re-run its cost/benefit tests assuming 80% non-response or increased usage rather than the Company's estimated 15-35% non-response. Due to the timing of Staff's data request and the deadlines for printing and filing this testimony, Staff Interrogatory No. 12-89 is still outstanding at the time of printing. Staff is unable to quantify the effects of higher-than-expected non-response or increased usage on the treatment group; however, Staff believes the reduced

[40] *See* the Company's response to Staff Interrogatory No. 7-70, Attachment Staff Set 7-70, pages 4-5, which are attached hereto as part of Attachment No. DJD-4. Due to the voluminous nature of the attachment, Staff is including only the excerpted, referenced pages. Staff has maintained an electronic copy of the attachment in its entirety and can provide it upon request.

[41] *Id.*

savings estimates that would result from such an adjustment may result in the program not passing at least three of the four cost/benefit tests.

Should the Commission determine that the proposed Phase VII Residential Customer Engagement Program is in the public interest, Staff recommends that the Company and its implementation vendor be required to track individual customer response to the program and remove customers shown to have persistent non-response or increased usage after receipt of treatment from the treatment group as appropriate.

Q24. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND PROGRAM DESIGN OF THE PROPOSED PHASE VII RESIDENTIAL EFFICIENT PRODUCTS MARKETPLACE PROGRAM?

A24. Staff's review of the assumptions and program design of the proposed Residential Efficient Products Marketplace Program revealed that approximately 14.80% of total measure installations is related to LED[42] general service lightbulbs.[43] General service lightbulbs represent approximately 12.23% of annual program energy savings and account for approximately 9.04% of total program costs. General service lightbulbs are subject to the 2007 Energy Independence and Security Act ("EISA").[44] It is Staff's understanding, by advice of counsel, that pursuant to EISA, if the Secretary of Energy failed to complete a rulemaking by January 1, 2017, to amend the standards in effect for general service

[42] Light-emitting diode.

[43] *See* Supplemental Attachment Staff Set 1-13 (27) (Res Efficient Products Marketplace) (Corrected). Due to the voluminous nature of the attachment, an excerpt is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the attachment and will provide it upon request.

[44] Pub.L. 110-140, December 19, 2007.

incandescent lamps, the sale of any general service lamp that does not meet a minimum efficacy standard of 45 lumens per watt will be prohibited after January 1, 2020.[45] It is Staff's understanding that the Department of Energy did not issue a final rule amending the standards in effect for general service incandescent lamps by January 1, 2017. Accordingly, from 2020 forward, compact fluorescent bulbs will, in effect, become the new commercial standard for required lighting efficiency rather than incandescent bulbs.[46]

There is also an overlap with lighting measures between the proposed Phase VII Residential EPM Program and the proposed Phase VII Residential Home Energy Assessment Program. Both proposed programs include LED general service lightbulbs, decorative lightbulbs, globe lightbulbs, and downlight lightbulbs. There are possible interactive effects on participation in both of these as they promote some of the same or substantially the same measures.

Staff notes that the Company only included savings benefits relative to LED general service lightbulbs for the six months of 2019.[47] Staff's concerns related to this measure within the proposed EPM Program relates to the appropriateness of incenting a behavior that would occur anyway a mere seven months after the program begins due to external regulations.

Staff Interrogatory No. 12-90 requested that the Company re-run its cost/benefit modeling of the proposed Phase VII Residential Efficient Products Marketplace Program

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[45] *See* 42 U.S.C.A. §6295(i)(6).

[46] *See* Attachment No. DJD-6.

[47] *See* the Company's extraordinarily sensitive response to Staff Interrogatory No. 1-13, Extraordinarily Sensitive Attachments Staff Set 1-13 (10) (MTH) and 1-13 (11) (MTH). Due to the voluminous nature of these attachments, excerpts are attached hereto as part of Attachment No. DJD-4. Staff has maintained complete, electronic copies of these attachments and will provide them upon request.

removing the measures associated with LED general service lightbulbs that would be subject to regulation by the EISA. Due to the timing of Staff's data request and the deadlines for printing and filing this testimony, Staff Interrogatory No. 12-90 is still outstanding at the time of printing. At this time, Staff is uncertain of the magnitude of the effect on the cost/benefit test results of removing these measures; however, Staff believes, generally, the results of these tests will be lower.

Q25. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND PROGRAM DESIGN OF THE COMPANY'S PROPOSED PHASE VII RESIDENTIAL HOME ENERGY ASSESSMENT PROGRAM?

A25. Staff's review of the assumptions of the proposed Phase VII Residential Home Energy Assessment Program revealed that, of the 35 individual measures, 16 include incentive amounts in excess of the incremental cost of the measure.[48] Table 3 below identifies these measures.

[48] *See* the Company's Supplemental Attachment Staff Set 1-13 (28) (Res Home Energy Assessment). Due to concerns regarding formatting and legibility, only an excerpt of the attachment is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the supplemental attachment and will provide it upon request.

Table 3

Residential Home Energy Assessment Measure Incentives in Excess of 100% of Incremental Costs				
Measure Name	**Incremental Cost**	**Incentive Amount**	**% of Incremental Cost**	**Total Installations**
GSL LED 40W Equivalent	$2.48	$7.16	288.71%	318
GSL LED 60W Equivalent	$1.98	$7.50	378.79%	42,318
GSL LED 75W Equivalent	$2.48	$9.40	379.03%	1,909
GSL LED 100W Equivalent	$4.65	$13.20	283.87%	7,955
GSL LED # Way 75/100/150W Equivalent	$5.76	$13.20	229.17%	154
Decorative LED 40W Equivalent	$5.76	$7.38	128.13%	10,302
LED Downlight 50W Equivalent	$8.20	$9.59	116.95%	3,605
LED Downlight 65W Equivalent	$8.20	$12.56	153.17%	412
LED Downlight 75W Equivalent	$8.20	$14.16	172.68%	205
LED Downlight 90W Equivalent	$8.20	$16.90	206.10%	102
LF Showerhead (Electric DHW Only)	$2.00	$22.87	1143.50%	49,455
LF Bath Aerator (Electric DHW Only)	$2.00	$2.30	115.00%	73,409
¾" WH Pipe Insulation	$3.00	$6.07	202.33%	262,727
½" WH Pipe Insulation	$3.00	$4.03	134.33%	7,727
Cool Roof, Per Sq. Ft.	$5.00	$226.20	4524.00%	5
Duct Sealing AC and HP (Per 5% Eff. Gain)	$120.00	$148.20	123.50%	5,200

Staff does not believe it is appropriate for incentive amounts to exceed the incremental costs of measures within the proposed Residential Home Energy Assessment

Program. In essence, should a customer choose only to install measures from those identified in Table 3, the customer could actually make money. To the extent that these measures are directly installed by a participating contractor, the incentive amounts would result in a profit margin for each measure. Should the Commission share Staff's concerns, a possible solution would be requiring incentive amounts to be set at no more than the incremental measure cost.

Q26. DOES STAFF HAVE ANY OTHER CONCERNS REGARDING THE PROPOSED PHASE VII RESIDENTIAL HOME ENERGY ASSESSMENT PROGRAM?

A26. Yes. Similar to the proposed Residential Efficient Products Marketplace Program, the proposed Residential Home Energy Assessment Program includes incentives for customers to install LED general service bulbs for six months in 2019. Again, the Company does not appear to offer incentives for or include savings associated with these bulbs beginning in 2020. Staff remains concerned about the appropriateness of incenting behavior that would have occurred only six months after the beginning of the program due to external regulations. Staff notes that the general service bulbs appear to account for approximately 8.75% of the total measures expected for installation or service, 2.69% of the annual energy savings, and 3.73% of the planned expenditures for measures under the proposed Home Energy Assessment Program.[49]

Staff requested that the Company re-run its cost/benefit model removing the LED general service lightbulbs from the program in Staff Interrogatory No. 12-91. Due to the timing of Staff's data request and the deadlines for printing and filing this testimony, Staff

[49] *See* Attachment No. DJD-4.

Interrogatory No. 12-91 is still outstanding at the time of printing. Accordingly, at this time, Staff is unsure of the magnitude of removing these measures from the proposed Phase VII Residential Home Energy Assessment Program, but believes the cost/benefit results will be reduced.

Q27. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND DESIGN OF THE COMPANY'S PROPOSED PHASE VII RESIDENTIAL SMART THERMOSTAT (EE) PROGRAM?

A27. The Company assumes that the purchase component of the proposed Smart Thermostat (EE) Program will incent the purchase of 21,221 smart thermostats.[50] The Company's response to Staff Interrogatory No. 10-79 stated that the Company has, as of April 2018 approximately 168,700 smart thermostats in its service territory.[51] Dominion also assumes that 141,139 eligible customers with qualifying smart thermostats will enroll in the remote optimization portion of the Residential Smart Thermostat (EE) Program from 2019 through 2023. This means that the Company expects that approximately 74.31% of all eligible customers with qualifying smart thermostats will enroll in the Residential Smart Thermostat (EE) Program remote optimization portion of the program through 2023.

Staff notes that, in the Company's Phase I Residential Air Conditioner Cycling Program ("Phase I AC Cycling Program"), the Company experienced 149,219 total

[50] *See* the Company's Supplemental Attachment Staff Set 1-13 (24) (Res Smart Thermostat EE and DR), page 2. Due to concerns regarding formatting and legibility, only an excerpt of the attachment is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the attachment and will provide it upon request.

[51] The Company's response to Staff Interrogatory No. 10-79 is attached hereto as part of Attachment No. DJD-4.

installations between 2010 and 2017.[52] This program was available to *all* residential customers who have electric air conditioning equipment on their premises. Staff notes that the number of customers with air conditioning equipment is likely significantly higher than the 189,921 customers with smart thermostats already installed or that will be incented to be installed through the proposed Residential Smart Thermostat (EE) Program. Of the 149,219 total installations under the Phase I AC Cycling Program, 59,937 customers uninstalled or deactivated their cycling equipment between 2010 and 2017.[53] This means that through 2017, 88,845 customers were actively participating in the Company's Phase I AC Cycling Program. The Company expected 97,037 participants through 2017.[54]

Staff notes that there are programmatic differences between the Phase I AC Cycling Program and the proposed Phase VII Residential Smart Thermostat (EE) Program, including that the Phase I AC Cycling Program is a DR program rather than an EE program and the Phase I AC Cycling Program is designed to cycle customers' air conditioning units through remote signal during peak times to reduce load, while the proposed Phase VII Residential Smart Thermostat (EE) Program intends to remotely adjust user settings, including temperature, to increase efficiency. The Phase I AC Cycling Program provides a $40 annual bill credit to participants[55] while the proposed Phase VII Residential Smart Thermostat (EE) Program offers only a $10 annual incentive.[56] These programmatic

[52] 2018 EM&V Report at 264.

[53] *Id.*

[54] *Id.*

[55] *Id.* at 261.

[56] *See* Supplemental Attachment Staff Set 1-13 (24) (Res Smart Thermostat EE and DR), page 3.

differences notwithstanding, Staff does not believe the Company's estimates of participation, considered in light of the lower-than-expected participation in a program also designed to affect customers' home temperatures and with a substantially lower incentive amount, are accurate or appropriate. Simply put, Staff questions whether customers will relinquish control of their thermostats for an incentive of less than $1 per month. Given the above, Staff lacks confidence that this program would pass three of the four cost/benefit tests.

Q28. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND DESIGN OF THE COMPANY'S PROPOSED PHASE VII RESIDENTIAL SMART THERMOSTAT (DR) PROGRAM?

A28. The Company's proposed Phase VII Residential Smart Thermostat (DR) Program also estimates 141,139 total participants from 2019 through 2023.[57] Staff again notes that only 189,921 of Dominion's residential customers currently have or are expected to be incented to purchase smart thermostats, meaning 74.31% of those customers would need to enroll in the Residential Smart Thermostat (DR) Program to achieve this expected participation.

Staff again notes that the Company's previously-offered Phase I AC Cycling Program only achieved 88,845 total participants through seven years, excluding removals or deactivations, meaning the Company expects 58.86% higher participation in its Phase VII Residential Smart Thermostat (DR) Program than it has actually experienced in its Phase I AC Cycling Program. The Company expects to offer participants in its Phase VII Residential Smart Thermostat (DR) Program an average of $18 annually for their

[57] *Id.*, page 1.

participation,[58] while the Phase I AC Cycling Program offers $40 annually to its participants. Because of the Company's historical performance regarding participation with the Phase I AC Cycling Program and the lower incentive for participation in the proposed Phase VII Residential Smart Thermostat (DR) Program, Staff does not believe the participation estimates in the Company's Phase VII Residential Smart Thermostat (DR) Program are accurate or appropriate.

Q29. DOES STAFF HAVE ANY OTHER CONCERNS REGARDING THE COMPANY'S PROPOSED PHASE VII RESIDENTIAL SMART THERMOSTAT (DR) PROGRAM?

A29. Yes. In addition to Staff's concerns regarding participation, the estimates that the program will result in a 1.5 kW peak load reduction per enrolled thermostat is a concern. Staff's review of several analyses and reports on programs which appear to be similar to the proposed Residential Smart Thermostat (DR) Program, which raise concerns regarding the possible overestimation of demand savings by the Company.

First, Staff reviewed the 2016 Impact Evaluation of San Diego Gas & Electric's ("SDG&E") Residential Peak Time Rebate ("PTR") and Small Customer Technology Deployment ("SCTD") Programs.[59] SDG&E's PTR Program provides bill credits for customers to reduce electricity consumption between 11:00 AM and 6:00 PM, while the

[58] *Id.*, and Kesler Direct, Schedule 11, at 10. The Company's response to Staff Interrogatory No. 2-20 (d), attached hereto as part of Attachment no. DJD-4, indicates that customers would receive a maximum incentive of $35 in the first year of enrollment and $10 per year for each subsequent year of enrollment.

[59] *See* 2016 Impact Evaluation of San Diego Gas & Electric's Residential Peak Time Rebate and Small Customer Technology Deployment Programs, Ex Post and Ex Ante Draft Report, CALMAC Study ID SDG0303, prepared by Itron, Inc. (Mar. 20, 2017). Select, referenced pages of this report are attached hereto as part of Attachment No. DJD-7.

SCTD Program offers free smart thermostats enabled to allow SDG&E to either cycle the customer's central air conditioning or to remotely alter thermostat settings between the hours of 2:00 PM and 6:00 PM.[60] Customers who only participated in the SCTD Program were found, on average, to provide a 0.31 kW reduction in demand for an average event in 2016 with variance based upon the method of treatment (either cycling or adjusted thermostat settings).[61] Customers enrolled in both the PTR and SCTD Programs were found on average to provide a 0.51 kW demand reduction for an average event in 2016.[62] Staff also reviewed a presentation from Itron, Inc., evaluating the 2017 performance of the SCTD Program, which found that for the peak event date, the average demand reduction per thermostat was 0.62.[63]

Staff next reviewed the Energy Impacts of Smart Home Technologies report of the American Council for an Energy-Efficient Economy.[64] The report discusses many smart home technologies, including smart thermostats. The programs described in the report include program administrators cycling air conditioners or remotely adjusting the thermostat settings.[65] The report states that, though there are individual utilities reporting

[60] *Id.* at ES-1, attached hereto as part of Attachment No. DJD-7.

[61] *Id.* at 3-3, attached hereto as part of Attachment No. DJD-7.

[62] *Id.*

[63] 2017 SDG&E Residential SCTD Evaluation, prepared by Itron, Inc. (May 4, 2018), page 5. This page is attached hereto as part of Attachment No. DJD-7.

[64] Energy Impacts of Smart Home Technologies, Report A1801, American Council for an Energy-Efficient Economy (April 2018), page 34, attached hereto as part of Attachment No. DJD-7.

[65] *Id.*

high savings, "a typical DR event resulted in 0.6-1.2 kW average peak load reduction per smart thermostat."[66]

Finally, Staff reviewed the Company's Phase I AC Cycling Program. Staff again acknowledges that the two programs are not analogous. Staff's review of the Company's Phase I AC Cycling Program, as reported in the Company's 2018 EM&V Report, shows that the Company achieved 0.68 kW reduction per participant.[67] The Phase I AC Cycling Program reduces the operating cycle of central air conditioning and heat pumps by 30-50% while an event is in progress. The proposed Phase VII Smart Thermostat (DR) Program would gradually adjust enrolled thermostats remotely during specific DR events called by the Company. Programmatic differences notwithstanding, Staff believes the Company's actually-experienced demand reduction of 0.68 kW in the Phase I AC Cycling Program is instructive in evaluating the reasonableness of the expected demand savings of the proposed Smart Thermostat (DR) Program. Staff does not believe the estimated 1.5 kW reduction, which is more than double the actual experienced savings in the Phase I AC Cycling Program, is appropriate.

Q30. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND DESIGN OF THE COMPANY'S PROPOSED PHASE VII NON-RESIDENTIAL LIGHTING SYSTEMS & CONTROLS PROGRAM?

A30. Staff reviewed the Company's proposed Phase VII Non-residential Lighting Systems & Controls Program as well as the previously-operated Phase III Non-residential Lighting

[66] *Id.*

[67] 2018 EM&V Report, Table 6-3. VA Residential AC Cycling Program Performance Indicators (2010-2017), page 264.

Systems & Controls Program as presented in the 2018 EM&V Report. The Company appears to have appropriately reduced the expected participation by individual customers based on the actual participation in the Phase III Non-residential Lighting Systems & Controls Program as reported in the 2018 EM&V Report,[68] as well as the new statutory exemption of Large General Service Customers in the GTSA. A comparison of the expected participation for the proposed Non-residential Lighting Systems & Controls Program, as well as the expected and actual participation in the Phase III Non-residential Lighting Systems & Controls Program is presented in Tables 4 and 5 below.

Table 4

Proposed Phase VII Non-residential Lighting Systems & Controls Program						
	2019	2020	2021	2022	2023	Total
Expected Participation[69]	333	665	366	366	366	2,098

Table 5

Phase III Non-residential Lighting Systems & Controls Program					
	2014	2015	2016	2017	Total
Expected Participation	688	1,504	1,531	1,533	5,276
Actual Participation	118	1,241	1,203	866	3,430

The Company's response to Staff Interrogatory No. 4-33 states that, through December 20, 2018, a total of 4,042 customers participated in the Company's Phase III Non-residential Lighting Systems & Controls Program.[70]

[68] 2018 EM&V Report, page 176.

[69] *See* the Company's Supplemental Attachment Staff Set 1-13 (15) (NonRes Lighting)(Corrected). Due to concerns regarding formatting and legibility, only an excerpt of the attachment is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the supplemental attachment and can provide it upon request.

[70] *See* the Company's response to Staff Interrogatory No. 4-33, attached hereto as part of Attachment No. DJD-4.

The Company's response to Staff Interrogatory No. 7-58, attached hereto as part of Attachment No. DJD-4, identifies three measures that would be phased out of the proposed Phase VII Non-residential Lighting Systems & Controls Program after 2020 due to the previously-mentioned EISA. The Company's response states in part, "...[U]pdates to the [EISA] may make the installed equipment required by code and thus no longer eligible to receive incentives." Staff again questions the appropriateness of incenting technology that will, in effect, become the baseline under external regulatory action seven months after implementation.

In Staff Interrogatory No. 12-92, Staff requested that the Company re-run its cost/benefit tests removing the measures identified in the Company's response to Staff Interrogatory No. 7-58 that would be subject to EISA regulation. Due to the timing of Staff's data request and the deadlines for printing and filing this testimony, Staff Interrogatory No. 12-92 is still outstanding at the time of printing. Staff is unable to quantify the reductions to the cost/benefit scores as a result of removing these measures. However, Staff suspects that the general result would be a reduction in the cost/benefit test ratios. As such, Staff does not have confidence that this program passes three of the four cost/benefit tests.

Q31. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND DESIGN FOR THE PROPOSED PHASE VII NON-RESIDENTIAL HEATING AND COOLING EFFICIENCY PROGRAM?

A31. Staff's review of the assumptions regarding the proposed Non-residential Heating and Cooling Efficiency Program raised concerns regarding the appropriateness of the

Company's expected participation. Functionally, the program is similar to the previously-offered Phase III Non-residential Heating and Cooling Efficiency Program. A comparison of the expected and actual participation in the Phase III Non-residential Heating and Cooling Efficiency Program as well as the expected participation in the proposed Phase VII Heating and Cooling Efficiency Program is presented in Tables 6 and 7 below.

Table 6

Proposed Phase VII Non-residential Heating and Cooling Efficiency Program						
	2019	2020	2021	2022	2023	Total
Expected Participation[71]	350	700	700	700	700	3,150

Table 7

Phase III Non-Residential Heating and Cooling Efficiency Program[72]					
	2014	2015	2016	2017	Total
Expected Participation	261	746	782	797	2,586
Actual Participation	6	114	89	103	312

As shown above, the expected participation in the proposed Non-residential Heating and Cooling Efficiency Program is greater than the Company's expected participation in its previously-offered Phase III iteration of the program. Staff notes that the expected participants in 2019 of the proposed Phase VII iteration of the program, 350 participants, is greater than the entire actual participation experienced over four years in the Phase III program through 2017. The Phase III Non-residential Heating and Cooling

[71] *See* the Company's Supplemental Attachment Staff Set 1-13 (14) (NonRes Heating and Cooling). Due to concerns regarding formatting and legibility, only an excerpt of the attachment is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the supplemental attachment and can provide it upon request.

[72] 2018 EM&V Report, page 204.

Efficiency Program experienced only 12.06% of the Company's expected participation over four years.

The Company's response to Staff Interrogatory No. 4-36, attached hereto as part of Attachment No. DJD-4, states that the Phase III Non-residential Heating and Cooling Efficiency Program had a total of 387 participants through December 20, 2018. Staff notes, however, that of these 387 total participants, approximately 35.92% were from rate schedules that qualify as "Large General Service Customers" under revised Code § 56-585.1 A 5 c and would thereby be statutorily exempt from participating in the Company's proposed Phase VII program. This large percentage of now-exempt customers participating in the similar, previously-offered Phase III Non-residential Heating and Cooling Efficiency Program, combined with the over-estimation of participation in the previously-offered Phase III program, leads Staff to have no confidence in the Company's participation estimates in the proposed Phase VII Non-residential Heating and Cooling Efficiency Program. As such, Staff believes the Company's cost/benefit test results should not be relied upon.

Q32. DOES STAFF HAVE ANY OTHER OBSERVATIONS REGARDING THE ASSUMPTIONS AND DESIGNS OF THE PROPOSED PHASE VII NON-RESIDENTIAL HEATING AND COOLING EFFICIENCY PROGRAM?

A32. Yes. In addition to the concerns regarding participation estimates discussed above, Staff also found that the actual average, per-participant direct rebate cost for the Company's Phase III Non-residential Heating and Cooling Efficiency Program was **[BEGIN EXTRAORDINARILY SENSITIVE]** [redacted] **[END**

EXTRAORDINARILY SENSITIVE][73] The Company's average rebate per participant planning assumption for the Phase III Non-residential Heating and Cooling Efficiency Program was $1,653. In the proposed Phase VII Non-residential Heating and Cooling Efficiency Program, the Company's planning assumption for the average rebate per participant is $1,901.[74] Staff believes it would be more appropriate for the Company to utilize a planning assumption for the proposed Phase VII Non-residential Heating and Cooling Efficiency Program that more accurately reflects the Company's actual per-participant direct rebate costs from Phase III. To the extent that actual rebates are greater than those planned for without proportionate increases to savings, it is likely the cost/benefit results will decrease. This underestimation of costs through incentive payments, combined with previously-experienced participation levels, only strengthens Staff's belief that the cost/benefit test results for the proposed Phase VII Non-residential Heating and Cooling Efficiency Program are unreliable.

In Staff Interrogatory No. 12-93, Staff requested that the Company re-run the cost/benefit tests for this program, assuming approximately 15.08% of as-filed expected participation, or 475 individual customers, and an average per-participant incentive amount of $10,000. Due to the timing of Staff's data request and the deadlines for printing and filing this testimony, Staff Interrogatory No. 12-93 is still outstanding at the time of printing. Staff maintains its position that the cost/benefit tests results for this program, due to the vastly over-estimated participation and understated per-participant incentive amount as compared to actual participation in the previous iteration of the program, are unreliable.

[73] Calculated from 2018 EM&V Report, page 204.

[74] Kesler Direct, Schedule 11, page 5.

Q33. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND DESIGN OF THE COMPANY'S PROPOSED PHASE VII NON-RESIDENTIAL WINDOW FILM PROGRAM?

A33. Staff's review of the Company's assumptions and the performance of the similar, previously-offered Phase III Non-residential Window Film Program showed that the Company expects a slight increase in participation, from 154 individual participants in the Phase III Non-residential Window Film Program through 2017[75] to an expected 212 individual participants in the proposed Phase VII Window Film Program.[76] The Company's subsequent response to Staff Interrogatory No. 7-71, attached hereto as part of Attachment No. DJD-4, updated the Phase III Non-residential Window Film Program participation through January 14, 2019, to 244 total participants. Staff calculates that approximately 10.66% of these 244 participants are customers that are now classified as Large General Service Customers and are statutorily exempt from participating in the proposed Phase VII Window Film Program.

The Company estimates that, typically, 2,850 square feet of window film will be installed per building under the proposed Non-residential Window Film Program.[77] This is consistent with the results of the Phase III Non-Residential Window Film Program as reported in the Company's 2018 EM&V Report through 2017.[78] However, the previously-

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[75] 2018 EM&V Report, page 223.

[76] *See* the Company's Supplemental Attachment Staff Set 1-13 (16) (NonRes Window Film). Due to concerns regarding formatting and legibility, only an excerpt of the attachment is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the supplemental attachment and can provide it upon request.

[77] *Id.*

[78] *See* Company's response to Staff Interrogatory No. 11-81, attached hereto as part of Attachment No. DJD-4.

discussed 10.66% of total participants in the previous iteration of the program, that now qualify as statutorily exempt Large General Service Customers appear to have received approximately 34.54% of the total incentive amounts paid under the Phase III Non-Residential Window Film Program. Specifically, the 19 participants from Company rate schedule GS-3 installed, on average, 6,468.3 square feet of window film per participant. This likely means that, despite relatively small numbers of Large General Service Customers participating in the previous program, these customers accounted for larger quantities of installations. The largest average square footage per participant for non-exempt rate schedules was seen in the Company's GS-1 rate schedule, which installed an average of 1,208.2 square feet per participant. The participation by Large General Service Customers in the Company's Phase III Window Film Program likely applied upward pressure on the Company's actual square footage installed per facility in its 2018 EM&V Report. Although the estimated square-footage of window film installed per building appears to be based on the Company's actual experience under the Phase III Window Film Program, the prohibition on participation for these Large General Service Customers who likely increased the square-footage of installed window film in the previous program does not lead Staff to have confidence that this assumed installation area estimate is appropriate for the proposed Phase VII Non-residential Window Film Program.

Q34. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND DESIGN OF THE PROPOSED PHASE VII NON-RESIDENTIAL SMALL MANUFACTURING PROGRAM?

A34. Staff's review of the assumptions of the proposed Phase VII Non-residential Small Manufacturing Program found that the Company's implementation vendor relied upon a combination of information from the Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 6.0[79] ("Illinois TRM"), professional judgement and experience, and custom engineering models.[80] Staff was unable to validate any of the Company's savings estimates provided in the Company's response to Staff Interrogatory No. 1-13, Supplemental Attachment Staff Set 1-13 (19) (NonRes Small Manufacturing) for measures for which data and formulae were available in the Illinois TRM.[81]

The Company's response to Staff Interrogatory No. 11-82 and its confidential attachments provided further detail regarding the calculation of savings estimates, including the referenced custom engineering models.[82] Staff notes that the custom engineering models provided as confidential Attachments 11-82(f) (1) through (10) all contained "reference errors" in the savings calculations cells of the spreadsheets. As such, Staff was unable to validate the calculation of savings estimates for the proposed Phase VII Non-residential Small Manufacturing Program. Staff Interrogatory No. 13-95 requested that the Company file attachments correcting these cell reference errors; however, due to

[79] Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 6.0, (Feb. 7, 2018).

[80] *See* the Company's Supplemental Attachment Staff Set 1-13 (20) (NonRes Small Manufacturing), attached hereto as part of Attachment No. DJD-4.

[81] Supplemental Attachment Staff Set 1-13 (19) (NonRes Small Manufacturing) is attached hereto as part of Attachment No. DJD-4.

[82] *See* the Company's response to Staff Interrogatory No. 11-82, attached hereto as part of Attachment No. DJD-4. Due to their voluminous natures, Attachments Staff Set 11-82(d) (1) and (2), and confidential Attachments Staff Set 11-82(f) (1) through (10) are not attached. Staff has maintained electronic copies of these attachments and will provide them upon request.

the timing of Staff's request and the deadlines for printing and filing this testimony, Staff Interrogatory No. 13-95 is still outstanding at the time of printing.

Should the Commission determine that the proposed Non-residential Small Manufacturing Program is in the public interest, Staff recommends that the Company be required to monitor the actual data points that would be utilized as inputs in calculating measure-specific energy savings and update the assumptions for cost/benefit analysis with actual data as soon as is practicable with information based on actual experience.

Q35. WHAT ARE STAFF'S FINDINGS AFTER REVIEWING THE ASSUMPTIONS AND DESIGN OF THE PROPOSED PHASE VII NON-RESIDENTIAL OFFICE PROGRAM?

A35. Staff's review of the Company's assumptions for the proposed Non-residential Office Program raised a concern regarding the appropriateness of the Company's assumed building size for office buildings within Dominion's service territory. Pages 1 and 2 of the Company's Supplemental Attachment Staff Set 1-13 (17) (NonRes Office), attached hereto as part of Attachment No. DJD-4, states the modelling assumptions used data from the U.S. Department of Energy's ("DOE") Commercial Reference Building study.[83] The attachment states that the Company modified the "Large Office" building, which is originally assumed to be 12 stories, plus a basement, for an assumed square footage of 498,600, or 38,350 square feet per floor. The modification involved scaling this assumed building size downward to a four-story model building, assumed to be approximately 150,000 square

[83] Due to the voluminous nature of Supplemental Attachment Staff Set 1-13 (17) (NonRes Office), Staff is only attaching pages 1 and 2 of that document. Staff has maintained a complete, electronic copy of Supplemental Attachment Staff Set 1-13 (17) (NonRes Office) and will provide it upon request.

feet above ground and subject to improvement under the proposed program, or approximately 37,500 square feet per floor. The Company's response to Staff Interrogatory No. 11-83 however, states that the Company utilized a four-story building from the DOE Commercial Reference Building study based on the "Medium Office" building.[84] Accordingly, Staff is unclear which reference building was utilized in the Company's modeling based on these conflicting responses. In any case, Staff's review of the DOE Commercial Reference Building data found that the "Medium Office" building is assumed to have three floors, and is listed as having a total of 53,628 square feet, or 17,876 square feet per floor. It may be more appropriate to scale the Medium Office building up by one floor rather than scaling down the Large Office by eight floors.[85] In both cases, however, Staff was unable to confirm the per-measure savings estimates provided in the Company's Supplemental Attachment Staff Set 1-13 (17) (NonRes Office) through either the Large Office or Medium Office buildings.

The assumed building size is utilized in the calculation of energy and demand savings for most of the measures contained within the program. As such, should the actual participants in the proposed Non-residential Office Program have substantially less square footage in their buildings, the measure- and program-level energy and demand savings estimates may be overstated.

Staff requested that the Company re-run its cost/benefit analysis with updating savings estimates commensurate with the above-discussed scaling of the DOE's Medium

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[84] *See* Attachment No. DJD-4.

[85] "Commercial Reference Buildings," U.S. Department of Energy, at www.energy.gov/eere/buildings/commercial-reference-buildings, accessed Jan. 28, 2019. A copy of the relevant table is attached hereto as part of Attachment No. DJD-8.

Office building in Staff Interrogatory No. 12-94. Due to the timing of Staff's data request and the deadlines for printing and filing this testimony, Staff Interrogatory No. 12-94 is still outstanding at the time of printing. Staff maintains its concerns regarding the cost/benefit results being improperly inflated due to the over-estimation of the size of the relevant building stock used in estimation of energy and demand savings.

COST-EFFECTIVENESS OF THE COMPANY'S ONGOING PROGRAMS

Q36. PLEASE COMMENT ON THE GOING-FORWARD COST EFFECTIVENESS ANALYSIS FOR THE PREVIOUSLY-APPROVED PROGRAMS.

A36. The Company provided the cost/benefit analysis of the previously-approved Phase II, Phase IV, Phase V, and Phase VI Programs as directed by the Commission's 2012 Order.[86] The cost/benefit test ratios are provided in Table 8 below for convenience. Staff is including the Phase I Residential Air Conditioner Cycling Program, the costs of which are currently recovered through base rates, for clarity.

Table 8

Individual Program Analysis for Phase I, Phase II, Phase III, Phase IV, Phase V, and Phase VI DSM Programs Going Forward				
Non-residential Programs:	**Participant Test**	**Utility Cost Test**	**TRC Test**	**RIM Test**
Distributed Generation	6.35	1.65	3.42	1.55
Small Business Improvement	2.05	1.27	1.07	0.52
Prescriptive	3.27	2.22	1.75	0.58
Residential Programs:				
Income and Age Qualifying Home Improvement	N/A	0.24	0.24	0.16
Air Conditioner Cycling	N/A	0.96	1.47	0.96

[86] Kesler Direct, Schedule 3.

The test ratios for the Non-residential Distributed Generation Program are lower on a going-forward basis than the estimates provided when the program was approved. This is consistent with last year's filing.[87] The test ratios for the Small Business Improvement Program are also lower on a going-forward basis than the estimates provided when the program was approved.[88] This is also consistent with last year's filing. The test ratios for the Non-residential Prescriptive Program are lower on a going-forward basis than the estimates provided when the program was approved.[89] Staff notes that the test ratios for the Phase I AC Cycling Program show the program is not cost effective under either the Utility Cost Test or the RIM Test.

Q37. DOES STAFF HAVE ANY CONCERNS REGARDING THE COST/BENEFIT SCORES OF THE COMPANY'S ONGOING PROGRAMS ON A GOING-FORWARD BASIS?

A37. Yes. As discussed previously, the Company believes that the amended language in the GTSA exempts Large General Service Customers from participation in and paying for the previously-approved EE programs. On advice of counsel, Staff does not believe the GTSA exempts Large General Service Customers from continuing to participate in or being

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[87] *Petition of Virginia Electric and Power Company, For approval to implement new demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2017-00129, Doc. Con. Cen. No. 171010149, Pre-filed Direct Testimony of Deanna R. Kesler, Schedule 3 (Oct. 3, 2017).

[88] *Petition of Virginia Electric and Power Company, For approval to implement new demand-side management programs, for approval to continue a demand-side management program, and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2015-00089, Doc. Con. Cen. No. 150850128, Pre-filed Direct Testimony of Ripley C. Newcomb, Schedule 2 (Aug. 28, 2015).

[89] *Petition of Virginia Electric and Power Company, For approval to implement new and to extend existing demand-side management programs and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUE-2016-00111, Pre-filed Direct Testimony of Deanna R. Kesler, Schedule 2, Doc. Con. Cen. No. 161010025, (Oct. 3, 2016).

responsible for costs associated with the Company's previously-approved Existing Programs. However, if the Commission determines that the Company is correct and these customers are now exempt, then it is Staff's position that the assumptions, particularly estimates of participation and energy savings, should be adjusted to reflect the ineligibility of these customers. Generally, Staff expects that the smaller pool of eligible customers could mean that the participation estimates are overstated. Staff also expects that the exemption of the Large General Service Customers – who would be expected to account for the installation of a larger number of measures on a per-customer basis which make larger energy and demand savings possible – would likely result in significantly lower estimates of energy and demand savings.

The Company's responses to Staff Interrogatory Nos. 4-33, 4-36, 7-71, 8-74, and 9-76 provides individual customer participation, by rate schedule, in Dominion's non-residential EE programs.[90] To illustrate Staff's previously-discussed concerns regarding the Phase VI Non-residential Prescriptive Program, Staff calculated that approximately 64 of the 869 individual participants, or 7.36%, of participants in the Company's Phase VI Non-residential Prescriptive Program are Large General Service Customers as defined in the GTSA's amendment to Code § 56-585.1 A 5 c. These 64 now-exempt participants accounted for approximately 12.01% of total measure installs and received approximately 46.58% of total incentives paid under the program. It is possible that, under the Company's proposal to exempt Large General Service Customers from participation in this and all non-

[90] *See* the Company's responses to Staff Interrogatory Nos. 8-74 and 9-76 are attached hereto as part of Attachment No. DJD-4.

residential programs going forward, that the Company's previous, as-filed, and going-forward cost/benefit analyses are inadequate.

ALLOCATION OF THE REVENUE REQUIREMENT

Q38. PLEASE DISCUSS THE COMPANY'S METHODOLOGY FOR ALLOCATING THE REVENUE REQUIREMENT TO ITS JURISDICTIONAL RATE CLASSES.

A38. The Company's proposed methodology for allocating the revenue requirement to its jurisdictional rate classes is discussed in the Direct Testimony of Company witness Crouch and is summarized in Schedule 46 D, statements 1-4. Program costs are assigned to the Virginia jurisdiction based upon participation in the respective programs. Common (indirect) costs are allocated to the Virginia jurisdiction based on the jurisdictional program costs (excluding common costs) compared to total program costs (excluding common costs) for the system. This methodology is generally consistent with the methodology approved by the Commission in Case No. PUE-2010-00084.[91] Company witness Crouch notes that the methodology used in the instant case is also consistent with that utilized in and approved by the Commission in Case No. PUR-2017-00129 regarding the removal of Federal, non-military service customers from the Virginia jurisdictional allocation.[92]

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[91] *Application of Virginia Electric and Power Company, For approval to continue two rate adjustment clauses, Riders C1 and C2, as required by the Order Approving Demand-Side Management Programs of the State Corporation Commission in Case No. PUE-2009-00081*, Case No. PUE-2010-00084, 2011 S.C.C. Ann. Rept. 342, Order Approving Rate Adjustment Clauses (Mar. 22, 2011).

[92] *Petition of Virginia Electric and Power Company, For approval to continue an existing demand-side management program and for approval of two updated rate adjustment clauses pursuant to § 56-585.1 A 5 of the Code of Virginia*, Case No. PUR-2017-00129, Doc. Con. Cen. No. 180530060, Final Order (May 10, 2018).

Q39. IS THE COMPANY PROPOSING ANY CHANGES TO ITS ALLOCATION METHODOLOGY IN THE INSTANT CASE?

A39. Yes. Company witness Crouch states there are two substantial changes to the allocation methodology in the instant case. First, Company witness Crouch proposes that the recorded system peaks, jurisdictional class peaks, and customer class peaks that are utilized in calculating Production Factor 1 for the projected costs of the 2019 Rate Year be adjusted to recognize energy and capacity generated by certain non-utility generators ("NUGs") that are connected at the distribution level and are therefore not accounted for in the measurement of power on the Company's transmission system. This creates what Company witness Crouch calls a "mismatch" between the system peak, jurisdictional class peak, and customer class peaks and the average components of the Company's average and excess methodology for cost allocation. In sum, Company witness Crouch states that the energy generated by the distribution-connected NUGs is included in the energy sales, or average, portion of the average and excess method for cost allocation, but the power generated by these NUGs is not captured in the previously-employed method of calculating the system peak, or excess portion of the average and excess method.[93]

To address this mismatch, Company witness Crouch proposes that the power generated by the distribution-connected NUGs be added to the recorded system demands at the time of system peak, jurisdictional class peaks, and customer class peaks.[94] Company witness Crouch demonstrates his proposed add-back methodology in Schedule 4 of his testimony and demonstrates the effects of this add-back method on the jurisdictional and

[93] Crouch Direct at 6-7.

[94] *Id.* at 7-8.

class allocations using 2017 values in Schedule 5 of his testimony. A summary of Company witness Crouch's Schedule 5 jurisdictional and customer class allocation factors is presented below for convenience.

Table 9: Jurisdictional and Class Allocation Comparison

	Current Methodology	Proposed Add-Back Methodology	Increase/(Decrease)
VA Jurisdiction	80.3861%	80.2673%	(0.1188%)
Residential	55.2007%	54.8529%	(0.3478%)
GS-1	5.3452%	5.3791%	0.0339%
GS-2	15.5039%	15.6101%	0.1062%
GS-3	14.6376%	14.7583%	0.1207%
GS-4	8.0563%	8.1452%	0.0889%
Special Contracts	0.6075%	0.6082%	0.0007%
Churches	0.4771%	0.4767%	(0.0004%)
OD Lighting	0.1717%	0.1695%	(0.0022%)

Staff notes that this proposed change is consistent with the testimony of Company witness Paul B. Haynes in the Company's filings for Riders B,[95] R,[96] S,[97] W,[98] GV,[99]

[95] *Application of Virginia Electric and Power Company, For revision of rate adjustment clause: Rider B, Biomass Conversions of the Altavista, Hopewell, and Southampton Power Stations for the Rate Year Commencing April 1, 2019*, Case No. PUR-2018-00083, Doc. Con. Cen. No. 180610102 (Jun. 1, 2018).

[96] *Application of Virginia Electric and Power Company, For revision of rate adjustment clause: Rider R, Bear Garden Generating Station for the Rate Year Commencing April 1, 2019*, Case No. PUR-2018-00085, Doc. Con. Cen. No. 180610089 (Jun. 1, 2018).

[97] *Application of Virginia Electric and Power Company, For revision of rate adjustment clause: Rider S, Virginia City Hybrid Energy Center for the Rate Year Commencing April 1, 2019*, Case No. PUR-2018-00086, Doc. Con. Cen. No. 180610095 (Jun. 1, 2018).

[98] *Application of Virginia Electric and Power Company, For revision of rate adjustment clause: Rider W, Warren County Power Station for the Rate Year Commencing April 1, 2019*, Case No. PUR-2018-00087, Doc. Con. Cen. No. 180610084 (Jun. 1, 2018).

[99] *Application of Virginia Electric and Power Company, For revision of rate adjustment clause: Rider GV, Greensville County Power Station for the Rate Year Commencing April 1, 2019*, Case No. PUR-2018-00084, Doc. Con. Cen. No. 180610113 (Jun. 1, 2018).

BW,[100] US-2,[101] and US-3.[102] Company witness Crouch states, on pages 6 through 8 of his testimony, that the Company believes this add-back methodology would fully and fairly consider actual customer demands during system peak, jurisdictional class peaks, and the customer class peaks used in the calculation of the average and excess method allocation factors.

Q40. WHAT IS STAFF'S POSITION REGARDING THIS PROPOSED MODIFICATION TO THE CALCULATION OF FACTOR 1?

A40. The Staff has reviewed this proposed change and, based upon its review, Staff is unopposed to the add-back methodology proposed in calculating Factor 1.

Q41. WHAT IS THE SECOND METHODOLOGICAL CHANGE PROPOSED BY THE COMPANY IN THE INSTANT CASE?

A41. The second change relates to how the costs associated with the Company's EE programs are allocated to the customer classes. Company witness Crouch proposes that the true-up portion of the revenue requirement for costs and recoveries for calendar year 2017 use the previously-approved methodology for cost allocation. The calculation of the allocation

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[100] *Application of Virginia Electric and Power Company, For revision of rate adjustment clause: Rider BW, Brunswick County Power Station, for the Rate Year Commencing September 1, 2019*, Case No. PUR-2018-00166, Doc. Con. Cen. No. 181010147 (Oct. 3, 2018).

[101] *Application of Virginia Electric and Power Company, For revision of a rate adjustment clause: Rider US-2, Scott, Whitehouse, and Woodland Solar Power Stations, for the Rate Year Commencing September 1, 2019*, Case No. PUR-2018-00167, Doc. Con. Cen. No. 181010138 (Oct. 3, 2018).

[102] *Petition of Virginia Electric and Power Company, For approval and certification of the proposed US-3 Solar Projects pursuant to §§ 56-580 D and 56-46.1 of the Code of Virginia and for approval of a rate adjustment clause, designated Rider US-3, under § 56-585.1 A 6 of the Code of Virginia*, Case No. PUR-2018-00101, Doc. Con. Cen. No. 180730228 (Jul. 24, 2018).

factors for the 2017 true-up portion of the revenue requirement is shown in Schedule 2 of Company witness Crouch's Direct Testimony. Company witness Crouch proposes that, for the projected costs associated with the previously-approved Existing Programs, as well as the proposed Phase VII programs for the 2019 Rate Year, the modified Factor 1 be utilized and that costs only be allocated to customers not exempted by the GTSA, *i.e.*, non-Large General Service Customers. Company witness Crouch provides the Company's explanation as to the appropriateness of this methodology in his Direct Testimony at pages 15 through 18. Company witness Crouch also provides the calculation of the allocation factors for the 2019 Rate Year in his Schedule 2.

Q42. WHAT IS STAFF'S POSITION REGARDING EXEMPTING LARGE GENERAL SERVICE CUSTOMERS FROM COST ALLOCATION FOR THE 2019 RATE YEAR?

A42. As discussed previously and on advice of counsel, Staff believes the GTSA exemption of Large General Service Customers from both participation in and cost responsibility for the Existing Programs is inappropriate. Rather, on advice of counsel and as discussed previously, Staff believes that the GTSA exempts Large General Service Customers only from new programs. Staff's position is that there should, in effect, be two Rider C2As: (1) a Rider C2A for costs associated with the previously-approved Existing Programs that will be allocated to all customers who were eligible for participating in and had not opted-out of such participation, and (2) a Rider C2A for costs associated with the newly-proposed and subsequently-approved Phase VII EE programs.

Rider C1A and C2A Rate Design

Q43. PLEASE DISCUSS THE CALCULATION OF THE PROPOSED SURCHARGES TO BECOME EFFECTIVE JULY 1, 2019.

A43. The Company's proposed Riders C1A and C2A, utilizing the Company's method which includes exempting Large General Service Customers from costs associated with the previously-approved Existing Programs, are displayed in Schedule 2 of Company witness Debra A. Stephens' Direct Testimony.

The jurisdictional revenue requirement assigned to each rate class for Riders C1A and C2A is shown in Schedule 3 of Company witness Stephens' Direct Testimony.

Generally, the Company used the same methodology to calculate rates for Riders C1A and C2A that it used to calculate the rates approved in Case No. PUR-2017-00129 with the modification of exempting the Large General Service Customers from cost responsibility for the new Phase VII Programs and previously-approved Existing Programs under Rider C2A. For Rider C1A, the Company calculates a charge for each of the eight customer classes by dividing their allocated class amounts of the jurisdictional revenue requirement by their respective projected kWh sales for the 12 months ending June 30, 2020. The eight customer class rates are then used to develop 23 charges, one applicable for each of the Company's 23 rate schedules.

For Rider C2A, Company witness Stephens proposes a new, two-step process for designing rates going forward. First, the Company designed rates for the rate year revenue requirement using a methodology consistent with the currently-approved methodology but removing Large General Service Customers from cost recovery for new Phase VII Programs and Existing Programs. Next, the Company calculated rates for the true-up

portion of the revenue requirement using the currently-approved methodology for Rider C2A. These rates were then aggregated into a total rate for each rate schedule as shown in Schedule 4 of her Direct Testimony.

Q44. PLEASE DISCUSS THE IMPACT OF THE COMPANY'S PROPOSED SURCHARGES ON TYPICAL CUSTOMER BILLS.

A44. Typical bill impacts for Residential Schedule 1, General Service Schedules GS-1, GS-2, GS-3, and GS-4, and Church Schedule 5C are shown in Schedule 3 of Company witness Stephens' testimony. As shown on page 1 of Company witness Stephens' Schedule 3, the total bill for a residential customer using 1,000 kWh per month would increase from $115.43 to $116.04 in the base months, reflecting an increase of $0.61 per month.

Q45. WHAT IS THE BILL IMPACT FOR A TYPICAL RESIDENTIAL CUSTOMER OF THE PROPOSED CHANGES IN RIDERS C1A AND C2A INCLUDING ALL CURRENT AND PENDING RIDERS?

A45. The bill impact for a typical residential customer using 1,000 kWh per month of all current and pending Dominion riders, including the Company's proposed changes in Riders C1A and C2A may be seen in Table 10 below.[103]

[103] *See* the Company's supplemental response to Staff Interrogatory No. 11-84, Updated Attachment Staff Set 11-84 (DAS), attached hereto as part of Attachment No. DJD-4.

Table 10: All Riders		
Seasonally Weighted Bill, February 1, 2019:		$117.64
Increase Effective 3/1/2019		**% Change**
Case No. PUR-2018-00101, Rider US-3	$0.21	0.18%
Increase Effective 4/1/2019		**% Change**
Case No. PUR-2018-00083, Rider B	$0.26	0.22%
Case No. PUR-2018-00084, Rider GV	$0.47	0.40%
Case No. PUR-2018-00085, Rider R	($0.09)	-0.08%
Case No. PUR-2018-00086, Rider S	$0.18	0.15%
Case No. PUR-2018-00087, Rider W	$0.04	0.03%
Base Rate Reduction for Federal Tax Cut and Jobs Act of 2017	($1.06)	-0.90%
Increase Effective 7/1/2019		**% Change**
Case No. PUR-2018-00168, Rider C1A	$0.04	0.03%
Case No. PUR-2018-00168, Rider C2A	$0.56	$0.48%
Increase Effective 9/1/2019		**% Change**
Case No. PUR-2018-0166, Rider BW	$0.23	0.19%
Case No. PUR-2018-00167, Rider US-2	$0.08	0.07%
Increase Effective 11/1/2019		**% Change**
Case No. PUR-2018-00195, Rider E	$2.15	1.81%
Subtotal:	$3.07	
Total Bill:	$120.71	

Staff notes that the values for Riders C1A and C2A are those proposed by the Company in the instant case and that the apparent difference is due to rounding.

Q46. HAS THE COMPANY PROVIDED ANY ALTERNATIVE RATE CALCULATIONS?

A46. Yes. In response to Staff Interrogatory No. 7-73, Attachment Staff Set 7-73 (DAS), the Company provided the calculation of the Rider C2A rate without excluding Large General Service Customers from cost allocation for costs incurred for the 2019 Rate Year for the Company's Existing Programs.[104] The Company's response states that allocating 2019 Rate

[104] The Company's response to Staff Interrogatory No. 7-73 and pages 1-2 of Attachment Staff Set 7-73 (DAS) is attached hereto as part of Attachment No. DJD-4. Staff has maintained a complete, electronic copy of the attachment and will provide it upon request.

Year costs for the Company's Phase II through Phase VI Programs to Large General Service Customers would result in an increase from $115.43 to $115.95 in the base months, reflecting an increase of $0.52 per month for a residential customer using 1,000 kWh per month.

Q47. DOES STAFF HAVE ANY ADDITIONAL COMMENTS REGARDING THE RIDERS C1A AND C2A SURCHARGES PROPOSED IN THIS CASE?

A47. Yes. Should the Commission approve a revenue requirement that differs from the Company's requested revenue requirement of approximately $48.6 million in this case, Staff recommends that the Riders C1A and C2A surcharges should be adjusted proportionately. Consequently, if the revenue requirement is lower than proposed, the Rider C1A and Rider C2A surcharges should be proportionately lower. This recommendation is intended to maintain the revenue apportionment and rate design methodology proposed either by the Company or by Staff in this case.

Evaluation, Measurement, and Verification Plan

Q48. HAS THE COMMISSION IMPLEMENTED ANY ADDITIONAL REQUIREMENTS REGARDING PETITIONS FOR DSM PROGRAMS?

A48. Yes. During the 2016 legislative session, the Virginia General Assembly passed HB 1053 and SB 395, both of which required:

> § 1. That the State Corporation Commission (the "Commission") shall evaluate the establishment of uniform protocols for measuring, verifying, validating, and reporting the impacts of energy efficiency measures implemented by investor-owned electric utilities providing retail electric utility service in the Commonwealth and the establishment of a methodology for estimating annual kilowatt

> savings and a formula to calculate the levelized cost of saved energy for such energy efficiency measures…The Commission shall submit to the Governor and the General Assembly a report of its findings and recommendations by December 1, 2016.

On March 30, 2016, the Commission established Case No. PUE-2016-00022 to, among other things, receive input from interested persons and entities.[105] In its Order on Evaluation, the Commission, among other things, directed Staff to propose EM&V regulations of general applicability to both electric and natural gas utilities and stated it would further consider the proposed rules in a subsequent, separately docketed proceeding.[106]

Subsequently, the Commission established Case No. PUR-2017-00047 on May 16, 2017 to consider Staff's proposed rules.[107] The Commission's Order Adopting Rules and Regulations found that, following amendments from interested parties, Staff's proposed rules should be adopted, effective January 1, 2018, and were set out at 20 VAC 5-318-10 through 20 VAC 5-318-60 ("EM&V Rules").[108]

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[105] *Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures*, Case No. PUE-2016-00022, Doc. Con. Cen. No. 180340071, Scheduling Order (Mar. 30, 2016).

[106] *Ex Parte: In the matter of receiving input for evaluating the establishment of protocols, a methodology, and a formula to measure the impact of energy efficiency measures*, Case No. PUE-2016-00022, Doc. Con. Cen. No. 161140091, Order on Evaluation (Nov. 30, 2016).

[107] *Ex Parte: In the matter of Adopting New Rules Governing the Evaluation, Measurement, and Verification of the Effects of Utility-Sponsored Demand-Side Management Programs*, Case No. PUR-2017-00047, Doc. Con. Cen. No. 170540139, Order for Notice and Hearing (May 16, 2017).

[108] *Ex Parte: In the matter of Adopting New Rules Governing the Evaluation, Measurement, and Verification of the Effects of Utility-Sponsored Demand-Side Management Programs*, Case No. PUR-2017-00047, 2017 S.C.C. Ann. Rept. 489, Order Adopting Rules and Regulations (Nov. 9, 2017).

Q49. HAS THE COMPANY FILED A PLAN TO COMPLY WITH THE EM&V RULES FOR THE PROPOSED PHASE VII PROGRAMS?

A49. Yes. Company witness Dan Feng filed a preliminary plan for complying with the EM&V Rules in her Appendix B.[109] Appendix B provides program-specific EM&V plans, including sources for deemed savings, methodologies for data collection and analysis, and calculation of lost revenues, should the Company seek them in the future. Staff believes, generally, that the methodologies described in Company witness Feng's Appendix B are appropriate for EM&V for the proposed programs. Staff does not take a position at this time as to the appropriateness of the Company's proposed methodology for calculating lost revenues and believes that this matter should be considered at such time as the Company files for recovery of lost revenues.

Conclusions and Recommendations

Q50. WHAT ARE STAFF'S CONCLUSIONS AND RECOMMENDATIONS REGARDING THE PETITION?

A50. Staff's conclusions and recommendations regarding the Petition are as follows:

1. On advice of counsel, Staff does not believe the Company's proposal to exempt Large General Service Customers from participating in or sharing cost responsibility for the Company's previously-approved Existing Programs is appropriate. Staff recommends that the Large General Service Customers be allowed to continue participation in the Company's Existing Programs and be required to pay for them through Rider C2A.

[109] *See* Pre-filed Direct Testimony of Company witness Dan Feng, Appendix B.

2. Should the Commission determine that the Company's exemption of Large General Service Customers from its Existing Programs is appropriate, Staff believes these programs are no longer those approved by the Commission and, as such, should be closed to further participation by all rate classes. The Company could then re-apply for the programs as "new" programs with updated assumptions as appropriate.

3. Staff has identified several concerns regarding participation, savings estimates, and design of the proposed Phase VII Programs. These concerns result in Staff lacking confidence that many of the proposed Phase VII Programs, when utilizing more appropriate assumptions, would pass at least three of the four cost/benefit tests.

4. Staff recommends that, should the Commission determine that any of the proposed Phase VII Programs are in the public interest, the Company be required to update its assumptions for purposes of the ongoing, going-forward cost/benefit tests with actual data, particularly as relates to participation in such programs, as soon as is practicable.

5. Should the Commission share Staff's uncertainty regarding the appropriateness of the Company's participation assumptions and resulting estimations of energy and demand savings, the Commission may wish to consider limiting approval of the proposed programs to a term of three years. This would allow the Company to gain experience in the administration of the programs and provide utility-specific data for future analysis. The Company could then, depending on the results of such programs, refine their assumptions and provide more reliable cost/benefit analyses in future applications for the programs.

Q51. DOES THIS CONCLUDE YOUR TESTIMONY?

A51. Yes, it does.

Attachment No. DJD-1

Company Exhibit No. __
Witness: DRK
Schedule 3
Page 1 of 1

VIRGINIA ELECTRIC & POWER COMPANY
PHASE I, II, IV, V, & VI PROGRAMS GOING-FORWARD COST-EFFECTIVENESS
INDIVIDUAL RESULTS (000's)
FEDERAL CO2 PLAN

	Air Conditioner Cycling Program			
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 46,885	$ 142,265	$ 142,265	$ 142,265
Total NPV Costs	$ -	$ 148,047	$ 97,056	$ 148,047
Net Benefits NPV	$ 46,885	$ (5,782)	$ 45,209	$ (5,782)
Benefit/Cost Ratio	N/A	0.96	1.47	0.96

	Distributed Generation			
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 8,610	$ 23,035	$ 23,035	$ 23,035
Total NPV Costs	$ 1,357	$ 13,942	$ 6,736	$ 14,897
Net Benefits NPV	$ 7,254	$ 9,093	$ 16,299	$ 8,138
Benefit/Cost Ratio	6.35	1.65	3.42	1.55

	Income and Age Qualifying Home Improvement Program			
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 22,616	$ 11,222	$ 11,222	$ 11,222
Total NPV Costs	$ -	$ 46,261	$ 46,261	$ 71,402
Net Benefits NPV	$ 22,616	$ (35,039)	$ (35,039)	$ (60,180)
Benefit/Cost Ratio	N/A	0.24	0.24	0.16

	Small Business Improvement Program			
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 94,867	$ 59,210	$ 59,210	$ 59,210
Total NPV Costs	$ 46,247	$ 46,475	$ 55,527	$ 113,025
Net Benefits NPV	$ 48,619	$ 12,735	$ 3,683	$ (53,815)
Benefit/Cost Ratio	2.05	1.27	1.07	0.52

	Non-Residential Prescriptive Program			
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 269,051	$ 189,458	$ 189,458	$ 189,458
Total NPV Costs	$ 82,198	$ 85,195	$ 108,125	$ 324,721
Net Benefits NPV	$ 186,852	$ 104,263	$ 81,333	$ (135,263)
Benefit/Cost Ratio	3.27	2.22	1.75	0.58

Attachment No. DJD-2

BRIEF DESCRIPTION OF THE FOUR REQUIRED COST/BENEFIT TESTS

This appendix contains a brief description of each of the four requisite cost/benefit tests required under § 56-576 of the Code along with a stylized version of the formulae. The description of each test includes a brief discussion of the purpose and/or characteristics of the test along with the components of cost and benefit that are to be included in the calculation of the test.

The test results may be expressed in several ways. Two of the most common methods of expression are as a net present value and as a ratio. If a test result is to be expressed as a ratio, the total benefits are divided by the total costs. A ratio greater than one indicates that the benefits exceed the costs.

Reliance on the cost/benefit ratios alone may be misleading. The net present values are more useful for summarizing and comparing programs.

Participant Test:

The purpose of the Participant Test is to estimate the costs and benefits for those customers who choose to participate in a given conservation or energy efficiency program, and thus, is a measure of the attractiveness of a given program to potential participants. It does not, however, capture the complexities and diversity of customer decision-making.

The benefits in the calculation of the test include the reductions in participating customer's bills, any incentive paid by utilities or third parties, and any federal, state, or local tax credit received.

The costs include any out-of-pocket expenses incurred by participants and any bill increases that participants incur.

$$\sum_{t=1}^{N} \frac{\text{Bill Reductions}_t + \text{Incentives Paid}_t + \text{Tax Credits}_t}{\text{Participant Costs}_t}$$

where,

N = the number of years in the measure or program life,
t = year 1, year 2, . . . , year N.

Utility Cost Test (also known as the Program Administrator Cost Test):

This test measures the net costs of a conservation or energy efficiency program as a resource option to the program administrator or the utility. For a given utility, the Program Administrator Test indicates the difference between a utility's avoided costs and the utility's costs to implement the program. The test does not include participants' costs, and thereby, reflects only a portion of the full costs of a program.

The benefits considered are the avoided costs of energy and demand.

The costs include the program or implementation costs for the utility, the incentives paid to participants, and any increased supply costs that may result from the program.

$$\sum_{t=1}^{N} \frac{\text{Utility Avoided Supply Costs}_t}{\text{Program Costs}_t + \text{Incentive Costs}_t}$$

where,

N = the number of years in the measure or program life,
t = year 1, year 2, . . . , year N.

Ratepayer Impact Measure Test:

The Ratepayer Impact Measure Test ("RIM Test") provides an indication of the impact of a program on customer bills or rates due to changes in utility revenues and operating costs caused by the program. As its alternative name, the Non-Participant Test, indicates, the test provides a measure of the impact of a conservation or energy efficiency program on customers who do not participate.

The benefits considered in this test include the avoided supply costs related to transmission, distribution, capacity, and generation (if applicable). Any revenue gain resulting from a conservation or energy efficiency program is also considered a benefit.

The costs used in this test are the program costs incurred by the utility and/or other entities incurring costs for creating or administering the program, the incentives paid by the utility, and any revenue loss associated with a program. Any increased supply cost resulting from a program's implementation is also considered a cost.

$$\sum_{t=1}^{N} \frac{\text{Utility Avoided Supply Costs}_t}{\text{Program Costs}_t + \text{Incentive Costs}_t + \text{Lost Revenues}_t}$$

where,

N = the number of years in the measure or program life,
t = year 1, year 2, . . . , year N.

Total Resource Cost Test:

The Total Resource Cost Test ("TRC Test") is an indicator of net cost of a conservation or energy efficiency program. It may be considered an indicator of the change in the average cost of energy services across all customers. It also may be considered as the summation of the benefit and cost terms in the Participant Test and the RIM Test. In this respect, the test ignores the issue of cross-subsidies between program participants and non-participants.

The benefits used to calculate this test include the avoided supply costs and any applicable federal, state, and/or local tax credits.

The costs in the test calculation include the utility's program costs, the net participant costs, and any increased utility supply costs.

$$\sum_{t=1}^{N} \frac{\text{Utility Avoided Supply Costs}_t}{\text{Program Costs}_t + \text{Net Participant Costs}_t}$$

where,

N = the number of years in the measure or program life,
t = year 1, year 2, . . . , year N.

Attachment No. DJD-3

is essential to ensure the proper treatment of inputs and the appropriate interpretation of cost-effectiveness results.

Categorizing programs is important because in many cases the same specific device can be and should be evaluated in more than one category. For example, the promotion of an electric heat pump can and should be treated as part of a conservation program if the device is installed in lieu of a less efficient electric resistance heater. If the incentive induces the installation of an electric heat pump instead of gas space heating, however, the program needs to be considered and evaluated as a fuel substitution program. Similarly, natural gas-fired self-generation, as well as self-generation units using other non-renewable fossil fuels, must be treated as fuel-substitution. In common with other types of fuel-substitution, any costs of gas transmission and distribution, and environmental externalities, must be accounted for. In addition, cost-effectiveness analyses of self-generation should account for utility interconnection costs. Similarly, a thermal energy storage device should be treated as a load management program when the predominant effect is to shift load. If the acceptance of a utility incentive by the customer to, install the energy storage device is a decisive aspect of the customer's decision to remain an electric utility customer (i.e., to reject or defer the option of installing a gas-fired cogeneration system), then the predominant effect of the thermal energy storage device has been to substitute electricity service for the natural gas service that would have occurred in the absence of the program.

In addition to Fuel Substitution and Load Building Programs, recent utility program proposals have included reference to "load retention," "sales retention," "market retention," or "customer retention" programs. In most cases, the effect of such programs is identical to either a Fuel Substitution or a Load Building program — sales of one fuel are increased relative to sales without the program. A case may be made, however, for defining a separate category of program called "load retention." One unambiguous example of a load retention program is the situation where a program keeps a customer from relocating to another utility service area. However, computationally the equations and guidelines included in this manual to accommodate Fuel Substitution and Load Building programs can also handle this special situation as well.

Basic Methods

This manual identifies the cost and benefit components and cost-effectiveness calculation procedures from four major perspectives: Participant, Ratepayer Impact Measure (RIM), Program Administrator Cost (PAC), and Total Resource Cost (TRC). A fifth perspective, the Societal, is treated as a variation on the Total Resource Cost test. The results of each perspective can be expressed in a variety of ways, but in all cases it is necessary to calculate the net present value of program impacts over the lifecycle of those impacts.

Table I summarizes the cost-effectiveness tests addressed in this manual. For each of the perspectives, the table shows the appropriate means of expressing test results. The primary unit of measurement refers to the way of expressing test results that are considered by the staffs of the two Commissions as the most useful for summarizing and comparing demand-side management (DSM) program cost-effectiveness. Secondary indicators of cost-effectiveness represent supplemental means of expressing test results that are likely to be of particular value for certain types of proceedings, reports, or programs.

This manual does not specify how the cost-effectiveness test results are to be displayed or the level at which cost-effectiveness is to be calculated (e.g., groups of programs, individual programs, and program elements for all or some programs). It is reasonable to expect different levels and types of results for different regulatory proceedings or for different phases of the process used to establish proposed program-funding levels. For example, for summary tables in

general rate case proceedings at the CPUC, the most appropriate tests may be the RIM lifecycle revenue impact, Total Resource Cost, and Program Administrator Cost test results for programs or groups of programs. The analysis and review of program proposals for the same proceeding may include Participant test results and various additional indicators of cost-effectiveness from all tests for each individual program element. In the case of cost-effectiveness evaluations conducted in the context of integrated long-term resource planning activities, such detailed examination of multiple indications of costs and benefits may be impractical.

Table I
Cost-Effectiveness Tests

Participant	
Primary	Secondary
Net present value (all participants)	Discounted payback (years) Benefit-cost ratio Net present value (average participant)
Ratepayer Impact Measure	
Lifecycle revenue impact per Unit of energy (kWh or therm) or demand customer (kW) Net present value	Lifecycle revenue impact per unit Annual revenue impact (by year, per kWh, kW, therm, or customer) First-year revenue impact (per kWh, kW, therm, or customer) Benefit-cost ratio
Total Resource Cost	
Net present value (NPV)	Benefit-cost ratio (BCR) Levelized cost (cents or dollars per unit of energy or demand) Societal (NPV, BCR)
Program Administrator Cost	
Net present value	Benefit-cost ratio Levelized cost (cents or dollars per unit of energy or demand)

Rather than identify the precise requirements for reporting cost-effectiveness results for all types of proceedings or reports, the approach taken in this manual is to (a) specify the components of benefits and costs for each of the major tests, (b) identify the equations to be used to express the results in acceptable ways; and (c) indicate the relative value of the different units of measurement by designating primary and secondary test results for each test.

It should be noted that for some types of demand-side management programs, meaningful cost-effectiveness analyses cannot be performed using the tests in this manual. The following guidelines are offered to clarify the appropriated "match" of different types of programs and tests:

1. For generalized information programs (e.g., when customers are provided generic information on means of reducing utility bills without the benefit of on-site evaluations or customer billing data), cost-effectiveness tests are not expected because of the extreme difficulty in establishing meaningful estimates of load impacts.

2. For any program where more than one fuel is affected, the preferred unit of measurement for the RIM test is the lifecycle revenue impacts per customer, with gas and electric components reported separately for each fuel type and for combined fuels.

Attachment No. DJD-4

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
First Set

The following response to Question No. 13 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on October 17, 2018 has been prepared under my supervision.

Q. A. Brown

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

Question No. 13

Please provide all assumptions, including those provided to the Company by outside consulting entities that support the cost/benefit analysis of the Proposed Phase VII energy efficiency and demand response programs.

Response:

See Extraordinarily Sensitive Attachments Staff Set 1-13 (1) – (13) (MTH) for the requested information. Extraordinarily Sensitive Attachments Staff Set 1-13 (1) – (13) (MTH) contain extraordinarily sensitive DSM Contracts and Prices information, as indicated by green shading, and are being provided to the Staff subject to the conditions in 5 VAC 5-20-170, the Company's Motion for Entry of a Protective Ruling and Additional Protective Treatment filed on October 3, 2018 in Case No. PUR-2018-00168, and the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information issued on October 23, 2018 in Case No. PUR-2018-00168.

Excerpt of Extraordinarily Attachment Staff Set 1-13 (10) (MTH) REDACTED

Program Name: Residential Efficient Products Marketplace

= Represents supplier input data

Program Assumptions

a	Net-to-Gross Ratio (NTGR)	70%		Include Impacts of Free Riders and any other reductions to gross penetrations
b	Program Weighted Average Measure Life (add lines for additional measures if any)	16.5	years	
c	Program Life	4.0	years *	
d	Average Incremental Measure Cost (one-time)	$ 4.55	per participant	Note: CLEAResult has defined the term "participant" as synonymous with the term "installation"
e	Average Incentive Payment (one-time, if paid on a one-time basis)	$ 2.01	per participant paid by Dominion, excluding federal and/or state incentives	
f	Average Incentive Payment (annual, if paid on annual basis)		per participant paid by Dominion, excluding federal and/or state incentives	
g	Non-Incentive Program Costs (one-time, if paid on a one-time basis)	$ 0.502	per participant	
h	Non-Incentive Program Costs as % of Incentive Cost (one-time)	25%	of (e), Includes switches and installation, marketing, coordination with M&V contractor and other non-incentive costs	
i	Non-Incentive Program Costs (annual, if paid on an annual basis)			
j	Non-Incentive Program Costs as % Incentive Payment (annual)		of (f)	

* Five-year program lives have historically been assumed by Dominion. If an alternative program life is appropriate, please explain.

Installations, Participants and Energy/Demand Savings

	2020	2021	2022	2023	Total
Gross Installations This Year	2,312,132	2,675,051	2,919,452	3,188,708	11,095,343
Active (cumulative) Gross Installations Through This Year	2,312,132	4,987,183	7,906,635	11,095,343	11,095,343
Gross Participants This Year	2,312,132	2,675,051	2,919,452	3,188,708	11,095,343
Active (cumulative) Gross Participants Through This Year	2,312,132	4,987,183	7,906,635	11,095,343	11,095,343

[redacted]

* Represents costs for June through December of this year.

Installations by Measure

	2020	2021	2022	2023	Total
A-Lines	1,309,740	1,531,562	1,689,225	1,863,557	6,394,084
Reflectors	396,666	442,336	468,888	497,600	1,805,490
Decoratives	174,151	198,076	212,940	229,217	814,384
Globes	407,695	476,810	519,504	566,548	1,970,557
Retrofit Kit and Fixture	1,254	1,379	1,517	1,669	5,819
Freezer	5,534	6,087	6,696	7,366	25,683
Refrigeration	6,733	7,406	8,147	8,962	31,248
Clothes Washer	4,098	4,507	4,958	5,454	19,017
Dehumidifier	501	551	606	667	2,325
Energy Star Air Purifier	4,761	5,237	5,761	6,337	22,096
Clothes Dryer	1,000	1,100	1,210	1,331	4,641
Dishwasher					

Excerpt of Extraordinarily Sensitive Attachment Staff Set 1-13 (11) (MTH) REDACTED

Program Name: Residential Efficient Products Program

[ ] = Represents supplier input data

Program Assumptions

a	Net-to-Gross Ratio (NTGR)	70%		Include Impacts of Free Riders and any other reductions to gross penetrations
b	Program Weighted Average Measure Life (add lines for additional measures if any)	16.5	years	
c	Program Life	0.58	years *	
d	Average Incremental Measure Cost (one-time)	$ 4.14	per participant	participant is defined as installation
e	Average Incentive Payment (one-time, if paid on a one-time basis)	$ 1.56	per participant paid by Dominion, excluding federal and/or state incentives	
f	Average Incentive Payment (annual, if paid on annual basis)		per participant paid by Dominion, excluding federal and/or state incentives	
g	Non-Incentive Program Costs (one-time, if paid on a one-time basis)	$ 0.499	per participant	
h	Non-Incentive Program Costs as % of Incentive Cost (one-time)	32%	of (e), includes switches and installation, marketing, coordination with M&V contractor and other non-incentive costs	
i	Non-Incentive Program Costs (annual, if paid on an annual basis)			
j	Non-Incentive Program Costs as % Incentive Payment (annual)		of (f)	

* Five-year program lives have historically been assumed by Dominion. If an alternative program life is appropriate, please explain.

Installations, Participants and Energy/Demand Savings

			2019*	Total
	Gross Installations This Year		2,972,475	2,972,475
	Active (cumulative) Gross Installations Through This Year		2,972,475	2,972,475
	Gross Participants This Year		2,972,475	2,972,475
	Active (cumulative) Gross Participants Through This Year		2,972,475	-
	[redacted]			

* Represents costs for June through December of this year.

Installations by Measure

			2019*	Total
	A-Lines		2,081,669	2,081,669
	Reflectors		495,170	495,170
	Decoratives		159,390	159,390
	Globes		68,330	68,330
	Retrofit Kit and Fixture		155,977	155,977
	Freezer		627	627
	Refrigeration		2,767	2,767
	Clothes Washer		3,366	3,366
	Dehumidifier		2,049	2,049
	Energy Star Air Purifier		250	250
	Clothes Dryer		2,380	2,380
	Dishwasher		500	500

Excerpt of Extraordinarily Sensitive Attachment Staff Set 1-13 (13) (MTH) REDACTED

Program Name: Appliance Recycling

[ ] = Represents supplier input data

Program Assumptions

a	Net-to-Gross Ratio (NTGR)		60%	Include impacts of Free Riders and any other reductions to gross penetrations
b	Program Weighted Average Measure Life (add lines for additional measures if any)		8.0	years
c	Program Life		5.0	years *
d	Average Incremental Measure Cost (one-time)	$	67	per participant
e	Average Incentive Payment (one-time, if paid on a one-time basis)	$	20	per participant paid by Dominion, excluding federal and/or state incentives
f	Average Incentive Payment (annual, if paid on annual basis)	$	-	per participant paid by Dominion, excluding federal and/or state incentives
g	Non-Incentive Program Costs (one-time, if paid on a one-time basis)	$	151	per participant
h	Non-Incentive Program Costs as % of Incentive Cost (one-time)		755%	of (e), includes switches and installation, marketing, coordination with M&V contractor and other non-incentive costs
i	Non-Incentive Program Costs (annual, if paid on an annual basis)	$	-	
j	Non-Incentive Program Costs as % Incentive Payment (annual)		#DIV/0!	of (f)

* Five-year program lives have historically been assumed by Dominion. If an alternative program life is appropriate, please explain.

Installations, Participants and Energy/Demand Savings

			2019*	2020	2021	2022	2023	Total
	Gross Installations This Year		5,500	10,000	10,000	10,000	10,000	45,500
	Active (cumulative) Gross Installations Through This Year		5,500	15,500	25,500	35,500	45,500	
	Gross Participants This Year		5,225	9,500	9,500	9,500	9,500	43,225
	Active (cumulative) Gross Participants Through This Year		5,225	14,725	24,225	33,725	43,225	
	[redacted]							

* Represents costs for June through December of this year.

Installations by Measure

			2019*	2020	2021	2022	2023	Total
	Refrigerator recycling		4,400	8,000	8,000	8,000	8,000	36,400
	Freezer recycling		1,100	2,000	2,000	2,000	2,000	9,100

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
First Set

The following **supplemental response** (dated November 16, 2018) to Question No.13 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on October 17, 2018 has been prepared under my supervision.

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

Question No. 13

Please provide all assumptions, including those provided to the Company by outside consulting entities that support the cost/benefit analysis of the Proposed Phase VII energy efficiency and demand response programs.

Response:

See Extraordinarily Sensitive Attachments Staff Set 1-13 (1) – (13) (MTH) for the requested information. Extraordinarily Sensitive Attachments Staff Set 1-13 (1) – (13) (MTH) contain extraordinarily sensitive DSM Contracts and Prices information, as indicated by green shading, and are being provided to the Staff subject to the conditions in 5 VAC 5-20-170, the Company's Motion for Entry of a Protective Ruling and Additional Protective Treatment filed on October 3, 2018 in Case No. PUR-2018-00168, and the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information issued on October 23, 2018 in Case No. PUR-2018-00168.

Supplemental Response (11-16-2018):

See the following supplemental attachments for additional information provided by the firms that generated the designs for the proposed Phase VII Programs:

- Supplemental Attachment Staff Set 1-13 (14) (NonRes Heating and Cooling)
- Supplemental Attachment Staff Set 1-13 (15) (NonRes Lighting)
- Supplemental Attachment Staff Set 1-13 (16) (NonRes Window Film)

- Supplemental Attachment Staff Set 1-13 (17) (NonRes Office)
- Supplemental Attachment Staff Set 1-13 (18) (NonRes Office)
- Supplemental Attachment Staff Set 1-13 (19) (NonRes Small Manufacturing)
- Supplemental Attachment Staff Set 1-13 (20) (NonRes Small Manufacturing)
- Supplemental Attachment Staff Set 1-13 (21) (Res Smart Thermostat DR)
- Supplemental Attachment Staff Set 1-13 (22) (Res Smart Thermostat EE)
- Supplemental Attachment Staff Set 1-13 (23) (Res Smart Thermostat EE)
- Supplemental Attachment Staff Set 1-13 (24) (Res Smart Thermostat EE and DR)
- Confidential Supplemental Attachment Staff Set 1-13 (25) (Res Customer Engagement)
- Confidential Supplemental Attachment Staff Set 1-13 (26) (Res Customer Engagement)
- Supplemental Attachment Staff Set 1-13 (27) (Res Efficient Products Marketplace)
- Supplemental Attachment Staff Set 1-13 (28) (Res Home Energy Assessment)

With respect to the Company's proposed Residential Appliance Recycling Program, projected energy and demand savings used as inputs to the cost-benefit analysis for this Program were derived from historical information associated with the Company's Phase IV Appliance Recycling Program contained in the latest Evaluation, Measurement, and Verification Report for Virginia Electric and Power Company, dated May 1, 2018, Appendix A (filed in Case No. PUE-2016-00111).

Confidential Supplemental Attachments Staff Set 1-13 (25) and (26) contain confidential and proprietary information and are provided to Staff subject to the conditions in 5 VAC 5-20-170, the Company's Motion for Entry of a Protective Ruling and Additional Protective Treatment filed on October 3, 2018 in Case No. PUR-2018-00168, and the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information issued on October 23, 2018 in Case No. PUR-2018-00168.

Excerpt of Supplemental Attachment Staff Set 1-13 (14) (NonRes Heating and Cooling)

Non-Residential HVAC Program - DSM7 (2018) Savings Calc Backup

Annual Participants					
2019	2020	2021	2022	2023	Totals
350	700	700	700	700	3,150

		Annual Installations					
Savings Calculation References	Measure	2019	2020	2021	2022	2023	Totals
kWh - NEEPv7, page 346, early replace	Packaged Terminal Air Conditioner Units and Heat Pumps	67	134	134	134	134	603
kW - NEEPv7, p354, early replace		67	134	134	134	134	603
Baseline EER, NEEPv7, p 345		67	134	134	134	134	603
		1	2	2	2	2	9
		1	2	2	2	2	9
		1	2	2	2	2	9
		1	2	2	2	2	9
kWh - NEEPv7, page 346, early replace	Unitary Air Cooled Air Conditioners	197	394	394	394	394	1773
kW - NEEPv7, p354, early replace		146	292	292	292	292	1314
Baseline EER, NEEPv7, p 344		59	118	118	118	118	531
		44	88	88	88	88	396
		7	14	14	14	14	63
kWh - NEEPv7, page 346, early replace	Unitary Air Cooled Heat Pumps	1	2	2	2	2	9
kW - NEEPv7, p354, early replace		1	2	2	2	2	9
Baseline EER, NEEPv7, p 343		1	2	2	2	2	9
		1	2	2	2	2	9
		1	2	2	2	2	9
kW - NEEPv7, p377	Water Cooled Chillers	1	2	2	2	2	9
Min Qualifying IPLV, NEEPv7,p380		1	2	2	2	2	9
Baseline kW/ton, NEEPv&,p379, DC		1	2	2	2	2	9
Baseline IPLV, NEEPv7,p380, DC		1	2	2	2	2	9
		1	2	2	2	2	9
kWh - NEEPv7, p376	Air Cooled Chillers	10	20	20	20	20	90
kW - NEEPv7, p377							
Baseline EER, NEEPv7, p378, Location Washington DC							
Baseline is ASHRAE 90.1-2010 (Table 6.8.1B)	Geothermal Heat Pumps	2	4	4	4	4	18
High performance from existing DSM3 HVAC program (this is ~50% better than the baseline)							
kWh - NEEPv7,p391	HVAC Economizers	21	42	42	42	42	189
kW - NEEPv7,p391		21	42	42	42	42	189
kWh - NEEPv7,p365	VFDs	57	114	114	114	114	513
kW - NEEPv7,p366		57	114	114	114	114	513

Excerpt of Supplemental Attachment Staff Set 1-13 (14) (NonRes Heating and Cooling)

kW - NEEPv7 p356		57	114	114	114	114	513
Cooling savings only - NEEPv7 p359	Mini Split Air Conditioners and Heat Pumps	24	48	48	48	48	216
		24	48	48	48	48	216
		24	48	48	48	48	216
Not addressed in TRM. Savings are 30% improvement over code with ASHRAE 90.1-2010 as baseline.	Variable Refrigerant Flows	1	2	2	2	2	9
		1	2	2	2	2	9
		1	2	2	2	2	9
Base from 90.1—2010 (Table 6.8.1B). Heat & Cool improvement limited to 15-17% because performance of available equipment determined by informal assessment of online manufacturer data. These performance numbers assume following rating conditions: 86 degree entering water temp for cooling and 68 degree entering water temp for heating.	Water Source Heat Pumps and Air Conditioners	80	160	160	160	160	720

Excerpt of Supplemental Attachment Staff Set 1-13 (16) (NonRes Window Film)

			kWh charge	$	0.082
Program/Facility Characteristics			Install incentive	$	0.05
Typical SF of install per building	2,850				

Savings Calculation References	Measure	kWh Savings	2019 Participants	2020 Participants	2021 Participants	2022 Participants	2023 Participants	Incentive
Relied on VA/NC Evaluation results compared to additional states' TRM savings for this measure.	Window Film per participant	47,025	24	47	47	47	47	$ 2,351
			2019 Installations (sq ft)	2020 Installations (sq ft)	2021 Installations (sq ft)	2022 Installations (sq ft)	2023 Installations (sq ft)	Incentive
			68,400	133,950	133,950	133,950	133,950	$ 1

Excerpt of Supplemental Attachment Staff Set 1-13 (17) (NonRes Office)

Load Shape & Deemed Savings for Dominion Energy DSM7 (2018) Non-Residential Office Program – Measure Modeling Notes

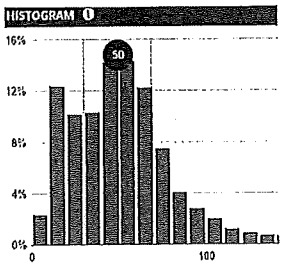
Analysis is based on DOE reference building "Large Office" with code vintage set to ASHRAE 90.1—2004 and the TMY weather file for Richmond, VA, which is located in ASHRAE climate zone 4A. Current energy code in Virginia is described online as "Between 90.1-2007 and 90.1-2010. 2004 vintage buildings and systems would be good candidates for RCx. Systems are generally assumed to be functioning properly, but can benefit from re-programming controls. The baseline system type (for occupied office spaces) is a central VAV system per floor with hot water reheat and chilled water.

The base building has other system types (CV, data center systems) in other parts of the building.

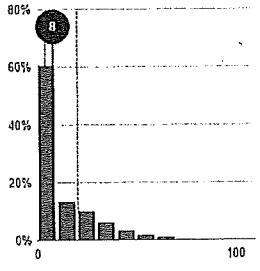
DOE/CBECS Data for Zone 4A Office Buildings (All Sizes)

Median site Electric EUI (50 kBtu/sqft/year) is equivalent to about 14.6 kWh/sqft/year for all offices surveyed in climate zone 4A. Median site Fuel EUI (8 kBtu/sqft/year) is equivalent to about 0.08 therms/sqft/year.

Electricity:



Fuel:



Base Building

The baseline energy model is derived from one of DOE's Commercial Reference Buildings—the large office. That model uses 24.35 kWh/sqft/year and 0.08 therms/sqft/year. Electricity usage includes a data center, typical of such buildings—hence the interior equipment load. The building type is a large office (12-story + basement, 498,600 sqft, 38,350 sqft/floor) with one built-up VAV system per above-ground floor,with hot water re-heats, and a single hot water and water-cooled chiller plant for the building.

Because program participants will be smaller than this, the reference building was modified to a 4-story building, was scaled from simulations of the large building, as is standard practice in building energy simulation modeling. The reference 12-story building model was modified by removing eight of the interior floors—reducing the building to four stories plus a basement data center. In fact, the interior floors of the 12-story DOE reference model were modeled in EnergyPlus with "multipliers," which means that the simulator itself was scaling results for the interior floors. The 4-story models were created by changing the multipliers from ten to two.

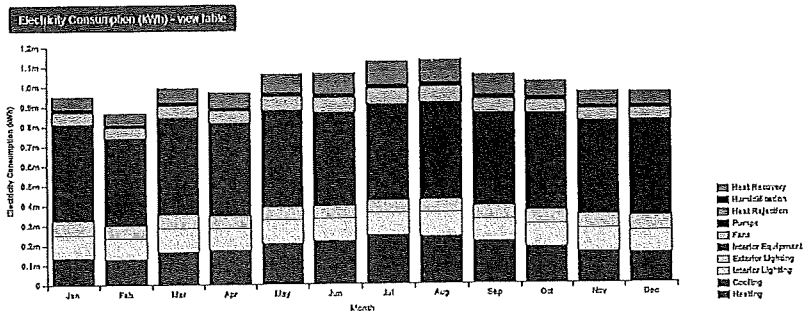
All but one of the load shapes were re-simulated using the 4-story model (191,764 sqft gross with about 150,000 sqft in the above-ground floors subject to controls improvements). Savings estimates were updated based on the new simulations and/or de-rated based on past engineering experience with the savings results of measures involved in facilities with characteristics similar to the 4-story office.

Excerpt of Supplemental Attachment Staff Set 1-13 (17) (NonRes Office)

Scaling of results predict savings for medium to large multi-story office buildings. Loads on HVAC equipment in such buildings tend to be dominated less by shell or envelope loads than internal loads such as people, lights, and equipment. Small buildings with relatively large exterior surface area compared to floor area (or larger sprawling buildings with only one or two floors) would not be modeled as well by scaling these results. On the other hand, small buildings would rarely be heated and cooled by VAV air-handlers with central hot water and chilled water plants.

The basement includes an 8,400 sqft data center and each floor includes its own small 390 sqft data center. Note: In general, the unoccupied basement areas (41,500 sqft) are not included in the savings rate (i.e. kWh/sqft) calculations below. Savings rates are normalized with a building area of 457,100 sqft (or 153,400 sqft for the 4-story models).

The simulation output screen-shots below are from the original 12-story model and demonstrate the initial round of savings estimates for each measure. Each measure was re-simulated with the 4-story model (except for one, which was merely scaled) to produce fresh load profiles and savings numbers. The updated savings figures appear in each load profile workbook and are printed at the bottom of each measure description.



Electricity Consumption (kWh) - view table

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Heating													
Cooling	136239.17	130268.89	165594.72	176661.11	205766.67	217797.78	245741.39	239594.72	213607.22	183376.39	159520.0	149527.5	2223885.56
Interior Lighting	114923.89	104626.67	119175.28	106535.56	119175.28	114325.56	111385.0	119175.28	110786.67	114923.89	114325.56	111385.0	1360743.61
Exterior Lighting	72461.67	63596.39	67688.33	63190.56	63452.22	60496.94	62002.78	64344.44	64467.22	69279.44	69498.06	73194.17	794472.22
Interior Equipment	490313.89	443363.89	492825.0	471769.44	492825.0	476836.11	488255.56	492825.0	474280.56	490313.89	476836.11	488255.56	5777700.0
Exterior Equipment													
Fans	55361.94	48950.83	57173.33	57407.5	65206.94	68645.0	73718.61	74177.22	64776.11	59628.61	54568.61	53458.06	733072.78
Pumps	22965.25	21018.33	24621.25	24365.72	26963.47	25842.94	27371.17	26989.61	25710.92	25230.31	23573.86	23708.42	297362.25
Heat Rejection	5725.14	6743.72	12203.33	20137.66	34979.17	48696.94	60668.33	57631.39	47638.89	21723.83	13396.19	10212.53	339557.03
Humidification	8.56												8.56
Heat Recovery	51440.83	47325.56	53498.61	48859.89	53498.61	51440.83	50926.39	53498.61	50926.39	51440.83	51440.83	50926.39	615232.78
Water Systems													
Refrigeration													
Generators													
Total	949441.34	865894.28	992779.86	968936.33	1060857.36	1063482.11	1120869.22	1128236.28	1052293.97	1015917.19	962659.22	960667.61	12142034.79

Energy Efficiency Measures

Existing systems are assumed to be ten years old with ten years of useful life remaining.

Supplemental Attachment Staff Set 1-13 (19) (NonRes Small Manufacturing)

Non-Residential Small Manufacturing Program Measure Calculations & References - DSM7 (2018)

Annual Participants					
2019	2020	2021	2022	2023	Totals
35	70	70	70	70	315

Measure Calculation References & Descriptions	Measure	kWh Savings	kW Savings	Incremental Cost	Incentive	Incentive % of Inceremental Cost
Reference separate file labeled "Small Manufacturing measure descp_ref"	Compressed Air Nozzles	12,609	3.1	$57	$40	70%
	Compressed Air Leaks (40 CFM)	8,038	2.1	$800	$600	75%
	No Loss Drains	1,287	0.3	$700	$500	71%
	Additional Storage (5 gal/CFM)	18,984	5.7	$1,800	$1,334	74%
	Heat of Compression Dryer	22,227	4.9	$36,400	$25,050	69%
	Low Pressure Drop Filter	1,578	0.3	$1,100	$800	73%
	VSD Air Compressor	26,082	8.3	$5,000	$3,500	70%
	Cycling Refrigerant Dryer	942	0.4	$1,300	$940	72%
	Dewpoint Controls	8,042	2.1	$3,465	$2,550	74%
	Pressure Reduction	789	0.2	$100	$70	70%
	Downsized VFD Compressor	27,339	9.5	$5,000	$3,700	74%

Annual Installations					
2019	2020	2021	2022	2023	Totals
7	14	14	14	14	63
35	70	70	70	70	315
70	140	140	140	140	630
7	14	14	14	14	63
3	6	6	6	6	27
35	70	70	70	70	315
35	70	70	70	70	315
35	70	70	70	70	315
3	6	6	6	6	27
9	18	18	18	18	81
3	6	6	6	6	27

Supplemental Attachment Staff Set 1-13 (20) (NonRes Small Manufacturing)

Load Shape & Deemed Savings for Dominion Energy DSM VII (2018) Non-Residential Small Manufacturing Program – Measure Modeling Notes

1.1 | Compressed air nozzles

This measure reduces compressed air demand by replacing open nozzles with engineered nozzles.

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of a typical two shift small industrial facility, per engineering experience and judgement. Capacity is based on weighted average of load/unload (35%), Inlet Modulation (35%), and VSD/variable inlet/reciprocating (30%). Baseline nozzle is 1/4" open tube with 58 CFM and engineered nozzle is 29 CFM, for 29 CFM savings per nozzle. CFM savings are per version 6 of the IL TRM, page 472.

1.2 | Compressed air leaks

Reduce compressed air demand by identifying and repairing leaks

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of a typical two shift small industrial facility, per engineering experience and judgement. Capacity is based on weighted average of load/unload (40%), Inlet Modulation (40%), and VSD (20%). Savings estimated for 20 cfm reduction in demand due to leak repair. Savings are based on a custom spreadsheet engineering model that uses compressor unloading curves from the Compressed Air Challenge and vendor data.

1.3 | No Loss Drains

Reduce compressed air demand by installing no-loss condensate drains.

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. Capacity is based on weighted average of load/unload (35%), Inlet Modulation (35%), and VSD/variable inlet/reciprocating (30%). Baseline drain is timer-actuated with 3 CFM savings per drain. CFM savings are per version 6 of the IL TRM, page 470.

Supplemental Attachment Staff Set 1-13 (20) (NonRes Small Manufacturing)

1.4 | Additional Storage

Install additional storage to compressed air system with load/no load compressors.

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of a typical two shift small industrial facility, per engineering experience and judgement. Baseline efficiency is average of 1gallons/cfm and 2 gallons/cfm values. Proposed efficiency is average of 5 gallons/cfm and 10 gallons/cfm. Savings are based on a custom spreadsheet engineering model that uses compressor unloading curves from the Compressed Air Challenge and vendor data.

1.5 | Heat of Compression Dryer

Replace a standard purge desiccant dryer with a heat of compression dryer.

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Purges at 90% baseline flow 16 hours/weekday, 90% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of a typical two shift small industrial facility, per engineering experience and judgement. Capacity is based on weighted average of load/unload (40%), Inlet Modulation (40%), and VSD (20%). Baseline operation uses 15% purge air and proposed operation uses 2% purge air. Savings are based on a custom spreadsheet engineering model that uses compressor unloading curves from the Compressed Air Challenge and vendor data.

1.6 | Low Pressure Drop Filter

Install low pressure-drop air filter for 2 psig reduction in compressor discharge pressure.

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of a typical two shift small industrial facility, per engineering experience and judgement. Capacity is based on weighted average of load/unload (35%), Inlet Modulation (35%), and VSD/variable inlet/reciprocating (30%). Baseline filter has 3 psig pressure drop, proposed filter has 1 psig pressure drop. CFM savings are per version 6 of the IL TRM, page 468.

1.7 | Variable Speed Air Compressor

Install rotary screw air compressor with variable speed drive.

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of

a typical two shift small industrial facility, per engineering experience and judgement. Baseline is the weighted average of load/unload (40%), Inlet Modulation (40%), and variable inlet/reciprocating (20%). Savings are based on a custom spreadsheet engineering model that uses compressor unloading curves from the Compressed Air Challenge and vendor data.

1.8 | Cycling Refrigerant Dryer

Replace an existing non-cycling refrigerated dryer with a cycling refrigerated dryer.

Assumes a 50 HP system and a 200 CFM refrigerated dryer, based on typical compressed air system sizes expected to be present in small industrial facilities (below the 500 kW demand threshold), per engineering judgement. The cycling dryer cycles as needed, matching the approximate load profile of the compressor system. Savings are based on a custom engineering model that includes compressor load and incoming air humidity.

1.9 | Dew point Controller

Install dew point sensor controls on a desiccant compressed air dryer. The dew point controls ensure that the purge air of the compressed air dryer is used as needed, and not run continuously.

Assumed a 200 CFM dryer, based on typical compressed air system sizes expected to be present in small industrial facilities (below the 500 kW demand threshold), per engineering judgement. Dew point controls reduced the purge air from 15% of rated capacity, to 15% of the compressed air demand. Savings are based on a custom spreadsheet engineering model that uses compressor unloading curves from the Compressed Air Challenge and vendor data.

1.10 | Pressure Reduction

Reduce compressor discharge pressure by 1 psig. This measure could be additive. Example, a customer who reduced pressure by 5psi would claim 5X of the savings. Applies system wide.

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of a typical two shift small industrial facility, per engineering experience and judgement. Capacity is based on weighted average of load/unload (35%), Inlet Modulation (35%), and VSD/variable inlet/reciprocating (30%). Pressure reduced by 1 psi. Savings are based on a custom spreadsheet engineering model that uses compressor unloading curves from the Compressed Air Challenge and vendor data.

1.11 | Downsized VFD compressor

This measure involves the installation of a VFD air compressor to replace an existing air compressor. In addition, the customer chooses to install a compressor that is 10% smaller than their previous compressor. A 10% size reduction is an estimate of the size reduction that can typically be realized due to compressor oversizing, per engineering judgement.

Supplemental Attachment Staff Set 1-13 (20) (NonRes Small Manufacturing)

Assumes a system with total 50HP, single-stage, lubricated, rotary screw compressor, which is the size of compressor expected to be present in small industrial facilities (below the 500 kW demand threshold) per engineering judgement. Operates at 75% baseline flow 16 hours/weekday, 60% baseline flow 8 hours/day Saturday, no Sunday operation. This loading profile is representative of a typical two shift small industrial facility, per engineering experience and judgement. Baseline is the weighted average of load/unload (40%), Inlet Modulation (40%), and variable inlet/reciprocating (20%). Savings are based on a custom spreadsheet engineering model that uses compressor unloading curves from the Compressed Air Challenge and vendor data.

Excerpt of Supplemental Attachment Staff Set 1-13 (24) (Res Smart Thermostat EE and DR)

Residential Smart Thermostat DR Program

Annual Participants					
2019	2020	2021	2022	2023	Totals
6,808	20,673	29,836	38,473	45,348	141,139

Savings Calculations References	Measure	Baseline Measure	2019 Quantity	2020 Quantity	2021 Quantity	2022 Quantity	2023 Quantity	kWh Savings	kW Reduction	Incentive
kWh - formula based on NEEP v7 for Cooling load kW - based on analysis of quantitative values from similarly delivered programs, see separate write-up for additional details	HP System DR Peak Reduction	No Peak Load Mgmt	3,358	10,300	14,575	18,625	22,192	12	1.5	$ 18
	AC System DR Peak Reduction	No Peak Load Mgmt	3,450	10,373	15,261	19,849	23,157	12	1.5	$ 18

Excerpt of Supplemental Attachment Staff Set 1-13 (24) (Res Smart Thermostat EE and DR)

Residential Smart Thermostat EE program (purchase component)

Annual Participants					
2019	2020	2021	2022	2023	Totals
2,263	4,237	4,492	4,735	5,494	21,221

Savings Calculations References	Measure	Baseline Measure	2019 Quantity	2020 Quantity	2021 Quantity	2022 Quantity	2023 Quantity	kWh Savings	kW Reduction	Percent of load in summer
kWh - formula based on combination of NEEP v7, page 109 & April 2017 NEEP Guidance Document for Claiming Savings from Smart Tstats, page 2 kW - NEEP v7	Smart Thermostat HP (New Installs)	Standard Programmable stat	2,263	4,237	4,492	4,735	5,494	538	0.0	15%
	Smart Thermostat CAC (New Installs)	Standard Programmable stat	0	0	0	0	0	104	0.0	79%

Excerpt of Supplemental Attachment Staff Set 1-13 (24) (Res Smart Thermostat EE and DR)

Residential Smart Thermostat EE Behavioral Program (system optimization / feedback component)

Annual Participants					
2019	2020	2021	2022	2023	Totals
6,808	20,673	29,886	38,473	45,348	141,139

Savings Calculations References	Measure	Baseline Measure	2019 Quantity	2020 Quantity	2021 Quantity	2022 Quantity	2023 Quantity	Incremental Cost	Incentive
kWh - formula based on NEEP v7 for Heating & Cooling loads coupled with analysis of quantitative values from similarly delivered programs, see separate write-up for additional details kW - NEEP v7	HP System Optimization	Customer controled settings	1,971	5,825	9,140	12,520	16,296	$ 3	$ 10
	AC System Optimization	Customer controled settings	863	2,594	3,816	4,963	5,790	$ 3	$ 10
	Behavioral Savings Elec Heat Pump	No usage performance feedback	3,358	10,300	14,575	18,625	22,192	$ 3	$ -
	Behavioral Savings CAC w Other Heat Source	No usage performance feedback	3,450	10,373	15,261	19,849	23,157	$ 3	$ -

Excerpt of Supplemental Attachment Staff Set 1-13 (28) (Res Home Energy Assessment)

Residential Home Energy Assessment Program Measure Calculations & References - DSM7 (2018)

Annual Participants					
2019	2020	2021	2022	2023	Totals
11,080	30,357	35,020	34,048	34,408	144,863

Measure	Baseline Measure	2019 Annual Installs	2020 Annual Installs	2021 Annual Installs	2022 Annual Installs	2023 Annual Installs	Per Measure Incremental Cost	Per Measure Incentive	Incentive % of Incremental Cost
Aline LED 40 W Equivalent	EISA compliant Incandescent	318	0	0	0	0	$ 2.48	$ 7.15	289%
Aline LED 60 W Equivalent	EISA compliant Incandescent	42318	0	0	0	0	$ 1.98	$ 7.50	379%
Aline LED 75 W Equivalent	EISA compliant Incandescent	1909	0	0	0	0	$ 2.48	$ 9.40	379%
Aline LED 100 W Equivalent	EISA compliant Incandescent	7955	0	0	0	0	$ 4.65	$ 13.20	284%
Aline LED # Way 75/100/150 W Equivalent	EISA compliant Incandescent	18	35	39	32	30	$ 5.76	$ 13.20	229%
Decorative LED 25W Equivalent	EISA compliant Incandescent	1	0	0	0	0	$ 5.42	$ 4.48	83%
Decorative LED 40W Equivalent	EISA compliant Incandescent	1212	2323	2625	2121	2020	$ 5.76	$ 7.38	128%
LED Downlight 50 W Equivalent	EISA compliant Incandescent	424	813	919	742	707	$ 8.20	$ 9.59	117%
LED Downlight 65 W Equivalent	EISA compliant Incandescent	48	93	105	85	81	$ 8.20	$ 12.56	153%
LED Downlight 75 W Equivalent	EISA compliant Incandescent	24	46	53	42	40	$ 8.20	$ 14.16	173%
LED Downlight 90 W Equivalent	EISA compliant Incandescent	12	23	26	21	20	$ 8.20	$ 16.90	206%
LF Showerhead (Electric DHW Only)	Standard 2.5 gpm showerhead	5818	11152	12606	10182	9697	$ 2.00	$ 22.87	1143%
LF Kitchen swivel Aerator (Elec DHW Only)	Standard 2.2 gpm aerator	3939	7550	8535	6894	6566	$ 2.00	$ 1.69	85%
LF Bath Aerator (Electric DHW Only)	Standard 2.2 gpm aerator	8636	16553	18712	15114	14394	$ 2.00	$ 2.30	115%
Smart Power Strip	NO active power control	1	0	0	0	0	$ 18.00	$ 3.12	17%
3/4" WH Pipe Insulation	No Insulation present	30909	59242	66970	54091	51515	$ 3.00	$ 6.07	202%
1/2" WH Pipe Insulation	No Insulation present	909	1742	1970	1591	1515	$ 3.00	$ 4.03	134%
WH Turndown 10 Degree	Current setting 135° F or hicher	303	581	657	530	505	$ 5.00	$ 1.57	31%
Tune Up HP	NO maintanence in last 5 years	2400	10080	11280	12160	12800	$ 105.00	$ 39.00	37%
Tune Up AC	NO maintanence in last5 years	1	0	0	0	0	$ 105.00	$ 23.40	22%
ECM Fan Motors HP or CAC+ Gas Furn	Permanent split capacitor (PSC) fan motor in place	1260	2562	4620	5040	5460	$ 98.00	$ 39.00	40%
ECM Fan Motors CAC only	Permanent split capacitor (PSC) fan motor in place	1	1	1	1	1	$ 98.00	$ 19.50	20%
Cool Roof ** per sq ft	Standard emmission roofing material	1	1	1	1	1	$ 5.00	$ 226.20	4524%
Duct Insulation & AS AC and HP **	No Duct Insulation present Unconditioned space	577	889	1042	1446	1350	$ 160.00	$ 70.20	44%
Duct Insulation & AS AC Only **	No Duct Insulation present Unconditioned space	153	492	577	640	630	$ 160.00	$ 70.20	44%
Air Source HP - SEER ≥16 HPSF 8.7	Energy Star Standard SEER 14	400	1700	1680	1440	1245	$ 394.00	$ 156.00	40%
Air Source HP - SEER ≥17 HPSF 9.2	Energy Star Standard SEER 14	276	1040	1190	1220	1150	$ 591.00	$ 195.00	33%
Air Source HP - SEER ≥18 HPSF 9.2	Energy Star Standard SEER 14	210	740	810	1095	1120	$ 788.00	$ 234.00	30%
Air Source HP - SEER ≥19 HPSF 10	Energy Star Standard SEER 14	77	488	690	945	1075	$ 985.00	$ 273.00	28%
Air Source HP - SEER ≥21 HPSF 10.5	Energy Star Standard SEER 14	1	0	0	0	0	$ 1,379.00	$ 312.00	23%
Ground Source Heat Pump	Energy Star Standard SEER 14 ASHP	1	0	0	0	0	$ 9,357.00	$ 390.00	4%
Replace Elec DHW with HP DHW	Energy Star Minimum Efficiency Electric Resistance unit	4	12	30	48	60	$ 1,338.00	$ 234.00	17%
Duct Sealing AC and HP (**per 5% eff gain)	No Duct sealing or Insulation present Unconditioned space	400	800	1200	1400	1400	$ 120.00	$ 148.20	124%
Duct Sealing AC only (**per 5 % eff gain)	No Duct sealing or Insulation present Unconditioned space	200	600	700	700	700	$ 120.00	$ 109.20	91%
Ductless MS HP - SEER ≥19 HPSF 10 perton	Energy Star Standard SEER 14 ASHP	24	120	240	340	340	$ 267.00	$ 195.00	73%

Individual measure values were based on a compilation of Version 7 of the MidAtlantic TRM, the May 2016 Evaluation, Measurement and Verification Report for Dominion Energy authored by DNVGL, the October 2017 Dominion Energy Efficiency Potential Study authored by Navigant, and the EISA regulations.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
First Set

The following **second supplemental response** (dated January 17, 2019) to Question No.13 of the First Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on October 17, 2018 has been prepared under my supervision.

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

Question No. 13

Please provide all assumptions, including those provided to the Company by outside consulting entities that support the cost/benefit analysis of the Proposed Phase VII energy efficiency and demand response programs.

Response:

See Extraordinarily Sensitive Attachments Staff Set 1-13 (1) – (13) (MTH) for the requested information. Extraordinarily Sensitive Attachments Staff Set 1-13 (1) – (13) (MTH) contain extraordinarily sensitive DSM Contracts and Prices information, as indicated by green shading, and are being provided to the Staff subject to the conditions in 5 VAC 5-20-170, the Company's Motion for Entry of a Protective Ruling and Additional Protective Treatment filed on October 3, 2018 in Case No. PUR-2018-00168, and the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information issued on October 23, 2018 in Case No. PUR-2018-00168.

Supplemental Response (11-16-2018):

See the following supplemental attachments for additional information provided by the firms that generated the designs for the proposed Phase VII Programs:

- Supplemental Attachment Staff Set 1-13 (14) (NonRes Heating and Cooling)
- Supplemental Attachment Staff Set 1-13 (15) (NonRes Lighting)
- Supplemental Attachment Staff Set 1-13 (16) (NonRes Window Film)

- Supplemental Attachment Staff Set 1-13 (17) (NonRes Office)
- Supplemental Attachment Staff Set 1-13 (18) (NonRes Office)
- Supplemental Attachment Staff Set 1-13 (19) (NonRes Small Manufacturing)
- Supplemental Attachment Staff Set 1-13 (20) (NonRes Small Manufacturing)
- Supplemental Attachment Staff Set 1-13 (21) (Res Smart Thermostat DR)
- Supplemental Attachment Staff Set 1-13 (22) (Res Smart Thermostat EE)
- Supplemental Attachment Staff Set 1-13 (23) (Res Smart Thermostat EE)
- Supplemental Attachment Staff Set 1-13 (24) (Res Smart Thermostat EE and DR)
- Confidential Supplemental Attachment Staff Set 1-13 (25) (Res Customer Engagement)
- Confidential Supplemental Attachment Staff Set 1-13 (26) (Res Customer Engagement)
- Supplemental Attachment Staff Set 1-13 (27) (Res Efficient Products Marketplace)
- Supplemental Attachment Staff Set 1-13 (28) (Res Home Energy Assessment)

With respect to the Company's proposed Residential Appliance Recycling Program, projected energy and demand savings used as inputs to the cost-benefit analysis for this Program were derived from historical information associated with the Company's Phase III Appliance Recycling Program contained in the latest Evaluation, Measurement, and Verification Report for Virginia Electric and Power Company, dated May 1, 2018 (filed in Case No. PUE-2016-00111).

Confidential Supplemental Attachments Staff Set 1-13 (25) and (26) contain confidential and proprietary information and are provided to Staff subject to the conditions in 5 VAC 5-20-170, the Company's Motion for Entry of a Protective Ruling and Additional Protective Treatment filed on October 3, 2018 in Case No. PUR-2018-00168, and the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information issued on October 23, 2018 in Case No. PUR-2018-00168.

Supplemental Response (1-17-2019):

Please see Supplemental Attachment Staff Set 1-13 (27) (Res Efficient Products Marketplace) (Corrected) for an updated version of this attachment. This update resolves an inconsistency between the "Appendix A" modeling input data and the backup data.

Excerpt of Supplemental Attachment Staff Set 1-13 (15) (NonRes Lighting)(Corrected)

Non-Residential Lighting Program Measure Calculations & References - DSM7 (2018)

Annual Participants					
2019	2020	2021	2022	2023	Totals
333	665	366	366	366	2,098

		Annual Installations					
Measure Calculation References	Measure	2019	2020	2021	2022	2023	Totals
NEEPv5 p277	T8 - 2 - 2ft 17watt Lamps with Reflector & NB	1	2	2	2	2	9
NEEPv5 p277	T8 - 3 - 2ft 17watt Lamps with Reflector & NB	1	2	2	2	2	9
NEEPv5 p277	T8 Enclosed Fixture - 2 Lamp NB No Reflector	10	20	20	20	20	90
NEEPv5 p277	T8 Enclosed Fixture - 3 Lamp NB No Reflector	10	20	20	20	20	90
NEEPv5 p277	T8 High-Bay - 4ft 3 lamp	10	20	20	20	20	90
NEEPv5 p277	T8 High-Bay - 4ft 4 lamp	10	20	20	20	20	90
NEEPv5 p277	T8 High-Bay - 4ft 6 lamp	20	40	40	40	40	180
NEEPv5 p277	T8 High-Bay - 4ft 8 lamp	20	40	40	40	40	180
NEEPv5 p284 (not 277)	T5HO - Double fixture Highbay 5L	1	2	2	2	2	9
NEEPv5 p284 (not 277)	T5HO - Double Fixture Highbay 6L	1	2	2	2	2	9
NEEPv5 p277	LW HPT8 4ft 1 lamp	125	250	250	250	250	1,125
NEEPv5 p277	LW HPT8 4ft 2 lamp	125	250	250	250	250	1,125
NEEPv5 p277	LW HPT8 4ft 3 lamp	125	250	250	250	250	1,125
NEEPv5 p277	LW HPT8 4ft 4 lamp	125	250	250	250	250	1,125
NEEPv5 p277	LW HPT8 4ft 2 lamp w Reflector	125	250	250	250	250	1,125
NEEPv5 p277	LW HPT8 4ft 3 lamp w Reflector	125	250	250	250	250	1,125
NEEPv5 p277	LW HPT8 4ft 2 lamp w Reflector	125	250	250	250	250	1,125
NEEPv5 p277	LW HPT8 4ft 1 lamp w Relfector	125	250	250	250	250	1,125
NEEPv5 p284 (not 277)	T5 HO Enclosed - 1 lamp 24/7	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 HO Enclosed - 2 lamp 24/7	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 HO Enclosed - 3 lamp 24/7	10	20	20	20	20	90
NEEPv5 p284 (not 277)	2 Lamp T5 28W NB	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 HO Enclosed - 2-lamp micro reflector 24/7	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 2 - 2ft lamps 24 watts	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 3 - 2ft lamps 24 watts	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 4 - 2ft lamps 24 watts	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 3 - 4ft HO lamps	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 HO - Highbay 2L	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 HO - Highbay 3L	10	20	20	20	20	90
NEEPv5 p284 (not 277)	T5 HO - Highbay 4L	20	40	40	40	40	180
NEEPv5 p284 (not 277)	T5 HO - Highbay 6L	20	40	40	40	40	180
NEEPv5 p277	T8 High-bay - Double Fixture 4ft 6 lamp	1	2	2	2	2	9
NEEPv5 p277	T8 High-bay - Double Fixture 4ft 8 lamp	1	2	2	2	2	9
NEEPv7 p271	LED Exit Signs	450	900	900	900	900	4,050
NEEPv7 p315	LED 2x4 Fixture 39W - 80W	900	1,800	1,800	1,800	1,800	8,100
NEEPv7 p315	LED 2x2 or 1x4 Fixture Retrofit Kit	900	1,800	1,800	1,800	1,800	8,100
NEEPv7 p275	LED Lamps ≤6W (Candle, A19, R, BR, MR, PAR)	450	900	-	-	-	1,350
NEEPv7 p275	LED Lamps >7W and ≤10W (A19, R, BR, PAR)	7,250	14,500	-	-	-	21,750
NEEPv7 p275	LED Lamps >10.5W and ≤18W (A19, A21, R, BR, PAR)	7,250	14,500	-	-	-	21,750
NEEPv7 p275	LED FILA Lamps >2W and ≤4.5W	500	1,000	1,000	1,000	1,000	4,500
NEEPv7 p275	LED FILA Lamps >4.5W and ≤6.5W	500	1,000	1,000	1,000	1,000	4,500
NEEPv7 p324	4PIN LED 7PL/H/70L/4P/IF	1,650	3,300	3,300	3,300	3,300	14,850
NEEPv7 p324	4PIN LED 9PL/H/90L/4P/IF	1,650	3,300	3,300	3,300	3,300	14,850
NEEPv7 p324	LED Can Replacement	35	70	70	70	70	315
NEEPv7 p311	LED Low Bay - High Bay	20	40	40	40	40	180
NEEPv7 p311	LED Low Bay - High Bay	20	40	40	40	40	180
NEEPv7 p311	LED High-Bay	100	200	200	200	200	900
NEEPv7 p311	LED High-Bay	90	180	180	180	180	810
NEEPv7 p319	LED Parking Garage	350	700	700	700	700	3,150
NEEPv7 p319	LED Parking Garage	350	700	700	700	700	3,150
NEEPv7 p319	LED Parking Garage	100	200	200	200	200	900
NEEPv7 p306	LED Exterior New Fixture	20	40	40	40	40	180
NEEPv7 p306	LED Interior New Fixture	90	180	180	180	180	810
NEEPv7 p306	LED Interior New Fixture	1	2	2	2	2	9
NEEPv7 p306	LED Exterior New Fixture	20	40	40	40	40	180
NEEPv7 p306	LED Exterior New Fixture	90	180	180	180	180	810
NEEPv7 p306	LED Exterior New Fixture	90	180	180	180	180	810
NEEPv7 p306	LED Exterior	35	70	70	70	70	315

Excerpt of Supplemental Attachment Staff Set 1-13 (15) (NonRes Lighting)(Corrected)

NEEPv7 p305	LED Exterior	35	70	70	70	70	315
NEEPv7 p305	LED Exterior	90	180	180	180	180	810
NEEPv7 p307	LED 24/7	20	40	40	40	40	180
NEEPv7 p308	LED 24/7	20	40	40	40	40	180
NEEPv7 p309	LED 24/7	35	70	70	70	70	315
NEEPv7 p310	LED 24/7	90	180	180	180	180	810
NEEPv7 p319	LED 24/7 Parking Garage Fixtures	400	800	800	800	800	3,600
NEEPv7 p319	LED 24/7 Parking Garage Fixtures	400	800	800	800	800	3,600
NEEPv7 p338 (not 337)	LED Strip/Bar/Tube	205	410	410	410	410	1,845
NEEPv7 p338 (not 337)	LED Strip/Bar/Tube	205	410	410	410	410	1,845
NEEPv7 p338 (not 337)	LED Strip/Bar/Tube	410	820	820	820	820	3,690
NEEPv7 p338 (not 337)	LED Strip/Bar/Tube	410	820	820	820	820	3,690
NEEPv7 p338	LED Strip/Bar/Tube	410	820	820	820	820	3,690
NEEPv7 p338 (not 339)	LED Strip/Bar/Tube	410	820	820	820	820	3,690
NEEPv7 p338 (not 340)	LED Strip/Bar/Tube	410	820	820	820	820	3,690
NEEPv7 p338 (not 341)	LED Strip/Bar/Tube	800	1,600	1,600	1,600	1,600	7,200
NEEPv7 p338 (not 342)	LED Strip/Bar/Tube	1,200	2,400	2,400	2,400	2,400	10,800
NEEPv7 p311	LED High-Bay	70	140	140	140	140	630
NEEPv7 p311	LED High-Bay	70	140	140	140	140	630
NEEPv7 p311	LED High-Bay	35	70	70	70	70	315
NEEPv7 p311	LED High-Bay	10	20	20	20	20	90
NEEPv7 p311	LED High-Bay	10	20	20	20	20	90
NEEPv7 p338 (not 342)	LED 24/7	1	2	2	2	2	9
NEEPv7 p338 (not 343)	LED 24/7	1	2	2	2	2	9
NEEPv7 p338 (not 344)	LED 24/7	35	70	70	70	70	315
NEEPv7 p311	LED High-Bay	35	70	70	70	70	315
NEEPv7 p311	LED High-Bay	70	140	140	140	140	630
NEEPv7 p311	LED High-Bay	35	70	70	70	70	315
NEEPv7 p311	LED High-Bay	10	20	20	20	20	90
NEEPv7 p311	LED High-Bay	10	20	20	20	20	90
NEEPv7 p324	LED New Can	900	1,800	1,800	1,800	1,800	8,100
NEEPv7 p325	LED New Can	900	1,800	1,800	1,800	1,800	8,100
NEEPv7 p331	LED Display Case Lighting	725	1,450	1,450	1,450	1,450	6,525
NEEPv7 p338 (not 337)	LED - 1 Linear 4ft Tube/Bar - 1 T8 Delamping with Retrofit Kit	55	110	110	110	110	495
NEEPv7 p338 (not 337)	LED - 2 Linear 4ft Tube/Bar - 1 T8 Delamping with Retrofit Kit	55	110	110	110	110	495
NEEPv7 p338 (not 337)	LED - 3 Linear 4ft Tube/Bar - 1 T8 Delamping with Retrofit Kit	55	110	110	110	110	495
NEEPv7 p338 (not 337)	LED - 2 Linear 4ft Tube/Bar - 2 T8 Delamping with Retrofit Kit	55	110	110	110	110	495
NEEPv7 p283	Occupancy Sensor <50W Connected Load	20	40	40	40	40	180
NEEPv7 p283	Occupancy Sensor 50W - <500W Connected Load	150	300	300	300	300	1,350
NEEPv7 p283	Occupancy Sensor ≥500W Connected Load	100	200	200	200	200	900
NEEPv7 p283	Occupancy Sensor Reach-In Unit Display Case	100	200	200	200	200	900
NEEPv7 p283 adjusted hours of operation to 8760 to account for continuous operation of safety lighting in a stairwell. Adjusted 0.28 to the coincidence factor of 67% as estimate of % time the stairwell would be unoccupied and occupancy sensors would result in savings	Stairwell integrated occupancy sensors controlling dimming fixtures	70	140	140	140	140	630

Excerpt of Supplemental Attachment Staff Set 1-13 (27) (Res Efficient Products Marketplace) (Corrected)

Dominion Lighting Savings

		GENERAL	REFLECTOR	DECO	GLOBE	DL FIXTURE	SPECIALTY	Total
2019	Units	2,081,669	495,170	159,390	68,330	107,263	48,714	2,960,536
	kWh	63,053,754	18,816,460	4,781,700	2,049,900	4,505,046	2,192,130	95,398,990
	kW	6,901	2,060	553	237	493	224	10,467
	Incentive	$2,433,106	$844,738	$182,381	$78,457	$273,792	$173,061	$3,985,535
2020	Units		1,309,740	396,666	174,151	278,270	129,425	2,288,252
	kWh		49,770,120	11,899,980	5,224,530	11,687,340	5,824,125	84,406,095
	kW		5,447	1,375	604	1,279	595	9,301
	Incentive		$2,052,296	$427,702	$188,066	$629,105	$409,733	$3,706,902
2021	Units		1,531,562	442,336	198,076	325,174	151,636	2,648,784
	kWh		58,199,356	13,270,080	5,942,280	13,657,308	6,823,620	97,892,644
	kW		6,370	1,534	687	1,495	697	10,783
	Incentive		$2,217,935	$452,809	$202,936	$663,959	$435,882	$3,973,522
2022	Units		1,689,225	468,888	212,940	354,082	165,422	2,890,557
	kWh		64,190,550	14,066,640	6,388,200	14,871,444	7,443,990	106,960,824
	kW		7,026	1,626	738	1,628	760	11,778
	Incentive		$2,322,205	$459,806	$208,644	$685,870	$452,148	$4,128,674
2023	Units		1,863,557	497,600	229,247	385,913	180,635	3,156,922
	kWh		70,815,166	14,928,000	6,876,510	16,208,386	8,123,575	116,956,597
	kW		7,751	1,725	795	1,774	830	12,875
	Incentive		$2,431,926	$467,407	$214,787	$709,130	$469,495	$4,292,746
Total	Units	2,081,669	6,889,254	1,964,880	882,714	1,450,702	675,832	13,945,051
	kWh	63,053,754	261,791,652	58,946,400	26,481,420	60,929,484	30,412,440	501,615,150
	kW	6,901	28,654	6,813	3,061	6,669	3,107	55,204
	Incentive	$2,433,106	$9,869,100	$1,990,104	$892,891	$2,961,858	$1,940,320	$20,087,379

		GENERAL PURPOSE	REFLECTOR	DECO	GLOBE	DL FIXTURE	SPECIALTY FIXTURE
Incentive p	2019	$ 1.17	$ 1.71	$ 1.14	$ 1.15	$ 2.55	$ 3.55
Incentive p	2020	#DIV/0!	$ 1.57	$ 1.08	$ 1.08	$ 2.26	$ 3.17
Incentive p	2021	#DIV/0!	$ 1.45	$ 1.02	$ 1.02	$ 2.04	$ 2.87
Incentive p	2022	#DIV/0!	$ 1.37	$ 0.98	$ 0.98	$ 1.94	$ 2.73
Incentive p	2023	#DIV/0!	$ 1.30	$ 0.94	$ 0.94	$ 1.84	$ 2.60

Excerpt of Supplemental Attachment Staff Set 1-13 (27) (Res Efficient Products Marketplace) (Corrected)

Dominion Appliance Savings

		FREEZER	REFRIGERATION	CLOTHES WASHER	DEHUMIDIFIER	AIR PURIFIER	CLOTHES DRYER	DISHWASHER	Total
2019	Units	627	2,767	3,366	2,049	250	2,380	500	11,940
	kWh	31,349	155,998	322,285	443,685	181,589	204,275	18,500	1,357,681
	kW	4	18	37	51	21	23	2	155
	Incentive	$31,346	$138,349	$168,321	$51,220	$12,520	$238,027	$25,000	$664,784
2020	Units	1,254	5,534	6,733	4,098	501	4,761	1,000	23,880
	kWh	62,698	311,995	644,570	887,370	363,178	408,549	37,000	2,715,362
	kW	7	36	74	101	41	47	4	310
	Incentive	$62,692	$276,698	$336,643	$102,441	$25,039	$476,054	$50,000	$1,329,567
2021	Units	1,879	6,087	7,406	4,507	551	5,237	1,100	26,268
	kWh	68,988	349,195	709,027	976,107	399,496	449,404	40,700	2,986,898
	kW	8	39	81	111	46	51	5	341
	Incentive	$68,961	$304,968	$370,307	$112,685	$27,543	$523,659	$55,000	$1,462,524
2022	Units	1,547	6,696	8,147	4,958	606	5,760	1,210	28,894
	kWh	75,865	377,514	779,930	1,073,718	439,445	494,345	44,770	3,285,587
	kW	9	43	89	123	50	56	5	375
	Incentive	$75,858	$334,805	$407,338	$123,953	$30,298	$576,025	$60,500	$1,608,776
2023	Units	1,069	7,366	8,960	5,454	667	6,336	1,331	31,784
	kWh	83,451	415,266	857,923	1,181,090	483,390	543,779	49,247	3,614,146
	kW	10	47	98	135	55	62	6	413
	Incentive	$83,449	$368,286	$448,072	$136,348	$33,327	$633,628	$66,550	$1,769,660
Total	**Units**	**6,446**	**28,450**	**34,614**	**21,066**	**2,575**	**24,474**	**5,141**	**122,765**
	kWh	**322,332**	**1,603,968**	**3,313,736**	**4,561,970**	**1,867,098**	**2,100,352**	**190,217**	**13,959,673**
	kW	**37**	**183**	**378**	**521**	**213**	**240**	**22**	**1,594**
	Incentive	**$322,301**	**$1,422,505**	**$1,730,681**	**$526,647**	**$128,727**	**$2,447,393**	**$257,050**	**$6,835,304**

	FREEZER	REFRIGERATION	CLOTHES WASHER	DEHUMIDIFIER	AIR PURIFIER	CLOTHES DRYER	DISHWASHER
Incentive p	$ 50.00	$ 50.00	$ 50.00	$ 25.00	$ 50.00	$ 100.00	$ 50.00

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 15 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018 has been prepared under my supervision.

Deanna R. Kesler
Regulatory Consultant
Dominion Energy Services, Inc.

The following response to Question No. 15 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018, has been prepared under my supervision as it relates to legal matters.

Vishwa B. Link
McGuireWoods LLP

Question No. 15

Has the Company performed cost/benefit analyses based upon the PJM load, capacity price, and energy price forecasts and inputs? If so, please provide the results of such analyses. If not, please perform such analyses and provide the results.

Response:

The Company objects to this request on the grounds that it is vague and would require original work. Subject to and notwithstanding the foregoing objection, the Company states that PJM does not provide long-term capacity and energy price forecasts; therefore, the Company cannot perform the cost/benefit analyses using the criteria above. Subject to and notwithstanding such objection, see Schedule 9, page 1 of 2, attached to Witness Kesler's prefiled direct testimony for

the "low load" sensitivity results. This "low load" sensitivity includes peak and energy values that are lower in all years than the PJM load forecast.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 16 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018 has been prepared under my supervision.

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

Question No. 16

Please provide a detailed description of the proposed Phase VII Residential Appliance Recycling Program, including, but not limited to, the information requested below:

(a) Provide the limitations proposed by the Company for the Appliance Recycling Program as referenced on page 10 of the pre-filed direct testimony of Michael T. Hubbard. Is the Company proposing any alteration to the previously-approved limitations and/or program parameters utilized in its implementation of the previous iteration of the Appliance Recycling Program?

(b) Please provide estimated costs associated with the removal and disposal of qualifying appliances.

(c) How will qualifying participants be required to dispose of their appliances to be recycled? Will a contractor or group of contractors be responsible for the removal and disposal of qualifying appliances?

Response:

The detailed description of the proposed Phase VII Residential Appliance Recycling Program is as follows:

(a) The Company proposes to use limitations for participation that are the same as those applied in the Company's previous iteration of the Appliance Recycling Program; at a

minimum, eligible appliances must be operational, at least ten years old, and between 10 and 32 cubic feet in volume.

(b) The proposing firm advises that the estimated cost of removing and disposing qualifying appliances would be approximately $80 per unit.

(c) The Company's proposed DSM Phase VII Residential Appliance Recycling Program will have one contractor that will be responsible for implementation of the Program and for the removal and disposal of qualifying appliances. It is possible that the primary contractor may use subcontractors to provide appliance pickup and transport services.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 17 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018 is my understanding of the responses provided by the program designer.

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

Question No. 17

Please provide a detailed description of the proposed Phase VII Residential Customer Engagement Program, including, but not limited to, the information requested below:

(a) How are customers selected for participation of this program? Can customers elect to enter this program of their own volition? If so, please provide a detailed narrative description of what steps would need to be undertaken for a customer do so. Can customers opt-out of this program? If so, please provide a detailed narrative description of what steps would be required for a customer to do so. If a customer is allowed to opt-out, is there a period during which the customer is prohibited from requesting re-enrollment in the program?

(b) Please provide a detailed narrative explanation of how the Company intends to communicate suggestions on methods to save energy to customers as discussed on page 10 of the pre-filed direct testimony of Michael T. Hubbard. Please specify the expected frequency of such communications and provide a sample of the documentation that would be provided to customers under this program.

(c) What data would be utilized in analyzing a customer's usage referenced in the Home Energy Report? For example, would it be one year of data, one month of data, etc.?

(d) Please provide a narrative explanation of what analyses will be performed as the basis for suggestions to customers to save energy. What details of a customer's energy usage would be included in the report?

(e) Please provide examples of suggestions that may be provided to customers to save energy that may be included in the report. Provide as many examples as possible.
(f) What entity or entities will perform the analyses necessary to provide the reports to participating customers? What entity or entities will produce the reports?

Response:

See Extraordinarily Sensitive Attachment Staff Set 2-17 (MTH) for the requested information. Although the Company expects to develop a detailed implementation plan in consultation with its implementation contractor upon approval of the Program, the Company expects that the program would be implemented in a manner generally consistent with the information provided by the proposing firm as Extraordinarily Sensitive Attachment Staff Set 2-17 (MTH).

Extraordinarily Sensitive Attachment Staff Set 2-17 is extraordinarily sensitive in its entirety in that it is a confidential communication from a potential vendor and contains DSM Contracts and Prices information, and is being provided to the Staff subject to the conditions in 5 VAC 5-20-170, the Company's Motion for Entry of a Protective Ruling and Additional Protective Treatment filed on October 3, 2018 in Case No. PUR-2018-00168, and the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information issued on October 23, 2018 in Case No. PUR-2018-00168.

Extraordinarily Sensitive Attachment Staff Set 2-17 (MTH) has been redacted in its entirety.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 18(a)-(f) and (h)-(i) of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018 has been prepared under my supervision.

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

Question No. 18

Please provide a detailed description of the proposed Phase VII Residential Efficient Products Marketplace Program, including, but not limited to, the information requested below:

(a) Please provide a detailed description of the website for the "online marketplace," including how it will operate (i.e., how will customers purchase products — will they be re-directed to a specific retail website, will purchases occur through the online marketplace, etc.).

(b) How will retail stores become participating retail stores? Will there be agreements to participate in the online marketplace in addition to traditional, brick-and-mortar stores?

(c) What entity (i.e., the Company, a contractor, some other third-party, etc.) will own and operate the online marketplace? What retailer or retailers will be utilized through the online marketplace? Does the Company expect that customers would be required to pay any shipping and handling charges for purchases made through the online portion of this program?

(d) How will incentives be structured, e.g., a fixed or relative percentage of costs, a fixed or relative amount per measure, etc.?

(e) Is there a limit to the number of measures a customer may be incented to purchase? Are there limits on specific types of measures (i.e., water heaters, refrigerators, etc.) a

customer may be incented to purchase? What is the maximum incentive amount allowed per customer?

(f) Please provide a detailed narrative explanation of the technical specifications of all eligible products offered under this program (i.e., threshold of Energy Star certification, SEER ratings, etc.). Will there be specific brand requirements for eligibility for incentive issuance?

(g) How did the Company perform its cost/benefit analysis for this program with two different sets of assumptions provided in the Company's response to Staff Interrogatory No. 1-13, Attachments 10 and 11?

(h) How will customers be made aware of the program, including specifically the online marketplace?

(i) Is the Company aware of any same or similar programs offered in other jurisdictions? If so, please provide the names of the utilities sponsoring these programs.

Response:

The responses below are based on information provided by the proposing implementation contractor. Although a detailed implementation plan would be developed in consultation with the Company's contractor and its subcontractor upon Program approval, the Company expects that the Program would be generally implemented as described below:

(a) The online marketplace will be managed by the Company's implementation contractor and its subcontractor, which will provide web platform services. The web platform will reflect the Company's branding, educational content, and appropriate Program product offerings. Customers will be able to purchase specific products electronically through the marketplace. They will not be re-directed to other online marketplaces. Information on participation options through brick and mortar stores will also be provided.

(b) If the Program is approved, the Company expects that customers would be able to purchase products through the online marketplace and brick and mortar stores. The Program implementation contractor would be expected to use its existing relationships and, as needed, issue one or more requests for proposals to suppliers and retailers that have a presence within the Company's service territory. Requests for proposals would outline the expectations for firms participating in the proposed program, including the ability to comply with data requirements, marketing material placement, and staff training.

(c) The specific entity to provide the actual online marketplace component has not yet been selected from the candidate firms under consideration; however, the selected firm will own and operate the online marketplace. The exact shipping and handling processes will be determined during development of the implementation plan for the

online marketplace. Customers may be required to pay shipping and handling; however, the proposing firm has advised that some online marketplace providers sometimes do not charge for shipping when per transaction total purchases exceed a set dollar amount.

(d) Incentives will be a fixed amount based on the product type.

(e) Although not specifically established at this time, the proposing implementation firm recommends establishing limits on the number of products that can be purchased according to product type, taking into account comparable limits in brick and mortar retailers, past program experience and evaluations as a guide.

(f) Products offered through this Program would be required to meet technical specifications consistent with Energy Star certification for each product.

(h) Although the Company expects to develop a detailed marketing strategy for the Program, if approved, it is the Company's understanding that the proposing firm's general marketing strategy includes awareness marketing through utility channels (such as bill inserts), purchased media, online messaging, point-of-purchase displays, retail employee training, and cross-program promotions.

(i) Through various proposals received from candidate program implementation firms, the Company has been advised of the existence of online marketplace offerings in other jurisdictions, including offerings by the entities below:

- AEP Appalachian Power & Wheeling Power
- Ameren Illinois
- Baltimore Gas and Electric
- CenterPoint Energy
- Columbia Gas
- Detroit Edison
- Duke Energy
- Eversource
- Efficiency Maine
- FirstEnergy (Pennsylvania)
- FirstEnergy Potomac Edison (Maryland)
- National Grid
- PacifiCorp
- Pasadena Water & Power
- PSEG Long Island
- PPL Electric Utilities
- Public Service Company of Oklahoma
- SCE&G
- SMECO
- SoCalGas

- UGI
- United Illuminating
- Xcel Energy

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 19 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018 2018 is my understanding of the responses provided by the program designer.

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

Question No. 19

Please provide a detailed description of the proposed Phase VII Residential Home Energy Assessment Program, including, but not limited to, the information requested below:

(a) Please describe the steps or procedures of the on-site energy audits that will be conducted. Please list any types of measures that will be included in the on-site energy audits in addition to those listed on page 11 of the pre-filed direct testimony of Michael T. Hubbard. Who will perform these audits?

(b) What is the cost of performing the energy audit? Will all participants receive identical energy audits? If the costs of energy audits vary for different participants, what will the costs of the respective energy audits be and how will these respective costs be determined?

(c) Will the maximum incentive amounts be identical for all participants? What steps must a participant follow to apply for and collect an incentive?

(d) Will any of the measures within the program be installed or performed at the time of the audit (i.e., efficient faucet aerators or showerheads, water heater turndown, etc.), or will customers be required to purchase and install the measures independently or otherwise schedule service appointments?

(e) For the duct insulation and sealing portion of this program, will contractors performing the requisite repairs be approved by, certified by, or otherwise affiliated with the Company or its program contractors? Will the repairs made to participants' duct and air distribution systems be inspected and/or verified? How will incentives for this portion of

the program be calculated? What is the maximum incentive that a qualifying participant may receive for this portion of the program?

(f) Will customers be able to install or perform all measures offered under this program or is there a limit to the possible number of measures per customer? If the latter, please explicitly identify the maximum number of measures per customer.

(g) Please provide a detailed narrative explanation of how the Company addressed the baseline technology shift as a result of the Energy Independence and Security Act, which applies to the lighting measure in this program.

Response:

The responses below are based on information provided by the proposing implementation contractor. Although a detailed implementation plan would be developed in consultation with the implementation contractor upon Program approval, the Company expects that the Program would be generally implemented as described below.

(a) The Company will offer residential customers the opportunity to receive an initial rebate incentive on a limited set of low cost direct installation measures by a trained participating contractor in conjunction with a walk-through energy assessment at their residence. Additionally, the Company and its implementation vendor will provide participating contractors with an audit software tool (at no charge to the contractors) that collects required site demographics, such as premise condition and usage data, while performing energy analysis calculations in accordance with DOE approved methodologies. This online audit software incorporates HPXML standards in concert with ongoing efforts for the national standardization of building data. The proposed Residential Home Energy Assessment Program will require all participating program audit contractors to use this audit software tool to capture the required program information and produce a customer-facing report listing and quantifying recommended measures based on cost-effectiveness. The audit tool will substantiate and quantify the energy savings benefit of each measure and the results will be used to determine the eligibility for incentives for each measure.

All data collected and all energy usage analyses will be transferred electronically and captured in the implementation vendor's online data management system. All minor program measures installed at the audit will be captured along with the estimated energy savings for each program measure. The software will also capture key data on all recommended major program measures including estimated savings and eligible incentives for each measure. Furthermore, every program rebate application will be verified against this dataset to verify that the amount and energy savings matches the audited results. Quantity, type, cost and deemed energy savings will be captured, maintained, and reported for each program measure and participating customer, and will match the value for program rebate dollars issued for each reporting period.

Additionally, audits and installation of all measures will be performed by program-approved participating contractors. A program rebate incentive will not be issued if the contractor that performed the work is not a program-approved participating contractor.

Program measures expected to be included as part of the on-site energy audit include the replacement of existing light bulbs with LED bulbs, installation of efficient faucet aerators and showerheads, water heater turndown, water heater insulation and pipe insulation. However, this does not preclude a participating contractor from installing any of the other program approved measures on the same day of the audit, if the customer agrees to have that work performed and the participating contractor has the necessary resources available to conduct the installation of the program measures.

(b) Since this is a market-based trade ally program, there is no set cost by the Company or its program implementer for performing the energy audit. Requirements of the energy audit will be consistent across all customers, with participating contractors using an audit software tool (at no charge to them) that collects required site demographic, condition and usage data while performing energy analysis calculations in accordance with DOE approved methodologies. This program will require all participating audit contractors to use this audit software tool to capture the required program information and produce a customer facing report listing and quantifying recommended measures based on cost-effectiveness. The audit tool will substantiate and quantify the energy savings benefit of each program measure and the results will be used to determine the eligibility for incentives for each program measure.

(c) Incentive amounts for this program are based on deemed savings generated from the installed energy efficiency measures. The available incentive for each measure is a prescriptive amount set by the program, but the total number of measures that the customer agrees to have installed based on savings opportunities and payback period – and therefore the total incentive issued by the program – will vary from premises to premises. Since energy savings and program measure opportunities will differ from one customer to the next, the resulting incentive amounts per customer will vary but the average incentive over the 5-year life of the program as filed will average $82 per participant. In order to apply for a rebate incentive, participants must submit a completed program rebate application with the assistance of their participating contractor. A complete program rebate application must capture the necessary customer information, the identity of the participating contractor, and the installed program measures in order to calculate the incentive amount and, pending review and approval of the application, issue the appropriate rebate incentive.

(d) Program specific measures that may be available to be installed on the same day of the audit, based on recommendations made during the on-site energy audits, include the replacement of existing light bulbs with LED bulbs, installation of efficient faucet aerators and showerheads, water heater turndown, water heater insulation, and pipe insulation. However, this does not preclude a participating contractor from installing any of the other program measures on the same day of the energy audit, if the customer agrees to have that work performed and the participating contractor has the materials available.

We do not anticipate this to be a likely scenario as typically, customers will schedule a follow-up service appointment for the installation of major measures, but the major program measure would be eligible for a program rebate if it is installed on the same day as the energy audit.

(e) Installation of all measures, including duct insulation and duct sealing, will be performed by program-approved participating contractors. A rebate incentive will not be issued if the contractor that performed the work applied for on the rebate application is not a program-approved participating contractor.

Measure installation will be verified in three ways. First, all relevant data for program measures will be collected in the audit software, which will calculate and report the cost effectiveness via payback period information for each recommended major measure, and on a rebate application that is entered online into the implementation vendor's rebate tracking system, including quantity and necessary specifications for all eligible measures for which they qualify. The implementation vendor will provide the rebate applications to all participating contractors and post online, requiring its use for all projects in the program. Participating contractors will be required to capture data for all measure installations and key operating conditions as defined during development of the Program data requirements prior to program launch.

Second, the implementation vendor will review the application inputs and results via its document Quality Control (QC) process to identify any data outliers or patterns of data that might indicate errors, ineligible installations, or data manipulation. All outliers will be investigated further since applications for all measures must include all required data elements necessary to confirm measures meet program efficiency improvement requirements.

Third, at least 5% of projects will be selected for on-site inspections by the implementation vendor. Selected projects for inspection will represent participating contractors, measures, and geographic regions. Quality Assurance (QA) Inspectors will verify that all recorded installations are in place, installed properly, and in current operation. The QA inspector will also confirm that all measures were installed in accordance with the measure protocol which has been designed to ensure that projected savings are achieved or exceeded. The implementation vendor will capture and track all QA inspection results.

Incentives for duct insulation and duct sealing will be calculated on a prescriptive basis, with customers receiving a defined incentive amount based on the installation of these measures per eligible HP or AC system. As designed, the customer would be eligible for a $70 incentive for the duct insulation measure per eligible HP or AC system, a $148 incentive for the duct sealing measure per eligible HP system, and a $109 incentive for the duct sealing measure per eligible AC-only system.

(f) There is no specific limit to the number of installed measures per participant. Measures are recommended based on energy savings and payback period information generated in the audit report.

(g) Standard A-line LED bulb measures are only eligible for a rebate incentive for installations in 2019, coinciding with the proposed next phase of EISA standards that are currently scheduled to begin in January 2020, and would render the A-line LED measures no longer cost effective. The other lighting measures will remain cost-effective after the new EISA standards are applied, so those installation volumes are incorporated from 2020-2023.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 20 (a)-(d) of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018 were prepared by me based on my understanding of the responses provided by the program designer, and the response to Question No. 20 (e) has been prepared under my supervision.

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

Question No. 20

Please provide a detailed description of the proposed Phase VII Residential Smart Thermostat Management Program (Demand Response Component), including, but not limited to; the information requested below:

(a) Please provide the technical specifications of the "qualifying smart thermostats" referenced on page 12 of the pre-filed direct testimony of Michael T. Hubbard. What other technologies (i.e., high-speed internet connection, etc.) are also required for participation in the program?

(b) Please describe the process by which customers may opt-out of events and provide a detailed explanation of any and all limits on opting out of events. Please identify the number of events a customer may opt out of before he or she forfeits his or her annual incentive. Will customers who forfeit an annual incentive in one year be permitted to participate in subsequent years of the program? Will customers who forfeit an annual incentive in one year be suspended from participation for any period?

(c) How will customers apply to participate in this program? What steps must a participant follow to apply for and collect an incentive?

(d) Will the replacement of multiple thermostats with "qualifying smart thermostats" make customers eligible to receive multiple incentive payments under this program? What is the maximum incentive that participants will be eligible to collect under this program?

(e) What controls are expected to be implemented to ensure applicants for participation in this program are not currently participating in the Company's Phase I AC Cycling Program? Has the Company performed any analysis of possible competition between this program and the Company's Phase I AC Cycling Program?

Response:

The responses below are based on information provided by the proposing implementation contractor. Although a detailed implementation plan would be developed in consultation with the implementation contractor upon Program approval, the Company expects that the Program would be generally implemented as described below:

(a) The technical specifications for a qualifying smart thermostat for this program were established and defined by the US Department of Energy's ENERGY STAR® program, and any ENERGY STAR certified smart thermostat will qualify. ENERGY STAR certified smart thermostats are required to:

- Work as a basic thermostat in absence of connectivity to the service provider.
- Give residents some form of feedback about the energy consequences of their settings.
- Provide information about HVAC energy use, such as monthly run time.
- Provide the ability to set a schedule.
- Provide the ability to work with utility programs to prevent brownouts and blackouts, while preserving consumers' ability to override those grid requests.

In addition to these requirements, EPA ENERGY STAR certified smart thermostats must meet the static temperature accuracy of <= +/- 2.0^{0}F, average network standby power consumption of <= 3.0Watts, and time to network standby after user interaction of <= 5 minutes.

Finally, as shown in the Table below, EPA ENERGY STAR certified smart thermostats are required to meet the energy savings criteria for reduction in cooling and heating system runtime and report electric resistance heat use for heat pumps. In order to demonstrate compliance with these energy saving criteria, smart thermostat service providers used EPA-provided software to analyze and combine a year of data from hundreds of their customers' homes, reflecting how the thermostats were actually used, to calculate national savings metrics for heating and for cooling. (The lower 95% confidence limit is similar to an average but takes into account the chance the particular homes that were sampled were all higher savers. The 20th percentile means that 4 out of 5 homes in the sample saved at least that much).

Table: Connected Thermostat Energy Savings Criteria [1]

Metric	Statistical Measure	Performance Requirement
Annual % run time reduction, heating	Lower 95% confidence limit of weighted national average	≥ 8%
	Weighted national average of 20th percentiles	≥ 4%
Annual % run time reduction, cooling	Lower 95% confidence limit of weighted national average	≥ 10%
	Weighted national average of 20th percentiles	≥ 5%
Average resistance heat utilization for heat pump installations	National mean in 5 ^{0}F outdoor temperature bins from 0 to 60 ^{0}F	Reporting Requirement

To get the full functionality and potential of smart thermostats as they are designed, the customer does need access to a wireless internet connection. The wifi connection required to participate in the DR program has no additional requirements beyond the manufacturer's standard requirements.

[1] EPA Energy Star Product specification documentation

(b) Customers may opt out of any event at any time. To opt-out of a DR event, the customer simply needs to adjust their thermostat setting (via the thermostat or the mobile app), which will automatically opt them out of that single event. It does not opt the customer out of the program, and the thermostat will be called on to participate in the next event per usual. Customers opting out of 25% or more events in a calendar year will not be eligible for the annual rebate incentive. All of these details will be plainly communicated to customers when they first enroll in the DR program, as well as via multiple follow-up messages after enrollment.

The Company's program implementation vendor has developed a proactive process to monitor the opt-out activity to identify potential patterns that connect to our control model. Additionally, the implementation vendor will continually assess and adjust its control models in an effort to reduce the opt-out rates. Lastly, the Company and its implementation vendor will have access to event participation metrics to verify annual incentive eligibility.

(c) Customers with qualifying smart thermostats can enroll in the program via two approaches. All participants receiving a rebate incentive for the Smart Thermostat EE program will be made aware of the opportunity to enroll in the separate DR program via

marketing outreach. Once the smart thermostat is connected to the manufacturer via the Internet, the customer will receive a connection verification email from their thermostat vendor with information about the DR program and an invitation to enroll. If interested, they can simply click on the link in the email, which will bring them into the program's DR enrollment portal. This portal will also have additional program specific information, terms and conditions, and FAQs.

If the customer chooses to enroll, they must provide their contact information (name, email, mailing address, etc.), which will be used to verify the customer's active utility account status and identify that unit to the customer's utility account. The program system then communicates with the thermostat manufacturer's portal for final authentication. The customer will receive a welcome email once the process is complete, verifying that they are an active Dominion Energy customer enrolled in future DR events. The customer will receive the appropriate annual rebate incentive.

Additionally, the Company and its implementation vendor have also developed partnerships with several smart thermostat manufacturers to identify and conduct outreach to eligible residential customers within the service territory who already have a qualifying smart thermostat operating in their home, ensuring they are made aware of the DR program and given an opportunity to enroll. The enrollment, eligibility verification and incentive processes will be similar to the responses provided above.

(d) Consistent with the approach in the DSM Phase I AC Cycling Program, each customer account is eligible for one annual incentive per household regardless of the number of qualifying smart thermostats enrolled in the DR program. The maximum annual incentive is $35 for the first year enrolled, then $10 for each subsequent year enrolled.

(e) The Company will continue to utilize comprehensive electronic quality controls, similar to those found in the Company's Account Funding Process and the corresponding exception report as it relates to the proposed Residential Smart Thermostat (DR) Program and its DSM Phase I AC Cycling Program. Additionally, the Company will work with its implementation vendors for the two programs to establish additional control measures, prohibiting cross-participation in these two different programs. The Company has not performed any analysis of possible competition between this program and the Company's DSM Phase I AC Cycling Program, as these are two different programs with different technologies.

Lastly, the Company and its implementation vendor will work together to ensure that no customer receives duplicate rebates for participating in the proposed Smart Thermostat Demand Response program and the ongoing DSM Phase I AC Cycling program. Any customer account applying to register for the Smart Thermostat Demand Response program will be cross-referenced against the database of customer accounts participating in the ongoing AC Cycling program and will not be accepted in the new program until they unsubscribe from the ongoing AC Cycling program and are confirmed to be ineligible for the annual incentive from the AC Cycling program.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Second Set

The following response to Question No. 21 of the Second Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on November 9, 2018 is my understanding of the responses provided by the program designer.

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

Question No. 21

Please provide a detailed description of the proposed Phase VII Residential Smart Thermostat Management Program (Energy Efficiency Component), including, but not limited to, the information requested below:

(a) Please provide the technical specifications of the "qualifying smart thermostats" referenced on page 12 of the pre-filed direct testimony of Michael T. Hubbard. What other technologies (i.e., high-speed internet connection, etc.) are also required for participation in this program?

(b) How will customers apply to participate in this program? What steps must a participating customer follow to apply for and receive an incentive?

(c) Will the replacement of multiple thermostats with "qualifying smart thermostats" make customers eligible to receive multiple incentive payments under this program? What is the maximum incentive that participants will be eligible to collect under this program?

Response:

The responses below are based on information provided by the proposing implementation contractor. Although a detailed implementation plan would be developed in consultation with the Company's contractor upon Program approval, the Company expects that the Program would be generally implemented as described below:

(a) Please see the Company's response to Staff Set 2-20(a) for a discussion of the technical specifications for a qualifying smart thermostat.

(b) Participating customers have the option of purchasing a qualifying smart thermostat though any brick-and-mortar retailer or online retailer selling Energy Star certified smart thermostats, through a program-branded online store, or through qualified local trade allies. Once the qualifying smart thermostat has been purchased, the device must be connected to the internet via the manufacturer's step-by-step instructions to provide full functionality controlling their home's HVAC system. In order to apply for a one-time rebate incentive for the purchase of their smart thermostat, participants must submit a completed rebate application that captures required information about the customer and the installed smart thermostat in order to verify customer eligibility and calculate the incentive amount. Pending review and approval of the rebate application, the Company will issue the appropriate rebate incentive. The review process will include remote signal validation to confirm the participating smart thermostat is online and operable prior to issuing the rebate incentive. Once the smart thermostat is connected to the manufacturer via the internet, the customer will receive a connection verification email from their thermostat vendor with information to participate in the behavioral component featuring season-long HVAC system optimization. If interested, they can simply click on the link in the email, which will bring them into the program's enrollment portal. This portal will also have additional program specific information, terms and conditions, and FAQs. If the customer chooses to enroll, they must provide their contact information (name, email, mailing address, etc.), which will be used to verify active utility account status and identify that unit to the customer's utility account. The program system then communicates with the thermostat manufacturer's portal for final authentication. The customer will receive a welcome email once the process is complete, verifying that they are an active Company customer enrolled in the behavioral program. The customer will receive the annual $10 rebate incentive at the end of each calendar year they remain enrolled.

The Company and its implementation vendor have also developed partnerships with several smart thermostat manufacturers to identify and conduct outreach to eligible residential customers within the service territory who already have a qualifying smart thermostat operating in their home, ensuring they are made aware of the behavioral component with season-long HVAC system optimization and given an opportunity to enroll. The enrollment, eligibility verification and incentive processes for the behavioral program will be similar to what is described in the responses provided above.

(c) There are two incentive opportunities for the Smart Thermostat EE component. The first is a purchase incentive for purchasing and installing a qualifying smart thermostat. For this first incentive, it is possible for an individual customer to receive an incentive for each qualifying smart thermostat but only under certain specific conditions. Qualification of any application for more than one smart thermostat unit for the same customer account will be based on confirmation that the smart thermostats have different model numbers and control sufficient independent cooling load (≥30,000 BTUs) to ensure that there are separate HP systems operated by each smart thermostat. These items will be verified

during the initial enrollment process, since each thermostat will be required to enroll separately via the process described in the Company's response to Staff Set 2-21(b).

The Company is proposing a maximum of two incentives (two rebated thermostats) per customer according to a tiered approach designed to align incentives with expected market conditions over the life of the Program. During the first year of the Program, the proposed incentive is a maximum of $100 per thermostat; a maximum of $40 during the second, third, and fourth years of the Program; and a maximum of $30 during the fifth year of the Program. Based on this tiered approach, a customer who purchased two thermostats during the first year of the Program could receive a maximum incentive of $200; if the customer purchased two thermostats during the final year of the Program, they could receive a maximum of $60.

The second incentive opportunity is enrolling in season-long HVAC system optimization. Consistent with the approach in the Smart Thermostat DR program, each customer account is eligible for one annual incentive per household regardless of the number of qualifying smart thermostats enrolled in the behavioral program. All of the DR-enrolled customers would receive the benefit of the behavioral energy savings information and the subset of customers that choose to take the additional step of enrolling in HVAC system optimization would receive an additional $10 incentive per household.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 24 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 24

Please refer to the Excel spreadsheet entitled Extraordinarily Sensitive Attachment Staff Set 1-13 (12) (MTH). More specifically, refer to lines 39, 40, and 41, columns C through G. These lines are categorized as % EE Savings Ramp-Up-Wave 1, % EE Savings Ramp-Up-Wave 2, and % EE Savings Ramp-Up-Paper, respectively. Provide the documentation or other support for the percent values entered in the specified cells of the spreadsheet.

Response:

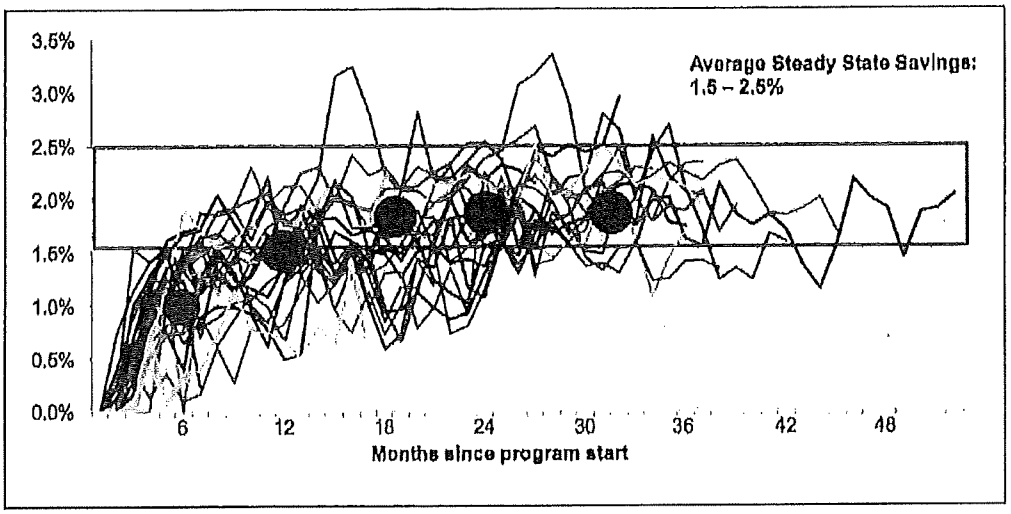
The following information was provided to the Company by the program designer in response to this question:

The program designer calculated the savings based on trends from similar utility-based Home Energy Reports (HER) programs and its own experience from similar behavioral programs. The approach for the Company's proposed program differs from traditional HER programs that send paper reports to ALL treatment customers. The program designer proposes to send either a paper report or an email report (eHER), but not both. In the proposed program design, the creation of three waves is proposed, one wave for paper reports and two waves for email reports. The two sections below outline the approach to generating savings for paper and email reports respectively.

Savings Rate for Paper Reports

HER savings typically take from 12 to 18 months to ramp up to steady-state savings. In the model for the Company, the program designer assumed a ramp up of 18 months (6 months of 2018 and all of 2019) and provided the estimated savings accordingly.

The chart below shows industry EE savings trends across multiple HER programs and depicts the progression of the EE savings percentage from program inception to steady state. These programs constitute paper HERs delivered to 100% of customers and subsequent savings reflect this program design.



Red- 6 mths; Purple- 12 months; Green- steady state savings

The table below summarizes the average savings rate (as depicted by the colored dots in the graph above):

Period	Savings %
6 months	1% (Ramp up)
12 months	1.5% (Ramp up)
18 months	2.0% (steady state)
24 months	2.0%

The table above reflects the projected savings the program designer employed for its paper wave design for the Company, and aligns with typical industry performance.

Savings Rate for Email Reports (Wave 1 Email and Wave 2 Email)

For email report savings, the program designer applied the steady state savings numbers achieved from its implementing two digital EE programs deployed at **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENITAL]**. Both programs featured a digital home energy report program of one year and generated savings of 1% and 1.1%, respectively. The evaluation reports are provided as Confidential Attachment Staff Set 4-24 (1) and Confidential Attachment Staff Set 4-24 (2).

The following assumptions were made for the Company's program design:

- The steady state EE savings numbers (2020 onwards) for Wave 1 (highest consumption customers with emails) as 1% and assumed a ramp up for 2018 and 2019 similar to the paper reports.

- For Wave 2, minor adjustments were made to the savings numbers because these customers have lower average consumption.

The EE savings numbers for the Company may be higher than estimated because the users in these programs were not high consumption users and in addition, the savings were determined while users were still ramping up. With that in mind, the program designer's conservative approach supports a strong program design with the flexibility to adjust the design, if needed, during program implementation. In summary, the program design incorporates savings numbers from a combination of industry lessons and prior implementation experience of the program designer's programs.

The above response and Confidential Attachments Staff Set 4-24 (1) and (2) have been marked as confidential because the identity of the program vendor selected for the Home Energy Savings Program has not yet been publically announced as the status of the Phase VII RFP is still open. The Company plans to officially notify bidders of the RFP in January. At that time, the Company will de-designate this material such that it may be used publically. However, at this time, all materials or responses that request vendor names or other identifying information (such as clients) will be marked as confidential. Accordingly, these documents are presently provided pursuant to the protections set forth in 5 VAC 5-20-170, the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information entered on October 23, 2018, any subsequent protective order or protective ruling issued in this proceeding, and the Agreements to Adhere executed pursuant to any such orders or rulings.

Excerpt of Attachment Staff Set 4-24 (2) CONF has been redacted in its entirety.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 32 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 32

Please provide a detailed description of the proposed Phase VII Non-residential Lighting Systems & Controls Program, including, but not limited to, the information requested below:

(a) Provide the applicable minimum standards and base standards, to the extent there is a difference, for lighting fixtures and lamps in non-residential buildings used as reference in this case.

(b) Why does the Company expect higher participation than was experienced in the Company's Phase III Non-residential Lighting Systems & Controls program as reported in the Company's 2018 EM&V Filing? Please include explicit descriptions of changes to program design and marketing materials intended to increase participation.

(c) Provide a detailed narrative explanation of what changes were made to the program design relative to the Company's Phase III Non-residential Lighting Systems & Controls Program to address the new statutory customer exemption threshold of 500 kilowatts ("kW").

(d) Does the Company intend for customers who participated in the Phase III Non-residential Lighting Systems & Controls program to be eligible to participate in the Phase VII Non-residential Lighting Systems & Controls program? If yes, how many customers that participated in the Phase III Non-residential Lighting Systems & Controls program would be eligible for participation in the proposed program?

(e) Will customers participate in the proposed Phase VII Non-residential Lighting Systems & Controls program in the same or a similar way as they participated in the Company's Phase III iteration of the program *(i.e.*, through participating contractors)?

(f) How will incentives be structured, *e.g.*, a fixed or relative percentage of costs, a fixed or relative amount per measure, etc.?

(g) Is there a limit to the number of measures a customer may be incented to install? What is the maximum incentive amount allowed per customer?

Response:

The following information was provided by the program designer in response to the question above:

a) For the purpose of responding to this question, it is assumed that "minimum standards" refers to the requirements of the lighting and controls equipment being installed with the support of the DSM Phase VII program, while "base standards" refers to the baseline or existing equipment that is being replaced. As compared to the original design of the DSM Phase III Lighting Systems & Controls program, the Company has removed T12 baselines as new T12 fixtures are no longer permitted for installation in nearly all lighting situations. Similarly, A-line lamps that may be impacted by upcoming EISA standards are removed from the program design after the initial phase of the program. Also, the installation of Compact Fluorescent lamps is no longer supported by the DSM Phase VII program design.

b) The DSM Phase III Lighting Systems & Controls program has been successful in garnering participation from 4,003 non-residential customers through November 2018, with over 400 trade allies registered as participating contractors in Dominion Energy Virginia's service territory. This customer participation level is higher than the filed total of 2,098 participants in the DSM Phase VII program, due mainly to the inclusion in the current DSM Phase III program of customers above the 500 kW demand threshold who would no longer be eligible to participate if the new DSM Phase VII program is approved. This existing infrastructure and relationships with trade allies combined with refined marketing strategies based on learnings and continuous improvement in the current program indicates that the Company will be able to continue the current momentum moving forward. Additionally, since the inception of the DSM Phase III program, there has been a shift in lighting technologies to include a wider array of LED applications and a few older technologies have been largely abandoned (for instance, T12 linear fluorescents), meaning parts and replacement lamps are no longer as available. This will create additional opportunities to bring customers with these product types into the program when they may have initially been resistant to change.

c) Significant changes are not needed in the measure types for a lighting program design from DSM Phase III to DSM Phase VII as specific measure counts are considered for each project, as opposed to items like chillers in a Heating & Cooling Efficiency program that could have a huge load component for a single piece of equipment that might push the facility over the threshold. However, the average savings per participant decreased from the existing DSM Phase III program's average savings per participant since smaller customers below the 500 kW demand threshold in DSM Phase VII will typically generate fewer installed measures, lower savings per participant and a lower average rebate incentive compared to DSM Phase III.

d) Yes, it is possible for a customer that participated in DSM Phase III to be eligible for rebate incentives in DSM Phase VII, particularly if they were installing new energy efficient lighting products in locations within their facility that did not previously receive a rebate in the current DSM Phase III program. However, it is possible in limited cases that customers who were incented for installed measures in the early years of DSM Phase III may wish to upgrade to higher efficiency lighting technology and would be eligible only if the DSM Phase III measure life had expired. For instance, a customer with T8 lighting in the early stages of DSM Phase III may wish to replace that lighting with new LED fixtures in the later stages of DSM Phase VII after the original T8 measure life has expired, and this would be eligible for a new incentive. This would be validated by the Company's implementation vendor during the initial assessment review prior to the project installation being authorized to proceed.

e) Yes. The existing program with measures installed by a participating contractor network or via self-installation has been successful and well-accepted within the marketplace. No substantive changes to the participation process are expected.

f) Incentives will be paid at a fixed rate per measure, dependent upon the measure type installed, and the total incentive amount will not exceed more than 75% of the total cost of the project. This approach is consistent with the incentives structure in the DSM Phase III program.

g) There is no limit to the total incentive amount or amount of measures a customer may be incented to install, as long as it meets the parameters defined in the Company's response to 32 (f).

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 33 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 33

Provide the following information regarding the company's Phase III Non-residential Lighting Systems & Controls program to date:

a) Number of customers from each eligible customer class that participated; and
b) Total incentive amounts paid to each customer class.

Response:

Please see the table below for the requested information.

Customer Class	Participant Count	Incentive Amount
DP-2	4	$20,176.00
GS-1	1507	$3,208,318.45
GS-2	1383	$9,140,415.93
GS-2T	733	$3,487,528.71
GS-3	233	$5,716,586.85
GS-4	24	$792,776.00
Schedule 10	63	$1,572,543.11
Schedule 10P	3	$253,128.98
Schedule 28	2	$17,825.00
Schedule 29	7	$16,997.00
Schedule 5	7	$55,797.00
Schedule 5C	53	$200,056.50
Schedule 5P	16	$81,743.00
Schedule 6TS	3	$8,514.00
Schedule 7	4	$8,818.00
Grand Total	**4,042**	**$24,581,224.53**

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 34 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 34

Which classes of customers are eligible for both the Phase V Small Business Improvement program and the proposed Phase VII Non-residential Lighting Systems & Controls program? With regards to measures available to participants under both programs (i.e., T5/T8 lamps, LED lamps, etc.), what steps are being implemented to ensure customers receive incentives under only one of these programs? What steps are being implemented to ensure that participation and net energy savings are being accounted for under only one of these programs?

Response:

Eligible customers in the following rate schedules are eligible to participate in the Company's DSM Phase V Small Business Improvement Program: Schedule 5, Schedule GS-1, and Schedule DP-1. Eligible participants in the Non-residential Lighting Systems & Controls Program: 5, 25, 5C, 5P, GS-1, GS-2T, 6, 6TS, 7, 29, GS-2, ND, DP-1, DP-2, and SP. Customers may not receive incentives for the same measure under multiple programs.

The Company's implementation vendor utilizes an online rebate tracking system that includes screening steps to ensure that participants only receive incentives for a given measure through one program. The system also screens for past participation in the Company's energy efficiency programs to ensure that there are no duplicate incentives issued for the same installed measures (i.e. no "double dipping"). The same tracking system calculates rebate incentives and estimated energy savings, thus the screening process handles both functions.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 35 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 35

Please provide a detailed description of the proposed Phase VII Non-residential Heating and Cooling Efficiency Program, including, but not limited to, the information requested below:

(a) How was the proposed Phase VII Non-residential Heating and Cooling Efficiency program design altered relative to the Company's Phase III Non-residential Heating and Cooling Efficiency program to address the new statutory customer exemption threshold of 500 kW?

(b) Why does the Company expect higher participation than was experienced in the Company's Phase III Non-residential Heating and Cooling Efficiency program as reported in the 2018 EM&V Filing? Please include explicit descriptions of changes to program design and marketing materials intended to increase participation.

(c) Refer to the pre-filed direct testimony of Company witness Hubbard at 14. Please specifically identify the measures that were offered under the Company's Phase III Non-residential Heating and Cooling Efficiency Program and have been removed in the proposed program as they, "...would be more appropriate for larger facilities." How many of these measures were installed as part of the Company's Phase III iteration of this program? Have any measures been added to the proposed program that were not included in the Company's Phase III program?

(d) Will customers participate in the proposed Phase VII Non-residential Heating and Cooling Efficiency program in the same or a similar way as they participated in the Company's Phase III iteration of the program *(i.e.,* through participating contractors)?

(e) Does the Company intend for customers who participated in the Phase III Non-residential Heating and Cooling Efficiency program to be eligible to participate in the Phase VII Non-residential Heating and Cooling Efficiency program? If yes, how many customers who participated in the Phase III program would be eligible for participation in the proposed program?

(f) Is there a limit to the number of measures a customer may be incented to install? What is the maximum incentive amount allowed per customer?

Response:

a) Chillers larger than 300 tons were removed from the measure list for the DSM Phase VII program, as customers that have equipment of this size would be exempted from program participation based on the new 500 kW demand threshold. The performance specifications of equipment available in the market were reviewed and considered in setting the required efficiency levels of equipment required to receive an incentive. Minimal updates were made to these levels to address energy code updates and equipment availability in the market.

b) The DSM Phase III Heating & Cooling Efficiency program has been successful in garnering participation from 385 non-residential customers receiving over 685 rebates issued through November 2018, with more than 175 trade allies registered as participating contractors in Dominion Energy Virginia's service territory. The inclusion of the new 500 kW demand threshold in the DSM Phase VII program will require the Company and its implementation vendor to focus on enrolling a higher volume of customers with smaller facilities than the typical customer participating in DSM Phase III. The Company knows this adjusted approach is achievable by leveraging the existing infrastructure and relationships with trade allies combined with refined marketing strategies that emphasize digital tactics like Search Engine Marketing and online lead generation via enhanced customer webpages, all of which is based on lessons and continuous improvement in the current DSM Phase III program that combine to continue the momentum moving forward.

c) Chillers larger than 300 tons were removed from the measure list for Phase VII, as customers that have equipment of this size would be exempted from program participation since they would exceed the 500 kW demand threshold. There were approximately 40 participants in the DSM Phase III program (roughly 10% of all participants) with this type of large chiller equipment. No additional measures have been added to the program.

d) Yes. The existing program with measures installed by a participating contractor network or via self-installation has been successful and well-accepted within the marketplace. No substantive changes to the participation process are expected.

e) Yes, it is possible for a customer that participated in the DSM Phase III Heating & Cooling Efficiency program to be eligible for rebates in DSM Phase VII if they are replacing different equipment than was rebated in DSM Phase III. This would be validated by the Company's implementation vendor during the initial assessment review prior to the project installation being authorized to proceed.

f) There is no limit to the total incentive amount or number of measures a customer may be incented to install. Incentives will be paid at a fixed rate per measure, dependent upon the measure type installed, and the total incentive amount will not exceed more than 75% of the total cost of the project. This approach is consistent with the incentives structure in the DSM Phase III program.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 36 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 36

Provide the following information regarding the company's Phase III Non-residential Heating and Cooling Efficiency program to date:

a) Number of customers from each eligible customer class that participated; and
b) Total incentive amounts paid to each customer class.

Response:

Please see the table below for the requested information.

Customer Class	Participant Count	Incentive Amount
GS-1	26	$183,182.50
GS-2	93	$1,007,985.50
GS-2T	122	$169,723.73
GS-3	100	$1,786,720.13
GS-4	13	$296,917.10
Schedule 10	21	$762,320.35
Schedule 5C	4	$25,973.00
Schedule 5P	3	$9,792.00
Schedule 6TS	5	$152,389.00
Grand Total	**387**	**$4,395,003.31**

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 37 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 37

Which classes of customers are eligible for both the Phase V Small Business Improvement program and the proposed Phase VII Non-residential Heating and Cooling Efficiency Program? With regards to measures available to participants under both programs (i.e., air conditioner and/or heat pump upgrades, variable frequency drives, etc.), what steps are being implemented to ensure customers receive incentives under only one of these programs? What steps are being implemented to ensure that participation and net energy savings are being accounted for under only one of these programs?

Response:

Eligible customers in the following rate schedules are eligible to participate in the Company's DSM Phase V Small Business Improvement Program: Schedule 5, Schedule GS-1, and Schedule DP-1. The following rate schedules as eligible participants in the Non-residential Heating and Cooling Efficiency Program: 5, 25, 5C, 5P, GS-1, GS-2T, 6, 6TS, 7, 29, GS-2, ND, DP-1, DP-2, and SP. Customers may not receive incentives for the same measure under multiple programs.

The Company's implementation vendor utilizes an online rebate tracking system that includes screening steps to ensure that participants only receive incentives for a given measure through one program. The system also screens for past participation in the Company's energy efficiency programs to ensure that there are no duplicate incentives issued for the same installed measures. The same tracking system calculates rebate incentives and estimated energy savings, thus the screening process handles both functions.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 38 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 38

Please provide a detailed description of the proposed Phase VII Non-residential Window Film Program, including, but not limited to, the information requested below:

(a) How was the proposed Phase VII Non-residential Window Film program redesigned relative to the Company's previously-offered Phase III Non-residential Window Film program to address the new statutory customer exemption threshold of 500 kW?

(b) Why does the Company expect higher participation than was experienced in the Company's Phase III Non-residential Window Film program as reported in the 2018 EM&V Filing? Please include explicit descriptions of changes to program design and marketing materials intended to increase participation.

(c) Does the Company intend for customers who participated in the Phase III Non-residential Window Film program to be eligible to participate in the Phase VII Non-residential Window Film program? If yes, how many customers who participated in the Phase III program would be eligible for participation in the proposed program?

(d) Is there a limit to the square feet of window film that a customer may be incented to install? What is the maximum incentive amount allowed per customer?

Response:

a) There were updates made to the Window Film program design for DSM Phase VII since it is a single standalone measure and the primary participation volume for the DSM Phase III program came from customers below 500 kW demand. These updates included analyzing the kWh savings per square foot and updating the correlating solar

heat gain coefficient (SHGC) levels accordingly. But making significant structural changes was inadvisable since the current program has gained substantial momentum in the out years and is working well for the end customers it needs to serve.

b) As referenced in the Company's response to Question 29 (d), the DSM Phase III Window Film program had a slow start initially, since it is often perceived as uncommon to offer as a single measure in a utility rebate program. However, the Company and its implementation vendor have found productive channels of communication to promote the programs via its trade ally network and refined the promotional messaging to bring the Window Film program to its current level of success. We will continue to grow the communication channels and relationships established to increase participation to the proposed levels based on knowledge gained from this experience, including but not limited to refined marketing strategies that emphasize digital tactics like Search Engine Marketing and online lead generation via enhanced customer webpages.

c) In general, customers would only be eligible for DSM Phase VII if they did not already have window film installed in DSM Phase III. If customers participated in the DSM Phase III program, but did not apply film to all of their windows, they would be eligible for participation in the new program for installing measures on windows that do not have film already applied, and this would be validated by the Company's implementation vendor during the initial assessment review prior to the project installation being authorized to proceed.

d) There is no limit other than the total square footage must be for windows currently lacking film at the customer's facility. Incentives will be paid at a fixed rate per measure, dependent upon the square footage installed, and the total incentive amount will not exceed more than 75% of the total cost of the project. This approach is consistent with the incentives structure in the DSM Phase III program.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 39 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 39

Please provide a detailed description of the proposed Phase VII Non-residential Small Manufacturing program, including, but not limited to, the information requested below:

(a) Provide all relevant characteristics that, in the Company's opinion, define a customer as a "small manufacturing facilit[y]" eligible for this program, as used on page 14 of the pre-filed direct testimony of Company witness Hubbard.

(b) Is there a limit to the number of measures a customer may be incented to install? What is the maximum incentive amount allowed per customer?

Response:

a) A qualifying customer for this program is defined as any non-residential customer utilizing compressed air equipment. This may include but is not limited to machine shops, small manufacturers, die casting, mills and other facility types. Any eligible non-residential customer that is not exempt based on exceeding the 500 kW demand threshold and meets this criteria for utilizing compressed air equipment is eligible for the program.

b) There will not be a limit, as customers will be encouraged to install packages of measures that make financial sense for their situation and facility. The incentive amount will be tied directly to the equipment installed and energy savings achieved, and there will not be a planned incentive cap per customer.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 40 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

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

Question No. 40

Please provide a detailed description of the proposed Phase VII Non-residential Office program, including, but not limited to, the information requested below:

(a) Please provide all relevant characteristics that would result in a customer being a "qualifying customer" as used on page 15 of the pre-filed direct testimony of Company witness Hubbard.

(b) Is there a limit to the number of measures a customer may be incented to install? What is the maximum incentive amount allowed per customer?

Response:

a) A qualifying customer for this program is defined as any non-residential customer utilizing a central digital control system to control their HVAC equipment. The digital control system is necessary to provide the control logic to achieve energy the energy savings specified in this program. Any eligible non-residential customer that is not exempt based on exceeding the 500 kW demand threshold and meets this criteria for utilizing a central digital control system is eligible for the program. Some example customer types include but are not limited to office buildings, medical clinics, event centers, and educational buildings.

b) There will not be a limit, as customers will be encouraged to install packages of measures that make financial sense for their situation and facility. The incentive amount will be tied directly to the measures implemented and energy savings achieved, and there will not be a planned incentive cap per customer.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 44 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

Ashwani Vaswani
Manager-Energy Market Quantitative Analysis &
Integrated Resource Planning
Dominion Energy Services, Inc.

The following response to Question No. 44 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision as it pertains to legal matters.

Lisa R. Crabtree
McGuireWoods LLP

Question No. 44

Please perform a *Plexos*® optimization modeling run consistent with the direction provided in the Commission's Order in Case No. PUR-2018-00065 at page 8 which states, "... [T]he Company shall utilize the Dominion Zone PJM coincident peak load forecast and energy sales forecast, scaled down to the Dominion load serving entity level, consistent with the methodology presented by Staff witness White..." for both the ongoing and the newly-proposed Phase VII programs and provide the results of such optimization.

Response

The Company objects to this request on the basis that it would require original work. Notwithstanding and subject to the foregoing objections, the Company is undertaking the requested optimization modeling run and will provide the results to Staff when available.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Fourth Set

The following response to Question No. 45 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision.

Deanna R. Kesler
Regulatory Consultant
Dominion Energy Services, Inc.

The following response to Question No. 45 of the Fourth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on December 13, 2018 has been prepared under my supervision as it pertains to legal matters.

Lisa R. Crabtree
McGuireWoods LLP

Question No. 45

Please perform a Strategist cost/benefit analysis consistent with the direction provided in the Commission's Order in Case No. PUR-2018-00065 at page 8 which states, "... [T]he Company shall utilize the Dominion Zone PJM coincident peak load forecast and energy sales forecast, scaled down to the Dominion load serving entity level, consistent with the methodology presented by Staff witness White..." for both the ongoing and the newly proposed Phase VII programs and provide the results of such cost/benefit analyses. Please include the Strategist printouts of the DCE Diagnostic #2: Benefit/Cost Detail and the DCE Diagnostic #8: Annual Program impacts for both the individual program and portfolio analyses.

Response

The Company objects to this request on the basis that it would require original work. Notwithstanding and subject to the foregoing objections, the Company is undertaking the cost/benefit analysis and will provide the results to Staff when available.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Seventh Set

The following response to Question No. 58 of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 11, 2019 has been prepared under my supervision based upon information from the program designer.

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

Question No. 58

Please refer to the Company's Supplemental Attachment Staff Set 1-13 (15), specifically the "Annual Participants" cells. Please provide an explanation of the sudden increase of participants from 2019 to 2020 and subsequent sudden decrease from 2020 to 2021. Is there some characteristic of the program design that causes the Company to expect a one-time surge in participation that is not sustained throughout the program life?

Response:

The increase in participation shown from 2019 to 2020 is due to the mid-calendar year start date of the program in 2019 after regulatory approval is secured. The participation for program year 2020 is representative of a full 12-month calendar year. The decrease from 2020 to 2021 is due to the potential for the specific measures listed below to be eliminated from the program based on updates to the Energy Independence and Security Act (EISA) that may make the installed equipment required by code and thus no longer eligible to receive incentives. The EISA updates are currently scheduled to begin in January 2020, and the Company believes it reasonable to allow non-residential customers that purchased these products prior to the implementation of EISA updates a 12-month window to complete installation and be eligible for a rebate incentive.

- LED Lamps ≤ 6W (Candle, A19, R, BR, MR, PAR)
- LED Lamps > 7W and ≤10W (A19, R, BR, PAR)
- LED Lamps > 10.5W and ≤18W (A19, A21, R, BR, PAR)

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Seventh Set

The following response to Question No. 70 of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 11, 2019 has been prepared under my supervision based on information from the program designer.

Michael Hubbard /SC

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

Question No. 70

Please refer to the Company's response to Staff Interrogatory No. 4-24, Attachment Staff Set 4-24 (2) CONF, specifically page 15.

a) Please provide a detailed explanation of program design elements that address the findings that, "While some customers are responsive to the program initially, this behavioural change does not persist over the full period," and, "Many customers do not make a behavioural change at all."
b) How many customers does the Company estimate will initially make behavioral changes as a result of the program but will not persist with these behavioral changes?
c) How many customers does the Company estimate will not make any behavioral change as a result of the program?

Response:

a) The savings of nearly all behavioral programs across the country are measured at an aggregate (wave) level, rather than at a household specific level. Third-party evaluations consistently confirm that behavior programs generally result in positive electric and gas savings at an aggregate level, with gross variances between programs driven by heating and cooling loads, demographics, behavioral content and delivery strategy and other influences. That said, the distribution of savings across customers varies for other behavioral and retrofit measure-based savings programs, especially in the residential sector.

b) Recently, EM&V studies have aimed to better understand the distribution of savings in Home Energy Report (e.g. behavior) programs. Opinion Dynamics completed one such study for Pacific Gas & Electric (PG&E) in December of 2018 (see section 3 of Attachment Staff Set 7-70). That report found that in aggregate, electric participants save

1.5% and gas participants save 0.8% annually. The distribution analysis, however, showed that a sizeable percentage of customers were neutral savers and some customers increased their energy use over the treatment period. The reasons for this are likely complex, but it should be assumed that the very mature nature of this program, the temperate climate and the lack of personalized and specific content led to these results.

The Opinion Dynamics report further outlines its recommendation to develop content specific to the operating conditions of the home, which is in fact a central component of the proposed program design. Via the proposed disaggregation methodology, the program designer can itemize and benchmark major appliance consumption, detailing for each customer the cost of the energy used by each major appliance monthly with the program implementation vendor's recommendations reflecting the customer's usage and inefficiencies, as compared to other customers with similar homes. These strategies together will help minimize the occurrence of neutral or negative savers. The report also suggests removing participants if over time, they are found not to generate any measurable savings. The program designer will work with the Company to continuously monitor the savings trends and potentially use these remediation strategies should the Company experience such outcomes.

c) Utilizing the Opinion Dynamics report and the proposed program design assumptions around targeting high-consumption customers and personalizing appliance level recommendations, the program designer assumes 15% to 35% of customers, over time, will not save energy, as found in the PG&E study. However, the program designer also assumes that the overall program will still achieve the aggregate projected savings.

Excerpt of Attachment Staff Set 7-70

Opinion **Dynamics**

Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

PG&E Home Energy Report (HER) Energy Savings Distribution Analysis and Trends Study

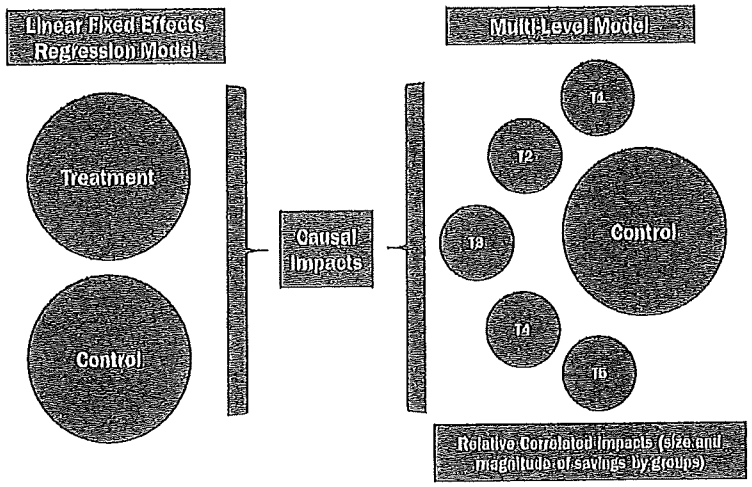
CALMAC ID: PGE0426.01

December 10, 2018

Excerpt of Attachment Staff Set 7-70

HER Energy Savings Distribution Analysis

Figure 1. Interpretation of Results – Differences in Modeling Approaches



2.2 Results

The following section presents the results associated with our analysis.

2.2.1 Distribution of Savings Groups

Opinion Dynamics developed a multi-level model to identify each HER participant's individual savings estimates for every year in which they received reports. We divided HER program participants into five savings groups based on the results of our model.[5] Working with PG&E, we decided to develop five groups to support identifying actionable program design revisions (i.e., to target the very positive and very negative savers differently from positive or negative savers). Distinguishing between very positive and very negative savers from the rest of the groups allows PG&E to target participants with much larger changes in energy consumption. We did this separately for the gas savings results and the electric savings results, so a dual fuel participant might be a positive gas saver and a neutral electric saver.

Based on our analysis of 2016 results, we found that HER report recipients vary in terms of their energy savings after receiving reports. In 2016, less than one quarter of participants saved energy, while nearly one quarter of participants increased their consumption, although the proportion of participants varied across electric and gas participants. This result is unsurprising given the results of third-party evaluations, which suggest that a small portion of participants have measurable savings. The following results reflect findings across all waves for 2016:

- Positive and very positive savers, those customers who save energy after receiving HERs, reflect 19% of electric participants, and 25% of gas participants.

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5 The very negative and very positive savers reflect savings more than 1.125 standard deviations, and the positive and negative savers groups reflect 0.375 standard deviations of the overall savings distribution. We selected the cut-offs for energy savings category to create groups that were actionable for program staff, and that reflected changes in energy consumption that allowed for recognizing the skewed nature of the very negative and very positive groups.

Excerpt of Attachment Staff Set 7-70

HER Energy Savings Distribution Analysis

- Negative and very negative savers, those customers who increase their consumption after receiving HERs, reflect a little over a quarter of electric participants (27%), and slightly less than a third (31%) of gas participants.
- Neutral savers, those that do not change their energy consumption after receiving HERs, represent over half of the electric participant population (53%), and 43% of the gas participant population.

Table 2 presents overall average percent savings across all waves in 2016 by savings group.

Table 2. Distribution of Savings by Savings Groups (2016)

Fuel Type	Savings Group	Number of Participants	Percent of Participants	Average Percent Savings
Electric (kWh)	Very Positive	89,421	7%	54%
	Positive	158,810	12%	21%
	Neutral	679,017	53%	0.03%
	Negative	284,018	22%	-25%
	Very Negative	61,144	5%	-59%
Gas (Therm)	Very Positive	102,438	8%	26%
	Positive	214,621	17%	13%
	Neutral	536,529	43%	0.6%
	Negative	299,091	24%	-20%
	Very Negative	86,376	7%	-48%

Results exclude 10% of customers within each wave randomly selected to validate savings.
Totals may not sum due to rounding.

As part of our analysis, we assessed whether baseline energy consumption produced any notable trends related to energy savings groups. Figure 2 shows the average kWh daily savings, and three pre-treatment average daily consumption (ADC) measures. These measures include "Pre-ADC", which is average daily consumption prior to receiving reports for all available months in the pre-period for each wave. We also look at seasonal baseline consumption for summer and winter. Summer Pre-ADC incorporate the months of June-September in the pre-period for each wave. Winter Pre-ADC incorporate the months of December-March in the pre-period for each wave.

Very positive electric savers tend to have higher average baseline consumption (pre-ADC) than other savings groups. This is consistent with existing research that suggests that baseline consumption is correlated with larger energy savings. Further, these customers tend to have higher summer and winter baseline consumption than other savings groups as well. However, for electric participants, those with very negative savings also tend to have higher baseline consumption than neutral or positive or negative savings.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Seventh Set

The following response to Question No. 71 of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 11, 2019 has been prepared under my supervision.

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

Question No. 71

Please provide the following information regarding the Company's Phase III Non-residential Window Film program to date:

a) Number of customers from each eligible customer class that participated; and
b) Total incentive amounts paid to each customer class.

Response:

Please see the table below for the Company's DSM Phase III Non-residential Window Film program data as of January 14, 2019:

Non-Residential Window
Film Program Participants
As of January 14, 2019

Customer Class	Participant Count	Total Incentive Amount
Schedule 5C	3	$1,106.45
Schedule 5P	1	$68.00
Schedule GS-1	124	$126,530.50
Schedule GS-2T	9	$5,199.20
Schedule GS-3	19	$94,564.85
Schedule GS-4	2	$378.85
Schedule 6TS	2	$4,301.85
Schedule 10	3	$3,061.55
Schedule GS-2	81	$60,961.00
Grand Total	244	$296,172.25

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Seventh Set

The following response to Question No. 73 of the Seventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 11, 2019 has been prepared under my supervision.

J. Clayton Crouch
Regulatory Consultant
Virginia Electric and Power Company

Debra A. Stephens
Regulatory Specialist
Virginia Electric and Power Company

Question No. 73

Please re-calculate the rate impacts for Rider C2A including cost allocation to and recovery from GS-3 and GS-4 customers associated with the previously-approved, ongoing programs *(i.e.,* Phases II through VI) assuming these customers are not exempt from paying for the previously-approved, ongoing programs.

Response:

Please see Attachment Staff Set 7-73 (DAS) for the requested information. Attachment Staff Set 7-73 (DAS) contains a revised version of Schedule 4 to the pre-filed direct testimony of Debra A Stephens showing an additional column for the requested Rate Year rates for currently approved programs (i.e., Phases II-VI), which were calculated using the previously approved opt out methodology as opposed to the exemption applied for large general service customers used in the Company's application. The Attachment also includes a column for Rate Year rates for the new Phase VII programs using the large general service opt out set forth in law. Finally, there is a column for the true-up rates for Rider C2A, which has not changed from the Company's pre-filed testimony. These three columns are combined to produce the total rate for Rider C2A. These rates are based on the originally filed revenue requirements.

The newly calculated rates have been used to update Schedule 3 to the pre-filed direct testimony of Company Witness Stephens containing typical bills. Please note, rider rates that have been updated since the Company's filing on October 3, 2018, are not reflected in these calculations so that the effect of the requested change on Rider C2A can be shown.

Attachment Staff Set 7-73 (DAS)
Page 1

VIRGINIA ELECTRIC & POWER COMPANY

Calculation of Rider C2A Total Rate

BASED ON STAFF DATA REQUEST 7-73

Rate Schedule	Rate Year PROGRAMS IN PHASES II TO VI C2A Rate (¢/kWh)	Rate Year PROGRAMS IN PHASE VII C2A Rate (¢/kWh)	True-Up C2A Rate (¢/kWh)	Total C2A Rate (¢/kWh)
Schedule 1	0.0429	0.0751	(0.0098)	0.1082
Schedule 1P	0.0429	0.0751	(0.0098)	0.1082
Schedule 1S	0.0429	0.0751	(0.0098)	0.1082
Schedule 1T	0.0429	0.0751	(0.0098)	0.1082
Schedule 1W	0.0429	0.0751	(0.0098)	0.1082
Schedule GS-1	0.0336	0.0592	(0.0076)	0.0852
Schedule GS-2	0.0304	0.0536	(0.0069)	0.0771
Schedule GS-2T	0.0304	0.0536	(0.0069)	0.0771
Schedule GS-3 (1) (2) (3)	0.0263	0.0000	(0.0060)	0.0203
Schedule GS-4 (1) (2) (3)	0.0187	0.0000	(0.0043)	0.0144
56-235.2 (1) (2) (3)	0.0000	0.0000	0.0000	0.0000
Schedule 5	0.0304	0.0536	(0.0069)	0.0771
Schedule 5C	0.0462	0.0813	(0.0105)	0.1170
Schedule 5P	0.0462	0.0813	(0.0105)	0.1170
Schedule 6 (1) (2) (3)	0.0263	0.0000	(0.0060)	0.0203
Schedule 6TS (1) (2) (3)	0.0263	0.0000	(0.0060)	0.0203
Schedule 7	0.0336	0.0592	(0.0076)	0.0852
Schedule 10 (Secondary) (1) (2) (3)	0.0263	0.0000	(0.0060)	0.0203
Schedule 10 (Primary & Transmission) (1) (2) (3)	0.0187	0.0000	(0.0043)	0.0144
Schedule 25	0.0414	0.0718	(0.0094)	0.1038
Schedule 27	0.0414	0.0718	(0.0094)	0.1038
Schedule 28	0.0414	0.0718	(0.0094)	0.1038
Schedule 29	0.0414	0.0718	(0.0094)	0.1038

Note
(1) Rate Schedules in GS-3, GS-4, and 56-235.2 customer classes will not pay rate year costs for Rider C2A NEW (Phase VII) programs.
(2) Rate Schedules in GS-3, GS-4, and 56-235.2 customer classes will pay rate year costs for Rider C2A EXISTING (Phases II to VI) programs.
(3) Rate Schedules in GS-3, GS-4, and 56-235.2 customer classes will pay true-up costs for Rider C2A programs.

Attachment Staff Set 7-73 (DAS)
Page 2

VIRGINIA ELECTRIC AND POWER COMPANY
TYPICAL BILLS - RESIDENTIAL - SCHEDULE 1

SUMMER MONTHS

	EFFECTIVE FOR USAGE ON AND AFTER 07-01-2019				EFFECTIVE FOR USAGE ON AND AFTER 07-01-2019					
KWH	BASIC RATE #	APPLICABLE NON-FUEL RIDERS##	FUEL *	TOTAL BILL	BASIC RATE #	APPLICABLE NON-FUEL RIDERS###	FUEL*	TOTAL BILL	DIFFERENCE	PERCENT DIFFERENCE
500	$40.59	$8.77	$13.50	$62.86	$40.59	$9.04	$13.50	$63.13	$0.27	0.4%
750	$57.52	$13.16	$20.25	$90.93	$57.52	$13.55	$20.25	$91.32	$0.39	0.4%
1,000	$76.38	$17.52	$27.00	$120.90	$76.38	$18.04	$27.00	$121.42	$0.52	0.4%
1,500	$115.06	$26.26	$40.50	$181.82	$115.06	$27.06	$40.50	$182.62	$0.80	0.4%
2,000	$153.76	$35.02	$54.00	$242.78	$153.76	$36.07	$54.00	$243.83	$1.05	0.4%
2,500	$192.45	$43.80	$67.50	$303.75	$192.45	$45.13	$67.50	$305.08	$1.33	0.4%
3,000	$231.13	$52.54	$81.00	$364.67	$231.13	$54.13	$81.00	$366.26	$1.59	0.4%
5,000	$385.89	$87.58	$135.00	$608.47	$385.89	$90.22	$135.00	$611.11	$2.64	0.4%

BASE MONTHS

KWH	BASIC RATE #	APPLICABLE NON-FUEL RIDERS##	FUEL *	TOTAL BILL	BASIC RATE #	APPLICABLE NON-FUEL RIDERS###	FUEL*	TOTAL BILL	DIFFERENCE	PERCENT DIFFERENCE
500	$40.59	$8.77	$13.50	$62.86	$40.59	$9.04	$13.50	$63.13	$0.27	0.4%
750	$57.52	$13.16	$20.25	$90.93	$57.52	$13.55	$20.25	$91.32	$0.39	0.4%
1,000	$70.91	$17.52	$27.00	$115.43	$70.91	$18.04	$27.00	$115.95	$0.52	0.5%
1,500	$95.92	$26.26	$40.50	$162.68	$95.92	$27.06	$40.50	$163.48	$0.80	0.5%
2,000	$120.94	$35.02	$54.00	$209.96	$120.94	$36.07	$54.00	$211.01	$1.05	0.5%
2,500	$145.96	$43.80	$67.50	$257.26	$145.96	$45.13	$67.50	$258.59	$1.33	0.5%
3,000	$170.97	$52.54	$81.00	$304.51	$170.97	$54.13	$81.00	$306.10	$1.59	0.5%
5,000	$271.04	$87.58	$135.00	$493.62	$271.04	$90.22	$135.00	$496.26	$2.64	0.5%

 # BASIC RATE INCLUDES BASE DISTRIBUTION, GENERATION, AND EMBEDDED TRANSMISSION RATES.
REFLECTS CURRENT AND PENDING APPLICABLE NON-BASE RATE RIDERS TO BE EFFECTIVE JULY 1, 2019 WITHOUT PROPOSED RIDER C1A & C2A CHANGE.
REFLECTS CURRENT AND PENDING APPLICABLE NON-BASE RATE RIDERS TO BE EFFECTIVE JULY 1, 2019 WITH PROPOSED RIDER C1A & C2A CHANGE.
** REFLECTS TOTAL PROPOSED FUEL LEVEL OF $0.02700 PER KWH.*
***THE RATES USED IN THIS SCHEDULE ARE BASED ON THE REVENUE REQUIREMENTS AS FILED IN EACH CASE*

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Eighth Set

The following response to Question No.74 of the Eighth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 16, 2019 has been prepared under my supervision.

Michael Hubbard -SC

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

Question No. 74

Provide the following information regarding the Company's Phase VI non-residential Prescriptive Program to date:

a) Number of customers from each eligible customer class that participated;
b) The number of measures (by type) implemented per customer class;
c) Amount of incentives paid per measure by customer class; and
d) Total incentive amounts paid to each customer class.

Response:

a) See the table below for the requested information:

Non-Residential Prescriptive Program
As of January 16, 2019

Customer Class	Participant Count
Schedule 5C	8
Schedule 5P	1
Schedule GS-1	185
Schedule GS-2T	259
Schedule GS-3	52
Schedule GS-4	9
Schedule 10	3
Schedule GS-2	352
Total	869

b) See the table below for the requested information:

Non-Residential Prescriptive Program
As of January 16, 2019

Customer Class and Measure	Number of Measures	Incentive Amount by Measure
Schedule 5C	**207**	**$131,111.50**
AC TUNE-UPS	126	$67,192.50
DOOR GASKET	1	$49.00
DUCT TEST AND SEAL	80	$63,870.00
Schedule 5P	**23**	**$19,785.00**
AC TUNE-UPS	23	$19,785.00
Schedule GS-1	**723**	**$179,271.76**
AC TUNE-UPS	52	$27,000.00
AUTO-CLOSERS	92	$4,852.04
DOOR GASKET	373	$74,021.64
DUCT TEST AND SEAL	88	$66,135.00
NIGHT COVER	5	$576.92
STRIP CURTAINS	113	$6,686.16
Schedule GS-2T	**1492**	**$888,936.34**
AC TUNE-UPS	91	$54,980.75
AUTO-CLOSERS	76	$5,049.23
DOOR GASKET	959	$576,416.41
DUCT TEST AND SEAL	312	$245,472.00
NIGHT COVER	6	$2,100.00
STRIP CURTAINS	48	$4,917.95
Schedule GS-3	**472**	**$1,517,704.09**
AC TUNE-UPS	78	$205,942.50
AUTO-CLOSERS	21	$2,231.28
DOOR GASKET	176	$136,989.11
DUCT TEST AND SEAL	182	$1,170,240.00
STRIP CURTAINS	15	$2,301.20
Schedule GS-4	**76**	**$287,771.79**
AUTO-CLOSERS	12	$2,197.79
DOOR GASKET	61	$46,174.00
DUCT TEST AND SEAL	3	$239,400.00
Schedule 10	**118**	**$337,705.00**
AC TUNE-UPS	59	$127,810.00
DUCT TEST AND SEAL	59	$209,895.00
Schedule GS-2	**2435**	**$1,238,866.02**
AC TUNE-UPS	404	$275,605.00
AUTO-CLOSERS	183	$10,688.61
DOOR GASKET	1168	$477,109.97
DUCT TEST AND SEAL	385	$446,887.50
NIGHT COVER	11	$5,653.67
STRIP CURTAINS	284	$22,921.27
Grand Total	**5546**	**$4,601,151.50**

c) See the table provided in response to subpart (b) for the requested information.
d) See the table provided in response to subpart (b) for the requested information.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Ninth Set

The following response to Question No. 76 (a)-(d) of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 23, 2019 has been prepared under my supervision.

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

The following response to Question No. 76 (e)–(g) of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 23, 2019 has been prepared under my supervision.

Deanna R. Kesler
Regulatory Consultant
Dominion Energy Services, Inc.

The following response to Question No. 76 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 23, 2019 has been prepared under my supervision as it pertains to evaluation, measurement and verification.

Dan Feng
Senior Consultant
DNV GL

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Ninth Set

The following response to Question No. 76 (a)-(d) of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 23, 2019 has been prepared under my supervision.

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

The following response to Question No. 76 (e)–(g) of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 23, 2019 has been prepared under my supervision.

Deanna R. Kesler
Regulatory Consultant
Dominion Energy Services, Inc.

The following response to Question No. 76 (a)–(c) and (e)–(g) of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 23, 2019 has been prepared under my supervision as it pertains to evaluation, measurement and verification.

Dan Feng
Senior Consultant
DNV GL

The following response to Question No. 76 of the Ninth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 23, 2019 has been prepared under my supervision as it pertains to legal matters.

Lisa R. Crabtree
McGuireWoods LLP

Question No. 76

For all of the Company's previously-operated DSM programs for the non-residential customer classes, please provide, by program, the following information:

a) Total projected unique participants;
b) Projected unique participants by rate schedule;
c) Total actual unique participants;
d) Actual unique participants by rate schedule;
e) Projected program-level energy and demand savings (in kWh and kW, respectively);
f) Actual total program-level energy and demand savings (in kWh and kW, respectively); and
g) Actual program-level energy and demand savings (in kWh and kW, respectively) by rate schedule.

Response:

The Company objects to this request on the grounds that it requires original work, which is not required by Rule 260 of the Commission's Rules of Practice and Procedure, 5 VAC 5-20-260. Subject to and notwithstanding this objection, the Company provides the following response.

(a, c, e, and f)

Please see the following table for the requested information. This information is based on the Company's May 1, 2018 evaluation, verification and measurement report, which was filed in Case No. PUE-2016-00111 and is accurate through December 31, 2017. Additional information, such as demand savings, can be found in Appendices A and B of the same.

Program	Gross Participants	Net Energy Savings kWh/year
Non-residential Programs		
Non-residential Duct Testing and Sealing – Virginia (DSM II)		

Program	Gross Participants	Net Energy Savings kWh/year
Actual	4,444	68,840,057
Planned (YE Total)	1,933	46,722,290
Cumulative % Toward Plan	230%	147%
Non-residential Energy Audit – Virginia (DSM II)		
Actual	1,632	39,138,178
Planned (YE Total)	2,410	52,159,321
Cumulative % Toward Plan	68%	75%
Non-residential Lighting Systems and Controls – Virginia (DSM III)		
Actual	3,430	134,735,543
Planned (YE Total)	5,276	97,112,026
Cumulative % Toward Plan	65%	139%
Non-residential Heating and Cooling Efficiency – Virginia (DSM III)		
Actual	312	23,632,707
Planned (YE Total)	2,586	75,204,654
Cumulative % Toward Plan	12%	31%
Non-residential Window Film – Virginia (DSM III)[1]		
Actual	439,004	5,143,800
Planned (YE Total)	3,333,400	33,459,821
Cumulative % Toward Plan	13%	15%
Non-residential Small Business Improvement – Virginia (DSM V)		
Actual	1,004	14,280,899
Planned (YE Total)	851	5,579,025
Cumulative % Toward Plan	118%	256%
Non-residential Prescriptive – Virginia (DSM VI)		
Actual	4	594
Planned (YE Total)	266	5,959,948
Cumulative % Toward Plan	2%	0%

(b and g)

The Company did not project participants by rate schedule and did not previously track energy and demand savings by rate schedule.

(d)

[1] Non-Residential Window Film program participation value is in square feet rather than participant count.

See the table below for the breakdown of actual program participants by rate schedule. See also Company's responses to Staff Set 4-33, Staff Set 4-36, Staff Set 7-71 and Staff Set 8-74 for the remainder of the Company's non-residential programs.

Program Name	Number of Participants
DSM I Commercial Lighting	**1856**
GS-1	328
GS-2	724
GS-2SG	1
GS-2T	432
GS-3	172
GS-4	12
Sch 10	62
Sch 26	6
Sch 27	10
Sch 28	47
Sch 30	2
Sch 42	9
Sch 5	20
Sch 5C	5
Sch 5P	15
Sch 6	2
Sch 6P	3
Sch 6TS	3
Sch 7	3
DSM I Commercial HVAC Upgrade	**118**
GS-1	1
GS-2	29
GS-2T	14
GS-3	53
GS-4	3
Schedule 10	11
Schedule 27	2
Schedule 30	1
Schedule 5	1
Schedule 6P	1
Schedule 6TS	2
DSM II Non-residential Energy Audit	**1,632**
Schedule 5	1
Schedule 5C	1
Schedule GS-1	157
Schedule GS-2T	733
Schedule GS-3	91
Schedule GS-4	6
Schedule 10	3
Schedule 28	1
Schedule GS-2	639

DSM II Non-residential Duct Testing and Sealing	**4,444**
Schedule 5	13
Schedule 5C	234
Schedule 5P	85
Schedule GS-1	1204
Schedule GS-2T	1136
Schedule GS-3	143
Schedule GS-4	6
Schedule 6TS	3
Schedule 6TS-SG	1
Schedule 7	5
Schedule 10	73
Schedule 28	2
Schedule GS-2	1534
Schedule DP-2	5
DSM V - Small Business Improvement	**1,541**
Schedule 5	1
Schedule 5C	85
Schedule 5P	8
Schedule GS-1	792
Schedule GS-2T	66
Schedule 7	1
Schedule GS-2	588

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Tenth Set

The following response to Question No. 79 of the Tenth Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on January 29, 2019 has been prepared under my supervision based upon information from the program designer.

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

Question No. 79

Please provide the number or an estimate of the number of smart thermostats currently in the Company's service territory.

Response:

The program designer obtained information from several thermostat manufacturers to estimate the quantity of installed smart thermostats in Dominion Energy Virginia's service territory at the time of initial program design development. The total estimated installed quantity as of April 2018 was approximately 168,700 smart thermostats.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Eleventh Set

The following response to Question No. 81 of the Eleventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on February 1, 2019 has been prepared under my supervision based upon information from the program designer.

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

Question No. 81

Please refer to the Company's Supplemental Attachment Staff Set 1-13 and provide a detailed explanation, including any sources or calculations, of the Company's estimated 2,850 square feet of window film installed per building.

Response:

The Company's estimated 2,850 square feet of window film installed per building is consistent with the DSM Phase III Non-residential Window Film Program participation to date (PTD) data from Table 5-17 labeled WF Program Performance Indicators (2014-2017) in the Company's 2018 EM&V Report.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Eleventh Set

The following response to Question No. 82 of the Eleventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on February 1, 2019 has been prepared under my supervision based upon information from the program designer.

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

Question No. 82

Please refer to the Company's Supplemental Attachment Staff Set 1-13 (20) (NonRes Small Manufacturing). Please provide the following information for each measure therein:

a) The formulae used to calculate the energy savings;
b) The value(s) utilized for each variable within the formulae in (a);
c) Any documentation, including TRMs, studies, and EM&V reports, supporting referenced "engineering judgements";
d) Any documentation, including appliance saturation studies, supporting assumptions regarding distribution of types of baseline equipment assumed for savings calculations;
e) Specific source(s) and documents for referenced "vendor data"; and
f) Copies of the "custom spreadsheet engineering model[s]" referenced in sections 1.2, 1.4, 1.5, 1.7, 1.8, 1.9, 1.10, and 1.11.

Response:

It should be noted that the proposed DSM Phase VII Non-residential Small Manufacturing Program does not utilize a deemed savings approach that was used for the proposed DSM Phase VII Lighting Systems and Controls, Heating and Cooling Efficiency, and Window Film programs. In deemed savings, a single value is used for savings for each instance of a defined measure. The savings for measures supported by the proposed Small Manufacturing Program will be calculated on a per instance basis using the methodologies shown in the sample calculations provided in "custom spreadsheet engineering model[s] as referenced in Staff Set 11- 82(f)."

This may be called a hybrid or engineered savings approach in many cases because the calculation is the same in every instance (similar to a deemed approach), but the specific input values and savings results vary and the savings are scaled using a relevant metric such as compressor nominal horsepower. Furthermore, the program design for the Small Manufacturing Program uses savings associated with a 50-hp compressor. The previously provided Supplemental Attachment Staff Set 1-13 (20) provides the calculation methods performed.

a) The formulae used to calculate energy savings are detailed in each individual "custom spreadsheet engineering model" provided as a response to Staff Set 11-82 (f).

b) The values utilized for each variable within the formulae in (a) are also provided in each individual "custom spreadsheet engineering model" provided as a response to Staff Set 11-82 (f).

c) Engineering judgement is the result of long exposure to processes and concepts associated with a particular practice, in this case, DSM program design, energy engineering and the related equipment. Thus, there are no specific references within individual documents. However, the approaches used to develop the concepts and structure of the Small Manufacturing program have been used previously including:

- Michigan: See Michigan Energy Measures Database (MEMD) that has compressed air measures on a per volume basis: https://www.michigan.gov/mpsc/0,4639,7-159-52495_55129---,00.html

  https://www.consumersenergy.com/-/media/CE/Documents/Energy%20Efficiency/business/business-catalog.ashx?la=en&hash=09CD1CAEA53CEEB7C909E417DB03942EE2444879

- Illinois: Illinois TRM attached as response to 82d and example program application from Ameren IL Leak Detection and repair measures based on system hp. https://amerenillinoissavings.com/portals/0/business/forms/py19-leak-repair.pdf

- Wisconsin Focus on Energy program: https://focusonenergy.com/sites/default/files/Focus%20on%20Energy%20TRM%20-%20PY2017_1%28Archive%29.pdf

  https://www.focusonenergy.com/sites/default/files/inline-files/2019_Process_Systems_IncentiveSupplementalDataSheet_FillableForm.pdf

d) The primary references were the Illinois Technical Reference Manual (TRM) and Compressed Air Challenge especially chapter 2 of the Sourcebook for Industry, see Attachments Staff Set 11-82(d) (1) and Staff Set 11-82 (d) (2). If further information about the Compressed Air Challenge is needed, the website is www.compressedairchallenge.org. The compressors described in the Small Manufacturing program are not related to the operation of 'appliances' thus no "appliance saturation studies" were utilized.

e) See Attachment Staff Set 11-82 (e).

f) See Confidential Attachments Staff Set 11-82 (f) (1), (2), (3), (4), (5), (6), (7), (8), (9), and (10).

Confidential Attachments Staff Set 11-82 (f) contain confidential information and are provided to the protections set forth in 5 VAC 5-20-170, the Hearing Examiner's Protective Ruling and Additional Protective Treatment for Extraordinarily Sensitive Information entered on October 23, 2018, any subsequent protective order or protective ruling issued in this proceeding, and the Agreements to Adhere executed pursuant to any such orders or rulings.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Eleventh Set

The following response to Question No. 83 of the Eleventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on February 1, 2019 has been prepared under my supervision based upon information from the program designer.

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

Question No. 83

Please refer to the Company's Supplemental Attachment Staff Set 1-13 (17) (NonRes Office). Please provide documentation, including relevant studies or estimates, supporting the estimated size of the 4-story model utilized by the Company.

Response:

It should be noted that the proposed Non-residential Small Office Program does not utilize a deemed savings approach that was used for the proposed DSM Phase VII Lighting Systems and Controls, Heating and Cooling Efficiency, and Window Film programs. In deemed savings, a single value is used for savings for each instance of a defined measure. The savings for measures supported by the Small office program will be calculated on a per instance basis using the methodologies shown in the sample calculations provided in Attachments Staff Set 11-82 (f).

This may be called a hybrid or engineered savings approach in many cases because the calculation is the same in every instance (similar to a deemed approach), but the specific input values and savings results vary and the savings are scaled using a relevant metric such as building square footage.

The program design for the Non-residential Small Office Program uses savings associated with a 4-story model as a sample because the model for this was created by experts to comply with all code requirements for the building type and location being sought by the program. It also possessed a suitable HVAC system type for modeling the energy efficiency measures included in the program design. Scaling the results from this building

model is justifiable because the building loads, schedules, envelope and equipment performance levels and controls would be similar.

The model of office energy use was based on one of the "Commercial Building Prototype Models" produced by PNNL and funded by the United States Department of Energy (DOE). These rigorously model a variety of commercial buildings for precise code-minimum performance for a variety of building types, climates, and code vintages. In order to provide sound and transferrable savings input to the program, the program designer believes the DOE's prototype models form a solid basis upon which to develop estimates of savings for various efficiency measures. The source for the model can be found at the link below link below:

https://www.energycodes.gov/development/commercial/prototype_models

The link above, prepared by PNNL engineers, describes the medium office model in detail. The only change made to this model, for use as the office baseline, was switching the weather file to Richmond, Virginia. DOE also provides large and small office building models. The medium office model was used as a baseline because it was considered to be more typical of the likely participating buildings (while accurately representing building loads, performance, and controls compared to a defensible standard) than the small (one-floor, 5,500 square feet) or large building (12-floor, 500,000 square feet) models.

Please note that there is no intended or implied correlation between the sizes in the model names and the name of the program. Different organizations simply define small/medium/large independently.

Virginia Electric and Power Company
Case No. PUR-2018-00168
Virginia State Corporation Commission Staff
Eleventh Set

The following response to Question No. 84 of the Eleventh Set of Interrogatories and Requests for Production of Documents Propounded by the Virginia State Corporation Commission Staff received on February 1, 2019 has been prepared under my supervision.

Debra A. Stephens
Regulatory Specialist
Virginia Electric and Power Company

Question No. 84

Please refer to page 6 of the Pre-filed Direct Testimony of Staff witness David J. Dalton in Case No. PUR-2017-00071. In the same format, please calculate a seasonally weighted typical bill based on 1,000 kWhs for Residential Schedule 1. Please provide the total customer bill, excluding any taxes and fees, including all currently approved Company rates as of February 1, 2019, and all other pending or known as-of-yet-to-be-filed rate applications (assuming the Commission approves these rates as requested). Please also identify the requested change as a percentage of the customer bill and as a bill impact separately for each individual application.

Response:

Please refer to Attachment Staff Set 11-84 (DAS).

Please note that the attachment does not include the effect of the Company's proposal to rebill the final base rates determined in Case No. PUR-2018-00055 for the period from January 1, 2018 through March 31, 2019.

Dominion Energy Virginia Updated Attachment Staff Set 7-53 (DAS)
Residential Schedule 1 Typical Bill Based on 1,000 kWhs

Seasonally Weighted Bill (February 1, 2019) $ 117.64

Seasonally Weighted Bill	Change	$ 117.64	% Change from 2/1/2019	Notes
Rider US-3 (Proposed Eff. March 1, 2019)	$ 0.21		0.18%	(1)
Total Changes from January 1, 2019 to March 1, 2019	$ 0.21	$ 117.85	0.18%	

Seasonally Weighted Bill	Change	Total Bill $117.85	% Change from 3/1/2019	Notes
Rider B (Proposed Eff. April 1, 2019)	$ 0.26		0.22%	(2)
Rider GV (Proposed Eff. April 1, 2019)	$ 0.47		0.40%	(3)
Rider R (Proposed Eff. April 1, 2019)	$ (0.09)		-0.08%	(4)
Rider S (Proposed Eff. April 1, 2019)	$ 0.18		0.15%	(5)
Rider W (Proposed Eff. April 1, 2019)	$ 0.03		0.03%	(6)
Base Rate Reduction for Federal Tax Cut and Jobs Act of 2017	$ (1.06)		-0.90%	(7)
Total Changes from March 1, 2019 to April 1, 2019	$ (0.21)	$ 117.65	-0.17%	

Seasonally Weighted Bill	Change	Total Bill $117.65	% Change from 4/01/2019	Notes
Rider C1A (Proposed Eff. July 1, 2019)	$ 0.04		0.03%	(8)
Rider C2A (Proposed Eff. July 1, 2019)	$ 0.56		0.48%	(9)
Total Changes from April 1, 2019 to July 1, 2019	$ 0.60	$ 118.25	0.51%	

Seasonally Weighted Bill	Change	Total Bill $118.25	% Change from 7/01/2019	Notes
Rider BW (Proposed Eff. September 1, 2019)	$ 0.23		0.19%	(10)
Rider US-2 (Proposed Approved Eff. September 1, 2019)	$ 0.08		0.07%	(11)
Total Changes from April 1, 2019 to September 1, 2019	$ 0.31	$ 118.56	0.26%	

Seasonally Weighted Bill	Change	Total Bill $118.56	% Change from 7/01/2019	Notes
Rider E (Proposed Eff. November 1, 2019)	$ 2.15		1.81%	(12)
Total Changes from September 1, 2019 to November 1, 2019	$ 2.15	$ 120.71	1.81%	

Notes:

1. Proposed Rider US-3

	Schedule 1 Rate per kWh	1,000 kWh Bill Impact
Current Rider US-3	$0.000000	$ -
Proposed Rider US-3 (PUR-2018-00101)	$0.000210	$ 0.21
Impact of Change for 1,000 kWh bill		$ 0.21

2. Proposed Rider B Change

	Schedule 1 Rate per kWh	1,000 kWh Bill Impact
Current Rider B (PUR-2017-00070)	$0.000773	$ 0.77
Proposed 4/1/2019 Rider B (PUR-2018-00083)	$0.001033	$ 1.03
Impact of Change for 1,000 kWh bill		$ 0.26

3. Proposed Rider GV Change

	Schedule 1 Rate per kWh	1,000 kWh Bill Impact

Updated Attachment Staff Set 7-53 (DAS)

Current Rider GV (PUR-2017-00071)	$0.001838	$	1.84
Proposed 4/1/2019 Rider GV (PUR-2018-00084)	$0.002307	$	2.31
Impact of Change for 1,000 kWh bill		$	0.47

4. Proposed Rider R Change	Schedule 1 Rate per kWh	1,000 kWh Bill Impact	
Current Rider R (PUR-2017-00072)	$0.001210	$	1.21
Proposed 4/1/2019 Rider R (PUR-2018-00085)	$0.001115	$	1.12
Impact of Change for 1,000 kWh bill		$	(0.09)

5. Proposed Rider S Change	Schedule 1 Rate per kWh	1,000 kWh Bill Impact	
Current Rider S (PUR-2017-00073)	$0.004001	$	4.00
Proposed 4/1/2019 Rider S (PUR-2018-00086)	$0.004181	$	4.18
Impact of Change for 1,000 kWh bill		$	0.18

6. Proposed Rider W Change	Schedule 1 Rate per kWh	1,000 kWh Bill Impact	
Current Rider W (PUR-2017-00074)	$0.002001	$	2.00
Proposed 4/1/2019 Rider W (PUR-2018-00087)	$0.002036	$	2.04
Impact of Change for 1,000 kWh bill		$	0.03

7. Base Rate Reduction for Federal Tax Cut and Jobs Act of 2017	1,000 kWh Bill Impact	
Current Base Rates	$	-
Proposed Base Rates 5/1/2019 (PUR-2018-00055)	$	(1.06)
Impact of Change for 1,000 kWh bill	$	(1.06)

8. Proposed Rider C1A Change	Schedule 1 Rate per kWh	1,000 kWh Bill Impact	
Current Rider C1A (PUR-2017-00129)	$0.000008	$	0.01
Proposed Rider C1A 7/1/2019 (PUR-2018-00168)	$0.000050	$	0.05
Impact of Change for 1,000 kWh bill		$	0.04

9. Proposed Rider C2A Change	Rate per kWh	Bill Impact	
Current Rider C2A (PUR-2017-00129)	$0.000595	$	0.60
Proposed Rider 7/1/2019 C2A (PUE-2018-00168)	$0.001160	$	1.16
Impact of Change for 1,000 kWh bill		$	0.56

10. Proposed Rider BW Change	Schedule 1 Rate per kWh	1,000 kWh Bill Impact	
Current Rider BW (PUR-2017-00128)	$0.002102	$	2.10
Proposed 9/1/2019 Rider BW (PUR-2018-00166)	$0.002332	$	2.33
Impact of Change for 1,000 kWh bill		$	0.23

11. Proposed Rider US-2 Change	Schedule 1 Rate per kWh	1,000 kWh Bill Impact	
Current Rider US-2 (PUR-2017-00127)	$0.000234	$	0.23
Proposed 9/1/2019 Rider US-2 (PUR-2018-00167)	$0.000308	$	0.31
Impact of Change for 1,000 kWh bill		$	0.08

12. Proposed Rider E Change	Schedule 1 Rate per kWh	1,000 kWh Bill Impact	
Current Rider E	$0.000000	$	-
Proposed 11/1/2019 Rider E (PUR-2019-00XXX)	$0.002149	$	2.15
Impact of Change for 1,000 kWh bill		$	2.15

Updated Attachment Staff Set 7-53 (DAS)

DOMINION ENERGY VIRGINIA
1,000 KWH SEASONALLY WEIGHTED RESIDENTIAL BILL
RATE SCHEDULE 1

BILL COMPONENTS		July 2019
DISTRIBUTION - BASE	$	26.97
GENERATION - BASE	$	36.00
TRANSMISSION	$	13.01
FUEL	$	27.00
GENERATION A6	$	15.06
DSM/EE A5	$	1.21
TOTAL BILL	$	118.26

	RATES	RATES	KWH 1,000	KWH 1,000	
BILL COMPONENTS	SUMMER	NON-SUMMER	SUMMER	NON-SUMMER	WEIGHTED
BASIC CUSTOMER CHARGE	$ 6.61	$ 6.61	$ 6.61	$ 6.61	$ 6.61
DISTRIBUTION 800 KWH	$ 0.021204	$ 0.021204	$ 16.96	$ 16.96	$ 16.96
DISTRIBUTION OVER 800 KWH	$ 0.012011	$ 0.012011	$ 2.40	$ 2.40	$ 2.40
ELECTRICITY SUPPLY SERVICE 800 KWH	$ 0.035856	$ 0.035856	$ 28.68	$ 28.68	$ 28.68
ELECTRICITY SUPPLY SERVICE OVER 800 KWH	$ 0.054545	$ 0.027655	$ 10.91	$ 5.53	$ 7.32
TRANSMISSION	$ 0.009700	$ 0.009700	$ 9.70	$ 9.70	$ 9.70
RIDER T1 - TRANSMISSION	$ 0.003311	$ 0.003311	$ 3.31	$ 3.31	$ 3.31
FUEL FACTOR RIDER A	$ 0.027000	$ 0.027000	$ 27.00	$ 27.00	$ 27.00
RIDER C1A (A5)	$ 0.000050	$ 0.000050	$ 0.05	$ 0.05	$ 0.05
RIDER C2A (A5)	$ 0.001160	$ 0.001160	$ 1.16	$ 1.16	$ 1.16
RIDER B - BIOMASS (A6)	$ 0.001033	$ 0.001033	$ 1.03	$ 1.03	$ 1.03
RIDER R - BEAR GARDEN (A6)	$ 0.001115	$ 0.001115	$ 1.12	$ 1.12	$ 1.12
RIDER S - VCHEC (A6)	$ 0.004181	$ 0.004181	$ 4.18	$ 4.18	$ 4.18
RIDER W - WARREN COUNTY (A6)	$ 0.002036	$ 0.002036	$ 2.04	$ 2.04	$ 2.04
RIDER BW - BRUNSWICK COUNTY (A6)	$ 0.002102	$ 0.002102	$ 2.10	$ 2.10	$ 2.10
RIDER GV - GREENSVILLE (A6)	$ 0.002307	$ 0.002307	$ 2.31	$ 2.31	$ 2.31
RIDER U - STRATEGIC UNDERGROUND PROGRAM (A6)	$ 0.001843	$ 0.001843	$ 1.84	$ 1.84	$ 1.84
RIDER US2	$ 0.000234	$ 0.000234	$ 0.23	$ 0.23	$ 0.23
RIDER US3	$ 0.000210	$ 0.000210	$ 0.21	$ 0.21	$ 0.21
BILL AMOUNT			$ 121.84	$ 116.46	$ 118.26
BLEND (SUMMER x 4 - NON-SUMMER x 8)			$ 487.36	$ 931.68	
AVG				$ 118.26	

Updated Attachment Staff Set 7-53 (DAS)

DOMINION ENERGY VIRGINIA
1,000 KWH SEASONALLY WEIGHTED RESIDENTIAL BILL
RATE SCHEDULE 1

BILL COMPONENTS		Nov 2019
DISTRIBUTION - BASE	$	25.97
GENERATION - BASE	$	36.00
TRANSMISSION	$	13.01
FUEL	$	27.00
GENERATION A6	$	15.37
DSM/EE A5	$	3.36
TOTAL BILL	$	120.71

	RATES	RATES	KWH 1,000	KWH 1,000	
BILL COMPONENTS	SUMMER	NON-SUMMER	SUMMER	NON-SUMMER	WEIGHTED
BASIC CUSTOMER CHARGE	$ 6.61	$ 6.61	$ 6.61	$ 6.61	$ 6.61
DISTRIBUTION 800 KWH	$ 0.021204	$ 0.021204	$ 16.96	$ 16.96	$ 16.96
DISTRIBUTION OVER 800 KWH	$ 0.012011	$ 0.012011	$ 2.40	$ 2.40	$ 2.40
ELECTRICITY SUPPLY SERVICE 800 KWH	$ 0.035856	$ 0.035856	$ 28.68	$ 28.68	$ 28.68
ELECTRICITY SUPPLY SERVICE OVER 800 KWH	$ 0.054545	$ 0.027655	$ 10.91	$ 5.53	$ 7.32
TRANSMISSION	$ 0.009700	$ 0.009700	$ 9.70	$ 9.70	$ 9.70
RIDER T1 - TRANSMISSION	$ 0.003311	$ 0.003311	$ 3.31	$ 3.31	$ 3.31
FUEL FACTOR RIDER A	$ 0.027000	$ 0.027000	$ 27.00	$ 27.00	$ 27.00
RIDER C1A (A5)	$ 0.000050	$ 0.000050	$ 0.05	$ 0.05	$ 0.05
RIDER C2A (A5)	$ 0.001160	$ 0.001160	$ 1.16	$ 1.16	$ 1.16
RIDER B - BIOMASS (A6)	$ 0.001033	$ 0.001033	$ 1.03	$ 1.03	$ 1.03
RIDER R - BEAR GARDEN (A6)	$ 0.001115	$ 0.001115	$ 1.12	$ 1.12	$ 1.12
RIDER S - VCHEC (A6)	$ 0.004181	$ 0.004181	$ 4.18	$ 4.18	$ 4.18
RIDER W - WARREN COUNTY (A6)	$ 0.002036	$ 0.002036	$ 2.04	$ 2.04	$ 2.04
RIDER BW - BRUNSWICK COUNTY (A6)	$ 0.002332	$ 0.002332	$ 2.33	$ 2.33	$ 2.33
RIDER GV - GREENSVILLE (A6)	$ 0.002307	$ 0.002307	$ 2.31	$ 2.31	$ 2.31
RIDER U - STRATEGIC UNDERGROUND PROGRAM (A6)	$ 0.001843	$ 0.001843	$ 1.84	$ 1.84	$ 1.84
RIDER US2	$ 0.000308	$ 0.000308	$ 0.31	$ 0.31	$ 0.31
RIDER US3	$ 0.000210	$ 0.000210	$ 0.21	$ 0.21	$ 0.21
RIDER E	$ 0.002149	$ 0.002149	$ 2.15	$ 2.15	$ 2.16
BILL AMOUNT			$ 124.30	$ 118.92	$ 120.71
BLEND (SUMMER x 4 - NON-SUMMER x 8)			$ 497.20	$ 951.36	
AVG				$ 120.71	

Attachment No. DJD-5

Company Exhibit No. __
Witness: DRK
Schedule 2
Page 1 of 2

VIRGINIA ELECTRIC & POWER COMPANY
PHASE VII DSM PROGRAMS COST-EFFECTIVENESS
INDIVIDUAL RESULTS (000's)
FEDERAL CO2 PLAN

Residential Efficient Products Marketplace Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 614,043	$ 236,049	$ 236,049	$ 236,049
Total NPV Costs	$ 53,803	$ 53,326	$ 67,560	$ 703,173
Net Benefits NPV	$ 560,240	$ 182,723	$ 168,490	$ (467,124)
Benefit/Cost Ratio	11.41	4.43	3.49	0.34
Residential Customer Engagement Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 329,129	$ 272,341	$ 272,341	$ 272,341
Total NPV Costs	$ 75,983	$ 12,924	$ 88,906	$ 383,274
Net Benefits NPV	$ 253,147	$ 259,417	$ 183,434	$ (110,934)
Benefit/Cost Ratio	4.33	21.07	3.06	0.71
Non-Residential Lighting Systems & Controls Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 47,295	$ 37,149	$ 37,149	$ 37,149
Total NPV Costs	$ 15,437	$ 21,772	$ 27,026	$ 64,455
Net Benefits NPV	$ 31,858	$ 15,378	$ 10,123	$ (27,305)
Benefit/Cost Ratio	3.06	1.71	1.37	0.58
Residential Appliance Recycling Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 42,143	$ 20,378	$ 23,857	$ 20,378
Total NPV Costs	$ 3,479	$ 18,506	$ 20,085	$ 60,097
Net Benefits NPV	$ 38,664	$ 1,872	$ 3,773	$ (39,719)
Benefit/Cost Ratio	12.11	1.10	1.19	0.34
Non-Residential Heating and Cooling Efficiency Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 43,861	$ 36,179	$ 36,179	$ 36,179
Total NPV Costs	$ 23,552	$ 13,367	$ 28,076	$ 53,557
Net Benefits NPV	$ 20,309	$ 22,813	$ 8,103	$ (17,378)
Benefit/Cost Ratio	1.86	2.71	1.29	0.68
Non-Residential Window Film Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 8,407	$ 7,923	$ 7,923	$ 7,923
Total NPV Costs	$ 2,317	$ 4,238	$ 5,566	$ 12,690
Net Benefits NPV	$ 6,090	$ 3,685	$ 2,357	$ (4,767)
Benefit/Cost Ratio	3.63	1.87	1.42	0.62

Company Exhibit No. __
Witness: DRK
Schedule 2
Page 2 of 2

VIRGINIA ELECTRIC & POWER COMPANY
PHASE VII DSM PROGRAMS COST-EFFECTIVENESS
INDIVIDUAL RESULTS (000's)
FEDERAL CO2 PLAN
(Cont.)

Residential Home Energy Assessment Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 90,368	$ 48,036	$ 48,036	$ 48,036
Total NPV Costs	$ 26,565	$ 34,771	$ 42,614	$ 117,139
Net Benefits NPV	$ 63,803	$ 13,265	$ 5,422	$ (69,103)
Benefit/Cost Ratio	3.40	1.38	1.13	0.41
Residential Smart Thermostat Management Program (DR)				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 21,147	$ 251,878	$ 251,878	$ 251,882
Total NPV Costs	$ 396	$ 59,450	$ 36,144	$ 59,450
Net Benefits NPV	$ 20,751	$ 192,428	$ 215,734	$ 192,432
Benefit/Cost Ratio	53.41	4.24	6.97	4.24
Residential Smart Thermostat Management Program (EE)				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 62,541	$ 30,650	$ 30,650	$ 30,650
Total NPV Costs	$ 5,076	$ 20,815	$ 14,280	$ 79,706
Net Benefits NPV	$ 57,465	$ 9,835	$ 16,370	$ (49,056)
Benefit/Cost Ratio	12.32	1.47	2.15	0.38
Non-Residential Office Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 25,977	$ 14,766	$ 14,766	$ 14,766
Total NPV Costs	$ 5,617	$ 13,682	$ 12,916	$ 36,433
Net Benefits NPV	$ 20,360	$ 1,084	$ 1,850	$ (21,667)
Benefit/Cost Ratio	4.62	1.08	1.14	0.41
Non-Residential Small Manufacturing Program				
	Participant	Utility	TRC	RIM
Total NPV Benefits	$ 17,796	$ 13,051	$ 13,051	$ 13,051
Total NPV Costs	$ 5,726	$ 9,548	$ 10,306	$ 24,417
Net Benefits NPV	$ 12,070	$ 3,503	$ 2,745	$ (11,365)
Benefit/Cost Ratio	3.11	1.37	1.27	0.53

Attachment No. DJD-6

LED lighting facts®
A Program of the U.S. DOE

MENU

About LED Lighting Facts

Policies and Expectations of Partnership

The U.S. Department of Energy (DOE) created the LED Lighting Facts program to assure decision makers that the performance of solid-state lighting (SSL) products is represented accurately as products reach the market. Sensitive to the setbacks that plagued consumer adoption of other new technologies, DOE developed the LED Lighting Facts program to manage user expectations and prevent the exaggerated performance claims that are often prevalent with new technologies.

Becoming an LED Lighting Facts partner requires a commitment to supporting improvement of the quality of SSL products, as well as using the LED Lighting Facts labels and logos according to program guidelines. Each partner must pledge to honor this commitment and uphold program goals specific to each partner type. The LED Lighting Facts Partner policies are designed to answer partner questions about the program and clarify the expectations of partnership. The policy links address the process for becoming a partner, appropriate use of the LED Lighting Facts label and graphics and policies unique to each of the partner types. Your continued partnership and use of the LED Lighting Facts website indicates that you agree to all of the terms and conditions. The content is subject to change at any time, should the program need to adjust policies and procedures. Partners will be notified of any such changes when they occur.

 | Program Disclaimer (/Home/ProgramDisclaimer)

Contact Us (/Contact)

The Energy Independence and Security Act (EISA) of 2007

Efficiency Standards for Light Bulbs

The Energy Independence and Security Act (EISA) of 2007 (http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/eisa_2007.pdf) was passed with the intention of moving the United States toward greater energy security, partly by increasing the standards for product efficiency. Section 321 of the Energy Independence and Security Act (EISA) establishes increased minimum energy efficiency standards for general service lamps. EISA does not ban incandescent light bulbs, but its minimum efficiency standards are high enough that the incandescent lamps most commonly used by consumers today will not meet the new requirements. Once implemented, the Act will essentially eliminate 40W, 60W, 75W, and 100W medium screw-base incandescent light bulbs.

Definition of a General Service Lamp

General service lamps include:

- General service incandescent lamps
- Compact fluorescent lamps (CFLs)
- General service light-emitting diode (LED) or organic light emitting diode (OLED) lamps
- Any other lamps that the Secretary of the Department of Energy (DOE) determines are used to satisfy lighting applications traditionally serviced by general service incandescent lamps

In addition, general service lamps are:

- Intended for general service applications
- Medium screw-base lamps
- Designed for a light output between 310 and 2600 lumens
- Capable of operating at a voltage range at least partially within 110 and 130 volts

Rated Lumen Ranges	Typical Current Lamp Wattage	Maximum Rate Wattage	Minimum Rated Lifetime	Effective Date	CA Effective Date
1490-2600	100	72	1,000 hrs	1/1/2012	1/1/2011
1050-1489	75	53	1,000 hrs	1/1/2013	1/1/2012
750-1049	60	43	1,000 hrs	1/1/2014	1/1/2013
310-749	40	29	1,000 hrs	1/1/2014	1/1/2013

The effective date for each phase listed above indicates the first date that non-compliant products are prohibited from being manufactured or imported into the United States. California will implement the standards one year before the rest of the country.

Exemptions

Twenty-two types of incandescent lamps are exempt from the new minimum efficiency standards defined by EISA. DOE will monitor sales of these exempted lamp types after the legislation is implemented. If DOE determines that any exempted lamp type doubles in sales, EISA requires DOE to establish an energy conservation standard for that lamp type. This provision will prohibit any exempted lamp type from taking market share from the general service lamps affected by the EISA efficiency standards listed in the chart above.

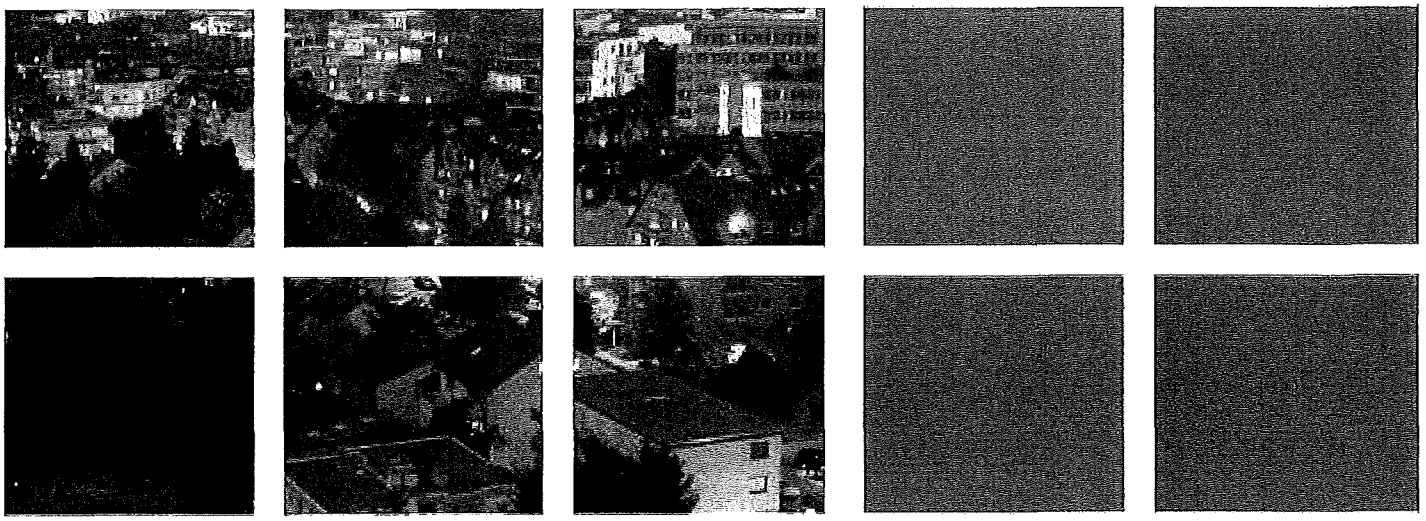
Exempted lamps:

1. Appliance lamps
2. Black light lamps
3. Bug lamps
4. Colored lamps
5. Infrared lamps
6. Left-hand thread lamps
7. Marine lamps
8. Marine's signal service lamps
9. Mine service lamps
10. Plant light lamps
11. Reflector lamps
12. Rough service lamps
13. Shatter-resistant lamps (including shatter-proof and shatter-protected)
14. Sign service lamps
15. Silver bowl lamps
16. Showcase lamps
17. 3-way incandescent lamps
18. Traffic signal lamps

19. Vibration service lamps
20. G shape lamps with a diameter of 5" or more
21. T shape lamps that use no more than 40W or are longer than 10"
22. B, BA, CA, F, G16-1/2, G-25, G-30, M-14, or S lamps of 40W or less

Please see the EISA Frequently Asked Questions (/library/content/faqs/eisa) for more information.

Attachment No. DJD-7



2016 IMPACT EVALUATION OF SAN DIEGO GAS & ELECTRIC'S RESIDENTIAL PEAK TIME REBATE AND SMALL CUSTOMER TECHNOLOGY DEPLOYMENT PROGRAMS

Ex Post and Ex Ante Draft Report
CALMAC Study ID: SDG0303

Submitted to:
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March 20, 2017

EXECUTIVE SUMMARY

This report presents the findings of the 2016 ex post and ex ante evaluation for San Diego Gas and Electric's (SDG&E) Peak Time Rebate (PTR) Program. SDG&E's PTR Program is marketed as the *Reduce Your Use*[SM] (RYU) Rewards. If customers are able to save electricity between 11 a.m. and 6 p.m. on RYU Reward days, they earn a credit on their SDG&E bill. To earn rewards, customers must set up an alert (text, email, phone, or a combination) preference and SDG&E will let them know when to expect an RYU day.

This report also includes the evaluation finding of the Small Customer Technology Deployment (SCTD) program. SDG&E marketed the SCTD pilot by offering free smart thermostats to customers who enrolled in the program. The smart thermostats are demand response technology enabled so that SDG&E can either cycle the customer's central air conditioning or raise their thermostat setting between the hours of 2 p.m. and 6 p.m. on PTR event days. SCTD participants are encouraged to enroll in RYU Rewards in order to receive an incentive for reducing their electricity use on RYU days.

E.S.1 EX POST EVALUATION SUMMARY

E.S.1.1 PTR Ex Post Evaluation

There was one PTR event during the summer of 2016, occurring on September 26th. The average temperature during event hours was 98.8°F. Table ES-1 shows the average and aggregate PTR *ex post* load impact estimates for the participant groups of interest in this evaluation. Across all of the 2016 PTR events, the overall PTR population had an average event hour load reduction of 0.10 kW per participant, representing an average reduction of 10.2% relative to the reference load. The average aggregate load reduction during event hours was 8.13 MW. Large participants delivered 61% of the aggregate load reduction (4.93 MW), while Medium and Small participants delivered the remaining 29% (2.15 MW and 1.00 MW, respectively). Inland customers experienced higher temperatures during events (100.4°F) than Coastal customers (97.2°F) and had a higher average load reduction during event hours (0.13 kW versus 0.08 kW). Low income participants had no load reduction during events, with an average of -0.01 kW (-1.4%). The participants who first enrolled in 2016 saved the most during the 2016 PTR events, with an average of 0.15 kW (14.6%) during event hours. Having both email and text event notification resulted a higher average event hour reduction of 0.11 kW (10.4%). The net energy metered (NEM) participants, as a group, did not see a load reduction at the meter but rather saw an increase in their energy exports as a result of there being less internal load to satisfy with the photovoltaic generation. This increase in energy export is expressed as a negative load drop (-9.9%).

TABLE 3-2: PTR DUALLY ENROLLED IN SUMMER SAVER EX POST LOAD IMPACT ESTIMATES – AVERAGE 2016 EVENT (3 P.M. TO 6 P.M.)

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All	3,915	1.50	1.31	0.19	12.3%	0.73	100.7
Summer Saver – 50% Cycling	1,408	1.70	1.72	-0.03	-1.4%	-0.04	100.9
Summer Saver – 100% Cycling	2,505	1.38	1.08	0.31	22.0%	0.77	100.6

TABLE 3-3: SCTD EX POST LOAD IMPACT ESTIMATES BY CUSTOMER CATEGORY - AVERAGE 2016 EVENT (2 P.M. TO 6 P.M.)*

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All**	9,670	1.79	1.37	0.42	25.1%	4.04	100.5
4 Degree Setback	4,761	1.78	1.28	0.49	29.8%	2.35	100.5
50% Cycling	3,388	1.79	1.33	0.46	27.2%	1.55	100.6
PTR	5,301	1.71	1.20	0.51	32.0%	2.68	100.5
PTR – 4 Deg. Setback	2,602	1.73	1.18	0.56	34.7%	1.45	100.5
PTR – 50% Cycling	1,875	1.69	1.13	0.56	35.4%	1.05	100.6
SCTD Only	4,369	1.89	1.57	0.31	17.9%	1.37	100.5
SCTD Only – 4 Degree Setback	2,159	1.83	1.41	0.43	24.8%	0.92	100.6
SCTD Only – 50% Cycling	1,513	1.91	1.58	0.33	18.3%	0.50	100.6

* Participants excluding Summer Saver load control.

** Cycling strategy is not available for some customers because of confidentiality restraints on the signaling portal.

3.1.1 Peak Time Rebate (PTR) Total

Figure 3-1 and Table 3-4 show the hourly event load impacts for the overall PTR customer population compared with the reference loads. In the 2016 event, there was a definitive load reduction during event hours (11 a.m. to 6 p.m.), averaging 0.10 kW per participant, representing an average reduction of 10.2% relative to the reference load. The hourly load reductions ranged between 0.08 kW and 0.13 kW during


Itron
2017 SDG&E Residential SCTD Evaluation
5/4/2018

RESULTS – SCTD

Event Date	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
Thursday, August 31st, 2017	17,588	1.87	1.26	0.61	32.8%	10.79	91.1
Friday, September 1st, 2017	17,645	2.22	1.60	0.62	27.8%	10.87	96.0
Saturday, September 2nd, 2017*	12,948	2.44	2.06	0.38	15.7%	4.98	95.1
Average 2017 Event**	**17,617**	**2.05**	**1.43**	**0.62**	**30.1%**	**10.84**	**93.6**

* One BYOT contractor did not signal this event.

**An average of 2017 weekday events only.

Energy Impacts of Smart Home Technologies

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April 2018
Report A1801

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the electricity rate via time-of-use pricing or show up as credits on participants' monthly bills.

The smart home is helping pave the way for the utility of the future by influencing how utilities manage the grid. In this new model, smart thermostats and smart water heaters are distributed energy resources, much like solar photovoltaics and battery storage. We describe smart thermostat and smart water heating programs in the following sections.

THERMOSTAT PROGRAMS

The recent development of ENERGY STAR criteria for connected (smart) thermostats has helped attach a value to this technology and move it into utility programs. Many residential demand response programs now incorporate load management through smart thermostats. Utilities offer incentives for purchasing these devices and participating in programs. Incentives are usually in the form of rebates, and some utilities cover the cost of installation. In certain direct-install programs, the utility covers the cost of the thermostat and installation as long as the customer participates in a demand response program for a specified length of time. A growing number of utilities sell rebated smart thermostats through specific online marketplaces. One evaluation of smart thermostat programs showed 13–15% average HVAC load reductions per home for each DR event, and 10% and 4% average savings in total household gas and electricity use, respectively. For the utility, a typical DR event resulted in 0.6–1.2 kW average peak load savings per smart thermostat (Colby 2015).

Program administrators deploy demand response mainly in the summer months, when peak electric demand (and pricing) is generally highest. The smart thermostat makes it possible for program administrators to monitor a home's indoor temperature and humidity and HVAC run time. A typical summer DR event might last four hours. At these times, participating customers allow the utility to cycle off their AC unit or raise the temperature setting on their smart thermostat. Utilities can establish a set-point ceiling, a maximum limit when raising indoor temperatures in DR events. Maintaining indoor temperatures below the ceiling prevents homes from overheating, something that can happen in conventional demand response using load control switches (Grant and Keegan 2016). Some summer DR programs incorporate precooling. The utility lowers the thermostat set point and cools down the home just prior to an event to help residents ride through it more comfortably. Customers also have the option to override an event by manually lowering the setting on their smart thermostat.

Some DR programs are coming online to reduce natural gas demand in the heating season (Walton 2017). These programs are referred to as winter demand response. In early 2017, the Southern California Gas Company launched its winter Seasonal Savings program for curtailing natural gas demand on the coldest days of the year. The average participating household can save about 8% on its natural gas space heating (SoCalGas 2017).

Some energy providers partner with thermostat manufacturers in deploying their energy efficiency and demand response programs. Nest and ecobee have developed software platforms that utilities can use in administering demand response. DR-specific platforms collect thermostat data during events and often interface with customers, serving as an

Attachment No. DJD-8

Commercial Reference Buildings

The U.S. Department of Energy (DOE), in conjunction with three of its national laboratories, developed commercial reference buildings, formerly known as commercial building benchmark models. These reference buildings play a critical role in the program's energy modeling software research by providing complete descriptions for whole building energy analysis using EnergyPlus simulation software.

There are 16 building types that represent approximately 70% of the commercial buildings in the U.S., according to the report published by the National Renewable Energy Laboratory titled *U.S. Department of Energy Commercial Reference Building Models of the National Building Stock*. These modules provide a consistent baseline of comparison and improve the value of computer energy simulations using software such as EnergyPlus.

AVAILABLE REFERENCE BUILDINGS

BUILDINGS

Commercial reference building models are available for the following categories:

- New construction
- Existing buildings constructed in or after 1980 ("post-1980")
- Existing buildings constructed before 1980 ("pre-1980")

BUILDING TYPE AND CLIMATE ZONE

DOE developed 16 reference building types that represent most commercial buildings across 16 locations, which represent all U.S. climate zones.

BUILDING TYPE NAME	FLOOR AREA (FT^2)	NUMBER OF FLOORS
Large Office	498,588	12
Medium Office	53,628	3
Small Office	5,500	1
Warehouse	52,045	1
Stand-alone Retail	24,962	1
Strip Mall	22,500	1
Primary School	73,960	1
Secondary School	210,887	2
Supermarket	45,000	1
Quick Service Restaurant	2,500	1
Full Service Restaurant	5,500	1
Hospital	241,351	5
Outpatient Health Care	40,946	3
Small Hotel	43,200	4
Large Hotel	122,120	6
Midrise Apartment	33,740	4

The 16 climate zones used to create the reference buildings are:

CLIMATE ZONE	REPRESENTATIVE CITY
BUILDINGS	Miami, Florida
2A	Houston, Texas
2B	Phoenix, Arizona
3A	Atlanta, Georgia
3B-Coast	Los Angeles, California
3B	Las Vegas, Nevada
3C	San Francisco, California
4A	Baltimore, Maryland
4B	Albuquerque, New Mexico
4C	Seattle, Washington
5A	Chicago, Illinois
5B	Boulder, Colorado
6A	Minneapolis, Minnesota
6B	Helena, Montana
7	Duluth, Minnesota
8	Fairbanks, Alaska

Please send all questions and comments regarding the reference buildings to referencebuildings@nrel.gov.

OFFICE of
ENERGY EFFICIENCY & RENEWABLE ENERGY

Forrestal Building

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Washington, DC 20585

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