

Category	Item	Virginia		
		2017	2018	Program Total (2017-2018)
Installed Demand Reduction (kW)	Total Gross Deemed Demand	0.1	3,083.6	3,083.7
	Realization Rate Adjustment (100%)	0.0	0.0	0.0
	Adjusted Gross Demand	0.1	3,083.6	3,083.7
	Net-to-Gross Adjustment (93%) ⁴⁶	0.0	-462.5	-462.6
	Net Adjusted Demand	0.1	2,621.1	2,621.1
	Planned Demand (Net)	0.0	4,296.0	4,296.0
	Annual % Toward Planned Demand (Net)	N/A	61%	61%
	Avg. Demand per Participant (Gross)	0.02	3.6	3.5
	Avg. Demand per Participant (Net)	0.02	3.0	3.0
Program Performance	Annual \$Admin. per Participant (Gross)	\$7,225	\$441	\$472
	Annual \$Admin. per kWh/year (Gross)	\$41.32	\$0.06	\$0.06
	Annual \$Admin. per kW (Gross)	\$351,557	\$123.59	\$132.96
	Annual \$EM&V per Total Costs (\$)	11%	2%	3%
	Annual \$Rebate per Participant (Gross)	\$156.88	\$5,314.53	\$5,290.79

⁴⁶ Ibid.

5.5.2.2 Key North Carolina Program Data

Key data highlights for enrollment, energy savings, demand reduction and program costs for North Carolina in 2018 are provided below. Following this summary, Figure 5-19 provides performance indicator data for 2018. Detailed program indicators by year and month are provided in Appendix B.7.



Program enrollment began during the final quarter of 2018; the number of participants was 21 (72% of planned).

- Net annual energy savings were 188,512 kWh (10% of planned) and the net demand reduction was 21.5 kW (7% of planned).
- On a per-participant basis, the average gross annual energy savings was 10,561 kWh (planned: 128,984 kWh planned) and the average gross demand reduction per participant was 1.2 kW (planned: 19.29 kW average over program life).



Total annual program costs in 2018 were 45% of planned.

Table 5-19. NC Non-residential Prescriptive Program Performance Indicators (2018)

Category	Item	North Carolina
		2018
Operations and Management Costs (\$)	Direct Rebate	
	Direct Implementation	
	Direct EM&V	
	Indirect Other (Administrative)	\$10,172
Total Costs (\$)	Total	
	Planned	
	Variance	
	Annual % of Planned	45%
Participants	Total (Gross)	21
	Planned (Gross)	29
	Variance	-8
	Annual % of Planned (Gross)	72%
Installed Energy Savings (kWh/year)	Total Gross Deemed Savings	221,779
	Realization Rate Adjustment (100%)	0
	Adjusted Gross Savings	221,779
	Net-to-Gross Adjustment (85%) ⁴⁷	-33,267
	Net Adjusted Savings	188,512
	Planned Savings (Net)	1,822,814
	Annual % Toward Planned Savings (Net)	10%
	Avg. Savings per Participant (Gross)	10,561
Avg. Savings per Participant (Net)	8,977	
Installed Demand Reduction (kW)	Total Gross Deemed Demand	25.3
	Realization Rate Adjustment (100%)	0.0
	Adjusted Gross Demand	25.3
	Net-to-Gross Adjustment (93%) ⁴⁸	-3.8
	Net Adjusted Demand	21.5
	Planned Demand (Net)	292.0
	Annual % Toward Planned Demand (Net)	7%
	Avg. Demand per Participant (Gross)	1.2
Avg. Demand per Participant (Net)	1.0	

⁴⁷ The program implementation vendor has listed the question, "Did the rebate incentive offered by Dominion Energy have any influence in your decision to have the work performed?" Of the participants who responded (from program inception to the end of this reporting period), the implementation vendor has calculated that 99% answered yes at the time they filled out the rebate application. This is not a substitute for a net-to-gross analysis conducted by DNV GL. See section 3.1.3 Net Savings Estimation for a description of net-to-gross estimation approaches.

⁴⁸ Ibid.

Category	Item	North Carolina
		2018
Program Performance	Annual \$Admin. per Participant (Gross)	\$484
	Annual \$Admin. per kWh/year (Gross)	\$0.05
	Annual \$Admin. per kW (Gross)	\$403
	Annual \$EM&V per Total Costs (\$)	4.7%
	Annual \$Rebate per Participant (Gross)	\$3,919

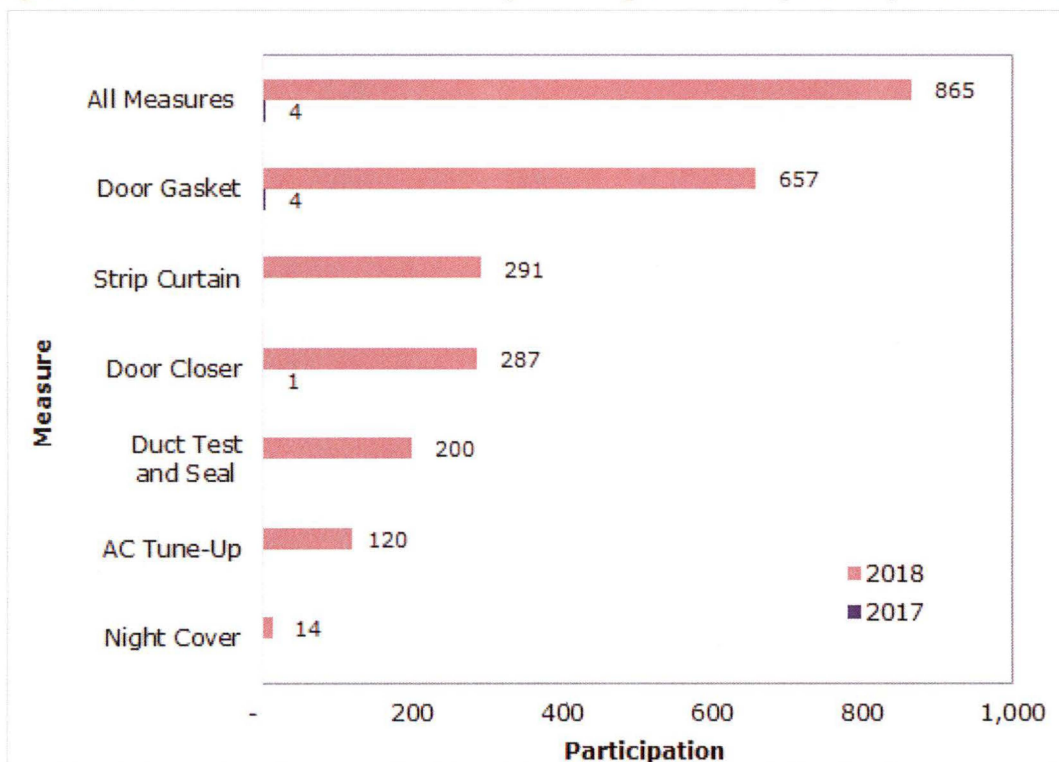
5.5.2.3 Additional Virginia Program Data

Additional program data regarding energy savings per participant, participation, and overall program savings for Virginia are provided below.

Note the "All Measures" and "All Building Types" categories in these figures represents the participation and/or savings from all new program participants, regardless of the measures installed and/or building types those measures were installed in. A participant in the "All Measure" and "All Building Type" categories is only counted once, the first time they receive a rebate. After the first time the participant enrolls in a program, future applications are not counted a new participant, though their savings are, in the "All Measures" and "All Building Types" categories. This differs from how participants are counted at a specific measure type or building type level in these figures, across years. For example, should a participant implement the same measure in multiple years, they are counted as a unique participant in each year, regardless of participation in prior or subsequent years.

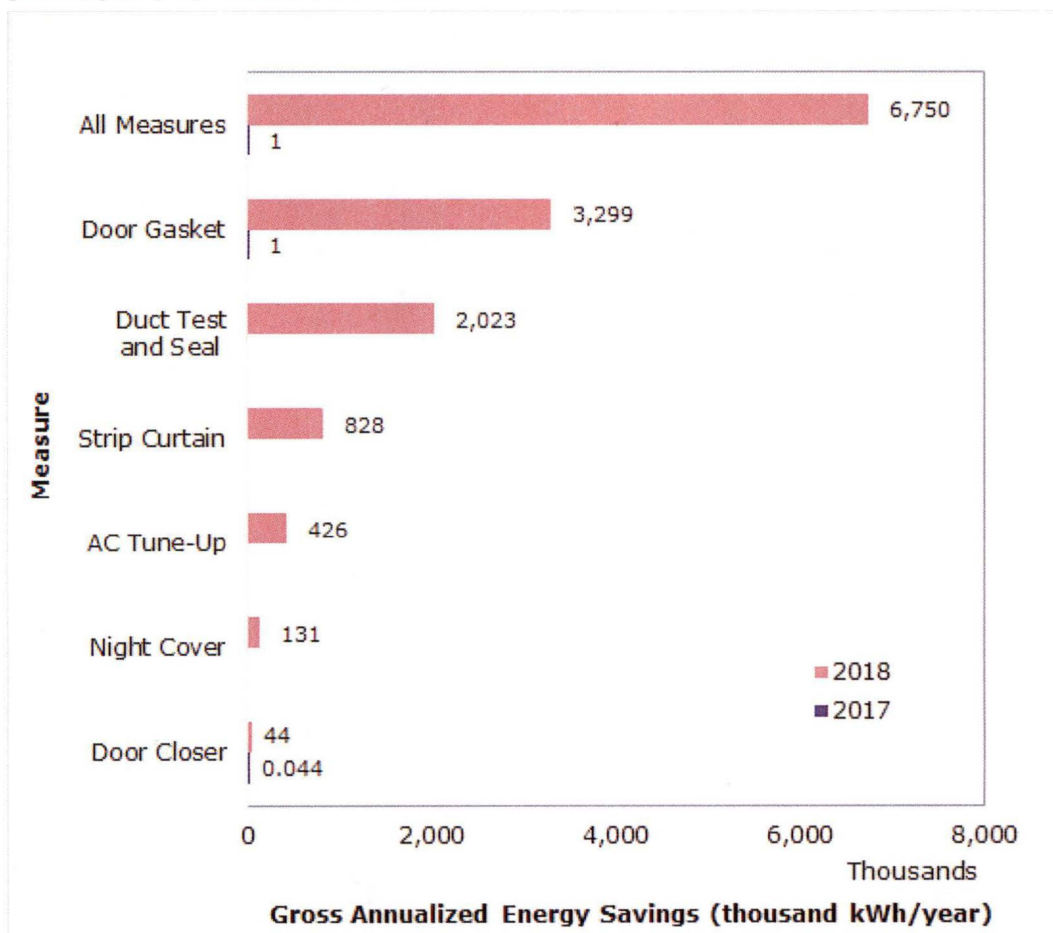
In Figure 5-47, we show that about three quarters of program participants thus far have installed door gaskets and only a tiny fraction had installed night covers in 2018. Fewer than one quarter had implemented duct test and seal or AC tune-up measures.

Figure 5-47. VA Non-residential Prescriptive Program Participation by Measure and Year



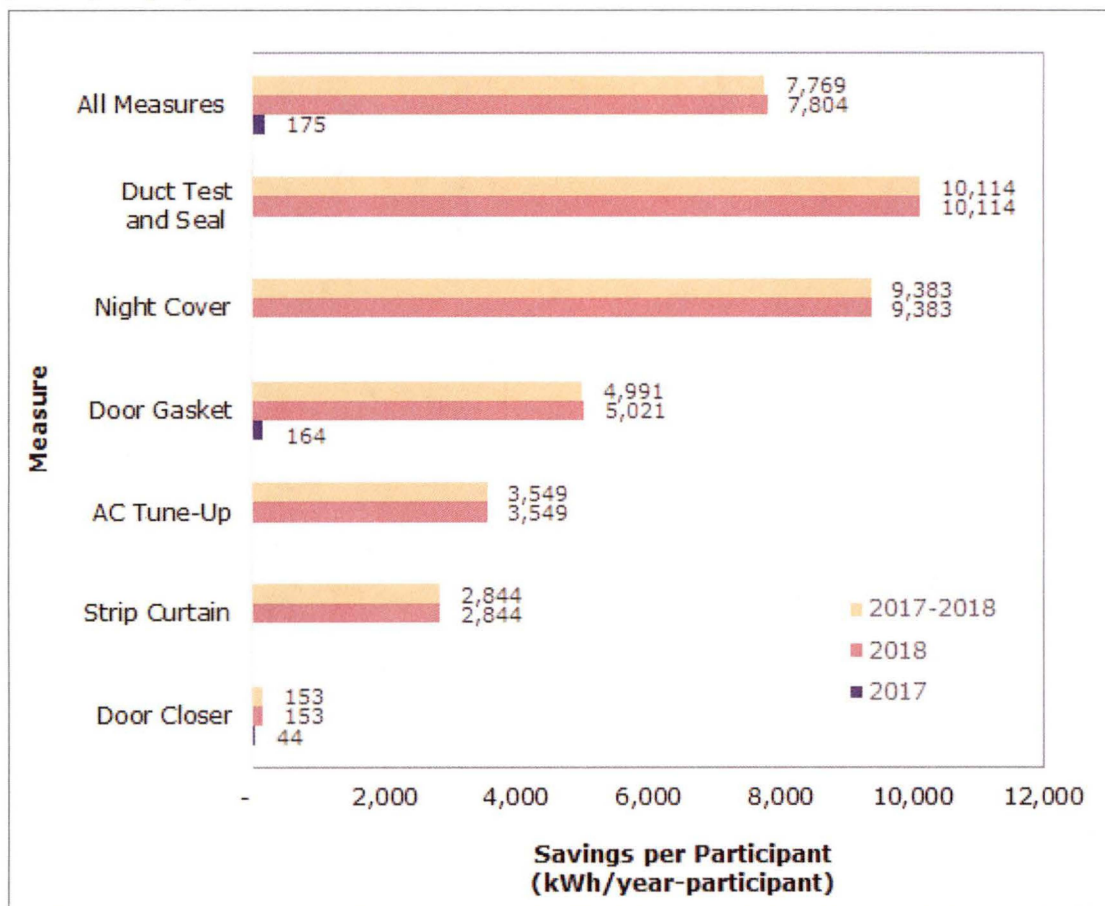
The gross annualized savings for the program came to 6,750 MWh/year in 2018, as shown in Figure 5-48. The greatest savings were provided by door gaskets at refrigerated spaces and by duct sealing at HVAC systems.

Figure 5-48. VA Non-residential Prescriptive Program Gross Annualized Energy Savings (MWh/year) by Measure and Year



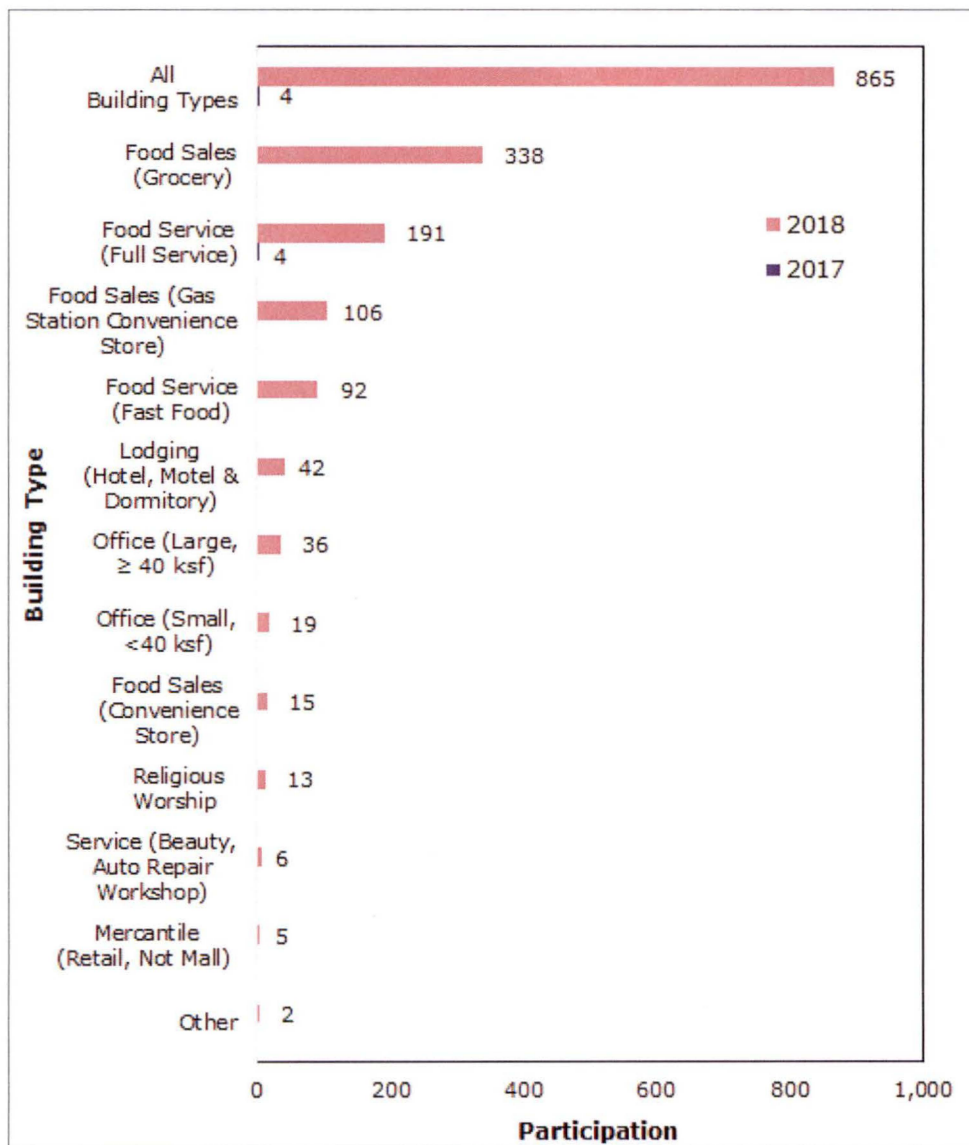
The average annual savings per participant were highest for the duct test and seal at HVAC systems and night covers at refrigerated display cases.

Figure 5-49. VA Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Measure and Year



The largest proportions of participants were comprised of grocery stores, full-service restaurants, and gas station convenience stores, as shown in Figure 5-50.

Figure 5-50. VA Non-residential Prescriptive Program Gross Participation by Building Type and Year



The gross annualized savings across all building types served for 2018 were 12,145 MWh, as shown in Figure 5-51. Grocery store measures yielded three quarters of the annual savings in 2018.

Figure 5-51. VA Non-residential Prescriptive Program Gross Annualized Energy Savings (MWh/year) by Building Type and Year

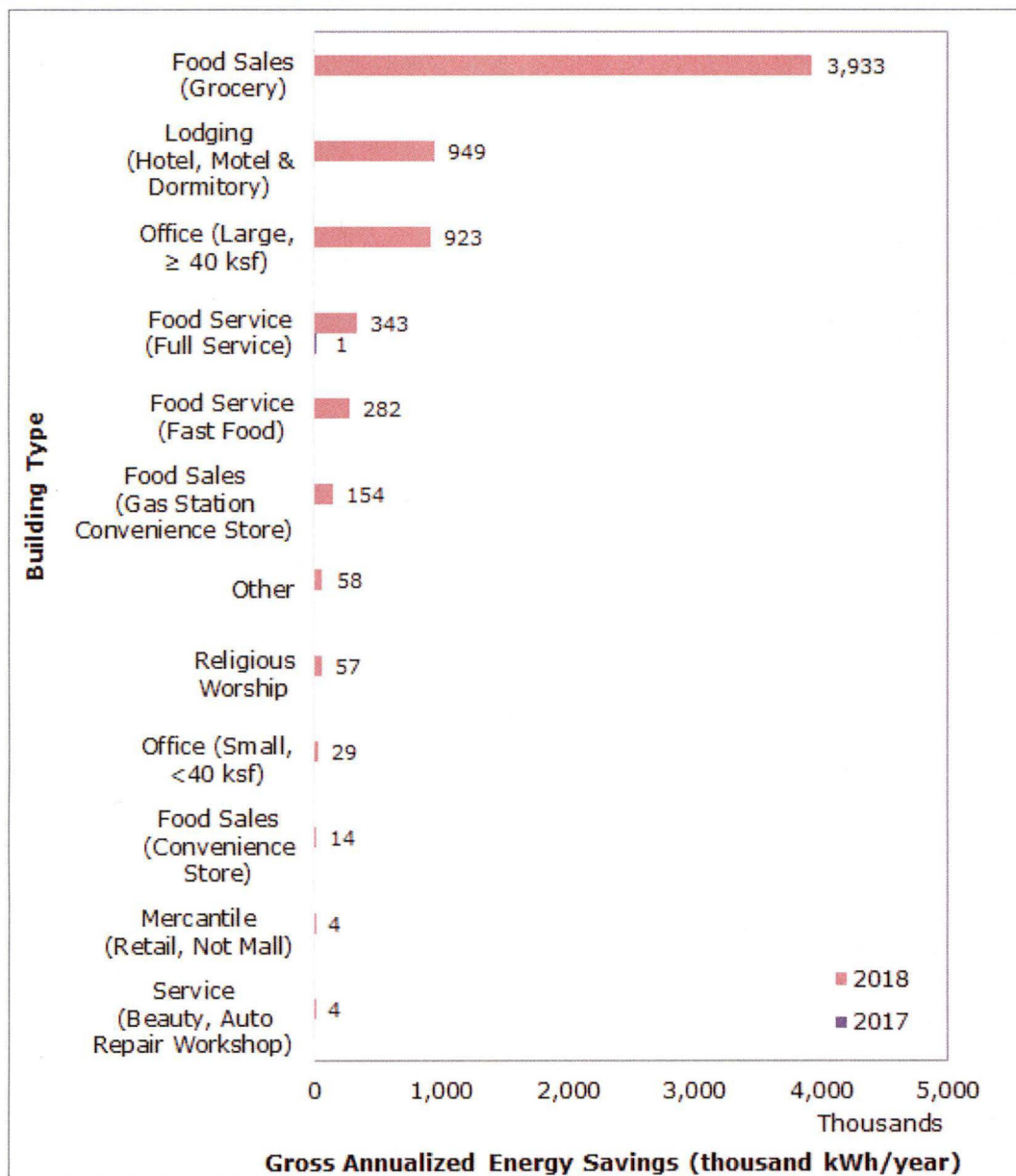
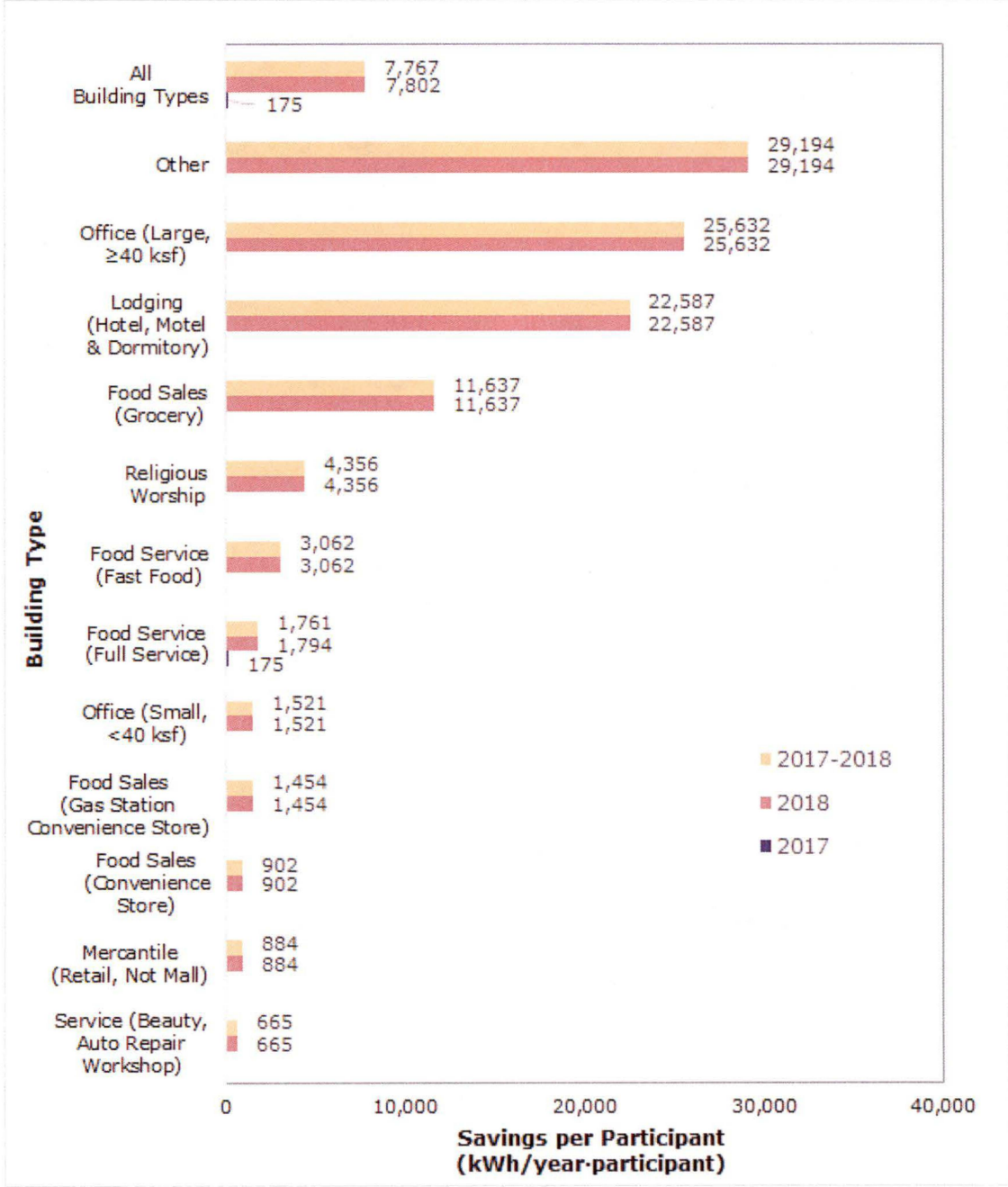


Figure 5-52 shows that the most gross annualized energy savings per participant were achieved at the "other" building type; this was closely followed by large offices and lodging.

Figure 5-52. VA Non-residential Prescriptive Program Gross Annualized Energy Savings per Participant (MWh/year-participant) by Building Type and Year

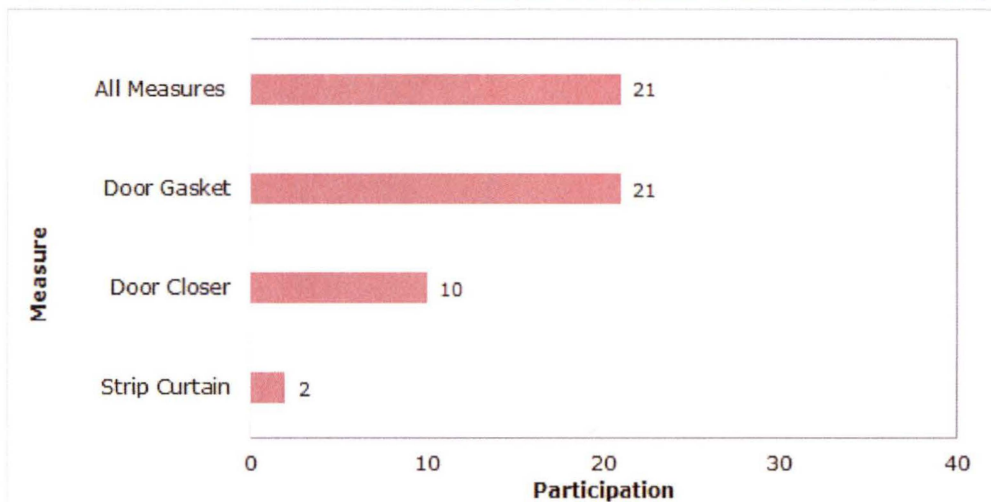


5.5.2.4 Additional North Carolina Program Data

Additional program data regarding energy savings per participant, participation, and overall program savings for North Carolina are provided below.

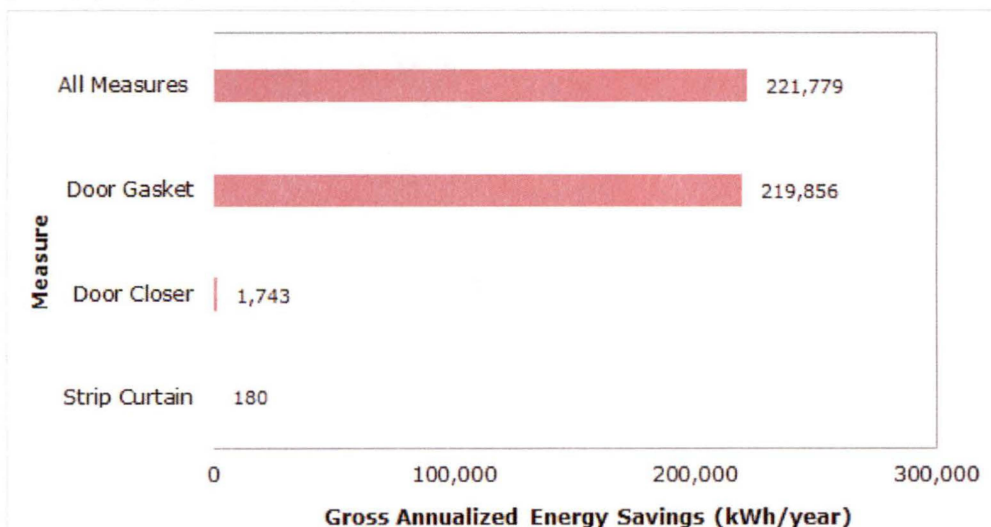
Door gaskets for refrigerated enclosures were installed by all 21 North Carolina participants in 2018, as shown in Figure 5-53.

Figure 5-53. NC Non-residential Prescriptive Program Gross Participation by Measure in 2018



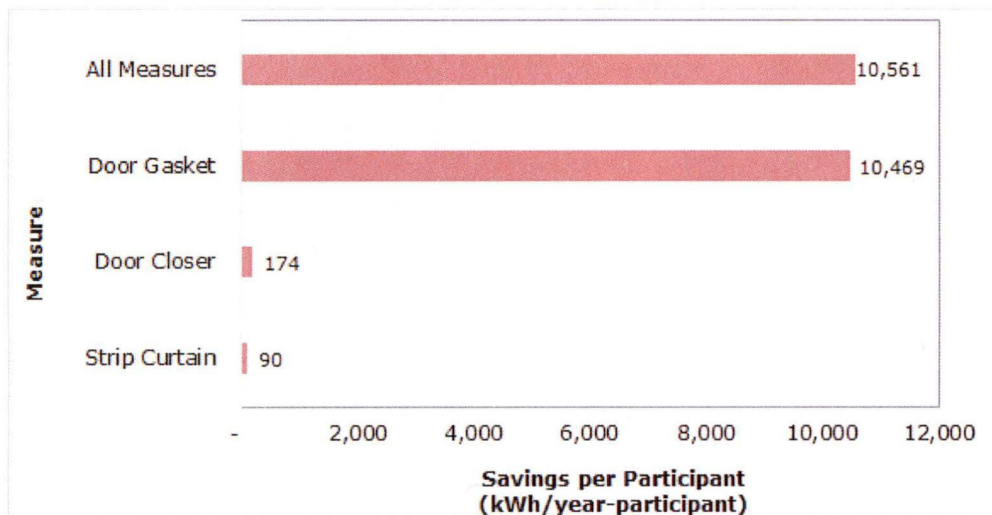
The total gross annualized savings in North Carolina came to 221,779 kWh/year as shown in Figure 5-54.

Figure 5-54. NC Non-residential Prescriptive Program Gross Annualized Energy Savings (kWh/year) by Measure in 2018



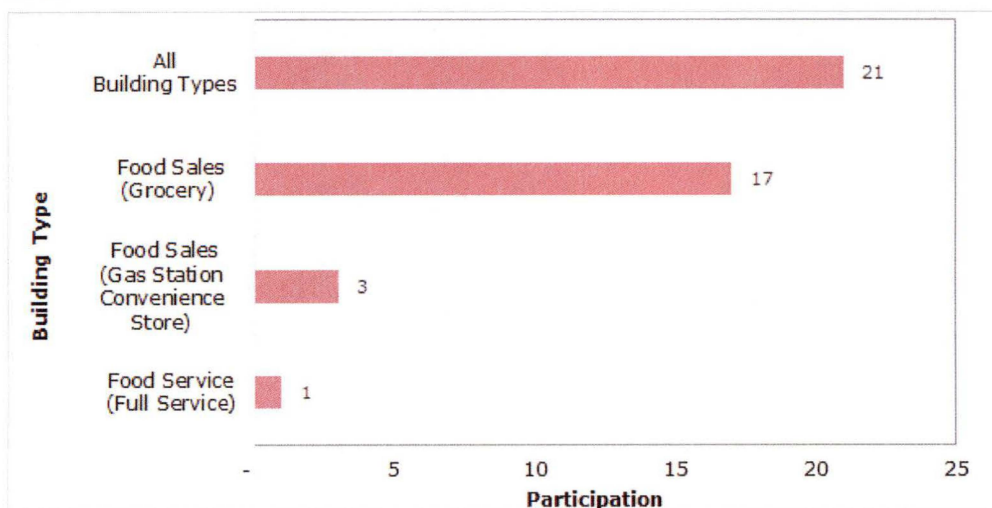
The average gross annualized savings per participant who installed the refrigeration measures was 10,561 kWh/year as shown in Figure 5-55. Door gaskets for refrigerated spaces dominated the per-participant savings in 2018.

Figure 5-55. NC Non-residential Prescriptive Program Gross Annualized Energy Savings per Participant (kWh/year-participant) by Building Type in 2018



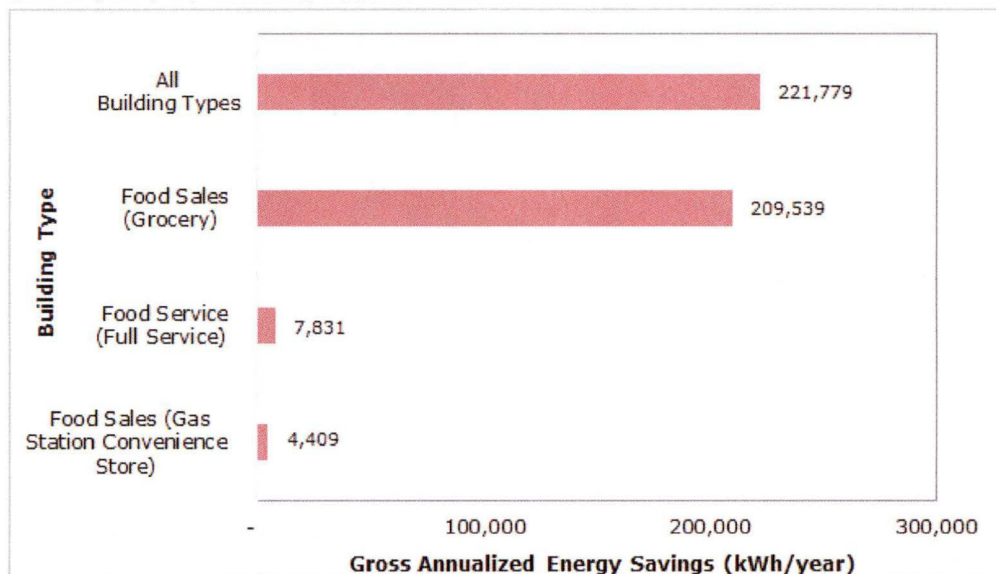
A total of 21 participants were enrolled in the North Carolina program during 2018 as shown in Figure 5-56. Again, the largest proportion of participants was comprised of grocery stores.

Figure 5-56. NC Non-residential Prescriptive Program Gross Participation by Building Type in 2018



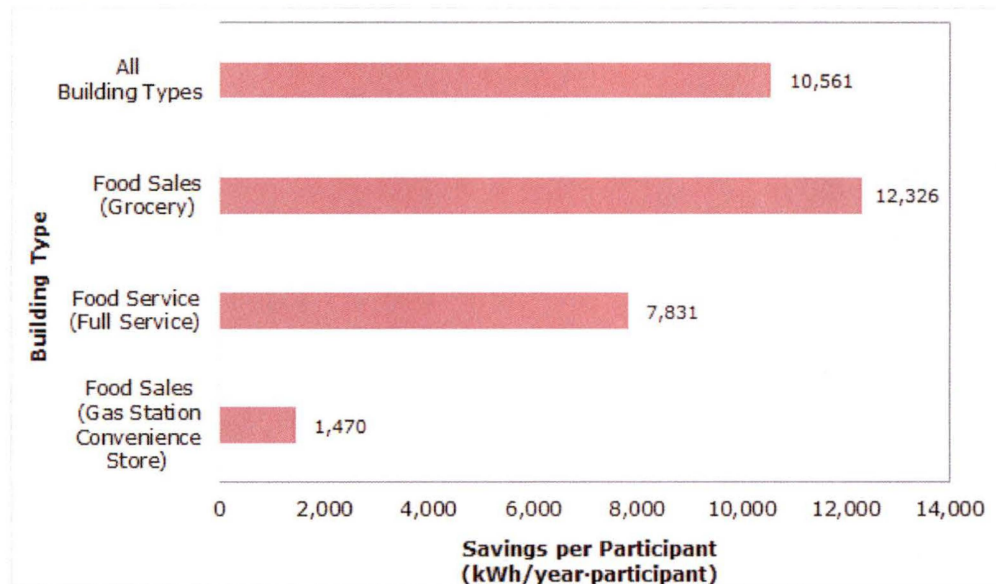
Not surprisingly, the vast majority of the gross annual energy savings were yielded at grocery stores, as shown in Figure 5-57. A small fraction of those savings was yielded at full-service restaurants and gas station convenience stores.

Figure 5-57. NC Non-residential Prescriptive Program Gross Annualized Energy Savings (kWh/year) by Building Type in 2018



Furthermore, grocery stores had the highest average energy savings per participant—at 12,326 kWh/year—as shown in Figure 5-58. This is not surprising given that such facilities typically contain far more extensive refrigeration systems than either full-service restaurants or gas station convenience stores.

Figure 5-58. NC Non-residential Prescriptive Program Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Building Type in 2018

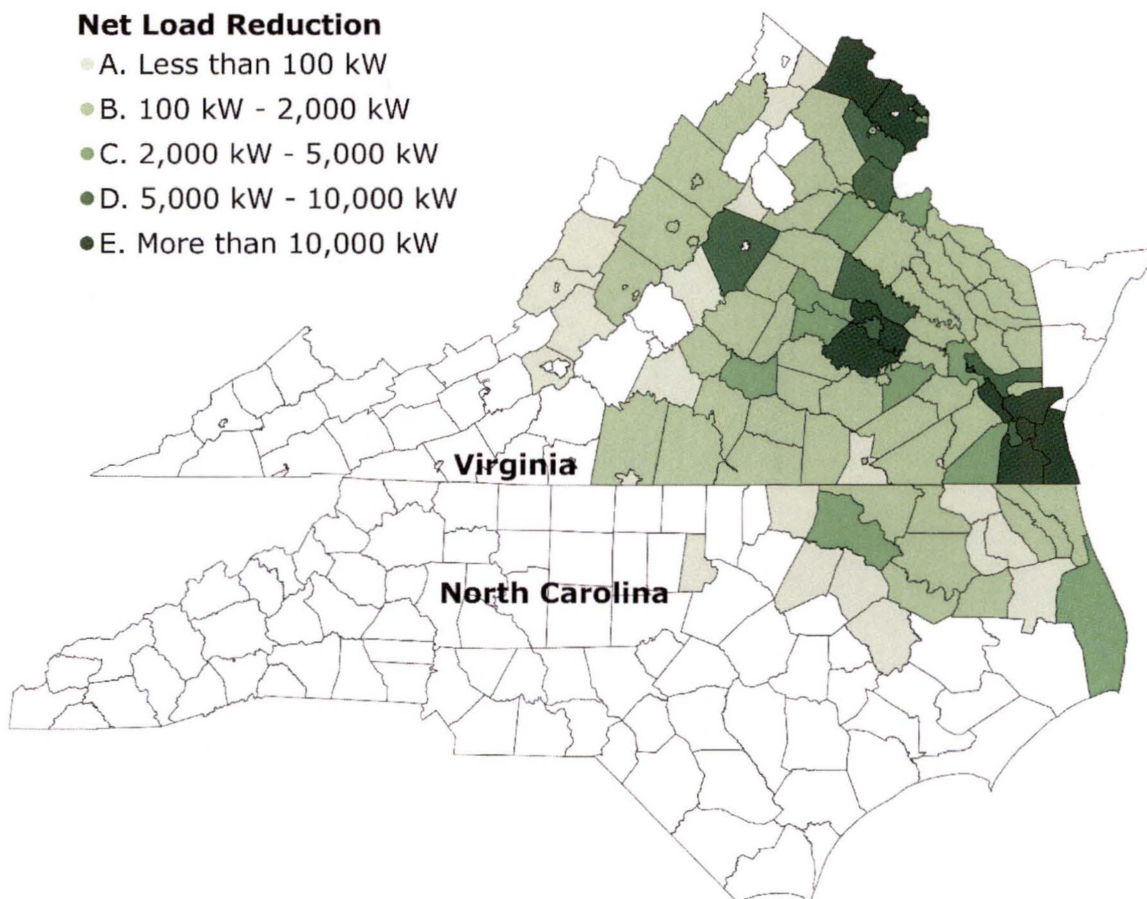


6 PEAK SHAVING PROGRAMS

The Company operates two peak shaving programs, the Residential AC Cycling Program and the Non-Residential DG Program. Both programs operate by dispatching load for a planned number of weekday (non-holiday) hours, referred to as controlled events, or events. Figure 6-1 illustrates the combined peak shaving potential (in kW) from both programs at the county level. The deeper the color, the greater the peak shaving potential.

As with the DSM energy efficiency programs, the Virginia counties with the highest potential center around Richmond, Norfolk, and northern Virginia. In decreasing order, the jurisdictions with the highest peak shaving potentials are Fairfax, Virginia Beach City, and Newport News City. In North Carolina, the jurisdictions with the highest peak shaving potentials are Dare, Halifax, Currituck, in decreasing order.

Figure 6-1. Distribution of Load Reduction Potential for all Residential AC Cycling and Non-residential Distributed Generation Program Participants in Virginia and North Carolina, by County, as of December 31, 2018



6.1 Residential AC Cycling – Virginia and North Carolina

The Residential AC Cycling Program, marketed as “Smart Cooling Rewards,” was implemented in 2010 in Virginia and 2011 in North Carolina, to provide the Company a supply resource by shaving summer peak electric demand. Residential customers living in an owner-occupied single-family home, townhouse, or condominium with central air conditioners, and electric and dual fuel heat pumps are eligible to participate.

Participants receive a \$40 on-bill credit in the December billing cycle in exchange for allowing the Company to reduce the operating cycle of their central air conditioning and heat pumps on pre-planned weekdays between June 1–September 30 (excluding holidays). When cycling events are initiated, a paging signal is broadcast by the Company and received by load curtailment switches installed on the central air conditioners and heat pumps of participating customers. The page initiates a curtailment switch that reduces the duty cycle of the air conditioning units between 30%–50% while the event is in progress. A typical event lasts between 2–4 hours.

In 2018, Virginia participation was 89% of the planned goal, a change from 92% in 2017. North Carolina’s participation for 2018 was 65% of plan goal, an increase from 60% over 2017. Consequently, total program costs were also below plan.

The program expenditures, number of participants, and load reduction impact estimates are reported and compared to Dominion Energy’s corresponding planning numbers in Section 6.1.2 of this report.

2018 kW peak shaving potential for AC Cycling was 0.63 kW for Virginia and North Carolina. This represents 82% of the planned estimates for Virginia and 60% for North Carolina. The Impact Evaluation of 2018 Dispatch Events is included in Appendix N-1, Impact Evaluation of 2018 Dispatch Events.

6.1.1 Methods for the Current Reporting Period

The evaluation methodology has remained consistent since the beginning of the program with two exceptions:

- in 2015 the evaluation switched to a customer level regression model to develop the event day baselines
- Since 2016 the analysis has been conducted on the census of AMI-enabled customers instead of a random sample of AMI-enabled customers

A detailed description of the evaluation methodology can be found in Appendix N-1, Impact Evaluation of 2018 Dispatch Events.

6.1.1.1 STEP Manual Computation of Demand Reduction

For 2018 events, monthly kW impacts per participant were assigned the ex ante kW impact of 0.63 according to regression parameters listed in the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) manual.

6.1.1.2 2018 Event Season Analysis of the AC Cycling Plan

The following steps are used to calculate the program impact estimates (kW) on the full census of AMI participants:

1. Half-hourly interval AMI consumption data for each participant are delivered to DNV GL monthly and subject to quality control tests.
2. AMI accounts are assigned weights based on the state, connected loads, and divisions of all participants to ensure that the AMI analysis is representative of the program population. The assigned weights and methods are included in Section 8, Sub-appendix II of the Impact Evaluation of 2018 Dispatch Events (Appendix N-1).
3. AMI interval data are merged with the record of customers who participated in each event.

6.1.1.3 Ex post Impact Regression Modeling

The ex post estimate, or what happened during the event, is the difference between the adjusted baseline during the event and the pre- and post-event baseline. Impacts are calculated at the end of each event hour. The load reduction calculated for each event is aggregated and weighted to all participants to produce program level impact estimates in kW per participant.

6.1.1.4 Ex ante Impact Regression Modeling

The ex ante estimates are calculated using a regression analysis of the ex post impacts for each event-hour with temperature humidity index (THI) as the predictor variable.⁴⁹ Ex ante results are the expected impacts extrapolated to a particular hour and THI. For example, the ex ante analysis is the source of the program metric for program impacts at The Company's peak planning conditions. The ex ante model is updated after each season to reflect the current year's ex post impacts and weather. The 2018 ex ante results are provided in Table 6-1.

The Dominion Energy peak condition for planning purposes is 95°F with 43% relative humidity for the hour ending 17. This corresponds with a THI of 83.4. Based on the ex ante regression model for the hour ending at 17:00 at a THI of 83.4, the summer demand impact was calculated with the following equation:

$$\text{Predicted Ex Ante kW Impact}_{17:00, \text{day}} = -2.545 + .038 * (83.4)$$

This method increases the reliability of the estimates of program resources (kW) and peak shaving performance while taking into account that the kW resource is dependent on temperature, time, and load.

⁴⁹ Temperature Humidity Index = THI = Td - (0.55 - 0.55*RH) * (Td - 58) where Td is dry bulb temperature and RH is relative humidity. Source: PJM Glossary: <http://www.pjm.com/Glossary.aspx>

Table 6-1. 2018 Ex ante Impacts by THI and Hour Ending per Participant

THI	Event Hour Ending				
	15	16	17	18	19
79	0.49	0.46	0.46	0.51	-0.19
80	0.51	0.48	0.50	0.54	0.06
81	0.53	0.50	0.54	0.56	0.32
82	0.55	0.52	0.57	0.58	0.57
83	0.57	0.55	0.61	0.60	0.83
84	0.59	0.57	0.65	0.62	1.09
85	0.61	0.59	0.69	0.64	1.34
86	0.64	0.62	0.73	0.66	1.60
87	0.66	0.64	0.76	0.68	1.85
88	0.68	0.66	0.80	0.71	2.11

By interpolating between 83°F and 84°F at 17:00, the expected peak load reduction is 0.63 kW per participant for 27 AC Cycling events called in 2018.

Table 6-2 outlines Dominion Energy's initial program planning assumptions, which were used during the program design. These assumptions are compared against actual program performance in Section 6.1.2.

Table 6-2. AC Cycling Program Planning Assumptions

Item	Description
Target Market	Residential single-family homes meeting eligibility requirements
Measure Life	15 years
Average. Number of AC Units/Premise	1.13

6.1.2 Assessment of Program Progress Towards Plan

Table 6-3 and Table 6-4 summarize the annual progress towards plan for key AC Cycling Program performance indicators in Virginia and North Carolina, respectively. Detailed indicators by year and month are provided for Virginia in Appendix A.8 and for North Carolina in Appendix B.8.

Table 6-3. VA Residential AC Cycling Program Performance Indicators (2010-2018)

Category	Item	Virginia	
		2018	Program Total (2010-2018)
Operations and Management Costs (\$)	Direct Rebate		
	Direct Implementation		
	Direct EM&V		
	Indirect Other (Administrative)	\$333,382	\$4,243,496
Capital (\$)	Direct Implementation		
Total Costs (\$)	Total		
	Planned		
	Variance		
	Cumulative % of Planned	70%	75%
Participants	Total (Cumulative @ End of Month)	151,798	151,798
	Removals (Uninstalled)/ Deactivations	-71,171	-71,171
	Net Participation (Cum.)	80,627	80,209
	Planned (Cum.)	90,267	90,267
	Variance (Cum.)	-9,640	-10,058
	Cum% toward planned total (Net basis)	89%	89%
	Removal (Uninstalled) /Deactivation Rate	-1.11%	-0.87%
	Connected Load kW	247,443	230,635
	Ex Ante Estimated kW	0.63	0.86
	Connected Load Per Participant (kW)	3.0	3.0
kW Potential	Peak Shaving Potential kW - Gross Participants	95,236	95,236
	Removed (Uninstalled) / Deactivated Peak Shaving Potential kW	-44,652	-44,652
	Dispatchable Peak Shaving Potential - Net Total kW	50,567	50,323
	Planned Demand (Cum.)	61,419	61,419
	Cum. % Toward Planned Total	82%	82%
Program Performance	Cum. \$Admin. per Cum. Participant (Gross)	\$28	\$28
	Cum. \$Admin. per Cum. kW (Gross)	\$43	\$43
	Cum. \$EM&V per Cum Total Costs (\$)	2%	2%
	Cum. \$Rebate per Cum. Participant (Gross)	\$159	\$159

Table 6-4. NC Residential AC Cycling Program Performance Indicators (2011-2018)

Category	Item	North Carolina	
		2018	Program Total (2011-2018)
Operations and Management Costs (\$)	Direct Rebate		
	Direct Implementation		
	Direct EM&V		
	Indirect Other (Administrative)	\$13,272	\$116,597
Capital (\$)	Direct Implementation		
Total Costs (\$)	Total		
	Planned		
	Variance		
	Cumulative % of Planned	53%	62%
Participants	Total (Cumulative @ End of Month)	5,969	5,969
	Removals (Uninstalled)/ Deactivations	-2,901	-2,901
	Net Participation (Cum.)	3,068	3,062
	Planned (Cum.)	4,733	4,733
	Variance (Cum.)	-1,665	-1,671
	Cum% toward planned total (Net basis)	65%	65%
	Removal (Uninstalled) /Deactivation Rate	-1.58%	-0.95%
	Connected Load kW	12,069	12,961
	Ex Ante Estimated kW	0.63	0.84
Connected Load Per Participant (kW)	3.93	3.74	
kW Potential	Peak Shaving Potential kW - Gross Participants	3,745	3,745
	Removed (Uninstalled) / Deactivated Peak Shaving Potential kW	-1,820	-1,820
	Dispatchable Peak Shaving Potential - Net Total kW	1,925	1,925
	Planned Demand (Cum.)	5,392	5,392
	Cum. % Toward Planned Total	60%	60%
Program Performance	Cum. \$Admin. per Cum. Participant (Gross)	\$16	\$18
	Cum. \$Admin. per Cum. kW (Gross)	\$26	\$31
	Cum. \$EM&V per Cum Total Costs (\$)	2%	2%
	Cum. \$Rebate per Cum. Participant (Gross)	\$158	\$158

6.1.2.1 Cumulative Indicators Over Time vs. Planned – Virginia and North Carolina



- Cumulative net participants and kW peak shaving potential were derived by subtracting cumulative participants from cumulative removals, deactivations, and opt-outs (Table 6-5).
- The peak shaving impact estimates at hour ending 17 during the 27 AC Cycling events called in 2018 are summarized in Table 6-6.

- As of December 31, 2018, the aggregate dispatchable peak shaving program resources consisted of 50,567 dispatchable kW from 80,627 active switches in Virginia and 1,925 dispatchable kW from 3,068 active switches in North Carolina.
- These peak shaving totals are 82% of the program planning estimates for Virginia and 60% for North Carolina.
- The average kW peak shaving potential was 0.63 kW per participant for Virginia and North Carolina at Dominion Energy's peak condition.
- The number of participants for Virginia and North Carolina were 89% and 65% of the program planning estimates, respectively.



- Key program cost data were provided previously in the performance indicator summary in Table 6-3 and Table 6-4. From 2010 through 2018, AC Cycling Program expenditures in Virginia were \$71,499,150 or 75% of the planned total. North Carolina's expenditures were \$2,920,994, or 62% of the planned total.
- For the 2018 program year, Virginia's expenditures were \$6,034,693, or 70% of the planned total. North Carolina expenditures were \$239,609 for the program year, or 53% of planned totals.

Table 6-5. Disposition from Cumulative and Net Participants, and Peak Shaving Potential (through December 31, 2018)

Reduction Factor to Participants/ Savings	Participants		Peak Shaving Potential (kW)		Average Peak Shaving Potential per Participant (kW)	
	Virginia	North Carolina	Virginia	North Carolina	Virginia	North Carolina
Cumulative Total	151,798	5,969	95,236	3,745	N/A	N/A
Reduction for Disenrollment	-71,171	-2,901	-44,652	-1,820	N/A	N/A
Net Total	80,627	3,067	50,567	1,925	0.63	0.63

6.1.2.2 Participants Included in the Analysis

Table 6-6 below shows the number of controlled participants included in the impact evaluation by connected load. Here, connected load is categorized as greater than 4.0 kW, less than 4.0 kW, and data not available. Overall, dispatched participants averaged 1.13 kW air-conditioner units per household, which is virtually identical to the planned assumption of 1.2 kW.

Table 6-6. Number of 2018 Controlled Participants by Connected Load

Connected Load (kW)	# of Participants
>4	23,310
<4	32,636
Data not Available	29,796
Total	85,742

Table 6-7 through Table 6-9 show the AC Cycling ex post impacts by event-day and hour. The daily high temperature, opt-out rate, and number of consecutive event days are shown. The color range indicates relative impacts over each interval (red indicating the highest relative impact).

Table 6-7. 2018 AC Cycling Impacts by Event-Day and Hour (Jun 18–Jul 27, 2018)

Event Date	18-Jun	19-Jun	28-Jun	29-Jun	2-Jul	3-Jul	5-Jul	10-Jul	11-Jul	16-Jul	17-Jul	26-Jul	27-Jul
Consecutive Event-days	1	2	1	2	1	2	1	1	2	1	2	1	2
Opt-out Percent	0.08%	0.17%	0.02%	0.05%	0.12%	0.05%	0.03%	0.004%	0.01%	0.01%	0.01%	0.01%	0.01%
THI	84	85	83	82	85	86	83	82	82	84	84	82	83
15:00		0.61									0.54		
16:00		0.68		0.48	0.45	0.56	0.52		0.52	0.51	0.63	0.33	0.49
17:00	0.59	0.73	0.43	0.51	0.66	0.64	0.53	0.47	0.55	0.66		0.40	0.61
18:00	0.68		0.43	0.54	0.68	0.62	0.53	0.42	0.43	0.70		0.39	0.61
19:00	0.61												
Average Impact (kW)	0.63	0.67	0.43	0.51	0.59	0.61	0.53	0.44	0.50	0.62	0.58	0.38	0.57

Table 6-8. AC Cycling Impacts by Event-Day and Hour (Aug 6–Aug 30, 2018)

Event Date	6-Aug	7-Aug	8-Aug	9-Aug	15-Aug	16-Aug	17-Aug	27-Aug	28-Aug	29-Aug	30-Aug
Consecutive Event-days	1	2	3	4	1	2	3	1	2	3	4
Opt-out Percent	0.02%	0.02%	0.06%	0.04%	0.01%	0.01%	0.03%	0.02%	0.02%	0.04%	0.04%
THI	84	84	85	82	82	83	84	83	84	84	84
15:00							0.55				
16:00	0.59	0.58	0.62	0.53		0.48	0.67		0.55	0.57	0.53
17:00	0.59	0.66	0.62	0.60	0.38	0.53	0.66	0.48	0.64	0.66	0.61
18:00	0.49	0.62	0.59	0.58	0.41	0.57		0.51	0.58	0.67	
19:00								0.45			
Average Impact (kW)	0.56	0.62	0.61	0.57	0.40	0.53	0.63	0.48	0.59	0.63	0.57

Table 6-9. AC Cycling Impacts by Event-Day and Hour (Sep 4–Sep 6, 2018)

Event Date	4-Sep	5-Sep	6-Sep
Consecutive Event-days	1	2	3
Opt-out Percent	0.04%	0.04%	0.05%
THI	84	84	83
15:00			
16:00	0.55	0.46	0.42
17:00	0.64	0.49	0.47
18:00	0.59	0.54	
19:00			
Average Impact (kW)	0.59	0.50	0.44

6.2 Non-residential Distributed Generation – Virginia

The DSM Phase II Non-residential DG program, marketed as the Commercial DG Program, provides qualifying customers with an incentive to curtail load by operating backup generation upon request. The program is implemented by a contractor who is responsible for enabling remote operation and monitoring the customer's power generators, and for dispatching load during curtailment events under the direction of the Company.

Non-residential customers with a minimum demand of 200 kW and existing on-site generation capacity are eligible for the program. Each customer site commits to a targeted level of dispatchable power (kW). The Company requests the implementation contractor to dispatch load up to 30 minutes prior to a curtailment event. The dispatched power is measured at each generator and compared against the site's enrolled commitment. The Company has the right to adjust the incentive amount based on evaluated performance if a site's dispatched load is less than 95% of its enrolled load.

The Non-residential DG Pilot was approved in January 2008, and the Non-residential DG Program was approved in 2012. When the program was approved in 2012, 19 of 27 pilot sites transitioned to the program. The remaining eight sites continued to participate in the pilot until it ended on December 31, 2014. Through the end of 2014, the pilot and program participants were evaluated together.

6.2.1 Methods for the Current Reporting Period

The evaluation methodology is defined by the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual, and has remained consistent over the program's history. Program tracking and metered power production data are delivered to DNV GL, and reviewed upon receipt for quality, and the impact evaluation is conducted at the end of each calendar year.

Table 6-10 below outlines the Non-residential DG program planning assumptions which are compared against actual program performance in Section 6.2.4.

Table 6-10. Non-residential DG Program Planning Assumptions

Item	Description
Target Market	Non-residential customers with at least 200 kW of demand and backup generation capable of serving the full electrical load for the customer site.
Participant Definition	1 participant = 1,000 kW of enrolled generation. A participant site may take on a decimal value, e.g., a participant site with 250 kW of generation would have a participant value of 0.25.
NTG Factor	100%
Measure Life	N/A
Average Demand Reduction (kW) per Participant	1,000 kW per participant per year

6.2.2 STEP Manual Computation of Demand Reduction

The STEP Manual defines the methodology used to estimate demand reduction. The key performance indicator for the Non-residential DG program is measured kW generated during dispatch events. Power generation is measured at the participant site level, which is defined as an installed generator.

Site-level realization rates are created by comparing measured generation (kW) to the dispatched generation (kW). Realization rates are calculated for each participant site by event-hour and aggregated to the event and program level.

6.2.3 Impact Analysis of 2018 Dispatch Events

The Non-residential DG Program is evaluated annually using metered power production data to verify event based dispatched load. Summary results from the 2018 impact evaluation are presented in Section 6.3.2.1. and Appendix O-1: Distributed Generation Program, Impact Evaluation of 2018 Dispatch Events. The objectives for the Non-residential DG impact evaluation are:

- to compute aggregate kW of load curtailment for one-hour intervals on each event day
- to compute realization rates for the Non-residential DG program comparing actual load curtailed to dispatched load
- to describe trends across event intervals related to program performance versus planned assumptions and to identify issues that should be addressed in program operation

6.2.4 Assessment of Program Progress Towards Plan

Table 6-11 below summarizes the annual progress towards plan for key program performance indicators in Virginia. Detailed program indicators by year and month are available in Appendix A.9.

Table 6-11. VA Non-residential Distributed Generation Program Performance Indicators (2012-2018)

Category	Item	Virginia	
		2018	Program Total (2012-2018)
Operations and Management Costs (\$)	Direct Rebate		
	Direct Implementation		
	Direct EM&V		
	Indirect Other (Administrative)	\$31,507	\$255,366
Total Costs (\$)	Total		
	Planned		
	Variance		
	Cumulative % of Planned	64%	45%
Participants	Total (Cumulative @ End of Month)	6.13	6.13
	Planned (Cum.)	8.15	8.15
	Variance (Cum.)	-2.02	-2.02
	Cum % Toward Planned Total (Net basis)	75%	75%
kW Potential	Total (Cumulative @ End of Month)	6,130	6,130
	Realization Rate	97%	97%
	Net kW (Cum.)	5,946	5,946
	Planned (Cum.)	8,149	8,149
	Cum % Toward Planned Total (Net basis)	73%	73%
	Avg. per Net Participant (Net kW)	970	858
Program Performance	Cum. \$Admin. per Cum. Participant (Gross)	\$5,140	\$5,140
	Cum. \$Admin. per Cum. kW (Gross)	\$5	\$5
	Cum. \$EM&V per Cum Total Costs (\$)	13%	13%
	Cum. \$Rebate per Cum. Participant (Gross)	\$577,089	\$577,089

6.2.4.1 Cumulative Indicators Over Time vs. Planned

The average kW dispatched per event interval per month ranged from 1,610 kW to 5,906 kW across the 32 events (on 31 event days) called in 2018. According to the program definition (1,000 enrolled kW equals one participant), the number of participants was 6.13, which is less than the 2018 plan total of 8.15 MW by 2.02 MW. The cumulative percentage towards planned participation is 75%.

The 2018 peak shaving realization rate for the Non-residential DG program is calculated by dividing the measured generation by the enrolled dispatched generation. The realization rate for 2018 was 97%. Despite the limited dispatch in May, the program's 97% realization rate through December 31st met the planned target of 95%. Summer events averaged 100%, and winter events averaged 85%. Winter realization rates are expected to be lower than summer rates because the planned kW peak shaved goal is based on summer peak load.⁵⁰ Table 6-12 and Table 6-13 show the aggregate hourly site-level realization rates for winter and summer events, respectively.

Table 6-12. 2018 Realization Rates by Event Day and Hour Ending–Winter

Realization Rate by Event Day and Hour Ending–Winter													
Event Day	Hour Ending											Average	
	5	6	7	8	9	10	11	18	19	20	21	22	
2-Jan-18	58%	65%	73%	78%	72%	73%	72%						70%
5-Jan-18			69%	95%	105%			94%	103%	102%	100%	96%	95%
6-Jan-18			76%	102%	106%								95%
7-Jan-18			77%	100%	106%								94%

⁵⁰ The winter season spans October–March, while the summer season spans April–September.

Table 6-13. 2018 Realization Rates by Event Day and Hour Ending (Summer)

Realization Rate by Event Day and Hour Ending–Summer							
Event Day	Hour Ending						Average
	15	16	17	18	19	20	
3-May-18	68%	67%	67%	66%	64%	61%	65%
18-Jun-18			86%	93%	92%		90%
19-Jun-18	98%	101%	102%				101%
28-Jun-18			87%	97%			92%
29-Jun-18		91%	94%	94%			93%
30-Jun-18			90%	95%	94%		93%
1-Jul-18			104%	111%	105%		107%
2-Jul-18		104%	110%	104%			106%
3-Jul-18		107%	116%	112%			112%
5-Jul-18		77%	82%	83%			81%
10-Jul-18			92%	103%			97%
16-Jul-18		66%	111%	109%			95%
27-Jul-18		93%	98%	91%			94%
6-Aug-18		90%	100%	97%			96%
7-Aug-18		93%	102%	103%			99%
8-Aug-18		105%	120%	118%			114%
9-Aug-18		111%	113%	115%			113%
15-Aug-18			90%	101%			95%
16-Aug-18		90%	92%	90%			91%
17-Aug-18	103%	109%	110%				107%
27-Aug-18			105%	109%	108%		107%
28-Aug-18		108%	112%	112%			111%
29-Aug-18		101%	109%	107%			106%
30-Aug-18		102%	110%				106%
4-Sep-18		106%	113%	113%			111%
5-Sep-18		111%	119%	115%			115%
6-Sep-18		116%	117%	47%			93%

Table 6-14 and Table 6-15 below show the event-day realization rates by site. Each site is assigned a unique identifier. Empty cells indicate that a site was not dispatched during an event. Realization rates greater than or equal to 95% are highlighted green, rates greater than 50% and less than 95% are light purple and rates less than or equal to 50% are highlighted red.

Table 6-14. Average Realization Rates by Site and Event Day (January 2–July 27, 2018)

Site ID	January				May	June					July						
	2	5	6	7		3	18	19	28	29	30	1	2	3	5	10	16
1	22%				70%	63%	67%	70%	69%	66%	74%	68%	91%	12%	71%	91%	74%
2	76%	62%	60%	27%		104%	111%	99%	102%	103%	108%	107%	110%	134%	102%	85%	60%
3	74%	82%	76%	76%		101%	107%	93%	99%	99%	99%	105%	107%	93%	101%	83%	98%
4	52%	62%	52%	52%		107%	112%	95%	95%	84%	85%	89%	87%	112%	80%	67%	82%
5	43%	48%	42%	42%		87%	90%	67%	80%	79%	83%	90%	89%	71%	82%	62%	85%
6	59%	59%	53%	56%	89%	92%	95%	79%	85%	82%	85%	92%	95%	94%	5%		110%
7	88%	80%	86%	86%		99%	103%	93%	100%	100%	102%	101%	101%	1%	91%	79%	103%
8	144%	134%	161%	175%		133%	146%	125%	2%		100%	107%	104%	208%	74%	2%	0%
9	133%	139%	137%	144%		138%	153%	136%	143%	146%	150%	161%	162%	107%	148%	100%	146%
10	143%	143%	147%	154%		120%	127%	100%	112%	116%	125%	129%	134%	144%	100%	84%	102%
11	205%	205%	201%	210%		215%	171%	213%	221%	224%	228%	232%	222%	227%	220%		
12	79%	77%	81%	89%		104%	108%	92%	97%	96%	105%	108%	107%	94%	92%	78%	98%
13	119%	128%	126%	140%		142%	145%	125%	139%	136%	145%	148%	151%	140%	142%	117%	137%
14	105%	112%	114%	116%		103%	105%	98%	107%	104%	104%	111%	114%	86%	105%	84%	85%
15	110%	114%	117%	130%		0%	144%	124%	127%	124%	93%	135%	140%	176%	129%	113%	126%
16	88%	98%	94%	96%	6%	74%	114%	97%	102%	98%	108%	110%	103%	78%	80%	91%	94%
17	55%	55%	55%	58%		94%	106%	85%	103%	96%	96%	103%	101%	104%	96%	80%	
18	123%	131%	120%	126%		126%	153%	144%	144%	143%	145%	147%	145%	133%	123%	105%	
19	151%	157%	154%	153%							213%	218%	218%	277%	207%	242%	238%
20	108%	101%	89%	88%							227%	130%	67%	227%	196%	203%	
21		73%	97%	38%							205%	210%	205%	0%	192%	203%	206%

Table 6-15. Average Realization Rates by Site and Event Day (August 6–September 6, 2018)

Site ID	August											September		
	6	7	8	9	15	16	17	27	28	29	30	4	5	6
1	80%	79%	90%	95%	70%	74%	80%	80%	78%	82%	78%	95%	95%	85%
2	93%	105%	105%	100%	102%	101%	108%	103%	107%	105%	106%	105%	106%	75%
3	101%	106%	108%	106%	92%	109%	112%	105%	114%	107%	106%	99%	112%	84%
4	93%	102%	103%	93%	84%	97%	105%	101%	103%	105%	94%	98%	102%	74%
5	79%	83%	87%	83%	66%	80%	85%	82%	86%	80%	79%	80%	85%	66%
6	64%	114%	116%	112%	103%	0%		107%	111%	0%				
7	90%	106%	108%	106%	93%	95%	97%	90%	102%	90%	91%	97%	101%	75%
8	90%	95%	104%		62%		100%	94%	104%	99%	79%	0%	99%	97%
9	146%	144%	143%	148%	121%	149%	149%	153%	153%	151%	136%	148%	157%	114%
10	2%	12%					14%	112%	122%	118%	106%	130%	129%	93%
11														
12	95%	95%	99%	96%	79%	98%	102%	98%	101%	99%	95%	95%	103%	72%
13	134%	137%	141%	137%	133%	139%	139%	140%	141%	145%	147%	142%	143%	103%
14	109%	108%	108%	100%	94%	99%	107%	104%	109%	108%	105%	107%	108%	79%
15	133%	133%	136%	134%	123%	135%	138%	125%	139%	133%	135%			
16	7%	99%	103%	97%	91%	0%	103%	99%	103%	103%	100%	100%	92%	70%
17														
18	148%	140%	150%	145%		0%	154%	136%	157%	160%	164%	158%	158%	119%
19	229%	1%	265%	261%	259%	256%	267%	256%	261%	263%	265%	251%	249%	220%
20	194%	210%	214%	206%	203%	203%	214%	211%	216%	212%	187%	203%	203%	175%
21	198%	201%	208%	203%	204%	199%	206%	205%	202%	205%	209%	205%	203%	180%

Site IDs 9, 11, and 13 met or exceeded the 95% target for every 2018 event day that they were called. These sites were also high performers in 2017. Sites 1 and 5 were the only sites that did not achieve a 95% realization rate for any event day in 2018.

The lowest performing summer event occurred on May 3, yielding a realization rate of 65%. On this day only three participants, located on the Peninsula, which includes Williamsburg, Newport News, and Hampton, were dispatched.

Table 6-16. Non-residential DG Program 2018 Monthly Average Performance Metrics

2018	Planned Participants (MW)	Enrolled Participants (MW)	Net kW Planned	Net kW Enrolled	Event Days	Average Dispatched (kW)	Average Generation (kW)	Average Realization Rate
Jan	8.15	6.0	8,149	6,000	4	4,757	4,043	85%
Feb	No events							
Mar	No events							
Apr	No events							
May	8.15	2.5	8,149	2,500	1	2,460	1,599	65%
Jun	8.15	5.7	8,149	5,799	5	5,638	5,300	94%
Jul	8.15	6.1	8,149	6,100	7	5,967	5,907	99%
Aug	8.15	5.8	8,149	5,800	11	5,606	5,830	104%
Sep	8.15	5.4	8,149	5,400	3	5,360	5,682	106%
Oct	No events							
Nov	No events							
Dec	No events							

7 CLOSED PROGRAMS

This section provides an overview of the DSM programs that have been closed in Virginia and North Carolina. Their past performance, and savings that are persisting are archived in Appendices A through D of this report.

1. Residential
 - a. DSM Phase I
 - i. Residential Lighting
 - ii. Residential Low-Income
 - b. DSM Phase II
 - i. Residential Heat Pump Upgrade
 - ii. Residential Heat Pump Tune-up
 - iii. Residential Duct Sealing
 - iv. Residential Home Energy Check-up
 - c. DSM Phase IV
 - i. Residential Appliance Recycling
2. Non-residential
 - a. DSM Phase I
 - i. Commercial Lighting
 - ii. Commercial HVAC
 - b. DSM Phase II
 - i. Non-residential Duct Testing and Sealing
 - ii. Non-residential Energy Audit

7.1 Residential Lighting

The Residential Lighting Program closed in Virginia and North Carolina as originally planned at the end of 2011. In Virginia, it began in May 2010 and concluded on December 31, 2011. The program in North Carolina began in mid-2011 and concluded on December 31, 2011. A summary of key program indicators from program inception through December 2012 are provided in Appendix A.9 (VA) and Appendix B.9 (NC).

7.2 Residential Low-Income

In Virginia, the Residential Low-Income program spanned from April 2010 through December 2014. It spanned from April 2010 through December 2015, in North Carolina.

A summary of key program indicators from program inception through December 2015 are provided in Appendix A.10 (VA) and Appendix B.10 (NC).

7.3 Residential Heat Pump Upgrade

In Virginia, the Residential Heat Pump Upgrade Program spanned from August 2012 through December 2017. In North Carolina, it spanned from January 2014 through December 2017.

A summary of key program indicators from program inception through December 2017 are provided in Appendix A.11 (VA) and Appendix B.11 (NC).

7.4 Residential Heat Pump Tune-up

In Virginia, the Residential Heat Pump Tune-up Program spanned from August 2012 to December 31, 2017. It spanned from January 2014 to December 31, 2017, in North Carolina.

A summary of key program indicators from program inception through December 2017 are provided in Appendix A.12 (VA) and Appendix B.12 (NC).

7.5 Residential Duct Sealing

In Virginia, the Residential Duct Sealing program spanned from August 2012 through December 31, 2017. It spanned from January 1, 2015 through December 31, 2017, in North Carolina.

A summary of key program indicators from program inception through December 2017 are provided in Appendix A.13 (VA) and Appendix B.13 (NC).

7.6 Residential Home Energy Check-up

In Virginia, the Residential Home Energy Check-up Program spanned from August 1, 2012 through December 31, 2017. It spanned from February 1, 2015 through December 31, 2017, in North Carolina.

A summary of key program indicators from program inception through December 2017 are provided in Appendix A.14 (VA) and Appendix B.14 (NC).

7.7 Residential Appliance Recycling

The Residential Appliance Recycling Program was only available in Virginia. It spanned from July 2015 to December 2017, with program spending lagging through to 2018 for program wrap-up activities.

A summary of key program indicators from program inception through December 2017 are provided in Appendix A.15 (VA).

7.8 Commercial Lighting

In Virginia, the Commercial Lighting Program spanned from May 2010 through December 2012. It spanned from December 2011 through December 2012, in North Carolina.

A summary of key program indicators from program inception through December 2012 are provided in Appendix A.16 (VA) and Appendix B.15 (NC).

7.9 Commercial HVAC Upgrade (Virginia & North Carolina)

In Virginia, the Commercial HVAC Program spanned from July 2010 through December 2012. It spanned from January 2012 through December 2012, in North Carolina.

A summary of key program indicators from program inception through December 2012 are provided in Appendix A.17 (VA) and Appendix B.16 (NC).

7.10 Non-residential Duct Testing and Sealing – Virginia and North Carolina

In Virginia, the Non-residential Duct Testing and Sealing Program spanned from July 1, 2012 through February 28, 2017. It spanned from April 1, 2014 through February 28, 2017, in North Carolina.

A summary of key program indicators from program inception through December 2017 are provided in Appendix A.18 (VA) and Appendix B.17 (NC).

7.11 Non-residential Energy Audit

In Virginia, the Non-residential Energy Audit Program spanned from July 1, 2012 through February 28, 2017. It spanned from January 1, 2014 through February 28, 2017, in North Carolina.

A summary of key program indicators from program inception through December 2017 are provided in Appendix A.19 (VA) and Appendix B.18 (NC).