

- As discussed in the text summarizing below, the majority of Virginia program participants and their associated gross energy savings are from multi-family properties. In general, multi-family properties have fewer opportunities for attic insulation and other measures when compared to single-family properties, which may contribute to the lower than initially assumed savings per participant.



- Total 2018 program spending was at 60% of plans.
- Total cumulative spending for 2015 through 2018 was 94% of plan.
- Average rebate per participant in 2018 was \$626, which is similar to rebate spending levels from previous years.
- On a per participant basis, administrative and EM&V costs all increased in 2018, when compared to past years. This is attributable to the program wind-down and re-launch.

**Table 4-3. VA Residential Income and Age Qualifying Home Improvement Program Performance Indicators (2015–2018)**

Category	Item	Virginia				
		2015	2016	2017 <sup>18</sup>	2018	Program Total (2015-2018)
Operations and Management Costs (\$)	Direct Rebate					
	Direct Implementation					
	Direct EM&V					
	Indirect Other (Administrative)	\$48,256	\$191,950	\$199,872	\$80,889	\$520,967
Total Costs (\$)	Total					
	Planned					
	Variance					
	Annual % of Planned	68%	108%	109%	60%	94%
Participants	Total (Gross)	1,523	8,403	5,970	1,141	17,037
	Planned (Gross)	1,849	3,843	3,846	2,000	11,538
	Variance	-326	4,560	2,124	-859	5,499
	Annual % of Planned (Gross)	82%	219%	155%	57%	148%
Installed Energy Savings (kWh/year)	Total Gross Deemed Savings	984,230	3,575,492	2,431,737	447,775	7,439,235
	Realization Rate Adjustment (100%)	0	0	0	0	0
	Adjusted Gross Savings	984,230	3,575,492	2,431,737	447,775	7,439,235
	Net-to-Gross Adjustment (80%)	-196,846	-715,098	-486,347	-89,555	-1,487,847
	Net Adjusted Savings	787,384	2,860,394	1,945,390	358,220	5,951,388
	Planned Savings (Net)	1,810,380	998,136	765,945	175,247	3,749,708
	Annual % Toward Planned Savings (Net)	43%	287%	254%	204%	159%

<sup>18</sup> The 2017 total gross deemed savings values reported in this table include adjustments of -12,182.94 kWh/year and -1.10 kW made to the January 2017 reported savings. The adjustments account for corrections to STEP Manual version 7.0.0 issued on May 1, 2017. Specifically, the correction was in section 2.1.5 for "Low-Flow Showerhead" measures, to the "ΔT" variable, which is a measure of the change in temperature of the water used for shower and temperature entering the house ( $\Delta T = T_{\text{shower}} - T_{\text{in house}}$ ). STEP Manual 7.0.0 reported the value as 44.9°F, but has been corrected to 44.1°F. This correction is reflected in STEP Manual version 8.0.0 in this EM&V report.



Category	Item	Virginia				
		2015	2016	2017 <sup>18</sup>	2018	Program Total (2015-2018)
	Avg. Savings per Participant (Gross)	646	426	407	392	437
	Avg. Savings per Participant (Net)	517	340	326	314	349
Installed Demand Reduction (kW)	Total Gross Deemed Demand	80.2	398.0	228.1	34.9	741.2
	Realization Rate Adjustment (100%)	0.0	0.0	0.0	0.0	0.0
	Adjusted Gross Demand	80.2	398.0	228.1	34.9	741.2
	Net-to-Gross Adjustment (80%)	-16.0	-79.6	-45.6	-7.0	-148.2
	Net Adjusted Demand	64.1	318.4	182.5	27.9	592.9
	Planned Demand (Net)	415.0	217.7	170.2	0.0	802.9
	Annual % Toward Planned Demand (Net)	15%	146%	107%	N/A	74%
	Avg. Peak Demand per Participant (Gross)	0.05	0.05	0.04	0.03	0.04
	Avg. Demand per Participant (Net)	0.04	0.04	0.03	0.02	0.03
Program Performance	Annual \$Admin. per Cum. Participant (Gross)	\$32	\$23	\$33	\$71	\$31
	Annual \$Admin. per Cum. kWh/year (Gross)	\$0	\$0	\$0	\$0.18	\$0.07
	Annual \$Admin. per Cum. kW (Gross)	\$602	\$482	\$876	\$2,318	\$703
	Annual \$EM&V per Cum. Total Costs (\$)	0.6%	1.4%	2.3%	6.8%	2.1%
	Annual \$Rebate per Cum. Participant (Gross)	\$582	\$612	\$644	\$626	\$621

The following table (Table 4-4) provides gross and net annualized energy savings and demand reduction for program year 2018, in Virginia, by measure type.

**Table 4-4. VA Residential Income and Age Qualifying Home Improvement Program Measure-Level Performance Indicators (2018)**

Program	Realization Rate		Net to Gross	
	kWh/year	kW	kWh/year	kW
Residential Income and Age Qualifying Home Improvement – Virginia (DSM IV)	100%	100%	80%	80%
Measure	kWh/year		kW/year	
	Gross	Net	Gross	Net
40w LED	39,440	31,552	4.0	3.2
60w LED	46,541	37,233	4.8	3.8
Attic Insulation	81,074	64,859	3.1	2.5
Bathroom Aerator	18,650	14,920	1.8	1.5
Kitchen Aerator	36,212	28,969	1.5	1.2
Pipe Insulation	120,115	96,092	13.7	11.0
Showerhead	105,743	84,595	5.9	4.7
<b>Total</b>	<b>447,775</b>	<b>358,220</b>	<b>34.9</b>	<b>27.9</b>

#### 4.1.2.2 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, Table 4-5 provides performance indicator data from January 1, 2016 through December 31, 2018. Detailed program indicators by year and month are provided in Appendix B.1.



- North Carolina had one participant in January 2018. This was an application and tracking data from the first phase of the program that entered the EM&V stream in January.
- The re-launched extended program did not enroll any new participants in North Carolina in 2018.
- From 2016 through 2018, participation was at 56% of planned levels.

- Net annualized energy savings for 2018 was at 579 kWh/year, which was savings from the one participant who was a carryover from the 2017 program.





- Total annual net energy savings from 2016 through 2018 were 173,518 kWh/year, which was 147% of plans. Total annual net demand reduction over the same period was 16 kW, 60% of plans.
- Percentages of measure quantity installed, energy savings, and demand reduction percentages are discussed in the following sections.



- Total 2018 program spending was 23% of planned.
- Total cumulative spending for 2016 to 2018 was 77% of plans.
- The average rebate amount per participant in 2018 was \$1,763. This is similar to average rebate amounts in previous years.
- As was the case in Virginia, on a per-participant basis, administrative and EM&V costs all increased in 2018, when compared to past years. This is attributable to the program wind-down and re-launch.

**Table 4-5. NC Residential Income and Age Qualifying Home Improvement Program Performance Indicators (2016–2018)**

Category	Item	North Carolina			
		2016	2017 <sup>19</sup>	2018	Program Total (2016-2018)
Operations and Management Costs (\$)	Direct Rebate				
	Direct Implementation				
	Direct EM&V				
	Indirect Other (Administrative)	\$8,999	\$12,899	\$1,949	\$23,847
Total Costs (\$)	Total				
	Planned				
	Variance				
	Annual % of Planned	75%	107%	23%	77%
Participants	Total (Gross)	157	130	1	288
	Planned (Gross)	257	254	0	511
	Variance	-100	-124	1	-223
	Annual % of Planned (Gross)	61%	51%	N/A	56%
Installed Energy Savings (kWh/year)	Total Gross Deemed Savings	106,379	109,794	723	216,897
	Realization Rate Adjustment (100%)	0	0	0	0
	Adjusted Gross Savings	106,379	109,794	723	216,897
	Net-to-Gross Adjustment (80%)	-21,276	-21,959	-145	-43,379
	Net Adjusted Savings	85,103	87,835	579	173,518
	Planned Savings (Net)	67,040	51,199	0	118,239
	Annual % Toward Planned Savings (Net)	127%	172%	N/A	147%

<sup>19</sup> The 2017 total gross deemed savings values reported in this table include adjustments of -306.89 kWh/year and -0.03 kW made to the January 2017 reported savings. The adjustments account for corrections to STEP Manual version 7.0.0 issued on May 1, 2017. Specifically, the correction was in section 2.1.5 for "Low-Flow Showerhead" measures, to the "ΔT" variable, which is a measure of the change in temperature of the water used for shower and temperature entering the house ( $\Delta T = T_{\text{shower}} - T_{\text{in house}}$ ). STEP Manual 7.0.0 reported the value as 44.9°F, but has been corrected to 44.1°F. This correction is reflected in STEP Manual version 8.0.0 in this EM&V report.



Category	Item	North Carolina			
		2016	2017 <sup>19</sup>	2018	Program Total (2016-2018)
	Avg. Savings per Participant (Gross)	678	845	723	753
	Avg. Savings per Participant (Net)	542	676	579	602
Installed Demand Reduction (kW)	Total Gross Deemed Demand	10.6	9.1	0.1	19.8
	Realization Rate Adjustment (100%)	0.0	0.0	0.0	0.0
	Adjusted Gross Demand	10.6	9.1	0.1	19.8
	Net-to-Gross Adjustment (80%)	-2.1	-1.8	0.0	-4.0
	Net Adjusted Demand	8.5	7.3	0.0	15.8
	Planned Demand (Net)	15.0	9.1	0.1	26.4
	Annual % Toward Planned Demand (Net)	57%	64%	N/A	60%
	Avg. Peak Demand per Participant (Gross)	0.07	0.07	0.06	0.07
	Avg. Demand per Participant (Net)	0.05	0.06	0.05	0.05
Program Performance	Annual \$Admin. per Cum. Participant (Gross)	\$57	\$99	\$1,949	\$2,106
	Annual \$Admin. per Cum. kWh/year (Gross)	\$0.08	\$0	\$2.70	\$3
	Annual \$Admin. per Cum. kW (Gross)	\$847	\$1,415	\$31,929	\$34,192
	Annual \$EM&V per Cum. Total Costs (\$)	2.0%	2.3%	18.2%	22.5%
	Annual \$Rebate per Cum. Participant (Gross)	\$1,442	\$1,939	\$1,763	\$1,667

The following table (Table 4-6) provides gross and net annualized energy savings and demand reduction for program year 2018, in North Carolina, by measure type.

**Table 4-6. NC Residential Income and Age Qualifying Home Improvement Program Measure-Level Performance Indicators (2018)**

Program	Realization Rate		Net-to-Gross Rate	
	kWh/year	kW	kWh/year	kW
Residential Income and Age Qualifying Home Improvement – North Carolina (DSM IV)	100%	100%	80%	80%
Measure	kWh/year		kW/year	
	Gross	Net	Gross	Net
40w LED	-	-	-	-
60w LED	148	118	0.015	0.012
Attic Insulation	21	17	0.016	0.013
Bathroom Aerator	31	25	0.003	0.002
Kitchen Aerator	79	63	0.003	0.002
Pipe Insulation	80	64	0.009	0.007
Showerhead	365	292	0.016	0.013
<b>Total</b>	<b>723</b>	<b>579</b>	<b>0.061</b>	<b>0.049</b>

#### 4.1.2.3 Additional Virginia Program Participant Data

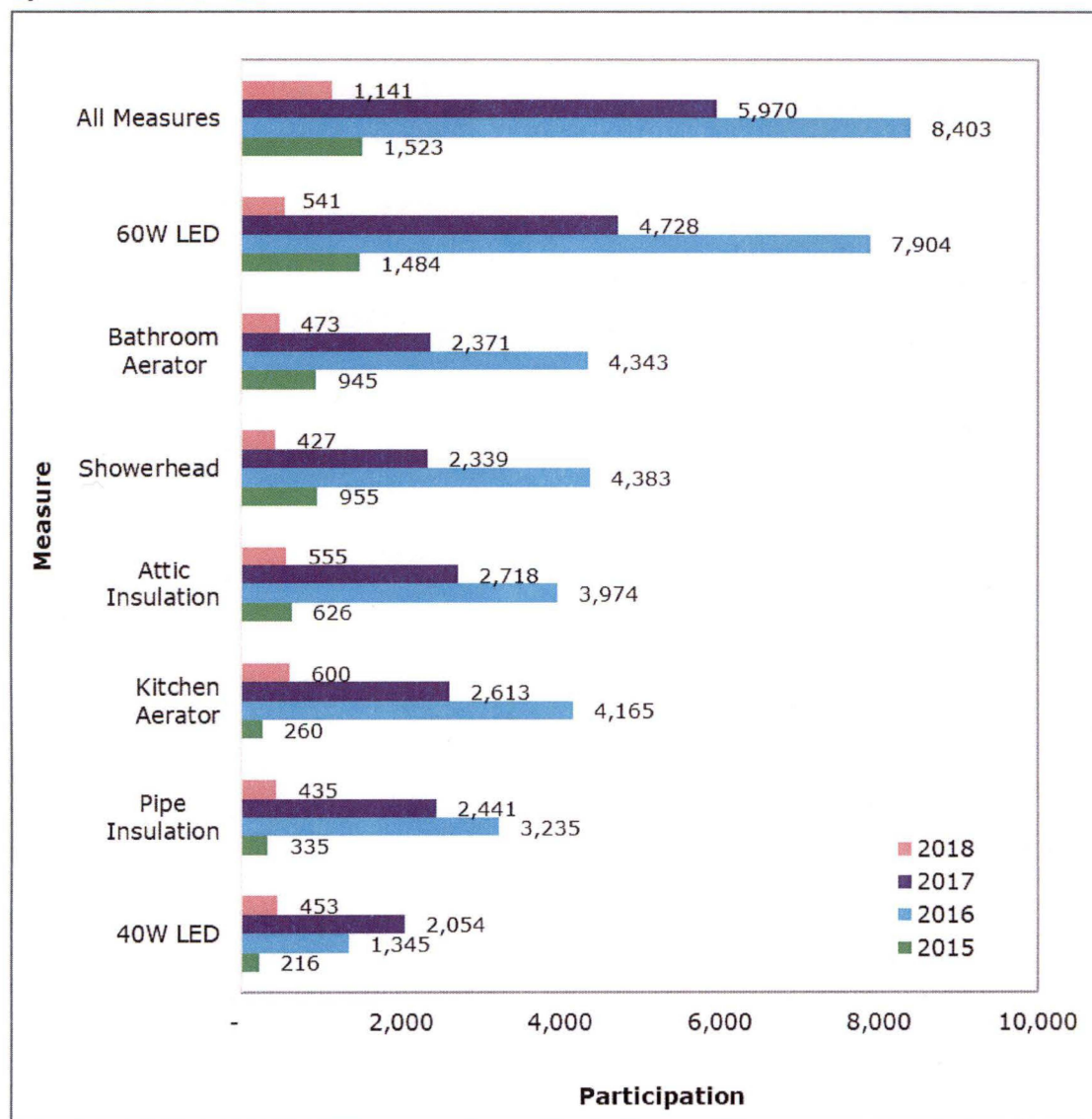
Figure 4-3 through Figure 4-8 show the Virginia program's participation, gross annualized energy savings, and average gross annualized energy savings per participant (for participants who installed the measure in the respective years) by measure type and by building type.

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.



Historically, the most-frequently-installed measures were LED replacements of 60 W incandescent lamps, bathroom aerators, and showerheads (Figure 4-3).

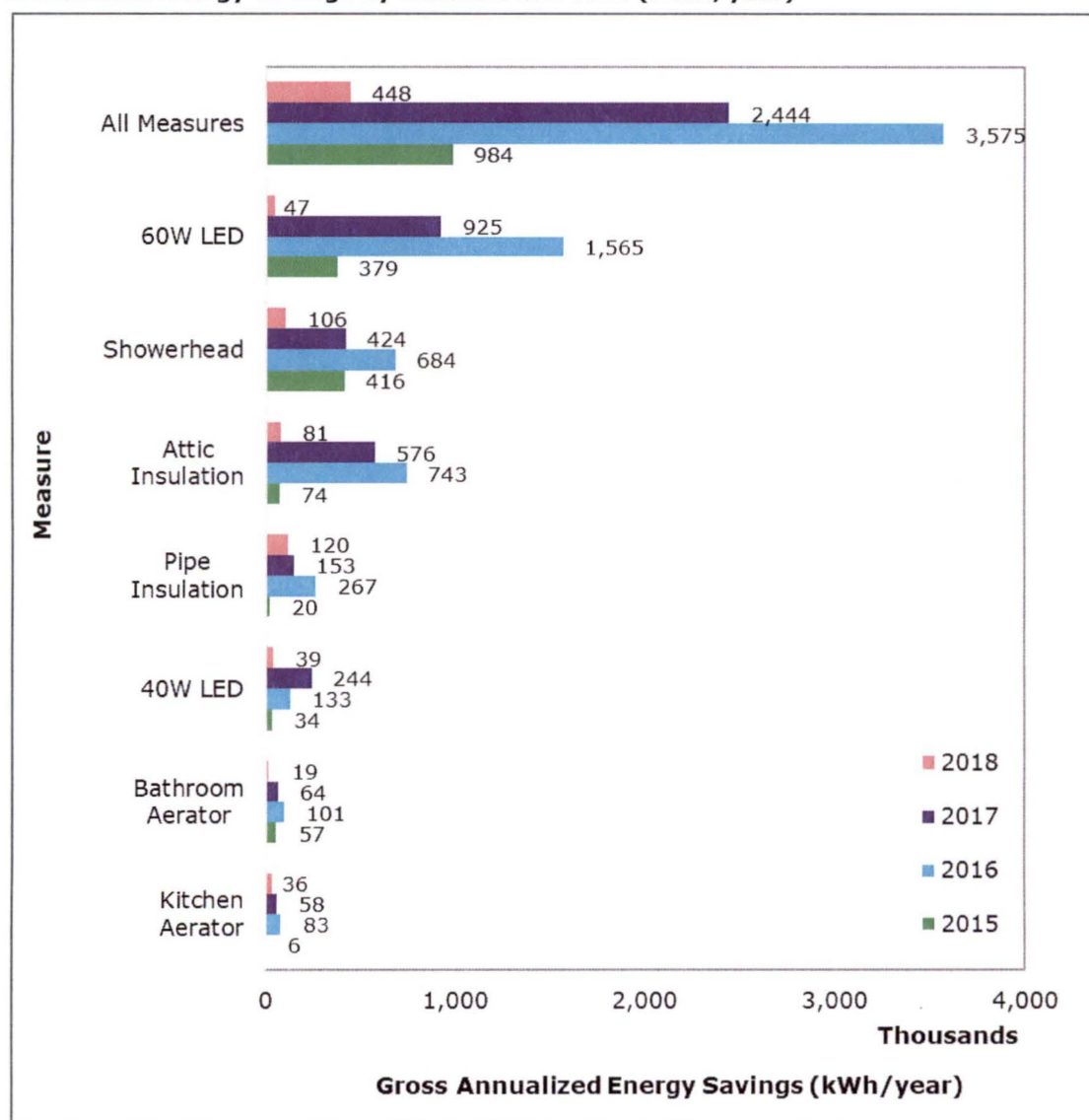
**Figure 4-3. VA Residential Income and Age Qualifying Home Improvement Program Participation by Measure and Year**



Program total gross energy savings grew from year one (green) and peaked in the second and middle year (light blue). Participant enrollment slowed down and decreased measure installation in its last year (purple). In 2018, the program was dormant for the first eight months of the year, until it was extended and relaunched at the end of 2018 (pink).

LED replacement of 60 W incandescent measure produced the highest of energy savings for the program life thus far, followed by showerheads, and attic insulation (Figure 4-4). The measures that produced comparatively higher savings in 2018 were pipe insulation (120 MWh/year), showerhead (106 MWh/year), and attic insulation (81 MWh/year).

**Figure 4-4. VA Residential Income and Age Qualifying Home Improvement Program Gross Annualized Energy Savings by Measure and Year (MWh/year)**





For 2015 through 2018, the low-flow showerheads and LED replacement of 60 W incandescent were the measures that had the highest gross annualized savings per participant, followed closely by attic insulation (Figure 4-5). In 2018, the energy savings from LED replacement of the 60 W incandescent declined dramatically, compared to previous years. This was a result of a change in the deemed savings calculation for this measure, where the hours of use (HOU) default input decreased, therefore decreasing the gross annualized savings for this measure.

**Figure 4-5. VA Residential Income and Age Qualifying Home Improvement Program Average Gross Annualized Energy Savings per Participant (kWh/year participant) by Measure and Year**

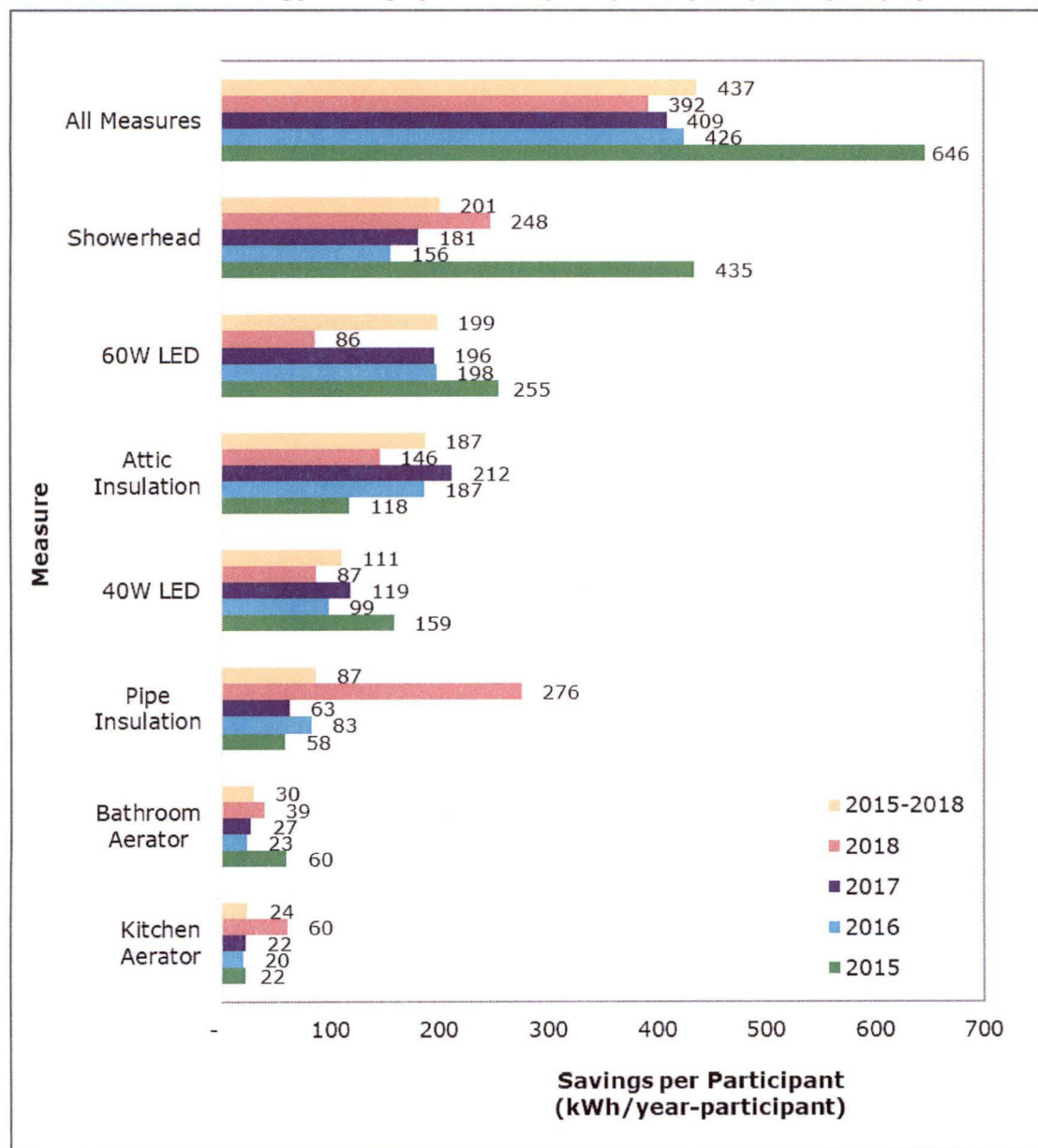
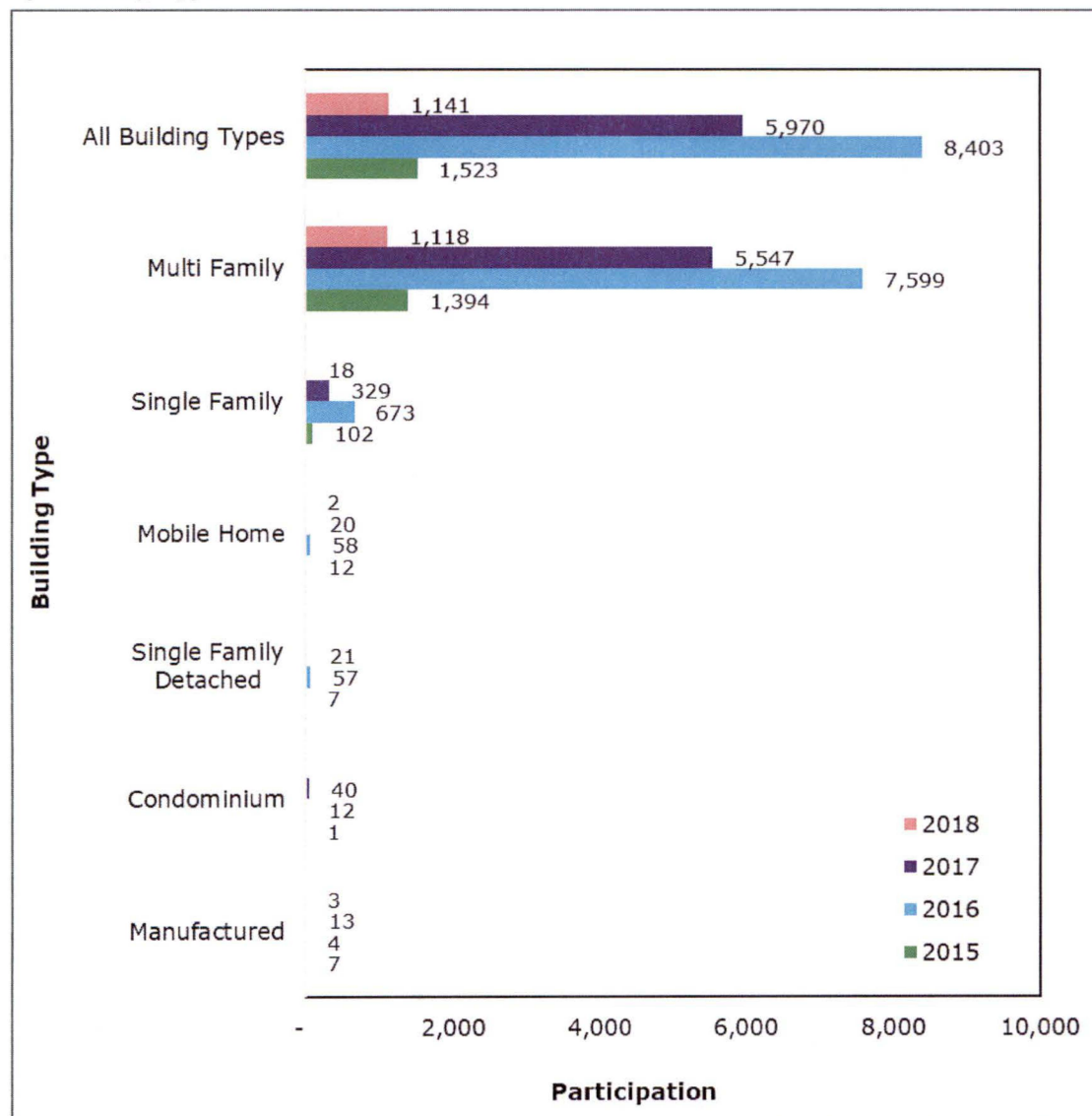


Figure 4-6 through Figure 4-8 show gross annualized energy savings, participation, and average annualized energy savings per participant (for participants who installed the measure in that year) by building type and program year. They show that, in all years, the vast majority of program participants (Figure 4-6) and gross annualized energy savings (Figure 4-7) live in multi-family buildings.

**Figure 4-6. VA Residential Income and Age Qualifying Home Improvement Program Participation by Building Type and Year**





**Figure 4-7. VA Residential Income and Age Qualifying Home Improvement Program Gross Annualized Energy Savings by Building Type and Year (kWh/year)**

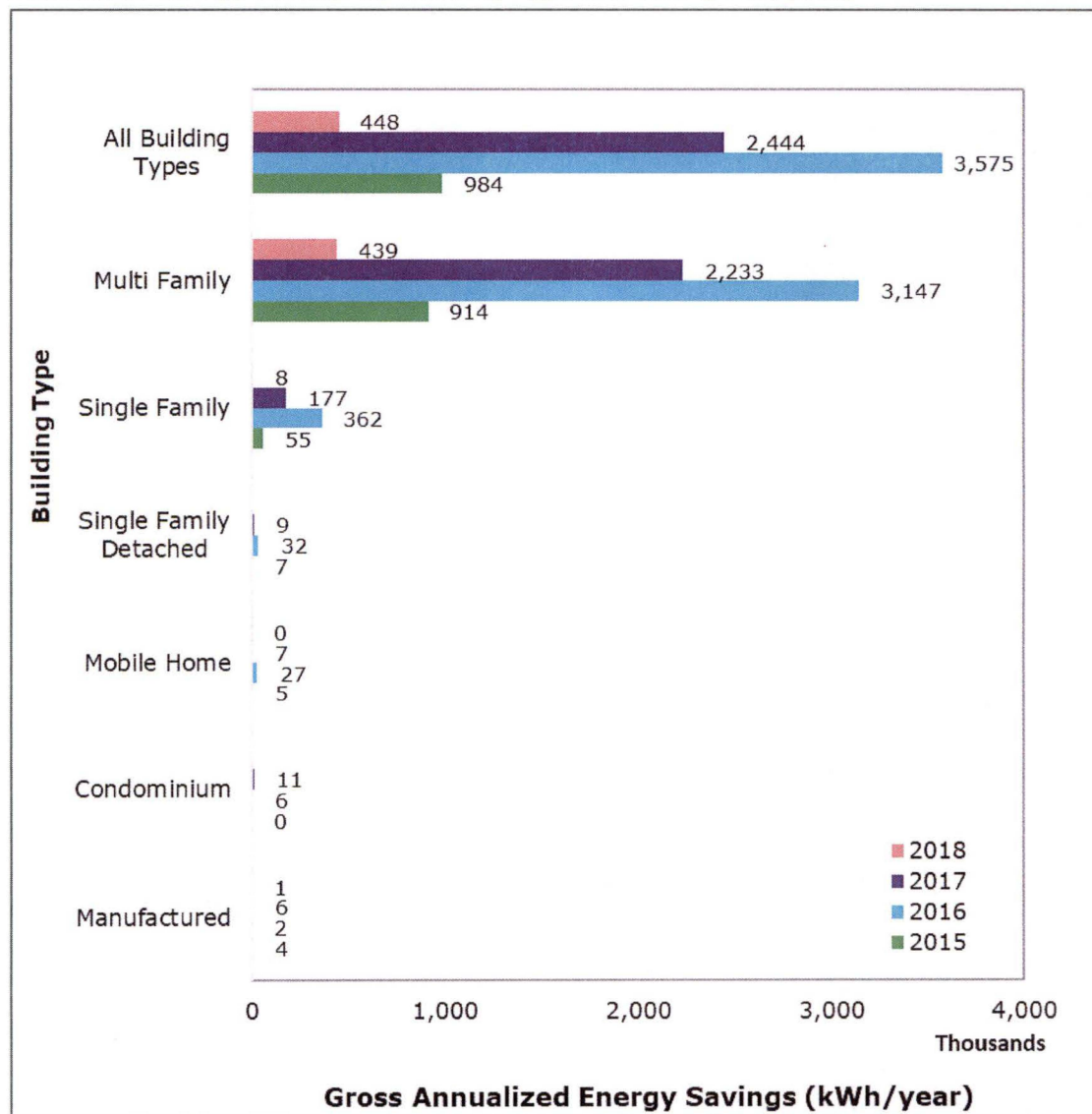


Figure 4-8 shows that the savings per participant for all years combined (2015-2018) and explained further in the bullets below, when analyzing the savings by the six different building types:

1. Single family or single family detached homes, have the highest average savings per participants, with slightly over 500 kWh/year-participant. The higher savings for single family homes, compared to other

building types, may be attributed to single family buildings generally having larger space area than other building types and more opportunities for savings.

2. Mobile, manufactured, and multi-family homes are next with average savings per participant of approximately 430 kWh/year-participant
3. Condominiums have the lowest average savings of the group, with slightly over 300 kWh/year-participant.

**Figure 4-8. VA Residential Income and Age Qualifying Home Improvement Program Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Building Type and Year**

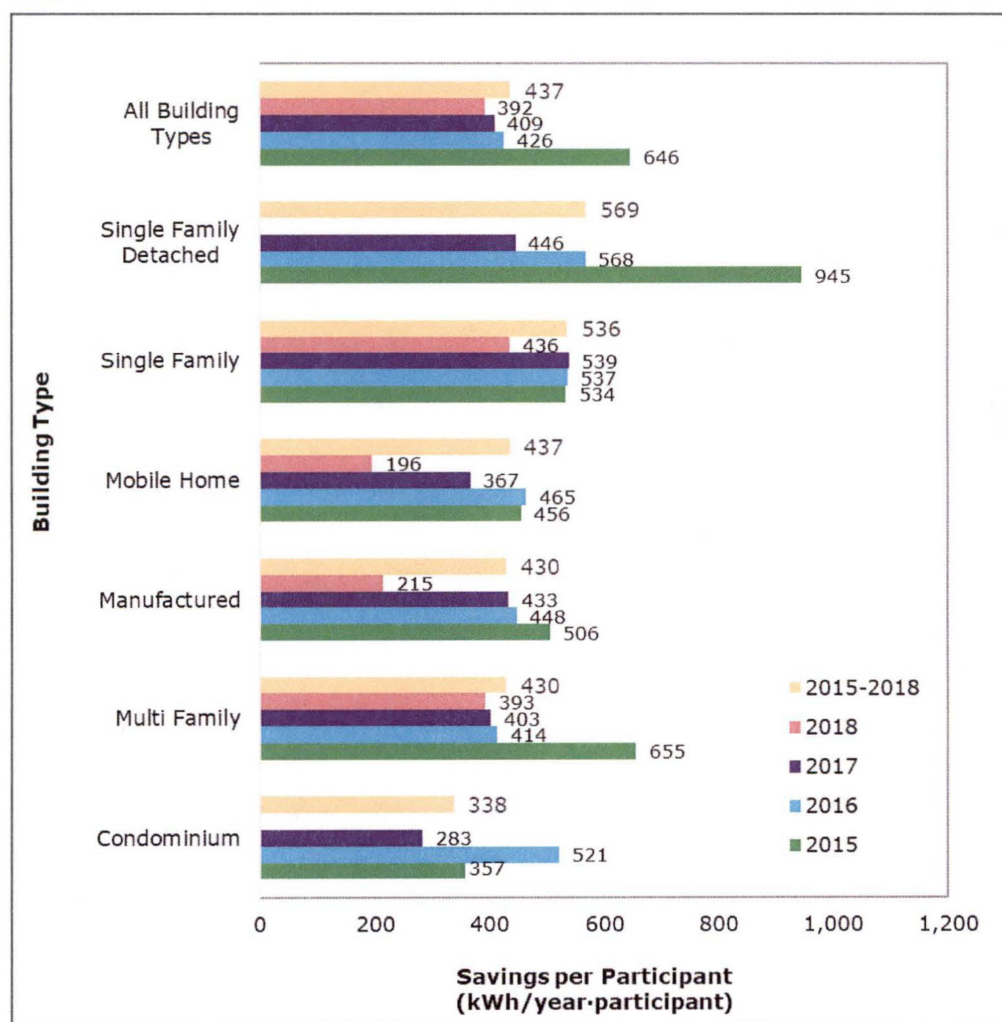
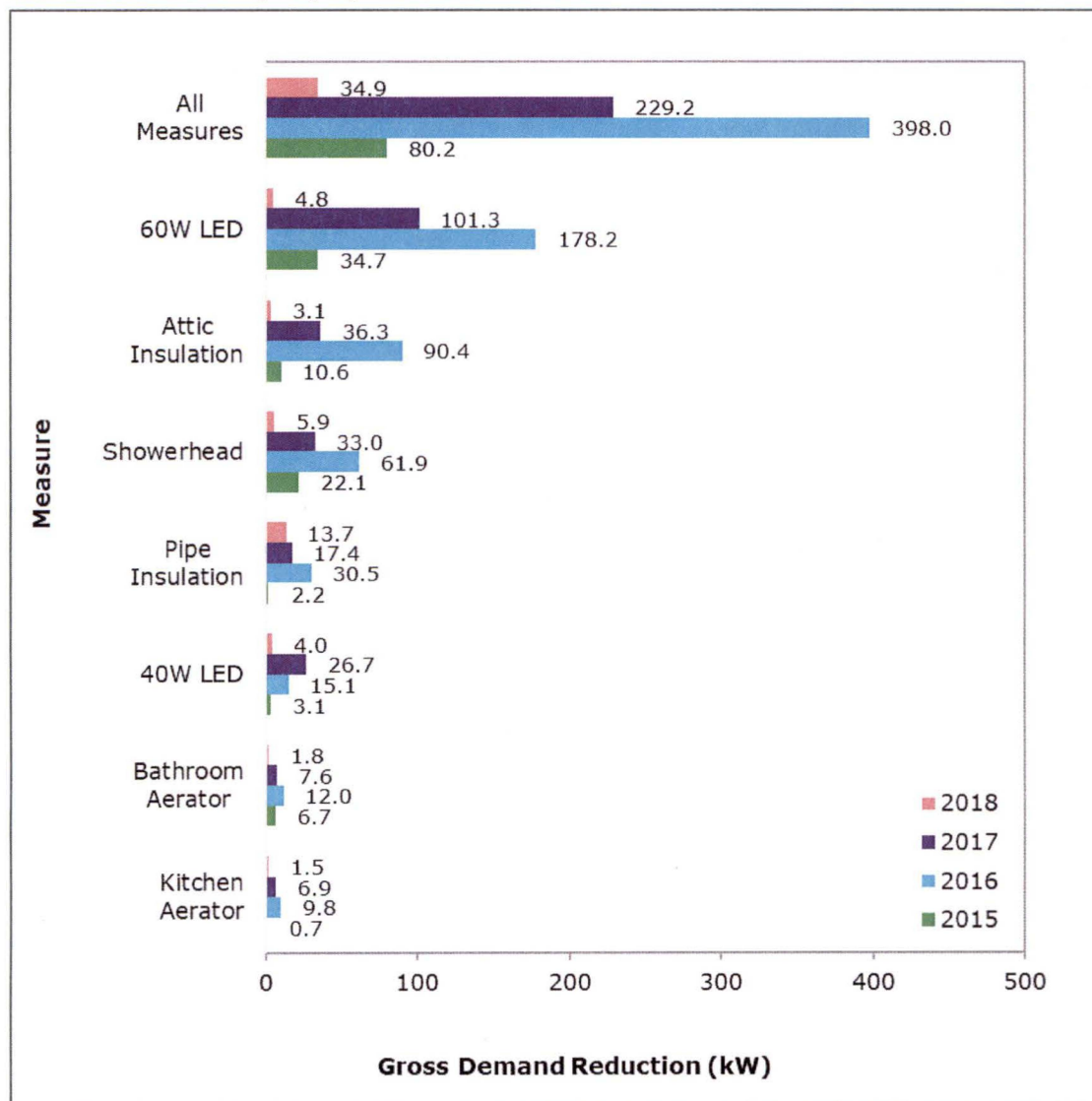


Figure 4-9 through Figure 4-11 show the Virginia program's gross demand reduction, and average demand reduction per participant (for participants who installed the measure in the respective years) by measure type and building type. Similar to energy savings, the top three measures that produce the highest gross



demand reduction and largest average gross demand reduction per participant are 60W LED, attic insulation, and showerhead.

**Figure 4-9. VA Residential Income and Age Qualifying Home Improvement Program Gross Demand Reduction (kW) by Measure and Year**



**Figure 4-10. VA Residential Income and Age Qualifying Home Improvement Program Average Gross Demand Reduction per Participant (kW/ participant) by Measure and Year**

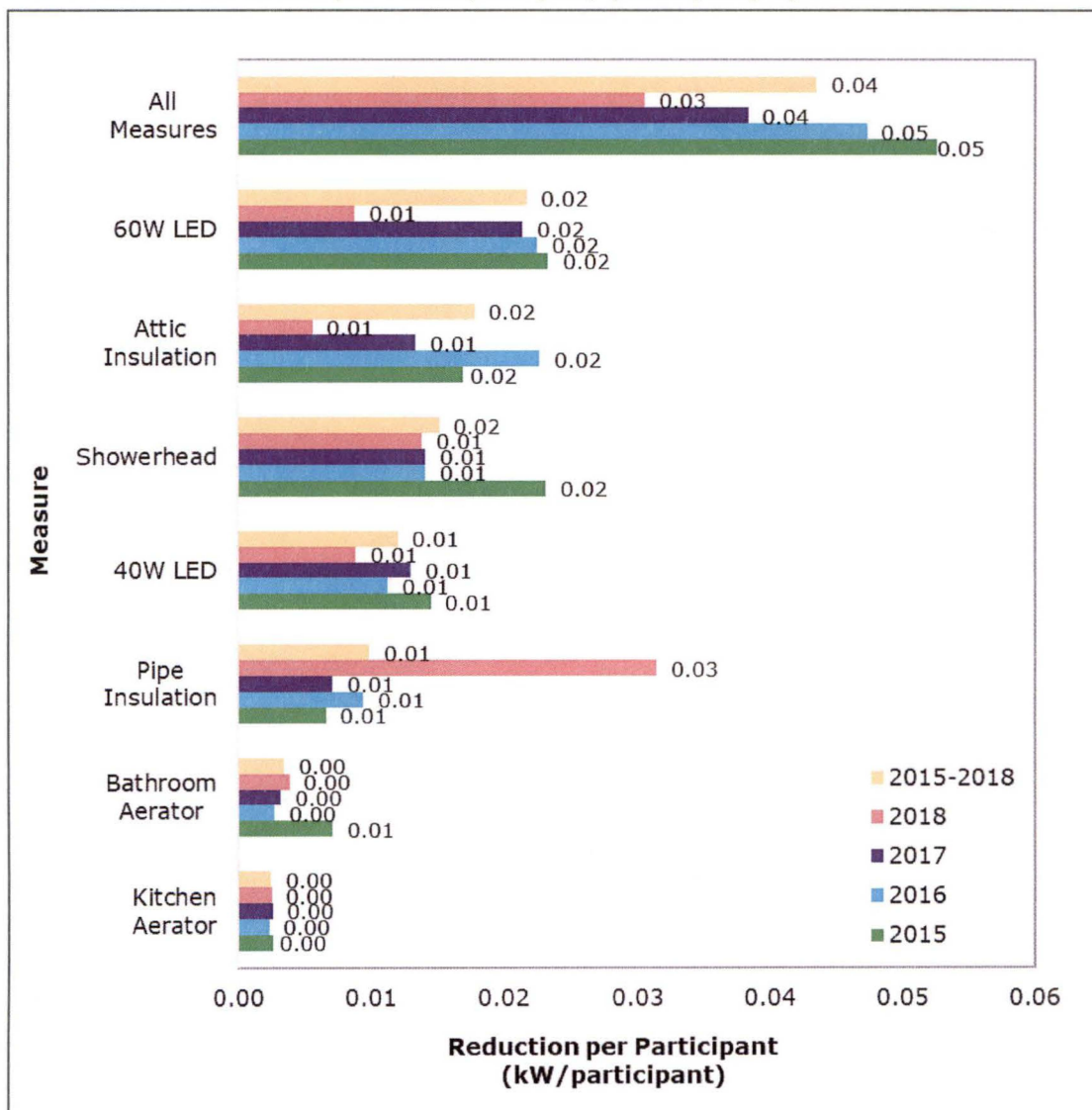
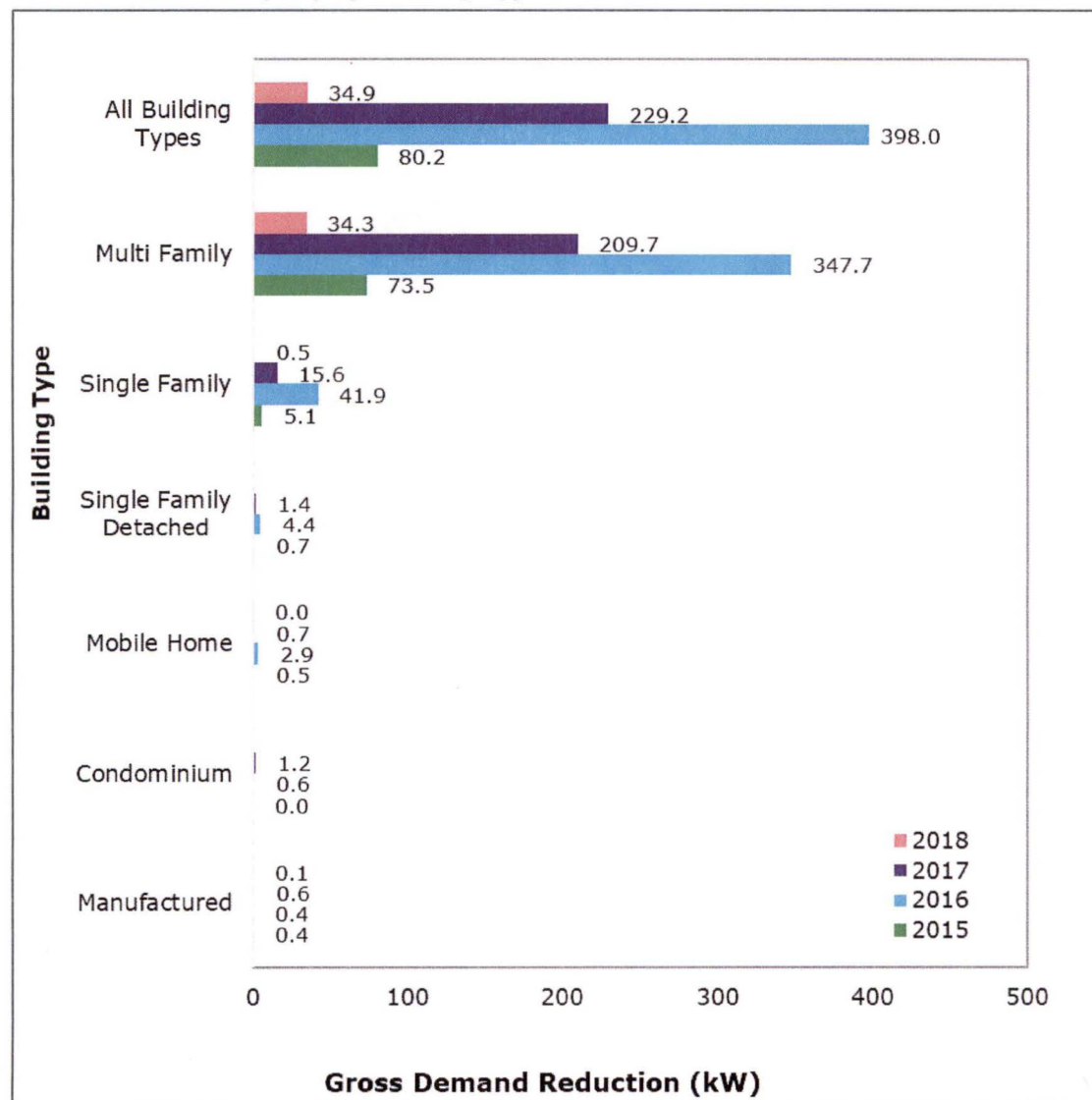




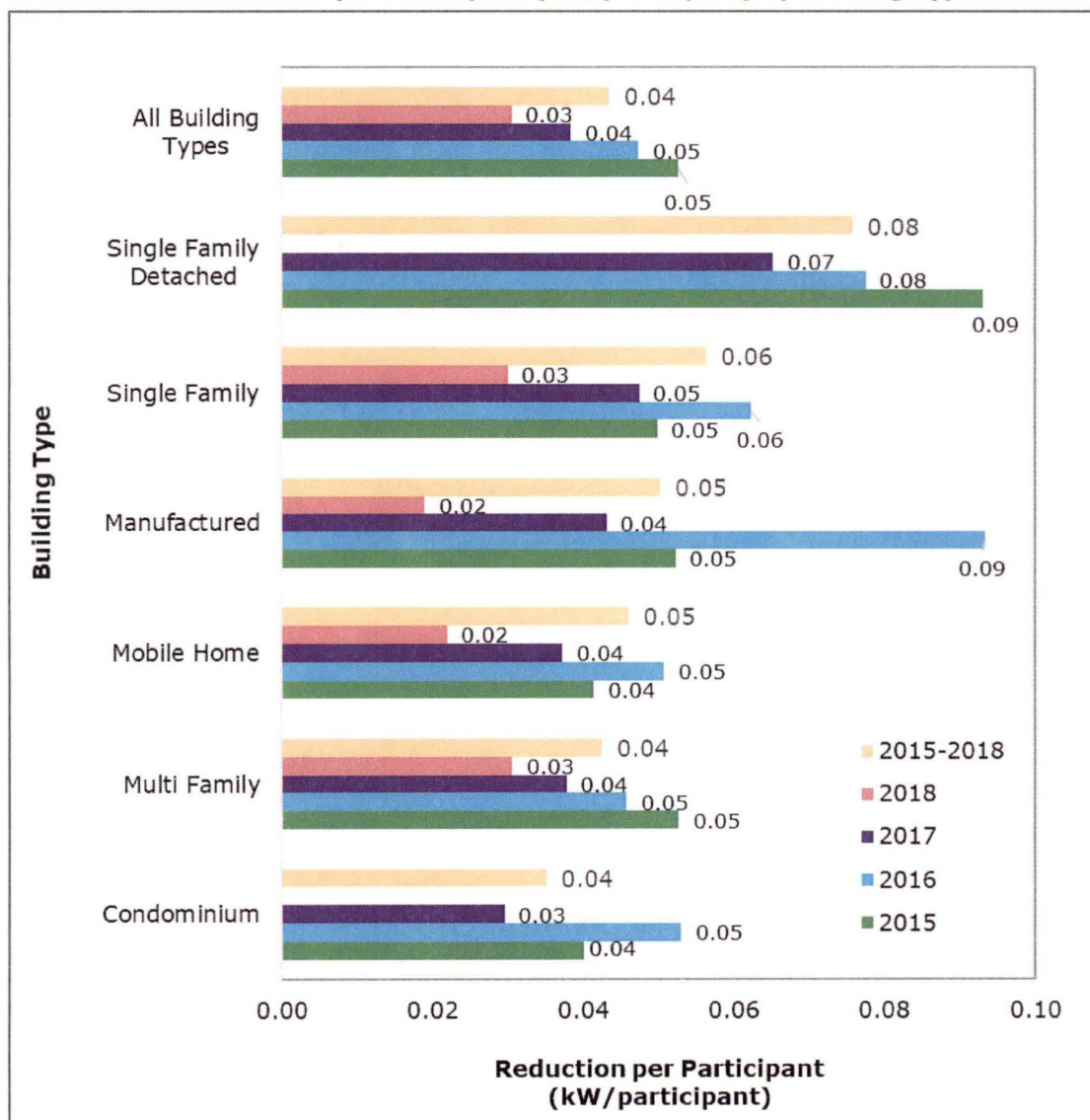
Figure 4-11 and Figure 4-12 show gross demand reduction and average gross demand reduction per participant, respectively. Similar to energy savings, they show that that multi-family buildings have the highest gross demand reduction.

**Figure 4-11. VA Residential Income and Age Qualifying Home Improvement Program Gross Demand Reduction (kW) by Building Type and Year**



While the relative difference between the average gross demand reduction per participant for each of the building types is not as clearly separated into six categories as for energy savings, single family homes still rank the highest, followed by manufactured, mobile, and multi-family buildings, and condominiums.

**Figure 4-12. VA Residential Income and Age Qualifying Home Improvement Program Average Gross Demand Reduction per Participant (kW/participant) by Building Type and Year**



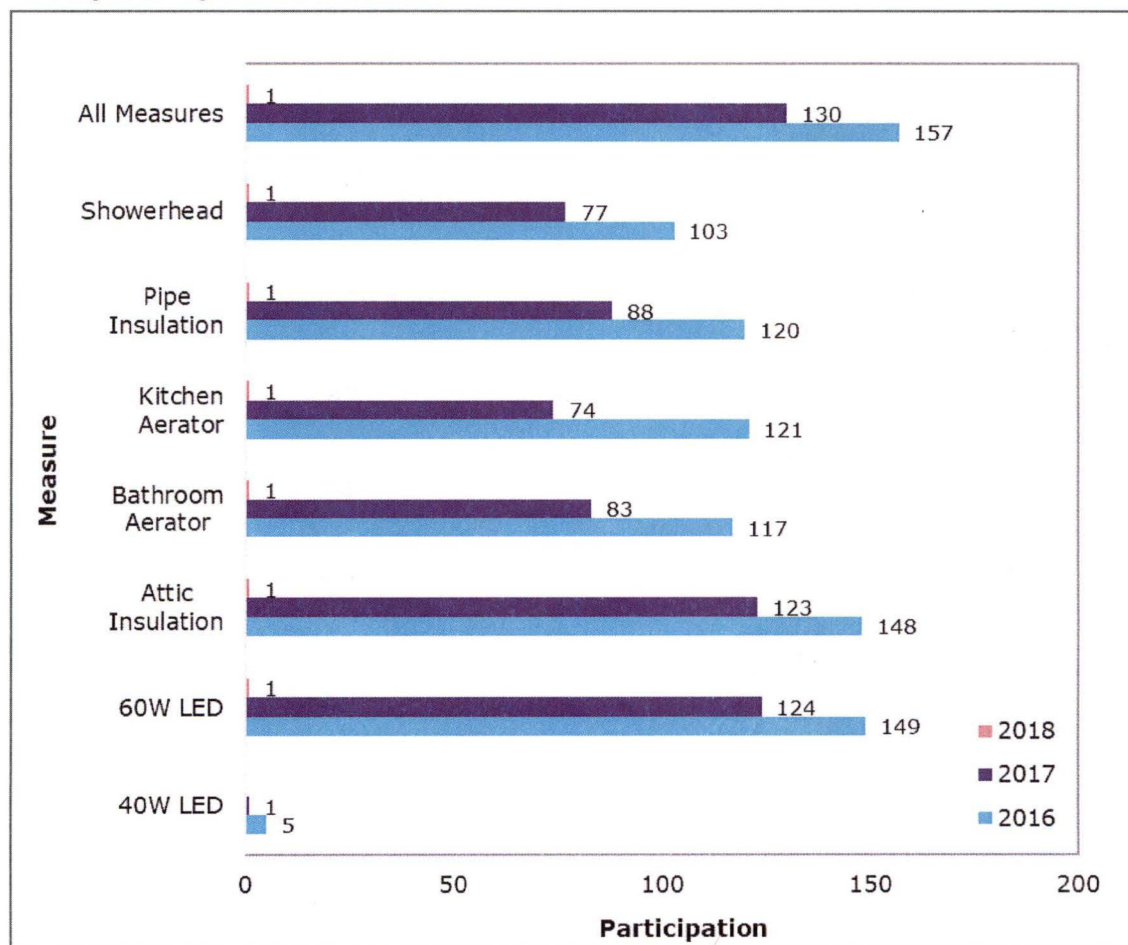


#### 4.1.2.5 Additional North Carolina Program Participant Data

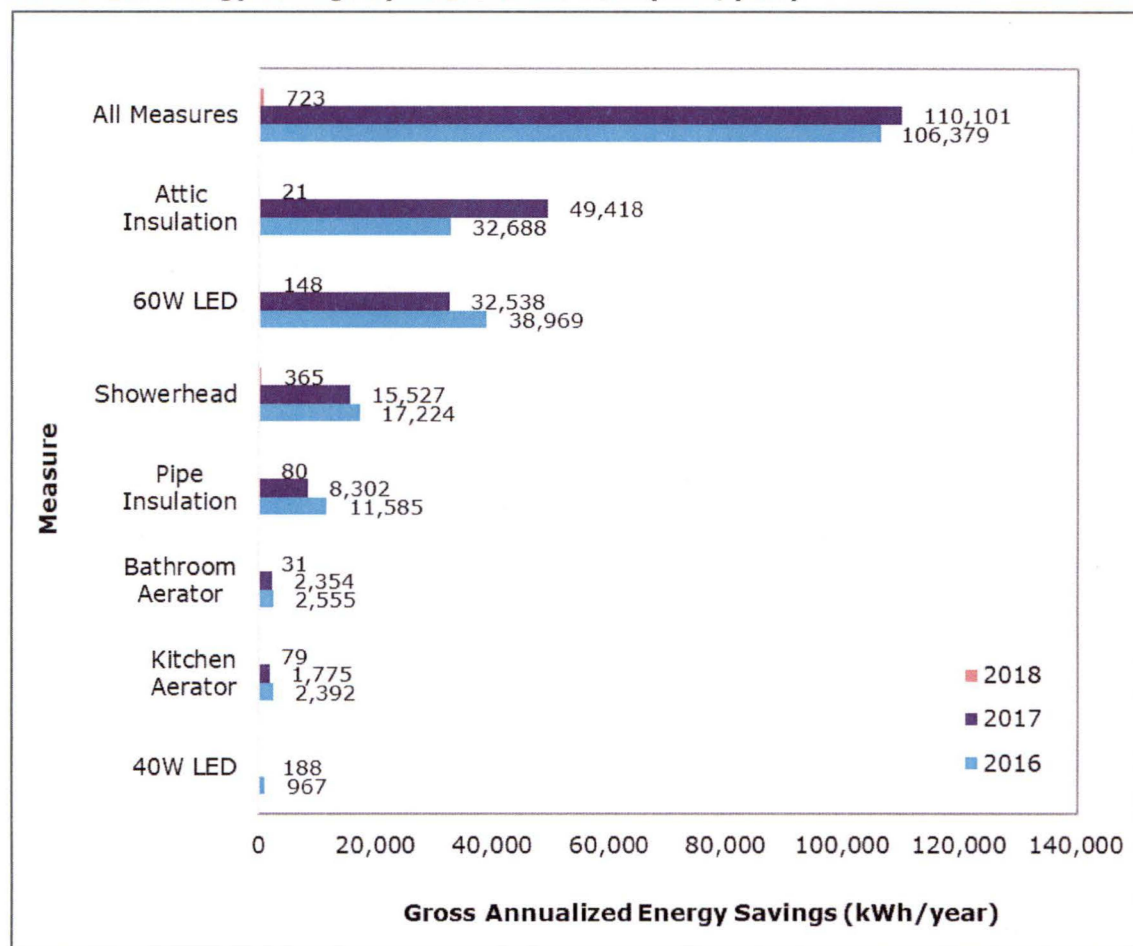
Figure 4-13 through Figure 4-15 show gross annualized energy savings, participation, and average annualized energy savings per participant (for participants who installed the measure in that year) by measure and by building type in North Carolina.

When reviewing this program cumulatively, from 2016 through 2018, most measures were adopted by more than 63% of all participants (except for the LED replacement of 40 W incandescent lamps). The two measures that had the greatest contributions to program gross annualized savings (LED replacement of 60 W incandescent lamps and attic insulation) were also the measures that were installed the most by participants and had the highest average savings per participant. When comparing 2018 results to previous years and cumulative for the program life, note the 2018 results were for a single program participant.

**Figure 4-13. NC Residential Income and Age Qualifying Home Improvement Program Participation by Measure and Year**

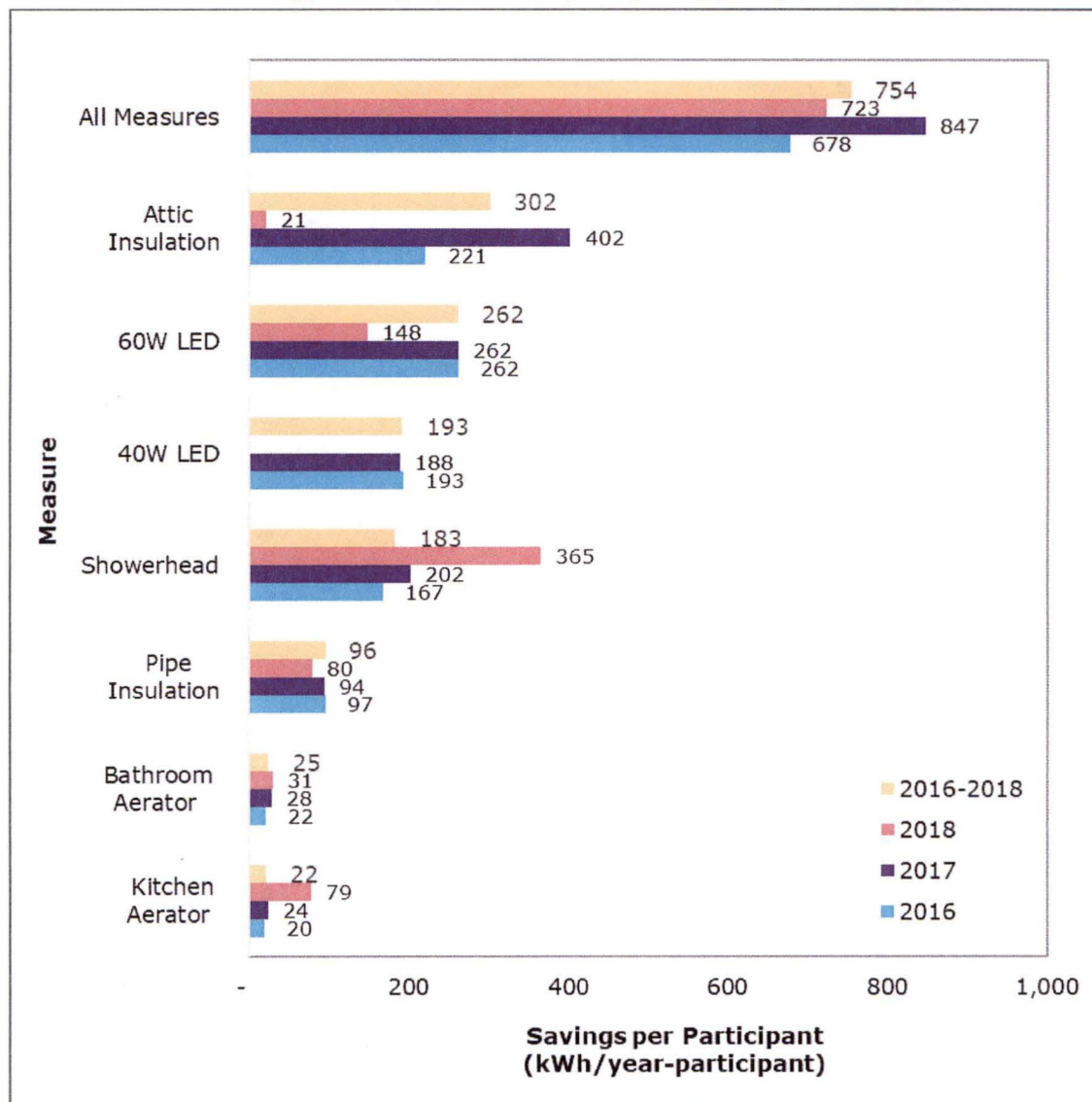


**Figure 4-14. NC Residential Income and Age Qualifying Home Improvement Program Gross Annualized Energy Savings by Measure and Year (kWh/year)**



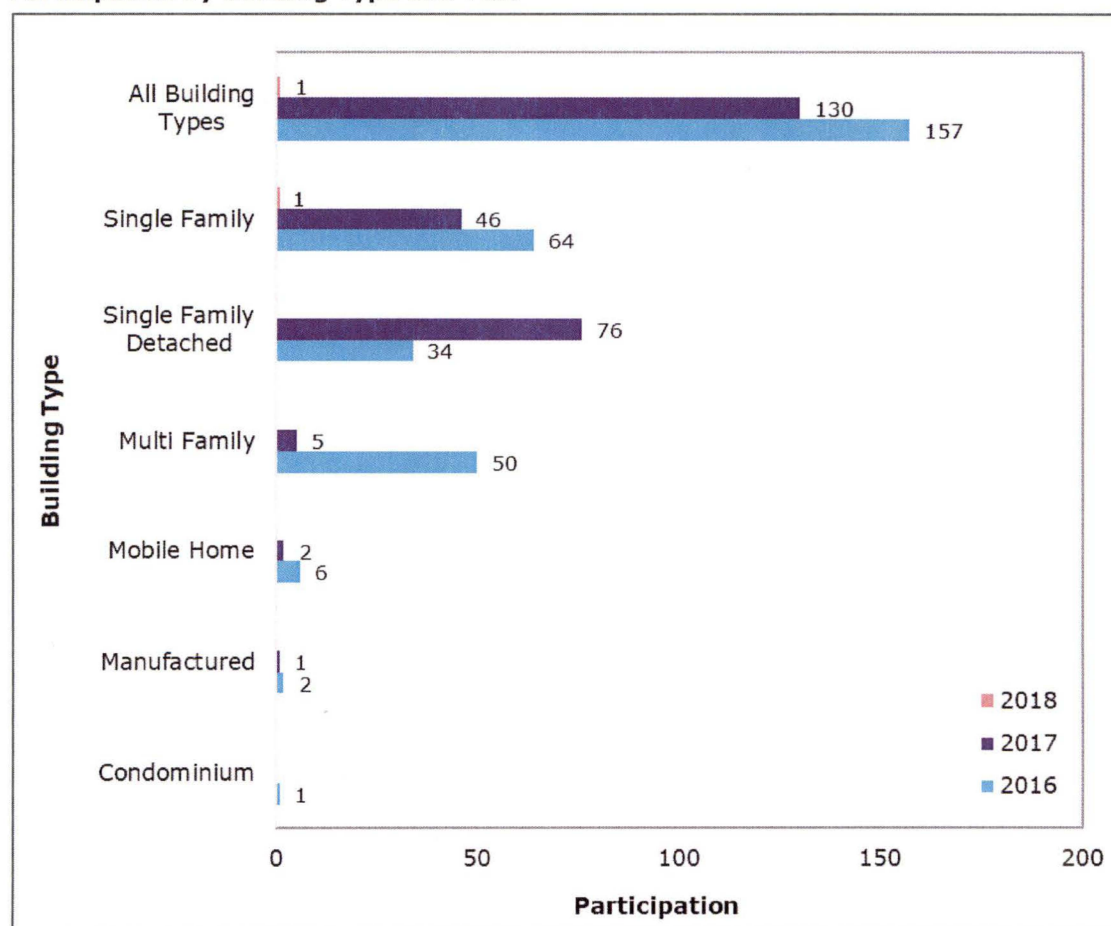


**Figure 4-15. NC Residential Income and Age Qualifying Home Improvement Program Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Measure and Year**



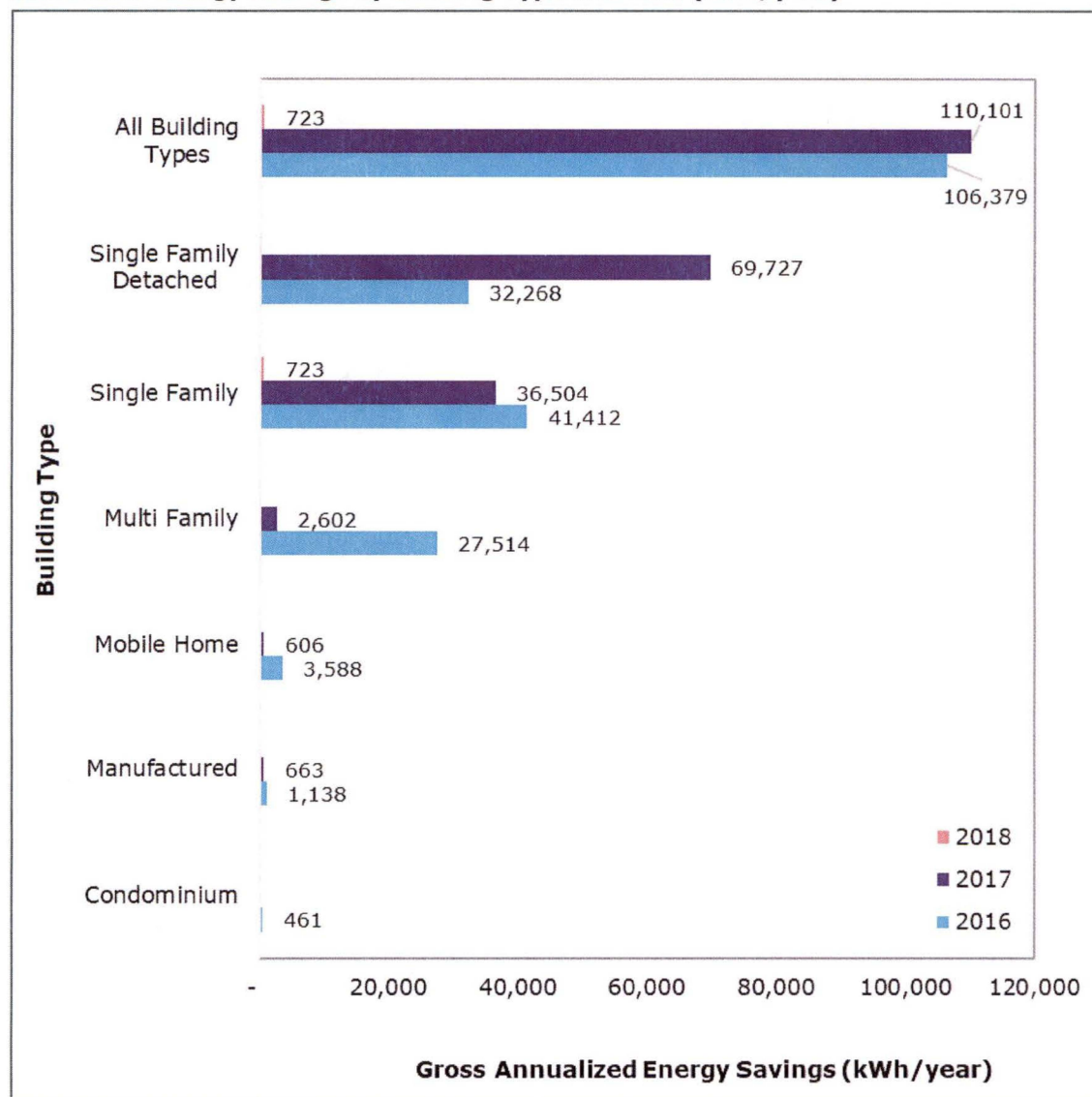
The differences between the Virginia and North Carolina program achievements may be explained by differences in the participant building type. In Virginia, the majority of participants lived in multi-family buildings. Figure 4-6 above shows that from 2016 through 2018, 92% of participants lived in multi-family buildings, 7% in single familiar buildings, and the remaining in other types. But, in North Carolina more participants lived in single family and single-family detached participants, and those same participants had the most savings, as shown in Figure 4-16 and Figure 4-17 on the following pages.

**Figure 4-16. NC Residential Income and Age Qualifying Home Improvement Program Participation by Building Type and Year**





**Figure 4-17. NC Residential Income and Age Qualifying Home Improvement Program Gross Annualized Energy Savings by Building Type and Year (kWh/year)**



Similar to what was observed in Virginia, single family and single-family detached homes had greater gross average savings per participant than all other home types (Figure 4-8).

Single family and single-family detached homes had gross average savings per participant for all years (2016 – 2018) of above 700kWh/year-participant; whereas all other home types had average per participant

savings, for all years (2016 – 2018), of 600 kWh/year·participant or below.

**Figure 4-18. NC Residential Income and Age Qualifying Home Improvement Program Average Gross Annualized Energy Savings per Participant (kWh/year·participant) by Building Type and Year**

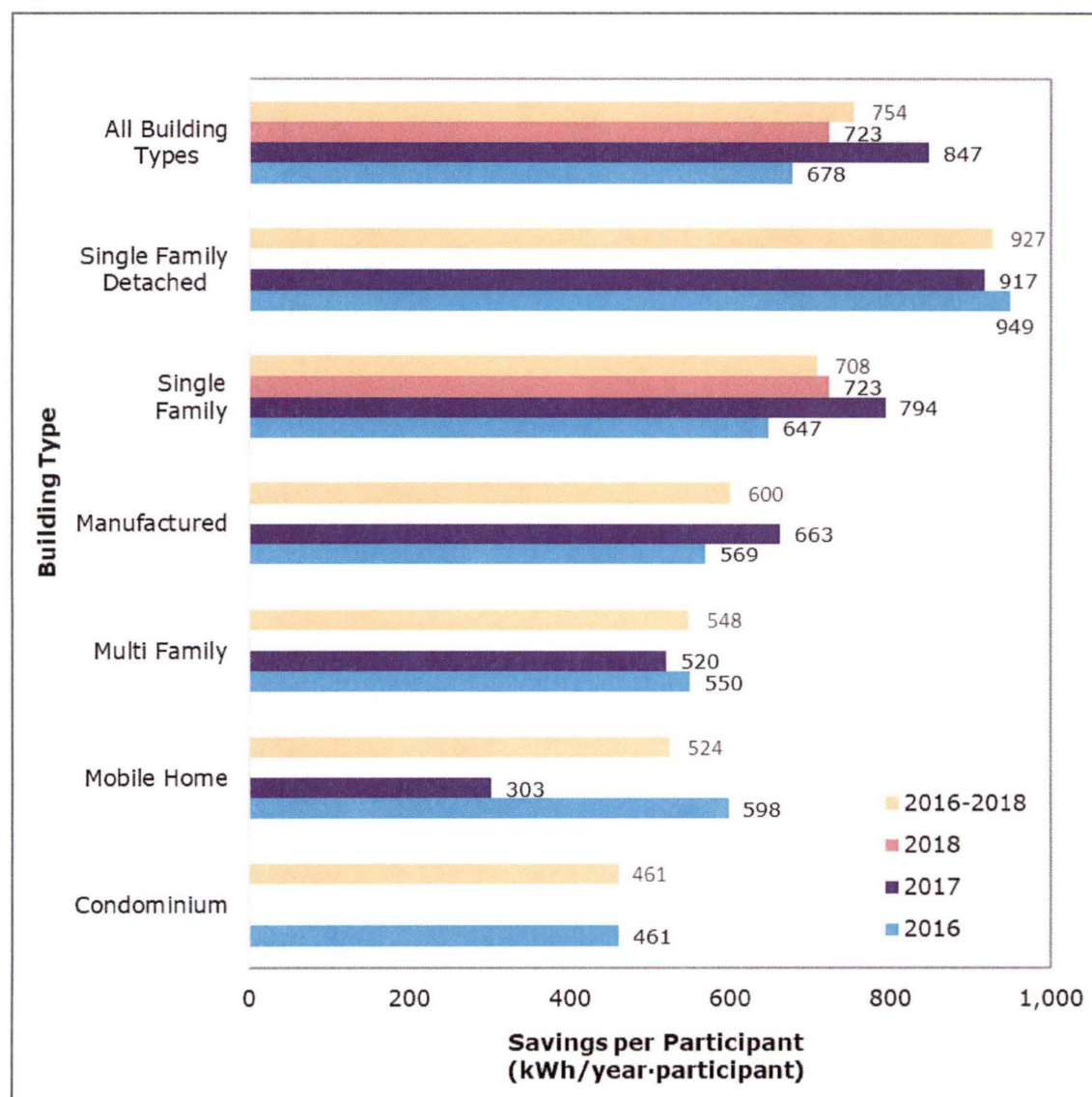
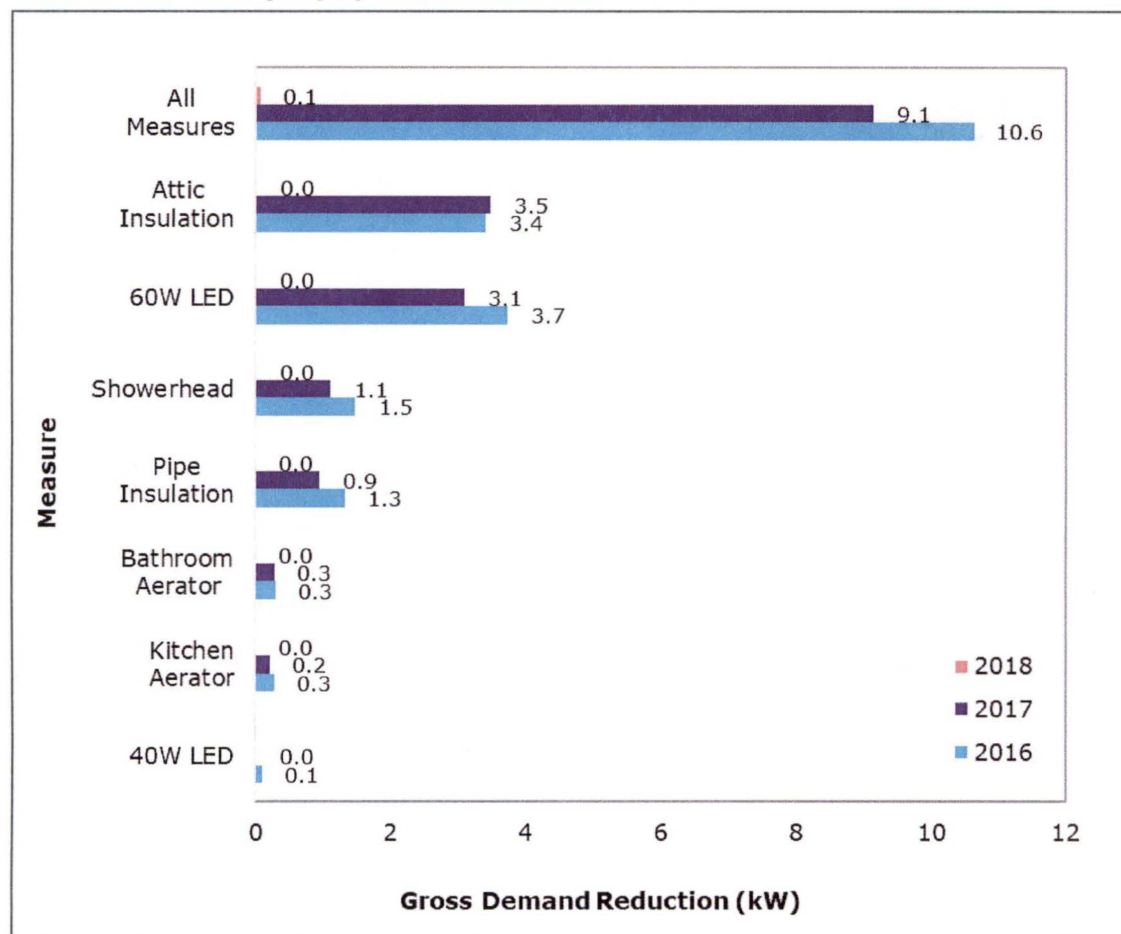


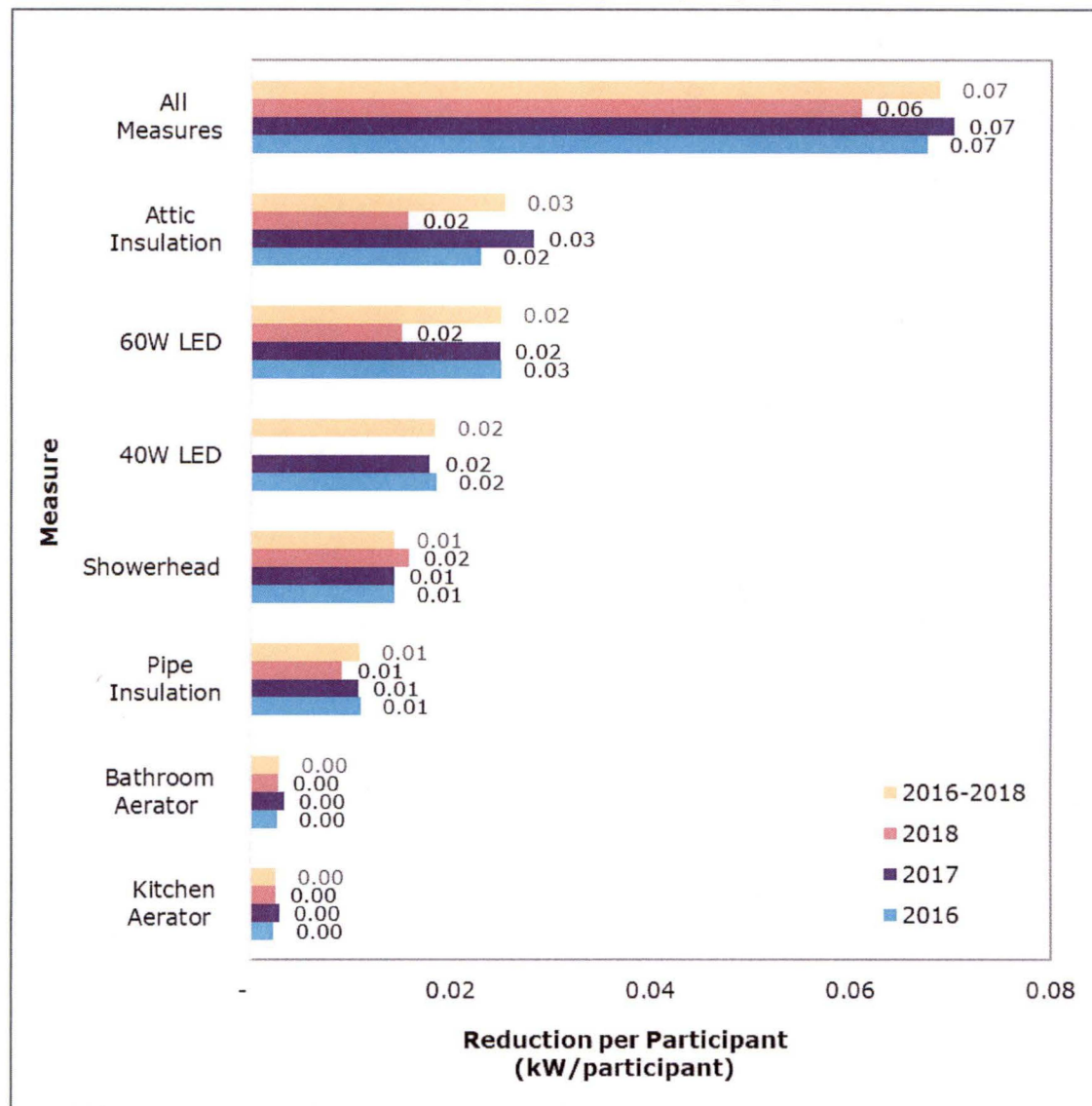
Figure 4-19 through Figure 4-22 show the North Carolina program's gross demand reduction, and average demand reduction per participant (for participants who installed the measure in the respective years) by measure type and building type. Similar to energy savings, the top measures that produced the highest gross demand reduction and largest average gross demand reduction per participant were attic insulation and 60W LED for measures installed in 2015 through 2018.

**Figure 4-19. NC Residential Income and Age Qualifying Home Improvement Program Gross Demand Reduction (kW) by Measure and Year**





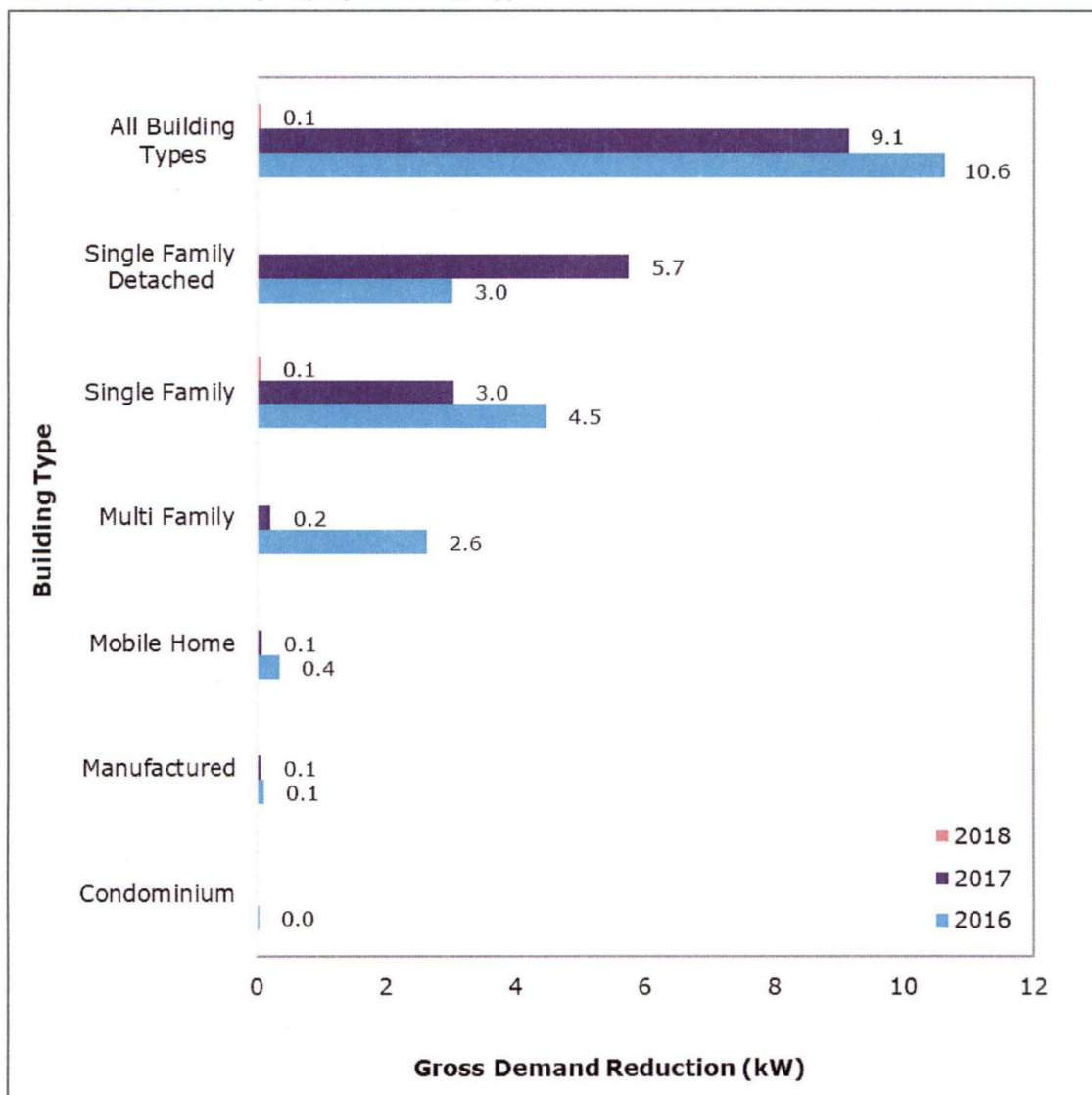
**Figure 4-20. NC Residential Income and Age Qualifying Home Improvement Program Average Gross Demand Reduction per Participant (kW/participant) by Measure and Year**



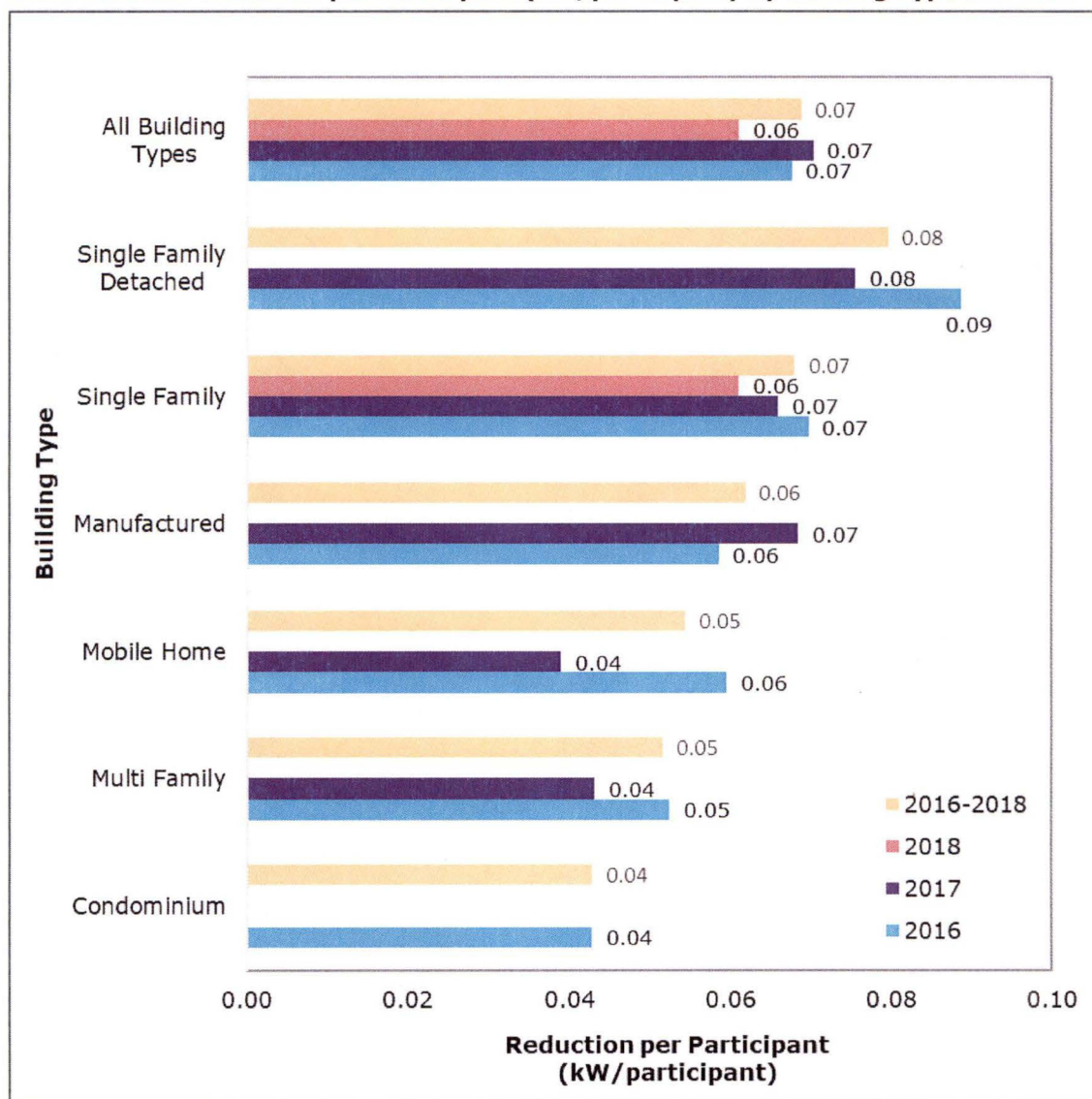
The trends seen in the North Carolina energy savings by building type charts, are mirrored in those seen in Figure 4-21 and Figure 4-22 for gross demand reductions, reconfirming that more North Carolina program

participants live in single family homes, with greater opportunities for both energy savings and demand reduction.

**Figure 4-21. NC Residential Income and Age Qualifying Home Improvement Program Gross Demand Reduction (kW) by Building Type and Year**



**Figure 4-22. NC Residential Income and Age Qualifying Home Improvement Program Average Gross Demand Reduction per Participant (kW/participant) by Building Type and Year**





#### 4.1.2.6 Comparison of Savings with Usage in Virginia

See Table 4-7 for a comparison of the 2018 program net adjusted savings in Virginia with the system-wide planned savings for the program, the annual usage for an average rate schedule, and the annual usage for eligible customers in the rate schedule. The program target rate schedule is Schedule 1, and eligible customers in the rate schedule are also assumed to be all customers in Schedule 1.

**Table 4-7. VA Residential Income and Age Qualifying Home Improvement Program Comparison of Savings with Usage by Rate Schedule**

Comparisons	Item	Value
<b>Schedule 1</b>		
<b>Comparison of Savings</b>	Systemwide Planned Savings	464 kWh/year·participant
	Net Adjusted Savings	314 kWh/year·participant
	Net Adjusted Savings as Percent of Planned Savings	84.5%
<b>Comparison to Average Annual Usage for Rate Schedule</b>	Average Annual Usage	13,831 kWh/participant <sup>20</sup>
	Net Adjusted Savings as Percent of Average Annual Usage	2.3%
<b>Comparison to Annual Usage of <u>Eligible Customers</u> in Rate Schedule</b>	Average Annual Usage	See "Comparison to Average Annual Usage for Rate Schedule"
	Net Adjusted Savings as Percent of Average Annual Usage	

## 4.2 Residential Retail LED Lighting – North Carolina



This program provided residential customers in the Company's North Carolina service territory with an instant discount for qualifying light-emitting diode (LED) light bulb purchases from a participating retailer. Qualifying bulbs will be those types that are commonly used, including general service (A-line) bulbs, specialty bulbs (candelabra base, globe, reflector) and small fixtures meeting ENERGY STAR® and Underwriters Laboratories standards. The instant rebates are marketed using a combination of in-store point-of purchase, direct mail, social media, and online communications.

The program limits customers to purchasing no more than 12 packages of participating LED light bulbs.

<sup>20</sup> FERC FINANCIAL REPORT FERC FORM No. 1: Annual Report of Major Electric Utilities, Licensees and Others and Supplemental Form 3-Q: Quarterly Financial Report." For Virginia Electric and Power Company. Year/Period of Report End of 2018/Q4. Filed 3/26/2019. Page 301, Line 2, Column D (Annual Usage); Page 301, Line 2, Column F (Average No Customers).

2017 was the first year of this two-year program, approved by the North Carolina Commission in Docket E-22, Sub 539 issued on December 20, 2016. 2018 is the second and final year that this program was available and will be reported on.

#### 4.2.1 Methods for the Current Reporting Period

DNV GL developed an EM&V Plan for this program, which is included in Appendix H. For the current period, the approach included reviewing the tracking data and then estimating gross energy savings and demand reductions. These were estimated by using STEP Manual equations and applying the assumed realization rate and NTG rate from the program design.

Table 4-8 outlines Dominion Energy's initial program planning assumptions that were used to design the program.

**Table 4-8. Residential LED Lighting Program Planning Assumptions in North Carolina**

Item	Description
Target Market	Residential, retail customers
NTG Factor	85%
Measure Life	20 years
Average Energy Savings (kWh) per Participant per Year	27.9 kWh per participant per year
Average Peak Demand Reduction (kW) per Participant	0.004 kW per participant per year
Average Rebate (US \$) per Participant	\$2.86 per participant

#### 4.2.2 Assessment of Program Progress Towards Plan

The next section describes the program's progress towards planned participants, energy savings, and demand reduction.

##### 4.2.2.1 Key North Carolina Program Data

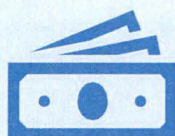
Key data highlights for enrollment, energy savings, demand reduction and program costs for North Carolina in 2018 are provided below. Following this summary, Table 4-9 provides performance indicator data from 2017 through December 31, 2018. Detailed program indicators by year and month are provided in Appendix B.2.



- For this program, a participant is counted as an individual LED lamp.
- In this second year, the program achieved 120% of its goal and incentivized the purchase of 264,236 lamps.
- Over its two-year program life, the program achieved 87% of its two-year participation goal.



- On average in 2018, a single lamp in the program saved 22 kWh/year of gross annualized energy and 19 kWh/year of net annualized energy.
- And over its two-year program life, the average lamp in the program saved 24 kWh/year of gross annualized energy and 21 kWh/year of net annualized energy.
- Compared to program design assumptions, on average, each lamp is saving approximately 25% less net annualized energy than initially anticipated.



- Compared to the initial program design, an average lamp was designed to have an incentive of \$2.86.
- The EM&V results over the two-year period show the rebate per participant was \$2.51, which is approximately 12% less than initially assumed.

**Table 4-9. NC Residential LED Lighting Program Performance Indicators (2018)**

Category	Item	North Carolina		
		2017 <sup>21</sup>	2018	2017-2018
Operations and Management Costs (\$)	Direct Rebate			
	Direct Implementation			
	Direct EM&V			
	Indirect Other (Administrative)	\$26,160	\$73,173	\$99,334
Total Costs (\$)	Total			
	Planned			
	Variance			
	Annual % of Planned	61%	111%	87%

<sup>21</sup> Values in the 2017 Installed Energy Savings (kWh/year) rows differ from those reported in the May 1, 2018 EM&V report in response to requests by the North Carolina Public Staff Utilities Commission Re: 2018 NC DSM Case – Docket No. E-22 Sub 545 and Sub 556 Data Request No. 05 (on September 28, 2018). The resulting two adjustments that were made affected the 2017 Purchased Energy Savings (kWh/year) calculations. First, an adjustment was made to Appendix F. Section 17, Residential Retail LED Lighting Program, Table 128. Input Parameter for LED Lighting Savings. The hours of use per year (HOU) value of 1,059 hours/year (Opinion Dynamics "Evaluation of the PH2015 Duke Energy Progress Energy Efficient Lighting Program" report, Dec. 5, 2016) was reduced to 920 hours/year (Northeast Energy Efficiency Partnership Mid-Atlantic Technical Reference Manual Version 7.0, May 2017). Second, there was a correction for the misapplication of the Non-residential Small Business Improvement NTG factor of 93% to the Residential Retail LED Lighting Program. The NTG rate was reduced to 85%, per program initial design assumptions, as documented in

Table 3-3. Net-to-Gross Factors and Sources by Program, and Table 4-8. Residential LED Lighting Program Planning Assumptions in North Carolina.



Category	Item	North Carolina		
		2017 <sup>21</sup>	2018	2017-2018
Participants	Total (Gross)	70,261	264,236	334,497
	Planned (Gross)	165,000	220,000	385,000
	Variance	-94,739	44,236	-50,503
	Annual % of Planned (Gross)	43%	120%	87%
Purchased Energy Savings (kWh/year)	Total Gross Deemed Savings	2,215,073	5,918,263	8,133,336
	Realization Rate Adjustment (100%)	0	0	0
	Adjusted Gross Savings	2,215,073	5,918,263	8,133,336
	Net-to-Gross Adjustment (85%)	-332,261	-887,739	-1,220,000
	Net Adjusted Savings	1,882,812	5,030,524	6,913,336
	Planned Savings (Net)	2,250,789	3,874,754	6,125,543
	Annual % Toward Planned Savings (Net)	84%	130%	113%
	Avg. Savings per Participant (Gross)	32	22	24
	Avg. Savings per Participant (Net)	27	19	21
Purchased Demand Reduction (kW)	Total Gross Deemed Demand	242.4	606.0	848.5
	Realization Rate Adjustment (100%)	0.0	0.0	0.0
	Adjusted Gross Demand	242.4	606.0	848.5
	Net-to-Gross Adjustment (85%)	-36.4	-90.9	-127.3
	Net Adjusted Demand	206.1	515.1	721.2
	Planned Demand (Net)	331.1	433.0	764.1
	Annual % Toward Planned Demand (Net)	62%	119%	94%
	Avg. Demand per Participant (Gross)	0.003	0.002	0.003
	Avg. Demand per Participant (Net)	0.003	0.002	0.002
Program Performance	Annual \$Admin. per Annual Participant (Gross)	\$0.37	\$0.28	\$0.30
	Annual \$Admin. per Annual kWh/year (Gross)	\$0.01	\$0.01	\$0.01
	Annual \$Admin. per Annual kW (Gross)	\$108	\$121	\$117
	Annual \$EM&V per Annual Total Costs (\$)	6.8%	6.6%	6.7%
	Annual \$Rebate per Annual Participant (Gross)	\$1.87	\$2.68	\$2.51

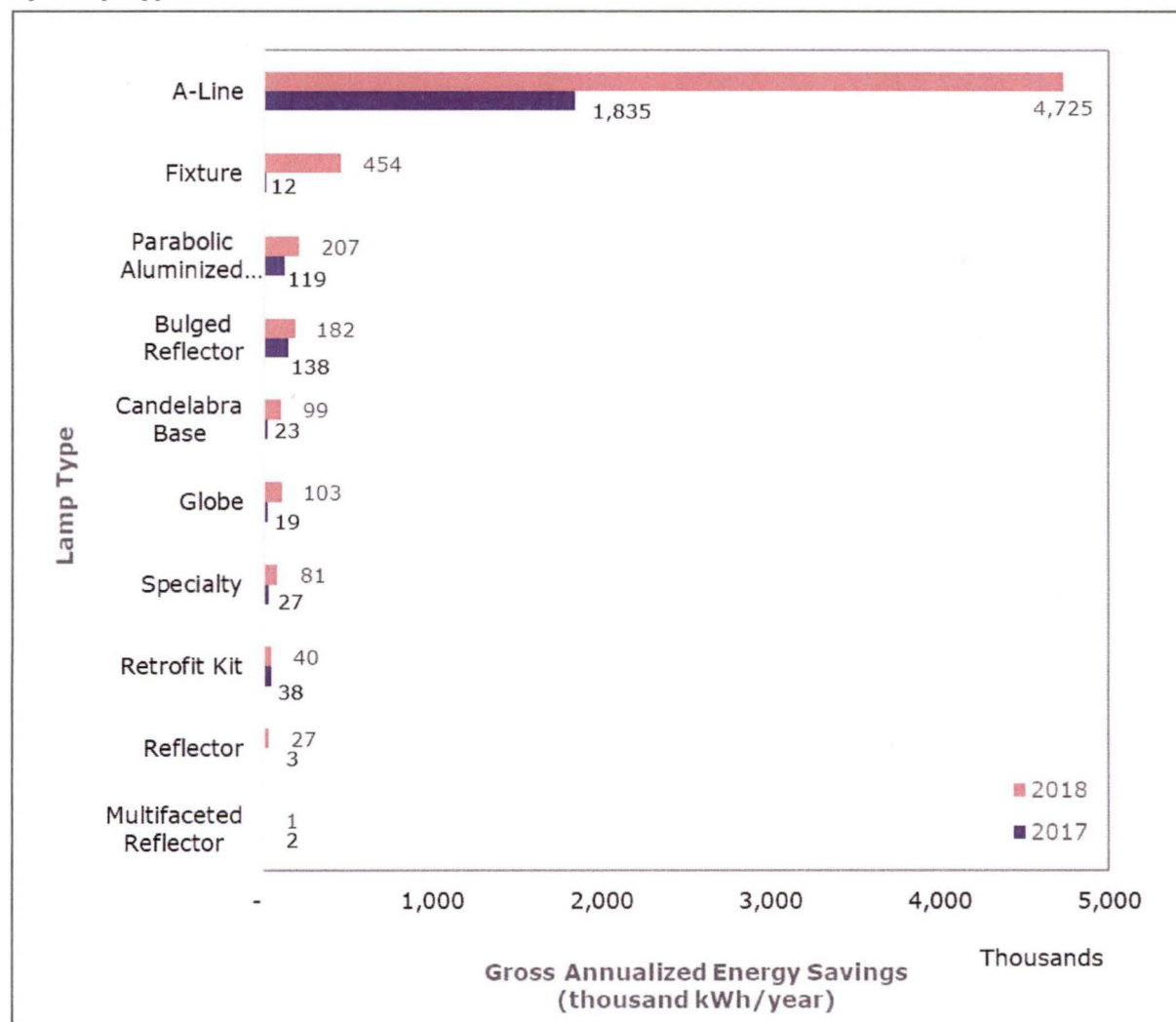
These differences between the initial program planned results and the EM&V results may be due to differences in the assumed mixture of lamp types (e.g., general service, globe, reflector) that would be purchased versus the actual lamp types that were purchased.

#### 4.2.2.2 Additional North Carolina Program Participant Data

The figures in this section (Figure 4-23 through Figure 4-24) show that this program offers a variety of LED lighting options, and by a number of manufacturers and retailers.

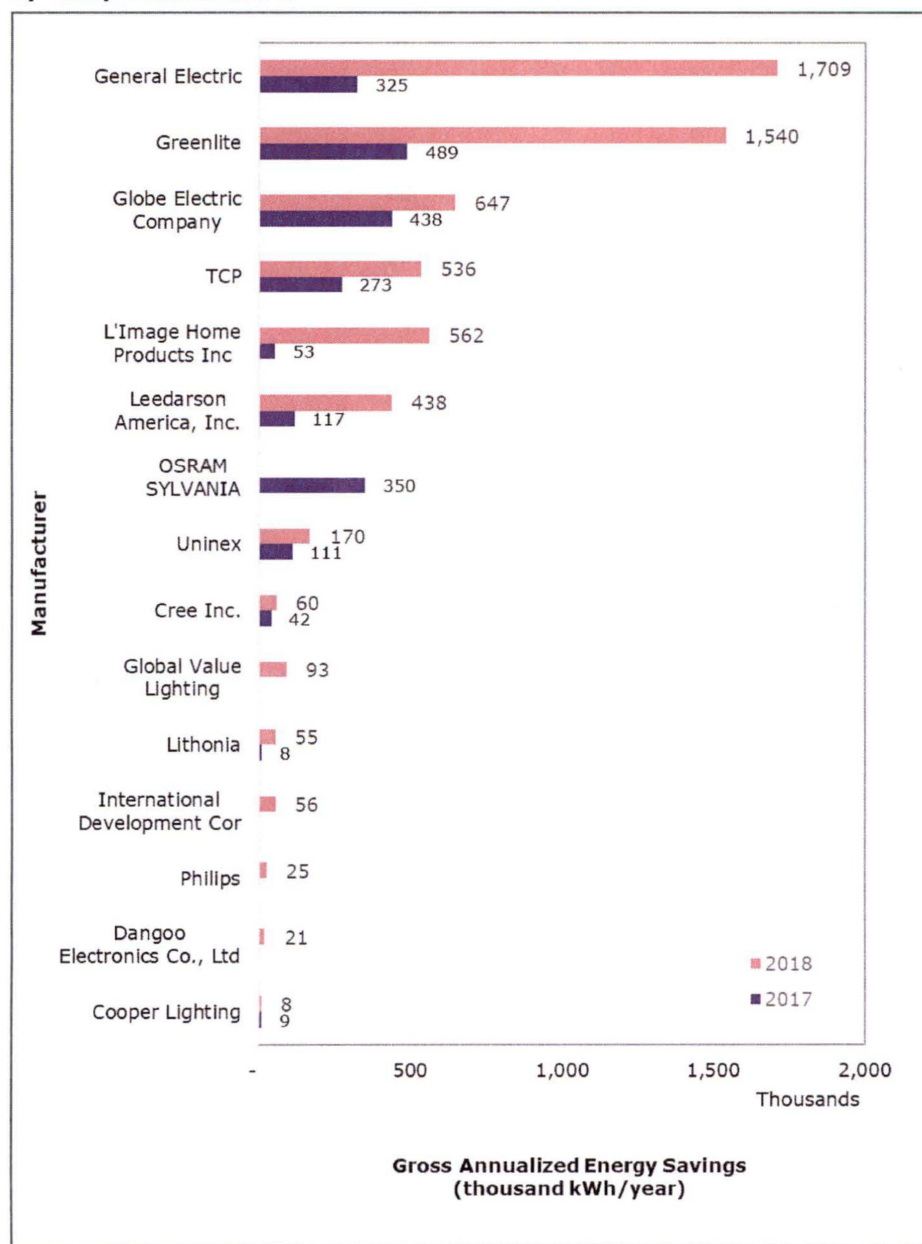
The LED measure that produced the highest savings for this program—in both 2017 and 2018—was the A-line lamp. Over the life of the program, A-line LED lamps produced 6,559,903 kWh of gross annualized energy savings and 81% of all program savings. The measure type that yielded the second-highest gross annualized savings was fixtures, which accounted for 6% of all program savings over both years.

**Figure 4-23. NC Residential LED Lighting Program Gross Annualized Energy Savings (MWh/year) by Lamp Type**



In 2018, customers purchased incentivized LED lamps made by 15 manufacturers as shown in Figure 4-24. Four of these manufacturers were new to the program in 2018. In terms of total program savings for 2017 and 2018, the top five manufacturers were General Electric, Greenlite, Globe Electric Company, TCP, and L'Image Home Products, Inc. Purchased LED lamps from these manufacturers produced 6,571,671 kWh of savings per year, which translates to approximately 81% of total program savings.

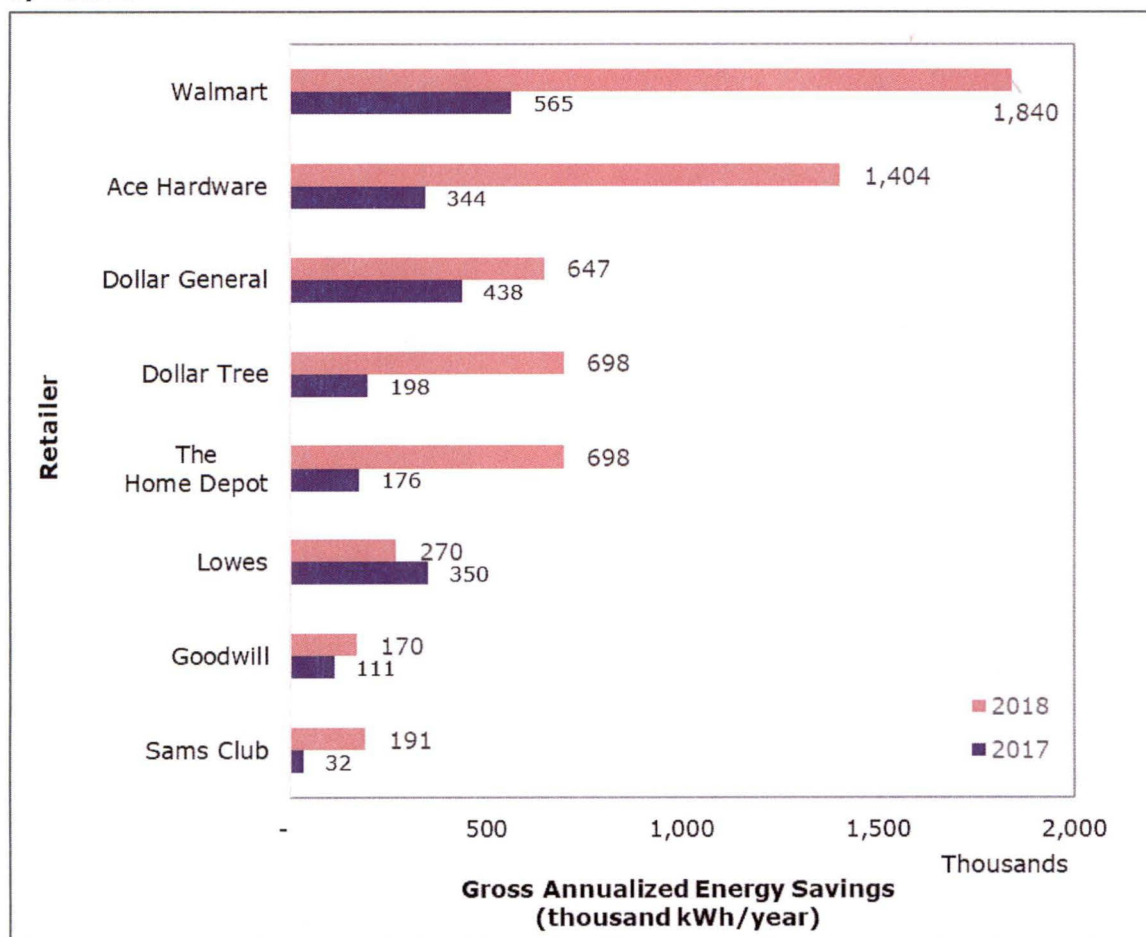
**Figure 4-24. NC Residential LED Lighting Program Gross Annualized Energy Savings (MWh/year) by Lamp Manufacturer**





Customers purchased program incentivized LED lamps from eight different retailers, as shown in Figure 4-25. The top four of them (Walmart, Ace Hardware, Dollar General, and Dollar Tree) accounted for approximately 75% of the total program savings in 2017 and 2018, combined.

**Figure 4-25. NC Residential LED Lighting Program Gross Annualized Energy Savings (MWh/year) by Retailer**



## 5 ENERGY EFFICIENCY PROGRAMS – NON-RESIDENTIAL

This section reports on non-residential EE program progress in 2018 for the following five non-residential EE programs. They are all available in both states.

1. Non-residential Lighting Systems & Controls (DSM Phase III)
2. Non-residential Heating and Cooling Efficiency (DSM Phase III)
3. Non-residential Window Film (DSM Phase III)
4. Non-residential Small Business Improvement (DSM Phase V)
5. Non-residential Prescriptive (DSM Phase VI)

Of the active programs in 2018, the 2018 non-residential EE programs accounted for the following proportions out of the portfolio of EE programs:

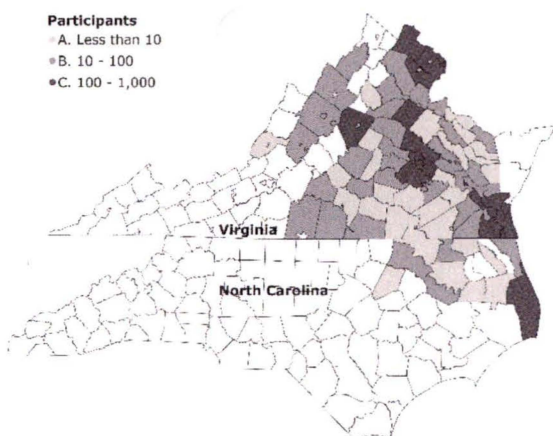
- 1% of all program participants across the Company's active program year 2018 residential and non-residential programs;
- 93% of net annualized savings across all active program year 2018 programs; and
- 90% of spending across all active program year 2018 programs

Figure 5-1 and Figure 5-2 on the next page show the cumulative count of non-residential EE program participation and gross annualized energy savings in Virginia and North Carolina at the county level, for the programs that were active in program year 2018. The deeper the color, the greater the participation and gross annualized energy savings.

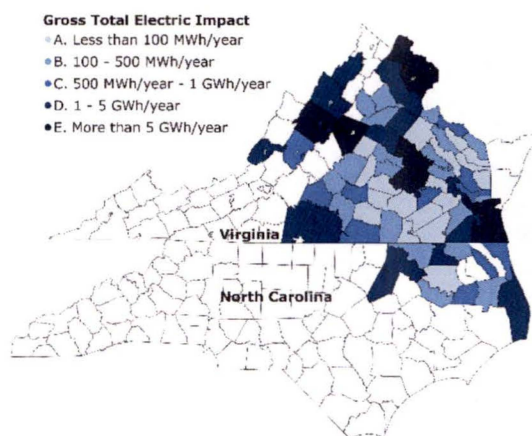
Figure 5-1 shows participation is greatest in the areas of Fairfax, Henrico, and Virginia Beach City (in decreasing order). In North Carolina, the jurisdictions with the highest participation are Dare, Halifax, and Currituck counties (in decreasing order).

Unlike the residential maps, Figure 5-2 shows that the jurisdictions with the highest gross annualized energy savings are Fairfax, Henrico, and Chesterfield (in decreasing order). In North Carolina, the jurisdictions with the highest savings are Halifax, Dare, and Nash.

**Figure 5-1. VA and NC Non-residential Energy Efficiency Program Participation Map (Active Programs), by County, Inception to December 31, 2018**



**Figure 5-2. VA and NC Non-residential Energy Efficiency Program Gross Annualized Energy Savings Map (Active Programs), by County, Inception to December 31, 2018**



## 5.1 Non-residential Lighting Systems & Controls – Virginia and North Carolina

The Non-residential Lighting Systems & Controls Program offers non-residential customers rebate incentives to retrofit their existing inefficient lighting system with a more cost-effective, energy-efficient lighting system. The program provides rebates for the following types of measures:

- T8 with electronic ballast
- High-performance T8
- T5 with electronic ballast
- CFLs
- LEDs
- Occupancy sensors

This program is implemented through a contractor network, so customers must contact a participating contractor to be eligible for the rebate. All Dominion Energy non-residential customers are eligible except those who are exempt by statute, special contract, or have opted-out. Customers are not considered participants until a completed application form is processed and a rebate is issued. This process can take several months, as customers have 45 days to submit their rebate application and Dominion Energy has 90 days to process it.



The SCC approved the DSM Phase III programs in Virginia on April 29, 2014 (Case No. PUE-2013-00072). In North Carolina, this program was approved on October 27, 2014 (Docket No. E-22, Sub 508). Upon approval, the Company worked to finalize data systems, build contractor networks, and finalize implementation details in both states.

In 2018, a similar proportion of Virginia program participants received rebates (73%) as compared to their contractors (27%) when compared to 2017 (75% went to program participants and 25% went to the contractor). In North Carolina, 78% of rebates were paid to contractors—an increase of 56% from 2017.

Table 5-1 provides the breakdown of rebate assignment by state for 2018.

**Table 5-1. Percent of 2018 Non-residential Lighting Systems & Controls Participants Who Assigned Rebates Directly to Contractors**

State	Percent of Rebates Given to Customers	Percent of Rebates Given to Contractors
VA	73%	27%
NC	22%	78%
<b>Total</b>	70%	30%

### 5.1.1 Methods for the Current Reporting Period

DNV GL developed an EM&V Plan for this program, which is included in Appendix I. For the current period, the approach included reviewing the tracking data, then estimating gross energy and demand savings using STEP Manual calculations.

Table 5-2 outlines Dominion Energy's initial program planning assumptions that were used to design the program. DNV GL uses the planned NTG factor in its net savings calculations until it can be verified through EM&V.

**Table 5-2. Non-residential Lighting Systems and Controls Program Planning Assumptions System-wide**

Item	Description
Target Market	Non-residential
NTG Factor	70%
Measure Life	9 years
Average Energy Savings (kWh) per Participant per Year	18,259 kWh per participant per year
Average Peak Demand Reduction (kW) per Participant	5.1 kW
Average Rebate (US \$) per Participant	\$2,957

## 5.1.2 Assessment of Program Progress Towards Plan

The next section describes the program's progress towards planned participants, energy savings, and demand reduction.

### 5.1.2.1 Key Virginia Program Data

Key data highlights for enrollment, energy savings, demand reduction and program costs for Virginia in 2018 are provided below. Following this summary, Table 5-3 provides performance indicator data from May 1, 2014 through December 31, 2018. Detailed program indicators by year and month are provided in Appendix A.2.



- A total of 649 customers participated in the program in 2018, which was about 36% of planned participation.
- Participation decreased 25% from 2017 (868 participants).

- The program achieved net energy savings of 31,610,279 kWh/year, 78% of its planned target.
- The average net energy savings per participant was 48,706 kWh—this is 19% higher than the average over the lifetime of the program.
- The program achieved a net demand reduction of 5,055.6 kW, 70% of its planned target.
- The average net demand reduction per participant was 7.8 kW—this is on par with the average over the lifetime of the program.



The same or greater savings achieved by fewer projects or applications contributes to the overall cost efficiency of the program.



**Table 5-3. VA Non-residential Lighting Systems & Controls Program Performance Indicators (2014-2018)**

Category	Item	Virginia					
		2014	2015	2016 <sup>22</sup>	2017	2018	Program Total (2014-2018)
Operations and Management Costs (\$)	Direct Rebate						
	Direct Implementation						
	Direct EM&V						
	Indirect Other (Administrative)	\$39,157	\$191,137	\$214,891	\$351,449	\$351,760	\$1,148,395
Total Costs (\$)	Total						
	Planned						
	Variance						
	Cumulative % of Planned	43%	123%	132%	170%	99%	119%
Participants	Total (Gross)	118	1,241	1,203	868	649	4,079
	Planned (Gross)	688	1,504	1,531	1,553	1,807	7,083
	Variance	-570	-263	-328	-685	-1,158	-3,004
	Cumulative % of planned (Gross)	17%	83%	79%	56%	36%	58%
Installed Energy Savings (kWh/year)	Total Gross Deemed Savings	4,749,693	50,828,062	65,876,985	71,024,607	45,157,541	237,636,888
	Realization Rate Adjustment (100%)	0	0	0	0	0	0
	Adjusted Gross Savings	4,749,693	50,828,062	65,876,985	71,024,607	45,157,541	237,636,888
	Net-to-Gross Adjustment (70%) <sup>23</sup>	-1,424,908	-15,248,419	-19,763,096	-21,307,382	13,547,262	-71,291,066
	Net Adjusted Savings	3,324,785	35,579,643	46,113,890	49,717,225	31,610,279	166,345,821

<sup>22</sup> The 2016 total gross deemed savings values reported in this table differs from values in the May 1, 2017 EM&V report and have been refiled with the Commission. The adjustments totaled 14,862,478 kWh/year and 168 kW for 2016 reported savings. The adjustments account for corrections to STEP Manual version 7.0.0 issued on May 1, 2017, in section 9.1.1. The adjustment was to waste heat factors (WHFe and WHFd) applied to lighting fixtures installed in 2016, where the program participant building HVAC systems was assumed to be heat pump heating and cooling systems, rather than the previous assumption of AC cool and non-electric heat systems. This adjustment was made in response to requests by the North Carolina Public Staff Utilities Commission Re: Docket No. E-22, Sub 545, on October 23, 2017. It is reflected in STEP Manual version 8.0.0 in this EM&V report.

<sup>23</sup> 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 all participants who responded (from program inception to the end of this reporting period), the implementation vendor has calculated that 97% 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.



Category	Item	Virginia					
		2014	2015	2016 <sup>22</sup>	2017	2018	Program Total (2014-2018)
	Planned Savings (Net)	12,317,239	27,461,536	24,119,220	33,214,031	40,368,376	137,480,402
	Cum. % Toward Planned Savings (Net)	27%	130%	191%	150%	78%	121%
	Avg. Savings per Participant (Gross)	40,252	40,957	54,761	81,826	69,580	58,259
	Avg. Savings per Participant (Net)	28,176	28,670	38,332	57,278	48,706	40,781
Installed Demand Reduction (kW)	Total Gross Deemed Demand	998.5	10,674.2	15,380.0	11,958.2	7,222.3	46,233.2
	Realization Rate Adjustment (100%)	0.0	0.0	0.0	0.0	0.0	0.0
	Adjusted Gross Demand	998.5	10,674.2	15,380.0	11,958.2	7,222.3	46,233.2
	Net-to-Gross Adjustment (70%) <sup>24</sup>	-299.5	-3,202.3	-4,614.0	-3,587.5	-2,166.7	-13,870.0
	Net Adjusted Demand	698.9	7,472.0	10,766.0	8,370.8	5,055.6	32,363.2
	Planned Demand (Net)	3,228.9	7,670.4	4,089.4	5,486.3	7,269.0	27,744.0
	Cum. % Toward Planned Demand (Net)	22%	97%	263%	153%	70%	117%
	Avg. Demand per Participant (Gross)	8.5	8.6	12.8	13.8	11.1	11.3
	Avg. Demand per Participant (Net)	5.9	6.0	8.9	9.6	7.8	7.9
Program Performance	Cum. \$Admin. per Cum. Participant (Gross)	\$332	\$154	\$179	\$405	\$542	\$282
	Cum. \$Admin. per Cum. kWh/year (Gross)	\$0.01	\$0.00	\$0.00	\$0.00	\$0.01	\$0.00
	Cum. \$Admin. per Cum. kW (Gross)	\$39	\$18	\$14	\$29	\$49	\$25
	Cum. \$EM&V per Cum. Total Costs (\$)	5.1%	1.8%	1.5%	1.1%	1.6%	1.6%
	Cum. \$Rebate per Cum. Participant (Gross)	\$4,355	\$4,487	\$5,025	\$8,725	\$7,668	\$6,050

<sup>24</sup> Ibid.

### 5.1.2.2 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, Table 5-4 provides performance indicator data from 2015 through December 31, 2018. Detailed program indicators by year and month are provided in Appendix B.2.



- A total of 43 customers participated in the program in 2018, which was about 36% of planned participation.
- Participation increased 87% from 2017, when 23 customers enrolled in the program, and matches a program high set in 2016.

- The program achieved net energy savings of 3,620,453 kWh/year, 136% of its planned target.
- The average net energy savings per participant was 84,197 kWh—this is 36% higher than the average over the lifetime of the program.
- The program achieved net demand reduction of 777.0 kW, 162% of its planned target.
- The average net energy demand reduction per participant was 18.1 kW—this is 37% higher than the average over the lifetime of the program.



The same or greater savings achieved by fewer projects or applications contributes to the overall cost effectiveness of the program.



**Table 5-4. NC Lighting Systems & Controls Program Performance Indicators (2015-2018)**

Category	Item	North Carolina				
		2015	2016 <sup>25</sup>	2017	2018	Program Total (2015-2018)
Operations and Management Costs (\$)	Direct Rebate					
	Direct Implementation					
	Direct EM&V					
	Indirect Other (Administrative)	\$3,511	\$11,956	\$9,940	\$14,072	\$39,480
Total Costs (\$)	Total					
	Planned					
	Variance					
	Annual % of Planned	34%	109%	73%	62%	69%
Participants	Total (Gross)	13	43	23	43	122
	Planned (Gross)	96	102	104	119	421
	Variance	-83	-59	-81	-76	-299
	Annual % of Planned (Gross)	14%	42%	22%	36%	29%
Installed Energy Savings (kWh/year)	Total Gross Deemed Savings	564,326	3,333,527	1,738,121	5,172,076	10,808,050
	Realization Rate Adjustment (100%)	0	0	0	0	0
	Adjusted Gross Savings	564,326	3,333,527	1,738,121	5,172,076	10,808,050
	Net-to-Gross Adjustment (70%) <sup>26</sup>	-169,298	-1,000,058	-521,436	-1,551,623	-3,242,415
	Net Adjusted Savings	395,028	2,333,469	1,216,685	3,620,453	7,565,635
	Planned Savings (Net)	1,752,864	1,619,973	2,220,165	2,661,116	8,254,118

<sup>25</sup> The 2016 total gross deemed savings values reported in this table differs from values in the May 1, 2017 EM&V report and have been refiled with the Commission. The adjustments totaled -481,137 kWh/year and 26 kW for 2016 reported savings. The adjustments account for corrections to STEP Manual version 7.0.0 issued on May 1, 2017, in section 9.1.1. The adjustment was to waste heat factors (WHFe and WHFd) applied to lighting fixtures installed in 2016, where the program participant building HVAC systems was assumed to be heat pump heating and cooling systems, rather than the previous assumption of AC cool and non-electric heat systems. This adjustment was made in response to requests by the North Carolina Public Staff Utilities Commission Re: Docket No. E-22, Sub 545, on October 23, 2017. It is reflected in STEP Manual version 8.0.0 in this EM&V report.

<sup>26</sup> 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 97% 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.



Category	Item	North Carolina				
		2015	2016 <sup>25</sup>	2017	2018	Program Total (2015-2018)
	Annual % Toward Planned Savings (Net)	23%	144%	55%	136%	92%
	Avg. Savings per Participant (Gross)	43,410	77,524	75,570	120,281	88,591
	Avg. Savings per Participant (Net)	30,387	54,267	52,899	84,197	62,013
Installed Demand Reduction (kW)	Total Gross Deemed Demand	104.6	743.2	334.5	1,109.9	2,292.3
	Realization Rate Adjustment (100%)	0.0	0.0	0.0	0.0	0.0
	Adjusted Gross Demand	104.6	743.2	334.5	1,109.9	2,292.3
	Net-to-Gross Adjustment (70%) <sup>27</sup>	-31.4	-223.0	-100.4	-333.0	-687.7
	Net Adjusted Demand	73.2	520.2	234.2	777.0	1,604.6
	Planned Demand (Net)	490.2	274.7	366.7	479.0	1,610.6
	Annual % Toward Planned Demand (Net)	15%	189%	64%	162%	100%
	Avg. Demand per Participant (Gross)	8.0	17.3	14.5	25.8	18.8
	Avg. Demand per Participant (Net)	5.6	12.1	10.2	18.1	13.2
Program Performance	Annual \$Admin. per Participant (Gross)	\$270	\$278	\$432	\$327	\$324
	Annual \$Admin. per kWh/year (Gross)	\$0.01	\$0.00	\$0.01	\$0.00	\$0.00
	Annual \$Admin. per kW (Gross)	\$34	\$16	\$30	\$12.68	\$17.22
	Annual \$EM&V per Total Costs (\$)	6.4%	1.8%	2.6%	2.5%	2.7%
	Annual \$Rebate per Participant (Gross)	\$5,260	\$7,742	\$8,251	\$4,310	\$6,364

<sup>27</sup>Ibid.

### 5.1.2.3 Additional Virginia Program Data

Figure 5-3 illustrates gross annual energy savings, gross demand reductions, and units installed by lighting measure type as a proportion of their respective totals in 2018. The most common lighting measure types installed were LEDs, which accounted for 95% of the installations and 98% of the gross annual energy savings and demand reductions. Occupancy sensors were the next most popular lighting measure, accounting for 4% of installed units.

T8/T5s lamps accounted for only 1% of the lighting measure types installed in 2018. The decrease in T8/T5s is a continuation of a trend starting from program inception in 2014, when T8/T5s comprised 22% of installed units. In 2015, that number decreased to 16% and then to 5% the following year, in 2016. In 2017 and 2018, they made up only 1% of installed units. Conversely, the proportion of LEDs has increased each year from 2014-2018, except in 2015 as follows: 76%, 71%, 91%, 92%, 95%.

The number of T8 and T5 fluorescent lamps being installed as part of this program are less than 1% of the total units installed. Note that T8s in the T8/T5 category refer to T8s with electronic ballasts and high performance T8s. T8s became the baseline lighting option in 2014, as required by the Energy Independence and Security Act (EISA) of 2007.

**Figure 5-3. VA Non-residential Lighting Systems & Controls Program Performance Indicators by Lamp Type as a Percentage of Total (2018)**

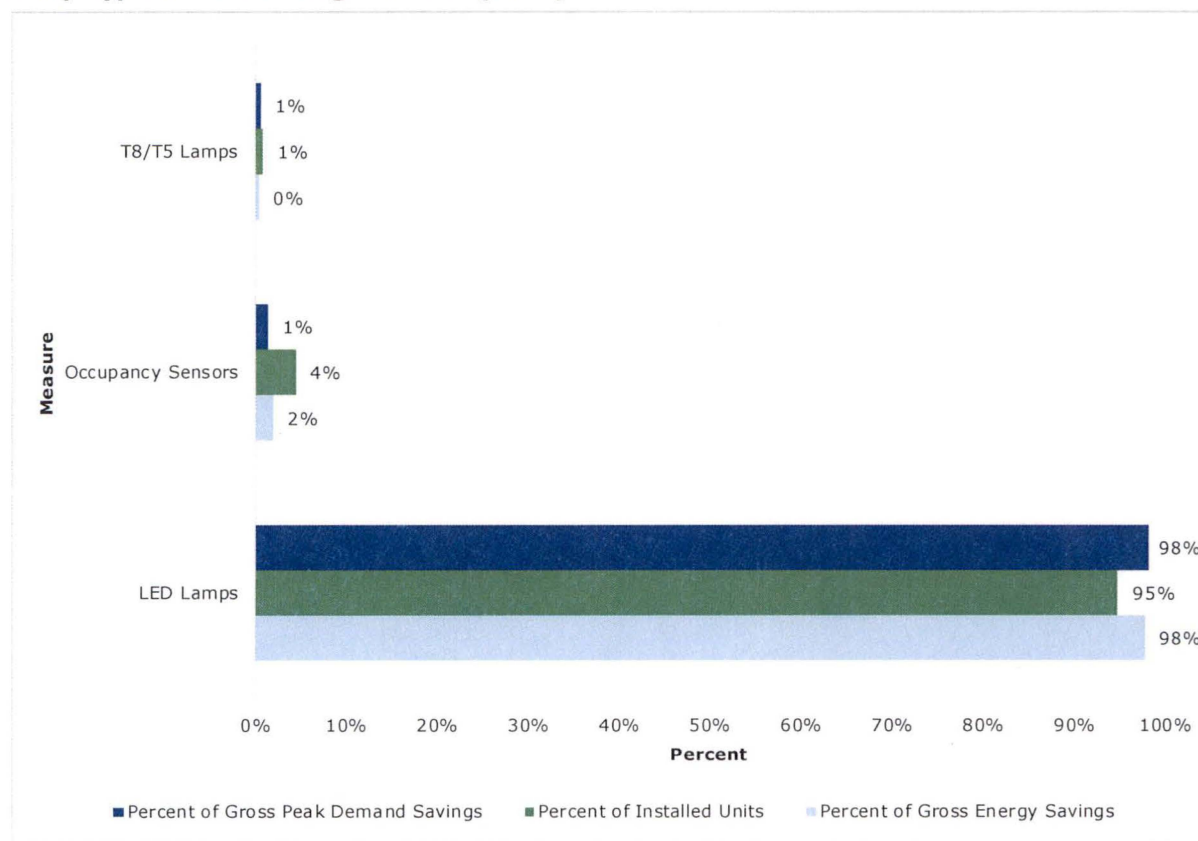


Figure 5-4 illustrates the upward trend of LEDs from program inception through 2018. Occupancy sensors accounted for 4% of the lighting measure types installed compared to 7% in 2017. Installations of other lighting types, especially T8/T5 lamps, have decreased as a percentage of total year-over-year.

**Figure 5-4. VA Non-residential Lighting Systems & Controls Program Percentage of Measures Installed by Program Year**

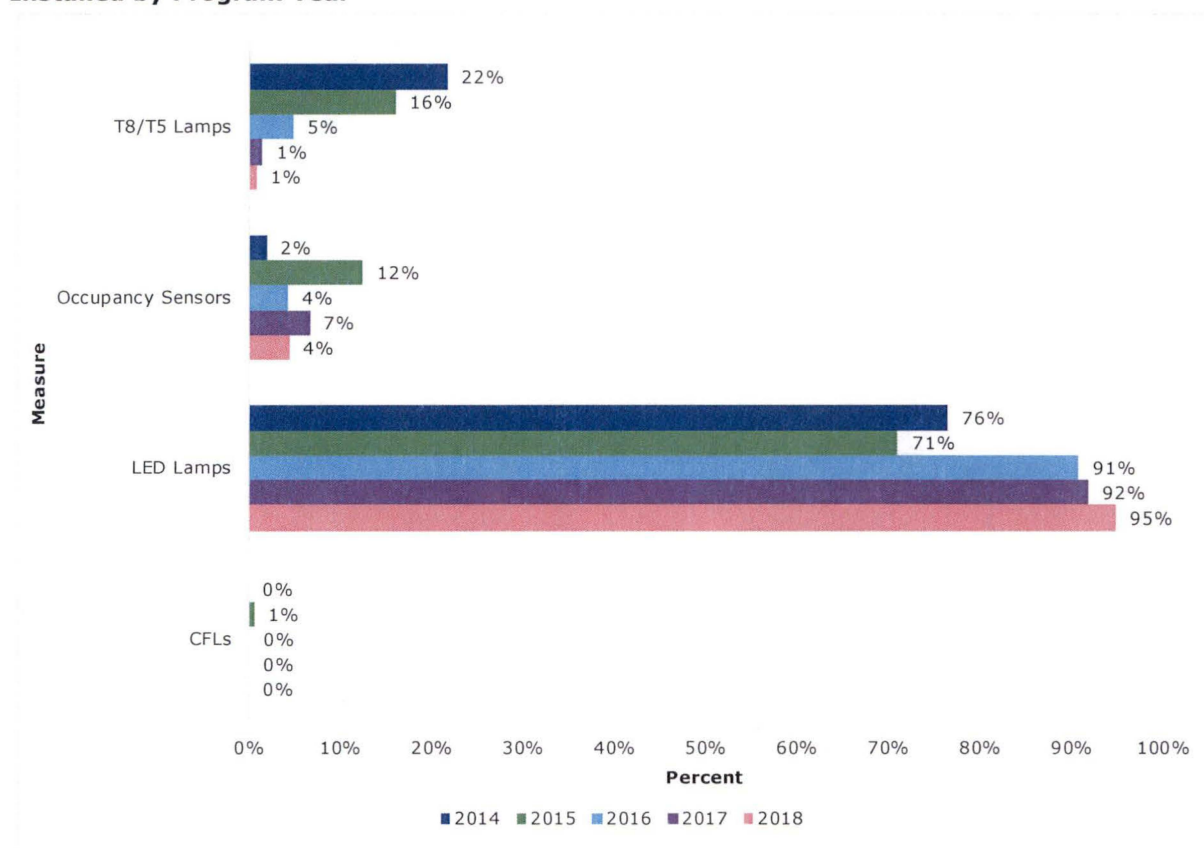
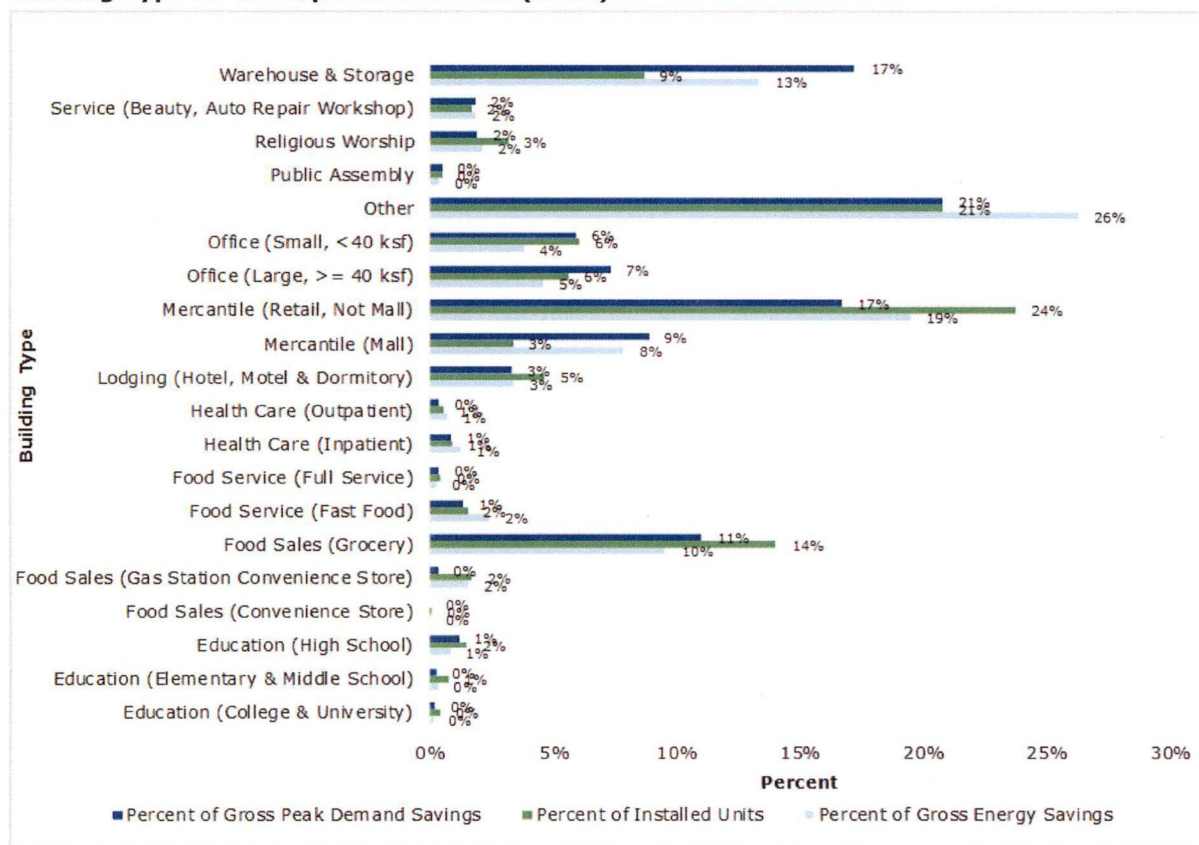




Figure 5-5 shows the gross energy savings, gross demand savings, and participation by building type as a percentage of 2018 totals. The most common building type with respect to units installed was mercantile (retail, not mall), accounting for 24% of the total measures installed. However, the "other" building type had the greatest proportion of savings, accounting for 21% of both gross energy and demand savings.<sup>28</sup>

**Figure 5-5. VA Non-residential Lighting Systems & Controls Program Performance Indicators by Building Type as % Proportion of Total (2018)**



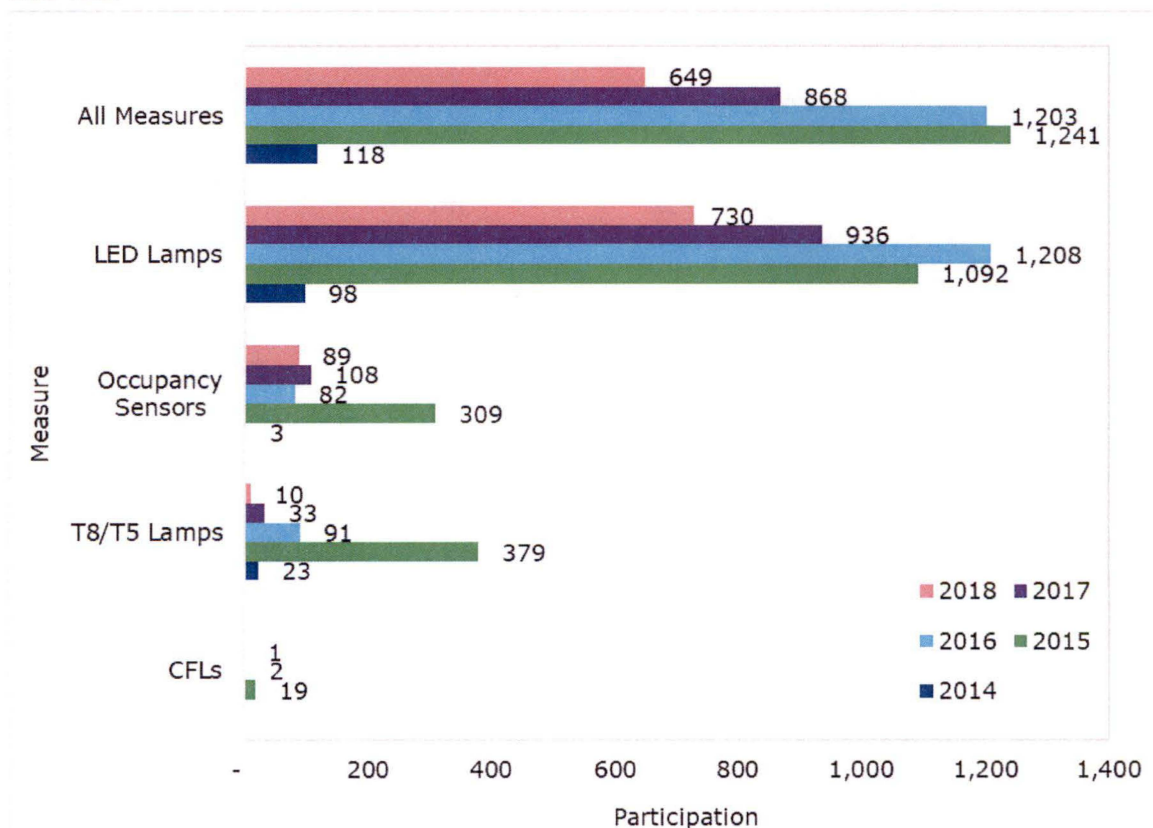
<sup>28</sup> Example "Other" building types include car dealerships, condominium associations, real estate development and management, and shipyards.

Figure 5-6 through Figure 5-8 show the program's total gross annualized energy savings, participation, and average annualized energy savings per participant (for participants who installed the measure in the respective year) by measure type and program year. Cumulatively, LED installations have produced the highest average savings per participant, total program savings, and are also the most popular program measure.

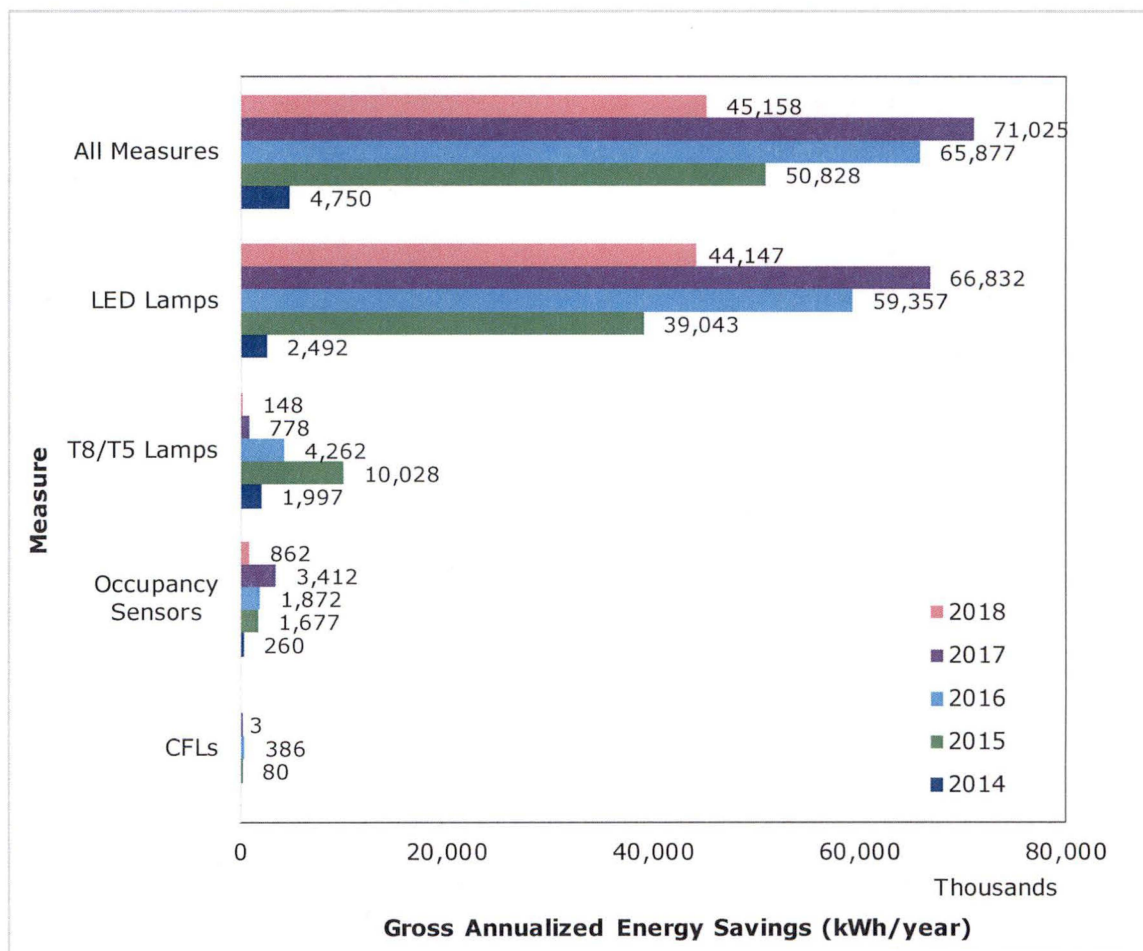
Note the "All Measures" and "All Building Types" categories in these figures represents the participation and/or savings from all new program participants, regardless of the measures installed and/or building types those measures were installed in. A participant in the "All Measure" and "All Building 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.

The most frequently-adopted measure has been the installation of LED lamps. This is likely due to the fact that they are the latest technology available in the market and the price has decreased significantly over the past few years.

**Figure 5-6. VA Non-residential Lighting Systems & Controls Program Participation by Measure and Year**



**Figure 5-7. VA Non-residential Lighting Systems & Controls Program Gross Annualized Energy Savings by Measure and Year (MWh/year)**





Each year since the program began, LED installations have produced the highest gross annualized savings per participant, shown in Figure 5-8.

**Figure 5-8. VA Non-residential Lighting Systems & Controls Program Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Measure and Year**

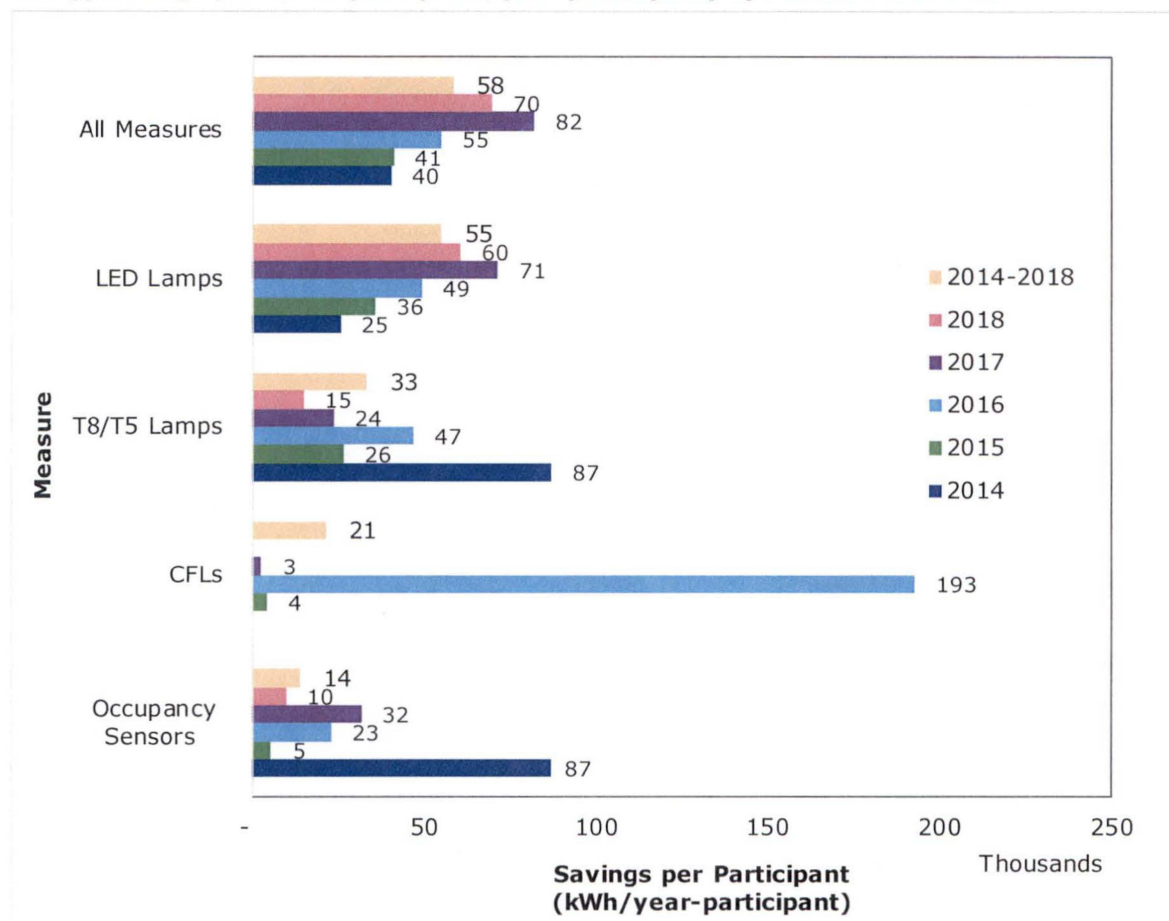
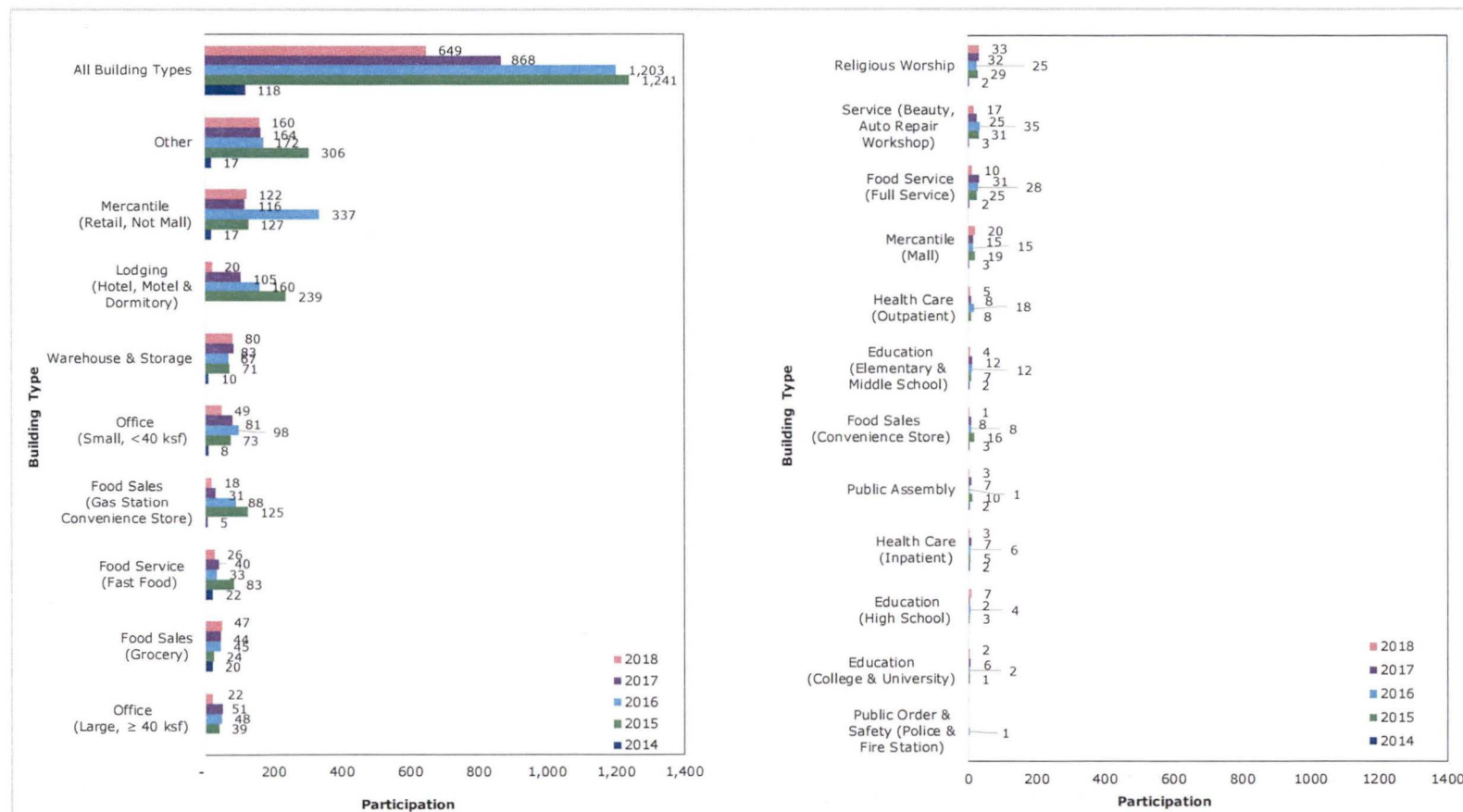


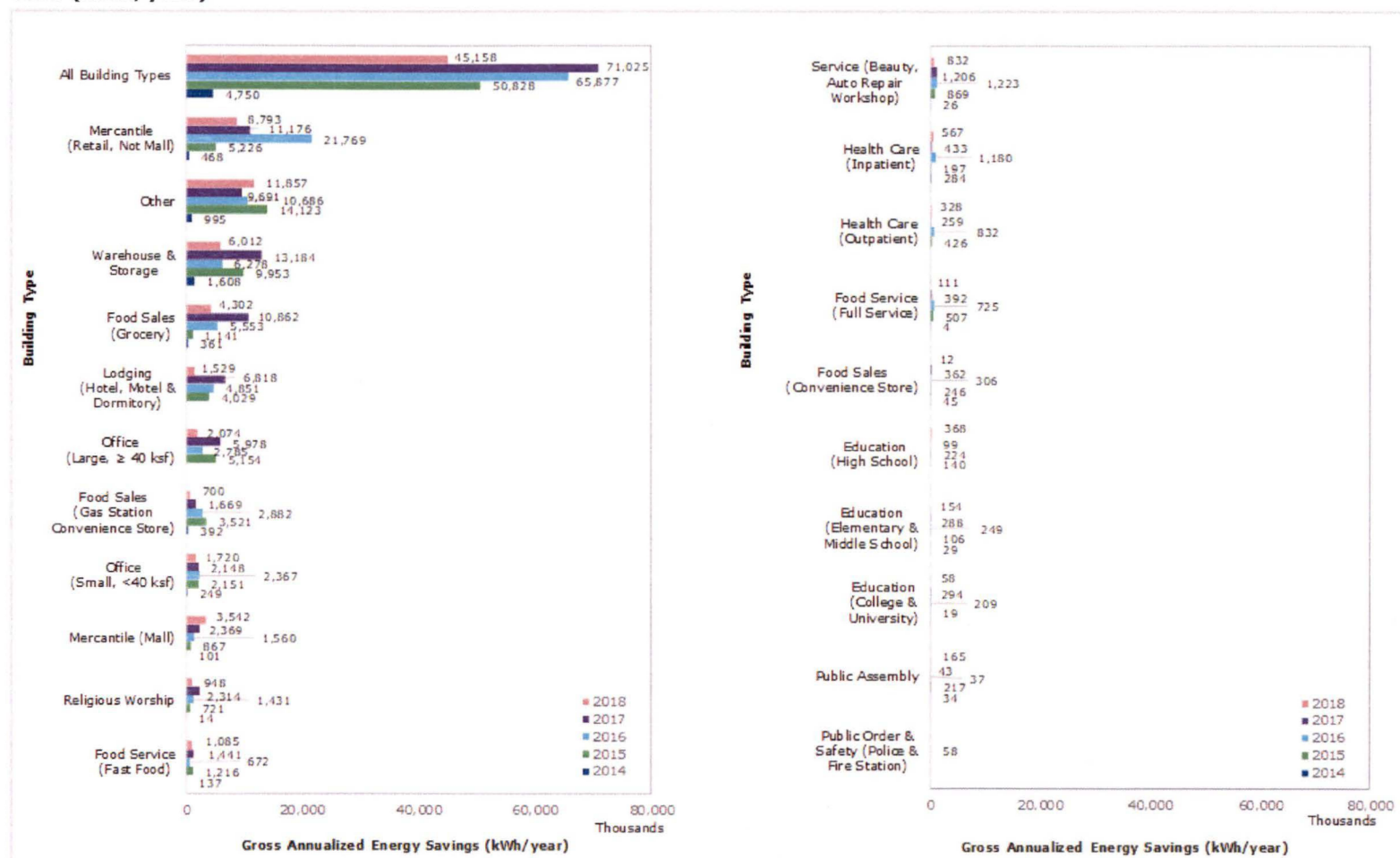
Figure 5-10 through Figure 5-11 show the program's total gross annualized energy savings, participation, and average annualized energy savings per participant (for participants who installed the measure in that year) by building type and program year.

Since program inception, the majority of program participants (Figure 5-9) occupy buildings classified as "other," followed by mercantile buildings, but the gross annualized energy savings (Figure 5-10) were highest in mercantile buildings followed by the "other" building category. This indicates the energy savings claimed per participant for mercantile buildings is higher than the other building category.

Figure 5-9. VA Non-residential Lighting Systems & Controls Program Participation by Building Type and Year



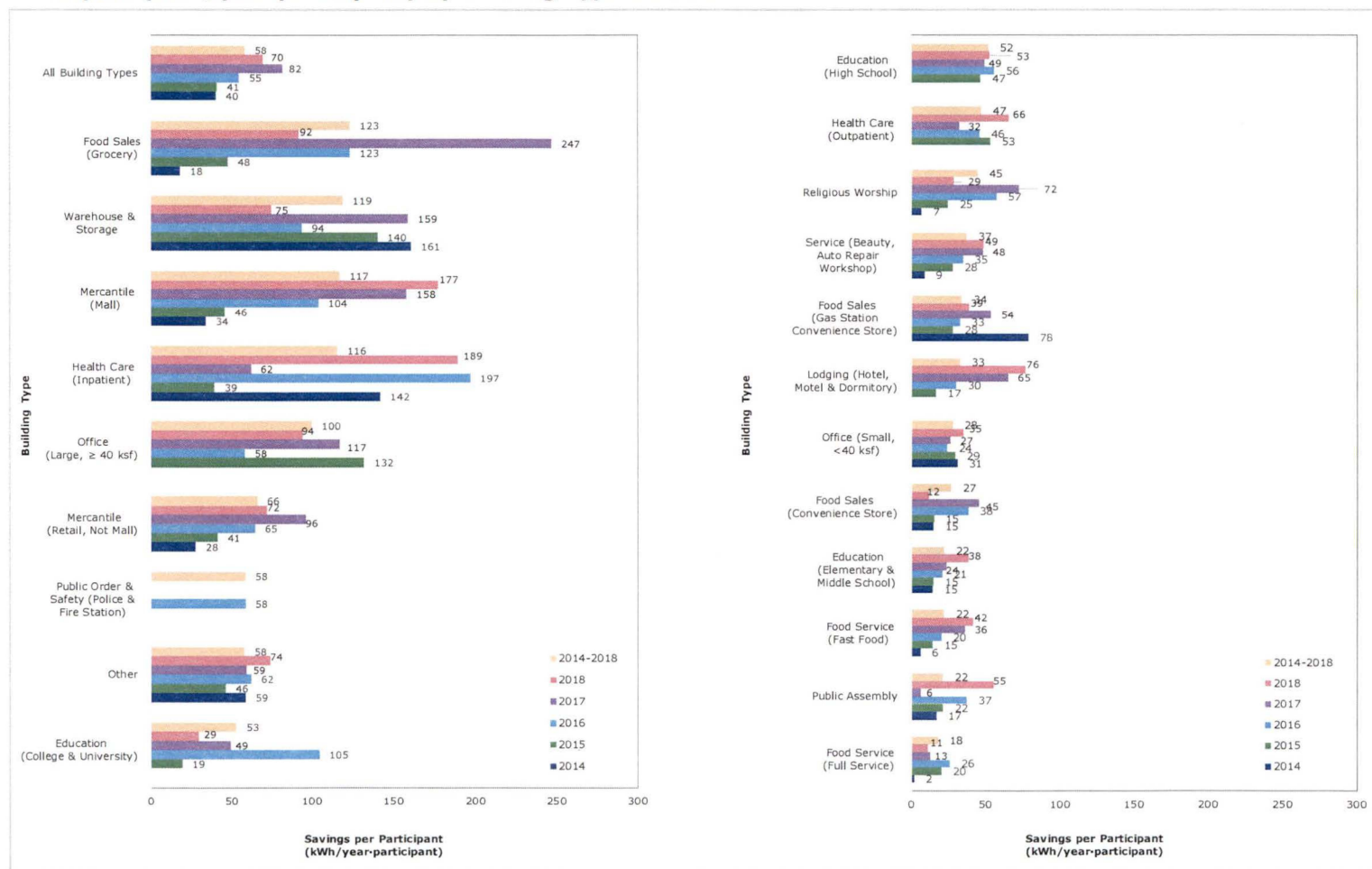
**Figure 5-10. VA Non-residential Lighting Systems & Controls Program Gross Annualized Energy Savings by Building Type and Year (kWh/year)**





Average gross energy savings per participant by building type (Figure 5-11) show that the savings per participant for all years combined (2014-2018) is highest for participants in food sales (grocery) and warehouse and storage buildings. This may be attributed to food sales (grocery) and warehouse and storage being generally larger than other building types and having longer operating hours thereby yielding greater savings.

**Figure 5-11. VA Non-residential Lighting Systems & Controls Program Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Building Type and Year**

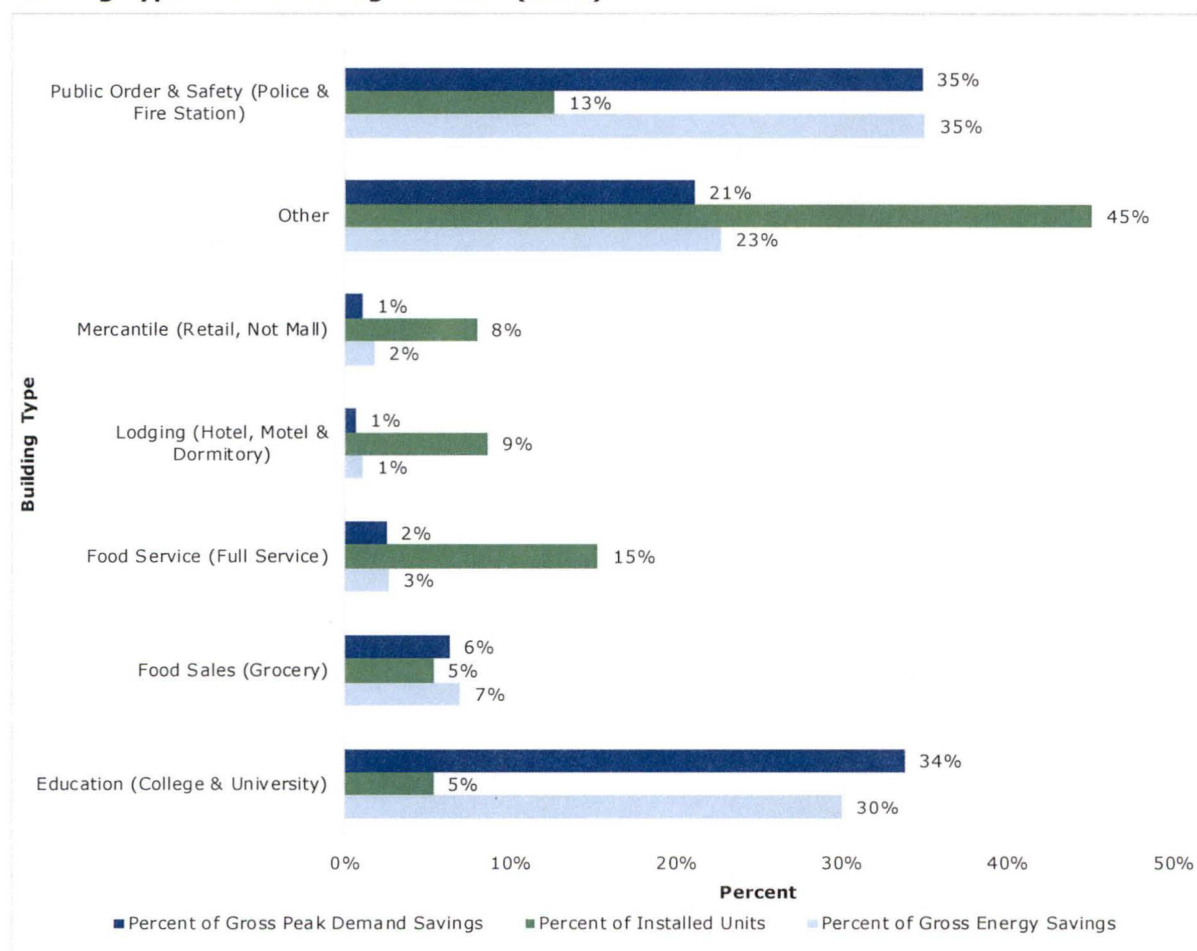


#### 5.1.2.4 Additional North Carolina Program Data

North Carolina enrolled 43 participants to the program in 2018, which matches a program high set in 2016. All 43 participants installed only LEDs, thereby accounting for 100% of the installed measures and subsequent savings in 2018.

The 2018 participants are located in different building types, as shown in Figure 5-12, which shows the gross annualized energy savings, gross demand reduction, and participation by building type as a proportion of total. In 2018, the most common building type to participate in the program is the "Other" category, making up 45% of the installed projects. The highest percentage of gross savings came from the Public Order & Safety category, comprising 35% of gross energy savings and 35% of gross demand savings in 2018.

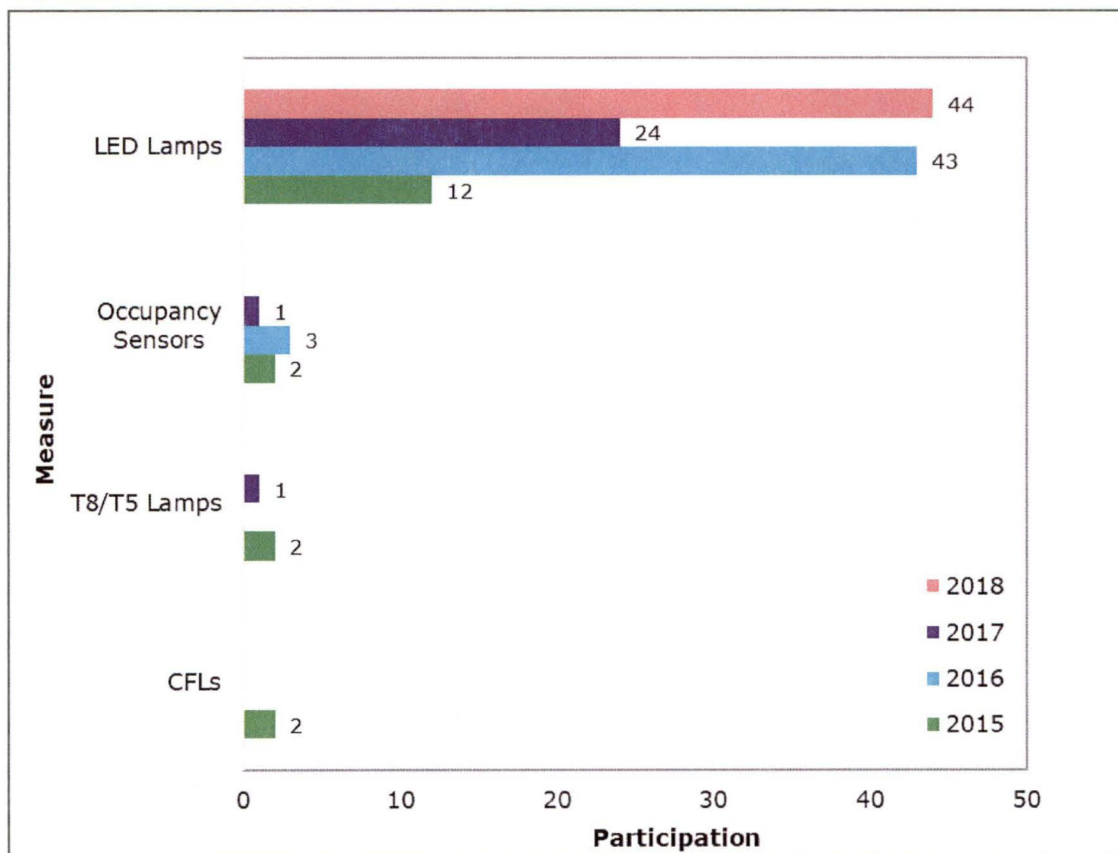
**Figure 5-12. NC Non-residential Lighting Systems & Controls Program Performance Indicators by Building Type as a Percentage of Total (2018)**



The remainder of this section shows program progress from inception (2015) to the end of the reporting year (2018). Figure 5-13 and Figure 5-14 shows gross annualized energy savings and participant (for participants who installed the measure in that year) by measure type and program year in North Carolina,

respectively. The installation of LED lamps contributed most to the program gross annualized savings and as expected was the measure that was installed the most by participants.

**Figure 5-13. NC Non-residential Lighting Systems & Controls Program Participation by Measure and Year**





**Figure 5-14. NC Non-residential Lighting Systems & Controls Program Gross Annualized Energy Savings (kWh/year) by Measure and Year**

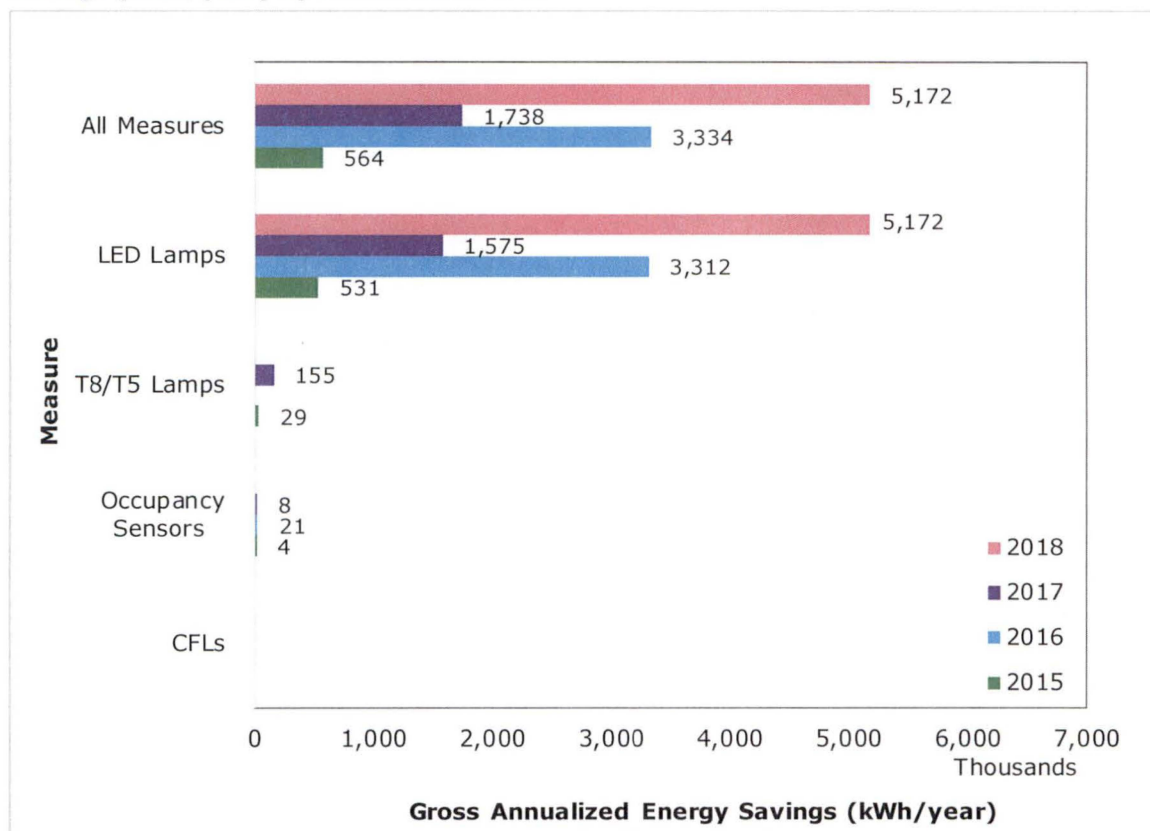


Figure 5-15 shows gross annualized energy savings per participant (for participants who installed the measure in that year) for each program year in North Carolina. The savings per participant for T8/T5 lamps in 2017 are highest due to one participant who installed 518 high-performance T8 lamps (Figure 5-15).

**Figure 5-15. NC Non-residential Lighting Systems & Controls Program Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Measure and Year**

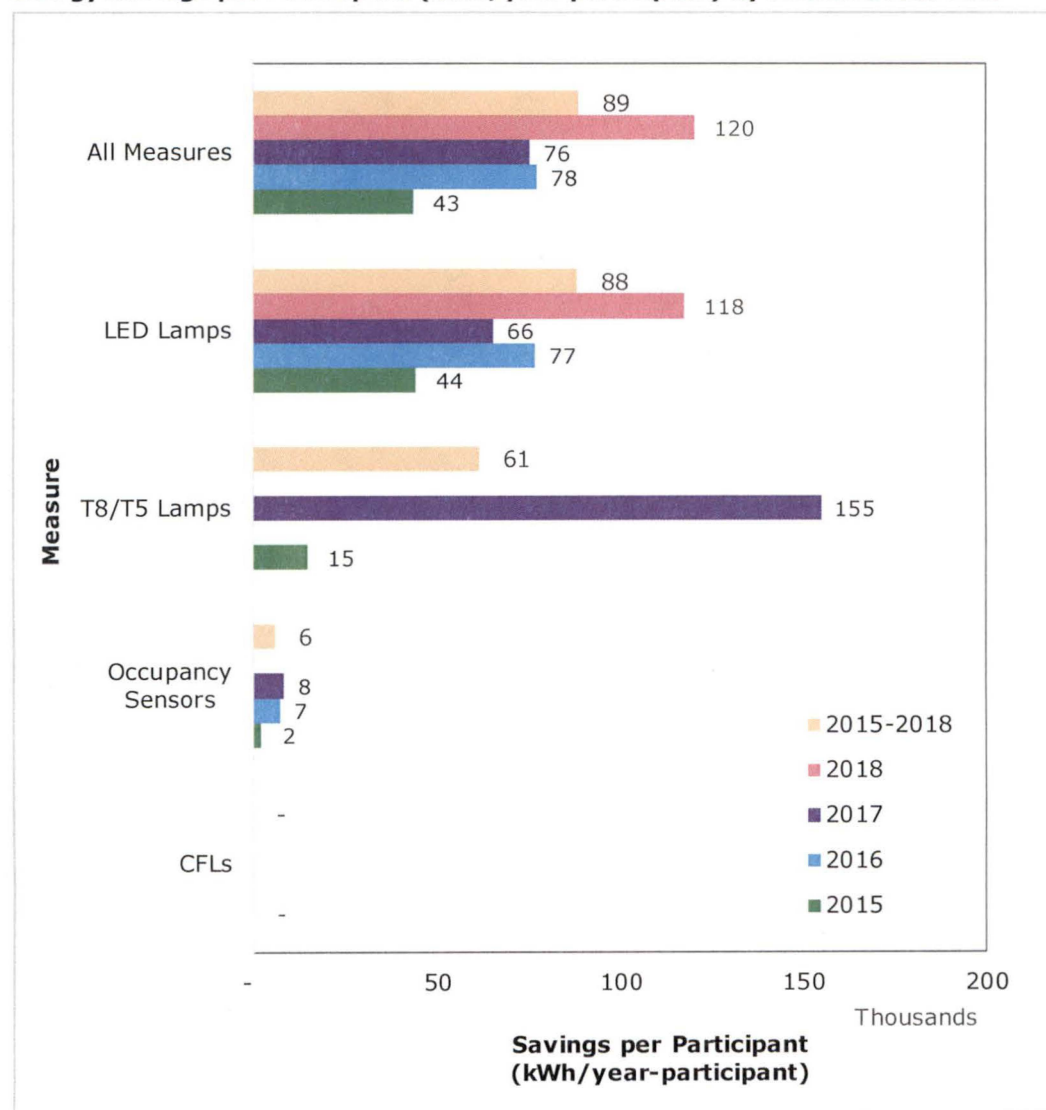
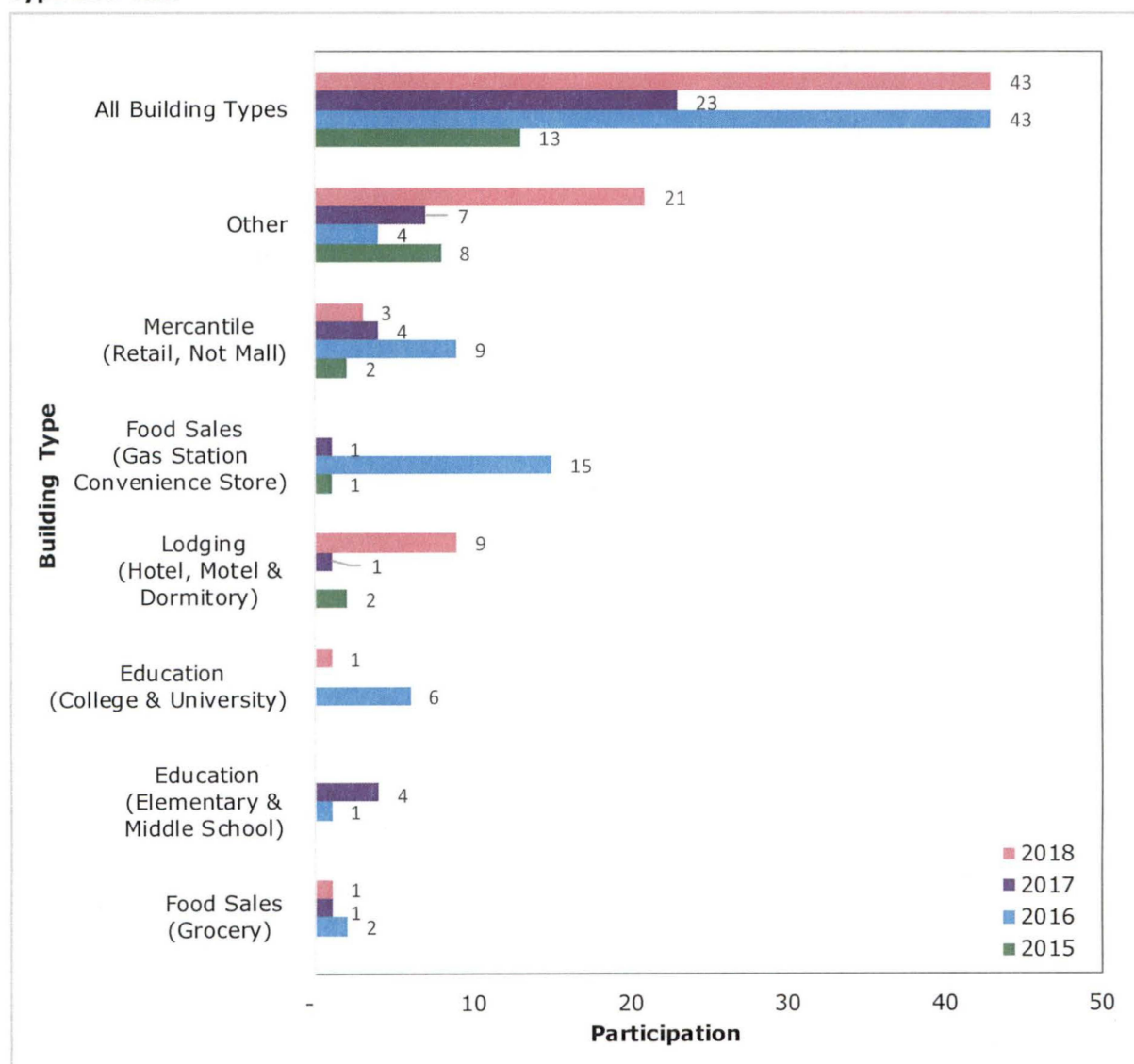


Figure 5-16 through Figure 5-18 shows the program's total gross annualized energy savings, participation, and average annualized energy savings per participant (for participants who installed the measure in the respective year) by measure type and program year. They show that in 2018, almost half (49%) of program participants (Figure 5-16) are located in "other" building types, however public order and safety buildings

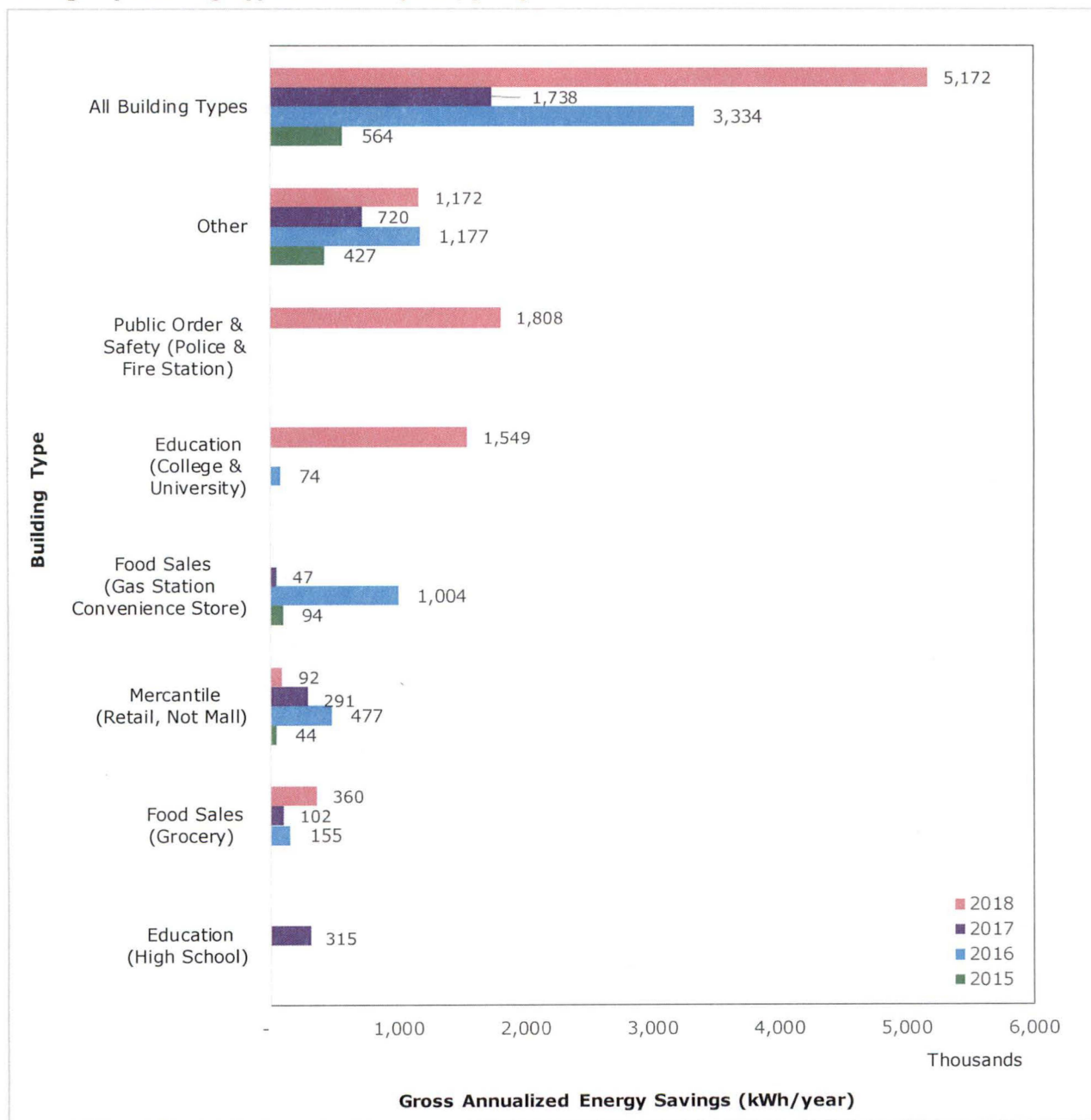
contributed most towards gross annualized energy savings (Figure 5-17), followed by college and universities.

**Figure 5-16. NC Non-residential Lighting Systems & Controls Program Participation by Building Type and Year**

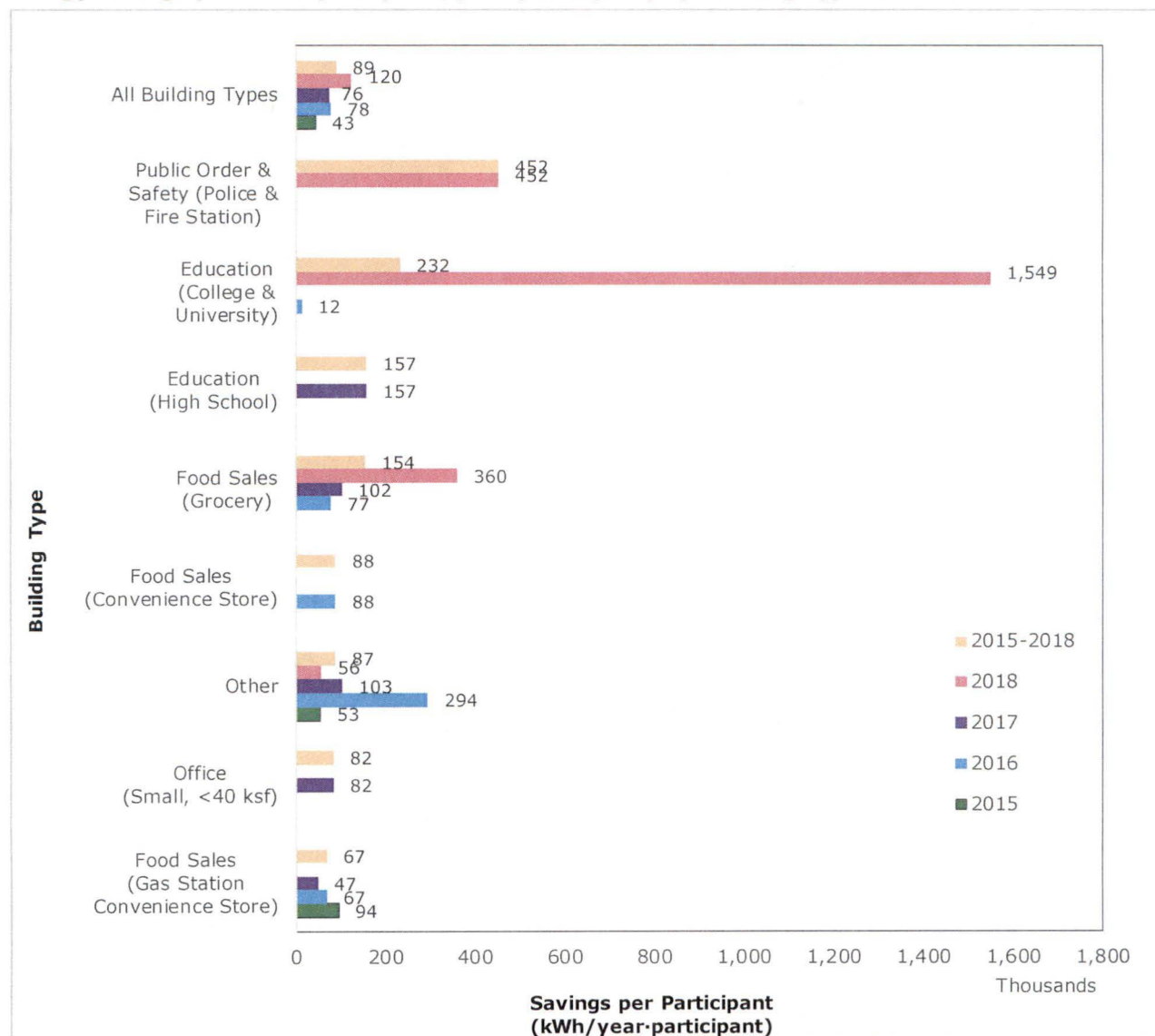




**Figure 5-17. NC Non-residential Lighting Systems & Controls Program Gross Annualized Energy Savings by Building Type and Year (kWh/year)**



**Figure 5-18. NC Non-residential Lighting Systems & Controls Program Average Gross Annualized Energy Savings per Participant (kWh/year-participant) by Building Type and Year**



## 5.2 Non-residential Heating and Cooling Efficiency – Virginia and North Carolina

The Non-residential Heating and Cooling Efficiency Program provides incentives to qualifying non-residential customers to either upgrade existing heating or cooling equipment or install new energy efficient equipment. All non-residential customers are eligible for this program except those who are exempt by statute or contract or have opted-out. Measures eligible to receive a rebate in 2018 included:

- Unitary and split AC units