

- Interior Non-CFL lighting type includes:
 - T5 Lighting
 - Pulse-Start Metal Halide fixture – interior
 - Solid State Lighting (LED) Recessed Downlight Luminaire
 - Delamping
 - Occupancy Sensor - wall box

Table 12-6: Non-residential Exterior Lighting Parameters By Lighting Type

Lighting Type	Exterior Lighting Annual Hours (hour/year)	CF _{SSP}	Demand Waste Heat Factor and Annual Energy Waste Heat Factor ¹⁷³	Source
Pulse Start Metal Halide - exterior	3,338	0.0	1.0	Mid-Atlantic TRM 2018, p.387
High Pressure Sodium	3,338	0.0	1.0	Mid-Atlantic TRM 2018, p.387
LED Exit Sign and "24/7" lights ¹⁷⁴	8,760	1.0	1.0	Mid-Atlantic TRM 2018, p.312; DNV GL judgement
LED Parking Garage	3,338 for canopy applications	0.0 for canopy applications	1.0	Mid-Atlantic TRM 2018, p.364
	8,760 for parking garage applications	1.0 for parking garage applications	1.0	
Outdoor LED and Roadway Lighting	3,338	0.0	1.0	Mid-Atlantic TRM 2018, p.347

The hours and coincident factors (CF) shown in Table 12-7 apply only to the Non-Residential Lighting and Non-Residential Cooling and Heating Programs.

¹⁷³ "If cooling and heating equipment types are unknown or the space is unconditioned, assume WHFd = WHFe = 1.0." Mid-Atlantic TRM 2018, p.527.

¹⁷⁴ DNV GL judgement that if non-residential lighting measure name contains "24/7" in the tracking data provided to DNV GL, treat it the same as "LED Exit Sign" when calculating savings.

Table 12-7: Non-Residential Interior Lighting Parameters by Facility Type

Building Types	Interior Lighting Annual Hours (hours)	CF _{SSP}	Demand Waste Heat Factor ¹⁷⁵	Annual Energy Waste Heat Factor ¹⁷⁶
Education – College and University	2,233	0.36	1.44	0.96
Education – High School	2,233	0.36	1.44	0.96
Education – Elementary and Middle School	2,233	0.36	1.44	0.96
Food Sales – Convenience Store	7,272	0.97	1.35	0.93
Food Sales – Gas Station Convenience Store	7,272	0.97	1.35	0.93
Food Sales – Grocery	7,272	0.97	1.35	0.93
Food Service - Fast Food	4,696	0.83	1.27	0.95
Food Service - Full Service	4,696	0.83	1.27	0.95
Health Care – inpatient	3,817	0.68	1.35	0.93
Health Care – outpatient	3,817	0.68	1.35	0.93
Lodging – (Hotel, Motel and Dormitory)	4,058	0.61	1.35	0.93
Mercantile (Retail, Not Mall)	4,696	0.83	1.27	0.95
Mercantile (Mall)	4,696	0.83	1.27	0.95
Office – Small (<40,000 sq ft)	3,044	0.69	1.36	0.94
Office – Large (>= 40,000 sq ft)	3,044	0.69	1.36	0.94
Other	4,058	0.61	1.35	0.93
Public Assembly	4,058	0.61	1.35	0.93
Public Order and Safety (Police and Fire Station)	4,058	0.61	1.35	0.93
Religious Worship	4,058	0.61	1.35	0.93
Service (Beauty, Auto Repair Workshop)	4,696	0.83	1.27	0.95
Warehouse and Storage	4,361	0.80	1.23	0.89

¹⁷⁵ Mid-Atlantic TRM 2018, p. 526-527. Selected waste heat factors from “Washington, D.C. All utilities”, AC (utility) WHFd and heat pump WHFe. Waste heat factors were provided for only 5 building types (1. Office, 2. Retail, 3. School, 4. Warehouse, 5. Other), therefore they were mapped to the full list of building types in Table as appropriate. Original source of waste heat factor values are from the “EmPOWER Maryland DRAFT Final Impact Evaluation Report Evaluation Year 4 (June 1, 2012 – May 31, 2013) Commercial & Industrial Prescriptive & Small Business Programs, Navigant, March 31, 2014. Values for Washington D.C. and Delaware assume values from Maryland, Pepco and Maryland, DPL, respectively.”

¹⁷⁶ Ibid.

12.4 Sub-appendix IV: Definition of Terms

baseline condition	Typically the less efficient system that is being replaced (pre-retrofit); for HVAC equipment upgrades, the baseline energy efficiency values used to calculate savings equal the minimum requirements set forth by the state building code
CDD	Annual cooling degree days
CEE	Consortium for Energy Efficiency
COP	The Coefficient of Performance (COP) of a heat pump is a - ratio of the change in heat at the system output to the energy input of the heat pump
DBT	A Dry-Bulb Temperature (DBT) is the temperature of air measured using a thermometer freely exposed to the air, but shielded from radiation and moisture. This is the most commonly reported measure of air temperature.
EER	The Energy Efficiency Ratio (EER), an energy efficiency rating for unitary air conditioning and heat pump equipment, is the ratio of cooling output to electric input at a prescribed set of interior and exterior conditions that reflect peak operation
energy-efficient condition	The more efficient replacement system (post-retrofit)
ENERGY STAR®	A program, operated by the Environmental Protection Agency, to benchmark efficiency standards for energy-consuming equipment or buildings
HDD	Annual heating degree days
HOU	Annual hours of use for energy-consuming equipment
HSPF	The Heating Seasonal Performance Factor (HSPF) is an estimate of seasonal heating energy efficiency that represents the total heating output of a heat pump, including supplementary electric heat, during the normal heating season (in Btu) as compared to the total electricity consumed (in wattWatt-hours) during the same period
IEER	The Integrated Energy Efficiency Ratio (IEER), an energy efficiency rating for unitary air conditioning and heat pump equipment larger than 65 kBtu/h, comprised of cooling part-load EER on the basis of weighted operation at various load capacities

ISR	In-service rate, the percentage of rebated equipment that remains installed and operational
kW/ton	Water-cooled chiller system efficiency, in kW/ton
ODP	Open, drip-proof (ODP) motor enclosure type
participant	Multiple strategies to count participants are in use (see Table 12-8)
Pascal	A Pascal is a derived SI unit of pressure equal to 1 kg/(m·s ²) or 1 N/m ²
R	R-value of insulation ¹⁷⁷
RPM	Rotational speed of motor, in revolutions per minute (rpm)
SEER	The Seasonal Energy Efficiency Ratio (SEER), an energy efficiency rating for unitary air conditioning and heat pump equipment ≤65 kBtu/h, is the total cooling output divided by the total electric input across a typical cooling season
SVGe	Percentage of annual lighting energy saved by lighting control
SVGd	Percentage of lighting demand saved by lighting control
ΔT	Average difference in temperature between cold intake water and shower water
TEFC	Totally enclosed fan-cooled (TEFC) motor enclosure type
TRM	Technical Reference Manual
time of sale¹⁷⁸	Time at which new equipment purchase takes place to replace an older, pre-existing piece of equipment that has reached the end of its useful life. Also referred to as "replace on burn-out."
VRF	This is a special type of air conditioner or heat pump that allows for Variable Refrigerant Flow (VRF) whereby refrigerant may be used as a cooling and heating medium simultaneously
ΔWater	Customer annual water savings per residential unit, in gallons
WBT	The Wet-Bulb Temperature (WBT) is the air temperature measured with a wet cloth surrounding the thermometer bulb while moving the bulb to simulate a breeze.

¹⁷⁷ New York Residential TRM. Prepared for New York Department of Public Service by New York Evaluation Advisory Contractor Team, p. 27.

¹⁷⁸ Mid-Atlantic TRM 2016, p. 97.

WHF

Waste-heat factor to account for electric cooling savings and/or negative electric heating savings from replacing baseline lighting with efficient lighting¹⁷⁹

Table 12-8. Participant Definition by Program

Program	DNV GL Definition of Participant	IRP Definition of Participant
Residential AC Cycling	A unique electric account ID	Single AC or HP unit
Non-residential Distributed Generation	1 MW available to Dominion for dispatch	1 MW of generated energy
Residential Age and Income Qualifying	Only the first instance of a Dominion-approved rebate associated with a given electric account ID is counted as a unique participant. It is counted as a participant in the month that their first rebate is approved. The savings associated with subsequent measure(s) for a repeated electric account ID will be attributed to the month of their Dominion-approved rebate but will not increase the participant tally.	Single household
Non-residential Heating and Cooling Efficiency		Single building
Non-residential Lighting Systems and Controls		
Non-residential Small Business Improvement		
Non-residential Prescriptive		
Non-residential Window Film		Square footage of installed window film at one building
Residential LED	A single eligible lamp sold through an approved retailer with a Dominion-approved invoice.	Single lamp

¹⁷⁹ Mid-Atlantic TRM, p. 22.

12.5 Sub-appendix V: General Equations

Equation 1: Cooling Capacities – Btu/h to tons

$$Size_{ton} = \frac{Size_{Btu/h}}{12,000 \text{ Btu/h/ton}}$$

Equation 2: Cooling Capacities – tons to Btu/h

$$Size_{Btu/h} = Size_{ton} \times 12,000 \frac{\text{Btu/h}}{\text{ton}}$$

Equation 3: Energy Efficiencies - SEER to EER,¹⁸⁰ for systems < 65,000 Btu/h

$$EER \cong -0.02 \times SEER^2 + 1.12 \times SEER$$

If $EER \leq 15.68$, then using the quadratic equation,

$$SEER \cong \frac{1.12 - \sqrt{(-1.12)^2 - (4 \times 0.02 \times EER)}}{2 \times 0.02}$$

Otherwise use,

$$SEER \cong \frac{EER}{0.9}$$

Equation 4: Energy Efficiencies - EER to IEER, for systems $\geq 65,000$ Btu/h

$$IEER \cong \frac{EER}{0.9}$$

Equation 5: Energy Efficiencies - HSPF to COP¹⁸¹

$$COP \cong -0.0255 \times HSPF^2 + 0.6239 \times HSPF$$

¹⁸⁰ A Component-Based Model for Residential Air Conditioner and Heat Pump Energy Calculations. Master's Thesis, University of Colorado at Boulder, Wassmer, M. (2003). Note this is appropriate for single speed units only.

¹⁸¹ Ibid.

If $COP \leq 3.81$, then

$$HSPF \cong \frac{0.6239 + \sqrt{((-0.6239)^2 - (4 \times 0.0255 \times COP))}}{2 \times 0.0255}$$

Otherwise use,

$$HSPF \cong \frac{COP}{3.412}$$

Equation 6: Energy Efficiencies - COP to EER

$$EER \cong 3.412 COP$$

Equation 7: Energy Efficiencies - $\frac{kW}{ton_{full-load}}$ to $\frac{kW}{ton_{IPLV}}$

$$\frac{kW}{ton_{IPLV}} \cong C \times \frac{kW}{ton_{full-load}}$$

where $C = 0.80$ for water-cooled chillers < 200 tons
 $= 0.95$ for water-cooled chillers ≥ 200 tons

Equation 8: Energy Efficiencies - $EER_{full-load}$ to EER_{IPLV}

$$EER_{IPLV} \cong C \times EER_{full-load}$$

where $C = 0.76$ for air-cooled chillers

12.6 Sub-appendix VI: Residential Retail LED Lighting Program Eligible Lamps

Table 12-9: Eligible Lamp Model Numbers for Residential Retail LED Lighting Program

Measure: Model Number	Measure: Product Description	STEP Bulb Type
37590	General Electric 6.5 Candelabra Base	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
73998	OSRAM SYLVANIA 10 Indoor Fixture	Recessed Downlight Luminaire
74054	OSRAM SYLVANIA 8 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
74056	OSRAM SYLVANIA 8 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
74060	OSRAM SYLVANIA 11.7 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
74062	OSRAM SYLVANIA 11.7 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
74069	OSRAM SYLVANIA 15.2 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
74071	OSRAM SYLVANIA 15.2 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
74090	LEDVANCE 7.3 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
74175	LEDVANCE 9 Multifaceted Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
75329	OSRAM SYLVANIA 10.6 Downlight Solid State Retrofit	Reflector with medium screw bases w/ diameter ≤ 2.25 "
77318	OSRAM SYLVANIA 4.5 A-Line	Standard A-Type
78046	OSRAM SYLVANIA 9 Bulged Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
78048	OSRAM SYLVANIA 9 Bulged Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
78711	LEDVANCE 13 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
79289	LEDVANCE 6 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter ≤ 2.25 "
99647	General Electric 3.5 Candelabra Base	Reflector with medium screw bases w/ diameter ≤ 2.25 "
1001653683	Leedarson America, Inc. 11.8 A-Line	Standard A-Type
1001653693	Leedarson America, Inc. 11.4 A-Line	Standard A-Type
11W/LED/OMNI/D30K	Greenlite 11 A-Line	Standard A-Type

Measure: Model Number	Measure: Product Description	STEP Bulb Type
11W/LED/PAR30 D/FL	Greenlite 11 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
11W/LED/RC- 5/6-D	Greenlite 11.1 Downlight Solid State Retrofit	Recessed Downlight Luminaire
12643	Globe Electric Company 5 Fixture	Recessed Downlight Luminaire
12644	Globe Electric Company 5 Fixture	Recessed Downlight Luminaire
12645	Globe Electric Company 5 Fixture	Recessed Downlight Luminaire
12646	Globe Electric Company 5 Fixture	Recessed Downlight Luminaire
12W/LED/OMNI/ 3W	Greenlite 12 A-Line	Standard A-Type
13193	General Electric 15 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
14812	General Electric 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
15W/LED/OMNI/ D30K	Greenlite 15 A-Line	Standard A-Type
15W/LED/PAR38 D/FL	Greenlite 15 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
16200	L'Image Home Products Inc 14.5 A-Line	Standard A-Type
16W/LED/OMNI/ 3W	Greenlite 16 A-Line	Standard A-Type
21940	General Electric 10 Bulged Reflector	*BR30, BR40, or ER40
22237	General Electric 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
271430	TCP 9 Bulged Reflector	*BR30, BR40, or ER40
30374	Globe Electric Company 9.5 A-Line	Standard A-Type
30374	Globe Electric Company 9.5 A-Line	Standard A-Type
37505	General Electric 4 Candle	Decorative (Shapes B, BA, C, CA, DC, F, G, medium and intermediate bases less than 750 lumens)
37507	General Electric 4 Candle	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)

Measure: Model Number	Measure: Product Description	STEP Bulb Type
37508	General Electric 5 Globe	Globe (medium and intermediate bases less than 750 lumens)
37906	General Electric 5 Globe	Globe (medium and intermediate bases less than 750 lumens)
3902401	Globe Electric Company 9 Bulged Reflector	*BR30, BR40, or ER40
45639	General Electric 7.5 Multifaceted Reflector	Reflector with medium screw bases w/ diameter <=2.25"
4BEMW LED 30K	Lithonia 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
4W/LED/CTC-D/FIL	Greenlite 4 Specialty	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
4W/LEDX/CTCD/CL	Greenlite 4 Candelabra Base	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
5aSA-A460ST-Q1D-01	Leedarson America, Inc. 6.5 A-Line	Standard A-Type
5aSA-A460ST-Q1D-04	Leedarson America, Inc. 6.5 A-Line	Standard A-Type
5aSA-A810SS-Q1D-01	Leedarson America, Inc. 9 A-Line	Standard A-Type
5aSA-A810SS-Q1D-02	Leedarson America, Inc. 9 A-Line	Standard A-Type
5aSA-A810SS-Q1D-04	Leedarson America, Inc. 9 A-Line	Standard A-Type
5bSA1600STQ1D01	Leedarson America, Inc. 15.4 A-Line	Standard A-Type
5bSA1600STQ1D03	Leedarson America, Inc. 15.7 A-Line	Standard A-Type
5bSA1600STQ1P01	Leedarson America, Inc. 14.8 A-Line	Standard A-Type
5bSA1600STQ1P03	Leedarson America, Inc. 14.9 A-Line	Standard A-Type
5bSM350SGU1011	Leedarson America, Inc. 4.5 Multifaceted Reflector	*All reflector lamps below lumen ranges specified above
5bSM450SGU1002	Leedarson America, Inc. 5 Parabolic Aluminized Reflector	*All reflector lamps below lumen ranges specified above
5W/LEDX/OMNI/D	Greenlite 5 A-Line	Standard A-Type
5W/LEDX/OMNI/D/A15/CL	Greenlite 5 A-Line	Standard A-Type

Measure: Model Number	Measure: Product Description	STEP Bulb Type
5W/LEDX/OMNI/ D/CL	Greenlite 5 A-Line	Standard A-Type
5WOMNI/ XA15/11B-2/17	Greenlite 5 A-Line	Standard A-Type
61601	GE LED Bright Stik 9 watt Soft White 6 Pack 60-watt replacement	Standard A-Type
61956	General Electric 5 A-Line	Standard A-Type
61961	General Electric 5 A-Line	Standard A-Type
61962	General Electric 9 A-Line	Standard A-Type
61966	General Electric 9 A-Line	Standard A-Type
61973	General Electric 5 A-Line	Standard A-Type
61986	General Electric 9 A-Line	Standard A-Type
63871	GE LED9LS5K-S6 LED Bright Stik 9W 5000K Daylight 60W Replacement 6 Pack	Standard A-Type
65721	General Electric 12 A-Line	Standard A-Type
65722	General Electric 12 A-Line	Standard A-Type
65729	General Electric 15 A-Line	Standard A-Type
65735	General Electric 12 A-Line	Standard A-Type
65743	General Electric 12 A-Line	Standard A-Type
65764	General Electric 15 A-Line	Standard A-Type
65935	General Electric 15 A-Line	Standard A-Type
65939	General Electric 15 A-Line	Standard A-Type
65BEMW LED 30K	Lithonia 12 Downlight Solid State Retrofit	Recessed Downlight Luminaire
67500	General Electric 6 A-Line	Standard A-Type
67500	General Electric 6 A-Line	Standard A-Type
67502	General Electric 6 A-Line	Standard A-Type
67511	General Electric 10 A-Line	Standard A-Type
67515	General Electric 10 A-Line	Standard A-Type
67607	General Electric 6 A-Line	Standard A-Type
67614	General Electric 6 A-Line	Standard A-Type
67615	General Electric 10 A-Line	Standard A-Type
67616	General Electric 10 A-Line	Standard A-Type

Measure: Model Number	Measure: Product Description	STEP Bulb Type
6W/LED/GLOBE	Greenlite 6.3 Globe	Globe (medium and intermediate bases less than 750 lumens)
6W/LED/OMNID	Greenlite 6 A-Line	Standard A-Type
74067	OSRAM SYLVANIA 14 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
74311	OSRAM SYLVANIA 5.5 A-Line	Standard A-Type
74312	OSRAM SYLVANIA 5.5 A-Line	Standard A-Type
74313	OSRAM SYLVANIA 9.1 A-Line	Standard A-Type
74314	OSRAM SYLVANIA 9.1 A-Line	Standard A-Type
74315	OSRAM SYLVANIA 9.1 A-Line	Standard A-Type
74316	OSRAM SYLVANIA 12 A-Line	Standard A-Type
74317	OSRAM SYLVANIA 12 A-Line	Standard A-Type
74318	OSRAM SYLVANIA 16 A-Line	Standard A-Type
74319	OSRAM SYLVANIA 16 A-Line	Standard A-Type
74454	OSRAM SYLVANIA 14 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
78041	OSRAM SYLVANIA 4.5 A-Line	Standard A-Type
78044	OSRAM SYLVANIA 9 A-Line	Standard A-Type
78045	OSRAM SYLVANIA 9.1 A-Line	Standard A-Type
79116	Sylvania 6 Parabolic Aluminized Reflector	*All reflector lamps below lumen ranges specified above
79166	Sylvania 11 Bulged Reflector	*BR30, BR40, or ER40
79169	Sylvania 9 Bulged Reflector	*BR30, BR40, or ER40
79174	Sylvania 7 Reflector	*R20
79490	OSRAM SYLVANIA 9.6 A-Line	Standard A-Type
79493	OSRAM SYLVANIA 14.8 A-Line	Standard A-Type
79635	Sylvania 6 Specialty	Decorative (Shapes B, BA, C, CA, DC, F, G, medium and intermediate bases less than 750 lumens)

Measure: Model Number	Measure: Product Description	STEP Bulb Type
79636	Sylvania 6 Specialty	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
79655	Sylvania 15 Bulged Reflector	*BR30, BR40, or ER40
79683	OSRAM SYLVANIA 17 A-Line	Standard A-Type
7W/LED/PAR20D/FL	Greenlite 7 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
7W/LED/R20/D	Greenlite 7 Reflector	*R20
7W/LED/R20-D/S	Greenlite 7 Reflector	*R20
7W/LED/RC-4-D	Greenlite 7.1 Downlight Solid State Retrofit	Recessed Downlight Luminaire
7W/LEDX/OMNI/D	Greenlite 7.2 A-Line	Standard A-Type
7W/LEDX/OMNI/D/CL	Greenlite 7.2 A-Line	Standard A-Type
7W/LEDX/OMNI D/CL	Greenlite 7 A-Line	Standard A-Type
8W/LED/BR/EXT/D	Greenlite 8.2 Retrofit Kit	Recessed Downlight Luminaire
8W/LED/BR30/D/30K	Greenlite 8 Bulged Reflector	*BR30, BR40, or ER40
8W/LED/BR30-D/S	Greenlite 8.5 Bulged Reflector	*BR30, BR40, or ER40
91949	GE 10 Watt A19 LED Light Bulbs - Soft White (4pk)	Standard A-Type
92117	General Electric 16.8 A-Line	Standard A-Type
92118	General Electric 16.8 A-Line	Standard A-Type
92915	General Electric 12 A-Line	Standard A-Type
92917	General Electric 12 A-Line	Standard A-Type
92919	General Electric 12 A-Line	Standard A-Type
92924	General Electric 15 A-Line	Standard A-Type
92930	General Electric 15 A-Line	Standard A-Type
92932	General Electric 15 A-Line	Standard A-Type
97230	General Electric 4.2 Candle	Decorative (Shapes B, BA, C, CA, DC, F, G, medium and intermediate bases less than 750 lumens)

Measure: Model Number	Measure: Product Description	STEP Bulb Type
98591	General Electric 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
98812	General Electric 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
99114	GE LED9LS-S6 LED Bright Stik 9W 5000K Daylight 60W Replacement 6 Pack	Standard A-Type
99681	GE LED 65W BR30 Soft White Flood Light (4-pk.)	*BR30, BR40, or ER40
9W/LED/OMNI/D /30K	Greenlite 9 A-Line	Standard A-Type
9W/LED/OMNID/ *	Greenlite 9 A-Line	Standard A-Type
9W/LEDOMNI//D	Greenlite 9 A-Line	Standard A-Type
A6A19A60WUL0 1	Leedarsen America, Inc. 9.5 A-Line	Standard A-Type
A6A19A60WUL0 2	Leedarsen America, Inc. 9.5 A-Line	Standard A-Type
A6GU10M50WES D02	The Home Depot Mfg 5.3 Parabolic Aluminized Reflector	Reflector with medium screw bases w/ diameter <=2.25"
A7A19A40WESD 01	EcoSmart 40W Equivalent Soft White A19 Energy Star and Dimmable LED Light Bulb (4-Pack)	Standard A-Type
A7A19A40WESD 02	EcoSmart 40W Equivalent Daylight A19 Energy Star and Dimmable LED Light Bulb (4-Pack)	Standard A-Type
A7A19A60WESD 01	EcoSmart 60W Equivalent Soft White A19 Energy Star and Dimmable LED Light Bulb (4-Pack)	Standard A-Type
A7A19A60WESD 02	EcoSmart 60W Equivalent Bright White A19 Energy Star and Dimmable LED Light Bulb (4-Pack)	Standard A-Type
A7A19A60WESD 03	EcoSmart 60W Equivalent Daylight A19 Energy Star and Dimmable LED Light Bulb (4-Pack)	Standard A-Type
B6A19100WESD 01	The Home Depot Mfg 15 A-Line	Standard A-Type
B6A19100WESD 02	The Home Depot Mfg 15 A-Line	Standard A-Type
BA19-04527OMF-12DE26-2U100	Cree Inc. 6 A-Line	Standard A-Type
BB13-02027OMC-12DE12-1C600	Cree Inc. 3.2 Specialty	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)

Measure: Model Number	Measure: Product Description	STEP Bulb Type
BB13-035270MC-12DE12-1C600	Cree Inc. 5.3 Candle	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
BPAR30L-0803025C-12DE26-1C100	Cree Inc. 10.5 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
BPAR30L-0803040C-12DE26-1C100	Cree Inc. 10.5 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
BPAR30S-0803040C-12DE26-1C100	Cree Inc. 10.5 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
C5A19A75WESD 04	The Home Depot Mfg 12.5 A-Line	Standard A-Type
C5A19A75WESD 06	The Home Depot Mfg 12.5 A-Line	Standard A-Type
FMLRL 11 14840	Lithonia 20 Fixture	Recessed Downlight Luminaire
FMLRL 14 20840	Lithonia 30 Fixture	Recessed Downlight Luminaire
FMLSL 11 14840	Lithonia 20 Fixture	Recessed Downlight Luminaire
FMLSL 14 20840	Lithonia 30 Fixture	Recessed Downlight Luminaire
FMLWL 24 840	Lithonia 20.1 Downlight Solid State Retrofit	Recessed Downlight Luminaire
FMLWL 48 840	Lithonia 39.7 Downlight Solid State Retrofit	Recessed Downlight Luminaire
FMML 7 830	Lithonia 10 Fixture	Recessed Downlight Luminaire
FMML 7 840	Lithonia 10	Recessed Downlight Luminaire
GVLAO10027D4	TCP 15.4 A-Line	Standard A-Type
GVLAO10050D	Great Value 100W General Purpose LED 4 Pack	Standard A-Type
GVLAO7527D4	TCP 11 A-Line	Standard A-Type
GVRLA6027ND	TCP 9 A-Line	Standard A-Type
GVRLA6027ND4	TCP 9 A-Line	Standard A-Type
GVRLA6050ND	TCP 9 A-Line	Standard A-Type
GVRLA6050ND4	TCP 9 A-Line	Standard A-Type
GVRLAO1027D	TCP 10 A-Line	Standard A-Type
GVRLAO1027D2	TCP 10.2 A-Line	Standard A-Type

Measure: Model Number	Measure: Product Description	STEP Bulb Type
GVRLAO1027D4	TCP 10.2 A-Line	Standard A-Type
GVRLAO1050D	TCP 10 A-Line	Standard A-Type
GVRLAO1050D4	TCP 10 A-Line	Standard A-Type
GVRLAO1850D	TCP 18 A-Line	Standard A-Type
GVRLAO727D	TCP 7 A-Line	Standard A-Type
GVRLAO750D	TCP 7 A-Line	Standard A-Type
GVRLBR3065W5 0KD2	TCP 9 Bulged Reflector	*BR30, BR40, or ER40
GVRLG2540W27 K	TCP 4.3 Globe	Globe (medium and intermediate bases less than 750 lumens)
GVRLG2540W50 K	TCP 4.3 Globe	Globe (medium and intermediate bases less than 750 lumens)
KL9906L6ES	Uninex 9 A-Line	Standard A-Type
KL9907L3ES	Uninex 7 A-Line	Standard A-Type
KL9907L5ES	Uninex 6 A-Line	Standard A-Type
KL9907L6ES	Uninex 6 A-Line	Standard A-Type
KL9910L4ES	Bas	*BR30, BR40, or ER40
KL9911L2ES	Uninex 6 Globe	Globe (medium and intermediate bases less than 750 lumens)
KL9911LES	Uninex 6 Globe	Globe (medium and intermediate bases less than 750 lumens)
KL9922L6ES	Uninex 11 A-Line	Standard A-Type
KL9923L6ES	Uninex 15 A-Line	Standard A-Type
KLFC4CL	Uninex 4 Specialty	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
KLFG4.5CL	Uninex 4.5 Globe	Globe (medium and intermediate bases less than 750 lumens)
KLL4DLF-410WP	Uninex 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
KLL4DLF-610WP	Uninex 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
KLL6DLF-611WP	11 Downlight Solid State Retrofit	Recessed Downlight Luminaire

Measure: Model Number	Measure: Product Description	STEP Bulb Type
LED BR30 9W 33966	Globe Electric Company 9 Bulged Reflector	*BR30, BR40, or ER40
LK3BMW LED	Lithonia 7.5 Downlight Recessed	Recessed Downlight Luminaire
LK4BMW LED	Lithonia 8.2 Downlight Recessed	Recessed Downlight Luminaire
LK4G2MW LED	Lithonia 8.2 Downlight Recessed	Recessed Downlight Luminaire
LK5BMW LED	Lithonia 10.6 Downlight Recessed	Recessed Downlight Luminaire
RA406930WHR	Cooper Lighting 9.8 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RA5606930WHR	Cooper Lighting 9.9 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL460WH830	Cooper Lighting 8.8 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL460WH835	Cooper Lighting 8.8 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL460WH840	Cooper Lighting a Division of Cooper Industries 9.5 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL460WH930	Cooper Lighting a Division of Cooper Industries 9.6 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL460WH935	Eaton's Cooper Lighting Business 8 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL460WH940	Cooper Lighting a Division of Cooper Industries 9.6 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL560WH6835R	Cooper Lighting 9.4 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL560WH6840R	Cooper Lighting 9 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL560WH6930R	Eaton's Cooper Lighting Business 8.8 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL560WH6935R	Eaton's Cooper Lighting Business 8.9 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL560WH6940R	Eaton's Cooper Lighting Business 9.2 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL560WH9835R	Cooper Lighting 13 Downlight Solid State Retrofit	Recessed Downlight Luminaire
RL560WH9935R	Cooper Lighting 13 Retrofit Kit	Recessed Downlight Luminaire
RL560WH-R	Cooper Lighting 9.4 Downlight Solid State Retrofit	Recessed Downlight Luminaire

Measure: Model Number	Measure: Product Description	STEP Bulb Type
SA19-04627MDFD-12DE26-1-14	Cree Inc. 5.6 A-Line	Standard A-Type
SA19-04650MDFD-12DE26-1-14	Cree Inc. 5.2 A-Line	Standard A-Type
SA19-08127MDFD-12DE26-1-14	Cree Inc. 9.5 A-Line	Standard A-Type
SA19-08150MDFD-12DE26-1-14	Cree Inc. 8.5 A-Line	Standard A-Type
SA19-11027MDFD-12DE26-1-11	Cree Inc. 11.2 A-Line	Standard A-Type
SA19-11050MDFD-12DE26-1-11	Cree Inc. 10.4 A-Line	Standard A-Type
SA21-16027MDFD-12DE26-1-11	Cree Inc. 16.5 A-Line	Standard A-Type
SA21-16027MDFD-12WE26-1-11	Cree Inc. 16.5 A-Line	Standard A-Type
SA21-16050MDFD-12DE26-1-11	Cree Inc. 15 A-Line	Standard A-Type
SB13-02427MDCH-12GE12-1-12	Cree Inc. 3.1 Specialty	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
SB13-03427MDCH-12GE12-1-12	Cree Inc. 5 Specialty	Decorative (Shapes B, BA, C, CA, DC, F, G, candelabra bases less than 1050 lumens)
SBR30-06527FLFD-12DE26-1-13	Cree Inc. 8 Bulged Reflector	*BR30, BR40, or ER40
SBR30-06550FLFD-12DE26-1-13	Cree Inc. 7 Bulged Reflector	*BR30, BR40, or ER40
SBR30-15027FLFH-12DE26-1-11	Cree 100W Equivalent Soft White (2700K) BR30 Dimmable LED Light Bulb	*BR30, BR40, or ER40
SBR30-15050FLFH-12DE26-1-11	Cree 100W Equivalent Daylight (5000K) BR30 Dimmable LED Light Bulb	*BR30, BR40, or ER40

Measure: Model Number	Measure: Product Description	STEP Bulb Type
SBR40-11027FLFD-12DE26-1-11	Cree Inc. 12.5 Bulged Reflector	*BR30, BR40, or ER40
SBR40-11050FLFD-12DE26-1-11	Cree Inc. 12 Bulged Reflector	*BR30, BR40, or ER40
SLD405830WHR	Cooper Lighting 12.2 Downlight Solid State Retrofit	Recessed Downlight Luminaire
SLD405930WHR	Eaton's Cooper Lighting Business 12.1 Downlight Recessed	Recessed Downlight Luminaire
SLD606830WHR	Cooper Lighting 12.2 Downlight Solid State Retrofit	Recessed Downlight Luminaire
SLD606930WHR	Eaton's Cooper Lighting Business 13.2 Downlight Solid State Retrofit	Recessed Downlight Luminaire
SPAR38-1503025TD-12DE26-1-11	Cree Inc. 16.9 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
SPAR38-1503045TD-12DE26-1-11	Cree Inc. 16.9 Parabolic Aluminized Reflector	R, PAR, ER, BR, BPAR or similar bulb shapes with medium screw bases w/ diameter >2.5" (*see exceptions below)
SR20-10027FLFH-12DE26-1-11	Cree 75W Equivalent Soft White (2700K) R20 Dimmable LED Light Bulb	*R20
SRDL4-0572700FH-12DE26-1-11	Cree Inc. 9 Downlight Solid State Retrofit	Recessed Downlight Luminaire
SRDL4-0575000FH-12DE26-1-11	Cree Inc. 8 Retrofit Kit	Recessed Downlight Luminaire
SRDL6-0652700FH-12DE26-1-11	Cree Inc. 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
SRDL6-0652700FH-12DE26-1-12	Cree Inc. 10 Downlight Solid State Retrofit	Recessed Downlight Luminaire
SRDL6-0655000FH-12DE26-1-11	Cree Inc. 8.5 Downlight Solid State Retrofit	Recessed Downlight Luminaire
SRDL6-0655000FH-12DE26-1-12	Cree Inc. 8.5 Retrofit Kit	Recessed Downlight Luminaire
SRDL6-1102700FH-12DE26-1-11	Cree Inc. 16 Retrofit Kit	Recessed Downlight Luminaire

12.7 Sub-appendix VII: Efficiency Ratings for Non-Residential HVAC Equipment

This sub-appendix contains the minimum efficiency metrics that are required by building codes for four categories of equipment:

1. Unitary air conditioners and condensing units, in Table 12-10
2. Unitary and applied heat pumps, in Table 12-11
3. Variable Refrigerant Flow (VRF) air conditioners and heat pumps, in Table 12-12
4. Water chilling packages (a.k.a. chillers), in Table 12-13

Table 12-10: Unitary Air Conditioners and Condensing Units - Minimum Efficiency¹⁸²

Equipment Type	Size Category (Btu/h)	Heating Section Type	Subcategory	Minimum Annual Efficiency	Minimum Demand Efficiency
Air conditioners, air cooled	< 65,000 Btu/h	All	Split system/ Single package	13.0 SEER	11.1 EER ¹⁸³
Through the wall (air cooled)	≤ 30,000 Btu/h	All	Split system/ Single package	12.0 SEER	10.5 EER ¹⁸³
Air conditioners, air cooled	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	Split system/ Single package	11.4 IEER	11.2 EER
		All other	Split system/ Single package	11.2 IEER	11.0 EER
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or none)	Split system/ Single package	11.2 IEER	11.0 EER
		All other	Split system/ Single package	11.0 IEER	10.8 EER
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric resistance (or none)	Split system/ Single package	10.1 IEER	10.0 EER
		All other	Split system/ Single package	9.9 IEER	9.8 EER

¹⁸² ASHRAE 90.1 2010, Table 6.8.1A - Electrically Operated Unitary Air Conditioners and Condensing Units - Minimum Efficiency Requirement.

¹⁸³ This value was not provided in ASHRAE 90.1 2010, Table 6.8.1A, so Equation 3 in Sub-appendix V was used to convert SEER to EER.

Equipment Type	Size Category (Btu/h)	Heating Section Type	Subcategory	Minimum Annual Efficiency	Minimum Demand Efficiency
Air conditioners, water cooled	≥ 760,000 Btu/h	Electric resistance (or none)	Split system/ Single package	9.8 IEER	9.7 EER
		All other	Split system/ Single package	9.6 IEER	9.5 EER
	< 65,000 Btu/h	All	Split system/ Single package	12.3 IEER	12.1 EER
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	Split system/ Single package	12.3 IEER	12.1 EER
		All other	Split system/ Single package	12.1 IEER	11.9 EER
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or none)	Split system/ Single package	12.5 IEER	12.5 EER
		All other	Split system/ Single package	12.5 IEER	12.3 EER
	≥ 240,000 Btu/h and < 760,000 Btu/h	Electric resistance (or none)	Split system/ Single package	12.6 IEER	12.4 EER
		All other	Split system/ Single package	12.4 IEER	12.2 EER
	≥ 760,000 Btu/h	Electric resistance (or none)	Split system/ Single package	12.4 IEER	12.2 EER
		All other	Split system/ Single package	12.2 IEER	12.0 EER

Table 12-11. Unitary and Applied Heat Pumps - Minimum Efficiency¹⁸⁴

Equipment Type	Cooling Capacity/ Size Category	Heating Section Type	Subcategory or Rating Conditions	Minimum Annual Efficiency	Minimum Demand Efficiency
Air Cooled (cooling mode)	< 65,000 Btu/h	All	Split System/ Single package	13.0 SEER	11.1 EER ¹⁸⁵
Through-the-wall (air-cooled cooling mode)	≤ 30,000 Btu/h	All	Split System/ Single package	12.0 SEER	10.5 EER ¹⁸⁵
Air Cooled (cooling mode)	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or none)	Split system/ Single package	11.2 IEER	11.0 EER
		All other	Split system/ Single package	11.0 IEER	10.8 EER
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or none)	Split system/ Single package	10.7 IEER	10.6 EER
		All other	Split system/ Single package	10.5 IEER	10.4 EER
	≥ 240,000 Btu/h	Electric resistance (or none)	Split system/ Single package	9.6 IEER	9.5 EER
		All other	Split system/ Single package	9.4 IEER	9.3 EER
Water source¹⁸⁶ (Cooling mode)	< 17,000 Btu/h	All	86°F entering water	Retrofits: 13.0 SEER ¹⁸⁵	Retrofits: 11.1 EER ¹⁸⁶
				RCx ¹⁸⁷ : 13.1 EER _{part-load}	RCx: 11.2 EER
	≥ 17,000 Btu/h and < 65,000 Btu/h	All	86°F entering water	Retrofits: 13.0 SEER ¹⁸⁵	Retrofits: 11.1 EER ¹⁸⁶
				RCx: 14.5 EER _{part-load}	RCx: 12.0 EER

¹⁸⁴ ASHRAE 90.1 2010, Table 6.8.1B - Electrically Operated Unitary and Applied Heat Pumps - Minimum Efficiency Requirement.

¹⁸⁵ This value was not provided in ASHRAE 90.1 2010, Table 6.8.1B, so Equation 3 in Sub-appendix V was used to convert between SEER and EER.

¹⁸⁶ Although ASHRAE values reflect the Building Code minimum, savings are calculated using the efficiencies shown. This is due to the Mid-Atlantic TRM 2018 assumption that the baseline technology—for residential ground source heat pump applications—is an air-cooled heat pump. (There is no corresponding commercial measure in the Mid-Atlantic TRM 2018.)

¹⁸⁷ Two types of measures are categorized as retro-commissioning (RCx) ones: Duct Testing & Sealing and AC/HP/Chiller Tune-ups.

Equipment Type	Cooling Capacity/ Size Category	Heating Section Type	Subcategory or Rating Conditions	Minimum Annual Efficiency	Minimum Demand Efficiency
Ground source¹⁸⁶ (cooling mode)	≥ 65,000 Btu/h and < 135,000 Btu/h	All	86°F entering water	Retrofits: 10.1 IEER ¹⁸⁸	Retrofits: 10.8 EER ¹⁸⁶
				RCx: 13.4 EER _{part-load}	RCx: 12.0 EER
	< 65,000 Btu/h	All	77°F entering water	Retrofits: 13.0 SEER ¹⁸⁵	Retrofits: 11.1 EER ¹⁸⁶
				RCx: 17.4 EER _{part-load}	RCx: 13.4 EER
	≥ 65,000 Btu/h and < 135,000 Btu/h	All	77°F entering water	Retrofits: 11.0 IEER ¹⁸⁸	Retrofits: 10.8 EER ¹⁸⁶
				RCx: 14.9 EER _{part-load}	RCx: 13.4 EER
Air cooled (heating mode)	< 65,000 Btu/h	-	Split system/ Single system	7.7 HSPF	N/A
Through-the-wall (air cooled heating mode)	≤ 30,000 Btu/h	-	Split system/ Single system	7.4 HSPF	N/A
Air cooled (heating mode)	≥ 65,000 Btu/h and < 135,000 Btu/h	-	47°F DBT/ 43°F WBT outdoor air	3.3 COP	N/A
	≥ 135,000 Btu/h (cooling capacity)	-	47°F DBT/ 43°F WBT outdoor air	3.2 COP	N/A
Water source (heating mode)	< 135,000 Btu/h (cooling capacity)	-	68°F entering water	4.2 COP	N/A
Ground source (heating mode)	< 135,000 Btu/h (cooling capacity)	-	32°F entering water	3.1 COP	N/A

¹⁸⁸ This value was not provided in ASHRAE 90.1 2010, Table 6.8.1B, so Equation 4 in Sub-appendix V was used to convert between EER and IEER.

Table 12-12: Variable Refrigerant Flow Air Conditioners and Heat Pumps - Minimum Efficiency¹⁸⁹

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Conditions	Minimum Annual Cooling Efficiency	Minimum Peak Cooling Efficiency	Minimum Heating Efficiency
VRF Air Conditioners, Air Cooled	< 65,000 Btu/h	All	VRF Multi-Split System	13.0 SEER	11.1 EER ¹⁹⁰	N/A
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or none)	VRF Multi-Split system	13.1 IEER	11.7 EER ¹⁹¹	N/A
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or none)	VRF Multi-Split system	12.9 IEER	11.6 EER ¹⁹¹	N/A
	≥ 240,000 Btu/h	Electric Resistance (or none)	VRF Multi-Split system	11.6 IEER	10.4 EER ¹⁹¹	N/A
VRF Heat Pumps, Air Cooled	< 65,000 Btu/h	All	VRF Multi-Split system	13.0 SEER	11.1 EER ¹⁹⁰	7.7 HSPF
	≥ 65,000 Btu/h and < 135,000 Btu/h	Electric Resistance (or none)	VRF Multi-Split system	12.9 IEER	11.6 EER ¹⁹¹	3.3 COP
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric Resistance (or none)	VRF Multi-Split system	12.3 IEER	11.0 EER ¹⁹¹	3.2 COP
	≥ 240,000 Btu/h	Electric Resistance (or none)	VRF Multi-Split system	11.0 IEER	9.8 EER ¹⁹¹	3.2 COP

¹⁸⁹ ASHRAE 90.1 2010, Tables 6.8.1I - Electrically Operated Variable Refrigerant Flow Air Conditioners- Minimum Efficiency Requirement and 6.8.1J - Electrically Operated Variable Refrigerant Flow Heat Pumps - Minimum Efficiency Requirement.

¹⁹⁰ This value was not provided in ASHRAE 90.1 2010, Table 6.8.1I and Table 6.8.1J, so Equation 3 in Sub-appendix V was used to convert between SEER and EER.

¹⁹¹ This value was not provided in ASHRAE 90.1 2010, Table 6.8. 1I and Table 6.8.1J, so Equation 4 in Sub-appendix V was used to convert between IEER and EER.

Table 12-13: Water Chilling Packages – Minimum Efficiency¹⁹²

Equipment Type	Size Category	Units	Path A		Path B	
			Full Load	IPLV	Full Load	IPLV
Air Cooled Chillers	< 150 tons	EER	≥ 9.562	≥ 12.750	NA	NA
	≥ 150 tons	EER	≥ 9.562	≥ 12.750	NA	NA
Water-cooled, electrically operated, positive displacement	< 75 tons	kW/ton	≤ 0.780	≤ 0.630	≤ 0.800	≤ 0.600
	≥ 75 tons and < 150 tons	kW/ton	≤ 0.775	≤ 0.615	≤ 0.790	≤ 0.586
	≥ 150 tons and < 300 tons	kW/ton	≤ 0.680	≤ 0.580	≤ 0.718	≤ 0.540
	≥ 300 tons	kW/ton	≤ 0.620	≤ 0.540	≤ 0.639	≤ 0.490
Water-cooled, electrically operated, centrifugal	≤ 150 tons	kW/ton	≥ 0.634	≤ 0.596	≤ 0.639	≤ 0.450
	≥ 150 tons and < 300 tons	kW/ton	≤ 0.634	≤ 0.596	≤ 0.639	≤ 0.450
	≥ 300 tons and < 600 tons	kW/ton	≤ 0.576	≤ 0.549	≤ 0.600	≤ 0.400
	≥ 600 tons	kW/ton	≤ 0.570	≤ 0.539	≤ 0.590	≤ 0.400
Water-cooled, unknown¹⁹³	< 75 tons	kW/ton	≤ 0.780	≤ 0.630	≤ 0.800	≤ 0.600
	≥ 75 tons and < 150 tons	kW/ton	≤ 0.775	≤ 0.615	≤ 0.790	≤ 0.586
	≥ 150 tons and < 200 tons	kW/ton	≤ 0.680	≤ 0.580	≤ 0.718	≤ 0.540
	≥ 200 tons and < 300 tons	kW/ton	≤ 0.634	≤ 0.596	≤ 0.639	≤ 0.450
	≥ 300 tons and < 600 tons	kW/ton	≤ 0.576	≤ 0.549	≤ 0.600	≤ 0.400
	≥ 600 tons	kW/ton	≤ 0.570	≤ 0.539	≤ 0.590	≤ 0.400

¹⁹² ASHRAE 90.1-2010, Table 6.8.1C - Water Chilling Packages - Efficiency Requirements. Consistent with International Energy Conservation Code 2009, Table 503.2.3(7) Water Chilling Packages, Efficiency Requirements, used in the 2018 Mid-Atlantic TRM. Compliance with this standard can be obtained by meeting the minimum requirements of Path A or Path B. However, both the full load and IPLV must be met to fulfill the requirements of Path A or Path B.

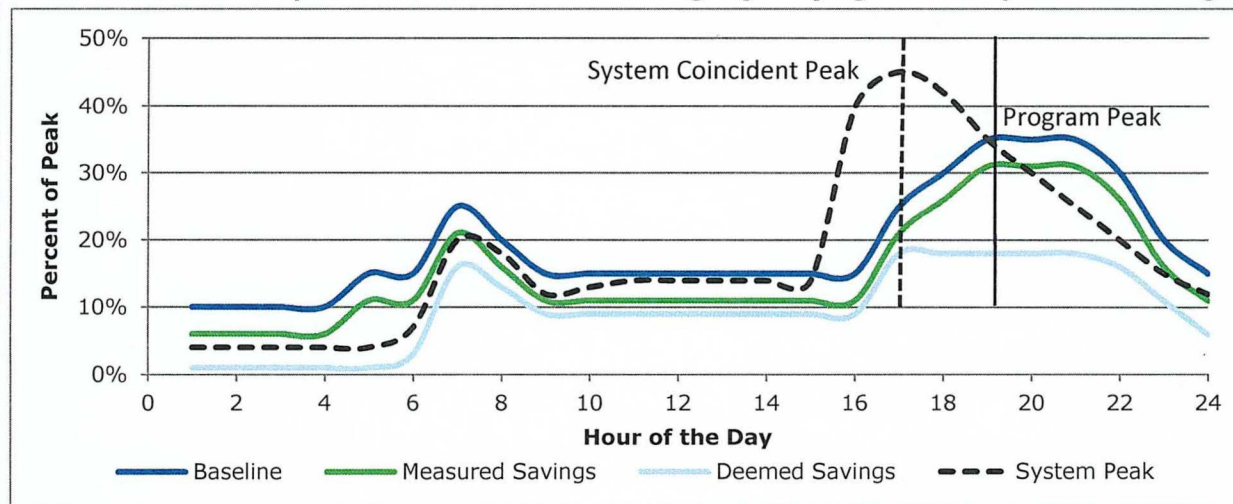
APPENDIX G. RESIDENTIAL INCOME AND AGE QUALIFYING HOME IMPROVEMENT PROGRAM EM&V PLAN (VERSION 9.0)

Residential Income and Age Qualifying Home Improvement Program	
Program Summary	The Income and Age Qualifying Home Improvement Program is designed to provide qualifying low-income (60% or less of Virginia state median income) and elderly (60+ and household income of up to 120% Virginia state median income) residential customers of the Company with a free energy audit that identifies certain areas where they can save money on their monthly electric bill. If homeowners (or authorized renters) approve, auditors may immediately make certain improvements while at the home.
Measures	<p>The following high efficiency measures are covered by the program:</p> <ul style="list-style-type: none"> • Incandescent lighting changed to LEDs (up to 6 lamps per home) • Pipe wrap installed on any exposed and accessible hot water supply lines from electric water heater • Showerhead changed from 2.5 gpm to low flow 2.0 gpm for electric heaters • Kitchen and bathroom aerators changed from 2.2 gpm to low flow 1.5 gpm for electric heaters • Attic insulation of a maximum of R-49
EM&V Method	<p><u>International Performance Measurement and Verification Protocol (IPMVP - Option C)</u>: The savings measurement approach defined in IPMVP Option C and ASHRAE Guideline 14 determines energy and demand savings through the use of whole-facility energy (end-use) data, which may be measured by utility meters or data loggers. This approach will involve the use of monthly utility billing data from a main meter for a twelve-month period before and after the audit/install date, and adjust the savings estimates derived from engineering algorithms applied to the Company's program participation data. The adjustment factor, also called a realization rate,¹ is then applied to the population of participants to estimate program savings. This approach will capture Company-specific customer usage data, which will be applied to actual participating households to quantify energy and peak demand savings.</p> <p>The following figure illustrates the various components used to arrive at the savings estimates.</p>

¹ The "realization rate" is the proportion of assumed or estimated energy and peak demand savings that is actually realized by a customer or project. It is expressed as a percentage, and is derived from follow-up research (billing analyses and customer surveys) to verify that measures were in fact installed and are operating as intended, and/or actions were taken.

Residential Income and Age Qualifying Home Improvement Program

Illustrative Load Shape: Residential Income and Age Qualifying Home Improvement Program



1. **Baseline Estimation Approach (Dark blue line):** The baseline wattage of all installed measures will be computed using baseline conditions tracked in the program participation data using the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual. The original source of these deemed savings approaches is derived from the Mid-Atlantic Technical Resource Manual (TRM) and other TRMs. The baseline will also be represented in the billing analysis by the pre-retrofit data period for the household, overall, and will be analyzed for measure-specific impacts.
2. **Deemed Savings Approach (Light blue line):** Deemed savings values will be estimated per the DNV GL Energy STEP Manual. The deemed savings approaches therein are largely derived from the Mid-Atlantic TRM.
3. **Measured Savings Approach (Green line):** The energy savings will be estimated from a billing analysis of participants based on comparing pre-installation and post-installation data.

Deemed Savings Approach

Refer to the Residential Income and Age Qualifying Home Improvement Program section of the STEP Manual for the standard deemed savings approach for the measures in this program.

Residential Income and Age Qualifying Home Improvement Program	
EM&V Measurement, Timeline, and Scope of Work	<ul style="list-style-type: none"> • Analysis of program tracking data: Annual Report (May 1 of each year following program launch). • Annual updates to STEP Manual for updates that occurred to its referenced sources. • Develop baseline, measure savings, and efficient load shapes. • Provide regulatory support as necessary
Document Revision History	Version 7.0 <ul style="list-style-type: none"> • New version
	Version 8.0 <ul style="list-style-type: none"> • Edited "EM&V Measurement, Timeline, and Scope of Work" section to be consistent with other programs.
	Version 9.0 <ul style="list-style-type: none"> • Formatting updates • Updated from DNV GL Energy to DNV GL Energy Insights

Appendix G-1. Residential Income and Age Qualifying Home Improvement Program Manual



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May 01 2019



Dominion Energy Income and Age Qualifying Home Improvement Program Manual

August 2018

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Preface

Marginal and Text Markings

Solid vertical lines in the margins within the body of the code indicate a change or new clarification from the previous program requirements.

(⇒) Deletion indicators are provided in the margin where a paragraph or item has been deleted.

Underlines within the body of the code indicate a clarification compared to the previous program requirements.

1

Introduction

The Income and Age Qualifying Home Improvement program (Program) has been designed to help qualifying low-income and elderly customers reduce energy expenses through installation of a select set of energy conservation measures (ECMs). The design of this program aligns with the Virginia Department of Housing and Community Development Weatherization Assistance Program (DHCD WAP), providing an opportunity for Dominion Energy approved Weatherization Service Providers to:

- Install eligible equipment funded by Dominion Energy
- Free up DOE and LIHEAP funds for addition measures under the VA WAP program
- Potentially reach more customers
- Provide energy efficiency measures for customers not traditionally eligible under DOE and LIHEAP

Virginia weatherization providers interested in applying as Dominion Energy Weatherization Service Providers (WSP) must be currently active and in good standing with Virginia's Department of Housing and Community Development (DHCD), and have a service territory that overlaps with Dominion's assigned electric service territory.

1.1 Program Implementer

The Dominion Energy (Dominion) Program is implemented by Nexant, Inc. Dominion has contracted and authorized the Program Implementer to perform activities including, but not limited to: reviewing, processing, and approving WSP and customer applications; qualifying, training, and educating WSPs; inspecting customer projects; and issuing incentive checks.

1.2 Program Manual

This Income and Age Qualifying Home Improvement Manual (Program Manual) is designed for use by Weatherization Service Providers (WSPs) approved to provide services to eligible Dominion customers through the Program. The Program Manual outlines the specific requirements for the Program and is designed to assist WSPs in understanding the program process; customer and measure eligibility requirements; project services; and WSP role.

1.3 Program Manual Updates for 2018

- The sections in the Program Manual have been re-arranged in a format that is similar to other weatherization guidelines.
- Program starts July 1, 2018 and all projects must be submitted by November 30, 2018 to be eligible to receive an incentive in 2018.
- Section 2.2 has been updated. Eligible low income master metered multi-family properties are eligible to participate only under the Energy Share Weatherization Services Program.
- Section 3.1.3 clarification on WSPs working within the confines of their Designated Service Areas. Weatherization agencies that own or manage low income properties are now required to coordinate with the assigned agency to include the property in the local agency's annual spending plan.
- Section 3.3.1 clarification on timeline for application submission. Failure to submit within the designated timeline can result in non-payment.
- Section 3.3.3 and the individual measures have been updated to state that photographs for 10% of each unit type must be submitted for multifamily buildings. 100% of Single Family homes need photos submitted.
- Section 3.3.3 clarification on timeline for completing applications in Missing Information Status and WSP responsibility for reviewing and providing feedback on Weekly Status Report.
- Added Section 3.3.4 WSP site inspection requirements for multi-family units.
- Section 5 Tables:
 - Required Documentation has been updated in each table, including new requirements for including bill of materials and site inspection documents for multi-family properties.
 - Updated the pipe wrap eligibility in Table 5.4 to include that pipe insulation shall be taped (using a high quality tape with good adhesion), caulked (with appropriate caulk to secure and adhere to insulation), or glued at all joints.
- Added Section 5.2.1 to clarify photographic documentation requirements for installed energy conservation measures (ECMs).
- Added Appendix C - Example Ineligible Address List and Signed Attestation
- Added Appendix D – Program Notices. This section is a placeholder for 2018 Program Notices.
- Added Appendix E – Weatherization Agency Site Inspection Checklist

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Customer Eligibility

This section outlines the customer and property eligibility requirements as well as the requirements for project pre-approvals.

2.1 Customer Eligibility Requirements

WSPs are required to verify the eligibility of potential customers before performing the energy assessment. All customers will be required to certify being income eligible for the Program by executing a Program consent form. To qualify for the Program, a customer must meet the following eligibility requirements:

- Customer must be a current Dominion or a new service customer intending to receive electric services on a residential rate schedule; and either
- Customer must have a total household income that does not exceed 60% of the Virginia Median Income; or
- Customer is 60 years or older with a total household income that does not exceed 120% of the Virginia Median Income.

Both owner-occupied and renter-occupied households are eligible to participate in the Program. Eligible customers must be responsible for the electric bill and either own the home or be able to secure permission from the owner to perform the Program qualifying installations or improvements.

Customer measures receiving incentives through this Program are not eligible to receive incentives through any other programs offered by Dominion. In addition, only one application may be submitted per household.

2.2 Property Eligibility

Eligible customers must be living in single family residences, townhomes, mobile homes, and separately metered multi-family dwellings (apartments and condos) with electric or non-electric heating and electric cooling. Customers residing in a multi-family facility must be in a multi-family facility that is sub-metered. Multifamily facilities owned by local housing authorities are not eligible under the Income and Age Qualifying Home Improvement Program.

Some measures have fuel restrictions (see Section 5.2 for details).

2.3 Multi-family Eligibility – Properties that aren't 100% Income Qualified Properties

Steps to qualification:

- 1) Responsible weatherization agency shall meet with the property manager or owner to confirm program eligibility requirements are met. In the meeting, the property management firm will bring a list containing the apartment unit number and tenant income. The weatherization agency will provide the income and other program requirements. On a unit by unit basis, the property management representative will confirm whether the individual resident(s) qualify for participation in the program. Please Note: this responsibility falls on the weatherization agency, and is not to be assigned to the subcontractor(s) performing the work
- 2) Property management representative will execute an attestation that this review has been performed. The items that must be included in the attestation are illustrated in Appendix C of this Program Notice.
- 3) Units that do not meet the program requirements are to be listed in the project application on the Ineligible Address List tab.
- 4) Weatherization agency must complete and sign attestation on the Ineligible Address List tab. See Appendix C for example of the ineligible address list tab and example of the signed attestation.
- 5) Note: Vacant units in properties that are not 100% tax credit or section 8 do not automatically qualify for program eligibility. Weatherization agency understands that if measures are installed, the units may not qualify for reimbursement once the unit is occupied.

2.4 Pre-Approval and Pre-Qualification

- All multifamily projects must secure pre-qualification prior to installation of equipment, regardless of incentive amount. Pre-qualification allows the Program Implementer to ensure that the residents meet the program age and income requirements and approve the measures for the project. To submit a project for pre-qualification, provide an email containing the following information 14 days in advance of scheduled ECM installation:
 - Contact name and information for the apartment's property manager
 - Number of units
 - A list of expected measures per unit type (1 bedroom, 2 bedroom, etc.)
 - The income limits for the apartment complex
- Failure to provide advance notice may delay WSP planned installation schedule.
- Dominion Energy is allowing installation of more than 6 LEDs on a case-by-case basis. Nexant must visually pre-qualify any property with more than 6 LEDs to confirm

applicability, and written confirmation (via email) will be provided if approved. The written confirmation is to be submitted with the rebate application.

- The maximum number of LEDs approved to be installed in any individual unit is no greater than 12 LEDs.

3

WSP/Contractor Expectations

This section outlines the roles and responsibilities of the WSP.

3.1 WSP Commitment and Customer Satisfaction

WSPs are the key to success and customer satisfaction for the Program.

3.1.1 Participation Commitment

Program-qualified WSPs are assigned an annual budget allocation for the IAQHI program. On a weekly basis, participation levels are tracked and a weekly status report is emailed to individual WSPs summarizing the status of that WSP's projects. A sample WSP Weekly report is provided in Appendix A.

Program approved WSPs shall provide a spending plan for the assigned allocation by the communicated delivery date for that year. Should Program approved WSPs not provide a spending plan, or if they fail to meet the submitted spending plan by a designated date each year, Dominion reserves the right to service eligible low income customers via a third party subcontractor.

3.1.2 Customer Satisfaction

Customer satisfaction is one of the top priorities of the Program. As such, it is the WSP's responsibility to represent the Program and interact with customers professionally and communicate the requirements for Program qualification accurately. WSPs shall be solely responsible to the customer for the installation of the ECM, and all WSPs are required to enter into a service agreement with customers for the installation services. Failure to do so will result in removal from the Program.

3.1.3 WSP Service Area

WSPs may only perform Program weatherization services in the service area for which the WSP has been approved by the Virginia DHCD or an area defined by Dominion or Program Implementer (Designated Service Area). Dominion and Program Implementer reserve the right to change the Program at any time.

3.1.4 Customer Information

Program Qualified WSPs receiving Customer information shall:

- Treat a customer's personal information as confidential;
- Safeguard customer information and take all reasonable precautions to prevent any unauthorized use or disclosure;
- Not use customer information for any purposes other than for the purpose of performing Program related services;

- Only disclose customer information to WSP employees and subcontractors directly involved in the Program, or as otherwise required by law and comply with all legal requirements to safeguard the customer's information.

3.2 Program Marketing Materials

WSP shall not use Dominion's or Program Implementer's corporate name, trademark, trade name, logo, identity, or any affiliation on WSP marketing or other materials (printed copy or electronic) for any reason, including, without limitation, soliciting customers, without Program Implementer's prior written consent. Approved Program marketing materials will be provided to WSPs with a space for a business card to be added; these materials may only be used for the sole purpose of promoting the Program and may only be used during the Program term.

3.3 WSP Role

3.3.1 Project Services

The WSP's role includes providing the following project services to eligible Dominion customers:

- Recruiting of and assistance to eligible customers participating in the Program including distribution of marketing materials; assistance in completing Program related documentation including completing the energy assessment form with customer; submitting the required documentation for each measure; answering any questions asked by the customer on the Program; and answering any questions or requests for documentation by the Program Implementer or Dominion concerning customer projects;
- Respond to all inquiries from Program Implementer, Dominion and its customers within two (2) business days. WSP shall communicate with the Program staff and Dominion customers, and resolve any customer issues related to a customer project in a timely, professional, and responsive manner;
- Verify customer eligibility prior to performing energy assessment and installing the proposed Program qualifying energy efficiency improvement and measures (ECM) project by:
 - Ensuring that the customer is a current Dominion residential electric customer,
 - Ensuring that the income qualifying customer meets Virginia Department of Housing and Community Development's (DHCD) Income requirements as outlined in the Program Manual, and
 - Ensuring that the age-qualifying customer meets the income threshold of 120% of the State of Virginia's median income if they are 60 years or older;
- Completing an accurate energy assessment of customer's project to identify Program eligible ECMs that would result in energy savings at the customer facility;
- Reviewing the energy assessment form and recommended improvements with the customer and obtain customer approval of WSP's installation of the customer selected ECMs with a signature on an installation agreement between WSP and the customer. Only one energy assessment form may be completed for a qualifying customer facility;

- Installing the ECMs in a professional and safe manner, in compliance with the customer installation agreement and Program requirements;
- Provide a copy of the energy assessment summary to the customer;
- Purchase and stock necessary Program-eligible ECMs;
- Submitting within 30 days of project completion, an invoice (Incentive Worksheet) to Program Implementer for Program Incentives, accurately reporting quantity of measures installed, and providing necessary documentation. In the case of delayed invoice submission, WSP is to communicate reason for delay to Program Implementer. Projects that are not submitted within 90 days risk non-payment.

3.3.2 Qualifying Energy Conservation Measures (ECM)

WSPs are required to submit ECM product technical specifications to Program Implementer for review and approval prior to placing orders, stocking inventory, and installing in customers' homes. Product specification sheet(s) must clearly indicate product and model number, and contain information that illustrates the product's compliance with *Eligibility Requirements* as stated in Tables 5-1 through 5-10.

Periodically the Program Implementer will pull the approved technical specifications and confirm product eligibility throughout the life cycle of the measure. This includes periodic inspection of equipment in the warehouse (or in transit to a site), inspection during installation, or inspection post-installation.

3.3.3 Project Documentation

The WSP shall collect and submit all required Program information and documentation on customer projects. As noted under 3.1.4, Customer Information, customer's personal information is to be treated as confidential. To ensure customer information is protected, the WSP shall submit the following program documentation through the SFTP service provided by the Program Implementer:

- Excel and PDF versions of the energy assessment form.
- PDF versions of the required project documentation for each ECM installed as outlined in Section 5.2. Pre-approved product sheets are not required to be submitted with project applications.
- Photographs, Multi-family – Pre- and post-installation photographs must be submitted for 10% of the total number of units (apartments) participating in the program and must also be distributed to cover 10% of each unit type (i.e. 1 BR, 2 BR, etc.). In addition, photos of the insulation in each building receiving attic insulation must be submitted.
- Photographs, Single Family - 100% of Single Family homes must have photos submitted.
- All photos must be equal to the measures shown on the Incentive Worksheet. Inaccurate documentation can result in projects getting stuck in Missing Information status or worse – unapproved for reimbursement. To reduce file sizes, photographs may be uploaded in a JPEG format.

- A copy of the executed (signed) WSP invoice (Incentive Worksheet) for Program eligible ECMs.
- A copy of the executed (wet signature) WSP installation agreement (Project Application) with the customer. Electronic or digital customer signatures are not acceptable.
- A copy of the material invoice or bill of materials for multi-family units
- A copy of the final inspection report for multi-family units
- Emailing documents is not permitted.
- All project applications must be complete prior to uploading to the SFTP. Incomplete applications may be rejected.
- Project applications that cannot be processed as a result of Missing Information must be resolved within 90 days or risk non-payment AND with no exception will payments for work completed in one year be paid after February 28th of the following year.

3.3.4 Site Inspections and Subcontractors

Weatherization Service Providers (WSPs) are required to perform a final inspection of a project before the job is submitted for rebate. In situations where a subcontractor is used to perform a portion or all of the weatherization work, the WSP is responsible for inspecting and certifying that the work has been completed to the program standards.

3.3.5 Other WSP Responsibilities

- Spend the annual budget allocation consistently throughout the program year. Failure to participate and serve eligible customers will result in assignment of a third party contractor to ensure Dominion's customers are served.
- Use the proper personal protective equipment. All Program services shall be performed by WSP in compliance with all applicable local, state, and federal laws, regulations, and ordinances.
- Assume full responsibility for removal of old equipment from the customer facility and for sorting, storage, recycling and proper disposal of equipment and waste material in compliance with all applicable laws and regulations and the prevailing local jurisdiction.
- Provide additional information and documentation, and right to inspect retained Program records, with respect to Program and customers and ECM pertaining to Program when requested by Program Implementer or Dominion.
- Conduct professional and ethical business at all times.

3.3.6 WSP Non-compliance Process

- Weatherization Service Providers (WSPs) are expected to meet the Program service expectations which include, but are not limited to:
 - Commitment to servicing customers and promoting the Program,
 - Customer satisfaction and education,

- Accurate and timely project document submissions,
 - Performing quality workmanship,
 - Providing a safe work environment, and
 - Conducting business in accordance with all applicable laws.
- WSPs will promote an atmosphere of respect and fair business dealings with Dominion's customers, suppliers, business partners and competitors in compliance with applicable law. WSPs will not take unfair advantage of any individual or company through manipulation, concealment, abuse of privileged information, misrepresentation of material facts, or any other unfair practices. WSPs shall deal fairly with all customers and competitors and will not enter into any type of agreement, understanding or arrangement between customers or competitors, whether written or oral, formal or informal, express or implied, that limits or restricts competition.
- Implementing Contractor may suspend WSP's right to participate in the Program if Implementing Contractor determines that there is non-compliance with Program requirements. Upon notice of suspension, all of WSPs rights with regards to the Program Benefits will be terminated during the period of suspension which may include Program customer acquisition and installation work.

Program Benefits:

- a. *Payment for approved Incentives*
 - b. *Program promotional materials*
 - c. *Customer referrals*
 - d. *Program-related training*
- If WSPs work is not in conformance with project pre-approval documents, the WSP shall correct such work, at its own expense, within seven (7) calendar days of written notice of non-compliance from Implementing Contractor. If the WSP fails or refuses to correct such non-conformance within seven (7) days after such notice, Implementing Contractor shall have the right to withhold the funds from the WSP.
- If WSP fails to comply with the guidelines outlined in this Program Manual or those in the Weatherization Service Provider Application and Agreement, Implementing Contractor may provide WSP with written notice of non-compliance. The written notice of non-compliance shall contain:
 - A summary of the non-compliant action;
 - Expectations for resolution;
 - A time frame for resolution; and
 - Scheduling of a resolution follow-up meeting, if required.
- The Implementing Contractor may terminate this Agreement for any WSP who receives two (2) or more notices of non-compliance.
- If the Implementing Contractor determines, in its sole discretion, that WSP is involved in fraudulent activity, the Implementing Contractor may immediately terminate this

Agreement and remove WSP from the Program. Such fraudulent activity that may result in immediate termination and removal include:

- Falsifying invoices;
 - Invoicing for more measures than actually installed;
 - Providing inaccurate information in a customer application, project documentation, or invoice in order to obtain or increase incentive amounts;
 - Misrepresenting the eligibility requirements for the Program to the customer; or
 - Misrepresenting its relationship to third parties.
- Implementing Contractor may withhold payment to WSP for any of the reasons noted below. Implementing Contractor shall give WSP written notice, by email is sufficient, stating the specific reasons for disapproval of WSPs submission for incentive payment. When the reason for withholding payment is removed or corrected, payment will be made.
- WSP fails to submit project documentation or deliverables in accordance with Program documentation submission requirements;
 - Nonconforming or defective work has not been corrected in a timely fashion; or
 - Implementing Contractor has reasonable suspicion that WSP is involved in fraudulent activity.

Removed WSPs

- In the event the WSP is removed from the Program, WSP shall:
- Not perform any Program customer acquisition or installation work after the termination date or a date approved by the Implementing Contractor in writing (email is sufficient).
 - Cooperate with Implementing Contractor in the Project Close-out Procedures provided below.
 - Immediately cease promoting its participation in the Program
- A removed WSP is not permitted to perform any work on Program projects as a subcontractor to any other WSP.
- A removed WSP is eligible to reapply to the Program after twelve (12) calendar months from the date of notification of removal.

Project Close-out Procedures

- After notice of termination, WSP will not be able to submit any projects to the Implementing Contractor for project pre-approval.
- For previously approved projects, WSP shall complete the pre-approved scope and submit final project documentation to Implementing Contractor within sixty (60) calendar days of the date of the termination notice in order to be considered for payment of incentives, regardless if a pre-approval notice has stated otherwise. NO PROJECT CLOSE-OUT TIMEFRAME EXTENSION REQUESTS WILL BE GRANTED. If WSP fails to submit the required documentation within the specified timeframe, Implementing

Contractor has the right to reassign the customer application and project to another WSP for completion of any outstanding work.

- All pre-approved projects with completed final documentation will be inspected by the Implementing Contractor and incentives will be paid on actual measures installed that are in compliance with Program requirements.

The above remedies are in addition to any other remedies that are available to Implementing Contractor and Utility under this Agreement or by law.

4 WSP/Contractor Participation Requirements

WSPs participating in the Program are required to comply with the below participation requirements throughout the term of their agreement. WSP is responsible for submitting all required participation documentation to the Program Implementer annually and for updating any changes or additions to their information immediately. During the term of its agreement, WSP shall provide to Program Implementer satisfactory evidence that it continues to be fully licensed and insured along with quality and timely submission of appropriate materials, consistent with the terms of its agreement, within (15) fifteen days of any request by Program Implementer for such verification.

4.1 Background Investigation Requirements

Prior to permitting any individuals to perform Program services on WSP's behalf, WSPs are required to perform background investigations on all WSP employees, and require their subcontractors to perform for their employees, who will have access to a Dominion's customer information and/or will be performing services at a customer's residence through the Program. Background investigations shall include a seven (7) year criminal history check for misdemeanor and felony convictions. WSP must conduct all background investigations in accordance with applicable federal and state laws.

WSP must certify to Program Implementer that background investigations have been completed for all applicable WSP employees and subcontractors prior to performing any services for the Program by submitting the WSP Background Certification Form (Certification) provided below as Exhibit 1. The certification provided by the WSP is an affirmative statement that background investigations for all relevant WSP employees and subcontractors have been completed in compliance with these Background Investigation Requirements and that no material items were discovered during the investigation that would impact performance of services for the Program or that may be deemed to pose an unacceptable safety or security risk to Dominion or its customers ("Adverse Findings"), and that all WSP employees and subcontractors will continue to be in compliance with these terms throughout performance of the services under the Program.

WSP shall not permit any WSP employee or subcontractor to perform services for a Dominion customer under this Program if an investigation shows Adverse Findings or such individuals fail to maintain compliance with these terms. If at any time after the Certification has been provided to Program Implementer, WSP becomes aware of Adverse Findings for employees or subcontractors who were listed in the Key Personnel List as part of the Certification, WSP shall discontinue use of such individual in performance of the Program services and WSP shall notify Program Implementer immediately.

4.2 Insurance Requirements

WSP shall cause its insurers to provide valid proof of insurance to Program Implementer of the applicable coverage and endorsements or copies of the applicable policy language affecting coverage as required before performance of any Program Services. Such insurance will remain in full effect for the term of the agreement. Failure of Program Implementer to enforce the minimum insurance requirements will not relieve the WSP of responsibility for maintaining the coverage(s). WSP is solely responsible for all premiums and deductibles for insurance required by the agreement.

- Automobile Liability Insurance for coverage of owned, non-owned, hired or rented, autos used in the performance of Program Services with minimum combined single limits of \$1,000,000 per accident for bodily injury, including death, and property damage.
- Workers' Compensation Insurance for WSP's employees to the extent required by applicable state statutory limits where services are performed or, as required by law, anywhere else a WSP's employee performing services is normally employed. Employers' liability with limits no less than \$500,000 Bodily Injury for Each Accident; \$500,000 Bodily Injury by Disease for Each Employee; \$500,000 Bodily Injury Disease Aggregate.
- Commercial General Liability Insurance on an occurrence basis including bodily injury and property damage, including premises liability, products/completed operations liability, and blanket contractual liability with limits no less than \$1,000,000 each occurrence; \$1,000,000 general aggregate; \$1,000,000 products/completed operations aggregate.

Additional Insurance Provisions

Any insurance required to be carried by WSP will be primary and is not contributing with any other insurance carried by Program Implementer.

Dominion, Nexant Inc., and their respective subsidiaries and each of their officers, directors, and employees shall be named as additional insureds on Commercial General Liability and Automobile Liability policies by a policy provision or endorsement.

WSP's insurer will provide Program Implementer with thirty (30) days prior written notice of cancellation, non-renewal or any material change of its insurance coverage.

WSP hereby grants to Program Implementer a waiver of any right to subrogation which any WSP insurer may acquire by virtue of the payment of any loss under such insurance against (i) the beneficiary, (ii) all additional insureds, (iii) Program Implementer and its subsidiaries, and (iv) the Utility. WSP agrees to obtain any endorsement that may be necessary to effect and permit waiver of subrogation, but this provision applies regardless of whether or not Program Implementer has received a waiver of subrogation endorsement from the insurer.

WSP shall ensure that WSP insurance covers the actions of any WSP subcontractors providing installation services and shall require its subcontractors at all tiers, if any, providing services to