

Program customers, to comply with these insurance requirements. WSP shall provide proof of insurance for such subcontractors, as requested by Program Implementer.

Program Implementer reserves the right to modify these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other special circumstances.

### 4.3 Licensing and Certification Requirements

WSP licensing and certification requirements are specified below. WSP shall provide copies of all required licenses and certifications to Program Implementer for all applicable WSP employees and subcontractors. The WSP firm must have a current Virginia Department of Professional and Occupational Regulation (DPOR) Contractor's License – Class A, B or C as appropriate - and Residential Building Energy Analyst Firm License.

WSP's field staff and subcontractors performing Program services must meet current Virginia Department of Housing and Community Development (DHCD) Weatherization Assistance Program requirements which include OSHA and EPA training/certifications, DPOR licensing requirements, Building Performance Institute (BPI) certification. These requirements are specified in more detail below:

#### **Required for WAP Energy Auditors (required within 12 - 18 months of employment):**

- Retrofit Installer Technician (RIT)
- HVAC Fundamentals
- Duct Sizing Class
- NEAT/MHEA Energy Audit Software
- ASHRAE 62.2
- Energy Auditor Classroom Revised June 2013 Chapter 9 – Training and Technical Assistance Virginia Weatherization Assistance Program Page 3 of 3 Program Operations Manual

#### **Required for WAP Workers (required within 9 months of employment):**

- Retrofit Installer Technician (RIT)
- Lead Safe Weatherization (LSW)
- OSHA 10 Construction Safety Course

#### **Required for WAP Crew Leaders (required within 12 months of employment):**

- Retrofit Installer Technician (RIT)
- Lead Safe Weatherization (LSW)
- OSHA 30 Construction Safety Course
- Required Lead training

- Lead Safe Weatherization (LSW)

**All WAP crew workers and subcontractors working on Weatherization, LIHEAP, or SERC must complete this class:**

- Renovation, Repair and Painting (EPA RRP rule)

## 4.4 Safety Requirements

WSP is responsible for ensuring that all individuals performing Program services on behalf of WSP comply with reasonable safety practices and protocols required to perform the services. WSP is required to have a safety program to be used as guidelines and direction for WSP employees and subcontractors, as applicable. The safety program must meet all federal, state, and local laws. WSP shall provide a copy of WSP's written safety policy to Program Implementer.

WSP's safety program must include the following minimum requirements:

- Safety policy and procedures which address all required local, state and federal occupational safety and health standards and trade-specific licensing and certification requirements and a safety officer responsible for program implementation;
- Safety rules and safe working practices which must be followed by employees at any location for the prevention of illness and injury;
- Processes addressing identification, prevention and control, and communication of safety and health hazards;
- Employee training which includes addressing site specific safety and health requirements;
- Tools, instruments, and safety equipment that meet minimum safety specifications (e.g., ASTM and ANSI standards) which are available and provided to employees by Contractor;
- Requirements for the use of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions or where regulations indicate the need for using such equipment;
- An injury and incident response and reporting procedure including Whistleblower protections and emergency action planning and enforcement procedures to address violations.

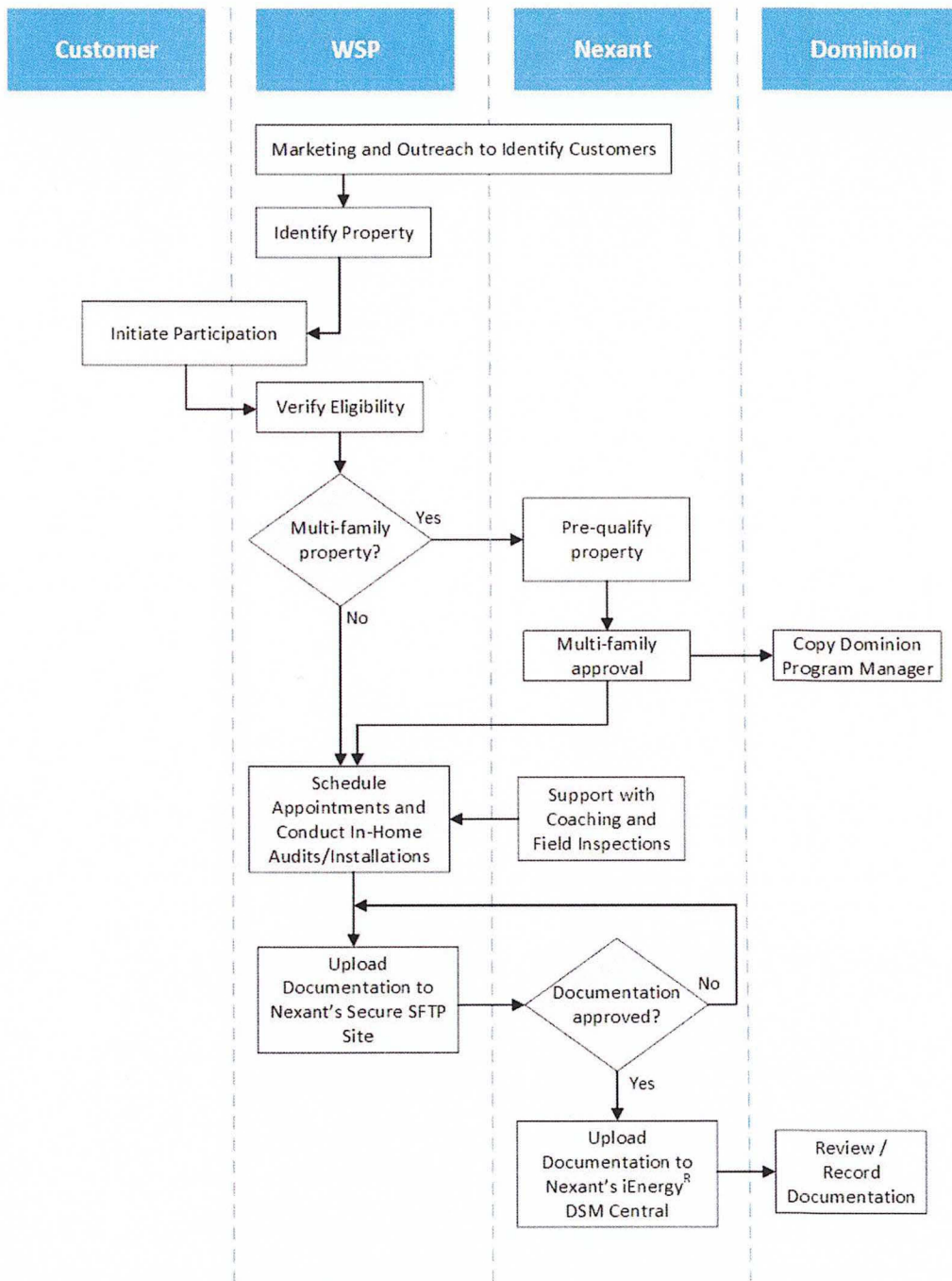


## 5

## Program Process

## 5.1 Process Flow Diagram

Figure 5-1: Process Flow Diagram



## 5.2 Measure Description and Documentation Requirements

Energy saving products—i.e., energy conservation measures (ECM)—selected for the Program are aimed to target the most common lighting, space conditioning and water heating related measures that income qualifying customers typically use. The Program includes free installation of the following selected ECM identified in Table 5-1, Table 5-2, Table 5-3, Table 5-4, and Table 5-5 on the following pages.

**Table 5-1: LED Lighting**

LED Lighting	
<b>Description</b>	ENERGY STAR® qualified LED light bulbs (screw base)
<b>Applicability</b>	<p>Up to six LED light bulbs per dwelling unit that must replace incandescent light bulbs (CFL not eligible) installed in high use applications. <u>Refer to section 2.4 for guidelines on seeking approval for more than 6 and no more than 12 LEDs.</u></p> <ul style="list-style-type: none"> <li>▪ Light fixtures must be permanent unless exception approved.</li> <li>▪ Existing incandescent lamps must be operational – nonfunctional lamps are not to be replaced.</li> <li>▪ Installation of LEDs in closets, storage rooms, or exterior fixtures is not approved.</li> <li>▪ Hall corridors are not typically designated as high use areas.</li> </ul> <p>Applicable to homes with electric or non-electric space or water heating.</p>
<b>Bulb Eligibility</b>	<p>LED lights must meet the following requirements:</p> <ul style="list-style-type: none"> <li>➤ <b>Rating:</b> 40 Watt or 60 Watt equivalent <u>lumen output</u></li> <li>➤ <b>Certification:</b> ENERGY STAR</li> <li>➤ <b>Rated Life:</b> 25,000 hours</li> <li>➤ <b>Efficacy:</b> 43 Lumens per watt (LPW) for down lights, and 50 LPW for omnidirectional lights</li> <li>➤ <b>CRI minimum:</b> 80</li> </ul>
<b>Required Documentation</b>	<ul style="list-style-type: none"> <li>➤ <b>Pre-approved Energy Conservation Measure (ECM):</b> submit lighting technical specifications for review and approval prior to placing orders, stocking inventory, and installing in customers' homes. <i>See Section 4.3.2 Qualifying ECMs.</i></li> <li>➤ <b>Photographic Documentation of Product Installation:</b> Pre- and post-installation photograph requirements <u>are detailed in Section 5.2.1. For multifamily buildings, photographs for 10% of each unit type must be submitted. Pre-qualification email must be submitted with the application when more than 6 LEDs have been previously approved.</u></li> </ul>



	<p>➤ <b>Multi-family Project Material Documentation:</b> Weatherization agencies are required to submit a copy of the material invoice or bill of materials demonstrating quantity of ECMs ordered for individual projects (prices may be redacted from invoices). Refer to Section 5.2.2 for additional information on the bill of materials.</p> <p>➤ <b>Weatherization Agency Use of Subcontractors:</b> Agencies are required to inspect each multi-family project where installation has been performed by a subcontractor. A copy of the subcontractor job completion form must be submitted with the application.</p>
--	--

#### Lighting Eligibility Question & Answer:

1. The customer has mixed 40 and 60 Watt bulbs in a single fixture. Are bulbs to be replaced exactly as installed, or are identical wattage bulbs to be installed in the fixture?

#### ANSWER:

The program is designed to be a 1 for 1 equivalent Wattage replacement with limited flexibility.

#### Example:

*Living room ceiling fan has two (2) 60 W bulbs and (2) 40 W bulbs. Replacement options:*

- a) Install 2 – 9 W and 2 – 6 W LEDs
  - b) De-rate the 60W incandescent bulbs to 40W bulbs, and install only 6W LEDs. The customer must be made aware that the lumen output is lower and approve of this de-rating substitution.
2. Can incandescent bulbs other than 40 or 60 Watt be replaced?  
The following Incandescent replacements are allowed with proper photo documentation is required.

Incandescent Lamp Rating, Watts	Allowed LED Replacement
38 Watt, 40 Watt, 43 Watt	6 Watt
60 Watt, 65 Watt	9 Watt

3. Can Hollywood bulbs or candelabra bulbs be replaced?  
If the Wattage rating stamped in the brass base is 40 or 60 Watts the bulb is eligible for replacement.
4. Can unmarked bulbs be replaced?  
No. Unfortunately the Wattage rating on some bulbs deteriorates over time. Existing bulbs must be marked to be eligible for replacement.

Table 5-2: Energy Saving Showerhead

Energy Saving Showerhead	
<b>Description</b>	Energy and water saving showerhead
<b>Applicability</b>	Must replace standard showerhead with flow of 2.5 gallons per minute (gpm) or greater in homes with electric water heating. Two (2) showerheads per dwelling unit maximum.
<b>Showerhead Eligibility</b>	Showerhead with flow of 2.0 gpm or less at 80PSI
<b>Required Documentation</b>	<ul style="list-style-type: none"> <li>➤ <b>Pre-approved Energy Conservation Measure (ECM):</b> submit showerhead technical specifications for review and approval prior to placing orders, stocking inventory, and installing in customers' homes. <i>See Section 3.3.2 Qualifying ECMs</i></li> <li>➤ <b>Photographic Documentation of Product Installation:</b> Pre- and post-installation photograph requirements are detailed in Section 5.2.1. <u>For multifamily buildings, photographs for 10% of each unit type must be submitted.</u></li> <li>➤ <b>Multi-family Project Material Documentation:</b> <u>Weatherization agencies are required to submit a copy of the material invoice or bill of materials demonstrating quantity of ECMs ordered for individual projects (prices may be redacted from invoices). Refer to Section 5.2.2 for additional information on the bill of materials.</u></li> <li>➤ <b>Weatherization Agency Use of Subcontractors:</b> <u>Agencies are required to inspect each multi-family project where installation has been performed by a subcontractor. A copy of the subcontractor job completion form must be submitted with the application.</u></li> </ul>

**Shower Head Eligibility Question & Answer:**

1. How is a device determined to be eligible when the GPM marking is damaged or illegible?

Perform a flow test to confirm GPM of existing device.

- Place bucket or container under fixture with ounce markings
- Turn cold water faucet on for exactly 10 seconds (use stopwatch on cell phone)
- Determine the number of ounces of water captured in 10 seconds
- Compute GPM:

$$\frac{\# \text{ ounces} \times 6}{128} = \text{GPM rating}$$

2. How is eligibility determined for unmarked devices?

Unmarked devices are treated the same as illegible devices, UNLESS unmarked devices are identified and measured during pre-qualification of multi-family projects. If unmarked devices identified during pre-qualification are determined to be eligible as a result of the flow test, then any unmarked devices located in the remaining units will be deemed eligible.



Table 5-3: High Efficiency Faucet Aerator

High Efficiency Faucet Aerator	
<b>Description</b>	High efficiency faucet aerator
<b>Applicability</b>	Must replace existing standard faucet aerator with a flow rate of 2.0 GPM or greater in homes with electric water heating. Two (2) faucet aerators per home maximum.
<b>Faucet Aerator Eligibility</b>	Faucet aerator with flow of 1.5 GPM or less
<b>Required Documentation</b>	<ul style="list-style-type: none"> <li>➤ <b>Pre-approved Energy Conservation Measure (ECM):</b> submit faucet aerator technical specifications for review and approval prior to placing orders, stocking inventory, and installing in customers' homes. See <i>Section 4.3.2 Qualifying ECMs</i></li> <li>➤ <b>Photographic Documentation of Product Installation:</b> Pre- and post-installation photograph requirements are detailed in <i>Section 5.2.1</i>. For multifamily buildings, photographs for 10% of each unit type must be submitted.</li> <li>➤ <b>Multi-family Project Material Documentation:</b> Weatherization agencies are required to submit a copy of the material invoice or bill of materials demonstrating quantity of ECMs ordered for individual projects (prices may be redacted from invoices). Refer to <i>Section 5.2.2</i> for additional information on the bill of materials.</li> <li>➤ <b>Weatherization Agency Use of Subcontractors:</b> Agencies are required to inspect each multi-family project where installation has been performed by a subcontractor. A copy of the subcontractor job completion form must be submitted with the application.</li> </ul>

**Aerator Eligibility Question & Answer:**

- How is a device determined to be eligible when the GPM marking is damaged or illegible?  
Perform a flow test to confirm GPM of existing device.
  - Place bucket or container under fixture with ounce markings
  - Turn cold water faucet on for exactly 10 seconds (use stopwatch on cell phone)
  - Determine the number of ounces of water captured in 10 seconds
  - Compute GPM:  

$$\frac{\# \text{ ounces} \times 6}{128} = \text{GPM rating}$$
- How is eligibility determined for unmarked devices?  
Unmarked devices are treated the same as illegible devices, UNLESS unmarked devices are identified and measured during pre-qualification of multi-family projects. If unmarked devices identified during pre-qualification are determined to be eligible as a result of the flow test, then any unmarked devices located in the remaining units will be deemed eligible.

Table 5-4: Pipe Wrap

Pipe Wrap	
<b>Description</b>	Pipe wrap insulation for hot water pipes
<b>Applicability</b>	Homes with electric water heating. All exposed hot water pipes with no previous insulation. Existing insulation that is worn or torn is not eligible for replacement.
<b>Pipe Wrap Eligibility</b>	Self-sealing pipe wrap insulation for hot water pipes. <u>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.</u>
<b>Required Documentation</b>	<ul style="list-style-type: none"> <li>➤ <b>Pre-approved Energy Conservation Measure (ECM):</b> submit pipe wrap technical specifications for review and approval prior to placing orders, stocking inventory, and installing in customers' homes. See <i>Section 3.3.2 Qualifying ECMs</i></li> <li>➤ <b>Photographic Documentation of Product Installation:</b> Pre- and post-installation photograph requirements <u>are detailed in Section 5.2.1. For multifamily buildings, photographs for 10% of each unit type must be submitted.</u></li> <li>➤ <b>Multi-family Project Material Documentation:</b> <u>Weatherization agencies are required to submit a copy of the material invoice or bill of materials demonstrating quantity of ECMs ordered for individual projects (prices may be redacted from invoices). Refer to Section 5.2.2 for additional information on the bill of materials.</u></li> <li>➤ <b>Weatherization Agency Use of Subcontractors:</b> <u>Agencies are required to inspect each multi-family project where installation has been performed by a subcontractor. A copy of the subcontractor job completion form must be submitted with the application.</u></li> </ul>



Table 5-5: Attic Insulation

Attic Insulation	
<b>Description</b>	Attic insulation addition
<b>Applicability</b>	Homes with electric or non-electric space heating. Insulation must be installed between a heated and an unconditioned space.
<b>Attic Insulation Eligibility</b>	<ul style="list-style-type: none"> <li>➤ Insulation type may be fiberglass or cellulose</li> <li>➤ Homes with electric space heating may be insulated to a maximum of R-49</li> <li>➤ Homes with non-electric space heating may be insulated to a maximum of R-38</li> <li>➤ Attic insulation must be installed by an approved WSP in qualifying households.</li> </ul>
<b>Required Documentation</b>	<ul style="list-style-type: none"> <li>➤ <b>Pre-approved Energy Conservation Measure (ECM):</b> submit technical specifications for review and approval prior to placing orders, stocking inventory, and installing in customers' homes. <i>See Section 3.3.2 Qualifying ECMs</i></li> <li>➤ <b>Photographic Documentation of Product Installation:</b> Pre- and post-installation photograph requirements are detailed in Section 5.2.1. <u>For multifamily buildings, photographs for 10% of each unit type that receives attic insulation must be submitted. Additionally, a photograph of each attic insulation certificate is required. The address including the unit number must be written on the certificate.</u></li> <li>➤ <b>Weatherization Agency Use of Subcontractors:</b> <u>Agencies are required to inspect each multi-family project where installation has been performed by a subcontractor. A copy of the subcontractor job completion form must be submitted with the application.</u></li> </ul>

### 5.2.1 PHOTOGRAPHIC DOCUMENTATION OF PRODUCT INSTALLATION:

The 2018 IAQHIP has new documentation requirements for measures.

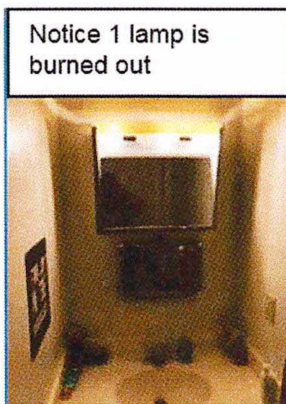
1. All photos must include a date and time stamp on the photo.
2. An exterior photo of each home, building and unit number. The photos must allow visual confirmation that the home, building and unit number match the submitted application.



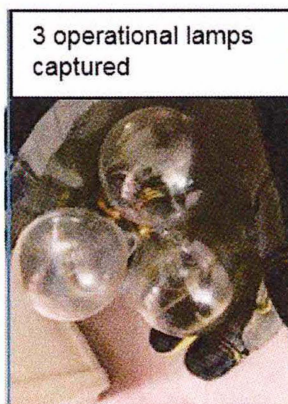
3. Pre- and post-installation photos per measure:

#### a) Lighting:

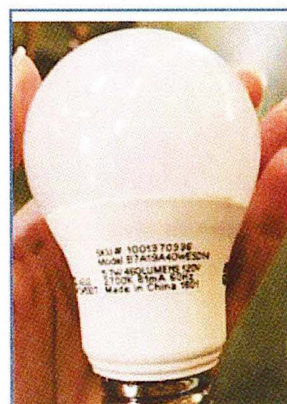
- Photo of space (room) where fixture is installed
- Photo of existing incandescent lamp(s) clearly showing wattage rating
- Photo of incandescent lamp(s) turned ON
- For lamps that are unmarked or manufacturer's rating is not legible, the incandescent will be assumed to be rated at 40 Watts
- Photo of LED lamp wattage
- Photo of fixture with LED(s) installed and turned ON



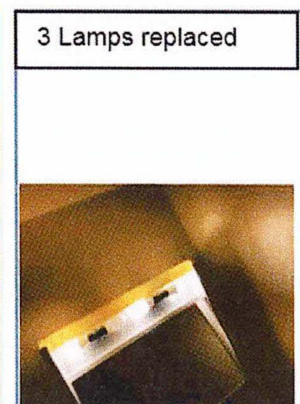
ROOM, LAMPS ON



LAMP WATTAGE



LED WATTAGE



NEW LEDs

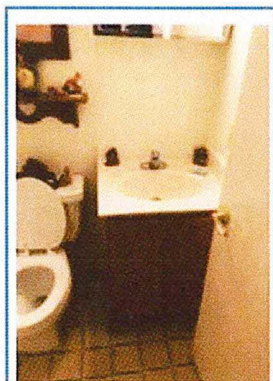


## 3. Pre- and post-installation photos per measure, continued:

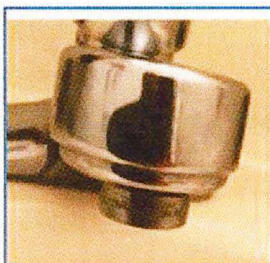
## b) Aerators

- Photo of room and sink
- Photo of existing aerator GPM. Aerator should be unscrewed and GPM ratings photo-documented if the rating on the installed faucet cannot be captured.
- Photo of faucet with new aerator

## BATHROOM

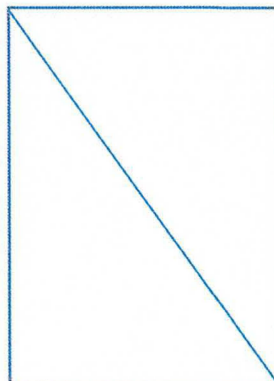


ROOM

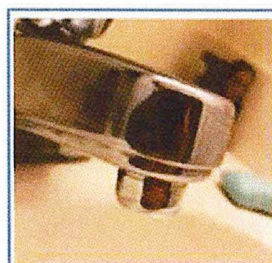


Note: GPM on submitted photo is legible

OLD AERATOR



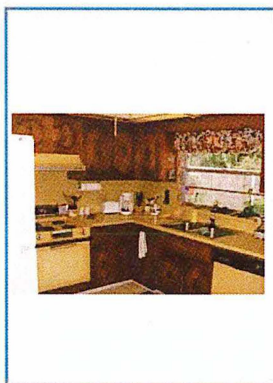
CLOSE UP



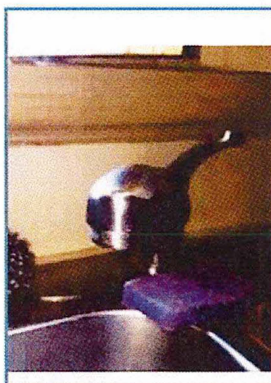
Note: GPM on submitted photo is legible

NEW AERATOR

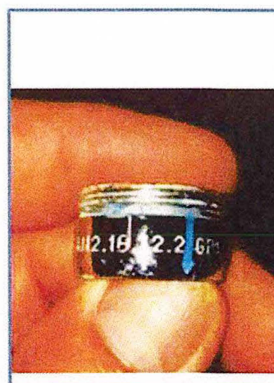
## KITCHEN



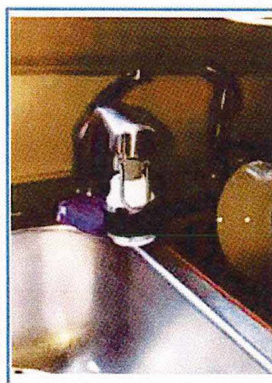
ROOM



KITCHEN SINK



AERATOR GPM



NEW AERATOR

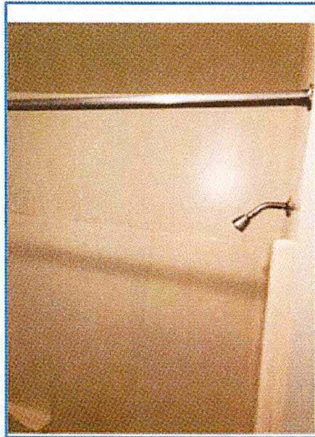
Photo of Ineligible Aerator to be replaced:



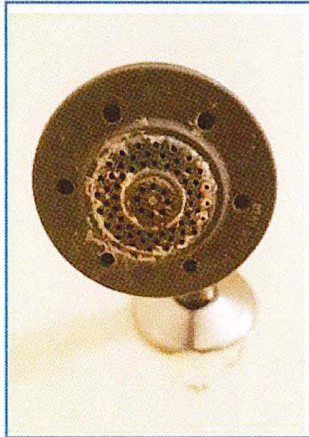


## c) Showerheads

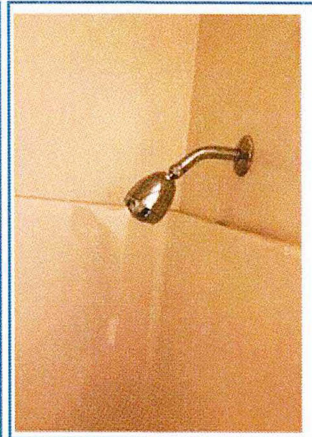
- Photo of room with showerhead
- Photo of existing showerhead GPM rating
- Shower enclosure with new showerhead



ROOM, OLD SHOWER



SHOWER GPM

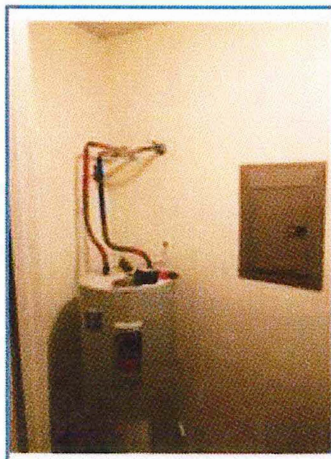


NEW SHOWER

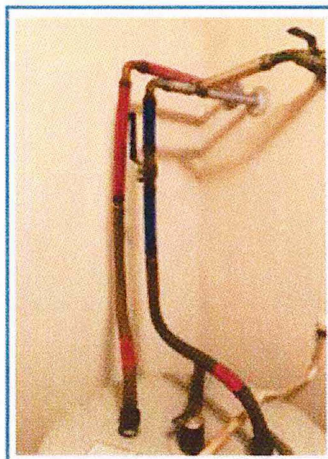
Note: GPM on submitted photo is legible

## d) Pipe wrap

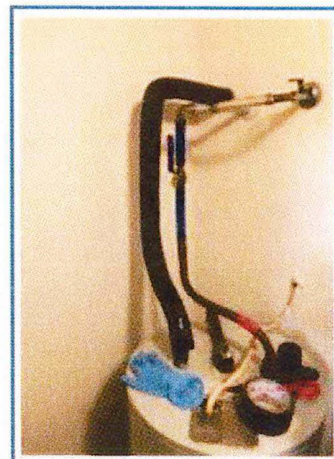
- Photo of water heater in room / space, including uninsulated pipe
- Photo of insulated hot water line



ROOM



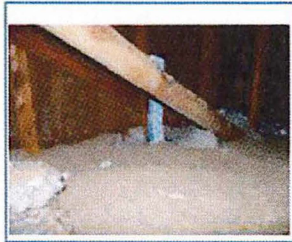
UNINSULATED



INSULATED



- e) Attic insulation, single family home
- Photo(s) of space to be insulated
  - Photo(s) of existing insulation levels at attic ruler
  - Photo(s) of installed insulation levels at attic ruler



ATTIC EXISTING



ATTIC EXISTING



ATTIC NEW

Note: ruler is legible  
in submitted image

- f) Attic insulation, multi-family units, 10% requirement:
- Exterior photo identifying building within property
  - Photo(s) of space to be insulated
  - Photo(s) of existing insulation levels at attic ruler
  - Photo(s) of installed insulation levels at attic ruler
- g) Attic insulation, multi-family units, all buildings requirement:
- Photos of the insulation certificate for each insulated space
  - Certificate must capture the address / unit number(s) for each space

### 5.2.2 BILL OF MATERIALS:

The excel application contains a Project Summary tab, created to provide a snapshot summary of all of the measures installed for a single property.

If the quantity of ECMs listed on the bill of materials is greater than the total quantity of ECMs (installed) listed on the project summary tab, the copy of the Bill of Materials is sufficient.

If the quantity of ECMs listed on the bill of materials is less than the total quantity of ECMs (installed) listed on the project summary tab, provide multiple documents to account for the total ECMs installed.

### 5.3 Incentives

WSPs are required to fund the resources, procure the workforce and material, and install Program qualifying measures at customer households. Dominion will only reimburse the incentive amounts shown in Table 5-6 for the Program ECMs installed according to Program rules and requirements.

### Table 5-6: IAQHI Program ECMs and Incentives

Measure Name	Unit	Incentive per Unit
LED Lighting	Per lamp installed	\$100
Energy Saving Showerhead	Per low flow showerhead installed	\$50
High Efficiency Faucet Aerator	Per faucet aerator installed	\$5
Pipe Wrap for Water Heaters	Per linear foot of pipe wrap installed	\$10
Attic Insulation	Per R-value per square foot installed	\$1.50

*Note: there is a program cap of \$4,000 in incentives per home, townhome, apartment, or manufactured home.*

### ATTIC INSULATION INCENTIVE CALCULATION EXAMPLES:

Example 1: 1,000 ft<sup>2</sup> attic; no existing insulation; electric heat

**Incentive** =

Example 2: 1,000 ft<sup>2</sup> attic; R-11 existing insulation; gas heat

**Incentive** =  $\frac{1}{\sigma^2} \left( \frac{\partial E[\pi]}{\partial x_i} - \frac{\partial E[\pi]}{\partial x_j} \right)$

## 5.4 Program Timeline

The Dominion Income and Age Qualifying Home Improvement Program is a three-year program. The associated rebates outlined in this manual are effective starting July 2018. In early December each year, Dominion suspends processing new applications so they can close the books on the current program year.

To ensure a project is processed in the current year, the cutoff date for submitting applications is the last Friday in November. This allows the processing team time to review and submit projects to Dominion for approval. Projects submitted after the cutoff date will continue to be accepted and processed by Nexant. These projects may be processed in the following program year and be applied against the following year's program funds.



Rebate applications are transmitted by the Program Implementer to Dominion on a weekly basis. Section 5.5 contains additional details concerning project applications. To ensure a project is processed in the current year complete project documentation must be received by Program Implementer by November 30<sup>th</sup> of each year.

Projects submitted by or before November 30<sup>th</sup> must be resolved by February 28<sup>th</sup> of the following year. Payments for work completed in one year will not be paid after February 28 of the following year.

Project applications that cannot be processed as a result of Missing Information must be resolved within 90 days or risk non-payment.

Projects submitted in December will be processed with the next year's allocation.

## 5.5 Project Application Approval Timeline


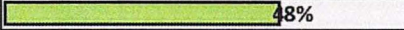
Providers are encouraged to submit applications as projects are completed. Details of the required documents are contained in section **3.3.3 Project Documentation**. Applications submitted by Weatherization Service Providers are extracted from the Nexant SFTP site on a daily basis and are reviewed.

The quality and accuracy of submitted applications has a direct effect on processing times. Providers submitting applications that are error-free, have an active Dominion account, are eligible to participate in the program, and have included all of the required documentation are processed quickly. Applications submitted with partial information take longer to review and process. Once a week, Nexant will submit a file of approved applications to Dominion for review and approval for payment.

The expected turnaround time for incentive payment checks is 4 to 6 weeks from the date of approved project application submission.

## Appendix A Example WSP Weekly Report

### BEST PROVIDERS 2016 Weekly Project Status REPORT

IAQ	Allocated Funds
 70%	\$50,000.00
ESWS	
 48%	\$75,000.00

Address	IAQ	ESWS
<b>Approved</b>	<b>\$12,688.11</b>	<b>\$10,979.23</b>
RIAQH_11111: 111 MY STREET	\$4,000.00	
RIAQH_11112: 112 MY STREET	\$2,000.00	
RIAQH_11111: 111 MY STREET	\$3,434.00	
RIAQH_11122: 122 MY STREET	\$3,254.11	
PIAHI_11118: 126 MY STREET		\$3,510.30
PIAHI_11119: 127 MY STREET		\$3,574.35
PIAHI_11124: 132 MY STREET		\$3,894.58
<b>Missing Information</b>	<b>\$9,100.00</b>	<b>\$6,956.55</b>
RIAQH_11113: 113 MY STREET	\$4,555.00	
RIAQH_11118: 118 MY STREET	\$4,545.00	
PIAHI_11115: 123 MY STREET		\$3,318.15
PIAHI_11120: 128 MY STREET		\$3,638.39
<b>Submitted on AFF</b>	<b>\$4,338.01</b>	<b>\$7,212.74</b>
RIAQH_11115: 115 MY STREET	\$1,212.00	
RIAQH_11120: 120 MY STREET	\$3,126.01	
PIAHI_11117: 125 MY STREET		\$3,446.25
PIAHI_11122: 130 MY STREET		\$3,766.49
<b>Request Payment</b>	<b>\$8,696.02</b>	<b>\$10,915.18</b>
RIAQH_11114: 114 MY STREET	\$121.00	
RIAQH_11116: 116 MY STREET	\$2,323.00	
RIAQH_11119: 119 MY STREET	\$3,061.96	
RIAQH_11121: 121 MY STREET	\$3,190.06	
PIAHI_11116: 124 MY STREET		\$3,382.20
PIAHI_11121: 129 MY STREET		\$3,702.44
PIAHI_11123: 131 MY STREET		\$3,830.54
<b>Grand Total</b>	<b>\$34,822.14</b>	<b>\$36,063.69</b>

The project number is unique to each project and can be found on the check contained in the Payee information. See Appendix B.

PROJECT STATUS KEY	
<b>Approved</b>	Nexant approved, to be included in next weekly batch to Dominion for approval
<b>Missing Information</b>	Unable to process - awaiting further information from WSP
<b>Request Payment</b>	Projects approved by Nexant and Dominion
<b>Submitted on AFF</b>	Nexant approved, submitted to Dominion for approval



## Appendix B Sample Incentive Check




OFFICIAL COPY

May 01 2019

Dominion Virginia Power

12440

OUR REF. NO.	YOUR REFERENCE	INVOICE DATE	INVOICE AMOUNT	AMOUNT PAID	DISCOUNT TAKEN	NET CHECK AMOUNT
142333	0001100533	06/14/2016	\$1,280.00	\$1,280.00	\$ .00	\$1,280.00
SUBTOTALS				\$1,280.00	\$ .00	\$1,280.00
TOTALS				\$1,280.00	\$ .00	\$1,280.00

<b>Dominion Virginia Power</b> 2223 S. Highland Drive, #E6-333 Salt Lake City, UT 84106		<b>12440</b>	
 <b>Dominion</b>		 90 78-1211	
		DATE	CONTROL NO.
		06/21/2016	000012440
		AMOUNT	
		\$1,280.00	
PAY TO THE ORDER OF One Thousand Two Hundred Eighty And 00/100 Dollars		VOID AFTER 90 DAYS TWO SIGNATURES REQUIRED OVER \$20000.00	
WEATHERIZATION SERVICE PROVIDER 11200 11200 MAIN STREET YOUR TOWN, VA		AUTHORIZED SIGNATURE 	

⑈012440⑈ ⑆121100782⑆ 040208654⑈

Dominion Virginia Power

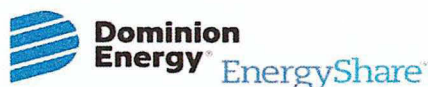
12440

Uncertain of the address (customer) this check is reimbursing? Cross reference the project number with the WSP Weekly Report.

WEATHERIZATION SERVICE PROVIDER  
 11200 11200  
 MAIN STREET  
 YOUR TOWN, VA

57665W

## Appendix C Ineligible Address List and Signed Attestation



Income and Age Qualifying Home Improvement  
Program  
Multi-Family Owner Consent Form

### Ineligible Address List

V.04.10.18

#### Property Information

Property name

Date of assessment

# Qualifying Units

# Ineligible Units

We certify that we have met with the property management firm and witnessed their review of tenant eligibility. We attest that of the total units at this property, the units noted in the list below do not qualify for the ESWS / IAQHI Program.

WX Rep Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Please list the tenant addresses that do not meet the income or other program qualification requirements below.

Address	Unit Number
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	



**Weatherization Agency or Property Management Agency Letterhead Example**

To all concerned:

This letter is to certify that all residents of Sherwood Forest Homes have been reviewed for compliance with the Tenant Eligibility Criteria noted as follows:

- Customer must have a total household income that does not exceed 60% of the Virginia Median Income; or
- Customer is 60 years of age or older with a total household income that does not exceed 120% of the Virginia Median Income; or
- The account holder is otherwise qualified to receive an energy audit by a Weatherization Assistance Provider certified by the Virginia DHCD; or
- A member of the household is currently receiving disability payments from the Social Security Administration; or
- A member of the household is currently receiving disability payments or supplemental income payments from the Veteran's Administration.

Eligibility Summary for property is as follows:

- 25 Residents have a total household income that does not exceed 60% of the currently published Virginia Median Income
- 15 Residents are over 60 and their income does not exceed 120% of the Virginia Median Income
- 10 Residents are receiving disability payments from the SS Administration, Veteran's Administration, or other state or federal agencies
- 5 Residents do not meet the program requirements
- 55 = Total Units at this property

Signature: Robin Hood

Date: April 10, 2018

Printed Name: Robin Hood

Title: Property Manager

Company: Nottingham Properties Inc.

## Appendix D 2018 Program Notices

Placeholder for Program Notices



## Appendix E Background Investigation Certification ("Certification") and Key Personnel List

Capitalized terms have the meanings given in the WSP Agreement. WSP certifies and agrees as follows:

- 1) (a) WSP performs, or causes its subcontractors to perform, investigations on all employees in accordance with the requirements described in the Background Investigation Requirements of the Program Manual; (b) WSP employees and subcontractors who will be performing services for the Program and will (i) have access to any customer information, and/or (ii) will be performing services at a customer's residence through the Program are identified on the attached Key Personnel List (c) the investigation(s) were conducted in accordance with the provisions of the Fair Credit Reporting Act, applicable federal and state laws, and the Background Investigation Requirements; (d) WSP has reviewed the results of the investigations for all such WSP employees and obtained Certifications for listed subcontractor employees; and (e) WSP did not discover any Adverse Findings in the investigation(s);
- 2) WSP agrees that if at any time after this Certification is provided, WSP begins utilizing any employee or subcontractor for the Program who were not included as part of the original Certification, WSP shall conduct background investigation, or cause its subcontractors to perform, on such individuals and provide Program Implementer with an updated Certification, or complete updated background investigations on employees, as reasonably requested by Program Implementer or Dominion; and
- 3) If at any time after this 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 this Certification, WSP shall discontinue use of such individual in performance of the Program services and WSP shall notify Program Implementer in accordance with the Background Investigation Requirements.

I am a duly authorized representative of WSP and have read, understand and agree to the accuracy of this Certification.

WSP Name: \_\_\_\_\_

WSP Representative Signature: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_ Date: \_\_\_\_\_

Once completed, return this Certification along with the Key Personnel List to the Program Implementer.

#### Key Personnel List

List the names of the WSP employees and WSP's subcontractor employees who are the subjects of the Background Investigation Certification.

Name	Company	Title	Date Completed





Nexant, Inc.

866-254-2237

[www.nexant.com](http://www.nexant.com)





## APPENDIX H. RESIDENTIAL RETAIL LED LIGHTING PROGRAM EM&V PLAN (VERSION 9.0)

Residential Retail LED Lighting Program	
<b>Program Summary<sup>2</sup></b>	<p>The Residential Retail LED Lighting Program is an instant discount for a variety of qualifying Light-Emitting Diode (LED) light bulb purchases from participating retailers. Participating vendors will pay manufacturers of eligible bulbs an incentive, which will enable the manufacturer to sell the eligible bulbs at a discount to area retailers, who then would sell the bulbs to consumers at the agreed discounted price. The incentive participants will receive is in the form of a discount on the price of the bulbs at the point of sale. Dominion estimates it will pay an average<sup>3</sup> incentive of \$3.00 per LED bulb. Customers are limited to 12 discounted bulbs per purchase.</p> <p>This program would operate the Program on a North Carolina-only basis. The benefits and the costs of the Program would flow 100% to North Carolina. The company is offering the Program for a two-year period, with the intent that a system-wide program which includes a residential lighting component is planned to be offered in the future.</p>
<b>Measures</b>	Refer to the Residential Retail LED Lighting Program section of the STEP Manual for a list of the eligible lighting measures.
<b>EM&amp;V Method</b>	<p><u>International Performance Measurement and Verification Protocol (IPMVP) Option A:</u> Because specific equipment is involved, IPMVP Option A is the appropriate EM&amp;V method to apply. IPMVP Option A is a partially measured retrofit isolation study that meters the selected parameters leading to the change in energy and demand of an installed efficiency measure from a representative sample of participants, and adjusts the savings estimates derived from engineering algorithms applied to the Company's program participation data. The ratio of deemed savings and adjusted savings, also called a realization rate,<sup>4</sup> is then applied to the population of participants to estimate program savings</p> <p>The following figure illustrates the various components used to arrive at the savings estimates.</p>

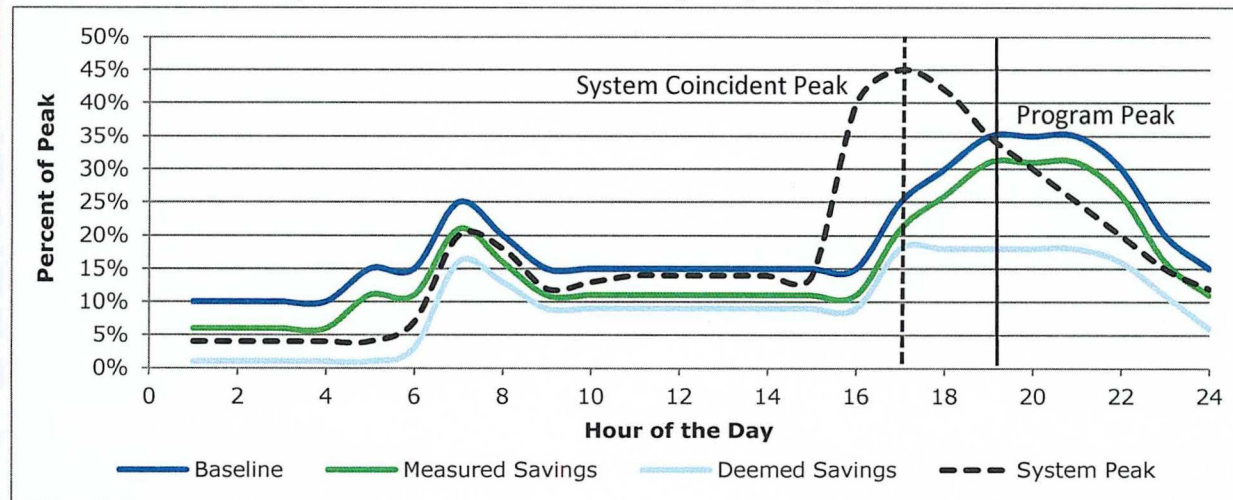
<sup>2</sup> Program eligibility requirements are based on the Residential Heat Pump Upgrade Program's terms and conditions and FAQ web pages accessed on March 3, 2015, which is no longer available, as the program has expired as designed..

<sup>3</sup> Through a data request, this was determined to be a weighted average across all bulb types and incentive amounts.

<sup>4</sup> 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 (on-site inspections or customer surveys) to verify that measures were in fact installed and are operating as intended, and/or actions were taken.

## Residential Retail LED Lighting Program

### Illustrative Load Shape: Residential Retail LED Lighting Program



1. Baseline Estimation Approach (Blue line): The baseline wattage of all installed measures will be computed using baseline conditions tracked in the program participation data using protocols developed in the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual.
2. Deemed Savings Approach (Green line): Deemed savings values will be estimated using calculation approaches in the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual, which are derived primarily from the Mid-Atlantic Technical Resource Manual (TRM) and other TRMs.
3. Measured Savings Approach (Red line): The wattage and hours of use data for the installed efficiency measure will be collected and metered through an on-site study of installed rebated measures from a representative sample of participants.

#### Deemed Savings Approach

Refer to the Residential Retail LED Lighting Program section of the STEP Manual for the standard deemed savings approach for the measures in this program.



Residential Retail LED Lighting Program	
EM&V Measurement, Timeline, and Scope of Work	<ul style="list-style-type: none"> <li>• Analysis of program tracking data; Annual Report (May 1 of each year following program launch).</li> <li>• Annual updates to DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual for updates that occurred to its referenced sources.</li> <li>• Develop baseline, measure savings, and efficient load shapes.</li> <li>• Provide regulatory support as necessary.</li> </ul>
Lost Revenue Methodology	<p>Measured and verified lost revenues for this program will be calculated as follows:</p> <ol style="list-style-type: none"> <li>1. Calculate program savings by applying the realization rate derived from the measured data based off the on-site studies.</li> <li>2. Apply the measured data to the actual participant data to arrive at program level energy and demand savings, reflected on a monthly basis. Program savings are annualized in the EM&amp;V tracking reports based on monthly participation data.</li> <li>3. Develop cumulative monthly energy savings based on measured and verified data to represent the lost sales (kWh) associated with the program.</li> <li>4. Multiply the cumulative monthly energy savings by the monthly marginal base distribution and generation rate derived using a marginal rate analysis of the participants in this program (such analysis will exclude the Basic Customer Charges, and exclude Fuel Charge Rider A and all other applicable riders) for the rate period to arrive at lost revenues.</li> </ol>
Document Revision History	<p>Version 8.0</p> <ul style="list-style-type: none"> <li>• New version</li> </ul>
	<p>Version 9.0</p> <ul style="list-style-type: none"> <li>• Formatting updates</li> <li>• Updated from DNV GL Energy to DNV GL Energy Insights</li> </ul>

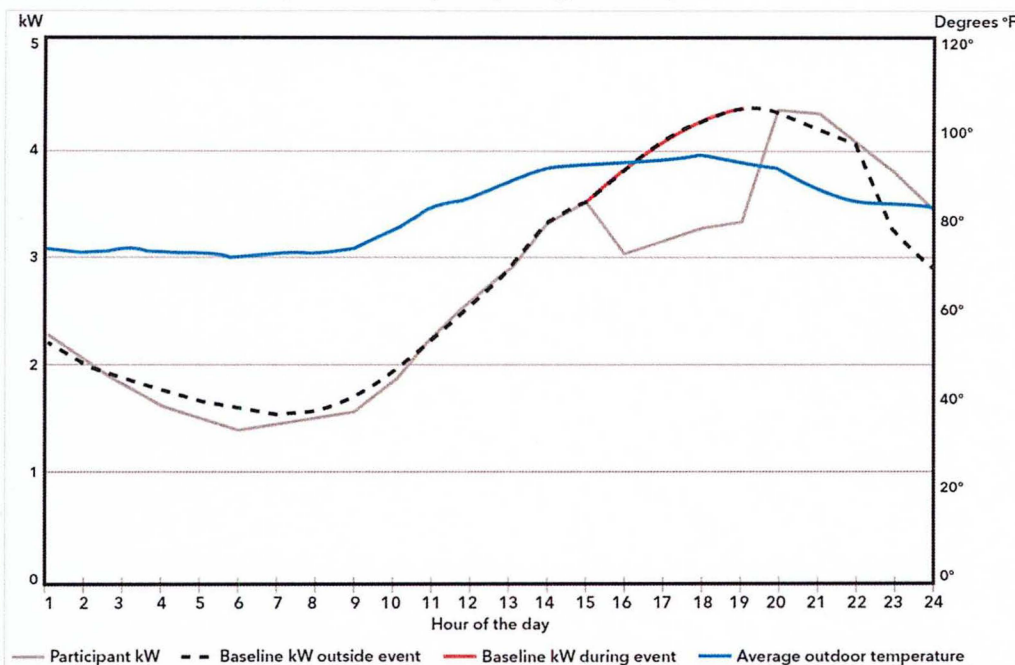




## APPENDIX I. RESIDENTIAL AIR CONDITIONER CYCLING PROGRAM EM&V PLAN (VERSION 9.0)

Residential Air Conditioner Cycling Program	
<b>Program Summary</b>	The Residential Air Conditioner (AC) Cycling Program, marketed as "Smart Cooling Rewards," compensates customers who allow the Company to reduce the cycle of their central air conditioning during peak load conditions by 30–50%. A \$40 incentive is credited to participating customers following event season. The AC cycling switch is controlled by a radio frequency paging signal and installed near the outdoor air-conditioning (AC) unit.
<b>Measures</b>	<p>The program measure is the AC cycling control switch. The eligible classes of air conditioners and heat pumps in the AC Cycling Program are:</p> <ul style="list-style-type: none"> <li>• Electric Residential Central A/C System</li> <li>• Electric and dual fuel heat pumps</li> </ul>
<b>EM&amp;V Method</b>	<p><u>International Performance Measurement and Verification Protocol (IPMVP - Option C)</u>: Because program impacts are estimated using whole premise 30-minute interval consumption data, IPMVP Option C is the appropriate EM&amp;V protocol. IPMVP Option C is a whole facility EM&amp;V standard using meter data from the entire site.</p> <p>The AC cycling event impacts are measured as the difference between baseline reference load and actual load during AC cycling events. The baselines will be calculated using accepted methodologies for residential demand response programs. Ex ante regression models will quantify the relationship of participating customers, the equipment, weather data, and load reduction during dispatch events. The ex-ante impact models will be used to quantify the nominated load for the program under peak conditions (using Dominion Energy's peak conditions), and by weighting the census of AMI participants to all participants.</p> <p>The following figure illustrates the various components used to arrive at the savings estimates.</p>

### Illustrative Load Shape for an A/C Cycling Participant



1. Event baseline estimation approach (red line): The event baselines will be estimated for every AMI participant using a regression model.
2. Estimated ex ante estimate: The ex ante estimates are then calculated using a regression analysis of the ex post impacts for each event-hour and temperature humidity index (THI).
3. Measured load reduction approach (brown line): The measured average load reduction is computed from the interval load data of all participants with advanced metering infrastructure (AMI).



Residential Air Conditioner Cycling Program	
EM&V Summary and Sampling Strategy	<p>DNV GL will follow the standard protocols for estimating demand reduction impacts. This will include:</p> <ul style="list-style-type: none"> <li>• Extrapolation of the impacts for census of customers with AMI meters to all participants, stratifying on location and connected load.</li> <li>• Production of event trackers for the program population</li> </ul>
	<p>DNV GL Energy tracked the dispatchable resource of the AC Cycling Program throughout the evaluation period by applying the STEP savings protocol to represent the expected peak shaving value of dispatchable resource. performance. Ex ante estimates are produced from the current year ex post impacts by hour and THI.</p> <p>Given the investment in this program and the planned peak shaving reductions, this EM&amp;V plan calls for ex post impact evaluation using interval data collected from all participating accounts with AMI meters. Consumption data is collected at 30-minute intervals for each sampled household and is transferred to the EM&amp;V contractor monthly. Representative 8,760-hour load shapes for the program resource will be updated following each event season.</p>
EM&V Measurement, Timeline, and Scope of Work	<ul style="list-style-type: none"> <li>• Conduct a monthly review of program tracking and AMI participant consumption data</li> <li>• Prepare monthly tracking indicator tables</li> <li>• Evaluate impacts of dispatch events and prepare an annual impact evaluation report</li> <li>• Enter annual updates of model specifications to the STEP Manual</li> <li>• Provide program and regulatory support as necessary.</li> <li>• Update EM&amp;V plans as needed</li> </ul>
Lost Revenue Methodology	Not applicable
Document Revision History	<p>Version 1.0</p> <ul style="list-style-type: none"> <li>• Added semi-annual program tracking summary table in the "Frequency of EM&amp;V Measurement &amp; Timeline" section.</li> <li>• Changed assumed error ratio from 0.5 to 0.96 (computed) with an error margin of 9.12%.</li> </ul>
	<p>Version 2.0</p> <ul style="list-style-type: none"> <li>• Updated document formatting.</li> <li>• Updated "KEMA" to "DNV KEMA."</li> <li>• Modified the required sample size from 300.</li> </ul>

**Residential Air Conditioner Cycling Program**

- Changed "Program Penetration & Initial Baseline Assumptions" section title to "Program Penetration" and removed initial baseline assumptions.
- Updated planned penetrations and added "Source" column to the "Program Penetration" table.
- Changed "Revision History" section title to "Document Revision History."

## Version 3.0

- Updated "EM&V Summary and Sampling Strategy" section with description of experimental design analysis for 2013.

## Version 4.0

- Update Program Penetration Table based on 2013 IRP.

## Version 5.0

- Removed 2013 planned customer penetration numbers.
- Added sentence on PJM requirements to end of "EM&V Method."
- Updated deemed savings approach to utilize ex ante estimates for aggregate program impacts conditional on temperature humidity index and hour, developed from a regression analysis of historical program performance. Changes affected EM&V Method and EM&V Summary and Sampling Strategy sections.

## Version 6.0

- Updated DNV KEMA to DNV GL Energy.
- Updated EM&V method to IPMVP Option C to reflect impact estimation using premise level AMI data
- Added description of analytical tasks to meet requirements for PJM compliance.
- Updated error ratio to reflect results used in 2014 sample design
- Added planned annual updates to the representative load shape of the program resource.
- Renamed "Frequency of EM&V Measurement and Timeline" section title to "EM&V Measurement, Timeline and Scope of Work" to more accurately reflect the content in that section
- Added on-going scope that was not explicitly mentioned to "EM&V Measurement, Timeline and Scope of Work" section.
- Deleted program penetrations section

## Version 7.0

- Updated "EM&V Summary and Sampling Strategy" section with description of the 2016 study population which includes all participants with AMI meters.



### Residential Air Conditioner Cycling Program

- Changed "semi-annual" to "monthly" program tracking summary table in the "Frequency of EM&V Measurement & Timeline" section.
- Prior to 2016, the measured average load reduction was computed from the interval load data of a sample of participating homes with AMI. Starting in 2016 the measured average load reduction is computed from the interval load data of all participants with AMI.
- Removed reference to a 96% operability rate
- Added scope description for ex ante and ex post demand reduction estimates in EM&V Measurement, Timeline and Scope of Work (Table S-2)

#### Version 8.0

- Updated with 2017 ex ante evaluated results

#### Version 9.0

- Formatting and minor edits
- Updated from DNV GL Energy to DNV GL Energy Insights
- Removed 2018 ex ante impact estimates



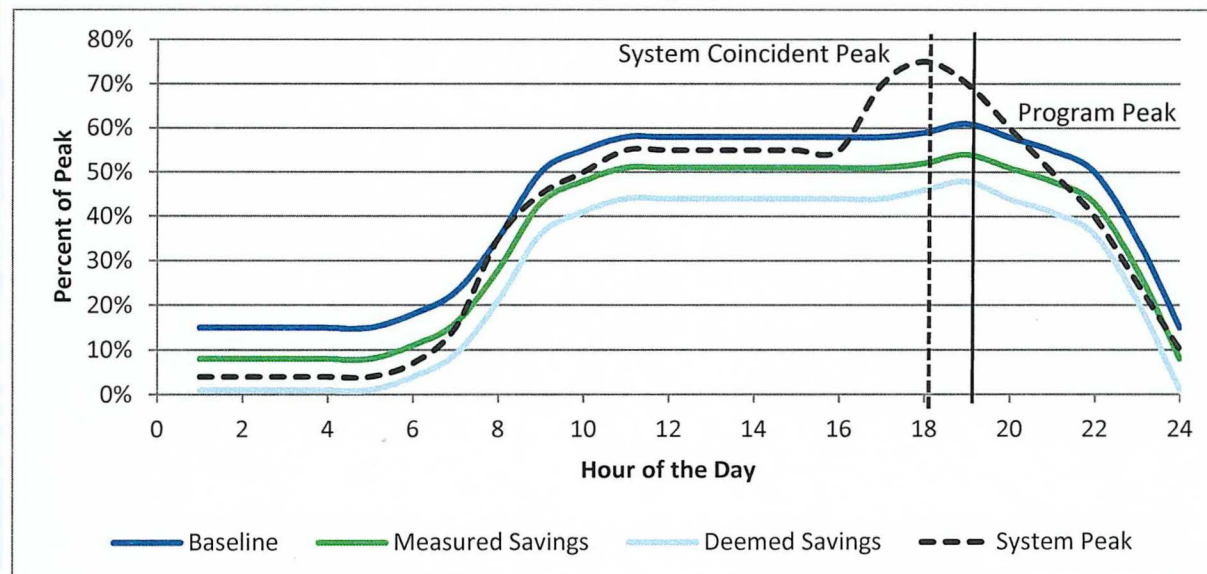


## APPENDIX J. NON-RESIDENTIAL LIGHTING SYSTEMS AND CONTROLS PROGRAM EM&V PLAN (VERSION 9.0)

Non-Residential Lighting Systems and Controls Program	
<b>Program Summary</b>	The Non-residential Lighting Systems and Controls Program is designed to provide commercial and industrial customers with an incentive to retrofit, or upgrade, inefficient lighting to qualifying high efficiency lighting systems. The incentive consists of a menu of rebates for over 75 different combinations of upgrades involving various types of efficient lighting measures.
<b>Measures</b>	<p>The following high efficiency lighting measures are included in the program:</p> <ul style="list-style-type: none"> <li>• T8 and HPT8 fixtures</li> <li>• T5 fixtures</li> <li>• LEDs and LED Exit Signs retrofits</li> <li>• CFLs and CFL fixtures</li> <li>• Occupancy sensor and controls installations</li> </ul>
<b>EM&amp;V Method</b>	<p><u>International Performance Measurement and Verification Protocol (IPMVP - Option A)</u>: Since this program focuses on specific lighting replacements, IPMVP Option A is the appropriate EM&amp;V method to apply. IPMVP Option A is a partially measured retrofit isolation study that meters the actual energy and demand of an installed efficiency measure from a representative sample of participants, and adjusts the savings estimates derived from engineering algorithms applied to the Company's program participation data. The adjustment factor, also called a realization rate,<sup>5</sup> is then applied to the population of participants to estimate program savings.</p> <p>The following figure illustrates the various components used to arrive at the savings estimates.</p>

<sup>5</sup> 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 (on-site inspections or customer surveys) to verify that measures were in fact installed and are operating as intended, and/or actions were taken.

**Illustrative Load Shape: Non-Residential Lighting Systems and Controls**



1. **Baseline Estimation Approach (Dark blue line):** The baseline wattage will be computed using the prescriptive replacement combinations presented in the Standard Tracking and Engineering Protocols (STEP) Manual. The replaced lighting fixtures from the rebate application data will be used, applying hours of use as metered in onsite studies of installed rebated measures from a representative sample of participants in Virginia.
2. **Deemed Savings Approach (Light blue line):** Deemed savings values will be estimated per the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual. The original source of this deemed savings approach is derived from the Mid-Atlantic Technical Resource Manual (TRM).



Non-Residential Lighting Systems and Controls Program	
	<p>3. Measured Savings Approach (Green line): The wattage and hours of use data for the installed efficiency measure will be collected and metered through an on-site study of installed rebated measures from a representative sample of participants.</p>
Deemed Savings Approach	Refer to the Non-Residential Lighting Systems and Controls Program section of the STEP Manual for the standard deemed savings approach for the measures in this program.
EM&V Summary and Sampling Strategy	<p>The evaluation of the Non-Residential Lighting Program will use a statistically adjusted engineering (SAE) analysis approach, consistent with IPMVP Option A. Engineering-based savings estimates will be adjusted based on a sample of on-site metering and inspections that verify measure installation, type, location, and facility reported hours of operation. Load shapes will be used from time-of-use data loggers installed at the time of inspection and in place for 6 to 8 weeks. A modified load shape will also be prepared to represent the program's energy savings.</p> <p>The evaluation of this program will consist of tracking customer penetration and applying the measured savings values from the sample to the population of lighting upgrades installed. Deemed savings values calculated using existing and installed wattages in the STEP Manual will be recalibrated based on the sample of on-site measurements.</p> <p>In order to satisfy PJM requirements for Energy Efficiency Resources, phone verification will be conducted on an annual basis between January 1 and May 30 of the program year, through 2015, which will be the final year Dominion bids this program's capacity to PJM. Phone surveys will verify installation of new lighting for a sample of new participants. Surveys will also verify persistence of a sample of all lighting installations eligible for auction during that delivery year.</p> <p><b><u>Lighting Persistence Study Sampling Strategy:</u></b></p> <ul style="list-style-type: none"> <li>Random sample of participants who installed lighting through the program and are eligible for auction in the PJM EE resource market during that delivery year. To satisfy PJM requirements for Energy Efficiency Resources, phone verification will be conducted on an annual basis between January 1 and May 30 of the program year. Phone surveys will verify installation of new sample of program participants. Surveys will also verify persistence of a sample of all installations eligible for auction during that delivery year.</li> </ul>

Non-Residential Lighting Systems and Controls Program	
	<ul style="list-style-type: none"> <li>Sample design will cover a proportion of lighting installations in the following technology groups: LED, CFL, Incandescent, Metal Halide, and "Other". Occupancy sensors and controls are not included in the PJM EE Resource auction and thus these installations are not surveyed.</li> </ul> <p>Stratified per energy savings per premise with Model Based Statistical Sampling (MBSS) methodology.</p>
<b>Sampling Confidence Level, Relative Precision, and Assumed Error Ratio</b>	<p>A sample of 100 will be drawn for M&amp;V after sufficient program participation is realized (approximately 2,000 participants). Planned sample sizes and design are based on participation projections upon a sufficient participant population to support such a study and may change. Standard sampling approach will consider the following:</p> <ul style="list-style-type: none"> <li>Confidence interval: 90%</li> <li>Relative Precision: 10%</li> </ul> <p>Error Ratio: to be updated prior to sample selection.</p>
<b>EM&amp;V Measurement, Timeline, and Scope of Work</b>	<ul style="list-style-type: none"> <li>Analysis of program tracking data: Annual Report (May 1 of each year following program launch).</li> <li>Annual updates to STEP Manual for updates that occurred to its referenced sources.</li> <li>Develop baseline, measure savings, and efficient load shapes.</li> </ul> <p>Provide regulatory support as necessary.</p>
<b>Document Revision History</b>	<p>Version 6.0</p> <ul style="list-style-type: none"> <li>New version</li> <li>Deleted program penetrations section</li> </ul>
	<p>Version 7.0</p> <ul style="list-style-type: none"> <li>Added clarification on year PJM resource nomination ends for this program.</li> <li>Removed requirement for semi-annual program tracking, as the North Carolina submission has been changed to line up with Virginia.</li> <li>Removed Persistence study for PJM resource nomination: Annual (Completed May, 2014).</li> <li>Updated Deemed Savings Approach section to reference the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual Manual.</li> </ul>
	<p>Version 8.0</p> <ul style="list-style-type: none"> <li>Updated "April 1" report date to "May 1" in "EM&amp;V Measurement, Timeline, and Scope of Work" section</li> </ul>



## Non-Residential Lighting Systems and Controls Program

### Version 9.0

- Formatting updates
- Updated from DNV GL Energy to DNV GL Energy Insights





## APPENDIX K. NON-RESIDENTIAL HEATING AND COOLING EFFICIENCY PROGRAM EM&V PLAN (VERSION 9.0)

Non-Residential Heating and Cooling Efficiency Program	
<b>Program Summary</b>	The Non-residential Heating and Cooling Efficiency Program is designed to induce customers to replace or upgrade inefficient HVAC units to qualifying high efficiency units by offering rebates that reduce the incremental cost of the new units.
<b>Measures</b>	<p>High efficiency models of the following types of equipment are covered by the rebates:</p> <ul style="list-style-type: none"> <li>• Package Terminal Air Conditioners and Package Terminal Heat Pumps</li> <li>• Unitary and Split Air Condition Systems and Air Source Heat Pumps (not gas)<sup>6</sup></li> <li>• Variable Frequency Drives</li> <li>• Economizer (Replacements and New Installations)</li> <li>• Water and Air Cooled Chillers</li> <li>• Geothermal Heat Pumps</li> <li>• Variable refrigerant flow system and mini split heat pumps</li> </ul>
<b>EM&amp;V Method</b>	<p><u>International Performance Measurement and Verification Protocol (IPMVP) Option A:</u> This will be used for HVAC system replacement measures. IPMVP Option A is a partially measured retrofit isolation study that meters the actual energy and demand of an installed efficiency measure from a representative sample of participants, and adjusts the savings estimates derived from engineering algorithms applied to the Company's program participation data. The adjustment factor, also called a realization rate,<sup>7</sup> is then applied to the population of participants to estimate program savings.</p> <p><u>IPMVP Option D:</u> This will be used for installed or replaced economizer measures. IMPVP Option D is a calibrated simulation study that uses computer simulation software (e.g., DOE-2.2 software) to predict the change in energy and demand of efficiency measures from a representative sample of participants, and adjusts the savings estimates derived from engineering algorithms applied to the Company's program participation data. The computer simulation is developed using economizer system inputs collected on-site or through interviews with installation and service</p>

<sup>6</sup> The heat pumps and any supplemental electric resistance heating will be analyzed, but not gas-fired supplemental heating. This also applies to the packaged terminal heat pumps.

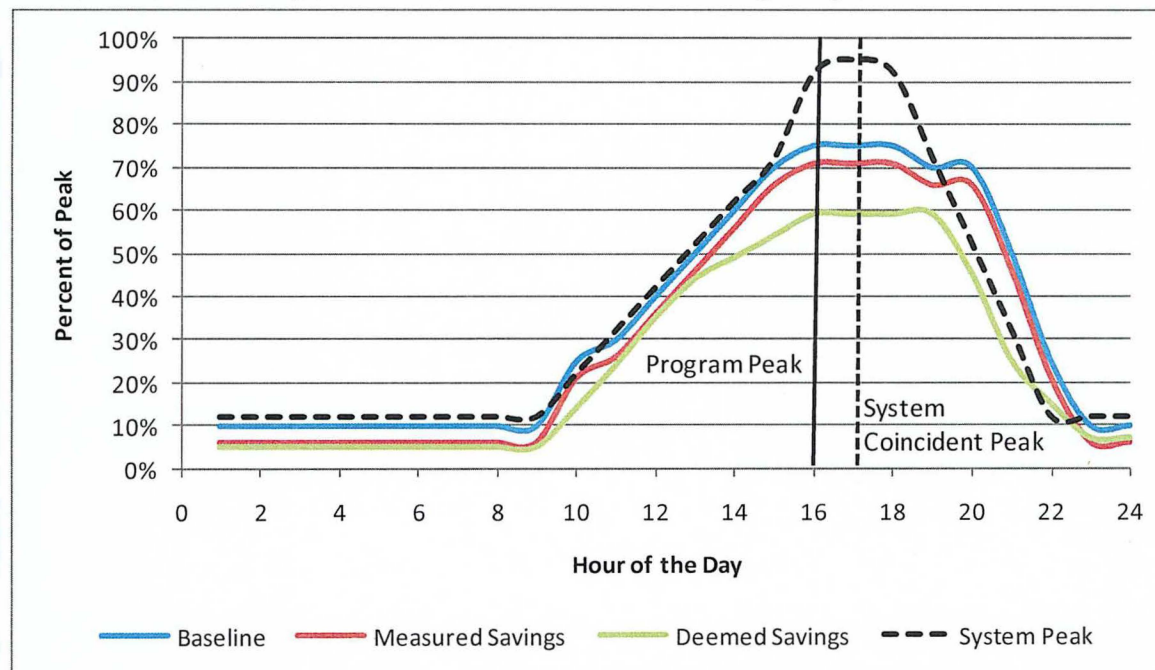
<sup>7</sup> The "realization rate" is the proportion of assumed or estimated energy and peak demand savings that is actually realized by a customer or project. It is expressed as a percentage, and is derived from follow up research (on-site inspections or customer surveys) to verify that measures were in fact installed and are operating as intended, and/or actions were taken.

## Non-Residential Heating and Cooling Efficiency Program

contractors. On-site hourly meter data is collected from the cooling systems and is used to calibrate the simulation for accuracy.

The following figure illustrates the various components used to arrive at the savings estimates.

### Illustrative Load Shape: Non-residential HVAC Efficiency Program



1. Baseline Estimation Approach (Blue line): The baseline load shape will be computed based on pre-retrofit capacity data from the rebate application data, applying Equivalent Full Load Hours (EFLH) as metered in on-site studies of installed rebated measures from a representative sample of participants.
2. Deemed Savings Approach (Green line): Deemed savings values will be estimated from the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual for complete heating and cooling system measures as well as VFD and economizer installations. The original source of these deemed savings approaches are derived from the Mid-Atlantic Technical Resource Manual (TRM) and other TRMs.



Non-Residential Heating and Cooling Efficiency Program	
<b>Deemed Savings Approach</b>  <b>EM&amp;V Measurement, Timeline, and Scope of Work</b>  <b>Document Revision History</b>	<p>3. <u>Measured Savings Approach (Red line)</u>: The wattage and hours of use data for the installed efficiency measure will be collected and metered through an on-site study of installed rebated measures from a representative sample of participants.</p> <p>The ratio of the weighted deemed and measured and verified savings, also called a realization rate,<sup>8</sup> 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 the actual measures installed to quantify energy and peak demand savings.</p>
	<p>Refer to the Non-Residential Heating and Cooling Efficiency Program of the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual for the standard deemed savings approach for the measures in this program.</p>
	<ul style="list-style-type: none"> <li>• Analysis of program tracking data: Annual Report (May 1 of each year following program launch).</li> <li>• Annual updates to STEP Manual for updates that occurred to its referenced sources.</li> <li>• Develop baseline, measure savings, and efficient load shapes.</li> <li>• Provide regulatory support as necessary.</li> </ul>
	<p>Version 6.0</p> <ul style="list-style-type: none"> <li>• New Version</li> <li>• Deleted program penetrations section</li> </ul> <p>Version 7.0</p> <ul style="list-style-type: none"> <li>• Removed requirement for semi-annual program tracking, as the North Carolina submission has been changed to line up with Virginia.</li> <li>• Updated Deemed Savings Approach section to reference the STEP Manual.</li> </ul> <p>Version 8.0</p> <ul style="list-style-type: none"> <li>• Updated "April 1" report date to "May 1" in "EM&amp;V Measurement, Timeline, and Scope of Work" section</li> </ul>

<sup>8</sup> 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 (on-site inspections or customer surveys) to verify that measures were in fact installed and are operating as intended, and/or actions were taken.

## Non-Residential Heating and Cooling Efficiency Program

Version 9.0

- Formatting updates
- Updated from DNV GL Energy to DNV GL Energy Insights



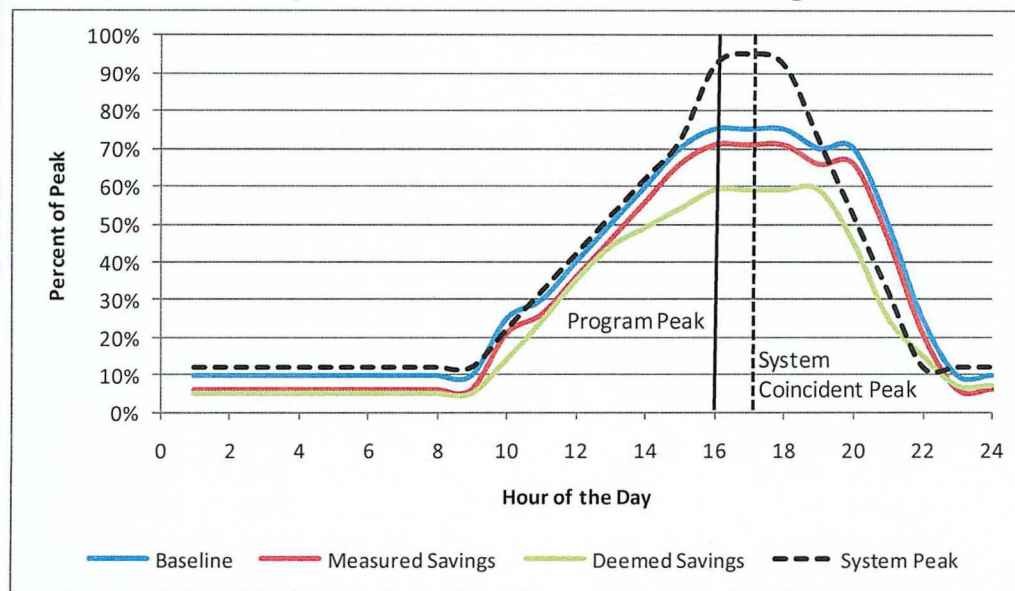


## APPENDIX L. NON-RESIDENTIAL WINDOW FILM PROGRAM EM&V PLAN (VERSION 9.0)

Non-Residential Window Film Program	
<b>Program Summary</b>	The Non-residential Window Film Program is designed to induce customers to install qualifying window film to existing windows to reduce solar heat gain and reduce cooling energy use by offering rebates that reduce the incremental cost of the window film.
<b>Measures</b>	<p>Solar window film installation(s) are eligible for rebate through the program under the following conditions:</p> <ul style="list-style-type: none"> <li>• Existing windows only</li> <li>• All windows are eligible regardless of the direction they are facing</li> <li>• Program eligibility applies to both single and double pane window</li> <li>• SHGC (Solar Heat Gain Coefficient) of window film of <math>\leq 0.40</math> and not less than 0.25</li> </ul>
<b>EM&amp;V Method</b>	<p>International Performance Measurement and Verification Protocol (IPMVP) Option D: IPMVP Option D will be used. IMPVP Option D is a calibrated simulation study that uses computer simulation software (e.g. DOE 2 or Energy Plus softwares) to predict the change in energy and demand of efficiency measures from a representative sample of participants, and adjusts the savings estimates derived from engineering algorithms applied to the Company's program participation data. The computer simulation is developed using building and window film parameters collected on-site or through interviews with installation and service contractors.</p> <p>The following figure illustrates the various components used to arrive at the savings estimates.</p>



**Illustrative Load Shape: Non-residential Window Film Program**



Non-Residential Window Film Program	
	<ol style="list-style-type: none"> <li>1. <u>Baseline Estimation Approach (Blue line)</u>: The baseline load shape will be computed based on pre-retrofit capacity data from the rebate application data, applying Equivalent Full Load Hours (EFLH) as metered in on-site studies of installed rebated measures from a representative sample of participants.</li> <li>2. <u>Deemed Savings Approach (Green line)</u>: Deemed savings values will be estimated from the DNV GL Energy Standard Tracking and Engineering Protocols (STEP) Manual. The source of the deemed savings values will be models of 21 prototypical building types using Database for Energy Efficiency Resources (DEER) average values for building parameters (building sq. ft., EFLH, etc.). Variations in deemed savings values are provided in the STEP manual for some important parameters reported on customer rebate applications, including: weather zone, window orientation, and heating system type.</li> <li>3. <u>Measured Savings (Red Line)</u>: Solar emittance spot measurement data and operation schedules will be collected through an on-site study of installed rebated measures from a representative sample of participants. Load data from applicable non-residential HVAC measures across all other Dominion programs will be used in the simulation model as the basis of the measured savings load shape.</li> </ol> <p>The ratio of the weighted deemed and measured and verified savings, also called a realization rate,<sup>9</sup> 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 the actual measures installed to quantify energy and peak demand savings.</p>
<b>Deemed Savings Approach</b>	Refer to the Non-Residential Window Film Program section of the STEP Manual for the standard deemed savings approach for the measures in this program.
<b>EM&amp;V Measurement, Timeline and Scope of Work</b>	<ul style="list-style-type: none"> <li>• Analysis of program tracking data: Annual Report (May 1 of each year following program launch)</li> <li>• Annual updates to STEP Manual for updates that occurred to its referenced sources</li> <li>• Develop baseline, measure savings, and efficient load shapes</li> <li>• Provide regulatory support as necessary</li> </ul>
<b>Document Revision History</b>	<p>Version 6.0</p> <ul style="list-style-type: none"> <li>• New version</li> <li>• Deleted program penetrations section</li> </ul>

<sup>9</sup> 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 (on-site inspections or customer surveys) to verify that measures were in fact installed and are operating as intended, and/or actions were taken.



Non-Residential Window Film Program	
	<p>Version 7.0</p> <ul style="list-style-type: none"> <li>Removed requirement for semi-annual program tracking, as the North Carolina submission has been changed to line up with Virginia</li> <li>Updated Deemed Savings Approach section to reference the STEP Manual</li> </ul>
	<p>Version 8.0</p> <ul style="list-style-type: none"> <li>Removed references to the "NRDUCT" and "NRHVAC" programs in the "EM&amp;V Method" section. Replaced with references to "non-residential HVAC measures across all other Dominion programs."</li> <li>Updated "April 1" report date to "May 1" in "EM&amp;V Measurement, Timeline, and Scope of Work" section</li> </ul>
	<p>Version 9.0</p> <ul style="list-style-type: none"> <li>Formatting updates</li> <li>Updated from DNV GL Energy to DNV GL Energy Insights</li> </ul>





## APPENDIX M. NON-RESIDENTIAL SMALL BUSINESS IMPROVEMENT PROGRAM EM&V PLAN (VERSION 9.0)

Non-Residential Small Business Improvement Program	
<b>Program Summary</b>	The Non-Residential Small Business Improvement Program provides low cost energy assessments, direct install measures, and incentives for energy efficiency improvements to small businesses meeting certain size and need-based requirements. It is available to non-residential, small business customers in the Company's Virginia service territory with historic demand not exceeding 100 kW more than 3 times in the past 12 months. Participants must be privately-owned small businesses with five or fewer qualifying locations within the Company's service territory. Participation in this program is strictly voluntary. This program is part of demand side management (DSM) Phase V in Virginia and North Carolina.
<b>Measures</b>	<p><u>HVAC Retrofit Measures</u></p> <ul style="list-style-type: none"> <li>• Unitary/split AC &amp; HP upgrades</li> <li>• Variable frequency drives (VFDs)</li> <li>• Dual enthalpy, air-side economizers</li> <li>• Mini-split heat pumps</li> <li>• Programmable thermostats</li> </ul> <p><u>HVAC Re-commissioning Measures</u></p> <ul style="list-style-type: none"> <li>• Duct testing and sealing</li> <li>• AC/HP tune-ups</li> <li>• AC/HP Refrigerant charge adjustment</li> </ul> <p><u>Lighting Measures</u></p> <ul style="list-style-type: none"> <li>• T8/T5 lamps/fixtures</li> <li>• LED lamps/fixtures</li> <li>• Occupancy sensors &amp; controls</li> </ul> <p><u>Other Measure</u></p> <ul style="list-style-type: none"> <li>• Air compressor leak repairs</li> </ul>
<b>EM&amp;V Method</b>	<u>International Performance Measurement and Verification Protocol (IPMVP) Option A</u> : For physically accessible equipment measures, an EM&V method like IPMVP Option A is applied. IPMVP Option A is a partially-measured retrofit

### Non-Residential Small Business Improvement Program

isolation study that measures the selected parameters leading to the change in energy and demand of an installed efficiency measure from a representative sample of participants, and adjusts the savings estimates derived from engineering algorithms applied to the Company's program participation data. IPMVP Option A shall be applied to a sample of unitary/split AC & HP upgrades, variable frequency drives, mini-split heat pumps, and air compressor leak repairs.

IPMVP Option D: IPMVP Option D is a calibrated simulation study that uses computer simulation software (e.g. DOE-2.2 software) to predict the change in energy and demand of the installed efficiency measures from a representative sample of participants, and adjusts the savings estimates derived from engineering algorithms applied to the Company's program participation data. IPMVP Option D shall be applied to sample of economizer measures.

For all measures, the evaluation will select a sample for on-site verification. Savings will be based on the DNV GL Energy STEP Manual deemed values with adjustments to key inputs that can be verified while on-site. The ratio of the weighted, measured, and verified savings to the weighted deemed savings, also called a realization rate,<sup>10</sup> 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 the actual measures installed to quantify energy and peak demand savings.

The following figure illustrates the various components used to arrive at the savings estimates.

<sup>10</sup> 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 (on-site inspections or customer surveys) to verify that measures were in fact installed and are operating as intended, and/or actions were taken.