

February 10, 2017

**VIA ELECTRONIC DELIVERY**

Honorable Kathleen H. Burgess  
Secretary  
New York State Public Service Commission  
Three Empire State Plaza, 19<sup>th</sup> Floor  
Albany, New York 12223-1350

**RE: Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision**

**Case 15-M-0252 – In the Matter of Utility Energy Efficiency Programs**

**Matter 15-01319 – In the Matter of the New York State Technical Resource Manual New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs – Residential, Multi-Family, and Commercial/Industrial Measures, Version 4**

**Programmable Thermostat Measure Update**

Dear Secretary Burgess:

In accordance with the requirements set forth in the Order Adopting Regulatory Policy Framework and Implementation Plan issued by the Commission on February 26, 2015 in Case 14-M-0101, Niagara Mohawk Power Corporation d/b/a National Grid, The Brooklyn Union Gas Company d/b/a National Grid NY and KeySpan Gas East Corporation d/b/a National Grid (collectively “National Grid”), Central Hudson Gas and Electric Corporation, Consolidated Edison Company of New York, Inc., National Fuel Gas Distribution Corporation, New York State Electric & Gas Corporation, Orange and Rockland Utilities, Inc., and Rochester Gas and Electric Corporation (collectively the “Joint Utilities”) assumed responsibility for maintaining the New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs— Residential, Multi-Family, and Commercial/Industrial Measures (“NY TRM”) on June 1, 2015.<sup>1</sup>

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<sup>1</sup> Long Island Electric Utility Servco LLC as agent of and acting on behalf of Long Island Lighting Company d/b/a LIPA (“LIPA”) was added to the TRM Management Committee in 2016.

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Based on the New York State Department of Public Service Staff's request for the Technical Resource Manual Management Committee ("TRM MC") to issue a one-time measure revision, outside of the cyclical schedule specified in the TRM MC's March 31, 2016 Management Plan filing, the TRM MC has reviewed and approved the attached update to programmable thermostats within Version 4 of the NY TRM, effective February 10, 2017. It should be noted that if a measure or technology is revised or added to the NY TRM, it does not mean that such measure or technology is expressly supported or endorsed by the member companies of the TRM MC. In addition, it should be noted that there is no guarantee that measures or technologies included in the TRM will be offered by utility energy efficiency programs prospectively.

Please direct any questions regarding this filing to:

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Respectfully submitted,

*/s/ Karla M. Corpus*

Karla M. Corpus  
Senior Counsel

Enc.

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## Single and Multi-Family Residential Measures

### HEATING, VENTILATION AND AIR CONDITIONING (HVAC) – CONTROL

#### THERMOSTAT – PROGRAMMABLE SETBACK

##### Measure Description

Programmable setback thermostats applied to single-family and multi-family residential air conditioners, heat pumps, boilers, furnaces, and electric resistance baseboard heating systems.

One programmable thermostat may be applied to each controlled HVAC system.

##### Method for Calculating Annual Energy and Peak Coincident Demand Savings

###### *Annual Electric Energy Savings*

$$\Delta \text{kWh} = \text{units} \times \left[ \begin{array}{l} \left( \text{tons/unit} \times \left( \frac{12}{\text{SEER}} \right) \times \text{EFLH}_{\text{cooling}} \times F_{\text{cooling}} \right) \\ + \left( \text{kBTU}_{\text{h}_{\text{out}}}/\text{unit} \times \left( \frac{1}{\text{HSPF}} \right) \times \text{EFLH}_{\text{heating}} \times F_{\text{heating}} \right) \end{array} \right]$$

###### *Peak Coincident Demand Savings*

$$\Delta \text{kW} = \text{N/A}$$

###### *Annual Gas Energy Savings*

$$\Delta \text{therms} = \text{units} \times \left[ \text{kBTU}_{\text{h}_{\text{in}}}/\text{unit} \times \left( \frac{1}{100} \right) \times \text{EFLH}_{\text{heating}} \times F_{\text{heating}} \right]$$

##### **where:**

- $\Delta \text{kWh}$  = Annual electric energy savings
- $\Delta \text{kW}$  = Peak coincident demand electric savings
- $\Delta \text{therms}$  = Annual gas energy savings
- units = Number of residences in which measure is installed under the program
- tons/unit = Tons of air conditioning per residence, based on nameplate data; for multifamily with central HVAC, this includes all residences served by central HVAC system
- $\text{kBTU}_{\text{h}_{\text{out}}}/\text{unit}$  = Output electric heating capacity in kBTU/h per residence, based on nameplate data (heat pumps); for multifamily with central HVAC, this includes all residences served by central HVAC system
- $\text{kBTU}_{\text{h}_{\text{in}}}/\text{unit}$  = Input heating capacity in kBTU/h per residence, based on nameplate data (boilers, furnaces, and electric resistance heating); for multifamily with central HVAC, this includes all residences served by central HVAC system
- SEER = Seasonal energy efficiency ratio in Btu/watt-hour. Total cooling output of an air conditioner during its normal annual usage period for cooling, in BTU, divided by the total electric energy input during the same period, in watt-hours.

## Single and Multi-Family Residential Measures

|                         |   |
|-------------------------|---|
| HSPF                    | = Heating seasonal performance factor, total heating output (supply heat) in BTU (including electric strip heat) during the heating season / total electric energy heat pump consumed (in watt-hours) |
| EFLH <sub>cooling</sub> | = Cooling equivalent full-load hours  |
| EFLH <sub>heating</sub> | = Heating equivalent full-load hours  |
| F <sub>heating</sub>    | = Energy savings factor for heating (percent of total consumption saved)  |
| F <sub>cooling</sub>    | = Energy savings factor for cooling (percent of total consumption saved)  |
| 12                      | = kBtU <sub>h</sub> /ton of air conditioning capacity   |
| 100                     | = Conversion factor, kBtU <sub>h</sub> /therm   |

### Summary of Variables and Data Sources

| Variable                               | Value | Notes   |
|--|-------|---|
| tons                                   |       | From application or use 3 as default. Use 0 if no central cooling   |
| SEER                                   | 13    | As defined by IECC 2015 and subsequently adopted by ECCCCNYS 2016 and NYCECC; assumes 3-ton, split-system AC <sup>1</sup> |
| EFLH <sub>cooling</sub>                |       | Vintage weighted average by city.   |
| F <sub>cooling</sub>                   | 0.09  |   |
| EFLH <sub>heating</sub>                |       | Vintage weighted average by city.   |
| F <sub>heating</sub>                   | 0.02  | Conservative estimate based on results of NYS RES HEHE evaluation <sup>2</sup>  |
| <b>If heat pump:</b>                   |       |   |
| kBTU <sub>h</sub> <sub>out</sub> /unit |       | From application or use 70 kBtU/hr as default   |
| HSPF                                   | 8.2   | As defined by IECC 2015 and subsequently adopted by ECCCCNYS 2016 and NYCECC; assumes 3-ton, split system HP <sup>3</sup> |
| <b>If furnace:</b>                     |       |   |
| kBTU <sub>h</sub> <sub>in</sub> /unit  |       | From application or use 90 kBtU/hr as a default. Use weighted average of furnace and boiler if system type unknown.       |
| <b>If boiler:</b>                      |       |   |
| kBTU <sub>h</sub> <sub>in</sub> /unit  |       | From application or use 110 kBtU/hr as default. Use weighted average of furnace and boiler if system type is unknown.     |
| <b>If resistance heater:</b>           |       |   |
| kBTU <sub>h</sub> <sub>in</sub> /unit  |       | From application or use 12 kBtU/hr (3.5 kW) as default  |
| HSPF                                   | 3.412 | Equivalent to COP = 1   |

<sup>1</sup> IECC 2015; Table C403.2.3(1): Minimum Efficiency Requirements: Electrically Operated Unitary Air Conditioners and Condensing Units.

<sup>2</sup> Opinion Dynamics: New York Statewide Residential Gas High-Efficiency Heating Equipment Programs Evaluation of 2009-2011 Programs; August 2014.

<sup>3</sup> IECC 2015; Table C403.2.3(2): Minimum Efficiency Requirements: Electrically Operated Unitary and Applied Heat Pumps.

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The nominal rating of the cooling capacity of the air conditioner or heat pump should be set equal to the rated capacity of all cooling equipment in the residence. The energy savings should be calculated based on the capacity of the HVAC system, with one thermostat controlling the system. For multifamily with central HVAC, total cooling capacity of the system should be used.

The nominal rating of the heating capacity of the heat pump should be set equal to the rated capacity of all heating equipment controlled in the residence. The energy savings should be calculated based on the capacity of the HVAC system, with one thermostat controlling the system. For multifamily with central HVAC, total heating capacity of the system should be used.

### Coincidence Factor (CF)

The recommended value for the coincidence factor is: N/A

### Baseline Efficiencies from which Savings are Calculated

The baseline system is a standard, non-programmable thermostat for a central heating and cooling system when a programmable thermostat is not otherwise required by applicable energy conservation code. If programmable thermostats are required by code, no deemed savings exist.

The baseline efficiency for air conditioners and heat pumps should be set according to the sections on air conditioner and heat pump efficiency above. Electric resistance heating systems should use an HSPF = 3.412, which is equivalent to a coefficient of performance of 1.0.

Studies of residential heating thermostat setpoint behavior indicate some amount of manual setback adjustment in homes without programmable thermostats. This behavior is accounted for in the prototypical building simulation model used to calculate heating equivalent full-load hours, as described in Appendix A. An assumption of 3°F of night time setback behavior is embedded in the models.

### Compliance Efficiency from which Incentives are Calculated

The energy savings factor for heating ( $F_{\text{heating}}$ ) is the ratio of the energy savings resulting from installation of a programmable setback thermostat to the annual heating energy. The heating energy savings factor assumption is derived from the results of a New York State specific residential gas program evaluation conducted by Opinion Dynamics. This evaluation indicated a 2-4% reduction in total annual gas consumption resulting from installation of programmable thermostats. A conservative value of 2% of the annual heating energy consumption is assumed as deemed savings for programmable setback thermostats in residential applications.

The cooling energy savings factor ( $F_{\text{cooling}}$ ) is the ratio of the energy savings resulting from installation of a programmable setback thermostat to the annual cooling energy. The cooling energy savings factor assumption is taken from the ENERGY STAR<sup>®</sup> website. The ENERGY STAR<sup>®</sup> calculator estimates an energy savings of 6% of the annual cooling energy consumption per degree of setback for programmable setback thermostats in residential applications. This measure assumes an average of 1.5 degrees of setback over the cooling season for an estimated annual cooling energy savings of 9%.

### Operating Hours

Cooling and heating equivalent full-load hours calculated from building energy simulation models are described in Appendix A and summarized in Appendix G.

## Single and Multi-Family Residential Measures

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### Effective Useful Life (EUL)

Years: 11

Source: DEER<sup>4</sup>

### Ancillary Fossil Fuel Savings Impacts

N/A

### Ancillary Electric Savings Impacts

N/A

### References

1. For examples of studies on residential thermostat setpoint behavior, see the literature review conducted for the California Energy Commission project “Residential Thermostats: Comfort Controls in California Homes,” CEC-500-03-026, *available at* [http://eetd.lbl.gov/sites/all/files/lbnl-938e\\_3.pdf](http://eetd.lbl.gov/sites/all/files/lbnl-938e_3.pdf)
2. Baseline thermostat setback assumptions taken from: Conner, C.C. and Lucas, R.L. 1990. Thermostat Related Behavior and Internal Temperatures Based on Measured Data in Residences. PNL-7465, Pacific Northwest Laboratory. Richland, WA. <http://elcap.nwcouncil.org/Documents/Thermostat%20Related%20Behavior.PDF>
3. IECC 2015: International Energy Conservation Code – 2015 [http://codes.iccsafe.org/app/book/content/2015-I-Codes/NY/2015%20IECC%20HTML/Chapter%204%20\[CE\].html](http://codes.iccsafe.org/app/book/content/2015-I-Codes/NY/2015%20IECC%20HTML/Chapter%204%20[CE].html)
4. ECCCNY 2016: Energy Conservation Construction Code of New York State – 2016 [https://www.dos.ny.gov/dcea/energycode\\_code.html](https://www.dos.ny.gov/dcea/energycode_code.html)
5. NYCECC 2016: New York City Energy Conservation Code – 2016 <https://www1.nyc.gov/site/buildings/codes/2016-energy-conservation-code.page>
6. Opinion Dynamics: New York Statewide Residential Gas High-Efficiency Heating Equipment Programs Evaluation of 2009-2011 Programs; August 2014 [http://www.nationalfuelforthought.com/docs/psc-reports/EEPS\\_Opinion\\_Dynamics\\_Corporation\\_Residential\\_Rebate\\_Program\\_Statewide\\_Impact\\_Evaluation\\_Report\\_Completed\\_August\\_2014.pdf](http://www.nationalfuelforthought.com/docs/psc-reports/EEPS_Opinion_Dynamics_Corporation_Residential_Rebate_Program_Statewide_Impact_Evaluation_Report_Completed_August_2014.pdf)
7. Programmable thermostat savings for the cooling season taken from the ENERGY STAR<sup>®</sup> website: [https://www.energystar.gov/sites/default/files/asset/document/ProgrammableThermostat\\_Calculator.xls](https://www.energystar.gov/sites/default/files/asset/document/ProgrammableThermostat_Calculator.xls)

### Record of Revision

| Record of Revision Number | Issue Date |
|---------------------------|------------|
| 0                         | 10/15/2010 |
| 1                         | 12/31/2015 |
| 1-17-3                    | 12/31/2016 |
| 2-17-1                    | 2/10/2017  |

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<sup>4</sup> California Public Utilities Commission: Database for Energy Efficient Resources (DEER) – 2014; Updated-EULrecords\_02-07-2014; EUL ID: HVAC-ProgTStats.

Available at: <http://deeresources.com/files/deerchangelog/deerchangelog.html>