



# Homes and Community Renewal

## HCR Clean Energy Initiative Program *Space Heating Load Calculation Guidance*

This document provides clarification and best practice guidance on select requirements detailed in the HCR CEI Term Sheets. **This document does not replace the relevant requirements in the HCR Sustainability Guidelines or Term Sheets.**

*Updated on 6/24/2024*

### Space Heating Load Requirements

Projects pursuing CEI funding for the Electrification of Heating in Existing Building projects (Goal 1 in the Substantial Rehab and Moderate Rehab Term Sheets) are required to comply with one of the following high-performance envelope options:

1. Option 1: Demonstrate existing envelope or envelope with planned improvements will comply with 2020 NYSECC prescriptive values.
2. Option 2: Demonstrate existing space heating load or space heating load with planned improvements is less than 8 Btu/HDD/ft<sup>2</sup>.

Note that the heating load intensity metric used in this calculation differs from the building's energy use intensity (EUI) as clarified below:

- **Energy Use Intensity (EUI):** The measurement of a building's energy consumption on a yearly basis, relative to its area (Btu/ft<sup>2</sup>/year). EUI is often used as a metric to describe the overall energy performance of a building, considering all loads and equipment efficiencies.
- **Heating Load Intensity:** The heating load quantifies the amount of heat that needs to be added to the space to offset heat loss through the envelope, infiltration, and ventilation to maintain the desired setpoint, without accounting for equipment efficiency. For the purposes of the CEI Program Term Sheet, heating load is divided by square footage and number of Heating Degree Days (Btu/HDD/ft<sup>2</sup>).

To meet the criteria of the Term Sheet using Option 2, project teams must calculate the heating load intensity, as opposed to the total EUI or the energy used to provide heating. Note this calculated heating load intensity *excludes consideration for heating equipment efficiency*. The intent of the heating load calculation is to provide an approximate metric for assessing existing thermal load conditions in a building, including envelope performance.

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## Calculating Thermal Demand Intensity from Utility Data

For Buildings with Gas, Oil, or Steam Heating

To complete this calculation, you will need:

- 2 years of gas, oil, or steam utility data from within the last 5 years (*Note: You should go through this calculation using a single year of utility data and repeat with the second year of data. Use the average of the two final values as your result.*)
- The total heated area of the building
- Efficiency of existing heating systems

### Instructions

1	<b>Determine Annual Base Fuel Usage</b>	<p>If all usage data is on a single meter, you will first need to estimate usage from end-uses other than space heating (like cooking or domestic hot water heating). <i>If there is sub-metered data available for the heating system, you can skip this step.</i></p> <ul style="list-style-type: none"> <li>• Find the <i>Total Fuel Usage</i> in the month with the lowest fuel usage (likely in the summer).</li> <li>• Divide the total by the number of days in that month to find the <i>Base Daily Fuel Usage</i>.</li> <li>• Multiply the <i>Base Daily Fuel Usage</i> by 365 to find the <i>Base Annual Fuel Usage Per</i>.</li> </ul>	<p>Base Daily Fuel Usage = Total Fuel Usage (in Summer Month) / # Days (in Summer Month)</p> <p>Base Annual Fuel Usage = Base Daily Fuel Usage * 365</p>
2	<b>Determine Annual Fuel Usage for Heating</b>	<ul style="list-style-type: none"> <li>• Find the <i>Total Annual Fuel Usage</i> for a single year period.</li> <li>• Subtract the <i>Base Annual Fuel Usage</i> (calculated in step #1) to find the <i>Annual Heating Fuel Usage</i>.</li> </ul>	<p>Annual Heating Fuel Usage = Total Annual Fuel Usage – Base Annual Fuel Usage</p>
3	<b>Estimate Annual Heating Load</b>	<ul style="list-style-type: none"> <li>• If current efficiencies of heating equipment in the building are known, find the <i>Average Efficiency</i>. If not, determine an appropriate estimate for the average efficiency of heating equipment in its current operating condition.</li> <li>• Multiply the <i>Annual Heating Fuel Usage</i> (calculated in step #2) by the <i>Average Efficiency</i> to find the <i>Annual Heating Load</i>.</li> <li>• Convert the <i>Annual Heating Load</i> to Btu. You can use the U.S. Energy Information Administration’s <a href="#">Energy Conversion Calculators</a> for the appropriate fuel type.</li> </ul>	<p><i>Annual Heating Load = Annual Heating Fuel Usage * Average Efficiency * Conversion Factor</i></p>
4	<b>Calculate Btu/HDD/ft2</b>	<ul style="list-style-type: none"> <li>• Find the number of <i>Heating Degree Days (HDD)</i> at the location of the building using a base temperature of 65°F, over the same time period as the utility data used to calculate usage. If possible, find this information from the utility bills used to calculate usage. Otherwise, you can do this using the <a href="#">NOAA Online Weather Data</a> for your location.</li> <li>• Divide the <i>Annual Heating Load</i> (calculated in step #3) by the number of <i>Heating Degree Days</i> and the <i>Total Heated Floor Area</i> of the building to find the heating load in Btu/HDD/ft2.</li> </ul>	<p><i>Heating Load [Btu/HDD/ft2] = Annual Heating Load / HDD / Total Heated Floor Area</i></p>
5	<b>Repeat For Year 2</b>	<ul style="list-style-type: none"> <li>• Repeat (steps #1-5) with the second year of utility data.</li> </ul>	<p>See above</p>
6	<b>Find the Average</b>	<ul style="list-style-type: none"> <li>• Average the Btu/HDD/ft2 values you calculated for the 2 separate years.</li> </ul>	<p><i>Average Heating Load = (Year 1 Heating Load + Year 2 Heating Load) / 2</i></p>

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If the resulting number is less than 8 Btu/HDD/ft<sup>2</sup>, the building meets the envelope criteria required to be eligible for CEI funding for Electrification of Heating. If it is above 8 Btu/HDD/ft<sup>2</sup>, applicants must demonstrate that the envelope with planned improvements will meet the 8 Btu/HDD/ft<sup>2</sup> requirement (see *Calculating Heating Load from Models* section for more information) OR meet the requirements of NYSECC 2020.

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## Calculating Heating Load from Utility Data

### For Buildings with Electric Heating

To complete this calculation, you will need:

- 2 years of electricity utility data from within the last 5 years
- The total heated area of the building
- Efficiency of existing heating systems

### Instructions

1	<b>Determine Annual Base Electricity Usage</b>	<p>If all electricity usage data is on a single meter, you will first need to estimate how much electricity usage is from end-uses other than space heating. <i>If there is sub-metered data available for the heating system, you can skip this step.</i></p> <ul style="list-style-type: none"> <li>• Find the two months in a one-year period with the lowest electricity consumption (typically May/September).</li> <li>• Add the total electricity use from those two months together and divide by the number of days in the months to find the <i>Base Daily Electricity Usage</i> (in kwh/day).</li> </ul>	$\text{Base Daily Electricity Usage} = \frac{\text{Total Electricity Use (in Lowest 2 Months)}}{\text{\# Days (In Lowest 2 Months)}}$
2	<b>Determine Annual Heating Electricity Usage in Heating Season</b>	<ul style="list-style-type: none"> <li>• Add together the <i>Total Electricity Usage</i> during the heating season (October through May) and note the total number of days in the period.</li> <li>• Determine the <i>Base Electricity Usage</i> during the winter period (by multiplying the <i>Base Daily Electricity</i> by the number of days).</li> <li>• Subtract the <i>Base Electricity Usage</i> over the winter period from the <i>Total Electricity Usage</i> over the winter period to find the <i>Heating Electricity Usage</i> (kwh).</li> </ul>	$\text{Base Electricity Usage (Heating Season)} = \text{Base Daily Electricity Usage} * \text{\# Days in Heating Season}$ $\text{Annual Heating Electricity Usage} = \text{Total Electricity Usage (Heating Season)} - \text{Base Electricity Usage (Heating Season)}$
3	<b>Estimate Annual Heating Load</b>	<ul style="list-style-type: none"> <li>• If current efficiencies of heating equipment in the building are known, find the <i>Average Efficiency</i>. If not, determine an appropriate estimate for the average efficiency of heating equipment in its current operating condition.</li> <li>• Multiply the <i>Annual Heating Fuel Usage</i> by the <i>Average Efficiency</i> to find the <i>Annual Heating Load</i>.</li> <li>• Convert the <i>Annual Heating Load</i> to Btu by multiplying by 3412 Btu/kwh.</li> </ul>	$\text{Annual Heating Load} = \text{Annual Heating Electricity Usage} * \text{Average Efficiency} * 3412 \text{ Btu/kwh}$
4	<b>Calculate Btu/HDD/ft2</b>	<ul style="list-style-type: none"> <li>• Find the number of <i>Heating Degree Days (HDD)</i> at the location of the building, over the same time period as the utility data used to calculate usage. If possible, find this information from the utility bills used to calculate usage. Otherwise, you can do this using the <a href="#">NOAA Online Weather Data</a> for your location.</li> <li>• Divide the <i>Annual Heating Load</i> by the number of <i>Heating Degree Days</i> and the <i>Total Heated Floor Area</i> of the building to find the heating load in Btu/HDD/ft2.</li> </ul>	$\text{Heating Load [Btu/HDD/ft}^2\text{]} = \frac{\text{Annual Heating Load}}{\text{HDD} / \text{Total Heated Floor Area}}$
5	<b>Repeat For Year 2</b>	<ul style="list-style-type: none"> <li>• Repeat (1-5) with the second year of utility data.</li> </ul>	See above
6	<b>Find the Average</b>	<ul style="list-style-type: none"> <li>• Average the Btu/HDD/ft2 values you calculated for the 2 separate years.</li> </ul>	$\text{Average Heating Load} = \frac{\text{Year 1 Heating Load} + \text{Year 2 Heating Load}}{2}$

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If the resulting number is less than 8 Btu/HDD/ft<sup>2</sup>, the building meets the envelope criteria required to be eligible for CEI funding for Electrification of Heating. If it is above 8 Btu/HDD/ft<sup>2</sup>, applicants must demonstrate that the envelope with planned improvements will meet the 8 Btu/HDD/ft<sup>2</sup> requirement (see *Calculating Heating Load from Models* section for more information) OR meet the requirements of NYSECC 2020.

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## Calculating Heating Load from Models

Project teams may submit the outputs of a load or energy model to demonstrate that the heating load with planned improvements is expected to be below 8 Btu/HDD/ft<sup>2</sup>.

- The value to report is the heating load itself, not the energy usage for heating. Therefore, this output should not be affected by the difference in efficiency between current and future heating equipment.
- Provide a summary of the improvements included in the model, including the associated model inputs compared to the known or estimated current values. Measures that are expected to lower the Heating Load in a model include:
  - Increased thermal performance of envelope components (i.e. window replacement)
  - Reduced infiltration through air sealing or other upgrades
  - Reduced outdoor air intake due to Demand Controlled Ventilation
- If possible, provide the current Heating Load in Btu/HDD/ft<sup>2</sup> calculated from utility data (as described on the previous pages) in addition to the projected future Heating Load.

This option is appropriate when the planned improvements are required to meet the performance criteria and should NOT be used to demonstrate the performance of the current envelope in the absence of utility data. Projects that do not have access to at least 3 years of utility data must submit a waiver request to HCR to demonstrate that their current building is meeting the requirements.