

No- or low-heating energy consumption

There are several reasons why an energy simulation can calculate no/low amounts of heating energy despite showing realistic heating loads in the design calculation. The following points are common reasons why heating energy is often underestimated.

Note: Not all of these inputs are necessarily incorrect. Some are reasons that heating energy may be minimized or eliminated.

Example 1

The screenshot shows the 'Create Rooms - Rooms' dialog box. The 'Room description' is 'Single Room'. The 'Size' section has 'Length' set to 30000 ft and 'Width' set to 1 ft. The 'Design' section has 'Cooling dry bulb' at 75°F, 'Heating dry bulb' at 68°F, and 'Relative humidity' at 50%. The 'Thermostat' section has 'Cooling driftpoint' at 90°F, 'Heating driftpoint' at 55°F, 'Cooling schedule' set to 'Cstat', and 'Heating schedule' set to 'Hstat'. The 'Humidity' section has 'Latent capacity' set to 'Medium' and 'Humidistat loon' set to 'Room'. The 'Acoustic ceiling resistance' is 1.786 hr·ft²·F/Btu. The 'Room mass/avg time lag' is 'None'. The 'Slab construction type' is '4" LW Concrete'. The 'Carpeted' checkbox is checked. The 'Acoustic ceiling resistance' is 1.786 hr·ft²·F/Btu. The 'Room mass/avg time lag' is 'None'. The 'Slab construction type' is '4" LW Concrete'. The 'Carpeted' checkbox is checked. The 'Acoustic ceiling resistance' is 1.786 hr·ft²·F/Btu.

- 1 The default values for the thermostat driftpoints, 90°F and 55°F respectively, are being used. This means that whenever there are 5 percent or less of the people in the space (determined from the people schedule), the room will be allowed to drift up to 90°F or down to 55°F before the equipment turns back on. If the building control system is not going to allow the room setpoints to setback this far, or at all, the default values need to be set to more realistic values.
- 2 The selected **Thermostat** schedules allow the building to drift to an unrealistic temperature at night. For example, the CSTAT and HSTAT schedules will allow the building to drift up to 95°F and down to 55°F, depending on the time of day. The values used in the schedules can be viewed by clicking **Schedules** on the **Libraries** menu and selecting **Thermostat** as the schedule type. Typically, users need to either create their own **Thermostat** schedules, or select *none* and let the program use the driftpoints (the schedules override the driftpoints).

Not correcting this input will result in an underestimation of the cooling and heating energy at night. Refer to “Frequently asked questions” on page 6–20 for information regarding how driftpoints and thermostat schedules interact.

- 3 Large areas are being modeled as a single space. This can cause the internal loads to negate the envelope losses, leading to an underestimation or elimination of the heating loads in the energy simulation. Because internal loads are typically neglected during the heating design calculations, reasonable heating-design results may be returned using this assumption. Modeling interior and perimeter areas as separate rooms will eliminate this modeling error. Refer to “Modeling large rooms and zones” on page 6–45 for a detailed explanation.

Example 2

- 1 The **Cooling Only (Design)** schedule is selected for any of the internal loads. This schedule should typically only be used for design calculations, not for energy analysis. It simulates 100 percent of the internal loads in the building 24 hours a day (except during the heating-design portion of the calculation), which may not be what is actually occurring in the building. This tends to lead to the internal loads meeting the heating loads. To view the schedule, click **Schedules** on the **Libraries** menu and select **Utilization** as the schedule type. Here the user should be able to view the schedule and find schedules that more-closely follow the actual operation of the building.
- 2 The internal loads are scheduled as **Available 100%**. This schedule should not be used for internal loads. It simulates 100 percent of the internal loads in the building 24 hours a day, which may not be what is actually occurring in the building. In addition, it also tells the program to take credit for the internal loads during the heating-design calculation.

This schedule tends to lead to an underestimation of heating energy and undersizing of the heating coils, due to the internal loads meeting all or most of the heating loads. To view the schedule, click **Schedules** on the **Libraries** menu. Here the user should be able to view the schedule and find schedules that more closely follow the actual operation of the building.

- 3 The custom schedule(s) for internal loads have values greater than zero for the heating-design day type. This tells the program to take credit for the internal loads during the heating-design calculation. This tends to lead to undersizing of the heating coils and is not common design practice. To view the schedule, click **Schedules** on the **Libraries** menu. Here the user should be able to view the schedule and the individual day types.

Example 3

- 1 No infiltration has been input on the **Airflows** tab of **Create Rooms**. Infiltration is air from outside the building that leaks into the room, often adding to the heating requirement.
- 2 No VAV minimum airflow has been input for VAV systems. This can result in no (or minimal) airflow being supplied to the space in heating mode.

Example 4

The screenshot shows the 'Create Systems - Design Temperatures' dialog box. The 'System description' is 'RTU-1' and the 'Fan Coil' is selected. The 'Design Air Temperature' section has 'Cooling supply' at 55°F, 'Leaving cooling coil' at 55°F, 'Heating supply' at 55°F (highlighted with a green box and a red callout '1'), 'Supply duct temperature difference' at 0°F, and 'Reheat temperature difference' at 0°F. The 'Direct/Indirect Dehumidification Methods' section has 'Type' set to 'None'. The 'Variable Fan Speed for capacity control' section has 'Number of fan speeds' set to 'None'. The 'Humidification' section has 'Design humidity ratio difference' and 'Minimum room relative humidity' set to 0%.

1 The heating supply-air temperature has been input at an unrealistically low temperature. The capacity of the heating coil is calculated based on the airflow through the coil and the temperature difference across the coil. If coil capacity is underestimated, the energy consumed by the coil will also be underestimated.

Example 5

The screenshot shows the 'Create Systems - Fan Overrides' dialog box. The 'System description' is 'RTU-1' and the 'Fan cycling schedule' is 'No fan cycling'. The 'Fan Overrides' table has the following data:

	Type	Static Pressure (in. wg)	Full Load Energy Rate	Full Load Energy Rate Units	Schedule
Primary	AF Centrifugal const vol	2.5	0.0002	kW/Cfm in wg	Off (0%)
Secondary	None	0	0	kW/Cfm	Available (100%)
Return	None	0	0	kW/Cfm	Available (100%)
System exhaust	None	0	0	kW/Cfm	Available (100%)
Room exhaust	None	0	0	kW/Cfm	Available (100%)
Optional ventilation	None	0	0	kW/Cfm	Available (100%)
Auxiliary	None	0	0	kW/Cfm	Available (100%)

The 'Schedule' column is highlighted with a green box and a red callout '1'.

1 The selected fan schedule does not allow the fan to run at hours when heating loads occur. If the fan is turned off, the heating coils cannot consume energy. Schedules for fans should be used only when the fans are turned off for certain time periods and not allowed to turn back on no matter what the temperature is in the space. The schedules Off (0 percent) and Heating Only (Design) would be two

examples of incorrect schedule selection. Refer to “Frequently asked questions” on page 6–20 for additional details regarding how fan schedules and fan cycling operate in TRACE 700.

Example 6

Alternative 1
System description: RTU-1 Single Zone

Capacity Overrides

	Capacity	Capacity Units	Schedule
Main cooling	100	% of Design Cooling Capacity	Available (100%)
Auxiliary cooling		% of Design Cooling Capacity	Available (100%)
Main heating	0 1	% of Design Capacity	Available (100%)
Auxiliary heating		% of Design Capacity	Available (100%)
Preheat	100	% of Design Capacity	Off (0%) 2
Reheat	100	% of Design Capacity	Available (100%)
Humidification	100	% of Design Capacity	Available (100%)

Diversity:
People: 100 %
Lights: 100 %
Misc loads: 100 %

Warning: The fields marked in red require other entries for a correct simulation. Contact C.D.S. Support at 800-787-3526 for a detailed explanation.

Selection Options Dedicated OA Temp/Humidity Fans Coils Schematic

- 1 The heating coil(s) capacity has been zeroed out. This will cause the program to eliminate all energy associated with the coil(s).
- 2 The heating coil(s) have been scheduled off during hours when heating loads occur. If the coil(s) are turned off, they cannot consume energy. Schedules for coils should be used only when the coils are turned off for certain time periods and not allowed to turn back on no matter what the temperature is in the space.

Example 7

Alternative 1

Heating plant: Boiler Plant
Equipment tag: Boiler - 1
Equipment category: Boiler
Equipment type: Gas Fired Hot Water Boiler

Capacity: Mbh
Energy rate: 83.3 Percent efficient

Thermal storage:
Type: None
Capacity: 0 ton-hr
Schedule: Storage

Hot water pump:
Type: Heating water circ pump
Full load consumption: 0 ft water

Equipment schedule: Off (0%) **1**
Demand limiting priority:

Configuration Cooling Equipment Heating Equipment Base Utility / Misc. Accessory

- 1 The heating equipment schedule does not allow the heating equipment to run during hours when heating loads occur. If the heating

equipment is turned off, then it cannot consume energy or meet the calculated heating loads.

Note: Switching to a full-year (8760 analysis) will typically provide a more-accurate estimation of heating energy consumption. Refer to “Adding weather locations and activating the 8760 calculation methodology” on page 6–137.