

**NY STATEWIDE CLEAN HEAT PROGRAM  
DOMESTIC HOT WATER (DHW) CALCULATOR**

**Version 3.2**

**USER GUIDE**

**September 2, 2024**

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## Summary

The Statewide Clean Heat Category 6 DHW Calculator is an excel based tool that has been developed to assist participating contractors applying to the New York State Clean Heat Program with calculating custom energy savings and incentives for centralized commercial and multifamily water heating systems which use the following technologies:

**Energy Star Certified Commercial Water Heater (HPWH)** – Large commercial heat pump water heaters over 80 gallons that are listed as an Energy Star Certified Commercial Water Heater. These units are rated with a COPh metric (not a UEF). These units are usually meant to be located indoors or in a partially vented utility room.

**Air-to-Water Heat Pump (AWHP) that is located outdoors** - An air-to-water heat pump that extracts heat from outdoor air and uses it to provide hot water, such as VRF units with a hydro kit or systems listed in the NEEA QPL.

**Ground-Source Heat Pump (GSHP) 1PH** - Single Phase, water-to-water ground-source heat pump that meets the Energy Star Certified Commercial Water Heater criteria.

**Ground-Source Heat Pump (GSHP) 3Ph** - Three Phase, water-to-water ground source heat pump.

Hot water consumption rates in this calculator are based on the New York Technical Resource Manual (NY TRM) version 11. See the [“Recommended DHW Use in Multifamily and Other Commercial Applications”](#) for guidance on hot water use, water temperature, and other assumptions for energy savings calculations.

**IMPORTANT NOTE: This calculator is designed to only handle one type (Water or Air Sourced) Heat Pump at a time. Only enter one type of heat pump per each calculator file.**

## When to Use this Calculator:

The Clean Heat DHW Calculator should be used as the default method to calculate energy savings for the category 6 technologies mentioned above.

Residential heat pump water heaters (HPWHs) with a rated UEF efficiency are not covered by this tool.

This XLS tool uses a bin analysis of centralized DHW heating systems in multifamily and commercial buildings. This tool is appropriate for commercial-scale, heat pump-based, water heating products.

## Revisions and Updates:

The following are the summary of updates from the last version of the Statewide Clean Heat HRC calculator:

Version	Date	Summary of Revisions
3.2	9/13/2024	<ul style="list-style-type: none"><li>○ Added new column in "Equipment" that allows you to set eligibility by selecting Yes for "On NEEA QPL"</li><li>○ Added per DU incentive for multifamily deemed savings.</li><li>○ Updated Con Edison incentive rates.</li></ul>
3.1	6/3/2024	<ul style="list-style-type: none"><li>○ Added new technology types (HPWH, AWHP, WWHP1, WWHP3, etc.) to replace one type.</li><li>○ Added capability for ground source HP option.</li></ul>

		<ul style="list-style-type: none"> <li>o Explicitly spelled out difference between AWHP and HPWH w/ COP_h.</li> <li>o Now must enter Rated COP for each technology type.</li> </ul>
2.1	3/26/2024	<ul style="list-style-type: none"> <li>o Fixed problem with Upstate weather data.</li> <li>o Made cold water / main temperature used bin-calculated values, instead of fixed values.</li> </ul>

## Exceptions to Using Calculator:

Under certain circumstances, applicants may bypass this calculator, opting instead to calculate savings using their own custom approach, even when one of the above statements is true. Justifiable reasons for doing so include, but are not limited to:

- The applicant has prepared a whole building energy model using one approved modeling software listed in the Clean Heat Program Guide.
- The project proposes installing a Heat Pump technology for water heating that does not fall into one of the above applicable categories available in the clean heat calculator and no prescriptive TRM methodology is available for calculating savings.

All calculation approaches must use applicable NYS ECC code minimum efficiencies and minimum efficiency requirements.

## General

Users shall review the 'Eqpt Schedule', 'COP Assignment', 'DHW Bldg & Operation Data' and 'Results Summary' tabs and input project specific details where needed. Cells requiring user input are highlighted in yellow including dropdown selection. Cells in green will auto-populate based on the inputs the user enters. Red cells or error message indicate there may be an issue with project entry or equipment eligibility. Follow the error message.

The screenshot shows a software interface with five tabs: 'Instructions', 'Eqpt Schedule', 'COP Assignment', 'DHW Bldg & Operation Data', and 'Results Summary'. A red arrow points from a text box to the 'Results Summary' tab, indicating that yellow shaded cells in this tab require user input.

Below the tabs is a table titled 'DHW Building & Operational Data Inputs'. The table has two columns: 'Project Information' and 'Data'. The 'Data' column contains several rows, some of which are highlighted in yellow to indicate that user input is required. A red arrow points from a text box to these yellow cells.

DHW Building & Operational Data Inputs	
Project Location	New York City - Central Park
Utility	Con Edison
Building Type (If Other, fill in Custom Information)	Large Office
Existing Building or New Construction	Existing Building
Please enter the number of Occupants in the building.	Occupants
Does the building have a recirculating pump?	

Rated Heating Capacity (Btu/h)	Rated COP	Rated Conditions for COP	Baseline System Characteristics	
			Baseline System Size/Category	Baseline Efficiency
76,582	3.00	COP_H@80F	Gas Storage Water Heaters/ > 75,000 Btu/h and <= 155,000 Btu/h/< 4,000 Btu/h/gal	0.80
54,750	3.00	COP@47F & LWT=140F		

When a row highlights in red, there may be an eligibility issue.

		Eligibility Check	
Eligibility		Min Efficiency Compliance	
Heat Pump Eligible?	Technology Check?	Minimum COP	Meet or Exceed?
Eligible	OK	3	1
Not Eligible	OK	2.31	0

The eligibility check will on the 'Eqpt Schedule' tab will determine minimum efficiency compliance.

Tabs should be completed in the following order:

1. Eqpt Schedule (Equipment Schedule)
2. COP Assignment
3. DHW Bldg & Operational Data
4. Results Summary
5. Instructions (Optional)



## Baseline System Characteristics

Baseline System Characteristics				
Baseline System Size/Category	Baseline Efficiency	Unique ID	Eligibility Heat Pump Eligible?	Technology Check?
Gas Storage Water Heaters/ > 75,000 Btu/h and <= 155,000 Btu/h/< 4,000 Btu/h/gal	0.80	NYS[Large HPWH]Colmac[CxV-5	Eligible	OK
Gas Storage Water Heaters/ <= 75,000 Btu/h/> 55 gals and <= 100 gals	0.80	NYS[Large AWHPI]	Eligible	OK

- **Select the Baseline System Size/Category:** Select the baseline system size and category that matches the existing system.
- **Baseline Efficiency:** Populates the baseline efficiency based on Table C404.2 of 2020 ECCCNY for the baseline system size and category chosen.
- **Unique ID:** Unique ID for the proposed equipment based on location, heat pump technology, make, and model.
- **Heat Pump Eligible:** Populates “Eligible” or “Not Eligible” by comparing the minimum COP to the rated COP of the equipment.
- **Technology Check:** Technology check to confirm the heat pump technology corresponds to the location chosen on the ‘DHW Bldg & Operation Data’ tab.

## Tab: COP Assignment

COP curves are assigned to each equipment model using 10°F temperature bins ranging from 0°F to 100°F. The temperature bins correspond to entering air temperature for air source heat pumps and entering water temperature for water source heat pumps. The COP trends should be determined from the engineering data available for each product.

For Northwest Energy Efficiency Alliance (NEEA) QPL-Listed Equipment, enter the known seasonal COP value into each bin. Similarly, enter COP<sub>h</sub> value into each bin for Large HPWH in indoor applications. See the following link for a list of NEEA QPL listed equipment: [NEEA Commercial/Multifamily HPWH Systems Qualified Products List](#)

For many products such as HPWH, performance data is often not available. In these cases, we recommend assuming a 10% drop in COP for each 10°F lower temperature bin, starting with the rated COP at 80°F. Correspondingly a 10% increase for 10°F higher temperature bins.

When COP data is available at various temperatures on the load side for multi-pass systems, we recommend using 100°F leaving load-side temperature as the average condition over a daily cycle.

Temperature Bin (F)	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10
0-10	2.06									
10-20	2.31									
20-30	2.29									
30-40	2.09									
40-50	2.54									
50-60	2.75									
60-70	2.99									
70-80	3.15									
80-90	3.33									
90-100	3.53									
Rated COP for Eligibility	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HPWH Unique ID	NYS   Large									
Tech Code	Large AWHP									
HP Unit Capacity (Btu/h)	52,757									
Number of Units	5									
Total Associated HPWH Percentage	100%									

- **COP Assignment Table:** Enter the COP values in 10F increments of entering air or water temperature for each piece of equipment.
  - For NEEA QPL-Listed Equipment, enter the known seasonal COP value into each bin
    - “Mild” for Long Island, NYC and Westchester counties.
    - “Cold” for rest of the state.
  - For Large HPWH in indoor applications enter COPh value into each bin.
- **HPWH Unique ID:** Unique ID for each equipment type populated based on information entered on the ‘Eqpt Schedule’ tab.
- **Tech Code:** Technology code populated based on the heat pump technology chosen in the ‘Eqpt Schedule’ tab.
- **HP Unit Capacity (Btu/h):** Total rated equipment capacity in Btu/h, populated based on information entered on the ‘Eqpt Schedule’ tab
- **Number of Units:** Number of units for each equipment type, populated based on information entered on the ‘Eqpt Schedule’ tab.
- **Total Associated HPWH Percentage:** Populates the percentage of total unit capacity entered on the ‘Eqpt Schedule’ tab included in the COP assignment table.
- Note: see "Sample DHW HP Curves" tab for possible values
- Note: COP values must be entered into this tab to produce accurate results on the ‘results’ tab. If the equipment is in a condition space, use the rated COP for each temperature range.

## Tab: Sample DHW HP Curves

- This tab provides sample COP values at varying entering air or water temperatures for select air-to-water and ground source heat pump models.
- These values can be entered into the ‘COP Assignment’ tab only if you are using one of the selected model numbers listed.



- Please enter the number of Occupants in the building: Prompt will appear for when 'Large Office' or 'Small Office' is chosen as the building type. Enter the number of occupants served by the heat pump water heater(s).
- Please enter the number of Restaurants in the building: Prompt will appear when 'Full-Service Restaurant' and 'Fast Food Restaurant' building types are chosen. Enter the number of restaurants served by the heat pump water heater(s).
- Please enter the number of residences served by the DHW unit: Prompt will appear when 'Single Family, Average', 'Single Family, 2-Person Household' and 'Single Family, 4-Person Household' building types are chosen. Enter the number of residences served by the heat pump water heater(s).
- Please enter the number of Apartment Units in the building: Prompt will appear when 'Multifamily, Senior Apartments', 'Multifamily, Market Rate' and 'Multifamily, Affordable Housing' building types are chosen. Enter the number of apartment units served by the heat pump water heater(s).
- Does the building have a recirculating pump: Select the appropriate response from the drop-down menu. Many large DHW systems also include a recirculation loop to ensure hot water is available at each load or fixture. If your system has a recirculation loop, then the thermal losses are assumed to increase the heating load (based on consumption) by 25%.

#### **HPWH Information:**

- DHW Usage per Unit (GPD): Hot water usage rate per unit in gallons per day. This value calculated based on the building type. These values are based on the New York State Technical Resource Manual Version 11. See here for more information: [Recommended DHW Use in Multifamily and Other Commercial Applications](#)
- DHW Peak Usage (GPH): Peak hot water usage in gallons per hour. This value is calculated based on building type and number of units input in cell C7.
- DHW Peak Load (Btu/hr): Peak thermal load in British Thermal Units per hour (Btu/h). This value is calculated based on the peak demand (GPH), hot water setpoint temperature of 125 (F), and average incoming water temperature (F).
- Average daily DHW use (GPD): Average domestic hot water usage in gallons per day calculated based by multiplying the units in cell C2 by the DHW usage populated in cell C12.
- Number of Units installed (#): Populated based on the number of units entered on the 'Eqpt Schedule' tab.
- Total Rated Heating Capacity (Btu/hr): Total heating capacity based on the total capacity of all heat pump water heaters being installed. This cell is populated based on the information entered on the 'Eqpt Schedule' tab.
- HPWH Sizing Ratio (Capacity / Peak Load): The ratio of heat pump capacity over peak load. This cell will turn red if the new heat pump water heater(s) are undersized or oversized. The system is undersized if this ratio is less than 0.9 and oversized if the ratio is more than 2.0.
- HP Location / Source Type: Select heat pump water heater location/intake source from the drop-down menu.
  - Select "Unconditioned" if the units are outdoor or include a ducted intake from outside. In an enclosed, unconditioned space, which is assumed to have a temperature that is weighted average of 20% outdoor temperature and 80% space temperature.
  - Select "Conditioned Space" if the units are in a conditioned space or has a ducted intake from a conditioned space.
  - Select "Outdoor Evaporator" for split system heat pump water heaters when the evaporator is located outside.

- Select “Ground Source” for geothermal heat pump water heaters. When “Ground Source” is chosen, the loop temperatures are specified by average, maximum, and minimum temperatures; the max ground loop temperature corresponds to the max ambient temperature bin; min loop to min ambient, and average loop to the heating/cooling changeover.
- HP Space Conditioning Type: Only applicable when “Conditioned Space” is chosen as HP location. Select the space conditioning type from the drop-down menu.
  - Heating Only: The space is provided with heating but not cooling.
  - Cooling Only: The space is provided with cooling but not heating.
  - Heating and Cooling: The space is provided with both heating and cooling.
- Average Setpoint for Conditioned Space (°F): Only applicable when “Conditioned Space” is chosen as HP location. Enter the average setpoint for the conditioned space over both heating and cooling seasons.

	<b>HP Location / Source Type</b>	Ground Source
	<b>HP Space Conditioning Type</b>	
	<b>Average Setpoint for Conditioned Space (°F)</b>	
Grnd Loop	<b>Average Ground Temperature (F)</b>	50
	<b>Maximum Ground Loop Temperature (F)</b>	80
	<b>Minimum Ground Loop Temperature (F)</b>	30

**Ground Loop: Only applicable if “Ground Source” is chosen as HP Location / Source Type.**

- Average Ground Temperature (F): Average ground water temperature throughout the year.
- Maximum Ground Loop Temperature (F): The maximum water temperature the ground loop will reach.
- Minimum Ground Loop Temperature (F): The minimum water temperature the ground loop will reach.

## Tab: Results Summary

SUMMARY									
Technology	Material Cost	Labor Cost	Total Cost	Net MMBtu Savings	Heating Electrification Savings (kWh)	Peak Demand Savings (kW)	Gas Fuel savings (Therms)	Effective U	Life (year)
Large AWHP	\$ 100.00	\$ 1,000.00	\$ 1,100.00	1,110.4	-154,546	-13.17	16,377.2		10

Lifetime Net mmbtu Savings	Category Incentive Rate	Uncapped Incentive	Incentive Capping based on Installation Costs
11,104.1	NYS	\$ 77,728.97	\$ 550.00

- Technology: Populated based on the technology entered on the ‘Eqpt Schedule’ tab.
- Material Cost: Enter the material cost of the heat pump(s)
- Labor Cost: Enter the labor cost of the heat pump(s)
- Total Cost: Populated based on the material and labor costs.
- Net MMBtu Savings: The total annual energy savings for the project measured in MMBtu. This value is calculated with the following equation: (Baseline Energy - Proposed Energy)
- Heating Electrification Savings (kWh): Annual electrical energy usage savings in kilowatt-hours. A negative number means electrical energy consumption will increase.
- Peak Demand Savings (kW): The peak electrical demand savings in kilowatts. A negative number means the peak electrical demand will increase.
- Gas Fuel Savings (Therms): Annual gas energy usage savings in therms.

- Effective Useful Life (years): The estimated lifespan of the equipment in years. This value obtained from the NYS TRM Version 11 – Appendix P.
- Lifetime Net MMBtu Savings: The estimated total lifetime energy savings for the project measured in MMBtu. This is calculated by multiplying the annual energy savings by the EUL.
- Category Incentive Rate: Cell will populate “Standard” or “LTO” (Limited Time Offer) based on current incentive offers.
- Uncapped Incentive: Total incentive automatically calculated and includes all compliant measures based on calculated Net MMBtu Annual Savings, project information and location. Applicable program incentive caps are not applied.
- Incentive Capping based on Installation Costs: Total incentive automatically populates and includes all compliant measures based on calculated Net MMBtu Annual Savings, project information and location. Applicable program incentive caps are applied.
- **The incentive value should not be construed as a Preliminary Incentive Offer Letter (PIOL). A PIOL will be offered after the project is reviewed by the participating utility.**

# Tab: Instructions

## SECTION 1: Account Holder Information

Project Details	
Program Name*	Clean Heat Program

Account Holder Information	
Account Name	
Account Number (14 Digits)	
Title	
Mailing Address	
Unit Number	
City	
Zip	

Site Information	
Contact First Name	
Contact Last Name	
Street Address	
Unit Number	
City	
Zip	
Phone	
Email	

Participating Contractor Information	
Installation Completed By	
Company Name	
Contact Name	
Title	
Mailing Address	
Phone	
Email	

- Complete all fields prior to submittal for review. The Account Holder Information, Site Information, and Participating Contractor Information should match the Clean Heat Program application.

