May 2020 – Version 3

NYS Clean Heat

Statewide Heat Pump Program Manual

Contents

1. Introduction

What is the NYS Clean Heat Statewide Heat Pump Program?

Heat pumps have been an efficient source of heating and cooling for many years but advances in technology now allow them to effectively address heating needs in cold climates, helping customers lower their energy costs and reduce greenhouse gas emissions. To achieve the statewide heat pump goals and build the market infrastructure for a low-carbon future, the NYS Clean Heat Statewide Heat Pump Program ("NYS Clean Heat Program" or "Program") will be implemented in coordination with a portfolio of market development initiatives. Across its component initiatives, the NYS Clean Heat Program aims to build market capacity to deliver building electrification solutions. The NYS Clean Heat Program, a collaborative effort between the New York Electric Utilities,[1] and the New York State Energy Research & Development Authority ("NYSERDA") (collectively, "Joint Efficiency Providers"[2]), is designed to provide customers, contractors, and other heat pump solution providers a consistent experience and business environment throughout New York State ("NYS").[3]

The NYS Clean Heat Program includes of a range of initiatives to advance the adoption of efficient electric heat pump systems that are designed and used for space and water heating in NYS. Core to the Program is the suite of incentives that support customer adoption of eligible heat pump technologies – both cold climate air source and ground source systems as well as their promotion and pricing by contractors and other heat pump solution providers. The market development effort includes support for training and qualification of contractors, processes to assure quality installations, and marketing and education to help customers understand and select among options and to operate systems optimally.

COVID-19 update: For New York State regions and approved activities that have been deemed reopened pursuant to the State's Regional Monitoring Dashboard, and in light of the paramount importance placed on health and safety at this time, the Joint Efficiency Providers hereby direct and require that contractors performing clean energy activity pursuant to a Joint Efficiency Provider contract or program to comply with all Executive Orders addressing the COVID-19 pandemic, and in all events, contractors are expected to continue

[1] The New York Electric Utilities consist of Central Hudson Gas & Electric Corporation ("Central Hudson), Consolidated Edison Company of New York, Inc.("Con Edison"), Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid"), New York State Electric & Gas Corporation ("NYSEG"), Orange and Rockland Utilities, Inc. ("Orange & Rockland"), and Rochester Gas and Electric Corporation ("RG&E") (collectively, "Electric Utilities").

[2] The New York Electric Utilities and NYSERDA are referred to as "Joint Efficiency Providers" for purposes of their partnership in the NYS Clean Heat Program.

[3] Version 1 of the NYS Clean Heat Program Manual was provided on March 16, 2020. This revised version is provided on May 29, 2020, consistent with direction from a March 31, 2020 letter from the New York State Department of Public Service Staff approving the NYS Clean Heat Implementation Plan contingent upon revised filings addressing several issues.

to comply with all relevant State, federal and local rules as well as any specific Joint Efficiency Provider guidance. All contractors are also accountable for staying current with any updates to these requirements. COVID-19 related guidance and references can be found on each respective Joint Efficiency Provider's website.

2. Program Summary

Heat pumps transfer heat from a source (or sink) including outdoor air, the ground, or a mechanically heated or cooled fluid loop rather than producing it (e.g. via an electric resistance coil or by burning fossil fuels). In the heating season, heat is extracted from the heat source and supplied to the conditioned space. During the cooling season, heat is extracted from the conditioned space and rejected to the heat sink. By participating in the NYS Clean Heat Program, Participating Contractors will be able to provide customers with multiple benefits at lower costs. Heat pump technology can provide customers with the following:

- Less volatile annual energy bills, especially advantageous for customers with fixed, low, or moderate incomes and service-oriented institutions like nonprofits, schools, community centers, and houses of worship.
- Greater comfort and health because of added air conditioning and improved indoor air quality delivered by emissions-free technology.
- A long-term solution to heating and cooling needs that is easier to maintain than alternatives.

The NYS Clean Heat Program funding has been designated by the New York State Public Service Commission through the Joint Efficiency Providers. Incentives are offered for both Air-Source Heat Pumps ("ASHPs") and Ground-Source Heat Pumps ("GSHPs") for both space heating and cooling as well as for Heat Pump Water Heaters ("HPWHs") for water heating.

To apply for incentives under this Program, ASHP installers, ASHP designers, GSHP installers, GSHP designers, and GSHP drillers must first become "Participating Contractors" by submitting one Participating Contractor Application for each Electric Utility indicating in which service territories they plan to perform work and a Contractor Participation Agreement for each of those specified territories (available at http://saveenergyny.ny.gov/nyscleanheat). Upon approval, the applicant will receive an approval notification from the Electric Utility and become eligible to apply for incentives in the Program.

Contractors installing only HPWHs do not have to be a Participating Contractor to submit an incentive application on behalf of a customer. GSHP drillers must also be approved through this process to become a "participating driller," but are not eligible to submit for and receive incentives. Each GSHP installation must be completed by a participating driller.

Multifamily and Commercial and Industrial (C&I) customers seeking incentives under Category 4 *Custom* may choose to be the applicant by submitting an incentive application to the Program directly. The direct applicant must work with a Participating Contractor in accordance with the program rules and requirements of the Program.

The Electric Utilities will rely on *The New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial,* known as the Technical Resource Manual ("TRM") and

best practices to estimate savings and verify installations of heat pumps installed through their programs.[4] For multiple-unit configurations not covered by the TRM, or for larger or custom systems, the Electric Utilities will perform custom analyses to determine savings, consistent with the approaches outlined for custom measures in the TRM.

The Joint Efficiency Providers recommend that site owners contact a heat pump professional to assess and implement energy efficiency opportunities related to building envelope and HVAC distribution system before, or in coordination with, installing a heat pump system. Common thermal efficiency upgrades include attic and wall insulation, air sealing, and duct sealing. Making these types of improvements can significantly help meet the goal to provide cost-effective heating with the installation of a cold-climate heat pump. Site owners can access programs and assistance through their local utility.

The Joint Management Committee, responsible for reviewing and maintaining the NYS Clean Heat Stateside Heat Pump Program, will establish and follow a process for making ongoing changes to the program including incentive structure, eligible technologies, program rules and other program features in order to be responsive to technology and market developments and maintain market confidence and stability. Participating Contractors will be notified electronically of any program modification or change.

2.1 Available Incentive Funding

Incentives are available on a first-come, first-served basis. Tables 1-3, below, provide summary information regarding the incentive programs, and additional detail is provided in following sections. Definitions for key terms are included in the NYS Clean Heat Program Glossary of Terms in Section 10. Table 1 provides the overall structure of the incentives, including identifying category description, target segments, eligible technology, incentive structure and eligibility criteria. Table 2 details the Total Incentive amount available per technology and installation type. Each Participating Contractor may retain up to the Participating Contractor Reward amount shown in Table 3. The balance of the Total Incentive less the Participating Contractor Reward must be passed or otherwise credited to the customer in its entirety. Incentives listed in Table 2 and Table 3 will be provided beginning April 1, 2020.

Multifamily and (C&I) customers seeking incentives under Category 4 *Custom* may choose to be the applicant by submitting an incentive application to the Program directly. The direct applicant must work with a Participating Contractor in accordance with the program rules and requirements of the Program. As the applicant, the multifamily and C&I customer choosing this option will receive direct payment of the Total Incentive amount listed in Table 2 from the Program.

[4] The New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs - Residential, Multi-Family, and Commercial/Industrial, known as the Technical Resource Manual (TRM), Version 7 effective January 1, 2020.

Table 1: Incentive Structure and Eligibility Criteria

Category Number	Description	Target Segments	Eligible Technologies	Incentive Structure	Eligibility Criteria
1	*Cold climate ASHP ("ccASHP"[5]): Partial Load Heating*	Residential, Multifamily, Small Commercial	Minisplit Heat Pump ("MSHP")	$/outdoor condenser unit	• Each unit in system must be on the Northeast Energy Efficiency Partnership ccASHP Product and Specification List ("NEEP Product List").[6] • Total heat pump system heating capacity is <300,000 British Thermal Units per hour ("Btu/h") • Total heat pump system heating capacity satisfies <90% of the building's design heating load ("BHL")
2	*ccASHP: Full Load Heating*	Residential, Multifamily, Small Commercial	Central ccASHP, MSHP	$/10,000 Btu/h of maximum heating capacity at 5°F as documented on the NEEP Product List	• Each unit in system must be on the NEEP ccASHP Product List. • Total heat pump system heating capacity is <300,000 Btu/h. For central ASHPs installed with a back-up furnace in the same cabinet, the back-up furnace must have capacity <225,000 Btu/h. • Total heat pump system heating capacity satisfies 90%-120% of the BHL

[5] The terminology "ccASHP" refers to products listed on the Northeast Energy Efficiency Partnership ccASHP Product and Specification List ("NEEP Product List"), available at: https://neep.org/ASHP-Specification

[6] The current specification and listed eligible units are available at: https://neep.org/ASHP-Specification.

Category	Description	Target Segments	Eligible Technologies	Incentive Structure	Eligibility Criteria
3	*GSHP: Full Load Heating*	Residential, Multifamily, Small Commercial	GSHP	$/10,000 Btu/h of full load heating capacity as certified by AHRI[17]	• Each heat pump in the system must be ENERGY STAR certified and meet or exceed ENERGY STAR Tier 3 Geothermal Heat Pump Key Product Criteria.[7] • Total heat pump system heating capacity is <300,000 Btu/h and consists only of individual appliance cooling capacity for closed-loop GSHP installs <135,000 Btu/h and/or individual appliance cooling capacity for direct exchange GSHP installs ≤180,000 Btu/h. • Total heat pump system heating capacity satisfies 90%-120% of the BHL • Ground loops must comply with applicable New York Department of Environmental Conservation ("NY DEC"), New York City ("NYC"), and International Ground-Source Heat Pump Association ("IGSHPA") standards • This category covers only ENERGY STAR certified systems with closed-loop ground heat exchangers. Systems that meet ENERGY STAR criteria but are not ENERGY certified and systems with open loop ground heat exchangers may qualify for Category 4, below.
4	*Custom*	Residential, Multifamily, Small	Central ccASHP, MSHP,	$/MMBTU of annual energy savings	• All VRF systems

[7] ENERGY STAR "Geothermal Heat Pumps Key Product Criteria." Current link showing Tier 3 requirements: https://www.energystar.gov/products/heating_cooling/heat_pumps_geothermal/key_product_criteria. Tier 3 specifications can also be found in "Product Specification for Geothermal Heat Pumps: Eligibility Criteria," p. 3. Current link: https://www.energystar.gov/sites/default/files/specs//private/Geothermal_Heat_Pumps_Program_Requirements%20v3.1.pdf

Category	Description	Target Segments	Eligible Technologies	Incentive Structure	Eligibility Criteria
		Commercial, Large C&I	Commercial Unitary Systems/Large Commercial ASHPs, Variable Refrigerant Flow Heat Pump ("VRF") and GSHP		• ASHP, MSHP and GSHP systems with three-phase heat pump equipment or with total system heating capacity ≥300,000 Btu/h • If all individual appliances in a MSHP system in this category are on the NEEP Product List, the system is eligible. • If all individual units in a GSHP system in this category are ENERGY STAR Tier 3 certified, the system is eligible. • Individual appliance cooling capacity for closed-loop GSHP installs ≥ 135,000 Btu/h. • Individual appliance cooling capacity for direct exchange GSHP installs >180,000 Btu/h. • Central ccASHP and VRF systems with heating capacities ≥ 65,000 Btu/h and < 240,000 Btu/h must meet or exceed ENERGY STAR Light Commercial HVAC Key Product Criteria.[8] • Installed systems must satisfy the dominant HVAC load for the building, per applicable code. If the building has a higher BHL than BCL, the system must be sized to satisfy BHL. If the building has a higher BCL, the system must be sized to satisfy BCL. For new construction or the comprehensive upgrade of a heating plant, the heat pump system heating capacity must satisfy at least 90% of the BHL; for phased upgrade of a heating

[8] Light Commercial HVAC Key Product Criteria. Current link: https://www.energystar.gov/products/heating_cooling/light_commercial_heating_cooling/light_commercial_hvac_key_product_criteria

Category	Description	Target Segments	Eligible Technologies	Incentive Structure	Eligibility Criteria
					plant, eligibility will be determined on a case-by-case basis via project-level analysis. • Eligibility for all other systems 1) within this category and 2) other technologies (*e.g.*, commercial water-source heat pump system) will be determined on a case-by-case basis via project-level analysis. • Requires confirmation of projected MMBTU savings to determine incentive amount.
5	*HPWH (up to 120 gallons of tank capacity)*	Residential, Multifamily, Small Commercial	HPWH	$/Unit	• ENERGY STAR Certified HPWH
6	*Commercial HPWH (above 120 gallons of tank capacity)*	Multifamily, Large C&I	HPWH	$/MMBTU of annual energy savings	• ENERGY STAR Certified HPWH
7	*GSHP Desuperheater*	Residential, Multifamily, Small Commercial	Optional component to GSHP systems	$/Unit	• Installed as integral component in an eligible Tier 3 ENERGY STAR certified GSHP
8	*Dedicated domestic hot water ("DHW") Water-to-Water Heat Pump ("WWHP")*	Residential, Multifamily, Small Commercial	Dedicated DHW WWHP	$/Unit	• Can be integrated into an eligible ENERGY STAR certified GSHP or installed as a separate, Tier 3 ENERGY STAR certified WWHP. • Must meet 100% of water heating load
9	*Simultaneous Installation of Space Heating & Water Heating*	All	HPWH plus others	Additional bonus incentive	• Category 2 *ccASHP*: *Full Load Heating* project that opts to add on a HPWH meeting the criteria in Category 5

Table 2: Total Incentives

Category	Description	Incentive	Central Hudson	Con Edison	National Grid	NYSEG/ RGE	Orange & Rockland
1	*ccASHP: Partial Load Heating*[9]	$/outdoor condenser unit	$800	$500[10]	$500	$500	$500[11]
2	*ccASHP: Full Load Heating*[12]	$/10,000 Btu/h of maximum heating capacity at NEEP 5°F	$1,600	$2,000[13]	$1,000	$1,000	$1,600[14]
3	*GSHP: Full Load Heating*	$/10,000 Btu/h of full load heating capacity as certified by AHRI	$2,000	$2,850	$1,500	$1,500	$2,000
4	*Custom*	$/MMBTU of annual energy savings	$80	$150	$80	$80	$80
5	*HPWH (up to120 gal)*	$/unit	$1,000	$1,000	$700	$700	$1,000
6	*Commercial HPWH (above 120 gal)*	$/MMBTU of annual energy savings	$80	$80	$80	$80	$80
7	*GSHP Desuperheater*	$/unit	$150	$150	$100	$100	$150
8	*Dedicated DHW WWHP*	$/unit	$1,000	$1,000	$900	$900	$1,000

[9] See section 3.2.1.2 for definition, pg.11.

[10] For Con Edison and Orange & Rockland, there will be additional distributor level incentives of $175/unit for ASHP units installed in residential applications.

[11] Refer to footnote 9.

[12] See section 3.2.1.2 for definition, pg. 11.

[13] Refer to footnote 9.

[14] Refer to footnote 9.

9	*Simultaneous Installation of Space Heating & Water Heating*	Additional bonus per combination installation	$250	$250	$250	$250	$250

Table 3: Participating Contractor Reward

Incentives listed in this table are included in the total incentives listed in Table 1.

Category	Description	Incentive	Central Hudson	Con Edison	National Grid	NYSEG/ RGE	Orange & Rockland
1	*ccASHP: Partial Load Heating*	**$/outdoor condenser unit**	$100/ outdoor unit	$250/ outdoor unit	$100/ outdoor unit	$100/ outdoor unit	$250/ outdoor unit
2	*ccASHP: Full Load Heating*	**$/10,000 Btu/h of maximum heating capacity at NEEP 5°F**	$500/ project	$1,000/ project	$500/ project	$500/ project	$500/ project
3	*GSHP: Full Load Heating*	**$/10,000 Btu/h of full load heating capacity as certified by AHRI**	$500/ project	$500/ project	$500/ project	$500/ project	$500/project
4	*Custom*	**$/MMBTU of annual energy savings**	$500/ project	$1,000/ project[15]	$500/ project	$500/ project	$500/ project
5	*HPWH (up to 120 gal)*	**$/unit**	N/A	N/A	N/A	N/A	N/A
6	*Commercial HPWH (above 120 gal)*	**$/MMBTU of annual energy savings**	N/A	N/A	N/A	N/A	N/A
7	*GSHP Desuperheater*	**$/unit**	N/A	N/A	N/A	N/A	N/A
8	*DHW WWHP*	**$/unit**	N/A	N/A	N/A	N/A	N/A
9	*Simultaneous Installation of Space Heating & Water Heating*	**Additional bonus per combination installation**	$250/ project	$250/ project	$250/ project	$250/ project	$250/ project

[15] Con Edison may seek to process Custom Incentives through its existing customer segmented energy efficiency programs where applicable. Per Con Edison's existing energy efficiency program rules, the Participating Contractor Reward may be determined or adjusted by the customer.

2.2 Modifications to Incentives

The Electric Utilities reserve the right to change the incentive offering (including but not limited to total incentive amount, Participating Contractor Reward, timing, recipient, structure, and cap) at any time. The Electric Utilities reserve the right to further limit the number of incentives per Participating Contractor, site owner, site, or meter.

If changing the incentive structure becomes necessary, the Electric Utilities will give a minimum of 30 days of notice to Participating Contractors via email. Program changes, including changes to this Program Manual, will also be e-mailed to Participating Contractors and posted at http://saveenergyny.ny.gov/nyscleanheat. The incentive amount for any project will be based on the incentive offering and program rules that are in effect at the time the project application is submitted. Participating Contractors are prohibited from cancelling submitted incentive applications and re-applying if the new incentive payment results in a higher amount. The Electric Utilities reserve the right to structure incentive payments differently to accommodate unique situations.

2.3 Green Jobs – Green New York Financing

The Green Jobs - Green New York ("GJGNY") Loan Fund for Residential Financing (the "GJGNY Loan Fund") was authorized by Title 9-A of Article 8 of the Public Authorities Law of the State of New York, as amended to finance energy audits and energy efficiency retrofits or improvements, including solar energy and other renewable installations, for the owners of residential 1-4 family buildings ("GJGNY Loan"). This GJGNY Loan Fund is administered by NYSERDA.

The ability to provide access to GJGNY Loans and other participant financing options ("Program Financing") and incentives through the GJGNY Program is reserved exclusively for Participating Contractors, including the NYS Clean Heat Program Participating Contractors. At no time may a non-participating subcontractor of a Participating Contractor represent itself as having the ability to access GJGNY Program Financing or incentives.

The Participating Contractor shall ensure that the GJGNY Program Financing options and incentives are utilized only for the installation of those eligible measures and accessories identified in the work scope submitted to, and satisfactorily approved by, the GJGNY Program.

The roles and responsibilities of a Participating Contractor offering a GJGNY Loan can be found in the Green Jobs Green New York Residential Implementation Manual, hereby incorporated in this Program Manual by reference and located on NYSERDA's Become a Loan-offering Contractor Homepage.

If a Participating Contractor wishes to offer financing other than GJGNY financing, they will need to comply with all applicable NYS and federal laws and regulations including NYS Banking Law.

3. Eligibility and Requirements

Projects and Participating Contractors must meet the requirements in this Program Manual for incentive eligibility.

3.1 Site Eligibility

Eligible sites include new and existing buildings owned or controlled by an active Electric Utility customer, where an eligible heat pump system for space heating, hot water heating, and/or process heating is being installed. Sites must be occupied year-round (or, in the case of planned installations at new construction sites, site owners must plan to have the site occupied year-round).

3.2 Eligible Technologies

This section describes the heat pump technologies that are eligible for the NYS Clean Heat Program. Eligible equipment is grouped into three major categories:

(1) ASHPs for space heating applications, including MSHPs;
(2) GSHPs for space and water heating applications; and
(3) HPWHs for domestic and service water heating applications.

Program incentive structures are described in terms of their applicability to various building types, which are:

- Residential (one to four units);
- Multifamily (five or more units);
- Small commercial businesses (small commercial); and
- Large commercial and industrial buildings ("C&I").

The Clean Heat Program provides incentives under nine categories reflecting applicable technology type, system size, customer type, and incentive structure. The incentive categories are as follows:

- Category 1 *ccASHP: Partial Load Heating*
- Category 2 *ccASHP: Full Load Heating*
- Category 3 *GSHP: Full Load Heating*
- Category 4 *Custom*
- Category 5 *HPWH (up to 120 gallons of tank capacity)*
- Category 6 *Commercial HPWH (above 120 gallons of tank capacity)*
- Category 7 *GSHP Desuperheater*
- Category 8 *Dedicated Domestic Hot Water ("DHW") Water-to-Water Heat Pump ("WWHP")*
- Category 9 *Simultaneous Installation of Space Heating & Water Heating*

To be eligible for incentives, heat pump projects must comply with the requirements described in this document. For projects installed at new construction sites, all components installed as part of an approved ASHP, GSHP and HPWH system must be new. For projects installed at existing sites, the heat pumps must be new and any system subcomponent or subassembly that is replaced should be replaced by a new subcomponent or subassembly. The use of used or refurbished equipment is not permitted under the program.

Heat pump projects are eligible for incentives no matter which heating fuel (e.g., fuel oil, natural gas, propane, biomass, or electricity) they are either transitioning from in the case of retrofits or declining to include in the case of new construction. For retrofit applications, the pre-existing heating source must be documented. For new construction, the baseline heating fuel will be determined on a case-by-case basis, based on contemporary construction practice in the area.

3.2.1 Code-Required System Sizing

The use of ASHPs in cold climates is growing rapidly, but system sizing and selection practices have not always kept up with the wide range of applications that are now available. System performance, comfort, and energy efficiency can be significantly impacted by poor sizing and system selection. The ASHP and connected ductwork must be properly sized for the application to meet the building heat load requirements, ensure occupant comfort and satisfaction, and optimize system performance and energy savings. The Joint Efficiency Providers therefore require Participating Contractors to review and to use the *NEEP Guide to Sizing and Selecting Air-Source Heat Pumps in Cold Climates*[16] to assist in sizing and selecting ccASHP equipment.

Participating Contractors are also encouraged to use additional design manuals as applicable to the system, including ACCA Manual D: Duct Design[17] ACCA Manual T: Air Distribution[18] and ACCA Manual B: Test, Adjust and Balance.[19.]

To be eligible for incentives, all heat pump systems must be sized in compliance with applicable state and municipal code.[20] Residential heating and cooling equipment and appliances shall be sized in accordance with ACCA[21] Manual S or other approved sizing methodologies based on building loads

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[16] *http://neep.org/sites/default/files/Installing%20Air-Source%20Heat%20Pumps%20in%20Cold%20Climates.pdf*

[17] ACCA Manual D: Duct Design: Method used to determine the overall duct lay-out including the individual duct sizes.

[18] ACCA Manual T: Air Distribution: Method used to determine how to distribute airflow.

[19] ACCA Manual B: Test, Adjust and Balance: Method designed to test and balance HVAC equipment in an order that speeds up and improves the balancing process.

[20] Energy Conservation Construction Code of New York State ("ECCCNYS") 2016, Section R403.7 and 2016 New York City Energy Conservation Code ("NYCECC"), Section R403.7. ECCCNYS 2016 and 2016 NYCECC require that systems serving multiple dwelling units, where commercial code is applicable, follow Sections C403 and C404 of the respective codes. In general, heat pumps installed in dwellings where residential code is applicable are required to be sized per ACCA Manual S. The intent is to match the equipment capacity closely to the load calculations of ACCA Manual J. In addition to program requirements regarding sizing heat pumps relative to the heating load, Manual S sets a maximum low-speed heat pump cooling capacity of 115% of the total Manual J cooling load for multi-speed or variable-speed heat pumps. As an alternate, if the sensible heat ratio (SHR) is >=95%, the maximum low-speed cooling capacity may be 15,000 Btu/h greater than the total Manual J cooling load for multi-speed or variable-speed heat pumps. For a single-speed water-to-water heat pump utilizing a buffer tank, the limit of 115% applies only to indoor coils that provide cooling from the buffer tank.

calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies.[22] Applicable exceptions shall apply.

Equipment installed in commercial buildings must be sized in accordance with heating and cooling load calculations following ANSI[23]/ASHRAE[24]/ACCA Standard 183-2007 (RA2017) or other code-approved equivalent computational procedure.[25] The output capacity of heating and cooling equipment shall be not greater than that of the smallest available equipment size that exceeds the calculated loads. A single piece of equipment providing both heating and cooling (such as a heat pump or heat pump system) shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.[26]

Calculation of the BHL shall be at the 99% dry bulb heating design temperature for the most relevant ACCA location. Calculation of the BCL shall be at the 1% dry bulb cooling design temperature for the same ACCA location.

Under the NYS Clean Heat Program, a full load heating ASHP or GSHP system is defined as a system installed as a building's primary heating source, with a total system heating capacity that satisfies 90% - 120% of the BHL, in accordance with applicable code. A partial load heating system is installed in addition to an existing heating system and has a total system heating capacity that satisfies <90% of BHL.

3.2.2 Air-Source Heat Pump Systems

Air-source heat pumps transfer heat between the inside of a building and outside air. A heat pump's refrigeration system consists of a compressor and two coils made of copper tubing (one inside and one outside), which are surrounded by aluminum fins to aid heat transfer. In the heating mode, liquid refrigerant in the outside coils extracts heat from the air and evaporates into a gas. The inside coils release heat from the refrigerant as it condenses back into a liquid. A reversing valve, near the compressor, can change the direction of the refrigerant flow for cooling as well as for defrosting the outside coils in winter.

Under the NYS Clean Heat Program, to be eligible for a program incentive, ASHP systems must either be

[21] Air Conditioning Contractors of America

[22] 2020 Residential Code of NYS, Chapter 14, Section M1401.3 Equipment and appliance sizing.

[23] American National Standards Institute

[24] American Society of Heating, Refrigerating, and Air-Conditioning Engineers

[25] ECCCNYS 2016, Section C403.1.1 Calculation of heating and cooling loads.

[26] ECCCNYS 2016, Section C403.3.1. The intent of this section is to provide some flexibility in design for systems such as heat pumps that provide both heating and cooling. For a commercial building that has a higher building heating load ("BHL") than building cooling load ("BCL"), the heat pump system capacity shall be as small as possible so as to adequately satisfy the BHL, while minimizing oversizing for the cooling function to the extent possible with available equipment. For commercial buildings for which BCL is higher than BHL the heat pump system capacity shall be as small as possible so as to adequately satisfy the BCL, while minimizing oversizing for the heating function.

listed on the NEEP Product List[27] or meet the criteria established in this Program Manual and the NYS Clean Heat Implementation Plan for product classes that are not covered by the NEEP Product List.

There are several categories of ASHPs eligible for the Statewide Heat Pump Program, including:

(1) Residential and Small Commercial Central ccASHPs identified on the NEEP Product List;

(2) Ductless or Partially Ducted MSHPs identified on the NEEP Product List, which include "single-head" (one indoor air handler per outdoor compressor) and "multi-head" or "multi-split" (more than one indoor air handler per outdoor compressor);

(3) Commercial Unitary (i.e., Large Commercial) ASHPs (Split or Single Package);

(4) VRFs

The customer may either decide to keep their existing heating system in service to provide back-up or emergency heat, or to decommission it. The Joint Efficiency Providers acknowledge that the decommissioning of existing systems is the preferred outcome, as long as they are decommissioned legally and safely. The Joint Efficiency Providers will work to educate customers on the benefits of safe decommissioning and to train and refer Participating Contractors to applicable jurisdictional programs, codes and requirements (e.g., federal, state, municipal, etc.) that govern decommissioning and facilitate best practices.[28]

3.2.2.1 Cold Climate Central ASHPs (Residential and Small Commercial)

Central Air Source Heat Pumps listed by NEEP as ccASHPs have capacities less than 65,000 Btu/h and are not contained within the same cabinet as a furnace with rated capacity greater than 225,000 Btu/h.[29] These are defined as "Residential" units under the ENERGY STAR® Key Product Criteria.[30] These units are typically sized to provide heating and cooling to the whole building through a central duct distribution system. They are a retrofit solution for existing homes and small businesses that are replacing central air conditioners, which were installed in conjunction with a separate heating system (typically a fossil fuel or electric furnace) that shares the same duct distribution system.

Eligibility, Sizing and Installation Requirements

Equipment Eligibility: Category 2 *ccASHP: Full Load Heating*

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[27] The current specification and listed eligible units are available at https://neep.org/ASHP-Specification.

[28] *See,* for example, *Amended Notice of Adoption – Rule amending and updating the Uniform Code* applies to "Abandonment or removal of heating oil storage tanks." March 25, 2020. NYS Register (April 8, 2020), pp. 14-22. I.D. No. DOS-14-20-00002-E. https://www.dos.ny.gov/info/register/2020/040820.pdf

[29] Code of Federal Regulations ("CFR") 10 CFR part 430, Subpart A, § 430.2 Definitions: definition of central air conditioner or central air conditioning heat pump: https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=29d99fa0a367f0166b9cc8528ad29023&mc=true&n=pt10.3.430&r=PART&ty=HTML#se10.3.430_12.

[30] ENERGY STAR "Air-Source Heat Pumps and Central Air Conditioners Key Product Criteria." Current link: https://www.energystar.gov/products/heating_cooling/heat_pumps_air_source/key_product_criteria.

Central ccASHPs are eligible for Program incentives under Category 2 *ccASHP: Full Load Heating*. To be eligible for an incentive under this category, the ccASHP units must be listed on the NEEP Product List.

Equipment Sizing: In order to be eligible for an incentive, a ccASHP system must be a Full Load Heating System installed as the building's primary heating source and having a total system heating capacity that satisfies 90%-120% of design BHL as calculated according to the system sizing methodology described in Section 3.2.1. The Participating Contractor is required to submit documentation of the load calculations with the application for incentives.

Most central ccASHP installations are comprised of single heat pump appliances connected to one central duct system. However, in order to accommodate larger or more complex building loads that may require installation of more than one central ccASHP, this category covers ccASHP systems with heating capacities up to 300,000 Btu/h as long as all individual ccASHP appliances in the installed system are listed by NEEP as ccASHPs, are powered by single-phase electricity, have capacities <65,000 Btu/h, and are not installed in the same cabinet as a furnace with heating capacity ≥225,000 Btu/h.

Equipment Installation: Systems and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements.

The Participating Contractor shall verify and document the system's operation with the equipment manufacturer's specifications via one or both of the following methods:

1. direct measurement of the system airflow across a dry indoor heat exchanger coil in CFM/ton; OR
2. measurement of the total external static pressure drop (air handler unit entering pressure minus the air handler unit exiting pressure) in Pascals or inches of water column.

Based on manufacturers installation manuals, outdoor units shall be installed above the local snow line. A map of the New York State average snow depth is available online at NYSERDA's website [31]

3.2.2.2 Cold Climate Mini-Split Heat Pumps (Residential and Small Commercial)

Cold climate MSHPs are ccASHPs that can circulate refrigerant between an outdoor unit containing a variable capacity compressor and one or more indoor air handlers ("indoor units"). Cold climate MSHPs are often referred to as "ductless mini-splits" because they are typically ductless, but can also be installed with short duct runs that enable single air handlers to serve more than one room at a time. For existing homes and businesses that have no central ductwork, cold climate MSHPs are a viable and energy efficient solution. Under the NYS Clean Heat Program, eligible cold climate MSHP installations fall into the following two categories:

- Partial load heating system: Cold climate MSHP systems installed in addition to existing heating

[31] Current link to NYSERDA's snow depth map: https://www.nyserda.ny.gov/-/media/files/programs/ashp/snow-depth-map.pdf

systems to provide both efficient cooling and < 90% of heating load. In this application, an existing heating system is kept in operation to provide supplemental heating and/or to provide heating to zones in which the cold climate MSHPs are not installed.

- Full load heating systems: Cold climate MSHPs systems installed with multiple indoor units to be primary heating system and designed to have a system heating capacity equivalent to 90%-120% of the BHL.

Eligibility, Sizing and Installation Requirements

Equipment Eligibility: Category 1 *ccASHP: Partial Load Heating* and Category 2 *ccASHP: Full Load Heating*

Cold climate MSHPs are eligible for Program incentives under Category 1 *ccASHP: Partial Load Heating* and Category 2 *ccASHP: Full Load Heating*. In order to be eligible for an incentive in these categories, cold climate MSHP systems must consist only of individual heat pump appliances that are listed on the NEEP ccASHP Product List.

Equipment Sizing: In order to be eligible for a Partial or Full Load Heating incentive, the MSHP system's total heating capacity must be <300,000 Btu/h. In order to determine which incentive category the system is eligible for (Partial or Full Load Heating), the Participating Contractor shall size and select equipment for the system using the methodology provided in Section 3.2.1. In order to be eligible for the Category 2 *ccASHP: Full Load Heating*, the system must be documented to satisfy 90-120% of the design BHL. If the system satisfies < 90% of design heating load, it will be eligible for the Category 1 *ccASHP: Partial Load Heating*.

The Participating Contractor is required to submit documentation of the load calculations with the application for incentives.

Equipment Installation: Systems and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code , the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements.

Based upon best practices and manufacturers installation manuals, outdoor units should be installed above the local snow line. A map of New York State highest annual snow depths can be found on NYSERDA's website.[32]

3.2.2.3 Commercial Unitary Systems/Large Commercial ASHPs

Large commercial ASHPs are eligible for Program incentives under Category 4 *Custom*. These are systems that have either of the following characteristics:

- Include individual heat pump appliances that are powered by three-phase electricity or have rated capacities ≥65,000 Btu/h; or
- Total system heating capacities ≥ 300,000 Btu/h.

[32] Current link to NYSERDA's snow depth map: https://www.nyserda.ny.gov/-/media/files/programs/ashp/snow-depth-map.pdf

Large commercial ASHPs are a retrofit solution for businesses and multifamily buildings that currently have rooftop or central air conditioners, which were often installed in conjunction with a separate heating system.

Eligibility, Sizing and Installation Requirements

Equipment Eligibility: Category 4 *Custom*

The eligibility criteria for commercial ASHPs is equivalent to the ENERGY STAR specification for Light Commercial HVAC, which covers heat pumps ranging from 65,000 Btu/h up to 240,000 Btu/h.[33] For systems with individual heat pump appliances sizes of 240,000 Btu/h and above, eligibility will be determined through project-specific analysis developed by each Electric Utility for their service territory.

Equipment Sizing: The Participating Contractor applying for incentives shall document that non-residential systems are sized according to requirements of Section 3.2.1. If the building has a higher BHL than BCL, the total system heating capacity must satisfy 90%-120% of the BHL, which is consistent with the requirement to satisfy BHL under relevant municipal or state code. If the building has a higher BCL than BHL, the system must be sized to satisfy 100%-115% of BCL, as required by relevant municipal or state code.

Equipment Installation: Systems and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements.

Based upon best practices and manufacturers installation manuals, outdoor units should be installed above the local snow line. A map of the New York State average snow depth can be found on NYSERDA's website.[34]

3.2.2.4 Variable Refrigerant Flow Heat Pump Systems

Variable Refrigerant Flow systems are an engineered direct exchange (DX) multi-split system that circulate refrigerant between a variable capacity compressor and multiple indoor air handlers, each capable of individual zone temperature control. They provide some major advantages, including the ability for heat recovery that allows them to heat and cool different zones simultaneously; optimized performance across a range of zonal comfort levels and part load conditions; and the avoidance of ductwork or the need for secondary circulation fluids such as chilled or heated water. Because they

[33] ENERGY STAR Light Commercial HVAC, specification: https://www.energystar.gov/products/heating_cooling/light_commercial_heating_cooling/light_commercial_hvac_key_product_criteria.

[34] Current link to NYSERDA's snow depth map: https://www.nyserda.ny.gov/-/media/files/programs/ashp/snow-depth-map.pdf

circulate refrigerant and allow for a separate outside air ventilation system, they require less ceiling space than conventional systems.

Eligibility, Sizing and Installation Requirements

Equipment Eligibility: Category 4 *Custom*

All VRF systems fall under the Category 4 *Custom*. In order to be eligible for the program, VRF systems up to 240,000 Btu/h heating capacity must meet or exceed current ENERGY STAR Light Commercial HVAC Key Product Criteria.[35] For systems with capacities greater than those covered by ENERGY STAR, program eligibility will be determined through a site-specific measure analysis.

Equipment Sizing: The Participating Contractor applying for incentives shall document that non-residential systems are sized according to the requirements of Section 3.2.1. If the building has a higher BHL than BCL, the total system heating capacity must satisfy 90%-120% of the BHL, which is consistent with the requirement to satisfy BHL under relevant municipal or state code. If the building has a higher BCL than BHL, the system must be sized to satisfy 100%-115% of BCL, as required by relevant municipal or state code.

Equipment Installation: Systems and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code , the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements.

In addition, the VRF systems must be in compliance with ASHRAE Standard 15-2019 Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants, which addresses refrigerant capacities and possible leakage, especially if the system serves small rooms, which could cause oxygen depletion. In addition, the VRF systems must comply with ASHRAE Standard 34-2019 Addendum L, which establishes the maximum refrigerant concentration limit ("RCL") of 26 lbs./1,000 ft^3 of room volume for occupied spaces.

3.2.3 Ground Source Heat Pumps (GSHPs)

GSHPs, also known as geothermal heat pumps, achieve high efficiency by exchanging thermal energy with the ground or with groundwater instead of outside air. GSHP systems work well in cold climates because of their ability to maintain capacity at low ambient air temperature. GSHPs are installed in all building sectors and are expected to provide heat to the whole home or/whole building.

GSHP systems also take advantage of the heat generated by the indoor compressor, particularly in cooling mode, by providing a desuperheater loop that pre-heats domestic hot water. GSHPs distribute heating and cooling in the building through a ducted air system or a water loop. System performance

[35] Like central ASHP, VRF systems are also covered under the ENERGY STAR Light Commercial HVAC, specification: https://www.energystar.gov/products/heating_cooling/light_commercial_heating_cooling/light_commercial_hvac_key_product_criteria

depends on an effective ground heat exchanger design and proper installation. The ground heat exchanger design can be highly site-specific, given the variability of site conditions that affect ground conductivity or loop designs.

Eligibility, Sizing and Installation Requirements

Equipment Eligibility: Category 3 *GSHP: Full Load Heating*, and Category 4 *Custom*.

Full Load GSHP Incentive: To be eligible for the Full Load GSHP Incentive, the GSHP system:

- Must be ENERGY STAR certified and meet or exceed ENERGY STAR Tier 3 Geothermal Heat Pump Key Product Criteria, which covers equipment powered by single-phase electricity.[36]
- Must have a system heating capacity equivalent to 90%-120% of BHL
- Must have a closed loop ground heat exchanger circulating a water/antifreeze solution or a direct expansion (DX) heat exchanger.
- Must have a total system heating capacity <300,000 Btu/h.; and consists only of individual appliance cooling capacity for closed-loop GSHP installs <135,000 Btu/h and/or individual appliance cooling capacity for direct exchange GSHP installs ≤180,000 Btu/h.
-

ENERGY STAR eligibility is based on the following test procedures to determine GSHP appliance Energy Efficiency Ratio ("EER") and Coefficient of Performance ("COP"):

- Closed Loop Systems:
  - ISO 13256-1-1998 "Water-source heat pumps – Testing and rating for performance – Part 1: Water-to-air and brine-to-air heat pumps" for water to air models; OR
  - ISO 13256-2-1998 "Water-source heat pumps – Testing and rating for performance – Part 2: Water-to-water and brine-to-water heat pumps" for water-to-water models.
- Direct Exchange Systems: AHRI 870 (I-P/2016) and AHRI Standard 871 (SI) – 2016 "Performance Rating of Direct GeoExchange Heat Pumps."

Eligibility for any GSHP less than 135,000 Btu/h of cooling capacity may be obtained from an AHRI rating certificate. For units larger than 135,000 Btu/h cooling capacity, which are not rated by AHRI, manufacturer specification sheets may be used instead, provided the units have been tested in accordance with the applicable test procedure.

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[36] ENERGY STAR "Geothermal Heat Pumps Key Product Criteria." Current link showing Tier 3 requirements: https://www.energystar.gov/products/heating_cooling/heat_pumps_geothermal/key_product_criteria. Tier 3 specifications can also be found in "Product Specification for Geothermal Heat Pumps: Eligibility Criteria," p. 3. Current link: https://www.energystar.gov/sites/default/files/specs//private/Geothermal_Heat_Pumps_Program_Requirements%20v3.1.pdf

For multi-stage systems for which AHRI certificates are not available, the EER and COP must be calculated using the following equations:

- EER = (full load EER + part load EER)/2
- COP = (full load COP + part load COP)/2

Calculation of the EER and COP values must be determined using the following AHRI-rated data:

- Ground loop heat pump (GLHP) for closed-loop system
- Direct GeoExchange for DX systems

Custom Incentive: Systems with individual heat pump appliances powered by three-phase electricity; have a total system heating capacity ≥300,000 Btu/h; have an individual appliance cooling capacity for closed-loop GSHP installs <135,000 Btu/h; have an individual appliance cooling capacity for direct exchange GSHP installs ≤180,000 Btu/h.

are installed with open loop ground heat exchangers; and/or have individual heat pump appliances whose performance meets ENERGY STAR Tier 3 criteria but do not have an ENERGY STAR certification, may be considered for a Category 4 *Custom*, based on a project-specific analysis performed by the sponsoring Electric Utility.

Equipment Sizing: In order to be eligible for an incentive, a GSHP must be a Full Load Heating System installed as the building's primary heating source and have a heating capacity equivalent to 90%-120% of design BHL, as calculated according to the system sizing methodology described in Section 3.2.1. The Participating Contractor is required to submit documentation of the heating and cooling load calculations with the application for incentives.

Equipment Installation: Systems and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements. GSHPs may have additional requirements specific to the type of ground heat exchanger the GSHP system is coupled to.

General Well/Borehole/Loop Field Requirements

- All projects must comply with New York State Department of Environmental Conservation; DEC regulations for geothermal well drilling, which may be found at www.dec.ny.gov/energy/43303.html.
- Projects in New York City must comply with NYC Department of Environmental Project ("DEP") rules concerning drilling and excavation, including insurance requirements, which may be found at: https://rules.cityofnewyork.us/content/regulation-drilling-0 .
- For non-DX systems, only polyethylene piping is appropriate for underground loop field piping.
- For large scale systems, Participating Contractors must show rated walls and ceilings and

specify firestopping of pipe penetrations.

- Any vertically bored, closed-loop GSHP system must have a borehole depth that is sufficient to provide a minimum entering water temperature to the heat pump of 30°F in heating mode and a maximum entering water temperature to the heat pump of 90°F in cooling mode.
- All well/bore fields must provide adequate well/bore spacing and thermal dispersion to accommodate the thermal load and thermal balance.
- For large GSHP systems, provide emergency eye washes on site, during installation, as required by OSHA.
- Piping must be stored on site in a manner that prevents damage and the introduction of foreign matter. Piping shall be kept free from damage, debris, and foreign matter during installation.
- Grout and admixtures must be received and stored in a way that protects them from moisture and contamination.
- Manifolds installed underground or in a buried enclosure must have proper valves, pressure, and temperature ports.
- All equipment and system parts should be labeled per IGSHPA and ASHRAE guidelines.
- Performance tests must be verifiable. Temperatures, pressures, flow rates, control valve operation, controls, balancing reports, sequence or operations, power measurements, software, start-up and commissioning efforts and reports are all subject to review and observation.
- Projects must meet all setback requirements enforced by the local authority having jurisdiction.
- It is also recommended that GSHP systems meet the ANSI/CSA C448 Series-16 standard.

Closed-Loop Systems: Unless specifically superseded by the requirements detailed in this manual, the design and installation of closed loop GSHP systems (including ground-loop and interior systems) must comply with the standards and practices outlined in the most recent edition of the Closed-Loop/Geothermal Heat Pump Systems: Design and Installation Standards edited by the IGSHPA Standards Committee and published by the International Ground Source Heat Pump Association. These standards are available online at https://igshpa.org/manuals on the IGSHPA website.

Table 3 presents program requirements for the maximum allowable rated pumping power at design conditions (based on duty point), as well as good-practice guidance based on an ASHRAE GSHP Design Guide[37] for large systems and field measurements for small systems.

Table 3: Maximum Allowable and Good Practice Pumping Power for Closed-Loop GSHP Systems in watts (W) per AHRI rated[38] full-load heating or cooling capacity of the installed system

GSHP System Size	Maximum Allowable Pumping Power in watts (W) per 10,000 Btu/h of full-load heating capacity OR in watts (W) per	Good Practice Pumping Power in watts (W) per 10,000 Btu/h of full-load heating capacity OR in watts (W) per ton of full-

[37] Kavanaugh and Rafferty (2014). Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

[38] Reference the AHRI Ground-loop Heat Pump Application (GLHP) rating for Full-Load Heating Capacity and for Full-load Cooling Capacity.

	ton of full-load cooling capacity	load cooling capacity
Individual GSHP units in residential and small commercial applications where each GSHP unit has its own dedicated loop pump	100	Less than 75
Large GSHP systems with multiple heat pump units served by centralized ground loop pumping	85	Less than 60

Closed Loop Antifreeze Protection Requirements: Propylene glycol (CAS No. 57-55-6), methanol (CAS No. 67-56-1) and ethanol (CAS No. 64-17-5) are the three presumptively acceptable antifreeze additives for use in the loop field. Use of any other antifreezes requires prior approval from the Joint Efficiency Providers. The acceptable denaturants for ethanol additives are denatonium benzoate (CAS No. 3734-33-6), ethyl acetate (CAS No. 141-78-6), isopropanol (CAS No. 67- 63-0), pine oil (CAS No. 8002-09-3), and tertiary butyl alcohol (CAS No. 75-65-0).

Large systems with ethanol and methanol must comply with Section 1207 of the 2020 Mechanical Code of New York State and, therefore, "the flash point of transfer fluid in a hydronic piping system shall be not less than 50°F above the maximum system operating temperature."

The maximum allowable concentration of methanol is 12.5% by weight. The maximum allowable loop field temperature in small systems using methanol as an antifreeze is 75°F. In addition, the designer and installer should ensure the loop field operating temperature is at least 50°F lower than the flash point of methanol at all times.

The maximum allowable concentration of ethanol is 10% by weight. The maximum allowable loop field temperature in a small system using ethanol as an antifreeze is 70°F. In addition, the designer and installer should ensure that the loop field operating temperature is at least 50°F lower than the flash point of ethanol at all times.

For loop fields with glycol or organic antifreeze, the Participating Contractor must sterilize with a chlorine shocking protocol that is similar to what is required in potable water plumbing systems. If the manufacturer recommends specific disinfection, the Participating Contractor should follow the manufacturer's protocols.

Horizontal-Loop Systems: Horizontal loops must be installed below the frost line and have a surface area that is sufficient to provide a minimum entering water temperature of 30°F to the heat pump in heating mode and a maximum entering water temperature of 90°F to the heat pump in cooling mode. Incentive applications must include the file from the horizontal-loop design software showing inputs and system design specifications.

Open-Loop Systems: A standing column well must include a bleed circuit, drywell, or locally approved receptor to maximize thermal efficiency based on available water production.

Incentive applications must quantitatively explain the method for determining pressure and flow rate. All projects must comply with NYS DEC regulations for geothermal well drilling, which can be found at

www.dec.ny.gov/energy/43303.html on the DEC website.

All projects must comply with ANSI/CSA/IGSHPA C448.6, *Installation of open-loop systems ground water heat pump systems.* All standing column well projects must comply with ANSI/CSA C448.7, *Installation of standing column well heat pump system.*

Table 4 presents program requirements for the maximum allowable rated pumping power at design conditions (based on duty point), as well as good-practice guidance.

Table 4: Maximum Allowable and Good Practice Pumping Power for Open-Loop GSHP Systems in watts (W) per AHRI rated[39] full-load heating or cooling capacity of the installed system

GSHP System Size	Maximum Allowable Pumping Power in watts (W) per 10,000 Btu/h of full-load heating capacity OR in watts (W) per ton of full-load cooling capacity	Good Practice Pumping Power in watts (W) per 10,000 Btu/h of full-load heating capacity OR in watts (W) per ton of full-load cooling capacity
Individual GSHP units in residential and small commercial applications where each GSHP unit has its own dedicated loop pump	140	Less than 105
Large GSHP systems with multiple heat pump units served by centralized ground loop pumping	120	Less than 90

DX System: Direct exchange heat pumps, which circulate a refrigerant typically through a closed-loop copper pipe system (whereas most systems utilize plastic pipes that circulate water or a water-antifreeze mixture), must meet the following additional conditions:

- DX systems must have a minimum loop field length of 100 feet per 12,000 Btu/h of heating capacity.
- DX wells require cathodic protection ensuring a minimum expected well life of 25 years.
- DX system owners must certify that they will undergo an end-of-life decommissioning that includes full-refrigerant recovery.
- The refrigerant must be R-410A unless otherwise approved by the Joint Efficiency Providers.
- The entire well depth interval for DX wells is grouted with thermally enhanced grout with hydraulic conductivity below 1 x 10-7 centimeters/second.
- A permanent placard must be attached to the heat pump unit, detailing the following:
    - loop field refrigerant content, type, and volume
    - loop location description

[39] Reference the AHRI Ground-water Heat Pump Application (GWHP) rating for Full-Load Heating Capacity and for Full-load Cooling Capacity

    - loop piping material
    - required maintenance schedule on loop field, refrigerant, and heat pump
    - planned decommissioning date and process, consistent with loop field useful life.
- DX systems must also comply with ANSI/CSA/IGSHPA C448.8, “Installation of direct expansion heat pump systems.”
- DX GSHP systems must use only ACR B280 Copper Piping for Underground Loop Field.
- DX GSHP systems must conform to requirements of ASHRAE Standard 15-2019.

Large GSHP System-Specific Requirements

- For large systems, a loop field design includes:
    - Loop/site plan
    - Loop sizing report (flexible)
    - Loop field pressure drop calculations
    - Antifreeze type and concentration
    - System documentation must include a piping schematic accurately representing below grade and above grade piping strategy
- Large systems with ethanol and methanol must comply with Section 1207 of the 2015 Mechanical Code of New York State and, therefore, “the flash point of transfer fluid in a hydronic piping system shall be not less than 50°F above the maximum system operating temperature.”
- Large systems must implement the following:
    - Show rated walls and ceilings and specify firestopping of pipe penetrations
    - Detail cross connection control devices in the design
    - Conform to the requirements and standards of ASHRAE 15

Thermal Conductivity Tests: For any new construction or retrofit for which a new vertically bored, closed-loop ground loop greater than 300,000 Btu/h system heating capacity is being installed, a test borehole must be drilled prior to system design to more accurately determine the soil’s thermal conductivity and enable accurate system modeling and design optimization. Testing should conform to the requirements detailed in the latest edition of the ASHRAE Applications Handbook and must report undisturbed ground temperature.

Test boreholes are recommended, but not required, for projects with system capacities between 135,000 Btu/h and 300,000 Btu/h .

3.2.4 Heat Pump Water Heaters and Ground Source Water-to-Water Heat Pumps

In addition to space heating, the NYS Clean Heat Program also promotes the use of heat pump technology for heating domestic hot water (DHW), as a replacement or in new construction in lieu of common electric resistance or fossil fuel water heaters. As with space conditioning heat pump technologies, for retrofit applications, the program will require that applicants report the existing water heating fuel that is being replaced; for new construction, the replaced unit will be determined on a case-by-case basis, based on contemporary construction practice in the area.

As with space conditioning, heat pump water heaters can be air source or ground source technology.

3.2.4.1 Heat Pump Water Heater

HPWHs are water heater tanks that heat domestic hot water through the use of an onboard air source heat pump that extracts heat from the air in the building surrounding the unit. They use a secondary electric resistance as a back-up to ensure that the water temperature meets the desired setpoint during times of high demand. Air source HPWH models come in two versions (integrated and split-system HPWH) and both versions are eligible for incentive under the program.

System eligibility: Category 5 *HPWH (up to 120 gallons of tank capacity)* and Category 6 *Commercial HPWH (above 120 gallons of tank capacity)*.
To be eligible for a program incentive, an HPWH must be an ENERGY STAR Certified Product.

A residential duty HPWH (defined as having a tank up to and including 120 gallons, a current rating ≤24 amps and voltage ≤250 volts)[40] shall receive incentives based on $/unit, under Category 5 *HPWH (up to 120 gallons of tank capacity)*.

Commercial Air Source HPWH (>120 gallons) [41] shall receive incentives based on $/MMBTU of annual energy savings, under Category 6 *Commercial HPWH (above 120 gallons of tank capacity)*.

Equipment Sizing: Systems shall be sized according equipment manufacturer recommendations.

Equipment Installation: Systems and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements. They shall be installed in spaces that provide sufficient make up air to support efficient heat pump operation, per manufacturer specifications.

3.2.4.2 Ground Source Desuperheaters and Dedicated DHW Water to Water Heat Pumps

Ground source systems provide two opportunities for highly efficient water heating, desuperheaters and full load DHW WWHPs.

Desuperheaters are available on most GSHP models. A desuperheater recovers heat from the GSHP's compressor during both cooling and part-load heating mode and transfers it to the DHW tank. Thus, they satisfy a portion of the building's annual DHW load. They therefore require some form of complimentary water heating.

Full-load DHW WWHPs can either be installed as a priority zone on a GSHP HVAC system, or as a stand-alone system. They are designed to provide all of the building's DHW needs.

System eligibility: Category 7 *GSHP Desuperheater* and Category 8 *Dedicated DHW WWHP*

[40] 10 CFR 430.2 – Definitions.

[41] https://www.energystar.gov/products/water_heaters/commercial_water_heaters/key_product_criteria

Any desuperheater that is installed on a GSHP system shall be eligible for an incentive under Category 7 *GSHP Desuperheater*.

A full-load DHW WWHP must be an ENERGY STAR Certified Product to be eligible for incentives. Ground Source DHW WWHPs are covered by the ENERGY STAR specification for Geothermal Heat Pumps.[42] Residential Ground Source DHW WWHPs (up to 120 gallon tanks), are eligible for $/unit incentives under Category 8 *Dedicated DHW WWHP*.

Commercial DHW WWHPs (>120 gallons) shall receive incentives based on $/MMBTU of energy savings.

Equipment Sizing: Systems shall be sized according equipment manufacturer recommendations.

Equipment Installation: Systems and system components must be installed in accordance with manufacturer specifications and installation requirements, and in compliance with all applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review, the Statewide Uniform Fire Prevention and Building Code and State Energy Conservation Construction Code, the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements.

Ground Source HPWH loop requirements shall be the same as those for GSHP, as described above in Section 3.2.2.

3.3 Warranty Requirements

All ASHPs, including VRF

Category 1 *ccASHP: Partial Load Heating*,Category 2 *ccASHP: Full Load Heating, Category 4 Custom*

Each qualified residential and small commercial ASHP receiving an incentive under this program must include a minimum five (5) year manufacturer's warranty for parts, including compressor.

Full Load Heating GSHP Systems

Category 3 *GSHP: Full Load Heating*
For small GSHP systems, including desuperheaters and WWHPs, Participating Contractors must transfer to the system owner the manufacturer's and/or distributor's/dealer's warranty. At a minimum, such warranty must cover all parts and equipment against breakdown or malfunction and the warranty period must be no less than five years. In addition, the warranty will cover the full costs, including labor and repair or replacement of components or systems.

The Participating Contractor must also provide additional warranty coverage that fully covers the labor and design services provided by the Participating Contractor (and any of its subcontractors). The warranty period must be no less than three years. Participating Contractors must present to the site owner any optional extended warranty up to the

[42] ENERGY STAR Program Requirements for Geothermal Heat Pumps. Current link: https://www.energystar.gov/sites/default/files/specs//private/Geothermal_Heat_Pumps_Program_Requirements

maximum supported by the manufacturer.

Custom GSHP Systems

Category 4 *Custom*

For large GSHP systems, the minimum manufacturer's warranty must be at least one-year parts and labor, as required by law. Participating Contractors must present to the customer any optional extended warranty up to the maximum supported by the manufacturer.

HPWH Systems

Category 5 *HPWH (up to 120 gallons of tank capacity),* Category 6 *Commercial HPWH (above 120 gallons of tank capacity)*

Each HPWH system receiving an incentive under this program must include a minimum ten (10) year manufacturer's warranty for parts and tank.

3.4 Operation and Maintenance Requirements

Electrified heating systems are often a new type of appliance for the site owner so it is important that owners understand how to effectively operate and maintain their new systems. Participating Contractors must inform site owners on system operation and maintenance, including on the use of these systems in both heating and cooling modes. A detailed manufacturer operation handbook as well as a maintenance manual containing information on the major components and a schedule of required system maintenance must be provided by the Participating Contractor.

The manual must include maintenance and testing requirements of antifreeze solutions used on the project. It must include any start-up/commissioning documentation for the system(s). For large systems, the O&M manual must include as-built drawings.

For ccASHP and cold climate MSHP installations under incentive Categories 1 and 2, the Joint Efficiency Providers require that Participating Contractors provide site owners with the "Get the Most Out of Your Air Source Heat Pump" tip sheet which can be found at http://saveenergyny.ny.gov/nyscleanheat.

The Joint Efficiency Providers strongly recommend that GSHP systems include a performance monitoring system. Recommended best practices for performance monitoring of GSHP systems can be found at http://saveenergyny.ny.gov/nyscleanheat.

Participating Contractors should strongly encourage system owners to purchase a maintenance agreement.

4. Participating in the Program

Customers who would like to have an ASHP or GSHP system installed in their home or property, can learn more about the different technologies and look for an approved Participating Contractor by visiting the NYS Clean Heat Contractor Reference web page at http://saveenergyny.ny.gov/nyscleanheat

Multifamily and C&I customers seeking incentives under Category 4 *Custom* may choose to be the applicant by submitting an incentive application to the Program directly. The direct applicant must work with a Participating Contractor in accordance with the program rules and requirements of the Program.

Step 1. Become a Participating Contractor

To participate in this Program, ASHP installers, ASHP designers, GSHP installers, GSHP designers, and GSHP drillers[43] must first become a Participating Contractor in the NYS Clean Heat Participating Contractor Network.

Note: Each GSHP loop field installation must be completed by a participating driller, but participating drillers are not eligible to apply for or receive incentives under this Program. Additionally, contractors installing only HPWH do not need a Participating Contractor to submit an incentive application on behalf of a customer.

To become a Participating Contractor, installers, designers, and drillers must complete and submit a Participating Contractor Application and Contractor Participation Agreement. Applicants will complete and submit a single statewide Participating Contractor Application, a separate signed Contractor Participation Agreement for each Electric Utility applied for[44] and all required supporting documentation (including a W-9) listed in the "Participating Contractor Requirements" section to **one** of the Electric Utilities as listed in the application. These documents can be downloaded at http://saveenergyny.ny.gov/nyscleanheat.

On the Participating Contractor Application, contractors must indicate the utility service territory(ies) in which they plan to submit incentive applications. They must also indicate contractor type: ASHP Contractor (installer or designer), GSHP Contractor, GSHP Designer <300,000 Btu/h system heating capacity, GSHP Designer ≥300,000 Btu/h system heating capacity, GSHP Driller, GSHP Direct Exchange (DX) Contractor or any combination of the above. Contractors must be approved for each specific contractor type by the Electric Utilities and will be listed separately on NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat by type if approved.

The Electric Utilities will review all applications, agreements and supporting documentation and determine if the contractor is accepted into the NYS Clean Heat Participating Contractor Network. Upon acceptance into the network, the Participating Contractor will receive an approval notification email and be eligible to apply for incentives in the program (except for participating drillers). Incentive applications

[43] GSHP Drillers must also be approved by the Electric Utilities through this process to become "participating drillers," but only participating installers and designers may submit rebate applications

[44] The Electric Utilities are working towards a single statewide Contractor Participation Agreement and any updates to the required documents and process will be noted on the Contractor Reference webpage.

can be found on each Electric Utility's website as well as the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat.

New Participating Contractors (except participating drillers) are initially granted provisional status until the successful completion and QA/QC assessment of three projects. New participating drillers approved by the Electric Utilities are immediately granted full status. If the contractor is not approved by Electric Utilities, the opportunity to re- apply is an option. More information on participation status be found in Section 6.

Information on the requirements and qualifications for the application—to become a Participating Contractor (installer, designer, or driller)—can be found in the following section of this Program Manual.

Transition

Contractors who are eligible to participate in NYSERDA's ASHP and GSHP Incentive Programs on March 31, 2020 are eligible to participate in the NYS Clean Heat Statewide Heat Pump Program beginning on April 1, 2020. A signed Contractor Participation Agreement must be submitted by July 1, 2020 to each Electric Utility in which they plan to submit incentive applications.

Contractors installing residential and small commercial ASHP equipment who have participated in a NYS Electric Utility heat pump program prior to April 1, 2020 are eligible to apply for incentives for residential and small commercial ASHP installations under Category 1 *ccASHP: Partial Load Heating* and Category 2 *ccASHP: Full Load Heating* of the NYS Clean Heat Program through August 1, 2020. Contractors must submit credentials and documentation (as detailed in the "Participating Contractor Requirements" section) and a signed Contractor Participation Agreement no later than July 1, 2020 to be eligible to participate in the NYS Clean Heat Statewide Heat Pump Program.

Any contractor not identified above, who would like to participate in the NYS Clean Heat Pump Program April 1, 2020 must submit a single Participating Contractor Application, credentials and documentation, and one Contractor Participation Agreement for each Electric Utility territory in which they plan to submit incentive applications.

Participating Contractor Requirements

Air Source Heat Pump Contractors

ASHP installers and designers seeking to become Participating Contractors must complete and submit to one of the Electric Utilities, a single NYS Clean Heat Program Participating Contractor Application and a separate signed Contractor Participation Agreement[45] for each Electric Utility in whose territory they plan to submit incentive applications. This document is available on the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat..

The application must include the following supporting documents:

- A copy of the U.S. Environmental Protection Agency Section 608 Technician Certification that is appropriate for the size of the system being installed.

[45] The Electric Utilities are working towards a single statewide Contractor Participation Agreement and any updates to the required documents and process will be noted on the Contractor Reference webpage.

- ASHP Manufacturer-sponsored Installation Training Certificate or comparable proof of training completion documentation covering the following areas:
    - Condensate Management;
    - Controls;
    - Electrical Wiring;
    - Evacuation and Charging;
    - Field Settings;
    - Piping and Charging;
    - Product Introduction;
    - R-410A and PVE Oil;
    - System Start-Up;
    - Tools;
    - Troubleshooting; and
    - Unit Location Considerations.
- A certificate of insurance satisfying the requirements outlined in each of the Electric Utilities' Contractor Participation Agreement is also required.
- Participating Contractors are required to review and use the *NEEP Guide to Sizing and Selecting Air-Source Heat Pumps in Cold Climates.*

Ground Source Heat Pump Contractors

Installer Credentials: A GSHP installer seeking to become a Participating Contractor must complete and submit to one of the Electric Utilities, a single Participating Contractor Application and a separate signed Contractor Participation Agreement[46] for each Electric Utility in whose territory they plan to submit incentive applications.

The application must include the following supporting documents:

- A copy of a current (and in good standing) International Ground-Source Heat Pump Association ("IGSHPA") accredited installer certificate;
- A certificate of insurance satisfying the requirements outlined in each Electric Utilities' Contractor Participation Agreement; and

The above-mentioned documents can be found at on the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat..

[46] The Electric Utilities are working towards a single statewide Contractor Participation Agreement and any updates to the required documents and process will be noted on the Contractor Reference webpage.

Designer Credentials

Category 3 *GSHP: Full Load Heating Incentive* Systems: A designer seeking to become a Participating Contractor for GSHP systems qualifying for the Category 3 *GSHP: Full Load Heating Incentive* must complete and submit to one of the Electric Utilities, a single Participating Contractor Application and a signed Contractor Participation Agreement[47], for each Electric Utility in whose territory they plan to submit incentive applications. Additional required documents include a copy of either a current (and in good standing) IGSHPA accredited installer certificate or an active Certified GeoExchange Designer ("CGD") certificate from the Association of Energy Engineers (AEE)/IGSHPA. Additionally, a certificate of insurance satisfying the requirements outlined in each Electric Utilities' Contractor Participation Agreement must be provided. The above-mentioned documents can be found on the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat.

Category 4 *Custom* GSHP Systems: A designer seeking to become a Participating Contractor for GSHP systems with three-phase heat pump equipment or with total system heating capacity ≥300,000 Btu/h, qualifying for the Category 4 *Custom*, must complete and submit to one of the Electric Utilities, a single Participating Contractor Application and a signed Contractor Participation Agreement[48] for each Electric Utility in whose territory they plan to submit incentive applications. Additional required documentation includes a certificate of insurance satisfying the requirements outlined in each Electric Utilities' Contractor Participation Agreement. The above-mentioned documents can be found at on the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat.

The application must include one the following supporting documents:

- An active Certified GeoExchange Designer ("CGD") certificate from the Association of Energy Engineers (AEE)/IGSHPA
- An active NYS Professional Engineering license
- An active NYS Registered Architect license

Designers must have an active CGD certificate from the Association of Energy Engineers (AEE)/IGSHPA to be promoted to full status.

Driller Credentials

Vertical Loop Field Drillers: Drillers seeking to become Participating Contractors (not eligible to receive incentives) must complete and submit to one of the Electric Utilities, a single Participating Contractor Application and a separate signed Contractor Participation Agreement for each Electric Utility in whose territory they wish to submit incentive applications. The above-mentioned documents can be found on the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat.

The application must include one the following supporting documents:

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[47] The Electric Utilities are working towards a single statewide Contractor Participation Agreement and any updates to the required documents and process will be noted on the Contractor Reference webpage.

[48] The Electric Utilities are working towards a single statewide Contractor Participation Agreement and any updates to the required documents and process will be noted on the Contractor Reference webpage

- Active registration (in good standing) and certification for open-loop geothermal well drilling by the NYS Department of Environmental Conservation
- National Ground Water Association Certified Vertical Closed-Loop Driller (CVCLD) certificate

Direct Exchange (DX) Requirements: Since there are currently no available industry trainings or certifications, designers, installers and drillers seeking to become Participating Contractors must submit a training certificate from a DX Ground Source Heat Pump manufacturer. The NY Electric Utilities reserve the right to review the training curriculum provided.

Additional Participation Qualifications:

Additional consideration will be given to applicants who also submit additional documentation verifying completion of training programs, including the following:

- Ground-loop designer
  - CGD
  - Geology or engineering degree (BS or higher)
  - Heat pump manufacturer/distributor training
- HVAC system designer
  - HVAC excellence residential heat load analyst
  - NYS licensed PE with a focus in mechanical engineering
  - Heat pump manufacturer/distributor training
- Heat pump/mechanical installer
  - North American Technician Excellence ("NATE") ground source heat pump loop installer
  - NYS licensed PE with a focus in mechanical engineering
  - Heat pump manufacturer/distributor training
- Distributions system installer
  - HVAC excellence duct and envelope testing
  - Plumbing license (hot water pipes)

Heat Pump Water Heater Contractors

Contractors installing HPWHs are not required to submit a Participating Contractor Application or a Contractor Participation Agreement to be eligible to receive incentives under this program.

Contractors installing a HPWH are required to be a NYS Licensed Contractor.

Site owners may install their own HPWH and apply for an incentive independently.

Step 2. Confirm Project Eligibility and Submit Project Applications

To apply for an incentive, the Participating Contractor or the applicant (Participating Contractor and/or customer) must submit the incentive application and associated documents to the respective Electric Utility based on directions on the application. Detailed instructions

for completing and submitting incentive applications can be accessed through the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat.or following utility websites:

- Central Hudson
- Con Edison
- National Grid
- Orange and Rockland
- NYSEG and RG&E

Incentive applications are accepted for eligible projects that meet the requirements set forth in Section 3 of this Program Manual.

- Incentive applications for ASHPs qualifying for incentives under Category 1 *ccASHP: Partial Load Heating* or Category 2 *ccASHP: Partial Full Heating* and HPWHs under Category 5 *HPWH (up to120 gal)* or Category 6 *Commercial HPWH (above 120 gal)* should be submitted after the installation is complete.

- Incentive applications for GSHPs qualifying for incentives under Category 3 *GSHP: Full Load Heating* or Category 7 *GSHP Desuperheater* or DHW under Category 8 *Dedicated DHW WWH* or Category 9 *Simultaneous Installation of Space Heating & Water Heating* can be submitted prior to project start or after project completion.

Incentive applications for Category 4 *Custom* projects should be submitted prior to project start.

Incentive applications must include the following:

- **NYS Clean Heat Incentive Application:** To be completed and signed by the Participating Contractor, site owner and the system owner (as applicable)—and includes contact information for key project staff, site information, and data on the proposed system.
- **Documentation:**
  - As stated in Section 3.2.1, in order to be eligible for incentives, all heat pump systems must be sized in compliance with applicable state and municipal code. Applications must provide documentation of heat pump system design and appliance selection based on BHL and BCL, as calculated using a code-approved methodology appropriate for the building type (Section 3.2.1). Documentation should be submitted in PDF format, unless otherwise requested.
    - Category 1 *ccASHP: Partial Load Heating* applications - The contractor shall provide the heat pump system's total heating capacity as a ratio of BHL, documenting that the system satisfies <90% of BHL.
    - Category 2 *ccASHP: Full Load Heating* and Category *3 GSHP: Full Load* applications - The contractor shall provide the heat pump system's total heating capacity as a ratio of BHL, documenting that the system satisfies 90%-120% of BHL.
    - Category 4: *Custom* applications - The contractor shall document that the heat pump system's total capacity is sufficient to satisfy the dominant load of the building. If the building's BHL is higher than the BCL, the heat pump system capacity must satisfy BHL; if the building's BCL is higher, the heat

pump system capacity must satisfy BCL.

- In addition to documentation on building loads and system sizing that is required for all Clean Heat Program projects, GSHP applications require additional documentation, as follows:
    - Category 3 *GSHP: Full Load* applications - If a project is selected for a design review, design documents will be requested. Documents should be submitted in PDF format, unless otherwise requested.
    - Category 4 *Custom* GSHP applications - GSHP applications in this category must include a preliminary assessment of technical viability conforming to Section 3 of this Program Manual. Additionally, each application must include designs for the GSHP system, including, at minimum, the following:
    - Loop field sizing report
    - Equipment schedule
    - Schematic of location of boreholes
    - Piping schematic for piping in loop field
    - Preliminary above-grade mechanical plans

  Note: Incentive applications for Category 4 *Custom* GSHP systems will not be accepted if construction of the loop field for such project has begun before the Electric Utilities send the Participating Contractor and/or customer an approval notice.

- **Invoice:** The invoice or contract with the Site Owner[49] must be submitted with each incentive application and demonstrate that at least the Total Incentive less the Participating Contractor Reward was passed on or credited in its entirety.
- **Commissioning Checklist (ASHPs only):** To be completed and signed by the Participating Contractor and Site Owner.

Step 3. Project Applications Reviewed/Receive Pre-Project Approval

Non-custom Systems qualifying for incentives under **Categories 1, 2, 3, 5, 7, 8, 9:** applications submitted after the project is complete will not receive pre-project approval. These incentive applications will be reviewed and determination for final approval and payment will be made.

Custom Systems qualifying for incentives under **Category 4:** The Electric Utilities will notify the applicant (Participating Contractor and/or customer) of the status of each incentive application within 30 business days of receipt. If the incentive application meets all program requirements and funding remains available, the Electric Utilities will issue an approval notification to the Participating Contractor via email that provides incentive details, including the incentive amount.

The Electric Utilities will not approve incentive applications with missing or inaccurate information. The Electric Utilities will contact the applicant (Participating Contractor and/or customer) and request the missing and/or correct information. The incentive application will be rejected if the information is not provided or corrected within 15 business days after the request or after three requests by the Electric Utilities. A rejected incentive application can be resubmitted.

The Electric Utilities strongly recommend that the Participating Contractor wait to start installation until after the Electric Utility has reviewed the application and notified the Participating Contractor of the approval or rejection. Projects that do not meet the requirements in this Program Manual are not

[49] The Site Owner must have title to the site at which the ASHP or GSHP is installed.

eligible to receive incentives.

Step 4. Complete Project/Submit Post-Project Application

Non-custom Systems Qualifying for incentives under Categories 1, 2, 3, 5, 7, 8 , 9: projects must be completed within 12 months of the date of the approval email for projects at existing buildings and within 24 months for projects at to-be-constructed buildings. In the event of unusual delays, the Participating Contractor may request an extension of time to complete the project by submitting an email to their respective Electric Utility listed in Section 9 explaining the reason for the delay. Extensions may be granted or denied at the Electric Utilities' discretion.

Custom Systems Qualifying for incentives under Category 4: projects must be completed within 24 months of the award date on the award letter for projects to be installed at existing buildings and 36 months for projects to be installed at to-be-constructed buildings. In the event of unusual delays, the applicant (Participating Contractor and/or customer) may request an extension of time to complete the project by submitting an email to their respective Electric Utility listed in Section 9 explaining the reason for the delay. Extensions may be granted or denied at the Electric Utilities' discretion.

Upon project completion, the Participating Contractor in cooperation with the system owner and/or site owner completes and submits (1) the project completion form; and (2) a completed manufacturer or distributor start-up sheet signed by the technician performing the start-up tests.

Step 5. Receive Incentive Payment

The Electric Utilities will pay incentives to the applicant (Participating Contractor and/or customer). Each Participating Contractor may retain up-to the Participating Contractor Reward amount shown in Table 2. The balance of the Total Incentive less the Participating Contractor Reward must be passed or otherwise credited to the customer in their entirety, documented in the site owner invoice or contract. Multifamily and commercial and industrial (C&I) customers seeking incentives under Category 4 *Custom* may choose to be the applicant by submitting an incentive application directly. As the applicant, the multifamily and C&I customers choosing this option will receive direct payment of the Total Incentive amount listed in Table 2 from the Program.

The Joint Efficiency Providers are committed to supporting Participating Contractors and developing the heat pump market in NYS. If a Participating Contractor has a business concern with receiving incentive payments directly, please reach out to the respective Electric Utility for alternative payment arrangements using the contact information provided in Section 9. The need for alternative payment arrangements will be reviewed on a case-by-case basis. The Joint Management Committee will monitor the number of alternative payment requests and may consider program revisions as necessary.

Non-custom Projects Qualifying for Incentives Under Categories 1, 2, 3, 5, 7, 8, 9: Once submitted, if the incentive application meets all program requirements and funding remains available, the incentive application will be approved, and full payment will be sent to the Participating Contractor.

Rejection or modification of an incentive application is at each Electric Utility's sole discretion for either of the following reasons:

- The Participating Contractor's past performance on the Joint Efficiency Providers' supported projects did not meet program requirements.
- The quality of the incentive application or responsiveness of the Participating Contractor is insufficient as determined by the respective Electric Utility.

Custom Projects Qualifying for Incentives Under Category 4: Once the project completion form is submitted, if the form and associated documentation meets all program requirements and funding remains available, the incentive application will be approved, and full payment will be sent to the applicant (Participating Contractor or customer).

Step 6. Review and Installation Assessment

Through participation in the program, Participating Contractors will be required to comply with a statewide QA/QC process for the purpose of ensuring quality installations. Please see Section 5 for more details. Additionally, Participating Contractors may be subject to utility-specific reviews and/or assessments for the purposes of verifying program measure implementation and acquisition.

5. Quality Assurance, Quality Control, and Compliance

5.1 Compliance with Manufacturers' Installation Requirements, Laws and Codes

Under the NYS Clean Heat Program, all ASHPs, GSHPs, HPWHs, system components, and installations must comply with any and all manufacturers' installation requirements and applicable laws, regulations, codes, licensing, and permit requirements. These include the New York State Environmental Quality Review, the New York State Building Code, or New York State Residential Code, New York State Plumbing Code, New York State Mechanical Code, New York State Energy Code, the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements. In the City of New York, all relevant New York City Codes and NYC Department of Environmental Protection requirements apply.

5.2 Execution of Work Requirements

All equipment and accessories must be installed in a competent and professional manner.

5.3 Quality Assurance/Quality Control Overview

The Electric Utilities will maintain program integrity through the Quality Assurance/Quality Control (QA/QC)[50] process consisting of routine and systematic assessment activities to support quality installations and assure that Participating Contractors comply with program rules. The Joint Efficiency Providers developed and will maintain the NYS Clean Heat QA/QC process and protocols as described herein, which will be implemented uniformly by all Electric Utilities and any representatives administering QA/QC activities on their behalf. These NYS Clean Heat QA/QC activities will be supplemented by any utility-specific review or assessment of heat pumps that may be conducted for the purposes of program implementation and measure acquisition.

5.3.1 Transition of the QA/QC Process and Infrastructure

NYSERDA will administer the NYS Clean Heat QA/QC process on behalf of the Electric Utilities until such time as the direct administration is transitioned to the Electric Utilities, no later than January 1, 2021. This transition period will allow the Electric Utilities to procure independent QA/QC contractors that are qualified to perform site assessments.[51] NYSERDA and the Electric Utilities will jointly share all relevant information during the transition period.

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[50] According to the American Society for Quality (ASQ) QA and QC, while both considered aspects of quality management, are distinctly different from each other: QA provides confidence that quality requirements will be fulfilled, whereas QC focuses on fulfilling quality requirements. *Retrieved May 28, 2020, from ASQ: https://asq.org/quality-resources/quality-assurance-vs-control.*

[51] The qualifications for the QA/QC contractors will meet or exceed the following minimum qualifications: Three (3) or more years of combined experience installing, designing, and/or inspecting Heat Pump systems. For contractors: BPI AC Heat Pump Certification or NATE, OR Professional Engineer (PE) in the relevant discipline.

5.3.2 Summary of QA/QC Process

The QA/QC process has several components including establishment of program standards, comprehensive, technology-specific documentation requirements, and site assessments. Such approaches are unique to the heat pump technologies and include the review of associated contractor credentials, project specific calculation methods, approved construction permits, accuracy of provided application data, and site assessments to assure optimal heat pump system performance.

The QA/QC process will employ sampling methods proportionate to the likely program risk associated with each application. Specifically, QA/QC including a site assessment will occur for every project until the Participating Contractor has a proven successful track record under the incentive program, after which a sampling protocol will be followed. Projects contributing a disproportionate share of anticipated savings or employing novel solutions and custom savings estimate methods will receive the increased scrutiny to identify opportunities for improvement as soon as possible. For larger-scale projects that pursue a custom incentive and require additional engineering review, the statewide QA/QC process (as applicable to the project and technology) will be supplemented with any utility-specific assessments and processes.

QA/QC field assessments will be conducted by qualified independent QA/QC contractors having associated expertise and using comprehensive QA/QC checklists. The QA/QC checklists include the criteria established for NYS Clean Heat and for each category of technology supported under the program. QA/QC checklists will be made available at: http://saveenergyny.ny.gov/nyscleanheat, for the following technologies:

1. Air Source Heat Pumps
2. Ground Source Heat Pumps
3. Heat Pump Water Heaters

The QA/QC contractor does not inspect projects for purposes of code compliance or enforcement nor compliance with manufacturers installation requirements. Following a site assessment, the QA/QC contractor will produce a QA/QC report that will document all evaluated criteria of the project and identify any nonconformances. If the QA/QC contractor observes an unsafe condition associated with the installation, the contractor shall immediately inform the Electric Utility consistent with their contractual obligations and the utility will in conformance with their own standard operating procedures inform the appropriate authorities and/or conduct a lock-out disabling use of such equipment. Discrepancies identified through the QA/QC process deemed not to endanger health and safety shall be remedied subject to program implementation rules.

5.4 Field Assessment

The purpose of field assessments is to provide the Electric Utility with an opportunity to verify that the heat pump system was installed according to all program requirements, and to assess the quality of workmanship of the heat pump installation.

The Electric Utility or its representative selects both in-progress and completed projects for field assessments following a rational sampling protocol with sampling rates primarily based on the Participating Contractor's current program status and whether the incentive application relates to an ASHP system, to a GSHP system, or to a HPWH.

QA field assessments are scheduled at the site owner's convenience. A notice of the scheduled field assessments assessment is sent to both the site owner and the Participating Contractor approximately one week in advance. Reasonable effort will be made to accommodate the schedule of the Participating Contractor, but the schedule of the system/site owner and efficient assessment scheduling take precedence.

Following the field assessment, the qualified third-party QA/QC Contractor produces a detailed report and determines whether the project fully complies with all program requirements and meets acceptable standards of workmanship. The report is made available to the installer after the assessment, following an internal review and scoring by the Electric Utility or its representative within 15 business days from the date of the assessment. If the site owner wishes to receive a copy of the report, they can submit a request their respective Electric Utility.

The Electric Utility or its representative may select any completed project at any point in the future for field assessments based on (1) site or system owner's complaints; (2) warranty related issues or a review of the work done by a Participating Contractor under status review or program disciplinary action; and (3) for any other cause at the sole discretion of the Electric Utility or its representative.

All Participating Contractors are encouraged to perform in-house quality control of each project.

ccASHP and HPWH Systems (Categories 1, 2, 5, 7, 8 and 9, as applicable)

The Electric Utility or its representative will select each Participating Contractors' initial three (3) completed ccASHP projects or combined ccASHP/HPWH projects for field assessments. Full status Participating Contractors are subjected to up to a 7.5% field assessment overall. Probationary and suspended status Participating Contractors are subjected to up to 100% field assessment on specific projects for cause.

ASHP and HPWH Systems (Categories 4, 6, and 9, as applicable)

All Participating Contractors will have their initial three (3) projects selected for assessment. The Electric Utility or its representative will generally conduct field assessments on up to 30% of larger ASHP equipment, and HPWH units installed by full-status Participating Contractor. Probationary and suspended status Participating Contractor are subjected to 30% field assessment sampling overall and up to 100% field assessment sampling on specific projects for cause.

GSHP Systems (Categories 3 and 4)

All Participating Contractors who are new to installing GSHPs in the Program will have their initial three (3) projects selected for assessment. Based on the results of the assessments completed, the Electric Utilities may reclassify the Participating Contractor to full, probationary, suspended, or terminated status.

For Category 4 *Custom* GSHP systems, the Electric Utility or its representative will generally conduct assessments on up to 30% of units installed by full-status Participating Contractors. Probationary and suspended status Participating Contractors are subjected up to 100% field assessment overall.

5.5 Photo Assessment (ASHP & GSHP Systems, Category 4 *Custom*)

The Participating Contractor is required to take and retain construction photos of each project. The Electric Utility or its representative may request construction photos for purposes of conducting a photo

assessment at any time. At present, photo documentation is focused on verifying compliance with program requirements and technical standards related to in progress work such as loop field installation. Photo documentation scores are taken into consideration, along with QA field assessment scores, when evaluating performance.

The minimum number and content of photos required for GSHP projects can be found in the GSHP QA/QC checklist (in Excel). If selected for photo assessment documentation, Participating Contractors receive an email with instructions from the Electric Utility or its representative detailing where and how to upload the required project photos. The Participating Contractor provides pictures upon request within 10 business days. Failure to provide a complete set of photos may result in disciplinary action. Photos should be submitted in JPEG format or another format approved by the Electric Utility.

5.6 Procedure for Handling Nonconformance and Corrective Action

The Participating Contractor is solely responsible for ensuring compliance of the heat pump system installation with all applicable laws, regulations, rules and standards, including requirements of the local AHJ The contractor is responsible for correcting all nonconformances identified in the QA/QC activities to the satisfaction of the program administrator. Contractors are required to submit proof demonstrating correction of all items identified. Contractors may also be put on probationary status, suspended or terminated based on the results of QA/QC activities or otherwise violating program requirements.

The assessment report (QA report) provided to the Participating Contractor will provide details of all evaluated elements of the project and list any nonconformances that were identified. The report will identify the overall score of the project for the purpose of maintaining good standing in the Participating Contractor Network and specific non-compliance issues that should be addressed.

Projects that have nonconformances related to health and safety (critical) or system performance (major) attributes automatically fail.

When the Electric Utility or its representative seeks specific corrective action, a corrective action response (CAR) form will be provided within the QA report. The CAR must be either disputed within 15 days by contacting the Electric Utility or its representative or remedied within 30 days. Sufficient evidence, such as photo documentation of remediation must be provided to the Electric Utility or its representative documenting the completion of required actions. If major or critical nonconformances are not disputed or remedied within the stated timeframe, the Electric Utilities will adjust the Participating Contractor status as described in Section 6.

Acknowledgment and plans for preventing future problems may be requested with the report. While some nonconformances cannot be corrected post installation, others can be remedied through corrective action to the documentation, incentive applied to the project, or remediation of the installation or its components.

The Electric Utility or its representative may, at its discretion, conduct a field verification of the remediated installation. The Electric Utility has the right to provide a copy of the QA report; CAR; or specific information from the QA field assessments directly to the site owner based on health, safety, and compliance concerns.

If the QA/QC contractor observes an unsafe condition associated with the installation, the contractor shall immediately inform the Electric Utility consistent with their contractual obligations and the utility will in conformance with their own standard operating procedures inform the appropriate authorities

and/or conduct a lock-out disabling use of such equipment.

The Electric Utility or its representative may communicate with any site owner on any matter relevant to a project. Such communications may be in reply to an inquiry from a site owner or at the Electric Utility's initiation.

The Electric Utilities expect Participating Contractors to avoid repeating nonconformances in future projects that were identified in a prior inspection report. Acknowledgement and plans for preventing future problems may be requested with the report.

5.7 Contractor Feedback and Training

Participating Contractor performance feedback strengthens the effects of learning and has significant, direct positive effects on performance.

Contractors will be evaluated and provided with performance feedback through the assessment report; the Joint Efficiency Providers will develop training and resources to recommend to Participating Contractors for continuous improvement. The Joint Efficiency Providers also will work with AHJ officials to offer training with the goal of increasing the familiarity with heat pump technologies and enhancing the quality of code inspections for these new technologies.

6. Participation Status

Participating Contractors will be classified in one of the following status designations: provisional, full, probationary, suspended, or terminated. Each designation will be subject to limitations or requirements associated with that status. The Joint Efficiency Providers reserve the right to modify the definition, limitations, and requirements of these designations. A Participating Contractor's progression into and/or through any status designation is determined at the sole discretion of the Joint Efficiency Providers. The designation or existence of a Participating Contractor in any status category does not relieve or modify the nature or scope of such Participating Contractor's responsibilities to fulfill any of its outstanding obligations under the program including, but not limited to, those obligations owing or relating to system or site owners.

As noted in Section 4, Contractors who are eligible to participate in NYSERDA's ASHP and GSHP Incentive Programs on March 15, 2020 will be eligible to participate in the NYS Clean Heat Statewide Heat Pump Program beginning on April 1, 2020 and must submit a signed Contractor Participation Agreement by July 1, 2020 to each Electric Utility in which they plan to submit incentive applications.

6.1 Provisional Status

All new Participating Contractors are initially classified as provisional. Following the completion of the third project review, the Joint Efficiency Providers will conduct a formal review to evaluate a change in status. Evaluation for a change to full status will be based upon the quality and consistency of work and full compliance with program rules including current qualifications as previously described.

Special requirements for GSHP Participating Contractors:

- Provisional installers are strongly encouraged to attend at least the first three QA field inspections as it provides an opportunity to learn the field inspection process.
- Provisional Participating Contractors will be recommended for relevant training.

6.2 Full Status

At the Joint Efficiency Providers' discretion, Participating Contractors may be placed in full status when they have:

(1) met all program requirements for credentialing and experience and installation quality;
(2) successfully completed the terms of the provisional period; and
(3) demonstrated quality services through past performance.

Participating Drillers are automatically deemed to have full status.

Full Participating Contractors must realize the following:

- Consistently deliver projects that pass QA field inspections consistently.
- Meet program standards in terms of timely responses to Joint Efficiency Provider communications and corrective-action requests related to QA field inspections.
- Take effective corrective actions to deficiencies in performance as identified by NYSERDA.
- Maintain one of the credentialing standards referenced in Section 4. Failure to satisfy this program requirement and present appropriate documentation results in an automatic downgrade to probationary status.

6.3 Probationary Status

Probationary status is reserved for Participating Contractors who have failed to consistently meet the requirements of the program. Probation is prescriptive in nature with both a specific list of requirements and a time frame for achieving results. Participating Contractors may be placed in probationary status for any of the following reasons:

- Violation of program rules or ethical standards.
- Failure to consistently deliver completed projects which pass the QA field inspection standard.
- Failure to take effective corrective actions on a critical or major deficiency or a repeated incidental or minor deficiency in work quality or performance.
- Three or more corrective action notices that have not been responded to, or remain unresolved, for more than 30 days.
- A lapse in required credentials

The probationary period will not be less than 30 days and will not exceed 90 days. Projects completed by Participating Contractor on probationary status may receive enhanced QA oversight. During the probationary period, the Participating Contractor can expect the following:

- Continues to be listed on the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat.
- May continue to submit new incentive applications, subject to restrictions based upon the reason for the probationary status.
- Is subject to higher QA inspection levels as outlined in this manual
- Must remediate all issues related to probation, as directed by NYSERDA or the Electric Utility.
- Must submit an agreed-upon action plan in writing designed to ensure future violations are avoided.
- Must demonstrate successful results through a specified number of completed projects.
- Must be mentored on its next installation.

Upon satisfactory completion of the action plan and all remediation and upon review of probationary period QA results, the Joint Efficiency Providers will determine in their sole discretion whether to return the Participating Contractor to full status, continue the probationary period, or suspend and/or terminate the Participating Contractor from the program.

6.4 Suspended Status

Participating Contractor who have failed to respond to prescriptive probation or commit to more serious violations of program rules will be suspended. Participating Contractor may be suspended from the program in the following situations:

- Fail to adequately fulfill the terms of the probationary period.
- Are placed on probation for a second time within 12 months.
- Are under investigation for (or the determination has been made) engaging in practices that put the public or program at risk.
- Have outstanding and unresolved request(s) for return of incentive payment to Electric Utility due to failure to meet program requirements.
- Have submitted any program application or incentive application documentation falsifying required items, including, but not limited to, permits, approvals, and site owner signatures.
- Fail to consistently deliver completed projects that pass the QA field inspection standard.
- Have a lapse in required credentials while on probationary status.

During a suspension, at the request of any Joint Efficiency Provider, the Participating Contractor is restricted in the following ways:

- Will be removed from the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat.
- Will not be allowed to submit new incentive applications to the program.
- Must complete any work, with system and/or site owner's consent, that was in progress at the time of suspension.
- Prohibited from being represented as a Participating Contractor except in the execution of remedial action.
- Depending on the reasons for suspension, be directed by NYSERDA or any Electric Utility to remediate issues related to the suspension, and may be required to submit to the program, in writing, an agreed- upon action plan that is designed to ensure future violations are avoided

At the Joint Efficiency Providers' sole discretion, suspended Participating Contractor either progress to probationary status upon satisfactory completion of the specified remedial activities or resolution of issues related to the suspension or they are terminated from program participation. Regardless of program status, Participating Contractors will remain responsible for fulfilling any outstanding obligations to the program or site owner.

6.5 Terminated Status

Participating Contractor who fail to respond to prescriptive and disciplinary measures or have committed serious violations of program rules may be terminated. Participating Contractor may be terminated from the program in the following situations:

- Have been on suspended status for more than 30 days and unresponsive or failed to adequately fulfill the terms of their suspension.
- Have had their credentials lapse while suspended.
- Submit falsified documents or unauthorized signatures to the program
- Commit illegal actions while participating in the program
- Are convicted or have a principal who is convicted of a criminal charge that casts the program in negative light or calls the integrity or work of the Participating Contractor into question
- Are in gross violation of program standards
- Bill for measures that are not installed.
- Fail to meet the terms of the provisional period

Terminated Participating Contractors are prohibited from further participation. Site owners with incomplete projects will be notified of the Participating Contractor termination. If appropriate, the Joint Efficiency Providers may notify the New York State Attorney General, the New York State Department of Labor, the Better Business Bureau, or others of their findings and decision to terminate the Participating Contractor.

The officers, directors, and owners of the terminated Participating Contractor are prohibited from holding positions of that nature with any other Participating Contractor. Regardless of program status, Participating Contractor will remain responsible for fulfilling any outstanding obligations to the program or site owner.

6.6 Inactive Status

A Participating Contractor may be declared inactive if they have not had an approved project in the

program over a 24-month period of time. They will be removed from the NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat., no longer receive email notifications, nor be eligible for incentives. Should they wish to participate in the future, they may reapply under the rules in place at that time.

6.7 Status Review Process

The status review process for administering probationary, suspended, or terminated status is as follows:

- NYSERDA or an Electric Utility will provide written notice of at least 10 business days of its intention to act. The notice will outline the specifics for disciplinary action along with supporting documentation for the proposed action.
- During this period, the Participating Contractor will have an opportunity to dispute the program violation notification.
- If the Participating Contractor fails to respond to NYSERDA or the Electric Utility prior to the end of the notice period, the stated disciplinary action will go into effect without further notice.
- NYSERDA or the Electric Utility will promptly review any request for an appeal of the decision received before the end of the notice period.
- NYSERDA or the Electric Utility will confirm, reverse, or place its action on hold based upon a review of all information received within 10 business days of receipt.
- Intended and final action letters will be sent via email and U.S. mail. The notice period commences on the date of the email from NYSERDA or the Electric Utility.

The Joint Efficiency Providers reserve the right to shorten these notice periods or take immediate action in the event of an emergency, as determined by NYSERDA or the Electric Utility.

When a Participating Contractor fails to consistently complete projects that pass NYSERDA QA evaluation or fails to respond to or remedy failed inspections, NYSERDA may review their status in the Program and take further action.

A Participating Contractor may be moved to probation or suspended status, in which specific results and a timeline for demonstrating those results will be prescribed and monitored. The Participating Contractor may be terminated from the Program if determined necessary.

7. Recommended Program Guidelines

In addition, the following is a summary of optional, but strongly recommended, program guidelines, installation, and design practices that the Joint Efficiency Providers encourage all Participating Contractor to follow:

- Participating Contractors who submit custom projects should wait to start installation until after the respective Electric Utility has reviewed the application and notified the Participating Contractor whether the incentive application has been approved or rejected.
- Participating Contractors should encourage site and system owners to work with their respective Electric Utility to assess and implement energy efficiency opportunities related to building envelope and HVAC distribution before or in coordination with installing a heat pump system.
- Test boreholes are recommended for GSHP projects with system capacities between 135,000 Btu/h and 300,000 Btu/h .
- The Electric Utilities strongly recommend that Category 4 *Custom* systems include a performance monitoring system.
- Installers, designers and drillers seeking to become Participating Contractors should submit any additional training and certification documentation, beyond the required documentation that would help bolster their credentials.
- The Electric Utilities recommend that, for projects that install heat pump systems to operate in combination with existing heating systems, the Participating Contractor install an integrated multi-stage control, in order to reduce backup heat from the existing system and emphasize heat pump operation. If an integrated multi-stage control is not available, the Participating Contractor should advise the site owner on the effective use of two thermostats to optimize heat pump system use.

8. General Information

8.1 Waiver

The purpose of these requirements is to ensure that heat pump systems installed under this Program are high-performing, high-quality installations that are used for space heating or hot water heating, which is critical to enabling market growth. However, the Electric Utilities encourage innovation in design and installation practices that improve performance and lower costs. If a Participating Contractor can substantiate that a deviation from a specific requirement will maintain or improve performance at a similar or lower cost, the Electric Utilities will consider granting a waiver to that specific requirement.

8.2 Logo Use Disclaimer

Participating Contractors are not permitted to use, reproduce or otherwise publish any of the Electric Utilities or NYSERDA logo. Contractors are permitted and encouraged to use the "NYS Clean Heat" name.

There are very strict policies regarding use of the Electric Utilities' and NYSERDA's logo. There are very few companies that are eligible to use a version of the Electric Utilities; and NYSERDA's logo on their marketing materials or for any other purpose. For these purposes, please contact the Electric Utilities or NYSERDA directly at the contact information in Section 9.

9. Contact Information

NYS Clean Heat Contractor Reference web page http://saveenergyny.ny.gov/nyscleanheat. **page:** http://saveenergyny.ny.gov/nyscleanheat

Submit questions by email to:

Central Hudson:
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NYSERDA
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10. Appendix: NYS Clean Heat Program - Glossary of Terms

This glossary provides definitions of key terms used in the NYS Clean Heat Implementation Plan and Program Manual.

Air-Conditioning, Heating, and Refrigeration Institute (AHRI): A trade association representing manufacturers of heating, ventilation, air-conditioning, refrigeration, and water heating equipment. AHRI provides the database of equipment performance specifications, which is used in this program to determine the rebate amount.

Air Source Heat Pump (ASHP): An HVAC system that provides space heating using electricity through vapor-compression refrigeration cycle. An ASHP extracts heat from outdoor air and transfers the extracted heat into the conditioned spaces via various means. ASHPs are also used to provide space cooling by reversing the cycle to extract heat from a building and transfer the heat to the outside air.

Btu/h: Unit of thermal power capacity that represents one British Thermal Unit (Btu) of energy transferred per hour.

Building Cooling Load (BCL): Building total sensible and latent heat gain in British Thermal Units per hour (Btu/h). For residential buildings, BCL shall be calculated using ACCA Manual J or another code-approved methodology. For commercial buildings, BHL shall be calculated following ANSI/ASHRAE/ACCA Standard 183-2007 (RA2017), or other code-approved equivalent computational procedure. Calculation of the building's design cooling load shall be at the 1% dry bulb cooling design temperature for the most relevant ACCA location.

Building Equivalent Full Load Hours (BEFLH): is for heating and cooling based on building type and location. It represents the equivalent full load operating hours for HVAC equipment based on 1% design temperature, TMY3 weather data, and the design heating load.

- Old, poorly insulated buildings constructed before 1979, before the NY State Energy Code went into effect. This vintage is referred to as the "old" vintage.
- Existing, average insulated buildings conforming to the 1980s era building codes. This vintage referred to as the "average" vintage, covering buildings constructed from 1979 to 2006.
- New construction conforming to the 2007 Energy Conservation Construction Code of New York State (ECCCNYS) for residential buildings. This vintage is referred to as the "new" vintage, and covers buildings constructed from 2007 to present.

Building Heating Load (BHL): Building heat loss in British Thermal Units per hour (Btu/h). For residential buildings, BHL shall be calculated using ACCA Manual J or another code-approved methodology. For commercial buildings, BHL shall be calculated following ANSI/ASHRAE/ACCA Standard 183-2007(RA2017), or other code-approved equivalent computational procedure. Calculation of the building's design heating load shall be at the 99% dry bulb heating design temperature for the most relevant ACCA location.

Central ASHP: An ASHP system that is typically sized to provide heating and cooling to the whole building through an air duct distribution system.

Coefficient of performance (COP): COP is the ratio of work or useful energy output of a system versus the work or energy input, measured in the same units. It is a measure of performance often used for

electrically-powered heating and cooling equipment, with the higher the system COP corresponding to the more efficient operation.

Cold Climate ASHP (ccASHP): A heat pump product listed on the Northeast Energy Efficiency Partnership (NEEP) Cold Climate Air Source Heat Pump (ccASHP) Specification and Product List ("NEEP Product List"), designed to identify air-source heat pumps that are best suited to heat efficiently in cold climates (IECC climate zone 4 and higher). The current specification and listed eligible units are available at (https://neep.org/ASHP-Specification).

Commissioning Report: A report that shows the results of project start-up tests conducted to ensure the system is operating effectively.

Corrective Action: In the Quality Assurance process, action(s) that must be undertaken by a participant at the direction of NYSERDA or the Electric Utility to correct identified nonconformances (i.e., specific deviations or work that fails to meet the established quality standard).

Commercial Unitary (i.e., Large Commercial) ASHP: Large commercial heat pump systems that include individual heat pump appliances that are powered by three-phase electricity or have rated cooling capacities ≥65,000 Btu/h for the individual appliance

Designer: Individual or company that designs heat pump system. Requirements to be an eligible designer in the NYS Clean Heat Program are described in the NYS Clean Heat Program Manual.

Desuperheater: An optional feature of a GSHP system that takes advantage of waste heat generated by the compressor and transfers the waste heat to a domestic hot water system.

Direct Exchange (DX) GSHP: Direct exchange GSHP systems circulate a refrigerant through a buried, closed-loop copper pipe.

Driller: Individual or entity that drills GSHP systems. Requirements to be an eligible driller in the NYS Clean Heat Program are described in the NYS Clean Heat Program Manual.

Energy Efficiency Ratio (EER): A measure of how efficiently a cooling system will operate when the outdoor temperature is 95 degrees Fahrenheit. It is calculated by dividing the rated cooling output at 95 degrees Fahrenheit by the watts used by the AC/HP system. A higher EER means the system is more efficient. It is an instantaneous measure of electrical efficiency, unlike SEER (Seasonal Energy Efficiency Rating), which is an averaged value of efficiency. This is a term applied to air conditioning equipment.

Full Load Heating System: A system installed as a building's primary heating source, with a total system heating capacity that satisfies 90%-120% of building heating load (BHL).

Ground Source Heat Pump (GSHP) system: An HVAC system comprising one or more heat pumps, ground loops, interior distribution systems and terminal units that enables the air and/or water in buildings to be conditioned by exchanging thermal energy with the ground, ground water, or other natural body of water.

Heat Pump System: One or more heat pump appliances installed in a building to provide partial or full load heating and cooling to the building's conditioned space. The heat pump appliances and associated components may be centrally or separately controlled. In a multifamily building in which a central heating plant serves more than one apartment, the heat pump system must be designed and installed to provide heating to all of the individual apartments and common areas otherwise served by the central heating plant.

Heat Pump System Heating Capacity: For buildings whose BHL exceeds BCL, the heat pump system heating capacity shall be as small as possible to satisfy BHL, while minimizing oversizing for the cooling

function to the extent possible with available equipment.

Heat Pump System Cooling Capacity: The sum of the cooling output of all heat pump appliances in the system, expressed in British Thermal Units per hour (Btu/h), at the cooling design temperature used for the building cooling load (BCL) calculation. For buildings whose BCL exceeds BHL, the heat pump system cooling capacity shall be as small as possible to satisfy BCL, while minimizing oversizing for the heating function to the extent possible with available equipment.

Heat Pump Water Heater (HPWH): HPWHs are water heater tanks that heat domestic hot water or process hot water through the use of an onboard air source heat pump that extracts heat from the air in the building surrounding the unit. They use a secondary electric resistance as a back-up to ensure that the water temperature meets the desired setpoint during times of high demand. Air source HPWH models come in two versions (integrated and split-system HPWH) and both versions are eligible for incentives under the program.

Incentive Category: One of nine incentive grouping in the NYS Clean Heat Program reflecting applicable technology type, system size, customer type, and incentive structure. The incentive categories are used to provide clarity regarding eligibility and are as follows:

- Category 1 *ccASHP: Partial Load Heating*
- Category 2 *ccASHP: Full Load Heating*
- Category 3 *GSHP: Full Load Heating*
- Category 4 *Custom*
- Category 5 *HPWH (up to 120 gallons of tank capacity)*
- Category 6 *Commercial HPWH (above 120 gallons of tank capacity)*
- Category 7 *GSHP Desuperheater*
- Category 8 *Dedicated DHW WWHP*
- Category 9 *Simultaneous Installation of Space Heating & Water Heating*

Installer: Individual or entity that installs a heat pump system. Requirements to be an eligible installer in the NYS Clean Heat Program are described in the NYS Clean Heat Program Manual.

International Ground-Source Heat Pump Association (IGSHPA): An association established to advance GSHP technology, which conduct geothermal research and installer training and accreditation.

Mini-Split Heat Pump (MSHP): A type of ccASHP that can circulate refrigerant between an outdoor unit containing a variable capacity compressor and one or more indoor air handlers. MSHPs are often referred to as “ductless mini-splits” because they are typically ductless. These units can also be installed with short duct runs that enable single air handlers to serve more than one room at a time.

MMBtu of Annual Energy Savings: Estimation of first-year site energy savings, which accounts for both the decreased fuel and the change in electricity consumed at the site.

Nonconformances: In the Quality Assurance process, specific deviations or work that fails to meet the quality standard established for program requirements, industry standards and quality requirements.

Partial Load Heating System: A partial load heating system is a system installed in addition to an existing heating system, and which has a total heat pump system heating capacity that satisfies <90% of BHL.

Participating Contractor: ASHP and GSHP designer and installer that is eligible to apply for and receive incentives under the NYS Clean Heat Program. To become a Participating Contractor, an entity must submit the statewide Participating Contractor Application and a Contractor Participation Agreement for each Electric Utility service territory where work will be performed (available at http://saveenergyny.ny.gov/nyscleanheat). Upon approval, the applicant will receive an approval notification from the Electric Utility and become eligible to apply for incentives in the Program. GSHP drillers must also be approved through this process to become a "participating driller," but are not eligible to submit for and receive incentives. Each GSHP installation must be completed by a participating driller. Contractors installing only HPWH do not have to be a Participating Contractor to submit an incentive application on behalf of a customer.

Variable Refrigerant Flow Heat Pump (VRF): VRF systems circulate refrigerant between a variable capacity compressor and multiple indoor air handlers, each capable of individual zone temperature control. VRF systems can be built with heat recovery and cooling capabilities that allow simultaneously heating to some zones and cooling to other zones.