Product Specifications

NYSERDA is seeking innovative proposals for the development and demonstration of advanced, cold-climate rated, high-efficiency Packaged Terminal and Through-Wall Heat Pumps tailored for the New York market. Proposals must comprehensively address both Market and Site Requirements stated in this attachment. Manufacturers are encouraged to highlight where their proposals exceed specifications. If they cannot fulfill a requirement, they should clarify why the requirement is not critical to heat pump adoption in every retrofit opportunity.

Market Requirements

Physical Fitment Compatibility

It is crucially important for the heat pumps resulting from the program to be physically compatible with existing standard size PTACs, PTACs in hydronic cabinets and through-wall ACs because these products are widespread in existing buildings across the state. Retrofitting existing units with compatible heat pumps minimizes costly structural changes, reduces installation complexity and ensures rapid deployment of heat pump solutions. Proposed heat pumps should be designed to fit one or more of the following categories:

1. **Standard Size Packaged Terminal Air Conditioning (PTAC)**

   The proposed heat pumps must be compatible with wall sleeves designed for standard size PTACs with integrated electric resistance or gas heat, having an external wall opening greater than, or equal to, 16 inches high; or greater than, or equal to, 42 inches wide, as defined in 10 CFR 431.92.

2. **PTAC in Hydronic Cabinets**

   The proposed heat pumps must fit within the PTAC space, including the width, length and depth dimensions of the existing unit in cabinets with hydronic heating coils, allowing for retrofit while maintaining compatibility with current hydronic heating. For example, the prototype must be compatible with common existing PTAC sizes such as:

   - 16" H x 42" W
   - 15 1/2" H x 40 3/4" W
   - 15 1/2" H x 36 3/4" W

3. **Through-the-Wall Air Conditioning (AC)**

   The proposed heat pumps must be compatible with common Through-the-Wall AC (TTWAC) sizes, such as:

   - 14 1/4" H x 24 1/4" W
   - 15 3/4" H x 26" W
   - 15 3/4" H x 23 3/4"

Additional Fitment Compatibility Considerations

- Manufacturers may offer flexible installation options, potentially including modular designs or adjustable components, to accommodate variations in wall thickness and sleeve depths across these categories.
- Manufacturers may include necessary adapters, trim kits, adjustable flanges and façade grilles to ensure proper fit and air sealing for various existing wall opening configurations.
- Manufacturers must provide clear documentation on compatibility with:
  - Standard opening sizes and types
  - Known non-standard sized PTAC makes and models commonly found in the New York market
  - Any limitations or special installation requirements for each configuration

Heating Performance

A well-designed heat pump must deliver efficient cold-climate heating without dramatically increasing the utility burden on occupants, ensuring that both comfort and cost-effectiveness are maintained throughout the winter season.

- Meet or exceed the requirements of the NEEP Cold Climate Air-Source Heat Pump Specification (Version 4.0) for PTHPs.
- Maintain 100% heating capacity down to 5°F outdoor air temperature without electric resistance heating.
- Demonstrate sustained heating operation at outdoor air temperatures down to -15°F (-26°C) without electric resistance heating.
- Implement an efficient defrost strategy to manage frost buildup on outdoor coils, maintaining effective operation down to at least -15°F (-26°C).
- Achieve a winter seasonal coefficient of performance (sCOP) of 3.0 or higher, ensuring on-par or lower heating costs compared to gas-fired furnaces and boilers across all climate zones in New York State. NYSERDA understands that demonstrating this performance may require manufacturers to propose alternative testing schemes beyond current market standards. The testing should account for the full range of outdoor temperatures and the number of hours at each temperature. To accurately predict operating costs, the testing must cover the entire temperature range and typical annual hours in New York, ensuring performance aligns with real-world conditions. Manufacturers must:
  - Describe methodology for calculating the winter Seasonal COP, including considerations for defrost cycles, low-load performance and performance at various outdoor temperatures representative of New York State climate zones.
  - Propose testing protocols that accurately reflect real-world operating conditions in New York State, potentially including extended low-temperature testing and low-load operations.
  - Provide comparative analysis showing how the proposed heat pump's heating costs align with or improve upon those of gas-fired heating systems across different building types and climate zones in New York State.
  - Identify any third-party verification or certification processes that could validate the claimed performance metrics.

Cooling Performance

Cooling efficiency is also important as many occupants may expand their air conditioning usage when upgrading from older PTACs, through-wall and window ACs. These legacy systems often underperform, prompting limited use, especially during peak cooling periods. With more effective heat pumps, occupants are likely to increase cooling usage, making it essential that the system operate efficiently to prevent excessive energy consumption and higher utility costs.

- Achieve a minimum SEER2 rating of 18.0, demonstrating competitive energy savings and reduced cooling costs comparable to other air-source heat pump products, including mini-split systems.
- Provide latent cooling for humidity control at part-load operations to manage high humidity conditions, preserving high efficiency during shoulder seasons, delivering comfort without lowering setpoints, minimizing indoor condensations, mold and mildew.

Acoustics

Manufacturers should articulate how their heat pump represent a significant acoustic improvement over current PTAC technology, detailing their approach to achieving the quietest possible operation while maintaining effective heating and cooling performance. Examples are:

- Strive for indoor sound pressure levels of 35 dB(A) or lower measured at 1 meter from the indoor unit.
- Include an analysis of the potential quality of life improvements for residents resulting from the reduced noise levels, particularly in terms of sleep quality and overall comfort.
- Detail the approach and technologies employed to achieve noise reduction compared to conventional PTACs, such as:
    - Advanced compressor and fan designs
    - Improved insulation and vibration dampening
    - Optimized airflow pathways

Energy Recovery Ventilation

In many older New York multifamily buildings, dedicated outdoor air is often provided only by opening windows, which can compromise energy efficiency. Improving ventilation is key to enhancing indoor environmental health and energy recovery ensures that fresh air is introduced without significantly raising energy costs.

- The system must operate in three modes for outdoor air delivery: occupied mode, providing full ventilation; unoccupied mode, reducing outdoor air delivery for energy savings; and off mode, halting ventilation when not required.
- Ventilation capability to deliver at least 48 CFM of outdoor air in occupied mode, based on a room with 4 occupants and an area of 300 square feet. This airflow is calculated as a combination of 7.5 CFM per occupant and 0.06 CFM per square foot of the room's area, following the guidelines of ASHRAE Standard 62.1-2019 to ensure proper indoor air quality.
- Reduce outdoor air delivery during unoccupied mode to improve energy efficiency.
- Unoccupied mode may be integrated with off mode for existing products where adding a distinct unoccupied ventilation mode would require extensive reengineering.

- The heat pump must be equipped with an energy recovery module that achieves an efficacy of at least 60% during occupied mode and at least 50% during unoccupied mode. The recovered thermal energy must be used to precondition outdoor air before introducing it into the indoor environment to ensure maximum energy efficiency and indoor air quality.

Controls & Grid Integration

Intelligent controls and grid integration are essential for optimizing the performance and efficiency of heat pumps in New York's buildings. Smart controls allow for precise management of heating and cooling based on occupancy, reducing energy waste and enhancing comfort. Grid integration enables coordination with utility demand response programs, helping to manage peak loads and reduce energy costs. The following are examples:

- Wi-Fi connectivity for remote monitoring, centralized management and seamless integration with building management systems.
- Include a proprietary external smart thermostat or be compatible with third-party wireless smart thermostats to enhance user control and optimize energy usage.
- Automate transitions between occupied and unoccupied modes to maximize efficiency based on real-time occupancy.
- Support utility or aggregator control, allowing modulation of unit operation for participation in demand management and demand response programs, helping to optimize grid performance and balance energy loads.
- Facilitate participation in demand cost reduction initiatives and demand response programs, enabling cost savings and support grid resilience.
- Coordinating the operation of all heat pumps in a building by staggering compressor start-ups to reduce peak coincidental loads.

Gaskets & Insulation

Heat pumps shall be designed to effectively prevent air leakage, minimize energy losses and reduce thermal bridging, while also managing condensate. Proper sealing, insulation and drainage are crucial to optimizing the heat pump's operations and ensuring durability in a variety of building conditions. The following are examples:

- Include durable and replaceable gaskets to seal the heat pump chassis to the wall sleeve, ensuring long-term performance and ease of maintenance.
- Provide isolations between heat pump sections to minimize crossflow leakage and reducing energy waste.
- Incorporate insulation on indoor-facing panels to minimize thermal losses, maintaining indoor temperature and reducing energy consumption.
- Design flexible pathways for condensate drainage to the building exterior, preventing water buildup and ensuring reliable operation in various climate conditions.

Maintenance & Serviceability

The design should prioritize ease of maintenance and serviceability to reduce downtime, minimize operational costs, and ensure long-term reliability, while also reducing disruption and inconvenience to occupants. By making routine tasks simpler and providing clear diagnostics, facility personnel and occupants can perform maintenance efficiently, ensuring the unit operates at peak performance with minimal impact on residents. The following are examples of features to enhance maintenance and serviceability:

- Allow easy, no-tool frontal access to filters, enabling quick replacements without specialized tools.
- Design the unit to facilitate ease of performing regular cleaning and repairs, reducing service time and increasing system uptime.
- Provide clear, human-understandable fault descriptors for common failure modes, aiding in accurate and efficient diagnostics and troubleshooting.
- Position electrical connections in easily accessible locations to simplify installation reducing complexity and time required for installation or removal.
- Designed with non-proprietary filters that are widely available through multiple sources, ensuring convenient and cost-effective replacements.

Site Requirements

Understanding and accommodating site requirements is crucially important to ensure the successful installation and operation of PTHPs or through-wall heat pumps in New York State’s buildings. Proposers must demonstrate a thorough understanding and appreciation of these site-specific conditions to ensure their product is suitable for immediate real-world applications. Ensuring compatibility with common building configurations will streamline retrofitting processes and reduce the potential for installation challenges. The following highlight important site requirements that proposers should consider:

- **Heating and cooling capacity:** The product must match the heating and cooling capacity needs of the site and individual rooms. The manufacturer may decide whether to offer a single product or a range of products to accommodate varying room sizes and climate zones, ensuring the ability to adequately heat and cool indoor environments.
- **Through-wall sleeve dimensions:** The product should be compatible with the actual existing wall openings, including standard size PTAC and through-the-wall AC configurations, to ensure seamless retrofits without requiring major construction.
- **Hydronic PTAC cabinet dimensions:** For installations in hydronic PTAC cabinets, the PTHP must be designed to fit within the existing volume of the current PTAC unit, ensuring that the PTHP can be installed without modifying the cabinet. Once installed, the cabinet must be able to close properly, maintaining its original appearance and functionality.
- **Electrical compatibility:** The heat pump should ideally be designed to reuse the existing electrical wiring and operate on the available voltage and amperage of the existing PTAC and through-wall AC installations, including those in hydronic PTAC cabinets. This ensures that retrofits can be completed without the need for costly electrical upgrades or rewiring.
- **Condensate management:** The heat pump should offer flexibility to accommodate the site owner's preference for condensate discharge, whether through external drainage, internal evaporation, or other methods. This ensures that the system can be tailored to the specific needs and constraints of the building, preventing water damage and maintaining reliable operation.

- **Ease of installation and serviceability:** The heat pump should allow for straightforward installation and maintenance, minimizing the need for specialized tools or expertise, and ensuring accessibility for regular servicing.
- **Other:** The heat pump must also account for additional site, building, and apartment-specific situations that could impact ease of installation, performance, and maintenance.