

Matter Number 16-00681, In the Matter of the Clean Energy Fund  
Investment Plan

# Clean Energy Fund Investment Plan: Products Chapter

Portfolio: Market Development

**Submitted by:**

**The New York State Energy Research and Development Authority**

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Clean Energy Fund Investment Plan:  
Clean Energy Products

<b>Revision Date</b>	<b>Description of Changes</b>	<b>Revision on Page(s)</b>
May 8, 2017	Original Issue	Original Issue
November 8, 2018	<ul style="list-style-type: none"> <li>• Updated savings and budget to reflect current program goals and progress, including a shift in budget to allocate a larger portion of the budget to ASHP activities</li> <li>• Updated the timing of milestones to reflect current program activities and timelines.</li> <li>• Expanded the advanced rooftop unit initiative to encompass a wider group of advanced commercial HVAC systems.</li> <li>• For product and appliance standards, added activities, budget, savings, and milestones, as well as market status and engagement plans.</li> <li>• Expanded product and appliance standards in the logic model.</li> </ul>	Multiple

# 1 Clean Energy Products

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Through its Clean Energy Products strategy, NYSERDA will implement approaches and interventions that accelerate the adoption of certain underutilized clean energy products – those with proven energy savings but limited adoption – by working to develop supply chains and service networks, as well as through supporting product and appliance standards that set minimum energy performance requirements for commercial products. Accelerating adoption of these products requires that they are available in the market and supported by key actors, such as distributors and contractors. Key stall points and barriers must be identified and addressed throughout the supply chain to increase stocking and servicing. Tools to help market actors empower their customers to make informed decisions must be readily available for use, awareness and trust among consumers must be increased to spur adoption, and regulations must become increasingly stringent to help customers save energy.

NYSERDA will focus initially on cold climate Air-Source Heat Pumps (ASHPs) and advanced commercial heating, ventilation, and air conditioning (HVAC) products. Technologies in these areas offer customers improved performance over other code-compliant HVAC technologies, with reduced energy bills and a lower carbon footprint. While they have not yet been widely adopted in New York, each technology utilizes mature supply chains and has support from regional and national organizations to develop shared resources. The initiative will aim to overcome barriers impeding progress including lack of availability in the local supply chain, higher upfront cost, lack of consumer awareness and education related to performance and savings, and lack of contractors with the knowledge and experience to sell and install high-performance products.

When the initiative was initially filed, it was anticipated that the advanced commercial HVAC strategy would focus on advanced rooftop units (ARTUs). However, this modification broadens the focus due to emerging opportunities with technologies like variable refrigerant flow (VRF) HVAC equipment in commercial and multifamily buildings. The ASHP program, focused on cold climate ASHPs in residential and multifamily applications, launched in fall 2017, and is continuing as designed in the modification. The focus on upstream tools, resources, and incentives to support growth in ASHPs products sales through manufacturers and distributors is designed to complement activities described in the Heat Pumps and Solar Thermal initiative in the Renewable Heating and Cooling Chapter. There the focus is on more general awareness of renewable heating and cooling generation and cost reductions through community campaigns and other activities that can improve cost effectiveness in the long-term.

In addition, to these supply-chain interventions, NYSERDA will also support activities related to product and appliance standards in New York for product categories that are not currently covered by federal standards. These cost-effective standards will save customers money on their utility bills, while at the same time significantly reducing GHG emissions. This modification adds funding and activities to support these activities.

Program investments and activities will continue to be informed through ongoing research, technical analysis, and engagement with stakeholders and subject matter experts.

# 1.1 Underutilized Product Support

## 1.1.1 Overview

<p><b>Present Situation</b></p>	<ul style="list-style-type: none"> <li>• Energy efficiency technologies continue to show improved performance, lower energy use and decreasing costs. However, some proven technologies continue to be underutilized. Matching these underutilized technologies to market needs is key for future success.</li> <li>• NYSERDA’s engagement with the market has identified several barriers that are limiting consumers’ awareness, acceptance, and ultimately broader adoption of these underutilized technologies, including lack of availability in the local supply chain, higher upfront costs, lack of trusted documentation of energy and cost impacts, lack of sizable contractor participation in installation and sales trainings, and lack of consumer awareness and education on the benefits of the technologies.</li> <li>• NYSERDA will initially focus on two underutilized HVAC technology categories, advanced commercial HVAC and air source heat pumps (ASHPs), that have shown through pilots and demonstrations that efficient deployments can match the comfort and exceed the performance provided by incumbent technologies.</li> <li>• According to internal research currently underway, advanced commercial HVAC technologies like variable refrigerant flow heat pumps (VRFs) have the potential to offer a 60%-90% reduction in annual on-site fossil fuel consumption while providing up to a 28% reduction in annual electricity consumption, depending on building size and type. By moving heat rather than producing heat, ASHP can heat and cool a space two to four times more efficiently than more traditional code-compliant heating and cooling equipment, saving an average customer more than \$500 per year on their energy bills. Despite these demonstrated savings, neither technology has been widely adopted in the US market.</li> <li>• Globally, ASHPs are well accepted in residential applications – they currently make up an estimated 98% of the Asian residential HVAC market and 50-70% of the European market. However, despite the international popularity, they have been slow to take hold in the U.S. and make up less than 5% of the residential market in New York.<sup>1</sup></li> <li>• In addition to targeting specific underutilized products, product standards can also drive savings. However, recently the federal government has sought to scale back its role in the setting and enforcing of new product and appliance efficiency standards. This change makes the need for action at the state level increasingly necessary to maintain the progress and success of standards in categories not currently covered by federal standards.</li> <li>• States like Connecticut, California, and Washington have been promoting product standards for years, signaling the national trend toward more rigorous energy efficiency standards and creating opportunity for collaborative efforts.</li> <li>• Moreover, state work on product standards would lay the foundation for future federal action, mirroring regulations currently placed on devices such as air conditioners and refrigerators, which have effectively reduced consumer and business energy usage and costs for nearly 30 years.</li> </ul>
<p><b>Intervention Strategy</b></p>	<p>The initiative will work to bolster availability of advanced products in the supply chain, expand demand for more advanced HVAC technologies among end-users, and support successful business models in the market to increase sales. Continued monitoring and research of underutilized technologies will complement this work to better inform additional technologies to target through these tactics. NYSERDA will:</p> <ul style="list-style-type: none"> <li>• Increase awareness of and demand for underutilized products, initially focusing on advanced commercial HVAC systems and ASHPs, by developing tools such as cost</li> </ul>

<sup>1</sup> Optimal Energy Inc., *Heat Pumps Potential for Energy Savings in NYS*, 26.

	<p>comparison calculators, case studies, and engaging in additional marketing and outreach efforts. These tools and education materials will provide contractors with verified, independent information to provide to customers, allowing them to make more informed decisions when choosing an HVAC technology.</p> <ul style="list-style-type: none"> <li>• Create a centralized database of all manufacturer trainings and distribute to contractors.</li> <li>• Provide incentives to distributors or contractors to decrease retail costs.</li> <li>• Test and validate HVAC sales models, such as equipment leasing, investing in successful models to reduce the risk for market actors such as contractors and energy services companies.</li> <li>• For ASHPs, encourage displacement of more traditional code-compliant heating equipment rather than full replacement, in recognition that ASHPs on their own will not always provide the required building heat load. The goal is to displace a large percentage of heating load to eliminate significant amounts of fossil fuel ignitions on site. In this situation, high efficiency ASHPs can operate efficiently for much of the year. Initial focus will be on cold-climate ASHPs, but other high-efficiency ASHPs can produce similar savings at lower costs if they are sized properly, especially in Climate Zone 4 and in commercial spaces.</li> </ul> <p>In addition, to these supply-chain interventions, NYSERDA will also support activities related to the development, promulgation, compliance, and enforcement of product and appliance standards for categories not currently covered by the federal government.</p> <ul style="list-style-type: none"> <li>• NYSERDA will work to provide clear information on the opportunities that emergent standards (not currently preempted by federal standards) provide New York State, and inform program opportunities that will save customers money on their utility bills, while at the same time significantly reducing GHG emissions. This effort will be coordinated with other states, such as California, to make industry compliance easier.</li> <li>• For a visual representation of this strategy, please reference the flow charts entitled “Logic Model: Products”, which can be found in Appendix A.</li> </ul>
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Reduce costs to purchase and install underutilized technologies.</li> <li>• Increase availability of efficient and underutilized products in the supply chain.</li> <li>• Increase installations of efficient and underutilized products.</li> <li>• Improve the quality of installations.</li> <li>• Increase customer awareness of and confidence in the benefits of efficient and underutilized technologies.</li> <li>• Advance product standards for product and appliance categories in New York not currently covered by federal standards.</li> </ul>
<b>State Energy Plan/Clean Energy Standard Link</b>	<ul style="list-style-type: none"> <li>• The 2015 New York State Energy Plan calls on NYSERDA to “address supply chain limitations and lack of knowledge of clean and efficient product options” in the market. Furthermore, it suggests NYSERDA should focus on upstream supply chain barriers through partnerships with manufacturers, distributors and contractors, as well as retail level education, outreach, and training.</li> <li>• Additionally, the 2018 <i>New Efficiency: New York</i> white paper calls on NYS to promote product and appliance standards.</li> <li>• Together, these efforts can help increase market share of underutilized technologies which can help to reduce costs and greenhouse gas emissions.</li> </ul>

### 1.1.2 Target Market Characterization

<b>Target Market Segment(s)</b>	<ul style="list-style-type: none"> <li>• The target market for advanced commercial HVAC interventions is small to medium businesses, particularly retail and food chains which may facilitate scaling in the market. NYSERDA will also target businesses with aging HVAC systems, such as office and multi-tenant light commercial buildings.</li> </ul>
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	<ul style="list-style-type: none"> <li>• The target market for ASHPs is residential customers who heat with fuel oil/propane or electricity, particularly those who are interested in installing central air conditioning, creating the most cost-effective solution for customers in terms of savings potential and installation.</li> </ul>
<b>Market Participants</b>	<ul style="list-style-type: none"> <li>• HVAC Contractors</li> <li>• HVAC Distributors</li> <li>• HVAC Manufacturers</li> <li>• Energy Service Companies</li> <li>• Engineers, architects, and HVAC and building operator trade groups</li> <li>• NYS Electric Utilities</li> <li>• NYS Local Governments</li> <li>• NYS Communities</li> <li>• New York Department of State</li> <li>• Product &amp; appliance manufacturers</li> <li>• Product &amp; appliance distributors</li> <li>• Product &amp; appliance retailers</li> <li>• Contractors</li> <li>• Regulators at the state, national, and international levels</li> </ul>
<b>Market Readiness</b>	<p><u>Advanced Commercial HVAC systems</u></p> <ul style="list-style-type: none"> <li>• Distributors and manufacturers have expressed interest in support from NYSERDA in the form of third party verified tools and marketing, as well as incentives to lower the upfront costs to help increase demand for the technology they are currently selling.</li> <li>• The use of alternative business models, such as equipment leasing, that are currently implemented in Europe may provide an opportunity to increase quality installation, maintenance, and inventory of Advanced Commercial HVAC systems in New York.</li> </ul> <p><u>Air Source Heat Pumps</u></p> <ul style="list-style-type: none"> <li>• Market demand for ASHPs is beginning to increase in New York. HVAC contractors indicate that ASHPs have gained popularity as a cost-effective alternative to window or central air conditioning, especially in older building stock without ducting, but action is needed to accelerate their adoption.</li> <li>• Manufacturers, distributors, and contractors have indicated that third party validation for their savings and comfort claims, support for contractor training, and contractor incentives to encourage stocking and selling of these units and potentially reduce customer first costs would provide needed support as they seek to grow the market for these products.</li> <li>• Other northeast states have exceeded NY in ASHP sales by as much as 30%<sup>2</sup>, indicating the efficacy of existing efficiency programs in the northeast.</li> </ul> <p><u>Product &amp; Appliance standards</u></p> <ul style="list-style-type: none"> <li>• Studies have shown that New York State has numerous opportunities to cost-effectively address product and appliance standards that are not currently preempted by federal actions.<sup>3</sup></li> <li>• States like Connecticut, California, and Washington have been promoting product standards for years, laying a foundation for collaboration and consistency among and between states.</li> <li>• Organizations like the US Climate Alliance, Appliance Standards Awareness Project, and Northeast Energy Efficiency Partnership will provide mechanisms for better coordination and effectiveness across states to ease updates and adoptions to standards, as well as maintain consistency.</li> </ul>

<sup>2</sup> NYSERDA Ductless Mini-split Heat Pump Market Characterization Study March 2017

<sup>3</sup> States Go First, Report A1702, Appliance Standards Awareness Project, July 2017

<b>Customer Value</b>	<ul style="list-style-type: none"> <li>• Manufacturers will see increased sales volume because of promotional and outreach support.</li> <li>• Distributors and contractors will see increased sales volume and faster payments, resulting in increased profit and greater cashflow.</li> <li>• Through sales and installation support, HVAC Contractors and other service providers will gain the tools and knowledge needed to better understand and effectively sell Advanced commercial HVAC products and ASHPs. Improved installations will also result in fewer call-backs and more satisfied customers.</li> <li>• End use customers will have access to more reliable and consistent product information that can be used to make more educated decisions on capital investments.</li> <li>• Ultimately, the adoption of underutilized technologies because of supply chain interventions and product standards will lead to energy bill savings, carbon reduction, and greater comfort for end use customers.</li> </ul>
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### 1.1.3 Stakeholder/Market Engagement

<b>Stakeholder/Market Engagement</b>	<ul style="list-style-type: none"> <li>• NYSERDA has and will continue to conduct in-person meetings and webinars with contractors, distributors and manufacturers to discuss key stall points and barriers, including increasing the number of qualified contractors, and boosting availability and sales across the state. Interviews with potential partners and customers will provide real time feedback and insight on what kind of market support is needed. To-date, these interactions have helped to understand the current HVAC market and find places where NYSERDA can effectively intervene to promote more efficient and controllable products.</li> <li>• Coordination will continue with the City of New York, which is focusing on decarbonizing residential heating through the OneNYC plan, to identify opportunities to foster public-private collaborations that can scale deployment of residential renewable heating and cooling (RH&amp;C) technologies, particularly ASHPs</li> <li>• NYSERDA will also continue to participate in the HVAC working groups for Northeast Energy Efficiency Partnerships (NEEP) and Consortium for Energy Efficiency (CEE) to share market insights and trends through research and peer exchanges.</li> <li>• NYSERDA will continue to engage with stakeholders, including trade associations, regulatory bodies, environmental organizations, and market actors, to inform product standards work. Outreach and engagement will occur regularly and take many forms, including through pre-rulemaking research and negotiations to create technologically feasible and market accessible standards that are cost-effective; and with other regulatory bodies to share learnings and create consistency in the market.</li> </ul>
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### 1.1.4 Theory of Change

<b>Market Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• <b>Higher upfront cost than standard HVAC technology:</b> Decisions by customers on HVAC technologies are often made at the time of failure and are based on cost and availability. New technologies tend to have higher initial costs due to more expensive components, lack of contractor experience with the technology (which may impact contractor bids), and low stocking and increased opportunity cost. By focusing on specific technologies with incentives to drive down cost, and tools to improve bidding, adoption will increase and eventually drive down costs. Because of increased awareness of life cycle advantages, customers will be more willing to accept higher first costs in return for savings and comfort.</li> </ul>
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	<ul style="list-style-type: none"> <li>• <b>Lack of understanding by contractors of energy, cost, and peak demand savings impacts:</b> Customers and market actors are often not as comfortable with the potential cost and energy savings associated with a new technology. While the technology may have been in the market for a while, without wide adoption, there is not a popular consensus that contractors and customers can rely on. Providing verified, independent savings information (leveraging data and tools from pilot projects and regional and national partners) will provide consistent information and increase market confidence.</li> <li>• <b>Lack of sizable contractor participation in quality installation and sales training:</b> Customers rely on information from their HVAC contractors to inform quick turnaround decisions, and if contractors are not well-informed about new technologies, and not comfortable selling and installing them, they will not recommend a new product. Having trainings easily accessible to contractors will increase their participation and increase the chances of them selling new products.</li> <li>• <b>Lack of consumer awareness:</b> With new technology products, if a customer does not know about them, they are unlikely to purchase them, especially if there is a price premium. By working with current market actors to amplify their messages through joint campaigns, and helping them to more effectively identify potential customers, customer awareness can be increased.</li> <li>• <b>Lack of action at the national level:</b> Without actions on new and updated product standards at the federal level, manufacturers of commodity products have little incentive to improve efficiency. State product standards, especially when actively coordinated across multiple states, can help address this gap in select categories not currently preempted by federal standards.</li> </ul>
<b>Testable Hypotheses</b>	<ul style="list-style-type: none"> <li>• If NYSERDA promotes installation training for underutilized technologies, more contractors will learn how to properly install these products based on manufacturer specifications, ensuring quality installations and reducing customer call-backs.</li> <li>• If NYSERDA supports and promotes accurate savings calculators for underutilized technologies, giving contractors an independent tool to demonstrate the savings and payback to customers, sales of these products will increase.</li> <li>• If NYSERDA offers manufacturers and contractors the opportunity to collaborate or co-brand on consumer awareness and educational campaigns, then adoption of and demand for these products will increase.</li> <li>• If NYSERDA provides incentives to distributors and/or contractors to increase the stocking, promotion, and sales of underutilized products, they will become more widely available and sales will increase.</li> <li>• If NYSERDA promotes sales trainings, contractors will learn the benefits and selling points of underutilized products and be better able to promote the technology to their customers.</li> <li>• If NYSERDA supports the development of a mapping tool to assist manufacturers, distributors and contractors in targeting prime candidates for the underutilized technology, then an increase in the adoption of these systems will occur.</li> <li>• If New York State promulgates new state level product standards in partnership with stakeholders and other states, more efficient products and appliances will be sold in New York, reducing usage of energy, water and emissions of greenhouse gases.</li> </ul>
<b>Activities</b>	<p><b><u>Tools &amp; resources for contractors</u></b></p> <p>As new products and services come into the market, contractors need new tools and resources to learn about the technology, including how to sell and install it. They also need to demonstrate to customers that this new technology is worth the investment. To ensure that contractors are prepared for new technologies, NYSERDA will:</p> <ul style="list-style-type: none"> <li>○ <b>Facilitate information sharing:</b> Leverage existing tools and resources already in the market from partners like NEEP and DOE’s Better Buildings Campaign, adapt them to New York State-specific needs, and expand their use and deployment throughout the supply chain to create consistent and effective messaging in the market</li> </ul>



- **Develop efficiency & cost calculators:** Collaborate to develop and disseminate energy and cost savings assessment tools that can be used by contractors to demonstrate trustworthy savings estimates to customers.
  - Promote and encourage contractor use of a calculator, as a sales tool to demonstrate advanced commercial HVAC savings and benefits to potential customers.
  - Issue a competitive solicitation to develop a third-party validated cost-savings savings calculator that HVAC distributors and contractors can utilize to more accurately provide customers with unbiased estimates of energy and cost savings (especially related to fuel switching and displacement of existing heat) associated with ASHP installations.
- **Promote mapping tool:** Develop and disseminate a mapping tool for contractors to identify targeted geographic areas that are good candidates for ASHPs (i.e. homes heating predominately with oil).
- **Develop and disseminate contractor training opportunities:**
  - Assess availability of installation trainings to ensure contractors are being trained to install the systems in a high-quality manner, and sales trainings to ensure that contractors are being trained to communicate the benefits meaningfully and consistently to prospective customers.
  - Collaborate with HVAC manufacturers and distributors and regional partners (e.g. NEEP) on the development and dissemination of additional installation and sales trainings to fill any demonstrated training gaps (e.g. installation training specific to cold-climates).
  - Promote sales training through supporting and co-branding existing manufacturer training, as well as by identifying sales tools and resources to assist contractors with bids and transactions.
  - Increase availability and access to contractor training by developing and sharing an online training database with trade group, distributor and manufacturer websites.
  - Work with utility programs to share this information with existing contractor networks to maximize participation.
  - Perform random quality checks on installed systems to ensure that contractors are installing systems properly.

**Consumer awareness & education**

In the HVAC space, awareness and timing are key issues that must be addressed. Customers often do not have full knowledge of the available products, and even when they do, often default to the least expensive option. This impact is amplified because decisions are often made in a reactionary manner that requires products to be in stock immediately. To address these issues, NYSERDA will:

- **Provide marketing & outreach support**
  - Develop promotional messages and materials, including case studies, to increase consumer awareness on the benefits of these technologies and disseminate in the market. These efforts will be tightly coordinated with manufacturers and distributors to help amplify their messaging in the market.
  - Issue a standard offer first come, first served solicitation to support opportunities to promote awareness and education in the market. This could support activities like co-op advertising to expand existing campaigns and outreach in the market.
  - Create peer exchanges to enable building owners that have adopted these technologies to share the benefits with owners that are considering making investments, thus increasing awareness of the technologies.
- **Enable customer targeting & acquisition**
  - Issue an RFP to identify ways to find and contact customers at or in advance of key decision points (e.g. through permitting data).

- **Expand data availability**

- Continue participation in HVAC working groups with DOE, NEEP, and CEE to share program insights and strategies to increase technology availability and adoption.

**Midstream incentives**

The first cost for these advanced systems continues to be higher than standard code compliant equipment.

- **Launch incentive program**

- Issue standard offer, first come, first served solicitation to provide incentives to distributors and/or contractors to decrease the wholesale cost of the products and encourage sales, stocking, service expansions, and/or promotion of early retirement or displacement.

**Technology & business model analysis**

While the underlying technology associated with these products and the business models used to deliver them to market are proven, there is room to improve both areas.

- **Technology solicitation**

- Research and prioritize opportunities in the advanced commercial HVAC space
- Issue a competitive solicitation for technology pilots to identify and deploy solutions for the integration of traditional and advanced systems in the residential and small commercial markets, based on current technologies and strategies being deployed in other sectors.

- **Business model solicitation**

- Issue a competitive solicitation to test and validate alternative business models for HVAC service and equipment, encouraging HVAC contractors, vendors, and ESCOs to adopt alternative business models by providing incentives to reduce the risk of implementing new methods or expanding current offerings. Some examples include efficiency-as-a-service, equipment leasing, and energy service agreements. If successful, NYSERDA will issue an open solicitation to scale and expand the validated alternative business models.

**Product & Appliance Standards**

- **Research & Outreach**

- Provide technical, market, and stakeholder analysis and support for potential state and federal appliance and product standards.
- Conduct studies to determine whether a new standard should be established, considering factors including potential impact on electricity usage, product availability, consumer and environmental benefits, and manufacturing costs, as well as research completed, and actions taken by other states and stakeholders
- Work closely with other regulatory authorities and stakeholders at the state, national, and international levels to share findings, collaborate on strategies, and ensure compliance.

- **Technical & Regulatory**

- Develop technical requirements and testing protocols for proposed standards. Work with technical consultants procured through a competitive solicitation and partner with market actors, trade associations, stakeholders, testing bodies, and other regulatory authorities to determine what standards are technically feasible and cost effective for manufacturers and consumers. This work will leverage and build on research and actions from other states and stakeholders to inform these standards.
- In conjunction with the New York Department of State and with outside consultant support procured through a competitive solicitation, develop and implement processes for compliance and enforcement, building on the work of other states and authorities.

<p><b>Key Milestones</b></p>	<p><b><u>Milestone 1 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Release solicitation for shared awareness &amp; education campaigns, as well as customer targeting and acquisition.</li> </ul> <p><b><u>Milestone 2 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation for technical analysis related to product and appliance standards.</li> </ul> <p><b><u>Milestone 3 (2017)</u></b></p> <ul style="list-style-type: none"> <li>• Launch open enrollment incentive program for ASHPs.</li> </ul> <p><b><u>Milestone 4 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• HVAC trainings assessed and compiled to facilitate increased contractor participation.</li> </ul> <p><b><u>Milestone 5 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Case studies developed and deployed in the market, along with current resources from regional and national organizations.</li> </ul> <p><b><u>Milestone 6 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation to support the development of product standards.</li> </ul> <p><b><u>Milestone 7 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Mapping tool for ASHP potential released in the market.</li> </ul> <p><b><u>Milestone 8 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation to identify and test alternative business models.</li> </ul> <p><b><u>Milestone 9 (2018)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation for pilots to identify and deploy solutions for the integration of traditional and advanced systems, such as ASHPs.</li> </ul> <p><b><u>Milestone 10 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Issue open solicitation to expand alternative business models based on results from competitive solicitation in 2018.</li> </ul> <p><b><u>Milestone 11 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Efficiency &amp; cost calculator released in the market.</li> </ul> <p><b><u>Milestone 12 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Issue competitive solicitation to support compliance with product standards, in conjunction with other states.</li> </ul> <p><b><u>Milestone 13 (2019)</u></b></p> <ul style="list-style-type: none"> <li>• Launch open enrollment incentive program for Advanced Commercial HVAC systems.</li> </ul>
<p><b>Goals Prior to Exit</b></p>	<p><b><u>Advanced Commercial HVAC</u></b></p> <ul style="list-style-type: none"> <li>• 20-25% of <u>new</u> commercial HVAC system purchases are advanced commercial HVAC systems.</li> <li>• 1% of installed base is changing over per year via early replacement or retrofit.</li> <li>• 4% of total installed base is an advanced commercial HVAC system</li> <li>• 25% of eligible contractors completing advanced commercial HVAC trainings.</li> <li>• Comparison calculator used by 20% of contractors to better enable customer understanding of costs, savings, and payback.</li> <li>• New business models have been proven and adopted in the market.</li> </ul>

	<p><u>Air Source Heat Pumps</u></p> <ul style="list-style-type: none"> <li>• 15% of heating/cooling systems purchased are ASHPs.</li> <li>• 10% of installed HVAC systems are replaced per year via early replacement or displacement.</li> <li>• 25% of eligible contractors completing ASHP trainings.</li> <li>• ASHP quotes are included in contractor HVAC bids as a standard practice.</li> <li>• Cost-savings calculator used by 20% of distributors and contractors to better enable customer understanding of costs, savings, and payback.</li> <li>• Mapping tool used by contractors to better enable them to target prime candidates for ASHPs and reduce customer acquisition costs by focusing on areas that have the greatest potential for savings.</li> </ul> <p><u>Product and Appliance Standards</u></p> <ul style="list-style-type: none"> <li>• Due to the nature of this work, including the ever-evolving status of product and appliance standards, NYSERDA envisions continuing to work in this space for many years. Research and technical support priorities will shift as various standards are enacted and additional areas to target are identified.</li> </ul>
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### 1.1.5 Relationship to Utility/REV

<b>Utility Role/Coordination Points</b>	<ul style="list-style-type: none"> <li>• NYSERDA will continue to work with the teams at the utilities to coordinate efforts and help them understand the investments being made and the interventions that are in the market. <ul style="list-style-type: none"> <li>○ NYSERDA has discussed this initiative with the New York utilities at multiple meetings of the Clean Energy Advisory Council Energy Implementation and Coordination Working Group.</li> <li>○ As these initiatives develop, NYSERDA will seek to gather information on complementary downstream incentives that can be shared directly with contractors, distributors, and/or manufacturers.</li> <li>○ Additionally, NYSERDA will share tools and resources among utility partners and contractors to expand the adoption of these new technologies.</li> </ul> </li> <li>• NYSERDA's supply chain investments and incentives complement downstream utility programs by bolstering the ability of contractors, distributors, and manufacturers to sell and service these new products. <ul style="list-style-type: none"> <li>○ These initiatives will engage directly with the contractors, distributors, and/or manufacturers who are in the field selling these and other products to customers, allowing NYSERDA to share specific tools and resources that would otherwise not be used and inform them about opportunities, such as utility rebate programs that can further reduce the cost of the technology.</li> </ul> </li> <li>• Work with distributors and contractors to effectively disseminate information on available utility incentives</li> </ul>
<b>Utility Interventions in Target Market</b>	<ul style="list-style-type: none"> <li>• Utility performance-based incentives are available through all utilities for Advanced Commercial HVAC systems but have not been widely utilized.</li> <li>• Currently, three utilities (Central Hudson, Con Edison and National Grid) provide incentives for ASHPs but have not been widely utilized.</li> <li>• NYSERDA activities have been planned as a complement to the utility incentives already in the market. NYSERDA incentives will increase the supply of units available to customers while also encouraging heating savings.</li> </ul>

### 1.1.6 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 1. Annual Market Development Budget Allocation – Commitment Basis**

Budget	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Direct Incentives and Services	\$1,000,000	\$3,550,000	\$6,850,000	\$5,450,000	\$4,750,000	\$-	\$-	\$-	\$-	\$21,600,000
Implementation Support	\$480,000	\$1,865,000	\$4,279,000	\$3,641,000	\$3,340,000	\$3,140,000	\$2,640,000	\$2,640,000	\$2,640,000	\$24,665,000
Tools, Training, and Replication	\$150,000	\$25,000	\$15,000	\$10,000	\$-	\$-	\$-	\$-	\$-	\$200,000
Total	\$1,630,000	\$7,965,000	\$12,334,000	\$10,336,000	\$3,140,000	\$3,140,000	\$2,640,000	\$2,640,000	\$2,640,000	\$46,465,000

**Table 2. Annual Expenditures Projection**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
<b>Expenditures</b>	2%	8%	18%	22%	18%	12%	6%	6%	6%	3%

### 1.1.7 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

**Table 3. Initiative Specific Metrics**

Indicators <sup>4</sup>		Baseline (Before/ Current)	2020 Estimate
<b>Advanced Commercial HVAC</b>			
<b>Activity/ Outputs</b>	Vendors using comparison calculator tools	0	100
	Vendors trained	0	200
	Peer exchange events	0	10
	Vendors offering alternative business models for HVAC service	0	20

<sup>4</sup> A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

	Midstream advanced commercial HVAC incentives offered on individual units	0	15,000
	Customers impacted by midstream incentives <sup>5</sup>	0	2,200
<b>Outcomes</b>	Advanced commercial HVAC units sold annually, because of the intervention	300	9,000
	Advanced commercial HVAC systems as percentage of standard commercial HVAC installed base, because of the intervention	0.15%	4%
	Average decrease in first cost	0%	15%
	Customers using alternative business models for HVAC service	0	125
<b>Air Source Heat Pumps</b>			
<b>Activity/ Outputs</b>	Vendors using the enhanced cost-savings calculator	0	75
	Vendors trained	0	400
	Upstream ASHP Incentives offered on individual units	0	11,433
	Count of completed ASHP control pilot projects related to managing dual-systems	0	2
<b>Outcomes</b>	ASHPs sold annually	32,000	53,000
	ASHPs as percentage of installed residential HVAC base	7%	15%
	Average decrease in first cost	0%	15%
	Vendor use of NYSERDA co-op assistance in promoting ASHPs	0	25
<b>Product &amp; Appliance Standards</b>			
<b>Activity/ Outputs</b>	Number of technical requirements and protocols finalized	0	20
	Number of cost/benefit studies completed	0	30
	Number of compliance and enforcement processes established	0	1
	Number of standards promulgated	0	20

In addition to the above outcomes, NYSERDA will also assess the following broad outcomes associated with Product and Appliance Standards:

- Number of products sold for covered categories
- Peak load reduction
- Water savings

<sup>5</sup> On average, commercial buildings have seven rooftop units per building; this number represents the number of incentives offered on individual units divided by seven.

Benefits shown in Tables 4 and 5 are direct, near term benefits associated with this initiative’s projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

**Table 4. Direct Impacts<sup>6</sup>**

Primary Metrics		2017	2018	2019	2020	2021	TOTAL
Energy Efficiency	MWh Annual	-	-	6,370	10,900	21,500	38,800
	MWh Lifetime	-	-	91,200	156,000	308,000	555,500
	MMBTU Annual	69,800	241,000	336,000	136,000	-	782,900
	MMBTU Lifetime	1,050,000	3,610,000	5,040,000	2,040,000	-	11,740,000
Renewable Energy	MWh Annual	-	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-	-
	MW	-	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		2,690	9,270	16,300	11,100	11,300	50,560
CO2e Emission Reduction (metric tons) Lifetime		40,300	139,000	242,000	161,000	162,000	744,400
Customer Bill Savings Annual (\$ million)		\$1.05	\$3.63	\$5.92	\$3.51	\$2.86	\$16.97
Customer Bill Savings Lifetime (\$ million)		\$15.8	\$54.5	\$88.2	\$51.6	\$41.0	\$251.1
Private Investment (\$ million)		\$13.5	\$46.6	\$71.5	\$39.0	\$27.2	\$197.8

**Table 5. Annual Projected Initiative Participation<sup>7</sup>**

	2017	2018	2019	2020	2021	Total
Participants	2,000	6,900	10,200	5,000	2,200	26,300

<sup>6</sup> Energy Efficiency values represent MWh savings from advanced commercial HVAC and MMBTU savings from ASHPs. The electricity required to utilize the ASHP technology (52,000 MWh annual and 780,000 MWh lifetime in total) is netted out of the emission reduction values shown in this table. Emission reductions are net, including both MMBTU and MWh savings (1,154,000 lifetime tons) and the additional electricity required to implement ASHPs, which was subtracted from the benefits (411,000 tons).

<sup>7</sup> Participants include the number of customers receiving the benefit of midstream incentives (units rebated divided by the average number of units per installation) for the ASHPs and advanced commercial HVAC. Participants do not include the number of customers or supply chain actors impacted by product standards.

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term because of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+ ) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSEERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSEERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

**Table 6. Estimated Indirect Market Impact<sup>8</sup>**

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	422,000	5,070,000	8,660,000
	MMBtu Cumulative Annual	256,000	1,230,000	3,370,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		220,000	2,570,000	4,620,000

### 1.1.8 Fuel Neutrality

<b>Fuel Neutrality</b>	<ul style="list-style-type: none"> <li>• The Advanced commercial HVAC component of this initiative is not being delivered on a fuel neutral basis.</li> <li>• Offering ASHPs on a fuel neutral basis will allow NYSEERDA to achieve savings at a cost of \$549 per ton of carbon, compared to a cost of \$847 per ton of carbon in an electric only scenario. Additionally, ASHPs provide significant benefits to the electric system and non-participants. This will help develop the market at the scale needed to achieve New York State’s clean energy goals as only 10% of NYS households heat with electricity, while 30% heat with oil or propane; targeting both expands the reach and potential success of this initiative.</li> <li>• Added electric usage from fuel-switching for ASHPs occur during non-summer months, thus increasing the grid capacity utilization.</li> </ul>
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### 1.1.9 Performance Monitoring and Evaluation Plans

<b>Performance Monitoring &amp; Evaluation Plan</b>	Routine reporting on energy savings to date, project lists developed, and progress against identified annual energy savings goals will be collected and reviewed. Redirecting (as needed) will ensure continued progress against goals.
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<sup>8</sup> Energy Efficiency values represent MWh savings from advanced commercial HVAC and product and appliance standards and MMBTU savings from ASHPs. The electricity required to utilize the ASHPs (224,000 MWh cumulative in 2030) and increased MMBTU of product and appliance standards (1,600,000 MMBTU cumulative in 2030) is netted out of the emission reduction values shown in this table. Emission reductions are net, including MMBTU savings and MWh savings (4,900,000 tons in 2030), which add to the emission benefits, and additional electricity required to implement ASHPs and additional MMBTU required for product and appliance standards (265,000 tons in 2030), which were subtracted from the benefits.



NYSERDA's approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below.

**Test-Measure-Adjust Strategy**

Each year, NYSERDA will undertake a reassessment of priorities and funding levels and will adjust the program as appropriate. Specifically:

- Track and monitor the uptake of incentives and market resources
- Use historical sales data to demonstrate market changes, adjusting the programs based on success or need for improvement
- Assess the portfolio of projects annually regarding goals, metrics, outputs and outcomes.
- Expand current technologies or add additional technologies based on identified need and fit with the strategy.

**Market Evaluation and Market-Based Impact Evaluation**

- Market Evaluation will draw on the logic model and will include baseline and longitudinal measurements of key indicators of programmatic and broader market success.
- Baseline measurements of key market indicators will occur in the near term and, where possible, in coordination with the evaluation of related initiatives (e.g., Renewable Heating and Cooling). Further, in collaboration with the NYC Mayors office of Sustainability, NYSERDA will conduct Market Characterization assessment of air source heat pump technologies for small residential sector in NYC. Longitudinal measurements will leverage programmatic data to provide additional insights to adjust the strategy. These include but are not limited to: number and dollar value of incentives; availability and use of new sales models, cost-savings calculator, mapping tool, training materials and promotional materials; increased upstream and midstream market actor awareness of the value of units; increased customer understanding of the value of the products; number of units sold; increased demand for units; reduced up-front cost of units; increased stocking and sales of units; and adoption and compliance of established NYS standards promulgated under this initiative.
- The evaluation of standards-related impacts is planned to commence in the later years, once the standards are known, developed, promulgated, and adopted.
- Given the upstream-focused, market transformational nature of this initiative, impact evaluation will be market-based, triangulating data such as number of units sold, secondary data such as such as national-level sales data (e.g., HARDI), and data collected from market actors including the influence of the initiative in increasing demand and adoption of targeted products. Deemed savings values will be applied to net unit sales to estimate energy savings where appropriate and may be supplemented by metered data that is collected to determine the volume and patterns of energy consumption for selected technologies.
- Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change will occur once the initiative is underway.
- Sources of data include intervention data, data from pilots and demonstrations; deemed savings and/or metered energy consumption values, commercially available data, and primary data collection through surveys of key market actors.

# Appendix A: Logic Model

## LOGIC MODEL: Products

