New York State
Clean Heat Program
2020 Annual Report

Jointly Filed By:

Central Hudson Gas & Electric Corporation
Consolidated Edison Company of New York, Inc.
Niagara Mohawk Power Corporation d/b/a National Grid
New York State Electric & Gas Corporation
New York State Energy Research and Development Authority
Orange and Rockland Utilities, Inc.
Rochester Gas and Electric Corporation

April 1, 2021

Table of Contents

1. Introduction

Pursuant to the January 16, 2020 *Order Authorizing Utility Energy Efficiency and Building Electrification Portfolios through 2025* ("Implementation Order"), the New York State Energy Research and Development Authority ("NYSERDA") and the NY Electric Utilities[1] (collectively, "Joint Efficiency Providers") hereby file this New York State Clean Heat Statewide Heat Pump Program ("NYS Clean Heat Program" or "Program") Annual Report for 2020 ("Annual Report").[2]

The NYS Clean Heat Program, which launched on April 1, 2020, provides customers, contractors, and other heat pump solution providers a consistent experience and business environment throughout New York State. The NYS Clean Heat Program represents a shift to a consistent statewide heat pump program designed to achieve the State's ambitious heat pump goals and build the market infrastructure for a low-carbon future.

The NYS Clean Heat Program includes initiatives to advance the adoption of efficient electric heat pump systems for space and water heating applications throughout New York State. The NY Electric Utilities provide incentives to support customer adoption of eligible heat pump technologies – including cold climate air source heat pump ("ccASHP") systems, ground source heat pump ("GSHP") systems, and heat pump water heaters ("HPWHs"), as well as their promotion and pricing by contractors and other heat pump solution providers.[3] The Implementation Plan[4] and the Program Manual[5] provide detail about the Program, including, but not limited, to incentive structure and levels, eligible technologies, program rules and processes, and information for participating contractors.[6] The Program is implemented in coordination with a portfolio of NYSERDA-led market development initiatives, which aim to build market capacity to deliver building electrification solutions. The market development efforts, which are described in Appendix 1 of the Implementation Plan, include support for training and qualification of

[1] 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, "NY Electric Utilities")."

[2] Case 18-M-0084, *In the Matter of a Comprehensive Energy Efficiency Initiative* ("NE: NY Proceeding"), Order Authorizing Utility Energy Efficiency and Building Electrification Portfolios Through 2025 (issued January 16, 2020) ("Implementation Order"), p. 93.

[3] NE: NY Proceeding, NYS Clean Heat: Statewide Heat Pump Program Implementation Plan ("Implementation Plan"), (initially filed on March 16, 2020 and refiled May 29, 2020), Appendix 3: NYS Clean Heat Program Glossary of Terms, pp. 69-72. This Glossary provides definitions of ccASHP, GSHP, HPWH, Participating Contractor, and other key terms used in this Annual Report.

[4] NE: NY Proceeding, Implementation Plan. The Joint Efficiency providers work in coordinating regarding and developing the NYS Clean Heat Program began in 2019, following the issuance of the Commission's NE:NY Order - NE: NY Proceeding, Order Authorizing Accelerated Energy Efficiency Targets (issued December 13, 2018) ("NE:NY Order").

[5] NE: NY Proceeding, NYS Clean Heat: Statewide Heat Pump Program Manual ("Program Manual"), (initially filed on March 16, 2020 and refiled May 29, 2020).

[6] Both the Implementation Plan and Program Manual are revisited, as necessary and with prior notice, on a separate schedule from this Annual Report.

contractors, processes to assure quality installations, and marketing and education to help customers understand and select among options and to operate systems optimally.

2. Executive Summary

The NYS Clean Heat Program officially launched on April 1, 2020, during the period of time addressed by the New York State on PAUSE Executive Order ("NYS on Pause"), which restricted and/or prohibited activities central to the Program.[7] Despite this challenge, over 5,700 Clean Heat projects were installed and incentivized in 2020, with another 1,000 identified as in development for 2021. Approximately 80% of projects submitted were ASHP technologies in residential buildings. Over 1,000 individuals across the heat pump supply chain were trained toward growing a quality-oriented skilled labor force, and at the end of 2020 there were 190 Participating Contractors offering NYS Clean Heat incentives throughout the State. Recruitment efforts continue to grow this pool of ASHP and GSHP contractors. As of this writing, there are over 300 Participating Contractors in the program and recruitment activities continue with the goal of ever increasing the pool of ASHP and GSHP contractors.

The NYS Clean Heat incentive program expended $26.4M (72% of projected spending) and achieved 282,000 MMBtu (118% of projected savings) in 2020. Details on individual Utility performance can be found in Section 4 of this report, as there were a variety of factors that contributed to the final total program metrics. One commonality, however, was the attribution of NYSERDA's Q1 heat pump achievement to Electric Utility performance. Under the previous NYSERDA heat pump programs, the incentives were generally lower and the MMBtu savings were higher (on a unit basis).

The Joint Efficiency Providers acknowledge that the 2020 rollout was not seamless, due to two main issues. On the program level, there was a need to align the new program requirements with the State's expectations of ensuring proper heating design and quality of installs. And on the project level, there was a need to create a coordinated project intake process amongst all the NY Electric Utilities – which were at various stages of implementation readiness. Details on key milestones and next steps for improvements can be found in Section 3.

Market development efforts expended $26.9M (68% of projected spending). Many of the initiatives were either delayed in 2020 or significantly limited by the pandemic and the related New York on PAUSE Executive Order. Initiatives that showed progress include: (1) the Marketing and Consumer Awareness Campaign, which was contracted and in development during 2020, with a targeted launch of Q2 2021; (2) Technical Assistance and Audits, for which steady requests continued despite the pandemic; (3) HVAC Technical Challenges activities that resulted in the execution of several contracts for the investigation of new clean energy solutions; (4) the Empire Buildings Challenge and the LMI Demonstration Pilot, which were launched in Q4 2020; and the Clean Thermal District System (Community Heat Pump Systems) solicitation which was developed with a targeted release of Q1 2021.

In 2020, estimated annual sales of all air source heat pumps (including non-cold climate units) ("ASHPs") in New York were steady, showing a slight increase from 2019. Estimated annual sales totaled

[7] The NYS on Pause Order was effective starting March 22, 2020. Governor Cuomo Issues Guidance on Essential Services Under The 'New York State on PAUSE' Executive Order | Governor Andrew M. Cuomo (ny.gov)

approximately 92,000 units in 2019 and approximately 103,000 units in 2020.[8] Based on an analysis of 2018 sales data, it is estimated that roughly one third of ASHP sales in NYS were cold climate heat pumps. Future assessments of this data will differentiate ccASHPs unit sales as a percentage of estimated total annual sales in New York.

Costs for heat pump systems remain high compared to traditional fossil fuel heating equipment. Based on an initial assessment of cost components for residential heat pump projects, average total project costs range from approximately $12,200 for an HVAC replacement project to approximately $17,800 for a whole-house ASHP system installation. Of these costs, equipment costs represented approximately 45% of total average project costs[9]; the balance of total costs (55%) are represented by soft costs such as marketing and customer acquisition, project design, installation labor, transaction costs, quality assurance and recruiting/hiring costs. This analysis and additional cost compression work will continue in 2021.

3. NYS Clean Heat – Statewide Heat Pump Incentive Program

This 2020 Annual Report describes the milestones, activities, results, findings, and next steps of the NYS Clean Heat Program for 2020. The prior heat pump achievement in Q1 2020 – as acquired by NYSERDA – has been incorporated into the respective NY Electric Utilities' individual 2020 budgets and targets, pursuant to the Implementation Order. Table 1 below shows 2020 program achievement as compared the goals from the Implementation Order.[10]

Table 1. Statewide Program Performance*

Metric	2020 Actual	2020 Projected	Difference 2020 Actual v. 2020 Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Total Budget Spend	$26,387,815	$36,564,440	$(10,176,625)	$454,318,220	6%
Gross MMBtu**	281,965	239,482	42,484	3,566,590	8%

** Information includes attributed NYSERDA Q1 achievement in this table and the similar utility-specific tables below.*
*** Equivalent Annual MMBtu, net of all energy savings and associated usage*

Each NY Electric Utilities' individual performance is presented in more detail under their respective "Utility-Specific Progress" section.

[8] Source: Heating, Air-conditioning & Refrigeration Distributors International ("HARDI"). HARDI provides analysis and growth estimates based on data captured from annual industry reports. Note these unit sales values represent all air source heat pumps, while NY's programming supports cold climate air source heat pumps exclusively.
[9] https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2020/1602180-NYSERDAEnergyEfficiencySoftCostMarketEvaluationReportOctober2020.pdf
[10] NY: NY Proceeding, Implementation Order, Appendix C; NE: NY Proceeding, Implementation Plan, pp. 4-5. Similar tables are shown for each utility in Section 4.

3.1 Summary of NYS Clean Heat Program in 2020

Recognizing the unprecedented challenge of the COVID-19 pandemic, 2020 was a successful and transformational year for the NYS Clean Heat Program.

The Program was mandated to launch on April 1st, which coincided with the initial outbreak of the COVID-19 pandemic and the resulting lockdown. This impacted the Program's overall 2020 performance, as "in-person" facility work (and subsequent incentive processing) was limited in the initial months. The Joint Efficiency Providers paused most of the planned communications, including marketing, and prioritized customer and contractor safety consistent with directives from Executive Orders and other applicable guidance. Contractors, unable to work in the field, attended webinar trainings focused on heat pumps and building electrification that were developed and broadly offered during the NYS on Pause period. As more activity resumed when the initial surge subsided, Participating Contractors and others continued to enforce COVID-related health and safety protocols. Recognizing the additional challenges for customers, Participating Contractors, and others, some of the NY Electric Utilities made temporary changes to incentives and programs, which are described in the respective "Utility-Specific Progress" sections below. Despite these challenges, the Joint Efficiency Providers launched the Program and made progress toward the Commissions' goals outlined in the Implementation Order.[11]

3.1.1 Key Milestones

As part of the effort in developing, initiating, and implementing the NYS Clean Heat Program, the Joint Efficiency Providers achieved numerous key milestones. These include:

- Development, filing, and approval of the Joint Efficiency Providers' first jointly filed NYS Clean Heat: Statewide Heat Pump Program Implementation Plan ("Implementation Plan").
- Development, filing, and approval of Market Development Plan, which is Appendix 1 of the Implementation Plan.
- Development, filing, and approval the Verified Gross Savings Specifications for NYS Clean Heat Statewide Heat Pump Program, as Appendix 2 of the Implementation Plan.
- Development, filing, and adoption of NYS Clean Heat Program Manual, which provides the detailed information on the Program including incentives, eligible technologies, Program rules and requirements, and information for Participating Contractors.[12]
- Development and filing of the NYS Clean Heat Joint Management Committee Plan ("NYS Clean Heat JMC Plan") which describes the establishment of the NYS Clean Heat Joint Management Committee ("JMC") a forum of the Joint Efficiency Providers to meet, discuss, implement, and calibrate the execution of the Program.[13]
- Development and continued support of the NYS Clean Heat Webpage that connects users with utility-specific incentive pages, a network of Participating Contractors, information on heat

[11] See, NE: NY Proceeding, Implementation Plan, pp. 3-5.

[12] NE: NY Proceeding, NYS Clean Heat: Statewide Heat Pump Program Manual ("Program Manual"), (initially filed on March 16, 2020 and refiled May 29, 2020).

[13] NE: NY Proceeding, NYS Clean Heat: Statewide Heat Pump Program Joint Management Committee Plan, (filed on June 15, 2020).

pump technology as well as financing options tied to On-Bill Recovery and other programs. Additional content was developed which guides heat pump installers through the Participating Contractor Application, features key program documents and additional background resources to answer common questions.[14]

- Stakeholder engagement session on November 20, 2020 that addressed topics including: summary of NYS Clean Heat Program to date; technologies eligible for the Program; Program administrative processes; proposed revisions to statewide Program documents, including the NYS Clean Heat Program Manual and Implementation Plan; and updates on NYSERDA NYS Clean Heat market development efforts.[15] Substantive Q&A was shared with the industry and uploaded to the NYS Clean Heat website.[16]

3.1.2 Additional Activities, Accomplishment, Findings and Next Steps

In addition to the Program milestones described above, the Joint Efficiency Providers have addressed and advanced numerous specific goals, topics, requirements, and Program work scopes. An illustrative list of these is provided, and additional detail is provided in Sections 4. and 5.

3.1.2.1 Key Program Achievements

- **Adoption and Activity of JMC Working Groups**
  - The NYS Clean Heat JMC meets regularly to administer the Program. The JMC adopted the use of numerous working group meetings as applicable to efficiently address Program topics described in this Annual Report.
- **Updates to Technical Resource Manual ("TRM")**
  - The Joint Efficiency Providers coordinated with the New York TRM Management Committee and related working groups to support the continuing updates of the TRM to reflect the NYS Clean Heat Program, including the establishment of robust calculations for savings impacts of heat pump technologies. These efforts, based on early program implementation experience, led to revisions of residential/multifamily and small commercial ccASHPs, as well as residential/multifamily and small commercial GSHPs. The process of providing feedback on existing measures, as well as coordinating on new TRM measures, is ongoing.
- **Alignment of applicable building energy codes with NYS Clean Heat Program**
  - The Joint Efficiency Providers coordinated with NY Department of State ("DOS") and others to provide an efficient path for activity under the NYS Clean Heat Program providing for the ability to confirm the eligibility of additional heat pump installations. This coordination resulted in a DOS issued Technical Bulletin (TB-7005-ECCNYS) clarifying the process of approving alternate methodologies for the calculation of heating and cooling loads and the sizing of residential heating and cooling equipment.
- **Advancement of Sizing Tools and Methods**

[14] https://saveenergy.ny.gov/NYScleanheat/

[15] NE: NY Proceeding, Notice of Stakeholder Conference For NYS Clean Heat Program, 2020 (Filed: October 19, 2020).

[16] https://saveenergy.ny.gov/NYScleanheat/assets/pdf/NYS-Clean-Heat-Stakeholder-Conference-Q-and-A-20201120.pdf

- The Joint Efficiency Providers worked with a wide range of stakeholders and industry experts to guide the development of sizing tools and methods to support optimal sizing and selection of cold climate heat pump technologies. These include: (1) a "BTU calculator" tool to help contractors and program administrators determine equipment capacities at heating design temperature and to estimate zonal loads for installations that involve multiple heat pumps; and (2) a code compliance resource tool, that, as a result of the DOS issued technical bulletin, provides a resource to size systems for heating and demonstrate compliance with code through an alternative calculation methodology.

- **Effective Program Data Exchange**
  - The Joint Efficiency Providers reviewed and updated reporting practices and intake fields – such as utility-specific online intake tools ("OITs") – to gather the necessary program information for Program administration and to inform the promotion of future heat pump development.
- **Transfer of Projects from NYSERDA Predecessor Heat Pump Program to NY Electric Utilities**
  - For projects that were commenced and/or for which applications were submitted to NYSERDA prior to April 1, 2020, the Joint Efficiency Providers developed processes for transferring such projects to the applicable NY Electricity Utility. For smaller projects, including residential and small commercial projects, such projects were completed by NYSERDA with invoices and savings handled jointly by the Joint Efficiency Providers. Larger customer projects were handled on a case-by-case basis.
- **Creation and Improvement of Statewide Program Forms**
  - The Joint Efficiency Providers developed and streamlined consistent statewide Program forms – including (1) a standardized Participating Contractor Application form, (2) a revised, utility-specific Participating Contractor Agreement form, and (3) a new Customer Completion and Acknowledgement From.
- **Statewide Coordination of Implementation Contractors**
  - The Joint Efficiency Providers coordinated with Program Implementation Contractors for efficient and optimal Program delivery and experience for customers, Participating Contractors, manufacturers, and others.
- **Alignment of Implementation Contractors**
  - The Joint Efficiency Providers coordinated communications, data transfer and understanding of Program goals between the two central implementation contractors and their associated utilities.
- **Savings Tool Development**
  - The Joint Efficiency Providers coordinated with industry experts and stakeholders to support the creation of savings tools to inform customers of potential benefits of switching from other Heating, Ventilation, and Air Conditioning ("HVAC") options and to determine incentive levels for the custom category heat pumps and water heating measures, based on annual energy savings. These include working with geothermal industry representatives to review emerging industry models, as well as development of

spreadsheet-based tools to model energy savings for cold climate heat pumps and variable refrigerant flow ("VRF") systems.

- **Marketing Campaign**
  - The Joint Efficiency Providers engaged a process to coordinate and develop a marketing campaign for the NYS Clean Heat Program, to advance the understanding and adoption of heat pumps. This campaign is scheduled to commence in Q2 2021.
- **Coordination with Statewide Low- and Moderate-Income ("LMI") Portfolio**
  - The Joint Efficiency Providers met regularly with representatives from Statewide LMI Portfolio teams to ensure the coordination of electrification solutions, including heat pumps, for the LMI market segment.
- **Market Development**
  - 2020 highlights include advancing training opportunities by pivoting to virtual forums; launch of the Empire Buildings Challenge, the Building Electrification Roadmap, and an LMI Demonstration Pilot. Additional details can be found in Section 3.

3.1.2.2 Areas of Continuing Work

- **Participating Contractor program experience**
  - The Joint Efficiency Providers continue to implement process improvements in response to industry feedback. The Joint Efficiency Providers acknowledge that the 2020 rollout was not seamless, due to two main issues:
    - Program-level: aligning the new program requirements with the State's expectations of ensuring proper heating design and quality of installations; and
    - Project-level: creating a coordinated project intake process amongst all the NY Electric Utilities, which were at various stages of implementation readiness.
  - The Joint Efficiency Providers will continue to work with the industry on addressing several key pain points. These include, but are not limited to:
    - Program-level: awareness on proper heating design, clarity on technology eligibility, and a defined methodology for Category 4: Custom projects; and
    - Project-level: application consistency, project tracking, and timeliness of payments.
- **Consideration of New Technologies**
  - The Joint Efficiency Providers collaborated with technical experts, manufacturers, and others to explore and integrate new heat pump technologies into the Program. These technologies include, but are not limited, to packaged terminal heat pumps ("PTHPs"), heat recovery chillers, air to water systems and optimization of existing air and ground-source applications. This work remains ongoing.
- **Coordination in Support of Upfront Calculation of Incentives for Large/ Custom Projects**
  - The development of program standards to facilitate fair and consistent incentives for large and custom projects is an ongoing effort for the Joint Efficiency Providers. The Joint Efficiency Providers continue to work with technical experts and other stakeholders to advance tools and methods that support the provision of clarity on

incentives for large and custom projects. Resolving this is necessary for market progress and will be a priority for 2021.

- **Quality Assurance/ Quality Control ("QA/QC")**
  - The Joint Efficiency Providers coordinated closely to address issues related to QA/QC for the Program. Because NYSERDA had developed a rigorous QA/QC program for its predecessor heat pump program, it was determined that NYSERDA would continue to oversee the Program QA/ QC activity through December 31, 2020. The Joint Efficiency Providers coordinated to effectuate the January 1, 2021 transfer of QA/ QC responsibility from NYSERDA to the NY Electric Utilities. Close coordination is expected to continue for QA/QC efforts. In addition, throughout 2020, the Joint Efficiency Providers reviewed and revised a range of elements in the QA/QC process to achieve efficiencies and consistency for the benefit of customers, Participating Contractors, and other stakeholders. The optimization of the QA/QC process is an ongoing effort.
- **Additional Engagement with Stakeholders**
  - In addition to the formal stakeholder session on Nov. 20, 2020, individuals from the Joint Efficiency Providers (both individually and as a group) regularly engaged with Program stakeholders, including manufacturers, Participating Contractors and trade groups, industry representatives, and New York Department of Public Service Staff ("Staff").
  - As noted in the Implementation Plan, the Joint Efficiency Providers view engagement with stakeholders as core to the design, implementation, and success of the Program, and this priority was reflected through discussions with the JMC and at applicable working groups to address stakeholder input and concern.
  - In addition, the Joint Efficiency Providers have engaged stakeholders through DPS Staff's Performance Management and Improvement Process ("PM&IP") initiative under the NE: NY proceeding.[17] This included a presentation and feedback with the PM&IP Stakeholder Advisory Group by the Joint Efficiency Providers on December 8, 2020. The Joint Efficiency Providers will continue to support this PM&IP initiative.
  - The Joint Efficiency Providers view regular collaboration with stakeholders to be a core element of the Program and are considering effective ways to improve this collaboration through targeted webinars, community outreach and meetings with relevant industry members.

4. Utility Specific Progress

4.1 Central Hudson

[17] NE: NY Proceeding, "Commencement of Energy Efficiency & Building Electrification Performance Management & Improvement Process" (filed May 29, 2020.) See also, Implementation Order, pp. 60-61.

Table 2. Central Hudson Program Performance

Metric	2020 Actual	2020 Projected	Difference 2020 Actual v. 2020 Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Total Budget Spend	$5,880,933	$3,354,852	$2,526,081	$43,221,312	14%
Gross MMBtu	61,412	17,728	43,684	255,292	24%

4.1.1 2020 Program Performance

Central Hudson overachieved and overspent on its 2020 savings targets and budget respectively, despite the abbreviated timeline of activity in 2020. The NYS Clean Heat program officially launched on April 1, 2020, during the NYS on PAUSE period, and activity did not resume until June. During this pause in activity, marketing activity was reduced, and Central Hudson facilitated one-on-one training sessions with Clean Heat contractors on rebate applications, and eligible technologies within the Program.

In order to assist the contractor base in rebounding from the impact of COVID shutdowns, Central Hudson offered a temporary 60-day contractor bonus for ASHP and GSHP full load installations through July. Through the established network of trade allies with experience in heat pump installations under previous energy efficiency programs, NYS Clean Heat activity in the territory resumed at a high level, resulting in the overachievement and overspend of the annual targets and budget in 7 months of activity.

Over 70% of projects involved heat pump adoption for the full heating and cooling needs of homes and businesses. In addition, nearly 80% of heat pump projects displaced oil, propane and other fossil fuel heating sources. With the return of activity post-shutdown, go-forward marketing efforts will focus on consumer education on the availability and benefits of heat pumps.

4.1.2 2021 Lookahead

Given the high adoption and spending rates in the Central Hudson territory, Central Hudson will be adjusting the total Category 1 Partial Load project rebates to $500 per outdoor condenser unit, matching the rebate levels of all other NY Electric Utilities. In addition, the Category 2 Full Load heating rebate will be $1,300 per 10,000 Btu/h of maximum heating capacity at 5 degrees Fahrenheit as documented on the Northeast Energy Efficiency Partnership ("NEEP") ccASHP Product and Specification List.[18] This will ensure that Central Hudson is able to continue offering rebates for qualifying projects over the life of the program.

While 2020 activity showed great market penetration and heat pump adoption in the Central Hudson territory, the adoption of GSHPs and HPWHs is an area for improvement. Moving forward, Central Hudson is increasing engagement with geothermal stakeholders and growing marketing efforts specific to GSHP projects. In addition, Central Hudson is monitoring the progress of midstream distributor

[18] See, NE: NY Proceeding, Program Manual, p. 7. The current specification and listed eligible units are available at: https://neep.org/ASHP-Specification.

incentive pilots for HPWHs in the marketplace. Central Hudson remains on track to exceed our savings targets through 2025.

4.2 Con Edison and Orange & Rockland

COVID-19 Note

During the COVID-19 pandemic, Con Edison and Orange & Rockland adhered to all Statewide orders, regulations, and guidance (e.g., New York State on PAUSE) and limited customer-facing work to emergencies only. During this time, the Companies[19] implemented a Customer Emergency Attestation Form to be utilized in case of an emergency installation. As the State began to lift its restrictions, Con Edison introduced a one-time, $3,000 "pre-payment" incentive for GSHP installations in an effort to re-stimulate the industry. This incentive was paid to the contractor at submission of signed sizing documents and customer contract and was passed along to the customer at the time of project completion. This was on a "first come, first-served" basis on a set budget amount. Orange & Rockland introduced an additional $500 incentive for Full Load ASHP projects, and an additional $1,000 for GSHP projects, that was paid to contractors who installed these projects after June 30, 2020.

4.2.1 Con Edison

Table 3. Con Edison Program Performance*

Metric	2020 Actual	2020 Projected	Difference 2020 Actual v. 2020 Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Total Budget Spend	$ 15,205,165	$ 18,037,338	$ (2,832,173)	$ 227,315,834	7%
Gross MMBtu	132,370	72,921	$ 59,449	1,000,000	13%

**Con Edison anticipates filing an update to its 2020 Q4 EE scorecard and others (e.g., Earnings Adjustment Mechanism ("EAM") filing). Those updates will reflect the numbers shown here in the Annual Report.*

[19] The terms "Company" and "Companies" are used in Section 4 to denote the particular utility or utilities addressed in each subsection.

Table 4. NYSERDA's Q1 Heat Pump achievement in Con Edison's service territory[20]**

Metric	2020 Actual
Total Budget Spend	$1,874,381
Gross MMBtu	45,521

***With respect to Con Edison's total 2020 NYSCH performance, NYSERDA's Q1 performance represented **34%** of total MMBtu savings at **12%** of total spend.*

4.2.1.1 Con Edison 2020 Program Performance

Con Edison underspent, but overachieved, on its 2020 budget and target primarily due to the attribution of NYSERDA's Q1 heat pump achievement. Under the previous NYSERDA program:

1. The incentives were lower (*i.e.*, $500 per unit, compared to thousands of dollars per unit based on heating capacity under the new framework); and
2. The savings were higher (*i.e.*, a higher deemed level per unit, compared to the revised TRM calculations which are applicable in NYS Clean Heat)

Absent NYSERDA, Con Edison would have still exceeded its 2020 target – but with a higher expenditure level commensurate with its performance ($160/MMBtu as opposed to $120/MMBtu).

Additionally, NYSERDA was tasked with continuing its QA/QC inspections on behalf of the NY Electric Utilities through the end of 2020. This expenditure is not reflected in the NY Electric Utilities' 2020 spend. While NYSERDA's QA/QC spend was minimal relative to the total NYS Clean Heat budget (approximately $110,000 across the State), Con Edison and Orange & Rockland expect to significantly ramp up their own QA/QC activities in 2021 as they formally take on the QA/QC function. This additional spend is expected to impact 2021 program metrics.

4.2.1.2 Con Edison 2021 Lookahead

Con Edison achieved its 2020 target primarily through its residential heat pump incentive offerings. However, as the Company looks to continue expanding its incentive offerings in all customer segments and geographic areas, Con Edison acknowledges several additional technical and economic challenges:

1. **Multifamily customers, many of whom are renters, may not be receiving the full benefit under the existing incentive structure.** Customers primarily benefit from the NYS Clean Heat incentive through an instant discount on their heat pump installation. Many renters, however, are not the primary decisionmaker on HVAC upgrades within their homes and would not receive this benefit. Additionally, many renters are responsible for their own electric account and would be responsible for the increased energy consumption through the heat pump.
2. **Small-to-medium business ("SMB") customers have less economic means than larger commercial entities (further compounded by COVID-19), and may require a higher incentive rate.**
3. **Large commercial customers may not be adequately incentivized under the existing incentive**

[20] Con Edison and Orange & Rockland provide this information to illustrate the impact of NYSERDA's contribution to their 2020 metrics. Further, approximately 75% of ccASHP projects transferred from NYSERDA were in Con Edison's service territory.

structure. The original NYS Clean Heat prescriptive incentive structure was primarily focused on the design and operation of smaller, residential systems. Heat pump designs for larger buildings must account for a variety of additional physical and technical constraints, which are not easily accounted for in the current incentive structure. Furthermore, the NYS Clean Heat custom incentive structure is based on a "total MMBtu savings" approach, which requires building-specific technical analysis and can vary significantly by project. Additionally, initial industry feedback has indicated that the current custom incentive rates may not be adequate for project economics.

4. **Heat pump projects in gas-constrained areas (e.g., parts of Westchester County) may warrant additional "kicker" incentives to further promote electrification.**
5. **New construction and weatherization projects that incorporate heat pump designs may require a detailed program methodology and incentive structure.** New construction projects incorporate different energy baselines (compared to retrofits) and are likely to be more energy efficient due to their design. Weatherization measures will result in more energy efficient homes, which may impact the size of the heat pump required to heat and cool the building. New projects of both types will likely incorporate heat pumps, and the Company seeks to account for the interactive effects of total project design when setting the appropriate incentive rate.

The Implementation Order's heat pump budgets and targets were based on a technoeconomic analysis focused on upfront incentives in residential applications. This framework was meant as a "starting point," and as additional learnings are realized, the 2020-2025 budget and target may need to be revisited to adequately support its customers' heat pump needs.

Furthermore, Con Edison is looking forward to the results of the statewide heat pump evaluation that will be conducted by DPS Staff. Initial peer utility benchmarking has indicated that heat pump installation savings realization rates are significantly reduced due to a variety of factors (customer behavior and application, technical design, weather conditions, etc.). Depending on the results of the evaluation, Con Edison acknowledges that the heat pump budget and target may warrant additional reassessment as the same incentive spend will likely not result in 100% savings achievement.

4.2.2 Orange and Rockland

Table 5. Orange and Rockland Program Performance

Metric	2020 Actual	2020 Projected	Difference 2020 Actual v. 2020 Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Total Budget Spend	$ 542,743	$ 1,236,326	$ (693,584)	$ 15,003,888	4%
Gross MMBtu	4,435	6,440	$ (2,005)	86,657	5%

Table 6. NYSERDA's Q1 Heat Pump achievement in Orange & Rockland's service territory*

Metric	2020 Actual
Total Budget Spend	$87,725
Gross MMBtu	2,021

With respect to Orange & Rockland's total 2020 NYSCH performance, NYSERDA's Q1 performance represented 46%** of total MMBtu savings at **16%** of total spend.*

4.2.2.1 Orange & Rockland 2020 Program Performance

Orange & Rockland underspent and underachieved for several reasons. The lack of an established contractor network when the program launched meant that Orange & Rockland and its implementation contractor, ICF, needed time to find and recruit contractors into the program. Also due to restrictions associated with COVID-19 at program launch, marketing efforts for the program were delayed. The scarcity of multifamily buildings in its service territory and lack of participation from commercial and industrial customers in 2020 limited program achievements to residential projects. Finally, the attribution of NYSERDA projects in Orange & Rockland's service territory, while not insignificant, was minimal.

4.2.2.2 Orange & Rockland 2021 Lookahead

Orange & Rockland began offering additional incentives in November of 2020 in an effort to increase program participation. The customer heat pump bonus amount was increased by $500 for full load ASHP and GSHP projects, and Orange & Rockland started offering the same bonus to the contractors associated with these projects. These additional incentives apply to projects installed after October 31, 2020. Consequently, there has been a significant increase in participation starting in December 2020. For 2021, Orange & Rockland is continuing to offer these enhanced incentive offerings indefinitely to close the gap between its achieved savings and target savings.

4.3 National Grid

Table 7. National Grid Program Performance (Niagara Mohawk)

Metric	2020 Actual	2020 Projected	Difference 2020 Actual v. 2020 Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Total Budget Spend	$2,728,960	$6,983,416	($4,254,456)	$84,398,834	3%
Gross MMBtu	38,993	71,239	(32,246)	1,112,681	3.5%

4.3.1 2020 Program Performance

National Grid underspent and underachieved on its 2020 budget and target, due to complexities of launching a new program and impacts of the COVID-19 pandemic:

1. National Grid first launched its program on April 1, 2020, during NYS on PAUSE during which in-home work due to COVID-19 suspended. The Program re-opened in June 2020.
2. Documentation required for vendor onboarding, incentive processing and savings calculations under the new statewide program are more technical than under the prior program. The 2020 program year revealed areas in which the National Grid program could be strengthened to support these technical elements to process applications and onboard vendors more quickly. In particular, it took more time and resources than anticipated to educate, enroll and grow the Participating Contractor network. Additionally, National Grid did not have an online portal for the 2020 program for vendors to submit applications. This created a heavy administrative burden in processing applications and technically reviewing each application, which slowed the approval process and diverted resources from onboarding vendors.
3. Due to the economic impacts of the COVID-19 pandemic, direct marketing to customers to promote heat pump purchases throughout spring and summer 2020 was curtailed. In the fall of 2020, marketing re-commenced but focused on general education about heat pump technologies.
4. Health and safety concerns from National Grid's customers prevented contractors from completing work within customer homes.
5. In 2020, NYSERDA continued QA/QC and contractor evaluation efforts on behalf of the NY Electric Utilities and this expenditure was not reflected in 2020 spend, however will become a National Grid program cost in 2021.

Overall, the Company saw an increase in Heat Pump installations compared to 2019, even though the program had launched during a pandemic.

To increase the participating contractor network, and help contractors with COVID impacts, the Company offered enhanced incentives through the summer and saw a 20% increase in contractor participation in just over 2 months. To build on this success enhanced incentives were increased and extended into the fall of 2020, growing the network by nearly another 20%.

National Grid coordinated with NYSEG and RG&E to offer the same incentives per category measure for both customers and contractors, and to develop a co-branded incentive application making it easier for Participating Contractors to participate between the overlapping territories. In addition, the Air Source Heat Pump Commissioning Checklist and Ground Source Heat Pump Completion Forms were also co-branded in an effort to minimize the paperwork that contractors needed to carry with them. Having the same documents across upstate New York territories made it easier for contractors to submit paperwork to their respective utility. The Company jointly contracted with NYSEG and RG&E and Central Hudson for QA QC services, which created a more unified process for inspecting contractor work and offers a more streamlined effort of compiling results for evaluation purposes.

4.3.2 2021 Lookahead

National Grid is on track to hire a new implementation vendor and to create an online portal for use in June 2021 to streamline and improve the application intake and savings calculation process. National

Grid will continue to work with the JMC to offer a series of contractor trainings to grow participation from contractors in the program. The Company expects to expand marketing efforts in conjunction with expanded JMC marketing efforts, with a focus on customer awareness and education through personalized videos and other helpful information sent via email. The Company is evaluating HPWH upstream offerings to help drive additional savings and is also looking to continue expanding its incentive offerings in all customer segments. The Company acknowledges several additional technical and economic challenges:

1. Multifamily customers, many of whom are renters, may not be receiving the full benefit under the existing incentive structure;
2. SMB customers have less economic means than larger commercial entities (further compounded by COVID-19) and may require a higher incentive rate;
3. Large commercial customers may not be adequately incentivized under the existing incentive structure; and
4. New construction and weatherization projects that incorporate heat pump designs will require a detailed program methodology and incentive structure.

The Company will continue to coordinate with other National Grid and Statewide programs to expand the NYS Clean Heat Program in 2021.

4.4 NYSEG and RG&E

Table 8. NYSEG Program Performance

Metric	2020 Actual	2020 Projected	Difference 2020 Actual v. 2020 Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Total Budget Spend	$1,544,587	$6,204,522	$(4,659,935)	$75,130,577	2%
Gross MMBtu	35,206	63,614	(28,407)	992,737	4%

Table 9. RG&E Program Performance

Metric	2020 Actual	2020 Projected	Difference 2020 Actual v. 2020 Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Total Budget Spend	$485,427	$747,986	$(262,559)	$9,247,775	5%
Gross MMBtu	9,549	7,541	2,008	119,223	8%

4.4.1 2020 Program Performance

NYSEG and RG&E launched the NYS Clean Heat program in conjunction with the other NY Electric Utilities on April 1, 2020. At program launch, the Companies utilized an existing vendor while a Request for Proposals was completed for a full scope program implementer. At program launch, the Companies coordinated incentive levels with National Grid and shared a paper application and corresponding forms. The program transitioned to the new implementor through the fall of 2020 with the launch of the online application in late October.

RG&E achieved its 2020 savings goal and remained under budget. RG&E gained savings through NYSERDA's program in the first quarter and was able to continue a similar level of participation through 2020. NYSEG did not meet the savings goal in 2020 and was under budget. This can be attributed to the need to fully stand up the program in NYSEG territory, engage contractors and other stakeholders and drive participation to meet the aggressive goals.

Both companies will see increased cost in 2021 as the NY Electric Utilities assume responsibility for the QA/QC portion of the program and the full scope of the implementation costs are seen. Savings from NYSERDA came with less associated cost as the NY Electric Utilities were responsible for rebate reimbursement.

4.4.2 2021 Lookahead

The program team is working closely with other internal teams on other associated programs, such as the economic development initiatives included in the rate case Joint Proposal.[21] Program team members meet regularly with Clean Heating and Cooling Communities, a clean energy advocacy and trade organization in the Companies' service territories, to review questions related to the Program and coordinate any initiatives. NYSEG and RG&E look forward to continuing the efforts with the JMC on contractor trainings, marketing campaigns and increased customer awareness. NYSEG and RG&E are working towards upstream offerings for heat pump hot water heaters to drive additional savings.

5. Market Development Plan

5.1 Overview

Starting in Q2 2020, the NY Electric Utilities launched the NYS Clean Heat Statewide Heat Pump incentive program. To achieve the statewide heat pump goals and build the market infrastructure for a low-carbon future, the incentive program has been paired with a portfolio of market development initiatives implemented by NYSERDA.

NYSERDA is investing more than $230 million in market enabling initiatives funded through Clean Energy Fund ("CEF") to support the NYS Clean Heat Market Development Plan which aims to build market capacity to deliver building electrification solutions.

[21] Cases 19-E-0378, 19-G-0379, 19-E-0380, 19-G-0381, "Order Approving Electric and Gas Rate Case Plans in Accord with Joint Proposal, with Modifications." (Issued November 19, 2020).

The NYS Clean Heat Market Development Plan is designed to address critical barriers and market needs through the initiatives listed in the table below. These initiatives have been approved through various NYSERDA CEF Investment Plans.

While NYSERDA does report benefits such as energy savings and leveraged funding from various investments outlined in the following table in routine CEF reporting (from investment plans unrelated to utility investments), NYSERDA's NYS Clean Heat performance is quantitatively assessed in the following manner:

1. Progress against the "central goals" described in the next section of this report;
2. Funding commitments made in comparison to the Implementation Plan; and
3. Progress against near-term output metrics and longer-term outcome metrics which are summarized in Appendix B of this report.

5.2 NYS Clean Heat Central Goals (by 2025)

Across its component initiatives, the NYS Clean Heat Market Development Plan aims to build market capacity to deliver building electrification solutions, including ASHPs, GSHPs, and HPWHs, to advance the adoption of heat pump systems that are designed and used for heating and cooling, to meet the central goals (by 2025) identified in Table 10, below, which also shows 2020 Performance related to each goal.

Table 10. NYS Clean Heat Market Development Central Goals (by 2025) and 2020 Performance

NYS Clean Heat Central Goal (by 2025)	2020 Performance
Help achieve the state's energy savings targets and green energy economy goals from the installation of heat pumps, including advancing heat pump solutions in over 130,000 buildings.	Over 5,700 heat pump installations received direct incentives through the NYS Clean Heat, with another 1,000 projects in development.
Increase the pool of skilled labor needed to grow a quality-oriented industry, training 14,000 workers across the heat pump supply chain, including 4,200 workers to sell, design, and install systems.	1,052 trained through end of 2020; 780 of those trained are in the sales, installation, and design category. Of those trained, 270 of those trained trainees are in other categories such as government, real estate, and utilities.
Reduce the cost of heat pump installations by at least 25%.	Cost compression strategy development was initiated. A study assessing cost components for residential heat pump projects found that installation costs represented approximately 50% of total project costs; the balance of total costs are represented by soft cost categories such as marketing and customer acquisition, project design, transaction costs, quality assurance and recruiting/hiring costs.[10] This study will be updated in the coming year.
Increase stocking of heat pumps by 50% above 2019 industry shipments and increase penetration of high-performance cold climate heat pumps to 90% of all heat pumps shipped for space conditioning in New York.	In 2020, and despite the COVID-19 pandemic, estimated annual sales of ASHPs in New York were steady, showing a slight increase from 2019. Estimated annual sales in 2019 totaled approximately 92,000 units and in 2020, estimated sales in New York were approximately 103,000 units. Future assessments of this data will differentiate cold climate ASHPs unit sales as a percentage of estimated total annual sales in New York.

NYSERDA expects that the market can deliver or exceed these overarching goals given the supportive policy framework initiated in 2020 to accelerate the scale of heat pump adoption, to support workforce training and consumer education, and to drive innovation in the supply chain and technology solutions.

5.3 NY Clean Heat Market Development Plan Funding Commitments

The table below summarizes NYSERDA 2020 progress of funding commitments per each Critical Market Need identified in the Market Development Plan; these metrics are also documented in quarterly/annual CEF reporting related to each NYSERDA investment plan supporting the Market Development Plan.

Table 11. NYSERDA 2020 Progress per Critical Market Need

Critical Market Need	Initiative	2020 Actual	2020 Projected	Difference Actual v. Projected	NENY 2020-2025 Total Goal	% of NENY Goal Realized as of 2020
Train and develop the needed clean heating and building electrification workforce	Workforce Development	$0.6M	$3.6M	-$2.9M	$38.2M	2%
Build consumer demand and market confidence and reduce customer acquisition costs	Marketing	$9.8M	$1.9M	$7.9M	$19.2M	51%
	Community Campaigns	$0.0M	$4.6M	-$4.5M	$10.0M	0%
	Critical Tools	$0.2M	$1.1M	-$1.0M	$4.0M	4%
	Technical Assistance & Audits	$6.6M	$4.2M	$2.4M	$27.7M	24%
Drive performance improvements, reduce cost, and deliver new economic solutions through technology innovation and demonstrations	Clean Thermal District Systems	$0.1M	$0.3M	-$0.2M	$15.0M	1%
	HVAC Technology Challenges	$4.8M	$4.2M	$0.6M	$15.0M	32%
	Empire Building Challenge	$1.3M	$0.3M	$1.0M	$15.0M	8%
	Multifamily Building Demonstrations	$0.0M	$0.3M	-$0.3M	$5.0M	0%
	Exploratory Cost Reduction Strategies	$0.0M	$0.0M	$0.0M	$10.0M	0%
Make electrification solutions available for LMI consumers	LMI	$1.3M	$9.2M	-$7.9M	$31.0M	4%
Make products available when and where consumers need them by building the clean heat supply chain	Clean Heat Supply Chain	$0.4M	$1.6M	-$1.1M	$12.0M	4%
Minimize winter electrical peak by investing in demand reducing "heat-pump ready" solutions	Comfort Home	$1.3M	$7.4M	-$6.0M	$26.5M	5%
Develop a long-term building electrification roadmap to guide the transformation of how New Yorkers heat and cool their buildings	Building Electrification Roadmap	$0.4M	$0.7M	-$0.3M	$1.0M	42%
Totals		**$26.9M**	**$39.3M**	**-$12.4M**	**$229.5M**	**12%**

Although most of the initiatives were either delayed in 2020 or significantly limited by the pandemic and related New York on PAUSE Executive Order, NYSERDA still realized 68% of the 2020 investment goal, and 12% of the overall 2020-2025 goal. As of the time of this publication, all of the initiatives planned through Q1 2021 are now in market. Funds to support the development and launch of the 5-year statewide Marketing and Consumer Awareness Campaign were contracted in 2020. Requests for Technical Assistance and Audits continued despite the pandemic. HVAC Technical Challenges activities resulted in the execution of several contracts for the investigation of new clean energy solutions. Both the Empire Buildings Challenge and the LMI Demonstration Pilot were launched in Q4 2020 and the Clean Thermal District System (Community Heat Pump Systems) solicitation developed is completed and is ready for release in early 2021.

5.4 2020 Updates: Critical Market Needs and Market Enabling Initiative

1. TRAIN AND DEVELOP THE NEEDED CLEAN HEATING AND BUILDING ELECTRIFICATION WORKFORCE

2020 Performance

Several training initiatives are underway, with building electrification prioritized under multiple program opportunity notices ("PONs"):

- 1,052 trained through end of 2020, including 23 interns through the Internship Program and 111 new hires through the On-the-Job Training program working on heat pumps. 780 of those trained are in the sales, installation, and design category. 270 of those trained are in "other" categories such as government, real estate, and utilities. The majority of individuals trained to date participated in free, on-line training developed and implemented to support contractors and others during the pandemic. The training was offered in three sessions covering heat pump design and installation considerations for residential applications and four sessions addressing commercial systems. Moving forward, the training will be offered through an LMS platform.
- Issued solicitation (PON 4463, total of $8.5 million in funding) for Career Pathways Training Partnerships for High Efficiency HVAC and Heat pumps with several contracts from the first round expected to be executed in Spring 2021.
- Initiated development of introductory level and technical ccASHP curriculum on sizing and design.
- Launched "Upstream Partners" Initiative to assess information channels and resources needed to educate contractors through their established networks.
- Offering higher incentives for workers hired through On the Job Training ("OJT") that work on heat pumps.
- Contracted for development of HVAC/Heat Pump Career Map to raise awareness of and build interest in career opportunities in the field.

- <u>Key Findings:</u>
    - Observed healthy demand for the initial heat pump series of stand-alone training efforts, including free, on-line training.
    - Training programs for new workers need to include a range of technical proficiencies beyond specific heat pump installation to prepare individuals for successful employment and career options.
    - Heat Pump distributors report strong interest in contractors seeking training on heat pump equipment for installations through distributor classes.

2021 Lookahead

- Identifying new opportunities to develop channel partnerships focusing on career pathway HVAC and heat pump training with community-based organizations and training organizations that work with priority populations in disadvantaged communities.
- PON 4463 Career Pathways Training Partnerships for High Efficiency HVAC and Heat Pumps was reissued in March 2021 to expand participation in the program.
- Upcoming revisions to PON 3981 will better focus on Career Pathways training related to Heat Pumps.
- Online building electrification training content will be transitioned to a Learning Management System to allow for flexible/on-demand participation.

2. BUILD CONSUMER DEMAND AND MARKET CONFIDENCE AND REDUCE CUSTOMER ACQUISITION COSTS

2020 Performance

Marketing

A NYS Clean Heat Consumer Awareness and Education Program is in development to increase adoption of heat pumps statewide and is scheduled to launch in April 2021. Development and launch of the campaign is the most ambitious collaboration and coordinated effort between NYSERDA and each of the State's investor-owned utilities launched under the CEF to date. The campaign will directly target those most likely to benefit from installing heat pumps in the near-term, while building broader awareness in geographies with higher opportunity and adequate coverage of contractor support. To understand current levels of awareness, familiarity, and intent, a baseline study was conducted and will be fielded following each wave of the campaign to gauge awareness. Messages will drive prospects to a single landing environment co-branded to represent the NY Electric Utilities. On the site, visitors can determine options available to them based on their home address and then reach out to area NYS Clean Heat contractors.[22] Metrics tracking will be coordinated with the NY Electric Utilities based on property address. This effort will launch in market in mid-April 2021.

In Q4 of 2020 the Cooperative Advertising and Training cost share was increased to help offset the negative market–effects caused by the pandemic. This additional aid was well received and resulted in a significant uptake in participation by heat pump contractors and manufacturers.

Community Campaigns

Phase 2 funding for Clean Heating and Cooling campaigns will likely start in 2022 after sufficient learning has been achieved based on Phase 1 work.

Critical Tools

An installer's ability to accurately calculate building load determining proper equipment sizing is key to installing heat pump equipment that will help achieve both customer satisfaction and NYS goals. New guidelines and templates focused on cold climate ASHP system sizing and design, to be delivered through manufacturer trainings, has been developed to support the future, enhanced contractor requirements for participation in the NYS Clean Heat program.

An issue in determining heat pump sizing was identified within the NYS Building Code. A NYSERDA-led team worked with the Department of State to issue a clarifying Technical Bulletin and Building Official sizing verification tool to insure proper and code compliant installation.

NYSERDA is supporting a NEEP effort to develop cold climate specifications for PTHPs in recognition of this emerging technology and anticipation of adding this as an eligible technology for NYS incentives.

[22] Note PSEG-LI is funding this campaign in their own territory.

NYSERDA has developed a Heat Pump Planner for consumers. This is a helpful tool to show several common configurations of heat pump installations in a consumer's home. A pdf version has been drafted and will be available in Q2 2021 and it will be integrated into the Consumer landing page (as part of the Consumer Awareness campaign) to provide tools and resources to help consumers plan and become more informed shoppers.

Technical Assistance

The commercial sector has approximately 40 FlexTech studies underway, having either an electrification component or focused on electrification. Contracts are in place to conduct 300 high level clean heating and cooling screenings. To date, 37 screenings are completed. Preliminary results demonstrate a wide range of simple payback estimates. There has been an increased interest in electrification from large energy users such as commercial real estate and colleges. The multifamily sector received 32 applications for electrification studies in 2020. There has also been an increased interest in electrification from multifamily building owners.

2021 Lookahead

Marketing

Lead delivery, tracking, and follow-up will be evaluated for effectiveness and opportunities for improvement will be identified and implemented. The campaign performance will be monitored over time, and based on findings, multiple components will be optimized to maximize outcomes.

Community Campaigns

Starting in 2018, NYSERDA has supported over 20 clean heating and cooling community campaigns around New York, including 6 new campaigns launched in 2020 and early 2021. NYSERDA is continuously improving the execution of Phase 1 Clean Heating and Cooling campaigns. There is a critical need and opportunity to synergize community campaign work both across technologies and with the work of NYSERDA's Communities and Local Government Teams like the Clean Energy Communities and Community Energy Engagement programs.

Critical Tools

NYS has successfully signaled to manufacturers that new clean technologies are needed in the marketplace. NYSERDA has hosted numerous webinars providing a platform for these manufacturers to present current, pending, and future equipment. NYSERDA intends to identify a process to evaluate and qualify these new products for potential eligibility for NYS incentives.

NYSERDA is an active member of the Heat Pump Coalition, led by the Northwest Energy Efficiency Alliance ("NEEA") and including several North American energy-related entities. This Coalition is focused on developing specification, test methods, labelling, best practices, etc. at scale that would gain interest of and influence large manufacturers.

NYSERDA will initiate additional areas of research identified in the 'Heat Pump Supplemental Heat Analysis' project conducted for NYSERDA by VEIC, to better identify when, where, and under what conditions supplemental heat is or is not needed.

Technical Assistance

NYSERDA is soliciting feedback on the clean heating and cooling screenings offered to large building owners. If feedback is favorable, NYSERDA intends to investigate opportunities to deliver more clean heating and cooling screenings. NYSERDA also is soliciting feedback on a decarbonization pathway program focused on P-12 schools, expected to launch in 2022.

3. DRIVE PERFORMANCE IMPROVEMENTS, REDUCE COST, AND DELIVER NEW ECONOMIC SOLUTIONS THROUGH TECHNOLOGY INNOVATION AND DEMONSTRATIONS

2020 Performance

Clean Thermal District Systems

The Clean Thermal District Systems focus has manifest as a solicitation entitled PON 4614: Community Heat Pump Systems, which was issued on February 4, 2021, offering $15 million. PON 4614 is a competitive selection format with a series of proposal due dates, the first of which is March 9, 2021. Extensive stakeholder engagements were conducted throughout 2020 to support development of the solicitation, including vetting a draft of the solicitation (a Strawman) via numerous small group discussions as well as via a WebEx held October 20, 2020, that attracted 241 attendees. A robust and diverse batch of proposals was received in response to Round #1 due date of March 9, 2021, regarding sites located upstate and downstate and addressing retrofits of existing facilities as well as new construction. This batch seeks to mobilize nearly two-dozen feasibility studies to be conducted by a dozen solution providers affecting more than 40-million square feet of buildings spanning sectors such as educational, medical, multifamily residential, and mixed-use campuses; multi-block downtown communities; and a cluster of single-family homes bundled with a nearby commercial building.

Cost Reduction Strategies

NYSERDA is collaborating with Rocky Mountain Institute ("RMI") to help develop strategies to reduce the costs of building electrification and heat pump deployment by 2030. This initiative will include expert interviews and feedback from market actors and is expected to be completed by end of Q2 2021.

HVAC Technology Challenges

While heat pumps offer a clean heating and cooling solution, broad adoption is challenged by concerns of cold climate performance, utilization of high global warming potential ("GWP") refrigerants, condensate management, and lack of available products for specific building applications. In the colder

regions of New York (Climate Zones 5-7) currently available heat pumps, at extreme low outdoor temperatures, can require supplemental back-up heating in certain applications that adds cost and complexity. Leakage of high GWP refrigerant can directly and indirectly (via performance) offset the GHG benefits of using heat pumps. Lack of a practical built-in condensate management solution for heat pumps in tall building retrofits can be a barrier to adoption. Lack of a diverse and easily deployable set of heat pump products for the range of applications (space conditioning, domestic hot water, centralized and decentralized, hydronic, and air) and building types hinders adoption of heat pumps. Through NYSERDA's NextGen HVAC Innovation Challenge (PON 3519), targeted and specific challenges are issued to the industry and innovation community to develop and commercialize innovative solutions addressing the issues to broader heat pump adoption.

In 2020, NYSERDA initiated 10 projects across the technology areas and opportunities of heat pumps, thermal distribution, energy pods, and technology transfer. Through the NextGen HVAC Technology Challenge, NYSERDA in collaboration with the New York City Housing Authority ("NYCHA") developed and issued a challenge for a window mounted heat pump as a solution for their portfolio of affordable multifamily buildings. If successful, such a solution would have broad multifamily application. Projects focused on the development and commercialization of a window mount heat pump are expected to be initiated in Spring 2021. Under the HVAC Technology Challenges several projects underway are focused on a cold climate PTHP replacement for inefficient Packaged Terminal Air Conditioners ("PTACs")/PTHPs found in use by many affordable multifamily buildings.

Empire Building Challenge

There is significant interest from real estate portfolio owners in clean heat technology innovations and demonstration projects that can meet the needs of dense, tall commercial office and multifamily buildings, as demonstrated by the 40+ applications the Program received from portfolio owners. The initial cohort of ten real estate partners selected in the Empire Building Challenge collectively control over 125 million square feet of NY real estate; and through this initiative, these portfolio owners are advancing 30 million square feet of buildings with public commitments to achieve carbon neutrality. This cohort will spend 2021 conducting technical analysis on a variety of approaches to decarbonize space and domestic hot water loads in their buildings. The program anticipates making results from this technical analysis available for public consumption by the end of Q1 2022.

Multifamily Building Demonstrations

The Low Carbon Pathways for Multifamily Buildings Program, which will cost-share and demonstrate performance of underutilized efficiency and electrification solutions, will launch in Q2 2021.

2021 Lookahead

Clean Thermal District Systems

The quantity and quality of proposals received by March 9, 2021, in response to PON 4614 will inform areas to be explored for improvement and future focus.

Cost Reduction Strategies

Currently there is a cost premium for building electrification solutions, in particular relative to gas systems, which is a challenge for heat pump uptake in NYS. There is a need for creative thinking, including input from international experts, about strategies to drive down costs of heat pump installations (in addition to the reduction in cost that is expected to come with market scale).

HVAC Technology Challenges

Clean heat projects initiated in 2020 comprise a $4.2M investment from the technology transfer challenge which seeks technologies not available in the U.S. but commercially available elsewhere. Under this challenge NYSERDA's intent is to accelerate the availability of innovative clean heat products in New York. Activities supported under technology transfer include the necessary product modifications and regulatory approvals, in NYS demonstration and to market activities. NYSERDA will spin-off the technology transfer challenge as a stand-alone open solicitation in Summer 2021. A second larger set of innovation challenges were issued in 2020 in the areas of window mounted heat pumps, low global warming potential refrigerant solutions, thermal energy storage, panelized and building envelope system solutions, and an energy pod concept for mid-rise buildings. Projects from this challenge to be selected and initiated in 2021.

Empire Building Challenge

The NYSERDA team is seeking to determine:

- Should the clean heat program support dual-fuel hybrid (or partial) electrification projects for big buildings? Hybrid electrification projects will be dominant in clean heat project models for the near future in big buildings. This approach raises questions around depth and persistence of carbon reduction achieved by hybrid electrification; and requires further analysis.
- Should buildings on Con Edison Steam transition off the system, or does Con Edison have a viable plan to decarbonize? Portfolio owners that are currently on the Con Ed Steam system are evaluating a range of investments to decarbonize their buildings, but uncertainty about the future carbon content of the Con Ed steam system introduces significant uncertainty in their long term decarbonization planning.

Multifamily Building Demonstrations

The Low Carbon Pathways for Multifamily Buildings Program is under development and will launch in Q2 2021. Opportunities for improvements will be assessed based on market response to the program and informed by progress under the related Empire Building Challenge.

4. MAKE ELECTRIFICATION SOLUTIONS AVAILABLE FOR LMI CONSUMERS

2020 Performance

The LMI Heat Pump Demonstration Pilot was launched in December 2020 which offers additional short-term incentives to offset the cost of heat pump installations for single family and multifamily residential buildings, leveraging NYSERDA's existing service programs of Empower, Assisted Home Performance, and Multifamily Performance Program. Results and findings from the demonstration projects will inform development of a longer-term LMI electrification investment strategy. Initial Market Research and Policy Analysis work is well underway and should be substantially completed by Fall 2021. The scope of additional pilot and demonstration investments is under development, including pilots in coordination with the state housing agency for integrating electrification solutions in the affordable housing pipeline.

2021 Lookahead

Engagement of disadvantaged communities ("DACs") and low-to-moderate income ("LMI") households around electrification and other clean energy topics is essential, but complex. DAC/LMI stakeholder engagement will help ensure strategies are informed by important, policy, regulatory and financial considerations that need to be addressed to accelerate electrification of the affordable housing sector. Efforts underway to integrate electrification directly within housing financing pipelines is a core strategy to integrate electrification into affordable housing. NYSERDA is working closely with NYS Housing and Community Renewal on the Raise the Green Roof collaboration that will be partially funded from NYS Clean Heat as well as other CEF Funding to support integrating energy efficiency and electrification investments into the state supervised housing portfolio. This work builds off separately funded affordable housing electrification work being scoped with NYC Housing Preservation and Development ("HPD") and NYCHA (see Appendix), and promises to help make electrification a regular component of capital improvements in regulated housing and helping move the market for affordable housing as a whole.

5. MAKE PRODUCTS AVAILABLE WHEN AND WHERE CONSUMERS NEED THEM BY BUILDING THE CLEAN HEAT SUPPLY CHAIN

2020 Performance

- Substantive insights have been gleaned from convening statewide roundtables among the largest HVAC contractors serving New York. Increasing share of heat pump sales for this segment is dependent on driving consumer demand, consumer education to reduce sales cycles, available affordable equipment to suit customers without oversizing or increasing energy burden, and accessible financing. Further analysis is underway to convene roundtables with other Supply Chain segments, including manufacturers, distributors, and ground source drillers, among others.

- Work is underway to create market and value maps of the full New York HVAC Supply Chain, to flesh out the largest influencers, understand the interdependencies between Manufacturers/Distributors and contractors, and to identify where NYSERDA could best intervene to accelerate clean energy technology adoption.
- NYSERDA has launched an upstream partners initiative to support the buildout of a trade ally network beginning with development of a needs-assessment for training and other technical and business resources to support market growth.

2021 Lookahead

- Further analysis is needed to better understand the need for dual-fuel hybrid systems by building sector (single family, multifamily, small commercial) to determine what role hybrid systems should play in the transition to full electrification.
- A critical need identified through our market research is the need to win over the "hearts and minds" of HVAC technicians as well as consumers. The team is in the process of developing a "hearts and minds" series of initiatives focused on getting HVAC technicians and other key influencers direct experience living and working in spaces heated with heat pumps to win them over and get them excited about it.
- As the insights gleaned from the market research and mapping lead us to identify potentially high impact intervention points, the team intends to work with the NY Electric Utilities and the supply chain network to develop initiatives targeting these opportunities, particularly mid-stream intervention.

6. MINIMIZE WINTER ELECTRICAL PEAK BY INVESTING IN DEMAND REDUCING "HEAT-PUMP READY" SOLUTIONS – THROUGH THE COMFORT HOME PILOT

2020 Performance

- Preliminary market and technical analysis have been completed to determine scenarios under which ccASHPs can provide 100% of residential heating needs in New York State without resorting to supplemental heat sources to minimize grid impacts of electrification. This work indicates it is possible to maintain comfort year-round in most of New York's climate zones with reasonably well sealed and insulated envelopes and properly designed ccASHP systems. However, additional work is needed to further define the level of envelope performance needed, develop meaningful performance metrics and specifications for ccASHPs, and develop supplemental heat strategies that minimize peak demand impact in residential homes.
- The Comfort Home program launched in Fall 2019 with home assessments beginning January 2020. The program promotes the installation of load reduction measure packages for 1–4-unit residential buildings. The approach seeks to promote cost effective strategies to prepare homes for installation of right-sized heat pumps. To date, 24 participating contractors have completed over 300 assessments and more than 150 load reduction projects to save 5,100 MMBtu in annual fossil fuel savings and 60 MWH in annual electricity savings. Potential grid impacts resulting from the initial 300 homes improved include an estimated avoided electrification-driven peak demand of 268 kW from heat pump operation alone, or as much as 550 kW in future winter peak demand reduction compared to electric resistance heat typically used as

back-up for whole house heat pump installations. With approximately 2.5 Million homes in need of insulation and air sealing improvements, these basic measures are projected to reduce future winter peak demand by as much as 2,200 MW in reduced heat pump capacity and 4,500 MW in avoided electric resistance back-up heat for the 1-4 unit residential market. A mid-pilot review suggests the measure package, load reduction strategy holds great promise and should continue to be pursued and identified a number of process improvements and contractor support enhancements to be implemented in 2021.

- Con Edison and NYSERDA collaborated in Westchester County to align the Comfort Home pilot with Con Edison's existing weatherization program offering. The joint offering stacks weatherization incentives for the Better and Best measure packages to expand program reach and project work scope through a "co-invest, co-save" framework. Central Hudson is exploring offering a weatherization measure in Duchess, Orange, and Ulster counties.

2021 Lookahead

- NYSERDA intends to convene expert meetings with subject matter experts to promote alignment among regional and national stakeholders on metrics and performance standards for cold climate heat pump technologies that will enable us to define an improved ccASHP specification that is consistent and addresses the shortcomings of the currently available specification classification and rating references (Air-Conditioning, Heating & Refrigeration Institute ("AHRI"), NEEP, ENERGY STAR).
- The program anticipates adding 12 new contractors and completing more than 400 load reduction projects in 2021. Additional utility partnerships may accelerate increased production levels. 2021 focus will include further testing the deployment of standardized simulation savings, demand impact calculation methods, and quantification of comfort impacts for load reduction measure packages. Adjustments to the implementation strategy include further streamlining of project application and submittal processes, deployment of enhanced customer segmentation and targeted marketing, and expanding the base of participating contractors.

7. DEVELOP A LONG-TERM BUILDING ELECTRIFICATION ROADMAP TO GUIDE THE TRANSFORMATION OF HOW NEW YORKERS HEAT AND COOL THEIR BUILDINGS

2020 Performance

NYSERDA gained technical and market insights from subject matter experts, including through convening a Market Advisory Group. In conjunction with the Carbon Neutral Buildings Roadmap also under development, key insights were shared with an advisory panel focused on the building sectors in the NYS Climate Action Council process. NYSERDA also has developed an analytical tool to estimate achievable market uptake for heat pumps and building shell upgrades, under forthcoming policy scenarios.

2021 Lookahead

- Further analysis and market engagement is needed around dual-fuel hybrid or partial electrification approaches, where the building switches to using electricity to meet a meaningful portion of its space heating or hot water needs but continues to use fossil fuels for the balance, as a transition path to all-electric systems.
- NYSERDA is working toward more detailed understanding of electrification challenges and opportunities in key segments, notably for commercial building typologies and for low-to-moderate income households and disadvantaged communities.
- Developing and incorporating building resilience solutions for all-electric buildings is critical.

6. Appendix A. Additional NYSERDA Activities to Advance Building Electrification

The initiatives identified below while not specifically included in the NYS Clean Heating Market Development Plan are all focused upon driving Carbon Neutral Buildings of which electrification of heating, cooling and appliances is a key element. These programmatic efforts are expected to produce additional benefits beyond those mentioned above.

Multifamily

In 2020, NYSERDA identified the five most prevalent types of multifamily buildings in NY, and worked with building owners and technical consultants to develop a Playbook for each building type. Each Playbook lays out the path to make these buildings highly efficient and fully electrify them over time, leveraging upcoming capital improvement points like equipment end of life or compliance with local ordinances. These Playbooks serve as an important building block for the launch of additional technical support for low carbon retrofits and electrification and the Low Carbon Pathways for Multifamily Buildings Program.

Multifamily Affordable Housing

In addition to the activities outlined in this report, NYSERDA is implementing and developing several initiatives that are advancing electrification in multifamily affordable housing. The RetrofitNY program is working aggressively to bring a large number of affordable housing units to or near net-zero energy use by 2025, including full electrification. NYSERDA is also working closely with HPD to launch a pilot that will integrate subsidies for electrification of main building system into HPD's existing refinancing and renovation programs, and is scoping similar initiatives with NYS Homes and Community Renewal. Lastly, NYSERDA is working with the NYC Housing Authority to test heat pump technologies that would enable the electrification of heating and cooling in the largest public housing portfolio in the country.

New Construction

The New Construction team is actively engaged in market transforming activities that decarbonize and electrify buildings across all building sectors in New York. The 2021 budget for all new construction activities is approximately $40M, split almost evenly between market rate and LMI funds. The total 2021-2025 budget for market rate activities is $102M and LMI funding is $112M.

One of the signature market initiatives is NYSERDA's Buildings of Excellence program, which provides funding and recognition for the design, construction and/or rehabilitation of carbon neutral buildings in the multi-family sector. This sector represents 40% of new construction in NYS and about 2/3 of units are affordable housing. The Buildings of Excellence program is the only program of its kind in the nation, combining carbon neutral performance requirements, with exceptional design for aesthetics, resiliency, affordability, and health. In the first two rounds of the program (2018 – 2021), 42 very low-carbon and carbon neutral buildings have received awards. All of the Round 2 projects are 100% electric, and most include improved resiliency and reduced embodied carbon versus typical code buildings. NYSERDA is

able to show the premium for high performing all electric buildings is being reduced by this community of leading designers and developers.

As of today, our standard offer new construction programs have been reformatted to only support decarbonized projects and NYSERDA will be moving our focus to early design stages to gain maximum leverage over the next year. NYSERDA expects to launch a single family design initiative later this as well as new strategic initiatives as part of the Net Zero for Economic Development in the Commercial sector in the 2021 CFA.

Codes & Standards

NYSERDA continues its work to advance codes and standards, using research, analysis, market engagement, education, pilots, and direct community support to improve compliance and enforcement, while advancing towards more stringent codes throughout New York State. With a budget of about $74M moving forward 2021-2025. A significant portion of work in the codes and standards space will focus on using statutes and regulations to build on the market development work outlined throughout this report. Specifically, research, analysis, and market outreach are currently underway on how best to include electrification-readiness requirements in the next NYS uniform code, preparing the way for a cost-effective shift to electric space and water heating in the future. In addition, NYSERDA has been working with stakeholders to map out how a combination of codes, appliance standards, and other mandates can be used to drive decarbonization in new construction and existing buildings starting in 2025. Included in the standards being examined are both elimination of fossil fuel appliances and equipment sales and building emission performance standards. NYSERDA is actively providing information to the Climate Leadership and Community Protection Act working teams. More work remains, but market development success will allow these mandates and requirements to move forward in a timely manner, helping NYS meet its 2050 decarbonization goals.

Clean and Green Schools

NYSERDA is working on a Clean Green Schools initiative and aiming to invest approximately $40M in low-carbon solutions for schools within disadvantaged communities. This work would build upon the existing NYSERDA programs available to PreK-12 schools to provide professional resources needed for planning carbon reduction and heat pump ready opportunities as well as funding of demonstrations to create a model for decarbonization and electrification of schools.

7. Appendix B. NYSERDA Output/Outcome Progress Summary

Several NYSERDA investment plans (initiatives) support the NYS Clean Heat Market Development plan, however not all initiatives have output/outcome indicators with targets attributed solely to NYS Clean Heat. Indicators shown below are limited to those specifically identifying targets for NYS Clean Heat

In a challenging year, most indicators show good progress against 2020 targets such as space and water heating technology installations, whereas delays to launch some program components in areas such as LMI households show indicators lagging 2020 expectations.

Table 12. NYSERDA Output/Outcome Progress Summary

			Baseline	*Cumulative Progress*	*Cumulative Targets by Year*					
	Initiative	**Indicators**	**Before/Current**	**2020**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Outputs	Heat Pumps Phase 2 (2020)	Number of leads generated for contractors	1	7969	30,000	140,000	250,000	430,000	680,000	1,000,000
		Customer acquisition costs offset, in dollars	0	429,379	185,000	600,000	1,000,000	1,600,000	2,250,000	3,000,000
		Coop advertising campaign costs offset, in dollars	0	429,379	600,000	3,150,000	5,850,000	8,250,000	9,500,000	
		Number of Clean Thermal District System projects supported by NYSERDA	0	0				2		
		Businesses provided with tools, technical support and business development assistance	TBD	0		50	75	125	150	200
		Number of LMI households with heat pump installations (demonstrations and direct installations)	TBD	0	2,300	5,650	7,500			
		Number of energy-efficient electrified space and water heating technologies installed through NYS Clean Heat	0	5718	3,900	18,200	32,500	55,900	88,400	130,000
	Residential	Number of homes that reduce energy loads in their homes to prepare for heat pump installations	0	119	800					8,775
	Multifamily	Number of low carbon technology demonstrations	0	0				10,217 units		
	Building Operations and Maintenance Partnerships	Increase in number of workers trained (electrification target shown in parenthisis)	20	1928 (0)					9,600 (1,000 electrification)	
	Talent Pipeline	Students placed in internships by training providers as part of training through this initiative (electrification target shown in parenthisis)	0	76 (0)			400 (150 electrification)			600 (300 electrification)
		Interns hired directly by businesses through Internship Program (electrification target shown in parenthisis)	0	427 (23)			900 (200 electrification)			2,000 (500 electrification)
		New hires through OJT Program (electrification target shown in parenthisis)	0	371 (111)			950 (500 electrification)			2,050 (1,200 electrification)
		Total workers trained through this initiative (electrification target shown in parenthisis)	0	4,809 (918)			14,000 (5,000 electrification)			25,000 (11,000 electrification)
Outcomes	Heat Pumps Phase 2 (2020)	Increase in awareness of CH&C technologies*	TBD	N/A			15%			50%
		Replication of Clean Thermal District System projects beyond NYSERDA supported projects	0	N/A					1	2
		Reduce the cost of heat pump installations in New York*	0%	N/A			10%			25%
		Increase stocking of heat pumps above HARDI 2019 shipments*	0%	N/A			20%			50%
		Increase penetration of high-performance cold climate heat pumps as a percent of all heat pumps shipped for space conditioning in New York (baseline 2018 HARDI ASHP data)*	61%	N/A			70%			90%

Table notes

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