2021 Pilots, Demonstrations and Assessments

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1. Introduction

The Company invests in pilots, demonstrations and assessments to research and develop new measures, solutions and programs to expand energy efficiency choices and benefits to customers. The Company continues to test new measures and solutions that were proposed in the 2020 Annual Plan and has proposed additional demonstrations and assessments for the 2021 Annual Plan. In 2019, as part of its commitment to innovation, the Company launched the new Customer Energy Management (CEM) Growth and Development team. This team has developed a new framework to assess and test new innovations for the energy efficiency and active demand response portfolios. This team will accelerate the process of developing and implementing pilots, demonstrations and assessments for the Company, resulting in new measures, solutions, and offerings for customers.

Process: The Company has developed a standard process by which it tests all new ideas and determines if the idea merits a pilots, demonstration, or assessment. Each idea is first assessed in the **Intake** stage to determine if the solution can be offered through the energy efficiency or demand reduction programs and if it is commercially available. The application of the idea, target customers, context of existing programs and offerings, initial identification of market barriers that the idea addresses or faces, and preliminary savings potential are developed in the **Concept** stage. Ideas in these two early stages of review make up the Innovation Pipeline of ideas that is continually moving as new ideas are examined and promising ideas are further vetted and launched into the portfolio.

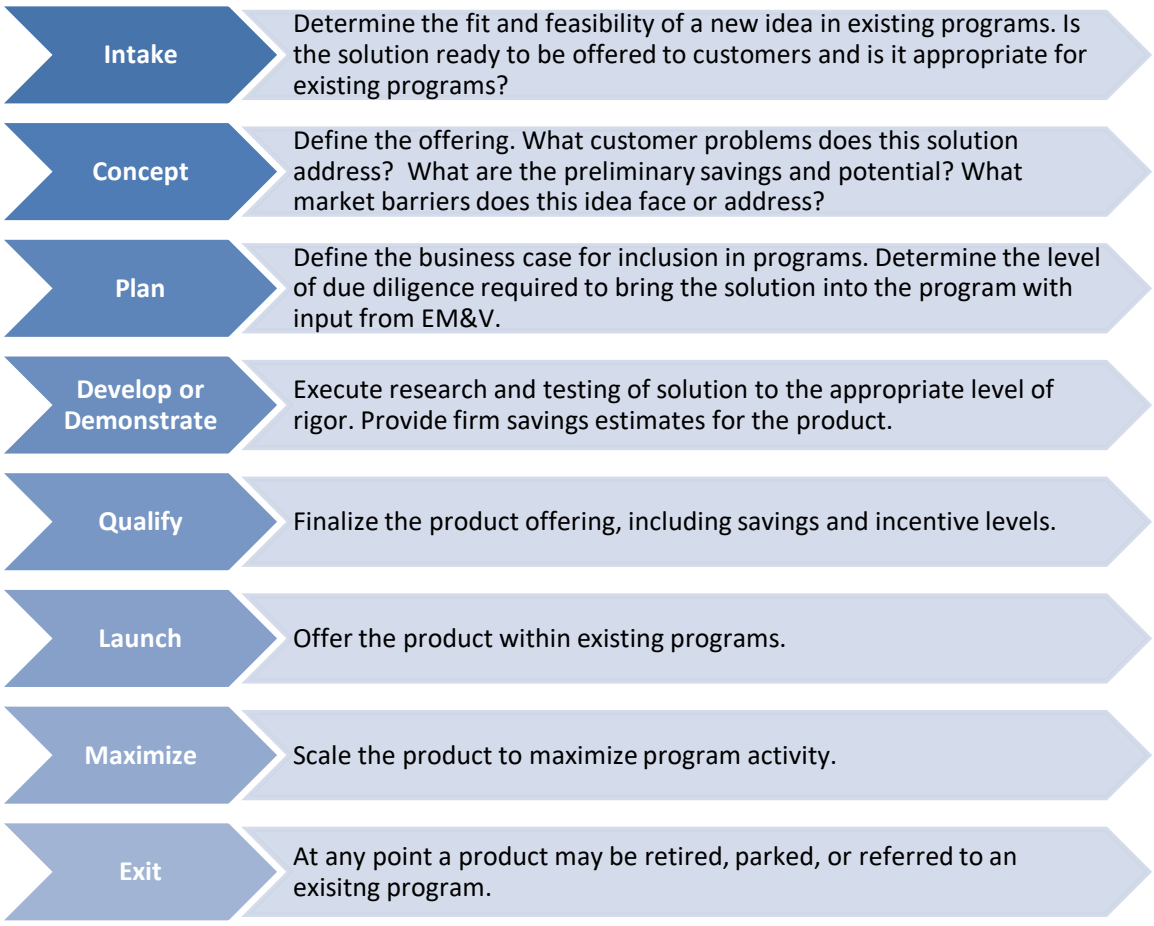
The Concept stage necessitates preliminary research and analysis of the product, which will inform the **Plan** stage. Key decisions of how to progress with the solution are made during the Plan stage, including if a pilot, demonstration, or assessment is required to develop the idea and, if so, whether an independent or vendor evaluation approach should be taken. The new ideas included in section 4 are all in the plan stage of development and recommended for a pilot, demonstration, or assessment beginning in 2021. The decisions around what type and rigor of testing required for each item will be made with input from the National Grid Evaluation Measurement & Verification (EM&V) team, EERMC Consultants, and OER.

The planned pilot, demonstration, or assessment will be executed in the **Develop or Demonstrate** stage. Updates will be provided to the stakeholder teams on a quarterly basis.

Once the develop or demonstration stage is complete, the offering will be finalized and launched through the **Qualify**, **Launch**, and **Maximize** stages. During these stages, the product

will be handed off to the CEM, vendor, and implementation teams who will manage the product as part of the Company's energy efficiency portfolio.

During any of the above stages it is possible for the idea to **Exit** the process. The product may be **Retired** if it does not fit into our programs or if there is no viable business case. The product may be **Parked** if the policy or infrastructure required for the idea to be successfully delivered to customers is not available, but may be in the near term. Finally, the product may be **Referred** directly to the programs if the idea is expected to produce reliable savings, fits readily into an existing program or measure, and the receiving program has the capability to finalize savings and incentives.



Innovation Pipeline: The process outlined above is designed to bring in as many ideas as possible and quickly determine to what extent the Company should invest resources in developing the idea. The pilots, demonstrations, and assessments discussed here have already been identified as ideas that should be further explored and tested, but it's possible that

additional ideas from the Innovation Pipeline will emerge for additional, immediate analysis through 2021. To ensure those emerging ideas can be quickly and efficiently vetted, the Company has set aside budget to assess approximately two ideas in each sector. Promising ideas may progress to a demonstration or as a program measure in the following year.

Evaluation: It is to be expected that each idea passing through this process will have a different set of requirements and research questions that must be answered prior to qualification and inclusion in programs. Depending on the characteristics of the idea, the expected program delivery pathway, and the nature of the uncertainty around the idea, the Company plans for different approaches to evaluate the idea during a pilot, demonstration, or assessment. For example, a low touch residential product that we expect to deliver through an upstream program requires a very different analysis than a high touch industrial measure with few potential customers across the state.

The Customer Energy Management Growth and Development team will recommend a research plan for each pilot, demonstration, or assessment approved through the planning process. The team will solicit input from the Company's EM&V team, OER, and EERMC consultants on whether the research requirements can be best met through an independent evaluation, a vendor evaluation, or an internal review. These approaches are further discussed in the next section.

2. Definitions

The Company, using guidance from the PUC, has outlined three separate pathways that may be used to assess ideas in the Innovation Pipeline: Pilot, Demonstration, or Assessment. It is assumed that any idea selected for a Pilot Demonstration, or Assessment has been vetted through the Intake and Concept stages outlined above. Ideas are vetted for fit and feasibility, commercial availability, and documented preliminary recommendations of characteristics like target customer, market barriers, magnitude of potential savings, and delivery pathway. A pipeline idea will only be recommended as a pilot, demonstration, or assessment if there are clearly articulated research goals that cannot be answered without a concerted research effort.

The Company has three research pathways that can be applied during a pilot, demonstration, or assessment: Independent Evaluation (highest rigor), Vendor Evaluation, or Internal Review (lowest rigor). The research pathway will be chosen depending on the needs and potential of a Pilot, Demonstration, or Assessment.

Table 1. Definitions: Pilots, Demonstrations and Assessments			
	Pilot	Demonstration	Assessment
Defining Characteristics	• May result in independent program • Long term and comprehensive engagement required to test and develop offering • Market capabilities may need to be developed	• Technology requires information gathering and field installations	• Technology addresses program need that can't be met with other, more certain solutions • Technology does not have a robust basis for energy savings
Cost effective savings information	Unknown or limited	Estimated savings	Unknown or limited
Evaluation Options*	Vendor or Independent	Vendor or Independent	Vendor, Independent, or Internal Review
Savings contribution to shareholder incentive	No	Yes	No
Cost recovery from SBC	Yes	Yes	Yes

* Each evaluation option will include input from EERMC and OER. Evaluation option selection based on factors such as uncertainty of savings, scope of offering, and whether technology is considered a pilot, demonstration, or assessment

Pilots

In 2019, the Company redefined what it considers a pilot in accordance with the Docket No. 4600-A PUC Guidance Document.

Pilot definition: As defined in the Docket 4600-A Guidance Document, “A pilot is a small scale, targeted program that is limited in scope, time, and spending and is designed to test the feasibility of a future program or rate design. It is incumbent upon the proponent of a pilot to

define these limits in a proposal for PUC review. Ideally, a pilot can provide net benefits and achieve goals, but the primary design and value of a pilot is to test rather than to achieve."[1]

This attachment summarizes each pilot and describes the way it advances, detracts, or remains neutral on achieving the Docket 4600 goals for the electric and gas system.

Pilots are designed to explore technologies and approaches to energy management not included in the core energy efficiency programs (Residential, Commercial and Industrial, and Multifamily) and that could potentially become a new, standalone program.

Pilots enable the Company to test technologies, new energy management strategies, customer adoption, workforce adoption, and cost effectiveness of emerging and new technologies. While pilots are designed to test standalone programs, pilot results may conclude that a standalone program is not recommended or that certain aspects of the pilot should be offered within existing programs. It is likely that pilots will require a long term commitment and broader set of stakeholder input, given the scope of adding a new core program to the Company portfolio. Savings associated with Pilots will not contribute to shareholder incentives. Pilots may be evaluated with either an independent or a vendor evaluation.

Pilots are likely to be recommended when:

- Solution meets fit and feasibility criteria of the Intake stage
- Solution is well defined in the Concept stage, including estimate of savings and potential
- Solution is unique and robust enough to operate as a standalone program
- Long term and comprehensive engagement required to determine the benefits and structure of a potential standalone program
- Market capabilities may need to be built before the program can be successful

For actions in this Plan that do not fall under the Docket 4600-A definition of pilots, the Company proposes the following definitions for demonstrations and assessments:

Demonstrations

Where a pilot will test the feasibility of a new program outside of the existing core programs, a demonstration will test the feasibility of a new product or offering for inclusion in existing programs. It is generally expected that demonstrations will be less time and resource intensive than pilots, since generally there is greater certainty around a narrow, incremental idea added to a program rather than a totally new set of offerings. Savings associated with demonstration

[1] Docket No. 4600-A PUC Guidance Document, October 27, 2017. Section V. Pilots.

projects may contribute to shareholder incentives. Demonstrations may be evaluated with either an independent or a vendor evaluation.

Demonstrations are likely to be recommended when:

- Solution meets fit and feasibility criteria of the Intake stage
- Solution is well defined in the Concept stage, including estimate of savings and potential
- Expected that the solution requires information-gathering and field installations
- Solution has a robust basis for energy savings

Assessments

Assessments will be deployed for solutions that address a particular gap or program need, but have significant uncertainty around the effectiveness or potential of the solution to realize savings. Because of the uncertainty, assessments will not include field demonstrations or customer installations. Instead, assessments will focus on information gathering to equip Company staff to make a more informed decision of whether and how to proceed with the idea. It is possible that an assessment could recommend further demonstration of the idea or determine the solution should exit the review process. Savings associated with assessments may not contribute to shareholder incentives. Assessments may be evaluated with an independent evaluation, vendor evaluation, or internal review.

Assessments are likely to be recommended when:

- Solution may have questions of fit and feasibility in the Intake stage
- Solution addresses a program need that can't be met with other, more certain options
- Solution does not have a robust basis for energy savings

Evaluation Pathways

Three evaluation pathways are available to determine the appropriateness of a particular solution for inclusion in the programs. The evaluation approach will be determined based on considerations such as the uncertainty of the savings, scope of the offering, market barriers, and whether the technology is considered under a pilot, demonstration, or assessment.

Independent evaluations will apply the greatest level of rigor to the pilot, demonstration, or assessment and will require broad coordination between teams. The CEM Growth and Development team will participate in the planning and review process, but the evaluation itself is subject to the procurement process, oversight, and methods outlined in Attachment 3. The third-party evaluator will develop the evaluation plan prior to customer installations to ensure the number and condition of customer installations are appropriately rigorous. The third-party evaluator may not necessarily perform customer installations, but they will be involved to the

extent required to ensure appropriate metering and customer feedback needed for the final analysis.

An independent evaluation is likely to be recommended if:

- Solution is expected to contribute significant savings towards program savings goals
- The pilot, demonstration, or assessment analysis must consider population level analysis, as opposed to site specific analysis, to answer research questions
- There are policy or baseline questions that should be addressed through the evaluation framework

Vendor evaluations will be managed by the CEM Growth and Development team from beginning to end with a single vendor completing all tasks of the evaluation. Vendor evaluations may be applied to a pilot, demonstration, or assessment. This evaluation pathway will engage a vendor to provide initial research on market readiness, market barriers, customer interest, and work in other territories, before they assess, install, and analyze the results of the technology. The vendor must not have a financial interest in the outcome of the pilot, demonstration, or assessment and must have the necessary engineering, research, or M&V experience to evaluate the idea in an unbiased manner. The vendor will provide recommendations for including the technology in the programs and key information to inform deployment of the offering such as target customers, market barriers, savings methodology, and best practices for installations and commissioning. The key differences between a vendor evaluator and independent evaluator related to oversight, since the independent evaluator is subject to the RI EM&V, and vendor procurement, since independent evaluators are subject to procurement processes in Attachment 3.

A vendor evaluation is likely to be recommended if:

- Solution will not contribute significant savings towards program savings either because it has a niche application or the savings are relatively small
- Solution is expected to be delivered through a custom pathway with site specific information inputs available during program delivery

Finally, an **Internal review** may use internal resources, primarily the CEM Growth and Development team, to explore a product through an Assessment. Internal reviews will not be applied to pilots, which require external capabilities, or demonstrations, which must maintain the integrity of the savings that may contribute to the shareholder incentive. An internal review will focus on key questions of uncertainty or policy related to the technology. The internal review can draw on available external resources and data, but will perform the research, analysis, and recommendations internally.

An internal review is likely to be recommended if:

- Solution is examined as an Assessment
- Research questions can be answered without customer installations
- Research can be delivered with internal resources and external resources that already available without procurement processes (such as ESource)

3. Summary of Commercial, Industrial and Residential Pilots, Demonstrations and Assessments

The following pilots' demonstrations and assessments are proposed for 2021 in the Commercial, Industrial, and Residential sectors. Savings estimates are approximate and only include primary fuel savings for the target customer population.

Table 2. Electric Commercial and Industrial Demonstrations and Assessments							
Classification	**Fuel**	**Name**	**C&I Programs**	**Duration**	**Budget***	**Savings Estimation**	**Evaluation**
Demonstrations							
Industrial	Dual	Continuous Energy Improvement (CEI)	C&I Retrofit	2018-2021	$ 380,800	900 MWh (projected for 2021)	Vendor
Lighting	Dual	Network Lighting Controls Plus HVAC (NLC+)	C&I Retrofit	2020-2021	$ 130,252	1.44 kWh/SF	Vendor
HVAC	Dual	Kitchen Exhaust	C&I Retrofit	2020-2021	$ 66,292	27 MWh (potential)	Vendor
	Dual	Smart Valves	C&I Retrofit	2021	$ 177,750	300 MWh (projected for 2021)	Vendor
	Elec.	Enzyme-based HVAC Coil Cleaning	C&I Retrofit	2021	$ 85,538	6-10% of HVAC consumption	Vendor
Innovation Pipeline**	Elec.	Innovative Electric	Allocated	2020	$ 32,401	To be estimated	To be determined
Assessments							
Laundry	Dual	Shared Laundry Facility Clothes Washers and Dryers	C&I New Construct-ion	2021	$ 6,480	Unknown	Internal Review
General	Dual	Use of Submetering to Support EE Opportunities	C&I Retrofit	2021	$ 25,921	Unknown	Internal Review
Refrigeration	Elec.	Refrigerant Leak Survey and Repair	C&I Retrofit	2021	$ 25,921	Unknown	Internal Review
HVAC	Elec.	HVAC Automation for Demand Response	C&I New Construct-ion	2021	$ 25,921	Unknown	Internal Review
Total Electric C&I Demonstration					**$ 873,033**		
Total Electric C&I Assessments					**$ 84,242**		

Note:
*Budgets indicated in this table include, evaluation, incentives, program administration, sales, marketing, technical assistance and training (if applicable). Pilots and Assessments budgets are not included in Performance Incentive calculations.
** Innovation budgets are for demonstrations that present opportunities during the plan term. Budget and savings estimates will be developed when the demonstrations are identified.

Table 3. Gas Commercial and Industrial Pilots, Demonstrations and Assessments							
Classification	**Fuel**	**Name**	**C&I Programs**	**Duration**	**Budget***	**Savings Estimation**	**Evaluation**
Pilot							
Active Demand Response	Gas	Gas Demand Response Pilot	N/A	2021	$ 215,780	27,280 Therms (projected for 2021)	Vendor
Demonstrations							
Industrial	Dual	Continuous Energy Improvement (CEI)	C&I Retrofit	2018-2021	$ 179,200	75,000 Therms (projected for 2021)	Vendor
HVAC	Dual	Network Lighting Controls Plus HVAC (NLC+)	C&I Retrofit	2020-2021	$ 64,154	0.012 Therms/sqft	Vendor
	Dual	Smart Valves	C&I Retrofit	2021	$ 59,250	23,000 Therms (projected for 2021)	Vendor
	Dual	Kitchen Exhaust	C&I Retrofit	2020-2021	$ 134,593	67,000 Therms (potential)	Vendor
	Gas	Gas Heat Pumps	C&I New Construct-ion	2022-2022	$ 233,287	15,000-20,000 Therms (for a 400-600 mbh unit)	Vendor
Innovation Pipeline**	Gas	Innovative Gas	Allocated	2021	$ 32,401	To be estimated	To be determined
Assessments							
Laundry	Dual	Shared Laundry Facility Clothes Washers and Dryers	C&I New Construct-ion	2021	$ 19,441	Unknown	Internal Review
General	Dual	Use of Submetering to Support EE Opportunities	C&I Retrofit	2021	$ 25,921	Unknown	Internal Review
Total Gas C&I Pilots					**$ 215,780**		
Total Gas C&I Demonstrations					**$ 702,885**		
Total Gas C&I Assessments					**$ 45,361**		

Note:
*Budgets indicated in this table include, evaluation, incentives, program administration, sales, marketing, technical assistance and training (if applicable). Pilots and Assessments budgets are not included in Performance Incentive calculations.
** Innovation budgets are for demonstrations that present opportunities during the plan term. Budget and savings estimates will be developed when the demonstrations are identified.

Table 4. Electric Residential Demonstrations and Assessments							
Classification	**Fuel**	**Name**	**Residential Program**	**Duration**	**Budget***	**Savings Estimation**	**Evaluation**
Demonstration							
HVAC	Dual	New Air Sealing and Insulation Products	EnergyWise	2021-2022	$ 25,921	0.05 kWh/sqft	Vendor
Demand Response	Elec.	Solar Inverter Direct Load Control	Residential Demand Response	2021-2023	$ 254,570	102.5 kWh/ inverter	Independent
****Innovation Pipeline**	Elec.	Innovation Electric	Allocated	2020	$ 32,401	To be estimated	To be determined
Assessments							
Whole Building	Elec.	Pre-Fab Whole House Energy Refurbishment	RNC	2021	$ 6,480	Unknown	Internal Review
Total Electric Residential Demonstration					**$ 312,892**		
Total Electric Residential Assessments					**$ 6,480**		

Note:
*Budgets indicated in this table include, evaluation, incentives, program administration, sales, marketing, technical assistance and training (if applicable). Pilots and Assessments budgets are not included in Performance Incentive calculations.
** Innovation budgets are for demonstrations that present opportunities during the plan term. Budget and savings estimates will be developed when the demonstrations are identified.

Table 5. Gas Residential Demonstrations and Assessments							
Classification	**Fuel**	**Name**	**Residential Program**	**Duration**	**Budget***	**Savings Estimation**	**Evaluation**
Demonstrations							
HVAC	Dual	New Air Sealing and Insulation Products	EnergyWise	2021-2022	$ 77,762	0.1 Therm/sqft	Vendor
	Gas	Gas Heat Pumps	HVAC	2021-2022	$ 201,445	250 Therms/unit	Independent
Innovation Pipeline**	Gas	Innovation Gas	Allocated	2021	$ 32,401	To be estimated	Independent
Assessments							
Whole Building	Dual	Pre-Fab Whole House Energy Refurbishment	RNC	2021	$ 19,441	Unknown	Internal Review
Total Gas Residential Demonstration					**$ 311,608**		
Total Gas Residential Assessments					**$ 19,441**		

Note:
*Budgets indicated in this table include, evaluation, incentives, program administration, sales, marketing, technical assistance and training (if applicable). Pilots and Assessments budgets are not included in Performance Incentive calculations.
** Innovation budgets are for demonstrations that present opportunities during the plan term. Budget and savings estimates will be developed when the demonstrations are identified.

4. Commercial and Industrial Pilots, Demonstrations and Assessments

4.1 Commercial and Industrial Pilots

a. Gas Demand Response

Pilot Stage: Develop of Demonstrate

Innovation Overview: The Company has been utilizing electric Demand Response (DR) to address grid constraints and help provide reliable service to our customers for a number of years. During the winter of 2018/19, the Company launched a Peak Period Gas Demand Response (PPDR) pilot offering, which incentivizes customers to shift their usage outside of the peak-period of the gas system (6AM-9AM from November 1st to March 31st). This pilot targeted commercial and industrial customers who have intra-day flexibility of their natural gas usage. Customers in this pilot would be able to provide their demand reduction via either fuel-switching or demand control (e.g. thermostat setback). In 2019/20, the company added the Expanded Demand Response (EDR) offering, which targeted large customers that could achieve 24 hour gas reductions, primarily with back-up heating. At the close of the 2019/20 season, the company had two participants in the PPDR pilot offering and two in the EDR pilot offering.

With gas DR, the Company will test distribution system benefits, reduction of gas system peak demand via a reduction in overall natural gas consumption, customer adoption of gas DR and incentive levels to drive participation. An in-depth study, Gas Peak Demand Savings, will get underway in 2020 and will quantify winter demand benefits. Testing Gas DR will allow the Company to understand the impact on gas systems and whether National Grid's role in the market has influenced market adoption.

The Company plans to target 40-45 dekatherms (DTh) of hourly peak reduction in the winter of 2020/21, with the below stated DR offerings. The Company continues to expect that the majority of these peak reduction savings will come from customers participating in the full day Extended Demand Response (EDR) pilot offering, with the remainder from customers participating in Peak Period Gas Demand Response (PPDR) pilot offering. These demand reduction pilot offerings are described in detail below. The above stated target is dependent on enrollment levels and setting an appropriate incentive level to drive participation. Since 2020/21 will be the second year running both of these pilot offerings, the budget is estimated based on the Company's current understanding of the customer base and incentives required to continue enrollment levels for the next two winter DR seasons, winters 2020/21 and 2021/22.

Customer segment addressed*:* The gas DR pilot offerings are focused on large, firm commercial and industrial customers, specifically those with gas equipment that can be curtailed without creating an unsafe environment. The goal of the project is to test the following:

- Are customers interested in participating in an incentivized Gas Demand Response program?
- If so, what are the acceptable price point values by customer business type and equipment type?
- What are the distribution system benefits?
- What is the scalability of the program?

Pilot Delivery: The gas DR pilot involves the installation of data recording hardware that provides granular usage data for participating customers. Data from the pilot will be evaluated each year, with a summary report produced in 2020 and 2021. In the winter of 2018/19, four Gas DR events were called and an average peak hour reduction of 18 DTh was achieved. In the winter of 2019/20, two Gas DR events were called and an average peak hour reduction of 19 DTh was achieved. A large resource was added in February of 2020, which only participated in one of the events, bringing down the average peak hour reduction, but increasing the potential peak hour reduction to 32 DTh in the EDR pilot offering.

Peak-Period Demand Response (PPDR): For winter 2020/21, the Company expects to increase participation in PPDR by adding one to two new customers on top of the two customers that participated in 2019/20. Many pilot parameters will remain similar to the terms of the pilot offering launched during the winter of 2019/20:

- National Grid can only call a limited number of event during a given winter.
- Customer participation in this pilot offering and the called events will be compensated via direct incentive payments, not in the form of a reduced rate.
- While enrolled customer participation in called events will be mandatory, this participation will be enforced through contractual structures and financial penalties – National Grid will not maintain a unilateral right to disrupt gas service to participating customers during called events.

Incentive Structure: As was the case in 2019/20, customer compensation for participation in the PPDR pilot offering will be based on a combination of 'availability' and 'energy' payments. Each of these rates will be standard offers to all customers, though customer earning opportunity will vary based on the volume of peak hour Dth reduction that each customer can commit to and deliver. New for 2020/21 will be the addition of a performance rating which will be applied to availability payments, providing a measure of customer reliability and limiting payments to poor performers.

Extended Demand Response (EDR): For the winter of 2019/20, the Company developed an offering for an Extended Demand Response pilot, which provided a meaningful reduction in the peak load requirement in the system. The EDR pilot offering incentivized customers with inter-day flexibility of their natural gas usage, or the existing ability to switch their heating fuel from natural gas to another fuel source for a full day period.

The basic parameters of this pilot offering match those of the PPDR pilot offering. However, in the EDR offering, the duration of each event would be 24 hours (10AM on day 1 until 10AM on day 2, Nov. 1st through March 31st). Customers in the EDR pilot offering are expected to achieve their committed demand reductions via fuel-switching. Limitations will also be put in place that will limit the number of consecutive days on which any individual customer could be called to participate in the EDR pilot offering. National Grid will have the right to call up to 6 events during the winter at the stated incentive rate.

The EDR pilot offering will provide incentives for customers who can eliminate their usage on a given day by switching to an alternative source (most typically a delivered fuel option) to meet their energy needs.

Incentive Structure: Customer compensation for participation in the EDR pilot offering will be based on the same combination of 'availability' and 'energy' payments outlined in the PPDR pilot offering description, set at different levels for each pilot offering. Each of these rates will be standard offers to all customers, though customer earnings opportunity will vary based on the volume of peak hour DTh reduction that each customer can commit to and deliver. As with the PPDR pilot offering, the EDR 'availability' incentives will now be subject to a performance rating based on a measurement of customer reliability.

Evaluation: Initial benefit cost analysis indicates that the Peak Period Demand Response pilot offering has a pathway to being cost effective. A more detailed analysis will be conducted in 2020 to determine results and inform the 2021-2023 Energy Efficiency Plan.

The gas DR pilot will be evaluated for benefits to the customer and the distribution system and to determine if it has a pathway to be cost effective at scale. Due to the small number of customers targeted by this pilot, this evaluation will be performed by the vendor, with oversight from the Company's EM&V team.

Changes in 2021: The Gas Peak Period Demand Response and Extended Demand Response pilot offerings will continue in the winter of 2020/21. The Company plans to retain current levels of enrollment in the EDR offering and slightly increase participation in the PPDR pilot offering. The addition of the previously mentioned performance rating will ensure that incentives paid by the company are aligned with the delivered reliability of customer resources. Slightly lower rates are expected to be offered in 2020/21 as well, allowing room for additional customers in PPDR.

Table 6: Docket 4600 Goals - Gas Demand Response	
4600 Goals for Gas distribution System	Advances/Detracts/Neutral
Provide reliable, safe, clean, and affordable energy to Rhode Island customers over the long term (this applies to all energy use, not just regulated fuels).	DR has the potential for many value streams, such as alleviating local distribution system constraints, increasing system flexibility, potentially delaying infrastructure reinforcement projects, and providing a revenue stream for participants.
Strengthen the Rhode Island economy, support economic competitiveness, retain and create jobs by optimizing the benefits of a modern grid and attaining appropriate rate design structures.	DR has the potential for many value streams, such as alleviating local distribution system constraints, increasing system flexibility, potentially delaying infrastructure reinforcement projects, and providing a revenue stream for participants that would support economic growth.
Address the challenge of climate change and other forms of pollution.	While demand response does not directly address climate change, the additional insight into usage due to the increased data resolution provided to participants may create an opportunity for additional energy efficiency projects. Additionally, there may be a reduction in carbon due to participation in DR events.
Prioritize and facilitate increasing customer investment in their facilities (efficiency, distributed generation, storage, responsive demand, and the electrification of vehicles and heating) where that investment provides recognizable net benefits.	Neutral – this pilot is neutral on this goal
Appropriately compensate distributed energy resources for the value they provide to the gas system, customers, and society.	Neutral – this pilot is neutral on this goal
Appropriately charge customers for the cost they impose on the grid.	Neutral – this pilot is neutral on this goal
Appropriately compensate the distribution utility for the services it provides.	Neutral – this pilot is neutral on this goal

Align distribution utility, customer, and policy objectives and interests through the regulatory framework, including rate design, cost recovery, and incentive.	Gas DR pilot advances this goal by putting incentives towards peak reduction on the gas distribution network that helps to achieve the GHG reduction goals of the Resilient Rhode Island Act of 2014 and the Rhode Island GHG Emissions Reduction Plan of 2016. There is also an alignment in the sense that customer participation could affect system planning, which could have a larger financial impact for all customers. In this way, participants are incentivized for providing the behavior that matches the goals of the company.

4.2 Commercial and Industrial Demonstrations

The Company has prioritized one new innovation for demonstration in 2021, as well as the continuation of four demonstrations included in prior years.

a. Enzyme-based HVAC Coil Cleaning

Demonstration Stage: Plan

Innovation Overview: HVAC coils, such as those on rooftop units, become soiled with dirt and biofilm over time. This meaningfully reduces the heat transfer coefficient of the coils, which can be reversed by coil cleaning, typically with pressure washing. Pressure washing may not, however, lead to full cleaning of the coils, particularly interior sections. Companies such as Blue Box Air have proposed cleaning with a bioenzyme foam; these vendors claim that enzyme-based cleaning leads to greater efficiency improvement and can also improve indoor air quality and potentially provide disinfection.

Target Customer and Program Fit: Hotels, hospitals, office buildings, universities – locations which have high occupancy, cooling costs, and place a premium on air quality – are the best fit for this innovation.

Prior Efforts: There have been no prior efforts for this technology.

Demonstration Delivery: The Company will work with sales and marketing to identify three to four customer sites that represent a mix of the above customer types. At the customer sites, the Company will target a mixture of HVAC systems, including condenser coils, fan coils, evaporator coils, and air handers. The Company will contract Blue Box Air to perform its cleaning process at those sites, with identified equipment. The cost of the cleaning process is expected to be

significantly lower than efficiency improvements, and the goal will be to compare the cost and benefits of this cleaning process to the relatively well-understood savings associated with conventional pressure washing.

Evaluation: Vendor evaluation, pre- and post-metering, with input from National Grid EM&V

b. Strategic Energy Management (SEM)/Continuous Energy Improvement (CEI)

Demonstration Stage: Develop of Demonstrate

Innovation Overview: Strategic energy management (SEM) is a set of processes for business energy management. The main goal of SEM is to activate industrial and manufacturing customers through a multiplicity of interventions, including individual and group coaching, to address operation and maintenance measures in the short-term, pursue capital measures in the medium-term, and establish a culture of continuous improvement in its energy performance over the long-term. This last part is of critical importance in the testing of this initiative.

Target Customer and Program Fit: Manufacturing and waste water customers.

Prior Efforts: In 2019, National Grid and its implementation partner, Cascade Energy, recruited seven sites to participate in the SEM demonstration. In addition, there are four wastewater sites from Rhode Island who are participating in the Massachusetts mixed manufacturing and wastewater SEM cohort. The energy models were developed during the summer of 2019. Five workshops have been held along with numerous activities, such as energy treasure hunts, where teams walk around buildings looking for quick ways to save energy. Customer participation has been consistent and enthusiastic.

In 2020, the Continuous Energy Improvement demonstration focused on identifying operation and maintenance energy savings while also providing energy management coaching to facility operators and building managers. In Q2 of 2020, the Company claimed over 186,000 therms of gas savings, the electric savings from 2020 will be claimed in Q4 of 2020.

Demonstration Delivery: The Company and its vendor are working closely with the customer cohort to identify energy savings opportunities at their facilities. Savings are derived from a site-specific regression model that considers the host of factors that may influence energy use within a facility. While an increase in capital measures is a frequent and desirable outcome of the SEM process, it is excluded from the ultimate savings reported by the initiative.

Evaluation: Independent evaluation

c. Network Lighting Controls Plus HVAC

Demonstration Stage: Develop of Demonstrate

Innovation Overview: Network Lighting Control Plus HVAC (NLC+) go beyond traditional advanced lighting controls. NLC+ systems have the hardware and software capabilities to act as a simple, stand-alone energy management system or to interface seamlessly with more sophisticated existing building systems. In either case, local, granular occupancy and other sensing data from the NLC+ system facilitates additional savings from HVAC, plug loads, and complete energy management. This technology could be implemented as a retrofit to existing buildings, or as a component of a comprehensive new construction project. The most significant challenge in realizing savings for these projects is the integration of HVAC controls and the commissioning of the system. A successful program offering must support the commissioning process.

Target Customer and Program Fit: Initial customer segments to be considered for this analysis are offices, schools/universities, industrial, retail and hospitals.

Prior Efforts: The NCL+ demonstration was initiated in 2020. Phase I of the research, which concluded in July 2020, included a market readiness assessment for this technology. Twenty-two interviews were completed with a collection of lighting and HVAC industry representatives, customers, and internal program staff. Interviews identified barriers and opportunities for NLC+ in Rhode Island.

Demonstration Delivery: The demonstration is focused on the potential of integrating lighting and HVAC controls through the networked lighting controls system. The most significant barriers identified in the Phase I research were related to the integration of the two systems, including bridging the siloed lighting and HVAC trades. Phase II of the demonstration will include up to four customer installations. The goal of the installation will be to investigate the energy and non-energy benefits of projects, pain points in commissioning the projects, and knowledge gaps that may hinder fully realizing expected HVAC savings. Finally, Phase II will recommend if and how this technology can be included in the energy efficiency programs.

Evaluation: Vendor evaluation

d. Kitchen Exhaust

Demonstration Stage: Develop of Demonstrate

Innovation Overview: Many kitchen exhaust hoods operate with manual switches, some running all kitchen hours or even 24/7. Three kitchen exhaust measures are explored in this

demonstration: demand control ventilation, energy recovery, and electrostatic filtration. These three measures can potentially be implemented together to comprehensively reduce the level of energy required to operate a commercial kitchen. Demand control ventilation (DCV) reduces the amount of exhaust air, and corresponding make up air, by monitoring the temperature or particulates of the exhaust air and only running when required. Energy recovery can offset water heating for dishwashers by utilizing heat in kitchen exhaust. Electrostatic filtration systems offer a lower pressure drop alternative to traditional exhaust filtration systems.

Target Customer and Program Fit: These three measures are appropriate for customers with large commercial kitchens such as restaurants and hotels, especially for kitchens with long hours of operation. Energy recovery is most appropriate for customers with simultaneous cooking and dishwashing. Electrostatic filtration systems are most appropriate for customers with local codes or requirements for kitchen exhaust pollution control, common in dense urban areas.

Depending on the demonstration findings, these products will be offered to customers with prescriptive incentives. Savings should be calculated with a simple, reliable calculation tool to expedite projects.

Prior Efforts: The Kitchen Exhaust demonstration was initiated in 2020. Phase I of the demonstration project identified the savings potential for each of the individual measures and for a combined, comprehensive package. The demonstration identified ideal candidates, current market conditions, and barriers to realizing energy savings. This initial research performed 8 interviews with trade allies, manufacturers, and customers.

Demonstration Delivery: The Phase I findings of this demonstration were promising and support moving forward with customer installations for electrostatic filtration and for energy recovery. The Company supports moving kitchen hood DCV directly to program implementation given the savings potential and prior experience with the technology.

Phase II will proceed with up to five installations. One university customer is interested in an energy recovery installation. Ideally the other installations can be made at a customer facility with an existing DCV system to better understand the interactive effects of the three measures.

Evaluation: Vendor evaluation

e. Smart Valves on Chilled Water Systems

Demonstration Stage: Plan

Innovation Overview: Pressure-independent control valves, or smart valves, can be used to replace existing two- and three-way valves on chilled water systems to control chilled water entering the air handlers. The valves include built in pressure regulators that stabilize flow

through a range of pressure, allowing stable flow control under a variety of system conditions. The local controller is mounted directly on the valve itself and can report back to the building BAS where the data can be used for additional analysis such as fault detection, energy monitoring, and real time performance. Smart valves will most often result in electric savings by reducing pumping and preventing overcooling, but can yield gas savings when installed in gas absorption chiller systems.

Target Customer and Program Fit: Customers with chilled water systems and air handlers.

Prior Efforts: There have been no prior efforts for this technology.

Demonstration Delivery: The Company will work with sales and marketing to identify three to four customer sites to demonstrate the energy savings of these smart valves. The demonstration will identify target customers for the technology, market barriers and solutions, investigate how smart valves may be used as part of a broader CHW plant optimization project, and potentially make recommendations on energy savings estimates. The demonstration will use the customer installations to identify best practices for installation and commissioning of these products.

Evaluation: Vendor evaluation

f. Gas Heat Pumps

Demonstration Stage: Plan

Innovation Overview: Gas Heat Pumps are a technology that, according to manufacturers, can be twice as efficient as conventional boilers, resulting in fuel savings. Gas Heat Pumps are ideal for facilities with simultaneous need for heating and cooling including athletic facilities, pools, food and beverage processing plants, hotels, and multi-unit residential buildings.

Target Customer and Program Fit: Large commercial customers with existing conventional boilers and simultaneous need for heating and cooling.

Prior Efforts: The Gas Heat Pump demonstration was initiated in 2020 and included preliminary research into available technologies and their applications. The Company will research facilities that have installed this technology for savings and barriers to adoption. Additionally, the Company will explore the potential to install this technology on customer sites to determine savings from traditional gas options, as well as benefits compared to electric options.

Demonstration Delivery: During the next phase of this demonstration, the Company will pursue three to four customer installations.

Evaluation: Vendor Evaluation

4.3 Commercial and Industrial Assessments

The Company has proposed four new C&I assessments for 2021.

a. HVAC Automation for Demand Response

Assessment Stage: Plan

Innovation Overview: Recently, demand response programs have trended in the direction of deeper automation and faster dispatch times of the loads in question. In California, this is achieved by the OpenADR standard, which sets automation requirements for energy management systems, controls, gateways, and other communications infrastructure so that the utilities can quickly, reliably reduce load on their network.

The OpenADR standard is not necessarily appropriate for all territories. An alternative to setting a binding automation requirement for participation in DR programs is to instead incentivize the adoption of equipment and controls which will allow for future dispatchable loads and faster response times. This will future-proof the Company's efforts to provide reliable demand response and create a base of compliant systems with ratepayers, to protect against future upgrade costs to meet with more rigorous future standards for DR. Furthermore, more sophisticated building energy systems and controls may also lead to optimization of operating profiles and claimable savings.

Target Customer and Program Fit: A greater degree of automation in building energy systems is broadly applicable across commercial and industrial customers, but particularly with segments such as grocery, hospitals, universities, and hospitality.

Prior Efforts: There have been no prior efforts.

Assessment Delivery: The Company will investigate the possible causal link between incentivizing building energy automation, specifically of HVAC systems, in order to evaluate the potential for achieving future DR capacity.

Evaluation: Internal review

b. Shared Laundry Facility Clothes Washers and Dryers

Assessment Stage: Concept

Innovation Overview: Commercial laundry facilities, like those found in multifamily common laundry facilities and laundromats, represent a market that is seemingly ideal for program intervention. There is potential for an upstream or midstream program offering, since there are only four major route operators that lease equipment to customers. The laundry units are a known technology with reasonable savings estimates available. However, there has not been a focused effort to include this equipment in the energy efficiency programs due to some unusual market characteristics and relatively low per-unit savings. In particular, the laundry equipment is usually leased by the customer rather than purchased outright and the customer will often prioritize a short cycle time over energy efficiency.

Target Customer and Program Fit: Multifamily buildings with common laundry facilities and laundromats.

Prior Efforts: There have been no prior efforts.

Assessment Delivery: For this assessment, the Company will further research the feasibility, potential, and possible path forward to create a meaningful intervention. The Company will collaborate, when possible, with other energy efficiency programs who are also investigating this market.

Evaluation: Internal Review

c. Use of Submetering to Support Energy Efficiency Opportunities

Assessment Stage: Concept

Innovation Overview: A typical commercial customer may have limited insight into their energy use. The most granular information many customers have is their monthly gas and electric bill. Even customers who have AMI data may not access it or use it in a meaningful way. The limited insight into energy use within a facility may obfuscate energy and maintenance issues within a facility that the customer may otherwise want to address.

There are many options available for bringing additional insight to customers about their energy use by installing and monitoring submetering. Submetering can be designed to capture different levels of data at different intervals. For example, submetering can be applied to capture information on a whole building, end use, or on specific equipment.

Despite the potential benefits of submetering, it is also the case that submetering can prove ineffective or infeasible for some customers due to cost, technical limitations, or energy use not being a priority.

Target Customer and Program Fit: Commercial and industrial customers with the ability to use submetering data to reduce energy use.

Prior Efforts: Submetering has been discussed on and off over time, but there has not been a concerted effort to study the topic for inclusion in the energy efficiency programs.

Assessment Delivery: Submeters do not directly result in energy efficiency savings, they only provide insights that may be used to improve efficiency. Because the effectiveness of submetering depends strongly on the customer's will to use the data and make changes based on it, the Company has had a policy not to incentive the upfront costs of submetering. Instead, the Company has directly incentivized energy improvements through programs like Pay for Performance.

Evaluation: Internal Review

d. Refrigeration Leak Survey and Repair

Assessment Stage: Concept

Innovation Overview: Supermarket refrigeration systems can emit significant levels of refrigerant each year. These emissions can be harmful in their own right and can result in less efficient refrigeration systems. A leak remediation program would assist customers in identifying and repairing costly refrigeration leaks in their systems.

A focus of this assessment is to entice customers to find and repair leaks at more aggressive levels than required by regulation. The Clean Air Act specifies regular refrigerant management practices for ozone-depleting substances, such as hydrochlorofluorocarbons, hydrofluorocarbons, and hydrofluoroolefins.

Target Customer and Program Fit: Grocery stores are the primary customer. This product could be offered along with other common grocery store measures or through the custom retrofit pathway.

Prior Efforts: This is a new innovation to the programs and has not been previously examined.

Assessment Delivery: The first focus of this assessment will be to understand current customer practices and regulations around refrigerant leak remediation and the impact of those practices on energy use. After the baseline practice is understood, the Company will estimate overall savings potential for this measure.

Evaluation: Internal review

5. Residential Pilots, Demonstrations, and Assessments

5.1 Residential Pilots

The Company does not propose any new or continued Residential Pilots for 2021.

5.2 Residential Demonstrations

The Company proposes three new demonstrations for the Residential sector in 2021.

a. New Air Sealing and Insulation Products

Demonstration Stage: Plan

Innovation Overview: Several new technologies claim improvements to infiltration and insulation of homes. The two technologies of focus in this demonstration are sprayed-in air-sealing and injection foam for residential and multifamily buildings.

Vendors such as AeroBarrier operate in both new construction and renovations, offering a waterborne acrylic sealing fluid, which is sprayed into homes, covering surfaces and filling gaps up to one-quarter inch in width. The Company performs this service alongside a blower door test to monitor leakage as the spray seals gaps.

Building envelope materials offers a polyurethane foam which can be injected into building cavities to improve R-value. The conventional limitation for this technology has been the risk of toxicity and hazardous particulates, but the manufacturer of this technology believes they have solved this problem.

Target Customer and Program Fit: Both technologies have the potential to significantly improve the heating and cooling efficiency of under-insulated buildings; target customers will be single-family homes, particularly those that are under-insulated.

Demonstration Delivery: The Company will work with the residential implementation vendor to identify several residential single-family sites with a need for improved insulation and will work with the two vendors to deploy their systems at those sites. Six homes in total will participate, two each with the individual technologies and two with both deployed.

Prior Efforts: There have been no prior efforts to evaluate these products.

Evaluation: Vendor Evaluation

b. Solar Inverter Direct Load Control (ConnectedSolutions)

Demonstration Stage: Plan

Innovation Overview: The primary function of solar inverters is to convert the power generated by customer-owned solar systems from DC to AC power, which is used on the grid. However, inverters are capable of several other functions which can increase the power quality of the grid, the most beneficial being power factor correction. Using customer-owned solar inverters to implement power factor correction will decrease the amount of power (kVA) that needs to be generated and distributed, increase the capacity on the grid for real current, decrease voltage fluctuations, and reduce energy loss due to power lines heating up more than necessary.

This demonstration will explore how the demand response program utilizes this existing functionality of customer solar inverters to benefit the grid by working with customers to promote the most beneficial inverter settings.

Target Customer and Program Fit: This program will enroll customers who already have a supported solar inverter or who are installing a new solar system with an inverter from a supported inverter manufacturer.

Only smaller solar systems (less than 2 MW-AC) will be eligible for this demonstration. If this demonstration successfully improves power quality with no or minimal negative consequences to the grid, the Company will consider expanding the offering to larger customers in the future.

Prior Efforts: Power factor correction using solar inverters has been demonstrated in several areas throughout the country. However, this demonstration will be the first program to enroll customer-owned solar inverters in a BYOD (Bring-Your-Own-Device) type program at a large scale (more than 20 systems).

Demonstration Delivery: The Company will work with some of the inverter manufacturers already in the ConnectedSolutions battery measure to email customers to opt-in to updating their inverter settings. Customers will receive an enrollment incentive and an annual incentive for staying in the program. Customers may leave the program at any time. The Company will receive data from every inverter to quantify how often and how much power factor was corrected. If the customer's solar generation (kWh) is decreased larger than the annual incentive, the customer will be given an additional incentive to guarantee they are not penalized for their participation in this demonstration.

The Company's Electric Business Unit (EBU) has provided the preferred setpoints for power factor correction. The EBU will use sensors on the grid to monitor this demonstration for any negative effects or unintended consequences. The EBU may periodically change the preferred

inverter setpoints, which will be pushed out to all participating inverters by our inverter manufacturer partners.

Evaluation: The Company will receive granular performance data from every participating inverter to quantify the system benefits. An independent evaluation will be completed in conjunction with the Company's Massachusetts service area, which will be conducting an identical demonstration.

c. Gas Heat Pumps

Demonstration Stage: Plan

Innovation Overview: The innovation potential for gas heat pumps is similar for a residential context as it is for a commercial or industrial context, as described previously in section 4.2.e. Gas heat pumps may offer efficiency improvements over conventional gas boiler or furnace technologies and can provide both heating and cooling from a single piece of equipment.

Target Customer and Program Fit: Target customers are existing gas customers. Sites will include both hydronic and ducted heating distribution systems.

Demonstration Delivery: This demonstration will validate cost and performance for gas heat pumps at two to three residential single-family customer sites, as well as two to three multifamily building installations. The demonstration will identify homes with gas furnaces or boilers, installing a mix of heating and heating-plus-cooling systems. Existing gas meters will provide comparison against prior gas consumption; the evaluation of gas heat pump performance in cold temperatures will be crucial.

Prior Efforts: The Company has previously assessed the applicability of gas heat pumps to C&I customers, but investigation in the residential sector is new.

Evaluation: Independent evaluation will be engaged to determine baseline, evaluate performance, and assess potential within residential customer base, with input from the Company's EM&V team.

5.3 Residential Assessments

The company proposes one new Residential Assessment for 2021.

a. Pre-Fab Whole House Energy Refurbishment

Assessment Stage: Concept

Innovation Overview: An approach developed in the Netherlands uses demand aggregation, a high envelope efficiency approach, and supply chain coordination to deploy high-quality, prefabricated mass-scale retrofit packages that are easy to install and are financeable through utility cost savings. This approach, dubbed Energiesprong in the Netherlands, is being investigated across western Europe, California, and New York in the United States where the goal is to spearhead the creation of standardized, scalable solutions and processes that will improve the aesthetic and comfort of residential buildings while dramatically improving their energy performance. One of the innovative aspects of the offering is the use of pre-fabricated facades that can be installed much more quickly and less invasively than more traditional options which typically require bespoke envelope refurbishment unique to the building.

While the concept of completely upgrading the exterior of a home or multifamily building is compelling, the Company will explore if the capability in the supply chain exists to accomplish this at scale and cost effectively. As such, this assessment will investigate the unique Rhode Island status of what we understand to be the main components of this approach:

- Identify typical Rhode Island building life-cycle "trigger event" whereby a building owner may undertake a whole-home exterior retrofit.
- Gauge the ability to aggregate demand among building owners, harnessing their collective market power.
- Assess the building industry capability to design and develop pre-fabricated exterior improvements to substantially improve housing buildings while residents continue to live in their homes or apartments.
- Identify financing options for building owners to fund projects by capturing energy savings.

Target Customer and Program Fit: Residential and multifamily buildings in standardized configurations and building designs.

Prior Efforts: While there have not been directly related prior efforts for this concept, the residential ZNE pilot will help to identify building industry partners capable of designing, supplying, and deploying whole-home exterior retrofits.

Assessment Delivery: The primary focus of this assessment will be to understand and baseline the current status of Rhode Island components needed to support whole-home exterior retrofits. After the baseline condition is understood, and if the components and capability exist, the Company will estimate overall savings potential for this measure and roadmap necessary to promote this approach.

Evaluation: Internal review