

# **Beyond Low Hanging Fruit: Recovery, RENEWal, and Residential Efficiency in the Merrimack Valley**

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## **ABSTRACT**

In 2018, Massachusetts gas lines experienced excessive pressure, resulting in explosions and fires in up to 40 Andover, North Andover, and Lawrence homes (“Merrimack Valley communities”). The subsequent lawsuit resulted in a settlement allocating \$21 million to low- and moderate-income residents for efficiency, electrification, and barrier mitigation, and \$20 million to support affordable housing, clean energy, and municipal-led decarbonization projects. State and community energy partners assembled to support these communities to transition away from natural gas and rebuild lives in light of this energy tragedy.

The RENEW Program is the central node of this energy transformation. It provides deep energy retrofit and electrification services to low- and moderate-income homeowners and renters, across Merrimack Valley communities. Expanding upon Mass Save, Massachusetts’s ratepayer-funded energy efficiency program, RENEW simplifies services for impacted communities by providing a single point of contact for project management, contractor oversight, and lifecycle assistance. Moving past the model of traditional infrastructure, this innovative pilot provided a pathway to providing turnkey services and substantial energy savings.

This paper analyzes data from three years of serving residents and businesses in three impacted communities, with over 500 households served via the RENEW fund and its deep energy retrofit programming. It contains several Merrimack Valley Renewal Fund (MVRF) case studies, ranging from municipal buildings to lighting walkways, to compare strategies for stacking and braiding grant funds. The data and stories reveal applicable program learnings that may expand and make more equitable residential efficiency offerings nationally.

## **Introduction**

On September 13, 2018, a gas contractor, following a plan developed by Columbia Gas of Massachusetts (Columbia Gas), was performing routine maintenance work on a low-pressure gas line in Lawrence, Massachusetts (Commonwealth of Massachusetts 2020). During the work, the line became over-pressurized, resulting in at least three explosions, 60 to 80 structure fires, and over 120 calls for emergency fire and EMS crews in Lawrence, Andover, and North Andover. These events destroyed approximately 15 homes and 131 structures in these three Commonwealth communities. Tragically, an eighteen-year-old resident was killed and 25 others

injured as a result of the explosions. This series of gas fires and explosions was the worst natural gas disaster in the history of Massachusetts (NTSB 2019).

A 2019 accident report by the National Transportation Safety Board found that most of the damage occurred from fires ignited by natural gas-fueled appliances; several of the homes were destroyed by natural gas-fueled explosions (NTSB 2019). In the community recovery efforts that followed, electrification was a focal point of households' emotional and physical recovery.

### **Lawsuit and settlement**

The natural gas distribution system which caused the explosion was owned and operated by Columbia Gas, a subsidiary of NiSource, Inc. At the time, Columbia Gas of Massachusetts delivered natural gas to about 325,000 customers in Massachusetts (NTSB 2019). In 2019, Columbia Gas agreed to a \$143 million class-action settlement with residents and businesses of the Merrimack Valley communities affected by the 2018 explosions. The settlement, approved by a judge in March 2020, provided claims to multiple impacted plaintiffs. Separately, Columbia Gas pleaded guilty to violating the Pipeline Safety Act, paid a \$56 million criminal fine, and exited Massachusetts by selling its operations to Eversource Energy.

### **The Merrimack Valley Renewal Fund (MVRF)**

\$56 million of this settlement is overseen by the Massachusetts Department of Energy Resources (DOER) and the Massachusetts Attorney General Office (AGO) to administer in support of the Merrimack Valley communities (AGO 2020).

The DOER and AGO established the Merrimack Valley Renewal Fund (MVRF) Advisory Committee ("Advisory Committee") to assist with stakeholder input and advice on the design and implementation of the programs. The members of the Advisory Committee were selected from categories of municipal, business and community leaders. Program development was informed by feedback received from residents, landlords, and business owners via on-line surveys (available in both English and Spanish). Over 200 stakeholders provided feedback through the residential survey (AGO 2022).

In addition, DOER and the AGO entered into a memorandum of agreement setting forth the terms for the administration of the MVRF programs, levels of funding for categories of initiatives and the desired outcomes from the investments. Table 1 provides a summary of the agreed-upon investment strategies:

Table 1. RENEWAL fund initiatives

| Initiative                 | Funding (millions) | Description | Lead Agency |
|----------------------------|--------------------|-------------|-------------|
| Private Affordable Housing | \$1.5              |             | DOER        |

|                                       |       |                                                                                                                                                                                                                                 |          |
|---------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Small Business                        | \$2   | The clean energy and energy efficiency grant programs are intended to benefit customers in the three communities by significantly reducing energy usage, energy costs, and greenhouse gas emissions while improving resiliency. | DOER     |
| Public Affordable Housing             | \$3   |                                                                                                                                                                                                                                 | DOER     |
| Market Rate Energy Efficiency         | \$3.5 |                                                                                                                                                                                                                                 | DOER     |
| Geothermal Microgrid                  | \$4   |                                                                                                                                                                                                                                 | DOER     |
| Municipal Enrichment                  | \$6   |                                                                                                                                                                                                                                 | AGO      |
| Low-Moderate Income Energy Efficiency | \$21  |                                                                                                                                                                                                                                 | DOER/AGO |

### **The RENEW Program: A Focus on Low-to-Moderate Income Energy Efficiency**

Representing the largest bucket of MVRF funding, the RENEW program is designed to leverage the Commonwealth's existing energy efficiency program, Mass Save. The grant program provides funding for projects in residential buildings, or buildings that include both commercial businesses and residences, located in Merrimack Valley communities that maximize energy efficiency, electrification (air or ground source heat pumps), and/or clean energy (storage, solar, or technologies that support active demand management), demonstrate a long-term commitment to providing affordable housing to low- or moderate-income residents, and provide local workforce development opportunities.

During the initial design of this program, the Advisory Committee determined it was important to include support for local workforce development. As a result of the Advisory Committee input, a small portion of this funding (\$2.5 million) was dedicated to workforce development. This set aside resulted in two new workforce programs. Greater Lawrence Technical School created a Clean Energy Careers Unit for ninth grade students to have semester-long exposure to career pathways in energy and the environment. Additionally, the technical school developed a wage reimbursement program that allows employers to hire recent graduates for three months to facilitate on-the-job training. In partnership with the Greater Lawrence Community Action Council, the Green Jobs Academy supported an introduction to weatherization and building science principles as part of ESL classes in the area.

## **Case Studies**

### **North Andover Town Building Electrification**

Utilizing its allocated MVRF municipal enrichment funds, the Town of North Andover focused on clean energy investments at its former senior center. The senior center has approximately 14,000 square feet, is adjacent to Town Hall, and has remained largely vacant since 2023. Originally constructed in 1983, it received an addition in 1997 and underwent a renovation in 2008. The existing HVAC equipment was at or near the end of its useful life. With upgrades, the

Town plans to use the building for additional town offices and a young adult life skills program run by the School Department.

This project included the installation of heat pumps replacing the existing fossil fuel systems and weatherization upgrades at this location, helping the Town move toward their longer-term carbon reduction goals and the goals of the Commonwealth (Table 3). Although the estimated energy cost savings are minimal, the Town would be saving on any long repair costs for the old equipment (Table 2). Natural gas supply prices have increased significantly and continuing to run older, less efficient systems is more expensive.

Table 2. North Andover Town building baseline conditions

|                                 | Baseline Conditions (2024)               |
|---------------------------------|------------------------------------------|
| Annual energy consumption       | 555.89 MMBtu                             |
| Annual greenhouse gas emissions | 32.9 MTCO <sub>2</sub> e                 |
| Native energy units             | Electric: 58,320 kWh<br>Gas: 3569 therms |

Table 3. Town of North Andover 120R Main Street building electrification measures

| Measure                | Description                                                         | Qualified Under MassSave? | Additional funding sources                                                | Selected Under RENEW? Additional cost? |
|------------------------|---------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------|----------------------------------------|
| Heat Pump Installation | Upgrades to the existing HVAC system, including some weatherization | Yes - \$112,000           | Town capital - \$200,454<br><br>State Green Communities grant - \$225,000 | Yes - \$1,292,145                      |

### Andover Town Municipal Building Electrification

Andover Town submitted a funding request to support energy efficiency retrofits in the Town's office building, related to municipal enrichment. The project included two measures: an upgrade of current transformers and stairwell door replacements (Table 4). The NEMA TP-1 standard for transformer energy efficiency was adopted in Massachusetts on January 1, 2020 (Massachusetts Board of Fire Prevention Regulations). Prior to that adoption, older transformers had much lower efficiencies, varying from 92% to 95% at rated load, and lower at typical loads. This project replaced and upgraded ten three-phase transformers with new high efficiency transformers.

Additionally, stairwell doors serve a dual purpose: ensuring life safety while also contributing to energy efficiency by controlling air movement. A tight seal, insulated construction, and proper

installation help prevent air leakage and improve a building's thermal performance, while stairwell pressurization systems balance safety with energy use. A poorly sealed stairwell door can significantly contribute to air leakage, which accounts for an estimated 6% to 20% of a commercial building's total heating and cooling load (LBNL). Stairwells often create a chimney effect, where warmer air rises and draws conditioned air out of the building. Stairwell doors help mitigate this effect by providing a barrier between floors and other building areas. After an energy audit, this project replaced four sets of 30-year-old fire rated doors to insulated doors (hollow metal doors with a polyurethane foam core) at Town Offices. The stairwells are heated in the winter but are not cooled in summer months (Figure 1). New high-quality, properly installed weatherstripping around the perimeter of the door frame now creates an airtight seal in addition to new door sweeps and thresholds. Finally, automatic controls were installed to prevent unnecessary exchange of conditioned and unconditioned air.

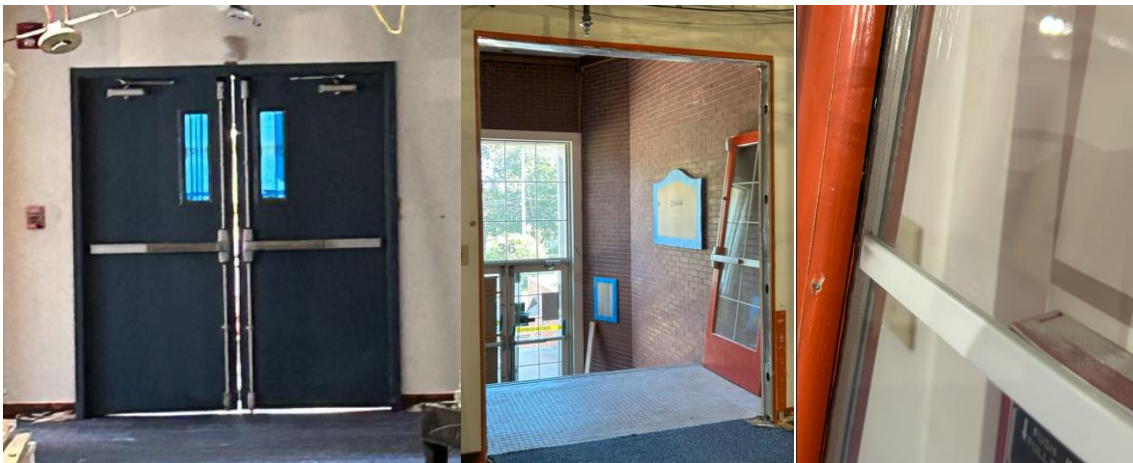


Figure 1. Baseline stairwell door conditions in Andover Town Offices. On the left, this image of a door shows the weatherstripping has worn away. Light is showing through highlights sources of air infiltration. The middle and right image show the main entry doors, where wood splitting and shrinking two-pane glass are visible. This set of doors is considerably older than the others and demonstrates similar weatherstripping issues.

Table 4. Andover Town Municipal building electrification measures

| Measure | Description | Qualified Under MassSave? | Selected Under RENEW ?<br>Addition al cost? | Annual incremental energy savings over MA code baseline | Annual, incremental energy savings attributable to MVRF contribution |
|---------|-------------|---------------------------|---------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------|
|         |             |                           |                                             |                                                         |                                                                      |

|                                    |                                                                                                                                                                                                                            |                          |                |                   |                   |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------|-------------------|-------------------|
| Transformer upgrade                | Replace and upgrade ten three-phase transformers with new high efficiency transformers.                                                                                                                                    | Yes – funded at \$23,486 | Yes – \$62,184 | 40,639 kWh        | 40,639 kWh        |
| Airlock Fire Rated Stairwell Doors | Replace four sets of 30-year-old fire rated doors to stairwells at Town Offices. This includes:<br>1) Insulated doors<br>2) Weatherstripping:<br>3) Door sweeps and thresholds<br>4) Glass inserts<br>5) Automatic closers |                          | Yes - \$87,270 | 2800-4000 kWh     | 2800-4000 kWh     |
| Totals                             |                                                                                                                                                                                                                            | \$23,486                 | \$149,454 .00  | 43,439-44,639 kWh | 43,439-44,639 kWh |

### Andover Playstead field walkway lighting

Since its completion in 2021, the paved walkway along the northern edge of World War I Memorial Playstead in the Town of Andover has substantially improved pedestrian access to key destinations including the Robb Senior Center, the Cormier Youth Center, the park, town offices, Doherty Middle School, and downtown Andover.

The pedestrian route has been a welcomed enhancement to students, seniors, and people with disabilities, and has provided a significant benefit to residents of the 200-unit Andover Housing Authority property located behind the field complex. However, it remained unlit, which significantly impacted the ability for the public to use the walkway later in the day.

In November, the Town of Andover was awarded a grant of \$147,421 through MVRF that enabled further enhancements to this frequently used walking corridor through the installation of solar powered streetlights along the pathway. This funded the purchase and installation of sixteen solar powered streetlights. Twelve of the units will be used to illuminate the pedestrian walkway, and the remaining four will be positioned to light the adjacent parking area.

Table 5. Andover Playstead Field Energy Efficiency Upgrades

| Measure | Description | Qualified Under MassSave? | Selected Under RENEW? | Annual incremental energy | Annual, incremental energy savings |
|---------|-------------|---------------------------|-----------------------|---------------------------|------------------------------------|
|---------|-------------|---------------------------|-----------------------|---------------------------|------------------------------------|

|                            |                                                                                                  |    | Additional cost? | savings over Massachusetts code baseline | attributable to MVRF contribution |
|----------------------------|--------------------------------------------------------------------------------------------------|----|------------------|------------------------------------------|-----------------------------------|
| Solar-powered streetlights | 16 total solar powered streetlights to illuminate the walking corridor and overflow parking lot. | No | Yes - \$147,421  | 3,504 kWh                                | 3,504 kWh                         |

The project selected First Light Technology SCL2 solar lights because they are energy efficient, cost effective, and easy to install (no trenching, conduits or new electrical service was required). The use of solar powered lighting means that the enhancement will result in no additional greenhouse gas emissions or added electricity costs to the Town. Compared to conventional LED streetlights, the sixteen solar powered lights are anticipated to avoid 54.6 MT of greenhouse gas emissions and save \$23,126 in electrical costs over the course of their estimated 22-year life.

### Stone Mill

In April 2021, DOER issued a solicitation for projects as part of Round 1 of the Merrimack Valley Building Excellence Grant Program. In June 2021, Winn Development was awarded \$2.9 million to support an affordable housing Stone Mill Project in Lawrence. The Stone Mill building is located 0.25 miles from downtown Lawrence, 0.4 miles from the MBTA Commuter Rail, and adjacent to over 500,000 square feet of commercial space, the project is part of Lawrence's revitalization and economic growth.

The project is an adaptive reuse of an old mill building. MVRF funds will result in an 86-unit (11 units less than 30% AMI, 58 units 31-60% AMI, and 17 units 61-80% AMI), high performing affordable housing building that supports the Commonwealth's climate mandates, as well as the community's long-term affordability and resiliency.



Figure 2 shows the baseline condition of the Stone Mill roof (left) and the new roof (right).

With grant funding, the building eliminated fossil fuels for space and hot water heating, and integrated high performance air sealing, insulation, and mechanical/electric/plumbing systems that eliminated fossil fuels and avoided greenhouse gas emissions, serving as model for new and innovative approaches for historic preservation and high-performance adaptive re-use.

The total project cost amounted to \$45 million, and the total cost of the project's energy-related scope of work was approximately \$18 million, for which the MVRF contribution accounted for \$33,500/unit, or approximately 16% of total energy-related project cost).

Based on post-completion modeling, this project resulted in 46.7% energy savings and 33% greenhouse gas emissions savings compared to a gas-heated Massachusetts stretch code baseline.

Additionally, Stone Mill created opportunity for more than 140 direct construction jobs and 160 indirect jobs and awarded 30% of construction labor hours to minority and women-owned business enterprises (MWBE) and local contractors.



Figure 3 shows interior work and unit track layout during the renovation of Stone Mill.

### **Lawrence Geothermal Network: A focus on outreach and proactive engagement**

Four million dollars was designated from the gas settlement to support a thermal energy network in the town of Lawrence. The Merrimack Valley was highlighted as a pilot for this system because geothermal energy networks (GENs or TENS) are distributed systems, their technical feasibility depends directly on individual participation and clustered uptake. A minimum thermal load with sufficient load diversity must be connected to the loop for the system to meet the requirements for efficient operation. Participation also impacts cost efficiency—if too few users opt in, the project may not meet marginal cost thresholds and could be considered an unsuccessful demonstration. This makes early engagement and ongoing collaboration essential.

The Commonwealth partnered with Lawrence to develop a local working group, where engagement around the TENS system is iterative and ongoing. For example, insights gained during the construction phase of the project will feed back into education materials and vice versa. Lessons from TENS demonstration projects show that a rigid, sequential approach fails the community; instead, implementors should maintain overlapping timelines (e.g. keep educational outreach going even as sites are being chosen). Additionally, stakeholder meetings should be recurrent, with agendas that evolve based on prior feedback. (One after-action review of the Merrimack Valley disaster emphasized the need to have “the appropriate people...in the room” throughout recovery— a lesson that applies here: the project will adjust who is at the table as new issues emerge.

DOER retained a consultant to assess potential sites and provide price estimates for a potential project. The consultant identified multiple sites and eventually recommended Lawrence Senior High School (LHS) for several reasons. Built in 2005, LHS enrolls over 3,000 students during

the school year, but is used by the community year-round (Figure 2). The school represents a large, multi-building campus that serves the community. It maintains proximity to other key sites, including Lawrence Housing Authority, South Lawrence East Elementary School. Additionally, its HVAC system is at end of useful life.

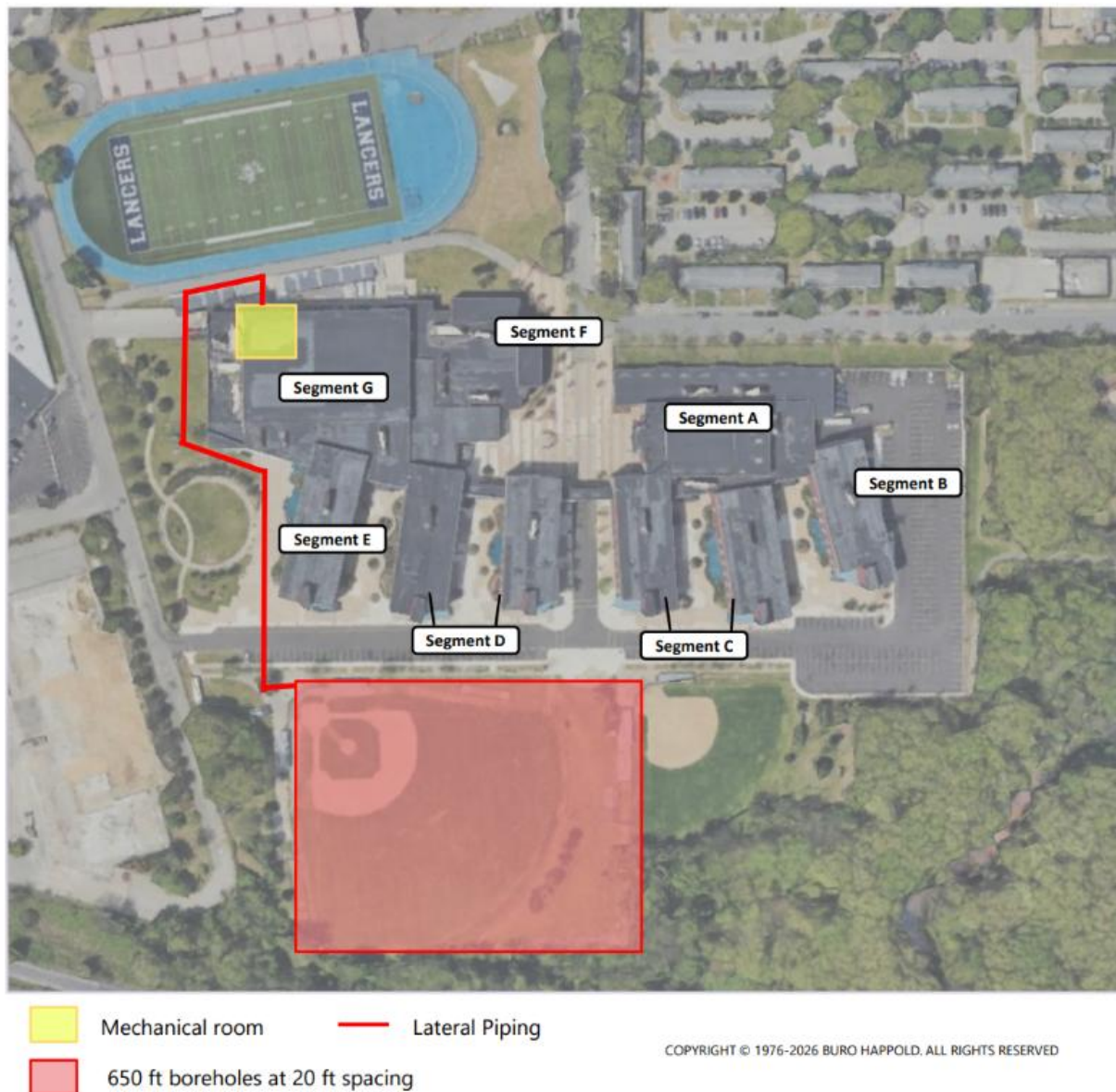


Figure 4. Retrofit strategy for the Lawrence Geothermal Network. The red area identified on plan demonstrates the area required for all three phases of implementation, which will constitute 484 boreholes, each at 650ft of depth.

The proposed project consists of three phases:

1. North Boiler Conversion, which includes creation of a new mechanical room to serve the North side of the building and meet heating load provided by boilers with appropriately sized geothermal bore field. The estimated cost is \$26,005,000.
2. South Boiler Conversion. Through phase one, the south side of the building would remain operational with the current boiler plant. Phase two would see heating load met provided by boilers with appropriately sized geothermal bore field. The estimated cost is \$20,459,000.
3. RTU Conversion. To achieve full-building electrification<sup>1</sup>, phase three will convert RTUs to DOAS units. The estimated cost is \$16,269,000.

The total cost of this project is estimated to be \$62,733,000, a figure which far exceeds what the MVRF can offer. Below summarizes the capital stack to fund the project and is still under development.

Table 6. Lawrence Geothermal Funding Stack

| Funding Source                        | Description                                                                                                                                                                                                                                                  | Funding amount           | % of total project cost |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------|
| Mass Save                             | Rebate applied to the GSHPs being installed as part of this network; incentive capped at \$3M per project.                                                                                                                                                   | \$3,000,000              | 3%                      |
| Section 48, 48E Investment Tax Credit | Base credit includes wells, distribution piping, electrical, controls, heat pump equipment, all required peripherals, and labor. The base credit of 6% increases to 30% if prevailing wage requirements are met. Construction must begin before Jan 1, 2035. | \$7,071,000 <sup>2</sup> | 11%                     |

## Lessons Learned

The Merrimack Valley Renewal Fund and its support of impacted communities after the 2018 gas disaster offers a unique look into building electrification and efficiency measures that support healthy, adaptable communities, and community healing. Based on its impetus, the program brings a customer focus and has priorities above and beyond simple cost effectiveness. The program demonstrates how differences across the communities – from culture and language to income level and state of the housing stock- greatly informed program delivery strategies to a

<sup>1</sup> DHW equipment is already electrified.

<sup>2</sup> Assumes 557 boreholes.

positive effect. Co-delivery of RENEW with Mass Save in many cases allowed for deeper retrofits that prioritized the competing concerns of energy efficiency, bill savings and affordability, equity, and importantly, safety.

However, across a number of projects, MVRF served as the primary vehicle to fund upgrades where projects were deemed ineligible under Mass Save. Programs often ask the question: should we maximize the use of existing funding sources, or fill gaps where existing funding falls short? The community-led approach of MVRF and RENEW demonstrates both answers can bring about enormous value.

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