Newton Climate Action Plan

Recommendations For Meeting Goals For The Residential Sector

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Prepared for:

The Citizens of the City of Newton,
The Newton City Council, and
The Honorable Ruthanne Fuller, Mayor of the City of Newton

Newton Citizens Commission on Energy
Newton, Massachusetts

Contents

Executive Summary

According to the United Nations Intergovernmental Panel on Climate Change (IPCC), Since 2019, Newton has made substantial progress in responding to climate change, the most significant being Newton Power Choice, BERDO, Specialized Stretch Code and the Ten Communities Pilot. Newton's residential sector is now the priority as well as the largest opportunity, accounting for 38% of total greenhouse gas emissions. Newton's stated goal is to retrofit all houses to achieve higher energy efficiency and replace fossil-fueled end-uses with electric space heating, water heating, and cooking. The Newton Citizens Commission on Energy (NCCE) believes that with effective planning and commitment this target is achievable more than ever.

This document presents the Newton Citizens Commission on Energy's near-term climate action strategy for the City of Newton. It is focussed on challenges and opportunities with energy consumption at private residences. Five components are each presented as a Recommended Action Item with an underlying problem statement and justification. The Commission has asked Mayor Fuller to translate these Recommended Action Items into the City's operating plan, with the policies, ordinances, attributions of specific tasks, procedures, timetables, budget, staffing, semi-annual progress reviews, and the managerial oversight necessary for timely success.

I. Existing Residential Buildings Are The Priority

The NCCE's analyses performed in 2019 for Newton's Climate Action Plan[1] estimated that approximately 800 completed weatherization projects and 450 heat pump installations would need to take place each year for the next 30 years for the rate of progress to achieve the Year 2050 target of Net 0% residential emissions. The three years of implementing the Plan have, so far, resulted in the running rates of annual energy efficiency projects and heat pump installations at about 42% and 12% of the needed rates of progress, respectively. Even allowing that start-ups can be slow and that we anticipate subsequent acceleration for the program implemented so far, Newton will continue falling further and further behind its stated goals, without a significant acceleration.

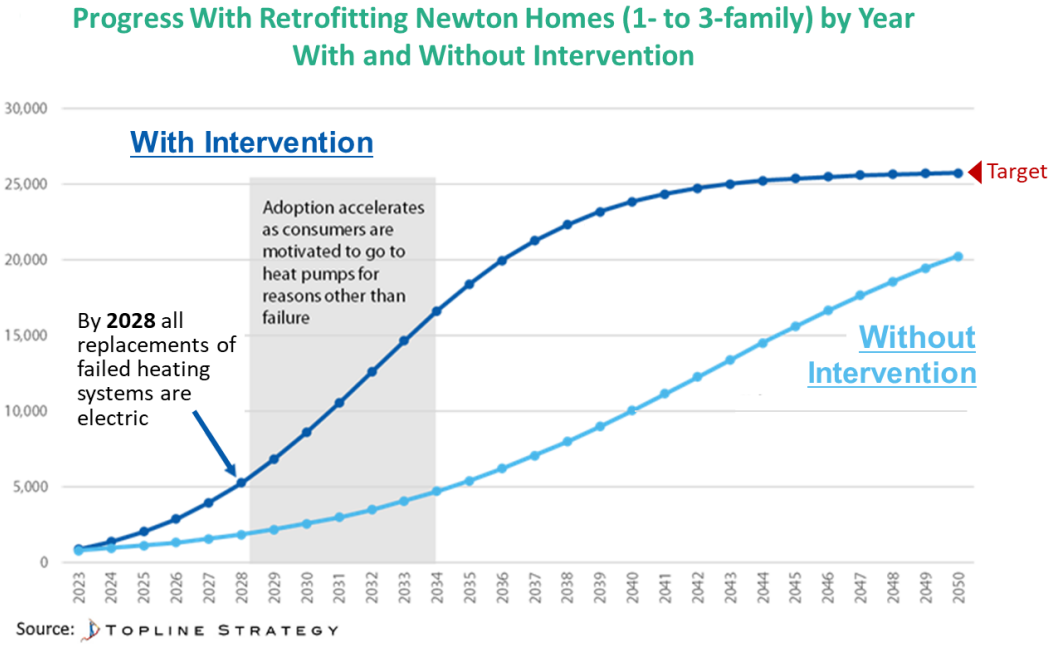
The Figure below shows the results of the most recent NCCE analysis of the rate at which Newton homes will be retorfitted[2]. At the current rate of progress (No Intervention scenario), by 2040 about 40% of the homes in Newton will be retrofitted. In the Intervention Scenario, based on the implementation of the five recommendations in this document, we estimate that by 2040

[1] https://www.newtonma.gov/home/showpublisheddocument/39649/637335412898900000

[2] Model calculations are based on a standard dynamic diffusion/adoption model for technology.

1. In Phase I, failure events are triggers for heat pump adoption: either in the heating system or central air-conditioning, or both. The frequency of failure events is every 20 years.
2. In 2022, only 10% of failure events triggered replacements with heat pumps; 90% were replacements with same-as-prior technology. This proportion increases over time, reaching 100% in 2033 for BAU and in 2028 for With Interventions scenarios.
3. After the heat pump proportion reaches 100% (at which point about 20% of all homes have heat pumps) the rate of adoption of heat pumps begins to exceed the failure rate. The accelerated rate follows a technology adoption model.

all residential homes could be retrofitted. For comparison (though using a different metric, namely greenhouse gas emissions), the Massachusetts Clean Energy and Climate Plan calls for 50% reduction by 2030 and 75% emission reduction by 2040, relative to 1990.



The Commonwealth's statewide efforts toward "gas-free future" will fall short of their goal if people do not put in place the physical construction needed to weatherize and electrify their homes.

Significantly faster progress is the strategic objective. Implementing a well-designed and strategic operational plan and implementation roadmap will accomplish it.

Facilitating the upgrade and modernization of Newton's existing housing stock is also an economic opportunity. First, the home improvement spending will substantially increase local business activity and resulting receipts and transaction volumes. Secondly, the modernization of dwellings will protect the wealth that current owners have accumulated in the value of their properties by increasing the real estate market's pricing of more energy-efficient older homes. The market already exhibits a pricing preference for greater efficiency, though not detectable in Newton's aggregate statistical summaries. The City can best help citizens maintain the market value of older homes by keeping them relatively efficient compared to new construction.

The timing for this effort is propitious:

- The current Five-Year Newton Climate Action Plan (CAP) expires in 2024. A successor plan and a road map will need to be developed (see CAP at Action A.1.6). Clarity on what of the initial plan worked and what has not, as well as the additional actions anticipated in the 30-year plan, ought to inform Newton's Second 5-Year Plan.

- The Commonwealth has adopted two climate laws and statewide targets supporting our objectives. In addition, Melissa Hoffer, Governor Healey's new "climate tsar" and cabinet-level official, has chosen installing heat pumps in homes and developing the necessary workforce among her top priorities.
- Mass Save® incentives aimed at enabling electrification have increased significantly, including rebates and zero-interest loans. In addition, on a national level, new funding mechanisms and incentives continue to emerge from Federal government initiatives.
- State-level organizations are starting to provide homeowners with technical advice and coaching on heat pumps, and a growing number of municiplalites adopt programs similar to the Newton Energy Coach Service.

II. The Plan For Reducing Energy Demand And Retiring Fossil Fuels

At its core, reducing greenhouse gas emissions in the residential sector is a matter of private action: if each homeowner in Newton reduces their energy demand by significantly weatherizing their "outer envelope", adjusts the thermostat, and provides for the remaining energy demand by heating and cooking with 100% renewable electricity, the City will meet the 2050 goal of zero emissions from the residential sector.

But retrofitting private homes is also part of a larger societal project to retire the current gas and oil infrastructure and to protect the electrical grid from an overload by reducing electricity demand. Specifically, retiring the fossil fuel infrastructure *requires* converting home heating and cooking from gas and oil to electricity. But that electrification requires weatherization, in order to be affordable. Conversely, every weatherized and electrified home makes it possible to plan for retiring that infrastructure and for having adequate electrical distribution capacity along City streets to power Newton's vibrant way of life.

This document focuses on homeowners in the larger gas and oil distribution system context. It looks for opportunities to pursue the two objectives simultaneously: improving homes and paving the way for lessening dependence on and a future retirement of natural gas infrastructure.

III. Overcoming Barriers To Home Retrofits

Effective policies for retrofitting private residences are much more challenging to put in place than for retrofitting commercial buildings or improving new construction. The reasons include:

- It requires engaging and motivating homeowners about their energy use, which is foreign to most people.
- It requires taking financial and lifestyle risks with relatively new technology in the face of not-compelling returns on a significant household investment.
- It requires shifting social norms regarding what constitutes a valuable and modernized house.

- Mandating individual residences to meet emission standards (as in BERDO) is politically and logistically infeasible.

The three principal barriers to homeowners taking steps to weatherize and electrify their homes are complexity, financing, and inertia.

Barrier 1: Cost and Financing. The general perception is that retrofitting a home is very expensive. Fortunately, it is only partly correct. Through Mass Save® and federal-level subsidies, the state has dramatically lowered the upfront costs of insulation and electrification, and the equipment cost will likely decline in the future. But what remains is not insignificant. And most people do not know how to take full advantage of the variety of subsidies and attractive financing mechanisms.

There is progress. Today, several state and federal programs offer attractive subsidies, low/no interest loans, and information for homeowners on how to access these programs. The private sector also provides soup-to-nuts approaches, leasing programs, maintenance contracts, and so on for homeowners and renters.

Barrier 2: Complexity. Homeowners who identify funds still face many challenges: Figuring out what to do and in what order; Finding competent and trustworthy contractors; Choosing from several options in design and equipment; Facing unexpected additional projects, such as electrical upgrades; Coordinating multiple specialists. That makes electrification projects risky.

Progress will take place over time. Several initiatives and programs at the state and municipal (in Newton) levels are concurrently addressing complexity. In Newton, these include the Energy Coach Service and the Sustainability Office's efforts to communicate closely with several contractors (e.g., Endless Energy, New England Ductless). On the state level, Green Energy Consumers Alliance, Clean Energy Center, Building Energy Accelerator, New England Energy Partnership NEEP, Building Energy Accelerator, and Massachusetts Climate Action Network are especially active in providing advice and coaching to homeowners.

As the electrification and weatherization services market matures, more experienced contractors with a known track record and a positive reputation are emerging. In addition, Governor Healey's new "climate tsar," Melissa Hoffer, has chosen workforce development as one of her top priorities.

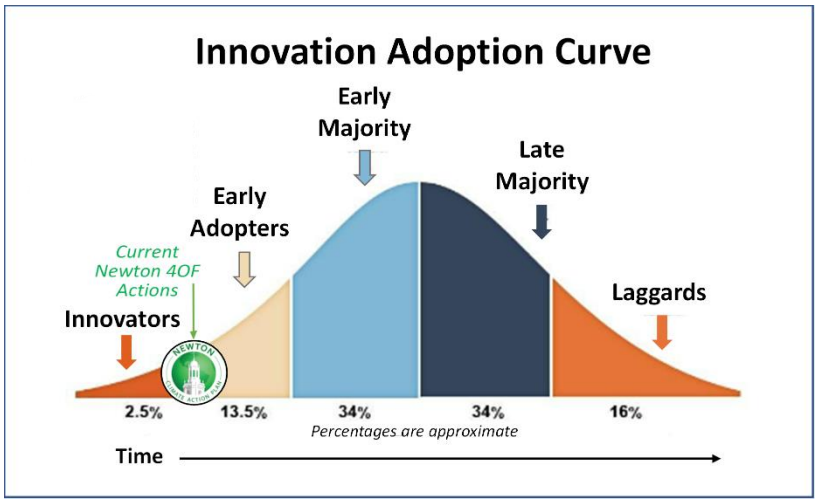
Barrier 3: Inertia. This barrier is the most challenging to tackle because it touches on such issues as individual freedom, consumer sovereignty, privacy, technical knowledge, interest, and low priority in people's lives.

Progress has been slow in Newton and other municipalities in Massachusetts and beyond. It requires a combination of approaches: a) deploying modern media communication, b) community-level action, c) neighbor-to-neighbor communication, and d) mandates. These approaches are most effective when undertaken at a municipal level. Hence, a *central key role for the City.*

IV. What Gets People To Act

Most people's energy use behavior results from either their being part of an institution and system (e.g., electric stoves and oil heating in areas without gas infrastructure), or from social norms (e.g., seeing other people do it, such as installing solar roof panels where neighbors have done so). Deliberate individual actions represent a tiny fraction of energy use decisions. More usually, energy use choices result from the demands of a specific situation (for example, the breakdown of a heating or air conditioning system, a new-found awareness of a financial opportunity or competitive advantage, or a mandate). This *inertia* is why getting people to increase their properties' energy efficiency and adopt heat pumps is so challenging.

Classic "innovation adoption" models typically subdivide a large population into five or so sub-population "waves" based on each group's aversion to risk and willingness to adopt the new idea (see illustration). Each group tends to adopt the change and then helps bring along the population behind them to do the same. The least risk-averse group comprising roughly 2.5% of the population – Innovators – are the easiest to convince to trial something new, followed by Early Adopters, with a total of approximately 15%. Getting the next group - the Early Majority - to follow is a major challenge though once a significant number of people in that category takes action, the rate of adoption increases geometrically.



Early adopters of heat pumps are and will be greatly helped by having easy access to information, coaching, funding, and other resources and various types of campaigns. *The great majority, however, will be motivated mainly by a new social norm (everybody is doing it) or by some mandate.*

In 2022, approximately 50 new heat pumps were installed (according to the City's latest statistics and based on electrical permits granted). According to the HeatSmart and Newton data, we estimate the total number to be around 300. These are the Innovators who represent about 1.2% of total homes. The number of Innovators is far fewer that the minimum 15% needed to achieve the critical mass that causes the rate of adoption to accelerate because "everybody does it."

Our challenge in Newton – as with every innovation starting to diffuse into society – is building the crtical mass so to get to the curve's acceleration point (upward-facing inflection point in the Figure above) *as soon as possible*.

A homeowner's trialing or adopting more sustainable energy use behaviors, by retrofitting their house, can start either weatherization or electrification. People who decide to insulate their houses to reduce the cost of utilities or eliminate drafts may also become interested in electrification if presented with an attractive package of incentives and ease of implementation. People who decide to electrify heating must perform an energy audit to qualify for Mass Save® rebates and loans; such an audit is an excellent opening for introducing weatherization to reduce energy demand and avoid oversizing the system.

V. What Is In This Document

There is no single silver bullet capable of speeding up the process of upgrading energy efficiency and electrifying Newton homes. This document describes Five Recommended Actions, which, when implemented *simultaneously and in a coordinated manner*, will bring the residential sector to the Commenwealth targets for 2040 and to zero emissions in 2050.

Building on the progress made on the state and federal levels regarding financial incentives and ongoing workforce development, this Plan focuses on actions intended to *overcome inertia and reduce homeowners' risks.* The Recommended Actions deploy carrots and sticks. They draw on modern communication methods, technical expertise within the City, and reliable data and information existing within the City administration and available to the public.

NCCE recognizes the constraints in the City budget. Therefore, the Recommended Actions aim for intelligent use of existing human resources, minimizing administrative complexity, and minimizing, though not entirely eliminating, requests for additional resources.

VI. Recommended Actions

1. Enhance the Energy Coach's effectiveness through the use of data-based target marketing

   RECOMMENDED ACTION #1: To move the outreach campaigns to a significant pace and with measurable results, identify opportunities for and design targeted campaigns using a robust set of relevant data and information available within the Assessor and Inspectional Services Departments. Partner with Green Newton and other grassroots organizations to implement. If necessary, add additional resources to City Energy Coach.

Achieving Newton's stated zero carbon goals will require, among other things, nearly all residents to change multiple aspects of their behavior. The magnitude of this task is made more evident by recent research[3] demonstrating Newton residents' general lack of awareness about the City's climate progress and programs. This can be described as a type of "innovation adoption challenge".

[3] Newton Climate Change Listening Project, Slote, et al., May 2022

Currently, the City is conducting a broad-based campaign, 4 Our Future which seeks to create a) a brand and awareness, b) inform residents about their opportunities and options, and c) link them to sources of information, including the Energy Coach service, and help regarding weatherization, electric heating, solar panels, and electric vehicles. The key activities include:

- Raising awareness/establishing the brand through creating and distributing marketing material, such as yard signs, banners, and brochures at strategic locations, mentions in newsletters, and others.
- Educating and connecting residents to vetted installers through the website, webinars, presentations, and tabling at events such as farmers' markets and festivals.
- Connecting with community groups to reach wider audiences and show peer engagement, via the schools, faith organizations, neighborhood associations, and block-by-block "green street" events.
- Through the City Energy Coach and a group of volunteer coaches/experts provide individual guidance to homeowners at any stage of their home energy improvement journey.

Success of this campaign hinges on significant participation by community members, especially among the innovators and early adopters. So far, this process has been slow. Over the next several years it might moderately accelerate or, alternatively, it might follow the fate of the 100% opt-up campaign for Newton Power Choice (which stubbornly stays at about 10%). Moreover, it is implemented by the City Energy Coach, who can dedicate only a *small fraction of her working hours to this campaign*. If we want to dramatically accelerate progress toward creating a critical mass of early adopters and engaging the early majority, this approach alone will not suffice. So how can we reach them effectively?

Progress in outbound communications to property owners should proceed along two parallel paths:

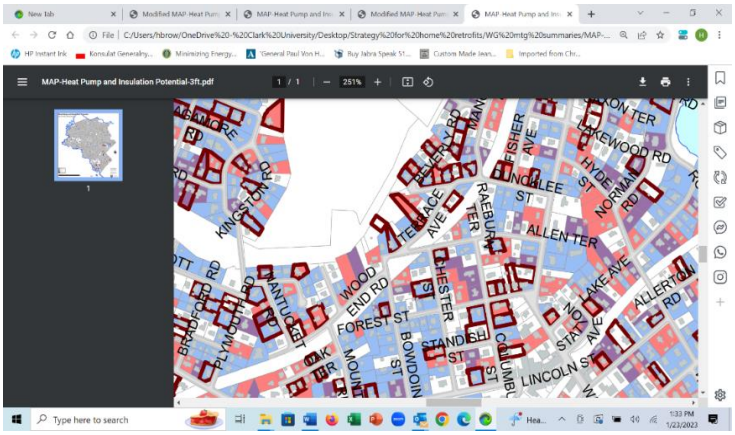
- Targeted campaigns based on data analysis and information (Recommended Action #1), including additional help for the Energy Coach;
- Communication-based on advanced technology (Recommended Action #2).

Targeted campaigns have a more significant potential to overcome the inertia of disengaged homeowners than non-targeted ones. Below are four examples of targeted campaigns based on house attributes and locations. These are illustrative, not an exhaustive list, and needing refinements. Further study of Newton homes will surely identify more opportunities.

Example 1. Studies have shown that people are most likely to invest in significant home improvements during the first three years after purchasing their homes. This situation is a promising cohort of homes for a targeted campaign. Targeting houses is an example of a

potential increased marketing focus. Houses with central air conditioning because the existing forced air ducts can be used for all house heat pumps, lowering the project's cost. Oil-heated houses are also promising targets because many want to phase out their oil heating, and we aim to help them leapfrog directly to electric heating rather than adopt gas as a fuel of choice.

Currently, the Sustainability Office is leading an outreach campaign targeting houses with these three attributes: recently purchased, oil heated, and with central A/C. According to Newton's Assessor's database, 179 houses meet these three criteria 1) bought in the past three years, 2) have central A/C, and 3) are heated with oil. These are shown on the fragment of a Newton map as purple with bold edging. In addition, houses with central Air Conditioning are highlighted in Blue, and those with oil heat are highlighted in Pink.



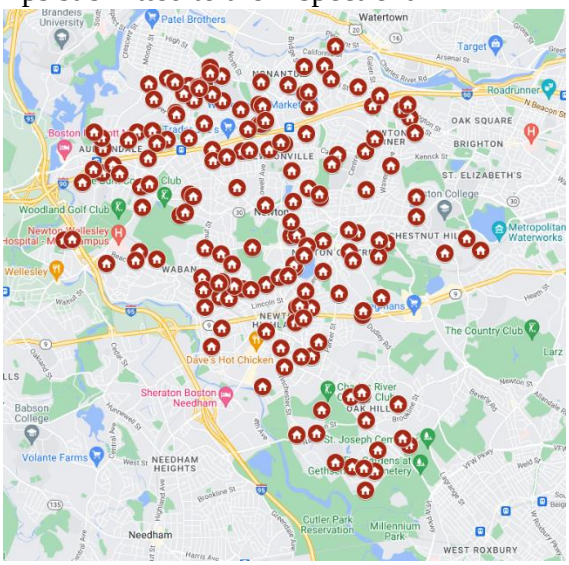
This situation is an opportunity for two types of actions:

- Direct outreach to these homeowners
- Mobilizing the real estate community to reach out to new homeowners at the closing of a house sale.

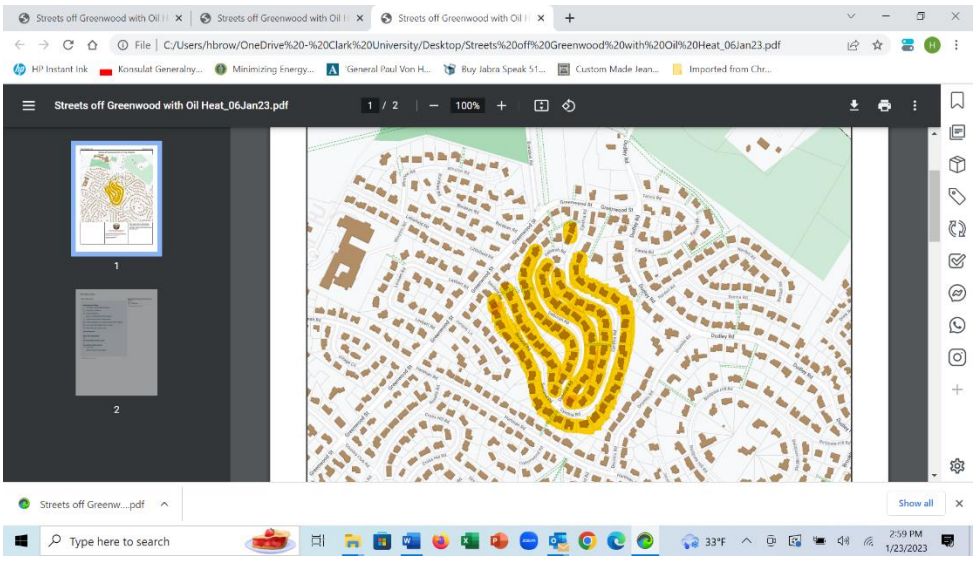
The City, NCCE, and Green Newton are developing a targeted campaign using the flier shown.

Example 2. As established by market research, homeowners are strongly motivated to install roof solar arrays when they see their neighbors do it. A similar buyer behavior may occur regarding weatherization and heat pumps. However, their invisibility in the neighborhood probably dampens that effect. Also, spatial clusters create an opportunity to organize neighborhood events and celebrations around energy efficiency and electrification projects: street parties, Q&A sessions, equipment demonstrations, and so on.

The accompanying map shows the location of Newton homes that have installed heat pumps in 2022. The data are based on electrical permits for heat pumps submitted to the Inspectional Services Department since November 2021. The map is an approximation because the data inputs are uncertain. A more reliable map will help understand the penetration of heat pumps in various neighborhoods and make outreach efforts more effective. Less reliable maps and messaging undermine the City's credibility in pursuing improvements (see Recommended Action Four).



Example 3. Neighborhoods near the Newton South High School in Oak Park were not built with a gas distribution system servicing them. Many houses there heat with oil delivered by tanker trucks. The following map shows one such cluster. Clusters of oil-heated houses are opportunities for progress on multiple fronts simultaneously. Retrofitting homes with insulation and sealing will enable electrification. And replacing those furnaces with heat pumps will preclude building-in gas distribution infrastructure where the stated objective is its phaseout.



The targeted outreach tactics could include the following:

- Neighbor-to-neighbor communications
- Bulk purchase of equipment and community-based deals with contractors
- Creating enthusiasm through localized community action
- Installation of heat pump equipment in each house and possibly a shared network geothermal system serving that cluster to use ground-source instead of air-source technologies
- Retirement of gas infrastructure among neighbors who currently use it.

- The town of Acton provides a possible model for such community action by organizing an entire neighborhood around transitioning from oil to electric heat. That project is in its early stage.

Example 4. At the current rate of increase in global temperatures, the number of days with temperature over 90 degrees Fahrenheit in Newton may reach 80 by 2050, compared with 10 in 2015. Many Newton residents may decide to install central airconditioning systems (A/Cs). This is an excellent opportunity to install all-house heat pumps, which, with the current incentives, are cheaper to buy and to operate than the traditional central A/Cs. We do not know exactly how many homes in Newton *do not have central air conditioning*, but according to the Assessor's database it is close to 50%. A targeted campaign toward these homeowners should be a priority. The Inspectional Service Department may develop an organized information campaign in connections with permit applications for central airconditioning, to direct homeowners toward heatpumps instead. In a complementary approach City should also propose to the Massachusetts Legislature to *ban the sale* of traditional AC systems in the near future.

The activities described above and the opportunities they create for follow-up activities exceed the resources available within the City Sustainability Team. Therefore, we recommend that the City partners with Green Newton and other grassroots local organizations to identify opportunities for designing and implementing targeted campaigns. This suggestion *will require modernizing* how the City collects, manages, and uses data and information (see Recommended Action #4).

2. Adopt modern communication techniques that at the norm for today's consumers.

   RECOMMENDED ACTION #2: Install a high-impact digital display on the northern wall of the gallery hallway in the Free Public Library. Designate an existing IT employee as a "digital communications coordinator," accountable for the digital display and process for managing effective content. Engage creatives and NewTV in program-producing rich media and interactive content for the facing, with messaging according to evolving priorities.

   This recommendation partially fulfills Mayor Fuller's Interactive Newton Network (INN) Initiative.

At about 600,000 visitors annually, the library walkthrough traffic is a much larger and broader potential audience than is typically reached in communication channels addressing climate issues. This opportunity should be leveraged by adopting modern communications techniques that are familiar and normal for today's consumers. Installing high-impact digital displays on the northern wall of the gallery hallway would make a prime facing. This display is very different from the display screens currently inside City Hall, which are easily overlooked, often challenging to read, and showing to a small audience. It is more impactful than tables staffed by volunteers to distribute brochures.

A modern communications platform can enhance the City's communications in multiple ways:

- Broadening the Audience – Beyond the early adopters, is a group often referred to as "the choir", which typically represent only 5-15% of a population. People who come to the library, many attracted by specialized events, include harder-to-reach groups like parents with younger children, students, and residents with less digital literacy.
- Deepening the Impact – Recent research demonstrates that Newton residents lack awareness about the City's climate progress and programs. Communication techniques through digital displays, such as video vignettes and testimonials, can help address this deficit. Displays could be interactive, allowing residents to take immediate action, like scheduling a Home Energy Assessment or a session with Energy Coach, positioning the City as a facilitator, not just a communicator.
- Keeping it Fresh – Content can be changed as needed, e.g., scheduled for easy management or switched at a moment's notice. In addition, this display can provide regular Climate Action Plan progress updates, tout very recent accomplishments, or remind people of an upcoming event of increasing likely relevance and, thus, interest.

  While we believe such a communications platform would enhance residents' engagement in the City's climate and sustainability program, it should also benefit *all other City programs* and activities.

Technical Design: The City should engage an outside audio-visual company to design, engineer, and budget digital display and content management solutions. The NCCE members with display

design experience could provide guidance and, if desired, project oversight to interact with vendors to develop sound proposals.

System Purchase and Installation: The City selects the best vendor proposal through its normal process, and once a contract is signed, supervise system installation.

The NCCE can provide proposal recommendations and assist on-site with installation oversight. NCCE may also pursue fundraising or contributions from private sources to help defray the project's costs.

Operational Planning: The City to designate an existing employee to be a "digital communications coordinator" accountable for the digital display content management process, including content screening, design standards, and display scheduling. This coordinator and relevant IT employee(s) should be trained on content management systems by vendors as part of their agreement to supply this equipment. In addition, all departments should be given design standards/guidelines to create appropriate content.

Some NCCE members have communications planning experience and can advise on setting up the coordinator role for success. In addition, they could be trained with the coordinator to provide backup support if needed.

3. Report, publish & benchmark building energy performance for all privately owned residential properties using the Energy Use Intensity (EUI) metric

   RECOMMENDED ACTION #3: All property owners should be required to calculate a comprehensive Energy Use Intensity metric (EUI), based on their actual annual energy consumption and report the resulting value to the municipal government. The Assessor should publish those values online among the characteristic attributes of the property described publicly.

   This is the recommended implementation of Action E.3.2 from the Newton Climate Action Plan of 2019, listed among the Top 20 Recommended Actions. Action E.3.2 stated: "*Explore opportunities for requiring a standardized, broadly accepted, building energy performance scorecard to be obtained by a potential seller and disclosed to potential buyers."*

Newton requires reporting an energy performance rating for all newly constructed houses (and further enforces a minimum performance threshold). The metric used is called a HERS rating. It is an expected energy performance index based on modeling devised by RESnet®, a corporation founded in 1995 by the National Association of State Energy Officials and Energy Rated Homes of America to develop a national market for home energy rating systems and energy efficient mortgages. Getting a HERS rating costs approximately $1,000 in Newton. Constituting a Public Record, Newton publishes each property's HERS rating on the Internet-accessible copy of Newton's Assessor's database. But over 95% of properties in Newton do not have a HERS

rating[4]. This recommendation endorses creating, using, and publishing a functionally similar metric for every pre-existing house, using Energy Use Intensity as the metric required by Newton.

The Energy Use Intensity (EUI) metric's strength lies in its simplicity and its being a measure of the actual energy used on-premises, as metered and documented in gas and electricity utility and oil or propane delivery bills. It is an absolute value, not a relative index (as is HERS). It is calculated by summing the energy consumed in a year and dividing it by the number of square feet in that house. There is no cost to a homeowner to obtain it, as it requires only data already contained in a consumer's utility bills and the Assessor's database. Unlike other metrics, an EUI can be calculated at any time, without a contractor, and at no cost to a property owner, government, or third party. Also, unlike energy rating systems introduced in a few places in the United States outside Massachusetts, it is not associated with, funded from, nor required by a real estate or other commercial transaction. EUI is independent of the real estate industry's political opposition to requiring energy rating for houses in Massachusetts.

Knowing the EUI of one's home can be essential for owners wanting to protect the value of their most significant capital investment. An EUI value is easily understood. It informs homeowners of the energy performance of their properties and can reveal opportunities for weatherization and increased comfort. It stimulates the demand for retrofits and adds to the local economic activity.

Through public postings, the EUI provides a simple mechanism for homeowners to compare their homes to others when wondering about or looking for ideas to improve their quality of life. A few Citizen Energy Coaches use EUI values in providing Newton's Energy Coach Service. Similarly, HeatSmart coaches use such actual energy use calculations. Having the EUI measure will help the Newton Energy Coach identify homes most in need of greater energy efficiency and be more relevant in providing advice on point (see Recommendation #1).

This recommendation incorporates the lessons learned from the political, legal, technical, market, and financial failures of those earlier attempts with modeled ratings and from successes with EUI metrics earned by the work of the Cities of Cambridge and Boston. Boston's BERDO, Cambridge's BEUDO, and Newton's under-development BERDO require reporting and public posting of EUI for commercial buildings, for which reporting costs are more easily imposed.

[4] The often-identified alternatives to HERS are based on the U.S. Department of Energy's earlier work on a nationwide Home Energy Score (HES). Like HERS, HES estimates performance by using house attributes as inputs to a statistical model. Operator training is required to assess and input the attributes properly. A HES report should cost about $300 and an on-site visit by a trained rater, based on a survey from years ago. Customized versions of HES use other names, such as Energy Disclosure Report in Minnesota and Home Energy Report in Portland (Oregon). About a dozen localities mandated a HES report be included in real estate transactions.

In Massachusetts, DOER attempted such a HES-based system in a 2012-2014 funded pilot. It was heavily invested in and financially supported, and the "DOER Scorecard" earned a very high level of acceptance by homeowners (99%) and a high rate of follow-up with weatherization projects (44% vs. the typical 20-25%). Governor Baker followed-up, sending bills to the legislature in 2017 and 2018, where they died in committee. The real estate industry opposed them. The utility companies opposed either requiring that they provide a rating (e.g., as part of Mass Save®) or to provide attributed-customer bill data to state regulators or to municipal government. Consequently, widespread energy scoring was not achieved in Massachusetts.

In 2009, Newton Mayor David Cohen endorsed the idea of using EUI to benchmark residential energy performance, and reached out to the utility to provide to the City the data on energy use in Newton homes. Newton's initiative had to be suspended because the utilities were unwilling to provide the billing data needed. Asking residents to provide bill data was considered neither feasible, reasonable, nor affordable.

The Energy Commission **has now found a solution** to those problems with reporting residential energy billing data in the form of an EUI calculator called "Before 2050™". This computer system was developed specifically to Newton's circumstance and the recommended approach to publishing EUI values. Homeowners can determine the EUI of their house on their own time and in the privacy of their homes. As efficiency improvements are made, homeowners can more easily see the extent of change in their energy use, than using other methods. The system is operable[5] and can be available to the City of Newton.

Further, the proposed implementation resolves the problems of homeowner privacy, out-of-pocket costs to homeowners and administrative burden to the City, which emerged in the earlier conversations with Mayor Fuller, her team, and several City Councilors about comprehensive reporting of residential energy use.

Using the EUI for reporting energy use on residential properties in Newton parallels the politically successful and currently continuing-to-advance uses of EUI for reporting on commercial properties in the Cities of Cambridge (BEUDO), Boston (BERDO) and possibly in Newton. EUI is one measure, one language for learning about the energy use of all kinds of buildings and supporting one community of citizens, elected officials, and development professionals working together on a common problem. It is owned by everyone and controlled by no one.

In short, the EUI requirement helps homeowners be responsible citizens. It gently signals that Newton homeowners, like large commercial building owners through BERDO, should act (and how). Requiring owners to submit their EUI values drives home the message that what people do with energy in their homes is more than a private matter; it makes emitting greenhouse gasses, whose impacts everywhere affect local and global communities, more easily understandable on a personal scale. However, unlike BERDO's requirements on owners of commercial buildings, enforcement of a building performance standard and financial penalties for poor performance is *not proposed here*.

Implementing this recommendation can be accomplished in three work steps, all achievable in the calendar year 2023. The Mayor's and the City Council's support and leadership are essential for these steps to be implemented.

[5] See Green Newton "Before 2050™ Energy Use Calculator" -- https://greennewton.org/before-2050-energy-usage-calculator/

1. Adopt Energy Use Intensity (EUI) as the reporting metric for all existing houses by including it with other property attributes on the Internet presentation of the Assessor's database, and include publishing reported values as part of Newton's standard operating procedures.

2. Seek proposals and let a contract for an information services provider to automate and operate the administrative procedures needed to deliver EUI values from property owners to the City of Newton in publication-ready form.

3. Work with Newton's City Council to draft, debate, and pass a municipal ordinance requiring owners of all residential properties to submit their EUI value annually.

4. Clean the City's data on sustainability and streamline reporting systems to enable the creation of regularly published sustainability dashboards.

   RECOMMENDED ACTION #4: Build dashboards of publicly available data on energy-related attributes of the residential homes and include information that provides a birds-eye view of energy-related sustainability initiatives in Newton.

   This is the recommended implementation of Action A.1.7 from the Newton Climate Action Plan of 2019. Action A.1.7 stated: "*Annual reports will be provided to the City Council and the public on progress made under this plan. Metrics identified in A.1.3. that can be readily updated more frequently will be updated on the City's website. The City will consider creating a 'dashboard' to facilitate publication of critical metrics."*

As noted in recommendations #1, #2, and #3, data are paramount to targeting CAP implementation efforts. Data and information, such as *type of heating fuel*, *central air-conditioning*, *HERS ratings*, and *EUI* are essential. These are fuels that move action. For example, we need data and information to 1) understand the penetration rate of energy retrofits in neighborhoods, 2) create reliable maps for targeted campaigns and local community actions, 3) design campaigns, identify homes that can benefit the most from energy efficiency projects, 4) engage residents with the energy performance of their homes, and 5) track progress in implementing Newton's Climate Action Plan.

These capabilities require a system that enables automated cross-system data transfer, uses consistent format and numerical metrics, and avoids manual data entry. **Our current data and systems cannot be relied on for this**. Some data on residences in the Assessor's database, such as the type of heating fuel used, are outdated to the extent that they can't be relied upon for designing targeted campaigns or understanding patterns. For example, based on a 2019 sampling of Newton homeowners showed that 2/3 of the reported oil heating systems were no longer in use but the Assessor's database did not reflect it. Furthermore, data entered manually are prone to error, are inconsistent in format, and are resource intensive.

Other data, such as recent permit histories indicative of electrification efforts by homeowners, are more current but require human eyes to retrieve information on individual homes. Such retention and formatting issues stand in the way of permit data being a valuable input to spatial and temporal analyses. Moreover, the high unit cost of retrieval is unscalable across a jurisdiction of Newton's size. This situation makes most secondary uses of this Newton information resource more resource intensive and expensive than more modern methods afford.

The NCCE calls upon the Mayor to lead an effort whereby the City Information Technology professionals, the Inspectional Services Department, Public Works, and Assesor's Department, cooperate to make these publicly available data into a sufficiently useful form to allow building dashboards to inform citizens' and City's actions and progress toward the goals of the Climate Action Plan. The scope of a current contract with Synapse (for BERDO) could be increased to include this one-time project. The NCCE is ready to contribute to that effort.

The City should undertake an initial manual rationalization project on a 10% sample of properties. This effort would identify and characterize the kinds of data transforms and handoffs needed to flow information from capture systems (such as in ISD) to consumption systems (such as the Assessor's database, in this one illustration). The Information Technology Department would then pursue a prioritized calendar of "glueware" developments (for inter-system communication pathways, conforming datatypes, and marshaling records) over several years to integrate an otherwise balkanized installed base of systems.

Simultaneously, a system for presenting dashboards, and a starter set of dashboard designs, should be invested in and built to provide a birds-eye view of CAP initiatives, such as the advancing penetration of residential electrification.

Reporting from the perspective of these recommended dashboards would *fulfill Action A.1.7* in Newton's Climate Action Plan, and do so with less ongoing staff effort and to a greater degree of quality, consistency, and reliability.

5. Assertively Inspect Heat Pump Proposals & Permits And Quality-Certify Completions

RECOMMENDED ACTION #5: Develop an Electric HVAC Inspector employee job grade and staff to perform engineering reviews of permit applications for electric heat/cooling systems, on-site workmanship verification, and certify completed projects. The Electric HVAC Inspector will be Newton's center of competence and a second-level support resource for City staff and resident-facing Newton Energy Coach service providers.

The experience of Newton's early adopters of heat pumps influences the rate and ultimate level of adoption through reputational word-of-mouth. The number of complaints has increased with the increasing number of installations in Newton. Property owners have complained about:

- improperly sized systems, resulting in high electricity bills
- improperly installed system, resulting in extremely high electricity bills.
- unbalanced airflow
- misplaced or incorrect selection of thermostat controls
- mistaken assumptions about the cold-weather performance of heat pumps and a failure to obtain, refer to or understand the product manufacturer's documentation
- lack of post-installation operation adjustments
- inadequate instruction on using the system newly installed
- perhaps either product specification ignorance, time pressures, or another issue preempting discursive engagement with paid-up customers experiencing difficulties

Though Newton's Co-Director of Sustainability testified that electrification would be more expensive to operate, at least some new systems can consume electricity in amounts shocking higher than those expectations. And 2022-2023 was a mild winter in Newton.

Mass Save and Mass CEC are actively training the workforce in installing heating systems and, along with several other organizations, are educating homeowners on finding reliable contractors and using their new heating systems. And Citizen Energy Coaches answer many questions from residents. But these efforts are insufficient to avoid costly mistakes and bad reputations because they are responsive, rather than proactive, and are not equipped to deal with technical and sometimes highly complicated situations. These require:

- Individualized consulting, reviewing contractors' proposals, and post-installation inspections.
- Ensuring that homeowners access the existing programs available to them.
- Ensuring that homeowners' experience is positive.

The private sector commonly performs these kinds of activities. Over time this will be the case with heat pumps, but for now, their absence is a serious barrier to the widespread adoption of heat pumps. To accelerate the transition from fossil fuels to electricity, the residents who take a chance with this new technology deserve to get help from the City. This effort is a form of consumer protection.

We call on the City to assist homeowners by retaining or establishing a position of Electric HVAC Inspector to perform technical review of permit applications and approve completed heat pump projects. The Inspecting Coach will:

- Review the general characteristics of a building to understand its heating, cooling, and energy efficiency needs

- Review mechanical design
- Review energy calculations such as Manual J, Manual S, and Manual D and encourage more accurate alternatives
- Inspect the project post-installation, including a review of any ductwork
- Train Energy Coach Service providers and City of Newton employees on how to handle some of the more complicated questions from homeowners

This could be accomplished by retraining one of the current inspectors at ISD or serving as the basis for a hire. Such a capability-enhancing effort could provide career-and-grade professional development opportunities for City personnel.

Should the functions of Electric HVAC Inspector be outside the purview of the Inspectional Services Department, it may make more sense for the City to locate it in a different administrative unit.

VII. Implementation

The NCCE recognizes the constraints in the City budget. Many of these recommendations require only redeployment or re-focusing existing resources. Some others can be funded through capital expenditures rather than operating monies. All can be in full implementation mode during the current calendar year of 2023. The NCCE is committed to providing hands-on assistance where appropriate and seeking outside financial and/or in-kind support for aspects of this plan.

We also recognize how instrumental the Mayoral email updates can be to the CAP. We encourage the Mayor to use it to feature on a regular basis its progress (e.g., solar and EV charging installations, number of weatherizations and heatpump installations in homes, Josh Morse's efforts to upgrade school and municipal buildings, insights from quarterly data trends, interesting case studies, etc.). Regular reminders about events that connect people (e.g., upcoming green events, testimonials about Energy Coaches, etc.) will also be very helpful.