

Newton Emission Inventory. 2013-2019

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Executive summary

The Newton Citizens Commission on Energy (NCCE) prepared an inventory of greenhouse gas (GHG) emissions, covering the period of 2013-2019, the first such update since 2013. The objectives of that 2021 work were:

- To track the trends in energy use and GHG emissions over the previous six years.
- To identify opportunities for and challenges in meeting the City's 2050 goal of carbon neutrality.
- To inform the priorities in implementing the Newton Climate Action Plan (NCAP) in 2022.

While we had access to data including the year 2020, we used 2019 as a benchmark, to avoid the atypical energy use during the year of the COVID-19 pandemic.

Early in this work, we discovered errors and unexplainable discrepancies in the 2013 GHG Emission Inventory. For that reason, we recalculated the energy use and GHG emissions for 2013 and the intervening years. Standard conversion factors were used to translate measured usage of electric and fuel energy into GHG emission equivalents, and to account for different sources of electricity generation.

It is too soon to use the Inventory to judge the effectiveness of the implementation efforts for the 2019 Newton Climate Action Plan, especially since many administrative functions became delayed during the Covid crisis. However, the inventory provides a hard reality check on the current status of energy demand and GHG emissions in Newton; and the likelihood of achieving the ambitious goals of the NCAP if our current policies and actions continue on the current trajectory. On that count, we are not doing well.

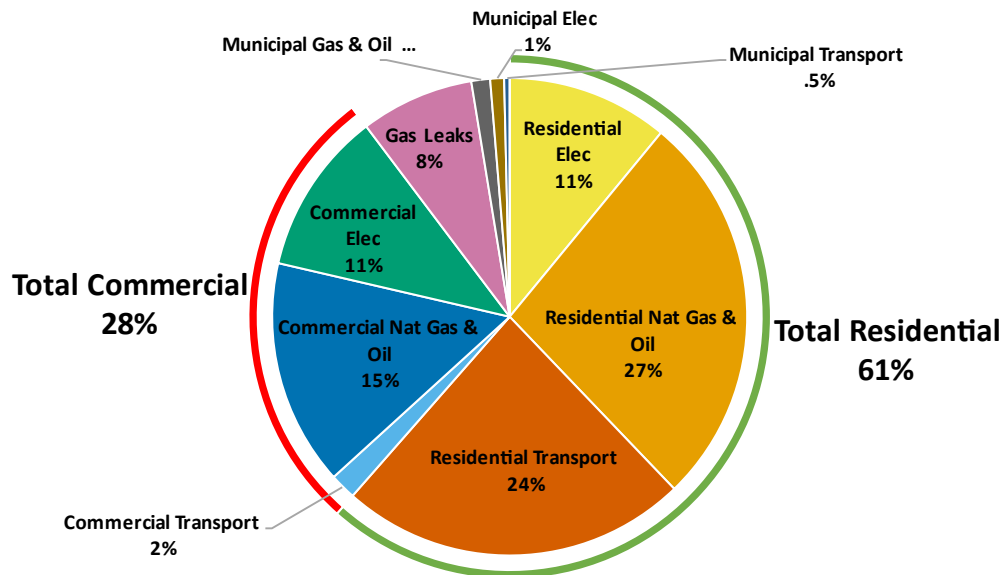
Main findings

1. At 61% of total emissions, the residential sector (houses and cars) continues to be the single most significant contributor to GHG emissions in Newton.
2. Overall, the amount of greenhouse gas emissions resulting from energy consumption in Newton increased by 1.8% between 2013 and 2019. However, if the Class 1 RECs in Newton Power Choice (NPC), which are a measure of energy production, are credited locally, the overall amount declined by 3.5%.

3. Since 2013, the use of electricity and automobile fuel has remained constant (within the uncertainties in the methodology).
4. The demand for heating fuel has increased in both the residential (5%) and commercial (8%) sectors, since 2013.
5. At 8%, leaks from gas distribution infrastructure have not changed and are a significant contributor to total GHG emissions.
6. At 80% default value in Newton Power Choice, we are well on the way to meeting the 100% target for 2025.
7. Participation in Newton Power Choice is 68% in the residential sector and 50% in the commercial sector. In both sectors, non-participants are representative of larger and more energy-intensive electricity users.
8. The demand for heating fuel in City operations has increased by 26%, owing to the expansion of several school buildings and one additional acquisition. In spite of that, the City reduced its demand for electricity by 8% and the GHG emissions from electricity by 18%. Overall, the municipal operations represent only 2.5% of total GHG emissions in Newton.

Newton Greenhouse Gas Inventory 2019

2019 was used as benchmark to prevent distortions due to Covid pander



Accounting for renewable sources of electricity used in Newton

Both Newton Power Choice and solar power generation systems installed in Newton contribute to greening the grid in New England. Both merit recognition in terms of Newton's efforts to

reduce greenhouse gas emissions related to electricity use. But their effects on greening the electricity used in Newton is indirect, so it would not be appropriate to call them reductions in GHG emissions from Newton electricity. There is also a difference between municipal solar generation, which is operated by private entities, who sell that electricity to "the grid", and residential generation, which is financed and used by its owners. The following conventions were used in this Inventory.

Solar installations. In 2019, residential solar systems in Newton generated approximately 16,932 MWh, which represents 2.1% of electricity used in Newton. Putting a solar installation on a roof is a strong statement by a homeowner or a business and a costly investment. In order to recognize these efforts, and to incentivize more Newton residents and businesses to do so, this Inventory counts residential generation as reductions in GHG emissions.

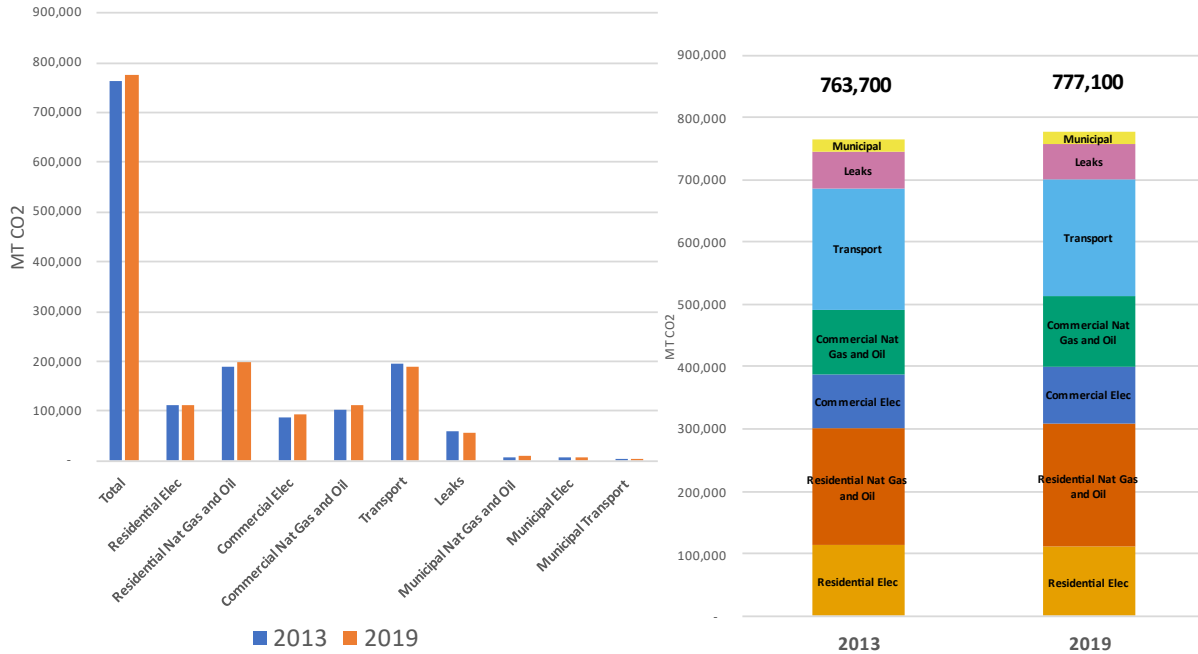
Municipal solar installations generated 5,560 MWh of electricity in 2020, which accounted for 32% of electricity used by the City of Newton. The visibility of these installations demonstrates leadership, sets an example and contributes to the grid greening in New England. However, because the city sells this electricity as RECs through the Eversource grid, it is not counted in the Inventory as a credit, reduction or offset. In addition, the City purchased 2,100 Class 1 RECs -- about 10% of the City's electricity use -- which are counted as offsetting Newton's GHG emissions in the same way as the RECs purchased through Newton Power Choice.

RECs purchased through Newton Power Choice. Purchasing these RECs contributes to greening the power grid by financially supporting the construction of new non-fossil fuel generation of electricity in New England (today and in the future) and generating more market demand. The purchased RECs cannot count, strictly speaking, as reductions, but they have a high value as an effort made by Newton toward reducing GHG emissions from electricity in New England, despite their higher cost relative to base electricity provided by Eversource. The Inventory counts all of NPC's RECs as offsets to the GHG emissions from Newton.

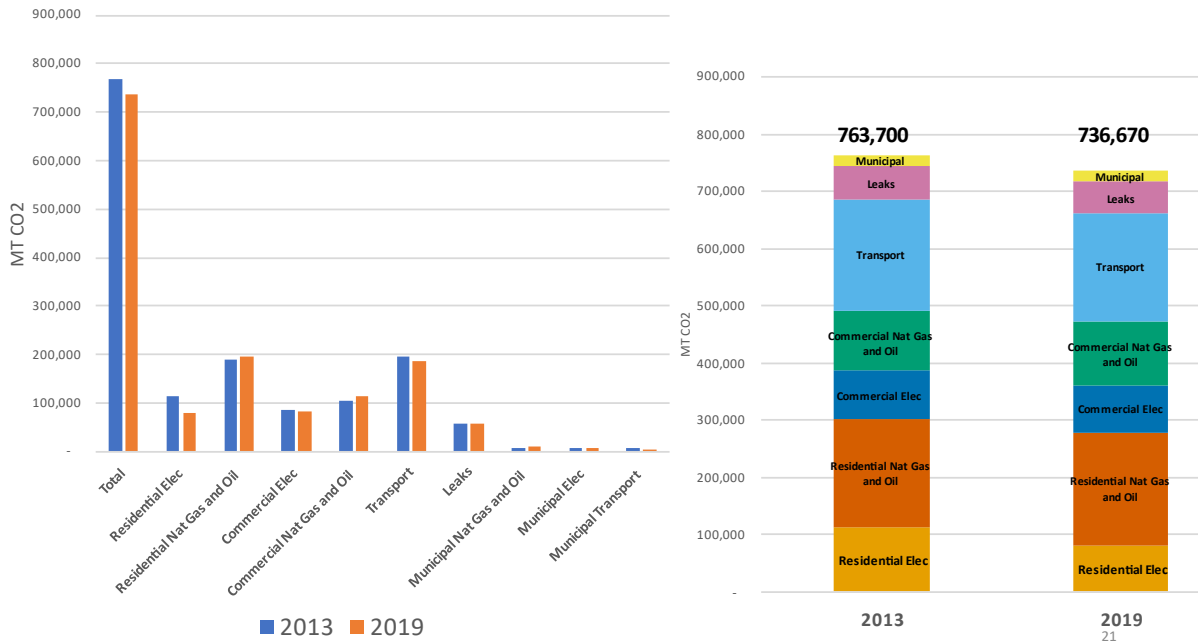
For the non-participants in NPC in both residential and commercial sectors, the Inventory assumes that the electricity came from Eversource in the R-1 basic service. That assumption may underestimate the renewable content of electricity use by large users who generally have contracts with electricity providers of their choice.

The two figures below show changes in Newton GHG emissions (2013-2019), without and with counting the Class 1 RECs as offsets to emissions from electricity (1.8% increase vs. 3.5% decrease, respectively).

Changes in Newton GHG emissions by source, based on use. 1.8% Increase



Changes in Newton GHG emissions by source including offsets from NPC. 3.5% decline



Progress toward goals of Newton Climate Action Plan

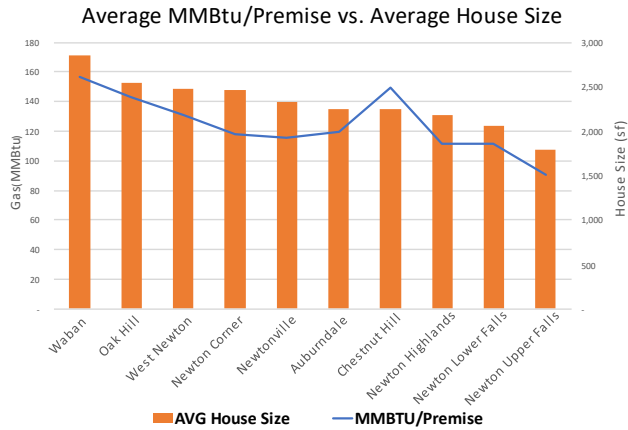
Comparing the 2019 GHG emissions and rates of change with the 2025 goals stated in Newton Climate Action Plan, we find great causes for concern, as shown in the table below. Unless radical changes occur in the rate of residential insulation, adoption of heat pumps and electric vehicles, and in the energy demand in the commercial sector, we will miss our goals by a wide margin.

Little progress toward 2025 Goals of Climate Action Plan

Progress	2025 Goal
EVs make up 1.67% of Newton's vehicle fleet	10% of total
Emissions from residential heating increased by 5%	7% reduction (3% from efficiency improvements and 4% from electrification)
Emissions from commercial heating increased by 8%	2030 Goal: 50% reduction (efficiency improvements and electrification combined)
Approx. 90 heat pumps installed/year (individual rooms, partial and full house combined)	400/year homes fully electrified
Approx. 250 home retrofits/year to improve energy efficiency	800/year

A closer examination of fuel demand in different parts of Newton shows that the villages with larger average house sizes use more energy per dwelling. Newton's current trends toward constructing very large homes undermine the current building code's energy efficiency gains in modern construction. As noted in the Citizens Climate Action Plan (2019), 77% of all single-family houses in Newton are 3000 sf or smaller, and 97% of duplexes are 2700 sf or smaller (for both dwellings combined). In a large proportion of these houses, the value of the building is less than 50% of the value of the land, which makes them prime candidates for being torn down. If the current trend of 4000-7000 sf replacement homes continues (including duplex townhouses replacing modest single-family dwellings), then the Climate Action Plan goals will lag even more.

Residential energy use increases with house sizes. The growing size of new homes undermines progress in efficiency



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The table below summarizes the changes in GHG emissions by source.

Changes in Newton GHG Emissions by Source. 2013-2019

Source	Change	Main Driver
Residential Electricity	No change	
Residential Electricity with NPC	-28%	Newton Power Choice
Commercial Electricity	No change	
Commercial Electricity with NPC	-5%	Newton Power Choice
Transportation	No change	<i>(Within method error)</i>
Natural Gas Leaks	No change	
Residential Gas and Oil	+5%	Increased Use
Commercial Gas and Oil	+8%	Increased Use
Municipal Electricity	-18%	Decreased Use
Municipal Gas and Oil	+17%	Larger space for heating
Municipal Transportation	+12%	Increased use of diesel fuel

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Conclusions

Continuing the current trends in energy demand and greenhouse gas emissions virtually guarantees that Newton will not meet its stated goals. While we made progress in shifting toward a more renewable electricity mix through NPC, the accounting reductions so produced are being counteracted by a growing demand for heating fuel in the residential, commercial and municipal sectors.

Newton Power Choice: At 80% Class 1 renewable content, Newton is by far a leader in Massachusetts in transitioning to renewable electricity. But at 68% and 50% participation in the residential and commercial sectors, respectively, there is plenty of opportunity for getting more out of Newton Power Choice. The outreach to the community should *focus on increasing participation*, not on persuading the current participants to opt up to 100% renewable electricity content.

New construction: In recent years, progress has been made toward reducing GHG emissions from new construction. This progress includes the achievements of the Building Standards Committee of Green Newton in steering large developers toward highly efficient construction, reduced embodied energy, and electrification. Their laudable achievements with developers of the Northland and Riverside projects represent the two most prominent of many such examples.

These achievements have set new ambitious norms of behavior for all developers contemplating new construction in Newton. On the state level, the ongoing work toward a net-zero stretch building code promises to raise the standards of residential construction in the near future. In addition, the growing momentum toward state-level legislation on electrification of new construction may facilitate the future shift from gas heating to heating with renewable electricity. Unfortunately, the increasing sizes of new homes partly undermine that progress. *The Net Zero By 2050 goal requires that Newton finds ways to reverse the trend.*

Existing buildings. Newton's greatest challenge is to *reduce energy demand in existing buildings and to facilitate their transition toward electric heat*. This is where we must focus our creativity and political capital, both through outreach and education of contractors and bold policy initiatives. So far, the generous subsidies through the Mass Save program have not led to a large-scale mobilization of residents and businesses to insulate buildings.

Under the leadership of Newton Energy Coach, the City and the grassroots community have just undertaken a major **4 Our Future** campaign aimed at Newton residents. While necessary, it is unlikely that this campaign, premised on responsible citizenship, will *alone* bring the annual number of energy retrofits and home electrifications to 800 and 400, respectively. Extensive national and international research and practical experience with mobilizing citizens to take climate action produces relatively small results in the absence of strong government policies (this well-studied phenomenon is referred to as "attitude-behavior gap"). Voluntary action by the commercial sector toward large energy reductions required by Newton Climate Action Plan is similarly open to question.

Transportation. Newton’s progress toward electric vehicles has so far been very slow. However, there are reasons to believe that this will rapidly change in the next few years, owing to market forces in car manufacturing, federal subsidies for purchasing electric vehicles, federal support for the national EV infrastructure, and overall cultural attitudes toward electric vehicles. The heating up grassroots campaign in Newton will undoubtedly play an essential role in that transition.

It is not clear to what extent the number of miles travelled by Newtonites will soon decline. Nor do our residents show any signs of abandoning energy-guzzling SUVs, which represent about 70% of our fleet. Any significant potential shift from a car- to bicycle-based mobility in Newton, although attractive, seems remote, though the increasing presence of electric bicycles and gradual increase in bicycle lanes are hopeful signs. For now, electric vehicles are our most significant leverage toward reducing GHG emissions from transportation.

Recommendations

A key lesson from the Newton Power Choice initiative is that bold leadership through municipal policy produces measurable progress. We must heed this lesson in developing an immediate plan for existing buildings. Newton Citizens Commission on Energy recommends that the City, in collaboration with the activist and business communities, develops *policies to implement the principle of universal energy use analysis, benchmarking and public disclosure for each and every property within city limits.*

- For the commercial sector, the City should adopt a program first adopted in 2012 in Cambridge and Boston and revised in September 2021 by the Boston City Council. The so-called “BERDO 2.0” requires energy use analysis, benchmarking, disclosure as well as compliance with specific GHG emission standards for different types of buildings. It includes financial penalties for buildings found to be out of compliance. Newton’s Sustainability Team is currently reviewing BERDO 2.0 as an option for Newton. We call for expedited review and presentation of an ordinance proposal to Newton City Council by January 2022.
- A similar program built on the principle of analysis-benchmarking-public disclosure is needed for the residential sector. Newton Citizens Commission on Energy will present a proposal for such a program to the Mayor and City Council. The proposal has a requirement for energy disclosure, analysis and reporting for all residential homes.

These actions will require strong *leadership from both the Mayor and President of the City Council.* The Mayor has a powerful bully pulpit in the form of her weekly electronic bulletin, which is read by a majority of households and businesses. A permanent weekly section on Climate Action should be created in that bulletin. The recently hired Energy Coach would work with the Communications Director to create content.

The City Council President has an equally important, though enabling role in making progress possible. Despite the challenges of legislating outside the range of long-established municipal competencies, the President will, nevertheless, need to build a consensus needed to pass ordinances establishing the principles for implementing Universal Energy Use Transparency: our society's best public policy for the foreseeable future.

The scale of work that lies ahead will require resources for administrative staff and technical advice. Designing the universal energy use, analysis, benchmarking and public disclosure program for Newton's residential and commercial sectors; or managing of data generated by these programs, are but two illustrations of such additional resource needs. Cities around the country, many with much smaller operating budgets than Newton, have made large financial commitments toward their Climate actions. Newton should do that too. Considering the climate crisis, we are facing right now, the Mayor should commit a large part of her *discretionary budget to Climate Action*.

No matter how large, the resources never match the challenges. We should therefore focus our energy on *actions that are likely to succeed rather than actions that we know how to implement. Our strategies and tactics should be evidence-based*. The fields of sociology, behavioral economics, management and others offer a large body of research and knowledge on how to effectively change individual, institutional and business behaviors; what works and what does not work. There lies Newton's best hope for the innovations needed in its next steps.

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