

2021 Dover Energy Commission Report

Bill Baber, Chair

Otis Perry, Vice-Chair

Michael Behrmann

Walter King

Zachary Koehler

Vincent Lyon

Susan Smith

James Barrett Miles - Alternate

Rebecca Ohler - Alternate

Deborah Thibodeaux, City Council Liaison

Elena Piekut, Staff Liaison

Energy Commission Mission Statement

The Dover Energy Commission shall advise the City through its boards and committees on ways to reduce energy use, develop alternative energy sources and increase economic security and energy independence. The goal of the Energy Commission is to promote and encourage energy conservation measures for Dover residents, businesses and municipal operations. The Commission will work with the City Council to review current energy efficiency practices and possible future actions. The Commission's work will be available to the Planning Board as a resource with respect to energy consideration in the next Master Plan Update.

In This Report

Page 3 - Energy Commission Pending Requests to Council: The Commission has two proposals before the Council that have yet to be acted upon. In 2019 we recommended the creation of an energy-focused staff position to assist the city more efficiently manage its \$2.5M expenditures on energy. In 2020 the Commission requested the Council create a select committee to address sustainability issues within the city. It is the current opinion of the Commission that both goals could be aided by the creation of the recommended position.

Page 6 - Lessons Learned from 2020 Solar RFP Responses: The Commission participated with a team of reviewers evaluating RFP responses to broadly explore the possibilities of expanding solar in the city. A number of findings led the review team to believe the City would be better served by a new, revised, more precisely targeted RFP. Some of the findings included: large scale, free-standing installations are far more cost effective; state and federal incentive programs were in a high state of flux last year; group net metering (typically a very large installation serving numerous off-site members) could be highly advantageous for the City.

Page 8 - Where the City's Energy is Consumed: Presented here is a graphic presentation demonstrating the highest electric, propane, and natural consumption areas in the municipality. A year-to-year comparison has not been presented due to the distortion of usage resulting from the abnormal consumption due to the pandemic's impact.

Page 11 - Fleet Fuel Usage by Department: Graphic presentation of gas and diesel consumed by department.

Page 12 - Synopsis on Energy Efficiency Programs: Improving the energy efficiency of all consuming sources is, in almost every case, the least expensive TCO option. This section outlines areas where the City has benefited from investments and the risks to State support for efficiency funding if the Triannual Energy Efficiency Plan is not adopted by the NH PUC.

Page 14 - Setting a Renewable Energy Goal for Dover: In 2019, the Energy Commission voted to include on its list of goals to explore and work towards 100% renewable sources for municipal energy. In this section, work toward similar goals by other cities and towns in New Hampshire are reviewed.

Page 16 - Electric Vehicle Overview and the Role Dover Could Play: Recently General Motors committed to produce only electric vehicles in a clear sign of the maturity of this technology. With 50% of greenhouse emissions generated by transportation, the need is clear. Now that the car purchased through the State contract with the lowest TCO is an electric vehicle (EV), the future is here today. Unfortunately, both the City and State compared to our neighbors are poorly equipped with charging infrastructure to meet future demand. Suggestions are presented for improving support for EVs.

Page 19 - Executive Summary of Community Power in NH: Community Power is a new concept authorized by the State in 2019. This law allows cities and towns, on their own or in a consortium, to become the authority for the purchase of electric power for the entire community with regulated utilities retaining their management of transmission and distribution. There are numerous perceived advantages to the model and it is being actively pursued by several communities in the State. House Bill 315 currently before the legislature would essentially gut this program before it can be implemented.

Page 20 - Preliminary Energy Implications from Utilities Master Plan Committee: The City of Dover is currently updating the 2009 Community Facilities and Utilities Master Plan Chapter. In this section, the Energy Commission member of the committee provides an early look at the implications for the City in regards to energy.

Energy Commission Pending Requests to Council

Creation of an Energy-Focused Staff Position - In the spring of 2019 the Commission made the following appeal to the Council:

*It is the position of the Energy Commission that Dover could benefit substantially by creating a position dedicated to energy assessment and management. Such a position would assist the city in cost effectively managing our energy expenses that the Commission estimates to be in the order of **\$2.5 million** annually. This position also could be instrumental in achieving the city's aspirational goals for carbon and nitrogen reduction.*

Background: Dover has made great strides in recent years by increasing energy efficiency and deploying substantial renewable energy resources. The mayor and city council have signaled their support for continuing progress demonstrated by their support for the Paris Climate Accord and investigating offshore wind energy, joining the EPA's Energy Star Challenge, and the mayor's signing on to the Climate Mayors initiative.

The city's management and staff have also provided leadership in moving Dover toward a future that will see the city become more energy efficient and less dependent on fossil fuels. Projects such as "Dover 2023, building for tomorrow," "Sustainable Dover," "Preparing for Climate Change in Dover," and updating the Master Plan with a new chapter on Climate Adaptation are all examples of a city with an eye on the future.

Dover has done more than think about these issues. It has been taking action and investing. Recent examples include replacing the city's streetlights with smart LED lighting, solarizing the city indoor pool and Children's Museum of N.H., and solarizing our new energy-efficient high school.

While all of the above represent important and significant achievements, the city lacks staff resources to ensure the city continues to make progress in a coordinated, wise, well-informed, and economical fashion. Just consider some of the variables that need to be assessed in making informed energy consumption decisions: assessment of all physical properties; assessment of the entire vehicle fleet and stationary systems; operating practices; and the exploration of alternative sources, techniques, designs, operating practices, government regulations, and grant opportunities. Currently many energy practices and purchases are done at the department operational level. Evolving toward a city-wide, coordinated energy management opens the opportunity for identifying those areas that represent the greatest return on investment and for standardizing system purchasing and support.

We strongly believe that the right person in such a position would save the city far more than her or his/her salary. The energy industry and energy technology are in a state of great flux. This is the time for the city to respond.

The Energy Commission continues to support the value to the City of the addition of such a position and now believes that the position scope should be expanded to cover support for sustainability issues.

Creation of a Select Committee to Address the City's Sustainability Vision - In July of 2020 the Commission made the follow request to the Council:

After more than a year of review and discussion, given that the charge of the Energy Commission is insufficient to cover the breadth of need and the task so large as to detract from our core mission, the the Dover Energy Commission recommends that the City Council create a select committee to address how the City might best execute the sustainability vision set forward in the Master Plan and various Council resolutions.

We believe such a select committee should address the following issues:

- 1. Dover has a documented, sustainable vision, yet much of that vision has failed to reach fruition. What actions are needed to assist the execution of that vision? Is there a need to create an entity in the city to assist with compliance, develop guidelines, and provide educational support?*
- 2. Dover has defined sustainability as "Balancing the values of environmental stewardship, social responsibility and economic vitality to meet our present needs while ensuring the ability of future generations to meet their needs." How do we develop guidelines to assist implementers attempting to balance these sometimes conflicting demands?*
- 3. A Sustainable Dover cannot be accomplished by city government actions alone. How can we better engage our residents to become more active participants?*
- 4. Are there areas of the existing Sustainable Dover and Master Plan visions and goals that may need updating to reflect current conditions and expectations (it appears work on these began in 2005)?*

Given that the scope of these issues are very broad indeed, we believe that select committee membership should be equally broad, including members of governance, staff, knowledge experts, business leaders, and the general public. The charge to the committee should be clear--an executable plan is needed.

Background:

In the process of defining the Energy Commission goals for 2019, members felt there was a need to explore our role in supporting unmet sustainability goals. We formed a sub committee to perform an initial review, and following their report we have discussed the topic at every meeting since. It is our conclusion that this topic is far too large to be taken on by any one committee as exemplified by this H.U.D. sustainability scope description:

- **Natural Systems** (ecosystems and habitat, water and stormwater, air quality, waste, and resource conservation)
- **Planning and Design** (land use, transportation and mobility, and parks, open space and recreation)
- **Energy and Climate** (energy, greenhouse gas emissions and other air pollutants, renewable energy, and green building) Economy
- **Economic Development** (clean technologies and green jobs, local commerce, tourism, and local food system)
- **Employment and Workforce Training** (green job training, employment and workforce wages, and youth skills) Society
- **Affordability and Social Equity** (affordable and workforce housing, poverty, human services and race and social equity)

- **Children, Health, and Safety** (community health and wellness, access to health care, and public safety)
- **Education, Arts, and Community** (education excellence, arts and culture, and civic engagement and vitality)

Clearly the full scope of sustainability does not fall under our jurisdiction as outlined in RSA 38-D where it is defined as "...sustainable practices such as energy conservation, energy efficiency, energy generation, and zoning practices." However, it was also clear that to attain the established sustainability goals of the City, we must take action.

A few positive examples of reasons for acting now:

- A robust approach to reducing plastic waste could lower the rapidly increasing cost of waste management, as well as reduce negative effects of plastic pollution on our health.
- A comprehensive approach to nitrogen runoff practices might minimize our need for expensive upgrades to our wastewater treatment plant.
- On site solutions to mitigate stormwater runoff might reduce the cost of pending EPA MS4 compliance.
- The total cost of housing could be reduced if energy efficiency building codes were updated.

The question is: have we provided the support infrastructure and leadership for such worthy goals to be achieved?

We acknowledge the important progress the City has made. Think of the progress possible if well conceived plans regarding sustainability are taken off the shelf and find their way into practice.

Lessons Learned from 2020 Solar RFP Responses

The City solicited responses to an RFP to explore the possibilities of expanding the City's current base of solar installations. At the encouragement of the Energy Commission, a broad scope of potential locations was included in the RFP. The RFP was limited to requests for power purchase agreements (PPAs). PPAs currently offer the most financially attractive way for non-profit entities to acquire solar as there are few or no upfront costs incurred and the City can indirectly leverage tax incentives otherwise unavailable. Only three responses to the RFP were received. The review team, with input from the City's energy consulting firm, Competitive Energy Services, concluded only two were viable. These submissions raised more questions than they answered, and the review team concluded that the City would be better served by a revised, more precisely targeted RFP.

Key issues learned

Size Matters - The cost per Kwh for a large off-roof installation (i.e. 1MW) from one vendor submitted a rate that was 40% lower than that of that of the smallest installation (i.e. Transportation Center.) Installations of 1MW in size were generating bids that were getting very close to Eversource's default rate for large, general service customers, which is their lowest rate class.

Roof-top Installations Can Be More Complicated - Each building site brings with it a set of unique issues for siting solar. These can include: the inability to orientate arrays in an optimal fashion; the ability of included roof(s) to support additional required loads; the age of roof surface and the potential need to replace during the solar installation lifecycle; the potential need to upgrade and/or re-engineer grid interconnect structure; the potential negative impact during construction to on-going work within the building.

Impact to Price on Contaminated Soil Sites - Bids were received for two locations where the installations would require ballasted pole mounts rather than simple in-soil mounting of support poles. Because of the scale of these installations, the cost per Kwh was still the lowest price submitted.

Renewable Energy Credits (RECs) - These credits are mandated by states to comply with renewable energy goals. The value varies with market conditions, the state in which the RECs are sold, and evolving government requirements. Under a PPA agreement, either the power purchaser or the power provider can retain credits earned from solar production and either sell them on the market or retain them to meet emission goals, or enter the REC market in an attempt to receive a higher return than the savings witnessed by allowing the developer to retain them.

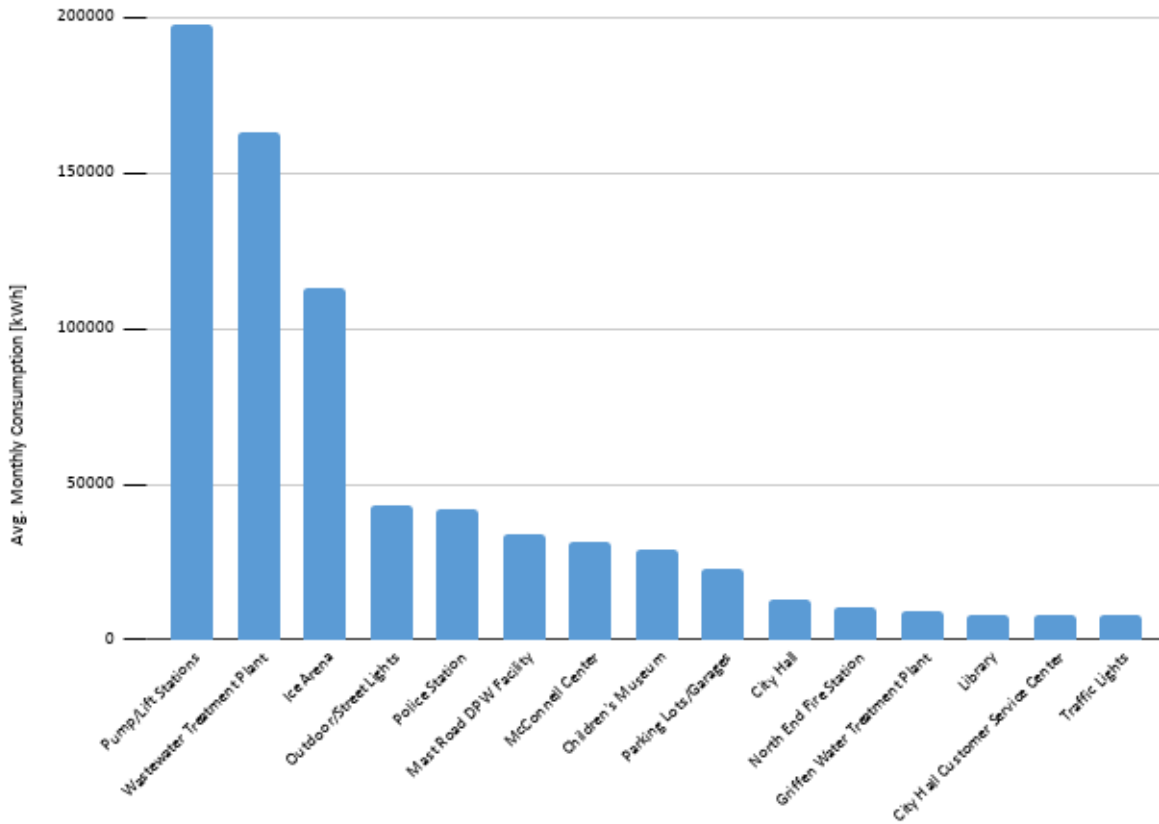
Group Net-Metering (GNM)- This option allows for solar installations on one site to share power among a group of members where the members (e.g. any independently metered building.) Under this model it is easier to reach the maximum allowed net-metered capacity which is currently 1MW. There is good reason to believe that this will be raised for municipalities only to 5MW this year. The potential advantages of GNM installations are: lowest possible cost per Kwh given economies of scale for larger projects; large projects attract more bidders insuring competitive pricing; the ability to utilize land that is not usable for other development (think Tolend Landfill); unrestricted array positioning provides maximum solar efficiency; no building-driven maintenance costs; and easier access for service.

Energy Commission Suggestions for Next Solar RFP

- *Think big* - Rather than focus on siting solar on buildings, we suggest surveying the City for appropriate sites for large pole or ballast-mounted solar arrays. We should be looking for sites of two sizes. Smaller sites of at least five acres to host a 1 MW GNM installation (the tannery waste fill at the City's wastewater treatment plant is a possibility) and a larger site suitable for a 5 MW (25 acre) installation should the GNM law be revised upward.
- *Timing may be important* - The cost effectiveness of all solar installations are impacted by government programs. It is reasonable to expect current, diminishing tax credits and other government incentive programs will be revitalized under the incoming Federal administration. As mentioned above, the possibility of a 5 times larger installation GNM may become possible this year in N.H.
- *Identify GNM potential members* - Ideal group members for a GNM installation are buildings or other metered systems that are heavy, daytime power consumers, especially during the summer months.
- *Include provisions for monitoring grid consumption* - The monitoring systems of our current installations are typical. They record the amount of energy produced by each installation and nothing more. They do not record the amount pushed onto the grid or the amount consumed from the grid. This makes evaluating the impact of an installation more complex requiring integrating data of solar energy produced with billing statements from the utilities. We recommend that future roof-top installations include production monitoring using software that provides for the integration of all of the City's solar sites.
- *Forgo retention of Renewable Energy Credits (RECs)* - Designated renewable energy sources are awarded RECs by the state based on the amount of energy they produce. These credits can be sold on an open market. A usual option under PPA agreements is the ability to retain these credits or assign them to the PPA owner, which will result in a lower kWh price to the City. Given the substantial uncertainty of the future value of these credits, and that under competitive bidding the lower price of unretained RECs should reflect market value, we believe the least risk for the City would be to assign ownership of the RECs to the PPA owner.
- The City would benefit from engaging with a consulting firm highly knowledgeable at assessing solar installations installed in New Hampshire and free of any conflicting business services.

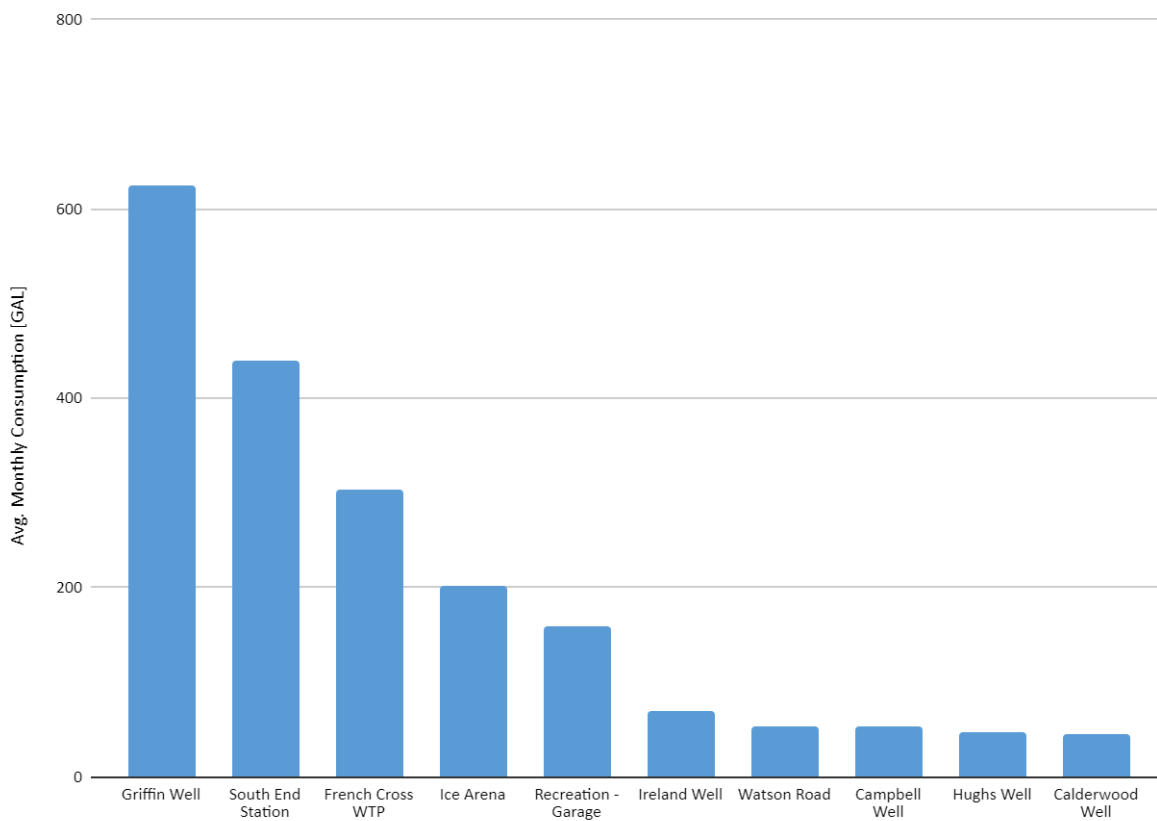
Where City's Energy is Consumed

A look at the 15 largest electric consumption areas over the past three years



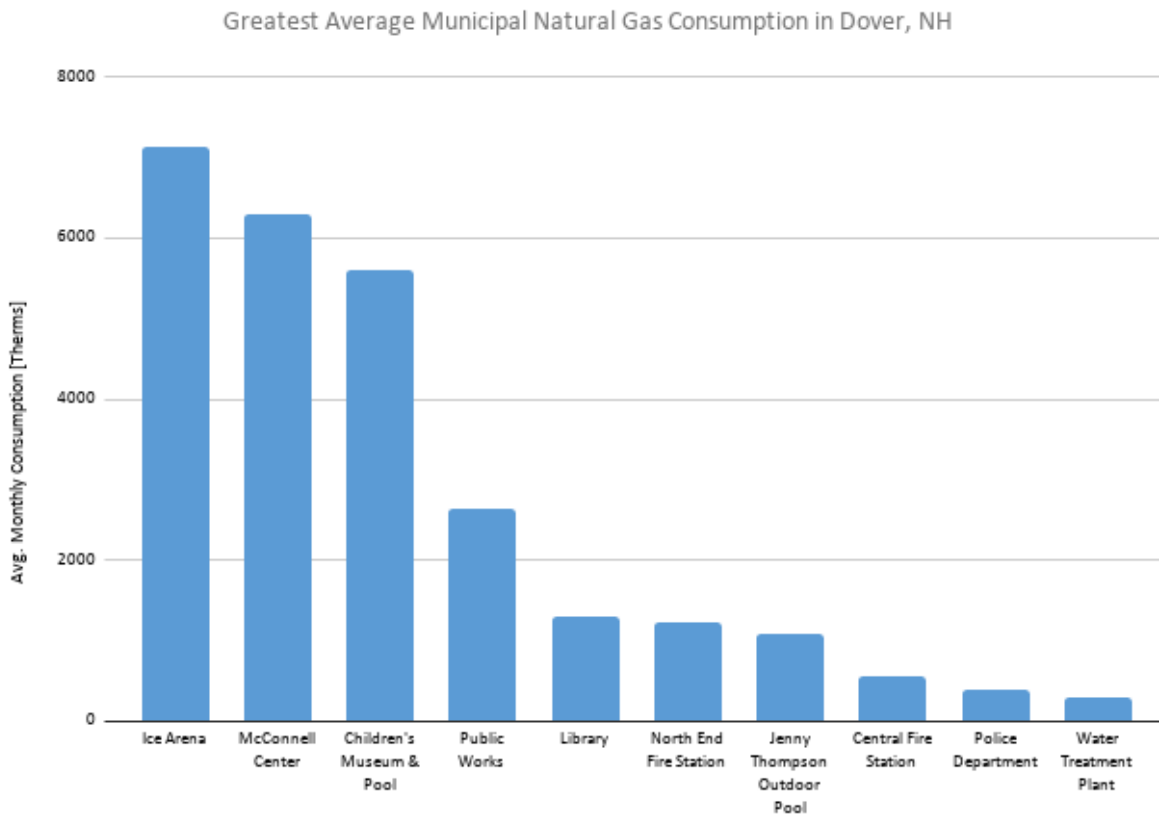
These 15 electricity uses make up 97% of the total electricity consumed by the City of Dover based on average, monthly consumption in the past three years. The Pump/Lift Stations category is a combination of 27 meters serving various distributed water and wastewater utility infrastructure. The Outdoor/Street Light category comprises some two dozen individual meters with the bulk of the consumption represented by a separate contract. The Mast Road DPW Facility is a combination of three separate meters at the facility. The Police Station and Parking Garage located at the same address are on separate meters. The Traffic Lights category is a combination of blinking lights, crosswalks, as well as three or four way intersection traffic lights distributed throughout the city.

A look at the 10 largest propane consumption areas over the past three years



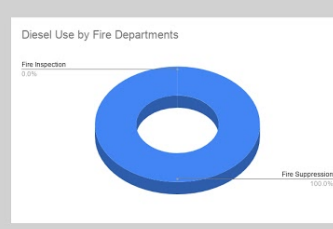
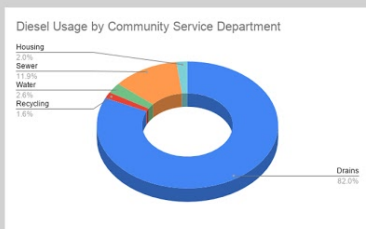
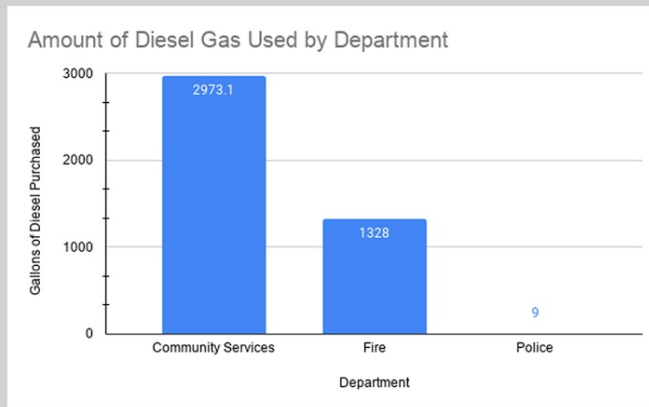
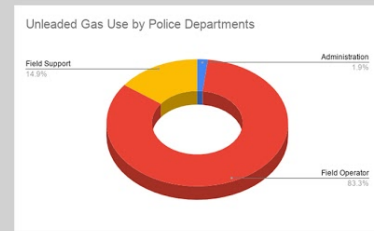
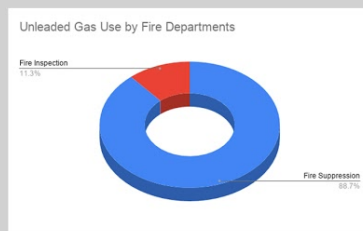
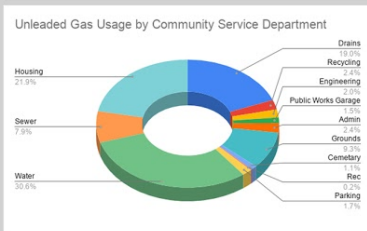
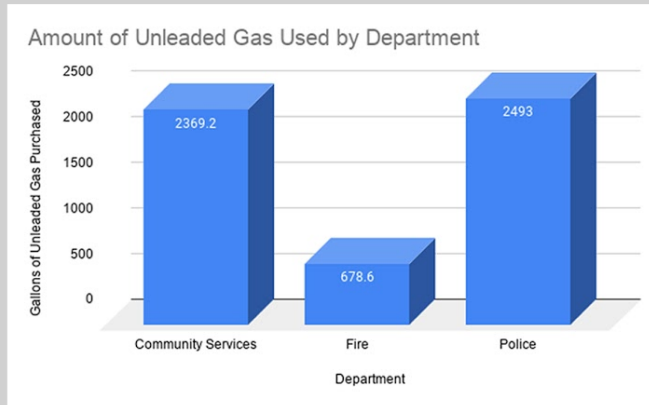
These 10 propane uses make up 90% of the total propane consumed by the City of Dover based on average monthly consumption over FY18 and 19, the time period where data was available. The bulk of municipal propane consumption is made up of the various wells throughout the city.

A look at the 10 largest natural gas consumption areas over the past three years



These 10 natural gas uses make up 98% of the total natural gas consumed by the City of Dover based on average monthly consumption over FY18 and 19, the time period where data was available.

2020 Fleet Fuel Usage by Department



Synopsis on Energy Efficiency Programs

The benefits of energy efficiency improvements for consumers has been well understood for many years. Policymakers, regulators, utility resource planners, and efficiency program administrators and implementers have used cost performance metrics, such as the cost of saved electricity, to assess energy savings potential, to design and implement programs in a cost-effective manner, and to help ensure electricity system reliability at the most affordable cost, which benefits utility company's bottom line. Programs for the residential sector delivered electricity savings at the lowest cost. However, New Hampshire has lagged its neighbors on energy efficiency. The state ranked 20th in the U.S. — and last in New England — in the most recent energy efficiency scorecard from the American Council for an Energy-Efficient Economy.

Four years ago, the New Hampshire Public Utility Commission (PUC) adopted an Energy Efficiency Resource Standard and, with it, the objective of “all cost-effective energy efficiency.” Last year, our electric and gas utilities submitted a three-year energy efficiency plan to the PUC in early September. The state's utilities reached agreement on this plan that would have expanded the NHSaves program which is run by the utilities and financed by a surcharge on customer utility bills called the System Benefits Charge.

This new plan sets new energy savings goals for 2021 through 2023 and is the culmination of 10 months of stakeholder discussions. Since 2002, New Hampshire's electric and natural gas customers have installed energy efficiency measures that have resulted in lifetime savings of more than 19.1 billion electric kWh and 45.7 MMBtu. This results in a cumulative customer savings in excess of \$3.4 billion. The proposed three-year plan includes energy savings of 5% of the electric utilities' 2019 delivery sales, up from 3.2% in the 2018-2020 plan. This would result in about 6.7 million megawatt-hours saved over the lifetime of the installed measures, according to the utilities. It means funding of more than \$350 million for the new plan, compared to about \$154 million for the current one. Natural gas energy savings would be 3% in the new plan compared to 2.1% now, with funding of about \$41.9 million, up from \$31.4 million. In this current economic depression brought on by the COVID pandemic, energy efficiency programs can help our state and local municipalities with economic recovery in three important ways: (1) reducing household and business energy bills, directly helping with affordability challenges; (2) serving as an economic stimulus by generating increased local employment (energy efficiency programs tend to be very labor intensive); and (3) reducing “dollar drain” from the local economy by reducing the need for imported energy fuels.

In December the State's Public Utility Commission failed to meet their own end of year deadline for approving the 2021-2023 Energy Efficiency Plan. This occurred despite a significant outpouring of support from the public and cities and towns. The PUC has stated it would take eight more weeks to consider the case and it temporarily extended the existing utility plans, which deliver fewer benefits to customers.

Last December, our City council supported a resolution in support of this new 2021-2023 New Hampshire Statewide Energy Efficiency Plan. Energy efficiency programs in Dover has recognized significant benefits and energy savings from 3 key energy efficiency programs:

1. LED Light Conversions
 - a. McConnell Center
 - b. Ice Arena
 - c. Indoor Pool
2. Solar Installations
 - a. Dover High School
 - b. Children's Museum of NH
 - c. Energize 360 program for the Seacoast Community of 200 families (251 clean energy and efficiency projects. Participants also locked in long-term energy cost savings of more than \$12 million)
3. Smart Street Lights

Our State should extend these programs by supporting the new 2021-2023 Energy Efficiency Plan for the benefit of our taxpayers, workers and environment.

Resources:

American Council for an Energy-Efficient Economy state score cards: <http://bit.ly/3oNFuTt>

NH PUC - 2021 NH Statewide Energy Efficiency Plan: <https://bit.ly/2XlqFFG>

Dover City Council Resolution in support of State of NH Energy Efficiency Plan - see attachment

Setting a Renewable Energy Goal for Dover

In 2019, the Energy Commission voted to include on its list of goals to explore and work towards 100% renewable sources for municipal energy, similar to the “Ready for 100 Campaign” (RF100) by Sierra Club. The RF100 Campaign advocates for an equitable and affordable energy system powered by 100% clean, renewable energy by the year 2050. The Commission is studying this topic and intends to make a formal recommendation to the City Council this year. At this time, there are over 170 cities and eight states already committed to this vision of 100% clean and renewable energy including the following New Hampshire communities.

Concord: in July 2018 adopted a 100% renewable energy goal by unanimous vote of the City Council, and one year later the Energy & Environment Advisory Committee released a 100% Renewable Energy Goal Strategic Plan. This goal was adopted with wide-ranging support from the business community, numerous organizations, and members of the public. The City is committed to 100% clean, renewable electricity community-wide by 2035 and for heating and transportation by 2030.

Hanover: committed to 100% renewable energy in May 2017, and the Town government now leads initiatives designed to help local institutions, businesses and residents transition to 100% renewable sources of electricity and fuel oil. The Town has begun by investing in energy efficiency and renewable electricity generation for Town facilities and will follow by transitioning to vehicles and heating systems fueled by renewable sources. The Sustainable Hanover Committee has a stated mission to “support the efforts of the community to assure that the Town of Hanover thrives for present and future generations.”

Keene: the City Council passed a Sustainable Energy Resolution in January 2019, which highlights the City’s commitment to climate action, and calls on the City to develop a strategic plan to achieve it’s renewable energy goals by December 2020. Major accomplishments thus far includes the following:

- Since 2002, the City has used a biodiesel blend to fuel its vehicle fleet, and added hybrid vehicles to the fleet.
- In 2003, the City installed a geothermal HVAC system at the Public Works facility on Marlboro Street and in 2018, the City installed the largest solar PV array in Keene at the time (643.2-kilowatts) on the roof of this same facility.
- Between 2000-2017, all traffic signals, airport beacons, parking facility lights, and street lights in Keene were converted to LEDs.
- In 2019, the City entered a two-year contract with Constellation Energy to procure Green-e® Certified Renewable Energy Certificates equivalent to 100% of municipal electricity use beginning in 2020.

Plainfield/Cornish: in July 2018, became the second and third towns in New Hampshire to make this commitment to 100% clean energy (Energy Committees from both towns have been working as a team since 2014). Initiatives thus far have included a cost-effective residential weatherization program, residential Solarization Initiative, the Electric Bike Loaner Program, and a renewable energy educational series presented by the Cornish & Plainfield Energy Collaborative.

Other NH communities actively working to lower their carbon footprints include:

New London: committed to 100% renewable energy in March 2018. The New London Energy Committee has a mandate to help the town examine issues around energy consumption, including creating opportunities relating to energy for the town’s government, citizens and businesses/institutions. They also work with area energy committees and other groups to address regional issues. Recent

projects include municipal solar panel installation, streetlight conversion, Electric Vehicle Expo, and “Solarize Kearsarge,” aimed at educating area homeowners about the viability of solar power.

Lebanon: In July 2007, the Lebanon Energy Advisory Committee (LEAC) was established by the City Council and issued the following charge: To identify opportunities and make recommendations to the City Council with regard to reducing energy use, increasing energy efficiency, exploring alternative energy usage and reducing pollution, to the environmental and fiscal benefit of the City. The charge was modified in February 2009 to include the promotion of energy conservation measures for city residents and businesses, thereby cutting greenhouse gas emissions and reducing energy costs for taxpayers. Subcommittees include solar, electric vehicles and municipal aggregation. More recently, Lebanon Outcomes is a work plan developed by Lebanon City Council and City staff to achieve sustainability and maintain Lebanon's quality of life. This work plan implements the outcomes of the Master Plan through ongoing department-specific tasks that are monitored and updated on an annual basis.

Peterborough: voters could commit the city next spring to a clean energy plan by the end of 2022, pursuit of clean electricity by 2030, and clean heating and transportation by 2050. The initiative would support solar and wind energy, including a community power agreement, small scale hydroelectric, and biomass for heating (with an eye for sustainable forestry methods).

Portsmouth: the City Council voted unanimously in 2007 to follow the recommendation of the Mayor's Blue Ribbon Committee on Sustainable Practices and signed a resolution fully acknowledging Portsmouth's commitment to become more sustainable. In early 2018 the City Council passed a net zero goal for the city. Most recently, in October the Mayor's Blue Ribbon Committee, presented a virtual community discussion via Zoom to provide an update on the committee's work in support of Portsmouth's Eco-Municipality commitment.

Temple: committed to 100% renewable energy in March 2018. As part of that commitment, the Temple Economical Energy Committee (TEEC) merged with Temple's 100% Renewable Energy Task Force. The Task Force's mission, as directed by the passage of a warrant article in the 2018 Town Meeting, is to recommend cost-effective, viable options to their BOS and residents for converting the town's municipal power sources to renewable energy by 2030. That mission supports and fully integrates with that of TEEC's mission--to reduce GHG emissions. Temple is part of the Monadnock Sustainability Action Plan, a regional climate and energy action plan which provides a practical guide for all sectors to identify and take actions to reduce energy demands, and to reduce dependence on imported fossil fuels.

Resources:

Concord's 100% Renewable Energy Goal Strategic Plan: <https://bit.ly/2MKJF4q>

Getting to 100% renewable energy in Hanover NH: <https://bit.ly/38sktb2>

Keen's Energy Plan: <https://www.keeneenergyplan.com>

Lebanon's Energy Chapter of their Master Plan: <http://bit.ly/3nlDjoE>

Portsmouth's Sustainability Initiatives: <https://www.cityofportsmouth.com/sustainability>

Electric Vehicle Overview and the Role Dover Could Play

The transportation sector in New Hampshire contributes almost 50 percent of the state's greenhouse gas emissions that contribute to global climate change, making it the largest single source of such emissions. This sector also produced over half of the emissions that contribute to elevated levels of ground level ozone, the primary ingredient in smog. Transportation electrification is the most effective strategy available today to drastically reduce these emissions while meeting our current transportation needs because, even when factoring in the emissions from the power plant to charge their batteries, electric vehicles reduce emissions in most parts of the United States. In New Hampshire, where electric energy is predominantly generated by nuclear and natural gas, electric vehicle emissions are about one-tenth that of a conventional gasoline vehicle.

Electric vehicles, collectively termed EVs, can be either battery electric vehicles (BEV) that are powered solely by the on-board batteries and must be charged from an external source; plug-in hybrid electric vehicles (PHEV) that can operate for 25-50 miles on batteries that are charged by plugging in, or can use the combustion engine to continually recharge the batteries for further travel; or fuel cell electric vehicles (FCEV) that utilize a hydrogen fuel cell to generate the electricity that powers the vehicle. Conventional hybrid electric vehicles (HEV) do not utilize any external power source and charge their batteries via regenerative braking and by the internal combustion engine. This discussion focuses on BEVs and PHEVs, which are available in most US vehicle markets including New Hampshire.

The size of the battery pack determines the range of an EV and is expressed in kilowatt-hours (kWh). One gallon of gasoline has the energy equivalent of 33.7 kWh. The fuel economy of an EV is expressed as "miles per gallon equivalent", or MPGe, to enable comparison between different EVs and to conventional gasoline vehicles. As an example, the 2020 Chevy Bolt has a combined fuel economy rating of 118 MPGe. With its 66 kWh battery pack it has a rated range of 259 miles on a single charge.

The size of an EV's battery pack significantly influences the price of an EV. Battery costs today are about \$137/kWh, down from approximately \$180/kWh in 2018. Industry experts predict that battery costs at or below \$100 per kilowatt-hour will bring EV purchase prices within range of their conventional counterparts. However, while the initial purchase price of EVs are currently higher than their conventional counterparts, the total cost of ownership (TCO), which factors in the purchase price, fuel costs, and maintenance costs over the useful life of the vehicle, is already lower for some EVs. There are ten model year 2021 EVs available in the US today, three of which, the Nissan Leaf, the Chevrolet Bolt, and the Mini Cooper, are in the more "affordable" range.

Battery electric vehicles must be charged from an off-board source. There are three different types of chargers, collectively referred to as electric vehicle supply equipment (EVSE), each with a different rate of charge and a different cost to install.

Level 1 charging is the least costly, only requires access to a conventional household 110 volt outlet, and can deliver 3 to 7 miles of range per hour of charging. Level 1 charging can support drivers who only need 30 to 40 miles of range per day. Most EVs come with a Level 1 charging cord.

Level 2 charging uses 208/240 volts (the same voltage as is used for household clothes dryers) and is differentiated between "networked" and "non-networked" chargers. Non-networked chargers are commonly used for residential charging applications, whereas networked chargers are typically installed in commercial and workplace settings. Level 2 chargers can deliver 14 to 35 miles of range per hour of charging.

Direct Current Fast Charging (DCFC), sometimes called Level 3, requires a 3-phase 480 volt alternating current (AC) electric circuit, but delivers direct current (DC) to the vehicle. DCFC power output ranges from 50 kW to 350 kW, though most EVs cannot yet use the higher power stations. Currently all PHEV are limited to the Level 1 or 2 charging options and some BEV are also not equipped to take the higher DCFC charge.

While most EV charging today occurs via home charging (about 80%), widespread adoption of EVs cannot occur until public charging options become available due to limitations on driving range and the inability of many residents, such as those in multi-unit dwellings, to install EVSE.

Municipalities heavily influence the EV adoption rate in their community in a number of ways, and that influence can be either positive or negative. The City of Dover can take several steps to enable and encourage adoption of EVs by our residents and businesses.

Streamline the permitting process for installation of EVSE. Numerous stories exist of communities where residents and commercial charging providers cannot get timely approval of charging infrastructure by local code enforcement officers. Commercial EVSE installers and operators cite delays and unnecessary additional requirements and costs as the primary reason for abandoning EVSE installations in some communities. The Granite State Clean Cities Coalition, a public/private stakeholder group working in support of alternative fuel vehicle adoption, has recently provided training to help municipalities streamline their EVSE permitting process. The City of Dover needs to ensure its codes encourage and enable EVSE installation and that its code enforcement officers and permitting staff are trained on best practices for such installations. Often DCFC charging locations are treated like gas stations when it comes to permitting. Gas stations deal with a toxic substance that can spill and are not a good model for permitting EVSE infrastructure. DCFC are typically added to existing developments as an accessory use and should be permitted as such.

Lead by example. Electric vehicles cannot yet meet every need for the City of Dover, but there are a number of operations that can be served well by EVs and should be considered. The City of Dover can “lead by example” by incorporating EVs and associated charging infrastructure in their own fleets, conspicuously marking these vehicles so citizens are aware of them, and highlight operational data to our residents, including total cost of ownership as compared to conventional vehicles. The Chevy Bolt is currently available to state agencies, municipalities and some non-profit organizations through the State of New Hampshire’s 2021 vehicle contract. At \$26,308, this vehicle has the lowest TCO of all the compact 5 passenger sedans in the State contract.

Install more public charging infrastructure. The City has already installed EVSE in the parking garage and should continue to install additional infrastructure in conspicuous and accessible locations in town. Visibility of public chargers is an important factor in spurring awareness and adoption of EVs and making Dover an “EV hotspot”.

Resources:

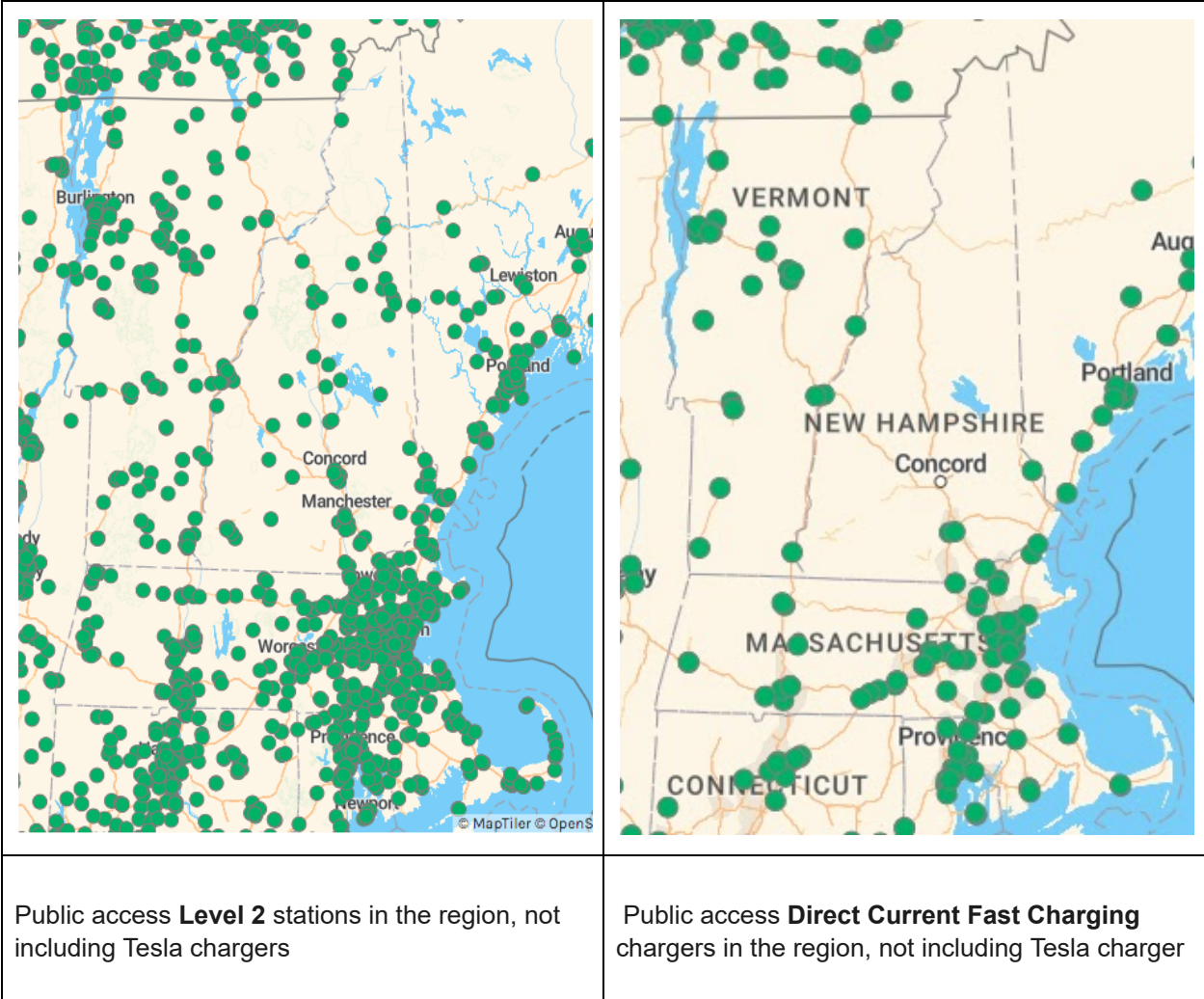
Emissions from Hybrid and Plug-In Electric Vehicles: <http://bit.ly/2M4TIGH>

Every Electric Car You Can Buy in 2021: <http://bit.ly/2M4wNWy>

Networked versus non-networked chargers: <https://calevip.org/electric-vehicle-charging-101>

Electric Vehicles: What NH Cities and Towns Need to Know: <https://bit.ly/3sGwYI9>

Regional Charging Station Distribution



Source: U.S. Department Energy Alternative Fuels Data Center, www.afdc.energy.gov, accessed 1/20/2021

Executive Summary of Community Power in NH

In 2019 New Hampshire authorized cities, towns, and counties to procure electricity in bulk on behalf of their residents and businesses. Electric utility companies (e.g., Eversource, Unitil, Liberty, NH Electric Cooperative) would continue to deliver power and maintain the poles and wires of the electric distribution and transmission systems. Community power programs have the potential of providing access to cheaper electricity; electricity from renewable resources; opportunities for residents and businesses to benefit from new technologies like solar, battery storage, electric vehicles; and more. The Energy Commission is following the development and implementation of the community power concept in New Hampshire to evaluate its value to the City of Dover.

Main benefits of Community Power:

1. *Local Control.* Community power aggregations democratize energy procurements to the local level and empower communities to realize their energy goals.
2. *Lower Costs.* Markets in MA, NY, CA, and elsewhere demonstrate ability to supply electricity at prices lower than, or competitive with, utility-supplied power.
3. *Renewables.* Community power aggregations can purchase renewable energy, or even enable construction of new, local renewables, to supply electricity to the community as a whole.

Process for implementing a Community Power program:

1. A local governing body (e.g., City Council) forms an electric aggregation committee
2. An Electric Aggregation Committee develops an Electric Aggregation Plan (see RSA 53-E:6). Templates/resources available.
3. A local legislative body (e.g., Town Council) approves the plan and authorizes the program.
4. Notify residents and businesses and then launch the program (aspects of the program, like opt-out mailers/notifications and energy procurement, may be handled by service providers.)

Public Power nonprofit: Several NH cities, towns, and counties are establishing a statewide, public power nonprofit to provide administrative, logistical, and operational support to community power aggregations.

Timeline: The Public Utilities Commission is developing rules that will enable the launch of initial programs in mid-2021. Initial programs may launch in 2021. A Coalition of towns are on track towards March 2022 Town Meeting authorizations and subsequent launches. Every municipality that signs up will be allocated 1 seat on the board of directors for the first 21 NH municipalities. The municipality would appoint an elected official or volunteer to serve in this capacity.

Legislative update: House Bill 315 has been introduced by ranking legislators on the House Science Technology and Energy Committee that would effectively gut the Community Power Law in favor of monopoly control.

Resources:

Brief introductory video to Community Power by Clean Energy NH: <https://bit.ly/2Lalfkn>
The Community Power Statute - RSA 53-E: <http://bit.ly/3nmghhg>
Community Power Coalition of NH: <http://www.communitypowernh.org/>
Full text of House Bill 315: <https://bit.ly/2XVAYXa>

Preliminary Energy Implications from Utilities Master Plan Committee

The City of Dover is currently updating the 2009 Community Facilities and Utilities Master Plan Chapter. This update includes an extensive inventory and assessment of the City's buildings and infrastructure with help from department heads and key personnel.

Early in the update process the consultant and Committee members worked to identify and integrate energy related information/themes/recommendations from other planning documents such as the Climate Change Adaptation Master Plan chapter, Dover Energy Commission's annual energy reports, Greenhouse Gas Inventory report, etc

Energy related topics have also been incorporated into the inventory form and pursued further during the site visits to the City's facilities. This includes questions for each facility about energy efficiency upgrades, future/current underway renewable energy projects, and potential renewable energy systems or energy conservation opportunities. This building specific information will be presented in the Chapter, and there will be a section of the chapter that covers the trends related to energy efficiency and renewable energy system installations since 2009.

The Chapter will conclude with specific implementation actions for the City to pursue in the years to come, and feedback on these actions will be welcomed.

Primary Content Contributors

Lessons Learned from 2020 Solar RFP Responses - Bill Baber and Michael Behrmann

Where the City's Energy is Consumed - Vincent Lyon

Fleet Fuel Usage by Department - Zachary Koehler

Synopsis on Energy Efficiency Programs - Walter King

Setting a Renewable Energy Goal for Dover - Susan Smith

Electric Vehicle Overview and the Role Dover Could Play - Rebecca Ohler

Executive Summary of Community Power in NH - James Barrett Miles

Preliminary Energy Implications from Utilities Master Plan Committee - Otis Perry