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Energy

Introduction

Energy is a critical component of day to day operations throughout Hudson, the region, and the entire globe. Energy is used to operate buildings, lighting, vehicles and other equipment. It is a driving force in the global economy requiring a tremendous amount of infrastructure for both supply and distribution. Our energy systems, however, are not without externalities. Traditional sources of energy and rates of consumption are no longer sustainable. Fossil fuels are in greater demand and shorter supply, increasing costs exponentially. And the burning of fossil fuels has harmful impacts on the environment, including release of criteria air pollutants and greenhouse gas emissions. Energy systems and the operations dependent on them are therefore changing rapidly, with greater emphasis on efficiency, cleaner supplies, reduced costs, and improved reliability, while also maintaining a significant contribution to the economy and job creation.

When thinking about energy as it relates to Hudson's Master Plan, it is important to keep this larger picture in mind. Energy planning is relevant to the Town's operation of buildings, vehicles, lighting, and other infrastructure, as well as to residents and businesses living and operating within the town. In addition to consumption, the Town must consider sources of energy, generation and distribution, security and reliability, and finally, the impact on the local economy.

In addition, energy issues are tightly linked to several other areas of this Master Plan, including land use, housing, economic development, public services and

facilities, transportation, and public health. These important connections will be highlighted throughout this chapter.

Energy Goals

- Incorporate energy efficiency considerations into all short- and long-term planning for capital improvements, transportation, infrastructure, housing, and land use.
- Lead Hudson by example in the promotion of energy efficiency and clean energy throughout municipal operations.
- Utilize policy, financial, educational, and other mechanisms to promote energy efficiency and clean energy among Hudson residents and businesses.
- Maintain the benefits of Hudson Light & Power as a community asset by maintaining electricity reliability and low costs to customers.

Hudson Light & Power

Hudson Light & Power (HLP) is the Town's municipal electric utility. It is a tremendous asset to the Town, providing a reliable source of electricity for residents and businesses and keeping electric rates low for its customers. In contrast to some other electric utilities in the region, and especially in other parts of the country, HLP also has a relatively clean fuel supply in its energy generation, with approximately 70 percent of its electric supply coming from sources that do not produce greenhouse gas (GHG) emissions, including hydro, solar and nuclear power.

HLP also offers a number of resources that can help residents and businesses in Hudson conserve energy, help the environment, and save money. These include:

- Free / discounted energy audits – free energy audits to residents that will assess and provide recommendations for building envelope, heating and cooling systems, lighting, appliances, overall energy consumption, and provide information on rebates available to implement conservation measures. Audits are provided to commercial customers at a discount.
- Renewable energy incentives – solar incentives for residential and commercial installations.
- Energy conservation incentives / rebates
    - For residents: reduced cost compact fluorescent lamp (CFL) replacements, appliance rebates.
    - For commercial: rebates for lighting upgrades and variable frequency drives.

Massachusetts has instituted a program called Green Communities and over 120 municipalities have been designated. Five criteria must be met to gain the designation including:

- Provide as-of-right siting in designated locations for renewable/alternative energy generation, research and development, or manufacturing facilities.
- Adopt an expedited application and permit process for as-of-right energy facilities.
- Establish an energy use baseline and develop a plan to reduce energy use by twenty percent within five years.
- Purchase only fuel-efficient vehicles.
- Set requirements to minimize life-cycle energy costs for new construction; one way to meet these requirements is to adopt the new Board of Building Regulations and Standards (BBRS) Stretch Code.[102]

Although the Town meets some of the criteria, it cannot pursue the Green Community designation is because the Town is served by a municipal utility and has not adopted the renewable energy charge for the MA Renewable Energy Trust Fund. The fund is supported by a surcharge of $0.0005 per kilowatt-hour, imposed on customers of all investor-owned electric utilities and competitive municipal utilities in Massachusetts. As a non-competitive municipal utility, HLP has not opted into the program. Instead, as described below, HLP offers a variety of incentive programs to assist its residential and non-residential customers.

[102] See http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/gc-grant-program/ Accessed March 2014.

Non-Municipal Utilities

In addition to Hudson Light & Power for electricity service, Hudson is served by NStar for natural gas service[103]. According to the US Census, 62 percent of homes in Hudson are heating with natural gas. Approximately 22 percent heat with fuel oil and 14 percent with electricity[104]. For the 22 percent heating with fuel oil, NSTAR offers natural gas heating system conversion installations and incentives. Natural gas, while still a fossil fuel that emits GHG emissions, is much cleaner and more affordable than heating oil. The Town may wish to consider working with NStar to further promote its natural gas conversion program or to provide enhanced incentives for making the switch.

In addition to natural gas conversion, NStar offers a number of energy efficiency incentives to both residential and commercial customers as well, including rebates for weatherization, programmable thermostats, high-efficiency water heaters, high-efficiency heating systems, and other programs.

Green Technologies

A number of green technologies can be utilized in the promotion of energy efficiency and clean energy throughout Hudson. Such green innovations will produce energy savings and can also help position the town for new forms of economic growth, as well as providing educational and job-training opportunities. Some technologies that the Town may consider in its energy planning, some of which were raised during the master planning outreach process, include the following.

Renewable energy installations:
Solar energy installations, such as solar photovoltaics and solar thermal systems, as well as other renewable energy installations (e.g., wind, geothermal) are a critical component of the future energy economy. Such technologies are renewable (i.e. unlimited supply), free of GHG emissions and other pollutions, and create jobs for clean technology manufacturing, research and development, and installation.

Massachusetts recently ranked 2nd in the nation in the 2013 U.S. Clean Tech Leadership Index, receiving a perfect score for clean energy policies and for clean tech investment. Clean energy jobs are on the rise throughout the state with approximately 5,000 clean energy companies.[105] Massachusetts has been

[103] Massachusetts Department of Public Utilities. http://www.env.state.ma.us/DPU_FileRoom/frmCityUtilitiesSP.aspx Accessed June 2013.
[104] US Census, American Community Survey, 2007-2011, 5-Year Estimates. http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_5YR_DP04
[105] MA Executive Office of Energy and Environmental Affairs. "Patrick Administration Announces National 2013 Clean Energy Report Ranks Massachusetts No.2," June 4, 2013. http://www.mass.gov/eea/pr-2013/mass-2nd-in-clean-energy.html

performing especially well in the field of solar technology, meeting Governor Deval Patrick's goal of 250 MW of solar installations four years early. A new aggressive target of 1,600 MW by 2020 has now been set. A number of programs have aided the state in achieving these goals by streamlining the permitting process and reducing up-front costs for installations, including:

- Solar Renewable Energy Credits (SRECs)
- Commonwealth Solar
- Solarize Massachusetts
- SunShot Initiative Rooftop Solar Challenge
- Community Shared Solar[106]

HLP offers its own solar installation incentives as well to further promote solar installations on homes and commercial properties. Hudson is well positioned to work with HLP and state and federal programs to further promote solar energy development. The Town should also consider the following policies and programs:

- Providing incentives to solar and other clean tech business to site within Hudson. Such incentives could be financially based or offer expedited permitting.
- Work with local technical schools to provide clean energy training programs.
- Work with HLP and DOER to enhance and promote incentives for solar and geothermal for residents and businesses.

Green roofs:

Green roofs have become increasingly popular because of the multiple benefits associated with them. These roofs utilize vegetation on roof spaces that provide additional insulation, reduce the urban heat island effect, provide stormwater management benefits, and aesthetic enhancements to buildings. The Town could pursue a demonstration project on a municipal building or school and/or provide information to local property owners and developers on the benefits of green roofs. Some municipalities have started including green roofs as a consideration in development approvals.

Energy management, monitoring, and tracking systems:

There are numerous programs available for managing energy within buildings, including building automation systems, as well as for monitoring and tracking energy use over time. These types of systems are helping facilities managers to manage heating, ventilation, and cooling (HVAC) systems more efficiently and monitor energy consumption in order to identify spikes in use and target areas for improvements. An energy management system has recently been installed at the 14,000 square foot Hudson Senior Center along with a geothermal exchange HVAC system. The Town should monitor improved comfort and energy and cost savings that result from this new system and consider implementation of a larger energy management system for multiple Town buildings.

[106] More information on all of these programs is available at: http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/solar/

The Department of Public Works has begun using MassEnergyInsight, a web-based energy monitoring tool for municipal governments. This tool will allow the Town to benchmark, monitor, and evaluate Town buildings' energy use over time.

Waste-to-energy:
An increasingly popular process in the U.S. and globally is converting sewage waste to energy. Wastewater treatment facilities can incorporate anaerobic digestion into their processes and use resulting methane gas as a source of energy. This typically involves the anaerobic digestion of biosolids in wastewater, though a new trend is adding food waste to the digesters, which has a few key benefits, including:

- Diversion of food waste from landfills. In the landfill the decomposition of food waste releases methane, a potent greenhouse gas. However, if diverted to a wastewater treatment facility, the methane can be captured and used as an energy source. This provides a useful opportunity for diverting food waste from the community's total waste stream.
- This energy production on site at the facility also reduces demand for energy from the grid, which in turn has additional GHG reduction benefits and reduces energy costs for the facility. Food wastes also have a much higher energy production potential than other biosolids.
- The facility can collect tipping fees for accepting food waste.

The following resource from the EPA Region 9 provides a helpful overview of food waste digestion at wastewater treatment facilities.
http://www.epa.gov/region9/organics/ad/Why-Anaerobic-Digestion.pdf

The Massachusetts Department of Environmental Protection also released "Tapping the Energy Potential of Municipal Wastewater Treatment: Anaerobic Digestion and Combined Heat and Power in Massachusetts" in 2011.
http://www.mass.gov/eea/docs/dep/water/priorities/chp-11.pdf

Smart Grid:
Smart grid generally refers to a modernizing of the electricity network, using computers to allow for two-way communication, feedback systems, remote control of energy systems, and automation. Making the electric grid "smarter" will improve efficiency throughout the grid and in utility companies' operations, and provide the data and control systems needed for homes and businesses to improve efficiency within their buildings. Under the American Recovery and Reinvestment Act (ARRA) of 2009, a number of investments were made in developing the smart grid, including the Smart Grid Investment Grant Program and the Smart Grid Demonstration Program.[107] There are currently eight smart grid projects underway in Massachusetts.[108] HLP and the Town of Hudson will

[107] SmartGrid.gov. http://www.smartgrid.gov/recovery_act/overview Accessed June 2013
[108] Smart Grid Network. http://www.massachusetts.smartgrid.com/smart-grid-projects/massachusetts# Accessed June 2013.

benefit from learning from these initial projects and beginning to engage in smart grid enhancements.

Municipal Energy Reduction and Renewables

The Town can play a significant role with regard to energy in leading by example within its own operations. In the public forum held March 4, 2013, 29 percent of participants responded that the single most important thing the Town can do with regard to energy is to address energy efficiency in municipal buildings. This includes identifying policies and practices to improve energy efficiency and the use of alternative or renewable fuels in its buildings, lighting, vehicle fleet, and other equipment. In fact, a goal for "Public Services and Facilities" in this Master Plan is to "lead by example in community facilities and operations by establishing sustainability principles and initiatives."

As mentioned earlier, the Town should begin by assessing its current energy consumption and efficiency. The Town has begun doing this utilizing the MassEnergyInsight tool. To date, this energy data tracking tool only contains data on the Town's Department of Public Works facilities. The Town can use this tool to benchmark and track energy use and associated greenhouse gas emissions for all of its facilities and vehicles. Having all of this data centrally located in one database will help the Town to identify the greatest opportunities for efficiency improvements and cost savings. It can then use this information for setting internal energy reduction targets and identifying the best combination of actions that will allow the Town to achieve those reductions. The Massachusetts Department of Energy Resources (DOER) has useful guidance for municipalities on establishing an energy baseline and creating an energy reduction plan. More information is available at: http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/gc-grant-program/criterion-3.html

The Town has already made significant progress in leading by example by retrofitting its existing historic buildings, which was recognized with the Leading by Example award in 2011. The Hudson Library, Hudson Senior Center, and the Cellucci Skate and Splash Park have all been retrofitted with various resource-conserving systems and upgrades. The Town has been able to install energy and cost-saving upgrades while retaining the historic character of these buildings. At the Library, 117 windows were upgraded using funds from an Energy Efficiency and Conservation Block Grant. The Town also installed 27 solar shades through this project. Some of the windows replaced were original pieces that were nearly 100 years old. For its success in integrating energy efficiency improvements into a historic setting, the Town was selected to present at an ARRA Best Practices Exchange conference.

The Town recently appropriated money to conduct audits aimed at reducing energy consumption and/or advancing renewable energy projects at municipally

owned properties including the Hudson Public Library, Town Hall, and the Police Station.

Finally, the Town is implementing a recycling and energy reduction programs in its municipal buildings including paper, book, furniture, ink cartridge and electronics recycling; purchasing energy efficient computer equipment; using programmable thermostats; and installing energy efficient lights.

To further these energy improvement efforts, the following are some additional strategies the Town may wish to consider.

Best practices for energy reduction and renewables in municipal operations:

- Audit municipal buildings and implement identified energy conservation measures for HVAC and lighting. Funding has already been approved to audit three Town buildings. As additional funding is available, the Town should conduct energy audits at all of its buildings.

- Conduct investment-grade audits for water and wastewater treatment facilities to identify upgrade opportunities.

    - Water and wastewater treatment facilities tend to be among the most significant source of energy consumption within municipal operations. In addition, the Town is completing a filtration project to connect the Kane and Cranberry wells to the Chestnut Street Water Filtration plant. The Kane Well was approved for operations returning it to service at the end of January 2014. Ensuring this and other treatment facilities are operating as efficiently as possible will be essential to keeping operations and maintenance costs down.

- Upgrade streetlights and traffic signals to light-emitting diode (LED) technology. It is common practice to upgrade traffic signals to LEDs given the energy savings and quick return on investment. Increasingly, communities are upgrading streetlights to LED technology as well due to the significant energy savings. Massachusetts DOER has developed guidance on how to get started when considering these upgrades: http://www.mass.gov/eea/docs/doer/green-communities/eap/led-street-lights-2-pager.pdf, which also includes a financial analysis tool to help in the calculation of the payback. Calculation of the payback for such an investment requires a thorough analysis of the cost for the light fixtures, operation and maintenance expenses, energy charges, and interest rates, among other factors.

- Conduct feasibility studies for renewable energy installations on municipal property, including solar photovoltaic, solar thermal, geothermal, and waste-to-energy. The Town is already considering solar arrays at two sites – the Gates Pond water treatment facility property (capped landfill) and the

Chestnut Well area land. These installations are scheduled to be considered at the May 2014 Town Meeting.

- Adopt a green building or energy efficiency policy/standards for new construction and major renovation of municipal facilities. The new Fire Department Headquarters building integrated energy efficient and green building design elements. The Town could adopt an official policy or design standards for all future new construction or major renovations.

    - The Town makes standard practice of recycling materials from demolition and construction of Capital Projects. During the recent reconstruction of our Senior Center, the scope of work called for a Waste Management Plan that resulted in end-of-project rates for salvage/recycling of 50 percent by weight of the total waste generated by the work. This Waste Management Plan, applied to both the demolition phase and the construction phase, consists of waste identification, waste reduction, handling, transportation and recycling/disposal procedures. The contractor is charged with coordinating and documenting compliance with the policy.

    - Green building design should be given special consideration for school buildings. The newly-built Quinn Middle School is a LEED Silver building. As other schools are renovated or new schools built, green construction and retrofitting should be considered. Green buildings provide a healthier and more productive learning environment for students. They also provide numerous opportunities to educate students and other building occupants on energy use, energy data, renewables, green building materials, and other attributes. MA DOER offers resources related to clean energy education in K-12 schools. More information is available at: http://www.mass.gov/eea/energy-utilities-clean-tech/energy-education/

- Adopt an energy efficiency purchasing policy that requires certain efficiency standards for HVAC equipment, windows, insulation, appliances, IT equipment, motors, etc., such as specifying Energy Star certified appliances.

- Adopt a policy for the municipal fleet that emphasizes energy efficient and alternative fuel vehicles. The DOER Green Communities program has numerous resources and templates to assist with developing an efficient vehicle policy. http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/gc-grant-program/criterion-4.html In addition, the Town should make an effort to right-size its fleet. In other words, have only as many vehicles as necessary for carrying out municipal operations. Adopting and enforcing an anti-idling policy among municipal vehicles can also have an impact on fuel reduction. Many municipalities have begun to

utilize alternative fuel vehicles and provide alternative fueling infrastructure on site to support them, including electric vehicles, biodiesel, compressed natural gas, and others. The Massachusetts Clean Cities Coalition is a helpful resource for municipalities making a shift to fuel-efficient and alternative vehicles and is a source of information on funding sources as well.

Commercial and Residential Energy Reduction

In addition to its own operations, the Town can also play a vital role in establishing policies and financial mechanisms to promote energy efficiency, renewables, and further develop the local economy. Housing in Hudson is approximately 72 percent owner-occupied with 68 percent of homes built before 1970.[109] This presents a significant opportunity for upgrading existing homes to be more energy-efficient and the Town can play a role in facilitating such upgrades.

Best practices for supporting energy reduction and renewables in the community:

- Create an energy outreach and education program. A primary hurdle in engaging residents and businesses in energy efficiency and renewable energy is education. The Town should work with HLP and other state/federal programs to create a robust education and outreach program that educates consumers on the benefits of energy reduction, renewable energy, what actions they can take, as well as technical and financial resources available to them. Components of this program may include:
  - Establishing a website clearinghouse of information and resources to improve energy literacy and knowledge of existing incentive programs. In addition, connect the website to social media to further engage the community.
  - Partner with local retailers to educate customers on efficient products and rebates.
  - Engage local schools and other community stakeholders in the program.

- Establish a revolving energy fund (or a property assessed clean energy finance program). The Town should partner with a financial institution to develop a revolving energy loan fund through which the Town –or other administering entity—can provide low-interest loans to residents and businesses for energy efficiency improvements or renewable technologies. The loans are paid back with the energy savings produced and replenish the fund. Establishment of such financing programs is permitted in

[109] US Census, American Community Survey, 2007-2011, 5-Year Estimates. http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_5YR_DP04

Massachusetts under the "Municipal Relief Bill" (H.B.4877) passed in July 2010. The Town must hold a public meeting and then pass a by-law for establishing the program. Further information is available at: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MA106F

- Adopt an expedited permitting process for renewable energy installations. Reducing permitting fees would further incentives renewable energy development, especially for larger installations.

- Adopt an energy efficient or green building code locally that is more stringent than the Massachusetts base energy code. More than 100 communities in the state have formally adopted the "Stretch Energy Code" as a condition under the Green Communities program. While Hudson does not intend to pursue designation as a Green Community, the Town could still pursue adoption of such a code and utilize the resources available in adopting and implementing the code. At the March 4 Public Forum, 36 percent of participants indicated that establishing green building or energy efficient building codes was the single most important thing the Town could do with regard to energy.

Energy Recommendations

The following is a summary of the recommendations provided in more detail throughout earlier sections of this chapter.

E 1. Create incentives (financial and non-financial) for clean energy businesses to locate in Hudson.
E 2. Support the development of clean energy/green jobs training at local technical schools.
E 3. Enhance and promote existing incentives for renewables offered through HLP and the State.
E 4. Consider a green roof demonstration project.
E 5. Integrate additional municipal buildings into MassEnergyInsight to completely benchmark and track municipal energy use.
E 6. Conduct energy audits on municipal buildings and implement recommended energy conservation measures.
E 7. Explore anaerobic digestion for waste-to-energy production.
E 8. Conduct investment-grade audits for efficiency improvements at water and wastewater treatment facilities.
E 9. Conduct feasibility studies for renewable energy installations on municipal property.
E 10. Upgrade outdoor lighting, streetlights, and traffic signals to LED.

E 11. Engage in Smart Grid enhancements to modernize and improve efficiency and resiliency of the electric grid.
E 12. Adopt a green building or energy efficiency policy for municipal buildings.
E 13. Adopt an energy efficiency purchasing policy.
E 14. New municipal buildings should endeavor to be LEED silver.
E 15. When conducting renovations to municipal buildings, a cost-benefit analysis of energy efficiency upgrades should be conducted whenever possible.
E 16. Adopt a policy emphasizing efficient and alternative fuel vehicles for the municipal fleet.
E 17. Establish an energy outreach and education program.
E 18. Establish a revolving energy loan fund.
E 19. Provide expedited permitting for renewable energy installations.
E 20. Adopt an energy efficient or green building code for residential and/or commercial new construction and major renovations.

Energy Resources

For more information on various energy topics, the following resources are suggested:

Town Resources:

Hudson Light & Power, http://www.hudsonlight.com/

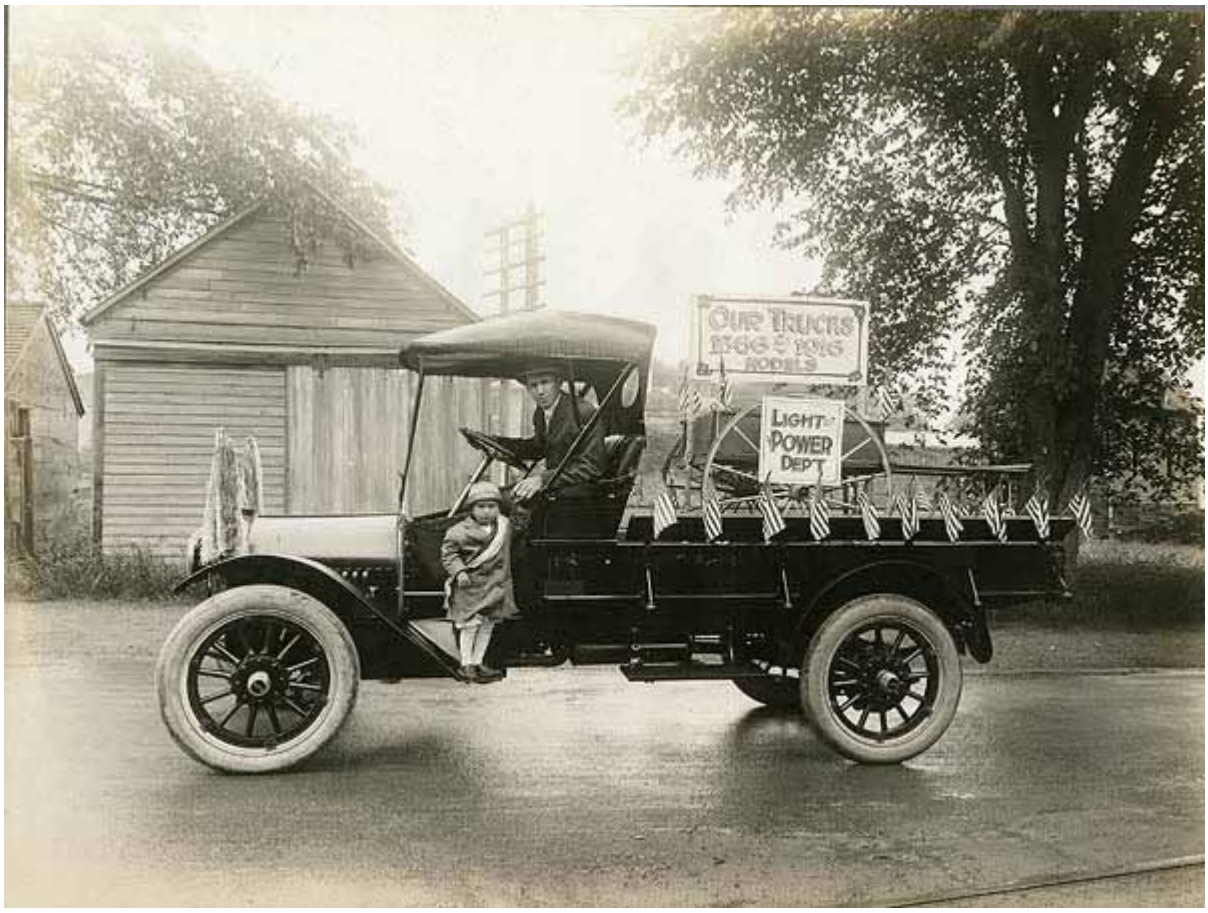
State and Other Resources:

MA Department of Energy Resources (DOER): http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/doer/

NStar: http://www.nstar.com/

MA Clean Cities Coalition: http://www.afdc.energy.gov/cleancities/coalition/massachusetts

MassSave: http://www.masssave.com/



Hudson Light and Power Department Parade Car in 1916

Source: Hudson Historical Society Collection