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MEMORANDUM

TO: Eileen M. Donoghue, City Manager

FROM: Katherine Moses, Energy Manager

DATE: January 17, 2019

SUBJECT: MOTION OF 12/11/18 BY COUNCILOR CIRILLO
REQUEST CITY MANAGER PROVIDE AN UPDATE TO THE CITY COUNCIL REGARDING
WHAT MECHANISMS THAT THE CITY HAS PUT IN PLACE TO UPHOLD OUR
COMMITMENT TO THE EMISSION REDUCTIONS OF THE PARIS AGREEMENT

Background:

In June 2017, the President announced that the United States intended to withdraw from the Paris Agreement. This agreement required all parties to put forward their best effort to reduce greenhouse gas (GHG) emissions through nationally determined contributions and to strengthen these efforts in the years ahead, including reporting on emissions and implementation efforts regularly. Prior to the notice to withdrawal, the U.S. committed to reduce its net GHG emissions by 26-28% below 2005 levels in 2025.

In response to the withdrawal from the Paris Agreement, many local, state, and private entities began signing onto the “We Are Still In” initiative, which affirmed support of the essence of the agreement. In August 2017, the Lowell City Council unanimously voted to adopt a letter from the Lowell Sustainability Council asking the Mayor to join with other cities and towns in honoring this commitment. Simultaneously, City Council unanimously voted for a resolution to express support for the goal of using 100% clean and renewable energy in Lowell by 2035. With these votes, the City signed onto the “We Are Still In” initiative with the climate action commitment of: “Work with energy utilities to increase renewable energy provided to residents and businesses.”

Some Achievements:

Lowell’s State Delegation has been instrumental in helping to meet this commitment by enacting statewide policies and renewable energy goals. In addition to this, the City of Lowell has taken many concrete steps to fulfill our renewable energy commitment. A full report on Lowell’s progress in the “Road to 100% Renewable Energy” is included with this response. Some highlights of the report are found below:

- 29.49% reduction in GHG emissions for municipal operations
- 7.2% estimated reduction in GHG emissions Citywide
- 10.2 MW solar installations within the geographic boundaries of Lowell, with an additional 6.8 MW of solar installations for which the City of Lowell is a Host Customer for net metering credits
- Implementation of multiple energy efficiency upgrades by the municipality and Lowell residents and businesses
- Participating in the Solarize Mass Plus program to allow residents to go solar at a reduced price
- Implementation of a Complete Streets Policy to encourage multi-modal transportation

The Department of Planning and Development looks forward to continuing to find solutions to create a more renewable future and a more sustainable world.

KM/ns

cc: Diane Tradd, Assistant City Manager/DPD Director
Craig Thomas, Deputy Director
Philip Ferreira, Housing and Energy Programs Manager
Attachment: Road to 100% Renewable Energy FY 2018 Update



City of Lowell

Road to 100% Renewable Energy

FY 2018 Update



Photo Credit: Ameresco

Prepared by:

Katherine Moses, Energy Manager
City of Lowell, Department of Planning and Development

Introduction

Lowell has a strong history of supporting renewable energy and energy efficiency. In 2010, the City of Lowell became one of the first designated Green Communities. That year, the City also made significant strategic investments of over \$21 million in energy efficiency. From 2010-2013, the City administered a Better Buildings Neighborhood program to reduce the Downtown Historic District's carbon footprint. In 2012, the City received the Massachusetts Department of Energy Resources Municipal Leading by Example Award. In 2016, the City committed to the Governor's Community Compact Best Practice of Maximizing Energy Efficiency and Renewable Opportunities.

On August 31, 2018, to build on this history, Lowell City Council passed a non-binding resolution supporting a goal of using 100% clean and renewable energy in Lowell, including in building energy use and transportation, by 2035. As part of this resolution, the City committed to take the following concrete actions to promote clean energy and reduce fossil fuel usage:

- Municipal solar projects
- Energy efficiency upgrades
- Community choice aggregation
- Municipal fleet replacement
- Installing public electric vehicle charging stations
- Promoting and participating in community solar projects
- Prioritizing public transportation

This annual report is intended to serve as an update on the steps taken by the City to improve these areas, as well as identifying challenges and opportunities in moving forward with the spirit of the resolution. The report includes both progress on the municipal operations front, as well as city-wide progress. Some categories of commitment may be included under both sections.

Challenges in Meeting 100% Renewable Goal

The City Council showed great leadership in passing the resolution to move toward 100% renewable energy. By endorsing the idea of prioritizing renewable energy, Lowell demonstrated its belief in the reality of climate change and its commitment to help address it through finding ways to reduce fossil fuel usage and encourage renewable energy development. There are several challenges, however, in measuring, tracking, and implementing this goal.

Definition Ambiguity

The largest challenge in implementing the resolution is in the definition of ambiguity. There have been many corporations that have set a goal of achieving 100% renewable energy. In most of these instances, they have defined this in more of a carbon-neutral fashion where they either enter into Power Purchase Agreements for renewable energy or purchase Renewable Energy Certificates, the environmental attributes of a renewable asset. In both cases, generally, the idea is to offset energy consumed by facilities (primarily generated through fossil fuels) with energy generated by renewable resources. There are some cases where renewable energy facilities (like wind and solar) are on-site and meet actual energy needs in real time. However, the quantity of energy needed to offset usage often requires outside contracts with offsite facilities.

Another challenge associated with the definition of 100% renewable energy is that it often only incorporates electricity generation because renewable assets are often tied to electricity production. Although there are renewable options for heating, with current technologies, these may not necessarily be economically viable for many consumers.

Data gaps and inconsistencies

There are two primary sources for information related to energy usage: municipal data and utility data. The challenges associated with these sources include: differing reporting periods and potential for missing information.

For municipal operations, energy data is tracked on a fiscal year basis based on actual energy bills. This data is available both in internal City data management systems and the statewide energy reporting system, Mass Energy Insight. Because municipal data is maintained in-house, it can be confirmed to be complete. In contrast, city-wide utility data is reported by National Grid on a calendar year basis. In order to protect sensitive customer information, National Grid's data is often aggregated by rate class. There is no way to determine if reported data is complete in this case.

Other sources of data that are not currently available to assess full fossil fuel usage within the City include: transportation fuel data for vehicles operating within the City; non-natural gas fuel data for homes that heat with oil, propane, or other heating fuels; and individual solar production data for homes and businesses within Lowell.

System wide limitations

Another challenge in defining the 100% renewable energy concept comes with the dispatch of energy within the electricity generation system. The Independent System Operator (ISO-New England) is responsible for ensuring the reliability of the grid so that electricity is available and dispatchable on a real-time basis. Energy is dispatched primarily through market-based mechanisms. Current market cost trends have resulted in a high percentage of electricity generation units being fossil fuel based. Because of the mechanisms involved in this system, the City of Lowell is not able to control where the electrons that are powering operations throughout the City originate from.

Budgeting limitations

Sensitivity to costs has always been a concern to the municipality in Lowell. Although renewable energy resources are currently available, economic viability of these resources may vary on a case-by-case basis. Since City budgets are already tight, it might be challenging to incorporate additional renewable resources in a fiscally responsible way.

Consumer freedom of choice

Lowell is a city of over 100,000 residents and over 38,000 occupied housing units. Over 70% of these housing units heat with natural gas. Though the City Council can provide leadership in moving away from fossil fuels, many Lowellians still have the freedom to choose to utilize fossil fuels to meet their heating and transportation needs.

Working Definition for 100% Renewable Commitment

When taking all of these factors into consideration, a measurable commitment to 100% renewable energy could be defined in the following manner:

On an ongoing basis, the City will take cost-effective, concrete steps to reduce fossil fuel usage and increase renewable energy production within its operations and encourage community members and institutions to take similar steps.

Baseline Information:

As mentioned in the introduction, there are multiple sources/timelines for the data gathered for this report. As this is the first annual report, the numbers below might be considered a baseline for future reports.

Municipal Operations (FY 18):

- Total electricity consumption¹: 42,079,987 kWh
- Total natural gas consumption¹: 1,647,930 therms
- Total gasoline consumption¹: 187,820 gallons
- Total diesel consumption¹: 57,355 gallons
- Total solar capacity (including out-of-city solar facilities)²: 9,390 kW
- Total electricity generated by municipal solar facilities²: 10,215,476 kWh
(9.3% on-site)
- Total CO₂e¹: 25,319 metric tons
- Percent emissions reduction from FY 2008^{1,3}: 29.49%

City-wide (calendar 2017, unless otherwise specified):

- Total electricity consumption⁴: 651,924,314 kWh
- Total natural gas consumption³: 45,118,856 therms
- Total gasoline consumption: not available
- Total diesel consumption: not available
- Total city-wide solar capacity (through Dec 2018)⁵: 10,262.3 kW
- Total electricity generated by solar facilities: not available
- Total CO₂e (estimated from available data)⁶: 700,229 metric tons
- Percent emissions reduction from 2008 baseline⁷: 7.2%

¹ Source: Mass Energy Insight

² Source: Internal City records

³ Note that even though the Paris Agreement bases emissions reductions vs. 2005, the most recent year that Lowell has baseline information for is 2008

⁴ Source: National Grid

⁵ Source: Massachusetts Clean Energy Center

⁶ Estimated EPA Greenhouse Gas Equivalencies Calculator with utility data

⁷ Assumes that unavailable fuel data constitutes 33% of overall emissions

Municipal Operations Progress

Municipal solar projects

Progress to date:

The City of Lowell has committed to renewable energy in a number of tangible ways over the last decade. The City has multiple solar assets that directly offset on-site energy usage of School and Enterprise facilities. Additionally, the City is the Host Customer for several off-site facilities that generate net metering credits which help to save utility bill costs. The following table summarizes current municipal solar projects with production and savings through FY 18:

Solar Facility	Size of Facility	Date Facility Became Operational	kWh Generated Since Facility Became Operational	Estimated Utility Bill Savings Since Facility Became Operational
Lowell Landfill *	1,504 kW	Jan 2014	7,834,512	\$228,388
Hunt Farm *(located in Orange, MA)	3,352 kW	Oct 2013	17,734,904	\$557,024
Adams Farm *(located in Athol, MA)	3,499 kW	Oct 2013	17,838,493	\$560,537
Water Utility **	609 kW	May 2013	3,491,075	\$401,746
Wastewater **	43.7 kW	Mar 2012	99,540	\$11,718
Lowell Memorial Auditorium	50.8 kW	Feb 2011	558,032	\$28,661
Shaughnessy Elementary School	35.5 kW	Nov 2010	430,781	\$11,568
Pawtucketville Elementary School	173.6 kW	Nov 2010	771,236	\$37,209
Reilly Elementary School	104.1 kW	Nov 2010	959,940	\$27,405
Butler Middle School	17.8 kW	Nov 2010	202,417	\$5,809
TOTAL	9,390 kW		49,920,930	\$1,870,065

* Generates net metering credits

** Savings do not include revenue from SRECs

Current projects:

- Solar Feasibility Request for Proposals (RFP): The City is currently drafting an RFP to investigate development of additional on-site solar facilities at various municipal buildings. The RFP is anticipated to be released within the third quarter of FY 19.

- Energy Storage Feasibility Grant: The City of Lowell received a Municipal Energy Technical Assistance grant from the Department of Energy Resources (DOER) to study the feasibility of integrating energy storage at Stoklosa Middle School in order to reduce demand charges at the facility. The feasibility analysis is anticipated to be complete by the end of the second quarter in FY 20.

Future opportunities:

- Based on the outcome of the RFP, implement the most economically-viable solar municipal projects.
- Based on the outcome of the energy storage feasibility analysis, consider exploring stand-alone energy storage or integrating storage at renewable facilities within the City.
- Continue to seek funding and other opportunities to increase solar energy development within municipal facilities.

Energy efficiency upgrades

Progress to date:

The City of Lowell has made significant investments in energy efficiency upgrades to its facilities. In 2010, the City signed an agreement with Ameresco to complete over \$21 million in energy efficiency upgrades. The final project included 28 different Energy Conservation Measures (ECM's) across 29 different school buildings and 19 different municipal buildings. In addition to these upgrades, the City has implemented an additional 28 ECM's

ECMs implemented include, but were not limited to: lighting upgrades/controls (including LED upgrades); energy management system integration; HVAC upgrades and replacements; combustion controls; hot water heater replacements; window replacements; vending machine and computer controls; pumps, fans, and motors upgrades; roof replacements; telecommunication upgrades; infiltration reduction; and insulation additions. These and other measures put in place since Lowell's designation as a Green Community have resulted in overall energy reduction of 14% (over 55,000 MMBTUs) vs. the baseline year of 2008. These reductions include a 14% reduction in therms of natural gas and 11% reduction in kWh of electricity.

Current projects



Photo Credit: Tanko Lighting

- **LED Streetlight Retrofit:** The City began upgrading 6,333 lights in December 2017 as part of the FY18 Capital Plan approved by the City Council. The project is currently 98% complete with some lingering punchlist items. Lights included in the scope of the project include: traditional highway streetlights (cobraheads), decorative lighting (such as Victorian and Acorn fixtures), flood lights, and shoebox lighting (found in parking lots and top levels of City garages). Once completed, the project is anticipated to save 2,295,999 kWh electricity annually.

- LED interior lights: The City received a Green Communities Grant to retrofit interior lighting at the Stoklosa Middle School, Morey Elementary School, and Reilly Elementary School. These upgrades began in December 2018 and are anticipated to be complete by the end of January 2019. Once complete, the projects are anticipated to save 88,447 kWh of electricity.
- Wireless pneumatic thermostats: The City received a Green Communities Grant to upgrade to wireless pneumatic thermostats at the Butler and Sullivan Middle Schools. These upgrades began in December 2018 and are anticipated to be complete by the end of January 2019. Once complete, the projects are anticipated to save 8,455 kWh of electricity and 7,637 therms of natural gas.
- Lowell High School: The City is working in conjunction with stakeholder, utility, and project management to design a more energy efficient renovation at Lowell High School.

Future opportunities:

- Continue to pursue grant funding for additional energy efficiency upgrades.
- Explore the creation of an Energy Efficiency Revolving Fund to reinvest savings from energy efficiency upgrades.
- Explore behavioral initiatives to engage students and/or facility staff in energy reduction activities.

Municipal fleet replacement

Progress to date:

As part of its Green Communities designation application, the City of Lowell adopted a Fuel Efficient Vehicle Policy. This policy has helped the City reduce its vehicle fuel usage by 17% since the baseline year, with an equal reduction in emissions. In March 2018, City Councilor Cirillo asked the City to explore the possibility of strategic electrification of the City's vehicle fleet to enhance these reductions. The Parking Enterprise Fund has already begun utilizing electric vehicles and associated charging infrastructure.

Current projects:

- **Created a Framework to Evaluate Vehicles Conversion to Electric Vehicles:** As a result of the motion by Councilor Cirillo, the Department of Planning and Development created a framework to analyze the fiscal feasibility of upgrading new vehicle purchases to electric vehicles (EV). This framework involves evaluating the Total Cost of Ownership (TOC). This calculation factors in metrics such as: initial cost, depreciation rate, years of ownership, annual fuel price, annual maintenance cost, annual insurance, and subsidies available. With current technology, vehicles with low usage, higher speed requirements, or long charging cycles may not be the best candidates for strategic electrification.

Future opportunities:

- On an annual basis, in conjunction with capital plan development, complete a TOC analysis for vehicles to recommend ideal candidates for replacement with EV.
- Explore vehicle fuel reduction technologies for vehicles that cannot feasibly be converted to EV.
- Continue to pursue grant funding opportunities to advance fleet replacement goals.

Installing public electric vehicle (EV) charging stations

Progress to date:

The City of Lowell currently has four Level 2 EV charging stations with a combined total of six ports available to the public within the Joseph Downes Garage, Edward J. Early Garage, and on Warren Street, in front of UTEC. All charging stations are on the ChargePoint network.



Photo Credit: DPD

Current projects:

- The City just completed installation of an additional EV charging station in the Leo Roy Garage, with an order of three additional charging stations that are anticipated to be installed before the close of FY 19.

Future opportunities:

- Continue to pursue grant funding opportunities to support future charging station installations.

Prioritizing public transportation

Progress to date:

Although public transportation is primarily coordinated through the Lowell Regional Transit Authority (LRTA), the City of Lowell has taken multiple active steps to encourage and enhance multi-modal transportation, which includes public transportation, as well as pedestrian and bicycling enhancements. In August 2015, the City Council enacted Lowell's Complete Streets Policy to create a multi-modal transportation system designed to provide improved mobility and accessibility opportunities for all users regardless of their age, income, or ability. The City has drafted a Complete Streets Prioritization Plan, which identifies 14 specific areas of focus to implement the policy. The City is also an active partner with the University of Massachusetts Lowell (UML) and supports them in their efforts to reduce emissions from transportation.

Current projects:

- The Lord Overpass project is one of the priority areas designed to incorporate design elements of the Complete Streets Policy, including dedicated pedestrian, bike, and public transportation lanes. This project completed 100% design in September 2018.
- The City received a Sarbanes grant to prepare a Request for Qualifications to provide Planning and Design services for the Downtown Lowell Multimodal Complete Streets Plan, which includes: analysis of existing bus routes; development and analysis of a new bus route scenario and other multimodal improvements including Transportation Demand Management (TDM) strategies.
- The City sits on the Steering Committee for UML Transportation Master Plan and meets with LRTA regularly to look for ways to improve mass transit ridership/usage.
- The City partners with UML who implemented the Roadster shuttle buses, which reduces student driving and shuttles students between campuses
- The City partners with UML, which offers subsidized passes for Commuter Rail to students and employees.
- As a member of the Middlesex 3 Coalition, the City has worked to develop shuttle services and create a survey to help City major employers determine commuter behavior and possible solutions to reduce SOV (single occupancy vehicle) use.
- In addition to public transit, the City is also actively working on expanding the trail system & bike infrastructure (bike master plan, 2-way cycle track project on E Merrimack St), both of which have the goal of reducing SOV use. Per MassDOT, SOV is the single biggest source of GHG emissions in MA.

Future opportunities:

- Continue to implement the Complete Streets Policy in future City projects.
- Continue to implement projects within the Complete Streets Prioritization Plan.
- Continue to utilize partnerships to encourage efficient transportation options within the City and surrounding communities.

City-wide Progress

Solar projects



Progress to date:

According to data available from the Massachusetts Clean Energy Center, as of December 2018, Lowell residents, businesses, and governmental entities installed **10,262.3 DC-kW** of solar systems.

In 2018, the City of Lowell received a Gold level designation from the national SolSmart program. This designation recognizes the municipalities for taking bold steps to encourage solar energy growth and remove obstacles to solar development. For companies looking to expand, a SolSmart Gold designation is a signal that Lowell is “open for solar business.” Through the designation process, Lowell documented and codified prior efforts the City had taken to encourage solar development, as well as created new processes to help make solar more understandable and accessible to the general public. A website with information on solar and permitting processes was created at: <https://www.lowellma.gov/1135/Go-Solar>

Current projects:



- Solarize Mass Plus: Lowell was selected to participate in the Mass Clean Energy Center’s Solarize Mass Plus program. This program uses a group purchasing model that allows homeowners to go solar at a reduced cost due to a volume discount. The program allows communities to pair solar with a complementary technology of air source heat pumps. ReVision Energy has been selected to be the lead contractor for the program. The program runs through the end of February 2019. Residents can learn more at: <https://solarizelowell.com/>

Future opportunities:

- Explore additional ways to allow residents and businesses learn more about how to participate in solar projects.
- Explore statewide guidelines for Property Assessed Clean Energy, which provides a new mechanism for commercial buildings to finance energy improvements, including energy efficiency projects and clean energy.

Energy efficiency upgrades

Progress to date:

Over the last decade, the City has shown leadership in connecting its residents and businesses with the information needed to complete energy efficiency upgrades. In 2010, the City received \$5 million through the Department of Energy's Better Buildings Neighborhood Program to implement energy upgrades in commercial and multifamily buildings while maintaining the historic character of the downtown. This program resulted in energy reductions of over 1.6 million kWh, 4.9 million therms on natural gas, and over 185,000 gallons of heating oil. The program also developed a sustainable and replicable model for energy efficiency in historic buildings, created 375 jobs in three years, and promoted multi-stakeholder partnerships.

In 2016, the City also participated in National Grid's Community Initiative. This initiative's purpose was to increase awareness and measurable participation in the utility's residential energy efficiency programs. Lowell hit all of its goals in this initiative, resulting in 7,842 MMBTUs in savings.

Current projects:

- **Lowell Energy Efficiency Plan (LEEP):** In October 2018, the City of Lowell submitted a petition for approval of a Lowell-specific energy efficiency plan to the Department of Public Utilities (DPU). This plan builds on the success of existing utility programs while creating mechanisms to better reach Lowell's unique demographic and community needs. The petition is currently in the DPU, awaiting docket assignment.

Future opportunities:

- Once LEEP is approved through the DPU, Lowell intends to begin administering LEEP for the benefit of all Lowellians.

Community choice aggregation

Progress to date:

In April 2014, Lowell launched its Community Choice Power Supply Program. At the time, it was the first power supply that was covered 100% by Renewable Energy Certificates (RECs), making it the Commonwealth's first carbon neutral supply. Since its inception, this has resulted in 929,144,916 kWh of supply being covered by renewable energy environmental attributes. Unfortunately, due to unexpected expenses incurred by the aggregation supplier, only required Renewable Portfolio Standard RECs have covered the aggregation supply since May 2018.

Current projects:

- The City's aggregation program is continuing to serve Lowell users. The current supply contract runs through November 2019. The Department of Planning and Development is working with the aggregation consultant to procure supply for upcoming years. In December 2018, in coordination with the Lowell Sustainability Council, there was a discussion about what types of renewable content should be priced into the next contract.

Future opportunities:

- Continue looking for ways to leverage the City's aggregation for the benefit of ratepayers and the environment.

Promoting and participating in community solar projects

Progress to date:

A Community Shared Solar (CSS) project is a solar system that provides benefits to multiple participants. A CSS is hosted by an entity with a suitable parcel of land and is supported by multiple participants who invest in the project or purchase the electricity or net metering credits generated. Under the new SMART incentive program, incentive levels are enhanced for entities which wish to build a CSS project. The City of Lowell has not taken an active role in promoting or participating in community solar projects due to the complexities of establishing and vetting participants, which is better handled by private entities.

Current projects:

- **Solarize Mass Plus:** Although the City is not directly involved in community solar projects, as part of the Solarize Mass Plus campaign, volunteers have been gathering interest and educating others on community shared solar potential.

Future opportunities:

- In order to help promote community solar projects going forward, the Department of Planning and Development will explore the possibility of enhancing the Go Solar portion of their website to help residents and businesses evaluate the benefits and drawbacks of participating in these projects.

Request for Feedback/Next Steps

This report combines the best information currently available to assess Lowell's progress in moving toward a 100% renewable future. Though the City has made progress, much more work is needed. Annual updates of progress will be compiled and sent to City Councilors.

The greatest renewable resource which has not been mentioned in this report is the renewable resource of the enthusiasm of Lowellians for creating a more sustainable future. In order to utilize this resource, the Department of Planning and Development would invite members of the public to submit feedback on tangible ways the City of Lowell can move toward our 100% renewable goal. You can email suggestions to: roadto100@lowellma.gov

Examples of feedback that would be helpful include:

- Solutions other communities in the Commonwealth have implemented.
- Grant opportunities the City should consider investigating.
- Sources to help fill data gaps in this report.