



City of Hartford Energy Action Plan



September 2014



CITY OF HARTFORD ENERGY ACTION PLAN

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ACKNOWLEDGEMENT

This Plan reflects the collective thoughts of the City of Hartford's Clean Energy Task Force, whose members are committed to reducing reliance on conventional energy, reducing the cost of energy, conserving natural resources and creating an attractive business climate.

The Task Force was assisted by Weston & Sampson Engineers Inc.

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■ OVERVIEW

The City of Hartford is home to 125,000 residents and a wide array of businesses, including some of the largest insurance companies. The City also serves as the state capitol and is the hub for a number of non-profit agencies and educational institutions.

The business of providing services to this diverse customer base is costly. With 112 municipal buildings to maintain and 630 additional housing complexes, foreclosed properties and vacant land to tend to, the need to reduce costs, expand the tax base and provide employment opportunities take center stage in virtually every City initiative.

The need to reduce energy costs and decrease dependence on petroleum-based sources is intricately linked to the City's efforts to operate in a sustainable and cost-effective manner. With state and local governments spending billions a year on energy to provide public services and meet the needs of residents, energy efficiency has expanded beyond the environmentally-conscious. Just about everyone is looking to save energy and reduce costs. The City of Hartford is no exception, and in fact, was at the forefront of establishing goals for energy efficiency.

In 2006, Hartford became a member of the International Council for Local Environmental Initiatives' (ICLEI) Cities for Climate Protection program. In the same year, the City signed the US Mayors Climate Protection Agreement, pledging to reduce energy use by 20% and obtain 20% of its energy from renewable sources by 2018. In 2011, the State of Connecticut began utilizing the newly created Connecticut Energy Efficiency Fund and the Clean Energy Finance Investment Authority, to offer an extensive array of clean energy programs to municipalities, businesses and residents.

Through these programs, energy conservation measures have been put in place, renewable energy systems have been installed, and there have been efforts to raise public awareness of the need to reduce energy consumption through participation in energy efficiency programs. The City's Department of Public Works (DPW) has taken a lead role in implementing many of these efforts and is working directly with the Mayor's office in order to achieve the goal.

CITY OF HARTFORD ENERGY CONSERVATION HIGHLIGHTS

2012 Clean Energy Task Force (CETF) is created to increase awareness and bolster cooperation among city departments, residents and other stakeholders.

2013 City reaffirms the Clean Energy Communities Pledge to reduce energy consumption 20% by 2018 and achieve incremental energy reduction goals for each fiscal year.

Mary Hooker Magnet School is one of three Connecticut schools and among 64 nationwide named by U.S. Department of Education as a Green Ribbon school for its focus on sustainability and energy conservation. The school was certified as a LEED-platinum building, certified in 2011

City contracts with Aequitas for electric commodity purchase with renewable energy profile.

Controls are installed in City's water spray pools to allow local, timed control during use to significantly reduce water consumption and waste water processing

City teams with CEFIA (Clean Energy Finance and Investment Authority) for C- PACE (Commercial Property Assessed Clean Energy) funding which allows long-term financing of energy upgrades through benefit assessment on property tax bills.

Hartford becomes one of the first recipients of a statewide microgrid pilot program - \$2.06 million is awarded for a combined heat and power generator for the Parkville Community Elementary School/Senior Center/Library. The microgrid will generate its own electricity and hot water to be used daily. Back-up power will be provided in the event of long term power outages to the Parkville Community Elementary School/Senior Center/Library, a nearby the gas station and food market.

2014 Process for developing an Energy Improvement Districts is approved by City Council.

Lighting retrofits are installed at the Department of Public Works.

Source One is contracted to carry out a comprehensive benchmarking program and to monitor energy savings and use.

OUR GOAL
20%
REDUCTION
of
Energy Consumption
2018

The City is continuing to pursue its goal of reducing energy consumption in its buildings by 20% and purchasing at least 20% of the electricity consumed by municipal facilities from clean, renewable energy sources by 2018. The City also wishes to play a role in the Connecticut Department of Environmental Protection's (DEEP) Lead by Example Program which has set forth the goal of reducing energy use in state and local buildings and operations.

Fiscal Year 2011-12 has been established as the City's energy baseline for municipal properties, which include City buildings and facilities, schools and street lights. Thus far, the energy conservation measures that have been implemented have resulted in a 2.1% reduction in energy consumption. The City is intent on doing more. With a total consumption of 266,000 MMBTUs, the City would need to reduce its consumption by 53,200 MMBTUs to meet the 20% goal.

The Clean Energy Task Force is taking the lead in establishing a framework for achieving this goal. Through the preparation and implementation of this Energy Action Plan, the Task Force would begin to accomplish the following objectives:

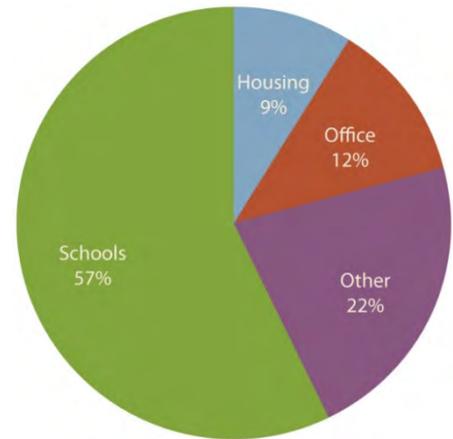
- Establish baseline energy consumption and track savings
- Formalize the City's efforts and develop recommendations
- Continue to implement energy conservation and alternative energy measures
- Partner with state agencies for technical and financial assistance
- Engage a cross section of participation in energy conservation and alternative energy

Throughout this document a common unit will be utilized to represent different types of energy; thus kWh of electricity, CCF of natural gas and gallons of oil will be converted to equivalent values in MMBTU which is 1,000,000 BTU (British Thermal Units).

CURRENT ENERGY PROFILE

Figure 1 – General Breakout of Buildings by Type

The City of Hartford is responsible for approximately 630 properties totaling over 8 million square feet (SF) which include municipal offices, emergency services, public, foreclosed properties and land as shown in Figure 1. “Other” includes auditoriums, park facilities, cold storage, cultural centers, medical facilities, libraries, parking, police and fire, and recreation.



Energy is provided to these facilities from a variety of sources. CL&P distributes electricity supplied by Aequitas who is currently under contract through November 2015. The majority of municipal buildings use natural gas or steam for heat. Connecticut Natural Gas (CNG) provides natural gas to various buildings; Hartford Steam delivers steam and chilled water to City Hall and the Hartford Public Library; and private companies provide oil for heat in outlying buildings, primarily pump stations.

As shown in Table 1, these facilities consume 69,000 MWhs of electricity, 303,660 Therms of gas, 10,359 M lbs of steam and 13,000 M Ton-hrs of chilled water annually.

Type	Quantity (units)	MBTu Equivalent
Electricity	69,769.6 MWh	238,124
Natural Gas	322,168 CCF	31,572
Chilled Water	13,000 Mton-hr	156,000
Steam	10,359 M lb	10,204
Total		435,900

As shown in Table 2, the City operates a diverse fleet of vehicles and equipment. Based on 2012 operations, 398,548 gallons of gasoline and 153,474 gallons of diesel fuel were consumed.

Type	Number
Passenger vehicles & vehicles up	561
Police motorcycles	20
Trucks & vehicles over 1 ton	72
Mowers, tractors, specialized	339
Heavy equipment	44

Energy consumption can also be broken down by user category as shown in Table 3.

Table 3. Energy Consumption by Use					
Type	Electric kWh	Gas CCF	Steam M lbs	Chilled Water MT	MMBTu equivalent
DPW	9,800,071	115,603	5,290	13,000	205,988
Fire Department	1,113,904	41,076			7,8
Libraries	1,613,375	-	5,069		10,499
Police Department	4,042,357	1,203			13,914
Schools	35,558,596	159,822			137,024
Street Lights	1,723,613				5,8
Other	15,917,716	4,464			54,765
TOTAL	69,769,632	322,168	10,359	13,000	435,900

TRACKING PROGRESS

Since the baseline year of 2011-2012, the City has invested \$1,118,850 in energy conservation measures and has received \$360,670 of incentives from utilities. These measures have reduced electricity by 2,099,869 kWh and natural gas by 22,725 CCF. These energy reductions translate into annual savings of \$693,887. Overall building energy use has been reduced by 2.1%.

Energy consumption in municipal buildings has been monitored since 2013 through the use of the US Environmental Protection Agency’s (EPA) online database called EPA Portfolio Manager. This on-line software tool allows the City to compare its buildings to other, similar structures to determine relative efficiencies. The database also allows the City to follow energy use trending to help determine if a building’s efficiency is changing.

The City contracted with SourceOne to obtain all of the necessary information to create a comprehensive database. Once complete, the system will serve as a data inventory and as a means to identify buildings where energy efficiency improvements may be warranted.

To achieve its goal of reducing building energy consumption by at least 20% (53,200 MMBTUs) by the completion of FY 2018, the City has committed to phasing in reductions as follows:

- Fiscal Year 2012-13: 5% Reduction
- Fiscal Year 2013-14: 8% Reduction
- Fiscal Year 2014-15: 11% Reduction
- Fiscal Year 2015-16: 14% Reduction
- Fiscal Year 2016-17: 17% Reduction
- Fiscal Year 2017-18: 20% Reduction

NOTE: These goals are on a BTU/SF basis. Since the City's inventory of space changes, a relative unit must be used.

The City's goal to voluntarily purchase at least 20% of its electricity from clean, renewable energy sources by 2018 will also be phased in over the course of six years, starting with 15% for the baseline Fiscal Year 2012-13 and increasing 1% each subsequent year to Fiscal Year 2017-18. This goal exceeds the State's mandatory energy Renewables Portfolio Standard (RPS) for Class I sources which requires utilities to source 17% by 2018.

ON-GOING INITIATIVES

Energy conservation measures that have been put in place thus far have reduced energy consumption by 2.1% from the FY 2012 baseline year. The City's primary initiatives are outlined below.

Renewable Energy

A 4 kW roof-mounted solar system is operating at the City's Southwest Branch library at 460 New Britain Avenue; a 5.28 kW solar electric system is installed at Hartford High School and a 5 kW system at the Mary Hooker School. The City's new Public Safety Complex on High Street has a fuel cell system to provide heating, cooling and power.

The City is currently discussing with the Materials Innovation and Recycling Authority (MIRA) mutually beneficial approaches to utilizing the power produced from a 1 MW system installed atop the City-owned landfill in the North Meadows area. Power is fed into the electric utility grid and sold to CL&P at a wholesale generation rate.

Additionally, the City entered into a two-year power purchase agreement with Aequitas Energy, effective December 1, 2013, whose portfolio consists of 18% from renewable power.

Clean Energy Communities Program

As part of an EnergizeCT initiative jointly offered by the Clean Energy Finance and Investment Authority and the Connecticut Energy Efficiency Fund, the City has become a Clean Energy Community. Through a three step process the community leaders, households, and local businesses work together to set clean energy goals and be rewarded for their achievements and demonstrate their leadership:

- Commit to the "Clean Energy Communities Municipal Pledge" (Appendix A) to save energy in municipal buildings and voluntarily purchase renewable energy
- Fulfill the Clean Energy Communities Municipal Pledge by taking actions to save energy and to support renewable energy
- Earn energy efficiency and renewable energy points that can be redeemed for clean energy systems and grants for energy-saving projects

Retro Commissioning

As part of the CL&P Retro-Commissioning Program that provides financial incentives through the Connecticut Efficiency Program, the City of Hartford retained a consultant to carry out energy evaluations and implement energy conservation measures in its schools and libraries. The objective of the program is to find low- or no-cost, non-capital energy efficient measures that can be implemented effectively to decrease energy consumption. The buildings are evaluated based on site visits, tabulations of utility bills, reviews of building drawings, and conversations with site maintenance and administrative personnel. The energy conservation measures recommended as a result of the investigations are then reviewed by CL&P and if accepted are eligible for up to 40% cost incentives.

Nine schools and the Central library have been evaluated and four ASHRAE Level I energy audits are in progress. Energy conservation measures are being implemented at the following:

- Annie Fisher School
- Capital Preparatory Schools
- Mary Hooker School
- University of Hartford Science and Engineering School
- Breakthrough School
- Maria Sanchez School

Examples of improvements that are applicable under this program include:

- Air sealing and insulation repair
- HVAC Controls improvements
- Lighting and/or lighting upgrades with most modern types and controls
- Occupancy sensors
- Motors and pumps
- New equipment upgrades to more efficient model
- Lighting and/or lighting upgrades with higher efficiencies
- Reprogramming existing controls sequences for more efficient operation.
- Miscellaneous Loads and Custom Energy Savings Measures
- Self Generation/Combined Heat and Power Evaluation
- Energy Supply Options (Energy cost only)

Other School-related Initiatives

Control systems, energy efficient motors and energy efficient lighting have been incorporated into all the schools in the School Construction Program. Global Studies at Quirk, M.D. Fox School and the Journalism and Media Academy were all constructed to meet or exceed LEED silver requirements. West Middle School and Hartford Magnet Trinity College Academy as well as any future construction will conform to the State of Connecticut's High Performance Building Standard which is comparable to the LEED Silver designation.

Almost 300,000 SF of building roof area has been evaluated for the potential to install solar electric panels (Appendix B). Although there is a potential to place 2,590 kW of PV on these roofs, many factors such as roof condition, strength and orientation would need to be considered.

Combined heat and power systems (CHP) utilize small, locally installed generators to produce electric power as a base load source of electricity and recover heat from the engines to offset hot water and heating loads. In 2013, Capital Preparatory Magnet School, Mary Hooker School and the Science, Technology, Engineering and Math (STEM) Magnet School at Annie Fisher had 60 kW CHP systems installed. Energy savings have yet to be quantified but will be added to the 2014 monitoring report.

A much larger (600 kW) CHP system is being evaluated for the Parkville Elementary/Senior Center/Library using a \$2.0M grant from DEEP. This project would provide local on-site generation with a provision to disconnect from the electrical grid during times of emergencies or grid outages. The project will include interpretive signage to educate students and the community about the system's operation and benefits.

C-PACE

Funding from Clean Energy Finance and Investment Authority (CEFIA) under its Commercial Property Assessed Clean Energy (C-PACE) program allows long-term financing of energy upgrades through repayment from a property tax benefit assessment.

The City participates in this program and is actively seeking additional candidates. The Bushnell Memorial Auditorium (166 Capitol Avenue), Walnut Huntley (41 Walnut) and ICH (1841 Broad) are currently participating in the program.

Alternative Fuel Vehicles

The City received funding from the Department of Transportation's 2014 Connecticut Clean Fuel Program and has contracted to purchase five new natural gas powered waste/recycle trucks which will reduce emissions and noise significantly.

As the City continues to reduce the total number of vehicles it owns and replaces vehicles with more efficient models, fleet management and transportation incentives will continue to be explored to reduce operation and maintenance costs and energy consumption.

Energy Improvement Districts

In March of 2014, the City approved a process for creating Energy Improvement Districts (EID), the locations and configurations of which are yet to be determined.

By having the ability to generate their own electricity, EIDs offer the potential of greater

flexibility and reliability of power sources for homes and businesses. EIDs have more rights when addressing concerns regarding power generation, transmission, and

distribution. These districts can be financed and managed outside the normal utility grid. Districts can also help businesses forecast their energy costs, hedge their purchases, and commit to long-term energy contracts.

EIDs can benefit other electric customers outside of the EID by taking demand off of the system and increasing capacity elsewhere on the grid. EIDs can also promote energy efficiency by using the heat produced in power generation to meet the heating and cooling needs of nearby customers.

Green Infrastructure

Green infrastructure predominantly involves the use of vegetation, soils, and other natural elements to manage stormwater. In urban areas, trees play a critical role in not only mitigating storm flow but also reducing energy and improving the livability of neighborhoods. Trees reduce and slow stormwater by intercepting precipitation in their leaves and branches. Trees effectively reduce energy usage by removing carbon dioxide and other pollutants; provide shade to mitigate the urban heat island effect and regulate temperatures.

The City's Department of Public Works has been working in partnership with KNOX Inc. (formerly the Knox Parks Foundation) in reaching the goal of planting 1,000 trees a year to expand and sustain the City's forested vegetation. This goal is relevant to energy reduction as an analysis conducted by KNOX with participation from CT DEEP, the City and the US Forest Service indicates that as of 2007, Hartford's forested vegetation removed carbon emissions equivalent to 2,400 barrels of oil a year and 73 tons of air pollutants annually.

The recommendations of the City's Green Ribbon Task Force Report and the Parks Master Plan also provide a blueprint for green infrastructure city-wide. Implementation of strategies and actions presented in these plans will support the City's energy goals.

ORGANIZATIONAL CONSIDERATIONS

With the completion of this initial plan, the City must provide a suitable framework for implementation. First and foremost the City would need to formally assemble a Clean Energy Committee. Doing so will impart all the necessary requisites needed for administration, decision-making and budgeting.

Secondly, while an Energy Committee provides direction and prioritization, the City would be well served by hiring a Sustainability Coordinator for implementation and day-to-day coordination and collaboration among departments. Having a Sustainability

Coordinator dedicated to continuing to evolve this Action Plan and serve as the City's champion for implementation is critical for monitoring benchmarks and tracking progress.

This individual would work closely with the DPW, the Board of Education and other City departments, to gain insight into evolving issues and ideas. The Coordinator could also assume responsibility for implementing a broader outreach program.

JUMPSTARTING

ACTION 1: Build Capacity

The City's DPW has been taking the lead in overseeing and carrying out many of the energy-related initiatives. Establishing the organizational framework and hiring a Sustainability Coordinator would be the first step in meeting the objectives of this plan.

ACTION 2: Finalize Benchmarking and Begin Tracking

The benchmarking is nearly complete. Information from a small number of accounts need to be gathered and confirmed to complete the benchmarking for the City's energy accounts. The benchmarking will establish a baseline from which the City's energy goals will be measured and priorities identified.

Once the baseline is finalized the City will be tracking and reporting energy consumption on a regular basis, and this will evolve into a City-wide comprehensive energy management program.

ACTION 3: Explore and Evaluate the ESCO Model

Energy Services Companies (ESCOs) could deliver City-wide turn-key energy upgrades without the City incurring any capital expenditures; thus providing the vital means to achieving the City's energy goals in an expeditious manner and without the need for budget programming and City financing. This model could also provide the means of funding the Sustainability Coordinator position. It is recommended that the City first informally speak to a range of ESCOs to learn about the approach and terms. Following this, a scope of services should be drafted so that a formal Request for Proposals could be issued by the City to procure turn-key energy services contracts.

ACTION 4: Continue Clean Energy Community Efforts

The City with help from citizen volunteers shall continue to meet the requirements of the program with specific focus on elements that obtain program credits that will directly contribute to achieving the City's energy goals.

ACTION 5: Identify and Prioritize Implementation Targets

There are a myriad of ideas on how best to reduce energy consumption and costs and meet the City's 2018 energy goal. These ideas primarily fall into two major categories: project specific or programmatic. Project-specific targets pertain to implementation of physical

energy saving measures such as retro-fitting, combined heat and power systems, or rooftop solar installations. Programmatic targets would encompass approaches, policies and administrative actions.

In carrying out this action, it is recommended that the City first appoint a lead person who will have the ability to work across departments. This person would be given the responsibility of identifying department-specific energy-related targets and assembling a decision-making matrix. Based on operational jurisdiction, the key departments to include would be the Department of Public Works, the Board of Education, Housing/Property Management and Development Services.

The prospective targets identified through this process would be evaluated based on a number of criteria including the need for and probability of funding and relevance to achieving the City's energy goal.

ACTION 6: Engage the Community

As the City's successes grow, there will be more opportunities to showcase these achievements and begin to expand efforts to engage residents and businesses. C-PACE and the Clean Energy Community designation are already helping in this regard. More formalized outreach such as regularly scheduled neighborhood meetings, video clips on the city's website and educational materials would be useful in spreading the word. Using school functions and dovetailing with the Livable & Sustainable Neighborhoods Initiative would also be effective mechanisms to engage the larger community.

APPENDIX A

Clean Energy Community Pledge

CLEAN ENERGY COMMUNITIES MUNICIPAL PLEDGE

The Clean Energy Communities program is an initiative funded by both the Clean Energy Finance and Investment Authority (CEFIA-formerly known as the Connecticut Clean Energy Fund) and the Connecticut Energy Efficiency Fund. CEFIA and the Energy Efficiency Fund develop programs which collectively seek to have Connecticut cities and towns both reduce energy use and increase support for clean, renewable energy for municipal facilities. The Energy Efficiency Fund programs are administered by The Connecticut Light and Power Company, The United Illuminating Company, Yankee Gas Services Company, The Southern Connecticut Gas Company, and/or Connecticut Natural Gas Corporation (collectively, "the Companies")

By applying currently available energy efficiency and clean, renewable energy technologies the City of Hartford can save money, create a healthier environment and strengthen local economies; and accordingly, the City of Hartford makes the following Clean Energy Communities Municipal Pledge:

1. The City of Hartford pledges to reduce its municipal building energy consumption by 20% by 2018. Building energy consumption shall be determined by benchmarking municipal building energy consumption to a baseline fiscal year. The City of Hartford can elect from the following fiscal years to determine its energy baseline year: 2008-2009, 2009-2010, 2010-2011, or 2011-2012.
 - a. The City of Hartford will seek to reduce its municipal building energy consumption for municipal facilities by at least 20% by 2018. The schedule follows:
 - i. Fiscal Year 2012-2013: 5% Reduction
 - ii. Fiscal Year 2013-2014: 8% Reduction
 - iii. Fiscal Year 2014-2015: 11% Reduction
 - iv. Fiscal Year 2015-2016: 14% Reduction
 - v. Fiscal Year 2016-2017: 17% Reduction
 - vi. Fiscal Year 2017-2018: 20% Reduction
 - b. The City of Hartford will work with the Companies, contractors or other entities to benchmark all of its municipal buildings (including board of education buildings) to determine all municipal building energy usage.
 - c. Beginning July 1, 2015, the City of Hartford agrees to provide documentation of its municipal building energy consumption on an annual basis by the end of the first quarter of the following fiscal year.
 - d. The City of Hartford pledges to create its own Municipal Action Plan (MAP) to determine its path in reducing its energy consumption. The City of Hartford may satisfy this requirement by submitting a pre-existing municipal energy plan, sustainability plan, climate change action plan or similar document.
 - e. There is no penalty if the City of Hartford fails to meet the reduction amounts set forth in the schedule above. However if these reduction targets are not met starting July 1, 2015, the City of Hartford will not be eligible to receive Bright Ideas Grants from the Connecticut Energy Efficiency Fund and Companies under the Clean Energy Communities program.
2. The City of Hartford pledges to purchase 20% of its municipal building electricity from clean, renewable energy sources by 2018.
 - a. The City of Hartford will seek to make a voluntary purchase of at least 20% of the electricity for municipal facilities from clean, renewable energy sources by annual CEC program requirements. The schedule follows:
 - i. Fiscal Year 2012-2013: 15% Purchase
 - ii. Fiscal Year 2013-2014: 16% Purchase
 - iii. Fiscal Year 2014-2015: 17% Purchase
 - iv. Fiscal Year 2015-2016: 18% Purchase

- v. Fiscal Year 2016-2017: 19% Purchase
- vi. Fiscal Year 2017-2018: 20% Purchase

b. The City of Hartford agrees to provide CEFIA documentation of its municipal clean energy purchases on an annual basis by the end of the first quarter of the following fiscal year. CEFIA intends to request documentation of municipal clean energy purchases for FY2011-2012 in July 2012.

c. The City of Hartford acknowledges that clean, renewable sources are those defined in section 16-1 of the general statutes as Connecticut Class I renewable energy sources or meeting Green-e® Energy certification standards.

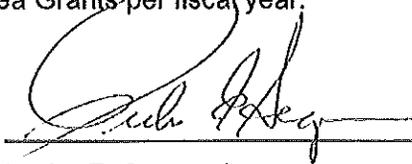
d. The City of Hartford may satisfy the voluntary purchase requirement by purchasing Green-e® Energy certified Renewable Energy Credits (RECs), enrolling one or more municipal facilities in the CTCleanEnergyOptionssm program, installing renewable energy systems (provided that the RECs associated with such system(s) are quantifiable and not held by a third-party) or any combination thereof.

e. There is no penalty if the City of Hartford fails to meet the items set forth in the schedule above; however, the City of Hartford will not be eligible to receive incentive rewards from CEFIA under the Clean Energy Communities program.

3. The City of Hartford agrees to promote energy efficiency and clean, renewable technologies in its community. The City of Hartford is encouraged to establish a Clean Energy Task Force, or comparable body. This entity will assist the municipality in meeting the Clean Energy Communities Municipal Pledge and to perform education and outreach among residents, businesses and institutions within the community concerning energy efficiency and clean, renewable energy programs.

By taking the pledge and meeting the Clean Energy Community Program requirements outlined by CEFIA and the Connecticut Energy Efficiency Fund, the City of Hartford may qualify, subject to the terms of separate formal contracts, for the following grants:

- a. CEFIA. For every 100 points, the City of Hartford may earn a 1 kilowatt (or equivalent) clean energy system.
- b. Energy Efficiency Fund. For every 100 points, the City of Hartford may earn a Bright Idea Grant that can be used for energy-saving projects. The City of Hartford is eligible for two Bright Idea Grants per fiscal year.



Pedro E. Segarra*

Mayor

City of Hartford

* The City of Hartford understands that the Clean Energy Communities Municipal Pledge is not a contract, and that CEFIA, the Energy Efficiency Fund, and the Companies have not contracted, committed, agreed or promised, to perform or incur any obligations, in any manner, hereunder.

APPENDIX B

Rooftop Solar Capacity Analysis



**CITY OF HARTFORD RFP # COH 5384 APPENDIX B2 (revised 051613)
MUNICIPAL & SCHOOL BUILDINGS
SOLAR POWER CAPACITY ASSESSMENT**



ALL BUILDINGS	ESTIMATED PV CAPACITY
Total PV kW capacity	2,590

Building	Address	Estimated Total SF	Estimated Roof SF	Year built (Assessor's data)	Roof Install date	Elec Use (kWh/yr)	CL&P Tariff	Potential Roof Area for PV (SF)	Potential PV System Capacity (AC)	Notes
Batchelder	757 New Britain Ave	96,715	48,360	1955	2012	564,333	40	40,000	400	
Capital Prep	1304 Main Street	105,402	35,000	1920	2009	1,245,166	56	30,000	300	60 kW CHP (not yet operational)
HPSC	253 High Street	80,000	60,000	2012	2012	1,000,000	56	40,000	50 to 280	See "HPSC breakdown" section
Kinsella	65 Van Block Ave	106,000	50,000	1973	2010	1,134,167	56	40,000	400	
Mary Hooker	200 Sherbrooke Ave	106,604	50,000	1952	2009	960,000	56	30,000	300	Onsite 5 kW PV & 60 kW CHP
Milner	104 Vine Street	93,432	30,000	1920	2012	624,667	35	20,000	200	
Parker Memorial	2621 Main St	30,000	30,000	2009	2009	670,000	37	20,000	200	
STEM at Fisher	280 Plainfield Street	116,680	115,000	1965	2011	1,165,167	55	34,000	340	Potential PV area includes south-facing sloped raised seam metal roofs; 60 kW CHP (not yet operational)
Wish	350 Barbour Street	90,402	45,000	1960	2012	490,833	35	45,000	450	
Total		825,235	463,360			7,854,333		299,000	2,590	

HPSC breakdown	Address	Estimated Total SF	Estimated Roof SF	Year Built	Roof Install Date	Elec use kWh/yr	CL&P Tariff	Roof SF PV area	PV kW capacity	Notes
HPSC (Hartford Public Safety Complex)	253 High Street	80000	60000	2012	2012	1000000	56	5000 to 28000	50 to 280	Onsite 400 kW UTC fuel cell trigen; kWh/yr estimated; full occupancy Feb 2013; building power peak estimates 0.9 kW winter / 1.6 kW
HPSC building "A" to NE, south facing sloped slate roofing	253 High Street	30000	15000	2012	2012			3,000	30	Relatively small irregular areas of south aspect sloped faux slate shingle roof
HPSC central building "B", flat roof with privacy screens & penthouse	253 High Street	40000	20000	2012	2012			5,000	50	Estimated potential roof area for PV includes south aspect flat roof only 20k SF estimated potential area for PV includes hypothetical PV structure atop garage; potential area for PV atop ~5k SF of existing raised seam shading with unknown structural capacity for PV TBD
HPSC building "C", parking structure to SW	253 High Street	50000	25000	2012	2012			5,000 to 20,000	50 to 200	

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