

TOWN OF MANCHESTER, CONNECTICUT
ENERGY CONSERVATION INITIATIVES



Status Report

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INTRODUCTION & SUMMARY

In order to both stabilize and reduce its energy costs, and to take leadership in averting the effects of global warming and global fuel consumption, the Town of Manchester is considering its options towards a concentrated effort to identify and implement methods of reducing municipal energy consumption. This report outlines a variety of energy conservation methods and discusses where the Town currently stands with regard to applying these techniques in its facilities and operations.

The following table summarizes the efficiency measures covered in this report, as well as their current implementation status.

CURRENT INITIATIVES		Status
	Solar Energy	Issued RFP and reviewed proposals; installing 3kW panels through 20/10 program
	CCM Energy Audit	Assembling facilities information for consultants; audit expected to begin within next 1-2 months
	Renewable Energy Credits	Issued RFP and selected provider
	Community Energy Challenge	Enrolled
	Reusable Grocery Bags	Purchased 2,000 for sale to residents
	Fuel Cells	Will be considered for Wastewater Treatment Plant upgrades
	Anti-Idling Policy	Town policy implemented
	ISO-NE Program	PD & New State Road are enrolled
	Landfill Gas Utilization	Deemed prospects unfavorable by TRC report
OTHER ENERGY EFFICIENCY INITIATIVES AND OPPORTUNITIES		
General Consumption Control		
	Plug Load Controls	Under Consideration
	Energy Conservation Policies	Limited Implementation
	Cogeneration	Under Consideration
	Efficient Machinery	Implemented
Efficient Lighting		
	T8 Fluorescents	Widely Implemented
	Compact Fluorescent Lamps	Pilot Program in Place
	LED Traffic Signals	Widely Implemented
	Daylighting Optimization	Under Consideration
	Lighting Reconfiguration	Under Consideration
	Occupancy Sensors	Widely Implemented
Efficient Temperature Control		
	Heat Loss Prevention	Widely Implemented
	Commissioning/Recommissioning	Under Consideration
	Economizers	Implemented in New Facilities
	Programmable Thermostats	Implemented in Major Facilities
	Geothermal Heat Pump Systems	Under Consideration
	Chillers	Implemented
	Water Resets	Under Consideration
	Variable Air Volume HVAC	Implemented in New Facilities

CURRENT INITIATIVES

Solar Energy

Solar RFP: On July 31st 2008, the Town received and reviewed proposals for the provision of solar panels under a power purchasing agreement (PPA). Two proposals were received, and only one was deemed to be responsive. The proposal would involve entering into a 20-year PPA, with a buyout option in year six, whereby the Town would pay 12 cents per kilowatt-hour, escalated at 3% per year, for 200kW of solar panels. The results of the RFP were discussed at the Alternative Energy Subcommittee meeting on September 4, 2008, and several concerns were raised, particularly regarding the 20-year duration of the agreement. No action has been taken, and the proposals are set to expire on October 29, 2008.

20/10 Program: Through the Town's participation in the 20/10 program, the Town is entitled to receive 3kW of solar panels at no cost from the Connecticut Clean Energy Fund (CCEF). A workshop was held on October 23, 2008, which provided Town staff an opportunity to learn how the process will proceed and how the panels will interface with the Town computer network to allow for energy production to be monitored and evaluated. Two members of the public attended the workshop. On the same day, a consultant contracted through CCEF inspected four sites proposed by the Town to assess their suitability for the project. Once all parties are in agreement for the location, CCEF will manage the procurement process, and a licensed installer will purchase and install the panels according to CCEF's specifications. In speaking with Bob Wall from CCEF, he noted that the ordering and shipment of the solar panels can take 2 to 6 months, so the solar panels may not be installed and operating until the spring or summer of 2009.

Other Considerations: Ideally, Building-Integrated Photovoltaics (BIPV's) could be incorporated into new construction, which has the added advantage of reducing material costs because the cells would double as building envelope components. There may also be some smaller auxiliary uses that could be explored.

CCM Energy Audit

Andy Merola of the Connecticut Conference of Municipalities (CCM), along with representatives from Siemens Building Technologies, Inc., held a workshop on October 8, 2008 with key staff to discuss progress to date on their Energy Efficiency Program for Manchester. CCM conducted an RFP process to select Siemens, and Manchester will "piggyback" on that process, consistent with the Town Charter's procurement provisions. In short, the program will provide the Town with a free energy audit of its major facilities to determine areas where energy cost savings can be realized through investment in new machinery or technologies. In cases where the projected energy savings will exceed the upfront investment over the life expectancy of the technology, the Town may enter into an energy performance contract whereby Siemens would provide all upfront costs for design, procurement, and installation, and the Town would pay off the debt as a percentage of annual energy savings attributed to the technology.

At this time, the final report is being prepared and will be presented around the end of November. The Board of Directors is considering a citizen oversight committee as the report is issued.

Renewable Energy Credits

As participants in the State's 20/10 program, the Town has arranged to purchase 20% of its electricity (approximately 4,230 MWh per year) through the form of renewable energy credits (REC's). Under this arrangement, the Town continues to receive its electricity from conventional means through Trans-Canada, but by purchasing the REC's at the cost differential between conventional and wind energy, the Town subsidizes renewable energy production in locations where it is available, thereby reducing the overall carbon footprint of human energy production.

Proposals for renewable energy credit purchasing were received August 29, 2008, and the contract is currently being reviewed by the Town Attorney.

EPA Community Energy Challenge

In August, 2008, the Town of Manchester enrolled in the EPA Community Energy Challenge, through which the Town pledges to set a 10% energy consumption reduction goal within a feasible timeframe. As a member, the EPA provides the Town with a vast variety of online resources for energy tracking, benchmarking, identifying programs and incentives, ideas for energy conservation, and so forth.

Once the Facilities Management department is fully-staffed, there will be more capacity for the Town to begin tracking detailed energy usage and to assess some of the numerous recommendations provided in the EPA literature.

Reusable Grocery Bags

The Alternative Energy Subcommittee approved, at its September 4th meeting, the purchase of 2,000 reusable grocery bags, made of recycled materials, at a cost of \$2.00 each. The bags are expected to come in by the end of October and are to be sold to residents for the same unit price at the Customer Services & Information Center at Town Hall. These will be advertised in Manchester Matters and/or other local publications. The bags can be used in place of plastic and paper bags, which contribute to solid waste production in the United States.

Fuel Cells

The Alternative Energy Subcommittee heard from two engineering firms who work with this technology, and subsequently held several discussions regarding the possibility of implementing fuel cells at Town facilities. While the State of Connecticut offers assistance for the purchase of fuel cells, repair and replacement would not be subsidized. The high cost of fuel cells has made this cost-prohibitive for most applications unless full utilization of the excess heat can be efficiently captured and used to offset other sources of energy. Based on the high energy needs of the Town's wastewater treatment plant, however, it was decided that the Town will investigate the potential use of fuel cells at the plant as part of the renovations and upgrade design process currently underway.

Anti-Idling Policy

The General Manager, in conjunction with the Police and Fire Departments, Water and Sewer Departments, and the Department of Public Works, recently enacted an Anti-Idling Policy, effective October 20, 2008. This policy prohibits vehicle operators from leaving vehicles and machines running when not in use in excess of three minutes (with specific exceptions). This policy aims to reduce the air pollution from vehicle and equipment exhausts, create a healthier environment, promote energy (fossil fuel) conservation, reduce noise pollution and reduce wear and service needs on Town vehicles and equipment. Each department has a more detailed policy for their operations which must comply with the Town's "umbrella" policy. These policies are available upon request.

ISO-NE Program

Currently the Town of Manchester participates in the ISO-NE's Demand Response Program. This program provides the Town with annual monetary incentives for agreeing to run on generators and remove themselves from the power grid upon request, in situations where a reduction in total grid demand is necessary. Currently the Police Department and the New State Road Well participate. As new generators are installed at Town facilities, the potential for inclusion into the ISO-NE program will be considered, pending continuation of this program.

Landfill Gas Utilization

The Town's landfill environmental consultant engineer, TRC, Inc. reviewed the feasibility to reclaim energy from methane that is naturally emitted from the Town's landfill. The results of their analysis, communicated in a memo dated March 5, 2008, stated that "the long term prospects for utilizing LFG [landfill gas] for energy recovery at the Manchester Landfill are not appealing" based on the prohibition of depositing municipal solid waste in the landfill since 1999, and the declining quality and quantity of methane produced, coupled with the fact that the landfill is expected to close within a few years. This report is available upon request. Future incentives, energy credit programs, and/or legislation may render landfill gas utilization a more viable option in the future.

Bennett School Improvements

The Town of Manchester was awarded over \$260,000 in grants from Connecticut Light and Power for the many energy-saving investments in the new school. Prior to its closure two years ago, the complex used about 105,000 gallons of fuel oil per heating season. Staff will report out new fuel usage results in the spring.

OTHER ENERGY EFFICIENCY INITIATIVES AND OPPORTUNITIES

General Consumption Control

Plug Load Controls

Description: Plug load control devices control the electric demand of electronics and machinery plugged into wall outlets. Typically, these devices use outlet-mounted occupancy sensors to control items such as printers, desk lamps, computer monitors, etc. which draw an electrical current even when they are not in use.



Status: Under **Consideration.** Currently, the Town of Manchester does not use plug load controls. These are priced around \$90/unit (MSRP), but lower prices could be anticipated through competitive bidding

and high-quantity purchase. The Town might consider utilizing plug load controls for specific machinery with a high standing consumption rate that does not need to remain on when the room is vacant (i.e. vending machines, office equipment, etc).

In cases where the savings would not be likely to warrant the cost of this device, power strips could be utilized and employees could shut off the power supply at certain times, or electronics could be connected to outlets with wall switches to prevent idle electrical consumption.

Energy Conservation Policies

Description: Policies may be implemented that encourage or require certain energy-saving measures. These may include requirements to turn computers off or place them in “hibernate” mode at the end of the day, turn office lights off, or even

turn off whole power strips in the office to prevent latent electricity drain from certain electronics. Similar energy-saving measures could be explored at some of the Town’s industrial operations.

Status: Limited Implementation. The Town of Manchester has recently implemented an anti-idling policy, but no policies regarding electrical consumption are in place.

Cogeneration

Description: Cogeneration is the production of energy to complement or, in some cases, substitute the use of energy from the power grid. This is achieved through the use of local power generators, which may be fuelled conventionally, through steam or other operational byproducts, or through alternate energy sources (which are covered separately in a later section of this report).

Status: Under Consideration. Turbine units are available that attach to HVAC and other heavy, steam-producing equipment to utilize liquid or gas flow to generate energy. Opportunities to implement this sort of technology should be explored.

Efficient Machinery

Description: As energy efficiency technologies advance, appliances and machinery are consistently improving in terms of the amount of energy they use. Several standards, particularly Energy Star, are employed to indicate to what degree different products meet the most current energy standards.

Status: Implemented. As machines and appliances are replaced, higher levels of energy efficiency are almost always realized. Energy efficiency is generally accounted for when large purchases are being considered. The Town may

improve its degree of energy-efficient purchasing by establishing a policy that prescribes energy efficiency standards or requires energy efficiency to be accounted for in bid specifications and equipment replacements.

Efficient Lighting

T8 Fluorescents

Description: T8 lamps are the highest efficiency lamps for 4 and 8-foot ceiling fixtures. The T8 lamps have a higher efficacy rating and better color rendering than T12 lamps.

Status: Widely Implemented. The Town of Manchester replaced a large number of T12 lamps with T8's in 2004 during the CL&P energy audit, which also saw the installation of occupancy sensors in the Town's major facilities. A few of the smaller Town buildings still have some T12 lamps in place, but these are being continuously replaced with T8's as ballasts wear out. All old T-12's are sent to a bulb recycling facility.

Compact Fluorescent Lamps (CFL's)

Description: A compact fluorescent lamp (CFL) is a type of fluorescent lamp designed to replace an incandescent lamp and can fit in the existing light fixtures.

Compared to incandescent lamps of the same luminous flux, CFLs use less energy and have a longer rated life. The purchase price of a CFL is higher than that of an incandescent lamp of the same luminous output, but this cost is recovered in energy savings and replacement costs over the bulb's lifetime.

Status: Under Consideration. Currently there has not been any concerted effort to replace bulbs with CFL's in Town. Most rooms are lit with fluorescent ceiling fixtures, but there may be some opportunities to apply this technology in certain Town offices.

CFL Streetlighting

Description: Just as CFL's can be used in place of indoor light bulbs, streetlights and outdoor lights may also take advantage of this technology.

Status: Pilot Program in Place. Last year, over a dozen CFL's were installed in the Parker Village region of Manchester. The Town's experience thus far has shown that the lights are comparable to maintain and are more aesthetically-pleasing than their traditional counterparts, and would be appropriate for residential use on high-set fixtures due to their relatively narrow emission range.

According to Manchester's CL&P account representative, the CL&P rate plans now allow for CFL's to be recognized and billed at a lower rate than incandescent lamps, which provides a cost incentive for pursuing CFL installation across other parts of Town. The Town plans to expand use of CFL's in specific locations in 2009.

LED Traffic Signals

Description: Unlike the incandescent-based lamps, which use a single large bulb, the LED-based lamps consist of an array of LED elements, arranged in various patterns. When viewed from a distance, the array appears as a continuous light source.



LED-based lamps (or 'lenses') have numerous advantages over incandescent lamps; among them are:

- Much greater energy efficiency (can be solar-powered).

- Much longer lifetime between replacement, measured in years rather than months.
- Brighter illumination with better contrast even in direct sunlight.

Status: Widely Implemented. The Town of Manchester implemented this technology in 2002 and has replaced all traffic signals with LED displays, and incandescent pedestrian walk lights are being replaced with LED's on an ongoing basis. The Department of Public Works has recently entered into a deal with the CT Department of Transportation to purchase LED's for the Town's crossing signals. Experience has shown that the energy savings from LED walk signals compensate for the replacement cost in as little as 8 months.

Daylighting Optimization

Description:

Daylighting is the architectural practice of placing windows, or other transparent media, and reflective surfaces so that, during the day, natural light provides effective internal illumination.



Energy savings from daylighting are achieved in two ways--either from the reduced use of electric lighting, or from passive solar heating or cooling. Electric lighting energy savings can accrue because occupants choose not to switch their lights on, or because an automatic lighting control system ("photocontrol system") switches the lights off or dims them to a lower level.

Status: Under Consideration. While any facility with windows allows for the use of daylighting in place of electrical lighting, no town facilities have been specifically designed to make optimal use of natural light to the extent that modern architectural designs have allowed for in recent years. Retrofitting a facility to incorporate daylighting would be extremely costly, and may present design difficulties. Consideration may be given to

utilizing daylighting designs in any new town facilities constructed in the future.

Lighting Reconfiguration

Description: Some rooms and facilities, especially from older construction, may be designed with an excessive amount of ceiling lighting. By reconfiguring lights in ways that light an area with fewer ballasts, less energy will be consumed per hour to light the area.

Status: Under Consideration. Currently, there are no active efforts to identify and address areas where lighting reconfiguration may be implemented. This would involve some electrical work and reconfiguration of ceiling elements, so it would be best to couple this sort of effort with renovation projects or new construction in order to be cost-effective.

Opportunities may be identified through use of a lumen-measuring device to identify areas where lighting may be reduced. Areas where lighting is concentrated in inefficient configurations, such as the Lincoln Center Director's Room, also present opportunities to explore energy-saving reconfigurations.

Occupancy Sensors

Description: Occupancy sensors use different technologies to detect the presence or absence of people in a space, including passive infrared (PIR), ultrasonic, and dual-technology — each of which has its own advantages and disadvantages. According to the U.S. Environmental Protection Agency, energy savings from using such devices can range from 13% to 50% in private offices, 30% to 90% in restrooms, 22% to 65% in conference rooms, 30% to 80% in corridors, and 45% to 80% in storage areas.

Status: Widely Implemented. The Town's major facilities were fitted with occupancy sensors by CL&P in 2004. Some of the smaller facilities were not fitted with occupancy sensors because the potential savings were too small to justify the cost of installation. Nonetheless, many of these

remaining facilities have been retrofitted with occupancy sensors since then, and installation is

ongoing as opportunities present themselves.

Efficient Temperature Control

Heat Loss Prevention

Description: Certainly the most effective method of controlling heating costs involves preventing heat loss in buildings.

Status: Widely Implemented. The Town of Manchester Facilities Department uses a number of measures to minimize heat loss. :

- **Roof insulation:** during any re-roofing project, the level of insulation is improved wherever possible, inasmuch as any given roof is capable of supporting additional load. Ceiling caps should also be inspected to ensure proper levels of insulation.
- **Windows:** the Town also takes the opportunity during new construction and renovations to install thermally-glazed windows, which are designed to minimize thermal conductivity. New thermal windows have most recently been installed at the Whiton and Mary Cheney Libraries, Bennet 6th Grade Academy, Manchester High School, and the Fire Museum. Thermal windows are also slated for installation at the Probate Court facility in 2008/09.
- **Pipe insulation:** the pipes in Town facilities are re-insulated during major renovations.
- **Other Considerations:** heat loss can be minimized in building design by reducing the amount of window space. Also, awnings and shades are helpful at maintaining cool temperatures during the winter.

Commissioning & Recommissioning

Description: Commissioning is a quality assurance process that ensures design intent and operational needs are met for new buildings or major rehabilitation. Ideally, commissioning takes place during the construction process and continues through occupancy. Recommissioning is essentially the same process as commissioning, but applied to existing building's HVAC, controls, and electrical systems. When standardized maintenance and energy management procedures fail to fix chronic building problems, recommissioning provides a systematic approach for discovering and solving them.

Recommissioning capitalize on heating, cooling, and electrical load reductions by continually monitoring energy consumption to optimize energy performance and savings. Recommissioning can be a cost-effective retrofit in itself, sometimes generating more savings than the cost of the retrofit measure.

Status: Under Consideration. To date, other than air balancing, complete building recommissioning is not required. Lincoln Center should be considered for air balancing recommissioning. Establishing a practice of commissioning new construction projects should also be considered.

There would need to be a determination as to whether commissioning costs would be reimbursable under Connecticut school construction financing guidelines; however, the State Department of Education's Ineligible and Limited Eligible Cost Worksheet did not list commissioning as an ineligible or limited-eligible expense, so it is unlikely that commissioning costs would be exempted from reimbursement.

The CCM Energy Audit (discussed under Current Initiatives) will achieve some of the benefits of recommissioning, in the sense that the efficiency of Town buildings will be assessed and improvements will be considered.

Economizers

Description: Air-side economizers can save energy in buildings by using cool outside air as a means of cooling the indoor space. When the temperature of the outside air is less than the temperature of the recirculated air, conditioning the outside air requires less energy than conditioning recirculated air.

Air-side economizers can reduce HVAC energy costs by as much as 10% in cold and temperate climates while also potentially improving indoor air quality.¹

Status: Implemented in New Facilities. Newer HVAC installations in the Town of Manchester utilize an economizer. Due to the cost of these units, it may be cost-prohibitive to do pro-active replacements.

Programmable Thermostats and Computerized Controls

Description: A programmable thermostat is a thermostat which is designed to adjust the temperature according to a series of programmed settings that take effect at different times of the day. Programmable thermostats may also be called setback thermostats or clock thermostats.



¹

http://www.fpl.com/business/savings/energy_advisor/PDF/P_PA_8.pdf

Status: Implemented at Major Facilities.

The major town buildings have automated temperature controls that allow for remote access. Town Hall, Lincoln Center and Weiss Center have timed on/off systems. Installation was completed this year at the Public Works facility. All spaces are set for evening and weekend temperature setbacks. Difficulties often arise in older buildings where there are “hot spots” and “cold spots” due to building design and envelope issues.

Geothermal Heat Pump Systems

Description: A geothermal heat pump system is a heating and/or an air conditioning system that uses the Earth's ability to store heat in the ground and water thermal masses. These systems operate on a stability of underground temperatures; the ground a few feet below surface has a very stable temperature throughout the year, typically somewhere in range of 50-85 °F (10-30 °C) depending upon location's annual climate. A water-source heat pump uses that available heat in the winter and puts heat back into the ground in the summer.

Status: Under Consideration. Currently, no Town buildings utilize geothermal pumps, but this is an option that may be pursued for future new construction.

High Efficiency Heaters/ HVAC

Description: A typical boiler will consume many times the initial capital expense in fuel usage. Consequently, a difference of just a few percentage points in boiler efficiency between units can translate into substantial savings.



Status: Widely Implemented. New boilers have been installed at Town Hall and the Weiss Center at the time of this writing. New boilers at Globe Hollow Water Treatment Plant were installed last year. The Bennet School boiler was recently replaced as part of their renovation project,

generating significant cost savings. Most of the Town large boilers are less than 12 years old and are 80%-84% efficient; older boilers are replaced with more efficient ones at the end of their life cycle.

CL&P also offers incentives through its Energy Efficiency Opportunities Program for high-efficiency machinery, including HVAC, water source heat pumps, and motors, which the Town has consistently taken advantage of.

Chillers

Description: A chiller is a machine that removes heat from water pipes, particularly pipes that are drawing



water away from some industrial process which has heated the water. The chilled water can then be used to cool and dehumidify air in mid- to large-size commercial, industrial, and institutional facilities. Most chillers are designed for indoor operation, but a few are weather-resistant.

Status: Implemented. Manchester currently does employ chiller technology in many facilities. It may be worthwhile to evaluate opportunities at the Wastewater Treatment Plant and explore the cost and benefits of further use of this technology. CL&P offers incentives through its Energy Efficiency Opportunities Program for the purchase of new chillers.

Water Resets

Description: A water reset device will monitor usage and/or outside temperature and adjust the degree of heating and cooling for the facility's water supply.

Status: Under Consideration. There may be opportunities to implement this technology; such opportunities should be identified and considered.

Variable Air Volume (VAV) HVAC

Description: Variable air volume (VAV) is a technique for controlling the capacity of an HVAC system. The simplest VAV system incorporates one supply duct that, when in cooling mode, distributes approximately 55 degree F supply air. So instead of expending energy to heat or cool the supply air, it maintains a constant temperature and instead varies the volume of air being released, which reduces fan usage and drastic heating and cooling changes, which consumes a good deal of electricity.

This technology can incorporate demand-controlled ventilation, which utilizes timers or CO2 detectors to determine times of high occupancy, and to reduce air volume during periods of low or zero occupancy.

Status: Implemented in New Facilities. Most newer HVAC units utilize this technology, and Bennet, Manchester High, and Illing have all had recent HVAC replacements. CL&P offers up to \$9,290 for VAV retrofitting through its Energy Efficiency Opportunities Program.