Report and Recommendations

of the

Climate Smart Library Advisory Committee

June 2012

Kingston Library

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We would like to thank the former and present Library Directors, Trustees and volunteers who were instrumental in the energy conservation measures that have been accomplished since the late 1990s.

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Executive Summary

The current state of energy use and sustainability for the Kingston Library is presented. Data analyses and reports were performed and are discussed. Over the last decade, the Library has accomplished much to conserve energy and operate sustainably. This has taken time and proved a worthy investment. Today, the building performs well over the national average. The committee gives recommendations for achieving a more sustainable Library covering all aspects of library operations and programming. Some of the recommendations are simple and can be carried out as a matter of course by staff. Some involve long term planning and/or capital expenditures. The community involved in the changes and innovations includes library staff, board of trustees, committees, patrons, and the broader Kingston and Ulster county community and beyond.

Introduction

This document reviews the Library's current condition, makes recommendations, and gives a plan of action on how the Library can:

- Reduce its impact on the environment including water, solid waste and stormwater
- Reduce its energy use and therefore greenhouse gases
- Practice sustainable purchasing
- Celebrate success and inspire others

As good stewards of public dollars, the Library has taken many steps to conserve energy over the last decade, including insulating the attic and replacing the roof, replacing windows, and installing programmable thermostats and energy efficient lighting. Appendix A gives a more complete list. In addition, public recycling has been improved, water conserving fixtures installed, and a parking lot design using green storm-water infrastructure was utilized to help obtain grant funding for parking lot construction.[1]

Today, the building performs well over the national average; energy costs are $\$0.84/ft^2$/year compared to a national average for similar buildings of $\$2.12/ft^2$/year. Greenhouse gas emissions are 3 $kgCO2e/ft^2$/year, compared to a national average of 8 $kgCO2e/ft^2$/year. The national average represents the Commercial Buildings Energy Consumption Survey (CBECS) national average data for Library buildings in the US. These values will serve as the baseline to measure progress in energy conservation and efficiency measures in the future.

The Kingston Library Climate Smart Advisory Committee was formed in order to help the Library further reduce its energy use and adopt practices for sustainability. The Committee's responsebility was to review the issues and propose a plan of action including facility operations and library programming. The Committee began meeting in June 2011, stemming from the passage of the Climate Smart Community Library Pledge by the Board of Trustees on September 16, 2010, see Appendix E. (http://www.kingstonlibrary.org/pdf/trustee/kl_climate_smart_pledge.pdf).

[1] While this Report was being finalized the Library installed a new parking lot, disconnected roof leaders from the sanitary sewer system and installed a rain garden and other infrastructure to manage stormwater, in the period from June to August 2012.

The committee is composed of City of Kingston residents, present and past Trustees and Directors and representatives City businesses that specialize in energy conservation.

The library building is a former elementary school, built in two stages; the section towards Furnace Street was built in 1878 and connected to an earlier school building on the lot. The section toward Prospect Street, somewhat larger, was constructed in 1888, replacing the earlier building. It has a footprint of just less than 8,000 ft^2; with the basement and two floors it is about 24,000 ft^2. It sits on a full city block, with a parking lot of approximately 26,000 ft^2. The Library has occupied the two-story brick building since 1978.

Overall recommendations:

- Set a goal of reducing energy use by 20% from 2001 levels by 2022.
- Implement recommendations in this report.
- Continue the Committee to help implement recommendations.
- Continue to monitor energy use, solid waste generation and water use, and evaluate progress on sustainable practices and greenhouse gas emissions, using EPA Portfolio Manager[2] and other tools, on at least an annual basis.
- Keep staff informed of work of committee and sustainable practices and goals
- Engage a professional firm to review interior space utilization and also all the Library building systems to maximize energy efficiency and conservation and to provide an interior environment that is functional and comfortable to employees and patrons. The firm should have the capacity to provide interior redesign of Library with emphasis on function, energy conservation and sustainability; evaluation of systems; analysis of how the systems and redesign integrate with each other, and funding opportunities, see Appendix C.
- Commission an in-depth study (using student intern) to analyze capital expenditures of the energy conserving measures taken over the last decade and calculate paybacks and return on investment, in order to evaluate the costs and benefits of measures.
- Celebrate and advertise successes: serve as a model and challenge other building owners to reduce energy use and adopt sustainable practices.
- Encourage and support other community, municipal, state and federal efforts and policies
- Provide programming and purchase materials that encourage energy conservation, sustainable living and commerce and local green jobs.

Greenhouse Gas Inventory

Greenhouse gas emissions were only calculated for building utility use. EPA Portfolio Manager was used, see Appendix F. Total greenhouse gas emissions are 65 MtCO2e/year[3], down from 84

[2] *EPA Portfolio Manager is an interactive energy management tool that allows building owners/ operators to track and assess energy and water consumption in a secure online environment. This web-based tool is provided for free by ENERGY STAR®, a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy. http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager*

MtCO2e/year in 2001 and compared to a national average of 164 MtCO2e/year for similar building and operations. Based on floor area (24,000 ft^2) the emissions have remained the same over the last decade: 3 $kgCO2e/ft^2$/year, compared to a national average of 8 $kgCO2e/ft^2$/year.

Operations

Energy Use

1. Situation:
    a. Electricity is used for interior and exterior building lighting, air conditioning, utilizing nine split system units, appliances, office equipment and computers.
    b. Lighting is mostly by high performance T-8 lamps and ballasts, which were installed in existing fixtures in 2005, replacing T-12 higher wattage fixtures. This replacement cost, $15,645, was partially grant funded. See Appendix G.
    c. A gas-fired steam boiler heats the building. It is quite old (>50 years) and was converted from oil to gas shortly after the Library moved into the building (>30 years ago). (In 2007 it was discovered that the oil tank still contained oil, the oil and tank were removed at a cost of >$5000.)
    d. A forty-gallon hot water heater is fueled by natural gas. Electric pumps distribute the hot water in the building.
    e. Over the years the Library has inquired about renewable energy options with various experts.
    f. Programmable thermostats were installed within the last 3 years. According to the website http://www.greenandsave.com/master_roi_table.html, the return on investment for programmable thermostats is 156% with a payback period of 0.6 years, see Table 2.
2. Studies and Reports
    a. **NYSERDA Energy Audit:** An energy audit, funded by the New York State Energy Research and Development Authority (NYSERDA) was conducted in late summer 2011 by L & S Energy Services Inc. This report, dated 9/2011 is included in Appendix H. Based on one year of utility bills, the top energy consumers are space heating and hot water, lighting and air conditioning, see Figure 1 (and Figure 4, page S-5 in the audit report). For electricity, lighting uses the most amount of energy (44%), followed by air conditioning (39%) and equipment (17%), see Figure 3, page S-4. The two refrigerators, 27 computers and monitors and hot-water pumps are the biggest consumers of electricity, adding up to about 90%, see Figure 2. The elevator was not mentioned in the audit. The most costly annual uses of energy are space heating, lighting, and air conditioning, see Figure 3 below and audit report Figure 4, page S-5.
    b. Utility Bills: Annual costs for water, electricity and gas are summarized in Table 1.

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[3] *Carbon Dioxide Equivalent - A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential. Carbon dioxide equivalents are commonly expressed as "metric tons of carbon dioxide equivalents (MtCO2e).* http://www.epa.gov/climatechange/glossary.html#C

c. An earlier energy audit was conducted in the early 2000s. However, the actual report could not be located. The Library carried out many energy conservation measures since the initial audit, presumably based on the audit.

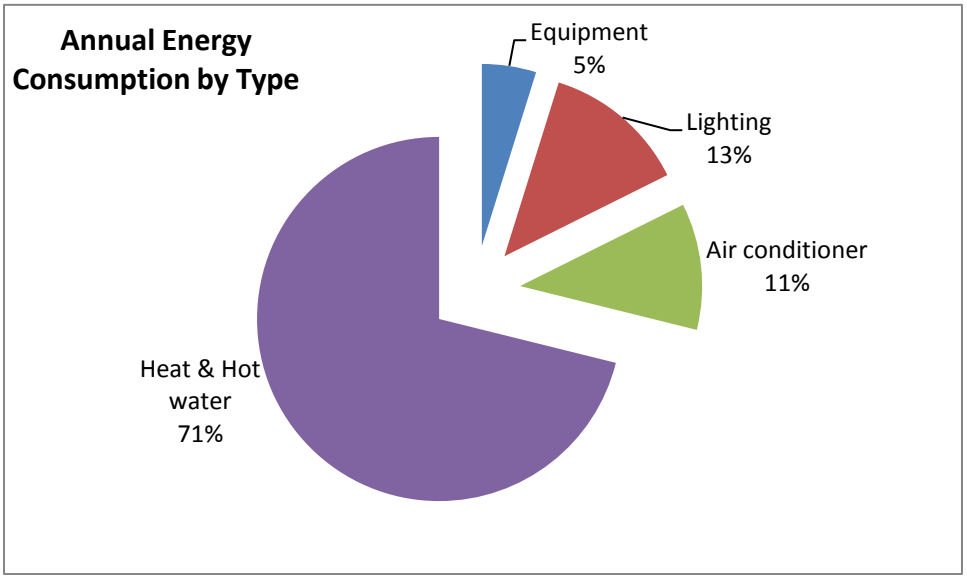


Figure 1

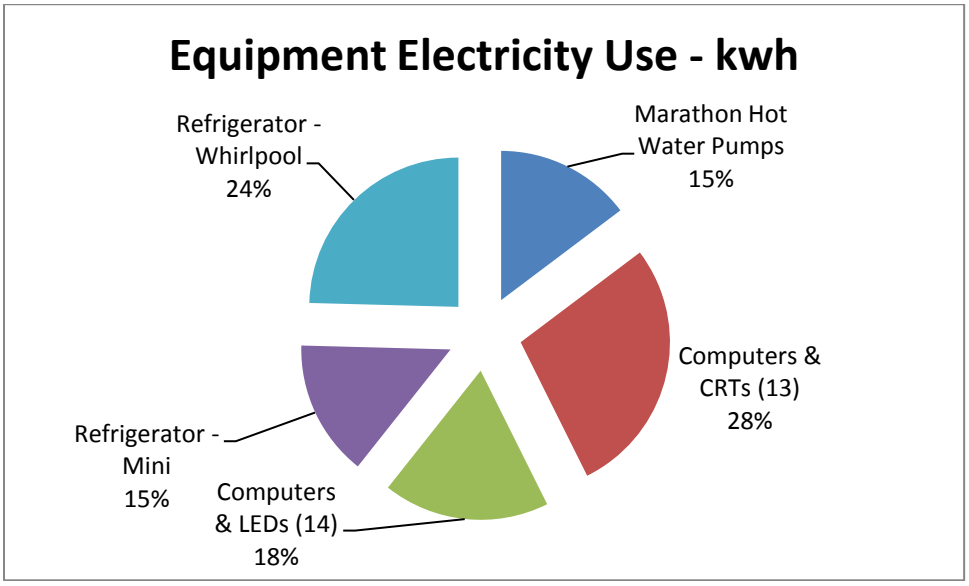


Figure 2

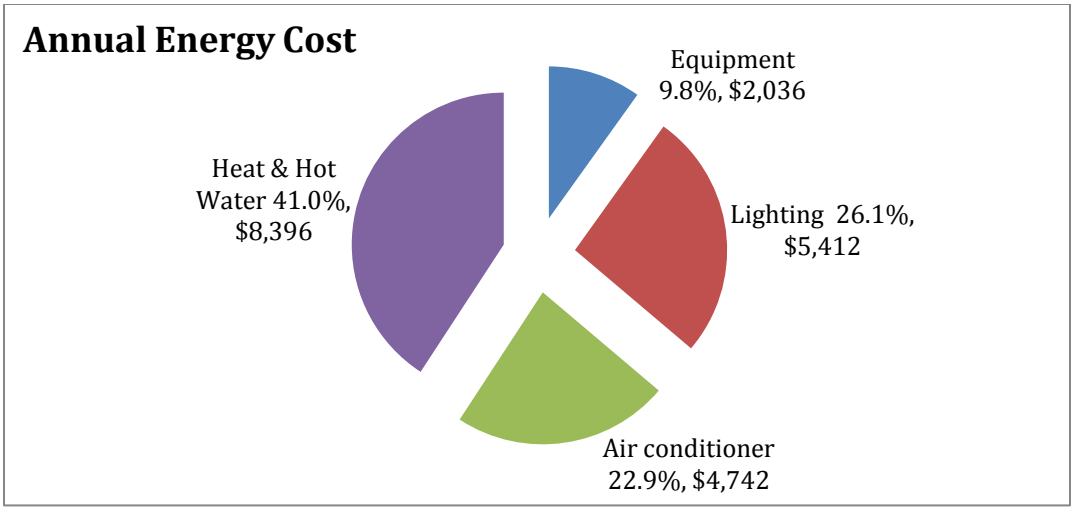


Figure 3

Table 1. Annual Utility Costs

Electricity Cost	Gas Cost	Water Cost
$12,200	$8,400	$1,480
June 10- May 11	June 10-May 11	Aug 09-May 10

d. Energy conserving measures: It is interesting to note that because of the earlier energy conserving measures, and the nature of the type of energy audit, very little was suggested for improvement. Below is a summary of the major recommendations (project costs and paybacks are listed in the original report, Appendix H):

i. Boiler Heat Timer: Installation of a heat timer on the gas fired boiler so it will operate more efficiently. This upgrade costs about $5000 and has a simple pay back of 5 years, the energy savings is estimated at $950/year.
A boiler heat timer is a device, which allows the duration of the steam supply to the building to be controlled in a cycle that is based on the outdoor temperature.

ii. Lighting: Conversion of lighting to more energy efficient: switch from incandescent lamps to compact fluorescent lamps in a few locations, mostly in the basement; upgrading the remaining T-12 lamps to T-8 lamps and ballasts by attrition.

iii. Occupancy Sensors: Installation of 12 occupancy sensors in restrooms and offices, that automatically turns off lights when no one is using the room.

- NYSERDA provides a financial incentive of $10 per sensor.

iv. Weather Stripping: Installation of weather stripping on exterior doors, primarily the rear emergency exit.

e. Historic energy use and cost: Utility bills, gas and electricity, for the years 2000-2011 were used to analyze historic energy cost and use. . and Figure 5 show the annual consumption over the last decade. The gas, electricity and water usage data are listed in Appendix D.

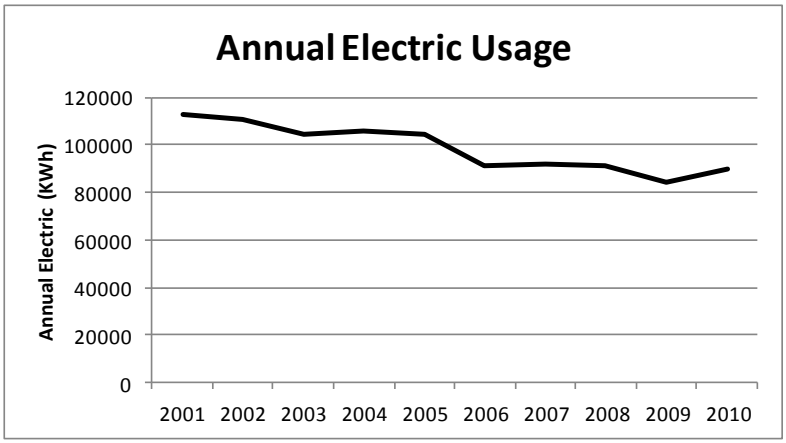


Figure 4. Annual electricity use for 2001 to 2010.

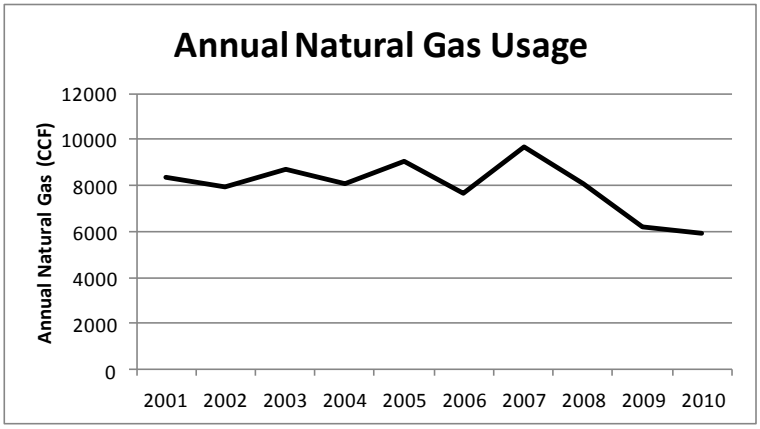


Figure 5. Annual natural gas usage 2001 to 2010

f. EPA Portfolio Manager: Committee members entered ten years of utility bills and information about the size and use of the rooms into the EPA Portfolio Manager. The results of this analysis show that the Library is performing well above the national average of similar buildings. Energy costs are \$0.84/ft^2/year compared to a national average for similar buildings of \$2.12/ft^2/year, see Figure 6. Greenhouse gas emissions are 3 $kgCO_2e/ft^2$/year, compared to a national average of 8 $kgCO_2e/ft^2$/year. The building emits 65 Metric Tonne (ton) Carbon Dioxide Equivalent see Figure 7 and Appendix F.

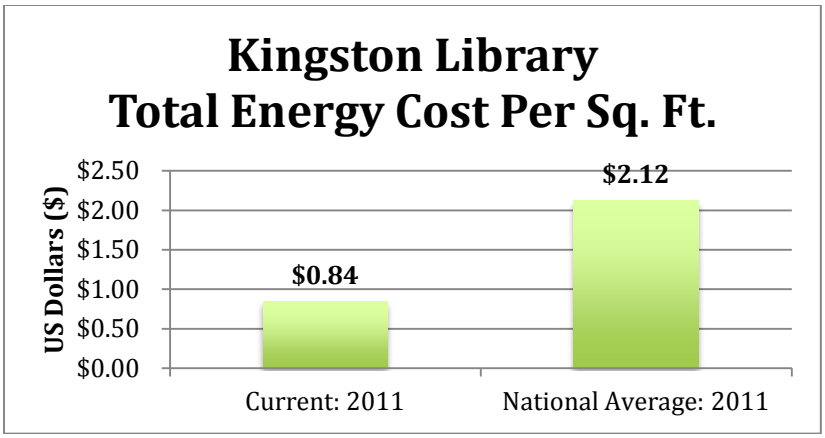


Figure 6

Please note the National Average represents the Commercial Buildings Energy Consumption Survey (CBECS) national average data for Library buildings. This building spends $1.28 less for energy per square foot than the CBECS national average for Library buildings.

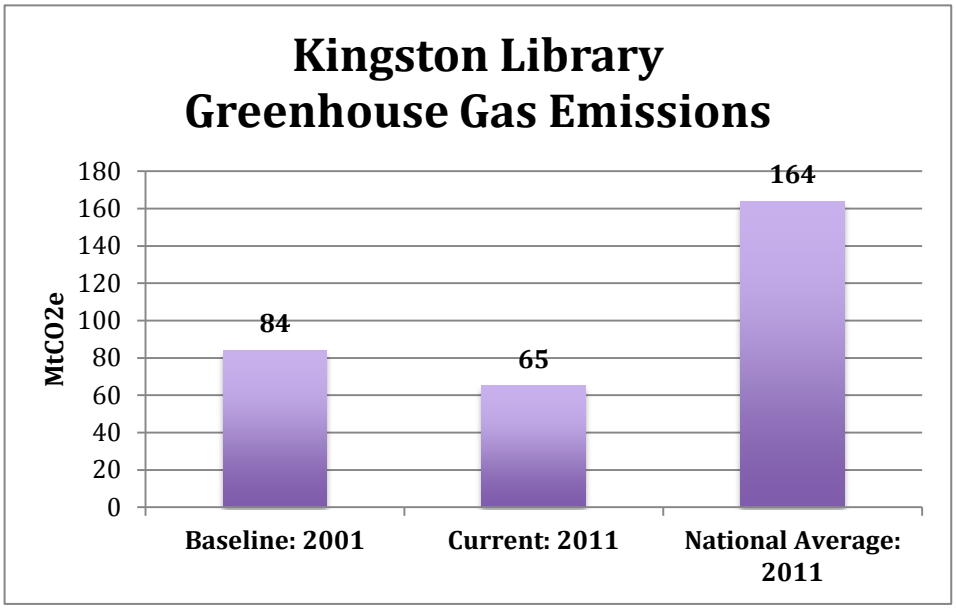


Figure 7

Please note the National Average represents the Commercial Buildings Energy Consumption Survey (CBECS) national average data for Library buildings. This building emits 99 $MtCO_2e$ less per year than the CBECS national average for Library buildings. MtCO2e stands for Metric Tonne (ton) Carbon Dioxide Equivalent. This is the standard measurement of the amount of CO2 emissions that are reduced or secluded from our environment.

3. Renewable Energy: Over the years, inquiries have been made in the past with various solar energy vendors about installation of photovoltaic system to supplement electricity use. Experts have told the Library that the roof is not well suited for such an installation. As technology and market changes there will be other options including solar thermal, geothermal heat utility, ice-based air conditioning, district energy, heating and cooling and building integrated photovoltaics. These options are aspirational, inspirational and innovative and some would include working with neighboring buildings such as Keegan Ales, 721, and former Gov. Clinton Market which houses People's Place and Michael's Candy. An ultimate goal would be to become energy positive, generating more than used.

4. Recommendations

Ongoing:

a. Monitor and evaluate progress: continue to collect and analyze data and use the EPA Portfolio Manager and other Energy Star tools.
b. Use Energy Star tools that help analyze whether energy projects are good investments, including, the Portfolio Manager, Target Finder, the Financial Value Calculator, the Building Upgrade Value Calculator, and the Cash Flow Opportunity Calculator.
c. Consider both the short-term payback and return on investment when evaluating projects. Table 2 from http://www.greenandsave.com/master_roi_table.html displays savings for common energy conserving measures.
d. Follow energy policy and funding opportunities.

Table 2 Payback and Return on Investment Examples

Energy Conservation Measures	Payback period	Added Cost	Annual Savings	10 Year Savings	Return on Investment
Programmable Thermostat	0.6	$115	$180	$1,800	156.50%
Standby Power Reduction	0.8	$20	$24	$240	120%
Compact Fluorescent Lighting	0.8	$60	$80	$800	133.30%

http://www.greenandsave.com/master_roi_table.html

Near term:

a. Investigate the feasibility of installing timers to shut off phantom current to computers and other equipment. According to the website http://www.greenandsave.com/master_roi_table.html , the return on investment for standby power reduction is 120% with a payback period of 0.8 years, see Table 2 above.
b. Encourage staff and patrons to use the stairs instead of the elevator by signage and directional arrows to the stairs.
c. Shade air conditioners with vegetation or fencing.
d. Keep refrigerators full. Consider unplugging community room refrigerator between events.
e. Establish policy to buy ENERGY STAR® appliances when replacement is needed.
f. Follow status of on-bill financing for institutions and businesses as part of Green Jobs Green NY and other financing mechanisms based on future savings.
g. Commission an evaluation of the boiler, checking efficiency, life expectancy and long terms costs compared to replacement with a new system. (See Appendix C and Overall Recommendations, page 4.)
h. Implement recommendations of the energy audit. Table 3 below shows the return on investment for these recommendations.
    i. Boiler Heat Timer: Installation of a heat timer on the gas fired boiler so it will operate more efficiently. This upgrade costs about $5000 and the energy savings is estimated at $950/year. (Simple Pay Back 5.3 years) [Note: this upgrade would only be completed if boiler is not replaced, based on evaluation above.]
    ii. Lighting: Conversion of lighting to more energy efficient: switch from incandescent lamps to compact fluorescent lamps in a few locations, mostly in the basement; upgrading the remaining T-12 lamps to T-8 lamps and ballasts by attrition. (Simple Payback 0.9 years)
    iii. Occupancy Sensors: Installation of 12 occupancy sensors in restrooms and offices, (automatically turn off lights when no one is in space). NYSERDA financial incentive $10 per sensor. (Simple Pay Back 5.4 years)
    iv. Weather Stripping: Installation of weather stripping on exterior doors. (Simple Pay Back 1.2 years)

Table 3 Calculation of Return on Investment for Library Energy Audit Suggestions

Calculation of Return on Investment for Library Energy Audit Suggestions	
Project Cost	$5,759
Annual cost savings	$1,872
Cost savings over life of retrofits (10 yrs)	$18,720
ROI for 10 year project ROI = (benefit - cost)/cost Assume a 10 year project life - i.e., retrofits will last 10 years before they are replaced	225%

Mid- Term

a. Review interior space utilization and also all the Library building systems (including HVAC) to maximize energy efficiency and conservation.

Long Term:

a. Buy *ENERGY STAR®* appliances when replacement is needed.
b. Replace hot water tank with tank-less water heater or solar thermal system when tank nears end of life.
c. Investigate the possibility of the purchasing electricity generated by renewable sources, even at higher rates than fossil fuel
d. Continue to investigate the feasibility of generating energy on- and off-site, including power purchase agreements

Water

1. Situation:

Water bills were examined for 2000- 2010, see

a. Table 4. Annual use is compared in Appendix D. The average water usage per quarter is 53 units. A unit is 748 gallons. The water rate structure is such that unit charges decrease with more usage. The average cost is $370/ quarter. Water bills include three costs: water usage, a fixed fixture charge of about $50/quarter and a sewer charge. The sewer rate is based on the unit of water consumed. The water and sewer rates have changed over the decade; no analysis has been done comparing rates. However, the sewer charge is generally equal to or more than the water charge. For example the May 2010 bill was Water: $135.50 Fixture: $54.45 Sewer: $140.10

Table 4 Average Water Use and Cost for from 2000-2010.

Average Water Use/Cost 2000-2010	Quarterly	Annual
Units used (1 unit = 748 gallons)	53	2012
Cost $	$370	$1475

b. Water production and wastewater treatment is a significant energy user. Energy usage and GHG emission calculations are the province of the Kingston Water Department and the wastewater treatment plant (Dept. of Public Works). The Library can both save money and reduce its GHG footprint by reducing water use.
c. Water use is limited to restrooms, toilets and sinks, the community kitchen sink and janitor's sink. There are low flow toilets in second floor staff restrooms and public restrooms. On the first floor, one of three restrooms has a low flow toilet. There are no low-flow or automatic on/off faucets.

2. Recommendations:
    a. Place "save water" reminders near all sinks.
    b. Repair leaky fixtures as problems arise.
    c. Replace old toilet fixtures as opportunity arises.
    d. Monitor and evaluate water use through water bills.

Solid Waste and Recycling

1. Situation: Source separation of recyclable material is a county and municipal law. Public recycling of paper and containers is promoted with special bins. Paper recycling is available for staff in work areas. Confidential papers are shredded and recycled. Bottle and can recycling is available in staff lunchroom. The Library has a contract with Waste Management Inc. for solid waste collection and disposal. Recycling (mixed paper, cardboard and containers) and yard waste are collected by the City. The heaviest discarded materials are books, magazines and newspapers. Books culled from the Library collection are sold through used book sales run by the Friends of Kingston Library. Donations are also accepted from the public, so the Library book sales serve as an outlet for reuse of books and other materials. Books that must be disposed of are recycled through the City. The Library has a policy on disposal of equipment and library materials.
2. Recommendations
    a. Signage and containers – Update regularly and check that collection containers are available in all spaces.
    b. Training – instruct new staff on recycling and reuse policies.
    c. Introduce a Sustainable Kitchen Practices Checklist for staff and outside groups, which cover recycling, waste minimization by use of washable cutlery and dishes, use of tap water rather than bottled water.

d. The policy on *Use of Meeting Rooms and Other Library Spaces* should be revised to indicate that the Library expects users of facilities to reduce, reuse and recycle and otherwise take responsibility for their garbage and includes mention of the Sustainable Kitchen Practices Checklist
e. Organics – A compost bin set up in the library garden could accept yard trimmings and organics from staff lunch. Staff and groups using rooms should be encouraged to take their organics home for composting.
f. Programming – Host events in cooperation with City of Kingston, Ulster County Resource Recovery Agency (UCRRA) and Cornell Cooperative Extension and other agencies on recycling, composting and reuse.
g. Encourage City of Kingston and UCRRA to set up collection of institutional organic waste for composting, which would include paper towel waste.
h. Monitoring and evaluation – monitor amount of trash and recycling and modify waste collection contract and policies as needed.

Stormwater

1. Situation:
    a. Run-off from the parking lot goes to street stormwater drains and is piped to Twalfskill Creek, which flows to Rondout Creek. There is a need to divert parking lot run-off so that it is absorbed on-site by "green infrastructure" and away from storm drains and ultimately the receiving water bodies.
    b. Roof-drains from the library roof are connected to the sanitary sewer system, which means that this stormwater is piped to the sewage treatment plant, even though separate stormwater sewers exist under the streets. There is a need to disconnect roof leaders from the sanitary sewer system and have stormwater absorbed on site by green-infrastructure and excess flow moving to storm drains.
    c. In spring 2010, the Library began working with green infrastructure experts, funded through a grant administered through the Hudson Valley Regional Council and including staff from Clearwater. This collaboration resulted in a design by Marcy Denker for a rain garden and other stormwater drainage features to divert stormwater. This design was used in 2011 in a grant proposal for funding through the Public Library Construction Grant Program, which resulted in a grant of $30,475.
    d. The Capital spending plan includes plans and funds for refurbishing the parking lot. The Library has hired a local engineering firm, Brinnier and Larios, to prepare bid documents for parking lot reconstruction, connection to stormwater sewers and green infrastructure. This work will be completed in spring 2012. [4]
2. Recommendations:
    a. Implement all green infrastructure design elements during parking lot reconstruction, including rain garden, working with Cornell Cooperative Extension

[4] While this Report was being put in final format, the Library installed a new parking lot, disconnected roof leaders from the sanitary sewer system and installed a rain garden and other infrastructure to manage stormwater, in the period from June to August 2012.

(CCE) on design and planting. Phase in other green infrastructure such as green roof on basement stairwell area as funding allows.

b. Implement programming: Work with Clearwater, Cornell Cooperative Extension, City, County and State agencies to showcase the green infrastructure. Submit description of project to Green Infrastructure Examples for Stormwater Management in the Hudson Valley.
c. Encourage City of Kingston to provide incentives or loans for other buildings to disconnect roof leaders from combined sewers.
d. Monitor and evaluate.

Grounds

1. Situation: The Library grounds are planted with a wide variety of trees, shrubs and perennials. The trees provide shade to the parking lot and surrounding sidewalks, helping to mitigate the heat island effect of urban areas. The plantings beautify the grounds and can serve as educational programming. There is a heavy infestation of invasive black swallowwort. A rain garden is planned for the southeast corner. An area with paving stones provides a picnic and meeting area.
2. Recommendations:
    a. Preserve plantings.
    b. Use permeable paving bricks for accents and upgrading of picnic area.
    c. Develop a landscape maintenance plan.
    d. Hire a professional landscape person to prune trees and shrubs and to train staff and volunteers.
    e. Form a garden committee.
    f. Use gardens and grounds as programming opportunities.

Sustainable Building Operations

1. Situation: The Library has made significant investments to improve facility operations while reducing energy expenses and environmental impacts. In its second life, the library is representative of the majority of older buildings in Kingston that are adapted for alternative uses. The Library could serve as a model and lend its experience to assist other building owners in adopting sustainable practices.
2. Recommendations
    a. Inform staff of this report, efforts to conserve energy and to operate the building sustainably.
    b. Adopt an aggressive sustainable building operations program modeled on the U.S. Green Building Council "LEED for Existing Building Operations and Maintenance (EBOM). The USGBC LEED-EB addresses a number of building systems including energy use, water use, and indoor air quality. The Library can begin to adhere to this program by adopting the following strategies:
        i.Follow U.S. EPA Energy Star Guidance for energy management (http: //www.energystar.gov/index.cfm?c=guidelines.guidelines_index)

ii. Follow U.S. EPA WaterSense "Best Management Practices for Federal Agencies" program (http://www.epa.gov/watersense/commercial/federal_agencies.html)

iii. Establish a written operations and maintenance documents for building mechanical equipment, including ventilation, heating and cooling equipment.

iv. LEED EBOM also requires implementation of green cleaning practices and procedures. As it relates to green cleaning chemical products, LEED-EBOM specifies that the product must meet the criteria of the Green Seal Standard for Institutional Cleaners (GS-37) (http://www.greenseal.org/)

v. Guidance available to the Library to meet these criteria include the following:

1. NYS Executive Order 134. On January 5, 2005, Governor Pataki issued Executive Order 134 that directs all state agencies to procure and use cleaning products that have "properties that minimize potential impacts to human health and the environment…." Kingston Library may use State green procurement guidance for product selection (see, https://greencleaning.ny.gov/)
2. The National Association of Counties has an online green purchasing tool kit for institutions: http://www.uscounties.org/GreenPurchasing/index.html

c. Monitor and evaluate, engage an intern to research and develop a cost-benefit analysis.

Preparing for Climate Change

1. Situation: The Library will be most affected by higher temperatures, drought and intense storms. Energy conserving measures such as window shades or drapery, high efficiency air conditioners, roof insulation and a white roof all help to keep the building cool. Trees provide shade and absorb water. Installation of green infrastructure features will manage stormwater run-off.
2. Recommendations
    a. Recognize importance and promote the use of the Library as a neighborhood cooling center.
    b. Preserve trees and plantings and install green infrastructure features
    c. Plan for higher air conditioning costs in the future.
    d. Consider climate change preparation in interior renovations and systems evaluation, capital projects and grounds and gardens
    e. Provide programming related to climate change preparation.

Community:

Transportation

1. Situation: Patrons and staff travel to the Library by car, bus, walking and bicycling. Parking is always an issue.
2. Recommendations
    a. Encourage carpooling and non-motorized transport among staff.
    b. Recommend facility users encourage car-pooling and non-motorized transport. This website has a tool for event ride sharing: http://www.rideshare.us
    c. Provide information on Library website on how to reach the Library by Citibus, UCAT and Trailways bus.
    d. Post signs in library thanking patrons for not leaving their vehicles idling.
    e. Provide adequate and convenient bicycle racks,
    f. Collaborate with other organizations for programming, including MetroPool, Kingston Complete Streets Advisory Council, Healthy Kingston for Kids and Bike Friendly Kingston.

Programming

1. Situation: The Library has partnered with other organizations to develop and organize programs focused on home energy efficiency, climate justice issues, Ride Share, Carbon Nation viewing, and Low Carbon Diet workshops. Community participation has varied, with low to moderate attendance.
2. Recommendations
    a. Partner with the City of Kingston, local organizations, and churches to conduct and publicize public programs.
    b. Survey patrons to identify areas of interest in sustainable programming.
    c. Seek funding to conduct and publicize workshops focused on raising awareness about sustainable practices.
    d. Run a series of workshops for businesses and landlords that focus on energy savings, economic benefits, and improved desirability of green properties.
    e. Run workshops for homeowners focusing on sustainable lawn and garden practices, household energy-saving improvements, renewable energy and other sustainable practices
    f. Hold a training for the Library Staff to inform them of this report and of sustainable practices that they can take part in:
        i. For Example: Challenge Trustees and Library Staff to have energy audits of their own homes and places of work and carry out the recommendations.
    g. Evaluate programming and offer new subjects and formats as needed.

Conclusion

This report has attempted to explain the present situation for the Library, discuss various data analyses and reports and give recommendations for achieving a more sustainable Library. Over the

last decade the Library has done much to conserve energy and operate sustainably. It has taken time and proved a worthy investment. Achieving more will take more effort, including behavior change and even policy change external to the Library. Some of the recommendations are simple and can be carried out as a matter of course by staff; some involve long term planning and/or capital expenditures. Especially for energy conservation measures, putting off an action is a decision to continue to pay higher utility bills. The recommendations cover all aspects of library operations and programming. The community involved in the changes and innovations includes library staff, board of trustees, committees, patrons, and the broader Kingston and Ulster county community and beyond.

APPENDIX A Energy Conservation Efforts over the Last Decade

In the early 2000s, the Library had an energy audit, conducted by Daylight Savings of Goshen. We have been unable to find this report. However many energy improvements were made based on the audit. The following list has been compiled from the collective memory, particular thanks to Marvin Eisenberg.

1. Insulation on attic floor
2. Dry pipes for sprinklers (maintained) to avoid heating attic
3. New roof with White roofing
4. Low energy fluorescent lighting
5. Balanced heating (7 zones)
6. Insulation of steam pipes
7. Insulation on boiler
8. Recycle stack heat
9. Low energy transfer windows and frames
10. Caulking and mortar repair around windows
11. Replacement of window air conditioners on second floor with central unit
12. Replacement of ancient low energy efficiency refrigerator in community room kitchen
13. Additional venetian blinds
14. Automatic inner entrance door
15. Programmable thermostats in each zone were installed since 2010.

DESIRED IMPROVEMENTS NOT MADE:

1. High efficiency boiler
2. High efficiency central air conditioning
3. Humidifier for heated air
4. Alternative energy sources for hot water and electricity

APPENDIX B

References and Resources

(For other references see the body of the report)

EPA Energy Star Portfolio Manager
http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

Green and Save: Return on Investment http://www.greenandsave.com/master_roi_table.html

NYSERDA http://www.nyserdasolutions.org

Zobler, Neil, and Robert Sauchelli (2009) Energy *Efficiency is a Good Business Decision, Especially Now!* An article written for publication of the National Electrical Manufacturers Association (NEMA) http://www.energystar.gov/ia/partners/spp_res/NEMA%20Article%20Feb%202009.pdf

APPENDIX C

Statement from Operations Committee on Library Systems Redesign

Gary Loeffel and Emilie Hauser May 1, 2012

The Operations Committee strongly recommends that the Board hire a professional architecture/engineering firm, at a near date, for an analysis and redesign of the spaces and systems of the library building. Despite the extensive--and expensive--steps that have been taken over the last decade to make the library building itself sound, the NYSERDA energy audit and the Climate Smart Committee's report on energy use clearly point to the need for additional steps that will improve the library's record for energy conservation and economical operation. It is also a fact that numerous building systems that serve the library are reaching the end of their useful life; for instance a cooling unit on the largest air conditioner) has recently had to be replaced. At least five of the other AC units are 15 years old. The Climate Smart Committee has recommended also that the boiler, over 50 years old, be tested, possibly upgraded as recommended by the NYSERDA audit, at a cost of more than $5,000, or possibly replaced, incurring major cost. The infrastructure of the library's technology operations is more than 15 years old. Though it has been added to and changed to accommodate vastly greater usage by both the public and the staff, it is overdue for an upgrade. At the same time, library functions and services are facing the challenge of upgrading to meet many new needs, relating to the collection, library services, and the comfort, safety and attractiveness of the facility for library patrons and staff. Only so many adjustments are possible within the spaces of the building as they are presently arranged.

The Operations Committee feels that the building's systems and its remodeling should be considered together, by professionals, working with the Library Director, the Board, and members of the public, who are our patrons. The firm should have the capacity to provide: interior redesign of Library with emphasis on function, energy conservation, efficiency and sustainability; evaluation of systems; analysis of how the systems and remodeling integrate with each other, and offers the best opportunity to obtain funding.

APPENDIX D Electricity, Gas and Water Usage

APPENDIX E Climate Smart Community Library Pledge (09/16/2010)

APPENDIX F Energy Star: Statement of Energy Performance (10/31/2011)

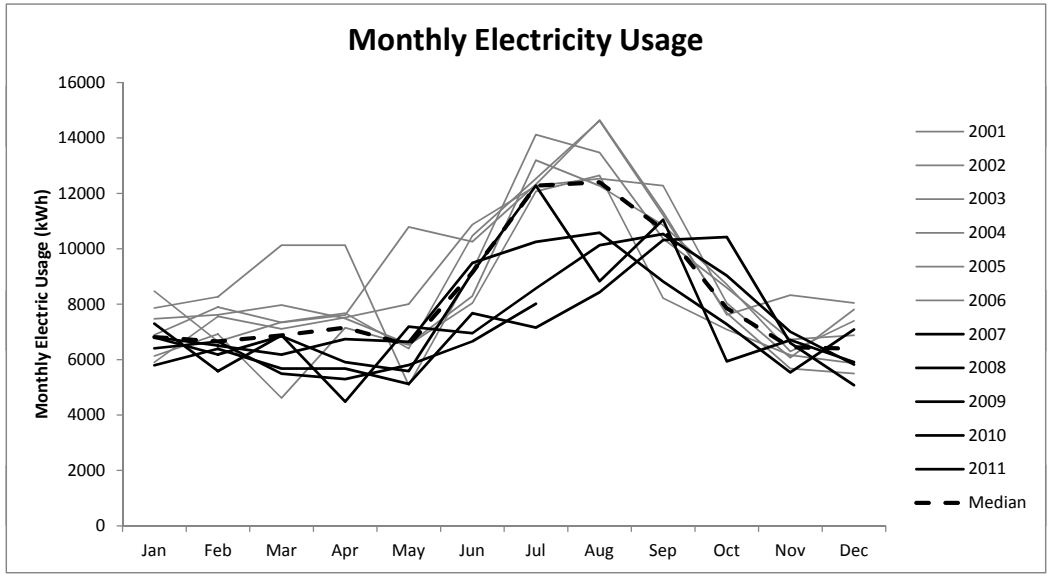
APPENDIX G Sass Lighting Upgrade (April 2005)

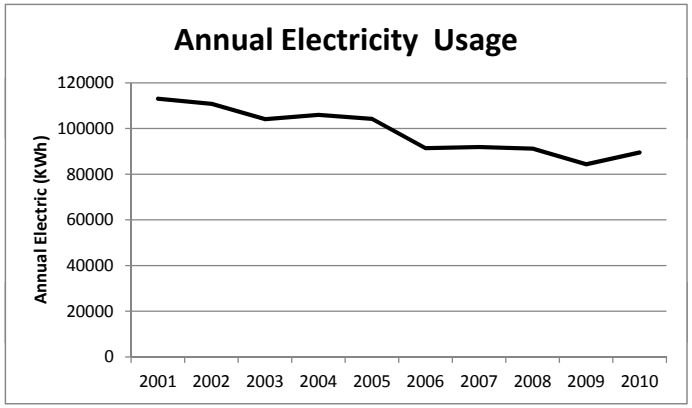
APPENDIX H L&S Energy Audit (September 2011)

Kingston Library Electricity Usage (kilowatt hours)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Year	1	2	3	4	5	6	7	8	9	10	11	12	Annual
2001	6894	7896	7342	7608	10788	10254	12323	14644	11326	7620	8329	8044	113068
2002	7862	8268	10127	10127	5080	9205	14118	13475	10364	8595	6726	6877	110824
2003	7473	7617	7968	7487	6560	8294	13196	12270	10851	8710	6296	7401	104123
2004	5903	7560	7108	7518	8007	10872	12274	12534	12278	8038	6071	7809	105972
2005	8470	6655	7352	7674	6399	10469	12534	14623	11216	7679	5677	5496	104244
2006	6130	6922	4614	7151	6530	8041	12071	12650	8216	7084	6165	5868	91442
2007	6815	6504	6182	6739	6641	9487	10250	10583	8819	7280	5537	7085	91922
2008	6800	6185	6847	5909	5587	9144	12276	8829	11045	5935	6703	5909	91169
2009	5795	6390	5676	5676	5121	7673	7155	8433	10315	10427	6604	5078	84343
2010	7300	5588	6878	4484	7190	6953	8572	10128	10536	9035	7008	5821	89493
2011	6407	6652	5492	5294	5802	6658	8015						
Median	6815	6655	6878	7151	6530	9144	12274	12402	10693.5	7858.5	6450	6393	

Chart below shows monthly electric use. The lighter grey lines show the years 2000-2006. The black solid lines shows 2007-2011. The dashed line shows the median of all years.

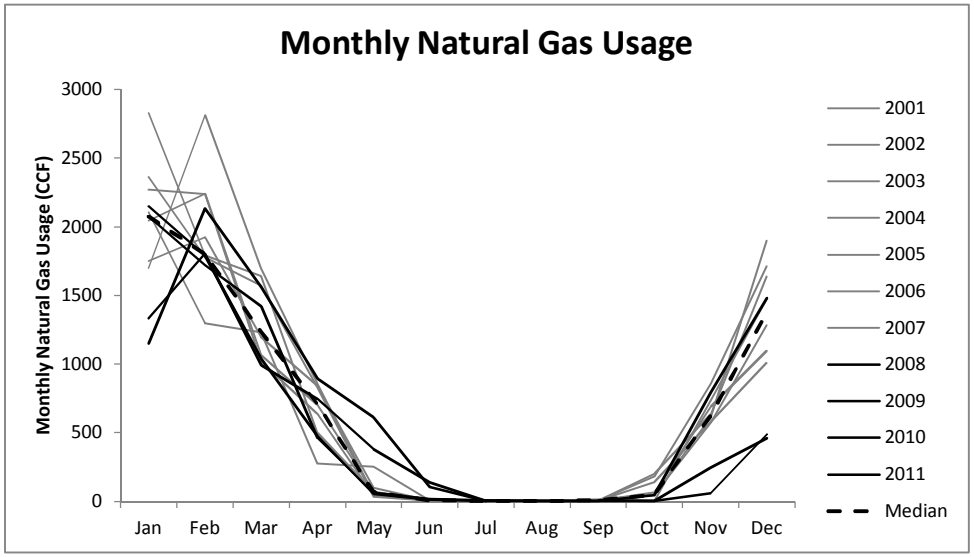


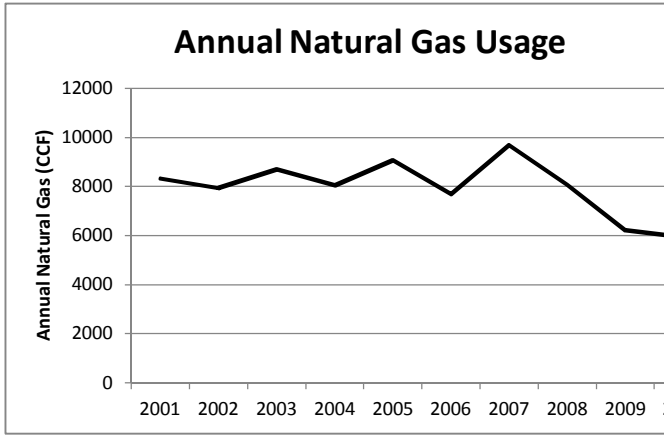


Kingston Library Natural Gas Usage (hundred cubic feet - ccf)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Year	1	2	3	4	5	6	7	8	9	10	11	12	
2001	2363	1779	1572	830	32	7	7	6	7	139	580	1006	8328
2002	2104	1297	1234	274	252	6	5	4	4	181	858	1713	7932
2003	2267	2236	1020	641	43	6	7	4	5	203	635	1636	8703
2004	2045	2239	1069	705	70	7	7	5	6	52	574	1282	8061
2005	2830	1793	1641	500	67	15	6	0	11	6	737	1472	9078
2006	1750	1922	1198	844	100	6	5	5	6	65	690	1098	7689
2007	1700	2811	1698	859	46	5	5	4	14	49	616	1898	9705
2008	2075	1721	1421	460	66	15	9	2	3	47	789	1479	8087
2009	2149	1788	1038	473	56	11	3		8	3	245	459	6233
2010	1331	1803	991	744	380	139	3	3	2	2	59	486	5943
2011	1148	2136	1559	895	615	105	3						
Median	2075	1803	1234	705	67	7	5	4	6	50.5	625.5	1377	

Chart below shows monthly natural gas use. The grey lines show the years 2000-2007. The black solid line shows 2008-2011. The dashed line shows the median of all years.

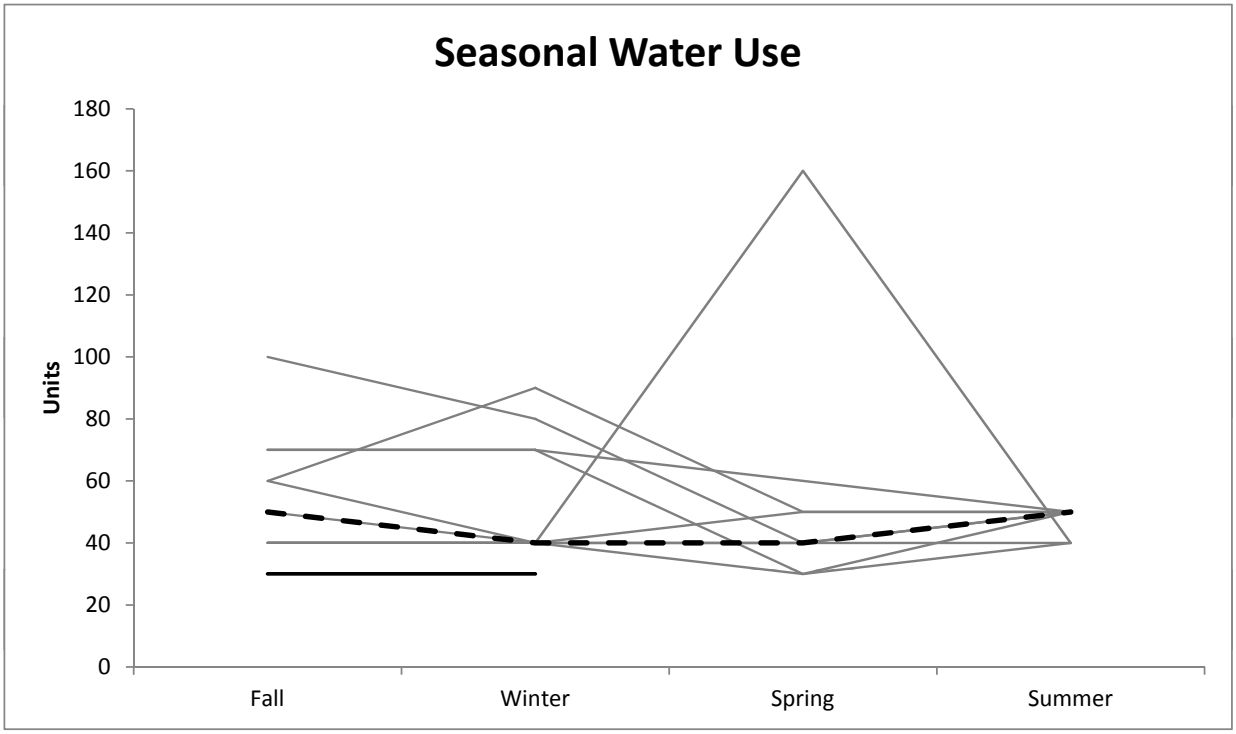




Kingston Library Water Utilities

Year	Fall	Winter	Spring	Summer
2000	100	80	40	40
2001	40	40	40	50
2002	40	40	40	50
2003	40	40	160	40
2004	50	40	50	50
2005	70	70	60	50
2006	60	90	50	50
2007	70	70	30	40
2008	60	40	30	50
2009	50	60	40	60
2010	30	30		
Median	50	40	40	50

Chart below shows seasonal water use. The grey lines show the years 2000-2009. The solid line shows 2010 (latest year with data available). The dashed line shows the median of all data. Fall = Jan/Feb bill; Winter = Apr/May bill; Spring=Jun/Jul bill; Summer=Oct/Nov bill.



Climate Smart Community Library Pledge

September 16, 2010 Trustee Paul Werbalowsky moved and Trustee Edwin Pell seconded that:

WHEREAS, the City of Kingston passed a Climate Smart, Green Jobs Pledge on October 6, 2009 and Kingston Library would like to show support for that Pledge and;
WHEREAS, the Board of Trustees of the Kingston Library understands that climate change poses a real and increasing threat to our local and global environments which is primarily due to the burning of fossil fuels; and

WHEREAS, the effects of climate change will endanger the world's infrastructure, economy and livelihoods; harm farms, orchards, ecological communities, including native fish and wildlife populations; spread invasive species and exotic diseases; reduce drinking water supplies and recreational opportunities; and pose health threats to our community's citizens; and

WHEREAS, we believe that our local response to climate change provides us with an unprecedented opportunity to save money, and to contribute to livable, energy-independent and secure communities, and vibrant innovation economies; and

WHEREAS, we believe the scale of greenhouse gas (GHG) emissions reductions required for climate stabilization will require sustained and substantial efforts; and

WHEREAS, we believe that even if emissions were dramatically reduced today, communities would still be required to adapt to the effects of climate change for decades to come,

WHEREAS, we understand that public libraries are good stewards of public dollars and therefore should investigate and invest in energy efficient cost saving option,

IT IS HEREBY RESOLVED that Kingston Library, in order to reduce greenhouse gas emissions and adapt to a changing climate will take certain steps.

1. Planning

- Set goals to reduce greenhouse gas (GHG) emissions and adapt to predicted climatic changes.
- Encourage stakeholder and public input by establishing an advisory committee to review the issues and propose a plan of action including facility operations and library programming. Recognize that climate mitigation and adaptation requires behavior change and actions by the Board, Director, staff and library patrons.
- Designate a joint staff-Board sub-committee who will oversee climate change initiatives and publicly report on progress.

- Work cooperatively with national, state and local initiatives, including the City of Kingston's Climate Smart Communities and Green Jobs Pledge, to ensure that efforts complement and reinforce one another.
- Integrate climate change considerations into library activities, policies and long term planning. Inform and inspire the public.

2. Library Facility Operations

- Gather data through an inventory of GHG gas emissions from electricity and natural gas usage, waste production, water use and other sources to establish baselines for Library operations. Set up a procedure to regularly collect data.
- Develop quantifiable interim GHG emission targets consistent with emission reduction goals such as Renewable Energy Task Force Plan (2008) goal of reducing electricity use by 15% from projected levels no later than 2015, NYS Governor's Executive Order 24, which creates a NYS goal to reduce NYS GHG emissions by 80% of 1990 levels by 2050 and NYS Governor's "45 by 15" initiative, which requires New York to meet 45 percent of its electricity needs through renewable energy and improved building energy efficiencies by 2015.

- Develop an emission reduction plan that details how to achieve the targets, and includes a schedule. The plan should address:
    - Energy conservation and efficiency retrofits
    - Renewable energy
    - Solid waste source reduction, reuse, recycling and other smart solid waste management practices
    - Water conservation
    - Actions that affect or influence the community
    - Purchasing policies for procuring climate smart goods and services.
- Carry out plans to reduce emissions, evaluate progress and make changes as required.

3. Library Programs

- Integrate climate change actions into library programs to inspire and engage patrons and the community.
- Provide opportunities to support community climate change mitigation and adaptation actions and a green innovative economy by providing climate-change related library materials, programming and other resources that will help community businesses and residents learn about climate protection, sustainability, and environmental goods and services.
- Lead by example, by highlighting the Library's commitment to reducing energy use, saving tax dollars, and adapting to changing conditions. Report GHG emissions and targets to Library patrons and constituents.
- Demonstrate the benefits of recycling, water conservation, stormwater management, energy savings, energy efficiency, and renewable energy projects by regularly communicating goals and progress to patrons and stakeholders.
- Provide opportunities for the community to reduce their carbon footprint such as encouraging walking, bicycling, carpooling, and public transit for employees and patrons or by discouraging vehicle idling in the parking lot.
- Compare successes, cooperate and collaborate with community and neighboring library's efforts to redirect less-effective actions and amplify positive results.

4. Adaptation to Unavoidable Climate Change

- Consider the risks and the Library's vulnerability to unavoidable climate change and factor them into long-term decision-making. Climate change impacts that could affect the Library include increased stormwater and flooding, drought, and extreme and prolonged summer temperatures.
- Use guidance and recommendations from NYS Climate Action Plan and other resources.

5. An Evolving and Adaptive Process

- Acknowledge that research and policy on climate protection are constantly improving and evolving.
- Be willing to consider new ideas and commit to update plans and policies as needed.
- Monitor and evaluate progress and make changes as warranted.

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Kingston Library

Building ID: 2813756
For 12-month Period Ending: June 30, 2011[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 31, 2011

Facility
Kingston Library
55 Franklin St
Kingston, NY 12401

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1974
Gross Floor Area (ft²): 24,652

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	295,952
Natural Gas (kBtu)[4]	721,623
Total Energy (kBtu)	1,017,575

Energy Intensity[5]

Site (kBtu/ft²/yr)	41
Source (kBtu/ft²/yr)	71

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	65

Electric Distribution Utility
Central Hudson Gas & Electric Corp [CH Energy Group Inc]

National Average Comparison

National Average Site EUI	104
National Average Source EUI	246
% Difference from National Average Source EUI	-71%
Building Type	Library

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Certifying Professional
N/A

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Kingston Library
55 Franklin St
Kingston, NY 12401

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Kingston Library	
Gross Floor Area Excluding Parking: (ft²)	24,652
Year Built	1974
For 12-month Evaluation Period Ending Date:	June 30, 2011

Facility Space Use Summary

Basement	
Space Type	Other - Library
Gross Floor Area(ft²)	8,217
Number of PCs°	0
Weekly operating hours°	0
Workers on Main Shift°	0

Parking	
Space Type	Parking
Gross Floor Area(ft²)	26,000
Enclosed Floor Area	0
Non-Enclosed Floor Area (w/roof)	0
Open Floor Area (w/o roof)	26,000
Weekly Hours of Access	39

Library	
Space Type	Other - Library
Gross Floor Area(ft²)	16,435
Number of PCs°	27
Weekly operating hours°	39
Workers on Main Shift°	5

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 06/30/2011)	**Baseline** (Ending Date 11/30/2001)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	41	53	6	N/A	104
Source (kBtu/ft²)	71	91	11	N/A	246
Energy Cost					
$/year	$ 20,619.01	$ 17,662.15	$ 3,071.87	N/A	$ 51,947.12
$/ft²/year	$ 0.84	$ 0.72	$ 0.13	N/A	$ 2.12
Greenhouse Gas Emissions					
$MtCO_2e$/year	65	84	10	N/A	164
$kgCO_2e$/ft²/year	3	3	0	N/A	8

More than 50% of your building is defined as Library. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Library. This building uses X% less energy per square foot than the CBECS national average for Library.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

PROPOSAL

J & J SASS ELECTRIC, INC.
ELECTRICAL / COMMUNICATIONS CONTRACTORS
30 Grand St. - P.O. Box 1910
KINGSTON, NEW YORK 12402
(845) 331-8666 FAX (845) 331-3176

DATE: 11-22-04

PROPOSAL SUBMITTED TO:

Kingston Area Library
55 Franklin Street
Kingston, NY 12401

ATTN.: Bruce

JOB NAME: Install new ballast and lamps

Provide Labor and Material necessary to do the following Electrical work:

First and Second Floor

1. Install new T8 ballast and lamps for 102, 1x4 lights.
2. Install new T8 ballast and lamps for 8, 1x8 pendent lights.
3. Install new T8 ballast and lamps for 3, 2x2 lights.
4. Install new T8 ballast and lamps for 7, 2 foot lights.
5. Install new T8 ballast and lamps for 64, 2x4 lights.
6. Install 7, new LED type exit lights.
7. Install 11, new 18 watt compact fluorescent lamps.
8. Install 5, new 23 watt compact fluorescent lamps.
9. Sales Tax not included.

Price $ 12,960.00

Basement

1. Install new T8 ballast and lamps for 13, 8 foot lights.
2. Install new T8 ballast and lamps for 9, 4 foot lights.
3. Install 4, new 2 lamp, 4 foot, T8 lights with lamps.
4. Tie in 4 new lights to existing circuit and switch.
5. Sales Tax not included.

Price $ 2,685.00

Note: If sockets need to be replaced add $ 25.00 per socket.
If lenses need to be replaced add $ 43.00 each.

We Propose hereby to furnish material and labor - complete in accordance with above specifications, for the sum of:

Fifteen Thousand – Six Hundred – Forty - Five and 00/100----------($ 15,645.00)

Payment to be made as follows:

Authorized

Signature James J. Sass Jr.

Note: 30 day limit on proposal

Acceptance of Proposal-The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work specified. Payment will be made as outlined above.

Signature---------- Bruce J. George Library Director

Date of Acceptance:---------4/13/05

Signature----------

JIM/QUOTES/KGNLIB7

nyserda
Energy. Innovation. Solutions.

ENERGY AUDIT PROGRAM

Energy Audit Report

Kingston Library

Kingston, NY

Audit No: ARRA51

Prepared By:

L&S Energy Services, Inc.
58 Clifton Country Road
Suite 203
Clifton Park, NY 12065

NYSERDA Contract #9849
September 2011

L&S Energy Services, Inc.

Notice

This report was prepared by L&S Energy Services, Inc. in the course of performing work contracted for and sponsored by the New York State Energy Research and Development Authority (hereafter "NYSERDA"). The opinions expressed in this report do not necessarily reflect those of NYSERDA or the State of New York, and reference to any specific product, service, process or method does not constitute an implied or expressed recommendation or endorsement of it.

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ABSTRACT

The purpose of the study was to investigate and report on the effects of installing various energy conservation measures for a library. An on-site visit was conducted by an experienced energy auditor familiar with this type of facility. Data was gathered during the site survey through visual inspections of building equipment and review of utility bills.

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SUMMARY

A summary of the recommended energy conservation measures with payback periods of less than 10 years is shown in Figure 1. If all of the recommended items were implemented, the total savings would be $1,872 for a overall payback of 3.1 years.

Some of the measures are eligible for Existing Facilities Program incentives totaling $120 as shown on Figure 1. The incentives for the Existing Facilities Program were estimated using the Pre-Qualified forms, which have a rebate per eligible item. These incentives could reduce the installed cost to $5,759 and the payback would be reduced to 3.1 years. Figure 2 shows ten year cash flow analyses, with and without financing.

Figures 3 and 4 show how the building uses energy. Figure 3 is by energy use and Figure 4 is by energy cost. Figure 5 is a summary of equipment and estimated run hours. Figure 6 is a monthly energy use summary for electricity. Figure 7 is a monthly energy use summary for natural gas.

Kingston Library
Kingston, NY

FIGURE 1 - PROJECT COST, ANNUAL SAVINGS AND PAYBACK SUMMARY

ECM #	ECM Code	Energy Conservation Measure (ECM) Description	Measure Type	Project Cost ($)	Annual Cost Savings ($)	Electric Cost Savings ($)	Fuel Cost Savings ($)	Water Cost Savings ($)	Demand Savings (kW)	Energy Savings (kWh)	Fuel Savings (MBTUs)	Water Savings (Mgal)	Simple Payback (Years)	NYSERDA Incentive ($)	Revised Project Cost ($)	Revised Payback (Years)
1	L3	Upgrade T-12 and T-8 With High Performance T-8 - By Attrition	Lighting	$0	$710	$850	-$140	$0	3.1	5,534	-11.6	0	Immediate	$0	$0	Immediate
2	L4	Replace Incandescent Lighting With CFLs	Lighting	$34	$36	$38	-$2	$0	0.3	71	-0.1	0	0.9	$0	$34	0.9
3	C1	Install Occupancy Sensors	Controls	$780	$123	$153	-$30	$0	0.4	1,173	-2.5	0	6.3	$120	$660	5.4
4	C4	Install Heat Timer	Controls	$5,000	$949	$0	$949	$0	0.0	0	79.0	0	5.3	$0	$5,000	5.3
5	B6	Weatherstrip Doors	Envelope	$65	$54	$0	$54	$0	0.0	0	4.5	0	1.2	$0	$65	1.2
Project Totals				$5,879	$1,872	$1,041	$831	$0	3.8	6,778	69.3	0	3.1	$120	$5,759	3.1

Region #	Customer #	Utility Name	Measure Type	Fuel Type	Project Cost ($)	Annual Savings ($)	Electric Cost Savings ($)	Fuel Cost Savings ($)	Water Cost Savings ($)	Demand Savings (kW)	Energy Savings (kWh)	Fuel Savings (MBTUs)	Water Savings (Mgal)	Simple Payback (Years)	NYSERDA Incentive ($)	Revised Project Cost ($)	Revised Payback (Years)
2	ARRA51	Central Hudson	Lighting	Gas	$34	$746	$888	-$142	$0	3.4	5,605	-11.7	0	Immediate	$0	$34	Immediate
2	ARRA51	Central Hudson	HVAC	Gas	$0	$0	$0	$0	$0	0.0	0	0.0	0		$0	$0	
2	ARRA51	Central Hudson	Controls	Gas	$5,780	$1,072	$153	$919	$0	0.4	1,173	76.5	0	5.4	$120	$5,660	5.3
2	ARRA51	Central Hudson	Envelope	Gas	$65	$54	$0	$54	$0	0.0	0	4.5	0	1.2	$0	$65	1.2
2	ARRA51	Central Hudson	Hot Water	Gas	$0	$0	$0	$0	$0	0.0	0	0.0	0		$0	$0	
2	ARRA51	Central Hudson	Custom	Gas	$0	$0	$0	$0	$0	0.0	0	0.0	0		$0	$0	
2	ARRA51	Central Hudson	Kitchen	Gas	$0	$0	$0	$0	$0	0.0	0	0.0	0		$0	$0	
Project Totals					$5,879	$1,872	$1,041	$831	$0	3.8	6,778	69.3	0	3.1	$120	$5,759	3.1

A total of five energy conservation measures have been recommended for implementation. They have an installed capital cost of $5,879 and an annual savings of $1,872 for a payback of 3.1 years. Incentives are available through the Existing Facilities Program totaling $120. These incentives will reduce the installed cost to $5,759 and the payback would be reduced to 3.1 years.

Annual Emissions Savings

Fuel Type	NOx (LBS)	SO2 (LBS)	CO2 (LBS)
Electricity	9	20	5,978
Natural Gas	7	0	8,108
Oil	0	0	0
Propane	0	0	0
Other: Other Fuel Type Name	0	0	0
Total	16	20	14,086

Kingston Library
Kingston, NY

Figure 2 - Ten Year Cashflow Projection

Project Cost	$5,879	Current Interest Rate	8.5%
Final Project Cost	$5,879	Net Interest	8.5%
Annual Energy Cost Savings	$1,872		
Final Annual Energy Cost Savings	$1,872	Utility Cost Annual Escalation	3.0%

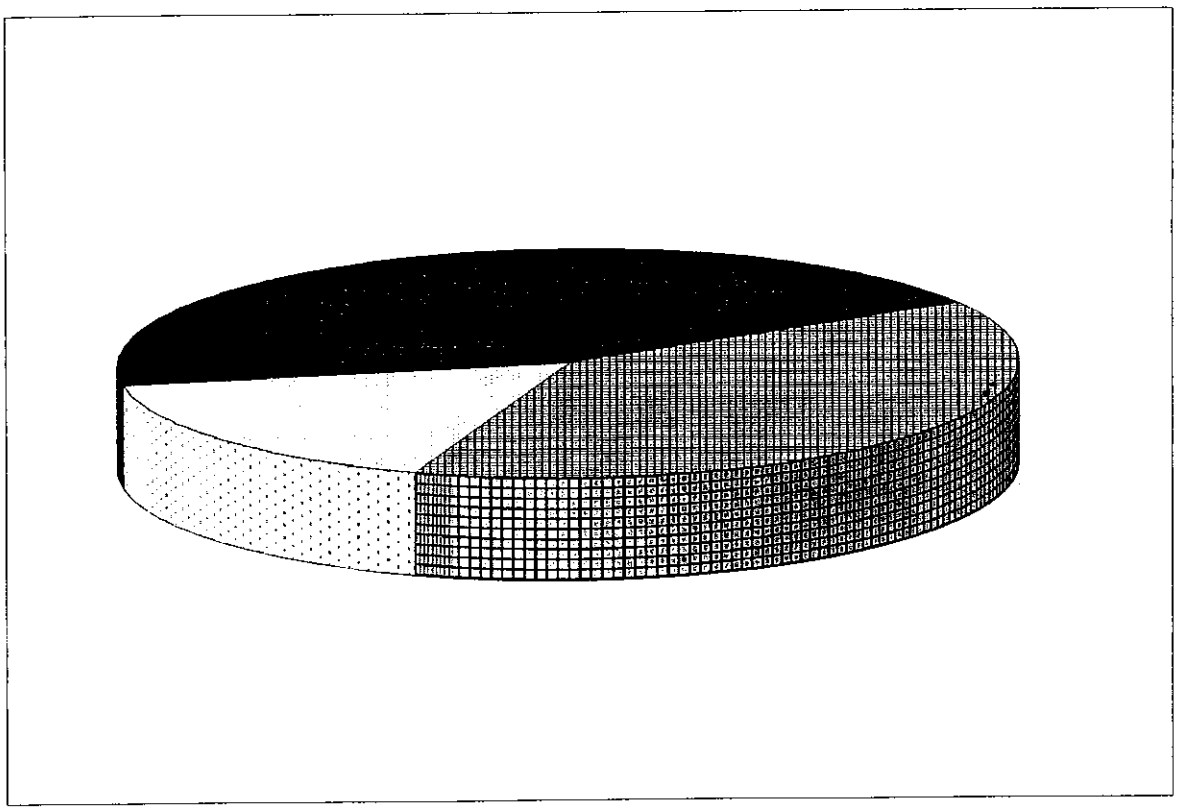
Year	1	2	3	4	5	6	7	8	9	10
Option 1										
No Loan										
Utility Cost Savings	$1,872.00	$1,928.16	$1,986.00	$2,045.58	$2,106.95	$2,170.16	$2,235.27	$2,302.32	$2,371.39	$2,442.54
Cash at Year End	-$4,007.00	-$2,078.84	-$92.84	$1,952.75	$4,059.70	$6,229.86	$8,465.13	$10,767.45	$13,138.85	$15,581.38
Option 2										
Bank Loan										
Loan Payments	$874.69	$874.69	$874.69	$874.69	$874.69	$874.69	$874.69	$874.69	$874.69	$874.69
Loan Balance	$5,291.10	$4,703.20	$4,115.30	$3,527.40	$2,939.50	$2,351.60	$1,763.70	$1,175.80	$587.90	$0.00
Utility Cost Savings	$1,872.00	$1,928.16	$1,986.00	$2,045.58	$2,106.95	$2,170.16	$2,235.27	$2,302.32	$2,371.39	$2,442.54
Cash at Year End	$997.31	$2,050.77	$3,162.08	$4,332.97	$5,565.23	$6,860.70	$8,221.27	$9,648.90	$11,145.60	$12,713.44

The chart shows two examples of cash flow analysis for a ten year period. The cost of energy is escalated by 3.0% per year. In the first example, owner financing is used. In the second example, 10 year financing is used with an 8.5% interest loan.

Kingston Library

Kingston, NY

Annual Energy Consumption
(Electricity - kWh/Yr)



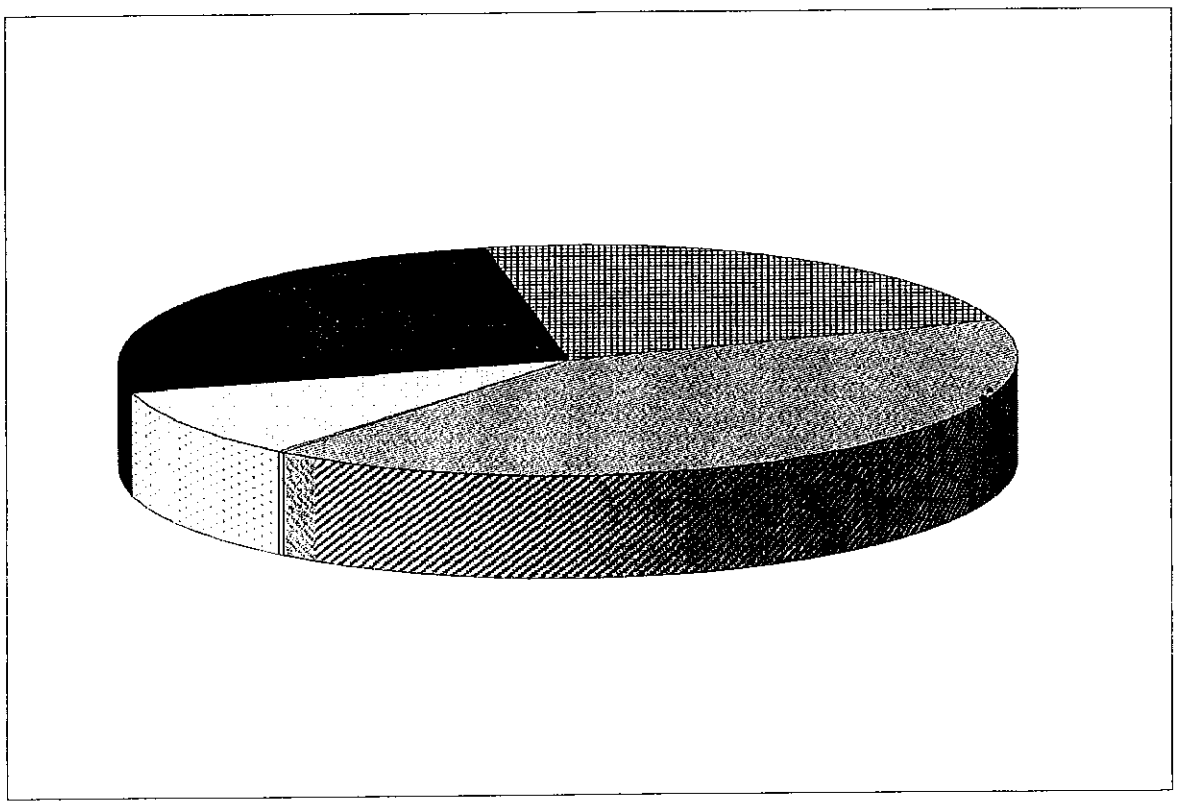
Legend		
	16.7%	Equipment
	44.4%	Lighting
	38.9%	AC

Figure 3

Kingston Library

Kingston, NY

Annual Energy Cost
($/Yr)



Legend		
	9.8%	Equipment
	26.1%	Lighting
	22.9%	AC
	41.0%	Space Heating
	0.2%	DHW

Figure 4

Kingston Library
Kingston, NY

Figure 5

Equipment Inventory

Lighting

Area	Quantity	Fixture Desc	Watts/fixture	Annual Hours	Annual kWhs	
Boiler Room	2	1I100	100	100	20	
Basement Book Storage Area	5	2F96T12	172	300	258	Surface
Basement Book Storage Area	5	2F40T12	92	300	138	Surface
Basement Book Storage Area	4	4F40T12	184	300	221	Surface
Basement Book Storage Area	1	1I200	200	300	60	
Main Entrance	13	2F32T8	60	2,450	1,911	Surface
Main Entrance	1	2LED2	3.8	8,760	33	
First Floor Northeast	24	2F32T8	60	2,450	3,528	Surface
First Floor Hallway	2	2F32T8U	60	2,450	294	Troffer
First Floor Restroom #1	2	1F17T8	17	918	31	Surface
First Floor Restroom #2	2	1F17T8	17	918	31	Surface
First Floor Restroom #3	2	1F17T8	17	918	31	Surface
First Floor Non-Fiction Section	12	2F32T8	60	2,450	1,764	Surface
First Floor Southwest	12	2F32T8	60	2,450	1,764	Surface
Local History Room	9	1CF23	23	500	104	
First Floor Central Area	22	2F32T8	60	2,450	3,234	Surface
Rear Stairwell	1	2F32T8	60	2,450	147	Surface
First Floor Northwest Room	24	2F32T8	60	2,450	3,528	Surface
Front Desk Area	4	2F32T8	60	2,450	588	Surface
First Floor Rear Office	2	3F32T8	90	2,450	441	Troffer
Reference Room	8	1F32T8	30	2,450	588	Pendant
Reference Room	21	2F32T8	60	2,450	3,087	Surface
Outside	3	1MH250	285	3,650	3,121	
Outside	1	1CF23	23	1,020	23	
Front Stairwell	1	2F32T8	60	2,450	147	Surface
Second Floor Northeast Room	1	1CF23	23	1,020	23	
Second Floor Northeast Room	15	3F32T8	90	1,020	1,377	Troffer
Tutoring Room	2	3F32T8	90	1,020	184	Troffer
Second Floor Hall	4	2F32T8	60	2,450	588	Surface
Second Floor Hall	2	4F32T8	120	2,450	588	Troffer
Second Floor Hall	4	2F32T8	60	2,450	588	Surface
Second Floor Hall	2	1CF23	23	2,450	113	
Second Floor Hall	2	2LED2	3.8	8,760	67	
Second Floor Main Room	34	3F32T8	90	2,250	6,885	Troffer
Second Floor Office Hallway	3	2F32T8U	60	2,450	441	Troffer
Office #1	3	3F32T8	90	2,450	662	Troffer
Office Restroom #1	1	2F20T12	40	918	37	Surface
Office Restroom #2	1	2F20T12	40	918	37	Surface
Office Area Break Room	2	3F32T8	90	1,000	180	Troffer
Second Floor Tech Office	2	3F32T8	90	2,450	441	Troffer
Director's Office	2	3F32T8	90	2,450	441	Troffer
Second Floor Lunch Room	3	2F32T8	60	1,000	180	Troffer
Second Floor Restroom #1	2	1CF15	15	918	28	
Second Floor Restroom #2	2	1CF15	15	918	28	
Second Floor Kitchen	2	2F32T8	60	250	30	Surface
					0	
Total	272				38,008	

Kingston Library
Kingston, NY

Figure 5

Equipment Inventory

Heating

Unit	Quantity	Input btuh	Output mbtu/h	Annual therms	Type
HB Smith 350 Mills	1	1,800,000	1,544		85% Efficient Gas-Fired Boiler
					(steam)
Total	1			6,959	

Cooling (HVAC)

Unit	Type	Quantity	Capacity Tons	Estimated EER	Consumption kWhs
Lennox HS29-036-13Y	Split System	2	3	13	4,431
Lennox HS29-036-13Y	Split System	6	5	13	22,154
Lennox LSA090C-1Y	Split System	1	7	10	6,720
Total		9			33,305

Water Heating (Gas)

Unit	Quantity	Input btu/h	Capacity Gallons	Standby therms	Consumption therms	Total therms	Type
Bradford White	1	40,000	40				Gas-Fired
Total	1					35	

Windows

Area	Quantity	Type	Height (in)	Width (in)	Area (sq ft)	Action	
Front Entrance	1	Single Pane	20	74	10		
First Floor North	4	Double Hung Double Pane	86	39	93		
First Floor North	3	Double Hung Double Pane	72	36	54		
Second Floor North	6	Double Hung Double Pane	86	39	140		
Second Floor North	3	Double Hung Double Pane	72	36	54		
First Floor Rear	6	Double Hung Double Pane	86	39	140		
Second Floor Rear	6	Double Hung Double Pane	72	36	108		
Second Floor Rear	2	Double Hung Double Pane	72	18	18		
First Floor South	7	Double Hung Double Pane	86	39	163		
First Floor South	3	Double Hung Double Pane	72	36	54		
Second Floor South	7	Double Hung Double Pane	86	39	163		
First Floor South	3	Double Hung Double Pane	72	36	54		
First Floor Front	7	Double Hung Double Pane	86	39	163		
Second Floor Front	7	Double Hung Double Pane	86	39	163		
Second Floor Front	2	Double Hung Double Pane	72	18	18		
					0		
Total	67				1,395		

Doors

Area	Quantity	Type	Height (in)	Width (in)	Area (sq ft)	Action
Front Entrance	1	Full Glass Single Pane Double Door	83	74	43	
Rear Entrance	1	Half Glass Double Pane Double Door	83	72	42	Replace Weather Strip
					0	
Total	2				84	

Auxiliary Equipment

Unit	Quantity	horsepower	amps	volts	watts	hours	kWh
Marathon Hot Water Pumps	2	0.33	3	120	360	1,460	1,050
Computer with CRT Monitor	13		1.3	120	150	1,020	1,989
Computer with LCD Monitor	14		0.8	120	90	1,020	1,285
HP Laserjet 3600	1		6	120	700	5	4
Cannon Fax Machine L90	1		5	120	600	5	3
HP Laserjet P2015	1		6	120	700	5	4
Fellowes Document Shredder PS60	1		4	120	450	5	2
Toshiba Studio 2032 MFC	1		13	120	1,500	5	8
Dayton Microwave	1		8	120	1,000	7	7
Summit Mini Refrigerator	1	0.30	3	120	360	2,920	1,051
Bunn Coffee Maker	1		7	120	800	100	80
Hamilton Beach Toaster	1		7	120	800	5	4
19" Television	1		1.7	120	200	40	8
Samsung Copier	1		6	120	700	5	4
Whirlpool Refigerator	1	0.50	5	120	600	2,920	1,752
Electric Oven	1		33	120	4,000	6	24
Total	42						7,275

Kingston Library
Kingston, NY

FIGURE 6 - HISTORICAL ELECTRIC BILLS

Utility Name: Central Hudson Gas & Electric
Account #: 3620-0940-00-9
Rate Class: Non-Residential

Start Billing Date	End Billing Date	Billing Days	Energy Usage (kWh)	Electric Energy Costs ($)	Maximum Demand Usage (kW)	Demand Cost ($)	Total Energy Cost ($)	Average Energy Cost ($/kWh)
06/16/2010	07/15/2010	29	10,128	$1,011.02	60.40	$483.20	$1,494.22	$0.15
07/16/2010	08/13/2010	29	10,535	$1,272.57	54.80	$438.40	$1,710.97	$0.16
08/14/2010	09/14/2010	32	9,035	$979.53	55.00	$440.00	$1,419.53	$0.16
09/15/2010	10/14/2010	30	7,008	$640.91	47.30	$378.40	$1,019.31	$0.15
10/15/2010	11/12/2010	29	5,821	$506.27	29.20	$233.60	$739.87	$0.13
11/13/2010	12/15/2010	33	5,407	$537.21	25.10	$200.80	$738.01	$0.14
12/16/2010	01/24/2011	40	6,652	$775.95	23.70	$200.80	$976.75	$0.15
01/25/2011	02/22/2011	29	5,492	$650.03	24.30	$194.40	$844.43	$0.15
02/23/2011	03/21/2011	27	5,294	$478.93	22.70	$181.60	$660.53	$0.12
03/22/2011	04/19/2011	29	5,802	$485.45	25.20	$201.60	$687.05	$0.12
04/20/2011	05/20/2011	31	6,658	$453.44	55.80	$446.40	$899.84	$0.14
05/21/2011	06/17/2011	28	8,015	$563.28	58.70	$469.60	$1,032.88	$0.13
Total		366	85,847	$8,354.59			$12,223.39	
Annualized		365	85,612	$8,331.76			$12,189.99	
Average Energy Cost ($/kWh)				$0.10			$0.14	
Demand Cost ($/kW)		Maximum	$8.47	Average	$8.04	Minimum	$8.00	

Central Hudson Gas & Electric supplies electricity. Annualized electricity cost for the billing period under rate class Non-Residential was $12,190 for 85,612 kWh and a unit cost of $0.14 per kWh. Demand is billed at maximum of $8.47 per kW.

Kingston Library
Kingston, NY

FIGURE 7 - HISTORICAL NATURAL GAS BILLS

Utility Name:	**Central Hudson Gas & Electric**
Account #:	**3620-0940-00-9**
Rate Class:	**Non-Residential**

Start Billing Date	End Billing Date	Billing Days	Gas Usage (Therms)	Gas Cost ($)	Average Cost ($/Therm)
06/16/2010	07/15/2010	29	3	$35.66	$11.89
07/16/2010	08/13/2010	29	2	$36.90	$18.45
08/14/2010	09/14/2010	32	2	$36.76	$18.38
09/15/2010	10/14/2010	30	59	$107.55	$1.82
10/15/2010	11/12/2010	29	486	$553.35	$1.14
11/13/2010	12/15/2010	33	1,148	$1,293.22	$1.13
12/16/2010	01/24/2011	40	2,136	$2,474.73	$1.16
01/25/2011	02/22/2011	29	1,559	$1,831.78	$1.17
02/23/2011	03/21/2011	27	895	$1,091.64	$1.22
03/22/2011	04/19/2011	29	615	$738.38	$1.20
04/20/2011	05/20/2011	31	105	$180.20	$1.72
05/21/2011	06/17/2011	28	3	$38.31	$12.77
Total		366	7,013	$8,418.48	
Annualized		365	6,994	$8,395.48	
Average Cost per Therm				$1.20	

Central Hudson Gas & Electric provides natural gas for space heating, cooking and domestic hot water. Natural gas usage was 6,994 therms with an average unit cost of $1.20 per therm for an annualized cost of $8,395.

Section 1

EXISTING CONDITIONS

1.1 BUILDING ENVELOPE

The Kingston Library is located at 55 Franklin Street in Kingston, New York 12401. It is a 16,000 square foot, two story brick masonry structure built in 1878. The building has a membrane covered roof and an attic. The attic was recently insulated but there is believed to be little insulation in the walls. Windows are mostly double pane. The building is open forty-nine hours per week and has twenty employees. Interior lighting is controlled manually and some outside lighting is on photo-sensors.

1.2 HEATING AND COOLING SYSTEMS

Heating is provided by an 85% efficient gas-fired steam boiler. Cooling is provided by nine split system air-conditioners.

1.3 LIGHTING SYSTEMS

Lighting is provided mostly by T-8 fixtures with some incandescent, compact fluorescent, T12 fluorescent and metal halide fixtures.

1.4 WATER HEATING SYSTEMS

Hot water is provided by a forty gallon gas-fired water heater. Hot water temperature is 124F.

Section 2

ENERGY CONSERVATION MEASURES (ECMs)

NYSERDA

Kingston Library

ECM SUMMARY SHEET

ECM NUMBER:	1	
ECM CODE:	L3	
ECM DESCRIPTION:	Upgrade T-12 and T-8 With High Performance T-8 - By Attrition	
PROJECT COST:	$0	
SIMPLE PAYBACK:	Immediate	Years
ELECTRICAL ENERGY SAVINGS:	5,534	kWh/Year
DEMAND SAVINGS:	3.1	kW/Month
OTHER FUEL SAVINGS:	-11.6	Mbtu/Year
WATER SAVINGS:	0	Mgal/Year
ANNUAL ENERGY COST SAVINGS:	$710	

EXISTING CONDITIONS:

The majority of the building lighting has been upgraded to T-8 lamps and electronic ballasts. There are several T-12 fixtures that could be updated. A standard two tube T-12 fixture with two 34 watt tubes consumes about 74 watts. Converting to 1" diameter 28 watt T-8 lamps with a high performance electronic ballast reduces the power consumption to 52 watts. Light output is increased as well as lamp and ballast life. Typically, one ballast is used for every two lamps but one ballast can run combinations of lamps from one to four. T-8 lighting can be used in 2', 3', 4', 8' and U-tube fixtures.

ECM SPECIFICATIONS:

Replace any remaining T-12 lamps and ballasts with 28 watt T-8 lamps and high performance ballasts using the existing fixtures. The existing 32 watt T-8 lamps and ballasts can be updated with 28 watt lamps and high performance ballasts over time. There is no capital cost since the new equipment does not have a price premium over traditional T-8 lamps and electronic ballasts. Refer to the calculation sheet in Appendix B for locations and the cost estimates in Appendix A for the quantities of lamps and ballasts to replace. Financial incentives are available from NYSERDA for any fixtures that are updated now. The current incentive is $15 per fixture upgrade.

NYSERDA

Kingston Library

ECM SUMMARY SHEET

ECM NUMBER:	2	
ECM CODE:	L4	
ECM DESCRIPTION:	Replace Incandescent Lighting With CFLs	
PROJECT COST:	$34	
SIMPLE PAYBACK:	0.9	Years
ELECTRICAL ENERGY SAVINGS:	71	kWh/Year
DEMAND SAVINGS:	0.3	kW/Month
OTHER FUEL SAVINGS:	-0.1	Mbtu/Year
WATER SAVINGS:	0	Mgal/Year
ANNUAL ENERGY COST SAVINGS:	$36	

EXISTING CONDITIONS:

There are a few incandescent bulbs in use in the building. Incandescent lighting is the least efficient form of lighting. Compact fluorescent lamps cost more but they use only 1/4 to 1/3 as much energy as incandescent lamps. Compact fluorescent lamps also last 5,000 to 12,000 hours, while incandescent lamps typically last 800 to 2,000 hours. A 15 watt compact fluorescent lamp can replace a 60 watt incandescent lamp. An 18 watt compact fluorescent lamp can replace a 75 watt incandescent lamp. 100 watt incandescent lamps can be replaced with 23 watt compact fluorescent lamps. If the lamps are in a cold or exterior location, install exterior rated compact lamps.

ECM SPECIFICATIONS:

Replace all incandescent bulbs with compact fluorescent lamps. Using warm white lamps will produce light that is more similar to incandescent lamps than cool white lamps. If the recommended lamp sizes do not fit, use a smaller size. For recessed fixtures, lamp extenders may be required. Refer to the cost estimates in appendix A for quantities and the calculation sheets in appendix B for exact locations.

NYSERDA

Kingston Library

ECM SUMMARY SHEET

ECM NUMBER:	3	
ECM CODE:	C1	
ECM DESCRIPTION:	Install Occupancy Sensors	
PROJECT COST:	$780	
SIMPLE PAYBACK:	6.3	Years
ELECTRICAL ENERGY SAVINGS:	1,173	kWh/Year
DEMAND SAVINGS:	0.4	kW/Month
OTHER FUEL SAVINGS:	-2.5	Mbtu/Year
WATER SAVINGS:	0	Mgal/Year
ANNUAL ENERGY COST SAVINGS:	$123	

EXISTING CONDITIONS:

During the survey, it was observed that many lights in three offices, seven restrooms, office area break room, and second floor lunch room remain lit when unoccupied.

ECM SPECIFICATIONS:

Install infrared sensors mounted in wall-switch boxes for the areas listed above. Refer to the calculation and cost estimate for locations and quantities of sensors to install. Financial incentives of $120 are available from NYSERDA if 12 switch sensors are installed.

NYSERDA

Kingston Library

ECM SUMMARY SHEET

ECM NUMBER:	4	
ECM CODE:	C4	
ECM DESCRIPTION:	Install Heat Timer	
PROJECT COST:	$5,000	
SIMPLE PAYBACK:	5.3	Years
ELECTRICAL ENERGY SAVINGS:	0	kWh/Year
DEMAND SAVINGS:	0.0	kW/Month
OTHER FUEL SAVINGS:	79.0	Mbtu/Year
WATER SAVINGS:	0	Mgal/Year
ANNUAL ENERGY COST SAVINGS:	$949	

EXISTING CONDITIONS:

The building is heated by a gas fired steam boiler. Control systems are available that will help increase overall operating efficiency. Heat Timer Corporation is one company that makes this type of control system.

ECM SPECIFICATIONS:

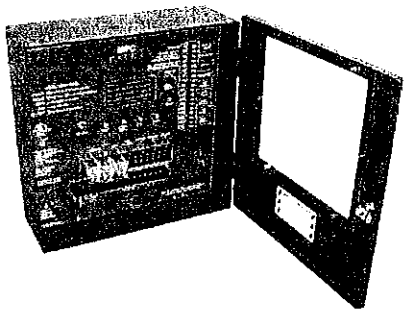
Install a heat timer to help the steam boiler operate more efficiently.

ISO 9001:2008

Registrar

Registered Firm

Our ISO 9001 Certificate



Platinum: MPC (Steam)

Steam Outdoor Reset Heat Cycling Controls
now available with optional Internet, BACnet, or Modbus communication

Application

The MPC Platinum control Series is designed to operate a steam boiler or a steam valve to provide steam outdoor reset in single-pipe and two-pipe steam heating systems. Utilizing the steam cycle concept and the outdoor temperature, the control varies the duration of the steam supply to the building in a cycle based on the outdoor temperature. Each of these options has a set of pre-configured, but adjustable settings to meet the specific needs of each building. The MPC Platinum will reduce fuel costs while maintaining a more comfortable space temperature.

The MPC Platinum offers multiple communication options. The Internet communication package offers a large group of optional sensors that can be monitored, logged, and alarm set. In addition, Heat-Timer can provide a cellular Internet connection to the control (See Internet communication). The BACnet Communication package provides BACnet IP or BACnet MSTP compatibility in addition to the capability of communicating using other protocols when used with a Fieldserver gateway. The Modbus Communication package provide Modbus RTU Communication capability to the MPC Platinum control.

With its 80 character alphanumeric display and easy-to-use menu structure, changing settings is a snap. In addition, it incorporates Shutdown and Prove inputs for EMS capability.

Features

- Built-In Steam Outdoor Reset
- Can be configured for Burner or District Steam
- Different Day and Night Adjustable outdoor temperature cutofs
- 4 programmable Day/Night adjustments per day
- Auxiliary Output that can control other equipment based on a separate Built-In programmable 4 separate On/Off schedule settings per day
- Thermal lockout does not allow the initiation of another heating cycle if the system had steam
- BACnet IP and MSTP Communication option (field upgradeable)
- Internet Communication option (field upgradeable)
- Modbus RTU Communication option (field upgradeable)
- Solid state sensors can be extended up to 500' from the control
- EE-Prom backup of all program settings
- 80 Character alphanumeric display
- EMS capable using the SHUTDOWN and PROVE inputs
- Can link to a Multi-Mod for multiple modulating boilers
- Additional Output relays to control other equipment based on the MPC Platinum cycle operation
- Network input allows the MPC Platinum to connect to multiple sensors (MIG Sensors, Neuron Sensors, Wireless Sensors, Water Meter, Gas Meter, Oil Level, Smoke Alarm) using the Internet to monitor and fine tune its operation
- Optional Remote Communication using the Internet, BACnet, or Modbus. You'll be able to view status, change settings as well as analyze performance from virtually anywhere
- MPC Platinum is NYC DEP Approved (DEE #42-04)

Models

The MPC Platinum comes complete with sensors and relays.

MODEL	CATALOG #
MPC Platinum Standard	926785-00
MPC Platinum for Internet Communication (Ask about our Cellular Internet service)	926785-RINet
MPC Platinum with BACnet Communication	926785-BAC
MPC Platinum with Modbus Communication	926785-BUS
OPTIONS	
Internet Communications Upgrade for MPC Platinum panels (Ask about our Cellular Internet service)	900204-00-RINet

Documents

- MPC Platinum CSI Specifications
- MPC Platinum Internet Setup Manual
- MPC Platinum Literature
- MPC Platinum Manual
- MPC Platinum MODBUS Manual

More

Case Studies

- Case Study 26
- Case Study 24
- Case Study 20
- Case Study 17
- Case Study 08
- Case Study 06
- Case Study 05
- Case Study 03

More

FAQs

More

Newsletters

- Newsletter-1 (Dueling Controls)
- Newsletter-2 (When Radiator Traps Fail, Trouble Follows)
- Newsletter-3 (What "The Old-Timer" Knows About Sizing Steam Boilers)
- Newsletter-6 (Zoning a Steam Systems? Watch Out!)

More

Related Products

- Communication: BACnet
- Communication: Modbus
- Communication: Internet
- DHW Energy Saver
- EPU EPU-CH
- Gold Series Controls (Obsolete)
- Motorized Valves (2-Way and 3-Way)
- Platinum: MPCQ (Steam)
- Platinum: Multi-MOD (Modulating)
- Platinum: SRC (Vacuum)
- Sensor: MLS/MLS-A - Smoke Alarm
- Sensor: OTM (Oil Tank Monitor)
- Sensors
- Sensors: Mini-MIG
- Sensors: Wireless Network Sensor System
- Valve: Precision Tempering Valves
- Valve: TMC and Solenoid Valves
- VARIVALVE®
- Visual Gold Plus 5.17 (Obsolete)

NYSERDA

Kingston Library

ECM SUMMARY SHEET

ECM NUMBER:	5	
ECM CODE:	B6	
ECM DESCRIPTION:	Weatherstrip Doors	
PROJECT COST:	$65	
SIMPLE PAYBACK:	1.2	Years
ELECTRICAL ENERGY SAVINGS:	0	kWh/Year
DEMAND SAVINGS:	0.0	kW/Month
OTHER FUEL SAVINGS:	4.5	Mbtu/Year
WATER SAVINGS:	0	Mgal/Year
ANNUAL ENERGY COST SAVINGS:	$54	

EXISTING CONDITIONS:

Existing exterior doors have gaps along the edges and at the jamb. Weatherstripping is required to eliminate infiltration. Infiltration of outside air requires the heating and cooling systems to run more to condition the incoming air. Occupant comfort will be increased after weatherstripping in installed due to the elimination of cold drafts. Weatherstripping comes in many shapes and types. The most durable type should be installed to insure maximum life of up to five years or more.

ECM SPECIFICATIONS:

Install new weatherstripping for the exterior doors. Be sure to install weatherstripping in the gap between double doors.

Appendix A

COST ESTIMATES

L&S ENERGY SERVICES, INC.

Project Name: Kingston Library
Project No.: NYSERDA Contract #9849
Calculated by:
Checked by:

Sheet No: 1 of 1
Date: September 7, 2011
Date: September 7, 2011

ECM #: 1
ECM Code: L3
ECM Description: Upgrade T-12 and T-8 With High Performance T-8 - By Attrition

Div.	Description	Qty.	Unit	Unit Labor	Cost Material	Total Labor	Total Material	Total	Ref.
	2 lamp electronic ballast 2'	2	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	1 lamp electronic ballast 4'	8	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	2 lamp electronic ballast 4'	157	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	3 lamp electronic ballast 4'	62	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	4 lamp electronic ballast 4'	11	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	1 lamp electronic ballast 8'	0	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	2 lamp electronic ballast 8'	0	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	28 watt T-8 4' Lamps	552	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	60 watt T-8 8' Lamps	0	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	18 watt T-8 2' Lamps	4	ea	$0.00	$0.00	$0.00	$0.00	$0.00	
	Subtotal					$0.00	$0.00	$0.00	
	City Factor 100.0%							$0.00	
	Contingency 0%							$0.00	
	Design Services 0%							$0.00	
	Contractor OH + GA 0%							$0.00	
	Contractor profit 0%							$0.00	
	Total							$0.00	
	Round-Up Total							$0.00	

The costs noted above are estimates only and may be modified by changing conditions or the passage of time.

L&S ENERGY SERVICES, INC.

Project Name: Kingston Library
Project No.: NYSERDA Contract #9849
Calculated by:
Checked by:

Sheet No: 1 of 1
Date: August 3, 2011
Date: August 3, 2011

ECM #: 2
ECM Code: L4
ECM Description: Replace Incandescent Lighting With CFLs

Div.	Description	Qty.	Unit	Unit Labor	Cost Material	Total Labor	Total Material	Total	Ref.
	15 watt compact lamp	0	ea	$0.00	$6.00	$0.00	$0.00	$0.00	
	18 watt compact lamp	0	ea	$0.00	$8.00	$0.00	$0.00	$0.00	
	23 watt compact lamp	2	ea	$0.00	$10.00	$0.00	$20.00	$20.00	
	32 watt compact lamp	1	ea	$0.00	$14.00	$0.00	$14.00	$14.00	
	Subtotal					$0.00	$34.00	$34.00	
	City Factor 100.0%							$34.00	
	Contingency 0%							$0.00	
	Design Services 0%							$0.00	
	Contractor OH + GA 0%							$0.00	
	Contractor profit 0%							$0.00	
	Total							$34.00	
	Round-Up Total							$34.00	

The costs noted above are estimates only and may be modified by changing conditions or the passage of time.

L&S ENERGY SERVICES, INC.

Project Name: Kingston Library
Project No.: NYSERDA Contract #9849
Calculated by:
Checked by:

Sheet No: 1 of 1
Date: August 3, 2011
Date: August 3, 2011

ECM #: 3
ECM Code: C1
ECM Description: Install Occupancy Sensors

Div.	Description	Qty.	Unit	Unit Labor	Cost Material	Total Labor	Total Material	Total	Ref.
	Switch Sensors with no manual on-off control	12	ea	$10.00	$55.00	$120.00	$660.00	$780.00	
	Subtotal					$120.00	$660.00	$780.00	
	City Factor 100.0%							$780.00	
	Contingency 0%							$0.00	
	Design Services 0%							$0.00	
	Contractor OH + GA 0%							$0.00	
	Contractor profit 0%							$0.00	
	Total							$780.00	
	Round-Up Total							$780.00	

The costs noted above are estimates only and may be modified by changing conditions or the passage of time.

L&S ENERGY SERVICES, INC.

Project Name: Kingston Library
Project No.: NYSERDA Contract #9849
Calculated by:
Checked by:

Sheet No: 1 of 1
Date: September 7, 2011
Date: September 7, 2011

ECM #: 4
ECM Code: C4
ECM Description: Install Heat Timer

Div.	Description	Qty.	Unit	Unit Labor	Cost Material	Total Labor	Total Material	Total	Ref.
	install a heat timer	1	ea	$1,000.00	$4,000.00	$1,000.00	$4,000.00	$5,000.00	
	Subtotal					$1,000.00	$4,000.00	$5,000.00	
	City Factor 100.0%							$5,000.00	
	Contingency 0%							$0.00	
	Design Services 0%							$0.00	
	Contractor OH + GA 0%							$0.00	
	Contractor profit 0%							$0.00	
	Total							$5,000.00	
	Round-Up Total							$5,000.00	

The costs noted above are estimates only and may be modified by changing conditions or the passage of time.

L&S ENERGY SERVICES, INC.

Project Name: Kingston Library
Project No.: NYSERDA Contract #9849
Calculated by:
Checked by:

Sheet No: 1 of 1
Date: August 3, 2011
Date: August 3, 2011

ECM #: 5
ECM Code: B6
ECM Description: Weatherstrip Doors

Div.	Description	Qty.	Unit	Unit Labor	Cost Material	Total Labor	Total Material	Total	Ref.
	Install door weatherstripping	26	lf	$1.00	$1.50	$26.00	$39.00	$65.00	
	Subtotal					$26.00	$39.00	$65.00	
	City Factor 100.0%							$65.00	
	Contingency 0%							$0.00	
	Design Services 0%							$0.00	
	Contractor OH + GA 0%							$0.00	
	Contractor profit 0%							$0.00	
	Total							$65.00	
	Round-Up Total							$65.00	

The costs noted above are estimates only and may be modified by changing conditions or the passage of time.

Appendix B

CALCULATIONS

Kingston Library

PARMETERS		
80%	Percent	Heating System Efficiency
100,000	BTU/therms	Heating Fuel Type Conversion Factor
3.0	COP	Cooling COP
3,413	BTU/kWh	Cooling Fuel Type Conversion Factor

ECM DESCRIPTION: ECM 1 L3- Upgrade T-12 and T-8 with High Performance T-8 by Attrition

ECM FIXTURE DETAILS

		PRE-RETROFIT CONDITIONS					POST-RETROFIT CONDITIONS					LIGHTING KWH SAVINGS			KW SAVINGS		COST SAVINGS ($)					Non-Elec. Heating Fuel Svgs MBTU	Non-Elec. Clg Fuel Svgs MBTU
ECM Number	Location	Fixt. Qnty	Fixture Description	Watts per Fixture	Installed Watts	Annual Operating Hours	Fixt. Qnty	Fixture Description	Watts per Fixture	Installed Watts	Annual Operating Hours	All Periods	Occuring in Heating Mode Only	Occuring in Cooling Mode Only	Installed Lighting	Lighting On-Peak	Demand	Lighting Energy	Heating (Penalty)	Cooling (Credit)	Total		
ECM1	Basement Book Storage Area	5	2F96T12	172	860	300	5	4F28T8	98	490	300	111	59	35	0.37	0.37	36	11	(3)	1.2	45	(0.3)	-
ECM1	Basement Book Storage Area	5	2F40T12	92	460	300	5	2F28T8	52	260	300	60	32	19	0.20	0.20	19	6	(2)	0.6	24	(0.1)	-
ECM1	Basement Book Storage Area	4	4F40T12	184	736	300	4	4F28T8	98	392	300	103	55	33	0.34	0.34	33	10	(3)	1.1	42	(0.2)	-
ECM1	Office Restroom #1	1	2F20T12	40	40	255	1	2F18T8	34	34	255	2	1	0	0.01	0.01	1	0	(0)	0.0	1	(0.0)	-
ECM1	Office Restroom #2	1	2F20T12	40	40	255	1	2F18T8	34	34	255	2	1	0	0.01	0.01	1	0	(0)	0.0	1	(0.0)	-
ECM1	Main Entrance	13	2F32T8	60	780	2,450	13	2F28T8	52	676	2,450	255	138	78	0.10	0.10	10	25	(7)	2.6	31	(0.6)	-
ECM1	First Floor Northeast	24	2F32T8	60	1,440	2,450	24	2F28T8	52	1,248	2,450	470	255	144	0.19	0.19	18	47	(13)	4.8	57	(1.1)	-
ECM1	First Floor Hallway	2	2F32T8U	60	120	2,450	2	2F28T8	52	104	2,450	39	21	12	0.02	0.02	2	4	(1)	0.4	5	(0.1)	-
ECM1	First Floor Non-Fiction Section	12	2F32T8	60	720	2,450	12	2F28T8	52	624	2,450	235	128	72	0.10	0.10	9	24	(7)	2.4	29	(0.5)	-
ECM1	First Floor Southwest	12	2F32T8	60	720	2,450	12	2F28T8	52	624	2,450	235	128	72	0.10	0.10	9	24	(7)	2.4	29	(0.5)	-
ECM1	First Floor Central Area	22	2F32T8	60	1,320	2,450	22	2F28T8	52	1,144	2,450	431	234	132	0.18	0.18	17	43	(12)	4.4	52	(1.0)	-
ECM1	Rear Stairwell	1	2F32T8	60	60	2,450	1	2F28T8	52	52	2,450	20	11	6	0.01	0.01	1	2	(1)	0.2	2	(0.0)	-
ECM1	First Floor Northwest Room	24	2F32T8	60	1,440	2,450	24	2F28T8	52	1,248	2,450	470	255	144	0.19	0.19	18	47	(13)	4.8	57	(1.1)	-
ECM1	Front Desk Area	4	2F32T8	60	240	2,450	4	2F28T8	52	208	2,450	78	43	24	0.03	0.03	3	8	(2)	0.8	10	(0.2)	-
ECM1	First Floor Rear Office	2	3F32T8	90	180	2,450	2	3F28T8	76	152	2,450	69	37	21	0.03	0.03	3	7	(2)	0.7	8	(0.2)	-
ECM1	Reference Room	8	1F32T8	30	240	2,450	8	1F28T8	26	208	2,450	78	43	24	0.03	0.03	3	8	(2)	0.8	10	(0.2)	-
ECM1	Reference Room	21	2F32T8	60	1,260	2,450	21	2F28T8	52	1,092	2,450	412	223	126	0.17	0.17	16	41	(11)	4.2	50	(1.0)	-
ECM1	Front Stairwell	1	2F32T8	60	60	2,450	1	2F28T8	52	52	2,450	20	11	6	0.01	0.01	1	2	(1)	0.2	2	(0.0)	-
ECM1	Second Floor Northeast Room	15	3F32T8	90	1,350	1,020	15	3F28T8	76	1,140	1,020	214	120	61	0.21	0.21	20	21	(6)	2.0	37	(0.5)	-
ECM1	Tutoring Room	2	3F32T8	90	180	1,020	2	3F28T8	76	152	1,020	29	16	8	0.03	0.03	3	3	(1)	0.3	5	(0.1)	-
ECM1	Second Floor Hall	4	2F32T8	60	240	2,450	4	2F28T8	52	208	2,450	78	43	24	0.03	0.03	3	8	(2)	0.8	10	(0.2)	-
ECM1	Second Floor Hall	2	4F32T8	120	240	2,450	2	4F28T8	98	196	2,450	108	58	33	0.04	0.04	4	11	(3)	1.1	13	(0.2)	-
ECM1	Second Floor Hall	4	2F32T8	60	240	2,450	4	2F28T8	52	208	2,450	78	43	24	0.03	0.03	3	8	(2)	0.8	10	(0.2)	-
ECM1	Second Floor Main Room	34	3F32T8	90	3,060	2,250	34	3F28T8	76	2,584	2,250	1,071	581	328	0.48	0.48	46	107	(30)	10.9	134	(2.5)	-
ECM1	Second Floor Office Hallway	3	2F32T8U	60	180	2,450	3	2F28T8	52	156	2,450	59	32	18	0.02	0.02	2	6	(2)	0.6	7	(0.1)	-
ECM1	Office #1	3	3F32T8	90	270	2,450	3	3F28T8	76	228	2,450	103	56	31	0.04	0.04	4	10	(3)	1.0	13	(0.2)	-
ECM1	Office Area Break Room	2	3F32T8	90	180	1,000	2	3F28T8	76	152	1,000	28	16	8	0.03	0.03	3	3	(1)	0.3	5	(0.1)	-
ECM1	Second Floor Tech Office	2	3F32T8	90	180	2,450	2	3F28T8	76	152	2,450	69	37	21	0.03	0.03	3	7	(2)	0.7	8	(0.2)	-
ECM1	Director's Office	2	3F32T8	90	180	2,450	2	3F28T8	76	152	2,450	69	37	21	0.03	0.03	3	7	(2)	0.7	8	(0.2)	-
ECM1	Second Floor Lunch Room	3	2F32T8	60	180	1,000	3	2F28T8	52	156	1,000	24	13	7	0.02	0.02	2	2	(1)	0.2	4	(0.1)	-
ECM1	Second Floor Kitchen	2	2F32T8	60	120	250	2	2F28T8	52	104	250	4	2	1	0.02	0.02	2	0	(0)	0.0	2	(0.0)	-

ECM SUBTOTALS

	KWH SAVINGS				KW SAVINGS		COST SAVINGS ($)					Non-Elec. Heating Fuel Svgs MBTU	Non-Elec. Clg Fuel Svgs MBTU
ECM Number	Lighting	Heating (Penalty)	Cooling (Credit)	Total	Installed Lighting	On-Peak	Demand	Lighting Energy	Heating (Penalty)	Cooling (Credit)	Total		
ECM1	5,023	-	511	5,534	3.09	3.09	296	502	(140)	51	710	(11.6)	-
Grand Total	5,023	-	511	5,534	3.09	3.09	296	502	(140)	51	710	(11.6)	-

Kingston Library

PARMETERS		
80%	Percent	Heating System Efficiency
100,000	BTU/therms	Heating Fuel Type Conversion Factor
3.0	COP	Cooling COP
3,413	BTU/kWh	Cooling Fuel Type Conversion Factor

ECM DESCRIPTION: ECM2 L4 - Replace Incandescent Lighting with CFL's

ECM FIXTURE DETAILS

		PRE-RETROFIT CONDITIONS					POST-RETROFIT CONDITIONS					LIGHTING KWH SAVINGS			KW SAVINGS		COST SAVINGS ($)					Non-Elec. Heating Fuel Svgs MBTU	Non-Elec. Clg Fuel Svgs MBTU
ECM Number	Location	Fixt. Qnty	Fixture Description	Watts per Fixture	Installed Watts	Annual Operating Hours	Fixt. Qnty	Fixture Description	Watts per Fixture	Installed Watts	Annual Operating Hours	All Periods	Occuring in Heating Mode Only	Occuring in Cooling Mode Only	Installed Lighting	Lighting On-Peak	Demand	Lighting Energy	Heating (Penalty)	Cooling (Credit)	Total		
ECM2	Basement Book Storage Area	1	1I200	200	200	300	1	1CF32	32	32	300	50	27	16	0.17	0.17	16	5	(1)	0.5	20	(0.1)	-
ECM2	Boiler Room	2	1I100	100	200	100	2	1CF23	23	46	100	15	8	-	0.15	0.15	15	2	(0)	-	16	(0.0)	-

ECM SUBTOTALS

	KWH SAVINGS				KW SAVINGS		COST SAVINGS ($)					Non-Elec. Heating Fuel Svgs MBTU	Non-Elec. Clg Fuel Svgs MBTU
ECM Number	Lighting	Heating (Penalty)	Cooling (Credit)	Total	Installed Lighting	On-Peak	Demand	Lighting Energy	Heating (Penalty)	Cooling (Credit)	Total		
ECM2	66	-	5	71	0.32	0.32	31	7	(2)	1	36	(0.1)	-
Grand Total	66	-	5	71	0.32	0.32	31	7	(2)	1	36	(0.1)	-

Kingston Library

PARMETERS		
80%	Percent	Heating System Efficiency
100,000	BTU/therms	Heating Fuel Type Conversion Factor
3.0	COP	Cooling COP
3,413	BTU/kWh	Cooling Fuel Type Conversion Factor

ECM DESCRIPTION: ECM 3 C1 - Install Occupancy Sensors

ECM FIXTURE DETAILS

		PRE-RETROFIT CONDITIONS					POST-RETROFIT CONDITIONS					LIGHTING KWH SAVINGS			KW SAVINGS		COST SAVINGS ($)					Non-Elec. Heating Fuel Svgs MBTU	Non-Elec. Clg Fuel Svgs MBTU
ECM Number	Location	Fixt. Qnty	Fixture Description	Watts per Fixture	Installed Watts	Annual Operating Hours	Fixt. Qnty	Fixture Description	Watts per Fixture	Installed Watts	Annual Operating Hours	All Periods	Occuring in Heating Mode Only	Occuring in Cooling Mode Only	Installed Lighting	Lighting On-Peak	Demand	Lighting Energy	Heating (Penalty)	Cooling (Credit)	Total		
ECM3	Second Floor Lunch Room	3	2F32T8	60	180	1,000	3	2F32T8	60	180	500	90	50	26	-	0.05	5	9	(3)	0.9	12	(0.2)	-
ECM3	Office Area Break Room	2	3F32T8	90	180	1,000	2	3F32T8	90	180	500	90	50	26	-	0.05	5	9	(3)	0.9	12	(0.2)	-
ECM3	Office #1	3	3F32T8	90	270	2,450	3	3F32T8	90	270	1,225	331	179	101	-	0.08	8	33	(9)	3.4	35	(0.8)	-
ECM3	First Floor Rear Office	2	3F32T8	90	180	2,450	2	3F32T8	90	180	1,250	216	117	66	-	0.05	5	22	(6)	2.2	23	(0.5)	-
ECM3	Director's Office	2	3F32T8	90	180	2,250	2	3F32T8	90	180	1,250	180	98	55	-	0.05	5	18	(5)	1.8	20	(0.4)	-
ECM3	Second Floor Restroom #1	2	1CF15	15	30	918	2	1CF15	15	30	255	20	11	6	-	0.01	1	2	(1)	0.2	3	(0.0)	-
ECM3	Second Floor Restroom #2	2	1CF15	15	30	918	2	1CF15	15	30	255	20	11	6	-	0.01	1	2	(1)	0.2	3	(0.0)	-
ECM3	Office Restroom #1	1	2F18T8	34	34	918	1	2F18T8	34	34	255	23	12	7	-	0.01	1	2	(1)	0.2	3	(0.1)	-
ECM3	Office Restroom #2	1	2F18T8	34	34	918	1	2F18T8	34	34	255	23	12	7	-	0.01	1	2	(1)	0.2	3	(0.1)	-
ECM3	First Floor Restroom #1	2	1F17T8	17	34	918	2	1F17T8	17	34	200	24	13	8	-	0.01	1	2	(1)	0.3	3	(0.1)	-
ECM3	First Floor Restroom #2	2	1F17T8	17	34	918	2	1F17T8	17	34	200	24	13	8	-	0.01	1	2	(1)	0.3	3	(0.1)	-
ECM3	First Floor Restroom #3	2	1F17T8	17	34	918	2	1F17T8	17	34	200	24	13	8	-	0.01	1	2	(1)	0.3	3	(0.1)	-

ECM SUBTOTALS

	KWH SAVINGS				KW SAVINGS		COST SAVINGS ($)					Non-Elec. Heating Fuel Svgs MBTU	Non-Elec. Clg Fuel Svgs MBTU
ECM Number	Lighting	Heating (Penalty)	Cooling (Credit)	Total	Installed Lighting	On-Peak	Demand	Lighting Energy	Heating (Penalty)	Cooling (Credit)	Total		
ECM3	1,065	-	108	1,173	-	0.37	35	106	(30)	11	123	(2.5)	-
Grand Total	1,065	-	108	1,173	-	0.37	35	106	(30)	11	123	(2.5)	-

Facility: Kingston Library
ECM Description: Install Heat Timer

Existing	Proposed	PARAMETERS	
78	88	%	Boiler Efficiency
6,959		FU	Annual Consumption
Therms	Therms	FU	Fuel Unit
1.2	1.2	FCF	Fuel Cost ($/Fuel Unit)
100,000	100,000	FC	Fuel Conversion Factor (BTU/Fuel Unit)
		$	Install or Premium Cost ($)

Annual Energy Savings

= Existing Annual Consumption x Existing Fuel Conv. Factor / (1 - (Htg Eff. Existing/Htg Eff. Proposed))

= 6,959 Therms x 100,000 BTU/Therms / (1 - (78% / 88%))

= 79,079,545 BTU

= 79 MBTU

Annual Fuel Savings

= Annual Energy Savings x Proposed Fuel Conv. Factor

= 79,079,545 BTU x (Therms / 100,000 BTU)

= 791 Therms

Annual Energy Cost Savings

= Annual Fuel Savings x Fuel Cost

= 791 Therms x ($1.2/ Therms)

= $ 949

Facility: Kingston Library
ECM Number: ECM5 - Heating Infiltration
ECM Description: B6- Weatherstrip Doors

OCCUPIED	UNOCCUPIED	PARAMETER	
70	60	Ti	Heating Season Setpoint Temperature, F
41.8	35.3	To	Average Outdoor Temperature in Heating, F
5	5	V	Average Wind Speed in Period, MPH
1403	4,207	H	Hours Requiring Heating In Period, H
Existing	Proposed		
26	26	L	Crack Length (FT)
0.060	0.000	W	Crack Width (IN)
18.7	0.0	EA	Effective Air Leakage Area, IN^2
18.7		AI	Reduction of Effected Air Leakage Area, IN^2
3		S#	Number Of Stories (1-3)
2		SC	Sheilding Class (1-5)
0.0449		Cs	Stack Coefficient, $CFM^2/(IN^4-F)$ - From ASHRAE 97F25.22
0.0143		Cw	Wind Coefficient, $CFM^2/(IN^4-MPH^2)$ - From ASHRAE 97F25.22
80%		E	Seasonal Efficiency
Therms		FU	Fuel Unit
100,000		FCF	Fuel Conversion Factor, BTU/Fuel Unit
1.20		FC	Fuel Cost ($/Fuel Unit)

1) FLOW RATE REDUCTION, CFM = $AI*[Cs*(Ti-To) + Cw*V^2]^{0.5}$

OCCUPIED PERIOD

= 18.72 IN^2 * [0.0449 CFM^2/(IN^4-F) * (70 F - 41.8 F) + (0.0143 CFM^2/IN^4-MPH^4 * (5 MPH)^2]^0.5

= 23.86 CFM

UNOCCUPIED PERIOD

= 18.72 IN^2 * [0.0449 CFM^2/(IN^4-F) * (60 F - 35.3 F) + (0.0143 CFM^2/IN^4-MPH^4 * (5 MPH)^2]^0.5

= 22.68 CFM

2) ANNUAL INPUT ENERGY SAVINGS = [1.08 * FLOW RATE * (Ti - To) * H * FCF] / SEASONAL EFFICIENCY

OCCUPIED PERIOD

= [1.08 * 23.9 CFM * (70 F - 41.8 F) * 1403 Hrs * (MTBU /1,000,000 BTU) / 80% = 1.3 MBTU

= [1.08 * 23.9 CFM * (70 F - 41.8 F) * 1403 Hrs * (Therms/ 100,000 BTU)] / 80%

= 13 Therms

UNOCCUPIED PERIOD

= [1.08 * 22.7 CFM * (60 F - 35.3 F) * 4207 Hrs * (MBTU/1,000,000 BTU) / 80% = 3.2 MBTU

= [1.08 * 22.7 CFM * (60 F - 35.3 F) * 4207 Hrs * (Therms/ 100,000 BTU)] / 80%

= 32 Therms

TOTAL SAVINGS

= 4.5 MBTU

= 45 Therms

3) ANNUAL ENERGY COST SAVINGS:

= 45 Therms * (1.2 $/Therms)

= $ 54