

**Report to
Rapport au:**

**Environment Committee
Comité de l'environnement
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**Submitted by
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Ward: CITY WIDE / À L'ÉCHELLE DE LA VILLE File Number: ACS2015-COS-PWS-0017

SUBJECT: Energy Management and Investment Strategy

OBJET: Stratégie de gestion et d'investissement énergétique

REPORT RECOMMENDATIONS

That the Environment Committee approve the Energy Management and Investment Strategy as information supplemental to the 2015-2018 Term of Council Priorities Report.

RECOMMANDATIONS DU RAPPORT

Que le Comité de l'environnement approuve la Stratégie de gestion et d'investissement énergétique à titre d'information complémentaire au rapport sur les priorités pour le mandat 2015-2018 du Conseil.

BACKGROUND

The City of Ottawa is committed to energy management as a key component of its operations and is striving to deliver improvements in an environmentally responsible way. Since amalgamation in 2001, the City of Ottawa has provided leadership in energy conservation and demand management. In 2008, Council approved the Energy Management and Investment Strategy, which highlighted the City's commitment to energy management and identified key measures that could reduce the City's energy consumption and associated utility costs.

In 2010, Council approved the five-year Smart Energy Program that was sponsored by the Service Ottawa Program and delivered by the Public Works Department. Council approved the investment of \$14 million to be used over five years between 2010 and 2014. The program leveraged the energy management expertise in the Public Works Department's Building Engineering and Energy Management unit to define and implement various capital conservation measures. The goal of the project was to reduce the City's overall environmental footprint while also reducing utility costs. Some of the benefits of the Smart Energy Program included:

- 12,000,000 kWh in annual electrical savings;
- 500,000 m³ in annual natural gas savings;
- 120,000 m³ in annual potable water savings;
- The conversion of 11 sites from oil or propane to natural gas use;
- The conversion of 1.4 million kWh of electricity use to natural gas;
- The integration of over 70 unique building automation systems into one harmonized interface.

The Smart Energy Program has been delivering on operational efficiency targets and energy reduction targets through the implementation of various capital measures within City facilities. These measures include:

- Facility retrofits such as lighting upgrades, high efficiency heating equipment, water conservation measures, and heat source conversions from oil/electricity to natural gas.

- The implementation of a harmonized building automation system integrator allowing for facility, maintenance and engineering staff to more effectively monitor and trouble shoot building systems.

The program exceeded its mandated 5-year simple pay back, at which time the City realized \$2 million in annual energy savings. For more information on the energy savings and investments please see Document 1: Smart Energy Program Key Successes.

In 2009, the Province of Ontario implemented the *Green Energy Act*, which included a requirement for public agencies, including municipalities, to develop energy conservation and demand management plans (CDMP). Under the associated regulations that came into effect in 2011, municipalities must develop energy CDMPs, at minimum, every five years. The CDMPs are to provide information about how the municipality will conserve energy. This information must be made available on the municipalities' websites and must be available in print format upon request.

To achieve the commitments being proposed in the City's CDMP and to continue to provide leadership in energy conservation and demand management by building upon the success of various energy efficient initiatives, such as the 2010-2014 Smart Energy Program, the Public Works Department proposed a revised five-year Energy Management and Investment Strategy in 2014.

On [14th of May 2014](#), the previous term of Council approved the 2015-2019 Energy Management and Investment Strategy and directed staff to "report to the appropriate Standing Committee and Council in 2015 with the business case and investment schedule to support the delivery of the Energy Management and Investment Strategy and Conservation and Demand Management Plan, for their consideration as part of the 2014-2018 Term of Council Priority and budget processes."

As directed by Council, the strategy was put forward as part of the 2015 budget process, with the proposed 2015-2018 Strategic Initiatives funding. As the funding has not been allocated, this report is being presented as information supplemental to the 2015-2018 Term of Council Priorities Report.

The 2015-2019 Energy Management and Investment Strategy will present a \$1M annual investment to implement capital energy reduction retrofits which will deliver a 5.5 year simple pay back and yield.

The report presented in 2014 also outlined the City's first CDMP, which highlights past accomplishments with respect to energy management and outlines the plan staff will be recommending for 2015-2019.

DISCUSSION

The 2015-2019 Energy Management and Investment Strategy has been developed with the goals of managing the City's growth and relative increasing demand for energy while implementing reduction measures to not only off-set this demand, but also to increase efficiencies. The strategy provides a road map to deliver on the commitments made in the Conservation Demand Management Plan (CDMP) and serves to help the City achieve its long-term environmental sustainability targets.

The strategy presents the proposal for an investment of up to \$4M in the next four- year period. The key areas identified for investment are:

- The continuation of energy efficient retrofits in City facilities; and,
- The expansion of the building automation system including centralized monitoring, targeting and support.

The recommended 2015-2019 Energy Management and Investment Strategy initiatives put forward as part of the 2015-2018 Term of Council Priorities is based on the annual investment of \$1M to implement capital energy reduction retrofits which will deliver a 5.5 year simple pay back and yield.

Planned Capital Measures

The Energy Management and Investment Strategy propose that the Building Engineering and Energy Management (BEEM) unit, of the Public Works Department, implement energy efficient retrofits within existing City facilities. These retrofits include but are not limited to lighting, water, heating and cooling, building controls and building envelopes. Below is a high level overview of the proposed capital measures:

Lighting upgrades to interior of the buildings:

- **Capital Investment:** \$300,000 annually (\$1.2M over four years)
- **Utility Savings:** \$55,000 annually (\$220,000 over four years)

Description: Lighting upgrades include hallways, office spaces, elevators, halls, washrooms, garages, and swimming pools, for example. Additional lighting control measures such as motion sensors, dimmers, time clocks and photo sensors will be installed where applicable. The replacement of these lighting systems to LED lighting will not only provide significant energy savings, but they will also provide better lighting

and result in significant maintenance savings. Some of the major facilities include City Hall, Nepean Sportsplex, Ben Franklin Place, May Pitt Centre, Fire Stations, and OC Transpo Stations/Buildings. The expected cost of the project at multiple sites is approximately \$300,000 annually (\$1.2M over four years) which will result in \$55,000 utility savings annually (\$220,000 over four years).

Building exterior lighting replacement (wall-packs) to LED:

- **Capital Investment:** \$150,000 annually (\$600,000 over four years)
- **Utility Savings:** \$25,000 annually (\$100,000 over four years)

Description Upgrading inefficient lighting systems to LED will typically save between 50% and 80% of the energy used. The new LED technology is more efficient, cuts down on spill light (light pollution), and can be dimmed up to 50% based on occupancy. In the past two years, staff have replaced wall-packs with LED across 130 City facilities. The new strategy is to replace the remaining lighting across all city facilities. This is expected to significantly improve in building security and reduction in maintenance costs.

Building Automation Controls (BAS) and upgrade to high efficient systems:

- **Capital Investment:** \$160,000 annually (\$640,000 over four years)
- **Utility Savings:** \$30,000 annually (\$120,000 over four years)

Description: BAS automatically controls a large portion of the heating, ventilation, air conditioning (HVAC) and lighting systems in many of the City's facilities. Used properly, these systems can allow for optimal efficiency in building operation. The City of Ottawa has many separate BAS installations from 14 different vendors. The new 'Integrator' system has allowed individual systems to be seen through a common front end. This system can now be accessed through any City computer or City Blackberry with the right authority. The new 'Integrator' system makes it easier for staff to run their facility from any location. Staff are no longer required to interface through a specific computer to make necessary changes to the schedule of the mechanical and lighting systems. Currently there are over 100 facilities under BAS Integration system. The strategy is to convert some of the inefficient HVAC systems to high efficiency, garage fan optimization, control of fans/pumps/motors/compressors and as well as improve better controls for the overall systems. The BAS Integration system will allow City staff to effectively identify and correct problems in a timely fashion within facilities.

Lighting upgrade in building parking lots to LED:

- **Capital Investment:** \$100,000 annually (\$400,000 over four years)
- **Utility Savings:** \$18,000 annually (\$70,000 over four years)

Description: This will be a similar initiative to the building exterior lighting (wall-packs) which will be retrofitted across many City parking lots. In past, staff have converted some parking lots to LED lighting, which has resulted in more security and better lighting.. The list of facilities includes recreational facilities, administration buildings, fire stations, libraries, and works yards, for example. This is not only expected to yield utility savings, it is also expected to yield significant maintenance savings.

Replacement of low efficiency gas furnaces and boilers with high efficiency condensing equipment:

- **Capital Investment:** \$150,000 annually (\$600,000 over four years)
- **Utility Savings:** \$25,000 annually (\$100,000 over four years)

Description: Some of the City's existing gas fired equipment has efficiencies between 55% and 75%. New condensing equipment has efficiencies in the 90% range. Some small facilities are still using oil to heat the building.

Addition of Variable Speed Drives (VFD) to pumps/fans/motors:

- **Capital Investment:** \$50,000 annually (\$200,000 over four years)
- **Utility Savings:** \$9,000 annually (\$36,000 over four years)

Description: VFDs allow fans and pumps to run at reduced speeds when not at full load thereby reducing energy use significantly. The project plan is to add VFDs at multiple sites where applicable.

Low flow toilets, urinals, faucets at various facilities:

- **Capital Investment:** \$50,000 annually (\$200,000 over four years)
- **Utility Savings:** \$10,000 annually (\$40,000 over four years)

Description: Water conservation measures include low flow aerators, efficient toilets and urinals.

Garage Door Controls:

- **Capital Investment:** \$40,000 annually (\$160,000 over four years)
- **Utility Savings:** \$7,000 annually (\$28,000 over four years)

Description: In many works yards, the doors are opened on a regular basis to allow for the entry and exit of vehicles. Often times these doors will be left open longer than required allowing cold outdoor air to enter. This causes the nearby heaters in the garage to run continuously while the door is open. Smart thermostats will be installed to interlock the unit heaters with the garage doors so that no heating is provided while a

door is opened. It will also allow night setback and occupancy control. The project plan is to implement this measure at some large works yards, such as Conroy and Navan.

Staff estimates that the annual capital measures identified would require an ongoing capital budget of \$1M per year, with a 5.5-year simple payback. This would generate an estimated \$725k in total annual savings after four (4) years and would yield the following conservation benefits:

- 4,500,000 kWh hours of electricity reductions
- 250,000 m³ of natural gas reductions
- 20,000 m³ of water reductions

Administration of the Energy Management and Investment Strategy

The BEEM unit of the Public Works Department has the mandate of “optimizing tomorrow’s energy use today”. The unit is within the Parks, Buildings and Grounds Services branch which leverages the relationships and expertise between facility staff and staff who monitor building system components and implement building retrofits. In addition to the resources dedicated to the delivery of the Energy Management and Investment Strategy, staff oversee the following day-to-day operations:

- Identify, develop and implement energy saving opportunities on behalf of the City of Ottawa.
- Support the Parks, Buildings and Grounds branch on technical issues such as energy, HVAC, lighting, water, legislative codes, and environmental issues.
- Maintain the Utility Management and Accounting System (UMAS) that includes gathering and uploading data, retrieving and analyzing results, developing and implementing tools, and supplying information to help all City departments with historical and budget information.
- Support the procurement of Natural Gas for the City
- Establish energy performance standards for equipment used in all construction projects within the City.
- Capitalize on energy efficiency incentive programs on behalf of the City.
- Analyze energy and water use in individual facilities and give feedback if rate of use climbs unexpectedly.

- Upgrade and develop the use of Building Automation Systems (BAS) to improve the performance of City facilities.
- Assist with ensuring facilities are safe and efficiently operated.
- Provide support and guidance to other City departments with respect to energy used and environmentally sustainable initiatives.

Staff within the Building Engineering and Energy Management unit will be responsible for preparing business cases for the proposed investments and resource requirements as outlined in the Energy Management and Investment Strategy and presenting them for consideration to Council. The resource requirements to support the proposed initiatives have been brought forward for consideration as part of the 2015-2018 Term of Council Priorities, subject to Council approval, with \$4M in capital investments and \$480k in operating funds to administer the Strategy.

Through the success of 5-year Smart Energy Program, the Public Works Department has demonstrated that long-term planning and cost certainty is critical in yielding not only environmental benefits, but also cost efficiencies. This was largely because the project received pre-defined and scheduled funding and benefitted from long-range project plans and volume pricing of equipment.

Through the Energy Management and Investment Strategy, the Public Works Department is hoping to maintain this momentum over the next five years through exploring leading-edge energy efficient technologies as well as continuing to perform retrofits that have already proved successful in City facilities. Based on the success of the last 5 years, the Public Works Department is confident that the Energy Management and Investment Strategy will help the City achieve its strategic priorities with respect to environmental sustainability.

RURAL IMPLICATIONS

There are no rural implications contained within the recommendations of this report.

CONSULTATION

There has been no public consultation for this report.

The Department will continue to consult regularly with the Energy Ottawa, the Ontario Regional Facilities Management Association and other internal City departments.

LEGAL IMPLICATIONS

There are no legal impediments to the receipt of the report for information.

RISK MANAGEMENT IMPLICATIONS

There are no risks associated with the recommendation of this report.

FINANCIAL IMPLICATIONS

The required funding to support the Energy Management Investment Strategy is included in the proposed 2015 – 2018 Strategic Initiatives.

ACCESSIBILITY IMPACTS

The Integrated Accessibility Standards Regulations will be considered through the planning and implementation phases of any built environmental related measures.

ENVIRONMENTAL IMPLICATIONS

The recommendations contained in this report will contribute to the City's overall environmental sustainability targets through energy efficient retrofits and new initiatives that will greatly reduce the City's energy consumption.

TERM OF COUNCIL PRIORITIES

Environmental Stewardship: there is a commitment to implement green technology in order to promote energy efficiency and reduce the City's environmental impact.

SUPPORTING DOCUMENTATION

Document 1: Smart Energy Program Key Successes. *Immediately follows the report.*

DISPOSITION

The Public Works Department will be responsible for the action items contained within the disposition of this report.

Document 1: Smart Energy Program Key Successes

In 2010, Council approved the five-year Smart Energy Program that was sponsored by the Service Ottawa Program and delivered by the Public Works Department. Council approved the investment of \$14 million to be used over five years between 2010 and 2014. The goal of the project was to reduce the City's overall environmental footprint while also reducing utility costs. Some of the benefits of the Smart Energy Program included:

- **Conversion of Street lighting to LED.** There are over 60,000 streetlights in the City which accounts for 17% of the electricity used by the City. This number grows with every new development built in the City. The street lighting fixtures use either High-Pressure Sodium or Metal Halide lighting technology. New LED lighting technology offers the opportunity to reduce energy use by over 50% which also saves a significant amount on maintenance costs. Pilot projects to replace street light fixtures with LED on Carling Avenue, Beausoleil Drive, Caldwell Avenue and Glebe Avenue were completed in 2014 and are expected to produce utility cost savings of \$80,000 annually.
- **Conversion of traffic signalized intersections to LED lighting.** There are over 1,130 signalized intersections where traffic signals automatically control the flow of traffic. These traffic signals consume significant amounts of energy as they use in-efficient incandescent lighting technology and operate 24/7. The new LED technology reduces electrical use by 80%, provides significant maintenance savings and reduces traffic interruptions. In 2014, the City converted 125 signalized intersections to LED which is expected to save the City \$110,000 annually on utility cost.
- **Savings and client satisfaction from Building Automation Systems (BAS).** BAS automatically controls a large portion of the heating, ventilation, air conditioning and lighting systems in many of the City's facilities. Used properly, these systems can allow for optimal efficiency in building operation. The City of Ottawa has many separate BAS installations from 14 different vendors. The new 'Integrator' system has allowed individual systems to be seen through a common front end. This system can now be accessed through any City computer or City Blackberry with the right authority. The new 'Integrator' system makes it easier for staff to run their facility from any location. Staff are no longer required to interface through a specific computer to make necessary changes to the schedule of the mechanical and lighting systems. Currently there are over 100

facilities under BAS Integration system. The BAS Integration system has allowed City staff to effectively identify and correct problems in a timely fashion within facilities. The eight largest sites converted to BAS include: St. Laurent/Don Gamble Recreation Complex, Overbrook Community Centre, Richelieu-Vanier Community Centre, Bayview maintenance yard, Sandy Hill Community Centre, Hintonburg Community Centre, Carleton Lodge Long Term Care and the Greenboro Community Centre, which resulted in energy savings of \$40,000 annually.

- **Enhanced reporting and benchmarking of facilities energy use.** City staff use the Utility Management Accounting System (UMAS) to perform various benchmarking exercises that compare energy intensity of individual types of facilities. Benchmarking reports are created to compare the energy use of different types of facilities by square footage and various other parameters. This identifies the energy intensive buildings within different segments of our portfolio and allows the City to concentrate on those with the most potential for savings. An annual report is generated that compares the use of electricity, natural gas, and water over the past three years across all City facilities. This is given to facility supervisors and if the utility consumptions are more than expected it is highlighted in the report for staff to investigate. The report highlights increases in energy and water use at the facilities that are in need of review, have opportunities to correct problems to existing systems, or are in need of energy efficient upgrade in order to reduce energy and water use.
- **Upgrading to energy efficient lighting across OC Transpo facilities.** The facilities include OC Transpo bus stations, garages, admin building and parking lots. There were various energy efficient lighting measures implemented across many OC Transpo sites which resulted in utility cost savings of \$270,000 annually.
- **Replacement of metal halide lighting to T5HO lighting across seven indoor rink surfaces.** The existing metal halide lighting systems require 10 to 15 minutes for the lamps to reach full output (with re-strike being very detrimental to lamp life). For this reason, the lights would be on when a facility is opened and turned off when staff leaves the building. The new T5 HO fixtures support 'instant-on', where staff are able to implement occupancy sensors that automatically turn off lighting after 15 minutes of inactivity on the rink. This project resulted in utility cost savings of \$50,000 annually across seven rinks.

- **Variable Speed Drives (VFD) at City facilities.** VFDs allow fans and pumps to run at reduced speeds when not at full load thereby reducing energy use significantly. At City Hall and Ben Franklin Place, implementation of this measure resulted in energy savings of \$80,000 annually.
- **Various other mechanical/heating upgrades at City facilities.** This includes conversion of air conditioning units to high efficiency units, garage door controls, garage fan optimization and control of fans/pumps/compressors and other small mechanical upgrades. This has provided a comfort environment to City facilities and resulted in utility cost savings over \$300,000 annually.
- **Low flow toilets upgrade at seventy small City facilities.** Water conservation measures including low flow aerators, efficient toilets and urinals resulted in water savings of \$17,000 annually. Other water conservation measures across various City facilities resulted in water savings of \$165,000 annually.
- **Replacement of oil, propane, and electric heating equipment with high efficiency natural gas equipment.** Natural gas is a very inexpensive source of energy when compared to other energy sources, such as electricity, oil, and propane; it is also relatively clean burning and thus reducing the carbon footprint. The City has converted a large number of heating appliances to use high-efficiency natural gas units. This has resulted in utility cost savings of over \$300,000 annually.
- **Building exterior lighting replacement (wall-packs) to LED.** The City has approximately 400 buildings with security lighting that can be metal halide, high pressure sodium, or incandescent lighting technologies. Some of the facilities have been marginally lit due to the existence of in-efficient lighting technologies. Upgrading these lights to LED will typically save between 50% and 80% of the energy used. The new technology is more efficient, cuts down on spill light (light pollution), and can be dimmed up to 50% based on occupancy. Currently, we have replaced wall-packs to LED across 130 City facilities. This has resulted in utility cost savings of \$85,000 annually as well as significant improvement in building security and reduction in maintenance cost.
- **Solar panels on City facilities.** The City has taken advantage of the Provincial Micro-Fit program by installing solar panels on the roof of three facilities. The total installed capacity is 23 kilowatts. The Smart Energy program provided the capital required to build energy generation and benefit from the Province's Micro-

Fit Program. As a result, the City has earned approximately \$45,000 since 2011 by installing solar panels at City Hall, OC Transpo building on Belfast and at Huron Early Education Centre on Capilano Avenue.

- **Re-commissioning of City facilities.** A re-commissioning project includes a comprehensive optimization process that improves a building's overall performance by implementing energy efficient design features and addressing equipment performance and system integration issues. A pilot project was implemented at Plant Bath which resulted in reduction of 17% of the electrical use and 3% of the natural gas use as a result of re-commissioning. Significant improvements in client comfort were also reported.
- **Replacement of low efficiency gas furnaces and boilers with high efficiency condensing equipment.** Some of the City's existing gas fired equipment has effective efficiencies between 55% and 75%. New condensing equipment has efficiencies in the 90% range. Conversion of seven smaller facilities to high efficiency condensing units resulted in gas savings of \$20,000 annually.