

The Regional Municipality of York

Housing York Inc.
November 2, 2017

Report of the
General Manager

Effectiveness of Previous Energy Management Retrofit Programs and Input for Future Energy and Utilities Management Plan

1. Recommendations

It is recommended that:

1. The Board of Directors direct staff to develop an Energy Management Plan based on the following principles:
 - a) Upgrade with high energy efficiency components at end of component life
 - b) Continue and expand energy education and awareness initiatives with residents
 - c) Upgrade with high energy efficiency components before end of component life if cost recovery is eight years or less
 - d) Pursue aggressive approach initiatives when Provincial and Federal funding is available to pay for the initiatives
2. The Energy and Utilities Management Plan be brought to the Board of Directors for approval in Q3 2018.

2. Purpose

The purpose of this report is to provide the Board with an assessment of the effectiveness of previous energy initiatives and to seek Board guidance on principles to assist with development of an Energy and Utilities Management Plan.

3. Background

In 2005 the Board approved an Energy Management Program

In [September 14, 2005](#), the Board approved a comprehensive program for energy management to address rising utility costs and reduction of emissions. The program included using new technology and systems, educating staff and residents, and maximizing opportunities for energy incentive funding and funding from various levels of government.

The Board approved an *Energy Conservation Pilot* in [September 2006](#). The pilot project implemented energy upgrades at Elmwood Gardens in the Town of Whitchurch-Stouffville and Founders Place in the Town of Newmarket. It included lighting retrofits and installation of building automation to increase the efficiency of the mechanical systems.

Based on the pilot project's success, in [December 2007](#) the Board approved a five-year Energy Management Retrofit Program to reduce greenhouse gas emissions

The program focused on 25 Housing York Inc. properties (five townhouse sites and 20 apartment buildings; see Attachment 1). Retrofits occurred over a five year period (2008 to 2012). The Board approved program budget was \$3.5 million. The program was adjusted based on resident feedback and ultimately implemented at 25 locations at a total cost of \$2.7 million. This program took a progressive approach to energy. Project examples included:

- High efficient mechanical equipment (boilers, hot water heaters)
- Building automation systems
- Low flow toilets
- Lighting upgrades
- Solarwall and solar water heating systems

Housing York Inc.'s 2017 to 2020 Plan includes analysis of past energy initiatives and creation of an Energy Management Plan

Housing York Inc.'s 2017 to 2020 Plan, [Achieving New Heights Through Innovation and Sustainability](#), includes energy management actions. The early actions include measuring the effectiveness of previous energy initiatives, and seeking Board input on future energy management initiatives. This report

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provides the assessment of the past energy initiatives and proposes principles upon which to develop an Energy and Utilities Management Plan, to be brought to the Board for approval in Q3 2018.

4. Analysis and Implications

Evaluation of Energy Management Retrofit Program

Measurement and verification has been completed at 18 of the 25 properties included in the energy management retrofit program

Of the 25 Housing York Inc. (Housing York) properties that received energy upgrades, 18 of the 20 apartment buildings were selected to conduct measurement and verification studies. The remaining two apartment buildings were omitted as one was demolished for redevelopment (the Woodbridge redevelopment in the City of Vaughan) and one was extended with a new addition (Kingview Court in the Township of King). The five townhouse sites that received energy upgrades have not been included in the measurement and verification studies as utilities are paid directly by the residents and Housing York does not have access to their utility bills.

The measurement and verification studies included multiple criteria to systematically evaluate the effectiveness of the energy conservation measures. The criteria used are as follows:

- Measurement and verification of actual utility savings: A consultant was retained to verify the actual utility savings achieved from past energy measures
- Operational feedback: Feedback sessions were held with staff to gain insights on the reliability, functionality and maintenance of equipment
- Resident Engagement Survey: Residents were surveyed on the impact of the energy measures

Energy management initiatives have resulted in more than \$140,000 in annual savings and an annual reduction of 266 tonnes of greenhouse gas emissions

The consultant's measurement and verification study compared actual monthly utility consumption data before the energy upgrades, to consumption data after the energy upgrades, the summary of estimated annual utility cost savings for the

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period 2008 to 2012 against the actual costs. The measurement and verification exercise identified a total annual savings of \$143,386, including:

- Natural Gas: the actual annual cost savings were \$57,903 which is 31 per cent more than estimated.
- Water: the actual annual cost savings were \$27,985 which is 83.2 per cent more than estimated.
- Electricity: the actual annual electricity cost savings were \$57,498 which is 43.5 per cent less than estimated. Cost savings related to energy initiatives were off-set by increased demand in other areas, such as an increase in technology devices that required electricity (for example, charging scooters within units).
- Housing York's total actual annual utility cost was reduced by seven per cent (\$143,386) of the total 2013 utility budget of \$2,056,870.
- Utility use was reduced as a result of the energy conservation measures.

Staff training and resident engagement are key to implementing energy initiatives

Energy upgrades such as enhanced building automation systems and high efficiency mechanical equipment have greater maintenance requirements than traditional systems. The new equipment relies on sophisticated technology to maximize energy efficiency. Enhanced staff training and specialized skill sets are necessary to ensure that equipment operates at an optimal level.

Resident engagement is an important component of energy initiatives because resident behaviour directly impacts energy consumption and costs. Staff went to 8 of the 25 properties to get feedback from the residents on the energy upgrades implemented between 2008 and 2012. The feedback was mixed:

- Some residents did not recall the upgrades as they were completed many years ago
- Others commented that some of the energy efficient stoves with safety elements took longer to heat up and to cook food
- Some residents responded that the initiatives had little to no impact on their day-to-day use

Based in these results, and more recent results from the Community Champion Program (see below) a recommended principle for the Energy and Utilities Management Plan is to continue and expand energy education and awareness initiatives with residents.

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Recent energy initiatives include resident engagement, lighting retrofits, a central heating control pilot and building upgrades

Since 2013, additional energy initiatives have been implemented:

- Lighting retrofits were completed at five properties to replace conventional parking lot light fixtures with lower energy consuming light-emitting diodes (LED lighting).
- Housing York partnered with the Housing Services Corporation to deliver a Community Champion Program, to engage residents in energy conservation. This program was implemented at three properties. Multiple sessions were held with residents to promote and increase awareness of energy conservation to residents. Feedback was positive, although results have varied from site to site with some having a reduction in use and others with no reduction.
- A central heating control was installed in 2016 at Evergreen Terrace, a 56 unit apartment building located in the Town of Richmond Hill, to optimize apartment heating element operations. The new control system will eliminate energy waste caused by windows open during the heating season while maintaining a comfortable indoor environment.

New developments incorporate energy efficiency, and sustainability in design and construction. High efficiency mechanical equipment and lighting were provided in the newly built properties including Lakeside Residences, in the Town of Georgina, and the Richmond Hill Hub. The Woodbridge Redevelopment (City of Vaughan) is currently under construction and will include energy measures such as light-emitting diodes lighting throughout the building and high performance mechanical equipment.

Development of a new Energy and Utilities Management Plan

The Province has announced \$657 million in future funding for energy initiatives

In 2016, Housing York, received \$43,000 from the Province under the Social Housing Electricity Efficiency Program, the first round of the Green Investment Fund. The funding was used to replace electrical baseboard heaters and provide light-emitting diodes lighting in ten units of a 100 unit building, Trinity Square in Markham. These ten units are the only units at this site where residents pay their own utilities, which was a requirement of the funding.

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In August 2017, the Province announced new funding for repairs and retrofits to social housing to improve living conditions and fight climate change. This investment is part of *Ontario's Climate Change Action Plan* and is funded by proceeds from the Province's carbon market. The five year Province-wide investment is \$657 million and will help improve the lives of residents with upgrades to social housing buildings such as new energy efficient heating, improved insulation, and window replacements.

Pending future carbon market proceeds, the Regional Municipality of York is conditionally allocated up to \$4,149,378 in 2017-18 and \$13,248,967 from 2018 to 2019 to 2020 to 2021

The first year of this program (2017 to 2018) will fund eligible greenhouse gas reduction retrofits in social housing apartment buildings of 150 units or more using the latest low carbon energy technologies. Years two through four of this program (2018 to 2019, 2019 to 2020, and 2020 to 2021) will fund eligible retrofits in social housing apartment buildings of 100 units or more. Housing York will be eligible for a share of this funding.

An Energy and Utilities Management Plan will help mitigate rising utility costs and reduce Greenhouse Gas Emissions

Utility costs continue to escalate. Electricity rates have been rising over the past ten years and are now 57 per cent higher than they were in 2006. Water rates have also dramatically increased and are 188 per cent higher than they were in 2006. In contrast, natural gas rates have declined 30 per cent over the past ten years as supply has been abundant. Energy efficient initiatives and resident education help mitigate rising utility costs by reducing consumption.

As part of its 2017 to 2020 Plan, the Board supported development of an Energy and Utilities Management Plan. This report recommends directing staff to develop an Energy and Utilities Management Plan for the period 2019 to 2023. The report would be brought forward in Q3 2018 for Board consideration and approval. This plan will take into consideration previous energy initiatives, and will make recommendations for future investment.

To assist in developing the Energy and Utilities Management Plan, staff require guidance from the Board on approach it is willing to commit to making energy improvements. The approach is important because it determines the direction of investment contributed to the reduction of greenhouse gases. The principles will help guide development of the draft plan.

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A progressive approach is recommended with optional aggressive initiatives

It is recommended that development of the Energy and Utilities Management Plan be based on principles that go beyond the status quo (baseline approach) to also consider a progressive approach. These initiatives are intended to achieve reductions in energy savings areas by installing proven technologies which will reduce the operational costs and greenhouse gases. In addition, it is recommended that aggressive energy initiatives also be developed as an optional part of the plan in order that Housing York will be positioned to move quickly to take advantage of any Provincial and Federal funding that may become available.

The sections below review three levels of approach and give the reasons for the recommended principles.

- Baseline approach (status quo): Low cost activities such as resident engagement to reduce consumption, and upgrading with high energy efficiency components at the end of component life
- Progressive approach Energy upgrades with high energy efficiency components, to be made before the end of the component’s useful life if cost recovery is 8 years or less
- Aggressive approach: Leading edge energy technologies and upgrades

A summary of the options and their impacts is included in Table 1.

Table 1
Approach on Future Energy and Utilities Management Program

Approach	Estimated Annual Utility Cost Savings (\$)	Estimated Annual Greenhouse Gas Reduction (Metric Ton CO2e)	Payback (Years)	Preliminary Estimated Annual Energy Investment for 5-year Plan (\$)
Baseline (status quo)	41,000	90	6	250,000 <small>(costs already considered in annual capital budget)</small>
Progressive	62,000	115	8	500,000
Aggressive	71,000	130	14	1,000,000

Baseline Approach (Status Quo)

As components reach end-of-life replacement, a review is conducted to determine if a high efficiency energy component is available to reduce energy consumption and operational costs. The annual cost of these upgrades is estimated at \$250,000, and this amount is already included in the annual capital budget. Energy education and awareness initiatives with residents are also included in an effort to achieve conservation through behaviour change.

Progressive Approach

A progressive approach would include implementing new energy management initiatives before the end of a component's useful life, provided that cost recovery would occur within eight years or less.

The types of initiatives that may be undertaken under a principle of Moderate/Progressive investment include building automation systems, mechanical equipment (boilers, chillers), LED lighting, lighting control system, and central heating control systems for in-suite heating. These systems yield the best results in the reduction of greenhouse gasses and operational cost savings. Based on a preliminary review, two building heating controls systems and two light control systems could be completed annually.

Aggressive Approach

An aggressive approach would include initiatives such as implementing new technologies and performing deep energy retrofits. Deep energy retrofits refers to taking a holistic approach to retrofitting such as building envelope improvements and adjustments of mechanical equipment capacity. This may also include upgrading of high energy efficiency components with a cost recovery longer than eight years provided that Provincial and/or Federal funding programs can be applied to reduce or entirely cover the overall capital cost.

The types of initiatives that may be undertaken under a principle of high/aggressive investment may include new technologies grey water treatment systems, photovoltaic panels, solar thermal air and geothermal systems. As technology is continuously advancing, each measure will be reviewed and adjusted to reflect industry changes.

The approach principals recommended can achieve a reduction of costs and greenhouse gas emissions

The approach recommended intend to:

- minimize the financial impact on existing capital budgets by leveraging existing plans and planned component replacement cycles

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- balance the goal of reducing greenhouse gasses and utility cost savings, with the capital cost required to implement energy initiatives

The Energy and Utilities Management Plan will include business cases assessing the viability of each energy initiative from financial, environmental and social perspectives (a triple-bottom line approach). Capital costs and operating costs for each initiative will be quantified in each business case and opportunities to access Provincial and Federal funding programs will be maximized.

Including optional aggressive energy initiatives as part of the plan will enable maximization of potential Provincial and Federal funding to further reduce greenhouse gases and achieve utility cost savings.

5. Financial Considerations

Nearly half of the Energy Management Retrofit Program funding came through grants and incentives

The total cost of the Energy Management Retrofit Program from 2008 to 2012 was over \$2.7 million gross with a Housing York contribution of approximately \$1.4 million and a third party funding equalling to \$1.3 million.

- In 2008, Housing York received an energy loan of \$800,000 from the Region and paid back the loan in three years after the program was completed
- In 2009, Housing York received almost \$1 million from the Province under Social Housing Renovation and Retrofit Program used for energy retrofit projects completed between 2009 and 2011
- Other funding sources included Housing York's capital budget as well as third-party incentives from agencies such as gas and electricity suppliers

Capital investments for the Energy Management Retrofit Program are summarized in Table 2.

Table 2
Capital Investment Breakdown for
Energy Management Retrofit Program
(2008 to 2012) Implemented on 25 Housing York Properties

Total Cost (\$)	Funding Source (\$)				Total Number of Energy Retrofit Project
	Provincial Grant through SHRRP*	Third Party Incentives	Annual Capital Program	Energy Loan from the Region	
2,727,445	1,071,882	245,075	610,488	800,000	107

*Social Housing Renovation and Retrofit Programs

More than \$700,000 in savings have been achieved since program implementation

Annual cost savings have been realized in the operating budget and have contributed to retained earnings and the capital reserve. The energy loan from the Region was paid back three years after the energy program was completed. The total accumulated annual utility cost savings since 2013 is estimated to be \$716,930.

Funding sources for the new Energy and Utilities Management Plan will be considered as part of developing the plan. Possible funding sources may include: funding through operational savings, additional capital investment, incentive programs, and Provincial and Federal funding programs.

Future funding for initial projects will be sought through the usual budget and approval process.

6. Local Municipal Impact

All local municipalities benefit from the reduction of greenhouse gas emissions. Reduced electrical consumption and peak demand reduces the burden on the local utility supply and infrastructure.

7. Conclusion

The previous energy initiatives reduced operating costs and greenhouse gas emissions through energy efficiency. Moving forward with development of a new

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Energy and Utilities Management Plan in 2018, will help achieve the targets set out in the Region's [Energy Conservation and Demand Management Plan](#).

For more information on this report, please contact Rick Farrell, General Manger at 1-877-464-9675 ext. 72091.

The Senior Management Group has reviewed this report.

Recommended by:

Approved for Submission:

Rick Farrell
General Manager

Katherine Chislett
President

October 18, 2017

Attachments (1)

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Accessible formats or communication supports are available upon request

Table 1
Properties Included in the Energy Management Program (2008 to 2012)

Property (address)	Municipality	Built Form	Number of Units	Measurement & Verification Completed
55 Orchard Heights	Aurora	Apartment	22	Yes
57 Orchard Heights	Aurora	Apartment	61	Yes
Hadley Grange	Aurora	Apartment	80	Yes
Oxford Village	East Gwillimbury	Apartment	36	Yes
37 Northview Court	Georgina	Apartment	40	Yes
39 Northview Court	Georgina	Apartment	32	Yes
Glenwood Mews	Georgina	Townhouse	64	No
Pineview Terrace	Georgina	Apartment	49	Yes
East Court	Georgina	Townhouse	10	No
Keswick Gardens	Georgina	Apartment	120	Yes
Kingview Court	King	Apartment	39	No
Nobleview Pine	King	Apartment	26	Yes
Trinity Square	Markham	Townhouse	100	No
Heritage East	Newmarket	Apartment	120	Yes
468 Fairy Lake Gardens	Newmarket	Apartment	97	Yes
474 Fairy Lake Gardens	Newmarket	Apartment	56	Yes
Brayfield Manors	Newmarket	Apartment	81	No
Mulock Village	Newmarket	Townhouse	104	No
Maplewood Place	Richmond Hill	Apartment	80	Yes
Springbrook Gardens	Richmond Hill	Townhouse	93	No

Property (address)	Municipality	Built Form	Number of Units	Measurement & Verification Completed
76 Dunlop Pine	Richmond Hill	Apartment	67	Yes
78 Dunlop Pine	Richmond Hill	Apartment	66	Yes
Evergreen Terrace	Richmond Hill	Apartment	56	Yes
Rose Town	Richmond Hill	Apartment	125	Yes
Woodbridge Lane	Vaughan	Apartment	32	No

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