Using Best Practice Targets to Achieve the Energy Conservation Potential in Community Centres

Methodology White Paper

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About the Community Centre Challenge

Community Centres are the biggest energy users for most municipalities. They are generally complex buildings which can include different combinations of ice rinks, swimming pools, gymnasium and public meeting spaces. They typically operate for long hours each day, seven days a week. As a result, they tend to be very energy intensive, and provide opportunities for significant energy and cost savings. The starting point for improving energy efficiency is to determine relative efficiency and conservation potential so that effort is focused on facilities with high savings-potential, and on strategic areas of opportunity within those facilities.

This White Paper documents the methodology by which site-specific energy targets are determined, which are used to establish conservation potential and relative energy efficiency for each facility. As described in the White Paper, targets are established based on a 2012 energy use dataset for 79 “basic” community centres (without pools or ice rinks), and then adjusted for site-specific amenities including pools and ice plants, weather (degree-day) variations from year to year, and heating energy sources.

The Community Centre Challenge (the Challenge) aims to identify, recognize and document the most energy efficient community centres. It will run from 2016 to 2020, and is open to municipalities and other organizations which operate such facilities. Participants will benchmark energy use for their buildings against each other, normalize for variables between buildings, and determine their conservation potential based on good practice targets from comparable facilities. Buildings with the least targeted savings potential are considered the most energy efficient. Participants in the Challenge receive their annual Energy Assessment Report for each year of the Challenge, presenting their electricity and thermal energy, utility cost and emissions savings potential, their actual, weather-normalized savings over the prior year, and where their remaining opportunities are to be found. The most energy efficient facilities for 2020 will be recognized and celebrated in 2021.

About the Mayors’ Megawatt Challenge (MMC)

The Mayors' Megawatt Challenge brings together leading municipalities to achieve exceptional levels of energy and environmental performance in municipal buildings. The Mayors’ Megawatt Challenge enables member municipalities to:

- Benchmark and monitor energy and water use in their Community Centres, Town/City Halls, and other facilities
- Use the program’s diagnostic tools to identify savings potential and determine where these savings can be found
- Receive guidance on operational improvements and capital projects
- Participate in regular webinars focused on case studies, best practices, progress with the Community Centre Challenge, and working towards or maintaining the MMC target of 20 ekWh/ft2/year in Town/City Halls
- Learn about utility company programs, and what other municipalities across Canada are doing through profiles of top-performing facilities and information sharing
- Access MMC tools and best practices to achieve deep reductions in energy and water use and greenhouse gas emissions
- Network with peers and industry experts through interactive webinars and email exchange
- Qualify for MMC Awards including Energy Performance Achievement Awards and 10% Club (savings) Awards
In 2011, the Mayors’ Megawatt Challenge (MMC) introduced the Town Hall Challenge, which engaged municipalities in reaching 20 ekWh/ft² total energy use (based on Ottawa 2010 weather) in their Town/City Halls by 2015, with winners announced in 2016. The Community Centre Challenge is the next major initiative aimed at a particular municipal building type.

About the Toronto and Region Conservation Authority (TRCA)

The Toronto and Region Conservation Authority (TRCA) is a major, not-for-profit organization with more than 50 years of experience and leadership in developing and implementing community and regional sustainability practices and programs. For more than a decade, TRCA’s Energy Efficiency Programs have been developing and delivering a unique, data-driven approach to wide-scale energy conservation in the municipal, hospital and K-12 school sectors. The methodology is centred on benchmarking and target-setting using monthly and interval utility data to determine the unique conservation potential for every building, and to uncover specific areas of inefficiency. The Programs monitor ongoing savings through a powerful online energy management system. In addition, top-performing and top-savings buildings are studied and profiled as case studies of best practices which are shared with the rest of the Program members. Benchmarks and targets are updated each year as the energy efficiency of individual buildings and the sectors as a whole continues to improve. TRCA works with governments, businesses, and individuals to create a greener, cleaner and healthier natural and built environment in accordance with its overarching vision for a new kind of community, The Living City, where human settlement can flourish forever as part of nature's beauty and diversity.

About Enerlife Consulting (Enerlife)

Based in Toronto, Ontario, Enerlife Consulting Inc. is a management consulting and engineering company working at the leading edge of high performance buildings. Enerlife works with major building owners, delivering a growing number of buildings which are among the most energy efficient in North America. Enerlife is an applied research firm as well as a practitioner, responsible for major developments and important publications in the field of data-driven, evidence-based energy efficiency for commercial and institutional buildings. Clients include governments and utility companies as well as commercial landlords, municipalities, school boards, universities, healthcare organizations and multi-unit residential building owners. Enerlife’s services are employed to design, direct and verify comprehensive energy efficiency projects and programs for individual buildings, sectors and portfolios.

About the Author

Ian Jarvis has been President of Enerlife Consulting since 2001, and is an authority in the fields of energy efficiency and green building performance. From 1992-1999 he was CEO of a leading energy performance contractor responsible for several of the largest energy retrofit projects in North America. From 2003-2007, Ian served as founding chair of the Canada Green Building Council. He is a member of Canada’s National Advisory Council on Energy Efficiency which advises the federal Office of Energy Efficiency, and of the Ontario Energy Minister’s Advisory Committee.

Please direct any questions or comments to:
Achieving Energy Targets in Community Centres

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1 Summary

Toronto and Region Conservation is officially launching the Community Centre Challenge in 2016 as an initiative under their Mayors’ Megawatt Challenge (MMC) program. This White Paper details the methodology used to establish performance levels, energy targets and conservation potential for individual community centres. It presents results for 48 facilities which are part of the MMC database, and describes the analysis performed to derive top-quartile (good practice) energy targets. Normalization factors used to adjust for weather (degree-days), site-specific uses and energy sources are presented and explained. Each community centre has been analyzed, separating energy use by weather dependent and non-dependent components, and applying its normalization factors to determine its energy efficiency and savings potential relative to its good performance target. The methodology, metrics and tools described in this White Paper have been reviewed with municipalities and leading energy and industry experts listed in Appendix C.

2 Related Initiatives

2.1 Real Property Association of Canada 20 by ‘15 Target

In September 2009, following extensive research and consultation, the Real Property Association of Canada (REALpac) announced the 20 by ‘15 national energy consumption target for office buildings. The goal of REALpac’s 20 by ‘15 initiative is to achieve the target of 20 equivalent kilowatt hours of total energy use per square foot of rentable area per year (ekWh/ft2), in office buildings, by the year 2015. A white paper, describing how the target was derived, was prepared by Enerlife and published in 2009, and led to establishing REALpac’s ongoing energy benchmarking and target-setting program.

2.2 Town Hall Challenge

In 2011, Toronto and Region Conservation’s Mayors’ Megawatt Challenge (MMC) introduced the Town Hall Challenge, which engaged cities and towns from eight provinces in identifying and recognizing some of the most energy efficient city and town halls in Canada. A peer-reviewed white paper was published in 2013, presenting the methodology used to establish a national energy efficiency target of 20 equivalent kilowatt-hours (ekWh) of total energy use per square foot per year, based on 2010 Ottawa weather conditions, to be achieved by 2015. This target would yield more than 40% energy savings in town and city hall and municipal administration buildings across Canada. Participation enabled municipalities to make substantial energy savings.

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1 See [http://www.realpac.ca/?page=RPEBP21Methodology](http://www.realpac.ca/?page=RPEBP21Methodology).
and financial savings, and gain recognition for what they accomplished. Winners will be announced in 2016.

2.3 Canada Green Building Council Pilot Projects

In 2008, to support its commitment to lowering greenhouse gas emissions through improved energy efficiency in buildings, the Canada Green Building Council (CaGBC) initiated a series of large-scale, national pilot projects aimed at establishing current energy use of existing buildings, documenting top performers, and setting the stage for efforts to substantially improve performance. CaGBC engaged Enerlife to conduct the projects in K-12 schools, commercial offices, public administration buildings, retail bank branches, universities, and municipal arenas. The pilots proceeded in parallel with, and informed the technical development of, the Canadian version of LEED for Existing Buildings: Operations & Maintenance.

The pilots developed new and important knowledge about energy performance in buildings. No correlation was found between building age and performance, and the projects documented that operations and maintenance are just as important in achieving high performance as design and building codes in effect at the time of construction. The combined database of hundreds of buildings served to identify and characterize top-performing buildings, and to establish for the first time whole-building and system-level metrics and standards, which have been used for each of these initiatives as well as this analysis.

3 Energy Targets for Community Centres

The power of evidence-based energy targets as the starting point for deep energy savings in individual buildings, sectors and portfolios has been well established through TRCA’s Energy Efficiency Programs and other, similar initiatives. Targets highlight high-potential buildings, and can point to where savings are to be found in individual buildings. They are particularly effective at uncovering operations and maintenance measures which often make up more than half of the energy savings potential. They support a continuous, systematic and comprehensive approach to achieving and maintaining high-performance. Target-setting ensures that nothing is missed, improvements are properly implemented, and measurable high performance is actually achieved and sustained over time.

Community centres are complex facilities with different combinations of use and operating seasons, and as such can be challenging to benchmark and set targets. The approach taken for the Community Centre Challenge is to establish a standard energy target for a simple “basic” facility which is gas-heated and partially air conditioned, before adjustments for site-specific characteristics such as indoor ice rinks and pools as described below.

This basic target is derived from top quartile (75th percentile) benchmark energy use intensities for a 2012 dataset of 79 recreational facilities in the Greater Toronto Area in the MMC database. The selected “basic” facilities have neither indoor rinks nor indoor pools. See Figure 1 below.

Energy consumption is presented in equivalent kilowatt hours per square foot (ekWh/ft²), where thermal energy types such as natural gas, steam or oil have been converted to equivalent units of kilowatt hours. Values are multiplied by 3.4 to convert to kBtu/ft².

Based on this analysis, the standard (top-quartile) basic facility target is 21.8 ekWh/ft² (74.4 kBtu/ft²).
Achieving Energy Targets in Community Centres

3.1 Component Energy Targets

This total energy standard target is sub-divided into four components - base (year-round) electricity, cooling (summer extra) electricity, heating (winter extra) electricity, base (year-round) thermal and heating (winter extra) thermal. These components are determined as follows:

Electric Baseload: This relates to systems which run year-round such as lighting, fan motors and equipment, and is set based on consumption levels in spring and fall.

Electric Cooling: This is the additional electricity use above the year-round base during summer months, and relates to air conditioning.

Electric Heating: This is the additional electricity use above the year-round base during winter months, and relates to electric heat and electricity use for heating plants (pumps, blowers etc).

Gas Baseload: This relates to systems which run year-round (mainly domestic hot water) and is set based on consumption levels in summer months.

Gas Heating: This is the additional gas use above the year-round base during winter months used to heat the building.

Component energy targets are set based on the top quartile energy intensity of the eligible data set (see Figure 2 below). Achievement of the targets anticipates all buildings with component energy intensities greater than the top quartile will reach that level already attained by one quarter of the buildings. The
Achieving Energy Targets in Community Centres

target is considered good practice, requiring no special technology, just consistent application of good design and operational practices which are already in wide use.

Utility bills used for this component energy analysis cover the period from January to December 2012 for the 79 building dataset. Suspect data have been removed. If the total number of days in the combined bills is greater than 385 or less than 345 (because of billing irregularities), the facility is excluded from the dataset used to determine energy use components and targets. As well, all values less than 5% of the average of the top 3 facilities are removed for the calculation of the component energy targets. Such low energy use intensity indicates that data could be incomplete or meters could be defective.

Components of actual energy use which are above the target levels point to where a building’s particular inefficiencies can be found. Measurement and testing can then be used to highlight building systems with high power densities which then become candidates for retrofits and control improvements.

Figure 3 below shows the energy use component breakdown for the basic building as a percentage of its total energy use target.
3.2 Energy Target Adjustments

These basic component energy targets for each individual facility for a given year are normalized for its particular amenities, usage profile, current year weather conditions and energy sources. Thus, the target for each facility is different, depending on use of spaces (indoor ice rinks, indoor pools etc.) and variances in climate and building systems. Normalization is limited to material factors which are estimated to account for 5% or more of electricity use, or 10% of thermal energy use. Adjustments are only made for factors which are expected to exceed these thresholds.

3.2.1 Adjustment for Indoor Ice Rinks

The top quartile standard for operation of an indoor ice rink, derived from the CaGBC Arenas Pilot project, and further developed by the Mayors’ Megawatt Challenge, is 0.5 kWh per ft² of ice area per week. See Appendix B.

This standard for Indoor Ice Rinks [0.5 kWh per ft² of ice area per week of ice-in] is multiplied by 52 weeks a year and by the Total Ice Surface Area (ft²), and added to the basic target to create the Electric Baseload Target for the facility.

The standard for Indoor Ice Rinks [0.5 kWh per ft² of ice area per week of ice-in] for the period when ice is not in use is then subtracted from the basic target to create the Electric Cooling Target for the facility.

3.2.2 Adjustment for Indoor Pools

The standard developed by the Mayors’ Megawatt Challenge for operation of an indoor swimming pool is 50 kWh of electricity (circulating pump and in-pool lighting) and 280 ekWh of natural gas per year per ft² of tank surface area.

This electricity use standard for Indoor Pools [50 kWh per ft² of tank area] multiplied by the Tank Area (ft²) is added to the basic target to create the Electric Baseload Target for the facility.

The base (non-weather-dependent) gas use standard for Indoor Pools [180 ekWh per ft² of tank area] multiplied by the Tank Area (ft²) is added to the basic target to create the Gas Baseload Target for the facility.

The heating (weather-dependent) gas use standard for Indoor Pools [100 ekWh per ft² of tank area] multiplied by the Tank Area (ft²) is added to the basic target to create the Gas Heating Target for the facility.

3.2.3 Adjustment for Outdoor Ice Rinks

Currently, there are no target adjustments for outdoor ice rinks.

3.2.4 Adjustment for Outdoor Pools

Currently, there are no target adjustments for outdoor pools.

3.2.5 Adjustment for Food Services

If there is a kitchen and cafeteria, 30 kWh per ft² multiplied by the % of the facility area occupied by food services (including seating area) is added to the Electric Baseload Target.
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3.2.6 Adjustment for Electrically Heated Buildings
The Gas Heating Target multiplied by % of area which is electrically heated and 75% deemed equivalent boiler efficiency is added to Electric Heating Target AND equivalent amount subtracted from the Gas Heating Target.

3.2.7 Adjustment for Heat Pumps
For ground source heat pump (GSHP), the Gas Heating Target multiplied by 0.19 multiplied by % of area served by GSHP is added to Electric Heating Target AND the Gas Heating Target reduced to 10% of the basic amount multiplied by % of area served.

For water source heat pump (WSHP), the Gas Heating Target multiplied by 0.19 multiplied by % of area served is added to Electric Heating Target AND equivalent amount subtracted from the Gas Heating Target.

3.2.8 Adjustment for Electric Domestic Hot Water
Gas Baseload Target multiplied by % of area served by electrically heated DHW multiplied by 75% deemed equivalent boiler efficiency is added to Electric Baseload Target AND equivalent amount subtracted from the Gas Baseload Target.

3.2.9 Adjustment for Electric Air Conditioning
The average percentage of building area served by air conditioning for the 79 building sample data set is 30%. The Electric Cooling Target for the facility is adjusted pro rata based on its actual % air conditioned relative to this average.

3.2.10 Adjustments for Other Energy Sources
Adjustments are made for buildings with purchased heating or chilled water to reflect the efficiency of the external plants. For purchased steam or hot water the standard adjustment is to 75% of the thermal heating target. For purchased chilled water from a normal cooling plant the standard conversion is 0.8 kWh/TH. For purchased chilled water from the Enwave Deep Lake Water Cooling system the conversion is 0.3 kWh/TH.

3.2.11 Adjustments for Weather
Weather-sensitive components of the energy targets are adjusted pro-rata for the differences in heating degree-days (balance temperature 15 degC) and cooling degree-days (balance temperature 10 degC) between Toronto Pearson Airport in 2012, and current year degree-days for the closest weather station.

4 The Community Centre Challenge

4.1 Setting the Stage
For ease of comparison, the facilities participating in the Community Centre Challenge are categorized into four types: facilities with both indoor ice rinks and indoor pools; facilities with neither indoor ice rinks nor indoor pools, facilities with indoor ice rinks only; and facilities with indoor pools only.

48 Ontario community centres owned by current MMC member municipalities make up the initial participants in the Challenge (see Appendix A for a list of participating facilities). Results of benchmarking
their total energy use are shown in Figure 4 below. The range of energy use intensity is more than 5:1, with a quarter of the buildings using more than 65 ekWh/ft². The median total energy use is 48.2 ekWh/ft²/year, while the top 10 have a median of 27.1 ekWh/ft²/year. In general, and as expected, facilities with neither indoor rinks nor indoor pools tend to have lower total energy use per square foot than facilities with indoor ice rinks and/or indoor pools. Swimming pool facilities are generally the most energy intensive.

![Figure 4 - 2014 Total Energy Benchmark for 48 Participating Community Centres](image)

4.2 Data Collection

Utility data for participating facilities are collected directly from utility companies, from scanned copies of bills, or entered by a participant manually, and uploaded to the MMC online energy management system and database. Where fuel oil is used, it is converted into natural gas equivalents with a conversion factor of 1.023 cubic meters of gas per litre. Participants can access their original data, benchmarks and monthly savings reports online at any time.
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4.3 Building Profile
An accurate building area is critical in the target setting process, since it is the denominator in every energy use component. The building area should ideally be measured from architectural drawings, or a report prepared by a professional firm. Gross floor area is used, defined by BOMA International standard “Gross Areas of a Building: Methods of Measurement (ANSI/BOMA Z65.3 – 2009) as the exterior gross area which includes basements, external circulations, floors, major vertical penetrations, permanent mezzanines, occupant voids and penthouses, minus the structured parking area.

Other important features of the building that are collected in order to complete the target adjustments as described in this paper are shown in Figure 5 below.

![Figure 5 - Sample Building Profile Template](image)

4.4 Weather-Normalization
The postal/zip code for each participating facility locates the closest weather station, which is used to weather-normalize the energy target as described in Section 3.2.11.

5 Energy Target and Savings Potential
The energy target for each facility is determined based on its Building Profile (Section 4.3) and weather station. Its savings potential is the difference between current actual energy use intensity and target energy use. If a facility already uses less energy than any of its target energy components, the savings potential is 0% for that component and the target is set equal to the actual energy use.

The resulting total energy savings potential for the 48 initial participants in the Challenge is shown in Figure 6. Two facilities have zero potential, meaning they meet all of their component energy targets. Eighteen facilities have greater than 30% savings potential, with a median savings potential of 23.4%.
Achieving Energy Targets in Community Centres

Figure 6 - Total Energy Savings Potential Benchmark

Table 1 presents the total savings potential for the 48 community centres. The potential is calculated separately for electricity and gas/thermal energy, and is presented in % and dollars per year. The dollar savings potential is based on the following prices per unit of energy (approximate 2015 rates).

- Electricity: $0.14 per kilowatt hour
- Gas: $0.25 per cubic meter

<table>
<thead>
<tr>
<th>Buildings</th>
<th>Electricity Savings Potential</th>
<th>Gas Savings Potential</th>
<th>Total Energy Savings Potential</th>
<th>Indoor Area</th>
<th>Avoidable GHG Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>$/yr</td>
<td>%</td>
<td>$/yr</td>
<td>ft²</td>
</tr>
<tr>
<td>TOTAL: 48 facilities</td>
<td>24%</td>
<td>$2,331,452</td>
<td>30%</td>
<td>$714,723</td>
<td>3,176,910</td>
</tr>
</tbody>
</table>

Table 1 – Energy Savings Potential for 48 participating Community Centres

Table 2 below expands on the Table 1 summary, showing the component energy savings potential for each individual community centre. Table 2 identifies the high potential facilities by dollar and percentage savings coded red under Total Energy Savings Potential. Energy components highlighted red have the highest percentage savings potential, while gold are moderate and green have little or no potential. The high potential energy components point to the building systems where the biggest percentage savings are to be found in each facility.
Note that for all facilities with ice rinks, the negative adjustment in summer when the ice is out can’t be separated from the air-conditioning. Therefore, electric cooling and baseload are combined (so no savings potential is indicated under electric cooling for facilities with ice rinks).

In addition, the “basic facility” has on average 30% air conditioning and the target adjustments are pro-rated from this level. Therefore, for facilities reported with less than 30% air conditioning, the electric cooling savings potential can be over 100%.

Table 2 – Savings Potential by Energy Use Component for each Community Centre
6  Top Performing Facilities (2014 data)
The most efficient facilities will meet the Community Centre Challenge by surpassing their total and component energy targets, leaving no energy savings potential. These facilities have the option of ramping up to pursue higher performance levels if they wish, but will be recognized for their achievement in “meeting the Challenge.” At the start of the Challenge (May 2016), there are two facilities (Building 47 and Building 48) that have no energy savings potential. See Table 3 below.

![Table 3 - Top Energy Performing Community Centres 2014](image)

These initial results find no correlation between the type of facility and energy savings potential. The top performing facilities include some with indoor rinks and swimming pools, so a few facilities of all types are performing close to their targets.

The target provides a clear end-point for conservation efforts, quantifies the savings potential for a building, and guides allocation of effort and resources. Adopting a specific target quantifies savings potential, makes the business case for action, supports planning of improvements and informs performance objectives for staff and service providers. The metrics presented in this White Paper can be used as design and/or retrofit standards for building systems, to be incorporated into specifications and service agreements.

Through the Community Centre Challenge, a growing number of facilities will be working towards reaching and surpassing the target, raising the bar for the whole initiative. The targets will be updated periodically as more facilities join in, and as performance levels continue to improve.

To support and validate the methodology, this White Paper is being distributed to a number of sector experts for their comments and feedback. The results of this consultation, along with a list of those who provided feedback, is provided in Appendix C and will be updated as feedback is received.

For more information on joining the Community Centre Challenge contact Bernie McIntyre at BMcIntyre@trca.on.ca.
### Appendix A - List of 48 Community Centres

<table>
<thead>
<tr>
<th>Community Centre</th>
<th>City Name</th>
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<tbody>
<tr>
<td>Albion Arena – City of Toronto</td>
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<tr>
<td>Allandale Recreation Centre – City of Barrie</td>
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<tr>
<td>Amesbury Community Centre – City of Toronto</td>
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<tr>
<td>Amesbury Park Arena – City of Toronto</td>
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<tr>
<td>Armour Heights Community Centre – City of Toronto</td>
<td></td>
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<tr>
<td>Bayview Hill Community Centre &amp; Pool – Town of Richmond Hill</td>
<td></td>
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<tr>
<td>Bond Lake Arena – Town of Richmond Hill</td>
<td></td>
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<tr>
<td>Brampton Soccer Centre – City of Brampton</td>
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<tr>
<td>Caledon Centre for Recreation &amp; Wellness - Town of Caledon</td>
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<tr>
<td>Caledon Community Complex and Arena – Town of Caledon</td>
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<tr>
<td>Cassie Campbell Rec. Centre - City of Brampton</td>
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<tr>
<td>Cedar Ridge Community Centre – City of Toronto</td>
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<td>Centennial Pool – Town of Richmond Hill</td>
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<tr>
<td>Central Library – Town of Richmond Hill</td>
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<tr>
<td>Century Gardens Rec Centre - City of Brampton</td>
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<td>Chinguacousy Wellness Centre - City of Brampton</td>
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<tr>
<td>Chris Gibson Rec. Centre - City of Brampton</td>
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<tr>
<td>Carmen Corbassan Community Centre – City of Mississauga</td>
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<tr>
<td>Cummer Arena – City of Toronto</td>
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<tr>
<td>Earnscliffe Rec. Centre - City of Brampton</td>
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<tr>
<td>East Bayfield Community Centre – City of Barrie</td>
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<tr>
<td>Ed Sackfield Arena – Town of Richmond Hill</td>
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<tr>
<td>Elgin Barrow Arena – Town of Richmond Hill</td>
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<tr>
<td>Elgin West Community Centre &amp; Pool – Town of Richmond Hill</td>
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<tr>
<td>Elvis Stojko Arena – Town of Richmond Hill</td>
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<tr>
<td>Frank McKecknie Community Centre – City of Mississauga</td>
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<tr>
<td>Habitant Arena – City of Toronto</td>
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<tr>
<td>Holly Community Centre – City of Barrie</td>
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<tr>
<td>Jim Archdekin Rec. Centre - City of Brampton</td>
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<tr>
<td>Kiwanis McMurphy Pool - City of Brampton</td>
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<tr>
<td>Legends Centre – City of Oshawa</td>
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<td>Loafers Lake Rec. Centre - City of Brampton</td>
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<thead>
<tr>
<th>Lois Hancey Aquatic Centre (Wave Pool) – Town of Richmond Hill</th>
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<tr>
<td>Markham Village Community Centre – City of Markham</td>
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<tr>
<td>Mayfield Recreation Complex – Town of Caledon</td>
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<td>McConaghy Centre – Town of Richmond Hill</td>
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<tr>
<td>Milliken Mills Community Centre – City of Markham</td>
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<tr>
<td>Richmond Green Sports Building – Town of Richmond Hill</td>
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<tr>
<td>Richvale Community Centre &amp; Pool – Town of Richmond Hill</td>
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<tr>
<td>Rouge Woods Community Centre – Town of Richmond Hill</td>
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<tr>
<td>South Fletcher’s Sportsplex - City of Brampton</td>
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<tr>
<td>Terry Miller Rec. Centre - City of Brampton</td>
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<tr>
<td>Tom Graham Arena – Town of Richmond Hill</td>
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<td>Toronto Central Arena – City of Toronto</td>
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<td>Victoria Village Arena – City of Toronto</td>
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<tr>
<td>Wallace-Emerson Community Centre – City of Toronto</td>
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<td>West End Community Centre – City of Guelph</td>
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<td>West Rouge Community Centre – City of Toronto</td>
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8 Appendix B – Target Adjustments

8.1 Target Adjustment for Indoor Ice Rink
Results show a wide range of ice plant consumption intensity from 0.2 to 0.9 kWh per square foot ice per week (based on actual ice plant consumption from 38 indoor ice rinks).

The standard used is 0.5 kWh per square foot ice per week.

Results obtained from CaGBC Arena Facilities Pilot - Ice Plant Data Logging results [2011]
9 Appendix C – Peer Review
Please direct any questions or comments to:

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http://trca.on.ca/the-living-city/programs-of-the-living-city/mayors-megawatt-challenge/