Fogler, Rubinoff LLP
Lawyers
77 King Street West
Suite 3000, PO Box 95
TD Centre North Tower
Toronto, ON M5K 1G8
t: 416.864.9700 | f: 416.941.8852
foglers.com

Reply To: Thomas Brett
Direct Dial: 416.941.8861
E-mail: tbrett@foglers.com
Our File No. 171294

April 12, 2017

VIA RESS, EMAIL AND COURIER

Ontario Energy Board
2300 Yonge Street
27th Floor
Toronto, Ontario
M4P 1E4

Attention: Kirsten Walli
Board Secretary

Dear Ms. Walli:

Re: EB-2016-0246: Enbridge Gas Distribution Inc. and Union Gas Limited, Application for Approval of New and Updated Conservation Measures and the Technical Resource Manual

Pursuant to Procedural Order No. 1, please find enclosed BOMA's Written Submission.

Yours truly,

FOGLER, RUBINOFF LLP

Thomas Brett
TB/dd
Encls.
cc: All Parties *(by e-mail)*

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EB-2016-0246

Ontario Energy Board

Union Gas Limited and Enbridge Gas Distribution Inc.

Application for Approval of New and Updated Conservation Measures and the Technical Resource Manual

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BUILDING OWNERS AND MANAGERS ASSOCIATION, GREATER TORONTO ("BOMA")

WRITTEN SUBMISSION

April 12, 2017

Tom Brett
Fogler, Rubinoff LLP
77 King Street West, Suite 3000
P.O. Box 95, TD Centre North Tower
Toronto, ON M5K 1G8

Counsel for BOMA

Historical Context

Government programs for energy conservation in Canada and Ontario began in the mid-1970s with initiatives by the federal government and some provincial governments, including Ontario. The federal Office of Energy Conservation was established in 1976. Renewable energy capability was introduced by 1978. The federal Office grew quickly. The initial efforts of the federal Office concentrated on policy, technology development, in particular, demonstration programs, and subsidy programs, such as the Canadian Home Insulation Program ("CHIP"), and an advisory program for industry. Ontario had a somewhat similar program structure.

Ontario and the federal government signed a federal-provincial agreement to launch a demonstration program for energy conservation and renewable energy technologies in 1979. Ontario Hydro participated as a delivery agent for some of the projects. In the early 1980s, an energy service industry emerged in Canada, led by companies such as Econoler, in Montreal, and Rose Technology, Engineering Interface, Johnson Controls, Honeywell, and Landis & Gyr, all in Toronto, and Canertech Conservation Inc., in Ottawa.

These companies (and others) pursued the comprehensive retrofit approach to improve energy efficiency in buildings, in particular, institutional and commercial buildings. The energy services companies ("ESCOs") offered a turnkey service to building owners, which included an energy audit, engineering, assembling of a package of financeable retrofit measures that might include more efficient boilers, heating and cooling systems, energy efficient lighting, digital building control systems, construction management, and ongoing energy management, to ensure persistence of the savings.

The industry has completed hundreds of projects across Canada, including schoolboards, hospitals, universities, colleges, and provincial, federal and municipal government buildings, and some commercial office buildings. It also developed sophisticated, measurement systems to compare the building's energy use before and after the project, often on a monthly basis, together with flexibility to adjust the savings to account for building additions, changes in building use, and other "framework" changes. While this approach was comprehensive, the ESCOs tended to emphasize capital projects, in part, in some cases, because of their sponsorship, in part because their percentage markups on equipment constituted a significant part of their profits. Typically, the contracts provided that the ESCO received all or most of the measured (metered) energy savings until it had recovered its investment. The approach was normally "open book" and "cost plus".

In 1994, in EBO-169-iii), after a lengthy hearing, the Ontario Energy Board directed the gas utilities to establish energy conservation programs. The Ontario Energy Board and the gas utilities were "late to the party", and they relied on the California Standard Practice Manual for utility conservation activity, which had been developed several years earlier by the California Energy Commission and approved by the California Public Utility Commission. The gas utilities did not, for the most part, utilize the expertise and models available in the energy service companies for reasons that are not entirely clear. They tended to view the ESCOs as competitors. The Board decided that the utilities would be able to earn an earnings bonus by meeting or achieving their energy savings targets and would be compensated for reduced margins due to lower gas sales. These incentives were sufficient to induce utilities to launch modest energy conservation programs. The utilities were directed to ensure their programs covered all customer groups, residential, commercial (including industrial), residential, and low

income. The Board also approved modest budgets, which were slowly increased over time. In order to reach their targets, and earn their substantial bonuses, the utilities leaned heavily on industrial programs (especially Union), and commercial/institutional buildings (especially EGDI), where savings could be obtained more easily and cost-effectively than in the residential sector. Over time, the utilities optimized their programs to ensure they earned their bonuses. Generally, they implemented the programs well. The deemed savings approach incorporated in the Technical Resource Manual, which had already existed in the United States (it had been developed in California), was adopted as it allowed the utilities to quickly amass savings by installing thousands of one-off products, without having to measure actual savings achieved (smart meters and big data had not arrived in 1994). So utilities adopted the deemed savings approach for all but the largest industrial, commercial and institutional facilities.

More recently, in the last ten years or so, there have been important changes in the Ontario energy conservation institutional framework. New companies have emerged, such as Enerlife and Energy Profile (see below), which specialize in assisting commercial, industrial and apartment building owners measure, understand and manage their energy consumption, and how to reduce that consumption through best energy management and operational practices, senior, middle management, and front line management, technicians, and staff engagement, intelligent use of control systems, and retrofits, where appropriate, working from both bottom-up and top-down initiatives. Ontario Regulations 397/11 and 20/17 have introduced energy conservation reporting on a facility and agency (eg. School Board) level, improving the availability of data. Smart meters, and smart information monitoring, aggregating and reporting systems have arrived and been improved. All of this has highly benefited BOMA members. Moreover, the Ontario government's launch of its GHG action plan, including its cap and trade regime, have meant its

Conservation First policy will assume greater importance as a means of GHG emission reductions.

While BOMA appreciates the work and effort that has gone into establishing the Technical Resource Manual ("TRM"), we remained concerned that this approach, based as it is on the California Standard Practice first established almost 40 years ago, uses a methodology that is based on deemed or estimated savings from a more efficient piece of equipment replacing a less efficient and older model piece of equipment, rather than real, measured and metered savings for the building(s) itself, is an outdated and second best approach, for the residential, commercial, institutional, multi-family residential, and industrial sectors. BOMA promotes environmental, energy efficient building standards. BOMA BEST® is Canada's largest environmental assessment and certification program for existing buildings with over 5,000 buildings having obtained a certification or recertification. BOMA BEST® is based on real data, including real energy savings data, and would prefer to see the Ontario Energy Board support government and industry led standards[1].

These are the problems that BOMA sees with the TRM approach to savings:

- Calculations are based on estimates, assumptions and weighted averages of factors used in a range of studies to determine cost and energy savings.
- Much of the supporting materials is US sourced as are the TRM consultants and the evaluation consultants.
- Weather normalization uses London, Ontario as its base case.

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[1] BOMA has attached a methodology document for TRCA's Sustainable School Project which makes use of such data, and illustrates the performance-based approach.

- Estimated data is not in line with the Ontario government's regulations with respect to building benchmarking for the broader public service and commercial building sectors.

Calculation of Savings

In Exhibit B, Tab 1, Schedule 3, page 5 of 8, Table 1, recreated below, provides the list of variables for every calculation.

Table 1. Substantiation Document Measure Definitions Summary Table Parameter

Measure Category	Retrofit, early replacement, new construction, or time of natural replacement. These terms are defined in the Measure Categorization section.
Baseline Technology	The existing condition, code compliant, or standard practice measure depending upon the measure category.
Efficient Technology	The installed high efficiency measure as described in the substantiation document
Market Type	Commercial, Residential, Multi-Residential,
Annual Natural Gas Savings	Expressed in cubic meters for prescriptive measures. Expressed as a savings factor (e.g. m3/lb) for quasi-prescriptive measures.
Annual Electric Savings	Expressed in kWh for applicable measures.
Annual Water Savings	Expressed in liters for applicable measures
Measure Life	The length of time that a measure is expected to be functional and performing as predicted.
Incremental Cost ($)	The incremental cost is the difference in cost between the high efficiency technology and the baseline technology. The incremental cost includes incremental installation costs where appropriate.
Restriction	Describes any limitations to the applicability of the measure's prescribed savings or relationships, such as minimum size or applicable building types.

One need only look at the logarithms use to estimate savings to see these many variables at play in determining the savings, even before evaluators examine what would the customer have done in the absence of a program. Below is an example from the TRM; in this case a COMMERCIAL – KITCHEN – DEMAND CONTROLLED VENTILATION (DCV) – RETROFIT:

> *"Natural gas savings result from reduced exhaust and corresponding make-up air flow rates. The savings values reported in Table 1 are derived using accepted engineering principles and empirical data taken from published case studies representing nineteen commercial kitchen DCV installations. Because the savings are directly dependent upon hood exhaust capacity expressed in CFM, saving values are provided for three ranges of size, with the savings value based on the midpoint of each flow range category. Data from the case studies includes measured average fan input power data for operation under constant volume (baseline case) conditions and with DCV systems installed (efficient case). This data was used in conjunction with the fan affinity laws to calculate the average % reduction in fan speed and air flow for each of the nineteen installations as follows.*
>
> *See algorithm on Exhibit B, Tab 1, Schedule 5, page 22, as reproduction here is difficult.*
>
> ***While the algorithm itself is complicated, it resulted in a "percent reduction in flow for each of the nineteen case studies ranging from 12% to 38% with an overall weighted average percent reduction of 25.1%."***

No building manager is comfortable calculating his or her retrofit savings using overall weighted average of 25.1% when the range is so broad yet stated to a seemingly precise one decimal place. And while the nineteen studies of which this calculation was based are from seemingly credible sources, most of them are US based.

This range of energy savings is further complicated by the addition of the incremental costs which vary widely and then converted to Canadian funds on the date used by the consultant who wrote the TRM. Footnote #4 "Converted to CAD based on Daily Currency Converted for Bank of Canada, as of 1/22/2016. (http://www.bankofcanada.ca/rates/exchange/daily-converter/)" How much larger would the demand savings be if the US results were converted today?

The Substantiation Table (1) is followed by pages of definitions which are required to set the parameters for each variable and while a quick glance may lead the reader to think that these definitions are generally accepted principles and that determination of savings is merely a mathematical exercise; that is not the case. Note that one of these variables not included in the table above, but one which complicates the calculations further are the assumptions. "Assumptions" is defined as:

> *"**Assumptions**: This section provides a reference table listing key assumptions that impact the measure savings analysis (e.g. hours of operation, equivalent full-load hours, weather criteria, load factors). For some measures, additional assumptions regarding hours of operation or the amount of time equipment or appliances are being used is provided, as applicable. It also provides references for the assumptions used in the measure analysis." (Exhibit B, Table 1, Schedule 3, page 7 of 8)*

Performance-Based Conservation

Increasingly, sophisticated BOMA members are using actual metered data to determine their savings. Performance-Based Conservation is transforming the knowledge and practice of energy conservation in buildings. This has led to unprecedented energy savings in a growing number of buildings and portfolios which are now among the most energy efficient in North America.

From major commercial landlords to leading hospitals, school boards and municipalities, performance based conservation is helping owners and managers achieve the full energy and environmental potential of their buildings. Using this approach, provides unique expertise and resources to achieve exceptional performance in individual buildings and across portfolios. Insight and knowledge are grounded in one of the largest online building performance databases in North America, and close working relationships with leading owners and partners.

Whatever a building owners' goals are, performance based conservation can help them achieve deeper savings in less time and at lower cost than traditional approaches. This integrated building performance process, which actively engages all the players and leaves nothing on the table, consistently delivers deeper savings by systematically addressing the interdependent roles of best design practice, operational excellence and active occupant engagement.

BOMA Prefers Real Data

BOMA has already stated its preference for real data over estimates for the reasons stated in the following excerpt from Environmental Defence's evidence in a recent case. Reference: EB-2012-0451, Exhibit L.EGD.ED.1 (Emphasis Added)

> *"Performance based conservation begins with identifying high energy intensity buildings through benchmarking and then works systematically towards identifying and fixing the particular inefficiencies causing the high use in each building. The nature of the inefficiencies runs the range of errors in design and construction, through equipment deterioration over time, to changes in use and operation of the building, and poor performance of controls and automation systems. It is the compound effect of these problems that leads to gas use levels in some buildings* ***which is 3 to 5 times*** *what is needed and already achieved by comparable, more efficient buildings. Fixing these problems requires a systematic methodology. The work involved in equipment repairs and replacement, right-sizing and rebalancing, refurbishment and re-programming, typically provides relatively short payback periods.*
>
> *Rather than relying on technologies, assumed penetration levels and engineering calculations, the Performance-Based Model analyzes actual, benchmarked energy use of different building types and establishes the potential savings due to all buildings reaching intensity levels already achieved by one half (median) or one quarter (top-quartile) of the peer group.* ***Simply bringing high gas use intensity buildings down to meet median base and heating energy levels of existing buildings yields overall percentage savings in the order of almost 19% for commercial and 12% for apartment buildings. Going further to meet top-quartile performance levels raises the potential to over 31% for commercial buildings and almost 24% for apartments.*** *It should be noted that attainment of today's top quartile gas use is by no means the greatest savings level that can be planned for and expected within the timelines in question. By definition, one quarter of existing buildings*

are already performing at or better than this level. Energy efficiency initiatives such as such as REALpac's 20 by '15 Target and TRCA's Town Hall Challenge and Greening Health Care programs have used top quartile gas use to set energy targets. Measures to improve efficiency in high gas intensity buildings go beyond those included in Marbek's DSM Potential Study and are typically site-specific equipment repairs, upgraded control of buildings systems, and testing, tuning and rebalancing of heating plant and systems. Such projects show generally good Total Resource Cost ("TRC") test values, can be implemented quite quickly, and serve to improve building performance as well as energy efficiency. They require a systematic approach to identify target buildings, engage owners, isolate the inefficiencies, implement the necessary improvements and verify the results."

In its recent submission to the Ministry of Energy on the Draft Ontario's Long-Term Energy Plan ("LTEP"), BOMA stated:

"i. *Providing financial incentives for operational savings is a natural evolution of Conservation and Demand Management (CDM) programs and a step towards making conservation practical and more accessible. This approach to conservation has not been fully explored until recently, with such proposed programs as OPsaver® from Toronto Hydro and the IESO's EPP. The BOMA BEST® National Green Building Report reveals that there is no correlation between energy use intensity and the number of energy efficient features within buildings. This leads to the conclusion that retrofit-based Energy Conservation Measures (ECM) alone cannot deliver optimized energy savings in buildings. There needs to be mechanisms to address, and motivate, better user behaviour and operational improvements, and performance based programs account for this. More performance-based programs are recommended.*

ii. *Whole-building performance-based programs would also drive innovation and persistence of savings from the installed ECMs and management best practices. The persistence factor is often overlooked, but is a critical factor to maximize ROI both for the province and for participants."* (p6)

Canadian Leadership in Performance-Based Conservation

Ontario is a leader in Performance-Based Conservation. Two Toronto-based consulting firms, Enerlife Consulting and Energy Profiles, are doing leading edge work in helping many BOMA members make use of real energy (and water) data to apply a performance based approach to conservation. Some sample Enerlife projects are shown below[2].

> *"**City of Toronto**: The City is a founding member of the Mayors' Megawatt Challenge program and Enerlife has been working with them on benchmarking, target-setting, case studies and best practices relating to a range of municipal facilities. The City engaged Enerlife to prepare its 5-year Energy Conservation and Demand Management (ECDM) Plan as required under Ontario Regulation 397/11. The ECDM plan adopted Enerlife's performance-based conservation methodology to establish the energy conservation potential for 543 buildings from sixteen different divisions including administration, library, police, recreation and fire department facilities. The plan establishes the total potential for energy, emissions and utility cost savings to create the business case for a comprehensive implementation program. It identifies high-, medium- and low energy savings potential buildings as the foundation of the implementation strategy. 54 high-potential facilities, accounting for approximately 60% of the total savings potential, will proceed with in-depth testing and analysis to define specific measures. The plan was featured in the 2015 MaRS Cleantech conference, "Capturing Energy Savings Using Big Data."*
>
> ***Simcoe Place**: Enerlife has been working with Cadillac Fairview since 2011 at their million square foot, Class A commercial office building in downtown Toronto. Leading the Integrated Building Performance Team, we have raised the building's performance from Energy Star 85 to over 95, and the building is on its way to Energy Star 98 when current projects are complete. Guided by our 2010 Roadmap Report, the Team has worked towards and surpassed REALpac's 20 by '15 energy target. We applied systematic testing and investigation to uncover and correct inefficiencies in just about every building system. Improved operations, maintenance and automation have combined with evidence-based retrofits to optimize performance of heating and cooling systems, transformers, elevator machinery and lighting, making Simcoe Place one of the most energy-efficient commercial properties in North America. Enerlife's ongoing work is focused on ensuring that established performance*

[2] http://www.enerlife.com/projects/

standards are maintained and continuously improved in future, with performance-based service contracts, operator training and documentation.

***Simcoe County District School Board**: Enerlife has been working with the Board since 2007, guiding its progress from median energy performance to reaching the top ten in the 2015 **Sustainable Schools'** Top Energy Performing Boards report. From 2009 to 2013, average energy intensity of the Board's 105 schools was reduced by 10%, delivering over $3,000,000 in utility cost savings and almost $1,000,000 in utility company incentives. A growing number of the board's schools are now among the most energy efficient of their kind in North America. Our integrated services combine benchmarking and target-setting to identify high-potential schools, design and implementation of site-specific retrofits and operational measures to achieve savings, and continuous monitoring of actual savings to drive ongoing improvement. We have established high-performance design standards for lighting, mechanical systems and building automation in the construction of new schools and retrofits of existing buildings, and delivered workshops with design teams, board staff and service contractors which get everyone working together towards a shared vision of making every building the best it can be. Building on this success, the Board engaged Enerlife to prepare its 5-year Energy Conservation and Demand Management (ECDM) Plan as required under Ontario Regulation 397/11. The ECDM plan identifies 28 schools with high energy savings potential and sets out the business case, strategy and work plan for implementation. Enerlife is currently guiding the ECDM plan implementation, which is projected to move the Board close to the top of the most energy efficient school boards in Ontario.*

***West Park Healthcare Centre**: Enerlife has been working with West Park Healthcare for over a decade, helping establish it among the most energy efficient continuing complex care hospitals in the Greening Health Care database. More importantly, the hospital could maintain this leadership position and has remained within the top five on the energy performance benchmark since 2004. Building on this success, the hospital engaged Enerlife to prepare its 5-year Energy Conservation and Demand Management (ECDM) Plan as required under Ontario Regulation 397/11. The ECDM plan highlights the remaining areas of energy conservation and utility cost savings potential, and sets out the business case, strategy and work plan for defining and implementing improvements to fan power, the boiler plant and water systems. To meet the targets established in the ECDM plan, we have undertaken systematic testing, metering and analysis leading to detailed design, installation and verification of specific operational, retrofit and control measures. These improvements will fully meet the hospital's energy target and place West Park among the most energy efficient healthcare facilities in North America. The cooperation of the hospital's operations staff in the redevelopment of the hospital will ensure that the successful conservation over the past decade is continued and further improved in the design of the new site. Enerlife has prepared a design vision report to help the hospital's ongoing*

leadership in the hospital energy and water performance."

Energy Profiles does not publish case studies on line, but their approach to conservation uses real data as well. Energy Profile presents the following on how their clients uses[3]:

> ***"BUILDING OPERATIONS**: Armed with real-time energy data, advanced analytics tools, and dashboards that instantly highlight anomalies, Building Operators can stay on top of performance. Proactive Operations Teams finally have the data they've been wanting to optimize performance. The goal: comfortable, efficient buildings filled with happy people.*
>
> ***PROPERTY MANAGERS**: Property Managers need to have confidence in their utility budgets, how actual utility costs are tracking versus budget, and an understanding of the reasons for any variance. Similarly, confidence is essential when allocating utility costs to tenants. Robust and accurate data, at their fingertips, provides this confidence. Identification of utility billing errors adds to the Property Managers trust, reducing the pain point of flagging these issues on their own. In addition, monthly electricity cost allocation statements by tenant/lease in addition to an overall cost allocation summary and annual tenant budgets can be created when submetering systems are in place – eliminating another pain point for Property Management.*
>
> ***SUSTAINABILITY OFFICERS/DIRECTORS**: Regulatory requirements and voluntary 3rd party sustainability benchmarks such as GRESB continue to evolve, and the reporting demands increase every year. Tracking sustainability across the range of indicators produces mountains of data that must be managed and interpreted to produce knowledge and action. Streamline and simplify your Corporate Responsibility and Sustainability Reporting (including GHG emissions reporting) by knowing you can rely on the quality and completeness of the underlying data. Our robust, audit-ready data management system can provide assurance to stakeholders that the final reports properly reflect actual performance.*
>
> ***INVESTORS/STAKEHOLDERS**: Progressive stakeholders – ranging from shareholders to employees to customers – want to know the details of your portfolio/building performance. It is increasingly pivotal to how your organization is judged. It is critical that stakeholders come to trust management reports on sustainability. Integrity, accountability, and transparency are the building blocks of this trust.*

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[3] http://energyprofiles.net/index.php/why/

EXECUTIVES: Executives want to know in an instant how the organization and/or buildings/portfolio is performing in terms of sustainability and utility costs. Tailored dashboard views allow them this line of sight, summarizing the KPI's that they care about. All of this is drawn from underlying data that is robust and complete.

OCCUPANTS/ TENANTS: Buildings are built for people to live, work or play in – they should make people feel good. With tools, such as lobby displays, public-facing online performance dashboards and tenant portals, all fed with real-time data, you can visually communicate all the great things your organization is doing. This allows engagement of occupants/tenants at a deeper level by providing real-time transparency and data in innovative ways.

PROPERTY ACCOUNTANTS: The Accounting group wants to have accurate utility budgets, know the as-billed utility costs, and have faith in accruals, together with understanding year to year variances in utility spends. Providing them with this information at their fingertips makes their lives easier, and facilitates co-operation with the Property Management teams."

Reducing Energy Intensity – the real measure of conservation

The real data approach to conservation also drove The Real Property Association of Canada (REALpac) to adopt an energy consumption target for office buildings of 20 equivalent kilowatt-hours of total energy use per square foot of rentable area per year (20 ekWh/ft2/year). In other words, " *20 by '15* ". The target represents a reduction of up to one half of the then energy use in Canadian office buildings. Achieving the target will lead to estimated energy cost savings in the order of $1.85 billion/year, and greenhouse gas emissions savings of 7.5 Megatonnes/year contributing 5% of Canada's national 2020 goal.

The REALpac target is derived from national, large-scale pilot projects conducted by the Canada Green Building Council (CaGBC) in 2008. The projects engaged more than 40 commercial office and government real property owners with 144 buildings totalling 48 million ft2, and created a large, detailed database of Canadian office building energy performance. Audits were conducted of top-performing buildings to document their building system characteristics, leading

to identification of best practice design standards. Workshops have also been conducted with participants to document best operational practices. Combining these design and operations best practices yields target energy use in the range of 16-20 ekWh/ft2/year.

The CaGBC pilot projects produced several remarkable conclusions. The range between the highest and lowest office building energy users per ft2 is more than 2.5:1. The range of lighting power density (Watts/ft2) is also more than 2.5:1 in new and retrofitted office buildings using similar technology for similar office space lighting applications. There is no apparent correlation between building age and performance – several of the top-performing buildings are more than 40 years old. Several office buildings are already operating at or close to the REALpac target, and even top-performing buildings were shown to have room to improve.

The pilot project workshops, and the continuing engagement of many owners in CaGBC's ongoing Green Up program, have also helped clarify how individual buildings and portfolios can work towards achieving the target. The common perception has been that improving energy efficiency in buildings is all about technology, retrofitting and capital expenditure. The emerging new understanding is that policy, process and people are in fact at the heart of achieving and sustaining high levels of energy efficiency and deep reductions in greenhouse gas emissions. Financial returns should be greater than has previously been expected, but significant organizational change is required to align policy, management, leasing, procurement, and HR programs with the demands of consistent energy efficient practice.

A roadmap is presented for achieving and sustaining high levels of energy performance in individual buildings and portfolios. The roadmap begins with benchmarking, and works through to performance monitoring, feedback and continuous improvement. Canada's real estate industry

is positioned to have a meaningful impact on the climate change mitigation agenda, through both its own potential to demonstrate greenhouse gas emission reductions, and the example it can provide. The methodology, metrics, standards and tools described in this paper did not exist a year ago. The commercial office sector and government real property departments have shown leadership, through their participation in the CaGBC pilot projects, in both substantiating the opportunity for deep cuts in energy use and emissions, and developing the means to achieve and sustain them. REALpac's " *20 by '15* " target takes this leadership to the next level (***Getting to 20: Achieving the Office Building Target of 20 ekWh/ft2/year by 2015).***

Energy Reporting and Benchmarking

Energy Reporting and Benchmarking policies and regulation are meant to facilitate the review of a building's energy use against its own past performance, and the performance of similar buildings. With this knowledge, building owners and managers may be motivated to improve the energy efficiency of their buildings.

The benefits of energy benchmarking are well understood in the commercial real estate (CRE) industry. But in order for any EWRB policy or regulation to be successful, the governing bodies must understand the various nuances that exist within the CRE industry with respect to the different building types and how those buildings are managed and operated. BOMA has taken the leadership to work with the Province and the City to make sure that all such nuances are given due consideration and all the concerns from our membership and the CRE industry in general are addressed adequately. To do so, BOMA members have been fully engaged in The Large Building Energy and Water Reporting and Benchmarking (EWRB) regulation which is now enacted by The Ontario Ministry of Energy (MOE), as Regulation 20/17 (see below). The

Energy and Water Reporting and Benchmarking (EWRB) initiative was introduced to help commercial building owners improve their building's energy and water efficiency, and follows the model established by Ontario Regulation 397/11 for institutional (public sector) buildings, such as those owned by municipalities, schools, and hospitals. It would make sense for the gas and electric utilities in Ontario to used data measurement that supports this initiative.

- Name of the Regulation: Ontario Regulation 20/17: Ontario's Reporting of Energy Consumption and Water Use
- What buildings are covered? Commercial (including shopping centres), Multi-Use Residential Buildings (w/more than 10 residential units), some industrial buildings
- What buildings are excluded? Data centres, trading floors, TV studios, public buildings (federal, provincial and municipal), most industrial - manufacturing & agricultural
- When is the first reporting deadline? July 1, 2018 for 2017 consumption (starting with buildings greater than 250,000 s.f.)
- What is reported? Monthly energy and water consumption, GHG emissions and intensity, building characteristics info
- How is it reported? Using Energy Star Portfolio Manager
- Where is it reported? Ministry of Energy reporting portal by July 1, of every year, starting 2018
- How is it implemented? Phased implementation, starting with buildings greater or equal to 250,000 s.f.
- Implementation schedule: Buildings greater or equal to 250,000 s.f. (2018); Buildings greater or equal 100,000 s.f. (2019); Buildings greater or equal to 50,000 s.f. (2020)

These new reporting regimes offer the opportunity for the utilities to utilize this data to measure the savings achieved for their programs, and to organize the programs on a whole-building basis. New equipment or equipment retrofits would be introduced when appropriate, as part of a whole-building conservation plan.

The use of real measured savings results improves the credibility of those results which in turn increase the appeal of the "conservation first" approach to energy policy, which is the foundation of Ontario's LTEP. The use of actual data on energy savings assumes even greater importance in the context of the Ontario government's Greenhouse Gas Reduction Policy, which will rely on enhanced energy efficiency policies and programs to achieve a substantial portion of targeted emissions reduction in 2020 and 2030 (see EB-2016-0004, Exhibit S3.EGDI.OGA.3, Attachment, pp 16, 17).

It is likely that the resources devoted to natural gas conservation will need to be increased substantially if GHG targets are to be met, and that the utilities, given their experience and management capabilities, and their status as capped entities under the GHG policy, would manage a substantial part of the required investments.

Given the changing policy framework, now is a good time to reorient utility programs toward the measurement of actual savings.

BOMA's view, therefore, is that the Board should view the TRM as a stop-gap measure, pending the development of a comprehensive performance-driven savings framework, based on measurement of actual savings for virtually all DSM programs.

This approach is consistent with the Board's statement in its Gas DSM Guidelines (EB-2014-0134), that:

> *"Where feasible and economically practical, the preference to determine LRAM and shareholder incentive amounts should be to use measured actual results, instead of input assumptions. For example, it may be feasible and economically practical to measure the natural gas savings of weatherization programs based on the results of the pre- and post-energy audits conducted by certified energy auditors on a custom basis, as opposed to input assumptions associated with the individual measures installed."*

As an interim step, the Board should ensure that its evaluation contractor conducts studies to confirm the reported savings for the 2015 and 2016 savings from a reasonable cross-section of TRM measures. The studies should look at actual before and after energy consumption of a sample of the buildings in which the various TRM measures were installed. The sample should, in each case, be large enough to have statistically valid results.

The utilities state they have not yet done such studies (see Exhibit 1, EGDI.BOMA.7, p3), yet the deemed savings of the TRM measures constitute 14% and 13% of Union's 2015 and 2016 (pre-audit) savings, respectively, and 16% and 22% of EGDI's 2015 and 2016 savings, respectively.

Second, the savings for all of Union's TRM measures should not be measured using London, Ontario weather; rather, the savings which are ambient temperature sensitive should be calculated using degree day data for the regions in which the facilities are located.

For an example, of the sensitivity of savings to climate, Union's evidence was that its total cumulative natural gas m^3 2016 savings for its Low Income Furnace End-of-Life installs (all in Union South) is 29,106 m^3 (pre audit), but that, if it had used North Bay, EFLH value, rather than

the Common Assumptions (of which London weather was one), savings from the same number of installs would increase by 32%.

Given the wide diversity of climate across Union's service territory, regional data should be used.

All of which is respectfully submitted, this 12th day of April, 2017.

Tom Brett,
Counsel for BOMA

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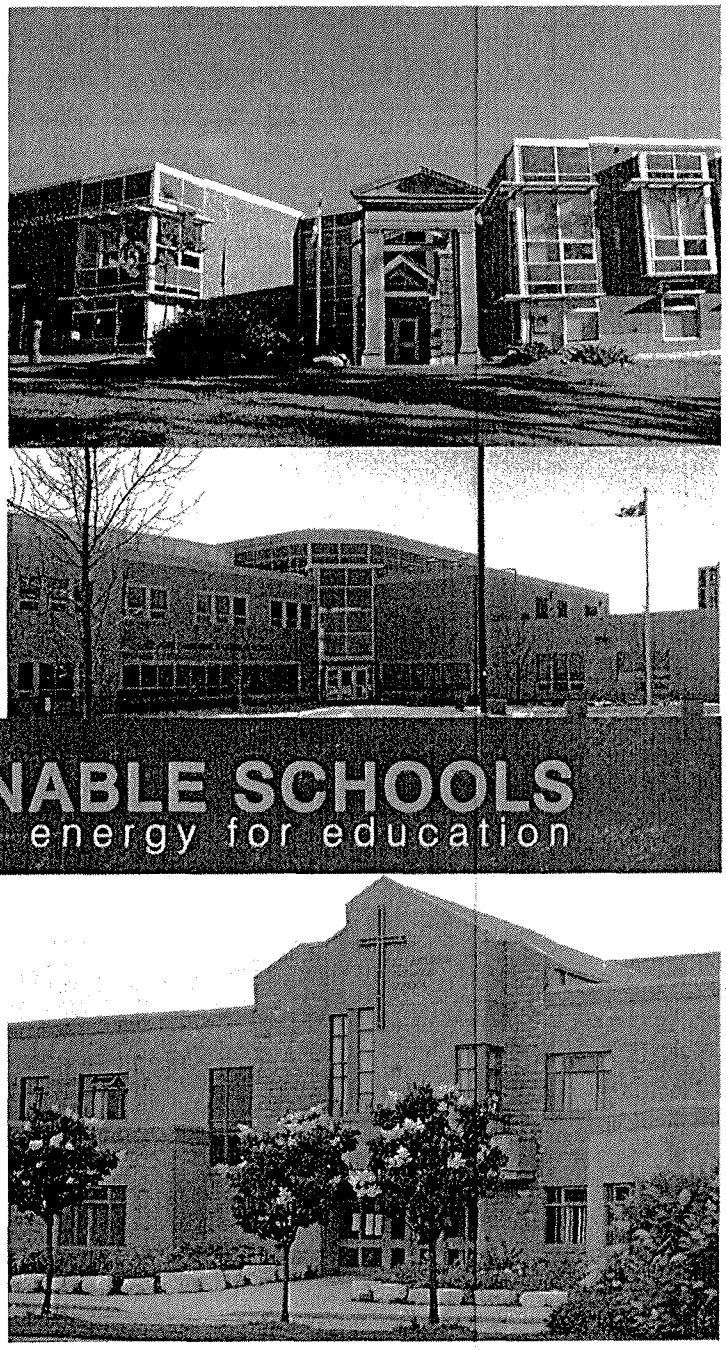

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Rating Ontario School Boards' Energy Efficiency: Top Energy Performing Boards Report

Methodology White Paper

Revised May 10, 2016

Enerlife consulting

Toronto and Region Conservation for The Living City

About Sustainable Schools

Sustainable Schools has been working since 2007 with hundreds of schools from many boards across Canada and in the United States, establishing the magnitude of energy savings potential in individual schools, highlighting where those savings are to be found, and providing tools and training to help boards achieve high performance energy targets. It is a program of The Living City delivered across Canada by Toronto and Region Conservation with technical direction by Enerlife Consulting Inc.

About Toronto and Region Conservation Authority

The Toronto and Region Conservation Authority (TRCA) is one of 36 Conservation Authorities serving communities across Ontario. TRCA has more than 50 years of experience in watershed management and leadership in developing and applying sustainability practices. TRCA works with governments, businesses, and individuals to build a greener, cleaner and healthier natural and built environment. TRCA's vision is 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 Inc.

Based in Toronto, Ontario, Enerlife Consulting works at the leading edge of high performance green buildings. Enerlife is an applied research firm as well as a practitioner, responsible for a number of major developments and important publications in the field of 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, who use our services to design, direct and verify comprehensive energy efficiency programs for individual buildings and whole 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 the National Advisory Council on Energy Efficiency which advises the federal Office of Energy Efficiency. Ian co-chaired the working group of the Race to Reduce, a program of CivicAction which engaged commercial office landlords and tenants across the Greater Toronto Area working together to improve energy efficiency.

Please direct any questions or comments to:

Bernie McIntyre
Senior Manager, Community Transformation Programs
Toronto and Region Conservation Authority (TRCA)
T: 416-661-6600 x 5326
E: BMcIntyre@trca.on.ca

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1. Summary

Toronto and Region Conservation Authority (TRCA) has published the 2016 Top Energy Performing Boards report in May 2016 as part of our Sustainable Schools program. This report follows the success of the 2015 report which analyzed the energy efficiency of 45 Ontario school boards to identify the top ten boards with the lowest savings potential. The 2016 report covers 71 Ontario boards, refines the methodology, and recognizes this year's top ten winners. This White Paper presents the methodology used to produce the 2016 results. For the reports and White Paper and further information visit the Sustainable Schools program website at www.sustainableschools.ca.

The 71 school boards provided annual energy use data for the 2013-14 school year for all of their schools and administration buildings. A site-specific energy target was set for every building, which in turn established its energy savings potential as the difference between actual and target consumption. A standard, good-practice energy target for elementary and secondary schools and administration buildings is adjusted for weather and school-specific variables to create the site-specific target. The savings potential for the individual buildings is then rolled up to produce the overall board potential, and to arrive at our ranking of all the boards. The top ten boards are those with actual energy use closest to the target for all of their buildings – that is, those with the lowest overall savings potential.

2. Foundations

2.1. 2015 Top Energy Performing School Boards Report

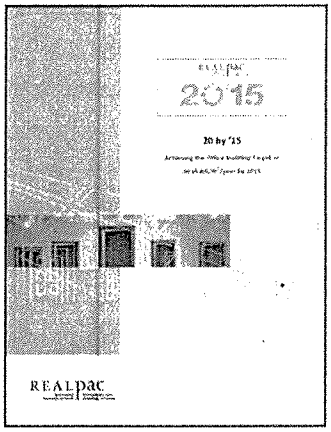
In 2008, Toronto and Region Conservation Authority published the first annual Top Energy Performing Schools Report, which identified and recognized some of the most energy efficient schools in North America. Subsequent annual reports added to the body of knowledge about how much energy school buildings need, and the common characteristics of the most energy efficient schools.

The 2015 report shifted focus by examining the overall energy performance and savings potential of school boards rather than individual schools. While many boards have a few schools which are particularly energy efficient due to exceptional technology, design and/or operations, overall board performance speaks more to policy and management practices which produce consistently good results across large portfolios and geographies. We used publicly available data from 45 Ontario school boards to determine the top ten most energy efficient boards (those with the least savings potential), and interviewed those boards to learn more about what sets them apart. The interviews were used to create case studies posted on the Sustainable Schools website.

The work developed a methodology for setting a rational energy target and derived savings potential for each individual school and administrative building. The analysis also highlighted the range of energy use between comparable buildings within and between boards, and flagged the high-potential buildings (those with greater than $10,000 per year in savings potential) as the focus for improvement.

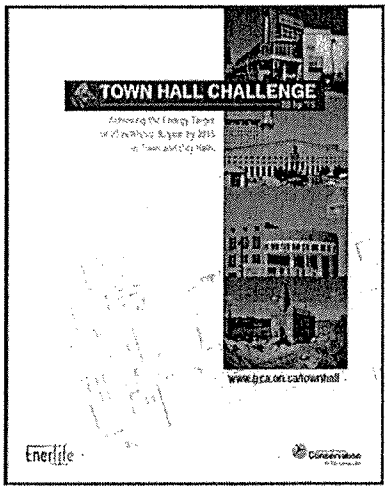
The report served useful purposes in quantifying the opportunity for energy, utility cost and emissions savings in this important sector, and helping boards, utility companies and government consider policy, strategy and program options for making improvements. It attracted significant interest from various stakeholders, raising the profile of and commitment to active energy conservation.

2.2. Real Property Association of Canada 20 by '15 White Paper



The Real Property Association of Canada (REALpac) announced the 20 by '15 national energy consumption target for office buildings in September 2009, following extensive research and consultation. 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 (20 ekWh/ft2/year), in office buildings, by the year 2015. A white paper, describing how the target was derived, was published in 2009, and led to establishing of REALpac's energy benchmarking and target-setting methodology[1]. This methodology informed the weather normalization and target-setting process used in the Top Energy Performing Boards analysis.

2.3. Town Hall Challenge White Paper (an initiative of Mayors' Megawatt Challenge)



Toronto and Region Conservation's Mayors' Megawatt Challenge (MMC) program brings together leading municipalities to achieve exceptional levels of energy and environmental performance in municipal facilities. In 2011, 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. This national initiative added substantially to the range of benchmarking, best practices and experience with all types of municipal facilities. A peer-reviewed white paper was published in 2013 to present 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 Ottawa weather conditions, to be achieved by 2015. The Top Energy Performing Boards Report uses a methodology similar to that

[1] See http://www.realpac.ca/?page=RPEBP21Methodology.

presented in the Town Hall Challenge white paper.

2.4. 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, government administration buildings, 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 pilot projects developed a great deal of new and important knowledge about energy performance in buildings. No apparent correlation was found between building age and performance. The projects documented that how a building is operated and maintained is just as important in achieving high performance as how it is designed and what kind of building codes are 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.

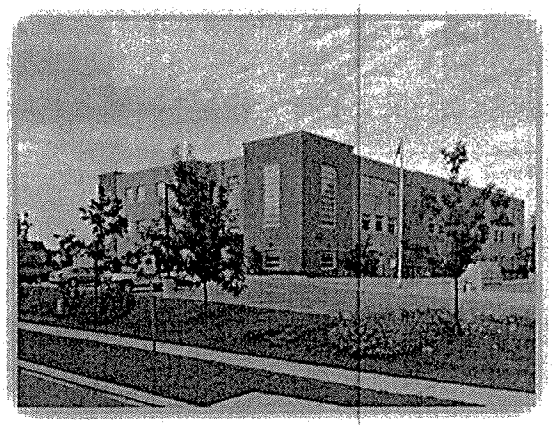
2.5. Green Energy Act, 2009

Beginning July 1, 2013 the Green Energy Act requires Ontario's Broader Public Sector (BPS) to report their annual energy use and greenhouse gas emissions, every year, to the Ministry of Energy, and to make the data publicly available on their websites. Ontario school boards are complying with this regulation, making available the data on which the Top Energy Performing School Boards reporting is based.

3. Methodology

3.1. Data Collection

In the fall of 2015 TRCA, with Ministry of Education support, requested that the school boards forward their 2013-2014 school year data for this analysis. In addition, the boards were asked to indicate use of electric heat or ground-source or water-source heat pumps, and the size of any swimming pools.



Each board reported on all facilities currently in use by the board, including leased buildings. The data include general information about the facilities (building name, address, operation type,

total floor area, average hours of use per week, swimming pools and numbers of portables) and energy use information (consumption of electricity, natural gas, oil, propane, coal, wood, district heating, and district cooling, in appropriate units). All facilities included by a board in the reporting template were analyzed, whether leased or owned.

Data cleaning

To avoid distortions, a number of facilities were removed from the analysis as follows:

- Total energy intensity of less than 5 ekWh per square foot, indicating incomplete data or abnormal use (36 facilities)
- Substantial anomalies likely due to energy data or building area issues (7 facilities)
- Closed/demolished/sold/unoccupied/vacant (79 facilities)
- Multiple buildings at one address and energy use split not clear (11 facilities)

Data processing

Oil, propane and district heating were converted into natural gas equivalents, and district cooling into electricity equivalents, using the following conversion factors:

Conversion factors	
Litre of oil	= 1.023 m3 of gas
Litre of propane	= 0.6818 m3 of gas
District heating to gas (m3)	26.8384326
District cooling to kWh	79.0177774 *0.75

3.2. Weather-Normalization and Target-Setting

A weather station was assigned to each facility in the analysis, based on geographic proximity and weather station data completeness and reliability. Weather data for the September 2013-August 2014 period was obtained from Climate Data Online website at http://climate.weather.gc.ca/. Balance temperatures of 15 and 10 degrees Celsius were used to calculate heating and cooling degree-days respectively.

The following standard targets (based on 2012-2013 Toronto International Airport weather) are used for buildings with conventional heating systems, before adjustment for weather and site-specific characteristics (portables, water- and ground-source heat pumps, and swimming pools):

Building type	Targets		
	Electricity	Natural Gas	Total Energy
Elementary	5.5 kWh/ft²	6.5 ekWh/ft²	12 ekWh/ft²
Secondary	7.5 kWh/ft²	7.5 ekWh/ft²	15 ekWh/ft²
Administrative	12.5 kWh/ft²	7.5 ekWh/ft²	20 ekWh/ft²

These standard targets for schools and administrative buildings are based on good practice benchmarked energy use intensities from Sustainable Schools and Mayors' Megawatt Challenge

databases, are considered readily attainable, and are already being met or surpassed by a growing number of buildings.

Standard targets were weather-normalized to the current year and the assigned weather station of each individual building using the weather-sensitive proportions below for different building types (elementary, secondary, and administrative):

Building type	Proportion of energy target that is weather-sensitive	
	Electricity	Natural Gas
Elementary	0%	91.5%
Secondary	0%	92.5%
Administrative	7.0%	97.5%

Proportions of gas use target in school buildings that are considered non-weather-sensitive were derived from top quartile benchmarking of conventionally-heated schools (without heat pumps) from the Sustainable Schools database, and determined separately for elementary and secondary schools.

In the Ontario climate cooling electricity consumption accounts for 5% or less of total electricity consumption of a well-performing school. Many schools are not air-conditioned and those with air conditioning are generally closed during July and August, when most cooling-degree days are recorded. Therefore no adjustment was made for cooling-degree-days for school buildings.

For administrative buildings, 7% of electricity use target and 97.5% of gas use target is considered weather-sensitive and was weather-normalized as described below. These proportions are consistent with the energy benchmarking and target-setting methodology adopted by the Real Property Association of Canada (REALpac)[2].

Weather-sensitive portions of energy use targets were normalized based on degree-day ratios between 2012-13 weather conditions at Toronto Lester B. Pearson International Airport and current reporting year (2013-2014) conditions at the weather station assigned to each facility.

Adjustment for portables

Adjustments for portables were calculated as the number of portables multiplied by weather-normalized standard annual electricity consumption required for one portable and divided by Total Floor Area of the associated building. The adjustment was then added to the standard target for Total Electricity.

The standard adjustment applied is 9,000 kWh/year, including a non-weather-sensitive portion of 3,000 kWh (to account for lighting, HVAC and computers) and a weather-sensitive portion of 6,000 kWh (heating based on Toronto International Airport 2012-13 weather data). This allowance has been increased from the 2015 analysis based on updated data from individually metered portables.

[2] See http://www.realpac.ca/?page=RPEBP21Methodology.

No allowance was made for air conditioning. The weather-sensitive portion of the target is normalized based on degree-day ratios between 2012-13 weather conditions at Toronto Lester B. Pearson International Airport and current reporting year (2013-2014) conditions at the weather station assigned to each facility.

Adjustment for swimming pools

The 2016 analysis incorporates new information from boards on the size of their swimming pools. The standard developed by TRCA's Mayors' Megawatt Challenge for operation of a swimming pool is 50 kWh of electricity and 280 ekWh of natural gas per year per square foot of water surface area. The adjustment to gas and electricity targets is applied to each facility based on the size of its swimming pool. If a board has reported the number of pools but not the water surface area, a default pool size of 2,723 sf was used (23m by 11m, 6 lanes).

Adjustment for all-electric buildings and heat pumps

The 2016 analysis incorporates new information from boards on the heating systems in their facilities. The adjustments to energy use targets were introduced as follows:

1. All-electric: The standard gas use target is then multiplied by 75% as a deemed gas-firing efficiency and added to the electricity target.
2. Ground-source or water-source heat pump:
    a. Electricity targets increased by

Heat pump	Elementary	Secondary
GSHP	1.1 kWh/sf	1.3 kWh/sf
WSHP	1.2 kWh/sf	1.4 kWh/sf

    b. Gas targets reduced by

Heat pump	Elementary	Secondary
GSHP	6.0 ekWh/sf	6.9 ekWh/sf
WSHP	1.6 ekWh/sf	1.9 ekWh/sf

The assumptions behind these adjustments are tabulated below.

Deemed boiler plant efficiency (conventionally heated school)	75%
% of heat required that is extracted from the ground (GSHP)	90%

% of electrical energy required to produce the same amount of heat	25%
Coefficient of Performance for the heat pump	4.0
Domestic hot water heated by heat pump	100%

As in case of targets for a conventional gas-fired system, the targets for electric heat and heat pumps were weather-normalized to current year and local weather station.

3.3. Establishing Savings Potential

The energy savings potential for each individual school and administrative building was calculated as the difference between actual energy use intensity and adjusted, weather-normalized target energy use. The savings potential was calculated separately for electricity and for gas, and is presented in %, energy units, emissions and dollars. The dollar savings potential is based on the following prices per unit of energy:

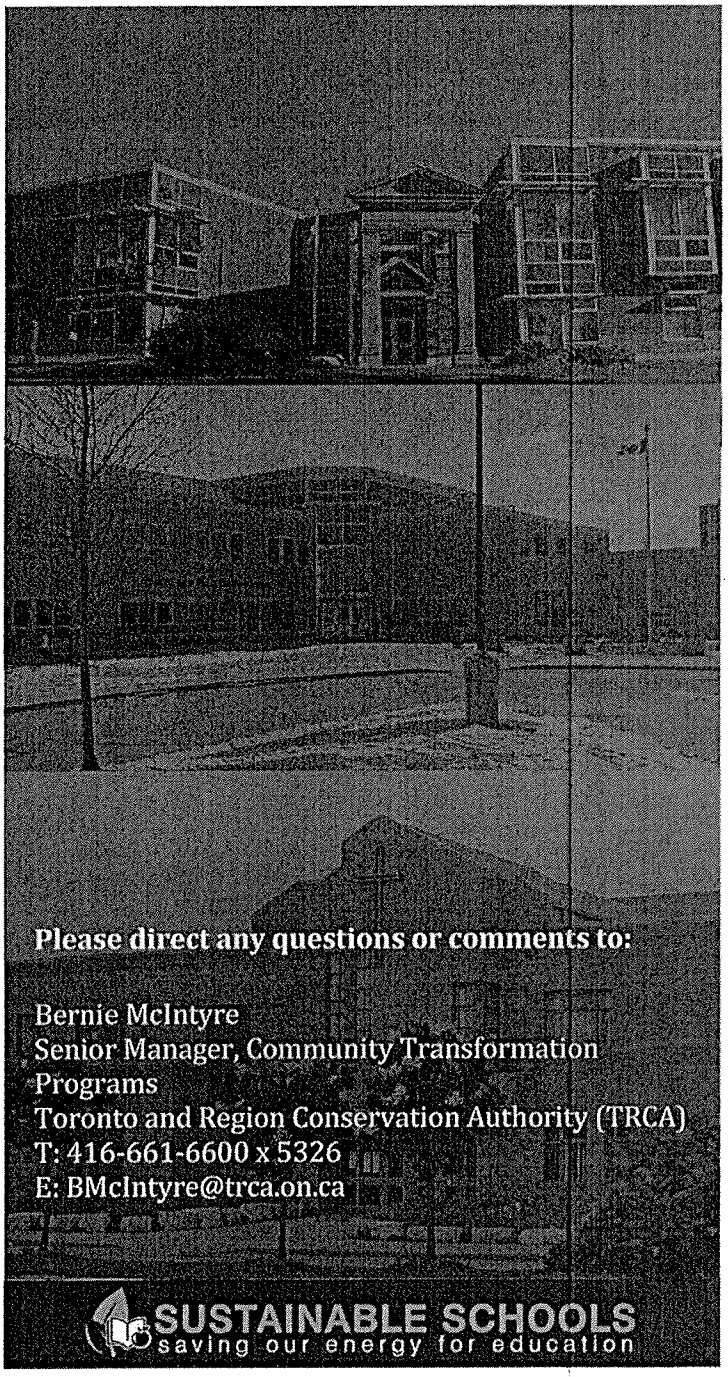
Electricity: $0.13/kWh
Gas: $0.20/m3

The board's total dollar savings potential is the sum of dollar savings potential values for all of its facilities. The board's total % energy savings potential, the metric which defines a board's placement in the Top Energy Performing Boards analysis, is the % difference between actual total energy use intensity for all buildings (weighted average of each building's actual total energy use intensity) and target total energy use intensity (weighted average of each building's target total energy use intensity). Thus the Top Ten Energy Performing Boards are the ten boards with the lowest total % energy savings potential, that is, their overall energy use intensity is closest to their target energy use intensity.

Appendix A: Weather Stations

Weather stations were selected based on completeness and reliability of data collected at the stations (http://climate.weather.gc.ca/). A weather station was assigned to each facility based on geographical proximity. The weather stations used in the 2016 report are as follows:

HAMILTON A
KENORA A
KINGSTON CLIMATE
KITCHENER/WATERLOO
LONDON A
MOOSONEE
OTTAWA INTL A
PETERBOROUGH
RAVENSCLIFFE
SAULT STE MARIE A
SHANTY BAY
SUDBURY CLIMATE
THUNDER BAY
TIMMINS A
TORONTO INTL A
WELLAND-PELHAM
WIARTON A
WINDSOR A



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