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Our File No. 153667

May 27, 2016

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: OEB, Rate Design for Electricity Commercial and Industrial Customers
Board File No. EB-2015-0043

Please find attached BOMA's comments on the Draft Report of the Board in this matter.

Yours truly,

FOGLER, RUBINOFF LLP

Thomas Brett
TB/dd
Encls.
cc: All Parties *(via email)*

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Comments on Staff Discussion Paper

Rate Design for Electricity Distributors – Commercial and Industrial Customers

Building Owners and Managers Association, Greater Toronto (BOMA) is pleased to provide its comments on the Board Staff Discussion paper: *Rate Design for Commercial and Industrial Electricity Customers: Aligning the Interests of Customers and Distributors*.

First of all, BOMA wishes to compliment Board Staff on a thorough review of the options. Secondly, BOMA is pleased that analysis clearly reflects the Board's statutory objectives as listed in section 1(1) of the *Ontario Energy Board Act, 1998* (the "OEB Act"); namely:

- To protect the interests of consumers with respect to prices and the adequacy, reliability and quality of electricity service.
- To promote economic efficiency and cost effectiveness in the generation, transmission, distribution, sale and demand management of electricity and to facilitate the maintenance of a financially viable electricity industry.
- To promote electricity conservation and demand management in a manner consistent with the policies of the Government of Ontario, including having regard to the consumer's economic circumstances.
- To facilitate the implementation of a smart grid in Ontario.
- To promote the use and generation of electricity from renewable energy sources in a manner consistent with the policies of the Government of Ontario, including the timely expansion or reinforcement of transmission systems and distribution systems to accommodate the connection of renewable energy generation facilities.

Primary Concern

While the range of options and sub-options are fulsome, all of them assume that commercial and industrial (including institutional) customers have timely and complete access to their utility data at a reasonable cost and have the capability to make full use of it. This is not the case, and access to this data is expensive, time consuming and error prone. Recently a report by the Utility Billing Data Access Working Group (UBDAWG), entitled *Transforming Energy Management in Canada - ELEVATING THE CAPTURE, COMPREHENSION, AND USEFULNESS OF UTILITY BILLING DATA FOR ALL CANADIAN CUSTOMERS* identified the key issues and solutions to the issues.[1]

> *The UBDAWG believes that there need to be changes on a number of fronts in order to resolve the problem. Government and regulators need to provide the necessary frameworks. Utilities need to better understand and meet their customers' data needs. Customers need to demand improved access to data – and, having gained that access, make use of the information to improve energy performance analysis.*
>
> Quote from a customer: "My organization's biggest challenge in energy management is the lack of timely access to our utility billing data. Without it, we cannot operate as efficiently or effectively as necessary to achieve energy management and greenhouse gas emission savings."
>
> *Currently, processes for capturing billing data and benchmarking performance are difficult, error-prone, and expensive. The expense and inaccuracy of current data capture processes, coupled with a general lack of understanding of how to utilize utility bill information to guide sound business decisions are substantial barriers to effective energy management in Canada.*

While this matter was seemingly out of scope, BOMA urges that the Board use its authority with respect to the design, presentment and content of non-residential bills to address this issue. The

[1] BOMA has included the full report as an appendix to this submission.

government's broader initiatives with respect to building labelling and greenhouse gas emissions also rest on access to timely and accurate utility data.

General Comments on Options

While the Staff Discussion Paper notes the boundary issues between rate classes, there are no solutions offered to address them or at least no analysis of the options that indicates how they should or could be addressed. This is particular interest to BOMA's members particularly those on the cusp of above or below 5000 kW. Conserving or shifting energy use off peak can have perverse effects if a customer falls below that amount with higher bills resulting.

The paper also notes that the design of rate classes was not included in the scope of the project. BOMA appreciates that such a broadened scope would complicate implementation and confuse customers, but recommends that a similar process look at rate class definitions including differentiate between buildings and industry. There are already differences among LDCs which address their local circumstances. BOMA suggests, given the likelihood of additional mergers and acquisitions, that the status quo should be challenged to better align the interests of customers and distributors.

The Staff Discussion Paper invites comments on how any of the options will be affected by large amounts of net metering. While this is a matter for consideration, BOMA finds that only looking at net metering restricts the opportunity for optimized use of distributed resources. BOMA supports the inclusion of valuing distributed energy resources as a principle for rate design. However, BOMA believes that the value should be considered not only from the perspective of individual customers, i.e. net metering and individual distributors, i.e. local avoided costs. The enhanced value of distributed energy resources is they can be shared and optimized with neighbouring customers within a micro grid application thereby enhancing the usefulness and applicability of distributed resources such as generation and electrical storage. Further, BOMA suggests that consideration be given to thermal (heating and cooling) storage in order to better

optimize local resources. Denmark is a world leader internationally, but one only look at the achievements of Markham's District Energy System to see the benefits of such considerations here in Ontario:[2]

> *It is not mandatory for buildings in Markham Centre and Cornell Centre to connect to Markham's district energy systems. Building owners choose to connect for a variety of reasons. Here are the top four reasons building owners are connecting to the Markham District Energy systems.*
>
> 1. ***Un-Matched Reliability**: Building owners and managers can count on district energy. Markham District Energy's Markham Centre system, now in its 14th year of operations, reports 99.998% heating reliability and 99.997% cooling reliability.*
>
> 2. ***Decreased Life-Cycle Costs**: A building using district energy does not need its own boilers or chillers, as a result district energy customers reduce upfront capital requirements and ongoing operating and maintenance costs considerably, which means less financial risk and a far better return on investment plus the elimination of principal and interest payments, property taxes associated with new boiler and chiller installations, costly insurance and annual maintenance contracts, and costs associated with operating boilers and chillers.*
>
> 3. ***Comfort and Convenience**: District energy service allows building operators to manage and control their own indoor environments. Building occupants can be both comfortable and satisfied, no matter what the outdoor temperature. District energy is available whenever a building needs heating or cooling. So even if there are unusually warm days in January, a building can receive chilled water or steam for air conditioning without starting up its own chillers. In addition, district energy reduces vibrations and noise problems that could annoy building occupants.*
>
> 4. ***Architectural design flexibility**: A building free of boilers and chillers provides architects with greater building design flexibility. Architects can easily design or renovate buildings to be more versatile and*

[2] http://www.markhamdistrictenergy.com/who-benefits/customers/

> *aesthetically pleasing for both potential occupants and the community. It is MDE's objective to deliver a district energy proposal to our customers that is cost competitive with conventional building systems when evaluated over the life of the building. Competitive, reliable and environmentally superior. We assume the responsibility of delivering this package of benefits while allowing our customers to do what they do best.*

> ***Janet Beed**, President & CEO Markham Stouffville Hospital: "Markham Stouffville Hospital (MSH) took and important step forward when it decided to partner with Markham District Energy (MDE). In this critical relationship, MSH does what it does best by providing high quality health care to our community; and MDE does what it does best, providing reliable, competitive, and environmentally superior energy services to our hospital."*

More recently, in testimony in EB-2016-0004, a witness for the Ontario Geo Thermal Exchange Association described the benefits of applying these same principles to geo based energy; similar benefits are available in non geo based systems:[3]

> *MR. HATHERTON: A really simple -- it is a thermal battery. You can just charge and discharge it however you choose. You can do it through a district system, but a real simple way to explain it is an ice rink with a swimming pool.*
>
> *There are quite a few facilities now that actually they take the heat out of the ice, and they heat the seats and the pool -- the seats where the people sit, and the excess heat actually goes into the swimming pool.*
>
> *So it kind of throws people off, but you can actually make ice and keep your butt warm, and watch a hockey game and go for a swim in the pool, instead of taking the energy out of the ice and throwing it outside.*
>
> *It really reduces -- it is a dramatic.*
>
> *And you could do that in a subdivision in an industrial way, where you could just retrofit a whole area and move all of the energy throughout the thermal battery, you know, back and forth, depending what the loads are.*

[3] EB-2016-0004, Transcript Volume 5, May 11, 2016, pages 88-89

> *It gives you a real opportunity to do that that you just -- I can't find anything else that can do that.*
>
> *So from that point of view, it's on-demand renewable. As a battery it works. It has a lot of flexibility.*

Currently, neighbouring buildings are limited in their ability to optimize distributed energy resources given the definition and regulation of utilities in Ontario and to some degree, the differences between regulation of natural gas and electricity.

Another matter that was not covered in the staff discussion paper was the increasing propensity of many BOMA members to provide sub metering to their customers, whether for energy management or billing purposes. Further analysis may be necessary to determine how best to optimize such arrangements under new distribution rate designs.

The final general concern relates to the potential for any of the proposed rate designs to become limitations on the growth and expansion of small businesses, in particular. While this too may be considered a boundary issue, rate design should encourage conservation but not discourage business expansion and therefore the addition of energy services within an existing business.

Specific Comments on Options

Options for GS<50

BOMA does not support either Option 1 or 4 as both are not supportive of conservation. Option 2 is a possibility, but the variable rate element should not be the same across both winter and summer; rather it should be distribution specific to address the geographic span in the province. Option 3 has some attractive elements, but it would require a lot timelier access to utility data in order to approximate the example from mobile phone use given to explain it in which customers have real time access to their usage data.

Options for GS>50

BOMA supports either 5b or 6b in but neither should use demand charges in off (system) peak periods. As above the geographical span in the province already creates too many disparities to the detriment of northern and rural areas.

Options for Intermediate Customers

Similar to the comments for GS>50, BOMA supports either 5b or 6b if neither use demand charges in off (system) peak periods. As above the geographical span in the province already creates too many disparities to the detriment of northern and rural areas.

Options for Large Customers

BOMA suggests that the Board differentiate rate design for large industrial customers and that for commercial and institutional buildings. Industrial customers clearly have greater flexibility for managing the timing of their energy use. In addition, many of them have benefited greatly from the changes to commodity costs, whereas BOMA members and similarly service based buildings have much less flexibility. With respect to the options, BOMA prefers 5b or 6b for the reasons given above.

Additional Concerns

BOMA wishes to express some additional concerns. Overall, Ontario's electricity pricing has devolved into a mishmash that, in total, no longer conforms to any standard of ratemaking.

- The allocation of the Global Adjustment on a kWh basis, with a 24/7 (except for large industrial customers) belies that fact that many of the costs in the global adjustment are time sensitive. If gas plants are intended to be for peaking purposes, their costs should all be allocated to peak consumption. Solar is clearly a peak generation technology for both winter and summer and its costs should

also be allocated to the peak hours. The costs associated with Bruce Power contracts are base load as are most of OPG's so only these costs should be allocated on a 24/7 basis. The timing of wind generation needs to be analyses and allocated according. Furthermore, BOMA's members are particularly troubled by the mismatch between energy use and the collection of the global adjustment.

- There has been a significant amount of distributed connected generation attached to the system, but every kWh sold through the grid pays for transmission whether it is actually transmitted or not. This has represented a significant windfall for Hydro One Transmission. It also contravenes the principle identified in this paper with respect to valuing distributed resources. This has also resulted in the opposite of what was envisioned under the Green Energy and Green Economy Act in which local projects can benefit local communities thereby exacerbating the NIMBY effect. While net metering may address some of these perverse consequences, again unless rate design and overall regulation address the matter of micro grids, Ontario customers will continue to pay for transmission services that they do not receive.

Utility Billing Data Access Working Group

(UBDAWG)

Transforming Energy Management in Canada

ELEVATING THE CAPTURE, COMPREHENSION, AND USEFULNESS OF UTILITY BILLING DATA FOR ALL CANADIAN CUSTOMERS

Table of Contents

Executive Summary

Problem

"My organization's biggest challenge in energy management is the lack of timely access to our utility billing data. Without it, we cannot operate as efficiently or effectively as necessary to achieve energy management and greenhouse gas emission savings."

Currently, processes for capturing billing data and benchmarking performance are difficult, error-prone, and expensive. The expense and inaccuracy of current data capture processes, coupled with a general lack of understanding of how to utilize utility bill information to guide sound business decisions are substantial barriers to effective energy management in Canada.

Analysis

The Utility Billing Data Access Working Group (UBDAWG) was established in 2014 to identify and evaluate potential solutions to the billing issues mentioned above that exist among multi-site utility customers. Utility representatives, energy market analysts, technical experts, billing data processing stakeholders and end users were convened and consulted with throughout 2015 to:

- Expose the utility data tracking problem faced by multi-site organizations;
- Identify the benefits of a standard data protocol to deliver bill information to customers and the utility industry
- Establish implementation criteria that include being easily adoptable, open-source, and compatible with widely used programs, tools, and software packages in today's marketplace.
- Complete strengths, weaknesses, opportunities, threats (SWOT) analysis of current methods for customers to easily capture and input critical data from their utility bill and to evaluate their applicability and functionality as solutions

Conclusion

UBDAWG analyzed 6 potential solutions in this paper: Electronic billing, Utility website portals, Barcode/QR Code/IQR Code, Green Button, Electronic Data Interchange (EDI), and Optical Character Recognition (OCR). Any of the six potential solutions reviewed in this report could provide the end customer with improved ability to easily capture and input essential data from their utility bills.

UBDAWG is not recommending any one particular solution over another but encourages readers to use the findings of this report to continue a dialogue in support of the identification and implementation of a standard.

UBDAWG also believes that there need to be changes on a number of fronts in order to resolve the problem. Government and regulators need to provide the necessary frameworks. Utilities need to better understand and meet their customers' data needs. Customers need to demand improved access to data – and, having gained that access, make use of the information to improve energy performance.

Part I: Background

1.0) Purpose of this White Paper

This paper is one stepping stone towards the ultimate solution and aims to achieve the following four objectives:

- Expose the utility data tracking problem faced by multi-site organizations;
- Identify the benefits of a standard data protocol to deliver bill information to customers, to the utility industry and to Canada.
- Establish implementation criteria that include being easily adoptable, open source, and compatible with widely used programs, tools, and software packages in today's marketplace.
- Complete a strengths, weaknesses, opportunities, threats (SWOT) analysis of current methods for customers to easily capture and input critical data from their utility bill and to evaluate their applicability and functionality as solutions

The potential solutions, SWOT analysis, and proposed implementation criteria are presented in this white paper. The purpose of the white paper is to raise awareness and stimulate discussion among key stakeholders and the general public. The longer-term objective is to move stakeholders toward consensus on a solution, and guide implementation.

We do not recommend one particular solution over another. Strengths and weaknesses are evaluated for each currently available option.

2.0) Framing the Problem

Based on the Working Group's experience, over 95% of multi-site utility customers do not have a basic understanding of how much they spend and consume annually on energy and water or how their energy bill is calculated. Energy users from diverse industry sectors have suggested that lack of information is one of their biggest energy management issues.

> ***"My organization's biggest challenge in energy management is the lack of timely access to our utility billing data. Without it, we cannot operate as efficiently or effectively as necessary to achieve energy management and greenhouse gas emission savings."***
>
> *– Suzanne Madder, Municipal Energy Conservation Officer, Town of Oakville*

Progressive organizations recognize that managing energy strategically will reduce costs, improve operational efficiencies, and reduce their organization's environmental impact. They want to track consumption and cost on a regular basis to identify savings opportunities. Processes for capturing billing data and benchmarking performance are currently difficult, error-prone, and expensive. The common practice of manually entering billing information into a database is often delegated to untrained staff. This results in inconsistent energy reporting and a reduced ability to identify savings opportunities.

The expense and inaccuracy of current data capture processes and a general lack of understanding of how to utilize utility bill information to guide sound business decisions are substantial barriers to effective energy management in Canada.

3.0) Utility Billing Data Access Working Group (UBDAWG)

The Utility Billing Data Access Working Group (UBDAWG) was established in 2014 to identify and evaluate potential solutions to the billing issues mentioned above that exist among multi-site utility customers.

Utility representatives, energy market analysts, technical experts, billing data processing stakeholders and end users were convened and consulted with throughout 2015 to collectively provide their input and strategize solutions regarding the inconsistency of utility data delivery to customers. A listing of group members can be found in **Appendix A**. All agreed that end users, utilities, and billing agents would benefit from a better solution to capture and access billing data.

The diversity of this Working Group allowed it to tackle the issue from different viewpoints. It was guided by the following mission statement:

"The Utility Billing Data Access Working Group will work to:

- Transform billing for Canada's utility systems into a consistent format that is easy to access for end users;
- Develop a standard for utility billing that can be adopted by all energy providers in all jurisdictions throughout Canada;
- Provide open-source solutions that will allow organizations to develop applications to read and report verified billing components in a consistent and efficient manner."

4.0) Solution Overview

UBDAWG determined that the best solution to these problems must allow easy access to and capture of uniform and relevant billing data from each utility across Canada. This does not suggest that each utility bill look the same or contain all the same data, but rather that the format must contain a consistent and easily extractable data package of key items that are available on all bills from each utility across Canada.

5.0) Benefits of Potential Solutions

Billing data accessibility ultimately results in decreasing energy costs and provides benefits to energy consumers, the utility industry and for Canada. Each alternative covered by this paper should provide the benefits listed below to varying degrees and at varying costs.

5.1) Benefits for Energy Consumers

The most direct benefit for energy consumers of more accessible utility billing data is that it will increase energy awareness and literacy throughout organizations, allowing many people within each organization to understand and focus on how to save the organization money and provide environmental benefits through energy management.

Organizations will have reliable and accessible data to establish a true understanding of what makes up their utility costs. Understanding these charges will allow organizations to prioritize where to focus efforts towards cost reductions and set baseline measurements to track the progress they have made. As energy costs constantly change, billing data is paramount in order to measure actual usage, pricing and associated savings in both areas.

Utility billing data provides fundamental information that allows more companies to proactively participate in energy management activities. More companies will be able to mitigate significant energy and environmental costs giving them a competitive edge in business.

Figure 1:

5.2) Benefits for Utilities and Canada

The greatest benefit associated with prioritizing energy efficiency is a reduced requirement for the construction and/or refurbishment of energy infrastructure. The costs involved with building or refurbishing such facilities can be enormous, and have a direct impact on the cost of energy. Energy conservation is a much more cost effective investment than increasing generation capacity (Figure 2) and allows utility or government energy authorities to ensure energy supply can handle demand while minimizing costs to consumers.

The increased energy awareness and literacy gained by energy consumers from a Billing Data Accessibility solution will help utilities meet their conservation targets.

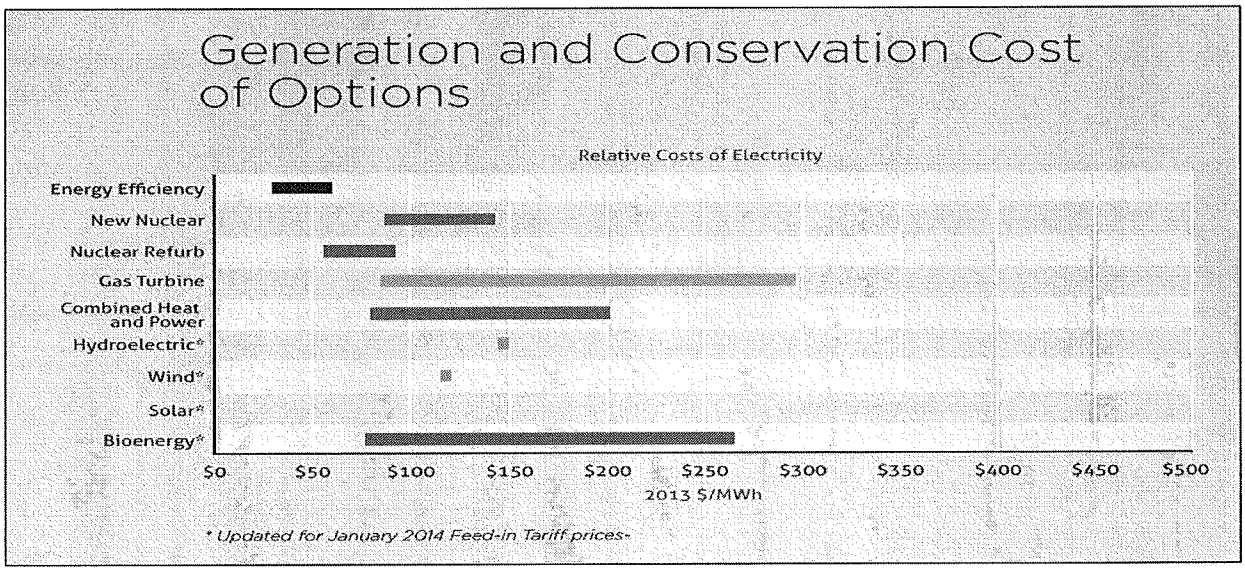


Figure 2: Energy efficiency support costs relative to building new types of electricity generation. Source: Ontario Long Term Energy Plan, 2014

Part II: Evaluation

6.0) Problems with Current Billing Situation

The process for commodity billing/invoicing has not significantly changed over time (see figure 3)

- A unit of measure is used to count the number of items moving past a fixed point;
- The commodity units are tallied;
- A formula is applied and a charge is rendered to the client; and
- The transaction is completed upon payment (or promise of payment.)

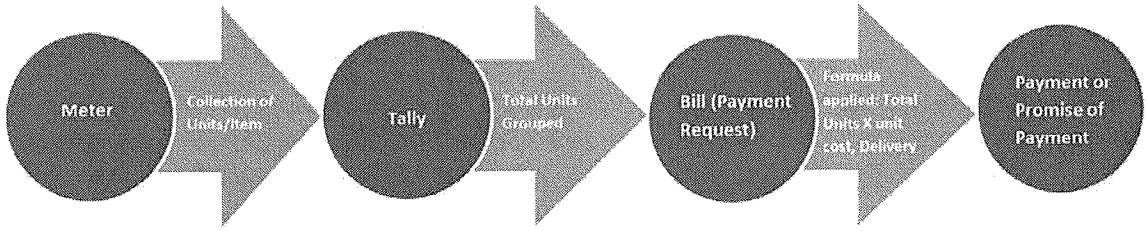


Figure 3: Current status: Gathering data through to payment of utility bill

In today's billing method there are additional levels of sophistication that can be applied to each of the steps in the process. The mechanisms to collect data, the validation checks between each step and the sophistication within the commodity itself have both enhanced and encumbered the customer experience. This system has typically been developed with bill payment as the primary driver, and has resulted in significant obstacles for organizations with a focus on energy management.

6.1) End-User Perspective on Issues

There was a clear consensus from the Working Group's end-users: the lack of timely access to utility billing data was the largest obstacle their organizations' had in energy management, alongside an insufficient understanding of how to apply the data they had effectively. Customers with the biggest challenge are those that deal with bills for multiple locations, across multiple utilities. They experience significant barriers to completely understanding how much energy they are using. They receive different bills from various utilities with varying information, in diverse formats and presented in inconsistent units. The adage "You can't manage what you don't measure" applies to this situation. It is impossible to measure any energy efficiency improvement actions if there is no way to effectively measure benchmarks.

6.2) Reading Billing Data

Every bill is different from utility to utility. Important information can often be hard to find and identify. The information presented by each utility may also be different, even if they deal with the same commodity. It is also not unusual for a utility to change the layout, design, and information presented on their bills. Some utility companies bill for multiple commodities, such as natural gas, electricity and water, on the same statement.

Unfortunately, all of these factors can lead to issues for many customers, especially for those with multiple sites. Important energy consumption, peak demand and costing information can be difficult to identify

given these differences, which makes consistently recording and analyzing data challenging. This often becomes a barrier for an organization to be able to report on their energy performance.

An important aspect of this paper and of solving the issue of data accessibility is to identify the key data items that need to be extracted from the utility bill to allow multi-site utility customers to effectively manage energy. This listing can be found in **Appendix B**.

6.3) Cost

Cost is one of the most burdensome barriers in capturing billing data. There is almost always a cost associated with obtaining and storing data in a format that is useful for the purposes of energy management.

In the case of manual data entry, participants noted a probable cost of $18,000 - $40,000 per year, based on the labour and time necessary to input a number of utility bills for electricity, natural gas, and water over different utilities and jurisdictions. Administrators of multi-site organizations such as municipalities, regional transit, provincial water and waste water plants, and industrial locations reported a cost that ran between $1.80 and $2.20 per invoice, regardless of the means used to capture billing information from paper (non-digitized) bills.

There are also issues with recording data correctly. With the case of manual entry, errors can be made, with error-correction representing up to 30% of the total time spent on capturing data. Correcting these mistakes increases costs for an organization.

6.4) Specific Issues with Paper Billing

Consumers identified the following issues in accessing information from paper utility bills:

- Often only one copy of the bill is sent to customers (may only be received and seen by one or two people in the organization, paid then filed);
- Not always clear how charges are being administered;
- Not clear what makes up the utility bill costs;
- Not always clear what information could be/should be focused on for energy management initiatives/purposes;
- Significant time and resources required to capture billing data manually;
- Changing bill design or information it contains can lead to issues for customers with automatic scanning software; can also slow down manual inputters as they look for necessary information
- For multi-site organizations, different utilities present different information in different locations on the bill (can make comparing locations and normalizing data difficult);
- Manual recording of information is slow; a large bottle neck for customers to overcome
- Manual input can lead to errors in data inputting, assessment and decision making;

7.0) Potential Solutions

UBDAWG identified and analyzed the following potential solutions:

1. Electronic billing

Electronic billing is an umbrella term to describe any method of presenting an invoice electronically to a customer for payment. It provides for centralized documentation in one location on a server. It provides for immediate invoice arrival and presentation. It can contain all the information a paper bill does, sometimes more, with lower costs for the sender.

2. Utility website portals

Utilities provide website space where customers sign in and access their account information. Website information varies by utility but can provide invoices, consumption data, utility updates, comparisons across regions, rate analysis, historical cost and consumption patterns.

3. Barcode/QR Code/IQR Code

The QR Code (Quick Response Code), an open source matrix bar code first designed for the Japan automotive industry. It has become popular due to its fast readability and data storage capacity. A QR Code can contain as many items as a creator would like, including invoice and meter numbers, account information, usage, costs, general marketing, rates etc.

4. Green Button

The Green Button is an open standard that enables residential, commercial, institutional and industrial customers to access and share their electricity, natural gas and water usage information in a secure, electronic private format.

5. EDI (Electronic Data Interchange)

Electronic Data Interchange can be used to automate existing processes and safely move data from one organization to another in a standard format. It has historically been utilized heavily in inventory management transportation and distribution operations.

6. OCR (Optical Character Recognition)

Optical Character Recognition is the electronic conversion of images of typewritten or printed text into machine encoded text. It is a common method of digitizing printed texts so they can be electronically edited, searched, stored or displayed on-line.

7.1) Keys Measures of a Successful Solution

- A standardized transport mechanism by which the data can be communicated;
- A standardized format to represent the data being communicated; energy management information must be made easily available;
- Reasonable cost for all parties;
- Ease of use for customers, utilities, software suppliers and energy service providers;
- Format is private and secure despite non-proprietary, open-source nature; provides open access for all involved parties as well as third-party application developers
- Provides critical information for senior management to participate in Energy Management;
- Facilitate adoption and drive customer value across utility, provincial and international boundaries regardless of utility or organization size
- Facilitate the incorporation of other related data e.g. weather, water, steam, gas etc.;
- The solution must be a product of collaboration between utilities and key customer representatives to ensure that it includes all of the measures mentioned above.

In light of these measures, UBDAWG evaluated each of the potential solutions using the SWOT analysis method.

7.2) SWOT Analysis

Solutions	Strength	Weakness	Opportunity	Threat
Electronic Billing	Direct Multiple copies possible Least expensive option for utility Software exists for extracting data	Software can be costly to customer Changes to bill format can cause issues/ additional costs to data collection	Potential for future protocols to be included on/in electronic bills	Cost of software install/ upgrades for customers
Utility website portal	Driven by customer Access to required information when the customer needs it	Multiple portal logins, formats Technical issues with portals	Potential for merged format/portals across utilities/ territories	Different portals existing already
Bar code/QR code	Can be included on paper or electronic billing Can allow for formalized data collection across utilities	No standard across the country	Proven technology Allows for easy, uniform data download at customer level Lower development, implementation, usage costs required for customer	Alternative solutions currently in development may make adoption problematic
Green Button	Already in development /use by some utilities Allows for easy download of usage data and access for 3rd party app developers	Currently developed for the download of usage data, not billing data. There have been instances of customers having issues utilizing the green button.	Can potentially be developed in future to include billing data Widespread adoption already underway	Ensuring compliance to the standard by utilities that adopt the green button.
EDI (Electronic Data Interchange)	Direct delivery to potentially multiple customers	Costs for both billing agent and user for software development & utilization	Allows for immediate/easy download of billing data	One of the costliest potential solutions Technical issues may limit adoption
OCR (Optical Character Recognition)	Ability to scan required data from bills directly into a database Allows for formalized data collection	Accuracy has been an issue in the past, with 90-98% accuracy considered average Higher cost to customer Reprogramming required whenever bill format changes	Technology is improving Software and hardware is starting to come down in price	Re-programming when new formats are implemented becomes expensive

7.3) Discussion of Potential Solutions

7.3.1) Electronic Billing

Many utilities are considering or already using electronic billing. It is environmentally friendly as it mitigates printing and transportation resource use associated with mailing paper bills. Information can be easily forwarded to many people within a customer organization. Ability to use Green Button or QR Code in combination with an electronic bill would allow for more billing data to be readily downloaded at less cost to the customer.

Without pairing electronic billing with another solution like the green button or QR Code, there is still some cost and effort required by the customer to access and analyse the data. Additionally, if a utility changes its billing format, this will require additional programming and manipulation of the customer's data extraction software. As such, manual entry is often still required for this potential solution.

7.3.2) Utility Website Portals

Many utilities have adopted online access for customers to access their pricing and use data. A number of these portals allow for the customer to request data for a certain timeframe and sometimes in different units or blocks of time depending on the service. Data is usually downloadable in a format that allows for it to be easily copied, pasted and otherwise manipulated in an Excel spreadsheet. This results in fewer errors that would be otherwise attributed to manual data entry.

The major issues associated with reliance on accessing information through web portals are:

- Information is not "pushed" to the end user- it requires customer action, namely increased time to log in and retrieve data;
- Sites can be difficult to navigate;
- The customer may be required to log into multiple websites, resulting in multiple user names / passwords, different platforms to navigate, which may be time consuming and become abandoned;
- Information may not be consistent from utility to utility, or from platform to platform.
- This option is ideally suited to small organizations, single site commercial or residential users.

7.3.3) Barcode/QR code/IQR Code (Quick Response Code)

The use of QR Codes is becoming standard practice in many business sectors. It would be a simple process to include a defined standard set of items in a utility based QR Code on each electricity, natural gas and water utility bill (paper or electronic). This solution would allow any consumer to capture utility use, demand and pricing in a consistent format. The cost to develop and implement QR codes is minimal. Many utilities and other organizations already use QR Codes for internal purposes. Due to the standard and universal data protocol, the data could be incorporated into a customer data base such as financial packages, energy management software or even smart phones/apps, as seen in **Appendix C.**

The cost to implement QR Codes is minimal and would not disrupt the utility billing process. It would alleviate major costs and security issues utilities must overcome when developing other ways of providing access to data.

The Barcode solution brings more advantages to multi-site organizations. This market tends to represent about 30 to 40 percent of all energy usage in Canada. Single site locations such as residential, commercial and industrial will also benefit at a lesser extent by quickly scanning this QR Code for tracking and assessment purposes.

7.3.4) Green Button

This solution has been encouraged for electric utilities to be deployed on a large scale. BC Hydro has initiated adoption of this protocol, and 60% of Ontario already has access to the use of Green Button. Utilities other than electricity have not adopted this solution at this time.

Green Button programming works well with current government initiatives, such as the Portfolio Manager software. This software is primarily used for conservation and demand management and not for energy procurement. The Green Button was designed for consumer access to a simplistic data download. As availability of data moves from monthly to hourly to near real time, the real value will be for customers to look ahead and better forecast consumption and cost as opposed to just analyzing historic data and associated cost.

A full summary regarding the Green Button, and a Canadian Utility's efforts to champion this solution throughout North America, can be found in **Appendix D.**

7.3.5) EDI (Electronic Data Interchange)

This globally used billing method fits many of the criteria for a viable solution, i.e. data is pushed to the customer and transferred into a spreadsheet automatically. However, the main weaknesses of this solution include the need for programming, the associated time commitment, and the installation of systems required to utilize EDI. These elements continue to be barriers and prevent widespread adoption of this solution.

Currently utilities and customers are not set up to implement this method. EDI requires significant business process changes, to which some organizations are not open. Without widespread uptake and education, there is not the motivation to implement. EDI is ideally suited to large users with the financial capability and time to implement new software and process changes.

7.3.6) OCR (Optical Character Recognition)

One of the greatest strengths of OCR as a solution is that it requires no action on the part of utilities. This option, used by many consumers currently, has an initial setup cost. It also requires time and effort when bills are re-designed by utilities. There is a degree of error in character recognition (though this has improved in recent years), and issues regarding characters in coloured fields on the bills.

OCR is ideally suited to medium to large commercial and industrial organizations currently using OCR in another fashion. It would be prohibitive for residential users and energy service providers.

8.0) Costs

As outlined in the SWOT analysis, each potential solution will require some expenditure by the consumer, the utility, or both. The key to success is to minimize costs for both customers and utilities, while maximizing the effectiveness of the preferred solution. The end goal is for customers to have easily accessible and accurate data for the purposes of energy management and cost containment. When data is costly or not easily accessible, it becomes a barrier to effective energy management. Consideration of the success of any potential solution should consider cost to the consumer, while minimizing costs to the utility.

The chart below explores the relative cost of each potential solution. In investigating costs associated with the various options, the Working Group found the following:

- Reported implementation costs varied, sometimes widely, from participant to participant, for similar items
- Participants were unwilling to share costing information and only provided "ballpark" values

Because exact costs are difficult to ascertain, we found it best to compare costs in "relative" terms, using costs reported by participants relative to other solutions. End-users and utilities evaluated the options in two categories based on each solution's relative cost to them: Low Relative Cost and High Relative Cost.

On the customer end, costs can be:

- Paying employees for the time involved to manually enter data;
- Creating and programming software for the various solutions;
- Creating and maintaining data portals and other complex programs.
- Technology investment

End-users evaluated the options as follows:

Solution	Relative Cost	Reasons
Electronic billing	**High**	Manual data inputting still required, error management costs
Utility website portal	**High**	Time costs associated with accessing portal, data transfer
QR Code	**Low**	Availability of QR code readers, easy and speed of scanning, less time managing errors
Green Button	**Low**	Streamlined information readily available
EDI	**High**	Initial investment costs in business process changes, software
OCR	**High**	Initial investment in OCR technology, error management costs, bill redesign costs

On the utility end, costs can be:

- Software development and support charges
- Business process changes
- Technology investment

Utilities evaluated the options as follows:

Solution	Relative Cost	Reasons
Electronic billing	**Low**	Reduction in printing costs, little to no change to business process needed
Utility website portal	**High**	Software development and ongoing support charges
QR Code	**Low**	Little to no change in business process needed, modest investment in QR code-creating software
Green Button	**High**	Software development and ongoing support charges
EDI	**High**	Software development and ongoing support charges
OCR	**Low**	No changes needed to current process

9.0) Conclusion

The UBDAWG goal has been to identify and evaluate all potential solutions available to the market for capturing, accessing and using utility billing data for successful energy management. Any of the six potential solutions reviewed in this report could provide the end customer with improved ability to easily capture and input essential data from their utility bills. Although the six potential solutions are all currently available to varying extents, it is clear that what is needed is a standardized, universal system which will reduce costs for both customers and utilities. The use of different methods prevents customers and utilities alike from achieving economies of scale, and fails to easily provide customers with the information needed to manage energy.

A broader national and international dialogue is needed to continue the work of this white paper, further developing an accessible, affordable, open-source format for conveying the utility data customers need to drive organizational change and improvement.

For this to happen, changes on a number of fronts are needed. Government and regulators need to provide the necessary frameworks. Utilities need to better understand and meet their customers' data needs. Customers need to demand improved access to data – and having gained that access, make use of the information to improve energy performance.

Appendices

Appendix A: UBDAWG Group

Allan, Jason; County of Simcoe, Sustainable Operations Program Supervisor
Arkell, David; 360 Energy Inc., President & CEO
Brodeur, Lisa; 360 Energy Inc., Project Manager (Group Secretary)
Brown, Tom; 360 Energy Inc., General Manager
Corbyn, Peter; GreenNexxus, Chief of Green
DiRuscio, Carmine; NRG Matters Corp., President (Group Chair)
Kee, Julie; 360 Energy Inc., Account Manager (Group Secretary)
Lennartz, John; Samuel, Son & Co. Limited, General Manager Canadian Operations – Samuel Packaging Systems Group
Mir, Syed; London Hydro, Vice President Corporate Services & CIO
Nicholas, Tyson; BC Hydro, Manager
Parsons, Deanna; Kubra, Strategic Client Manager
Pooley, John; 360 Energy Inc., Vice President
Small, Sara; Kubra, Marketing Analyst
Tyler, Terry; TG Tyler Consulting, Owner and Principal
Zahir, Saif Dr.; University of Northern British Columbia, Department of Computer Science.

Additional thanks to Susan Grant, Suzanne Madder, Jennifer Niece, Adam Vaiya and James Williams for their contributions to the editing process.

Appendix B: Items that should be made available on utility bills

DATA PACKAGE TO BE EXTRACTED FROM BILLING

Version 1
Date February-02-16

This work book is intended to collect the necessary 'data fields' that are regarded as essential and desirable in the development of energy management from utility bill data.
This spreadsheet is an on-going work in progress. All comments and contributions are welcomed.
However, there are a number of principles behind the compilation of the sheets

ONE **The data fields need to cover all three utilities and all Canadian jurisdictions**
The issue here is that for this process to have wide value it needs to be accessible across Canada and all three utilities

TWO **Selected fields need to support on-going energy management**
For 'top-line' energy management not every item of data is required

THREE **Payload of 'package' to be minimized if a scanable code is to be used**
Method of data delivery may have limited data capacity

FOUR **Use of 'buckets'**
Setting up a number of 'buckets' that can be used to collect types of charges that may vary by jurisdiction/utility
E.g. debt retirement, clean energy, etc.

Regulatory charges	Fixed charges	Demand charges	Consumption related charges (but not direct consumption)

Version	1			
Date	February-02-16			
ELECTRICITY				
	Field Name	**Field Type**	**Field Size**	**Bill Example**
Essential	Supplier Name:	Text	5	Toronto Hydro
Essential	Utility Type	Number	1	Electricity
Essential	Account #	Text	13	99 99 99 99999 9
Essential	Post Code	Text	7	L9G 4V5
Essential	Meter #	Text	10	99999999
Essential	Billing/Statement Date:	Date	8	11/30/14
Essential	Meter Read Period From	Date	8	12/01/14
Essential	estimated/actual	Text	1	Estimated
Essential	Meter Read Period To	Date	8	12/03/14
Essential	estimated/actual	Text	1	Actual
Essential	Total Bill Incl. Tax (Amount Due)	Currency	10	$1,000,000.00
Essential	Total Tax	Currency		$1,000,000.00
Essential	Consumption kWh:	Number	10	844,810.50
Essential	Adjusted Consumption kWh:	Number	10	876,575.37
Essential	Demand KVA	Number	7	2,001.13
Essential	Demand kW	Number	9	1,711.50
Essential	Total Current Electricity Charges (pre-tax)	Currency	10	$1,000,000.00
Essential	Fixed Monthly charges	Currency	10	$1,000,000.00
Essential	Total commodity charges	Currency	10	$1,000,000.00
Essential	Total distribution charges	Currency	10	$1,000,000.00
Desirable	Line losses	Number	10	?
Desirable	Meter multiplier	Number	4	10
Desirable	Retailer charge	Currency	10	$1,000,000.00
Desirable	Total monthly demand charges	Currency	10	$1,000,000.00
Desirable	Total monthly consumption charges	Currency	10	$1,000,000.00
Desirable	Rate Structure	General	7	Rate 315
Desirable	Power Factor	Number	5	90.56
Desirable	Deposit interest	Currency	10	1000000
Desirable	Penalties	Currency	10	1000000

Version	1			
Date	February-02-16			

NATURAL GAS

	Field Name	Field Type	Field Size	Bill Example
Essential	Utility Name:	Text	5	Toronto Hydro
Essential	Utility Service:	Number	1	Electricity
Essential	Account #	Text	13	99 99 99 99999 9
Essential	Post Code	Text	7	L9G 4V5
Essential	Meter #	Text	10	99999999
Essential	Billing/Statement Date:	Date	8	11/30/14
Essential	Meter Read Period From	Date	8	12/01/14
Essential	estimated/actual	Text	1	Estimated
Essential	Meter Read Period To	Date	8	12/03/14
Essential	estimated/actual	Text	1	Actual
Essential	Total Bill Incl. Tax (Amount Due)	Currency	10	$1,000,000.00
Essential	Total Tax	Currency		$1,000,000.00
Essential	Units used	Number	1	m3
Essential	Total natural Gas used (units)	Number	7	136,147
Essential	Total Gas charges	Currency	9	$1,000,000.00
Desirable	Commodity charge	Currency	10	$1,000,000.00
Desirable	Distribution charge	Currency	10	$1,000,000.00
Desirable	Transmission charge	Currency	10	$1,000,000.00
Desirable	Storage charge	Currency	10	$1,000,000.00
Desirable	Monthly utility charge	Currency	10	$1,000,000.00
Desirable	Auxiliary services charges	Currency	10	$1,000,000.00
Desirable	Adjustments	Currency	10	$1,000,000.00
Desirable	Low rate consumption	Number	7	197
Desirable	Deposit Interest	Currency	10	$1,000,000.00
Desirable	penalties	Currency	10	$1,000,000.00

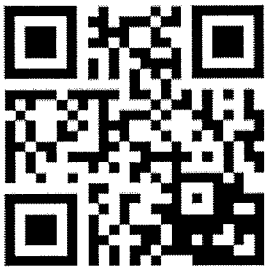
Version	1			
Date	February-02-15			

WATER

	Field Name	Field Type	Field Size	Bill Example
Essential	Utility Name:	Text	5	Region of Peel
Essential	Utility Service:	Number	1	Water
Essential	Account #	Text	13	99 99 99 99999 9
Essential	Post Code	Text	7	L9G 4V5
Essential	Meter #	Text	10	99999999
Essential	Billing/Statement Date:	Date	8	11/30/14
Essential	Meter Read Period From	Date	8	12/01/14
Essential	estimated/actual	Text	1	Estimated
Essential	Meter Read Period To	Date	8	12/03/14
Essential	estimated/actual	Text	1	Actual
Essential	Water Consumption (units)	Number	10	9,690,970.00
Essential	Total Bill Incl. Tax (Amount Due)	Currency	10	$1,000,000.00
Essential	Total Charges (pre-tax)	Currency	10	$1,000,000.00
Desirable	Total Water Charges	Currency	10	$1,000,000.00
Desirable	Total Sewage Charges	Currency	10	$1,000,000.00
Desirable	Other charges	Currency	11	$1,000,000.00
Desirable	Deposit Interest	Currency	10	1000000
Desirable	Penalties	Currency	10	1000000

Appendix C: (QR Code) Quick Response Code incorporating standard data package to be extracted from utility bills

Example: QR Code for Electricity Data



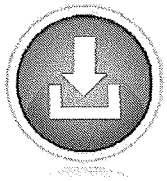
Data for Electricity QR Code			
	Field Name	Field Type	Example Data
1	Utility Type	Text	Electric
2	Supplier Name	Text	Horizon
3	Site Name	Text	360 Energy Inc
4	Street Address	Text	1480 Sandhill Drive
5	Unit/PO Box	Text	Unit 8B
6	City	Text	Ancaster
7	Province	Text	Ontario
8	Postal Code	Text	L9G 4V5
9	Account #	Text	123456789012
10	Meter #	Text	HG124578
11	Bill/Statement Date	Date	4/15/2016
12	Meter Read From	Date	3/1/2016
13	Previous Reading	Number	5,000,000
14	Estimated/Actual	Text	Actual
15	Meter Read To	Date	3/30/2016
16	Current Reading	Number	5,030,305
17	Estimated/Actual	Text	Actual
18	Amount Due	Currency	$4,976.48
19	Total Tax	Currency	$572.51
20	Consumption (kwh)	Number	30,305
21	Adjusted Consumption	Number	31,396
22	Demand KVA	Number	58.77
23	Demand KW	Number	60.86
24	Power Factor	Number	0.93
25	Flat charges (sum)	Currency	$380.73
26	$ for consumption	Currency	$3,671.92
27	$ for demand	Currency	$539.69
28	Total Pre-Tax Charges	Currency	$4,592.34
29	Customer Rate Class	Text	GS 50 - 999 kw
30	Penalties	Currency	0.00
31	Credits	Currency	0.00
32	TBD	text	0.00
33	TBD	Currency	0.00
34	TBD	number	0.00

Appendix D: Green Button and London Hydro

London Hydro was selected by the Ontario Ministry of Energy to be part of its Green Button initiative in late 2012. London Hydro has played a significant role in driving the development, promotion, testing, and implementation of a framework based on the Green Button standard. Over the last several years there has been lots of work done on the standard based on input from many utilities, government agencies and standards organizations across North America (e.g. NIST, PG&E, SCE, SDG&E, London Hydro, MaRS, Chai Energy, US DoE, Ont MoE, UL) .

As well, London Hydro is a founding member of Green Button Alliance organization http://greenbuttonalliance.org. London Hydro would encourage any organization that's part of the UBDAWG to consider membership in the Green Button Alliance organization as a means of helping influence the direction for the Green Button standard and specifically the scope of the Billing Data extension. Adding Billing Data to the Green Button standard is currently in scope of PG&E's utility pilot.

Green Button



Green Button is an open standard that enables customers to access and share their electricity, natural gas and water usage information in a secure, electronic, standardized and privacy enabled way. The Green Button standard can enable streamlined data access for residential, commercial and institutional and industrial consumers.
The Green Button standard has been extended to include Utility Billing data and is currently in pilot with Pacific Gas and Electric (PG&E).

Ontario
MINISTRY OF ENERGY

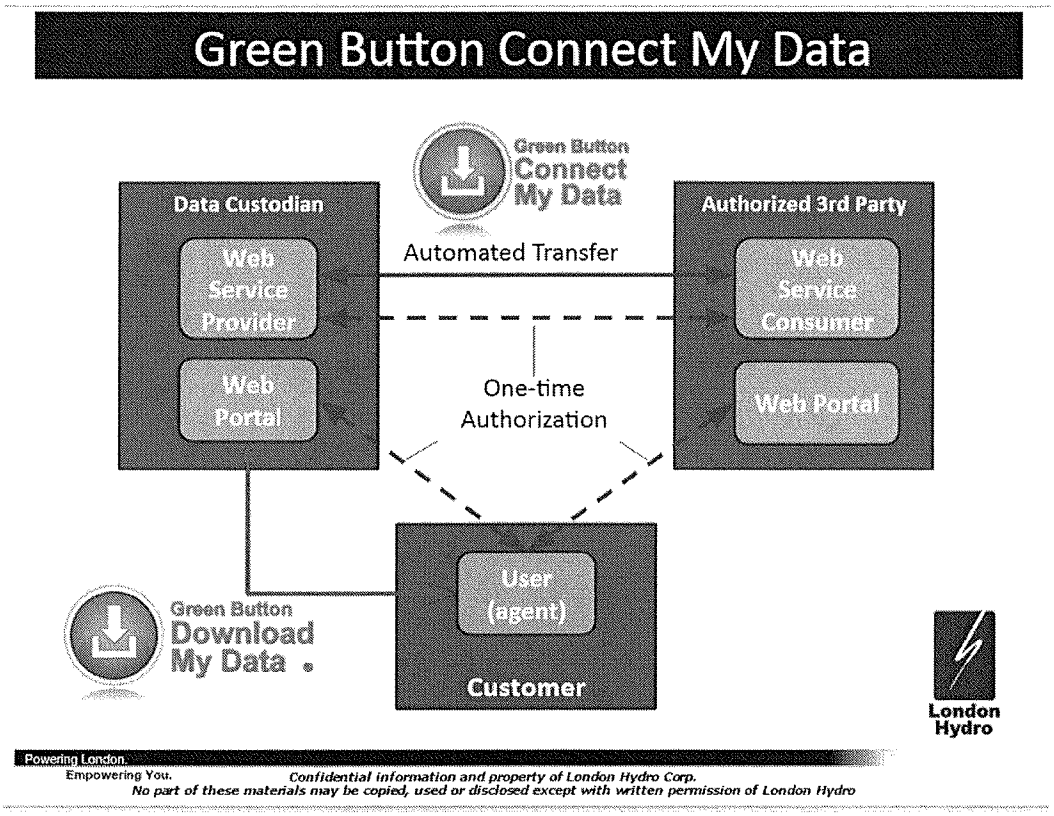
Background
The Green Button initiative is part of the Ontario Ministry of Energy "Conservation First" initiative and Ontario's Long -Term Energy Plan (LTEP). Green Button started in the United States after a White House call to action to empower consumers to manage their own energy usage by giving them access to their energy data and more options for managing their consumption.

Green Button is steadily being adopted across North America as well as being implemented in international jurisdictions like Italy and actively considered in Japan, Germany and others. Presently, 100 million consumers in the US have access to the standard, approximately 60% of Ontario has access to the standard through Green Button "Download My Data" and "Connect My Data". BC Hydro has initiated its adoption of the Green Button standard.

Green Button formatted consumption (and in the future Utility Billing data) can be access by the end user in one of 2 ways:

- Downloaded directly from their participating Utility via the "Download My Data" function on the Utilities Customer portal. This data can be downloaded in either "CSV" or "XML" format, on-demand.

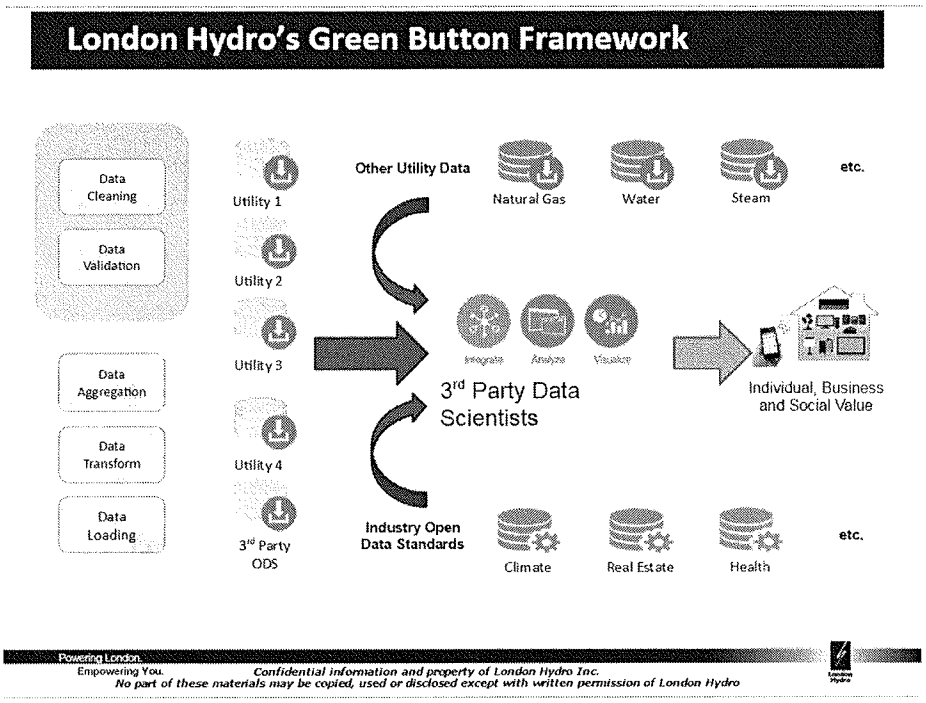
- Integrated into a 3rd Party app through the "Connect My Data" API. This will provide a seamless access to multi-facility customer locations that span utility boundaries. This access is contingent on authorization by the customer and would be a 3-party agreement including the data custodian (Utility) and the 3rd party app provider. London Hydro's customer authorization model is illustrated below:



While initial implementations in Ontario focused on implementing Green Button enabled data access for the residential sector, it quickly became apparent that the real need for standardized utility data was in the commercial and institutional sector. These needs include an interest in ongoing energy management [not just when you receive the bill at the end of the month or two or three (for gas and water)] and the increasing voluntary and mandatory reporting requirements that C&I sector is subject to. Some examples are the upcoming legislation on mandatory energy reporting and benchmarking for the C&I sector, reg 397/11 for all public sector buildings and the upcoming Cap and Trade data reporting requirements for gas data reporting. Given the increasing need for this data in a standardized, streamlined and at no cost to the C&I sector, large property manager (including the top 5 national banks) and industry associations like BOMA Toronto, BOMA Canada and REALpac have all issued letters to govt to mandate the adoption of Green Button across electricity and natural gas in Ontario.

These C&I associations, large property managers and their energy management and reporting service providers (both in Ontario and in the US) have also identified the need for having access to billing data via the Green Button standard. In response to this request, the Green Button standards groups are currently testing the provision of billing data using the Green Button standard in PG&E today. While it is early to tell the results of this implementation now, it is likely that given the large need demonstrated by industry (as noted earlier) that the next iteration of the standard will provide billing data as part of the Green Button data stream.

The following illustration depicts London Hydro's vision for a Green Button Framework:



The Green Button data standard can also be applied to sub-metered data, where now consumer/ property managers cannot have access to their whole building consumption data but may also be able to access their sub-metered consumption data in the same billing format. This has already been implemented in Washington DC, where First Fuel (Energy analytics/management company) used both whole building utility meter consumption data in a Green Button format and also used sub-metered data in Green Button format (provided through Schneider Electric sub-meters. Similar efforts are underway in Ontario where multiple sub-metering companies have started to explore the provision of their sub-metered data in the Green Button format due to increasing customer interest in the standard from the C&I sector.

The Ontario Ministry of Energy plans to conduct stakeholder consultations to mandate Green Button across electricity, natural gas and potentially water in Q1 2016. These consultations present an excellent opportunity to provide input that Ontario's implementation of Green button include billing data (or prioritize its development and adoption into the standard) and also require that Green Button be rolled out within time-frames that are better aligned with the user groups represented in this Working Group.

Green Button can be deployed by each individual utility on their IT systems as a custom development or can be enabled through a hosted service by a Green Button hosted service solution provider like Schneider Electric or London Hydro (who have already deployed multiple instances of their hosted platform across North America). The latter option can significantly reduce the time, cost, and utility infrastructure needs to implement Green Button across utilities of diverse sizes.

London Hydro's Green Button Platform

London Hydro has been championing the Green Button initiative as part of the Ontario Ministry of Energy "Conservation First" initiative and Ontario's Long -Term Energy Plan (LTEP) since 2013.
The Green Button initiative prompted third parties to develop new and innovative applications to help customers monitor, reduce and conserve electricity. Using these apps residential customers is able to track

their data in a secure way to proactively manage energy usage on an hourly, daily and weekly basis before the monthly bill arrives. Additionally, commercial and industrial customers can access usage information across facilities that span utility boundaries for benchmarking purposes and overall energy management. In February 2013, London Hydro was the first utility in Canada to provide Green Button Download My Data to customers through its customer engagement portal, MyLondonHydro. Since then Green Button Connect My Data gave London Hydro an opportunity to meet its strategic objective of providing leading edge technologies to its customers and worked closely with the government to explore this emerging market. Currently, 60% of London Hydro's customer consumption data is accessible through Green Button to third party applications. Additionally, London Hydro is deploying a Green Button Platform as "Software as a Service" to two utilities in Ontario

For further information on how the Green Button standard applies to C&I sector consumer please visit the Green Button for Business Consumer link:

http://greenbuttondata.ca/businesses/