



THE ATLANTIC CANADA ENERGY DATA ROADMAP

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EXECUTIVE SUMMARY

The Atlantic Canada Energy Data Roadmap (Roadmap) is a guide to changing the way we collect, manage, use, and think about energy and greenhouse gas (GHG) emissions data in a world of overwhelmingly large amounts of data.

The Roadmap was developed through a combination of research, and consultation with a diverse range of content experts and stakeholders, across Atlantic Canada - Nova Scotia, Prince Edward Island, New Brunswick and Newfoundland and Labrador.

Through the research and consultations for the Roadmap, it was discovered that there is a broad need for more detailed data on energy use and GHG emissions; there is a compelling case for ensuring that individual consumer energy data remains private; and, that others have addressed these issues and Atlantic Canada can learn from their experience.

The Roadmap establishes a common vision, identifies the characteristics of a shared energy information system, and sets out policy and program options, as well as tools to support the effective implementation of the Roadmap.

The Roadmap starts with a vision for an energy information system that collects data in a comprehensive manner and regularly reports on an aggregated basis for community energy and emissions inventories. The Roadmap is also guided by a series of values which include:

- The need for society to make informed and good energy and environmental policy, program and investment decisions, and measure success.
- The protection of personal information by requiring the de-identification of energy use data before public reporting.
- The right of consumers to decide if they want to share personal energy data, and enable them to do so in an informed, secure, and simple manner.
- Technology solutions that use common standards and operate with simplicity, clarity, and enhanced accountability for users and efficiency programmers.

- Technology solutions that improve operations.
- Regional and national cooperation and linkages to other information initiatives.

To protect privacy, the Roadmap suggests that governments consider the balance between energy consumer privacy and the collection and analysis of useful information. In each case, data that is published or reported outside of a secure environment would need to be consolidated or de-identified unless there has been explicit, informed, voluntary permission granted by the energy user. The Roadmap also suggests governments make a decision on whether consumer rights should best be protected by the adoption of voluntary industry recommended best practices or by developing legislative compliance requirements.

The Roadmap outlines a series of policy and program options for governments and stakeholders to consider, including choices between voluntary requests for energy providers to provide more data, or legislative requirements that would be staged and sensitive to the economic costs of implementation.

The Roadmap suggests governments adopt the following outcomes:

- The rights and obligations of consumers and energy providers are fully supported by regulatory decisions, and if required, by new laws.
- Laws and policies surrounding energy data reflect a flexible and staged implementation through new programs, and if required, regulatory actions consistent with the Roadmap Implementation Milestones.
- To the greatest extent possible, governments and regulators should strive for a coordinated and consistent approach to definitions, standards and expected outcomes, with the understanding that not all provinces will move at the same pace.
- The framework establishes roles and responsibilities and delegates to efficiency and information/statistics agencies wherever possible.
- The framework anticipates the possibility of a Canadian Energy Information Agency and allows for delegation to that entity when and if it emerges.

In the end, the Roadmap suggests the decision on roles and responsibilities for energy data should be founded upon a determination of trust. Energy providers have been

protecting customer data since they started serving them and often have significant investments in information technologies and security with strong regulatory oversight. Governments have also established infrastructure and credibility for their statistics agencies. All players have strengths, and when choosing where to locate important roles and responsibilities, care should be taken on emphasizing how they will maintain public trust when they carry out these duties.

The Roadmap also puts forward suggestions on how to improve the presentation of energy and GHG data in a more efficient and useful form. The options include application developments by the private sector, by efficiency agencies and by regional cooperation on a common energy data use app across the region for consumers, planners, and researchers. The Roadmap also outlines how governments could play a role in developing technology that improves the operations of energy providers.

The Roadmap suggests energy providers adopt the following outcomes:

- Collaboration with governments and other stakeholders to develop cost-effective implementation of the Roadmap.
- Collaboration among energy providers to establish details such as standards for the classification of energy use by customer and building type, as well as, standards for de-identification of energy use and related data.

Finally, the Roadmap considers actions that could enhance regional cooperation and linkages to other initiatives such as climate change legislation and regulation, as well as, the potential creation of a Pan-Canadian Energy Information Agency.

To guide the implementation of the Roadmap, a timeline is presented for when to enact the suggested policies and programs over the course of the coming decade to balance between public interest and consumer costs. The timeline is flexible in order to reflect the reality that some parts of Atlantic Canada will take longer to enact the options recommended as a result of different needs, priorities, and past investment decisions.

KEY MILESTONES

End of 2018 – Energy use data reported annually on a provincial basis by all major energy providers.

End of 2021 – Energy use data reported annually on a municipal boundary basis by all major energy providers in a consistent standard regarding building and occupancy type.

End of 2023 – Electricity and natural gas suppliers provide their customers with access to the energy use data in a standard electronic format, likely the Green Button Standard.

End of 2025 – Major oil heat and propane energy providers enable their customers to access usage data in a standard electronic format.

Electricity and natural gas energy providers enable their customers to electronically share their data.

End of 2028 – Oil and propane energy providers enable their customers to electronically share their data.



**SECTION ONE:
BUILDING AN ATLANTIC CANADA
ENERGY DATA ROADMAP**

INTRODUCTION

A roadmap is a guide to a journey and is often associated with a change – a move from one state, or condition, to another. In many cases, the change means progress. The Atlantic Canada Energy Data Roadmap (Roadmap) is a guide to changing the way we collect, manage, use, and think about energy data in a world of overwhelmingly large amounts of data. The Roadmap proposes an approach that can be different in each Atlantic province because each province has its own unique circumstances, but the approach suggests everyone can be headed in the same direction and arrive roughly at the same point, at their own pace – hopefully to the benefit of consumers and society.

The Roadmap addresses energy use for the heating and cooling of buildings, where some of the energy use data gaps are greatest and where the amount of information in parts of the region will increase the most. It also addresses, to a lesser extent, the issues associated with the collection of energy use data in the transportation sector. The Roadmap outlines the key relationships between technologies that enable measurement and control of energy use and how they can be integrated with energy production – especially new technologies that produce renewable energy and storage.

WHY WE NEED AN ATLANTIC CANADA ENERGY DATA ROADMAP

The adage “You can’t manage what you can’t measure” is particularly true when it comes to reducing greenhouse gas (GHG) emissions in Canada and, especially, in Atlantic Canada. Most GHGs come from the production and use of energy. However, through the research and consultations done for the Roadmap, it has become clear that we do not have all the energy use data we should have to improve accountability, measure progress, and develop new goals and objectives for a lower carbon economy and for Smart Energy Communities.¹

¹ Smart Energy Communities improve energy efficiency, enhance reliability, cut costs, and reduce GHGs. They do this by integrating conventional energy networks (electricity, natural gas, district energy, and transportation fuel) in communities to better match energy needs with the most efficient energy source; integrate land use and transportation planning; harness local energy opportunities; and focus on the importance of energy efficiency for whole communities. Visit <http://www.questcanada.org/thesolution> to learn more.

Atlantic Canada suffers the same energy and emissions data gaps as the rest of the country, but is especially disadvantaged because its pattern of GHG emissions and the amounts used (Carbon Profile) is quite different from the rest of Canada. Unlike most of the country, Atlantic Canada uses a significant amount of home heating oil and that energy data is not generally available electronically or in a readily comparable way for consumers, governments, or researchers, but it makes up an important aspect of the energy use picture.

At the same time, while Atlantic Canada has gaps in some areas, new technology will soon give the Atlantic region a wealth of useful information in other areas, such as detailed electricity use as reported by new Advanced Meter Infrastructure (AMI) that allows two-way communication on energy use, and is expected to be rolled out between 2019-2021 in Nova Scotia and New Brunswick.

In late 2017, NS Power applied to install AMI technologies for its customers to collect energy use information on an hourly or quarter-hourly basis with the energy data sent over a secure wireless network. This near real-time information will allow for improved outage response, billing improvements, and customer information on changes in energy use. The AMI is also a platform for future innovation, as it will also include two-way communication to enable customers to access new rate designs, and programs that could respond to price changes and renewable energy availability.

Tackling the gaps and managing the surge of data requires a plan to balance both public and consumer interests. The public needs accountability and measurement. Consumers need data too, but when it comes to their data, privacy is paramount. Consumers must be able to decide if they want to share their energy use data with someone else.

The Roadmap outlines the path stakeholders can take (i.e. governments, consumers, energy providers, regulators and efficiency interests) to build a world where energy and GHG data is collected, used, shared and reported at a high-level to improve accountability, while energy use data at an individual level is made more accessible to consumers, and easily shared by them voluntarily.

THOSE WHO NEED A ROADMAP FOR AN EVOLVING ENERGY DATA LANDSCAPE

There are a variety of different stakeholders in need of a roadmap. Ultimately, they include everyone, but each has a different perspective and somewhat different needs. All of the stakeholders will benefit if they can plan for a process that may take as much as a decade to be fully implemented.

The following groups can immediately benefit from this Roadmap on how to collect, manage and report on energy and GHG data to enable them to do their job or manage their needs better, including:

- **Energy Consumers** to better manage their energy use and carbon footprint
- **Energy Providers** to improve service delivery, reliability and plan for the future
- **Governments (federal, provincial, territorial, and municipal) and Planners** to improve accountability, measure progress and develop new goals and objectives for a lower carbon economy and Smart Energy Communities
- **Public Efficiency Agencies and Programmers** to improve accountability on program outcomes and program design
- **Regulators** to obtain more evidence of utility and programmer effectiveness
- **Technology Developers** to create new tools to report on energy use and advise on opportunities for improvement
- **Researchers** to understand social and economic trends and report on them to assist in public policy development
- **Commercial Interests** to seek new markets for goods and services

For a broader discussion of who needs energy/GHG data and why, contact QUEST for the Atlantic Canada Energy Data Project Background Research Papers.

HOW THE ROADMAP WAS DEVELOPED AND WHO WAS INVOLVED

The Roadmap was developed using a combination of research, discussion with experts, and consultation with a diverse range of stakeholders across Atlantic Canada.

In addition, experts were consulted in Ottawa, Ontario, British Columbia and in the United Kingdom to gain an understanding of how they managed the challenges and opportunities associated with energy data. For a more detailed discussion of the research and consultation for the Roadmap, please contact QUEST for the Atlantic Canada Energy Data Project Background Research Papers.

SECTION TWO: WHAT WE LEARNED & KEY ISSUES CONSIDERED



Through the research and consultations for the Roadmap, we learned, at a very high level, that:

- There is a broad need for more detailed data on energy use and GHG emissions,
- There is a compelling case for ensuring individual consumer energy data remains private; and,
- Others have addressed these issues and the Atlantic Region can learn from their experiences.

The Roadmap itself incorporates these learnings. The following section presents insights and best practices derived from the research, as well as key considerations and implementation advice that have been incorporated into the Roadmap.

PUBLIC NEED FOR ENERGY DATA

ATLANTIC CANADA SPECIFIC CHALLENGES

Atlantic Canada has unique energy and GHG data requirements due to the prevalence of home heating oil in Nova Scotia and Prince Edward Island, as well as significant pockets in New Brunswick and Newfoundland and Labrador. Atlantic Canadian oil heat suppliers are fragmented, with 80 in Nova Scotia alone. These suppliers are set to report on consumption at a handful of terminals, but not at a customer energy use/company sales information level. This has resulted in data gaps for community energy planning, efficiency programming, and GHG inventory building. The Roadmap provides a path to closing these gaps.

CURRENT ENERGY DATA SOURCES

Today there are a variety of sources of information about energy production and energy use. While some producers and consumers (large emitters of GHGs for example) provide detailed information, many do not. Instead, information is collected for other purposes or estimated through surveys. The result is energy use data that is protected by confidentiality requirements or is incomplete due to small sample sizes.

Survey information in some cases is not timely enough because it is gathered infrequently or is released quite some time after it was originally collected. In a world where electrification is rapidly growing, lagged and infrequent snapshots are not enough. See Table 1 below for a summary of data sources and fuels.

² For more detail on data sources, contact QUEST to receive the Atlantic Canada Energy Data Roadmap Background Research Papers.

³ For more detail on Near Term Energy Data Sources, contact QUEST for the Atlantic Canada Energy Data Roadmap Background Research Papers.

Table 1 – Current Energy Data Sources²

Fuel Type	Direct Reports to Governments and Regulators	Statistics Canada Surveys	Tax Data
Electricity	Y	Y	Y
Natural Gas	Y	Protected	Y
Gasoline/Diesel	Incomplete	Y	Protected
Propane	N	Incomplete	Incomplete
Biomass	N	Infrequent	N
Oil Heat	N	Incomplete	N

In the near future, the data collection system for electricity in Nova Scotia and New Brunswick is expected to change as the major electric utilities in both provinces have applications in to the regulators seeking approval for the investment in AMI. Some utilities have already invested in a form of more modern technology called Advanced Meter Readers (AMR). These meters may collect detailed energy use, but can only report results when a collection device is nearby.

In addition, the two major natural gas utilities in Atlantic Canada are planning for upgrades to their IT and billing systems that will allow for more consumer information. As a result, the current and near-term energy data collection and reporting system for Atlantic Canada as outlined in Table 2 below.

Table 2 – Current Energy Data Collection Reporting Systems

Energy Provider	Technology	Green Button	E-billing
NS & NB Power	Planning AMI	Possible	Web Portal today
Heritage Gas	Examining AMI/AMR	Examining	Paper only today/ examining Web Portal
Enbridge Gas	Examining AMI/AMR	Examining	Paper only today/ examining Web Portal
Maritime Electric		N	Web Portal today
NFLD Power	AMR	N	Web Portal today
NFLD Hydro	AMR	?	Web Portal ³ today
Oil Heat	N	N	Mainly paper
Propane	N	N	Mainly paper
Wood/Pellets	N	N	Mainly paper

TRADITIONAL METHODS OF SURVEYING AND MODELLING ARE NOT ENOUGH

Surveys have flaws due to limited sample sizes, particularly in smaller and more diversified markets, such as Atlantic Canada. They are also expensive to conduct. The Roadmap acknowledges that modelling can help fill in the gaps, but more models of Atlantic Canada's climate and older building stock needs more energy data. The Roadmap approach to the collection of more energy use data, including voluntary contributions of information from consumers themselves, should help in the development of more effective modelling.

PRIVACY CONSIDERATIONS AND SOLUTIONS

PRIVACY PROTECTION PRINCIPLES

The gathering and use of energy data is directly linked to broad international concepts of privacy. Canada's Panel on Research Ethics⁴ provides a very useful review of the legislation and research codes of practice in this area. The fundamental privacy determination process outlined by the panel is whether data has or once had personal information; whether that data is being disclosed voluntarily with informed consent; or whether the data has had the personal information removed.

Applying that process to energy data, the owner of the energy data, and the entity that would protect data from improper disclosure, would be the energy provider. However, if the energy provider removed the personal information (through a process of consolidation or de-identification), then the new set of data would no longer be personal and disclosure would be permitted.

De-identification can be accomplished by either removing personally identifiable attributes such as a name or street address, or through consolidation/aggregation, that is, adding it together with other records of the same type to create a grouping of sufficient size where it would be impossible to re-identify any one customer. These broad principles form the foundation of the Roadmap approach to privacy.

PRIVACY LEGISLATION IN CANADA

In Canada, there are a number of laws that govern or impact the sharing of data, including energy data. Some provincial Acts, including Nova Scotia's Public Utility Act⁵ (section 79K), the Electricity Efficiency and Conservation Restructuring (2014)

⁴ <http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/chapter5-chapitre5/>

⁵ <http://nslegislature.ca/legc/statutes/public%20utilities.pdf>

Act⁶ and Newfoundland and Labrador's Act Respecting the Taxation of Utilities and Cable Television Companies⁷, have specific provisions on who should receive information about energy consumers and energy use. A recent ruling by the Nova Scotia Utility and Review Board confirmed that the Efficiency Nova Scotia franchise holder has full access to customer data on energy use.

There are also a number of Acts that broadly affect all forms of data, including energy data when it includes personal information. For all of Canada, there are two specific acts that govern privacy. The Privacy Act, which covers personal information-handling practices of federal government departments and agencies, and the Personal Information Protection and Electronic Documents Act (PIPEDA)⁸, which covers the personal information-handling practices of many businesses, including private energy service providers including Fortis and its subsidiaries in Newfoundland and Labrador and Prince Edward Island, and Emera and its subsidiaries in Nova Scotia, Newfoundland and Labrador and New Brunswick.

Canada also has legislative protection for the public collection of data under the Statistics Act.⁹

There is also privacy legislation in each province for the protection of personal information in areas of provincial jurisdiction including crown corporations, such as New Brunswick Power, Nalcor and the Prince Edward Island Energy Corporation, as well as municipal utilities, such as Saint John Power and a number of smaller electrical utilities in New Brunswick, Summerside Electric in Prince Edward Island, and a number of smaller electric utilities in Nova Scotia.

MORE DATA IS COMING: NEW PRIVACY ISSUES NEED TO BE ADDRESSED

In the absence of specific federal or provincial Energy Data Protection Legislation, the general laws will provide the legal framework for all types of energy use data privacy. However, if approval is given for utilities to invest in AMI, much more detailed energy use data will be collected. This data can be very useful to energy providers, their customers and society. But the level of detail that makes it more useful, also makes the sharing of that information more sensitive.

The issue of privacy in this case is specific to how the energy use data is collected and conveyed to other parties, as well as related issues such as the processes used to remove or mask the personal information. If governments chose to develop

⁶ http://nslegislature.ca/legc/bills/62nd_1st/3rd_read/b041.htm

⁷ <http://www.assembly.nl.ca/Legislation/sr/statutes/t00-1.htm>

⁸ <https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/>

⁹ <http://laws.justice.gc.ca/eng/acts/S-19/FullText.html>

specific energy data legislation, there is the opportunity to have legal rights and responsibilities that reflect the unique challenges associated with energy data and associated data integration and reporting.

Experts in other places have found solutions, including British Columbia, Ontario and the United Kingdom and their experiences have been incorporated into the development of the Roadmap. The policy options for privacy are more fully discussed in the Roadmap policy sections.¹⁰

NATIONAL AND PROVINCIAL IMPENDING POLICIES AND REGULATIONS

FEDERAL REGULATIONS AND REQUIREMENTS FOR GHG EMISSIONS

Canada collects energy and GHG emissions information from direct reports and Statistics Canada surveys. Under new regulations that are currently being planned, Canada will be lowering the threshold for reporting from 50,000 T annually down to 10,000 T. In addition, Environment and Climate Change Canada as well as their provincial and territorial counterparts and energy ministers are discussing ways to improve the accuracy of information now calculated from Statistics Canada surveys.

ATLANTIC CANADA CARBON PRICING REGIMES

All four Atlantic Provinces have agreed to establish a price on carbon, and each appear to be tailoring their approach to their own circumstances and forecasts.

For example, Nova Scotia recently passed legislation amending the Nova Scotia Environment Act to implement a carbon-pricing regime based upon a form of Carbon Cap and Trade. In New Brunswick, the government announced a hybrid system that takes part of the existing taxes on gasoline and diesel to become carbon taxes and adopts federal intensity targets for large final emitters.

Newfoundland and Labrador and Prince Edward Island are expected to adopt a mix of carbon pricing strategies as well. In each case, having more detailed energy use data would help establish benchmarks and report on progress

¹⁰ For more details on the experience of others please contact QUEST to receive the Atlantic Canada Energy Data Project Background Research Papers.

CANADIAN ENERGY INFORMATION AGENCY

For years, the Provinces, Territories and the Government of Canada have discussed the need to improve the collection of, and access to, information about energy production, use, and pricing. They have also discussed ways to create reports to discuss implications of matters such as new technologies. These discussions resulted in a number of reports to the Canadian Energy Ministers on potential solutions and opportunities for collaboration, but no action.

A recent federal review of the National Energy Board included a discussion of the Board's role in collecting and reporting on energy data. The review recommended that the responsibility for collecting and reporting energy information be transferred to a new agency, a Canadian Energy Information Agency that could have a broader focus and help policy makers when looking at matters such as renewable energy and climate change.

At the August 2017 Canadian Energy and Mines Ministers' Conference (EMMC) in St. Andrews-by-the-Sea, New Brunswick¹¹, all Ministers endorsed the idea of improving access and availability of energy data across jurisdictions.¹²

Natural Resources Canada, (NRCan) also released Build Smart: Canada's Building Strategy at EMMC,¹³ which described energy information as a "key driver of the Pan-Canadian Framework on Clean Growth and Climate Change." Among the thematic areas addressed by the report includes the strategy on "Setting Energy Data Free." Specific activities agreed to by Provinces, Territories and the Government of Canada include:

- Working collaboratively through a federal, provincial and territorial working groups building on existing resources, to develop an online platform and framework for home and building energy labelling and disclosure by 2019;
- Expanding ENERGY STAR Portfolio Manager in Canada starting in 2017.
- Completing a national survey of commercial and institutional building energy use in 2020

The emerging scope, roles and responsibilities of a new arrangement for collecting and analyzing energy information will likely have implications for how Atlantic Canada implements the Roadmap for improved energy use data.

¹¹ <http://www.nrcan.gc.ca/publications/11102>

¹² <http://www.scics.ca/en/product-produit/news-release-energy-and-mines-ministers-agree-to-collaborate-on-clean-growth-the-development-of-natural-resources-and-competitiveness/>

¹³ https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/Building_Smart_en.pdf

MANAGING ENERGY DATA

ROLES AND RESPONSIBILITIES

Energy use data starts with the energy provider, which collects data for billing and operational purposes. The data is then reported to customers, traditionally for simple billing purposes, but increasingly for customers to be able to act on that information to reduce use and lower costs. Energy data is also reported to governments and their statistics and efficiency agencies. The Roadmap examined the roles and responsibilities associated with each entity today and into the future.

In its assessment of future roles, the Roadmap suggests governments ensure that the efficiency agencies gain full access to energy use data, first from electric utilities as they fully implement electronic online information, but eventually electronic data from most major energy providers, including natural gas and home heating oil. It also suggests there is a fully developed framework to spell out how that data will be used and for what purpose. Governments should also decide who is in the best position to analyze energy data and related information and report on it, considering privacy protection and cost-effectiveness. Options examined include the energy providers, efficiency agencies, statistics agencies, or another government entity such as a new energy information agency. For a visualization of data types and aggregation levels needed for decisions by a variety of stakeholders, see Appendix I.

GREEN BUTTON STANDARD

The Green Button Standard is a common reporting protocol providing guidance on how to format, encrypt, transmit, and unencrypt energy data. The standard is only a few years old (established in 2012) but many utilities have adopted it to manage data flows for electricity, gas and water. Both Nova Scotia Power and New Brunswick Power are considering adopting the Green Button Standard to allow consumers access to their energy use in a consistent consumer and electronic friendly fashion.

Allowing energy users to access their data also opens up opportunities for them to share it with others on a voluntary basis. New electronic permissions and coordinated marketing campaigns could lead to community planners and researchers gaining access to large detailed samples to improve accountability, while gaining insights into energy use patterns.

By adopting a common standard, data can flow from many utility sources and be easily trued up for common reporting. For example, detailed daily electricity data can be easily adjusted to be compared and integrated with monthly energy use data from a natural gas meter.

The focus of the Green Button Standard is to enable consumers to access their individual data and give consent for third parties to interpret it to help the consumer understand their energy use patterns. Powered by this information – and often paired with rate designs that reward reducing energy use at certain times of day or under certain operating circumstances – the consumer can reduce and adjust their energy use.

The Standard currently works in two ways – first, a utility installs a virtual Green Button on their website labelled *Download My Data*. Homeowners or property managers receive their data in a common computer readable XML format. Once a Green Button initiative is in place, consumers can easily access their historical and current usage data, analyze trends, and make informed resource-management choices.

A related process, the Green Button *Connect My Data* standard allows consumers to authorize secure transfers of their electricity, natural gas, or water usage data to the web and mobile apps. These apps connect energy use with other data such as local energy use patterns and weather information. Through the use of standardized Green Button technology, third-party app developers can more-rapidly create and offer products, services, and applications that will work with Green Button implementations.

The complexity of running a full *Connect My Data* system might be reduced through the development of a Share My Data protocol. In that model, a consumer would consent to having the data shared with a public body, such as an efficiency or energy information agency.

Each of these Green Button applications involves voluntary access by a consumer and their agreement to share. Following Green Button Standards for privacy and security, privacy should not be an issue as access is by consent. For more information on the Green Button Standard, see Briefing Note Files online at <http://www.questcanada.org/hub/research/DataRoadmap>

STANDARDIZING HOW WE REPORT ON ENERGY DATA AND EMISSIONS – BRITISH COLUMBIA EXPERIENCE

Community energy planners and energy efficiency programmers need to analyze information about energy use in a standardized and consistent manner. For example, data on energy use and associated GHG emissions from different fuel types should be collected on a consistent basis for different building types and occupancy usage.

In British Columbia, planners gained valuable experience regarding how to get many parties working together to allow energy and emissions data to be paired with other data sets such as building type (wood frame, concrete etc.) and attribute information (residential, retail etc.). This Government of Canada funded project resulted in the TaNDM method that is used in British Columbia's Community Energy and Emissions Inventories (CEEI), and could be explored for potential application by the Atlantic Provinces.¹⁴

OTHER ISSUES CONSIDERED IN THE DEVELOPMENT OF THE ROADMAP

ENERGY AND GHG DATA FOR TRANSPORTATION

The Roadmap research focused primarily on building energy use, but for many public policy planning issues, energy and GHG data for transportation is also a key consideration. A critical challenge remains with regards to getting access to transportation energy and emissions data.

In today's vehicles, there is a wealth of information about fuel usage. The vehicle of the near future will use more sensors to collect, report, monitor, and act upon fuel use, route planning, vehicle sharing, and fuelling locations. However, today there is no easy way for consumers or governments to get access to that information, or indeed collect general information on transportation energy use or travel patterns for planning.

Some efforts have been made through surveys. For instance, Dalhousie University has a Transportation Research group called DaTRAC which uses an automated telephone survey approach to gain insights on transportation patterns by vehicles, bicycles, and by foot.

¹⁴ For more on the TaNDM method and opportunities to enhance community energy planning contact QUEST for the Atlantic Canada Energy Data Project Background Research Papers.

There is also the promise of more detailed tracking by GPS in smartphones and in vehicles. A company in Halifax, B-Line Transportation Analytics, has an application that uses smart phone GPS and accelerometer sensors to record transportation patterns for building owners and organizations to set and measure sustainability goals. Computers and smartphones already integrate a variety of sources of information. It may be possible to create a total energy profile by integrating the Green Button data with these transportation applications – resulting in a personal, and social media shareable, carbon footprint.

It is anticipated that public policy to support gradually rising fuel efficiency standards and enabling more frequent and in-depth surveys will help manage and measure progress on transportation energy use.

Regardless of the type of process used to collect energy transportation data, significant barriers remain due to confidentiality provisions in various taxation laws, similar to energy supply for buildings. Accordingly, the Roadmap also includes suggestions on how to improve access to transportation energy use data.

ENERGY DATA ISSUES FOR ENERGY PROVIDERS

Utility online activities can become vulnerable to attack by hostile agents seeking to take control or interfere with their operations. Any system that is used to collect and transmit energy use data is potentially vulnerable to such attacks. Utilities, regulators, and governments have taken this risk very seriously. New data transfer elements such as Green Button have been designed to ensure the data collected is encrypted before transmission. However, how these systems connect to an entire utility system needs to be documented, analyzed for cyber vulnerabilities, and safeguarded. The Roadmap suggests regulators and governments require utilities to demonstrate that their systems operate under industry best practices and are secure.

ENERGY DATA TO INTEGRATE PRODUCTION AND ENERGY USE

The Roadmap consultations frequently heard about the value of energy data to manage renewable energy production. As energy utilities incorporate communication systems that can operate in two directions – send information on energy use (demand for power) and then send a signal to control one or more appliances (reduce or shift demand to a different time) the utility can better match rising or falling supplies from intermittent renewables. For this purpose, detailed energy use interval data is highly valued.

The Roadmap acknowledges the value of interval data and suggests regulators put a high value on modern data communication systems to enhance utility planning and operations.

ENERGY AND EMISSIONS MAPPING

The Roadmap also determined that energy and GHG data (related to energy production and use) is enhanced if it includes precise location information and the opportunity for visual representation. Major utilities around the world use locational/geospatial data to map their systems to gain important insights on operations and future plans. These precise locational data sets also assist in reliability by better enabling asset management.

Adding the x-y coordinate point of a meter and its unique numeric identifier to the polygon or shapefile of the property, within which the meter is located, and the unique Property Identification (PID) number during a rollout of AMI, is a prudent asset management approach.

Knowing the energy meter locations helps during storm recoveries, as well as, enables precise boundary datasets for community energy plans. Good linkages between energy meter and parcel data is also the foundation for integrating building type and attribute data, and, using modelled energy data, further strategic spatial analysis to explore efficiency and renewable energy technology integration scenarios.

The Roadmap encourages energy providers to collect locational information and suggests governments and regulators support the investment required.

ENERGY AND GHG DATA FOR COMMERCIAL AND INSTITUTIONAL BUILDINGS

In most cases, gaining energy use data and fuel type information from energy providers will be both an efficient and sufficient step toward painting a picture of a community carbon footprint. However, in the case of some very large energy users, such as commercial (offices and retail) and institutional (governments and universities), there is benefit from gaining access to that data and making it public. In these cases, there are no privacy issues because privacy is rooted in protection of people, not government or businesses.

During the Roadmap consultation process, representatives of building owners expressed concern about their competitive position if they released energy use data and others did not. However, this concern is alleviated to some degree if everybody is required to report. This concept is about to be rolled out

in Ontario. Starting in 2018, Ontario¹⁵ is phasing in public reporting of energy use for many large commercial buildings. The Roadmap suggests this initiative should be monitored to see whether it does address concerns about competitiveness.

ENERGY DATA DEVELOPMENT SUPPORTS CLEAN TECHNOLOGY GROWTH

THE CLEAN TECHNOLOGY GROWTH AGENDA

Along with a Canadian commitment to lower our GHG emissions through energy conservation and development of lower carbon fuels, is a commitment to develop and promote the clean technologies that make this possible. This commitment underpins expectations for new business and job growth within Canada and in exports. In Atlantic Canada, the major utilities have been in the forefront of exploring new approaches and technologies.

In 2010, New Brunswick Power, along with other utilities, governments, and universities in the Maritimes, used a grant from the Government of Canada to build a large-scale model of a virtual power plant. The Powershift Atlantic Project¹⁶ was pioneering in demonstrating the possibility of shifting the need for electricity at times when it is expensive to produce.

New energy data systems could aid utilities and systems operators to manage demand at peak times. For example, instead of starting up new generation during a spike in demand for energy, they could reduce non-critical energy uses or call on distributed energy storage.

New Brunswick Power and Nova Scotia Power, with its parent company Emera, have continued to invest heavily in research and development initiatives that take advantage of new energy data usage, and they have acted upon that information - making the systems "smart". An example of this is the University of New Brunswick, Emera, and New Brunswick Power Research Centre for Smart Grid Technologies¹⁷ located in Fredericton, New Brunswick.

¹⁵ <http://www.energy.gov.on.ca/en/ontarios-ewrb/>

¹⁶ <http://www.powershiftatlantic.com>

¹⁷ <http://unb.ca/smartgrid/about.html>

In Nova Scotia, EfficiencyOne is a leader in developing, implementing, and testing programs for energy efficiency. Expanded funding throughout the region for efficiency under climate change and the clean technology growth agenda means the Atlantic region is well positioned to develop new technologies and solutions.

EfficiencyOne is the franchise holder of Efficiency Nova Scotia – the first energy efficiency utility in Canada. In 2017, the regulator determined that as an energy efficiency utility it should have access to customer data, including energy use. EfficiencyOne is now working on plans to use the data to gain insights into customer needs, improve targeting and recommendations for savings, improve program design, foster innovation, and lower costs. AMI data is expected to have very significant GHG reduction implications for heavy energy users in the commercial and industrial sectors.

NEW ENERGY AND GHG DATA SOURCES AND TECHNOLOGIES

The foundation for clean technology development will be AMI, which includes smarter meters, communications systems, and sensors. To fully gain advantage of the opportunity, the Roadmap supports the implementation of a common data standard (Green Button Standard) to enable new applications unique to Atlantic Canada. These new applications could include new service company and efficiency upgrade program modelling based upon Atlantic Canada's unique multi-fuel profile, and smartphones apps to record energy use from space heating to transportation. The Roadmap concludes that AMI lays a foundation for more customer choice, and at some point in the future, if policy and regulation allow, more competition for energy supplies as well.

LEADING CONSIDERATIONS FOR THE DEVELOPMENT OF THE ROADMAP

From the research and consultations, the following considerations were prioritized for Roadmap development:

- Public policy on energy and the environment needs more energy data, and when reporting, it should be at the building type or on broad consumer categories at the municipal or provincial level.
- Individual consumers need better access to their own energy use data, but they need it in a useful format. Consumers should be able to voluntarily determine who to share their individual information with.
- All energy providers, including those selling transportation fuels, should enable electronic access to energy use data for their customers and governments.
- Utilities that provide efficiency services should have broad access to energy data, not just electricity.
- Energy and emissions data should be provided in a consistent format to enhance ease of management, security, and reporting.
- Researchers and planners have a need for more energy use data, but they can either make use of broad non-personal information or gain access to the detailed data they need from volunteers giving informed consent.
- There is great value to be gained from visual representations of data for energy providers and others as well as value for energy provider operations.
- There are public institutions and agencies that can play an important role in managing and reporting on broad energy data-sets, as well as new sources of voluntary data.
- Regional and national cooperation can increase the value of energy and GHG data collected and lower the cost of management.

IMPLEMENTATION ADVICE FOR THE ROADMAP

The implementation of the Roadmap will require support by energy providers, governments, efficiency agencies, and regulators. Each of these stakeholders will need to examine the policy and programs outlined in the next section.

Implementation will be influenced by both the urgent public need for better data to inform governments' plans for carbon pricing to address climate change, and the need to provide a policy response to the technology change from AMI.

To enable the timely implementation of the Roadmap, the following elements need to be considered:

- Individual provinces need to determine and commit their support for the overall plan and set objectives on the form and timing of implementation.
- Energy providers need to determine the cost of implementing their part of the plan and build a business case for those costs including costs to customers, the rationale for public support, and in some cases, public investment.
- Energy researchers, planners, efficiency interests, and technology developers need to more deeply explore the benefits from better access to energy data and enhance the case for implementation in a manner that achieves those benefits.



**SECTION THREE:
THE ATLANTIC CANADA
ENERGY DATA ROADMAP**

In the following section, the Roadmap outlines a series of actions, policies, and programs for governments and stakeholders to use when designing a new way to collect, manage, and report on energy use data and the associated GHG emission impacts to a wide-range of interests in Atlantic Canada over the course of the next decade.

The Roadmap establishes a common vision, identifies the characteristics of a shared energy information system, and sets out policy options, model legislation and tools to support effective implementation.

The Roadmap acknowledges that some parts of Atlantic Canada will take longer to enact the options recommended as a result of differences in needs, priorities, and past investment decisions. In the end, by working towards a common vision, all parts of Atlantic Canada can eventually arrive at the same destination for the collection, reporting, and use of energy and emissions data.

VISION

An Atlantic Canada energy information system that collects data in a comprehensive manner and regularly reports aggregated information for community energy and emissions inventories; manages the data collected in a secure and private manner; uses the data to improve the efficiency and effectiveness of energy systems; and, enables consumers to access and share their individual data on an informed, voluntary basis to gain insights into energy use patterns for the benefits of themselves and society.

CHARACTERISTICS OF A NEW ENERGY INFORMATION SYSTEM

Implementation of the energy information system would lead to a point where energy providers collect more information electronically to improve operations and serve their customer and shareholder interests more effectively. It will also give governments and communities a much more accurate picture of general energy use patterns to measure progress towards a lower carbon future.

In addition, consumers will have easy access to reports and displays on their full energy use picture. They would be able to share that information with a public interest body and clearly indicate with whom that public body may further share it. Those who could get access could include energy efficiency programmers and community planners, researchers, and potentially some commercial interests.

VALUES

The Atlantic Canada future energy information system would value:

- The need of society to make informed and good policy, program, and investment decisions and measure success through access to accurate energy information.
- The protection of personal information by requiring the de-identification of energy use data before public reporting by governments, including municipalities.
- The right of consumers to decide if they want to share personal energy and GHG data, and enable them to do so in an informed, secure and simple manner.
- Technology solutions that use common standards and operate with simplicity and clarity for users.
- Systems that support easy access to meaningful data for energy efficiency program design, accountability, and research.
- Technology solutions that improve operations.
- Regional cooperation.
- Regional and national cooperation and linkages to other information initiatives.

ENERGY DATA ROADMAP TOOLS

POLICIES AND PROGRAMS

Programs and policies are largely incentive-based or guiding in nature. Policies are often the foundation that allow other measures, such as programs or legislation/regulation, to be built upon. Examples of a policy and a program to help advance the Roadmap would be program funding to help energy providers cover some of their costs in putting their data into Green Button formats.

VOLUNTARY COMPLIANCE

Good public policy starts with encouraging stakeholders to voluntarily move in the direction desired. Sometimes change is best started through pilots and leadership before requiring compliance. Many of the matters addressed in the Roadmap could be addressed in this manner. However, sometimes there is urgency or a need for certainty to reach the desired goal and in that case, voluntary compliance may not be enough.

REGULATORY ACTION AND LEGISLATION

In some areas setting policy is not enough. Major public issues such as privacy require a degree of certainty for the public to feel confident their rights are being protected. Likewise, if it is in the public interest for energy providers to do something, there may need to be a legal requirement for them to do so.

One consideration for energy data legislation is whether existing laws and authority given to regulators is sufficient or whether new legislation needs to be enacted. The need for new legislation will likely vary by jurisdiction. Likewise, the timing for the introduction of legal measures may also vary, as each jurisdiction will have a somewhat different timetable due to differing circumstances.

SOCIETY'S ACCESS TO ENERGY AND GHG DATA

Governments (federal, provincial, territorial, and municipal) need access to energy use information from energy providers. The need to establish baselines as carbon pricing comes into effect gives urgency to the requirement to have access to energy use and GHG data. The urgency is particularly acute at the provincial level and with respect to data on fuel delivery sources, such as oil heat and propane. Community planners have also struggled and incurred significant costs in attempting to secure data for energy planning activities. For example. In some of these areas full coverage will likely be impossible, but the Roadmap suggests improvement is certainly possible.

Having established a need for more energy and emissions data, particularly in a form that can be reported on a geographical basis, it is left to governments to determine how the data should be collected, managed and reported. The Roadmap puts forward considerations below.

COLLECTION OF DATA FOR SOCIETY'S NEEDS

The data needed for society is currently collected by Statistics Canada. Each province has an agency that operates under Statistics Canada standards and requirements. Emerging federal-provincial policy may suggest some of these functions could be included under a new energy information body. In addition, some provinces have requirements for energy use and related data to be provided to energy efficiency agencies to assist in program design and measurement of program effectiveness.

Accordingly, it makes sense to have enhanced energy data collection to meet society's needs by a statistics/energy information/energy efficiency agency. These agencies could have the authority to require specified energy providers to transmit data on energy use and related information on a periodic basis. Where such agencies are closely tied to one source of energy (e.g., New Brunswick Power, which is both an electric utility and an all-fuels efficiency agency), the data received from multiple providers would need to be carefully segregated from the utility operations.

MANAGEMENT OF DATA FOR SOCIETY'S NEEDS

Energy providers already operate under legal requirements to protect the privacy of their customers' information. To the extent that they are tasked with the responsibility to prepare energy and GHG data for use in provincial or government accountability and planning reports, their obligations to transfer such data to others may be covered under existing legislation, or in some jurisdictions there may be a need to consider additional legal direction.

Public agencies that follow a statistics or energy efficiency agency model already operate under a broad legal requirement to protect privacy. They have strict rules on how they store data and manage it while they undertake research and reporting. By placing the responsibility for enhanced energy and related data collection within such bodies, the public may be assured that privacy issues are being properly addressed.

REPORTING OF DATA TO MEET SOCIETY'S NEEDS

Privacy is also paramount when there are public reports on energy and related data. In public reports, no individual private information should be disclosed. Instead, after the data has been analyzed, it would need to be consolidated or aggregated. By placing energy and GHG data into larger data sets, individual data is no longer available and the information becomes de-identified.

Setting the rules for how large a sample needs to be reported for energy use data is an important statistical question.

Fortunately, there is a great deal of experience being gained in this area, notably by the Institute for Big Data Analytics at Dalhousie University. Once the rules for the types of data to be linked to energy use data are set, the rules for minimum aggregated data reporting levels can also be set.

It would be expected that data would need to be reported:

- At a provincial and municipal level for measurement and accountability, including reporting geographically through maps and graphics.
- By building archetype and socio-economic conditions within a particular provincial or municipal boundary.
- Before and after the application of efficiency upgrades to assist in program design and effectiveness.

Each Atlantic province is best placed to determine its own needs for the collection and reporting of energy use and related information, but the methodologies and definitions should be consistent across Atlantic Canada, and if possible, across Canada.

While this approach would help meet many public objectives, researchers, community planners, and others may wish to gain more detailed information on individual energy use and GHG emissions. That need could be met by an enhanced system to enable voluntary disclosure.

PROTECTING PERSONAL INFORMATION

Many businesses collect information about customers and their activities in return for services. That information is detailed and pervasive and consumers often do not fully understand what they are agreeing to, for example your browsing patterns on Google or buying history with Amazon.

Energy data is becoming increasingly detailed and pervasive, but as it is currently private, a new energy data information system needs to either respect that or provide a compelling reason for change. Research for the Roadmap found no compelling reason for change. Accordingly, the Roadmap suggests privacy remain paramount when establishing the new framework and puts forward the following for consideration:

- Energy consumers, whether residential, commercial, institutional, or industrial, need to know with whom they are

sharing their data, for what purpose, and at what level of detail. These are the pillars of informed consent.

- Even though individual energy use data may be collected and managed for society's needs, there may be a need to more explicitly define who has been given access, what they will do in return, how they will protect the security of the data, and how long they will retain the data. Policy and Program options are discussed further under Consumer Rights and Energy Provider Obligations.

When voluntarily sharing data with researchers or for the development of local community energy plans¹⁸, applications that enable this type of publication will need to have built-in links to explanations of the codes and processes which researchers or planners will abide by, including their protocols to protect breaches of security.

Public interest groups, governments, and energy providers should encourage consumers to voluntarily disclose their data. Policy and Program options are discussed further under Enabling Research and Innovation.

¹⁸ A Community Energy Plan (CEP) is a tool that helps define community priorities around energy with a view to improving efficiency, cutting emissions, and driving local economic development. CEPs provide a pathway for communities - the places where we live, work and play - to become Smart Energy Communities

When sharing data more openly, in effect publishing it for all the world to see, there must be explicit understanding of what data is being shared, what it is to be used for (social science research for example), where the data will be published (an academic journal or social media for example), and whether the consumer will have any control over its deletion (e.g., applications that allow data to be put on a Facebook page need to have built in explanations of what such a posting means in terms of level of data and implications).

POLICIES AND PROGRAM ALTERNATIVES

1. Each energy provider reports to governments and/or their energy efficiency agencies on a voluntary basis.

- Utilities are already gathering this information and some have complied with requests (e.g., NS Power to Town of Bridgewater).
- Fuel delivery players in Atlantic Canada are not regulated with respect to data reporting and to date have not provided this information.

2. Governments create legislative authority to require reporting.

- This would ensure uniform requirements across sectors and opens the opportunity for regional reporting standards.
- There could be concerns by non-regulated fuel delivery suppliers about disclosure of commercially sensitive information to competitors and individual consumer concerns over privacy would need to be addressed by ensuring energy data with locational information is received by a secure statistics/energy information/efficiency agency with robust segregation of such data from other responsibilities of the agency.
- There could be concerns over costs, particularly for small energy providers with non-electronic billing. There is a need to carefully balance costs and benefits and to examine the case for public financial support.

CONSUMER RIGHTS AND ENERGY PROVIDER OBLIGATIONS

The following rights and obligations could be adopted as policy by all stakeholders and implemented by governments and regulators. Implementation timing would be expected to occur in stages as technology and other cost-effective solutions emerge. The Roadmap suggests the following:

CONSUMER RIGHTS

All energy consumers should have the right to:

- The privacy of their individual energy data.
- Receive data in a standard electronic format.
- Share their individual data electronically, easily, and voluntarily with those they choose through a public-interest intermediary.

ENERGY PROVIDER OBLIGATIONS

Energy providers should have the following obligations:

- To collect accurate, timely, and meaningful sets of energy data.
- To manage their energy use data in a secure and private manner to improve the effectiveness and efficiency of their energy system, including customer service.
- To report to government statistics/energy information/efficiency agencies on energy use in a manner that allows the agency to report on energy use, GHG(s), and other related information at the provincial and municipal level.
- To provide customer energy use information in a standard electronic format at a billing-level or more detailed if that data is available.
- To enable energy efficiency agencies that work under a utility-regulated framework to access energy data from all energy providers and use that data for specified purposes.
- To enable customers to easily share their data by electronically giving permission for access and analysis on an informed basis with specified others, including researchers and planners.

POLICIES AND PROGRAM ALTERNATIVES

1. Energy providers only send de-identified data.

In this model, specified energy providers do not analyse the energy data, but transmit it to an agency in a de-identified form that fits geographically into predetermined provincial and municipal boundaries. The agency then combines de-identified data sets from each energy provider into energy use tables and graphics for each province and municipality.

- This approach minimizes the value of the data collected, as it would be de-identified at a very high level. Detailed analysis on the relationships between energy use and other variables such as building types would require a high uptake in voluntary data sets.
- This approach also maximizes privacy, but perhaps on an overly cautious basis. The critical issue in privacy is the release of private information to an unauthorized person. Robust security protocols within various public agencies would help ensure the energy use data is not improperly disclosed. Also, strong de-identification processes could ensure that reports on energy use are properly aggregated to a level to make re-identification very unlikely.

2. Energy providers send full data to public bodies.

In this model energy providers send all their energy and related locational data to a statistics/energy information/efficiency agency. The receiving agency would be tasked with integrating multiple energy providers' data, placing the data into geographical boundaries, and conducting analysis on building types and other demographic metrics before reporting on a provincial and municipal level.

- This approach minimizes additional costs to energy providers although they would still face costs in preparing the energy use data and related locational information before transmission.
- This approach puts additional costs on the agencies; however based upon the experience in British Columbia, these costs are mainly up front while continuing costs are minimal.

3. Energy providers manage data and prepare reports.

In this model, energy providers would take the energy and emissions data, place it into geographic boundaries, integrate the energy use data with other data on building types and use it to create reports where such information is aggregated to a level where it becomes de-identified.

- This approach keeps all personal information with the energy provider.
- It also puts the cost of analyzing data on the energy providers and minimizes the cost to public agencies. These costs may be mitigated by collaboration among energy providers to create standard processes and governments may wish to provide assistance to energy providers in setting up the systems.

CONSISTENT, SIMPLE AND COMPELLING

Providing access to energy and GHG data is only the beginning. Gaining access needs to be accompanied by consumer-friendly applications that are similar to the ease of use and quality found in top-rated commercial apps. Having a common standard for formatting energy and emissions data would facilitate the creation of new applications that are designed for Atlantic

Canada's multi-fuels market. Attractive and simple designs will encourage adoption. Models to link efficiency incentives and app design could help build a case for consumers to install the apps on computers or smartphones.

For many parts of Canada, the overwhelming dependence on electricity or natural gas for space heating makes the creation of an energy dashboard fairly simple. In Atlantic Canada, where non-regulated fuels are a significant source of energy, integration of all fuels is more complex.

POLICIES AND PROGRAM ALTERNATIVES

1. Ask governments/regulators to establish an Industry Recommended Best Practice for Rights and Obligations.

- Some of the aspects with respect to privacy are already covered in legislation. Federal (commercial suppliers) and provincial (crown corporations).
- Some, but not all, regulators have authority to regulate energy data reporting and may not have authority to fully implement the measures outlined.
- Some energy providers are not regulated and without legislative changes, would only have to comply on a voluntary basis.

2. Governments to create legislative authority to require compliance:

- Would ensure uniform requirements across sectors and opens the opportunity for regional compliance requirements.
- Regional or national statistics/energy information/efficiency agencies to access energy and related location data on a request basis to create integrated energy use reports for a community and other plans.
- The requirements on how locational data would be managed and reported upon by the energy provider and the statistics/energy information agency could be placed into regulation for transparency and accountability.
- Potential concerns by non-regulated fuel delivery suppliers and even some utilities about increased cost burden would need to be addressed

3. Establish Programs to offset some of the compliance costs:

Electronic billing and the sharing of data functions of the new electronic energy information system. Cooperation across the region, even on a staged basis could find economies of scale. Programs on a regional basis could seek federal funding to test new technology and practices to achieve lower carbon goals

ENABLE RESEARCH AND INNOVATION

There is value in fostering technical and socio-economic research on energy use that will uncover patterns and relationships among the variables that influence energy use. As a result, the Roadmap suggests the following to support wider uptake for research.

Although there is some value in accessing broad energy trend data at the provincial and municipal level, researchers also need access to more detailed energy data and that access should come from either de-identified data or through voluntary disclosure.

To encourage voluntary disclosure, researchers (including community energy planners), should participate in voluntary disclosure initiatives with similar-minded participants (efficiency agencies, NGOs, municipal community energy planners etc.). Participation by multiple groups in coordinated campaigns should increase the uptake of voluntary disclosure.

Researchers and others should have access to de-identified data sets, from statistics/energy information/efficiency agencies.

- For commercial purposes, such data should be de-identified and reported only at the billing data level (i.e., monthly/bi-monthly average and demand peak intervals if such data is captured).
- For public interest research, such data should be de-identified at the billing-level or at the micro-level, and if at the micro-level it must be done under:
 - strict ethical and secure research conditions;
 - with approval/funding by a public body (e.g., Statistics Canada, new Canadian Energy Information body, a regulator, SSHRC etc.); and,
 - de-identification, through aggregation to the municipal level or provincial scales.

There is benefit in having researchers in the region share experience and build solutions in common with colleagues in the rest of the country as well as those in jurisdictions facing similar privacy issues.

POLICIES AND PROGRAM ALTERNATIVES

1. Adopt requirements similar to those identified in the above section for consistent, simple, and compelling reporting.

- Researchers would support the creation of a Share My Data function under Green Button (See Figure 1 for Data Flow Schematic).

2. Adopt policy and program supports

- Encourage the voluntary granting of access to energy use data by consumers themselves.
- Regional government support for energy data research and support for federal funding for pilots and social behaviour change through marketing campaigns to encourage the sharing of data.
- Municipal and community energy planners support sharing marketing campaigns.
- Statistics/energy information/efficiency agencies manage the receipt of data access permissions and access by researchers (including municipalities).
- Researchers work together to coordinate campaigns to encourage consumers to grant requests.
- Researchers can gain best practice experience in other jurisdictions with United Kingdom emerging experience identified as an early jurisdiction to study.¹⁹

VALUE TECHNOLOGY SOLUTIONS THAT IMPROVE OPERATIONS

Energy providers collect data today for the operation of their billing and management system, and can capture the flow of energy into and out of their systems to gain insights into operations and future planning. New technology that integrates energy data with operational needs should be able to improve those operations for the benefit of utility ratepayers and shareholders.

Energy providers who deliver their fuels in discrete volumes (oil and propane delivery) do very little with their data today. However, much like any modern business, there are benefits from putting billing information into electronic form, such as enabling new insights for operations and marketing.

Energy providers and governments should also consider the opportunity to support the linking of energy use meter locational information (in the form of x-y coordinates, or delivery points) with parcel data via the Parcel ID (PID and parcel polygon or outline).

Energy providers creating and maintaining precise locational information in their AMI is a good asset management practice. It also enables improved operations, enhanced business insights, and improved emergency response. Furthermore, quality assured linkages between smart meter points and parcels become a solid foundation for additional energy mapping activities, including linking building type and attribute information and integrated efficiency and renewable technology scenario analysis.

Energy providers and governments should consider engaging in research and demonstration projects leveraging Open Geospatial Consortium standards to integrate data in a secure manner to produce dynamic energy maps which would help assess cost optimal pathways to net zero energy.

POLICIES AND PROGRAM ALTERNATIVES

1. Create Policy and Program support for Electronic Data Management

- Support the development of energy provider locational information through program funding and support. Such program support should include requirements to:
 - Include meter x-y coordinates and Parcel Identification (PID) information; and,
 - Consider enabling access to such precise locational information for emergency location services (not the energy use data, just the locational data).
- Even with policy and program support, there is no guarantee of program take-up.
- Consider using leveraging Open Geospatial Consortium spatial data interoperability standards

2. Require the PID/GIS Mapping by Legislation

- Require all or some energy providers to collect PIDs/GIS coordinates through legislation but make implementation subject to proclamation, or timing subject to regulation, which would allow governments and energy providers' time to develop a realistic implementation schedule and determine whether all parties are willing to engage voluntarily.

REGIONAL COOPERATION

The Roadmap suggests coordination among regulators in Atlantic Canada to consult with stakeholders across the region and create consistent reporting methodologies for regional energy suppliers. It could create a flexible implementation schedule through regulations to allow for the installation of new technologies for consistent information gathering and reporting, but at a pace that varies regionally.

The Roadmap also suggests the provinces collaborate through existing mechanisms to develop common categories and standards for classifying energy use data to ensure consistency and avoid duplication for energy providers.

LINKAGES TO OTHER INITIATIVES

In implementing the Roadmap, energy providers, governments, efficiency agencies, and regulators need to take advantage of other Canadian energy information initiatives. Among the initiatives coinciding with the development of the Roadmap are:

- Commitment by Energy Ministers to improve access and availability of energy data across jurisdictions.
- Initiatives related to Build Smart: Canada's Building Strategy.
- Commitment by Environment Ministers to improve the accuracy of a more detailed GHG inventory. Such an outcome may require more detailed energy use data.
- CanmetENERGY's modelled energy archetype data and its TaNDM and ICEM Methodologies.

POLICIES AND PROGRAM ALTERNATIVES

1. Coordinate actions by Energy and Environment Departments

- The work at the national level should be aligned and coordinated by both Ministries.

2. Full participation by Atlantic Canada Energy Ministers

- Ministers should fully participate in national processes to scope and define a new Canadian Energy Information initiative.
- Atlantic Canada support for the initiative could be based upon the findings, values and implementation of the Roadmap.

3. Legislated Roles for New Canadian Energy Information Initiative

- If energy data requirements are put into a legislative framework, such a framework could include flexibility to delegate roles and responsibilities to a new Canadian Energy Information initiative as long as such an initiative has processes and values similar to those in this Roadmap.

¹⁹ For more information contact QUEST for the Atlantic Canada Energy Data Project Background Research Papers.

ENERGY DATA ROADMAP IMPLEMENTATION PLAN AND MILESTONES

Successfully advancing the implementation of the Roadmap and its vision for an integrated energy systems information network can be sequenced and the following steps are put forward.

PART I – ESTABLISHING THE FOUNDATION

The first step is to have the Vision supported by energy providers, governments, efficiency agencies, and regulators. Following general acceptance, governments should take steps to enable implementation.

PART II – IMPLEMENTATION TOOLKIT

Implementation of the Roadmap can be done through a series of programs, policies, and voluntary compliance, regulatory action, or as legislation as required. The options have already been explored and the implementation schedule assumes governments have made an appropriate choice.

PART III – IMMEDIATE - BY THE END OF 2018

- All major providers of energy within Atlantic Canada should report sales within each of the provincial boundaries.
 - Major suppliers could include electricity, the major home heating oil, propane, and natural gas companies. In addition, suppliers of motive fuels should be consulted to determine a timeline and methodology for reporting on motive fuels including gasoline and diesel on a provincial basis.
 - Reporting on wood energy use would not likely be required, but larger suppliers could be encouraged to report sales.
- Reporting is conducted by a public statistics/energy information agency that would request data from energy providers and then report on a fully de-identified basis.
- Reporting within each jurisdiction by suppliers should be consistent by sector.

- Sales to residences should include apartments on a consistent basis among fuel types.
- Sales to institutions, commercial, and industrial buildings should also be on a consistent definition basis.
 - Housing and building attribute data held by provincial tax assessment authorities is evaluated for suitability for energy analysis by utilities and municipalities.
 - Evaluation is undertaken of individual attributes for reliability for energy analysis, and is available consistently across building types, geography, and time, as well as for privacy concerns.
 - Development is underway on a common set of definitions for building types and their coding to enable the merging of various data sets across organizations (the province, utilities, and NRCan and Statistics Canada for the Canadian Housing Statistics Program) to advance the agenda to develop representative models of building type for each climate.
- Reporting within each jurisdiction by transportation fuel suppliers would not need to be reported beyond where the fuel has been delivered to regional terminals.

PART IV – MEDIUM TERM - BY THE END OF 2021

- All major energy providers are undertaking energy reporting on sales within each Atlantic Canada municipal boundary by end of 2021 and each subsequent year on an annual basis.
 - This timeline is consistent with the publically announced planned implementation dates for AMI (2020/2021) in NS and the expected timeframe for New Brunswick.
 - Municipalities would be allowed to request more detailed community level reporting where such reporting does not and could not result in re-identification.
 - Reporting within each jurisdiction by transportation fuel suppliers would need to report on the location of the service station where the fuel has been delivered from regional terminals.
- The reporting within each jurisdiction by suppliers is carried out on a more detailed and consistent sub-sector basis.
 - Sales to residences distinguish between single-family and multi-family residences on a consistent basis among fuel types.
 - Sales to institutions, and commercial buildings is carried out on a more detailed and consistent basis to

enable more targeted analysis of energy use, including the breakdown of institutions and commercial by major function (e.g., hospitals, schools, colleges and universities, places of worship, and commercial sub sectors such as office, small and large retail, large grocery, and warehouse).

- Complete work to have regional consistency in reporting (and if possible reporting consistently nationally as well).
- Evaluation of the TaNDM method for consideration to create consistent Community Energy and Emissions Inventory reports for buildings has occurred. This would be done collaboratively between the provinces, energy providers and, ideally, NRCan.
 - Ensure housing and building attribute data held by provincial tax assessment authorities is evaluated for application to support energy analysis by utilities and municipalities.
 - Evaluate individual attributes for reliability for energy analysis, availability consistently across building types, geography and time, and to fully mitigate privacy and commercial interest risks.
 - Develop a cross-walk table of building types enabling a coherent building type approach across organizations (the province, utilities, and NRCan).
 - Share the building type and attribute data with and support energy providers in integrating this data with their customer information system records, in a spatial format.
 - Enable energy providers to produce energy and emissions inventory reports for their fuel types. This would involve collating this information within the appropriate provincial department or agency and report in a consistent, authoritative and fully privacy-compliant manner to municipalities and efficiency programming agencies.
 - Establish schedule for future reporting.
 - Pair technical guidance documentation with funding if necessary.

PART V – MEDIUM TERM - BY THE END OF 2023

- Electricity and natural gas suppliers provide customers with access to their energy use data in a standard electronic format at a meaningful level.
 - It is assumed that the standard chosen for consistency would be the Green Button Standard.
 - A meaningful level would likely be at the minimum, at billing level and, if more frequent information is available, it would be used, or at least accessible upon request.

– Integration of water-use data with energy use data is underway.

PART VI – LONGER TERM - BY THE END OF 2025

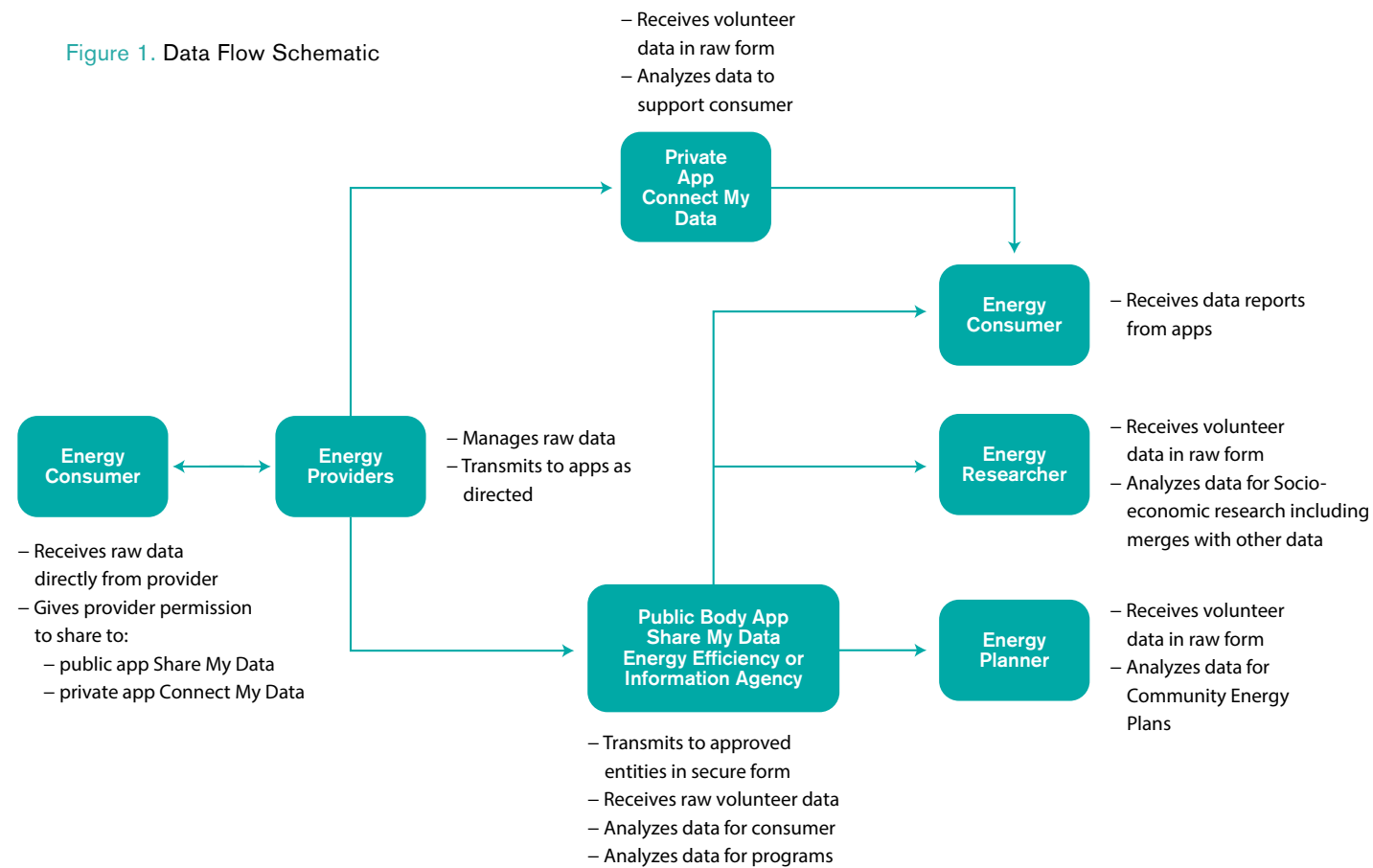
- Major oil heat and propane suppliers provide customers with access to their own energy use data in a standard electronic form at a meaningful level.
 - It is assumed that the standard chosen for consistency would be the Green Button Standard.
 - A meaningful level would likely be on a fuel delivery level.
- Electricity and natural gas suppliers enable their customers to electronically give permission for the sharing of their data, including sharing with a public body (See Figure 1 for illustration of how data flow could work).
 - The public body would likely vary by jurisdiction and could include an efficiency agency (either stand alone or inside a department or utility), an academic entity, or a government department or special purpose entity.
 - The public body could contract with others to manage the information infrastructure if they met strict privacy and security requirements.
 - The public body could establish a cost-recovery regime under standard government or regulatory processes and requirements.
 - The public body could receive consumer energy and potentially other data when the consumer has given permission voluntarily with informed electronic consent for the purposes explicitly approved by the consumer.
 - Standard energy data conveyed could include:
 - building address or PID if available;
 - energy use on a best interval-level available;
 - total billing amount during a billing period covered by the intervals (including demand charges and HST); and,
 - customer class (building type) established on a uniform basis.
- Standard permissions for energy data could include sharing with:
 - an efficiency agency for project measurement, evaluation, and/or for program design and marketing, if they do not already have access to such information;
 - a government department or agency with a mandate for building performance measurement and improvement

- a municipal entity for community energy planning development and reporting; and/or,
- a university, college or research institute for research into social, environmental and economic issues associated with energy use.
- Potential additional information sharing could include voluntary disclosure of associated socio-economic information.
- Potential additional sources could include the results of a questionnaire that solicits information on:
 - number of building occupants;
 - age of occupants;
 - types of heating appliance(s); and,
 - Social-psychological questions about attitudes toward the value of energy conservation/efficiency.

PART VII – LONGER TERM - BY THE END OF 2028

- Major oil and propane suppliers enable their customers to give permission for the sharing of their data with a public body electronically.

Figure 1. Data Flow Schematic



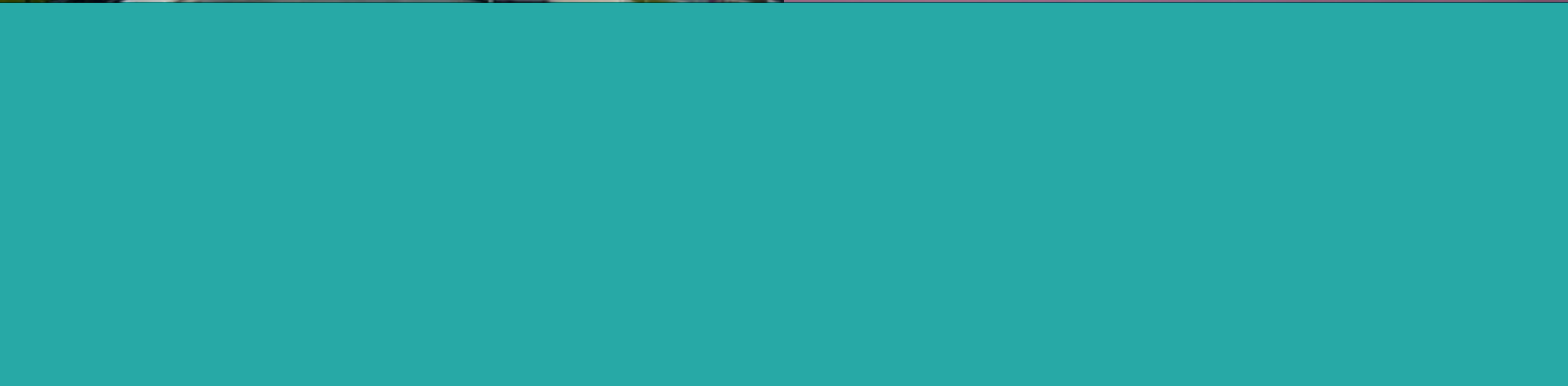
APPENDIX I



Scale	Type of Decision	Data	Level of Aggregation for Energy Usage Data
Building Scale (home / business)	<ul style="list-style-type: none"> – Compare building performance (historical, current) – Monitor / Manage Energy Use – Determine possible efficiency improvements – Determine suitability of e.g., solar, wind, geothermal, biomass, district heat, storage 	<ul style="list-style-type: none"> – Energy usage / billing data (historical and instantaneous/interval data) – Building location and attributes – Renewable Resource availability (on site / adjacent to site) – Modelled building energy data to identify cost optimal pathways to net zero energy 	<p>Individual building / meter(s)</p> <p>Modelled data on a home or archetype basis</p>
Building Scale (industrial / commercial)	<ul style="list-style-type: none"> – Compare building performance (historical, current) – Monitor / Manage Energy Use/process-related energy peak use – Determine possible efficiency improvements – Determine suitability of e.g., solar, wind, geothermal, biomass, district heat, storage – HVAC System Planning and Optimization – Determine utility programs in your area (e.g., efficiency, demand response, net-metering, etc). – Make investment decisions – Communicate efforts and engage the public 	<ul style="list-style-type: none"> – Location of all municipally owned facilities – Energy use and demand, billing data (historical and instantaneous/interval data) – Building locations and attributes – Proximity to lines / substation (+ availability of net metering, embedded generation, or power purchase agreement for the utility) – Fuel billing data, vehicle performance data, vehicle age and maintenance – Land use, commuter patterns – GHG co-efficients for each Province – Cost / Saving attributes – Public input/volunteered geographic information – Open Data (e.g., municipal utility, transit, and road networks) – Land Use / Basemap Data, Zoning – Modelled building energy data to identify cost optimal pathways to net zero energy 	<p>Individual buildings / pumps / lights, meter(s)</p> <p>Modelled data on an individual building or archetype basis</p>

Scale	Type of Decision	Data	Level of Aggregation for Energy Usage Data
Community Scale	<ul style="list-style-type: none"> – Compare neighborhood energy demand – Determine GHG emissions from energy usage – Compare to other communities – Target actions for improving efficiency, harnessing waste energy, renewable energy resources, etc. – Determine suitability of e.g., solar, wind, geothermal, biomass, district heat, storage – Provide input toward a Community Energy Plan 	<ul style="list-style-type: none"> – Aggregated energy usage (historical, by sector, all fuels) – Land Use / Zoning – Building or parcel footprints, attributes – Public input / volunteered geographic information – Open Data (e.g., municipal utility, transit, and road networks) – Green Button data – Aggregated total consumption from utilities (by sector) – Renewable Resource availability – Cost / Saving attributes – Modelled building energy data to identify cost optimal pathways to net zero energy 	<p>Aggregated monthly, seasonal, and yearly total energy consumption (all fuels) by residential, commercial, industrial, institutional sectors, normalized to building age/stock, and rolled up from a parcel level to a zone/neighborhood level, merging zones where there are low counts until a minimum privacy threshold has been reached (e.g., starting with minimum 25 clients, with none representing more than 50% of total consumption).</p> <p>Modelled building energy data on an archetype basis to identify cost optimal pathways to net zero energy</p>
Energy Utilities	<ul style="list-style-type: none"> – Monitor and forecast demand – Match Supply to Load (instantaneous) – Determine potential for new renewable sources (small/large scale) – Identify and target older/low-efficiency neighborhoods – Determine capacity constraints / investments in distribution grid – Determine impact of DER, ADR – Determine impact of CEPs – Activate controllable loads / ADR, to curtail peak demand – Predict and respond to outages 	<ul style="list-style-type: none"> – Energy usage / demand, billing data (historical and instantaneous / interval data) – Renewable resource availability – Distribution Network Topology – Substation / Feeder Readings – Emissions Sensor readings – Volt / Var readings (power quality control) – Availability of DER / DR assets – Data from CEPs – Vegetation cover – Weather models/data 	<p>Energy usage (historical, current, forecast) all meters, represented at various scales as needed</p> <p>Quantification of electrical load, thermal load, and opportunities for demand curtailment (electrical load and thermal shifting) – this would include exact figures for available kWh/MW reductions from DER / DR assets.</p>

Scale	Type of Decision	Data	Level of Aggregation for Energy Usage Data
Provincial Government (their buildings)	<ul style="list-style-type: none"> - Measure seasonal / annual energy and GHGs - Monitor / Manage energy usage - Determine possible efficiency improvements - Determine suitability of e.g., solar, wind, geothermal, biomass, district heat, storage - Siting of new installations / facilities 	<ul style="list-style-type: none"> - Energy usage / demand, billing data (historical and instantaneous / interval data) - Provincial GHG coefficient - Cost/Saving attributes 	<p>Individual buildings / lights, meter(s)</p> <p>(electricity, all fuels)</p>
Provincial Government (e.g., GHG reporting)	<ul style="list-style-type: none"> - Measure seasonal / annual energy and GHGs (all sectors) 	<ul style="list-style-type: none"> - Aggregated energy usage (by sector, for each fuel type) - Provincial GHG coefficient 	<p>Total consumption aggregated by season/ year, by sector, for each fuel type, for an entire Province.</p>
Energy Service Providers	<ul style="list-style-type: none"> - Determine possible efficiency improvements (of client) - Monitor / Manage energy usage - Determine suitability of e.g., solar, wind, geothermal, biomass, district heat, storage - Siting of new installations / facilities 	<ul style="list-style-type: none"> - Aggregated Energy Usage (historical for a zone) - Green Button Data (client's billing data, with consent – this could include historical and instantaneous energy usage / demand) - Renewable resource availability - Proximity to Utilities 	<p>Total consumption (electricity / all fuels) aggregated by season / year, by sector, for a community</p> <p>Individual buildings / lights, meters (e.g., from Green Button)</p>



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