THINK BIG: SCALING UP ENERGY EFFICIENCY IN CANADA'S COMMERCIAL BUILDING STOCK

INPUT TO THE GOVERNMENT OF CANADA'S PUBLIC CONVERSATION ON CLIMATE CHANGE

JUNE 27, 2016

ADVANCED ENERGY CENTRE
MaRS Cleantech | Ontario, Canada

The Advanced Energy Centre at MaRS Discovery District welcomes the opportunity to share our insights with the Government of Canada. With the enclosed strategy document, we have mapped out a new, holistic strategy on accelerating and scaling up energy efficiency retrofits in commercial buildings in Canada. The Centre submits this strategy to the Working Groups focused on *How and Where to Reduce Emissions*, as well as *Clean Technology, Innovation and Job Creation*. We look forward to continuing this discussion.

EXECUTIVE SUMMARY

At COP21, Canada committed to reducing greenhouse gas emissions, to be a leader in the transition to a low-carbon and climate resilient economy, and to contribute to keeping global temperature increases to below 2°C. To achieve our ambitious target of 524 Mt CO_2 eq. by 2030, emissions from Canada's commercial buildings must be reduced by nearly one half.[i]

A national plan for Canada's buildings should focus on accelerating retrofits while unlocking opportunities for entrepreneurs, and enabling investors to deploy capital into new ultra-efficiency buildings and cost-effective energy retrofit projects.

What is the problem?

- Energy bills don't attract attention, representing under 20% of operational expenditures
- Facility managers are busy; spending only minimal time on sustainability initiatives
- Split incentives between tenants (operating expenses) and landlords (capital expenses)
- Investors are wary of historically overestimated savings from retrofit projects

How can we scale-up building energy efficiency retrofits in Canada?

These leverage points will spur collaboration between industry and government, reward early adopters, and attract the private capital required for energy efficiency to scale. To achieve these climate and economic benefits, we recommend the Government of Canada:

1. **Spark impetus to act** with accessible data and well-defined benchmarking policy
2. **Reduce friction by characterizing efficiency** retrofit investments and showcase options
3. **Measure, verify and challenge** by fostering data-driven culture and engaging innovators

HOLISTIC PATH TO SCALING-UP

SPARK ACTION	REDUCE PROJECT FRICTION	MEASURE, VERIFY AND CHALLENGE
1. Enable open access to building performance data 2. Create framework for national energy benchmarks to spark action 3. Lead by implementing retrofits in federal government buildings	4. Support Pan-Canadian implementation of the Investor Confidence Project (ICP) framework 5. Enable project aggregation for institutional investors 6. Support initiatives to match project benefits to costs	7. Demand measurement & verification; pay for results in energy and emissions 8. Expose energy efficiency challenges to innovators and entrepreneurial competition

ACCESS TO BUILDING ENERGY & EMISSIONS PERFORMANCE DATA

KEY RECOMMENDATIONS

Action #1: Enable open access to building performance data

Action #2: Create national framework for regional, building-type EUI targets

Action #3: Lead by implementing retrofits to federal government buildings

Action #4: Support national implementation of the ICP framework for Canada

Action #5: Enable project aggregation for larger institutional investors

Action #6: Support initiatives that aim to match project benefits to actual costs

Action #7: Demand measurement & verification; pay for results [GHG/energy]

Action #8: Expose energy efficiency challenges to competitive innovators

What is the Advanced Energy Centre?

The mission of the Advanced Energy Centre is to accelerate the adoption of innovative energy technologies in Canada, and to drive exports of Canadian energy innovation to international markets.

Founded in 2014 at the MaRS Discovery District, the Centre is a public-private partnership between founder partner Siemens, and utilities such as Ontario Power Generation, London Hydro, Hydro Ottawa, the Independent Electricity System Operator (IESO), NRStor, and the Ministry of Energy at the Government of Ontario.

Leveraging our close relationship with Canada's leading clean technology entrepreneurs at MaRS Cleantech, the Centre acts as a catalyst for the adoption of energy innovation by facilitating collaborative approaches to addressing system level challenges in the energy sector. We aim to coalesce stakeholders equally around innovative public policy, new business models and technologies, as well as capacity-building and market development.

As a neutral, third-party catalyst, the Centre focuses on thorny system-wide challenges, for which solutions address innovative public policy, new technologies and business models, and market capacity-building required to scale innovation. We believe that convening and engaging with actors from key stakeholder groups with a system-wide lens will result in more lasting and impactful change.

The Advanced Energy Centre commends the Government of Canada on its renewed investments in clean energy and clean technologies, and the support for conservation through the Canadian Energy Strategy with provincial and territories. Furthermore, we applaud the prioritization of projects that help to mobilize private capital alongside public support, as well as seeking early wins in the pre-2020 period.

Background

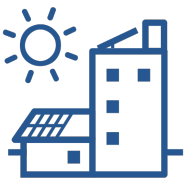
In 2013, over 12% (86 Mt CO_2) of national greenhouse gas (GHG) emissions were from energy consumption in buildings, largely released from space and water heating; natural gas is the primary heating source for over half of Canada's commercial and institutional buildings. As such, it is clear that deeply reducing energy consumption in Canada's commercial building stock is critical to achieving our emissions targets set at COP21.

Emissions from Canada's commercial building stock are rising, despite great strides on energy efficiency. From 1990 to 2011, overall commercial energy use increased by 27%, but energy intensity decreased by 29%.

This intensity reduction stems from implementation successful programs, such as the ecoENERGY Efficiency for Buildings and Housing programs from Natural Resources Canada, as well as initiatives from provincial and territorial governments, such as the New Brunswick Energy Smart Commercial Buildings Retrofit Program. In Ontario, the saveONenergy programs at the Independent Electricity System Operator (IESO) demonstrated over 671 million kWh of energy savings in 2012 at a unit cost of only $0.04/kWh, roughly a third of Ontario's on-peak rate at the time.

There are more than 480,000 C&I buildings in Canada (over 750 million m^2 of floor space), consuming more than 233 TW-h annually, according to the Survey of Commercial and Institutional Energy Use at NRCan in 2009. With many cost-effective energy efficiency retrofits currently available, this is a tremendous opportunity for relatively inexpensive greenhouse gas emissions, with a distinct opportunity for private-sector investment.

How can Canada achieve deep emissions from buildings? Through the design of a more holistic approach to energy efficiency, we can spark collaboration between industry and government, reward our early-adopters, and attract the private capital necessary to implement deep efficiency retrofits.



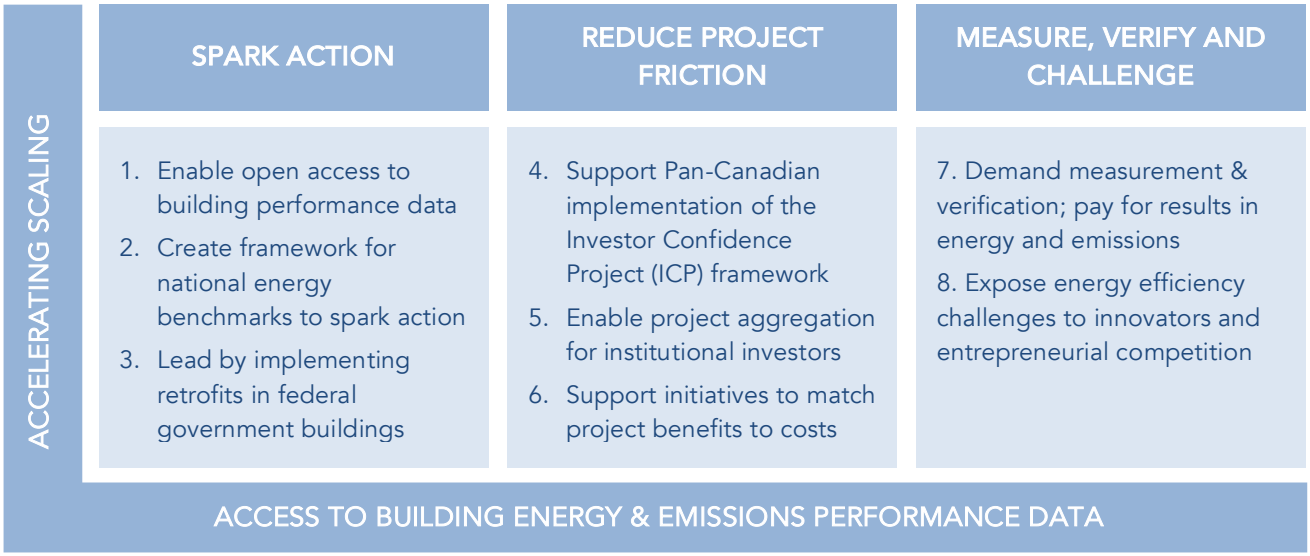
A National Approach for Scaling Up

To illustrate our proposed approach, we've segmented activities around three vectors:

i. **Spark impetus to act** with accessible data and well-defined benchmarking policy, including consistent national action for reporting and transparency;

ii. **Reduce friction by characterizing efficiency** retrofit investments and showcase options for technology and business models that can enable private sector investment;

iii. **Measure, verify and challenge** by fostering a data-driven culture that pays for results, and engaging innovators in challenges, through hackathons, design competitions and more;



SPARK ACTION

Action #1: Enable open access to building energy and emissions performance data

Through Natural Resources Canada's Office of Energy Efficiency, the Government of Canada should align energy reporting and benchmarking policies with all provinces and territories Framework for energy reporting and benchmarking national database. Common national access to this data would empower government to set objectives and benchmark industry performance against peers, recognize the achievements of high-performance facilities, and create a venue for sharing results and best practices with buildings across Canada.

In January 2016, the Canadian Green Building Council (CaGBC) issued the National Energy Benchmarking Framework[1] to support cities and provinces that are developing energy reporting and benchmarking (ERB) strategies and regulations. A standardized approach enables investors to deploy capital towards building retrofits, resulting in greenhouse gas emissions and energy reductions. This report emphasizes the importance of open data and public transparency, and the economic benefits of accessible energy data, as illustrated in the 2012 MaRS Discovery District report, the Market Impact of Accessible Energy Data [2].

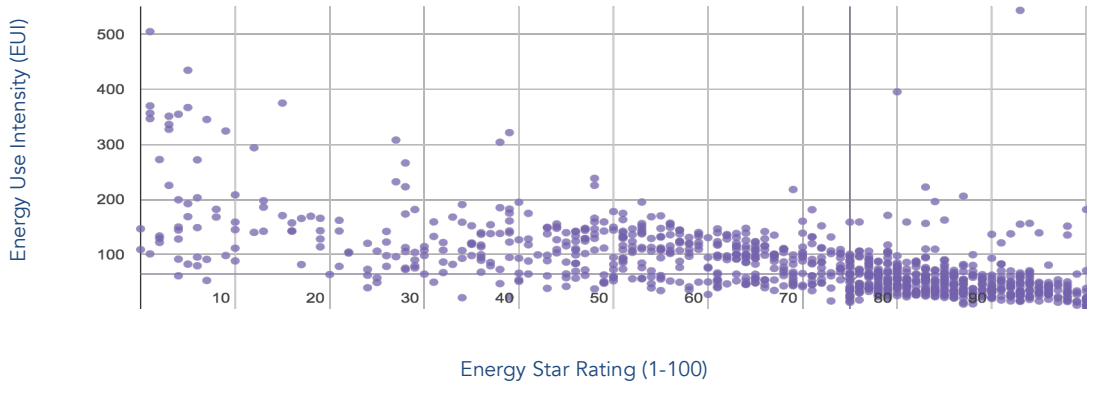
In Ontario, the **Green Button Connect-my-Data** standard has enabled secure and automated transfer of consumption data from smart meters, and could be leveraged as a common data format for benchmarking and reporting requirements in such an ERB framework or database.

Peer comparison of building emissions and performance data is crucial to targeting efficiency opportunities, as well as motivating building owners and occupants to make informed investments decisions towards sustainable and energy efficient technologies.

Case Study: US Department of Energy Building Performance Database

In 2013, the U.S. Department of Energy created a Building Performance Database (BPD) that helps the real estate investment community, building managers, and owners better evaluate the financial costs and benefits of energy efficiency in buildings, and helps to guide investment decisions[1]. The database currently includes data (such as annual consumption, energy use intensity, floor area, building classification, location, and climate data) over 850,000 buildings, and taps into municipal building data disclosure feeds from Boston, Chicago, New York, Washington D.C., San Francisco, Minneapolis and Philadelphia. The team at Lawrence Berkeley National Laboratory built the platform, but the data is largely crowd-sourced from owners and operators from across the U.S.

Sample Database Output: Energy Star Rating vs. EUI (Sample: 32,504 U.S. commercial buildings)



[1] National Energy Benchmarking Framework: Report on Preliminary Working Group Findings. Canada Green Building Council. https://www.cagbc.org/cagbcdocs/resources/CaGBC%20National_Energy_Benchmarking_Framework_Working_Group_Summary_Report_EN.pdf

[2] Market Impact of Accessible Energy Data, MaRS Discovery District. www.marsdd.com/mars-library/the-market-impact-of-accessible-energy-data

Exposing data to the innovation community, including the entrepreneurs and startups working with MaRS Cleantech, will catalyze development of new and optimized energy management solutions based on a real dataset. Furthermore, accessible data empowers industry to showcase successes to date, identify specific areas that require more attention, and provides evidence to support development of new federal and sub-national policy aimed at reducing energy consumption (and greenhouse gas emissions) from Canada's commercial and institutional buildings.[3]

Action #2: Create national framework for EUI targets (regional, building-type specific)

We believe that the federal government, through Natural Resources Canada, should require energy-use benchmarking and reporting for all large buildings, using the Energy Star Portfolio Manager platform. The government could further require national public disclosure of building performance data within two years of launch of reporting requirements, or sooner where possible. Expanding on the Government of Ontario's Energy Reporting and Benchmarking (ERB) policy[4] and lessons learned in New York[5], we recommend the program start with buildings over 50,000 square feet and reduce the size threshold over time.

Emissions reductions, energy savings, economic benefits, and broader policy objectives all motivate the sector to take action on building energy efficiency – but we lack sufficient data to measure and characterize the impact of individuals on these broader objectives. Some cities are advancing reporting requirements for building performance, but Canada lacks a centralized access point for operators and investors to meaningfully compare and benchmark against peers from across the country.

Action #3: Lead by implementing efficiency retrofits to federal government buildings

In Canada, our federal government has the opportunity to play a catalytic and leadership role, with ownership or lease on almost 300 million square feet (27 million square meters)[6] from coast to coast. By sharing the performance data from these 38,048 buildings, private owners or operators would immediately have a reference point. Subsequently, buildings owned or leased by sub-national governments could be added to the database, and large private owners or operators could then be prompted to voluntarily report performance data.

[3] U.S. Department of Energy: Building Performance Database. www.energy.gov/eere/buildings/building-performance-database

[4] Large Building Energy and Water Reporting and Benchmarking, Environmental Registry, Government of Ontario. www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTI3ODY0&statusId=MTkzMTc3

[5] New York Puts Building Energy use in the Spotlight, Institute for Market Transformation. www.imt.org/news/the-current/new-york-puts-building-energy-use-in-the-spotlight

[6] Treasury Board of Canada Secretariat: www.tbs-sct.gc.ca/dfrp-rbif/home-accueil-eng.aspx

After demonstrating leadership by implementing energy efficiency retrofits, the federal government can lead, then subsequently pull provinces and territories along, and then build traction with the private sector, moving towards critical mass adoption at scale.

REDUCE PROJECT FRICTION

As technology is evolving rapidly, it is challenging for building owners and operators to choose a path forward, without fully trusting projected efficiency savings and revenues.

There is also considerable friction within project transactions, which deters investment from lower-cost, more risk-averse, sources of capital. For example, the analysis on energy savings is often performed several times (e.g. by an investor *and* building owner) adding unnecessary cost to the project. With the Investor Confidence Project, Canada has the opportunity to better characterize the technologies and investments using common language and protocols, reducing project soft costs, and enabling access to debt at a rate commensurate with the characteristics of the project itself.

Action #4: Support Canadian implementation of Investor Confidence Project protocols

With a framework of engineering standards and protocols, the deal friction of building energy efficiency retrofits can be greatly reduced. In the United States and Europe, the Investor Confidence Project (ICP) is being used to designate projects as "*Investor Ready Energy Efficiency*"[7], increasing certainty around energy savings and financial return. In many cases, building owners are reluctant to invest, as they don't know if a retrofit project will generate enough savings to service their new debt.

The ICP framework of standards and protocols aims to reduce the risk associated with retrofit projects, and empower proponents to access lower-cost capital to finance their projects. Our team at the Advanced Energy Centre at MaRS Discovery District is working to adapt the ICP framework to the Canadian ecosystem, and is looking for immediate pilot opportunities to validate the framework.

Action #5: Enable project aggregation and securitization to catalyze private investment

Although costly, individual project deals are not large enough to attract these investors, but aggregation could lead to new deals exceeding $50-100m. Through better depiction (and standardization) of investment opportunities, building owners and operators can greatly

[7] Project Certification, Investor Ready Energy Efficiency: www.eeperformance.org/project-certification.html

benefit from financial aggregation of energy efficiency projects, as this will attract patient and low-cost capital from pension funds, sovereign wealth funds, or other large investors.

Characterization of energy efficiency investments can lead to aggregation at the project level, but also at the financial level. (i.e. securitization of savings cash flows for package and resale). This financial maturation of investment class will lower the overall cost of financing of these projects.

Action #6: Support initiatives that aim to match project benefits to actual costs

These initiatives should include consumer rebates, supply chain incentives, and innovative financing options. Property Assessed Clean Energy (PACE) loans can allow government to fund the up-front cost of energy efficiency retrofits, which are paid back over time by the property owner. PACE loans are available in many regions across the United States, and have been quite popular in Colorado and California. Similarly, some municipalities can offer Local Improvement Charges (LICs) to effectively finance capital investments, to the benefit of certain residents, and collect repayment through a long-term surcharge on a property tax bill. To be effective, these financing tools must be made available to homeowners and building owners through public or private 'one-stop-shop' outfits which offer energy assessments, access to financing, and either provide the energy services directly or assist in the selection of pre-qualified contractors.

MEASURE, VERIFY AND CHALLENGE

Action #7: Demand measurement, verification, and paying for results [emissions, energy]

Through new and existing energy efficiency programs at Natural Resources Canada, the Government of Canada can instill a culture of data-driven 'pay for performance' that insists upon proper measurement and verification of savings – as what is not measured, is not changed. Ensuring that both emission and energy savings are quantified and verified will empower the federal government to prioritize existing initiatives with demonstrable results, and embark on new initiatives that can show early verified results that could results in 'quick wins' in emissions reductions pre-2020.

Action #8: Expose energy efficiency challenges to competitive innovators

As building owners and operators are well aware, a plethora of technologies and platforms exist for energy efficiency in buildings – and yet there are continually new, and more cost-

effective designs and business models under development in Canada's cleantech innovation ecosystem. Entrepreneurial spirit and competition will drive new solutions.

However, without proper exposure to the challenges and objectives of government policy, innovators are forced to watch from the sidelines as engrained solutions are given preference without proper consideration of innovative alternatives.

The Advanced Energy Centre believes that focusing on these leverage points will spur collaboration between industry and government, reward early adopters, and attract the private capital required for energy efficiency to scale in Canada.

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The Advanced Energy Centre at MaRS Discovery District is a neutral, third-party catalyst for innovative action on the energy sector's most complex challenges. We encourage the Government of Canada to treat the Centre as an advisory resource and convener of industry, innovators, and government to advance next-generation Canadian energy solutions.

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Footnotes:

[i] Assuming emissions from Canada's buildings must be reduced by a similar proportion as the overall economy to meet the target of 524 Mt in 2030 (less than 60% of the 'High Emissions Scenario' for 2030, 875 Mt). Buildings constituted 12% of national emissions in 2013, or 86 Mt CO2 eq.

[2] BOMA. 2010. Practical Industry Intelligence for Commercial Real Estate.

[3] Managers Need to Keep up with Changing Technology. Facilities Net. www.facilitiesnet.com/maintenanceoperations/article/Managers-Need-to-Keep-up-with-Changing-Technology-Facility-Management-Maintenance-Operations-Feature--12434

[4] Too big to save: why commercial buildings resist energy efficiency. The Guardian. www.theguardian.com/sustainable-business/energy-efficient-buildings-savings-challenges-behavior-change-research

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