

June 23, 2016

The Honourable Catherine McKenna
Minister of Environment and Climate Change
200 Sacre-Coeur Boulevard
Gatineau, QC K1A 0H3

Dear Minister McKenna

Re: Recommendations to deploy energy storage solutions to help address Canada's climate change challenges from Energy Storage Ontario (ESO)

ESO Summary of Recommendations

- **Assign an economic value to carbon emissions;**
- **Increase grid efficiency by encouraging and enabling the deployment of the energy storage projects in Canada;**
- **Implement policies that encourage innovation and investment in the development and growth in clean-tech energy storage industry.**

Energy Storage Ontario (ESO) is pleased to make this submission to Environment and Climate Change Canada to support Canada's efforts to meet carbon reduction targets, to strengthen Canada's energy infrastructure, and to transform the economy towards innovation and clean, green technologies.

As the federal/provincial Working Groups deliberate on policy, ESO is making recommendations to ensure that the value of energy storage is understood and considered in the suite of electrification and infrastructure options to help meet Canada's climate change goals.

We will be providing more detailed information and input on these measures as the federal-provincial Working Group process continues throughout the next few months.



Energy Storage Ontario

ESO is the industry organization that represents the broad range of companies engaged in the energy storage business in Ontario and Canada. We are the only trade association in Canada focused on advancing the role of energy storage and building the market for the energy storage business. ESO has become the hub for energy storage in Canada. Through networking, knowledge-sharing, advocacy and stakeholder education, we are helping to build a stronger industry and showcase the value that energy storage can bring to improve our environment and our economy.

Our membership represents all players along the energy storage value chain -- technology providers, project developers, investors and operators, local electricity distribution companies, and NGOs.

We have also partnered with other organizations, such as the National Research Council of Canada (NRC), and with Ryerson University on their Energy Storage Technology Network projects funded through Natural Sciences and Engineering Research Council of Canada (NSERC). Both organizations are carrying out important work to research and develop new energy storage knowledge and applications.

In addition, we are reaching out to like-minded industry associations, such as the Canadian Solar Industries Association, the Canadian Wind Energy Association, and other organizations that are pursuing similar goals and recommendations.

Attached to this submission you will see a full list of our membership.



Overall Opportunity

Energy Storage Ontario welcomes Canada's focus on meeting GHG emission targets of 30% below 2005 emissions by 2030. We also support those provinces where policies have, or intend to, put a price on carbon. Carbon pricing is an effective policy instrument to curb carbon emissions and shape new practices and behaviour.

There is also important potential and compatibility with climate change measures introduced in specific provinces, such as Ontario's Climate Change Action Plan and Alberta's Climate Leadership Plan.

Energy storage optimizes all the resources on the grid and in the energy system, it lowers greenhouse gas emissions, helps defer costly transmission and distribution system upgrades, and increases resilience and efficiency.

As such, Canada is now in a tremendous position to demonstrate leadership on how an economy can grow prosper while migrating to low carbon energy systems. To get there three critical components are required:

1. An economic value placed on carbon emissions that provides consumers and business with financial incentives to move to low carbon energy systems;
2. High efficiency energy systems that use less energy to do the same or more work and;
3. Energy storage systems that will enable meaningful reduction of fossil-based energy generation through the existing carbon-free energy systems and the further deployment of additional renewable generation such as wind and solar.



Energy storage systems should play an increasingly vital role in Canada's energy future as we modernize our energy systems. Today, there are significant market barriers that inhibit the deployment of energy storage systems and the improvement and sustainability of grid infrastructure.

With the right market structures, Canada can ensure affordable and reliable energy that supports carbon reduction goals, advances a more efficient system for operation and enhanced renewables integration, and spurs innovation and economic development.

Value Proposition of Energy Storage

Energy Storage technologies fundamentally improve the way we generate, deliver, and consume electricity. They have the power and versatility to make our power networks more resilient, efficient, and cleaner than ever before.

These technologies include different types of batteries, flywheels, power-to-gas (hydrogen), compressed air and pumped hydro. Energy Storage adds value at all points in the energy system-- transmission grid, local distribution network and behind the meter on a customers' premises. It can increase the value of the energy produced by other sources and adds capacity to the system. It can act as a load and generator and provide a range of grid balancing services including regulation services, voltage support and congestion management to allow grid operators to integrate increasing amounts of renewable generation. Energy storage assets can lower greenhouse gas emissions by permitting more efficient dispatch of gas-fired generators, and lower system costs by deferring costly transmission and distribution system upgrades. The result is a cleaner, more flexible and cost-effective electricity system.



Energy storage systems also have the ability to absorb excess energy from the grid, store it, and then provide it when it is needed as power, or alternatively, provide a pathway to decarbonize the transportation sector. For example:

1. The storage of low-emission baseload generation capacity at low demand periods and its re-injection into high value areas on the transmission grid and high density load centers within the distribution grid during periods of high demand. Not only does this maximize the value of current energy generation resources it also maximizes the use of existing transmission and distribution assets by reducing congestion;
2. The rapidly growing contribution of carbon-free electricity from renewable, intermittent sources can be smoothed out and its use maximized, allowing very high penetration into the electricity system;
3. The deployment of local area microgrids that will provide communities with energy resiliency improving the reliability of local energy supply during climate-induced weather events;
4. The mass adoption of electric vehicles without the need for a complete redesign of the distribution grid facilitating “energy storage based vehicle charging stations”.
5. The production of renewable fuel from electricity as hydrogen to power fuel cell electric vehicles.

Energy Storage in Canada

Ontario is the leading jurisdiction in Canada, and one of the top jurisdictions in North America, for energy storage. Ontario deployed energy storage through a 50MW procurement first announced in 2013, which was completed in late 2015. This procurement was oversubscribed with a variety of



innovative, and fully commercial, energy storage projects that have set the foundation for the applications that improve grid operation and resiliency in Ontario.

Energy storage is particularly relevant in Canada as it can:

- Enable further carbon emission reductions by making the electricity grid more efficient, integrating renewables and allowing clean, renewable electricity to be injected into other parts of Canada's energy system, such as transportation and industrial uses;
- Move northern communities and resource developments off of diesel- based energy systems; reducing the carbon footprint of these communities and improving conditions in often underserved First Nations communities in the North;
- Enable grid islanding, increasing reliability and resiliency of local grids. This capability is especially relevant to an electricity grid like Canada's where high density areas of consumption are interconnected by long transmission lines that are increasingly under pressure from extreme weather events;
- Provide home owners with residential storage with back-up power in the event of grid outages, control over time-of-use electricity prices without altering behaviour and ease integration with rooftop solar system for self-consumption, overall lowering electricity costs, increasing resiliency and reducing carbon emissions right in the home.
- Help to leverage Canada's thriving clean-tech innovation and manufacturing industry in the home market to encourage exports and further enable a low-carbon world economy.



Carbon Reductions

Canada can take this opportunity to emerge as a global leader in energy storage, while at the same time meeting out aggressive GHG reduction and low carbon economy policy objectives. In Ontario

alone, there is an opportunity to use storage to reduce carbon-emissions from gas plants by up to 4.5 million tonnes of CO₂ per annum.

In 2015, 91% of available Gas Fired Generation Capacity ran, on average, for just under three hours each day, accounting for 8.3 TWh of Ontario's electricity generation and emitting approximately 4.5 million tonnes of CO₂. Approximately 1-1.5 million tonnes of CO₂, out of this 4.5 million Tonnes, could be eliminated with 1,000 MW of energy storage by negating 2-3 TWh of thermal gas power generation.

This assumes that natural gas generation operates at peak loads and at a capacity factor of 32% (as referenced in the IESO Power System Planning August 13, 2015 document).

Micro-Grid Diesel Displacement

In conjunction with wind and solar, storage can also play an integral role in northern "off-diesel" strategies for Canada. Specifically, storage plus renewable microgrid systems can greatly reduce the amount of expensive, dirty diesel being shipped to these communities, while increasing power supply resiliency and reliability. These solutions can be installed relatively quickly and can bridge the gap for communities that might be awaiting a transmission line.



Local Grid Resiliency

The Canadian energy system and electricity grid is a vast and somewhat fragmented grid with pockets of high consumption often separated by hundreds of kilometers. With extreme weather events increasing the pressure on the long transmission and distribution infrastructure connecting these pockets to centralized generation the local grids will need to be increasingly self-sufficient. Energy storage can enable these local grids to be much more reliable without as much dependency on outside supply, allowing for economically and technically optimized asset deployment to meet reliability standards.

Innovation Economy

Canada is flush with innovators, entrepreneurs and established companies working to improve the market for energy storage. Support for the Canadian energy storage industry will not only improve the electric grid and its contribution to carbon reduction targets but also will create countless Canadian job opportunities and export potential for Canadian companies.

ESO's membership boasts innovative companies founded in Canada, active in the Canadian market and seeking opportunities in new export markets. For example, we highlight here just three examples of Canadian-based companies who are pioneers in energy storage in Canada – as creators and manufacturers of innovative technologies, and a developer that seeks deployment opportunities and harnesses the value of these technologies:

- **Temporal Power** makes large steel flywheels respond to two-second signals from the electricity system operator to help regulate and match the power supply and demand
- **Hydrogenics** has pioneered high power density electrolyzers which split water to produce hydrogen allowing longer term energy storage as renewable fuel or renewable gas.



- **NRStor** is a developer that has won contracts with Ontario's Independent Electricity System Operator to develop projects with flywheels and compressed air energy storage technology as well as partnering with Tesla Energy and Opus One (another Ontario start-up) to bring the Tesla Powerwall home battery to Canada.

U.S. Model

It is instructive to look at other jurisdictions to learn how they have introduced energy storage into their energy systems. Various states in the U.S. (e.g. California, Texas, Massachusetts) have taken important leadership to ensure the deployment of energy storage systems and technologies. The energy storage market there is set to grow to an annual installation size of 6 gigawatts (GW) in 2017 and over 40 GW by 2022 — from an initial base of only 0.34 GW installed in 2012 and 2013, according to research firm IHS.

In June, 2016, President Obama's administration announced new executive actions as well as state and private sector commitments to accelerate the integration of storage, which is expected to result in at least 1.3 gigawatts of additional storage procurement or deployment over the next five years.

Federal Policy Support for Energy Storage

ESO recommends the Canadian government implement policies that encourage the deployment of energy storage across the various provincial energy markets. Policies should be broad enough to include multiple technology types and investor types as well as be flexible enough to be integrated into the varying provincial policies. These support mechanisms could include, without limitation, the following measures:

1. Support for studies identifying the need and use cases of energy storage;



2. Direct/Match funding of projects or innovation programs;
3. Loan guarantees or other mechanisms providing low cost investments;
4. Introduce tax incentives for Energy Storage, which could include
 - An Investment Tax Credit on Capital Costs for taxpayers who invest in energy storage projects;
 - Allow energy storage to be eligible for the Canadian Renewable and Conservation Expense (CRCE) tax incentives;
 - Allowing energy storage assets to be eligible for accelerated depreciation under class 43.2 for at least 10 years
 - Exempting all corporate taxpayers from the “Specified Energy Property” rules;
 - Granting legislative exemption from the application of the tax shelter rules and the rules that prevent the benefit of the tax incentives from being allocated disproportionately between the taxable and tax exempt partners;
 - Exempting taxpayers who invest in energy storage project partnerships from the application of the at-risk rules and the negative ACB rules;

We look forward to discussing energy storage and our proposals with you.

Yours truly,

Patricia Phillips
Executive Director



Energy Storage Ontario Membership

The Voice of Leadership in Energy Storage



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