

MEETING NOTE

NAME OF ORGANIZATION: Stem Inc.

DATE/TIME OF MEETING: Monday, March 26, 2018

LOCATION OF MEETING: 900 Bay Street, 4th Floor, Hearst Block, DMO Boardroom

PURPOSE: To discuss the value and opportunities of behind the meter energy storage in Ontario.

ATTENDEES: Minister of Energy
Glenn Thibeault

Stem Inc.
TBD

LAST MEETING: N/A

ANTICIPATED AGENDA ITEMS:

1. Addressing Barriers to Energy Storage
2. Behind-the-Meter Opportunities in Ontario: Electricity Rates & Rate Initiatives
3. Demand Response
4. Behind-the-Meter Storage – Opportunities in Ontario via Industrial Conservation Initiative

NOTES ON AGENDA ITEMS:

1. Addressing Barriers to Energy Storage

- Recent events in energy storage are demonstrating that certain applications of energy storage are already commercially competitive with traditional technologies.

Suggested Response:

- Through the Long-Term Energy Plan (LTEP), we reaffirmed our commitment to overcoming barriers to the cost-effective deployment of energy storage, and working to capture the full value this important technology can have for all electricity sector participants.

- **The Ontario Energy Board (OEB) and Independent Electricity System Operator (IESO) have released their implementation plans, which commit to addressing barriers to energy storage – including enabling partnerships behind-the-meter. Will you be participating in their public consultations?**
- **I would be interested to hear other ideas about how we can realize the value of behind-the-meter energy storage.**

Background:

- Stem's business is focused on behind-the-meter energy storage solutions. Customers may choose to deploy Stem's technology to reduce cost associated with drawing electricity from the grid at peak loading periods.
- Energy storage can provide a number of other solutions, such as promoting power quality behind-the-meter, providing backup energy, and providing services to promote the efficient functioning of the broader grid.
- In the LTEP, the Ministry committed to address two barriers that could enable these outcomes. They include:
 - Exploring ways for utilities to make use assets like energy storage to participate in market opportunities that would ultimately reduce ratepayer costs; and,
 - Finding ways for utilities to partner with their customers to applications like energy storage to address system needs.
- These initiatives will largely be addressed through the IESO and OEB implementation of their LTEP directives.
- In their implementation plan, the IESO committed to working with the OEB, storage providers, and other interested parties to further identify obstacles to energy storage and propose mitigation strategies to overcome those barriers.
- The IESO will conduct four main activities, including:
 - a jurisdictional scan to understand how barriers to energy storage participation in other jurisdictions are addressed;
 - development of principles with stakeholders to guide the determination of inappropriate obstacles;
 - identification of obstacles facing energy storage resources in Ontario with input from the public and stakeholders in the storage community; and,
 - where appropriate, development of mitigating strategies for those obstacles that are found to be inappropriate.
- Through Q1 and Q2 2018, the IESO will engage stakeholders to develop principles and identify obstacles to the fair competition of energy storage

resources. By Q3 2018, the IESO will report back on obstacles identified and any proposed mitigation strategies.

- The OEB will also investigate barriers to energy storage as part of a broader initiative to enable distributed energy resources (DER). This effort should identify potential regulatory reforms to assess and allocate the value DER appropriately.
- This effort will be led by the OEB's Advisory Committee on Innovation, which aims to provide advice to the regulator on how to appropriately support cost effective DER. Stakeholder engagement on the paper will occur in 2019, and a final report on new framework/regulatory reforms Q3 2020.

2. Behind-the-Meter Opportunities in Ontario: Electricity Rates & Rate Initiatives

- Stem may wish to discuss how their technology can provide customers benefits in relation to Ontario's electricity rate structures and initiatives.

Suggested Response:

- **As you may know, the Ontario Energy Board is working with LDCs to pilot different time-of-use (TOU) price structures for residential customers across Ontario. The OEB is also exploring price options for small business electricity consumers.**
- **I understand that your technology can help customers who pay TOU prices manage their energy costs. Can you describe what benefits your technology could provide in a future where customers could potentially choose between different rate plans, including real-time pricing and critical peak pricing plans, where there is limited advanced notice of price changes?**

Background:

Regulated Price Plan – TOU Pilots

- In 2015 the OEB launched a comprehensive review of the Regulated Price Plan (RPP), which will include testing different TOU pricing structures to test their impact on electricity demand-shifting and conservation.
- The OEB has approved five LDCs to undertake TOU pilots, London Hydro, Alectra Utilities, Oshawa PUC Networks Inc, Hydro One and Customer First.
- Together the pilots are targeting 26,500 customers and will be testing the following price structures: Critical Peak Pricing, enhanced TOU, variable peak

pricing, super peak TOU, seasonal TOU, real time pricing and flat rates (see Appendix A for descriptions of each price structure).

- The pilots are being launch between Q1 and Q2 2018 and will run for one year. The LDCs are expected to provide results to the OEB by the end of 2019. The pilot results will help guide future OEB decisions on potential new pricing plans that could be made available province wide (OEB report expected in 2020).

Regulated Price Plan – Class B Customers

- As part of the OEB's review of the RPP, the OEB will be holding ongoing stakeholder engagement, including activities with small and medium sized businesses, to inform price and non-price options.
- The OEB report on a framework for future price plans is expected in 2020.

3. Demand Response:

- Ontario offers a leading Demand Response Auction that is spurring innovation in new technologies, such as smart thermostats, energy management software and communication technologies.

Suggested Response

- **You may be interested to know that energy storage technology is eligible to participate in the IESO's Demand Response auction. Every December the IESO makes a public call for eligible resources to submit the quantity of DR capacity they are willing to provide in the following year's summer (May October) and winter (November to April) commitment periods.**
- **Your presentation notes that your technology is enabling demand response resources in other jurisdictions. Have you considered either applying to become an eligible participant for the IESO Demand Response Auction or partnering with an Ontario-based company that could themselves apply to the auction using your products?**

Background:

- The IESO administers the Demand Response Auction pursuant to section 32 of the *Electricity Act, 1998*.
- In 2015, the IESO stopped purchasing demand response resources through multi-year contracts in favour of an annual auction.

- Every December, eligible resources submit the quantity of demand response capacity they are willing to provide for the upcoming summer (May to October) and winter (November to April) commitment periods.
- All resources selected in the auction receive the clearing price for each MW accepted; this payment is made on a monthly basis as an availability payment.
- As part of its Market Renewal Initiative, the IESO is planning to incorporate the Demand Response Auction into an Incremental Capacity Auction. This change is expected to take place in 2020.

4. Behind-the-Meter Storage – Opportunities in Ontario for Industrial Conservation Initiative participants

- With the recent expansion of the Industrial Conservation Initiative (ICI), more consumers will have the opportunity to use behind-the-meter storage to reduce Global Adjustment (GA) charges.

Suggested Response:

- **The Industrial Conservation Initiative (ICI) allows large electricity consumers to lower their electricity costs by reducing their demand during peak hours.**
- **Reducing demand during peak hours benefits companies financially and benefits the electricity system by deferring the need for new peaking generation.**
- **I understand that you have a specific energy storage business offering for Ontario consumers, I am interested to learn more about how this offering works.**

Background:

- Consumers participating in ICI are charged Global Adjustment (GA) on the basis of their share of the total Ontario demand during the highest five peak hours of the year. All other consumers (i.e., Class B) are charged GA volumetrically based on total consumption.
- As part of Ontario's Fair Hydro Plan, ICI has been expanded to include smaller manufacturers and greenhouses with peak demand over 500 kW, in addition to the consumers over 1 MW who were already eligible.

- ICI participants currently save an average of 33 per cent on their electricity bills compared to non-ICI participants. Approximately 1,100 electricity consumers are participating in ICI.
- Stem has developed an AI-powered energy storage solution which automatically switches a facility to stored battery power during periods that it forecasts may be one of Ontario's highest peak periods.
 - Stem's AI, Athena, discharges stored power so that a building draws power from Stem's batteries instead of from the grid, lowering GA fees.
 - Stem provides a turnkey subscription service in which it handles the installation, operation, remote monitoring, and maintenance of the energy storage system. Stem's system installs and uses third party suppliers' batteries and does not produce their own batteries.
- By using stored energy during peak hours, participants could reduce or eliminate their peak demand contribution from the grid and consequently reduce or eliminate their GA cost, while maintaining the same level of consumption.
- The 2017 LTEP forecasts GA to decrease in the longer term as generator contracts expire and additional nuclear units go offline for refurbishment. This could reduce the attractiveness of investment in energy storage specifically to reduce GA charges.

KEY FACTS:

- Stem Inc., based in Millbrae, California, is an energy storage company that is a global leader in artificial intelligence powered energy storage. Stem's world class analytics optimize the value of customer's energy assets and facilitate their participation in energy markets, yielding economic and societal benefits while decarbonizing the grid.
- Stem has created Athena, an Artificial Intelligence (AI) platform that uses big data and machine learning to optimize the timing of energy use with speed and precision. It links energy storage facilities into a powerful network that can instantly form virtual power plants to generate value for all members.
- Stem has had a strong year in Ontario, Canada, and looks to continue its momentum with its Global Adjustment offering—specifically designed for Ontario—which is ideal for large manufacturing plants and other industrial operations that seek improved control over energy costs.
- In January 2018, a group of investors – including the Ontario Teachers' Pension Plan – provided Stem with \$80 million of equity funding.

APPENDIX A

TOU Pilot Price Structures:

- Critical peak pricing (CPP) - increases prices for a fixed number of days/hours of the year when demand is expected to be high. This price is overlaid with the current TOU price structure. May include short notice (“quick ramping”) of a price increase during peak period.
- Enhanced TOU - increases the current on-to-off peak TOU ratio.
- Super Peak TOU - eliminates the mid-peak period and drastically increase the on-to-off peak ratio in the summer and winter periods.
- Variable Peak TOU - eliminates the mid-peak and only has an on and off-peak price. The on-peak price can vary depending on forecasted day ahead demand.
- Seasonal TOU – offers flat rates in shoulder seasons of spring and autumn, eliminates the mid-peak period, and increases the on-to-off peak ratio in the summer and winter.
- Two-Period TOU - eliminates the mid-peak period and increases the on-to-off peak ratio.
- Real Time Pricing – changes the summer and winter periods and offers a single price in all hours in