Energy Storage Industry Learnings Forum Workshop 6

I. Purpose of this workshop

The purpose of this session is to learn from the experiences and expertise of the ESILF members and guest speakers on their presented topics.

- Learning Exchange
- Topic Discussions

II. Workshop agenda

Est. Time	Agenda Items	Presenter
8:30 – 9:00	Registration and greetings	Luis Garrido
9:00 – 9:05	Welcome and Introduction	Ata Rehman, *Director, Grid Planning & Operations Engineering*
9:05 – 9:30	Presentation 1 "Energy storage developments in Canada and the US"	Geoff Osborne and Nathan Cox *Capstone*
9:30 – 10:00	Discussion	Luis Garrido / Leon Weinstein
10:00 – 10:05	Break	
10:05 – 10:30	Presentation 2 "Congestion relief and energy storage resources"	Robert Tremblay, *Energy Storage Canada* Travis Lusney, *Power Advisory*
10:30 – 10:55	Discussion	Luis Garrido / Leon Weinstein
10:55 – 11:00	Wrap up and next steps	Ata Rehman, *Director, Grid Planning & Operations Engineering*

III. Attendees

Company	Attendees
ASEA Brown Boveri (ABB)	Dan Gustafson
Alberta Utilities Commission (AUC)	Olex Vasetsky

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Company	Attendees
Alberta Innovates	Christophe Owttrim
AltaLink	Hao Liu
ATCO	Heereon Rho
CanWEA	Evan Wilson
Capstone	Geoff Osborne
Capstone	Nathan Cox
Capstone	Waleed Abdulaal
Power Advisory	Travis Lusney
Energy Storage Canada	Robert Tremblay
Enfinite	Jason White
Hitachi Energy	Omar Osorio
Market Surveillance Administrator	Derek Olmstead
Northland Power	Scott Petty
Solas Energy	Paula McGarrigle
TERIC Power	Craig Barnes
TransAlta	Akira Yamamoto
AESO	Ata Rehman
AESO	Brad Coleman
AESO	Dan Wiebe
AESO	Galen Lam
AESO	Kasey Abdallah
AESO	Leon Weinstein
AESO	Luis Garrido
AESO	Mahdi Hajian
AESO	Peter Huang

IV. Overall outcomes from the day

The workshop was designed for the AESO and ESILF members to learn from the experience and expertise of the guest speakers. Each speaker was allotted 25 minutes to provide information they believed would

add value to the AESO in integrating energy storage in Alberta. Once presentations had completed, a discussion was held which allowed the AESO and ESILF members to ask questions and obtain clarity from each presenter.

The meeting began with a short welcoming of all attending members and guest speakers and was led by Ata Rehman. Mindful of time and duration of the workshop, the presentations began with the first speakers Geoff Osborne and Nathan Cos from Capstone, who presented on *'Energy storage developments in Canada and the US'*.

After the completion of the first presentation, and the discussion period, the workshop resumed with the second presentation *'Congestion relief and energy storage resources',* presented by Robert Tremblay from Energy Storage Canada, and Travis Lusney from Power Advisory.

Workshop presentations can be found on the Energy Storage Industry Learnings Forum page of the AESO website.

V. Discussions

Below are questions, statements, recommendations and concerns, and corresponding responses which occurred during the discussion periods after presentation on each topic.

Energy storage developments in Canada and the US – Presentation by Geoff Osborne and Nathan Cox from Capstone

- Question from AltaLink representative regarding the Hydro One business case in the presentation, and how the commercial portion is completed. Is this a Hydro One investment or contract by a 3rd party arrangement?
    - Capstone representative responded with what is currently public information. Effectively Hydro One owns the battery fully and is considered a distribution asset and is rate based. There is no cost to the homeowner at this point in time. Hydro One has justified the investment based on this being the lowest cost solution to improve the distribution system performance. And although the business case presented worked for that specific opportunity, in Ontario, there are completely 3rd party owned power wall powerplants. Both work independently which creates a lot of opportunity for 3rd party ownership, together with regulating utility participation. Also, you could commercialize other uses for that asset to reduce the price, however, this has not happened in that specific business case.
- When you interconnect a large-scale battery storage, what kind of interconnection standards are being followed? Is it IEEE-1547 or a special standard or study they follow?
    - Capstone representative responded that at Hydro One had a lot of early renewable connections, because it owned a lot of the distribution system when wind and solar was connecting in Ontario. During this early phase of a generation connecting to the system, Hydro One produced the technical interconnection requirements for generation, and iterated on that in the following years. They weren't following IEEE-1547 because it was not fully developed at the time. Currently, utilities looking at interconnections have a much better advantage by following IEEE-1547.

- Question from AltaLink representative regarding the mention of Texas being similar to Alberta, and ahead of Alberta in Energy Storage development. And requested on the Tariff treatment of Energy Storage in Texas specifically around how storage would pay for its charging costs.
    - Capstone representative advised he was not able to answer the question pertaining to Texas but advised that in California when energy storage is charging, it will pay wholesale rates. Initially it was a requirement in California that the auxiliary loads of the unit had to separately metered as a retail customer. That ultimately went away, and evolved to the point, where now in California connections can keep all auxiliary loads behind the single wholesale meter point. The way that "demand charges" (costs that utilities recovery for polls and wires) are recovered in California is fundamentally different, and storage doesn't have a demand charge on its wholesale meter. Because cost recovery was not developed with storage in mind, every market has developed their own methods of recovering these costs with these new technologies.
- Question from the AESO regarding Energy Storage use of inverters to connect to the grid, and with Technological development maturing on the inverter side, how easy is to interact with the inverter manufacturers to retrofit facilities to meet requirements for Inverter Based Resources (IBRs)?
    - Capstone representative responded that in the past Capacitors were used, but they were not very flexible. Now the inverters or renewables have very interesting features for the capability of the equipment. "Old" wind and solar is not at end of life yet, so they are operating with older inverters that are operating at a fixed rate; but new projects will be able to benefit from the capabilities of new inverters. Utilities should investigate how to connect ES and use its capabilities, enables by the new inverters. Tariff needs to be properly designed to facilitate this.
- Question from the AESO in reference to Slide 15 of the presentation – regarding ES grid/commercial deployment declining and residential increasing and if this will be the continuing trend given that there seems to be an incongruency between the amount of storage that is being deployed at the grid scale compared to the amount of storage that is in the pipeline. Is this cost driven, or are there other factors in play as well?
    - Capstone representative responded that ultimately it is cost driven, however, there are major structural differences that are happening. In California what has happened is, retail rates have risen to the point where the payback period for residential storage has dropped materially. There are major structural elements in markets that are driving storage deployment behind the meter. Deployment at a large scale is highly sensitive to price changes, and deployments at the consumer level is not as price sensitive. This seems to be a temporary trend, lots of markets in the US are going to ramp up ES grid deployments.

Presentation 2: Congestion relief and energy storage resources – presentations by Rob Tremblay from Energy Storage Canada, and by Travis Lusney from Power Advisory

- Questions from AltaLink representative regarding Bill 22 where ES could be a transmission asset, but what are the pros and cons of ES being used as a transmission asset to relieve congestion vs the concept of a commercial compensation structure.
    - Energy Storage Canada representative stated that same approach can be taken for either, where the transmitter precures the services of an ES facility and retains it within their rates for the period of time that it is needed. Essentially offering a transmission service using the energy storage. If the congestion relief is needed long term, an ownership shift to the transmitter can be done.

- Question from the AESO regarding the payment scheme presented – during the time for when the contract for capacity was in place, would it be envisioned that the asset would be used exclusively for controlling congestion, or could the AESO derive other benefits from it (i.e. frequency regulation)? If so, would that be perceived as unfair competition?
    - Power Advisory representative stated that the presentation was created specifically with the idea that it would be used for congestion relief, to avoid concerns of the manipulating impact of other electricity products that are dispatched through the market mechanism.
    - TransAlta representative added that it would be helpful to get a competitive market developed for fast frequency response services, because there are opportunities beyond just ES that can provide those services.
- Question from Northland Power representative regarding the AESO having the most information on the congestions that exists on the system. Should congestion be precured by the AESO, or should the AESO identify the area of congestion, and have it contracted out bilaterally?
    - Power Advisory representative advised that it makes sense that the AESO contracts and procures for this, because they have better visibility to the overall status in real-time.
    - AltaLink representative added that commercial arrangements would be very complicated based on time and locational dependencies, and how can the value of the asset be maximized to address other reliability problems.
    - Power Advisory representative agreed with the AltaLink representative. The biggest strength the AB market has is its simplicity and that both established and new market participants can quickly understand the core concepts to compete on. It is easier to introduce competitive pressures by starting with a more simplistic approach rather than introducing more cost-effective solutions that can add complexity with severe consequences.
- Question from the AESO regarding ES being used purely for transmission congestion relief, and if there is a typical or optimal storage duration for this use?
    - Power Advisory representative stated it depends on many different factors and what the cause of the congestion are. There needs to be planning involved to scope out what those attributes are. The value of storage is that it is quite flexible in design if adjustments are required to match the need. There is not set standard at this time.
    - Energy Storage Canada representative also added that some battery technologies can be mobile and move around on the grid. For most that are building out ES today, unless they are very mobile, they may not be as responsive to the AESO's signal on where to locate, unless there were other long-term benefits for those locations.

VI. Wrap Up and Next Steps

As the session came to an end, Dan Wiebe from the AESO, thanked all presenters and attendees for participating in the discussions.

Any further questions can be sent to the Energy Storage inbox at energystorage@aeso.ca.