**February 7, 2020**

**Alberta Utilities Commission**
**1400, 600 Third Avenue S.W.**
**Calgary, Alberta T2P 0G5**

**ATTN: Randy Lucas, Application Officer**

**Re: Distribution System Inquiry, Proceeding 24116 – Energy Storage Canada responses to preliminary information requests**

## Introduction

Energy Storage Canada (ESC) is a small non-profit, membership-based and funded trade association working to build a framework that recognizes the range of benefits that storage can offer to our current electricity systems. Our mission is to advance the energy storage industry in Canada through collaboration, education, policy advocacy and research.

ESC has prepared responses to several of the Preliminary Information Requests submitted by the Alberta Utilities Commission[1]. Our focus has been on issues that directly impact energy storage facilities and to which we can contribute to the Commission's understanding of the issue. We have coordinated our response with the Community Generation Working Group (CGWG), the Pembina Institute for Appropriate Development (Pembina) and Allied Community Renewable Energy Interests (Allied) to reduce duplication of responses on issues where there is overlap[2]. ESC points out that a lack of response to a particular Information Request does not preclude us from addressing the issue in our written submission or concluding remarks, or from asking questions of other parties in the technical meeting or hearing.

**ESC-AUC-2019NOV29-001**
**Issue: Small micro-generation**
**Request**

(e) Referring to tables 2 and 3, which depict a representative rate structure for small micro-generation customers, please comment on the incentives the rate structure creates to deploy capital for:

(ii) Customer

(iv) Technology provider/installer

[1] 24116_X0470_2019-11-29AUC PreliminaryIRstoAllParties_0509.pdf
[2] 24116_X0497_2020-01-17AUCletter-Rulingoncosteligibil_0549.pdf, paragraph 25

**Response:**
(e)
(ii) The customer is incented to invest in a micro-generation technology that best matches the demand profile. The strategy will be to maximize the value of the investment by reducing the volume of energy procured from the grid. Under this rate structure, the use of energy storage will be incented in order to shift energy from times when the electricity would be sent to the grid to time when the volume of electricity withdrawn from the grid can be reduced.

(iv) Suppliers and installers will be incented to provide technologies, including energy storage, that facilitate the customer time shifting behaviour described in the response to IR 001-e-ii.

**ESC-AUC-2019NOV29-002**
**Issue: Large micro-generation**

**Request:**

(e) Referring to tables 4 and 5, which depict a hypothetical rate structure for large micro-generation customers, please comment on the incentives the rate structure creates to deploy capital for:

(ii) Customer

(iv) Technology provider/installer

**Response:**

(e)
(ii) The incentive in the large micro-gen case is different than the small micro-gen case because the pool price varies hour by hour and from day to day. The optimal strategy for the customer will be to procure or supply energy to maximize the energy value taking into account power price and potential non-energy cost savings. The customer will also be incented to install energy storage due to the flexibility to shift consumption and generation patterns on a dynamic basis to maximize value.

(iv) Suppliers and installers will be incented to provide technologies such as energy storage and energy control systems that facilitate the dynamic optimization customer behaviour described in 002-e-ii.

**ESC-AUC-2019NOV29-004**
**Issue: Distribution-connected generation with no associated load**

**Request:**

(a) With reference to the information contained in the preamble, please provide your understanding of the current situation for the distribution-connected generation with no associated load.

**Response:**

(a) The *Small-Scale Generation Regulation* does not identify the impact of adding an energy storage technology to a small-scale generating unit. Consider the situation where a generating unit qualifies as an "eligible generating unit"[3] under the regulation. Consider further the facility owner chooses to add an energy storage technology to perform price arbitrage with the condition that no power will be withdrawn from the grid. It is not clear if the generating unit with storage is still an "eligible generating unit" under the regulations.

The *Small-Scale Generation Regulation* is an example of the extent to which energy storage technologies have not been fully considered in existing regulations.

**ESC-AUC-2019NOV29-005**
**Issue: Grid-connected customer with generation solely for its own use**

**Request:**
(a) With reference to the information contained in the preamble, please provide your understanding of the current situation for on-site generation solely for own use.

(e) Referring to tables 2 and 4, which depict a hypothetical rate structure for various sizes of customers, please comment on the incentives the rate structure creates to deploy capital in the case of on-site generation installed for the customer's own use for:

(ii) Customer

(iv) Technology provider/installer

**Response:**
(a) Energy storage technologies are well suited to support the situation described in the preamble. For a customer looking to reduce energy and demand costs, energy storage allows increased withdraw of energy from the grid at low energy prices and reduced draw at times of high energy prices or in hours where consumption affects demand charges. Energy storage can be used as an energy sink when generation exceeds native supply to ensure no energy flows back to the grid.

[3] Small Scale Generation Regulation, AR 194/2018, 1(f)

Note that in general, the Alberta energy market merit order is steeper at higher prices than it is in lower prices. Consequently, the price decrease from suppling energy to the grid from energy storage is likely lower than the price increase from diverting energy to storage that would otherwise be supplied to the grid. The combined result is that arbitrage behaviour enabled by energy storage results in lower electricity prices for all consumers.[4]

(e)

(ii) A customer is incented to install energy storage technology to shift energy from hours with a low power price to hours with a higher power price or to exploit an opportunity so save on non-energy costs.

(iv) Suppliers and installers will be incented to provide technologies such as energy storage and control systems that allow customers to optimize their energy use as described in the response to IR 005-e-ii.

**ESC-AUC-2019NOV29-007**
**Issue: All other generation for self-supply and export not otherwise enabled by an enactment**

**Request:**

(b) For all parties: Please provide a description of the rules for how energy is offered into the market from customers who self-supply and export without an industrial systems designation (or similar), if at all, including how these rules depend on fuel source or size of the generator. If the energy is not offered into the market, please explain how this affects the settlement of power pool prices.

**Response:**

(b) Members of ESC (ESC) do not currently own or operate facilities in Alberta that self-supply and export energy. However, ESC supports the efforts of the Commission to continue the process initiated by Bulletin 2019-16 to expand the ability to export and self-supply beyond the current limitation to ISDs and micro-generators. An expansion of this capability represents an opportunity to increase investment and innovation in the province, especially in the area of energy storage and provide value in the electricity market to all power consumers as an additional source of supply. The value of energy storage investments has been described in detail in the ESC submissions in Module 1[5].

[4] Techno-economics of Energy Storage, Alberta Innovates Technology Futures, 2014, page 45. Filed with the Commission as a separate exhibit.
[5] 24116_X0159, 24116_X0410

**ESC-AUC-2019NOV29-008**
**Issue: Other load and generation configurations**

**Request:**
Please describe any additional load and generation configurations of significance that were not identified in these preliminary IRs.

**Response:**
The treatment of a stand-alone energy storage facility is not covered by the previous IRs. Since energy is withdrawn from the grid then later injected into the grid, energy storage facilities do not fit in the self-supply and export configurations described in IRs 001 to 008. ESC highlights two comments:

1) Current Situation: the regulatory process to connect a stand-alone energy storage facility is not well described in either the AESO or AUC rules. The current tariff treatment for energy storage is deficient and is an impediment to energy storage development[6]. There are six energy storage projects on the AESO project list[7] and four applications are currently under consideration by the Commission[8].

2) Under the tariff structures presented by the AUC in IRs 001 and 002, a stand-alone storage facility is unlikely to be developed because the cost of the withdrawn energy is greater than the value of the injected energy. This is an unfortunate consequence because the other services and benefits a stand-alone energy storage resource could provide to customers, Distribution Facility Owners (DFOs) and the AESO are not available. ESC proposes that it would be appropriate for the AUC to consider a new tariff for stand-alone energy storage to reduce the financial impediment to energy storage project development, while recovering an appropriate portion of wires costs. ESC suggests that the new storage specific tariff rate be could be based on an interruptible service. Specifically, the resource owner would retain control of the storage resource operation while the AESO and/or the DFO would have the ability to interrupt supply to or withdrawals from the grid when the grid needs capacity due to wires constraints. This new tariff structure would properly incent storage through an appropriately priced service. A storage specific interruptible tariff rate will provide the following benefits:
    a. The cost to stand-alone storage facilities would be appropriate, which removes the current impediment to energy storage development
    b. Reliability control would be maintained by the AESO and DFOs with no need for additional system grid costs
    c. An appropriate contribution by the energy storage resource to AESO and DFO system costs

[6] Oct-3-2018-DRS-Stakeholder-Session-FINAL.pdf, slides 41 and 50.
[7] Final-Project-List-January-2020.xls
[8] http://www.auc.ab.ca/regulatory_documents/Pages/current-applications.aspx, proceedings 25234, 25205, 24856, 24198

d. The benefits of stand-alone storage would be enabled for all Customers with no additional system grid expenditures

For simplicity, the interruptible service tariff rate would be applicable to all stand-alone storage facilities and storage added to generation at a specific site but would not be applicable when storage is combined with any load configuration. The case of storage combined with generation only is addressed in more detail in the response to IR 013-(i)-(v).

To determine the cost of the interruptible service, ESC recommends that the AESO perform:

- A cost of service study,
- A stakeholder engagement process on the new structure before tariff filing with the Commission
- Finalize the tariff structure through a tariff proceeding, ideally the next AESO application expected in Q3, 2020.

Further, ESC recommends that DFO's be directed to employ a flow through of this interruptible tariff rate in their future tariff proposals within a reasonable timeframe.

**ESC-AUC-2019NOV29-011**
**Issue: Profiled rate classes**

**Request:**
(b) What are the effects of having profiled rate classes (for example, does it lead to any cross subsidies among profiled and non-profiled rate classes)?

**Response:**

(b) The effect of a profiled rate class is a disadvantage to those customers that have installed BTM generation or energy storage because the time of use benefit of the technology is lost. The Community Generation Working Group has submitted a more detailed response.

**ESC-AUC-2019NOV29-012**
**Issue: Electric vehicles and charging stations Level-1, Level-2 and DC (direct current) fast charging**.

**Request:**
(a) With reference to the information contained in the preamble, please provide your understanding of the current situation for customers that install EV charging infrastructure.

(g) Referring to figures 12 through 14, which show the representative marginal cost of electricity (i.e., the current rates that are not specific to EVs), please comment on the incentives the rate structure creates to deploy capital in the case of EVs for:
(ii) Customer

(iv) Technology provider/installer

(h) Given the current tariff structures of the distribution utilities, please explain the following, with respect to installing Level-2 and/or DC fast chargers for public use as part of an existing load site, or as a standalone site:
(i) The difference in incentives for the customer

(iv) Implications for the efficient use of the grid

**Response:**

(a) The preamble is an accurate description of the current situation.

(g)
(ii) The rates as presented do not incent customers to deploy additional capital. If the rate structure included a time-of-day component, then customers may be incented to invest in technology that maximizes charging during low priced hours and restricts charging during high priced hours.

(iv) Suppliers and installers will be incented to provide standard equipment and technology that is available today. The lack of a time-of-day component inhibits the incentive to supply new or innovative equipment and/or control technologies

(h)
(i) Level-2 and Fast Charger owners, who are the DFO customers in this case, will include the tariff structure into their business case and will adjust their revenue model accordingly to ensure a profit is earned. Depending on the corporate risk tolerance and competitive environment among Fast Charge owners, the owners may choose to match the tariff structure or deviate from the structure if they believe they can achieve a competitive advantage. At this time, ESC is aware of EV charging price structures that include different components including:

a fixed or membership fee[9]; an energy charge[10]; or a time charge[11]. It is reasonable that some owners may choose to offer different rates that depend on time of use if that is reflected in their utility costs. Once there are enough owners deploying a range of revenue options, EV users will start to choose the charging service they feel provides the most value. It is too early to say what the impact of tariff structure on EV user choice will be.

(iv) Because of the potential variations in the Fast Charger owner revenue model, it is difficult to link tariff structure with eventual EV charging use and the consequent implications for efficient use of the grid. More efficient use of the grid could result from Fast Charger owners that install energy storage facilities to smooth electricity demand from EV charging.

**ESC-AUC-2019NOV29-013**
**Issue: Energy storage resources**

**Request:**
Scenario 1 – Energy storage resource located on the distribution system

a) Please provide your views on whether a DFO, another party, or both should own an energy storage resource and if so, under what terms.

(b) For a DFO-owned energy storage resource, please provide your views on:

(i) How energy lost as part of round-trip efficiency should be accounted for. For example, would energy lost be a part of distribution line losses and/or unaccounted-for-energy (UFE)?

(ii) Whether a DFO-owned energy storage resource should be permitted to participate directly in the markets for energy or ancillary services, or whether its participation should be through an arms length subsidiary. If a DFO-owed energy storage resource should be permitted to participate directly, please comment on implications for cost recovery and rate base associated with this option.

(iii) Whether PBR offers sufficient incentives for DFOs to own and operate an energy storage resource in place of a traditional wires solution (e.g., transformer replacement).

(c) For a DFO-owned energy storage resource, or one owned by another party, please provide your views on:

(i) What tariff(s) should be applied.

(ii) How the two-way flow of energy to and from the battery should be metered.

(iii) Whether and, if so, what kind of grid reliability studies need to be performed before an energy storage resource can be installed. How should the cost of these studies be recovered by a DFO (i.e., through PBR rates, customer contributions or special charges)?

[9] https://www.chargeyourcar.org.uk/#ev-driver
[10] https://www.tesla.com/support/supercharging
[11] https://www.petro-canada.ca/en/personal/fuel/ev-fast-charge-network

(d) For an energy storage resource owned by another party, please provide your views on:

(i) Whether an energy storage resource in this scenario fits in any existing DFO rate classes.

(ii) Whether, and how, information on the optimal siting of energy storage resources on the distribution system should be provided to other parties. Does PBR offer sufficient incentive for DFOs to do this on their own?

Scenario 2 – Energy storage resource located on the transmission system

(e) Please provide your views on whether a TFO, another party, or both should own an energy storage resource and if so, under what terms.

(f) For a TFO-owned energy storage resource, please provide your views on:

(i) How energy lost as part of round-trip efficiency should be accounted for. For example, would energy lost be a part of transmission line losses?

(ii) Whether a TFO-owned energy storage resource should be permitted to participate in the markets for energy or ancillary services. If a TFO-owned energy storage resource should be permitted to participate, please comment on implications for cost recovery and rate base associated with this option.

(iii) Whether the current regulatory framework offers sufficient incentives for TFOs to own and operate an energy storage resource in place of a traditional wires solution (e.g., transmission reinforcement).

(g) For a TFO-owned energy storage resource, or one owned by another party, please provide your views on:

(i) What tariff(s) should be applied.

(ii) How the two-way flow of energy to and from the battery should be metered.

(iii) Whether and, if so, what kind of grid reliability studies need to be performed by the AESO and/or TFO, before an energy storage resource can be installed. How should the cost for these studies be recovered?

(iv) Whether energy storage resources should be permitted to provide both grid services and participate in the energy or ancillary services markets.

(h) For an energy storage resource owned by another party (other than the TFO):

(i) Please provide your views on how the optimal siting of energy storage resources should be managed. For example, should an energy storage resource be placed in the AESO's connection queue, and be connected similar to generation? Or, as another option, should the AESO hold a competitive procurement process where parties bid for the right to construct and operate an energy storage resource, similar to the Fort McMurray West 500-kV Transmission Project?

Scenario 3 – A behind-the-meter energy storage resource (i.e., behind the utility's meter at the customer's site)

(i) Please provide your views on how an energy storage resource should be treated when installed on the following sites. Please consider the following in your response: permissibility to supply energy to the market (and which markets), how market participation would be managed, metered and compensated and charged for grid reliability/connectivity services.

(i) A site in conjunction with a micro-generation generating unit under the *Micro-generation Regulation.*

(ii) A site that is only load (prior to addition of the energy storage resource).

(iii) A site that has load and on-site generation installed under an enactment other than the *Micro-generation Regulation.*

(iv) A site that has load and on-site generation not installed under a current enactment.

(v) A site that is only a generator connected to the distribution system (no load).

(vi) A site that is only a generator connected to the transmission system (no load).

**Response:**
Scenario 1 – Energy storage resource located on the distribution system

(a) Both DFOs and private companies should be allowed to own an energy storage resource. However, DFO's and other Utilities should not be allowed to participate in the energy market on an ongoing basis but only to use storage as a non-wire's solution. DFO's and other Utilities must ensure impartial open access and, therefore, full competition with private firms utilizing storage should be discouraged. Having DFO's and other Utilities provide full storage capability would be similar to having these Utilities participate as generators in the energy market.

As an alternative to DFO or other Utility owned energy storage, regulations need to allow market participants to develop commercial arrangements with DFOs or other Utilities that permit innovative developers and owners to earn a fair return while delivering electricity and associated services to consumers at the lowest cost.

Further, ESC submits that the Commission should require the AESO, DFOs and other Utilities to consider energy storage and other non-wires alternatives during their planning processes and to demonstrate their complete evaluation of the storage and non-wires alternatives during relevant applications to the Commission.

(b)

(i) Energy lost as round-trip efficiency is similar to line losses on the distribution system. The volume of line losses is the difference between the energy entering the distribution system from the transmission system and the energy leaving the distribution system to a customer. Energy lost due to round trip efficiency similarly represents the difference between the energy entering the storage resource and the energy leaving the storage resource. Since line losses

and energy lost due to round-trip efficiency are the same, they should be treated the same way by a Distribution firm or other Utility that utilizes storage as a non-wire's alternative. However, as stated above, the Utilities should not be allowed to use energy storage to compete in the energy market on an ongoing basis.

Private Storage firms that sell non-wires solutions to Utilities would receive similar treatment for the portion of energy storage resource that provides the non-wires solutions. Other efficiency losses arising from activities such as market arbitrage or the provision of ancillary services would be solely to the account of the Private storage firms.

(ii) DFO-owned energy storage should not be permitted to participate on an ongoing basis in the markets for energy or ancillary services. Instead, should a DFO wish to participate in an energy storage project, DFOs should contract with a private storage owner for a portion of, or access to the installed energy storage resource. The contracts should be procured by the DFO through a competitive process. The cost of a competitively procured contract should be eligible for inclusion in the DFO or other Utility rate base if the storage resource offers a non-wires solution that is less costly on a full cycle basis, as compared to an efficiently costed wires solution.

(iii) DFO's may be incented to consider energy storage since PBR provides the opportunity for Utilities to be rewarded by reducing costs. However, ESC recommends that the Commission direct the DFO's to create a business case evaluating storage alternatives in all situations where substantial system costs are to be expended. The DFO business case must consider a DFO owned storage option as well as a private firm owned storage option. Once the initial business cases templates are established, this new activity should not create a heavy burden on the DFO's, and the Commission can satisfy itself regarding the completeness of the business cases in ongoing PBR proceedings.

(c)

(i) The interruptible storage-specific tariff rate, as described in the response to IR-008-(2), should be applied for an energy storage resource regardless of the resource owner.

(ii) The two-way flow could be net-metered, or each direction could be metered, on a cumulative or time-of-use basis depending on the following: the needs of the customer; the needs of the DFO; the nature of the energy storage resource; the structure of associated facilities; and any commercial arrangements.

(iii) Reliability study requirements for an energy storage resource should be consistent with study requirements for generating and load resources of comparable size with proper consideration given to the interruptible nature of stand-alone storage loads. For stand-alone storage facilities, private firms should receive a customer contribution for the cost of the study. Study costs for non-wires storage solutions should be covered by the DFO through PBR rates.

(d)

(i) Existing rate classes are based on a strict separation between generation and load resources. Energy storage resources do not conform to this approach and therefore ESC recommends a new AESO and DFO storage-specific interruptible rate class. Energy Storage

assets should not create a need for system expansion and will provide grid support, therefore these assets should be afforded reasonable and fair tariff treatment.

(ii) PBR offers sufficient incentive for optimal siting of energy storage resources assuming DFOs are required to consider energy storage in the system planning process and energy storage resources are competitively procured as described in response to IR 013-(b)-(ii).

Scenario 2 – Energy storage resource located on the transmission system

(e) In general, the regulations for DFO and TFO ownership of an energy storage resource should be as consistent as possible to avoid favouring one type of installation over another. In this case the argument expressed in response to IR 013-(a) applies and both TFOs and private companies should be allowed to own energy storage resources. However, a DFO or TFO should not be allowed to compete with other forms of generation through ongoing participation in the energy and ancillary services markets.

(f)

(i) As with the DFO case, round-trip efficiency losses should be part of transmission line losses for the portion of the resource that provides non-wires solutions.

(ii) As described for DFOs in the response to IR-013-(b)-(ii), TFOs should not be permitted to participate in energy or ancillary services markets other than for non-wires solutions, but may enter into a contract with a private company for the provision services from a portion of an energy storage resource.

(iii) The current regulatory framework is not sufficient. Regulations should be updated to allow for commercial agreements between TFOs or the AESO and private companies that maximize the value of the resource and results in the lowest cost of services to customers. Further, ESC recommends that AESO and TFOs be directed to consider energy storage and other non-wires alternatives during the planning process and provide evidence of such consideration in relevant facility applications.

(g)

(i) The new interruptible storage-specific tariff as described in the response to IR-008-(2) should be applied to stand-alone energy storage resources regardless of resource ownership.

(ii) The two-way flow could be net-metered, or each direction could be metered, on a cumulative or time-of-use basis depending on: the needs of the customer; the needs of the TFO; the nature of the energy storage resource; the structure of associated facilities; and any commercial arrangements.

(iii) Reliability study requirements for an energy storage resource should be consistent with study requirements for generating and load resources of comparable size. The interruptible nature of stand- alone storage resources should be considered in the grid studies which would result in no increase in load system peaks.

(iv) TFO's should not be permitted to participate on an ongoing basis in the energy and ancillary services markets. An individual private energy storage resource should be allowed to

provide both grid services to a TFO or the AESO and participate in the energy or AS markets. The regulations should allow commercial arrangements between private resource owners and TFOs to provide grid services from a portion of or access to an energy storage resource.

(h)
(i) Privately developed energy storage resources should follow the AESO connection queue process just like other resources. ESC assumes the AESO will continue to develop the connection process for energy storage per the storage roadmap[12].
In parallel, when the AESO identifies the use of energy storage as a potential resource during the transmission planning process as a non-wire's solution, then a competitive process should be executed to procure the services at the lowest price.

Scenario 3 – A behind-the-meter energy storage resource (i.e., behind the utility's meter at the customer's site)

(i)

(i) Storage added to a micro-generation site should not result in any changes to the treatment of the site. In this case, from the perspective of the DFO, the energy storage resource is behaving exactly like the site without the storage resource, in that energy is both delivered to and withdrawn from the grid, and therefore no changes are required.

(ii) A site that is load only should be permitted to supply energy to the energy market and withdraw energy from the energy market. A load site that adds storage will continue to be subject to the existing load tariff treatment. The use of storage will likely reduce the tariff costs under the existing load tariff.

(iii) *Similar treatment as (ii) above.*

(iv) *Similar treatment as (ii) above.*

(v) The site that is only a generator connected to the distribution system should be permitted to both supply energy to and withdraw energy from the energy market. However, the facility owner should be permitted to specify whether energy will be withdrawn from the grid.

If the owner chooses not to withdraw energy from the grid, and if the STS capacity is not increased with storage, then there are no changes to the treatment of the site from being a generator.

Alternatively, the site owner may select to be able to withdraw energy from the grid. In this case, the storage-specific interruptible tariff rate would apply to the storage capacity. The AESO and DFO would retain interruption rights in the energy storage capacity as with a stand-alone energy storage resource.

(vi) *Similar treatment as (v) above.*

[12] https://www.aeso.ca/assets/Uploads/Market-Initiatives-Dec-19-2019.pdf, page 3.