Information Document
Battery Energy Storage Facility Technical and Operating Requirements
ID #2016-001R

Information Documents are not authoritative. Information Documents are for information purposes only and are intended to provide guidance. In the event of any discrepancy between an Information Document and any Authoritative Document(s)[1] in effect, the Authoritative Document(s) governs.

1 Purpose

This Information Document relates to the following Authoritative Documents:

- Section 502.13 of the ISO rules, *Battery Energy Storage Facility Technical Requirements* ("Section 502.13"); and
- Section 502.14 of the ISO rules, *Battery Energy Storage Facility Operating Requirements* ("Section 502.14").

The purpose of this Information Document is to provide additional guidance that may be of interest to the legal owners and operators of battery energy storage facilities in Alberta.

2 Background

Section 502.13 sets out the minimum technical requirements for a battery energy storage facility connecting to the transmission system.

Section 502.14 sets out the requirements for a legal owner and operator of a battery energy storage facility to operate the battery energy storage facility, and to notify the AESO and mitigate any issues in the event of component failure. Section 502.14 also contains the ongoing testing requirements associated with a battery energy storage facility.

3 Battery Energy Storage Facility Technical Requirements

Section 502.13 requires the legal owner of the battery energy storage facility to determine various parameters associated with the facility, including, but not limited to, voltages, maximum authorized charging power and maximum authorized discharging power. During the connection process of a project for a battery energy storage facility, the AESO may request these parameters and other information from the legal owner for use in the connection process, including preparing the functional specification and studies.

3.1 Maximum Authorized Charging Power, Maximum Authorized Discharging Power and Reactive Power Requirements

The examples below relate to subsections 3 and 4 of Section 502.13, and are intended to provide guidance on the relationship between the maximum authorized discharging power, maximum authorized charging power and reactive power requirements for a battery energy storage facility.

Example 1: Where the legal owner of a battery energy storage facility has determined that the facility will have a maximum authorized charging power and maximum authorized discharging power of 100 MW, the following reactive power capabilities for the battery energy storage facility would meet the minimum reactive power requirements under subsection 5 of Section 502.13:

(a) over-excited reactive power obligation (0.90 power factor) = 48.4 MVAr;

(b) under-excited reactive power obligation (0.95 power factor) = 32.9 MVAr; and

[1] "Authoritative Documents" is the general name given by the AESO to categories of documents made by the AESO under the authority of the *Electric Utilities Act* and regulations, and that contain binding legal requirements for either market participants or the AESO, or both. AESO Authoritative Documents include: the ISO rules, the Alberta reliability standards, and the ISO tariff.

(c) MVA rating at this value = 111.1 MVA.

Example 2: Some battery energy storage facilities may have a lower maximum authorized charging power rate when compared to the maximum authorized discharging power rate for the facility.

Where the legal owner of a battery energy storage facility has determined that the facility will have a maximum authorized charging power of 40 MW, while still having a maximum authorized discharging power of 100 MW, the following reactive power capabilities for the battery energy storage facility would meet the minimum reactive power requirements under subsection 4 of Section 502.13, while charging the facility:

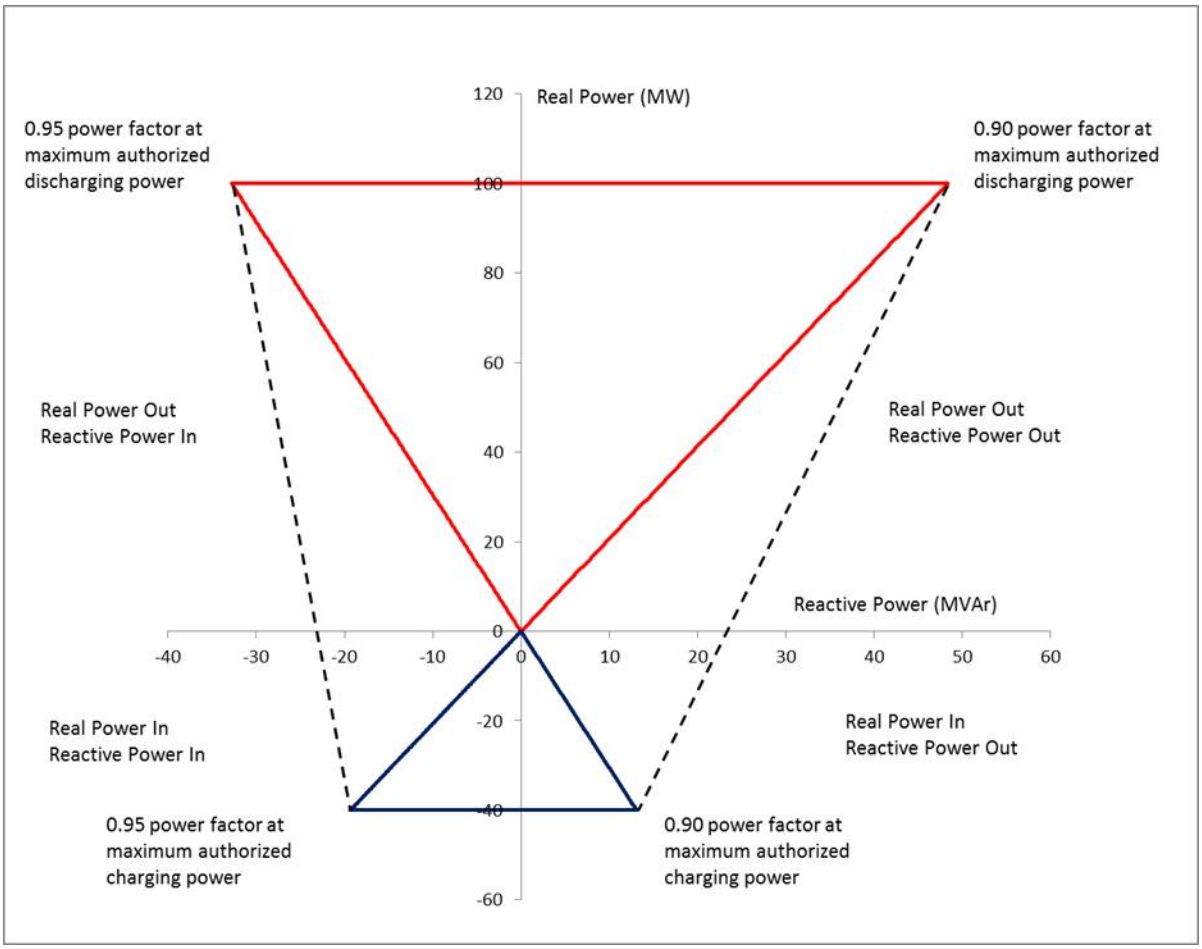
(a) over-excited reactive power obligation (0.90 power factor) = 19.4 MVAr; and

(b) under-excited reactive power obligation (0.95 power factor) = 13.1 MVAr.

The relationship between maximum authorized charging power, maximum authorized discharging power and reactive power is illustrated in Figure 1, below. Figure 1 is based on the following maximum authorized discharging power and maximum authorized charging power values:

- maximum authorized discharging power = 100 MW; and
- maximum authorized charging power = 40 MW

Figure 1 - The relationship between maximum authorized charging power, maximum authorized discharging power and reactive power



Example 3: Where the legal owner of a generating facility is considering the addition of a battery energy storage facility, such that the two facilities would share a common point of connection, and where there is excess reactive power available from the generating facility, the excess reactive power may be used to supplement the reactive power capability of a battery energy storage facility, in accordance with subsection 4(4) of Section 502.13.

Where the generating facility is a wind aggregated generating facility rated at 100 MW that has an existing static reactive power device, the reactive power capability of the wind aggregated generating facility (as required in Section 502.1 of the ISO rules, *Wind Aggregated Generating Facilities Technical Requirements*) would be similar to the reactive power capability described in Example 1 above:

(a) over-excited reactive power obligation (0.90 power factor) = 48.4 MVAr; and

(b) under-excited reactive power obligation (0.95 power factor) = 32.9 MVAr.

If a battery energy storage facility is added to the existing wind aggregated generating facility, such that the two facilities share a common point of connection, and the battery energy storage facility is rated at 10 MW for both the maximum authorized discharging power and the maximum authorized charging power, the following reactive power capabilities for the battery energy storage facility would

meet the reactive power requirements under subsection 4(4) of Section 502.13:

(a) over-excited reactive power obligation (0.90 power factor) = 4.8 MVAr; and

(b) under-excited reactive power obligation (0.95 power factor) = 3.3 MVAr.

However, the battery energy storage facility would not be required to have reactive power capability if the existing static reactive power device at the wind aggregated generating facility had additional reactive power capability totaling at least:

(a) over-excited reactive power obligation (0.90 power factor) = 53.2 MVAr; and

(b) under-excited reactive power obligation (0.95 power factor) = 36.2 MVAr.

3.2 Auxiliary Systems

Just as a complex may contain more than one generating unit, a complex may also contain more than one battery energy storage facility. Subsection 11 of Section 502.13 and subsection 2(6) of Section 502.14 relate to the auxiliary systems a of battery energy storage facility that is located in a complex with more than one battery energy storage facility.

In general, where the various battery cells, inverters, and other components in a complex operate cohesively under a single governor system and voltage regulating system, the complex is considered to be composed of a single battery energy storage facility.

Where the operation of the various battery cells, inverters, and other components in a complex is controlled by separate governor systems and voltage regulating systems, the complex is considered to be composed of multiple battery energy storage facilities.

Subsection 11 of Section 502.13 includes requirements to prevent the loss of multiple battery energy storage facilities as a result of a single point of failure of an auxiliary system, such as a common power supply to pumps for flow batteries.

The AESO recognizes that there may be times when the battery energy storage facilities located within a complex are operated with a single point of failure of an auxiliary system. When operating with a single point of failure of an auxiliary system for multiple battery energy storage facilities, the AESO requires notification in accordance with subsection 2(6) of Section 502.14.

4 Participation of Battery Energy Storage Facilities in the Market

The AESO has received questions regarding how other ISO rules and Alberta reliability standards apply to battery energy storage facilities. The AESO is in the process of reviewing these questions and will issue further communications on this matter once the review is complete. See also ID #2009-003R, *Acceptable Operational Reasons* and ID #2012-009R, *Restatements.*

Revision History

Posting Date	Description of Changes
2017-05-11	Addition of section 4
2016-04-25	Initial release