

Request for Expressions of Interest

FOR THE **LOAD SHED SERVICES FOR IMPORTS COMPETITION**



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1. Introduction

1.1 PURPOSE

The Alberta Electric System Operator (AESO) is opening a competition to procure Load Shed Services for imports (LSSi) for 2019 and subsequent years. The purpose of this Request for Expressions of Interest (REOI) is to assist the AESO in identifying those parties interested in participating in this competition, and to provide some of the key details relating to the Request for Proposals (RFP) stage of this competition and the accompanying Import Load Shed Agreement (ILSA).

1.2 BACKGROUND

The AESO's mandate is derived from the *Electric Utilities Act* and related regulations. The AESO is governed by its board (**AESO Board**) which is comprised of individuals (**Members**) appointed by the Minister of Energy. Each Member must be independent of any person having a material interest in the Alberta electric industry.

The AESO is responsible for a broad range of duties, responsibilities and functions with respect to the electricity industry, including:

- Operating Alberta's fair, efficient and openly competitive energy-only market for electricity;
- Designing and implementing the addition of a capacity market to the current electricity market;
- Determining the order of dispatch of electric energy and ancillary services;
- Providing system access service on the transmission system;
- Directing the safe, reliable and economic operation of the interconnected electric system;
- Planning the capability of the transmission system to meet future needs;
- Developing, implementing and administering renewable electricity programs; and
- Administering load settlement.

Further information on the AESO and its legislative mandate is available at www.aeso.ca

The AESO has a corporate credit rating of AA-/Stable from S&P Global Ratings.

1.3 REOI: AN OPPORTUNITY TO DEMONSTRATE INTEREST WITH NO OBLIGATION

This REOI is not a request for qualifications (RFQ), a request for proposals (RFP) or a call for tenders. This REOI merely seeks to identify those who may have an interest in participating in the LSSi RFP described in this REOI.

No person is obligated to respond to this REOI, and the AESO has no responsibility to reimburse or compensate any person for responding to this REOI.

1.4 COMPETITION OBJECTIVES

Key objectives for this competition are as follows:

- Utilize competitive market forces to determine the cost;
- Conduct a fair and transparent competition overseen by a fairness advisor;
- Minimize perceived or actual barriers to participation;
- Be straightforward and efficient; and
- Be guided by the principle of allocating risk to those best able to manage it.

2. Load Shed Services for imports

2.1 OVERVIEW OF LSSI

Load Shed Services for imports (LSSI) is a transmission system reliability product developed as part of the AESO's efforts to fulfill its intertie restoration obligation as mandated by legislation. LSSI is provided by load customers that agree to be quickly taken offline following the sudden loss of imports across the interties.

LSSI loads will be armed to be ready for trip, as required by the AESO, based upon scheduled flows across the interties between Alberta and the neighbouring Western Electricity Coordinating Council (WECC) jurisdictions. The use of LSSI allows for additional scheduled imports to access the Alberta market without compromising system reliability. During high import conditions, LSSI allows the rapid arrest and recovery from frequency decay, hence preserving the system stability by reducing the risk of firm load shed on the Alberta Interconnect Electric System (AIES) should the intertie trip while operating above certain import levels.

The AESO currently has contracts in place with various loads in Alberta to provide this service.

The AESO recognizes that there may be loads that currently do not have LSSI capability and may need capital investment or modification to meet the technical requirements to provide LSSI. The AESO hopes to identify, through this REOI, any additional information it could provide to assist loads in participating in the RFP process.

2.2 COMPETITIVE PROCESS STAGES AND KEY FEATURES OF LSSI

The competitive process will consist of two stages:

- This REOI stage; and
- An RFP stage wherein each RFP proponent will submit bid prices for each proposal.

The proponents who meet all eligibility criteria will be selected based on lowest bid prices through a fair and transparent evaluation process. The evaluation criteria will be provided during the RFP stage. The selected proponents will enter into an ILSA with the AESO.

Key features for this competition include the following:

- **Volume:** The AESO targets to procure 315 MW of LSSi.
- **Term:** The ILSA is for a term of three years and is expected to commence Jan. 1, 2019 and end Dec. 31, 2021.
- **Payment Mechanism:** The payment mechanism includes three components:
 1. **Availability Payment:** a service provider is compensated for making their load available for provision of LSSi. Availability price (\$/MW) will be submitted during the RFP stage of this competition. The service provider will be compensated using the following formula for their load availability in each hour:
$$\text{Availability Payment} = \text{Availability Price} * \text{Available MW in that hour} * (\text{Available MW} / \text{Contracted MW})$$
 2. **Arming Payment:** a service provider is given an additional payment when the Under Frequency Relay associated with the LSSi load is armed. Arming Price (\$/MW) will be submitted during the RFP stage of this competition. The service provider will be compensated using the following formula for each hour they are armed:
$$\text{Arming Payment} = \text{Arming Price} * \text{MW armed in that hour}$$
 3. **Trip Payment:** a service provider is paid when their load is tripped due to an under frequency event.
$$\text{Trip Payment at any given hour} = \$1000/\text{MW} * \text{Actual MW Tripped in that hour}$$
- The relationship between the AESO and the successful proponent(s) will be governed by the ILSA.

2.3 LSSI TECHNICAL REQUIREMENTS

The eligibility criteria and requirements that a proponent needs to fulfill in order to provide LSSi are provided as Attachment A to this document.

2.4 SCHEDULE

The AESO's anticipated schedule for the LSSi competition is as follows:

AESO OPENS REOI	May 1, 2018
REOI information session	May 8, 2018
REOI concludes & EOI Forms due	May 14, 2018, 3:30 p.m. MDT
AESO OPENS RFP TO PROPONENTS	June 1, 2018
RFP submissions due	July 16, 2018
Selection of successful proponent(s) and execution of ILSA	Q4 2018
TARGET OPERATIONAL READINESS DATE	January 1, 2019

The AESO may delete, modify or add to any of the above steps and timeline, or may choose not to pursue any further activities associated with this REOI.

2.5 COMMUNICATIONS

The mandatory method of communication between interested parties and the AESO is through LSSi@aeso.ca prior to June 1, 2018. Other than the information provided at the REOI information session referred to in Section 3.4, information obtained verbally during the LSSi competition or from any other sources is not official and cannot be relied upon.

During the REOI stage, at the information session, and up to the start of the RFP stage of the competition, interested parties will be able to submit further questions or seek clarifications from the AESO by sending their questions to LSSi@aeso.ca

2.6 REOI QUESTION SUBMISSION PERIOD

Questions regarding this REOI or other LSSi competition questions may be submitted to LSSi@aeso.ca no later than 3:30 p.m. Mountain Daylight Time (MDT) on May 4, 2018, with the subject line "Question for the LSSi competition." The AESO will make every effort to address these questions at the REOI information session referred to in Section 3.4. No answers to these questions will be provided any earlier than the REOI information session. Questions received following the REOI information session may be submitted to LSSi@aeso.ca and the AESO may post answers to additional questions before the start of the RFP Stage.

Refer to AESO's [Ancillary Services Procurement page](#) for updates to the LSSi competition.

2.7 SHAREPOINT

The AESO will use a SharePoint portal for the RFP stage of this LSSi competition. Interested parties can request access to SharePoint for registration in the competition and, to access the competition documents by sending a request to LSSi@aeso.ca with the subject line "Request to Register for LSSi SharePoint." Interested parties will be required to execute a Sharepoint Access Agreement in order to be provided access to Sharepoint.

Interested parties must submit their proposals electronically through SharePoint no later than July 16, 2018, by 3:00 pm MDT.

Interested parties are responsible for ensuring that they have received the RFP, and any addenda issued by the AESO once they are registered on the LSSi SharePoint and the documents have been posted.

3. Expression of Interest

3.1 EXPRESSION OF INTEREST (EOI) FORM

Please complete and submit the Expression of Interest Form (**EOI Form**) as soon as possible, and no later than 3:30 p.m. MDT on **May 14, 2018**. The EOI Form must be submitted electronically to LSSi@aeso.ca with **“EOI Form – LSSi” and the interested party’s name in the subject line of the email**. The AESO will confirm receipt of the EOI Form by responding to the email from which the EOI Form was received no later than 48 hours after it is received. See Section 3.2 for information about accessing the EOI Form.

Submissions in an EOI Form are not evaluated in any way and will neither exclude nor shortlist interested parties.

Submitting an EOI Form is not a prerequisite to participating in the further stages of the LSSi competition.

Please note this is an Expression of Interest only, not an RFP submission.

3.2 ACCESSING THE REOI AND THE EOI FORM

This REOI is available to download from the AESO website. Each interested party is responsible for making appropriate arrangements to download the REOI and, if they so choose, submit the EOI Form via email to the AESO at LSSi@aeso.ca. A sample of the EOI Form is included in Section 4; however, interested parties must complete and submit the fillable PDF form available on the AESO website. To download the REOI and EOI Form, visit the AESO’s [Ancillary Services Procurement page](#).

3.3 REVIEW OF EOI FORM

The AESO will review the EOI Forms and other information to identify interested parties and may use the information it receives through the EOI Form to refine elements of the LSSi competition.

3.4 REOI INFORMATION SESSION

An REOI information session for this LSSi competition is planned for Tuesday, **May 8, 2018 from 1:30 – 2:30 p.m MDT**. Registration for in-person attendees starts at 1:00 pm MDT and the presentation begins at 1:30 pm MDT.

The session will be held in the Amber B room at the Matrix Hotel in Edmonton, Alberta.

Interested parties can RSVP to attend in person no later than 3:30 p.m. MDT on May 4, 2018 by emailing LSSi@aeso.ca with the subject line **“RSVP for LSSi information session.”** Please note that space is limited for those wishing to attend in person. To register to attend via webinar, [please click here](#). The presentation and webinar recording will be posted on the [Ancillary Services Procurement page](#) for those unable to attend.

The information session will consist of a presentation on the need for LSSi, general requirements for LSSi, and key details on the RFP stage of the competition. There will also be a question and answer period at the information session.

3.5 COLLECTION OF INFORMATION FROM INTERESTED PARTIES

Profile information related to each EOI Form submission is being collected for the purposes of identifying interested parties who may wish to participate in the RFP stage of the LSSi competition. The AESO intends to maintain a log of all the contact names and contact information of interested parties submitting an EOI Form or otherwise expressing an interest to the AESO in providing Load Shed Services for imports.

3.6 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY

The AESO appreciates that the information provided on the EOI Form may include some sensitive business information and accepts this information in confidence. Notwithstanding the forgoing, the AESO is a public body subject to the provisions of the *Freedom of Information and Protection of Privacy Act (FOIP Act)* and may be required to disclose such information pursuant thereto, in the absence of a mandatory exception (FOIP Act, Sections 16 and 17).

Should third party information held by the AESO be requested under the FOIP Act, the AESO is required to notify each affected party and request representations regarding disclosure.

3.7 ERRORS AND OMISSIONS

The information contained in this REOI is supplied solely as a guideline for interested parties. The information is not guaranteed or warranted to be accurate by the AESO nor is it necessarily comprehensive or exhaustive. Nothing in this REOI is intended to relieve interested parties from forming their own opinions and conclusions with respect to the matters addressed in this REOI.

3.8 NO OBLIGATION TO PROCEED

This REOI does not constitute an offer of any kind, including an offer to enter into any contract with any person. This REOI does not in any way commit the AESO to, or make the AESO responsible for, anything whatsoever, including proceeding with RFP stage.

3.9 ADDITIONAL SOURCES OF INFORMATION

For additional information regarding LSSi, interested parties are encouraged to visit the [LSSi page on www.aeso.ca](http://www.aeso.ca).

4. Expression of Interest Form – Load Shed Services for imports (LSSi)

Please complete and submit this EOI Form as soon as possible, and no later than **May 14, 2018 at 3:30 pm MDT**. The EOI Form must be submitted electronically to LSSi@aeso.ca with "EOI Form - LSSi" and the interested party's name in the subject line of the email. No other documents, including supporting information, will be accepted. Please note this is an Expression of Interest only, not an RFP submission.

Interested party name (full legal name) _____

Contact name and title _____

Contact phone _____

Contact email _____

Mailing address _____

EXPRESSION OF INTEREST

Describe your level of interest in participating in the LSSi competition. High Medium Low

Does your company have previous experience providing LSSi? Yes No

Please indicate why you are interested in providing LSSi:

Does your facility or facilities require capital upgrades to provide LSSi? Yes No

The target timeline for the commencement of LSSi is January 1, 2019.
Do you foresee any issues with meeting this timeline? Yes No

If yes, why?

SAMPLE EOI FORM

Are there features of the LSSi competition such as schedule, payment mechanism, technical requirements or other factors that materially impact your level of interest in participating in the competition?

Yes No

If yes, why?

Please describe the proposed LSSi facilities below:

Name of plant/unit _____

Average load [MW] _____ Max Load [MW] _____ Average Availability [%] _____

Will your load change in the future? Yes No If yes, by how much? _____

What contract volume are you interested in submitting [MW]? _____

CONFIRMATION, ACKNOWLEDGMENT AND AUTHORIZATION

By submitting this EOI Form, you:

- Confirm you have reviewed the REOI and are interested in receiving further information regarding this LSSi competition.
- Acknowledge that the REOI is an inquiry only and does not imply a commitment by the AESO to proceed with any competitive bidding process for the procurement of LSSi as discussed in the REOI; and
- Authorize the AESO to send further correspondence relevant to the REOI via the email address provided in this form.

On behalf of the Interested Party, this EOI Form is submitted by:

Name _____

Title _____

Company _____

Date _____

Attachment A:

LOAD SHED SERVICES FOR IMPORTS (LSSi) REQUIREMENTS

This document outlines the eligibility criteria and requirements that a LSSi Service Provider needs to meet in order to provide LSSi.

Definitions

Capitalized terms not defined in this document shall have the meaning ascribed to them in the AESO's [Consolidated Authoritative Document Glossary](#).

1. Eligibility to Provide LSSi

- 1.1 The load offered for LSSi must be located within the Alberta Balancing Authority Area and be connected to the AIES.
- 1.2 The load must be able to provide a minimum of 1 MW of LSSi.
- 1.3 The load may be an aggregation of several individual loads from various facilities throughout the AIES irrespective of whether the individual loads are electrically separated from each other via transmission or not.
- 1.4 Loads that are part of the [Under Frequency Load Shedding \(UFLS\) program](#) are eligible to provide LSSi except for the time-delayed blocks D1, D2 and D3. The AESO may need to evaluate the total volume of loads participating in LSSi that are also part of the UFLS program. The LSSi Service Provider needs to inform the AESO whether the load offered for LSSi is connected to an UFLS relay and if so, the UFLS relay setting value.
- 1.5 The AESO may need to evaluate the maximum amount of load offered for LSSi in any one geographical location or by any one LSSi Service Provider if the Trip of this amount of load causes an adverse impact on system reliability in the area of the LSSi Service Provider.

2. Communication Requirements

- 2.1 The LSSi Service Provider must be able to receive and respond to SCADA signals received from the System Controller energy management system (EMS) as primary communication for the purpose of arming/disarming the LSSi scheme, receiving and responding to the SCADA Trip Signal, and for load restoration. The LSSi Service Provider must install and maintain reliable telemetry signals to the System Controller in accordance with the ISO rule 502.8 (SCADA technical and operating requirements). Both analog and status points shall have a latency of no more than 30 seconds. LSSi Service Providers are exempt from the requirement to provide GPS time synchronization and 1ms time stamped accuracy as stated in sub-section 8 of the ISO rule 502.8.

a) *The following analog SCADA data shall be provided:*

From the LSSi Service Provider to the AESO:

- The total amount of real power (MW) that is being consumed or is being consumed as an aggregated volume by the LSSi Service Provider that is subject to LSSi (the “Actual Volume”); a measured quantity
- The amount of real power offered by the LSSi Service Provider (in MW and recorded as a whole number) (the “Offered Volume”); an entered quantity
- The amount of real power (in MW), agreed by the LSSi Service Provider, to be armed for LSSi following a Dispatch (the “Armed Volume”); an entered quantity

From the AESO to the LSSi Service Provider:

- The amount of real power (in MW) to be armed for LSSi as Dispatched by the System Controller (the “Dispatched Volume”); an entered quantity

b) *The following status SCADA data shall be provided:*

From the LSSi Service Provider to the AESO:

- Armed or disarmed status of the service. This is a contact that is either open or closed, where open means “disarmed” and closed means “armed” (or a corresponding digital signal, or a word)
- SCADA Trip Signal status confirmation
- The SCADA Trip Signal will be a 2 second momentary pulse signal from the AESO and the SCADA Trip Signal response will be a 30 second momentary pulse returned to the AESO by the LSSi Service Provider

From the AESO to the LSSi Service Provider:

- An arm or disarm Dispatch signal; an entered quantity that can be either a digital value or a word
- SCADA Trip Signal status

2.2 The LSSi Service Provider must be able to receive and respond to voice communication from the System Controller as backup communication. Voice communication for normal telephone service shall be in accordance with ISO rule 502.4 (Automated Dispatch and Messaging System and Voice Communication System Requirements), Table 1, Column A. Market Participant, Subcategory, Section 2. Note that access to the AESO Automated Dispatch and Messaging System (“ADaMS”) is not required for the provision of LSSi.

Refer to Section 1 of Attachment “1” for an illustration of the LSSi SCADA communications.

3. Operational Requirements

- 3.1 The LSSi Service Provider must be able to arm and disarm the LSSi scheme. “Arming” means enabling the functionality of the LSSi scheme such that it is continuously measuring system frequency and operates when the target frequency is reached or a SCADA Trip Signal is received. “Disarming” means disabling the functionality of the LSSi scheme such that no load shedding happens as a result of a frequency deviation or if a SCADA Trip Signal is received.
- 3.2 An LSSi Service Provider may not arm a LSSi scheme without receiving a Dispatch or verbal instruction from the System Controller to do so.
- 3.3 The LSSi Service Provider must arm or disarm the LSSi scheme within fifteen (15) minutes in response to a SCADA Dispatch from the System Controller. The Dispatch may be verbal under emergency conditions or if the telemetry / SCADA system has failed.
- 3.4 Once the LSSi scheme is armed, the Actual Volume that will be Tripped by the LSSi scheme must remain within ninety five percent (95%) to one hundred and fifty percent (150%) of the Dispatched Volume.
- 3.5 Once a load volume has been armed, the LSSi Service Provider must maintain the Armed Volume within the tolerances, described in Section 3.4, for at least the duration of the scheduling hour. A scheduling hour has duration of 80 minutes: it begins 10 minutes before the hour, includes the 60 minutes of the hour and includes 10 minutes of the following hour. If the LSSi Service Provider desires to change the Offered Volume, the change will be Dispatched by the System Controller no later than the next scheduling hour.
- 3.6 An LSSi Service Provider must have their Offered Volume for the next scheduling hour submitted to the AESO no later than twenty three (23) minutes prior to the start of the next hour. At that time the Offered Volume in place becomes a commitment of Availability for the next scheduling hour.
- 3.7 Once the LSSi scheme has been armed it may not be disarmed until a Dispatch or verbal instruction to that effect is received from the System Controller.
- 3.8 The LSSi Service Provider must ensure that their SCADA point for the Actual Volume is current and accurate at all times with the amount of LSSi load available from the LSSi Facility.
- 3.9 Once the LSSi Service Provider has received a SCADA Dispatch to arm LSSi, the System Controller will interpret the telemetered real power consumed by the LSSi load as the Armed Volume.
- 3.10 An LSSi Service Provider Dispatched at thirty five minutes after any hour (“XX:35”) must provide service at the Armed Volume within fifteen (15) minutes for the scheduling hour that starts at 10 minutes prior to the start of the next hour (“XX:50”). Hence, a Dispatch at 12:35 creates a firm commitment to provide service at the Armed Volume until as late as 2:10.
- 3.11 Any load participating in LSSi must be able to remain off the grid for up to sixty (60) minutes.

- 3.12 After a Trip event, when the LSSi scheme has operated and the load has been shed, the LSSi Service Provider can restore the load only when directed by the System Controller, or after a minimum of sixty (60) minutes have elapsed from the Trip event instant.
- 3.13 The LSSi Service Provider is not obligated to restore a load subject to a Trip event. However, the LSSi Service Provider must ensure that the Offered Volume telemetered to the AESO via SCADA is accurate and reflects the LSSi Service Provider's capability.
- 3.14 Any load that is Tripped must not be restored automatically or taken over by another feeder at any other point within the System and shall remain off the grid until the System Controller has directed the LSSi Service Provider that it is safe to restore their load or after a minimum of sixty (60) minutes have elapsed from the time of the event that caused the LSSi load to Trip. The System Controller will notify the LSSi Service Provider that it is safe to restore their load by sending the LSSi Service Provider a disarm signal. Phone communication will be used as a back-up to the disarm signal.
- 3.15 The LSSi Service Provider must comply with the provisions of ISO Rule 303.1 (Load Shed Service) as revised, amended, or otherwise modified from time to time.
- 3.16 LSSi requires that the committed amount of load is disconnected from the System within ten (10) minutes of the SCADA Trip Signal being sent from the AESO. See Section 2.2 of Attachment 1 for further information.

4. Technical Requirements – Underfrequency Relay Scheme

- 4.1 When armed, the under-frequency relay scheme requires that the Armed Volume is disconnected from the System within zero point two (0.2) seconds (12 cycles) of the frequency reaching 59.50 Hz (+/- 0.02 Hz). The zero point two (0.2) seconds is the sum of the frequency measurement time plus any time required to Trip the load. See Section 2 of Attachment 1 for further information.
- 4.2 The under-frequency relay scheme shall be developed using digital under-frequency relay(s) measuring frequency at the load facility. Each isolation device to be Tripped must be directly connected to the under-frequency relay. A remote “central” measurement point with communications between the under-frequency relay and the isolation device is prohibited.
- 4.3 A relay used in the UFLS program must not be used for the under-frequency relay scheme.
- 4.4 The LSSi Service Provider must be capable of recording the frequency, timing and real power (in MW) for the Trip event that was triggered by the under-frequency relay scheme. The Trip event record must be comprehensive enough such that the pre-Trip event and post-Trip event recording clearly demonstrates performance. The Trip record to be provided to the AESO must include the following:
 - a) the frequency observed by the relay at the site where the load is being shed;
 - b) the RMS real power (MW) of the load (either total plant load or LSSi load) prior to the under frequency event and the RMS real power (MW) of the load (either total plant load or LSSi load) after the under-frequency event; and
 - c) demonstration that the load was shed in 12 cycles (200ms) or less, once a frequency of 59.5 Hz is detected by the under-frequency relay.

4.5 The LSSi Service Provider must be capable of providing the Trip event record in digital form, preferably in “csv” format. The record shall show the actual volume for sixty (60) seconds prior to the Trip event, during the Trip event and for sixty (60) seconds after the Trip event.

- a) A data file such as Disturbance Fault Recorder (“DFR”) type data using sixty (60) Hz current and voltage sine wave traces are not acceptable.

4.6 The above record shall be retained by the LSSi Service Provider for a minimum of one (1) year after any Trip event.

5. Monitoring

5.1 The AESO will monitor the response of load assets to Trip events through the normal telemetry (SCADA) system. However, because the SCADA system does not provide sufficient detail for any given event, the AESO may request the LSSi Service Provider to provide a copy of the electronic record referred to in 4.4 through 4.6 above following every Trip event.

6. Testing

6.1 The LSSi Service Provider must provide the AESO, with a report certified by a Professional Engineer registered with the Association of Professional Engineers and Geoscientists of Alberta (APEGA), of a test confirming that the load will disconnect from the System within zero point two (0.2) seconds following an event wherein the system frequency reaches fifty-nine point five (59.5) Hz.

6.2 Upon the AESO's request, the LSSi Service Provider must schedule a test with the AESO for verification that the SCADA Trip Signal being sent from the AESO is received and that the proper response sent from the LSSi Service Provider is received by the AESO.

6.3 The AESO also requires a certified report demonstrating the data collection and retention ability of the LSSi scheme that meets the requirements described in section 4.4 through 4.6.

6.4 The above certified test described in 6.1 needs to be repeated any time there is a material change to the equipment providing the LSSi and the report of the new test must be submitted to the AESO.

6.5 The functional test described in 6.1 above needs to be repeated after five (5) years of a previous test and the certified report submitted to the AESO, even if there has been no change to the equipment.

6.6 Any time there has been a failure of the LSSi scheme to comply with any of the foregoing requirements above, the AESO may require the performance of a test after corrective action has been taken in order to confirm the capability of the LSSi scheme.

6.7 The AESO does not require that any testing of the LSSi scheme is required to actually Trip the load.

See Section 3 of Attachment “1” for an illustration of two loads being armed, Tripped and restored.

ATTACHMENT "1"

Attachment "1" is provided for guidance and information purposes only.

1. Illustration of LSSi SCADA Communications for Arming and Offers

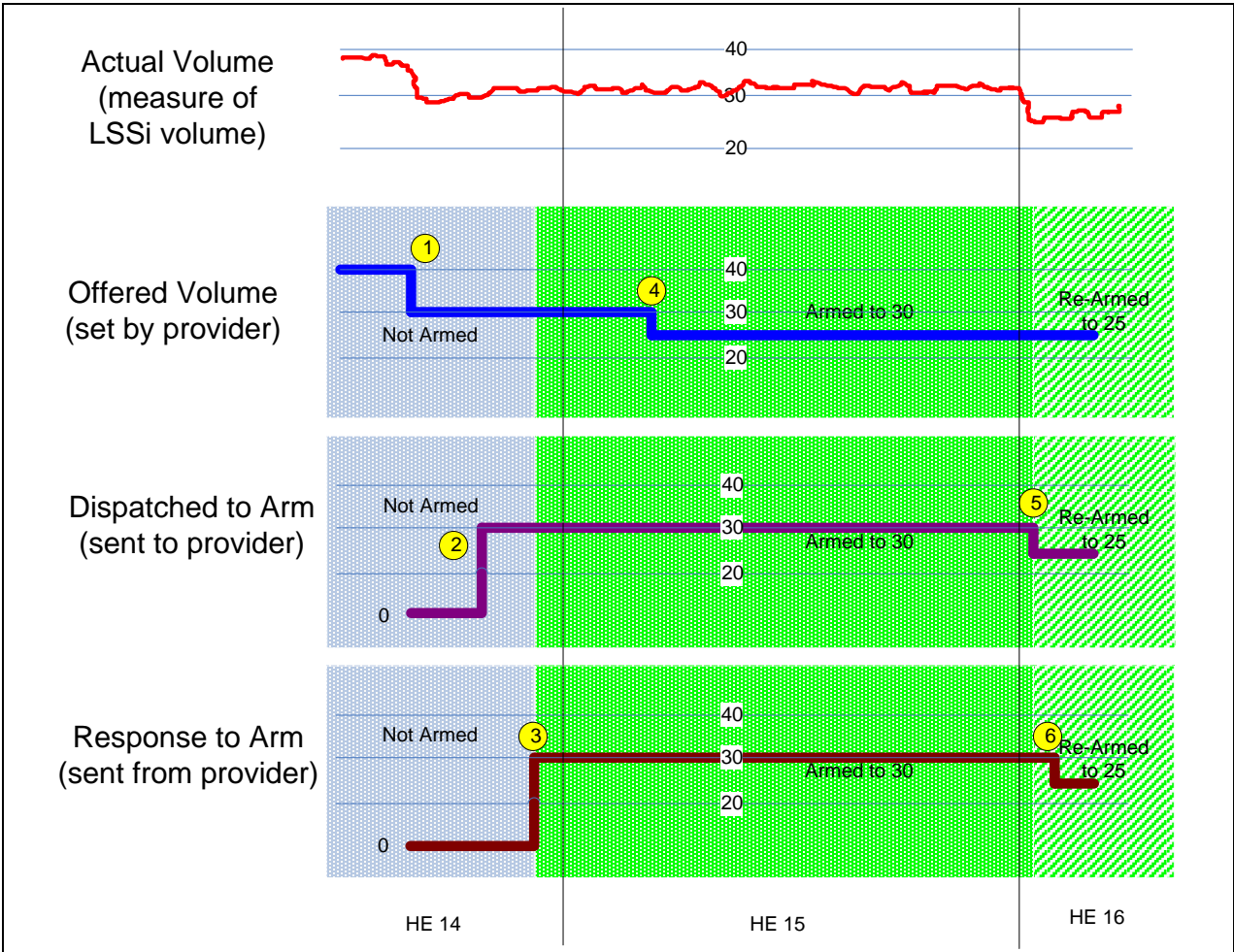


Figure 1: Illustration of the LSSi SCADA communication for Arming and Offers

The highlighted events above correspond to the following actions:

- 1) At 13:23 the LSSi Service Provider changes their Offered Volume from 40 MW to 30 MW. The change is transmitted via SCADA to the System Controller indicating that the LSSi Service Provider can only offer 30 MW of LSSi from this point forward. At this point the LSSi Service Provider is not armed and does not have any volume obligations.
- 2) At 13:45 the System Controller determines that 30 MW of LSSi are required from the LSSi Service Provider based on net import schedule and a merit order of LSSi Service Provider offers. The Dispatched Volume is transmitted by SCADA to the LSSi Service Provider, indicating that the System Controller will require the 30 MW of offered LSSi to be armed. The System Controller

expects the LSSi Service Provider to comply with the Dispatch within fifteen (15) minutes of the Dispatch.

- 3) At 13:54 the LSSi Service Provider arms the LSSi scheme and ensures that the load armed to Trip reflects the Offered Volume. The state of the LSSi scheme (armed or not armed) and a confirmation of the 30 MW Armed Volume are sent back to the System Controller indicating the site is armed for 30 MW, as Dispatched.
- 4) At 14:16 the LSSi Service Provider determines they only wish to provide 25 MW of LSSi from this point forward and changes their Offered Volume to 25 MW. However, because the LSSi Service Provider was already armed for 30 MW, they are committed to provide that 30 MW for the remainder of the current scheduling hour unless Dispatched otherwise by the System Controller. The System Controller will Dispatch the Service Provider for the new Offered Volume at 15:10, i.e. the volume is firm for the scheduling hour.
- 5) At 15:10 the System Controller Dispatches the LSSi from 30 MW to the new Offered Volume of 25 MW. The System Controller may not always need the LSSi Service Provider to maintain the originally Armed Volume of 30 MW until 15:10 due to a change in the intertie schedule, for example, but the LSSi Service Provider must be capable of maintaining the load until 15:10 unless Dispatched otherwise by the System Controller. This new Dispatch is transmitted by SCADA to the LSSi Service Provider indicating that the System Controller will require the 25 MW of offered LSSi to be armed. The System Controller expects compliance to the Dispatch Volume within fifteen (15) minutes of the Dispatch instruction.
- 6) The LSSi Service Provider ensures that the Actual Volume reflects the Armed Volume. The state of the LSSi scheme (armed or not armed) and a confirmation of the 25 MW Armed Volume are sent back to the System Controller indicating that the site is armed for 25 MW, as requested.

2. Guide to Meeting the LSSi Trip Requirement

2.1 The requirement to provide LSSi is that the committed real power (MW) amount is disconnected from the System within zero point two (0.2) seconds of the system frequency reaching fifty-nine point five (59.5) Hz. It can be met by employing an under-frequency relay set to fifty-nine point five (59.5) Hz and installing a fast breaker such that the total time used for measurement and breaker operation is zero point two (0.2) seconds or less. See Figure 2 below.

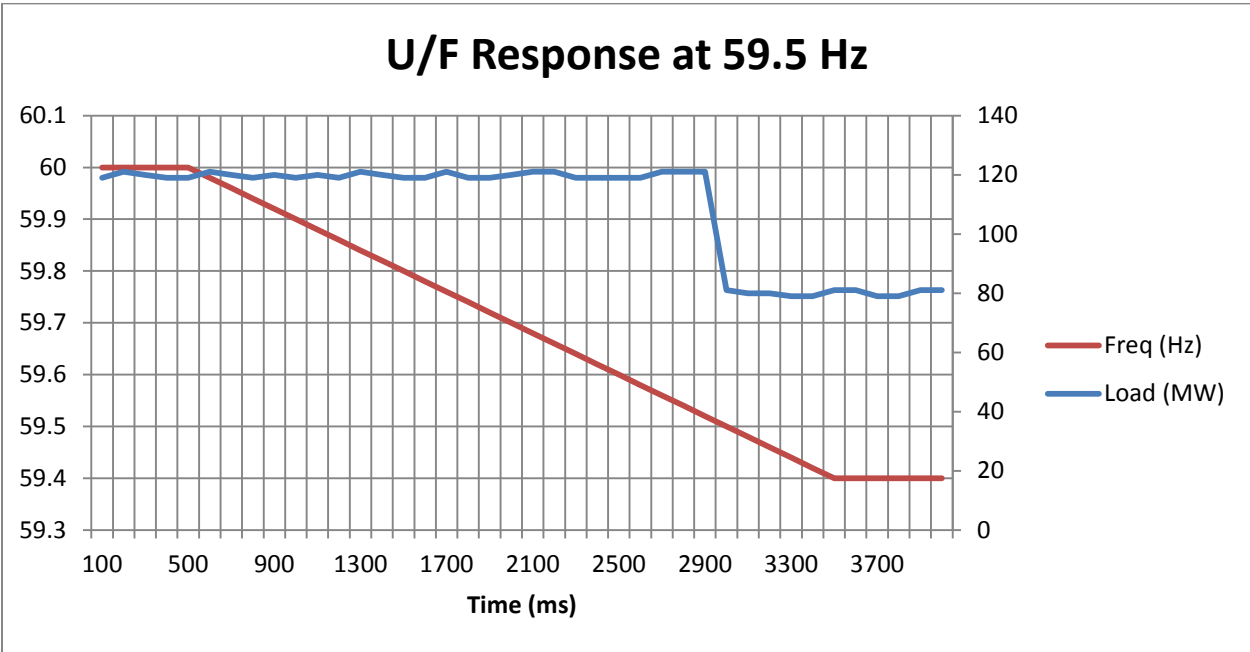


Figure 2: Shows a load disconnecting from the System 0.2 seconds after the system frequency reaches 59.5 Hz when the under-frequency relay is set at 59.5 Hz. The amount of load shed is 40 MW as indicated by the right hand scale.

2.2 Additionally a SCADA Trip Signal may be sent from the AESO at any time. When the SCADA Trip Signal is sent by the AESO the LSSi Service Provider must remove the Armed Volume within ten (10) minutes.

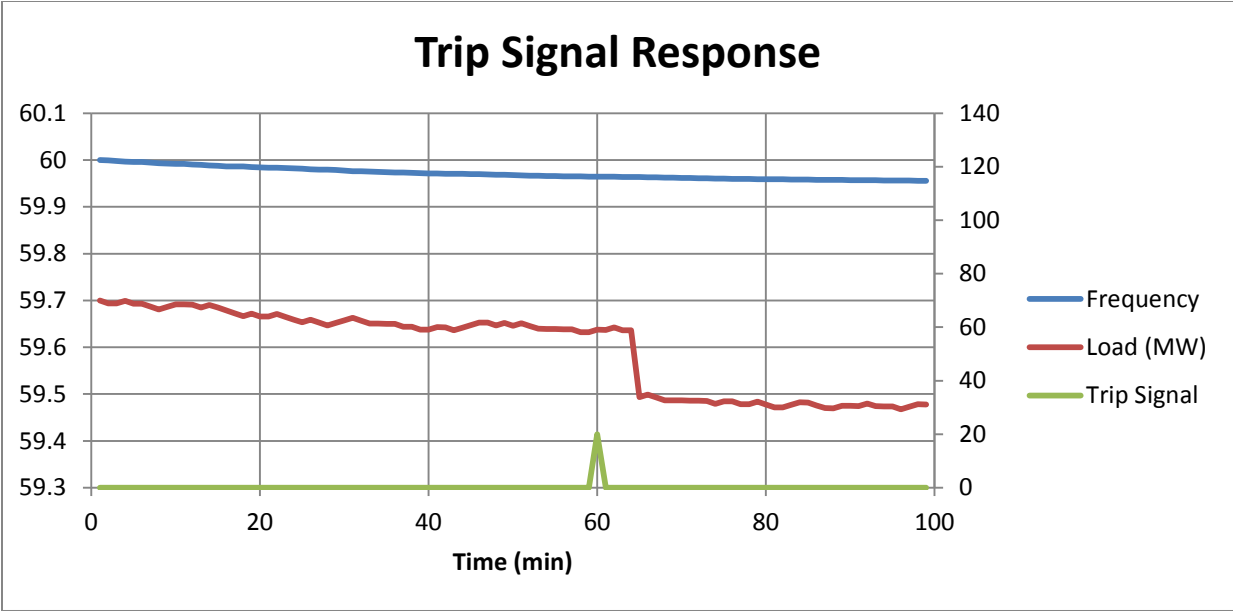


Figure 3: Shows a load disconnecting from the System within 10 minutes of the AESO SCADA Trip Signal being sent to the LSSi Service Provider. The amount of load shed is 30MW as indicated by the right hand scale.

3. LSSi Arming, Tripping and Restoration Sequence

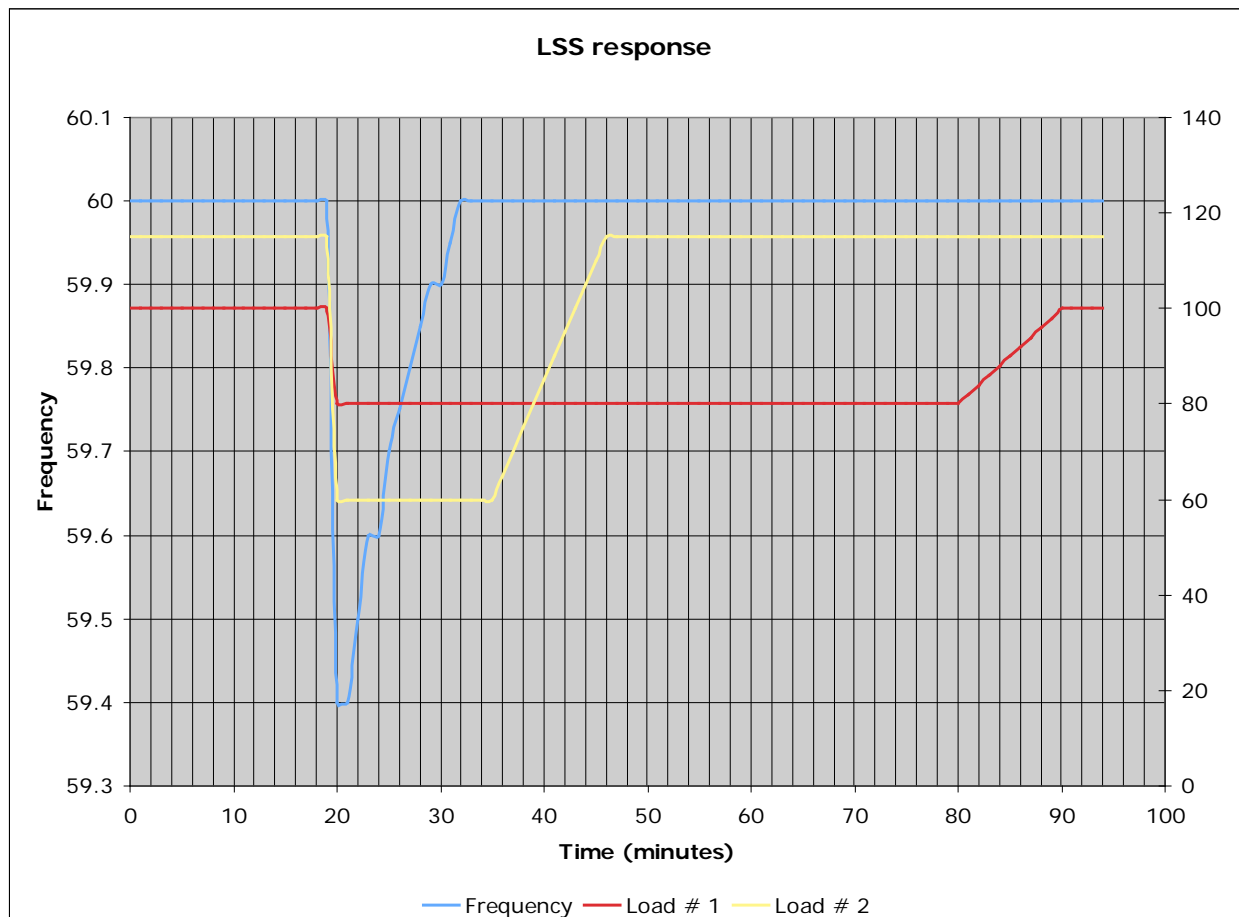


Figure 4: Example of two LSSi loads being armed, Tripped and restored as follows (load MW shown in the right hand scale).

Timeline for a 59.5 Hz under-frequency load shed on the System:

- 3.1 at time $t = 0$ Load # 1 is armed for 20 MW and Load # 2 is armed for 55 MW;
- 3.2 at time $t = 19$ minutes, a system event takes place and the frequency drops to 59.4 Hz and Load # 1 sheds 20 MW and Load # 2 sheds 55 MW;
- 3.3 at time $t = 32$ minutes the frequency is restored to normal;
- 3.4 at time $t = 35$ minutes the System Controller releases the Trip directive for Load # 2 and allows it to restore. However, the directive for Load # 1 is not released so it remains at the reduced level;
- 3.5 at time $t = 80$ minutes (60 minutes after it Tripped) Load # 1 begins to self-restore even though the Trip directive has not been released by the System Controller.