



# LOAD SHED SERVICE for IMPORT (LSSi) Requirements

**Requirements for the Provision of Load Shedding  
Service for Import**

**Version 3.0**

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# Change History

<b>Date</b>	<b>Version</b>	<b>Detail</b>	<b>Changes By</b>
Jan 20, 2011	2.0	New Issue	L. Jamniczky
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**This document** outlines the eligibility criteria and requirements that an LSSi Provider needs to fulfil in order to provide LSSi.

## **DEFINITIONS**

Capitalized terms not defined in this document and its attachments 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 Provider needs to inform the AESO whether the load offered for LSSi is connected to a UFLS relay and if so, what the UFLS relay setting is.
- 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 provider if the trip of this amount of load causes a violation of reliability criteria.

### **2. Communication Requirements**

- 2.1 The LSSi 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 and for load restoration. The LSSi Provider must install and maintain reliable telemetry signals to the System Controller in accordance with the AESO SCADA Standard. In particular, the requirements in Section 4.4 and Section 5.1 through to Section 5.5 of the AESO SCADA Standard must be met with regards to the integrity scan and analog telemetry. Both analog and status points shall have a latency of no more than 30 seconds. LSSi Providers are exempt from the requirement to provide GPS time synchronization and 1ms time stamped accuracy as stated in Section 7 of the AESO SCADA Standard.
  - a) The following analog SCADA data shall be provided:
    - i) From the LSSi Provider to the AESO:

- A) The total amount of real power (MW) that is being consumed from the loads subject to LSSi (the “**Actual Volume**”); a measured quantity;
  - B) The offered amount of real power (MW) (the “**Offered Volume**”); an entered quantity;
  - C) The dispatched amount of real power (MW) agreed to be armed for LSSi (the “**Armed Volume**”); an entered quantity;
- ii) From the AESO to the LSSi provider:
    - A) The dispatched amount of real power (MW) to be armed for LSSi (the “**Dispatched Volume**”); an entered quantity;
  - b) The following status SCADA data shall be provided:
    - i) From the LSSi Provider to the AESO:
      - A) 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).
    - ii) From the AESO to the LSSi provider:
      - A) An arm or disarm dispatch signal; an entered quantity that can be either a digital value or a word.
- 2.2 The LSSi 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 the AESO [Operational Voice Communications Standard](#) as required under Table 4-1 for the category “All Participants who are required to receive ancillary service dispatches”. 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 An LSSi Provider may not arm an LSSi scheme without receiving a dispatch from the System Controller to do so.
- 3.2 Once the LSSi scheme has been armed it may not be disarmed until a dispatch to that effect is received from the System Controller.
- 3.3 The LSSi 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 The LSSi 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 facility and/or facilities.
- 3.5 Once the LSSi Provider has received a SCADA dispatch to arm the LSSi, the System Controller will interpret the telemetered real power consumed by the LSSi load as the Armed Volume.
- 3.6 Once a load volume has been armed, the LSSi Provider must maintain the Armed Volume within the tolerances, described in Section 4.5 below, for at least the duration of the scheduling hour<sup>1</sup>. If the LSSi Provider desires to change the Offered Volume, the change will be dispatched by the System Controller no later than the next scheduling hour.
- 3.7 An LSSi 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 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.
- 3.8 After a trip event, when the LSSi scheme has operated and the load has been shed, the LSSi 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.
- 3.9 The LSSi Provider is not obligated to restore a load subject to a trip event. However the LSSi Provider must ensure that the Offered Volume telemetered to the AESO via SCADA is accurate and reflects the LSSi provider's capability.
- 3.10 The LSSi Provider must comply with the provisions of [OPP 312](#) "Import Load Remedial Action Scheme (ILRAS) and Load Shed Service (LSS)", and the proposed ISO Rule 303.1 "Import Load Remedial Action Scheme Service and Load Shed Service" when it comes into effect.

#### 4. Technical Requirements

- 4.1 LSSi requires that the committed amount of load is disconnected from the AIES within 0.2 seconds (12 cycles) of the frequency reaching 59.50 Hz (+/- 0.02 Hz). The 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 LSSi scheme shall be developed using digital devices, with the possible exception of the circuit breaker that trips a load. Each device to be tripped shall be hard-wired to the under-frequency relay measuring frequency and no communications shall be used between a "central" measurement point and the device that is to trip.
- 4.3 A relay used in the UFLS program must not be used for LSSi.
- 4.4 The LSSi Provider must be able to arm and disarm the LSSi scheme. "**Arming**" means enabling the LSSi scheme's functionality such that it is continuously measuring system frequency and operates when the target frequency is reached. "**Disarming**" means

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<sup>1</sup> 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.

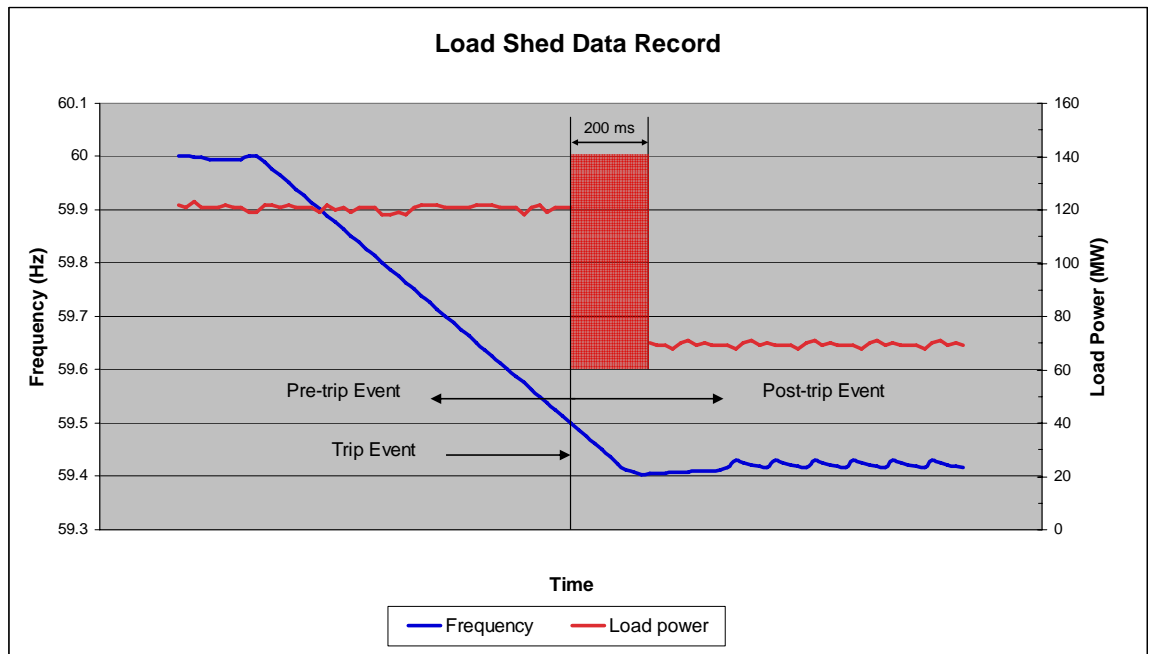
disabling the LSSi scheme's functionality such that no load shedding happens as a result of a frequency deviation.

- 4.5 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 twenty percent (120%) of the Dispatched Volume.
- 4.6 Any load that is tripped must not be restored automatically or taken over by another feeder at any other point within the AIES and shall remain off the grid until the System Controller has directed the LSSi 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 Provider that it is safe to restore their load by sending the LSSi Provider a disarm signal. Phone communication will be used as a back-up to the disarm signal.
- 4.7 Any load participating in LSSi must be able to remain off the grid for up to sixty (60) minutes.
- 4.8 The LSSi Provider must be capable of recording the frequency, timing and real power (MW) for the trip event. The trip record must be comprehensive enough such that the pre-trip event and post-trip event recording clearly demonstrates performance according to the requirements of the RFP. The trip record to be provided to the AESO must include the following:

- ◆ the frequency observed by the relay at the site where the load is being shed.
- ◆ 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.
- ◆ 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.

A data file such as Disturbance Fault Recorder (DFR) type data using 60 Hz current and voltage sine wave traces will not be acceptable.

The figure below shows an example of a 50 MW load being shed in 200 ms after the frequency reaches 59.5 Hz +/- 0.02 Hz



- 4.9 The above record shall be retained by the LSSi Provider for a minimum of one (1) year after any trip event.
- 4.10 The LSSi Provider must be capable of providing the trip event record in digital form, preferably in “csv” format to the AESO upon request. 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 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 Provider to provide a copy of the electronic record referred to in 4.8 through 4.10 above following every trip event.

## 6. Testing

- 6.1 The LSSi Provider must provide the AESO with a report certified by a Professional Engineer registered with The Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) of a test confirming that the load will disconnect from the AIES within 0.2 seconds following an event wherein the system frequency reaches 59.5 Hz.
- 6.2 The AESO also requires a report demonstrating the data collection and retention ability of the LSSi scheme that meets the requirements described in section 4.8 through 4.10.
- 6.3 The above certified test 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.

- 6.4 The functional test described 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.
- 6.5 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.
- 6.6 The AESO does not require that the test of the LSSi scheme 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

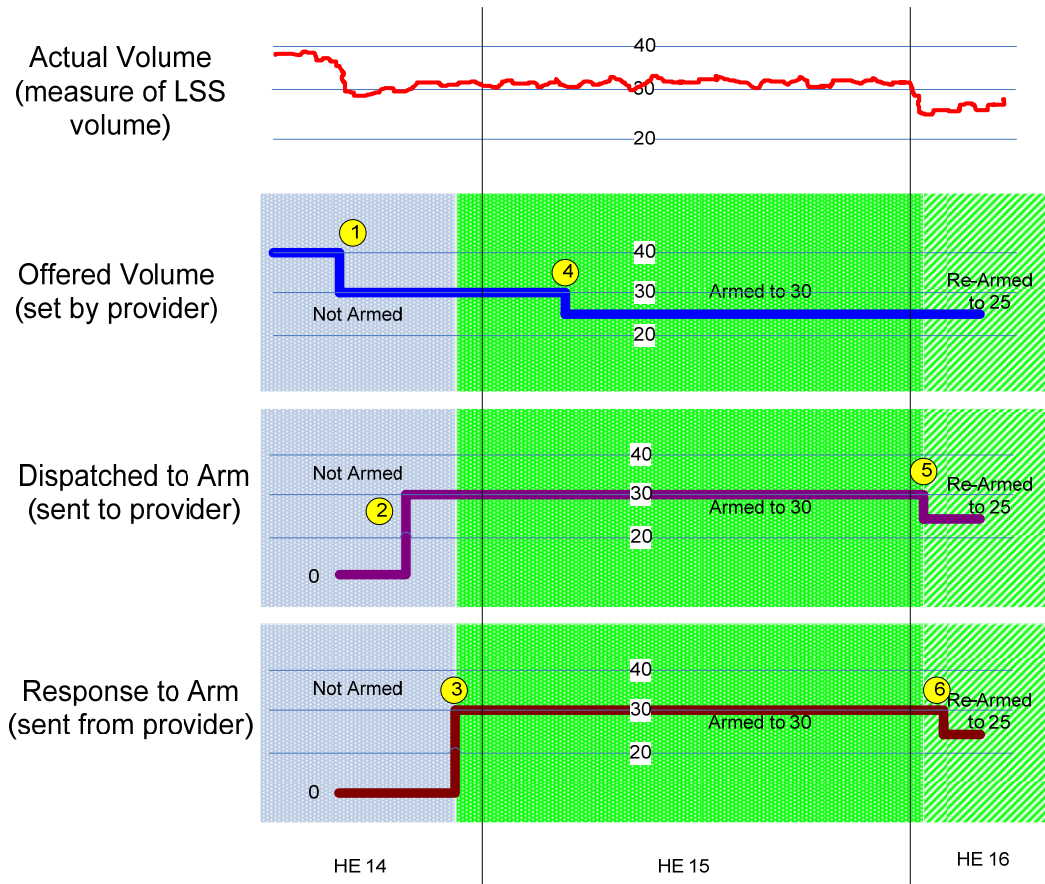


Figure 1 – Graphical Illustration of the LSSi SCADA Communication

The highlighted events above correspond to the following actions:

- 1) At 13:23 the LSSi 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 Provider can only offer 30 MW of LSSi from this point forward. At this point the LSSi 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 Provider based on net import schedule and a merit order of service provider offers. The Dispatched Volume is transmitted by SCADA to the LSSi Provider, indicating that the System Controller will require the 30 MW of offered LSSi to be armed. The System Controller expects the LSSi Provider to comply with the dispatch within 15 minutes of the dispatch.
- 3) At 13:54 the LSSi 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 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 Provider was already armed for 30 MW they are committed to provide that 30 MW unless dispatched otherwise by the System Controller. The System Controller will dispatch the 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 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 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 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 15 minutes of the dispatch instruction.
- 6) The LSSi 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

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

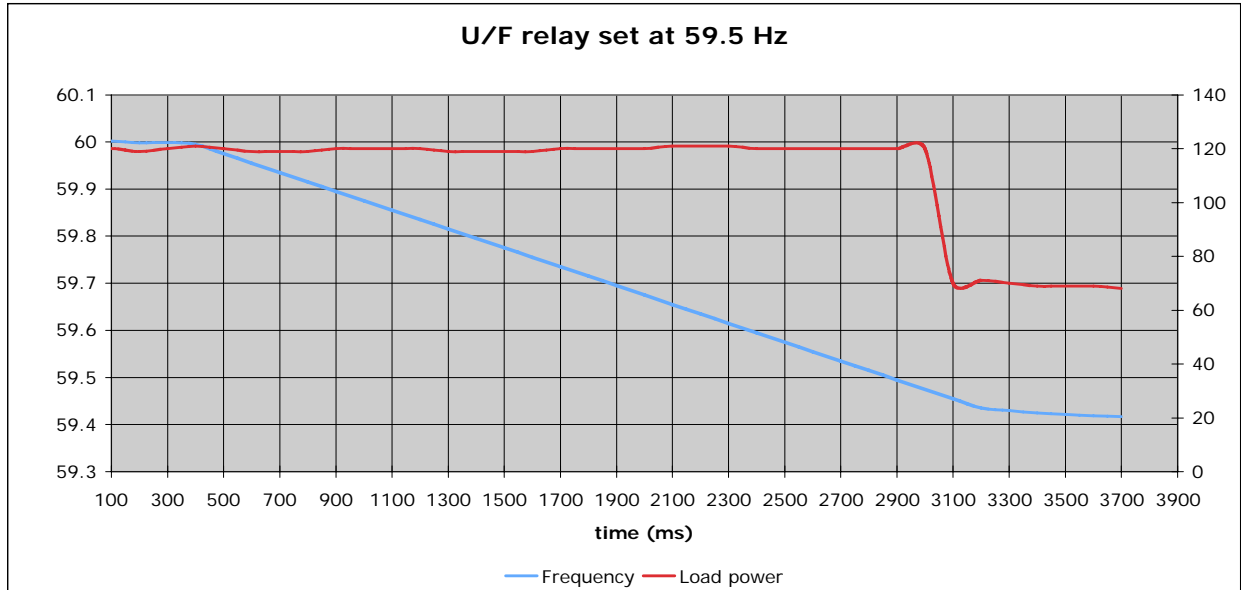


Figure 2 - Shows a load disconnecting from the AIES 0.2 seconds after the system frequency reaches 59.5 Hz when the under-frequency relay is set at 59.5 Hz. The amount of load shed is 50 MW as indicated by the right hand scale.

### 3. LSSi Arming, Tripping and Restoration Sequence

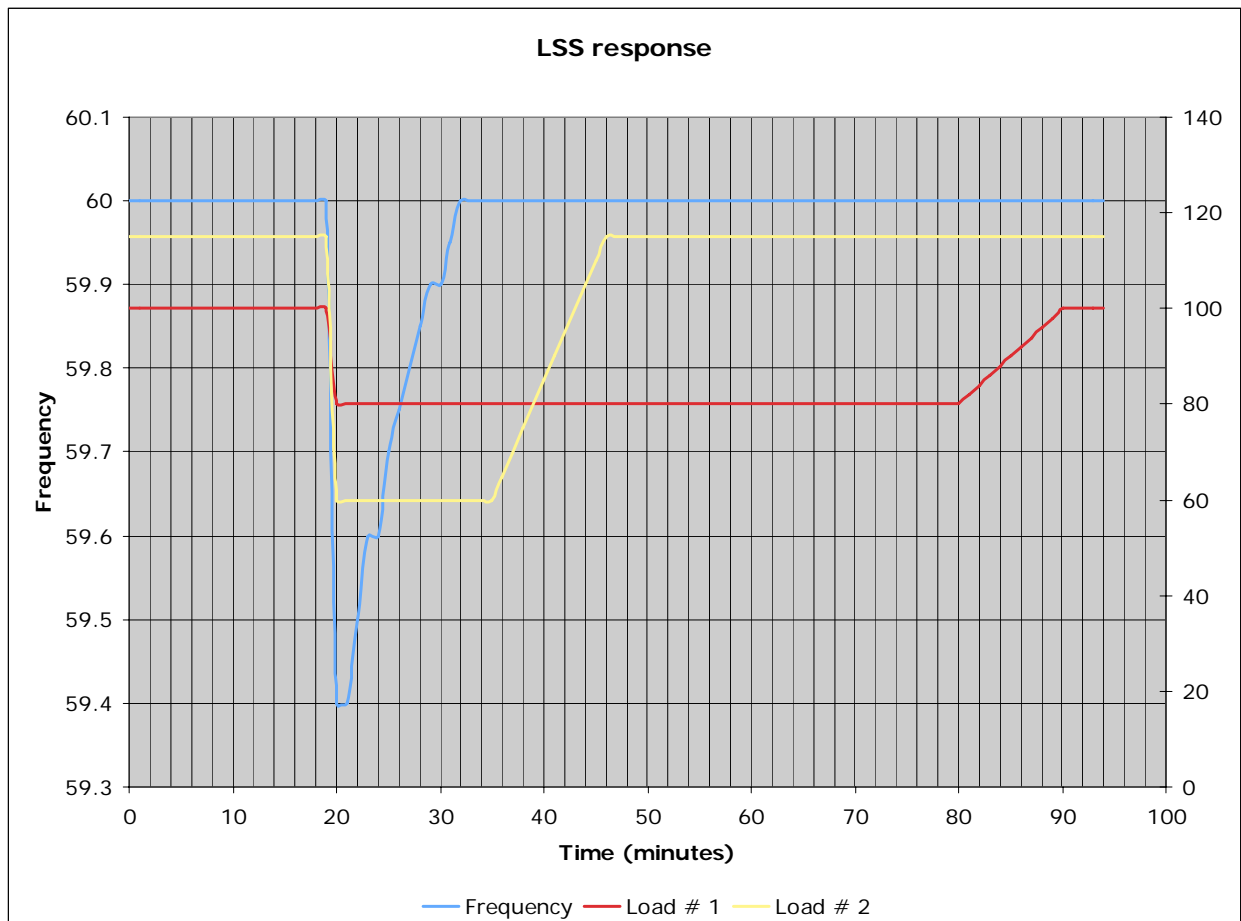


Figure 3 – Example of two LSSi loads being armed, tripped and restored as follows (load MW shown in the right hand scale):

- 1) at time  $t = 0$  Load # 1 is armed for 20 MW and Load # 2 is armed for 55 MW;
- 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) at time  $t = 32$  minutes the frequency is restored to normal;
- 4) at time  $t = 35$  minutes the SC 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;
- 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 SC.

#### 4. Under-Frequency Events from 2005 to 2010

The chart below is provided as information only and shows the number of under-frequency events experienced by the AIES at different frequency levels during the 2005 to 2010 period.

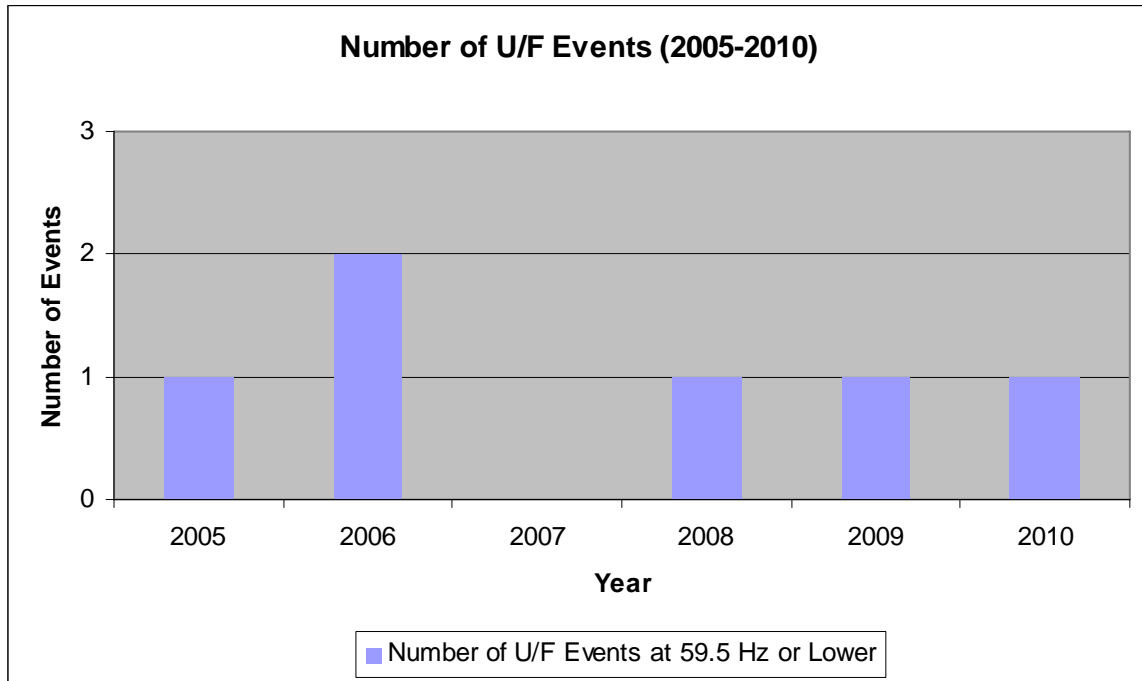


Figure 4 – Number of Under-Frequency Events at 59.5 Hz or lower for the years 2005 to 2010