

LSSi Technical Workshops

March 31, 2011 - Edmonton

April 1, 2011 - Calgary

This document is not part of the LSSi RFP



Welcome



- Purpose:
 - Review the technical specifications for LSSi
 - Provide potential service providers an opportunity to clarify technical questions prior to submitting a proposal in response to the RFP
- Out of Scope:
 - Commercial and/or compliance questions in relation to either the LSSi RFP or the LSSi Agreement

LSSi Background



Topics



- **Background**
- **Rationale for LSSi**
- **Benefit of LSSi**

Background – Demand Response



- Demand Response Workgroup initiated in 2008
- LSSi was identified as one option to increase load participation in the market
- Key driver is that LSSi increases import capacity on the BC intertie

Background – Transmission Regulation



- 16(2)** The plan to restore interties to their path ratings must specify how the ISO intends to restore and maintain each intertie to, or near to, its path rating without the mandatory operation of generating units. – AR 86/2007 (T-Reg)
- LSSi is a market service that serves to partially meet the T-Reg obligation on the import side

Background – Key Documents



- Demand Response Discussion Paper

[http://www.aeso.ca/downloads/Demand_Response_Discussion_Paper_-_Final_\(3\).pdf](http://www.aeso.ca/downloads/Demand_Response_Discussion_Paper_-_Final_(3).pdf)

- Intertie Restoration Discussion Paper

http://www.aeso.ca/downloads/Alberta_Intertie_Restoration_Initiative_-_Discussion_Paper.pdf

- Intertie Restoration Recommendation Paper

http://www.aeso.ca/downloads/Intertie_Restoration_Recommendation_Paper_Final.pdf

- Request for Expression of Interest in LSSi

http://www.aeso.ca/downloads/LSSi_EOI_11-05-2010_Final.pdf

- Request for Proposals - LSSi

http://www.aeso.ca/downloads/LSSi_RFP_FINAL.pdf

Why LSSi?

- LSS and LSSi both serve to offset impact of losing the B.C. intertie on the system
- Current LSS product is very similar to LSSi
- LSSi adds armable component
 - Making the service armable allows more total service to be used
 - Current LSS limit is about 150 MW due to concerns during export hours

LSSi Benefit

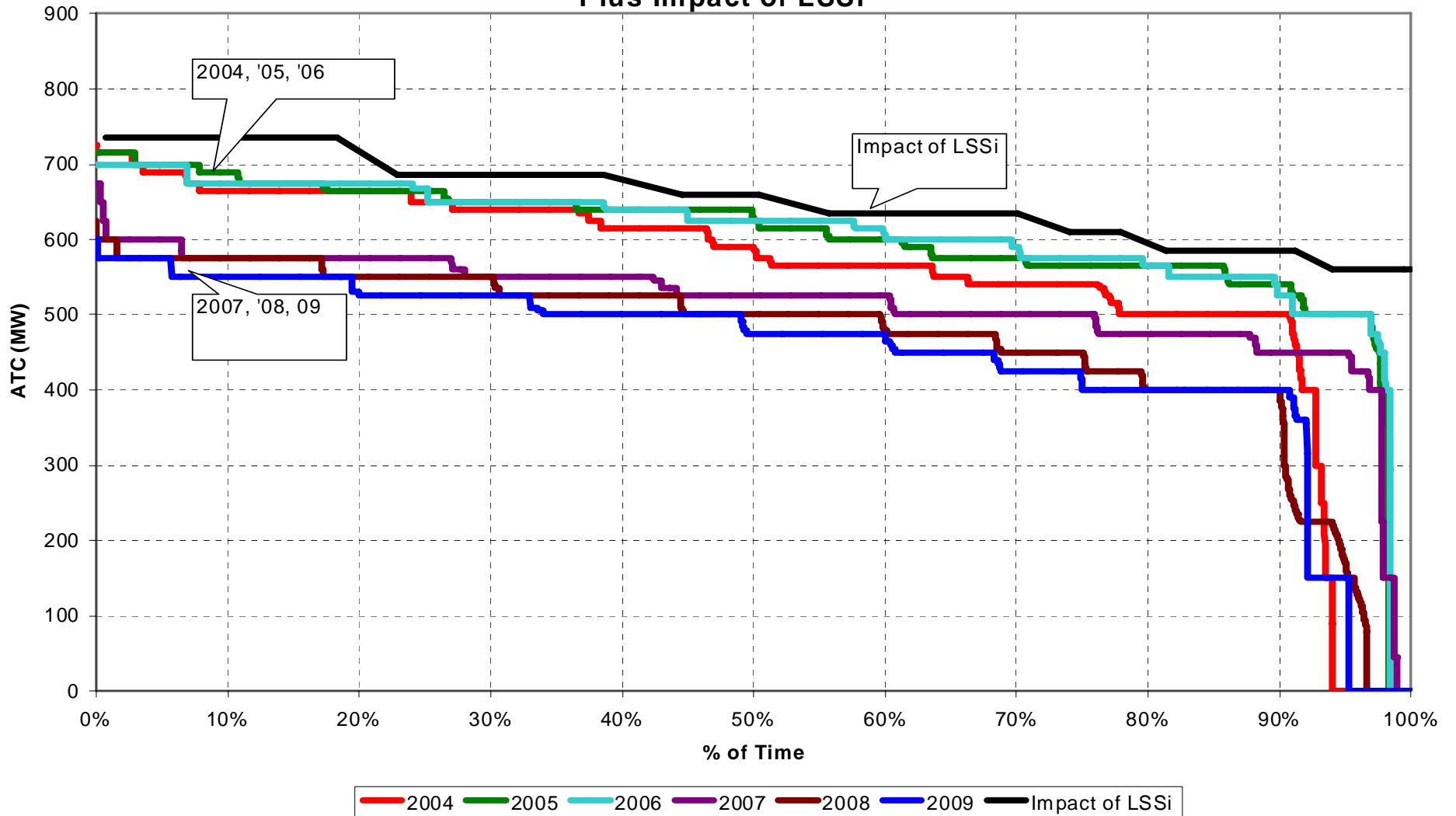


- Current maximum for imports is generally 600 MW
- LSSi can increase the ATC limit to 700 MW
- 380 MW of LSSi is effective in increasing the import limit
 - 380 MW of LSSi would put the import limit at 550 MW in low load hours and 700 MW in high load hours
 - 150 MW to 200 MW of import capacity added across the ATC duration curve
- AESO seeking to procure up to 485 MW in order to provide 'backup' in the LSSi availability

LSSi Benefit



BC Import ATC Duration Curve 2005 - 2009 Plus Impact of LSSi



Thank you



Overview of LSSi Technical Requirements



Eligibility to Provide LSSI



- Load must be within Alberta Balancing Authority Area
- The load must provide 1 MW or more
- The load may be the result of aggregation
- The load may be part of the UFLS program except for the time delayed blocks (D1, D2 and D3)

Technical requirements



- Load must be disconnected from the AIES within 12 cycles (200ms) of frequency reaching 59.5 Hz
- LSSi relay must not be the same as the UFLS relay
- Use digital devices hard wired to trip device (no communication between relay and trip device)
- Provider is able to arm/disarm the service
- After arming, the load to be tripped must be within 95% and 120% of the dispatched volume
- Load that is shed cannot be taken over by another feeder in the AIES
- Load must be able to stay off for 60 minutes
- Provider must be able to record frequency and load volume for 60 seconds prior to trip, during trip and 60 seconds after trip at a rate of 20ms or faster.
- This record must be stored for a minimum of one year and provided to the AESO upon request in “.csv” format

Monitoring



- AESO will monitor performance of the LSSi scheme via SCADA
- If needed AESO will request the “fast” data file described above

- Provider to give the AESO a certified test report showing 59.5 Hz trip in 12 cycles
- Tripping of the load itself is NOT required
- Provider to demonstrate to the AESO the “fast” data collection and retention ability
- Certified test to be repeated if material change to the equipment
- Certified test to be repeated after 5 years even if there is no change to the equipment
- Test may be required any time there is a failure of the equipment to comply with technical requirements

Questions?



Thank you



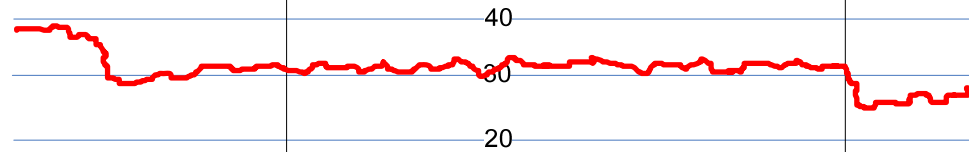
Appendices



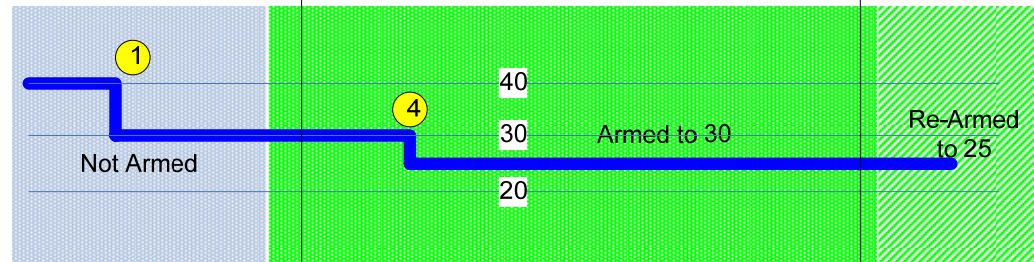
Illustration of some of the SCADA signals



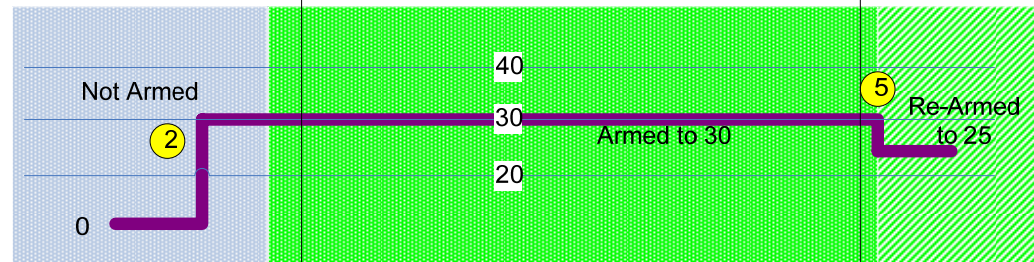
Actual Volume
(measure of LSS
volume)



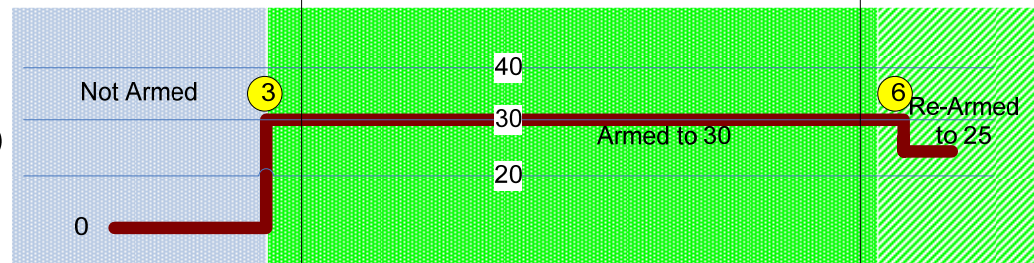
Offered Volume
(set by provider)



Dispatched to Arm
(sent to provider)



Response to Arm
(sent from provider)



HE 14

HE 15

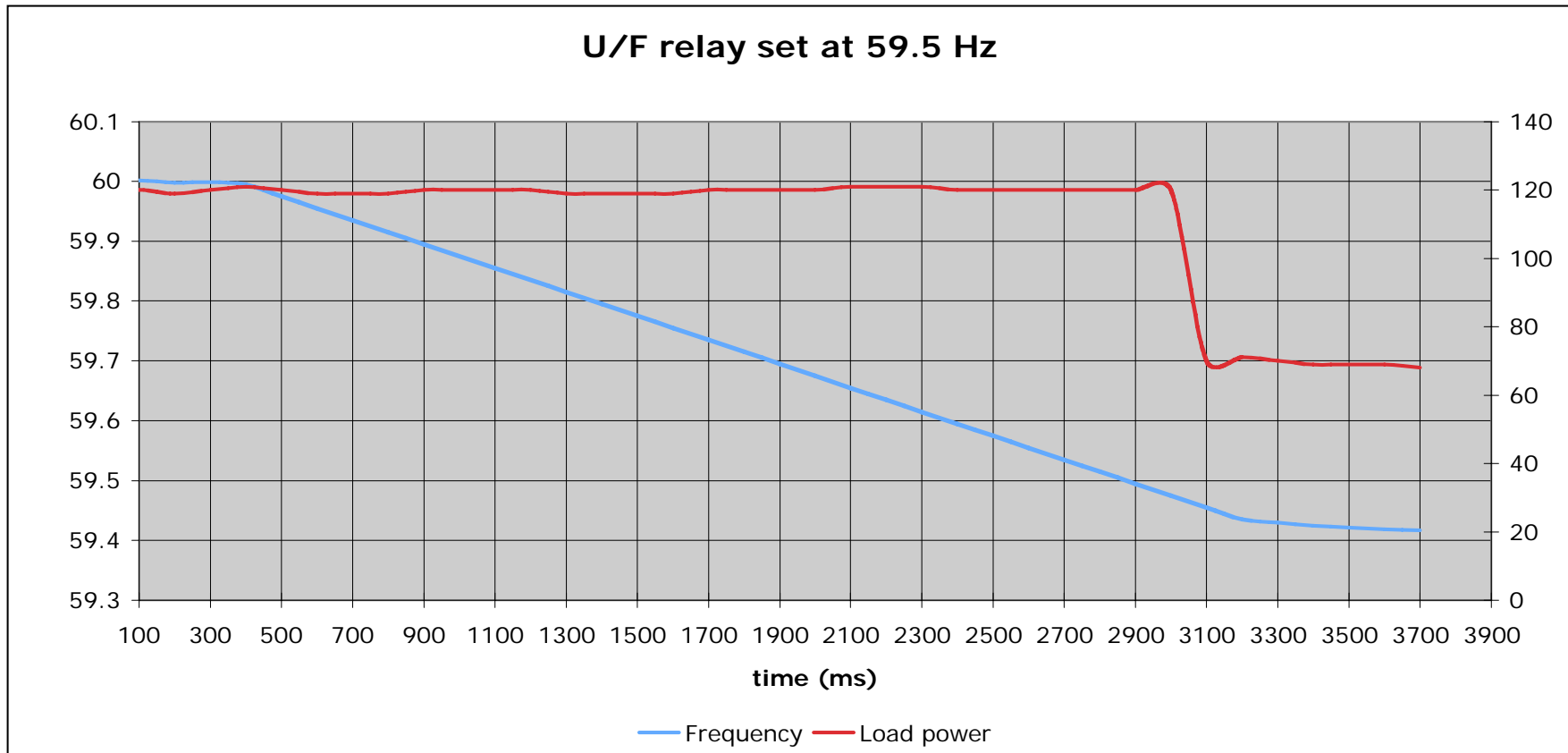
HE 16

Illustration of some of the SCADA signals (cont'd)

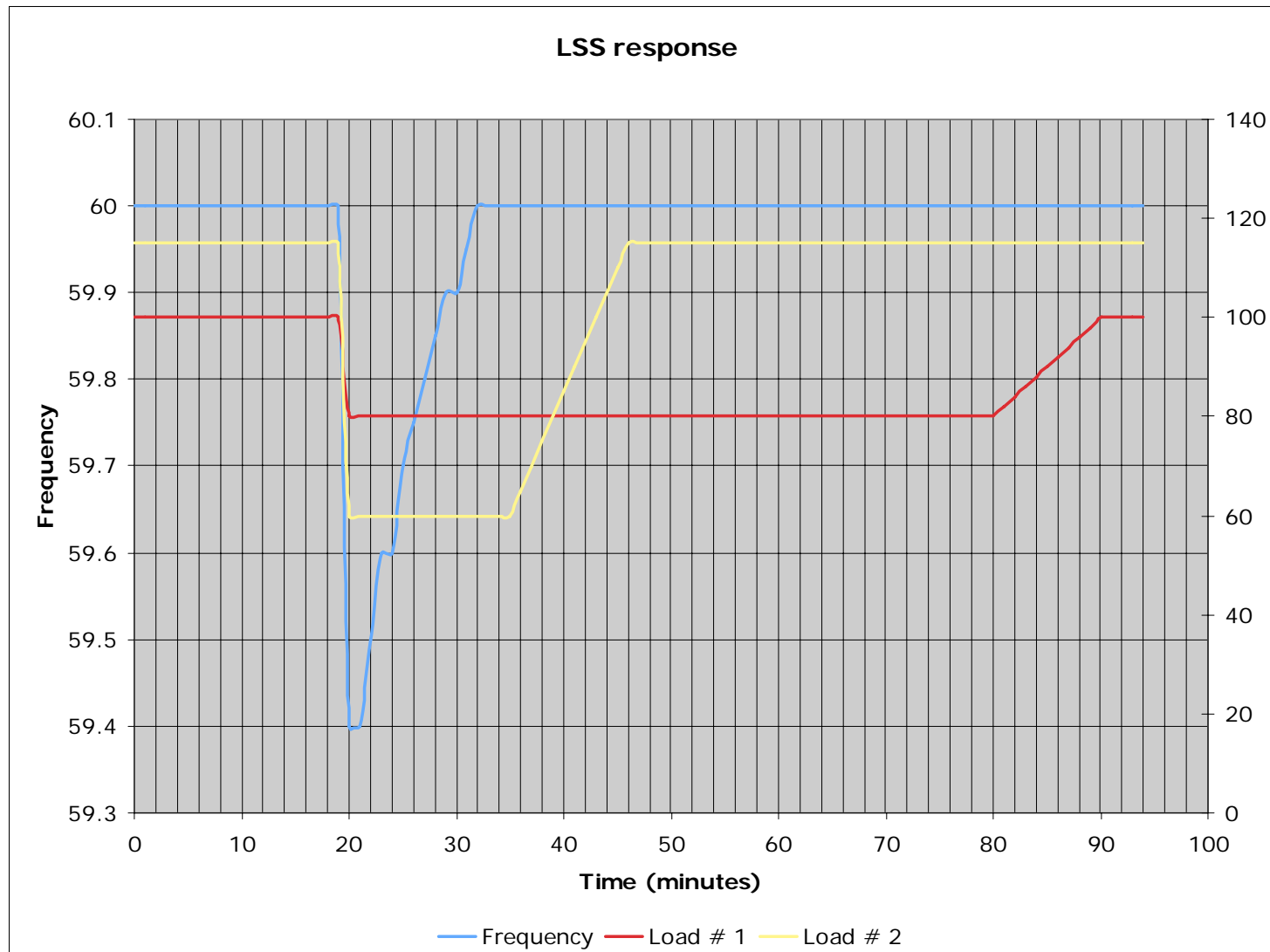


- 1) At 13:23 the LSSi Provider changes their Offered Volume from 40 MW to 30 MW. The change is transmitted via SCADA to the System Controller indicating that the LSSi Provider can only offer 30 MW of LSSi from this point forward. At this point the LSSi Provider is not armed and does not have any volume 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.

Tripping at 59.5 Hz in 12 cycles



LSSi tripping and restoration

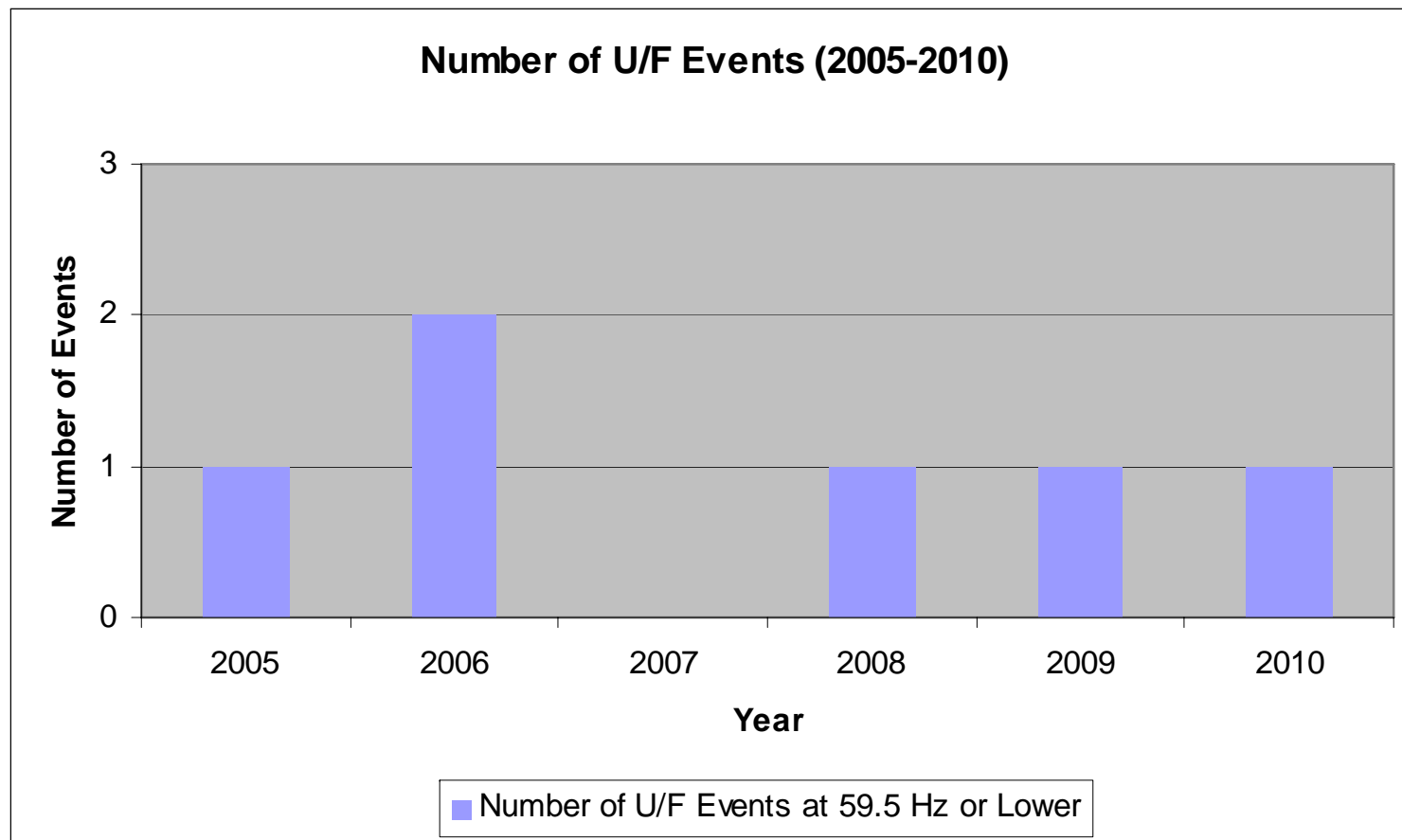


LSSi tripping and restoration (cont'd)



- 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.

History of under-frequency events



Overview of SCADA Requirements



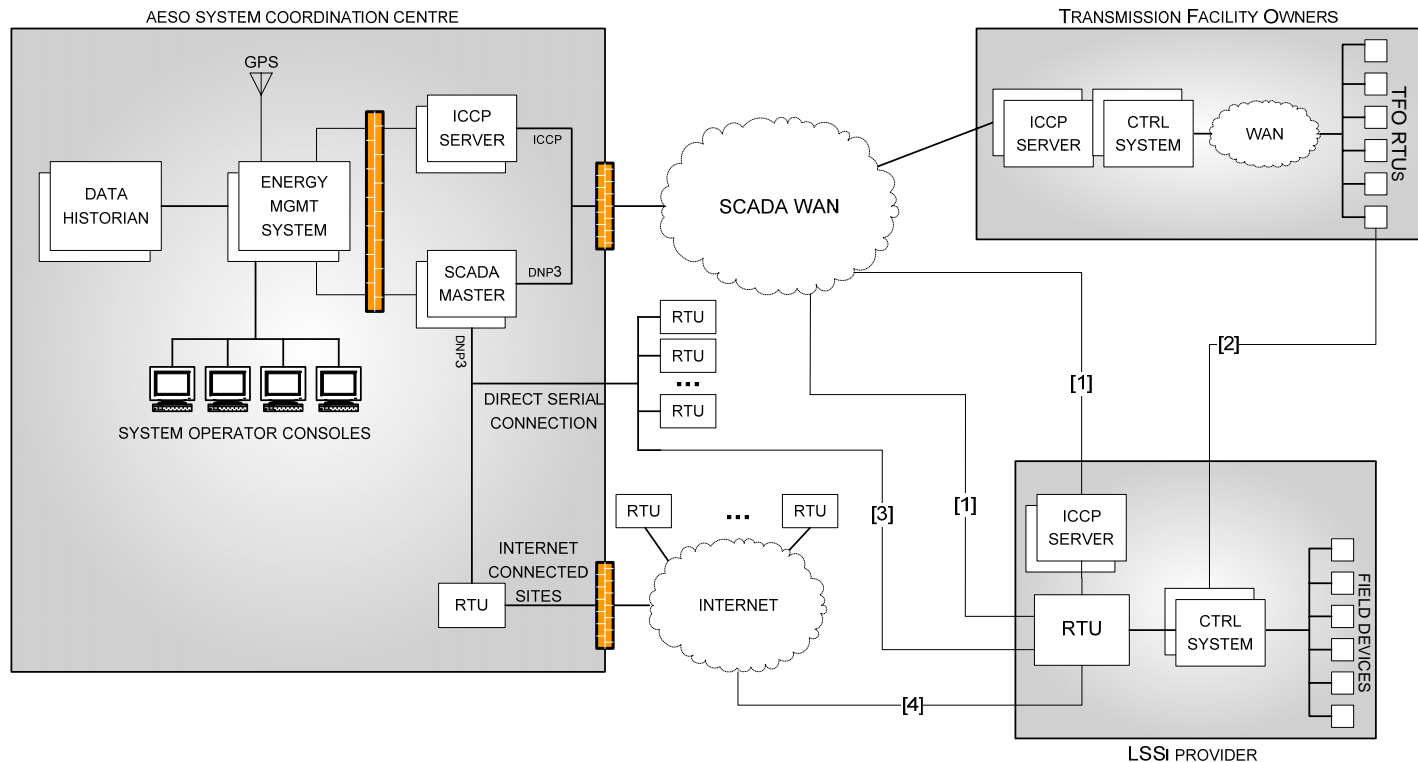
Introduction



1. Overview of EMS and Communication Options
2. Review of SCADA signals applicable to LSSi and technical requirements
3. EMS Connection Sub-process

Energy Management System and Communication Options

Typical LSSi Communication Options



SCADA communications can be established using the following options:

- [1] SCADA WAN
- [2] TFO WAN
- [3] Direct serial
- [4] Internet

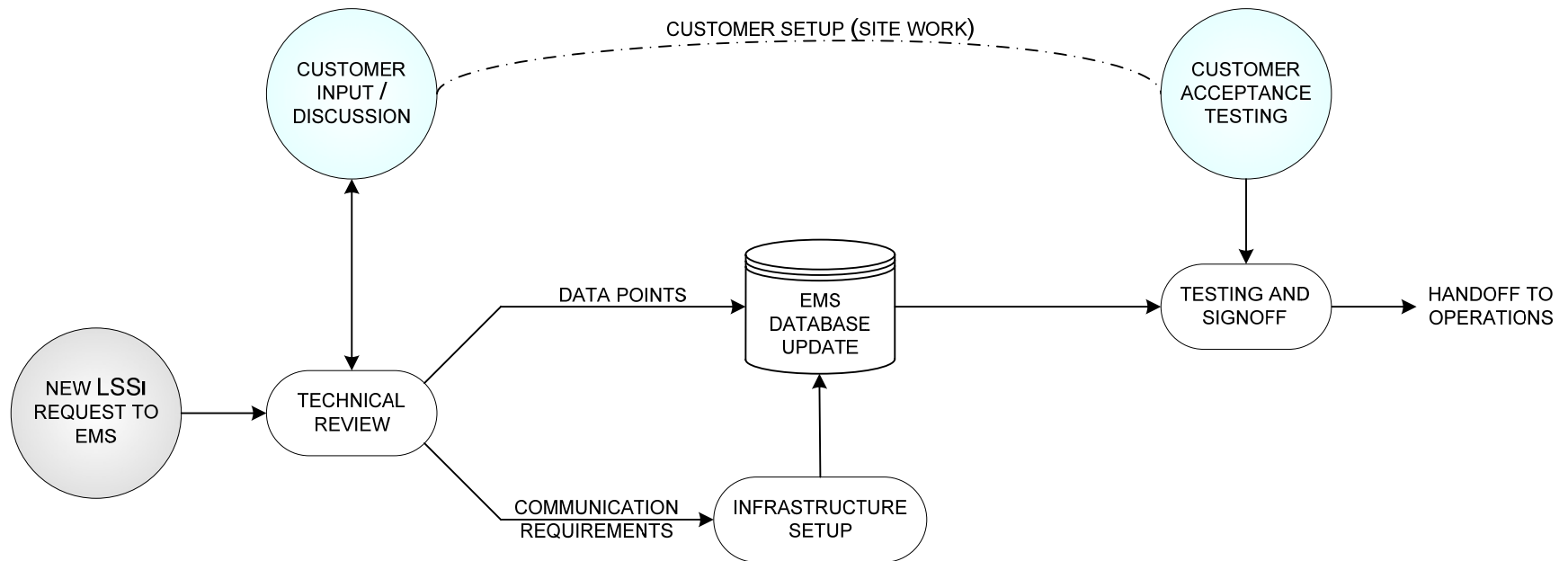
Note – the communications scheme used is dependent on LSSi volume and service availability

SCADA Requirements



- To the AESO's SCADA system
 - Actual volume (MW)
 - Offered volume (MW)
 - Armed volume (MW)
 - Armed/disarmed status
- From the AESO's SCADA system
 - Dispatched volume (MW)
 - Arm/disarm dispatch signal
- Meet AESO SCADA standard
 - Section 4.4 and 5.1 through 5.5
- AESO will monitor performance of the LSSi scheme via SCADA data (real-time and as stored in the data historian)

LSSI Provider – EMS Connection Process





Thank you



Overview of LSSi SC Dispatching



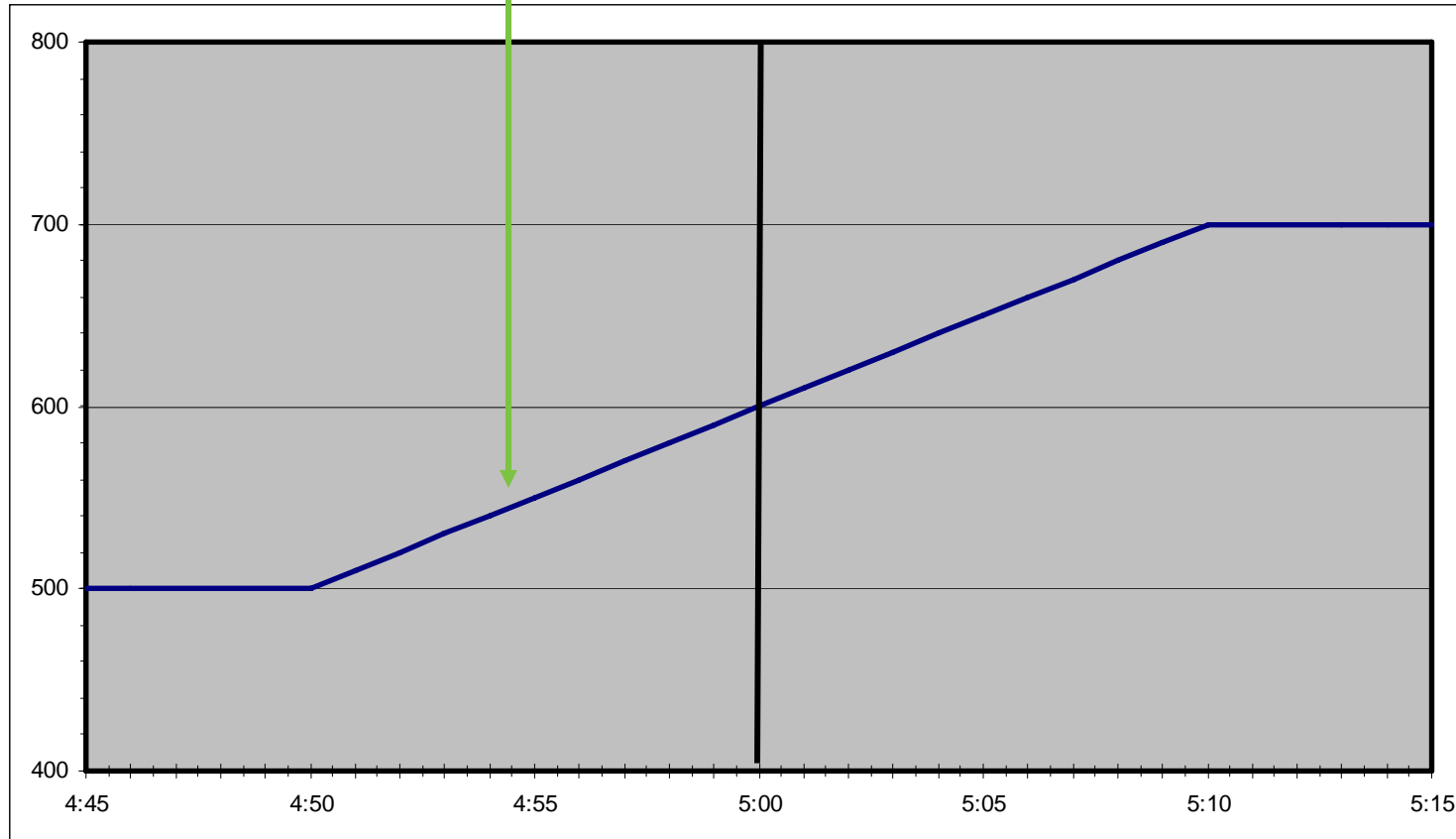
LSSi Dispatch



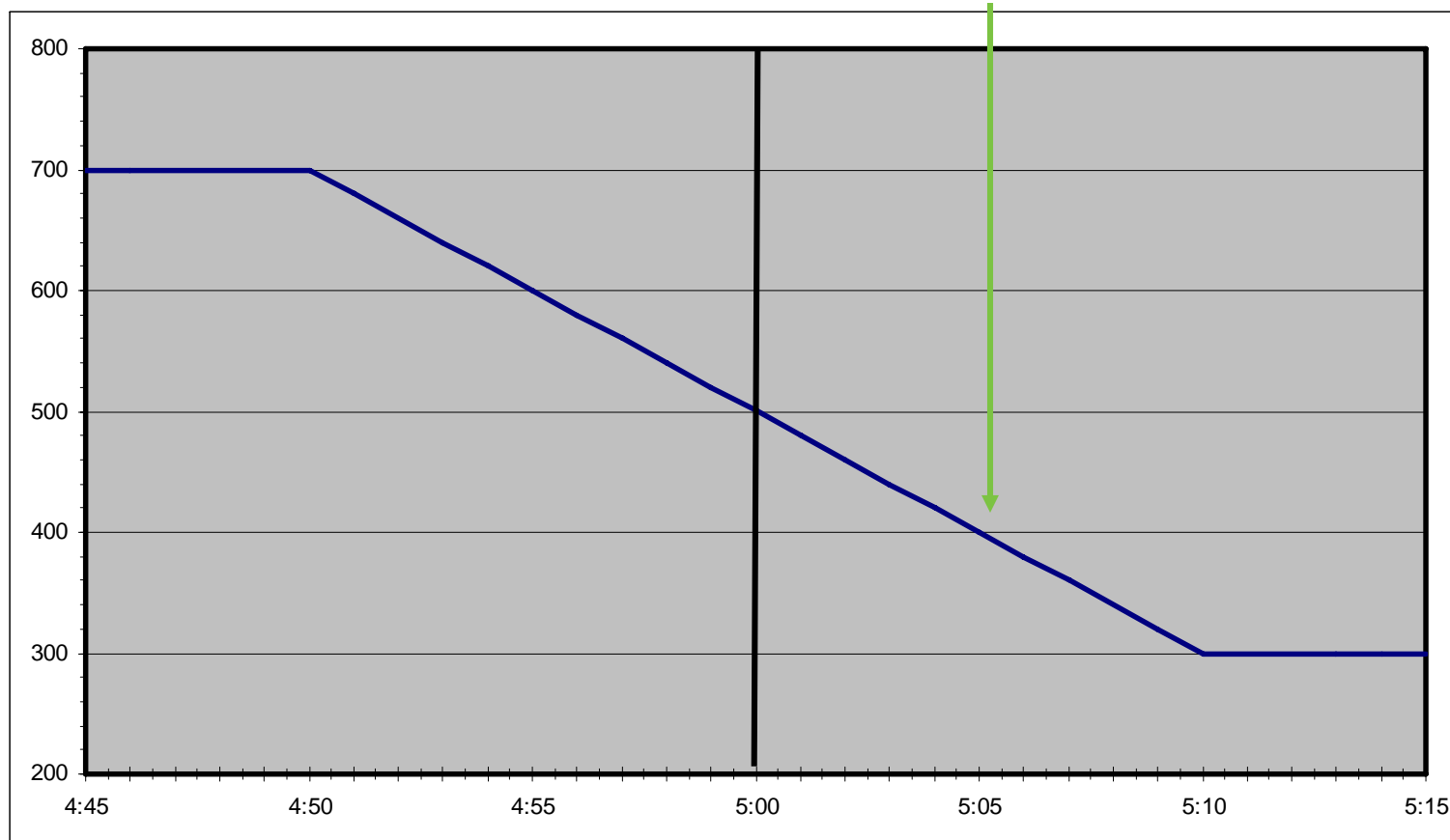
- LSSi is directly related to the import levels on the Alberta interties
- Therefore dispatching of LSSi has to be coordinated with the scheduling of the interties - This coordinating is done by the system controller.
- Interties are ramped up and down over a 20 minute interval, starting 10 minutes prior to the top of the hour and ending 10 minutes after the hour
- More LSSi is required when the import levels increase above a threshold (OPP 312), as the import levels increase, more LSSi is required to be armed, conversely as the import levels decrease, less LSSi is required to be armed

LSSi Dispatch

When the inertia is increasing from current hour to next hour,
LSSi may need to be armed ahead of the scheduling hour to meet the coming inertia
ramp.



When the inertia is decreasing from current hour to next hour,
LSSi may need to remain armed into the next hour until the inertia has reduced to a
level where the armed LSSi is no longer required.



LSSi Dispatch



- The LSSi provider must arm or disarm the LSSi scheme within fifteen (15) minutes in response to a SCADA dispatch from the system controller. If SCADA is down, the dispatch and response will be verbal.
- Once dispatched, the LSSi provider is expected to maintain the armed volume until the system controller dispatches the provider off or to the new offer level
- 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. It can be as late as XX:10 in the next scheduling hour.
- An LSSi device is to be armed or disarmed only when a dispatch from the system controller has been received

LSSi Dispatch



An Example of the System Controller LSSi interface

LSSI MAIN													Required LSSI NIS			
													25.0	<input type="checkbox"/>		
Priority	LSSI Device	Actual Load	N I S	Armed Load	N I S	Offered Volume	N I S	Armed Dispatch	N I S	Info	Dispatch Sent DT/TM	Arm/Re-Arm/Disarm Status	Control	Inhibit Alarm	Device NIS	
Totals		171.0		25.0		155.0		25.0								
1.0	ABCDEFGHIJ	15.0	<input type="checkbox"/> G	15.0	<input type="checkbox"/> G	15.0	<input type="checkbox"/> G	15.0	<input type="checkbox"/> G		01-Jan-2011 13:32:34	Armed		<input type="checkbox"/>	<input type="checkbox"/>	
2.0	NIYH-TRYUYT	10.0	<input type="checkbox"/> G	10.0	<input type="checkbox"/> R	10.0	<input type="checkbox"/> G	10.0	<input type="checkbox"/> G		09-Jan-2011 09:20:09	Armed		<input type="checkbox"/>	<input type="checkbox"/>	
3.0	RRRRRRRRRR	21.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G	20.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G			Disarmed		<input type="checkbox"/>	<input type="checkbox"/>	
4.0	AAAAAAAAAA	25.0	<input type="checkbox"/> X	0.0	<input type="checkbox"/> G	25.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G			Disarmed		<input type="checkbox"/>	<input type="checkbox"/>	
5.0	BBBBBBBBBB	30.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G	30.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G			Disarmed		<input type="checkbox"/>	<input type="checkbox"/>	
6.0	CCCCCCCCCC	15.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G	10.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G			Disarmed		<input type="checkbox"/>	<input type="checkbox"/>	
7.0	JJJJJJJJJJ	45.0	<input type="checkbox"/> X	0.0	<input type="checkbox"/> G	45.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G			Disarmed		<input type="checkbox"/>	<input type="checkbox"/>	
8.0	KKKKKKKKKK	0.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G	30.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G			Disarmed		<input type="checkbox"/>	<input type="checkbox"/>	
9.0	TTTTTTTTTT	10.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G	10.0	<input type="checkbox"/> G	0.0	<input type="checkbox"/> G			Disarmed		<input type="checkbox"/>	<input type="checkbox"/>	

LSSi Dispatch



- After a trip event, 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.
- 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.



Thank you





Contact Information

LSSi RFP Project Manager

daniel.clark@aeso.ca

Ph: 403-539-2810

