Information Document
Calgary Area Transmission Constraint Management
ID # 2015-001R

Information Documents are not authoritative. Information Documents are provided 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) in effect, the Authoritative Document(s) governs.

1 Purpose

This Information Document relates to the following Authoritative Document[1]:

(a) Section 302.1, *Real Time Transmission Constraint Management*.

The purpose of this Information Document is to provide additional information regarding the unique operating characteristics and resulting constraint conditions and limits in the Calgary area of the Alberta interconnected electric system.

Section 302.1 of the ISO rules sets out the general transmission constraint management protocol steps the AESO uses to manage transmission constraints in real time on the Alberta interconnected electric system. These steps are referenced in Table 1 of this Information Document as they are applied to the Calgary area.

2 General

The Shepard cutplane is defined as the net to grid generation of the Shepard pool asset as measured across the generator transformer circuit breakers. To ensure the safe and reliable operation of the Alberta interconnected electric system, the AESO has established operating limits for the Shepard cutplane. For flow into the Calgary area greater than 250 MW, if the Shepard remedial action scheme is not available, an AESO real-time contingency analysis study determines the Shepard cutplane limit, ensuring the 138 kV system is protected.

The AESO has provided a geographical map of the Calgary area, indicating bulk transmission lines, in Appendix 2 of this Information Document. The AESO has also provided a schematic of the Shepard cutplane, including the pool assets effective in managing a transmission constraint, in Appendix 3 of this Information Document.

A cutplane is a common term used in engineering studies and is a theoretical boundary or plane crossing two (2) or more bulk transmission lines or electrical paths. The cumulative power flow across the cutplane is measured and can be utilized to determine flow limits that approximate conditions that would allow safe, reliable operation of the Alberta interconnected electric system.

3 Constraint Conditions and Limits

3.1 Non-Studied Constraints and Limits

For system conditions that have not been pre-studied, the AESO uses energy management system tools and dynamic stability tools to assess unstudied system operating limits in real time.

3.2 Studied Constraints and Limits

Constraints information during the Most Severe Single Contingency

In the Calgary area, the Shepard generating pool asset is connected to the Alberta interconnected electric system by a radial feed when two (2) of the three (3) 240 KV lines line are out of service (985L, 1003L or 1080L). When this situation occurs, the Shepard generating pool asset may be the most severe single

[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. Authoritative Documents include: the ISO rules, the Alberta reliability standards, and the ISO tariff.

2500, 330-5th Avenue SW, Calgary, Alberta T2P 0L4 Phone: 403-539-2450 Fax: 403-539-2949
www.aeso.ca www.poweringalberta.com

contingency.

The AESO has determined the maximum allowable most severe single contingency for the combined output of the Shepard generating pool asset through engineering studies. The maximum allowable combined output of the Shepard generating pool asset under these conditions is equal to the lesser of (a) 1,000 MW or (b) the British Columbia import total transfer capability, plus the Montana import total transfer capability, minus sixty-five (65), plus dispatched contingency reserve. When the Shepard generating pool asset becomes the most severe single contingency, the AESO adjusts the intertie import available transfer capability to ensure the safe and reliable operation of the Alberta interconnected electric system. The import available transfer capability of the combined Alberta-British Columbia and Alberta-Montana interconnection when the Shepard generating pool asset becomes the most severe single contingency is determined as follows:

1. If the Shepard total generation exceeds or is equal to the maximum allowable most severe single contingency for the combined output of the Shepard generating pool asset, then the intertie available transfer capability is set at zero (0).
2. If the Shepard total generation is less than maximum allowable most severe single contingency for the combined output of the Shepard generating pool asset, then the intertie available transfer capability is set at the maximum allowable contingency, minus the anticipated Shepard total generation.

Remedial Action Scheme

The Shepard remedial action scheme in the Calgary area is designed to protect the Enmax 138 KV system at SS-65. This remedial action scheme will shed Shepard pool asset generation upon the loss of both 985L and 1003L. For flow into the Calgary area greater than 250 MW, if the Shepard remedial action scheme is not available, then an AESO real-time contingency analysis study determines the Shepard cutplane limit, ensuring the 138 kV system is protected.

4 Application of Transmission Constraint Management Procedures

The AESO manages transmission constraints in all areas of Alberta in accordance with the provisions of section 302.1 of the ISO rules. However, not all of those provisions are effective on the Shepard cutplane due to certain unique operating conditions that exist in that area. This Information Document represents the application of the general provisions of section 302.1 to the Shepard cutplane, and provides additional clarifying steps as required to effectively manage transmission constraints in that area.

The protocol steps which are effective in managing transmission constraints are outlined in Table 1 below.

Table 1

Transmission Constraint Management

Sequential Procedures for Shepard Cutplane

Section 302.1 of the ISO rules, subsection 2(1) protocol steps	Is the procedure applicable to the Shepard cutplane?
(a) Determine effective pool assets	Yes
(b) Ensure maximum capability not exceeded	Yes
(c) Curtail effective downstream constraint side export service and upstream constraint side import service	No
(d) Curtail effective demand opportunity service on the downstream constraint side	No
(e)(i) Issue a dispatch for effective contracted transmission must-run	No
(e)(ii) Issue a directive for effective non-contracted transmission must-run	No
(f) Curtail effective pool assets in reverse energy market merit order followed by pro-rata curtailment	Yes
(g) Curtail effective loads with bids in reverse energy market merit order followed by pro-rata load curtailment	No

Applicable Protocol Steps

The first step in managing a transmission constraint is to identify those pool assets, both generating units and loads that are effective in mitigating the transmission constraint. A list of the generating pool assets that are effective in managing constraints are identified in Appendix 1.

Step (a) in Table 1

The effective pool assets are as shown in Appendix 1.

Step (b) in Table 1

Ensuring maximum capability levels are not exceeded is effective in managing Calgary area transmission constraints.

Step (c) in Table 1

There are no interties that impact the Shepard cutplane, and curtailing import and export flows elsewhere on the system is not effective in managing a transmission constraint.

Step (d) in Table 1

Curtailing effective demand opportunity service on the downstream constraint side is not effective in managing Calgary area constraints because there is no demand opportunity service in the area.

Step (e) in Table 1

With respect to steps (e)(i) and (ii), there are no transmission must-run contracts in the Calgary area and using transmission must-run is not effective in managing a transmission constraint in this area.

Step (f) in Table 1

Curtailing effective pool assets using reverse energy market merit order, followed by pro-rata curtailment, is effective in managing Calgary area transmission constraints.

Step (g) in Table 1

Downstream load curtailment is not effective in managing Calgary area transmission constraints, as curtailing downstream load does not directly lessen the flow across the cutplane, and available downstream generating pool assets can reasonably supply that load.

5 Project Updates

As necessary, the AESO intends to provide information in this section about projects underway in the Calgary area that are known to have an impact on the information contained in this Information Document.

6 Appendices

Appendix 1 – Effective Pool Assets

Appendix 2 – Geographical Map of the Calgary Area

Appendix 3 – Single Line Drawing showing Calgary Area

Appendix 4 – Shepard Cutplane Operating Limits

Revision History

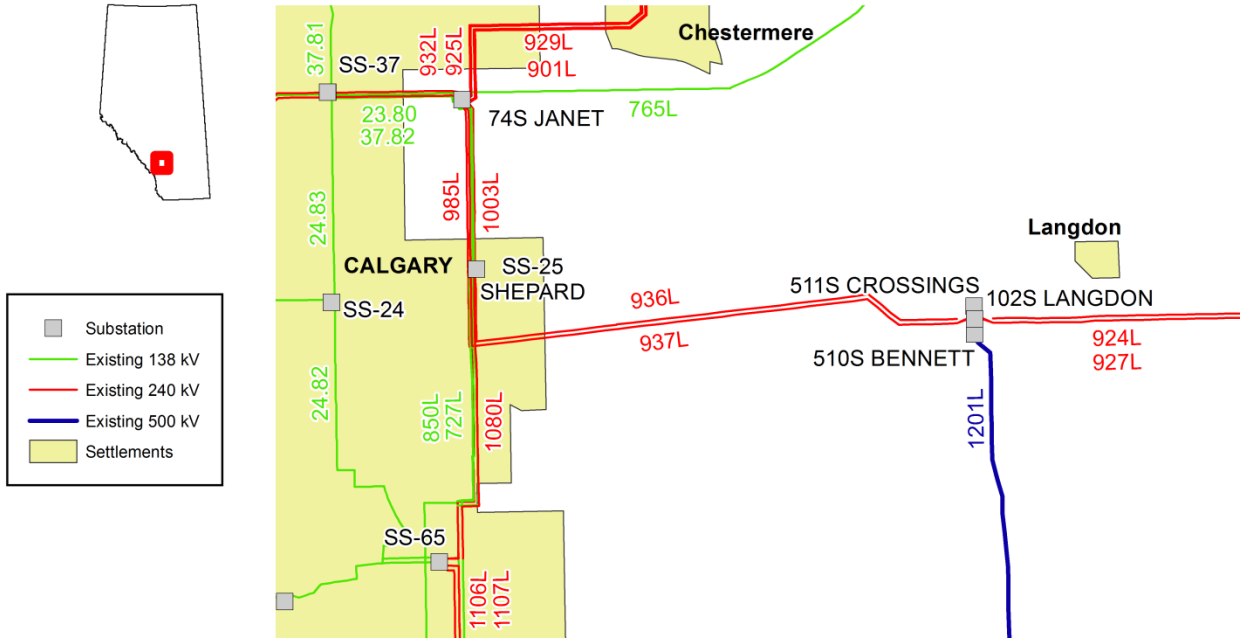
Version	Posting Date	Description of Changes
1.0	2015-01-15	Initial Release
2.0	2015-04-16	Revised note 3 in appendix 4 to clarify that the limits have been established based on a split 138 kV bus at SS-65.
3.0	2015-08-20	With energization of components of Foothills Area Transmission Development (FATD), maps updated to include new lines. Sections 2 and 3.2 revised to account for the possibility of RAS being unavailable and real-time contingency analysis being performed to determine limits.

Appendix 1 – Effective Pool Assets

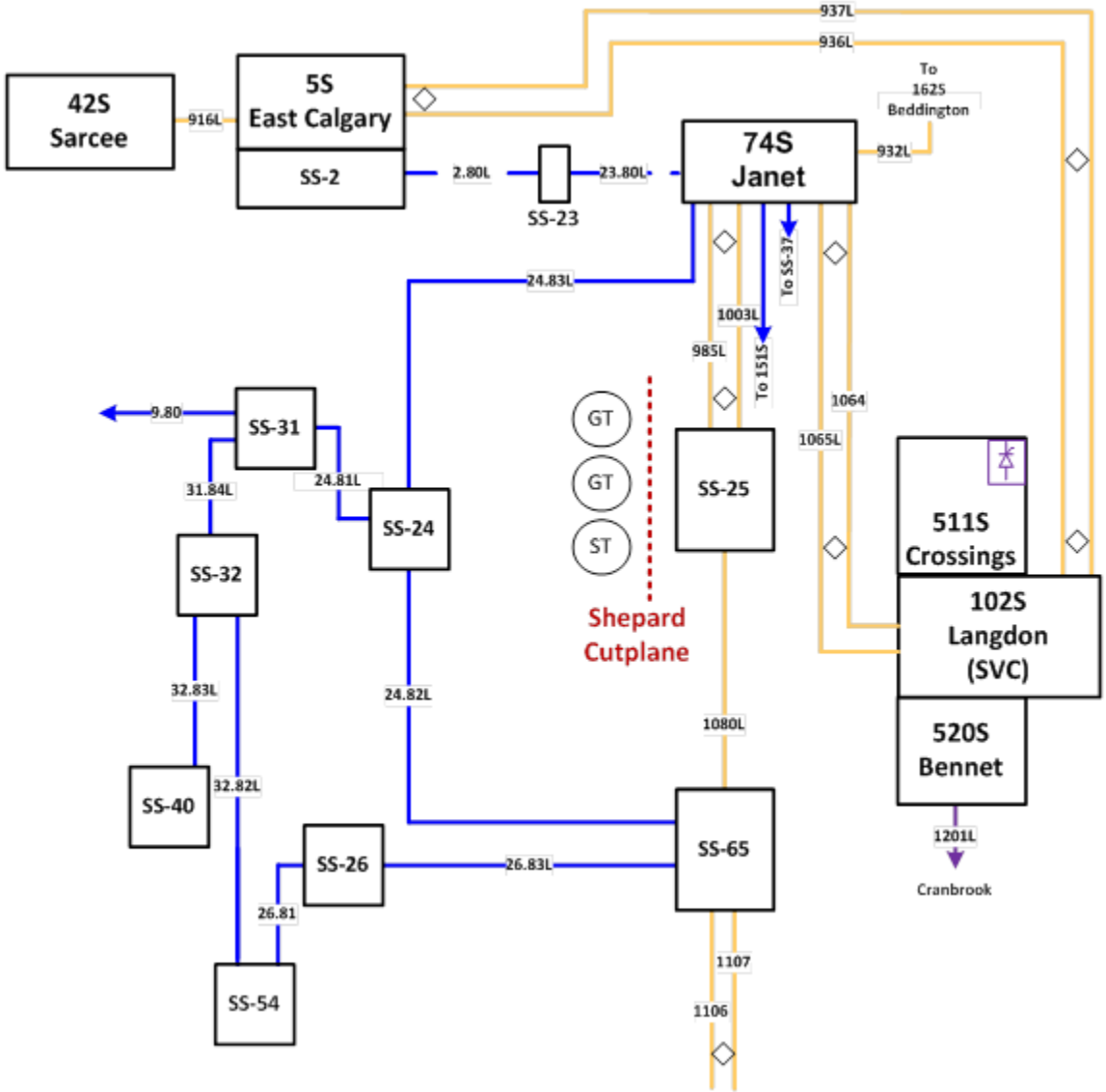
The effective pool assets for the Shepard cutplane, listed alphabetically by their pool IDs, are:

EGC1

Appendix 2 – Geographical Map of the Calgary Area



Appendix 3 – Single Line Drawing showing Calgary Area



Appendix 4 – Shepard Cutplane Operating Limits

If real time contingency analysis allows a higher or lower cutplane limit for the contingencies listed in the tables below, the AESO operates to that higher or lower limit.

Shepard Cutplane Limits			
N – 0 System Normal	851		
N-1 Contingency	**1106L and 1107L flow into SS-65 ≤ 250MW[1]**		**Limiting Contingency**
	Summer (May 1 – Oct. 31)	Winter (Nov. 1 – April 30)	
985L	670[3, 4]	750[3, 4]	1003L
1003L	670[3, 4]	750[3, 4]	985L
N-2 Contingency			**Limiting Contingency**
1080L and 985L	The Shepard Cutplane limit is dependent on the real time most severe single contingency this ranges between 466 MW and 851 MW.		1003L[2]
1080L and 1003L	The Shepard Cutplane limit is dependent on the real time most severe single contingency this ranges between 466 MW and 851 MW.		985L[2]

Note:

1. For 1106L and 1107L flow into SS-65 greater than 250 MW, the AESO real-time contingency analysis study determines the Shepard cutplane limit, ensuring the 138 kV system is protected.
2. For the simultaneous loss of 985L and 1003L, the Shepard N-2 remedial action scheme operates. After the operation of this remedial action scheme, the Shepard pool asset output on 1080L is not to exceed Alberta's most severe single contingency or the thermal limits for 1080L.
3. These limits have been established based on a split 138 kV bus at SS-65 to protect against thermal overload on 24.82L or 26.83L.
4. If an AESO real-time contingency analysis study determines either a higher or lower Shepard cutplane limit is warranted, then the AESO will operate to that higher or lower limit.