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 in effect, the authoritative document governs.

1 Purpose

This information document relates to the following authoritative document[1]:

- Section 302.1 of the ISO Rules, *Real Time Transmission Constraint Management* ("Section 302.1")

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 interconnected electric system.

Section 302.1 sets out the general transmission constraint management protocol steps the AESO uses to manage transmission constraints in real time on the 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 AESO has provided a single line diagram of the Calgary area, indicating bulk transmission lines and area generators, in Appendix 2.

2.1 Shepard Cutplane

The Shepard cutplane[2] is the net to grid generation of the Shepard pool asset measured across the generator transformer circuit breakers. The AESO has established operating limits for the Shepard cutplane in order to ensure the safe and reliable operation of the interconnected electric system. Refer to Appendix 6.

The AESO has also provided a schematic of the Shepard cutplane, including the pool assets effective in managing a transmission constraint, in Appendix 2.

3 Constraint Conditions and Limits

3.1 Non-Studied Constraints and Limits

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

3.2 Studied Constraints and Limits

Generating Units

AESO engineering studies have determined that in order to mitigate identified transient stabliity concerns, certain Calgary area generators have a maxmimum allowable output under identified system conditions. Refer to Appendix 3, Appendix 4 and Appendix 5.

[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.

[2] A cutplane is a common term used in engineering studies and is a theoretical boundary or plane crossing 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 interconnected electric system.

Constraints information during the Most Severe Single Contingency

In the Calgary area, the Shepard generating pool asset is connected to the interconnected electric system by 4 240 KV lines (985L, 1109L, 1003L or 1080L). When 3 of the 4 240 KV lines line are out of service, the Shepard generating pool asset asset may be the most severe single contingency.

When the Shepard generating pool asset becomes the most severe single contingency, the AESO adjusts the intertie import available transmission capability to ensure the safe and reliable operation of the 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:

If the Shepard generating pool asset total generation:

(a) Exceeds, or is equal to, the maximum allowable most severe single contingency the intertie available transfer capability is set at 0.

(b) Is less than the maximum allowable most severe single contingency then the intertie available transfer capability is set at the maximum allowable contingency, minus the anticipated Shepard total generation.

Shepard Remedial Action Scheme

The Shepard remedial action scheme in the Calgary area is designed to protect the ENMAX 138 KV system at SS-65. The remedial action scheme sheds Shepard pool asset generation on the loss of both 985L and 1003L. If the Shepard remedial action scheme is not available, and flow into the Calgary area is greater than 250 MW, the Shepard cutplane limit is determined by an AESO real-time contingency analysis study.

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. 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 – Calgary Area Single Line Drawing

Appendix 3 - Cavalier (EC01) Transient Stability Limits

Appendix 4 - Summit (CRS1,CRS2,CRS3) Transient Stability Limits

Appendix 5 – Cavalier(EC01) and Carseland (TC01) Thermal Constraints

Appendix 6 – Shepard Cutplane Operating Limits

Revision History

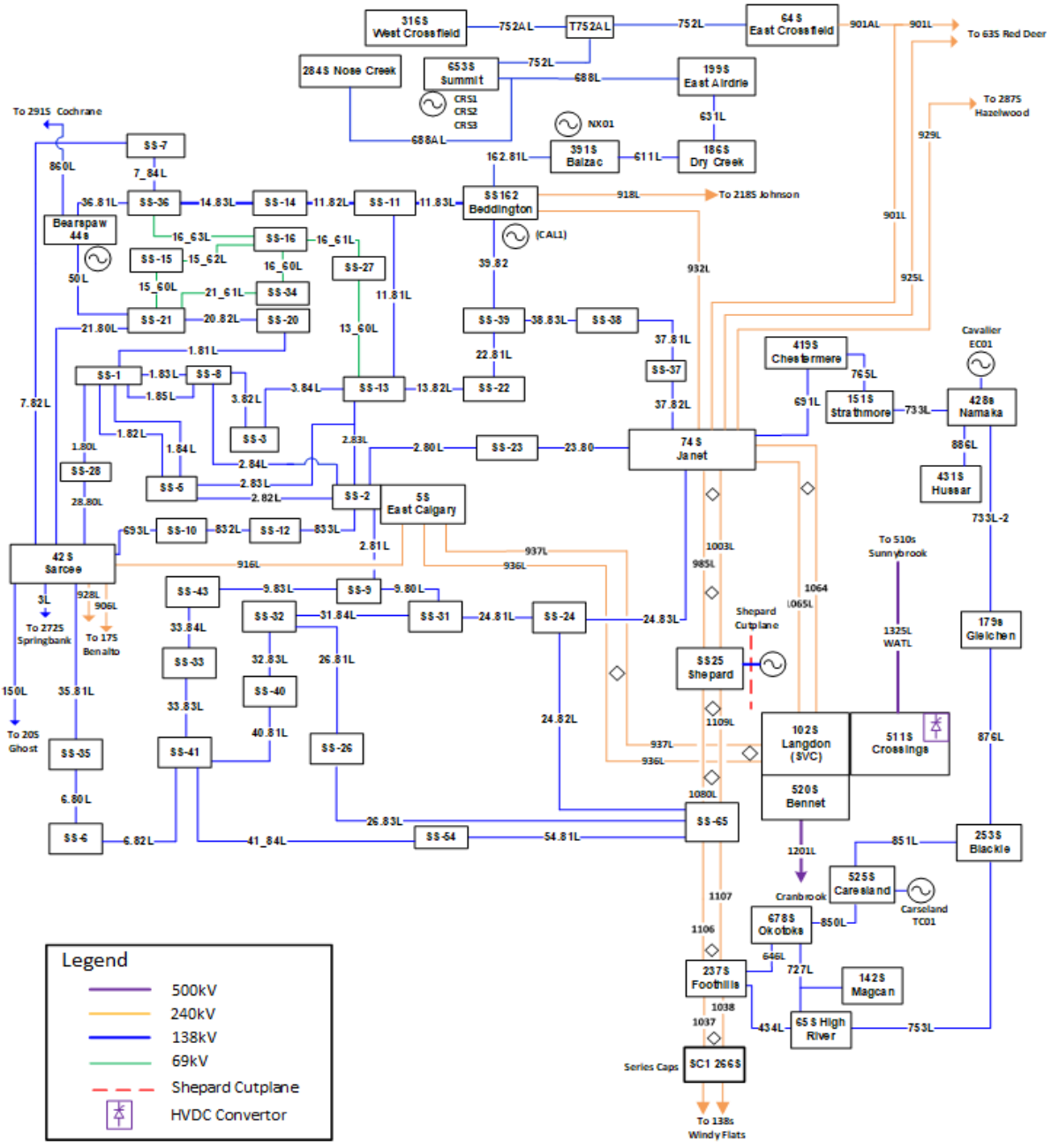
Posting Date	Description of Changes
2021-01-20	Updated Appendix 2-Calgary Area SLD Removed Appendix 3-Carsland Transient Stability Limits Added Appendix 5–Cavalier(EC01) and Carseland (TC01) Thermal Constraints Amended Appendix 6-Shepard Cutplane Operating Limits
2020-10-21	Updated Appendix 2. Added Appendix 3, Appendix 4, and Appendix 5. Amended Section 3.2
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.
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.
2015-01-13	Initial release

Appendix 1 – Effective Pool Assets

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

EGC1

Appendix 2 – Calgary Area Single Line Drawing



Appendix 3 – Cavalier (EC01) Transient Stability Limits

Outage		Number of Cavalier units online[1]	Maximum Output Limit (MW)	Limiting Contingency
N-0 (System Normal)	None	3	N/A	N/A
		2		
N-1	691L 74s Janet - 419s Chestermere	3	112	753L 65s High River - 253s Blackie
		2	71	
	765L 151s Strathmore - 419s Chestermere	3	110	
		2	70	
	733L 151s Strathmore - 428s Namaka	3	105	753L 65s High River - 253s Blackie **or** 646L 237s Foothills - 678s Okotoks **or** 851L 525s Carseland - 253s Blackie
		2	65	

Note:

1. The Cavalier asset (EC01) is comprised of three units: G1, G2, G3.

Appendix 4 – Summit (CRS1,CRS2,CRS3) Transient Stability Limits[1]

Outage		Number of Summit units online	Maximum Output Limit (MW)	Limiting Contingency
N-0 (System Normal)	None	3	126	611L 391s Balzac-186s Dry Creek
		2	88	

Note:

1. If the bus voltage at 653s Summit can be maintained at or above 141 kV there are no transient stability limits.

Appendix 5 – Cavalier (EC01) N-1 Thermal Constraints[1]

Overloaded Element	Possible Mitigation
765L (151s-419s)	1) Consider opening 765L (151s-419s) 2) If the overload is caused by an N-1 contingency of: a) 850L (525s to 678s): i) Consider opening 876L (179s to 253s) b) 733L (179s to 428s): i) Apply CDG as needed to Cavalier (EC01)

Note:

1. Real Time Contingency Analysis will determine the amount of constraint applied.

Appendix 6 – Cavalier (EC01) and Carseland (TC01) N-1-1 Thermal Constraints[1]

Overloaded Element	Possible Mitigation
753L (65s- 253s)	Apply CDG as needed to: a) Cavalier (EC01) b) Carseland (TC01)
850L (525s- 678s)	
851L (525s- 253s)	
765L (151s-419s), 691L (74s-419s) and 733L (151s-428s)[2]	

Note:

1. Real Time Contingency Analysis will determine the amount of constraint applied.
2. This mitigation is based on potential overloads caused by multiple contingencies.

Appendix 6 – Shepard Cutplane Operating Limits

If real time contingency analysis indicates a higher or lower limit thermal cutplane limit, the AESO operates to that limit for the contingencies listed in the table.

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

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. 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.
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. 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.