

## **517 KEEPHILLS/ELLERSLIE/GENESEE (KEG) AREA OPERATION**

### **1. Purpose**

To define the interim policies and procedures applicable for the 2010 Keephills 3 system and the Edmonton region 240kV transmission line upgrades project.

### **2. Background**

(1) The KEG area cut plane means and consists of the Keephills 240/138kv transformer and all transmission lines connecting the Keephills and Genesee substations to the interconnected electric system. The KEG area transmission system is illustrated in [Figure 1](#).

(2) The KEG area transmission system will be the subject of a major construction project in 2010 with the addition of Keephills #3, the decommissioning of Wabamun #4, and an upgrade to the transmission system extending from the Lake Wabamun area to south Edmonton. The overall project includes a new phase shifting transformer and another 240kV transmission line terminated at Keephills. 1202L which currently operates at 240kV will be operated at 500kV.

(3) For the duration of this project, a significant number of expedited changes to the KEG area operating procedures are required and will be identified in the System Coordination Plan throughout the duration of the project. The schedule for the project phases is available to market participants on the AESO website <http://www.aeso.ca/transmission/20222.html>.

(4) Specifically, as the KEG area transmission system reinforcements proceed, the ISO must implement a number of transient generation curtailments related to the various transmission line outages. In addition, when 1203L or 1209L is out of service, the total generation output from the Genesee plant is transmitted on the sole remaining 500 kV line connecting the Genesee plant. This significantly increases the most severe single contingency level on the interconnected electric system. The ISO therefore must issue directives to ensure the continued reliable interconnected electric system operations, which limits may include limiting import levels and Genesee total plant output.

(5) Other area 240 kV transmission line contingencies also may require reliability directives to ensure that the system can meet reliability criteria. Delayed fault clearing on any of the 240 kV transmission lines connected to the KEG area and Sundance generating plants may cause angular instability to the area generators. Refer to [Section 3.3\(2\)](#) for a list of these transmission lines.

(6) Throughout the project schedule, the operation of the KEG area transmission system must meet WECC reliability criteria, which is summarized in the following two categories:

- (a) The interconnected electric system must be able to continue to operate safely and efficiently, even with the immediate effects of the contingencies; and
- (b) That system must be able to recover from the contingencies and prepare for the next contingency in a timely fashion that meets WECC standard requirements.

### 3. Interim Operating Policy during 2010/2011 Project

#### 3.1 KEG cut plane

(1) The determination of the KEG cut plane and the calculation of the total outflows will change as the project progresses and the interconnected electric system in the KEG area evolves from its current state to the final state when the project is completed. The KEG cut plane outflows will be defined as the total outflows on the 240 kV and 500 kV lines connecting the Keephills (T320P) and Genesee (E330P) substations to the interconnected electric system.

(2) For the purposes of calculating the sum of the flow under subsection 1, it will be deemed to be zero (0) if the flow is towards the measured point.

#### 3.2 System Normal

(1) Under normal system conditions the KEG cutplane (see [Figure 1](#)) will be constrained to specific limits. As these limits are subject to change through this project, the limit as it changes from time to time will be displayed on the AESO website:

<http://www.aeso.ca/transmission/20222.html>.

#### 3.3 Allowable Most Severe Single Contingency at Genesee

(1) With respect to the KEG area transmission system, during the 2010 project period of system upgrading, reinforcement and construction, the ISO system controller will operate the interconnected electric system within prescribed limits determined by engineering studies, and will take any requisite immediate action to reduce the most severe single contingency to acceptable levels.

(2) Specifically, if the Genesee generating facilities are connected to the interconnected electric system by a radial feed when 1203L or 1209L are out of service; then the MW output of the Genesee generating facilities, consisting of the net to grid energy and dispatched operating reserve for GN1, GN2, and GN3, will become the interconnected electric system's most severe single contingency.

(3) Therefore, the maximum allowable most severe single contingency for Genesee generating facilities is:

(a) 1,000 MW if the Alberta-BC interconnection import ATC is not constrained as per [OPP 304](#) (zero import assumed); or

(b) 450 MW if the Alberta-BC interconnection import ATC is constrained by transmission element outages as identified in Table 2 of [OPP 304](#).

(4) The sum of the net to grid output and dispatched operating reserves from the Genesee generating facilities by directive will be constrained to the maximum allowable most severe single contingency level.

(5) With respect to the most severe single contingency for Genesee, the NWPP reserve sharing (refer to OPP 405) will be used by the ISO system controller for the portion of the reserve requirement exceeding the Alberta contingency reserve obligation. To reserve capacity on the Alberta-BC interconnection for the delivery of the NWPP reserve sharing energy, the Alberta-BC interconnection import ATC will be reduced.

(6) To facilitate the reduction in import ATC referred to in Subsection 3(a) above, a variable import TRM will be used, and will be a quantity in MW calculated as follows:

Import TRM equals:

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Import TTC as per [OPP 304](#) MINUS the import ATC (see [Table 3](#))

(7) Notwithstanding any other provision of this OPP 517, if the available NWPP reserve sharing to Alberta is insufficient to support the most severe single contingency at the Genesee generating facilities, then the most severe single contingency at Genesee will be reduced accordingly.

### 3.4 Generating Facilities Curtailments

(1) As transmission system elements are removed from service to facilitate the various construction and upgrade configurations, the ISO system controller by directive and as necessary will curtail the output of generating facilities situated in the KEG area transmission system, but only as required to ensure the most severe single contingency limits will keep the interconnected electric system operating in a safe and reliable state.

(2) If the system controller is required to curtail the sum in MW of the outputs of two or more generating facilities to specified levels, then the curtailments must be calculated and implemented on a pro-rata basis, based on the STS level of each of the generating facilities.

(3) No generating unit which is the subject of a curtailment directive will be curtailed to a level below its minimum stable generation if another generating unit in the KEG area subject to such a directive can be curtailed to meet the limit.

(4) For any generating facilities, the system controller will first curtail net to grid energy, followed by the dispatched operating reserves.

(5) Any generating facilities receiving a directive to curtail under this OPP 517 must have responded and complied with the directive to reduce output to the required limits no later than 40 minutes after the time of receipt of the directive.

(6) The ISO must prepare, publish and keep timely a System Coordination Plan for the KEG area which sets out:

(a) any and all known or reasonably anticipated MW curtailments or restorations to generating facilities output, transmission line outages, and Alberta-BC interconnection import limits which are required during the 2010 period of upgrading, construction and reinforcement,

(b) any additional operational information as is reasonably necessary for directly impacted market participants to further understand the objectives, timing and scheduling relating to the 2010 project.

### 3.5 Delayed Fault Clearing

(1) The removal of a faulted transmission line from service is required of a transmission facility owner (based on studies) to provide for increased interconnected electric system reliability and stability.

(2) Delayed fault clearing on any of the 240/500 kV transmission lines terminated at the Keephills substation (T320P), the Genesee substation (E330P) or the Sundance substation (T310P) could potentially result in angular instability to the area generators. These lines include 190L, 902L, 903L, 908L, 909L, 913L, 919L, 922L, 926L, 973L, 974L, 989L, 1202L, 1203L and 1209L or 1043L, 1044L and 1045L as renumbered lines replacing 904L and 908L.

(3) The transmission facility operator of any of the specific transmission lines referred to in subsection 3.3 (2) above must immediately notify the ISO system controller of any known risk of delayed fault clearing on the subject transmission line, and take immediate action to rectify the problem.

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(4) Upon notification by the transmission facility operator on potential delayed fault clearing on any of the transmission lines, the system controller will make a real time assessment, taking into consideration the current and expected operating conditions, and may issue directives for the curtailment of area generation or require the removal of the affected transmission line or equipment, or any or all such actions.

## **4. Responsibilities**

### **4.1 ISO**

The system controller must:

- (1) Call the real-time operations manager for assistance upon notification by the transmission facility operator of potential delayed fault clearing on the following lines: 190L, 902L, 903L, 908L, 909L, 913L, 919L, 922L, 926L, 973L, 974L, 989L, 1202L, 1203L and 1209L or 1043L, 1044L and 1045L as renumbered lines replacing 904L and 908L;
- (2) Issue directives for any mitigation plan as recommended;
- (3) Issue directives requiring any curtailments referred to in this OPP 517 for each phase of the project;
- (4) Adjust and implement the import TTC, TRM and ATC on the Alberta-BC interconnection in accordance with this OPP 517;
- (5) Inform the BCTC operator when Alberta most severe single contingency exceeds 450 MW.
- (6) Determine the need for and initiate NWPP contingency reserve requests; and
- (7) Coordinate with all transmission facility owners when energizing transmission lines and transformers in the KEG.

### **4.2 Transmission Facility Operators**

KEG area transmission facility operators must:

- (1) Investigate any force outage to 1202L, 1203L, 1209L, 190L, 903L or 320P T1 and inform the system controller of the status of the affected line or transformer;
- (2) Immediately inform the system controller of any potential delayed fault clearing on any of the following lines: 190L, 902L, 903L, 908L, 909L, 913L, 919L, 922L, 926L, 973L, 974L, 989L, 1202L, 1203L and 1209L, or 1043L, 1044L and 1045L as newly numbered lines replacing 904L and 908L, and take immediate action to rectify the problem. Inform the system controller when the problem has been resolved; and
- (3) Consult with the system controller before energizing the following transmission lines and transformers in the KEG area:
  - (a) T320P Keephills 500/240 kV transformer T6;
  - (b) Lines energized at 500 kV, presently 1203L and 1209L and 1202L when operating at 500kV;
  - (c) T89S Ellerslie 500/240 kV transformers T1 and T2.

## **5. Procedures**

None specified.

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6. Figures and Tables

Figure 1

KEG area transmission system

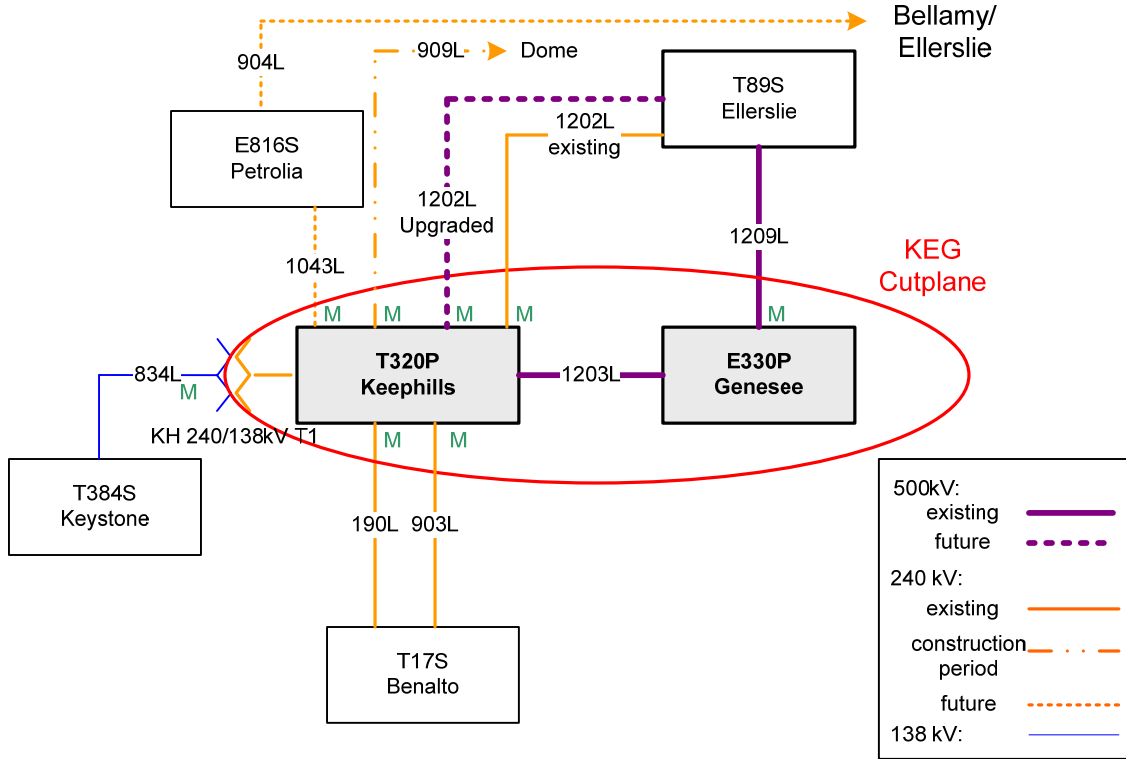


Table 1 Maximum allowable most severe single contingency at Genesee when 1203L or 1209L is out of service

System Conditions	Maximum Allowable SLC at Genesee (MW)
Alberta-BC Interconnection import TTC not constrained by transmission element outages as identified in Table 3 of <a href="#">OPP 304</a>	1,000 (zero import assumed)
Alberta-BC Interconnection import TTC constrained by transmission element outages as identified in Table 3 of <a href="#">OPP 304</a>	450

Table 2

Alberta-BC interconnection import ATC for various Genesee most severe single contingency, (identified as MSSC in the table below) levels when 1203L or 1209L is out of service

Genesee MSSC (MW) <sup>1</sup>	Alberta-BC Interconnection Import ATC (MW)
Genesee MSSC ≤450 MW	As per <a href="#">OPP 304</a> Table 3 and without the 1203L or

Transmission

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	1209L constraint
450 MW < Genesee MSSC < 1,000 MW	1,000 MW <i>minus</i> Genesee MSSC
1,000 MW ≤ Genesee MSSC	0

**Note:**

1. Genesee MSSC is the sum of the total net generation and dispatched operating reserves of the generating units at Genesee.

**Table 3**

KEG area generators contracted STS levels

Confidential

**Table 4**

KEG area generators minimum stable generation levels

Confidential

[View confidential Table 3 and Table 4](#) **7. Revision History**

Issued	Description
2010-xx-xx	Supersedes 2008-11-27
2008-11-27	Supersedes interim OPP effective 2008-11-01
2008-11-01	Approved for interim implementation effective 2008-11-01
2008-05-30	Approved for interim implementation effective 2008-05-30
2007-09-27	Supersedes 2006-07-11
2006-07-11	Supersedes 2005-03-30
2005-03-30	Supersedes interim OPP effective 2004-11-02
2004-11-02	New issue approved for interim implementation

**8. SC Tool Version**

Date	Version	Description
2010-05-27	SC Workbook	1 <sup>st</sup> stage of Keephills 3 project.
2008-11-01	MARGO release 4.1	Implement the KEG cut plane
2008-05-30	MARGO release 3.2.1.1	Implement changes for 500 kV upgrade