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503 EMPRESS AREA OPERATION

1. Purpose

To define the policies and responsibilities for the Empress Area load customers and the policies and procedures for the system controller (SC) in managing load levels and motor starts in the Empress area.

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2. Background

The increase in the Empress area load has created a concern for system security during single contingency transmission outages.

The Empress area load includes the following substations and converter station: Amoco Empress (T163S), Empress Liquids (T164S), Sandy Point (T204S), Jenner (T275S), Empress (T394S), Sand Hills (T341S), McNeill (A840S), Bindloss (A914S) and Wardlow (230S). Figure 1 shows the Empress area.

Overloads on 951L, Ware Junction to Amoco Empress, need to be managed due to a line terminal current transformer rating of 333 MVA.

Due to the increase in the number of large motors in the area, the probability has increased that multiple motors will attempt simultaneous starts, possibly subjecting the area to under voltage conditions. For this reason, the SC will coordinate starting of motors 25,000 hp or larger.

Specific operating conditions must be met before starting the 54,000 hp motor at Sand Hills to limit the effect of under voltage in the area. Starting the 54,000 hp motor at Sand Hills may have an adverse effect on system security if certain system conditions are not met.

3. Policy

3.1 Empress area load

- The Empress area load is the sum of the following MW flows into the Empress area. This value is calculated by the energy management system and is shown on the PI voltbar display as AMC load.
  - 944L MW flow at Jenner (T275S)
  - 951L MW flow at Ware junction (T132S)
  - 7L760 MW flow at Oyen (A767S)
  - 760L (south terminal) MW flow at Empress (T394S)
- The maximum Empress area load must not exceed 355 MW during normal operating conditions, when all transmission lines in the Empress area are in service.
- If the 951L operating limit of 333 MVA is exceeded due to either a 944L or 945L trip or either line being out of service, then the loading on 951L must be reduced to below the limit within 10 minutes.

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- The Empress area load must not exceed 260 MW if no capacitor banks at Amoco Empress (T163S) are available for service.
- When a curtailment of Empress area load is required, exports to Saskatchewan will be curtailed first, followed by demand opportunity service (DOS) load and then demand transmission service (DTS) load, if necessary. The DTS load will be curtailed pro-rata on the basis of the contracted levels of DTS
- Under-voltage conditions that cannot be corrected by adjusting transformer tap changes or switching capacitors bank must be corrected by:
  - First, curtailing exports to Saskatchewan (see OPP 306).
  - Second, dispatching off DOS load in the Empress area (see OPP 901).
  - Third, curtailing DTS load in the Empress area (see Section 5.2).

3.2 Switching Amoco Empress (T163S) capacitor banks

Depending on the real-time system conditions and when practical, one capacitor bank at Amoco Empress (T163S) will be put in service when any of the following conditions occurs:

- One Sheerness unit is out of service.
- MW flows into the Empress area are greater than 260 MW.
- One of 944L or 951L or 945L is out of service due to planned or forced outage and MW flows into the Empress area are 230 MW or higher.
- Before starting 54,000 hp motor at Sand Hills 341S.
- Before starting 30,000 hp or 25,000 hp motors simultaneously at Amoco Empress 163S.

Depending on the real-time system conditions and when practical, the second capacitor bank at Amoco Empress (T163S) will be put in service when any of the following conditions occurs:

- Both Sheerness units are out of service.
- MW flows into the Empress area are greater than 305 MW.
- One of 944L, 951L or 945L is out of service due to planned or forced outage and MW flows into the Empress area are 260 MW or higher.

3.3 Motor starting in the Empress area

With the exception of the Sand Hills motor, motor starts in the Empress area are not considered to be an issue with the transmission system intact. However, simultaneous starts of large motors could result in low voltage in the area. To avoid two or more large motors starting at once, the SC will coordinate the starting of all motors, 25,000 hp or larger. The intent is to delay motor starts only for the time required to avoid simultaneous starts.

- Empress area DTS customers will seek approval from the SC to start any motors 25,000 hp or larger.
- The SC will grant approval to start the motor unless the SC is aware of:
  - Another motor start, 25,000 hp or larger, that is in progress.
  - System conditions that would not allow a motor start.

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- When the attempt to start the motor has been completed, whether successful or not, the customer requesting for motor starting will inform the SC.

3.4 Motor starting at Sand Hills

- The DTS customer at Sand Hills (T341S) will seek approval from the SC to start their 54,000 hp motor.
- The SC will deny the request for approval to start the 54,000 hp motor at Sand Hills if the motor starting could adversely affect system reliability or if the following conditions are not met:
  - 944L, 945L, 951L and the Amoco Empress (T163S) 240/138 kV transformer are in service.
  - The McNeill converter station (A840S) is not ramping an energy schedule.
  - Both Sheerness generators are on line, unless the SC approves starting the motor with one generator off line. (see Section 5.4 and Section 5.5).
  - No other motors are known to be starting in the area.
  - One capacitor bank at Amoco Empress (T163S) is in service.
- The SC will notify the AltaLink operator and the ATCO Electric operator of the request to start the motor and confirm that they are not aware of any reason to not start the motor.
- If the motor starting could not adversely affect system reliability and all of the above conditions are met the SC will grant the customer permission to start the motor.
- When the attempt to start the motor has been completed, whether successful or not, the customer will inform the SC who will then inform the AltaLink operator and the ATCO Electric operator.

3.5 Communication test

- To ensure operational preparedness for the requirements in this OPP, the SC will perform regular communication tests with the operational contact personnel listed in Section 4.2 once every six months. Details are presented in Section 5.8.
- The communication test will not be announced in advance. The exact date and time will be determined by the SC.
- The communication test records will be retained by the SC for a minimum of two years.

4. Responsibilities

4.1 ISO

The ISO will:

- Review the Empress area reliability limits to ensure the safe and reliable operation of the system, when required.

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- Outline, in the System Coordination Plan submitted to the SC, transmission facility owners (TFOs) and generation facility owners (GFOs), any transmission outages that would affect the Empress area load levels or the motor starting capabilities in the area.

System Controller

The SC will:

- Determine the available transfer capability (ATC) on the Alberta-Saskatchewan interconnection based on the AIES conditions in real-time and then do both of the following:
  - Adjust the ATC posted on the ISO's web site, if required by system conditions in real-time; and
  - Inform the SaskPower system operator of any adjustment to the ATC on the Alberta-Saskatchewan interconnection, based on system conditions in real-time.
- Approve or deny motor starts of 25,000 hp or larger.
- Coordinate motors starts of 25,000 hp or larger.
- As system conditions require, coordinate the curtailment of loads in the Empress area.
- Perform communication testing as required.

4.2 Empress area DTS customers

Empress area DTS customers or their designated operational contact personnel will:

- Phone the SC to seek approval to start motors, 25,000 hp or larger.
- Inform the SC when the motor start is complete.
- Have an implementation plan for load curtailment as described in Section 5.2.
- Curtail DTS and/or DOS load within 10 minutes of receiving a directive from the SC.
- Restore the load only as permitted by the SC.
- Participate in the communication tests.
- Work to resolve problems identified by the communication test.

The following is a list of DTS customers subject to load curtailment procedures as specified in Section 5.2.

Substation (point of delivery)	DTS Customer	Operational Contact Personnel
275S Jenner	FortisAlberta	AltaLink South Transmission (speed dial)
164S Empress Liquid		
204S Sandy Point		
163S Amoco Empress/ 341S Sand Hills		
394S Empress		
394S Empress	Provident Energy	Provident Energy Control

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163S Amoco Empress	Foothills Pipeline	BP Empress Control
230S Wardlow	Kinder Morgan Canada	Express Pipeline Control Centre
914S Bindloss	ATCO Electric	ATCO Electric System Control Centre

5. System Controller Procedures

5.1 Managing high Empress area load

Table 1 lists the alarm and load levels.

The SC will:

1. When the Empress area load over high limit 1 alarm (≥260 MW) is received:
   a. Put one capacitor bank at Amoco Empress (T163S) in service, when practical
   b. If additional voltage support is required and the McNeill converter is available but not in service:
      - Request the ATCO Electric operator to place the McNeill converter station in service mode and on voltage control with a voltage set point of 142 kV.
      - Request the AltaLink south transmission operator to adjust the 240/138 kV transformer taps at Amoco Empress (T163S) so that a minimum of 16 MVAr is supplied on 830L from McNeill converter station to Amoco Empress.
   c. If no capacitor banks at Amoco Empress (T163S) are available for service :
      - Curtail exports to Saskatchewan to reduce Empress area load to 260 MW or less within 10 minutes (see OPP 306).
      - Curtail DOS load in the Empress area, as required, to reduce the Empress area load to 260 MW or less within 10 minutes (see OPP 901).
      - Curtail DTS load in the Empress area as identified in Section 5.2, to reduce Empress area load to 260 MW or less, if curtailment of DOS load is not sufficient to achieve this level.
      - Repost the export ATC to Saskatchewan, if required.
2. When the Empress area load over high limit 2 alarm (≥305 MW) is received:
   a. Put the second capacitor bank at Amoco Empress (T163S) in service, when practical
   b. If the second capacitor bank is not available,:
      - Curtail exports to Saskatchewan to reduce Empress area load to 305 MW or less within 10 minutes (see OPP 306).
      - Curtail DOS load in the Empress area, if required, to reduce the Empress area load to 305 MW or less within 10 minutes (see OPP 901).
      - Curtail DTS load in the Empress area as identified in Section 5.2, to reduce Empress area load to 305 MW or less, if curtailment of DOS load is not sufficient to achieve this level.

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– Repost the export ATC to Saskatchewan, if required.

3. When the Empress area load over high limit 3 alarm (≥ 355 MW) is received:

   a. Curtail exports to Saskatchewan to reduce Empress area load to 355 MW or less within 10 minutes (see OPP 306).

   b. Curtail DOS load in the Empress area, if required, to reduce the Empress area load to 355 MW or less within 10 minutes (see OPP 901).

   c. Curtail DTS load in the Empress area as identified in Section 5.2, to reduce Empress area load to 355 MW or less, if curtailment of DOS load is insufficient to achieve this level.

   d. Repost the export ATC to Saskatchewan, if required.

5.2 Curtailment of Empress area DTS load

The SC will:

1. Determine the amount of DTS load that needs to be curtailed by subtracting the Empress area high limit 1 amount, 260 MW, from the current Empress area load. For example:

   280 MW – 260 MW = 20 MW.

   Ranger display #6083 populates Table 2 (confidential) for information.

2. Determine the amount of DTS load to curtail for each customer on a pro rata basis by dividing the customer's DTS level from Table 2, by the total area DTS level, multiplied by the amount that needs to be curtailed. For example:

   90 MW ÷ 295 MW x 10 MW = 3.1 MW

3. Issue directives to the customers (see confidential Table 3 for DTS customer operational contact information) to curtail DTS to a level that is equivalent to the customer DTS level minus the amount required to be curtailed by that customer. For example:

   90 MW – 3.1 MW = 86.9 MW = required DTS level

4. Use the following script to issue directives to curtail DTS loads:

   "This is (*name of System Controller*), system controller from the Alberta Electric System Operator. Curtail your DTS loads down to XX MW."

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5.3 Starting motors, 25,000 hp or larger, in the Empress area

The SC will:

1. Ensure that no other motors, 25,000 hp or larger, have requested a start at that time.
2. Ensure the system voltages are normal and that system conditions will support a large motor start.
3. Give approval to start the motor.

5.4 Starting the 54,000 hp motor at Sand Hills with two Sheerness units on line

The SC will:

1. Check to see if all the required system conditions are met to start the motor (see Section 3.4).

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2. If any of the conditions stated in Section 3.4 are not met, or the SC assesses that the motor start could adversely affect system security, deny the request by the customer to start the motor.
3. If all the conditions are met:
   a. Notify the ATCO Electric operator and the AltaLink operator of the pending motor start and confirm they have no concerns about starting the motor.
   b. Give approval to the customer to start the motor.

5.5 Starting the 54,000 hp motor at Sand Hills with one Sheerness unit on line

The SC will:

1. When the customer at Sand Hills requests approval to start the motor, ensure the conditions stated in Section 3.4 are met.
2. With the exception of both Sheerness generators on line, if any of the conditions stated in Section 3.4 are not met, or the SC assesses that the motor start could adversely affect system security, deny the request by the customer to start the motor.
3. Notify the ATCO Electric operator and the AltaLink operator of the pending motor start and confirm they have no concerns about starting the motor with one Sheerness generator off line.
4. If either the ATCO Electric operator or the AltaLink operator have a concern that starting the motor will have detrimental effect on the transmission system, and the SC agrees, contact the customer and deny the request to start the motor.
5. If neither the ATCO Electric operator and the AltaLink operator have a concern regarding the starting of the motor, contact the customer and approve the request to start the motor.

5.6 Managing overload on 951L

When 951L is overloaded, the SC will:

1. Curtail exports to Saskatchewan to reduce 951L loading to 333 MVA or less within 10 minutes (see OPP 306).
2. Curtail DOS load in the Empress area to reduce 951L loading to 333 MVA or less within 10 minutes (see OPP 901).

5.7 Returning to normal operation

When the Empress area load is below the restrictive limit the SC will:

1. Restore an amount of Empress area DTS load that does not cause the restrictive limit to be exceeded.
2. Restore an amount of Empress area DOS load that does not cause the restrictive limit to be exceeded after all the Empress area DTS load has been restored.
3. Post ATC for exports to Saskatchewan to a level that will not cause the Empress area load to exceed the restrictive limit after all the Empress area DOS loads are restored.
4. When the Empress area load is below 260 MW and there is no other condition requiring the McNeill converter station (A840S) to be in the service mode (see OPP 305), inform the ATCO operator that the McNeill converter station is no longer required to support the Empress area load.

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5.8 Performing communication tests

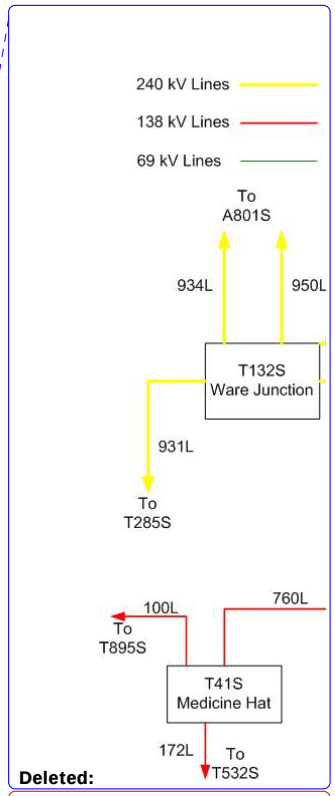
The SC will:

1. Determine the date and time of the test on a random basis; a communication test will be conducted at least once every six months.
2. On the scheduled date and time, call the operational contact personnel listed in Section 4.2. The contact information is provided in confidential Table 3.
3. If these communication tests are not performed for any reason, the SC will log the reasons why the tests could not be performed and will re-schedule the tests as soon as possible.
4. On the scheduled time, call the operational contact personnel listed in Section 4.2
   a. Identify yourself and note the name of the operational contact personnel.
   b. Communicate with the operational contact personnel about the purpose of the call. Ensure the personnel understand that the purpose is to perform the communication test described in OPP 503 and that actual load shedding is not required.
   c. Ask the operational contact personnel if they understand and know how to implement an SC directive for curtailing load as described in OPP 503.
   d. Record and forward the testing results to SC Operation Support staff.
   e. Report any discrepancies.

6. Figures and Tables

Figure 1

Empress Area



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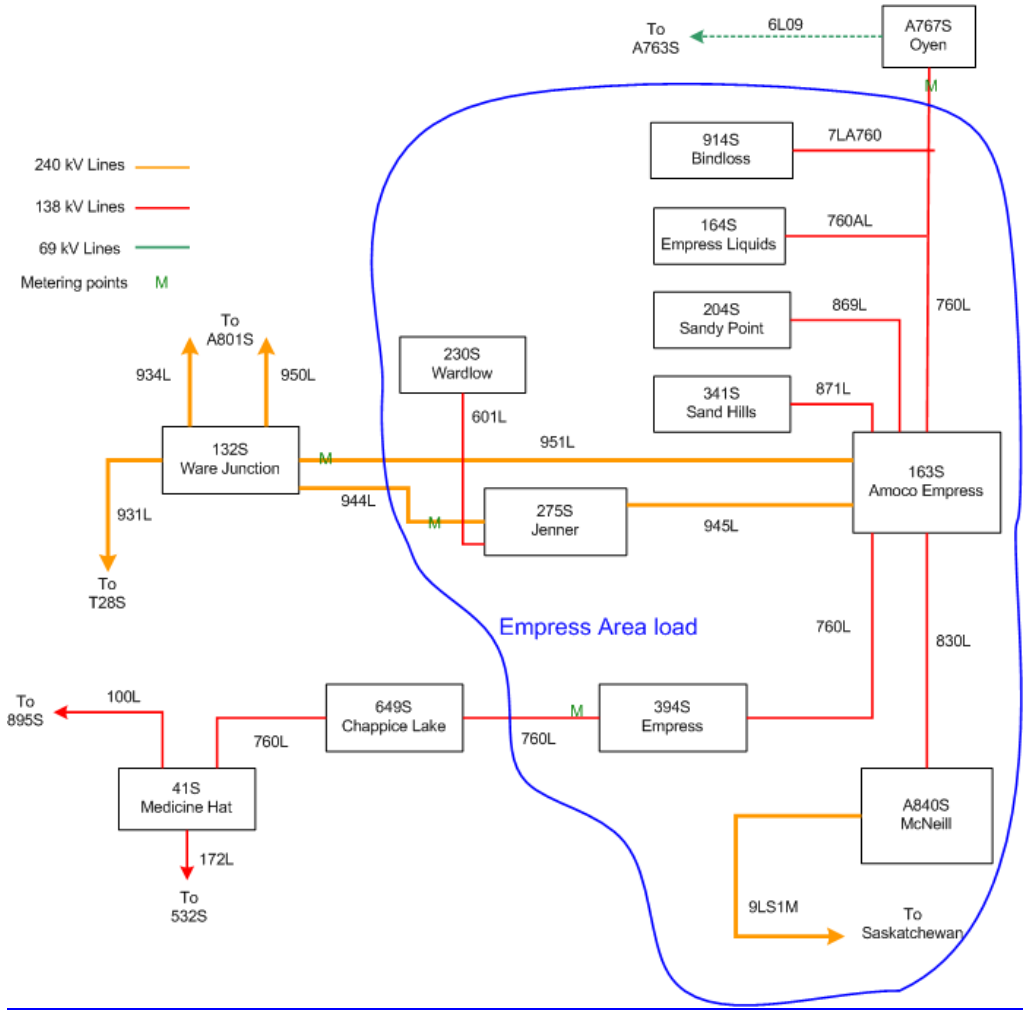

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Table 1

Load limit alarms

Alarm (Ranger Point Name)	Load Level (MW)	Condition	Action
EMPRESS AREA exceed HLM1	≥260	System intact	Put one capacitor bank at Amoco Empress (T163S) in service
		If additional voltage support is required and McNeill available but not in service	• Place McNeill in service on voltage control set point 142 kV • Adjust T163S taps so that >16 MVAr is supplied on 830L from McNeill
		No capacitor banks at Amoco Empress (T163S) available	• Curtail the Empress area load to 260 MW or less as described in Section 5.1.1.c
EMPRESS AREA exceed HLM2	≥305	System intact	Put the second capacitor bank at Amoco Empress (T163S) in service
		The second capacitor bank not available	• Curtail the Empress area load to 305 MW or less as described in Section 5.1.2.b
EMPRESS AREA exceed HLM3	≥355	System intact	• Curtail the Empress area load to 355 MW or less as described in Section 5.1.3

Table 2

DTS levels for the Empress area

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Table 3

DTS customer contact information

Confidential

View confidential tables

7. Revision History

Issued	Description
2009-	Supersedes 2007-12-03
2007-12-03	Supersedes 2006-09-29
2006-09-29	Supersedes 2006-05-16
2006-05-16	Supersedes 2006-02-21
2006-02-21	Supersedes 2003-09-30
2003-09-30	Supersedes 2003-07-28
2003-07-28	Revised to ISO Operating Policies and Procedures

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