BC HYDRO

REAL TIME OPERATIONS

OPERATING ORDER 7T – 12

RELIABILITY MUST RUN GENERATION REQUIREMENTS

Supersedes 7T-12 issued 20 September 2011
Major Revision

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Denotes Revision ‖

1.0 GENERAL

Responsibility for implementing generation constraints within the BCH Balancing Authority Area rests with the Generation Coordinator at the BC Hydro Control Centre. Generation constraints are required under all operating conditions to ensure the electric system is operated within criteria established by NERC, WECC and BCUC. To inform Generation Owners of these generation constraints, the Generation Coordinator issues directives called Reliability Must Run restrictions (RMRs). BCH uses RMRs to record all situations when generation is impacted due to the transmission system.

This order:

- provides a general description of RMRs,
- describes the methods of communicating RMRs between the Grid Operator, the Generation Coordinator and the Generator Owners,
- provides specific RMRs that are normally applicable, considered Standing RMRs,
- provides additional specific RMRs to accommodate planned and forced outages of important Transmission facilities, considered Temporary RMRs.

2.0 RMR DESCRIPTION

RMRs fall into one of two types, Standing or Temporary. Both Standing and Temporary RMRs specify either:

- The minimum or maximum Megawatt levels that must be observed at a particular generating plant or group of generating plants.
- The minimum number of generators that must be spinning at a particular generating plant or group of generating plants.
- Generators required off line or available for start.

Standing RMRs, covered in System Operating Orders, cover generation constraints that are permanent or seasonal in nature.

Temporary RMRs cover generation constraints that are temporary in nature, typically resulting from either a planned or forced outage of a key system element.

3.0 OUTAGE SCHEDULING AND RMR REQUIREMENTS

Refer to OO 1T-22 for more details on the Outage Scheduling process.

Standing RMRs are part of normal system operation and thus are detailed in System Operating Orders. They are not linked to Outage Requests and are not subsequently tracked by any other electronic system except TSA-PM.

Temporary RMRs may be effective immediately or within a few hours. These RMRs are linked to Outage Requests and are tracked in an electronic database and communication system called DCM (Dispatch and Compliance Monitoring) to advise Generator Owners of the RMR requirements. RTO Operations Engineers are responsible for creating planned RMR. RTO Operators are responsible for checking that RMRs listed in CROW associated with planned equipment outages were created in DCM and left in pending state. As these RMRs are only effective when the equipment is out of service or only during certain hours such as peak load, they are to be entered into DCM as Pending until required.

4.0 RMR IMPLEMENTATION IN DCM

Standing RMRs are considered to be Implemented at all times as they are part of normal system operations and managed using TSA-PM. Standing RMRs are considered to be always in effect and hence are not listed in DCM. DCM generation dispatch instructions sent by the Generator Owner (PSOSE) will meet standing RMR requirements.

Temporary RMRs are to be considered Pending until required. The RMR Implementation process is:

4.1 For Level I and Level II Equipment

- Generation Coordinator is responsible for Implementing RMR when required.
- Generation Coordinator is responsible for ensuring DCM generation dispatch instructions are sent to satisfy RMR if required.
- Generator Owner (PSOSE) is responsible for sending DCM generation dispatch instructions to operate within RMR.

4.2 For Level III and Level IV Equipment

- Grid Operator is responsible for contacting Generation Coordinator to Implement RMR.
- Generation Coordinator is responsible for Implementing RMR based on requirement from Grid Operator.
- Generation Coordinator is responsible for ensuring DCM generation dispatch instructions are sent to satisfy RMR if required.
- Generator Owner (PSOSE) is responsible for sending DCM generation dispatch instructions to operate within RMR.

5.0 RMR TERMINATION IN DCM

All RMRs are to be considered Implemented until no longer required. They must be terminated when no longer required to limit the impact to Generation Owners. The RMR Termination process is:

5.1 For Level I and Level II Equipment

- Generation Coordinator is responsible for Terminating RMR when no longer required.
- Generation Coordinator is responsible for contacting Generation Owner (PSOSE) to determine new generation schedule.
- Generator Owner (PSOSE) is responsible for sending DCM generation dispatch instructions to operate without RMR
- Generation Coordinator is responsible for ensuring DCM generation dispatch instructions are sent to satisfy new generation schedule if required.

5.2 For Level III and Level IV Equipment

- Grid Dispatcher is responsible for contacting Generation Coordinator to Terminate the RMR.
- Generation Coordinator is responsible for contacting Generation Owner for notification of RMR termination.
- Generation Owner (PSOSE) is responsible for ensuring DCM generation dispatch instructions are sent to satisfy new generation schedule.

6.0 LIST OF STANDING AND SPECIFIC RMRs

Appendix 1 documents the RMRs that are applicable under the identified system conditions. The RMRs listed are based on historical operations as well as requirements from other System Operating Orders.

Some of these constraints may be relaxed under a narrow range of generator patterns, system loads and transfers. The System Operator will issue new RMRs when system conditions result in a revised requirement.

Appendix 2 lists the RMRs that are required when a system element is out of service, such as a transmission line, transformer, circuit breaker, etc.

The System Operator will work closely with:

- Market participants and generator owners subject to the Standards of Conduct to minimize the impact of scheduled planned outages of Transmission facilities.
- The Transmission Asset Manager and Field Services staff to reduce the number of forced outages and to minimize the duration of planned outages.

7.0 REVISION HISTORY

Revised By	Revision Date	Summary of Revision
DSG	28 Apr 2005	For 2L221 and 2L222 RMR revised so they are same for both lines. For 5L91 SEL + 5L98 SEL + 2L112 NLY>-700 MW, the only change is that less than symbol is replaced with greater than symbol. Deleted 60L309 section because NWE is not used to supply Local area load.
RDB	11 July 2005	Update PCN generation limits for 5L7 outages.
BJH/BLL	2 August 2005	Major revision to add specific details to RMR process as to how it is implemented, terminated and who is responsible for doing that.
JL	11 Oct 2005	1. Update 2L293 and 2L112 pre-outage restriction to reflect the addition of 2L293/2L112 O/L protection at NLY. 2. Update the limitation on 5L91 from 400 MW to 1500 MW during 5L98 OOS to reflect the addition of new 5L76 & 5L79 RAS
TCSF	24 Mar. 2006	Added RMR for ALU/SFN/RUS during winter peak load condition to support Metro 60kV system.
GPR	7 April. 2006	Generation Owner to replace "PSOSE" 5.1 Level IV changed to Level II and 5.2 wording corrected. 60L72 RMR removed
CBM	25 January 2010	New line 3L5, new station KWL added. Also updated to reflect new workforce model.
DSG	20 September 2011	Updated after BCH/BCTC merger
TY,RAC, SSS,	22 July2013	Complete Revision. Reviewed and updated RMRs. RMRs split into 2 sections – Standing and Temporary, with separate appendices
RAC/CM/DS /CHK/MPP, et al	08 July 2014	Revised to update RMR requirements that are currently in effect for system normal and various outage configurations.

Appendix 1
Standing Reliability Must Run Restrictions

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
System Normal	BGS has 2 units available as synchronous condenser			Voltage control
Metro 60kV System Normal	ALU, SFN, RUS to run as required to meet winter peak load			To prevent overload and under-voltage conditions
All system conditions	Minimum of two BRR units are required online at all times	Loss of BRT T4	7T-14	Control voltages after BRT T4 contingency
All system conditions	The GMS+PCN+QTY pre-outage and post-outage limits must be reduced by the amount of import from Alcan exceeding 150 MW		7T-13	System stability
All system conditions	Min unit on line requirement at GMS/PCN		7T-13 Att. 1	System stability
All system conditions	4 GMS with PSS or 3 GMS with PSS and 2 PCN with PSS in service		7T-13	Self-excitation
All system conditions	REV G1, G2, G3 and G4 shall not exceed 500MW each REV G5 shall not exceed 518MW		7T-34	Unit Capacity
All system conditions	REV Plant cannot exceed 2000MW unless various transmission conditions are satisfied		7T-34	Voltage Control
All system conditions	SEL area and FBC generation may be restricted depending on system conditions	Loss of 5L91 & 5L96	7T-34 Att. 1	Prevent post-contingency over frequency
All system conditions	SEL area and FBC generation may be restricted depending on system conditions	Loss of 2L221, or 2L222, or 2L295, or 2L299, or 62L, or 77L	7T-34	To ensure lines remain within thermal rating
All system conditions	Minimum units online requirements to support import		7T-64	Rotational energy requirement
All system conditions	Minimum units online requirements at GMS, PCN, MCA, REV, SEV, KCL, ALH and WAN to support export	Loss of 5L51 and 5L52	7T-18	Control of post-disturbance voltages
All system conditions	Ordering the changes in reactive output and/or voltage at GMS, PCN, MCA, REV, BR, KCL, SEV, BGS, SFN, RUS, CMS, SCA, LDR, JHT and VIT		7T-22	Voltage control and dynamic reactive reserve
All system conditions	Minimum units online requirements		7T-22	Voltage control and dynamic reactive reserve

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
All system conditions	Minimum units online requirements at MVA, REV, SEV, KCL, and ALH	Loss of 5L81 and 5L82	7T-34	To support post outage voltages
All system conditions except 5L71 & 5L72 OOS or 5L87 & (5L71 or 5L72) OOS	At least 2 MCA units shall not exceed 465MW and no one unit can exceed 478MW		7T-34	
5L29 & 5L30 I/S	If 5L29 + 5L31 MW > 1450 MW, VI generation support is required to keep 5L29 + 5L31 MW < 1450 MW	Loss of one of 5L29/5L30	7T-40	Security of supply to VI
5L71 OOS	MCA generation is restricted to 1650 MW or lower		7T-34	Transient Stability
5L72 OOS	MCA generation is restricted to 1650 MW or lower		7T-34	Transient Stability

7T-12 Appendix 2
Temporary Reliability Must Run Restrictions

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
60L13 OOS	ALU offline			Separated from system
60L13 section OOS	ALU online and generation restricted to area load			To supply area load
60L129 OOS	DTR, SSH, M3C IPP's off line			Separated from system
60L20 OOS (any section)	• (SON+WDN+LAJ) < 65MW to prevent BR1 T3 from overloading • (SON+WDN) < 55MW to prevent 60L21 from overloading • SON reduced to 10MW and 0MW for switching • Keep SON on line for next contingency (60L21 or BR1 T3) to serve area load (Lillooet) • Note: Criteria 1 and 2 may be relaxed by a few MWs depending on Area Load. However, note that Summer temperatures in the area can be expected to reach 40C		7T-25	Thermal rating of BRT T3 and 60L21
60L21 OOS	• 60L21 out from WDN to BR1:(SON+WDN) < 35MW due to system stability constraints • 60L21 out from WDN to SON: SON < 35MW due to system stability constraints • (SON+WDN) reduced to 15MW for switching • Keep SON and LAJ on line for next contingencies (loss of 60L20 and 60L22 respectively) to serve area loads		7T-25	System stability
BR1 T3 OOS	(LAJ+WDN+SON) < 35MW due to system stability constraints (LAJ+WDN+SON)< 15MW for switching		7T-25	System stability
60L22 OOS	LAJ offline		7T-25	Separated from system
60L22 section OOS	LAJ online and generation restricted to area load		7T-25	To supply area load
60L35 or 60L36	LB1 and/or SFN and/or RUS units may be required online			For support of 60kV system
60L218 OOS	WHN off line, PIN IPP off line, SCB IPP off line			Separated from system
60L219 OOS	PIN IPP off line			Separated from system

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
60L301	• (SON+WDN+LAJ) < 65MW to prevent BR1 T3 from overloading • (SON+WDN-Area Load) < 55MW to prevent 60L21 from overloading • Keep SON available to serve area load following 60L21 forced outage		7T-25	Thermal rating of BRT T3 and 60L21
60L309 OOS	NWE offline			Separated from system
60L395 OOS	RPG offline			Separated from system
1L10 OOS	JOR available	Loss of 1L11 or 1L14	6T-63	To restore load following RAS operation
1L11 OOS	JOR available	Loss of 1L10 or 1L14	6T-63	To restore load following RAS operation
1L14 OOS	JOR available	Loss of 1L10 or 1L11	6T-63	To restore load following RAS operation
1L31 OOS	COM available for voltage support as required	1L35		May be required for pre-contingency voltage support, or to be started to serve the local COM load post contingency
1L32 OOS	COM available for voltage support as required	1L35		May be required for pre-contingency voltage support, or to be started to serve the local COM load post contingency
1L35 OOS	COM available for voltage support as required	1L31		May be required for pre-contingency voltage support, or to be started to serve the local COM load post contingency
1L44 OOS	COM offline SCG IPP off line			Separated from system
1L44 section OOS	COM online and generation restricted to area load			To supply area load
1L105 OOS	ASH online	Loss of 1L114		To supply area load
1L114 OOS	ASH online	Loss of 1L105		To supply area load
1L127 GCL-ASH OOS	ASH offline			Separated from system

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
1L127 PAL-GCL OOS	ASH online and generation restricted to area load IPPs offline			Separated from system
1L143 SOO-JOR OOS	JOR online and generation restricted to area load			To supply area load
1L143 CLD-SOO OOS	JOR online and generation restricted to area load			To supply area load
1L146 OOS	JOR online and generation restricted to area load			To supply area load
1L101	ICG+LDR+SCA+PUN output restricted	Loss of 1L102, 1L106, 1L119	6T-60	Prevent overload of parallel line and RAS operation for next contingency
1L102	ICG+LDR+SCA+PUN output restricted	Loss of 1L101, 1L106, 1L119	6T-60	Prevent overload of parallel line and RAS operation for next contingency
1L106	ICG+LDR+SCA+PUN output restricted	Loss of 1L101, 1L106, 1L119	6T-60	Prevent overload of parallel line and RAS operation for next contingency
1L119	ICG+LDR+SCA+PUN output restricted	Loss of 1L101, 1L102, 1L106	6T-60	Prevent overload of parallel line and RAS operation for next contingency
1L246 OOS	WGS offline			Separated from system
1L359 OOS	FNG online and generation is restricted to area load			To supply area load
2L9 OOS	CMS+COM+IPPs restricted	System Normal or Loss of 2L13		Overload of CKY-MSA 138 kV and/or CKY-WLT 230 kV transmission paths
2L12 OOS	CMS off line			Separated from system
2L13 OOS	CMS+COM+IPPs restricted	System Normal or Loss of 2L9		Overload of CKY-MSA 138 kV and/or CKY-WLT 230 kV transmission paths
2L14 OOS	CMS+COM+IPPs restricted	System Normal		Overload of CKY-MSA 138 kV and/or CKY-WLT 230 kV transmission paths
2L17 OOS	CMS+COM+IPPs restricted	System Normal		Overload of CKY-MSA 138 kV and/or CKY-WLT 230 kV transmission paths

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
Switching 2L77 or 2L78/ROS T1	• Shut down WAH G1 prior to switching • WAH G1 should not be connected to 3L3 because if 3L2 open-ends at BRT, self-excitation at WAH is possible.		7T-14	To reduce the closing angle across 360/60kV connection at WAH
Switching (2L75 or 2L76 or 2L79) with 5L40 or CBN T1/T2 OOS	• Restrict BR1+BR2+KWL such that BRT T4 < 450MVA rating • WAH may be required for voltage support		7T-14	Prevent overload and provide voltage support
2L77 OOS or (2L77 and 3L3) OOS	• At least 2 BRR VAR-units online (MW output <60%) • WAH may be required online With no UHT reactors online: • Minimum of (2 BR2 units and 1 BR1 unit) OR (4 BR1 units) must be online • All UHT IPP plants must be offline With one UHT reactors online: • Minimum of (2 BR2 units) OR (3 BR1 units) must be online • Minimum of 12 bigger UHT IPP units must be online With two UHT reactors online: • Minimum of 7 bigger UHT IPP units must be online	Loss of BRT T4, 3L2 open-end at BRT	7T-14 and 7T-14 Att. 1	Transient stability. Self-excitation at BRR or KWL

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
2L78/ROS T1 OOS or (2L78/ROS T1 and 3L3) OOS	• At least 2 BRR VAR-units online (MW output <60%) • WAH may be required online With no UHT reactors online: • Minimum of (2 BR2 units and 1 BR1 unit) OR (4 BR1 units) must be online • All UHT IPP plants must be offline With one UHT reactors online: • Minimum of (2 BR2 units) OR (3 BR1 units) must be online • All 14 UHT IPP plants must be online With two UHT reactors online: • Minimum of 9 bigger UHT IPP units must be online	Loss of BRT T4, 3L2 open-end at BRT	7T-14 and 7T-14 Att. 1	Transient stability. Self-excitation at WAH, BRR or UHT
3L2 OOS	• At least 2 BRR VAR-units online (MW output <60%) • With no UHT reactors online, a minimum of approx 8 bigger UHT IPP units (112 MVA or 100MW capacity) must be online • With one UHT reactors online, a minimum of approx 2 bigger UHT IPP units (35MVA or 31MW capacity) must be online	Loss of 2L78/ROS T1 3L5 open-end at ROS 2L77 open-end at CBN	7T-14	Transient stability. Self-excitation at BRR or UHT
Switching 3L2 or 3L5	WAH G1 shut down unless WAH required for voltage control in Fraser Valley 60kV (i.e. During summer LLH or Winter HLH)		7T-14	Prevent excessive accelerating torque on WAH G1
3L3 OOS	Adjust WAH G1 output to avoid overload on WAH T2 / T5 / 60L93 / 60L95		7T-14	Thermal overload
Switching 3L3	Adjust WAH to reduce flow on 3L3 between ±5MW		7T-14	Minimize angle across WAH 60CB1

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
3L5 OOS or (3L5 and 3L3 and 2L78/ROS T1) OOS	• At least 2 BRR VAR-units online (MW output <60%) With no UHT reactors online: • Minimum of (2 BR2 units and 1 BR1 unit) OR (4 BR1 units) must be online • All 14 UHT IPP plants must be online With one UHT reactors online: • Minimum of (2 BR2 units) OR (3 BR1 units) must be online • Approximately 8 bigger UHT IPP units (112 MVA or 100MW capacity) must be online With two UHT reactors online: • Approximately 2 bigger UHT IPP units (27MVA or 24MW capacity) must be online	Loss of BRT T4, 3L2 open-end at BRT	7T-14 Att. 1	Transient stability. Self-excitation at BRR or UHT
BRT T4 OOS or 2L19 OOS	For switching: • Reduce SON+LAJ+WDN to 15MW and BR1+BR2 <200MW • Preferred to have 1 BRR unit at minimum load (20MW) and excluded from 3L2 genshed For outage: • BRR restricted to 400MW or 3L2 rating if it is lower • At least 2 BRR VAR-units online (MW output <60%) • With no UHT reactors online, a minimum of (2 BR2 units and 1 BR1 unit) OR (4 BR1 units) must be online • With one UHT reactors online, a minimum of (2 BR2 units) OR (3 BR1 units) must be online	3L2 open-end at UHT, 3L5 open-end at ROS, Loss of 2L78/ROS T1, Loss of 2L77	7T-14 and 7T-14 Att. 1	For switching, lightly loaded unit to carry area load and limit over-frequency, preserve station service supply Transient stability. Transient under-voltage. Self-excitation at BRR.
3L2 and 3L5 OOS	• At least 2 BRR VAR-units online (MW output <60%)	Loss of 2L1, 2L2, 2L5 or 2L90	7T-14 Att. 1	Transient stability
3L2 and 3L3 and 3L5 OOS	• At least 2 BRR VAR-units online (MW output <60%)	Loss of 2L1, 2L2, 2L5 or 2L90	7T-14 Att. 1	Transient stability
Outages at BR areas with BR generation terminal voltages below 13.8 kV	BR output must be reduced below 250 MW		7T-14	Transient stability

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
3L13 OOS	BR2 G5 and G6 off line			Separated from system
3L14 OOS	BR2 G7 and G8 off line			Separated from system
3L15 OOS	BR2 G1 and G4 off line			Separated from system
3L16 OOS	BR1 G2 and G3 off line			Separated from system
BRT 3CB1 OOS	Preferred to have BR1 G2, G3 and BR2 G7, G8 online	Loss of (2L77 or 2L78) and (2L19 or BR1 T3 or BRT T4)	7T-14	Self-excitation at BRR
BRT 3CB2 OOS	Preferred to have BR1 G1, G4 and BR2 G5, G6 online	Loss of (2L77 or 2L78) and (2L19 or BR1 T3 or BRT T4)	7T-14	Self-excitation at BRR
Switching of 60kV tie between WAH and ALZ	Temporary adjustments to WAH G1 output may be requested		7T-14	
BRT 2CB1 or 2CB2 or 2CB3 or 2CB4 OOS system normal and with additional circuits OOS	LAJ <=22MW, and SON <=40MW, and WDN <=10MW	Loss of BRT T4/2L19	7T-14 Att.1	Refer to 7T-14 Attachment 1 notes for additional details. The RMR applies only for certain circuit breakers OOS with certain circuits OOS concurrently. As a result, requirement is specified in each Table separately.
BR1 T1 OOS	BR1 G1 and G4 off line			
BR1 T2 OOS	BR1 G2 and G3 off line			
BR2 T5 OOS	BR2 G5 off line			
BR2 T6 OOS	BR2 G6 off line			
BR2 T7 OOS	BR2 G7 off line			
BR2 T8 OOS	BR2 G8 off line			
BRT T3/T4 switching	BR generation bellow 200 MW for switching Reduce SON, LAJ and WDN total generation below 15MW for switching		7T-14	Switching requirements for BRT T3/T4

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
(2L1 or 2L5) and 2L2 OOS	Limit BR1 + BR2 <= 434MW; additional restrictions to KWL may be applied.		7T-14 Att. 2 (Case 7)	See RMR's for individual line outages - also applicable. This RMR requirement predates KWL implementation.
2L2 and 2L90 OOS	Limit BR1 + BR2 <= 434MW; additional restrictions to KWL may be applied.		7T-14 Att. 2 (Case 9)	See RMR's for individual line outages - also applicable. This RMR requirement predates KWL implementation.
(2L1 or 2L5) and 3L2 OOS	Limit BR1 + BR2 <= 450MW		7T-14 Att. 2 (Case 33)	See RMR's for individual line outages - also applicable.
2L2 and 3L2 OOS	Limit BR1 + BR2 <= 450MW		7T-14 Att. 2 (Case 34)	See RMR's for individual line outages - also applicable.
3L2 and 2L90 OOS	If temperature at CKY <= 25C then limit BR1 + BR2 <= 170MW If temperature at CKY > 25C then limit BR1 + BR2 <= 115MW At least two BR2 units and total of 5 BRR units must be online either as S/C or in generate		7T-14 Att. 2 (Case 35)	See RMR's for individual line outages - also applicable.
(2L78/ROS T1 OOS or 2L77 OOS) and (2L1 or 2L5) OOS	Limit BR1 + BR2 + WAH <= 434MW + 60MW Do not operate with less than 4 BR2 and 5 BR1/BR2 units online	BRT T4	7T-14 Att. 2 (Case 41)	Self-excitation. See RMR's for individual line outages - also applicable. This RMR requirement predates KWL implementation.

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
(2L78/ROS T1 OOS or 2L77 OOS) and 2L2 OOS	Limit BR1 + BR2 + WAH <= 434MW + 60MW Do not operate with less than 4 BR2 and 5 BR1/BR2 units online; additional restrictions to KWL may be applied	BRT T4	7T-14 Att. 2 (Case 42)	Self-excitation. See RMR's for individual line outages - also applicable. This RMR requirement predates KWL implementation.
(2L78/ROS T1 OOS or 2L77 OOS) and 2L90 OOS	If temperature at CKY <= 25C then limit BR1 + BR2 + WAH <= 170MW + 60MW If temperature at CKY > 25C then limit BR1 + BR2 + WAH <= 115MW + 60MW Do not operate with less than 4 BR2 and 5 BR1/BR2 units online Additional restrictions to KWL may be applied	2L1, 2L2, 2L9	7T-14 Att. 2 (Case 43)	Electromechanical instability See RMR's for individual line outages - also applicable. This RMR requirement predates KWL implementation.
3L2 and 2L90 and BR1 T3 OOS	Limit BR1 + BR2 <= 170MW Do not operate with less than 4 BR2 and 5 BR1/BR2 units online		7T-14 Att. 2 (Case 60)	See RMR's for individual line outages - also applicable.
5L1 OOS	GMS+PCN+QTY generation is restricted to approximately 3100 MW. Actual limit is calculated in TSAPM and is based on system load, voltage at GMS/PCN and Alcan transfer exceeding 150MW		7T-13	Transient stability
5L2 OOS	GMS+PCN+QTY generation is restricted to approximately 3100 MW. Actual limit is calculated in TSAPM and is based on system load, voltage at GMS/PCN and Alcan transfer exceeding 150MW		7T-13	Transient stability
5L3 OOS	GMS+PCN+QTY generation is restricted to approximately 3100 MW. Actual limit is calculated in TSAPM and is based on system load, voltage at GMS/PCN and Alcan transfer exceeding 150MW		7T-13	Transient stability

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
5L4 OOS	Either restrict PCN output to within 25MW of KDS load or open KDS 5CB1 to black out KDS load. Minimum unit online requirement depends on status of reactors at PCN and WSN. GMS+PCN+QTY output restricted to 3100MW.	5L7 open ended at WSN	7T-13	To prevent self excitation and minimize over frequency
5L7 OOS	PCN generation should be less than 250 MW and should match KDS load as close as possible. If PCN generation cannot be matched within 25 MW of KDS load, consider opening PCN 5CB1 or 5CB2 to separate some of the PCN generation should 5L4 trip. GMS+PCN+QTY output restricted to 3100MW.	5L4 open ended at PCN or GMS and PCN generation is islanded with KDS load.	7T-13	To prevent self excitation and minimize over frequency
5L11 OOS	GMS+PCN+QTY generation is restricted to approximately 3100 MW. Actual limit is calculated in TSAPM and is based on system load, voltage at GMS/PCN and Alcan transfer exceeding 150MW	Loss of 5L12 and 5L13	7T-13	Transient stability
5L11 Genshed OOS	KMO generation is restricted to maintain transfer on 2L103 to 150 MW or lower	Loss of 5L11	7T-13	Transient stability
5L12 OOS	GMS+PCN+QTY generation is restricted to approximately 3100 MW. Actual limit is calculated in TSAPM and is based on system load, voltage at GMS/PCN and Alcan transfer exceeding 150MW	Loss of 5L11 and 5L13	7T-13	Transient stability
5L12 Genshed OOS	KMO generation is restricted to maintain transfer on 2L103 to 150 MW or lower	Loss of 5L12	7T-13	Transient stability
5L13 OOS	GMS+PCN+QTY generation is restricted to approximately 3100 MW. Actual limit is calculated in TSAPM and is based on system load, voltage at GMS/PCN and Alcan transfer exceeding 150MW	Loss of 5L11 and 5L12	7T-13	Transient stability

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
5L13 Genshed OOS	KMO generation is restricted to maintain transfer to 150 MW or lower	Loss of 5L13	7T-13	Transient stability
5L61 OOS	RPG FLS and KMO on line and restricted to area load		7T-30	To supply area load
5L62 OOS	RPG FLS and KMO on line and restricted to area load		7T-30	To supply area load
5L63 OOS	RPG FLS and KMO on line and restricted to area load		7T-30	To supply area load
SKA T1 or T2 OOS	RTA export restricted	Loss of parallel bank	7T-30	Limit overfrequency
2L99 OOS	RTA export restricted		7T-30	Islanded operation carrying MIN area load
2L103 OOS	RTA export restricted		7T-30	Islanded operation - separated from BCH system
2L101 OOS	RPG, FLS, BRL IPP online and running at area load. One RPG unit running in 0% droop.		3T-RUP-01, 6T-73	To supply area load

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
2L86, 2L96, 2L94,2L352, OOS	NWE energy on line or available as much as possible			There are no RMR agreements with NWE, however, it is advantageous to have on line for these outages. Schedule outages accordingly.
500 kV Lines or Series Capacitor switching in Northern Interior	Reduce existing GMS+PCN+QTY output limit by 500MW while switching		7T-13	System Stability
PSS OOS at GMS	Reduce GMS output limits by 25 MW for each on-line unit operating without PSS in service		7T-13	Any unit operating without its PSS I/S is violating WSCC RMS criteria and is to be avoided if possible
Two of GMS LR1 or LR2 or LR3 OOS	Reduce existing GMS+PCN+QTY output limit by 300 MW		7T-13	System Stability
All GMS LRs OOS	Reduce existing GMS+PCN+QTY output limit by 600 MW		7T-13	System Stability
KMO Gen Shed OOS	KMO output restricted such that genshed does not need to be armed	Loss of 5L11, 5L12 or 5L13	7T-13 7T-30	Transient stability

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
KLY 5B11 OOS	• Take one KLY-WSN line out-of-service (i.e. 5L11) • Limit (GMS+PCN) < 3000MW • Satisfy minimum unit online requirement at GMS and PCN • Load units selected to stay online for minimum unit online requirement equal to Area Load - North Interior IPP Generation - 150MW • North Interior IPP Generation includes MCM, NWE, BMW, DKW, RPG, QTY, etc. • Arm remaining GMS and PCN units to shed for double KLY-WSN line contingency (i.e. 5L12 and 5L13)	KLY 5B12 or KLY T4	7T-13	Transient stability, reduce over frequency, reduce over-voltage from off-loaded lines
KLY 5B12 OOS	• Take one KLY-WSN line out-of-service (i.e. 5L11) • Limit (GMS+PCN) < 3000MW • Satisfy minimum unit online requirement at GMS and PCN • Load units selected to stay online for minimum unit online requirement equal to Area Load - North Interior IPP Generation - 150MW • North Interior IPP Generation includes MCM, NWE, BMW, DKW, RPG, QTY, etc. • Arm remaining GMS and PCN units to shed for double KLY-WSN line contingency (i.e. 5L12 and 5L13)	KLY 5B11 or KLY T1	7T-13	Transient stability, reduce over frequency, reduce over-voltage from off-loaded lines
GMS 5B11 OOS	GMS G7, G8, G9, G10 + PCN plant output restricted to 1000 MW or lower	Loss of GMS 5B12 or GMS T12		Transient stability, prevent 5L3 and 5L7 from overloading
GMS 5B12 OOS	GMS G7, G8, G9, G10 + PCN plant output restricted to 1000 MW or lower	Loss of GMS 5B11 or GMS T11		Transient stability, prevent 5L3 and 5L7 from overloading
LAJ 60D23 OOS	LAJ required on line			Supply area load

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
5L29 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of 5L31	7T-40	Security of supply to VI
5L30 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of 5L32	7T-40	Security of supply to VI
5L31 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of 5L29	7T-40	Security of supply to VI
5L32 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of 5L30	7T-40	Security of supply to VI
5L42 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of 5L45	7T-40	Security of supply to VI
5L45 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of 5L42	7T-40	Security of supply to VI
CKY 5MB1 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of CKY 5MB2		Security of supply to VI
CKY 5MB2 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of CKY 5MB1		Security of supply to VI

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
DMR T1 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of DMR T2	7T-40	Security of supply to VI
DMR T2 OOS	JOR available for post-contingency load restoration VI Dependable Generation loading as required	Loss of DMR T1	7T-40	Security of supply to VI
MDN T1 OOS	Require BGS generation support, up to 450 MW depending on area load. May require max generation at CMS	Loss of MDN T3 or MDN 5MB2		Security of supply to Vancouver downtown
MDN T3 OOS	Require BGS generation support, up to 450 MW depending on area load. May require max generation at CMS	Loss of MDN T1 or MDN 5MB1		Security of supply to Vancouver downtown
MDN 5MB1 OOS	Require BGS on line with generation support, up to 450 MW depending on area load	Loss of MDN 5MB2 or MDN T3		Security of supply to Vancouver downtown
MDN 5MB2 OOS	Require BGS on line with generation support, up to 450 MW depending on area load	Loss of MDN 5MB1 or MDN T1		Security of supply to Vancouver downtown
MSA T1 or T2	COM may be required online	Loss of MSA T2 or T1		Supply area load
2L101 OOS	RPG and FLS on line and generation is restricted to area load			To supply area load

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
2L221 OOS	SEV generation is restricted.			2L221 outage takes out SEV G1 & G2
2L222 OOS	SEV generation is restricted.			2L222 outage takes out SEV G3 & G4
2L253 OOS	WHN/PIN IPP/AKO IPP may be off line except some may carry area load.			
2L295 OOS, or 2L299 OOS	KCL/SLC river plants generation is restricted.		7T-34 Att. 2	Thermal rating of the line
5L71 gen shed RAS OOS	MCA generation is restricted to 1650 MW or lower	3 phase fault on 5L71		Transient stability
5L72 gen shed RAS OOS	MCA generation is restricted to 1650 MW or lower	3 phase fault on 5L72		Transient stability
5L87 OOS	Limit MCA <= 1100 MW, each MCA unit shall not exceed 450 MW, 2 MCA units must be in SC mode or generating less than 100 MW each unit	Loss of both 5L81 and 5L82	7T-34 Att. 1	Transient stability
5L91 OOS	MCA, REV and SEL area generation may be restricted to keep 5L96 within thermal limits. See 7T-34 Table 1.12.		7T-34 Att. 1	Thermal rating of the line

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
5L98 OOS	Transfer limits on 5L91 & 5L96 based on FBC Load and number of ACK 5CXs in service may impact SIE generation.	Loss of 5L91	7T-34 Att. 1	
	System conditions may require increasing REV and/or SIE generation to address post-contingency under-frequency concerns	Loss of 5L76 and 5L79	7T-34 Att. 1	To prevent post-contingency frequency drop
NIC 5MB4 OOS	REV, KCL, SEV restricted. Exact RMR dependent on system conditions	Loss of 5MB1/2		Transient stability
SEL T1 OOS	SEL area and FBC generation may be restricted depending on 2L293 MW flow and FBC generation and load		7T-34 Att. 2	To avoid overloading SEL T2/T3
SEL T2 & T3 OOS	SEL area and FBC generation may be restricted depending on 2L293 MW flow and FBC generation and load		7T-34 Att. 2	To avoid overloading SEL T1/T4
SEL T4 OOS	SEL area and FBC generation may be restricted depending on 2L293 MW flow and FBC generation and load		7T-34 Att. 2	To avoid overloading SEL T1/(T2 & T3)
SEL 5CB1 or/and SEL 5CB2 OOS	Limit: (FBC to BCH) + (AB to BC) < (WAN shedable generation amount + 0.98 * SELT1MVA_Rating + AAL/CBK/NTL load – 660 MW)	Loss of SEL T4	7T-34 Att. 2	Overloading on SEL T1
SEL 5CB4 OOS	Limit: (FBC to BCH) + (AB to BC) < (WAN shedable generation amount + 0.98 * SELT4MVA_Rating + AAL/CBK/NTL load – 2SEV@ MIN.MW – 2KCL@ MIN.MW –100 MW)	Loss of SEL T1	7T-34 Att. 2	Overloading on SEL T4

System Conditions	Impact on Generation	Related Contingency	SOO/LOO	Reason
2L289 OOS	KCL and WAN generation may be restricted to address thermal overload concerns		7T-34 Att. 2	Thermal rating of the line
2L289 OOS	If FBC's BRD Gen Shedding RAS for loss of both 2L288 AND 2L289 is unavailable, AND If on-line BRD units >= 3, then • Limit: (-7L BTS – 8L BTS) < on-line BRD units * 15 + 30 MW	Loss of 2L288	7T-34 Att. 2	
2L288 OOS	If FBC's BRD Gen Shedding RAS for loss of both 2L288 AND 2L289 is unavailable, AND If on-line BRD units >= 3, then • Limit: (-7L BTS - 8L BTS) < on-line BRD units * 15 + 30 MW	Loss of 2L289, or 2L289 & 2L295, or 2L289 & 2L299, or 2L289 & 2L295 & 2L299	7T-34 Att. 2	
2L293 OOS, or SEL T1 and 2L293 OOS with all SEL 2CBs & 5CBs I/S	Limit 62L ESS to WTS flow to the lesser of: • 270 – 0.13 * (SEV G1 + SEV G2), or • 270 – 0.13 * (SEV G3 + SEV G4)	Loss of 2L221 or 2L222	7T-34 Att. 2	
2L293 OOS, or SEL T1 and 2L293 OOS with all SEL 2CBs & 5CBs I/S	WAN Generation may be restricted to limit flow on 2L277 and 62L ESS		7T-34 Att. 2	Thermal rating of the line
2L277 OOS	WAN Generation may be restricted to limit flow on 62L ESS and 34L WTS		7T-34 Att. 2	Thermal rating of the line
2L277 OOS	WAN generation restrictions may exist		7T-34 Att. 2	2L289 & 2L295 & 2L299 contingency or 77L contingency