British Columbia Transmission CORPORATION™

Transfer Limits of Alcan Exporting to BCTC Under System Normal Conditions

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Table of Contents

Executive Summary

This study updates the transfer limits of Alcan exporting to BCTC under system normal conditions to incorporate the effect of separation scheme recently installed at Kitimat. The study results would be used to update the existing system operating order 7T-30.

DETERMINATION OF TRANSER LIMITS OF ALCAN EXPORTING TO BCTC

1 INTRODUCTION

This study updates the transfer limits of Alcan exporting to BCTC to incorporate the benefit of a new separation scheme that Alcan has installed at KIT. The study results would be used to update the existing system operating order 7T-30.

The separation scheme at KIT contains two relays to detect multi-phase faults. One relay looks toward Alcan system, another toward the BCTC system. If either relay detects any multi-phase faults, the KIT to MIN (2L103) line will be tripped immediately. In addition, detection of any type of fault on one of the two KMO to KIT lines will also trip open 2L103. With this separation scheme in service, the Alcan to BCTC exporting limit can be increased. This study is focused on system normal conditions only.

2 STUDY ASSUMPTIONS

a) The separation scheme at KIT is in service.
b) The power generated by Eurocan IPP supplies Eurocan loads only.
c) Existing out-of-step relay and settings at MIN substation remain unchanged.
d) The maximum load at KIT is assumed to be 630MW.
e) The maximum load at MIN is assumed to 100MW (*The load at MIN is defined as -2L103MIN-2L99MIN*).

3 TRANSFER LIMITS OF ALCAN EXPORTING TO BCTC

The transfer capability of Alcan exporting to BCTC is determined based on the separation scheme described below in place:

2L103 will be tripped open upon detecting anyone of the following faults:

(a) Multi-phase faults on the Alcan system, such as potlines, transformers at KIT, etc.
(b) Multi-phase faults on the transmission lines off MIN.
(c) Multi-phase faults on MIN transformers.
(d) Any fault on one of the KMO to KIT lines.

The transfer limits from Alcan to BCTC vary with KIT and MIN load.
The load at MIN, L_{MIN}, is defined as L_{MIN} = -2L103MIN-2L99MIN.
If L_{MIN} > 100MW, set L_{MIN} =100MW; if L_{MIN}<0, set L_{MIN} = 0.

The load at KIT, L_{KIT}, is defined as L_{KIT} = -87KIT-88KIT-2L103KIT.
If L_{KIT} <300MW, set L_{KIT}=300MW; if L_{KIT}>630MW, set L_{KIT}=630MW.

The transfer limits are listed in Table-1 and graphically illustrated in Appendices A-1 to A-6. The transfer limits have been simplified as a function of L_{MIN} and L_{KIT}, and calculated by the following linear equation, *i.e*.

P_T (P_2L103) is the lesser of
- 380 MW, or
- $(A + B*L_{MIN})$

where A and B depend on L_{KIT}. Details on computation of A and B are listed in Table-2.

Table-1: Transfer Limits from Alcan to BCTC

System Condition	No. of Capacitor Banks In Service	No. of KMO Units On-Line	Kitimat Load, L_{KIT} (MW)	KIT to MIN Transfer Limit P_T(=P_2L103) (MW)
System Normal	5	8	$300 < L_{KIT} \le 450$	360 MW ~ 380 MW
			$450 < L_{KIT} \le 536$	294 MW ~ 380 MW
			$536 < L_{KIT} \le 580$	230 MW ~ 294 MW
			$580 < L_{KIT} \le 630$	160 MW ~ 250 MW
	6	8	$300 < L_{KIT} \le 450$	360 MW ~ 380 MW
			$450 < L_{KIT} \le 536$	294 MW ~ 380 MW
			$536 < L_{KIT} \le 580$	250 MW ~ 294 MW
			$580 < L_{KIT} \le 630$	200 MW ~ 250 MW
	5	7	$300 < L_{KIT} \le 450$	290 MW ~ 380 MW
			$450 < L_{KIT} \le 536$	254 MW ~ 340 MW
			$536 < L_{KIT} \le 580$	160 MW ~ 274 MW
			$580 < L_{KIT} \le 630$	40 MW ~ 210 MW
	6	7	$300 < L_{KIT} \le 450$	290 MW ~ 380 MW
			$450 < L_{KIT} \le 536$	274 MW ~ 340 MW
			$536 < L_{KIT} \le 580$	230 MW ~ 294 MW
			$580 < L_{KIT} \le 630$	140 MW ~ 230 MW
	5	6	$300 < L_{KIT} \le 450$	220 MW ~ 350 MW
			$450 < L_{KIT} \le 536$	140 MW ~ 220 MW
			$536 < L_{KIT} \le 580$	0 MW ~ 140 MW
	6	6	$300 < L_{KIT} \le 450$	220 MW ~ 350 MW
			$450 < L_{KIT} \le 536$	140 MW ~ 220 MW
			$536 < L_{KIT} \le 580$	90 MW ~ 140 MW
			$580 < L_{KIT} \le 620$	0 MW ~ 90 MW

Table-2: Calculation Formula for A and B of $P_T = A + B*L_{MIN}$

System Condition	No. of KIT Capacitor Banks In-Service	No. of KMO Units On-Line	KIT load, L_{KIT} (MW)	Calculation formulas for A and B	
System Normal	5	8	$300 < L_{KIT} \le 450$	$A = 430-0.467*(L_{KIT}-300)$	$B = 0.5+0.3*(A-430)/70$
			$450 < L_{KIT} \le 536$	$A = 360-0.767*(L_{KIT}-450)$	$B = 0.2+0.2*(A-360)/66$
			$536 < L_{KIT} \le 580$	$A = 294-1.0*(L_{KIT}-536)$	$B = 0.0+0.2*(A-294)/44$
			$580 < L_{KIT} \le 630$	$A = 250-1.0*(L_{KIT}-580)$	$B = -0.2+0.2*(A-250)/50$
	6	8	$300 < L_{KIT} \le 450$	$A = 430-0.467*(L_{KIT}-300)$	$B = 0.5+0.3*(A-430)/70$
			$450 < L_{KIT} \le 536$	$A = 360-0.767*(L_{KIT}-450)$	$B = 0.2+0.2*(A-360)/66$
			$536 < L_{KIT} \le 630$	$A = 830-L_{KIT}$	$B = 0.0$
	5	7	$300 < L_{KIT} \le 450$	$A = 360-0.467*(L_{KIT}-300)$	$B = 0.5$
			$450 < L_{KIT} \le 536$	$A = 290-0.186*(L_{KIT}-450)$	$B = 0.5+0.7*(A-290)/16$
			$536 < L_{KIT} \le 580$	$A = 274-1.455*(L_{KIT}-536)$	$B = -0.2+0.3*(A-274)/64$
			$580 < L_{KIT} \le 630$	$A = 210-1.6*(L_{KIT}-580)$	$B = -0.5+0.4*(A-210)/80$
	6	7	$300 < L_{KIT} \le 450$	$A = 360-0.467*(L_{KIT}-300)$	$B = 0.5$
			$450 < L_{KIT} \le 536$	$A = 290-0.186*(L_{KIT}-450)$	$B = 0.5+0.3*(A-290)/16$
			$536 < L_{KIT} \le 580$	$A = 274-1.0*(L_{KIT}-536)$	$B = 0.2+0.2*(A-274)/44$
			$580 < L_{KIT} \le 630$	$A = 230-1.0*(L_{KIT}-580)$	$B = 0.0+0.4*(A-230)/50$
	5	6	$300 < L_{KIT} \le 450$	$A = 300-0.533*(L_{KIT}-300)$	$B = 0.5+0.5*(A-300)/80$
			$450 < L_{KIT} \le 536$	$A = 220-0.930*(L_{KIT}-450)$	$B = 0.0$
			$536 < L_{KIT} \le 580$	$A = 140-1.136*(L_{KIT}-536)$	$B = 0.0+0.9.*(A-140)/50$
	6	6	$300 < L_{KIT} \le 450$	$A = 300-0.533*(L_{KIT}-300)$	$B = 0.5+0.5*(A-300)/80$
			$450 < L_{KIT} \le 536$	$A = 220-0.581*(L_{KIT}-450)$	$B = 0.0$
			$536 < L_{KIT} \le 580$	$A = 140-1.136*(L_{KIT}-536)$	$B = 0.0$
			$580 < L_{KIT} \le 620$	$A = 90-1.25*(L_{KIT}-580)$	$B = 0.0+0.4*(A-90)/50$

4 CONCLUSIONS

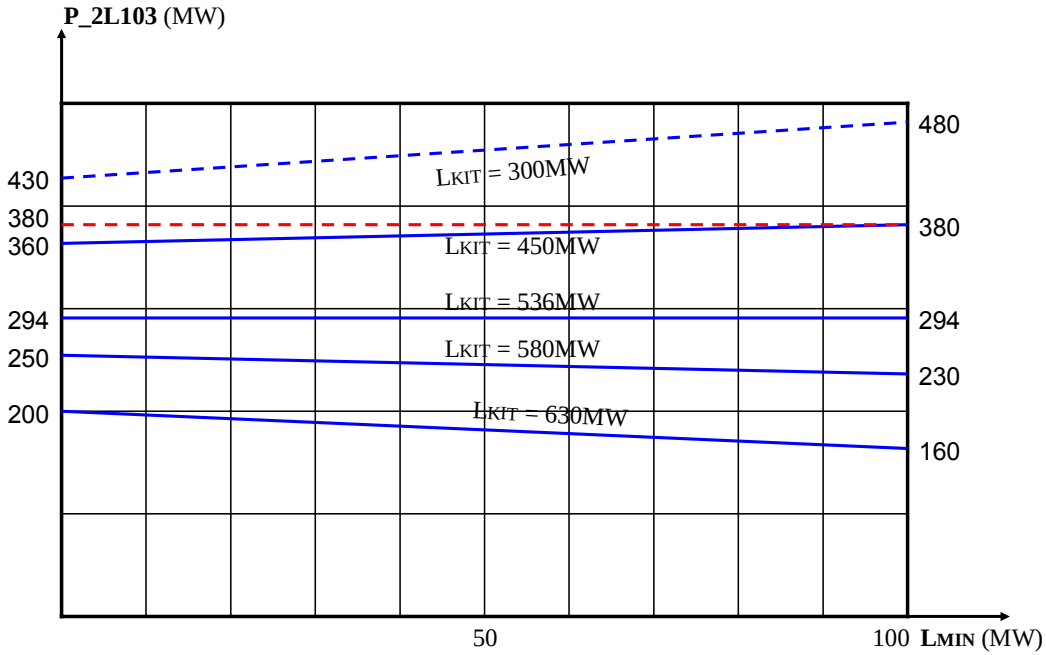
The transfer limits of Alcan exporting to BCTC have been updated to incorporate the effect of the separation scheme recently installed at KIT. With the separation scheme in service, Alcan export to BCTC limits can be increased.

Appendix A

TRANSFER LIMITS FROM ALCAN TO BCTC
ALL CIRCUITS IN SERVICE

Appendix A-1

Transfer Limit of Alcan Exporting to BCTC
All Circuits in Service
Based on 8 KMO Units and 5 Capacitor Banks at KIT in Service



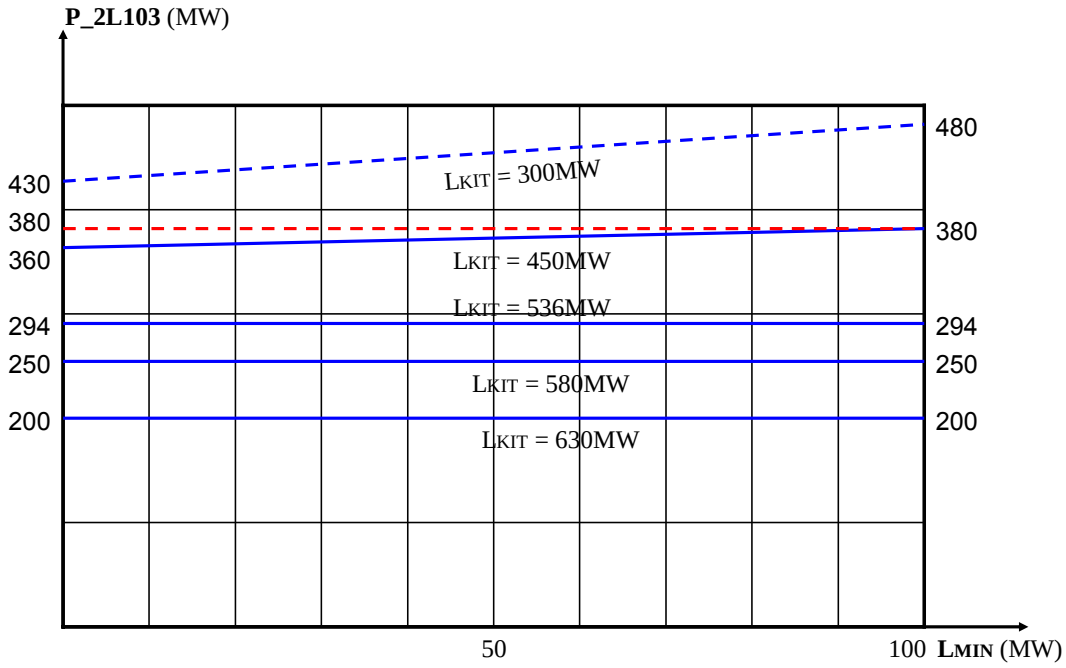
MIN area load

Limited by maximum allowable real power over 2L103

Limited by acceptable transient performance or KMO reactive power reserves

Appendix A-2

Transfer Limit of Alcan Exporting to BCTC
All Circuits in Service
Based on 8 KMO Units and 6 Capacitor Banks at KIT in Service



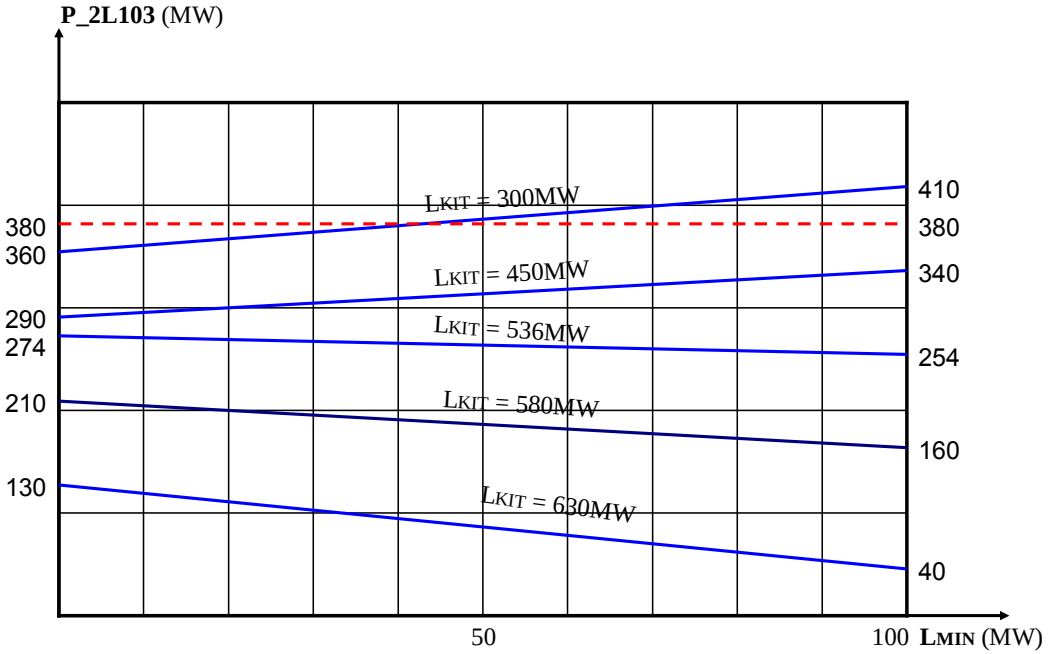
MIN area load

Limited by maximum allowable real power over 2L103

Limited by acceptable transient performance or KMO reactive power reserves

Appendix A-3

Transfer Limit of Alcan Exporting to BCTC
All Circuits in Service
Based on 7 KMO Units and 5 Capacitor Banks at KIT in Service



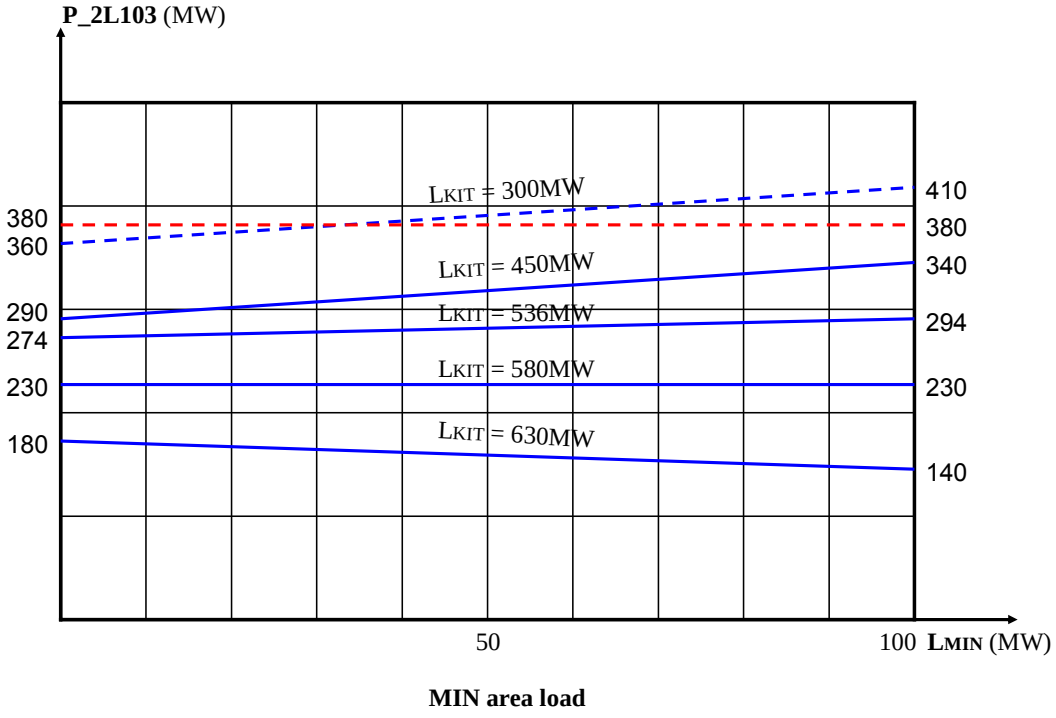
MIN area load

Limited by maximum allowable real power over 2L103

Limited by acceptable transient performance or KMO reactive power reserves

Appendix A-4

Transfer Limit of Alcan Exporting to BCTC
All Circuits in Service
Based on 7 KMO Units and 6 Capacitor Banks at KIT in Service

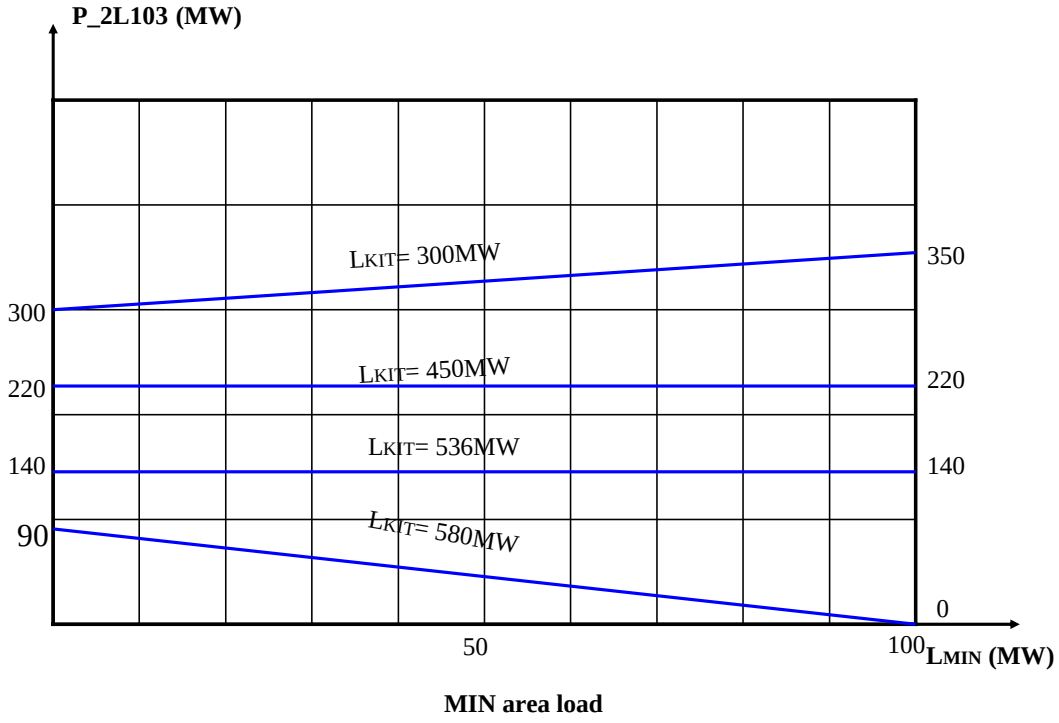


Limited by maximum allowable real power over 2L103

Limited by acceptable transient performance or KMO reactive power reserves

Appendix A-5

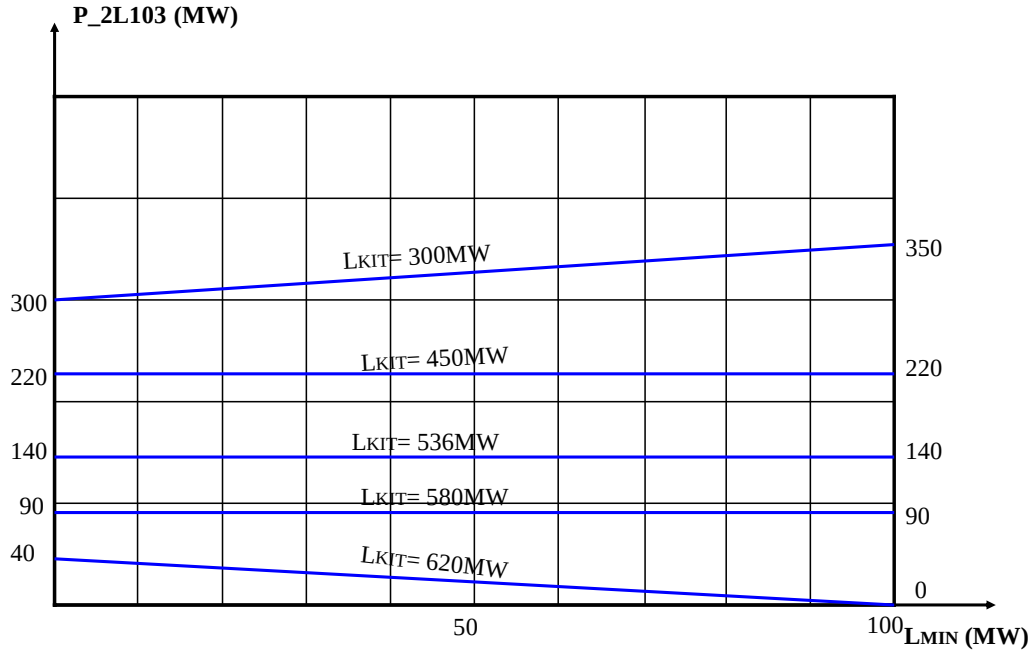
Transfer Limit of Alcan Exporting to BCTC
All Circuits in Service
Based on 6 KMO Units and 5 Capacitor Banks at KIT in Service



Limited by acceptable transient performance or KMO reactive power reserves

Appendix A-6

Transfer Limit of Alcan Exporting to BCTC
All Circuits in Service
Based on 6 KMO Units and 6 Capacitor Banks at KIT in Service



Limited by acceptable transient performance or KMO reactive power reserves