INFORMATION RELEASE

5L83 – INCREMENTAL AVAILABLE POWER DELIVERY TO INGLEDOW SUBSTATION

BACKGROUND

This information release provides an estimate of the incremental transfer capability along the Interior to Lower Mainland (ILM) grid to Ingledow Substation. It considers adding the 5L83 circuit to the ILM grid in 2014 and reviews the increase in available power delivery to Ingledow Substation with and without additional reactive power support at Meridian and Nicola substations. Seasonal variations of the network load and their impact on the amount of available power delivery to Ingledow are considered. The estimated incremental available power deliveries to Ingledow represent a combination of firm and non-firm available power deliveries. Results of the analysis are presented.

INCREMENTAL POWER DELIVERY TO INGLEDOW SUBSTATION

Table 1 summarizes the results of this analysis for the 2006 LTAP Base Resource Plan and BC Hydro's December 2006 Reference Load Forecast for the peak load in 2014/15. This table approximates the incremental available power delivery to Ingledow Substation with and without 5L83.

Table 2 presents a similar set of results for the ILM grid with the addition of 5L83, 250 MVAr, 500 kV reactive power support at Nicola Substation, and 2x110 MVAr, 230 kV reactive power support at Meridian Substation[1].

The incremental transfer capabilities to Ingledow would decline in the years following 2014/15 by an amount approximately equal to the coastal load growth offset by any future coastal generation additions.

[1] The transfer capability information presented in this briefing note is based on the peak hour dispatch of total dependable capacity of the Coastal resources, total dependable capacity of South Interior resources, and balancing the peak hour load by North Interior resources. For non-peak hour dispatches, the peak hour generation dispatch is scaled down proportionately. The resulting available power deliveries to Ingledow are derived from these generation patterns and should not be used for any Point-to-Point applications.

Table 1: 5L83 Addition Compared to the Existing ILM Grid

EXPECTED INCREMENTAL AVAILABLE DELIVERY TO INGLEDOW[2] IN 2014/2015						
Line (calculation)		**Peak Winter[3]**	**Off-Peak Winter[3]**	**Heavy Summer[3]**	**Medium Summer[3]**	**Light Summer[3]**
	Existing ILM Grid					
1	TTC[4] (MW)	5800	5800	5800	5800	5800
2	CU[5] (MW)	5850	3930	3930	3140	2760
3	Losses (MW)	0	110	110	140	150
4 (1-2-3)	Available Delivery to ING (MW)	0	1760	1760	2520	2890
	ILM Grid with 5L83					
5	TTC[6] (MW)	6550	6550	6550	6550	6360
6	CU[5] (MW)	5810	3910	3910	3125	2740
7	Losses (MW)	40	130	130	165	170
8 (5-6-7)	Available Delivery to ING (MW)	700	2510	2510	3260	3450
9 (8-4)	Incremental Avl. Dlv. to ING (MW)	700	750	750	740	560

Table 2: 5L83 + Reactive Power Addition Compared to the Existing ILM Grid

EXPECTED INCREMENTAL AVAILABLE DELIVERY TO INGLEDOW[2] IN 2014/2015						
Line (calculation)		**Peak Winter[3]**	**Off-Peak Winter[3]**	**Heavy Summer[3]**	**Medium Summer[3]**	**Light Summer[3]**
	Existing ILM Grid					
1	TTC[4] (MW)	5800	5800	5800	5800	5800
2	CU[5] (MW)	5850	3930	3930	3140	2760
3	Losses (MW)	0	110	110	140	150
4 (1-2-3)	Available Delivery to ING (MW)	0	1760	1760	2520	2890
	ILM Grid with 5L83 and Reactive Power					
5	TTC[7] (MW)	7120	7120	7120	6660	6365
6	CU[5] (MW)	5810	3910	3910	3125	2740
7	Losses	80	170	170	175	175
8 (5-6-7)	Available Delivery to ING (MW)	1230	3040	3040	3360	3450
9 (8-4)	Incremental Avl. Dlv. to ING (MW)	1230	1280	1280	840	560

[2] The firm and non-firm export capabilities of the western inter-tie are 1750 MW and 2850 MW respectively. Any higher north - south transfer would require review and reinforcement of the inter-tie. Also, the specified limits do not address transmission transfer capability south of the border in the BPA transmission grid.
[3] In this analysis seasonal loads are defined as percentages of the forecasted peak hour load for 2014/15 as follows: Peak Winter load: 100% to 80%, Off-Peak Winter and Heavy Summer loads: 79% to 65%, Medium Summer load: 64% to 50%, Light Summer load: less than 50%
[4] Total Transfer Capability of the existing ILM grid is capped by its 5800 MW voltage stability limit.
[5] Committed Use is defined as the sending end flows on the 5L41, 5L42, 5L81, 5L82, and 2L90 circuits to serve the Network Load, the committed firm export to the US, and the Transmission Reliability Margin in 2014/15.
[6] TTC of the 5L83 added ILM grid is capped by the ILM 6550 MW voltage stability limit except for light summer flows that are capped by its thermal limit.
[7] TTC of the 5L83 + Reactive Power added ILM grid is capped by the ILM 7120 MW voltage stability limit except for medium and light summer flows that are capped by its thermal limits.

DISCLAIMER

The reinforcement options set out in this Information Release do not reflect all possible solutions to the identified TTC constraints. The information set out in this Information Release is based on a number of assumptions, only some of which have been identified. The reinforcements option set out in this Information Release are only based on those assumptions. Changes to relevant factors (including without limitation different load and generation forecasts or different construction timelines for the reinforcement options) may make those assumptions invalid, and therefore the actual reinforcement options available and their costs may differ substantially from those presented here.

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BCTC's Response to Customer Questions about the 5L83 – Incremental Available Power Delivery to Ingledow Substation

BCTC's answers to a customer questions are with respect to the Revision 1 of the "Incremental Available Power Delivery to Ingledow Substation" dated 18 September 2004.

1) What was the LM/VI generation assumptions for each of scenarios studied?

Answer to question # 1:

Table 1

	% of Peak Load	Load Season	Upgrade Option	Generation / Load (MW)				Export / Import (MW)		
				BC Hydro	NI	SI	Coastal	To USA	From Alberta	From Alcan
1	**100%**	Winter Peak	**5L83**	10941 / 10061	2867/ 1487	5760 / 1117	2314 / 7457	280	250	147
2	**100%**	Winter Peak	**Do-nothing**	11001 / 10061	2927/ 1487	5760 / 1117	2314 / 7457	280	250	147
3	**75%**	Heavy Summer OR Off-Peak Winter	**5L83**	8122/ 7545	1308/ 1305	4800 / 804	2014 / 5436	280	250	147
4	**75%**	Heavy Summer OR Off-Peak Winter	**Do-nothing**	8155 / 7545	1341/ 1305	4800 / 804	2014 / 5436	280	250	147
5	**60%**	Medium Summer	**5L83**	6494/ 6034	680/ 953	4100 / 670	1714 / 4410	280	250	147
6	**60%**	Medium Summer	**Do-nothing**	6518/ 6034	704/ 953	4100 / 670	1714 / 4410	280	250	147
7	**50%**	Light Summer	**5L83**	5436/ 5033	236/ 558	3700 / 625	1500 / 3850	280	250	147
8	**50%**	Light Summer	**Do-nothing**	5452/ 5033	252/ 558	3700 / 625	1500 / 3850	280	250	147

2) When loads are scaled down in LLH, how is the Peace & Columbia dispatch adjusted?

Answer to question # 2:

Please see the answer to question #1 for medium and light summer load seasons.

3) Notes 6 & 7 refer to thermal limits, are these 1 hour limits or continuous limits?

Answer to question # 3:

Both notes 6 and 7 refer to cases where the continuous rating of the 5L83 reinforced ILM grid is exceeded.

4) How should we reconcile the differences in ILM transfer capability from Table 1 of the 24 August 2007 posting (4570 MW pre-5L83 and 6480 MW post-5L83) and Table 1 of the 6 September 2007 posting (5800 MW pre-5L83 and 6550 MW post-5L83)?

Answer to question # 4:

The two reports were done for two different purposes. In the August report a sample case was used that followed an arbitrary straight line trajectory of future North Interior and South Interior resource additions and was not meant to be used to determine the maximum transfer capabilities.

5) By assuming the 5800 MW Voltage Stability rating for this analysis what sort of upgrades have been assumed of the AMC thermal limits?

Answer to question # 5:

No upgrades have been assumed at American Creek Series Capacitor Station (AMC).

6) Why is there 230 MW of Available Delivery to Ingledow for the existing system in 2014/15? If this is related to the Skagit Treaty, why is it not included in the Committed Use? If it is not related to the Skagit Treaty does this imply that there is still surplus ILM transfer capability in F2015 (which seems at odds with the 2004 NITS study results)?

Answer to question # 6:

In the 06 September 2007 posting, the 230 MW Skagit treaty commitment and the 50 MW TRM were not included in the definition of Committed Use (CU) of the ILM grid. This error is fixed in the 18 September 2007 revision of the posting. In the revised posting, the CU represents the flows to serve the Network Load, the Skagit Treaty, and the TRM. Footnote 5 of the posting is revised to clarify the inclusion of these factors in the CU. The revised document shows that during the peak hours of 2014/15 there will be no transmission capacity for delivering additional power to ING.

7) What upgrade assumptions were made for the MDN to ING path?

Answer to question # 7:

No upgrades are assumed for the MDN to ING path.

8) Is the Incremental Power Delivery shown in Tables 1 & 2 considered N-1 firm or is it N-0 non-firm (i.e. can it be delivered with 5L44 out of service)?

Answer to question # 8:

The Incremental Power Deliveries shown in Tables 1 and 2 of the 18 September 2007 posting are developed with all transmission lines in service. However, in accordance with the current operating practices at BCTC, a voltage stability cap is imposed on the amount of power transfer on the ILM grid. The specified numbers are a combination of both firm (N-1) and non-firm (N-0) transfers.

9) How much generation shedding is required to support these transfer levels?

Answer to question # 9:

To serve the Lower Mainland and Vancouver Island load and to deliver the Skagit contract, by using the ILM gird, no generation shedding would be required. Generation reduction may only be required when the incremental power delivered to ING has to be curtailed. In this case, the generation reduction would be proportional to the transfer curtailment.

10) Please confirm the resource assumptions that are used in the studies:
    a. Exactly which version of the 2006 LTAP used in the assumptions

Answer to question # 10:

BCTC used the BC Hydro information captured in the following spreadsheet:
"2006 LTAP BCTC Schedule 2007-01-26_IEP-to BCTC.xls"

11) How are the losses calculated?
    a. Why are losses on Winter Peak 0 MW?
    b. Why do losses increase as the load decreases for LLH and Summer conditions?

Answer to question # 11:
The 18 September 2007 analysis approximates the incremental ILM losses based on the following approach: In the load flow simulations, the base case ILM transfer is to serve the Network Load, full 230 MW Skagit Treaty commitment, and 50 MW TRM in 2014/15. The base case ILM transfer is increased up to the point that the TTC limit of the ILM grid is reached. When the TTC level is reached, the increase in delivery to ING and also the additional transfer from KLY and NIC (CU) is recorded. Then, the difference between the "TTC" and the "CU+Available Delivery to ING" is calculated. This difference is attributed to the approximate incremental losses. The other approximation is caused by rounding off the TTC and CU numbers to be multiples of five.
a) In the 18 September 2007 posting, there is no peak hour available delivery to ING for the existing ILM grid. Therefore, there will be no incremental transmission losses associated with it.
b) When the seasonal Network Load decreases, it creates more unused capacity on the ILM grid. The lighter the Network Load, the higher the unused transfer capacity of the ILM grid. In the 18 September 2007 tables, incremental losses are associated with the usage of this unused capacity up to the point that the TTC is reached. These incremental losses increase as the load decreases and more capacity for transfer on the ILM become available.

12) What was the actual load level for the Peak Winter, Off-Peak Winter, Heavy Summer, Medium Summer and Light Summer levels? Specifying a range is suggests that multiple studies at the high and low ends of the range were done.

Answer to question # 12:
Please see the answer to question # 1.
The analysis was done assuming 75% for off-peak winter and heavy summer, 60% for medium summer, and 50% for light summer loads. These numbers were chosen to represent typical seasonal flows. For instance, 75% load level is considered as a typical heavy summer flow knowing that heavy summer flows are defined to be between 79% and 65% load levels.