BC Hydro
Power smart

6911 Southpoint Drive (B03)
Burnaby, BC
V3N 4X8

July 30, 2024

[redacted]

RE: CEAP IR 59 - [redacted] Project - Interconnection Feasibility Study Report

Enclosed is the Interconnection Feasibility study report for the proposed [redacted] Project submitted under Attachment M-2: Transmission Service and Interconnection Service Procedures for Competitive Electricity Acquisition Process (CEAP) of the Open Access Transmission Tariff (OATT). This letter provides a non-binding good faith estimate of the cost and time to construct the facilities required to interconnect your project to BC Hydro's Transmission System, being the Network Upgrades, based on the findings of the Interconnection Feasibility study.

Open Access Transmission Tariff

The OATT defines Network Upgrades as additions, modifications, and upgrades to BC Hydro's Transmission System required at or beyond the Point of Interconnection to accommodate the interconnection of the Generating Facility to the BC Hydro's Transmission System. Pursuant to the OATT, BC Hydro will design, procure, construct, install, and own the Network Upgrades. While BC Hydro will pay the costs for the Network Upgrades, the Interconnection Customer provides security for such costs.

Cost Estimate

Based on the Interconnection Feasibility study, the non-binding good faith estimated cost (typical accuracy range of +150%/-50%) for Network Upgrades required to interconnect your project is $79.3 M.

Major Scope of Work Identified:

- Expand and extend the existing 230 kV bus structure at BC Hydro Tumbler Ridge (TLR) substation
- Supply and install one 230kV line position with the associated substation equipment at TLR
- Expand the existing control building, if required, to accommodate the new P&C panels and other equipment at TLR
- Thermal upgrade (reconductor) 30.9 km of 2L313 transmission line
- Supply and install protection relays and other required protection / telecom equipment

Exclusions:

- GST
- Right-of-Way or Property costs
- Permits

Key Assumptions:

- Construction will be done by contractor
- 3 years of construction
- Early Engineering and Procurement
- No piles or ground improvements will be required
- No contaminated soil will be encountered during construction
- No new access roads or improvements to access roads required
- No expansion of existing stations to accommodate new equipment

Key Risks:

- Additional Right of Way or acquisition of more property may be required
- Transmission routing may be different than assumed, including number of disconnect switches and structure types may change
- No defined supply chain strategy, construction costs may increase depending on delivery method
- Cost of construction may increase based on geotechnical condition of the actual project site
- Project schedule may be longer than expected, leading to increase costs
- Cost of materials and major equipment may be affected by market conditions and escalation
- Expansion of station site may be required leading to increased costs and/or longer project schedule

Please note that the Revenue Metering requirements and associated costs required to interconnect your project have not been determined at this stage and, therefore, not included in the above estimate. Revenue Metering costs that are attributable to the Interconnection Customer are to be paid in cash. For more details on Revenue Metering requirements and responsibilities, please refer to:

https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/distribution/standards/ds-rmr-complex-revenue-metering.pdf.

Schedule

Based on the Interconnection Feasibility study, the non-binding good faith estimated in-service date for your project's Network Upgrades is Quarter 3 2031 (calendar year). To achieve this timeline, we may need to expedite certain activities, including engineering design and procurement of long-lead equipment.

Timely actions required from you to minimize risks to the schedule:

- Submission of additional technical data required for the System Impact Study and Facilities Study
- Submission of any required information or document such as demonstration of Site Control
- Execution of Combined Study Agreement and Standard Generator Interconnection Agreement
- Financial commitments and securities

Please note that changes to your interconnection request, delays in data submission, or financial commitments may also impact the target in-service date.

Next Steps

In September 2024, we will issue a final invoice for the Feasibility Study costs. This invoice will reflect the total amount due, taking into account the $15,000 Feasibility Study deposit you have already paid and any remaining amount on the non-refundable $15,000 Interconnection request deposit that we did not spend in reviewing and validating your interconnection request.

If you have any questions, please contact the BC Hydro CEAP Team at ceap2024@bchydro.com.

Sincerely,

[redacted]

Senior Manager, Transmission Interconnections

BC Hydro

Encl.: CEAP2024_IR_59_[redacted]_FeS_Report_final.pdf

[redacted]

[redacted] Project

Interconnection Feasibility Study

BC Hydro EGBC Permit to Practice No: 1002449

2024 CEAP IR # 59

Prepared for: [redacted]

[redacted]

Report Metadata

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Revision	Date	Description
0	2024 Jul	Initial release

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Executive Summary

[redacted] the interconnection customer (IC), requests to interconnect its [redacted] Project (2024 CEAP IR # 59) to the BC Hydro (BCH) system. [redacted] Project has thirty-four (34) [redacted] 5.88 MW [redacted] Type 4 wind turbine generators with total installed capacity of 200 MW. The proposed Point of Interconnection (POI) is on BC Hydro's Tumbler Ridge (TLR) 230 kV substation. The IC's project will connect to the POI via a 51.55 km 230 kV interconnection line (2LXXX). The IC's proposed commercial operation date (COD) is Oct 1, 2031.

To interconnect the [redacted] Project and its facilities to the BCH Transmission System at the proposed POI, this Feasibility Study has identified the following conclusions and requirements:

1. A new 230 kV line position at TLR is required to interconnect the IC's generating project to the BC Hydro system.

2. The connection of [redacted] Project will cause 2L313 thermal overload under system normal conditions. Thermal upgrade of the line for these three sections are required. The required minimum ratings are as follows.

Circuit	Circuit Section Terminals		Limiting Section Type	Existing rating		New minimum rating requirement	
	A	B		Summer normal (30° C)		Summer normal (30° C)	
				A	MVA	A	MVA
2L313	SNK	KGP Tap	Overhead	1082	431	1290	514
2L313	KGP Tap	MNK Tap	Overhead	1082	431	1290	514
2L313	MNK Tap	MKT	Overhead	1073	427	1290	514

3. The connection of the [redacted] project will exacerbate the existing overloads on 2L308 or 2L312, and cause new overloads on 2L309, GMS T13 or GMS T14 under single contingencies (2L308, 2L309, 2L312, SGB 2CB6, SGB 2CB7, SLS 2CB11, SLS 2CB12, SLS 2CB14, DKT 2CB2, DKT 2CB3, DKT 2CB4, SNK 2CB1, or SNK 2CB12). The existing Peace Region Local Gen-shedding RAS will continue to be relied upon to mitigate these overloads and [redacted] will be required to participate

in the RAS (shedding at feeder level). In addition, new contingencies, SGB 2CB6, SGB 2CB7, or SLS 2CB14 shall be added in Peace Region Local Gen-shedding RAS. The exact requirements will be determined in subsequent studies if the project proceeds.

4. [redacted] Project may be islanded with other generations and BC Hydro loads in the area after certain contingencies which may result in over-voltages. The IC's project is required to participate in the existing peace region anti-islanding direct transfer trip (DTT) scheme. A list of contingencies is provided in Section [redacted]. In addition, the IC is required to install anti-islanding protection within their facility to disconnect the IC's wind farm from the grid when an inadvertent island with the local loads forms.
5. Transmission line requirement:
   Thermally upgrade the overhead circuit 2L313 (SNK to KGP Tap, KGP Tap to MNK Tap, MNK Tap to MKT) from existing 1082 Amps to required 1290 Amps (30°C ambient summer Temperature) by changing from the existing SP 927.2 ASC to new ASC Columbine (at 90°C conductor temperature, 30°C ambient summer Temperature) with structure replacements may be required.

6. BC Hydro will provide line protection for 2LXXX protection (BC Hydro end only). As part of the new line protection, telecommunication facilities will be required to accommodate the new protection schemes. The IC shall provide required relays, telecom facility and associated equipment at its facilities to accommodate the new protection schemes.

The above conclusions are made based on the IC's input data and study assumptions listed in Section 4, which represent the best available information on May 22, 2024.

A non-binding good faith estimated cost and time to construct the Network Upgrades required to interconnect the proposed project will be provided in a separate letter to the IC.

Contents

Appendices

Acronyms

The following are acronyms used in this report.

BCH	BC Hydro
CEAP	Competitive Electricity Acquisition Process
COD	Commercial Operation Date
DTT	Direct Transfer Trip
ERIS	Energy Resource Interconnection Service
FeS	Feasibility Study
IBR	Inverter-Based Resources
IC	Interconnection Customer
LAPS	Local Area Protection Schemes
MPO	Maximum Power Output
NERC	North American Electric Reliability Corporation
NRIS	Network Resource Interconnection Service
OATT	Open Access Transmission Tariff
POI	Point of Interconnection
RAS	Remedial Action Scheme
TIR	BC Hydro “60 KV to 500 kV Technical Interconnection Requirements for Power Generators”
WECC	Western Electricity Coordinating Council
WTG	Wind Turbine Generator
FVO	Fraser Valley Office
SIO	South Interior Office
TLR	Tumbler Substation

1 Introduction

Table 1-1 below summarizes the project reviewed in this Feasibility Study.

Table 1-1 Summary of Project Information

Project Name	[redacted] Project	
Name of Interconnection Customer (IC)	[redacted]	
Point of Interconnection (POI)	Tumbler Ridge (TLR) 230kV	
IC's Proposed COD	1st October 2031	
Type of Interconnection Service	NRIS ☒	ERIS ☐
Maximum Power Injection [1] (MW)	190.85 MW (Summer)	190.85 MW (Winter)
Number of Generator Units	34 x 5.88 MW WTGs	
Plant Fuel	Wind	
Note 1: The maximum achievable power injection at the POI is approx. 189 MW after accounting for MW losses and service load which is lower than the IC proposed 190.85 MW.		

[redacted] the interconnection customer (IC), requests to interconnect its [redacted] Project (2024 CEAP IR # 59) to the BC Hydro (BCH) system. [redacted] Project has thirty-four (34) [redacted] 5.88 MW [redacted] Type 4 wind turbine generators with total installed capacity of 200 MW. The proposed Point of Interconnection (POI) is on BC Hydro's Tumbler Ridge (TLR) 230 kV substation. The IC's project will connect to the POI via a 51.55 km 230 kV interconnection line (2LXXX). The IC's proposed commercial operation date (COD) is Oct 1, 2031.

Figure 1-1 shows the Peace region 138/230 kV transmission system diagram, including higher queued projects and the [redacted] Project. 1L377 is normally open between ET3 and PLD.

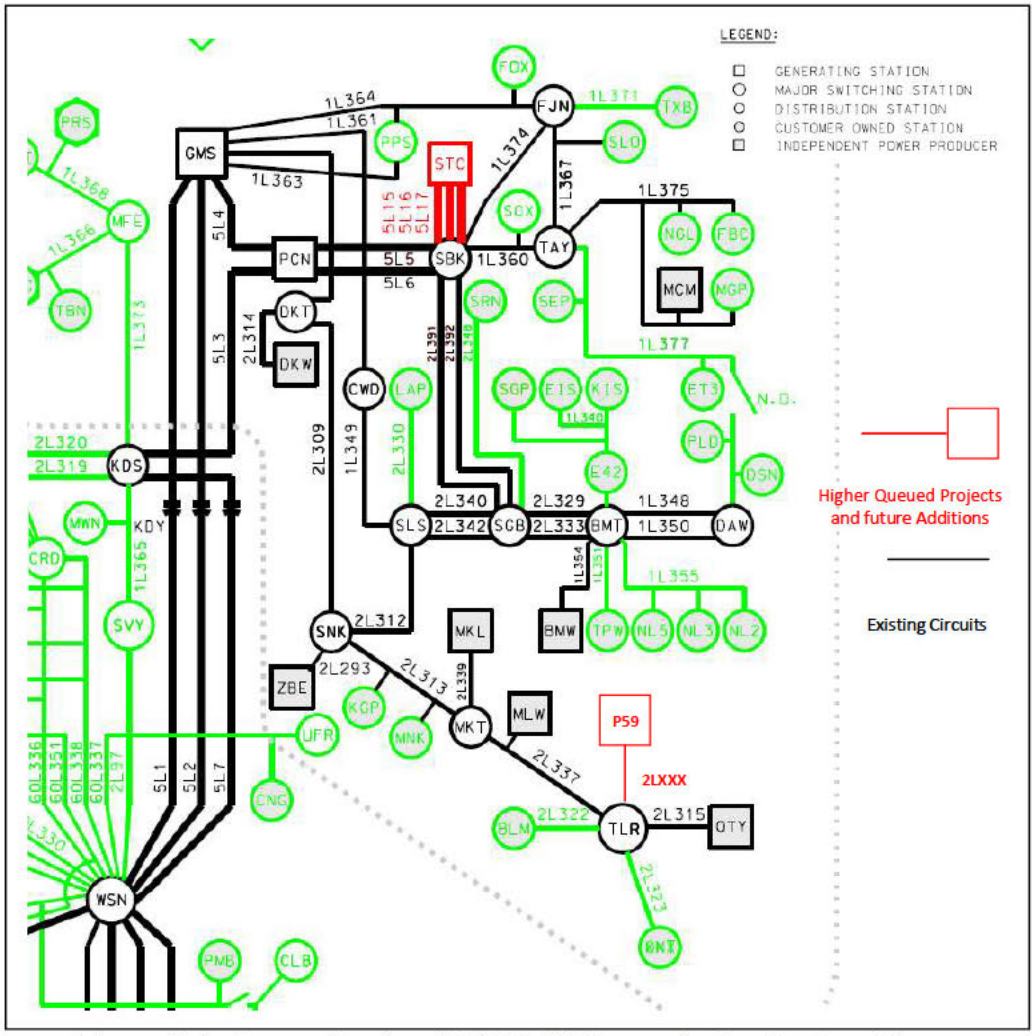

Figure 1-1: Peace Region 138/230 kV Transmission System Diagram

The Peace region 138/230 kV system has pre-existing branch overload and voltage stability concerns under single or multiple contingencies. The Peace Region Load Shedding and Generation Shedding RAS are relied on to address these overload and voltage stability concerns.

In the Peace region, Site C generating project is the major capital project under construction, which will add six hydroelectric generators with a total installed capacity of 1200 MW. The transmission component of this project, which includes two parallel 500 kV lines (5L5 and 5L6) to Peace Canyon substation (PCN), has entered service in 2023. Based on the schedule available at the time of study, the Site C project will be completed by end of 2025.

2 Purpose and Scopes of Study

This Feasibility Study is a preliminary evaluation of the system impact of interconnecting the proposed project to the BC Hydro system based on power flow and short circuit analysis in accordance with BCH's Open Access Transmission Tariff (OATT). A non-binding good faith estimated cost of required Network Upgrades and estimated time to construct will be provided.

Per OATT, the feasibility study is performed individually for each of the participating projects in the CEAP process and focuses specifically on the BC Hydro regional transmission system where the proposed generating project is proposed to be constructed. An assessment of the incremental effect on the 500 kV bulk transmission system is beyond this study scope.

This is a "limited scope" study which is restricted to power flow studies of P0, P1 and P2 planning events as defined in TPL-001-4 and short circuit analysis. The study does not address other technical aspects such as transient stability and switching transients and impact of multiple contingencies. These subjects would be addressed in subsequent System Impact Study if the project is a Successful Participant of the CEAP.

In case impact to the adjacent external systems to BC Hydro is observed, such impact would be addressed in subsequent detailed and coordinated studies with the relevant adjacent entities if the proposed interconnection proceeds further.

3 Standard and Criteria

The Feasibility Study is performed in compliance with the North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) reliability standards, and the BCH interconnection requirements in the TIR, and upon the ratings of the existing BCH transmission facilities described in Operating Orders, specifically:

- NERC standards: TPL-001-4 and FAC-002-3 relevant to the scope of this Feasibility Study.
- WECC criteria TPL-001-WECC-CRT-4 Transmission System Planning Performance, July 1, 2023.
- BC Hydro's 60 kV to 500 kV Technical Interconnection Requirements for Power Generators.
- BC Hydro Operating Order 5T-10, Ratings for All Transmission Circuits 60 kV or Higher, April 16, 2024.
- BC Hydro Operating Order 5T-14, Ratings for All Transmission and Distribution Transformer, November 8, 2022.
- BC Hydro System Operating Order 7T-22 System Voltage Control, September 19, 2023.

4 Assumptions and Conditions

This Feasibility Study is performed based on the IC's submitted data and information available to BC Hydro on May 22, 2024 for the study purpose.. Appendix A shows the plant single line diagram for the IC's project used in the study model. Certain assumptions were, as set out below, made to the extent required.

The power flow study cases used in this Feasibility Study are established based upon the BC Hydro's base resource plan and load forecasts available at the time of performing the study, which includes existing and future generations, transmission facilities, and loads in addition to the subject interconnection project in this study. Applicable seasonal conditions and the appropriate study years for the study planning horizon are also incorporated.

Additional assumptions are listed as follows.

1) The regional generation are dispatched to the patterns that stress the transmission system in the study area. In these patterns, the regional generations are typically set to their Maximum Power Outputs (MPO) unless otherwise specified.

2) Based on the latest information at the time of this study, the projected in-service date for BMT T4 project is June 2026, which is before the projected in-service date of this IC.

3) Based on the schedule available at the time of this study, the Site C project will be completed by end of 2025.

4) 1L377 is normally open between ET3 and PLD.

5 System Studies and Results

5.1 Power Flow Study Results

Power flow studies were performed to evaluate whether the IC's generating project would cause any unacceptable system performance (e.g. equipment overloads, steady-state voltage violation and voltage instability) and to determine the reinforcement requirement based on steady state performance analysis.

The study focuses on the 2032 light summer (32LS) system load condition which is typically a stressed condition for a generation interconnection project, taking into considerations of factors such as load conditions, seasons and generation patterns. The 2032 heavy summer (32HS) and 2031 heavy winter (31HW) cases are also checked at a high level to capture any possibility of performance violations under high load conditions.

5.1.1 Branch Loading Analysis

Table 5-1 shows a summary of branch loading analysis under system normal and single contingencies (P1, P2) for light load conditions.

Branch overload is identified under system normal (P0) and light summer conditions (32LS). 2L313 SNK-KGP Tap, KGP Tap – MNK Tap, or MNK Tap – MKT sections is overloaded by 113%, 113%, or 115% of its continuous ratings respectively. Thermal upgrades of the line for these three sections are required and the proposed new minimum ratings are given below.

Circuit	Circuit Section Terminals		Limiting Section Type	Existing rating		New minimum rating requirement	
	A	B		Summer normal (30° C)		Summer normal (30° C)	
				A	MVA	A	MVA
2L313	SNK	KGP Tap	Overhead	1082	431	1290	514
2L313	KGP Tap	MNK Tap	Overhead	1082	431	1290	514
2L313	MNK Tap	MKT	Overhead	1073	427	1290	514

The connection of the [redacted] project will exacerbate the existing overloads on 2L308 or 2L312, and cause new overloads on 2L309, GMS T13 or

GMS T14 under single contingencies (2L308, 2L309, 2L312, SGB 2CB6, SGB 2CB7, SLS 2CB11/12, SLS 2CB14, DKT 2CB2, DKT 2CB3, DKT 2CB4, SNK 2CB1, or SNK 2CB12). The existing Peace Region Local Gen-shedding RAS will continue to be relied upon to mitigate these overloads and [redacted] will be required to participate in the RAS (shedding at feeder level). In addition, new contingencies, SGB 2CB6, SGB 2CB7, or SLS 2CB14 shall be added in Peace Region Local Gen-shedding RAS. The exact requirements will be determined in subsequent studies if the project proceeds.

Table 5-1: Summary of Branch Loading Analysis Results

Case	IC's Plant Output	Contingency		Branch/Equipment loading (MVA)						
				2L313		2L312	2L308	2L309	T13	T14
		Cat.	Description	SNK-MNK	MNK-MKT	SNK-SLS	GMS-DKT	DKT-SNK	GMS	GMS
Summer Rating (MVA)				431	427.5	424.7	427.5	427.5	300	300
E r32ls	MAX	P0	System Normal	113%	115%					
		P1	2L308	114%	115%	154%				
		P1	2L309	113%	115%	122%				
		P1	2L312	117%	118%		157%	125%	112%	112%
		P2	SGB 2CB6	114%	115%		129%			
		P2	SGB 2CB7	114%	115%		129%			
		P2	SLS 2CB11/2CB12	117%	118%		157%	125%	112%	112%
		P2	SLS 2CB14	114%	115%		129%			
		P2	SNK 2CB1	114%	115%	115%				
		P2	SNK 2CB12	117%	118%		150%	118%	107%	106%
		P2	DKT 2CB2	114%	115%	122%				
		P2	DKT 2CB3	114%	115%	122%				
		P2	DKT 2CB4	114%	115%	122%				

Notes:
SGB 2CB6, SGB 2CB7 or SLS 2CB 14 breaker contingencies shall be added in Peace Region Gen-shedding RAS to mitigate the identified overload issue. For other identified overload issues, the existing Peace Region Gen-shedding RAS will be relied upon to mitigate these issues.

5.1.2 Steady-State Voltage Analysis

With the connection of the IC's project, the voltage performance under system normal condition and single contingencies is acceptable for all the three load

conditions (32LS, 32HS, 31HW). Table 5-2 shows a summary of steady-state voltage performance under light load system condition and contingencies.

Table 5-2: Summary of Steady-State Voltage Study Results

Case	IC's Plant Output	Contingency		Bus Voltages (pu)					
		Cat.	Description	DKT 230	GMS 230	MKT 230	P59W	SNK 230	TLR 230
32LS	MAX	P0	System Normal	1.021	1.008	1.044	1.084	1.033	1.052
		P1	GMS_T14&12	1.021	1.009	1.044	1.084	1.032	1.052
		P1	GMS_T13&11	1.021	1.009	1.044	1.084	1.032	1.052
		P1	2L391	1.020	1.008	1.044	1.084	1.033	1.052
		P1	2L392	1.020	1.008	1.044	1.084	1.033	1.052
		P1	SBK_T21	1.021	1.008	1.044	1.084	1.033	1.052
		P1	SBK_T22	1.021	1.008	1.044	1.084	1.033	1.052
		P1	SBK_T11	1.021	1.008	1.044	1.084	1.033	1.052
		P1	SBK_T12	1.021	1.008	1.044	1.084	1.033	1.052
		P1	SBK_Reactor	1.021	1.008	1.044	1.084	1.033	1.052
		P1	2L308	1.021	1.005	1.044	1.084	1.021	1.052
		P1	2L309	1.020	1.011	1.044	1.084	1.031	1.052
		P1	2L314	1.016	1.010	1.044	1.084	1.032	1.052
		P1	2L393	1.021	1.009	1.044	1.084	1.031	1.052
		P1	2L313	1.023	1.019	0.000	0.000	1.037	0.000
		P1	2L329	1.019	1.007	1.044	1.084	1.030	1.052
		P1	2L333	1.019	1.007	1.044	1.084	1.030	1.052
		P1	2L339	1.021	1.012	1.043	1.084	1.036	1.052
		P1	2L337	1.021	1.015	1.044	0.000	1.037	0.000
		P1	2L322	1.021	1.008	1.044	1.084	1.033	1.052
		P1	2L315	1.021	1.011	1.044	1.089	1.036	1.058
		P1	2L330	1.021	1.008	1.044	1.084	1.033	1.052
		P1	2L312	0.972	0.973	1.035	1.084	0.997	1.052
		P1	2L340	1.020	1.008	1.044	1.084	1.032	1.052
		P1	2L342	1.020	1.008	1.044	1.084	1.032	1.052
		P1	2L348	1.020	1.007	1.044	1.084	1.033	1.052
		P2	SGB 2CB3	1.018	1.007	1.044	1.084	1.029	1.052
		P2	SGB 2CB4	1.018	1.007	1.044	1.084	1.029	1.052
		P2	SGB 2CB5	1.018	1.007	1.044	1.084	1.029	1.052
		P2	SGB 2CB6	0.995	0.987	1.044	1.084	1.019	1.052
		P2	SGB 2CB7	0.995	0.988	1.044	1.084	1.019	1.052
		P2	SGB 2CB9	1.019	1.007	1.044	1.084	1.029	1.052

Case	IC's Plant Output	Contingency		Bus Voltages (pu)					
		Cat.	Description	DKT 230	GMS 230	MKT 230	P59W	SNK 230	TLR 230
		P2	SGB 2CB12	1.019	1.007	1.044	1.084	1.032	1.052
		P2	SLS 2CB11	0.972	0.973	1.035	1.084	0.997	1.052
		P2	SLS 2CB12	0.972	0.973	1.035	1.084	0.997	1.052
		P2	SLS 2CB13	1.020	1.008	1.044	1.084	1.032	1.052
		P2	SLS 2CB14	0.995	0.988	1.044	1.084	1.019	1.052
		P2	SLS 2CB21	1.019	1.007	1.044	1.084	1.031	1.052
		P1	1L354	1.021	1.010	1.044	1.084	1.032	1.052
		P2	SNK 2CB1	1.021	1.012	1.044	1.084	1.029	1.052
		P2	SNK 2CB21	1.021	1.017	0.000	0.000	1.031	0.000
		P2	SNK 2CB12	0.976	0.976	1.035	1.084	0.997	1.052
		P2	DKT 2CB2	0.000	1.009	1.044	1.084	1.031	1.052
		P2	DKT 2CB3	1.010	1.010	1.044	1.084	1.031	1.052
		P2	DKT 2CB4	1.035	1.009	1.044	1.084	1.033	1.052

5.1.3 Reactive Power Capability Evaluation

The BC Hydro TIR requires IBR power plant to have the dynamic reactive power capability at a minimum of +/- 33% of its MPO at the high voltage side of the IC's switchyard over the full MW operating range.

Based on the PSS/E power flow data submitted by the IC and the power flow study, the proposed generating project would be capable of meeting the BC Hydro's reactive capability requirement at the plant's maximum MW output, which is subject to further verification in the next stage of interconnection study.

Furthermore, the BCH TIR requires the IC's project to provide sufficient reactive power capability over full MW operating range including at zero MW output level. According to the IC-provided reactive capability curve, the proposed WTG has 0 Mvar reactive capability at zero MW output, which does not meet BC Hydro's reactive power requirement. This issue needs to be addressed if the IC's project proceeds further.

5.1.4 Anti-Islanding Requirements

The IC's project may be inadvertently islanded with the existing generators and BC Hydro loads, which is not allowed, for the outages listed below.

- Loss of GMS T13&T14, or 2L308(GMS-DKT) with 2L312 OOS
- Loss of 2L309 (DKT-SNK) with 2L312 OOS
- Loss of 2L313 (SNK-MKT)
- Loss of 2L337 (MKT-TLR)
- Loss of 2L312 (SNK-SLS) with 2L308 or 2L309 or GMS T13&14 OOS

A direct transfer trip (DTT) from the above contingencies (for protective and unintentional tripping) to the switching station (TLR) is required to isolate the wind farm.

In addition, the IC is required to install anti-islanding protection within its facility to disconnect the IC's wind farm from the grid when an inadvertent island with the local load forms.

5.2 Fault Analysis

The short circuit analysis in the FeS is based upon the latest BC Hydro system model, which includes the generating facility information and associated impedance data provided by the IC. A more detailed study will be performed at the system impact study stage if needed.

5.3 Stations Requirements

The POI of [redacted] be 230kV switchyard of the existing substation Tumbler Ridge (TLR). Following is the scope of station work:

At TLR:

- Expand the substation and extend the existing 230 kV bus structure.
- Add one 230kV line position with the associated substation equipment. Refer to the attached one-line diagram for details.
- Expand the existing control building, if required, to accommodate the new P&C panels and other equipment.
- Terminate the [redacted]
- Other associated station work.

Refer to the one-line sketch in Appendix B for details.

At both SNK and MKT:

- Upgrade 2L313 line drops at SNK and MKT to summer rating of 1500 A (30°C).

5.4 Transmission Line Requirements

Thermally upgrade the overhead circuit 2L313 (SNK to KGP Tap, KGP Tap to MNK Tap, MNK Tap to MKT) from existing 1082 Amps to required 1290 Amps (30°C ambient summer Temperature) by changing from the existing SP 927.2 ASC to new ASC Columbine (at 90°C conductor temperature, 30°C ambient summer Temperature) with structure replacements may be required.

5.5 Protection & Control Requirements

BC Hydro will provide line protections (BC Hydro end only) for 2LXXX 230 kV transmission line that will integrate [redacted] to BC Hydro system at Tumbler Substation (TLR). As part of the new line protection, telecommunication facilities will be required between TLR and [redacted] (P59).

The IC is to provide the following for the interconnection of [redacted] project.

- Entrance protection that complies with the latest version of the "60 kV to 500 kV BC Hydro Technical Interconnection Requirements for Power Generators."
- Provide two SEL-411L-1 relays (firmware and options specified by BC Hydro) at the entrance of [redacted] (P59) to provide protection coverage for 2LXXX. BC Hydro P&C Planning will provide core protection settings for these relays to protect transmission line 2LXXX from TLR to the IC during a transmission line fault. Non-core protection such as local breaker failure, auto-reclosing, backup protection for station elements will not be provided by BC Hydro P&C Planning.
- The IC is responsible for NERC PRC-related tasks, settings to compliance standards within their facilities.
- The IC is responsible for providing a communications link for remote interrogation of the PPIS equipment by BCH servers.

- Provide anti-islanding protection as stated in Section 5.1.

The runback schemes or RAS requirements stated in Section 5.1 are mainly to address the overloading concerns under contingencies, which are preliminary. These RAS requirements may utilize the communication channels required for protection purposes included in the cost estimate. If the proposed project proceeds through the CEAP process, subsequent System Impact Studies may identify additional RAS requirements for this interconnection. These RAS functional requirements will include initiating events, control actions, and latency times. Depending on these supplementary requirements, additional telecommunication facilities may be needed to facilitate signal transmission between the BC Hydro substations and customer facilities.

5.6 Telecommunications Requirements

BC Hydro performed a high-level feasibility assessment of a telecom solution to meet the following requirements.

Teleprotection Requirements for Telecom

- WECC Level 3 64 kbps synchronous circuits PY & SY, TLR – P59, with C37.94 interfaces.

Telecontrol Requirements for Telecom

- Provide P59 SCADA circuit off FVO & SIO.

Other Requirements for Telecom

- Provide PY & SY T1s over separate OC3s between P59 -TLR.
- Provide MPLS links and LSPs for new TLR MPLS nodes.

Certain assumptions were made for determining a potential telecom solution. Details of the telecom solution (e.g. assumptions made, alternatives investigated and work required for BCH and the IC) would be provided at the next study stage.

6 Cost Estimate and Schedule

The non-binding good faith estimated cost and time to construct the Network Upgrades required to interconnect the proposed project will be provided in a separate letter to the IC.

7 Conclusions

To interconnect the [redacted] Project and its facilities to the BCH Transmission System at the POI, this Feasibility Study has identified the following conclusions and requirements:

1. A new 230 kV line position at TLR is required to interconnect the IC's generating project to the BC Hydro system.

2. The connection of [redacted] Project will cause 2L313 thermal overload under system normal conditions. Thermal upgrade of the line for these three sections are required. The required minimum ratings are as follows.

Circuit	Circuit Section Terminals		Limiting Section Type	Existing rating		New minimum rating requirement	
	A	B		Summer normal (30° C)		Summer normal (30° C)	
				A	MVA	A	MVA
2L313	SNK	KGP Tap	Overhead	1082	431	1290	514
2L313	KGP Tap	MNK Tap	Overhead	1082	431	1290	514
2L313	MNK Tap	MKT	Overhead	1073	427	1290	514

3. The connection of the [redacted] project will exacerbate the existing overloads on 2L308 or 2L312, and cause new overloads on 2L309, GMS T13 or GMS T14 under single contingencies (2L308, 2L309, 2L312, SGB 2CB6, SGB 2CB7, SLS 2CB11, SLS 2CB12, SLS 2CB14, DKT 2CB2, DKT 2CB3, DKT 2CB4, SNK 2CB1, or SNK 2CB12). The existing Peace Region Local Gen-shedding RAS will continue to be relied upon to mitigate these overloads and [redacted] will be required to participate in the RAS (shedding at feeder level). In addition, new contingencies, SGB 2CB6, SGB 2CB7, or SLS 2CB14 shall be added in Peace Region Local Gen-shedding RAS. The exact requirements will be determined in subsequent studies if the project proceeds.

4. [redacted] Project may be islanded with other generations and BC Hydro loads in the area after certain contingencies which may result in over-voltages. The IC's project is required to participate in the existing peace region anti-islanding direct transfer trip (DTT) scheme. A list

of contingencies is provided in Section [redacted]. In addition, the IC is required to install anti-islanding protection within their facility to disconnect the IC's wind farm from the grid when an inadvertent island with the local loads forms.

5. Transmission line requirement:
   Thermally upgrade the overhead circuit 2L313 (SNK to KGP Tap, KGP Tap to MNK Tap, MNK Tap to MKT) from existing 1082 Amps to required 1290 Amps (30°C ambient summer Temperature) by changing from the existing SP 927.2 ASC to new ASC Columbine (at 90°C conductor temperature, 30°C ambient summer Temperature) with structure replacements may be required.

6. BC Hydro will provide line protection for 2LXXX protection (BC Hydro end only). As part of the new line protection, telecommunication facilities will be required to accommodate the new protection schemes. The IC shall provide required relays, telecom facility and associated equipment at its facilities to accommodate the new protection schemes.

Appendix A
Plant Single Line Diagram Used for Power Flow Study

Figure A-1 shows [redacted] Project single line diagram used for power flow study.

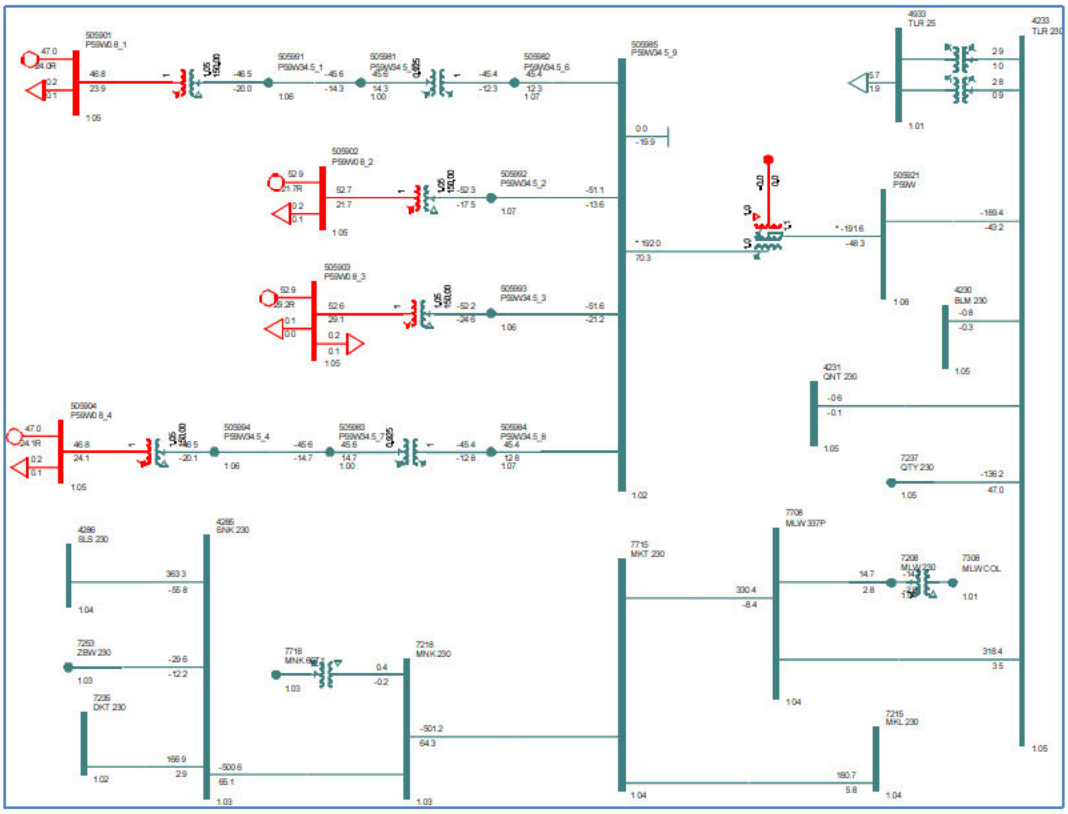

Figure A-1: [redacted] Project Single Line Diagram for Power Flow Study.

As seen in the diagram, [redacted] Project has one main power transformer, four (4) feeders connecting 34 wind turbines to the collector station and two switchable shunt capacitors (13 Mvar and 6 Mvar each). In the PSS/E case, the two capacitors are model as one 19 Mvar shunt capacitor.

Appendix B
One-Line Sketch of Upgrades at TLR Substation

Figure B-1 shows the required upgrades at the existing substation Tumbler Ridge (TLR).

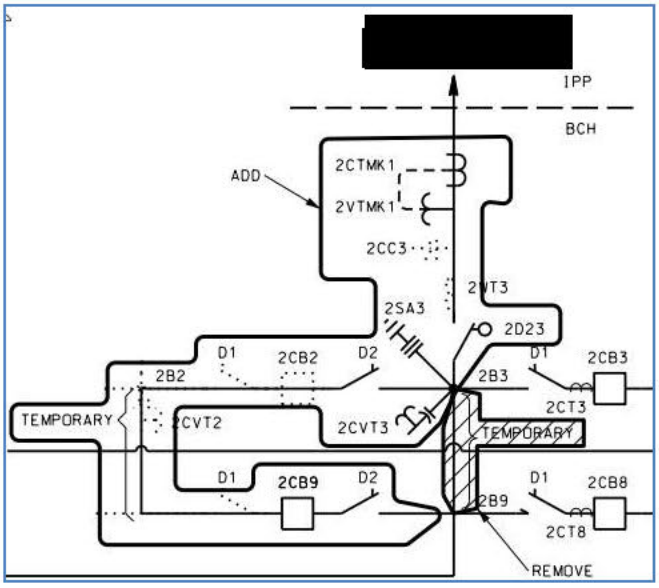

Figure B-1: One-Line Sketch of Upgrades at TLR Substation