BC Hydro
Power smart

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

July 30, 2024

[redacted]

[redacted]

[redacted]

RE: CEAP IR 74 - [redacted] - Interconnection Feasibility Study Report

Enclosed is the Interconnection Feasibility study report for the proposed [redacted] 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 $14.1M.

Major Scope of Work Identified:

- New tap structure between Str 12-01 and 12-02 of the existing transmission line 1L31
- Supply and install 3 disconnect switch structures
- Supply and install protection relays and other required protection equipment
- Supply and install required telecommunications equipment

Exclusions:

- GST
- Right-of-way
- Permits

Key Assumptions:

- Construction by contractor
- 2 years of construction
- Early Engineering and Procurement
- No piles or ground improvements will be required
- No contaminated soil will be encountered during construction

Key Risks:

- Additional right-of-way or acquisition of additional 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 increased costs
- Costs may be affected by market conditions and escalation

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_74_[redacted]FeS_Report_final.pdf

[redacted]

Interconnection Feasibility Study

BC Hydro EGBC Permit to Practice No: 1002449

2024 CEAP IR # 74

Prepared for: [redacted]

[redacted]

Report Metadata

Header:	[redacted]
Subheader:	Interconnection Feasibility Study
Title:	[redacted]
Subtitle:	2024 CEAP IR # 74
Report Number:	431-APR-00004
Revision:	0
Confidentiality:	Public
Date:	2024 Jul 30
Volume:	1 of 1

[redacted]

Related Facilities:	1L31
Additional Metadata:	Transmission Planning 2024-084 Filing Subcode 1350

Revisions

Revision	Date	Description
0	2024 Jul	Initial release

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Executive Summary

The [redacted] requested a Feasibility Study for the 40.5 MW independent power producer (IPP) [redacted] (2024 CEAP IR # 74), located in the North Shore- Sunshine Coast (NSC) area of the province of BC. The proposed commercial operation date is October 1, 2031.

The interconnection customer (IC) proposed to be connected to the BCH network via a tap on 1L31 (CKY-GIB). The Point of Interconnection is 0.75 km west of the existing [redacted] customer (WFL) tap, or 19.1 km from the CKY end. The WFL LNG customer Point of Interconnection (POI) is on 1L31 in the present WFL Interim Stage. The WFL LNG POI will be re-located to the CKY substation in the ultimate WFL Permanent Stage.

This Feasibility Study has the following conclusions:-

- The BCH system can accommodate the proposed P74 under system normal and contingency conditions in the present WFL Interim Stage. There is no system upgrade requirement identified in the WFL Interim Stage.
- The BCH system can accommodate the proposed P74 under system normal conditions in the ultimate WFL Permanent Stage. However, 1L31 and 1L35 will be overloaded in single contingency conditions in the ultimate WFL Permanent Stage. P74 generation curtailment will then be required in single contingency conditions in the ultimate WFL Permanent Stage.
- The impact on BC Hydro bulk transmission system is not part of study scope of the feasibility study. The IC may be required to participate in a Remedial Action Scheme on generation shedding for bulk transmission system contingencies.
- The P74 IC may be islanded with existing IC and/or BC Hydro loads under certain system contingencies. P74 IC is required to install anti-islanding protection within their facility to disconnect the generators from the grid under an inadvertent island condition.
- The impact on BC Hydro bulk transmission system is not part of study scope of the feasibility study. The P74 may be required to participate in a

Remedial Action Scheme on generation shedding for bulk transmission system contingencies.

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.

ALCx Proposed Microwave Site east of CKY (unofficial site code)

BCH BC Hydro

COD Commercial Operation Date

ERIS Energy Resource Interconnection Service

EDM Edmonds Office

FVO Fraser Valley Office

IC Interconnection Customer

IPP Independent Power Porducer

LAPS Local Area Protection Schemes

NRIS Network Resource Interconnection Service

NSC North Shore- Sunshine Coast

NERC North American Electric Reliability Corporation

OATT Open Access Transmission Tariff

POI Point of Interconnection

P74 [redacted]

RAS Remedial Action Scheme

SIO South Interior Control

TIR BC Hydro 60 KV to 500 kV Technical Interconnection Requirements for Power Generators

WECC Western Electricity Coordinating Council

WFL [redacted] customer

WTPx New Microwave Facility near Watts Point (unofficial site code)

1 Introduction

The project information for this Feasibility Study report is in below:-

Table 1-1: Summary Project Information

Project Name	[redacted] (P74)	
Proponent Name	[redacted]	
Point of Interconnection	Tap on 1L31, 0.75 km west of WFL tap (19.1 km from CKY end)	
Applicant Proposed COD	1st October 2031	
Type of Interconnection Service	NRIS ☒	ERIS ☐
Maximum Power Injection (MW)	40.5 MW (Summer)	40.5 MW (Winter)
Number of Generator Units	Two @12 MW, one @ 16.5 MW	
Plant Fuel	Hydro	

The [redacted] requested a Feasibility Study for the Interconnection Customer (IC) [redacted] (2024 CEAP IR # 74) located in the North Shore- Sunshine Coast (NSC) area of the province of BC. The proposed COD is October 1, 2031.

The IC proposed to be connected to the BCH network via a tap on 1L31 (CKY-GIB). The P74 Point of Interconnection (POI) is 0.75 km west of the existing [redacted] customer (WFL) tap, or 19.1 km from CKY. WFL is presently supplied with N-0 supply reliability in this WFL Interim Stage which is under construction. It is supplied only under normal system condition and will be interruptible under single contingency conditions. WFL is also proposing to design and build a double circuit 132 kV line parallel to the existing 1L31 to the CKY substation for N-1 supply reliability in the ultimate WFL Permanent Stage. The transmission network of the BCH NSC area with the P74 IC is shown in below:

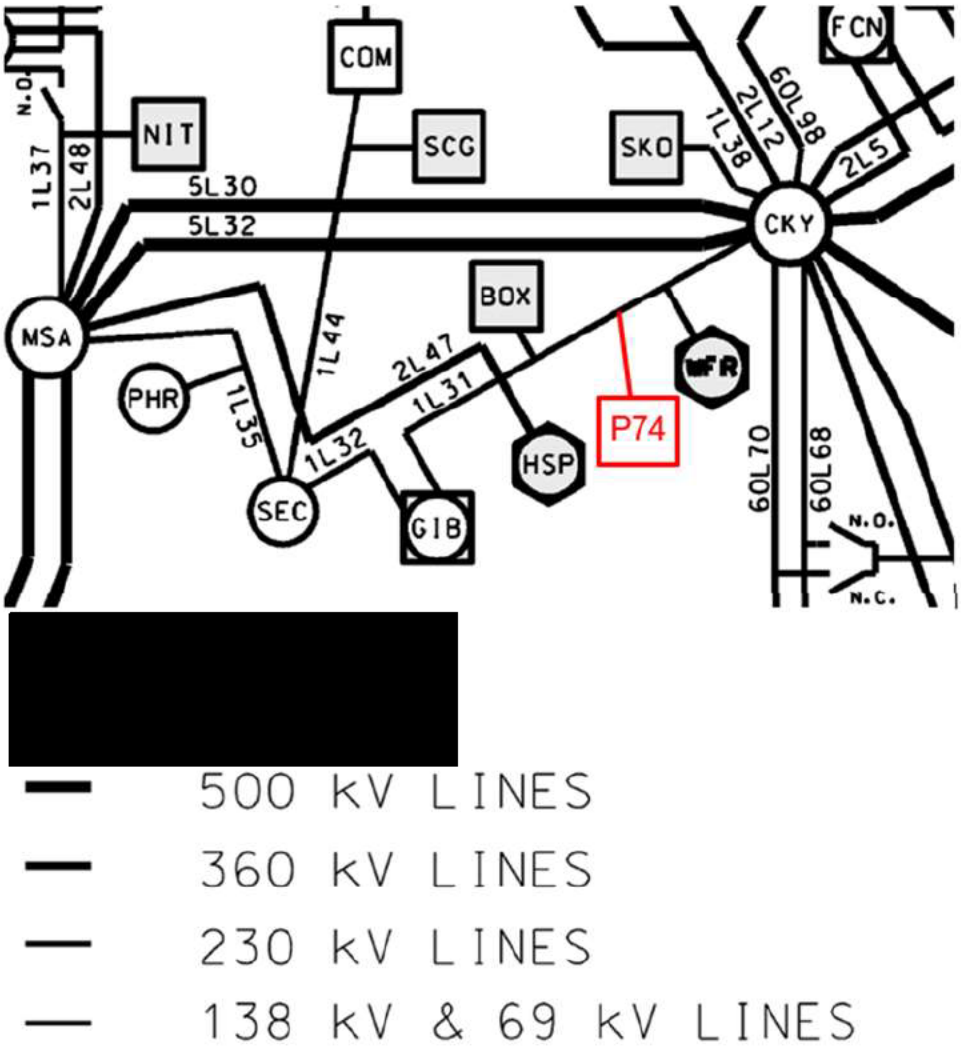

Figure 1-1: BCH North Shore-Sunshine Coast region transmission system diagram

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 500kV 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. 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.

This study also does not address generation dispatch alternatives as a means to mitigate performance violations under system normal conditions. In case impact to the adjacent external systems to BC Hydro is observed, such impact would be addressed in System Impact Study.

A System Impact Study is required to confirm findings in the Feasibility Study.

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, the BCH transmission planning criteria as referenced in the BCH TIR, and 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 proposed POI will be 0.75 km west of the existing [redacted] customer (WFL) tap on 1L31, 19.1 km from CKY .
2. **WFL Interim Stage**--- WFL is presently under construction for supply with N-0 supply reliability in the NSC area in the WFL Interim Stage. It will be interruptible under single contingency conditions.
3. **WFL Permanent Stage**--- WFL is proposing to design and build a double circuit 132 kV line parallel to the existing 1L31 to the CKY substation for N-1 supply reliability in the ultimate WFL Permanent Stage.
4. It is assumed that this project proceeds after construction of a nearby liquid natural gas facility, [redacted] Within that project, microwave links would be constructed from CKY to a new microwave site (ALCx), and from there to a new microwave facility near Watts Point (WTPx). Pre-existance of these two new microwave facilities are relied upon for this study.

5 System Studies and Results

5.1 Power Flow Study Results

Study Results

This NSC area of the BCH transmission network is characterised by the backbone CKY- GIB-SEC-MSA 138 kV transmission lines with power supplied from the Cheekye Substations (CKY) and Malispina Substation (MSA) in the east and west end respectively. A series of steady-state power flow studies has been conducted with the focus on various system operating conditions. The 2031HW, 2032 HS and LS base cases have been adopted.

WFL Interim Stage

In the present WFL Interim Stage, the WFL load locate 0.75 km east from the P74 IPP. Required power will be supplied from both ends of the CKY- MSA lines. The WFL load will be interruptible under system contingency conditions. The P74 IPP effectively reduces the WFL 126 MW load demand requirements by its generation output. There will be no surplus generation to be transferred from the CKY-MSA area to the rest of the BCH system to cause network overload conditions.

Normal system conditions:

No system overload nor voltage violation condition has been identified in the various system normal and contingency conditions. There is no system upgrade requirement identified for the normal system conditions with the P74 IPP interconnection in WFL Interim Stage.

Single contingency system conditions:

No system overload nor voltage violation condition has been identified in the various system contingency conditions. There is no system upgrade requirement identified for the single contingency system conditions in the WFL Interim Stage. Details of the load flow study results are shown in below:-

Table 1-2: WFL Interim Stage load flow voltage and line loading results*

Case	Outage	V-POI (pu)	V-SEC (pu)	1L31 Sec I, II and III**	1L32 (GIB-SEC)	1L35 (SEC-MSA)
*****WFL load tapped on 1L31*****						
b32HW	None	1.026	1.034	I. 93.5/ 48.0% II. 30.6/ 29.6% III.. 15.4/ 14.9%	41.0/ 30.0%	20.2/ 14.5%
b32HW	1L35	1.024	1.015	I. 94.0/ 48.3% II. 35.6/ 34.6% III.. 15.4/ 14.9%	30.1/ 21.8%	-

Note: * Line loadings in MVA/ % rating
** 1L31: Sec I (CKY- WFL); Sec II (WFL- BOX); Sec III (BOX- GIB)

The corresponding WFL Interim Stage load flow diagrams are shown in Figures 1-2A and 1-2B.

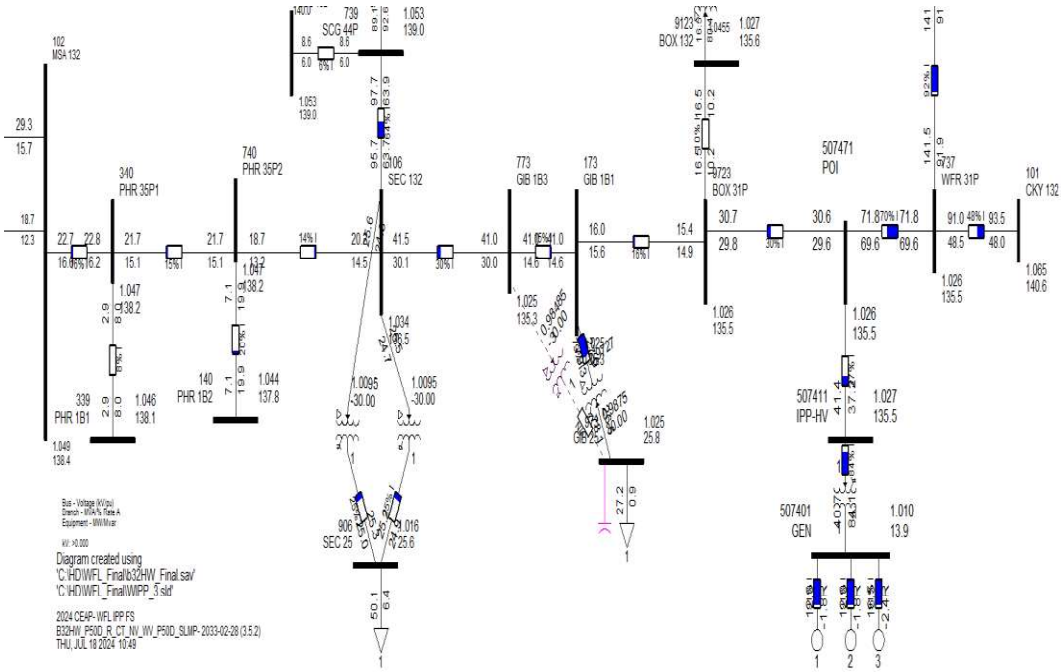

Figure 1-2A: Typical WFL Interim Stage load flow condition (b32HW, system normal).

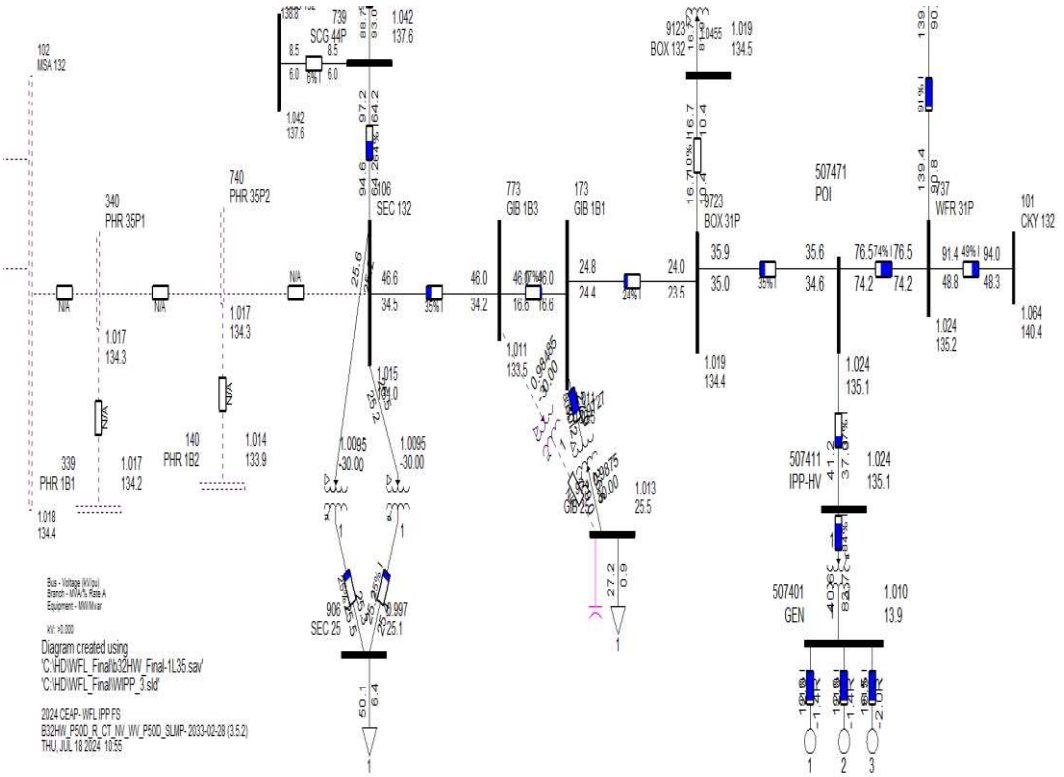

Figure 1-2B: WFL Interim Stage load flow conditions-(b32HW, 1L35 outage)

In the present WFL Interim Stage, no system overload nor voltage violation condition has been identified in the various system normal and contingency conditions. No unacceptable system violation condition has been identified in this Feasibility Study. There is no system upgrade requirement identified for this P74 IC project in the present WFL Interim Stage.

WFL Permanent Stage:-

In the ultimate WFL Permanent Stage with the WFL POI will be re-located to the CKY 132 substation bus. The load demand on the CKY-MSA lines will be decreased. For condition with all generating units in the local area at maximum power output, there will be surplus generation to be transferred to the rest of the BCH system via both CKY and MSA ends of the CKY-MSA lines.

Normal system conditions:-

No system violation condition has been observed in respective system normal conditions to export the local surplus power via both CKY-MSA ends of the lines.

Single contingency system conditions:-

When the one end of the MSA- CKY circuit is out-of-service, the local surplus generation in the CKY-MSA area will be transmitted to the rest of the BCH network via the other in-service end. For condition with all generating units in the area at maximum power output, respective sections of 1L31 and 1L35 will be overloaded in summer. P74 IPP curtailment or shedding will be required to alleviate overload conditions in single contingencies in the ultimate WFL Permanent Stage. Further studies including generation shedding schemes for the ultimate WFL Permanent Stage can be performed in subsequent project phases. The WFL Permanent Stage load flow study results are summarized in below:-

Table 1-3: WFL Permanent Stage load flow voltage and line loading results*

Case	Outage	V-POI (pu)	V-SEC (pu)	1L31* Sec I, II and III**	1L32* (GIB-SEC)	1L35* (SEC-MSA)
WFL Permanent Stage (WFL load supply from CKY substation)						
b32LS	1L35	1.042	1.027	146.1/ 122.3% 103.7/ 87.4% 88.8/ 138.3%	88.2/ 78.6%	-
b32LS	1L31-Sec I (CKY-WFR)	1.043	1.029	- 44.0/ 36.4% 59.3/ 89.7%	60.1/ 52.5%	150.4/129.9%

Note: * Line loadings in MVA/ % rating
** 1L31: Sec I (CKY- WFL); Sec II (WFL- BOX); Sec III (BOX- GIB)

The corresponding WFL Permanent Stage load flow diagrams are shown in Figures 1-2C and 1-2D.

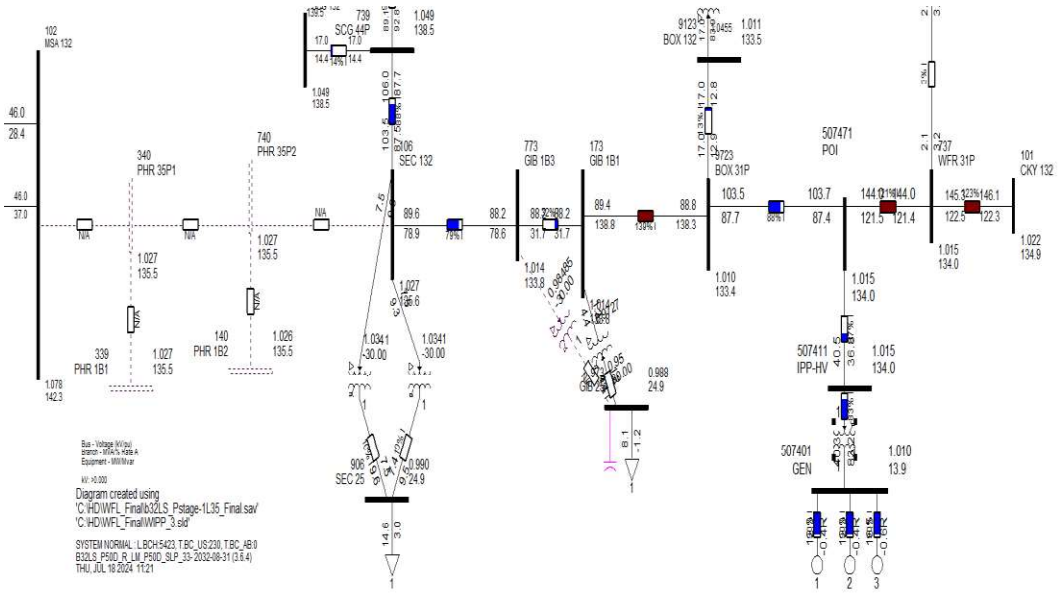

Figure 1-2C: WFL Permanent Stage load flow conditions-(b32LS, 1L35 outage)

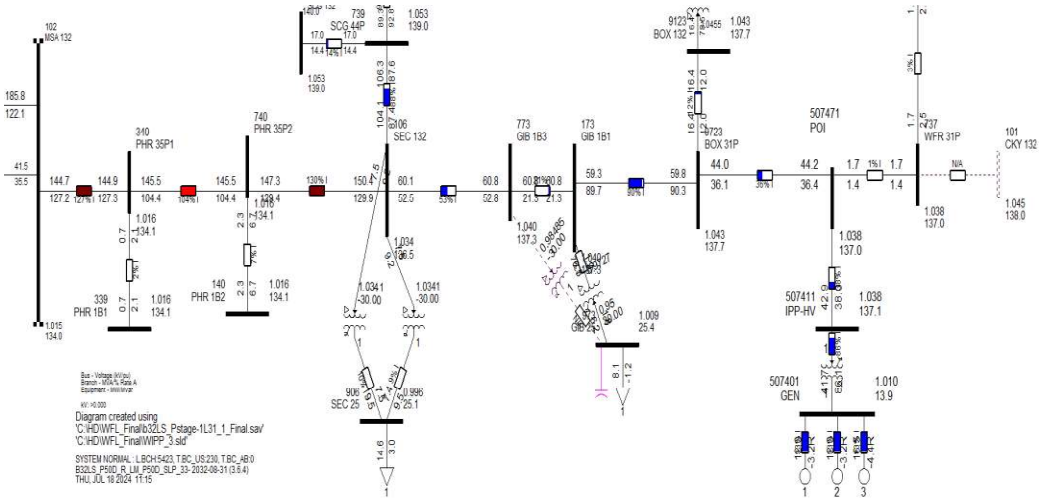

Figure 1-2D: WFL Permanent Stage load flow condition-(b32LS, 1L31 Sec I outage)

A System Impact Study is required to confirm findings in the Feasibility Study.

5.2 Fault Analysis

The short circuit analysis is based upon the latest BC Hydro system model, which includes project equipment and impedances provided by the IC. A more detailed study will be performed at the System Impact Study stage if needed.

5.3 Stations Requirement

No station work is required.

5.4 Transmission Line Requirements

No transmission line upgrade has been identified for this project.

At the POI, BCH will design and build the tap that will include a tap structure and up to three switch structures. A 152 kV rated disconnect switch will be installed to isolate the IC's facilities from the BCH system. Two 152 kV rated disconnect switches will be installed to isolate the trunk circuit on both sides. Additional Right-of-Way may be required to accommodate the tap.

5.5 Protection & Control Requirements

BC Hydro will retain existing 1L31 line protection systems. Telecommunication facilities are required from Gibsons (GIB) to P74 to trip the customer entrance circuit breakers for protection operation of 1L31.

The IC, [redacted] to provide the following for the interconnection of P74:

- Entrance protection that complies with the latest version of the "60 kV to 500 kV BC Hydro Technical Interconnection Requirements for Power Generators."
- Provide redundant line protection relays at the entrance of [redacted] to provide protection coverage for 1L31. BC Hydro P&C Planning will review and accept protection settings for these relays.

- The IPP is responsible for NERC PRC-related tasks, settings to compliance standards within their facilities.
- The IPP is responsible for providing a communications link for remote interrogation of the PPIS equipment by BCH servers.
- Provide anti-islanding protection as per Regional System Planning requirements.

5.6 Telecommunications Requirements

The schedule for this and other projects at [redacted] in Assumption 4 have a great influence on this study. If Assumption 4 is false, about 20 km of fibre optic cable would need to be constructed on existing 1L31 structures from the proposed project to CKY substation.

Tele-protection Requirements for Telecom

1. Provide WECC Level 3 transfer trip facilities from GIB to P74 for “GIB 1L31 PYPN TT to P74” and “GIB 1L31 SYPN TT to P74”.

Tele-control Requirements for Telecom

1. Provide P74 SCADA circuit.

Other Requirements for Telecom

1. None identified.

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

A non-binding good faith cost for required network upgrades and estimated schedule for construction will be included in a separate letter to the Feasibility Report.

If the IC's project advances to the next stage of interconnection study, the Interconnection System Impact Study report will provide greater details of the Interconnection Network Upgrade requirements.

7 Conclusions

This Feasibility Study has the following conclusions:-

- The BCH system can accommodate the proposed P74 under system normal and contingency conditions in the present WFL Interim Stage. There is no system upgrade requirement identified in the WFL Interim Stage.
- The BCH system can accommodate the proposed P74 under system normal conditions in the ultimate WFL Permanent Stage. However, 1L31 and 1L35 will be overloaded in single contingency conditions in the WFL Permanent Stage. P74 generation curtailment will then be required in single contingency conditions in the ultimate WFL Permanent Stage.
- At the POI, BCH will design and build the tap that will include a tap structure and up to three switch structures. A 152 kV rated disconnect switch will be installed to isolate the IC's facilities from the BCH system. Two 152 kV rated disconnect switches will be installed to isolate the trunk circuit on both sides. Additional Right-of-Way may be required to accommodate the tap.
- The impact on BC Hydro bulk transmission system is not part of the project scope of the feasibility study. The IC may be required to participate in Remedial Action Scheme on generation shedding for bulk transmission system contingencies.
- The P74 IC may be islanded with existing IC and/or BC Hydro loads under certain system contingencies. P74 IC is required to install anti-islanding protection within their facility to disconnect the generators from the grid under an inadvertent island condition.

Above conclusions are made based on assumptions and information as received from P74 IC on or before 2024-05-21.

A System Impact Study is required to confirm findings in the Feasibility Study.

Appendix A
Plant Single Line Diagram for the IC's Project

[redacted]

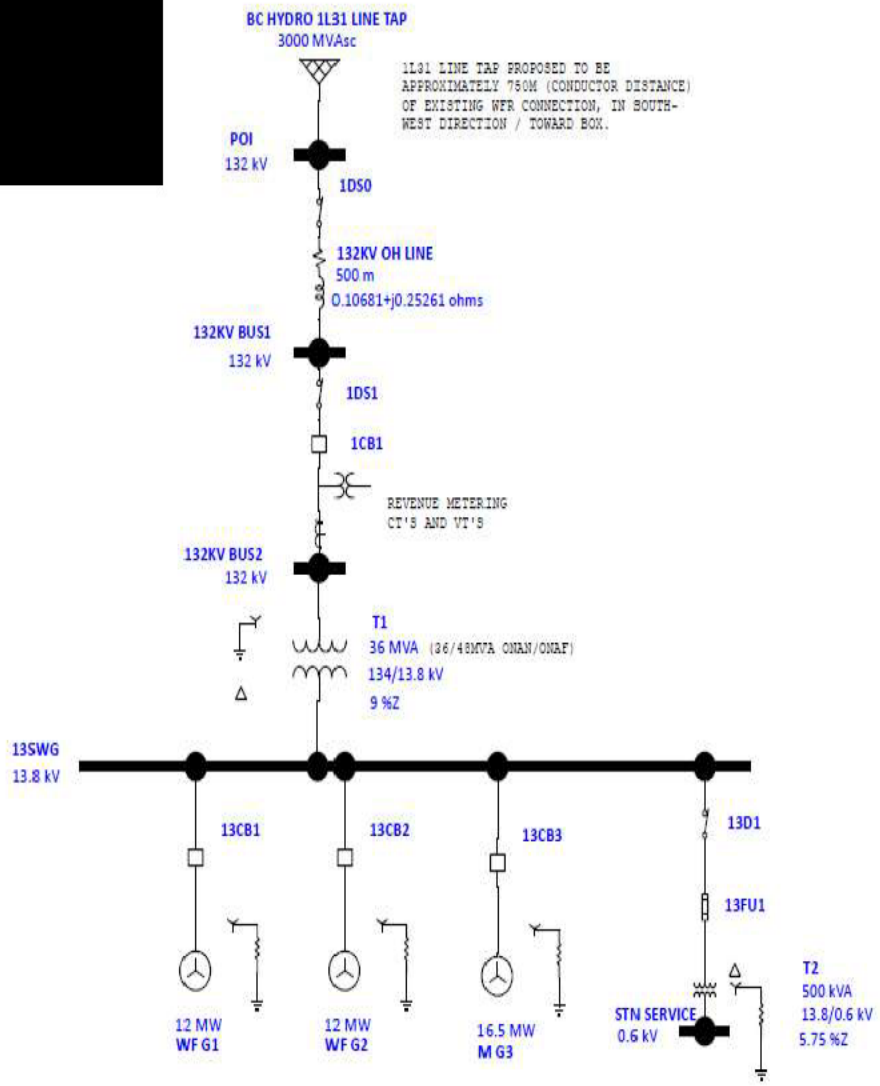

Figure A-1 Plant Single Line Diagram for the IC's Project (*extracted from Customer GIDF on 2024-05-09*).