BC Hydro
Power smart

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

July 30, 2024

[redacted]

[redacted]

Dear [redacted]

RE: CEAP IR 41 - [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 $96.4 M.

Major Scope of Work Identified:

- Construct a new outdoor 138/25kV Kitsault (KST) substation to supply the Kitsault town load of 0.95MW
- Construct a new control building and other required substation facilities and infrastructure for KST
- Add one 138kV line position at BC Hydro Aiyansh (AYH) substation with the associated substation equipment.
- Expand the substation and extend the existing 138kV bus structure at AYH
- Expand the existing control building or add a new control building to accommodate the new P&C panels and other equipment at AYH
- Refurbish the existing power line 25F53AYH (formerly 1L387AMX) for 138kV operation (42km) and reconducting.
- Supply and install 42km of fibre optic cable between AYH and Point of Interconnection

- Replace structures with 138kV standard wood pole H-Frames and add midspan structures to accommodate fibre optics installation on refurbished 25F53AYH
- Supply and install protection relays and other required protection equipment
- Other Telecom and Protection work, as required

Exclusions:

- GST
- Right-of-Way
- Permits

Key Assumptions:

- Construction will be done by contractor
- 3 years of construction
- Early Engineering and Procurement
- No ground improvements for crossing towers will be required

Key Risks:

- 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
- 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,

Senior Manager, Transmission Interconnections

BC Hydro

Encl.: CEAP2024_IR_41_[redacted]FeS_Report_final.pdf

[redacted]

Interconnection Feasibility Study

BC Hydro EGBC Permit to Practice No: 1002449

2024 CEAP IR # 41

[redacted]

Report Metadata

Header:	[redacted]
Subheader:	Interconnection Feasibility Study
Title:	[redacted]
Subtitle:	2024 CEAP IR # 41
Report Number:	900-APR-00010
Revision:	0
Confidentiality:	Public
Date:	2024 Jul 30
Volume:	1 of 1

[redacted]

Related Facilities:	AYH
Additional Metadata:	Transmission Planning 2024-056 Filing Subcode 1350

Revisions

Revision	Date	Description
0	2024 Jul	Initial release

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Executive Summary

The [redacted] (2024 CEAP IR # 41) requested a Feasibility Study for a 43.2 MW independent power producer (IPP) project located in the northwestern part of the province of BC. The proposed commercial operation date is October 1, 2031.

The IC proposed to be radially connected to the BCH network via sections of 69 kV submarine cables, lines, a 69kV / 138 kV transformer and a short 138 kV overhead line. The short 138 kV line will be tapped to the BC Hydro (BCH) 25F53AYH feeder to be upgraded to 138 kV operation.

This Feasibility Study has the following conclusions:-

- Connect the P41 IC at the end of former 1X387AMX (currently operated at 25 kV as 25F53AYH, and provided with a decommissioned designation of 1X387AMX). Refurbish existing 25F53AYH/1X387AMX for 138 kV operations, and re-connect to the AYH 138 kV bus.

- The existing customer on 25F53AYH will be supplied from a new 138 kV-25 kV distribution substation via a line tap connection to the refurbished feeder at 138 kV.

- Power flow study shows that the BCH system can accommodate the proposed P41 IC under system normal and single contingency conditions without further system upgrade requirements.

- P41 IC may be islanded with existing IC and/or BC Hydro loads under certain system contingencies. P41 IC is required to install anti-islanding protection within their facility to disconnect the generators from the grid when an inadvertent island with the local load forms.

- The impact on BC Hydro bulk transmission system is not part of study scope of the feasibility study. The P41 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

AYH Aiyansh Substation

BCH BC Hydro

COD Commercial Operation Date

ERIS Energy Resource Interconnection Service

FVO Fraser Valley Office

IC Interconnection Customer

IPP Independent Power Producer

KST Kitsault Substation

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

P41 [redacted] (site)

RAS Remedial Action Scheme

SIO South Interior Office

SKA Skeena Sunstation

STW Steward Substation

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

WECC Western Electricity Coordinating Council

1 Introduction

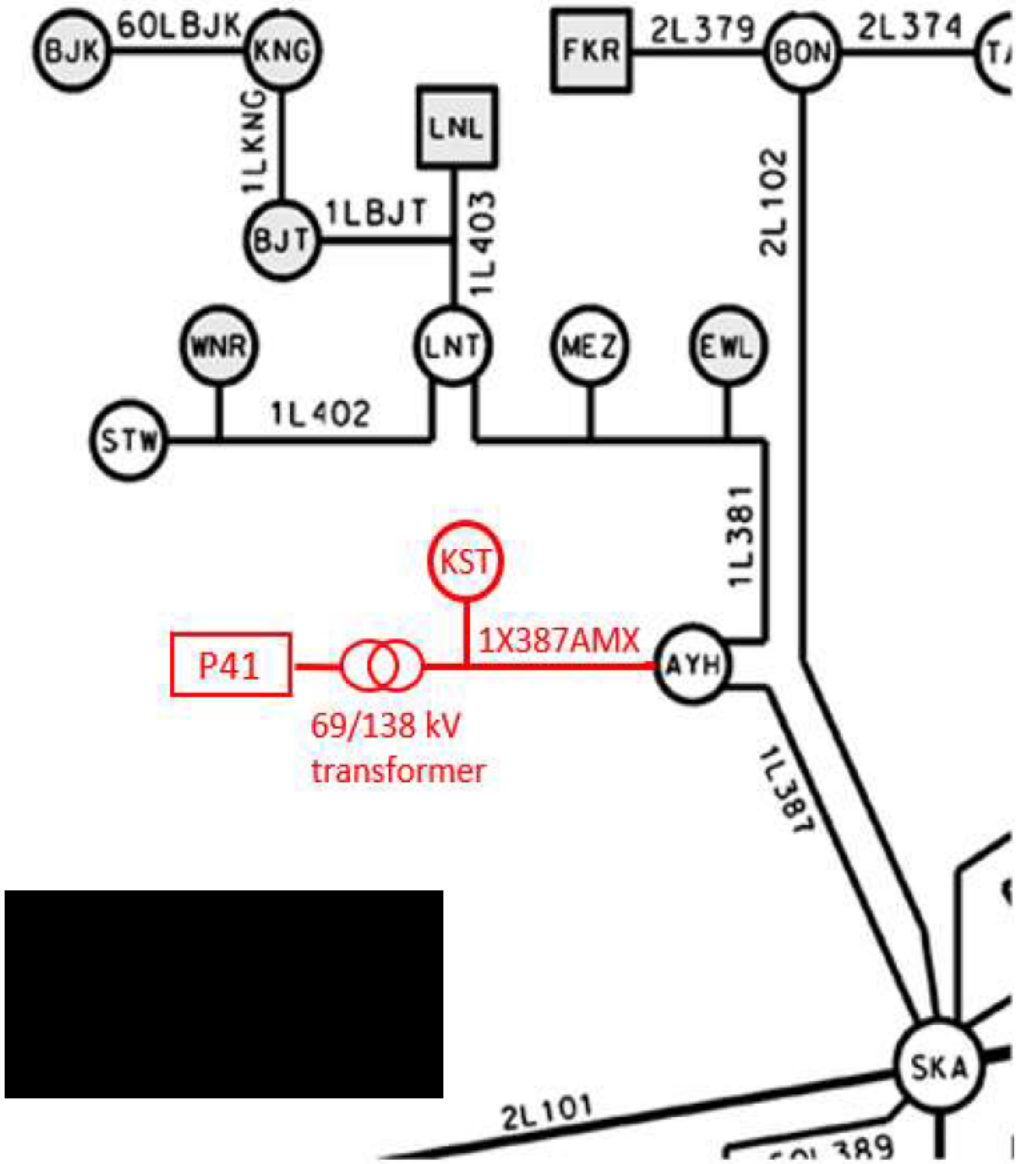
The project information for this Feasibility Study report is as in below:-

Table 1: Summary Project Information

Project Name	[redacted]	
Proponent Name	[redacted]	
Point of Interconnection	138 kV line end (1X387AMX), 42 km from AYH	
Applicant Proposed COD	1st October 2031	
Type of Interconnection Service	NRIS ☒	ERIS ☐
Maximum Power Injection (MW)	43.2 MW (Summer)	43.2 MW (Winter)
Number of Generator Units	3 @ 15 MW	
Plant Fuel	Hydro	

The [redacted] (2024 CEAP IR # 41) requested a Feasibility Study for an independent power producer (IPP) project located in the northwestern part of the province of BC (2024 CEAP Project Code: # 41). The proposed commercial operation date (COD) is October 1, 2031.

The IC proposed to be radially connected to the BCH network via series of 69 kV submarine cables and 69/ 138 kV overhead lines. At the end of 69 kV connection line the voltage will step up to 138 kV from 69 kV for connecting to the BCH 25F53AYH (1X387AMX) feeder to be upgraded to 138 kV operation. The IC's proposed Point of Interconnection (POI) is on this BC Hydro's upgraded 138 kV line, approx. 42 km from Aiyansh substation (AYH). A new 138 kV- 25 kV step-down transformer will also be installed for BCH to supply the existing 25F53AYH feeder load of about 0.9 MW. The P41 IC and the BCH North Coast transmission network of the SKA- STW area is shown in Figure 1-1.



Note: BCH 25F53AYH feeder from AYH to POI to be upgraded to 138 kV operation. A 138 kV-25 kV transformer will be installed for BCH to supply the existing 25F53AYH feeder load. Further details are shown in Appendices A and B.

Figure 1-1: BCH North Coast region system diagram with [redacted] IPP (P41 IC).

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. 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 at the end of 25F53AYH(former1X387AMX), 42 km from AYH.
2. The BCH 25F53AYH/ 1X387AMX feeder upgrade to 138 kV operation and a new 138 kV- 25 kV step-down transformer to supply the existing 25F53AYH feeder load are completed by the time the IC's generating project enters service.
3. 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 unless otherwise specified.

5 System Studies and Results

5.1 Power Flow Study Results

This North Coast area of the BCH transmission network is characterised by long radial transmission lines. The P41 IC may be inadvertently islanded with the existing loads in the radial network. This is not an allowed operation scheme. The IC is required to install anti-islanding protection within their facility to disconnect the generators from the grid when an inadvertent island with the local load forms.

A series of steady-state power flow studies has been conducted with the focus on various system operating conditions. The 2031HW, 2032 HS/ LS base cases have been adopted. The details for the b32 Light Summer condition are shown in Figure 1-2.

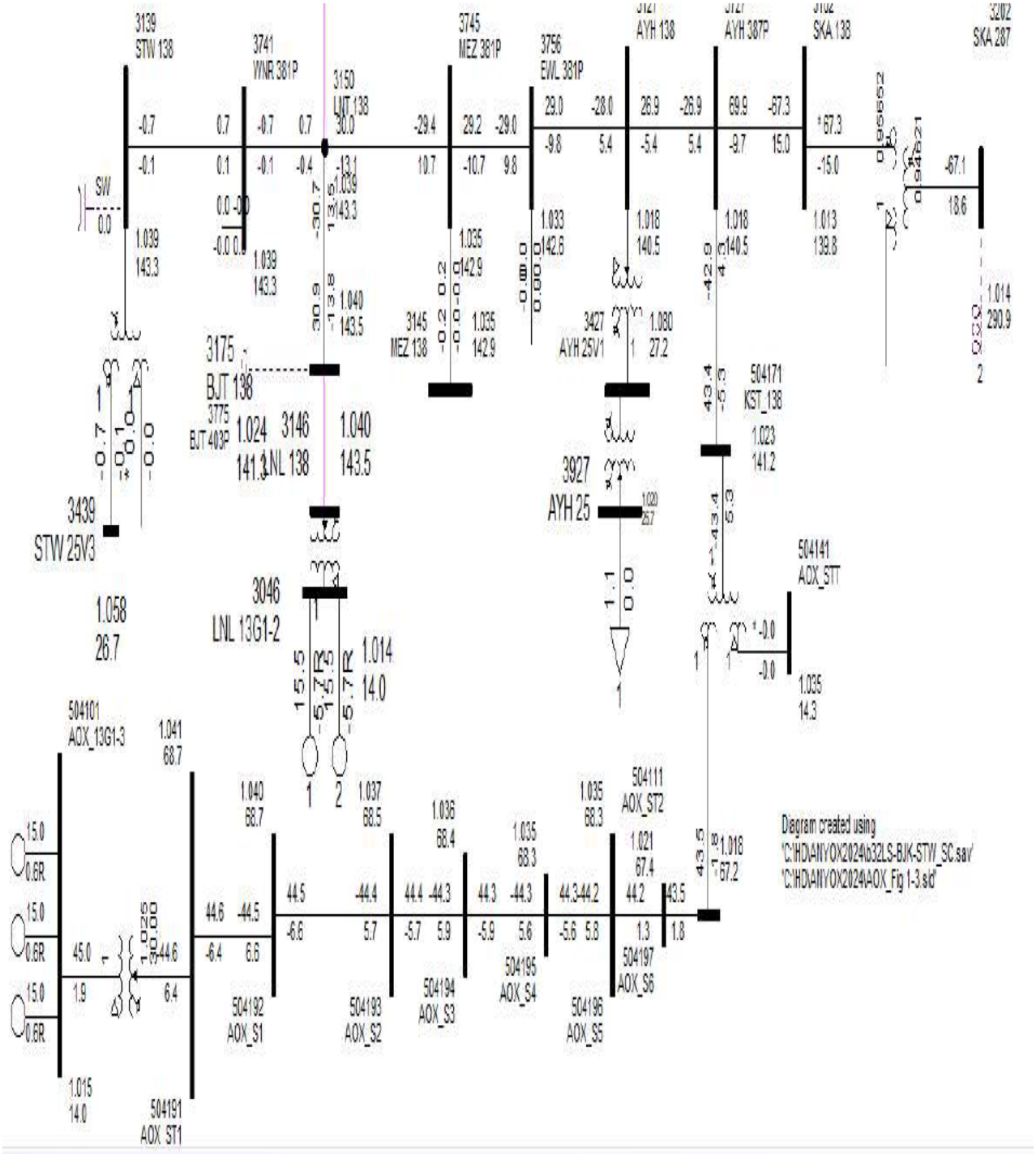


Figure 1-2. Worst P41 IC system load flow condition- BJK load rejection (b32LS)

The detailed load flow results are as shown in below:-

Table 2: Load flow conditions of P41 IC load flow studies for normal and worst single contingency condition.

Case	Contingency	V-STW (pu)	V-LNL (pu)	V-AYH (pu)	1L381 11111(MVA/ %rating)	1X387 (MVA / %rating)	1L402 (MVA/% rating)
b31HW-without P41	normal	1.024	1.023	1.037	3.1/ 2.4%	11.7/ 11.7%	4.0/ 32.7%
b31HW-with P41	normal	1.022	1.020	1.033	40.7/ 32.2%	11.1/ 11.1%	4.0/ 32.7%
b31HW-with P41	BJK oos*	1.036	1.038	1.018	62.9/ 50.6%	30.4/ 30.0%	3.1/ 24.8%
b32LS-with P41	BJK oos*	1.058	1.040	1.018	32.7/ 22.7%	37.1/ 22.7%	0.7/ 5.7%

* oos- out of service.

Respective voltage regulation schemes including SKA transformer Load Tap Change have been implemented in various substations in the area. There is no additional voltage regulation requirement for the addition of P41 IC generating units. Voltages are within 0.95 to 1.05 pu in the normal and 0.90 to 1.10 pu in the single contingency conditions. No system overload nor voltage violation condition has been identified in the various system normal and single contingency conditions. No unacceptable system violation condition has been identified in this Feasibility Study.

5.2 Fault Analysis

The short circuit analysis for the FeS is based upon the latest BC Hydro system model, which includes project equipment and impedances provided by the IC. A more detailed study to assess the existing station equipment will be performed at the next stage of Interconnection Study.

5.3 Stations Requirements

To interconnect this customer, the following station work is required at:

Aiyansh substation:

- Add one 138kV line position with the associated substation equipment. Refer to the one-line diagram (Appendix B) for details.
- Expand the substation and extend the existing 138 kV bus structure. Property is available only on the South-West of the station so 138kV cable is needed to connect the associated equipment of the new line position (design to confirm in the next stage).
- Expand the existing control building or add a new control building to accommodate the new P&C panels and other equipment.
- Reterminate the 25F53AYH (1X387AMX) to the 138kV bus to connect the [redacted]
- Other associated station work.

New Kitsault substation:

This scope assumes the new distribution station can be built at the former KST substation site. The old Kitsault (KST) substation was decommissioned after the former mine was shut down and the company town sold in 1995. BC Hydro also still provides distribution power to the privately-owned town of Kitsault. Properties confirmed BCH still owns the property of the former Kitsault substation. Also, this study scope assumes the former transmission line to the mine, approximately 2.6 km from the re-activated KST substation to the line tap-structure connecting to the refurbished feeder at 138 kV operation, must be upgraded (to be confirmed in the next stage of the project).

- Construct a new outdoor 138/25kV substation to supply the Kitsault town load of 0.95MW. Refer to the one-line diagram (Appendix B) for details.
- Construct a new control building and other required substation facilities and infrastructures.
- Other work as required.

5.4 Transmission Line Requirements

Since 25F53AYH / former 1X387AMX's existing conductor, "Hawk ACSR" and "Partridge ACSR" are able to meet the 195A summer ampacity requirement, therefore for resume 25F53AYH / former 1X387AMX to 138kV, no transmission design scope of work is identified. Guyed structures on 1X387AMX have a known class defect with the existing guy anchors, and to return to 138kV service the guy anchors are assumed to require upgrading. Additionally, a condition assessment of the existing 1X387AMX is required to identify and correct any defects that are required for resuming service from 25kV to 138kV.

A fibre optic cable running between AYH and P41 (along 25F53AYH / former 1X387AMX) will be required. The distance is approximately 42 km. Structure replacement and additional structures may be required due to fibre addition.

5.5 Protection & Control Requirements

For successful integration of the new IC, new line protection relays will be installed at BC Hydro's Aiyansh (AYH) and IC's Anyox Hydroelectric Project (P41) substation (at KT1 as shown in the IC provided one-line diagram) to protect 1X387AMX using line current differential scheme (87L). As part of the line protection addition, telecommunication facilities will be required between the two substations.

The [redacted] (P41) IC, by [redacted] to provide the following for the interconnection of P41:

- 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) relays at the entrance of P41 at the IC's substation KT1 to provide protection coverage for 1X387AMX. BC Hydro P&C Planning will provide core protection settings for these relays to protect transmission line 1X387AMX during a transmission line fault. Non-core protection such as local breaker failure, auto-reclosing, backup protection, NERC PRC related settings 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 line protection relays and PPIS equipment by BCH servers.
- Provide anti-islanding protection as per Regional System Planning requirements.

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

1. Provide WECC Level 3 64 kbps synchronous circuits between AYH and P41 for "AYH-P41 1X387AMX PY DIGITAL TELEPROT" and "AYH-P41 1X387AMX SY DIGITAL TELEPROT" with C37.94 interfaces.

Telecontrol Requirements for Telecom

1. Provide P41 SCADA circuit off FVO & SIO.

Other Requirements for Telecom

1. Provide PY & SY T1s between AYH-P41.

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

To interconnect the P41 IC Project and its facilities to the BCH Transmission System at the POI, this Feasibility Study has identified the following conclusions and requirements:

- Connect the P41 IC at the end of the former 1X387AMX (currently operated at 25 kV) including refurbishing the existing 25F53AYH for 138 kV operations and re-connecting to the AYH 138 kV bus.
- The existing customer on 25F53AYH will be supplied from a new 138 kV-25 kV distribution substation via a line tap connection to the refurbished feeder at 138 kV.
- From BCH Transmission Planning perspectives, the BCH system can accommodate the proposed P41 IC under system normal and single contingency conditions without further system upgrade requirements.
- P41 IC may be islanded with existing IC and/or BC Hydro loads under certain system contingencies. P41 IC is required to install anti-islanding protection within their facility to disconnect the generators from the grid when an inadvertent island with the local load forms.
- 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 a Remedial Action Scheme on generation shedding for bulk transmission system contingencies.

Above conclusions are made based on assumptions and information as received from P41 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

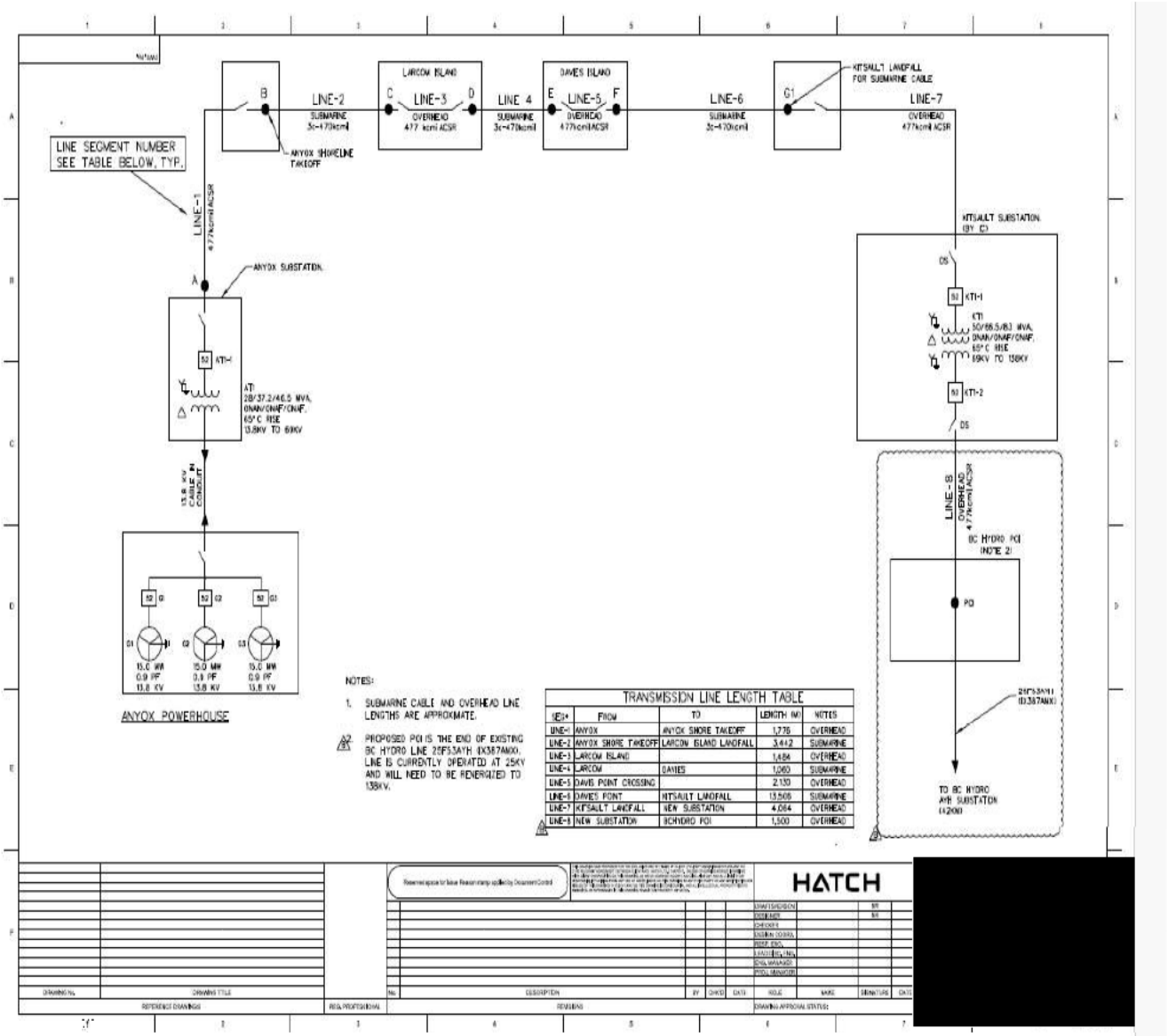


Figure A-1 [redacted] IC single line diagram (*extracted from Customer GIDF on 2024-05-09*).

Appendix B
One-Line Diagram for AYH and KST Substations

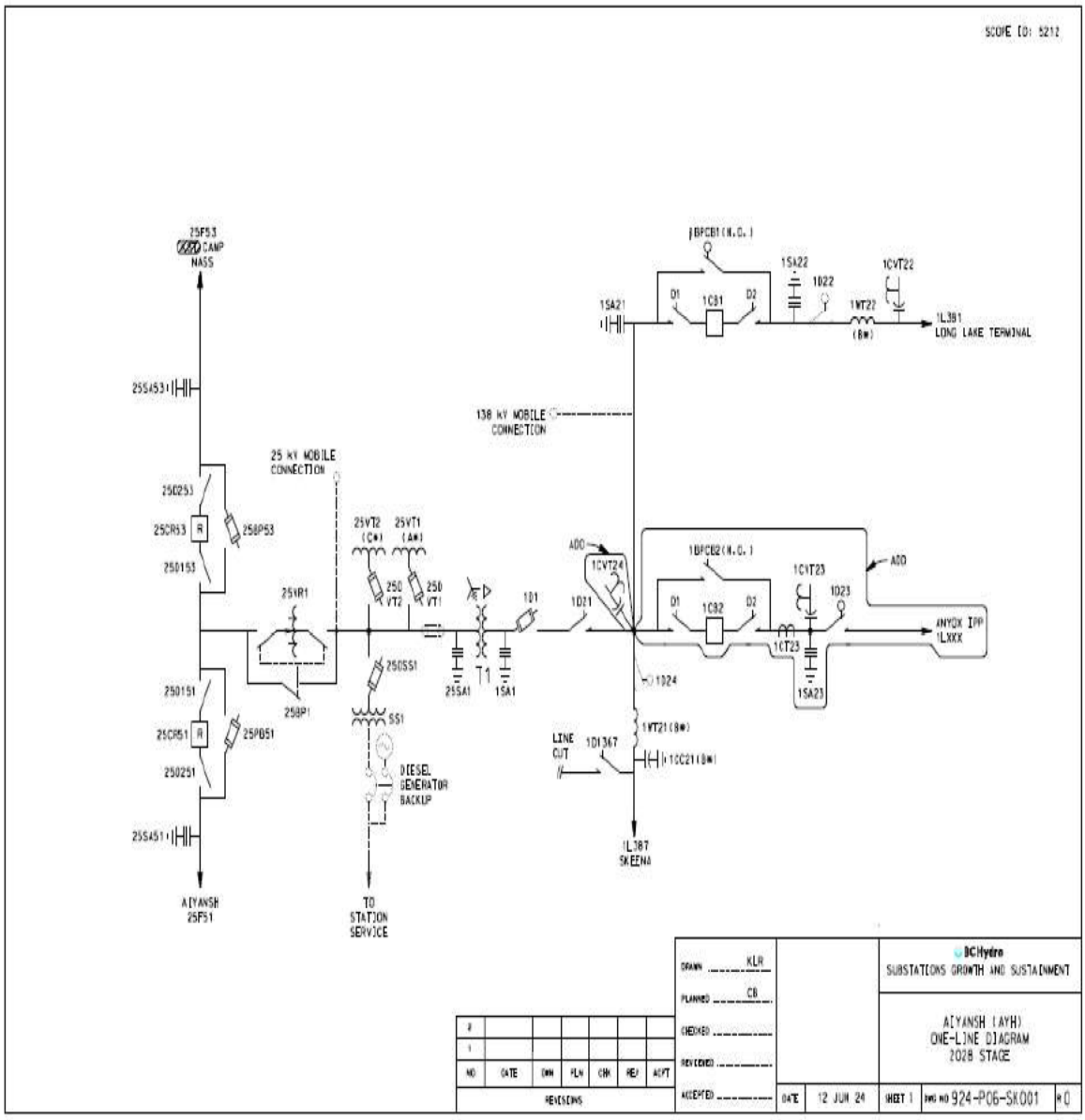


Figure B-1: Stations Planning One-Line Diagram for the Aiyansh Substation.

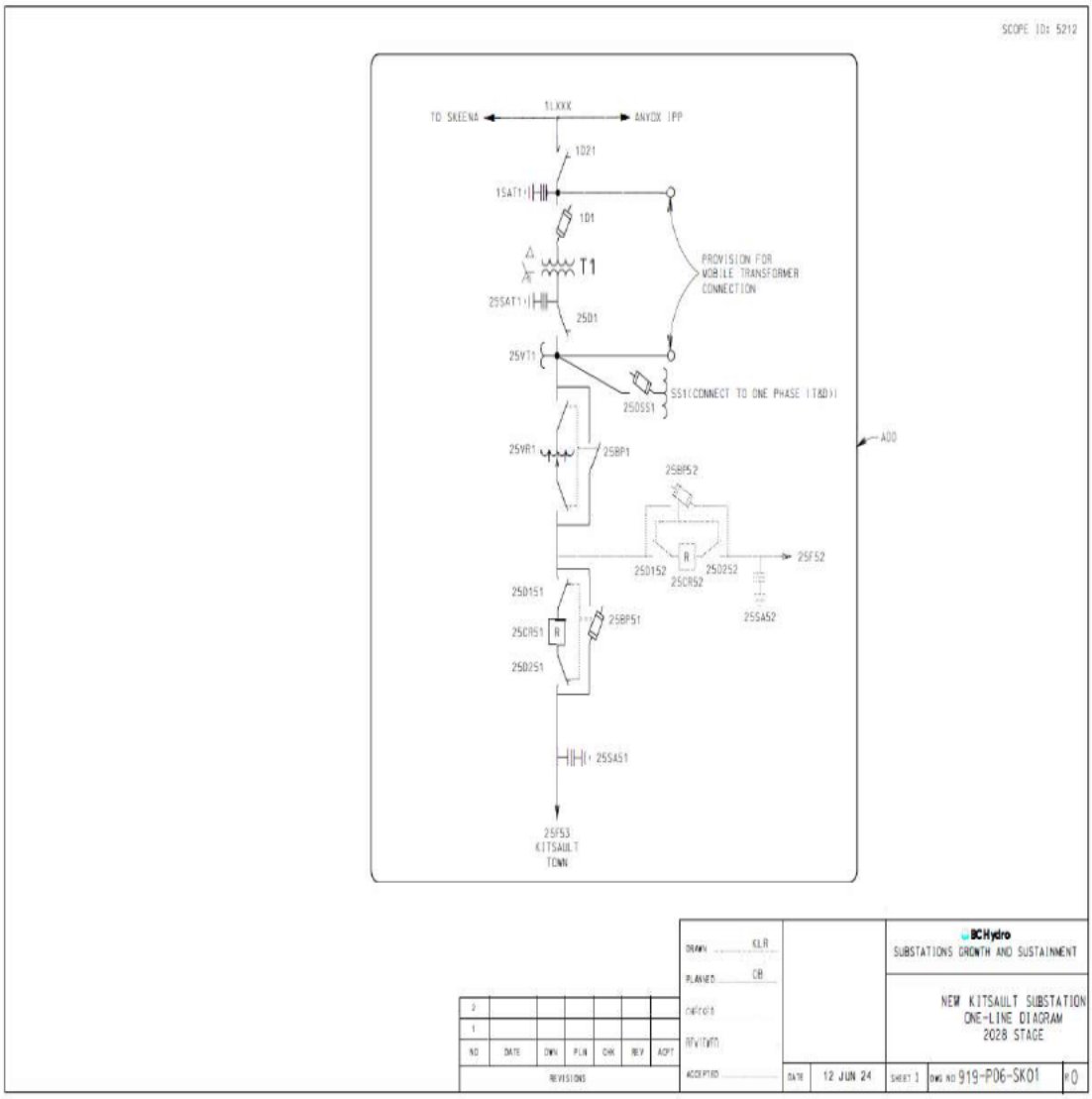


Figure B-2: Stations Planning One-Line Diagram for the Kitsault Substation.