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V3N 4X8

July 30, 2024

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RE: CEAP IR 73 - Natanik Solar Project - Interconnection Feasibility Study Report

Enclosed is the Interconnection Feasibility study report for the proposed Natanik Solar 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 \$75.7 M.

Major Scope of Work Identified:

- Acquire adequate property for a new switching station close to the existing transmission line 60L283
- Construct a new outdoor 60kV, 3- circuit breaker ring bus AIS switching station
- Supply and install microwave tower, waveguides, antennas, and other required telecommunications equipment
- Supply and install protection relays and other required protection equipment

Exclusions:

- GST
- Right-of-ways
- Permits
- Access road work

Key Assumptions:

- Property is considered only for the 3-CB switching station required for the customer interconnection
- Construction will be done by contractor
- 3 years of construction is considered
- 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 more property may be required
- 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

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

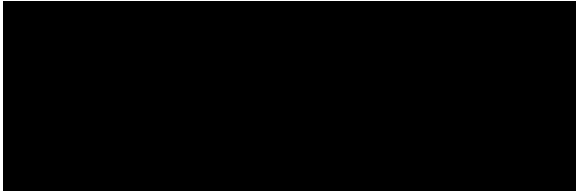
Please note that changes to your interconnection request, delays in data submission, or financial commitments may also impact the target in-service date.

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_73_Natanik Solar_FeS_Report_final.pdf



Natanik Solar Project

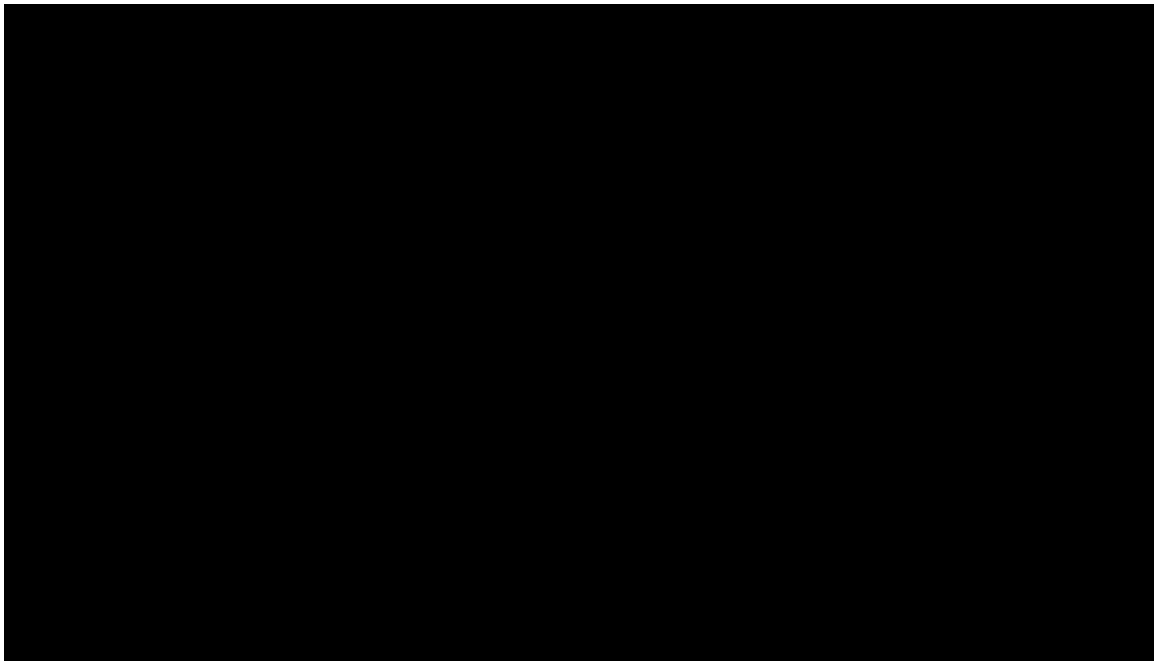
Interconnection Feasibility Study

BC Hydro EGBC Permit to Practice No: 1002449

2024 CEAP IR # 73



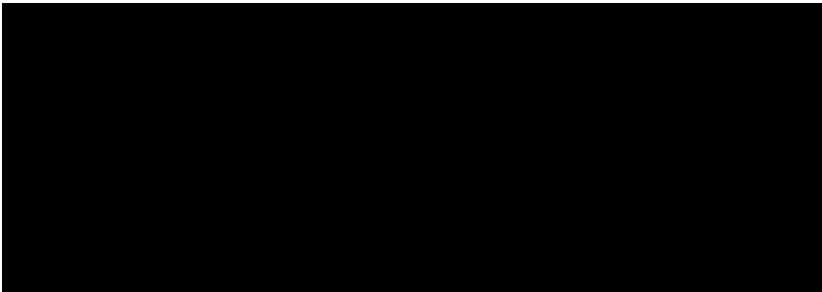
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Revision	Date	Description
0	2024 Jul	Initial release



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Executive Summary

 the Interconnection Customer (IC), requests to interconnect its Natanik Solar project (2024 CEAP IR # 73) to the BC Hydro (BCH) system. Natanik Solar project has 11  solar inverters with total installed capacity of 41.5 MW. The IC's proposed Point of Interconnection (POI) is on BC Hydro's 60 kV line 60L283, approx. 21.4 km from Cranbrook substation (CBK). The IC's project will connect to the POI via a 0.02 km 60 kV tie line. The proposed commercial operation date (COD) is January 1, 2027.

To interconnect the Natanik Solar 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 60 kV switching station (referred to as "P73T") on 60L283 is required at the proposed POI for interconnecting the IC's generating project to the BCH system. With the new switching station P73T, 60L283 will be segregated into two segments, and three new lines are temporarily referred to as: 60L283_A (CBK-P73T), 60L283_B (P73T-MVL) and 60L283_C (P73T-P73).
2. The connection of Natanik Solar Project does not cause any performance violation (i.e. thermal overload, voltage performance violation or voltage stability concern) under system normal and single contingency conditions.
3. The Natanik Solar project is not arranged for islanded operation. The IC is required to install anti-islanding protection within their facility to disconnect the Natanik Solar project from the grid when an inadvertent island with the local load forms.
4. According to BC Hydro's TIR, the IC's project must have sufficient reactive power capability over full MW operating range including at the zero MW output level. The Natanik Solar as submitted does not meet the reactive capability requirement at zero MW output level.
5. BC Hydro will provide line protections for 60L283_A, 60L283_B, and 60L283_C at the BC Hydro end only. As part of the line protection replacements for each of the three lines, 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.



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Appendices

Appendix A	Plant Single Line Diagram Used for Power Flow Study
Appendix B	One-Line Sketch for New Switching Station



Acronyms

The following are acronyms used in this report.

BCH	BC Hydro
CBK	Cranbrook Substation
CEAP	Competitive Electricity Acquisition Process
COD	Commercial Operation Date
EDM	Edmonds Office
ERIS	Energy Resource Interconnection Service
FeS	Feasibility Study
FVO	Fraser Valley Office
IBR	Inverter-Based Resources
IC	Interconnection Customer
KBY	Kimberly Substation
KSD	Teck Metals Ltd. - Stiles Substation
MVL	Marysville Substation
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
SIO	South Interior Office
TIR	BC Hydro “60 KV to 500 kV Technical Interconnection Requirements for Power Generators”
WECC	Western Electricity Coordinating Council



1 Introduction

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

Table 1-1 Summary of Project Information

Project Name	Natanik Solar	
Name of Interconnection Customer (IC)		
Point of Interconnection (POI)	on 60L283 at 21.4 km from Cranbrook substation (CBK)	
IC's Proposed COD	1 st January 2027	
Type of Interconnection Service	NRIS <input checked="" type="checkbox"/>	ERIS <input type="checkbox"/>
Maximum Power Injection (MW)	40.8 MW (Summer)	40.8 MW (Winter)
Number of Generator Units	11 x 3.75 MW	
Plant Fuel	Solar	
The maximum achievable power injection at the POI is approx. 40.8 MW after accounting for MW losses and service load which is lower than the IC proposed 41.5 MW.		

[REDACTED] the Interconnection Customer (IC), requests to interconnect its Natanik Solar project (2024 CEAP IR # 73) to the BC Hydro system. Natanik Solar project has 11 [REDACTED] solar inverters with total installed capacity of 41.5 MW. The IC's proposed Point of Interconnection (POI) is on BC Hydro's 60 kV line 60L283, approx. 21.4 km from Cranbrook substation (CBK). The IC's project will connect to the POI via a 0.02 km 60 kV interconnection line. The proposed commercial operation date (COD) is January 1, 2027.

Figure 1-1 shows the South Interior East (SIE) region 60/230/500 kV transmission system diagram. The 60 kV transmission system in the region is supplied by four (4) 60 kV transmission lines (60L283, 60L299, 60L284, 60L289) and one 230 kV transmission line (2L258) originating from the Cranbrook substation (CBK).

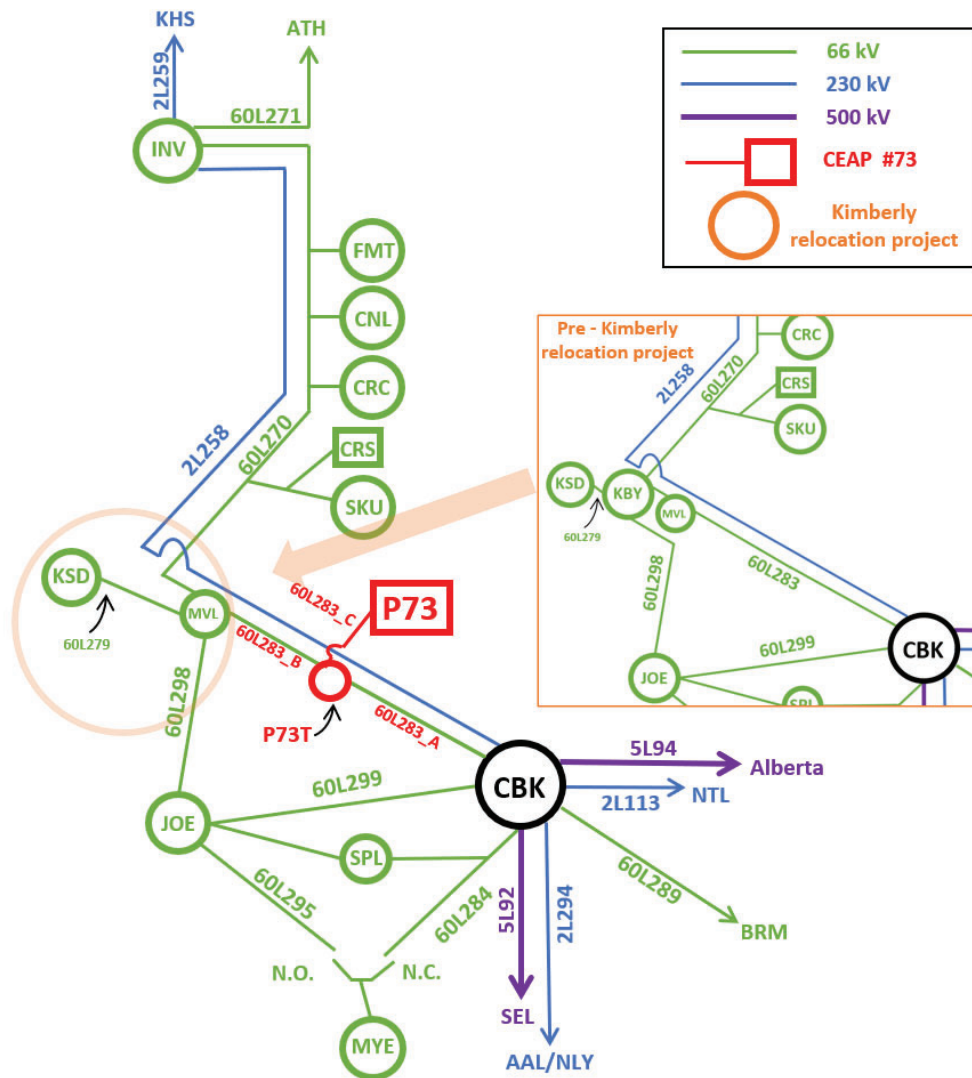


Figure 1-1: SIE region 500/230/60 kV Transmission System Topology Diagram

Prior to the Natanik Solar project, the existing 60 kV Kimberly (KBY) substation will be decommissioned as planned. After decommissioning KBY, the existing 60 kV circuits 60L270, 60L283 and 60L298 currently terminated at KBY will be re-terminated at the to-be-rebuilt Marysville substation (MVL), and the load at KSD will be served from the MVL via a renamed line 60L279 (MVL-KSD). An existing small solar farm Sun Mine (close to 1 MW) is connected to KSD.



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 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) Kimberly relocation project is assumed to be completed by the time the Natanik Solar project is in-service.



5 System Studies and Results

Based upon the IC's submitted information and the area system conditions, a new switching station (referred to as "P73T") at the proposed POI on 60L283 is required to interconnect the IC's generating project to the BCH system. The addition of the new switching station would help to maintain reliability and adequate protection performance to serve the existing customers and the new addition.

With the new switching station P73T, the existing line 60L283 will be segregated into two segments, and three new lines are temporarily referred to as: 60L283_A (CBK-P73T), 60L283_B (P73T-MVL) and 60L283_C (P73T-P73). The temporary line designations will be replaced by permanent designations at a later stage of interconnection study.

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.

In corresponding to the power call schedule, the study focuses on the 2029 light summer (29LS) 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 2029 heavy summer (29HS) and 2028 heavy winter (28HW) 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 (Category P1 and P2) for various load conditions.

The study finds no transformer or line overload under system normal and single contingency conditions for all three load conditions studied.



Table 5-1: Summary of Branch Loading Analysis Results

Case	IC's Plant Output	Contingency		Branch Loading		
				60L283 A	60L283 B	60L298
		Cat.	Description	P73T - CBK	P73T - MVL	MVL- JOE
Winter Rating				94 MVA	94 MVA	68.6 MVA
28HW	Max	P0	System Normal	21.1 %	23 %	21 %
		P1	60L283_B OOS	43.4 %	N/A	9.5 %
		P2.1	60L283_B P73T breakers	43.4 %	N/A	9.4 %
Summer Rating				49.7 MVA	49.7 MVA	49.7 MVA
29HS	Max	P0	System Normal	49.7 %	33.1 %	37.5 %
		P1	60L283_B OOS	81.5 %	N/A	13.1 %
		P2.1	60L283_B P73T breakers	81.5 %	N/A	12.8 %
29LS	Max	P0	System Normal	55.3 %	27.1 %	38.7 %
		P1	60L283_B OOS	81.6 %	N/A	17.6 %
		P2.1	60L283_B P73T breakers	81.6 %	N/A	17.3 %

Single contingencies in the 230 kV system are also studied. The 60 kV transmission system near Natanik Solar project would have branch overload and voltage instability concerns after a single contingency on 2L258, which is similar to the outcome in the pre-existing system. This issue can be addressed by existing local protections, which will open 2L259 and 60L271 lines at INV after a 2L258 contingency and trip off the loads in the northern part of INV.

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 (29LS, 29HS, 28HW). Table 5-2 shows a summary of steady-state voltage performance under various system conditions and contingencies.

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

Case	IC's Plant Output	Contingency		Bus Voltage (PU)		
		Cat.	Description	P73T 66	CBK 66	MVL 66
28HW	Max	P0	System Normal	1.041 PU	1.050PU	1.038 PU
		P1	60L283_B OOS	1.042 PU	1.048 PU	1.029 PU
		P2.1	60L283_B P73T breakers	1.042 PU	1.048 PU	1.030 PU
29HS	Max	P0	System Normal	1.030 PU	1.036 PU	1.024 PU
		P1	60L283_B OOS	1.033 PU	1.034 PU	1.014 PU
		P2.1	60L283_B P73T breakers	1.033 PU	1.034 PU	1.015 PU
29LS	Max	P0	System Normal	1.033 PU	1.039 PU	1.029 PU
		P1	60L283_B OOS	1.035 PU	1.038 PU	1.023 PU
		P2.1	60L283_B P73T breakers	1.035 PU	1.038 PU	1.023 PU



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, 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 subjected 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. The proposed wind farm does not meet this requirement at near zero MW output.

5.1.4 Anti-Islanding Requirements

The Natanik Solar project is not arranged for islanded operation. The IC is required to install anti-islanding protection within their facility to disconnect the Natanik Solar project 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

A new outdoor 60 kV, 3-circuit breaker ring bus Air-Insulated-Switchgear (AIS) switching substation (P73T temporarily) will be built at the proposed POI, close to the existing 60 kV transmission line 60L283. The existing transmission line 60L283 will be cut and looped into, and 60 kV line for Natanik Solar Project (60L283_C) will be terminated at the new substation.

The station scope at the new switching station P73T is as follows:

- Acquire adequate property for a new substation close to the existing transmission line 60L283.



- Construct a new outdoor 60 kV, three-circuit breaker ring bus AIS switching substation. Refer to the one-line sketch in Appendix B for details.
- Construct a new control building and other required substation facilities and infrastructures.
- Cut the existing 60L283 and loop into the substation.
- Terminate 60 kV line of Natanik Solar Project at the station P73T.

5.4 Protection & Control Requirements

BC Hydro will provide line protections for 60L283_A (CBK-P73T), 60L283_B (P73T-MVL), and 60L283_C (P73T-P73) at the at the BC Hydro end only. As part of the line protection replacements for each of the three lines, telecommunication facilities will be required to accommodate the new protection schemes.

The IC is to provide the following for the interconnection of Natanik Solar 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 P73 to provide protection coverage for 60L283_C. BC Hydro P&C Planning will provide core protection settings for these relays to protect transmission line 60L283_C during a transmission line fault. Setting for 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.
- The IC is required to provide anti-islanding protection as stated in Section 5.1.

With addition of the Natanik Solar project, the existing local are protection scheme may need to be updated.

5.5 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 PY & SY, CBK – P73T, with C37.94 interfaces.
- WECC Level 3 PY & SY, P73T – P73, with C37.94 interfaces.
- WECC Level 3 PY & SY, P73T – MVL, with C37.94 interfaces.

Telecontrol Requirements for Telecom

- One P73 SCADA circuit off FVO and SIO.
- One P73T REMACC circuit off EDM.
- One P73T SCADA circuit off FVO and SIO.

Other Requirements for Telecom

- 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

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 Natanik Solar 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 60 kV switching station (referred to as “P73T”) on 60L283 is required at the proposed POI for interconnecting the IC’s generating project to the BCH system.
2. The connection of Natanik Solar Project does not cause any performance violation (i.e. thermal overload, voltage performance violation or voltage stability concern) under system normal and single contingency conditions.
3. According to BC Hydro’s TIR, the IC’s project must have sufficient reactive power capability over full MW operating range including at the zero MW output level. The Natanik Solar as submitted does not meet the reactive capability requirement at zero MW output level.
4. BC Hydro will provide line protections for 60L283_A, 60L283_B, and 60L283_C at the BC Hydro end only. As part of the line protection replacements for each of the three lines, 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 Natanik Solar project single line diagram used for power flow study.

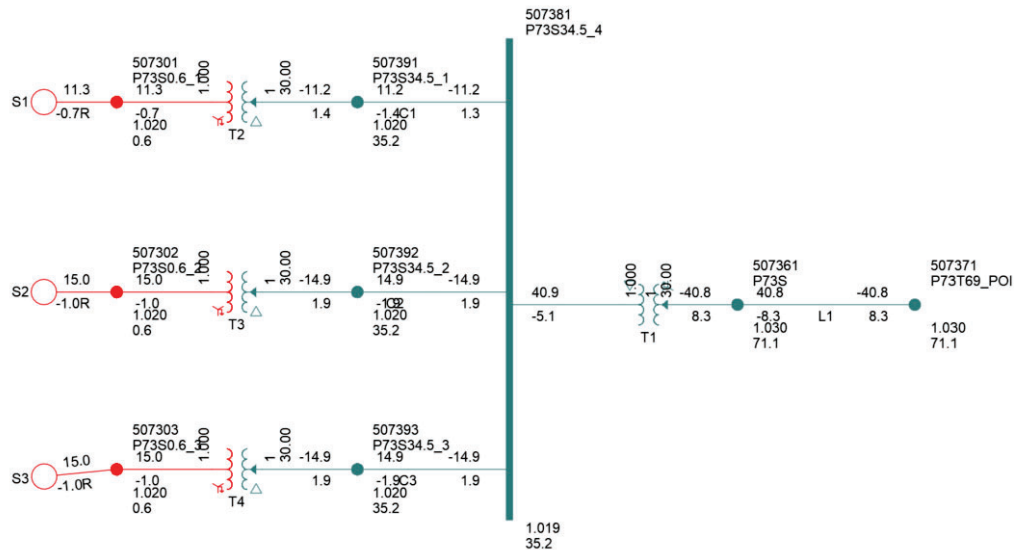


Figure A-1: Natanik Solar Project Single Line Diagram for Power Flow Study.

As seen in the diagram, Natanik Solar project has one main power transformer and three (3) feeders connecting 3~4 wind turbines to the collector station.

One-Line Sketch for New Switching Station

[illegible]

Figure B-1: Stations Planning One-Line Sketch for the New Switching Station P73T.