Chris Sandve
Chief Regulatory Officer
Phone: 604-623-3726
Fax: 604-623-4407
bchydroregulatorygroup@bchydro.com

June 30, 2021

Mr. Patrick Wruck
Commission Secretary and Manager
Regulatory Support
British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC V6Z 2N3

Dear Mr. Wruck:

RE: Project No. 1598990
British Columbia Utilities Commission (BCUC or Commission)
British Columbia Hydro and Power Authority (BC Hydro)
Fiscal 2020 to Fiscal 2021 Revenue Requirements Application

BC Hydro writes in response to Directive 35 of the BCUC's Decision on BC Hydro's Fiscal 2020 to Fiscal 2021 Revenue Requirements Application (**F2020-F2021 RRA**), which states:

> The Panel further directs that BC Hydro conduct a workshop, by March 31, 2021, with BCUC staff present, to present the information in this filing to current and potential interconnection customers and current and potential IPPs. BC Hydro is directed to submit a further filing to the BCUC, by June 30, 2021, with its most recent performance on interconnections, its activities to date to improve its performance, and a revised plan for further improvement.

In response to Directive 35, BC Hydro conducted a workshop on March 11, 2021, with BCUC staff, potential interconnection customers and current and potential independent power producers.

Further to the workshop and to complete the requirements set out in Directive 35, this filing provides:

- A discussion of BC Hydro's recent interconnection performance;
- An update on BC Hydro's progress on interconnection performance improvement initiatives; and
- BC Hydro's plans for additional interconnection performance improvement initiatives.

1 Background and Overview

In the F2020-F2021 RRA decision, the BCUC made two directives with regard to BC Hydro's interconnections process: Directive 34 and Directive 35.

Directive 34 directed that:

> BC Hydro submit a filing to the BCUC, by December 31, 2020, explaining its progress to date in implementing each of the recommendations included in the Black and Veatch report, plus any other initiatives BC Hydro has or is undertaking to improve its interconnection process.

In response to Directive 34 BC Hydro filed a letter with the BCUC on December 23, 2020, which provided information on:

- The progress BC Hydro made in implementing the recommendations included in Black & Veatch's Transmission Generator and Customer Interconnection Process Assessment Report; and
- Other BC Hydro initiatives to improve our interconnection process for generator, large distribution and transmission load customers (**Interconnection Process**).

As described in the December 23, 2020 filing and at the March 11, 2021 workshop, BC Hydro has made progress in recent years to improve its Interconnection Process, with a focus on three areas:

- Improved oversight and cross-company collaboration for customer driven work;
- Streamlined processes; and
- Benchmarking with peers and feedback from customers to identify and implement additional measures for improvement.

BC Hydro's initiatives and ongoing efforts have produced improvements in our interconnections performance. As discussed further below, these improvements have been demonstrated through BC Hydro's performance metrics and the results of the fiscal 2021 internal audit of interconnections.

BC Hydro continues to improve its Interconnection Process by seeking feedback from customers as well as by planning and implementing additional initiatives to connect customers more quickly and cost effectively and to respond to the increased work volume expected in upcoming years as BC Hydro implements its Electrification Plan.[1]

The following sections explain BC Hydro's interconnections performance metrics, provide updates on the initiatives reported in the December 23, 2020 filing, and provide information on additional initiatives planned to achieve further improvements.

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[1] The Electrification Plan will be included in BC Hydro's upcoming Fiscal 2023 to Fiscal 2025 Revenue Requirements Application filing.

2 BC Hydro Interconnections Performance

Certain project complexities, which may include frequent customer-driven changes, coordination between BC Hydro and the customer, and coordination with third parties[2] on large interconnection projects, require BC Hydro to track a variety of interconnections performance metrics.

2.1 Key Metrics That Highlight BC Hydro's Improvements

The two key metrics that highlight BC Hydro performance improvements are:

1. The fiscal 2021 performance on "studies meeting customer timelines," (see Table 1 below) which improved to 91.5 per cent in fiscal 2021 compared to 78.4 per cent in fiscal 2019 and 88.9 per cent in fiscal 2020; and
2. Interconnection customer surveys which indicate a high level of customer satisfaction, with an overall rating of 87 per cent.[3] Surveys are sent to customers upon completion of interconnection studies, deliverables, and implementation of projects.

2.2 Overview of Interconnections Studies and Implementation Duration Metrics

BC Hydro also tracks study and implementation durations. BC Hydro's duration metrics are provided in Table 1 through Table 7 below. The different study types and implementation activities are as follows:

- System Impact Study – This study identifies impacts to the BC Hydro system and the facilities required, as well as an order-of-magnitude cost estimate for the connection options;
- Planning Study – This study identifies the facilities required for a Large Distribution Load Interconnection request. A high-level servicing proposal, including a preliminary estimate and a high-level project timeline is prepared;
- Facilities Study – This study confirms the preferred interconnection option and identifies more detailed technical requirements. A project plan and a refined implementation cost estimate are prepared;
- Implementation – The implementation phase activities include the completion of the interconnection work defined in the project plan, including detailed design and engineering, procurement of major equipment, construction and commissioning of facilities;

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2 Examples of third parties are BC Hydro or customer retained consultants or contractors, municipal or provincial government agencies.

3 Based on 14 months of survey data to date (from February 2020 to March 2021). There were 15 responses in that timeframe.

- Transmission Feasibility Study – This is an optional study for Transmission Load Interconnection customers to provide a high level limited technical assessment of potential impacts and required system upgrades for the proposed interconnection. The Transmission Feasibility Study is a useful alternative if the customer is not ready to commit to the System Impact Study; and
- Pipeline and Other Clearance Study – This study is performed to assess major pipeline works proposed near BC Hydro power lines, facilities, or rights-of-way to ensure the installation and operation of the pipeline is coordinated in accordance with BC Hydro standards, operational and access requirements, and public safety.

The duration metrics are informative, but may not accurately reflect BC Hydro's performance for reasons including:

- Complex studies or projects could skew the average number higher, whereas lower complexity studies or projects could skew the average number lower;
- The particular month in which the study or project is completed may skew the metric for the fiscal year average;
- Customer-driven changes or third-party changes outside of BC Hydro's control and the delays caused by them are often embedded in the durations; and
- BC Hydro may proceed at a slower pace to meet customer needs (for example, to accommodate customer cashflow limitations) or to allow BC Hydro to prioritize its resources on more urgent and high priority projects while still meeting customer needs.

2.3 Overall Interconnections Studies Performance Metrics

As a part of the F2020-F2021 RRA proceeding, BC Hydro provided metrics related to Interconnections Performance (as of January 2020). The performance metrics for fiscal 2020 and fiscal 2021 are summarized in Table 1 below.

Table 1 Overall Interconnections Performance Metrics

Metric	F2020	F2021	F2021 Target
Studies meeting customer timelines In percent (number on time/total number of studies completed)	88.9%[4] (40/45)	91.5% (75/82)	80%

[4] Planning Studies are excluded from this metric in fiscal 2020 because agreed upon target delivery dates were not set between BC Hydro and the customer. A portion of Distribution Facilities Studies are excluded from this metric in fiscal 2020 because of a change in how these studies were tracked. For fiscal 2021, the tracking of Planning Studies and Distribution Facilities Studies is aligned with other study types and included in this metric.

Metric	F2020	F2021	F2021 Target
Transmission System Impact Studies Average study duration in days (number of studies completed)	127 (16)	150 (14)	150
Transmission Facilities Studies Average study duration in days (number of studies completed)	136 (3)	78 (2)	180
Planning Studies, Distribution System Impact Studies, and Closed Transition Transfer projects[5] Average study duration in days (number of studies completed)	70 (51)	61 (52)	60
Distribution Facilities Studies Average study duration in days (number of studies completed)	496 (13)	471 (8)	365
Transmission Feasibility Studies Average study duration in days (number of studies completed)	89(3)	25(1)	N/A[6]
Pipeline and Other Clearance Studies Average study duration in days (number of studies completed)	Not available[7] (7)	Not available[6] (5)	N/A[8]
Transmission System Impact Studies following Expedited Transmission Interconnection Process[9] Average study duration in days (number of studies completed)	54 (5)[8]	47 (2)[8]	80

With respect to Table 1:

- The average duration of Transmission System Impact Studies has increased by 23 days between fiscal 2020 and fiscal 2021, although the number of System Impact Studies decreased. This is a result of having System Impact Studies of higher complexity in fiscal 2021 compared to fiscal 2020 (e.g., larger load interconnection in a constrained area of the transmission system);
- The average duration of Transmission Facilities Studies in fiscal 2021 is lower than the target. This is a result of the two studies completed being of lower complexity;

5 Closed Transition Transfer projects are defined in section 2.4.6.

6 Not applicable; no target set as there is little historical data available and the scope of Transmission Feasibility Studies is customizable by the customer.

7 Durations for Pipeline Studies are not available for fiscal 2020 and fiscal 2021 because only the completion dates were tracked for these studies. Starting fiscal 2022, the start dates are now being tracked so that durations can be reported.

8 Not applicable; no target set as historical duration data is not available.

9 Included in Transmission System Impact Studies metric above.

- The average duration of Planning Studies, Distribution System Impact Studies, and Closed Transition Transfer projects in fiscal 2021 is greater than the target (60 days) due to two Distribution Generator Interconnection[10] projects and five Closed Transition Transfer[11] projects. The average duration of these seven studies was 167 days. Although the target duration was not met, BC Hydro met the customer's schedule for all projects. The delay was due to higher complexity studies (for Distribution Generator Interconnection) and project prioritization (for Closed Transition Transfer) by BC Hydro;
- The average duration of the Distribution Facilities Studies is greater than the target (365 days) due to two projects, which took 739 days and 1,198 days respectively. Although the target duration was not met, BC Hydro met the customer's schedule for both projects. The delay was due to project prioritization by BC Hydro so that resources could focus on other urgent studies that had higher risks to the in-service dates.

2.4 Interconnection Studies and Implementation Performance Metrics by Types of Interconnections and Complexity

In addition to the performance metrics, BC Hydro has been publishing the volumes of interconnection studies, the average timelines to complete the studies, and the percentage of time that BC Hydro met its targets on a quarterly basis, since October 2020. The information includes not only study phase metrics but also implementation phase metrics. These performance metrics are located on our external website at the following links:

- **Industrial interconnections**: https://app.bchydro.com/accounts-billing/electrical-connections/industrial-connections.html
- **Transmission generator interconnections:** https://app.bchydro.com/accounts-billing/electrical-connections/transmission-generator-interconnections.html
- **Distribution generator interconnections:** https://app.bchydro.com/accounts-billing/electrical-connections/distribution-generator-interconnections.html

The performance metrics are categorized by types of interconnections and complexity, which are represented by dollar amount thresholds. The larger dollar amount thresholds are generally indicative of higher complexity. BC Hydro does not have a historical trend on these metrics since we began reporting the information in fiscal 2021. These performance metrics and additional information are summarized in Table 2 to Table 7 below.

[10] Distribution Generator Interconnections are defined in section 2.4.5.

[11] Closed Transition Transfer projects are defined in section 2.4.6.

The target delivery dates for the various interconnection phases are compared to the actual completion dates to derive the "% Meeting Target Timelines" measure. The target delivery date is the date agreed to by BC Hydro and the customer.

2.4.1 Transmission Load Interconnections

Transmission Load Interconnections are connections of load customers to the BC Hydro transmission system (60 kV and above). Table 2 below provides the performance metrics for the delivery duration of transmission load interconnection requests. In fiscal 2021, BC Hydro met the target timelines for ten of fourteen System Impact Studies, all Facilities Studies and six of seven implementation projects. Although some of the studies did not meet the target timelines, BC Hydro mitigated the impact to customers by providing preliminary information or a draft report to aid customers in their decision making.

Table 2 Transmission Load Interconnections Performance Metrics Fiscal 2021

	Avg. Timeline (days)	No. of Projects	Meeting Target Timelines (%)
System Impact Studies[12]			
Studies < than $50 k	61	3	67
Studies ≥ than $50 k <than $300 k	175	11	73
Studies ≥ than $300 k	0	0	N/A
Facilities Studies[13]			
Studies < than $150 k	92	1	100
Studies ≥ than $150 k < than $1 M	64	1	100
Studies ≥ than $1 M	0	0	N/A
Implementation			
Projects < than $250 k	254	2	100
Projects ≥ than $250 k < than $20 M	419	4	75
Projects ≥ than $20 M	1086	1	100

With respect to Table 2:

- Two System Impact Studies in the second quarter of fiscal 2021 did not meet the target delivery date. One study was late by two days due to cost estimate revision at

[12] Includes Transmission Load Interconnections - Expedited Transmission Interconnection Process System Impact Study projects shown in Table 3.

[13] Includes Transmission Load Interconnections - Expedited Transmission Interconnection Process Facilities Study projects shown in Table 3.

the later stage of the study. The other study was late by five days due to short-term unavailability[14] of BC Hydro personnel on the critical path of the study schedule;

- Two System Impact Studies in the fourth quarter of fiscal 2021 did not meet the target delivery date. One study was late by five days due to short-term unavailability of BC Hydro personnel on the critical path of the study schedule. The other study was late by 26 days due to a BC Hydro resource constraint[15] and a delay of customer confirmation on the study assumptions; and
- One project in the first quarter of fiscal 2021 did not meet the target in-service date. Although all the construction was completed by the target in-service date, the customer energization date was delayed by seven weeks due to an inability to secure an outage to minimize impacts to other customers in the area during the beginning of the COVID-19 pandemic.

2.4.2 Transmission Load Interconnections - Expedited Transmission Interconnection Process

Table 3 below provides the performance metrics for the study delivery duration for Transmission Load Interconnection requests processed using the expedited transmission interconnection process. Requests to follow this process are considered for low complexity projects where the interconnection scope of work is limited. Typically, these projects do not trigger a new point of interconnection and have limited potential impacts to the BC Hydro transmission system. Examples of customer requests that may fit in this category are a small load increase at an existing customer site, indirect load interconnection by sharing an existing point of interconnection with an existing customer, or load replacement at an existing customer site (not triggering any system reinforcements). Although we report the performance metrics for studies that follow the expedited transmission interconnection process separately, these studies are included in the Transmission Load Interconnections performance metrics in Table 2. BC Hydro met the target timelines for one of two System Impact Studies and all Facilities Studies.

Table 3 Transmission Load Interconnections - Expedited Transmission Interconnection Process Performance Metrics Fiscal 2021

	Avg. Timeline (days)	No. of Projects	Meeting Target Timelines (%)
Expedited Transmission Interconnection Process			
System Impact Study	47	2	50
Facilities Study	92	1	100

[14] A study delay caused by short-term unavailability (e.g., illness, family emergency) of BC Hydro personnel is hard to mitigate if it happens at a later stage of the study.

[15] This resource constraint is addressed in the resource plan that BC Hydro plans to implement as a future improvement initiative shown in Table 9, item 4.

With respect to Table 3:

- One System Impact Study in the fourth quarter of fiscal 2021 was late by five days. The reason for this delay was provided as a part of Table 2 above.

2.4.3 Transmission Generator Interconnections

Transmission Generator Interconnections consist of connections of generator customers to the BC Hydro transmission system (60 kV and above). Table 4 below provides the performance metrics for the delivery duration of transmission generator interconnection requests. There was one Implementation project in fiscal 2021. It was completed within the target timeline.

Table 4 Transmission Generator Interconnections Performance Metrics Fiscal 2021

	Avg. Timeline (days)	No. of Projects	Meeting Target Timelines (%)
System Impact Studies			
Studies < than $150 k	0	0	N/A
Studies ≥ than $150 k	0	0	N/A
Facilities Studies			
Studies < than $500 k	0	0	N/A
Studies ≥ than $500 k	0	0	N/A
Implementation			
Projects < than $10 M	482	1	100
Projects ≥ than $10 M	0	0	N/A

2.4.4 Large Distribution Load Interconnections

Large Distribution Load Interconnections are connections of load customers which have greater complexity and an estimated cost of $2 million or higher. Table 5 below provides the performance metrics for the delivery duration of large distribution load interconnection requests. BC Hydro met the target timelines for thirty-eight of forty-one Planning Studies, all Facilities Studies, and nine of eleven implementation projects.

Table 5 Large Distribution Load Interconnections Performance Metrics Fiscal 2021

	Avg. Timeline (days)	No. of Projects	Meeting Target Timelines (%)
Planning Studies			
Projects < $5 M	28	28	100
Projects ≥ $5 M	81	13	77
Facilities Studies			
Projects < $5 M	368	7	100
Projects ≥ $5 M	1,198	1	100
Implementation			
Projects < $5 M	389	7	100
Projects ≥ $5 M	560	4	50

With respect to Table 5:

- Three Planning Studies were one day, 184 days, and 421 days late, respectively. The latter two studies were delayed due to a combination of complexity (several in progress and planned internally and externally driven projects in the area, and significant upgrades required to bring capacity to the location of the requests) and planning resource constraints due to a BC Hydro personnel departure; and
- Two projects were 67 and 116 days late, respectively due to the procurement for civil works taking longer than anticipated as a result of higher than estimated costs and the civil works contractor taking longer than expected to complete the work. Beginning in summer 2021, a review of BC Hydro's civil tendering process will begin for the purpose of identifying areas for improvement, including both timelines and risk mitigations. The intent of this review is to find opportunities to bring greater cost certainty to customer projects.

2.4.5 Distribution Generator Interconnections

Distribution Generator Interconnections are connections of generators to the BC Hydro distribution system. Table 6 below provides the performance metrics for the delivery duration of distribution generator interconnection requests. There were four System Impact Studies and two Implementation projects in fiscal 2021, all of which met the target timelines.

Table 6 Distribution Generator Interconnections Performance Metrics Fiscal 2021

	Avg. Timeline (days)	No. of Projects	Meeting Target Timelines (%)
System Impact Studies			
Projects < 1 MW	131	4	100
Projects ≥ 1 MW	0	0	N/A
Facilities Studies			
Projects < 1 MW	0	0	N/A
Projects ≥ 1 MW	0	0	N/A
Implementation			
Projects < 1 MW	171	1	100
Projects ≥ 1 MW	27	1	100

2.4.6 Closed Transition Transfer Projects

Closed Transition Transfer (**CTT**) projects involve customers that, on occasion, are required to operate temporarily in parallel with BC Hydro to eliminate an outage when power is being restored after an outage. These types of projects are often utilized in hospitals, data centres and critical facilities where load is sensitive to momentary power loss when transferring between a temporary source of power (i.e., backup diesel generator) to the utility source. BC Hydro evaluates these projects and creates a set of specific project interconnection requirements to ensure their safe and reliable operation. Table 7 below provides the performance metrics for duration of CTT projects. There were seven CTT projects in fiscal 2021, all of which met the target timelines.

Table 7 CTT Projects Performance Metrics Fiscal 2021

	Avg. Timeline (days)	No. of Projects	Meeting Target Timelines (%)
Planning & Project Interconnection Requirements			
All Projects	113	7	100

3 Update on BC Hydro's Progress on Performance Improvement Initiatives

In BC Hydro's letter to the BCUC filed December 23, 2020, we provided an update on the initiatives BC Hydro has undertaken, or is undertaking, to improve its Interconnection Process.

In Table 8 below, BC Hydro summarizes the initiatives which were identified as ongoing or future initiatives in the December 23, 2020 filing and provides a status update on the

initiatives. As shown below, the improvements may apply to only Transmission interconnections (T), only Distribution interconnections (D), or to both Transmission and Distribution interconnections (T+D).

Table 8 Improvement Initiatives Status Update

Actions Taken	T or D	Status Update
In fiscal 2022, BC Hydro will review the distribution civil delivery process for the Definition and Implementation phases to better identify and document construction risks in the Definition phase to support improved cost estimates.	D	Scheduled to start summer 2021.
In fiscal 2021, BC Hydro initiated ex-plan projects so that transmission service can be provided within the timelines required by customers (e.g., Prince George to Terrace Capacitors Project and North Montney Region Electrification Project).	T+D	North Montney Region Electrification Expression of Interest was issued in March 2021 and closed in May 2021. BC Hydro is currently reviewing the submissions to inform the development of conceptual level project scope, including transmission line routing and the location of the terminus substation.
BC Hydro is working with the Government of B.C. to utilize federal infrastructure funding to reduce interconnection costs for customer projects that reduce greenhouse gas emissions.	T+D	The CleanBC Facilities Electrification Fund was announced in January 2021. The fund is available to BC Hydro customers with fuel switching projects that reduce greenhouse gas emissions and will help reduce the cost of interconnecting into BC Hydro's grid.
To support Phase 2 of the Government of B.C.'s Comprehensive Review, BC Hydro is exploring ways to reduce the cost and time for industrial customers to connect. Concepts identified in the Phase 2 Interim Report include eliminating the Tier 2 energy charge, an economic development rate for new clean industries and fuel switching opportunities. Timing for implementation will be determined once the final Phase 2 Comprehensive Review report is issued.	T+D	To support the Electrification Plan, which will be included in BC Hydro's Fiscal 2023 to Fiscal 2025 Revenue Requirements Application, performance improvement initiatives are planned as discussed in section 4 below.

Actions Taken	T or D	Status Update
Once Phase 2 of the Comprehensive Review is completed, BC Hydro is planning to conduct a review of transmission and distribution extension policies and tariffs. The transmission tariff (Tariff Supplement No 6) has not been updated since it was approved in 1991. The distribution extension tariff (Section 8 of the Electric Tariff) was last updated in 2007. Potential changes to these tariffs and policies can directly impact the interconnection processes.	T+D	The review has not been initiated because t Phase 2 of the Comprehensive Review has not been completed.
BC Hydro is undertaking an independent internal audit focusing on all aspects of the load Interconnection Process. The audit is scheduled to be completed by March 31, 2021.	T+D	The audit was completed in February 2021 and resulted in a "Green" rating (i.e., only minor issues and impacts identified). The audit report is included as Appendix A to this filing.
In November 2020, BC Hydro initiated a review of the queue management business practice and process. The intent of this review is to achieve a balance between maintaining continuity for customers as they move through the Interconnection Process while also exploring opportunities for changes that support optimal utilization of the existing transmission assets or reinforcement of the transmission system.	T	Options have been identified and are being evaluated. Interconnection study agreement templates have been updated to allow BC Hydro to enforce the existing queue management practice.

An internal audit of BC Hydro's Customer Interconnections was completed in February 2021 and resulted in a "Green" rating (i.e., only minor issues and impacts identified). Key findings of the audit include established and effective governance, good understanding of roles and responsibilities by an experienced team, effective monitoring and control of key risks, and consistent and frequent updates to the customers. The audit also identified recommendations for improvement, which are being implemented as additional initiatives, as discussed below. The full audit report is included in Appendix A to this filing.

4 BC Hydro's Future Plan for Additional Performance Improvement Initiatives

In addition to the initiatives identified in the December 23, 2020 filing and updated above, BC Hydro has identified additional initiatives to address the interconnections audit recommendations, customer feedback and to support BC Hydro's Electrification Plan. Table 9 below summarizes the additional actions that BC Hydro is currently undertaking or planning as future initiatives.

Table 9 Current and Future Improvement Initiatives

Objectives and Key Action Items	Target Date (Quarter and Fiscal)
1. Improve our ability to connect our customers more quickly and cost effectively: – Build on previous "Work Smart" successes, streamline and scale aspects of Interconnection Process, including identifying additional activities that can be done in parallel versus in series; – Develop better alignment with electrification funding and Interconnection Process in collaboration with the Government of B.C.; – Create fit-for-purpose tools that better make use of our resources while addressing the specific needs of customers, rather than relying on standard comprehensive studies; and – Upfront engagement with customers to assist in optimal site selection and decision making. Build on our "brownfield" strategy efforts to facilitate requests from transportation and data centre sectors to locate in areas with minimal required work and existing BC Hydro infrastructure.	Q4 F2022
2. Improve our ability to support customers that are ready to connect: – Revise queue management practices to provide BC Hydro clear rights to remove customers from the queue when customers are not progressing through the Interconnection Process; – Develop and implement "pre-queue" process so that we can focus on requests that are real and truly "priority"; – Develop new queue management practices for unique situations such as North Montney Region Electrification; and – Cluster studies and/or open calls for capacity in areas of capacity constraint to fairly allocate capacity and facilitate the justification of larger capital infrastructure.	Q4 F2022

Objectives and Key Action Items	Target Date (Quarter and Fiscal)
3. Improve our ability to plan our work and increase performance accountability: – Develop workload demand forecasting process and resource modeling for interconnection studies; – Develop interconnection projects priority ranking criteria and processes; – Fill the key strategic roles identified in the Electrification Plan including filling internal positions and securing external resources; – Formalize escalation / governance processes at a "task" level to address issues such as priorities, resource allocation, and technical issue resolution; – Introduce leading metrics for System Impact Studies to provide better visibility on potential issues and delays; and – Improve metrics to be able to identify the source of delays between the customer and BC Hydro.	Q3 F2022
4. Develop a Resource Plan to identify resource requirements to prepare for an anticipated increase in the volume of requests due to BC Hydro's Electrification Plan.	Q2 F2022
5. Implement the Management Action Plans for the Recommendations identified in the interconnections audit report (Appendix A).	Q1 F2022 to F2023

For further information, please contact Joe Maloney at 604-623-4348 or by email at bchydroregulatorygroup@bchydro.com.

Yours sincerely,

Chris Sandve
Chief Regulatory Officer

st/rh

BC Hydro
Power smart

MANAGEMENT AUDIT REPORT

INTEGRATED PLANNING

CUSTOMER INTERCONNECTIONS

Q3 F2021

FEBRUARY 9, 2021

AU2105IP

Prepared By:

BC Hydro Staff:
P. Chang
A. D'Andrea
P. Howard
A. Lagnado

Distributed To:	**R. Hefflick**	**M. Daschuk**
	S. Jones	**A. Leonard**
	F. Lin	**J. Fraser**
	A. Darby	**C. Mitha**
	A. Kumar	**D. Wong**
	M. Wynne	**C. O'Riley**
	M. Holland	
	K. Anderson	

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CONTENTS

Legend:

Minor issues and impacts identified

Critical issues and impacts identified

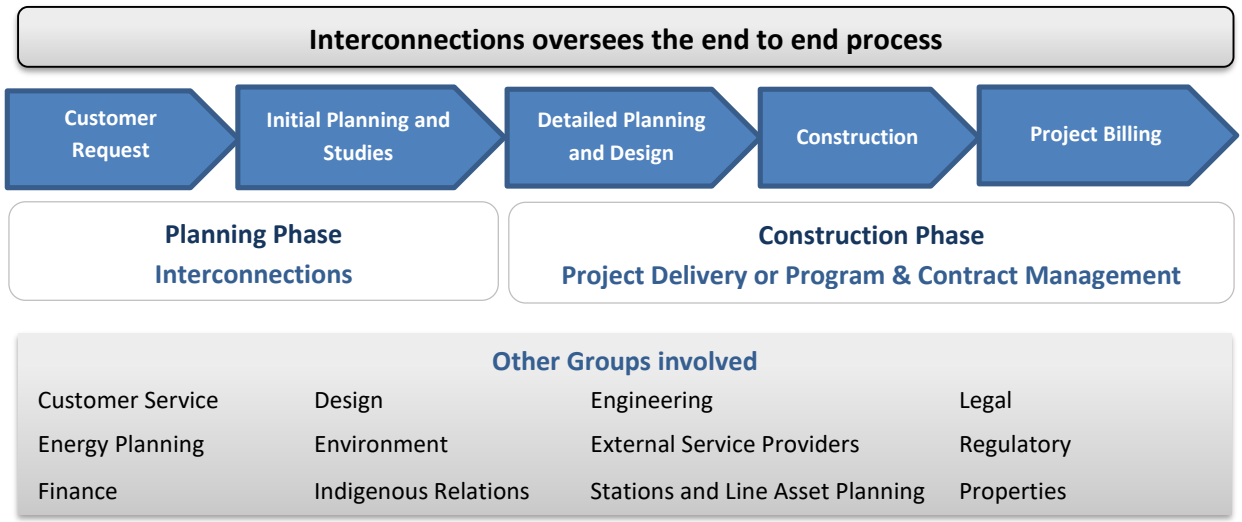
Customer Interconnections F2021

1a. Executive Summary

- For each audit, Audit Services provides two separate Audit Reports. The first report is a Summary Audit Report prepared for Senior Management and the Audit & Finance Committee (AFC) of the Board. The Management Audit Report provides additional information and related audit recommendations for management purposes and will not be presented to the AFC.
- Management should also refer to the Summary Audit Report for high level conclusions and findings.

1b. Background

- Interconnections group manages customer requests to connect to or supply power to BC Hydro's electric system. This group is part of the Integrated Planning function that balances customer needs while protecting the interest of ratepayers and meeting applicable tariffs and reliability standards.
- Interconnections works with the customer from the concept stage to project completion. This audit focused specifically on the Transmission and Major Distribution load projects.
  - Transmission Interconnection projects require BC Hydro to provide service greater than 35kV. Major Distribution Interconnection projects require service under 35kV.
  - Generator Interconnection projects were not included in the audit due to the decline in activity as a result of a change in Government policy on Independent Power Producers.
- Currently there are approximately 100 Major Distribution load projects representing $260M and 60 Transmission load projects representing $980M. Each type of project is governed by different tariff requirements, queue assignment and business practices.
  - Customers include mines, gas processing plants, LNG facilities, high density residential and commercial developers.
- While Interconnections is responsible for managing the overall process, reliance is placed on many other BC Hydro groups to complete each project. The process is illustrated below.



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- Interconnections initiate each project with a preliminary study to provide customers with a preliminary estimate of time to complete and cost. Depending on size, risk, complexity, and location, significant time may be required to determine the best approach for the project.
  - Once initial planning and studies are completed, detailed design and construction is assigned to either Project Delivery or Program & Contract Management.
  - Project Delivery is responsible for most Transmission and complex Major Distribution projects. Most Major Distribution projects are delivered by Program & Contract Management.

1c. Audit Objective and Scope

Objective

- The audit assessed the effectiveness of the Customer Interconnections processes to ensure projects comply with tariffs while maintaining customer relationships.

Scope

- This audit focused on assessing key business risks and controls for both Major Distribution and Transmission Load Interconnections processes from project initiation to completion.
  - Governance – Oversight, roles and accountabilities, risk assessment, policies and procedures
  - Program Execution – Requests, studies, construction, agreement signing, project billing, and account set up
  - Monitoring & Reporting – Customer communication, internal and external reports, metrics, and customer feedback
- Detailed testing of individual projects in the project design and delivery phases, and Distribution projects not involving Interconnections were excluded from the audit.
- This audit was conducted in conformance with the International Standards for the Professional Practice of Internal Auditing.

1d. Findings, Recommendations and Management Action Plans

Summary

There is an effective governance framework established to oversee the Major Distribution and Transmission Load Interconnections projects.

Processes are in place to ensure projects are successfully executed and comply with tariffs while maintaining customer relations. Individual projects are monitored throughout the processes and there is consistent communication with customers.

Project completion times are impacted by BC Hydro's stringent requirements and competing priorities. Continuous efforts are being made to streamline requirements and reduce timelines, but the overall process is still extensive. There is also a need for higher cost transparency, particularly for cost increases.

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Governance

Overall Conclusion

An effective governance framework is in place including Executive Steering Committee oversight of key industry projects. Roles and responsibilities are well understood by the process stakeholders. Policies and procedures are updated for internal users and guidance is provided to customers through the BC Hydro website. Key risks are defined and monitored at the program level and for individual projects.

Key Conclusions and Findings

Oversight

- **A Steering Committee and Working Group provide strong oversight to guide projects in the LNG, oil and gas, and mining sectors.** Key stakeholders are included in both the Steering Committee and Working Group.
  - The Steering Committee meets monthly to provide strategic direction and guidance on critical projects. Committee members include the Executive Team members and senior leaders from Integrated Planning, People, Customer & Corporate Affairs, and Capital Infrastructure Project Delivery (Project Delivery).
  - A Working Group meets bi-weekly to ensure activities are progressing as planned. The working groups include representatives from Asset Planning, Interconnections, Project Delivery, Indigenous Relations, Environment, Customer Service, Legal, and Finance.
- **The oversight structure is less formal for projects outside of the key sectors.** Interconnections initiate and oversee the progress of projects by working directly with key stakeholders.
  - Interconnections Managers are involved with assigned projects from initiation to completion and are the main customer contact. Any unresolved issues are escalated within Interconnections and other business areas as necessary.

Roles and Responsibilities

- **Roles and responsibilities are well understood by an experienced team.**
  - The Responsible, Accountable, Consulted, and Informed (RACI) documents the roles and responsibilities between Interconnections, Project Delivery, and Customer Service.
  - Updated flow charts are in place for the Major Distribution and Transmission load projects. The flow charts provide the level of detail required for employees closely involved with the process.
  - A high-level Rights and Obligations document is not yet complete to further clarify the rights during decision-making process for Interconnections projects.

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Policies and procedures

- **Policies and procedures are in place and provide direction and guidance for both internal stakeholders and customers**.
  - A Distribution Policy Team is responsible for developing clear policies, procedures and guidelines that align with the Electric Tariff. Management is considering a similar team to assist with the interpretation and development of Transmission Policies.
  - Internal policies, procedures and instructions provide clarity and direction on:
    - Review, approval and execution of commercial documents.
    - Queue Management for initiating transmission load system impact studies.
    - Interpretation of Tariff Supplement No. 6 for transmission projects including customer dispute resolution, customer construction and application of the revenue offset and security provisions.
    - Interpretation of the Electric Tariff distribution design including procedures when customers apply for electric service, agreements required and record retention.
  - The BC Hydro website provides customers with an overview of Interconnections processes including expected study duration range, responsibility for costs and links to applicable tariffs.

Risk Mitigation

- **Internal and external risks are identified and monitored for customer projects at all levels within BC Hydro**.
  - Interconnections' business plan objective and risk identification includes facilitating new connections loads to support BC Hydro and the Province's Clean BC and affordable electricity rates goals.
  - Recently developed risk registers are also in place for both Major Distribution and Transmission Interconnections load groups. The risk registers are comprehensive and reviewed quarterly by managers and team leads. The assignment of risk owners is still to be considered.
  - Identified program risks include:
    - Government and regulatory changes impacting project volumes and timelines.
    - Increases in work volume affecting Interconnections project duration and costs.
    - Projects prioritization influenced by government or strategic considerations.
    - Customer complaints escalated to BCUC or government about the cost loadings.
  - Risk registers are also maintained for the individual projects once the work has been assigned to either Project Delivery or Program & Contract Management project.

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	Recommendations	Management Action Plans
	Governance	
1	❑ Assign risk owners for identified risks for the Transmission and Major Distribution Interconnections load groups.	❑ Management agrees and is targeting completion by September 30, 2021.
2	❑ Document Rights and Obligations to clarify end to end framework for Interconnections projects.	❑ Management is targeting to have the recommendation completed by March 31, 2022. Management will use either the Rights and Obligations Framework or equivalent.

Program Execution

Overall Conclusion

Projects are successfully executed and controls are in place to comply with policies and tariff requirements. The handover of projects for delivery is clear between business groups, and communication with customers is consistent to keep them informed.

Project completion times can be adversely impacted by BC Hydro's stringent requirements and competing priorities. There is also a need for further transparency of project costs, particularly when there are significant increases.

Key Conclusions and Findings

Compliance

- **Major Distribution and Transmission load projects comply with specific tariffs, study requirements and project delivery procedures.** Specific requirements depend on the type of project and the group responsible for delivery.
  - From approximately 160 projects, a sample of 15 Major Distribution and 7 Transmission projects at different stages of development were selected for review. Key criteria were identified based on a review of the tariffs and procedure requirements with input from Interconnections Managers.
  - Testing identified overall compliance for both Major Distribution and Transmission projects. While management provided reasonable explanations to most exceptions for Transmission projects, additional rigor with the documentation will improve transparency.
    - Exceptions discussed with management included: justification not documented for customers entered in the queue before meeting requirements, inconsistent issuance of change orders, customer payments not always received within the required timeline, and delays in reconciling study costs.

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Customer feedback on projects tested

- **Audit Services interviewed 14 customers to understand their concerns with the processes and communication.**
  - Most customers surveyed felt BC Hydro is providing good service and regular updates. Positive comments received included:
    - Staff is helpful and responsive, information received from BC Hydro is consistent and BC Hydro is proactive in identifying issues early for resolution.
    - Customers recognize that BC Hydro is a subject matter expert. Smaller companies would appreciate further guidance and assistance from BC Hydro throughout the project lifecycle.
  - Customer concerns included cost transparency and the ability to meet timelines. Comments included:
    - Lack of detail and justification for large cost increases, processes not easy to understand, and processes too extensive and too costly for smaller projects.
    - Two customers were angry with in-service dates not being met due to the civil tendering process causing significant delays. Program & Contract Management is planning a process improvement review to address civil work including improvements in tendering.

To further understand the processes, the following areas were reviewed: Project Handover, Scalability of Processes, Customer Billing and Project Completion.

Project Handover

A key step in the process is the completion of the planning and handover to Program & Contract Management or Project Delivery.

- **The handover of Major Distribution load projects between Interconnections and Program & Contract Management is clear and efficient.**
  - Monthly meetings are held between the groups to facilitate the handover of projects. The early involvement of the Program & Management Contract group in the detailed design study, and participation in customer communication also enhance the handover.
  - To ensure that BC Hydro knowledge is utilized and standards are followed, all projects must involve either a BC Hydro Project Manager or Designer. If the Project Manager is an external resource, the design work must be completed by a BC Hydro resource.
  - Major handover improvements have recently been made and include implementation of:
    - An accelerated Expenditure Authorization Request which requires less upfront approvals to allow for quicker starts for Interconnections customer projects.
    - Project Tracking Spreadsheet to track key project information such as project phase, Managers assigned, study duration and in-service dates.

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- **The handover of Transmission projects is also clear between Interconnections and Project Delivery.**
  - Monthly meetings are held between Interconnections, Engineering, and Project Delivery to identify potential issues prior to handover and resource planning. Quarterly meetings are held between Integrated Planning, Engineering and Project Delivery to identify projects ready to handover in the next four quarters and resource planning.
  - Significant improvements have been made and management continues to streamline the handover process.
    - Interconnections completes a checklist to handover projects. While all information may not be initially complete, Interconnections is transparent about the documents still to be completed which assists Project Delivery in understanding the impact.
    - The 2016 WorkSmart initiative reduced the handover timeline. Management indicated average time has been reduced by 23% from 155 to 120 days.
  - A challenge arises when Project Delivery is given a dated System Impact Study. This compresses the Project Delivery timeline as additional time has to be spent updating the Study and customers may still hold BC Hydro accountable to the original timeline.

Scalability of Processes

- **BC Hydro's stringent requirements may not be perceived as adding value and represent a challenge for smaller and less complex projects.** Continuous efforts are being made to streamline requirements and reduce timelines but the overall process is still extensive.
  - All projects follow a similar linear path, involving many specialized areas, each with its processes and competing priorities. One group falling behind the schedule impacts the overall timeline. Customer projects constantly compete with internal projects and priorities.
  - The stringent requirements are necessary as projects become part of the infrastructure of the overall BC Hydro system and must meet BC Hydro standards.
  - Larger companies tend to have good understanding of project complexity and the time it takes to properly design and construct. Smaller companies are not as knowledgeable and may not understand the extent of due diligence required.
  - Through discussions with customers and industry feedback from the Revenue Requirement Application, time and costs associated with the rigorous process have long been an area of concern.
- **Program & Contract Management projects are generally less technically complex.** These projects involve fewer engineering disciplines and follow a "repeatable delivery" approach which is better able to accommodate tight timelines.
  - The delivery process requires less documents and approvals so there is higher flexibility to streamline according to project needs.

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- **Project Delivery manages unique projects, each with different challenges so the delivery process is not repeatable with less flexibility to accommodate customer timelines.**
  - Each project involves multiple engineering disciplines, designs and reviews. Other considerations such as Indigenous Relations and environmental concerns may require consultation and permitting processes that are outside of BC Hydro's control.
  - A rigorous delivery process is followed which involves checks and balances at different stages. While requirements are scalable to suit project needs, there is less flexibility to streamline with so many groups involved and the required minimal level of due diligence.
- **Management continues to identify opportunities to streamline Transmission project requirements. Recent improvements include:**
  - The 2019 WorkSmart initiative reduced the System Impact Study timeline for low complexity projects. Management reported a 50% reduction of study time in F2020.
  - Early Engineering Procurement Agreements are signed with customers whenever possible to procure equipment with long lead time in the study stage, so equipment is ready when projects move to implementation.
  - Most projects delivered by Project Delivery go through two approval gates instead of three to reduce the timeline.

Customer Billing

Customers are responsible for providing upfront payments to fund studies and certain project implementation costs according to stipulations in the applicable Tariff.

- **For Major Distribution projects there is limited visibility for the customer of the breakdown of the costs. A variance analysis is not performed to determine if there is a significant difference between estimated and actual costs.**
  - The Electric Tariff specifies Major Distribution projects are to be billed based on estimate. Estimates are prepared by the Designers utilizing the PassPort system to determine the average unit costs. The information is reviewed by Engineering, Design and Interconnections Managers for accuracy.
  - PassPort cannot provide detailed breakdown of project costs for the customer. Each project consists of multiple components and cost for each component is based on a provincial average.
  - At the completion of the project, total costs for BC Hydro are compared to the budget. However, management does not perform a variance analysis of the estimated cost billed to the customer versus actual costs.

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- **All Transmission customers are billed on actual costs. The process to determine customer costs is manual and reliance is placed on the Interconnections Managers to ensure accuracy.** With any manual process there is a high potential for errors resulting in customers being over or under charged.
  - Most Transmission projects are funded by customers and BC Hydro. Customers pay for the Basic Transmission Extension and provide security for System Reinforcement costs while BC Hydro pays for Revenue Metering. Definitions of costs are defined in Tariff Supplement No. 6.
  - In addition, external loading rates are applied to customer costs for BC Hydro to recover overhead not directly assigned to projects. Examples include training, IT, Finance, and Safety. External loading rates are determined by Finance, ranging from 10% to 73%.
  - BC Hydro's system is designed for internal projects so it does not track customer responsible costs or apply external loading rates. Interconnections review detailed cost reports to determine customer costs and the correct loading rates. This involves judgement and extensive manual review which is susceptible to errors.

Project Completion

- **Based on limited testing, customer accounts and meters are set up in a timely manner.** However, bills for two of four customers energized were not issued promptly.
  - A customer energized in December 2019 did not receive their first bill until July 2020. This resulted in back billing for seven months.
  - Another customer energized in May 2020 received their first bill in September 2020 for the month of August 2020. The Key Account Manager is investigating the delay.

	Recommendations	Management Action Plans
	Program Execution	
3	For Major Distribution projects: ❑ Ensure Program & Contract Management completes civil tendering process review and identify areas to shorten the timeline. ❑ Ensure variance analysis is performed on billing estimate to actual costs. ❑ Consider providing customers more cost details particularly on cost increases.	❑ Management agrees and will work with Program & Contract Management to complete the civil tendering process to identify areas of improvements, including both timelines and risk mitigations. Program & Contract Management is currently targeting initiation by June 2021. ❑ Management agrees and will commence performing estimate to actual comparisons for Major Distribution projects in April 2021. ❑ Management agrees however the ability to do so will depend on the system capability. An update on next steps will be provided by September 2021.

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	Recommendations	Management Action Plans
4	For Transmission projects: ❑ Continue to look for scaling opportunities in project delivery processes for smaller projects. ❑ Interconnections to work with Finance to generate automated invoices for customers. ❑ Finance to refresh the external loading rates and consider simplifying and reducing the number of external loading rates for better customer communication.	❑ Management agrees and will: ◆ Continue to develop joint initiatives with Project Delivery for the coming year and beyond. ◆ Finance has committed to completing the loading rates refresh by March 2021. ◆ Management will work with Finance and IT to provide a plan by September 2021 to implement this recommendation.

Monitoring & Reporting

Overall Conclusion

Monitoring and reporting is in place with opportunities to establish additional metrics to track progress of ongoing studies and identify the sources of project delays.

Communication with customers is consistent and surveys are issued to solicit feedback.

Key Conclusions and Findings

External Metrics and Communication with Customers

- **External metrics have been recently published in response to a commitment made in the F2020/2021 Revenue Requirement Application process.** Metrics for Major Distribution and Transmission projects are included.
  - Information provided is categorized by project size and the average time to complete studies and implementation. This may be helpful to establish expectations for potential customers.
- **Customers receive frequent updates through meetings and informal communication.** With the exception of a few large customers, standard practice does not involve issuing customer reports.
  - Customer meetings involve key team members from BC Hydro with the meeting minutes summarizing the discussion and action plans. The in-service date and any required changes are prominently identified.
  - Through discussion with some customers, most agree that updates from BC Hydro are frequent and adequate. However, communication on costs, particularly cost increases, can be an area of frustration for customers. Customers would like further details on cost increases.

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Internal Metrics and Reporting

- **Interconnections' metrics focus on completed studies rather than tracking progress of studies currently underway.**
  - Without tracking studies in progress, the opportunity to identify potential projects for escalation may be missed. This can be detrimental to smaller customers who are not overseen by the Steering Committee.
  - Current metrics measure the average days to complete studies, and are compared to targets set by Interconnections. Management agrees further metrics are needed to assess if BC Hydro meets timelines agreed with customers.
  - Establishing reliable metrics to differentiate delays caused by the customer or BC Hydro is challenging and it will take continuous refinement to achieve this goal.
  - Management established a new metric in 2019 to separately report smaller Transmission projects eligible for fast tracking. This is a good metric to differentiate smaller projects.
- **The process to calculate metrics is manual and prone to errors.** Reliance is on each Interconnections Manager to accurately input the information.
  - Issues noted include inconsistent understanding of start dates, completed studies not reported in the actual month of completion, and transposition errors.
- **Both Program & Contract Management and Project Delivery produce monthly reports to identify the status of ongoing projects at the portfolio and project level.** The reports provide a high-level understanding of project progress with colour codes to alert users when projects are assessed as red.
  - High level reports provide an overall heath indicator for each project, and the project cost at completion compared to the approved budget. Individual project level reports provide further information.
  - Currently, customer and internal projects are reported together. It is difficult to identify customer projects in the reports unless users are familiar with the project names.
  - Project Delivery added two new milestones for customer projects in May 2020: Ready for Customer to Connect and Customer Ready to Connect. These milestones will give a better indication of whether project delays are due to BC Hydro or the customer.

Customer Feedback & Lessons Learned

- **Customer feedback is requested through a survey at the completion of planning studies and after project implementation.** An improved automated online customer survey process was implemented in February 2020.
  - Prior to 2020, phone surveys were used however completion rate was quite low. For example, only three surveys were completed in 2017.
  - Six surveys have been received since February 2020. The majority of customers were either satisfied or very satisfied. One customer was dissatisfied due to major cost increase without detail provided and in-service date delays.
- **Lessons Learned are discussed by Interconnections as part of group meetings.** Completion reports are prepared for all projects which includes a lessons learned section.

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	Recommendations	Management Action Plans
	Monitoring and Reporting	
5	❑ Consider new metrics to further track: ◆ Progress of ongoing System Impact and Conceptual studies ◆ Measure against original timelines agreed with customers ◆ Define and measure source of delays between the customer and BC Hydro	❑ Management agrees in principle and will look for ways to provide additional metrics with higher level of granularity starting in F2023. Consideration will need to be given to the following: ◆ Availability of tools. ◆ Ability to objectively and practically attribute delays to different parties. ◆ Ease of implementation.