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September 29, 2022

File: N1L4-0150 & W2014L4-0001

David Dewar
Northwest Territories Power Corporation
4 Capital Drive,
Hay River, NT, X0E 1G2

Sent by email

Dear David Dewar,

Re: 2021 Annual Dam Inspection Report and Implementation Plan – Snare Hydroelectric Facility – Power – Snare River, NT

The Wek'èezhii Land and Water Board (Board) met on September 28, 2022 and considered the 2021 Annual Dam Inspection Report and Implementation Plan¹ submitted by the Northwest Territories Power Corporation (NTPC) on November 9, 2021, as required by Water Licences (Licences) N1L4-0150 and W2014L4-0001.^{2,3}

The Board has conducted a conformity check and determined that the submissions meet the requirements set out in the Licences. The Board acknowledges that NTPC plans to implement most recommendations provided in the 2021 Annual Dam Inspection Report and has ongoing activities to address the outstanding recommendations from the 2020 Annual Dam Inspection Report, 2011 DSR, and the 2018 DSR. The Board also understands that NTPC will not be pursuing activities related to recommendations #12 and #15 from the 2018 DSR and has provided direction in the attached Reasons for Decision.

Please direct questions or concerns regarding this letter to Ryan Fequet in writing.

¹ See WLWB Online Registry www.wlwb.ca/ for [N1L4-0150 - NTPC - 2021 Annual Dam Inspection Report - Nov 9 21](#).

² See WLWB Online Registry for [N1L4-0150 - NTPC - Water Licence - Rectification of Clerical Errors - Aug 30 22](#)

³ See WLWB Online Registry for [DPC - Water Licence - Rectification of Clerical Errors - Apr 20 15](#).

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Mason Mantla', written in a cursive style.

Mason Mantla
Chair, Wek'èezhii Land and Water Board

BCC'd to: Wek'èezhii Distribution List
 Patrick Smith, NTPC
 Meg McCluskie – Inspector, GNWT-ENR

Attached: Reasons for Decision



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Reasons for Decision

Licensees: Northwest Territories Power Corporation (NTPC) & Dogrib Power Corporation (DPC)	
Location: Snare Hydroelectric Facility	Files: N1L4-0150 & W2014L4-0001
Subject: 2021 Dam Inspection Report and Implementation Plan	

Decision from the Wek'èezhii Land and Water Board Meeting of September 28, 2022

1.0 Decision

On September 28, 2022, the Wek'èezhii Land and Water Board (WLWB or the Board) considered the Northwest Territories Power Corporation (NTPC) & Dogrib Power Corporation's (DPC) 2021 Dam Inspection Report and Implementation Plan¹ as well as outstanding Annual Dam Inspection and Dam Safety Review (DSR) recommendations. Dam Safety Review Inspection Reports and Implementation Plans are required by Licence N1L4-0150, Part C, Condition 13² and Licence W2014L4-0001, Part C, Conditions 6 and 7.³ In consideration of the submission and information provided by NTPC in response to Board staff questions,⁴ the Board has made the following decisions:

1. To require NTPC and DPC to assess the status of remaining 2011 and 2018 DSR recommendations in the upcoming 2023 Dam Safety Review;
2. To require NTPC and DPC to provide a letter from a professional engineer with supporting rationale for the proposed activities related to 2018 DSR recommendation Item #15 for the Cascades powerhouse; and
3. That NTPC and DPC review the Standard Water Licence Conditions and ongoing best practices related to Dams and OMS Manuals when preparing for the Water Licence renewal process.

¹ See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 - NTPC - 2021 Annual Dam Inspection Report - Nov 9 21](#).

² See WLWB Online Registry at [N1L4-0150 - NTPC - Water Licence - Rectification of Clerical Errors - Aug 30 22](#).

³ See WLWB Online Registry for [DPC - Water Licence - Rectification of Clerical Errors - Apr 20 15](#).

⁴ See WLWB Online Registry for [N1L4-0150 - NTPC - Annual Dam Inspection Report and DSR - Recommendation Follow up - Sept 9 22](#).

2.0 Background

The Snare Hydro System is located approximately 144 kilometers (km) northwest of Yellowknife on the Snare River. The system includes four separate hydroelectric plants: Snare Rapids, Snare Falls, Snare Cascades, and Snare Forks. These four plants utilize the difference in elevation (63.3 m) between Big Spruce Reservoir (above Snare Rapids) and Strutt Lake (below Snare Forks) for electric power production. The system also includes about 150 km of transmission lines owned and maintained by NTPC. The Snare Hydro System provides power to Yellowknife, Behchoko and Dettah. Currently, the Snare Hydro System supplies 60% of the capacity and 80% of the energy demand of the Yellowknife market.

Currently, NTPC holds a Type A water licence (N1L4-0150) for Snare Rapids, Snare Falls, and Snare Forks facilities, and the Dogrib Power Corporation (DPC) holds a separate Type A water licence (W2014L4-0001) for Snare Cascades. These licences authorize NTPC and DPC to store and divert water for hydroelectric power generation. Even though the Snare Cascade facility is owned by DPC, it is operated by NTPC to allow for efficient generation of hydroelectric power.

2.1 Review of NTPC's History of DSR Recommendation Implementation

NTPC's three previous DSRs for the Snare Hydro System were completed in June 2018,⁵ December 2011,⁶ December 2006,⁷ and October 2000. The most recent 2018 DSR did not identify any significant deficiencies in the system. The structures are in satisfactory condition with minor repairs recommended. The 2018 DSR included 13 recommendations, each was given a priority code (very high, high, medium, and low); however, no deadlines were provided with these recommendations.

2.2 2021 Dam Inspection Report

On November 9, 2021, NTPC submitted the 2021 Dam Inspection Report⁸ and an implementation plan for the recommendations from the professional engineer. The Dam Inspection Report included 20 recommendations and the Board reviewed the implementation plan to determine whether NTPC has adequately addressed recommendations made by the professional engineer. In addition, the Board reviewed the following documents to identify any outstanding recommendations:

- 2018 Dam Safety Review⁹
- 2018 Dam Inspection Report¹⁰

⁵ See WLWB Online Registry for [N1L4-0150 - NTPC - 2018 Dam Safety Review Part 1 - Jun 14 19.pdf](#); [N1L4-0150 - NTPC - 2018 Dam Safety Review Part 2 - Jun 14 19.pdf](#); [N1L4-0150 - NTPC - 2019 Dam Safety Review - Implementation Plan - May 21 19.pdf](#)

⁶ See WLWB Online Registry for [N1L4-0150 – NTPC – Dam Safety Review – Snare Hydro System – December 2011](#).

⁷ See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 – NTPC – Comprehensive Dam Safety Review – Snare Hydro System – December 2006](#).

⁸ See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 - NTPC - 2021 Annual Dam Inspection Report - Nov 9 21.pdf](#).

⁹ See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 - NTPC - 2018 Dam Safety Review Part 1 - Jun 14 19.pdf](#); [N1L4-0150 - NTPC - 2018 Dam Safety Review Part 2 - Jun 14 19.pdf](#).

¹⁰ See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 - NTPC - 2018 Annual Dam Inspection Report - Snare Hydro - Dec 11 18.pdf](#)

- 2019 Dam Inspection Report¹¹
- 2020 Annual Water Licence Report¹²
- 2021 Annual Water Licence Report¹³

3.0 Reasons for Decision

The 2021 Dam Inspection Report indicated that the Snare Rapids, Snare Cascades, Snare Forks, and Snare Falls developments appear structurally sound and are in satisfactory condition so long as on-going maintenance occurs. Visual inspections indicated that there is no imminent risk of failure.

In previous Dam Safety Reviews, the Snare Forks Dykes have been noted to be more susceptible to settlement (downward movement of a structure or its foundation) as these structures have been built on permafrost affected foundations. The 2021 Dam Inspection Report noted that special attention is required at the Snare Forks Dykes due to its foundations and on-going site summer traffic. The Board reviewed NTPC and DPC's 2021 Implementation Plan and identified that NTPC has monthly and annual monitoring programs in place for the Snare Forks Dykes and that these structures are currently at or slightly above the elevations required by design documents.¹⁴

While reviewing the 2021 Dam Inspection Report, the Board identified outstanding recommendations from the 2020 Dam Inspection Report as well as the 2011 and 2018 Dam Safety Reviews. Board staff contacted NTPC on August 24, 2022 to follow up on the status of these recommendations and NTPC responded on September 9, 2022.¹⁵ In their response, NTPC clarified that some recommendation-related activities were either completed or on-going and that the Dam Inspection Report for 2022 should provide further updates. The outstanding recommendations and NTPC's responses are described in the sections below.

2.1 Outstanding Dam Safety Inspection Report Recommendations

The Board identified a number of Inspection Report recommendations that were either outstanding, on-going, or would be completed in 2022. Upon review of the 2021 Annual Water Licence Report, the status of 2020 Dam Inspection Report recommendation #16 could not be found. The 2021 Dam Inspection Report also repeated three recommendations (#16, #19, and #25) from the 2020 Inspection Report (item #16, #20, and #27). Recommendation #16 of the 2021 Dam Inspection Report was marked as high-priority and recommended that an irregularity in readings at the Dyke 1 weir at Snare Forks be investigated, corrected, and a more permanent set-up for the weir be established for long term monitoring.

¹¹ See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 - NTPC - 2019 Annual Dam Inspection Report - Jan 28 21.pdf](#)

¹² See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 - NTPC - 2020 Annual Water Licence Report - May 31 21.pdf](#)

¹³ See WLWB Online Registry at www.wlwb.ca for [N1L4-0150 - NTPC - 2021 Annual Water License Report - Apr 22 22.pdf](#)

¹⁴ See WLWB Online Registry for [N1L4-0150 - NTPC - Annual Dam Inspection Report and DSR - Recommendation Follow up – Sept 9 22](#). See pg. 9/13, 2020 Annual Water License Report, number 1.

¹⁵ See WLWB Online Registry for [N1L4-0150 - NTPC - Annual Dam Inspection Report and DSR - Recommendation Follow up - Sept 9 22](#).

Board staff contacted NTPC on August 24, 2022 for additional information on the status of outstanding Dam Inspection Report recommendations, and 2021 Dam Inspection Report recommendations #16, #19, and #25. NTPC’s September 9, 2022 responses clarified that several activities related to Dam Inspection Report recommendations had been completed and that activities for remaining recommendations were on-going. NTPC also clarified that actions were being taken to monitor the Dyke 1 weir mentioned in the 2021 Dam Inspection Report recommendation #16 and that a trail camera has been set up to monitor water level over the weir. Activities related to 2021 Dam Inspection Report recommendations #19 and #25 are also on-going or planned. A summary of the outstanding Dam Inspection Report recommendations that have yet to be completed and their status are listed in the Table below.

Year	Item	Recommendation	NTPC Response (Sept 9, 2022)
2020	#5	Snare Rapids Dam - To plot the seepage reading vs. reservoir elevation for Snare Rapids in 2021.	These graphs are an ongoing activity for areas of known, measurable seepage at NTPC dams. These graphs have not been shared with the Board.
2020, 2021	#20, #19	Snare Forks, Dyke 2 - Record leakage readings when the forebay level is above Spillway Crest at the road culvert downstream of Dyke 3 simultaneously with recording the forebay water level.	On-going, plans to install and attach a steel plate weir to this culvert are in place for next spring/summer.
2020, 2021	#16	Snare Forks, Dyke 1 - The irregularity in readings at the Dyke 1 Weir be investigated /corrected and a more permanent set-up for the weir be established for long term monitoring.	On-going, a trail camera has been set up to monitor water level over the weir.
2020, 2021	#27, #25	Snare Forks Spillway - Repair concrete along the sill where reinforcing steel is exposed.	Incomplete, materials are on site and project will be pursued when the opportunity arises. NTPC notes that this work is not a major concern.
2021	#12	Snare Rapids, 5B - Repair the weir below the Dyke to stop flow from bypassing underneath the weir and resume readings. When taking readings, record time, date and reservoir level.	NTPC plans to fix the weir approach in summer 2023.

As NTPC has planned or is undertaking on-going activities to address outstanding recommendations from the 2020 and 2021 Dam Inspection Reports, the Board has no direction at this time and will review the 2022 Annual Water Licence Report for updates to ensure these recommendations continue to be addressed.

3.2 Outstanding Dam Safety Review (2011 & 2018) Recommendations

The Board identified a number of 2011 and 2018 DSR recommendations that were outstanding. In addition, upon review of the 2021 Annual Water Licence Report, the status of several outstanding recommendations could not be found (e.g., 2011 DSR recommendation Item # 18, 2018 DSR recommendation Item #15 and #16). The 2021 Dam Inspection Report also repeated three recommendations from the 2018 DSR (Items #14, #15, and #16). 2018 DSR recommendation Items #14 and #16 were identified as high priority in the 2021 Dam Inspection Report and NTPC did not address 2018 DSR recommendation Item #15 in the 2021 Implementation Plan. Recommendation Item #14 recommended that the central core wall in the rockfill Dyke at Snare Cascades be raised from 184.5 to 185 m, recommendation Item #15 recommended an evaluation of the stoplogs at the Snare Cascades powerhouse, and recommendation Item #16 recommended the spillway at the Snare Cascades be inspected in the absence of flow and that repairs may be required.

Board staff contacted NTPC on August 24, 2022 for additional information on the status of outstanding recommendations and the recommendations (i.e., #14, #15, and #16) that were repeated in the 2018 DSR. NTPC's September 9, 2022 responses clarified that several activities related to 2011 and 2018 DSR recommendations, including 2018 DSR recommendation Item #16, were completed. Details on on-going or outstanding recommendations are summarized in the Table below.

Year	Item	Recommendation	NTPC Response (Sept 9, 2022)
2011	#18	To raise elevation of the Snare Cascade canal dyke by 0.5m with concrete.	In-progress, work should be completed either before winter 2022 or by spring 2023. NTPC will provide an update with the annual water licence report.
2018	# 2	To review crest elevations against freeboard requirements and top up as necessary	Crest elevations are surveyed every 3 years for all dams at Snare, they are surveyed every year for Forks Dykes 1,2,3. The most recent surveys were completed this summer. The majority of dams have limited history of settlement but would be topped up if any significant settlement were occurring. The Forks dykes settle due to their foundations, but are currently at or a bit above design elevation from work on the crest a few years ago.
2018	# 9-12	Complete a hydrology/ flood routing review for the Snare Hydro Facility in 2020.	On-going over fall and/or winter 2022. NTPC will provide an update in the annual water license report.
2018	# 12	The 2011 Meco DSR noted stability and erosion	Further investigations not recommended at this time due to good performance, though

		concerns and recommended that site investigations be conducted at all sites to better define these conditions.	investigations into materials may be conducted if NTPC were ever doing any significant repairs at a dam. Forks dykes underwent a drilling program in 2013 to assess permafrost/soil conditions of foundation.
2018	# 13	Review seepage weir functionality and monitoring requirements and consider installing additional seepage weirs to monitor and quantify areas of known seepage.	Seepage monitoring has seen improvements – a Seepage Monitoring program document has been created which provides a list of seepage locations, monitoring methods in place (weir, measuring cup/stopwatch, visual, etc.), and frequency. 5B is being brushed this summer which should allow us to fix the approach to the weir next summer and set up better monitoring. NTPC is collecting seepage vs reservoir water level data for locations below Dyke 1, Dyke 2/3, Rapids powerhouse weir, Rapids tailrace outlet, Taltson West & East Gorges.
2018, 2021	# 14	Raise the central core wall in the rockfill Dyke at Snare Cascades from 184.5 to 185 m to avoid overtopping in the event of the design flood.	In-progress, NTPC is prioritizing completion of this activity as this has been a recommendation for some time.
2018, 2021	# 15	Evaluate stoplogs at the Cascades powerhouse in 2022 to prevent flooding of the Powerhouse during flood periods.	This is not a priority for NTPC. There are already guides stoplogs that can be placed against in event of extreme flooding and a berm constructed above the garage door access. Future improvements are being considered, including a change to the overall design.

NTPC clarified that activities related to 2018 DSR recommendation Item #14 are in progress and that activities related to recommendation Item #15 are not being pursued, and stated that a change in design for the Cascades powerhouse was being considered. NTPC also stated that further investigations into stability and erosion conditions under recommendation Item #12 would not be pursued due to good facility performance.

Given that two of the 2018 DSR recommendations (Items #14, #15) were reiterated in the 2021 Dam Inspection Report, Item #14's high priority rating, and the ongoing or incomplete nature of the remaining DSR recommendations, it is unclear to the Board whether NTPC and DPC's proposed activities are adequate at this time to address the recommendations of the various third-party professional engineers.

The Board believes that the status of outstanding 2011 and 2018 DSR recommendations should be re-evaluated in the upcoming 2023 DSR in accordance with Section 5.5 of the CDA guidelines. This Section states that a Dam Safety Review Report is to include information on gaps in past documentation. Therefore, if a previous Dam Safety Review identified recommendations, the new Dam Safety Review would require an evaluation of their status.

- ***Decision #1: NTPC and DPC are to assess the status of the remaining 2011 and 2018 DSR recommendations in the upcoming 2023 Dam Safety Review.***

In addition, despite being restated in the 2021 Dam Inspection Report, 2018 DSR recommendation Item #15 was not addressed in NTPC and DPC's 2021 Implementation Plan and supporting rationale was not provided until Board staff contacted NTPC on September 9th, 2022. As this item has been a recommendation since 2018, the Board believes that NTPC and DPC must provide a letter with rationale from a professional engineer to support NTPC and DPC's proposed activity, and similarly for any future instance where NTPC and/or DPC proposes to decline a recommendation resulting from a DSR or Dam Inspection Report.

- ***Decision #2: NTPC and DPC are to provide a letter from a professional engineer with supporting rationale for proposed activities related to 2018 DSR recommendation Item #15 for the Cascades powerhouse.***

3.3 Water Licence Renewal

The NTPC and DPC Licences will expire on May 29, 2024, and Board staff and NTPC have begun preparing for the Type A Water Licence renewal process. The NTPC Licence was issued on September 30, 1986 and Standard Licence Conditions have been changed considerably since this time. Standard Conditions related to dams¹⁶ (e.g., Operation and Maintenance (OMS) Manuals) that are not included in NTPC's current Licence should be included in the renewal application so they can be discussed and considered during the renewal proceeding.

- ***Decision #3: NTPC and DPC are to review the Standard Water Licence Conditions and ongoing best practices related to Dams and OMS Manuals when preparing for the Water Licence renewal.***

Signed the 28th day of September 2022, on behalf of the Wek'èezhìi Land and Water Board



Mason Mantla
Chair, Wek'èezhìi Land and Water Board



Witness

¹⁶ See WLWB Online Registry for [LWB Standard Water Licence Conditions and Schedules - Version 2.0 - Feb 1 22.pdf](#)