Note: NGB-055

Dear Sir,

I have the honour to refer to the on-going negotiations between our Governments in relation to the modernization of the *Treaty between Canada and the United States of America relating to the Cooperative Development of the Water Resources of the Columbia River Basin* ("Treaty"). On July 8, 2024, our Governments reached an agreement in principle regarding the modernization of the Treaty. The agreement in principle refers to a milestone in the Treaty modernization negotiations. The summary document produced in the context of those negotiations reflects the mutual understandings of our Governments on core issues and is the basis on which we are drafting text to amend the Treaty with a view to developing a "Modernized Treaty". Amendments to the Treaty would be subject to domestic processes, on which our Governments are working as a matter of priority to complete, for approval and entry into force.

In the meantime, the Entities designated under Article XIV of the Treaty have developed an assured plan of operation for the operating year 2024-25 (AOP25). AOP25 reflects the C2 Prime AOP studies referred to by the Entities in recent correspondence with the Permanent Engineering Board. AOP25 is attached to the *Columbia River Treaty Entity Agreement Regarding an Assured Plan of Operation for 2024-25* ("AOP25 Entity Agreement").

The executed AOP25 Entity Agreement is enclosed with this note and, per its terms, becomes effective upon an exchange of notes between our Governments pursuant to Article XIV(4) of the Treaty.

The Government of Canada observes that the AOP25 Entity Agreement provides that "[t]he Entities will agree to assured plans of operation for each operating year subsequent to operating year 2024-25, but if by 2400 hours on January 31 of any year the Entities have not agreed in writing to the assured

Mr. Brian A. Nichols
Assistant Secretary of State for Western Hemisphere Affairs
Department of State
United States of America

plan of operation in relation to the operating year that starts on the following August 1, the assured plan of operation for that operating year will be the then-applicable assured plan of operation".

The Entities have also determined the downstream power benefits in the United States of America to which Canada would be entitled in the period before the Modernized Treaty enters into force; these are the same as the Canadian Entitlement agreed in principle during negotiations and enclosed with this note. These downstream power benefits are set out in a report entitled *Interim Period Determination of Downstream Power Benefits*. In turn, that report is attached to the *Columbia River Treaty Entity Agreement Regarding the Interim Period Determination of Downstream Power Benefits* ("DDPB Entity Agreement").

The executed DDPB Entity Agreement is attached to this note and, per its terms, becomes effective upon an exchange of notes between our Governments pursuant to Article XIV(4) of the Treaty.

The Government of Canada recognizes that the scope of the Treaty, which remains in force, includes "*cooperative measures for hydroelectric power generation and flood control*" and so encompasses both the DDPB Entity Agreement and the AOP25 Entity Agreement.

This note, together with your reply, constitutes the exchange of notes contemplated by Article XIV(4) for the purposes of empowering and charging the Entities to enter into the AOP25 Entity Agreement and the DDPB Entity Agreement, including any subsequent entity agreements in relation to assured plans of operation for operating years subsequent to operating year 2024-25, as contemplated by the AOP25 Entity Agreement.

The Government of Canada is also of the view that AOP25 departs substantially from the immediately preceding assured plan of operation. Thus, under Article IV(1) of the Treaty, it must be confirmed by an exchange of notes between the Government of Canada and the Government of the United States of America in order to be effective. I am pleased to provide, via this note, the Government of Canada's confirmation of AOP25 which, with your confirming response, will constitute the confirmation by exchange of notes required under Article IV(1) and make AOP25 effective.

The Government of Canada understands that the Entities are taking the actions set out in this note as a prudent step to enable continued coordinated operation of storage projects on the Columbia River pending the entry into force of the Modernized Treaty, notwithstanding the disagreements between them on the development of assured operating plans and the determination of downstream power benefits. The Government of Canada emphasizes its understanding that the empowerment, charge and confirmation provided through this exchange of notes does not waive any options that may be available to either Party to resolve any difference arising under the Treaty, as provided in its Article XVI, and is without prejudice to the rights and obligations of the Parties under the Treaty.

The Government of Canada will provide a French version of this note, equally valid, within 60 days of the date of this note.

Please accept, Sir, the renewed assurances of my highest consideration.

Mr. Glen Linder
Assistant Deputy Minister, Americas
Department of Foreign Affairs, Trade and Development
Government of Canada

Enclosures:

1. *Columbia River Treaty Entity Agreement Regarding an Assured Plan of Operation for 2024-25*
2. *Columbia River Treaty Entity Agreement Regarding the Interim Period Determination of Downstream Power Benefits*
3. *Chart showing Canadian Entitlement amounts for Operating Years 2025 through 2044 (subject to reduction from Specific Operation implementation)*

OTTAWA, September 18, 2024

COLUMBIA RIVER TREATY
ENTITY AGREEMENT REGARDING
AN ASSURED OPERATING PLAN FOR 2024-2025

The Columbia River Treaty between Canada and the United States of America (**Treaty**) requires that the Entities prepare annually an assured plan of operation for Canadian Treaty storage.

On July 8, 2024, Canada and the United States of America reached an agreement in principle regarding the modernization of the Treaty**.** The agreement in principle is a milestone in the Treaty modernization process produced in the context of negotiations and is the basis on which the countries are drafting text to amend the Treaty with a view to developing a "Modernized Treaty". Amendments to the Treaty would be subject to domestic processes, on which the Governments are working as a matter of priority to complete, for approval and entry into force.

The following definitions are adopted for the purpose of this agreement:

- *"Interim Period" means the period from and including August 1, 2024, to the first July 31 following the entry into force of the Modernized Treaty."*

- *"Modernized Treaty" means the Treaty relating to the Cooperative Development of the Water Resources of the Columbia River Basin (including its Annexes A and B, and the Protocol), as amended by the Parties in accordance with this AIP."*

The Entities agree that:

- The assured plan of operation for the 2024-25 operating year is the attached report, the *2024-25 Assured Operating Plan* (**AOP25**). For greater certainty, AOP25 is based on the "C2 Prime AOP" studies referred to in recent correspondence with the Permanent Engineering Board.
- The Entities will agree to assured plans of operation for each operating year subsequent to operating year 2024-25, but if by 2400 hours on January 31 of any year the Entities have not agreed in writing to the assured plan of operation in relation to the operating year that starts on the following August 1, the assured plan of operation for that operating year will be the then-applicable assured plan of operation.
- For greater certainty, the Entities may agree to change an assured plan of operation from one operating year to the next to incorporate modified flows; to incorporate upper rule curves associated with pre-planned flood risk management as contemplated by the agreement in principle; or as otherwise agreed by the Entities.
- This agreement will come into force on the same date that the countries empower and charge the Entities to enter into it through an exchange of notes under Article XIV(4) of the Treaty.

The Entities understand that the exchange of notes referred to above will also confirm and make effective AOP25, and will not waive any options that may be available to either country to resolve any difference arising under the Treaty as provided for in its Article XVI, and is without prejudice to the rights and obligations of the countries under the Treaty. Similarly, this entity agreement, including the attachment, does not waive any options that may be available to the Entities to resolve differences between them arising under the Treaty, and is without prejudice to the rights and obligations of the Entities under the Treaty.

IN WITNESS WHEREOF the United States Entity and the Canadian Entity have caused this agreement to be executed.

Executed for the United States Entity:

Signed by:
By: John Hairston Date: 9/17/2024
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John Hairston, Chair
Administrator and Chief Executive Officer
Bonneville Power Administration

HANNAN.WILLIAM.CARL.JR.10801366 Digitally signed by HANNAN.WILLIAM.CARL.JR.1080136699 Date: 2024.09.16 15:41:39 -07'00'
By: 99 Date: 9/16/24

William C. Hannan, Jr., Member
Brigadier General
Commander, Northwestern Division
U.S. Army Corps of Engineers

Executed for the Canadian Entity:

DocuSigned by:
By: Chris O'Riley Date: 9/13/2024
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Chris O'Riley, Chair
President and Chief Executive Officer
British Columbia Hydro and Power Authority

Attachment: *2024-25 Assured Operating Plan*

COLUMBIA RIVER TREATY

2024-25
Assured Operating Plan

The Canadian and U.S. Entities

September 2024

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Table of Contents, *continued*

COLUMBIA RIVER TREATY
HYDROELECTRIC OPERATING PLAN 2024-25
ASSURED OPERATING PLAN

1. Introduction

The “Treaty between Canada and the United States of America relating to the cooperative development of the water resources of the Columbia River Basin” (Treaty), dated 17 January 1961, requires that each year the Entities designated by the two governments will formulate and carry out operating arrangements necessary to implement the Treaty and will agree on an assured operating plan (AOP) for the storage provided by Canada under Article II of the Treaty (Canadian Treaty Storage) and resulting downstream power benefits for the sixth succeeding operating year.

This AOP for 2024 -25 provides the Entities with an operating plan for Canadian Treaty Storage and information for planning the power systems that are dependent on or coordinated with the operation of the Canadian Treaty Storage projects. It is subject to an exchange of notes between Canada and the United States of America under Article XIV(4) of the Treaty that empowers and charges the Entities to agree to it.

Article IV(2) of the Treaty providing for pre-planned and “on call” flood control, and the associated “Columbia River Treaty Flood Control Operating Plan” dated May 2003 (FCOP), will expire on September 16, 2024. Article IV(3) comes into effect on the same date, providing that, "For the purpose of flood control after… [September 16, 2024], and for so long as flows in the Columbia River in Canada continue to contribute to potential flood hazard in the United States of America, Canada shall, when called upon by an entity designated by the United States of America for that purpose, operate within the limits of existing facilities any storage in the Columbia River basin in Canada as the entity requires to meet flood control needs for the duration of the flood control period for which the call is made”.

The Glossary of Terms attached to this AOP as Appendix D sets out the meaning of terms used in this document.

2. Development of the Assured Operating Plan

(a) Basis for Preparation

The entities are empowered and charged by an exchange of notes between Canada and the United States of America, under Article XIV(4) of the Treaty and dated September 2024, to enter into this AOP.

(b) Specific Procedures

(i) Streamline Procedures

This AOP incorporates the first of the three streamline procedures defined in Appendix 6 of the “Principles and Procedures” (“POP”). This streamline procedure includes “Forecasting Loads and Resources” for determining the thermal installations, as described in Subsection 7(d). Section 7 of this AOP also describes how other procedures defined in the POP are incorporated in this AOP.

(ii) Capacity Critical Procedures and Assumptions

This AOP incorporates the same capacity critical procedures that were used in the AOPs used for the operating years 2019-20 through 2023-24 (AOP20-24) to address similar circumstances, on a without prejudice basis.

(iii) Incorporation of Libby operation

The Libby operation in this AOP is based on Libby's planned operations per the CRSO EIS Record of Decision (September 2020), with some modifications in the final water year of the Critical Period that affect the long-term study. For further description, see Section 7(g).

(c) System Regulation Studies

Consistent with the Protocol, paragraph VII(2), this AOP provides a reservoir-balance relationship for each month for the whole of the Canadian Treaty Storage. This relationship is determined from the following:

- Assured flood control for Canadian Treaty Storage projects under Article IV(2)(a) of the Treaty expires on September 15, 2024. However, since there are no assured flood control requirements for the period August 1, 2024 to September 15, 2024, the URCs for Canadian Treaty Storage have been set to full pool for the entire period of the AOP25 studies;

- The Critical Rule Curves (CRCs), Upper Rule Curves (URCs), and the related rule curves and data for each project used to compute the individual project Operating Rule Curves (ORCs);

- Mica Project Operating Criteria, Arrow Project Operating Criteria and minimum flows for operation of the Canadian Treaty Storage, all developed in accordance with the principles contained in the Protocol, paragraph VII(2); and

- The supporting data and model used to simulate the 30-year operation for the Step I Joint Optimum system regulation study (Joint Optimum Study)[1].

This AOP was prepared consistent with Annex A, paragraph 7, of the Treaty, which requires Canadian Treaty Storage operation for joint optimum power generation in both Canada and the U.S.

This AOP is based on operating year 2024-25 estimated loads and resources in the Pacific Northwest Area (PNWA) from the Bonneville Power Administration's (BPA) October 2020 White Book (WB19)[2], including estimated flows of power from and to adjacent areas and hydro resources in the Columbia River Basin in British Columbia.

Consistent with the Protocol, paragraph VIII, this AOP is based on a 30-year stream flow period and an operating year of 1 August through 31 July. The AOP25 studies used historical flows for the period August 1928 through July 1958, modified by

[1] "BPA Hydroelectric Power Planning Program, Assured Operating Plan 30-year System Regulation Study 25-41," dated 14 March 2024.
[2] 2019 Pacific Northwest Loads & Resources Study.

estimated irrigation depletions for the 2010 level[3] and including updated estimates of Grand Coulee net pumping requirements.

The CRCs were determined from critical period studies of optimum power generation in both Canada and the U.S. The Step I study indicated a 42 calendar-month critical period for the U.S. Step I system resulting from the low flows during the period from 1 September 1928 through 29 February 1932. With the exception of Dworshak and Libby, it was assumed that all reservoirs, both in the U.S. and Canada, were full at the beginning of the critical period except where minimum release requirements made this impossible.

(d) Determination of Optimum Generation in Canada and the U.S.

To determine whether optimum power generation in both Canada and the U.S. was achieved in the system regulation studies, the annual firm energy capability, dependable peaking capability, and average annual usable secondary energy were computed for both the Canadian and U.S. Step I systems. The Canadian Treaty Storage operation in the Joint Optimum Study was designed to achieve a weighted sum of these three quantities that was greater than the weighted sum achieved in the U.S. Optimum Study.

To measure optimum power generation, the quantities were assigned the following relative values:

Quantity	Relative Value
Annual firm energy capability (average megawatts, aMW)	3
Dependable peaking capability (megawatts, MW)	1
Average annual usable secondary energy (aMW)	2

The sum of the three weighted quantities showed a net gain in the Joint Optimum Study compared to the U.S. Optimum Study. This result is in accordance with Section 3.2.A of the POP. The results of these calculations are shown in Table 2.

3. Rule Curves

The operation of Canadian Treaty Storage will be guided by the ORCs and CRCs for the whole of Canadian Treaty Storage and project operating criteria for Mica and Arrow. The ORCs and CRCs were first determined for the individual Canadian Treaty Storage projects and then summed to yield the Composite ORC for the whole of Canadian Treaty Storage, consistent with paragraph VII (2) of the Protocol. The ORCs are derived from the various curves described below.

(a) Critical Rule Curves

The CRC is defined by the end-of-period storage content of Canadian Treaty Storage during the critical period. It is used to determine proportional draft below the ORCs as defined in Section 4(b). Generally, CRCs are adjusted for crossovers by the hydro regulation model as defined in Section 2.3.A of the POP. CRC crossovers occur when the second, third, or fourth year CRCs are higher than any of the lower

[3] BPA (2011). 2010 Level Modified Streamflow, 1928- 2008. DOE/BP-4352. Portland, Oregon.

numbered CRCs, and past practice was for the hydro regulation model to lower the storage amounts in the higher numbered CRCs at all projects as needed to eliminate the crossover. For the Canadian Treaty Storage projects, this adjustment is applied only if the sum of Mica + Arrow + Duncan Treaty storage has a Composite CRC crossover. The adjustment is made to Arrow first unless or until Arrow is empty, then the adjustment is made to Duncan. The CRCs for Duncan, Arrow, Mica, and the Composite CRCs for the whole of Canadian Treaty Storage are tabulated in Table 3.

(b) Refill Curves

There are two types of refill curves, Assured Refill Curves (ARCs) and Variable Refill Curves (VRCs), which are discussed in the following sections.

Tabulations of the ARCs and VRCs, and supporting data used in determining the ARCs and VRCs for Mica, Arrow, and Duncan are provided in Tables 4, 5, and 6, respectively.

(i) Assured Refill Curves

The ARCs indicate the minimum August through June end-of-period storage contents required to meet firm load and refill the coordinated system storage by 31 July, based on the 1930-31 inflows. The upstream storage refill requirements and the Power Discharge Requirements (PDRs) are determined in accordance with Section 2.3.B and Appendix 1 of the POP. The 1930-31 inflows are the second lowest January through July unregulated streamflows at The Dalles, Oregon, during the 30-year (1928-58) stream flow period, which has approximately a 95% probability of exceedance.

(ii) Variable Refill Curves

The VRCs indicate the minimum January through June end-of-period storage contents required to refill the coordinated system storage by 31 July based on the 95% confidence forecasted inflow volume. The upstream storage refill requirements and PDRs are determined in accordance with Section 2.3.B and Appendix 1 of the POP. In the system regulation studies, historical volume inflows, adjusted for the 95% confidence forecast error, were used instead of forecast inflows. The PDRs are a function of the unregulated January through July runoff volume at The Dalles, Oregon. In those years when the January through July runoff volume at The Dalles is between 80 million acre-feet (Maf) and 110 Maf, the PDRs are interpolated linearly between the values shown in Tables 4-6. In those years when the January through July runoff volume at The Dalles is less than 80 Maf, or greater than 110 Maf, the PDR values for 80 Maf and 110 Maf, respectively, are used. For this AOP, as since AOP12, the VRC Lower Limit (VRCLL) was applied as a fixed rule curve for Grand Coulee only.

Tables 4-6 illustrate the range of VRCs for Mica, Arrow, and Duncan for the 30-year stream flow period. In actual operation, the PDRs and VRCLLs will be based on the forecast of unregulated runoff at The Dalles.

(c) Operating Rule Curve Lower Limits (ORCLLs)

The ORCLLs indicate the minimum 31 January through 15 April end-of-period storage contents that must be maintained to protect the ability of the system to meet

firm load during the period 1 January through 30 April. The ORCLLs protect the system's ability to meet firm load in the event that the VRCs permit storage to be emptied and sufficient natural flow is not available to carry the load prior to the start of the freshet. Such rule curves shall limit the ORC to be no lower than the ORCLLs. The ORCLLs are developed for 1936-37 water conditions which include the lowest January through April unregulated streamflows at The Dalles during the 30-year stream flow period. The ORCLLs for Mica, Arrow, and Duncan are shown in Tables 4, 5, and 6, respectively.

(d) Upper Rule Curves

A notable change from previous AOPs is that this AOP does not include pre-planned FRM space reserved at the Treaty projects in Canada. To account for this, the Upper Rule Curves (URCs) were set to full for the Treaty projects in Canada. While the volume of usable storage committed for power operation purposes under the Treaty is 15.5 Maf, the U.S. Entity can call upon the Canadian Entity to provide up to the total 20.5 Maf of storage in Canada for FRM purposes in certain circumstances under Article IV(3). Showing Canadian project URCs as full in the system regulation studies for this AOP does not prevent the U.S. Entity from calling upon Canada in accordance with Article IV(3) if needed.

(e) Operating Rule Curves

The ORCs define the normal limit of storage draft to produce secondary energy and provide a high probability of refilling the reservoirs. In general, AOPs do not permit serving secondary loads at the risk of failing to refill storage and thereby jeopardizing the firm load carrying capability of the Step I U.S. system during subsequent years.

During the period 1 August through 31 December, the ORC is defined as the CRC for the first year of the critical period (CRC1) or the ARC, whichever is higher. During the period 1 January through 31 July, the ORC is defined as the higher of the CRC1 and the ARC, unless the VRC (limited by the VRCLL) is lower, then the VRC defines the ORC. During the period 1 January through 15 April, the ORC will not be lower than the ORCLL. The ORC shall be less than or equal to the URC at each individual project in all periods. The Composite ORCs for the whole of Canadian Treaty Storage for the 30-year stream flow period are included in Table 10 to illustrate the probable future range of these curves based on historical water conditions.

4. Operating Rules

The system regulation storage operation results for the whole of Canadian Treaty Storage for the 30-year stream flow period are shown in Table 11. The studies contain the ORCs and CRCs, and operating procedures and constraints, such as maximum and minimum project elevations, discharges, and draft rates. These constraints are included as part of this operating plan and are listed in Appendix A.

The following rules and other operating criteria will apply to the operation of Canadian Treaty Storage.

(a) Operation at or above ORC

The whole of Canadian Treaty Storage will be drafted to its ORC subject to project physical characteristics and operating constraints.

(b) Operation below ORC

The whole of Canadian Treaty Storage will be drafted below its ORC to the extent that a system regulation study determines that proportional draft below the ORC is required to produce the hydro firm energy load carrying capability (FELCC) of the Step I U.S. system.

FELCC is determined by the applicable critical period regulation study. Proportional draft between rule curves will be determined as described in Section 2.4.C of the POP.

(c) Canadian Treaty Storage Project Operating Criteria

Mica and Arrow reservoirs will be operated in accordance with project operating criteria listed in Tables 1 and Table 1.1.

(i) Mica Project Operating Criteria

In general, the Mica operation in each period is either a target flow or target content, as listed in Table 1 and determined by Arrow's storage content at the end of the previous period. In the event that Mica's operation to the Table 1 operating criteria results in more or less than the project's share of draft from the whole of Canadian Treaty Storage as described in Sections 4(a) or 4(b) above, compensating changes will be made from Arrow to the extent possible.

Mica storage releases in excess of 7.0 Maf that are required to maintain the Mica outflows specified under this plan will be retained in the Arrow reservoir, subject to project operating criteria at Arrow. The total combined storage draft from Mica and Arrow will not exceed 14.1 Maf, unless minimum flow or maximum storage criteria will not permit the excess Mica storage releases to be retained at Arrow. Based on this AOP, the probability of a combined Mica + Arrow storage release in excess of 14.1 Maf occurring has been judged to be negligible; however, in actual operations, should Treaty specified constraints require combined Mica + Arrow storage draft in excess of 14.1 Maf, such releases may occur for the sole purpose of this AOP. If such a release should occur, the target Mica operation will remain as specified in Table 1, and the excess release will be returned as soon as the operating criteria permit.

(ii) Arrow Project Operating Criteria (APOC)

In general, Arrow reservoir will be operated to provide the balance of the required Canadian Treaty Storage as described in Sections 4(a) or 4(b) above, subject to physical and operating constraints. These constraints include, but are not limited to, rate-of-draft and minimum flows limits, and the APOC.

The APOC is shown in Table 1.1a (i) and Table 1.1a (ii) and consists of maximum storage limits, minimum storage limits, maximum outflow limits and minimum outflow limits at Arrow. The maximum storage limits apply from August to September and February to July, while the minimum outflow limits apply in all periods. The maximum storage and the February to June portions of the minimum outflow limits depend on the total unregulated runoff volume/forecast for Arrow. For August to September, the April through July observed runoff volume from the prior operating year is used. In February and

March, the January through July volume forecast at Arrow is used and in April to July, the April through July volume forecast at Arrow is used. The minimum storage and maximum outflow limits apply under all water conditions. In no circumstance shall the minimum outflow be reduced below the Treaty specified minimum of 5,000 cfs.

The maximum storage limits, minimum storage limits, maximum outflow limits and minimum outflow limits for the 30-year historical streamflow record used in the AOP25 Step I study are shown in Table 1.1(b) and Table 1.1(c).

(d) Other Canadian Project Operation

Revelstoke, Upper Bonnington, Lower Bonnington, South Slocan, Brilliant, Seven Mile, and Waneta are included in this AOP as run-of-river projects. Generation at Arrow is modeled in the studies. Corra Linn and Kootenay Canal are included and operated in accordance with criteria utilized in prior AOPs.

5. Canadian Entitlement

The amount of Canadian Entitlement is defined in the document “Interim Period Determination of Downstream Power Benefits.”

The Treaty specifies return of the Canadian Entitlement at a point near Oliver, British Columbia, unless otherwise agreed by the Entities. Because no cross-border transmission exists near Oliver, the Entities completed an agreement on Aspects of the Delivery of the Canadian Entitlement for 1 April 1998 through 15 September 2024, dated 29 March 1994 (Aspects Agreement). The Aspects of Delivery agreement expires on September 15, 2024, and the Entities expect to replace the Aspects Agreement, with a similar agreement that is consistent with the AIP.

6. Preparation of Detailed Operating Plan

The Entities are able to prepare and implement Detailed Operating Plans (DOP) pursuant to Article XIV(2)(k) of the Treaty to produce results more advantageous than those that would arise from the implementation of AOPs. The entities expect to continue that practice while this AOP is in effect.

In particular, subject to an exchange of notes under Article XIV(4) of the Treaty, the entities expect that they will be able to incorporate into one or more DOPs, as required, the operation of the 3.6 MAF of pre-planned flood risk management storage consistent with the operations and corresponding payment obligation in the agreement in principle negotiated between the Treaty parties.

7. Summary of Changes Compared to the 2023-24 AOP and Notable Assumptions

Data from the recent AOPs are compared and summarized in Table 12. The following explanations of important changes and notable assumptions are relative to the 2023-24 AOP.

(a) Pacific Northwest Area (PNWA) Firm Load

Loads for the AOP25 studies are based on BPA’s WB19 expected load forecast for operating year 2024-25. The WB19 forecast for the 2024-25 regional firm load is 23,720 annual aMW, which is 169 aMW lower than AOP24. There were minor changes to the Idaho portion of the Rocky Mountain Power (formerly known as Utah

Power and Light) load, and to the Coulee pumping requirements leading to a decrease in the net PNWA firm load by 88 annual aMW from AOP24 to that in the AOP25 Studies.

The average critical period load factor decreased from 76.68% in AOP24 to 75.67% in the AOP25 Studies. This was mainly due to changes in the energy and peak load forecast.

(b) Flows of Power at Points of Interconnection

The Step I system load includes the net effect of flows of power at points of interconnection which are all imports and exports, except those classified as thermal installations, plant sales, and flow-through-transfers.

(c) Non-Step I Hydro and Other Non-Thermal Resources

The Step I system load is reduced by hydro-independent generation, non-Step I coordinated hydro, and miscellaneous non-thermal resources. For this AOP, these resources, which include firm wind, increased by 19 annual aMW from AOP24, primarily due to an increase in renewables.

(d) Thermal Installations

Because of increasing difficulty in forecasting Thermal Installations, the streamline procedure “Forecasting Loads and Resources” as described in the POP was used for determining Thermal Installations, as has been used since AOP07. The procedure includes the Columbia Generating Station (CGS) plus one generic thermal installation. In this AOP, an average of the two-year (2024-25 and 2025-26) maintenance cycle at CGS was used, which resulted in an increase of 77 annual aMW of energy and an increase of 39 MW in peaking capability compared to AOP24.

For this AOP, the shape of the generic thermal installation was determined from the shape of the committed WB19 large thermal, co- generation, and combustion turbines without CGS and independent power producers.

In this AOP, the Step I system when balanced on energy resulted in a January 1932 peak deficit of 2,197 MW. The generic thermal installation was increased to bring the Step I system into peak load/resource balance with a resulting annual average firm energy surplus of 1,888 aMW.

(e) Hydro Project Modified Streamflows

As in AOP20-24, the unregulated base streamflows used in the system regulation studies were based on the 2010 Modified Streamflows published by BPA in August 2011. Modified Streamflows are determined from historic observed streamflows, adjusted to remove the historic storage regulation effect at modeled upstream projects, and modified to a common level of irrigation depletions (2010 level) and reservoir evaporation. Additionally, the flows were further adjusted to include net Grand Coulee pumping updates from the PNCA 1 February 2021 data submittal.

(f) Hydro Project Rule Curves

Step I hydro regulation studies were performed in the AOP25 studies per the POP. Changes and notable assumptions from AOP24 include:

- In September 2024, Article IV(2) of the Treaty providing for assured and "on call" flood control, including the obligation to operate Canadian Treaty storage as described in that Article for the purpose of flood control in accordance with the applicable provisions of Annex A of the Treaty and flood control operating plans made thereunder, will expire. Accordingly, the URCs for the Canadian Treaty projects were set to full.

- The URC FRM data for the US system was developed by the U.S. Army Corps of Engineers using the 2010 Modified Streamflows with no Canadian storage allocation and US projects consistent with the Environmental Impact Statement for the Columbia River System (Libby October 2020 SRD, Grand Coulee October 2020 SRD, Hungry Horse variable FRM, 1998 Brownlee procedures, and no Dworshak/Brownlee shift). Studies assumed Libby Dam and Duncan Dam operations are not constrained by the IJC rule curve on Kootenay Lake;

- Monthly distribution factors based on the 2010 Modified Flows were updated as reflected in the January 2018 update to Appendix 8 of the POP;

- Hedges (also called forecast errors) were used as reflected in the January 2018 update to Appendix 8 of the POP;

- The use of a fixed VRCLL at Grand Coulee only, equal to the ORCLL for January and February, and based on historic minimum elevations for firm power operation for March to June, including 1225.0 feet for March to April, 1240.0 feet for May, and 1285.0 feet for June;

- For the AOP25 critical period study, the March ARC content for Grand Coulee is set to 2343.1 ksfd, as has been done since AOP16. This is based on the average of the AOP12, 14 and 15 ARCs from the ARC optimization study, and is limited by flood risk management constraints at Grand Coulee.

- To save time, Composite Canadian crossovers were not adjusted in the U.S. Optimum study; and

- The refill study was performed for each step of the AOP25 studies. Power discharge requirements (PDRs) were developed by the Corps of Engineers using the Corps' HYSSR model for each cyclic reservoir contained in the study, starting with minimum flows and increasing PDRs for individual projects as needed to pass the refill test. For more information on refill, see section 3(b).

(g) Libby Treatment and Hydroregulation Modeling

For this AOP, Libby is operated to the Columbia River System Operation EIS Record of Decision (September 2020) and October 2020 SRD. This operation was pre-determined from a RiverWare modeling run performed by the USACE using the 2010 Modified Flows and input as target operations in the Step I study, including the first three years of the critical period. In the fourth year of the critical period, Libby was coordinated with the rest of the Step I system to determine the CRC4. In the long-term regulation, Libby was operated to the target operation unless the system draft

point exceeded four (4), when Libby proportionally drafted along with the rest of the system to meet load.

A new HYDSIM build was adopted for the long-term study that had several Libby-specific switches to:

- enable Libby to follow the target operations while the system draft point was at or below four (4), and to override the target operation in order to proportionally draft with the rest of the system when the system draft point exceeded four (4), and

- limit Libby's outflows to full powerhouse capacity from December through April, so the required draft to meet the URC is constrained to the max turbine capacity to reflect operational constraints.

(h) Other Hydro Project Operating Procedures, Constraints, and Plant Data

For this AOP, the hydro project operating procedures, constraints and plant data were updated from the PNCA 1 February 2016 through 2023 data submittals in accordance with POP procedures, except as noted below.

The nonpower requirements for Base System projects are as described in the 29 August 1996 Entity Agreement. These requirements are essentially the nonpower requirements included in the 1979-80 and prior AOP/DDPB studies and therefore may not reflect current or actual operating requirements. Nonpower constraints for non-Base System projects are updated as outlined in this AOP document. A detailed list of the additions and changes to hydro project operating procedures, constraints, and plant data from AOP24 is set out in Appendix B. Some notable assumptions for the AOP25 studies include:

- Brownlee no longer has an at-site minimum flow requirement but is required to support a year-round flow of 6500 cfs at Hells Canyon for navigation purposes, based on the 1988 Agreement between the U.S. Army Corps of Engineers and Idaho Power Company as well as the proposed license modeling criteria of the Hells Canyon FERC license application. In addition, the Brownlee operation was refined in Step I to not start the critical period full and carry over the AOP 20-24 fall shaping;

- Dworshak is operated to a minimum flow or FRM criteria October through May, and a target operation June through September, to obtain uniform outflows July through August;

- Hungry Horse's modelling of the transmission constraint with Libby in Step I was updated to remove the 9,500 cfs maximum flow limit and to update the head vs maximum generation table to more consistently model the 310 MW generation limit during all periods;

- Little Goose, Lower Monumental and Lower Granite (non-base system projects) operations were modified to implement Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) requirements, and includes changes to minimum operating pool, minimum turbine flows and spill;

- The 30-year storage operation at Mossyrock, Cushman #1, Alder, Swift #1, Merwin, Yale, and Timothy was set to a fixed operation (first coded) from AOP06 because they are no longer coordinated resources in PNCA Planning. Although included in the Step I hydro regulation model, these projects are now essentially the same as a hydro-independent project; and

- The Willamette hydro-independent projects (Detroit, Lookout Point, Green Peter, Cougar, Foster, Dexter, Big Cliff, and Hills Creek) were updated with generation data submitted by USACE in March 2023 to reflect Willamette Valley System Environmental Impact Statement injunction operations.

Table 1
Mica Project Operating Criteria
2024-25 Assured Operating Plan

Period	End of Previous Month Arrow Storage Content (ksfd)	Target Operation Month Average Outflow (cfs)	Target Operation Month End Storage Content (ksfd)[1]	Target Operation Minimum Target Treaty Storage Content (ksfd)[2]	Target Operation Maximum Outflow (cfs)	Target Operation Minimum Outflow (cfs)
August 1-15	3520 to Full	n/a	3454.1	n/a	54000	15000
August 1-15	3020 to 3520	24000	n/a	0	n/a	15000
August 1-15	2440 to 3020	28000	n/a	0	n/a	15000
August 1-15	0 to 2440	42000	n/a	0	n/a	15000
August 16-31	3570 to Full	n/a	3529.2	n/a	54000	15000
August 16-31	3290 to 3570	n/a	3454.1	n/a	54000	15000
August 16-31	2540 to 3290	38000	n/a	0	n/a	15000
August 16-31	0 to 2540	40000	n/a	0	n/a	15000
September	3570 to Full	n/a	3529.2	*n/a*	54000	10000
September	3170 to 3570	n/a	3404.1	*n/a*	54000	10000
September	2600 to 3170	22000	n/a	0	n/a	10000
September	0 to 2600	40000	n/a	0	n/a	10000
October	3500 to Full	n/a	3404.1	n/a	54000	10000
October	3200 to 3500	15000	n/a	0	n/a	10000
October	2870 to 3200	25000	n/a	0	n/a	10000
October	0 to 2870	34000	n/a	0	n/a	10000
November	3560 to Full	16000	n/a	304.1	n/a	12000
November	2700 to 3560	24000	n/a	304.1	n/a	12000
November	2300 to 2700	27000	n/a	304.1	n/a	12000
November	0 to 2300	35000	n/a	304.1	n/a	12000
December	3320 to Full	19000	n/a	204.1	n/a	18000
December	3210 to 3320	28000	n/a	204.1	n/a	18000
December	2780 to 3210	32000	n/a	204.1	n/a	18000
December	0 to 2780	36000	n/a	204.1	n/a	18000
January	3340 to Full	25000	n/a	204.1	n/a	15000
January	2250 to 3340	40000	n/a	204.1	n/a	15000
January	1960 to 2250	34000	n/a	204.1	n/a	15000
January	0 to 1960	40000	n/a	204.1	n/a	15000
February	1680 to Full	36000	n/a	0	n/a	15000
February	1290 to 1680	27000	n/a	0	n/a	15000
February	0 to 1290	20000	n/a	0	n/a	15000
March	500 to Full	15000	n/a	0	n/a	15000

[1] For end-of-month storage content target operation, a maximum outflow of 54000 cfs will apply if the Target End-of-Period Storage Content is less than 3529.2 ksfd. The maximum outflow limit may be exceeded to avoid storage above 3529.2 ksfd.
[2] For month average outflow target operation, Mica outflows will be reduced to the lesser of the target outflow and the minimum outflow to maintain the reservoir above the Minimum Treaty Storage Content. This will override any flow target.

Table 1
Mica Project Operating Criteria, End-of-period maximum storage limit (ksfd) *(continued)*

Period	End of Previous Month Arrow Storage Content (ksfd)	Target Operation Month Average Outflow (cfs)	Target Operation Month End Storage Content (ksfd)[1]	Target Operation Minimum Target Treaty Storage Content (ksfd)[2]	Target Operation Maximum Outflow (cfs)	Target Operation Minimum Outflow (cfs)
March	0 to 500	20000	n/a	0	n/a	15000
April 1-15	1240 to Full	10000	n/a	0	n/a	10000
April 1-15	530 to 1240	12000	n/a	0	n/a	10000
April 1-15	0 to 530	20000	n/a	0	n/a	10000
April 16-30	630 to Full	10000	n/a	0	n/a	10000
April 16-30	500 to 630	12000	n/a	0	n/a	10000
April 16-30	0 to 500	15000	n/a	0	n/a	10000
May	1310 to Full	4000	n/a	0	n/a	4000
May	1100 to 1310	8000	n/a	0	n/a	4000
May	480 to 1100	6000	n/a	0	n/a	4000
May	0 to 480	4000	n/a	0	n/a	4000
June	2340 to Full	4000	n/a	0	n/a	4000
June	1490 to 2340	6000	n/a	0	n/a	4000
June	1280 to 1490	4000	n/a	0	n/a	4000
June	0 to 1280	12000	n/a	0	n/a	4000
July	2700 to Full	n/a	3404.1	n/a	54000	10000
July	2560 to 2700	16000	n/a	0	n/a	10000
July	1830 to 2560	28000	n/a	0	n/a	10000
July	0 to 1830	36000	n/a	0	n/a	10000

Table 1.1a (i)
Arrow Project Operating Criteria: Definition for Storage
2024-25 Assured Operating Plan

Period	Volume Runoff Period[1]	Arrow Total Volume Runoff (Maf)	Maximum Storage Limit (ksfd)[2]	Minimum Storage Limit (ksfd)[3]
August 1-15	Apr-Jul	≤ 18	Full	1813.5
August 1-15	Apr-Jul	> 18 to < 21	Full to 3300	1813.5
August 1-15	Apr-Jul	≥ 21	3300	1813.5
August 16-31	Apr-Jul	≤ 18	Full	1813.5
August 16-31	Apr-Jul	> 18 to < 21	Full to 3300	1813.5
August 16-31	Apr-Jul	≥ 21	3300	1813.5
September	Apr-Jul	≤ 18	Full	1538.4
September	Apr-Jul	> 18 to < 21	Full to 3300	1538.4
September	Apr-Jul	≥ 21	3300	1538.4
October	none	n/a	Full	1272.1
November	none	n/a	Full	1116.5
December	none	n/a	Full	1012.8
January	none	n/a	Full	765.2
February	Jan-Jul	≤ 16	3000	391.8
February	Jan-Jul	> 16 to < 18	3000 to 1500	391.8
February	Jan-Jul	≥ 18	1500	391.8
March	Jan-Jul	≤ 16	3000	391.8
March	Jan-Jul	> 16 to < 18	3000 to 1500	391.8
March	Jan-Jul	≥ 18	1500	391.8
April 1-15	Apr-Jul	≤ 18	3000	391.8
April 1-15	Apr-Jul	> 18 to < 21	3000 to 1400	391.8
April 1-15	Apr-Jul	≥ 21	1400	391.8
April 16-30	Apr-Jul	≤ 18	3000	391.8
April 16-30	Apr-Jul	> 18 to < 21	3000 to 1400	391.8
April 16-30	Apr-Jul	≥ 21	1400	391.8
May	Apr-Jul	≤ 18	3000	1272.1
May	Apr-Jul	> 18 to < 21	3000 to 2100	1272.1
May	Apr-Jul	≥ 21	2100	1272.1
June	Apr-Jul	≤ 18	Full	1813.5
June	Apr-Jul	> 18 to < 21	Full to 3300	1813.5
June	Apr-Jul	≥ 21	3300	1813.5
July	Apr-Jul	≤ 18	Full	1984.0
July	Apr-Jul	> 18 to < 21	Full to 3300	1984.0

[1] The periods from August to September will use the Apr-Jul volume from the prior operating year. The periods starting February will use the volume forecast for the current operating year.
[2] Interpolate when there are two values. For example, if February's Jan-Jul volume runoff is between 16 Maf and 18 Maf, then Maximum Storage Limit is interpolated between 3000 ksfd and 1500 ksfd.
[3] The Minimum Storage Limit is an operating limit and takes precedence over the Minimum Average Monthly Outflow Limit, except May and Jun, when the Minimum Average Monthly Outflow Limit takes precedence over the Minimum Storage Limit.

Period	Volume Runoff Period[1]	Arrow Total Volume Runoff (Maf)	Maximum Storage Limit (ksfd)[2]	Minimum Storage Limit (ksfd)[3]
July	Apr-Jul	≥ 21	3300	1984.0

Table 1.1a (ii)
Arrow Project Operating Criteria: Definition for Flows
2024-25 Assured Operating Plan

Period	Volume Runoff Period	Arrow Total Volume Runoff (Maf)	Minimum Outflow Limit (cfs) [1, 2]	Maximum Outflow Limit (cfs)[3]
August 1- December 31	none	n/a	10000	none
January	none	n/a	10000	70000
February	Jan-Jul	≤ 16	10000	60000
February	Jan-Jul	> 16 to < 18	10000 to 20000	60000
February	Jan-Jul	≥ 18	20000	60000
March	Jan-Jul	≤ 16	10000	none
March	Jan-Jul	> 16 to < 18	10000 to 20000	none
March	Jan-Jul	≥ 18	20000	none
April 1-15	Apr-Jul	≤ 16	10000	none
April 1-15	Apr-Jul	> 16 to < 18	10000 to 15000	none
April 1-15	Apr-Jul	≥ 18	15000	none
April 16-30	Apr-Jul	≤ 16	10000	none
April 16-30	Apr-Jul	> 16 to < 18	10000 to 15000	none
April 16-30	Apr-Jul	≥ 18	15000	none
May	Apr-Jul	≤ 16	5000	none
May	Apr-Jul	> 16 to < 18	5000 to 10000	none
May	Apr-Jul	≥ 18	10000	none
June	Apr-Jul	≤ 16	5000	none
June	Apr-Jul	> 16 to < 18	5000 to 10000	none
June	Apr-Jul	≥ 18	10000	none
July	none	n/a	10000	none

[1] Interpolate when there are two values. For example, if February's Jan-Jul volume runoff is between 16 Maf and 18 Maf, then the Minimum Average Monthly Outflow Limit is interpolated between 10,000 cfs and 20,000 cfs.
[2] The Minimum Average Monthly Outflow Limit is an operating limit and may be reduced to as low as 5,000 cfs (Treaty minimum) to avoid drafting Mica+Arrow storage beyond 14.1 Maf. The Minimum Average Monthly Outflow Limit takes precedence over the Minimum Storage Limit in May and June, but the Minimum Storage Limit takes precedence over the Minimum Average Monthly Outflow Limit in other periods.
[3] The Maximum Average Monthly Outflow Limit takes precedence over the Maximum Storage Limit. However, the Average Monthly Outflow Limit may be exceeded to avoid storage above full.

Table 1.1b
Arrow Project Operating Criteria: 30-Year Operating Data (Storage)

End-of-period maximum storage limit (ksfd)
2024-25 Assured Operating Plan

Years	Aug 15 - Sep	Oct - Jan	Feb	Mar	Apr 15	Apr 30	May	Jun - Jul
1928-29	none	n/a	2781.7	2781.7	3000.0	3000.0	3000.0	3579.6
1929-30	3579.6	n/a	1500.0	1500.0	2850.4	2850.4	2915.8	3553.4
1930-31	3553.4	n/a	"	"	3000.0	3000.0	3000.0	3579.6
1931-32	3579.6	n/a	"	"	1400.0	1400.0	2100.0	3300.0
1932-33	3300.0	n/a	"	"	1608.4	1608.4	2217.2	3336.4
1933-34	3336.4	n/a	"	"	1400.0	1400.0	2100.0	3300.0
1934-35	3300.0	n/a	"	"	2403.5	2403.5	2664.5	3475.4
1935-36	3475.4	n/a	"	"	1906.5	1906.5	2384.9	3388.5
1936-37	3388.5	n/a	3000.0	3000.0	3000.0	3000.0	3000.0	3579.6
1937-38	3579.6	n/a	1500.0	1500.0	2644.9	2644.9	2800.2	3517.5
1938-39	3517.5	n/a	"	"	3000.0	3000.0	3000.0	3579.6
1939-40	3579.6	n/a	"	"	2752.6	2752.6	2860.8	3536.4
1940-41	3536.4	n/a	1949.6	1949.6	3000.0	3000.0	3000.0	3579.6
1941-42	3579.6	n/a	1905.7	1905.7	"	"	"	"
1942-43	"	n/a	2609.8	2609.8	"	"	"	"
1943-44	"	n/a	3000.0	3000.0	"	"	"	"
1944-45	"	n/a	"	"	"	"	"	"
1945-46	"	n/a	1500.0	1500.0	1400.0	1400.0	2100.0	3300.0
1946-47	3300.0	n/a	"	"	1938.0	1938.0	2402.6	3394.0
1947-48	3394.0	n/a	"	"	1608.4	1608.4	2217.2	3336.4
1948-49	3336.4	n/a	2112.7	2112.7	3000.0	3000.0	3000.0	3579.6
1949-50	3579.6	n/a	1500.0	1500.0	1887.2	1887.2	2374.0	3385.1
1950-51	3385.1	n/a	"	"	2338.2	2338.2	2627.8	3464.0
1951-52	3464.0	n/a	"	"	2657.9	2657.9	2807.6	3519.8
1952-53	3519.8	n/a	"	"	3000.0	3000.0	3000.0	3579.6
1953-54	3579.6	n/a	"	"	1400.0	1400.0	2100.0	3300.0
1954-55	3300.0	n/a	"	"	2485.2	2485.2	2710.4	3489.6
1955-56	3489.6	n/a	"	"	1565.0	1565.0	2192.8	3328.8
1956-57	3328.8	n/a	"	"	1802.5	1802.5	2326.4	3370.3
1957-58	3370.3	n/a	"	"	1586.9	1586.9	2205.1	3332.7

Table 1.1c
Arrow Project Operating Criteria: 30-Year Operating Data (Outflow)
Period Average Outflow limits (cfs)
2024-25 Assured Operating Plan

Maximum Outflow Limits

	Aug 15 - Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
All years	n/a	70000	60000	n/a	n/a	n/a	n/a	n/a	n/a

Minimum Outflow Limits

	Aug 15 - Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
1928-29	10000	10000	11455	11455	10000	10000	5000	5000	10000
1929-30	''	''	20000	20000	15000	15000	10000	10000	''
1930-31	''	''	''	''	13742	13742	8742	8742	''
1931-32	''	''	''	''	15000	15000	10000	10000	''
1932-33	''	''	''	''	''	''	''	''	''
1933-34	''	''	''	''	''	''	''	''	''
1934-35	''	''	''	''	''	''	''	''	''
1935-36	''	''	''	''	''	''	''	''	''
1936-37	''	''	10000	10000	10000	10000	5000	5000	''
1937-38	''	''	20000	20000	15000	15000	10000	10000	''
1938-39	''	''	''	''	14823	14823	9823	9823	''
1939-40	''	''	''	''	15000	15000	10000	10000	''
1940-41	''	''	17002	17002	10000	10000	5000	5000	''
1941-42	''	''	17296	17296	10391	10391	5391	5391	''
1942-43	''	''	12601	12601	10000	10000	5000	5000	''
1943-44	''	''	10000	10000	''	''	''	''	''
1944-45	''	''	''	''	''	''	''	''	''
1945-46	''	''	20000	20000	15000	15000	10000	10000	''
1946-47	''	''	''	''	''	''	''	''	''
1947-48	''	''	''	''	''	''	''	''	''
1948-49	''	''	15915	15915	10000	10000	5000	5000	''
1949-50	''	''	20000	20000	15000	15000	10000	10000	''
1950-51	''	''	''	''	''	''	''	''	''
1951-52	''	''	''	''	''	''	''	''	''
1952-53	''	''	''	''	12995	12995	7995	7995	''
1953-54	''	''	''	''	15000	15000	10000	10000	''
1954-55	''	''	''	''	''	''	''	''	''
1955-56	''	''	''	''	''	''	''	''	''
1956-57	''	''	''	''	''	''	''	''	''
1957-58	''	''	''	''	''	''	''	''	''

Table 2
Comparison of Assured Operating Plan Study Results
2024-25 Assured Operating Plan

Study 25-41 Provides Optimum Generation in Canada and in the United States
Study 25-11 provides Optimum Generation in the United States only.

Firm Energy Capability (aMW)

	Study No. 25-41	Study No. 25-11	Net Gain
US System[1]	11653.1	11619.6	33.5
Canada[2], [3]	3093.9	3047.2	46.7
Total Firm Energy Capability	14747.0	14666.8	80.2

Dependable Peaking Capacity

	Study No. 25-41	Study No. 25-11	Net Gain
US System[4]	30082.6	30204.0	-121.3
Canada[5]	7729.9	7739.0	-9.0
Total Dependable Peaking Capacity	37812.5	37943.0	-130.4

Average Annual Usable Secondary Energy (aMW)

	Study No. 25-41	Study No. 25-11	Net Gain
US System[6]	3310.9	3324.1	-13.3
Canada[7]	309.6	343.8	-34.2
Total Average Annual Usable Secondary Energy	3620.5	3668.1	-47.5

Weight and Net Change in Value

	Net Gain	Weight	Value
Net Gain in Firm Energy Capability (aMW)	80.2	3	240.7
Net Gain in Dependable Peaking Capacity (MW)	-130.4	1	-130.4
Net Gain in Average Annual Usable Secondary Energy (aMW)	-47.5	2	-95.0
Net Change in Value			15.3

[1] US System firm energy capability was determined over the US system critical period beginning September 1, 1928 and ending February 29, 1932.
[2] Canadian system includes Mica, Arrow, Revelstoke, Kootenay Canal, Corra Linn, Upper Bonnington, Lower Bonnington, South Slocan, Brilliant, Seven Mile, and Waneta.
[3] Canadian system firm energy capability was determined over the Canadian system critical period beginning October 1, 1940 and ending April 30, 1946.
[4] US system dependable peaking capability was determined from January, WY 1932.
[5] Canadian system dependable peaking capability was determined from December WY 1945.
[6] US system 30-year average secondary energy limited to secondary market.
[7] Canadian system 30-year average generation minus firm energy capability.

Table 3
Critical Rule Curves

End-of-Period Treaty Storage Contents (ksfd)
2024-25 Assured Operating Plan

Mica Critical Rule Curves

Year	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
1928-29	3529.2	3529.2	3529.2	3452.6	3053.5	2218.1	1266.4	422.9	422.0	349.4	124.6	550.0	2191.0	3374.0
1929-30	3529.2	3529.2	3437.7	3032.1	2392.4	1413.3	222.1	0.0	30.6	35.0	71.8	456.1	2039.6	3359.2
1930-31	3529.2	3529.2	3515.3	3316.9	2845.4	1707.8	531.9	0.0	0.0	0.0	0.0	102.8	1464.5	1986.3
1931-32	1976.7	1943.0	1925.7	1666.2	1031.6	222.4	31.8	0.0						

Arrow Critical Rule Curves

Year	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
1928-29	3579.6	3579.6	3573.3	3526.9	3202.7	2228.8	1390.2	700.4	354.3	385.7	278.5	1232.3	2777.4	3343.0
1929-30	3312.2	3135.5	3186.6	2906.5	2405.4	1531.1	971.7	391.8	19.9	0.0	78.4	1194.3	2358.1	3426.3
1930-31	3472.7	3454.4	3383.8	2941.2	2342.3	1510.5	719.8	391.8	26.5	0.0	0.0	1367.3	1992.6	2278.5
1931-32	2226.0	2098.2	1882.4	1690.6	1553.4	682.8	259.9	0.0						

Duncan Critical Rule Curves

Year	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
1928-29	705.8	705.8	600.2	575.0	525.0	400.0	200.0	85.2	91.1	96.6	107.9	225.4	500.2	687.2
1929-30	700.0	675.0	550.0	500.0	450.0	300.0	100.0	75.0	0.0	13.4	46.5	161.5	381.1	550.0
1930-31	600.0	600.0	525.0	450.0	400.0	200.0	75.0	25.0	0.0	0.0	0.0	157.2	395.1	500.0
1931-32	550.0	550.0	450.0	350.0	150.0	0.0	0.0	0.0						

Composite Critical Rule Curves[1]

Year	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
1928-29	7814.6	7814.6	7702.7	7554.5	6781.2	4846.9	2856.6	1208.5	867.4	831.7	511.0	2007.7	5468.6	7404.2
1929-30	7541.4	7339.7	7174.3	6438.6	5247.8	3244.4	1293.8	466.8	50.5	48.4	196.7	1811.9	4778.8	7335.5
1930-31	7601.9	7583.6	7424.1	6708.1	5587.7	3418.3	1326.7	416.8	26.5	0.0	0.0	1627.3	3852.2	4764.8
1931-32	4752.7	4591.2	4258.1	3706.8	2735.0	905.2	291.7	0.0						

[1] Individual project rule curves are input to the AOP25 Step 1 study and adjusted to eliminate any Canadian composite crossovers according to Subsection 3(a) of this AOP25 document.

Table 4

Mica Assured and Variable Refill Curves

Distribution factors, forecast errors, power discharge requirements, variable refill curve and operating rule curve lower limits

2024-25 Assured Operating Plan

Assured Refill Curve (ksfd)

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
All years	0.0	0.0	0.0	17.1	82.1	98.3	93.0	81.4	88.0	113.1	176.4	954.4	2520.0	3529.2

Variable Refill Curves (ksfd)

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
1928-29	n/a	n/a	n/a	n/a	n/a	n/a	1206.4	1116.8	1081.3	965.1	1006.5	1459.1	2440.2	3529.2
1929-30	n/a	n/a	n/a	n/a	n/a	n/a	183.1	53.1	9.1	0.0	68.8	855.2	2150.1	"
1930-31	n/a	n/a	n/a	n/a	n/a	n/a	441.2	320.4	271.6	151.9	243.3	874.2	2226.4	"
1931-32	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	304.0	1887.2	"
1932-33	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	203.3	1721.0	"
1933-34	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	0.0	1978.1	"
1934-35	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	463.4	1844.4	"
1935-36	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	439.6	2133.8	"
1936-37	n/a	n/a	n/a	n/a	n/a	n/a	1193.2	1082.9	1032.6	905.5	995.0	1471.2	2472.5	"
1937-38	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	527.4	1981.0	"
1938-39	n/a	n/a	n/a	n/a	n/a	n/a	209.8	157.3	122.5	28.7	141.0	861.2	2435.6	"
1939-40	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	658.7	2190.9	"
1940-41	n/a	n/a	n/a	n/a	n/a	n/a	626.5	526.6	497.0	396.6	574.5	1251.1	2454.2	"
1941-42	n/a	n/a	n/a	n/a	n/a	n/a	448.0	351.9	314.2	190.5	267.5	879.0	2179.8	"
1942-43	n/a	n/a	n/a	n/a	n/a	n/a	633.7	515.1	474.1	350.2	503.3	1152.6	2224.5	"
1943-44	n/a	n/a	n/a	n/a	n/a	n/a	1299.0	1173.1	1136.3	1018.3	1087.2	1580.5	2615.2	"
1944-45	n/a	n/a	n/a	n/a	n/a	n/a	1163.3	1074.4	1051.5	944.2	994.1	1444.2	2483.3	"
1945-46	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	3.4	1883.0	"
1946-47	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	263.1	1952.7	"
1947-48	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	59.4	1836.9	"
1948-49	n/a	n/a	n/a	n/a	n/a	n/a	1177.9	1059.4	1001.2	876.9	954.6	1430.1	2625.7	"
1949-50	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	279.8	1644.1	"
1950-51	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	398.4	2013.6	"
1951-52	n/a	n/a	n/a	n/a	n/a	n/a	233.9	105.5	58.1	0.0	4.1	692.7	2164.2	"
1952-53	n/a	n/a	n/a	n/a	n/a	n/a	515.4	405.2	367.0	243.0	303.5	847.3	2130.4	"
1953-54	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	0.0	1615.6	"
1954-55	n/a	n/a	n/a	n/a	n/a	n/a	150.6	68.3	46.9	"	23.2	619.3	1814.3	"
1955-56	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	"	0.0	296.8	1926.3	"
1956-57	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	382.6	2264.2	"
1957-58	n/a	n/a	n/a	n/a	n/a	n/a	"	"	"	"	"	279.8	2021.4	"

Distribution Factors and Forecast Errors

	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
Distribution Factors	0.9760	0.9790	0.9750	0.9820	0.9650	0.7920	0.5060	n/a
Forecast Errors (ksfd)	863.8	750.8	707.2	560.0	560.0	496.7	371.5	n/a

Power Discharge Requirements (cfs)

	Vol[1]	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
Assured Refill Curve	n/a	3000	3000	3000	3000	3000	3000	8000	24000
Variable Refill Curves	80 MAF	3000	3000	3000	3000	3000	3000	5000	10000
Variable Refill Curves	95 MAF	3000	3000	3000	3000	3000	3000	3000	3000
Variable Refill Curves	110 MAF	3000	3000	3000	3000	3000	3000	3000	3000
Variable Refill Curve Lower Limits (ksfd)	80 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Variable Refill Curve and Variable Refill Curve Lower Limits are organized by volume runoff at The Dalles.

Other Hydro Project Operating Procedures, Constraints, and Plant Data *(continued)*

Variable Refill Curve Lower Limits (ksfd)	95 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Variable Refill Curve Lower Limits (ksfd)	110 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating Rule Curve Lower Limits (ksfd)	n/a	208.9	0.0	0.0	0.0	n/a	n/a	n/a	n/a

Table 5
Arrow Assured and Variable Refill Curves
Distribution Factors, Forecast Errors, Power Discharge Requirements, and Operating Rule Curve Lower Limits
2024-25 Assured Operating Plan

Assured Refill Curve (ksfd)

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
All years	0.0	0.0	0.0	0.0	0.0	0.0	0.0	712.8	801.8	980.2	1385.3	2486.5	3411.1	3579.6

Variable Refill Curves (ksfd)

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
1928-29	n/a	n/a	n/a	n/a	n/a	n/a	1775.2	2367.7	2328.7	2197.4	2558.9	3001.3	3295.2	3579.6
1929-30	n/a	n/a	n/a	n/a	n/a	n/a	1089.3	1082.7	1171.8	1037.6	1395.3	2489.3	3373.2	"
1930-31	n/a	n/a	n/a	n/a	n/a	n/a	1361.3	1290.7	1320.7	1270.5	1521.7	2325.5	3317.3	"
1931-32	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	1732.3	3157.2	"
1932-33	n/a	n/a	n/a	n/a	n/a	n/a	"	34.4	68.7	"	186.3	1876.6	3091.7	"
1933-34	n/a	n/a	n/a	n/a	n/a	n/a	"	0.0	0.0	"	0.0	2293.3	3579.6	"
1934-35	n/a	n/a	n/a	n/a	n/a	n/a	492.3	610.5	753.1	626.1	882.6	2110.1	3187.6	"
1935-36	n/a	n/a	n/a	n/a	n/a	n/a	374.1	396.0	372.2	168.6	433.9	2109.5	3443.6	"
1936-37	n/a	n/a	n/a	n/a	n/a	n/a	2097.5	2632.2	2582.6	2422.6	2805.4	3175.4	3361.1	"
1937-38	n/a	n/a	n/a	n/a	n/a	n/a	872.8	959.7	980.5	848.4	1167.2	2376.8	3402.7	"
1938-39	n/a	n/a	n/a	n/a	n/a	n/a	1319.4	1230.1	1257.3	1181.3	1422.4	2428.1	3466.1	"
1939-40	n/a	n/a	n/a	n/a	n/a	n/a	842.4	932.7	1010.0	947.5	1355.7	2409.9	3422.6	"
1940-41	n/a	n/a	n/a	n/a	n/a	n/a	1810.9	1872.4	1891.9	1916.3	2588.1	3285.9	3579.6	"
1941-42	n/a	n/a	n/a	n/a	n/a	n/a	1960.6	1919.4	1969.0	1890.1	2168.4	2863.8	"	"
1942-43	n/a	n/a	n/a	n/a	n/a	n/a	2235.5	2240.4	2227.4	2082.1	2612.0	3283.4	"	"
1943-44	n/a	n/a	n/a	n/a	n/a	n/a	2536.0	3197.8	3171.4	3014.3	3416.2	3579.6	"	"
1944-45	n/a	n/a	n/a	n/a	n/a	n/a	1997.1	2601.1	2600.0	2496.9	2853.7	3193.0	3511.0	"
1945-46	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	1856.9	3295.2	"
1946-47	n/a	n/a	n/a	n/a	n/a	n/a	272.6	299.7	334.9	197.5	567.9	2276.6	3394.2	"
1947-48	n/a	n/a	n/a	n/a	n/a	n/a	52.5	99.8	112.9	0.0	146.6	1971.4	3322.5	"
1948-49	n/a	n/a	n/a	n/a	n/a	n/a	1366.2	1948.0	1957.0	1837.9	2305.1	3018.0	3579.6	"
1949-50	n/a	n/a	n/a	n/a	n/a	n/a	296.9	322.4	331.2	150.7	438.3	1892.8	2967.8	"
1950-51	n/a	n/a	n/a	n/a	n/a	n/a	591.6	698.2	764.3	566.0	925.7	2245.8	3465.2	"
1951-52	n/a	n/a	n/a	n/a	n/a	n/a	1006.8	950.1	1016.0	860.4	1124.6	2292.1	3434.3	"
1952-53	n/a	n/a	n/a	n/a	n/a	n/a	1385.0	1334.1	1393.3	1326.2	1604.1	2401.4	3415.1	"
1953-54	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	1575.1	2976.9	"
1954-55	n/a	n/a	n/a	n/a	n/a	n/a	690.9	755.0	840.4	701.3	978.5	1966.6	2947.2	"
1955-56	n/a	n/a	n/a	n/a	n/a	n/a	0.0	14.4	37.6	0.0	177.4	1966.5	3325.0	"
1956-57	n/a	n/a	n/a	n/a	n/a	n/a	179.9	225.8	255.7	72.8	389.5	1823.3	3452.9	"
1957-58	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	273.8	1853.0	3361.3	"

Distribution Factors and Forecast Errors

	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
Distribution Factors	0.9730	0.9760	0.9700	0.9740	0.9510	0.7420	0.4670	n/a
Forecast Errors (ksfd)	1656.2	1427.7	1358.8	1049.9	1049.9	837.4	648.9	n/a

Power Discharge Requirements (cfs)

	Vol[1]	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
Assured Refill Curve	n/a	5000	5000	5000	5000	5000	8500	31500	50900
Variable Refill Curves	80 MAF	5000	5000	5000	5000	5000	5000	21000	33000
Variable Refill Curves	95 MAF	5000	5000	5000	5000	5000	5000	21000	33000
Variable Refill Curves	110 MAF	5000	5000	5000	5000	5000	5000	21000	33000
Variable Refill Curve Lower Limits (ksfd)	80 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Variable Refill Curve Lower Limits (ksfd)	95 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Variable Refill Curve and Variable Refill Curve Lower Limits are organized by volume runoff at The Dalles

Other Hydro Project Operating Procedures, Constraints, and Plant Data *(continued)*

Variable Refill Curve Lower Limits (ksfd)	110 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating Rule Curve Lower Limits (ksfd)	n/a	556.9	0.0	0.0	0.0	n/a	n/a	n/a	n/a

Table 6
Duncan Assured and Variable Refill Curves
Distribution Factors, Forecast Errors, Power Discharge Requirements, and Operating Rule Curve Lower Limits
2024-25 Assured Operating Plan

Assured Refill Curve (ksfd)

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
All years	0.0	0.0	50.4	81.1	98.6	109.8	120.0	129.2	143.3	154.1	169.7	299.0	509.9	705.8

Variable Refill Curves (ksfd)

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
1928-29	n/a	n/a	n/a	n/a	n/a	n/a	342.4	325.2	326.3	305.7	321.8	415.0	565.0	705.8
1929-30	n/a	n/a	n/a	n/a	n/a	n/a	340.8	323.2	324.1	303.1	326.8	435.3	576.8	"
1930-31	n/a	n/a	n/a	n/a	n/a	n/a	285.2	269.0	273.3	257.5	279.8	385.2	565.0	"
1931-32	n/a	n/a	n/a	n/a	n/a	n/a	10.2	0.0	7.1	0.0	31.5	203.4	474.7	"
1932-33	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	29.4	336.6	"
1933-34	n/a	n/a	n/a	n/a	n/a	n/a	26.8	29.4	46.2	41.9	87.7	282.6	547.3	"
1934-35	n/a	n/a	n/a	n/a	n/a	n/a	75.6	66.1	81.8	65.1	88.8	240.9	469.9	"
1935-36	n/a	n/a	n/a	n/a	n/a	n/a	51.9	36.6	41.0	23.0	50.0	237.6	526.4	"
1936-37	n/a	n/a	n/a	n/a	n/a	n/a	278.1	260.0	263.1	242.6	263.0	370.4	546.2	"
1937-38	n/a	n/a	n/a	n/a	n/a	n/a	70.3	61.9	70.8	60.8	90.5	252.2	503.5	"
1938-39	n/a	n/a	n/a	n/a	n/a	n/a	122.8	112.1	117.6	102.7	133.9	292.5	550.2	"
1939-40	n/a	n/a	n/a	n/a	n/a	n/a	109.7	103.9	117.2	111.7	145.6	295.4	536.3	"
1940-41	n/a	n/a	n/a	n/a	n/a	n/a	193.9	185.3	194.5	190.7	235.7	374.7	559.4	"
1941-42	n/a	n/a	n/a	n/a	n/a	n/a	188.0	181.8	190.8	175.9	204.7	338.1	540.1	"
1942-43	n/a	n/a	n/a	n/a	n/a	n/a	200.2	186.7	194.4	177.9	216.2	359.9	532.7	"
1943-44	n/a	n/a	n/a	n/a	n/a	n/a	348.6	336.0	341.7	323.0	346.1	441.9	596.0	"
1944-45	n/a	n/a	n/a	n/a	n/a	n/a	271.1	258.8	265.7	247.7	265.4	371.1	554.4	"
1945-46	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	144.9	472.5	"
1946-47	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	188.9	482.2	"
1947-48	n/a	n/a	n/a	n/a	n/a	n/a	33.3	21.9	32.4	14.5	38.9	206.3	497.1	"
1948-49	n/a	n/a	n/a	n/a	n/a	n/a	259.5	243.1	247.4	227.7	252.5	377.0	599.3	"
1949-50	n/a	n/a	n/a	n/a	n/a	n/a	59.6	43.6	50.6	31.5	57.5	210.1	432.4	"
1950-51	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	174.6	464.6	"
1951-52	n/a	n/a	n/a	n/a	n/a	n/a	90.4	76.5	86.8	68.7	94.1	267.2	515.5	"
1952-53	n/a	n/a	n/a	n/a	n/a	n/a	87.6	76.5	84.6	68.1	90.6	241.7	477.9	"
1953-54	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	104.6	407.3	"
1954-55	n/a	n/a	n/a	n/a	n/a	n/a	23.5	11.8	20.1	4.5	32.1	186.8	407.2	"
1955-56	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	155.2	465.4	"
1956-57	n/a	n/a	n/a	n/a	n/a	n/a	43.4	25.5	31.8	15.7	44.4	204.9	533.7	"
1957-58	n/a	n/a	n/a	n/a	n/a	n/a	0.0	0.0	0.0	0.0	0.0	144.8	485.5	"

Distribution Factors and Forecast Errors

	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
Distribution Factors	0.9740	0.9800	0.9760	0.9790	0.9570	0.7510	0.4810	n/a
Forecast Errors (ksfd)	177.4	153.6	147.1	116.9	116.9	99.5	84.8	n/a

Power Discharge Requirements (cfs)

	Vol[1]	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
Assured Refill Curve	n/a	100	100	100	100	100	1000	1000	1000
Variable Refill Curves	80 MAF	100	100	100	100	100	100	1100	1400
Variable Refill Curves	95 MAF	100	100	100	100	100	100	1100	1400
Variable Refill Curves	110 MAF	100	100	100	100	100	100	1100	1400
Variable Refill Curve Lower Limits (ksfd)	80 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Variable Refill Curve Lower Limits (ksfd)	95 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] Variable Refill Curve and Variable Refill Curve Lower Limits are organized by volume runoff at The Dalles

Other Hydro Project Operating Procedures, Constraints, and Plant Data *(continued)*

Variable Refill Curve Lower Limits (ksfd)	110 MAF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating Rule Curve Lower Limits (ksfd)	n/a	123.1	0.0	0.0	0.0	n/a	n/a	n/a	n/a

Table 7
Mica Upper Rule Curves
End-of-Period Treaty Storage Contents (ksfd)[1]
2024-25 Assured Operating Plan

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
All years	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2	3529.2

Table 8
Arrow Upper Rule Curves

End-of-Period Treaty Storage Contents (ksfd)[1]
2024-25 Assured Operating Plan

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
All years	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6

Table 9
Duncan Upper Rule Curves

End-of-Period Treaty Storage Contents (ksfd)[1]
2024-25 Assured Operating Plan

	AG1	AG2	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUN	JUL
All years	705.8	705.8	705.8	705.8	705.8	705.8	705.8	705.8	705.8	705.8	705.8	705.8	705.8	705.8

[1] Canadian project upper rule curves (flood risk management) are set to full in AOP25 and are retained here to preserve formatting and numbering.

Table 10
Composite Operating Rule Curves for the Whole of Canadian Treaty Storage

End-of-Period Treaty Storage Contents (ksfd)
2024-25 Assured Operating Plan

Years	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
1928-29	7814.6	7814.6	7702.7	7554.5	6781.2	4846.9	2796.6	1264.9	1367.1	1483.7	1731.4	3739.9	6245.3	7814.6
1929-30	''	''	''	''	''	''	1498.2	895.1	954.2	1134.3	1623.8	3640.7	6033.2	''
1930-31	''	''	''	''	''	''	2002.5	1162.4	1216.7	1286.2	1731.4	3498.7	6053.6	''
1931-32	''	''	''	''	''	''	888.9	0.0	7.1	0.0	31.5	2239.7	5519.1	''
1932-33	''	''	''	''	''	''	''	34.4	68.7	''	186.3	2109.3	5149.3	''
1933-34	''	''	''	''	''	''	''	29.4	46.2	41.9	87.7	2575.9	5899.1	''
1934-35	''	''	''	''	''	''	''	676.6	834.9	691.2	971.4	2814.4	5501.9	''
1935-36	''	''	''	''	''	''	''	432.6	413.2	191.6	483.9	2786.7	6054.8	''
1936-37	''	''	''	''	''	''	2783.4	1264.9	1367.1	1483.7	1731.4	3739.9	6343.5	''
1937-38	''	''	''	''	''	''	1204.8	774.7	872.6	909.2	1257.7	3156.4	5887.2	''
1938-39	''	''	''	''	''	''	1652.3	982.2	1041.9	1111.6	1660.2	3581.8	6356.6	''
1939-40	''	''	''	''	''	''	1174.4	816.7	919.0	1059.2	1501.3	3364.0	6111.9	''
1940-41	''	''	''	''	''	''	2210.6	1264.9	1367.1	1483.7	1731.4	3739.9	6375.2	''
1941-42	''	''	''	''	''	''	2026.2	1193.9	1259.3	1324.8	''	3664.5	6100.8	''
1942-43	''	''	''	''	''	''	2223.9	1264.9	1367.1	1483.7	''	3739.9	6145.5	''
1943-44	''	''	''	''	''	''	2856.6	''	''	''	''	''	6441.0	''
1944-45	''	''	''	''	''	''	2753.5	''	''	''	''	''	6404.3	''
1945-46	''	''	''	''	''	''	888.9	0.0	0.0	0.0	0.0	2005.2	5650.7	''
1946-47	''	''	''	''	''	''	''	299.7	334.9	197.5	567.9	2728.6	5829.1	''
1947-48	''	''	''	''	''	''	''	121.7	145.3	14.5	185.5	2237.1	5656.5	''
1948-49	''	''	''	''	''	''	2744.1	1264.9	1367.1	1483.7	1731.4	3739.9	6441	''
1949-50	''	''	''	''	''	''	888.9	366.0	381.8	182.2	495.8	2382.7	5044.3	''
1950-51	''	''	''	''	''	''	923.6	698.2	764.3	566.0	925.7	2818.8	5889.3	''
1951-52	''	''	''	''	''	''	1363.8	894.8	946.7	929.1	1222.8	3252.0	6085.2	''
1952-53	''	''	''	''	''	''	2023.5	1194.5	1253.4	1291.3	1652.3	3490.4	6019.4	''
1953-54	''	''	''	''	''	''	888.9	0.0	0.0	0.0	0.0	1679.7	4999.8	''
1954-55	''	''	''	''	''	''	1022.9	792.9	868.8	705.8	1033.8	2772.7	5168.7	''
1955-56	''	''	''	''	''	''	888.9	14.4	37.6	0.0	177.4	2418.5	5716.7	''
1956-57	''	''	''	''	''	''	''	251.3	287.5	88.5	433.9	2410.8	6185.2	''
1957-58	''	''	''	''	''	''	''	0.0	0.0	0.0	273.8	2277.6	5868.2	''

Table 11
Composite End Storage for the Whole of Canadian Treaty Storage

End of Period Treaty Storage Contents (ksfd)
2024-25 Assured Operating Plan

Years	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
1928-29	7814.6	7814.6	7702.7	7554.5	6781.2	4846.9	2856.4	1208.5	867.4	831.7	511.0	2007.7	5468.6	7404.1
1929-30	7541.3	7339.6	7174.1	6438.6	5247.8	3244.4	1293.8	466.8	50.4	48.3	196.6	1811.9	4778.8	7335.5
1930-31	7601.9	7583.6	7424.0	6708.1	5587.5	3418.1	1326.7	416.8	26.4	0.0	0.0	1627.3	3852.2	4764.8
1931-32	4752.7	4591.2	4258.1	3706.8	2735.0	905.2	291.7	0.0	0.0	119.9	207.5	1994.8	5435.5	6948.5
1932-33	7255.8	7459.9	7174.3	6612.7	6440.9	4846.9	2745.0	1110.1	68.7	0.0	162.7	1968.3	5149.3	7446.3
1933-34	7571.4	7496.3	7340.7	7477.3	6781.2	"	2821.1	1336.9	856.2	675.3	1109.6	3601.4	5899.1	7535.0
1934-35	7535.0	7442.1	7223.3	6775.8	"	"	2754.9	1490.3	1004.4	735.4	854.0	2586.5	5501.9	7585.3
1935-36	7710.4	7635.3	7473.3	7031.6	6040.6	3780.3	1619.3	676.4	317.0	215.0	483.9	2786.7	6054.8	7498.4
1936-37	7541.4	7339.7	7181.2	6504.3	5338.0	3244.4	1380.8	473.5	75.4	7.0	0.0	1428.6	4297.3	6078.2
1937-38	6077.2	5950.3	5734.9	5260.3	4913.8	3650.8	1551.6	774.7	448.1	425.0	696.8	2746.7	5823.9	7492.0
1938-39	7541.4	7339.7	7342.7	7012.0	6269.0	4463.6	2320.4	1056.8	686.4	706.4	1084.7	3581.8	5678.1	7689.5
1939-40	7739.5	7570.4	7314.0	6935.8	6294.9	4834.4	2717.9	1166.8	915.9	993.8	1293.1	3364.0	5463.5	7315.0
1940-41	7480.7	7294.3	7174.3	7129.7	6198.6	4194.2	2162.6	1127.1	991.7	1311.0	1699.2	2953.3	4499.2	5911.2
1941-42	5783.7	5624.7	5911.1	6302.8	6021.3	4846.9	2718.1	1193.9	878.5	918.5	1137.1	3001.3	5626.2	7402.8
1942-43	7739.5	7814.3	7412.9	6908.8	6452.1	"	2658.4	1264.9	1077.3	1229.8	1655.0	3017.9	5421.0	7324.5
1943-44	"	7814.6	7599.0	7392.3	6664.4	4552.1	2669.4	1222.5	744.6	787.7	610.7	1920.3	3729.6	4394.7
1944-45	4467.8	4369.7	4287.7	4158.2	3275.3	1415.4	599.9	198.1	9.6	0.0	0.0	1829.4	4524.5	5964.3
1945-46	6150.7	5891.9	5560.0	5153.3	4472.7	3160.4	1131.7	0.0	0.0	"	"	2005.2	5650.7	7409.9
1946-47	7535.0	7459.9	7304.3	7269.0	6728.1	4846.9	2662.2	1030.0	468.1	391.8	567.9	2728.6	5829.1	7503.9
1947-48	7629.0	7553.9	7398.3	7554.5	6781.2	"	2688.7	1217.0	695.5	426.0	418.7	2551.5	5656.5	7571.4
1948-49	7571.4	7496.3	7340.7	7421.5	"	"	2744.1	1338.5	1072.8	1154.9	1547.1	3739.9	6094.8	7134.0
1949-50	7487.2	7339.7	7193.4	6790.8	6584.5	"	2660.5	1033.9	400.4	289.5	326.6	1662.8	5044.3	7620.1
1950-51	7620.1	7545.0	7389.4	7392.3	6781.2	"	2742.7	1231.8	764.3	566.0	711.7	2818.8	5671.7	7573.9
1951-52	7699.0	7623.9	7468.3	7417.2	"	"	2661.6	1022.5	613.2	529.2	945.7	3252.0	6085.2	7629.7
1952-53	7754.8	7641.2	7434.3	6937.1	5949.1	4168.3	2036.3	1194.5	803.2	708.5	787.2	2771.1	5872.4	7514.7
1953-54	7739.5	7814.6	7702.7	7554.5	6781.2	4846.9	2720.9	1352.8	828.8	580.0	424.9	2162.8	4999.8	7535.0
1954-55	7535.0	7459.9	7304.3	7456.4	"	"	2768.8	1312.9	868.8	705.8	463.8	1542.1	5168.7	7599.5
1955-56	7724.6	7649.5	7493.9	7371.6	"	"	2714.4	1405.1	872.2	633.0	601.3	2598.7	5716.7	7563.8
1956-57	7563.8	7488.7	7333.1	7433.0	"	"	2681.9	1230.8	722.2	470.7	428.9	2998.4	6184.9	7480.2
1957-58	7541.4	7339.7	7267.0	6999.2	6344.6	"	2711.3	1124.8	38.5	0.0	141.8	2277.6	5868.2	7442.6

Summary Statistics

Years	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
Maximum	7814.6	7814.6	7702.7	7554.5	6781.2	4846.9	2856.4	1490.3	1077.3	1311.0	1699.2	3739.9	6184.9	7689.5
Median	7552.6	7474.3	7323.6	7005.6	6446.5	4846.9	2665.8	1147.0	708.9	547.6	539.5	2592.6	5564.1	7463.3

Other Hydro Project Operating Procedures, Constraints, and Plant Data *(continued)*

Years	Aug 15	Aug 31	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr 15	Apr 30	May	Jun	Jul
Average	7248.2	7159.5	6997.3	6755.3	6071.7	4247.6	2247.1	989.3	572.2	515.3	635.6	2511.3	5368.2	7122.3
Minimum	4467.8	4369.7	4258.1	3706.8	2735.0	905.2	291.7	0.0	0.0	0.0	0.0	1428.6	3729.6	4394.7

Table 12
Comparison of Recent Assured Operating Plan Studies

Mica Target Operation (ksfd or cfs)

	AOP15	AOP16- AOP17[1]	AOP18- AOP19[2]	AOP20-AOP24[3]	AOP25
Aug 15	3379.2	3379.2	3494.1	3494.1	3454.1
Aug 30	FULL	FULL	FULL	FULL	FULL
Sep	FULL	FULL	FULL	3454.1	FULL
Oct	3428.4	3404.1	3404.1	3394.1	3404.1
Nov	22000	21000	19000	16000	16000
Dec	22000	17000	23000	28000	19000
Jan	24000	24000	24000	28000	25000
Feb	21000	26000	23000	24000	36000
Mar	25000	25000	10000	10000	15000
Apr 15	17000	21000	15000	10000	10000
Apr 30	10000	10000	10000	10000	10000
May	8000	8000	8000	8000	4000
Jun	10000	8000	8000	8000	4000
Jul	3467.2	3436.2	3436.2	3374.1	3404.1

Composite CRC1 Canadian Treaty Storage Content (ksfd)

	AOP15	AOP16-AOP17	AOP18-AOP19	AOP20-AOP24	AOP25
1928 Aug 31	7814.6	7814.6	7814.6	7814.5	7814.6
1928 Dec	5282.1	5092.5	5436.9	5057.6	4846.9
1929 Apr 15	1078.2	1024.5	1198.5	1272.1	831.7
1929 Jul	7500.9	7585.9	7649.8	7607.0	7404.2

Composite Canadian Treaty Storage Average content (ksfd)[4]

	AOP15	AOP16-AOP17	AOP18-AOP19	AOP20-AOP24	AOP25
Aug 31	7406.8	7415.3	7385.9	7346.2	7194.1
Dec	4644.6	4490.1	4524.4	4408.8	4325.4
Apr 15	889.3	716.3	811.0	803.2	635.1
Jul	7279.9	7303.8	7388.7	7359.8	7194.1

Step I Gains and Losses due to Reoperation

	AOP15	AOP16-AOP17	AOP18-AOP19	AOP20-AOP24	AOP25
US firm Energy (aMW)	0.0	0.0	-0.5	0.9	33.5
US Dependable Peaking Capacity (MW)[5]	-3.9	-2.1	6.9 / 35.3	54.0	-121.3
US Average Annual Usable Secondary Energy (aMW)	21.3	17.6	22.7	27.9	-11.1
BCH Firm Energy (aMW)	44.0	24.0	18.6	26.1	46.7
BCH Dependable Peaking Capacity (MW)	47.8	28.2	37.2	9.3	-9.0
BCH Average Annual Usable Secondary Energy (aMW)	-33.4	-16.2	-24.1	-25.7	-34.2

[1] AOP17 for 2016-17 uses the same Step I system regulation studies as used in AOP16 for 2015-16.
[2] AOP19 for 2018-19 uses the same Step I system regulation studies as used in AOP18 for 2017-18.
[3] The AOPs for 2019-20, 2020-21, 2022-23 and 2023-24 use the same Step I system regulation studies as used in the AOP for 2021-22.
[4] Prior to AOP15, average content was based on 60 years of modified flows. AOP15 through AOP17 averages were based on 70 years of modified flows. AOP18 through AOP25 were based on 80 years of modified flows.
[5] Due to changes between AOP18 and AOP19 to the peak load shape, the period in which the U.S. system dependable peaking capability was determined changed from 15 August 1931 to January 1932

Table 12
Comparison of Recent Assured Operating Plan Studies,
Comparison of Recent Assured Operating Plan Studies *(continued)*

Table 12
Comparison of Recent Assured Operating Plan Studies,
Comparison of Recent Assured Operating Plan Studies *(continued)*

Coordinated Hydro Load (1929) (aMW)

	AOP15	AOP16-AOP17	AOP18-AOP19	AOP20-AOP24	AOP25
Aug 15	11187	11367	12028	11927	11307
Aug 30	10971	10944	11399	11560	10967
Sep	9756	9822	10207	9934	9102
Oct	9758	10051	9233	8894	9150
Nov	11821	12152	11434	11525	11399
Dec	13836	13744	13523	13869	13929
Jan	13323	13933	13862	14121	14118
Feb	13179	12876	13006	13069	13049
Mar	12022	11269	11264	10880	10835
Apr 15	10476	10894	9583	10984	10837
Apr 30	11012	11600	10684	11329	12594
May	12198	12166	12344	11079	11756
Jun	12208	11291	11314	12048	11070
Jul	11954	11812	12256	12096	10846
Annual Average	11819	11794	11689	11695	11503

Appendix A
Project Operating Procedures
for 2024-25 Assured Operating Plan

Definition of split months:

- "Apr" is April 1-30, "Apr 15" is April 1-15, "Apr 30" is April 16-3
- "Aug" is August 1-31, "Aug 15" is August 1-15, "Aug 31" is August 16-31

Each project is listed with its name, followed by the USACE ID number, then the HYDSIM ID number.

Canadian Projects

Mica (1; 1890)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	3,000 cfs	All Periods	In place in AOP79, AOP80, AOP84

Arrow (2; 1831)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	5,000 cfs	All Periods	In place in AOP79, AOP80, AOP84
Draft Rate Limit	1.0 ft/day	All Periods	In place in AOP79, AOP80, AOP84

Duncan (5; 1681)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	100 cfs	All Periods	In place in AOP79, AOP80, AOP84
Maximum Flow	10,000 cfs	All Periods	In place in AOP79, AOP80, AOP84
Draft Rate Limit	1.0 ft/day	All Periods	In place in AOP79, AOP80, AOP84
Other		Remove 5 step logic, operate to meet IJC orders for Corra Linn	CRTOC agreement to remove 5-step logic procedures to implement 1938 IJC order, 2012

Base System Projects

Hungry Horse (10; 1530/1531)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	400 cfs	Minimum project discharge, all periods	In place in AOP79, AOP80, AOP84
Minimum Content	No limit	None	In place in AOP79, AOP80, AOP84
Other		No VECC Limit	VECC limit in place in AOP79

Kerr, Seli'š Ksanka Qlispe' (SKQ) (11; 1510)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	1,500 cfs	All Periods	In place in AOP80, AOP84
Maximum Flow		None	In place in AOP80, AOP84
Minimum Content	614.7 ksfd (2893.0 ft)	Aug - Sep	MPC 2-1-92, PNCA submittal similar operation. Jun-Aug 15 in AOP80
Minimum Content	426.3 ksfd (2890.0 ft)	May	MPC 2-1-92, PNCA submittal similar operation. Jun-Aug 15 in AOP80
Minimum Content	614.7 ksfd (2893.0 ft)	Jun - Jul	MPC 2-1-92, PNCA submittal similar operation. Jun-Aug 15 in AOP80
Maximum Content	58.6 ksfd (2884.0 ft)	March (included to help meet the April 15 FERC requirement)	In Place in AOP80, AOP84
Other	n/a	No VECC Limit	VECC limit in place in AOP79
Other	0.0 ksfd (2883.0 ft)	Conditions permitted, should be at or about empty on Apr 15	FERC, AOP80

Thompson Falls (54; 1490)

Constraint Type	Requirements	Explanation	Source

Appendix A
Project Operating Procedures, Base System Projects, *(continued)*

No constraints noted	-	-	-

Noxon Rapids (38; 1480)

Constraint Type	Requirements	Explanation	Source
Minimum Content for Step I	116.3 ksfd (2331.0 ft)	Aug	In place in AOP84, similar operation in AOP80.
Minimum Content for Step I	112.3 ksfd (2330.0 ft)	Sep - Jan	In place in AOP84, similar operation in AOP80.
Minimum Content for Step I	78.7 ksfd (2321.1 ft)	Feb	In place in AOP84, similar operation in AOP80.
Minimum Content for Step I	26.5 ksfd (2305.0 ft)	Mar	In place in AOP84, similar operation in AOP80.
Minimum Content for Step I	0.0 ksfd (2295.0 ft)	Empty Apr 15, Apr 30, and end of CP	In place in AOP84, similar operation in AOP80.
Minimum Content for Step I	116.3 ksfd (2331.0 ft)	May - Jul	In place in AOP84, similar operation in AOP80.
Draft Rate Limit	0.67 ft/day	All periods	In place in AOP84

Cabinet Gorge (56; 1475)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	3,000 cfs	Aug, Nov - Jul	Feb 1, 2021 PNCA data submittal
Minimum Flow	4,000 cfs (= 15/30 x 3000 + 15/30 x 5000)	Sept	Feb 1, 2021 PNCA data submittal
Minimum Flow	5,000 cfs	Oct	Feb 1, 2021 PNCA data submittal

Albeni Falls (16, 1465)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	4,000 cfs	All periods	In place in AOP80, AOP84.
Minimum Content	December may fill on restriction, see note below	December	In place in AOP80, AOP84.
Minimum Content	582.4 ksfd (2062.5 ft)	Aug	In place in AOP80, AOP84.
Minimum Content	465.7 ksfd (2060.0 ft)	Sep	In place in AOP80, AOP84.
Minimum Content	190.4 ksfd (2054.0 ft)	Oct	In place in AOP80, AOP84.
Minimum Content	57.6 ksfd (2051.0 ft)	Nov - Apr 15	In place in AOP80, AOP84.
Maximum Content	0.0 ksfd (2049.7 ft)	Empty at end of CP	In place in AOP80, AOP84.
Minimum Content	190.4 ksfd (2054 ft)	Apr 30	In place in AOP80, AOP84.
Minimum Content	279.0 ksfd (2056.0 ft)	May	In place in AOP80, AOP84.
Minimum Content	582.4 ksfd (2062.5 ft)	Jun - Jul	In place in AOP80, AOP84.
Minimum content for Steps I	Optimum to run CP & LT to Jun-Oct minimum content		In place in AOP80, AOP84.
Kokanee Spawning	1.0 ft	Draft limit below Nov. 20th elevation through Dec. 31st, supported by minimum contents noted above.	In place before AOP80
Kokanee Spawning	0.5 ft	If project fills, draft no more than this amount. Dec. 31 - Mar 31, operate between minimum contents (noted above), and URC; and within above noted draft limits.	In place before AOP80
Other Spill	50 cfs	All periods	

Box Canyon (57; 1460)

Constraint Type	Requirements	Explanation	Source
No constraints noted.	-	-	-

Grand Coulee (19; 1280/1281)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	30,000 cfs	All periods	In place in AOP79, AOP80, AOP84.
Minimum Content Step I only	0.0 ksfd (1208.0 ft)	Empty at end of CP	In place in AOP79, AOP80, AOP84.
Minimum Content	884.4 ksfd (1240.0 ft)	May	Retain as a power operation (for pumping).
Maximum Content Step I only	2615.5 ksfd (1288.0 ft)	Sep - Nov (2 ft draft for operating room)	In place in AOP89; Retain as a power operation.
Maximum Content Step I only	2574.6 ksfd (1287.0 ft)	Dec - Feb (3 ft draft for operating room)	In place in AOP89; Retain as a power operation.

Appendix A
Project Operating Procedures, Base System Projects, *(continued)*

Constraint Type	Requirements	Explanation	Source
Draft Rate Limit	1.3 ft/day	Bank sloughage. This constraint was submitted as 1.5 ft/day; interpreted as 1.3 ft/day month average	

Chief Joseph (66; 1270)

Constraint Type	Requirements	Explanation	Source
Other Spill	500 cfs	All periods	USACE Feb 1, 2007 PNCA data submittal

Wells (67; 1220)

Constraint Type	Requirements	Explanation	Source
Other Spill	1,000 cfs	All periods	2/1/05 C. Wagers, Douglas, With Fish ladder
Fish Spill		None	

Rocky Reach (68; 1200)

Constraint Type	Requirements	Explanation	Source
Fish Spill/Bypass		None	
Other Spill	200 cfs	Aug 31 - Apr 15 (leakage)	Feb 1, 1994 PNCA data submittal

Rock Island (69; 1170)

Constraint Type	Requirements	Explanation	Source
Fish Spill/Bypass		None	

Wanapum (70; 1165)

Constraint Type	Requirements	Explanation	Source
Fish Spill/Bypass		None	
Other Spill	2,200 cfs	All periods	With Fish Ladder

Priest Rapids (71; 1160)

Constraint Type	Requirements	Explanation	Source
Minimum Flow		Limit removed	
Fish Spill/Bypass		None	
Other Spill	2,200 cfs	All periods	With fish ladder

Brownlee (21; 767)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	0 cfs	All years, all periods in CP and LT Studies	4-04 C Henriksen
Downstream Minimum Flow	6,500 cfs	All periods for navigation requirement downstream at Hells Canyon (project #762). Draft Brownlee to help meet this requirement in CP and LT studies.	IPC and USACE 1988 Agreement (April 2012)
Power Operation		Agree to use similar "historic" power operation (rule curves) provided by IPC and used in AOP since AOP97 for CP. Optimizer was used in the Step I critical period study to get a starting point for Brownlee operations. Results were then modified to follow the general shape of the "historic" shape for power with the exception of going empty at the end of the critical period. To the extent possible, CRC1 is used in every year.	Feb 1, 1991 PNCA data submittal 5-12 P. Kingsbury, T. Downen (BPA)

Oxbow (72; 765)

Constraint Type	Requirements	Explanation	Source
Other Spill	100 cfs	All periods	

Ice Harbor (79; 502)

Constraint Type	Requirements	Explanation	Source
Fish Spill/Bypass		None	
Other Spill	740 cfs	All periods	Feb 1, 2009 PNCA data submittal
Incremental Spill		None	
Minimum Flow		None	
Other	204.8 ksfd (440.0 ft)	All periods	Defined by Columbia River Treaty

Appendix A
Project Operating Procedures, Base System Projects, *(continued)*

McNary (80; 488)

Constraint Type	Requirements	Explanation	Source
Other Spill	3,475 cfs	All periods	Feb 1, 2009 PNCA data sub
Incremental Spill		None	

John Day (81; 440)

Constraint Type	Requirements	Explanation	Source
Fish Spill/Bypass		None	
Other Spill	800 cfs	All periods	USACE Feb 1, 2009 PNCA data sub
Incremental Spill		None	
Minimum Flow	50,000 cfs	Aug - Nov	USACE PNCA data sub for 1997-98 OY
Minimum Flow	12,500 cfs	Dec - Feb	USACE PNCA data sub for 1997-98 OY
Minimum Flow	50,000 cfs	Mar - Jul	USACE PNCA data sub for 1997-98 OY
Step I target contents	269.7 ksfd (268.0 ft)	Aug 15	In place AOP80
Step I target contents	242.5 ksfd (267.0 ft	Aug 31 - Sep	In place AOP80
Step I target contents	153.7 ksfd (263.6 ft)	Oct - Mar	In place AOP80
Step I target contents	114.9 ksfd (262.0 ft)	Apr - May	In place AOP80
Step I target contents	269.7 ksfd (268.0 ft)	Jun - Jul	In place AOP80

The Dalles (82; 365)

Constraint Type	Requirements	Explanation	Source
Fish Spill/Bypass		None	
Other Spill	1,300 cfs	All periods	USACE Feb 1, 2009 PNCA data sub
Incremental Spill		None	
Minimum Flow	50,000 cfs	Aug - Nov	USACE PNCA data sub for 1997-98 OY
Minimum Flow	12,500 cfs	Dec - Feb	USACE PNCA data sub for 1997-98 OY
Minimum Flow	50,000 cfs	Mar - Jul	USACE PNCA data sub for 1997-98 OY

Bonneville (83; 320)

Constraint Type	Requirements	Explanation	Source
Fish Spill/Bypass		None	
Other Spill	8,040 cfs	All periods	Feb 1, 2009 PNCA data submittal
Incremental Spill		None	

Kootenay Lake/Corra Linn (6; 1665)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	5,000 cfs	All periods	BC Hydro Conditional Water Licence, 1971
Other		Remove 5-step logic; operate to meet IJC orders for Corra Linn	CRTOC agreement to remove 5-step logic procedures to implement 1938 IJC order, 2012

Chelan (20; 1210/1211)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	50 cfs	All periods	In place in AOP79, AOP80, AOP84
Minimum Content	308.5 ksfd (1098.0 ft)	Aug - Sep	In place in AOP79, AOP80, AOP84
Minimum Content	308.5 ksfd (1098.0 ft)	Jul	Feb 1, 2000 PNCA data submittal (Note: Constraint valid except as needed to empty at end of Critical Period.)

Coeur d'Alene Lake (18; 1341)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	50 cfs	All periods	In place in AOP79
Minimum Content	112.5 ksfd (2128.0 ft)	Aug	In place in AOP79
Minimum Content	112.5 ksfd (2128.0 ft)	May - Jul	Feb 1, 2000 PNCA data submittal (Note: Flood control may override these minimum contents)

Post Falls (18; 1340)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	50 cfs	All periods	In place in AOP79, AOP80, AOP84

Appendix A
Project Operating Procedures, Base System Projects, *(continued)*

Libby (3; 1760)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	4,000 cfs	All periods	Feb 1, 1997 PNCA data submittal
Other Spill	200 cfs	All periods	Feb 1, 1995 PNCA data submittal
Target Operation	2435.6 ksfd (2455.7 ft)	1928 Aug 15	FRM draft, refill and summer operations per CRSO EIS ROD, September 2020. FC from RiverWare outputs.
Target Operation	2247.0 ksfd (2447.4 ft)	1928 Aug 31	"
Target Operation	2128.1 ksfd (2442.1 ft)	1928 Sep	"
Target Operation	2189.5 ksfd (2444.9 ft)	1928 Oct	"
Target Operation	2019.4 ksfd (2437.0 ft)	1928 Nov	"
Target Operation	1802.4 ksfd (2426.5 ft)	1928 Dec	"
Target Operation	1681.5 ksfd (2420.5 ft)	1929 Jan	"
Target Operation	1636.7 ksfd (2418.2 ft)	1929 Feb	"
Target Operation	1591.1 ksfd (2415.8 ft)	1929 Mar	"
Target Operation	1568.7 ksfd (2414.6 ft)	1929 Apr 15	"
Target Operation	1576.6 ksfd (2415.4 ft)	1929 Apr 30	"
Target Operation	1877.9 ksfd (2430.3 ft)	1929 May	"
Target Operation	2414.7 ksfd (2454.8 ft)	1929 Jun	"
Target Operation	2432.1 ksfd (2455.6 ft)	1929 Jul	"
Target Operation	2405.3 ksfd (2454.5 ft)	1929 Aug 15	"
Target Operation	2339.0 ksfd (2451.7 ft)	1929 Aug 31	"
Target Operation	2260.4 ksfd (2448.1 ft)	1929 Sep	"
Target Operation	2244.5 ksfd (2447.4 ft)	1929 Oct	"
Target Operation	2019.2 ksfd (2437.0 ft)	1929 Nov	"
Target Operation	1803.0 ksfd (2426.6 ft)	1929 Dec	"
Target Operation	1618.6 ksfd (2417.2 ft)	1930 Jan	"
Target Operation	1581.9 ksfd (2415.2 ft)	1930 Feb	"
Target Operation	1535.1 ksfd (2412.8 ft)	1930 Mar	"
Target Operation	1517.1 ksfd (2411.8 ft)	1930 Apr 15	"
Target Operation	1513.0 ksfd (2411.6 ft)	1930 Apr 30	"
Target Operation	1807.0 ksfd (2416.8 ft)	1930 May	"
Target Operation	2391.7 ksfd (2453.9 ft)	1930 Jun	"
Target Operation	2455.0 ksfd (2456.6 ft)	1930 Jul	"
Target Operation	2420.3 ksfd (2455.0 ft)	1930 Aug 15	"
Target Operation	2343.1 ksfd (2451.8 ft)	1930 Aug 31	"
Target Operation	2275.4 ksfd (2448.8 ft)	1930 Sep	"
Target Operation	2270.6 ksfd (2448.6 ft)	1930 Oct	"
Target Operation	2019.2 ksfd (2437.0 ft)	1930 Nov	"
Target Operation	1801.4 ksfd (2426.5 ft)	1930 Dec	"
Target Operation	1749.5 ksfd (2423.9 ft)	1931 Jan	"
Target Operation	1696.3 ksfd (2421.2 ft)	1931 Feb	"
Target Operation	1643.5 ksfd (2418.5 ft)	1931 Mar	"
Target Operation	1628.3 ksfd (2417.8 ft)	1931 Apr 15	"
Target Operation	1626.1 ksfd (2417.9 ft)	1931 Apr 30	"
Target Operation	1992.3 ksfd (2435.7 ft)	1931 May	"
Target Operation	2195.2 ksfd (2445.2 ft)	1931 Jun	"
Target Operation	2320.4 ksfd (2450.8 ft)	1931 Jul	"
Target Operation w/CP override	2292.9 ksfd (2450.8 ft)	1931 Aug 15	Target Operation provided as other periods; CP operation allowed to override for FELCC in the last WY of the CP.
Target Operation w/CP override	2267.4 ksfd (2450.0 ft)	1931 Aug 31	"
Target Operation w/CP override	2042.2 ksfd (2439.5 ft)	1931 Sep	"
Target Operation w/CP override	2001.5 ksfd (2438.2 ft)	1931 Oct	"
Target Operation w/CP override	1938.0 ksfd (2435.5 ft)	1931 Nov	"
Target Operation w/CP override	1440.0 ksfd (2410.4 ft)	1931 Dec	"
Target Operation w/CP override	1221.5 ksfd (2400.1 ft)	1932 Jan	"
Target Operation w/CP override	1115.5 ksfd (2388.8 ft)	1932 Feb	"

Appendix A
Project Operating Procedures, Other Major Step I Projects, *(continued)*

Dworshak (31; 535)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	1,600 cfs	All periods	Feb 1 2012 PNCA data submittal (1,500 cfs powerhouse plus 100 cfs hatchery water supply)
Maximum Flow	14,000 cfs	Apr - Aug (URC may override)	Feb 1 2002 PNCA data submittal
Maximum flow	25,000 cfs (Up to 25 kcfs for FRM all periods)	Sep - Mar	Feb 1 2002 PNCA data submittal
Critical Period initial contents	652.6 ksfd (1556.8 ft)	Aug 15	Supports Step I Critical Period
Critical Period ending contents	218.4 ksfd (1490.2 ft)	Feb	Supports Step I Critical Period
Other	Run on minimum flow or URC observing maximum and minimum flow requirements Oct - May and meet target operation June - Sep to obtain uniform outflows Jul - Aug		Feb 1, 2005 PNCA data submittal
Target Operation	652.6 ksfd (1556.8 ft	Aug 15	Target Elevation based on 2010 Modified Streamflows and 80-yr FRM data for Jul-Aug 15 and Sep based on use of 80-yr median (May 2012)
Target Operation	497.0 ksfd (1535.0 ft)	Aug 31	''
Target Operation	390.7 ksfd (1519.2 ft)	Sep	''
Target Operation	1016.0 ksfd (1600.0 ft)	Jun	''
Target Operation	780.9 ksfd (1573.4 ft)	Jul	''
Other Spill	100.0 cfs	All periods	Feb 1 2012 PNCA data submittal (see Minimum Flow, above)

Other Major Step I Projects

Lower Granite (76; 520)

Constraint Type	Requirements	Explanation	Source
Bypass date		None	
Other spill	510 cfs	Aug 15	Feb 1, 2009 PNCA data submittal
Other spill	470 cfs	Aug 31	Feb 1, 2009 PNCA data submittal
Other spill	480 cfs	Sep	Feb 1, 2009 PNCA data submittal
Other spill	530 cfs	Oct	Feb 1, 2009 PNCA data submittal
Other spill	410 cfs	Nov	Feb 1, 2009 PNCA data submittal
Other spill	340 cfs	Dec	Feb 1, 2009 PNCA data submittal
Other spill	100 cfs	Jan	Feb 1, 2009 PNCA data submittal
Other spill	130 cfs	Feb	Feb 1, 2009 PNCA data submittal
Other spill	230 cfs	Mar	Feb 1, 2009 PNCA data submittal
Other spill	420 cfs	Apr 15	Feb 1, 2009 PNCA data submittal
Other spill	440 cfs	Apr 30 - May	Feb 1, 2009 PNCA data submittal
Other spill	460 cfs	Jun	Feb 1, 2009 PNCA data submittal
Other spill	450 cfs	Jul	Feb 1, 2009 PNCA data submittal
Incremental spill	None	Removed	
Fish spill	17,267 cfs (= 14/15 x 18000 + 1/15 x 7000)	Aug 15	Feb 1, 2023 PNCA data submittal
Fish spill	7,000 cfs	Aug 31	Feb 1, 2023 PNCA data submittal
Fish spill	715 cfs (= 9500 x 4/24 x 14/31)	Oct	Feb 1, 2023 PNCA data submittal
Fish spill	369 cfs (= 9500 x 4/24 x 7/30)	Nov	Feb 1, 2023 PNCA data submittal
Fish spill	766 cfs (= 9500 x 4/24 x 15/31)	Mar	Feb 1, 2023 PNCA data submittal
Fish spill	52,578 cfs (= 20 kcfs x 8/24 x 13/15 plus 81 kcfs x 16/24 x 13/15)	Apr 15	Feb 1, 2023 PNCA data submittal
Fish spill	60,667 cfs (= 20 kcfs x 8/24 plus 81 kcfs x 16/24)	Apr 30 - May	Feb 1, 2023 PNCA data submittal
Fish spill	46,444 cfs (= 20 kcfs x 8/24 x 20/30 plus 81 kcfs x 16/24 x 20/30 plus 18 kcfs x 10/30)	Jun	Feb 1, 2023 PNCA data submittal
Fish spill	18,000 cfs	Jul	Feb 1, 2023 PNCA data submittal

Appendix A
Project Operating Procedures, Other Major Step I Projects, *(continued)*

Constraint Type	Requirements	Explanation	Source
Spill Cap	70,200 cfs (= 81 kcfs x 13/15)	Apr 15	Feb 1, 2023 PNCA data submittal, not currently used
Spill Cap	81,000 cfs	Apr 30 - May	Feb 1, 2023 PNCA data submittal, used in calculations for monthly fish spill targets above for "gas cap spill" (e.g. see fish spill calculation for Apr 15)
Spill Cap	67,300 cfs (= 81 kcfs x 20/30 plus 40 kcfs x 10/30)	June	Feb 1, 2023 PNCA data submittal, not currently used
Spill Cap	40,000 cfs	Jul - Aug	Feb 1, 2023 PNCA data submittal, not currently used
Minimum Flow	11,600 cfs	Aug - Nov and Mar - Jul	Feb 1, 2023 PNCA data submittal
MOP operation	235.3 ksfd (735.5 ft)	Aug 31 - Mar	Feb 1, 2021 PNCA data submittal (Note: the data submittal outlines MOP as applying Sep-Mar but to model those minimums on a monthly timestep, the elevation for Aug31 must be set to MOP so that the first day of Sep starts above the minimum.)
MOP operation	228.2 ksfd (733.8 ft)	Apr - Aug 15	Feb 1, 2021 PNCA data submittal (Note: see above)

Little Goose (77; 518)

Constraint Type	Requirements	Explanation	Source
Bypass date		None	
Other spill	620 cfs	Aug 15	Feb 1, 2009 PNCA data submittal
Other spill	500 cfs	Aug 31	Feb 1, 2009 PNCA data submittal
Other spill	750 cfs	Sep	Feb 1, 2009 PNCA data submittal
Other spill	640 cfs	Oct	Feb 1, 2009 PNCA data submittal
Other spill	500 cfs	Nov	Feb 1, 2009 PNCA data submittal
Other spill	460 cfs	Dec	Feb 1, 2009 PNCA data submittal
Other spill	120 cfs	Jan	Feb 1, 2009 PNCA data submittal
Other spill	240 cfs	Feb	Feb 1, 2009 PNCA data submittal
Other spill	380 cfs	Mar	Feb 1, 2009 PNCA data submittal
Other spill	530 cfs	Apr 15	Feb 1, 2009 PNCA data submittal
Other spill	580 cfs	Apr 30	Feb 1, 2009 PNCA data submittal
Other spill	660 cfs	May	Feb 1, 2009 PNCA data submittal
Other spill	590 cfs	Jun - Jul	Feb 1, 2009 PNCA data submittal
Incremental spill	None	Removed	
Fish Spill (% of outflow)	28% (= 30% x 14/15)	Aug 15	Feb 1, 2023 PNCA data submittal
Performance Standard Fish Spill (% of outflow)	8.7% (= 30% x 8/24 x 13/15)	Apr 15	Feb 1, 2023 PNCA data submittal
Flex Fish Spill	46,800 cfs (= 81 cfs x 16/24 x 13/15)	Apr 15	Feb 1, 2023 PNCA data submittal
Performance Standard Fish Spill (% of outflow)	10% (= 30% x 8/24 x 15/15)	Apr 30 - May	Feb 1, 2023 PNCA data submittal
Flex Fish Spill	54,000 (= 81 cfs x 16/24)	Apr 30 - May	Feb 1, 2023 PNCA data submittal
Performance Standard Fish Spill (% of outflow)	16.67% (= 30% x 8/24 x 20/30 plus 30% x 24/24 x 10/30)	Jun	Feb 1, 2023 PNCA data submittal
Flex Fish Spill	36,000 (= 81 cfs x 16/24 x 20/30)	Jun	Feb 1, 2023 PNCA data submittal
Fish Spill (% of outflow)	30%	Jul	Feb 1, 2023 PNCA data submittal
Fish Spill	467 cfs (= 7 kcfs x 1/15)	Aug 15	Feb 1, 2023 PNCA data submittal
Fish Spill	7,000 cfs	Aug 31	Feb 1, 2023 PNCA data submittal
Fish Spill	527 cfs (= 7 kcfs x 4/24 x 14/31)	Oct	Feb 1, 2023 PNCA data submittal
Fish Spill	272 cfs (= 7 kcfs x 4/24 x 7/30)	Nov	Feb 1, 2023 PNCA data submittal
Fish Spill	565 cfs (= 7 kcfs x 4/24 x 15/31)	Mar	Feb 1, 2023 PNCA data submittal
Spill Cap	30,000 cfs	Jul - Aug 31	Feb 1, 2023 PNCA data submittal, not currently used
Spill Cap	81,000 cfs	Apr 15 - Jun	Feb 1, 2023 PNCA data submittal, used in calculations for monthly fish spill targets above for "gas cap spill" (e.g. see "Flex Fish Spill" for Apr 15 period)
Minimum Flow	11,500 cfs	Aug 15 - Oct and Mar - Jul	Feb 1, 1997 PNCA data submittal (Note: data submittal says the flow minimum applies through Nov; consider updating for future AOP studies)
MOP operation	272.7 ksfd (635.5 ft)	Aug 31 - Mar	Feb 1, 2021 PNCA data submittal
MOP operation	264.4 ksfd (633.8 ft)	Apr 15 - Aug 15	Feb 1, 2021 PNCA data submittal

Appendix A
Project Operating Procedures, Other Major Step I Projects, *(continued)*

Lower Monumental (78; 504)

Constraint Type	Requirements	Explanation	Source
Bypass date		None	
Other spill	860 cfs	Aug 15	Feb 1, 2009 PNCA data submittal
Other spill	770 cfs	Aug 31	Feb 1, 2009 PNCA data submittal
Other spill	780 cfs	Sep	Feb 1, 2009 PNCA data submittal
Other spill	840 cfs	Oct	Feb 1, 2009 PNCA data submittal
Other spill	750 cfs	Nov	Feb 1, 2009 PNCA data submittal
Other spill	720 cfs	Dec	Feb 1, 2009 PNCA data submittal
Other spill	450 cfs	Jan	Feb 1, 2009 PNCA data submittal
Other spill	410 cfs	Feb	Feb 1, 2009 PNCA data submittal
Other spill	560 cfs	Mar	Feb 1, 2009 PNCA data submittal
Other spill	770 cfs	Apr 15	Feb 1, 2009 PNCA data submittal
Other spill	780 cfs	Apr 30	Feb 1, 2009 PNCA data submittal
Other spill	840 cfs	May	Feb 1, 2009 PNCA data submittal
Other spill	780 cfs	Jun	Feb 1, 2009 PNCA data submittal
Other spill	790 cfs	Jul	Feb 1, 2009 PNCA data submittal
Incremental spill	None	Removed	
Fish Spill	16,333 cfs (= 17 kcfs x 14/15)	Aug 15	Feb 1, 2023 PNCA data submittal
Fish Spill	7,000 cfs	Aug 31	Feb 1, 2023 PNCA data submittal
Fish Spill	602 cfs (= 8 kcfs x 4/24 x 14/31)	Oct	Feb 1, 2023 PNCA data submittal
Fish Spill	311 cfs (= 8 kcfs x 4/24 x 7/30)	Nov	Feb 1, 2023 PNCA data submittal
Fish Spill	645 cfs (= 8 kcfs x 4/24 x 15/31)	Mar	Feb 1, 2023 PNCA data submittal
Fish Spill	69,911 cfs (= 106 kcfs x 16/24 x 13/15 plus 30 kcfs x 8/24 x 13/15)	Apr 15	Feb 1, 2023 PNCA data submittal
Fish Spill	80,667 cfs (= 106 kcfs x 16/24 plus 30 kcfs x 8/24)	Apr 30 - May	Feb 1, 2023 PNCA data submittal
Fish Spill	59,444 cfs (= 106 kcfs x 16/24 x 20/30 plus 30 kcfs x 8/24 x 20/30 plus 17 kcfs x 24/24 x 10/20)	Jun	Feb 1, 2023 PNCA data submittal
Fish spill	17,000 cfs	Jul	Feb 1, 2023 PNCA data submittal
Spill Cap	91,867 cfs (=106 kcfs x 13/15)	Apr 15	Feb 1, 2023 PNCA data submittal, not currently used
Spill Cap	106,000 cfs	Apr 30 - May	Feb 1, 2023 PNCA data submittal, used in calculations for monthly fish spill targets above for “gas cap spill” (e.g. see the spill calculations for Apr 15)
Spill Cap	76,333 cfs (=106 kcfs x 20/30 + 17 kcfs x 10/30)	Jun	Feb 1, 2023 PNCA data submittal, not currently used
Spill Cap	17,000 cfs	Jul - Aug 31	Feb 1, 2023 PNCA data submittal, used in calculations for monthly fish spill targets above for “gas cap spill” (e.g. see the spill calculations for Jun)
Minimum Flow	11,500 cfs	Aug - Oct and Mar - Jul	Feb 1, 1997 PNCA data submittal (Note: data submittal says the flow minimum applies through Nov; consider updating for future AOP studies)
MOP operation	185.2 ksfd (538.5 ft)	Aug 31 - Mar	Feb 1, 2021 PNCA data submittal
MOP operation	183.0 ksfd (537.8 ft)	Apr 15 - Aug 15	Feb 1, 2021 PNCA data submittal

Cushman (158; 2206)

Constraint Type	Requirements	Explanation	Source
Other Spill	200 cfs	Aug - Sep	FERC license no. 460
Other Spill	210 cfs	Oct	FERC license no. 460
Other Spill	225 cfs	Nov	FERC license no. 460
Other Spill	235 cfs	Dec	FERC license no. 460
Other Spill	230 cfs	Jan	FERC license no. 460
Other Spill	215 cfs	Feb - Mar	FERC license no. 460
Other Spill	220 cfs	Apr	FERC license no. 460
Other Spill	240 cfs	May	FERC license no. 460
Other Spill	230 cfs	Jun	FERC license no. 460

La Grande (156; 2188)

Constraint Type	Requirements	Explanation	Source
Other Spill	30 cfs	All periods	April 1, 1997 PNCA data submittal

Appendix A
Project Operating Procedures, Other Major Step I Projects, *(continued)*

Lower Baker (154; 2025)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	1,000 cfs	Aug - Sep	Feb 1, 2014 PNCA data submittal
Minimum Flow	1,200 cfs	Oct - Jul	Feb 1, 2014 PNCA data submittal
Maximum Flow	3,600 cfs	Aug	Feb 1, 2014 PNCA data submittal
Maximum Flow	3,200 cfs	Sep - Oct	Feb 1, 2014 PNCA data submittal
Maximum Flow	3,600 cfs	Nov - Dec	Feb 1, 2014 PNCA data submittal
Maximum Flow	5,600 cfs	Jan - Mar	Feb 1, 2014 PNCA data submittal
Maximum Flow	3,600 cfs	Apr - May	Feb 1, 2014 PNCA data submittal
Maximum Flow	5,600 cfs	Jun - Jul	Feb 1, 2014 PNCA data submittal
Max Storage Limit	67.0 ksfd (442.4 ft)	All periods	Feb 1, 2013 PNCA data submittal
Min Storage Limit	30.4 ksfd (404.8 ft)	Aug - Sept	Feb 1, 2013 PNCA data submittal
Min Storage Limit	18.0 ksfd (389.0 ft)	Oct - May	Feb 1, 2013 PNCA data submittal
Min Storage Limit	30.4 ksfd (404.8 ft)	Jun - Jul	Feb 1, 2013 PNCA data submittal

Upper Baker (153; 2028)

Constraint Type	Requirements	Explanation	Source
Max Storage Limit	107.4 ksfd (727.8 ft)	Aug - Sep	Feb 1, 2016 PNCA data submittal
Max Storage Limit	89.3 ksfd (720.0 ft)	Oct	Feb 1, 2016 PNCA data submittal
Max Storage Limit	77.1 ksfd (714.8 ft)	Nov	Feb 1, 2016 PNCA data submittal
Max Storage Limit	70.8 ksfd (711.6 ft)	Dec - Feb	Feb 1, 2016 PNCA data submittal
Max Storage Limit	84.6 ksfd (718.0 ft)	Mar - Apr	Feb 1, 2016 PNCA data submittal
Max Storage Limit	107.4 ksfd (727.8 ft)	May - Jul	Feb 1, 2016 PNCA data submittal
Min Storage Limit	100.5 ksfd (724.8 ft)	Aug	Feb 1, 2016 PNCA data submittal
Min Storage Limit	93.5 ksfd (721.8 ft)	Sep	Feb 1, 2016 PNCA data submittal
Min Storage Limit	25.5 ksfd (685.0 ft)	Oct - Apr	Feb 1, 2016 PNCA data submittal
Min Storage Limit	86.5 ksfd (718.8 ft)	May	Feb 1, 2016 PNCA data submittal
Min Storage Limit	100.5 ksfd (724.8 ft)	Jun - Jul	Feb 1, 2016 PNCA data submittal

Timothy (166; 117)

Constraint Type	Requirements	Explanation	Source
Minimum Flow	10 cfs	All periods	AOP98 Basetape
Maximum Flow	535 cfs	All periods	AOP98 Basetape
Minimum Content	31.1 ksfd (3190.0 ft)	Aug	Feb 1, 2001 PNCA data submittal
Minimum Content	27.8 ksfd (3185.2 ft) (= (31.1 ksfd +24.5 ksfd)/2)	Sep	Feb 1, 2001 PNCA data submittal
Minimum Content	24.5 ksfd (3180.0 ft)	Oct - May	Feb 1, 2001 PNCA data submittal
Minimum Content	31.1 ksfd (3190.0 ft)	Jun - Jul	Feb 1, 2001 PNCA data submittal
Minimum Content	0.0 ksfd (3125.0 ft)	Empty by end of Critical Period	Feb 1, 2001 PNCA data submittal

Long Lake (64; 1305)

Constraint Type	Requirements	Explanation	Source
Minimum Content	50.1 ksfd (1535.0 ft)	Aug - Nov	Feb 1, 2002 PNCA data submittal
Minimum Content	19.7 ksfd (1522.0 ft)	Dec - Mar	Feb 1, 2002 PNCA data submittal
Minimum Content	50.1 ksfd (1535.0 ft)	Apr - Jul	Feb 1, 2002 PNCA data submittal

Priest Lake (146; 1470)

Constraint Type	Requirements	Explanation	Source
Rule Curve	35.5 ksfd (3.0 ft)	Aug - Sep	Hard coded rule curve values for proportional draft calculation; CP overwrites these values with first-coded operation to meet load. In place since AOP11.
Rule Curve	0.0 ksfd (0.0 ft)	Oct - Apr	‘’
Rule Curve	35.5 ksfd (3.0 ft)	May - Jul	‘’
Maximum Content	0.0 ksfd (0.0 ft)	Oct - Nov	Feb 1, 2003 PNCA data submittal
Max/Min Content	35.5 ksfd (3.0 ft)	Maintain at or near, after runoff through Sep	

Ross (150; 2070)

Constraint Type	Requirements	Explanation	Source
Maximum Flow	6,300 cfs	All periods	Feb 1, 2005 PNCA data submittal
Minimum Contents	521.6 ksfd (1601.0 ft)	Aug, dependent on Skagit fisheries	Feb 1, 2012 PNCA data submittal
Minimum Contents	504.5 ksfd (1598.0 ft)	Jun, dependent on Skagit fisheries	Feb 1, 2012 PNCA data submittal
Minimum Contents	530.5 ksfd (1602.5 ft)	Jul, dependent on Skagit fisheries	Feb 1, 2012 PNCA data submittal
Target Contents	0.0 ksfd (1475.0 ft)	Empty at end of CP	Feb 1, 2012 PNCA data submittal

Appendix A
Project Operating Procedures, Other Major Step I Projects, *(continued)*

Constraint Type	Requirements	Explanation	Source
ARCs and VRCs	Fixed	Based on 2010 Modified Streamflows	Sent from SCL, April 2012

Gorge (152; 2065)

Constraint Type	Requirements	Explanation	Source
Maximum Flow	4,500 cfs	Aug 31	Feb 1, 2013 PNCA data submittal
Maximum Flow	4,000 cfs	Sep - Oct	Feb 1, 2013 PNCA data submittal
Maximum Flow	4,600 cfs	Nov - Dec	Feb 1, 2013 PNCA data submittal
Maximum Flow	5,000 cfs	Mar	Feb 1, 2013 PNCA data submittal
Maximum Flow	4,500 cfs	Apr	Feb 1, 2013 PNCA data submittal
Maximum Flow	3,500 cfs	May	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,000 cfs	Aug	Feb 1, 2013 PNCA data submittal
Minimum Flow	1,500 cfs	Sep - Oct	Feb 1, 2013 PNCA data submittal
Minimum Flow	1,700 cfs	Nov	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,000 cfs	Dec	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,700 cfs	Jan	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,600 cfs	Feb	Feb 1, 2013 PNCA data submittal
Minimum Flow	3,000 cfs	Mar	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,800 cfs	Apr	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,000 cfs	May	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,400 cfs	Jun	Feb 1, 2013 PNCA data submittal
Minimum Flow	2,600 cfs	Jul	Feb 1, 2013 PNCA data submittal
Additional Minimum Flows	Monthly minimum flows that vary by water year	All periods	Provided via the Skagit Fisheries Settlement

Appendix B
Other Changes from AOP24

This Appendix contains other changes to project operating procedures, constraints and plant data beyond those described in sections 7(a) through (g), some of which were highlighted in section 7(h).

- Brownlee no longer has an at-site minimum flow requirement but is required to support a year-round flow of 6500 cfs at Hells Canyon for navigation purposes, based on the 1988 Agreement between the Corps of Engineers and Idaho Power Company as well as the proposed license modeling criteria of the Hells Canyon FERC license application. In addition, the Brownlee operation was refined to not start the CP full and carry over the AOP 20-24 fall shaping;
- Hungry Horse's modelling of the transmission constraint with Libby was updated to remove the 9,500 cfs maximum flow limit and to update the head vs maximum generation table to more consistently model the 310 MW generation limit during all periods;
- Little Goose, Lower Monumental and Lower Granite (non-base system projects) operations were modified to implement Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) requirements, and includes changes to minimum operating pool, minimum turbine flows and spill;
    - The Storage Limits table was adjusted to the Lower Monumental, Little Goose, and Lower Granite minimum operating pool (MOP) operation per the 1 February 2021 PNCA data submittal;
    - The Flow Limits table was updated for Lower Granite’s, Little Goose’s, and Lower Monumental’s Minimum Turbine Flow (supported in the Spill Limits file) based on data from the February 1, 2021 PNCA data submittal;
    - The Spill Limits table was adjusted for Lower Granite (minimum fish spill) to more closely match the 1 February 2023 PNCA data submittal. In addition, the Spill Limits tables were updated in Step I for Little Goose and Lower Monumental per the 1 February 2021 PNCA data submittal;
- The 30-year storage operation at Mossyrock, Cushman #1, Alder, Swift #1, Merwin, Yale, and Timothy was set to a fixed operation (first coded) from AOP06 because they are no longer coordinated resources in PNCA Planning. Although included in the Step I hydro regulation model, these projects are now essentially the same as a hydro-independent project;
- The Head vs. Generation per Flow table (H/K) was updated for Libby, Dworshak, Little Goose, and Lower Granite per the 1 February 2016 PNCA data submittal. The Head vs H/K tables were updated for Ice Harbor and Chief Joseph, and Hungry Horse per the 1 February 2016 PNCA data submittal. The Head vs H/K table was updated for Long Lake and Noxon from an addendum (18 May 2016) to the 1 February 2016 PNCA data submittal;
- Project Limits tables (LT) were updated for Long Lake and Noxon from an addendum (18 May 2016) to the 1 February 2016 PNCA data submittal;

Appendix B
Other Changes from AOP24, Gorge (152; 2065) *(continued)*

- Discharge vs. Generation tables (GD) were updated in Step I for Cabinet Gorge, Little Falls, Monroe Street, Nine Mile, Post Falls, Upper Falls, and Wanapum per the 1 February 2016 PNCA data submittal. In addition, the GD tables were updated for Box Canyon per an addendum (dated 14 September 2016) to the 1 February 2016 PNCA data submittal;
- Discharge vs. Spill tables (SD) were updated in Step I for Cabinet Gorge, Little Falls, Monroe Street, Nine Mile, Post Falls, Upper Falls, and Wanapum per the 1 February 2016 PNCA data submittal. In addition, the SD tables were updated for Box Canyon (Steps I, II, and III) per an addendum (dated 14 September 2016) to the 1 February 2016 PNCA data submittal. A correction was made for the Priest Rapids Discharge vs. Spill table based on the 1 February 2006 PNCA data submittal;
- Storage vs Maximum Discharge table (MD) was updated for Kerr (also referred to as Seli'š Ksanka Qlispe' (SKQ) Dam after 2015) during implementation of 1 February 2016 PNCA data updates based on data from the 1 February 2015 PNCA data submittal. Update to Arrow's Storage vs Maximum Discharge table due to limited use of one low-level outlet (LLOG1) based on data from the 1 February 2016 PNCA data submittal. Storage vs Maximum Discharge table (MD) was updated for Corra Linn with an adjustment for Grohman Narrows hydraulic capacity curve;
- The Discharge vs Tailwater Elevation table was updated at Arrow to reflect the limited use of one low-level outlet gate based, per the 1 February 2016 PNCA data submittal;
- The Storage limits table in Step I was updated for Chelan during implementation of 1 February 2016 data updates to better model slope of data from the 1 February 1996 PNCA data submittal. A Correction to Libby's End Storage table was made during implementation of the 1 February 2019 PNCA data submittal based on data from the 1 February 1989 PNCA data submittal;
- The Flow Limits table was updated for Cabinet Gorge (min flow), per the 1 February 2016 PNCA data submittal. In addition, the Flow Limits table was also updated for Cushman 1, per Tacoma Power's FERC license and confirmed in October 2020;
- The Storage Limits table was updated for Upper Baker (max and min storage), per the 1 February 2016 PNCA data submittal;
- Update to Monroe Street's, Post Falls', and Upper Falls' Requested Spill values (supported in Spill Limits file) based on data from the 1 February 2019 PNCA data submittal; in addition, the Spill Limits table was also updated for Cushman 2, per Tacoma Power's FERC license;
- Seattle City Light's Tributary flows between Newhalem and Marblemount were updated for May through July based on SCL's current 2021 FERC-approved operations; and
- The Willamette hydro-independent projects (Detroit, Lookout Point, Green Peter, Cougar, Foster, Dexter, Big Cliff, and Hills Creek) are updated with generation data submitted by USACE in March 2023 to reflect Willamette Valley System Environmental Impact Statement injunction operations.

Appendix C
Abbreviations

Abbreviation	Description
aMW	Average megawatt
AOP	Assured Operating Plan
APOC	Arrow project operating criteria
ARC	Assured Refill Curve
BCH	BC Hydro
BPA	Bonneville Power Administration
cfs	Cubic feet per second, a rate of flow
CGS	Columbia Generating Station
CRC	Critical Rule Curve
CRTOC	Columbia River Treaty Operating Committee
DDPB	Determination of downstream power benefits.
DOP	Detailed operating plan
FCOP	Flood Control Operating Plan, “Columbia River Treaty Flood Control Operating Plan”, dated May 2003, and its updates
FELCC	Firm energy load carrying capability
FRM	Flood Risk Management
IJC	International Joint Commission
IPC	Idaho Power Company
kcfs	One thousand cubic feet per second, a rate of flow
ksfd	One thousand cubic feet per second per day (or 24-hour period), a measurement of volume
Maf	Million acre-feet, a measurement of volume
MW	Megawatt
ORC	Operating Rule Curve
ORCLL	Operating Rule Curve Lower Limit
PDR	Power Discharge Requirement
PEB	Permanent Engineering Board
PNWA	Pacific Northwest Area
POP	Principles and Procedures
URC	Upper Rule Curve
U.S.	United States
USACE	U.S. Army Corps of Engineers
VRC	Variable Refill Curve
VRCLL	Variable Refill Curve Lower Limits
WB	White Book

Appendix D
Glossary of Terms

Unless otherwise noted by reference to a different source[1], the reference is to a location in this AOP document.

Term	Definition or Description	Reference
2010 Modified Streamflows	The 2010 Modified Streamflows published by BPA in August 2011	Section 7(e)
29 August 1996 Entity Agreement	The "Columbia River Treaty Entity Agreement on Resolving the Dispute on Critical Period Determination, the Capacity Entitlement, for the 1998-99, 1999-00, and 2000-01 AOP/DDPBs, and Operating Procedures for the 2001-02 and Future AOPs," signed 29 August 1996	Section 7(h)
AOP20-24	AOPs that were prepared by the Entities for operating years 2019/20 through 2023/24.	Section 2(b)(ii)
AOP25 Studies	Any reference to the "AOP25 Studies" in this document will mean the critical period and long-term studies based on C2 Prime (C2'), as described to the Permanent Engineering Board by the Entities in January 2024.	Section 2(c)
Arrow Project Operating Criteria (APOC)	A set of operating criteria applied to Arrow Dam in order to calculate the Treaty operation.	Section 4(c)(ii)
Aspects Agreement	An agreement on Aspects of the Delivery of the Canadian Entitlement for April 1, 1998 through September 15, 2024, dated March 29, 1999, as amended on December 13, 2007, among the Entities	Section 5
Assured Operating Plan (AOP)	Assured operating plan for Canadian Treaty Storage; an AOP for a specific operating year can be abbreviated by appending the last two digits of the operating year (e.g. AOP25 is for the operating year 2025, that is from 1 August 2024 through 31 July 2025).	Section 1 POP – Appendix 2

[1] **Key to Sources**

"Treaty" refers to "Treaty between Canada and the United States of America relating to the cooperative development of the water resources of the Columbia River Basin dated 17 January 1961"

"Interim Period DDPB" refers to "Columbia River Treaty Interim Period Determination of Downstream Power Benefits" dated ● 2024,

"POP" refers to "Columbia River Treaty Entity Agreement on the Principles and Procedures for Preparing and Implementing Hydroelectric Operating Plans for Operation of Canadian Treaty Storage" dated October 2003 and signed 16 December 2003, as updated.

Term	Definition or Description	Reference
Assured Refill Curves (ARCS)	The Assured Refill Curve indicates the end of month storage content required to assure reservoir refill based on the 1931 historical volume inflow (the second lowest Jan - Jul volume inflow in the 30-year streamflow record). The resulting curve provides a check on the Variable Refill Curve and allows a deeper draft if the Variable Refill Curve is found to be overly conservative (POP).	Section 3(b)(i) POP – Section 2.3.B(1)
Average critical period load factor	The average of the monthly load factors during the Critical Period (see Critical Period)	Section 7(a) Treaty - Article 1(a)
Base System	The plants, works and facilities listed in the table in Annex B of the Treaty as enlarged from time to time by the installation of additional generating facilities, together with any plants, works or facilities which may be constructed on the main stem of the Columbia River in the United States of America.	Appendix A, Base System Projects Treaty - Article 1(b)
Canadian Entitlement	The downstream power benefits to which Canada is entitled as described in Article V (1) and Article VII of the Treaty and determined in accordance with the Treaty; for more information, refer to the Interim Period DDPB.	Section 5
Canadian Entity	The Canadian Entity, except for disposals of Canadian Entitlement, is the British Columbia Hydro and Power Authority (BC Hydro). For disposals of the Canadian Entitlement, the Canadian Entity is the government of the Province of British Columbia.	POP - Section 1.5
Canadian Treaty Storage	The storage provided by Canada under Article II of the Treaty. (“Canadian storage” is the term used in the Treaty itself; it is defined in Section 1(c) of the Treaty)	Section 1
Columbia Generating Station	Nuclear power generator owned by Energy Northwest	
Columbia River Treaty Operating Committee (CRTOC)	The Columbia River Treaty Operating Committee authorized by the Entities to govern implementation of the Columbia River Treaty	
Composite Critical Rule Curve	The Composite CRC for the whole of Canadian Treaty Storage for a month is the summation of the storage corresponding to the Critical Rule Curves indicated for Mica, Arrow and Duncan for that month.	Section 3(a) POP - Section 2.4.A

Term	Definition or Description	Reference
Composite Operating Rule Curve (ORC)	The Composite ORC for the whole of Canadian Treaty Storage for a month is the summation of the storage corresponding to the Operating Rule Curves indicated for Mica, Arrow and Duncan for that month. (see Operating Rule Curve)	Section 3(a) POP – Section 2.4.A
Critical Period	The period, beginning with the initial release of stored water from full reservoir conditions and ending with the reservoirs empty, when the water available from reservoir releases plus the natural stream flow is capable of producing the least amount of hydroelectric power in meeting system load requirements. (This is the same as the term “critical stream flow period” in the Treaty.)	Section 2(b)(iii) POP - Section 2.2.A
Critical Rule Curves (CRCs)	The Critical Rule Curves are developed for each reservoir by the Critical Period Regulation Study. They guide the reservoir drafts and fills to maximize the system firm energy load carrying capability. The first Critical Rule Curve is used in the development of the Operating Rule Curve. The Critical Rule Curves define proportional drafting points below the Operating Rule Curve, to guide reservoir operation while generating system firm energy load carrying capability during low water conditions. The designation “CRC1” indicates the Critical Rule Curve from the 1st year of the critical period that is used in the development of the Operating Rule Curve.	Section 3(a) POP – Section 2.3.A
Detailed Operating Plan (DOP)	Pursuant to Article XIV(2) of the Treaty, the detailed operating plan can be created to update an AOP.	Section 6
Determination of the downstream power benefits (DDPB)	The determination of downstream power benefits is the determination of additional power generation in the U.S. Base System that results from the coordinated power operation in the AOP. The DDPB for a particular operating year is abbreviated by appending the last two digits of the operating year (e.g. the DDPB24 indicates the DDPB for the operating year from 1 August 2023 through 31 July 2024).	Section 5
Entities/Entity	An entity designated by either Canada or the United States of America under Article XIV of the Treaty and includes its lawful successor.	Section 1 Treaty - Article 1(g)
Firm energy load carrying capability (FELCC)	The firm energy load that a system is able to supply in any period from firm resources of the coordinated system, after deducting the required energy reserve and forced outage reserve	Section 4(b)

Term	Definition or Description	Reference
Interim Period DDPB	"Columbia River Treaty Interim Period Determination of Downstream Power Benefits"	Section 2(g)(ii)
International Joint Commission (IJC)	The International Joint Commission was created under the Boundary Waters Treaty of 1909 between the United States and Canada to render decisions on the use of boundary waters, investigate important problems arising along the common frontiers not necessarily connected with waterways, and make recommendations on any question referred to it by either government.	Section 7(f)
Joint Optimum	Operation of Canadian Treaty Storage [in operating plans designed] to achieve optimum power generation at-site in Canada and downstream in Canada and the U.S.	Section 2(c)
Joint Optimum Study	The Joint Optimum system regulation studies, both critical period and long-term studies. The Joint Optimum study can be referred to by appending "-41" to the study shorthand name (e.g. "AOP25-41").	Section 2(c)
Load factor	A "monthly load factor" is the ratio of the average load for a month to the integrated maximum load over one hour during that month An "average load factor" is the monthly load factor averaged over one year, weighted by days in each month.	Section 7(a) Treaty - Article 1(j)
Operating Rule Curve Lower Limits (ORCLL)	Indicates the minimum month-end storage contents which must be maintained to provide a high probability of maintaining the system firm energy load carrying capability from 1 Jan to 30 Apr, in the event that the Variable Refill Curve permits storage to be emptied prior to the start of the freshet.	Section 3(c) POP – Section 2.3.C
Operating Rule Curves (ORCs)	Is developed from the 1st Critical Rule Curve (CRC1), Assured Refill Curve (ARC), Variable Refill Curve (VRC), Operating Rule Curve Lower Limit (ORCLL) and Upper Rule Curve (URC), as described in the POP.	Section 3(e) POP – Section 2.3.E
Operating year	The Entities have adopted the 1 August through 31 July period as the operating year.	Section 2(c) POP - Section 1.2
Pacific Northwest Area (PNWA)	The Pacific Northwest Area for the purposes of the determinations in Paragraph 7, Annex B of the Treaty is Oregon, Washington, Idaho, and Montana west of the Continental Divide but shall exclude areas served on the Treaty ratification date by the California Oregon Power Company and the Utah Power and Light Company.	Treaty - Annex B

Term	Definition or Description	Reference
Power discharge requirements (PDRs)	A parameter used to develop the Refill Curves, determined in accordance with the POP.	Section 3(b) POP - Section 2.3.B(3)
Principles and Procedures (POP)	"Columbia River Treaty Entity Agreement on the Principles and Procedures for Preparing and Implementing Hydroelectric Operating Plans for Operation of Canadian Treaty Storage" dated October 2003 and signed 16 December 2003, as updated.	
Protocol	"Protocol – Annex to Exchange of Notes, Dated January 22, 1964 Between the Governments of Canada and the United States Regarding the Columbia River Treaty"	
Step I system (Step I)	The system for the period covered by the estimate will consist of the Canadian storage, the United States base system, any thermal installation operated in coordination with the base system, and additional hydroelectric projects which will provide storage releases usable by the base system or which will use storage releases that are usable by the base system. The installations included in this system will be those required, with allowance for adequate reserves, to meet the forecast power load to be served by this system in the United States of America, including the estimated flow of power at points of inter-connection with adjacent areas, subject to paragraph 3 of Annex B, plus the portion of the entitlement of Canada that is expected to be used in Canada. The capability of this system to supply this load will be determined on the basis that the system will be operated in accordance with the established operating procedures of each of the projects involved.	Treaty, Annex B, Paragraph 7
Storage	The space in a reservoir which is usable for impounding water for flood control or for regulating stream flows for hydroelectric power generation	Treaty - Article 1(m)
Treaty	"Treaty between Canada and the United States of America relating to the cooperative development of the water resources of the Columbia River Basin dated 17 January 1961"	
Upper Rule Curve (URC)	The Upper Rule Curve defines the minimum reservoir drawdown required to regulate floods to non-damaging levels, if possible. The amount of drawdown varies with the time of year and the runoff volume forecast.	POP – Section 2.3.D
U.S. Entity	The U.S. Entity is composed of the Administrator of the Bonneville Power Administration and the Division Engineer of the Northwestern Division, U.S. Army Corps of Engineers	POP - Section 1.5

Term	Definition or Description	Reference
U.S. optimum	The operation of Canadian Treaty Storage for optimum power in the U.S.	Section 2(d)
U.S. optimum study	Study to establish U.S. Optimum operation. The U.S. Optimum study may be referred to by appending "-11" to the study abbreviation (e.g. "Study 25-11").	POP - Table 4
Variable Refill Curve (VRC)	The Variable Refill Curve indicates the end of month storage content required to refill the reservoir based upon a 95% refill probability, the most current at-site volume inflow forecast, and upstream refill requirements. For nonoperating studies (e.g. Assured Operating Plan and Detailed Operating Plan studies), the curve is developed from actual historic inflows, not forecasts. The Variable Refill Curve provides a guide to optimize production of usable energy, when such production does not jeopardize refill.	Section 3(b) POP – Section 2.3.B(2)
Variable Refill Curve Lower Limits (VRCLL)	The Lower Limit to the Variable Refill Curve values	POP – Section 2.3.B(2)
White Book (WB)	The "White Book" is The Pacific Northwest Loads and Resources Study, produced annually by BPA. It is a set of 10-year projections of retail loads, contract obligations, contract purchases, and resource capabilities of both the federal system and the region, and contains information obtained from other formalized resource planning reports and data submittals. WBs may be referred to by the operating year in which they were developed by appending the last two digits after the name, e.g. WB19 refers to the White Book based on conditions as of 1 December 2019.	BPA 2019 Pacific Northwest Loads and Resources Study

COLUMBIA RIVER TREATY
ENTITY AGREEMENT REGARDING
THE INTERIM PERIOD DETERMINATION OF DOWNSTREAM POWER BENEFITS

The Columbia River Treaty between Canada and the United States of America (**Treaty**) requires that the Entities determine the downstream power benefits to which Canada is entitled in relation to the operation of Canadian Treaty storage.

On July 8, 2024, Canada and the United States of America reached an agreement in principle regarding the modernization of the Treaty**.** The agreement in principle is a milestone in the Treaty modernization process produced in the context of negotiations and is the basis on which the countries are drafting text to amend the Treaty with a view to developing a "Modernized Treaty". Amendments to the Treaty would be subject to domestic processes, on which the Governments are working as a matter of priority to complete, for approval and entry into force.

The following definitions are adopted for the purpose of this agreement:

- *"Interim Period" means the period from and including August 1, 2024, to the first July 31 following the entry into force of the Modernized Treaty."*

- *"Modernized Treaty" means the Treaty relating to the Cooperative Development of the Water Resources of the Columbia River Basin (including its Annexes A and B, and the Protocol), as amended by the Parties in accordance with this AIP."*

The Entities agree that:

- During the term of this agreement, the downstream power benefits to which Canada is entitled are the same as agreed in principle during modernization negotiations, as shown in the attached report, "*Interim Period Determination of Downstream Power Benefits*" (**Interim Period DDPB**).

- This agreement terminates at the end of the Interim Period;

- This agreement will come into force on the same date that the countries empower and charge the Entities to enter into it through an exchange of notes under Article XIV(4) of the Treaty.

The Entities understand that the exchange of notes referred to above will not waive any options that may be available to either country to resolve any difference arising under the Treaty as provided for in its Article XVI, and is without prejudice to the rights and obligations of the countries under the Treaty. Similarly, this entity agreement, including the attachment, does not waive any options that may be available to the Entities to resolve differences between them arising under the Treaty, and is without prejudice to the rights and obligations of the Entities under the Treaty.

IN WITNESS WHEREOF the United States Entity and the Canadian Entity have caused this agreement to be executed.

Executed for the United States Entity:

Signed by:
By: John Hairston Date: 9/17/2024
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John Hairston, Chair
Administrator and Chief Executive Officer
Bonneville Power Administration

HANNAN.WILLIAM.CARL.JR.10801366 Digitally signed by HANNAN.WILLIAM.CARL.JR.1080136699 Date: 2024.09.16 15:36:02 -07'00'
By: 99 Date: 9/16/24

William C. Hannan, Jr., Member
Brigadier General
Commander, Northwestern Division
U.S. Army Corps of Engineers

Executed for the Canadian Entity:

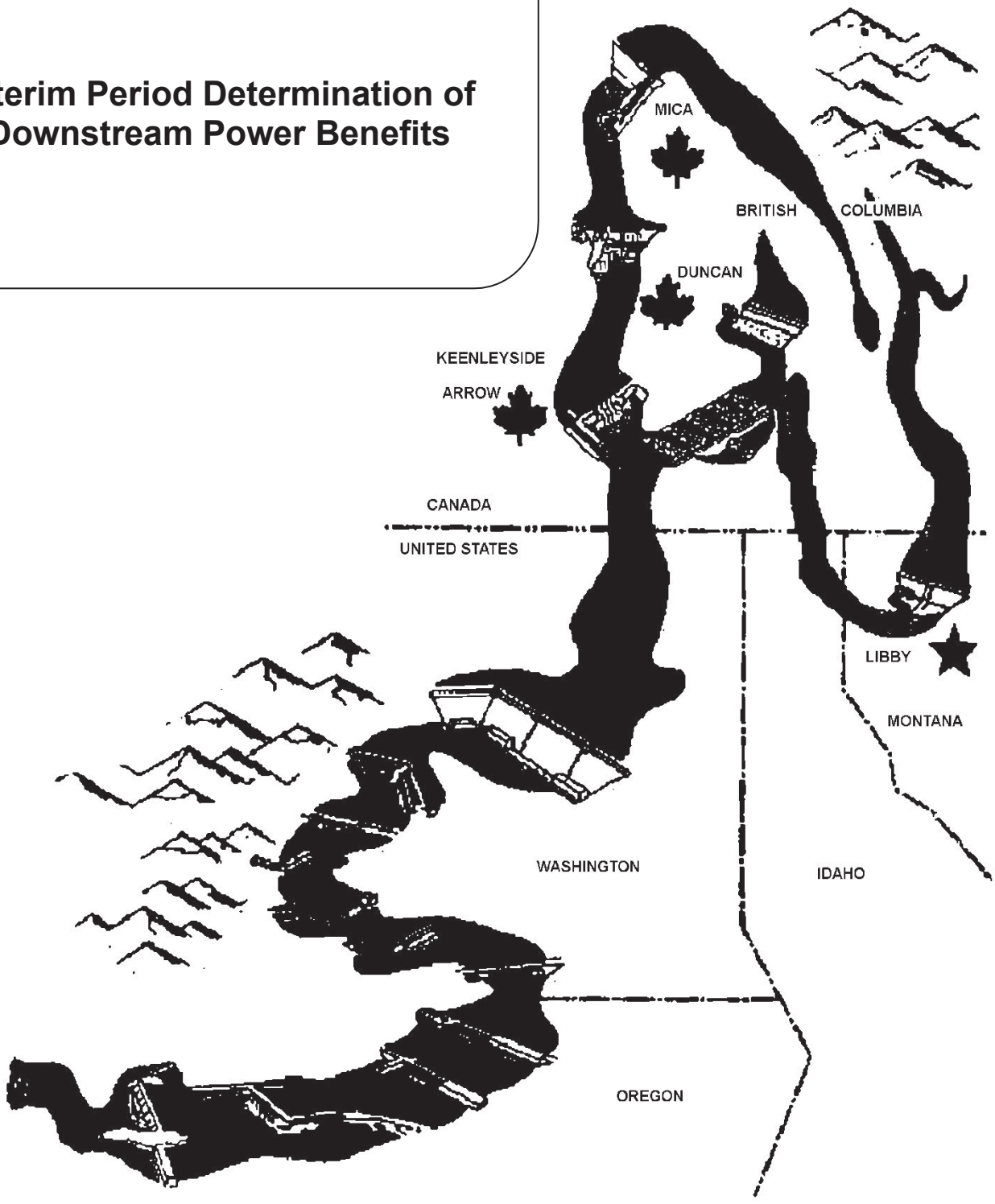
DocuSigned by:
By: Chris O'Riley Date: 9/13/2024
9B053BB55048469...

Chris O'Riley, Chair
President and Chief Executive Officer
British Columbia Hydro and Power Authority

Attachment: *Interim Period Determination of Downstream Power Benefits*

COLUMBIA RIVER TREATY

Interim Period Determination of Downstream Power Benefits



The Canadian and U.S. Entities

September 2024

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Section **Page**

Introduction

The "*Treaty between Canada and The United States of America relating to the Cooperative Development of the Water Resources of the Columbia River Basin*" (**Treaty**), dated 17 January 1961, requires that each year the Entities designated by the two governments will, among other things, determine the downstream power benefits to which Canada is entitled.

Table 1 below shows the downstream power benefits to which Canada is entitled during the term of the agreement to which this report is attached.

Table 1: Downstream Power Benefits to Which Canada Is Entitled Under the *Columbia River Treaty Entity Agreement regarding the Interim Period Determination of Downstream Power Benefits*

Operating Year	Capacity (MW)	Energy (aMW)
2025	660	305
2026	660	305
2027	660	305
2028	660	305
2029	660	305
2030	590	278
2031	573	225
2032	565	225
2033	558	225
2034	550	225
2035	550	225
2036	550	225
2037	550	225
2038	550	225
2039	550	225
2040	550	225
2041	550	225
2042	550	225
2043	550	225
2044	550	225

1. Procedures

Not applicable for reasons stated in the agreement to which this report is attached.

2. Results of Canadian Entitlement Computations

Not applicable for reasons stated in the agreement to which this report is attached.

3. Computation of Maximum Allowable Reduction in Downstream Power Benefits

Not applicable for reasons stated in the agreement to which this report is attached.

4. Delivery of the Canadian Entitlement

Not applicable for reasons stated in the agreement to which this report is attached.

5. Summary of Information Used for Canadian Entitlement Computations

Not applicable for reasons stated in in the agreement to which this report is attached.

6. Summary of Changes Compared to the 2023-24 DDPB and Notable Assumptions

Not applicable for reasons stated in the agreement to which this report is attached.

Enclosure 3: Chart showing Canadian Entitlement amounts for Operating Years 2025 through 2044 (subject to reduction from Specific Operation implementation)

The Canadian Entitlement amounts that began on August 1, 2024, and continue through July 31, 2044, are shown in the table below. These amounts are expected to be reduced by 6.5% per MAF of Specified Operation Volume unilaterally chosen by Canada.

Operating Year	Capacity (MW)	Energy (aMW)
2025	660	305
2026	660	305
2027	660	305
2028	660	305
2029	660	305
2030	590	278
2031	573	225
2032	565	225
2033	558	225
2034	550	225
2035	550	225
2036	550	225
2037	550	225
2038	550	225
2039	550	225
2040	550	225
2041	550	225
2042	550	225
2043	550	225
2044	550	225

DEPARTMENT OF STATE
WASHINGTON

September 20, 2024

Madam:

I have received your predecessor's diplomatic note, dated September 18, 2024, and have the honor to refer to the on-going negotiations between our governments in relation to the modernization of the Treaty between the United States of America and Canada relating to the Cooperative Development of the Water Resources of the Columbia River Basin ("Treaty").

On July 8, our governments reached an agreement in principle regarding the modernization of the Treaty. The agreement in principle refers to a milestone in the Treaty Modernization negotiations. The summary document produced in the context of those negotiations reflects our governments' mutual understandings on core issues and is the basis on which we are drafting text to amend the Treaty with a view to

Mrs. Shalini Anand,
Assistant Deputy Minister, Americas,
Department of Foreign Affairs, Trade
and Development of Canada,
Ottawa.

DIPLOMATIC NOTE

developing a "Modernized Treaty." Amendments to the Treaty would be subject to domestic processes, on which our governments are working as a matter of priority to complete for approval and entry into force.

In the meantime, the Entities designated under Article XIV of the Treaty have developed an assured plan of operation for the operating year 2024-25 (AOP25). AOP25 reflects the C2 Prime studies referred to by the Entities in recent correspondence with the Permanent Engineering Board. AOP25 is attached to the Columbia River Treaty Entity Agreement Regarding an Assured Plan of Operation for 2024-25 ("AOP25 Entity Agreement").

The executed AOP25 Entity Agreement was enclosed with your note and, per its terms, becomes effective upon an exchange of notes between our governments pursuant to Article XIV(4) of the Treaty.

The Government of the United States of America observes the AOP25 Entity Agreement provides that "[t]he Entities will agree to assured plans of operation for each operating year subsequent to operating year 2024-25, but if by 2400 hours on January 31 of any year the Entities have not agreed in writing to the assured plan of operation in relation to the operating year

that starts on the following August 1, the assured plan of operation for that operating year will be the then-applicable assured plan of operation."

The Entities have also determined the downstream power benefits in the United States of America to which Canada would be entitled in the period before the Modernized Treaty enters into force; these are the same as the Canadian Entitlement agreed in principle during negotiations and enclosed with your note. These downstream power benefits are set out in a report entitled the Interim Period Determination of Downstream Power Benefits. In turn, that report is attached to the Columbia River Treaty Entity Agreement Regarding the Interim Period Determination of Downstream Power Benefits ("DDPB Entity Agreement").

The executed DDPB Entity Agreement was attached to your note and, per its terms, becomes effective upon an exchange of notes between our Governments pursuant to Article XIV(4) of the Treaty.

The Government of the United States of America recognizes the scope of the Treaty, which remains in force, includes "cooperative measures for hydroelectric power generation and flood control" and so encompasses the AOP25 Entity Agreement and the DDPB Entity Agreement.

This reply, together with your note, constitutes the exchange of notes contemplated by Article XIV(4) for the purposes of empowering and charging the Entities to enter into the AOP25 Entity Agreement and the DDPB Entity Agreement, including any subsequent entity agreements in relation to assured plans of operation for operating years subsequent to operating year 2024-25, as contemplated by the AOP25 Entity Agreement.

The Government of the United States of America shares the Government of Canada's view that AOP25 departs substantially from the immediately preceding assured plan of operation. Thus, under Article IV(1) of the Treaty , it must be confirmed by an exchange of notes between the Government of the United States of America and the Government of Canada in order to be effective. I am pleased to provide, via this note, the Government of the United States of America's confirmation of AOP25 which, with the Government of Canada's confirmation previously communicated in your note, constitutes the confirmation by exchange of notes required under Article IV(1) and makes AOP25 effective.

The Government of the United States of America understands the Entities are taking the actions set out in this note as a prudent step to

enable continued coordinated operation of storage projects on the Columbia River pending the entry into force of the Modernized Treaty, notwithstanding the disagreements between them on the development of assured operating plans and the determination of downstream power benefits. The Government of the United States of America emphasizes its understanding the empowerment, charge, and confirmation provided through this exchange of notes does not waive any options that may be available to either Party to resolve any difference arising under the Treaty, as provided in its Article XVI and is without prejudice to the rights and obligations of the Parties under the Treaty.

The Government of the United States of America understands that the Government of Canada will provide a French version of its note, equally valid, within 60 days of the date of its note.

Accept, Sir, the renewed assurances of my high consideration.

For the Secretary of State