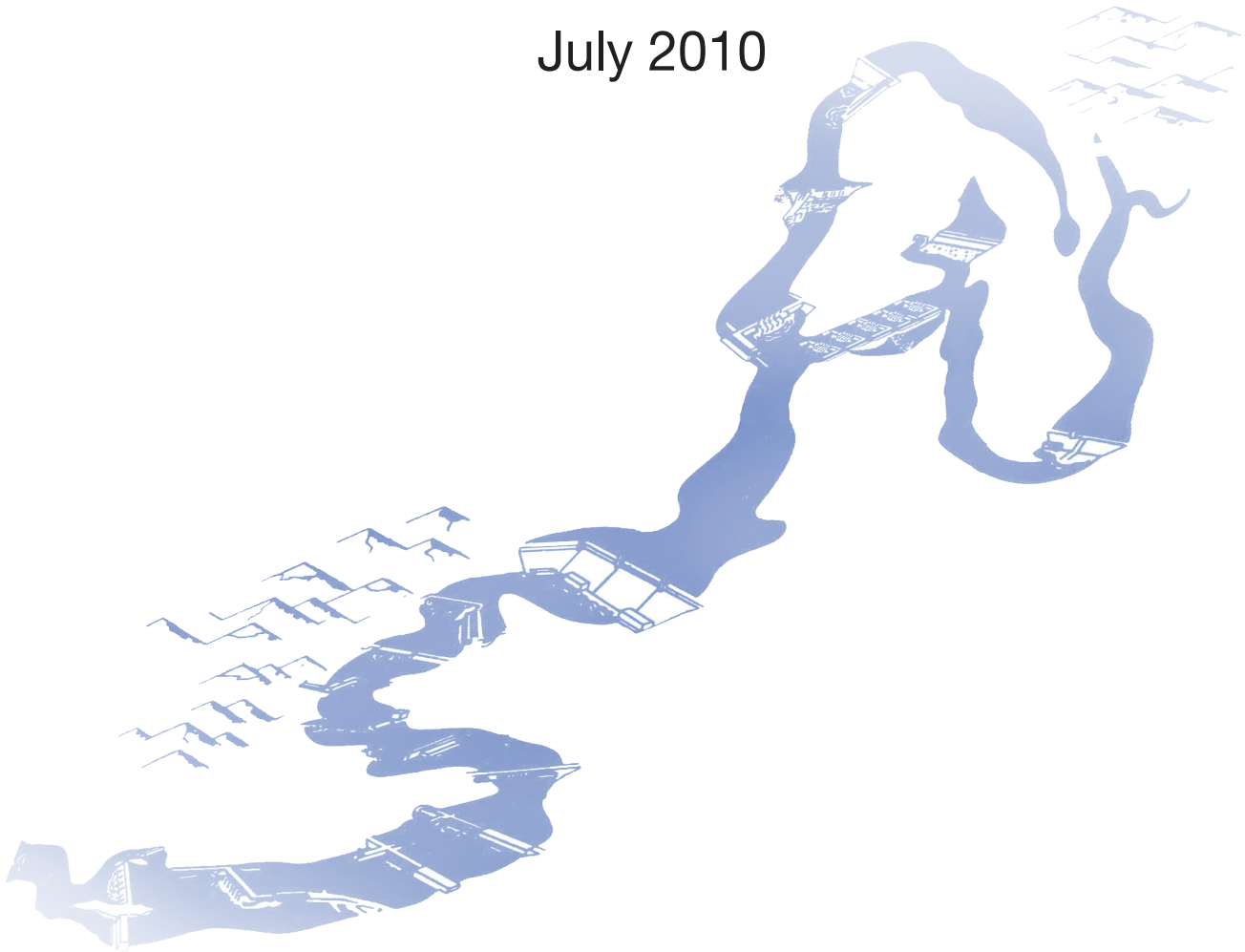


Columbia River Treaty

2014/2024 Review • Phase 1 Report

EXECUTIVE SUMMARY

July 2010



Canadian and United States Entities

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Executive Summary

Columbia River Treaty
2014/2024 Review
Phase 1 Report

The Columbia River Treaty

Under the Columbia River Treaty (Treaty or CRT) of 1964, Canada and the United States (U.S.) jointly regulate and manage the Columbia River as it flows from British Columbia into the U.S. The Treaty has provided substantial flood control and power generation benefits to both nations.

The Treaty established Canadian and U.S. Entities as implementing agents for each government. British Columbia Hydro and Power Authority (BC Hydro) was designated as the Canadian Entity. The Bonneville Power Administration (BPA) Administrator and the U.S. Army Corps of Engineers (Corps) Division Engineer, Northwestern Division, were designated as the U.S. Entity.

The Canadian and U.S. Entities are empowered by their respective governments with broad discretion to implement the existing Columbia River Treaty. They are not, however, authorized to terminate, renegotiate, or otherwise modify the Treaty. In the U.S., authority over international treaties rests with the President, assisted in foreign relations and international negotiations by the Department of State and subject in certain cases to the advice and consent of the U.S. Senate. In Canada, international treaties are within the prerogative of the executive branch of the federal government. Under current policy, treaties are tabled in the House of Commons, and are subject to a waiting period before the executive branch brings the treaty into effect. In the case of the Columbia River Treaty, Canada has assigned certain rights and obligations relating to the Treaty to British Columbia pursuant to the Canada-B.C. Agreement. The Phase 1 report is provided to those respective governmental bodies to support possible independent and/or joint decisions that may be made with respect to the future of the Treaty.

The Treaty contains two important provisions that take effect on and after September 16, 2024, that could impact the current power and flood control benefits:

1. Canadian flood control obligations automatically change from a pre-determined annual operation to a “Called Upon” operation.
2. The year 2024 is the earliest date that either Canada or the U.S. can terminate most of the provisions of the Treaty, with a minimum 10-years advance written notice.

Hence, September 16, 2014, is the latest date that either nation could provide notice of intent to terminate and still have the termination effective at its earliest possible date in 2024. While termination would end most Treaty obligations, Called Upon flood control and Libby coordination provisions will continue regardless of termination. However, it is important to note that the Treaty has no end date and absent either country using the termination option will continue indefinitely.

Given the significance of the provisions that will take effect in 2024, it is important that the Canadian and U.S. Entities work toward an understanding of the implications for post-2024 Treaty planning and Columbia River operations. The joint effort by the Entities to conduct initial post-2024 modeling and analysis is referred to as Phase 1 of the 2014/2024 Columbia River Treaty Review.

Phase 1 Study Overview

This Phase 1 report of the 2014/2024 Columbia River Treaty Review describes the results of the three Phase 1 studies. The purpose of the Phase 1 studies was to provide information about post-2024 conditions both with and without the current Treaty from the perspective of the two purposes of the Treaty, power and flood control. The three studies were:

Treaty Continues: The Treaty was assumed to continue post-2024 with its current provisions. Canadian flood control obligations would change from the current prescribed annual operation of a dedicated amount of storage to an assumed Called Upon operation. Assured Operating Plans (AOPs) for power benefits and Canadian Entitlement provisions would continue, but modifications to current procedures would be required to reflect the revised Canadian flood control obligations.

Treaty is Terminated: The Treaty was assumed to be terminated in 2024 with no replacement agreement. The U.S. payment of the Canadian Entitlement would end, as would the requirement for Canada to regulate flows for U.S. power interests. Canadian flood control obligations would change to an assumed Called Upon operation. Absent the Treaty obligation to coordinate for power, Canada might operate its projects for Canadian power, flood control, and other benefits. Two Canadian operational scenarios were developed to depict a range of possible flows across the border into the U.S. One scenario represented a Canadian operation with minimal Canadian reservoir storage draft, for local flood control only, and one scenario represented a Canadian reservoir draft for power production in Canada.

Continuation of Pre-2024 Conditions: The Treaty was assumed to continue post-2024 with the pre-2024 Flood Control Operating Plan (FCOP), AOPs, and Canadian Entitlement procedures. The initial long-term purchase of prescribed annual flood control operation by the Canadian projects constructed under the Treaty is set to expire in 2024 independent of potential Treaty termination. This study is not consistent with the existing Treaty language in that it assumed the current coordinated FCOP operation would continue post-2024. Therefore, new arrangements (e.g., an extension or replacement of the current flood control purchase) would be required to implement these study conditions. This study was conducted to provide a basis for comparison with current operations.

The three Phase 1 studies included 13 scenarios. The scenarios were designed to test and compare a range of possible situations with varying: 1) study time horizons, 2) maximum flood control flow objectives, 3) AOP procedures, and 4) observed and forecast mode water supply and inflow model simulations.

Expected outcomes of the studies were to identify, discuss, and evaluate the impacts of these alternative post-2024 scenarios on:

- Canadian and U.S. power operations

- Future Canadian Entitlement levels
- Potential Called Upon flood control operations
- Potential outflows across the border from Arrow and Duncan
- Elevations and storage contents at Canadian and U.S. reservoirs

Findings and Conclusions

In general, the Phase 1 studies showed that power and flood control operations have common interests and requirements, regardless of whether or not the Treaty is terminated. Both operations attempted to reshape the flow of the Columbia River from peaks in the spring into the winter. Beyond that, there were basic similarities and trade-offs between those two purposes under both the Treaty Continues and Treaty is Terminated studies:

If the Treaty remains in place after 2024...

- U.S. flood control and power benefited from an assured operating plan for Canadian storage.
- Canada benefited from continued Canadian Entitlement and increased flexibility to optimize generation in Canada.
- Although there is uncertainty with the estimate, Canadian Entitlement energy levels were expected to decrease from about 470 aMW in 2024 to a minimum level of about 290 aMW by around 2040. The amount of future thermal resources used to meet load in the PNWA was the most important factor affecting the Canadian Entitlement¹. The latter generally decreases with increases in thermal resources.
- Compared to the Treaty is Terminated scenario, coordinated U.S./Canadian assured power drafts provided substantial flood control benefits to the U.S., including more certainty and less volume of Canadian storage required during a Called Upon flood control request.
- The coordinated and assured operation provided substantial power benefits to the U.S. by shaping flows from Arrow from low power value months during the spring freshet to high-value winter/summer months, providing approximately 225 aMW of additional firm energy during the critical period compared with Treaty is Terminated, and maintaining a four-year critical period.²

If the Treaty terminates after 2024...

¹ Estimated energy conservation is one example of how Conservation assumptions can introduce uncertainty into the Entitlement calculation. The Phase 1 Entitlement calculation used conservation values from the NW Power and Conservation Council's 5th Power Plan, whereas the Council's 6th Power Plan included considerably more energy conservation. Higher conservation values result in a slower decline in Canadian Entitlement over time.

² Critical period is the historical streamflow period over which the water available from reservoir releases plus the natural streamflow is capable of producing the least amount of hydroelectric power in meeting system load requirements.

- Canada lost the Canadian Entitlement but gained flexibility to operate solely for Canadian power and non-power interests, with the exception of during a Called Upon operation.
- Canada was motivated to operate with Arrow elevations higher and on average more constant discharges across the year for more optimal power generation.
- Due to its proximity to the U.S./Canadian border, Arrow storage is more effective in providing U.S. flood control protection than either Mica or Duncan. Therefore, most of the Called Upon flood control draft was at Arrow.
- The Phase 1 power studies were limited to monthly time steps. However, average monthly flows do not represent the variability of discharges that may occur in actual operations. Uncertainty in daily/weekly/monthly flow releases could increase as Canada operated for its own needs and the operation was not coordinated.
- The reduction of Arrow plus Duncan outflows in August caused Grand Coulee to draft during the month and not fully refill during the fall and early winter in most years. In comparison, under the Treaty Continues scenario, the coordinated operation maintained flows from Arrow during this period and allowed a higher elevation at Grand Coulee.
- Overall average annual hydro energy production in Canada and the U.S. did not change much; however, the month-to-month shape of generation differed dramatically from the coordinated operation under the Treaty Continues scenario.
- The critical period was shortened from four years to one year and may be a concern during prolonged dry sequences.

Regardless of whether the Treaty is terminated or continues after 2024, system flood control operations are expected to change significantly, from an annual specified operation, to an operation as provided under Called Upon provisions. In either case, the U.S. will have access to flood control storage in Canadian reservoirs within the rights and limitations for Called Upon storage defined by the Treaty. Canada will be compensated by the U.S. for any operating costs incurred by Canada and economic losses arising directly from Canada forgoing alternative uses of the storage used to provide the flood control in the U.S. The Treaty provides the basic outline for Called Upon flood control but contains little detail with respect to procedures and methodologies for actual implementation. Those details remain to be resolved.

There are different views between the Entities with regard to interpretation of Called Upon rights and obligations and flood control objectives. Thus, two different flow objectives were simulated to provide information regarding a potential range of future operations. According to the FCOP, flooding begins around 450 kcfs as measured at The Dalles, Oregon, while major damages begin around 600 kcfs in the lower Columbia. Scenarios with maximum flood control objectives of 600 kcfs and 450 kcfs were conducted for both the Treaty Continues and Treaty is Terminated studies.

The Phase 1 studies are a starting point to understand Called Upon by examining one set of assumed procedures and methodologies. On the basis of those assumptions, some findings specific to Called Upon flood control include:

- The frequency that Called Upon flood control operations would be required was driven by the assumed procedure and maximum flood control target flow measured at The Dalles. As expected, the lower the target the more frequently Called Upon storage in Canada was needed. In scenarios where the target was 600 kcfs at The Dalles, Called Upon was needed in 21 years out of the 70-year record, and where the target at The Dalles was 450 kcfs, Called Upon was needed in 52 years of the 70-year record. This result was the same whether the Treaty continued or was terminated. The joint study team believes these results overestimate the frequency of Called Upon years, but further investigation was deferred to follow-up studies.
- The average volume of Called Upon storage required to meet U.S. flood control needs (additional storage over and above planned Canadian power and local flood control drafts) increased substantially when comparing the Treaty Continues and Treaty is Terminated studies, ranging from an average of 1 Maf to 11 Maf, respectively. The relative certainty of Canadian operations in the Treaty Continues versus Treaty is Terminated studies was the primary driver of Called Upon volumes as well as the duration of Called Upon events.
- The Treaty limits access to Called Upon storage only for flood events that cannot be adequately controlled by all related storage in the U.S. In the Phase 1 studies, effective use of flood control storage resulted in U.S. reservoirs being drawn down more frequently and deeper than current conditions, with reduced refill reliability. Comparing Called Upon years to non-Called Upon years, Hungry Horse, Dworshak and Brownlee reservoirs were drawn down an average of 45, 27 and 31 feet deeper, respectively, by April 30. Depending on the alternative flood control operation, Libby Reservoir in Called Upon years was drawn down an average of 11 to 47 feet deeper. At Grand Coulee, for Called Upon years in which refill began after May 1, the reservoir was drawn down an average of 14 to 18 feet deeper. In addition, Grand Coulee drafted empty four years out of the 70-year record in the base condition, compared to 30 years when the flow objective at The Dalles was 450 kcfs and 10 years when the flow objective was 600 kcfs.
- Most of the Called Upon draft from Canadian reservoirs is required from Arrow reservoir, since it is the most-effective Canadian reservoir for reducing flows at The Dalles. Because of the deep power draft at Mica, Called Upon did not usually affect Mica, and similarly, had only a minor impact at Duncan.
- Called Upon operation provided incidental power benefits to the U.S. while managing flooding in the U.S.

Possible Future Studies

The Phase 1 studies, while providing valuable information and knowledge, also generated many questions. Areas identified for possible further evaluation, either independently or jointly, include:

- **Called Upon Flood Control:** Regardless of a decision to continue or terminate the Treaty, the Canadian and U.S. Entities will be responsible for implementing Called Upon flood control operations after September 16, 2024, and there are many details to be resolved by the Entities. Assumed methods and procedures applied in the Phase 1

studies assisted in identifying some constraints and shortcomings. The Phase 1 report presents a series of recommendations for additional technical evaluations that should be undertaken to refine possible Called Upon flood control operations, including the associated economic losses and operating costs, and the use of all U.S.-related storage.

- **System Power Studies:** The Phase 1 studies did not examine optimizing the critical period and refill studies that determine operating criteria. Future studies could also explore methods to optimize firm load carrying capability and secondary energy production. In addition, other areas that were not considered or analyzed in detail in the Phase 1 studies were alternative scenarios for loads and resources, ability to meet peak loads, system reliability, the value of power, and the possible transition from an energy-deficit system to a capacity-deficit system.
- **Climate Change:** It is important when considering the future of the Columbia River Treaty or developing and assessing the implementation of Called Upon to consider the possible changes to the meteorology and hydrology of the Columbia Basin due to climate change. The scope of the Phase 1 studies did not include climate change scenarios; however, it is recognized that differing scenarios could be modeled in future studies.
- **Evaluation of Other Interests:** Analysis of the benefits and impacts associated with the Phase 1 studies described in this report was strictly limited to power generation and flood control. No attempt was made in this report to evaluate the future effects and benefits of the Phase 1 scenarios on other operating interests of the Columbia River system, such as fisheries, wildlife habitat, cultural resources, recreation, irrigation, water supply, water quality, and navigation. The Canadian and U.S. Entities recognize that evaluation of the potential impacts of system operations on other interests under alternative futures in which the Treaty is continued or terminated will be necessary in any future phases of study conducted under the Columbia River Treaty Review.

Either nation may choose to terminate most provisions of the Treaty as of 2024 with 10-year advance notice. At this time, no decision has been made by either the U.S. or Canada to terminate the Treaty. Similarly, no decision has been made to attempt to renegotiate or otherwise modify the current terms of the Treaty. Absent those decisions, the Entities will continue to collaborate to implement the existing Treaty within their authorities while seeking to more fully integrate mutually beneficial contemporary fish and other environmental and social needs into system operations. The Entities recognize that there are significant issues beyond the basic power and flood control scenarios examined in the Phase 1 studies. The U.S. and Canada will work to hear from regional interests, stakeholders, and sovereigns to define additional scenarios for analysis.

Disclaimer

The scenarios included in this Phase 1 Report are identified for analysis purposes only and do not represent a determination, decision, or commitment of either the Canadian Entity or the U.S. Entity or their respective governments concerning any particular position, operation, or other course of action. Furthermore, notwithstanding anything contained in this Phase I Report, assumptions used in developing the Phase 1 Report scenarios do not represent the future expected position, interpretation, or perspective on any matter of either Entity or its respective government.

Nothing in this report (including the studies undertaken) sets a precedent or implies agreement by either Entity concerning interpretation of Treaty rights and obligations. In addition, nothing in this report, or actions taken by the Entities and their representatives in preparing this report, represents a past practice or procedure or constitutes a Treaty modification or interpretation that prejudices, changes, or waives in any way Treaty rights and obligations. In preparing this report, the Entities have agreed that:

- Participating in this report is not to be considered as an acknowledgment or admission by either Entity of facts, rights, or obligations that may be implied by preparing the report, any assumptions used in the report, or the results of the report.
- No operating response identified by an Entity as a possible or likely response to any condition is an admission of the required response or is to be considered to limit options that may be available to the Entity or to affect or limit the response of the Entity.
- No assumption used in this report shall be considered to be an acknowledgment or admission by either Entity of facts, rights, or obligations that may be implied by any such assumption used in the report, and each Entity reserves the future right to challenge any assumption, notwithstanding its use in this report.
- Neither Entity makes any representation or warranty concerning assumptions, inputs, or responses provided to the other Entity in conducting the Phase 1 studies.
- Failure of an Entity to object to an assumption or operating response in this report is not to be considered acceptance of that assumption or operating response.
- Report results are non-binding on the Entities and without prejudice.
- The absence of any scenario, alternative, curve, or similar output in this report is not to be considered an acknowledgment that such scenario, alternative, curve, or output is not valid or relevant to the 2014/2024 Columbia River Treaty Review.

The Treaty does not provide detailed procedures for Called Upon, and there are differences between the Entities with regard to interpretation of Called Upon rights and obligations, including flood control objectives (e.g. 600 kcfs or 450 kcfs). Thus, on a without prejudice basis, two different flow objectives were simulated to provide information regarding a potential range of future operations.

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