

Non-Treaty Storage Agreement

Technical Report

**NON-TREATY STORAGE AGREEMENT
TECHNICAL REPORT**

BONNEVILLE POWER ADMINISTRATION
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TECHNICAL REPORT

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NON-TREATY STORAGE AGREEMENT

TECHNICAL REPORT

CHAPTER 1.0

INTRODUCTION

The Bonneville Power Administration (BPA) and British Columbia Hydro and Power Authority (BC Hydro) are negotiating an agreement to enhance power production capabilities and provide operational flexibilities on both the United States (U.S.) and BC Hydro systems. The proposal is that the existing Non-Treaty Storage Agreement (NTSA), which has been in effect since 1984, be used as a model for the proposed agreement. The proposed agreement would expand the amount of existing non-Treaty storage space available to BPA and BC Hydro from the current 2.0 million acre-feet (MAF) up to about 4.5 MAF and would extend the term of the agreement from 1993 (the termination date of the existing agreement) to 2003. The proposed NTSA with BC Hydro is the primary subject of the environmental assessment (EA) and this Technical Report. The proposed agreement does not require any particular operation by the parties and thus does not have any direct environmental effects. However, the agreement may enable changes in hydro system operations and their associated environmental effects. The EA analyzes the use of up to 5.0 MAF of non-Treaty storage (the total amount available in Mica), although the agreement as currently negotiated proposes that 4.5 MAF of storage be made available.

Some Canadian actions that affect Columbia River flows at the U.S.-Canadian border, such as storing or releasing water from an upstream reservoir, also may affect generation at the non-Federal mid-Columbia River projects. Therefore, BPA desires agreements with the owners of those projects and their power purchasers (the mid-Columbia participants (MCP)) to enable them to participate in actions that would occur under the agreement between BPA and BC Hydro. Agreements with the MCP are also addressed in the EA.

1.1 BACKGROUND

Coordination of the Pacific Northwest (PNW) and BC Hydro systems began in 1964 with the ratification of the Columbia River Treaty (Treaty). Under the Treaty, Canada was required to construct 15.5 MAF of storage at Mica, Arrow (Keenleyside), and Duncan projects (Figure 1). The U.S. was allowed to construct 5 MAF of storage at Libby Dam.

BC Hydro also built storage on the Columbia River system beyond that required by the Treaty (termed non-Treaty storage), including Revelstoke Dam and an additional 5 MAF of usable storage at Mica. On occasion, BC Hydro has also made available 2 feet of storage in Arrow above the normal full elevation. Agreements in addition to the Treaty are required to operate existing non-Treaty storage space on the Columbia River in Canada. Two short-term agreements were signed in 1983 between BPA and BC Hydro, along with companion agreements with MCP, to enable storage of surplus water to help initially fill Revelstoke Dam prior to the existing NTSA. Currently, under the NTSA signed in 1984, BPA and BC Hydro equally share 2 MAF of the Mica non-Treaty storage. The potential environmental effects of the existing Non-Treaty Storage Agreement were evaluated in the EA for the Proposed Agreements to Resolve Revelstoke Filling Issues and Access Reservoir Storage Space in Canada (October 1983). Based on the EA and on the public comments received on the EA, a Finding of No Significant Impact was made on December 9, 1983. An Administrator's Record of Decision (ROD) was issued in January 1984.

BPA and BC Hydro agreed in October 1987 to study additional coordination of the Columbia River in Canada. The two agencies propose to:

- Increase the amount of non-Treaty shared storage behind Mica Dam which can be utilized by BC Hydro and the U.S. from 2 MAF to about 4.5 MAF.
- Extend the existing NTSA from 1993 to 2003.
- Modify the terms of the existing NTSA if necessary.

The existing and proposed non-Treaty storage agreements address the use of both Treaty and non-Treaty space in Canada. Non-Treaty space that is available on a continuous basis is referred to as active storage space. Non-Treaty storage space that BC Hydro may make available from time to time is referred to as recallable storage space.

Up to the full 5 MAF of non-Treaty space in Mica may be available under the proposed agreement. It currently appears that 4.5 MAF will be available as active storage, with 0.5 MAF as potential recallable space. Figure 2 depicts the volume and distribution of Inactive storage (storage space that is kept full), Treaty storage, and non-Treaty storage in BC Hydro Columbia River reservoirs.

Figure 1

COLUMBIA RIVER SYSTEM

LEGEND

- FEDERAL DAM AND PLANT 
- NON-FEDERAL DAM AND PLANT 
- COLUMBIA R. BASIN BOUNDARY 

GIS GEOGRAPHIC INFORMATION SYSTEM
BONNEVILLE POWER ADMINISTRATION

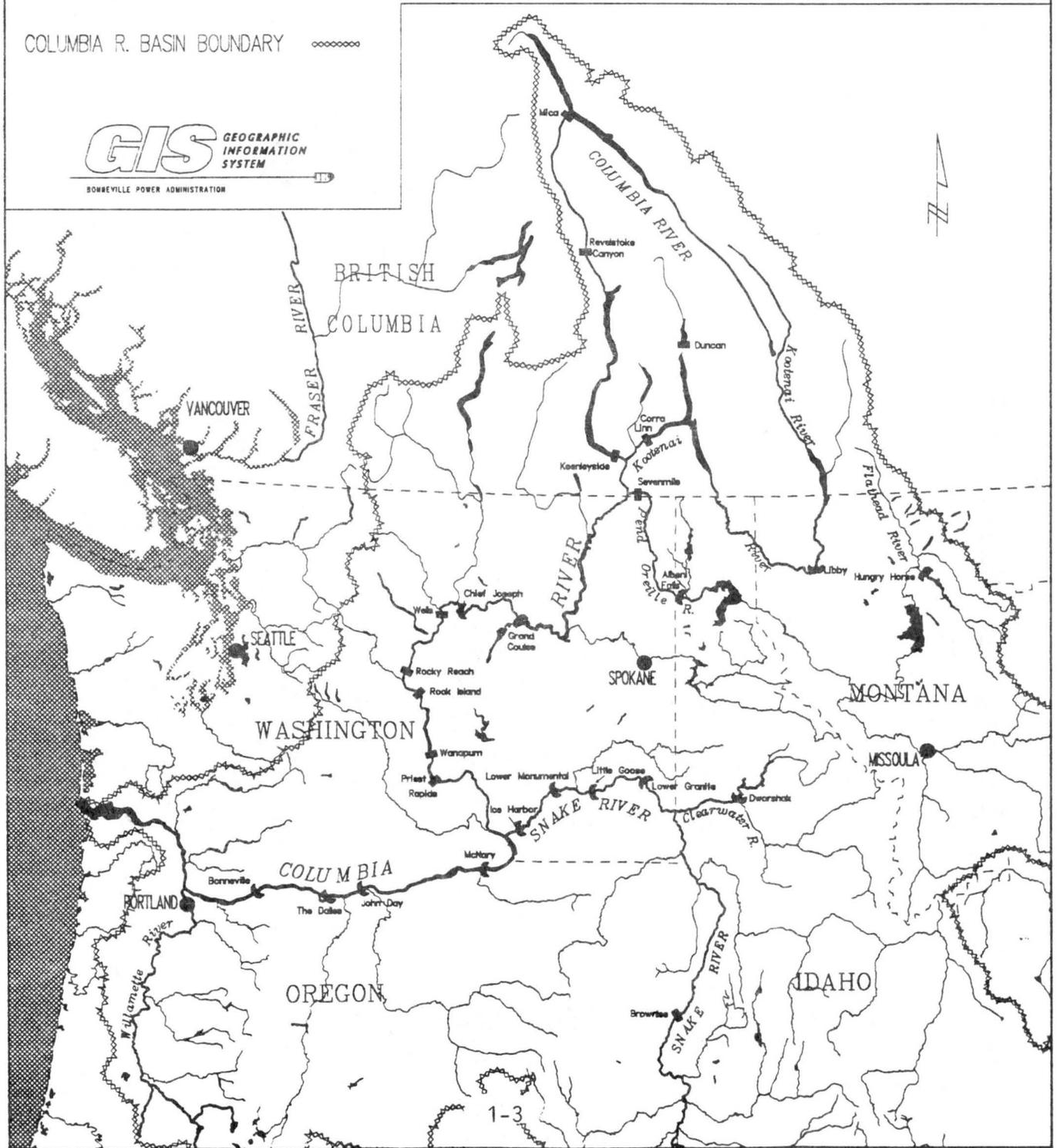
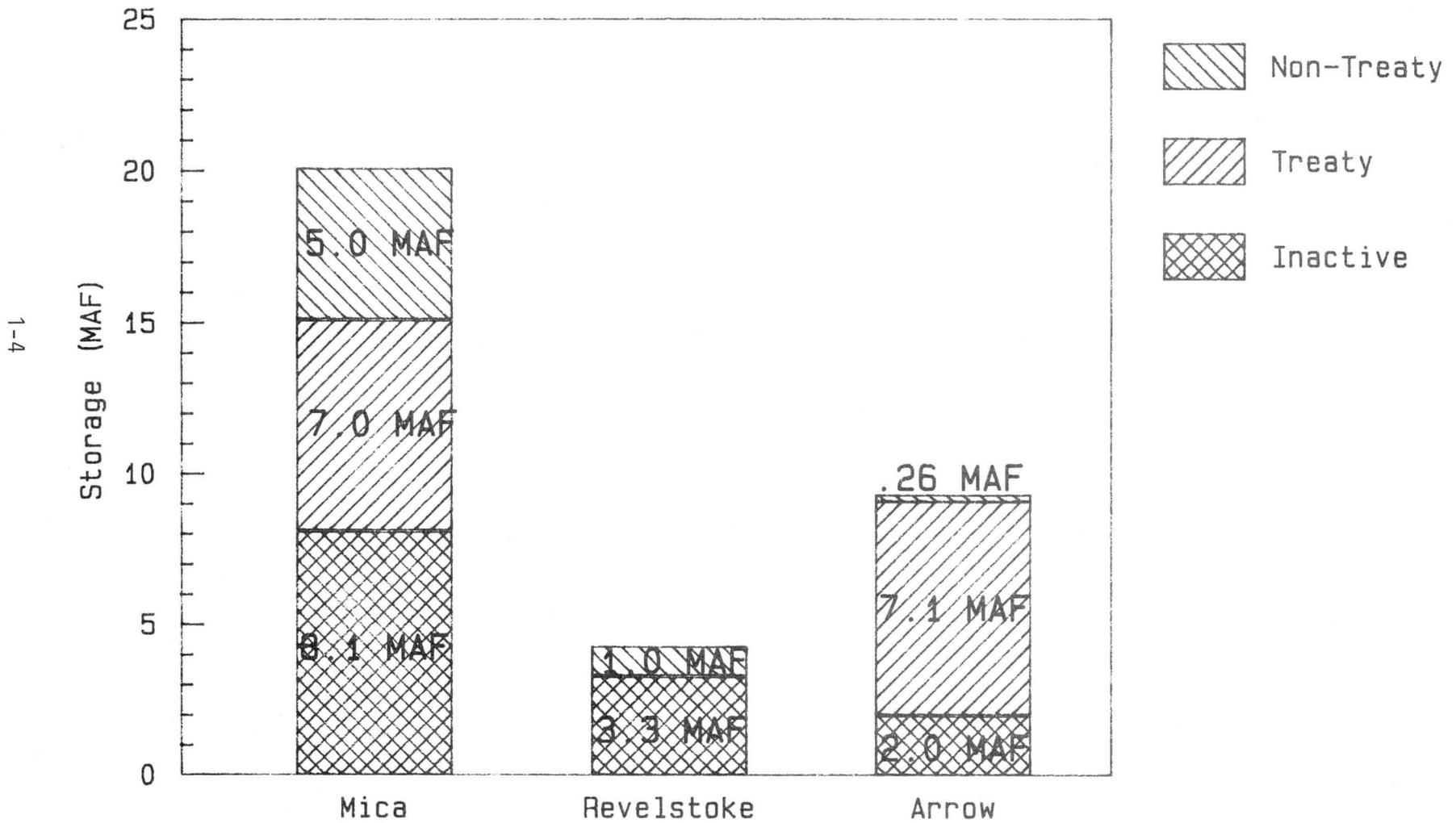


Figure 2
Non-Treaty Storage in Existing BC Hydro Columbia River Reservoirs



The added ability to store and release water from Columbia River reservoirs in Canada resulting from a revised NTSA could affect hydroelectric project operations on the Columbia River downstream through Bonneville Dam. Therefore, the non-Federal hydroelectric projects on the Columbia River--Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids Dams--may also participate in the NTSA. BPA will need to sign separate agreements with the owners of these mid-Columbia projects and with the utilities that purchase power from them.

1.2 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The EA evaluates the potential environmental impacts of both the proposed Non-Treaty Storage Agreement with BC Hydro and BPA-proposed agreements with the MCP. Negotiation of agreements with the MCP will not occur, however, until after the agreement with BC Hydro has been executed. Although the EA focuses on the U.S. PNW, changes in power sales could have environmental effects in California, and changes in reservoir operations could have environmental effects in Canada. Therefore, potential air quality and thermal impacts in California are examined in Section 3.6 and potential environmental effects in Canada are discussed in Section 3.5. The environmental effects in Canada are summarized from a document prepared by Triton Environmental Consultants, Ltd. for BC Hydro in February 1989. This document, B.C. Hydro and Power Authority Reservoir Coordination Studies, Environmental Impact Assessment, Summary Report has been cross-referenced in the EA and this Technical Report. The summary report is included as Appendix O to this report.

CHAPTER 2.0

EXPLANATION OF ALTERNATIVES

Each of the alternatives addresses several operational activities or aspects. The aspects are largely patterned after those in the existing NTSA and are considered together because none of them on its own is sufficiently beneficial for all parties to justify a long-term agreement. A brief description of each of the aspects follows.

1. Initial Fill of New BC Hydro Reservoirs on the Columbia River

One of the main purposes for the existing NTSA was to resolve a dispute over initial filling of storage at Revelstoke, Seven Mile, and potentially, other new BC Hydro reservoirs on the Columbia River. Initial filling of Revelstoke and Seven Mile has been completed. Thus, the proposed NTSA refers only to initial filling of new reservoirs on the Columbia River. The magnitude of this potential storage is relatively small, less than 0.3 MAF.

2. Use of Active Non-Treaty Storage Space

Of the types of storage addressed in the proposed NTSA, storage in active storage space in Mica is expected to be the most utilized, as it has been in the existing agreement. It is to be available on a continuous basis (subject to operating limitations--described in Appendix F) and provides a sizeable volume of storage. The existing agreement provides for use of 2.0 MAF of active non-Treaty space in Mica, shared equally by BPA and BC Hydro. The proposed NTSA would expand the volume of this storage to approximately 4.5 MAF, half to be used by BC Hydro and half to be shared by U.S. utilities. Of the operational activities provided for in the agreement, use of active storage space is expected to have the greatest potential for environmental impacts due to its size and flexibility.

3. Use of Mica and Arrow Treaty Space

The existing NTSA essentially replaced the year-by-year agreements that provided for storage in Mica Treaty space to enhance the refill of Mica. The existing agreement also allows BC Hydro to store water in Arrow Treaty space, similar to the rights BPA has under the Treaty. There are charges associated with releases of water from Treaty space under the agreement. The proposed NTSA continues the provisions for storage in Treaty space.

4. Use of Additional Non-Treaty Space

The existing NTSA also replaced short-term agreements that allowed BPA to store water into and release water from non-Treaty storage space BC Hydro made available from time to time (recallable storage space). The proposed NTSA retains these provisions, allowing shared use of a potential 0.5 MAF

of non-Treaty storage in Mica and 0.26 MAF of non-Treaty storage in Arrow. The analyses for the EA assume that the 0.5 MAF of potential recallable space in Mica is operated as active storage.

5. BC Hydro Flexibility

Two operational provisions included in the proposed agreement are not included in the existing agreement. These provisions allow BC Hydro to retain operational flexibility on its system. The first of these provides for use of 0.5 MAF of currently empty space in Mica. This is the same 0.5 MAF of storage space that may be available as recallable storage (see Item 4) and has been studied as active storage space. The second provision allows use of additional non-Treaty water, primarily in Revelstoke, to meet BC Hydro loads on an infrequent basis in very low water conditions.

2.1 ALTERNATIVE: NO-ACTION

This alternative assumes that no new NTSA is negotiated and that the present agreement expires in 1993. Until then, BPA and BC Hydro continue to operate under the existing agreement, including operation of 2 MAF of Mica active non-Treaty storage.

Prior to the existing NTSA, BPA and BC Hydro had several short-term agreements for the storage and release of water in Canadian reservoirs on the Columbia River headwaters or for storage in other Canadian reservoirs of excess generation due to fishery releases. Appendix A provides a list of those agreements. Following termination of the existing agreement, short-term agreements may be negotiated, as needed, to use some storage in Canada, similar to those used prior to the existing NTSA. Potential future short-term agreements are not now proposed and are not analyzed in this EA. They will be analyzed in an appropriate procedure once their terms are proposed and can be fully evaluated.

2.1.1 Description of Existing Agreement

The following discussion summarizes the major provisions of the existing agreement with BC Hydro. These provisions served as the model for the proposed agreement.

1. Initial Fill of BC Hydro Reservoirs on the Columbia River

The initial filling of Revelstoke reservoir and resolution of disputes involving initial filling of Seven Mile reservoir, occurred under provisions of the existing NTSA. The agreement also provides a mechanism for initial filling of future BC Hydro reservoirs that may be constructed during the term of the agreement. Under the existing agreement, BPA and BC Hydro share equally the obligation to fill future BC Hydro reservoirs on the Columbia River. BPA fulfills its obligation to fill those reservoirs by requesting that BC Hydro reduce the flow out of Canada and store the water in the reservoir to be filled. No energy is scheduled in either direction as a result of BPA's obligation. BPA suffers any loss of energy production at U.S. projects and BC Hydro suffers any loss of energy production at Canadian projects. BC Hydro fulfills its obligation by reducing flow out of Canada and storing the water in the reservoir to be filled. BC Hydro also delivers energy to BPA to compensate for lost energy production at U.S. projects. BPA delivers energy to MCP for lost generation at mid-Columbia projects as a result of filling by both BC Hydro and BPA.

This operation fills BC Hydro's reservoirs and compensates the U.S. for energy losses associated with BC Hydro's obligation. After expiration of the existing agreement, fill of new reservoirs would require additional agreements.

2. Use of Active Storage Space (Non-Treaty Storage)

BC Hydro made 2.0 MAF of non-Treaty storage available to be equally shared by BPA and BC Hydro during the term of the agreement.

BC Hydro may release water in their share of active storage space and receive the generation produced at all projects downstream from the storage reservoir. When BC Hydro refills that space, it must compensate BPA for the loss of energy at U.S. projects. BPA then delivers energy to MCP for lost generation at mid-Columbia projects as a result of storing by BC Hydro. BPA may release water in active storage space and receive generation from BC Hydro projects downstream from the storage (Mica and Revelstoke) as well as from Federal projects. When BPA refills the space, it requests that flows be reduced at Mica and Revelstoke and compensates BC Hydro for the loss of energy at those two projects. The amount of water that can be stored or released on any given day is limited by several factors, including minimum and maximum flow levels at the Canadian Projects (Mica, Revelstoke, and Arrow) and at projects downstream in the U.S. There are no energy deliveries between BPA and MCP associated with BPA storage transactions. However, the MCP may request release of water (or delivery of an equivalent amount of energy) stored in BPA's non-Treaty space.

The parties are obligated to leave the 2.0 MAF full at the end of the agreement (July 31, 1993). In the event either party is unable to comply, provisions allow storing to continue into (but not releasing from) this space for up to 7 years. During any extension, BPA will compensate BC Hydro for any reductions in energy production at Mica due to reduced head resulting from BPA's fill deficiency.

3. Use of Treaty Storage Space

This provision allows BPA and BC Hydro more flexibility than they have under the Treaty to fill Treaty space. Under some runoff conditions, Mica Reservoir has a lower probability of refill than the U.S. Coordinated System. Mica also refills later in the year. At times these conditions result it being advisable to store in Mica when other Coordinated System reservoirs have a 95 percent confidence of refilling and Mica does not. BPA may use this provision to improve the probability of filling Mica Reservoir in years the failure to fill Mica might otherwise impact the level of Coordinated System Firm Energy Load Carrying Capability (FELCC). Enhancement of Mica refill occurred prior to the existing NTSA on an as-needed basis through short-term contractual arrangements between BPA and BC Hydro.

Treaty space in Mica is available any time that Mica's Treaty space is below its maximum flood control elevation. Each party has the right to store in one-half of the available space. Charges are assessed on energy delivered to BC Hydro when BC Hydro releases water from Mica Treaty space. BPA may compensate BC Hydro for energy deliveries by payment of money at the time of release or by additional energy deliveries at the time of storage into Mica Treaty space.

The agreement also allows BC Hydro to store in Treaty space in Arrow. BPA does not require a similar right because under provisions of the Treaty

BPA can store in Treaty space in Arrow up to its maximum flood control elevation. Charges are assessed on energy deliveries to BC Hydro by BPA when BC Hydro releases water from Arrow Treaty space.

Treaty space is filled in the same manner as the refilling of active storage space. When a party stores water in Treaty space, it must compensate the other party for lost energy. When the water is released, the releasing party receives the energy generated at all generating projects downstream from the storage reservoir.

4. Use of Additional Non-Treaty Storage Space (Recallable Storage Space)

BC Hydro may make additional non-Treaty storage space available from time to time. This space is shared equally between the parties. The mechanism for storage and release of water from the additional non-Treaty storage space is the same as for active storage space. This provision is a long-term arrangement for use of storage space that may become available on an interim basis. Prior to the present NTSA, such storage was managed by means of short-term agreements between the parties.

2.2 ALTERNATIVE: PROPOSED AGREEMENT

This alternative provides for expanding use of the existing non-Treaty storage space in Mica from 2 MAF to approximately 4.5 MAF and extending the agreement until 2003 with possible extension of some provisions for up to 7 additional years. The proposed agreement does not contain provisions for early termination as does the existing agreement. The environmental analysis of the proposed agreement considers operation of non-Treaty storage both for opportunity storage and as a firm resource.

The proposal also allows for direct participation by MCP in non-Treaty storage transactions that is not provided for under the existing agreement.

2.2.1 Description of Proposed Agreement

1. Initial Fill of Canadian Reservoirs

The initial filling of Revelstoke and resolution of disagreements regarding the initial filling of Seven Mile occurred under the provisions of the existing NTSA and therefore are not issues in the proposed NTSA. The proposed agreement provides for initial fill of Columbia River reservoirs in Canada if any such new reservoirs are constructed during the term of this agreement. The magnitude of this storage is relatively small, less than 0.3 MAF. Any such new reservoir would be operated as a run-of-river project. BC Hydro and the U.S. will each have an obligation to fill half of such space. This space will be filled in a manner similar to that provided for in the existing agreement.

2. Use of Active Storage Space (Non-Treaty Storage)

Under the proposed agreement BC Hydro would make available 4.5 MAF of non-Treaty storage in Mica Reservoir to be shared equally between the U.S. and BC Hydro. Similar mechanisms apply to use of this space as apply to use of non-Treaty storage space in the existing agreement. It is expected that the MCP would control a portion of the non-Treaty space and that they would participate in energy deliveries when BPA stores or releases water in non-Treaty space.

3. Use of Treaty Storage Space

Provisions for use of Treaty storage space are essentially unchanged from the existing agreement.

4. Use of Additional Non-Treaty Storage Space

As in the existing agreement, the proposed NTSA provides for use of additional non-Treaty storage space that BC Hydro may make available from time to time. In the proposed agreement, however, most of the non-Treaty space in Mica is designated as active storage space; therefore, the only additional non-Treaty recallable storage is 0.5 MAF in Mica and the 0.26 MAF (the top 2 feet) in Arrow. Mechanisms for storage and release remain the same as under the existing agreement.

5. BC Hydro Flexibility

There is approximately 0.5 MAF of vacant non-Treaty storage space in Mica that is not part of the existing agreement. BC Hydro desires to retain the ability to fill this space with late runoff, so this space is reserved for their use. This is the same 0.5 MAF of space that BC Hydro may make available as recallable storage space.

BC Hydro uses flexibility on their system to move water between Mica and Arrow. This adjusts generation at Mica and Revelstoke to meet BC Hydro's loads. This operation is internal to BC Hydro's system and does not affect flows across the U.S.-Canadian border. Without this additional provisions, the proposed agreement could limit BC Hydro's ability to transfer water between their projects and thus their ability to serve load. The proposed agreement allows BC Hydro to use 0.05 MAF of storage in Mica (this is distinct from the 0.5 MAF of storage in Mica used for flexibility) and 1.0 MAF of storage in Revelstoke, that BC Hydro may release only when Mica Treaty space is empty (i.e., rarely, and only at the end of a period of prolonged low flows).