Non-Treaty Storage Agreement – Renegotiation Process

Prepared for: Stakeholder Forum Session #2, and First Nation Session #3

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Introduction

Background

The Non-Treaty Storage Agreement (NTSA) is a commercial agreement between BC Hydro and the Bonneville Power Administration (BPA) relating to the management of reservoir and power plant operations on the Columbia River in Canada and the U.S. The NTSA covers most of the Canadian storage on the Columbia River that is not already coordinated under the Columbia River Treaty (CRT) providing for further coordination of water storage and power benefits for reservoir and powerplant operations on the Columbia River.

The NTSA was first signed by BC Hydro and BPA in 1984 and then expanded in 1990. The release provisions of the NTSA expired in June 2004, while storage refill provisions remained in effect for an additional seven years. The NTSA storage is currently about 90 per cent full and will be completely refilled by the end of June 2011.

BC Hydro and BPA have commenced negotiations regarding a potential replacement long–term agreement.

Prior to committing to a potential long-term agreement, BC Hydro committed to engaging with interested stakeholders and consulting with First Nations on the potential impacts of various operating scenarios considered for Non-Treaty Storage. The first Stakeholder Forum Session was held in Castelgar in late October. Materials reviewed and discussed at that session are posted to the website: http://compassrm.com/ntsa/

This pre-read package provides updated information on additional performance measures and refinements to other measures that were discussed at the October session. If you did not attend the October session, you are strongly encouraged to read the pre-read package and review the presentations which are posted at the link above.

The overall intent of the process is to engage with First Nations and stakeholders in order to integrate their values into possible water flow management and environmental management decisions related to the utilization of any Non-Treaty Storage that may result from an agreement between BC Hydro and BPA. The specific focus is to provide feedback and input related to potential social and environmental effects as they relate to operating scenarios that will be considered for a potential new long-term agreement.

The meeting in November will be our last prior to BC Hydro formally entering into negotiations with BPA. Please come prepared to give your key messages!

Context for Compensation / Mitigation

One topic that came up in the October session, and at previous meetings, is the compensation and mitigation considerations that have been delivered within the Columbia Basin. BC Hydro has no mandate to address compensation for dam footprint issues, beyond that which is provided by the Fish and Wildlife Compensation Program.

Four primary mechanisms and programs are currently in place to deal with the topics of compensation and mitigation, including:

Fish and Wildlife Compensation Program[1]

The current Fish & Wildlife Compensation Program (FWCP) was created in 1995 to offset the impacts resulting from construction of BC Hydro dams in the Columbia Basin (this consolidated all previous compensation programs in the Basin). The Program delivers projects to sustain and enhance fish and wildlife populations affected by BC Hydro dam-related activities. Funding is $3.2 million (indexed for inflation based on 1995 dollars) in perpetuity from BC Hydro as a part of their water license agreement. This current year, the Notional Fund is $4.3 million.

In April 1998, BC Hydro made a commitment through the Columbia Basin FWCP to contribute $300,000 annually (indexed for inflation) to help fund operation and management requirements of the Creston Valley Wildlife Management Area.

Columbia Basin Trust[2]

The Columbia Basin Trust (CBT) was created by the *Columbia Basin Trust Act* in 1995 to benefit the region most adversely affected by the Columbia River Treaty (CRT).

The CBT mission is to support efforts by the people in the Canadian portion of the Basin to create a legacy of social, economic and environmental well-being and to achieve greater self-sufficiency for present and future generations.

A binding agreement was also established which resulted in the following for the residents of the Basin through Columbia Basin Trust:

- $276 million to finance power project construction;
- $45 million, which CBT used as an endowment; and
- $2 million per year from 1996 to 2010 for operations.

Working closely with people who live in the Basin, CBT develops and delivers programs and initiatives that respond to their needs and supports communities. By focusing on local priorities and issues, bringing people together around key issues,

[1] For more information, go to: http://www.fwcp.ca/version2/about/index.php

[2] For more information, go to: http://www.cbt.org/About_Us/

providing information, encouraging collaboration, and supporting planning, CBT is delivering benefits to the residents of the Columbia Basin.

Grants-in-lieu of Taxes

BC Hydro pays grants-in-lieu of property taxes for generation facilities located in Municipalities and Regional Districts as prescribed under the Province of British Columbia, Order of the Lieutenant Governor In Council, number 510, approved June 25 2007.

Total grants for generation facilities were increased to $10.1 million in 2007 (from $5.9 million in 2006) as outlined in Order In Council (OIC) number 510.

Water Use Planning / Water License Requirement Programs[3]

BC Hydro's Water Use Plan (WUP) for the Columbia River was developed through a consultative planning process involving participants, such as government agencies, First Nations, local citizens and other interest groups. In January 2007, the Comptroller of Water Rights in BC approved the Columbia River WUP and issued BC Hydro with the Implementation Order which directs and mandates:

- all current operations within the system
- delivery of 62 monitoring programs & feasibility studies and 25 physical works at a cost of approximately $120M over 12 years.

The monitoring programs and physical works are currently being implemented under BC Hydro's Water License Requirements (WLR) Program.

[3] For more information, go to:
http://www.bchydro.com/planning_regulatory/water_use_planning/southern_interior.html

Summary of System Operations for Four Scenarios

Four Non-Treaty Storage Scenarios

There are four different scenarios – simply labelled A, B, C, and D – under consideration by BC Hydro as they prepare for negotiations with BPA (see Table 2 next page). The October pre-reading document included two appendices that provided a snapshot of the modelling results that are available for each location in the system. Table 1 below provides a summary of the differences between scenarios, based on mean outcomes.

We will have a spreadsheet modelling tool available that enables a comparison of the four scenarios for representative water years during any season or location of interest in order to answer any detailed questions that may arise.

Table 1: Summary of key hydrological differences across the four Non-Treaty Storage Use Scenarios

Location / Facility	Highlights
Kinbasket Reservoir Elevations	• The three NTS scenarios have generally larger reservoir draw downs compared to the No NTS scenario (D). Effects are more pronounced in the December through June time period. Winter reservoir elevations at Kinbasket will typically be lower, with greater utilization of Non-Treaty Storage.
Mica Dam Discharges	• The dam discharge profiles are similar under all four scenarios.
Revelstoke Reservoir Elevations	• NTS scenarios are not expected to have an effect on Revelstoke Reservoir operations
Revelstoke Dam Discharges	• The dam discharge profiles are similar under all four scenarios.
Arrow Lakes Reservoir Elevations	• The three NTS scenarios have generally larger reservoir draw downs. Effect more pronounced in the August through April time period.
Lower Columbia River Flows	• The three NTS scenarios have similar flow profiles in most years. Compared to the No NTS scenario (D), flows are generally lower in October, November & February, and higher in December and August.
Koocanusa Reservoir	• The potential interaction with Koocanusa Reservoir (i.e., the Libby-Arrow swap) has not been modelled. The expectation is that differences would be minor across all scenarios and consistent with historical operations.

Table 2: Non-Treaty Storage Use Scenarios

Scenario	Description	Mechanism for delivery
A	Base Case – High Volume Utilization: This scenario allows for the operational usage of all available Non-Treaty storage. This scenario would approximate the operation that would be expected in the 1990 Non-Treaty Storage Agreement. As well, the level of flexibility and operational outcome is considered to be generally consistent with conditions under which operational alternatives were evaluated during the Columbia Water Use Plan.	Enabling agreement with maximum Non-Treaty draft of 4.5 MAF (full available Non-Treaty Storage at Mica).
B	Moderate Volume Utilization: This scenario allows for the operational usage of a moderate volume of Non-Treaty storage (1.5 MAF less than Scenario A). In addition, the scenario provides the US with flexibility to release additional water in summer to manage fisheries objectives. This additional flexibility is modeled as: – Freshet release of 0.5 MAF in June in years that have flows that are less than 72 MAF (78% of Normal) at The Dalles (lower 15 percentile of HYSIM years). – Return of storage in upcoming year, if greater than 92 MAF at Dalles (above average) – Requirement to store back, prior to next release.	Enabling agreement with either: – Non-Treaty active account limited to 3.0 MAF, or – BC Hydro constraining usage of Non-Treaty water. US with flexibility to release 0.5 MAF of water in spring/summer, under unusually dry conditions.
C	Low Volume Utilization: This scenario allows for the operational usage of a limited volume of Non-Treaty storage (2.5 MAF less than Scenario A). This scenario can be achieved by either restricting the size of the Account via the Contract, or limitations being placed on the account draft through the enabling agreement format. . This level of usage of Non-Treaty storage, is considered to be the minimum volume necessary to provide: – Fall/Winter draft for Kinbasket, to serve system load. – Key fisheries/power operations in the spring and summer. – Flexibility to manage Kinbasket reservoir operation in exceptionally high inflow years.	Enabling agreement with either: – Non-Treaty active account limited to 2.0 MAF, or – BC Hydro constraining usage of Non-Treaty water.
D	No Utilization: This scenario reflects an operation that is driven by the Columbia River Treaty. The scenario can be achieved by either not signing an agreement with the US on the operation of Non-Treaty Storage, or by limiting the draft of account to zero, within an enabling agreement.	No Non-Treaty Storage Usage

Scenario Assessment Results

Objectives and Performance Measures

To support the assessment of the four NTS utilization scenarios, the Project Team is undertaking modelling and assessments guided largely by the objectives and performance measures that were originally developed during the WUP. Wherever possible, adjustments have been made to incorporate additional data or information from recent Water License Requirement monitoring programs and discussions arising during this planning process.

Table 3 is a summary list of these performance measure results. The PM Info Sheet Number refers to the filename of the document in Appendix A, which contains a description of the methodology as well as the detailed results for each performance measure.

At this time we have numerous measures, some of which are overlapping or alternative ways of evaluating the same objective. During the meeting we will be interested in hearing your feedback regarding which performance measures best represent your interest in a particular objective.

Table 3: Performance Measures for NTS Scenario Evaluation

Location / Objective	Performance Measure	PM Info Sheet #
Kinbasket Reservoir		
Navigation	Navigability: The number of days per year that a site is navigable to commercial operators.	1
Recreation	Access: The number of days per year that reservoir elevation is within the preferred ranges for shore-based and boat-access activities.	2
Heritage	Archaeological Site Protection: The number of days per year that reservoir elevations are within sensitive elevation zones, weighted by the number of identified sites per zone.	3
Erosion	Erosion Control: The number of days each year that the reservoir water level is above a high elevation of importance and potentially leading to erosion and slumping of the upper elevations of the drawdown zone.	4
Vegetation	Establishment / Survival: The number of flooded weeks over the growing season.	5
Dust	Dust Generation Risk: The total monthly sq-km days that drawdown zone is exposed and therefore has potential to emit fugitive dust.	6

Pelagic Productivity	Photic Volume: The cumulative volume of water penetrated by light over the growing season, integrated over time. (Mm^3-Days)	7
Fish Entrainment	Entrainment Risk: The estimated number of fish from reservoir population entrained through the Mica and Revelstoke facilities as a proportion of the population in the reservoirs.	8
Revelstoke Reservoir		
Productivity	Reservoir Stability: The frequency of events that reservoir drawdown exceeds a threshold over the year and over the summer period.	9
Mid Columbia River		
Recreation	Access: The number of days per year that reservoir elevation is within the preferred ranges for shore-based and boat-access activities.	10
Vegetation	Establishment/Survival: The number of flooded weeks over the growing season.	11
Fish Habitat	Functional River Length: The average annual minimum length of large river habitat that is functional downstream of Revelstoke Dam. Energy Expenditure & Predation Risk: The average maximum daily velocity difference over the month. Response of Lower Trophic Levels: The amount of substrate that is productive. Sturgeon Spawning Habitat: The percentage of time there is suitable sturgeon spawning habitat over the spawning and rearing period.	12
Wildlife	Habitat Protection: The percent of habitat that is not inundated during the nesting and fall migratory seasons.	13
Wetland Productivity	Inundation: The number of flooded weeks and depth of inundation at four significant wetlands within Revelstoke Reach.	14
Arrow Lakes Reservoir		
Navigation	Navigability: The number of weighted days per year the reservoir water levels allow for log transport through the Narrows.	15
Recreation	Access: The number of weighted days per year that reservoir elevation is within the preferred ranges for shore-based and boat-access activities.	16
Heritage	Archaeological Site Protection: The number of days per year that reservoir elevations are within sensitive elevation zones, weighted by the number of identified sites per zone.	17
Dust	Dust Generation Risk: The number of days per year that	18

	reservoir elevations are below a threshold where dust generation potential is highest in the lower elevations.	
Pelagic Productivity	Photic Volume: The cumulative volume of water penetrated by light over the growing season, integrated over time. (Mm^3-Days)	7
Fish Entrainment	Entrainment Risk: The number of fish from reservoir population entrained through the Mica and Revelstoke facilities as a proportion of the population in the reservoirs.	19
Recreation *Soft Constraint*	Access: The number of days per year that reservoir elevation is within the preferred ranges for shore-based and boat-access activities.	20
Fish *Soft Constraint*	Tributary Access: The number of days per year that reservoir elevation is above the threshold to allow tributary access during fall spawning season.	21
Vegetation *Soft Constraint*	Establishment / Survival: The number of days per year that reservoir elevation is within the preferred ranges for vegetation growth/survival.	22
Heritage *Soft Constraint*	Archaeological Site Protection: The number of days per year that reservoir elevations are below an elevation of importance.	23
Erosion *Soft Constraint*	Erosion Control: The number of days per year that reservoir elevations are above a high elevation of importance.	24
Wildlife *Soft Constraint*	Habitat Protection: The number of days per year that reservoir elevation is below thresholds for spring nesting and fall migratory bird use.	25
Summary *Soft Constraint Performance*	Performance: Summary of performance in meeting multiple management objectives for Arrow Lakes Reservoir over the years 2007-2009.	26
Lower Columbia River		
Recreation	Access: The number of days per year that river flows are within the preferred ranges for shore-based and boat-access activities.	27
Flooding	Flood Flows: Frequency with which flows exceed specified threshold.	28
Fish Habitat	Total Gas Pressure: The number of days that TGP production exceeds a threshold value over the entire year and summer period.	29
Whitefish	Egg Loss: Predicted egg mortality caused by daily variability in river flows in the lower Columbia River.	30
Power Generation		
Financial	Incremental Cost: Average annual gain (loss) in value of	31

Value of Power	electricity relative to Base Case. Value is determined from the sum of: Total value of BC Hydro system generation + The value of incremental water passing through the US system, from NTS transactions assumed to be made by BC Hydro.	
Green House Gas Emissions		
GHG impact of operating Non-Treaty Storage	Incremental Energy & Carbon Benefit: Metric Tonnes of CO2	32

Summary Consequence Table

Table 4 contains a consequence table of performance measure results to serve as a starting point for our discussions regarding the relative trade-offs associated with different approaches to Non-Treaty Storage utilization. Note that all results are mean (or average) statistics – for the full suite of PM statistic results see each PM sheet in Appendix D.

The first column of the consequence table lists the general location and objective of interest. The second column provides a basic summary of the performance measure definition. The third column "Direction" shows the direction of preferred change for each performance measure: ''H" means that more is preferred; "L" means that less is preferred. The "MSIC" column is the minimum amount by which any two alternatives must differ on a performance measure score before one alternative can be considered to perform significantly better than the other.

The final four columns in **Table 4** 4 present the results for the four NTS scenarios A, B, C and D. The table is colour-coded to help provide a quick guide to the relative performance of each scenario. Scenario A, which is intended to approximate operations assuming the "full utilization" of Non-Treaty Storage, serves as the base case and is shown in blue. The relative performance of the other three scenarios are colour-coded as "Better" (green) or "Worse" (red) using the MSIC values as shown.

Some of the key messages and trade-offs that are apparent in **Table 4**:

- In comparison to the results we reviewed in October, the addition of more performance measures has increased our ability to see differences across all scenarios. That said, Scenarios A, B and C still perform similarly over a range of performance measures.
- Scenario D, which has no Non-Treaty Storage utilization, performs significantly different than all other scenarios across most PMs, with some results better and

some worse. Some of the key trade-offs in Scenario D operations (relative to operations with NTS) that are apparent at different locations include:

  - Kinbasket Reservoir: Potential improvements in *Navigation, Recreation Dust and Heritage (inundation)* vs. potential impacts on *Heritage (erosion), Vegetation and bank Erosion*.
  - Mid Columbia River: Potential improvements in *Recreation (Boat Access)* vs. potential impacts on *Recreation (Shoreline Access), Wetlands (duration and depth of flooding), and Aquatic (e.g., River Length).*
  - Arrow Lakes Reservoir: Potential improvements in *Navigation, Recreation, Dust and Heritage (inundation)* vs. potential impacts on *Heritage (erosion), Shoreline Access, Heritage Protection, Vegetation and Wildlife Habitat (fall migrant birds)*.
  - Lower Columbia River: Potential improvements in *TGP.*

- From a financial perspective, there is relatively modest impact associated with reduced volumes of utilization from Scenario A to B or C; however there is a significant impact ($11.8 M/yr) associated with Scenario D that does not operate Non-Treaty Storage.
- Scenarios A, B, C were found to have significant GHG emissions benefits, when compared with the Scenario D.

Table 5 contains a consequence table of hydrological performance measure results for the Arrow Lakes Soft Constraints alone. These results clearly highlight the trade-offs that are known to exist in trying to meet the multiple management objectives for Arrow Lakes Reservoir. These results can be reviewed in parallel with the review of recent years' actual operational performance under the Soft Constraints, which are summarized in the PM Summary Information Sheet: Soft Constraints for Arrow Lakes Reservoir (Appendix A).

Conclusion and Next Steps

In an overall sense, the goal of any technical scenario evaluation and consultation process is to help seek the best balance among all management objectives and interest areas. The results described above will serve as a starting point for discussion of the potential implication of various Non-Treaty Storage scenarios. We will discuss these results in detail during our upcoming meetings in order to provide BC Hydro with specific feedback and input related to potential social and environmental effects. This will inform their negotiations with BPA regarding a potential new long-term NTS agreement.

Table 4: Summary Consequence Table of Performance Measure Results. All results are mean (average) statistics. Scenario A as base case (blue). Relative performance of scenarios B, C and D displayed as "Better" (green) or "Worse" (red) using significance screening (MSIC values).

Objective	Attribute	Direction	Units	MSIC Type	MSIC Val	A (Full Utilization)	B (Moderate & Flex)	C (Low Utilization)	D (none)
Kin - Navigation	Total site-days / year (Downie)	H	days	A	7	343	346	350	360
Kin - Rec - Water - Canoe	2404 < days < 2475	H	days	A	7	150	151	155	168
Kin - Rec - Water - Columbia	2375 < days < 2475	H	days	A	7	174	175	176	181
Kin - Rec - Shore - Columbia	2444 < days < 2473	L	days	A	7	50	44	45	46
Kin - Heritage	Weighted days - Erosion	L	days	A	7	205	206	213	233
Kin - Heritage	Weighted days - Inundation	H	days	A	7	507	522	543	601
Kin - Vegetation	Flooded Weeks (early; 749-751m)	L	weeks	R	10%	2.20	2.30	2.40	3.10
Kin - Dust	SqKm - Days (April)	L	sqkm-days	R	10%	1,500	1,490	1,410	1,300
Kin - Erosion	days >= 2470	L	days	A	7	52	61	64	76
Kin - Pelagic Productivity	Mm3-Days	H	Mm3-days	R	10%	0.84	0.84	0.85	0.86
Rev Reservoir - Stability	0.25m over 1-day rolling	L	rolling days	R	10%	210	227	212	204
Mid-Col - Rec - Boat Access	days > 1435	H	days	A	7	36	30	36	71
Mid-Col - Rec - Shore Access	days < 1435	H	days	A	7	146	151	145	109
Mid-Col - Wetlands	Flooded Weeks - Montana - Fall	L	weeks	R	10%	5.00	5.10	5.60	14.20
Mid-Col - Wetlands	Flooded Depth (m) - Montana - Fal	L	metres	R	10%	1.40	1.20	1.40	2.10
Mid-Col - Aquatic - River Length	kilometres - October	H	km	R	10%	24.90	24.10	24.10	16.60
Mid-Col - Sturgeon - WUA	% time > 200 m2	H	percent	R	10%	76%	75%	77%	83%
Arr - Fish - Pelagic	Mm3-Days	H	Mm3-days	R	10%	1.78	1.78	1.79	1.82
Arr - Fish - Entrainment	to come	H	days	A	7	0	0	0	0
Arr - Rec	Weighted days	H	days	A	7	221	220	229	257
Arr - Heritage	Weighted days - Erosion	L	days	A	7	212	209	216	262
Arr - Heritage	Weighted days - Inundation	H	days	A	7	129	115	136	221
Arr - Dust	days < 1410	L	days	A	7	43	42	43	28
Arr - Vegetation	Flooded Weeks (latter; 436-437)	L	weeks	R	10%	3.50	3.70	3.90	10.70
Arr - Wildlife	% Useabe Habitat - Nesting	H	percent	R	3%	6%	12%	6%	1%
Arr - Wildlife	% Useabe Habitat - Fall Migration	H	percent	R	4%	30%	28%	24%	1%
Arr - Navigation	Weighted-Days	H	days	A	7	221	220	229	257
LCR - Boat Access	40000 < days < 103000	H	days	A	7	61	60	61	64
LCR - Shoreline Access	60000 < days < 99000	H	days	A	7	87	87	87	92
LCR - Flooding at Genelle	days > 165 kcfs	L	days	A	n/a	0	0	0	0
LCR - Whitefish	% Egg Loss	L	percent	R	10%	22%	22%	22%	16%
LCR - TGP	days > 115%	L	days	R	10%	36	31	38	82
Power Generation	Incremental Cost	L	$M/yr	A	0.5	$ 0.00	$ 0.10	$ 0.60	$ 11.80
Greenhouse Gas	Incremental Carbon Benefit	H	Ktonnes/yr	R	10%	171	153	176	0

Table 5: Summary Consequence Table of Performance Measure Results for the Arrow Lakes Soft Constraints. All results are mean (average) statistics. Scenario A as base case (blue). Relative performance of scenarios B, C and D displayed as "Better" (green) or "Worse" (red) using significance screening (MSIC values).

Objective	Attribute	Direction	Units	A (Full Utilization)	B (Moderate & Flex)	C (Low Utilization)	D (none)
Arr - SC - Recreation	1435 < days < 1440	H	days	26	22	27	63
Arr - SC - Fish	days > 1430	H	days	53	47	53	116
Arr - SC - Vegetation (early)	days > 1424 (may-july)	L	days	57	54	58	58
Arr - SC - Vegetation (late)	days > 1424 (aug - sept)	L	days	42	40	45	55
Arr - SC - Heritage	days <= 1430	H	days	280	288	277	202
Arr - SC - Erosion	days >= 1440	L	days	9	7	9	8
Arr - SC - Wildlife (nesting bird)	days < 1424	H	days	34	37	34	34
Arr - SC - Wildlife fall migrants)	days < 1437	H	days	85	85	85	58