Mica - Kinbasket Reservoir

Interests	**Treaty Continue**	**Treaty Terminate**
Maintaining more stable and higher reservoir levels to support fish, recreation, navigation and reduce dust. Modeled by maintaining a minimum elevation in Kinbasket of 730 m (2395 ft) year round. This causes a loss of 4.6 MAF of active storage and leaves 7.45 MAF active. Treaty Storage = 7 MAF Non-treaty storage = 5 MAF	+ Benefits Recreation - Flexibility exists to increase boat access, stretching a 5 month season by roughly 3 weeks in an average year Fisheries - Higher reservoir levels may increase phytoplankton and zooplankton production (food source for Kokanee) Arrow reservoir elevations - Arrow drafts on average, about 10 ft lower in June and 5 ft lower in July providing a benefit to wildlife/vegetation.	+ Benefits Recreation - Termination does not lead to improved boat access. But flexibility exists within some Terminate options to increase access by about 5 weeks Fisheries - Higher reservoir levels may increase phytoplankton and zooplankton production (food source for Kokanee) Arrow reservoir elevations - Higher elevations in Kinbasket do NOT have to cause lower Arrow reservoir levels.
	- Impacts Power - Average energy gain of 115 GWh/year, but value loss of $32M/year - Firm energy loss ~1100 GWh/year Arrow reservoir elevations - Arrow drafts on average, about 10 ft lower in June and 5 ft lower in July impacting recreation on the reservoir. Reduces 3 month recreation period by 1 month Total Cost = $32M/year + firm energy	-Impacts Power - Average energy gain of 142 GWh/year, but value loss of $28M/year - Firm Energy loss ~ 1100 GWh/year Arrow reservoir elevations - Arrow would not have to be drafted to meet Treaty constraints so able to make domestic decision about Arrow reservoir tradeoffs (recreation vs wildlife/vegetation) Total Cost = $28M/year + firm energy + Loss of Canadian Entitlement

Note:

1. Treaty Continue alternatives assume continuation of Non-Treaty Storage Agreement.
2. Energy value is evaluated with 2024 average market price forecast of $38.3 per MWh and adjusted according to inflow conditions in each year. Seasonal price shaping also included.
3. Canadian Entitlement range in value $100 – $300 million

Arrow Reservoir & Mid-Columbia River (1)

Interests	**Treaty Continue**	**Treaty Terminate**
Two potential, although conflicting, sets of interests. 1) Hold Arrow lower in the spring/summer for vegetation/wildlife benefits at the north end of the reservoir and to increase river habitat in the Columbia River between Revelstoke and Arrow. Modeled by adding the following maximum end-of-month elevation constraints: Apr, May, Jun = 435 m (1427.2 ft) July, August = 439 m (1433.8 ft)	+ Benefits Wildlife/Vegetation - Potential to establish vegetation at lower elevations providing additional riparian vegetation. - Vegetation provides shorebird habitat and some protection for archaeological sites. - Lower elevations reduce impacts on nesting birds Fisheries - Length of the Columbia River above Arrow increases as the reservoir is lower	+ Benefits Wildlife/Vegetation - Potential to establish vegetation at lower elevations providing additional riparian vegetation. - Vegetation provides shorebird habitat and some protect for archaeological sites. - Lower elevations reduce impacts on nesting birds Fisheries - Length of the Columbia River above Arrow increases as the reservoir is lower
	- Impacts Power - Average energy loss of 102 GWh/year representing a loss of $20M/year Recreation - Preferred range reduced by ~4 weeks (on an average 3 month season) Fisheries (below Arrow) - Unable to provide rainbow trout flows below Arrow as these flows are negotiated each year with the US by storing 1MAF of flow augmentation water at Arrow in spring, which causes higher reservoir levels. Dust - Potential for increased Total Cost = $20M/year	-Impacts Power - Average energy loss 153 GWh/year representing a loss of $6M/year Recreation - Can maintain in lower (1425-1434ft) portion of recreation range Fisheries (below Arrow) - Able to provide rainbow trout flows as there is no need for US flow augmentation. Total Cost = $6M + Loss of Canadian Entitlement

Note:

1. Treaty Continue alternatives assume continuation of Non-Treaty Storage Agreement.
2. Energy value is evaluated with 2024 average market price forecast of $38.3 per MWh and adjusted according to inflow conditions in each year. Seasonal price shaping also included.
3. Canadian Entitlement range in value $100 – $300 million

Arrow Reservoir & Mid-Columbia River (2)

Interests	**Treaty Continue**	**Treaty Terminate**
2) Maintain higher reservoir levels for power benefits and reservoir-based recreation. Power operation maintains Arrow reservoir 1441.5 - 1442 ft year round. Recreation preferred range is 1425- 1440 ft.	Maintaining a higher Arrow reservoir level is limited by draft requirements in the Treaty, so this alternative is only investigated for the Treaty Terminate condition or Treaty Plus condition.	+ Benefits Power - Average energy gain 300 GWh/year representing a gain of ~$5-20 M/year Recreation - Able to maintain year around elevation between 1438ft to 1442ft -Impacts Wildlife/Vegetation - Vegetated riparian areas would be eliminated below ~1442ft. Fisheries - Length of the Columbia River above Arrow is reduced Total Cost= Loss of Canadian Entitlement - $5-20M/year

Note:

1. Treaty Continue alternatives assume continuation of Non-Treaty Storage Agreement.
2. Energy value is evaluated with 2024 average market price forecast of $38.3 per MWh and adjusted according to inflow conditions in each year. Seasonal price shaping also included.
3. Canadian Entitlement range in value $100 – $300 million

Lower Columbia River – Hugh Keenleyside Dam (Arrow) to U.S.-Canada border

Interests	**Treaty Terminate – Hydrograph #1**	**Treaty Terminate – Hydrograph #2**
Flow regimes to potentially benefit rainbow trout, white fish, and white sturgeon. More naturalized hydrographs: Fisheries Hydrograph #1 - A 5-day peak freshet release of 200 kcfs at Birchbank with a subsequent natural decline in flow Fisheries hydrograph #2 (Sturgeon): - A rapid 2-week increase in releases starting around June 1st - A 4-week peak freshet release of 185 kcfs at Birchbank starting in mid-June in 60% of inflow sequences - A decline in flow reduction of 55% within 4 weeks Fisheries hydrograph #3: Hypothesis that stabilizing flows throughout the year and maximizing the weighted habitat would produce the highest fisheries value in Canada. The details of this hypothesis have not been defined or modeled. These alternatives would not meet Treaty requirements, so this alternative is only investigated for the Treaty Terminate or Treaty Plus condition.	+ Benefits Fisheries - Experimental flows required to determine if flows would benefit fish populations. Recreation/Vegetation - Able to make domestic decision about Arrow reservoir tradeoffs (recreation vs wildlife/vegetation). Cost of providing hydrograph would increase with lower reservoir levels for wildlife/vegetation. -Impacts Power - Average Energy loss 59 GWh/year representing a loss of $7M/year Flooding – flood damage above 165 kcfs and increased risk of major flood damage Total Cost = $7M + Loss of Canadian Entitlement	+ Benefits Fisheries - Sturgeon flows alone unlikely to remove reliance on hatchery. Experimental high flows in Kootenay River have not provided recruitment. Arrow Wildlife - Low reservoir levels in late summer/fall could benefit fall migratory bird habitat. - Impacts Power - Loss 505 GWh/year with sturgeon flow representing a loss of $21M/year Arrow Reservoir -High levels in spring to store water, then rapid drafting in summer (5.5m by Jul 1 and 15.6m by Aug 1) - Negative impact on reservoir based recreation. Levels below recreation range in first half of July. - Negative impacts to veg/wildlife Flooding – flood damage above 165 kcfs and increased risk of major flood damage Total Cost = $21M/year + Loss of Canadian Entitlement

Note:

1. Treaty Continue alternatives assume continuation of Non-Treaty Storage Agreement.
2. Energy value is evaluated with 2024 average market price forecast of $38.3 per MWh and adjusted according to inflow conditions in each year. Seasonal price shaping also included.
3. Canadian Entitlement range in value $100 – $300 million