NON-TREATY STORAGE AGREEMENT

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BC Hydro
FOR GENERATIONS
WHAT IS THE NON-TREATY STORAGE AGREEMENT?

An agreement between BC Hydro and Bonneville Power Administration (BPA) that support the use of the 5 MAF of additional storage space in Kinbasket Reservoir.
Columbia River Treaty:
- International Treaty
- Entities: BC Hydro (BCH), Bonneville Power Administration (BPA) and the US Army Corp of Engineers (COE)
- 15.5 million acre feet (MAF) of storage operated under a set of rules (at Mica, Arrow, and Duncan)

Non-Treaty Storage Agreement:
- Bilateral agreement between BCH and BPA
- An enabling agreement that provides for up to 5 MAF of storage operated by mutual agreement (at Mica, but also impacts Arrow)
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>Original NTSA signed (2 MAF)</td>
</tr>
<tr>
<td>1990</td>
<td>Expanded NTSA signed (5 MAF)</td>
</tr>
<tr>
<td>2004</td>
<td>NTSA release provisions expired, with refill required over 7 years.</td>
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</table>
| 2010 | Both BCH and BPA motivated to renegotiate new NTSA.  
BC Hydro convenes NTSA Stakeholder Forum to provide feedback related to social and environmental effects of Non-Treaty Operations |
| 2011 | Non-Binding Term Sheet signed with BPA  
Report back to NTSA Stakeholder Forum |
| 2012 | New NTSA signed with BPA in April. |
Objectives: To secure an agreement with BCH that would:

- Deliver power benefits for BPA
- Seek opportunities to provide benefits for Endangered Species Act - listed fish.
  - Flexibility to shape water in the spring-summer to support fish objectives.
  - Provide additional water from Canadian Storage during low flow freshets.
Objectives: To secure an agreement with the US that would:

- Optimize additional power and non-power benefits for BC Hydro
- Improve control of Kinbasket/Arrow reservoir levels
- Provide more system flexibility to meet existing Columbia Water Use Planning objectives.
- Extend to 2024 but allow for short notice termination if needed.
2012 NTSA Summary
NTSA: Then and Now

**1990 - 2004 Agreement**
- Active Account: 4.5 MAF
- Recallable Account: 0.5 MAF

**2012 – 2024 Agreement**
- Active Account: 3.0 MAF
- Recallable Account: 1.5 MAF

Operated by Mutual Agreement

Availability and Terms of operating at BCH Option
Routine Non-Treaty Operations

- All release and storage is carried out:
  - On a weekly time-step.
  - Requiring mutual agreement of both BCH and BPA.
    - BCH can restrict activity to manage upstream/downstream issues.
    - Only within the Active Accounts (unless otherwise agreed).
BPA Release Option

• 0.5 MAF release in May/June, under low runoff conditions.
  – ~20% chance of occurring.
• Can only be released out of Active Storage
• Driven by US Biological Opinion
  – Objective: To help migration of salmon smolt to the ocean.
<table>
<thead>
<tr>
<th>BC Hydro Release Option</th>
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<tbody>
<tr>
<td>• 2 kcfs release in October – April, under dry conditions:</td>
</tr>
<tr>
<td>– ~20% chance of being triggered</td>
</tr>
<tr>
<td>• Can be released out of both Active and Recallable Storage</td>
</tr>
<tr>
<td>• Benefits:</td>
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<tr>
<td>– About 1,080 GWh/year of firm energy.</td>
</tr>
<tr>
<td>– Reduced the requirement for BCH procurement of new resources.</td>
</tr>
</tbody>
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NTSA Operations
Arrow Reservoir: No NTSA

Based on AOP 2012, with critical supplemental agreements.
Arrow Reservoir: With NTSA

Based on AOP 2012, with critical supplemental agreements.
**Arrow Reservoir: Key Differences**

**BCH Non-Treaty Storage Account**
(Average Operation)

- Steep draft in August due to release of spring storage.
- Steeper rise in May/June due to storage of Non-Treaty water.

*Arrow Flood Control Level*
*Deeper Draft*

- Treaty + Non-Treaty Operation
- Treaty Operation Only
**NTSA Soft Constraint Overview:**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Attribute</th>
<th>Period</th>
<th>2012 NTSA</th>
<th>No NTSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arr - SC - Recreation</td>
<td>1435 &lt; Elev &lt; 1440</td>
<td>May 24 - Sep 30</td>
<td>17%</td>
<td>48%</td>
</tr>
<tr>
<td>Arr - SC - Fish</td>
<td>Elev &gt; 1424</td>
<td>Aug 25 - Nov 15</td>
<td>47%</td>
<td>87%</td>
</tr>
<tr>
<td>Arr - SC - Vegetation (early)</td>
<td>Elev &lt; 1424</td>
<td>May 1 - Jul 31</td>
<td>41%</td>
<td>37%</td>
</tr>
<tr>
<td>Arr - SC - Vegetation (late)</td>
<td>Elev &lt; 1424</td>
<td>Aug 1 - Sep 30</td>
<td>34%</td>
<td>10%</td>
</tr>
<tr>
<td>Arr - SC - Heritage</td>
<td>Elev &lt; 1430</td>
<td>Year Round</td>
<td>79%</td>
<td>55%</td>
</tr>
<tr>
<td>Arr - SC - Erosion</td>
<td>Elev &lt; 1440</td>
<td>Year Round</td>
<td>98%</td>
<td>98%</td>
</tr>
<tr>
<td>Arr - SC - Wildlife (nesting bird)</td>
<td>Elev &lt; 1424</td>
<td>May 1 - Jul 16</td>
<td>47%</td>
<td>44%</td>
</tr>
<tr>
<td>Arr - SC - Wildlife (fall migrants)</td>
<td>Elev &lt; 1437</td>
<td>Aug 7 - Oct 31</td>
<td>99%</td>
<td>67%</td>
</tr>
</tbody>
</table>
2012 Columbia Flood Event
2012 Columbia Flood Event

• Cause:
  – 110% Snowpack
  – Unprecedented precipitation in June and July

• Resulting Lower Columbia River Flows (late July):
  – Arrow outflows reached 115 kcf/s (Normal of ~60 kcf/s)
  – Birchbank flows reached 215 kcf/s (High water alert at ~165 kcf/s)
• Non-Treaty releases opened about 20 feet of additional storage space at Kinbasket/Arrow.
• Additional flexibility was made available to reduce Keenleyside flows and capture water in the reservoir.
• Use of the additional storage space resulted in:
  – About 50 kcfs reduction in peak flows at Birchbank.
  – Reduction in duration of damaging high flows at Birchbank.