Northwest Power and Conservation Council

May 11, 2011

MEMORANDUM

TO: Council Members

FROM: John Fazio, Senior Power Systems Analyst
Jim Ruff, Manager – Mainstem Passage and River Operations

SUBJECT: Summary of Columbia River Treaty Analyses

While the Columbia River Treaty (Treaty) between U.S. and Canada has no specified end date, either nation can terminate most of its provisions as early as September 2024, with a minimum 10 years' written notice. However, regardless of the Treaty status, current assured annual flood control operating procedures will end in 2024. Thus, U.S. and Canadian entities have initiated a set of analyses to investigate potential post-2024 operations and their effects.

To date, the "Phase I Studies" and "Supplemental Report" studies have been completed by the Corps of Engineers and the Bonneville Power Administration. These analyses examine post-2024 power and flood control operations with and without Treaty requirements and with and without fishery requirements. These reports provide a preliminary set of results:

- Terminating the Treaty increases the uncertainty in the volume and timing of water entering the U.S. system, making it more difficult to plan for U.S. operations.
- Without the Treaty, the U.S. regains about 300 to 500 MWa of energy and about 1,300 to 1,500 MW of capacity that is currently returned to Canada for downstream benefits.
- The power gains above, however, will be reduced somewhat depending on the post-2014 Canadian operation (the Supplemental Report estimates a reduction of about 90 MWa).
- Regardless of the Treaty status, flood control operations will change to a "called upon" flood control (CUFC) operation in 2024. How much storage for flood control will be needed and how much it will cost are still being investigated. The U.S. and Canada are also still debating what constitutes a U.S. need for CUFC.
- U.S. hydro generation is likely to increase during winter and decrease in summer. This will reduce the likelihood of meeting FCRPS biological opinion fish flow targets during late spring and summer in both the lower Columbia and Snake rivers.

The U.S. Entity plans to make a recommendation to the State Department by September of 2013. Between now and then, the Corps of Engineers will continue its Flood Risk Management assessment and the U.S. Entity will continue to refine its analysis and engage regional sovereign entities and stakeholders in the process.

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Summary of Columbia River Treaty Analyses

NW Power and Conservation Council
Hood River, Oregon
May 11, 2011

Caveats

- The task of evaluating benefits, costs and risks of changing the status of the Columbia River Treaty is extremely complex.
- Federal agencies have begun this task and have provided preliminary results to begin discussions.
- At this point in the effort, it is more important to focus on the process and not so much on the exact numbers.
- Thus, the results presented within are primarily aimed at illustrating the types of operational changes that will be a part of future discussions and analyses.

Outline

- Summary of Columbia River Treaty Review Process
- Phase 1 Studies
- Supplemental Report
- U.S. Entity Perspective
- Ongoing Studies and Engagement Process

Columbia River Treaty Review Process

- Phase I Studies — Completed July 2010
- Supplemental Report — Completed Oct 2010
- Flood Risk Assessment Report — Due March 2012
- Refinement of analysis — Ongoing
- Sovereign's Review Team and stakeholder's meetings — Ongoing
- U.S. Entity recommendation to Department of State — Sep 2013

Phase 1 Studies

- Joint studies by the U.S. and Canadian Entities
- Provide preliminary information about post-2024 power and flood control operations only with and without the Treaty
- Current flood control operating plan (FCOP) is replaced with "called upon" flood control in 2024 regardless of Treaty outcome
- Scenarios
  1. Treaty continues
  2. Treaty is terminated
  3. Treaty continues with FCOP (e.g. status quo, not likely to continue)
- Did not model biological opinion constraints

Post-2024 Flood Control
Regardless of Treaty Status

- Transitions to a "called-upon" flood control operation by the U.S. at Canadian dams
- Requests limited to floods that cannot be adequately controlled by U.S. storage
- Canada must be consulted
- Called-upon storage will provide no greater degree of flood protection than prior to 2024
- U.S. must pay for called-upon operations

Called Upon Flood Control Assumptions

- Called upon flood control was modeled by assuming a maximum flow limit at The Dalles

- Used max peak flow objectives of 450 and 600 kcfs to bracket the range of impacts for flood control (labeled 450 CUFC and 600 CUFC in the slides)

- Refining actual flood control needs will be done through future studies and the Corps' Flood Risk Management effort

Other Assumptions

- Future U.S. Loads and Resources
  - Estimated from available information, including BPA's projections of renewable resources and conservation
  - For the 2024-25 and 2044-45 periods
  - Only one forecast level was used

- Future Canadian Operating Scenarios
  1. Operate for BC flood control only
  2. Operate for BC power needs

Phase I Results: Treaty Continues

- Canadian Entitlement decreases from about 490 MWa in 2024 to 290 MWa in 2040
- Entitlement capacity is not expected to change much
- Provides planners more certainty with respect to expected inflows into the U.S. hydroelectric system

Phase I Results: No Treaty

- Average annual energy production in Canada and the U.S. remained essentially unchanged
- However, monthly hydro generation shape changed with more generation in winter/spring and less in summer
- U.S. hydro system loses about 225 MWa of firm hydro generation (FELCC) – although this is not a meaningful result because BiOp flow/spill requirements were not modeled

Supplemental Report

- A companion report to the Phase 1 Studies report
- Analysis includes FCRPS biological opinions and other fish operations at U.S. projects
- Studies done with and without called upon flood control operation (CUFC)
- Purpose was to assess more realistic impacts of post-2024 operations with and without the Treaty

Supplemental Report Results

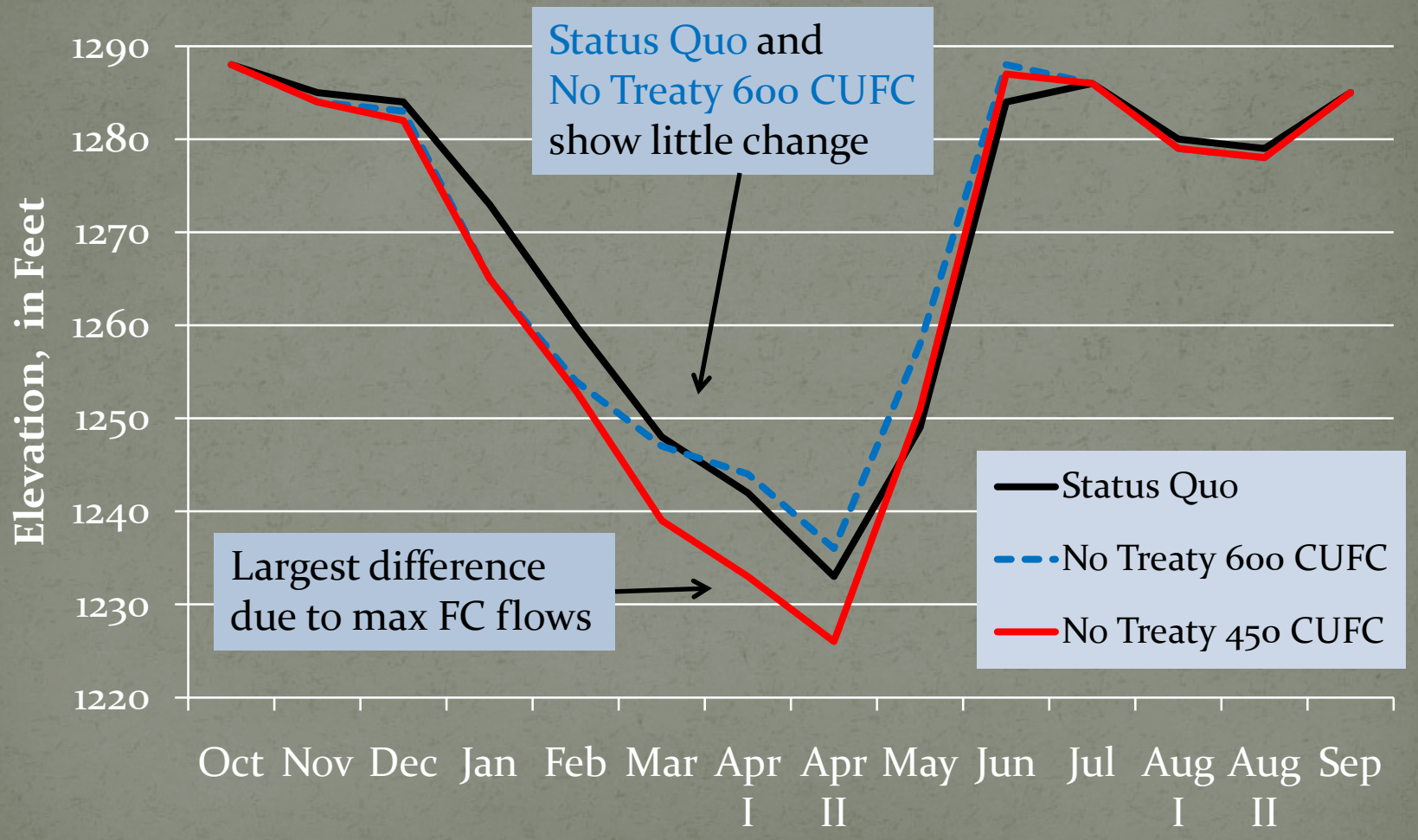
For the No Treaty + CUFC 450 Scenario*

- Reservoirs would be drafted deeper during the January-to-April period, thus providing higher flows and more generation during that time
- Reservoir refill probabilities would likely decrease except in high water years
- Flows would be lower more often during the July-to-September period
- The results are driven more by the flood control assumptions than by the Treaty status

*Focused on this scenario to illustrate the impacts. Results for the 600 CUFC scenario were similar.

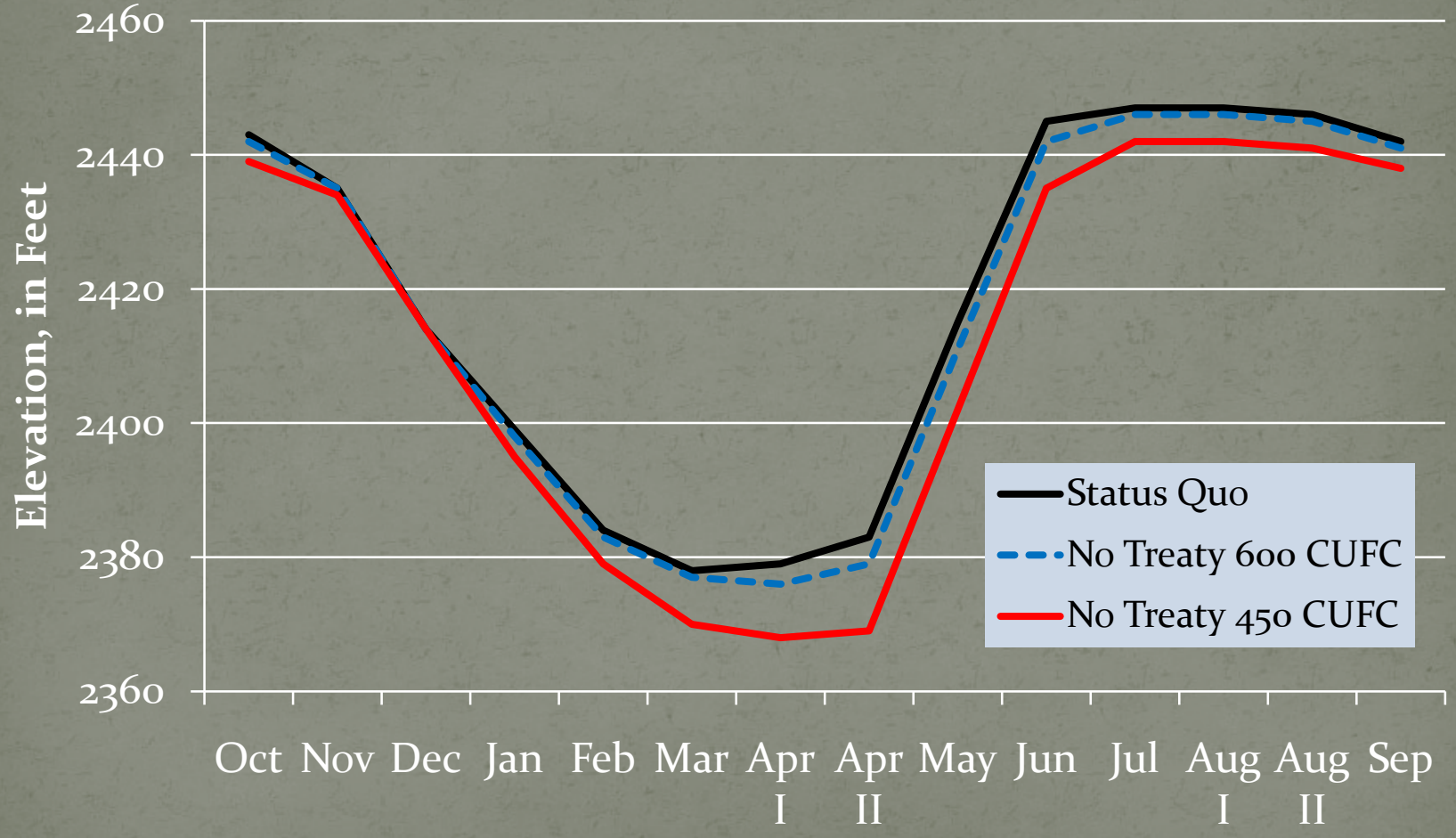
Grand Coulee Elevation

(70 water year average)



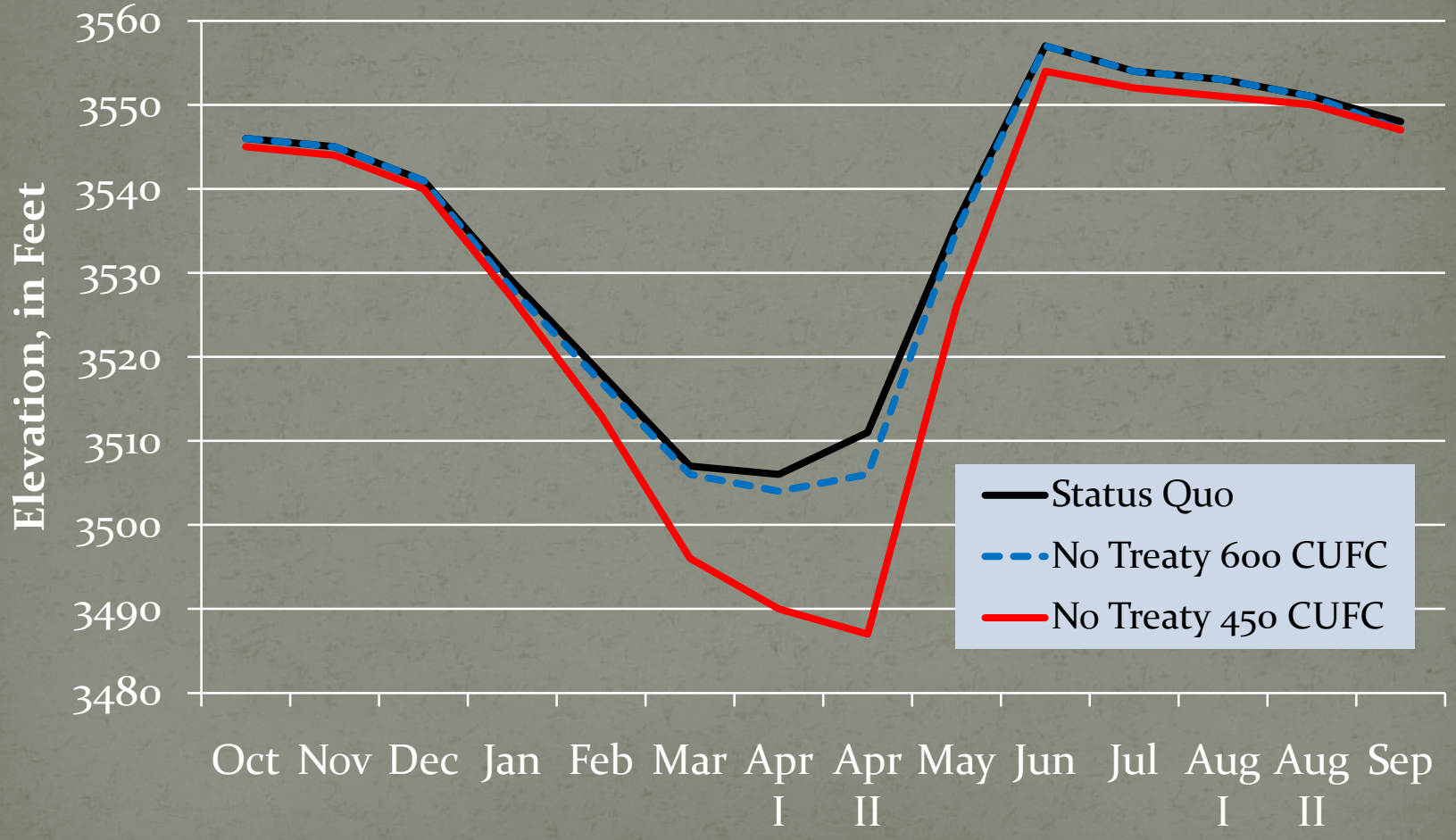
Libby Elevation

(70 water year average)



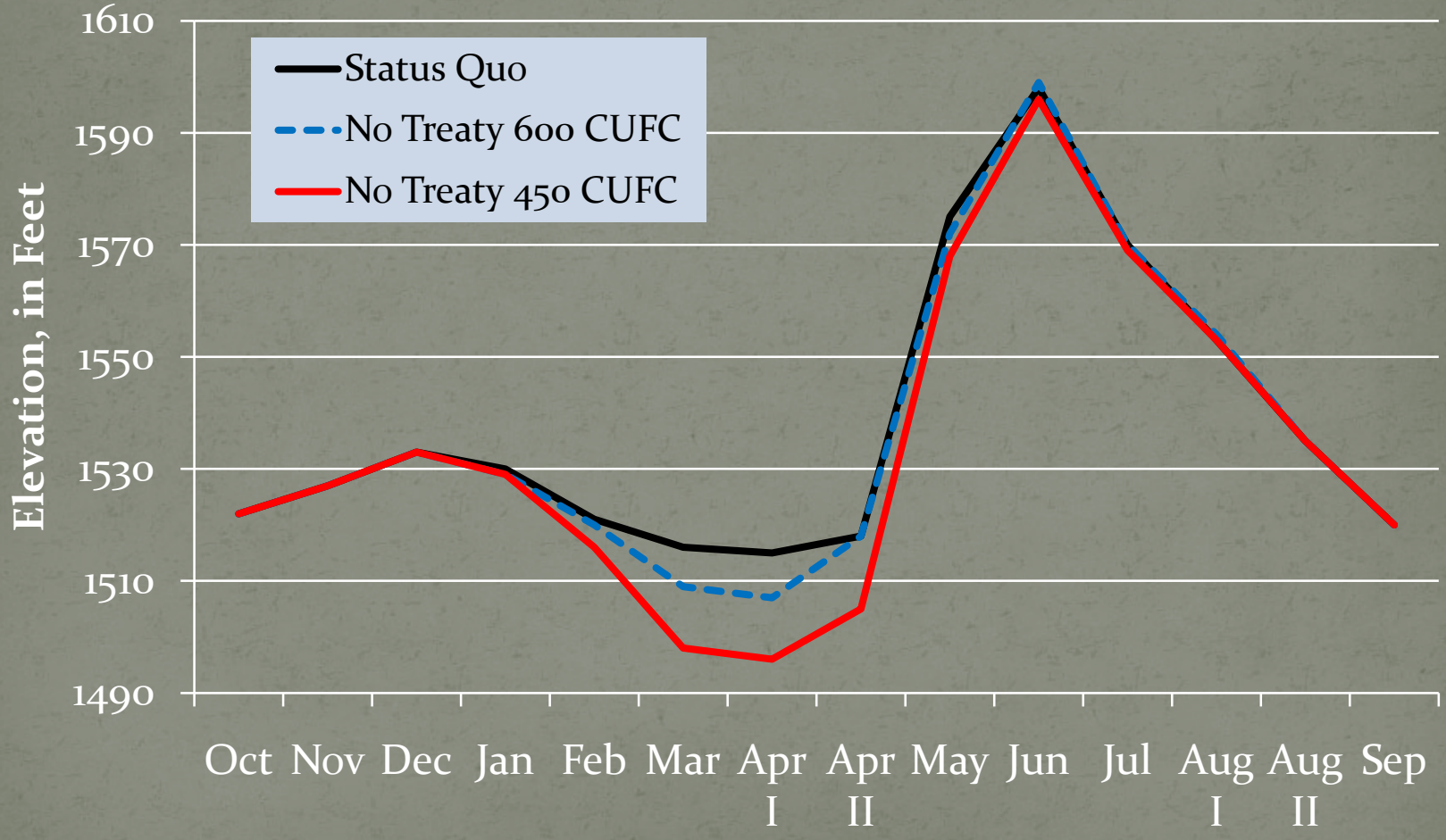
Hungry Horse Elevation

(70 water year average)



Dworshak Elevation

(70 water year average)

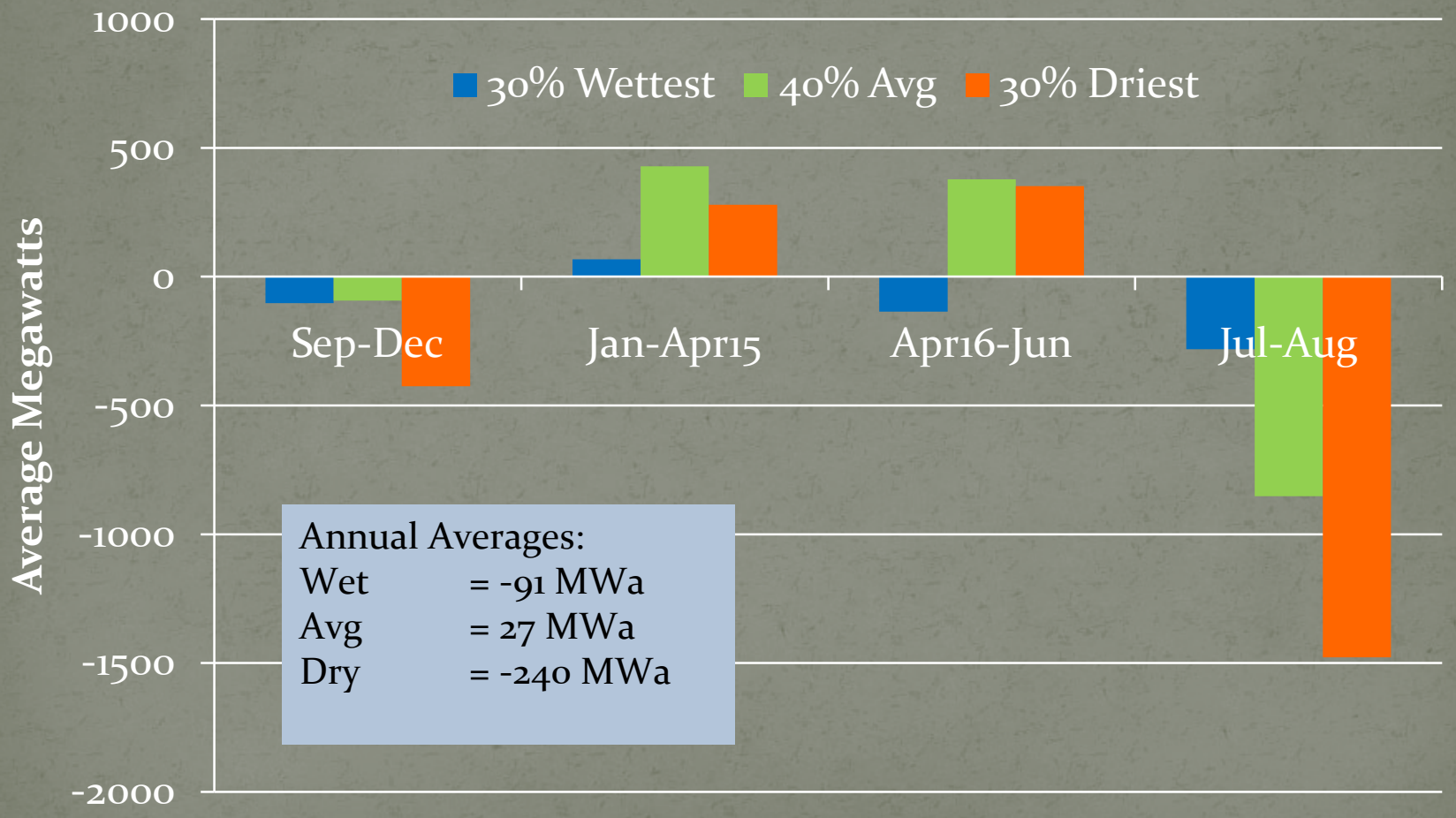


Supplemental Report Results: Change in Generation

- Across all water conditions, average annual hydro generation was reduced by about 90 MWa (system average is about 15,800 MWa)
- On average, hydro generation increased in winter-spring months and decreased in summer-fall months
- On average, in the driest 30% of years, hydro generation was reduced by 230 MWa annually and about 1,460 MWa during the summer period

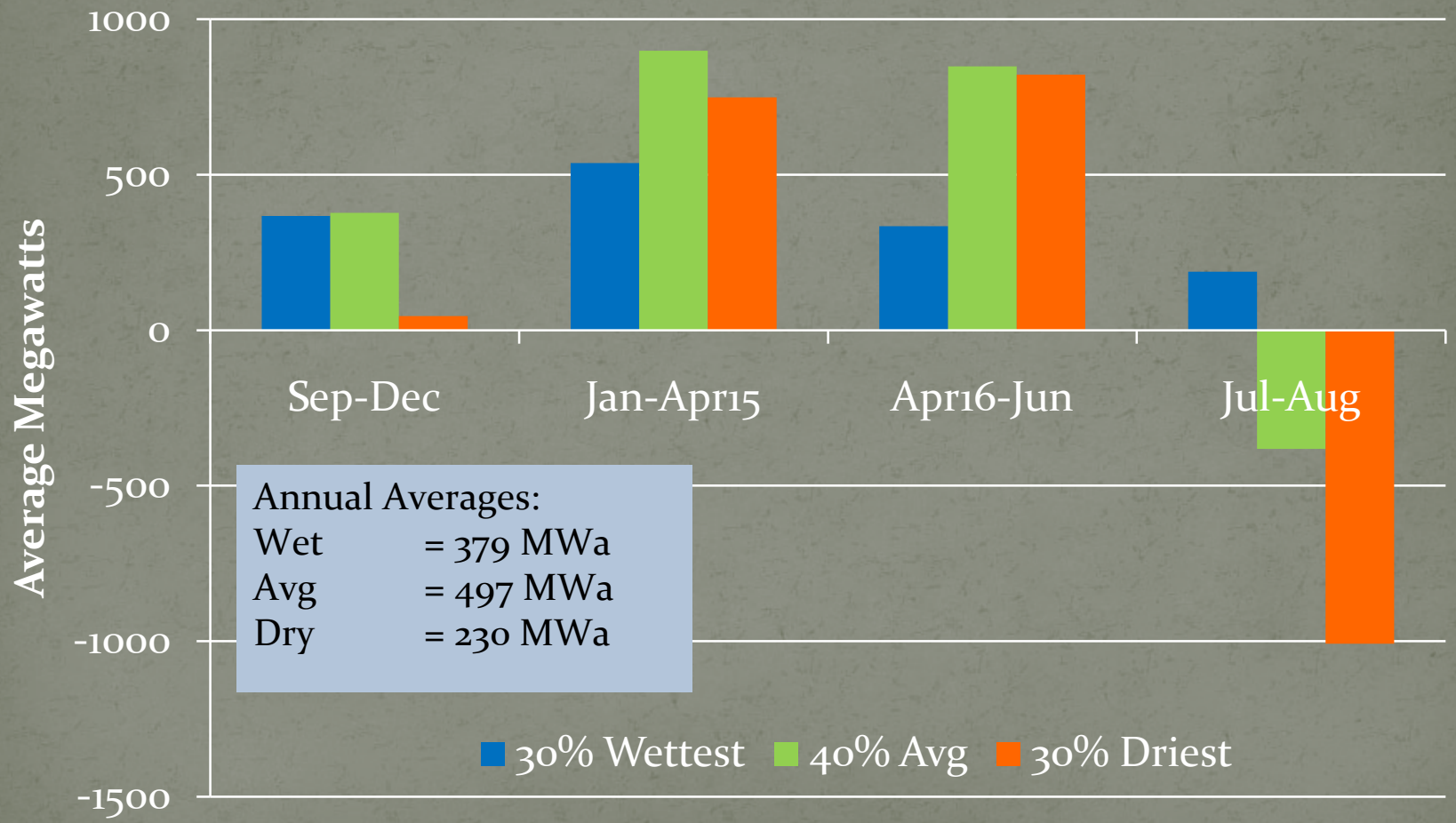
Change in Hydro Generation

No Treaty 450 CUFC Scenario



Change in Generation

plus 470 MWa of Entitlement not Returned to BC

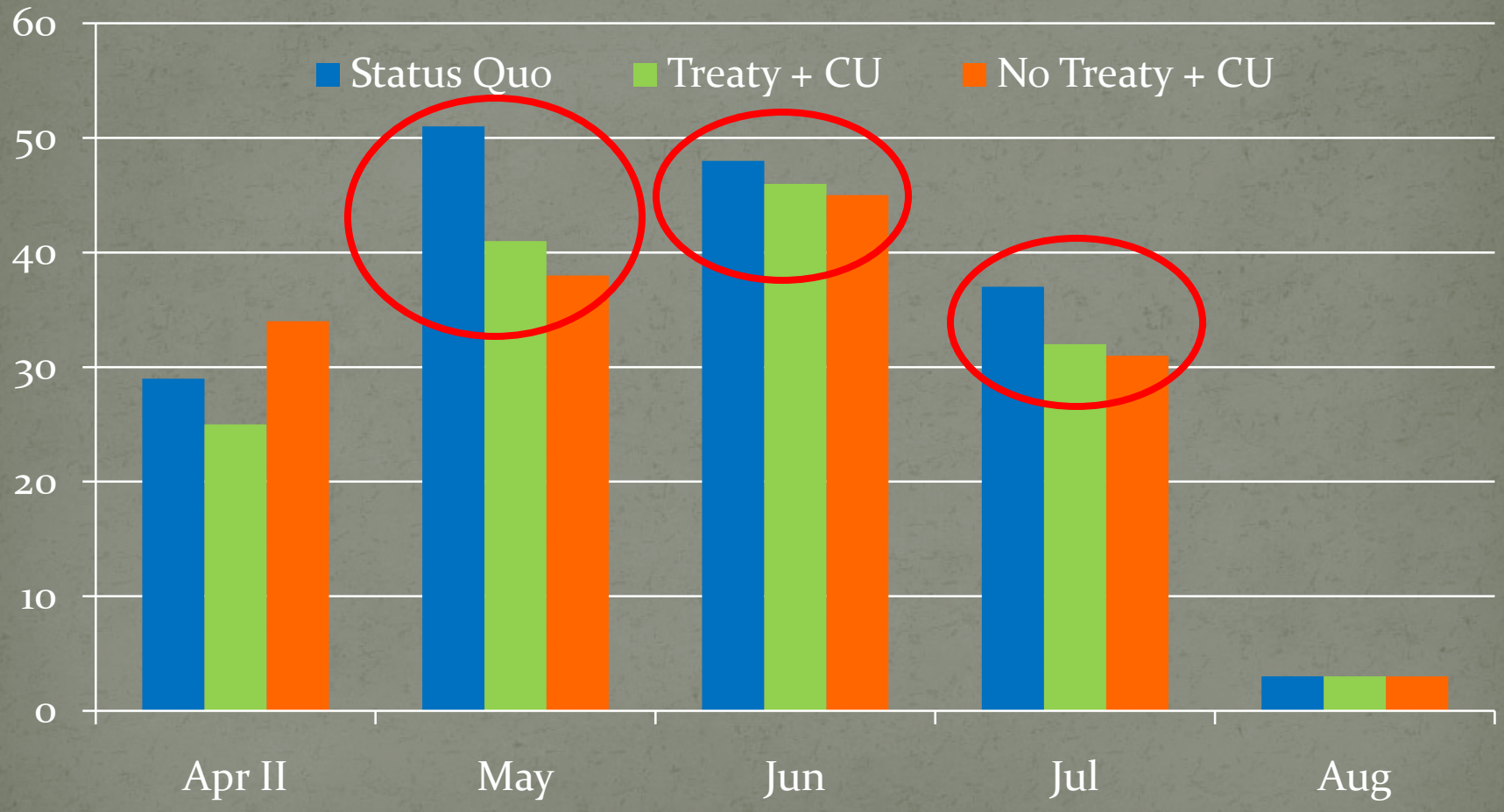


Supplemental Report Results: Fish Flows

- System's ability to meet fish flow objectives during late spring and summer would be reduced (most significantly at McNary Dam)
- Important Note:
  Reservoir refill and draft levels, and thus the system's ability to meet fish operation requirements, were mostly affected by the implementation of called upon flood control requirements at U.S. projects and not by the status of the Treaty

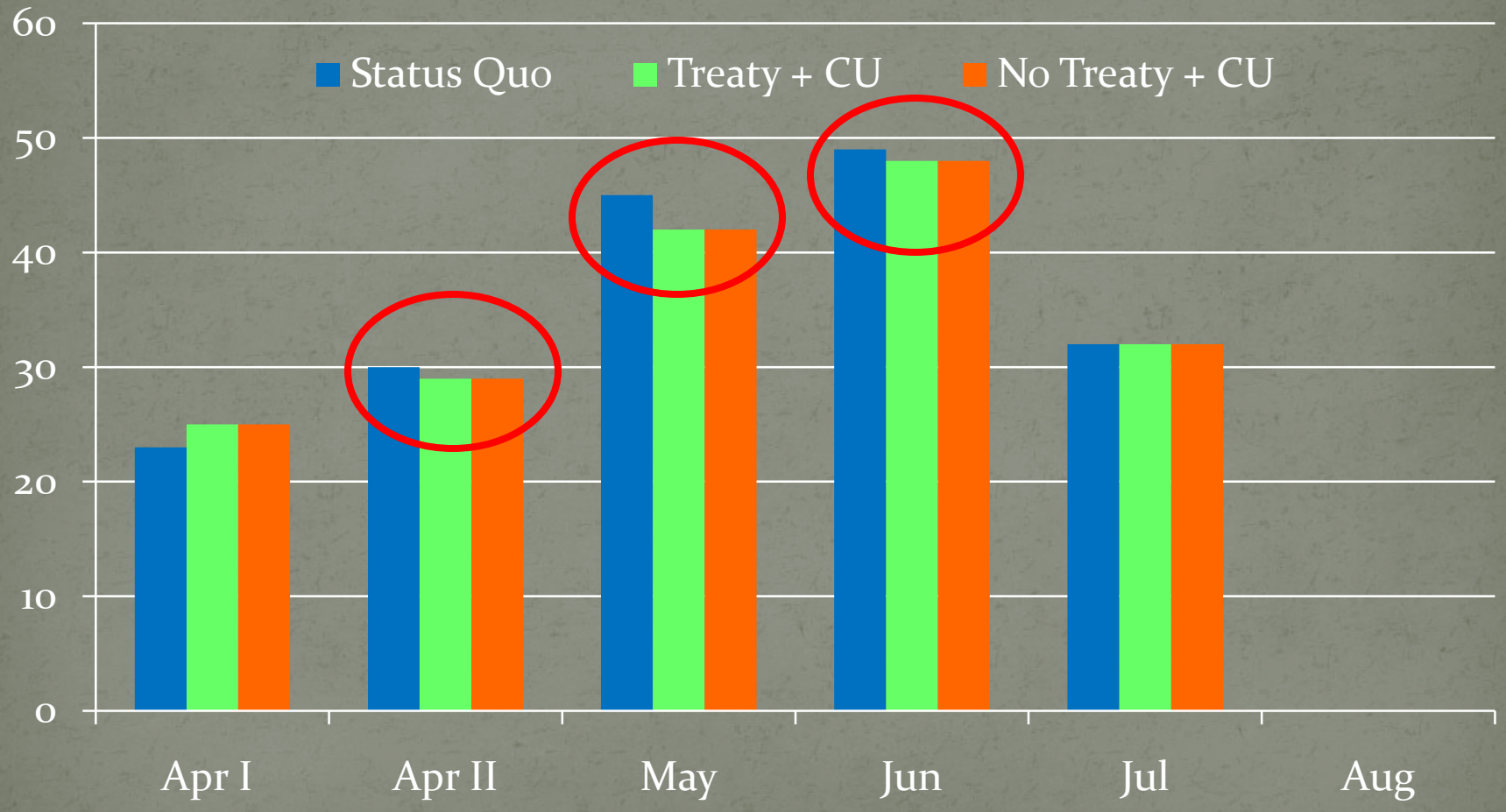
Times McNary Flow Target Met

(Out of 70 years, No Treaty 450 CUFC)



Times LWG Flow Target Met

(Out of 70 years, No Treaty 450 CUFC)



U.S. Entity Perspective

- Terminating the Treaty increases the uncertainty in the volume of water entering the U.S. system, making it more difficult to plan U.S. operations
- On the other hand, without the Treaty, the U.S. regains about 300 to 500 MWa of energy and about 1,300 to 1,500 MW of capacity
- The power gains above, however, will be offset somewhat by reductions due to an uncoordinated U.S./Canada operation

U.S. Entity Perspective

- Regardless of the Treaty status, flood control operations will change in 2024
- How much Called Upon FC will be needed and how much it will cost are still being investigated
- The U.S. and Canada are still debating what constitutes a U.S. need for CUFC
- U.S. reservoirs will likely have to be operated differently for flood control post-2024, which could have significant physical implications and costs

Ongoing Studies

- USACE's Flood Risk Management Assessment
- Federal studies to refine the Supplemental Report analysis
  - Incorporating operations for all river uses
  - Investigating the effects of climate change
  - Estimating potential costs and benefits vs. uncertainties and risk
- Refinement of studies to outline potential post-2024 Canadian hydro operations
- To be done with participation from all stakeholders (see next slide)

Engagement Process

Sovereign Review Team established in October 2010

- States: OR, WA, ID, MT
- NW Tribes: USRT, CRITFC, UCUT, Cowlitz, CSKT
- Federal Agencies: NMFS, USFWS, BOR, USACE, BPA, BLM, EPA, USFS, USGS, BIA, NPS

NW Stakeholders – can participate in several ways:

- Regional workshops
- Joint Sovereign Team/Stakeholder meetings
- Technical consultations – with regional experts