

Additional Questions Regarding Analysis of Potential Replacement Resources for the Services Provided by the Four Lower Snake River Dams and Bonneville's Answers

The Bonneville Power Administration (BPA) provided the following answers to additional questions from interested entities regarding its ongoing analysis of potential replacement resources for the services provided by the four lower Snake River dams.

- 1. Will the E3 analysis include one or more “clean” replacement portfolios that draw on wind, solar, battery storage, demand response, energy efficiency and the ability of other FCRPS projects to meet system requirements in a system without the lower Snake River dams (LSRDs)?***

Yes, the E3 analysis will examine multiple scenarios with various levels of decarbonization policy and technology availability - one of which will not include fossil-combustion generation. As the Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) Record of Decision noted, the Columbia River System (CRS) projects¹ have many non-power constraints that impact operations, including flood risk management, fish operations, navigation, irrigation, and recreation. Project generation modeled in the E3 analysis will reflect those constraints. The CRS projects operate differently under the low/middle/high water conditions as the flood risk management and biological constraints vary depending on flow volumes and runoff shape. The resource replacement model does not change CRS operations to meet system requirements differently in the runs with and without the four lower Snake River dams.

- 2. Will E3 develop a “base case” to describe the services LSRDs currently actually provide in the context of the various water year/fish operation information BPA has given them? If not, how will E3 know what services need to be replaced?***

Yes. The Hydro operating data in the E3 RESOLVE model uses representative water conditions for low/middle/high historical years (2001, 2005, 2011) for all regional resources with the Columbia River System project generation, adjusted to be consistent with the fish passage spill operations from the CRSO EIS Record of Decision. For each scenario, two versions of the CRS hydro generation for each low/middle/high water condition will be run – one with LSRD generation, and one without.

- 3. Will E3 look only at a one-to-one replacement portfolio, e.g., same generation profile over the course of a year, for the services the LSRDs provide?***

No, the resource portfolio optimizer in the RESOLVE model selects resources with certain attributes to meet a planning reserve margin and not to replace the four lower Snake River dams' attributes one-for-one. These attributes include energy, sustained capacity, reserves, and fast ramping. Resource Adequacy is the primary driver of the

¹ The term “Columbia River System” or “CRS” is used to refer to the coordinated operation of 14 specific federal projects in the Columbia River Basin. These 14 federal projects, however, are a subset of the 31 federal projects that compose the Federal Columbia River Power System. This term is intended to eliminate past confusion with the FCRPS terminology.

resource portfolios selected. E3 will also address the replacement of any attributes not covered by the RESOLVE model qualitatively.

4. *Will E3 draw on the work it did for BPA in its EIM analyses and if so, how?*

No, the EIM analysis was a static analysis specifically looking at redispatching the existing system. The LSRD removal study is a dynamic analysis about how to replace the energy and capacity.

5. *How is the analysis E3 is doing different from the analysis of replacing the services of the LSRDs in the CRSO EIS?*

BPA received some comments from the public on the CRSO EIS that specified that the analysis should use a replacement resource portfolio optimizer. E3's study uses a resource optimizer.

Additional Follow-up Questions:

1. *What other models is E3 using?*

E3's RESOLVE model is the primary model for this analysis. They will use supplemental information for qualitative analysis of the replacement of specific grid services.

2. *What is the time horizon for breaching and for the analysis?*

The study goes through 2045 when the 100% Clean Retail Sales requirement goes into effect. The study will examine LSRD breaching in 10 years and in 2 years, consistent with the approach used in the CRSO EIS.

3. *How is climate change affecting the analysis?*

The study is modeling scenarios with and without incorporation of state climate change policies. Scenarios will include deep decarbonization and electrification of transportation and buildings. Hydropower generation assumes water conditions from the last 20 years, so incorporates recent potential impacts of climate change to water supply.

4. *How are the state emission standards factoring in to market purchases?*

The study is modeling scenarios with and without incorporation of state climate change policies. The emissions associated with energy production in the model and hence any surplus energy from non-Federal generation that is available for market purchases will vary accordingly.

5. *Is the model daily, hourly, etc... can it follow load ramps?*

The RESOLVE capacity expansion model has an operational module that simulates hourly conditions over 40 representative days. This module dispatches hydro and other resources hourly to meet hourly demand. An additional module captures extreme conditions to ensure no blackouts occur during periods of high load and low hydro conditions.