BPA's Power Services
2020 Resource Program Summary

Project team

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Introduction

In support of Bonneville's 2018-2023 Strategic Plan, Power Services' 2020 Resource Program provides analysis and insight into long-term, least-cost power resource acquisition strategies. To accomplish this, the Resource Program examines uncertainty in loads, water supply, resource availability, natural gas prices, and electricity market prices to develop a least-cost portfolio of resources that meet Bonneville's obligations.

Key Take-Aways:

- This is a refresh of the 2018 Resource Program – with updates to some main inputs
- BPA's needs look lower in 2020 than in 2018 (broadly across metrics)
- BPA no longer shows a capacity need during the planning horizon, as measured by its 18-hour capacity metric
- Demand Response, in light of the lack of capacity needs and upward cost adjustments, is not currently being selected
- Results continue to show energy efficiency as the least-cost way of meeting future resource needs
- Caveats: modeling incorporates the 125% total dissolved gas (TDG) flex spill operation, but not all of the CRSO EIS Preferred Alternative impacts and does not include a soon-to-be executed long-term capacity sale

Inputs

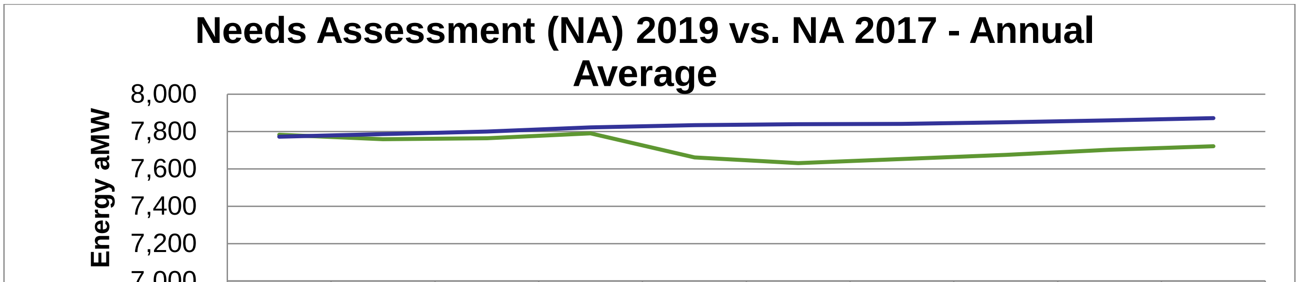
The 2020 Resource Program (2020RP) builds on the inputs and methodology used for the 2018 Resource Program (2018RP). Some inputs have been updated to reflect new information or program accomplishments. These are discussed in more detail below.

Load Forecast

An updated frozen efficiency[1] load forecast was developed to inform the needs in the 2020RP (Graph 1). Compared to 2017, annual load in the updated load forecast declined due to the termination of the Alcoa DSI contract, Pacific Northwest Generating Cooperative's election to self-supply a greater portion of its load and an overall decline in BPA's Priority Firm Tier 1 Load forecast.

[1] The frozen efficiency load forecast was developed at BPA in 2017, and consists of a Statistically Adjusted End Use (SAE) load forecasting model. The primary benefit over BPA's traditional econometric load forecast is that the frozen efficiency load forecast does not presume future incremental energy efficiency savings are automatically acquired. Without this presumption, loads are higher, and BPA is able to consider whether or not to pursue energy efficiency savings based on need, cost, and other factors.

Graph 1: Needs Assessment Obligations forecast for use in 2018RP and 2020RP



	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
2019 NA	7,783	7,760	7,764	7,790	7,661	7,631	7,654	7,675	7,702	7,722
2017 NA	7,773	7,787	7,800	7,822	7,835	7,839	7,840	7,849	7,861	7,872
Delta	11	(27)	(36)	(31)	(173)	(208)	(187)	(175)	(158)	(150)

Needs Assessment

The 2020RP also included an updated Needs Assessment (NA), which incorporated: 125% TDG, flex spill, early spill cessation assumptions, new spill calculations, and the 200MW capacity sale to Portland General Electric. With these new assumptions on resources and obligations, combined with the load forecast, average energy needs (per the P10 Monthly HLH metric[2]) decreased on average by 120 aMW over the 2022-2026 timeframe and 440 aMW from 2027-2031. Formerly, the months with the highest average needs were January and February, but this has shifted to April in the new NA because higher spill operations and the wide range of uncertainty[3] surrounding April weather and streamflow combinations. Finally, the 18-hour capacity metric no longer shows a capacity deficit due to the beneficial impacts of early spill cessation.

Market Prices

The forecast of market prices used in the 2020RP's optimization model shows a significant decline in average electricity prices from the 2018RP to 2020RP, largely due to declining regional gas prices, increasing renewable resource penetration and modeling improvements that better capture the impacts of increasingly stringent renewable portfolio standards. In the 2018RP the average Mid-C price was $36.50/MWh over the 2020-2039 study horizon. In the 2020RP, the Mid-C price is $23.60/MWh over the 2022-2031 study horizon. The change to a 10-year study horizon also puts downward pressure on average prices. All else being equal, a lower average market price can be expected to drive fewer resource acquisitions compared to the 2018RP. Additionally, on average across all 3200 price iterations, HLH/LLH price inversions occur as soon as April 2023, occur in March-November in 2028, and every month but January in 2031 (the last year of analysis).

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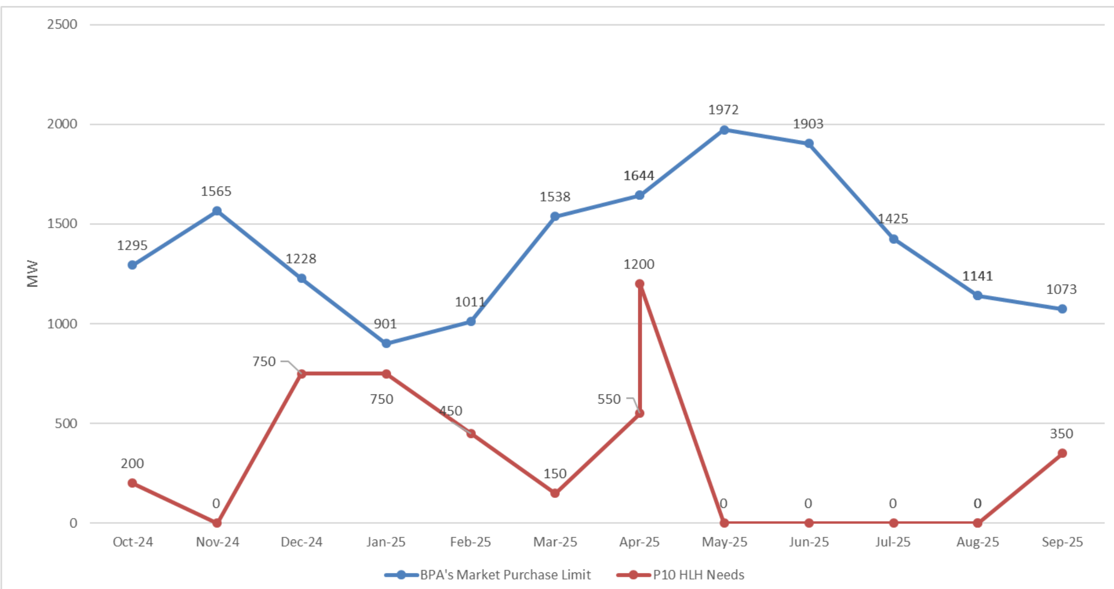
[2] The P10 HLH energy metric utilizes the stochastic analysis conducted by BPA's Needs Assessment. In this study, many different combinations of potential future load and resource scenarios are combined to create unique combinations where BPA either has enough energy to serve its heavy load hour load obligations, on a monthly basis, or does not. The P10 HLH metric goes to the 10th percentile of this distribution (looking at the bad outcomes for BPA) and determines, by month, whether BPA is surplus or deficit resources required to meet load. If BPA is surplus, at the P10, then BPA considers itself not to have an energy need in that month. If BPA is deficit in any month, then the size of the deficit becomes BPA's energy need, for that month, to solve for in the Resource Program.

[3] While April shows a large deficit at the 10th percentile, it flips to a surplus at the 24th percentile, and the surplus grows from there.

Market Availability

BPA assumes a limited amount of energy purchases will be available from the Mid-Columbia trading hub to help meet its energy needs. This assumption of availability is calculated monthly, in AURORA, for the duration of the study period, and is unchanged from the 2018RP. If in any month the optimization model has a need for energy remaining after purchasing its full monthly allowance from the spot market, the model will fill any gaps in those months by adding incremental resources to the least-cost portfolio. In the 2018RP, BPA's monthly needs occasionally exceeded BPA's monthly market purchase limit. In the 2020RP this is no longer the case – in the 2020RP, BPA's share of the market exceeds BPA's forecasted energy needs in every month. This is illustrated for a representative year, FY 2025 (Figure 1). The practical impact of this is the model will never be forced to acquire a resource because it never runs out of assumed market depth. Further, this means that, to acquire a resource to meet BPA's needs, that resource must be cheaper than the market, otherwise the model will simply choose to serve the need with market purchases.

Figure 1: Bonneville's Needs vs. Market Purchase Limits in FY 2025[4]



Resources

The resource categories considered in the 2020RP are the same as those considered in 2018, but include updates to resource costs and savings shapes, where applicable. These updates are detailed below.

- Renewable Resources: Wind and solar capital costs decreased by approximately $200/kW (to $1,366/kW fixed cost for a 2025 build date) and $50/kW (to $1,242/kW fixed cost for a 2025 build date), respectively, before tax credits are applied.
- Natural Gas Turbines: Capital and variable costs for natural gas plants are unchanged from the 2018RP ($1,047/kW fixed cost for a 2025 build date).

[4] Note that, for its planning purposes, April is divided in half due to the substantially different weather, streamflow, and operational requirements across the month. The two points above April in the graph represent the measures of heavy load hour energy need for the two halves, April I and April II.

- Market Purchases: Average Mid-C prices declined over the study horizon from the 2018RP to the 2020RP.
- Energy Efficiency (EE): Supply curves from the 2018 Conservation Potential Assessment were updated to account for 90aMW of planned EE acquisitions and 56 aMW of expected market transformation and momentum savings over the 2020-2021 time period.
- Demand Response (DR): Updates to assumptions and corrections to the levelized cost calculations for DR resources increased the cost of DR resources in the 2020RP relative to 2018. All else being equal, increases in the cost of DR resources will tend to reduce the amount of DR selected by the model.

Preliminary Results

Given these updates, the results of the 2020RP lean toward slightly lower amounts of EE acquisition than in 2018, with the least-cost portfolio shedding a few of the more expensive EE bundles. This follows from the lower needs, eliminated capacity metric and lower market price forecast. Also as a result of these changes, EE is the only resource selected in any of the relevant portfolios. A comparison of the EE acquisitions from the 2020RP and 2018RP are shown in Table 1 below. The first 2 years' cumulative total amount of EE selected in the least cost portfolio is one of the inputs used to determine how many average megawatts of EE BPA will programmatically pursue in the ensuing rate case – in this instance, in BP-22.

Table 1: EE Acquisition of Least-Cost Portfolio in 2020RP and 2018RP

2020 Cumulative Savings (aMW)	
	2-year
Portfolio 1	111

2018 Cumulative Savings (aMW)	
	2-year
Portfolio 1	121

Considerations

The 2020RP was developed using the most up-to-date information available at the time. However, some developments that occurred after the finalization of the NA could potentially influence BPA's needs and thus the least-cost resource selections in the Resource Program. The most significant of these developments are an update to, or elimination of, the Hourly Operations System Scheduler (HOSS) tool (resulting in changes to the NA metrics and/or their calculations), the impact of the Columbia River System Operations Environmental Impact Study Preferred Alternative, and an impending 5-year capacity sale to an external party. The influence of these developments on BPA's NA and Resource Program are uncertain at this time, though they are all anticipated to exert directionally upward pressure on BPA's needs metrics. Potential impacts can be assessed, in part, with future sensitivity analysis.