MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

Rely on us.

TO:	Commissioners McRae, Barofsky, Schlossberg, Brown, and Carlson
FROM:	Brian Booth, Chief Energy Resources Officer; Megan Capper, Energy Resources Manager; Ben Ulrich, Lead Energy Resources Analyst
DATE:	November 22, 2024
SUBJECT:	Initial Results of BPA Product Analysis
OBJECTIVE:	Information and Board Discussion

Issue

EWEB must select a Bonneville Power Administration (BPA) product for its next contract by June 2025. To support this decision, EWEB staff are preparing an Energy Resource Study (ERS) that will compare the available BPA products offered in the next "Provider of Choice" contract. Staff have conducted initial quantitative analysis and will share initial findings.

Background

BPA is planning to offer four base products in the Provider of Choice post 2028 contracts. A summary of these products was provided at the July 9, 2024 Board meeting[1]. The products are:

- Slice/Block
- Block Only
- Block with Shaping (and optional Peak Load Variance Service)
- Load Following

Staff have prepared an initial set of scenario-based financial analysis, which compares the costs of energy portfolios containing sets of BPA products and supplemental resources. BPA product and rate design details are still evolving and by early next year we will have refined this analysis and incorporated additional consideration for risks. The quantitative analysis presented in this memo provides the foundation from which we will build and is complementary to the qualitative discussions commissioners had at the Oct. 15 work session.

[1] 2025 Energy Resource Study: BPA Product Choice Overview (PDF), https://www.eweb.org/your-public-utility/board-of-commissioners/2024-board-agendas-and-minutes/07-09-24-board-agenda

Discussion

Initial Findings of Energy Resource Study Modeling

The purpose of these initial results is to aid management in highlighting products to study in more detail and key drivers of differences in cost between products. However, these results should be considered preliminary, and subject to change over time. BPA rate/product design is still being actively negotiated and there is uncertainty in product terms and conditions embedded in these initial modeling assumptions. To address this, staff are collaborating with BPA and other public utilities to refine and validate models, assumptions, and results. Analytical findings will continue to be vetted and evaluated in the coming months. Our initial modeling results show the scale of the decision EWEB is making: The BPA product decision reflects a $2.5 to $3 billion investment over the next 20 years. This investment in a reliable, affordable, environmentally responsible and resilient energy supply will benefit our community for years to come. These results are identified as "initial" because staff plan to continue to evaluate our modeling approach and refine assumptions between now and the completion of the study.

The financial scale of the decision is significant. But all the BPA product choices are good choices for EWEB. Each will enable EWEB to reliably serve our customers with affordable, low-carbon energy. The details between products differ, but each retains EWEB's access to the federal hydropower system, which has always been the foundation of our energy supply.

As staff prepared initial modeling results and explored key drivers for EWEB's 2028 product selection, a key question emerged: How will EWEB meet its future capacity requirements?

Capacity is the ability to provide energy to our customers *when they need it.* Energy resources that provide significant amounts of capacity are dispatchable – they can be turned on when needed. A key driver for both the region and EWEB's need for capacity is due to growing concerns that the western grid may not have sufficient resources to be reliable in the future. To address this, EWEB committed to participate in the binding phase of the Western Resource Adequacy Program (WRAP) by 2028. The WRAP is intended to bolster regional reliability by ensuring that all participants procure enough resources on a planning basis to carry their share of reliability obligations. This includes procuring enough capacity to meet a Planning Reserve Margin above EWEB's average peak, which is a higher planning standard than we have had in the past. The WRAP is an important program for the region to ensure that the regional grid remains reliable for all customers.

The initial modeling results reveal that the cost of acquiring sufficient WRAP capacity is a key driver of cost differences between the various BPA products and will be an important consideration in EWEB's product choice.

Staff used the modeling tools (described in Appendix A) to establish a Base[2] case set of assumptions and results. Staff then performed sensitivity analysis to understand which variables were most impactful to the Base case when comparing the BPA products. Given the uncertainties in the future, sensitivity testing was the easiest way to determine which assumptions were most impactful to identifying the least-cost BPA product option for EWEB. The initial scenarios tested by staff were not based on likelihood, but instead focused on identifying which assumptions created the most differences between products, and whether least-cost product rankings were impacted. Said another way, staff intentionally chose to model scenarios that changed which product was the "winner" or "least-cost option" to identify good candidates for further study.

The following table provides a summary of the total portfolio costs for each BPA product, itemized to highlight the financial magnitude of each key element of BPA product cost.

Figure A: Initial Base case results summary

Study Period: 2025-2045	Real 2024$ in millions				
	Block	**Slice/Block**	**Block with Shaping**	**Block w/Shaping + PLVS (80%)**	**Load Following**
BPA Composite Charge	$ 2,060	$ 2,060	$ 2,060	$ 2,060	$ 2,060
Demand/Capacity Charge	$ -	$ -	$ 410	$ 410	$ 540
BPA Bill Credits	$ (430)	$ (110)	$ (440)	$ (460)	$ (550)
Peak Load Variance Service	$ -	$ -	$ -	$ 100	$ 100
Total BPA Tier 1 Bill	$ 1,630	$ 1,950	$ 2,030	$ 2,110	$ 2,150
Surplus Remarketing	$ (170)	$ (250)	$ (290)	$ (310)	$ (160)
Non-Federal Resources	$ 1,800	$ 1,250	$ 1,190	$ 740	$ 460
Study Period Total	$ 3,260	$ 2,950	$ 2,930	$ 2,540	$ 2,450
Average Per Year	$ 155	$ 140	$ 140	$ 121	$ 117
Percent Difference	28%	18%	18%	3%	0%

Results summary line-item descriptions:

BPA Composite Charge: Fixed charge designed to recover the capital and operating expenses for the Tier 1[3] Federal System, applies to all BPA products.

[2] The Base case represents a reasonable set of initial assumptions and provides a benchmark for additional analysis, but it does not necessarily represent EWEB's most likely, or expected, future. Staff established Base case assumptions by selecting an average or mid value within a range of estimates.

[3] Tiered rates are a *ratemaking* approach used by BPA to separate the costs of BPA's existing federal resource portfolio from the costs of new resources to meet load growth. Tier 1 power is based on the capabilities and costs of the existing federal hydro system and accompanying resources, while Tier 2 power is based on forecast market rates or the cost of new resources.

Demand/Capacity Charge: Variable charge based on actual peak demands (in MW) which is designed to send a marginal price signal to customers to both recover the cost of holding capacity to serve customer loads and encourage the efficient use of BPA Tier 1 capacity.

BPA Bill Credits: BPA has proposed two billing credits for the Provider of Choice 2028 contracts. The first is a 'mitigation' credit, intended to mitigate rate impacts between the Regional Dialogue and Provider of Choice contracts that are due purely to rate design changes. The second is a 'capacity' credit intended to ensure that customers are allocated access to the value of existing federal capacity in their BPA bills. These billing credits apply differently to each product. The difference depends on how much capacity a customer is purchasing from BPA and whether a given product is cheaper or more expensive under the new contract compared to current Regional Dialogue products.

Peak Load Variance Service: With this service, BPA provides planning capacity for up to that customer's 1-in-10 peak load, for a fee. This is intended to be an 'insurance' type product for infrequent load events and may meet some or all WRAP capacity obligations, depending on WRAP accreditation.

Surplus Remarketing: Estimated secondary sales of surplus energy and capacity of any supplemental, non-federal resources. These values are calculated monthly based on forecasted average generation minus average load multiplied by forecasted market prices.

Non-Federal Resources: The cost of building supplemental resources to meet EWEB's energy and capacity needs over the 20-year study period. Based on the forecasted cost of building new, utility-scale resources like wind, solar, geothermal, battery, etc. and the capacity gaps for each BPA product. Note, if EWEB's loads grow in the future, it is likely that EWEB would need to purchase some supplementary resources, regardless of which product EWEB chooses.

Initial findings

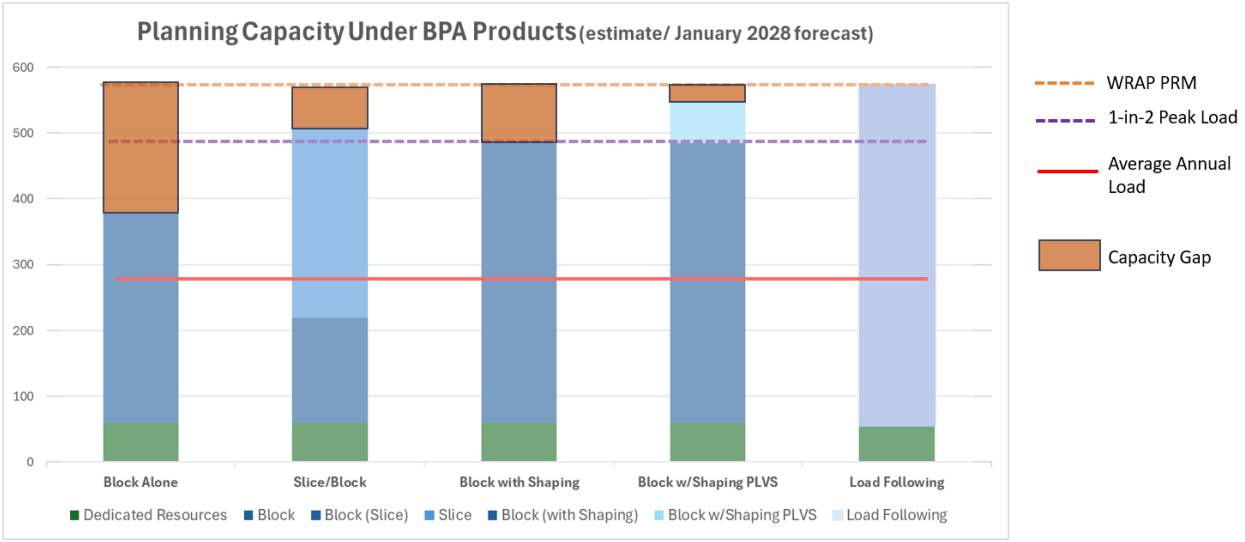
While these initial results contain many estimates, staff believe there are some early analytical findings that will remain consistent throughout the study, even as our numbers continue to be reviewed and refined.

BPA capacity gaps drive portfolio cost effectiveness

Initial Base case modeling results showed that BPA products that left larger portfolio capacity gaps were estimated to cost more because they access the least amount of currently available low-cost legacy BPA capacity and required more expensive supplemental capacity resources (i.e. new utility-scale wind, solar, geothermal, battery, etc.). As shown in Figure A, products like Block, Slice/Block and Block with Shaping (excluding PLVS) were estimated to be 18-28% more expensive than Load Following and Block with Shaping + PLVS.

The chart in Figure B below helps show the conceptual differences between products and their ability to meet WRAP Planning Reserve Margin (PRM) requirements and the resulting "capacity gap" that would need to be filled with supplemental, non-federal resources.

Figure B: Illustration of WRAP capacity gap differences between BPA products



Peak Load Variance Service is a cost-effective way to serve future needs

Access to Peak Load Variance Service (PLVS) from BPA reduces the need for supplemental non-federal resources. Looking at the Block with Shaping Product with and without the PLVS product, it's possible to see the cost of PLVS is estimated to add roughly $100 million ($5 million per year) in additional BPA billing cost, but it reduces non-federal resource costs by $450 million ($22.5 million per year). This implies that the net benefit of this peaking service alone is roughly $350 million ($17.5 million per year). The key drivers of value for PLVS are 1) the capacity requirements of the WRAP which increases EWEB's need for this capacity service from BPA and 2) the proposed pricing of this service by BPA at 'embedded cost of capacity' which is roughly 50-60% less than the cost of marginal capacity resources. As a result, the PLVS product option provides EWEB with access to low-cost capacity that could be used to meet future WRAP obligations.

Both the Load Following product and Block with Shaping + PLVS product options include this type of capacity, but there are differences. The Load Following Product covers a larger amount of capacity service because BPA provides full WRAP compliance to Load Following customers, whereas PLVS is subject to a capacity cap at 1-in-10 forecasted peak loads[4] for the Block with Shaping product. Load Following has full WRAP compliance and costs built in, whereas Block with Shaping + PLVS customers would need to supplement their BPA product with some additional capacity to meet WRAP planning reserve margin requirements. This can be seen on Figure A which shows that the Block with Shaping + PLVS product has more non-federal resource costs when compared to the Load Following product.

Initial scenario testing

As mentioned above, the Base case contains a set of assumptions which, taken as a whole, represent a feasible view of the next 20 years from a power supply point of view. The Base case modeling results include assumptions for EWEB system load growth, future BPA rates, the availability and costs of potential new supplemental non-federal resources, estimates of transmission costs, market prices and many other assumptions.

Scenario testing is a way to stress the Base case by changing the input assumptions in a systematic and methodical way while noting how the results change. This testing is called "scenario" because it involves envisioning a particular future different than the Base case,

[4] 1-in-10 forecasted peak loads is a high load occurring only once every 10 years. This is a higher level of service above 1-in-2, but it falls short of the WRAP compliance standard of a 1-in-10 year loss of load event.

determining how to alter the settings in the model to create that scenario, and then running the model and noting the resulting changes in cost from the Base case.

As an example, one important assumption in the Base case is that EWEB load will grow due to population growth and EV adoption over time. In order to better understand the effect of that load growth assumption's impact on the portfolio cost and how it may impact each BPA product differently, staff created a "no load growth" scenario and a "high load growth" scenario. To implement these scenarios, new monthly loads were incorporated into the model in place of the Base case assumption. The model was then run for each BPA product, and the portfolio cost recorded. Now, instead of a single point of data (i.e. the Base case portfolio cost) we now have estimated a range of costs or "bookends" for how the load growth assumption may impact product costs.

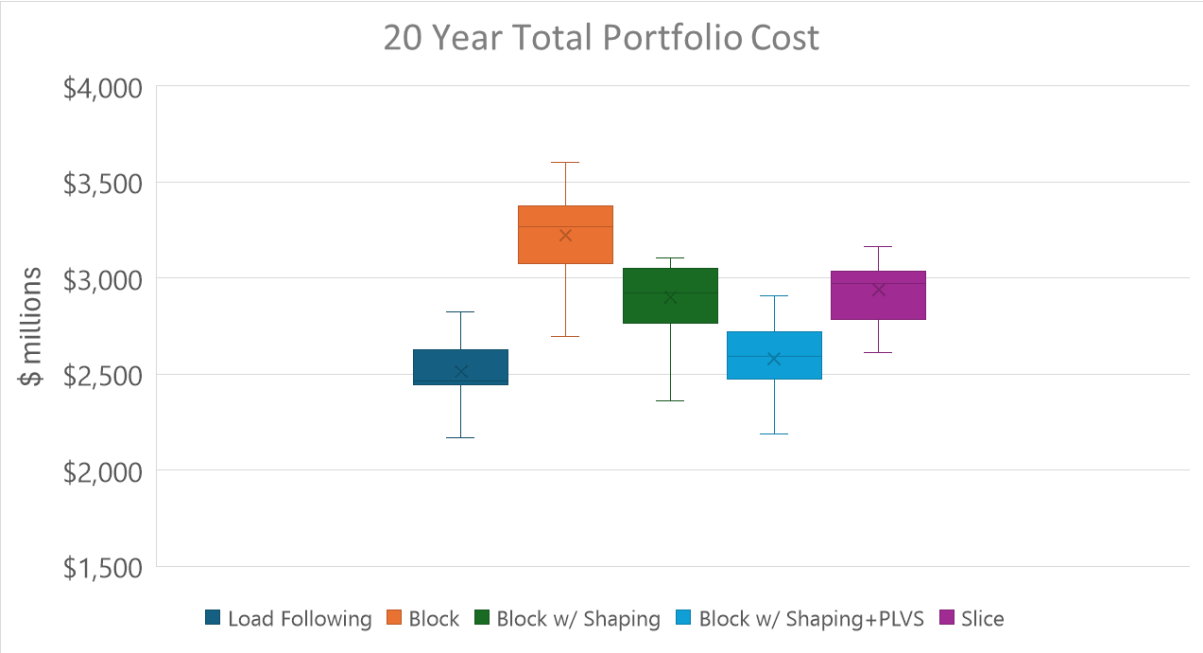
After setting up the models and completing a Base case based on average or mid values, staff analyzed the following simple scenarios:

- Load growth: no load growth and high load growth
- Market prices: high, very high, and low market prices
- New resource costs: high and low non-federal resource costs
- BPA Rates: High BPA rate
- WRAP compatibility: Alignment with WRAP and Planning Reserve Margin obligations

Staff combined various assumptions to create 17 initial scenarios. Each scenario run produced a different total portfolio cost which provided a sense of how these assumptions influence the costs of each BPA product. Since the focus of this study is to find out how the BPA products fare against each other, staff ran each of the modeled scenarios separately for each BPA product, intentionally choosing scenarios that would create differences when comparing the products. These 17 scenarios are not probabilistically weighted, but instead were designed to explore which assumptions are most influential over the relative rankings of each product. Determining which assumptions influence the analysis help staff pinpoint areas for more in depth analytical focus.

To illustrate the variation in product costs based on the initial 17 scenarios, staff utilized a box & whisker diagram in Figure C.

Figure C: Box and whisker diagram of 17 initial scenarios variation in cost



The box & whisker diagram breaks the results for each product into quartiles with 50% of the 17 scenarios falling within the box section and the upper and lower quartiles shown in whiskers. Box & whisker diagrams are most often used to illustrate statistical characteristics about a dataset. However, it should be noted that a dataset of 17 scenarios is very small and not intended to indicate likelihood of a particular outcome, instead this diagram is supposed to illustrate a general range of variation the 17 scenarios create through "stress testing".

Initial modeling conclusions and next steps

The portfolios created with these BPA products appear to create two distinct groups. A higher-cost group (including Block, Slice/Block, and Block with Shaping (excluding PLVS)), and a low cost group (including Load following and Block with Shaping + PLVS). The low-cost portfolios are generally more cost effective at providing the same level of service, when compared to the high-cost group. As such, they are more likely to be picked by EWEB's management as a recommended product.

Thinking specifically about the products, the Slice/Block has served EWEB's needs under the existing Regional Dialogue contract, however the emerging WRAP capacity requirements appear to make Load Following and the Block with Shaping + PLVS a better value for EWEB given current assumptions about the cost of BPA capacity. Looking forward, staff plan to focus additional analysis efforts on the low-cost group of products: Load Following and Block with Shaping + PLVS. Given initial findings these products are most likely to be picked as EWEB's

recommended products. Slice/Block will continue to be considered in our analysis as a business as usual comparison product.

Recommendation & Requested Board Action

No action is requested. Initial modeling results are being shared with commissioners to provide context and understanding for how Energy Resource Study is progressing, and how/why staff intend to focus analytical efforts on a subset of potential BPA products.

Appendix A:

Modeling Approach

To estimate the costs of each BPA product choice, staff use a variety of analytical tools. The first is the Aurora software which is used to estimate future market prices of energy over the 20-year study period. These market prices inform the value of any surplus energy in EWEB's future resource portfolio. These prices also influence what resources get selected by the What'sBest! optimization tool (an excel add-on). The WhatsBest! optimization tool identifies the least-cost mix of resources that could be used to supplement a selected BPA product. Staff have also created a BPA Rates model to estimate the cost for each BPA product. When combined, the What'sBest! Optimization tool and BPA rates model can be used to estimate the total portfolio costs for each BPA product over the next 20 years. Lastly, staff are also exploring the use of "@Risk" an excel-based Monte Carlo Risk analysis tool to help estimate the impacts of uncertainty on our modeling results. Staff will only be presenting modeling results from the What'sBest! and BPA Rates models at the December Board meeting.

The purpose of the quantitative analysis is to align assumptions among the BPA products to compare the estimated financial impacts of a product choice. At the Energy Resource Study kickoff presentation to commissioners in February 2024, staff presented the concept of a "Quantitative Variables Matrix" which could be populated using study results. An updated

illustration of that matrix is presented below:

Quantitative Variables Matrix					
	Analytical Tool	**Load Following**	**Block with Shaping (+PLVS)**	**Block only**	**Slice/Block**
BPA Service Level		High	Mid/High	Mid/Low	Low
BPA Costs (Rates x Billing Determinants)	BPA Rates Model	$$$	$$$	$$	$$
Non-Fed Resource Costs	What'sBest! Optimizer	$	$	$$$$	$$$
Total Portfolio Costs (20 year)		**$$$$**	**$$$$**	**$$$$$$**	**$$$$$**

This decision matrix illustrates that the total energy portfolio costs of a given BPA product choice is the sum of the cost of each product (a function of BPA rates) and the cost of non-federal resources that EWEB would need to procure to supplement each BPA product. In order to compare the products, EWEB must consider both the BPA product cost and the non-federal resource costs. A table in this format showing initial Base case results summary is presented in Figure A within the body of the memo.