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June 7, 2022

MEMORANDUM

TO: Council Members

FROM: Jennifer Light, Interim Director of Power Planning

SUBJECT: Bonneville Resource Program Report, Part 2

BACKGROUND:

Presenter: Ryan Egerdahl, Torsten Kieper, Eric Graessley and Dave Moody, Bonneville

Summary:

Bonneville staff will continue their presentation of its Resource Program. Bonneville's Resource Program develops forecasts of federal system energy, capacity, and balancing needs and evaluates resource development solutions to meet those needs. The timeframe for the next Bonneville Resource Program is 2024-2033, which aligns with the beginning of the next rate case.

This presentation is the second of a two-part presentation to the Council's Power Committee. At this meeting, Bonneville staff will:

1. Revisit the key findings presented at the May Power Committee
2. Share the results of the Resource Program

(1) Revisiting Findings from Part 1

At the May Power Committee meeting, Bonneville staff shared its analysis and findings from its needs assessment, wholesale market price forecast, and wholesale market depth analysis. At the June meeting, Bonneville staff will briefly revisit the key findings

shared during the May discussion. The purpose is to allow committee members to ask additional questions and ensure a full understanding of the inputs, before digging into the results.

(2) Resource Program Results

After wrapping up discussion on the inputs, Bonneville staff will share out the results of the Resource Program. These results show a range of energy efficiency acquisition, demand response, and some need for resources like solar PV and offshore wind in later years of the study. These results are an input into Bonneville's acquisition strategy, which is to be consistent with the Council's 2021 Power Plan.

Relevance:

Bonneville's resource acquisition strategy is also a subject for the Council's power plan under the Northwest Power Act. To summarize briefly and at a high level, the Council's power plan is to set forth a scheme for implementing conservation measures and developing resources to reduce or meet Bonneville's obligations(Section 4(e)(2)) and the power plan is to include: a conservation program to be implemented under this Act (Section 4(e)(3)(A)); a forecast of the amount of power resources estimated by the Council to be required to meet Bonneville's obligations and portions of such obligations that can be met by resources in each of the priority categories; and the approximate amounts of power the Council recommends should be acquired by Bonneville, with an estimate of the type of resources from which such power should be acquired(Section 4(e)(3)(D)).

In turn, the Act specifies that all of Bonneville's actions to acquire resources pursuant to Section 6 of the Act are to be consistent with the Council's power plan except as otherwise specifically provided for in the Act (e.g. Sections 4(d)(2),6(a),6(b)). This includes acquiring conservation resources, with Section 6(a)(1) obligating Bonneville to acquire conservation and implement conservation measures "as the Administrator determines are consistent with the [Council's power]plan," as well as the acquisition of other resources, with Section 6(b)(1) adding that "[e]xcept as specifically provided in this section, acquisition of resources under this Act shall be consistent with the plan, as determined by the Administrator." Therefore, Bonneville's resource authorities and decisions are tied to the Council's power plan through a consistency obligation.

The Council's 2021 Power Plan provides specific recommendations to Bonneville, informed by the analysis in the plan, including a Bonneville specific scenario. The recommendations to Bonneville around resource acquisitions include:

- Acquire between 270 and 360 aMW of cost-effective energy efficiency by the end of 2027, of which at least 243 aMW must be from programmatic savings, and at least 865 aMW by 2041, and additionally Bonneville should
 - Use the Council's methodology and associated parameters for determining which energy efficiency is cost-effective
 - Contribute to all aspects of the regional conservation program
 - Work with the Council to ensure that budget is established successfully to meet the plan's efficiency targets

- Work to enable and encourage its customer utilities to pursue low-cost and high-value demand response, including time-of-use rates and demand voltage regulation
- Look to mid-term and long-term market resources for additional energy when needs are beyond those met by the recommended energy efficiency and demand response resources
- Compare market products, both in price and capacity, to renewable power purchase agreements to ensure that the lowest-cost product that suffices to meet any need is identified

Our understanding of the current iteration of Bonneville's Resource Program is that it is intended to work within that framework. And the Council's ultimate interest is in seeing Bonneville make resource decisions consistent with the Council's power plan as provided for under the Act. Council staff are committed to continuing to work with Bonneville staff as they develop their strategy acquiring resources consistent with the Council's 2021 Power Plan.

More Info:

[May Power Committee Presentation on Part 1 of the Resource Program](#)



2022 BPA Resource Program

Preliminary Resource Solutions

Power Committee Meeting

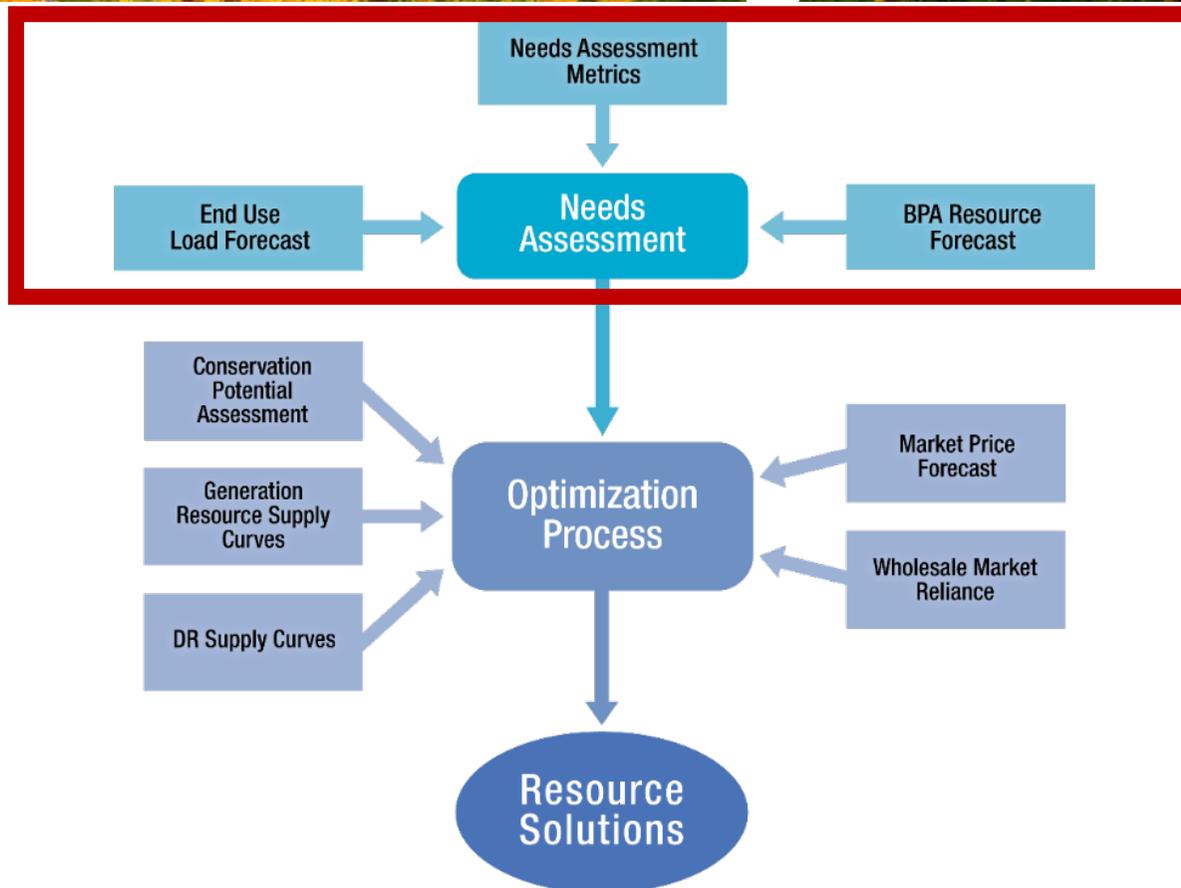
June 14, 2022



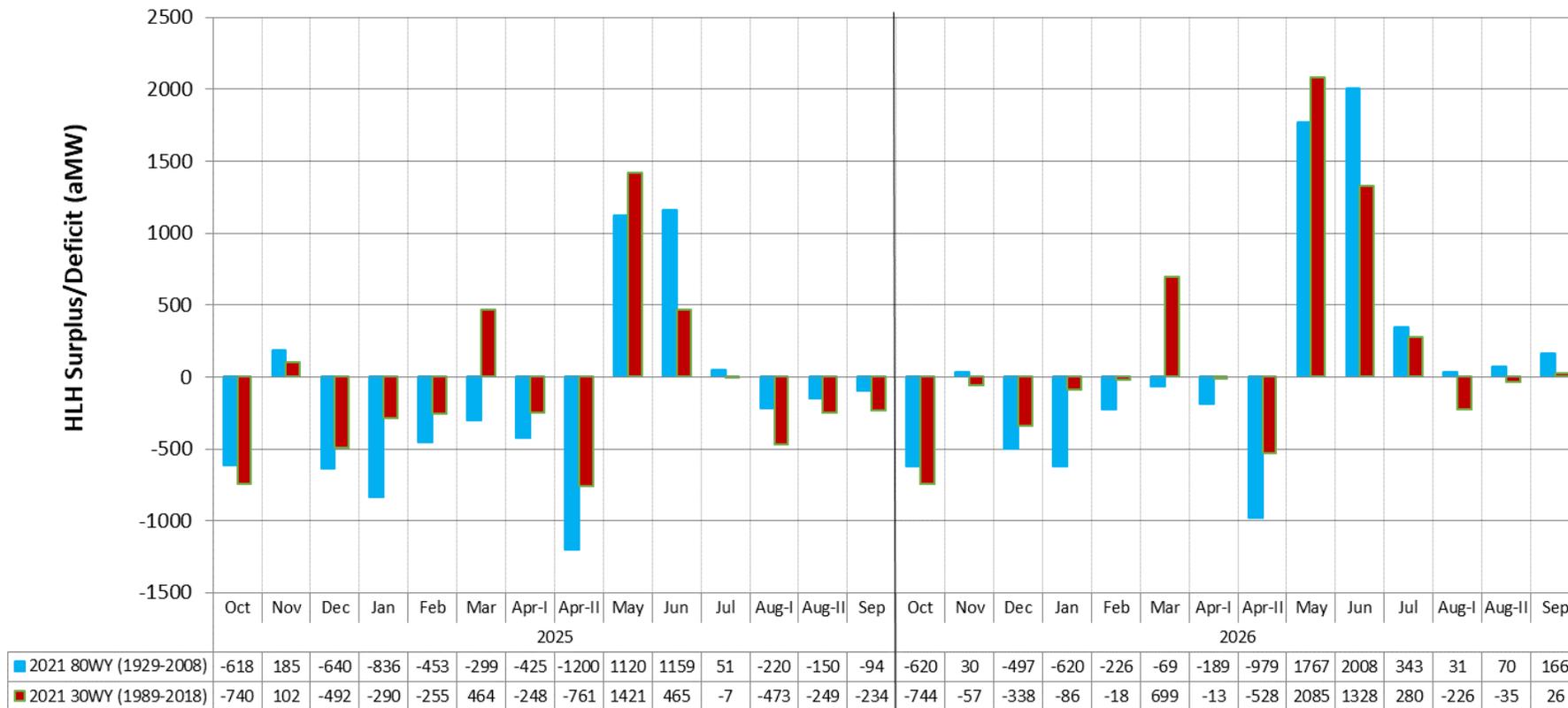
Agenda

- Recapping last meeting
 - Needs Assessment
 - Long-Term Capacity Expansion
 - Market Prices
 - Market Limits
- Draft Portfolio Optimization Results (aka Resource Solutions)

2022 Resource Program Process

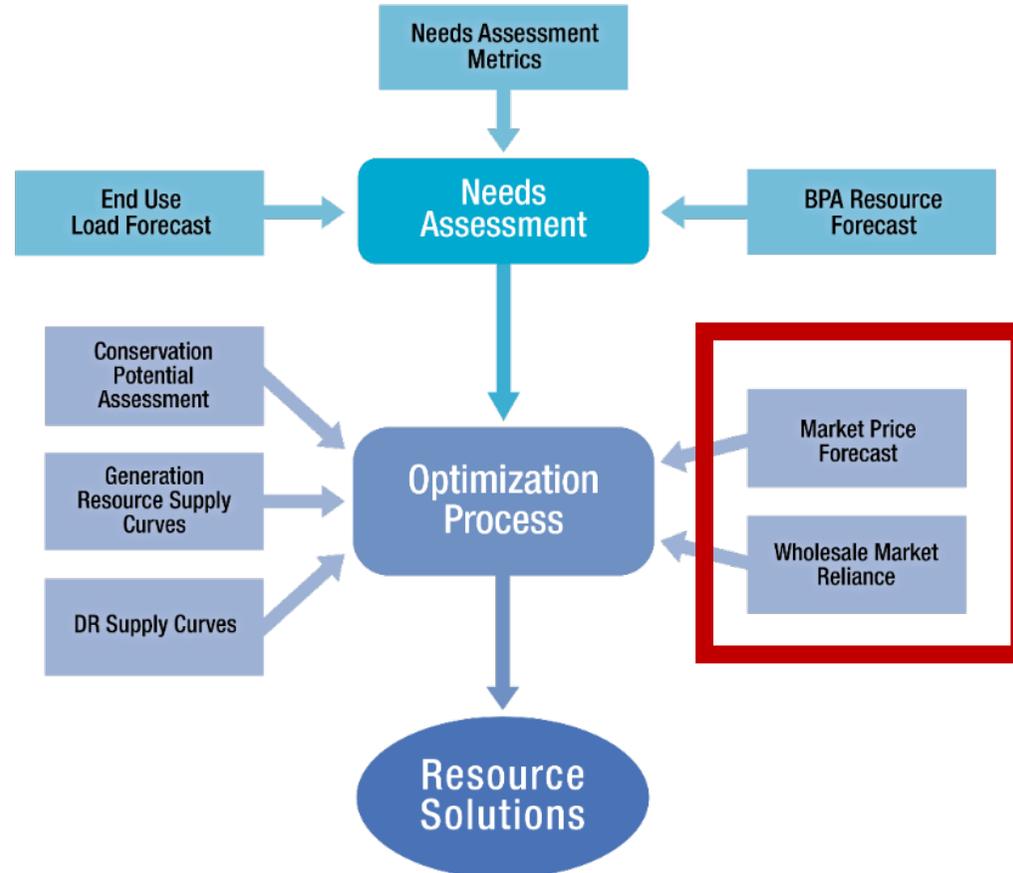


P10 Heavy Load Hour Metric

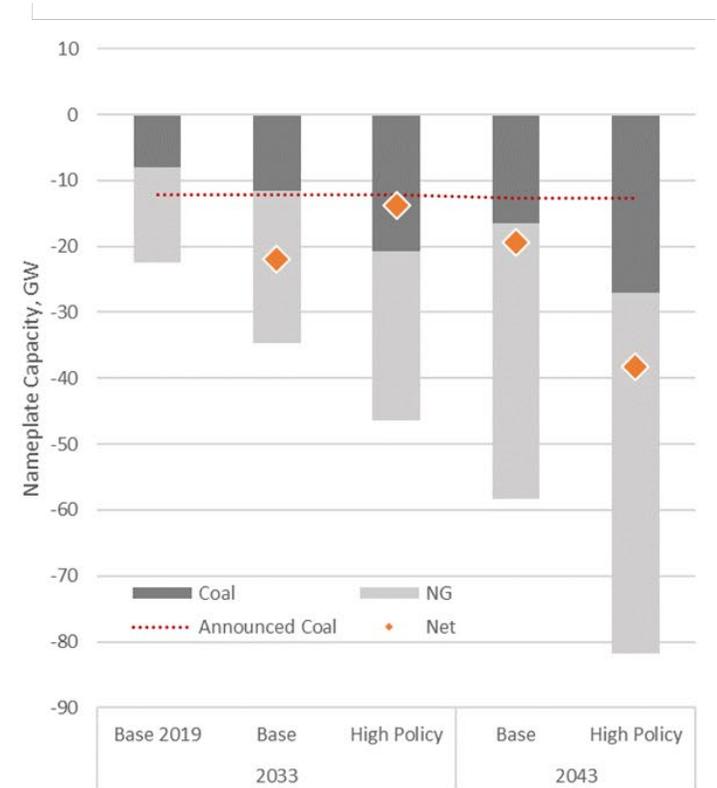
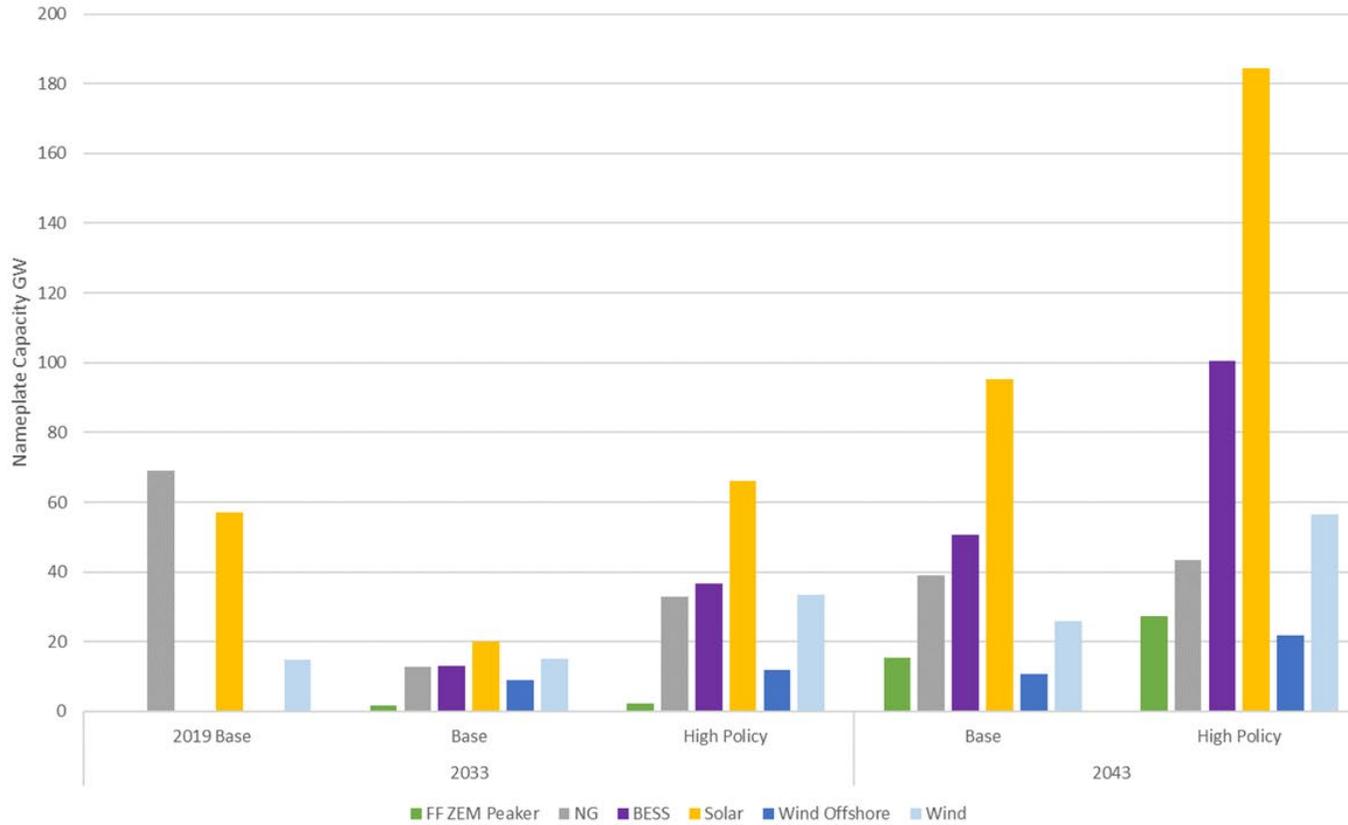


- 30 years of historical streamflows results in more generation in winter and less generation in summer, compared to the 80 years of history.

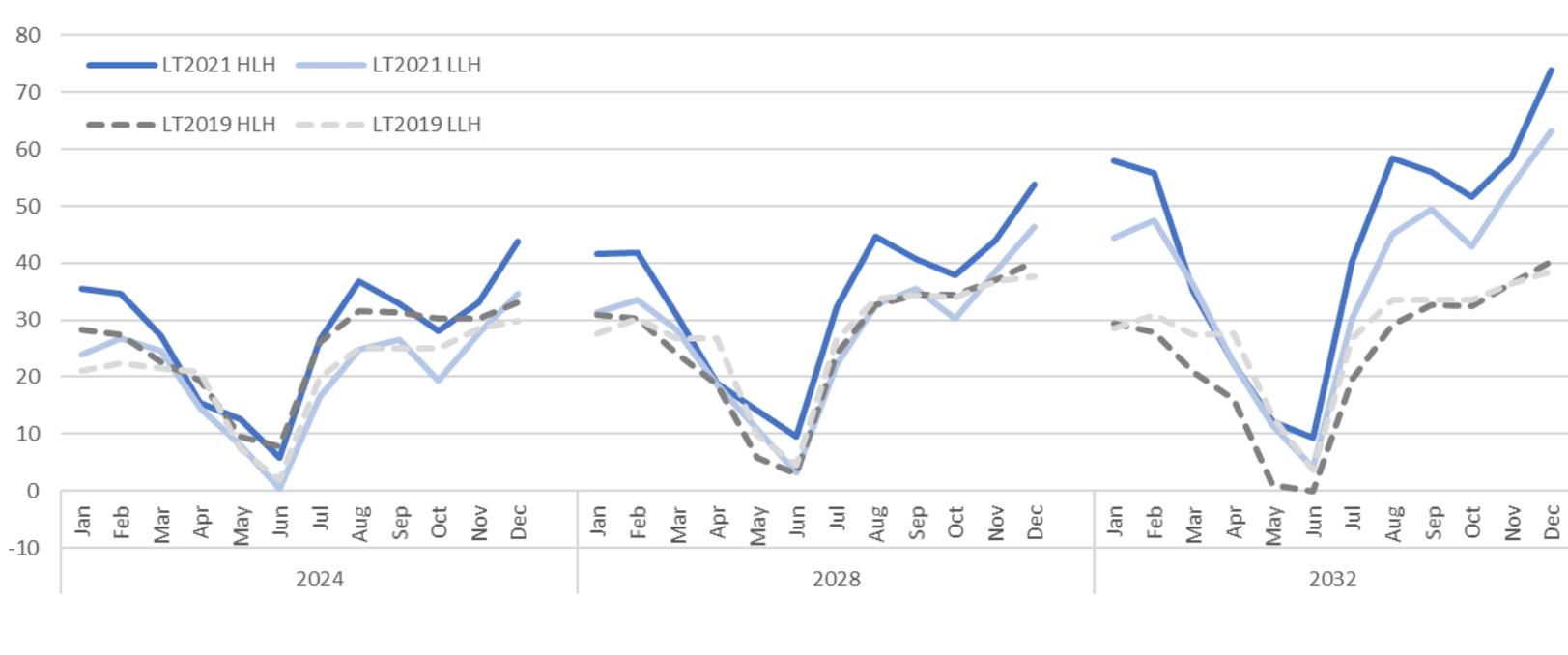
2022 Resource Program Process



Cumulative WECC Builds & Retirements

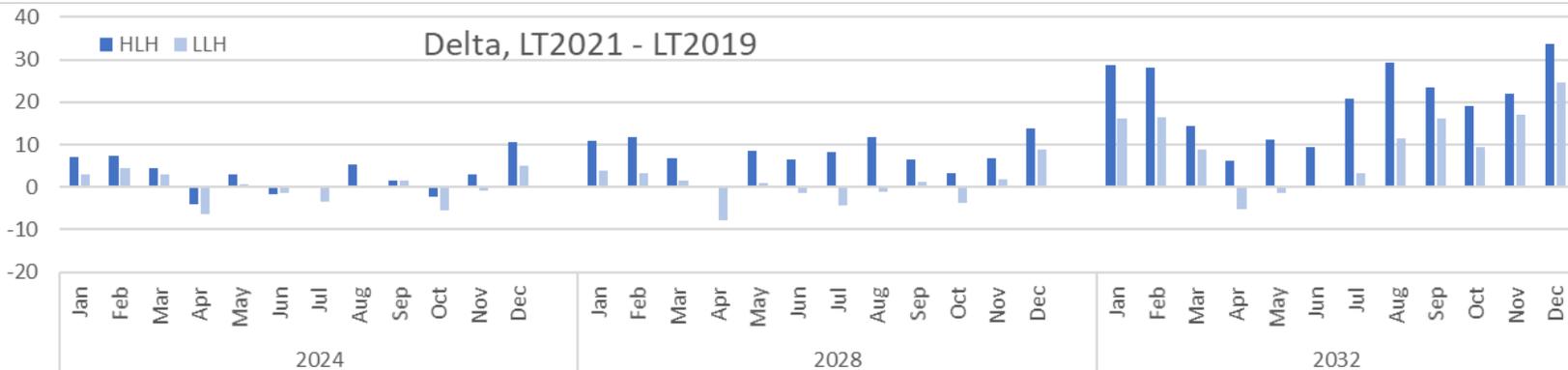


\$/MWh, Nominal

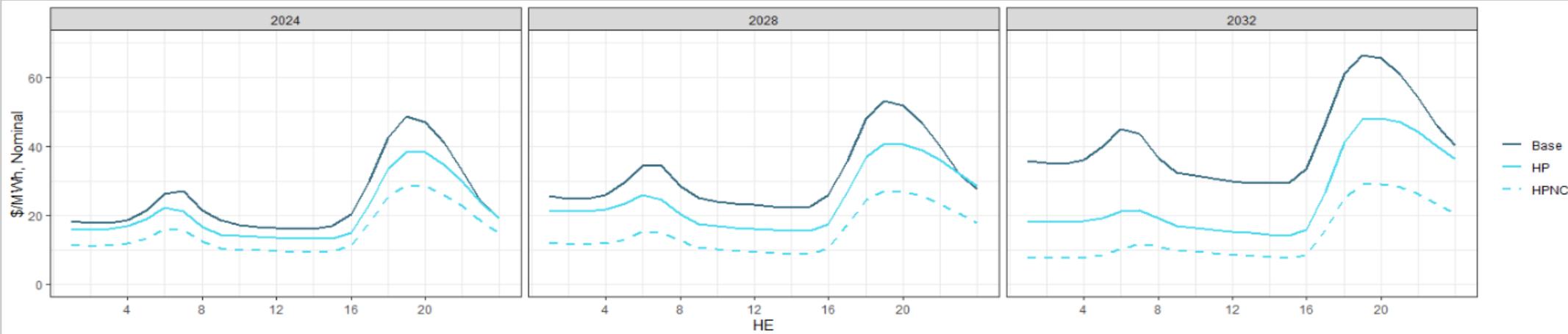
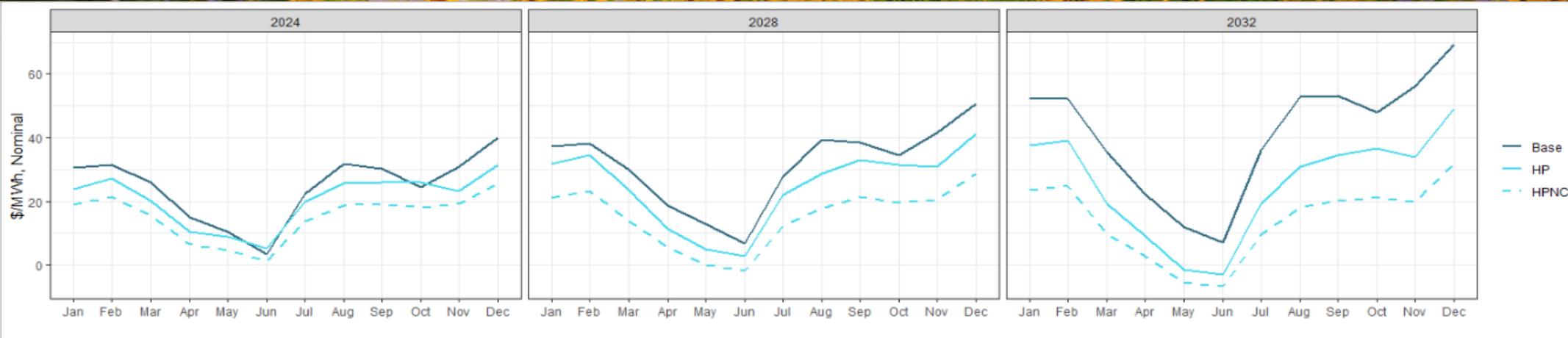


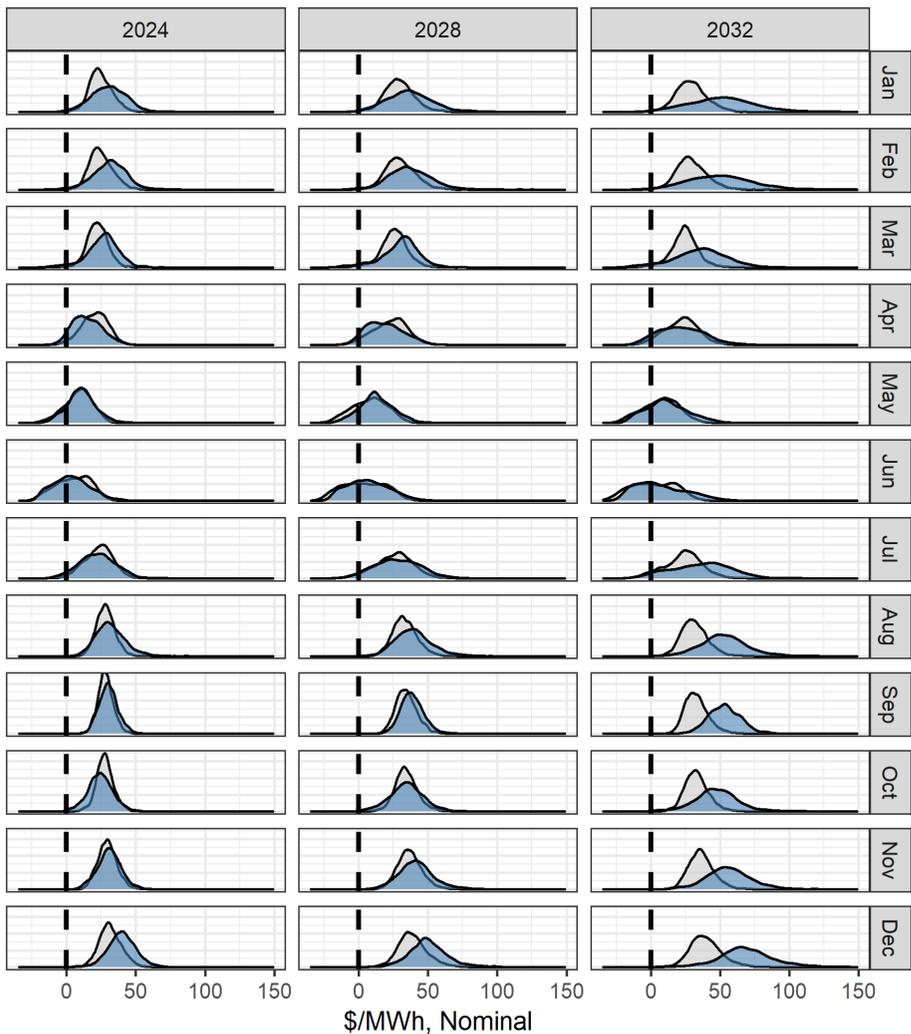
PNW Prices Diurnal Month Avg.

LT2019 Base vs LT2021 Base



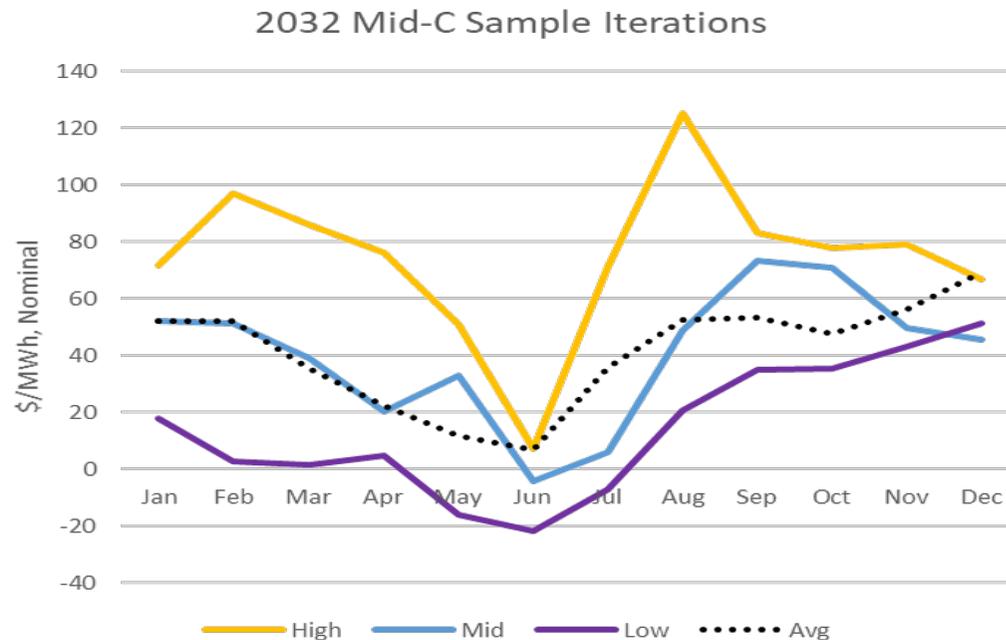
LT 2021 PNW Prices, Avg. by Month and Hour



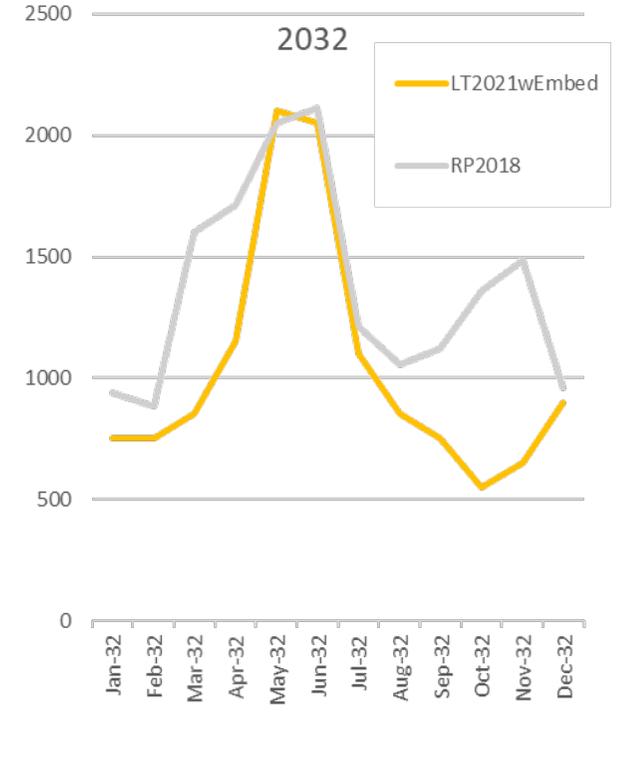
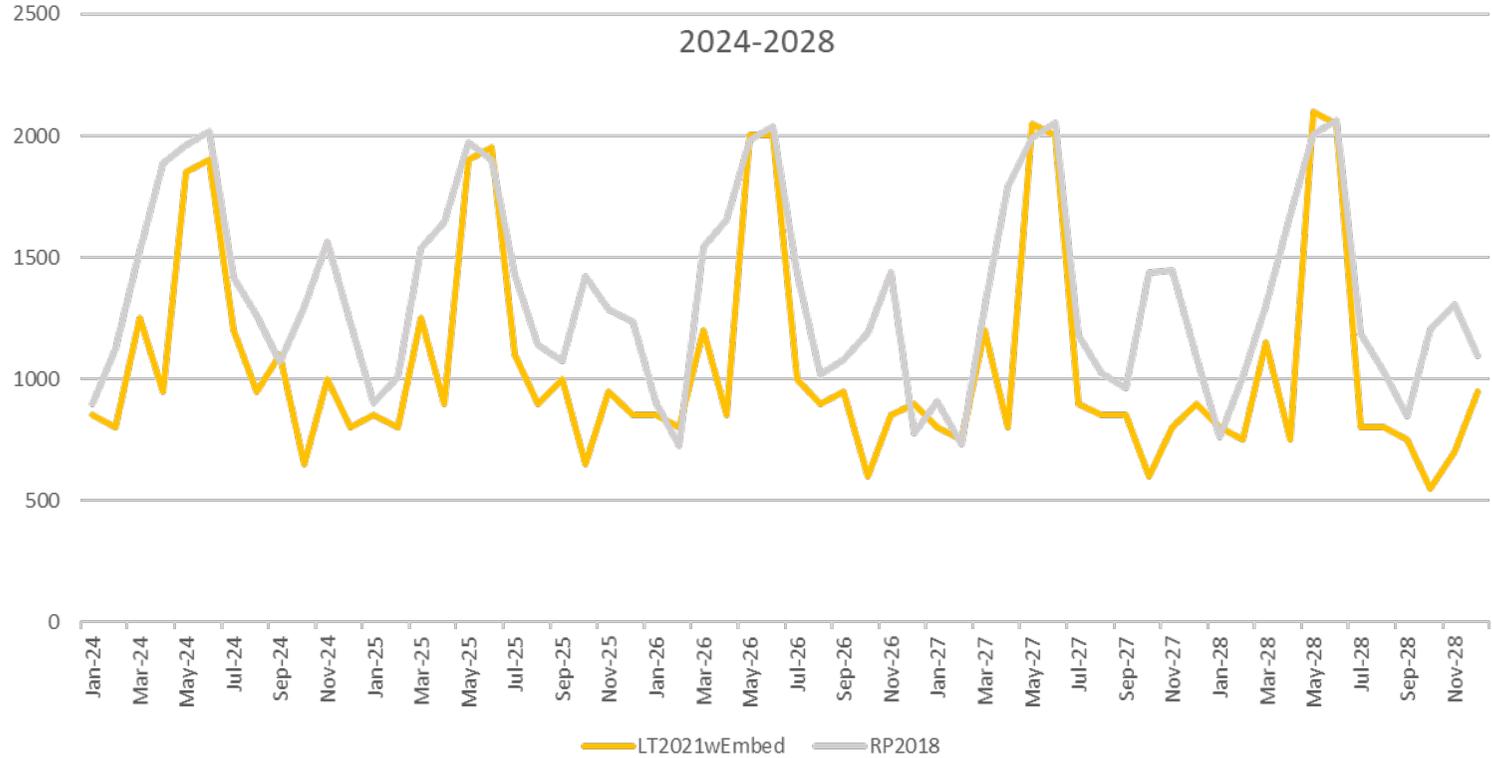


PNW Price Distributions

- Month flat avg. PNW prices, **gray is LT2019, blue is LT2021**
- More volatile over time, and price variability is more significant in tighter months (winter & summer)
- Note the difference between average of Aurora forecasts and individual iterations (futures)



BPA Market Limit Results, Month HLH aMW



30 Water Year (WY) and Market Purchase Limits (MPL)

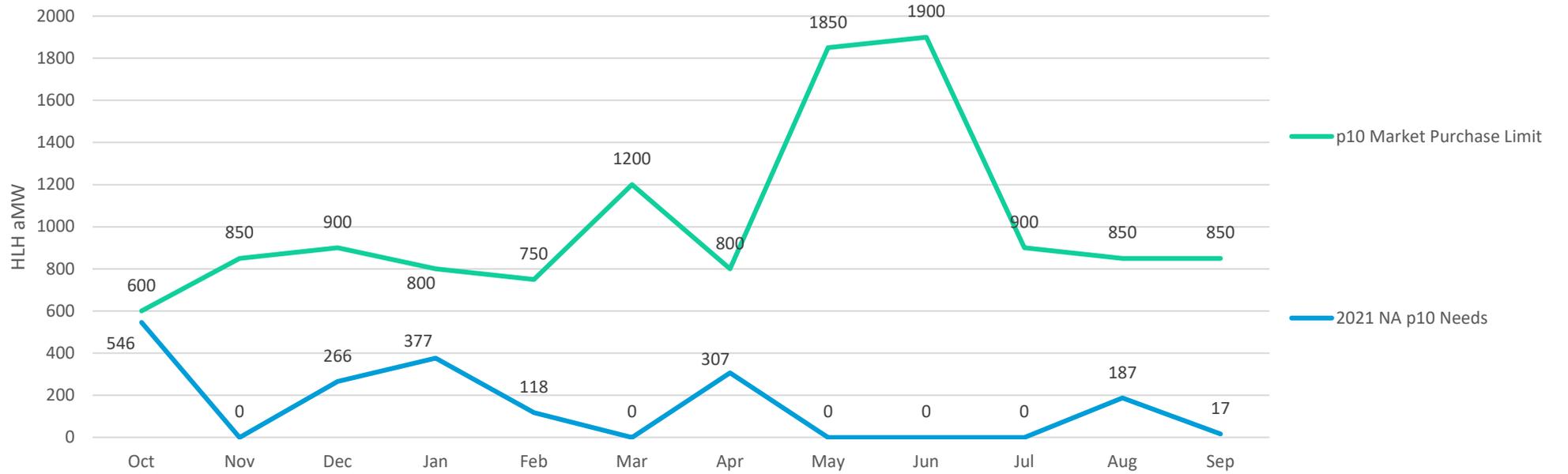


Climate Change & Streamflows

- As we reviewed in our Needs Assessment conversation, BPA is looking to incorporate the impacts of climate change on hydro generation, and hence our needs for energy/capacity
- We see the streamflow conditions from 1989 to 2018 (recent 30 years) as representative of the changing climate and a good predictor of conditions in next 10 years
 - Recent 30 years of streamflows aligns well with the RMJOC-II (River Management Joint Operating Committee) streamflow forecasts
- We are now carrying those 30 WY needs into portfolio optimization

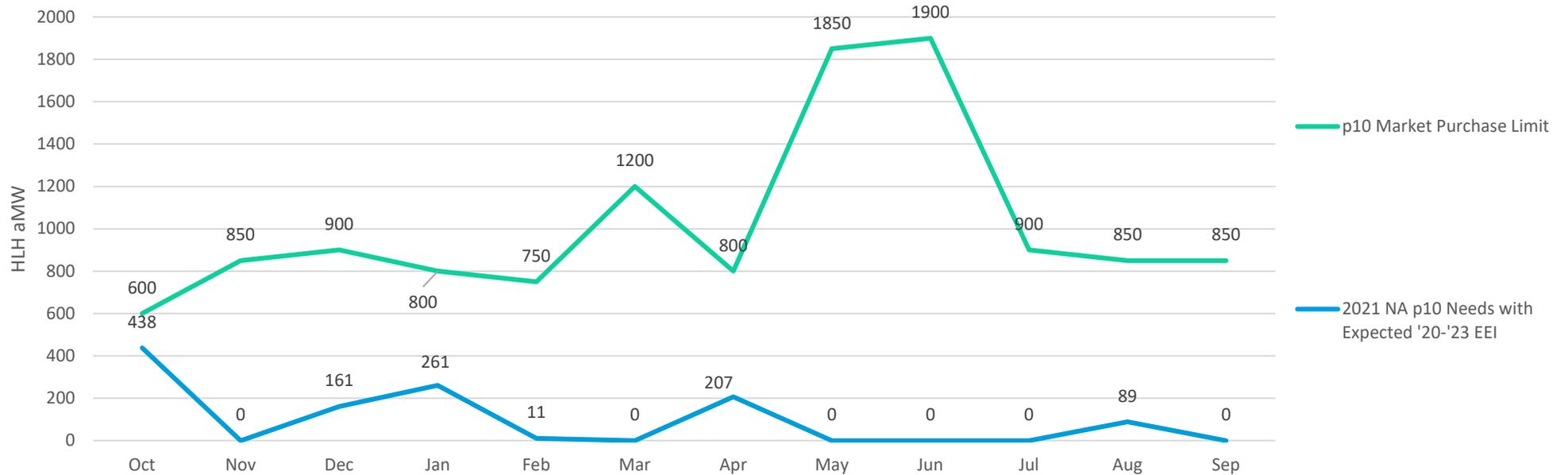
MPLs and Needs in FY 2027

2027 p10 HLH Needs vs Market Purchase Limits



MPLs and EEI-Adj Needs in FY 2027

2027 p10 HLH Needs with Expected 2020-2023 EEI vs Market Purchase Limits



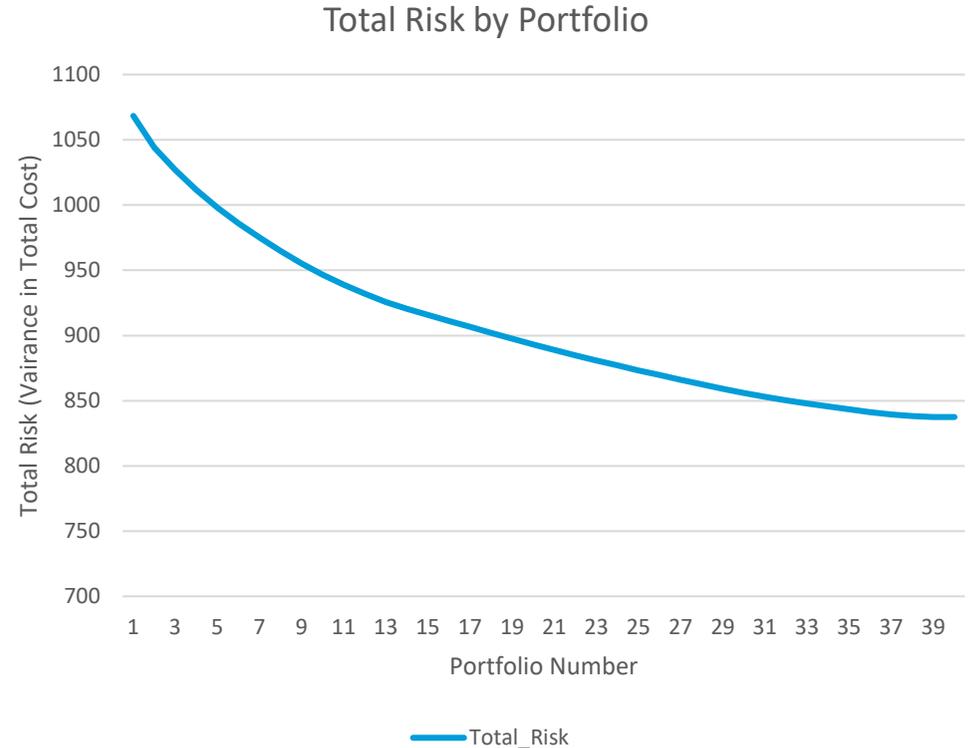
Portfolio Optimization Refresher



Refresher: Portfolio Optimization

- **Step 1:** Find Portfolio 1, the “least-COST” mix of resources that meet P10 HLH Energy needs and don’t violate Market Purchase Limit
- **Step 2:** Find Portfolio 40, the “least-RISK*” mix of resources that meet P10 HLH Energy needs and don’t violate Market Purchase Limit
- **Step 3-40:** Incrementally add budget to Portfolio 1’s budget value and remix resources to find risk minimizing combination at given budget level

*Risk is the variance in total portfolio cost across iterations, with expected resource costs and expected market prices causing most of the variance



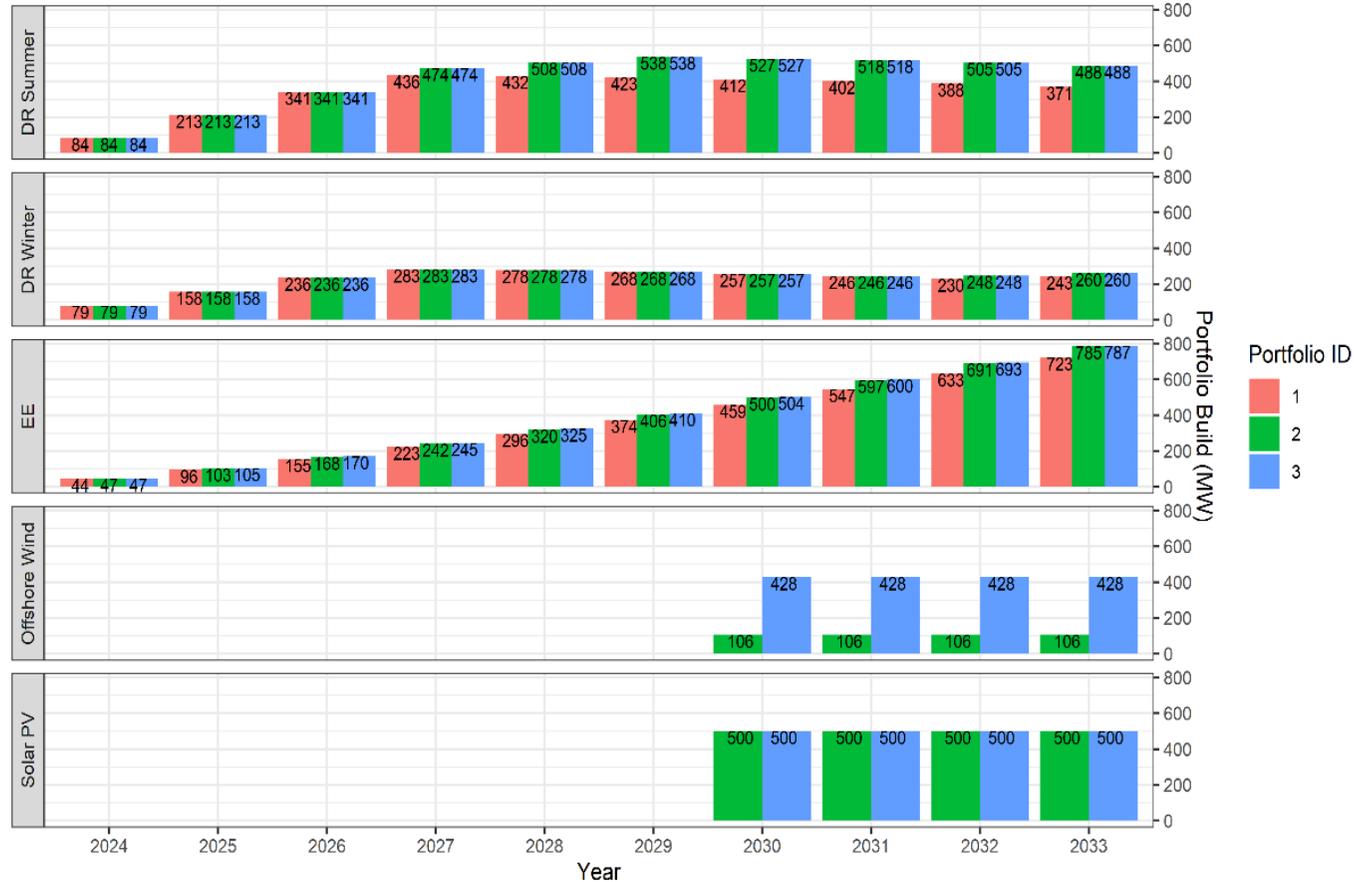
Preliminary Results



Preliminary Resource Solutions Summary

- EE aMWs are consistent with Council target in Power Plan
- DR shows up as a regularly deployed, low impact, low cost energy related load management product
- Renewables are selected to reduce volatility in risk reducing scenarios, highlighting the potential benefit of resource diversity from potential thin-market futures

Preliminary Resource Solutions



EE Results and Comparison to 2020

2022RP Cumulative Savings (aMW)

	2-year	4-year	10-year
Portfolio 1	96	223	723
Portfolio 2	103	242	785
Portfolio 3	105	245	787

2020RP Cumulative Savings (aMW)

	2-year	4-year	10-year
Portfolio 1	111	229	506
Portfolio 2	123	250	501
Portfolio 3	126	256	505

Comparison to Council's 2021 Power Plan

- The 2022 Resource Program uses updated EE supply curves from the 2021 Plan
 - BPA's market price forecast, needs assessment, market purchase limits
- 2022 RP, Portfolio 1 EE Savings over 2021 Plan Timeline:

Corresponding to NWPCC 2021 Plan Timeline (Cumulative aMW of EE)

	2022*	2023*	2024	2025	2026	2027
2022 RP Port 1	38	76	119	171	231	299

- NWPCC 2021 Draft Plan EE target for BPA is 270-360 cumulative aMW by 2027¹

¹Source: NWPCC 2021 Draft Plan, Section 8. https://www.nwcouncil.org/sites/default/files/2021powerplan_2021-5.pdf

*Represents anticipated EE acquisitions for 2022 and 2023, prior to 2022 RP study horizon

Demand Response Assumptions

- Demand response can be used to meet short-duration energy needs
- DR products are split into summer and winter classes
 - “Summer” is April – September
 - “Winter” is October – March

Demand Response in 2022 RP

Demand Response Capacity (Peak MW)

Portfolio	Season	2-year	4-year	10-year
1	Summer	213	436	371
	Winter	158	283	243
2	Summer	213	474	488
	Winter	158	283	260
3	Summer	213	474	488
	Winter	158	283	260

- Least-cost DR totals are mainly comprised of four products: DVR, and Residential, Commercial, and Industrial CPP programs.
- DVR comprises roughly half of the total for the 2-year and 4-year periods.
- Risk-reducing portfolios start to add other DR products
- Portfolio 1 acquires DVR and CPP
 - And winter residential BYOT in 2033
- Portfolios 2 and 3 acquire those and additionally Residential Summer TOU in 2024

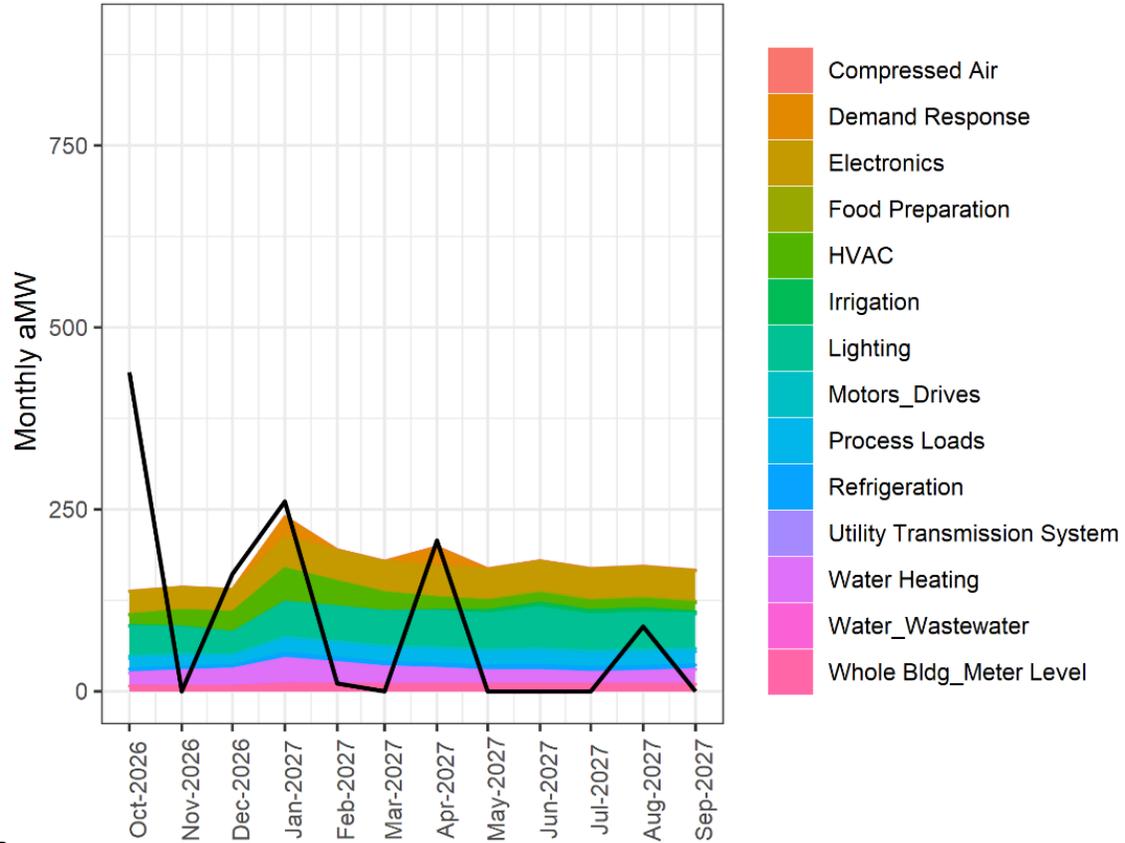
Generation Resources in 2022 RP

Generating Resources (Nameplate Capacity, MW)

Portfolio	Resource	2-year	4-year	10-year
1	Solar PV	0	0	0
	Offshore			
	Wind OR S	0	0	0
2	Solar PV	0	0	500
	Offshore			
	Wind OR S	0	0	106
3	Solar PV	0	0	500
	Offshore			
	Wind OR S	0	0	428

- No non-DSM resources are acquired in the least-cost portfolio
- 500MW of Solar PV acquired in 2030 in portfolios 2 and 3
- Offshore wind in southern Oregon is acquired starting in 2033 in portfolios 2 and 3
- Any resource in portfolio 2 or onward reduces market reliance during volatile (i.e. high variance) periods

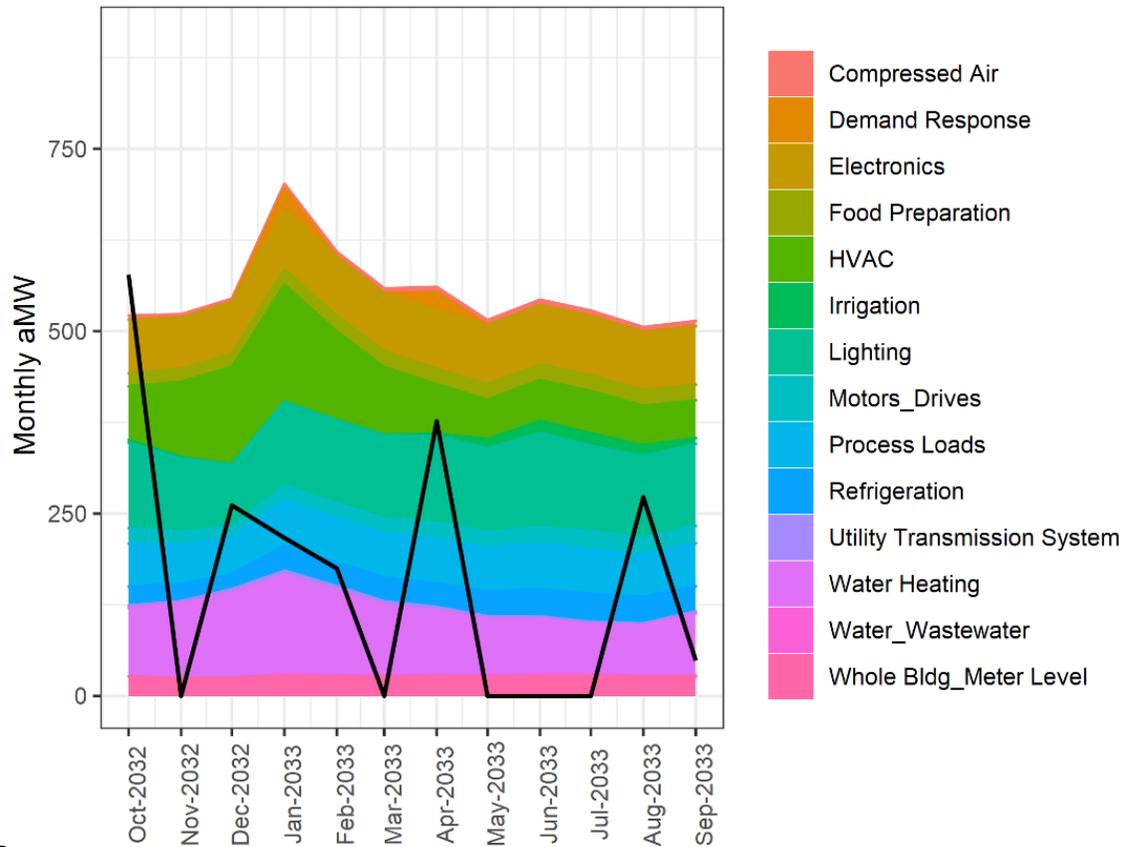
FY 2027 Resource Build



Solid black line = P10 HLH Needs that are EEI adjusted

Draft - For Discussion Purposes Only

FY 2033 Resource Build



Solid black line = P10 HLH Needs that are EEI adjusted