



2022 BPA Resource Program

Preliminary Resource Solutions

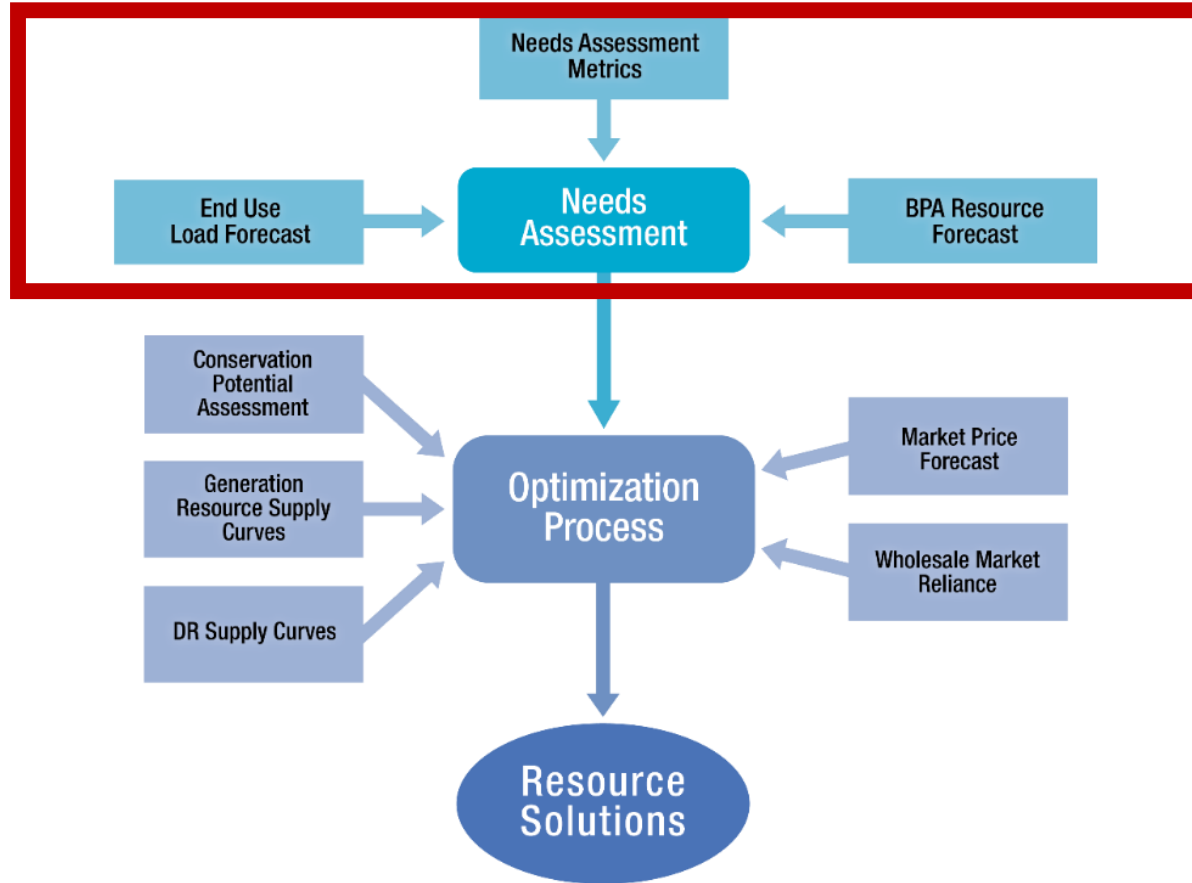
June 28, 2022



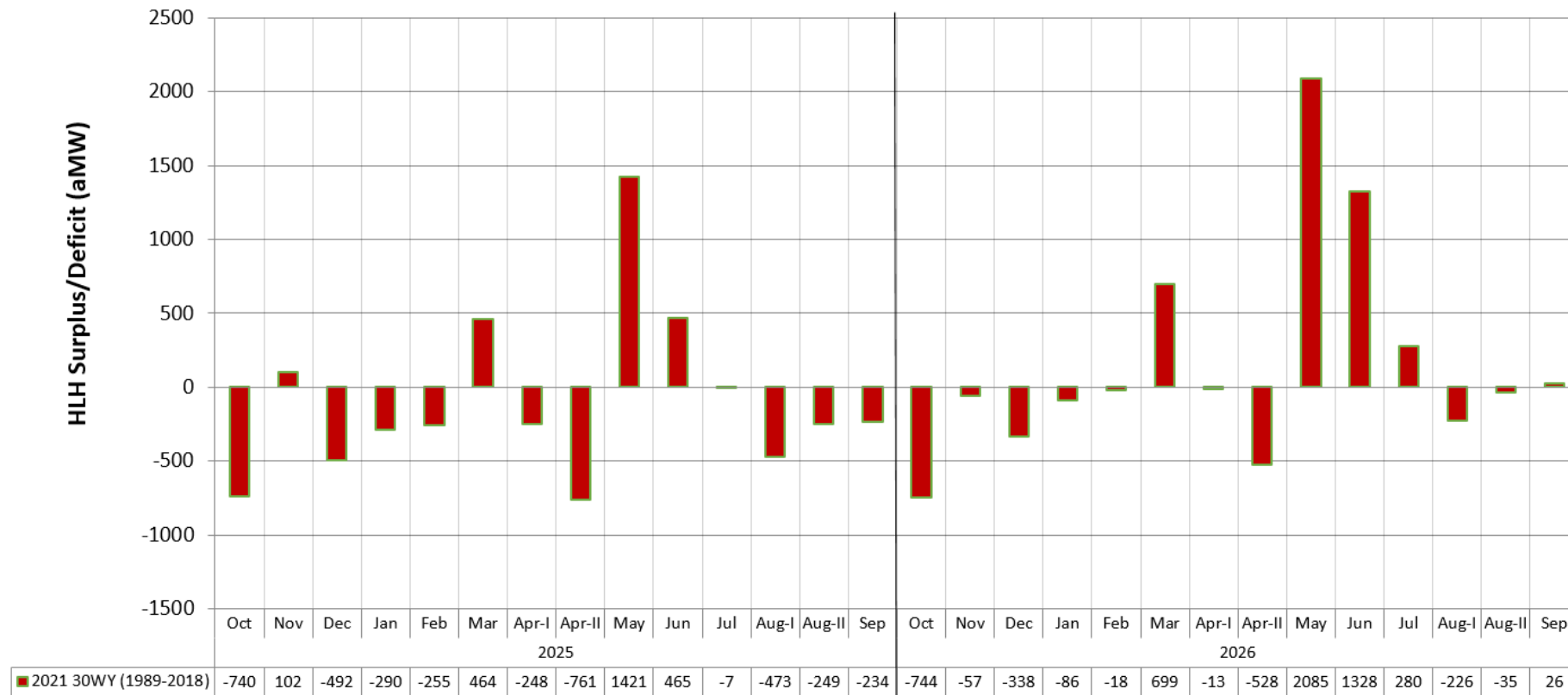
Agenda

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

2022 Resource Program Process

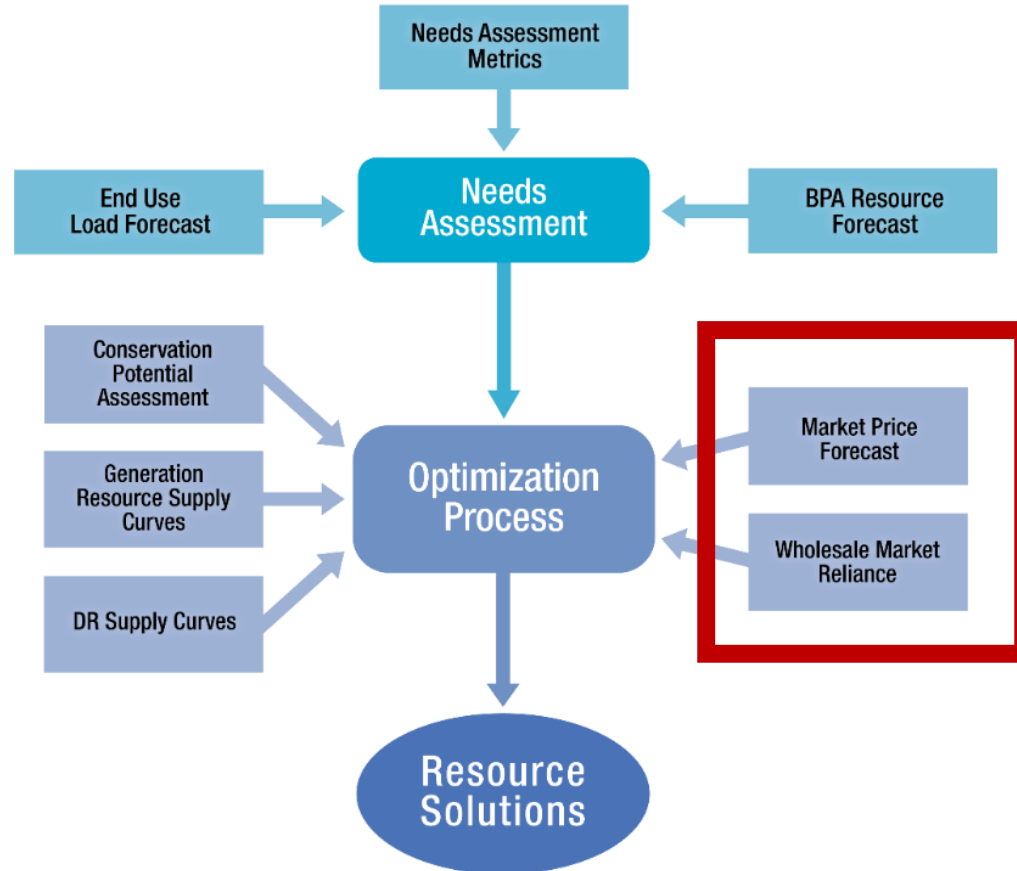


P10 Heavy Load Hour Metric

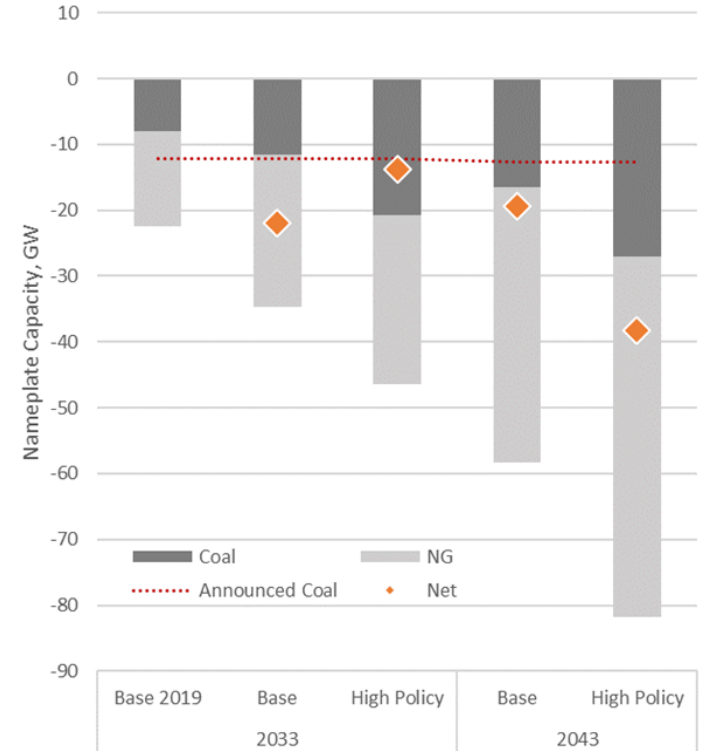
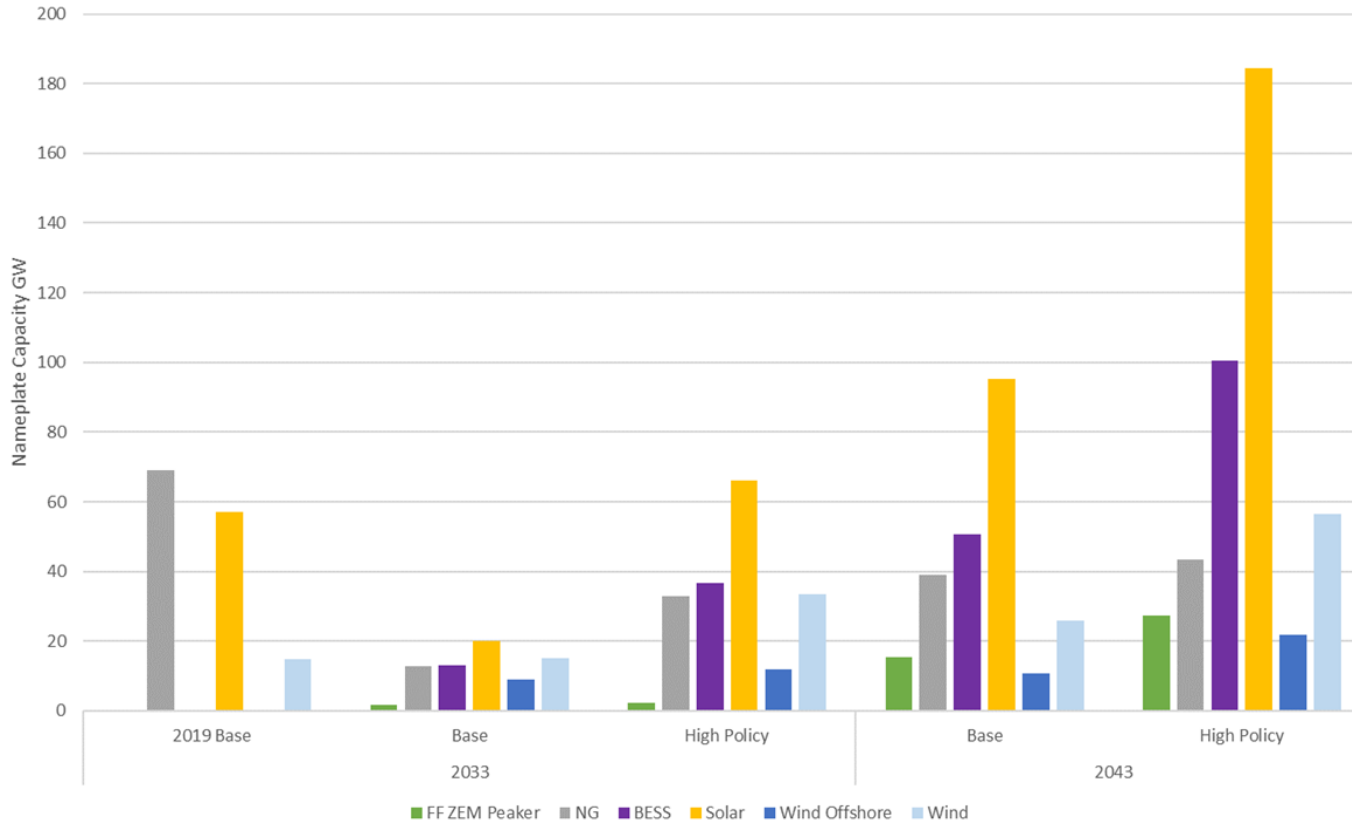


- 30 years of historical streamflows results in more generation in winter and less generation in summer, compared to the 80 years of history.

2022 Resource Program Process



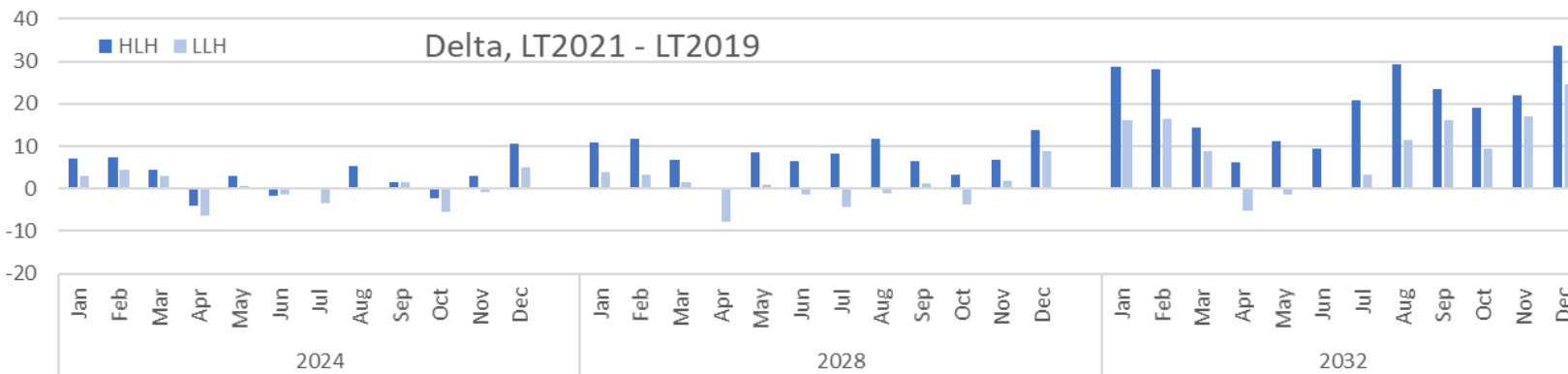
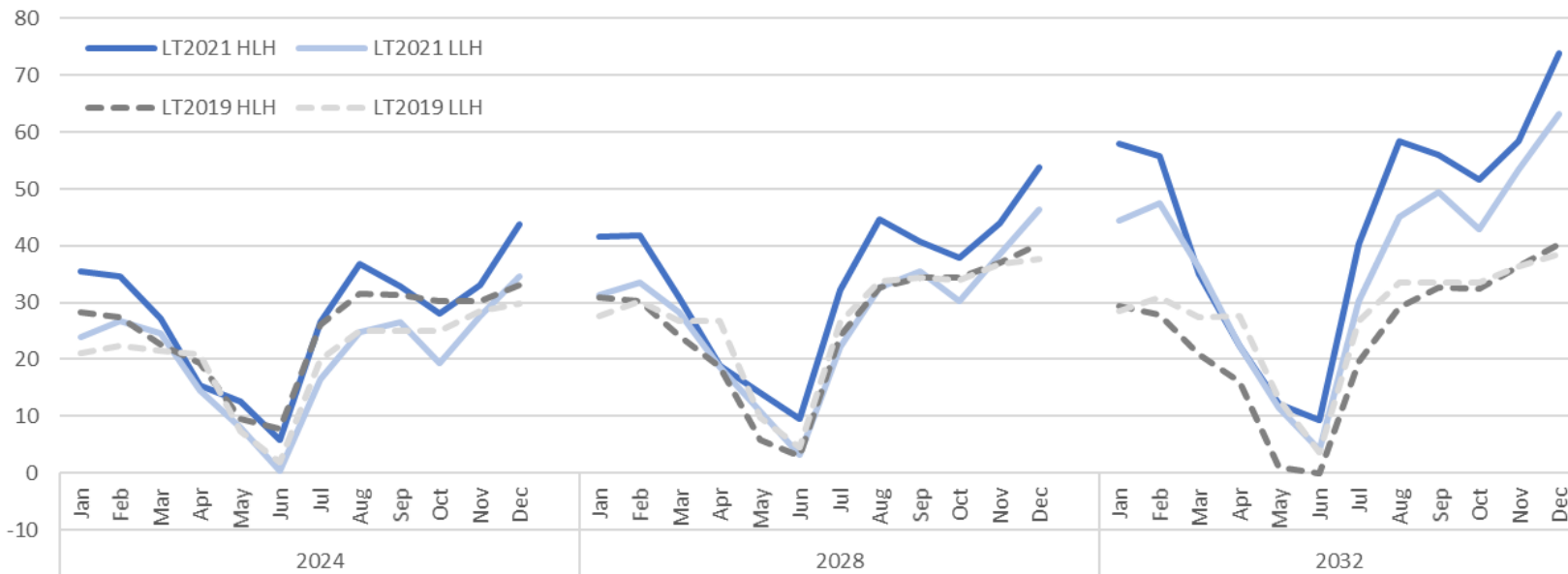
Cumulative WECC Builds & Retirements



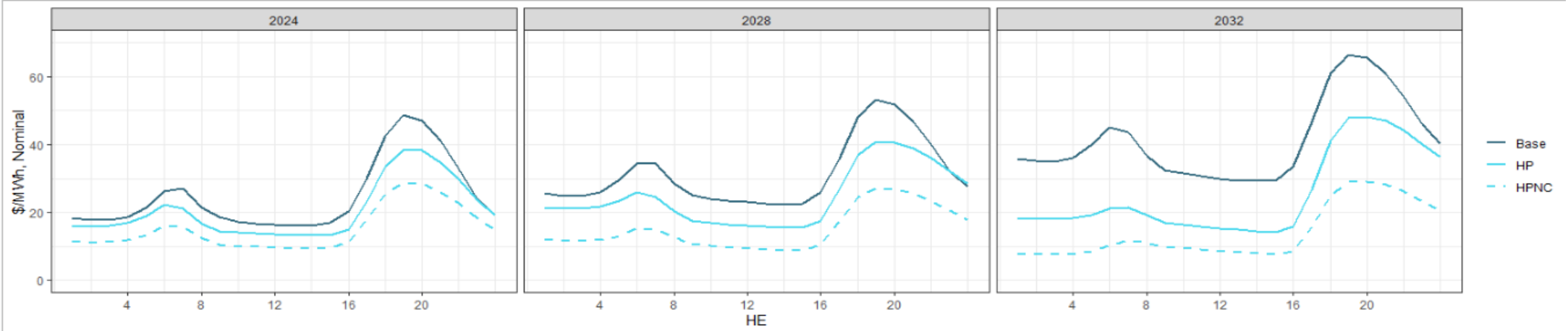
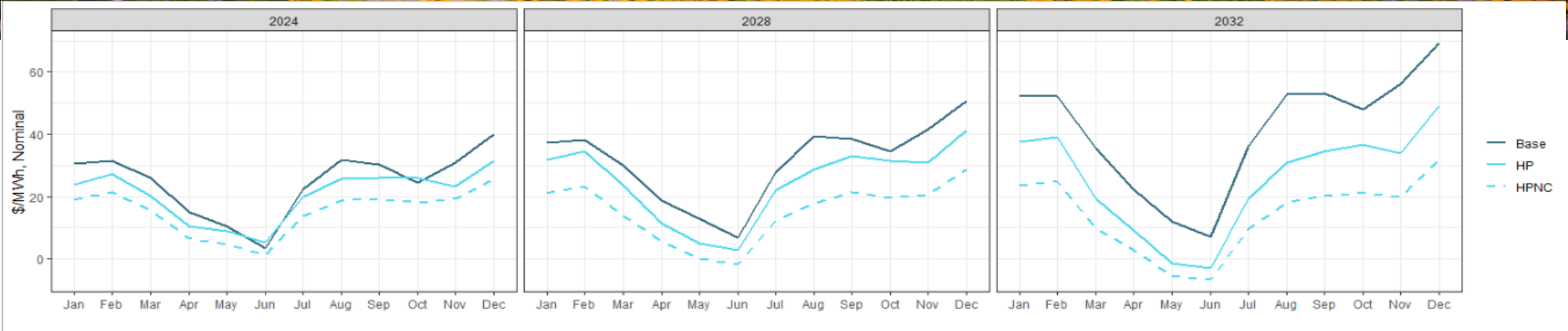
PNW
Prices
Diurnal
Month
Avg.

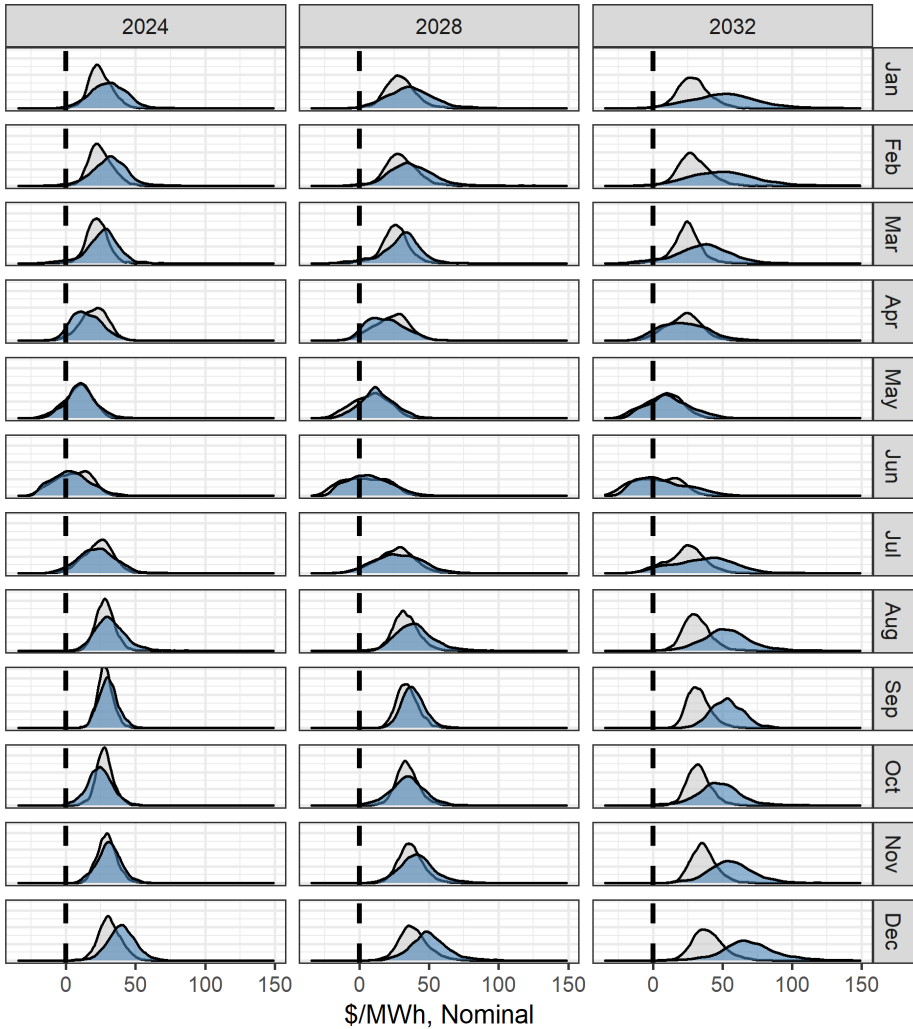
LT2019
Base
vs
LT2021
Base

\$/MWh, Nominal



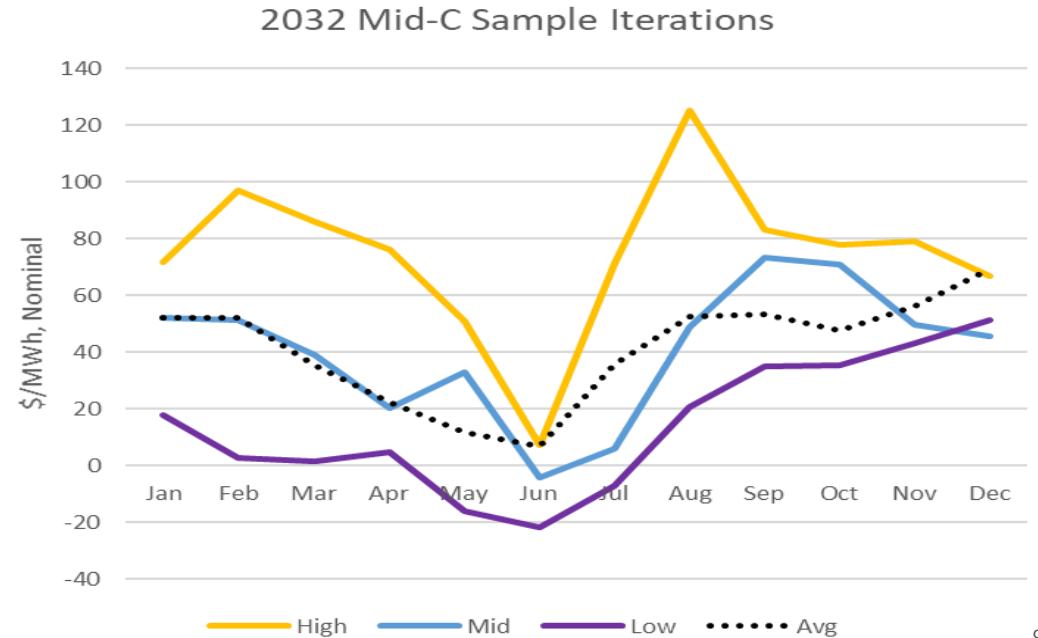
LT 2021 PNW Prices, Avg. by Month and Hour



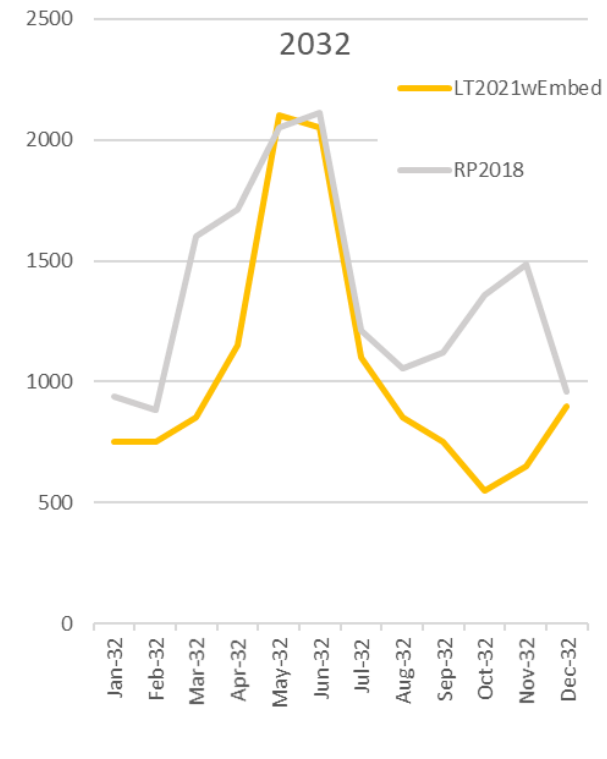
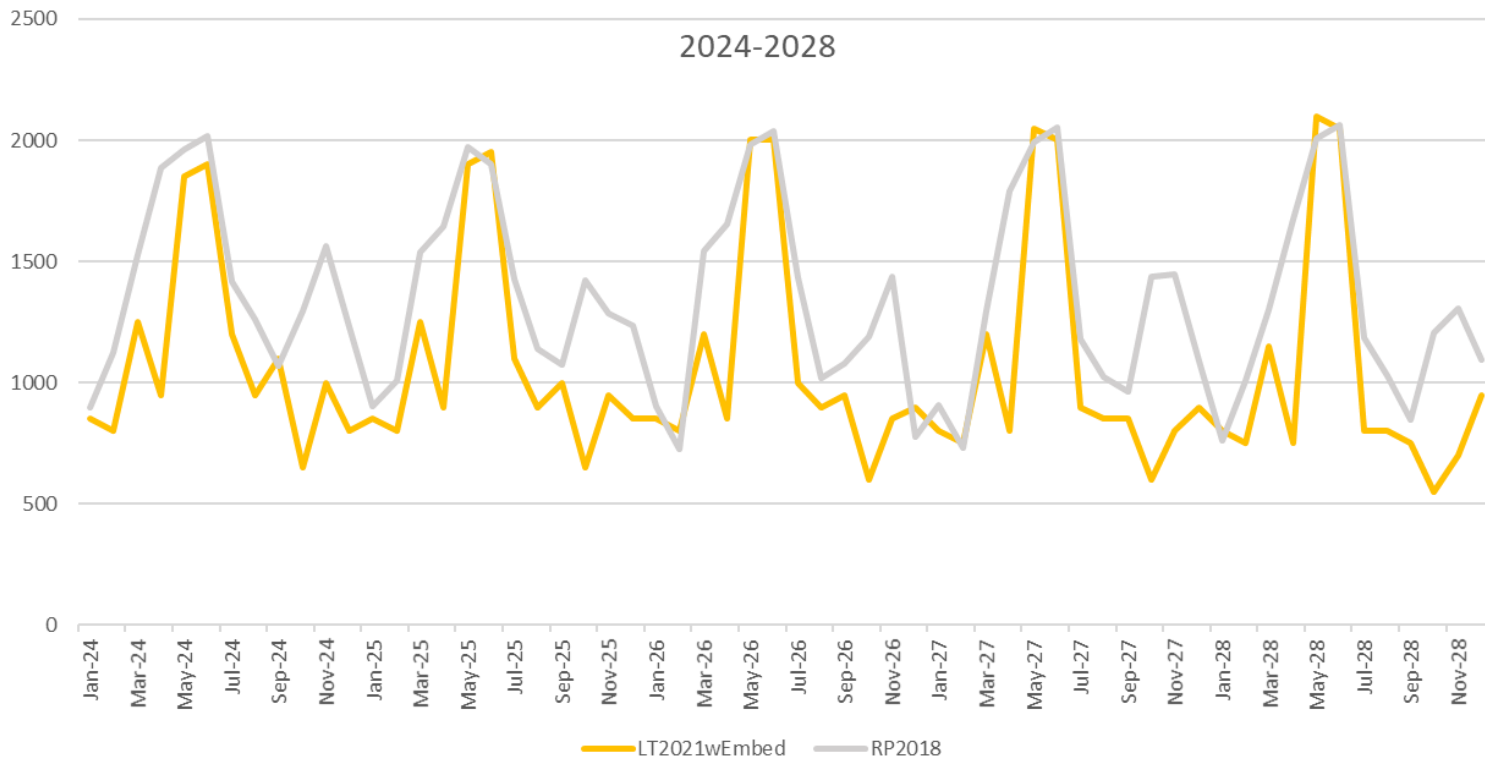


PNW Price Distributions

- 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)

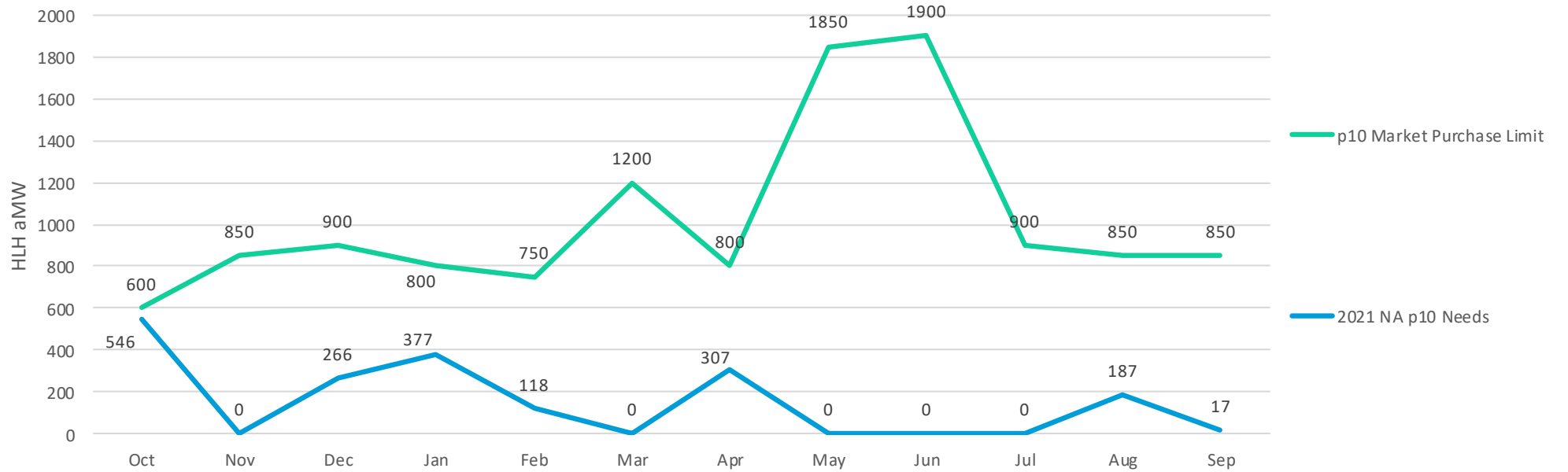


Climate Change & Streamflows

- 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

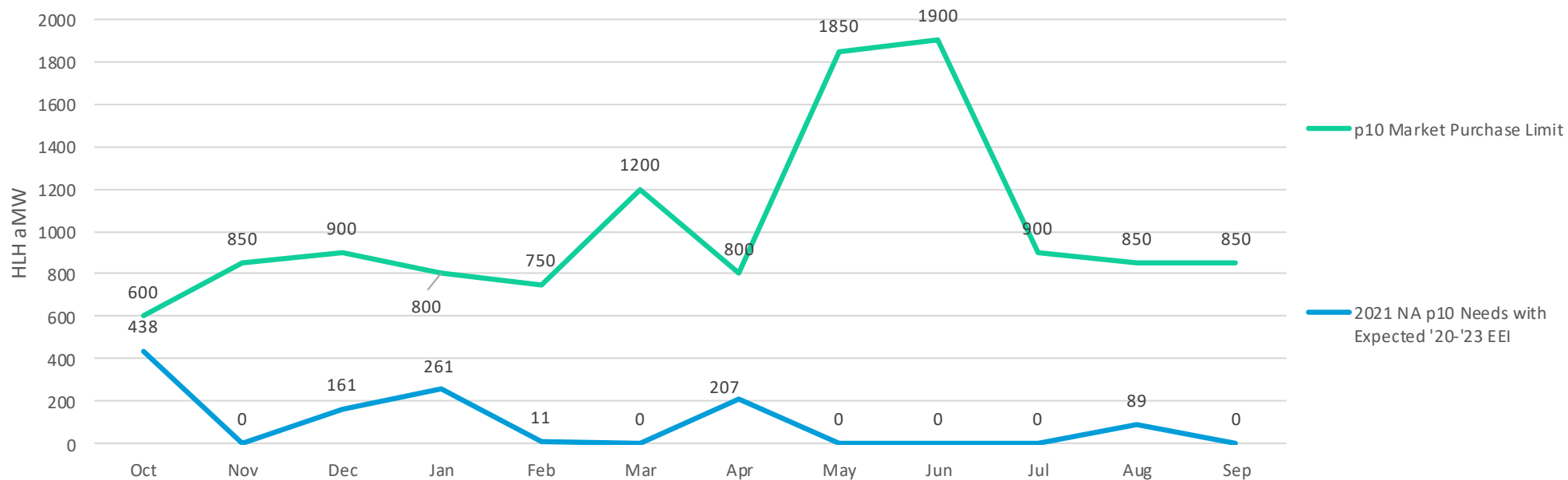
MPLs and Needs in FY 2027

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



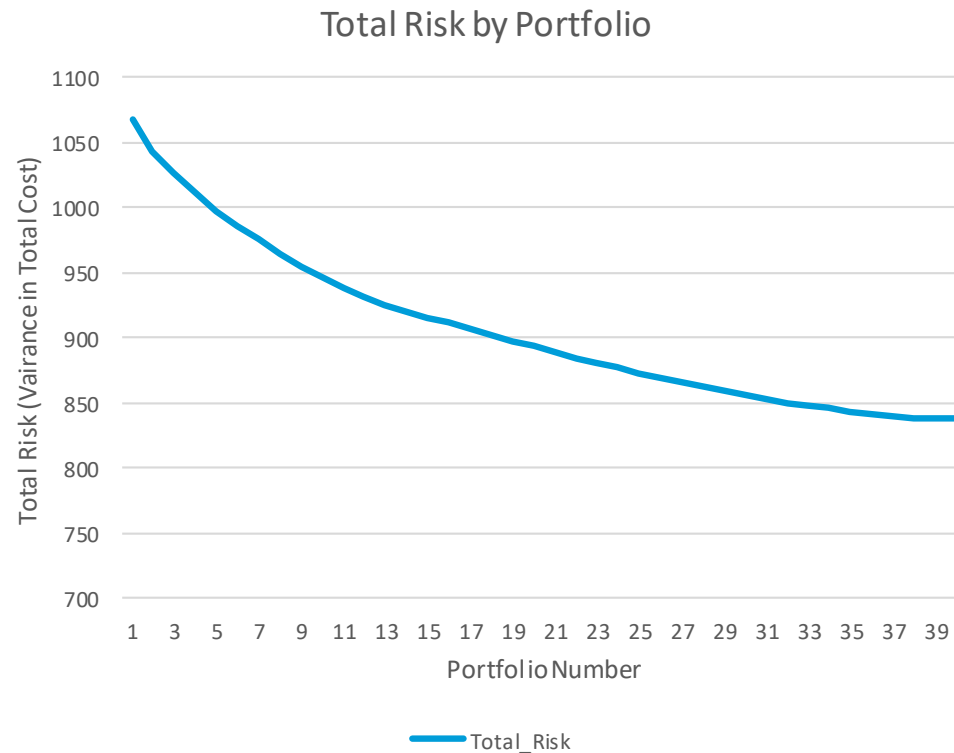
Portfolio Optimization Refresher



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



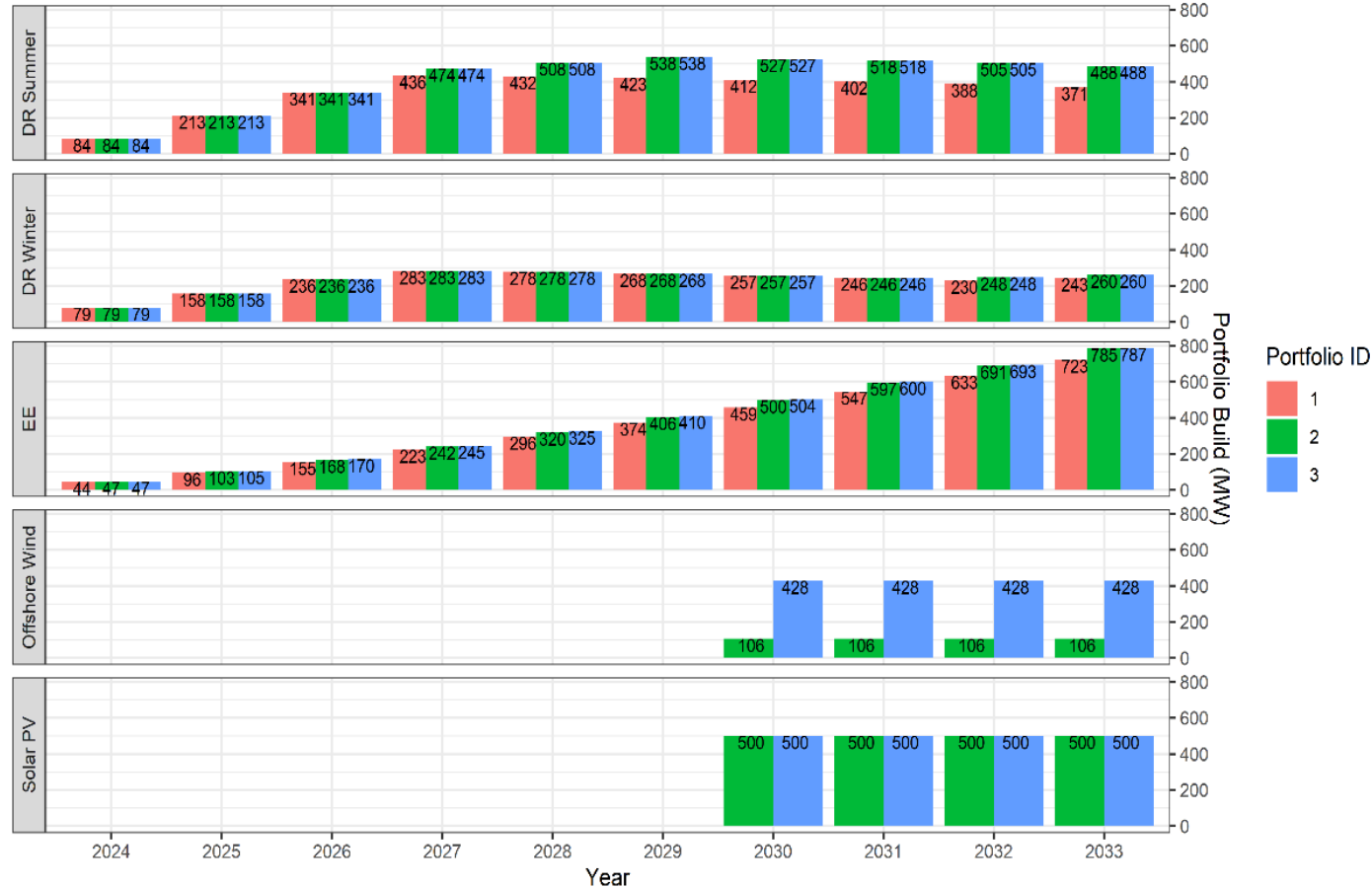
Preliminary Results



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 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

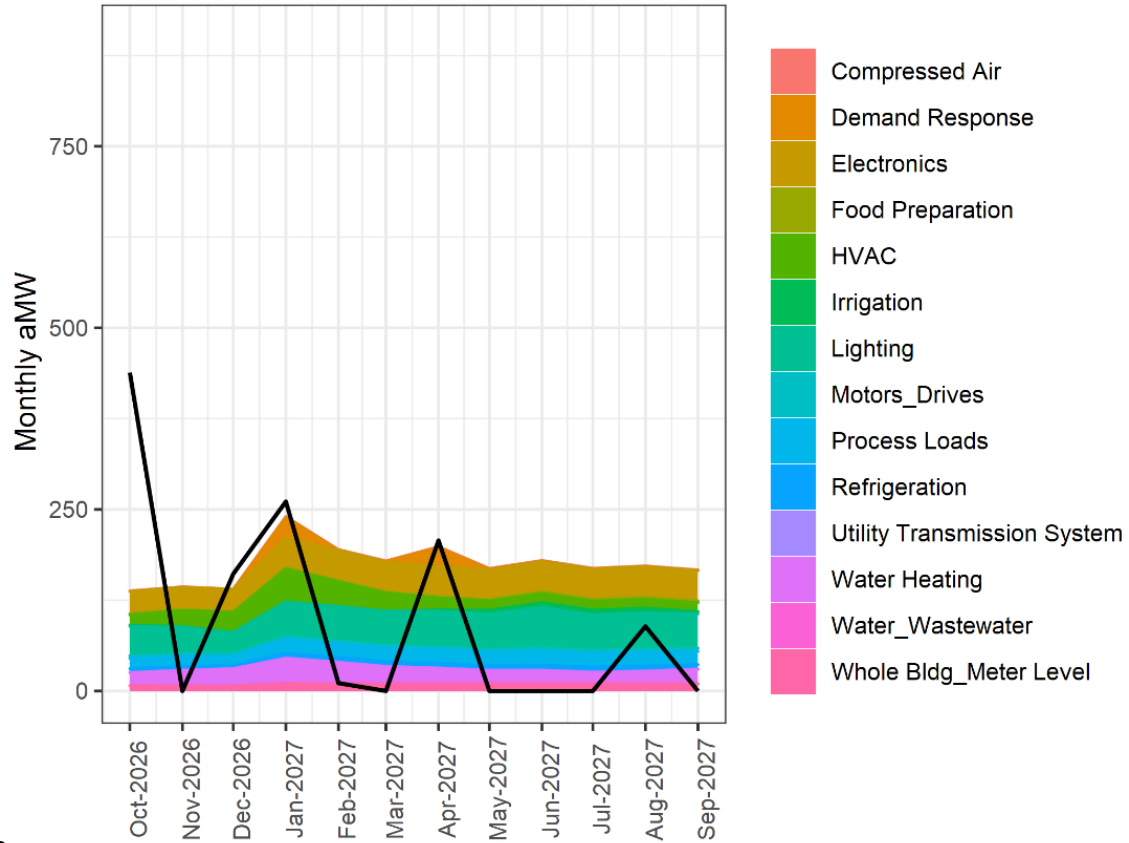
Generation Resources in 2022 RP

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

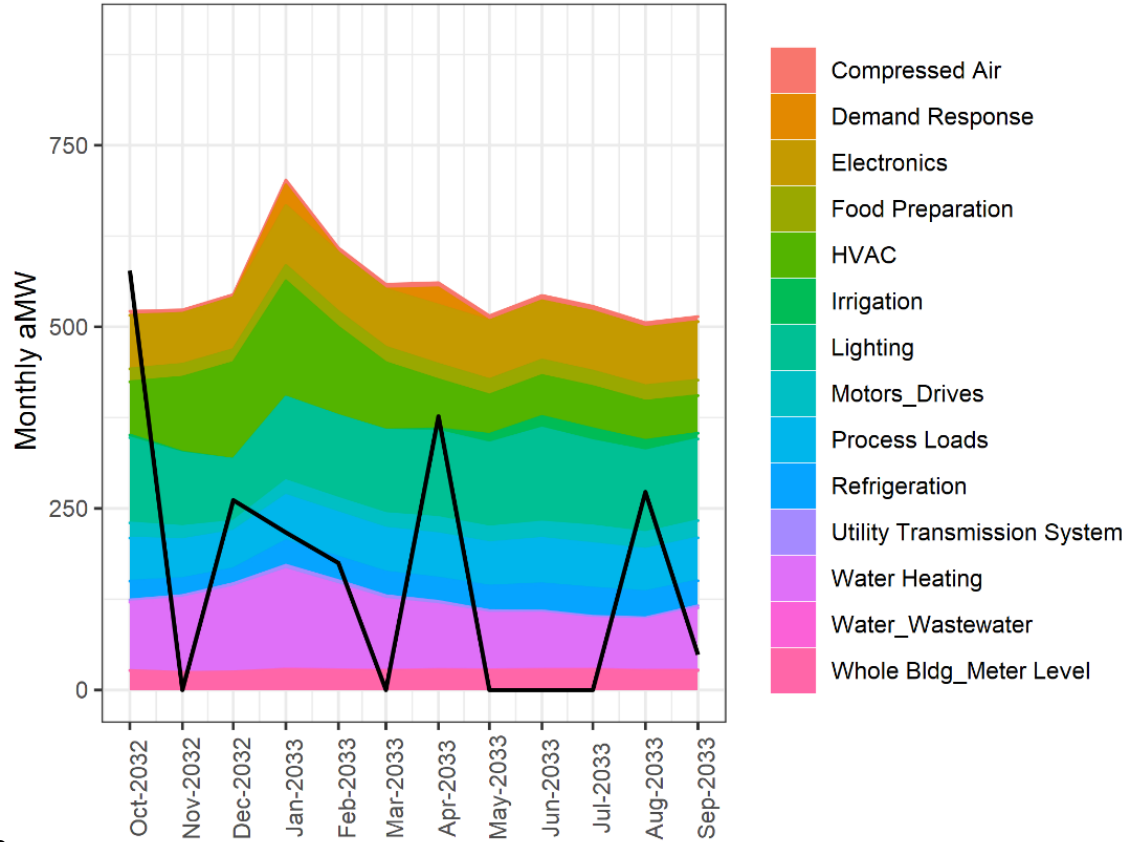
- No non-DSM resources are acquired in the least-cost portfolio
- 500MW of Solar PV acquired in 2030 in portfolios 2 and 3
- Offshore wind in southern Oregon is acquired starting in 2033 in portfolios 2 and 3
- Any resource in portfolio 2 or onward reduces market reliance during volatile (i.e. high variance)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

FY 2027 Resource Build



Solid black line = P10 HLH Needs that are EEI adjusted

FY 2033 Resource Build



Solid black line = P10 HLH Needs that are EEI adjusted

Next Steps

Final Resource Program public workshop in August

- Share High Policy scenario results
- Share next steps for BPA's Potential Resource Solutions

EE Action Plan

- Provides an operational plan for BPA to achieve its energy efficiency goals.
- Bottoms up plan using Power Plan, Resource Program, customer needs, and market intelligence to create an operational roadmap.
- Will guide BPA's implementation efforts over the 2021 Power Plan period.
- Timeline
 - Spring/Summer: Internal workshops and input gathering
 - Fall: Draft Action Plan
 - Winter: Publish draft Action Plan for comment
 - Spring: Final Action Plan published