

2021 All-Source RFP Workshop: Market Reliance Analysis



September 30, 2021

Safety moment

Distractions driving is the act of driving while engaged in other activities that take the driver's attention away from the road.

- A driver talking on a cell phone is as impaired as a driver with a .08 blood-alcohol level.
- A driver who is texting is as impaired as a driver with a .16 blood-alcohol level. That's double the legal limit.
- Drivers talking on cell phones are half a second slower to hit the brakes in emergencies and miss more than half the visual cues seen by attentive drivers.



Washington Statistics:

30% of crash fatalities are due to distracted driving

23% of serious crashes in Washington are due to distracted driving.

Drivers are **3X** more likely to be in a crash when talking on a phone.

70% of observed distracted drivers were using their cell phones.

Agenda



- Safety Moment / Opening Remarks
- Zoom Instructions
- Addressing Market Reliance
- Market Risk Assessment: Short-term Market View
- Market Risk Assessment: Long-term Planning View
- Closing Comments / Wrap-up

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How to use Zoom

- Attendees will remain in listen-only mode
- The “chat” feature is disabled
- Enter questions anytime in the Q&A chat – organizers will read questions aloud during Q&A period of each presentation
- Call-in participants can still access the Q&A box if viewing the presentation online



If you have a question,
type it in the Q&A box!

Market reliance need included in the 2021 All Source RFP is driven by increasing uncertainty of Mid C liquidity and extreme weather conditions

Up to 979 MW reduction in market reliance by 2027

- IRP market risk assessment identified need to reduce market reliance on short-term Mid C market purchases by up to 979 MW
- Regional resource transformation from baseload resources to variable energy resources is well documented and increased frequency of extreme weather is clearly evident
 - 2021 weather headlines – U.S. coldest February in more than 30 years. Dallas colder than Anchorage during Texas cold event. Lytton, BC now has higher recorded temperature than Las Vegas, Nevada
- Similar to other regional IOUs, PSE’s portfolio going through transformation
 - Colstrip 1&2 retired in 2020
 - Colstrip units 3&4 will be removed from PSE’s portfolio after 2025
 - Expiration of the Centralia Power Purchase Agreement in 2025
- Actual glide path will be driven by resource opportunities and risk assessment

	A	B	C	D	E	F
	2022	2023	2024	2025	2026	2027
1 2021 Draft IRP Need/(Surplus)	-230	-350	-306	-257	369	527
2 Reduced Market Reliance Need	185	372	574	776	979	
3 Total Resource Need/(Surplus)	-230	-165	66	317	1,145	1,506
4 Net Hydro Capacity Additions	-101	-106	-71	-71	-71	-71
5 Adjusted Total Resource Need/(Surplus)	-331	-271	-5	246	1,074	1,506
6 Estimated Glide Path of Incremental Resource additions	300	300	300	300	300	306



Updates to the resource adequacy model in 2022 will inform Phase 2 of the RFP

Phase 2 of the RFP will use the updated resource adequacy analysis developed as part of the 2023 IRP Progress Report.

Schedule



Mid-2022 Updated load forecast and RA analysis
 January 2023 Draft IRP Progress Report with updated CPA and portfolio analysis
 April 1, 2023 Final 2023 IRP Progress Report

Will be included in Phase 2 of the RFP

Market reliance update based on:

- How much capacity can reasonably be managed in short-run?
- Evaluation of market availability of resources
- Northwest Power Pool RA program developments and insights as initiative moves forward

Resource Adequacy Modeling/Resource Need updates will include:

- Climate change in load forecast: energy and peaks
- Climate change impacts on hydro generation
- Other items included or examined per E3's recommendations



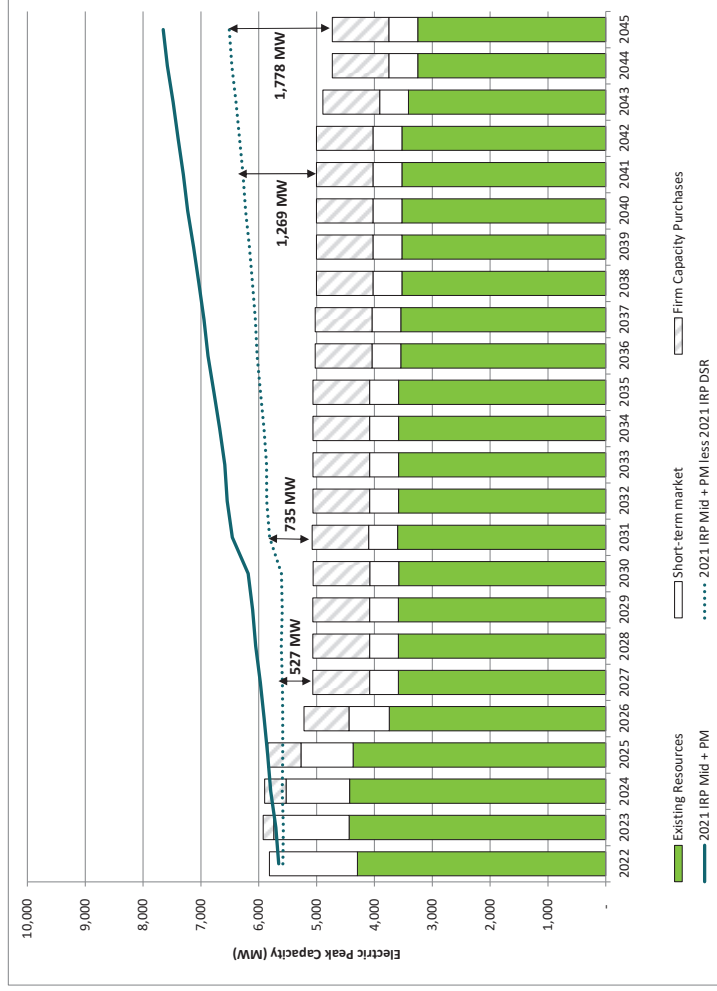
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Addressing Market Reliance



Peak Capacity Need assumes 1500 MW of Mid-C market purchases

- PSE's current transmission portfolio includes 1,500 MW of firm transmission rights that can be used to purchase energy at the Mid-C and deliver to PSE.
- PSE relies on the 1500 MW of Mid-C market purchases for peak capacity planning (white bars on the chart).



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2021 IRP Reduction in Market Reliance

2021 IRP Assumptions

- Reduce reliance on short-term market from 1500 MW down to 500 MW
- Phase in over 5 years

2021 IRP Executive Summary (p. 7): ongoing review and evaluation

- Ongoing technology advancements
- Outcome of the All-source RFP
- Regional resource adequacy developments

Need to Reduce Short-Term Market Reliance

Reasonable principles

- Do not leave more capacity to short-term than can be reasonably managed
- Commercial reality question more than analytical one

Foundation of concerns

- Short-term market experience: signs of tightening
 - Day-ahead/real time should be liquid for capacity if region adequate
- Long-term studies pointing toward regional capacity concerns
 - Council's last official/approved adequacy report forecast 26% LOLP by 2026

2021 IRP

- Reduce market reliance over time from 1500 to 500 MW

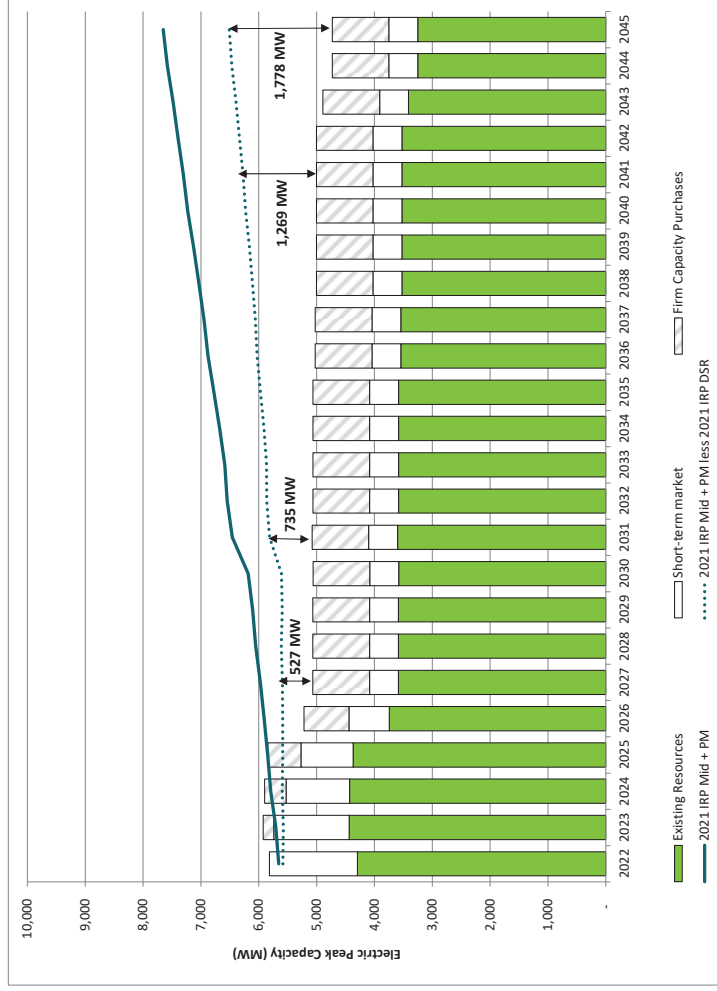


Market Risk Assessment: Short-term Market View



Peak Capacity Need assumes 1500 MW of Mid-C market purchases

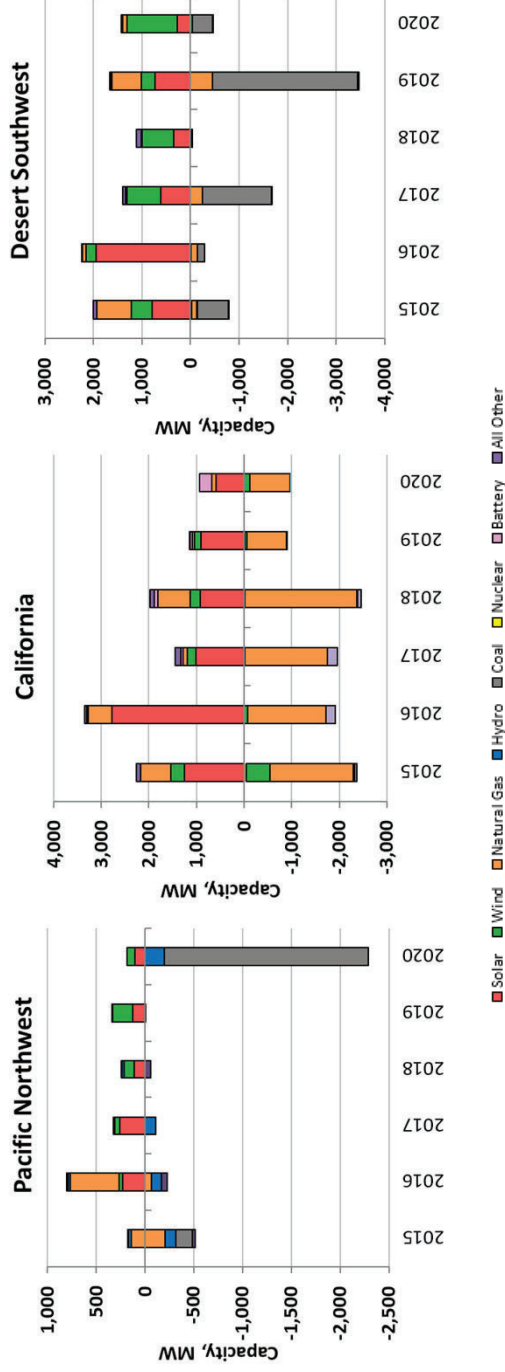
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Dispatchable high-capacity resources are declining in the West

- While substantial wind and solar resources have been built in the West, dispatchable high-capacity thermal generation has been retired.
- Pacific Northwest coal retirements in 2020 reduce the energy available to procure through bilateral transactions at the Mid-C trading hub.



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PSE market purchases are higher than other IOUs

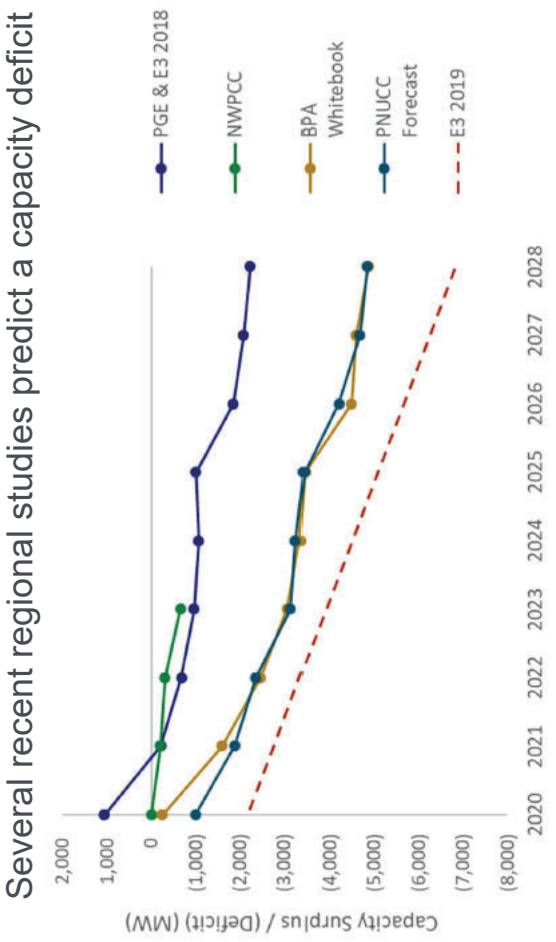
Entity	Planned Summer Market Reliance Limit (MW)	Planned Winter Market Reliance Limit (MW)	Commentary
Avista	330	330	From the 2021 IRP. Market purchases are limited to 500 MW during 'unconstrained' hours, and 330 MW during 'constrained' hours
Idaho Power	N/A	N/A	The current IRP (2019) assumes market purchases of 500 MW in the summer and 425 MW in the winter. Specific market purchase limits are not defined in the IRP.
PacifiCorp	500 – Aggregate 150 – Mid-C Seasonal HLH	1000 – Aggregate 0 – Mid-C Seasonal HLH	Proposed Front Office Transaction Limits for the 2021 IRP cycle.
Portland General Electric	50	0	Estimates from recent PGE capacity studies.
Puget Sound Energy	1,500	1,500	From the 2021 IRP. PSE counts historical energy offers at the Mid-C hub as available capacity to meet peak demand needs in the winter and summer.



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Predicted capacity deficits could reduce Mid-C bilateral transactions

- Recent studies have concluded that the PNW faces a capacity shortfall in the near term.
 - PGE (2018)
 - NWPCC (2020)
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- Current investigations into August 2020 events point to material resource adequacy failures in the western interconnect.
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Source: NWPCC Exploring a Resource Adequacy Program for the West, October 2019

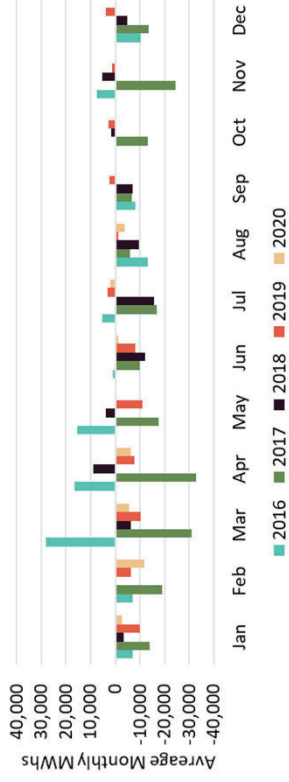


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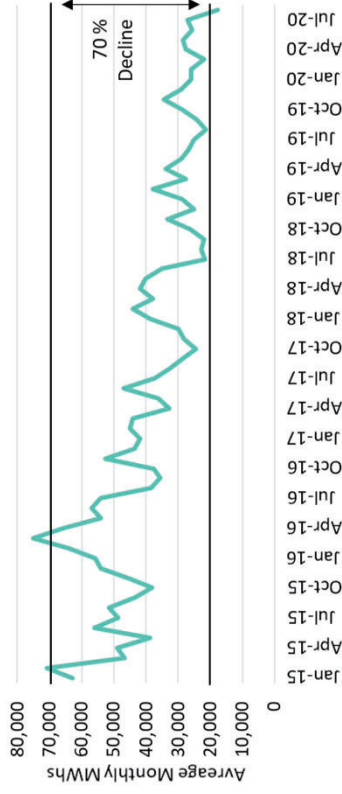
Trading volumes are declining at the Mid-C bilateral hub

- Trading volumes of day ahead physical energy for delivery at the Mid-C market hub have trended downward.
 - Average monthly peak profile day ahead spot transactions have consistently decreased year over year.
 - Month over month volumes are also trending lower.
- Reduced spot market liquidity drives increases in spot price volatility.

ICE Mid-C Day Ahead Heavy Load Volume Year Over Year Change by Month

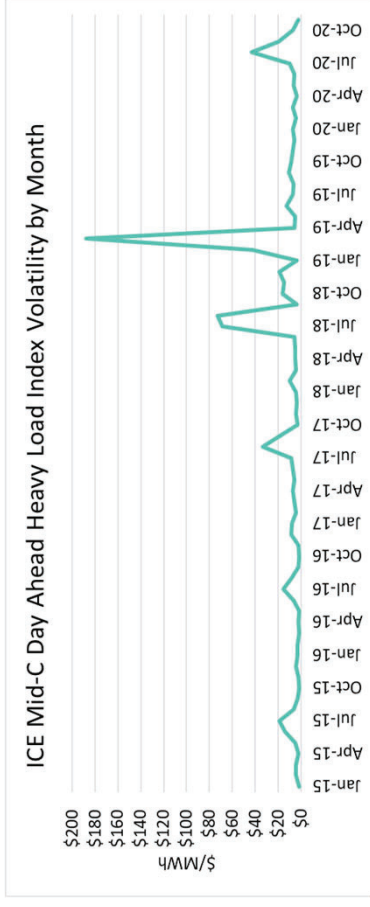
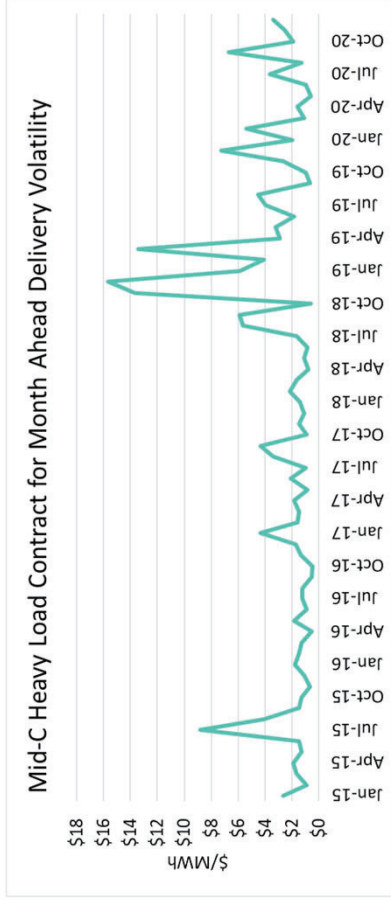


ICE Mid-C Day Ahead Heavy Load Volume by Month



Short-term market volatility has increased

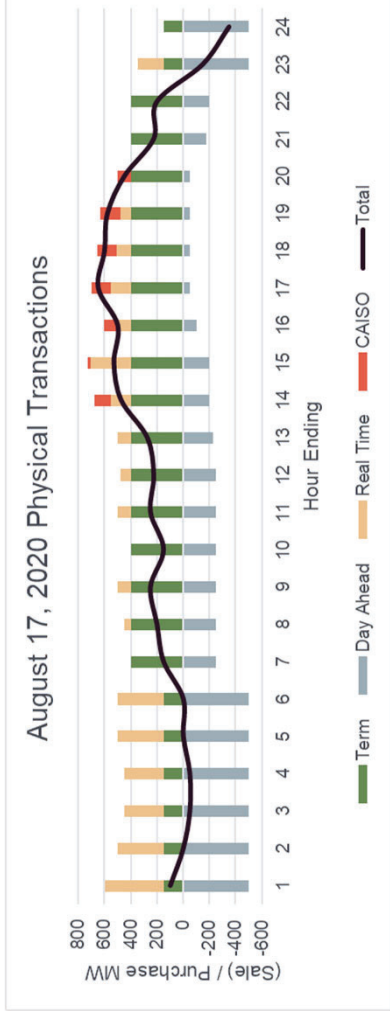
- Term volatility in the forward market has remained relatively stable and range bound, but has increased in the spot market.
- Price volatility has increased at the Mid-C in the spot market in response to tighter supply/demand fundamentals.
- High prices are indications of near misses
 - Summer 2018 – hot regional temperatures coinciding with Colstrip forced outages
 - March 2019 – cold regional temperatures coinciding with reduced Westcoast pipeline and Jackson Prairie storage availability
 - August 2020 – West-wide heat event



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Mid-C bilateral liquidity evaporated in August 2020

- Several entities in the WECC declared energy emergencies during the west-wide heat wave of August 14th - 19th, 2020.
 - CAISO progressed to stage 3 on August 14th and 15th and was forced to cut firm load.
 - PSE declared a stage 1 emergency on August 17th, as we anticipated that supplies required to meet demand could not be procured from resources or the market – PSE’s total Mid-C market reliance was 400-505 MW during this time.



Conclusion: Short-term markets all ready showing signs of tight capacity

- Short-term is where buck stops for whether adequate resources exist in the region: blackouts happen in the short-run
- Short-term markets are signaling scarcity.



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Questions & Answers



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10-minute break

Market Risk Assessment: Long-Term Planning View



Long-term resource adequacy outlook is concerning

Northwest Power and Conservation Council's latest formal regional resource adequacy assessment¹ shows the region is failing 5% LOLP adequacy metric

- By 2021: 7.5% LOLP for region
- By 2024: 8.2% LOLP for region-Jim Bridger 1 early retirement increases LOLP to 12.8%
- By 2026: 17% LOLP for region-Jim Bridger 2 early retirement increases LOLP to 26%
- Regardless of the analytical tool used to assess power supply adequacy, it is safe to say that the region will be facing a huge resource gap over the next decade. Between now and 2028, announced coal plant retirements add up to as much as 4,800 megawatts of generating capacity (see Figure 2) – nearly enough capacity to serve five cities the size of Seattle. (p. 9)

Resource adequacy assessment of PSE's portfolio

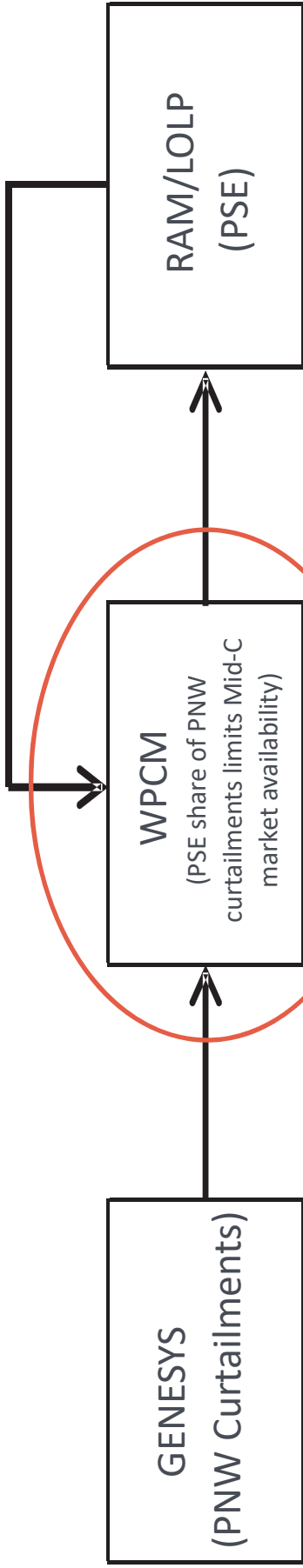
- By 2027: 68% LOLP with no additional resources
- By 2027: 907 MW of firm, dispatchable capacity needed to balance portfolio



1 - <https://www.nwccouncil.org/sites/default/files/2024%20RA%20Assessment%20Final-2019-10-31.pdf>

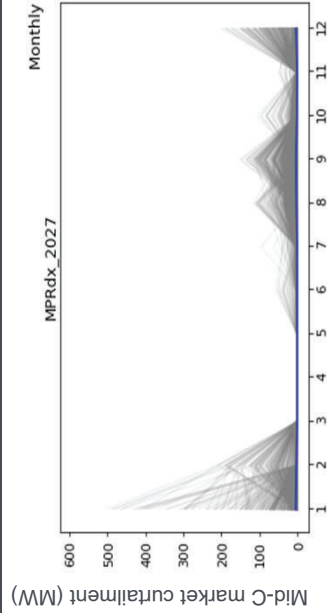
Resource Adequacy Model

- GENERation Evaluation SYStem Model (GENESYS)
 - Models entire Pacific Northwest region including imports from California
- Wholesale Purchase Curtailment Model (WPCM)
- Resource Adequacy Model (RAM)
 - The RAM/LOLP model and WPCM models are used iteratively, with the final output of the RAM/LOLP model used in the next WPCM modelling run.



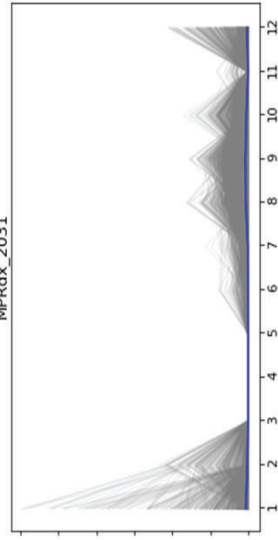
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Mid-C market curtailment from WPCM

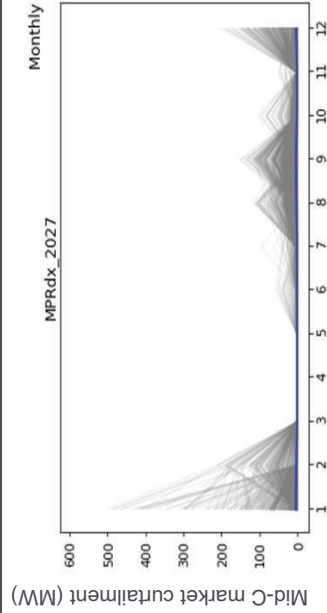


Monthly Compare Mean

MPRdx_2031

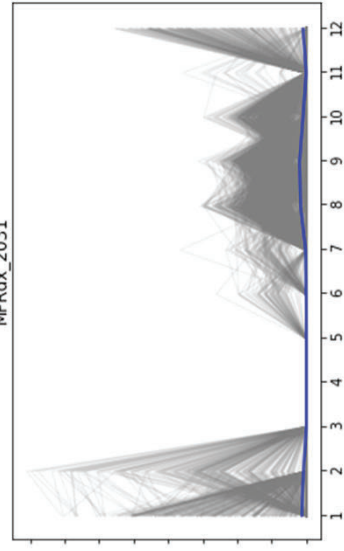


Average market curtailment across all hours in month



Monthly Compare 95 %

MPRdx_2031



95th percentile of market curtailment across all hours in month



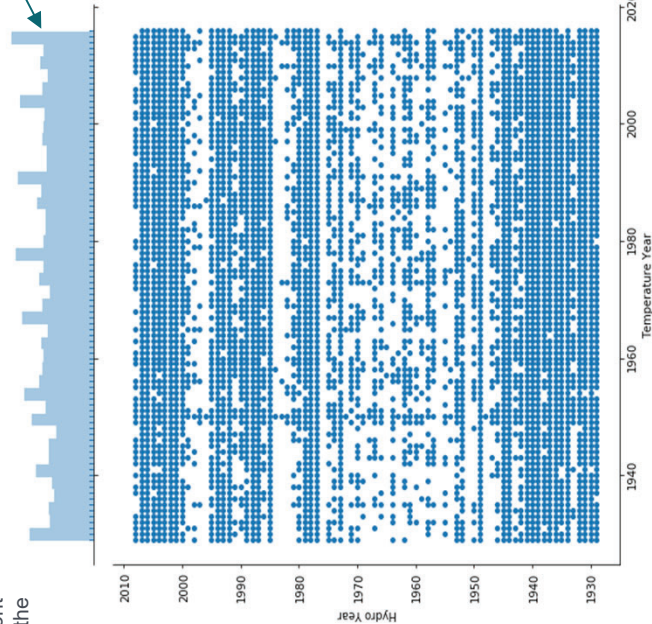
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Mid-C market curtailment events

Annual MWh Market Purchase Reduction for all 7,040 simulations

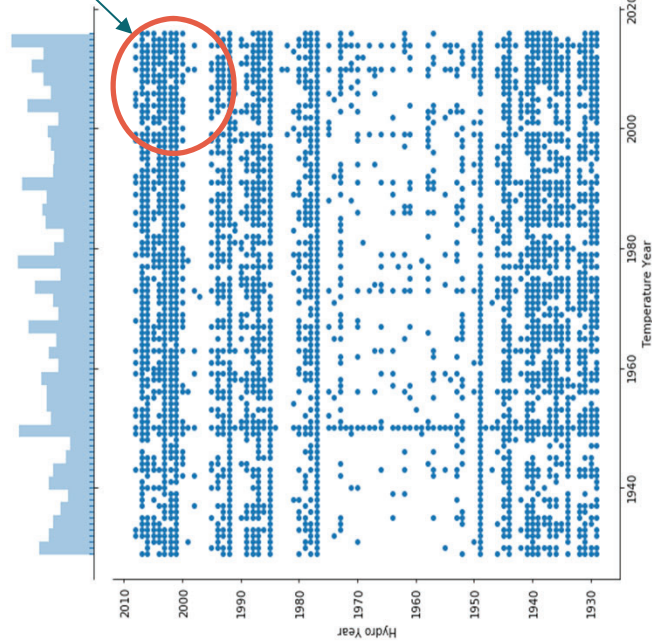
The magnitude of the curtailment event (MWh) for the year

Annual MWh Market Purchase Reduction 2031



A curtailment event occurred during the simulation

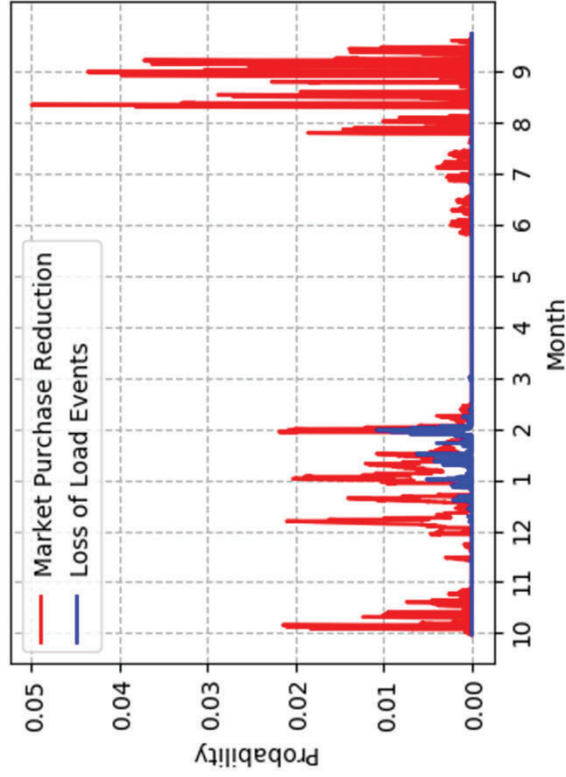
Annual MWh Market Purchase Reduction 2027



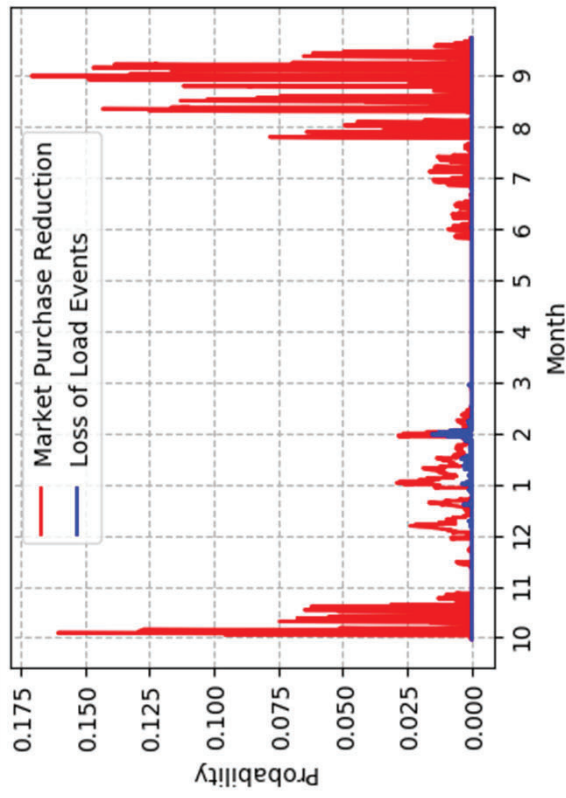
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Market curtailment probability compared to PSE loss of load events

Market Purchase Reduction v.s. Loss of Load Events 2027

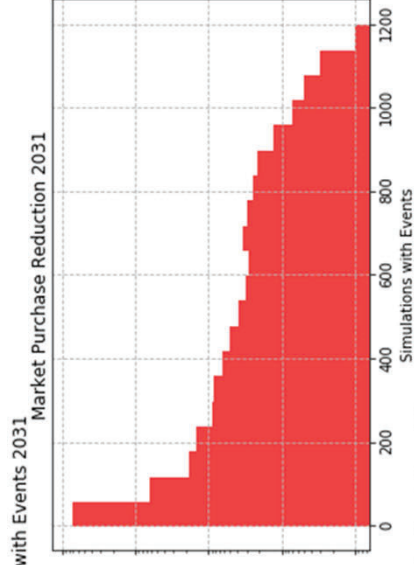
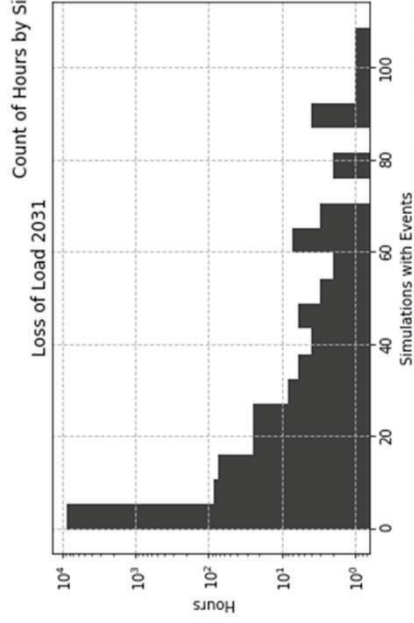
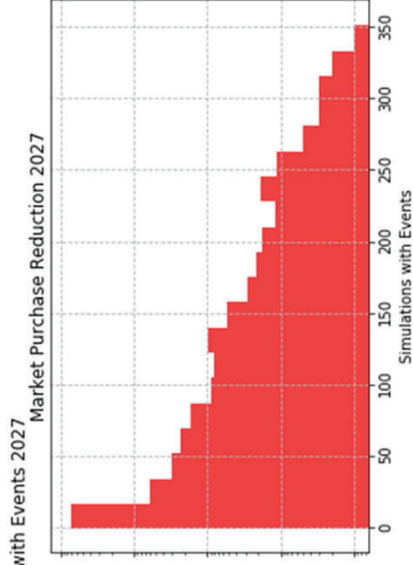
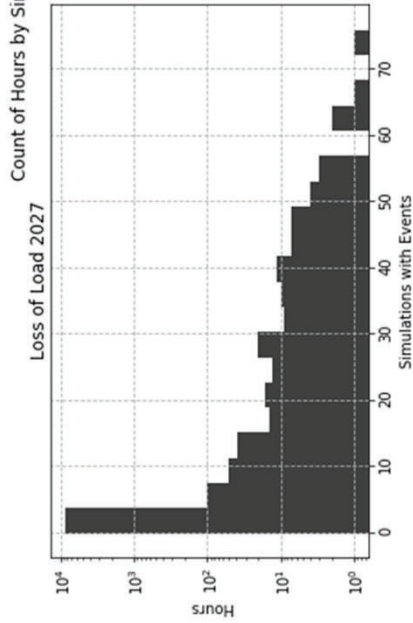


Market Purchase Reduction v.s. Loss of Load Events 2031



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Number of hours in simulation with a loss of load or market curtailment event

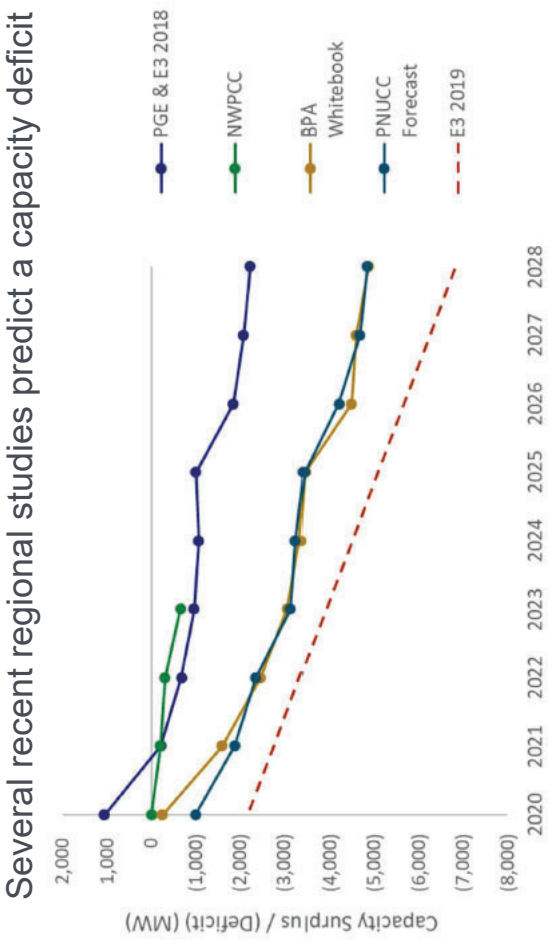


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Long-term resource adequacy outlook concerning

- Regional resource adequacy assessment studies highlight that the region is moving from surplus to short capacity
- Continuing to rely on other market players being surplus is not reasonable.



Questions & Answers



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Schedule



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Updated load
forecast and RA
analysis

January 2023
Draft IRP
Progress Report
with updated
CPA and
portfolio analysis

April 1, 2023
Final 2023 IRP
Progress Report



Will be included in
Phase 2 of the RFP

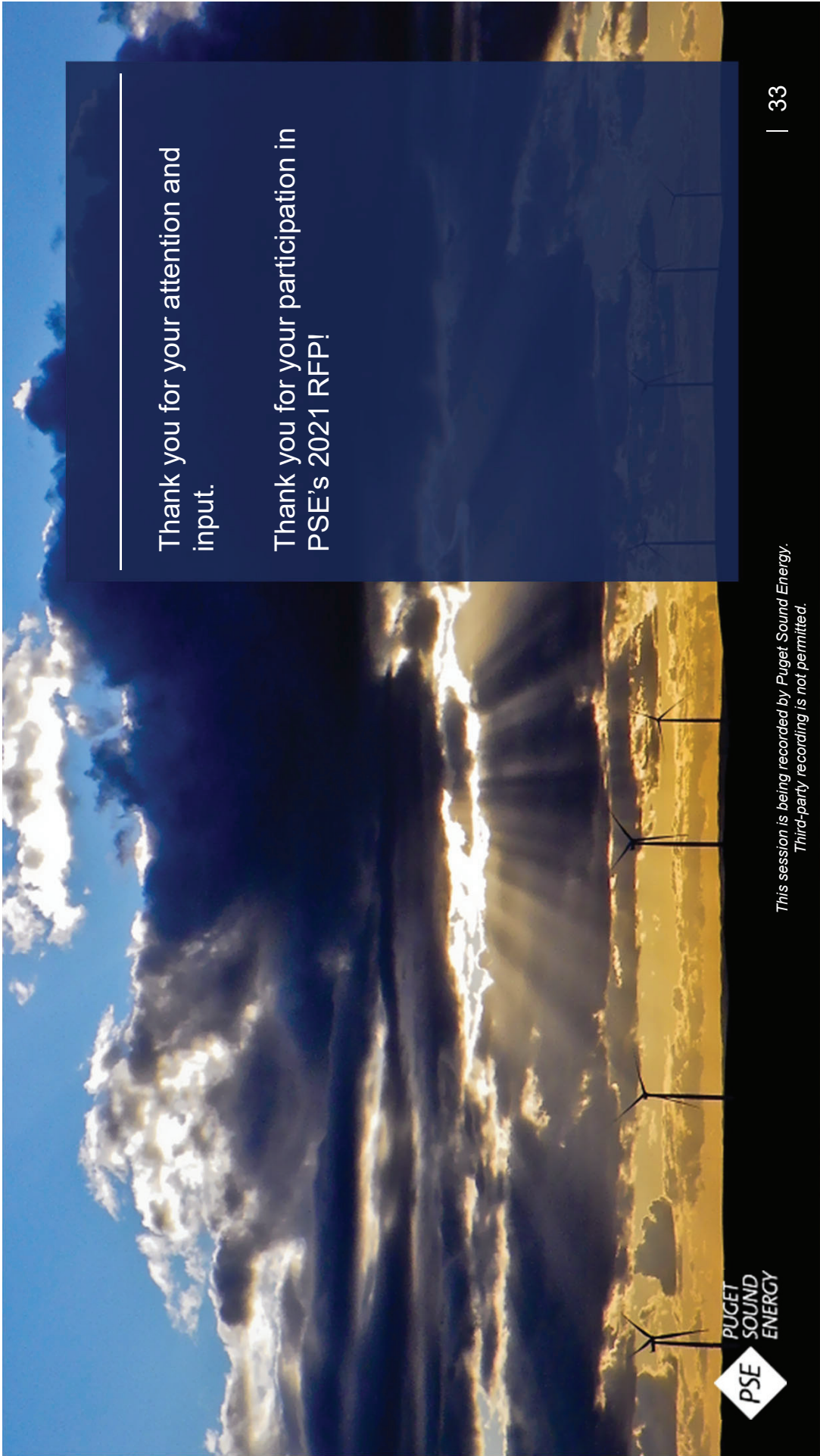
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Thank you for your attention and input.

Thank you for your participation in PSE's 2021 RFP!



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