Serving our customers



Integrated Resource Plan Public Workshop 4 Portfolio Performance and Selection



June 29, 2020

WELCOME!











Portfolio Performance How do our candidate portfolios perform according to our metrics?





Reminder: Candidate Portfolios

Renew BPA Slice/Block

- Tacoma Power Hydro + BPA Slice
- Tacoma Power Hydro + BPA Slice + renew CBH (continue current portfolio)
- Tacoma Power Hydro + BPA Slice + 60MW Solar
- Tacoma Power Hydro + BPA Slice + 100MWWA Wind
- Tacoma Power Hydro + BPA Slice + 100MWGorge Wind
- Tacoma Power Hydro + BPA Slice + 150MW Pumped Storage at Cowlitz
- Tacoma Power Hydro + BPA Slice + 150MW 3rd Generator at Cowlitz
- Tacoma Power Hydro + BPA Slice + 50MW Demand Response

Renew BPA with Shapeable Block

- Tacoma Power Hydro + BPA Block
- Tacoma Power Hydro + BPA Block + renew CBH
- Tacoma Power Hydro + BPA Block + 60MW Solar
- Tacoma Power Hydro + BPA Block + 100 MW WA Wind
- Tacoma Power Hydro + BPA Block + 100 MW Gorge Wind
- Tacoma Power Hydro + BPA Block + 150MW Pumped storage at Cowlitz 🕨
- Tacoma Power Hydro + BPA Block + 150MW 3rd Generator at Cowlitz
- Tacoma Power Hydro + BPA Block + 50MW Demand Response (DR)

Feasibility not certain, as 50MW of DR may be more than we can acquire

No BPA Renewal (not technically feasible at this time)

- Tacoma Power Hydro + 650MW WA Wind + 650MW Gorge Wind + 100MW MT Wind + 300MW DR
- Tacoma Power Hydro + 700MW WA Wind + 700MW Gorge Wind + 100MW MT Wind + 250MW DR + 150MW Pumped storage
- Tacoma Power Hydro + 700MW WA Wind + 700MW Gorge Wind + 100MW MT Wind + 250MW DR + 150MW Cowlitz Generator
- Tacoma Power Hydro + 700MW WA Wind +700MW Gorge Wind + 100MW MT Wind + 200MW DR + 100MW Small Nuclear
- Tacoma Power Hydro + 650MW WA Wind + 650MW Gorge Wind + 100MW MT Wind + 100MW DR + 200MW Natural Gas

Feasibility not certain due to licensing requirements

Reminder: Selection Criteria



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CETA Compliance: 80% Clean to Load



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- Market purchases are comparable for the portfolios that include a BPA product resulting in little to no difference in Percent Clean values across scenarios.
- Market price and volatility (as reflected in scenarios) are more impactful to portfolios without BPA

Resource Adequacy Before 2028 BPA Renewal Decision



% Normalized Expected Unserved Energy (NEUE) Current Portfolio w/out CBH Renewal



Current Portfolio w/out CBH Renewal





We are **occasionally inadequate** in certain years under certain scenarios using certain metrics.

We will need to develop a strategy to prepare for these potential inadequacies.

Renewing our Columbia Basin Hydro (CBH) contract does not improve adequacy.

Summary of RA Performance Post-2028

	Share of Years with Inadequacies			Consider Portfolio?	
Portfolio	NEUE	LOLH	LOLE		
Shapeable Block Only	0%	0%	0%	YES	
Shapeable Block + DR	0%	0%	0%	YES	•
Shapeable Block + Pumped Storage	0%	0%	0%	YES	
Shapeable Block + Add Generator	0%	0%	0%	YES	
Shapeable Block with E. WA Wind	0%	0%	10%	YES	
Shapeable Block with Gorge Wind	5%	0%	55%	NO	
Shapeable Block with Solar	0%	0%	0%	YES	
Shapeable Block with CBH	33%	0%	100%	NO	
Slice Only	29%	5%	5%	YES	
Slice + DR	0%	0%	0%	YES	
Slice + Pumped Storage	0%	0%	0%	YES	
Slice + Add Generator	0%	0%	0%	YES	
Slice with E. WA Wind	95%	55%	50%	NO	
Slice with Gorge Wind	81%	35%	45%	NO	*
Slice with Solar	29%	5%	10%	YES	
Slice with CBH	95%	100%	100%	NO	
Renewables + DR (no BPA)	33%	0%	20%	NO	1
Renewables + PSH + DR (no BPA)	5%	0%	0%	YES	
Renewables + Add Gen + DR (no BPA)	5%	0%	5%	YES	•
Renewables + SMN + DR (no BPA)	38%	5%	15%	NO	
Renewables + Gas + DR (no BPA)	33%	0%	20%	NO	

We are <u>always adequate</u> when we renew BPA with Shapeable Block and don't reduce the amount we get from BPA (our net requirement)

We are <u>mostly adequate</u> in portfolios where we renew BPA Slice and don't reduce our net requirement

We are <u>mostly adequate in</u> <u>most portfolios</u> when we renew BPA with Shapeable Block and "diversify" by reducing the amount we get from BPA slightly but <u>mostly inadequate</u> when we diversify with Slice.

It is <u>very difficult to replace</u> <u>BPA</u> primarily with renewables.

o Always adequate o Minimal adequacy issues o Adequacy concerns

Replacing BPA primarily with renewables is not only infeasible but also higher cost and higher financial risk than BPA portfolios.

Adding pumped storage or a generator at Cowlitz presents higher financial risk in addition to significant licensing risk

Small adjustments to Slice portfolio (like adding DR) could eliminate adequacy concerns at a lower cost than switching to a Block product.

Slice is lowest cost & lowest financial risk but presents some potential adequacy concerns.



Preferred Portfolio Which portfolio is the best fit for Tacoma Power?

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2020-2028

Adequacy concerns: Identify strategy to eliminate minor adequacy concerns (e.g. small DR investment, participate in interim Resource Adequacy program, etc.)

CBH Renewal: Unlikely to recommend CBH renewal, as it does not improve adequacy, and is unlikely to be offered at a sufficiently low price to make it cost-effective.

Post-2028

BPA Renewal: BPA renewal is more feasible, less costly and lower risk financially and also results in lower portfolio emissions than a renewablesheavy portfolio

BPA Product Choice: Slice/Block product is currently looking most promising from a cost, financial risk and emissions standpoint but some adjustment to portfolio is needed to avoid resource adequacy issues in tail risk events

BPA Diversification: If there is a desire to diversify BPA, small amount of solar diversification looks most promising but will not solve adequacy concerns.

Proposed Additional Portfolios to Test TACOMA S POWER

- 1. Renew Slice/Block and CBH (no reduction in BPA net requirement)
 - Objective: Confirm recommendation to NOT renew CBH contracts
- 2. Renew Slice/Block and add 60MW of E WA wind (no reduction in net requirement)
 - Objective: Determine whether wind might provide the winter capacity needed to solve potential adequacy concerns
- **3.** Renew Slice/Block and add 10MW DR (no reduction in net requirement)
 - Objective: Determine whether more achievable amount of DR might be enough to solve potential adequacy concerns
- 4. Renew Slice/Block and add 60MW of E WA wind and 10MW DR (no reduction in net requirement)
 - Objective: Determine whether wind + achievable amount of DR might be enough to solve potential adequacy concerns at a reasonable cost if wind or 10MW DR are not enough on their own

Impacts of Climate Change How might climate change impact our resource adequacy?

Selected same models as NW Power & Conservation Council for this IRP

- High emissions (RCP8.5) climate models
- 3 of 80 possible climate/downscaling/hydrology models
- Models with highest concentration of extreme low and high temps and inflows selected

Preliminary attempts at adjusting loads & generation are presented

 More work to follow in next IRP to refine choice of climate models & approach to modeling

Maximum Daily Temperatures

Minimum Daily Temperatures

Load Changes

Yearly Peak

Yearly Average Energy

Grand Coulee Dam

Snake River

Cowlitz Project Mossyrock Dam

Slice Portfolio

Total Monthly Generation

RA Impacts: Climate change may relieve small adequacy concerns with Slice as potential winter issues lessen.

IRP Action Items What do we need to do for next time?

Next steps for 2020 IRP

Draft List of Action Items Following 2020 IRP

	Next 2 years	Next 10 years		
Resource Acquisition/	Acquire 2-year CPA potential	Acquire 10-year CPA target		
Retirement	Notify parties of CBH renewal decision			
Further Investigation	Actively participate in discussions with	Continue to follow development of		
into Resources	BPA on future product options	new technologies		
	Conduct DR "potential assessment"	Pilot cost-effective DR options		
	Further investigate value of solar			
	diversification			
Continue Improving	Refine approach to modeling DR	Continue improving functionality		
Modeling & Analysis	Model EE as a resource in system	of SAM		
	model (SAM)			
	Refine climate change modeling			
	Incorporate impacts of electrification			
	Update models to include most recent			
	weather years			
	Improve WECC modeling of storage			
Equity	Develop metric(s) to account for	Fully incorporate equity into		
	equity in resource acquisition	resource acquisition decisions		
	decisions	29		
Public Input	TBD	TBD		

Feedback for Next IRP Process What can we do to improve?

Reminder: Next steps

