



# Integrated Resource Plan

## 2021 IRP Public-Input Meeting

### June 25, 2021



# Agenda



- 9:00am-9:15am Pacific – Introductions
- 9:15am-11:45am Pacific – Update on Key Activities
  - 9:15am-10:00am Pacific – Natrium Demonstration Project
  - 10:00am-11:00am Pacific – All-Source 2020 Request for Proposals Final Shortlist
  - 11:00am-11:15am Pacific – Boardman to Hemingway Transmission Line
  - 11:15am-11:30am Pacific – Carbon Capture Utilization and Sequestration Update
- 11:30am-12:00pm Pacific – Lunch Break
- 12:00pm-1:00pm Pacific – Intuitive Case
- 1:00pm-2:00pm Pacific – Granularity and Reliability Adjustments
- 2:00pm-2:30pm Pacific – Production Process
- 2:30pm-3:00pm Pacific – Next Steps Modeling and Analysis
- 3:00pm-3:30pm Pacific – Washington Clean Energy Implementation Plan Update
- 3:30pm-3:45pm Pacific – Stakeholder Feedback Form Update
- 3:45pm-4:00pm Pacific – Wrap-Up/Next Steps



# Sodium Demonstration Project



# Natrium Demonstration Project



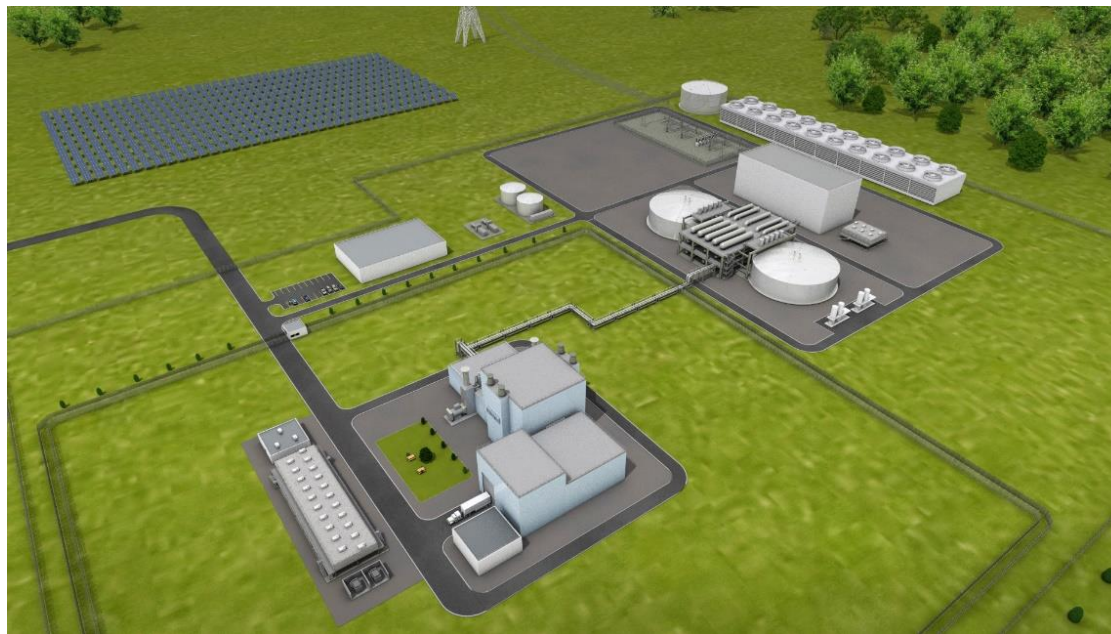
- On June 2, 2021, PacifiCorp announced efforts with TerraPower and the U.S. Department of Energy to advance the Natrium demonstration project to be sited at a retiring coal plant in Wyoming. More information can be found on the Wyoming Advanced Energy webpage at:
  - [wyomingadvancedenergy.com](http://wyomingadvancedenergy.com)
- The project features an advanced nuclear reactor developed by TerraPower and GE Hitachi, represented by a 345 MW sodium-cooled fast nuclear reactor with a molten salt-based energy storage system
- The energy storage system can increase the project's output to 500 MW for more than five and a half hours when needed – equivalent to powering around 400,000 homes
- The technology uses structural advancements that separate and simplify major structures, reducing complexity, cost and construction schedule while delivering safe and reliable electricity
- The Natrium advanced reactor also has enhanced safety features which take advantage of natural forces that do not require human intervention with the ability to shut down independently, indefinitely if needed



# Natrium Demonstration Project Con't



- PacifiCorp's 2021 IRP will evaluate locations for the Natrium advanced reactor, to be sited at a retiring coal plant in Wyoming. The economics of the demonstration project will be evaluated to ensure it is beneficial for PacifiCorp's customers.
- TerraPower will build the reactor and have ownership during construction. PacifiCorp may purchase the facility upon commercial operation. Specific timing is subject to further analysis and demonstration that it is in the interest of PacifiCorp's customers.



*Natrium reactor and integrated energy storage project*

# Natrium Operating Characteristics



- The Natrium demonstration project has three primary elements:
  - A nuclear reactor to produce heat
  - A steam generator to convert heat to electricity
  - A molten salt tank to store heat
- The nuclear reactor is a reliable source of baseload energy
  - 345 MW of baseload energy production at a 92.5% capacity factor
  - Equivalent to annual energy production from roughly 1,000 MW of solar
- The steam generator provides dispatchability and flexibility analogous to that of the PacifiCorp's existing steam generators
  - Maximum output of 500 MW
  - Minimum output of 100 MW
  - Ramp rate is ~40 MW per minute from min to max
- The molten salt storage has a longer lifespan and higher efficiency relative to standalone batteries
  - Supports maximum output of 500 MW for 5.5 hour duration (max output then drops to 345 MW baseline until output is reduced further and more heat is stored)
  - 30-year PacifiCorp book life assumed (matching assumed NRC license life; TerraPower suggested design life is 60 years)
  - Assumed maximum storage efficiency of ~99% versus ~85-90% for battery storage
    - Thermal storage does not require phase changes or chemical reactions, losses primarily reflect heat transfer out of the insulated tank, which is low, particularly over a short duration





# 2020 All-Source (2020AS) Request for Proposals Final Shortlist



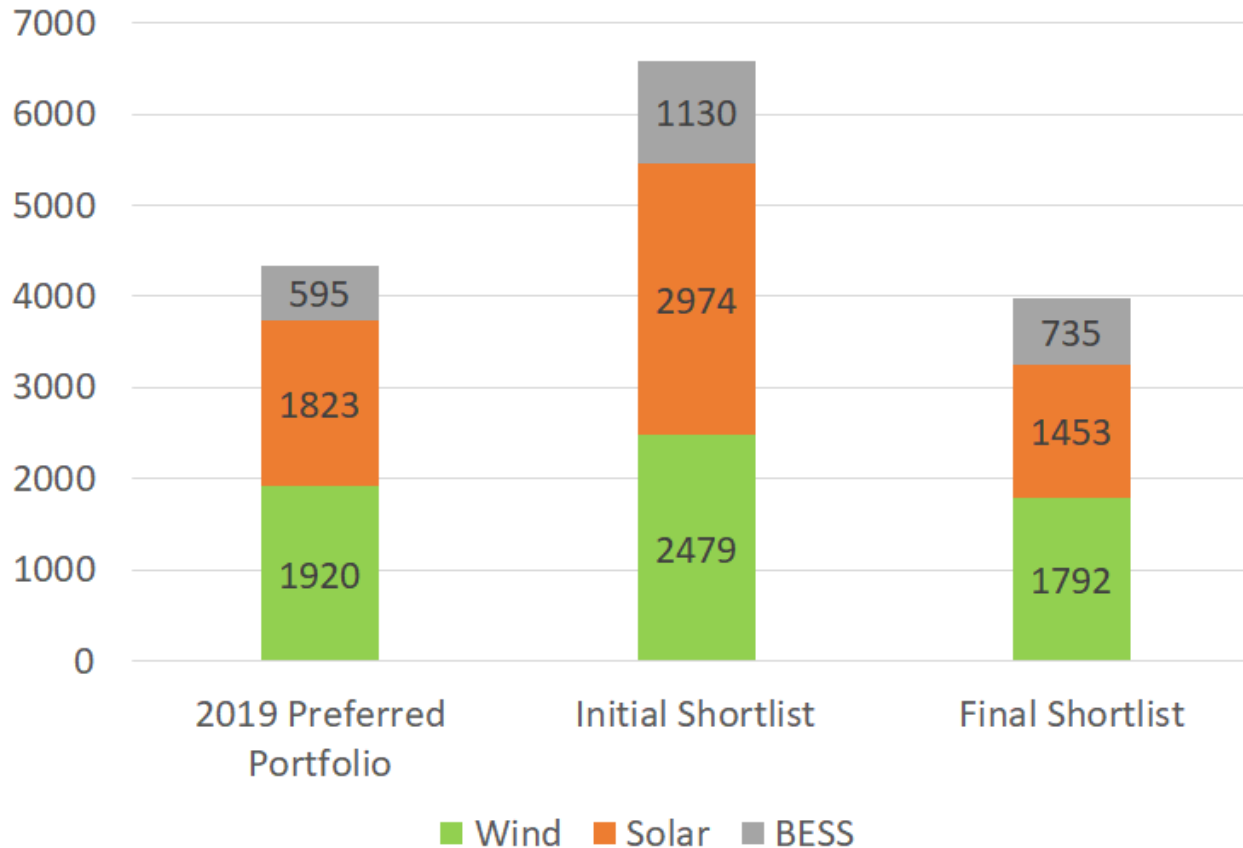
# 2020 All-Source RFP Final Shortlist



- PacifiCorp issued the 2020AS RFP to the market on July 7, 2020; bidder responses were returned to PacifiCorp for evaluation on August 10, 2020
  - The market responded with over 28,000 MW of conforming bids
  - An additional 12,500 MW of bids were submitted that did not conform with minimum requirements set forth in the 2020 AS RFP
- In October 2020, the initial shortlist was identified, which included 5,453 MW of renewable resource capacity—2,974 MW of solar or solar with storage (1,130 MW of battery storage), 2,479 MW of wind, and 200 MW of standalone battery capacity
- The transitional interconnection cluster study process was subsequently initiated, and in April 2021, PacifiCorp began to evaluate best-and-final pricing updates from bidders
- Consistent with the bid evaluation and selection methodology set forth in the 2020AS RFP, PacifiCorp has evaluated a range of potential bid portfolios, reflecting results from the transitional interconnection cluster study process, to select the final shortlist, which includes:
  - 1,792 MW of new wind resources (590 MW as build-transfer agreements and 1,202 MW as power-purchase agreements)
  - 1,453 MW of solar capacity (all power-purchase agreements)
  - 735 MW of battery energy storage system capacity—535 MW paired with solar bids and 200 MW as standalone battery storage (power-purchase agreement)
- When using base case market price and CO<sub>2</sub> price assumptions, present-value net benefits of the final shortlist portfolio are preliminarily estimated at \$323 million



# 2019 IRP Preferred Portfolio vs. Initial Shortlist vs. Final Shortlist (MW)



Note: BESS is not additive to Solar and Wind.

# 2020 All-Source RFP Final Shortlist



Project Name	Bidder	Type	Location	COD	Contract	Term/Life (Years)	Resource Capacity (MW)	Battery Capacity (MW)
Anticline	NextEra	Wind	Wyoming East	12/31/2024	PPA	30	100.5	n/a
Cedar Springs IV	NextEra	Wind	Wyoming East	12/31/2024	PPA	30	350.4	n/a
Rock Creek I	Invenergy	Wind	Wyoming East	12/31/2024	BTA	30	190	n/a
Rock Creek II	Invenergy	Wind	Wyoming East	12/31/2024	BTA	30	400	n/a
Boswell Springs	Innergex	Wind	Wyoming East	10/1/2024	PPA	30	320	n/a
Two Rivers	Blue Earth Renewables LLC & Clearway Renew LLC	Wind	Wyoming East	12/31/2024	PPA	25	280	n/a
Cedar Creek	rPlus Energies	Wind	Goshen	12/31/2022	PPA	25	151	n/a
Steel Solar I & II	DESRI	PVS	Utah North	12/31/2023	PPA	25	147	37.5
Rocket Solar II	DESRI	PVS	Utah North	12/31/2023	PPA	25	45	12.5
Fremont	Longroad Energy	PVS	Utah South	11/30/2023	PPA	20	99	49.5
Rush Lake	Longroad Energy	PVS	Utah South	11/30/2023	PPA	20	99	49.5
Parowan	First Solar	PVS	Utah South	12/31/2024	PPA	25	58	58
Hornshadow I	enyo energy	PVS	Utah South	12/31/2023	PPA	30	100	25
Hornshadow II	enyo energy	PVS	Utah South	12/31/2023	PPA	30	200	50
Green River I & II	rPlus Energies	PVS	Utah South	12/31/2024	PPA	20	400	200
Hamaker	ecoplexus	PVS	Southern OR	12/31/2023	PPA	30	50	12.5
Hayden 2	ecoplexus	PVS	Southern OR	12/31/2023	PPA	30	160	40
Dominguez I	Able Grid	BESS	Utah North	7/1/2024	BSA	15	n/a	200
Glen Canyon	sPower	Solar	Utah South	12/31/2023	PPA	30	95	n/a

**Total wind and solar capacity = 3,245 MW**

Wind = 1,792 MW  
Solar = 1,453 MW

**Total battery energy storage system capacity (BESS) = 735 MW**

Paired with photovoltaic (PVS) = 535 MW  
Standalone BESS = 200 MW

# Resource Need



Calendar Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>System</b>										
<b>Total Resources</b>	10,671	10,646	10,685	10,391	10,334	9,997	9,943	9,043	8,538	8,313
<b>Obligation</b>	9,899	9,985	10,064	10,103	10,162	10,012	10,011	10,044	10,069	10,112
<b>Reserves</b>	1,310	1,321	1,331	1,336	1,344	1,325	1,324	1,329	1,332	1,338
<b>Obligation + Reserves</b>	11,209	11,306	11,395	11,439	11,506	11,336	11,335	11,372	11,401	11,449
<b>System Position</b>	(538)	(660)	(711)	(1,048)	(1,172)	(1,339)	(1,392)	(2,329)	(2,863)	(3,136)

- Final shortlist bids will help PacifiCorp fill a resource need
- After accounting for a higher load forecast and recently signed contracts, the company's unmet capacity position is 1,172 MW in 2025—the first summer in which all resources from the 2020AS RFP will be online
- The final shortlist has an estimated capacity contribution value of 1,028 MW
- While the company's 2019 IRP assumed that over 1,400 MW of market purchases could be used to meet its requirements, the capacity position of the western interconnect is much tighter than in past years, with resource adequacy an ongoing concern in California and a growing concern elsewhere

# Portfolio-Selection Scenarios



- Portfolios were selected under a range of price-policy scenarios, plus others recommended by staff of the Public Utility Commission of Oregon:
  - LN: low gas/market price, no carbon price
  - MM: medium gas/market price, medium carbon price
  - HH: high gas/market price, high carbon price
  - SL: Staff's low market price sensitivity that assumes high renewable penetration in the WECC, medium gas price, and medium carbon price
  - SNS (MM): medium gas/market price, medium carbon price, but no wholesale market sales allowed
  - SNST (MM): The same as SNS (MM), plus PTC/ITC assumed extended through 2030
- Portfolios with no RFP bids were also prepared—these scenarios are compared to the final shortlist bid portfolio to calculate net customer benefits

# Demand Response Selections



- Each 2020AS RFP bid portfolio includes bids submitted into the 2021DR RFP as a resource alternative (as selected by the System Optimizer model)
- Demand response selections are incremental to existing programs
- Demand response selections vary by portfolio-selection scenario
- Selected programs begin in 2022 and grow over the first ten years
- The ability to ramp quickly into the full capacity identified starting in 2022 in any scenario below may be limited by program selection, design, and delivery requirements
- Commitments to specific programs will be made as part of ongoing or new procurement processes, and in some instances regulatory approvals

DR Bid Selections (MW)	2022			2030		
	MM	SNS	LN	MM	SNS	LN
Rocky Mountain Power	59	75	75	229	245	245
Pacific Power	2	22	46	43	152	315
<b>Total</b>	<b>61</b>	<b>97</b>	<b>121</b>	<b>272</b>	<b>397</b>	<b>560</b>



# Boardman to Hemingway (B2H) Transmission Line Update





# Boardman to Hemingway (B2H)



- Approximately 290 mile, 500-kV transmission line from a new proposed substation near Boardman, OR to the Hemingway substation southwest of Boise, ID
- Joint Permit Funding Agreement between Idaho Power, Bonneville Power Administration and PacifiCorp
  - 1,050 MW capacity west-to-east, 1,000 MW east-to-west
- Commercial negotiations have achieved a tentative agreement and progress continues for resolution of key action items
- Benefits to PacifiCorp customers include reducing reliance on third party transmission service, cost savings that result from arbitrage of low-cost northwest markets relative to southwest markets, capacity benefits resulting from winter and summer peaking differences across PacifiCorp's system, and increased load serving capability in Central Oregon. In conjunction with Gateway West increased access to renewable energy to meet changing state regulation
- Idaho Power has identified Boardman-to-Hemingway in its most recent integrated resource plan preferred portfolio with an in-service date in 2026 and initiated contractual owner negotiations in Q2 2019 to proceed with building the line



## Current project schedule (Energy Gateway, Segment H):

- Pre-construction activities start Q4 2019 – Q4 2022
- Oregon final order and site certificate – Q3 2022
- BLM Notice to Proceed / Plan of Development – Q3 2023
- Line construction start Q2 2023
- Substation construction start Q1 2024
- Project in-service mid-year 2026



# Carbon Capture Utilization and Sequestration (CCUS) Update



# Carbon Capture Utilization and Sequestration



- Request for Expression of Interest/Request for Proposal
  - As part of its evaluation of CCUS, PacifiCorp plans to initiate a Request for Expression of Interest (REOI) for CCUS projects with a planned release date of June 29, 2021.
  - The REOI process will identify any parties interested in CCUS projects at PacifiCorp coal plants. The REOI will also collect information about parties' technologies, capabilities, and costs.
  - The REOI will serve as a precursor to the company issuing a Request for Proposal (RFP) that will call for proposals and bids for carbon capture projects at PacifiCorp plants. Information and interest received during the REOI process will facilitate development of the RFP.
- Evaluation of required NO<sub>x</sub> and SO<sub>2</sub> controls necessary for CCUS operation
  - PacifiCorp is analyzing a broader emissions data set (3 years) for each coal unit to evaluate the level of potential NO<sub>x</sub> and SO<sub>2</sub> controls necessary to ensure proper operation and avoid equipment degradation for amine-based post-combustion capture systems.
  - While NO<sub>x</sub> and SO<sub>2</sub> controls are relevant to other environmental compliance requirements (i.e., regional haze) this analysis is focused on the emissions' impacts on CCUS-system operation and functionality.



# Indicative Case



# Plexos Progress



- PacifiCorp has made significant progress on its ability to produce long-term resource portfolios from the Plexos LT model following updates provided at the April public-input meeting
- PacifiCorp has also been able to advance the LT portfolios through MT and ST model runs to evaluate the LT model's resource decisions, assess reliability and to enable cost and risk analysis. Reporting tools are under development for cost and risk information
- For today's discussion, PacifiCorp has developed a reliable 20-year resource portfolio (the indicative portfolio) that incorporates the best information available today regarding known and anticipated resource activities and assumptions
- Through the development of the indicative portfolio, PacifiCorp has been able to develop a methodology to ensure portfolios are reliable and improve the LT model portfolio selection
- These efforts, including the indicative portfolio, are presented in detail on the following slides and will inform more complete modeling efforts to be presented at the July 29-30, 2021, public-input meeting

# Indicative Portfolio Assumptions



Case "Name"	Price-Policy	Existing Coal	Existing Gas	Other Existing Resources	Proxy Resources
Indicative Case	MM	2019 IRP Preferred Portfolio	2019 IRP Preferred Portfolio	End of Life	Optimized starting in 2026 – no new gas resources allowed

- Assumes 2019 IRP coal and gas retirement dates
- Includes Gateway South 440-mile, 500-kV transmission line (2025 as first full year)
- Includes Boardman to Hemingway 290-mile, 500-kV transmission line (2026)
- Includes the All-Source 2020 Request for Proposals final shortlist
  - Demand response, energy efficiency, FOTs optimized over the planning period
  - New proxy resources allowed to be selected starting in 2026
- Includes 500 MW Natrium demonstration project in 2028
- Includes requirement to select at least one pumped storage proxy resource between 2030-2040



# Indicative Portfolio Summary



Resource	Incremental Capacity, MW																				Total
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	
<b>Expansion Options</b>																					
Gas - CCCT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gas - Peaking	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSM - Energy Efficiency	157	121	126	134	163	183	207	229	238	247	246	239	222	221	200	173	147	128	110	98	3,589
DSM - Demand Response	-	132	176	64	44	33	33	32	33	32	33	13	20	22	22	88	109	61	254	61	1,261
Renewable - Wind	-	-	151	43	1,641	600	-	-	-	-	-	-	-	-	-	755	884	1,053	-	285	5,413
Renewable - Wind+Storage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable - Utility Solar	-	-	-	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	95
Renewable - Utility Solar+Storage	-	-	-	901	457	-	-	83	350	-	200	-	400	-	-	200	1,360	2,278	752	-	6,981
Renewable - Battery, Wind+Storage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renewable - Battery, Solar+Storage	-	-	-	277	258	-	-	42	175	-	100	-	200	-	-	100	680	1,139	376	-	3,346
Renewable - Geothermal	-	-	-	-	-	-	300	-	-	-	-	-	-	-	-	-	-	-	-	-	300
Battery - Stand Alone	-	-	-	200	-	325	-	-	-	-	-	-	-	-	-	-	-	-	400	-	925
Storage - CAES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Storage - Pumped Hydro	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	300
Sodium Demonstration Project	-	-	-	-	-	-	-	500	-	-	-	-	-	-	-	-	-	-	-	-	500
Front Office Transactions	400	432	466	437	517	428	391	388	400	381	450	553	620	731	783	804	925	949	991	976	601
<b>Existing Unit Changes</b>																					
Coal Plant End-of-life Retirements	-	-	-	-	-	(230)	-	(788)	(123)	-	-	-	-	-	-	-	(909)	(699)	-	(268)	(3,018)
Coal Early Retirements	-	-	-	(354)	-	(357)	-	-	(359)	-	-	-	-	-	-	-	-	-	-	-	(1,070)
Coal - CCUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coal - Gas Conversions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Coal Plant ceases running as Coal</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gas Plant End-of-life Retirements	-	-	-	-	-	-	-	-	(247)	-	-	(356)	-	-	-	(237)	-	-	-	-	(840)
Retire - Hydro	-	-	(163)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(163)
Retire - Wind	-	(10)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(10)
Expire - Wind PPA	-	-	-	(41)	-	(65)	-	-	(99)	(200)	(49)	-	-	-	-	-	-	-	-	-	(454)
Retire - Solar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(18)	-	-	-	-	(18)
Expire - Solar PPA	-	-	-	-	-	-	-	(2)	-	-	-	(8)	-	-	-	(73)	-	-	-	-	(83)
Expire - QF	-	(2)	-	(50)	-	-	(29)	-	(83)	(0)	-	(81)	(181)	(91)	(19)	(208)	(744)	(30)	(100)	(92)	(1,712)
Retire - Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(32)	-	-	(32)
Expire - Other	-	-	-	32	(84)	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	(49)
<b>Total</b>	<b>556</b>	<b>674</b>	<b>755</b>	<b>1,738</b>	<b>2,996</b>	<b>918</b>	<b>902</b>	<b>483</b>	<b>531</b>	<b>215</b>	<b>980</b>	<b>717</b>	<b>925</b>	<b>883</b>	<b>986</b>	<b>1,911</b>	<b>2,125</b>	<b>4,847</b>	<b>2,783</b>	<b>1,361</b>	

# Indicative Case Near-Term Resources



	2021	2022	2023	2024	2025	Total
<b>East</b>						
Battery				200		200
Solar				95		95
PVS Solar				690	457	1,147
PVS Battery				224	258	482
Wind			151	43	1,641	1,835
Energy Efficiency	104	74	79	91	115	463
Demand Response		84	106	35	21	246
<b>West</b>						
PVS Solar				211		209
PVS Battery				53		53
Energy Efficiency	53	48	46	42	48	237
Demand Response		48	70	30	23	171
<b>Total</b>	<b>157</b>	<b>253</b>	<b>452</b>	<b>1,714</b>	<b>2,563</b>	<b>5,138</b>

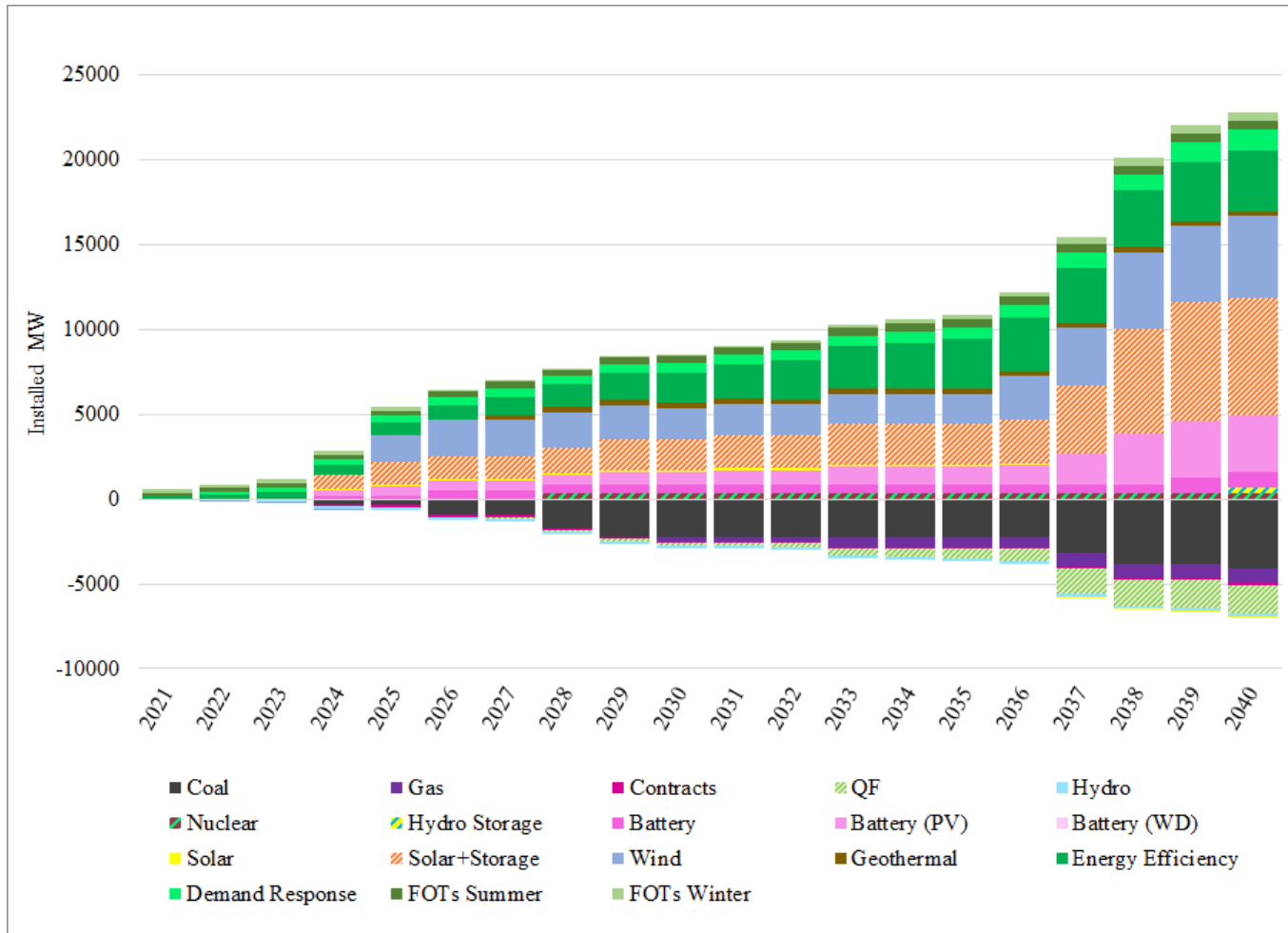
# Indicative Case New Transmission



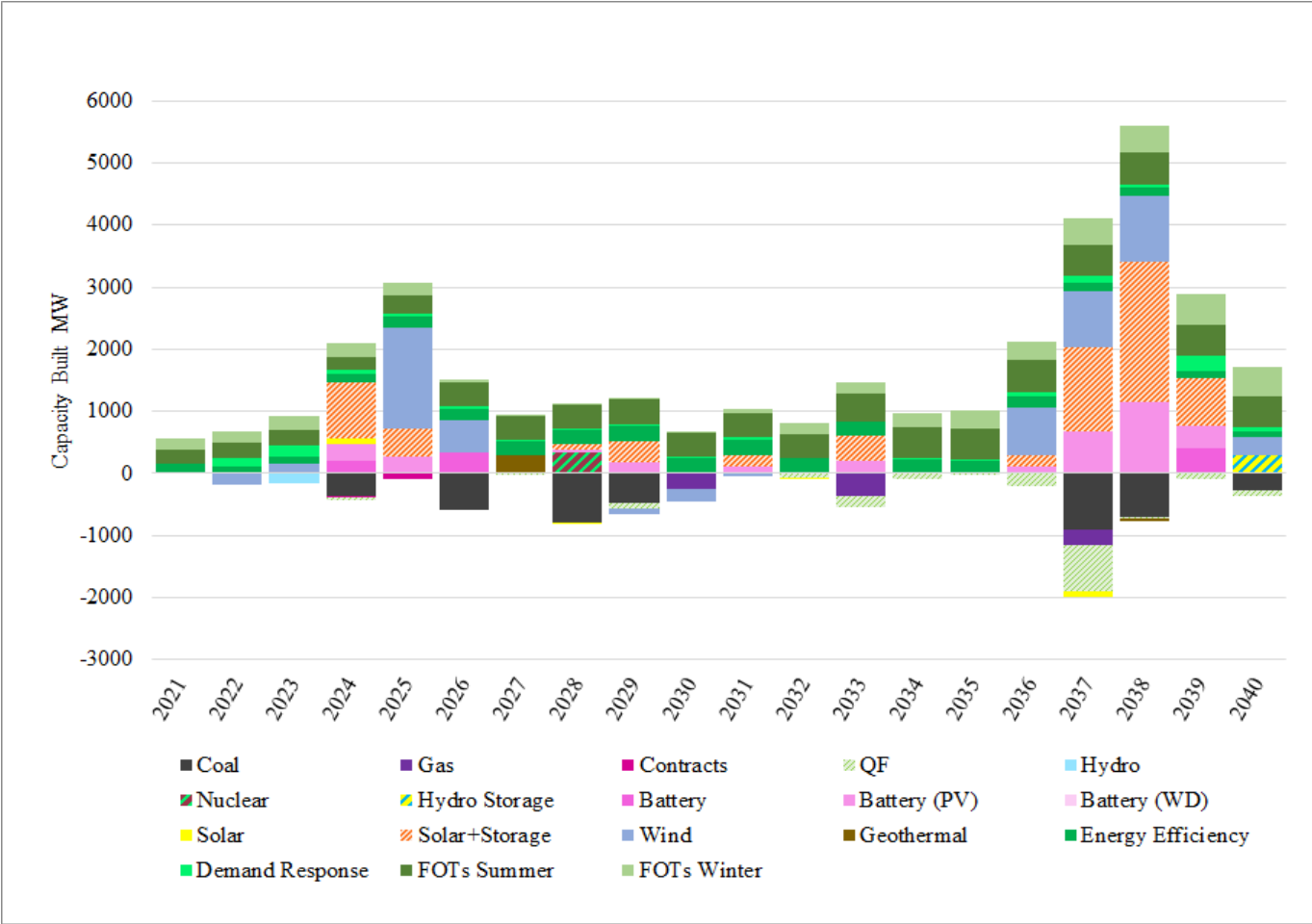
- Gateway South (GWS)
  - Transfer capability from Wyoming East to Clover (central UT)
  - Supports additional interconnection capability in Wyoming and Utah
  - Expected in-service date late 2024
- Boardman to Hemingway (B2H)
  - Westbound transfer capability from Borah to Hemingway to Midpoint
  - Eastbound transfer capability from Walla Walla to Borah
  - Supports additional interconnection capability in Idaho (Borah)
  - Expected in-service date 2026
- Southern Oregon (interconnection only, selected 2027)
- Utah North (interconnection only, selected 2029)
- Utah South to Utah North (selected in 2032)
  - Transfer capability from Utah South to Utah North
  - Interconnection capability in Utah South



# Cumulative Resource Changes



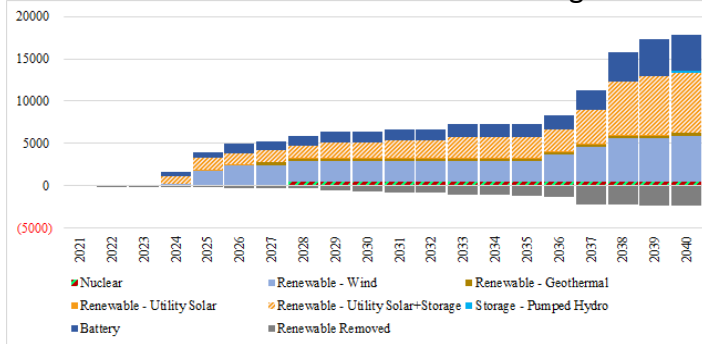
# Incremental Portfolio Changes



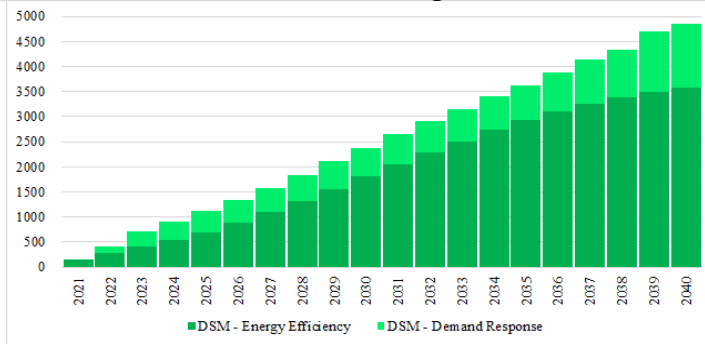


# Indicative Portfolio Resources

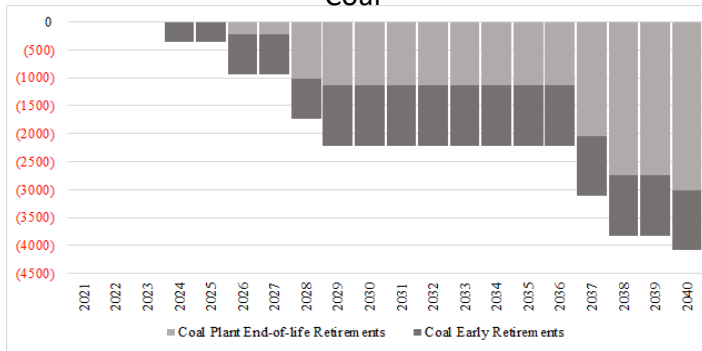
### Renewables & Non-carbon Emitting



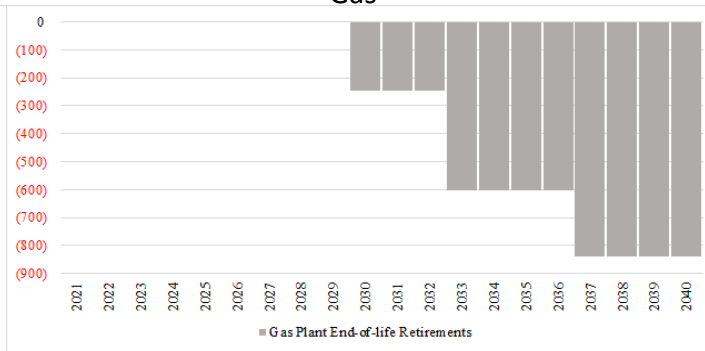
### Demand-side Management



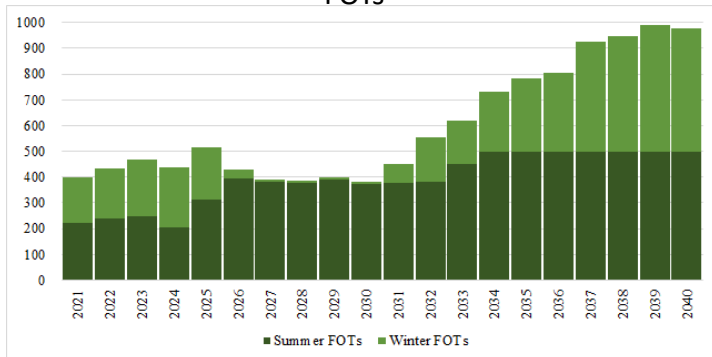
### Coal



### Gas



### FOTs



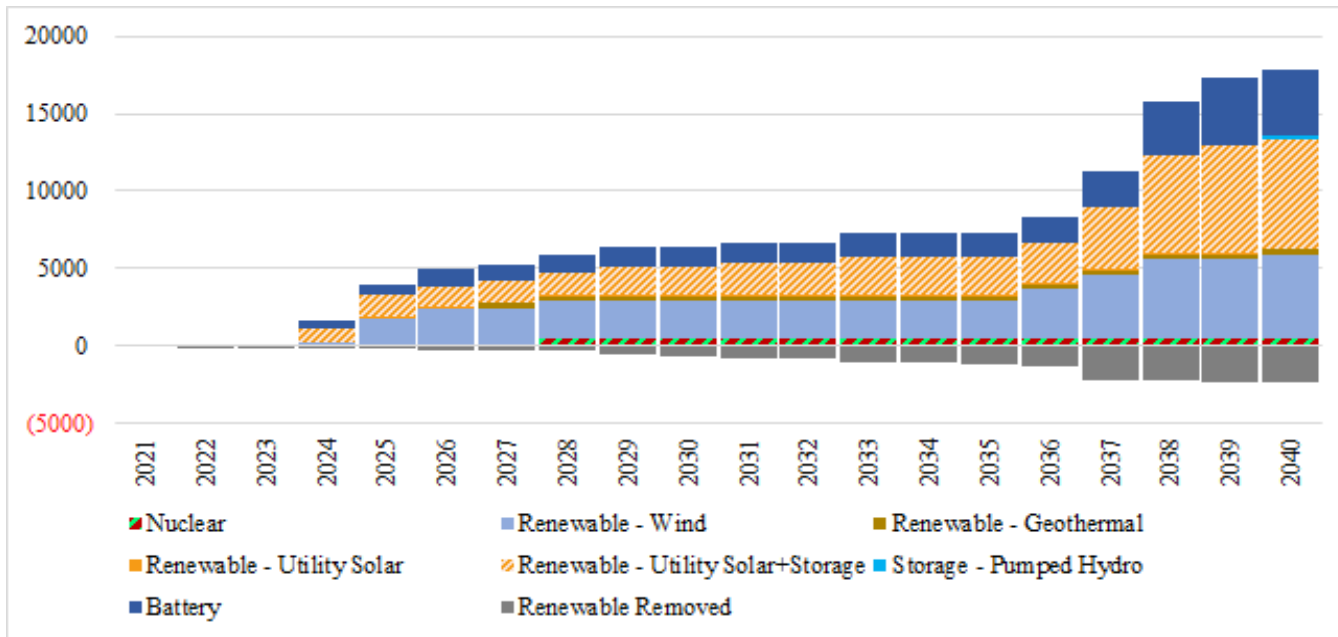
Resource Type	Resource Additions*
Wind	4910
Solar	6919
Battery	4271
Energy Efficiency	3589
Demand Response	1261
Gas	(840)
Coal	(4088)
Sodium Demonstration Project	500
Pumped Storage	300

\* Net of retirements and expirations





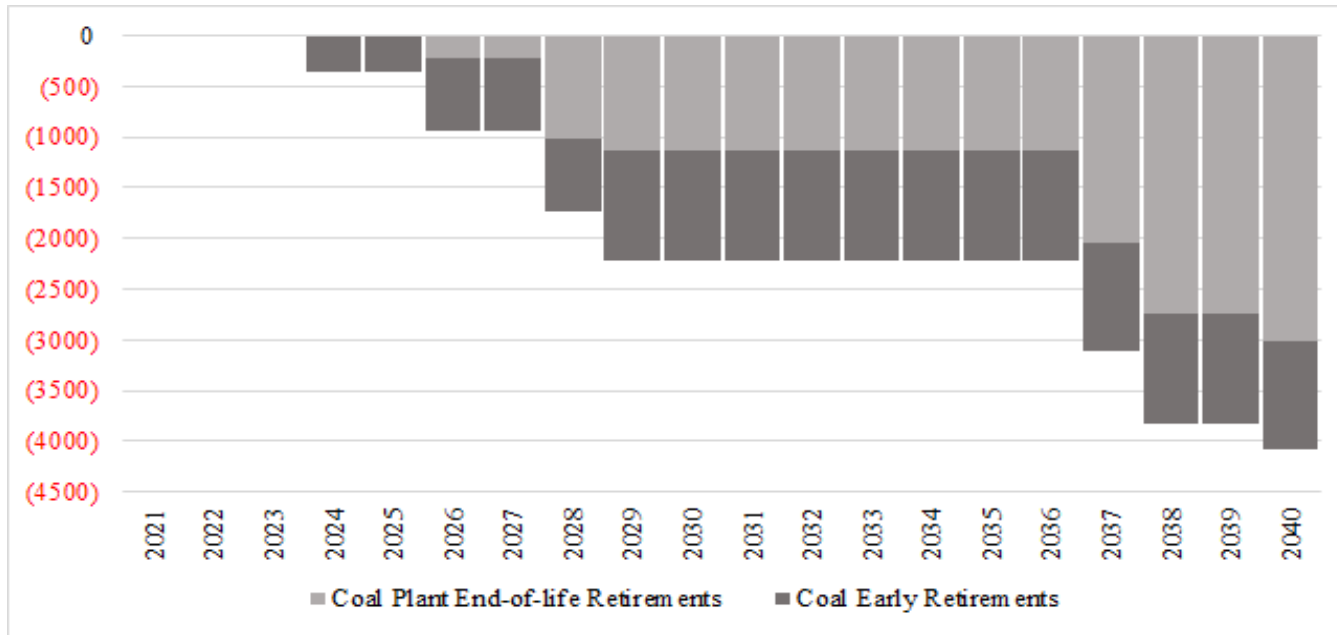
# Renewables & Non-Emitting



- By 2025, includes 1,784 MW of net wind increasing to 4,910 MW by 2040
- By 2025, includes 1,453 MW of net solar increasing to 6,919 MW by 2040
- By 2025, includes 200 MW of new standalone battery increasing to 925 MW by 2040
- Includes the 500 MW Sodium demonstration project in 2028
- Includes a 300 MW pumped storage project in 2040
- Includes 300 MW geothermal resource in 2027



# Coal Retirements

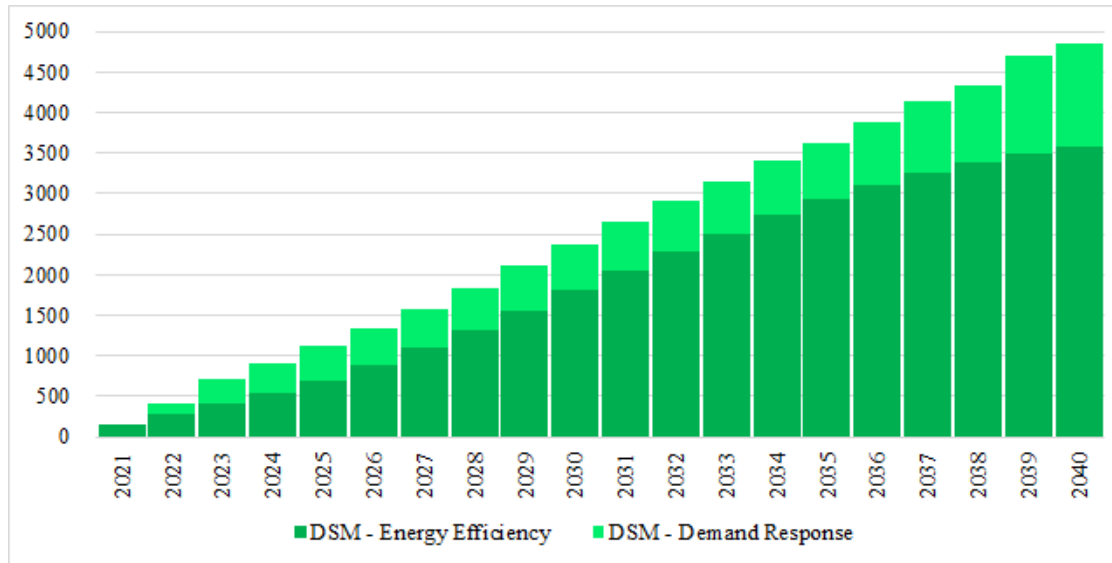


Location	Coal Retirements (2021-2025)*	Coal Retirements (2026-2030)*	Coal Retirements (2031-2040)*
Wyoming	2023 = 351 MW (J. Bridger 1) 2025 = 357 MW (Naughton 1-2)	2027 = 755 MW (D. Johnston 1-4) 2028 = 356 MW (J. Bridger 2)	2037 = 702 MW (J. Bridger 3-4) 2039 = 268 MW (Wyodak)
Colorado	2025 = 82 MW (Craig 1)	2026 = 82 MW (Craig 2) 2030 = 77 MW (Hayden 1-2)	n/a
Montana		2027 = 148 MW (Colstrip 3-4)	n/a
Utah	n/a	n/a	2036 = 909 MW (Huntington 1-2)

\* Coal plant retirements are based on the 2019 IRP Preferred Portfolio



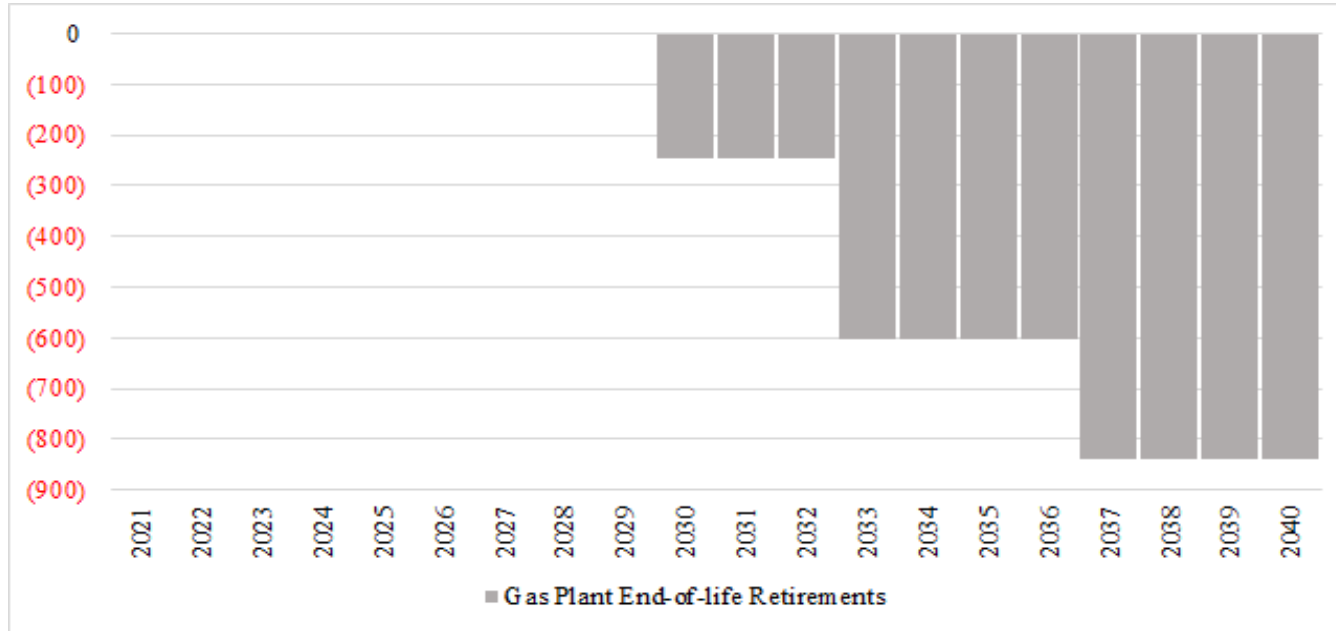
# Demand-Side Management



State	DSM (2021-2025)	DSM (2026-2040)
Utah	2021-2025 = 372 MW EE 2021-2025 = 196 MW DR	2026-2040 = 1540 MW EE 2026-2040 = 445 MW DR
Wyoming	2021-2025 = 57 MW EE 2021-2025 = 28 MW DR	2026-2040 = 243 MW EE 2026-2040 = 38 MW DR
Oregon	2021-2025 = 173 MW EE 2021-2025 = 104 MW DR	2026-2040 = 551 MW EE 2026-2040 = 206 MW DR
Washington	2021-2025 = 58 MW EE 2021-2025 = 61 MW DR	2026-2040 = 324 MW EE 2026-2040 = 45 MW DR
Idaho	2021-2025 = 34 MW EE 2021-2025 = 22 MW DR	2026-2040 = 203 MW EE 2026-2040 = 78 MW DR
California	2021-2025 = 6 MW EE 2021-2025 = 6 MW DR	2026-2040 = 29 MW EE 2026-2040 = 32 MW DR



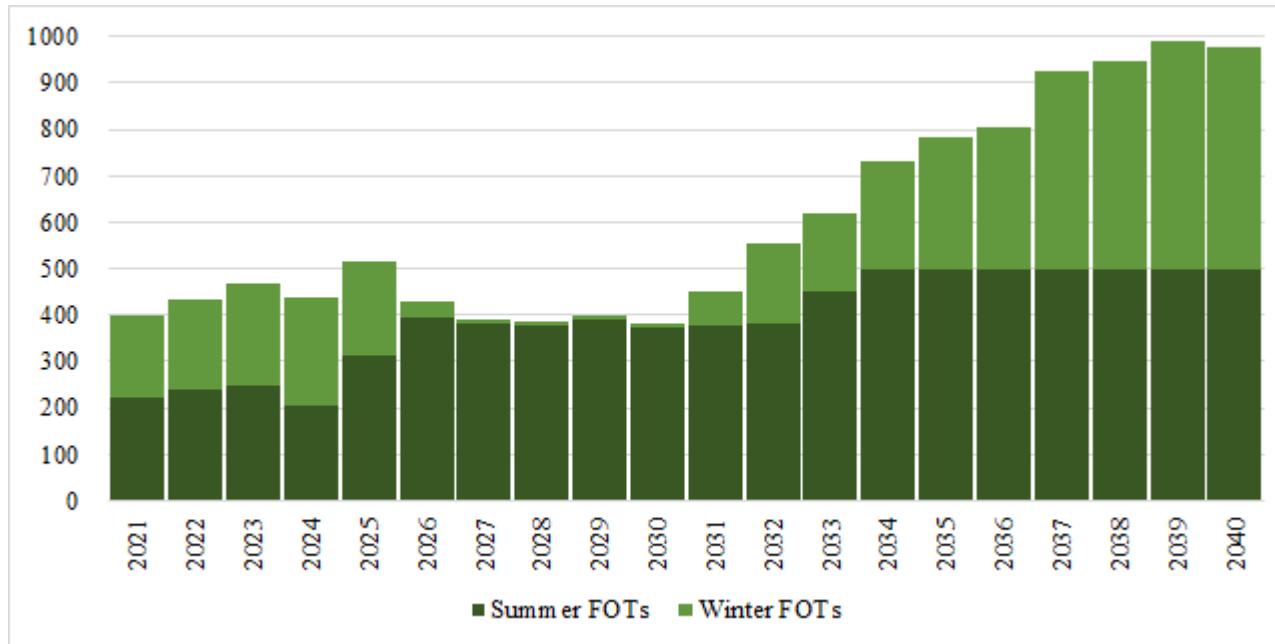
# Natural Gas Retirements



State	Gas Retirements (2021-2024)*	Gas Retirements (2025-2040)*
Wyoming	n/a	2029 = 247 MW Naughton 3
Utah	n/a	2032 = 356 MW Gadsby 1-6
Oregon	n/a	2036 = 237 MW Hermiston

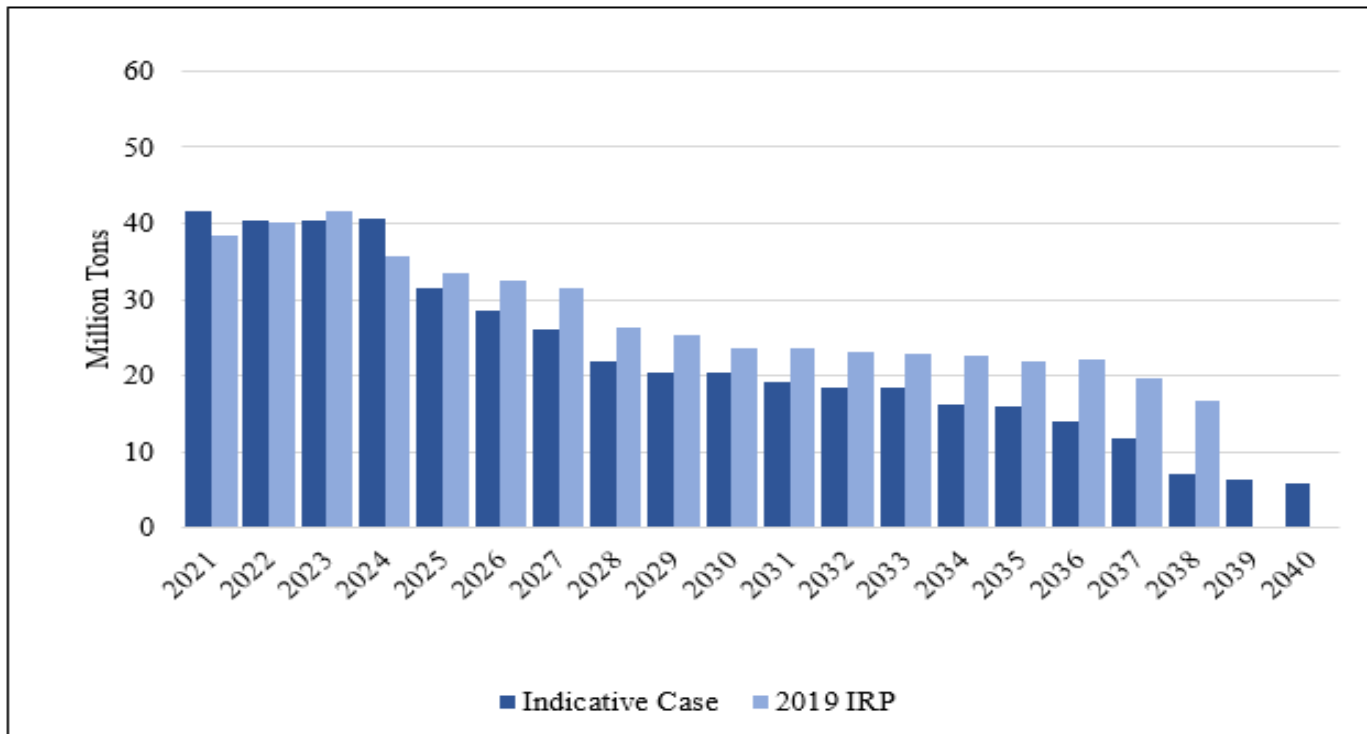
\* Natural gas plant retirements are based on the 2019 IRP Preferred Portfolio

# Front Office Transactions



- Selection of front office transactions remains relatively steady for summer FOTs and increases in the back years along with an increase in winter FOTs, as more coal and gas retirements occur

# CO<sub>2</sub> Emissions





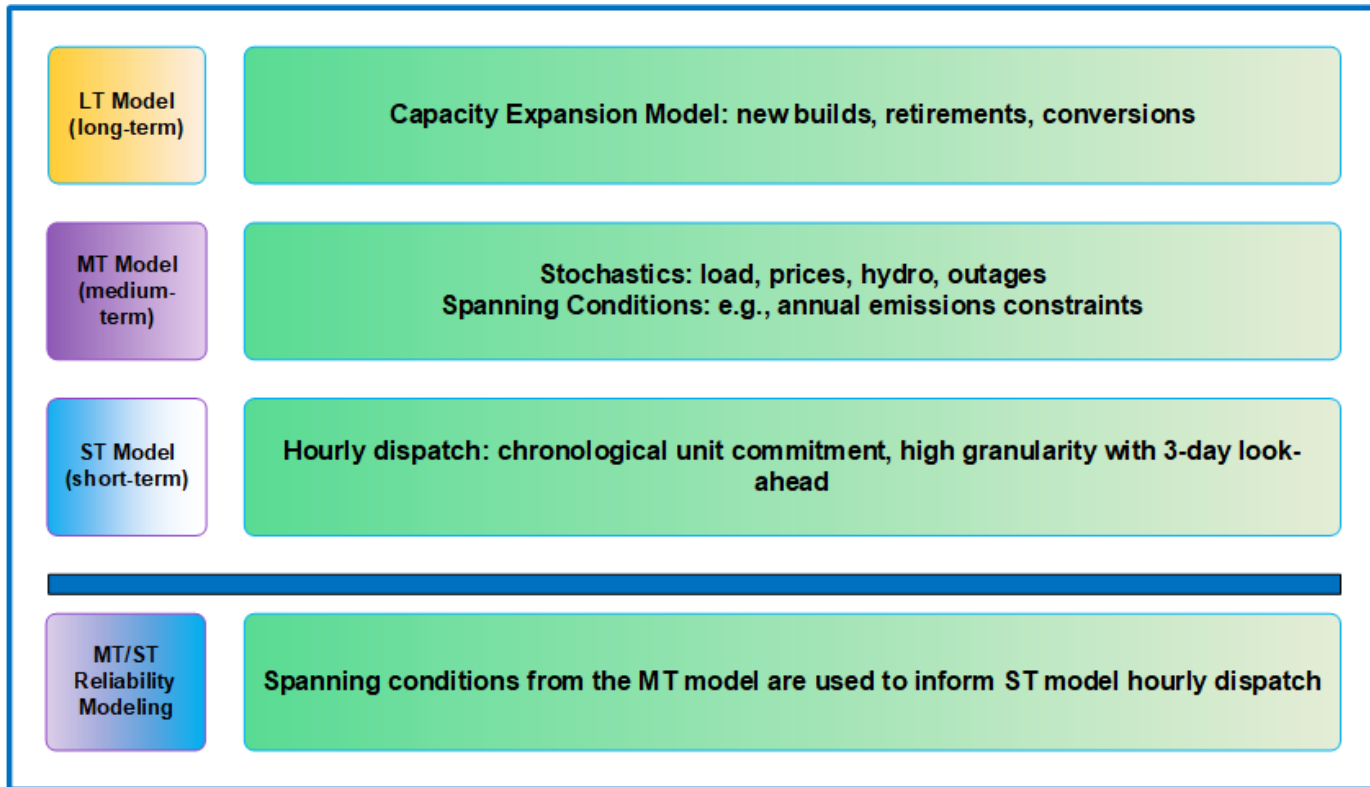


# Granularity and Reliability Adjustments





# Plexos Modeling

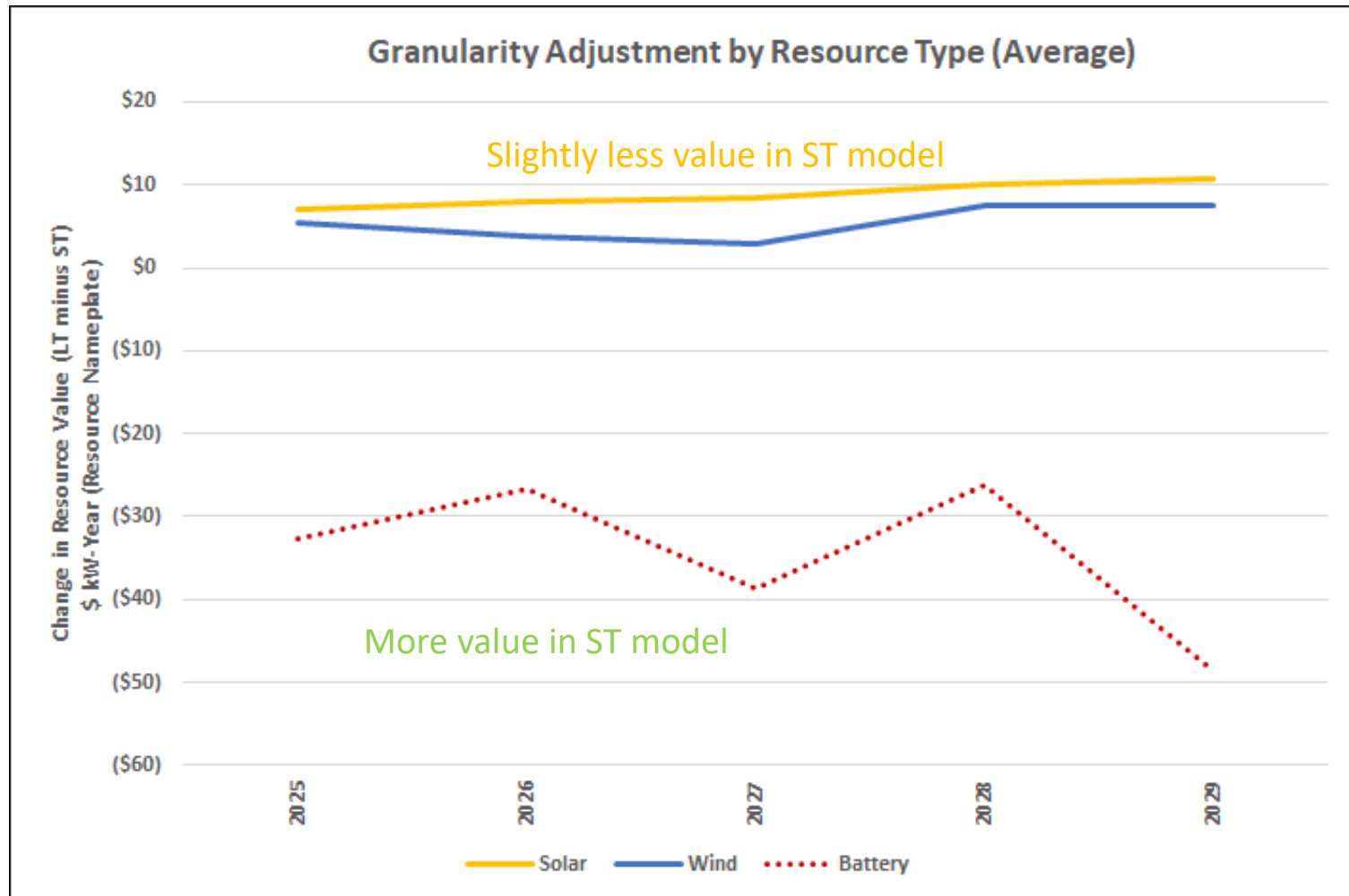


# Granularity and Reliability Adjustments

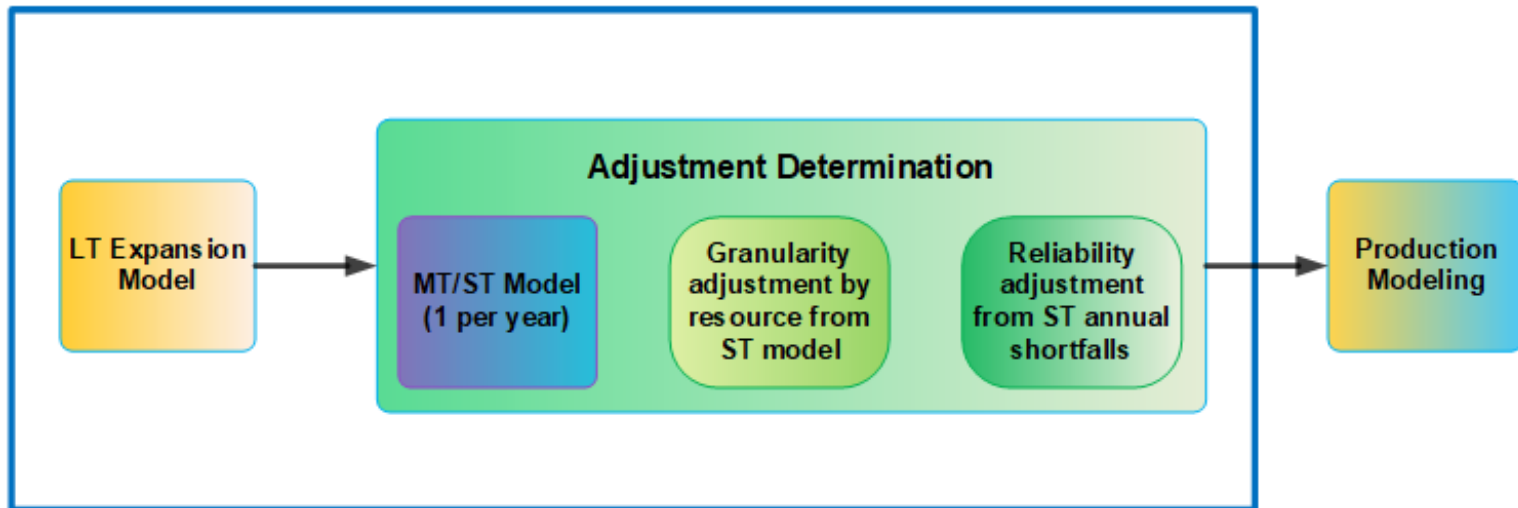


- Plexos models are more integrated than our prior models.
  - They share the same base data and setups
  - They can be run at equivalent granularities (although LT hourly runs are performance prohibitive even for simple systems)
  - The LT, MT and ST models can be readily used to inform and support each other
  - In PacifiCorp’s prior model, communication had to be continually re-aligned and data implemented in multiple ways to support both System Optimizer and Planning and Risk
- The granularity adjustment in Plexos is more precise and more broadly applied than in prior models:
  - The LT and ST models both provide energy and operating reserve values specific to each resource in its modeled location – the adjustment reflects the difference from ST to LT
  - Operating reserve value applies to all resources, not just selected “flexible resources”
  - Every resource, including all EE programs and DR, is assessed for its relative value to the portfolio
  - Previously, granularity adjustments were only calculated annually for east/west and technology type
- Reliability additions to meet shortfalls can be addressed without iterating the LT model:
  - Capacity additions by type, size and location are determined based on ST results
  - A capacity addition to account for stochastic uncertainty is also included in the development of the reliability adjustment; this uncertainty is reflective of uncertainty experienced in operations
  - The MT/ST reliability modeling can then be used again to check success of the reliability additions

# Sample Granularity Adjustment Values



# Granularity and Reliability Process



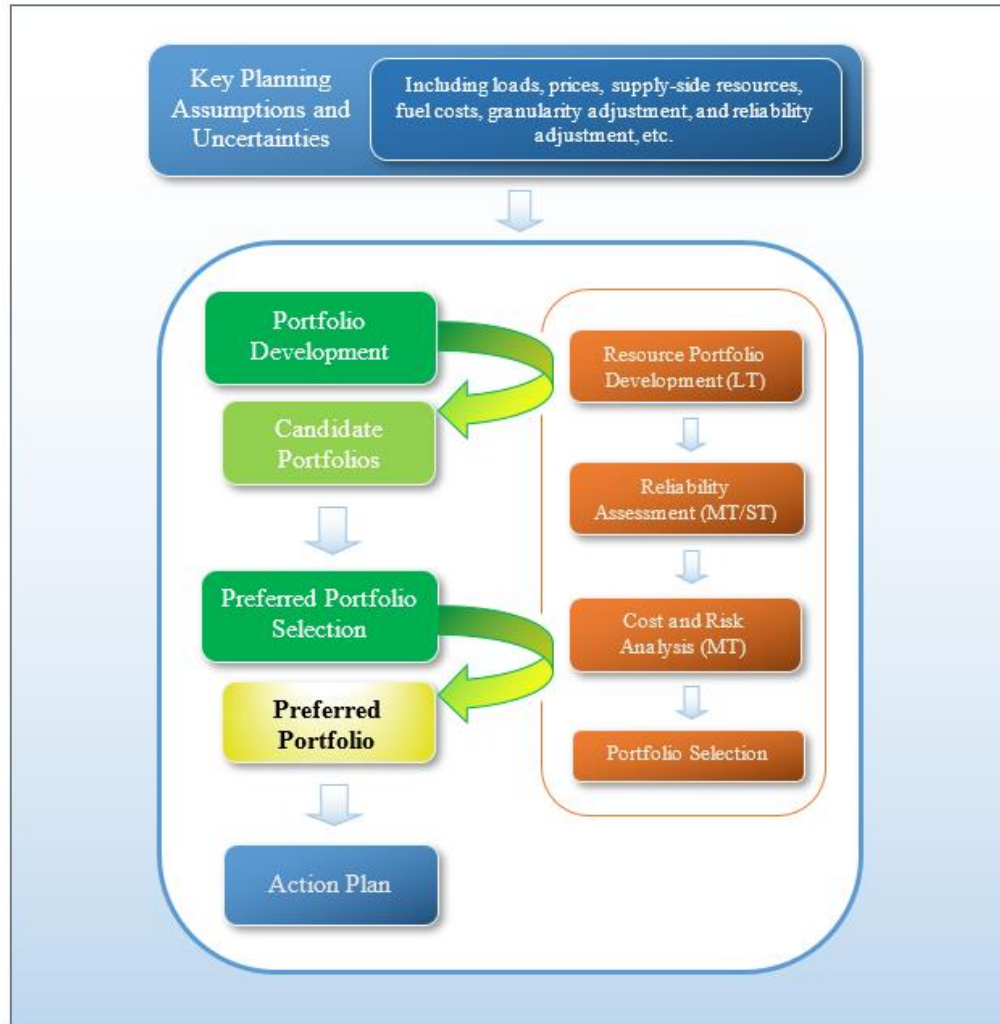
- Granularity adjustment values and reliability adjustment amounts are determined for each price-policy scenario (LN, MM, MN, HH, SC-GHG)
- Granularity adjustment values are specific to each resource type
- Granularity adjustment values and reliability adjustment amounts are inputs to the Plexos LT model by corresponding price-policy scenario



# Production Process



# Production Process



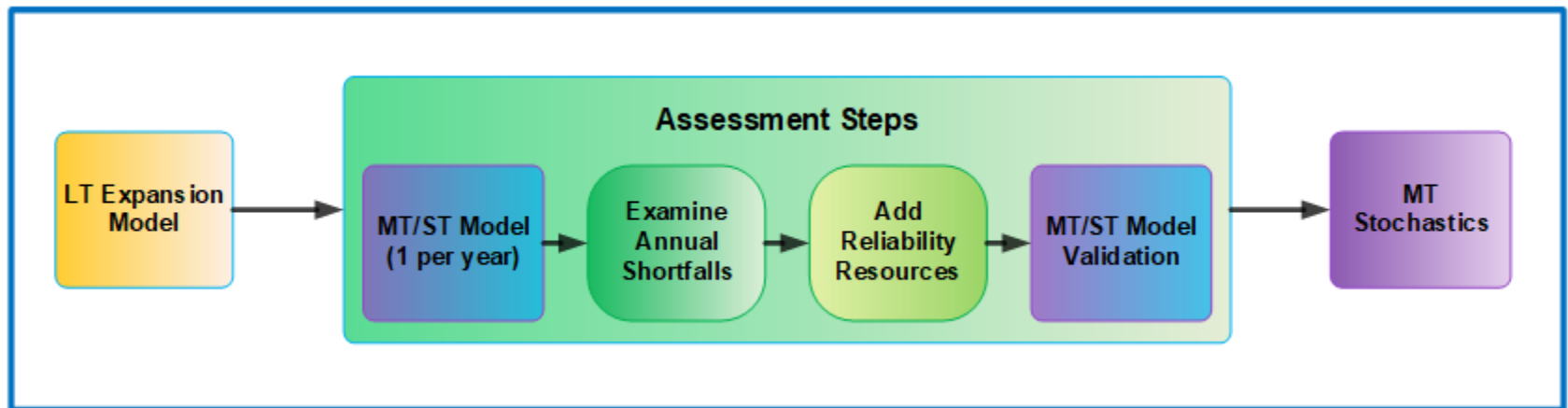
# Reliability Assessment



- The granularity and reliability adjustments discussed on previous slides help inform the LT model to make resource selections that will be more reliable at an hourly granularity of assessment. Portfolios may or may not require further adjustment following a reliability assessment of the LT portfolio
- The LT model inherently optimizes resource selections to meet load requirements and operating and regulation reserve requirements based on 4 blocks per month
- The LT blocking methodology however does not benefit from short-term hourly analysis
- The LT model selects resources on a least-cost basis and cannot see with precision how they contribute to reliability at an hourly level of granularity
  - For example, variable energy resources are modeled with fixed hourly generation profiles however, in operation there is uncertainty on a day-ahead, hour-ahead and real-time basis
  - This uncertainty on an operational basis may be met in the near-term with higher firm market purchases or higher thermal unit commitments; this uncertainty can be met on a longer-term basis by incremental capacity additions
- A reliability assessment, informed by short-term hourly annual MT/ST model runs based on sample years, will be conducted on all portfolios to ensure that they adequately meet reserve requirements
- Additional capacity may be necessary to add to the portfolio to remedy shortfalls, if identified

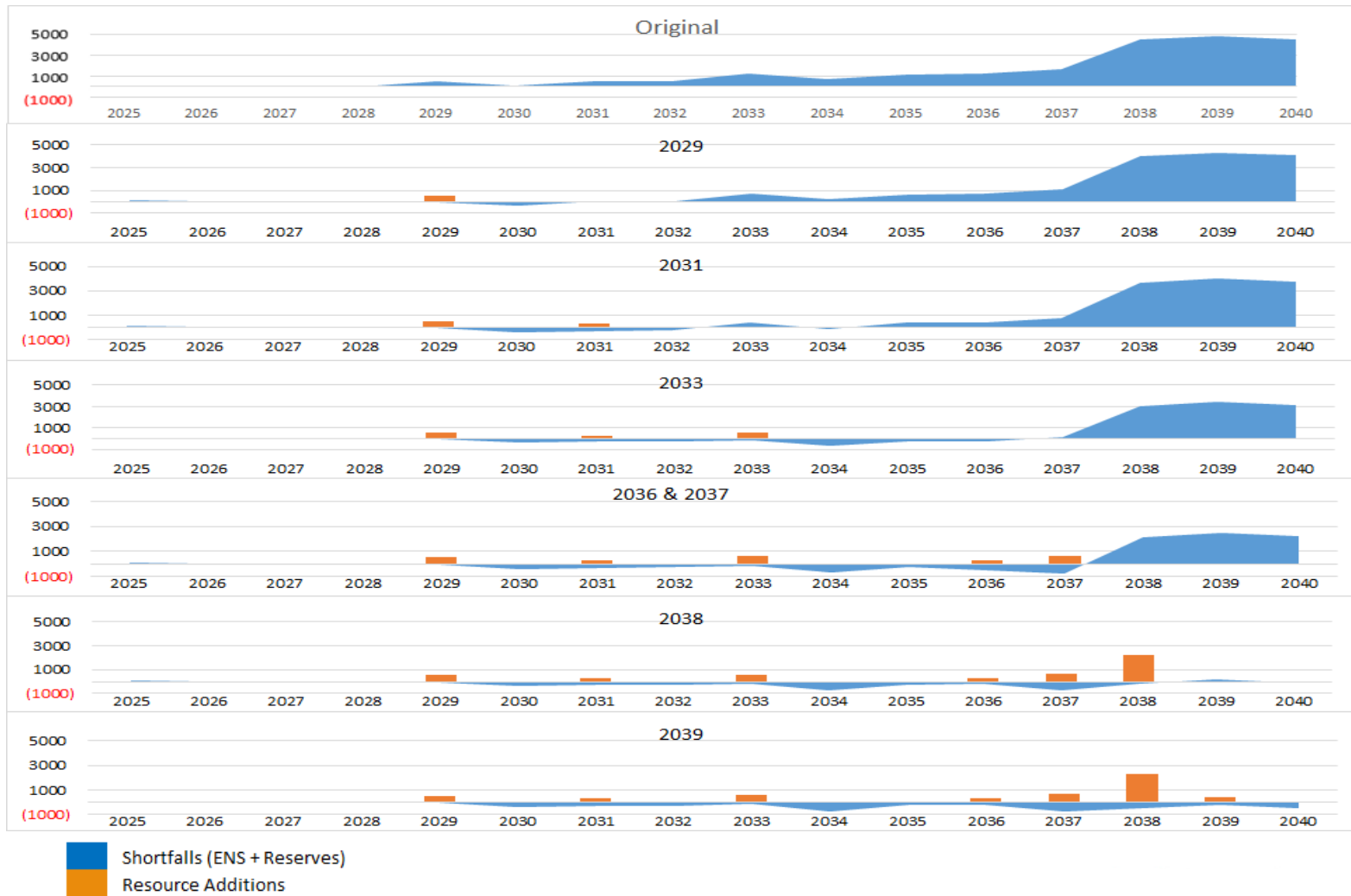


# Reliability Assessment Approach



- Shortfalls are assessed on a monthly and east/west basis for every portfolio
- If shortfalls are identified, an adjustment is made to incorporate additional resources based on resource value determined by ST model outcomes

# Indicative Case Reliability



\* Note: Trivial shortfalls in the front years are rounding differences due to vertical chart sizing.



# Next Steps Modeling and Analysis



# Next Steps Modeling and Analysis



- Complete portfolio modeling and analysis necessary to determine the preferred portfolio including, but may not be limited to:
  - Alternative portfolio operational scenarios as outlined at the December 3, 2021, public-input meeting including Business as Usual portfolios (BAU1 and BAU2) and P02 (optimized – no new gas) and P03 (optimized – no new gas and coal retire 2030)
  - Market price, CO<sub>2</sub> policy and SC-GHG assessment (price-policy scenarios)
  - Assessment of implementation and resource adequacy risk, employee and community transitions (*i.e.* staging of potential early coal retirements as applicable)
  - Risk assessment of near-term replacement resources (acquisition path analysis)
  - Assessment of expected schedules to implement a request for proposals process consistent with new legislation in Wyoming and potential interactions with state-driven new resource procurement rules
  - Other required scenarios, sensitivities and stakeholder requests

# Portfolio Development Cases



Case "Name"	Price-Policy	Existing Coal	Existing Gas	Other Existing Resources	Proxy Resources*
BAU1-MM	MM	End of Life	End of Life	End of Life	Optimized
BAU1-MN	MN	End of Life	End of Life	End of Life	Optimized
BAU1-LN	LN	End of Life	End of Life	End of Life	Optimized
BAU1-HH	HH	End of Life	End of Life	End of Life	Optimized
BAU1-SC-GHG	SC-GHG	End of Life	End of Life	End of Life	Optimized
BAU2-MM	MM	2019 IRP	2019 IRP	2019 IRP	2019 IRP+
BAU2-MN	MN	2019 IRP	2019 IRP	2019 IRP	2019 IRP+
BAU2-LN	LN	2019 IRP	2019 IRP	2019 IRP	2019 IRP+
BAU2-HH	HH	2019 IRP	2019 IRP	2019 IRP	2019 IRP+
BAU2-SC-GHG	SC-GHG	2019 IRP	2019 IRP	2019 IRP	2019 IRP+

\* Excludes new gas proxy resources not including options for gas conversion of specific existing resources that will be optimized

# Portfolio Development Cases (Cont'd)



Case "Name"	Price-Policy	Existing Coal	Existing Gas	Other Existing Resources	Proxy Resources*
P02-MM	MM	Optimized	End of Life	End of Life	Optimized
P02-MN	MN	Optimized	End of Life	End of Life	Optimized
P02-LN	LN	Optimized	End of Life	End of Life	Optimized
P02-HH	HH	Optimized	End of Life	End of Life	Optimized
P02-SC-GHG	SC-GHG	Optimized	End of Life	End of Life	Optimized
P03-MM	MM	Retired by 2030	End of Life	End of Life	Optimized
P03-MN	MN	Retired by 2030	End of Life	End of Life	Optimized
P03-LN	LN	Retired by 2030	End of Life	End of Life	Optimized
P03-HH	HH	Retired by 2030	End of Life	End of Life	Optimized
P03-SC-GHG	SC-GHG	Retired by 2030	End of Life	End of Life	Optimized

\* Excludes new gas proxy resources not including options for gas conversion of specific existing resources that will be optimized

- This set of cases would produce 20 unique resource portfolios—each to be assessed using the MM, MN, LN, and HH price-policy assumptions
- Portfolios generated with SC-GHG price-policy assumptions are consistent with RCW19.280.030 in Washington
- Additional cases may be developed once preliminary results are available (i.e., as required to achieve RPS targets or Washington Clean Energy Transformation Act requirements)

# Other Required Scenarios, Sensitivities and Stakeholder Requests



## Stakeholder-defined "Business As Usual" Portfolios (BAUs)

- Requested through stakeholder feedback forms by Wyoming Office of Consumer Advocate, Wyoming Public Service Commission, Renewable Northwest, and a coalition of parties
- One BAU portfolio will be based on existing assets that will be assumed to operate through end of life (no early retirement) and contracts through end of term (BAU1)
- The other BAU portfolio will be reasonably aligned with 2019 IRP preferred portfolio (updated for cost and performance), new proxy resources added as needed to meet load (BAU2)

## State Required

- Oregon required analysis to identify cost-effective coal retirements
- Washington required scenarios under the Clean Energy Transformation Act to include future climate change, maximum customer benefit, and alternative lowest reasonable cost
- Wyoming required scenario to include a reference case based on the 2017 IRP updated preferred portfolio, updated with known changes to system resources
- Utah Business Case sensitivity

## Planned Sensitivities

- High/low load, 1-in-20 load
- High/low private generation
- High/no customer preference
- Market reliance
- Business plan sensitivity
- Forced CCUS/WY HB 200
- SC-GHG applied as a dispatch adder in operations
- Evaluation of portfolio performance under strained system/regional conditions based on actual weather events that have occurred in recent years



# Washington Clean Energy Implementation Plan (CEIP) Update





# Washington CEIP Update



- At its May 25, 2021, open meeting, the Washington Utilities and Transportation Commission approved PacifiCorp's filing of a complete 2021 IRP by September 1, 2021
- PacifiCorp's Motion to Amend General Order 601 to allow filing of the draft 4-year Washington-specific CEIP by November 1, 2021, and its Petition for Exemption of WAC 480-100-6410(1) to file the final CEIP by January 1, 2022, are pending decision
- PacifiCorp plans to file an update to its CEIP public participation plan (filed previously on May 1, 2021) to incorporate expanded opportunities for input and participation from the public and our customers in Washington
- As a near-term next step, PacifiCorp plans to make available an online survey in July to seek input on what matters to our customers and public to ensure that the health, safety, and well-being of our communities is considered in the CEIP development process
- Further opportunities for the 2022 CEIP process and subsequent CEIP development efforts are also being discussed
- PacifiCorp will file this revised CEIP public participation plan with the Washington Utilities and Transportation Commission by July 30, 2021

# Washington Equity Advisory Group (EAG)



- PacifiCorp held its second meeting of its Washington EAG on June 16, 2021 and welcomed new EAG members
- The meeting was focused on establishing understanding of highly-impacted communities and vulnerable populations and exploring challenges faced
- The third meeting of the EAG is scheduled July 21, 2021 from 1:00pm-4:00pm pacific
- The upcoming meeting will focus on PacifiCorp's existing customer programs in Washington and how they could better align with HICs and vulnerable populations and the role and exploration of potential Customer Benefit Indicators (CBIs)
- Meeting materials, upcoming meeting schedule, and public participation information are posted in advance of PacifiCorp's Washington CEIP  
webpage: [pacificorp.com/energy/washington-clean-energy-transformation-act-equity.html](https://www.pacificorp.com/energy/washington-clean-energy-transformation-act-equity.html)



# Stakeholder Feedback Form Update



# Stakeholder Feedback Form Update



- 81 stakeholder feedback forms submitted to date
- Stakeholder feedback forms and responses can be located at [pacificorp.com/energy/integrated-resource-plan/comments](https://pacificorp.com/energy/integrated-resource-plan/comments)
- Depending on the type and complexity of the stakeholder feedback received responses may be provided in a variety of ways including, but not limited to, a written response, a follow-up conversation, or incorporation into subsequent public-input meeting material
- Stakeholder feedback forms received following the previous public-input meeting is summarized on the following slide(s) for reference

# Recent Stakeholder Feedback Forms



Stakeholder	Date	Topic	Brief Summary (complete form available online)	Response (posted online when available)
Utah Association of Energy Users (080)	May 25, 2021	Stakeholder feedback and timeline	Questions regarding stakeholder feedback opportunities, and recommendation for inclusion of the 2020 AS RFP results into the 2021 IRP Process	Responded and posted to the webpage on June 2, 2021.
Sierra Club (081)	June 11, 2021	Proposed Natrium demonstration project	Questions around timing, location, analytical assumptions, and commitments regarding the Natrium demonstration project.	Response targeted to be sent the week of July 5, 2021.



# Additional Information/Next Steps



# Additional Information



- Public Input Meeting and Workshop Presentation and Materials:
  - [pacificorp.com/energy/integrated-resource-plan/public-input-process](https://pacificorp.com/energy/integrated-resource-plan/public-input-process)
- 2021 IRP Stakeholder Feedback Forms:
  - [pacificorp.com/energy/integrated-resource-plan/comments](https://pacificorp.com/energy/integrated-resource-plan/comments)
- IRP Email / Distribution List Contact Information:
  - [IRP@PacifiCorp.com](mailto:IRP@PacifiCorp.com)
- IRP Support and Studies:
  - [pacificorp.com/energy/integrated-resource-plan/support](https://pacificorp.com/energy/integrated-resource-plan/support)
- Information on PacifiCorp's Washington-specific Clean Energy Implementation Plan:
  - [pacificorp.com/energy/washington-clean-energy-transformation-act-equity.html](https://pacificorp.com/energy/washington-clean-energy-transformation-act-equity.html)

# Next Steps



## Upcoming Public-Input Meeting Dates:

- July 29-30, 2021 – Public-Input Meeting
- August 6, 2021 – Public-Input Meeting (modeling updates placeholder)
- August 12, 2021 – Public-Input Meeting (if needed)
- No later than September 1, 2021 – File 2021 IRP

*\*meeting dates are subject to change*