

Resource Planning Advisory Group meeting

2027 Integrated System Plan

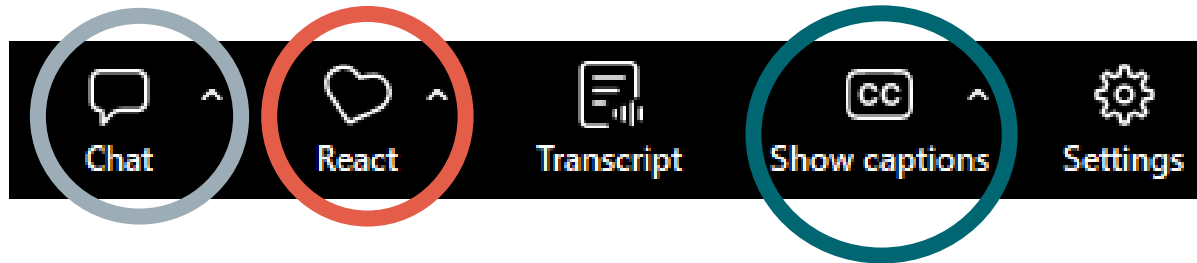
September 23, 2026



Welcome to the meeting!

PSE

Use the **React** feature to raise your hand or respond to content with emojis



RPAG members and PSE staff are welcome to use the **Chat** feature*

Click **Show Captions** to see real-time closed captioning

Facilitator requests

The logo for PSE (Public Science Engagement) is located in the top right corner. It consists of a teal diamond shape with the letters 'PSE' in white, set against a background of red and teal geometric shapes.

- 1 Engage constructively and courteously towards all participants
- 2 Respect the role of the facilitator to guide the group process
- 3 Avoid use of acronyms and explain technical questions
- 4 Use the feedback form or email isp@pse.com for additional input to PSE
- 5 Aim to focus on the webinar topic
- 6 Public comments will occur after PSE's presentations
- 7 To ensure members of the public can see the RPAG chat, please select "Everyone" from the chat dropdown menu

September is National Preparedness Month



Build an emergency kit



Make an emergency plan with your family



Enable local emergency alerts on your phone



Find out more at [ready.gov](https://www.ready.gov)

Today's speakers



PSE

Hilary Wilkinson

Facilitator, Maul Foster & Alongi (MFA)

Mark Lenssen

Manager, Development and Evaluation, PSE

Heather Mulligan

Manager, Customer Clean Energy Solutions, PSE

Elizabeth Hossner

Manager, Resource Planning and Analysis, PSE

Jennifer Coulson

Director, Resource Planning Analytics, PSE

Ryan Lambert

Manager, System Planning, PSE

Eleanor Ewry

Manager, Transmission System & Planning, PSE

Kara Durbin

Director, Clean Energy Strategy, PSE

Brian Tyson

Manager, Clean Energy Planning and Implementation, PSE

Today's discussion topics

The logo consists of a teal diamond shape containing the letters 'PSE' in white, positioned next to a red triangle pointing towards the top right corner of the slide.

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1:05 p.m.

Introduction and scenario framing

Jen Coulson

1:25 p.m.

Scenario and sensitivity results – customer programs

Mark Lenssen and Heather Mulligan

1:40 p.m.

Scenario and sensitivity results – delivery system planning

Ryan Lambert

1:55 p.m.

Scenario and sensitivity results – electric supply

Elizabeth Hossner

2:35 p.m.

Break

2:40 p.m.

Draft electric sensitivity results

Elizabeth Hossner and Eleanor Ewry

3:05 p.m.

Preferred portfolio development

Kara Durbin

3:40 p.m.

Equitable distribution of benefits – minimum designation

Brian Tyson

3:50 p.m.

Next steps & public comment opportunity

Hilary Wilkinson

Introduction and scenarios framing

Jen Coulson

Director, Resource Planning Analytics, PSE

September 23, 2026



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Objectives

Scenarios framing

- ◆ **Purpose of this session**
 - ◇ *Inform* RPAG on the completed scenario analysis
- ◆ **What PSE needs from you**
 - ◇ Feedback and clarifying questions on the scenario results, to inform a shared understanding on the results presented (consult)
- ◆ **How your feedback will be used**
 - ◇ Feedback may (time allowing) inform additional sensitivity analysis

Scenario and sensitivity results

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AUGUST - GAS UTILITY

Customer

Supply

Transmission and distribution

TODAY - ELECTRIC UTILITY

Customer

Supply

Distribution and transmission

Scenario matrix

Demand assumptions across five load scenarios

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S2–S4 assume different forms of mandated electrification; these load levels are unlikely to occur organically

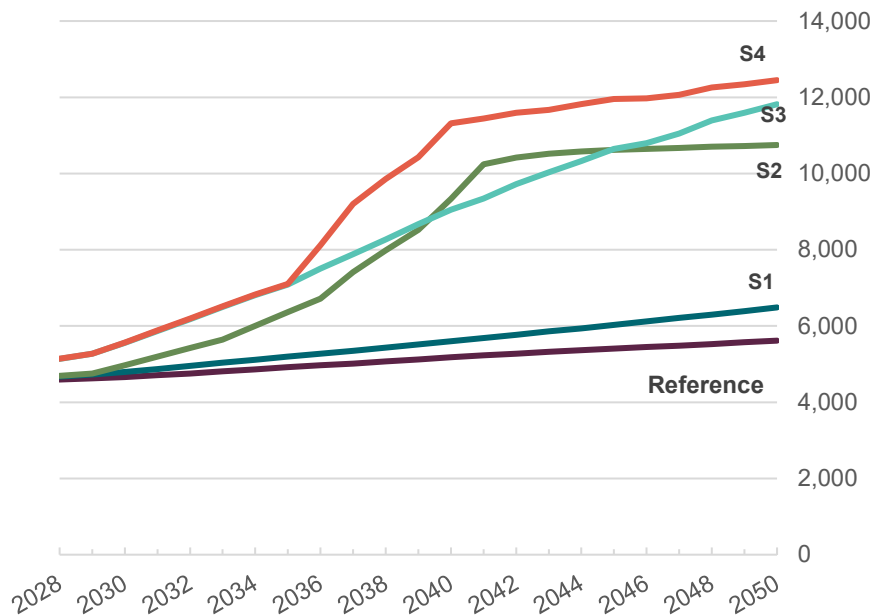
As the scenario progresses, system winter peaks rise on the electric side while, conversely, peaks on the gas system decline

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Electric and natural gas system peaks under the 2027 ISP scenarios, 2030–2050

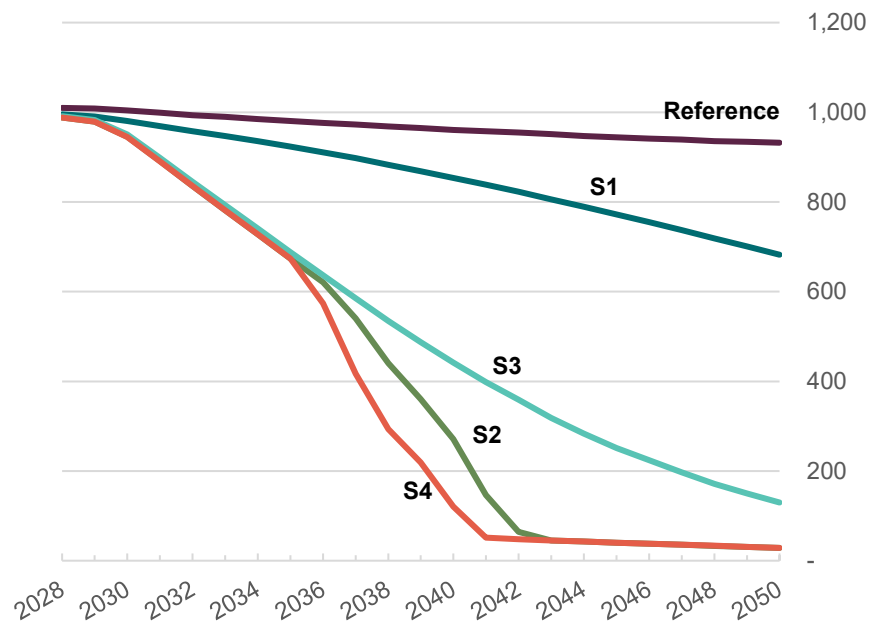
Electric system winter peak

Units: MW



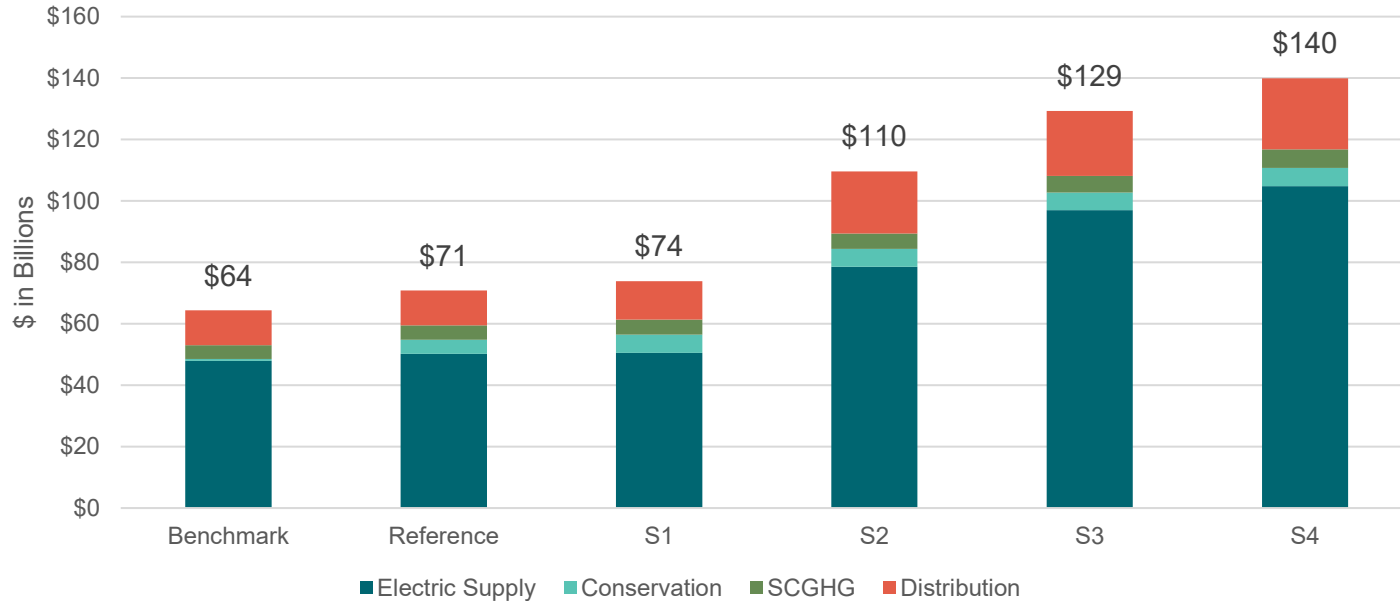
Natural gas system peak

Units: MDth (Therms /10,000)



Total electric system NPV (study period 2028 – 2050) by scenario

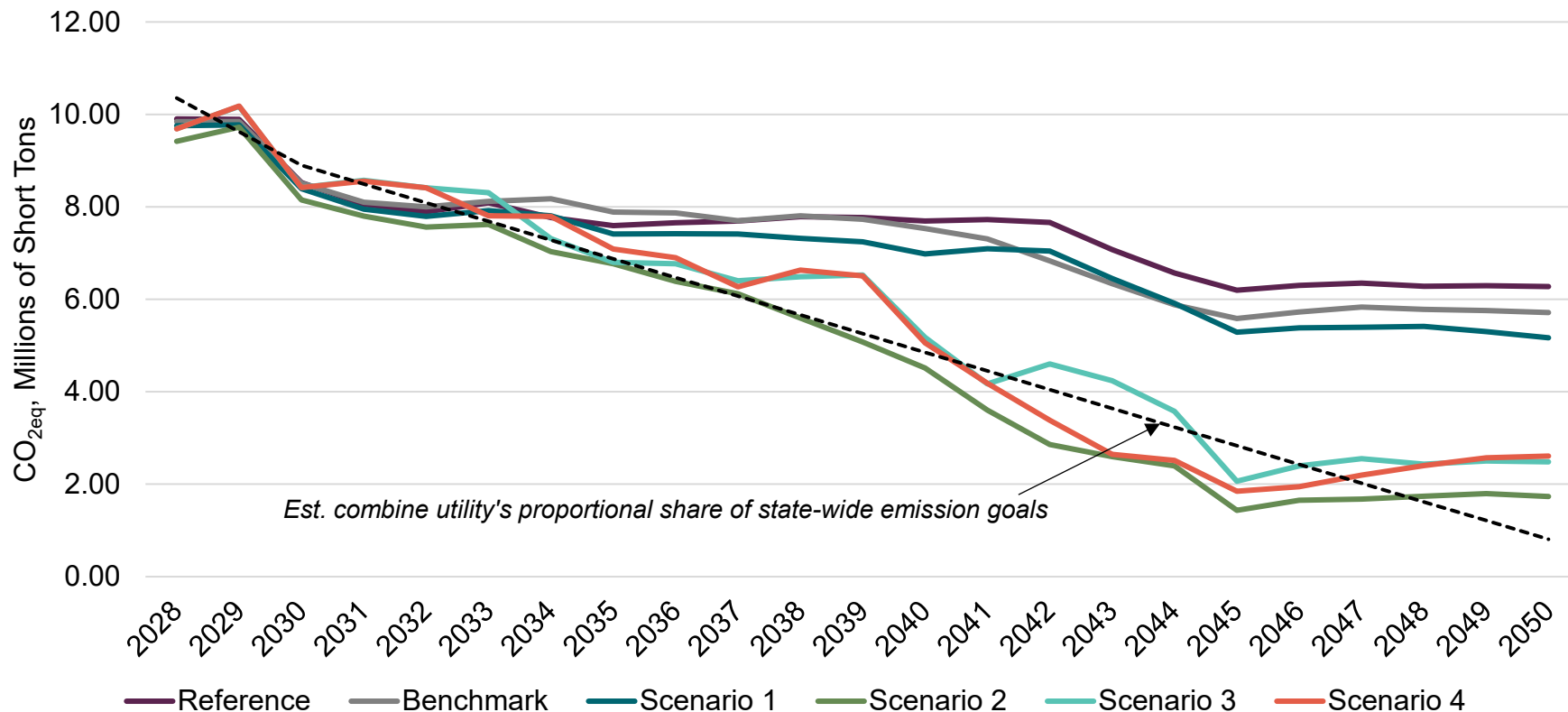
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Note: Portfolio costs do not reflect the costs of electrification load shifted to other electric utilities.

Electric and gas combined emissions are relatively similar across the various portfolios in the near term

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Scenario and sensitivity results – customer programs

Mark Lenssen

Manager, Strategic Planning,
Evaluation & Research, PSE

Elizabeth Hossner

Manager, Resource Planning &
Analysis, PSE

Heather Mulligan

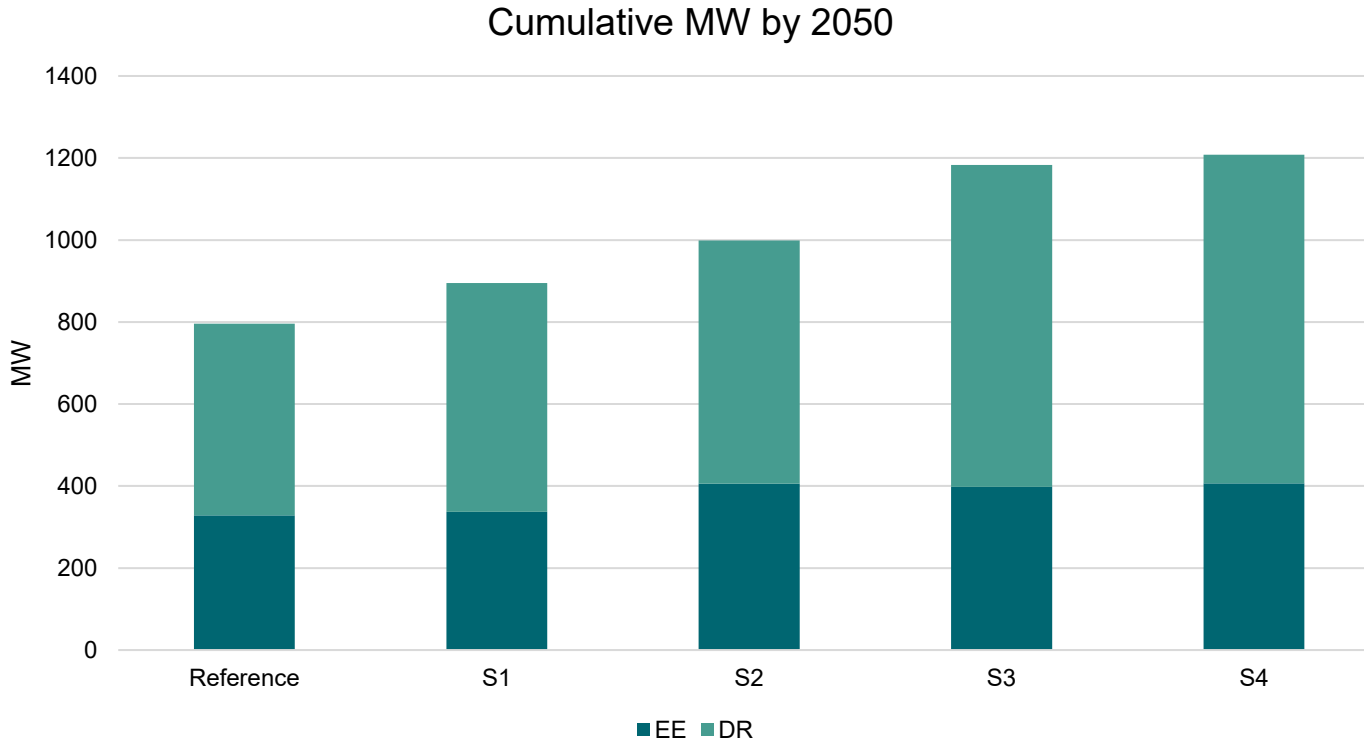
Manager, Customer Clean
Energy Solutions, PSE

September 23, 2026

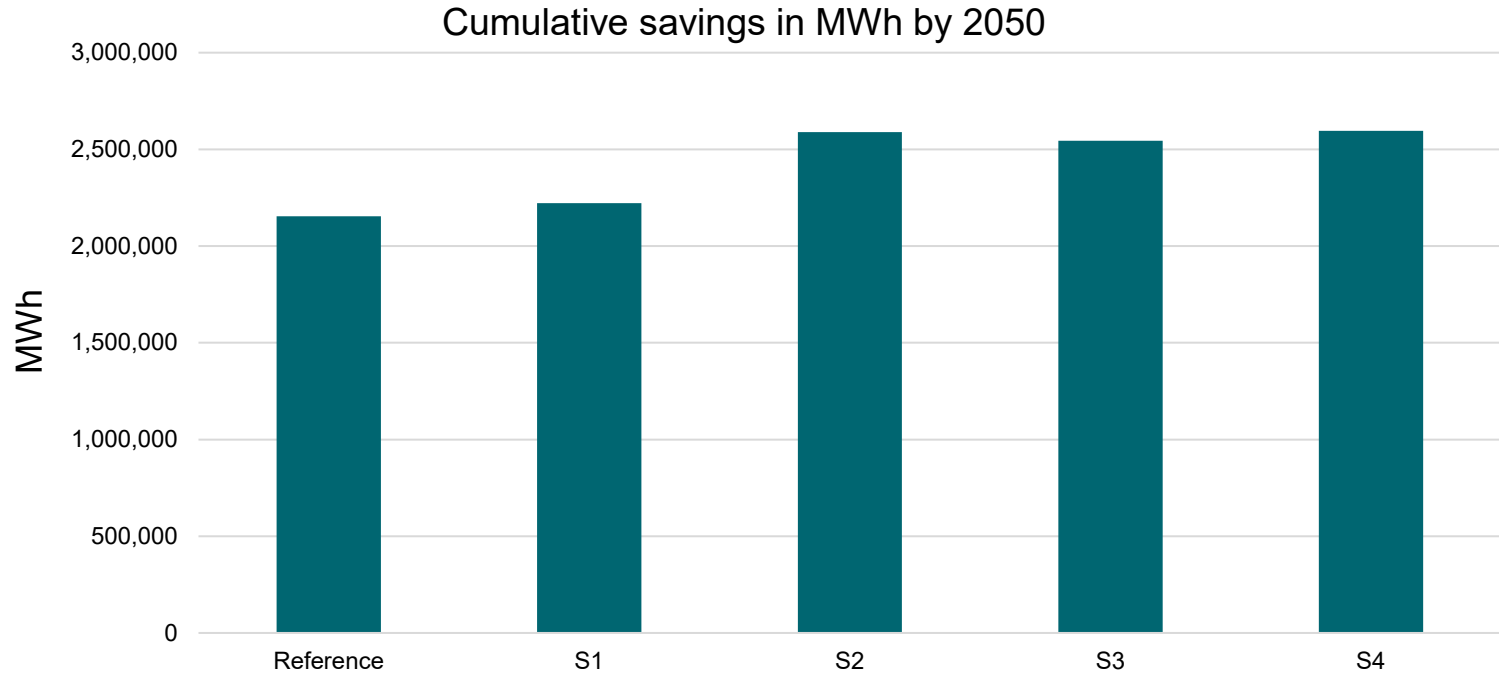


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Modeled MW by customer programs, by scenario (energy efficiency + demand response)



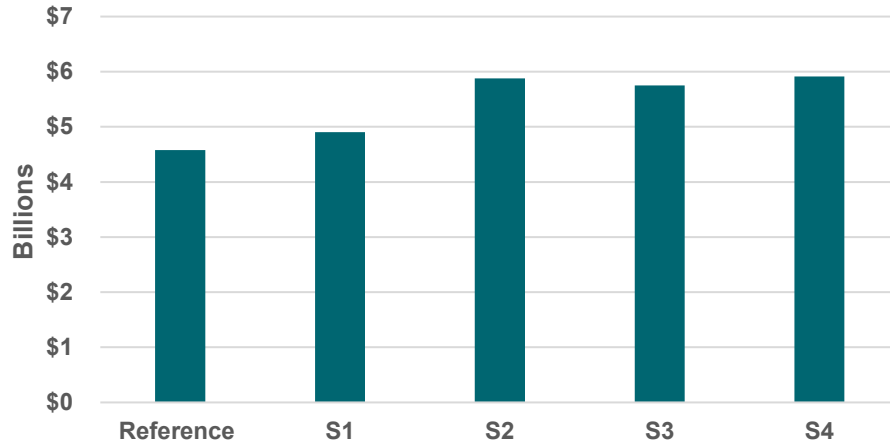
Delivered MWh by customer programs, by scenario (energy efficiency)



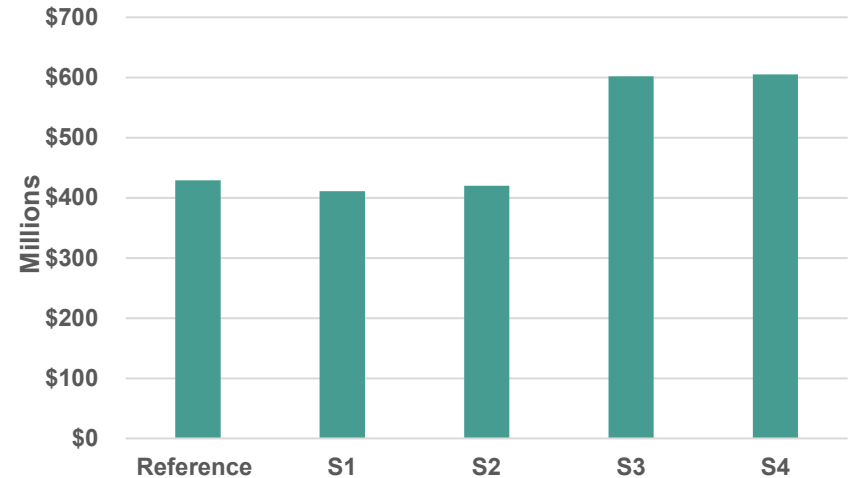
Customer energy efficiency (EE) and demand response (DR) program costs, by scenario

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EE Cost 2050 NPV



DR Cost 2050 NPV



Key takeaways for energy efficiency and demand response

The logo for PSE (Pacific States Energy) is located in the top right corner. It consists of a teal diamond shape with the letters 'PSE' in white, set against a background of overlapping teal and orange geometric shapes.

1 Demand response drives most of the scenario MW spread

DR grows 71% from 468 MW in the Reference Case to 801 MW in S4, while energy efficiency moves just 24%.

2 Efficiency savings plateau across S2–S4

Cumulative savings converge near 2.6 million MWh by 2050, with S2, S3 and S4 nearly the same due to similar customer fuel switching by the end of the planning period.

3 Costs rise in higher scenarios, but the DR program stays relatively small

Energy Efficiency 2050 NPV grows to ~\$6 billion in S4; DR grows to \$600 million

Customer programs: Reference case vs. Benchmark sensitivity

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Reference case

Assumptions defined as inputs into the electric supply

- Customer demand side resources defined as must-take:
 - Energy efficiency
 - Demand response
 - Distributed solar
 - Distributed storage
- Delivered energy savings and peak mitigation are set largely based on short-term alignment with actual program results merged with long-range conservation potential assessment forecast

Benchmark (sensitivity)

Customer program level optimized by the model based on cost effectiveness when compared to other resources

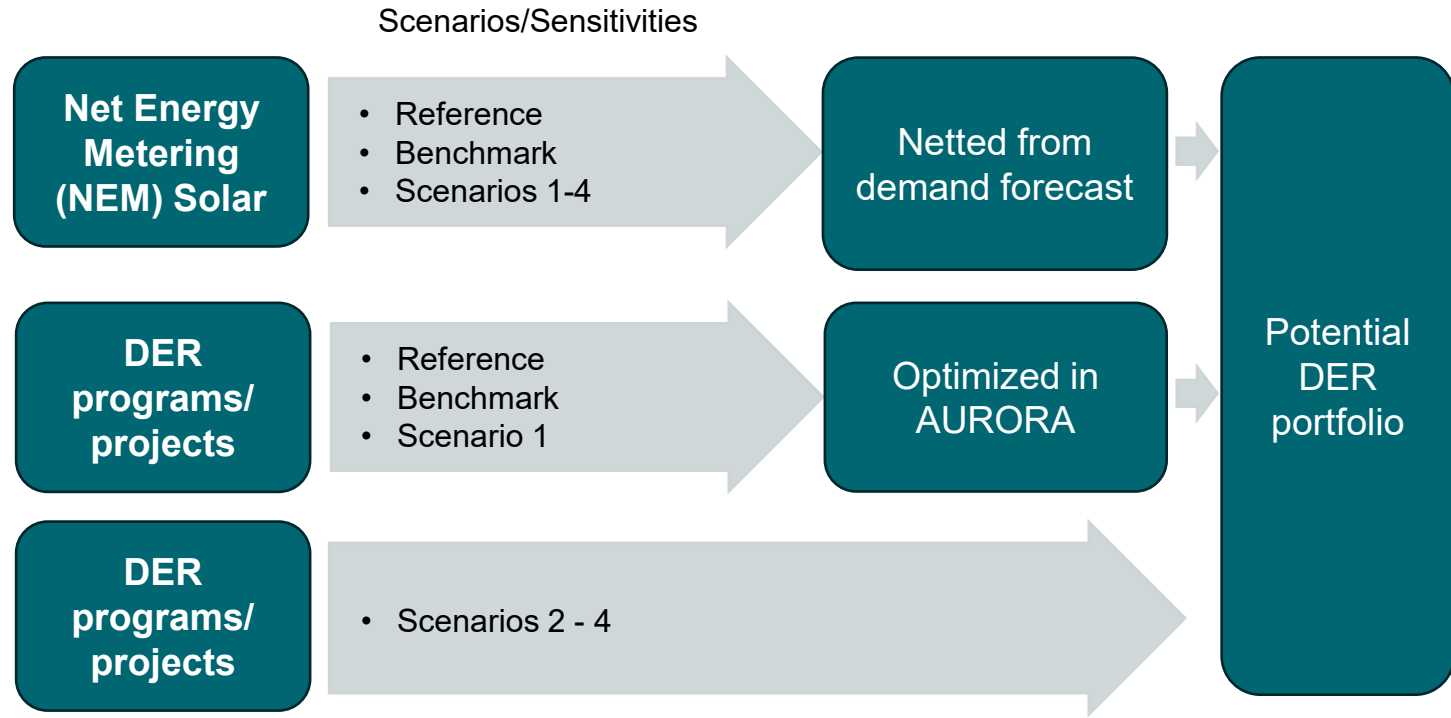
- Energy efficiency measures are sorted into bundles of similar levelized costs, organized from least cost to highest cost
- The optimization model selects through these bundles as it compares them to the entirety of available resources remaining

Customer DER portfolios are made up of programs, projects, and Net Metered Solar

The logo for PSE (Puget Sound Energy) is located in the top right corner. It consists of a teal diamond shape with the letters "PSE" in white, set against a background of red and teal geometric shapes.

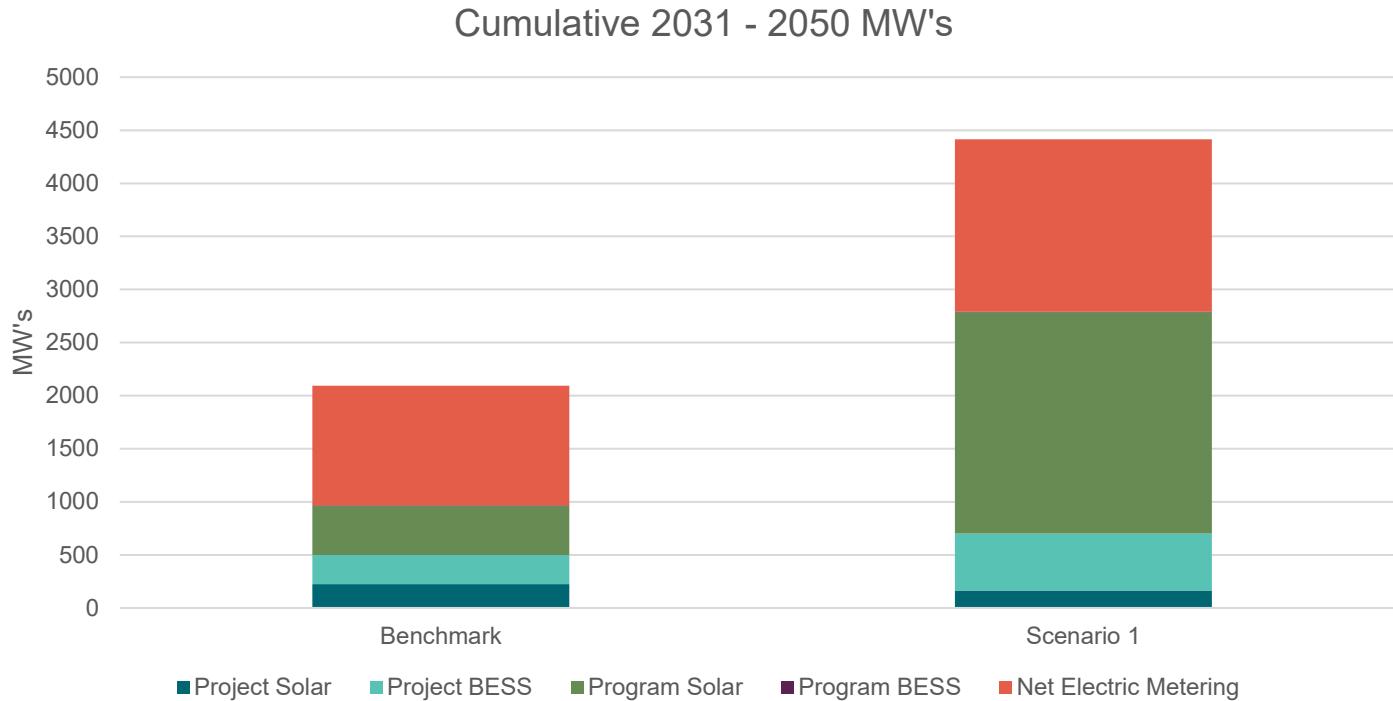
	PROGRAM Solar & BESS	PROJECT Solar & BESS	Net Metering
Ownership	Customer-owned	PSE owned or acquired	Customer-owned
Position vs. meter	Behind the customer meter	In front of the customer meter	Behind the customer meter
Controlled by	Customer	PSE	Customer
Includes	Incremental adoption beyond net metering, including commercial projects greater than 100 kW	May be located on PSE- owned property or on property leased from a customer	Solar Projects up to 100kW located on residential or commercial properties

Modeling treatment of distributed energy resources (DERs)



Benchmark and Scenario 1 comparison

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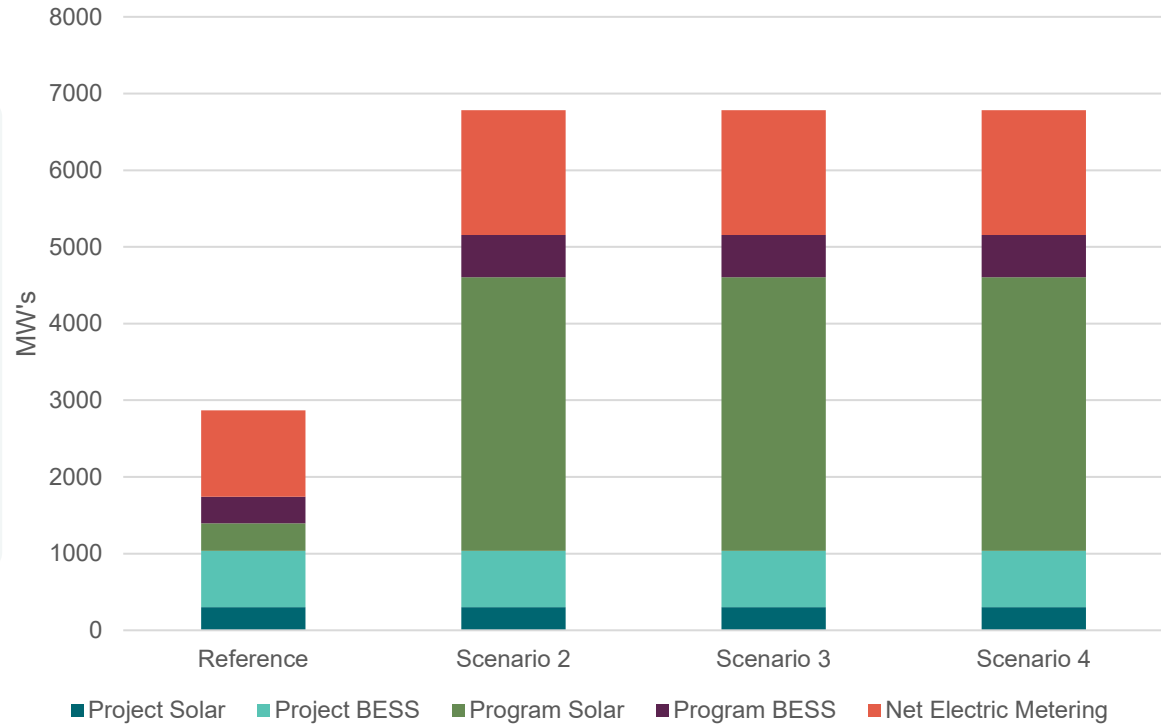
Reference and Scenarios 2-4 comparison

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Scenario input considerations:

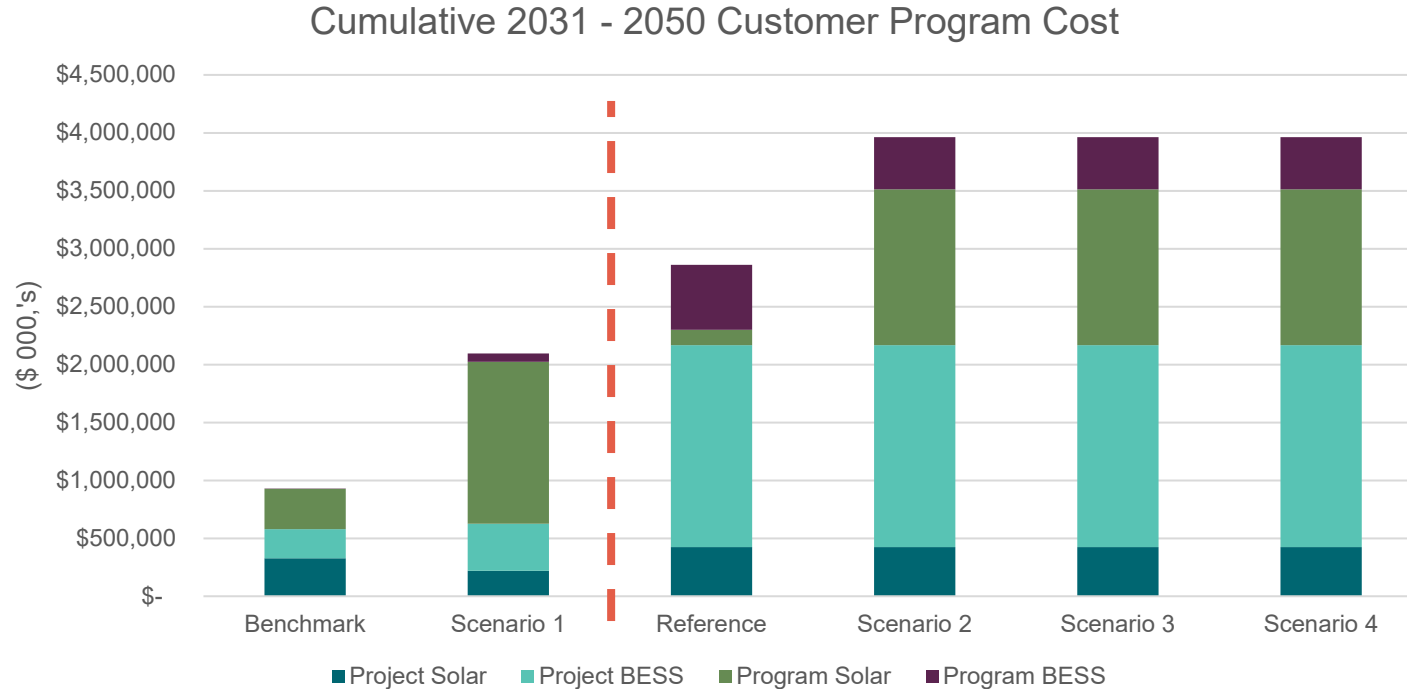
- DER Project MW inputs for Scenarios 2–4 have same potential as Reference Case output
- dGen rate-increase and technical market potential limits resulted in identical AURORA MW inputs across Scenarios 2–4

Cumulative 2031- 2050 MW's



DER customer program scenario costs

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Note: Benchmark and Scenario 1 based on Benchmark Sensitivity dollar inputs; Reference and Scenarios 2-4 based on Reference Case dollar inputs.

Key takeaways for customer DER

The logo for PSE (Pacific States Energy) is located in the top right corner. It consists of a teal diamond shape with the letters "PSE" in white, set against a background of red and teal geometric shapes.

1

Scenarios 2–4 max out market potential

All three scenarios reach full market potential adoption for DER resources, so there is little to no material difference between them.

2

Scenario 1 removes the ITC and PTC

Built off the Benchmark, which removed the Income Tax Credit and Production Tax Credit for all resources except commercial battery programs and projects — driving much lower adoption than the Reference Case.

3

Lower ELCC cuts program battery uptake

Scenario 1 and the Benchmark reflect lower Effective Load Carrying Capacity, which significantly impacted how much program battery was picked up.

4

Program solar incentives (conceptual) beginning in 2030

Scenario 1 and the Benchmark include incentives for program solar from 2030, producing incremental adoption beyond net metering. Without them, modeled adoption is minimal.

Benchmark sensitivity reduces estimated electric portfolio costs by ~\$4 billion

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Total Portfolio Cost comparison

Reference Case

Since received updated BPA costs



\$59.5 B

Benchmark Sensitivity

Demand-side programs optimized



\$55.7 B

BY 2050 THIS RESULTS IN

Energy efficiency up to

\$150/MWh (Bundle 9)

Selected in optimization

Energy efficiency selected

333 aMW

122 aMW reduction from Reference

Portfolio cost

\$670M NPV

~\$4.5B in Reference Case

Demand response

259 MW

~50% of MW in Reference Case

Questions?



Scenario and sensitivity results - delivery system planning

Ryan Lambert

Manager, System Planning, PSE

September 23, 2026

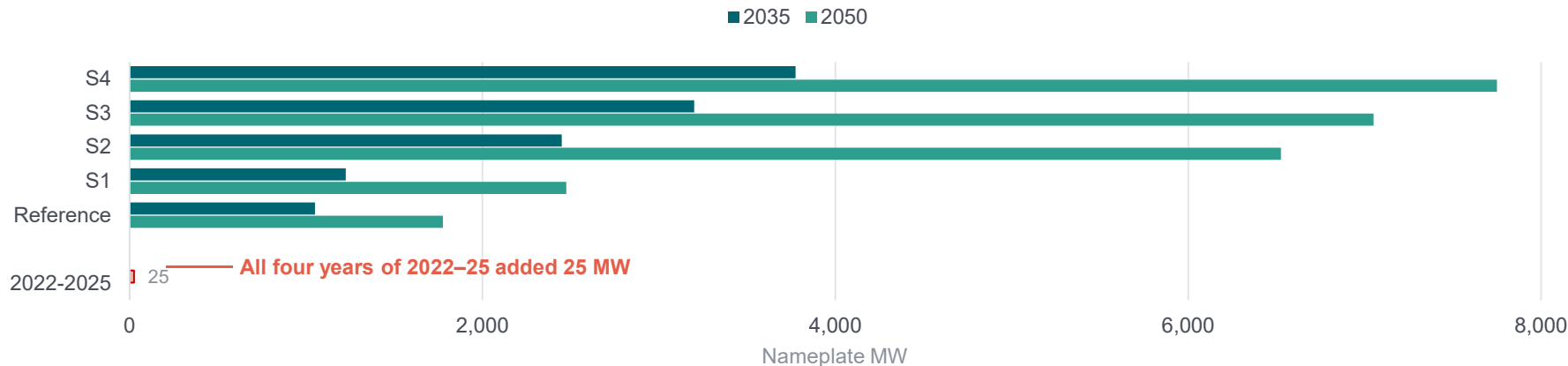


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All scenarios require substantial substation upgrades, especially S2-S4, by 2035 and 2050

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Cumulative substation capacity by 2050, every case measured against the 25 MW added in 2022–25



71×

the Reference case alone versus all capacity added in 2022–25

71–310×

the range across every case — none of them near our build history

310×

S4, the ceiling — about 12 substations every year to 2050

Even the Reference case needs 1,775 MW by 2050 — about 71 single-bank substations, roughly three every year for 25 years. S2 and S3 already reach 6,525 and 7,050 MW, so S4 is the ceiling of an extreme range, not an outlier.

Required distribution line upgrades are included; substation upgrades are typically 25 MW (single bank) or 50 MW (double bank).

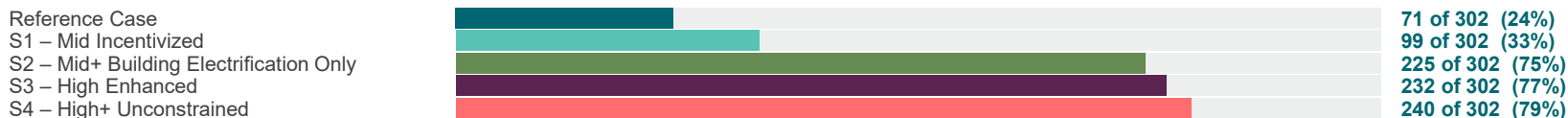
Higher scenarios require many more electric distribution substation transformers

The following table represents the total number of substation transformers overloaded by scenario based on the different time intervals (5-year, 10-year, 20-year, 25-year):

Scenario	5-Year		10-Year		20-Year		25-Year	
	>100%	>200%	>100%	>200%	>100%	>200%	>100%	>200%
Reference Case	28	0	42	0	63	0	71	0
S1 - Mid Incentivized	30	0	49	0	84	0	99	0
S2 - Mid+ Building Electrification Only	34	0	98	0	223	17	225	18
S3 - High Enhanced	55	0	126	1	217	11	232	25
S4 - High+ Unconstrained	55	0	149	1	232	24	240	35

Note: PSE currently has 302 substation transformers

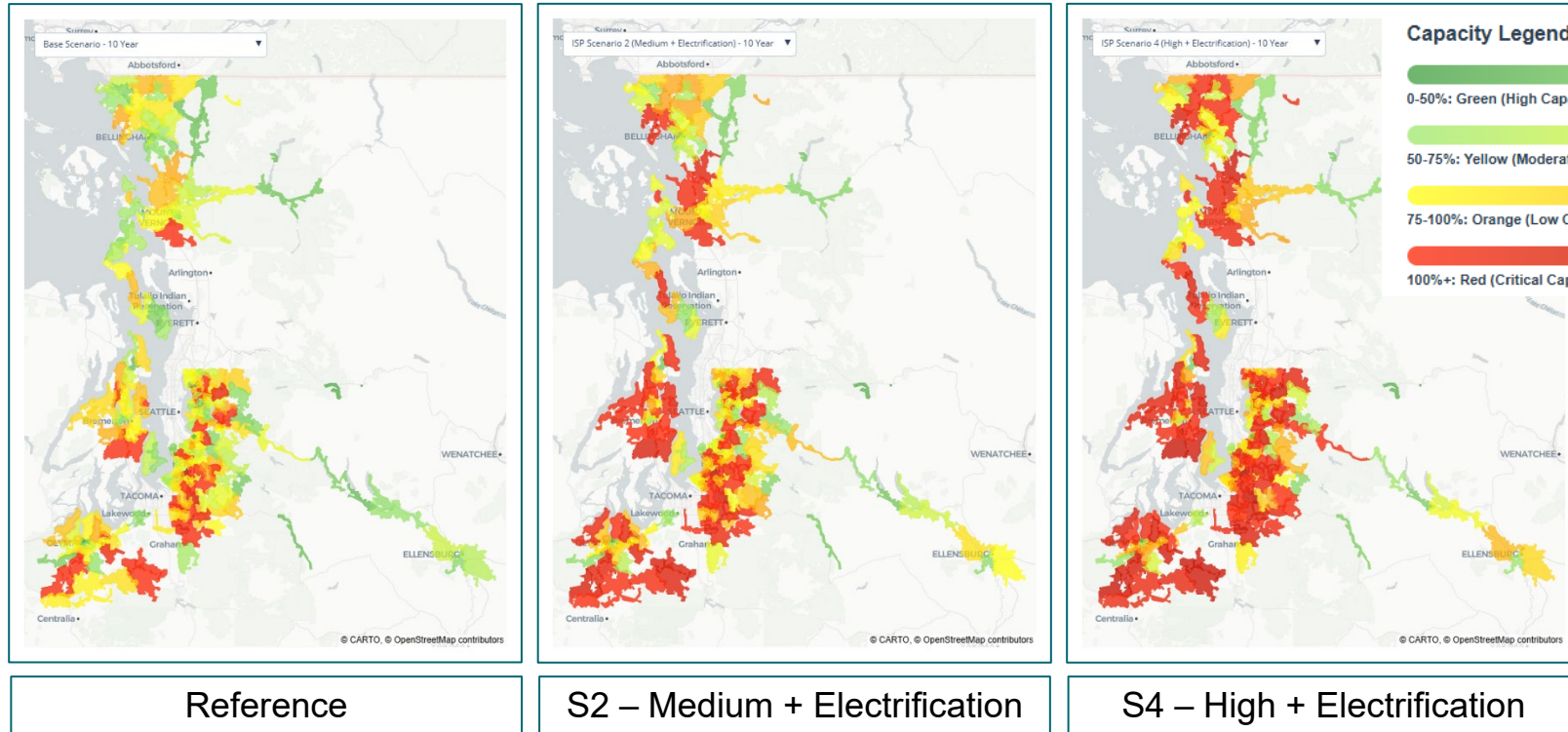
At 25 years: share of PSE's 302 substation transformers overloaded (>100%)



Substation loading in 2035

PSE

The following maps represent substation transformer loading projected in 10 years for three scenarios*

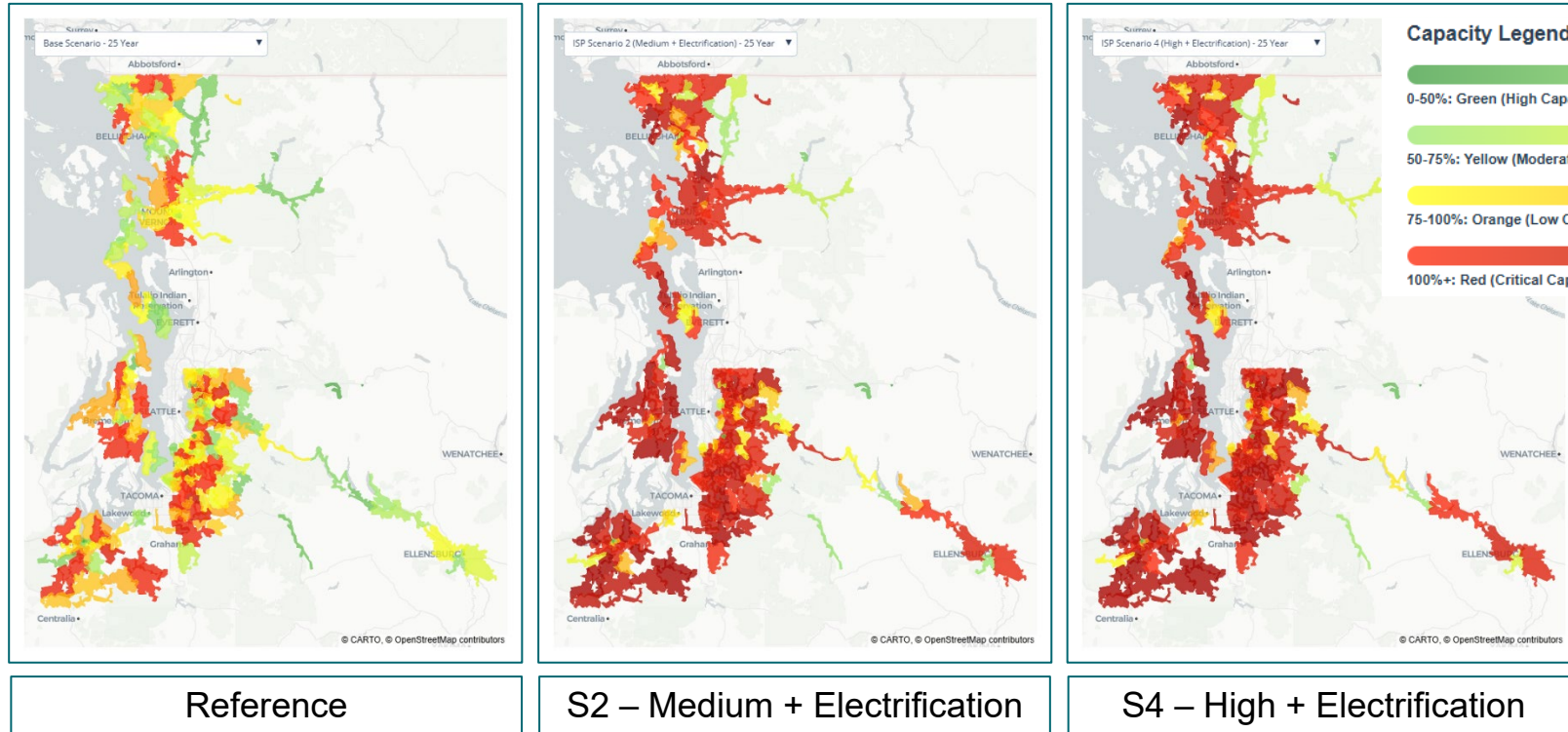


*Scenarios 1 and 3 are available in the appendix

Substation loading in 2050

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The following maps represent substation transformer loading projected in 25 years for three scenarios

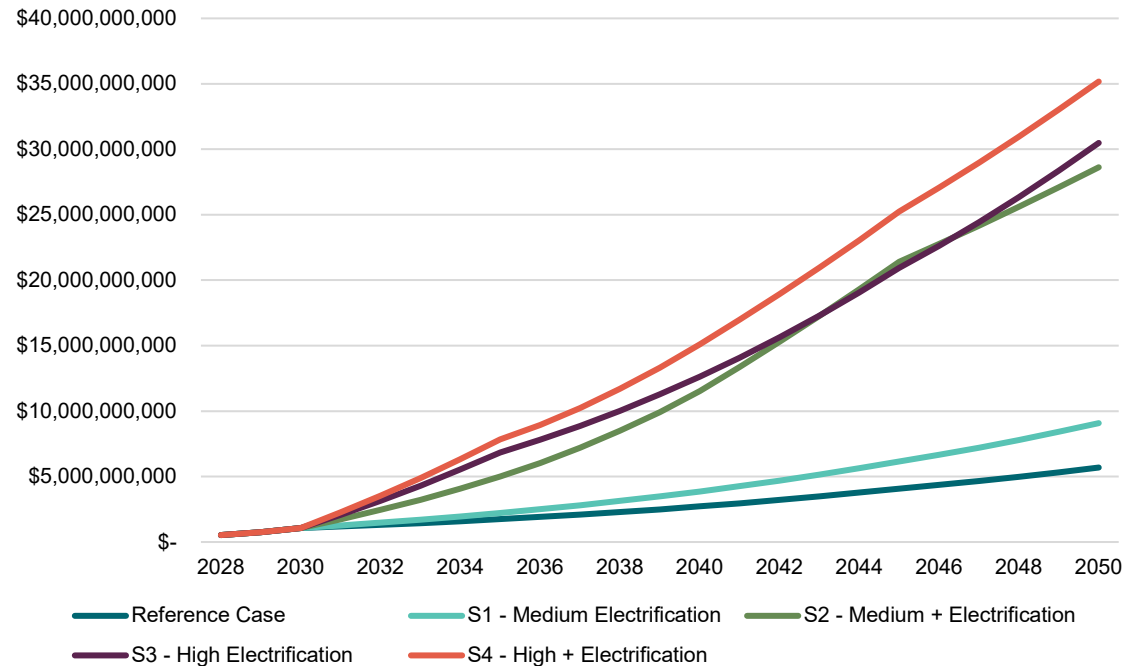


*Scenarios 1 and 3 are available in the appendix

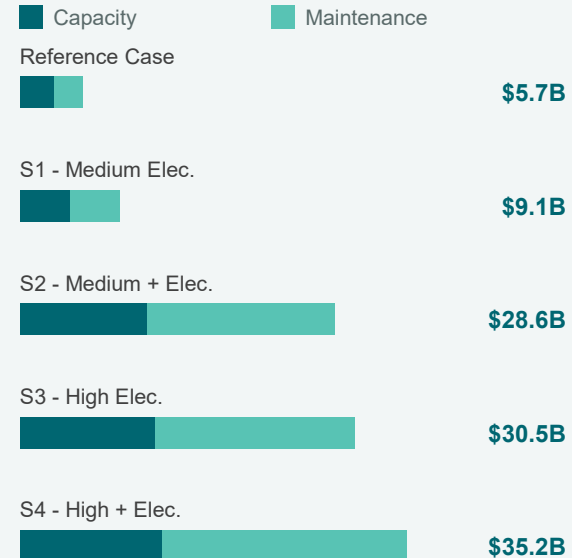
Electric distribution capacity and maintenance investments are especially high in S2-S4

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Total cumulative capacity + maintenance investment by scenario



2050 cumulative total, by component



Key takeaways for delivery system planning

The logo for PSE (Pacific States Electric) is located in the top right corner. It consists of a teal diamond shape with the letters 'PSE' in white, set against a background of red and teal geometric shapes.

1

Electrification drives a step change in need

All scenarios require unprecedented substation capacity by 2050.

2

Most of the transformer fleet is overloaded by 2050

In the high electrification scenarios, up to 240 of PSE's 302 substation transformers exceed 100% loading, versus 71 in the Reference Case.

3

Maintenance outgrows capacity investment in S2-S4

In S4, by 2050, incremental *maintenance* reaches \$22.2B, exceeding the capacity investment of \$12.9B.

4

Combined investment ranges from \$5.7B to \$35.2B

Cumulative capacity plus maintenance spending grows roughly six-fold from the Reference Case to S4, concentrating risk in the electrification scenarios.

Questions?



Scenario and sensitivity results – electric supply

Elizabeth Hossner

Manager, Resource Planning and Analysis, PSE

September 23, 2026



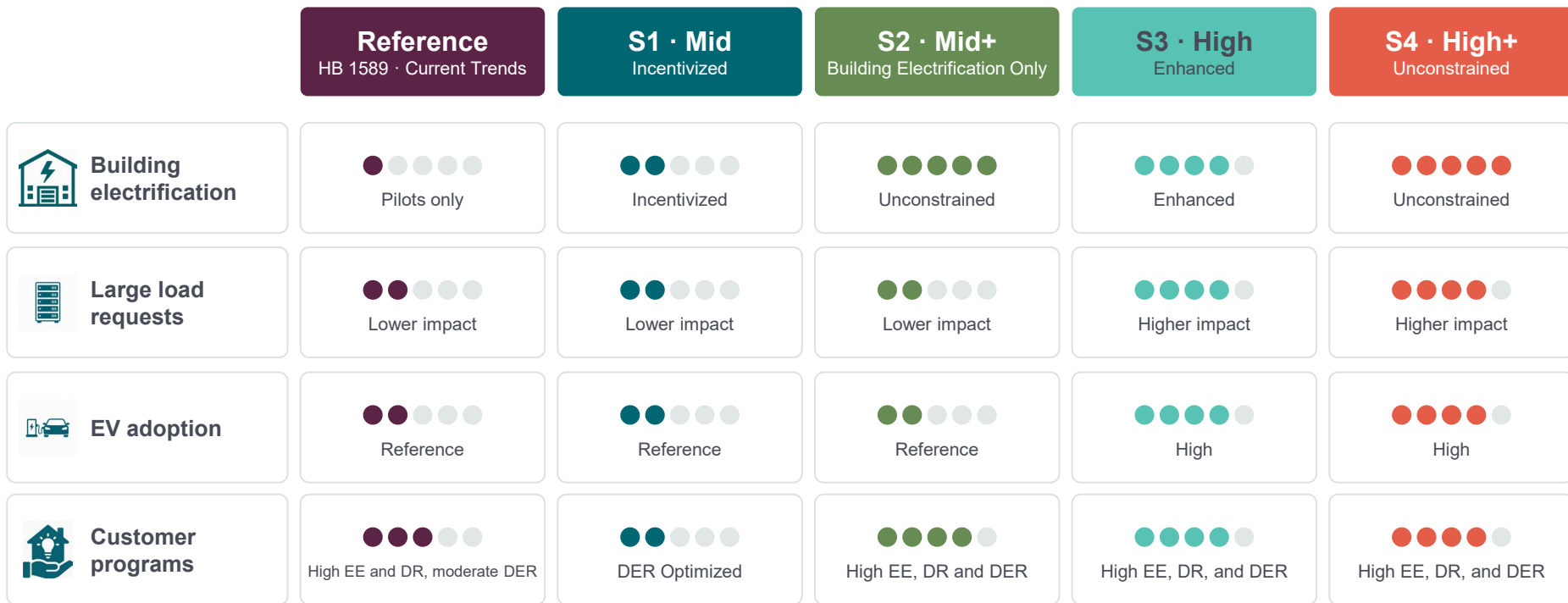
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Scenario matrix

Demand assumptions across five load scenarios

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S2–S4 assume different forms of mandated electrification; these load levels are unlikely to occur organically



Key aspects to remember across the scenarios



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1 Scenarios 2 and 4 share building electrification assumptions

Both are paced to the state GHG emission goal with forced retirement before end of life.

2 Scenario 3 is constrained by equipment failure

Its building electrification assumptions are similar to Scenarios 2 and 4, but adoption is limited to equipment failure rather than forced retirement.

3 Scenario 2 isolates building electrification

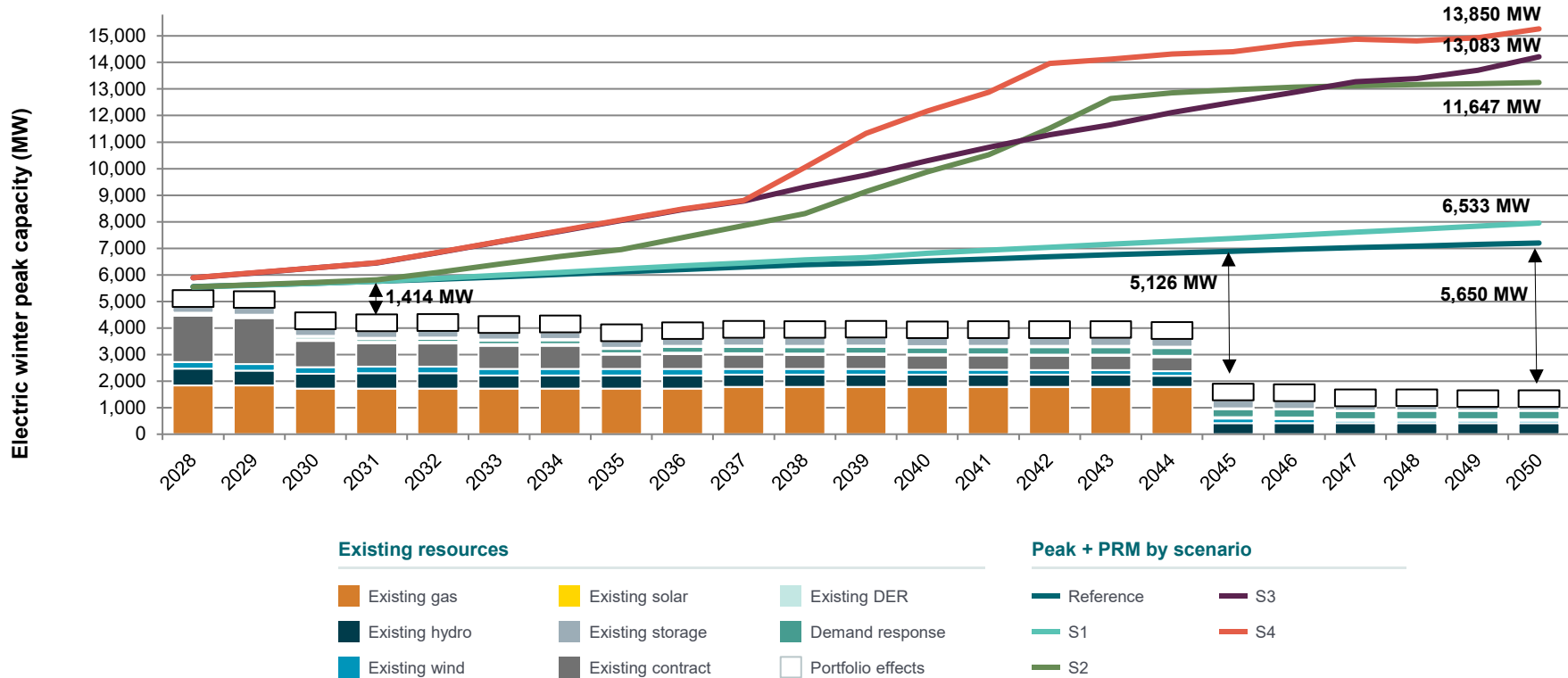
Scenario 2 analyzes increased building electrification only, while Scenario 4 layers on increased large loads and transportation electrification.

4 DER programs assume the same technical potential

S2 - S4 see similar amount of customer program adoption (DER & EE) - this is due to reaching technical potential.

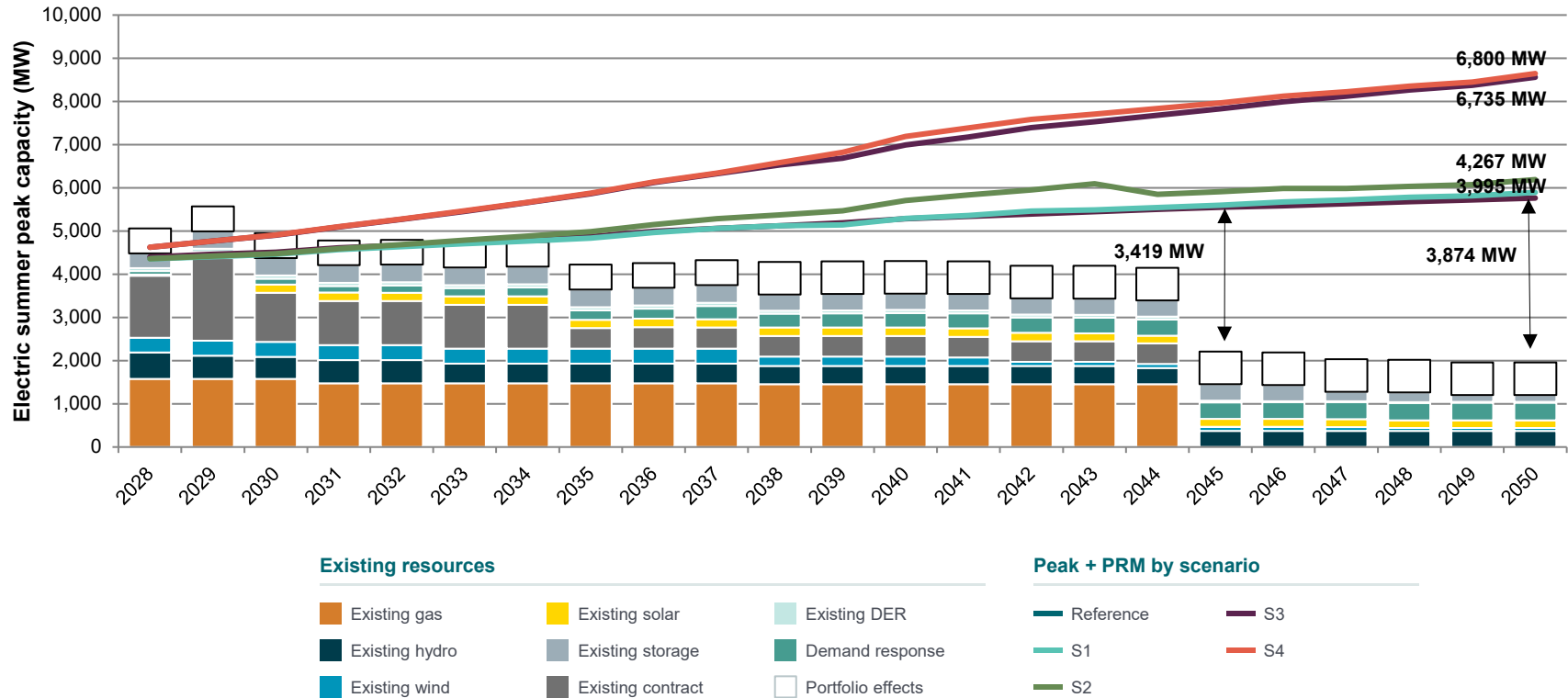
Winter resource need exceeds existing capacity by ~5,700–13,900 MW in 2050

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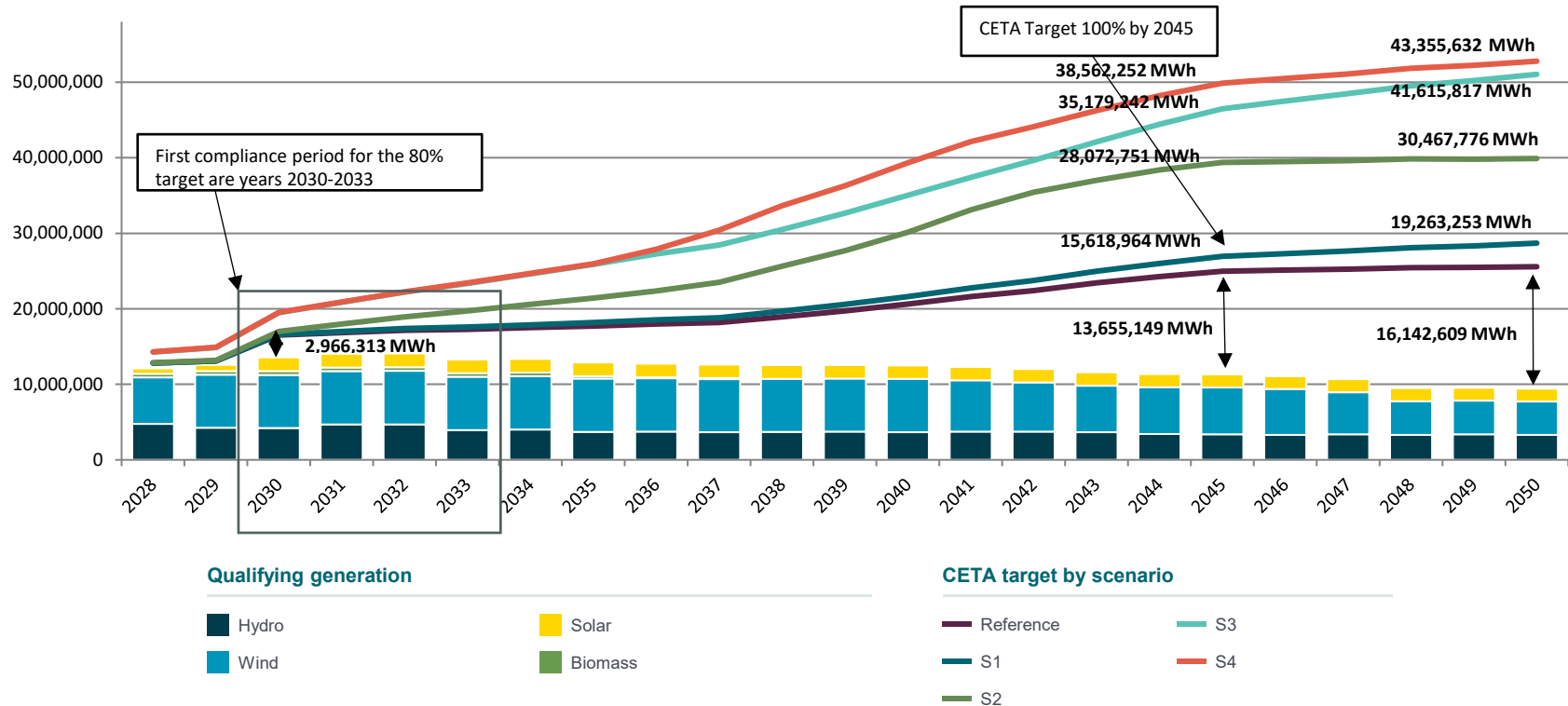


Summer resource need exceeds existing capacity by ~3,900–6,800 MW in 2050

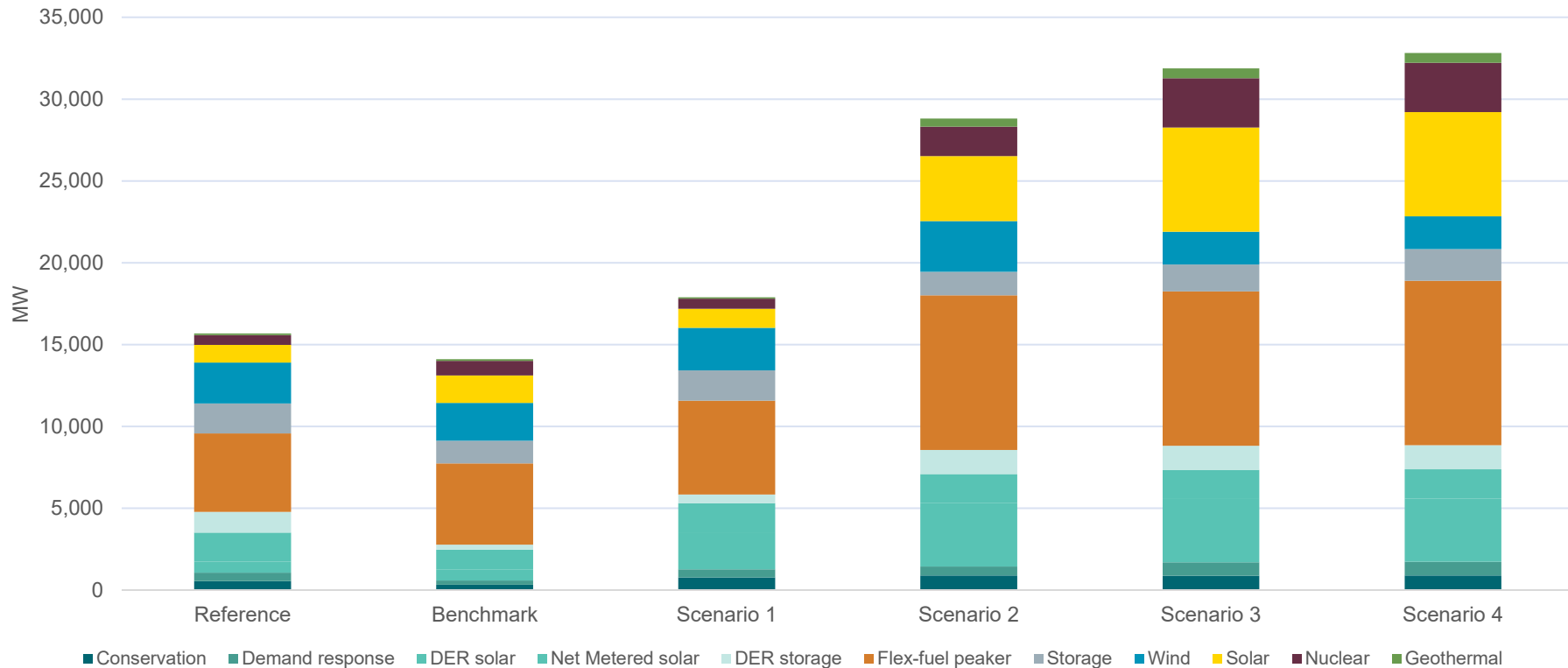
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CETA need grows significantly with increasing electrification

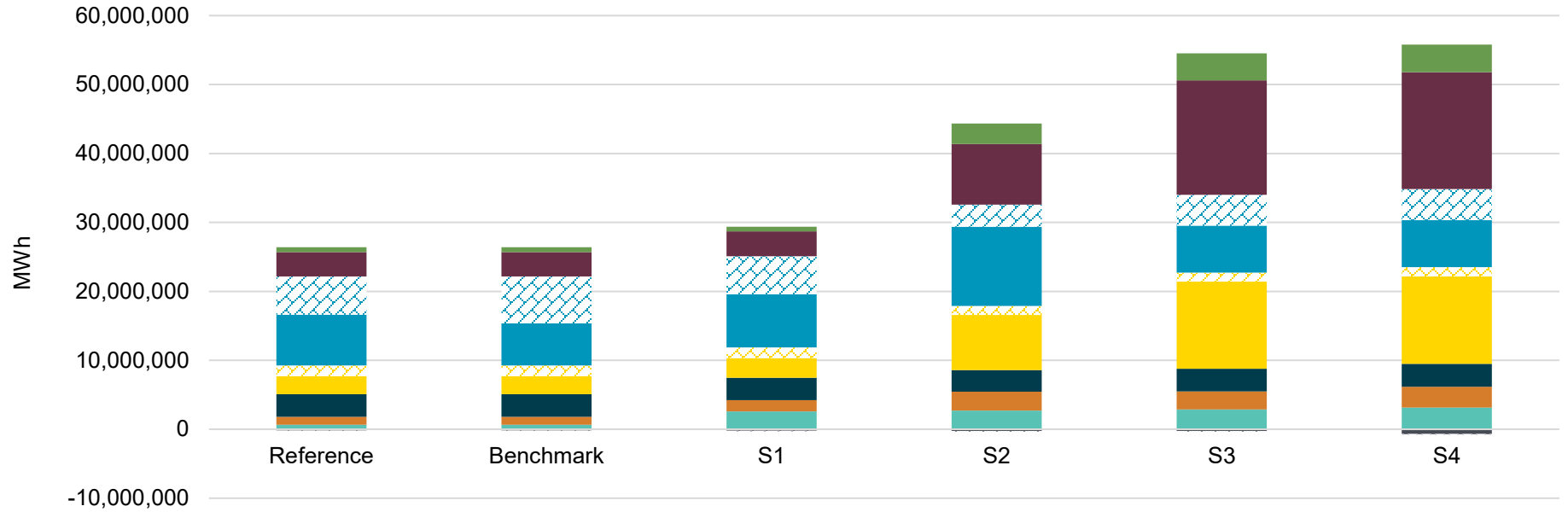


Electric supply: Cumulative nameplate builds across all cases (2050), S2-4 builds are double the reference



MWh of generation (2050)

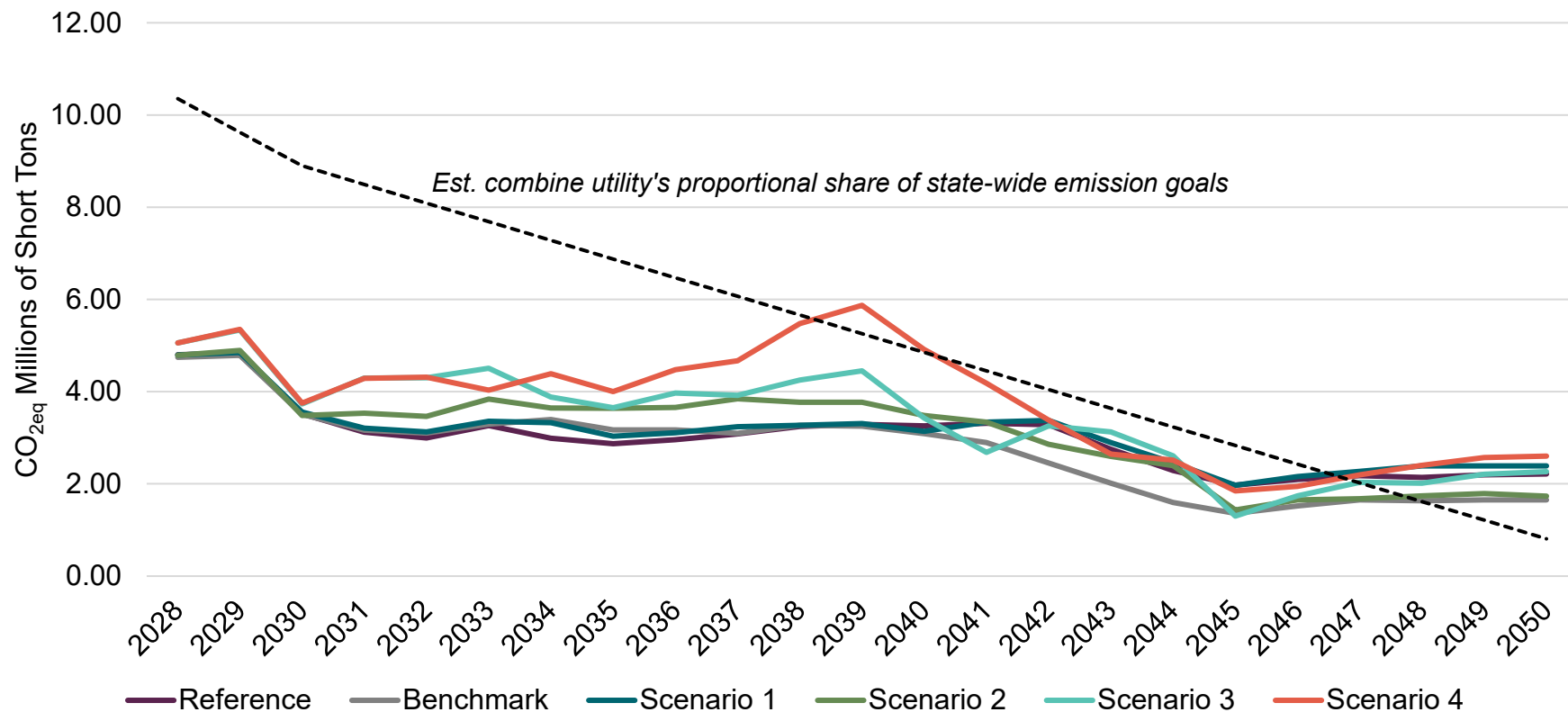
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■ Contract ■ DER ■ DR ■ Flex-fuel peaker ■ Hydro ■ Solar ■ Hybrid solar ■ Storage ■ Hybrid storage ■ Wind ■ Hybrid wind ■ Nuclear ■ Geothermal

Electric emissions with market purchases

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High levels of electrification almost doubles the total electric portfolio cost

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Total Portfolio Cost comparison across scenarios



Note: total portfolio costs only include impacts to PSE electric and do not include any cost impacts to other utilities

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Key takeaways

The logo for PSE (Pacific States Energy) is located in the top right corner. It consists of a dark teal diamond shape with the letters 'PSE' in white, sans-serif font. The diamond is partially overlaid by a red and a teal triangle.

1 Meeting future demand takes a large supply- and demand-side build

Supply-side resources grow from ~12,000 MW in S1 to ~24,000 MW in S4, while demand-side resources rise from ~4,570 MW to ~7,130 MW.

2 Resource adequacy is tightly constrained at high electrification

In Scenarios 3 and 4 the model initially misses CETA and planning reserve margin targets despite a major buildout.

3 The scale of buildout would be unprecedented

PSE acquired ~2,600 MW over 2022–2025. Even the lowest electrification scenario calls for 4,600 MW of supply-side resources by 2031 — five years away.

4 DSR potential is fully utilized in Scenarios 2–4

Customers tap all available demand-side potential in these scenarios, leaving no additional headroom to offset supply-side builds.

Big picture: While electrification may provide some benefits to customers, the pace and scale of the required buildout raises real feasibility concerns — how do we build this many MW in under 25 years while minimizing cost impacts on customers, and is this level of DER adoption and dispatch achievable in practice?

Questions?



Break



Draft electric sensitivity results

Elizabeth Hossner

Manager, Resource Planning & Analysis, PSE

Eleanor Ewry

Manager, Transmission System & Planning, PSE

September 23, 2026



Sensitivity analysis

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REFERENCE PORTFOLIO

The least-cost set of resources that meets the base set of assumptions.

SENSITIVITY ANALYSIS

Changes one or more base assumptions to examine the effect on the portfolio.



Transmission Availability

Availability and timing of transmission capacity

Policy Changes

Shifts in regulatory and policy requirements

Emerging Technology

Portfolio is offered various emerging technologies

Customer Programs

Levels of demand-side and customer program participation

Other Sensitivities

Additional assumptions raised through RPAG and public feedback

Draft 27 ISP sensitivities – electric supply

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TRANSMISSION AVAILABILITY 14	POLICY CHANGES 8	EMERGING TECHNOLOGY 10	CUSTOMER PROGRAMS 4	OTHER SENSITIVITIES 3
BPA Low	Keep NG post 2045	No emerging tech	Benchmark conservation, demand response, and DER	Alternative compliance cost
BPA high	◆ No CETA + Benchmark	No emerging tech + unlimited batteries	★ V2X or V2G	Residential Exchange
★ No New Transmission	No CETA, no SCGHG, includes CCA + Benchmark	★ No emerging tech + unlimited batteries + long duration storage	◆ 2% for energy savings, 10% for demand response	★ Resource Adequacy
Unconstrained 2040	No CETA, no SCGHG, no CCA + Benchmark	★ No flex-fuel peakers	Net metering to net billing	
High BPA Cost	No CCA	★ Force 500 MW long duration storage: 300 MW in 2035 and 200 MW in 2037		
PSE Cross Cascades (CC) build	CCA mid-price	★ Lower capital cost on geothermal		
PSE Cross Cascades build (Phased)	CCA floor price	★ Lower cost on geothermal + 500 MW LDES		
BPA Cross Cascades Phased	◆ Maximum customer benefits	★ Limited flex-fuel peakers		
North Plains Connector (NPC) – Option 1		★ Lower geothermal costs + no flex-fuel peakers		
North Plains Connector (NPC) – Option 2		★ Lower geothermal costs + limited flex-fuel peakers		
Montana to Washington (M2W/TWTC) + Colstrip Transmission (CTS)				
Montana to Washington (M2W/TWTC) + CTS + CC				
NPC + CTS + M2W/TWTC + CC				
NPC + Cross Cascades				

★ Feedback from interested parties

◆ Required by rules

Running count: 39

Key takeaways from the sensitivity analysis

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Transmission

- Increased transmission availability increases access to lower cost resources to meet CETA requirements.
- Overall, transmission access is the primary driver of cost and resource allocation, reducing pressure on the PSE zone.
- Total resource additions increase significantly with more transmission access, with nuclear and geothermal dropping to zero and replaced by storage and wind once Cross Cascades access becomes available.

Policy Changes

- With removal of CETA and CCA, the portfolio cost is lower but leans heavily on natural gas to meet energy and peak.
- CCA has an impact on the dispatch and use of existing resources but does not impact the long-term new resource builds.

Emerging Technology

- Costs and availability of emerging technology have an impact on the long-term decisions for 2035 and beyond, but do not impact the shorter-term needs by 2031.
- For a COD of 2035, decisions to invest will need to be made by 2030 given a 5-year lead time.
- For a resource with a 10-year lead time, decisions will also need to be made by 2030 for a 2040 COD

Customer Programs

- Optimizing customer programs selects far less energy efficiency, demand response, and DER at a lower total portfolio cost than the reference case.

Other Sensitivities

- ELCC of energy limited resources such as batteries is uncertain since there were no existing resources to validate and benchmark data. This affects the near-term resource requirement, where the resources will saturate and get to the same point by 2040.

Transmission assumptions

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Initial Assumptions

Reference case inputs

- Regional transmission capacity: BPA Low, Medium, and High
- Transmission costs:
 - Transmission Provider tariff rates
 - BPA annual tariff rate increase of 5.7%
- Resource integration cost: \$13/MWh (wind), \$13.56/MWh (MT wind), \$7.54/MWh (solar)
- No local system transmission constraints
 - On-system Network Upgrade cost: \$850k/MW

Reference / Scenario Case Assumptions

On-system builds for electrification

- BPA Medium assumptions for regional transmission
- DSR/DSM contribution to peak load
- Resource locations on PSE's system

Transmission Sensitivities

Combinations of regional transmission investments

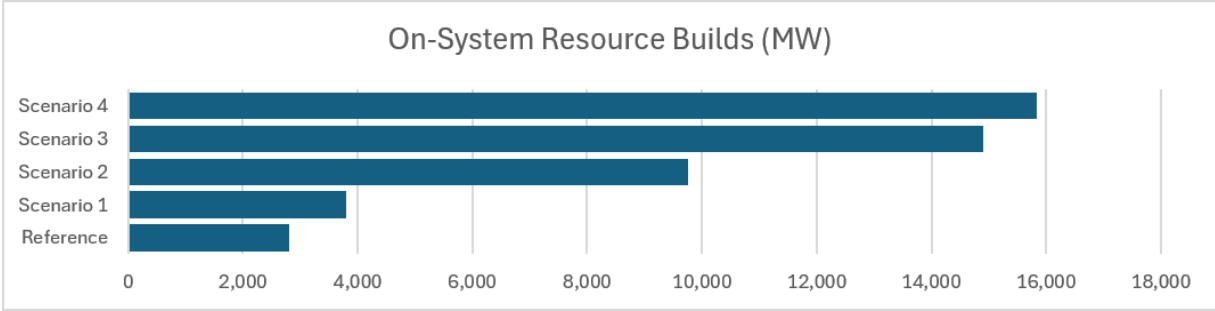
- Known regional transmission development (GERP 1.0 and 2.0, Cross-Cascades, North Plains Connector, CTS)
 - Capacity, capital cost, and/or tariff rates
 - Variations on capacity buy-in
- Conceptual transmission projects (TWTC and WestTEC)
 - Capacity, capital cost, and/or tariff rates
- BPA segmented rate for GERP 2.0

Scenarios – local transmission builds

The following table represents the transmission build necessary to meet each scenario for the 10-year and 20-year horizons:



	Reference			Scenario 1			Scenario 2			Scenario 3			Scenario 4		
	2035	2045	Total	2035	2045	Total	2035	2045	Total	2035	2045	Total	2035	2045	Total
115 kV transmission (miles)*	17.4	0	17.4	136.4	71.9	208.3	316	346.5	662.5	236.3	448.7	685	267.8	458.7	726.5
230 kV transmission (miles)*	30.5	0	30.5	80.5	0	80.5	209.4	34.3	243.7	177.4	75.2	252.6	203.4	104.5	307.9
New Bulk Transformers	4	0	4	4	0	4	8	5	13	5	11	16	3	15	18
New Transmission Substations	3	0	3	3	0	3	5	3	8	2	10	12	3	9	12



All scenarios outpace transmission investments made over the last 10 years

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Transmission investments over the last 10 years include:

35.8

Miles of 115 kV transmission*

40

Miles of 230 kV transmission*

3

New bulk transformers*

4

New transmission switching stations*

All scenarios require significantly more transmission build to accommodate both resource interconnection and load service.

4-7x more 115 kV transmission miles

2-5x more 230 kV transmission miles

Transmission Investment by Year (\$MM)



**Includes transmission line uprates, rebuilds, and new builds, switching station rebuilds and new builds, and bulk transformer replacements and additions*

Transmission sensitivities

PSE

Reference

Emerging technologies enable cost-effective clean energy transition through reliable baseload nuclear power and flexible renewable peakers

BPA SENSITIVITIES

Reference + BPA Segmented Rate Includes the 9.5 times incremental rate for 2493 MW of BPA capacity from E WA to PSE in 2035 based on letter received from BPA.

BPA Low 100% of the TSRs requiring BPA's GERP 1. Projects are delivered to the Puget Sound Area.

BPA High 100% of the TSRs requiring both BPA's GERP 1.0 and 2.0 projects are granted and are deliverable to the Puget Sound Area.

No New Tx No additional transmission capacity beyond what is currently in PSE's transmission portfolio.

Unconstrained 2040 100% of the TSRs requiring BPA's GERP 1.0; 50% of the TSRs requiring BPA's GERP 2.0 are deliverable to the Puget Sound Area by 2035. By 2040, transmission constraints are lifted.

CROSS CASCADES PROJECT

Cross Cascades Double circuit 500 kV transmission line from PSE's local transmission system to Mid-C. Includes BPA GERP 1.0 capacity.

Cross Cascades Phased Double circuit 500 kV transmission line from PSE's local transmission system to Mid-C. Assumes one circuit is energized in 2035 and the second circuit is energized in 2045. Includes BPA GERP 1.0 capacity.

BPA Cross Cascades Phased By 2035, 100% of the TSRs requiring BPA's GERP 1.0 projects are granted and deliverable to the Puget Sound Area. PSE receives a capacity lease on BPA's GERP 2.0 project. By 2040, single circuit transmission line from PSE's local system to Mid-C.

NORTH PLAINS CONNECTOR PROJECT

NPC 1 A 375 MW stake in the North Plains Connector project with 375 MW of North Dakota wind resources.

NPC 2 A 375 MW W-E and 525 MW E-W stake in the North Plains Connector project with 525 MW of North Dakota wind resources.

MONTANA PROJECT

M2W + CTS Incremental increase in Colstrip Transmission System Capacity as well as additional transmission capacity from Montana to PSE's system.

M2W + CTS + CC Incremental increase in Colstrip Transmission System Capacity as well as additional transmission capacity from Montana to Mid-C. Includes double circuit 500 kV transmission line from PSE's local transmission system to Mid-C.

COMBINED PROJECTS

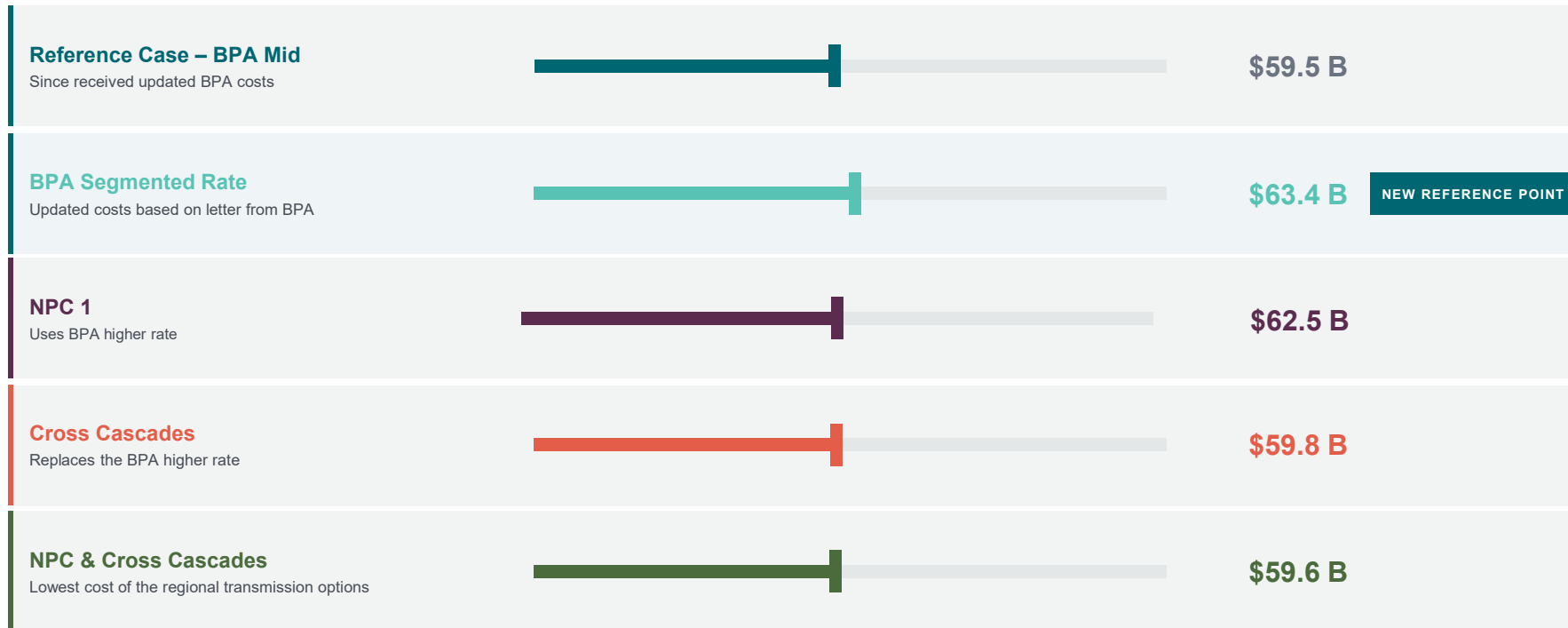
M2W + CTS + CC + NPC A 375 MW stake in the North Plains Connector project with 375 MW of North Dakota wind resources. Incremental increase in Colstrip Transmission System Capacity as well as additional transmission capacity from Montana to Mid-C. Includes double circuit 500 kV transmission line from PSE's local transmission system to Mid-C.

★ **NPC + Cross Cascades** A 375 MW stake in the North Plains Connector project with 375 MW of North Dakota wind resources plus double circuit 500 kV transmission line from PSE's local transmission system to Mid-C. Includes BPA GERP 1.0 capacity.

Summary of the transmission sensitivities and the value of NPC and Cross Cascades to the portfolio

PSE

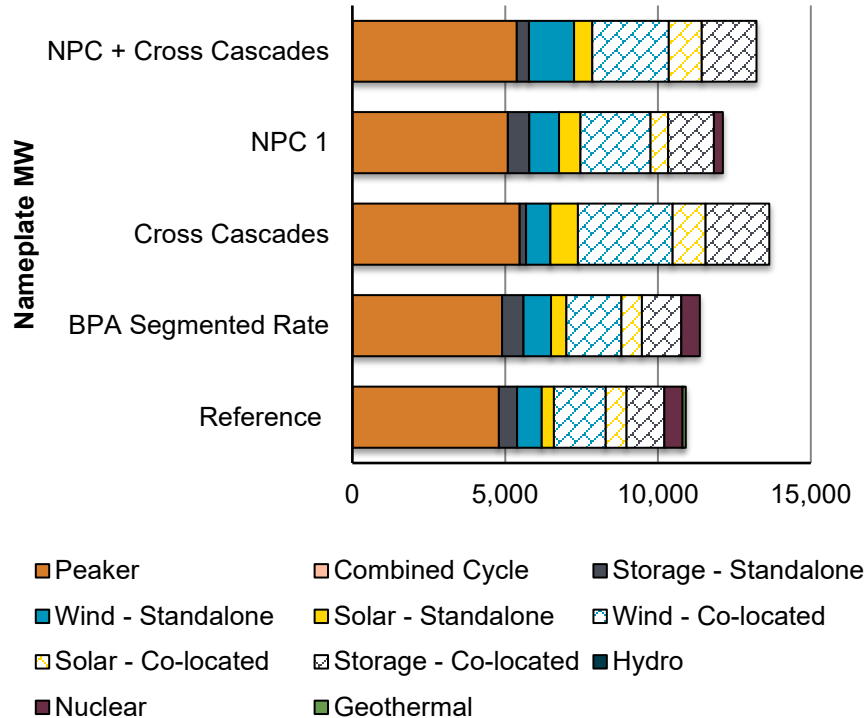
Total Portfolio Cost comparison across transmission sensitivities



Cumulative 2050 builds compared to reference

PSE

2050 Cumulative Builds



Resource Additions (MW)	Reference	BPA Segmented Rate	Cross Cascades	NPC 1	NPC + Cross Cascades
Peaker	4,792	4,900	5,478	5,085	5,380
Storage	1,840	1,990	2,290	2,190	2,190
Wind	2,500	2,700	3,900	3,275	3,975
Solar	1,075	1,175	1,975	1,275	1,675
Nuclear	600	600	0	300	0
Geothermal	100	0	0	0	0
Total	10,907	11,365	13,643	12,125	13,220

Key findings

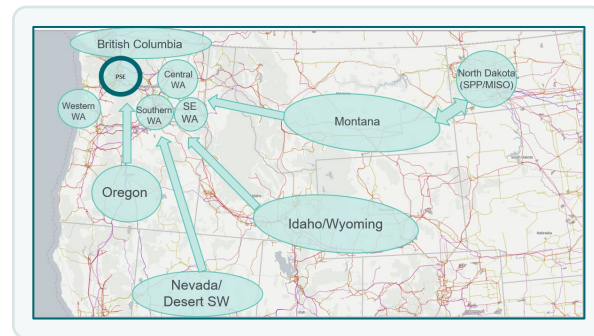
PSE

1 Resource mix shifts once Cross Cascades opens
Total resource additions increase significantly with more transmission access, with nuclear and geothermal dropping to zero and replaced by storage and wind once Cross Cascades access becomes available.

2 Both projects help meet CETA
Both Cross Cascades and North Plains Connector have benefits to meeting CETA requirements.

3 Higher nameplate build, lower revenue requirement
With increased Cross Cascades transmission more wind and solar are added instead of the higher cost emerging technology in the reference portfolio — a higher nameplate build, but lower revenue requirement for new resources.

4 Transmission access is the primary driver
Overall, transmission access is the primary driver of cost and resource allocation. Increased transmission can reduce pressure on the PSE zone.



Regional transmission study area

Questions?



Preferred portfolio development

Kara Durbin

Director, Clean Energy Strategy, PSE

September 23, 2026



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Objectives

Preferred portfolio development

- ◆ **Purpose of this session**
 - ◇ *Provide update on the Cost Test*
 - ◇ *Review Decision Framework elements*
 - ◇ *Preview upcoming preferred portfolio development*
- ◆ **What PSE needs from you**
 - ◇ Feedback on general approach to developing the preferred portfolio (consult)
 - ◇ Feedback on including feasibility as a factor in the Decision Framework (consult)
- ◆ **How your feedback will be used**
 - ◇ Influence preferred portfolio development and evaluation

Refresher on the ISP Cost Test rule

WAC 480-96-030 Integrated assessment and planning requirements

8) **Cost test.** Pursuant to RCW 80.86.020(9), each large combination utility must use the cost test for the purpose of determining the lowest reasonable cost of decarbonization and electrification measures in integrated system plans, at the portfolio level. Each large combination utility must use the cost test as a key input in the selection of its preferred portfolio per WAC 480-96-050(7), and as an input to the commission's determination on whether the ISP is in the public interest pursuant to WAC 480-96-080(6).

What does the Cost Test aim to do?

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The cost test aims to monetize, quantify, or evaluate qualitatively various benefits and impacts at the portfolio level to inform the lowest reasonable cost portfolio.

Monetized

Can be measured in or readily converted to dollars.

Quantitative

Can be measured in some way but not readily converted to dollars.

Qualitative

Cannot be measured quantitatively but impacts and benefits can be described.

Update on the ISP cost test

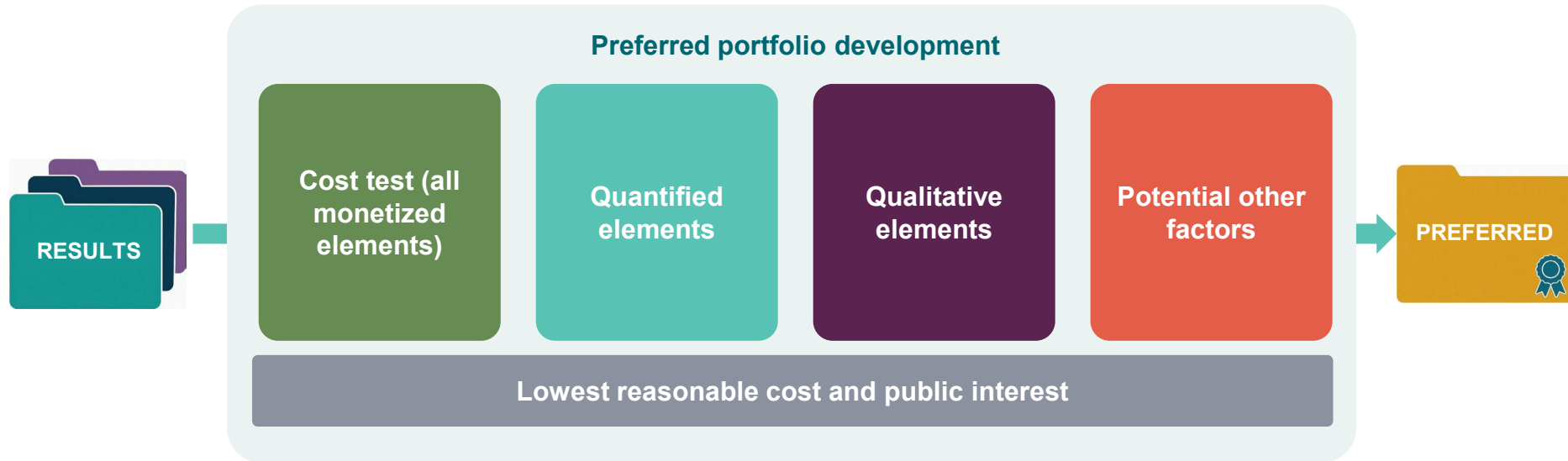
The logo consists of a red triangle and a teal triangle meeting at a point, with a dark teal diamond containing the white text 'PSE' in the center.

PSE

- In February and March, PSE engaged the RPAG, EAG and CRAG on many ISP cost test elements.
- That feedback led PSE to investigate additional potential sources for measuring certain elements.
- Most proved challenging to measure or execute at a portfolio level.
- PSE generally intends to move forward with the cost test elements as categorized on **slide 118** in the appendix — these are substantially similar to what we discussed with you in March.

Developing a decision framework to inform selection of a preferred portfolio

PSE



What could be an additional factor to consider as part of a decision framework?

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Factor

Feasibility

What is it?

Assessment of the execution risk of the portfolio

How could it be measured?

- Self-assessment by program area
- Considerations may include:
 - External factors (permitting, supply chain, etc.)
 - Historical build and/or acquisition rates

FEEDBACK REQUEST

What should PSE consider in developing a feasibility element as part of the decision framework?

Preferred portfolio development | next steps

The logo for PSE (Public Service Enterprise Group) is located in the top right corner. It consists of a teal diamond shape with the letters 'PSE' in white, set against a background of red and teal geometric shapes.

PSE plans to come back to the RPAG in October with a draft approach for assessing the reference case and scenarios using the cost test and decision framework elements.

High level plan

Refine Cost Test and Decision Framework components

Assess reference case & scenarios using Cost Test and Decision Framework elements

Discuss next steps to support development of a preferred portfolio

Reminder of RPAG feedback request

Feedback on the proposed self-assessed feasibility metric.

Questions?



Equitable distribution of benefits – minimum designation

Brian Tyson

Manager, Clean Energy Planning and Implementation, PSE

September 23, 2026



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Objectives

Minimum designation

◆ Purpose of this session

- ◇ *Preview PSE's approach to minimum designation in the 2027 ISP that focuses on customer benefits, aligns with customer needs, and provides flexibility*

◆ What PSE needs from you

- ◇ RPAG reactions and feedback on the approach (consult)

◆ How your feedback will be used

- ◇ RPAG input to help finalize how deepest need benefits are designated, defined, and measured

What is the origin of minimum designations and deepest need?

PSE

2023 — ORDER 08, CONDITION 20

Set the framework

- 30% of DER solar, storage, DR and EE benefits to Named Communities by tranche
- Develop a targeting approach for deepest need
- Set a deepest-need minimum by the 2023 Biennial Update

2024 — ORDER 12, CONDITION 2

Expand to deepest need

- Deepest-need minimum at least proportional to that group's share of electric customers in the 2025 CEIP
- Definition of deepest need still being refined with advisory groups

Today: a 2.5% minimum designation covered 2024–25. Condition 2 applies to the 2027 ISP.

Full condition language appears in the appendix.

PSE has learned a lot about barriers to EE, DR and DER programs through our engagement work



PSE

High upfront costs

For technologies like heat pumps, EV chargers, battery storage, solar panels

Additional costs for necessary home upgrades

Such as panel or roof upgrades, which can be thousands of dollars and are not covered by incentives

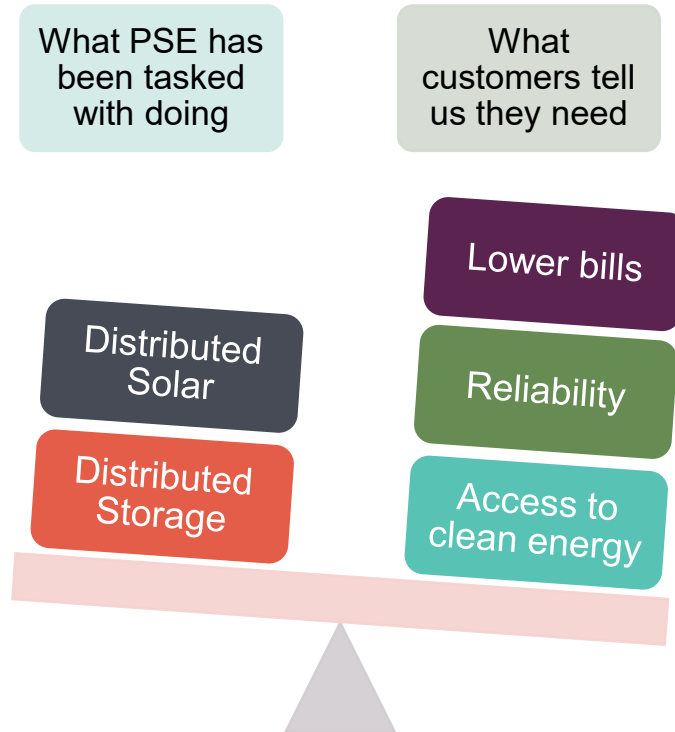
Administrative challenges

Current qualification thresholds may exclude customers who really need it

Outcome: Minimum designations are mostly achievable but do not appear to align with what we hear customers most want or need

We want to maintain the core intent of delivering benefits to deepest need customers

PSE



EAG feedback reinforced the importance of *measuring meaningful benefits* in addition to delivery targets

PSE

What we presented

- **Aggregate benefits** rather than uniform delivery across tranches
- **Include community-scale benefits** such as solar on a food bank
- **Prioritize** the programs customers say they need

What we heard

- Aggregation may **mask barriers** across tranches
- Success looks **different by tranche**
- Community benefits are **important but hard to measure**
- **Customer needs** should drive priorities

What we did

- Explored **tranche-level reporting**
- Investigated **methods to measure** community-serving benefits
- Conducted **additional customer research** on priorities and barriers

Deepest need survey timeline

PSE



Solid = complete | Dashed outline = planned

Survey reach

70,000

Deepest Need customers with an email address on file

60%

of all Deepest Need customers

A sustainable framework should measure both investments and the benefits those investments create

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PSE

Current Situation

The 2027 ISP requires minimum designations across multiple resource tranches: distributed storage, distributed solar, demand response, energy efficiency.

Proposed Direction

- **Measure** investments across resource tranches.
- **Evaluate** the customer benefits those investments create, including broader community-scale benefits where relevant.
- **Prioritize** investments that maximize customer-stated priorities: affordability, resilience, and access.

A sustainable framework should measure both investments, and the benefits those investments create

PSE

Possible metric examples:

ENERGY EFFICIENCY

~6.8% (based on previous 3-year average)

Proportional share target

Metric: Incentives delivered

DEMAND RESPONSE

~6.8%

Proportional share target

Metric: Incentives delivered

DER SOLAR

~6.8%

Proportional share target

Metric: percent of \$ invested/spent

DER STORAGE

Community benefit

Reframe the measure to reflect community benefit

Metric: to be determined

Next steps

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PSE

Three workstreams shape the minimum designation approach for the 2027 ISP

BY END OF SEPTEMBER

Deepest need survey

Analyzing the results by end of September.

IN PROGRESS

Understand and evaluate feasibility

Internal teams to investigate and evaluate feasibility of using potential benefit metrics.

SEPTEMBER / OCTOBER

Reflect on EAG feedback

How it informs an approach to minimum designation in the ISP that focuses on customer benefits, aligns with the needs of deepest need customers, and provides flexibility.

Questions?



Next steps

September 23, 2026



Feedback process



PSE

01

One week prior to meeting

The feedback window for the upcoming meeting opens.

02

3-5 business days prior to meeting

PSE posts the meeting agenda and slide deck on the Clean Energy website.

03

Day of meeting

PSE engages RPAG for feedback and facilitates a public comment opportunity.

04

One week post meeting

The feedback window for the latest RPAG meeting closes.

05

Four weeks post meeting

PSE posts the meeting summary and feedback report from the latest RPAG meeting on the Clean Energy website.

Feedback received outside this window will go into the subsequent feedback report.

Upcoming activities



PSE

Date	Activity
September 30, 2026	Feedback form for this meeting closes
October 27, 2026 (tentative)	RPAG meeting
November 18, 2026 (tentative)	RPAG meeting
December 15, 2026 (tentative)	RPAG meeting
January 6, 2027 (tentative)	RPAG drop-in session (optional)

Contact us

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EMAIL

isp@pse.com

FORM

cleanenergyplan.pse.com/contact

PHONE

425-818-2051

SUBSCRIBE

[Subscribe to our email list](#)

WEBSITE

cleanenergyplan.pse.com

Public comment opportunity

The background of the slide features a dark, atmospheric photograph of a firefighter in silhouette, wearing a helmet with a bright light and carrying a hose. The scene is set at night with some distant lights visible. Overlaid on the right side of the image is a series of overlapping, semi-transparent diamond shapes in various shades of gray, creating a geometric pattern.

September 23, 2026



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How to participate in public comment opportunity

PSE

1

Raise your hand

Please use the “raise hand” feature if you would like to provide comment

2

Three minutes each

Each speaker will have up to 3 minutes to give comments

3

Stay on today's topics

Comments should relate to today's meeting topics

4

Keep remarks respectful

Please keep remarks respectful – no personal attacks

After the meeting

Comments and questions will be included in the feedback report with PSE's response

You are welcome and encouraged to send written feedback and questions to:

isp@pse.com

Thank you for joining us!



Appendix

Definitions and acronyms

Acronym	Definition
aMW	Average megawatt
BESS	Battery energy storage system
BPA	Bonneville Power Administration
CCA	Climate Commitment Act
CEIP	Clean Energy Implementation Plan
CETA	Clean Energy Transformation Act
COD	Commercial operation date
CTS	Colstrip transmission
DER	Distributed energy resource
DSM	Demand-side management
DSR	Demand-side resources
EAG	PSE's Equity Advisory Group
EE	Energy efficiency
ELCC	Effective load carrying capacity

Acronym	Definition
EV	Electric vehicle
GERP	Grid enhancement for regional performance
ISP	Integrated System Plan
LDES	Long-duration energy storage
NG	Natural gas
NPC	North Plains Connector
NPV	Net present value
PRM	Planning reserve margin
RCW	Revised Code of Washington
RPAG	PSE's Resource Planning Advisory Group
SCGHG	Social cost of greenhouse gas
SMR	Small modular (nuclear) reactor
TRL	Technology readiness level
V2G/V2X	Vehicle to grid/vehicle to everything

Appendix: Customer programs

Customer programs sensitivities

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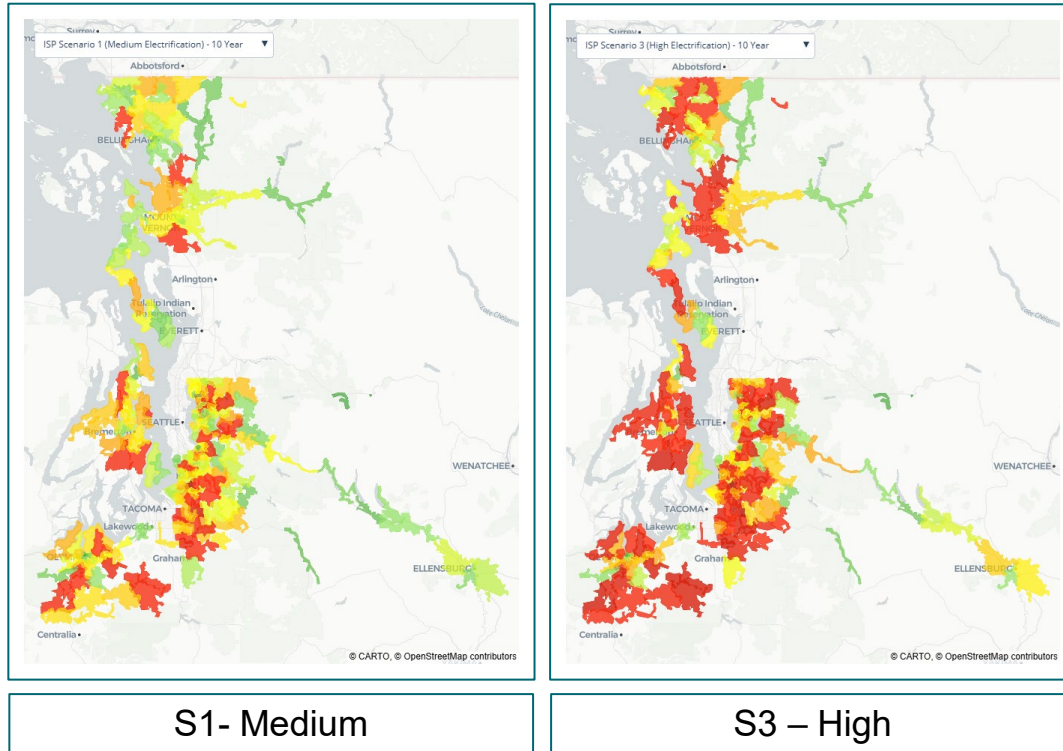
SENSITIVITY	DESCRIPTION	KEY TAKEAWAYS
C1 ★ Benchmark	All demand-side resources are brought back into the model like a traditional IRP. This sensitivity allows for a full optimization of demand response, distributed resources, and conservation, with updated inputs to capture changes in federal tax credits.	Selected less demand-side resources than the Reference Case. Output primarily used for EIA target setting for the subsequent Biennial Conservation Plan.
C2 2% for energy savings 10% for demand response	Evaluates the additional conservation and demand flexibility acquisition required to achieve HB 1589's 2% conservation and 10% demand flexibility targets. This sensitivity departs from the commercially feasible ISP Reference Case by increasing program participation, adoption rates, and resource acquisition assumptions to assess what levels of savings, demand reduction, and utility investment may be required to meet the statutory targets.	2% energy savings (annual basis) is only theoretically achievable assuming very optimistic adoption rates and including future/emerging savings. 10% demand response (nameplate) is achievable in the future, not near term.
C3 Vehicle-to-X (V2X)	Under development. To be run in the BCA. Based on the cost findings, the team plans to monitor these technologies through market research and current pilots outlined in the Transportation Electrification Plan (TEP).	Total Resource Cost is still high. Focus on monitoring market development and pilots.
C4 Net Metering to Net Billing	Considers the impacts to adoption of moving from traditional retail-rate Net Metering to a Net Billing solution that compensates customers for exported solar at a rate that is less than retail and aligns with other energy export compensation rates such as Solar Energy Credit.	The move to Net Billing is expected to slow customer adoption to some extent, but greater shift will come from customers installing smaller systems that optimize around self-consumption.

Appendix: Delivery system planning

DRAFT Substation Loading in 2035

PSE

The following maps represent substation transformer loading projected in 10 years for a few scenarios



Capacity Legend

0-50%: Green (High Capacity)

50-75%: Yellow (Moderate Capacity)

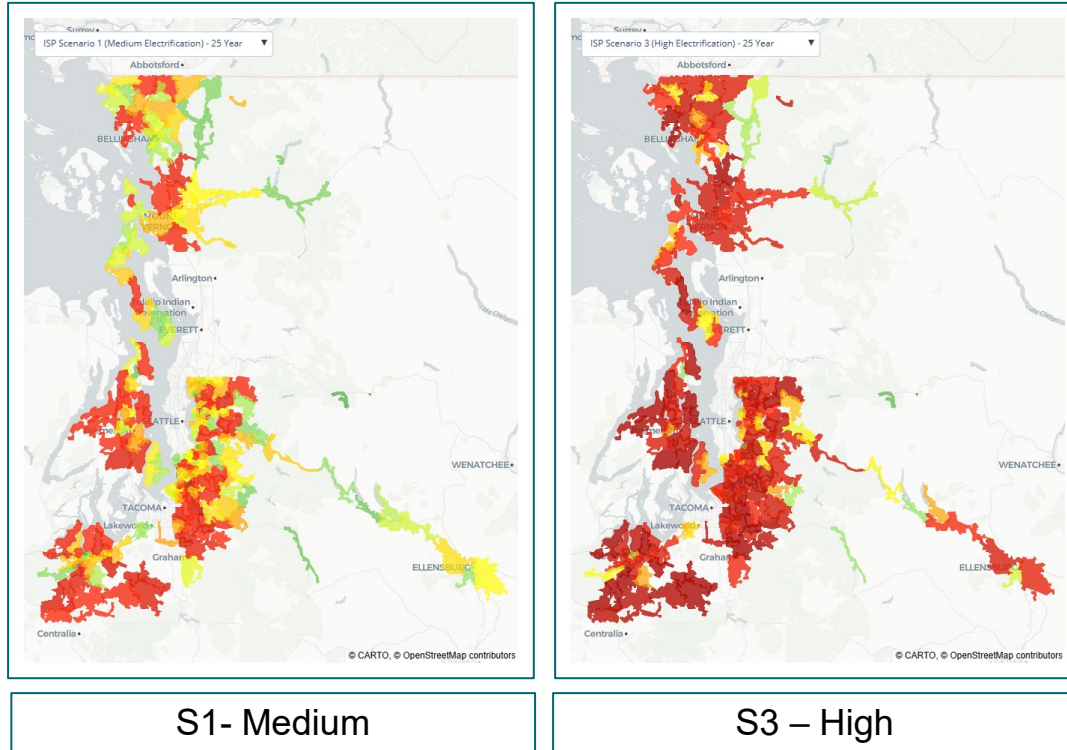
75-100%: Orange (Low Capacity)

100%+: Red (Critical Capacity)

DRAFT Substation Loading in 2050

PSE

The following maps represent substation transformer loading projected in 25 years for a few scenarios



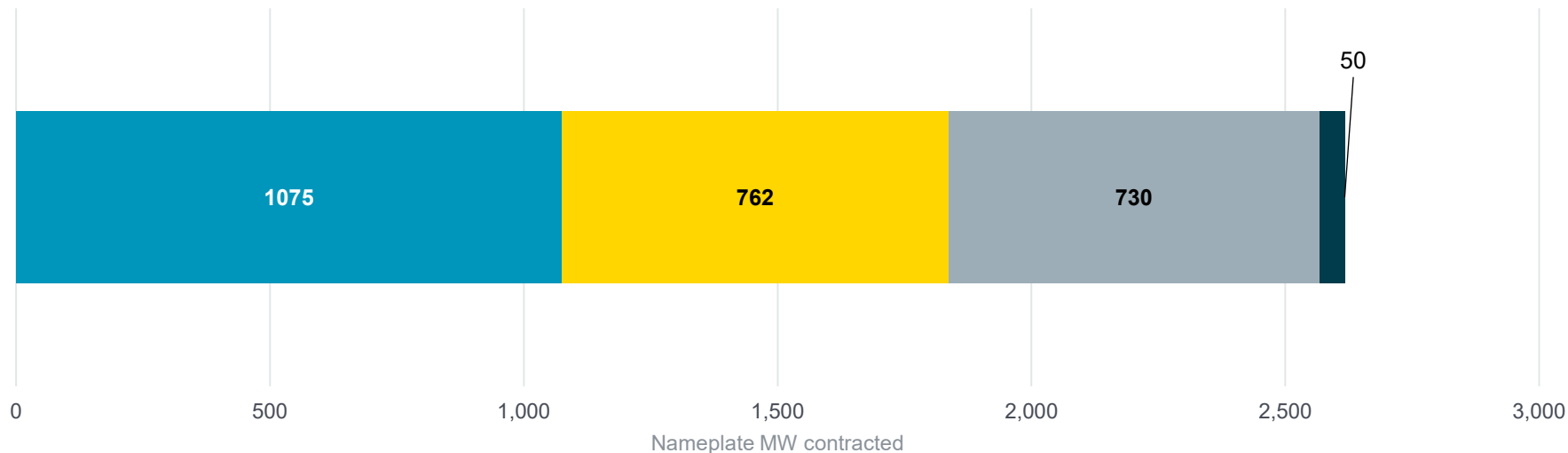
Appendix: Electric supply

What PSE has actually acquired, 2022–2025

Long-term, utility-scale resource acquisitions executed during the CEIP implementation period

PSE

Wind Solar Short duration storage Hydro



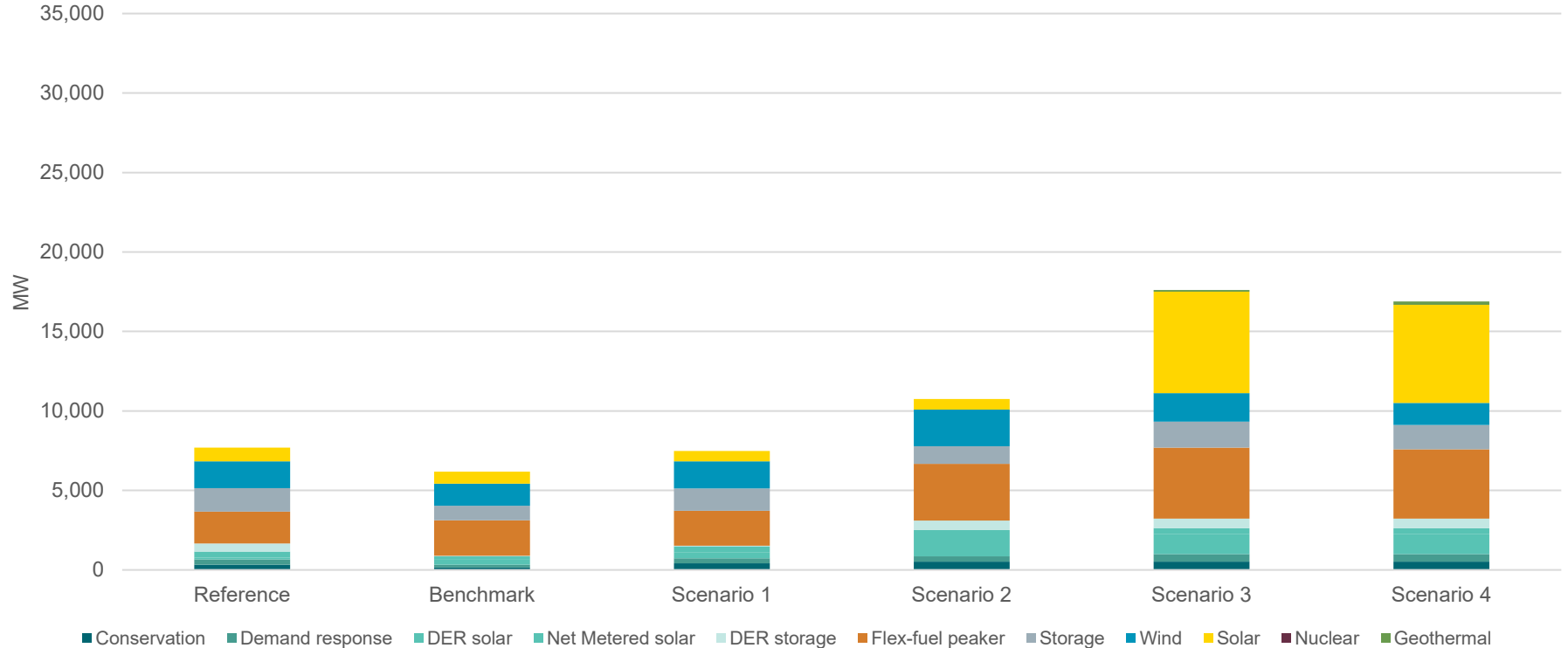
Source: PSE 2026 Clean Energy Compliance Report, Table 22.

2,617 MW contracted across four years

Provided for comparison: roughly 650 MW a year, with delivery running three to five years behind execution.

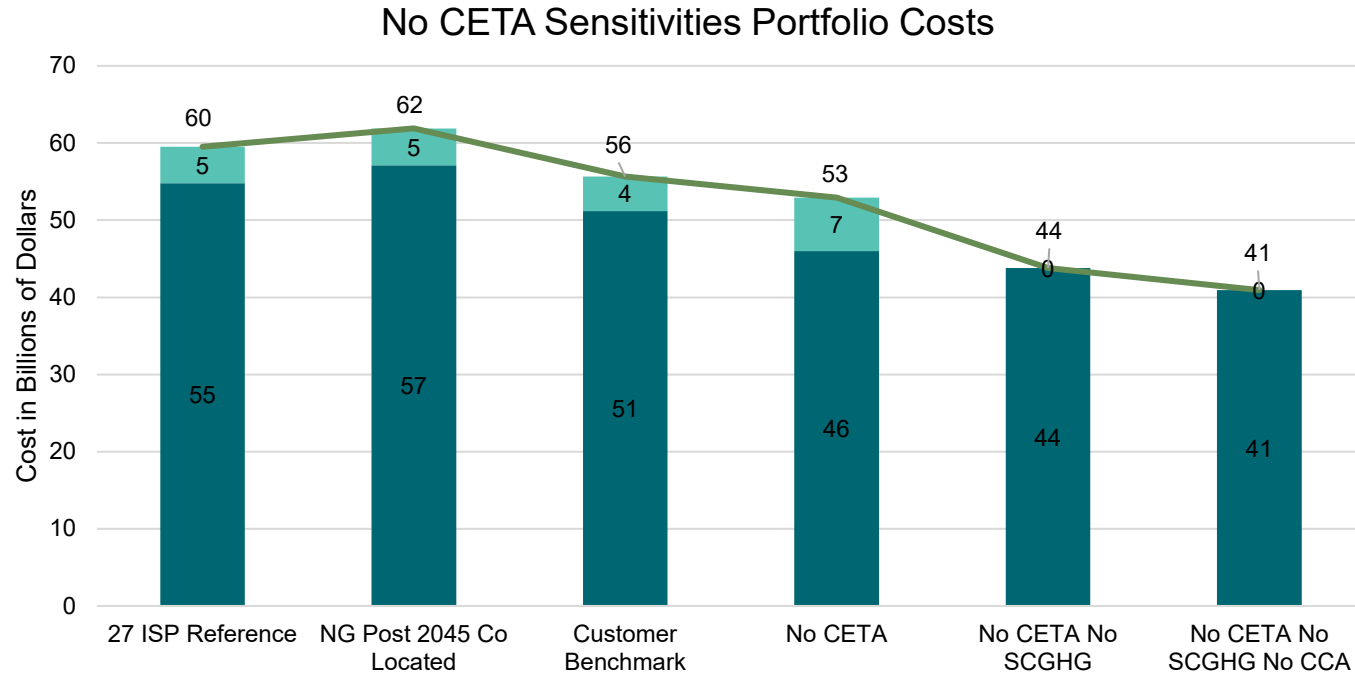
Electric supply: Cumulative builds across all cases (2035)

PSE



No CETA Sensitivities Portfolio Costs

PSE

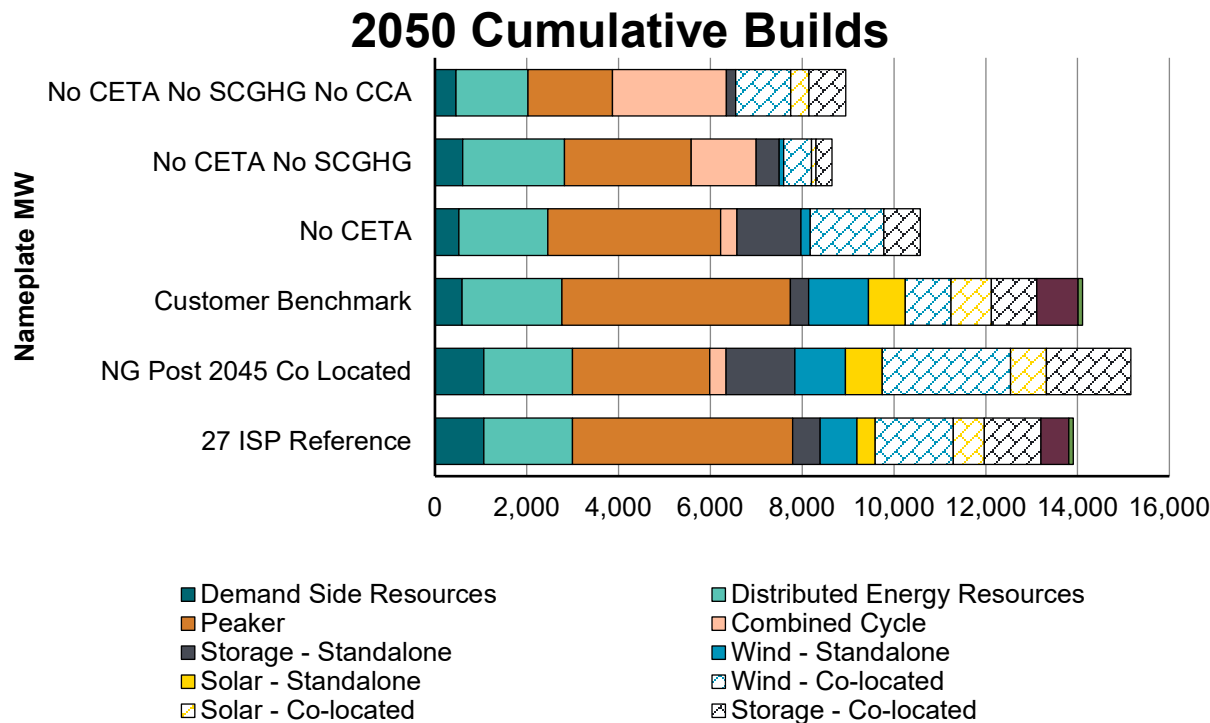


Revenue Requirement SCGHG Total

No CETA sensitivities builds - 2050

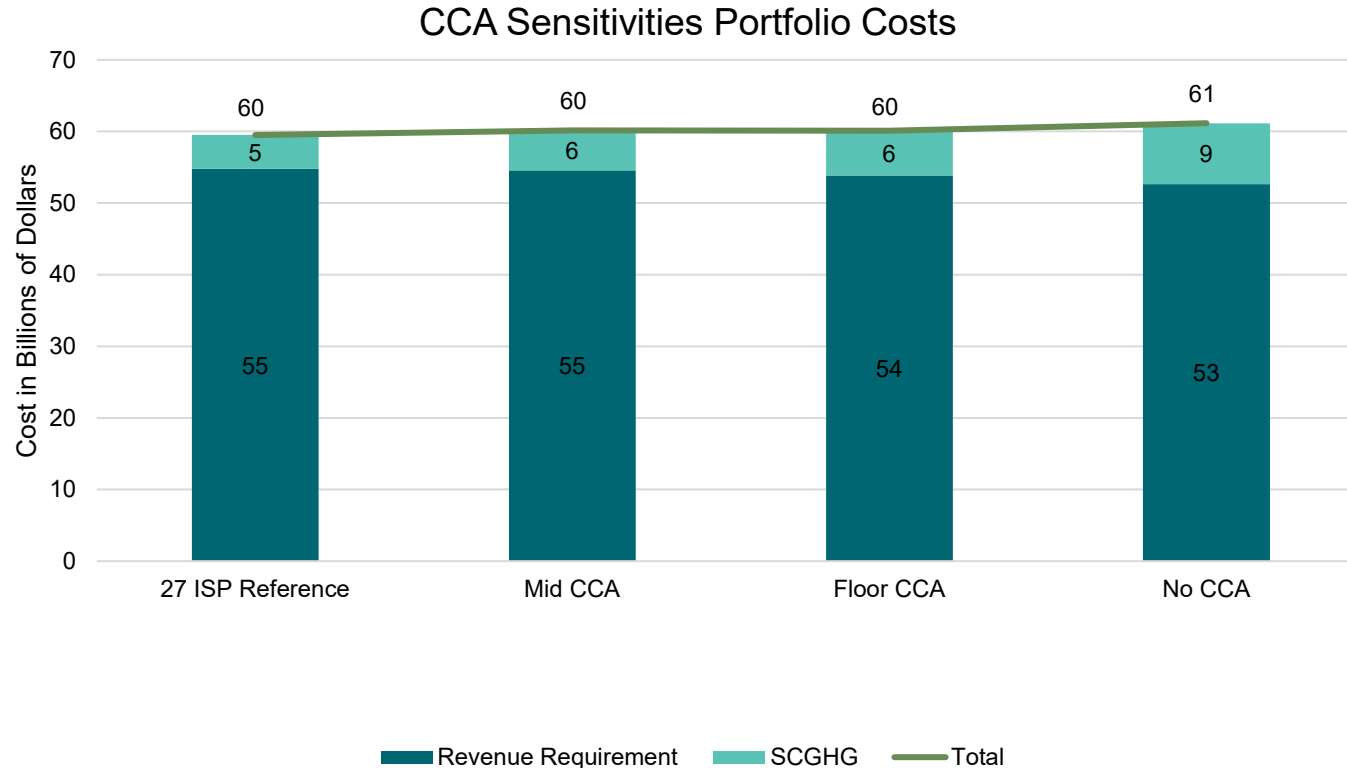
PSE

- Solar dropped off quickly with wind following once the CCA was removed
- No Nuclear or Geothermal in all of the No CETA cases



CCA sensitivities portfolio costs

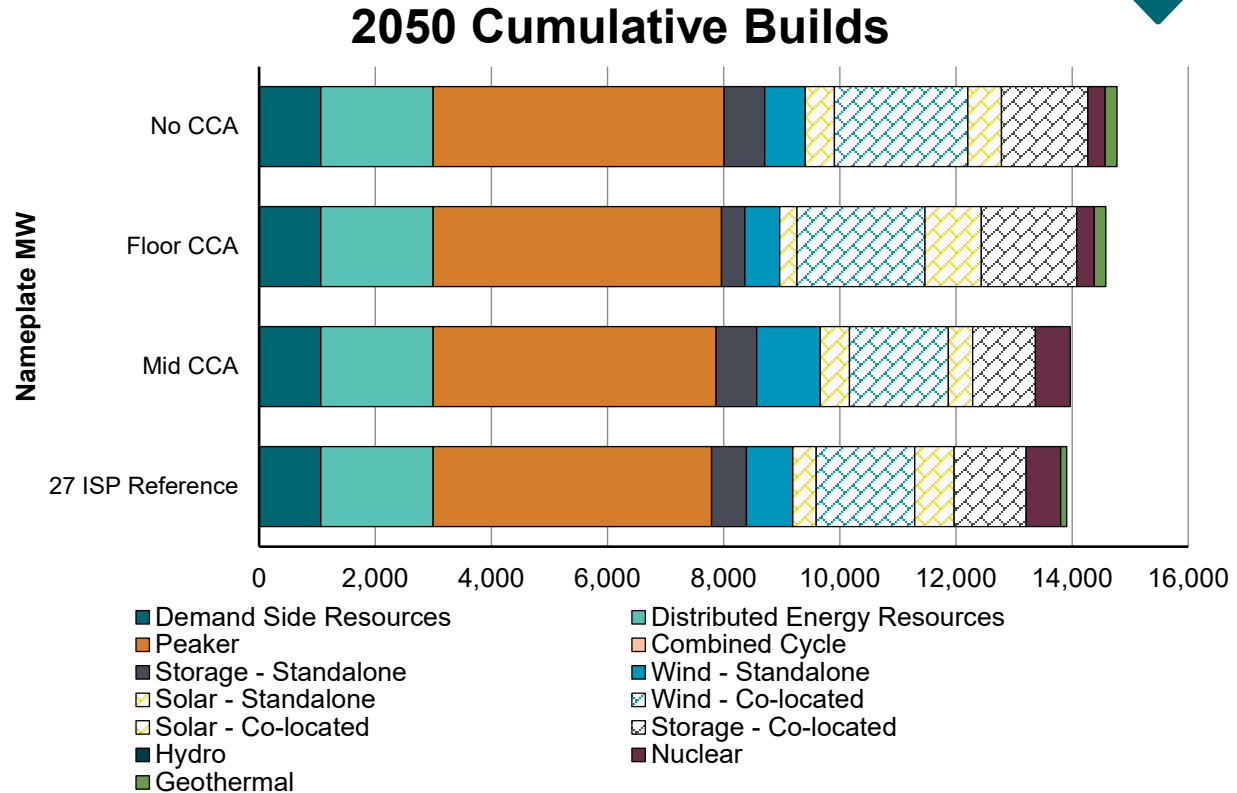
PSE



CCA sensitivities builds - 2050

PSE

- 300 MW less nuclear is built in Floor and No CCA cases, likely driven by lower costs for gas plants
- The model makes up for this lost capacity with a mix of storage and peakers which are less ELCC efficient
- General balance of resources is consistent between all cases and the reference

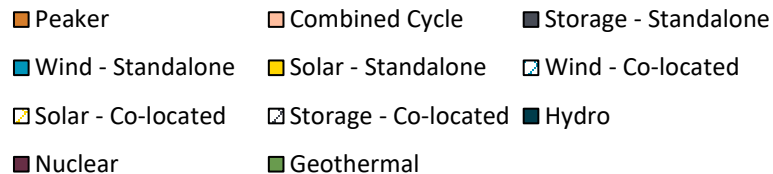
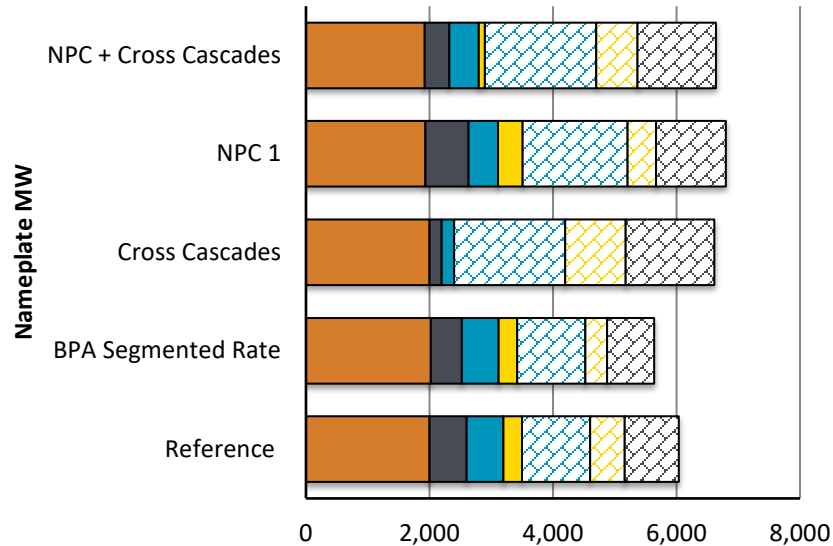


Appendix: Transmission

Transmission cumulative 2035 builds compared to Reference

PSE

2035 Cumulative Builds



Resource Additions (MW)	Reference	BPA Segmented Rate	Cross Cascades	NPC 1	NPC + Cross Cascades
Peaker	1,999	2,021	1,999	1,934	1,924
Storage	1,480	1,260	1,640	1,830	1,670
Wind	1,700	1,700	2,000	2,175	2,275
Solar	860	655	975	860	770
Nuclear	0	0	0	0	0
Geothermal	0	0	0	0	0
Total	6,039	5,636	6,614	6,799	6,639

Emerging Tech Sensitivities



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Emerging technology sensitivities modeled

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TECHNOLOGY AVAILABILITY

No emerging tech

Only currently commercially available technology included (wind, solar, gas, and lithium-ion batteries).

No solution

No emerging tech + unlimited batteries

Same as “no emerging tech” above, with build limits removed for lithium-ion batteries and solar.

Manual intervention required

No emerging tech + unlimited batteries + LDES

Adds long duration batteries as an option in the optimization.

Add 500 MW LDES

Forced in 500 MW of LDES: 300 MW in 2035 and 200 MW in 2037.

GEO THERMAL

Lower capital cost for enhanced geothermal

Updated the base capital cost to \$6,500/kw from \$10,525/kw and allowed the model to optimize.

Lower cost geothermal + 500 MW LDES

Optimize lower cost geothermal + forced in 500 MW of long duration batteries.

Lower cost geothermal + limited flex-fuel peaker builds

Optimize lower cost geothermal + flex-fuel peaker builds limited to 2,500 MW.

Lower cost geothermal + no flex-fuel peakers

Optimize lower cost geothermal + emerging technology but excludes flex-fuel peakers.

FLEX-FUEL PEAKER

Limited flex-fuel peaker builds

Peakers limited to half the builds in the reference case portfolio (2,500 MW).

Emerging tech + no flex-fuel peakers

Emerging technology long and mid duration batteries, nuclear SMR, geothermal, and offshore wind as an option in the optimization. Excludes flex-fuel peakers.

Our reference case is our starting point for further analysis

PSE

RESOURCES AVAILABLE TO THE REFERENCE CASE

Yes Geothermal (original cost)

No Geothermal (lower cost)

Yes Flex-fuel peaker

Yes Long- and mid-duration energy storage

Yes Nuclear small modular reactor

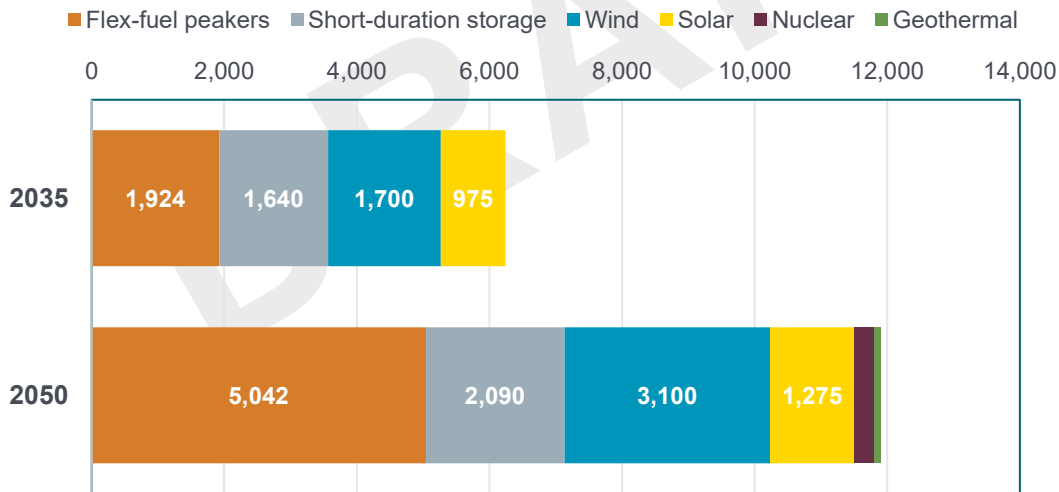
Yes TRL 9 resources

2, 4, 6 & 8-hr lithium-ion batteries, offshore and onshore wind, solar, NG peakers

2035 TOTAL NAMEPLATE
6,239 MW

2050 TOTAL NAMEPLATE
11,907 MW

Cumulative resource builds, reference case (MW)



DRAFT – Subject to change

TRL: Technology readiness level

Co-locating Resources

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HYBRID VS. CO-LOCATION

Hybrid

A battery energy storage system paired with a renewable resource such as wind and solar, but limited to just charge from the renewable resource.

Co-location

Similar to hybrid but includes the transmission interconnection and the ability to charge from the grid when the renewable resource is not generating, giving BESS more flexibility in use and reliability.

2027 ISP INCLUDES SEVERAL OPTIONS

1 Optimization of existing transmission

Adding solar and batteries to existing resources.

2 New resources

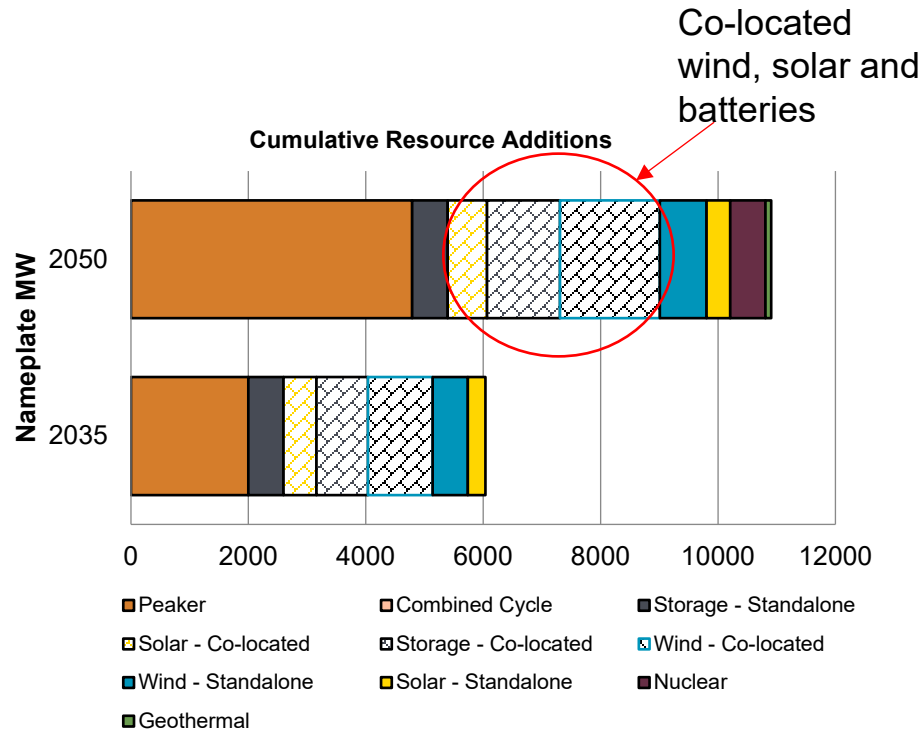
Wind + BESS

Solar + BESS

Wind + Solar + BESS

How Co-location can optimize transmission

- ◆ In the 2027 ISP reference portfolio, majority of the wind, solar, and batteries are co-located to optimize the use of existing transmission and availability of new transmission
- ◆ This is a common theme across all scenarios and sensitivities. Every portfolio optimized the use of existing transmission and locations first before adding new resources.

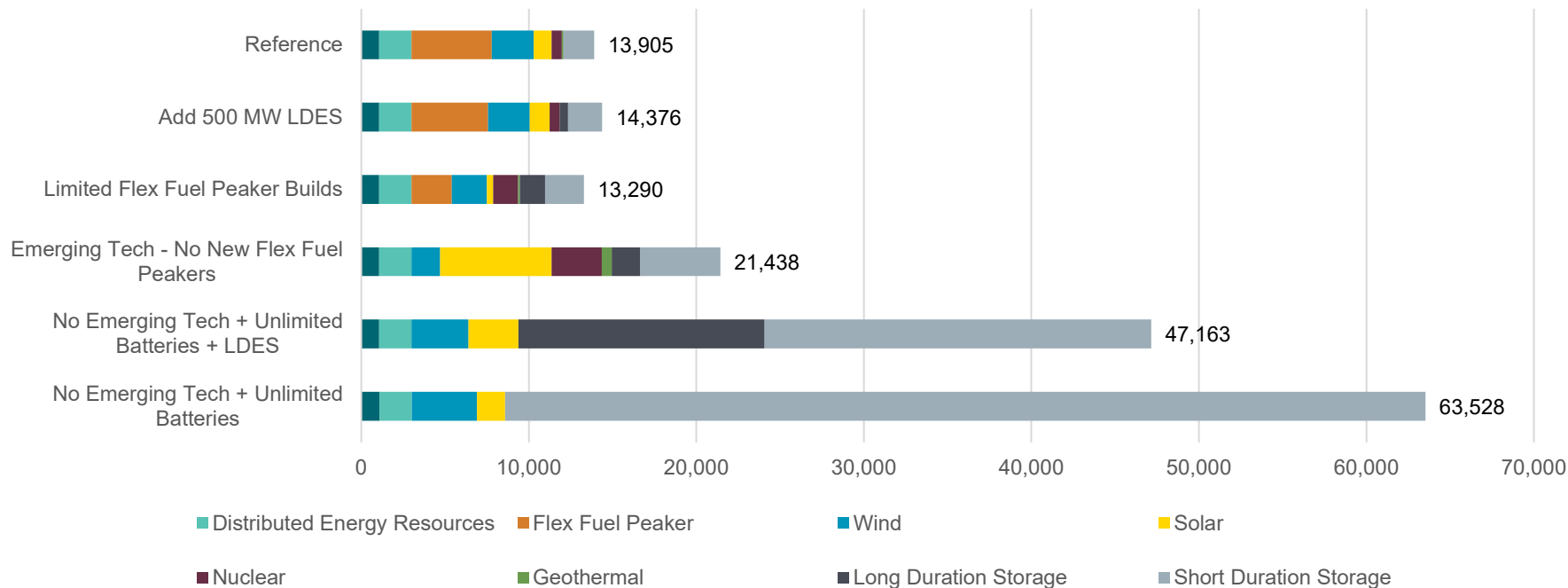


Sensitivity	Geothermal original cost	Lower cost geothermal	Flex-fuel peaker	Long duration energy storage	SMR, offshore wind and mid duration energy storage	TRL 9 resources: Short duration energy storage, onshore wind and solar
Reference case	Yes	No	Yes	Yes	Yes	Yes
No Emerging Tech	No	No	No post 2045	No	No	Yes
No Emerging Tech + unlimited batteries	No	No	No post 2045	No	No	Yes + exceeded input threshold
No Emerging Tech + unlimited batteries + Long Duration Energy Storage (LDES)	No	No	No post 2045	Yes	No	Yes + exceeded input threshold
Limited flex-fuel peaker builds	Yes	No	Yes – limit (2500MW)	Yes	Yes	Yes
Emerging Tech + no flex-fuel peakers	Yes	No	No post 2045	Yes	Yes	Yes
Add 500 MW LDES	Yes	No	Yes	Yes -Forced in 500 MW: 300 MW in 2035 and 200 MW in 2037	Yes	Yes
Lower capital cost for enhanced geothermal	No	Yes	Yes	Yes	Yes	Yes
Lower capital cost for enhanced geothermal + 500 MW LDES	No	Yes	Yes	Yes – forced in 500 MW	Yes	Yes
Lower Capital cost for enhanced geothermal + limited flex-fuel peaker builds	No	Yes	Yes – limit (2500MW)	Yes	Yes	Yes
Lower Capital cost of Enhanced geothermal + no flex-fuel peakers	No	Yes	No post 2045	Yes	Yes	Yes

Limiting peakers results in LDES being selected and reduces the magnitude of total builds

PSE

2050 Cumulative Builds



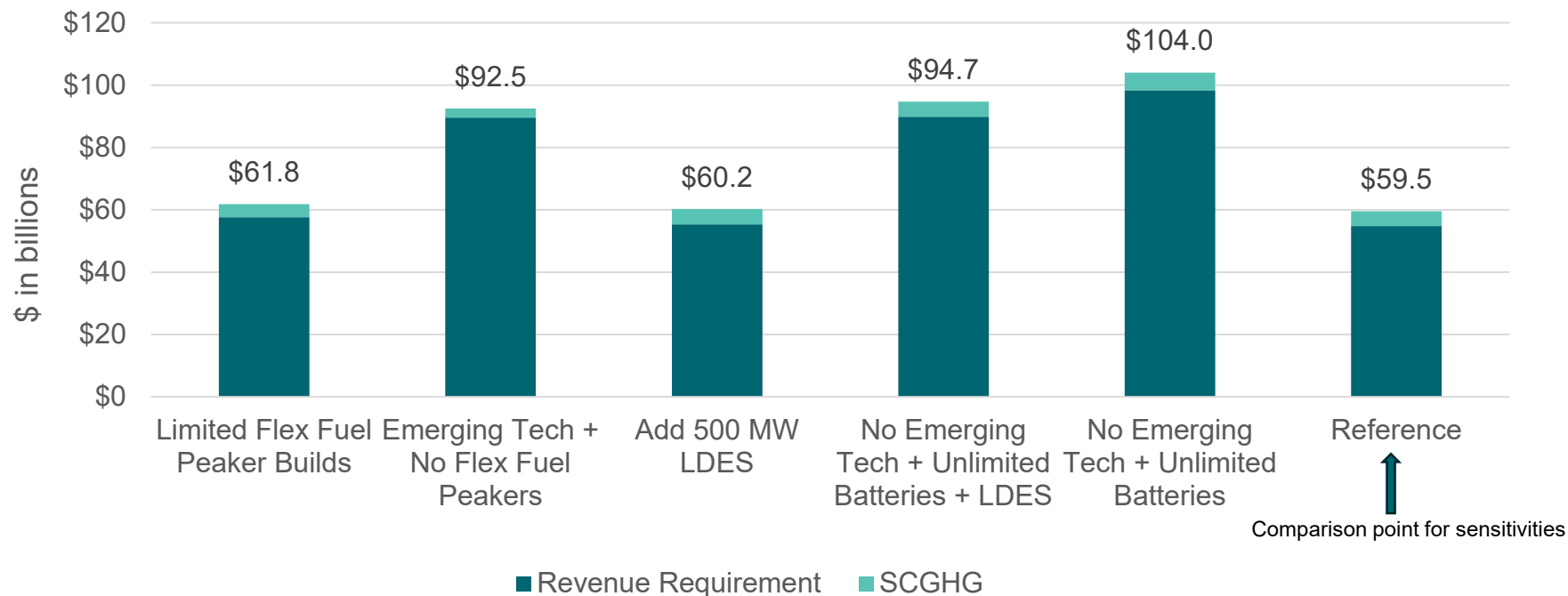
DRAFT – Subject to change

Note: all sensitivities, including the no emerging tech cases, meet CETA requirements; cost and storage volume are what differ.112

Adding storage increases portfolio costs in all sensitivities

PSE

Net present value (NPV) portfolio costs

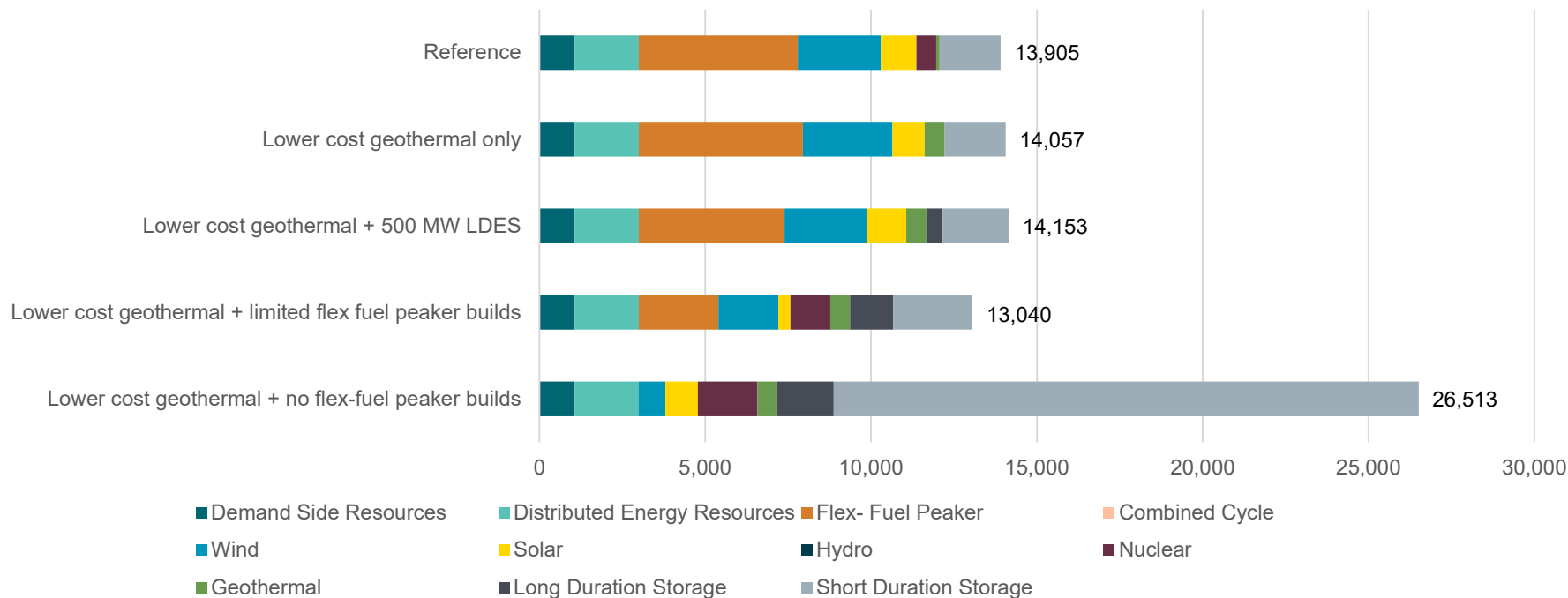


DRAFT – Subject to change

Note: all sensitivities, including the no emerging tech cases, meet CETA requirements; cost and storage volume are what differ.

Lower cost geothermal and LDES together help reduce total builds

2050 cumulative builds



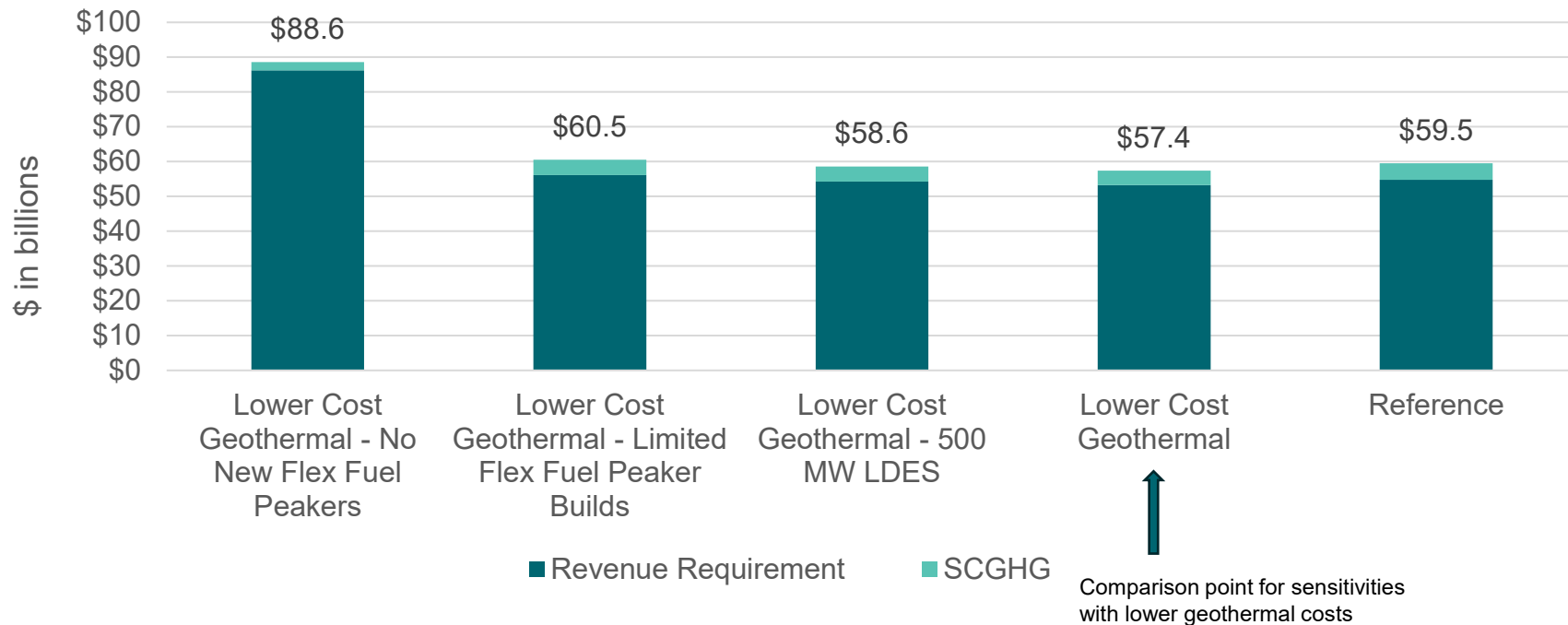
DRAFT – Subject to change

Note: All sensitivities meet CETA requirements.

Geothermal and LDES modelled together may partially provide an alternative to peakers on the margins

PSE

Net present value (NPV) portfolio costs



DRAFT – Subject to change

Note: All sensitivities meet CETA requirements; total build stays near 14,000 MW, so the resource mix shifts rather than the overall need changing.

Emerging tech sensitivities analysis show how these resources may add value (if available in the future)

PSE

Significant feasibility and cost challenges without emerging technology availability

\$104B ↑

NPV without emerging technology, as compared to \$55.0B for the Reference case

Lower cost geothermal reduces portfolio costs

\$2.1B ↓

lower NPV with lower cost geothermal, roughly 4% below the \$59.5B reference case

Volume of flex-fuel peakers could potentially be reduced with moderate NPV increase over reference

400 MW

less flex-fuel peaker nameplate than reference case when 500 MW of long duration storage is added, but NPV rises \$0.8B

54,940 MW ↑

of short-duration storage nameplate without emerging technology, roughly 30x the 1,840 MW in the reference case

\$1.3B ↑

higher NPV when adding LDES when compared to the reference case with lower geothermal costs.

\$95B ↑

NPV when long-duration storage is allowed, replacing 33,650 MW of short-duration storage

Appendix: Preferred portfolio development

Current cost test elements categorization

PSE

Categories

Monetized

Quantitative

Qualitative

Undetermined

Not applicable

Rate impacts

Electric rate impact
annually \$/kWh

Gas rate impact annually
\$/therm

Utility system impacts

Electric revenue
requirement with and
without SCGHG*

Gas revenue
requirement with and
without SCGHG*

Societal impacts

Social cost of
greenhouse gas
(SCGHG)*

Reliability*

Resiliency*

Security of supply*

Host customer*

Health and safety

Risk reduction premium*

Other environmental

Equity

Economic development

Other fuels

Appendix: Equitable distribution of benefits

Original minimum designation condition language

The logo for PSE (Pacific States Energy) is located in the top right corner. It consists of a dark teal diamond shape with the letters "PSE" in white, sans-serif font. To the left of the diamond is a red triangle pointing right, and to the right is a teal triangle pointing left.

Order 08, Condition 20 (2023)

“Minimum Designations. PSE will file with the Commission an amendment to this CEIP to designate for Named Communities a minimum of 30% of the energy benefits of its DER solar, DER storage, DR, and EE programs, with benefits measured across each tranche of resources. PSE will commit to developing a targeting approach to identify the customers and communities with deepest need within the broader category of Named Communities in consultation with interested persons and advisory groups. By the 2023 Biennial CEIP Update, PSE will designate a minimum percentage of energy benefits that will flow to Named Communities with deepest need.”

Order 12, Condition 2 (2024)

“PSE will set a minimum designation of energy benefits to customers in deepest need that is at least equal to that subset’s proportion of electric customers in the Company’s 2025 CEIP. PSE will continue to work with its advisory groups and other interested persons as appropriate to refine the definition of deepest need.”