Resource Planning Advisory Group Meeting

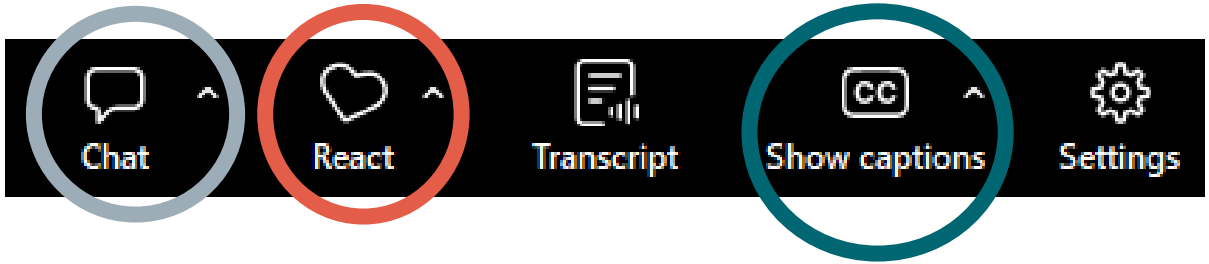
2027 Integrated System Plan

August 25, 2026

PUGET SOUND ENERGY

Welcome to the meeting!

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

**To ensure members of the public can see RPAG questions and comments, please select "Everyone" in the chat dropdown menu*

Facilitator requests

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

SAFETY MOMENT

Wildfire smoke safety

Check your local air quality at www.airnow.gov or on your phone's weather app.

Reduce your exposure to wildfire smoke by staying indoors when possible and avoid running or exercising outdoors.

Use high-efficiency air filters in your central A/C system or make a DIY air cleaner with a box fan and air filter.

Wear a tightly fitting respirator mask if air conditions are poor and you must go outside.

Today’s speakers

Hilary Wilkinson
Facilitator, Maul Foster & Alongi (MFA)

Jennifer Coulson
Director, Resource Planning Analytics, PSE

Kara Durbin
Director, Clean Energy Strategy, PSE

Mark Lenssen
Manager, Development and Evaluation, PSE

Steve Schueneman
Manager, Emerging Technology and Sustainability, PSE

Gurvinder Singh
Consulting Resource Planning Analyst, PSE

Elizabeth Hossner
Manager, Resource Planning and Analysis, PSE

Niecie Weatherby
Manager, Gas Systems Integrity, PSE

Today's discussion topics

1:05 p.m.	**Work plan update** Kara Durbin, PSE
1:10 p.m.	**Emerging technology assumptions and methodology** Steve Schueneman, PSE
1:25 p.m.	**Electric supply emerging technology sensitivities results** Elizabeth Hossner, PSE
1:45 p.m.	**Scenario analysis refresher** Jen Coulson, PSE
2:05 p.m.	**Gas scenario results – customer programs** Mark Lenssen, PSE
2:25 p.m.	**Gas scenario results – gas supply** Gurvinder Singh, PSE
3:00 p.m.	**Gas scenario results – gas delivery system** Niecie Weatherby, PSE
3:50 p.m.	**Next steps & public comment opportunity** Hilary Wilkinson, MFA

What we need from you

Share your questions, reflections, and advice on today's topics

Let us know if anything is missing or unclear

Flag areas where deeper discussion is needed

Help us identify risks, tensions, or points of misalignment early

Questions?

PSE PUGET SOUND ENERGY

Work plan update

Kara Durbin
Director, Clean Energy Strategy

August 25, 2026

PUGET SOUND ENERGY

DRAFT External engagement work plan for remainder of 2027 ISP cycle

September	October	November	December	January	Feb–March	April
RPAG • Scenarios and sensitivities draft results (continued) • Equitable distribution of benefits update	**RPAG** • Portfolio development • Cost test; decision framework update and application • Equitable distribution of benefits continued	**RPAG** • Portfolio development continued • Targets and goals • Specific actions	**RPAG** • Overview of Draft ISP Summary with Q/A	**RPAG** • Draft ISP Summary drop-in session to support final comments *Other advisory groups optional*	**PSE INTERNAL WORK** • Review public comments • Develop ISP filing	**MILESTONE** **On or before April 1** File ISP Commission review process begins
EAG • Equitable distribution of benefits (minimum designations continued)	**EAG** • Equity considerations (includes decision framework)	**EAG** • Portfolio development	**PUBLIC** • Overview of Draft ISP Summary with Q/A	**PUBLIC** • Overview of Draft ISP Summary with Q/A		
CRAG • Energy efficiency and demand response targets		**PUBLIC** • Portfolio development	**Draft ISP Summary public comment period**			

Emerging technology assumptions and methodology

Kara Durbin
Director, Clean Energy Strategy

Steve Schueneman
Manager, Emerging Technology and Sustainability

August 25, 2026

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Objectives

Revisiting emerging technology assumptions

- **Purpose of this session**
  - *Revisit* emerging technology assumptions previously developed through RPAG engagement
- **What PSE needs from you**
  - Shared understanding for how emerging technology is evaluated
- **How your feedback will be used**
  - Feedback may (time allowing) inform additional sensitivity analysis
  - Feedback not incorporated this cycle will be reconsidered for future planning cycles

Previous emerging technology engagement

Oct. 7, 2024 RPAG meeting	Black & Veatch technology assessment introduced the technology readiness level (TRL) framework and the cost and performance characteristics for emerging resources.
May 15, 2025 RPAG meeting	Emerging resource alternatives reviewed, including enhanced geothermal and the Black & Veatch cost estimates.
June 24, 2025 RPAG meeting	Emerging technology capital costs by technology, drawn from the Black & Veatch assessment.
Oct. 1, 2025 *Feedback memo*	PSE responses to modeling feedback, including which requests were incorporated and ELCC treatment of hybrid resources.
May 28, 2026 RPAG meeting	Revisited emerging technology assumptions and how they factor into the reference case.
Aug. 25, 2026 Today	Emerging technology assumptions and methodology, and the sensitivity results that follow.

How we treat emerging technology

We track emerging technology continuously, but only acquire it once it is commercially mature

Part of the ISP process

Outside the ISP process

1 Monitor

Track pilots and demonstrations from a distance; not yet a resource option in the model.

2 Assess

Review cost, performance and supply-chain evidence with the RPAG and set a first-year-available date based on technology readiness level (TRL).

3 Model

Technology enters the model as a candidate resource once its cost and performance are credible.

4 Acquire

Handled through separate competitive procurement, such as a request for proposal (RFP) where there are multiple vendors for specific technologies — not part of the ISP.

What we mean by mature

Proven at utility scale
Operating commercial projects, not pilots

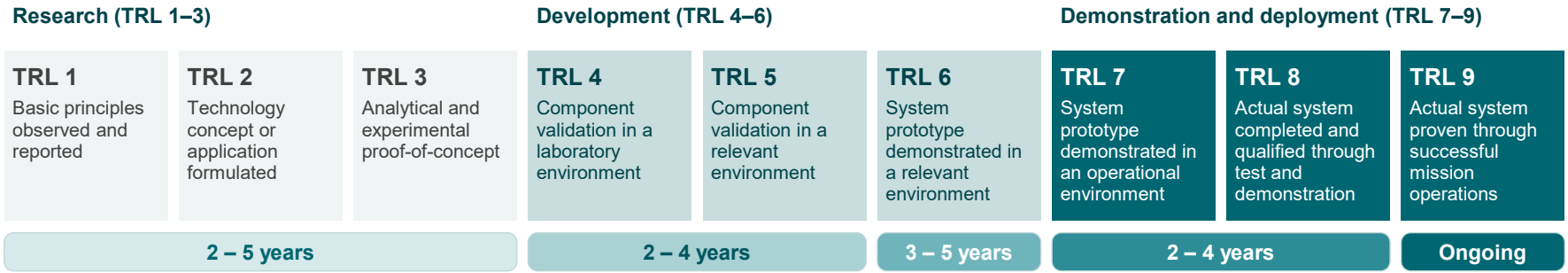
Credible cost and performance
Independent, verifiable data

Deliverable supply chain
Equipment, labor and financing available

Clear path to interconnect
Siting, permitting and transmission in hand

How technology readiness is measured

Black & Veatch rates every resource on the standard nine-point readiness scale used across the 2027 ISP



Where the resources modeled in the 2027 ISP sit on this scale

TRL 6/7 — prototype in an operational environment
Long-duration iron-air storage, enhanced geothermal, nuclear small modular reactors. Working pilots in the field, no commercial fleets yet.

TRL 8 — system completed and qualified
Advanced compressed air storage and floating offshore wind. Demonstrated at scale, with limited commercial fleets.

TRL 9 — proven through sustained operation
Wind, solar, lithium-ion storage and peaking generation. Established supply chains and decades of operating data.

A resource has to reach TRL 6/7 before cost modeling assumptions can be refined and included as a sensitivity. The gap between TRL 7 and TRL 9 is what separates a working pilot from a resource with proven commercial operation.

Source: Black & Veatch; scale definitions follow the NASA 1-9 technology readiness level convention.

Why long-duration storage is modeled as available in 2035

First commercial units are shipping, but factory ramp, procurement cycles and construction push realistic PSE-scale delivery into the 2030s

Through 2024

Pilot agreements signed: Great River Energy, Georgia Power (15 MW / 1,500 MWh) and two 10 MW Xcel coal-site projects.

2025

Weirton, WV factory expansion completes; first commercial batteries ship in October to Cambridge, MN.

2026

Cambridge 1.5 MW / 100-hour system due fully operational; Georgia Power 15 MW targeted online.

2026-28

Xcel and Google commit to 300 MW / 30 GWh in Minnesota; DOE-backed 85 MW Lincoln, ME project advances.

2028

Factory reaches at least 500 MW per year; first modules ship for the 300 MW project.

2030s

Sustained, competitive supply and delivery terms at the scale a utility portfolio requires.

What it takes to bring a PSE-scale project online

Technology readiness

Black & Veatch rates iron-air batteries TRL 7 of 9; a prototype proven in an operational environment, not a commercial system.

Procurement and approvals

Georgia Power ran from IRP identification (2022) to definitive agreement (2023) to a 2026 in-service target; about four years.

Supply and delivery queue

One factory scaling to 500 MW per year by 2028; Form Energy says pipeline demand already exceeds its planned 2028-30 output.

Construction and interconnection

Cambridge took about two years from groundbreaking to operation; projects reuse coal and mill sites to shorten interconnection.

Starting procurement of a 500 MW iron-air battery in 2030 would likely take until 2034 to bring it online by January 1, 2035. If the technology matures faster and proves cost-effective, PSE could potentially acquire it sooner (nothing in the ISP process prevents that) and we will update our assumptions each cycle.

Sources: Black & Veatch; Form Energy; Great River Energy; Georgia Power; Xcel Energy. Publicly announced projects as of mid-2026.

Technology modeled – first year available

First year available and resource capital cost, by technology (outlined rows are emerging technologies)

Type	TRL (1–9)	First year available	Resource Capital Costs In 2020$/kw vintage year 2025
Wind (eastern Washington)	9	2031	$1,972
Solar (eastern Washington)	9	2031	$1,938
Short-duration storage (Li-ion battery)	9	2031	$1,844
Natural Gas Peaker	9	2031	$1,624
Renewable Peaker	9	2031	$1,988
Mid-duration storage (advanced compressed air)	8	2035	$2,321
Long-duration storage (iron air)	7	2035	$2,273
Enhanced geothermal	7	2035	$11,893*
Nuclear small modular reactor	7	2040	$13,518
Offshore wind (floating foundation) Class 12	8	2045	$16,224

Every currently available resource modeled is TRL 9 and available by 2031; the emerging set sits at TRL 7-8 and does not arrive until 2035-2045.
TRLs for emerging resources per Black & Veatch; proven commercial resources shown as TRL 9. Offshore wind fixed foundation is TRL 9, but the floating foundation needed for the Pacific coast is TRL 8.

** PSE is testing lower cost geothermal via sensitivities.*

Technology modeled – effective load carrying capacity

Winter season

Type	Tranche 1	Tranche 2	Tranche 3
Wind (eastern Washington)	6%	3%	1%
Solar (eastern Washington)	10%	4%	1%
Short-duration storage (Li-ion battery)	25%	16%	10%
Natural Gas Peaker	95%	95%	95%
Renewable Peaker	91%	91%	91%
Mid-duration storage (advanced compressed air)	44%	19%	11%
Long-duration storage (iron air)	85%	85%	13%
Enhanced geothermal	96%	96%	96%
Nuclear small modular reactor	97%	97%	97%
Offshore wind (floating foundation) Class 12	34%	11%	2%

Note: ELCC methodology and values were presented to and discussed with the RPAG at the September 30, 2025 meeting, where E3 reviewed PSE's resource adequacy framework, ELCC and planning reserve margin in detail.
Source: 2027 ISP Resource Adequacy results materials (E3), September 30, 2025 RPAG meeting.

Questions?

PSE PUGET SOUND ENERGY

Electric supply emerging technology sensitivities results

Elizabeth Hossner
Manager, Resource Planning and Analysis, PSE

August 25, 2026

PUGET SOUND ENERGY

Objectives

Electric supply sensitivities results

- **Purpose of this session**
  - Describe sensitivities completed to date and how they are driven by RPAG and public feedback (more sensitivities to come in Sept.)
  - *Inform* RPAG on results to date
  - *Consult* on potential additional sensitivities (time allowing)
- **What PSE needs from you**
  - Feedback on potential additional sensitivities that may be needed
- **How your feedback will be used**
  - Feedback may (time allowing) inform additional sensitivity analysis for 2027 ISP
  - Feedback will also inform future ISP cycles

Feedback driving emerging technology sensitivities

FEEDBACK THEMES

Model enhanced geothermal at lower costs

Parties suggested geothermal is on the verge of a breakthrough and requested PSE model lower costs.

Reduce presumed reliance on gas peakers

The reference case portfolio includes ~5,000 MW of flex-fuel peakers by 2050. Parties asked PSE to model alternatives that reduce or eliminate reliance on peakers.

Give long-duration storage a closer look

Comments suggested long-duration energy storage (LDES) is closer if not already commercially viable and requested PSE model this more aggressively.

Revisit build limits

Comments asked PSE to not artificially limit batteries and solar.

PSE-INITIATED

Understand the downside risk if emerging tech does not arrive

Reliance on emerging technology creates risk as pilots are running but not at utility scale, so the sensitivities also test a portfolio limited to **currently** commercially available technology.

Emerging technology sensitivities modeled

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.

GEOTHERMAL

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.

If date is not specified, the forced in date aligns with the online date shown on slide 17 specific to that resource type

Our reference case is our starting point for further analysis

RESOURCES AVAILABLE TO THE REFERENCE CASE

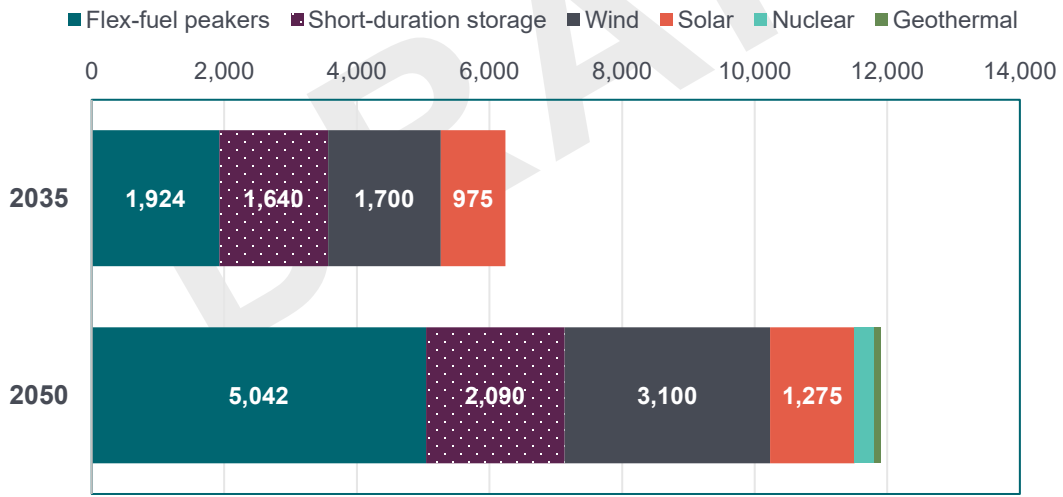
Yes	Geothermal (original cost)
No	Geothermal (lower cost)
Yes	Flex-fuel peaker
Yes	Long- and mid-duration energy storage
Yes	Nuclear small modular reactor
Yes	TRL 9 resources

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

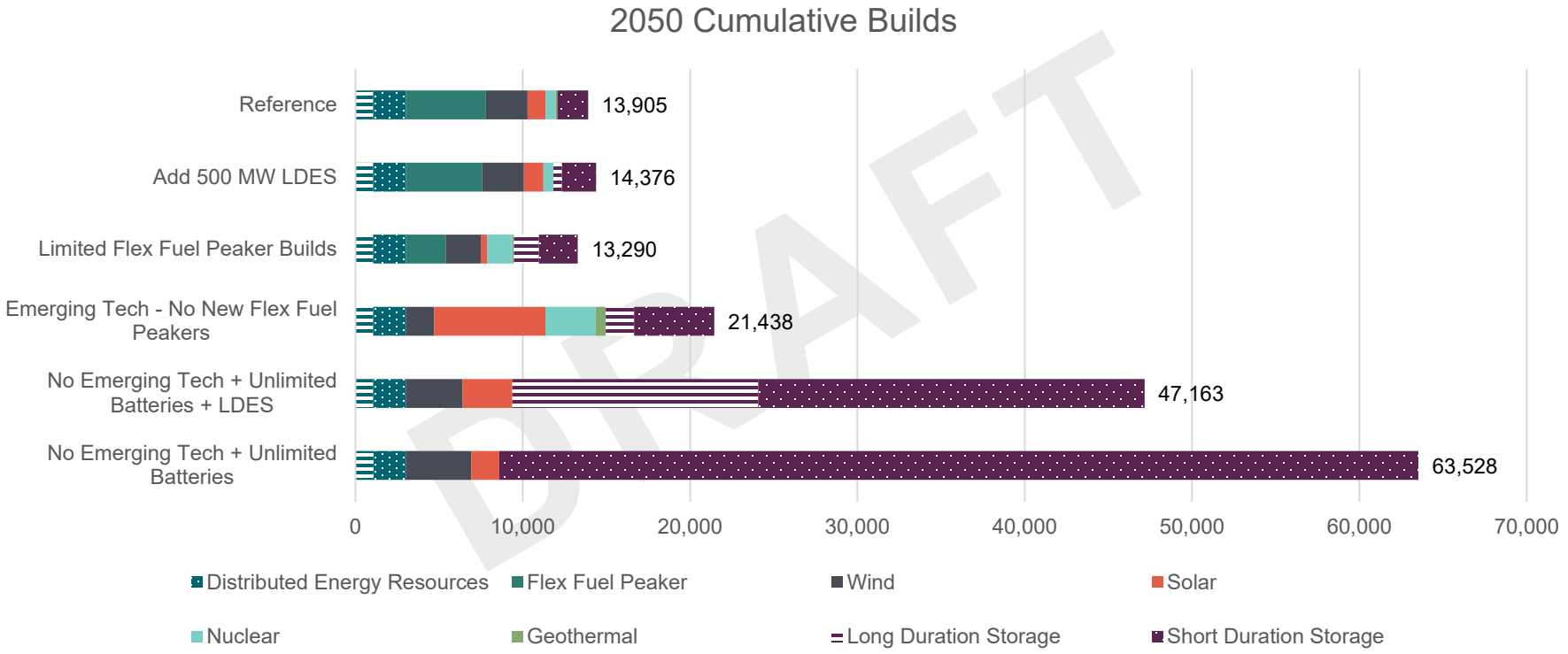
Cumulative resource builds, reference case (MW)



TRL: Technology readiness level

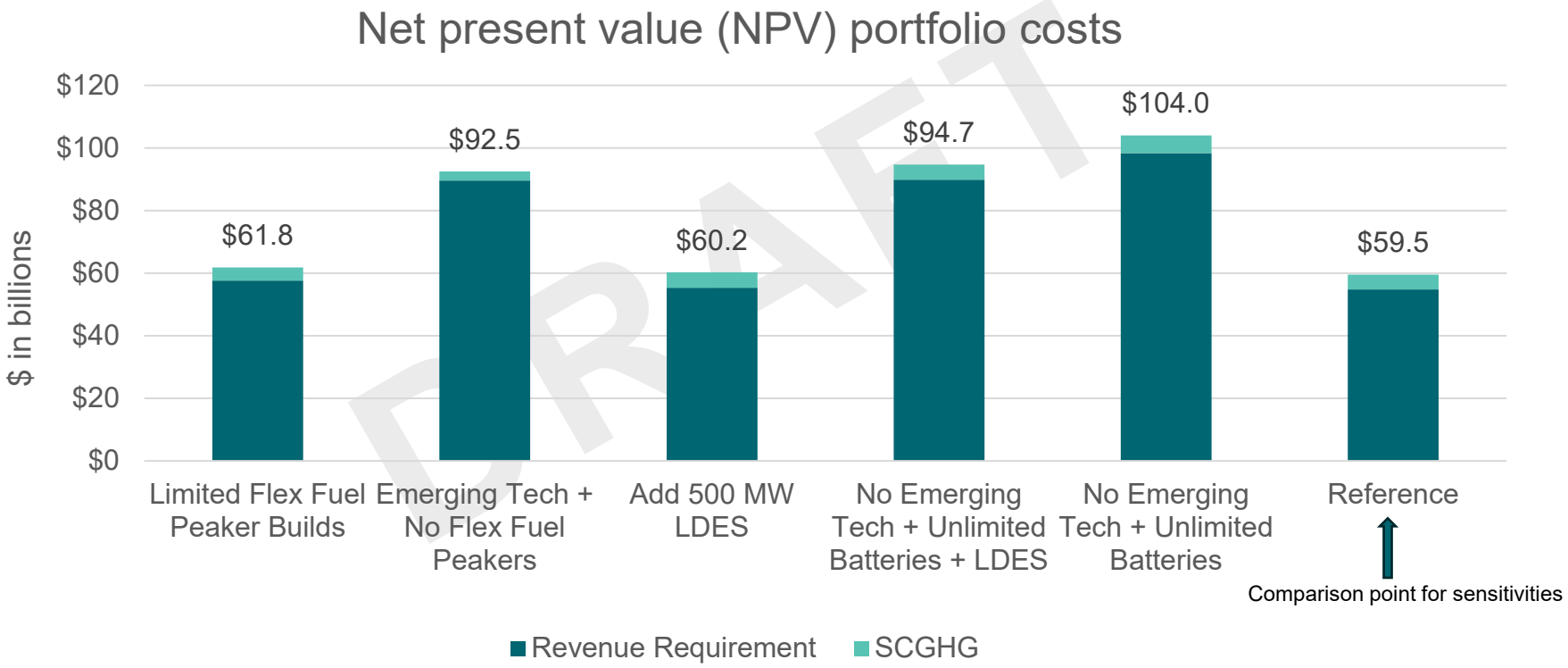
Sensitivity	Geothermal original cost	Lower cost geothermal	Flex-fuel peaker	Long duration energy storage	SMR, offshore wind and mid duration energy storage	TRL 9 resources: Short duration energy storage, onshore wind and solar
Reference case	Yes	No	Yes	Yes	Yes	Yes
No Emerging Tech	No	No	No post 2045	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



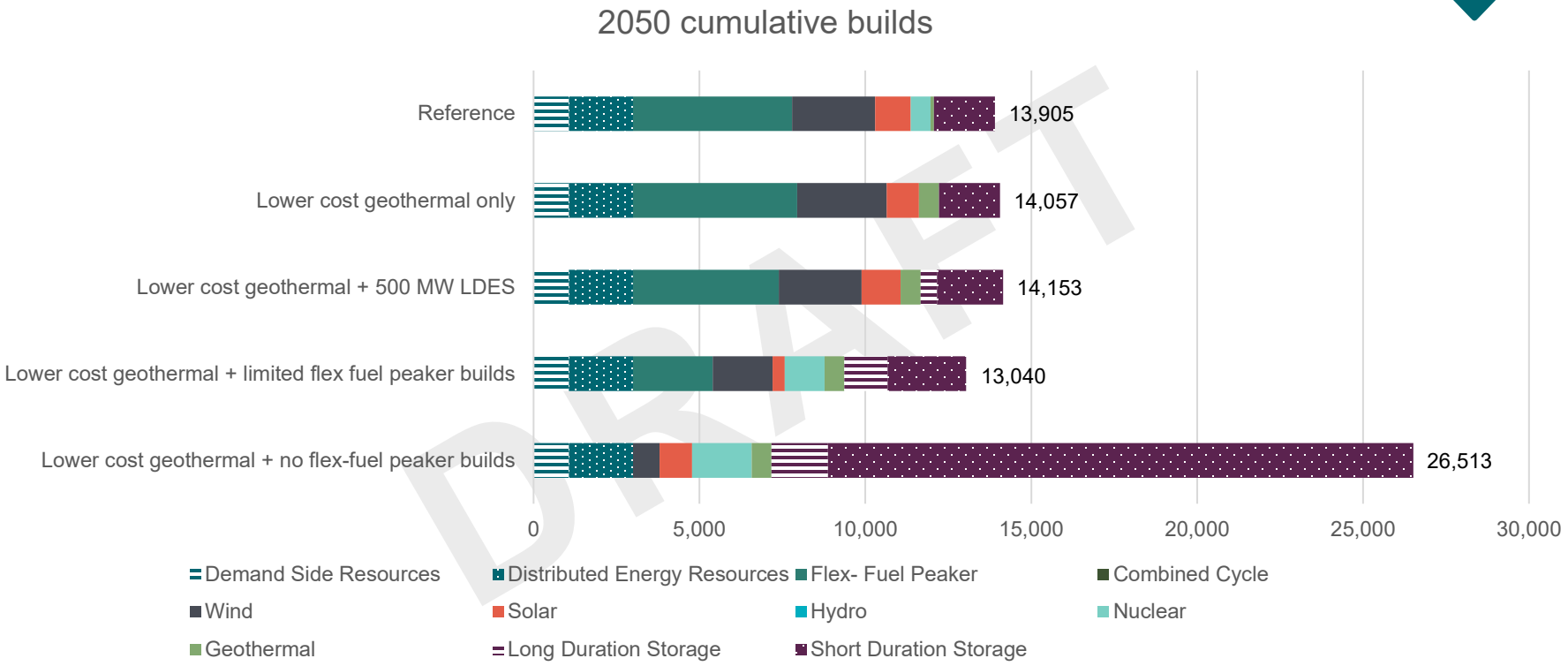
Note: all sensitivities, including the no emerging tech cases, meet CETA requirements; cost and storage volume are what differ.

Adding storage increases portfolio costs in all sensitivities



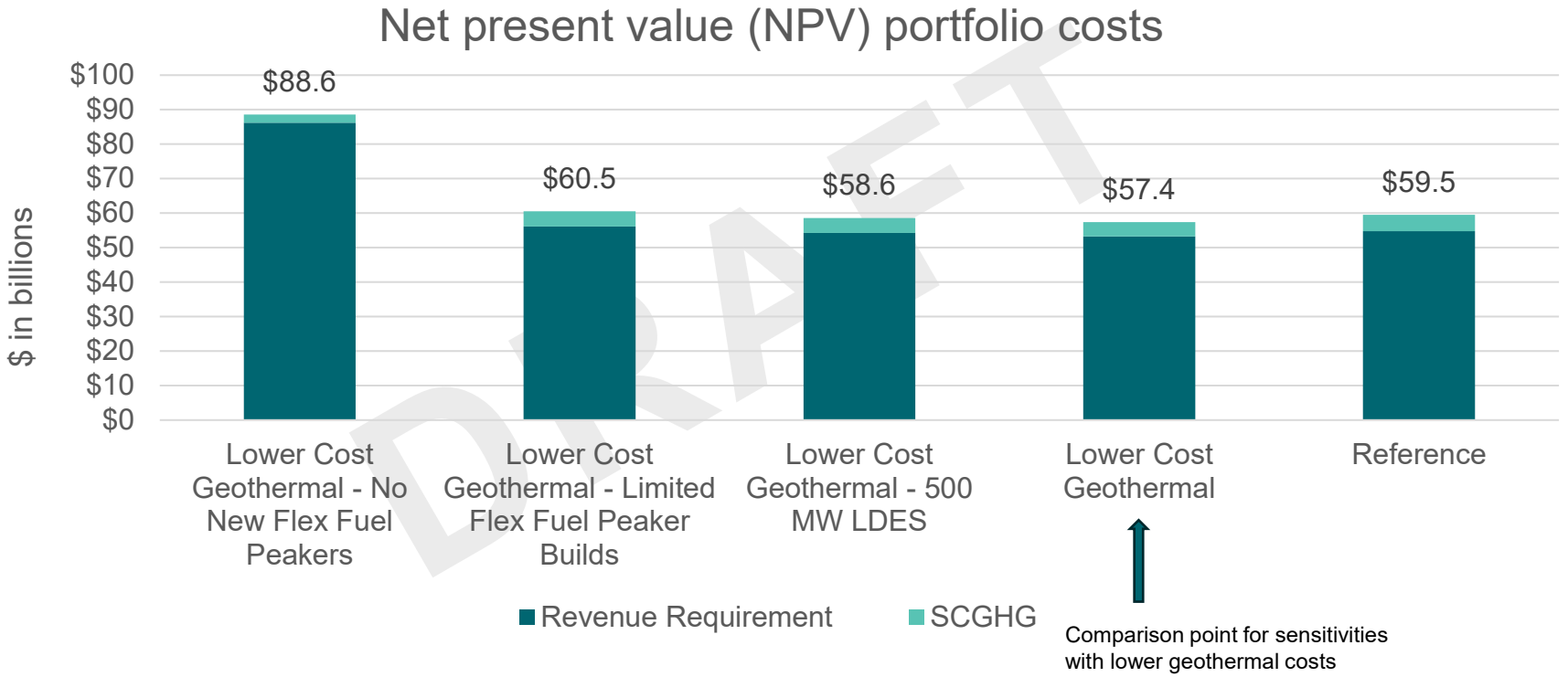
Note: all sensitivities, including the no emerging tech cases, meet CETA requirements; cost and storage volume are what differ.

Lower cost geothermal and LDES together help reduce total builds



Note: All sensitivities meet CETA requirements.

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



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)

Significant feasibility and cost challenges without emerging technology availability

$104B ↑

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

54,940 MW ↑

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

$95B ↑

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

Lower cost geothermal reduces portfolio costs

$2.1B ↓

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

$1.3B ↑

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

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

Discussion questions

01

Sensitivity coverage

Are the emerging technology sensitivities capturing your feedback? If not, what are we missing?

02

Portfolio combinations

Are we missing an emerging technology combination that would be critical to inform a preferred portfolio?

Your input here shapes which sensitivities we carry into preferred portfolio development.

Questions?

PSE PUGET SOUND ENERGY

Scenario analysis refresher

Jen Coulson
Director, Resource Planning Analytics, PSE

August 25, 2026

PUGET SOUND ENERGY

Objectives

Scenario analysis refresher

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

Scenario results - part 1 of 2

TODAY- GAS UTILITY	NEXT MONTH- ELECTRIC UTILITY
Customer	Customer
Supply	Supply
Transmission and distribution	Distribution and transmission

Scenario background

Four tests every scenario should pass — discussed with the RPAG (Oct. 29 and Dec. 19, 2024)

1 **Realistic**
Outcomes that could plausibly occur within the next 10 years.

2 **Bookends**
Frame the full range of outcomes.

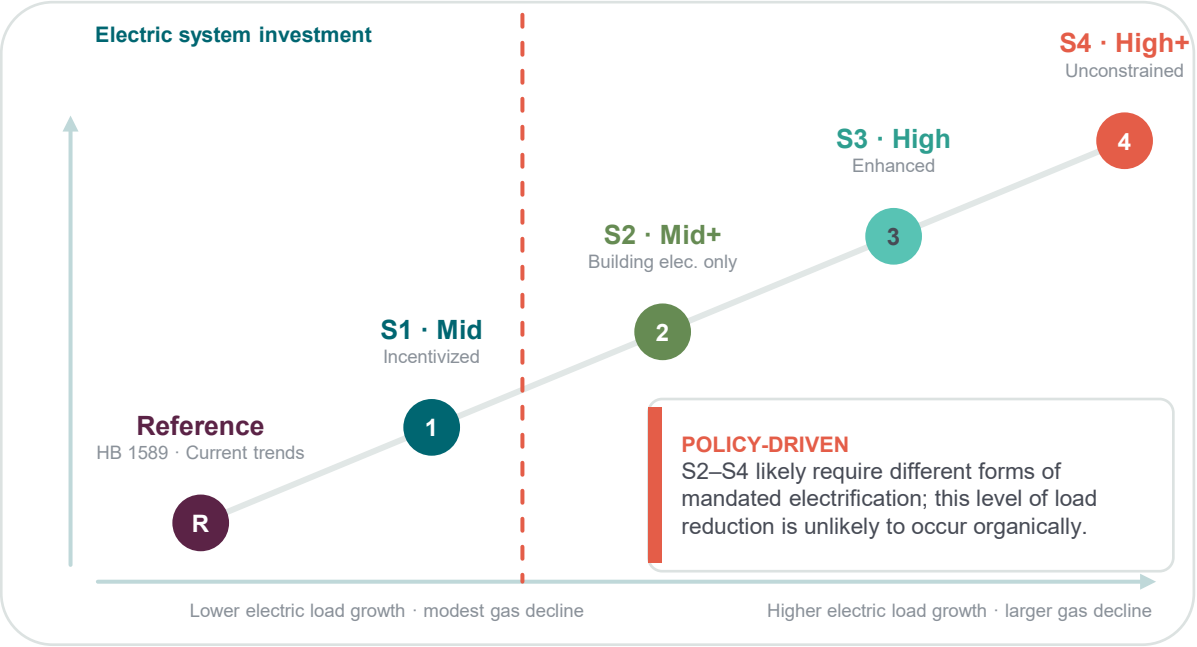
3 **Actionable**
Weigh the risk and likelihood of building too little — or too much.

4 **Cross-tested**
Evaluated by six planning teams.
Gas and electric customer · gas transmission and delivery · gas supply · electric supply · electric transmission and delivery

We speculated implications of each scenario (slide 42) but did not know the outcome for each scenario or the resource need that would follow.

What is the purpose of the load scenarios?

Five scenarios spanning the magnitude of clean electrification



REFERENCE CASE
Leverages current laws and requirements, assuming current or expected future conditions continue.

SCENARIOS S1–S4
Economic and environmental impacts outside of PSE's control, plus other extremes.

SCENARIOS S2 and S4
Include forced early retirements of gas appliances.

Scenarios establish the range of energy need (gas and electric) that a given portfolio must serve — not preferred outcomes. S2–S4 depend on policy that mandates electrification.

Scenario matrix

Demand assumptions across five load scenarios

	Reference HB 1589 · Current Trends	S1 · Mid Incentivized	S2 · Mid+ Building Electrification Only	S3 · High Enhanced	S4 · High+ Unconstrained
Building electrification	Pilots only	Incentivized	Unconstrained	Enhanced	Unconstrained
Large load requests	Lower impact	Lower impact	Lower impact	Higher impact	Higher impact
EV adoption	Reference	Reference	Reference	High	High

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

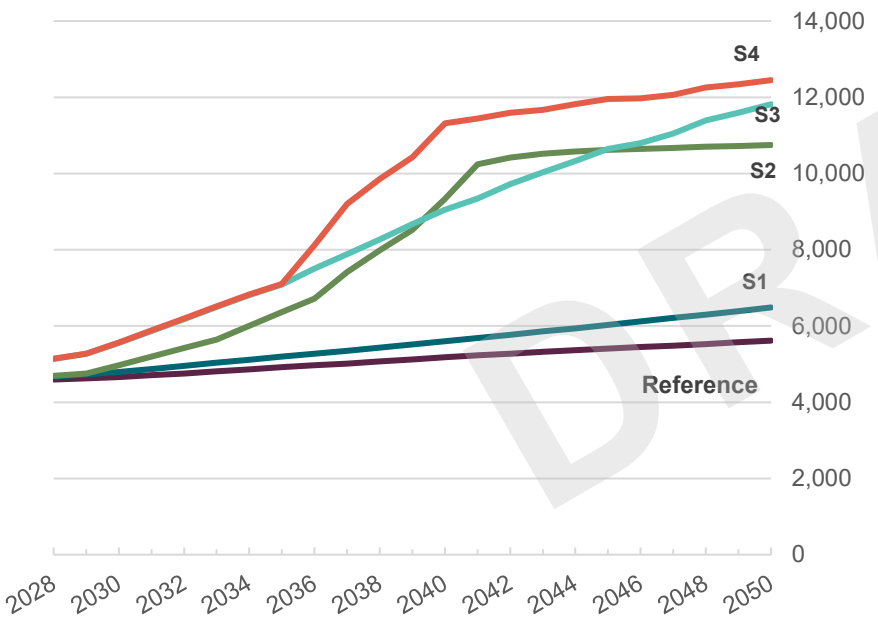
Dots show the relative intensity of each modeling assumption in each scenario.

Scenario system winter peaks

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

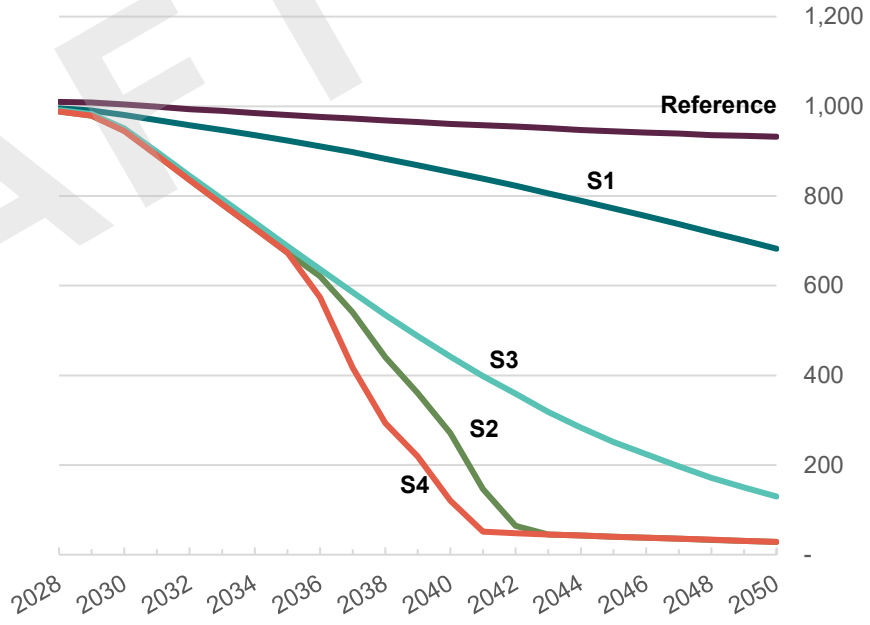
Electric system winter peak

Units: MW

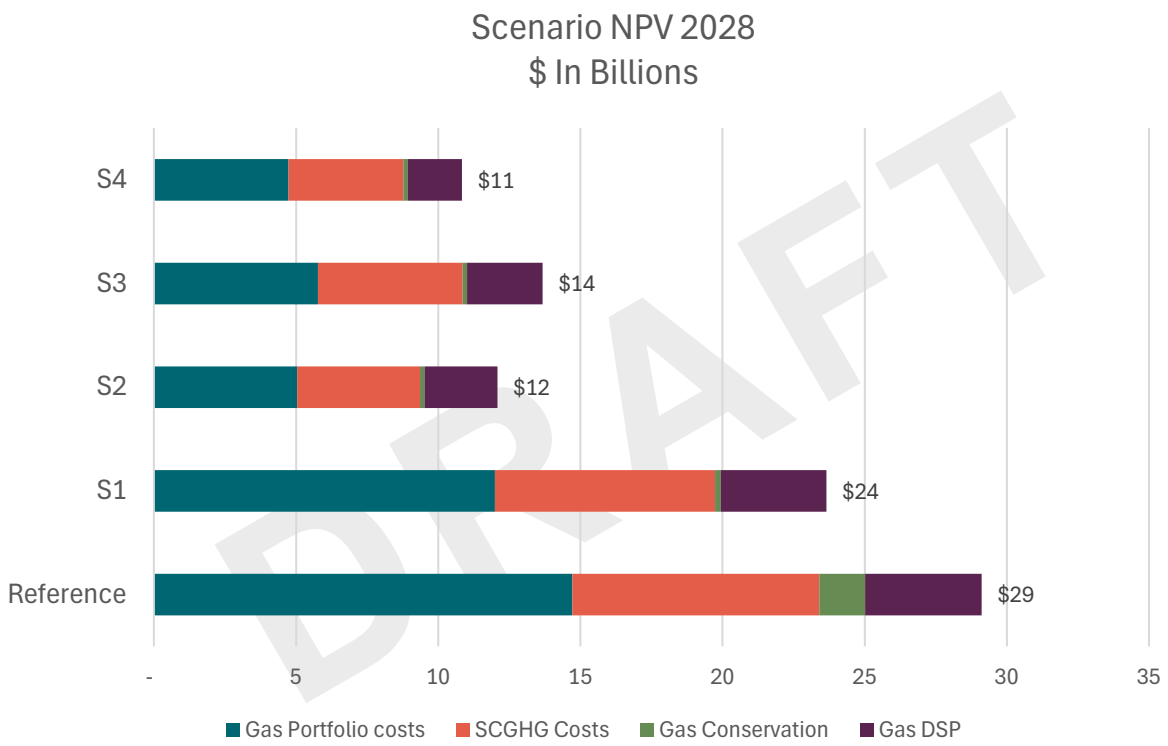


Natural gas system peak

Units: MDth (Therms /10,000)



Gas NPV by scenario (study period 2028 - 2050)

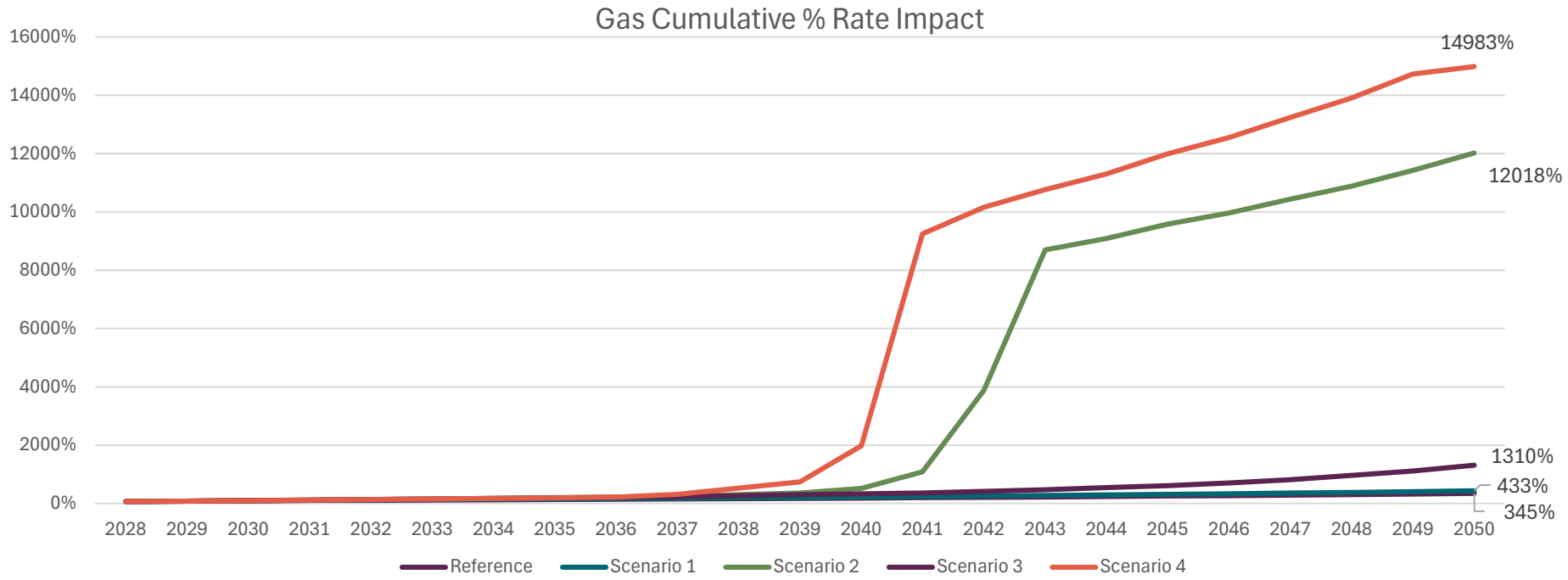


WHAT THIS DOES / DOES NOT INCLUDE

- Only includes costs from modeled work for the gas system
- **Does not reflect the costs and benefits associated with retirement of the gas system**. This is an area we would like to spend more time to evaluate and incorporate into future ISPs.
- Gas costs include gas system (upstream city gate), CCA and SCGHG, conservation, and Gas DSP. **This does not include the cost for the electrification or the corresponding electric utility costs.**
- **Value of no-cost allowances is not included.**

NPV: Net present value DSP: Delivery system planning CCA: Climate Commitment Act SCGHG: Social cost of greenhouse gas

Cumulative gas rate impact

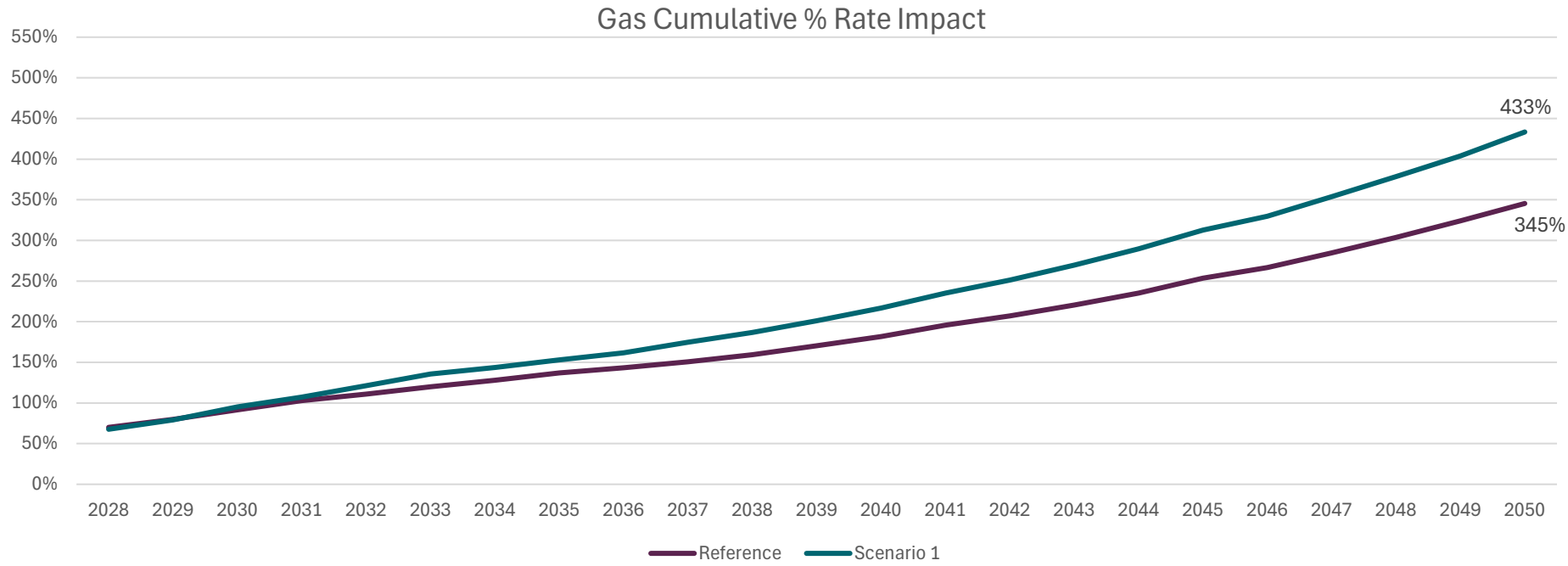


Scenario 2-4 are significantly higher in comparison due to small amount of remaining gas customers

Rate impacts are illustrative only and based on hypothetical assumptions, including CCA ceiling prices rather than expected CCA prices. The projections above should not be interpreted as PSE's expected rate impacts.

CCA: Climate Commitment Act

Cumulative gas rate impact: Reference & S1 (scaled up)



Rate impacts are illustrative only and based on hypothetical assumptions, including CCA ceiling prices rather than expected CCA prices. The projections above should not be interpreted as PSE's expected rate impacts.

Questions?

PSE PUGET SOUND ENERGY

Gas results – customer programs

Mark Lenssen
Manager, Strategic Planning, Evaluation & Research

August 25, 2026

PSE PUGET SOUND ENERGY

Objectives

Gas results – customer programs

- **Purpose of this session**
  - *Inform* RPAG on what is included in gas conservation programs, how the conservation potential assessment and reference case were built, and explain the results from scenario modeling
- **What PSE needs from you**
  - Dialogue to ensure the information is fully explained and understood
- **How your feedback will be used**
  - Feedback may (time allowing) inform additional sensitivity analysis

Gas conservation

WHAT IS INCLUDED IN GAS CONSERVATION

Residential

Includes but not limited to:

- Home weatherization
- Air sealing
- Duct sealing
- Hybrid heat pumps (heat pump with gas furnace backup)

Commercial

Includes but not limited to:

- Space heat and water heat equipment
- Building and/or system controls
- Heat recovery
- Commissioning and energy management

Industrial

Includes but not limited to:

- Process equipment
- Water heating
- Commissioning and energy management
- Energy recovery

Conservation Potential Assessment (CPA)

Guided by the load forecast available at the time and service territory building stock and end use load information.

Target setting & the Biennial Conservation Plan

Targets are established in coordination with the Conservation Resource Advisory Group in odd years (2027 is next up for the 2028/2029 program cycle). ISP inputs and analysis inform the gas BCP target setting process.

Gas conservation reference case and scenarios

Reference case

Blend between short-term program portfolio and the long-term CPA

HB 1589

- No **residential gas appliance** conservation (began in 2026)
- No **residential hybrid heat pump** incentives starting in 2030
- No **commercial gas equipment** conservation starting in 2030

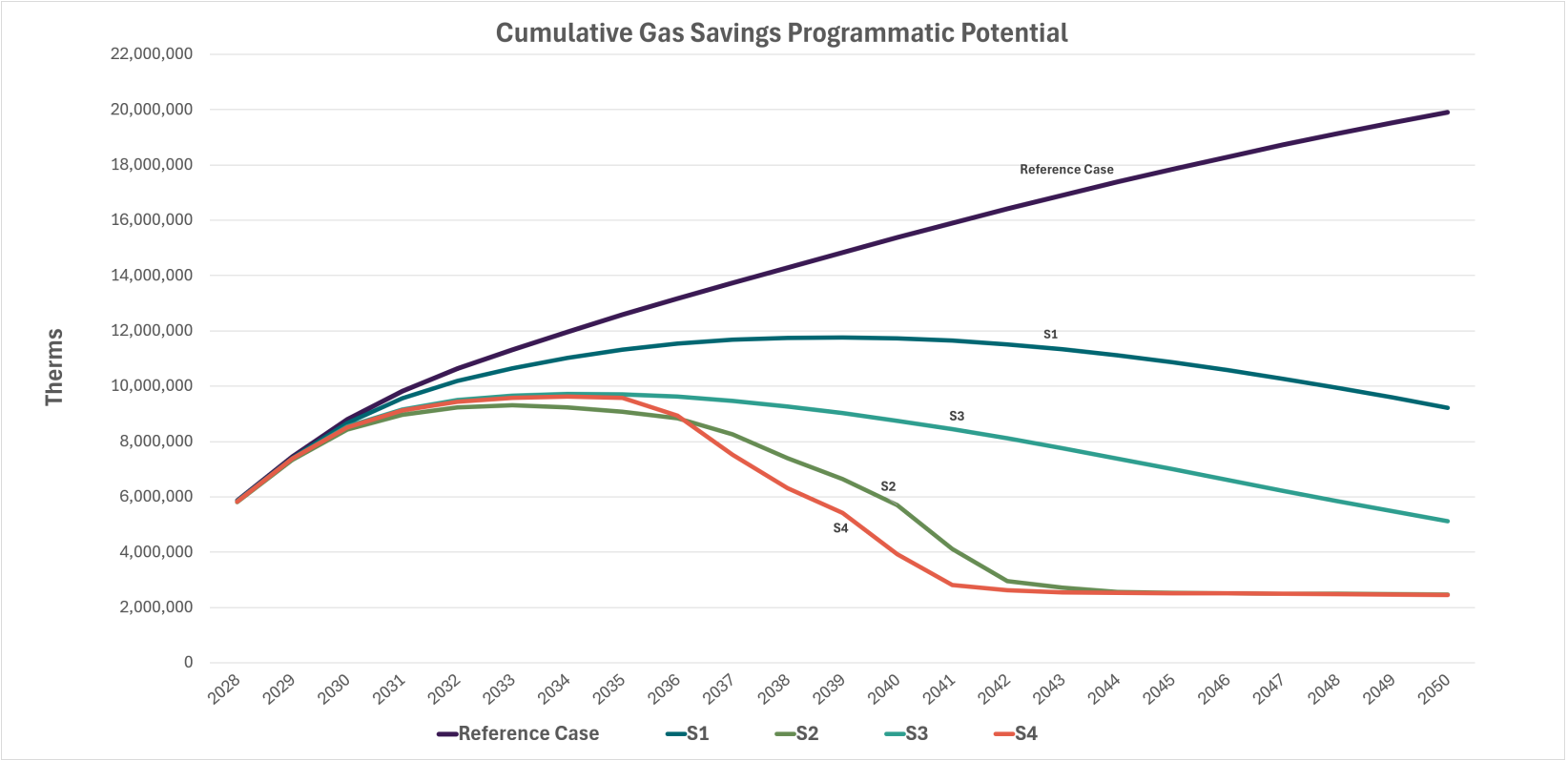
Includes residential, commercial and industrial customer savings

Scenarios

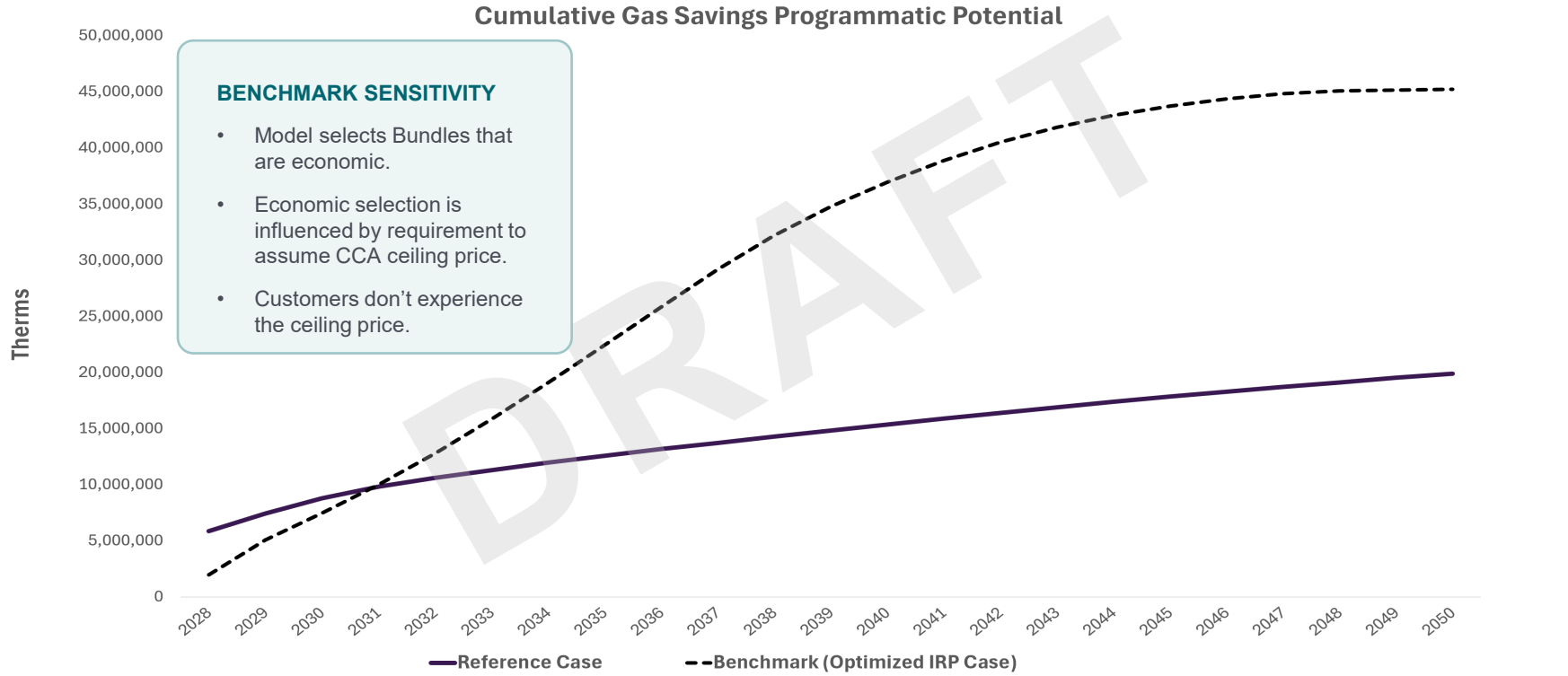
Building on reference case assumptions

- Demonstrate the result of differing levels of building electrification
- Net result shows the impacts to gas conservation (what's left) after customers switch from natural gas to electric alternatives

Gas conservation reference case & scenarios



Gas conservation reference case vs. benchmark sensitivity



Gas conservation – portfolio cost

Model	2035 ($ millions)	2050 ($ millions)
Reference	$269M	$443M
Scenario 1 (S1)	$237M	$282M
Scenario 2 (S2)	$183M	$184M
Scenario 3 (S3)	$203M	$207M
Scenario 4 (S4)	$200M	$201M

*The 2026/2027 Biennial Conservation Plan's two-year budget is ~$92M, or ~$46M/year.

Target setting and Biennial Conservation Plan

01 Target setting process

- Odd year planning cycle (2027 is up next supporting 28/29 BCP)
- Leverages the output of the CPA and ISP analysis (formerly IRP)
- Frequent engagement with the Conservation Resource Advisory Group (CRAG), particularly in a planning year

02 Biennial Conservation Plan

- Filed prior to the launch of the biennium
- Includes both gas and electric savings programs, as well as demand response
- Identifies energy savings goals and budgets
- UTC decision late in year or early the following year with the launch of the biennium

BCP: Biennial Conservation Plan CPA: Conservation Potential Assessment

Questions?

PSE PUGET SOUND ENERGY

Results – gas supply

Gurvinder Singh
Consulting Energy Resource Planning Analyst, PSE

August 25, 2026

PUGET SOUND ENERGY

Objectives

Results – gas supply

- **Purpose of this session**
  - *Inform* RPAG on gas supply scenario and sensitivity results
- **What PSE needs from you**
  - Feedback on the results and a shared understanding of the results to inform further analysis (as needed and time allows)
- **How your feedback will be used**
  - Feedback may (time allowing) inform additional sensitivity analysis

Key gas utility assumptions

Demand

Scenario demand forecast & weather

Gas Price

Mid for all scenarios

Climate Commitment Act Allowance Price

Ceiling for all scenarios

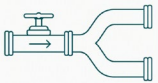
Social Cost of Greenhouse Gas

WUTC provided

Existing Resources

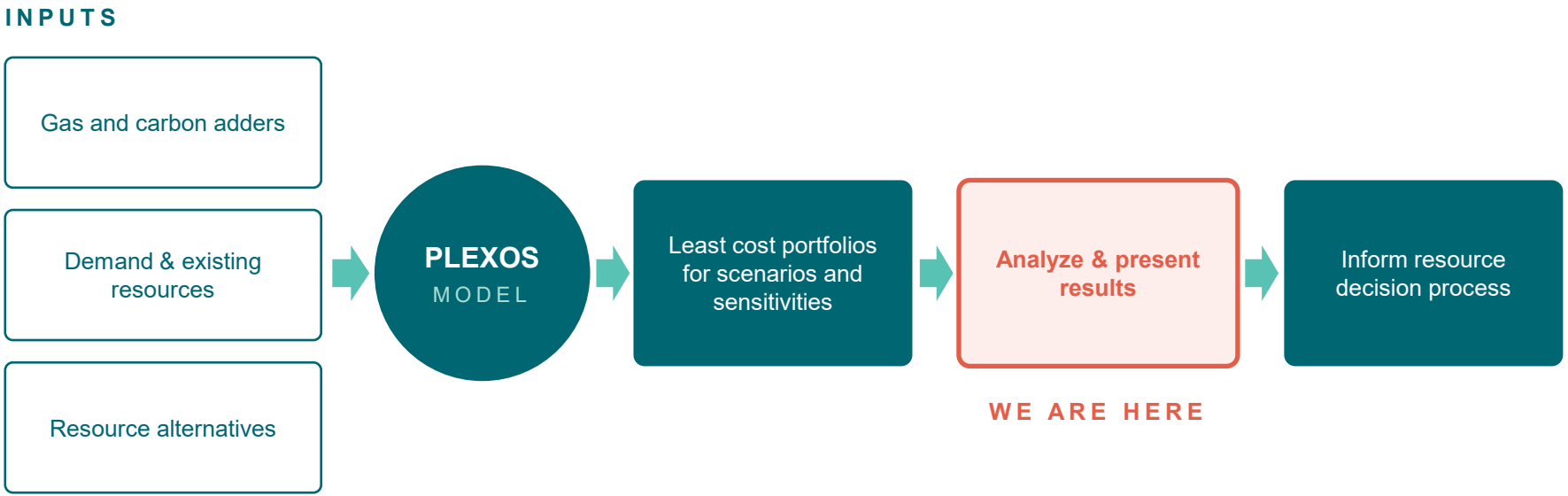
Operational and cost parameters

Resource Alternatives



Resources to be optimized

Gas analysis process

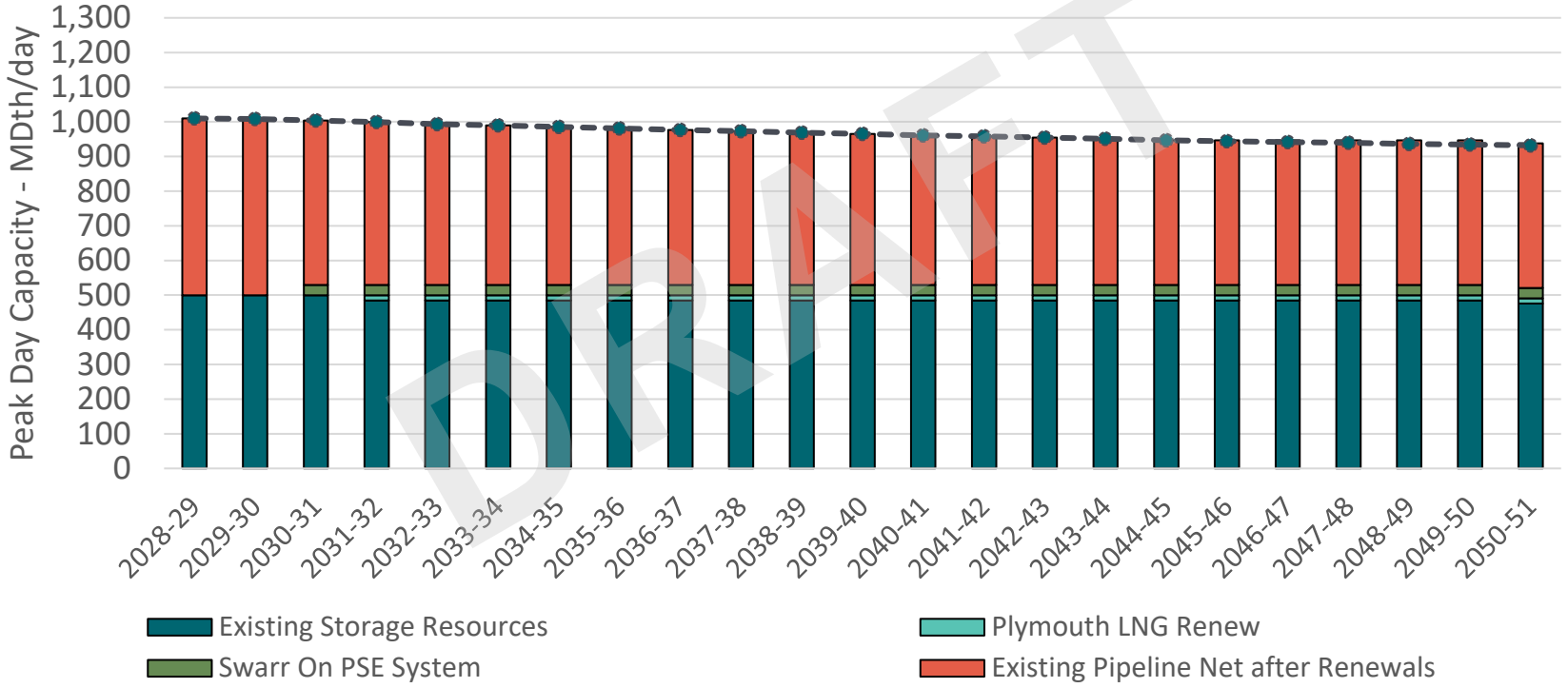


Gas supply costs are greater in 2027 ISP compared to 2023 IRP reference case

Portfolio	Portfolio Costs NPV $ billions		Draft results
	2028 - 2045	2028 - 2050	
2023 IRP *(NPV 2026-2045)*	$21.1	N/A	Preferred Portfolio – Last published analysis
DRAFT – May RPAG: 2027 ISP Reference	$24.4	$29.2	Notable updates: • CCA Ceiling price assumed • Modeling refinements
DRAFT – August RPAG: 2027 ISP Reference	$19.0	$23.4	Notable updates: • Updated CCA consigned allowances • Unused storage evaluation

Costs have been updated since May 2026 RPAG; now exclude CCA consigned allowances (only purchased allowances are retained).

Gas supply cumulative reference resource balance shows continued reliance on existing resources, Swarr, and Plymouth LNG



Costs have been updated since May 2026 RPAG.

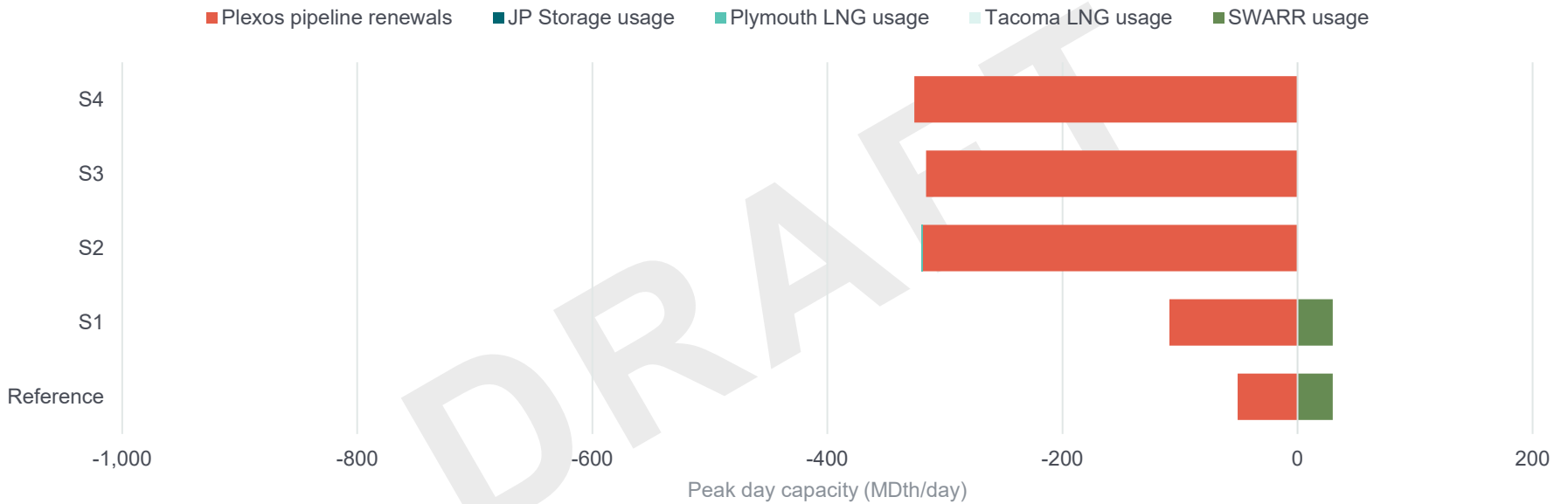
Gas scenarios

Scenario Name	Description	Gas Price	CCA Price	SCGHG
Reference (HB1589)	Current building electrification pilots, funding low income through CCA	Mid	Ceiling	WUTC Provided March 2026
Scenario 1 (Mid)	Building electrification >2030, **equipment failure, market adoption w/ incentives**	Mid	Ceiling	WUTC Provided March 2026
Scenario 2 (Mid+)	**Early** building electrification >2030, **bring emissions below** utility's proportional share of GHG emissions	Mid	Ceiling	WUTC Provided March 2026
Scenario 3 (High)	Building electrification >2030, **equipment failure, policy replacement**	Mid	Ceiling	WUTC Provided March 2026
Scenario 4 (High+)	**Early** building electrification >2030**, bring emissions below** utility's proportional share of GHG emissions	Mid	Ceiling	WUTC Provided March 2026

CCA: Climate Commitment Act GHG: Greenhouse gas SCGHG: Social cost of greenhouse gas WUTC: Washington Utilities and Transportation Commission

Cumulative 2035 gas supply-side resource builds

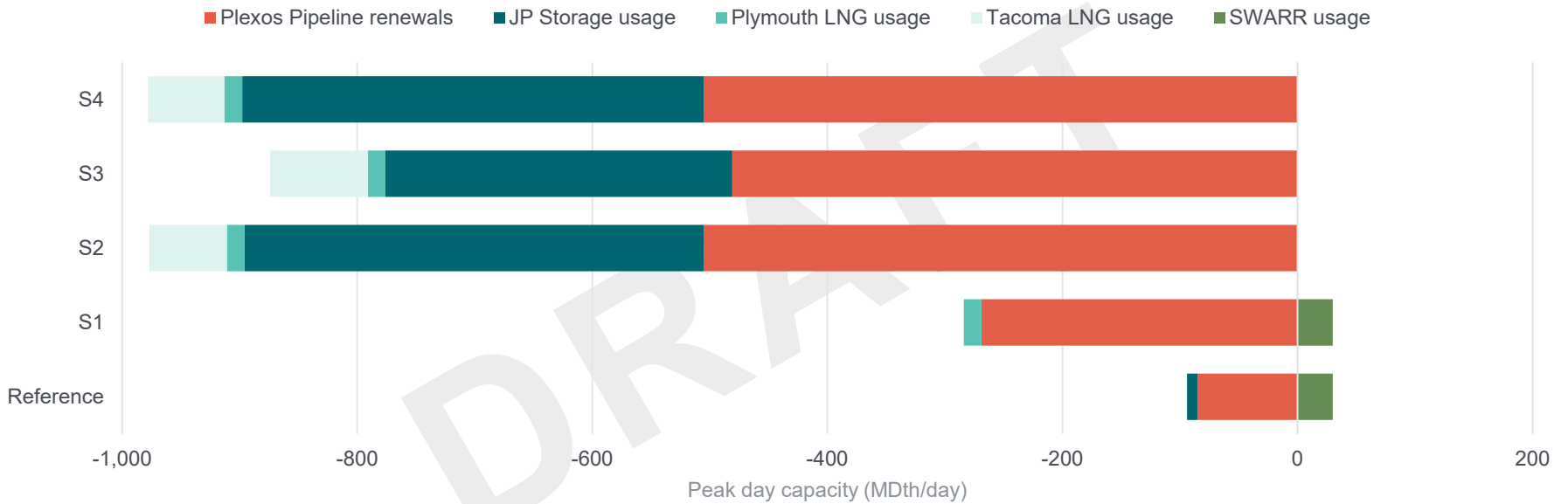
Cumulative winter peak day capacity, reference vs. S1–S4



In the 2035–36 winter, gas changes are modest and driven almost entirely by pipeline renewals.

Cumulative 2050 gas supply-side resource builds

Cumulative winter peak day capacity, Reference vs. S1–S4



By 2050–51 winter the higher-electrification scenarios reduce Jackson Prairie storage and LNG on top of pipeline renewals, roughly tripling the 2035–36 winter total.

Gas supply costs by scenario

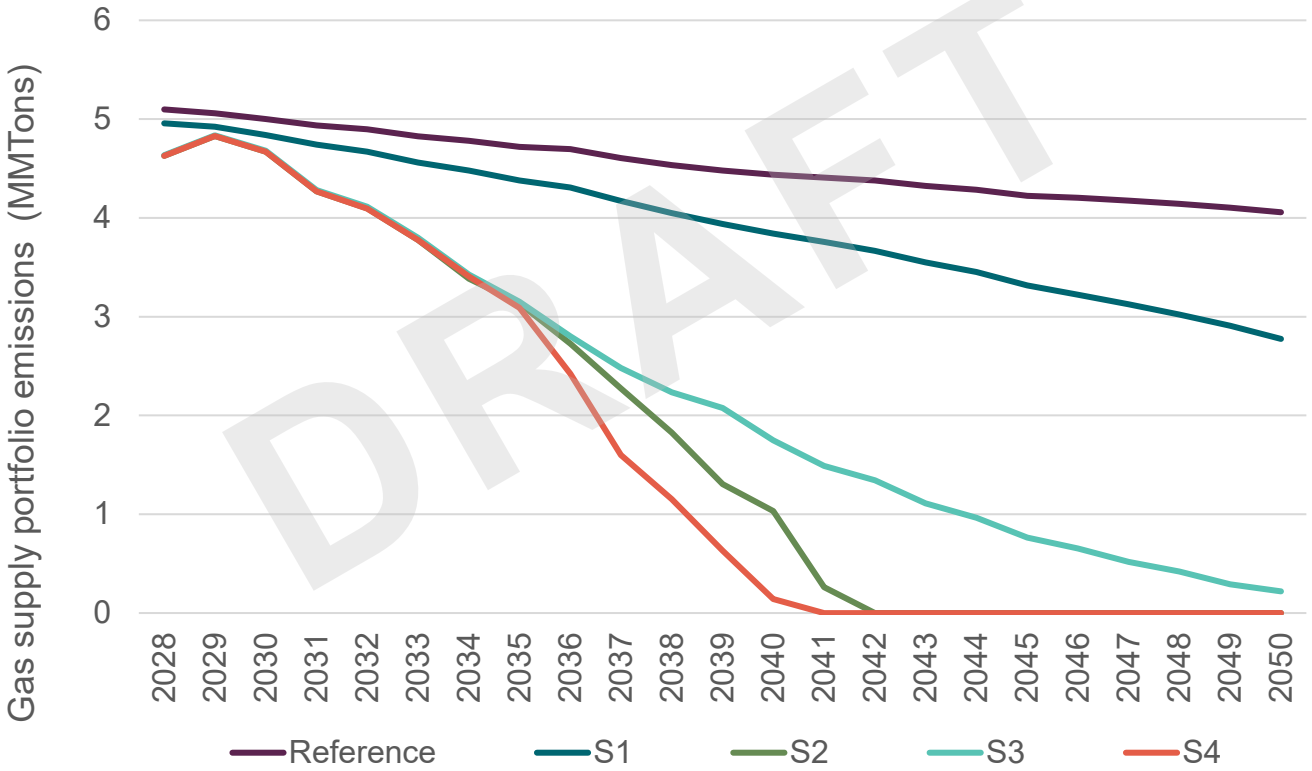
Portfolios	Gas Supply Costs NPV $ Billions 2028 - 2050
Reference (HB 1589): Current Trends	$23
Scenario 1 (S1 - Mid): Incentivized electrification	$20
Scenario 2 (S2 - Mid+): Building Electrification Only	$9
Scenario 3 (S3 - High): Enhanced electrification	$11
Scenario 4 (S4 - High+): Unconstrained electrification	$9

GAS SUPPLY COSTS DO NOT INCLUDE:

- Electrification conversion costs
- Conservation costs
- Gas transmission and distribution costs
- Costs associated with the unused supply side assets

Combined costs for **scenarios 1–4** (electric & gas) will be presented in the September RPAG.

Gas supply emissions by scenario



WHAT THIS INCLUDES

- These are emissions associated with just the gas portfolio, the impact from the combined electric/gas utility will be presented at the September RPAG
- Existing RNG included reduces emissions
- Transport customers with emissions <25k not included

DRAFT gas supply key takeaways

Reference Scenario

- Demand declines net of demand-side resources
- Northwest Pipeline peak day usage is reduced by 85 MDTh per day in 2050
- Usage of existing storages operate virtually at full capacity throughout the study
- All gas peaker plants (Swarr and LNG plants) usage is at full capacity on peak day
- Plymouth LNG contract renewed in 2031 – cost effective

Scenario 1-Mid*

- Demand declines due to demand-side resources and modeled customer adoption of electrification
- Modeled incentivized electrification reduces gas system emissions by 1.3 million metric tons in 2050
- Northwest Pipeline peak day usage is reduced by 269 MDTh per day in 2050
- The usage comments in Reference Scenario on storage and peakers are consistent under these modeled conditions
- Plymouth LNG contract renewed in 2031 – cost effective

Scenarios 2-Mid+ & 4-High+*

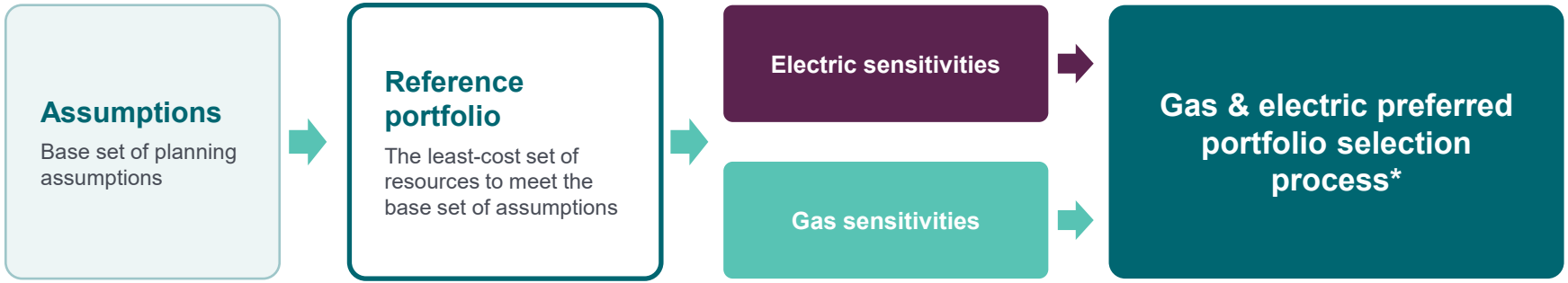
- Demand and emissions approach zero in 2050 based on modeled assumptions
- Assumes mandated electrification – early replacement of gas equipment
- Pipeline, storage and peaker usage is reduced to zero in later half of study period
- Gas portfolio system costs do not include costs for unused gas supply side assets

Scenario 3-High*

- Demand and emissions decline significantly by 2050 based on modeled assumptions
- Assumes mandated electrification – end of life replacement of gas equipment
- Gas portfolio systems costs do not include costs for unused gas supply side assets

Key takeaways are gas supply specific; incorporating the electric utility impacts is imperative to understand the studied outcomes of scenarios 1-4. This will be addressed in the September RPAG.

Sensitivity process overview



Sensitivity analysis changes one or more of the base assumptions to examine the effect on the portfolio

Note – Sensitivities are one aspect of the portfolio selection process, there are many other components not represented here (e.g., scenarios, decision framework)

Gas sensitivities – assumptions matrix

Name	Allowance Price (CCA)	SCGHG included	Demand	Gas Price	RNG
Reference Scenario	Ceiling	Yes	Net Reference	Mid	Existing
Benchmark DSR	Ceiling	Yes	Gross Reference	Mid	Existing
CCA Mid	Mid	Yes	Net Reference	Mid	Existing
CCA Floor	Floor	Yes	Net Reference	Mid	Existing
No CCA	None	Yes	Net Reference	Mid	Existing
No CCA, No SCGHG	None	No	Net Reference	Mid	Existing
High Gas Price	Ceiling	Yes	Net Reference	High	Existing
Low Gas Price	Ceiling	Yes	Net Reference	Low	Existing
NA Sourced RNG	Ceiling	Yes	Net Reference	Mid	RTCs

- CCA = Climate Commitment Act
- Net Reference = 2027 ISP Update Demand Forecast Net of Demand Side Resources (DSR)
- Gross Reference = 2027 ISP Update Demand Forecast before DSR
- NA = North America
- RTC = Renewable Thermal Credit

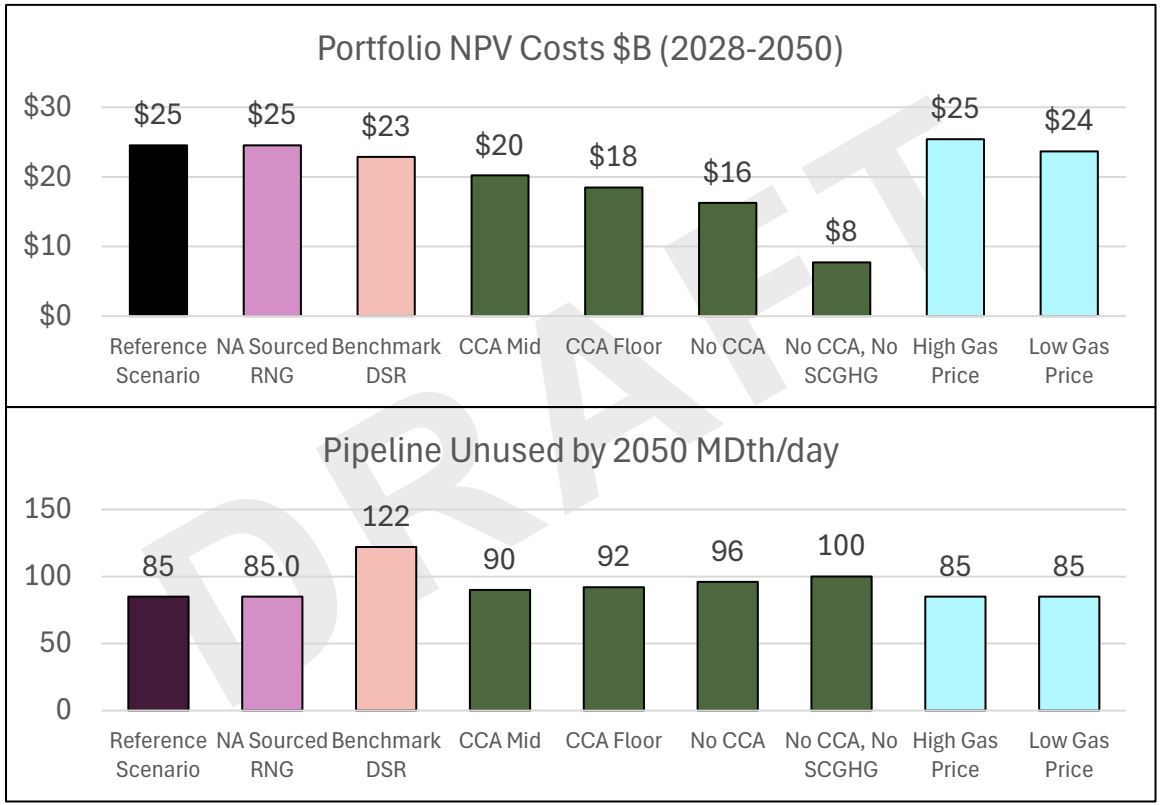
Gas supply sensitivities – results (2050)

Compare Sensitivity to Reference	Emissions in MMtons in 2050	Pipeline Unused in 2050 MDth/day	Storage Unused in 2050 MDTh/day	Portfolio NPV Costs $B (2028-2050)	Portfolio Cost Percent Change from Reference
Reference Scenario[1]	4.1	85	9	$25	0%
NA Sourced RNG[2]	4.1	85	9	$25	0%
Benchmark DSR	3.8	122	9	$23	-7%
CCA Mid	4.1	90	9	$20	-18%
CCA Floor	4.1	92	0	$18	-25%
No CCA	4.1	96	0	$16	-34%
No CCA, No SCGHG	4.3	100	0	$8	-69%
High Gas Price	4.1	85	15	$25	4%
Low Gas Price	4.1	85	15	$24	-4%

Notes:
1. Reference Scenario portfolio costs include the embedded Demand Side Resource costs
2. The “NA Sourced RNG” sensitivity did not select any Renewable Thermal Credit, so the results are the same as the Reference Scenario

RNG: Renewable natural gas DSR: Demand-side resources CCA: Climate Commitment Act NPV: Net present value

Gas sensitivities – portfolio NPV costs and key takeaways



KEY TAKEAWAYS

- Sensitivities focused on portfolio cost impacts
- CCA costs are a major contributor to gas supply portfolio costs
- Effects of CCA on changes in DSR were not evaluated
- Carbon adders impact on emissions is minor without alternatives offered
- Unused pipeline is driven primarily by embedded demand-side resources
- Benchmark DSR results in higher amount of unused pipeline
- Storage usage is essentially unchanged at full peak day capacity
- Renewable Thermal Credits were not found to be cost effective within this modeling exercise

Note: the Reference Scenario portfolio costs include embedded DSR costs (those costs are not included on slide 62)

NPV: Net present value CCA: Climate Commitment Act DSR: Demand-side resources RNG: Renewable natural gas

Questions?

PSE PUGET SOUND ENERGY

Scenario results – gas delivery system

Niecie Weatherby
Manager, Gas System Integrity

August 25, 2026

PUGET SOUND ENERGY

Objectives

Results – gas delivery system

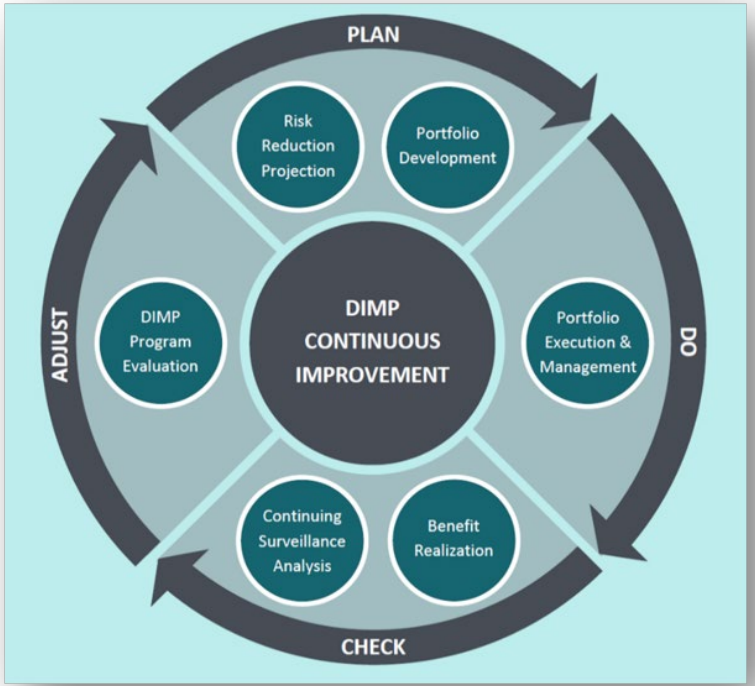
- **Purpose of this session**
  - *Inform* RPAG on gas transmission and delivery system scenario and sensitivity results in this ISP.
- **What PSE needs from you**
  - Clarifying questions and feedback on the scenario and sensitivity results.
- **How your feedback will be used**
  - Feedback may (time allowing) inform additional sensitivity analysis

Natural gas transmission and delivery system

- Purpose: Provide **safe, reliable natural gas** at the lowest reasonable cost
- Comprised of a combination of known or planned work and emergent work
- The analysis:
  - 2028–2050 planning horizon
  - Outputs of this analysis are costs to safely maintain and operate the natural gas system

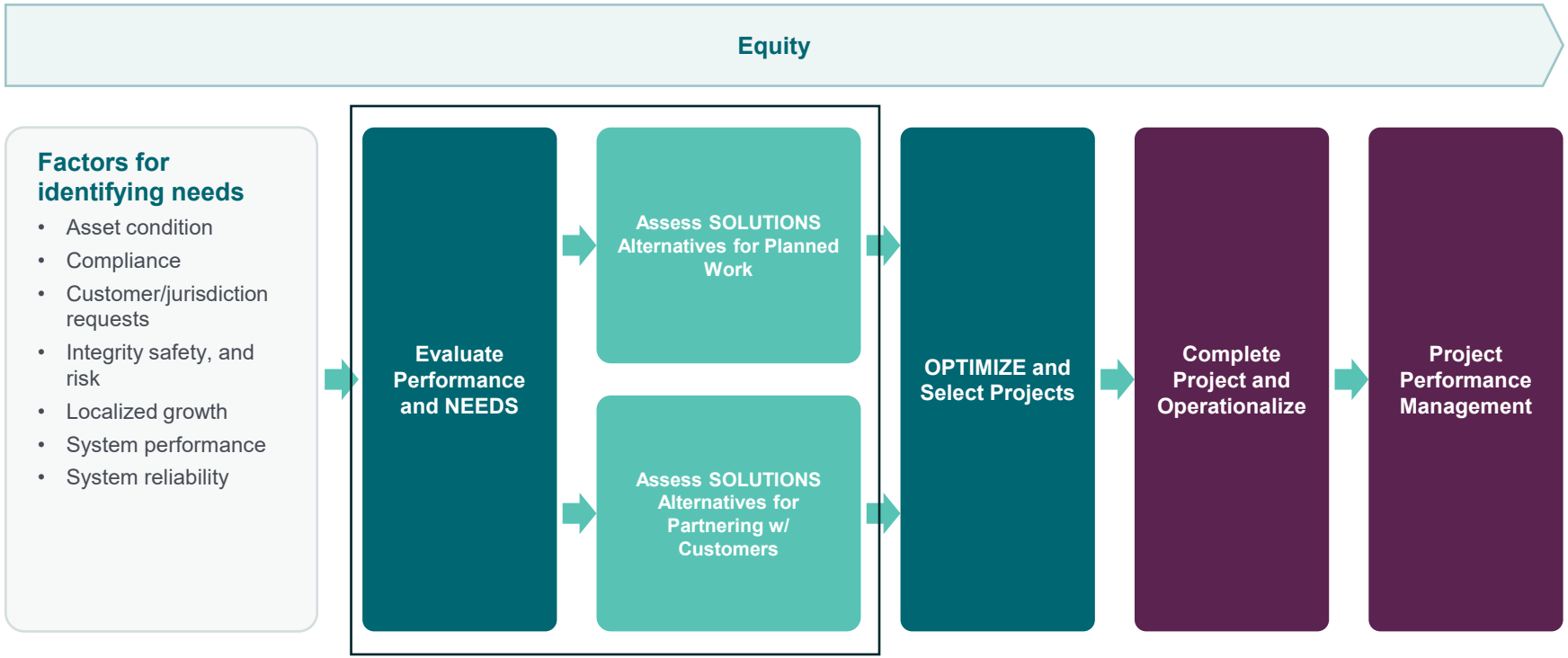
Federal integrity management programs support pipeline safety and reliability

- Federal pipeline safety programs provide a framework for managing pipeline risk*
- PSE maintains detailed knowledge of its gas system and identifies potential threats
- System risks are evaluated and prioritized based on likelihood and consequences
- Lessons learned, inspections, and performance monitoring drive program improvement
- Risks are addressed through appropriate mitigations
- Programs are regularly reviewed for effectiveness and compliance by WUTC



*Distribution Integrity Management Program (DIMP), Transmission Integrity Management Program (TIMP) and Pipeline Safety Management System

Identified needs are addressed through the most appropriate solution, including non-pipeline alternatives, continued monitoring, system reinforcement, or replacement



Work to ensure the system is safe and reliable is represented in 3 categories

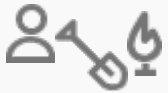
Customer requested and public projects

Respond to customer and jurisdictional requests

Reliability and resiliency

Deliver gas from the city gate to the customers in all conditions

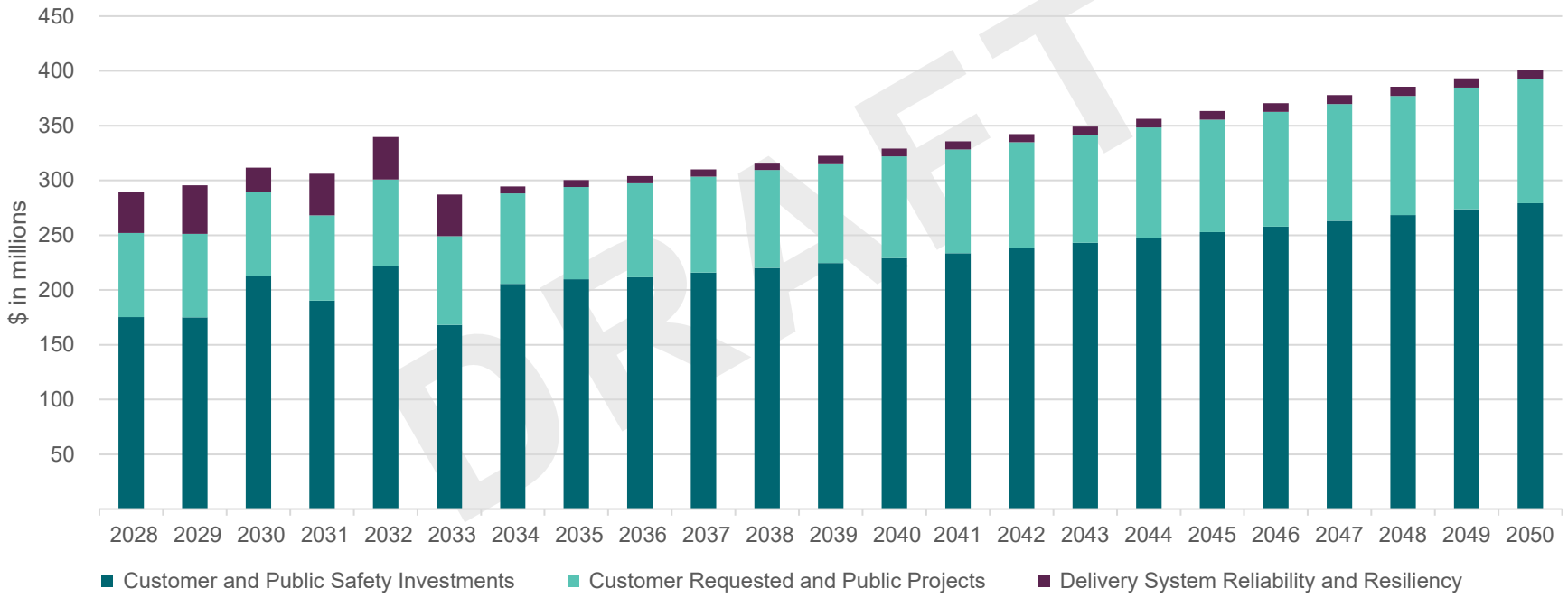
Customer and public safety



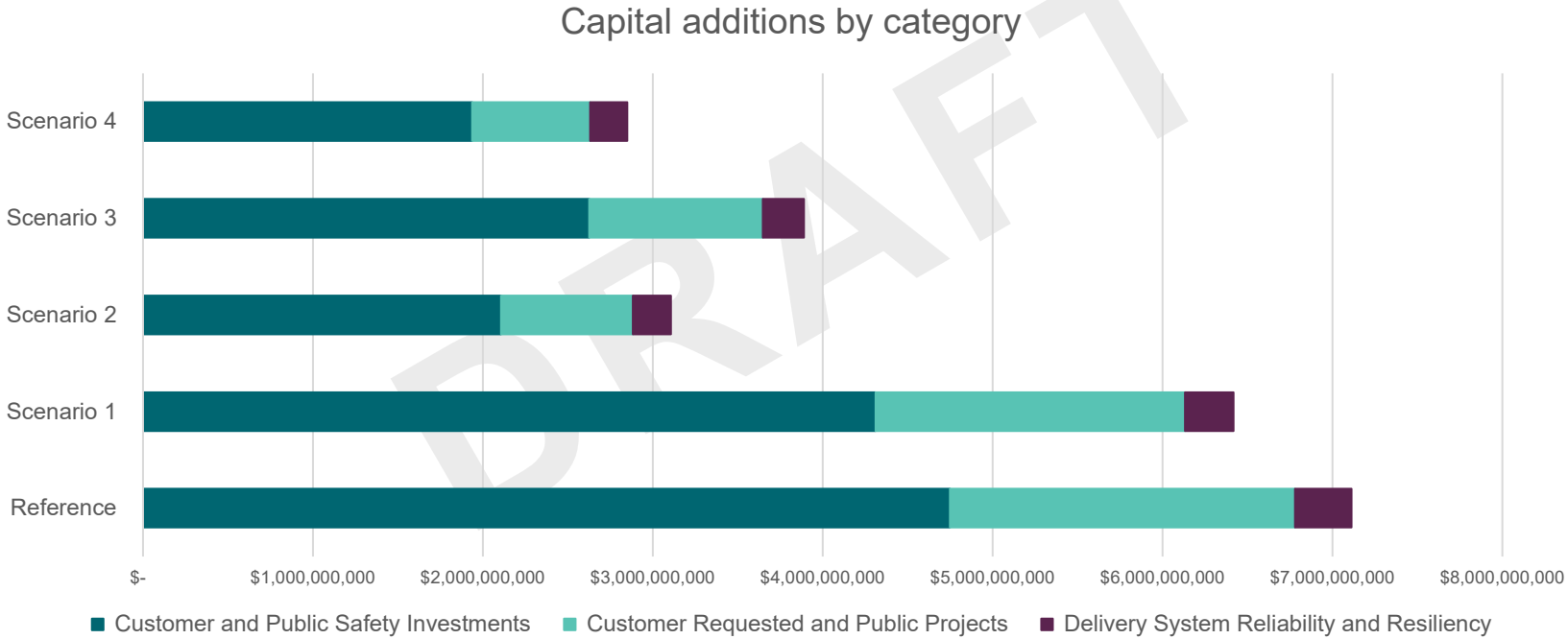
Respond to emergent needs, operate and maintain the system, and proactively identify and mitigate risks to the pipeline

Approximately 50% of the system needs for 2028 – 2030 are known today. The remainder will emerge over time through customer and public driven work, emergent needs, emergency repairs, and field discoveries. Planning uncertainty increases as the analysis horizon extends.

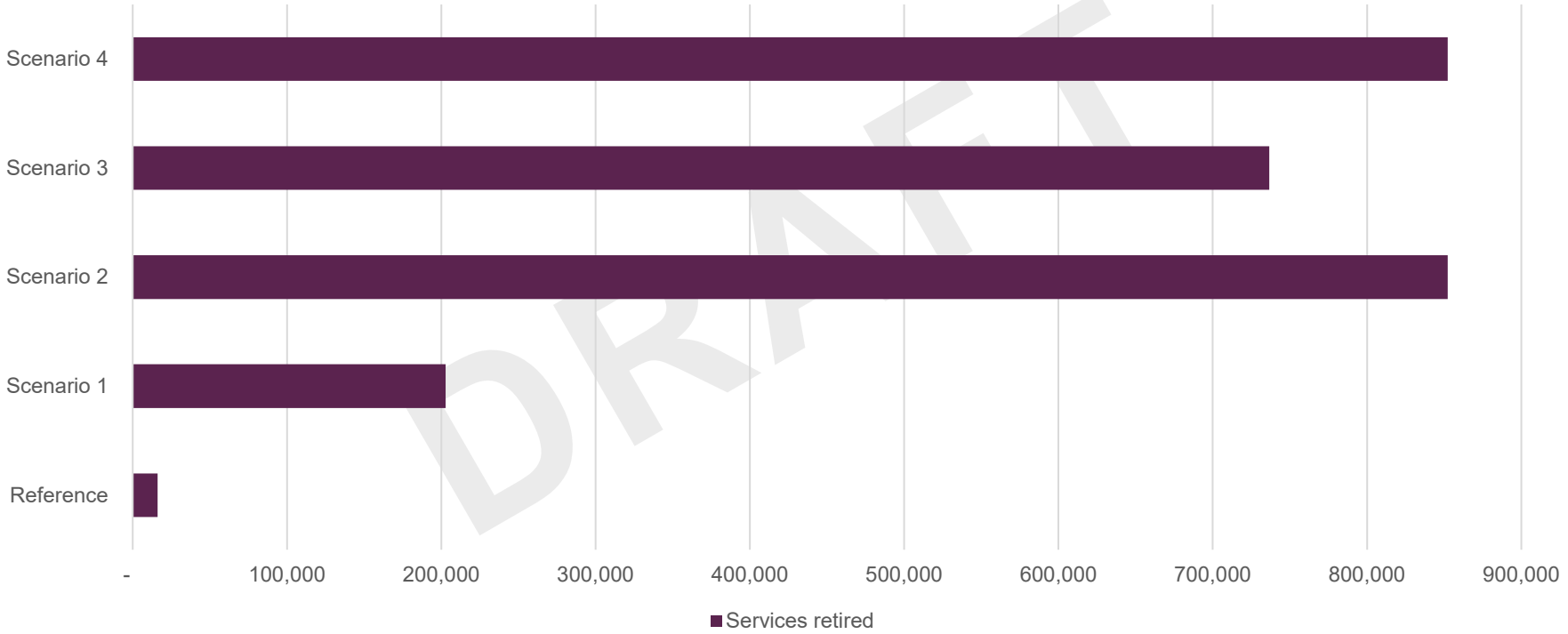
Reference case: Inflation and flat customer counts result in steady increase in annual investments in safety and customer requested/public projects



Capital requirements decline with number of customers, but cost efficiency is highly dependent on the location and concentration of customer departures (study period 2028 – 2050)



All scenarios require a significant increase in retirement activities (study period 2028 – 2050)



For comparison, PSE retired 500-700 services annually over the past few years.

Gas delivery system sensitivities highlight in limited changes to overall system needs

Sensitivity 1: Renewable fuel
Assumption – contract only, sensitivity – evenly distributed through system

8 additional needs · ~$3M

- Highlights potential renewable fuel injection areas where demand-side NPAs would be evaluated

Sensitivity 2: Customer growth
Assumption – customer counts are declining, sensitivity small growth

14 additional needs · ~$12M

- Localized growth drives new constraints in areas that are currently operating within capacity
- Impacts are concentrated in specific pockets rather than across the system

Sensitivity 3: Electrification
Assumption- "peanut butter", sensitivity directed customer attrition

2 projects scoped down · ~$20M

- ***Electrification*** – directed to system need, assumption peanut butter
- Scope reduced, project deferred, or non-replacement solution chosen
- More integrity concerns addressed through retirement rather than replacement
- Current NPA opportunities may naturally resolve as customers leave the system
- Additional needs become suitable for NPAs

Declining customer counts and usage shift system activities toward retirements; safety and compliance remain priorities

System reliability

- Existing system constraints drive most identified projects
- Growth and lower fuel heat content result in limited additional project needs
- Most needs require projects; a small number are sensitive to electrification and require further evaluation
- Constrained-area needs are similar across scenarios and sensitivities through 2035

Customer requested and public improvement

- Driven by customer decisions and public agency project timing
- Future needs remain highly uncertain across scenarios
- Limited opportunity for targeted electrification because projects are customer- and location-specific
- Some level of work remains necessary as long as customers continue to receive gas service

Customer and public safety

- Emergent work remains a significant component of ongoing system operations
- Long-term forecasts reflect expected activity levels, not a fixed list of known projects
- Inspections and assessments continue to identify new repair and replacement needs
- In Scenarios 2-4, proactive replacement declines significantly after 2032; remediation is prioritized by highest-risk assets and compliance requirements
- Targeted electrification opportunities are limited and more prevalent in the Reference Case and Scenario 1

Asset retirement and decommissioning

- Customer departures create retirement work, not simply avoided work
- Asset retirement is a field and construction activity
- Retired facilities may be abandoned in place or removed, depending on jurisdictional requirements
- Scenarios 2-4 require retirement activity at a scale far greater than current practice (~150,000 vs. ~700 services per year)

Questions?

PSE PUGET SOUND ENERGY

Next steps

August 25, 2026

PSE PUGET SOUND ENERGY

Feedback process

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

Date	Activity
September 2, 2026	Feedback form for this meeting closes
September 23, 2026	RPAG meeting
October 27, 2026 (tentative)	RPAG meeting
November 17, 2026 (tentative)	RPAG meeting
December 15, 2026 (tentative)	RPAG meeting
January 6, 2027 (tentative)	RPAG drop-in session (optional)

Contact us

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

August 25, 2026

PUGET SOUND ENERGY

How to participate in public comment opportunity

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!

PSE PUGET SOUND ENERGY

Appendix

PSE PUGET SOUND ENERGY

Definitions and acronyms

Acronym	Definition
BCP	Biennial Conservation Plan
BESS	Battery energy storage system
CCA	Climate Commitment Act
CETA	Clean Energy Transformation Act
CPA	Conservation potential assessment
CRAG	PSE's Conservation Resource Advisory Group
DSP	Delivery system planning
EAG	PSE's Equity Advisory Group
ELCC	Effective load carrying capacity
EV	Electric vehicle

Acronym	Definition
IRP	Integrated Resource Plan
ISP	Integrated System Plan
LDES	Long-duration energy storage
LNG	Liquid natural gas
NPV	Net present value
RFP	Request for proposal
RPAG	Resource Planning Advisory Group
SCGHG	Social cost of greenhouse gas
SMR	Small modular (nuclear) reactor
TRL	Technology readiness level

Emerging technology vs. "commercially available"

WAC 480-96-020(5) | "COMMERCIALLY AVAILABLE" MEANS EITHER:

Currently available
Currently available for purchase, procurement, or installation

Reasonably anticipated to be available
Reasonably anticipated to be available within the integrated system plan's study period

Our reference case applies this full definition — including in the model resources available today **AND** emerging technologies reasonably anticipated to become available in the ISP study period.

DIFFERENT EMERGING TECHNOLOGY ASSUMPTIONS ARE TESTED THROUGH OUR SENSITIVITY ANALYSIS:

Mid- and long-duration storage

Enhanced geothermal

Small modular nuclear reactors

Offshore wind

Non-pipeline alternatives within PSE

Need	Type of Action	Alternative	Status of PSE Implementation
Peak load management	Geographic demand-side management	Curtailment rate	Mature and implemented when appropriate
		Energy Efficiency	Weatherization primary option
		Demand Response (DR)	Residential DR not currently able to defer investment on roadmap
		Targeted Electrification for constrained areas	Pilot approved in PSE 2024 general rate case for Duvall area
Peak load management/Supply	Peak shaving/ injection	Compressed Natural Gas (CNG)	Mature and implemented
		Liquefied Natural Gas (LNG)	Mature and implemented
		Air Propane	Mature and implemented
	Pressure increase	Bypass (temporary)	Mature and implemented
		Pressure Increase/Uprate (permanent)	Mature and implemented
Integrity/Safety	Repair	Fix problem with O&M or smaller capital solution	Mature and implemented
	Pressure decrease	Pressure decrease/downrate (permanent)	Mature and implemented
	Retirement	Targeted electrification for retirement	Pilot
		Networked Geothermal	Pilot being investigated
		Cut and cap	Mature and Implemented

Implemented | **Pilots** | Maturing Tech

Provide safe, reliable gas in the most cost effective/efficient manner

ISP category	Description	Programs/drivers included	2028 – 2050	Additional notes
Customer requested and public projects	Non-capacity, localized work driven by customer and public agency requests, including service additions, relocations, and system modifications to maintain service	• Customer requests • Public improvement	Add: $2,031M Ret: $74M	Customer work is typically customer-funded and site-specific. Jurisdictional work involves infrastructure relocations to support public projects (e.g., roadway, bridge, and culvert improvements).
Transmission and distribution system reliability and resiliency	Investments required to reliably deliver gas to customers and support system performance under peak and adverse conditions.	• Pipeline reinforcement • Cold weather action equipment	Add: $334M Ret: $11M	Utility driven to address existing system need
Customer and public safety investments	Condition-based repairs and replacements driven by safety, integrity, and regulatory compliance requirements. Includes time-sensitive work necessary to mitigate risk.	• Integrity management • Pipeline replacement plan • Digital monitoring • Gas leaks • Critical safety system issues • Customer billing inquiries	Add: $4,749M Ret: $431M	Estimated total pipeline main replaced –per year (0.4%)

Components of the analysis

Gas transmission and delivery system investments include supply, pipeline safety and integrity, regulatory compliance, system reliability, and operations

Category	Reference Case
General rate case	Assumes approval of PSE's General Rate Case (GRC) proposal for rate years 2028 and 2029.
Load and customer count	Starting in 2030, uses F25 Q4 load and customer count assumptions. Analysis includes all customer classes, including **transport** customers.
Investment decisions	• 2028–2029: Based on proposed GRC investment levels. • 2030–2050: Reflects known projects and programs, with other investment categories trended over time. • Investment levels are influenced by usage and load, miles of pipeline, number of customers, and other system assets.
Capital retirements	• 2028–2029: Retirement levels aligned with GRC assumptions. • 2030: Includes planned retirement programs and retirement of approximately 5% of replacement expenditures. • 2031–2050: Retirement levels increase in proportion to customers exiting the system
Operations and maintenance expense	• 2028–2029: Based on GRC proposed expenditures. • 2030–2050: Estimated using cost-per-customer benchmark assumptions.

Reference case assumptions and variables driving the analysis

Category	Assumption
Customers count	Remains constant over planning horizon
Customer load	Remains stable in the near term, followed by an approximate 10% decline by 2050.
Miles of main	Remains constant
Number of services	Service retirements are largely offset by modest additions. When customers permanently exit the system, associated services are assumed to be removed within two years.
Number of pressure regulating stations	Remains constant
Pipe age/fully depreciated	Pipe age and the presence of fully depreciated assets do not independently drive investment decisions.
Rate of targeted electrification	Continues at the current rate and is incorporated into the plan, limited to 3–5 small, cost-effective projects annually.
Demand side targeted electrification	Limited to the existing Duvall pilot program.
Renewable fuels	Assumes renewable fuels within the PSE service territory are primarily represented by certificates (RECs/RNG credits) rather than physical gas supply, resulting in negligible impacts to modeled pipeline heat content and volumetric flow.

REC: Renewable energy credit RNG: Renewable natural gas