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November 15, 2023

Via Electronic Filing

Public Utility Commission of Oregon
Attn: Filing Center
201 High St. SE, Suite 100
Salem OR 97301

Re: In the Matter of PORTLAND GENERAL ELECTRIC CO.
Request for a General Rate Revision.
Docket No. UE 416

Dear Filing Center:

Please find enclosed the Comments of the Alliance of Western Energy Consumers on PGE's final MONET update in the above-referenced docket.

Thank you for your assistance. Please do not hesitate to call if you have any questions.

Sincerely,

<u>/s/ Jesse O. Gorsuch</u>
Jesse O. Gorsuch

Enclosure

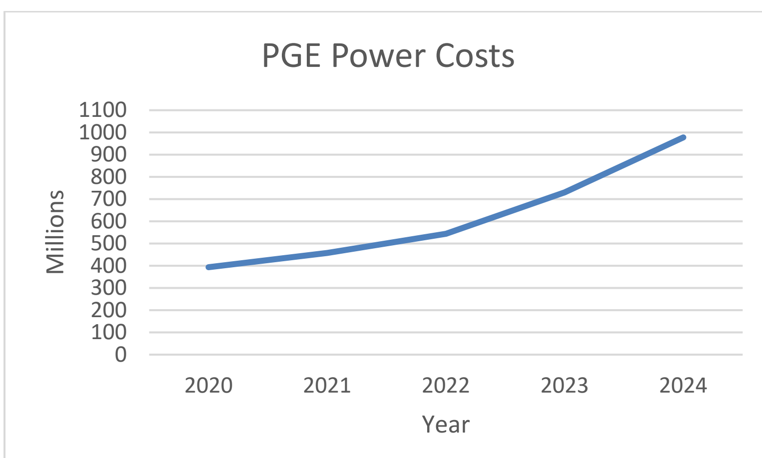
BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UE 416

In the Matter of PORTLAND GENERAL ELECTRIC COMPANY, Request for a General Rate Revision; and 2024 Annual Power Cost Update.	))))))))	COMMENTS OF THE ALLIANCE OF WESTERN ENERGY CONSUMERS

AWEC appreciates the opportunity to file comments on Portland General Electric Company's ("PGE" or "Company") final MONET update. PGE's rate case this year is unusual in that the rates approved are higher than what PGE requested in its initial filing. This is due entirely to the difference in PGE's power cost forecast at the beginning of this case relative to its final update. Just since last year, PGE's power cost forecast has climbed from $730 million[1] to $978 million.[2] And this is not an isolated occurrence. In 2020, PGE's forecasted power costs were $393.5 million.[3] Thus, in four years the Company's power costs have more than doubled.



[1] Docket UE 402, PGE Final MONET Update (Nov. 15, 2022).
[2] Docket UE 416, PGE Final MONET Update (Nov. 15, 2023).
[3] Docket UE 359, PGE Final MONET Update (Nov. 15, 2019).

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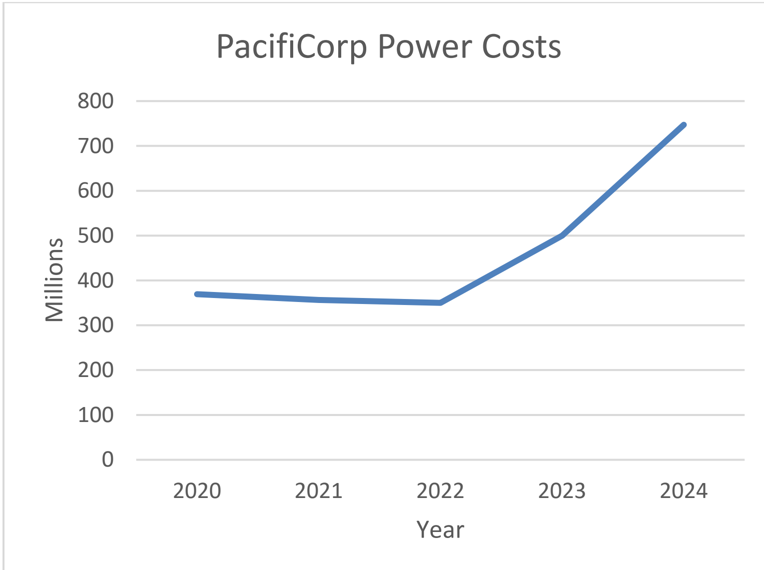
Meanwhile, over the same period PacifiCorp's Oregon-allocated power costs have also doubled, from $369 million[4] to $739 million.[5]



It is no secret why this is occurring – the capacity available in the market has declined significantly with the retirement of dispatchable resources as the region transitions to a lower carbon generation mix. Yet, because most of this replacement generation is non-dispatchable, the region has, ironically, relied more in recent years on gas-fired generation than it has historically,[6] which has driven up gas prices, a key input to electric prices. Scarcity pricing in certain months also demonstrates the increased potential for reliability events – the region has been lucky in recent years not to face a bad hydro year. Moreover, despite a greater penetration of renewable resources and the closure of the Boardman coal plant, electric sector emissions have barely budged in the last 10 years, and this is true even accounting for load growth.[7] Thus,

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4 Docket UE 356, PacifiCorp Advice No. 19-017 at 2 (Nov. 15, 2019).

5 Docket UE 420, PacifiCorp Advice No. 23-021 at 2 (Nov. 15, 2023). PacifiCorp's recent PCAM filings have also shown that these numbers have under-forecast actual power costs.

6 Energy Information Administration, Oregon Natural Gas Consumption by End Use, *available at*: https://www.eia.gov/dnav/ng/NG_CONS_SUM_DCU_SOR_A.htm.

7 In 2012, Oregon's electric sector emissions were 17.3 million metric tons ("MT"), at a rate of 0.352 MT/MWh. In 2021, the most recent year with information available, these numbers were 17.8 million MT at a rate of 0.316 MT/MWh. Oregon Department of Environmental Quality, "Greenhouse Gas Emissions

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customers are paying a higher price for a less reliable product while getting little benefit from lower carbon emissions.

A number of factors have contributed to the market dynamics that are increasing costs and reducing reliability for customers, and these factors indicate that such impacts are only likely to increase in the coming years.

One factor is legislation and policy initiatives to decarbonize the electric sector without any plan for whether or how it can be achieved in the required timeframe, or at what cost. As a consequence, PGE's Integrated Resource Plan and Clean Energy Plan ("CEP") relies entirely on the supply side on unspecified "proxy" resources based on speculative and problematic modeling. This means that whether PGE has any chance of meeting the 2030 requirement in HB 2021 and at what cost will only be determined through subsequent RFP processes.[8] That does not instill confidence in PGE's ability to meet the State's clean energy targets, and provides no information on how much it will cost to do so. Meanwhile, PacifiCorp's CEP openly admits that it cannot meet the State's clean energy targets and falls back on complicated, costly, and contingent allocation proposals.

Another factor is that the capacity resources available to utilities are becoming increasingly limited. A significant reason for the increase in PGE's power costs this year is new supply contracts for limited resources that are currently attracting competition for their output. By requiring that all contracts have a Joint Capacity Attestation Form, the Western Resource

from Electricity Use", *available at*: https://www.oregon.gov/deq/ghgp/Pages/GHG-Emissions.aspx. PGE's emissions over this period decreased on a mass basis from 7.084 million metric tons to 6.116 million metric tons and decreased from a rate of 0.365 MT/MWh to 0.315 MT/MWh. This is equivalent to a 1.4% decrease per year.

8 PGE's Preferred Portfolio in the IRP consists of 2,090 MW of variable energy proxy resources, 232 MW of storage proxy resources, and 255 MW of transmission expansion proxy resources. It also includes 200 MW of "non-GHG emitting contract extension."

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Adequacy Program ("WRAP") has severely reduced the ability of market participants to rely on the Western Systems Power Pool Schedule C contract, which provides firm power based on liquidated damages and has been the backbone of Northwest power markets for decades. While AWEC understands the need to prevent double-counting of capacity, the WRAP requirements on top of the retirement of major capacity resources leave few options for utilities to meet their capacity needs while participating in the WRAP. This is significantly driving up the cost of these few options. PGE has historically benefitted from transactions with the Mid-C utilities (Grant, Douglas, and Chelan PUD), but whether PGE will be able to extend these transactions in the future is highly uncertain given that these utilities face their own clean energy obligations under Washington's Clean Energy Transformation Act ("CETA") and may need more of these resources to serve their own retail load requirements once CETA's obligations become binding in 2030. If these resources are no longer an option for PGE and other utilities, this will make it even more difficult for these utilities to meet their clean energy obligations while maintaining reliability. Further development of storage resources and expansion of regional markets may help mitigate these issues, but they are unlikely to solve them entirely, and they are at best a long-term play. Customers are feeling the price impacts today.

Meanwhile, as if none of this is happening, the region is also aggressively pushing to electrify everything, again without any plan for how utilities will meet this increased load or any recognition of the cost and reliability benefits a diversified system provides. This will only exacerbate the supply problems the region is facing and further increase costs to customers, to say nothing of the reliability risks they may face and costly transmission investments that will be necessary. Moreover, it is far from certain that electrification will achieve its primary purpose of reducing emissions and that the cost will be worth it. The electric sector produces far more

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emissions than the natural gas sector today,[9] and for the reasons discussed above, there is no guarantee that the region will be able to eliminate or even materially reduce its reliance on natural gas-fired generation if it intends to maintain a reliable system. Puget Sound Energy has contracted with E3 and the Cadmus Group to study electrifying its system.[10] That study shows that electrification will result in higher near-term emissions than the base case,[11] and that costs will substantially exceed the societal benefit of reduced emissions.[12]

The Commission certainly does not control many of these factors, but it does control aspects of these factors and it controls how it responds to them. As electric costs continue to grow, the Commission should prioritize mitigating rate impacts over potentially competing policies and initiatives where possible. In this vein, AWEC welcomes the Commission's acknowledgement in its recent order in this case of "the magnitude of [rate] changes" and its recognition of the need to:

> [C]onfront managing the impacts of advancing multiple policy objectives through utility investment while simultaneously keeping rates reasonable for all customers. We are asked to decarbonize the system with significant community benefit, and to provide substantial low-income support while ensuring many new investments are made to harden the system and mitigate risks associated with wildfires and other natural disasters. Achieving these objectives, while keeping rates reasonable in a time of historic inflation and market price volatility will require creativity, compromise, and potentially difficult choices. PGE and all stakeholders must recognize that we intend to be proactive about this central challenge to utility oversight.[13]

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9 *Infra* n. 14.

10 Exhibit A.

11 Exhibit A, Slide 15. Between Puget's gas and electric system combined, electrification reduces emissions in the long-term, but electric emissions in an electrification scenario are always above the base case, including in 2045 when PSE must fully decarbonize its electric system under CETA. Exhibit A, Slides 13-14.

12 Exhibit A, Slide 17.

13 Order No. 23-386 at 14-15 (Oct. 30, 2023).

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The Commission can and should be a leader on cost containment. This can take many forms in addition to continuing to scrutinize utility rate requests. It can include reporting to the Legislature on the scale of utility rate increases and the reasons for them. It can mean revisiting certain programs in which policy interests have been prioritized over cost, such as community solar and net metering. It can mean emphasizing the importance of, and clearly signaling a willingness to implement, cost caps where they exist, such as in HB 2021, as well as carefully monitoring the utilities' costs of meeting HB 2021's requirements on a regular basis in their Clean Energy Plans. It can mean recognizing the value of the natural gas system that provides low-cost heating and supports reliable industrial processes while contributing relatively little to the State's greenhouse gas emissions profile.[14] Finally, it can mean drawing attention to the increasing importance of the resources the region has that provide reliable and clean electricity, such as the Snake River Dams.

AWEC agrees that climate change is a massive and urgent challenge, but too often that fact is used to shut down debate on what actions Oregon should take in response – because climate change is massive and because it is urgent, any action is justifiable and anyone that disputes this is putting profit over the environment. But Oregon's ability to mitigate climate change is limited, and imposing requirements regardless of the cost and without first studying the impacts is likely to have counterproductive and counterintuitive results, such as inducing carbon leakage and even increasing Oregon's own emissions.

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[14] In 2019, Residential, Commercial, and Industrial natural gas consumption constituted 11% of the State's greenhouse gas emissions. The same sectors' electricity use constituted nearly 30% of the State's greenhouse gas emissions. Oregon Department of Environmental Quality, Oregon Greenhouse Gas Sector-Based Inventory Data, *available at*: Department of Environmental Quality : Oregon Greenhouse Gas Sector-Based Inventory Data : Action on Climate Change : State of Oregon

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Moreover, if costs continue to spiral upward, this risks not only causing lasting economic damage to the State but also a political backlash that could reverse the policies that have been implemented in recent years. If that occurs, it will set back the goals of these policies further than if the Commission and stakeholders take a deliberate and reasoned approach to implementing these policies in the first place.

Dated this 15th day of November, 2023.

Respectfully submitted,

DAVISON VAN CLEVE, P.C.

<u>/s/ Tyler C. Pepple</u>
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GRC Settlement Study

PSE Draft Financial Results

November 8th, 2023

PUGET SOUND ENERGY

Safety moment

- As we enter the winter months, reminder to turn on headlights especially during the rain
- Always use turn signals
- To see and be seen

Speakers

Jennifer Coulson
Manager, Resource Planning

Nathan Critchfield
Associate Analyst, Resource Planning

Bob Williams
Consulting Analyst, Resource Planning

Agenda

- Scope update
- September results meeting recap
- Draft emission reduction
- Draft financial results

Scope update

Requirement	Status	Comments/Questions
(Pg. 35) PSE's final updated decarbonization study and the results of its electrification pilot will be made available to the public with no designations of confidentiality.	N/A	PSE plan to make the study, outputs and most of the inputs public (PSEs resource models, transmission models, and market prices are confidential).
a. A more up-to-date electrification scenario that takes into account recent performance trends of cold climate heat pumps (CCHPs)	✓	Draft PSE generation & T&D system impact results on September 28, 2023. Cadmus reviewed load results in meeting on August 10, 2023.
b. An accounting of both near-term (3-5 years) and long-term costs and benefits of electrification, including carbon reductions and avoided gas system infrastructure costs due to fewer new customer connections.		Discussed near and long-term PSE generation & T&D system impact results on September 28, 2023. Updates will be provided in the December meeting.
c. A segmentation of new and existing customers to separately evaluate the costs and benefits of electrifying new and existing customers and a scenario whereby PSE seeks to electrify all new customers and projected corresponding carbon emission reductions.	✓	Draft PSE generation & T&D system impact results on September 28, 2023. Cadmus reviewed load results in meeting on August 10, 2023.
d. A review of the time to build out and the cost of incremental electric system costs based on recent cost trends in power and capacity, as well as sensitivity analysis around electric system assumptions to understand how these assumptions impact the viability of high electrification scenarios.	✓	Draft PSE generation & T&D system impact results on September 28, 2023

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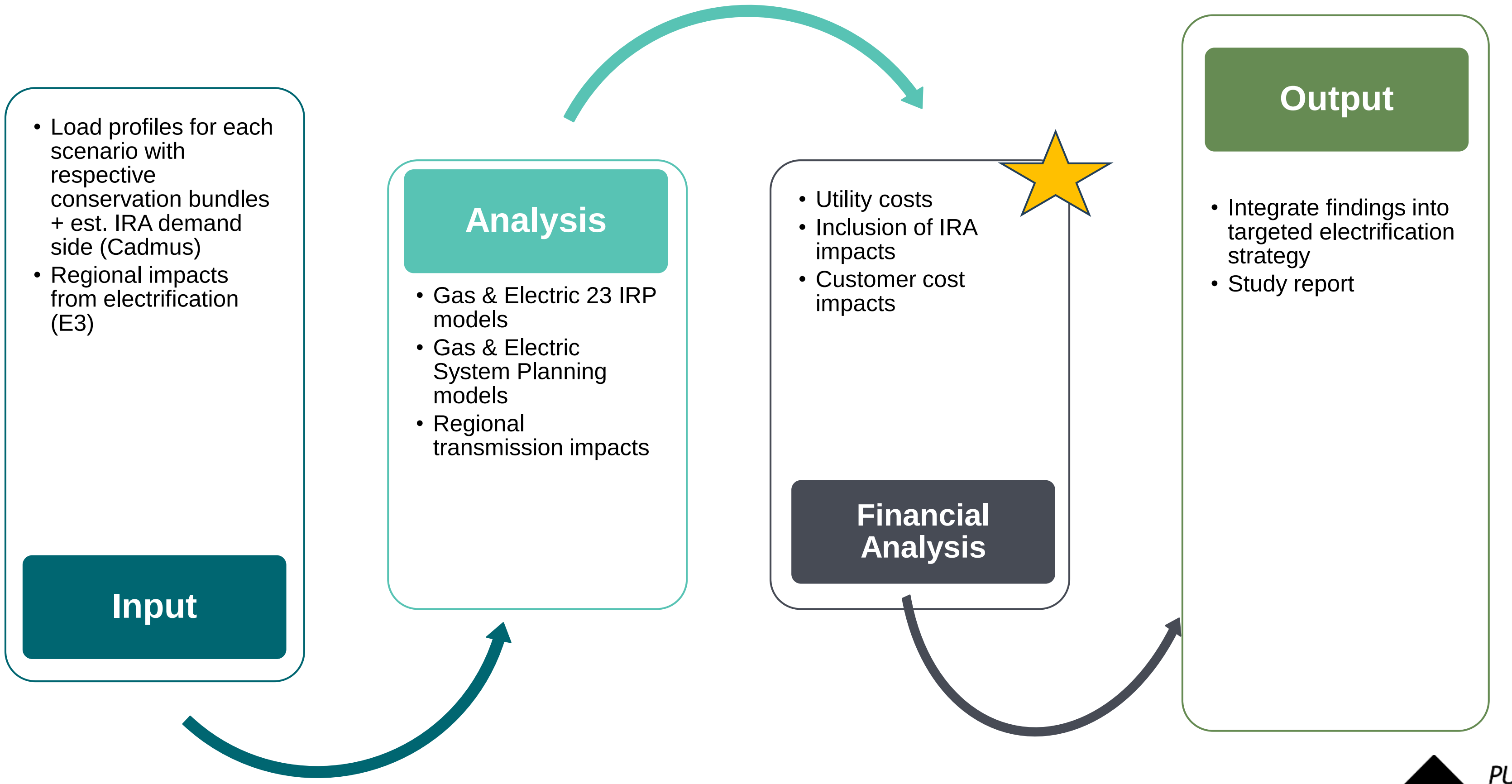
Scope update

Requirement	Status	Comments/Questions
e. Updated unit costs, including the incentives provided by the Inflation Reduction Act (IRA).	✓	Completed, see Cadmus presentation from August 10, 2023.
f. Study the impacts and benefits of electric heat pump technologies on PSE's gas constrained delivery systems.	✓	Completed, see PSE presentation on September 28 2023.
g. Collaborate with adjacent consumer-owned utility electric service providers to conduct coordinated electric delivery system and gas delivery system studies or pilots.	✓	This item is being met via the Targeted Pilot work with SCL.
h. Evaluate how to use the biennial conservation planning process to advance least-cost decarbonization strategies in PSE's gas utility service area, including by promoting fuel switching to electric utility service.	◕	Plan provided via email on August 31, 2023. Ongoing process and will provide updates in the December meeting.
i. Include regional forecasted load and market price sensitivities that reflect regional electrification.	✓	Completed, see E3 presentation from August 24, 2023.
j. An evaluation of the impact of electrification with and without hybrid heat pumps on gas and electric rates, to provide an update to the existing analysis in the E3 study referenced above.	◕	Reviewed draft PSE generation & T&D system impact results on September 28th, 2023. Rate impacts will be discussed today.
k. The results of the updated study will be incorporated into PSE's 2025 Natural Gas Integrated Resource Plan and a compliance filing in this docket by January 2025.	N/A	PSE will incorporate and expand on this study in the 2025 Natural Gas IRP.

PSE PUGET SOUND ENERGY

High-level modeling approach



PUGET SOUND ENERGY

GRC stipulation: study scenarios

Scenario 1: Electrification w/ ASHP
- Fully electrifying customers with Air Source Heat Pump (ASHP)

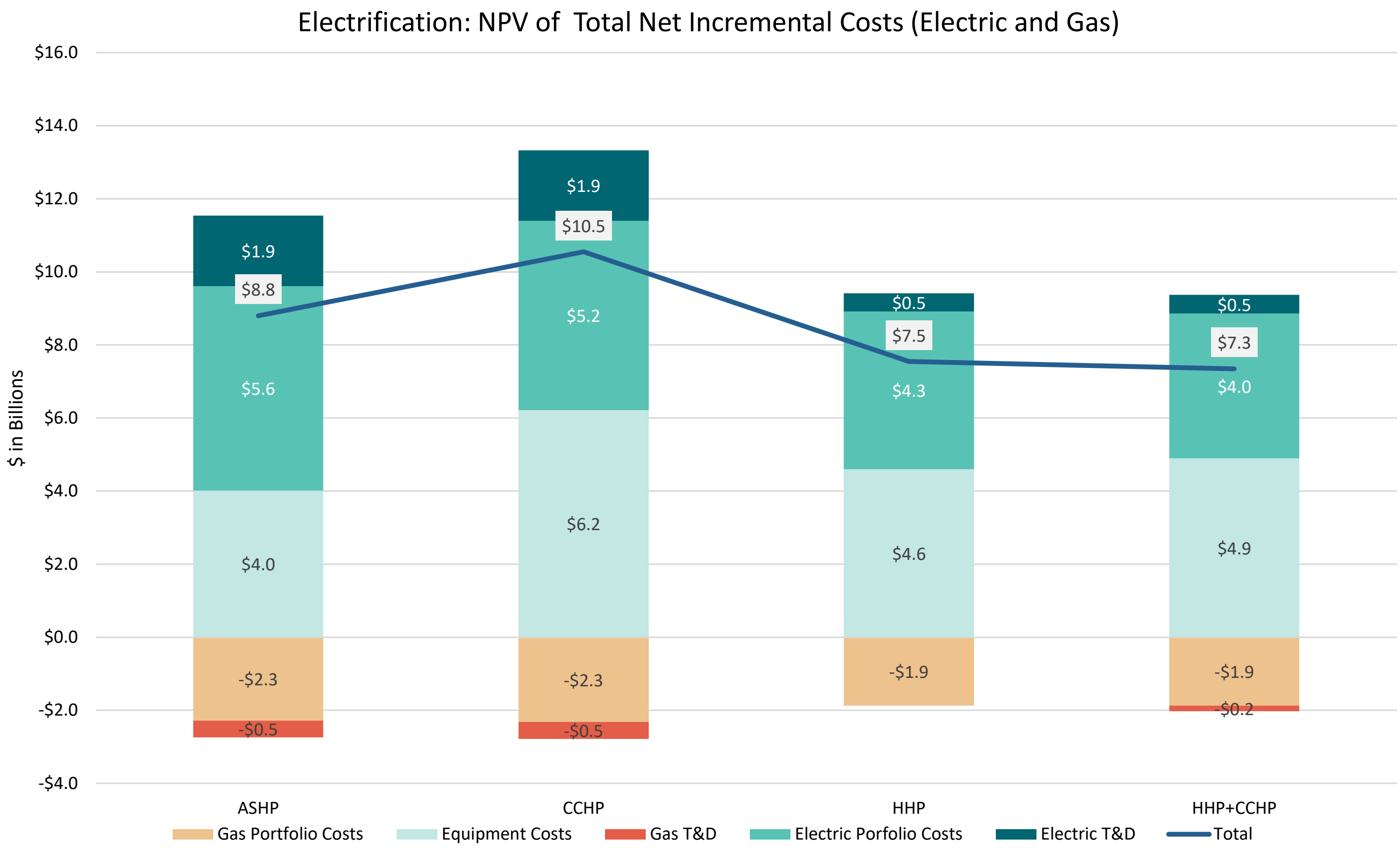
Scenario 2: Electrification with CCHP
- Fully electrifying customers with Cold Climate Heat Pumps (CCHP)
- Based on CCHP performance research

Scenario 3: Hybrid Heat Pump (HHP)
- Convert existing gas customers to Hybrid Heat Pump (HHP) based on Cadmus burn out rate

Scenario 4: Disaggregate by Vintage
- HHP Existing & Electrify new customers with CCHP
- Leverages retrofit opportunities with HHP

All Scenarios:
- Appliance turnover rate based on Cadmus burn out rate
- Incorporate Climate Commitment Act (CCA) expected allowance pricing, did not include carbon offsets
- Incorporates Cadmus's estimated impacts of Inflation Reduction Act (IRA) on the demand side
    - Inflation reduction act impacts on supply side incorporated as they were in the 2023 IRP
- Gas Extension Tariff changes for new customer connections are incorporated into the baseline
- Analysis includes safety and reliability investments

Draft total electric & gas portfolio, system and conversion costs



Key:
ASHP = Air source heat pump
CCHP = Cold climate heat pump
HHP = Hybrid heat pump (dual fuel heat pump, gas furnace backs up heat pump)
T&D = Transmission and Distribution

Example of impacts: Scenario 2 CCHP timeline

ILLUSTRATIVE

2025

- **13 Electrification Pilots** (16,000 CCHPs)
- **3.6 million MWh of utility-scale renewables**
- **6 utility-scale batteries** (570 MW capacity)
- **1 transformer per year** (2 total)

2030

- **100 Electrification Pilots** (122,000 CCHPs)
- **8.6 million MWh of utility-scale renewables**
- **28 utility-scale batteries** (2,800 MW capacity)
- **1,200 MW of Cross-Cascades transmission**
- **~1 transformer per year** (9 total)

2035

- **260 Electrification Pilots** (308,000 CCHPs)
- **12 million MWh of utility-scale renewables**
- **36 utility-scale batteries** (3,600 MW capacity)
- **1,800 MW of Cross-Cascades transmission**
- **~4 local transmission projects** (59 miles)
- **~4 transformers per year** (31 total)

2040

- **420 Electrification Pilots** (504,000 CCHPs)
- **22 million MWh of utility-scale renewables**
- **47 utility-scale batteries** (4,700 MW capacity)
- **3,600 MW of Cross-Cascades transmission**
- **~6 local transmission projects** (91 miles)
- **~3 transformers per year** (48 total)

2045

- **570 Electrification Pilots** (686,000 CCHPs)
- **26 million MWh of utility-scale renewables**
- **58 utility-scale batteries** (5,800 MW capacity)
- **4,600 MW of Cross-Cascades transmission**
- **~7 local transmission projects** (117 miles)
- **~3 transformers per year** (62 total)

Key

- Cold climate heat pumps adopted, as Electrification Pilot size (1,200 residential customers)
- MWh of utility-scale renewable generation built
- MW of capacity resources built, as generic utility-scale battery installation (100 MW)
- Miles of local 115kV transmission needed, as Energize Eastside projects (16 miles)
- MW of Cross-Cascades transmission needed
- New distribution substation transformers needed, assuming completed within previous 5 years

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Emission Reduction

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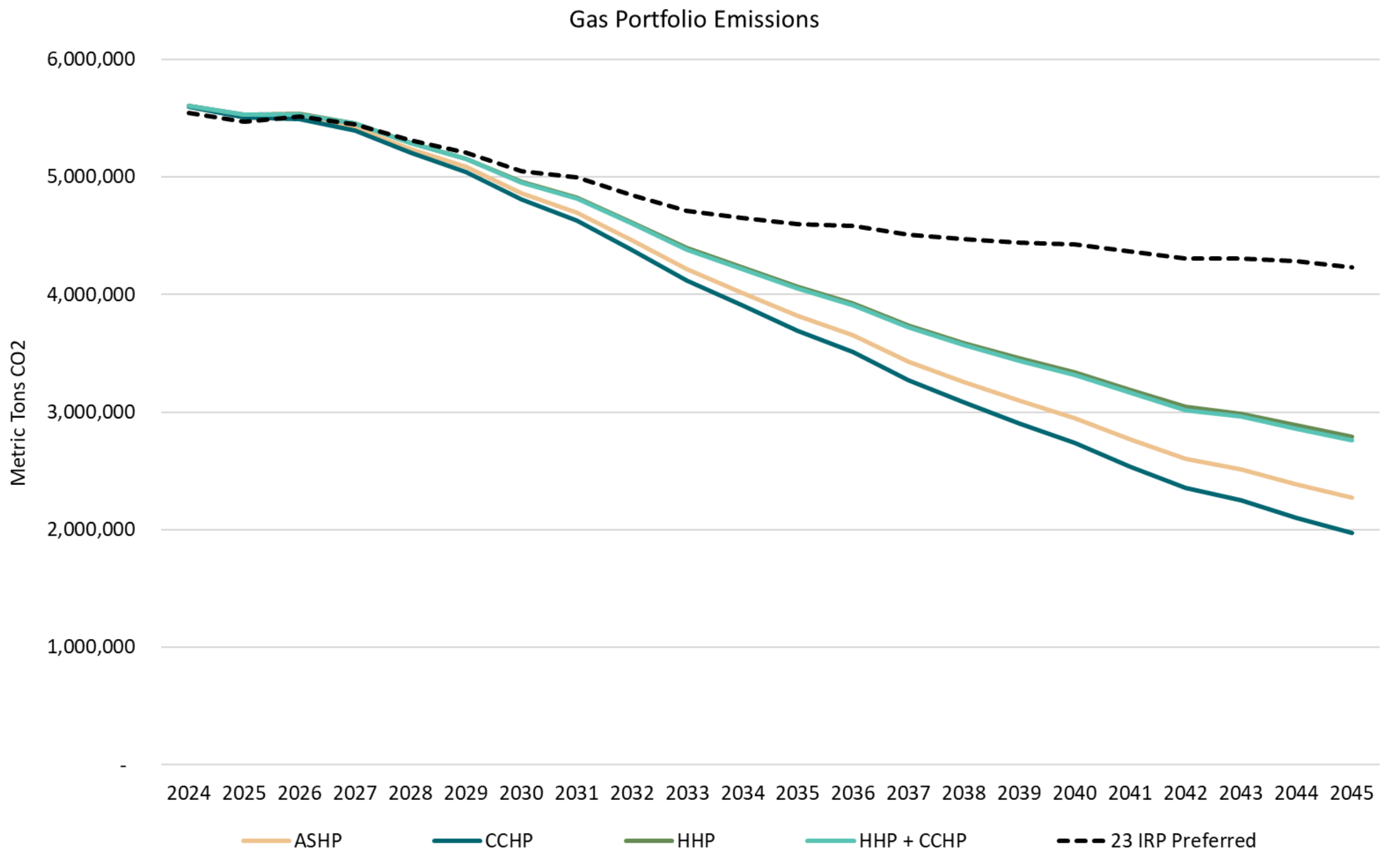
Draft gas portfolio emissions reductions



Key:
SC = Scenario
ASHP = Air source heat pump
CCHP = Cold climate heat pump
HHP = Hybrid heat pump (dual fuel heat pump, of gas back up heat pump)

Draft electric portfolio emissions

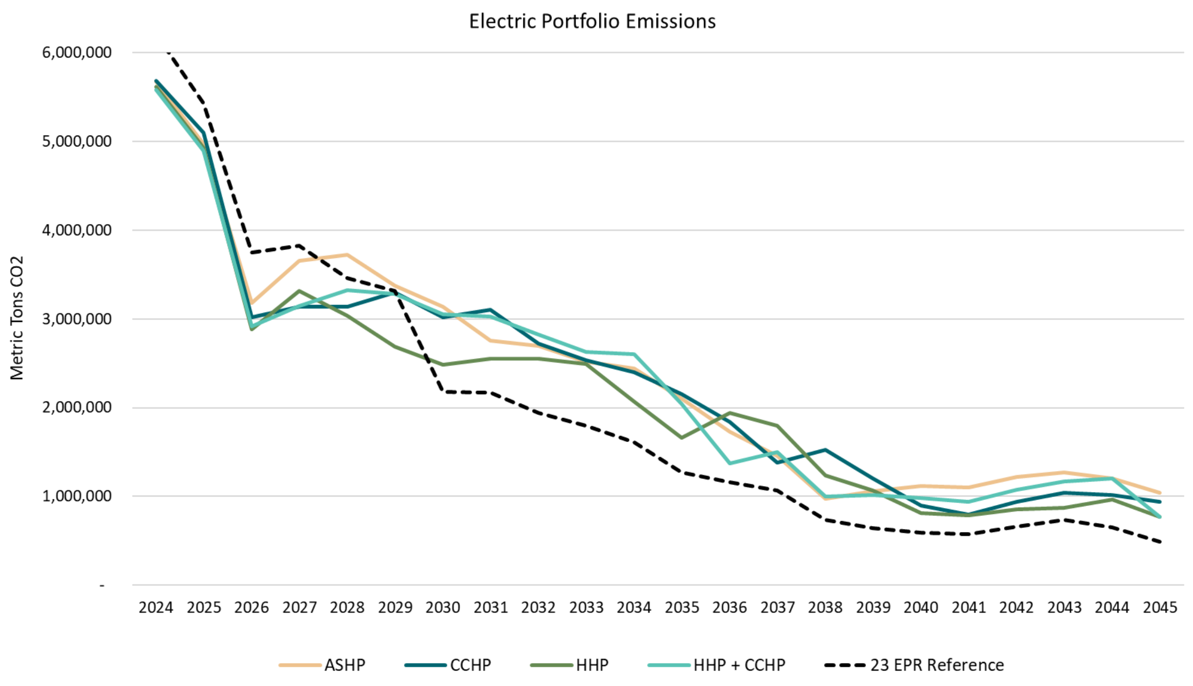
CETA Market Emission Rate

Per CETA, PSE must use a static **0.437 mt/MWh** emission rate for unspecified market purchases.

- This does not accurately reflect a market with an increased share of renewables.
- **PSE Average CCCT = 0.420 mt/MWh**

Ecology Rate (CETA requirement)

- **CCHP Scenario** --
  - 2030: 38% **above Reference**
  - 2045: 91% **above Reference**
- **HHP Scenario** --
  - 2030: 14% **above Reference**
  - 2045: 57% **above Reference**



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Draft electric portfolio emissions

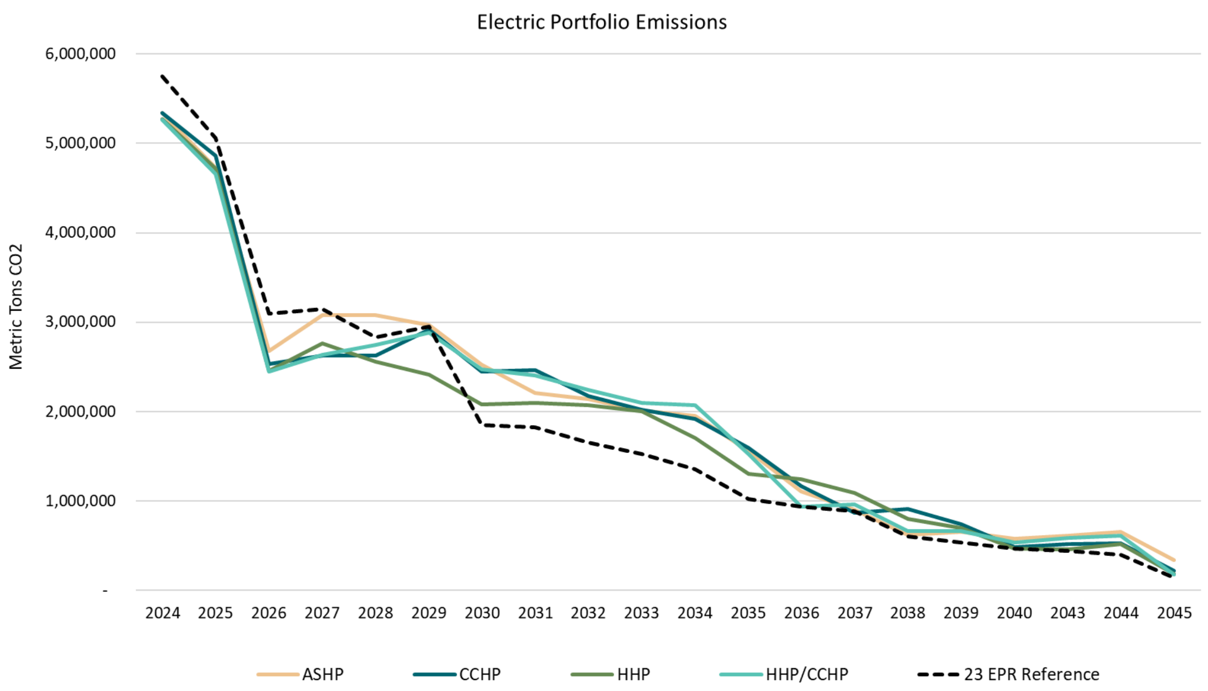
WECC Market Emission Rate

WECC rates starts at **0.25 mt/MWh** and goes to **0.10 mt/MWh** by 2045

- This is a better representation of the market incorporation of renewables over time

WECC Rate (regional electrification)

- **CCHP scenario** --
  - 2030: **32% above Reference**
  - 2045: **51% above Reference**
- **HHP scenario** --
  - 2030: **13% above Reference**
  - 2045: **26% above Reference**



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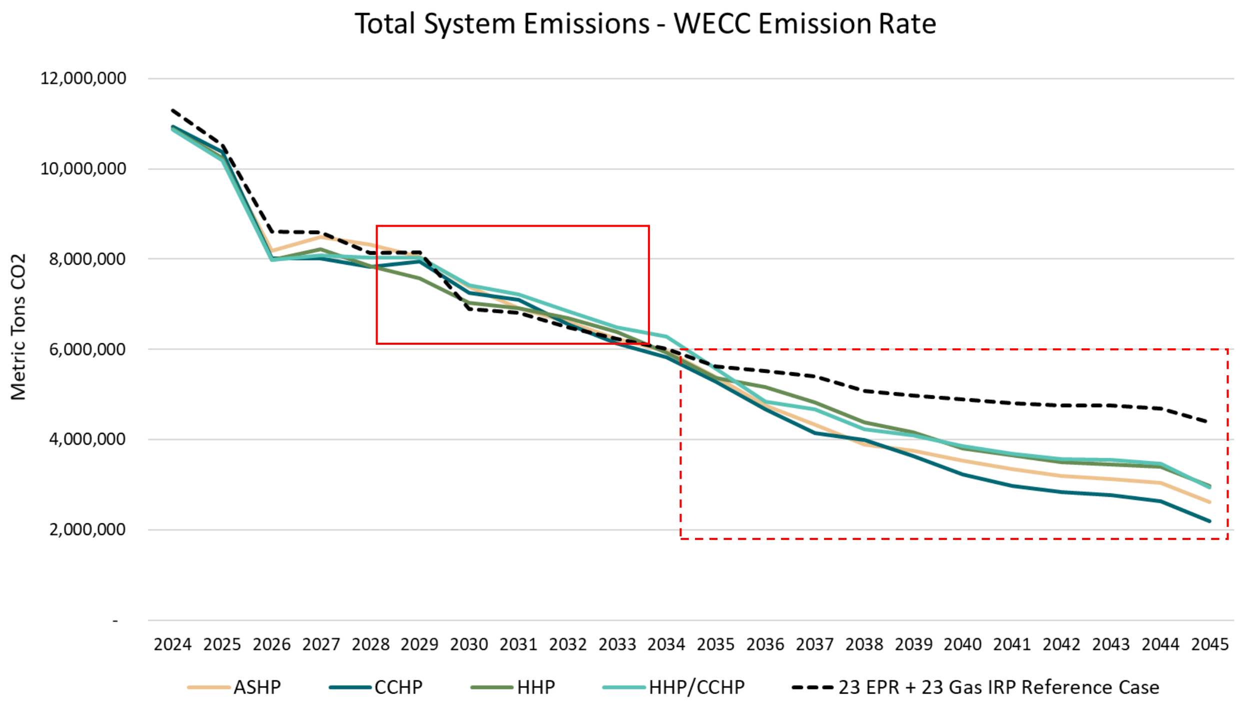
Draft gas & electric system emissions

Near term increase while system builds, followed by long-term reduction

Benchmarked to 23 IRP (Reference)

WECC Rate (regional electrification)

- **CCHP scenario** --
  - 2030: **5% above Reference**
  - 2045: **50% below Reference**
- **HHP scenario** --
  - 2030: **2% above Reference**
  - 2045: **32% below Reference**



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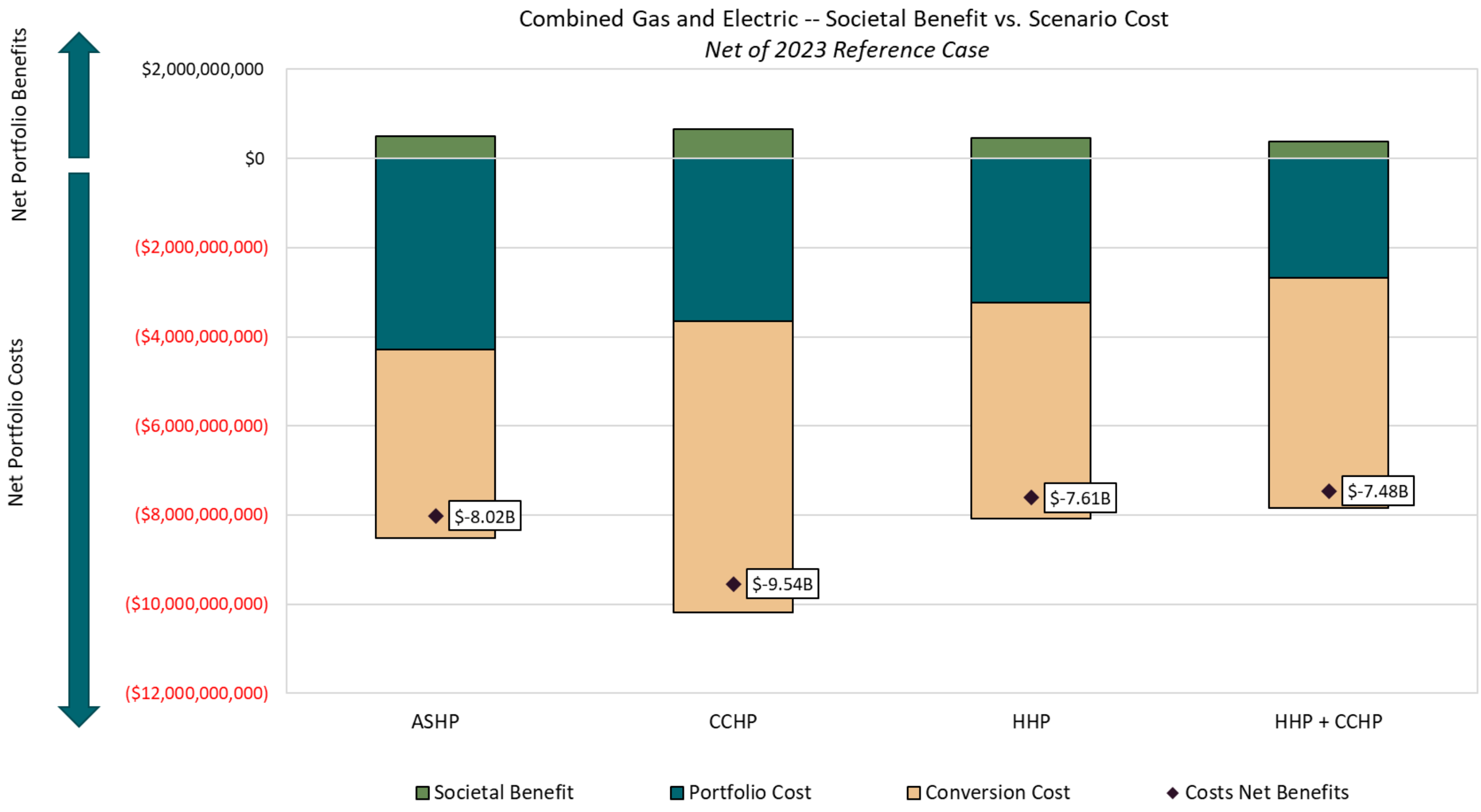
Draft **societal benefit** of reduced emissions

Per the CETA requirements an electric utility must incorporate the societal cost of carbon into their integrated planning process.

- Societal benefit aims to quantify the benefit to society associated with reducing emissions
- This methodology avoids discounting emissions directly
- Steps to calculate societal benefit:
  - Find annual net emissions between a given scenario and the reference case
  - Multiply those net emissions by the Social Cost of Greenhouse Gases (SCGHG) value in each year
  - Take the Net Present Value (NPV) of the resulting cost strip to get a monetized societal benefit value

- The resulting societal benefit can be compared to the total scenario cost

Draft total cost exceeds societal benefit



November 8th, 2023

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Draft key takeaways for emission reduction potential

- All four scenarios decrease emissions in the long term, but acceleration of electrification drives an increase in near-term emissions

- The gap in electric emissions in the late years is largely a function of electric market purchases
  - These values change depending on the emission rate applied
  - Holding the Ecology emission rate constant results in higher emitting scenarios, while WECC-wide results in lower emitting scenarios

Bill impact analysis

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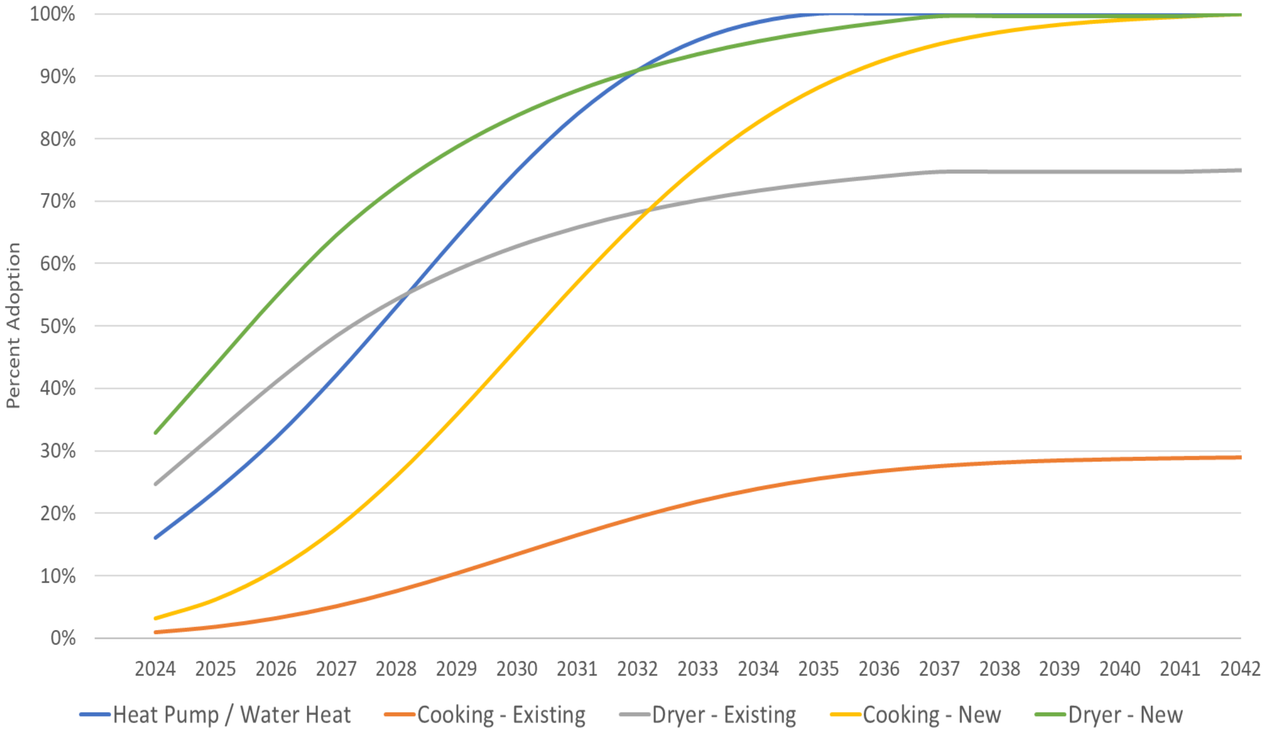
Draft key assumptions

- The analysis compares the economics among the four heat pump technologies independently. No cross over between scenarios.
- As the gas furnaces burn out the analysis assumes the furnace will be replaced with each of the heat pump technologies.
- The billing information assumes the electrification of the gas heat only.
- The gas billing information refers to those customer who haven’t moved over to heat pump technology yet.
- Bill increases are somewhat mitigated with the reduction in overall usage as a result of climate change.

Draft adoption curve

100% adoption potential for electrification of Heat Pump and Water Heater replacements by 2035 in each of the scenarios reflected by the blue line



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Draft bill impact overview

Based on estimated annual residential bill

Includes conversation cost + equipment cost for specific scenarios (provided by Cadmus)

Scenario 1 - ASHP	Scenario 2 - CCHP	Scenario 3 - HHP	Scenario 4 – HHP + CCHP
HP Converted: Customer who converted to **ASHP**	**HP Converted:** Customer who converted to **CCHP**	**HP Converted:** Customer who converted to **HHP**	**HP Converted: Existing** customer converted to **HHP, new** customers converted to **CCHP**
Gas: Customer who hasn't converted to ASHP	**Gas:** Customer who hasn't converted to CCHP	**Gas:** Customer who hasn't converted to HHP	**Gas:** Customer who hasn't converted to HHP or CCHP based on burnout

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Draft example of customer costs of the conversion from gas to electric in **2030 (provided by Cadmus)**:

End Use	Air Source Heat Pump	Cold Climate Heat Pump	Hybrid Heat Pump	Gas Furnace
Heat Pump	20,093	25,292	13,740	-
Gas Furnace	-	-	6,555	6,555
Total	20,093	25,292	20,295	6,555
Term Year	10	10	10	10
Interest Rate	8%	8%	8%	8%
Annual Amortization				
Heat Pump	2,994	3,769	2,048	
Gas Furnace	-	-	977	977
Total	**2,994**	**3,769**	**3,025**	**977**

Per the latest legislative policy (10 CFR 430.2) on gas furnaces, high efficiency gas furnace is estimated to be $1,700 more
For the ASHP system, you need an air mover (air handler) while for the HHP system, the gas furnace is the air mover.

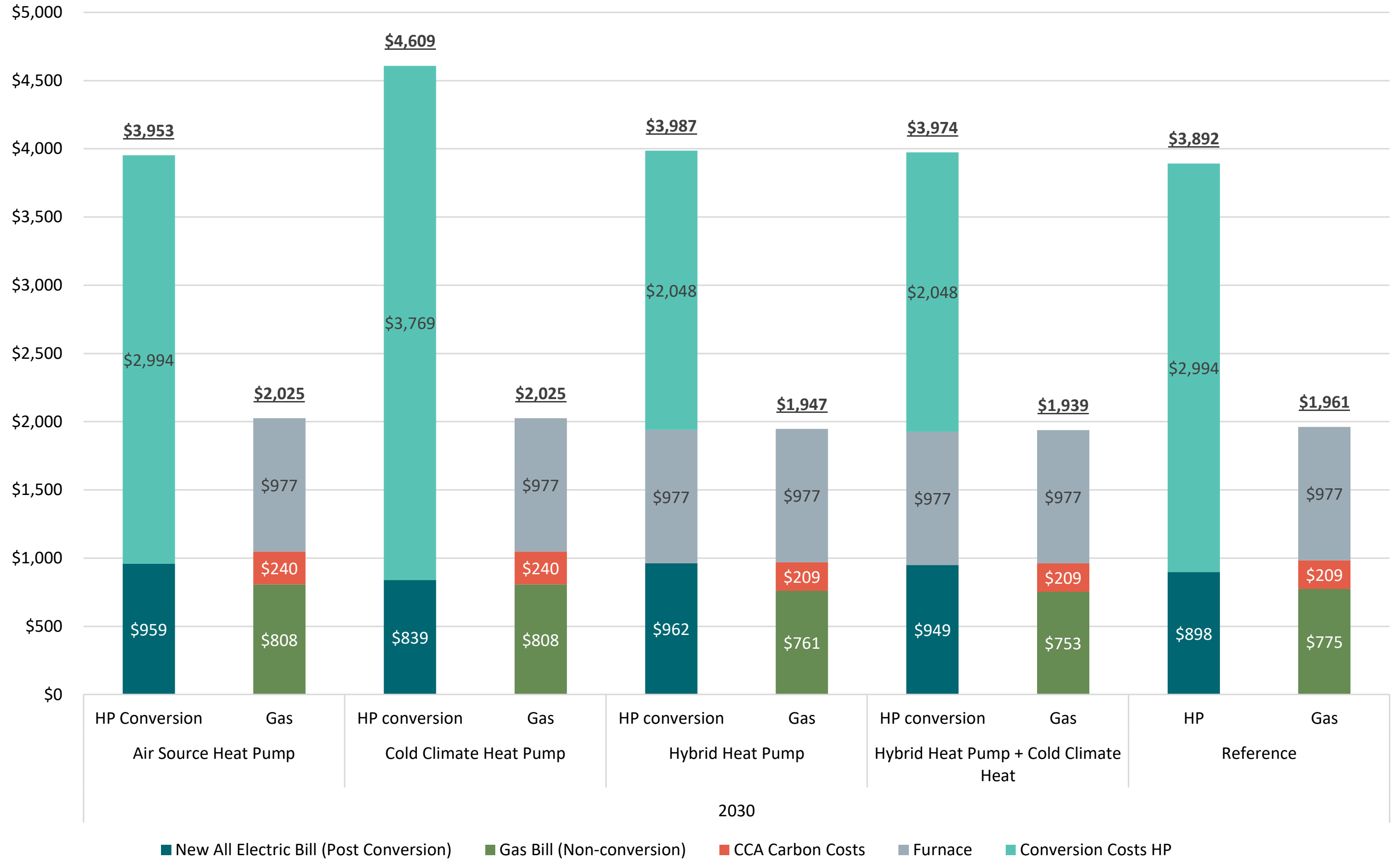
Draft annual residential bill for HP customer vs all gas customer **2030**

Dollars are shown in 2030 dollars

2030 residential bill impacts

- Billing impacts across all scenarios are very similar.
- A customer would likely not get a price signal to move if their equipment does not need replaced.

Note- the equipment costs are annualized over 10 years (refer to slide 22 for total equipment investment).



PUGET SOUND ENERGY

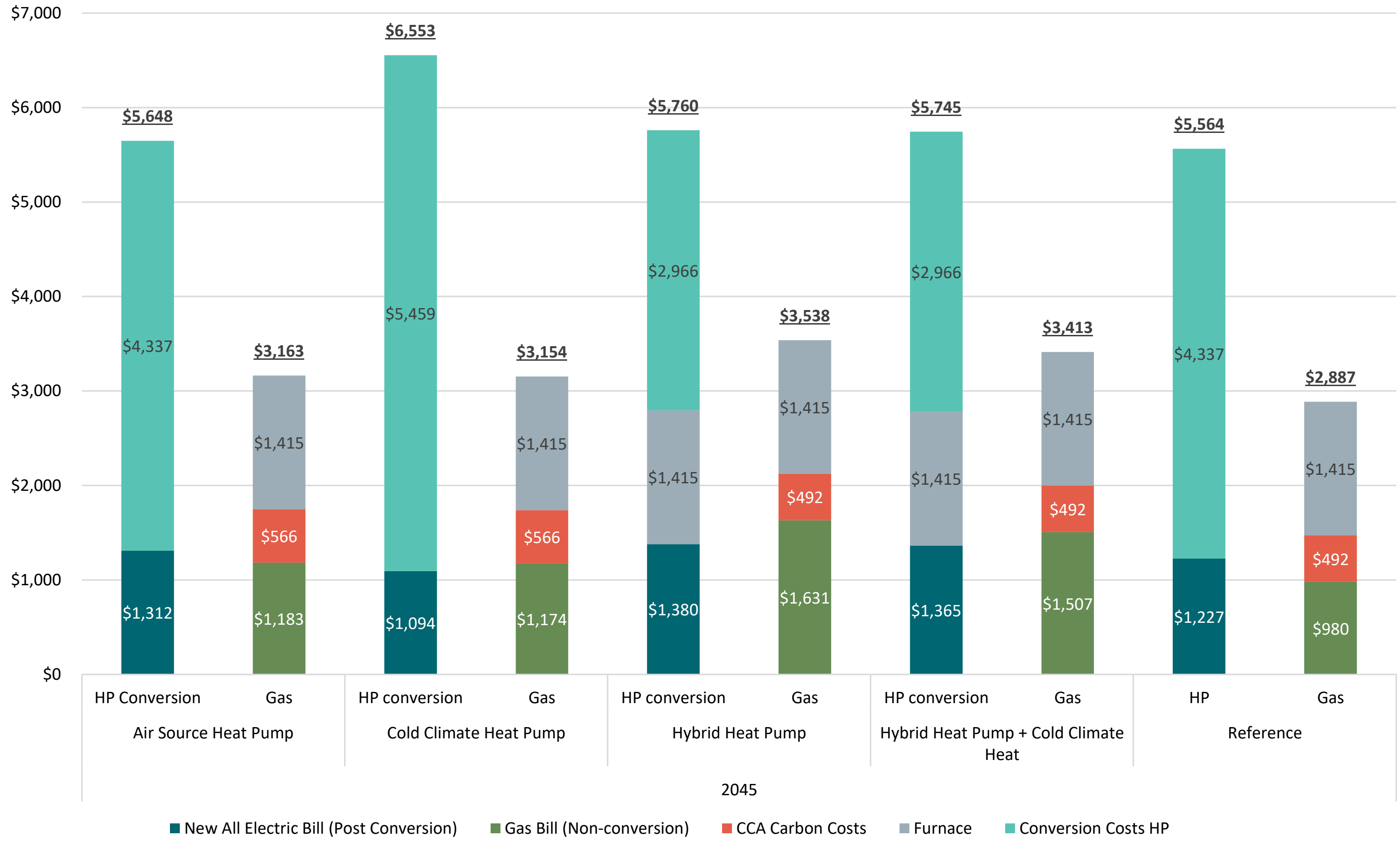
Draft annual residential bill for HP customer vs all gas customer **2045**

Dollars are shown in 2045 dollars

2045 residential annual impacts

- Looking out 20 years, any of these scenarios could flex in either direction

Note- the equipment costs are annualized over 10 years (refer to slide 22 for total equipment investment).



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Draft key takeaways for billing impact analysis

- All four scenarios **increase costs to the customer at a similar rate**
  - The delta between the scenarios is small
    - We're projecting costs out 20 years, we don't predict the future

- **From a consumer's perspective**, in all the scenarios, it appears the investment may not be cost-effective

- The **electrification pilot results will better inform** whether the burn out adoption rate is realistic

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Next steps for decarb study work

- Feedback by November 15th
- Final meeting with Parties on December 8th
- Filing December 22nd

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Appendix

Electric Portfolio & Electric T&D Update

- After further review of the draft results, we found the hydrogen prices were not incorporated into the Electric Portfolio model (Long-term capacity expansion (LTCE) model) as intended, therefore this analysis was rerun to include updated hydrogen fuel price
- Also included in this run was a modeling correction to the availability/usage of biodiesel
- The LTCE model chooses the cost-effective volume of conservation, the T&D model looks at loads after conservation, so the T&D model was updated to reflect the outputs of the LTCE rerun
- Changes in results was not a dramatic departure from initial draft results

Updated draft electric system outputs – 2030 key components

Description	Unit	$/unit	2024-2030 (units / $M)							
			S1: ASHP		S2: CCHP		S3: HHP		S4: HHP+CCHP	
		Total Load (MW)	439		419		101		106	
115 kV Transmission (incl. substation transmission)	Miles	$4.6M	0	$-	0	$-	0	$-	0	$-
230 kV Transmission	Miles	$6.9M	0	$-	0	$-	0	$-	0	$-
Bulk 230/115 kV Transformers	Transformers	$9.2M	0	$-	0	$-	0	$-	0	$-
Transmission Switching Stations	Switching Stations	$17.2M	0	$-	0	$-	0	$-	0	$-
Distribution Substation Transformers	Transformers	$12.1M / transformer	10	$121	10	$121	3	$36	3	$36
Distribution Feeder	Miles	$2.3M / mile	42	$97	40	$92	10	$23	10	$23
Distribution Service Transformers	Transformers	$18,100 / transformer	12,271	$222	11,708	$211	2,815	$51	2,965	$54
		Sub-Total ($M)		$439		$424		$110		$113
		Planning Estimate (+50%)		**$658**		**$636**		**$165**		**$169**

Typical permitting, design and construction timelines for long-lead items:
- Substation 5 – 7 years
- Transmission line 10 years

PUGET SOUND ENERGY

Updated draft electric system outputs – 2045 key components

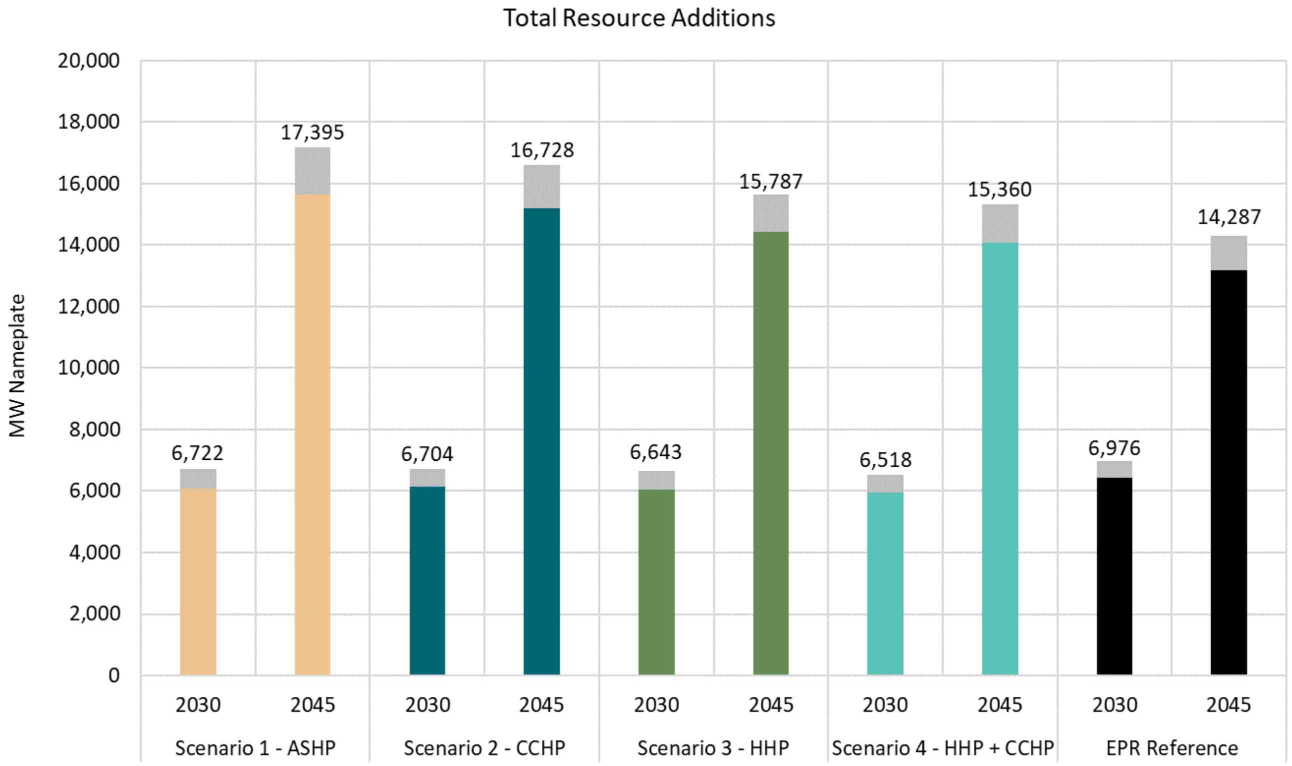
			2024-2045 (units / $M)							
Description	Unit	$/unit	S1: ASHP		S2: CCHP		S3: HHP		S4: HHP+CCHP	
		Total Load (MW)	2,013		1,714		417		432	
115 kV Transmission (incl. substation transmission)	Miles	$4.6M	135	$621	115	$529	28	$129	29	$133
230 kV Transmission	Miles	$6.9M	4	$28	4	$28	1	$7	1	$7
Bulk 230/115 kV Transformers	Transformers	$9.2M	7	$64	6	$55	2	$18	2	$18
Transmission Switching Stations	Switching Stations	$17.2M	6	$104	5	$86	2	$35	2	$35
Distribution Substation Transformers	Transformers	$12.1M / transformer	72	$869	61	$737	15	$181	16	$193
Distribution Feeder	Miles	$2.3M / mile	91	$209	78	$179	19	$44	20	$46
Distribution Service Transformers	Transformers	$18,100 / transformer	52,039	$940	44,331	$800	10,792	$195	11,181	$202
		Sub-Total ($M)		$2,835		$2,414		$608		$634
		Planning Estimate (+50%)		**$4,252**		**$3,622**		**$912**		**$951**

Typical permitting, design and construction timelines for long-lead items:

- Substation 5 – 7 years
- Transmission line 10 years

PUGET SOUND ENERGY

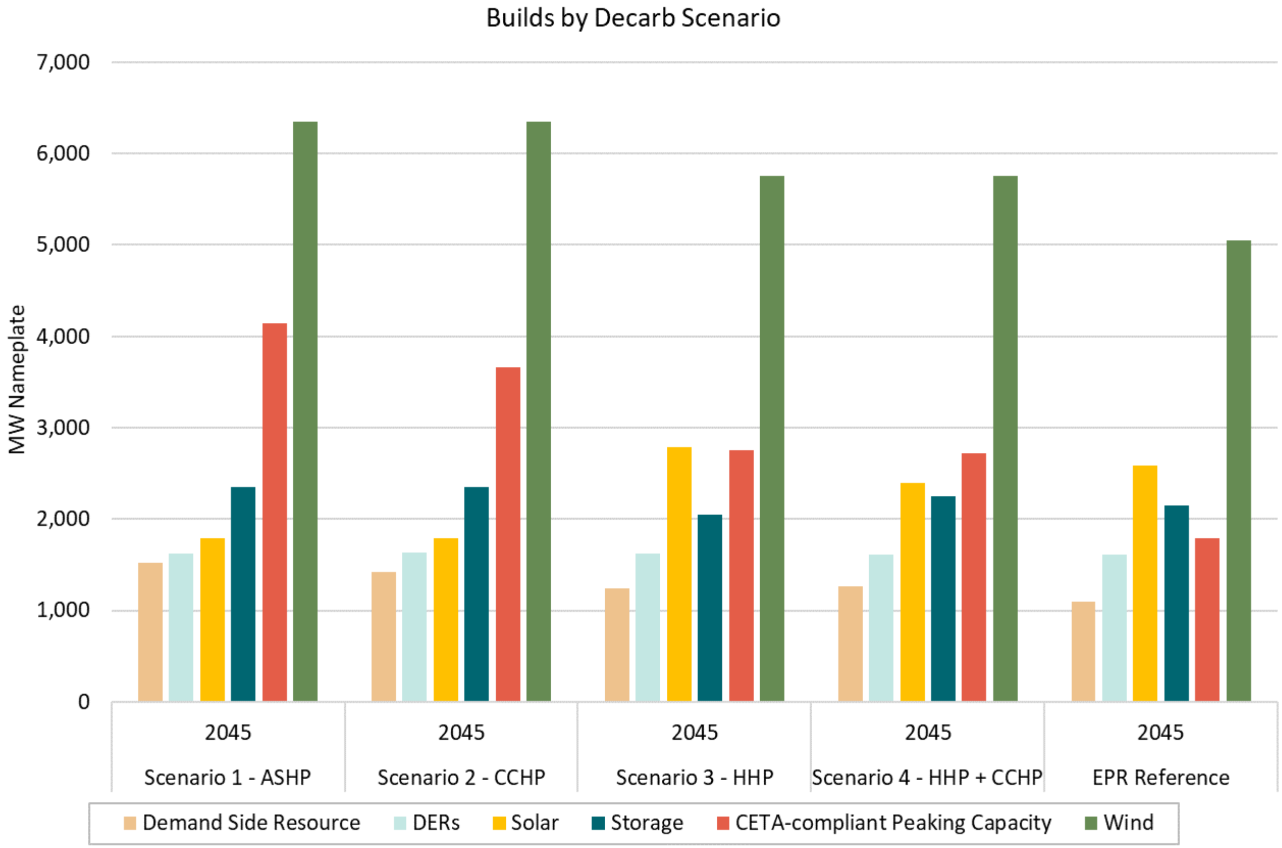
Updated draft electric portfolio outputs – new builds



Key:
ASHP = Air sour
CCHP = Cold climate heat pump
HHP = Hybrid heat pump (dual fuel heat pump, of gas back up heat pump)
EPR = Electric Progress Report

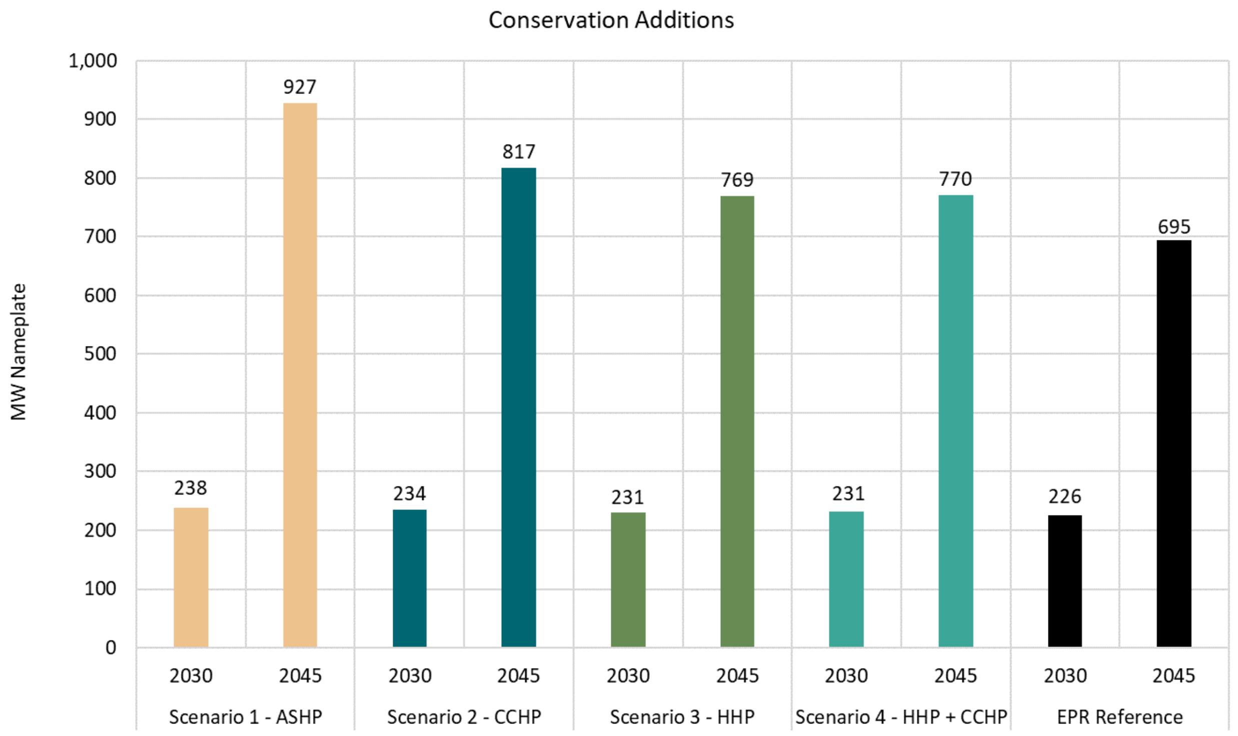
PUGET SOUND ENERGY

Updated draft electric portfolio outputs – builds by resource type



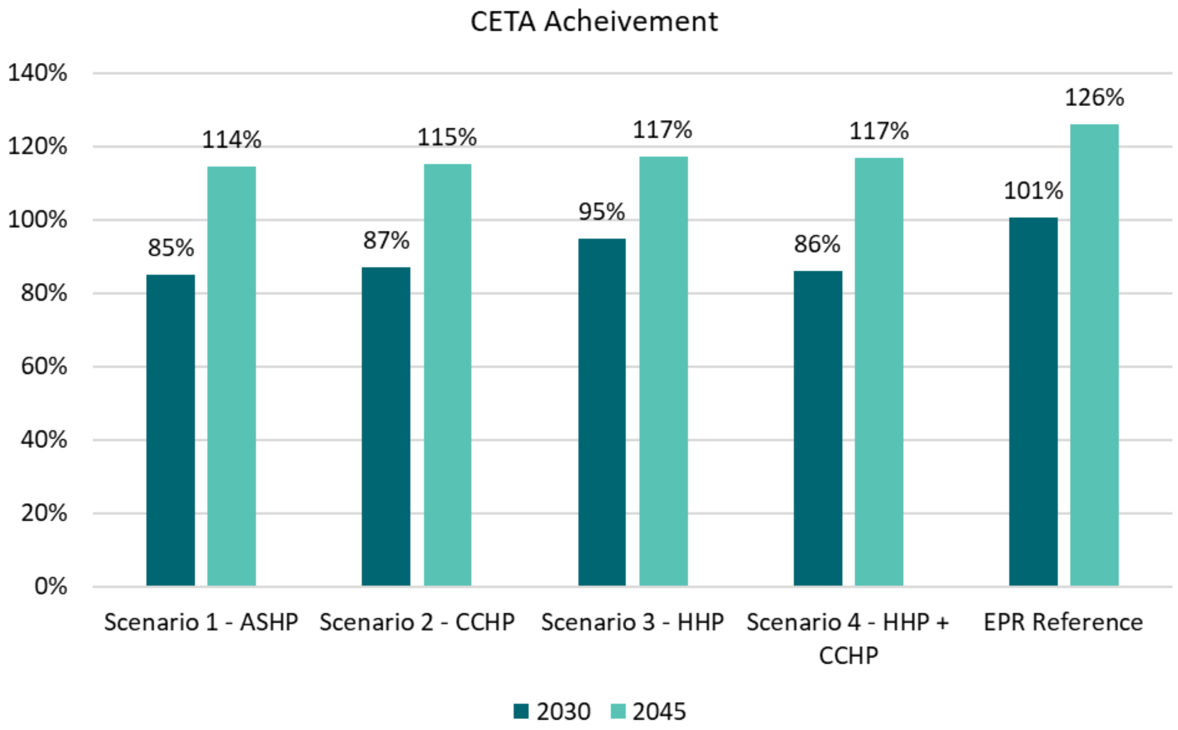
PUGET SOUND ENERGY

Updated draft electric portfolio conservation volume



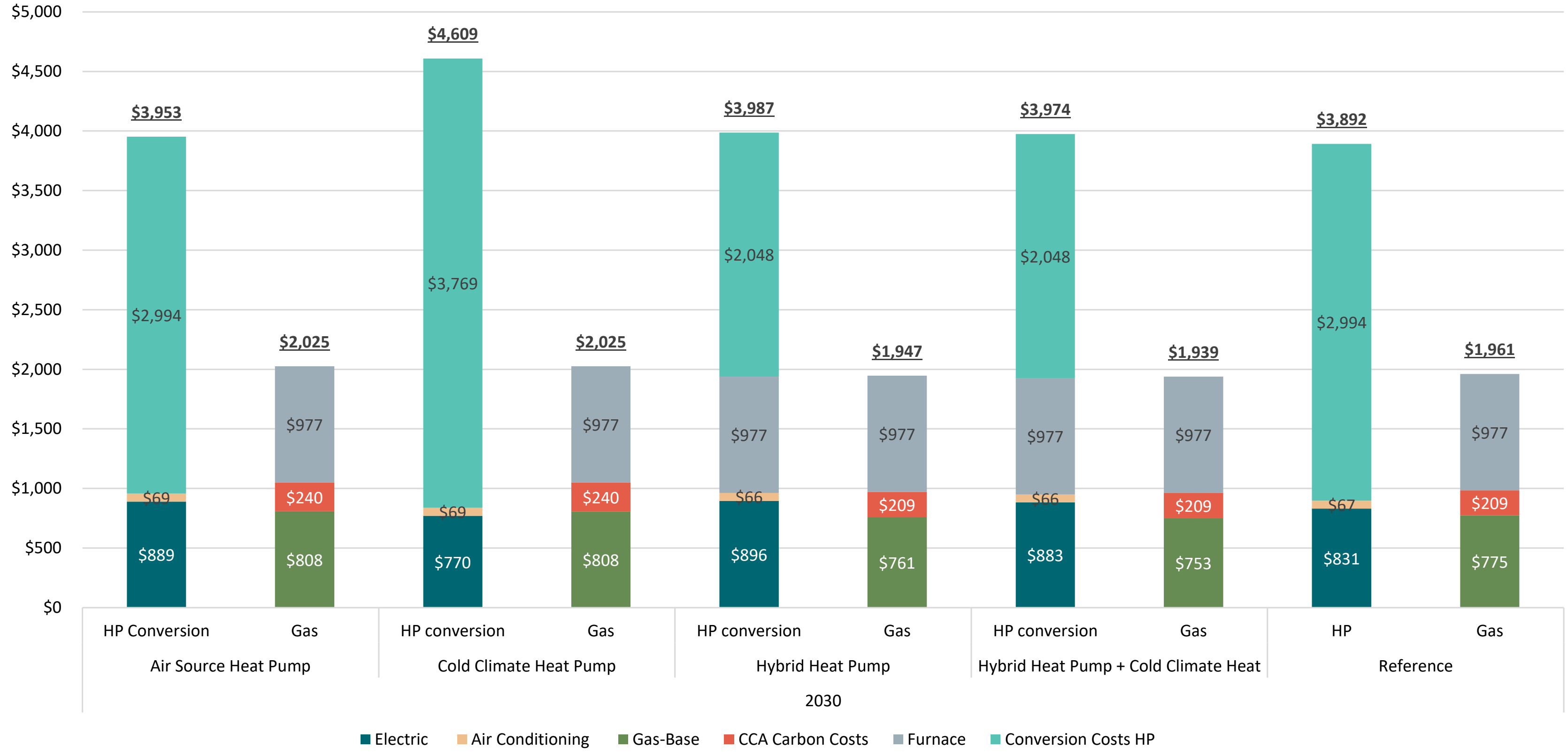
PUGET SOUND ENERGY

Updated draft electric portfolio outputs – clean energy transformation act (CETA)



Dollars are shown in 2030 dollars

Draft annual residential bill for HP customer vs all gas customer **2030**



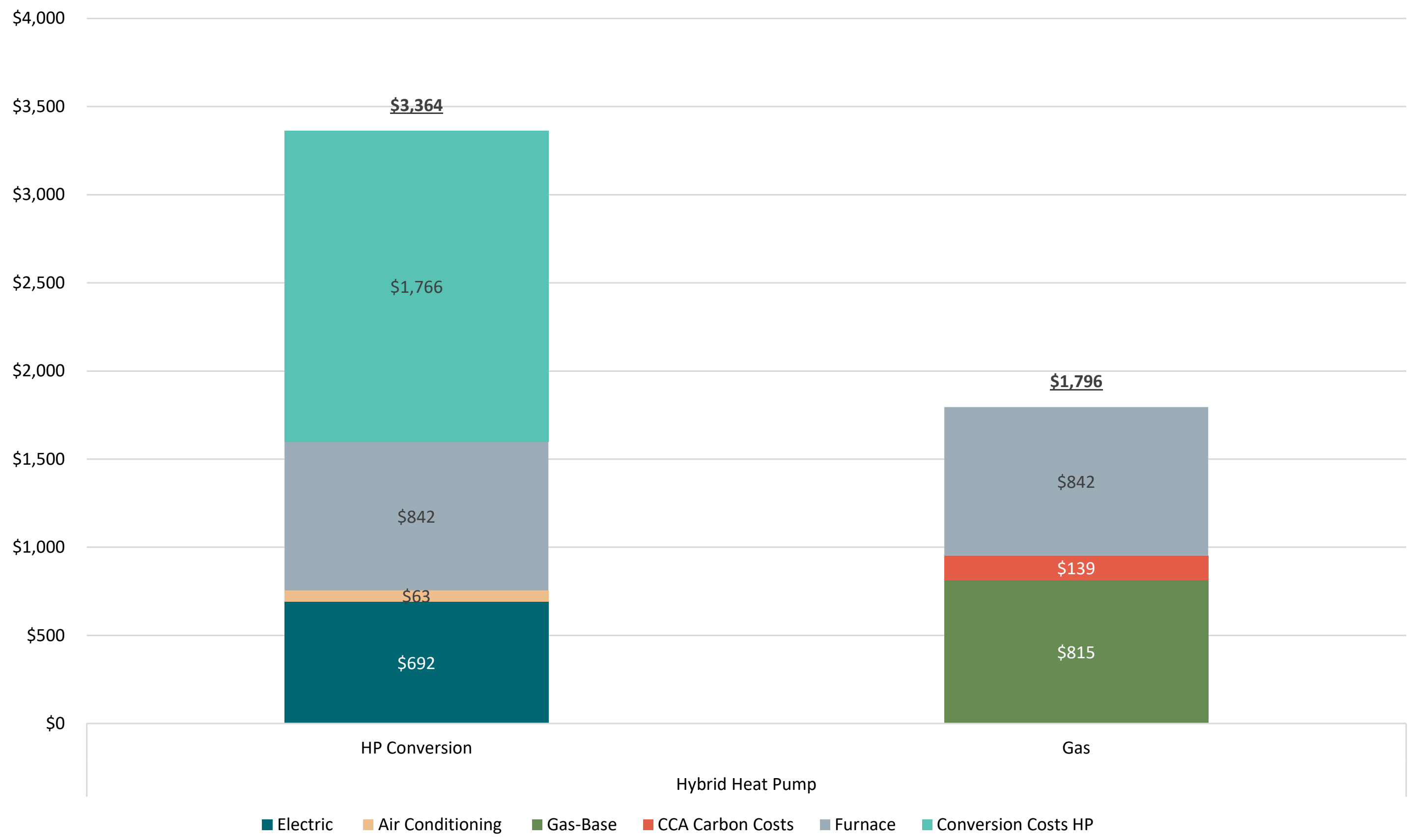
PUGET SOUND ENERGY

Dollars are shown in 2045 dollars

Draft annual residential bill for HP customer vs all gas customer **2045**

PUGET SOUND ENERGY

Draft **current** annual residential bill for HPP customer vs all gas customer **2024**



PUGET SOUND ENERGY