# RESOURCE PLAN
## CHAPTER TWO



PUGET SOUND ENERGY

# Contents

# 1. Introduction

Puget Sound Energy's (PSE's) preferred portfolio results from robust analyses developed with input from interested parties, and it meets the Washington Administrative Code requirements. To support the portfolio analysis and arrive at the preferred portfolio, we used two distinct types of analysis. Deterministic portfolio analysis solves the least cost solution and assumes perfect foresight about the future. The stochastic analysis assesses the risk of potential future changes in natural gas prices, carbon pricing, and load forecasts. We used these analytic methods to identify and evaluate the preferred portfolio. As part of our efforts to integrate equity considerations into resource planning, we included a spatial analysis of vulnerable populations in the conservation potential assessment.[1]

# 2. Resource Plan

Puget Sound Energy is committed to a clean energy future. This preferred portfolio of resources that make up the 2023 Gas Utility Integrated Resource Plan (2023 Gas Utility IRP) reflects the changes needed to achieve the low-carbon future envisioned by Washington State's Climate Commitment Act (CCA). We tested electrification scenarios for this plan, but electrifying gas demand as gas appliances need to be replaced does not reduce gas sales to achieve the low-carbon future mandated by Washington State's Climate Commitment Act.

**Near-term Priorities (2024–2029):**

- Continue to acquire cost-effective conservation.
- Determine which expiring pipeline contracts would be feasible to let expire rather than renew.
- Explore technical feasibility and any other issues of upgrading the Swarr propane-air injection facility.
- Purchase carbon allowances to meet CCA compliance requirements.
- Reduce emission profile by exploring Renewable Natural Gas (RNG) within the Pacific Northwest and outside the region.

**Long-term Priorities (2030–2050):**

- Explore clean technology and fuel such as direct air capture, green hydrogen, and RNG.
- Turn back transport pipeline capacity to the pipeline company when the portfolio becomes surplus due to decreasing loads.

## 2.1. Preferred Portfolio Summary

We summarize changes to the preferred portfolio in Figures 2.1 and Table 2.1, followed by a discussion of the factors that drive the mix of resources included in the preferred portfolio. Puget Sound Energy must meet peak use during

[1] As described in Chapter One: Executive Summary, we intend to further address equity in the 2025 Gas Utility IRP. Find details of the analysis in Appendix C: Conservation Potential Assessment.

the winter heating seasons which is November to February. The years shown here represent the gas planning year from November of the current year through October of the following year.

Figure 2.1 and Table 2.1 below show net negative new supply-side resources because the portfolio does not need to renew some firm pipeline contracts due to a combination of lower demand after conservation and lower cost new peaking resources. Additionally, renewable fuels delivered on the PSE system provide a more cost-effective solution than renewing pipeline contracts to meet winter peaks. This diversified resource mix and PSE-owned resources help maintain a flexible gas portfolio while ensuring enough resources to meet customer needs regardless of changes in customer demand.

Figure 2.1: Preferred Portfolio Resource Builds — Peak Day Capacity

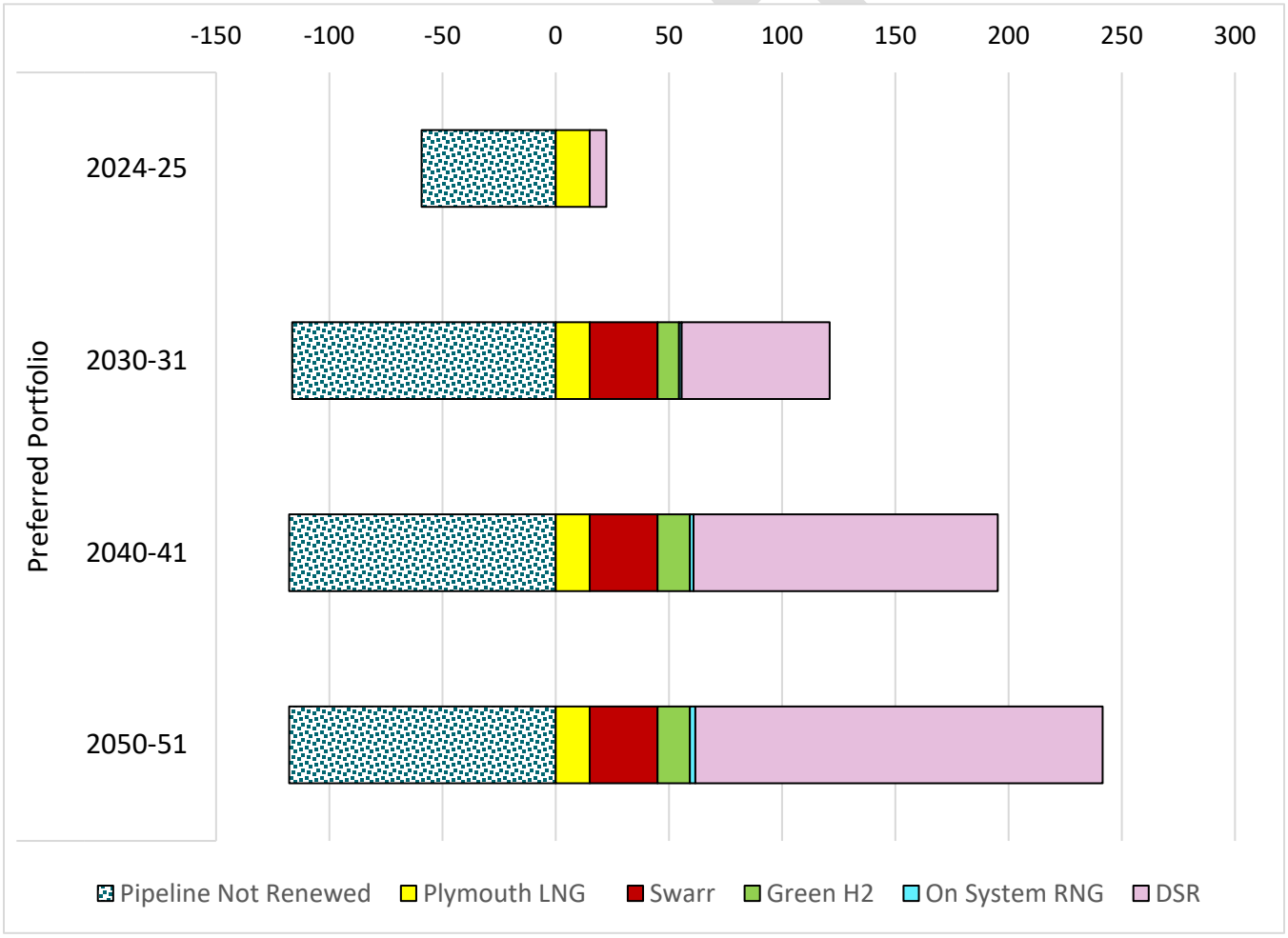


Table 2.1: Resource Additions by Type and Time (Capacity in MDth/day)

| Resource (MDth/d) | 2024 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| Energy Efficiency | 7 | 61 | 127 | 172 |
| Swarr Propane Plant | - | 30 | 30 | 30 |
| Plymouth LNG | 15 | 15 | 15 | 15 |
| Pipeline Renewals | (59) | (120) | (122) | (122) |
| RNG PNW Regional | 3 | 9 | 11 | 10 |
| RNG On-system | - | 1 | 2 | 2 |
| Green H2 - Gas Blending | - | 9 | 14 | 14 |
| **Net Supply Resources** | **(44)** | **(65)** | **(61)** | **(60)** |

The gas sales preferred portfolio integrates demand-side and supply-side resources to arrive at the lowest reasonable cost portfolio capable of meeting customer needs over the 20-year planning period. We ran several scenarios and sensitivities for this IRP that focused around changes in fuel costs, carbon costs, and demand. The preferred portfolio is not based on one single scenario, but is a combination of the results and information learned from the different scenarios and sensitivities. The preferred portfolio is mostly based on the reference scenario with the following changes:

- Conservation targets for zero-growth of gas demand sensitivity
- Higher allowance price: Washington Department of Ecology (Ecology) ceiling allowance price

There are two reasons for reflecting these conditions in developing the preferred portfolio:

1. Demand for allowances will likely exceed the supply

   The results of the gas portfolio modeling show that the least-cost portfolio complies with the CCA by purchasing significant volumes of allowances. We expect that demand for allowances will likely be high as regional local distribution companies (LDCs) and Emissions Intensive Trade Exposed (EITE) entities look to meet their emissions compliance obligations. This demand leads us to conclude allowances will probably reach the ceiling price.

2. Slowing gas demand

   With all the focus on reducing emissions from fossil fuels and legislative and building code changes, a reduction in gas growth is likely. As part of the IRP process and analysis, we test several scenarios and sensitivities. One of the sensitivities tested was around the gas demand forecast where there is no new growth forecasted. Our preferred portfolio leverages the conservation targets from sensitivity F — zero-gas growth to mitigate this unknown impact. This sensitivity produces one of the lowest cost-effective savings of all the

scenarios and sensitivities when the electrification portfolios are excluded, which mitigates potential over-investment in conservation.

Puget Sound Energy's preferred portfolio combines ceiling price (sensitivity A) and the conservation from the zero-growth gas demand growth (sensitivity F). This preferred portfolio has a slightly lower amount of energy efficiency. It shows the importance of alternative fuels by selecting regional RNG and green hydrogen as cost-effective over the reference case scenario. Figure 2.1 and Table 2.1 show the resource builds.[2]

➔ Please see Chapter 4: Key Analytical Assumptions for a discussion on scenarios and sensitivities and Chapter Six: Gas Analysis for results.

## 2.2. Emission Reduction Potential

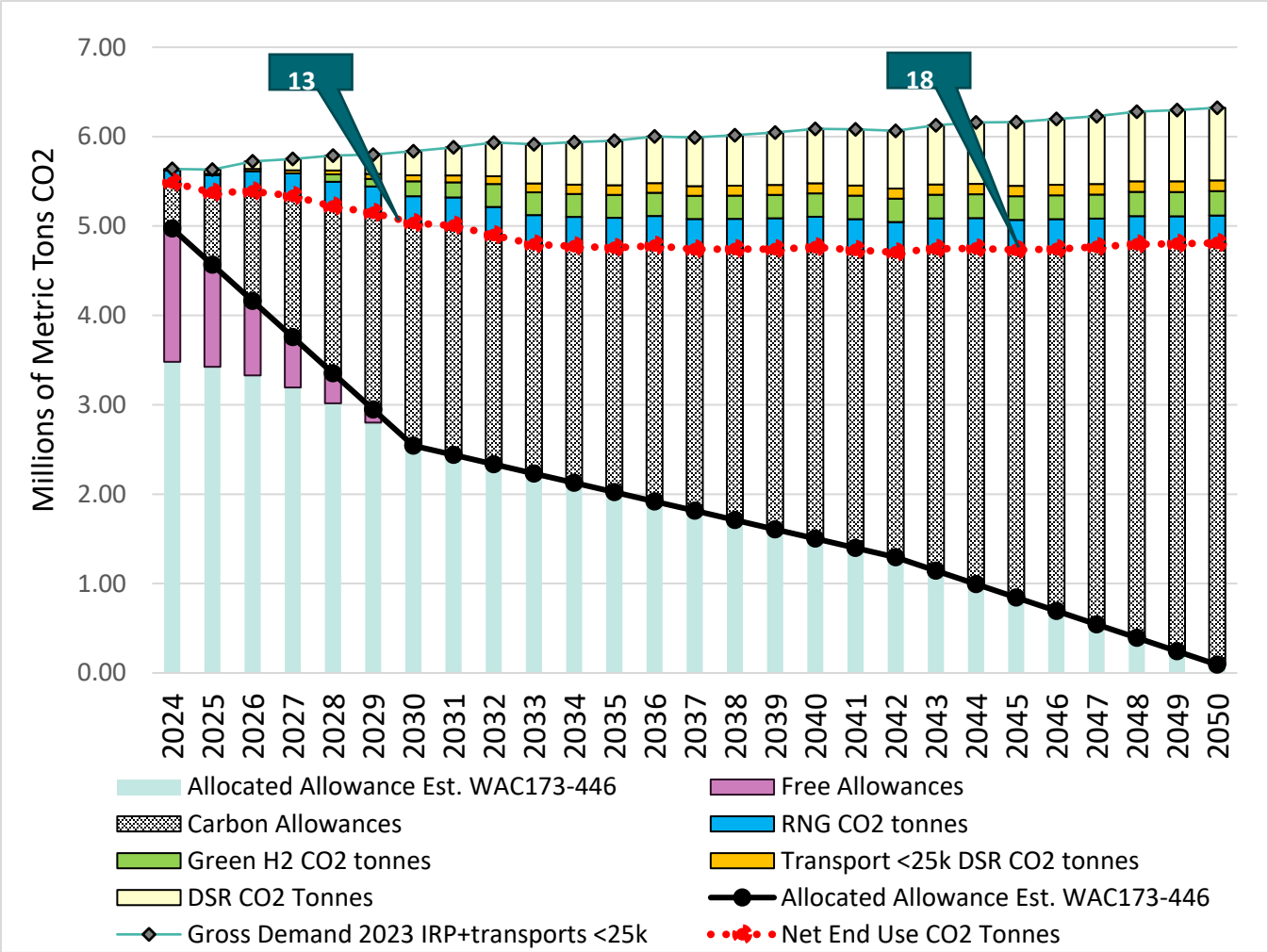
We focused on emission reduction in the 2023 Gas Utility IRP because it supports PSE's aspirational goal to reduce customer end-use carbon emissions by 30 percent by 2030 and achieve net-zero carbon emission for customer end-use by 2045. The preferred portfolio leverages three carbon-reducing resources: continued investment in conservation, RNG, and green hydrogen. The preferred portfolio pulls the conservation targets from the zero-growth sensitivity F.

The CCA and Inflation Reduction Act (IRA) help support this goal by allowing alternative fuels, such as green hydrogen, to appear cost-effective in the portfolio when we use the ceiling allowance price from the CCA. The resulting decrease in emissions is not as extensive as PSE's aspirational goal, even at the ceiling price. If RNG were not limited to the Pacific Northwest under the CCA, there would be more significant emission reduction potential (see Chapter Six, sensitivity D). We did not include in this analysis the carbon market's stimulating effect on investment in new renewable technologies and those potential impacts on the portfolio. Another end-use carbon-reducing technology offered in the model, which we did not choose as a cost-effective measure, was hybrid heat pumps. Figure 2.2 shows the emission reduction potential of the preferred portfolio, the final emission profile will depend on the evolving policies around electrifications, sourcing restrictions on RNG, equity, etc.



[2] Since most of the regional RNG is received at the gas hubs and displaces natural gas only, it does not show up in the resource builds in Figure 2.1 and Table 2.1, we show only the on-system RNG which displaced transport pipeline resources.

Figure 2.2: Emissions Reduction in the Preferred Portfolio




# 3. Developing the Preferred Portfolio

The resource plan highlights several key areas for our focus in the near term to ensure the supply- and demand-side resources meet the portfolio needs. The forecast additions we described are consistent with the optimal portfolio additions produced for the preferred portfolio by the SENDOUT gas portfolio model. SENDOUT is a helpful tool, but in reviewing its results, one must exercise judgment since the model does not reflect real-world market conditions and limitations on resource additions. The following summarizes key decisions for the preferred portfolio.

➔ Please see Chapter Six: Gas Analysis and Appendix F: Gas Analysis Results for detailed modeling results.

# 3.1. Conservation Demand-side Resources

Energy efficiency is one of the best options to reduce portfolio costs, risks, and emissions. This preferred portfolio incorporates cost-effective demand-side resources (DSR) from the zero-growth gas sensitivity F. Natural gas prices appear to have little impact on DSR, regardless of the load growth forecast. The primary variable affecting the resource decision is the social cost of greenhouse gases (SCGHG) adders and the CCA carbon allowance pricing.

We derived the SCGHG adders from the requirements stated in HB 1257, which became law during the 2019 legislative session[3]. The law requires that we incorporate SCGHG adders in the planning analysis as part of capacity expansion decisions. We derived the CCA price allowance adders using the forecasts produced by Ecology; for details, refer to Chapter Three. The results show that cost-effective conservation in the preferred portfolio is likely to be a safe decision, as conservation costs increase across all scenarios and sensitivities due to the higher cost of natural gas.

The cost-effectiveness of DSR in the deterministic reference case, zero-growth in sensitivity G, and ceiling allowance price in Sensitivity A are robust. Table 2.2 shows a narrow range of savings expected with a wide range of allowance prices and demand forecasts, indicating a low-risk resource for reducing emissions and costs to the portfolio. The preferred portfolio is consistent with the zero-growth sensitivity, which tracks towards the lower end of the range of cost-effective DSR in the non-electrification portfolios ensuring that no matter the scenario, this amount of DSR would be cost-effective, hence mitigating risks of overbuilding. In the outer years, the zero growth is lower due to lower demand than in the reference scenario. This path allows us to implement in the near term with the flexibility to continue to evaluate any changes needed in the longer term in subsequent IRP cycles.

Table 2.2: Conservation Savings Range by Scenarios and Sensitivities (MDth/day)

| Scenario/Sensitivity | Winter 2024–2025 | Winter 2030–2031 | Winter 2040–2041 | Winter 2050–2051 |
|---|---|---|---|---|
| Reference Scenario | 7 | 6 | 144 | 195 |
| Electrification Scenario | 10 | 78 | 114 | 114 |
| Sensitivity A: Ceiling Price | 8 | 69 | 147 | 199 |
| Sensitivity B: Floor Price | 7 | 64 | 139 | 190 |
| Sensitivity C: Limited Emissions | 11 | 97 | 193 | 250 |
| Sensitivity D: RNG NA | 7 | 67 | 144 | 195 |
| Sensitivity E: HHP Policy | 6 | 46 | 79 | 87 |
| Sensitivity F: No Gas Growth | 7 | 61 | 127 | 172 |
| Sensitivity G: High Gas Price | 7 | 67 | 144 | 195 |

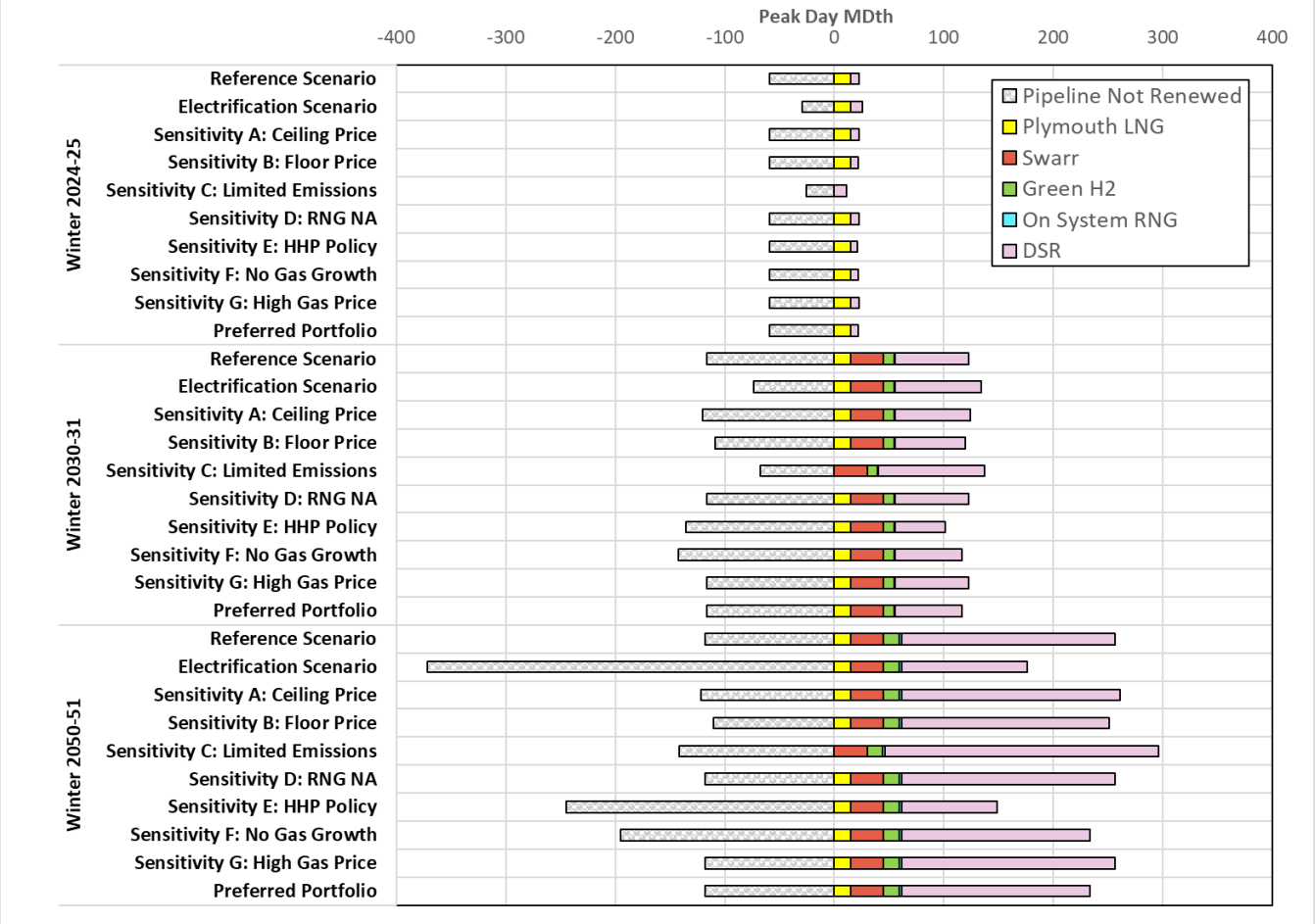
[3] 1257-S3.SL.pdf (wa.gov)

➔ Details on the load forecast are in Chapter Five: Demand Forecast, and impacts of conservation across the various scenarios and sensitivities in Chapter Six: Gas Analysis.

## 3.2. Supply-side Resources

We show the results of all the portfolio additions to serve the peak day in Figure 2.3. The figure includes supply-side resource additions for winter 2024–2025, 2030–2031, and 2050–2051 periods of the study.

Figure 2.3: Portfolio Additions – Including Supply Side Resources




The supply-side resources — upgrades to the Swarr Propane Plant, renewing the Plymouth Liquid Natural Gas (LNG) peaker contract, and pipeline capacity not renewed — represent the preferred portfolio resource additions. There are no near-term resource decisions except for Plymouth LNG. The lead time to acquire the Plymouth LNG peaker contract is short, so a decision to add this contract to the gas book will be needed by 2024. We show Swarr in the preferred portfolio as a need in 2030; this is a PSE-owned and controlled facility; thus, we are in the near term. Pipeline capacity release would begin as soon as 2024; the SENDOUT model simulates a simplified de-contracting

approach. The rate of returning these pipeline contracts may vary based on the terms and conditions of PSE's current pipeline contracts.

### 3.2.1. Swarr Propane Plant

Upgrades to PSE's propane injection facility, Swarr, are the least-cost resource in the preferred portfolio. The load forecast and gas prices drive the timing of the Swarr upgrade. In the preferred portfolio, Swarr is needed by 2030. Upgrades to Swarr are essentially within PSE's ability to control, so PSE has the flexibility to fine-tune the timing. The Swarr upgrade has a short lead time. However, we need to determine whether upgrading Swarr has negative or positive equity impacts on the local community as a key input to the decision to upgrade the facility.

### 3.2.2. Plymouth LNG

We selected the Plymouth LNG peaker contract as the least-cost resource in the preferred portfolio. The plant is in PSE's electric portfolio, and the contract is up for renewal in April 2023; the natural gas sales portfolio could buy the contract. In the preferred portfolio, we selected the plant to start service in winter 2024–2025. The plant has an associated pipeline capacity of 15 MDth per day on the Northwest Pipeline to deliver the natural gas to PSE.

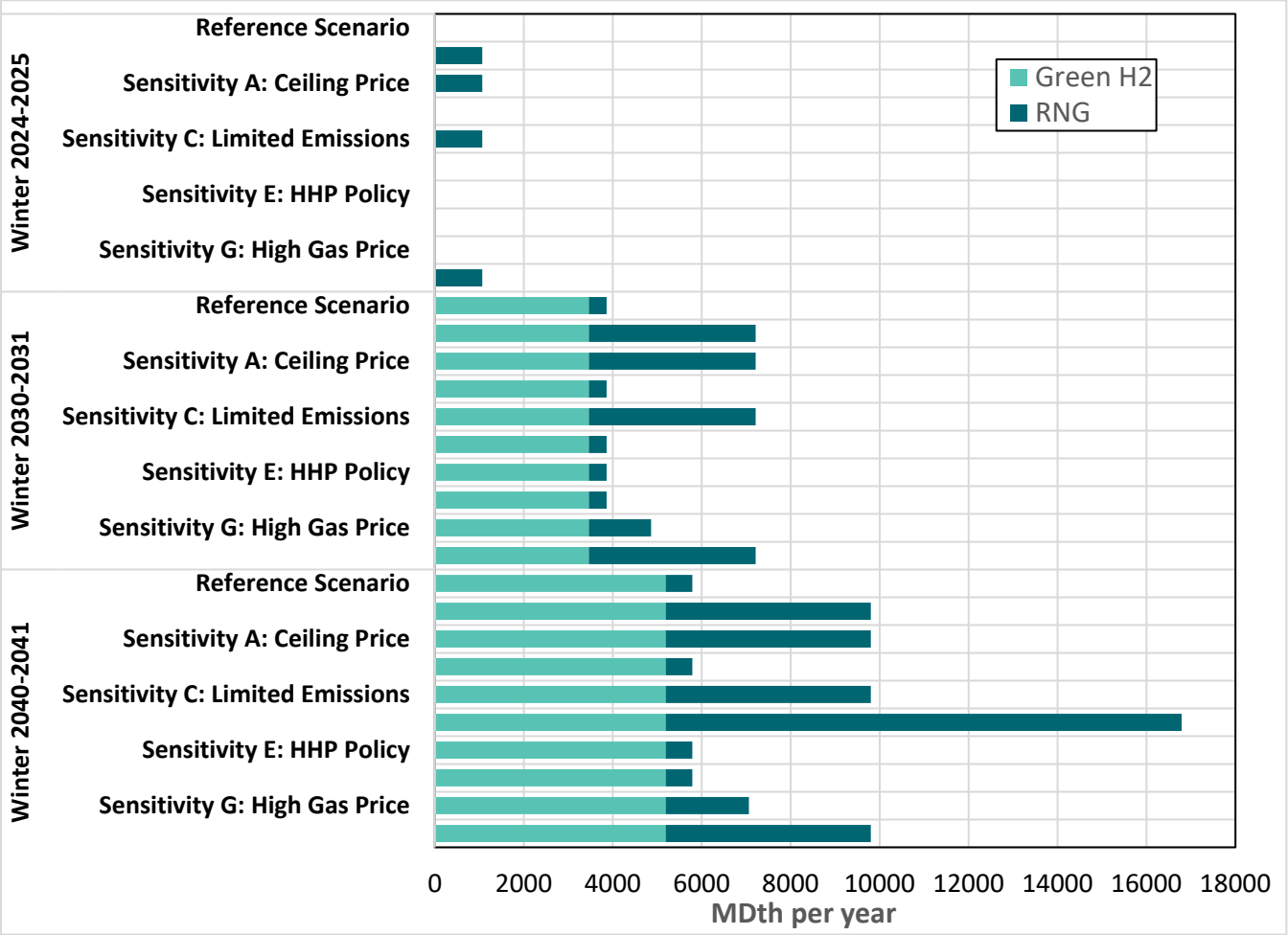
### 3.2.3. Pipeline Capacity

In a departure from prior IRPs, where we assumed we would renew existing pipelines capacity annually, this IRP offered the annual renewal as a resource alternative to allow renewals to compete with other supply-side resources and DSR. Segments aggregated multiple contracts from Sumas in the north and the south connector via Gas Transmission Northwest (GTN) to the AECO hub and Rockies. We bundled these contracts into specific periods and offered them in the models for renewal. Transmission pipelines not renewed amount to 120 MDTh/day in 2030 and 122 MDth/day in 2040, shown in table 2.1.

## 3.3. Investment in Alternative Fuels

This IRP incorporated RNG and green hydrogen as alternative fuels to support our carbon reduction aspirational goals. The preferred portfolio has RNG starting in 2024 and green hydrogen the first year it was offered in 2028. We will need to move forward with RNG and green hydrogen as soon as possible to ensure we can acquire the desired amount noted in the preferred portfolio. We are pursuing RNG contracts and stimulating hydrogen development in Washington State. Figure 2.4 shows the alternative fuels added to the portfolios as cost-effective options that also reduce emissions to the gas system. These energy units per year are shown for the winters of 2024–2025, 2030–2031, and 2050–2051.

Figure 2.4: Alternate Fuel Additions by Scenario and Sensitivity




## 3.3.1. Renewable Natural Gas

We selected RNG as a least-cost resource in the preferred portfolio across the PNW region and on our local distribution system. We modeled current RNG contracts that PSE could acquire today for the physical gas and the clean attributes. In the preferred portfolio, we selected the PNW regional gas and the on-system gas to start service in the winter of 2023–2024. This service will start with 3 MDth/day for the winter of 2023–2024 and grow to 13 MDth/day by 2040.

## 3.3.2. Green Hydrogen

We selected green hydrogen as a least-cost resource in the preferred portfolio due to the cost reductions from the IRA. We modeled potential future green hydrogen contracts that would be available by 2028, limiting the amount that could blend into the PSE system to 5 percent by energy. The 5 percent was determined to be the maximum limit of blending into the system with no meaningful impact on operations and integrity of the pipeline infrastructure. This analysis assumes that we could acquire the physical gas and the clean attributes. In the preferred portfolio, we selected

green hydrogen to begin service in 2028, the first year it was offered in the analysis. This service will start with a total of 9.5 MDth/day for the winter of 2030–2031 and grow to 14 MDth/day by the winter of 2032–2033.

## 3.4. Portfolio Costs

Portfolio costs reflect the new resources' total cost and the portfolio's operating costs, including all direct carbon costs[4]. Figure 2.5 shows the portfolio cost per dekatherm (Dth) of served load/demand by year and offers the range of costs for all the scenarios and sensitivities. The cost of the preferred portfolio ranges between the sensitivity C with Limited Emissions on the high end to the Floor Price sensitivity B on the low end. The preferred portfolio cost is higher than the Reference Scenario due to the higher allowance costs. The preferred portfolio's net present value (NPV) is about $0.94 billion more than the reference scenario, primarily driven by the higher carbon allowance costs.



[4] The social cost of greenhouse gases (SCGHG) with the upstream emissions has been removed from the portfolio costs shown here.

Figure 2.5: Total Portfolio Costs ($/ per dekatherm of served demand)