

Gas and Deep Decarbonization



ACEEE EE as Resource
October 17, 2019



Who is NW Natural?



Deliver natural gas to businesses and homes in OR and SW Washington

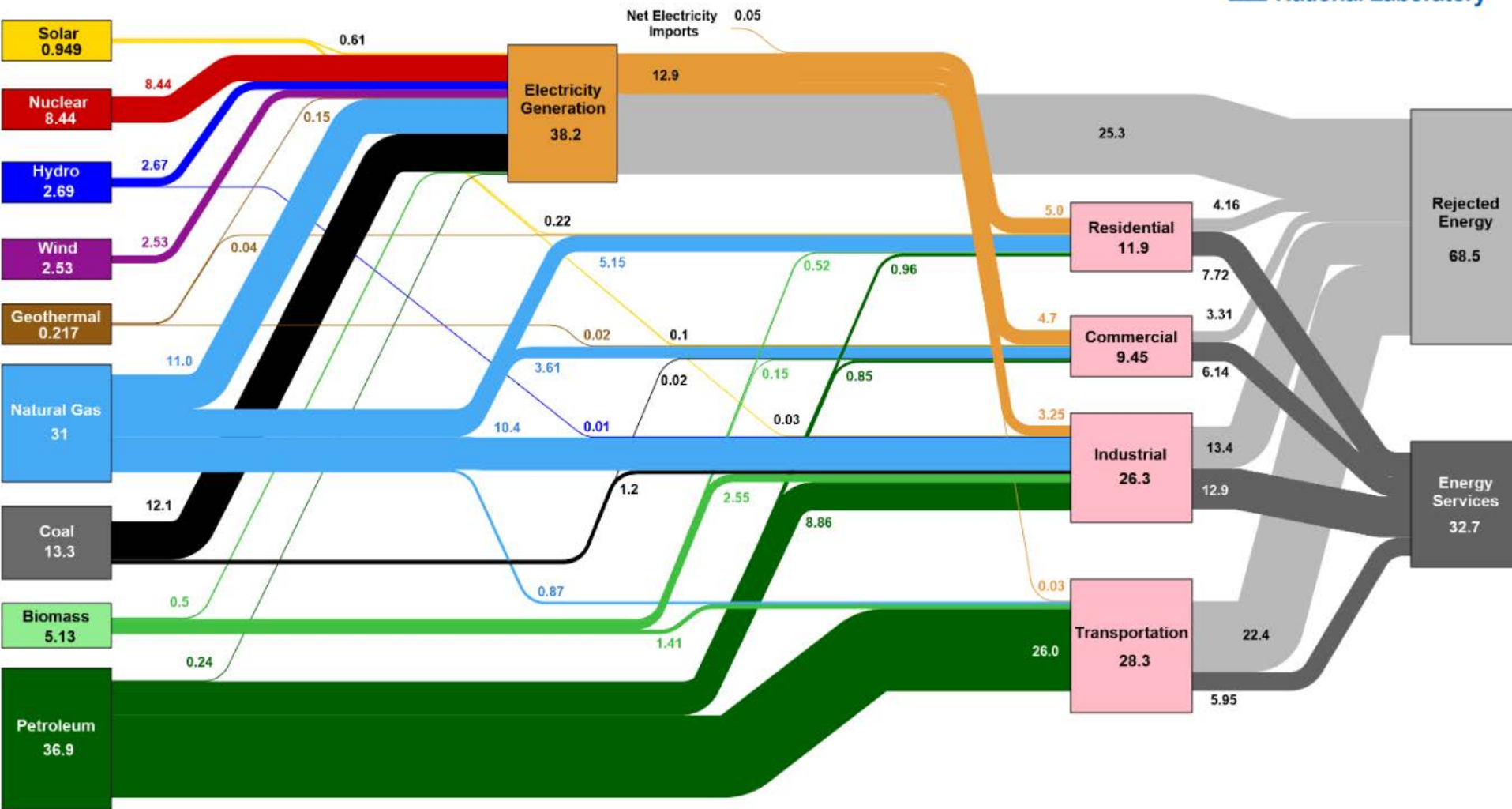


Our residential customers depend on the direct use of natural gas to heat their homes and water, which is especially important on the coldest days of the year

Carbon emission reduction is core to company's strategic direction



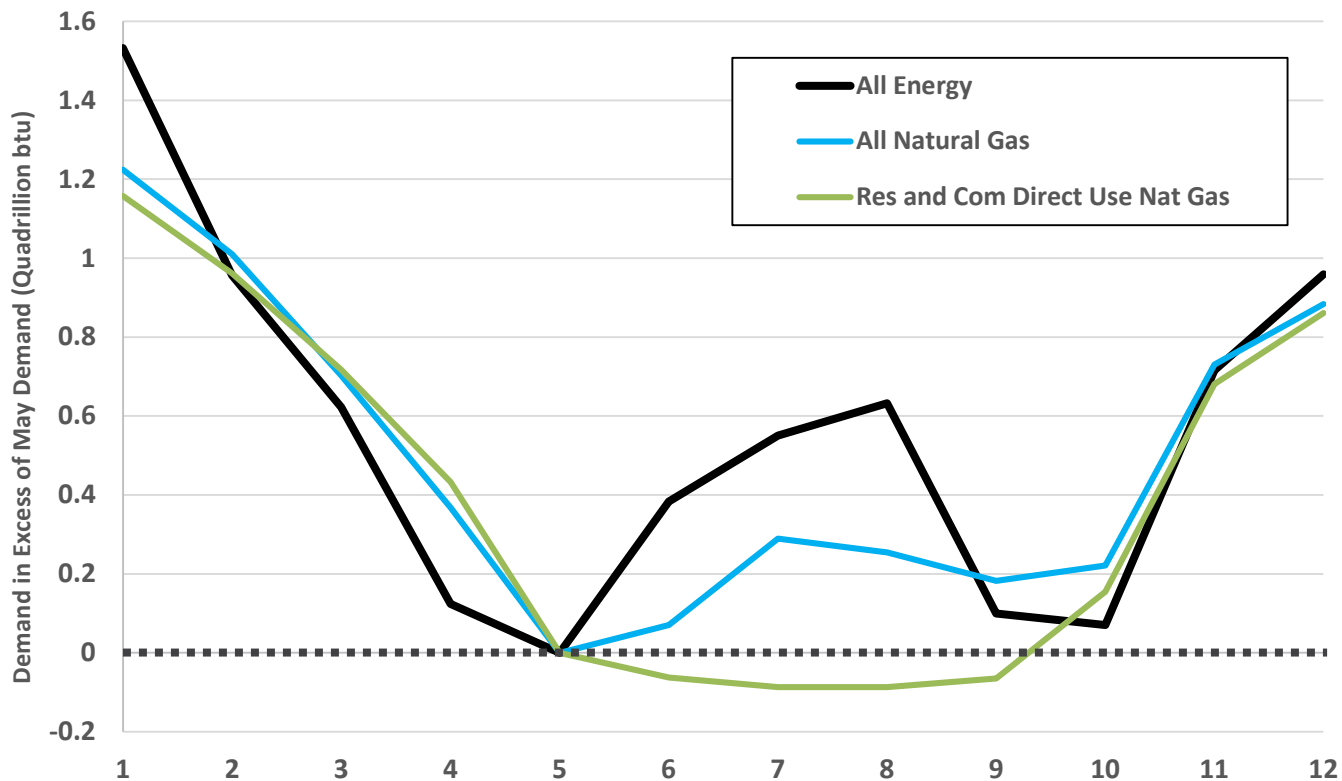
Estimated U.S. Energy Consumption in 2018: 101.2 Quads



Source: LLNL March, 2019. Data is based on DOE/EIA MER (2018). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is

Seasonality in Energy Use Balanced Primarily by Natural Gas Storage

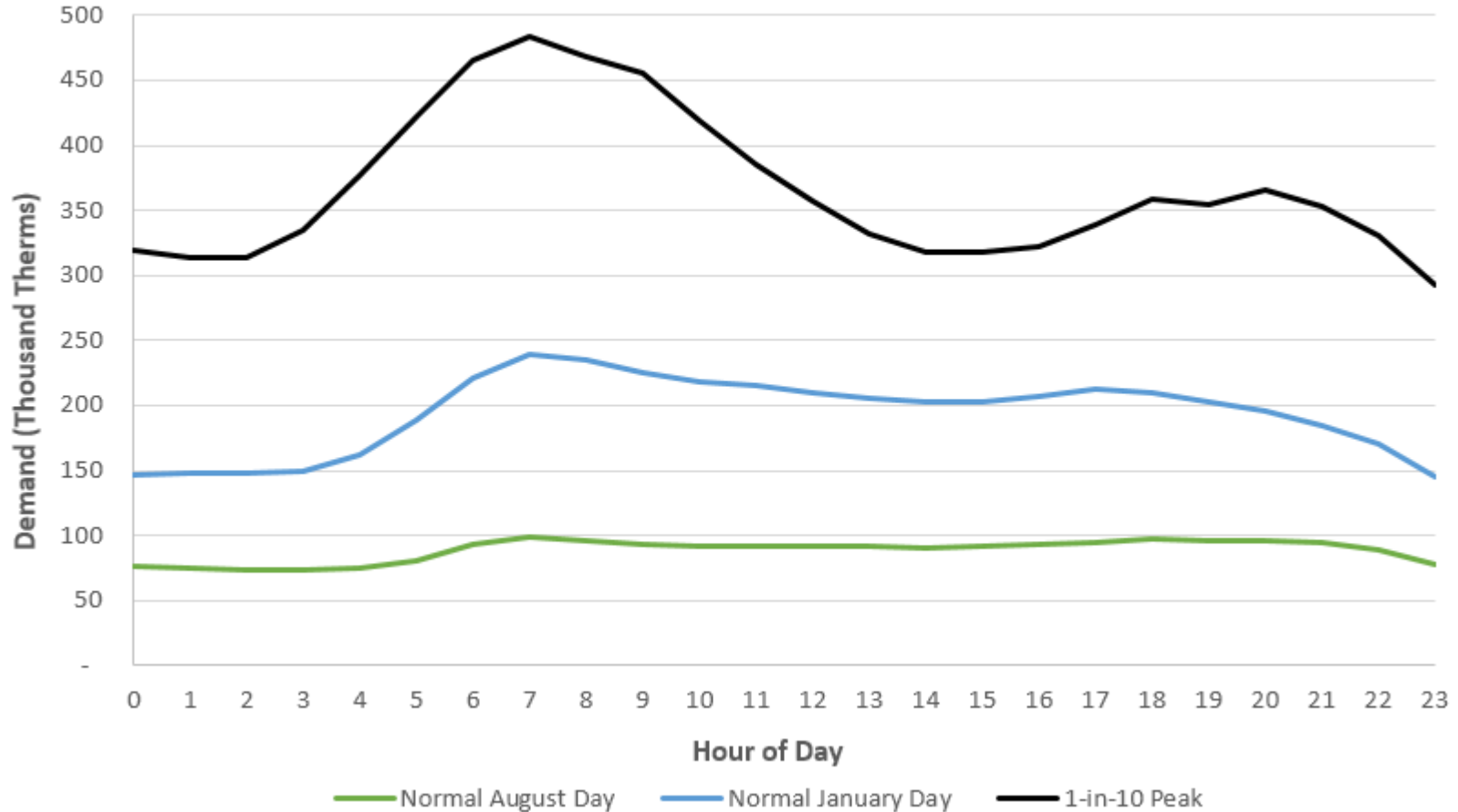
Seasonality in United States Energy Consumption



Seasonality in residential and commercial direct use natural gas consumption accounts for most of the seasonality in total energy consumption in the United States

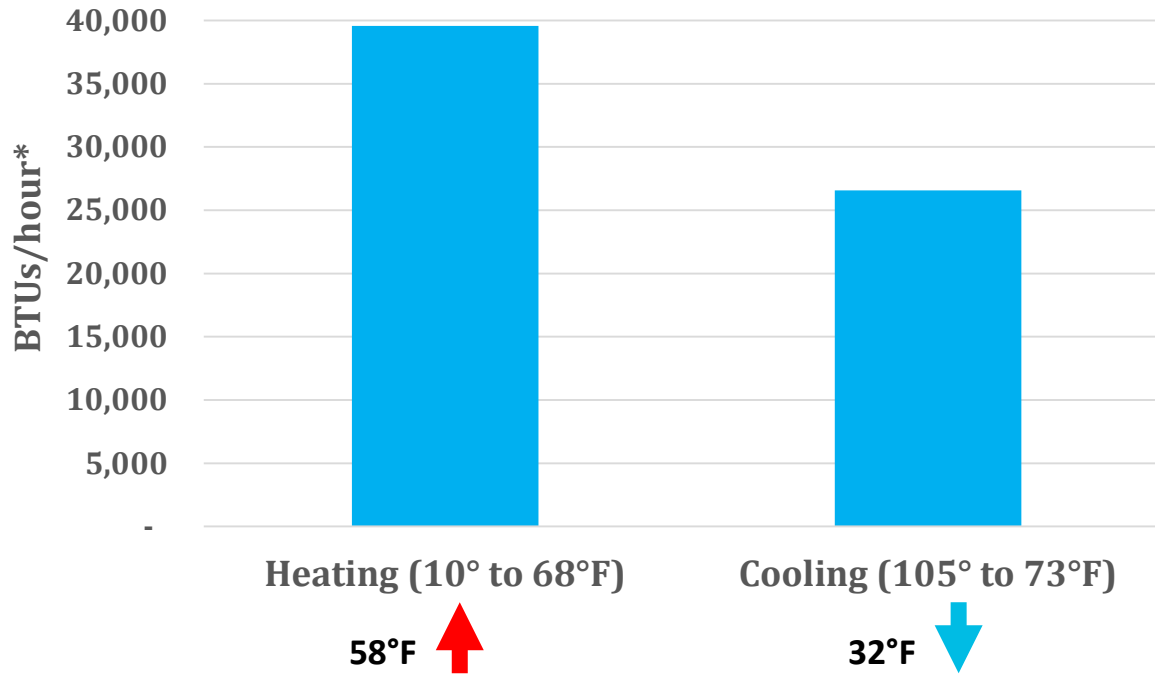
Gas Demand is Seasonal and Peaky

Hourly Demand by Season



What makes a peak?

Energy Required to Heat or Cool the Average Oregon Home During Cold and Hot Events



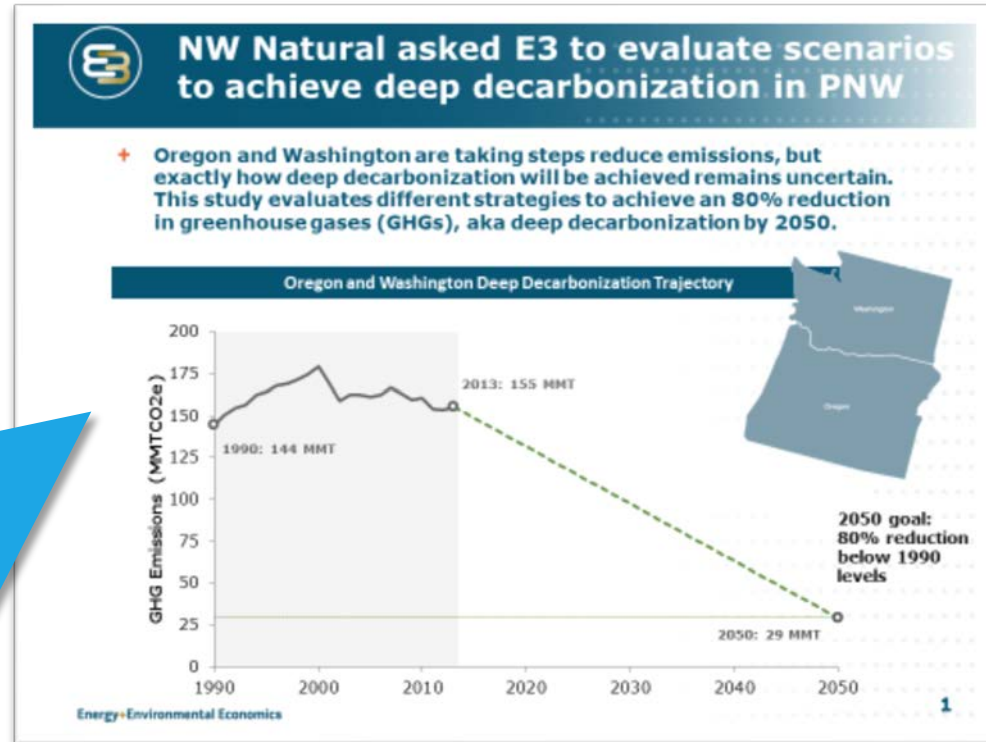
- Peak needs are typically driven by heating or cooling loads during extreme weather events
- For the majority of Americans more energy is required to heat their home during cold snaps than to cool it home during heat waves
- When considering all energy use – not just electricity – the majority of the country is in a winter peaking climate

*Based upon energy needs of 2,000 square feet single family home with average shell efficiency. Shows the energy required to heat or cool a home, not the energy usage of the equipment used to provide those energy services

Pacific Northwest Deep Decarbonization Study

Deep Decarbonization Study of Northwest Focusing on Role of Building

80% reduction, economy wide, in greenhouse gas emissions by **2050**

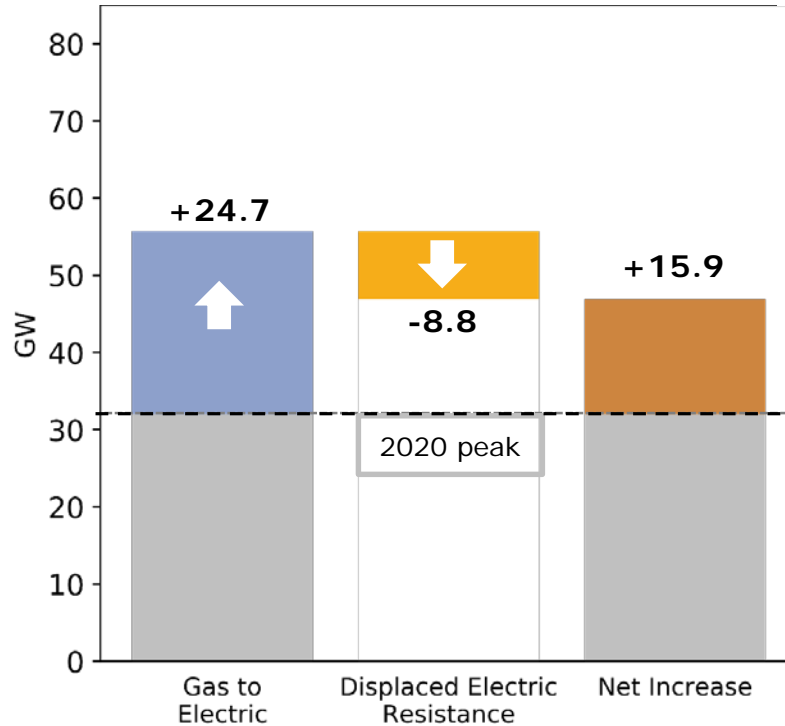




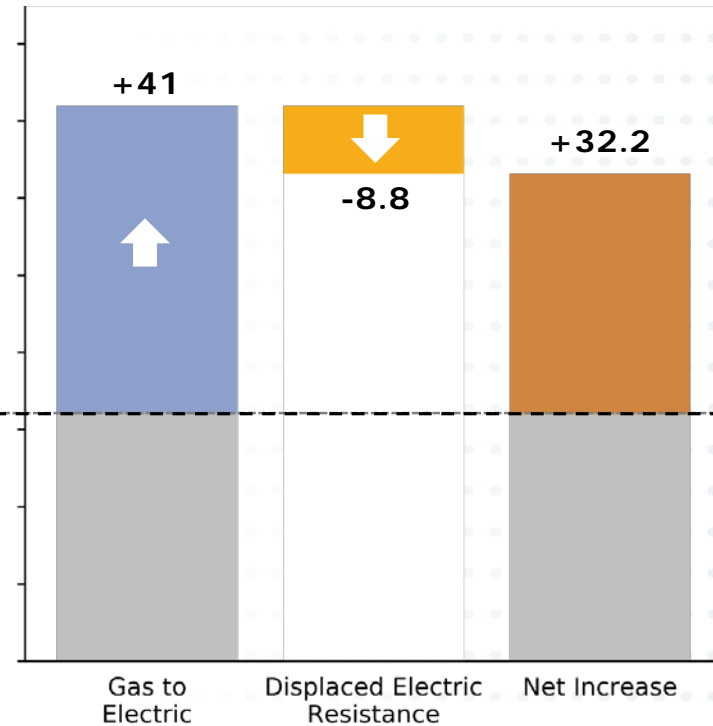
Electrification of space heating increases peak electricity demand

+ **New loads from electrification of space heating will, net of displaced resistance load, be incremental to existing peak demands**

Cold Climate Electric Heat Pump Scenario: 2050
Contribution to Northwest System Peak Demand (GW)



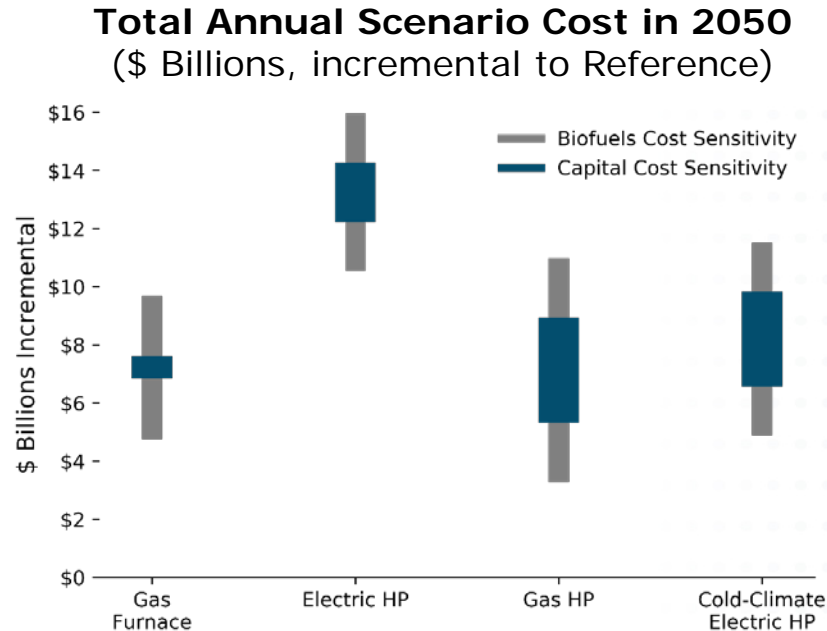
Electric Heat Pump Scenario: 2050 Contribution to
Northwest System Peak Demand (GW)





Economy-wide scenario costs in 2050 are similar for three scenarios, electric heat pump scenario is highest cost due to winter peak capacity need

- + The 2050 economy-wide scenario costs range from \$3 - \$16 billion/year in 2050, relative to Reference scenario
 - Equivalent to ~1% of projected 2050 regional Gross Domestic Product
- + Cost forecasts are uncertain and sensitive to assumptions about technology costs for building heat equipment and biofuel prices



Direct Use Gas Decarbonization



Renewable Natural Gas

Potential to serve half of current natural gas needs with biomethane (RNG)

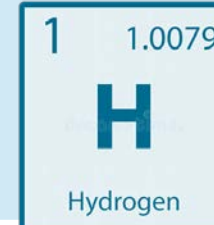
When carbon pricing and capacity benefits are considered RNG is cost-competitive with conventional gas



Energy Efficiency

Energy Efficiency has cut gas use in homes in half while serving more end uses.

More opportunity-deep EE and product innovation (e.g., gas heat pumps).



Renewable Hydrogen

A key storage strategy for excess renewables generation – using the gas system

Can be blended into natural gas supply or used as pure hydrogen