Northwest **Power** and **Conservation** Council

August 8, 2017

MEMORANDUM

TO: **Council Members**

FROM: **Steven Simmons**

SUBJECT: **Presentation on the efforts underway at NW Natural to pursue Low Carbon Pathways, including Renewable Natural Gas**

BACKGROUND:

Presenter: Bill Edmonds, Director of Environmental Management and Sustainability at NW Natural

Summary: NW Natural is a natural gas distribution and storage company, serving over 725,000 utility customers in Oregon and Washington. The utility plays a key role in the region for meeting winter peak energy needs. Recently, the venerable 158 year old gas company has begun undertaking efforts to develop lower carbon pathways using existing natural gas infrastructure. Actions include replacing use of diesel fuel in the transportation sector with cleaner burning natural gas and renewable natural gas, and the reduction of upstream methane releases.

Relevance: The direct use of natural gas can be an efficient way to meet winter peak energy needs in the region. The abundance of new North American supplies and low prices, coupled with existing infrastructure has boosted demand for natural gas as a transportation fuel. Consumption of natural gas in the transportation sector in the United States has been growing at roughly six percent annually over the past ten years. Adding renewable natural gas to the mix may further offset diesel fuel use and could help to lower the overall carbon intensity of the transportation sector.

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Workplan: Improve long-term load forecast for emerging markets, including transportation

Background:

Renewable natural gas (RNG) is pipeline quality gas which is interchangeable with geologic natural gas. It can be produced from a variety of biogas feedstocks including water treatment plant waste, manure, and landfill gas. Once the biogas is processed and upgraded to RNG, it can be fed into distribution pipelines for direct use in home and businesses, or used as a transportation fuel.

Earlier this year, NW Natural entered into a partnership with the City of Portland to inject RNG from the Columbia Boulevard Wastewater Treatment Plant into the gas company's distribution pipeline system. As part of the project, NW Natural will also build and maintain a RNG transportation fueling station at the site for medium and heavy duty trucks.

OUR LOW-CARBON PATHWAY

Kim Heiting, VP Communications and Chief Marketing Officer
Bill Edmonds, Director Environmental Management & Sustainability
Ryan Bracken, Principal Economist

August 2017

NW Natural®

A LOW CARBON FUTURE

- We believe there is a climate imperative.
- We believe NW Natural and natural gas have an important role to play in a smart and affordable Northwest climate strategy.
- We believe greater emission reductions are possible through voluntary, collective action and constructive policy engagement.

NWN OBJECTIVES

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Long-term goal of deep decarbonization that leaves no one behind.	Near-term actions take advantage of the natural gas infrastructure already in place.	Lead the way on natural gas innovations - and share broadly for larger impact.

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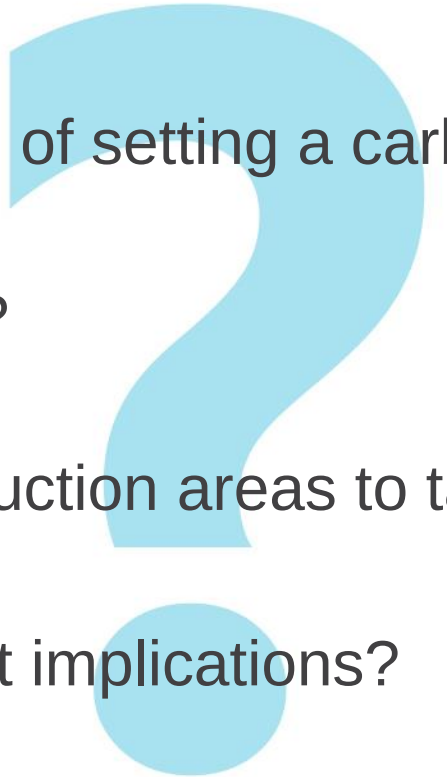
KEY QUESTIONS TO ADDRESS

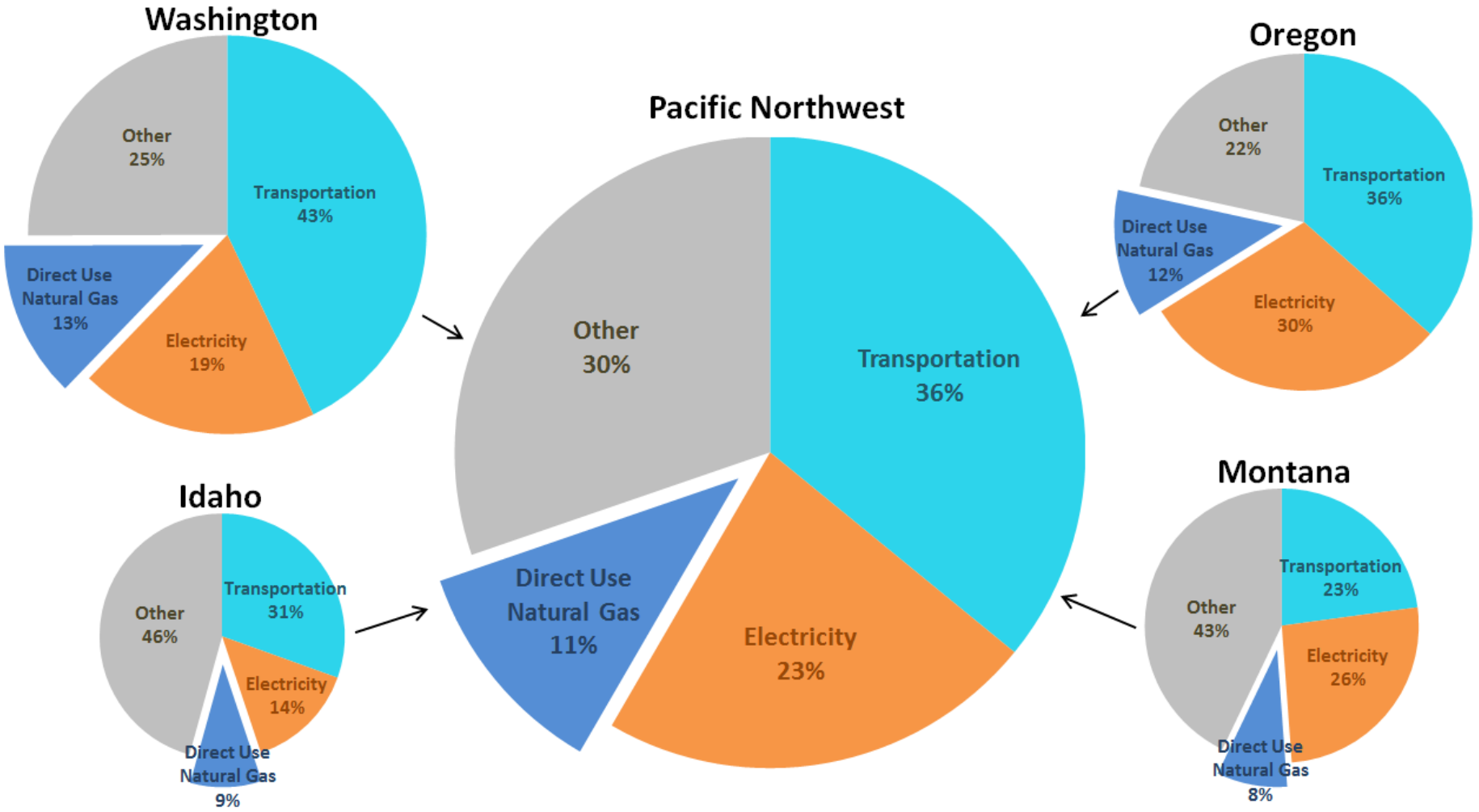
- Is the direct use of natural gas important?
- What is the value of setting a carbon savings goal?
- What is our goal?
- What are the reduction areas to target?
- What are the cost implications?



IS THE DIRECT USE OF NATURAL GAS IMPORTANT?

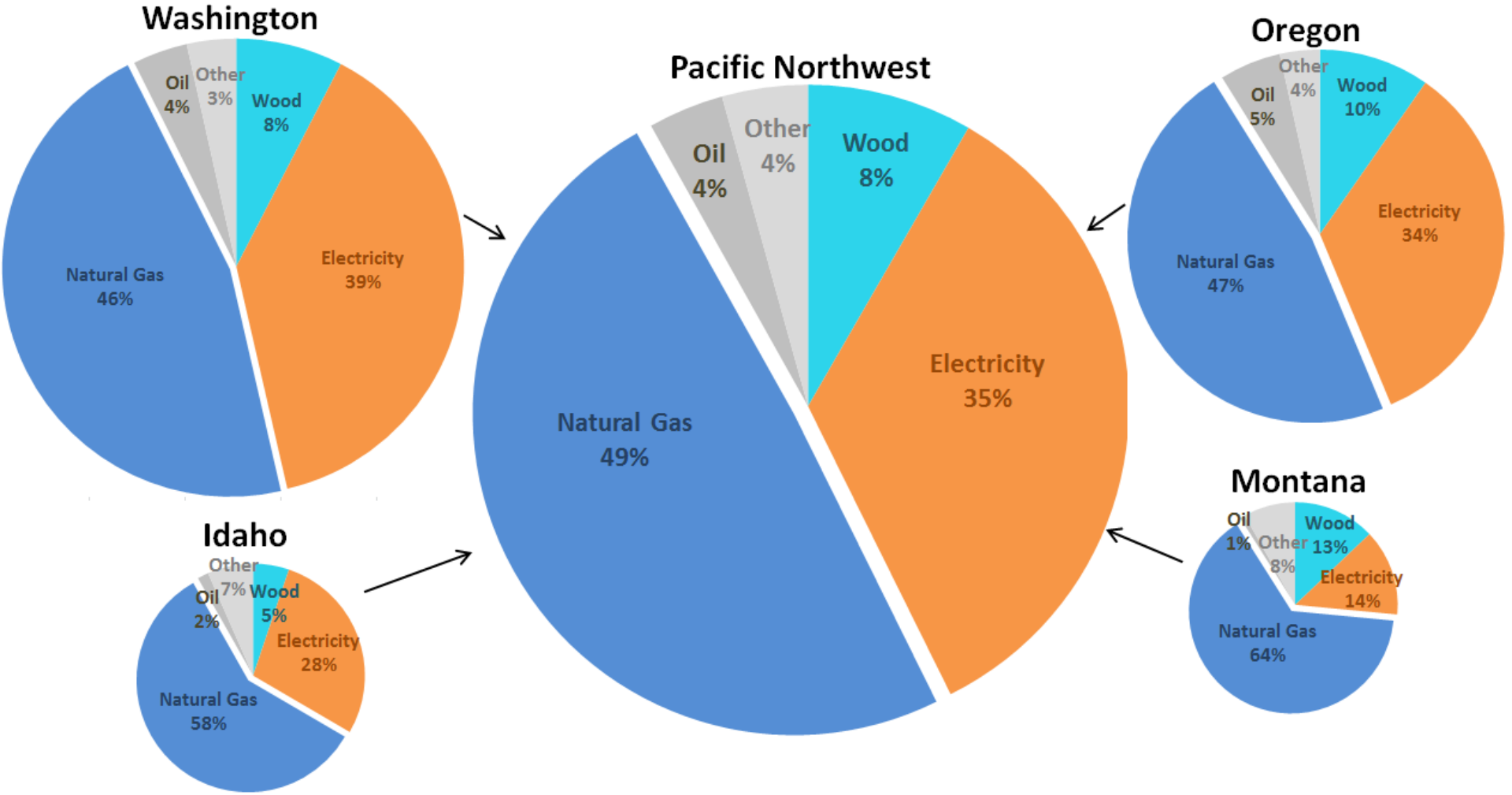
Modest contributor to state emissions,
but a critical resource for heating.

CURRENT GHG EMISSIONS PROFILE OF THE PNW



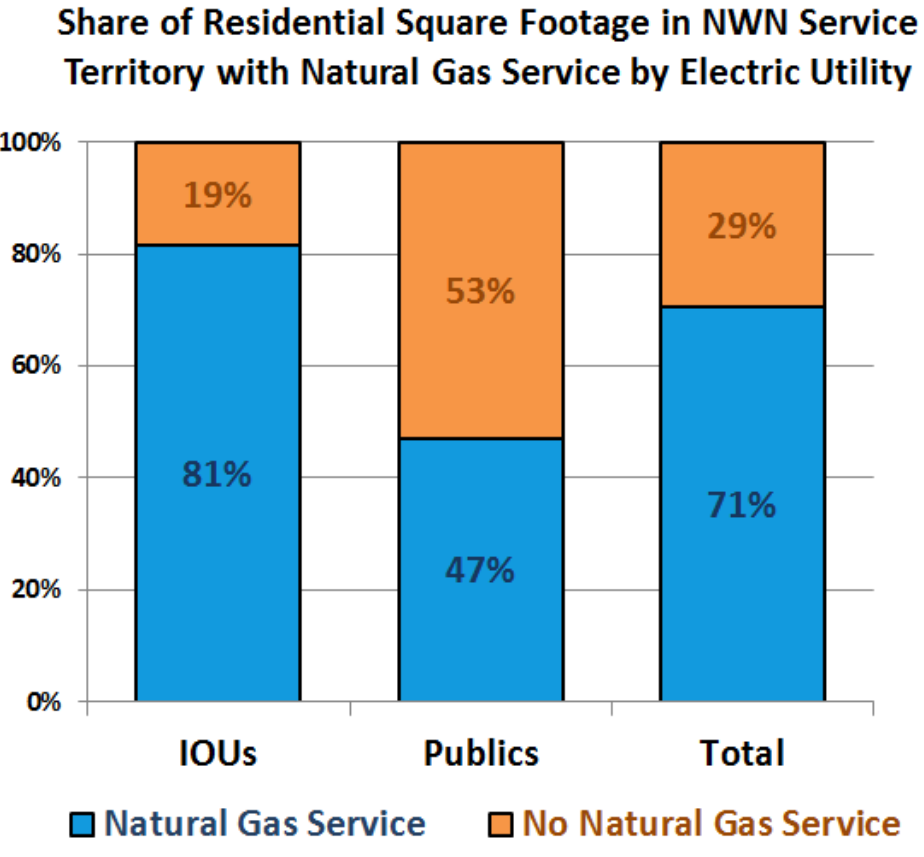
Pie sizes represent GHG emissions (in CO2 equivalent) of the state and the region. Source of data: latest year from the GHG emissions inventories published by the Oregon, Montana, and Idaho Department's of Environmental Quality and the Washington Department of Ecology

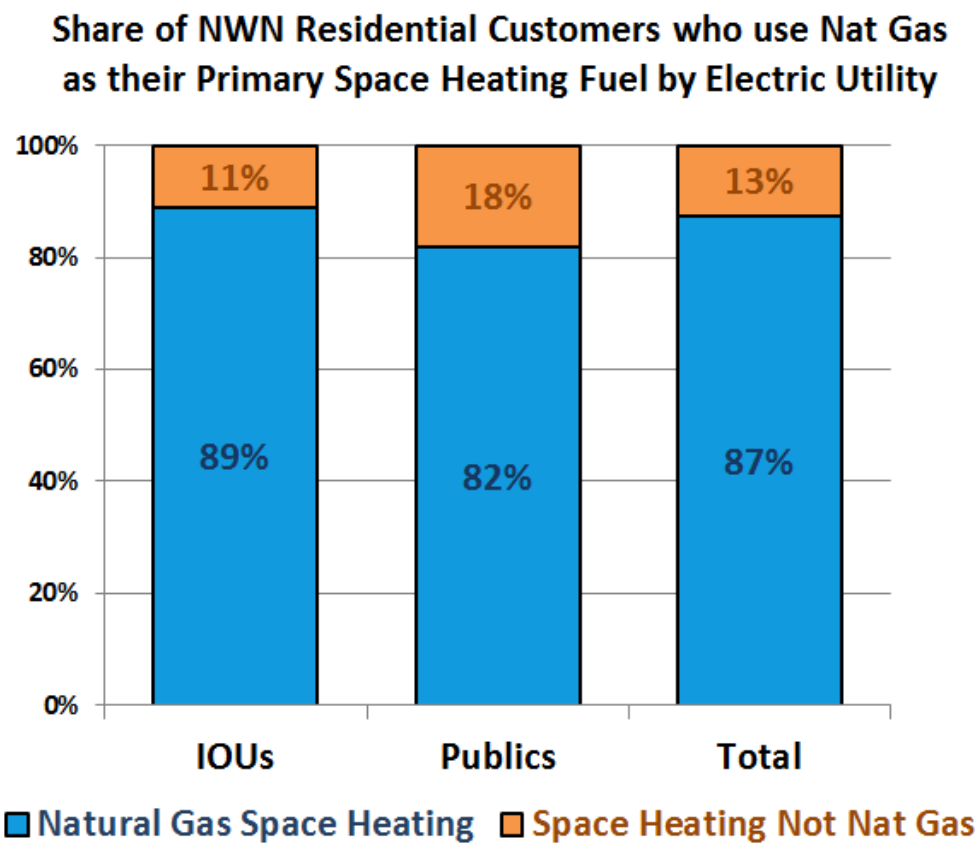
RESIDENTIAL SPACE HEATING IN THE PNW



Relative pie sizes represent the number of housing units in each location. Data from the Northwest Energy Efficiency Alliance's (NEEA) 2011 Residential Building Stock Assessment (RBSA); primary space heating equipment of single-family housing shown

WHERE AVAILABLE DIRECT USE NAT GAS MARKET SHARE IS SUBSTANTIAL





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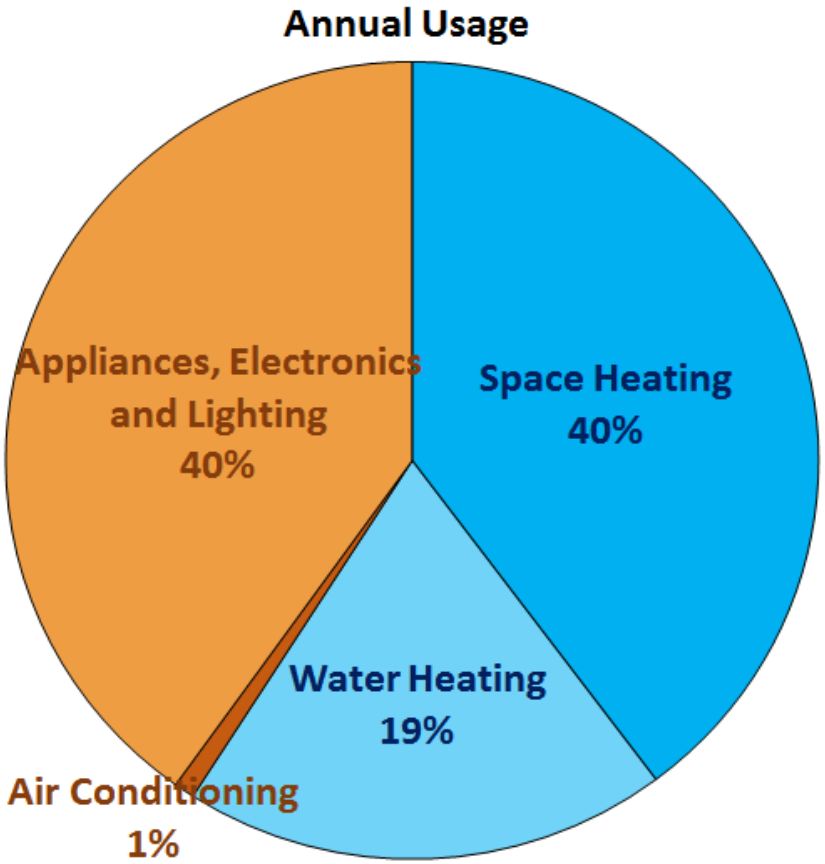
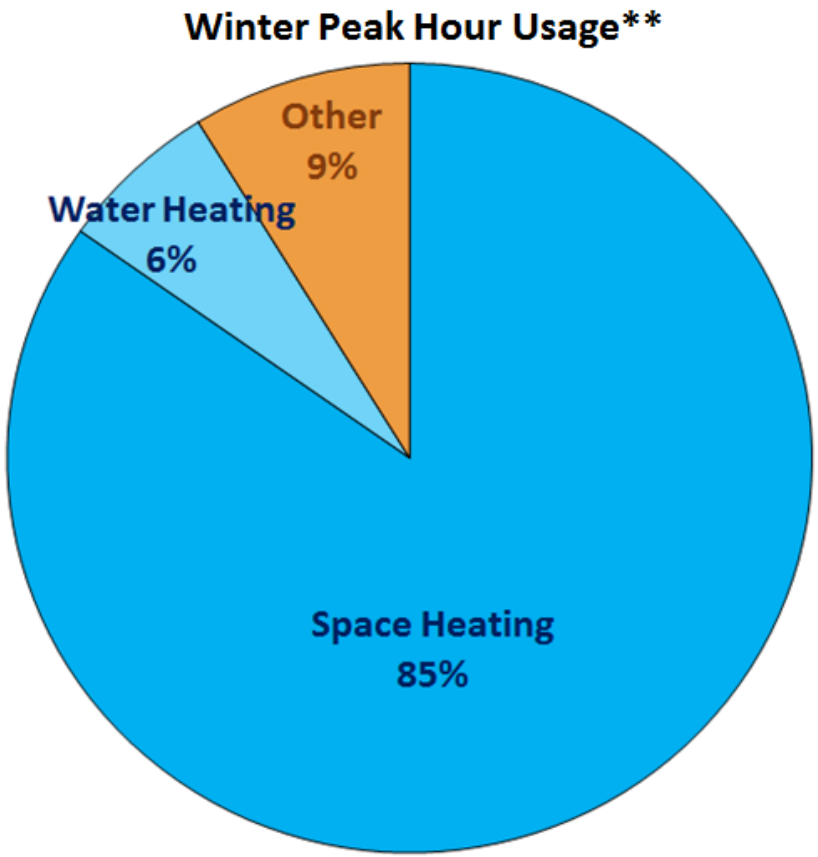
SPACE AND WATER HEATING: 90% OF PEAK HOUR ENERGY USE

PNW Household Usage: Annual vs. Peak Hour





* *Based on kWh usage of a home with a 9.0 HSPF heat pump and standard electric water heater for the 7am hour in the winter with a temperature of 7°F.

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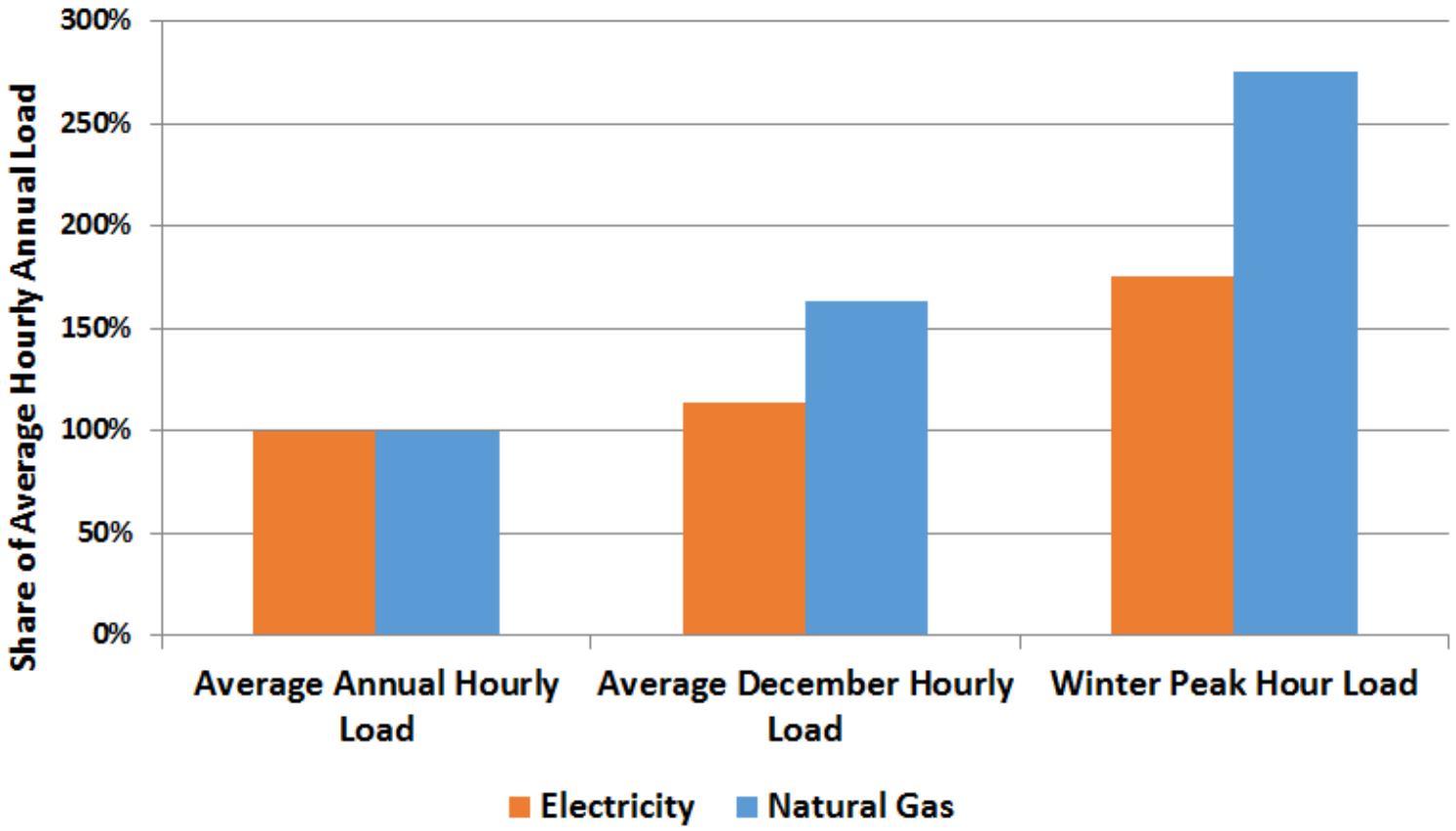
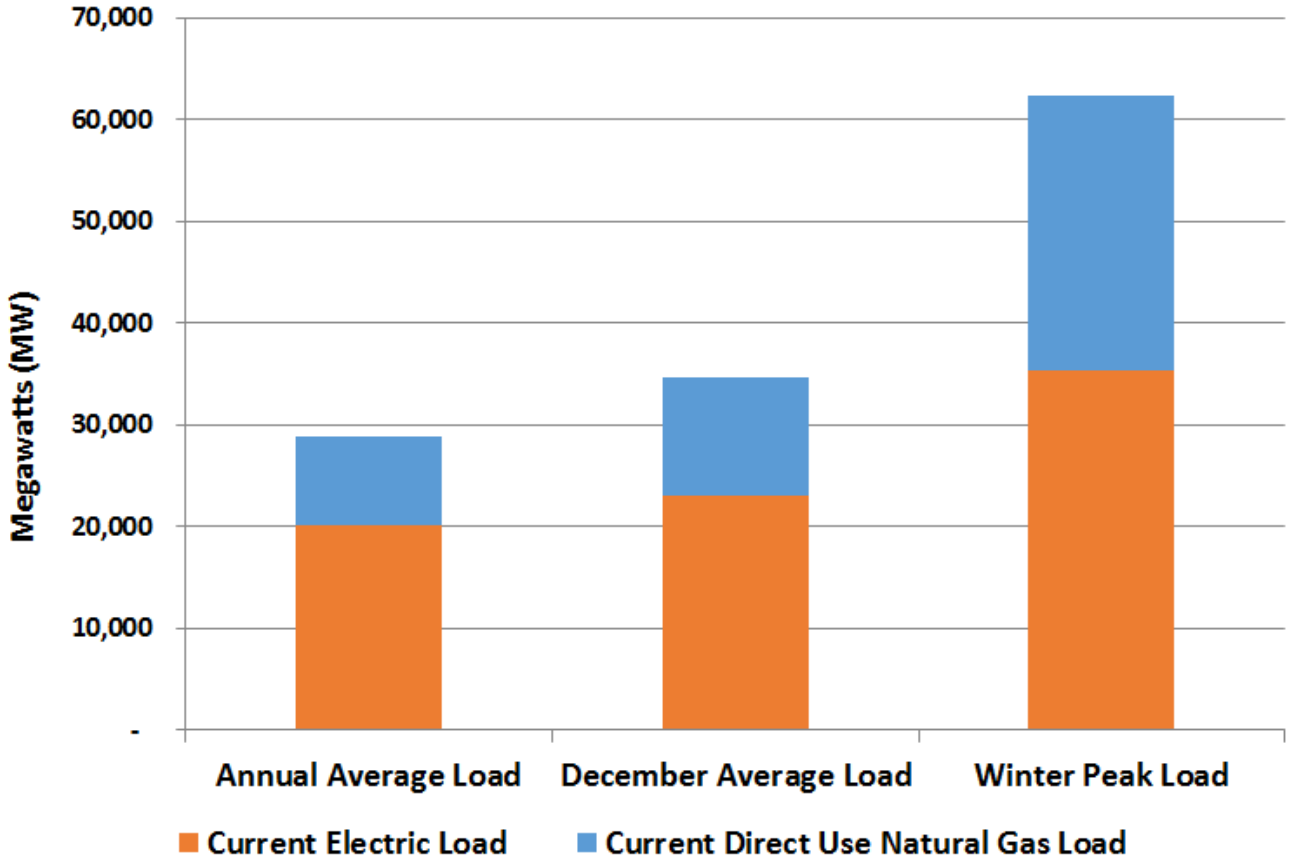
NATURAL GAS DIRECT USE LOAD IS VERY "PEAKY"



(1) Hourly loads less than the average hourly load for the year are less than 100% in this accounting
(2) Includes load from direct use natural gas transportation schedule customers who buy and schedule their own commodity purchases. When only load from natural gas sales customers who purchase their natural gas from local distribution utilities is considered the winter peak hour load is more than 400%.
(3) Based upon load shapes from the NWPCC and an aggregation of loads from of the natural gas local distribution companies where service territories overlap

NATURAL GAS SYSTEM ESSENTIAL AT PEAK



- It is estimated that winter peak load would be ~80% higher than the current peak load
- It is estimated that December load would be ~50% higher than the current December load

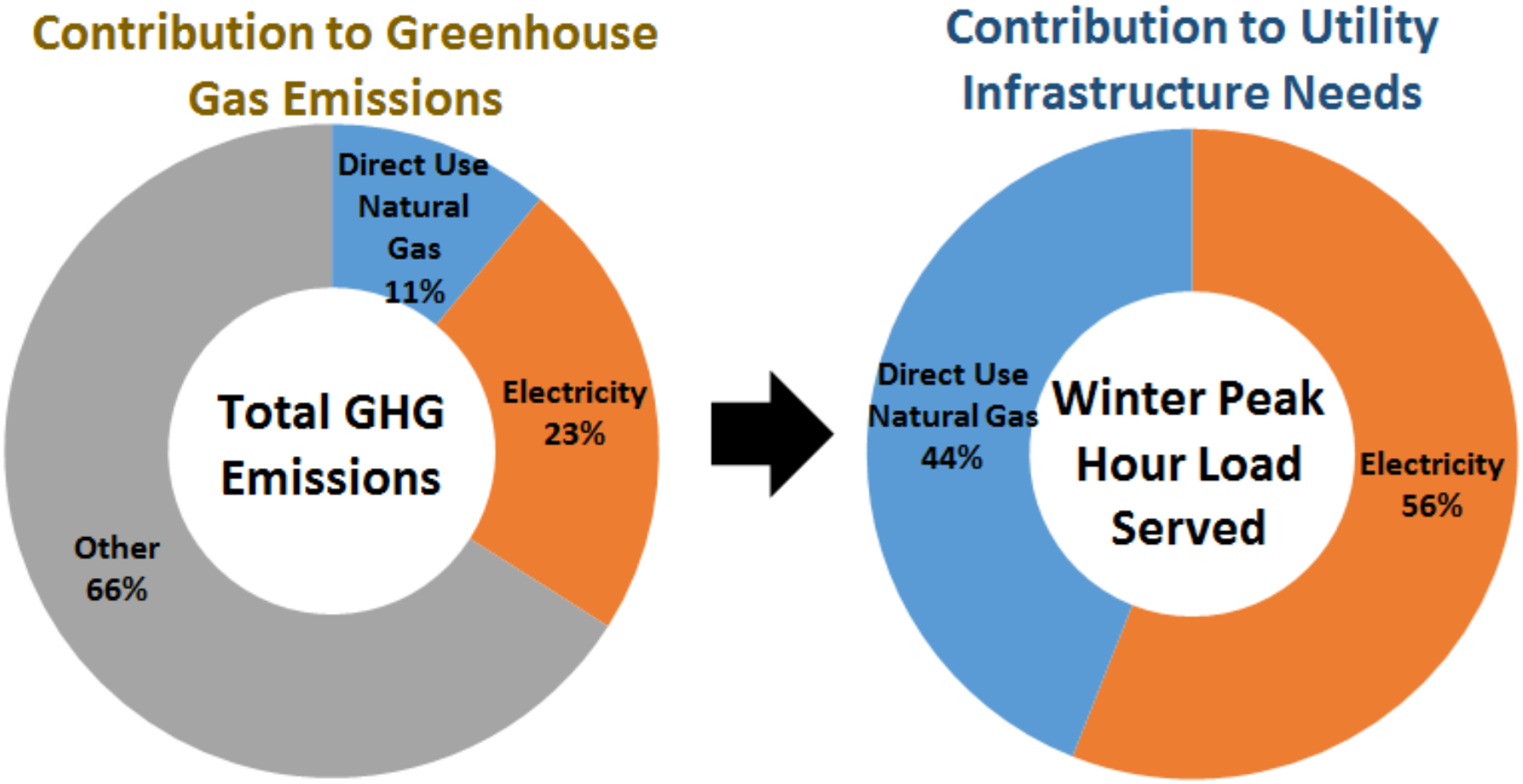
(1) Does not include load from electrification of the transportation sector

(2) Assumes (i) all natural gas space heating is replaced with high efficiency heat pumps (9.5 HSPF) (ii) natural gas water heating is replaced with heat pump water heaters, (iii) heat pumps work per manufacturer specifications, and (iv) customers do not use heat pump emergency setting during peak periods

(3) Assumes natural gas industrial process load can be electrified but this load does not contribute to peak load

(4) Assumes increased air conditioning penetration from heat pumps does not increase air conditioning load

NATURAL GAS EMISSIONS AND INFRASTRUCTURE FOOTPRINT



Based upon an analysis of what electric winter peak hour load would be in the Pacific Northwest if the current direct use of natural gas load were electrified. Assumes electrification of the transportation sector does not contribute to electric winter peak load.

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DIRECT USE TAKEAWAYS

NW Natural's system is a highly efficient way to serve winter peak energy needs.

- **Heats 74%** of residential square footage in the areas we serve
- **Provides 90%** of peak day energy needs for our residential space and water heat customers
- **Serves 60%** of total peak hour energy use of buildings in the areas we serve
- **NW Natural's emissions account for 8%** of state's total carbon emissions

For perspective; to serve the current gas peak load with electricity, the Northwest's winter peak electric load would roughly double (increase by ~25GW).

- Assumes comprehensive adoption of high efficiency heat pumps for space and water heating.
- Assuming adoption of today's commonly purchased heat pumps, the electric winter peak load would roughly triple (increase by ~50GW).

WHY SET A GOAL?

Reduces customer risk over time and drives collective action toward greater reductions and innovation.

WHAT IS IT?

A carbon emission savings from a 2015 baseline.

WHY IS IT MEANINGFUL?

We can achieve reductions affordably, despite substantial regional growth.

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WHY SET A CARBON GOAL?

Drives action to reduce emissions using existing gas infrastructure

- Direct use of natural gas plays critical role in meeting regional heating needs, can also play an important role in lowering emissions
- Exclusive focus on electric sector increases costs and leaves affordable reductions on the table; diversified approach allows for higher-value investment

Reduces risks for our customers

- Compliance requirements expected, should be informed by opportunities for savings
- Critical to understand lowest cost reductions, most of which are up and downstream of distribution system

Drives collaboration, focus and expertise

- With few emissions under our direct control, partnerships across value chain needed
- Customers and stakeholders expect us to focus on reducing emissions
- Expertise in GHG reductions will not be developed overnight – need a running start

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GOAL:
30% CARBON SAVINGS BY 2035

Why create a savings goal?

- Focus on savings allows for absolute reductions across sectors - resulting in lower emissions overall.

Baseline: 2015 emissions from customer end use, plus NWN operations

- Emissions from NWN pipes, compressors, vehicles, and facilities are about 1% of emissions baseline.
- Voluntary efforts can achieve meaningful reductions in a number of areas - up and down the value chain.

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WHERE ARE THE OPPORTUNITIES?

Substantial savings can be realized when we look at the entire natural gas value chain.

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OUR LOW-CARBON PATHWAY

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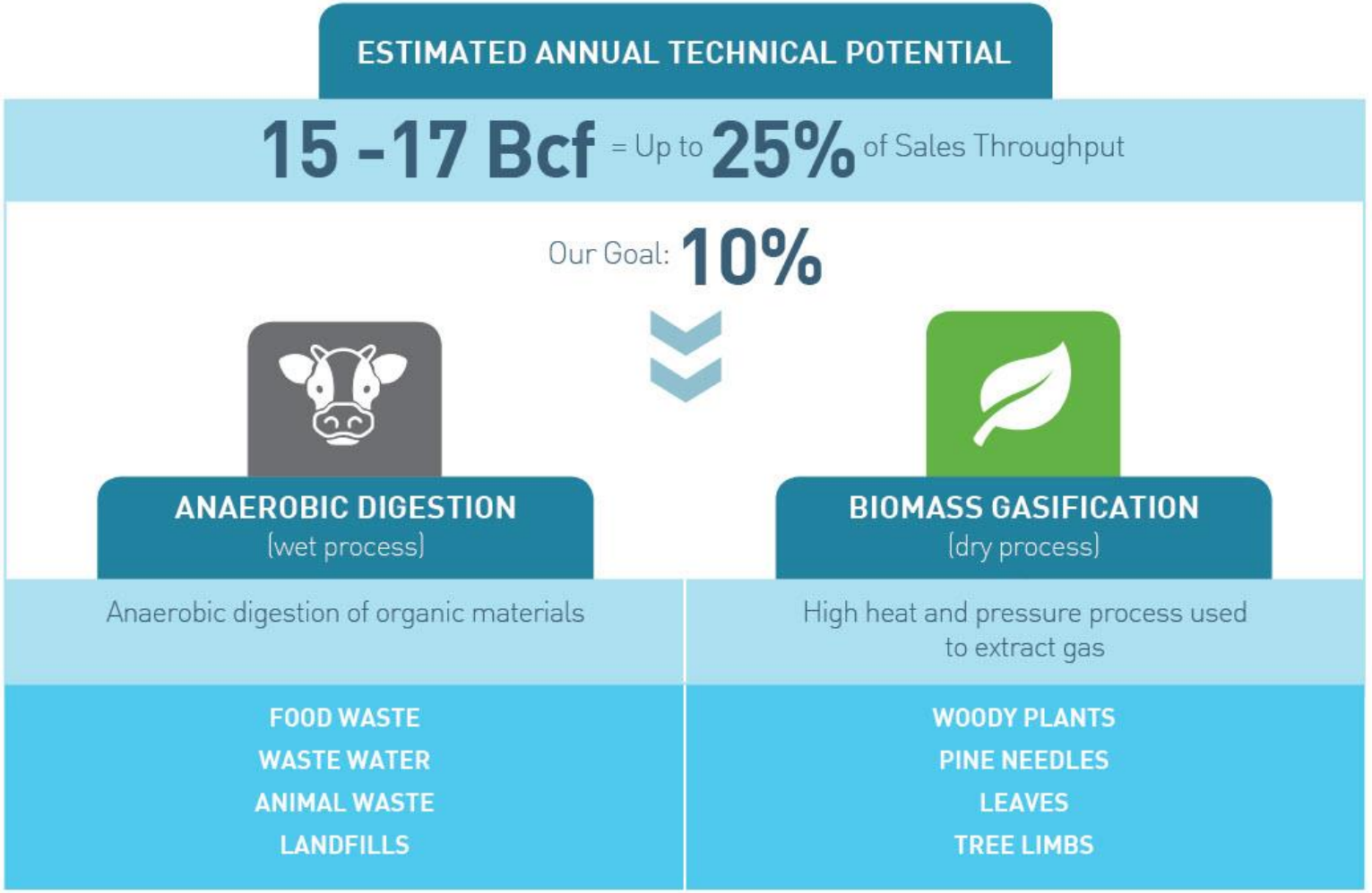
OREGON RENEWABLE NATURAL GAS POTENTIAL



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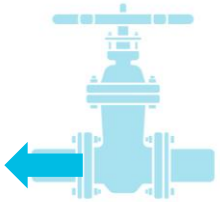
LOW CARBON GAS

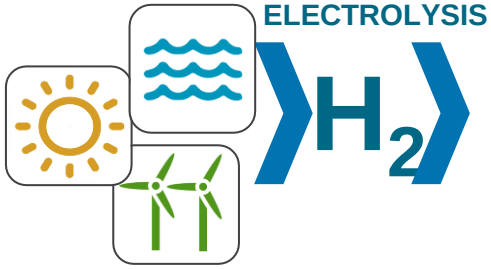
REDUCE UPSTREAM METHANE



- Nationally, less than 2% of methane is emitted from full natural gas value chain
- Largest portion of this happens in the production sector.

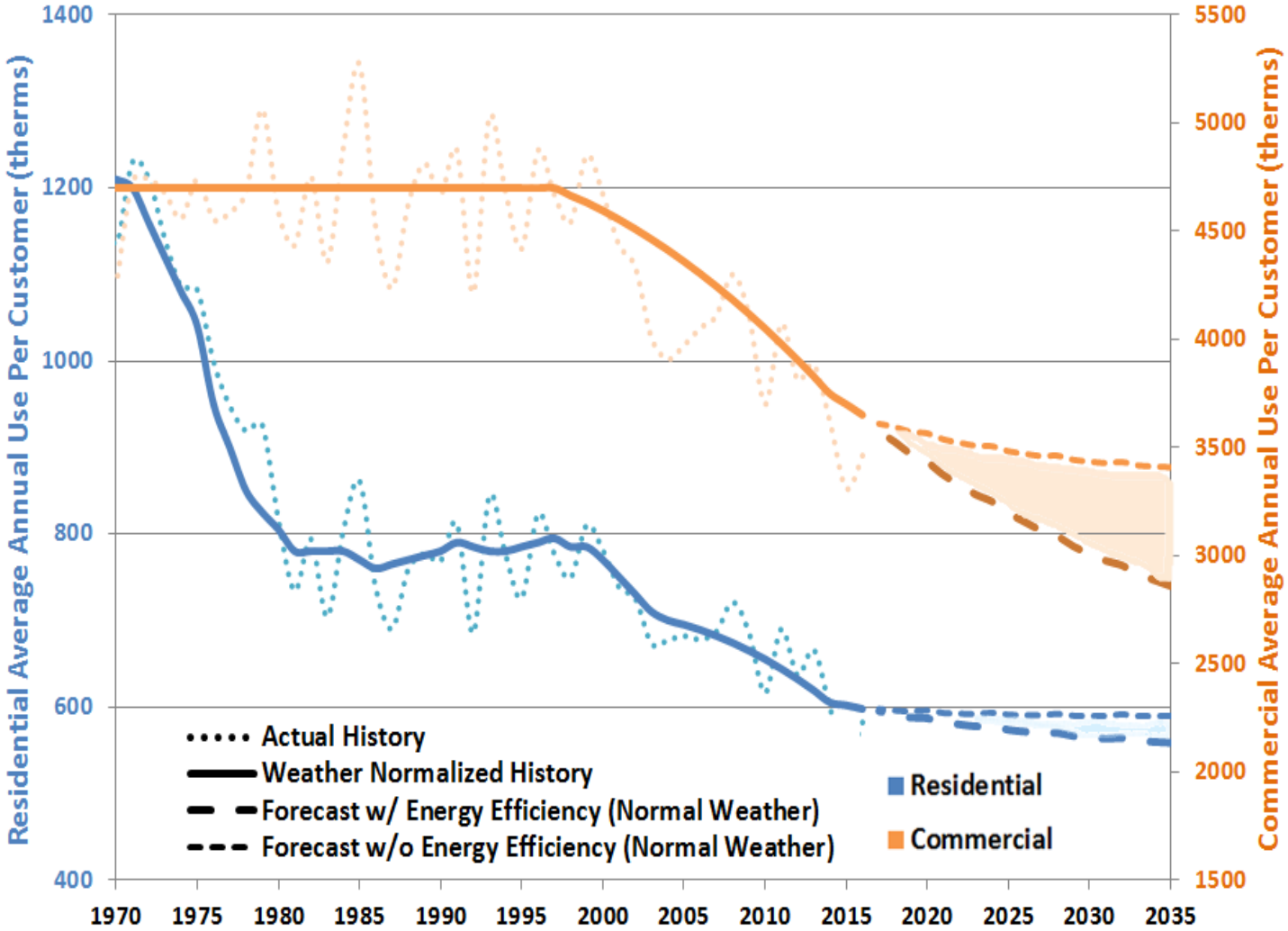
- NRDC to identified 6 best practices that can reduce methane during production by up to 30%.
- Developing a pilot aimed to drive producers to adopt best practices above and beyond regulation

POWER TO GAS (P2G)



- Viable Seasonal Renewable Storage Solution
- Create hydrogen and blend up to 15% into the natural gas pipeline system without any impacts on end-use equipment, as we work toward 100% hydrogen utilization.

ENERGY EFFICIENCY



By 2035, if the goal is achieved, Energy Trust gas efficiency programs are projected to save enough energy to heat 230,000 homes annually, which is about the same number of new homes Oregon expects to add over the next decade.

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TRANSPORTATION

Near Zero Emission (NZE) Natural Gas Vehicles (NGVs): Cleanest available technology for heavy duty applications.

- Transportation is the largest contributor to emissions and growing.
- In Oregon, nearly 50% of NOx emissions (air pollution) in the transportation sector come from heavy duty vehicles.
- Heavy duty vehicles account for the bulk of transportation emissions and air quality impacts.
- There are limited electric alternatives for heavy-duty use.
- New NGVs emit 90% less smog-forming pollutants than the cleanest diesel.
- NGV's deliver about a 20% reduction in carbon emissions
- Allows for drop-in renewable natural gas - provides for 80% or more reduction in GHGs.

WHAT ARE THE POTENTIAL COST IMPLICATIONS?

This goal can be achieved affordably using existing infrastructure.

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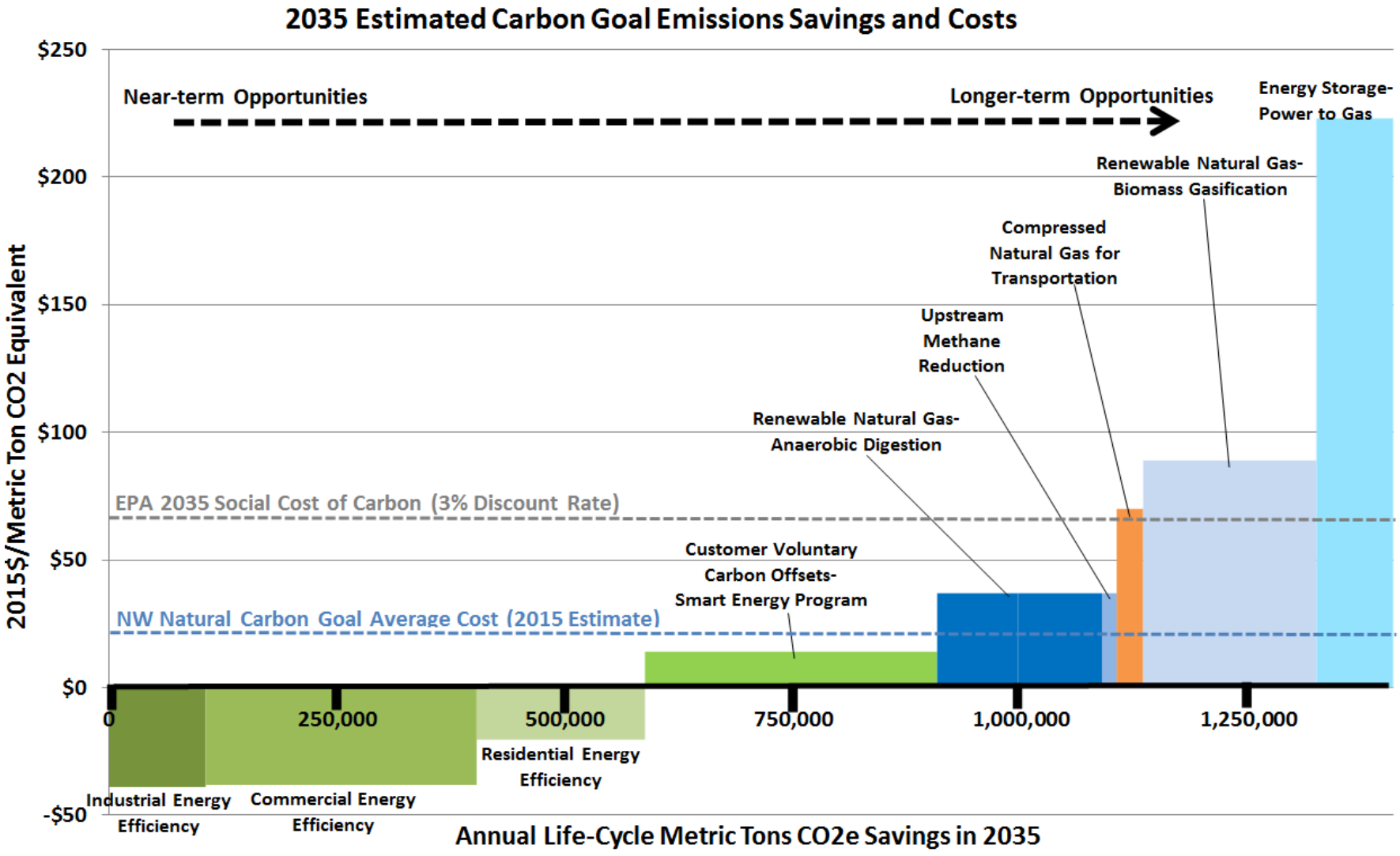
CARBON GOAL POTENTIAL COSTS



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KEY TAKEAWAYS

- **Direct use of gas is critical to serve region's heating needs, especially on coldest days.**
- **A carbon savings goal creates focus and engagement on opportunities for reductions in the gas sector proactively.**
  - **Our Goal: 30% carbon emissions savings by 2035 from 2015 baseline.**
  - **Target Areas: Our Product, Customer Use, Heavy-Duty Transportation**
  - **Can be done affordably using existing, modern pipeline infrastructure.**

OPPORTUNITIES FOR COLLABORATION

- **NW Natural looks forward to refining this analysis in collaboration with regional stakeholders.**
- **Council staff may be particularly helpful in areas that include:**
  - **Further regional analysis of peak implications of electrification - especially regarding space heat**
  - **Consideration of Power to Gas among energy storage options**

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THANK YOU