

# Pathway to Beyond Net Zero Carbon by 2045

**JANUARY 2021**  
Puget Sound Energy

# Pathway to Beyond Net Zero by 2045

## EXECUTIVE SUMMARY

In October 2018, the Intergovernmental Panel on Climate Change released the Special Report on Global Warming of 1.5°C, describing the expected impacts of 1.5°C and 2°C of warming and outlining global greenhouse gas (GHG) emission reduction pathways that could limit warming to those levels. Their overarching conclusion is that every fraction of a degree of warming matters. As evidenced by early symptoms of climate change, letting temperatures rise will exact a massive toll on lives, natural systems, and the economy. And in order to hold global temperatures to 1.5°C above pre-industrial levels, we must cut greenhouse gas emissions 45% by 2030, and hit net-zero emissions by the middle of the century. For Washington State, the realities of a warming climate will continue to challenge the health of our communities, economy, and ecosystems unless we work together to address these challenges. It is also clear that without action these impacts are likely to disproportionately affect certain communities and populations.

PSE has a critical interest and important role in achieving a sustainable future and limiting widespread impacts of climate change. We must shift from what is practical, convenient, or easy, to climate action that is both grounded in the latest science and ambitious enough in speed and scale to transition to a more sustainable economy for ourselves, our customers, and society.

This transition must not only mitigate disproportionate impacts, but also ensure benefits to already disadvantaged segments of our society.

Washington State is already a clean energy leader and addressing climate change in our energy systems. The transition to clean energy offers an opportunity to grow the state's clean energy economy, creating new jobs and opportunity.

That is why PSE is announcing an ambitious goal and bold plan to reduce its carbon equivalent emissions to zero, and to ultimately go beyond net zero carbon by leveraging the company's energy resources and influence to help Washington State, our customers and communities reduce their carbon impacts as well. Not only will this make progress in achieving a sustainable future, but PSE's goal will help Washington State reach its 2035 GHG emission reduction goal of a 45% reduction below 1990 levels. To be successful we will need new products, partnerships and policies that reflect our shared interest in a healthy and sustainable future. To that end this is a living document given what we know today.

	1.5°C	2.0°C	Impacts of 2.0°C	
<b>Extreme Heat</b>	Global population exposed to heatwaves	~4 billion	~6 billion	~2 billion more people
<b>Agriculture &amp; Fisheries</b>	Reduction in global corn harvests	10%	15%	1.5x worse
	Decline in marine fisheries	4.5 million metric tons	6.0 million metric tons	1.3x worse
<b>Plants &amp; Animals</b>	Further decline in coral reefs	70-90%	99%	up to 1.4x worse
	Vertebrates, plants & insects losing at least 1/2 of their range	7%	15%	2x worse
<b>Water Resources</b>	Global population exposed to new or aggravated water scarcity	4%	8%	2x worse
	People exposed to drought each month	114.3 million	190.4 million	76.1 million more people
	Additional global population affected by river floods	108.4 million	146.3 million	37.9 million more people
<b>Economy</b>	Global costs of warming	\$54 trillion	\$69 trillion	\$15 trillion more
	U.S. Gross Domestic Product (GDP) losses	0.6%	1.2%	2x worse

From UW Climate Impacts Group (adapted from World Resources Institute)

“ We want to help Washington be a leader in climate change, but this is a journey that will take all of us working together. ”

–Mary Kipp, President and CEO

# Pathway to Beyond Net Zero by 2045

## PSE'S COMMITMENT TO GREENING WASHINGTON STATE'S ENERGY SUPPLY

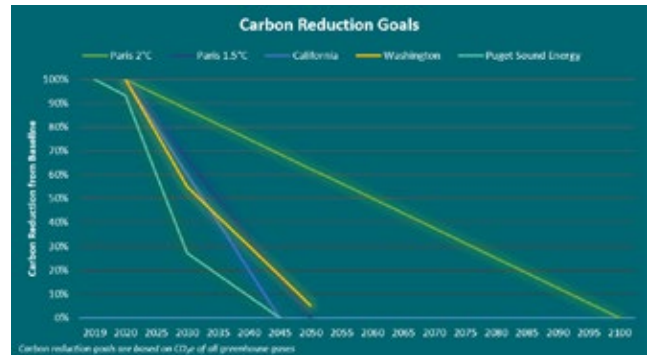
Washington benefits from access to abundant low-cost renewable energy resources and is the largest producer of hydroelectric power in the U.S., which supplies more than two-thirds of the state's electricity. While Washington is a leader in U.S. renewable electricity generation, PSE's challenges include limited access to the federal hydropower system that serves Washington public utility districts directly, refer to chart below.

In light of this, PSE has been an early leader in addressing climate change, investing billions in renewable resources and energy efficiency for homes and businesses. That said we recognize that we have much more to do. PSE is committed to meeting the current and future needs of our customers, delivering on the objectives of Washington's Clean Energy Transformation Act (CETA), and setting ambitious goals that go beyond net zero carbon emissions.

### OUR EFFORTS TO DATE

- Energy Efficiency**

National leader saving 67 billion electric kWh and 600 million natural gas therms through energy efficiency programs since the inception of our program that help our customers save energy. This is the equivalent of eliminating the typical residential customer electric usage for one year for roughly 6.2 million homes and eliminating the typical residential customer natural gas usage for one year for roughly 800,000 homes.

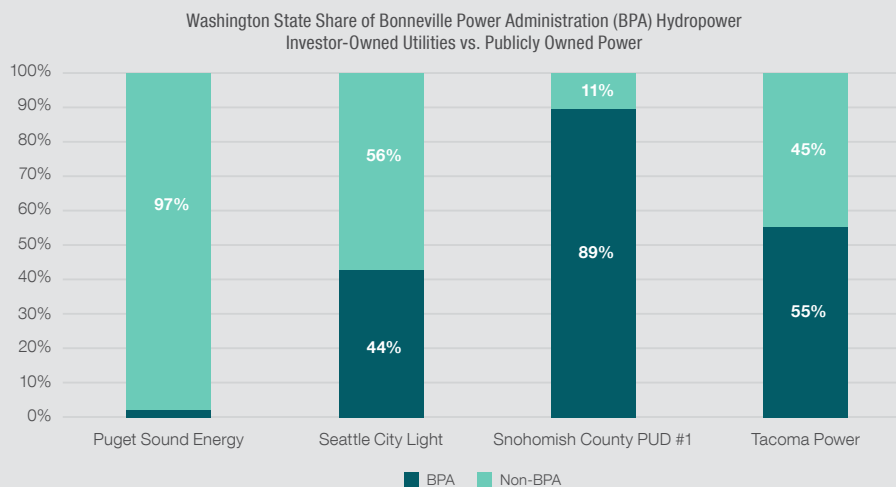


### CARBON DIOXIDE EQUIVALENT CO<sub>2</sub>e

A carbon dioxide equivalent or CO<sub>2</sub> equivalent (CO<sub>2</sub>e) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

Carbon dioxide equivalents are commonly expressed as million metric tonnes of carbon dioxide equivalents, abbreviated as MMTCDE:

$$\text{MMTCDE} = (\text{million metric tonnes of a gas}) * (\text{GWP of the gas}).$$



# Pathway to Beyond Net Zero by 2045

- **Clean Energy Customer Programs:**

- » **Green Power Program** for residential and commercial customers (gives customers an option to buy low or carbon free electricity and thereby achieve net zero carbon emissions from their own electric usage).
- » **Green Direct Program** for governments and large energy users (gives them the option to work with PSE to create new renewable energy resources).
- » **Carbon Balance Program** for all customers (gives customers an option to buy offsets for their natural gas consumption thereby achieving net zero carbon emissions from their own gas usage).
- » **Up & Go Electric Program** for electric vehicle owners (supports electric car market transformation through a comprehensive education and outreach program and the launch of charging stations for customer use).
- » **Customer Connected Solar** for customers who own their own renewable energy (through net metering that allows connection to PSE's grid to maintain reliability; more than 10,000 PSE customer homes now net meter using solar panels).

- **Renewable Energy Production:**

- » Largest utility *producer of renewable energy* in Washington State.
- » National leader in *wind generation adoption*.
- » Fourth largest utility generator of *wind power* in the U.S. with total capacity up to 772 megawatts of

electricity, enough to power 165,000 homes:

- \* Wild Horse Wind and Solar Facility in Kittitas County;
- \* Hopkins Ridge Wind Facility in Columbia County;
- \* Lower Snake River Wind Facility in Garfield County.

- **Battery and Solar Projects:** PSE is piloting, testing and installing batteries in several communities to evaluate safety, reliability, and cost associated with various energy storage options for homes, businesses, and communities.

- **Renewable Natural Gas (RNG):**

- » Began integrating RNG onto its gas system more than 30 years ago from a local wastewater treatment plant.
- » First utility in the region (and one of the first in the country) to partner with a pipeline quality landfill RNG project in 2009 and expanding landfill gas further:
  - \* Today, PSE acquires RNG equal to 1.5% of our sales volume;
  - \* Recently acquired another landfill RNG supply contract which will increase our RNG to 2% in 2021 and grow to nearly 3.5% of our annual gas sales by 2024.
- » PSE is continuing to investigate and pursue more regional RNG supply opportunities to support voluntary customer choice RNG programs.



# Pathway to Beyond Net Zero by 2045

- **Hydrogen:** founding member of Renewable Hydrogen Alliance with the goal of exploring hydrogen replacement of fossil gas on pipelines and a path to green hydrogen.
- **Low Income Clean Energy Programs:**
  - » **Weatherization:** in 2019, PSE's Weatherization Assistance Program served more than 1,800 households, delivering \$7.6 million in benefits.
  - » **Low-Income Electric Vehicle (EV) Pilot Projects:** PSE partnered with HopeSource in Kittitas County to install a level 2 charging station and provided a portion of vehicle funding for a 2020 Kia Niro EV to be used by all departments at HopeSource to provide client services.
  - » **Community Solar:** a portion of Community Solar subscriptions will be reserved for income-eligible customers who will receive the financial and environmental benefits of the project at no cost.
  - » **Solar Green Power:** part of the Green Power Program for low income (funded the installation of solar at administrative or housing facilities for 10 non-profits in the past year alone, and has provided more than \$1 million to support solar for low income agencies and housing since 2017).
- **Public Policy:**
  - » Enabled state-wide initiatives, laws and regulations with tools aimed at carbon reduction, including:
    - \* A closure plan for Washington State's only coal plant that serves as a national model for community and worker transition;
    - \* One of the earliest renewable portfolio standards in the country;
    - \* Mandatory energy conservation targets;
    - \* The nation's most stringent emission performance standard for natural gas generation.
  - » Supported passage of CETA.
  - » Advocated for stringent federal methane emission restrictions at the wellhead.

## OUR NEW BOLD 2020 GOAL: BEYOND NET ZERO CARBON BY 2045

Our commitment to Beyond Net Zero has three pathways



### PSE operations and electric supply

We will achieve the following

- Net zero carbon emissions for all PSE operations and electric supply by 2030
- 100% carbon free electric supply by 2045



### Natural gas sales customer end use

Our aspirational objective

- Reduce customer end use carbon emissions 30% by 2030
- Net zero carbon emissions for customer end use by 2045



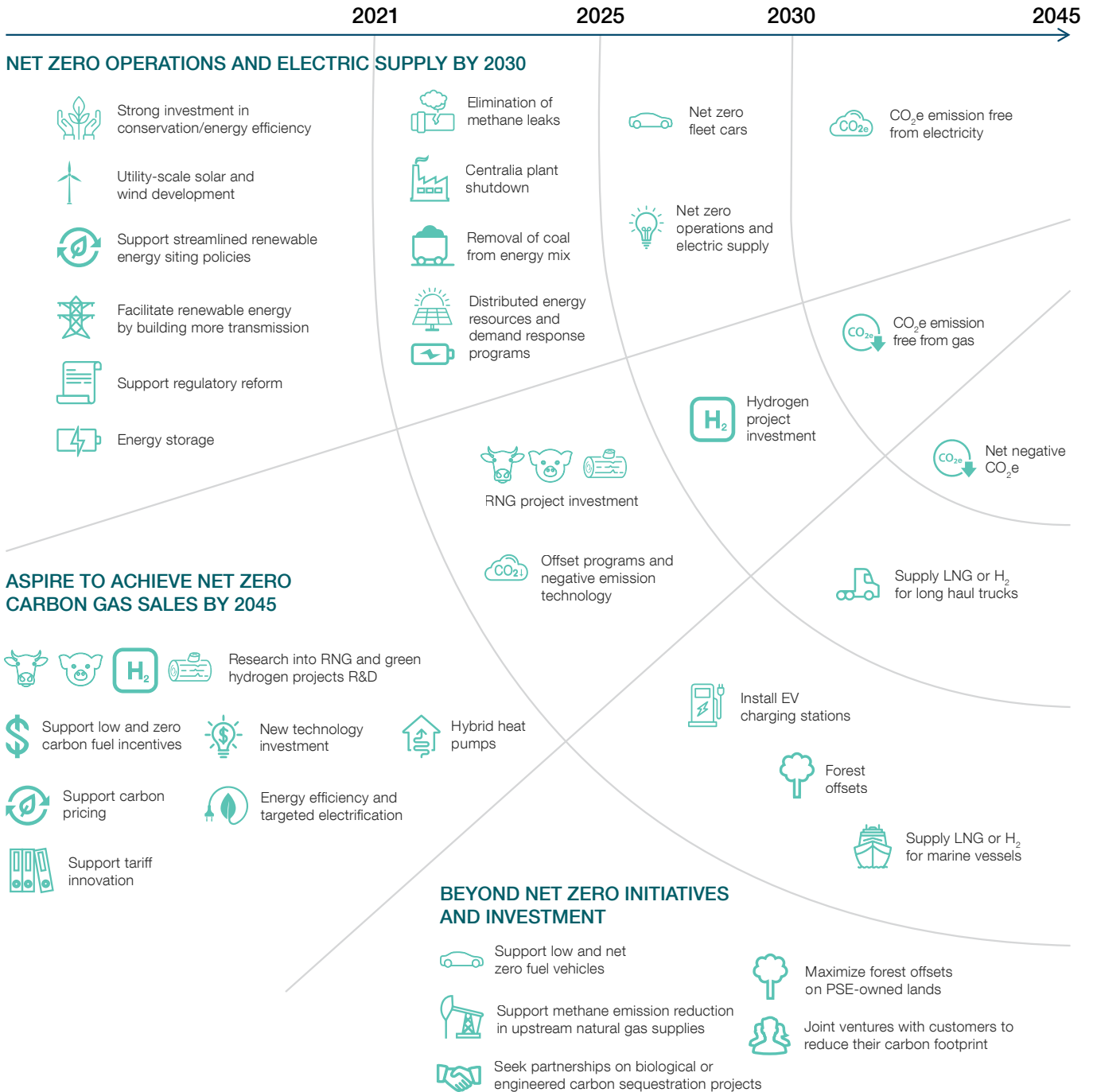
### Beyond PSE reported emissions

We will help other sectors reduce carbon

- Electric vehicles
- LNG for marine and long haul trucking
- RNG/hydrogen or other low carbon fuels for transportation
- Upstream methane emission reduction

# Pathway to Beyond Net Zero by 2045

## ROADMAP TO A BEYOND NET ZERO CARBON COMPANY BY 2045 THAT PSE AIMS TO ACHIEVE



\* CO<sub>2</sub>e = Carbon Dioxide Equivalent

# Pathway to Beyond Net Zero by 2045

## PSE'S APPROACH

### Equitable and sustainable clean energy for all

- Society is only as safe and sustainable as its most vulnerable members.
- As we consider the opportunities to work together on climate solutions in energy, we need to ensure that the solutions pursued improve the livelihoods of all people on this planet.
- Climate change is a global problem, but its effects are profoundly local, and often refract through long-standing patterns of inequality and racism.
- In Washington State and beyond, low-income residents and people of color shoulder an outsized share of the climate burden. They face greater risks from heat waves, floods and other climate-related impacts. And they have suffered collateral damage from the harmful pollutants produced by using fossil fuels.
- Now is the time for us to make equity the cornerstone of this vision for a greener, livable future.
- We at PSE must also ensure that costs and rate impacts of our clean energy future do not place unfair burden on disadvantaged communities.

### Transparent and data-driven

- Use a 2019 baseline of CO<sub>2</sub> equivalent emissions to track progress based on data submitted annually by PSE to the U.S. Environmental Protection Agency and the Washington State Department of Ecology. This annual data becomes part of Washington State's annual inventory and the United Nations Convention on Climate Change annual inventory.
- Develop a carbon accounting balance sheet and expanded annual inventory report to track performance and communicate results transparently and consistently.
- Conduct PSE decarbonization studies and partner with other utilities for cross-utility analysis to maximize clean energy benefits while minimizing costs.

- Integrate GHG commitment into PSE's future resource planning to ensure company-wide alignment.
- In collaboration with customers and stakeholders, develop methodologies and metrics to evaluate equity impacts in planning and operations. Begin with electric sector, as required by CETA, and expand to other company operations, gas sales and more over time.
- Implement internationally and nationally established standards and credit programs that are verifiable and support initiatives within Washington State as much as possible.

US Compliance Programs	US Voluntary Programs*
California Compliance Offset Program	American Carbon Registry (ACR)
Regional GHG Initiative (RGGI)	Climate Action Reserve (CAR)

\*Green-e® Climate certification endorsed programs

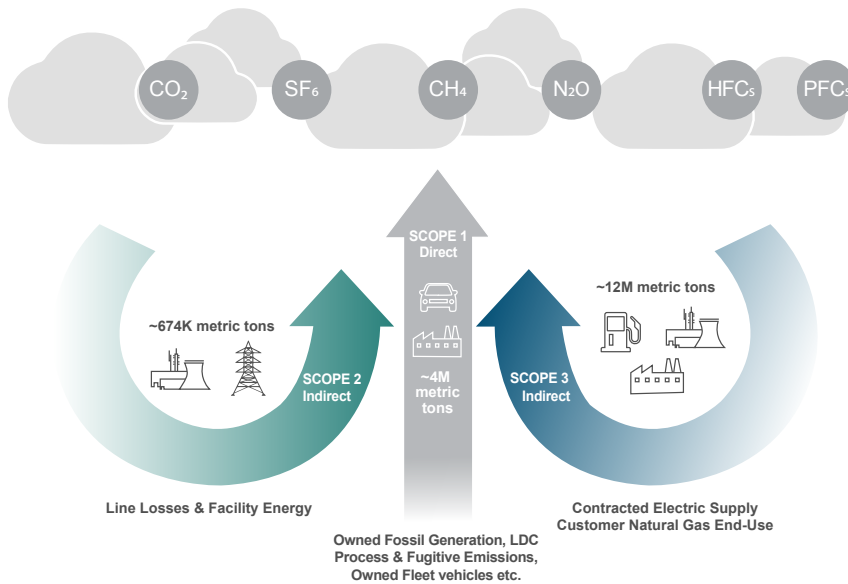
### Accountability to customers and an unwavering commitment to reliability, safety and affordability

- Establish a "Beyond Net Zero" external advisory committee comprised of a diverse set of community members, partners, technical experts and others to provide meaningful input, inform transparent communications and enable opportunities for collective action.
- Provide meaningful opportunities for customers to inform PSE approaches and develop stronger partnerships with customers to empower equitable and sustainable GHG reductions.
- Remain consistent with our almost one hundred-fifty year history of providing reliable, safe and affordable power for our customers.

# Pathway to Beyond Net Zero by 2045

## PSE'S 2019 GHG EMISSIONS AS BASELINE FOR NET ZERO CARBON EMISSIONS

PSE's total GHG emissions in 2019 were approximately 17.2 million metric tons of CO<sub>2</sub> equivalent (CO<sub>2</sub>e).



Scope 1 emissions: Direct from sources owned or controlled by the company.

Scope 2 emissions: From the generation of purchased electricity consumed by the company, excluding electricity for resale.

Scope 3 emissions: From sources not owned or controlled by the company, as a consequence of company's activities.

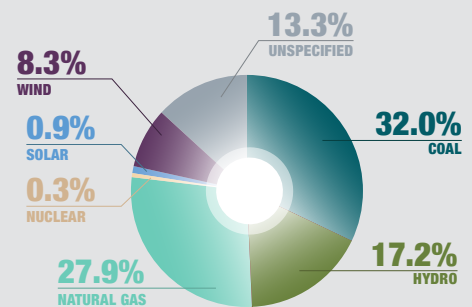
Definitions follow The Greenhouse Gas Protocol.

## GETTING TO NET ZERO CARBON ON OPERATIONS AND ELECTRIC SUPPLY BY 2030

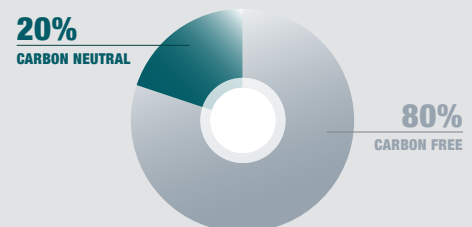
Net zero carbon on electric operations and supply by 2030

- Development and implementation of CETA to get to GHG neutral electric supply by 2030 and carbon free electric supply by 2045 thereby reducing carbon emissions from our electric supply by approximately 11.2 million metric tons of CO<sub>2</sub> equivalent from 2019 levels.
  - » Eliminating coal power and decreasing our dependence on natural gas generation.
  - » Expanding customer-side resources (such as energy efficiency and demand response).
  - » Increasing renewables including utility-scale solar and wind development and local, distributed renewables, and associated electric transmission.
  - » Developing large scale energy storage.
  - » Innovative customer programs and partnerships.
  - » Investing in alternative compliance actions in Washington State as necessary to mitigate rate impacts to customers as we transition the system to increased reliance on renewable resources.

2019 PSE Electric Supply



2030 Expected PSE Electric Supply





# Pathway to Beyond Net Zero by 2045

## Net zero carbon on PSE gas operations by 2030

- Elimination of methane leaks on PSE's distribution system by 2022.
- Reduction or offset of all other methane emissions from operation and maintenance of PSE's gas infrastructure system by 2030.

## Net zero carbon from PSE transportation fleet for all operations by 2030

- Electrification of most fleet vehicles by 2030.
- Use lower carbon fuels for fleet vehicles that can't be electrified and offset remaining emissions by 2030.

## ASPIRING TO NET ZERO CARBON FROM GAS SALES BY 2045

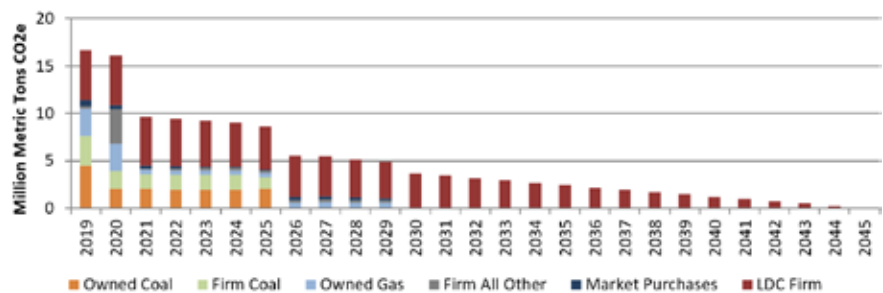
- Obtain carbon pricing designed to maximize linkage to other markets, addresses equity issues, promotes the use of low or carbon free fuels (such as renewable natural gas and hydrogen), and encourages technology advancements in negative carbon technologies to use as offsets.
- Increased energy efficiency and modification of tariffs and incentives to mitigate natural gas load growth including modification of line extension tariff and appliance incentives as needed.
- Decarbonize PSE's gas sales 30% below 2019 levels by 2030 including aggressive scale up of zero carbon and low carbon fuel technologies, such as RNG, biosynthetic gas, hydrogen and other clean fuels.
- Implement a carefully designed statewide policy towards targeted electrification that optimizes existing infrastructure to maximize carbon reduction while mitigating impacts on vulnerable populations and maintaining reliability standards in all energy distribution systems, including:
  - » hybrid heat pumps that use clean fuels, such as RNG and hydrogen, for backup energy for peak demand periods.
  - » clean fuels, such as RNG and hydrogen.

- Focus on local and statewide opportunities that support economic diversification for businesses.
- Expand voluntary customer choice programs to reduce emissions equitably such as Carbon Balance Program.
- Explore new technologies to close any emissions gaps including carbon negative emission technologies.
- Initiate a workforce program to ensure the health and satisfaction of the gas operations workforce so we are able to continue to attract and retain a technically competent work force with our labor union partners to ensure a safe, reliable transition away from fossil fuel gas to renewable gas and hydrogen.

## BEYOND NET ZERO CARBON INITIATIVES AND INVESTMENT

- Support transformation of transportation sector to low and net zero fuels:
  - » Plan for, promote and supply sufficient and reliable electricity for EVs;
  - » Promote and supply LNG for long haul trucks and marine vessels with option for transformation to hydrogen or other future lower or zero carbon fuel technology.
- Strive for net zero methane emissions upstream by partnering with regulators and natural gas suppliers.
- Maximize opportunities for forest offsets on PSE owned lands.
- Pursue joint ventures with customers to reduce their carbon footprints.
- Seek partnerships on biologic or engineered carbon sequestration projects.
- Pursue RNG projects to reduce methane emissions from municipal solid waste and biomass sources, such as agricultural waste and forestry sources.

Projected Net Electric Supply & Gas LDC Emissions (2019 - 2045)



# Pathway to Beyond Net Zero by 2045

## THE NEED FOR COMPLEMENTARY ENERGY SYSTEMS

We believe that complementary energy systems are needed to maintain reliability and affordability for our customers. Our existing gas delivery infrastructure is a valuable system with much potential. Yet, at the same time, we understand that natural gas is an ongoing source of carbon emissions that must be mitigated—especially as we consider transitions and/or new technologies. In the interim:

- A complementary gas energy system offsets the need to build additional electric transmission and distribution facilities that are difficult to permit and site.
- The pipeline infrastructure can be utilized for renewable gas, hydrogen and other low or zero carbon fuels to deliver energy with very low or zero GHG emissions.
- Mandates for full electrification risk significant detrimental carbon emissions, reliability, affordability and vulnerable population impacts.
- Hybrid heat pump technology is a valuable technology to consider in new construction as an alternative approach:
  - » Hybrid heat pumps address carbon emissions, reliability and affordability issues;
  - » Hybrid heat pumps fueled with renewable gas use half the amount that would be needed from a peaking unit to produce the equivalent electric power.

## WORKING ALONGSIDE OUR PARTNERS

Washington State is home to innovative businesses and organizations dedicated to reducing environmental impacts. PSE needs new partnership opportunities with organizations to pursue initiatives that can accelerate and scale GHG reductions inside and outside the PSE carbon footprint. Examples include:

- Innovative and expansive renewable energy initiatives.
- Distributed energy and battery pilot projects.
- Renewable gas opportunities from development of Washington State biomass resources.
- Integration of hydrogen or other zero carbon fuels.
- Energy efficiency efforts that go beyond state standards.
- Carbon removal and storage technologies.
- Expanded PSE customer programs.
- Programs serving highly impacted communities and vulnerable populations to co-create opportunities for carbon reductions and economic and health benefits.
- Programs in cooperation with labor unions to ensure retention of qualified employees to ensure safety and reliability.



# Pathway to Beyond Net Zero by 2045

## THE UNKNOWN

This goal is ambitious. PSE doesn't have all the answers and we face a number of significant challenges in meeting the current and future needs of our customers while delivering on the objective of greening Washington State's energy. PSE is an essential provider of services mandated to be lowest cost in a state that does not yet have carbon pricing.

The path to achieve the following is unknown:

- New relationships and dedicated time and resources needed to ensure an equitable and beneficial transition for ALL communities, especially the most vulnerable in our society.
- Certainty about carbon regulation in Washington State so PSE can adequately conduct long-range resource planning.
- CETA implementation including the availability and affordability of a sufficient renewable energy supply to meet peak demand while maintaining system reliability during long-duration extreme weather events (the Northwest wind fleet is typically not running when regional temperatures are very cold or very hot and demand is high).
- Regional cooperation to ensure focus on adequate electric supply to meet demand growth increases for EVs.
- Regional grasp that on peak winter days, PSE delivers a significant amount of energy through the natural gas distribution system—for example, roughly two-thirds of the energy delivered in the city of Seattle flows through PSE's gas system on these peak days.
- Commercially developed and affordable large scale RNG and other low-carbon or zero carbon gas, such as hydrogen supply and infrastructure.
- Affordable carbon reduction technologies with less geographic constraints for sequestration, and infrastructure constraints for carbon utilization.
- New behind-the-meter capabilities to reshape energy demands to lower peak capacity need.
- Recognition that distributed wind/solar requires new technical infrastructure as well as costs, with an inability to capitalize costs and earn a regulated return.
- State-wide, regional and local cooperation and collaboration will be required with all utilities because gas and electric service territories are not synced up to match by utility.



# Pathway to Beyond Net Zero by 2045

## REGULATORY AND PUBLIC POLICY ALIGNMENT

Our current regulatory framework does not provide a known path to meet our state's policy and our customers' desire for clean energy. The following changes are needed to align Washington's regulatory and public policy environment with PSE's ambitious goal to reduce its emissions to net zero.

## NET ZERO OPERATIONS AND ELECTRIC SUPPLY BY 2030

- **Regulatory reform:** The regulatory paradigm must shift to foster and support a forward-thinking regulatory environment where utilities can focus on cost-effectively meeting the state's ambitious energy policy objectives, as well as the utilities' evolving customer needs while staying financially viable.
- **Siting and permitting:** Implementation of a policy to support efficient siting and permitting of renewable energy transmission lines and renewable generation.

## ASPIRE TO ACHIEVE NET ZERO CARBON GAS SALES BY 2045

### Carbon pricing: cap and invest, or cap and trade

- **Direct link with California's cap and trade program** for equal trading to maximize efficiency for carbon and energy markets.
- **One consistent regional system** that recognizes equity and reliability issues associated with localized carbon regulation.
- **Financial protections for natural gas customers** (free allowances initially and subsequently ratchets down 1.8% per year).
- **Assurance of equitable distribution of benefits,** invests in mitigation actions for highly impacted communities.
- **Maximum economic opportunity** in Washington State and avoids negative economic impacts and GHG emissions shifting to other jurisdictions.
- Deliberate and thoughtful development of **transition plans for impacted workforce sectors.**

## BEYOND NET ZERO INITIATIVES AND INVESTMENT

- **Additional complementary carbon reduction programs:**
  - » **Low carbon fuel standard:** incentivize more low, zero and negative fuel development.



Combined electric and natural gas service  
Electric service  
Natural gas service

- » **Emission reduction plan:** thoughtfully designed statewide emissions reduction policy that both (1) includes targeted electrification and (2) leverages existing gas infrastructure to minimize carbon emissions, while maximizing equity, reliability and collaboration with regional utilities by maintaining a back up and/or complimentary clean fuel option.
- » **Clean transportation incentives for customers,** e.g., EVs and LNG for long haul and marine.
- » **RNG and hydrogen incentives,** including subsidies to research and develop infrastructure for further biomass development (from deadfall forestry and agriculture industry debris, etc.).
- **Research, Development, Demonstration and Deployment of energy intensity and carbon reducing or carbon negative technologies**
  - » **Gas-related clean energy implementation planning:** gas utilities to propose specific carbon reduction plans as part of IRPs with a complete financial plan for how gas utilities can provide affordable and reliable service, and achieve a financially sustainable business while driving net emissions toward a significant reduction by 2045.
- **Regulatory tools and state financial investment** to avoid significant cost-shifts among natural gas customers including regulatory support and approval for new customer programs and tariffs designed to achieve PSE and customer GHG reduction goals (i.e., line extension tariffs, managed and flexible electric load tools such as time-of-use pricing, etc.).



 **PUGET SOUND ENERGY**