Introduction to PSE and electric energy

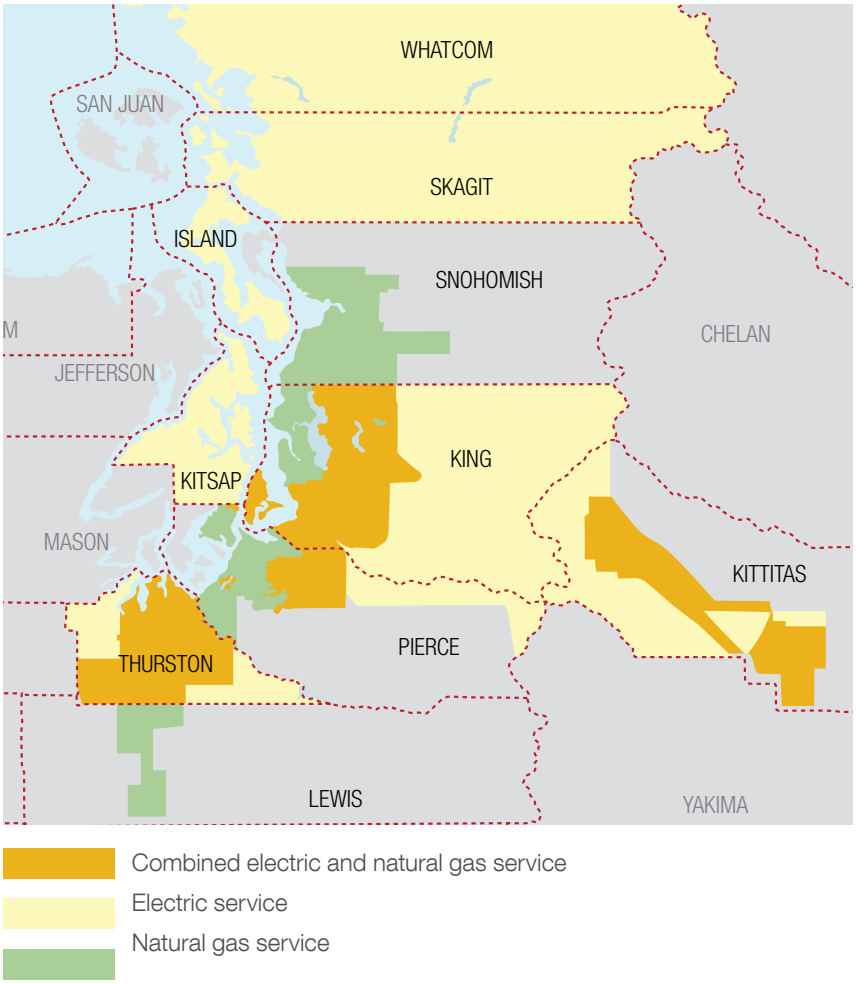
4/8/2021

Puget Sound Energy: Washington's largest and oldest local energy utility

For nearly 150 years, Puget Sound Energy (PSE) has been the local energy provider for neighborhoods and communities across Washington—serving one-third of all of the electric and natural gas energy in our state. As the state's largest utility, we are proud to keep the lights on and the heat running for more than 1.5 million customers.

PSE meets the energy needs of its customers, in part, through incremental and cost-effective energy efficiency strategies, procurement of sustainable energy resources, and far-sighted investment in the infrastructure that delivers energy to customers.

PSE is headquartered in Bellevue, Wash. and has 3,100 employees working in the 10 counties we serve.



Clean energy leadership

PSE has set an aspirational goal to be a Beyond Net Zero Carbon company by 2045, meaning PSE will reduce its own carbon emissions to net zero and go beyond by helping other sectors reduce their own carbon emissions across the state of Washington.

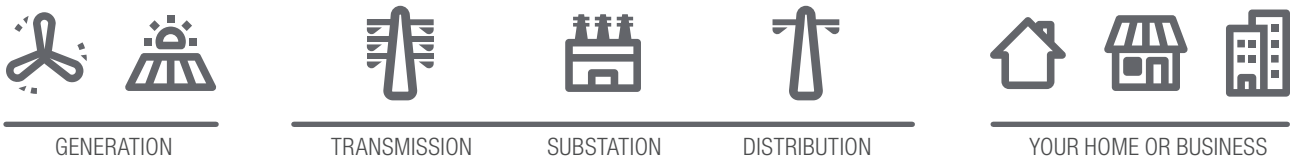
Our mission and commitment to clean energy today focuses on deep decarbonization, reducing greenhouse gas emissions and delivering on the objectives of Washington's Clean Energy Transformation Act. PSE will be coal free by 2025 and our electric system will be carbon neutral by 2030.

A regulated utility

PSE is an investor-owned utility. PSE's rates and business practices are carefully monitored, reviewed, and approved by the Washington Utilities and Transportation Commission (UTC). The UTC is the state agency that regulates private, investor-owned utilities to ensure safe, reliable and fairly-priced energy and services.

PSE PUGET SOUND ENERGY

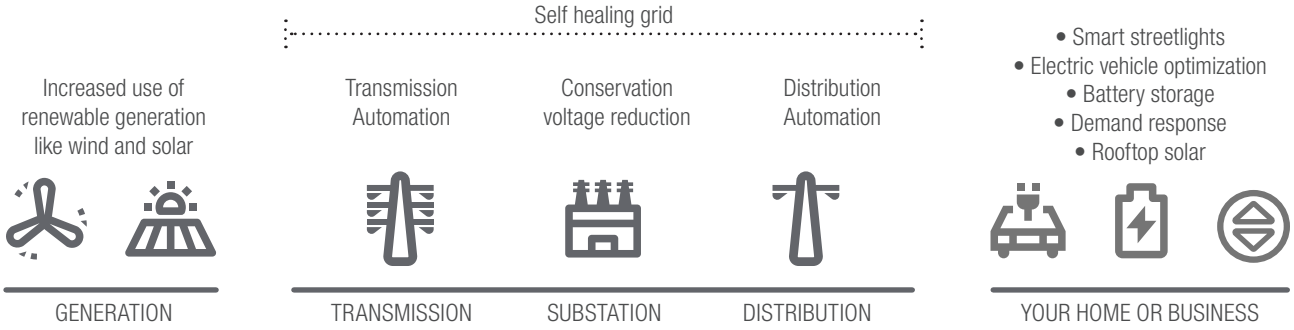
How power gets to you



1. Your electric system starts at a **generation** source – hydroelectric dams, wind facilities and solar energy systems generate electricity, for example.
2. At the heart of the electric system are the **transmission lines**, which carry high-voltage electricity long distances from the generation source to local communities.
3. At the local level, **substations** step down the voltage to distribute electricity throughout a community.
4. **Distribution lines carry** electricity from the substation to your neighborhood.
5. **Transformers** step voltage down further to a level appropriate to use for things like the lights in homes. Transformers are the green boxes in some residences' front yards or the barrel-like canisters on utility poles.
6. **Service lines** are overhead or underground lines that are the final connection between the distribution lines and the meter at your home or business.

Electric grid modernization

PSE is transforming our electric grid for a better energy future through our plans for clean energy and grid modernization.



Automation helps us detect and address outages more quickly, decreasing the overall time customers are without power.

Conservation voltage reduction (CVR) optimizes voltage so we can operate more efficiently and better response to periods of high demand.

Battery storage can provide temporary back-up power during a power outage, store energy from solar panels, help businesses manage their energy usage, and more. PSE is testing and installing batteries to evaluate how this rapidly-evolving technology can provide safe, reliable, and affordable options for customers.

Demand response gives PSE and customers flexible ways to decrease demand on the grid during periods of peak use by working with customers to adjust energy demand to match supply.

Washington's Clean Energy Transformation Act: A Primer

Washington's Clean Energy Transformation Act (CETA) passed the Washington Legislature in 2019 and was signed into law by Gov. Inslee on May 7, 2019. This legislation addresses numerous parts of Washington's electricity supply. The major components are:

Electricity Supply: CETA requires all electric utilities to transition to 100 percent clean electricity by 2045, with the following milestones:

- Coal-free by 2025
- Carbon neutral by 2030
- Carbon free by 2045

CETA also requires that in this transition, energy and non-energy benefits are equitably distributed to all customers, including vulnerable populations and highly impacted communities.

Utility Planning: CETA requires all utilities to develop and file forward-looking plans (e.g., Clean Energy Implementation Plans) every four years to identify their next steps and targets in achieving CETA's energy targets, while ensuring that benefits are equitably distributed. This process requires extensive public participation.

Energy Assistance: CETA requires all utilities and Department of Commerce to systematically assess energy burden (energy costs) on households across Washington and take actions to ensure that Washingtonian's can access bill assistance if needed.

Tax extensions: CETA extends some sales tax credits on renewable energy equipment.

Administrative provisions: CETA also includes some clarification of regulatory structure for utilities to allow rates to be aligned with clean energy plans, an update of the state energy strategy document, and a study of regional transmission needs.

State agencies, including the Department of Commerce, Utilities and Transportation Commission, Department of Health, and Department of Ecology have been and will be making rules on how to implement CETA.

Where your electricity comes from today

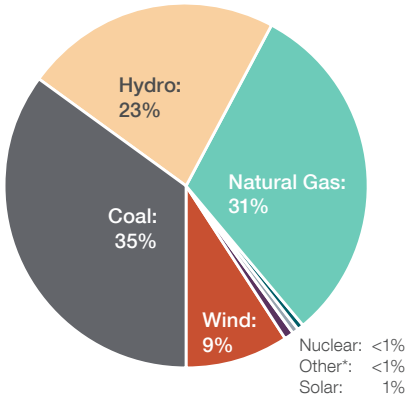
PSE uses a diverse mix of resources to generate reliable electricity for its customers. PSE must meet the electricity needs of all customers for every hour of the year; these needs change minute to minute, hour to hour as customers go about their daily routines and season change. The chart and graph below detail PSE's fuel mix for electricity delivered to customers in 2019.

While more than a third of electricity comes from clean hydroelectric dams and wind facilities, we know our customers want cleaner sources of energy. PSE will be coal free by 2025 and will transition to a carbon-neutral electric supply by 2030, with a 100% non-emitting electric supply by 2045.

PSE was an early leader in offering clean energy options. We've invested billions in renewable energy, including three wind farms in Washington, and we're the third-largest utility producer of wind power in the United States.

2019 electricity fuel mix

Coal	35%
Hydroelectric	23%
Natural Gas	31%
Nuclear	<1%
Other*	<1%
Solar	1%
Wind	9%
Total	**100%**



*Biomass, non-biogenic, and petroleum.

Source: Published by the Washington Department of Commerce, October 2020, with data reported by PSE in August 2020.

Electric resources for a clean electricity future

Energy efficiency: Energy efficiency means conserving energy while staying comfortable by using tools and appliances. PSE provides a variety of tailored services and incentives to help our residential and business customers save energy and money. Our energy-efficiency programs have helped PSE customers conserve more than 7 billion kilowatt-hours of electricity, which is the equivalent to the electricity used by nearly 838,000 homes in a year.

Our conservation programs include:

- Rebates for affordable energy-efficient products such as heating equipment and lighting.
- Engineering consultation for commercial and industrial projects.
- Tailored grants for retrofits and upgrades in energy-intensive buildings.
- Income-based program provides free "weatherization" upgrades for single family homes, manufactured homes or eligible apartment buildings to help keep them warm and cozy.

Demand response (DR): Tools that give PSE and customers flexible ways to decrease demand on the grid during times of peak use. DR involves modifying the way customers use energy – particularly when they use it. For instance, businesses might work with PSE to voluntarily adjust their operations during a specified range of time. Residential customers might automate their usage with smart thermostats or water heaters. While there are often financial incentives to participate in DR pilots and programs, it's also a way for both PSE and customers to increase efficiency and reduce their carbon footprints.

Distributed energy resources (DER): DERs are small scale generators and other assets, like rooftop solar panels, batteries, and electric vehicle chargers, which are located on the distribution system (below the substation level). These tools can help balance energy demand and supply, and /or supplement sources of energy generated and transmitted from larger, more traditional utility resources like hydroelectric dams that are farther away.

Market purchases: PSE purchases electricity from the energy market to meet our customers' needs cost effectively. We purchase electricity from a variety of other utilities, independent power producers and energy marketers across the western United States and Canada. We purchase power on the market when the costs are lower than our own production costs, which saves our customers money, or when customer demand may exceed our generation capabilities.

Battery storage: Batteries have the potential to solve energy challenges we all care about. They can provide temporary back-up power when you experience an outage, store energy from solar panels, help businesses manage their usage, and much more. Their ability to provide storage for renewables, like wind and solar, can also support our customers' and PSE's desire for cleaner energy.

But when it comes to battery storage installations, it's not one-size-fits-all. We're testing and installing batteries in a number of local places to evaluate how this exciting and rapidly-evolving technology can provide safe, reliable, and affordable options for homes, businesses, and communities.

Energy planning process overview

One of PSE's highest priorities is to ensure you have safe, dependable and affordable electricity today and into the future. PSE plans years in advance to ensure we have the supply and infrastructure necessary to deliver electricity. This planning process includes input from customers, regulators and stakeholders.

Broadly, our energy planning process includes:

- **Integrated Resource Plan (IRP)** - The IRP is a planning exercise that evaluates how a range of potential future outcomes could affect PSE's ability to meet our customers' electric and natural gas supply needs. The analysis considers policies, costs, economic conditions and the physical energy system, and proposes the starting point for making decisions about what resources may be procured in the future.

  The preferred electric portfolio is the result of IRP analyses that evaluate a range of potential future resource portfolios to identify the lowest reasonable cost, least risk portfolios that meet customer needs, policy requirements and support the equitable transition to a clean energy future, while maintaining affordability and reliability for customers.

  The IRP does not make resource or program implementation decisions. The IRP is a 20+ year view of what appears to be cost effective based on the best information we have today about the future.

  Clean Energy Action Plan (CEAP) - identifies the lowest-reasonable cost energy resource plan that PSE will pursue over the next 10 years to meet customer energy needs, as well as risk and equity.

  The electric IRP/CEAP analysis is repeated every four years and updated every two years, and includes a public participation process.

- **Clean Energy Implementation Plan (CEIP)** - a roadmap that identifies our clean energy targets, actions, programs and investments over a 4-year period. The CEIP builds upon the resource portfolio in the IRP and CEAP to develop the roadmap to identify how we'll feasibly implement clean electricity over the next four years and ensure equitable distribution of benefits and reduce burdens.

  The 2021 CEIP will be PSE's first CEIP, and PSE is convening an Equity Advisory Group and implementing a public participation process for the CEIP.

- **Biennial Conservation Plan (BCP)** - a two-year plan that lays out PSE's cost-effective conservation savings targets, program details and budgets and associated tariffs in accordance with Washington's Energy Independence Act. PSE works with the Conservation Resources Advisory Group (CRAG) to develop the BCP, and it is approved by the Utilities and Transportation Commission (UTC).

- **Delivery System Planning** - a process that is the engineering function of evaluating how PSE's energy delivery system (e.g., power lines, substations, etc) must operate in order to meet customer needs and identifying solutions to predicted deficiencies under various conditions to ensure reliable delivery of energy into the future.

Glossary

Term	Definition
AURORA	One of the models PSE uses for integrated resource planning. AURORA uses the western power market to produce hourly electricity price forecasts of potential future market conditions and identifies hypothetical portfolios of resources.
BESS	Battery energy storage system
CEAP	Clean Energy Action Plan
CEIP	Clean Energy Implementation Plan
CETA	Clean Energy Transformation Act, which sets rules for PSE's electric energy supply. CETA includes the clean energy standards and ensuring all customer benefit from the clean energy transformation.
Clean energy	Under CETA, clean energy focuses on electric energy resources like renewable energy and alternative resources, like demand resource and distributed energy resources.
Conservation	Measures to improve efficiency of customer's electric loads reducing energy use and reducing peak demand.
CRAG	PSE's Conservation Resource Advisory Group
Consumption	Consumption is the amount of electricity that customers use over the course of a year and it's measured in kilowatt hours.
Customer benefit indicator (CBI)	As defined by CETA, a customer benefit indicator is "an attribute, either quantitative or qualitative, of resources or related distribution investments associated with customer benefits described in RCW 19.405.040(8)." [WAC 480-100-605]
Demand	The amount of power being required by customers at any given moment, and it's measured in kilowatts.
Demand response (DR)	Flexible, price-responsive loads, which may be curtailed or interrupted during system emergencies or when wholesale market prices exceed the utility's supply cost.
Demand-side resources	These resources reduce demand. They include energy efficiency, distribution efficiency, generation efficiency, distributed generation and demand response.
Distributed energy resources (DER)	Small-scale electricity generators and other assets, like rooftop solar panels, that are located on the distribution system.
Distribution line	A distribution line is a medium-voltage (12.5 kV–55 kV) line that carries electricity from a substation to customers. Roughly half of PSE's distribution lines are underground. Distribution voltage is stepped down to service voltage through smaller transformers located along distribution lines
Distribution system	A distribution system is the medium-voltage (12.5 kV–35 kV) infrastructure that carries electricity from a substation to customers and includes the substation transformer.
Electric Resource Portfolio	A specific mix of electric resources to meet electric load.
Energy efficiency (EE)	Tools or appliances that help customers save energy.
Energy storage	A variety of technologies that allow energy to be stored for future use, like battery energy storage system (BESS) or pumped hydro.
EV	Electric vehicle
GHG	Greenhouse gas
Highly impacted communities (HIC)	As defined by CETA, a highly impacted community means "a community designated by the department of health based on the cumulative impact analysis required by RCW 19.405.140 or a community located in census tracts that are fully or partially on "Indian country," as defined in 18 U.S.C. Sec. 1151." [WAC 480-100-605]
Intermittent resources	Resources that provide power where the time of generation can't be controlled, such as wind and solar power.

Term	Definition
Kilovolt (kV)	A kilovolt (kV) is equal to 1,000 volts of electric energy. PSE uses kilovolts as a standard measurement when discussing things like distribution lines and the energy that reaches our customers.
Kilowatt hours (kWh)	Measurement of energy. PSE uses kilowatt hours to measure customer energy use, so you see it on your bill.
LIAC	PSE's Low Income Advisory Committee
Load	The total of customer demand plus planning margins and operating reserve obligations.
Megawatt (MW)	Unit of measurement of power. A megawatt (MW) is equal to 1,000,000 watts of electric energy. PSE uses megawatts as a standard measurement when discussing things like system load and peak demand.
Net metering	A program that enables customers who generate their own renewable energy to offset the electricity provided by PSE.
Non-wires alternatives (NWA)	Alternatives that are not traditional poles, wires and substations. These alternatives can include demand reduction technologies, battery energy storage systems, and distributed generation.
Peak demand	Customers' highest demand for electricity at any given time. It is measured in megawatts.
Pumped hydro	Pumped hydro facilities store energy in the form of water, which is pumped to an upper reservoir from a second reservoir at a lower elevation. During periods of high electricity demand, the stored water is released through turbines to generate power in the same manner as a conventional hydropower station.
Reliability	The dependability of electric service to customers. Reliability is measured in the duration and frequency of outages to customers.
Renewable energy	As defined by CETA, renewable energy is "water; wind; solar energy; geothermal energy; renewable natural gas; renewable hydrogen; wave, ocean, or tidal power; biodiesel fuel that is not derived from crops raised on land cleared from old growth or first growth forests; or biomass energy."[WAC 480-100-605]
Resiliency	Planning and preparedness for high impact, low frequency events
Substation	A substation is a vital component of electricity distribution systems, containing utility circuit protection, voltage regulation and equipment that steps down higher-voltage electricity to a lower voltage before reaching your home or business.
Supply-side resources	Resources that generate or supply electric power, or supply natural gas to gas sales customers. These resources originate on the utility side of the meter, in contrast to demand-side resources.
Transformer	A transformer is a device that steps electricity voltage down from a higher voltage, or steps it up to a higher voltage, depending on use. Typically it steps voltage down from a distribution voltage to 120 to 240 volts for customers' residential use. Transformers are the green boxes in some residences' front yard or the barrel-like canisters on utility poles.
Transmission line	Transmission lines are high-voltage lines that carry electricity from generation plants to substations or from substation to substation. Transformers at the substation "step down" the electricity's transmission voltage (55 to 230 kilovolts) to our primary distribution voltage (12.5 kV).
Vulnerable population (VP)	As defined by CETA, vulnerable populations means "communities that experience a disproportionate cumulative risk from environmental burdens due to: Adverse socioeconomic factors, including unemployment, high housing and transportation costs relative to income, access to food and health care, and linguistic isolation; and sensitivity factors, such as low birth weight and higher rates of hospitalization." [WAC 480-100-605]
Wholesale market purchases	Generally short-term purchases of electric power made on the wholesale market.
WUTC	Washington Utilities and Transportation Commission