

Energy Dashboard

Overview

The Energy Dashboard, a part of the Energy Analytics Project, is a tool to help de-carbonize the energy sector by providing easy access to publicly available data.

Presenter

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Presentation Date

Nov 14, 2019

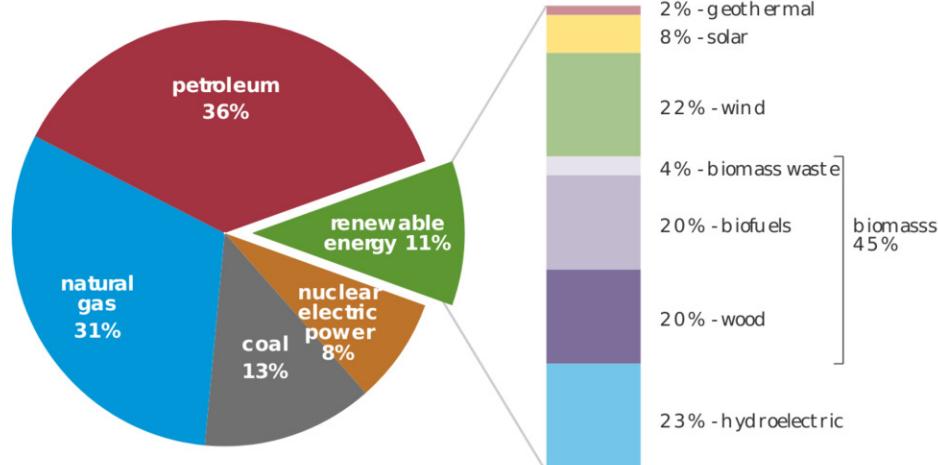
Energy Overview : Federal (USA)

Consumption by Source

U.S. primary energy consumption by energy source

total = 101.3 quadrillion
British thermal units (Btu)

total = 11.5 quadrillion Btu



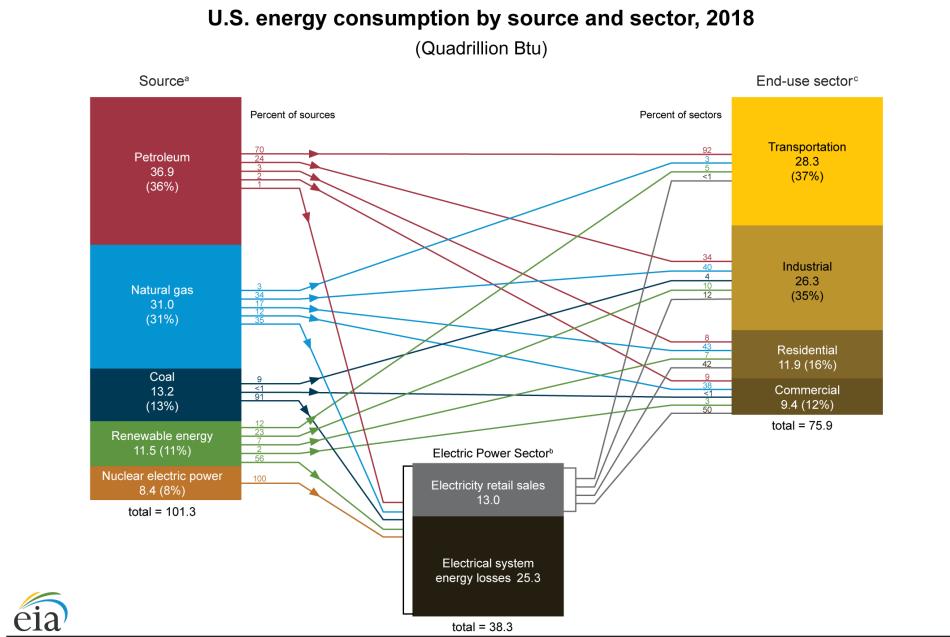
Note: Sum of components may not equal 100% because of independent rounding.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 1C
April 2019, preliminary data



Image courtesy of [EIA \(<https://www.eia.gov/energyexplained/us-energy-facts/>\).](https://www.eia.gov/energyexplained/us-energy-facts/)

Consumption by Source and Sector



^aPrimary energy consumption. Each energy source is measured in different physical units and converted to common British thermal units (Btu). See U.S. Energy Information Administration (EIA), *Monthly Energy Review*, Appendix A. Noncombustible renewable energy sources are converted to Btu using the "Fossil Fuel Equivalency Approach"; see EIA's *Monthly Energy Review*, Appendix E.

^b The electric power sector includes electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public. Energy consumed by these plants reflects the approximate heat rates for electricity. EIA's *Monthly Energy Review*, Appendix A. The total includes the heat content of electricity net imports, not shown separately. Electrical system energy losses are calculated as the primary energy consumed by the electric power sector minus the heat

content of electricity retail sales. See Note 1, "Electrical System Energy Losses," at the end of EIA's *Monthly Energy Review*, Section 2.

^c End-use sector consumption of primary energy and electricity retail sales, excluding electrical system energy losses from electricity retail sales. Industrial and commercial sectors consumption includes primary energy consumption by combined-heat-and-power (CHP) and electricity-only plants contained within the sector.

Note: Sum of components may not equal total due to independent rounding. All source and end-use sector consumption data include other energy losses from energy use, transformation, and distribution not separately identified. See "Extended Chart Notes" on next page.

Sources: EIA, *Monthly Energy Review* (April 2019), Tables 1.3, 1.4a, 1.4b, and 2.1-2.6.

Image courtesy of [EIA \(<https://www.eia.gov/energyexplained/us-energy-facts/>\).](https://www.eia.gov/energyexplained/us-energy-facts/)

The Grid

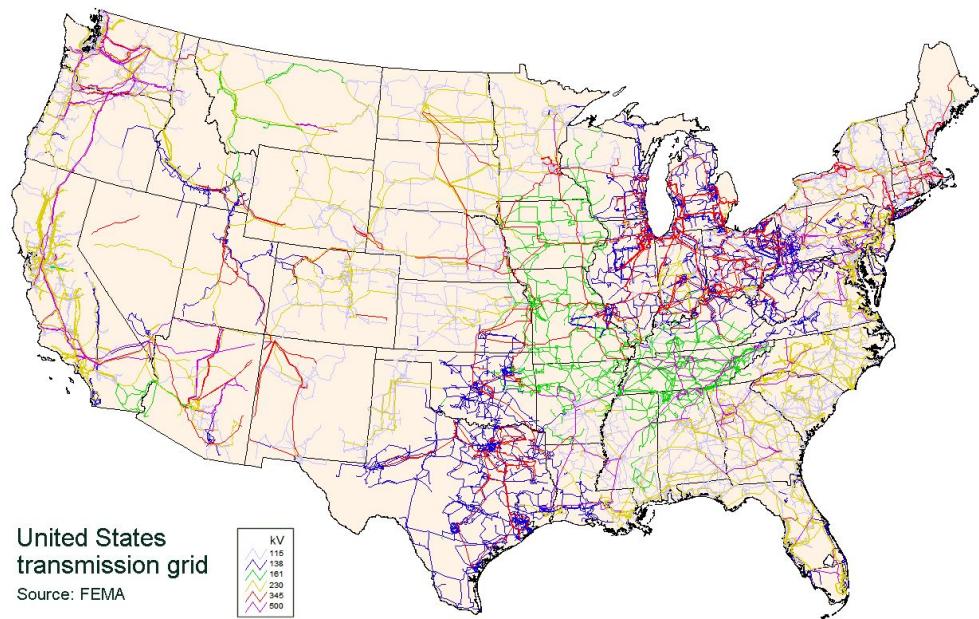


Image courtesy of [GENI](https://geni.org) (<https://geni.org>).

Power Flow

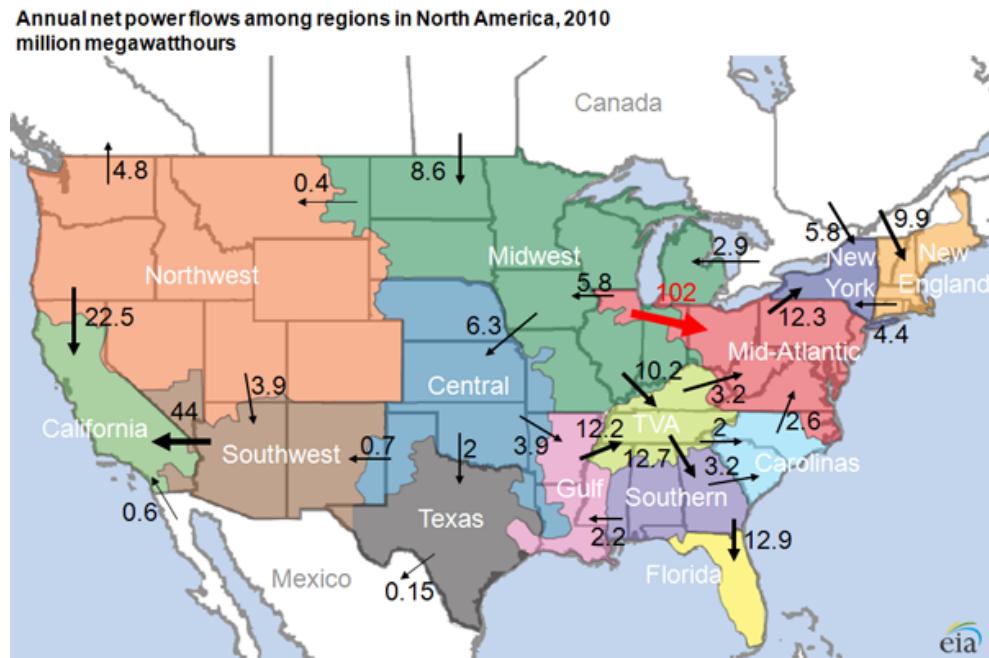
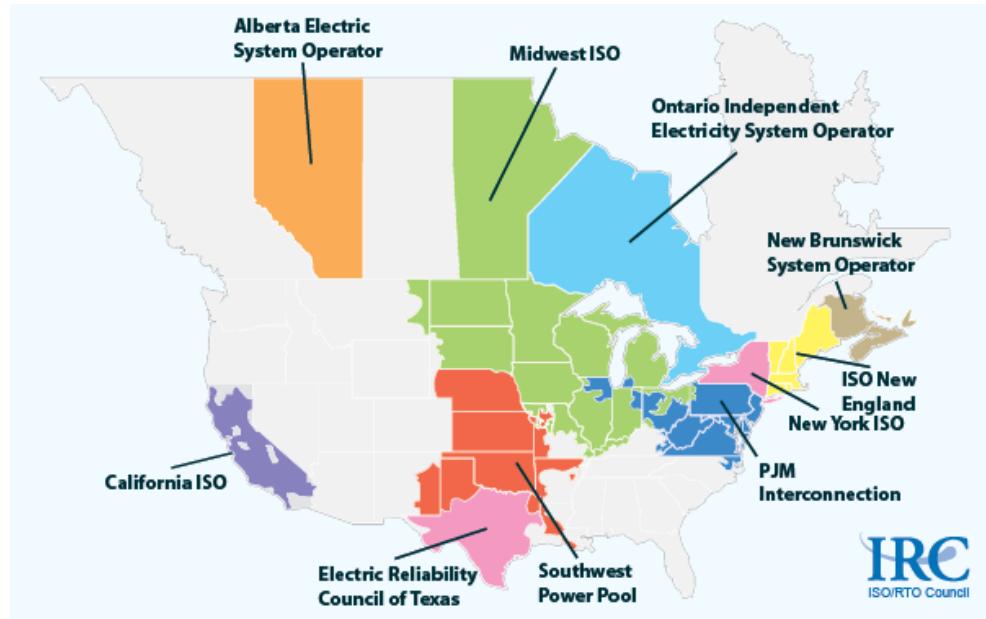


Image courtesy of EIA (<https://www.eia.gov>).

Energy Grid



RTO

Regional Transmission Organization

ISO

Independent System Operator

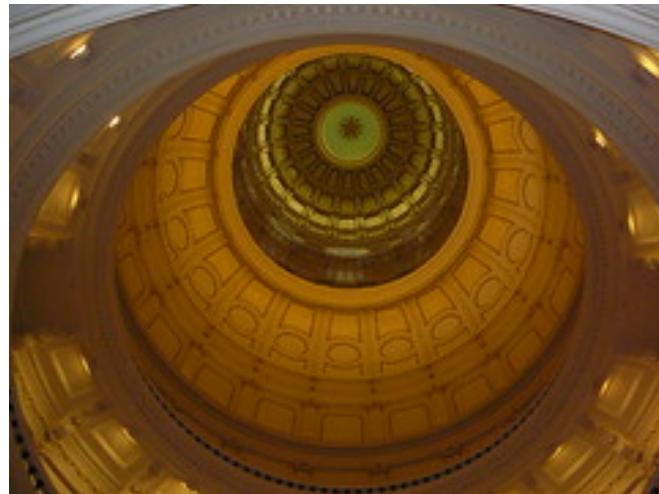
A *regional transmission organization (RTO)* in the United States is an electric power transmission system operator (TSO) that coordinates, controls, and monitors a multi-state electric grid.[wikipedia \(https://en.wikipedia.org/wiki/Regional_transmission_organization_\(North_America\)\)](https://en.wikipedia.org/wiki/Regional_transmission_organization_(North_America))

An *independent system operator (ISO)* is similarly an organization formed at the recommendation of FERC. In the areas where an ISO is established, it coordinates, controls, and monitors the operation of the electrical power system, usually within a single US state, but sometimes encompassing multiple states.[wikipedia \(https://en.wikipedia.org/wiki/Regional_transmission_organization_\(North_America\)\)](https://en.wikipedia.org/wiki/Regional_transmission_organization_(North_America))

RTOs do the same thing (as ISOs) with an added component of greater responsibility for the transmission network, as established by the FERC. [wikipedia \(https://en.wikipedia.org/wiki/Regional_transmission_organization_\(North_America\)\)](https://en.wikipedia.org/wiki/Regional_transmission_organization_(North_America))

Photo courtesy of [wikimedia \(https://wikimedia.org\)](https://wikimedia.org).

Government Agencies



Agency	Acronym
United States Department of Energy	DOE
Federal Energy Regulatory Commission	FERC
National Institute of Standards and Technology	NIST
Bureau of Ocean Energy Management	BOEM
Office of Surface Mining Reclamation and Enforcement	OSMRE
Bonneville Power Administration	BPA
U.S. Army Corps of Engineers	USACE
Pacific Northwest National Laboratory	PNNL

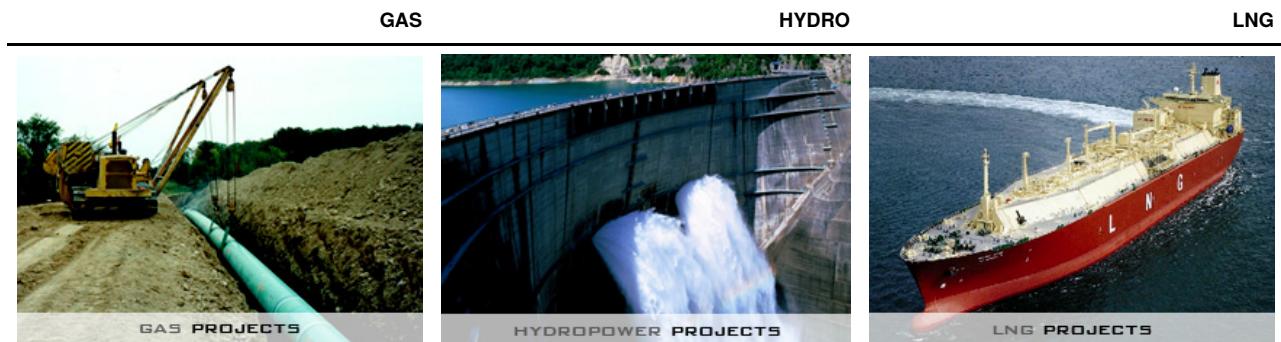
DOE : <http://www.energy.gov> (<http://www.energy.gov>)



The United States Department of Energy (DOE) is a cabinet-level department of the United States Government concerned with the United States' policies regarding energy and safety in handling nuclear material. Its responsibilities include the nation's nuclear weapons program, nuclear reactor production for the United States Navy, energy conservation, energy-related research, radioactive waste disposal, and domestic energy production. [wikipedia \(https://en.wikipedia.org/wiki/United_States_Department_of_Energy\)](https://en.wikipedia.org/wiki/United_States_Department_of_Energy)

Photo courtesy of [creativecommons \(https://creativecommons.org\)](https://creativecommons.org).

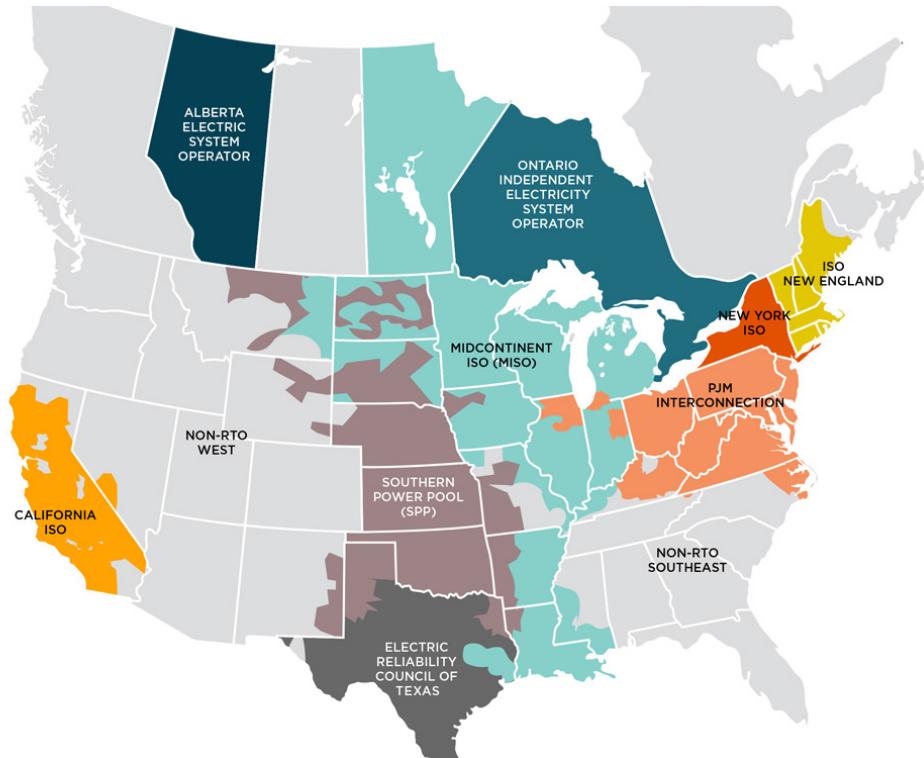
FERC : <https://www.ferc.gov> (<https://www.ferc.gov>)



The Federal Energy Regulatory Commission (FERC) is the United States federal agency that regulates the transmission and wholesale sale of electricity and natural gas in interstate commerce and regulates the transportation of oil by pipeline in interstate commerce. FERC also reviews proposals to build interstate natural gas pipelines, natural gas storage projects, and liquefied natural gas (LNG) terminals, in addition to licensing non-federal hydropower projects. [wikipedia \(https://en.wikipedia.org/wiki/Federal_Energy_Regulatory_Commission\)](https://en.wikipedia.org/wiki/Federal_Energy_Regulatory_Commission)

Photos Courtesy of [FERC \(https://www.ferc.gov\)](https://www.ferc.gov).

FERC : <https://www.ferc.gov> (<https://www.ferc.gov>)



NIST : <https://www.nist.gov> (<https://www.nist.gov>)



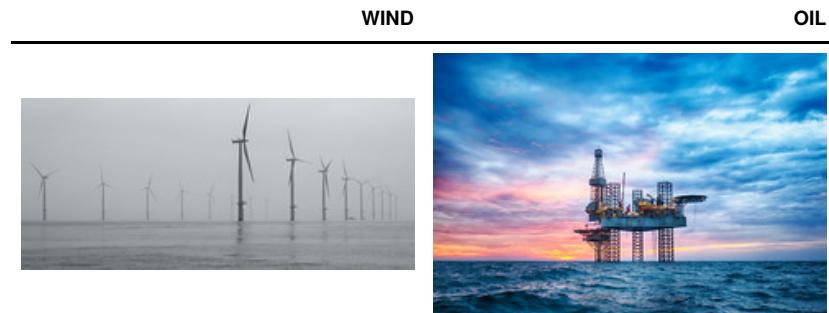
The National Institute of Standards and Technology (NIST) is a physical sciences laboratory, and a non-regulatory agency of the United States Department of Commerce. Its mission is to promote innovation and industrial competitiveness. NIST's activities are organized into laboratory programs that include nanoscale science and technology, engineering, information technology, neutron research, material measurement, and physical measurement.[wikipedia](https://en.wikipedia.org/wiki/National_Institute_of_Standards_and_Technology).(https://en.wikipedia.org/wiki/National_Institute_of_Standards_and_Technology)

<https://www.nist.gov/topics/energy> (<https://www.nist.gov/topics/energy>)

NIST develops the testing, measurements, and reference materials needed to ensure the quality of energy-related products and services and ensure fairness in the marketplace.[NIST](https://www.nist.gov/topics/energy).(<https://www.nist.gov/topics/energy>)

Photos Courtesy of [creativecommons](https://creativecommons.org).(<https://creativecommons.org>).

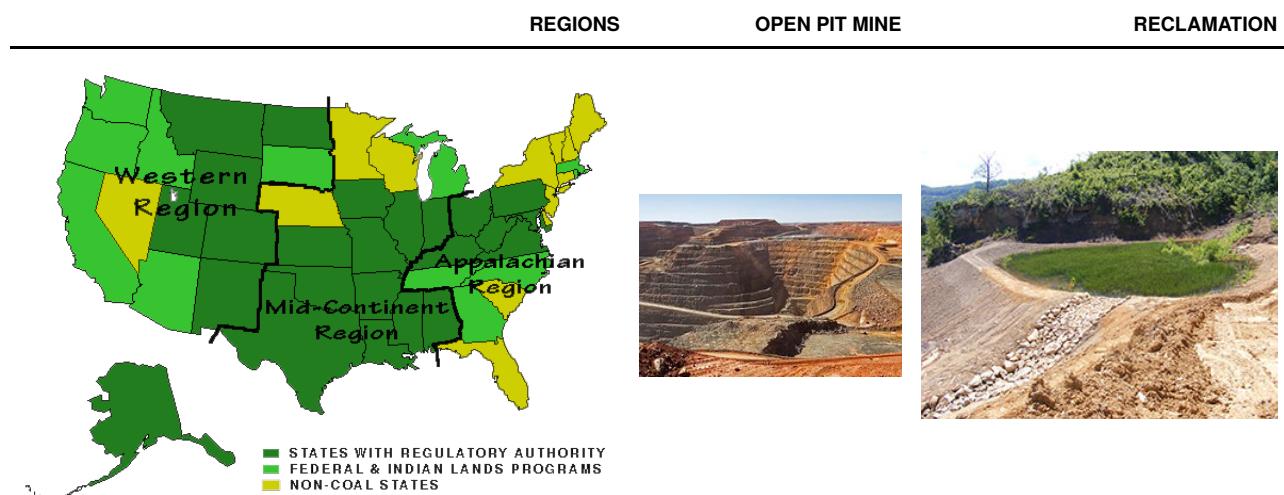
BOEM : <https://www.boem.gov/> (<https://www.boem.gov/>)



The Mission of the Bureau of Ocean Energy Management is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.[BOEM \(https://www.boem.gov/About-BOEM/\)](https://www.boem.gov/About-BOEM/)

Photos Courtesy of [creativecommons \(https://creativecommons.org\).](https://creativecommons.org/)

OSMRE : <https://www.osmre.gov/> (<https://www.osmre.gov/>)



The Office of Surface Mining Reclamation and Enforcement (OSMRE) is a bureau within the United States Department of the Interior. OSMRE is responsible for establishing a nationwide program to protect society and the environment from the adverse effects of surface coal mining operations, under which OSMRE is charged with balancing the nation's need for continued domestic coal production with protection of the environment.[OSMRE \(https://www.osmre.gov/about.shtm\)](https://www.osmre.gov/about.shtm)

Photos courtesy of [OSMRE \(https://www.osmre.gov\).](https://www.osmre.gov)

BPA : <https://www.bpa.gov> (<https://www.bpa.gov>)



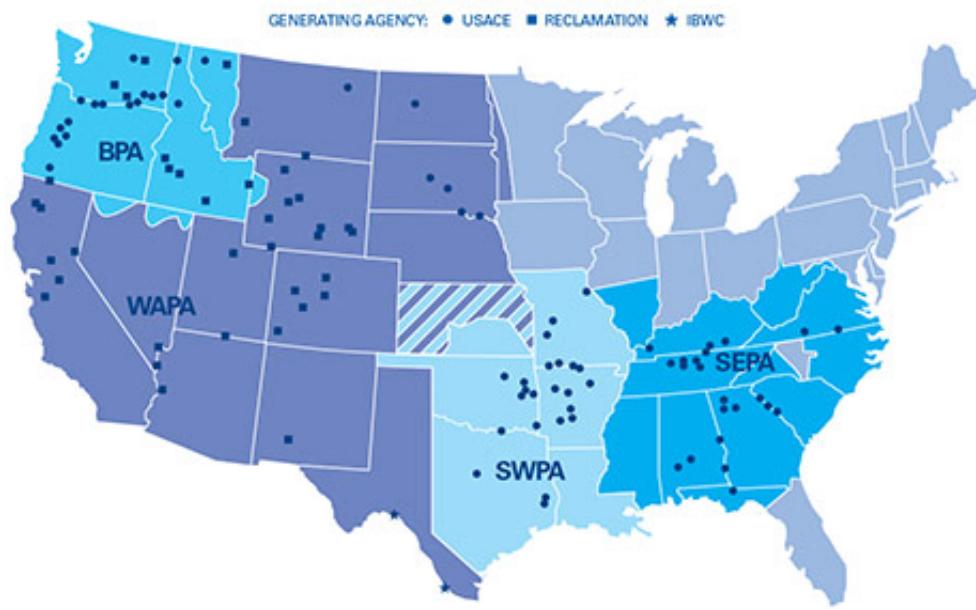
The Bonneville Power Administration is a nonprofit federal power marketing administration based in the Pacific Northwest. Although BPA is part of the U.S. Department of Energy, it is self-funding and covers its costs by selling its products and services. BPA markets wholesale electrical power from 31 federal hydroelectric projects in the Northwest, one nonfederal nuclear plant and several small nonfederal power plants. The dams are operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation. The nonfederal nuclear plant, Columbia Generating Station, is owned and operated by Energy Northwest, a joint operating agency of the state of Washington. BPA provides about 28 percent of the electric power used in the Northwest and its resources — primarily hydroelectric — make BPA power nearly carbon free.

Photo courtesy [creativecommons](https://creativecommons.org) (<https://creativecommons.org>).

BPA : <https://www.bpa.gov> (<https://www.bpa.gov>)

Federal Power Administrations

**Federal Power Marketing Administrations
Territories and Facilities**



Photos courtesy of [BPA](https://www.bpa.gov) (<https://www.bpa.gov>).

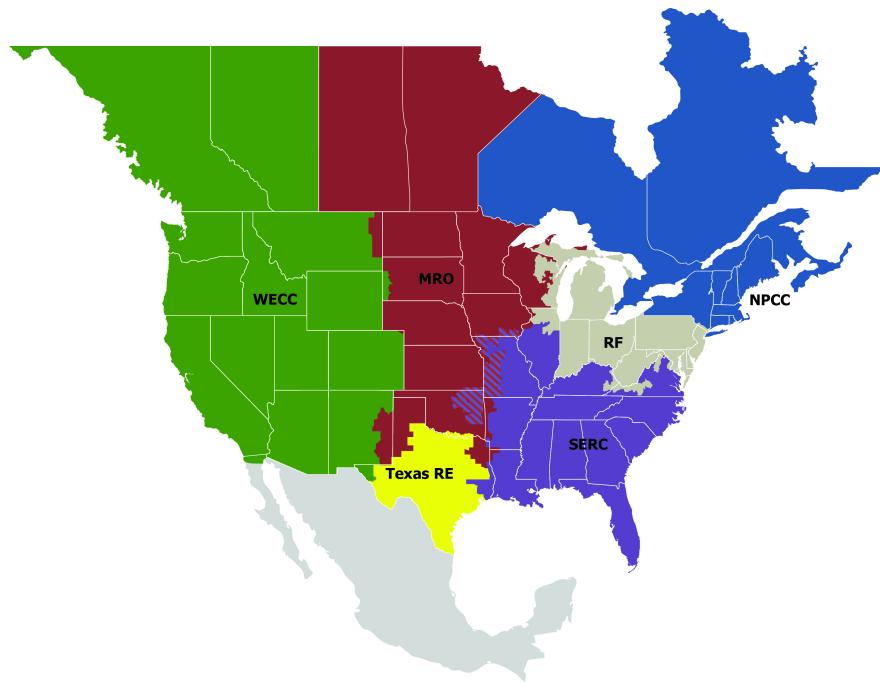
USACE : <https://www.usace.army.mil> (<https://www.usace.army.mil>)



The U.S. Army Corps of Engineers is the largest operator of hydroelectric power plants in the U.S., and one of the largest in the world. The 75 Corps plants have a total installed capacity of 20,474 megawatts and produce nearly 100 billion kilowatt-hours a year. Nearly a third of the nation's total hydropower output, it's enough energy to serve about ten million households, or roughly ten cities the size of Seattle. [USACE/HYDROPOWER](https://www.nwp.usace.army.mil/hydropower) (<https://www.nwp.usace.army.mil/hydropower>)

Photo courtesy of [USACE](https://www.usace.army.mil) (<https://www.usace.army.mil>).

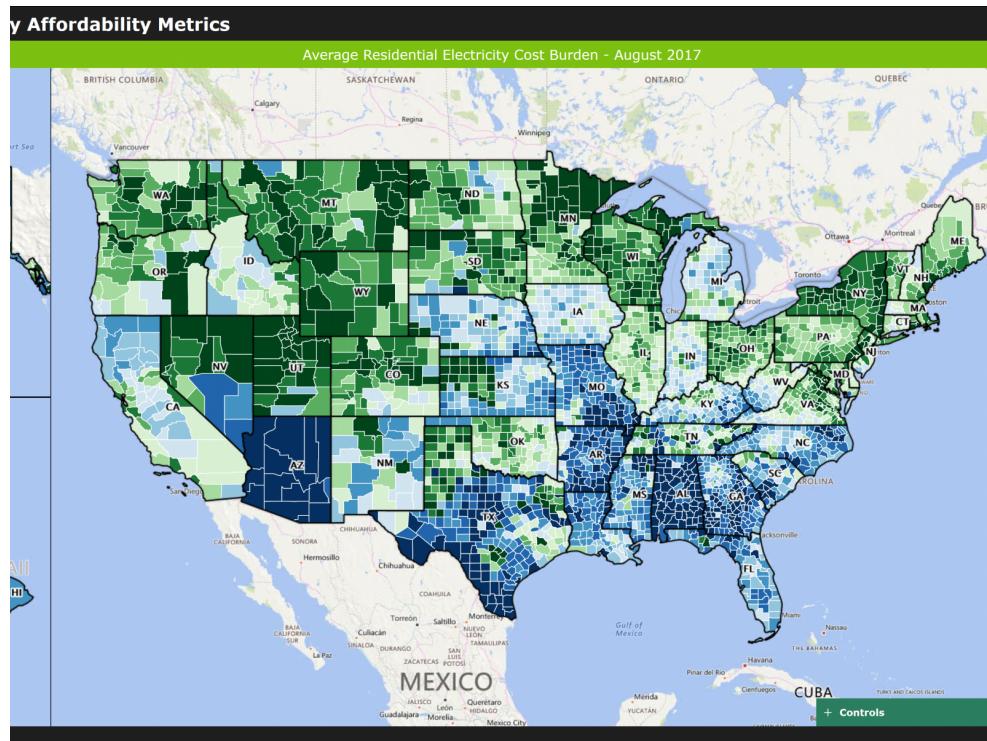
NERC : <https://www.nerc.com> (<https://www.nerc.com>)



The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the bulk power system through system awareness; and educates, trains, and certifies industry personnel. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico. NERC is the electric reliability organization (ERO) for North America, subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC's jurisdiction includes users, owners, and operators of the bulk power system, which serves more than 334 million people. [NERC \(<https://www.nerc.com/AboutNERC/Pages/default.aspx>\)](https://www.nerc.com/AboutNERC/Pages/default.aspx)

Image courtesy of [NERC \(<https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx>\)](https://www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx).

PNNL : <https://www.nerc.com> (<https://www.nerc.com>)



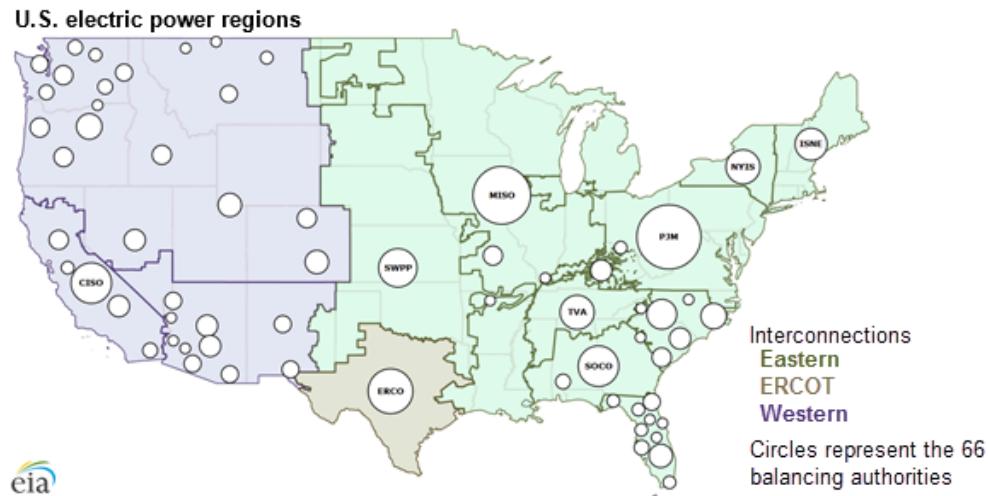
Pacific Northwest National Laboratory plays a leading role in developing a power grid that enables real-time predictive operation to improve reliability and efficiency; incorporates advanced controls that engage new devices and enable new services at scale while ensuring resilience; and uses new approaches and technologies, such as energy storage, microgrids, and transactive energy, to provide flexibility in support of an array of energy futures.[PNNL](https://www.pnnl.gov/electric-grid-modernization) (<https://www.pnnl.gov/electric-grid-modernization>)

Federal Agencies (SUMMARY)

AGENCY	FOCUS
DOE	NUCLEAR
FERC	INTERSTATE TRANSMISSION/COMMERCE
NIST	STANDARDS & RESEARCH
BOEM	OFFSHORE ENERGY (DRILLING & WIND)
OSMRE	COAL
BPA	HYDRO & TRANSMISSION
USACE	HYDRO (in this context)
NERC	REGULATORY
PNNL	RESEARCH

Energy Overview : The West

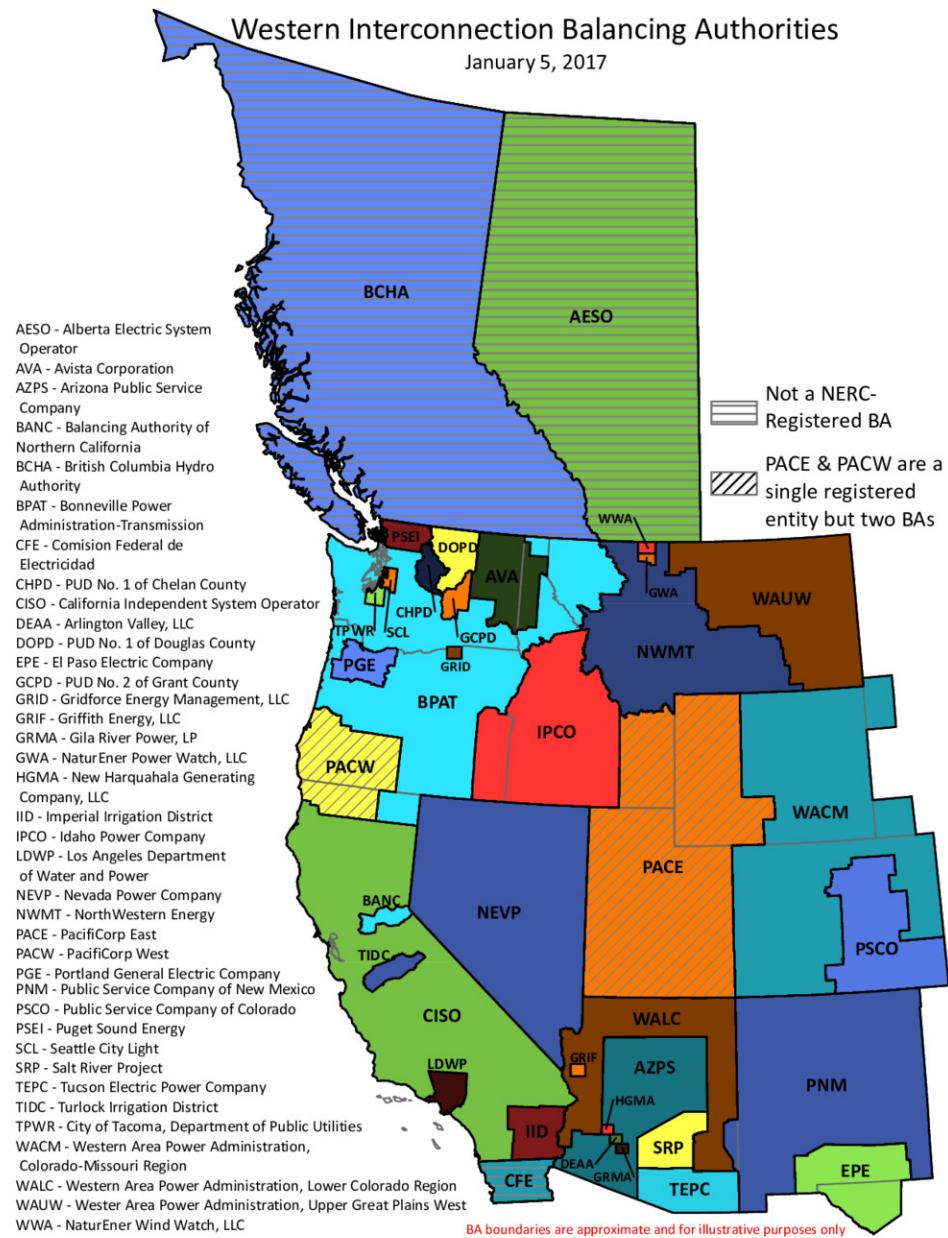
Balancing Authority



A balancing authority ensures, in real time, that power system demand and supply are finely balanced. This balance is needed to maintain the safe and reliable operation of the power system. If demand and supply fall out of balance, local or even wide-area blackouts can result. [EIA \(<https://www.eia.gov/todayinenergy/detail.php?id=27152>\)](https://www.eia.gov/todayinenergy/detail.php?id=27152)

Image courtesy of EIA.gov.

WECC Balancing Authorities



The Western Electricity Coordinating Council (WECC) is a not-for-profit organization that works to effectively and efficiently mitigate risks to the reliability and security of the Western Interconnection's Bulk Power System. WECC operates under a Federal Energy Regulatory Commission (FERC) approved delegation agreement with the North American Electric Reliability Corporation (NERC) and in accordance with WECC's Bylaws. [WECC](https://www.wecc.org/WREGIS/Pages/Default.aspx) (<https://www.wecc.org/WREGIS/Pages/Default.aspx>)

Image courtesy of WECC.

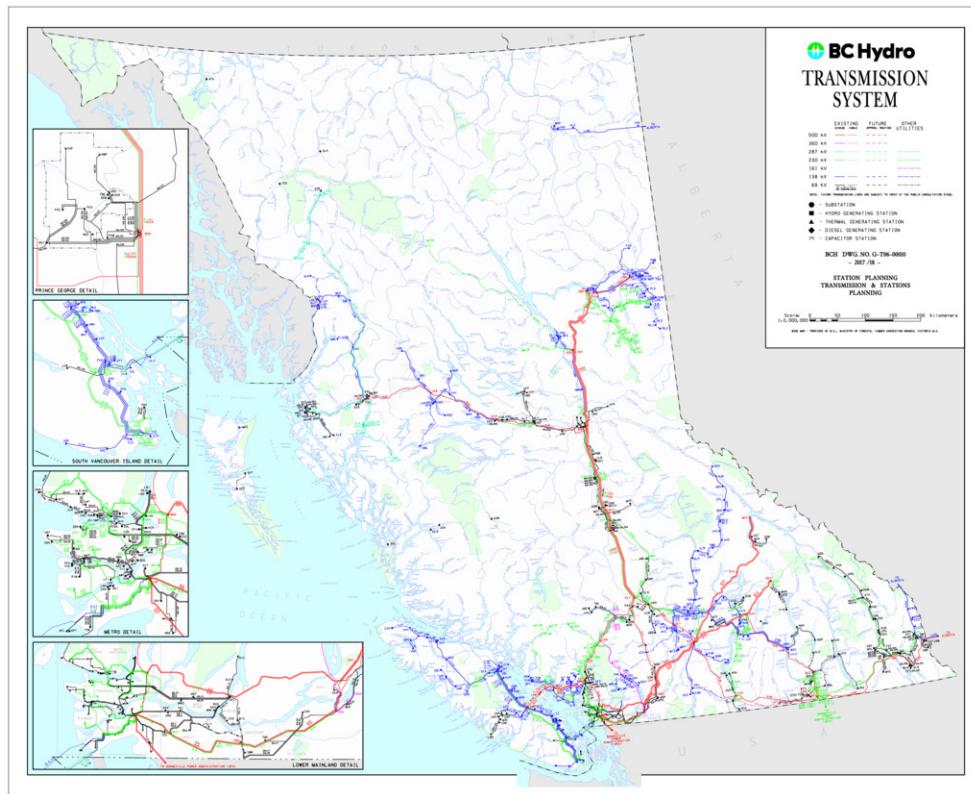
Key West Coast Players

Key Agencies

AGENCY	FUNCTION
British Columbia Hydro Authority (BCHA)	Balancing Authority
Bonneville Power Administration (BPA)	Hydro Producer, Transmission, Balancing Authority
Environmental Protection Agency (EPA)	Columbia River Basin
North West Power and Conservation Council (NWPCC)	Regional Oversight
California Independent Service Operator (CAISO)	Balancing Authority

BCHA : <https://www.bchydro.com> (<https://www.bchydro.com>)

Service Area



Generating Capacity

HYDRO (#)	HYDRO (MW)	THERMAL (#)	THERMAL (MW)	TOTAL (MW)
31	11,932	3	177	12,109

[BCHydro-Annual-Service-Plan-Report-2018-2019](https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/accountability-reports/financial-reports/annual-reports/BCHydro-Annual-Service-Plan-Report-2018-2019.pdf) (<https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/accountability-reports/financial-reports/annual-reports/BCHydro-Annual-Service-Plan-Report-2018-2019.pdf>) [EIA](https://www.eia.gov/todayinenergy/detail.php?id=16891) (<https://www.eia.gov/todayinenergy/detail.php?id=16891>)

BC Hydro is a Crown corporation, owned by the government and people of British Columbia. It's our job to safely provide our customers with reliable, affordable and clean electricity throughout the province. [BCHA](https://www.bchydro.com/toolbar/about.html) (<https://www.bchydro.com/toolbar/about.html>)

BPA : <https://www.bpa.gov> (<https://www.bpa.gov>)

Service Area

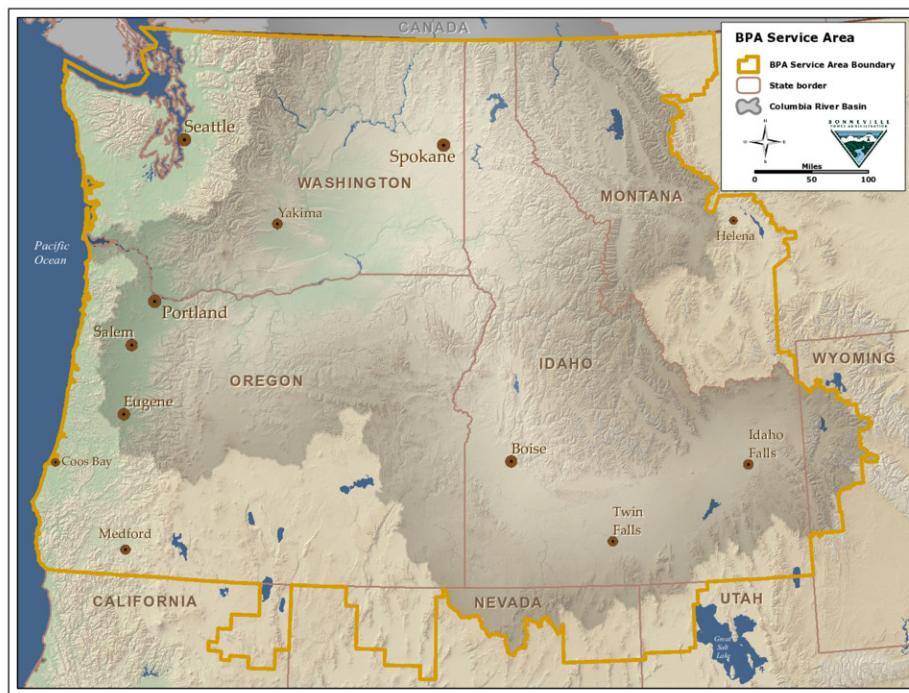
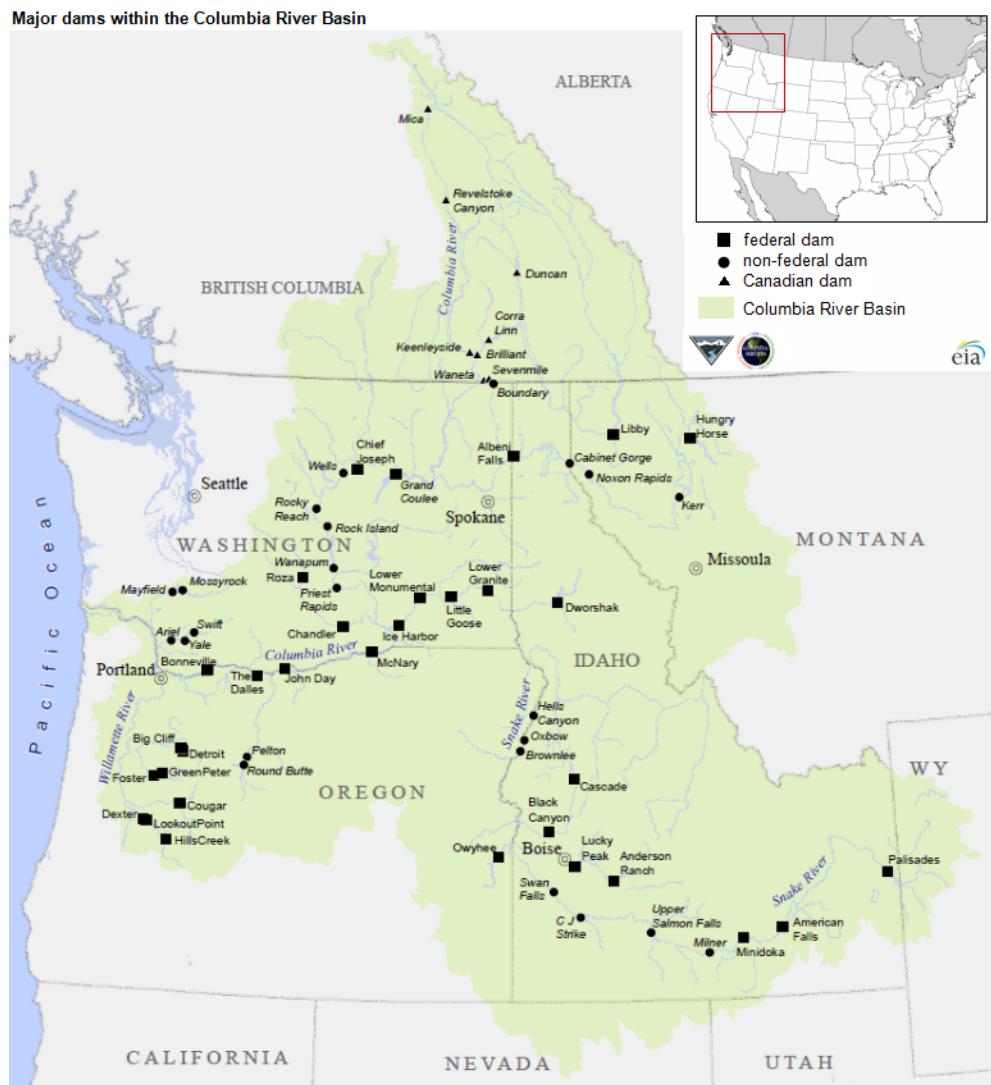


Image courtesy of [BPA](https://www.bpa.gov/news/pubs/map/BPA_ServiceArea.pdf) (https://www.bpa.gov/news/pubs/map/BPA_ServiceArea.pdf)

BPA : <https://www.bpa.gov> (<https://www.bpa.gov>)



Generating Capacity

Entire Columbia River Basin including Tributaries and 3 Dams in BC, Canada

HYDRO (#)	HYDRO (MW)	THERMAL (#)	THERMAL (MW)	TOTAL (MW)
32+	29,000	N/A	N/A	29,000

Hydroelectric power plants located in the Columbia River Basin account for a little more than one third of all the hydroelectric capacity in the United States. The Columbia River runs from the Canadian Rockies and flows 1,214 miles through Idaho, Oregon, and Washington, but the river basin also includes parts of Montana, Nevada, Wyoming, and Utah. Hydroelectric power plants located on the river and its tributaries account for 29 gigawatts (GW) of hydroelectric generating capacity and contributed 44% of the total hydroelectric generation in the nation in 2012. [EIA \(<https://www.eia.gov/todayinenergy/detail.php?id=16891>\)](https://www.eia.gov/todayinenergy/detail.php?id=16891)

Image courtesy of [EIA \(<https://www.eia.gov>\)](https://www.eia.gov).

BPA : <https://www.bpa.gov> (<https://www.bpa.gov>)

BPA Transmission Lines and Facilities

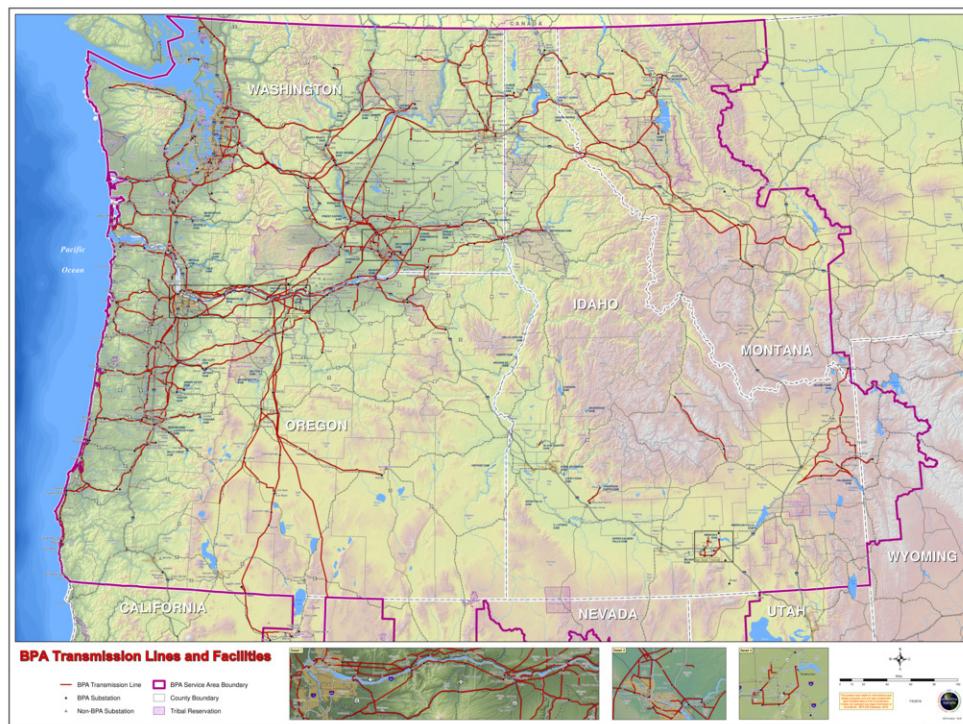
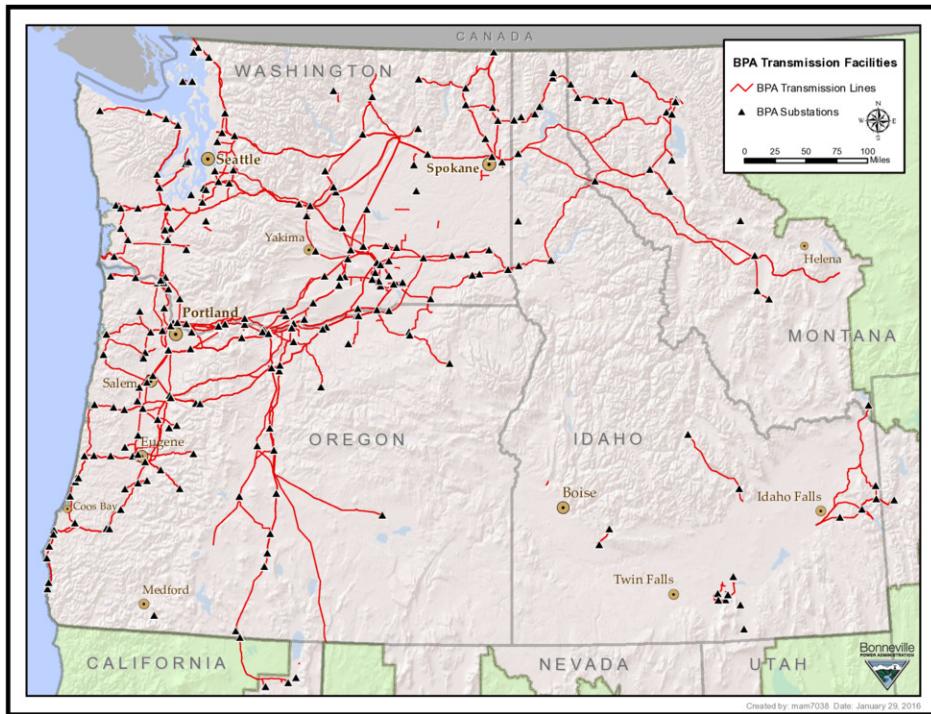


Image courtesy of [BPA](https://www.bpa.gov/news/pubs/map/BPA_TransmissionLines_and_Facilities.pdf) (https://www.bpa.gov/news/pubs/map/BPA_TransmissionLines_and_Facilities.pdf)

BPA : <https://www.bpa.gov> (<https://www.bpa.gov>)

BPA Transmission Lines and Facilities



BPA also operates and maintains about three-fourths of the high-voltage transmission in its service territory. BPA's territory includes Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah and Wyoming. [BPA](https://www.bpa.gov/news/AboutUs/Pages/default.aspx) (<https://www.bpa.gov/news/AboutUs/Pages/default.aspx>)

Image courtesy of [BPA](https://www.bpa.gov/news/pubs/map/BPA_TLines_small.pdf) (https://www.bpa.gov/news/pubs/map/BPA_TLines_small.pdf)

EPA : <https://www.epa.gov> (<https://www.epa.gov>)

Columbia River Basin Restoration Program



- [Chemicals of Emerging Concern](https://www.epa.gov/columbiariver/chemicals-emerging-concern-columbia-river) (<https://www.epa.gov/columbiariver/chemicals-emerging-concern-columbia-river>)
- [Toxics](https://www.epa.gov/columbiariver/2009-state-river-report-toxics) (<https://www.epa.gov/columbiariver/2009-state-river-report-toxics>)
- [Cold Water Refuges](https://www.epa.gov/columbiariver/columbia-river-cold-water-refuges) (<https://www.epa.gov/columbiariver/columbia-river-cold-water-refuges>)

Congress amended the Clean Water Act in 2016 by adding Section 123, which required EPA to establish a Columbia River Basin Restoration Program. It was the first legislation to officially designate the national importance of restoring the Columbia River Basin, one of our nation's largest watersheds. The legislation focuses on the U.S. portion of the Basin, including the states of Oregon, Washington, Idaho, and Montana. [EPA](https://www.epa.gov/columbiariver/about-epas-work-columbia-river-basin) (<https://www.epa.gov/columbiariver/about-epas-work-columbia-river-basin>) Photo courtesy of EPA.

Key West Coast Players

Large Companies

COMPANY	WA	OR	CA
Pacificorp	X	X	O
Puget Sound Energy	X	O	O
Portland General Electric	O	X	O
Pacific Gas & Electric (PGE)	O	O	X

[source](https://www.bestenergynews.com/solar/utility_co/utility_companies.php) (https://www.bestenergynews.com/solar/utility_co/utility_companies.php)

In the News

DATE	ACTORS	ARENA	DESCRIPTION
2019	Washington State & BC Hydro	Clean Grid	Fight Climate Crisis Together (https://www.geekwire.com/2019/washington-state-b-c-launch-joint-clean-grid-initiative-align-renewable-energy-transition/)
2019	BPA & CAISO	EIM	BPA signs implementation agreement with CAISO to join EIM (https://www.bpa.gov/Projects/Initiatives/EIM/Pages/Energy-Imbalance-Market.aspx)
2017	BC Hydro (Powerex) & CAISO	EIM	Powerex joins EIM (www.caiso.com/Documents/PowerexWillJoinWesternEnergyImbalanceMarket.pdf)

Current Issues

- Capacity
- Transmission
- Storage
- RE Disruption

CAISO OASIS DEEP DIVE

TODO

What was Enron?

TODO

What is CAISO?

TODO

What is CAISO OASIS?

TODO

What is the Energy Dashboard?

TODO

More Links

- [\(https://en.wikipedia.org/wiki/Regional_transmission_organization_\(North_America\)\)](https://en.wikipedia.org/wiki/Regional_transmission_organization_(North_America))
- [\(https://www.thebalance.com/who-regulates-energy-companies-in-the-united-states-1182615\)](https://www.thebalance.com/who-regulates-energy-companies-in-the-united-states-1182615)
- [\(https://en.wikipedia.org/wiki/Regional_transmission_organization_\(North_America\)\)](https://en.wikipedia.org/wiki/Regional_transmission_organization_(North_America))
- [\(https://isorto.org/\)](https://isorto.org/)
- [\(https://en.wikipedia.org/wiki/Columbia_River\)](https://en.wikipedia.org/wiki/Columbia_River)
- [\(https://www.eia.gov/todayinenergy/detail.php?id=16891\)](https://www.eia.gov/todayinenergy/detail.php?id=16891)
- [\(http://www.cbr.washington.edu/hydro\)](http://www.cbr.washington.edu/hydro)
- [\(https://www.nwcouncil.org/reports/columbia-river-history/hydropower\)](https://www.nwcouncil.org/reports/columbia-river-history/hydropower)
- [Orcas Briefing.\(https://www.nwcouncil.org/sites/default/files/2019_1015_1.pdf\)](https://www.nwcouncil.org/sites/default/files/2019_1015_1.pdf)
- [Marine Heat Waves Briefing.\(https://www.nwcouncil.org/sites/default/files/2019_1015_2.pdf\)](https://www.nwcouncil.org/sites/default/files/2019_1015_2.pdf)
- [\(https://www.nwcouncil.org/\)](https://www.nwcouncil.org/)
- [\(https://www.nwpp.org/\)](https://www.nwpp.org/)
- [Seventh Power Plan.\(https://www.nwcouncil.org/energy/7th-northwest-power-plan/about-seventh-power-plan\)](https://www.nwcouncil.org/energy/7th-northwest-power-plan/about-seventh-power-plan)
- [Invenergy IPP.\(https://www.nwcouncil.org/sites/default/files/2019_1015_8.pdf\)](https://www.nwcouncil.org/sites/default/files/2019_1015_8.pdf)

normal