Idaho Governor's Office of Energy and Mineral Resources

IDAHO ENERGY LANDSCAPE 2024

304 N. 8th Street, Suite 250
P.O. Box 83720
Boise, Idaho 83720

Created by the Idaho Governor's Office of Energy and Mineral Resources

304 N. 8th Street, Suite 250
P.O. Box 83720
Boise, Idaho 83720-0199

Special thanks to Intermountain Gas Company, a subsidiary of MDU Resources Group, for printing and binding this edition of the Idaho Energy Landscape.

Note: Energy statistics compiled for the 2024 Energy Landscape reflect the most recent data available from a wide variety of sources. Different sources will update energy data at irregular intervals, some more frequently than others. For that reason, the facts and statistics referenced in this document, including graphs and tables, represent the most up-to-date information available, but may be several years old. Each year, the Idaho Governor's Office of Energy and Mineral Resources staff conducts thorough research to ensure that the data presented in this document is accurate and complete.

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1. Idaho's Energy Landscape

1.1 Energy Leadership and the Economy

Idaho's abundant natural resources enable reliable and low-cost energy which sustains Idaho's economy and quality of life for citizens. Idaho's diverse economy is comprised of many energy-intensive sectors, including technology, manufacturing, agriculture, tourism, healthcare, and construction, all of which benefit from Idaho's low cost of energy.

Idaho's history is rich with energy innovation and its future is being propelled with pioneering technologies. Idaho has long been a global energy innovator. Idaho is home to the first atomic-powered city in the world, the first public installation of solar-powered roads, and is a national leader in clean energy generation and resilient grid infrastructure. The following key attributes enable a dynamic energy industry in Idaho:

- Low cost of doing business
- Access to affordable and reliable hydroelectricity
- Availability of an energy-ready workforce
- Access to leaders in carbon-free energy and energy innovation
- Sizable and diverse industry supply chain
- Friendly business climate and tax structures

The state's energy industry contributes $6.3 billion to the state's GDP spurring technology innovation, launching of start-ups, and fueling research, growth, and discovery.[1] Idaho has approximately 2,400 energy businesses and there are over 50,829 energy industry jobs in Idaho. Wages in the sector average $91,000 per year, and the anticipated growth rate is 19% over the next 10 years.[2] Idaho Falls has the highest concentration of nuclear engineers in the country.[3]

Figure 1: Lamb Weston Invests $415 Million in American Falls Expansion

In 2023, Lamb Weston, an Idaho-based frozen potato company, announced a $415 million expansion at its American Falls facility. Lamb Weston maintains goals to increase energy efficiency by washing potatoes using techniques that conserve energy, saving energy by capturing and reusing overflow water, using scraps to create energy in anaerobic digesters, and installing energy-efficient lighting and processing equipment.[4,5]

[1] Idaho Dept. of Commerce. "Idaho's Expanding Energy Economy." https://commerce.idaho.gov/content/uploads/2022/02/Idahos-Expanding-Energy-Economy.pdf
[2] Idaho Dept. of Commerce. "Idaho's Expanding Energy Economy". https://commerce.idaho.gov/content/uploads/2022/02/Idahos-Expanding-Energy-Economy.pdf
[3] Idaho Dept. of Commerce. "Idaho's Expanding Energy Economy." https://commerce.idaho.gov/content/uploads/2022/02/Idahos-Expanding-Energy-Economy.pdf
[4] Idaho Farm Bureau Federation. "Lamb Weston Expansion Project is a $415 Million Investment in Idaho Potatoes." https://www.idahofb.org/news-room/posts/lamb-weston-expansion-project-is-a-415-million-investment-in-idaho-potatoes/
[5] Lamb Weston. "Fiscal Year 2022 Environmental, Social, and Governance Report." https://esg.lambweston.com/lambweston-2022-esg.pdf

1.2 Energy Production, Consumption, and Sources

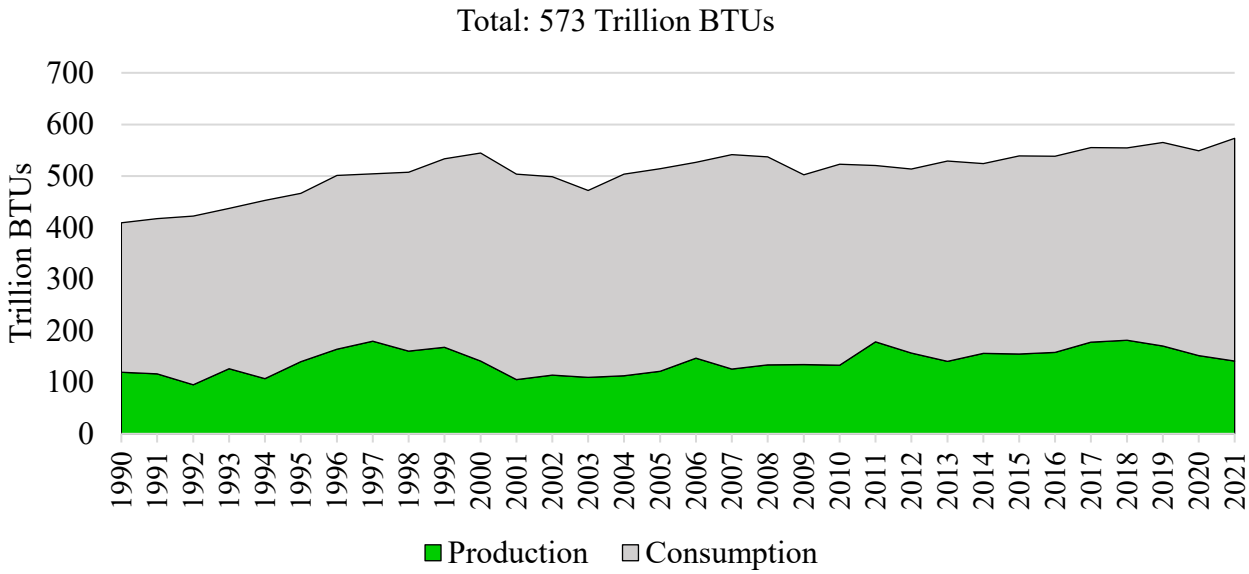
In 2021, Idaho consumed the equivalent of approximately 573 trillion British thermal units (BTUs) of energy. Of that amount, 20% was produced in Idaho, as shown in Figure 2. The state's reliance upon imported energy requires a robust and well-maintained infrastructure of highways, railroads, pipelines, and transmission lines to facilitate economic development and meet Idahoans' needs.

Resource adequacy is an important concept in the energy sector that ensures a reliable and resilient supply of energy resources, such as electricity or natural gas, to meet energy demand which supports economic growth and enhances Idaho's clean and sustainable energy sources.

Energy markets aim to ensure resource adequacy, energy independence, and energy security. Energy independence refers to a state or region's ability to meet its energy needs without relying heavily on imports or external sources for energy supply. Energy security is having enough energy to meet demand and having protected energy infrastructure.

Participating utilities can meet energy demands by having access to resources that are not located within the state. The larger geographic range enables utilities to access a wide variety of resources in times of high demand when in state resources are not adequate. A diverse portfolio of energy resources helps create resiliency and reliability for the grid.

Figure 2: Idaho Energy Production and Consumption[6,7]

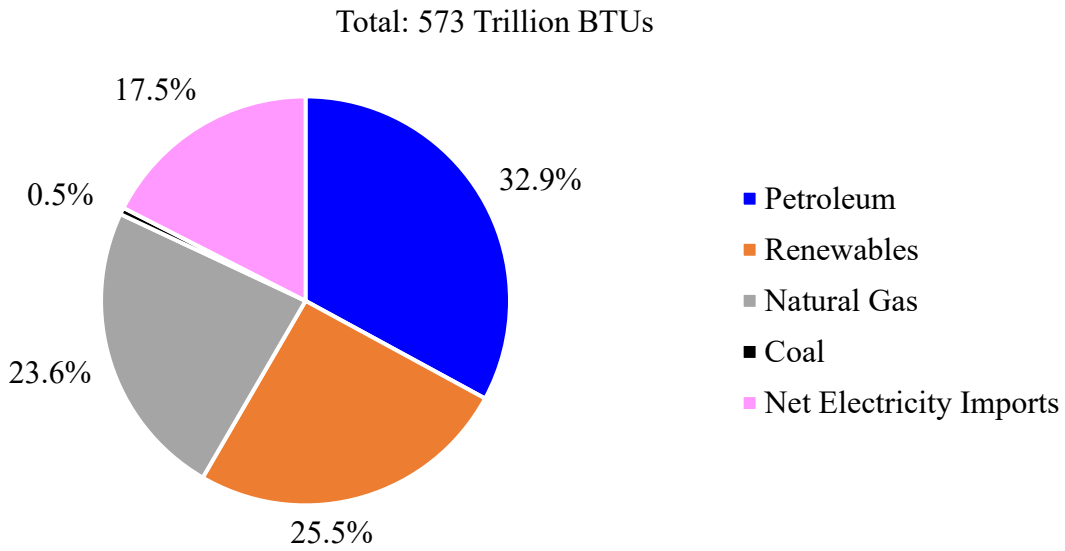


[6] U.S. Energy Information Administration. "Primary Energy Consumption Estimates." https://www.eia.gov/state/seds/sep_use/total/pdf_cb/use_tot_IDcb.pdf

[7] U.S. Energy Information Administration. "Primary Energy Production Estimates." https://www.eia.gov/state/seds/sep_prod/pdf/PT2_ID.pdf

Petroleum accounts for approximately one-third of Idaho's energy consumed, mostly consisting of motor gasoline and diesel. Renewables represent approximately one-fourth of Idaho's total energy consumed. This share includes hydroelectricity, biomass, geothermal, solar, and wind.

Figure 3: Sources of Total Energy Consumed in Idaho, 2021[8]



Idaho has no petroleum refineries and limited storage capacity. Petroleum in Idaho is moved through four major modes of transportation: pipelines, railcars, barges, and truck delivery. Petroleum pipeline infrastructure within Idaho includes the Northwest Products Pipeline, which connects Salt Lake City refineries with Idaho Falls, Pocatello, Burley, and Boise, and continues to Pasco and Spokane in Washington state. This pipeline delivers refined petroleum products predominantly to southern Idaho. Much of the refined petroleum products for northern Idaho are sourced from refineries near Billings, Montana, with the product being moved through the Yellowstone Pipeline and terminating in Moses Lake, Washington. Idaho's petroleum products are mostly transported using pipelines, while some are shipped on the Snake River into Lewiston, via barge, and others are transported via truck. End use refined petroleum products are typically delivered from terminal via truck to fueling stations.

Idaho's small population contributes to it being among the ten states with the lowest total petroleum consumption, but Idaho's per capita petroleum use is near the national average. Idaho's prices for these products are typically higher than the national average. Idaho had the eighth highest average gasoline price in the U.S. in October 2023, as shown in Figure 5. The average combined (local, state, and federal) gasoline tax in 2022 was 57.09 cents per gallon. Idaho's combined gasoline tax rate in 2022 was 51.40 cents per gallon.[9]

[8] U.S. Energy Information Administration. "Primary Energy Consumption Estimates." https://www.eia.gov/state/seds/sep_use/total/pdf_cb/use_tot_IDcb.pdf
[9] American Petroleum Institute. "Gasoline Taxes." https://www.api.org/oil-and-natural-gas/consumer-information/motor-fuel-taxes/gasoline-tax

Figure 4: Idaho Petroleum System[10]

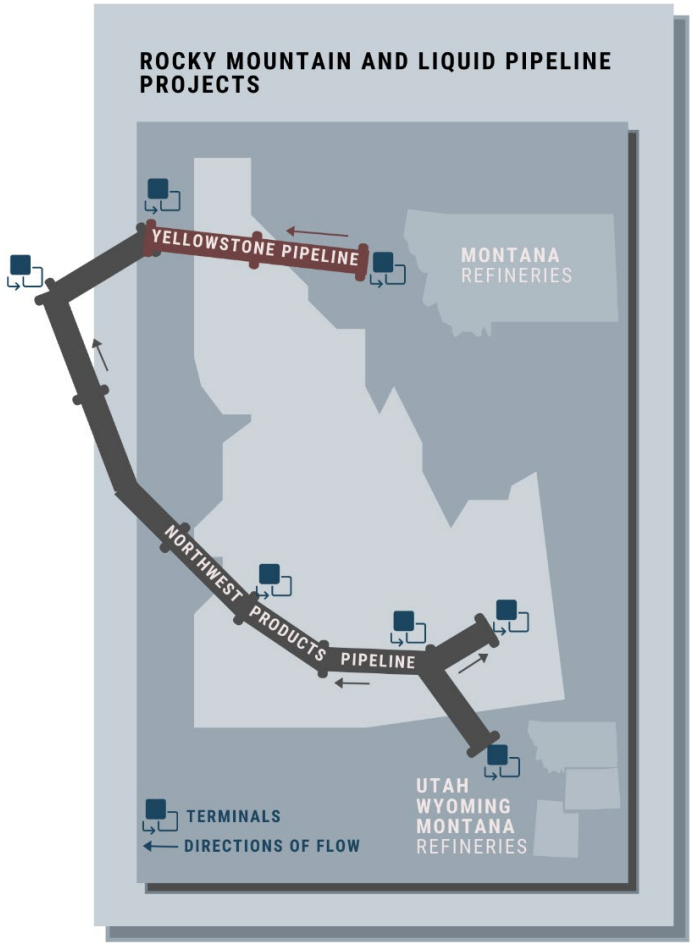
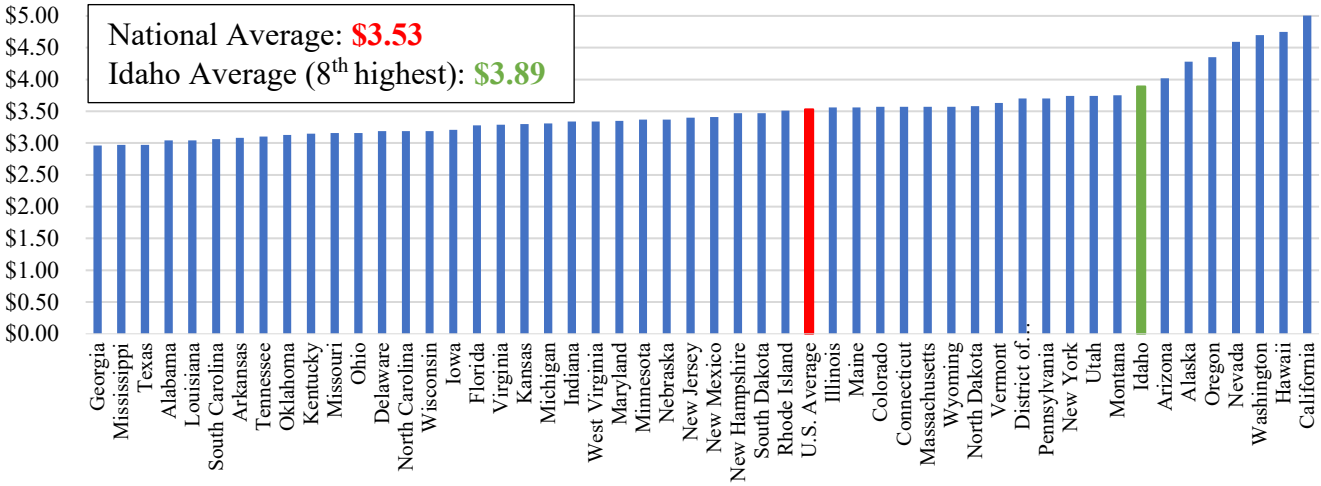


Figure 5: Idaho's 2023 Retail Gasoline Prices Compared to Other States[11]



[10] Office of Energy and Mineral Resources. "2022 Idaho Energy Security Plan." https://oemr.idaho.gov/wp-content/uploads/2022-Idaho-Energy-Security-Plan-Redacted.pdf

[11] AAA. "Gas Prices." https://gasprices.aaa.com/state-gas-price-averages/

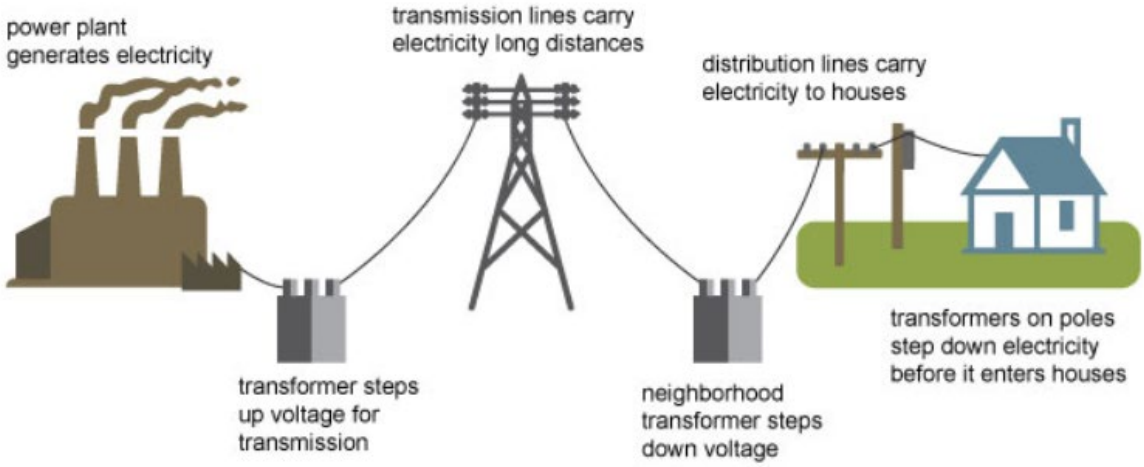
1.3 The Grid and Electricity

The grid is a system of electricity substations, transformers, and power lines that transport electricity to customers. There are three main components to the grid: generation, transmission, and distribution, as seen in Figure 6. Electricity is produced at a power plant from a generation resource. Electricity from power plants moves through a substation then through transformers that increase the voltage. Transmission lines then carry electricity over long distances to a substation that decreases the voltage. Once the voltage decreases, distribution lines safely deliver power to customers.[12] This infrastructure enables the efficient distribution of electricity across regions and ensures a reliable power supply for consumers in the United States.

Transmission is important in several contexts including energy integration, economic growth, energy security, and reliability and resiliency. A robust transmission network allows for the efficient integration of energy sources into the grid. Diverse and interconnected transmission networks enhance energy security by providing support during system failure or disruptions, which is especially important in areas prone to extreme weather conditions.

Reliable and resilient infrastructure is important for Idahoans. This infrastructure ensures uninterrupted power supply to essential services like hospitals and other emergency services. A resilient grid also defends against potential disruptions caused by natural disasters, cyberattacks, or other unforeseen events.

Figure 6. Generation, Transmission, and Distribution[13]

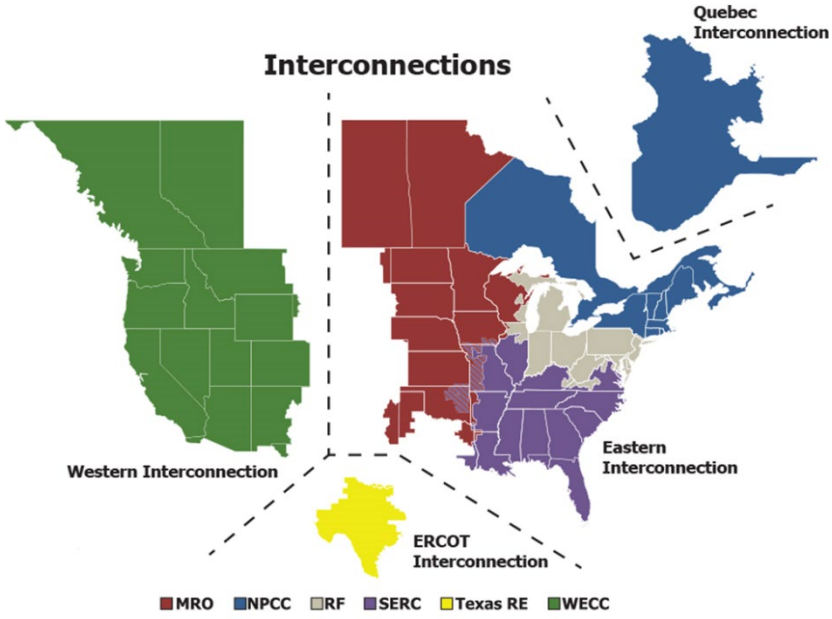


[12] U.S. Department of Energy. "How It Works: Electric Transmission & Distribution and Protective Measures." https://www.energy.gov/sites/default/files/2023-11/FINAL_CESER%20Electricity%20Grid%20Backgrounder_508.pdf
[13] U.S. Energy Information Administration. "Electricity Explained." https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php

Figure 7: Idaho's Investments in Grid Resiliency

In 2022, OEMR's Idaho Energy Resiliency Grant Pilot Program awarded funding to Idaho Power to apply mesh fire wrap to their transmission infrastructure. The mesh wrap protected their transmission poles from a fire that occurred in Summer 2023.

Figure 8: North American Electric Reliability Corporation (NERC) Regional Electric Interconnections[14]

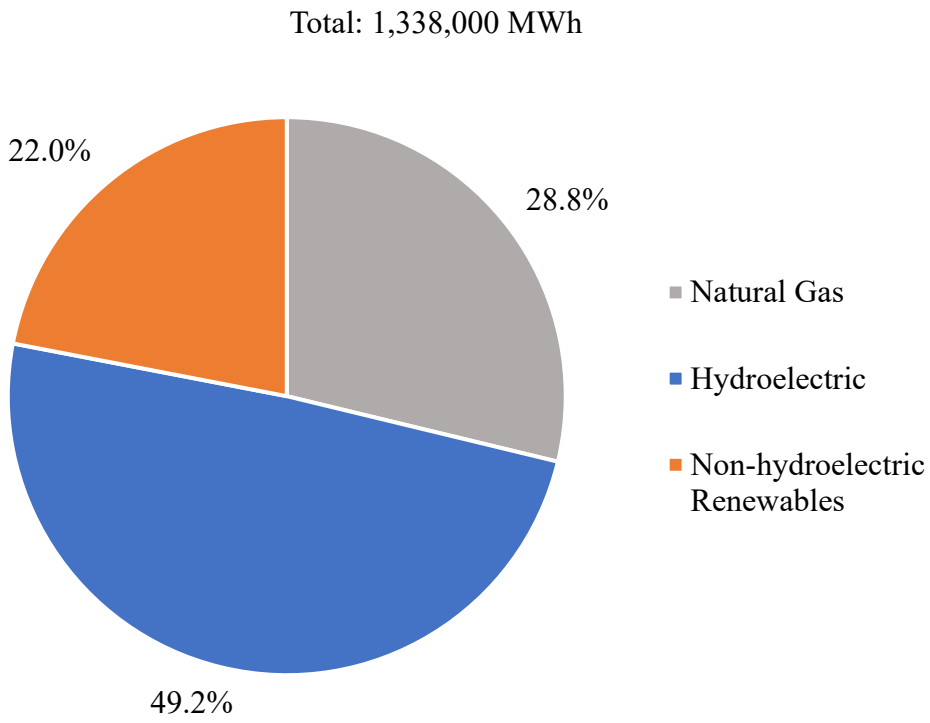


The electrical transmission network in the U.S. and Canada is made up of four separate interconnections. The Western Interconnection links Idaho with the rest of the western U.S. and two Canadian provinces. It serves over 80 million people, is comprised of approximately 136,000 miles of transmission lines, and spans more than 1.8 million square miles.[15] Generation in the Western Interconnection makes up just under 20% of the North American total. A large proportion of generation comes from hydroelectricity, wind, and solar. Coordination throughout the Western Interconnection on a local, sub-regional, and regional basis ensures a reliable and adequate integrated system of electricity for consumers. The Western Electricity Coordinating Council (WECC) is the regional entity that monitors and enforces compliance with electricity reliability standards throughout the Western Interconnection.[16]

[14] North American Electric Reliability Corporation. "Maps: NERC Interconnections." https://www.nerc.com/AboutNERC/keyplayers/PublishingImages/NERC%20Interconnections.pdf
[15] The Western Electricity Coordinating Council. "The Western Interconnection." https://www.wecc.org/epubs/Stateoftheinterconnection/pages/the-western-interconnection.aspx
[16] Western Electricity Coordinating Council. "About WECC." https://www.wecc.org/Pages/AboutWECC.aspx

In 2023, renewable energy sources generated approximately 71% of the electricity in Idaho, the fourth highest share for any state after Vermont, South Dakota, and Washington.[17] Hydroelectric power plants have typically supplied more than two-thirds of Idaho's in-state generation. However, in recent years, drought has reduced the hydroelectric share of the state's total annual generation to approximately 49%.[18] Natural gas produces over one-quarter of Idaho's electricity. Idaho Power and Avista own and operate five natural gas-fired power plants each.[19,20]

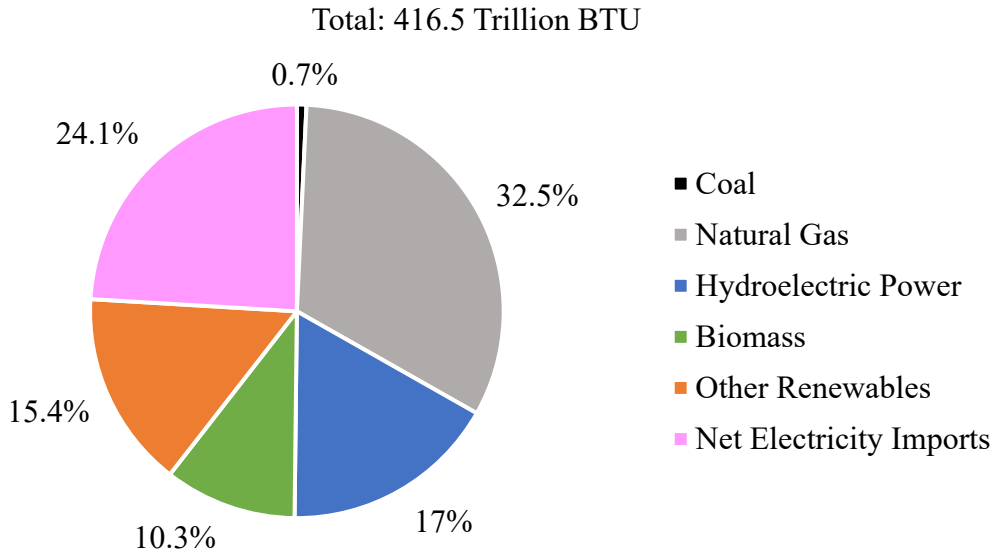
Figure 9: Idaho Electricity Generation by Resource, June 2023[21]



Idaho consumes more electricity than it generates. A portion of electricity consumed in Idaho comes from renewable in-state resources like hydroelectric, wind, solar, biomass, and geothermal. The remaining portion comes from neighboring states like Wyoming, Montana, and Utah, and is generated from hydroelectric, wind, natural gas, coal, and other sources. Figure 9 highlights Idaho's electricity generation by resource while Figure 10 highlights Idaho's electricity consumption by resource.

[17] U.S. Energy Information Administration. "Idaho Profile Overview." https://www.eia.gov/state/?sid=ID#tabs-4
[18] U.S. Energy Information Administration. "Idaho Net Electricity Generation by Source, June 2023." https://www.eia.gov/state/?sid=ID#tabs-4
[19] *2023 Integrated Resource Plan.* Idaho Power. https://docs.idahopower.com/pdfs/AboutUs/PlanningForFuture/irp/2023/2023-irp-final.pdf
[20] *2023 Electric Integrated Resource Plan*. Avista Utilities. https://www.myavista.com/about-us/integrated-resource-planning
[21] U.S. Energy Information Administration. "Idaho Net Electricity Generation by Source, June 2023." https://www.eia.gov/state/?sid=ID#tabs-4

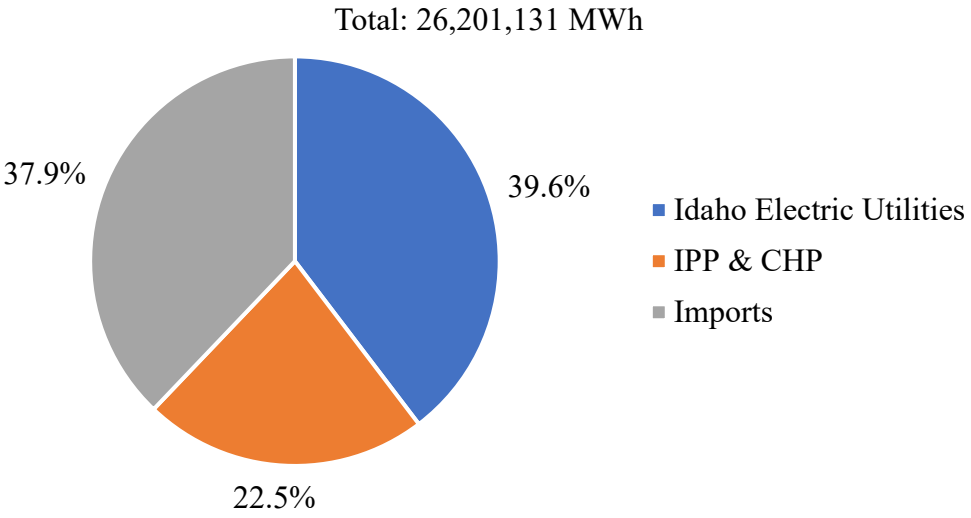
Figure 10: Idaho's Electricity Consumption by Resource, 2021[22]



Idaho depends on imported electricity to meet demand. Idaho's utilities generate approximately 40% of the electricity utilized in-state, see Figure 11. 22% is provided by combined heat and power (CHP) or independent power producers (IPP). The remaining 38% is comprised of market purchases and energy imports from out-of-state generating resources owned by Idaho utilities. Idaho's retail sales of electricity totaled 26,201,131 megawatt hours (MWh).

Imports grew over 15% from 2019 to 2022. This is likely attributed to Idaho utilities' involvement in the Western Energy Imbalance Market (WEIM), described further under Section 2.2, which allows participants to buy and sell power close to the time electricity is consumed, managing transmission congestion and providing supply at lower costs.[23]

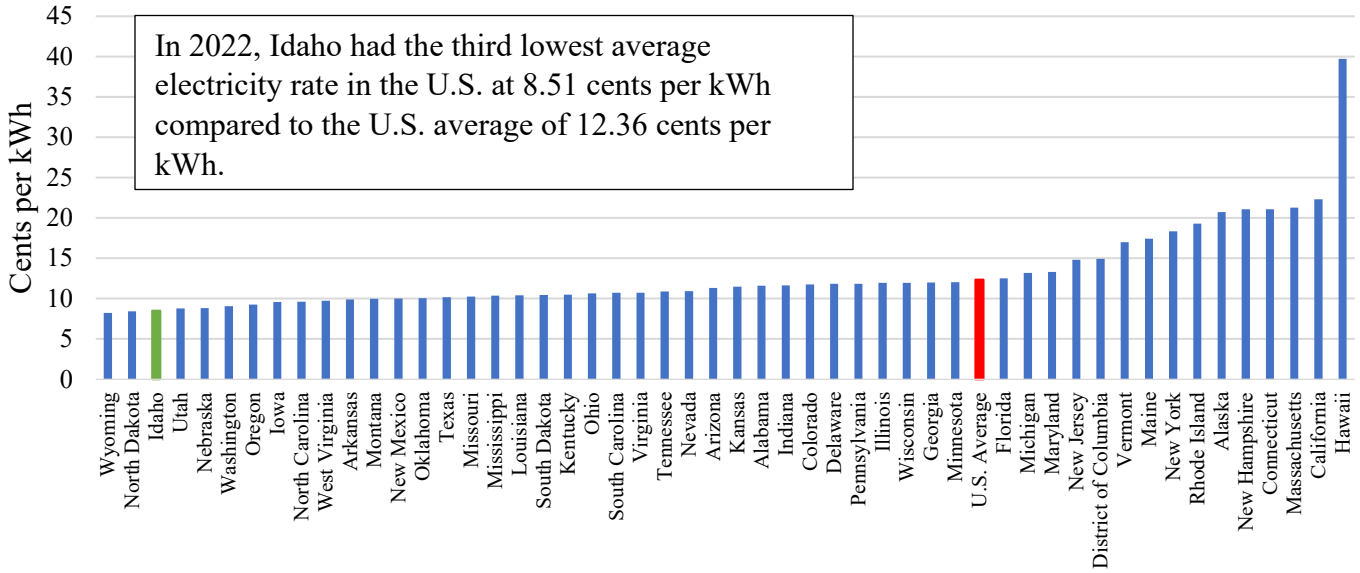
Figure 11: Idaho's Electricity Sources, 2022[24]



[22] U.S. Energy Information Administration. "Primary Energy Consumption Estimates." https://www.eia.gov/state/seds/sep_use/total/pdf_cb/use_tot_IDcb.pdf
[23] Western Energy Imbalance Market. "How it Works." https://www.westerneim.com/Pages/About/HowItWorks.aspx
[24] U.S. Energy Information Administration. "Idaho Electricity Profile 2021." www.eia.gov/electricity/state/idaho/index.cfm

Idaho's baseload resources, including hydroelectricity and geothermal, provide a constant source of reliable low-cost electricity to Idaho utilities. As a result, Idaho's average electricity rates were the third lowest among the fifty states in 2021, shown in Figure 12. Low energy rates have consistently attracted energy-intensive industries to Idaho, including mining, pulp and paper, agriculture, food processing, and computer chip manufacturing. Electric rates in Idaho fall below the United States average in all sectors (residential, commercial, industrial) by over 25%.[25]

Figure 12: Idaho's Average Electricity Rates Compared to Other States, 2021[26]



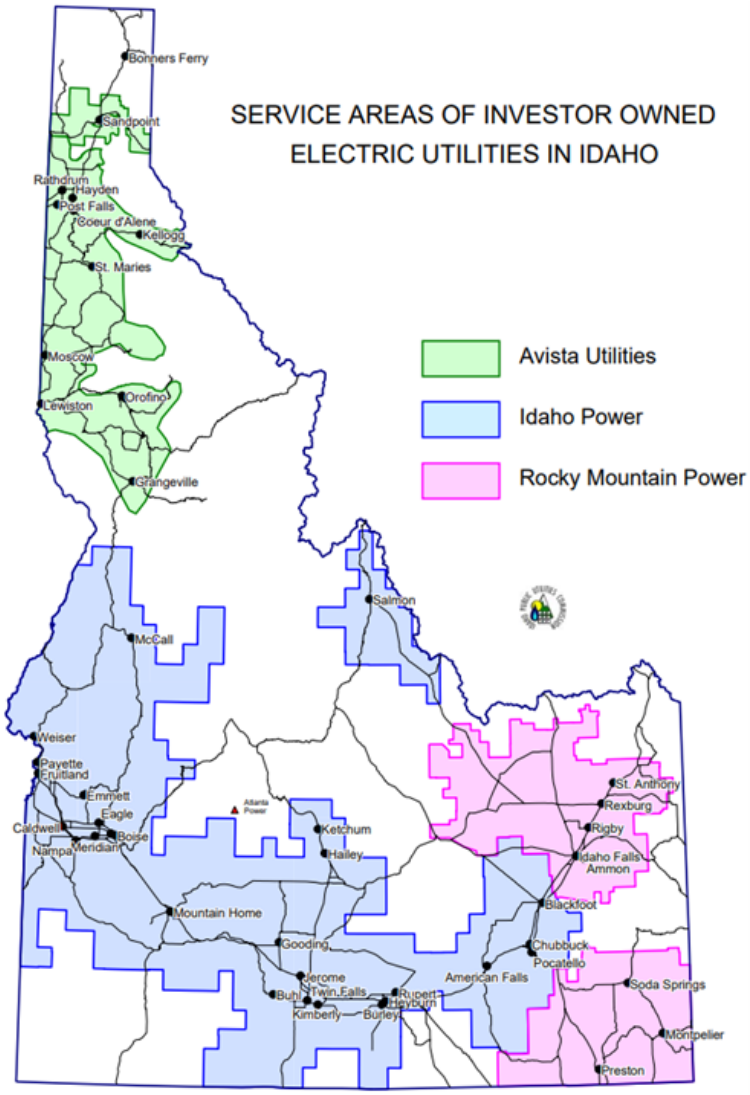
1.4 Investor-owned Utilities

Idaho's grid is operated by three investor-owned utilities (IOUs), as well as 29 municipal and rural electric cooperative utilities, which are listed in Appendix A. The three IOUs serve approximately 84% of the state's electricity needs, while the municipal and rural electric cooperative utilities serve the remaining 16%.[27]

Idaho's IOUs work with local stakeholders to develop Integrated Resource Plans (IRPs) that must be filed with the Idaho Public Utilities Commission (PUC) every two years. IRPs forecast energy demands over 20 years and evaluate a variety of different resources to meet demand, including the addition of generation resources and demand-side measures such as conservation and energy efficiency programs. IRPs typically select a "preferred resource strategy" based on evaluation criteria including cost, risk, reliability, and environmental factors. In 2023, Idaho's IOUs submitted new IRPs to the PUC. Key findings from each IOU's IRP can be found under the IOU's description within the report.

[25] Idaho Dept. of Commerce. "Idaho's Expanding Energy Economy." https://commerce.idaho.gov/content/uploads/2022/02/Idahos-Expanding-Energy-Economy.pdf
[26] U.S. Energy Information Administration. "US Electricity Profile 2022." https://www.eia.gov/electricity/state/#:~:text=Archived%20State%20Electricity%20Profiles%20%20%20%20Name,%20%2045%2C851%2C003%20%2039%20more%20rows%20
[27] U.S. Energy Information Administration. "Annual Electric Power Industry Report, Form EIS-861 detailed data files." https://www.eia.gov/electricity/data/eia861/

Figure 13: Idaho's Investor-owned Electric Utilities Service Territories[28]



Avista Corporation

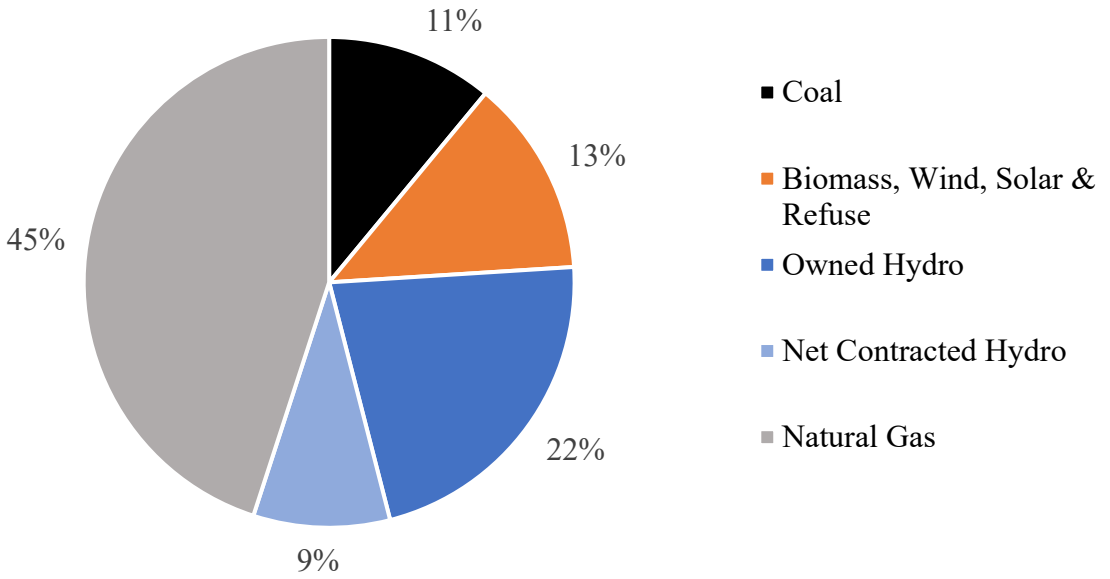
Avista is an investor-owned electric and natural gas utility headquartered in Spokane, Washington. Avista serves more than 141,000 electric and 92,000 natural gas customers in Idaho's northern and central regions.

Avista generates electricity by utilizing a mix of hydroelectric, natural gas, coal, biomass, and wind generation, see Figure 14. This electricity is delivered through 2,800 miles of electrical transmission lines, 19,300 miles of electrical distribution lines, and 8,000 miles of natural gas lines.[29] Hydroelectric generation accounts for over half of Avista's electricity mix, which provides low-cost energy to customers. Avista's company-owned and contract hydroelectric resources are in western Montana, eastern Washington, and northern Idaho (Post Falls, Clark

[28] Idaho Public Utilities Commission. "Service Areas of Investor-Owned Electric Utilities in Idaho." https://puc.idaho.gov/Fileroom/PublicFiles/maps/elec.pdf
[29] Avista. "2022 Quick Facts." Avista Quick Facts 2022_web.indd (avistacorp.com)

Fork River Hydroelectric Development and Cabinet Gorge); and its natural gas-fired baseload and capacity resources are in Idaho, Oregon, and Washington. It also has an ownership share in the Colstrip coal-fired power plant in Montana which is scheduled to stop serving Avista's customers by the end of 2025.[30]

Figure 14: Avista 2024 Resource Portfolio[31]



Avista has saved 267 average megawatts (aMW) since it began offering energy efficiency programs in 1978. Current Avista energy efficiency programs reduce demand by nearly 11.4%, or by 155 aMW.[32] Avista predicts that energy efficiency will serve 27% of future demand, reducing demand by 85 aMW through 2045. Avista's demand response and energy efficiency programs reduce the need to purchase high-cost wholesale electricity from out-of-state networks, allowing Avista to meet both winter and summer peak loads.[33]

Avista expects an average annual growth rate of 0.86% between 2024 and 2045, with winter peaks loads estimated to grow at 1.16% and summer peak loads at 1.24%. [34] In April 2019, Avista announced its goal to have a carbon neutral portfolio by the end of 2027 and to serve its customers with 100% clean electricity by 2045. Avista's resource strategy focus for the next 10 years plans to invest in energy efficiency, distributed generation, energy storage technologies, renewable fuels, green hydrogen, and ammonia.

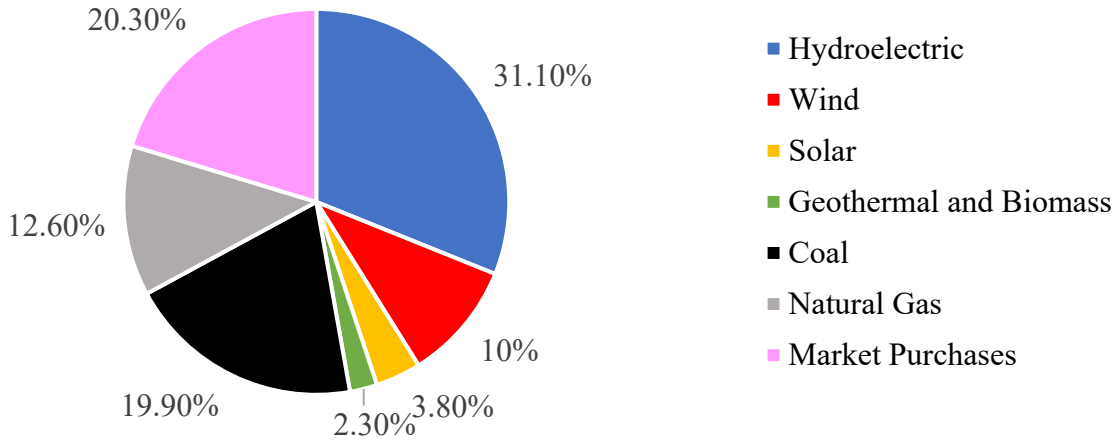
[30] Avista. "2023 Electric Integrated Resource Plan." https://www.myavista.com/about-us/integrated-resource-planning
[31] Avista. "About Our Energy Mix." https://www.myavista.com/about-us/about-our-energy-mix
[32] Avista. "2023 Electric IRP." https://www.myavista.com/about-us/integrated-resource-planning
[33] Avista. "2023 Electric Integrated Resource Plan." https://www.myavista.com/about-us/integrated-resource-planning
[34] Avista. "Avista Announces Natural Gas Emission Reduction Goal." https://www.myavista.com/about-us/our-commitment

Idaho Power Company

Founded in 1916, Idaho Power Company is the largest electricity provider in the state. Headquartered in Boise, Idaho Power services about 639,000 customers in a 24,000 square mile service territory in southern Idaho and eastern Oregon.[35]

Idaho Power has a significant hydroelectric generation power base, including the 1,167 MW Hells Canyon Complex which provides approximately 70% of Idaho Power's hydroelectric generating capacity and 30% of the company's total generating capacity. With 17 low-cost hydroelectric projects at the core of its diverse energy mix, Idaho Power's residential, business, and agricultural customers pay among the nation's lowest prices for electricity.[36] This electricity is supplied through 4,800 miles of transmission lines and more than 27,000 miles of distribution lines.[37] In 2026, Idaho Power will complete construction of the 300-mile Boardman to Hemingway 500 kV transmission line, which will begin construction in 2024. Idaho Power also generates electricity using natural gas at a combined-cycle combustion plant at Langley Gulch, near New Plymouth, and two simple-cycle plants near Mountain Home. Idaho Power has partial ownership in baseload coal facilities located in Wyoming and Nevada, the Jim Bridger and North Valmy plants. Idaho Power exited the Boardman coal facility located in Oregon in 2020 and half of its share of the Valmy coal facility in 2019. In 2024, two of the four units at Jim Bridger will be converted from coal to natural gas, with the other two units planned to be converted in 2030. In 2026, North Valmy's two units are also planned to be converted from coal to natural gas, and Idaho Power will reenter operation of its full share of the facility. Idaho Power's resource portfolio mix for 2022 is shown in Figure 15. Idaho Power-owned generating capacity was the source for about 64% of the energy delivered to customers. Purchased power comprises 36% of the total energy delivered to customers.[38]

Figure 15: Idaho Power 2022 Resource Portfolio[39]



[35] Idaho Power. "Company Facts." Company Facts - Idaho Power
[36] Idaho Power Company. "What Powers Us All? Affordable Energy." https://www.idahopower.com/about-us/company-information/what-powers-us-all/
[37] Idaho Power Company. "Transmission and Power Lines." https://www.idahopower.com/energy-environment/energy/delivering-power/transmission-and-power-lines/
[38] Idaho Power Company. "2021 Integrated Resource Plan." https://docs.idahopower.com/pdfs/AboutUs/PlanningforFuture/irp/2021/2021%20IRP_WEB.pdf
[39] Idaho Power Company. "Our Energy Sources". https://www.idahopower.com/energy-environment/energy/energy-sources/

Since 2002, Idaho Power has achieved a cumulative average annual load reduction of 324 aMW through energy efficiency investments. In 2022, Idaho Power's energy efficiency programs had energy savings of 169,889 MWh, which is enough energy to power more than 14,900 average homes for one year.[40] Idaho Power predicts energy efficiency savings to be approximately 111,220 MWh in 2024 and reach 2,043,000 MWh cumulative achievable savings by 2042.[41] Additionally, Idaho Power operated three demand response programs in 2022. The total demand response capacity was approximately 312 MW with an actual load reduction of 200 MW.[42]

Idaho Power company experienced a record-breaking peak-hour load of 3,751 MW in June 2021 due to rising growth and an extended heat wave.

In 2019, Idaho Power announced its goal to provide 100% clean energy to its customers by 2045. The average annual number of Idaho Power customers is expected to increase from nearly 639,000 in 2024 to 855,000 in 2043, adding approximately 11,400 customers each year throughout the 20-year planning period.

PacifiCorp/Rocky Mountain Power

PacifiCorp operates under the name Rocky Mountain Power in Idaho, Utah, and Wyoming, and serves 82,000 customers in 14 Idaho counties. PacifiCorp serves more than 2 million retail customers across 141,390 square miles of service territory in California, Idaho, Oregon, Utah, Washington, and Wyoming.[43]

PacifiCorp owns 11,668 MW of generation capacity from a diverse mix of hydroelectric, wind, natural gas, coal, solar and geothermal sources, see Figure 16.[44] PacifiCorp's customers receive electricity through approximately 17,000 miles of transmission lines, 64,000 miles of distribution lines, and 900 substations.[45] The Populus Substation known as Energy Gateway West Sub-Segment D.3 is scheduled to come online in 2028 in Southwest Idaho. This transmission line will run 200 miles at 500 KV of high voltage, which should help meet the expected increase in demand in Idaho.

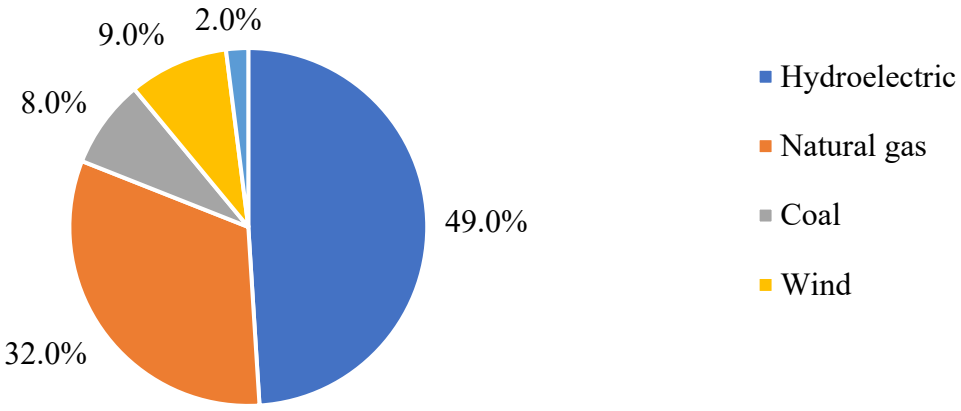
The forecasted system load in the region has increased 14.9%, with the average annual growth rate set at approximately 2% for load and peak. The changes to load forecast are due to higher project demand from new large customers driving up the commercial forecast and increased residential forecast. Peak demand is expected to grow in the Western Interconnection by 11% in the next ten years. Residential customers in Idaho are expected to grow 1.82% per year and commercial customers in Idaho are expected to grow 1.18% per year.

[40] Idaho Power Company. "Demand-Side Management 2022 Annual Report." https://docs.idahopower.com/pdfs/EnergyEfficiency/Reports/2022DSM.pdf
[41] Idaho Power. "Our Plan." https://docs.idahopower.com/pdfs/aboutus/planningforfuture/irp/2023/2023-irp-final.pdf
[42] Idaho Power. " Demand-Side Management 2022 Annual Report." https://docs.idahopower.com/pdfs/energyefficiency/reports/dsm_2022.pdf
[43] PacifiCorp. "About." https://www.pacificorp.com/about.html
[44] PacifiCorp. "Energy." https://www.pacificorp.com/energy.html
[45] PacifiCorp. "Transmission." https://www.pacificorp.com/transmission.html

In 2017, the company announced the Energy Vision 2020 initiative, which aims to add 1,150 MW of new wind resources, upgrade the existing wind fleet and construct/rebuild transmission segments.[46]

PacifiCorp's 2023 Integrated Resource Plan identifies the company's investments in clean energy, expanding modernized transmission, advanced nuclear, and energy storage to meet forecasted demand.[47] Rocky Mountain Power is the largest regulated utility owner of wind power in the West and the company plans to expand their wind, solar and storage resources on their path to a net-zero emissions future.[48]

Figure 16: Rocky Mountain Power 2021 Resource Portfolio[49]



1.5 Municipal and Cooperative Utilities

A municipal utility is owned and operated by a municipality or a group of municipalities. A cooperative electric utility is a private, not-for-profit electric utility legally established to be owned and operated for the benefit of those using its service. It will generate, transmit, and/or distribute supplies of electric energy to cooperative members.

The Idaho Consumer-Owned Utilities Association (ICUA) has 21 members and serves over 140,000 Idahoans, or about 16% of total Idaho electricity customers; however, not all Idaho municipal and cooperative utilities are members of ICUA. [50] The 29 municipal and cooperative utilities are not subject to regulation by the PUC.[51] Instead, Idaho's municipal and cooperative electric utilities provide competitively-priced energy services to their members and residents and are generally governed by an independently elected Board of Directors or city councils.

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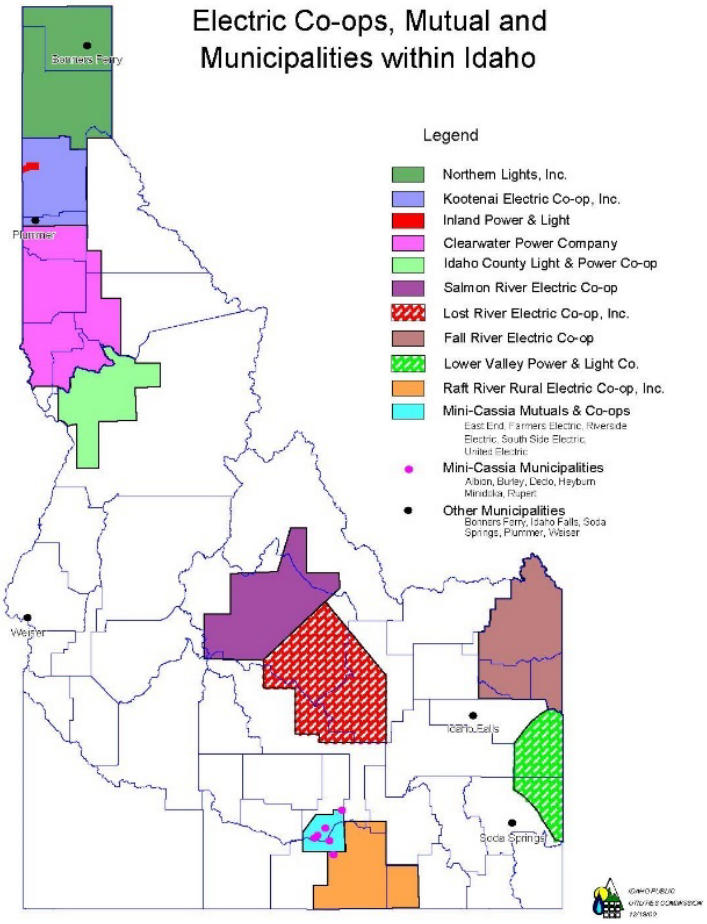
[46] PacifiCorp. "Renewable Energy." https://www.pacificorp.com/environment/renewable-energy.html
[47] PacifiCorp. "2023 Integrated Resource Plan, Volume I." https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2023-irp/2023_IRP_Volume_I.pdf
[48] Rocky Mountain Power. "Building the Foundation for a Net-Zero Future." https://www.rockymountainpower.net/about/innovation-environment.html
[49] PacifiCorp. "Rocky Mountain Power – Power Content Label." https://www.rockymountainpower.net/savings-energy-choices/blue-sky-renewable-energy/product-content-label.html
[50] Idaho Consumer-Owned Utilities Association. "Members." https://www.icua.coop/members/. *Note:* Wells Rural Electric Co. is an ICUA member, but does not service customers in Idaho.
[51] Idaho Public Utilities Commission. "About the Commission." https://puc.idaho.gov/Home/About

Over 96% of ICUA power is purchased from the Bonneville Power Administration (BPA); however, some municipalities and cooperatives are beginning to acquire their own generation resources and are entering into Power Purchase Agreements (PPAs) with other energy providers.[52] For example, Idaho Falls Power owns and operates five hydroelectric projects, owns a portion of the Horse Butte Wind project, and operates a small amount of solar.[53]

Figure 17: Idaho's Municipal and Cooperative Utilities Service Territories[54]



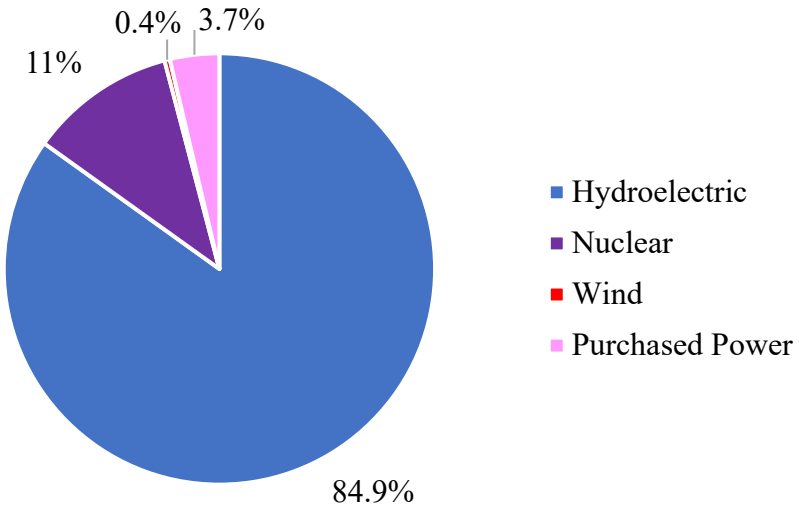
Three of Idaho's municipal and cooperative utilities and the Idaho Energy Resources Authority are members of the Utah Associated Municipal Power Systems (UAMPS). UAMPS is a nonprofit headquartered in Salt Lake City, Utah, that supports its 48 members across seven Intermountain states with financial-, acquisition-, construction-, and operation-related energy services. UAMPS conducts resource planning, evaluation of power resources or services for its members, and develops power-generating facility projects.[55] UAMPS members can choose to participate in any of UAMPS's 15 ongoing projects to support resource needs.[56]

[52] Idaho Consumer-Owned Utilities Association. "Members." https://www.icua.coop/members/
[53] Idaho Falls Power. "Power Portfolio." https://www.ifpower.org/about-us/generation-power-statistics
[54] Idaho Public Utilities Commission. "Electric Co-ops, Mutual, and Municipalities within Idaho." https://puc.idaho.gov/Fileroom/PublicFiles/maps/elecoop.pdf
[55] UAMPS. "About Us." http://www.uamps.com/About-Us
[56] UAMPS. "About Us." http://www.uamps.com/About-Us

1.6 Bonneville Power Administration

BPA is one of four Power Marketing Administrations (PMAs) under the U.S. Department of Energy (DOE) that supply power throughout their regions.[57] BPA is a separate and distinct entity in the DOE under the DOE Organization Act of 1977.[58] BPA is self-funded and has its own federal borrowing and procurement authorities which it utilizes to serve the Northwest. BPA supplies about 28% of regional power, primarily from hydroelectric generation. BPA's territory includes Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah, and Wyoming. BPA serves publicly-owned cooperatives, municipalities, public utility districts that serve federal installations, regional investor-owned utilities, and direct-service industrial customers.[59]

Figure 18: BPA Resource Portfolio, 2022 [60]



BPA sources power from 31 federal hydroelectric dams that are operated by the U.S. Army Corps of Engineers (USACE) and the Bureau of Reclamation (BOR). These dams are referred to as the Federal Columbia River Power System. It also markets power generated from some non-federal plants in the Northwest, as well as additional power from the 1,169 MW Columbia Generating Station nuclear power plant in Richland, Washington.[61] BPA's energy resources are shown in Figure 17. BPA operates and maintains approximately 15,000 miles of high-voltage transmission lines and 262 substations servicing 323 transmission customers that serve about 14.4 million people in its service territory.[62]

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[57] U.S. Energy Information Administration. "Federal Power Marketing Administrations operate across much of the United States." https://www.eia.gov/todayinenergy/detail.php?id=11651
[58] Department of Energy. "DOE Organization Act in U.S.C." https://www.energy.gov/sites/prod/files/2017/10/f38/DOE%20Organization%20Act%20in%20U.S.C..pdf
[59] Bonneville Power Administration. "Annual Report 2022." https://www.bpa.gov/-/media/Aep/finance/annual-reports/ar2022.pdf
[60] Bonneville Power Administration. "BPA Fuel Mix 2022." https://www.bpa.gov/-/media/Aep/power/fuel-mix/2022-bpa-fuel-mix.pdf
[61] U.S. Nuclear Regulatory Commission. "Columbia Generating Station." https://www.nrc.gov/info-finder/reactors/wash2.html
[62] Bonneville Power Administration. "Fact Sheets." https://www.bpa.gov/-/media/Aep/about/publications/general-documents/bpa-facts.pdf

Annually, BPA publishes a Pacific Northwest Loads and Resources Study (White Book) which documents regional retail loads and resource capabilities that serve the federal system and Pacific Northwest for 10 years. The most recent White Book details resource capabilities from 2021 through 2030. The study uses public resource planning reports submitted by individual utilities, the Northwest Power and Conservation Council (Council), and the Pacific Northwest Utilities Conference Committee. Under average water conditions, the Federal Columbia River Power System is projected to have annual energy surpluses through the study period.[63] Under the Northwest Power Act, BPA is responsible for providing the net load requirements of its requesting customers. This includes IOUs in the Pacific Northwest.

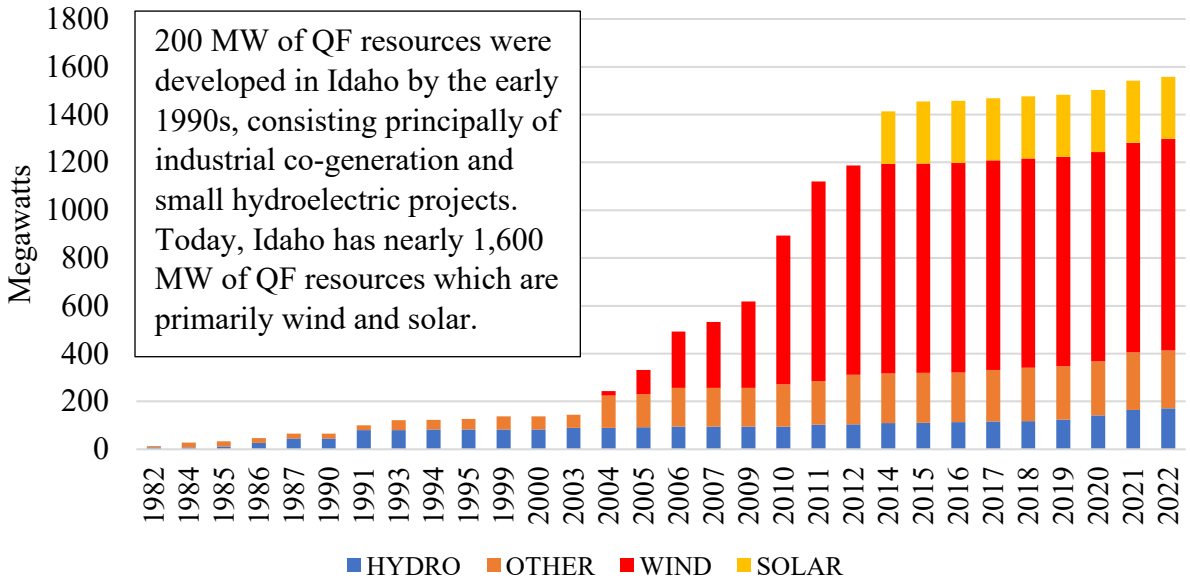
Under BPA's current 20-year power sales contract, Idaho municipal and cooperative utilities (customers) purchase power under a tiered rate methodology. Tier 1 locks in the federal base system's lowest cost generation portfolio. When the customer exceeds their Tier 1 allocation, they can purchase a Tier 2 resource from BPA, acquire resources independently, or jointly with other utilities to meet future demands. BPA's current 20-year contracts run through 2028. BPA is conducting its "Provider of Choice" process to review its power sales products for consideration by customers for contract renewals for service after 2028.

BPA works with customers to fund and implement energy-efficiency programs. Since the early 1980s, BPA and its customers have acquired more than 2,505 aMW in electricity savings through energy efficiency.[64] In 2022, BPA updated its Energy Efficiency Action Plan targets to reflect new input from the Council's 2021 Power Plan and its own Resource Program analysis. BPA sets an energy efficiency incentive budget every two-year rate period.

Idaho cooperative and municipal utilities, through their power rates with BPA, invested over $5 million in energy efficiency measures through direct payments to customers in 2020 and 2021. Cooperative and municipal utilities in Idaho have been utilizing energy efficiency programs to help meet additional resource needs for over 30 years.

[63] Bonneville Power Administration. "2019 Pacific Northwest Loads and Resources Study." https://www.bpa.gov/p/Generation/White-Book/wb/2019-WBK-Summary.pdf
[64] Bonneville Power Administration. "Fiscal Year 2020 Red Book." https://www.bpa.gov/EE/Utility/researcharchive/Documents/The_Red_Book_FY2020.pdf

Figure 19: PURPA Generation in Idaho, 1982-2022[65]



The Public Utility Regulatory Policies Act of 1978 (PURPA) requires utilities to purchase energy from qualifying facilities (QFs) —such as wind, solar, geothermal, and biomass—at the cost that the utility would otherwise incur if it self-generated the electricity or obtained it from elsewhere, known as the avoided cost rate.[66] While PURPA requires utilities to buy from QFs, the PUC determines the avoided-cost rate and other contract terms and conditions for utilities within the state.

PURPA categorizes QFs as either small power production facilities, or cogeneration facilities (for example, electricity and steam for industrial uses). To qualify for the required purchase at the avoided cost rate, a small power production facility must generate 80 MW or less, with a primary energy source that is renewable, biomass, waste, or geothermal. In 2020, the PUC established a separate QF category for energy storage. Energy storage QFs over 100 kW are limited to two-year-long PPAs using published, rather than negotiated, rates.

In response to wind developers disaggregating large projects into 10 MW units to qualify for the published PURPA rates, the PUC reduced the eligibility to published rate contracts from 10 MW to 100 kW for intermittent resources (wind and solar) in 2010.[67] Additionally, the Idaho PUC reduced contract length in 2015 for non-published rate (a.k.a. negotiated) PURPA contracts from 20 years to two years.[68]

[65] Data obtained from the PUC on October 30, 2023.
[66] Federal Energy Regulatory Commission. "PURPA Qualifying Facilities." https://www.ferc.gov/qf
[67] Idaho Public Utilities Commission. "CASE NO. GNR-E-10-04, PRESS RELEASE." https://puc.idaho.gov/fileroom/cases/elec/GNR/GNRE1004/staff/20110329PRESS%20RELEASE.PDF
[68] Idaho Public Utilities Commission. "CASE NO. IPC-E-15-01, AVU-E-15-01, PAC-E-15-03, ORDER NO. 33357." http://www.puc.idaho.gov/fileroom/cases/elec/IPC/IPCE1501/ordnotc/20150820FINAL_ORDER_NO_33357.PDF

1.7 Natural Gas

Natural gas is a type of fossil fuel comprised of mostly methane and small amounts of other hydrocarbon liquids, carbon dioxide, and water vapor. Natural gas occurs naturally underground between and within certain rock formations. To extract it from the earth, developers drill a gas well down into the gas-bearing rock, install collectors, and collect it on the surface. Collected natural gas is then shipped to processing plants where contaminants are removed. After refining, natural gas pipelines carry the gas to end-use customers.[69]

In Idaho, the Southwest Idaho Play in Payette County produced 33,248 barrels of condensate, 1.88 billion cubic feet of natural gas, and created over $300,000 in tax revenue for Idaho in FY 2022.[70]

Between 2016 and 2022, natural gas consumption per capita in Idaho ranked among the lowest one-third of states, despite about half of Idaho households using natural gas as their primary heating energy source.[71] Avista Utilities and Intermountain Gas Company (IGC) provide most of the natural gas service in Idaho. A third utility, Dominion Energy, provides service to Idaho customers in a portion of Franklin County in the southeastern part of the state.[72] Figure 21 shows natural gas consumption by sector in million cubic feet as of September 2023.

Figure 20: Southwest Idaho Play Wellhead in Payette County

[69] U.S. Energy Information Administration. "Natural Gas Explained." https://www.eia.gov/energyexplained/natural-gas/
[70] *2022 Annual Report.* Idaho Department of Lands. https://www.idl.idaho.gov/wp-content/uploads/sites/2/2023/01/IDL-AnnualReport-Digital-Spreads-01092023.pdf
[71] U.S. Energy Information Administration. "Natural Gas Consumption by End Use." https://www.eia.gov/dnav/ng/ng_cons_sum_a_EPG0_VC0_mmcf_a.htm
[72] Dominion Energy. "About Us – Western Gas Operations." https://www.dominionenergy.com/about-us/moving-energy/western-gas-operations

Figure 21: Sources of Natural Gas Consumption, 2021[73]

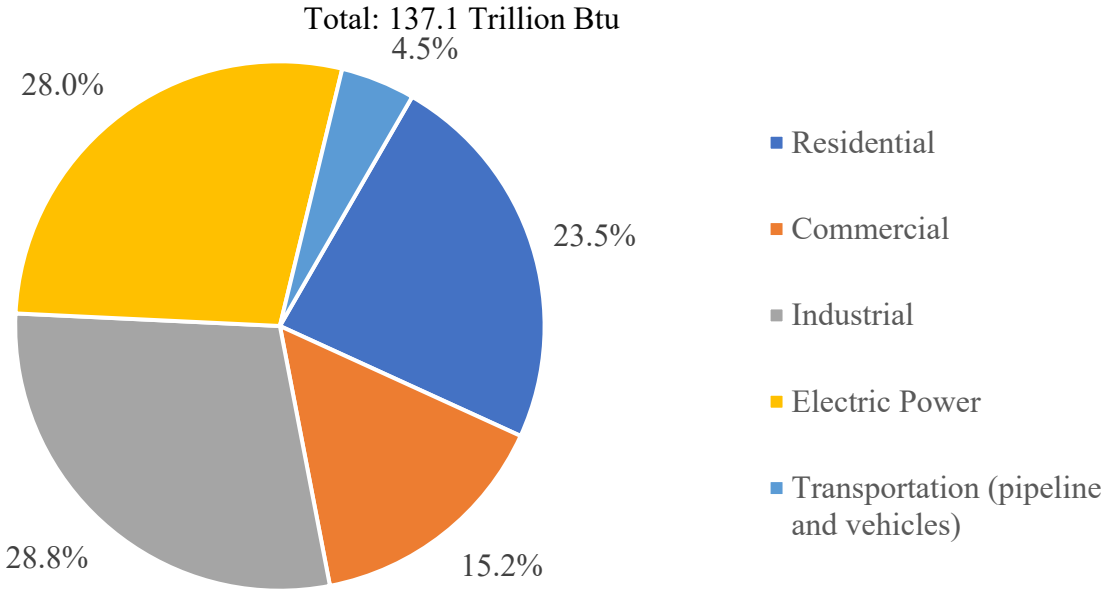
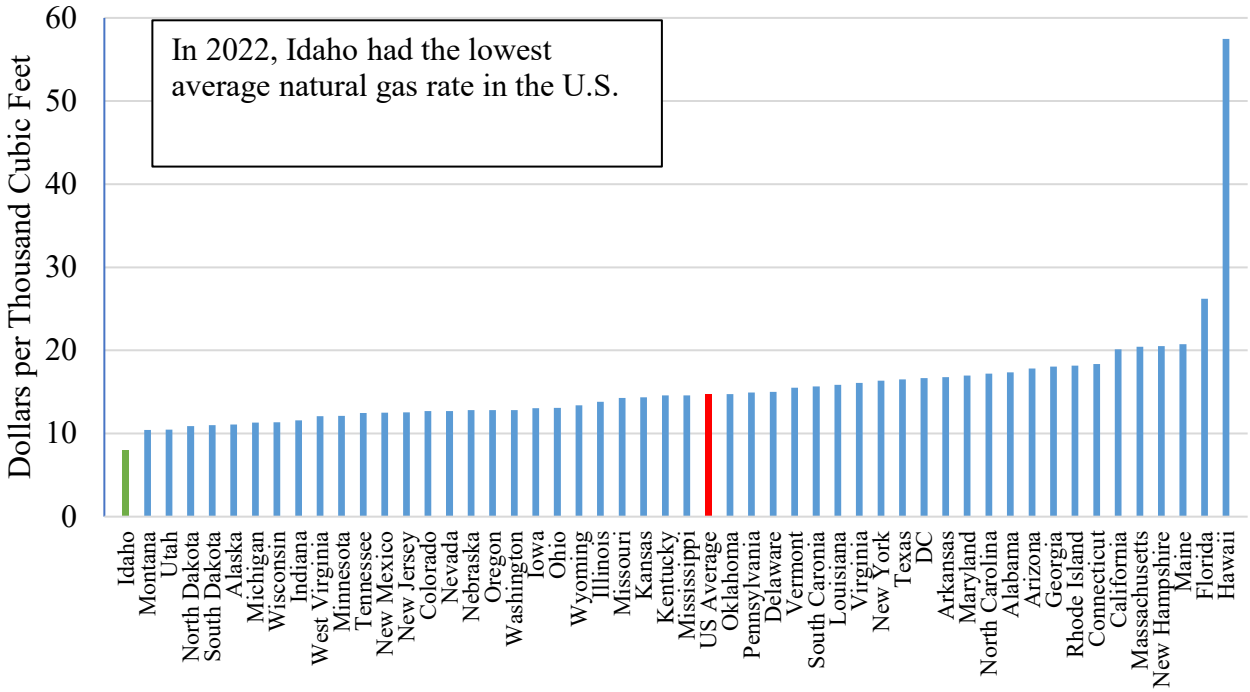


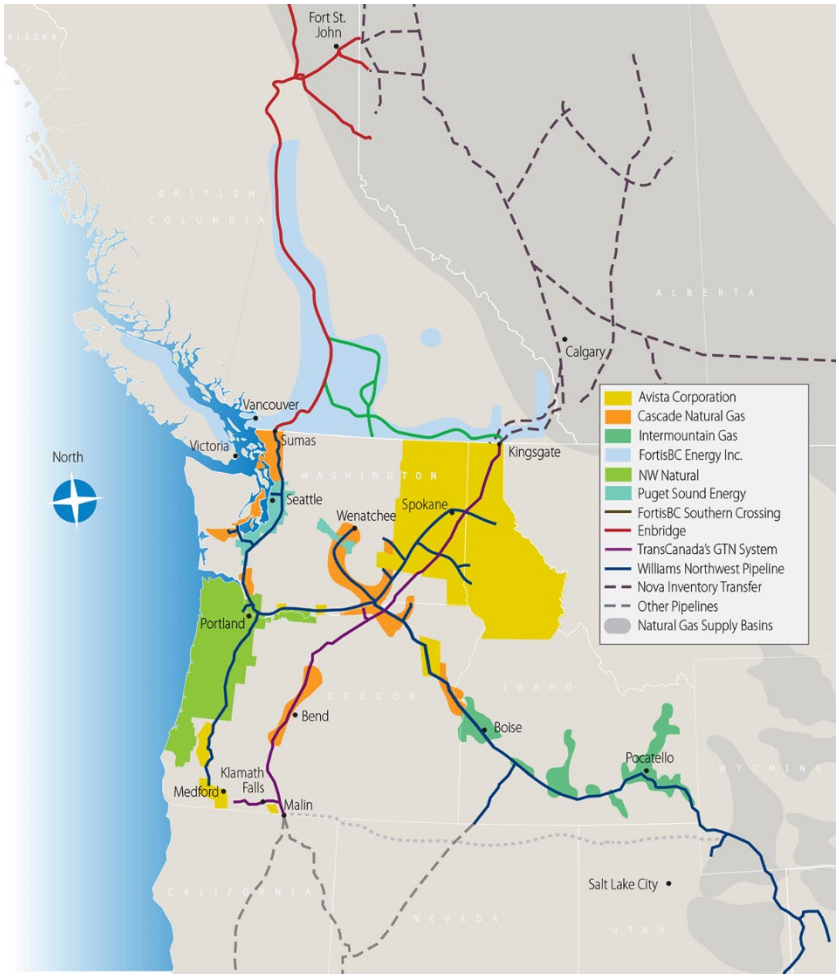
Figure 22: Residential Natural Gas Prices Compared to Other States, 2022[74]



[73] U.S. Energy Information Administration. "Table F18: Natural Gas Consumption Estimates, 2021." https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_use_ng.html&sid=US&sid=ID

[74] U.S. Energy Information Administration. "Natural Gas Prices." https://www.eia.gov/energyexplained/natural-gas/prices.php

Figure 23: Western Interstate Natural Gas Pipeline System and Service Territories[75]



Avista Utilities

Avista serves over 93,000 natural gas Idahoans in the northern and central regions. Avista's North Division supplies gas to eastern Washington and northern Idaho by more than 40 points along its 75-mile interstate pipeline.[76]

Avista's natural gas distribution system consists of approximately 3,300 miles of distribution pipelines in Idaho. Avista holds firm access rights to both Canadian and Rocky Mountain natural gas supplies through the Williams Northwest and TransCanada Gas Transmission Northwest pipelines. Avista also holds rights to the Jackson Prairie storage facility in Washington.

[75] Northwest Gas Association. "Natural Gas Facts." https://www.nwga.org/_files/ugd/054dfe_5391c325d32346fbaedfb48af81d37a7.pdf

[76] Avista. "2023 Natural Gas Integrated Resource Plan." https://www.myavista.com/about-us/integrated-resource-planning

According to Avista's 2023 Natural Gas IRP, forecasting natural gas customer demand is becoming more difficult due to policy updates in Oregon and Washington.[77] Nevertheless, Avista estimates natural gas customers will increase by 1.1% annually.[78]

Intermountain Gas Company

IGC was founded in Idaho in 1950 and is a subsidiary of MDU Resources Group. IGC distributes natural gas to over 412,500 residential, commercial, and industrial customers in 74 Idaho communities.[79] IGC's 140 industrial and transport customers comprise 49% of its annual energy demand, while residential and commercial customers comprise 34% and 17%, respectively.

IGC uses approximately 13,300 miles of pipelines across 50,000 square miles in southern Idaho.[80] IGC holds firm capacity rights on William's Northwest Pipeline as well as three upstream pipelines to deliver gas to the distribution system. The upstream systems are Gas Transmission Northwest, Foothills Pipeline, and Nova Gas Transmission. IGC owns and operates the Nampa liquified natural gas (LNG) storage facility and leases storage at the Jackson Prairie underground facility, the Plymouth LNG facility, and from Dominion Energy's Clay Basin underground storage field.

Since 2017, the IGC Energy Efficiency Program has operated with the goal of acquiring cost effective demand-side management (DSM) resources in the form of natural gas therm savings. Residential customers can earn rebates for the purchase and installation of high-efficiency natural gas equipment and construction of energy efficient homes. Similarly, commercial customers can earn rebates for the purchase and installation of high-efficiency natural gas space heating and kitchen equipment. In 2022, 7,945 rebates were issued to IGC customers, a 43% increase from the previous year. The program also provides customers with interactive ways to learn about energy efficiency for their home or business through online educational materials and customer engagement activities. In 2023, IGC commissioned a Conservation Potential Assessment to identify residential and commercial energy efficiency savings potential.

Residential, commercial, and industrial peak day load growth on IGC's system is forecast to grow at an average annual rate of between 1.14% to 3.10% over 2021-2026.

Dominion Energy

Dominion Energy, formerly called Questar Gas, based in Salt Lake City, provides natural gas service to residential, commercial, and industrial customers in Utah, southwestern Wyoming and about 2,200 customers in Franklin County, Idaho.[81] The PUC has elected to allow the Utah Public Service Commission to regulate Dominion Energy's activities in its small Idaho service area.[82]

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[77] Avista. "2023 Natural Gas Integrated Resource Plan." https://www.myavista.com/about-us/integrated-resource-planning
[78] Avista. "2023 Natural Gas Integrated Resource Plan." https://www.myavista.com/about-us/integrated-resource-planning
[79] Intermountain Gas. "About Us." https://www.intgas.com/in-the-community/about-us/
[80] Intermountain Gas. "About Us." https://www.intgas.com/in-the-community/about-us/
[81] Dominion Energy. "Western Gas Operations."
https://www.dominionenergy.com/company/moving-energy/western-gas-operations
[82] Idaho Public Utilities Commission. "Merger Agreement." https://puc.idaho.gov/Case/Details/3245

2. Energy Stakeholders

2.1 State Entities

Idaho Governor's Office of Energy and Mineral Resources

The Idaho Governor's Office of Energy and Mineral Resources (OEMR) coordinates energy and mineral planning and policy development in the state of Idaho. OEMR works to ensure that Idaho's energy and mineral resources are developed and utilized in an efficient, effective, and responsible manner that enhances the economy and sustains the quality of life for its residents. The office serves as the clearinghouse and first point of contact for the state on energy and mineral matters. It oversees the Idaho Strategic Energy Alliance, serves as a resource for policymakers, and coordinates efforts with federal and state agencies and local governments.[83]

As of December 2023, OEMR administers the following energy-related programs. A detailed list of OEMR's programs can be found in Appendix B.

- Idaho Energy Resiliency Grant Program
- Energy Efficiency Conservation Block Grant Program
- Government Leading by Example
- State Energy Loan Program
- National Electric Vehicle Infrastructure Program
- Idaho Awards for Leadership in Energy Efficiency
- Idaho K-12 Energy Efficiency Program [program will launch in 2024]

The office prepares the Idaho Energy Landscape, Idaho State Energy Plan, Idaho State Energy Security Plan, and Idaho Emergency Fuel Shortage Plan.[84]

Idaho Public Utilities Commission

The PUC regulates Idaho's investor-owned electric, natural gas, telecommunications, and water utilities to ensure adequate service at just, reasonable, and sufficient rates. The PUC has authority to promulgate administrative rules under the Idaho Administrative Procedures Act.[85] Statutory authorities for the commission are established in Idaho Code Titles 61 and 62. The PUC consists of three commissioners, appointed by the Governor and subject to Senate confirmation, who serve staggered six-year terms. No more than two commissioners may be of the same political party. The PUC

[83] Governor Brad Little. "Executive Order 2020-17." https://oemr.idaho.gov/wp-content/uploads/eo-2020-17.pdf
[84] Idaho Governor's Office of Energy and Mineral Resources. "Reports and Publications". https://oemr.idaho.gov/financial-information/reports-and-publications/
[85] Idaho Legislature. "Title 67 State Government and State Affairs. Chapter 52 Idaho Administrative Procedure Act." https://legislature.idaho.gov/statutesrules/idstat/Title67/T67CH52/
Idaho Statues § 61 and § 62. https://legislature.idaho.gov/statutesrules/idstat/Title61/ Idaho Statutes § 61and § 62." https://legislature.idaho.gov/statuterules/idstat/

renders decisions about utilities based upon evidence presented in the case record. PUC orders may be appealed directly to the Idaho Supreme Court.[86]

The PUC holds formal hearings that resemble judicial proceedings and are recorded and transcribed by a court reporter. Technical hearings consist of formal parties that have been granted "intervenor status" and present testimony and evidence. During public hearings, members of the public are able to testify before the commission. All cases are a matter of public record.

To ensure its decisions are based upon the best information available, the PUC employs engineers, accountants, economists, and investigators to analyze issues and provide recommendations. In the PUC's formal proceedings, the staff is a separate party to the case and may present its own testimony, evidence, and expert witnesses. Staff recommendations are considered by the PUC along with those of other parties to each case, which may include utilities, the public, and agricultural, industrial, business, or consumer groups.

Idaho Strategic Energy Alliance

The Idaho Strategic Energy Alliance (ISEA) engages stakeholders through its Board of Directors and Task Forces to develop recommendations for effective and long-lasting responses to existing and future energy challenges.[87] The information and recommendations provided by ISEA increase the public's understanding of Idaho's diverse energy resources and the cost-effective energy efficiency opportunities in the state, improve communication and collaboration between Idaho's public and private sector on energy efficiency, conservation, and sustainable energy development, and showcase new and innovative energy technologies developed in-state.

ISEA has published reports on alternative fuels, utility-scale storage, energy reliability and resiliency, baseload resources, wind energy, hydroelectric power, energy efficiency, geothermal energy, woody bioenergy, and municipal and cooperative utilities.[88] ISEA recently established two new working groups, the State Energy Plan Working Group and the Advanced Nuclear Framework Working Group.

Leadership in Nuclear Energy Commission

The Leadership in Nuclear Energy (LINE) Commission makes recommendations to the Governor on policies and actions of the State of Idaho to support and enhance the long-term viability and mission of INL and associated industries in

[86] Idaho Public Utilities Commission. "About the Commission." https://puc.idaho.gov/Page/Info/35
[87] Governor Brad Little. "Executive Order 2020-18." https://oemr.idaho.gov/wp-content/uploads/eo-2020-18.pdf
[88] Idaho Governor's Office of Energy and Mineral Resources. "Idaho Strategic Energy Alliance." https://oemr.idaho.gov/isea/

Idaho.[89] Membership of the Commission includes cabinet officials, local government leaders, representatives from Idaho tribes, INL, Idaho universities, the nuclear industry, and members of the public.

Idaho Energy Resources Authority

The Idaho Energy Resources Authority (IERA) is an energy lending/financing entity authorized to issue revenue bonds to diversify and expand the state's economy through improvements in Idaho's electricity infrastructure. It was established by the Idaho State Legislature in 2005 to promote transmission, generation, and clean energy development in the state and the region.[90]

The IERA allows Idaho's municipal and cooperative utilities to jointly own and finance transmission and generation projects for the benefit of their ratepayers. The IERA can participate in planning, financing, constructing, developing, acquiring, maintaining, and operating electric generation and transmission facilities and their supporting infrastructure. While the IERA has bonding authority to promote specific projects, it has no legislative appropriation, no full-time staff, and no ability to finance projects that are not backed by ratepayers. The services provided by the IERA offer unique opportunities for Idaho's municipal and cooperative electric utilities to help materially lower the development costs of critical energy projects in the state.

Idaho Office of Emergency Management

The Idaho Office of Emergency Management (IOEM) is the state's emergency management agency and part of the Idaho Military Division. IOEM is tasked with assisting Idaho's 44 counties and Tribes in navigating disasters. IOEM prepares the state in preparing, protecting, and mitigating the effects and potential damages from all hazards including energy and fuel related response during a disruption event. IOEM oversees the Emergency Operations Plan, the Threat and Hazard Identification and Risk Assessment and Stakeholder Preparedness Review, State Hazard Mitigation Plan, and the Idaho Response Center (IRC).[91]

The IRC is a space for stakeholders to facilitate response and recovery operations resources during an emergency or disaster. The stakeholders may include but are not limited to federal, local, and tribal governments and the private sector. IOEM monitors incidents within the state that may solicit a state level response using the WebEOC. The Operations Branch of IOEM coordinates statewide alerts, warnings, notifications and conducts trainings for hazardous materials incidents.[92]

[89] Idaho Leadership in Nuclear Energy Commission 3.0. "LINE Home." https://line.idaho.gov and Governor Brad Little. "Executive Order 2019-05." https://gov.idaho.gov/wp-content/uploads/2019/05/eo-2019-05.pdf
[90] Idaho Energy Resources Authority. "Purpose". https://iera.info/purpose/
[91] Idaho Office of Emergency Management. "About." https://ioem.idaho.gov/about/
[92] Idaho Office of Emergency Management. "Operations." https://ioem.idaho.gov/operations/

Idaho Department of Lands and Oil and Gas Conservation Commission

The Idaho Department of Lands (IDL) leases and issues rights-of-way for energy projects on state endowment lands and provides some regulation of Idaho's mining industry.[93] Approximately 3.4 million acres of endowment lands exist in Idaho with 2.5 million acres being the surface estate. Projects on endowment lands are managed to secure long-term financial return for endowment beneficiaries, including Idaho's public schools.[94] The endowment beneficiaries are the Idaho Department of Corrections, Idaho State Department of Education, Idaho Division of Veterans Services, Idaho Educational Services for the Deaf and the Blind, University of Idaho, Lewis and Clark State College, Idaho State University, and the Idaho Capitol Commission.[95] IDL services are provided by 10 Supervisory Areas that include 14 offices.

The Oil and Gas Conservation Commission (OGCC) is administratively housed within the IDL. The OGCC regulates the exploration, drilling, and production of oil and gas resources in Idaho to ensure the conservation of resources and the protection of surface water and groundwater. The OGC consists of a county commissioner from an oil and gas producing county and four governor appointed members. Technical experts with degrees in geoscience or engineering and at least 10 years of experience in the oil and gas industry.[96]

IDL reviews applications for drilling, well treatment, pit construction, and other activities in conjunction with the Idaho Department of Water Resources and the Idaho Department of Environmental Quality. The Oil and Gas Administrator may hold administrative hearings on certain types of applications for activities that may affect other mineral interest owners.[97]

Idaho Department of Environmental Quality

The Idaho Department of Environmental Quality (DEQ) was created by the Idaho Environmental Protection and Health Act[98] and is responsible for enforcing state environmental regulations and administers a number of federal environmental protection laws including the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act.[99] DEQ issues permits for energy and mining projects under the Idaho Pollutant Discharge Elimination System, in which DEQ received

[93] Idaho Department of Lands. "About Us." https://www.idl.idaho.gov/about-us/;
[94] Idaho Department of Lands. "Oil & Gas Leasing." https://www.idl.idaho.gov/leasing/oil-gas-leasing/
[95] Idaho Department of Lands. "Understanding Endowment Land." https://www.idl.idaho.gov/about-us/understanding-endowment-land/
[96] Idaho Code §47-314 (1)
[97] Idaho Code §47-328
[98] Title 39 Health and Safety. "Chapter 1 Environmental Quality-Health." https://legislature.idaho.gov/statutesrules/idstat/Title39/T39CH1/
[99] Idaho Department of Environmental Quality. "About." http://deq.idaho.gov/about-us/

full permitting authority as of July 1, 2021.[100] DEQ has six regional offices across the state that work in partnership with local communities, businesses, and citizens to identify and implement cost-effective environmental solutions for projects.[101] In addition to energy and mining related projects, DEQ has partnered with OEMR and the Idaho Transportation Department (ITD) to administer electric vehicle (EV) programs. DEQ administers the Vehicle Replacement Program (VRP) a rebate program to replace certain medium- and heavy-duty diesel vehicles with alternative fuel or new diesel fuel vehicles.[102]

Idaho State Department of Agriculture

Agriculture is Idaho's largest industry. The Idaho State Department of Agriculture (ISDA) oversees more than 60 sections of Idaho Code.[103] The Bureau of Weights and Measures (Bureau) is responsible for assuring the accuracy of commercial weighing and measuring devices such as petroleum meters, fuel pumps, and propane meters. The Bureau monitors gasoline octane levels and is responsible for Idaho's fuel quality and labeling.[104] It assures national traceability to Idaho's primary mass and volume standards through a nationally recognized metrology laboratory.

Idaho Department of Water Resources and Idaho Water Resource Board

The Idaho Department of Water Resources (IDWR) approves or denies proposals to appropriate water or change existing water rights, archives water right records, recommends and records adjudicated water rights, and oversees the delivery of water in times of shortage.[105] This is important in the development of energy and mineral projects to ensure all water rights during project construction and operation are protected. IDWR is responsible for the safety of dams, geothermal drilling permits, ground water protection (well construction oversight), the regulation of stream channel alterations, and coordination with local communities to comply with the National Flood Insurance Program.

The Idaho Water Resource Board (IWRB) is responsible for the formulation and implementation of a state water plan, financing of water projects, and the operation of programs that support sustainable management of Idaho's water resources. IWRB was created by the Idaho legislature in 1965 and merged with IDWR in 1974.[106]

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[100] Idaho Department of Environmental Quality. "Idaho Pollutant Discharge Elimination System." http://deq.idaho.gov/water-quality/wastewater/
[101] Idaho Department of Environmental Quality. "Regional Offices & Issues." http://deq.idaho.gov/regional-offices/
[102] Alternative Fuels Data Center. "Biodiesel Laws and Incentives in Idaho." https://afdc.energy.gov/fuels/laws/BIOD?state=ID
[103] Idaho State Department of Agriculture. "About ISDA." https://agri.idaho.gov/main/about/about-isda/
[104] Idaho State Department of Agriculture. "Weights and Measures." https://agri.idaho.gov/main/weights-and-measures/
[105] Idaho Department of Water Resources. "Strategic Plan FY2022-2025." https://idwr.idaho.gov/wp-content/uploads/sites/2/general/IDWR-SP-FY22-25_FINAL.pdf
[106] Idaho Department of Water Resources. "Idaho Water Resource Board Responsibilities and Authority." https://idwr.idaho.gov/iwrb/about-the-iwrb/

Idaho Department of Fish and Game

The Idaho Department of Fish and Game (IDFG) protects, preserves, perpetuates, and manages Idaho's wildlife resources.[107] IDFG provides data and technical assistance for energy and mineral projects to evaluate potential effects to fish, wildlife, and habitat as in-state and out-of-state energy demands are addressed. IDFG cooperates with project developers to mitigate and reduce impacts to wildlife. The agency is split into seven regions and is coordinated from the headquarters office in Boise.

Idaho Governor's Office of Species Conservation

The Idaho Governor's Office of Species Conservation (OSC) is dedicated to planning, coordinating, and implementing the state's actions to preserve, protect and restore species listed as candidate, threatened, and endangered under the federal Endangered Species Act.[108] This work is done in coordination with other state agencies and input from the citizens of Idaho for energy and mineral projects to ensure responsible development of resources and adequate protection for species. OSC is headquartered in Boise and has staff in Salmon, Sandpoint, and Moscow.

Idaho Department of Parks and Recreation

The Idaho Department of Parks and Recreation (IDPR) is the state authority on outdoor recreation and resource stewardship. IDPR manages thirty state parks and recreation programs throughout the state. IDPR analyzes impacts to recreation from energy and mineral project development, and administers the recreation programs for boats, snowmobiles, and other off-highway vehicles.[109]

Idaho State Historic Preservation Office

The Idaho State Historic Preservation Office (SHPO) is administratively housed within the Idaho State Historical Society. SHPO offices nationwide encourage the preservation, documentation, and use of cultural resources. For energy and mineral projects, the Idaho SHPO consults with federal agencies to review effects to historic properties under Section 106 of the National Historic Preservation Act.[110] SHPO maintains the state inventory of documented cultural resources in the state, administers the Historic

[107] Idaho Department of Fish and Game. "About Fish and Game." https://idfg.idaho.gov/about
[108] Idaho Governor's Office of Species Conservation. "Home – About OSC." https://species.idaho.gov/
[109] Idaho Department of Parks and Recreation. "Strategic Plan Fiscal Year 2022." https://parksandrecreation.idaho.gov/wp-content/uploads/IDPR_2021-2025_Strategic_Plan.pdf
[110] Idaho State Historic Preservation Office. "Section 106 Project Review." https://history.idaho.gov/section-106/

Rehabilitation Tax Incentive program, and provides educational and technical assistance on historic preservation issues.

Idaho Transportation Department

The Idaho Transportation Department (ITD) is the state authority on transportation infrastructure. ITD maintains and operates existing roadways and plans transportation infrastructure for the future growth of the state. The agency is split into six districts and is headquartered in Boise.[111] ITD, OEMR, and DEQ, collectively referred to as the Interagency Working Group, administer the Idaho NEVI Program, discussed in Appendix B.

Idaho Department of Health and Welfare

The Idaho Department of Health and Welfare (DHW) promotes and protects Idahoans health and safety. DHW provides services to promote healthy people, safe children, and stable families.[112] DHW administers the State of Idaho Weatherization Assistance Program (WAP). DHW contracts with local community action agencies and nonprofits to install weatherization improvements in low-income households throughout the state.[113] WAP conserves energy, saves money, and increases the comfort of homes.

Idaho Workforce Development Council

The Idaho Workforce Development Council (WDC) was established by the Executive Office of the Governor in 2017 to coordinate efforts and direct public outreach and engagement in support of improving the quality of and access to workforce education and training programs throughout Idaho. WDC administers Idaho LAUNCH, discussed in Section 2.4.

2.2 Regional Entities

Northwest Power and Conservation Council

Congress created the Council in 1980 through the Northwest Power Act to better engage with Idaho, Montana, Oregon, and Washington to ensure an affordable and reliable energy system while enhancing fish and wildlife in the Columbia River Basin.[114] The Council is funded solely by wholesale power revenues from BPA. It forecasts future electricity load growth in the region and helps plan how to best meet future needs while informing the public about regional energy issues.

[111] Idaho Transportation Department. "Home". https://itd.idaho.gov/
[112] Idaho Department of Health and Welfare. "Agency Overview." https://healthandwelfare.idaho.gov/about-dhw/our-mission
[113] U.S. Department of Energy. "Weatherization Assistance Program Fact Sheet." https://www.energy.gov/eere/wap/articles/weatherization-assistance-program-fact-sheet
[114] Northwest Power and Conservation Council. "About." https://www.nwcouncil.org/about

Every five years, the Council prepares and updates a least-cost Power Plan to advise the BPA on electricity demand forecasts, electricity and natural gas price forecasts, an assessment of cost-effective energy efficiency that can be acquired over the life of the plan, and a least-cost generating resources portfolio. Since the release of the Council's first Northwest Power Plan in 1983, the region's utilities have achieved more than 7,200 aMW of energy efficiency, an amount of power equal to the annual energy consumption of 5.3 million Northwest homes. Energy efficiency is the Northwest's second-largest resource behind hydroelectricity. [115]

The Council published the 2021 Northwest Power Plan in May 2022. The action plan focuses on a six-year period from 2022-2027 and recognizes maintaining an adequate and reliable power supply over the action plan period will be challenging due to the region's increased dependence on variable clean resources. The Council recommends that the region acquire between 750 and 1,000 aMW of cost-effective energy efficiency by the end of 2027 and at least 2,400 aMW by the end of 2041. The 2021 Power Plan includes less efficiency than past plans, which underscores the high achievements of the last 40 years. Further, the Council recommends utilities examine two demand response products: residential time-of-use (TOU) rates and demand voltage regulation (DVR) to offset the electric system needs during peak periods and the region acquire at least 3,500 MW of clean resources by 2027 as a cost-effective option for meeting energy needs.[116]

Western Electricity Coordinating Council

WECC is the regional entity that monitors and enforces reliability standards in the Western Interconnection subject to oversight by NERC and FERC. These reliability standards apply to electric utilities and other entities that own or operate generation, transmission, or other facilities in the bulk power system. WECC promotes reliability in the Western Interconnection by serving as a central repository of data and other technical metrics about the grid.[117]

Western Interstate Energy Board

The Western Interstate Energy Board (WIEB) is an organization of 11 western states and two western Canadian provinces. WIEB provides the instruments and framework for cooperative state efforts to enhance the economy of the west and contribute to the well-being of the region's people. The legal basis of WIEB is the Western Interstate Nuclear

[115] Northwest Power and Conservation Council. "2021 Power Plan Summary". https://www.nwcouncil.org/media/filer_public/45/b0/45b02281-e3da-4788-ad74-355e5c755a75/2022-2.pdf
[116] Northwest Power and Conservation Council. "2021 Plan Summary". https://www.nwcouncil.org/media/filer_public/45/b0/45b02281-e3da-4788-ad74-355e5c755a75/2022-2.pdf
[117] Western Electricity Coordinating Council. "About WECC." https://www.wecc.biz/Pages/AboutWECC.aspx

Compact.[118] WIEB achieves this by promoting energy policy that is developed cooperatively among member states and provinces and with the federal government.[119] WIEB's work is conducted through committees such as the Committee on Regional Electric Power Cooperation (CREPC), the High-Level Radioactive Waste Committee (HLRW), and the Western Interconnection Regional Advisory Body (WIRAB).

WIEB Committee on Regional Electric Power Cooperation

CREPC was established in the 1980s. CREPC is a joint committee of WIEB and the Western Conference of Public Service Commissioners. CREPC is comprised of the public utility commissions, energy and facility siting agencies, and consumer advocates in the western states and Canadian provinces and works to improve the efficiency of the western electric power system.[120]

WIEB Western Interconnection Regional Advisory Body

WIRAB was created under Section 215(j) of the Federal Power Act of 2005, which provides for the establishment of a federal regulatory system of mandatory and enforceable electric reliability standards for the nation's bulk power system.[121] WIRAB's membership is composed of representatives from all states and international provinces that consumer electricity within the Western Interconnection. Members are appointed by Governors or Premiers.[122]

WIRAB was established in the Western Interconnection to advise the NERC, Federal Energy Regulatory Commission (FERC), and WECC on whether proposed reliability standards within the region, as well as the governance and budgets of NERC and WECC, are just, reasonable, not unduly discriminatory, or preferential, and in the public interest.

WIEB High-Level Radioactive Waste Committee

HLRW is composed of nuclear waste transportation experts appointed by the governors of 11 western states. HLRW works with the DOE to develop a safe and publicly acceptable system for transporting spent nuclear fuel and high-level radioactive waste under the Nuclear Waste Policy Act.[123] HLRW's primary management directives come from a series of western governors' resolutions dating back to 1985, which express the governors' goal of safe transport of nuclear waste.[124]

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[118] Western Interstate Energy Board. "WIEB- Western Interstate Energy Board." https://www.westernenergyboard.org/western-interstate-energy-board/
[119] WIEB. "WIEB Board." https://www.westernenergyboard.org/western-interstate-energy-board/
[120] WIEB. "CREPC." https://www.westernenergyboard.org/committee-on-regional-electric-power-cooperation/
[121] United States Code, 2018 Edition. "Title 16-Conservation. Chapter 12- Federal Regulation and Development of Power." https://www.govinfo.gov/content/pkg/USCODE-2018-title16/html/USCODE-2018-title16-chap12-subchapII-sec824.htm U.S.C. Title 16 - CONSERVATION (govinfo.gov)
[122] WIEB. "WIRAB." https://www.westernenergyboard.org/western-interconnection-regional-advisory-body/
[123] U.S. Department of Energy. "Nuclear Waste Policy Act." https://www.energy.gov/sites/prod/files/edg/media/nwpa_2004.pdf
[124] WIEB. "High-Level Radioactive Waste." https://www.westernenergyboard.org/high-level-radioactive-waste-committee/

Reliability Coordinator West
A Reliability Coordinator (RC) coordinates with electric utilities and transmission operators to ensure the bulk power system is operated within specified limits and that system conditions are stable across the area. RC West is currently the RC for 42 entities in the Western Interconnection, overseeing 87% of the load in the western U.S.[125]

California Independent System Operator
CAISO is one of nine independent system operators/regional transmission organizations (ISOs/RTOs) in the country and serves all three of Idaho's IOU providers. ISOs/RTOs operate and provide non-discriminatory access to transmission systems for regions of the country where they provide wholesale energy marketplaces.

Western Energy Imbalance Market and Extended Day-Ahead Market
WEIM was launched in 2014 as an agreement between PacifiCorp and CAISO. WEIM's daily operations are managed by CAISO.[126] As of 2023, 22 utilities with service territories in the western U.S. and British Columbia, Canada have joined.[127] Idaho Power joined WEIM in April 2018, Avista joined in March 2022, and BPA joined in May 2022. The service territories of all WEIM participants are depicted in Figure 24.

WEIM utilizes regional transmission systems to balance supply and demand across a larger geographical footprint in real time. WEIM manages transmission congestion and optimizes procurement of imbalance energy (positive or negative) through economic bids submitted by the EIM Participating Resource Scheduling Coordinators in the fifteen-minute and five-minute markets.[128]

In 2019, CAISO announced an initiative to develop the Extended Day-Ahead Market (EDAM) to improve market efficiency by integrating renewable resources using day-ahead unit commitment and scheduling across a larger area.[129] Fifteen WEIM entities participated in the EDAM Feasibility Assessment in January 2019. The CAISO issued its draft final market design for the EDAM in December 2022.[130] Onboarding of the initial EDAM participants is expected to begin in early 2026. In December 2022, PacifiCorp was the first utility to publicly announce plans to join the EDAM.[131] The EDAM design was jointly approved by the ISO Board of Governors and

[125] California ISO. "RC West." http://www.caiso.com/informed/Pages/RCWest/Default.aspx
[126] Western Energy Imbalance Market. "About." https://www.westerneim.com/Pages/About/default.aspx
[127] Western Energy Imbalance Market. "About." https://www.westerneim.com/Pages/About/default.aspx
[128] Western Energy Imbalance Market. "EIM Track 2 Overview – Agreements." https://www.westerneim.com/Documents/EIMTrack2Overview-Agreements.pdf
[129] California ISO. "Public Comment Letter." http://www.caiso.com/Documents/PublicCommentLetter-EIMEntites-EDAM-Sep16-2019.pdf
[130] California ISO. "Initiative: Extended Day-Ahead Market." https://stakeholdercenter.caiso.com/StakeholderInitiatives/Extended-day-ahead-market
[131] PacifiCorp. "PacifiCorp to build on success of real-time energy market innovation as first to sign on to new Western day-ahead market." https://www.pacificorp.com/about/newsroom/news-releases/EDAM-innovative-efforts.html

WEIM Governing Body in February 2023, and was filed with FERC in August 2023. Onboarding of the initial EDAM participants is expected to begin in 2024 and 2025.[132]

Figure 24: WEIM Entities[133]

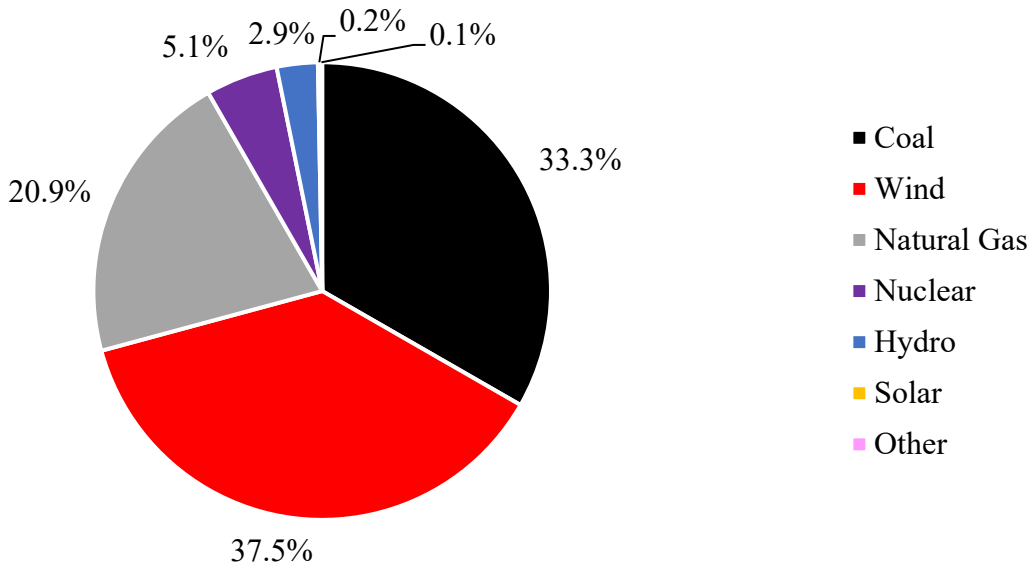
Southwest Power Pool

The Southwest Power Pool (SPP) is an RTO that is mandated by FERC to provide reliable power sources, transmission infrastructure, and competitive electricity prices. SPP offers a variety of services to its members including transmission expansion, market operations, tariff administration, regional scheduling, reliability coordination, and training. Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming are members of the SPP. SPP has initiated service offerings in the Western Interconnection in recent years and currently provides technical

[132] California ISO. "EDAM: Extended Day Ahead Market." http://www.caiso.com/Documents/extended-day-ahead-market-edam-fact-sheet.pdf
[133] Western Energy Imbalance Market. "About." https://www.westerneim.com/Pages/About/default.aspx

services for the Western Resource Adequacy Program (WRAP) and operates the Western Energy Imbalance Service market for several Intermountain balancing areas.

Figure 25: SPP Resources (2023)[134]



SPP sources power from 949 generation plants with a generation capacity of 105,464 MW. SPP's energy production fuel types are shown in Figure 25 SPP operates and maintains 72,004 miles of transmission lines and 5,180 substations.[135]

SPP Markets+

SPP's Markets+ initiative (Markets+) is a day-ahead market proposed by SPP aimed to simplify transmission services, centralize day-ahead markets, and efficiently integrate the new fleet of renewable generation. In 2022, SPP engaged western utilities in design of its proposed Markets+ day-ahead market, which could be an alternative market to the CAISO EDAM. SPP issued its final service offering in November 2022 and is seeking commitments from western utilities to share in funding its next phase of initial market design. In February 2023, BPA announced that they would contribute funds to the Markets+ Initiative but are still discussing market options.[136] BPA will collaborate with customers and constituents, through a series of public workshops, to develop a policy direction toward a specific day-ahead market option and potential participation. BPA anticipates issuing a policy direction in early 2024.[137]

[134] Southwest Power Pool. "Fast Fact." https://www.spp.org/about-us/fast-facts/
[135] Southwest Power Pool. "Fast Fact." https://www.spp.org/about-us/fast-facts/
[136] Bonneville Power Administration. "BPA Will Contribute Funds to SPP Markets+ Phase 1 Development." https://www.bpa.gov/about/newsroom/news-articles/2023/20230224-bpa-will-contribute-funds-to-spp-markets-phase-1-development
[137] RTO Insider LLC. "Region Still Split as BPA Approaches Day-ahead Market Decisions." https://www.rtoinsider.com/64516-bpa-alters-timeline-day-ahead-market-decision/

Western Power Pool

The Western Power Pool (WPP) is a Portland-based voluntary organization that coordinates power plant operational data and provides guidelines for power system operations in the west. WPP's members include electric utilities that own generating plants and sell power throughout the Western U.S. and Canada. WPP activities are largely determined by major committees – the Operating Committee, the Pacific Northwest Coordination Agreement Coordinating Group, the Reserve Sharing Group Committee, and the Transmission Planning Committee.[138]

Western Resource Adequacy Program

Given the recent trend in decommissioning coal plants and increasing clean energy integration, WPP coordinates activities related to a comprehensive review of resource adequacy in the WPP region and the development and implementation of WRAP. WRAP was created to address WPP's customer utilities concerns about resource adequacy in the region. It aims to create a region-wide approach to addressing resource adequacy and enhancing reliability by engaging stakeholders to understand regional resource supply and demand.[139] The increased quantity and quality of information related to the WRAP will provide significantly enhanced visibility into the forward supply that enable load to be served reliably in the region.[140]

In December 2021, the WRAP announced that it entered the first stage of program implementation, a non-binding phase titled Phase 3A. Twenty-six western utilities are participating in Phase 3A of the WRAP, including Avista, BPA, Idaho Power, and PacifiCorp. These twenty-six participants represent an estimated peak winter load of 65,122 MW and an estimated peak summer load of 66,768 MW across 10 states and one Canadian province.[141] In December 2022, 11 utilities formally committed to moving forward with the WRAP, including BPA, Idaho Power, PacifiCorp, and Avista.[142,143,144] In February 2023, FERC approved the tariff for the WRAP, creating a path for implementation of the region's first west-wide reliability program. [145]

[138] Western Power Pool. "Home". https://www.westernpowerpool.org/
[139] Western Power Pool. "WRAP FAQs." https://www.westernpowerpool.org/news/wrap-faqs
[140] Western Power Pool. "NWPP Resource Adequacy Program – Detailed Design." https://www.westernpowerpool.org/private-media/documents/2021-08-30_NWPP_RA_2B_Design_v4_final.pdf
[141] Western Power Pool. "WRAP Announces Full Participation of Phase 3A." https://www.westernpowerpool.org/news/wrap-announces-full-participation-of-phase-3a
[142] Bonneville Power Administration. "Western Resource Adequacy Program." https://www.bpa.gov/learn-and-participate/projects/western-resource-adequacy-program
[143] Idaho Power. "Idaho Power Moves Forward with Regional Energy Adequacy Group." https://www.idahopower.com/news/idaho-power-moves-forward-with-regional-energy-adequacy-group/
[144] Western Power Pool. "WPP Welcomes First Participants for Next Phase of WRAP". https://www.westernpowerpool.org/news/wpp-welcomes-first-participants-for-next-phase-of-
[145] Wester Power Pool. "History." https://www.westernpowerpool.org/about/history/

NorthernGrid

Pursuant to rules adopted by FERC, Idaho's IOUs are required to participate in local and sub-regional transmission planning and to coordinate with neighboring sub-regional planning groups and local stakeholders.[146] NorthernGrid, the planning association which facilitates regional transmission planning across the Pacific Northwest and Intermountain West, is responsible for producing transmission expansion and economic study plans on a periodic basis.[147] These local, sub-regional, and regional planning processes identify transmission project costs, benefits, and risks and their allocation to customer group beneficiaries. They explore opportunities for project coordination at the sub-regional and regional levels to avoid costly duplication of facilities. OEMR and the PUC participate in the development of these plans.

Northwest Energy Efficiency Alliance

The Northwest Energy Efficiency Alliance (NEEA) provides support to 140 regional utilities and groups, which provide services to over 13 million customers, to implement energy efficiency and conservation programs. A primary focus is to help meet future energy needs by recognizing different energy efficiency markets such as new products, services, practices, and approaches.[148] NEEA funds initiatives and serves as a forum for collective industry consensus on market acceptance of energy efficient products.[149] Idaho Power, BPA, and Avista participate in NEEA. The Idaho Governor has appointed the OEMR Administrator to serve on the NEEA Board of Directors.[150]

Regional Electric Vehicle Infrastructure Development in the West Partnership

In 2017, former Governor Otter signed a Memorandum of Understanding (MOU) between Idaho and seven other western states (Signatory States) to collaborate on Regional Electric Vehicle infrastructure development in the West Partnership (REV West).[151] In 2019, the Signatory States signed a revised MOU to update their EV corridor goals. Signatory States are committed to educating consumers, coordinating EV charging locations, using and promoting REV West Voluntary Minimum Standards, identifying and developing opportunities to incorporate EV charging stations into planning and development processes, encouraging EV manufacturing to stock and market a variety of EVs, collaborating on funding opportunities, and supporting the build-out of charging stations.[152,153]

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[146] Federal Energy Regulatory Commission. "FERC Order Nos. 890 and 1000." https://ferc.gov/industries-data/electric/industry-activities/open-access-transmission-tariff-oatt-reform/summary-compliance-filing-requirements-order-no-890 and https://www.ferc.gov/electric-transmission/order-no-1000-transmission-planning-and-cost-allocation
[147] Northern Grid. "Purpose." https://www.northerngrid.net/northerngrid/purpose/
[148] The Northwest Energy Efficiency Alliance. "Working with the Market." https://neea.org/our-work/working-with-the-market
[149] Northwest Energy Efficiency Alliance. "About NEEA." http://neea.org/about-neea
[150] Northwest Energy Efficiency Alliance. "Board of Directors." https://neea.org/about-neea/board-of-directors
[151] NASEO. "2017 REV West MOU." https://www.naseo.org/issues/transportation/rev-west
[152] NASEO "2019 REV West MOU." https://www.naseo.org/issues/transportation/rev-west
[153] NASEO. "REV West Voluntary Minimum Standards." https://www.naseo.org/issues/transportation/rev-west

ChargeWest™

ChargeWest™ is an effort between Idaho, Montana, Wyoming, Nevada, Utah, Colorado, New Mexico, and Arizona to support consumer education, stakeholder engagement and rural infrastructure development of EV charging from the expansion of alternative fuel corridors (AFCs). The goal of ChargeWest™ is to support electrifying AFCs in three main areas: to remove investment barriers to enable private station development, identify key infrastructure gaps and develop solutions to deploy charging stations in rural regions required to complete corridors, and develop replicable educational tools to encourage EV consumer awareness.[154]

2.3 Federal Entities

Department of Energy

DOE administers national energy, environmental, and nuclear policies through science and technology solutions.[155] DOE oversees the nation's nuclear infrastructure, and operates energy research facilities throughout the nation, including 17 national laboratories, among them INL. DOE provides state energy program funding to states to enhance energy security, advance state-led energy initiatives, improve grid resiliency, and maximize the benefits of decreasing energy waste.

Federal Energy Regulatory Commission

FERC is an independent regulatory agency within the DOE. FERC has jurisdiction over interstate electricity sales, wholesale electric rates, hydroelectric licensing, natural gas transmission and related services, pricing, oil pipeline rates and gas pipeline certification.[156]

North American Electric Reliability Corporation

NERC is a non-profit subject to oversight by the FERC and governmental authorities in Canada whose mission is to ensure the reliability and security of the bulk power system in North America. NERC accomplishes this by developing and enforcing reliability standards and assessing seasonal and long-term reliability. NERC has four interconnection regions, including the Western Interconnection. NERC's bulk power system serves approximately 400 million people.[157]

[154] ChargeWest™. "What is ChargeWest™?" https://chargewestev.org/
[155] U.S. Department of Energy. "About Us." https://www.energy.gov/about-us
[156] Federal Energy Regulatory Commission. "About FERC." https://ferc.gov/what-ferc
[157] North American Electric Reliability Corporation. "About NERC." https://www.nerc.com/aboutnerc/pages/default.aspx

NERC hosts the GridEx exercise every two years. GridEx trains utilities on response and recovery from simulated coordinated cyber and physical security threats and incidents, strengthens crisis communications relationships, and provides a forum for lessons learned. The most recent GridEx simulation, GridEx VII, was held in November 2023.[158]

Army Corps of Engineers

The Army Corps of Engineers (USACE) is a reporting unit of the U.S. Army that provides engineering services for energy, national security, and risk reduction.[159] USACE maintain and operate approximately 740 dams throughout the nation through their Dam Safety Program. The program provides several benefits to U.S. residents including conservation, flood mitigation, irrigation, recreation, and power. They also house the National Inventory of Dams database that acts as a central location for dam information across the U.S. This database includes USACE dams, as well as dams operated by other entities.[160] The database identifies 410 total dams in Idaho.[161]

Nuclear Regulatory Commission

The Nuclear Regulatory Commission (NRC) is an independent federal agency that oversees licensing, safety, security, storage, and disposal of nuclear materials. The state works with NRC on small-scale nuclear projects at INL, and to ensure that materials transported through Idaho for disposal and the materials present at INL adhere to appropriate safety guidelines.[162] The Governor appoints NRC liaison, who is currently the DEQ's INL Oversight Program Manager.

Department of the Interior

The Department of the Interior (DOI) manages public lands, territories, and tribal matters in the U.S. through the bureaus and offices it administers, which includes the Bureau of Land Management (BLM), BOR, the National Park Service, the U.S. Fish and Wildlife Service (USFWS), and many others. OEMR coordinates state agency comments on energy and mineral-related projects subject to National Environmental Policy Act review.[163]

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[158] North American Electric Reliability Corporation. "GridEx VII – November 14-15, 2023." https://www.nerc.com/pa/CI/ESISAC/Pages/GridEx.aspx
[159] U.S. Army Corps of Engineers. "About Us." https://www.usace.army.mil/About/
[160] U. S. Army Corps of Engineers. "Dam Safety Program." https://www.usace.army.mil/Missions/Civil-Works/Dam-Safety-Program/
[161] National Inventory of Dams. "Dams of Idaho." https://nid.sec.usace.army.mil/#/
[162] U.S. Nuclear Regulatory Commission. "The Commission." https://www.nrc.gov/about-nrc/organization/commfuncdesc.html
[163] U.S. Department of Interior. "About." https://www.doi.gov/about ; and National Environmental Policy Act. "Laws & Regulations." https://ceq.doe.gov/laws-regulations/states.html

Examples of DOI's management in Idaho includes: BOR oversight of federal water resource management efforts and management of several dams in Idaho including Anderson Ranch, Arrowrock, American Falls, and Palisades; BLM administration of energy and mineral leases throughout Idaho; and USFWS analysis on the impact of energy generation and transmission on endangered species and migratory birds.

Forest Service

The U.S. Forest Service (USFS), administered under the U.S. Department of Agriculture, is responsible for managing and protecting national forests and grasslands. OEMR has worked with USFS on transmission rights-of-way through national forests, energy and mineral development on National Forest System lands, revision of forest land management plans, and development of woody biomass as a source of energy.[164]

National Marine Fisheries Service

The National Marine Fisheries Service (NMFS), administered under the U.S. Department of Commerce through the National Oceanic and Atmospheric Association, oversees endangered anadromous fish species, and ensures compliance with fisheries regulations. The state works closely with NMFS on fisheries issues, including those related to salmon, steelhead, and hydroelectric facilities in the Federal Columbia River Power System.[165]

Environmental Protection Agency

The Environmental Protection Agency (EPA) establishes minimum standards for clean air, land and water in energy-generating processes including those involving nuclear, coal, and hydroelectric. EPA works closely with the state departments responsible for air and water quality, including DEQ, to develop and ensure compliance with environmental standards.[166] EPA administers the Comprehensive Environmental Response, Compensation, and Liability Act, commonly known as "Superfund," which allows EPA to clean up contaminated sites.[167] There are currently six sites in Idaho on the Superfund National Priorities List.[168]

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA), an agency of the Department of Homeland Security, leads nationwide risk mitigation efforts and coordinates disaster response operations. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) provides today's current disaster relief framework. FEMA has 10 regional offices; Idaho is located within FEMA Region 10. OEMR and the PUC work closely with FEMA

[164] U.S. Forest Service. "Energy." https://www.fs.usda.gov/science-technology/energy-forest-products/energy
[165] National Oceanic and Atmospheric Administration Fisheries. "About Us." https://www.fisheries.noaa.gov/about-us
[166] U.S. Environmental Protection Agency. "About EPA." https://www.epa.gov/aboutepa/our-mission-and-what-we-do
[167] U.S. Environmental Protection Agency. "What is Superfund?" https://www.epa.gov/superfund/what-superfund
[168] U.S. Environmental Protection Agency. "National Priorities List by State." https://www.epa.gov/superfund/national-priorities-list-npl-sites-state#ID

Region 10 Emergency Support Function #12 (Energy) personnel in planning and response efforts.[169]

2.4 Energy Research and Education in Idaho

Higher education institutions, community colleges, and research and development institutions located in Idaho are engaged in educating tomorrow's energy workforce.

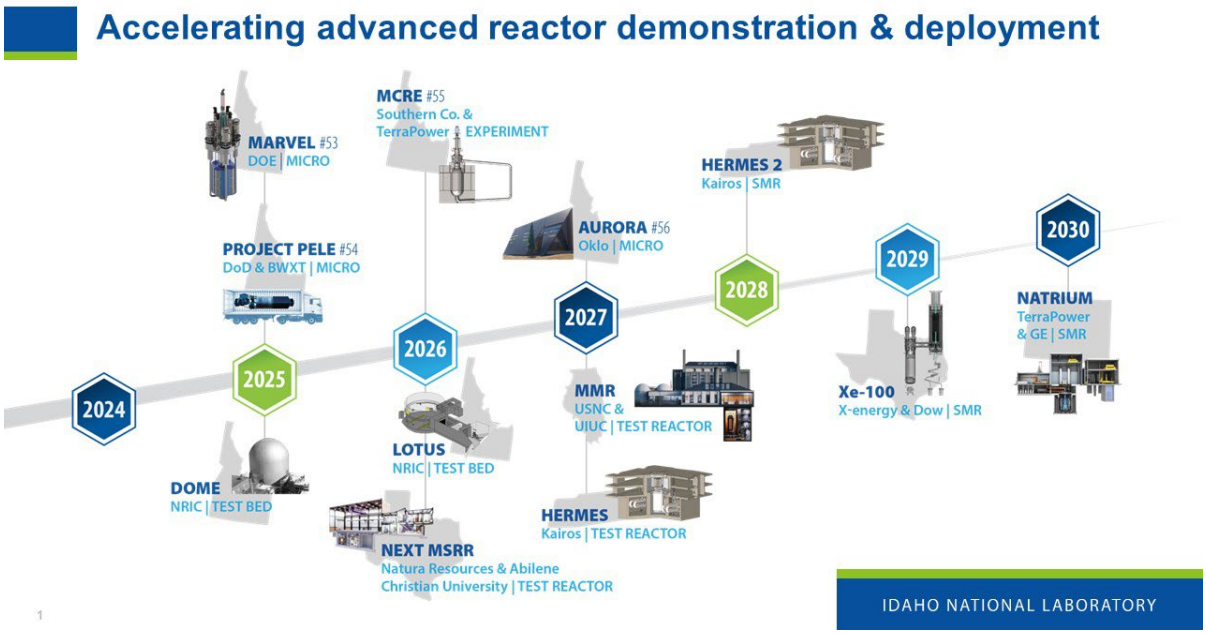
Idaho National Laboratory

With over 6,100 employees, the INL is one of the state's largest employers and a major contributor to Idaho's economy. INL is the DOE's nuclear energy research, development, and demonstration center. INL is a leader in clean energy and battery technology research and a recognized world leader in cybersecurity and critical infrastructure protection. On its 890 square-mile site and growing campus in Idaho Falls, INL has many unique research facilities and capabilities.

Nuclear Science & Technology: INL pioneers several advanced nuclear energy projects to address growing carbon-free power needs. INL leads two national programs focused on commercializing advanced nuclear technologies: the Gateway for Advanced Innovation in Nuclear (GAIN) and the National Reactor Innovation Center.

Several advanced reactor demonstrations are expected to be located at INL this decade.

Figure 26: INL Advanced Reactor Timeline[170]



[169] Federal Emergency Management Agency. https://www.fema.gov/about/strategic-plan/about-fema.
[170] Picture courtesy of INL.

Energy Environment Science and Technology: INL's researchers work to accelerate the integration of clean energy sources into the nation's grid. Those sources include nuclear, solar, wind, geothermal, and bio-based energy.

INL is working directly with nuclear power providers to use excess heat at their power plants to produce clean hydrogen, which can be used to decarbonize industrial, manufacturing, and transportation processes. INL has also provided technical assistance and research for developing Regional Clean Hydrogen Hubs.

INL works with the agricultural industry to convert waste products into clean energy through the Biomass Feedstock National User Facility.[171] Additionally, INL is a recognized world leader in the development of charging station infrastructure and EV battery research at the Battery Test Center.[172]

National & Homeland Security: INL is recognized for its work in industrial cybersecurity and critical infrastructure security and resilience. INL's research supports national broadband resiliency through their Wireless Test Bed, the nation's first security-focused 5G wireless testing area. This project allows the Department of Defense and other agencies to address communication challenges, advance 5G security, and improve safety for troops.[173]

In 2022, INL energized one of the nation's most comprehensive electric power grid test beds. The test grid is used by experts from across the federal government and private industry to develop and demonstrate technologies that improve security and enhance resiliency.[174]

INL is home to two state-owned facilities dedicated to cybersecurity: the Cybercore Integration Center which unifies public, private, and academic partners to anticipate and address national cyber and critical infrastructure threats, and the Collaborative Computing Center which supports INL and state academic researchers with high-performance computational power. Both cybersecurity projects collaborate with Idaho universities to train the next generation of researchers for Idaho's and the nation's security.[175]

Center for Advanced Energy Studies

The Center for Advanced Energy Studies (CAES) is an Idaho Falls-based research, education, and innovation consortium that brings together INL, Boise State University (Boise State), Idaho State University (ISU), and the University of Idaho (U of I). CAES leverages the expertise,

[171] Idaho National Laboratory. "Bioenergy Research." https://bioenergy.inl.gov/SitePages/Home.aspx
[172] Idaho National Laboratory. "Infrastructure and Energy Storage." https://cet.inl.gov/SitePages/Infrastructure%20and%20Energy%20Storage.aspx
[173] Idaho National Laboratory. "Wireless Test Bed." https://inl.gov/wireless/testing/
[174] Idaho National Laboratory. "A Decade in the Making, Idaho Researchers Unveil Enhanced Electric Power Grid Test Bed." https://inl.gov/national-homeland-security/a-decade-in-the-making-idaho-researchers-unveil-enhanced-electric-power-grid-test-bed/
[175] Idaho National Laboratory. "Cybercore Integration Center." https://inl.gov/cybercore/. "Collaborative Computing Center (C3)." https://factsheets.inl.gov/FactSheets/C3%20Factsheet%20Groundbreaking.pdf

facilities, and capabilities of the member organizations to collaboratively address challenges in nuclear energy; energy-water nexus; cybersecurity; advanced manufacturing; innovative energy systems; energy policy; and computing, data, and visualization.[176]

Based at Boise State, the Energy Policy Institute (EPI) is the policy arm of CAES. EPI focuses on how to manage energy shifts in natural, technical, and human systems. EPI's team works with policymakers, industry, and communities to advance understanding and decisions about clean, safe, and secure energy systems.

Boise State University

Elective and certificate courses are offered in energy generation, energy efficiency and renewable energy at Boise State.[177] The courses provide both non-science and engineering students with a solid grounding in energy fundamentals, which is helping Boise State educate a knowledgeable generation of energy consumers, policymakers, teachers, and business leaders.

The Micron School of Materials Science and Engineering (MSE) at Boise State University is home to one of the most productive materials science and engineering programs in the northwest. MSE's Advanced Nanomaterials and Manufacturing Laboratory formulates microscopic materials for energy applications.[178]

University of Idaho

The Department of Biological and Agricultural Engineering at U of I houses the Biodiesel Fuel Education Program which provides science-based information about biodiesel and assists in the development of educational tools for a national biodiesel outreach program. The program develops and distributes educational materials that support advances in biodiesel infrastructure, technology transfer, fuel quality, fuel safety, and increasing feedstock production.[179]

U of I's Integrated Design Lab performs research, education and outreach supporting energy efficiency in Idaho. Their team performs energy audits for OEMR's Government Leading by Example Program.[180]

U of I also hosts the National Institute for Advanced Transportation Technology. This institute is focused on environmental protection through transportation research, technology transfer, and education. The institute contributes to the sustainability of the environment through the development of clean vehicles, alternative fuels, efficient traffic control systems, safe transportation systems, sound infrastructure, and the policies that support these systems.[181]

[176] Center for Advanced Energy Studies. "Core Capabilities." https://caesenergy.org/research/core-capabilities/
[177] Boise State University. https://www.boisestate.edu/
[178]Boise State University. "Micron School of Materials Science and Engineering." https://www.boisestate.edu/coen-materials/
[179] University of Idaho. "Biodiesel Education." http://biodieseleducation.org/
[180] University of Idaho "Integrated Design Lab." Integrated Design Lab | University of Idaho (uidaho.edu)
[181]University of Idaho. "National Institute for Advanced Transportation Technology." www.uidaho.edu/engr/research/niatt

U of I offers two energy-related options under its B.S. Geology degree. The Sustainable Mining and Earth Resources option introduces students to modern mining methods through "hands-on" experiential work with regional employers to learn mining planning, implementation, restoration, and maintenance of the natural landscapes. The Energy Resiliency option introduces students to ways critical energy resources can be obtained and used in a sustainable and responsible manner.[182]

Idaho State University

ISU offers bachelor's and master's degree programs in nuclear engineering and prepares graduates to excel in a wide range of careers associated with nuclear reactors, the nuclear fuel cycle, and other applications of nuclear technology.[183]

ISU established the Energy Systems Technology and Education Center (ESTEC) in its College of Technology. ESTEC integrates the education and training required for graduates to maintain existing plants. Students learn to install and test components in new plants in key areas of technology, including electrical engineering, instrumentation and control, mechanical engineering, wind engineering, instrumentation and automation, nuclear operations, and renewable energy.[184] In 2022, NuScale Power collaborated with ISU to open the Energy Exploration Center, where students can experience hands-on nuclear learning opportunities similar to the control rooms they might see on the job.[185]

College of Southern Idaho

Since 1981, instructors at the College of Southern Idaho (CSI) in Twin Falls have trained the next-generation energy workforce through the Renewable Energy Systems Technology Program.[186] CSI received a $4.4 million Economic Development Administration federal grant in 2011 to build the Applied Technology and Innovation Center in Twin Falls. Completed in 2014, the 29,600 square foot energy efficient center houses the college's expanding HVAC, environmental technology, wind energy, and machine technology programs with classrooms, hands-on labs, and administrative offices.[187]

College of Eastern Idaho

College of Eastern Idaho (CEI) and ISU co-host the two-year Energy Systems Technology Program. Students complete their first year at the CEI campus in Idaho Falls and the second at

[182] University of Idaho. "B.S. Geology." https://www.uidaho.edu/sci/ess/bs-geology.
[183] Idaho State University. "Programs of Study." https://www.isu.edu/ne/
[184] Idaho State University. "College of Technology." https://www.isu.edu/estec//
[185]Idaho State University. "NuScale Power, LLC and Idaho State University Open Energy Exploration Center." https://www.isu.edu/news/2022-fall/nuscale-power-llc-and-idaho-state-university-open-energy-exploration-center.html
[186] College of Southern Idaho. "Renewable Energy Systems Technology Program." https://www.csi.edu/programs/renewable-energy-systems-technology/default.aspx
[187] U.S. Economic Development Administration. "CSI Applied Technology & Innovation Center." https://www.eda.gov/success-stories/workforce/stories/college-of-southern-id.htm

ISU in Pocatello. The program equips students to become energy systems maintenance technicians with mechanical, electrical, and instrumentation and control skills.[188,189]

College of Western Idaho
The College of Western Idaho provides in-demand energy engineering skills in its Advanced Mechatronics Engineering Technology program. This one-to-two-year program teaches students about electricity, robotics, wireless communication, renewable energy, instrumentation, and computerized control systems.[190]

Northwest Lineman College
The Northwest Lineman College (NLC), based in Meridian, trains lineman apprentices and educates students in construction, maintenance, and operation of the grid. NLC also develops customized training services for power and construction companies worldwide. With over 8,000 trainees annually, NLC has educated more Power Delivery trade professionals than any other educational institution in the U.S.[191]

Kootenai Electric Cooperative
Kootenai Electric Cooperative constructed a new headquarters and training facility in Rathdrum in October 2023. These facilities will host new hire orientation, internal safety trainings, and external trainings from the Northwest Line Joint Apprenticeship Training Committee, the Northwest Public Power Association, and others.[192]

Idaho LAUNCH
Idaho LAUNCH is a workforce training program that was expanded in 2023 to encourage Idaho high school seniors to enter education and training programs that lead to in-demand careers. Programs for many energy industry jobs are covered by the Idaho LAUNCH grants, such as HVAC technicians, refrigeration mechanics and installers, electrical engineers, electrical power-line installers and repairers, nuclear technicians, and more.[193]

3. Energy Sources

3.1 Hydroelectricity

Hydroelectricity is a carbon-free energy resource generated by using the force of moving water. Idaho has more than 140 generating hydroelectric power plants with a combined capacity of 2,704 MW, which makes Idaho the eighth-largest hydroelectric power producer in the nation.[194]

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[188] College of Eastern Idaho. "Energy Systems Technician." https://cei.edu/falcons/resources/programs/estec-packet.pdf http://www.cei.edu/programs-of-study/trades-industry/energy-systems-technician
[189] Idaho State University. "Energy Systems Technology and Education Center." https://www.isu.edu/estec/
[190] College of Western Idaho. "Advanced Mechatronics Engineering Technology." https://cwi.edu/program/advanced-mechatronics-engineering-technology
[191] Northwest Lineman College. https://lineman.edu/students-home/campuses/idaho/
[192] Kootenai Electric Cooperative. "Rathdrum Headquarters Update." https://www.kec.com/rathdrum-headquarters-update
[193] Idaho Launch. "About Launch." https://idaholaunch.com/about-launch/
[194] U.S. Energy Information Administration. "Where Hydropower is Generated." https://www.eia.gov/energyexplained/hydropower/where-hydropower-is-generated.php

Idaho's largest hydroelectric power projects are the 1,167 MW Hells Canyon Complex (consisting of the Hells Canyon, Oxbow, and Brownlee dams) owned by Idaho Power, the 400 MW Dworshak dam operated by the USACE, and the 260 MW Cabinet Gorge Project owned by Avista.[195] Depending on water supply, the actual output of energy produced by hydroelectricity may vary.

The flexible nature of hydroelectricity enables it to meet the fluctuating demands of the grid and mitigate losses of supply associated with intermittent resources such as wind and solar. Idaho's robust water resources allow for hydroelectricity to be a valuable baseload renewable energy resource that provides clean and reliable energy to the state. Hydroelectricity supplies about 49% of Idaho's in-state electricity and contributes to Idaho-based energy providers' ability to supply low-cost power to customers.[196]

In addition to providing clean and reliable energy, hydroelectric power plants also provide flood control, reliable irrigation for agriculture, and opportunities for recreation at reservoirs such as boating, fishing, and swimming throughout the state.

Figure 27: Swan Falls Dam

Built in 1901, Swan Falls Dam, located near Kuna, is the oldest dam on the Snake River. Swan Falls was constructed to provide power to mines in Silver City.[197] Today, Swan Falls generates approximately 27 MW.

3.2 Wind

Wind is a carbon-free energy resource that utilizes a turbine to harness power and generate electricity. Idaho's wind production grew 1,184% from 2008 to 2021.[198] Wind accounts for

[195] Idaho Governor's Office of Energy and Mineral Resources. "Hydroelectric." https://oemr.idaho.gov/sources/re/hydropower/
[196] U.S. Energy Information Administration. "Idaho: State Profile and Energy Estimates." https://www.eia.gov/state/?sid=ID#tabs-4
[197] Idaho Power. "Swan Falls Park." https://www.idahopower.com/community-recreation/recreation/parks-and-campgrounds/swan-falls-park/
[198] U.S. Energy Information Administration. "Electricity Data Browser." https://www.eia.gov/electricity/data/browser/#/topic/0?agg=1,0,2&fuel=008&geo=00000000008&sec=o3g&freq=A&start=2001&end=2021&ctype=linechart&ltype=pin&rtype=s&pin=&rse=0&maptype=0

approximately 17% of Idaho's electricity and is provided by nearly 550 wind turbines.[199,200] At the end of 2019, the wind industry directly employed over 500 Idahoans.[201]

Wind mapping studies estimate that Idaho has almost 213,000 MW of potential wind generation.[202] The Snake River Plain in southern Idaho represents the greatest wind resource potential in Idaho.[203] Projects developed on endowment lands create income for the Idaho State Endowment Fund, which funds schools and other state institutions. Annually, wind projects in the state generate approximately $13 million for local communities.[204]

To supplement wind's intermittent nature, storage and dispatchable resources, including hydroelectric, nuclear power, and natural gas-fired generators, must be ready to meet and/or supplement demand when wind generation is not available.

Figure 28*:* Fossil Gulch Wind Farm

3.3 Solar

Solar power is a carbon-free renewable energy resource that harnesses the abundant energy coming from the sun. Electricity can be produced either through photovoltaic (PV) solar cells, or through concentrated solar power (CSP). PV solar cells convert sunlight directly into electricity using solar plates stationed on an array angled towards the sun. CSP technologies reflect sunlight from mirrors and concentrate it onto receivers that convert the solar energy into heat. This

[199] U.S. Energy Information Administration. "Idaho Profile Analysis." https://www.eia.gov/state/analysis.php?sid=ID#:~:text=Idaho's%20electricity%20generation%20from%20utility,come%20online%20in%20mid%2D2024
[200] United States Geological Survey. "The U.S. Wind Turbine Database." https://eerscmap.usgs.gov/uswtdb/
[201] American Wind Energy Association. "AWEA Wind Energy in the United States." https://public.tableau.com/app/profile/american.wind.energy.association/viz/WindEnergyintheUnitedStates/AnnualReportViz
[202] Wind Exchange. "US Installed and Potential Wind Power Capacity and Generation." https://windexchange.energy.gov/maps-data/321
[203] U.S. Energy Information Administration. "Profile Analysis." https://www.eia.gov/state/analysis.php?sid=ID#88
[204] American Wind Energy Association. "AWEA Wind Energy in the United States." https://public.tableau.com/app/profile/american.wind.energy.association/viz/WindEnergyintheUnitedStates/AnnualReportViz

thermal energy can then be used to produce electricity via a steam turbine or to heat an engine that drives a generator.[205]

Utility-scale solar power generation in Idaho began in August 2016 and produced 0.2% of the total power generated in Idaho that year. As of September 2023, the total installed solar had grown to 825 MW, enough to power 106,928 homes. There are 43 total solar companies consisting of manufacturers, developers, installers, and other companies operating in Idaho that employ nearly 633 people.[206] In 2022, Idaho Power completed construction on the 120 MW Jackpot Solar plant, which is currently Idaho's largest solar project. Grand View PV Solar II, shown in Figure 29, is a 108 MW project in Elmore County, Idaho.

Solar energy can be used to heat water and residential and commercial buildings. There are two types of solar water heating systems, active and passive. Active solar water heating systems circulate liquid, either water or an anti-freezing heat-transfer fluid, through a series of pumps and controls located in pipes throughout a home. Passive solar water heating systems use the movement of hot water rising and cool water sinking to push water through a pipe system in the home without the use of pumps. Both types of systems need a storage tank for the water and solar panels to collect the heat.[207]

Figure 29: Grandview Solar Project II

3.4 Bioenergy

Bioenergy is renewable and derived from biological materials – or biomass. Biomass can include agricultural crop waste, animal and plant waste, algae, and wood products and can produce heat, electricity, and transportation fuels. It is produced from agricultural wastes and dedicated energy

[205] U.S. Department of Energy. "Solar Energy Technology Basics." https://energy.gov/eere/energybasics/articles/solar-energy-technology-basics
[206] Solar Energy Industries Administration. "Idaho Fact Sheet." https://www.seia.org/sites/default/files/2023-09/Idaho.pdf
[207] U.S. Department of Energy. "Solar Water Heaters." https://energy.gov/energysaver/solar-water-heaters

crops such as switchgrass and miscanthus. Poplar trees are particularly useful as biofuel sources because of their quick growth rate and high energy density.[208]

Wood waste biomass from Idaho forests provided about 3% of Idaho's electricity production in 2022.[209] Feedstock projections indicate that Idaho produces over 2.5 million metric tons of wood waste from forests, mills, and urban sources, respectively.[210] Idaho has three dedicated biomass production facilities and several research-based operations across the state.[211] Clearwater Paper, based in Lewiston generates roughly half of its energy through biomass and black liquor renewable biomass – black liquor is a by-product of paper mills. As of March 2023, Advanced Biofuels of Idaho partnered with a Kansas-based company to produce low-carbon-intensity, renewable natural gas (RNG) at its Magic1 facility in Heyburn. Expected to be completed in late 2024, Magic1 will convert 460,000 gallons of food and agricultural waste biomass and produce about 2,000 million BTU of RNG every day.[212]

As of 2023, Idaho has one operating ethanol plant in Burley capable of producing 60 million gallons of ethanol per year.[213] There is currently no commercial production of biodiesel in Idaho.

DOE's Bioenergy Technologies Office provides technical assistance, educational workshops, and cost sharing to help the citizens and companies of Idaho take advantage of local renewable biomass energy resources. Since 2005, DOE has awarded more than $77 million to national laboratory, university, and industrial partners in Idaho to research, develop, and deploy sustainable bio-based fuels and products.[214]

3.5 Geothermal

Geothermal energy is a renewable carbon-free energy resource derived from the heat within the sub-surface of the earth. Unlike intermittent resources, geothermal energy provides reliable baseload power generation because it can be utilized 24 hours a day, or whenever it is needed. An estimated 13,550 MW of untapped geothermal power exists in Idaho, much of it in the southern portions of the state.[215] Ormat Technologies manages Cassia County's 11 MW Raft River Enhanced Geothermal System Project, Idaho's only operating commercial geothermal

[208] Advanced Biofuels USA. "Poplar (Populus spp.) Trees for Biofuel Production." https://advancedbiofuelsusa.info/poplar-populus-spp-trees-for-biofuel-production/
[209] EIA. "Idaho." https://www.eia.gov/state/analysis.php?sid=ID#:~:text=About%20two%2Dfifths%20of%20Idaho%20is%20covered%20by%20forests.&text=Biomass%2C%20primarily%20wood%20waste%20from,generate%20electricity%20in%20the%20state.
[210] U.S. Department of Energy. "Benefits of Biofuel Production and Use in Idaho." https://www.energy.gov/sites/prod/files/2015/10/f27/idaho_biofuels_benefits.pdf
[211] EIA. "Monthly Biomass Fuel Report." https://www.eia.gov/biofuels/biomass/#dashboard
[212] Advanced Biofuels of Idaho. "Advanced Biofuels of Idaho Selects Navitas as EPC Contractor for Its Magic1 Biogas Facility." https://abidaho.com/news/2023/3/31/advanced-biofuels-of-idaho-selects-navitas-as-epc-contractor-for-its-magic1-biogas-facility-read-more
[213] EIA. "U.S. Fuel Ethanol Plant Production Capacity." https://www.eia.gov/petroleum/ethanolcapacity/
[214] U.S. Department of Energy. "Benefits of Biofuel Production and Use in Idaho." https://www.energy.gov/sites/prod/files/2015/10/f27/idaho_biofuels_benefits.pdf
[215] Geothermal Energy Association. "Geothermal Development Needs in Idaho." https://www.idahogeology.org/pub/Geothermal/References/Miscellaneous/Fleischman.2006_GeothermalReport.pdf

power plant.[216] Idaho is one of seven states with utility-scale electricity generation from geothermal energy.[217]

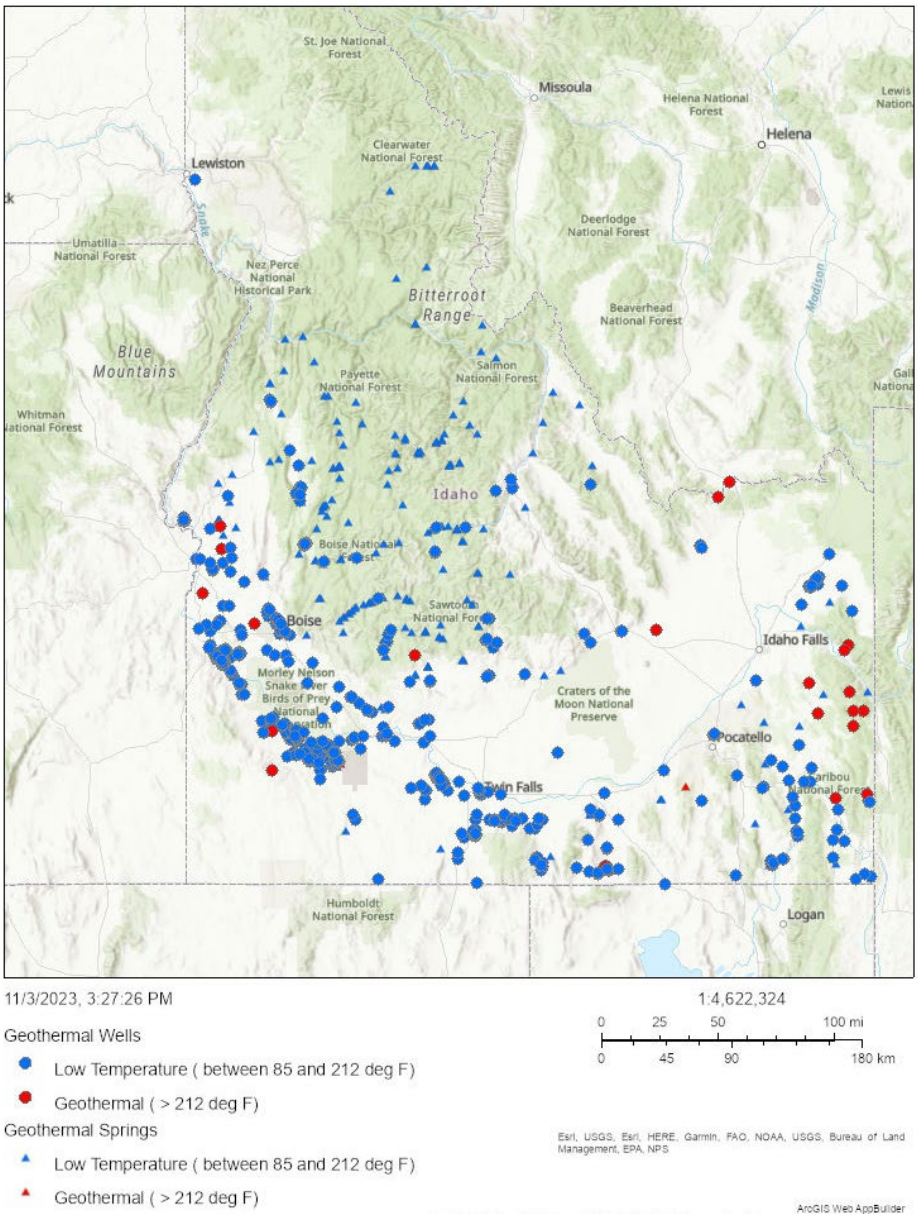
In addition to electric generation, direct use of geothermal waters is the oldest, most versatile, and most prevalent utilization of geothermal energy.[218] There are over 1,000 wells and 200 springs across Idaho. Geothermal wells are holes drilled to access subterranean geothermal resources, while geothermal springs are natural bodies of surface water heated by the earth's crust. Most of Idaho's geothermal potential lies in the southern half of the state. Wells that have a bottom hole temperature greater than 85 degrees Fahrenheit and less than 212 degrees Fahrenheit are designated as low-temperature geothermal (LTG) resource wells.[219] These LTG resources are used for space heating, aquaculture, greenhouses, and recreation throughout the state.

Idaho's capital city, Boise, is home to the nation's first geothermal district heating system, Warm Springs Heating District, which was built in the late 19th century and continues to service over 300 customers in the East End neighborhood of Boise.[220] The City of Boise's geothermal heating utility delivers naturally heated water through over 20 miles of pipeline to more than 6 million square feet of building space. Boise plans to expand by its geothermal system by 40% to help Boise achieve carbon neutrality by 2050.[221]

The Capitol Mall Geothermal Energy Project was completed in 1982 and continues to provide low-cost space and hot water heating to the Idaho State Capitol and eight other major state buildings. The Idaho Statehouse is the only geothermally-heated capitol building in the nation.

[216] Ormat. "Global Projects." https://www.ormat.com/en/projects/all/main/
[217] U.S. Energy Information Administration. "Profile Analysis." https://www.eia.gov/state/analysis.php?sid=ID#88
[218] U.S. Department of Energy. "Low Temperature Deep Direct-Use Program Draft White Paper." http://energy.gov/eere/geothermal/low-temperature-deep-direct-use-program-draft-white-paper
[219] Idaho Department of Water Resources. "Geothermal Resource Wells." https://idwr.idaho.gov/wells/geothermal-wells/
[220] Boise Warm Springs Water District. "About." https://bwswd.com/about/
[221] City of Boise. "Boise's Climate Action Roadmap." https://www.cityofboise.org/media/12984/boise-climate-roadmap.pdf

Figure 30: Geothermal Locations in Idaho[222]



3.6 Combined Heat and Power

Several Idaho facilities and industrial users have incorporated systems that generate on-site electricity and thermal energy in a process known as CHP. CHP is typically deployed at sites such as industrial operations and university or corporate campuses, which have high demand for electricity and hot water or steam. As of 2023, there are 21 CHP systems in Idaho with a capacity of 197 MW, predominantly used in wood product facilities, dairies, hotels, and large industrial food processors. Ten of Idaho's 21 CHP facilities utilize renewable fuels.[223]

[222] Idaho Governor's Office of Energy and Mineral Resources. "Direct Use." https://oemr.idaho.gov/sources/re/geothermal/
[223] U.S. Department of Energy Combined Heat and Power and Microgrid Installation Databases. "Combined Heat and Power Installations in Idaho." https://doe.icfwebservices.com/state/chp/ID

3.7 Nuclear

Nuclear energy is a carbon-free power source. Nuclear power contributes nearly 20% of electricity in the nation and is the largest source of clean energy in the U.S.[224] While no commercial nuclear power generation exists in Idaho today, the state receives some nuclear electricity from the Columbia Generating Station through BPA. Additionally, PacifiCorp's 2023 IRP outlines plans to acquire 500 MW of advanced nuclear through the Natrium reactor by 2030 and has plans to acquire an additional 1,000 MW of advanced nuclear resources over the next several years.[225] In 2021, 93 nuclear reactors in 28 states provided the most reliable and largest source of clean energy in the U.S., providing 790 billion kilowatt hours (kWh) of electricity.[226]

Idaho supports the responsible development of nuclear energy and has taken action to protect Idahoans from nuclear waste. The Idaho Settlement Agreement, implemented in 1995, agreed to allow the U.S. Navy and DOE to bring small amounts of spent nuclear fuel (SNF) into the state for 40 years. DOE agreed to not send certain types of SNF to the state and agreed to treat and permanently remove waste and SNF from Idaho. Governor Batt had three conditions for the settlement agreement: Idaho will not become a default waste repository, DOE must address the waste already in Idaho, and INL must become a viable national lab. Since the Idaho Settlement Agreement in 1995, five agreements have been reached. These include: the Agreement to Implement of 2008, the Navy Addendum of 2004, the Commercial Fuel Memorandum of Agreement of 2011, the Supplemental Agreement of 2018, and the Advanced Test Reactor (ATR) Agreement.[227]

INL, located in southeastern Idaho, is the nation's leading laboratory for nuclear energy research. INL is the birthplace of nuclear energy for electricity generation and for Navy nuclear propulsion and has influenced every reactor designed in the U.S. INL researchers are working on several initiatives, including advanced nuclear reactors such as microreactors and small modular reactors as well as integrated energy systems, that will help shape the future of nuclear energy worldwide.[228]

Advanced nuclear reactors (ANRs) represent the cutting edge in nuclear technology. ANRs are being designed to more quickly adjust their electricity output to match demand, helping them stabilize the grid in areas with a high volume of intermittent renewables. Additionally, many ANRs are safer by design and can operate without the need for safety-related backup electrical systems. ANRs will use a variety of coolants including water, molten salt, high temperature gas and liquid metal, and come in a wide range of MW output, from a few MWs to more than 1,000 MW (like traditional nuclear reactors). ANR applications are attractive to smaller utilities and for

[224] U.S. Department of Energy. "Nuclear." https://www.energy.gov/nuclear#:~:text=Nuclear%20power%2C%20the%20use%20of,the%20electricity%20generated%20in%20America.
[225] PacifiCorp. "2023 IRP." 2023_IRP_Volume_I.pdf (pacificorp.com)
[226] U.S. Department of Energy. "Five Fast Facts about Nuclear Energy (2021)." https://www.energy.gov/ne/articles/infographic-five-fast-facts-about-nuclear-energy-2020
[227] Idaho Governor's Office of Energy and Mineral Resources. "Nuclear." https://oemr.idaho.gov/sources/nuclear/
[228] Idaho National Laboratory. "About." https://inl.gov/about-inl/

isolated and distributed applications. Further, ANRs will offer a variety of benefits beyond electricity generation, such as water desalination, process heat and alternative fuels generation, and access to power beyond the grid. Some designs will also recover and recycle elements in used spent nuclear fuel that can still produce energy.[229]

Many advanced reactors are still in the development phase, which requires expensive research and testing before they can even begin to bring return on investment. Cost-sharing partnerships between the federal government and developers are working to ease the burden, such as access to INL's GAIN program.[230]

Figure 31: Nuclear Reactor Types[231]

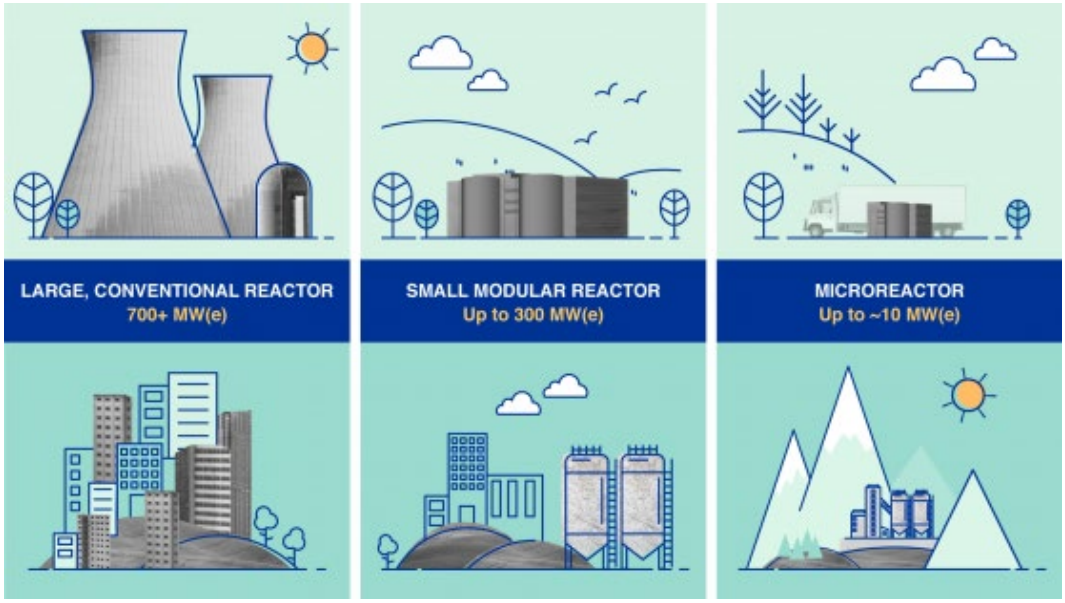


Figure 32: Idaho is Home to the First City Powered by Nuclear Energy

In 1951, the Experimental Breeder Reactor-I (EBR-1), located in Butte County, Idaho, became the first power plant to produce electricity using nuclear energy.[232] In 1955, the Borax III reactor powered Arco, Idaho, making it the first community in the world to receive all its electricity from a nuclear power plant.[233]

[229] Nuclear Energy Institute. "Advanced Nuclear". https://www.nei.org/fundamentals/advanced-nuclear#:~:text=Advanced%20nuclear%20reactors%20are%20being,temperature%20gas%20and%20liquid%20metal.
[230] Idaho National Laboratory. "GAIN". https://gain.inl.gov/SitePages/Home.aspx
[231] International Atomic Energy Agency. "What are Small Modular Reactors?" https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs
[232] Idaho National Laboratory. "Experimental Breeder Reactor-I." https://inl.gov/experimental-breeder-reactor-i/
[233] Visit Idaho. "A Road Tripper's Guide to the Peaks to Craters Scenic Byway." https://visitidaho.org/travel-tips/a-road-trippers-guide-to-the-peaks-to-craters-scenic-byway/

3.8 Natural Gas

Natural gas is utilized in Idaho to heat homes, power businesses, move vehicles, and serves as a key component in many industrial processes. More than half of Idaho households use natural gas as their primary energy source to heat their home.[234] Natural gas power plants can adjust generation in real-time in response to the ebbs and flows of electricity generated by intermittent resources. Advances in gas turbine design and natural gas-fired internal combustion engines have improved the operating flexibility of natural gas generation. Natural gas reserves were detected in the Payette Basin of western Idaho in 2010.[235] These discoveries led to Idaho's first commercial production of natural gas and natural gas liquids in 2015.[236] In 2022, Idaho produced 1,880 million cubic feet of natural gas.[237]

As a transportation fuel, natural gas is used as compressed natural gas (CNG) or as LNG. Both compression and liquefaction are methods to increase the amount of natural gas storage in the vehicle and thus increase driving range. RNG is an emerging resource essentially made of biogas, the gaseous product of the decomposition of organic matter. Like conventional natural gas, RNG is pipeline-quality gas that is fully interchangeable with conventional natural gas and can be used as a transportation fuel in the form of CNG or LNG. Furthermore, RNG qualifies as an advanced biofuel under the Renewable Fuel Standard.[238]

Idaho has two public CNG vehicle refueling stations, one in Boise and another in Nampa.[239] Some municipal and commercial fleets utilize natural gas and operate their own CNG refueling stations. There are no commercial RNG facilities in Idaho as of 2023.

3.9 Propane

Propane is used to heat homes and businesses throughout the state, particularly in rural areas. Residential propane prices in Idaho fluctuated between $2.28/gallon to $2.769/gallon as of October 2023.[240] Propane consumption is seasonal, with peak consumption in fall and winter.

Propane is also used as a transportation fuel, for which there are nine publicly available stations for refueling in Idaho.[241] As a transportation fuel, propane is most used in specialized medium-

[234] U.S. Energy Information Administration. "Idaho State Profile and Energy Estimates – Profile Analysis." https://www.eia.gov/state/?sid=ID
[235] Dunnahoe, Tayvis. "Idaho enters ranks of hydrocarbon producing states." Oil and Gas Journal (February 6, 2017). https://www.ogj.com/exploration-development/article/17229353/idaho-enters-ranks-of-hydrocarbon-producing-states
[236] U.S. Energy Information Administration. "Natural Gas Gross Withdrawals and Production, Gross Withdrawals, Annual, 2012-2017." https://www.eia.gov/dnav/ng/NG_PROD_SUM_DC_NUS_MMCF_A.htm
[237] Idaho Department of Lands. "2022 Annual Report." https://www.idl.idaho.gov/wp-content/uploads/sites/2/2023/01/IDL-AnnualReport-Digital-Spreads-01092023.pdf
[238] U.S. Department of Energy. "Alternative Fuels Data Center." https://afdc.energy.gov/fuels/natural_gas_renewable.html
[239] U.S. Department of Energy Alternative Fuels Data Center. "Natural Gas Fueling Station Locations." https://afdc.energy.gov/fuels/natural_gas_locations.html#/find/nearest?fuel=CNG
[240] U.S. Energy Information Administration. "Weekly Idaho Propane Residential Price (Dollar per Gallon)." https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPLLPA_PRS_SID_DPG&f=W
[241] U.S. Department of Energy. "Alternative Fuels Data Center." https://afdc.energy.gov/fuels/propane_locations.html#/find/nearest?fuel=LPG

duty and heavy-duty vehicles with engines capable of running on liquified petroleum gas. DEQ's VRP has provided funding for several propane school buses.[242]

3.10 Petroleum

Due to Idaho's rural nature, petroleum is a vital commodity to nearly every aspect of Idahoans' lives. Petroleum products include gasoline, diesel, and aviation fuel and are used in transportation, electricity production, and heating. See Section 1.2 for more information about petroleum infrastructure in Idaho.

3.11 Hydrogen

Hydrogen is the most abundant element in the universe. Today, hydrogen is commonly used in industrial aerospace operations, electricity generation, and vehicle transportation. Hydrogen can be blended in natural gas lines and combusted with natural gas, providing similar thermal output with lower carbon impact. While Idaho utilities do not currently utilize hydrogen, Idaho Power aims to add 340 MW of hydrogen power generation to two natural-gas-fired electricity plants by 2037.[243, 244]

Hydrogen has the potential to decarbonize several industries, including naval operations, aviation, transportation, and large industry. In 2022, DOE established a grant program to create regional hydrogen hubs. This initiative strives to motivate domestic demand for hydrogen technologies. In October 2023, DOE selected the Pacific Northwest Hydrogen Association's PNWH2 Hub for funding negotiations. The PNWH2 Hub could receive up to $1 billion over 9 years and is expected to create over 10,000 jobs in the region.[245]

3.12 Coal

Idaho has no in-state utility-scale coal-fired power plants. However, Idaho utilities hold ownership shares in coal-fired power plants located in neighboring states. One sugar beet processing plant in Twin Falls utilizes coal for its refining operations.[246]

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[242] United States Environmental Protection Agency. "School Bus Rebates: Diesel Emissions Reduction Act (DERA)." https://www.epa.gov/dera/rebates

[243] U.S. Energy Information Administration. "Hydrogen Explained." https://www.eia.gov/energyexplained/hydrogen/use-of-hydrogen.php

[244] Idaho Power Company. 2023 Integrated Resource Plan. https://docs.idahopower.com/pdfs/AboutUs/PlanningForFuture/irp/2023/2023-irp-final.pdf.

[245] Washington State Department of Commerce. "US Dept. of Energy Selects Pacific Northwest for Regional Clean Hydrogen Hub." https://www.commerce.wa.gov/news/us-dept-of-energy-selects-pacific-northwest-for-regional-clean-hydrogen-hub/

[246] U.S. Energy Information Administration. "Idaho State Profile and Energy Estimates." https://www.eia.gov/state/analysis.php?sid=ID&CFID=19979425&CFTOKEN=6ac60633ec26f3b3-9C7FAA90-237D-DA68-24023FFD41A835EC&jsessionid=8430bccceb80dc2263757c222e31663d5a40#112

4. Energy Efficiency and Energy Technologies

4.1 Energy Efficiency

Conservation, energy efficiency, and demand response are energy saving and economic strategies that can be utilized to meet the energy needs of customers. Conservation refers to personal actions that reduce the use of energy, for example turning the lights off when leaving a room. Energy efficiency is the utilization of technology that consumes less electricity while providing sufficient service. For example, switching from incandescent light bulbs to LEDs. Implementing energy efficiency measures in buildings provides many potential benefits such as: saving money on utility bills, reducing maintenance costs, increasing comfort levels for occupants, and increasing energy resiliency for the community. Demand response refers to customers temporarily altering energy consumption during times of higher demand for electricity, usually in response to signals from the utility or grid operator. Collectively, these resources are often referred to as DSM. DSM resources offset future energy loads by reducing energy demand through energy efficiency or demand response.

The PUC directs IOUs to conduct cost-effective conservation, energy efficiency, and demand response programs.[247] Each IOU calculates the level of cost-effective efficiency potential in their IRP and offers a suite of efficiency programs for customers, as mentioned throughout Section 1.4. Cost-effectiveness is realized when the lifecycle energy, capacity, transmission, distribution, and other quantifiable savings to Idaho residents and businesses exceeds the direct costs of the measure to the utility and participant. Cost-effective energy measures provide economic benefits to Idaho utilities by increasing the capacity for energy within their system to meet future energy demands.

Energy efficiency technologies have significantly improved over the past several decades. Today, there are many ways that people and businesses can save money and energy, see Table 1 for examples.

Table 1: Energy Efficiency Sector & Technologies[248]

Residential	• High-efficiency home heating, ventilation, and air conditioning (HVAC) systems • Insulation • Efficient appliances
Commercial	• Efficient consumer electronics • Commercial refrigeration • LED lighting with sensors
Industrial	• Fuel-efficient motors

[247] Idaho Public Utilities Commission. "CASE NO. IPC-E-1O-27, ORDER NO. 32245." www.puc.idaho.gov/fileroom/cases/elec/IPC/IPCE1027/ordnotc/20110517ORDER_NO_32245.PDF

[248] United States Agency International Development. "Overview of Energy-Efficient Technologies." https://www.usaid.gov/energy/efficiency/basics/technologies

	• Enhancements to the building envelope (e.g. roof, siding, windows)
Agriculture	• Efficient pumps and motors
Transportation	• Fuel economy standards • Fuel-saving tire design

The State of Idaho administers several energy efficiency programs, most are administered by OEMR and are covered in Appendix B.

Figure 33: Government Leading by Example Program (GLBE)

Rural cities and counties participating in GLBE receive an energy audit. Then, participants may be eligible for cost share for retrofits. Past participants include public K-12 schools, community centers, libraries, wastewater treatment facilities, city halls, county museums, and emergency service buildings. In 2016, Lava Hot Springs completed a weatherization and insulation project at their fire station.

4.2 Energy Technologies

Smart Grid

Across the country, the grid is aging and reaching capacity. Modernizing the grid to make it "smarter" and more resilient through use of cutting-edge technologies, equipment, and controls that communicate and work together to deliver electricity more reliably and efficiently can reduce the frequency and duration of power outages, reduce storm impacts, and restore service faster when outages occur. Smart grid technologies are made possible by two-way communication technologies, control systems, and computer processing. These advanced technologies include advanced sensors that allow operators to assess grid stability, advanced digital meters that give consumers better information and automatically report outages, relays that sense and recover from faults in the substation automatically, automated feeder switches that re-route power around problems, and batteries that store excess energy and make it available later to the grid to meet customer demand.[249]

Emerging smart grid technologies could make it possible for consumers to individually balance their energy supply and demand. Allowing consumers to adjust electricity use in response to available supplies and costs could enhance the capacity and flexibility of the power system and may have a significant impact on Idaho's grid.

[249] U.S. Department of Energy. "Grid Modernization and the Smart Grid." https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid

Distributed Energy Resources

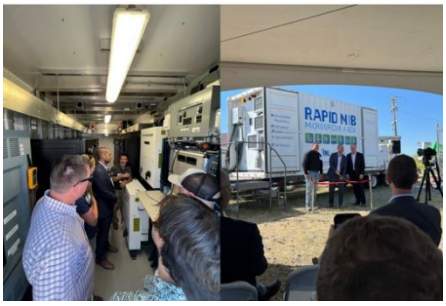
Distributed energy resources (DERs), also called on-site, dispersed, or decentralized generation, are small power sources that can be combined to provide power to satisfy demand.[250] Typically producing less than 10 MW, such sources can include micro-turbines, small natural gas-fueled generators, CHP plants, battery storage, biomass, wind and solar thermal or PV installations. The use of DERs is becoming common due to the potential for affordable renewable energy, and an increased desire for grid resiliency, largely motivated by increased occurrences of natural disasters such as storms and wildfires.[251] Complex and expensive integration upgrades and power-balancing mechanisms will be required as use of DERs increases.[252]

RTOs/ISOs are required to open their electricity markets to participation by aggregated DERs. To comply, each RTO/ISO must file with FERC tariff provisions that establish market rules addressing specific technical and operational details impacting market participation by DER aggregations.[253]

Microgrids

A microgrid is a group of interconnected loads and DERs within clearly defined electrical boundaries that acts as a single controllable entity. A microgrid can connect and disconnect from the grid as needed.[254] Microgrids are an emerging technology that optimizes access to reliable, clean, and resilient energy through local, interconnected energy systems that incorporate loads, decentralized energy resources, battery storage, and control capabilities.

Figure 34: Microgrid in a Box Demonstration



In July 2023, INL celebrated the deployment of their new mobile "Microgrid in a Box" at the Fall River Electric Cooperative Hydropower Plant near Felt, Idaho. The Microgrid in a Box has "blackstart" capabilities which is the process of restarting and energizing power generation units, transmission, and distribution systems to restore electricity after a blackout or widespread power disruption.[255] Microgrid technology such as Microgrid in a Box can enhance the resiliency of critical facilities and communities with limited resources.

[250] Electric Power Research Institute. "The Integrated Grid: Realizing the Full Value of Central and Distributed Energy Resources 2014." https://www.epri.com/#/pages/product/3002002733/?lang=en-US
[251] North American Electric Reliability Corporation. "Distributed Energy Resources: Connection Modeling and Reliability Considerations." https://www.nerc.com/comm/Other/essntlrlbltysrvcstskfrcDL/Distributed_Energy_Resources_Report.pdf
[252] NERC. "Distributed Energy Resources Connection Modeling and Reliability Considerations." https://www.nerc.com/comm/Other/essntlrlbltysrvcstskfrcDL/Distributed_Energy_Resources_Report.pdf
[253] Advanced Energy Economy. "Opening the Door to DERs." https://info.aee.net/hubfs/Order%202222%20Explainer%20final.pdf
[254] U.S. Department of Energy. "The U.S. Department of Energy's Microgrid Initiative." https://www.energy.gov/sites/prod/files/2016/06/f32/The%20US%20Department%20of%20Energy's%20Microgrid%20Initiative.pdf
[255] Idaho National Laboratory. "New Tech Brings Resilience to Small-town Hydropower." https://inl.gov/water-power/new-tech-brings-resilience-to-small-town-hydropower/

Electric Vehicles

EVs are vehicles that run on batteries powered by electricity rather than an internal combustion engine which typically runs on petroleum. EV adoption is increasing rapidly across the country as advancements in technology have improved battery performance and range. Moreover, many Idaho organizations, such as Boise State University, are transitioning to electric fleet vehicles. As of 2022, Idaho had a total of 6,213 EV and 2,032 plug-in hybrid vehicles registrations statewide.

Figure 35: EVs Showcased at ChargeWest Event in Island Park, Idaho

There are three "levels" of EV charging. EVs can be charged overnight via common 120-volt outlets, also called Level 1 charging. Level 2 charging stations have a 240-volt capacity, which can be installed at residences, businesses, or fleet locations to charge at a faster rate (about 3-5 hours for a full charge).[256] Lastly, direct current fast chargers (DCFC) require a specialized, 480-volt outlet and can provide a full charge after 20-30 minutes. Level 1 and 2 chargers are better suited to day-to-day use and DCFC are best suited for long range road trips.[257] As of 2022, Idaho has 164 EV station locations and 419 EVSE ports available to the public.[258]

[256] U.S. Department of Energy. "Electric Vehicles: Charging at Home." https://www.energy.gov/eere/electricvehicles/charging-home
[257] U.S. Department of Energy. "Electric Vehicles: Vehicle Charging." https://energy.gov/eere/electricvehicles/vehicle-charging
[258] U.S. Department of Energy. "Electric Vehicle Charging Station Locations Idaho." https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?fuel=ELEC

Figure 36: DCFC at the Idaho Science Center in Arco, Idaho.

The Volkswagen Clean Air Act Civil Settlement enabled the state of Idaho to allocate $2.6 million to provide incentives for entities to deploy EVSE. Throughout 2017-2022, Idaho's EVSE Program provided cost-share funds for the deployment of public DCFC equipment along Idaho's major travel corridors. Intotal, twelve sites were selected in Lewiston, Hailey, Bonners Ferry, Coeur d'Alene, Sagle, McCall, Ashton, Driggs, Kamiah, Grangeville, Arco, and Island Park.

Energy Storage

Energy storage technologies provide the ability to store energy for use at later times, adding enhanced control, reliability, and resiliency to the grid. In 2023, ISEA published the Utility-scale Storage Task Force serve as a resource to aid in the understanding of both existing and future opportunities for utility-scale energy storage in the state of Idaho.[259] In 2022, the U.S. had 31.6 GW of installed energy storage.[260] Approximately 96% of existing storage is pumped-hydroelectric storage. [261] Energy storage is important as the grid incorporates intermittent energy resources such as wind and solar.

While there is new research and development in energy storage, some technologies are widely deployed to provide added resilience and reliability to the grid. Common storage technologies include mechanical (pumped-storage hydroelectric power and compressed air), electrochemical (lithium-ion batteries, flow batteries, and hydrogen), and thermal.

Energy storage can play a key role in providing overall grid security and resilience, while allowing critical infrastructure, hospitals, police stations, and essential services to remain operational during emergency situations. There are federal programs that promote the adoption of additional energy storage in the U.S. for resiliency purposes at critical facilities. While the cost of energy storage infrastructure is significant, more affordable utility-scale storage systems are under development.[262]

[259] Idaho Governor's Office of Energy and Mineral Resources. "ISEA Utility-Scale Storage Task Force Report." https://oemr.idaho.gov/wp-content/uploads/ISEA-Utility-Scale-Storage-Task-Force-Report_FINAL.pdf
[260] University of Michigan Center for Sustainable Systems. "U.S. Grid Energy Storage." https://css.umich.edu/sites/default/files/2023-10/U.S.%20Energy%20Storage_CSS15-17.pdf
[261] University of Michigan Center for Sustainable Systems. "U.S. Grid Energy Storage." https://css.umich.edu/sites/default/files/2023-10/U.S.%20Energy%20Storage_CSS15-17.pdf
[262] U.S. Department of Energy: Office of Electricity. "Energy Storage." https://www.energy.gov/oe/activities/technology-development/energy-storage

Battery Storage: Battery storage can store excess energy at residential, commercial, and utility scales. Energy storage batteries work similarly to smaller batteries used in our everyday lives but have much greater storage capacities. Battery storage technology is rapidly growing and evolving due to scalability and accessibility. Projections show an estimated 30 GW of battery storage by 2025.[263] Battery projects typically range from 10 kWh to 10 MWh. Small-scale batteries are being added to residential solar systems by the nation's leading solar installers. A fast-growing trend is utility-scale hybrid generation plants which combine renewable energy with on-site storage, offering increased stability and flexibility to the grid. In 2020, 36% of solar project that connected to the grid were paired with batteries.[264]

Batteries usually have short- to mid-range response times of seconds to hours. There are two categories of batteries used for energy storage, solid-state and flow batteries. Solid-state batteries utilize solid chemical compounds for varying grid services while flow batteries utilize chemical compounds that are dissolved in liquid within the battery to create a reaction that produces electricity. Typical solid-state battery types include the widely adopted lithium-ion and sodium-ion, but hybrid batteries and flow or redox flow batteries with a wide range of chemistries are becoming increasingly popular. Research continues across all battery storage types.[265]

Thermal Storage: Thermal storage traps energy temporarily in the form of heat or cold which allows the energy to be turned into electricity later. An example of this at utility-scale includes solar thermal power plants that use molten salt or other heat-retaining substances to store the sun's energy, which can be utilized later in steam generating processes.[266]

Mechanical Storage: Mechanical storage systems use kinetic or gravitational forces to store energy. One example of a mechanical storage system is the flywheel, a device in which rotational energy is stabilized and maintained through movement of an accelerating wheel that can then store the energy kinetically for future use. A generator is then applied to easily convert the stored energy from mechanical to electrical energy.[267]

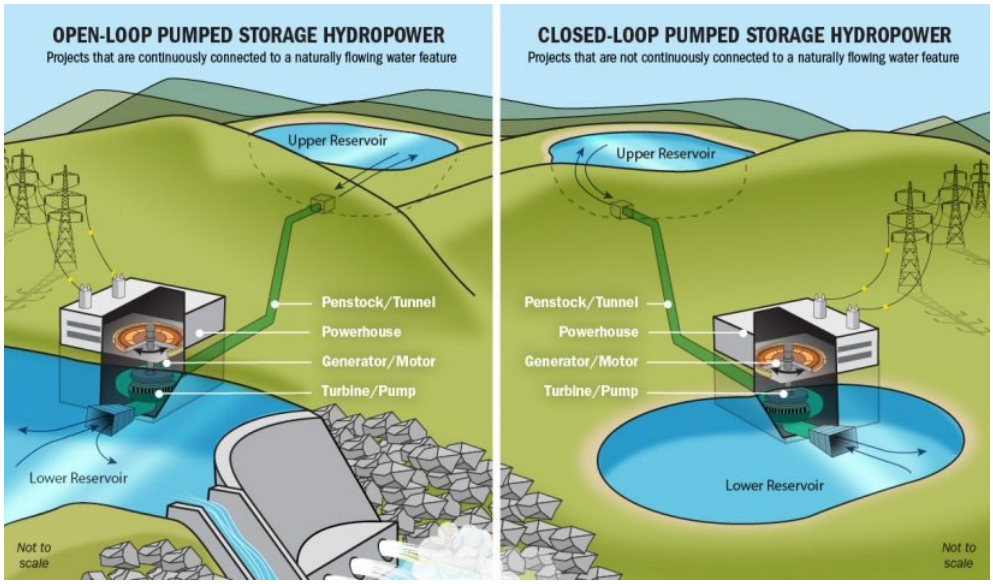
Another example of mechanical storage is pumped hydroelectric storage. Pumped hydroelectric storage facilities, commonly referred to as pumped-hydro or pumped-storage, store energy by utilizing excess electricity when energy demand is low and pumping water from a lower to a

[263] U.S. Energy Information Administration. "U.S. Battery Storage Capacity will Increase Significantly by 2025." https://www.eia.gov/todayinenergy/detail.php?id=54939
[264] Lawrence Berkeley National Lab. "Keep it short: Exploring the impacts of configuration choices on the recent economic of solar-plus-battery and wind-plus-battery hybrid energy plants." https://eta-publications.lbl.gov/sites/default/files/doe_webinar_hybrid_configuration_briefing_final.pdf
[265] Energy Storage Association. "Batteries." https://energystorage.org/why-energy-storage/technologies/solid-electrode-batteries/
[266] Energy Storage Association. "Thermal Energy Storage." https://energystorage.org/why-energy-storage/technologies/thermal-energy-storage/
[267] Energy Storage Association. "Mechanical Energy Storage." https://energystorage.org/why-energy-storage/technologies/mechanical-energy-storage/

higher reservoir to be released through turbines when energy demand is high. Additionally, pumped hydroelectric storage provides added reliability or ancillary services.[268]

Much of the pumped hydroelectric storage infrastructure across the nation emerged during the 1970s. Pumped hydroelectric storage projects range from 10 MWh to 10 GWh. As of 2021, the U.S. electricity system had about 24 GW of energy storage, 23 GW of which is pumped hydroelectric storage.[269]

Figure 37: Pumped Hydroelectric Storage[270]



Hydrogen Storage: Electricity can be converted into hydrogen, which can be stored and re-electrified. This can occur in fuel cells or through burning in combined cycle gas power plants. Small amounts of hydrogen can be stored in pressurized vessels and large amounts of hydrogen can be stored in constructed underground salt caverns. Electrolysis can mitigate the grid impacts associated with excess wind or solar production, including seasonal-scale variations.[271] Hydrogen projects range in size from 1 GWh to 1 TWh.

Like pumped-storage, hydrogen storage relies on using energy when demand is low (or generation is particularly high) to power an electrolysis mechanism and ultimately create hydrogen. Hydrogen has a multitude of uses once it is created. Hydrogen can be used in fuel cells, power generation, natural gas blending, or stored as compressed gas. Hydrogen can be stored for long periods of time and in very large quantities.

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[268] Energy Storage Association. "Pumped Hydropower." https://energystorage.org/why-energy-storage/technologies/pumped-hydropower/
[269] Office of Energy Efficiency and Renewable Energy. "U.S. Hydropower Market Report." https://www.energy.gov/eere/water/events/key-industry-trends-us-hydropower-overview-2021-edition-us-hydropower-market
[270] U.S. Department of Energy. "Pumped Storage Hydropower." https://www.energy.gov/eere/water/pumped-storage-hydropower

5. Minerals

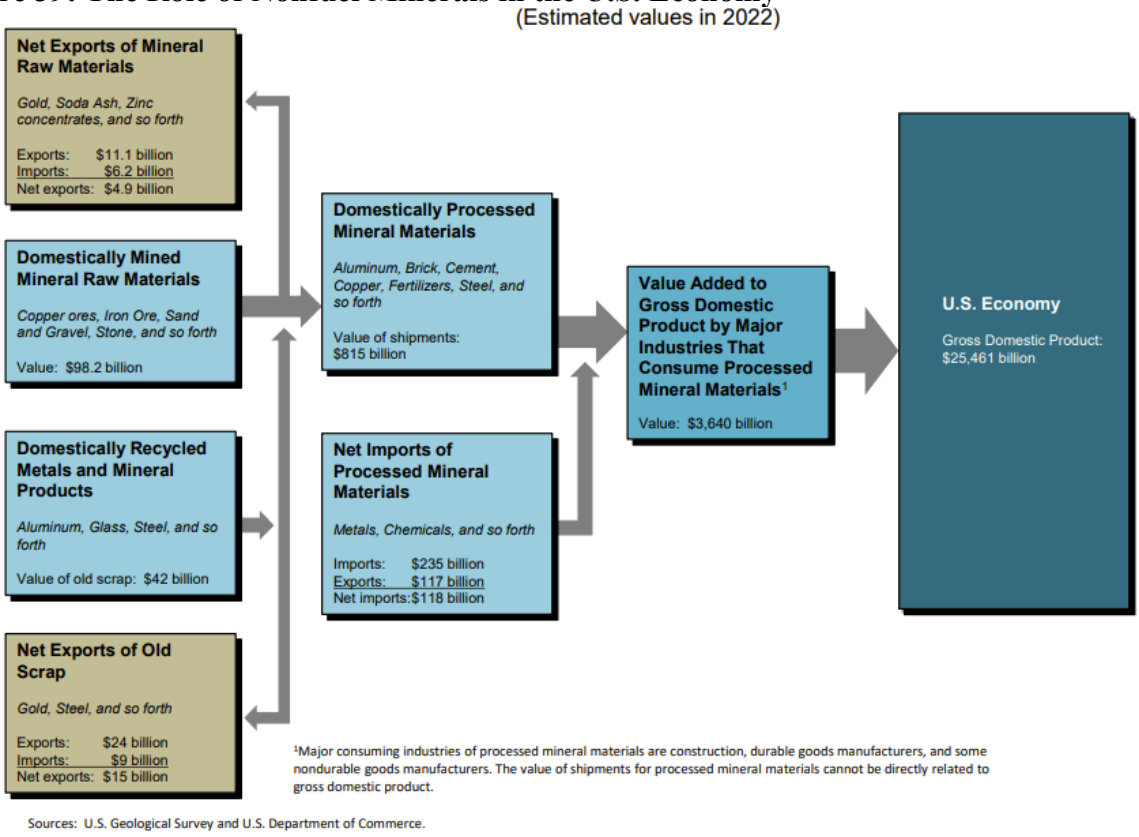
Minerals play an important role in the development of energy technologies. Idaho is home to a wealth of different minerals that are integral to everyday life and to the advancement of modern science. Idaho's mining legacy has shaped the settlement of the state, brought worldwide recognition to Idaho's natural resources, and continues to provide domestically sourced raw materials to advance modern technology. The essential application of minerals bolsters the economy, innovation for the future, and national security.

Figure 38: Thompson Creek Mine[272]

In 2022, mining, quarrying and oil/gas extraction contributed $850 million to Idaho's GDP.[273] Currently mining in Idaho supports over 15,000 direct and indirect jobs.[274] Direct mining jobs require highly specialized engineering and skilled labor, in addition to administrative support workers and transportation workers. As demand for domestically sourced raw materials increases, the mining industry will need a skilled and diverse workforce to meet the needs of the country's increased standard of living.

[272] Photo courtesy of Centerra Gold.
[273] U.S. Bureau of Economic Analysis. "SAGDP2N Gross domestic product (GDP) by state: Mining, quarrying, and oil and gas extraction.
https://apps.bea.gov/itable/?ReqID=70&step=1&acrdn=1&_gl=1*ziatdx*_ga*NjUxNDg4NTI0LjE2OTkwNTExNTk.*_ga_J4698JNNFT*MTY5OTA1MTIyOS4xLjEuMTY5OTA1MTI3OC4wLjAuMA..#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyOSwyNSwzMSwyNiwyNywzMF0sImRhdGEiOltbIlRhYmxlSWQiLCI1MDUiXSxbIk1ham9yX0FyZWEiLCIwIl0sWyJTdGF0ZSIsWyIwIl1dLFsiQXJlYSIsWyIxNjAwMCJdXSxbIlN0YXRpc3RpYyIsWyI2Il1dLFsiVW5pdF9vZl9tZWFzdXJlIiwiTGV2ZWxzIl0sWyJZZWFyIixbIjIwMjIiXV0sWyJZZWFyQmVnaW4iLCItMSJdLFsiWWVhcl9FbmQiLCItMSJdXX0=."
[274] National Mining Association. "Economic Impact of Mining – Idaho." https://nma.org/map/idaho/

Figure 39: The Role of Nonfuel Minerals in the U.S. Economy[275]



Minerals in Energy Technology

Conductive metals are used in electronic components for modern technologies. As renewable energy technology advances, demand for minerals is rapidly increasing. For instance, copper is used in the wiring of solar panels and is a critical component to function for wind turbines. Manganese is used as a steel alloy in the power-storing batteries for hybrid and EVs. Rare-earth elements are requisite for electronics such as smartphones, tablets, and nuclear reactor components.

Idaho has a reserve of naturally occurring raw critical minerals which contributes to the integrity of the national economy and plays an integral role in domestic supply chains, especially in light of federal Buy America requirements. In 2022 the DOI, through the U.S. Geological Survey, released a list of minerals deemed critical to national security for the U.S. This list changes with time as supply and society's needs shift. Idaho is home to many of these critical minerals, notably cobalt. Additionally, deposits of critical minerals, such as antimony are in the permitting and exploration process.[276]

[275] U.S. Geological Survey. "Mineral Commodity Summaries 2023." https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf
[276] U.S. Geological Survey. "U.S. Geological Survey Releases 2022 List of Critical Minerals". https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals#:~:text=The%202022%20list%20of%20critical%20minerals%20includes%20the,ceramics%2C%20glass%2C%20metallurgy%2C%20and%20polishing%20compounds%20More%20items

Minerals are also vital for the development of EVs. Lithium, cobalt, and nickel are used in the lithium-ion batteries and the wiring that power EVs. As EV adoption rapidly increases, policy for the sources and supply chains of minerals will continue to develop.

Minerals in Manufacturing

Minerals are one of the most important raw materials used in manufacturing. For instance, platinum is used in over 20% of manufactured goods. In order to produce more manufactured goods domestically, more minerals and metals are needed to supply that demand. Aluminum, iron ore, steel, and titanium are fundamental components of most metallic manufactured goods. In 2022, mined materials contributed $3.64 trillion in value to the U.S. economy (GDP).[277]

Minerals in Construction

Sand and gravel are the basic building blocks for all construction materials. Aggregate is used to pave roadways, create concrete building foundations, and serves important environmental functions like drainage for stormwater. Natural aggregates (construction sand and gravel and crushed stone) make up the largest component of nonfuel mineral materials consumed in the U.S.[278] Concrete is essential for the construction and long-term reliability of energy projects. Mineral materials used in construction are important to Idaho's construction industry, which employs nearly 88,000 Idahoans in 2021.[279]

Minerals in Agriculture

Minerals and agriculture share a common interest: fertilizer. Mineral fertilizer is essential to the productivity of farmland as the balance of minerals in soil is required for the growth and development of plant life. Phosphorus, calcium, and sulfur are some of the most common nutrient elements used for plant growth. Southeastern Idaho is home to one of the largest sources of phosphate ore in the U.S. This industry alone has contributed nearly $500 million to Idaho's economy and has distinguished itself as the largest mineral industry in the state.[280] Calcium is mined primarily from limestone deposits in Idaho. Small sulfur deposits throughout the state also contribute to the agricultural industry in Idaho.

[277] U.S. Geological Survey. "Mineral Commodity Summaries 2023." https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf
[278] U.S. Geological Survey. "Materials in Use in U.S. Interstate Highways." https://pubs.usgs.gov/fs/2006/3127/2006-3127.pdf
[279] University of Idaho Extension Indicators. "Idaho: Employment by Industry." http://indicatorsidaho.org/DrawRegion.aspx?RegionID=16000&IndicatorID=17
[280] Idaho Geological Survey. "Idaho Mining and Geology." https://www.idahogeology.org/pub/GeoNotes/geonote_40.pdf

Appendix A: List of Idaho Electric and Natural Gas Utilities

Investor-Owned Utilities

Avista Utilities	800-227-9187
Dominion Energy (formerly Questar)	800-323-5517
Idaho Power Company	800-488-6151
Intermountain Gas	800-548-3679
Rocky Mountain Power	888-221-7070

Municipal Electric Utilities

Albion Light and Water Plant	208-673-5352
Bonners Ferry Light and Water	800-626-4950
Burley Electric Department	208-878-2224
Declo Municipal Electric Department	208-654-2124
Heyburn Electric Department	208-679-8158
Idaho Falls Power	208-612-8280
Minidoka Electric Department	208-531-4101
Plummer Electric Department	208-686-1641
Rupert Electric Department	208-436-9600
Soda Springs Electric Light and Power	208-547-2600
Weiser Electric Department	208-414-1964

Rural Electric Cooperatives

Bonneville Power Administration	800-282-3713
Atlanta Power	208-459-7014
Clearwater Power	888-743-1501
East End Mutual Electric	208-436-9047
Fall River Rural Electric	800-632-5726
Farmers Electric	208-436-6384
Idaho County Light and Power	877-212-0424
Inland Power and Light	800-747-7151
Kootenai Electric Cooperative	800-240-0459
Lost River Electric Cooperative	208-588-3311
Lower Valley Energy	800-882-5875
Northern Lights Incorporated	800-326-9594
Missoula Electric Cooperative	800-352-5200
Raft River Rural Electric	800-342-7732
Riverside Electric Cooperative	208-436-3855
Salmon River Cooperative	208-879-2283
South Side Electric	208-654-2313
United Electric Co-Op Inc.	208-679-2222
Vigilante Electric Cooperative	800-221-8271

Appendix B: OEMR Programs

Idaho Energy Resiliency Grant Program
The Idaho Energy Resiliency Grant Program (ERGP) fosters strategic investments that demonstrate measurable improvements to grid resiliency, deliver modernized grid infrastructure, and mitigate risks from increased electrification and disruptive events. ERGP funding is available to electric grid operators, electricity storage operators, electricity generators, transmission owners and operators, distribution providers, and fuel suppliers as a subaward pursuant to Section 40101(d) of the Bipartisan Infrastructure Law (BIL) – Preventing Outages and Enhancing the Resilience of the Electric Grid Formula Grants to States and Indian Tribes. OEMR closed Round 1 applications in December 2023. OEMR will solicit Round 2 applications.

Idaho Energy Efficiency and Conservation Block Grant Program
The Idaho Energy Efficiency and Conservation Block Grant program (Idaho EECBG) provides competitive subawards of up to $100,000 to rural cities and counties to enable local governments to promote energy efficiency and conservation practices while continuing to meet the needs of its growing communities, reducing tax burdens, and keeping energy rates low. Section 40552 of the BIL provides federal formula grants to states to support subgrant funding opportunities for local governments. The Idaho EECBG application closes on January 17, 2024.

State Energy Loan Program
The State Energy Loan Program is one of OEMR's longest running and most utilized programs. Since the 1980's, the State Energy Loan Program has offered low-interest loans to develop energy projects for homes and businesses located within Idaho. Eligible projects under the State Energy Loan Program include:

- HVAC replacement
- Efficient lighting
- Insulation
- Windows
- Weatherization
- Appliances
- Renewable energy projects

Loan amounts range between $1,000-$30,000 for single-family homes. A loan cannot be provided for energy retrofits that have already been performed or to complete new construction. All loans are evaluated by a financial institution for creditworthiness and must be secured by real estate. All loan applicants are charged a credit analysis fee of $100 for single-family home loans. Consumers may choose to leverage loans by accessing utility incentives and federal and state tax credits and deductions, if available. Applications will reopen in Summer 2024.

Government Leading by Example Program
GLBE provides financial assistance to rural communities to conduct energy audits to discover potential efficiency upgrades within publicly owned facilities and save taxpayer dollars. OEMR continues to work with The University of Idaho's Integrated Design Lab. The Integrated Design

Lab conducts a Level 1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) energy audit.

Upon completing the energy audit, the Integrated Design Lab, the applicant, and OEMR meet to discuss energy efficiency upgrades. Depending on the recommendations and the cost, OEMR may offer the applicant cost-share to complete retrofits for the publicly owned building. Energy upgrades eligible for cost-share include:

- Building weatherization
- Lighting retrofits
- Insulation replacement/ upgrade
- Heating/Cooling unit replacement/ upgrade
- HVAC system repair
- Room/attic ventilation

Applications are accepted year-round.

Idaho Awards for Leadership in Energy Efficiency
The Idaho Awards for Leadership in Energy Efficiency Program recognizes Idaho businesses, industrial facilities and government organizations for their achievements in reducing their energy consumption and energy costs. Organizations are recognized for minimizing their energy use through operational processes and behavioral actions and/or upgrading structures within their facilities with more cost-effective and efficient technologies. There are three classifications – small business, large business, and government entities – and four geographic regions: north, central, southwest, and southeast. An award in each category is issued in each region. Applications are evaluated on the two most recent year's total electric energy use, gas energy use, and physical and/or programming changes. From the applications received, one application is selected to receive the Governor's Award for Leadership in Energy Efficiency. This award is given to a single applicant that has demonstrated outstanding efforts to significantly reduce their energy use over the past year. Applications will reopen in Spring 2024.

National Electric Vehicle Formula Program
The NEVI Program was enabled through the BIL and established by the FHWA to provide states with federal funding to strategically deploy EV direct current fast charging stations (DCFC) and establish an interconnected network of EV charging across the U.S. Throughout Fiscal Year 2022-2026, Idaho will receive approximately $29 million to install DCFC along designated Alternative Fuel Corridors and in rural and disadvantaged areas. OEMR, ITD, and DEQ are developing a Siting, Feasibility, and Access Study to inform the strategic buildout of charging infrastructure and will release Request for Applications for DCFC sites in Lewiston, Bliss, and Pocatello in early 2024.

Glossary

Average Megawatt (aMW): An average megawatt is the amount of electricity produced by the continuous production of one megawatt over a period of one year. The term, sometimes also called average annual megawatt, defines power production in megawatt increments over time. Because there are 8,760 hours in a year, an average megawatt is equal to 8,760 megawatt-hours.

Avoided cost: The cost to produce or otherwise procure electric power that an electric utility does not incur because it purchases this increment of power from a qualifying facility (QF). It may include a capacity payment and/or an energy payment component.

Baseload: The minimum amount of electric power or natural gas delivered or required over a given period at a steady rate. The minimum continuous load or demand in a power system over a given period.

Baseload plant: A plant that is normally operated to take all or part of the minimum continuous load of a system and that consequently produces electricity at an essentially constant rate. These plants are operated to maximize system mechanical and thermal efficiency and minimize system operating costs. Traditionally, coal, nuclear plants and some high efficiency natural gas plants have been considered baseload plants. Baseload plants are also required to firm intermittent energy resources such as wind or solar.

British Thermal Units (BTUs): British Thermal Unit is a traditional unit of energy equal to about 1,055 joules. Production of 1 kWh of electricity generated in a thermal power plant requires about 10,000 BTUs. 1 gallon gasoline ≈ 125,000 BTUs.

Bulk-power system: Facilities and control systems necessary for operating an interconnected electric energy transmission network (or any portion thereof) and electric energy from generation facilities needed to maintain transmission reliability.

Capacity (electric): The maximum power that can be produced by a generating resource at specified times under specified conditions.

Capacity factor: A capacity factor is the ratio of the average power output from an electric power plant compared with its maximum output. Capacity factors vary greatly depending on the type of fuel that is used and the design of the plant. Baseload power plants are operated continuously at high output and have high-capacity factors (reaching 100%). Geothermal, nuclear, coal plants, large hydroelectric and bioenergy plants that burn solid material are usually operated as baseload plants. Many renewable energy sources such as solar, wind and small hydroelectric power have lower capacity factors because their fuel (wind, sunlight or water) is not continuously available.

Capacity (gas): The maximum amount of natural gas that can be produced, transported, stored, distributed or utilized in a given period of time under design conditions.

Capacity, peaking: The capacity of facilities or equipment normally used to supply incremental gas or electricity under extreme demand conditions. Peaking capacity is generally available for a limited number of days at a maximum rate.

Carbon dioxide (CO_2): A gaseous substance at standard conditions composed of one carbon atom and two oxygen atoms produced when any carbon-based fuels are combusted.

Cogeneration (CHP): The simultaneous production of heat (usually in the form of hot water and/or steam) and power utilizing one primary fuel. Cogeneration is often used to produce power as a secondary use of the waste steam/heat from a primary industrial process.

Commercial: A sector of customers or service defined as non-manufacturing business establishments, including hotels, motels, restaurants, wholesale businesses, retail stores and health, social and educational institutions. A utility may classify the commercial sector as all consumers whose demand or annual use exceeds some specified limit. The limit may be set by the utility based on the rate schedule of the utility.

Conservation: Demand-side management (DSM) strategy for reducing generation capacity requirements by implementing programs to encourage customers to reduce their energy consumption. Program examples include incentives/savings for the installation of energy efficient appliances, lighting and electrical machinery, and weatherization materials.

Cooperative electric utility (Co-op): Private, not-for-profit electric utility legally established to be owned by and operated for the benefit of those using its service. It will generate, transmit and/or distribute supplies of electric energy to cooperative members. Such ventures are generally exempt from federal income tax laws. Many were initially financed by the Rural Electrification Administration, U.S. Department of Agriculture.

Cost-effective: Cost-effectiveness of an energy measure means that the lifecycle energy, capacity, transmission, distribution, and other quantifiable savings to residents and businesses exceed the direct costs of the measure to the utility and participant.

Demand: The amount of power consumers require at a particular time. Demand is synonymous with load. It is the amount of power that flows over a transmission line at a particular time. System demand is measured in megawatts.

Demand-side management (DSM): The term for all activities or programs undertaken by an electric system to influence the amount and timing of electricity use. Included in DSM are the planning, implementation and monitoring of utility activities that are designed to influence customer use of electricity in ways that will produce desired changes in a utility's load shape such as, among other things, direct load control, interruptible load and conservation.

Dispatch: The monitoring and regulation of an electrical or natural gas system to provide coordinated operation; the sequence in which generating resources are called upon to generate power to serve fluctuating load; the physical inclusion of a generator's output onto the transmission grid by an authorized scheduling utility.

Distribution (electrical): The system of lines, transformers and switches that connect the high-voltage bulk transmission network and low-voltage customer load. The transport of electricity to ultimate use points such as homes and businesses. The portion of an electric system that is dedicated to delivering electric energy to an end user at relatively low voltages.

Distribution (gas): Mains, service connections and equipment that carry or control the supply of natural gas from the point of local supply to and including the sales meters.

Distributed generation: Electric power produced other than at a central station generating unit, such as that using fuel cell technology or on-site small-scale generating equipment.

Electric utility: A corporation, person, agency, authority or other legal entity that owns and/or operates facilities for the generation, transmission, distribution or sale of electric energy primarily for use by the public. Facilities that qualify as co-generators or small power producers under the Public Utility Regulatory Policies Act (PURPA) are not considered electric utilities.

Electricity generation: The process of producing electric energy by transforming other forms of energy such as steam, heat or falling water. The amount of electric energy produced is expressed in kilowatt-hours or megawatt-hours.

Electricity transmission congestion: Transmission congestion results when transmission lines reach their maximum capacity, so no additional power transactions can take place, regardless of power needs. Attempting to operate a transmission system beyond its rated capacity is likely to result in line faults and electrical fires, so this can never occur. The only ways the congestion can be alleviated are to tune the system to increase its capacity, add new transmission infrastructure, or decrease end-user demand for electricity.

Forecasting: The process of estimating or calculating electricity load or resource production requirements at some point in the future.

Generator nameplate capacity (installed): The maximum rated output of a generator or other electric power production equipment under specific conditions designated by the manufacturer. Installed generator nameplate capacity is commonly expressed in megawatts (MW) and is usually indicated on a nameplate physically attached to the generator.

Grid: The layout of the electrical transmission system or a synchronized transmission network.

High-voltage lines: Wires composed of conductive materials that are used for the bulk transfer of electrical energy from generating power plants to substations located near to population (load) centers. Transmission lines, when interconnected with each other, become high voltage transmission networks. In the U.S., these are typically referred to as "power grids" or sometimes simply as "the grid". Electricity is transmitted at high voltages (110 kV or above) to reduce the energy lost in long distance transmission. Power is usually transmitted through overhead power lines. Underground power transmission has a significantly higher cost.

Independent power producers (IPPs): A non-utility power generating entity, defined by the 1978 Public Utility Regulatory Policies Act, that typically sells the power it generates to electric utilities at wholesale prices.

Industrial customer: The industrial customer is generally defined as manufacturing, construction, mining, agriculture, fishing and forestry establishments. The utility may classify industrial service using the Standard Industrial Classification codes or based on demand or annual usage exceeding some specified limit. The limit may be set by the utility based on the rate schedule of the utility.

Integrated Resource Plan (IRP): A plan that IOUs produce periodically for regulators and customers to share their vision of how to meet the growing need for energy. These plans contain a preferred portfolio of resource types and an action plan for acquiring specific resources to meet the needs of customers including conservation measures. Specific resources will be acquired as individual projects or purchases and, when appropriate, through a formal request for proposals (RFP) process.

Interconnection: A link between power systems enabling them to draw on one another's reserves in times of need to take advantage of energy cost differentials resulting from such facts as load diversity, seasonal conditions, time-zone differences and shared investments in larger generating units.

Interstate pipeline: A natural gas pipeline company that is engaged in the transportation of natural gas across state boundaries and is therefore subject to FERC jurisdiction and/or FERC regulation under the Natural Gas Act.

Investor-owned utility (IOU): A utility that is a privately owned, often publicly traded corporation whose operations are regulated by federal and state entities.

Kilowatt (kW): A unit of electrical power or capacity equal to one thousand watts.

Kilowatt-hour (kWh): A unit of electrical energy that is equivalent to one kilowatt of power used for one hour. One kilowatt-hour is equal to 1,000 watt-hours. An average household will use between 800 and 1,300 kWhs per month, depending upon geographical area.

Load: The amount of electric power delivered or required at any specific point or points on a system. The requirement originates at the energy-consuming equipment of the consumers. The load of an electric utility system is affected by many factors and changes on a daily, seasonal and annual basis, typically following a general pattern. Electric system load is usually measured in megawatts (MW). It is synonymous with demand.

Megawatt (MW): A unit of electrical power equal to 1 million watts or 1,000 kilowatts. Plant power output is typically measured in megawatts.

Megawatt-hour (MWh): One million watt-hours of electric energy. A unit of electrical energy that equals one megawatt of power used for one hour.

Metering: Use of devices that measure and register the amount and/or direction of energy quantities relative to time.

Microgrid: A small network of electricity users with a local source of supply that is usually attached to a centralized national grid but is able to function independently.

Municipal utility (Muni): A utility owned and operated by a municipality or group of municipalities.

Net metering: A method of crediting customers for electricity that they generate on site in excess of their own electricity consumption.

Network: An interconnected system of electrical transmission lines, transformers, switches and other equipment connected in such a way as to provide reliable transmission of electrical power from multiple generators to multiple load centers.

Nuclear power plant: A facility in which nuclear fission produces heat that is used to generate electricity.

Off peak: The period during a day, week, month or year when the load being delivered by a natural gas or electric system is not at or near the maximum volume delivered by that system for a similar period of time (night vs. day, Sunday vs. Tuesday).

On peak: The period during a day, week, month or year when the load is at or near the maximum volume.

Peak demand: The maximum load during a specified period of time.

Peak load plant or peaker unit: A plant usually housing low-efficiency, quick response steam units, gas turbines, diesels or pumped-storage hydroelectric equipment normally used during the maximum load periods. Peakers are characterized by quick start times and generally high operating costs, but low capital costs.

Pipeline system: A collection of pipeline facilities used to transport natural gas from source of supply to burner tip, including gathering, transmission or distribution lines, treating or processing plants, compressor stations and related facilities.

Power plant: A plant that converts mechanical energy into electric energy. The power is produced from raw material such as gas, coal, nuclear or other fuel technologies.

Qualifying facility (QF): A designation created by PURPA for non-utility power producers that meet certain operating, efficiency and fuel-use standards set by FERC. To be recognized as a qualifying facility under PURPA, the facility must be a small power production facility whose primary energy source is renewable or a cogeneration facility that must produce electric energy and another form of useful thermal energy, such as steam or heat, in a way that is more efficient than the separate production of both forms of energy. It must meet certain ownership, operating and efficiency criteria established by FERC.

Regional transmission organization (RTO): A proposal advanced by FERC to establish regional groups to expedite the coordination of wholesale wheeling. The group is voluntary in each region and may include transmission system owners, wholesale purchasers and independent power generators. *(See wheeling)*

Reliability: the ability of the Bulk-Power System to withstand sudden disturbances while avoiding uncontrolled cascading blackouts or damage to equipment.

Renewable resource: An energy source that is continuously or cyclically renewed by nature, including solar, wind, hydroelectric, geothermal, biomass or similar sources of energy.

Reserve capacity: Capacity in excess of that required to carry peak load, available to meet unanticipated demands for power or to generate power in the event of loss of generation.

Residential consumer: A consumer residing at a dwelling served by the company and using services for domestic purposes.

Residential time-of use rates (TOU): Shift electricity use to lower priced times of the day.

Resiliency: The ability to avoid, prepare for, minimize, adapt to, and recover from anticipated and unanticipated energy disruptions.

Resource adequacy: The ability of a power system to supply enough electricity, at the right locations, to keep the lights on during all hours of the year. This means system planners must ensure the mix of resources can meet demand during hot summer afternoons and cold winter nights.

Retail: Sales covering electrical energy supplied for residential, commercial and industrial end-use purposes. Agriculture and street lighting are also included in this category. Power sold at retail is not resold by the purchaser to another customer.

Service area: The territory in which a utility system is required or has the right to supply service to ultimate customers.

Substation: Equipment that switches, changes or regulates electric voltage. An electric power station that serves as a control and transfer point on an electrical transmission system. Substations route and control electrical power flow, transformer voltage levels and serve as delivery points to industrial customers.

Tariff: A document filed by a regulated entity with either a federal or state commission, listing the rates the regulated entity will charge to provide service to its customers as well as the terms and conditions that it will follow in providing service.

Thermal generation: The production of electricity from plants that convert heat energy into electrical energy. The heat in thermal plants can be produced from a number of sources such as coal, oil or natural gas.

Transmission: The network of high-voltage lines, transformers and switches used to move electrical power from generators to the distribution system (loads). This network is utilized to interconnect different utility systems and independent power producers together into a synchronized network.

Turbine: The part of a generating unit usually consisting of a series of curved vanes or blades on a central spindle that is spun by the force of water, steam or heat to drive an electric generator. Turbines convert the kinetic energy of such fluids to mechanical energy through the principles of impulse and reaction or a measure of the two.

Volt: A unit of measurement of electromotive force or electrical potential. It is equivalent to the force required to produce a current of one ampere through a resistance of one ohm. Typical transmission level voltages are 115 kV, 230 kV and 500 kV.

Watt: A measure of real power production or usage equal to one joule per second.

Wheeling: The use of the transmission facilities of one system to transmit power for another system. Wheeling can apply to either wholesale or retail service.