BRITISH COLUMBIA

StrongerBC

for everyone

BACKGROUNDER:
BC's Energy System

BC's Energy Systems

Whether it is heating and lighting our homes, moving people and goods, or supporting industrial growth, energy underpins almost every aspect of our lives and economy in British Columbia.

The four main types of energy used in BC are electricity, natural gas, biofuels and renewable natural gas, and refined petroleum products such as gasoline and diesel fuel. Infrastructure that produces and delivers this energy is vitally important to the province's economy, climate goals, and quality of life for the 5.5 million people who call BC home.

Our energy system helps ensure energy security, keeps our energy bills affordable and continues to support our collective efforts to take climate action by reducing greenhouse gas emissions. We can continue to use energy more efficiently and move to a cleaner energy future where our energy comes from more clean electricity, renewable natural gas, low carbon hydrogen and liquid biofuels.

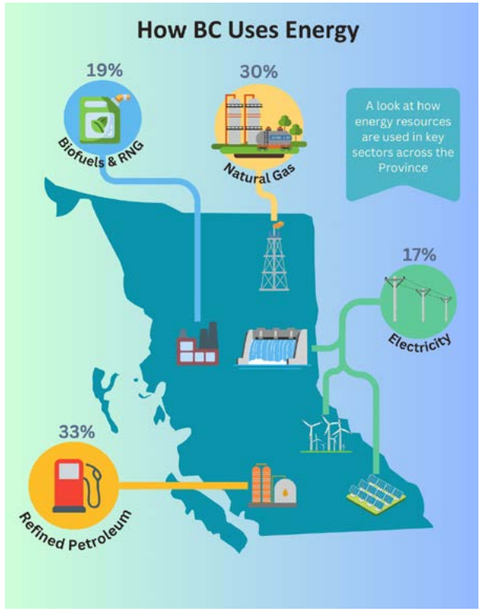
Energy Use in BC

The transition to cleaner types of energy is a substantial undertaking for every jurisdiction in the world, and one that will not happen overnight. About 63% of the energy used in BC in 2021 was supplied by either refined petroleum products or natural gas.[1] However, it is also important to remember that the challenge of transitioning to cleaner types of energy is not as large as it seems.

ENERGY USE AND ENERGY SERVICES

The energy we need to provide us with services like heat, power, and mobility is only a fraction of what is being produced and used. Energy is lost or wasted at each stage in the process of converting raw inputs to services through production, delivery, and conversion.

Processes that convert fossil fuels into services tend to also create a large amount of waste heat along with the service (e.g., internal combustion vehicles and thermal furnaces). Electricity is a more efficient energy source to convert into the services that people use.



This means that we do not need to replace all the energy we use today with cleaner sources. Instead, we need to use all our energy resources more efficiently while also transitioning to cleaner resources and more efficient technologies.

[1] CER: Exploring Canada's Energy Future - Canada Energy Regulator (cer-rec.gc.ca)

MOBILITY

For 1 Gigajoule (GJ) of energy input, an average gasoline car travels 335 km, while an average electric vehicle can travel 1,170 km and Hydrogen-fuel cell vehicle can travel 800 km. (**Source:** energy effectiveness ratio's (EERs) developed for the BC Low Carbon Fuels Act under the Technical Regulations.)

HEATING

Heat pumps deliver two to three times more heat for the same amount of energy input than gas furnaces and other conventional fossil fuel heating.

ELECTRICITY

About 98% of electricity in BC comes from clean and renewable sources. BC's clean electricity is supplied by 89% hydroelectric, 5% biomass, 3% wind and 1% solar.

NATURAL GAS

This fuel is mostly used by industry for process heat and steam generation, and in buildings for heating. Natural gas is used widely for home heating.

BIOFUELS AND RENEWABLE NATURAL GAS

Most biofuels in BC are woody biomass used to power industrial processes. A small portion (less than 1% in 2023[2]) of renewable natural gas is blended into the natural gas system to heat buildings.

REFINED PETROLEUM

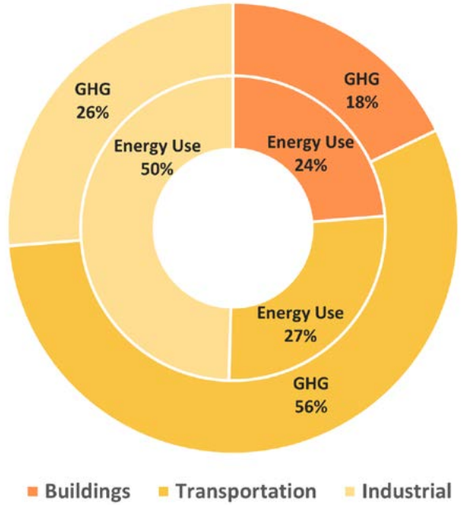
Used primarily in the form of gasoline and diesel fuel. In 2021 the transportation sector used about three-quarters as much of this energy type as industry (Figure 1), while contributing twice the total greenhouse gas emissions as a sector (Figure 2).

WOODY BIOMASS is used by the forest sector to produce both electricity and steam. Forest residuals and wood waste from lumber mills are combusted to produce steam in boilers, and the steam is used both directly within the facility and for the generation of electricity.

Energy Type	Overall Use (PJ)	Breakdown by Sector
Refined Petroleum	394 PJ (33%)	• 74% Transportation • 24% Industrial • 2% Buildings
Natural Gas	366 PJ (30%)	• 60% Industrial • 40% Buildings
Biofuels and Decarbonized Gas	229 PJ (19%)	• 81% Industrial • 13% Transportation • 6% Buildings
Electricity	208 PJ (17%)	• 57% Buildings • 43% Industrial
Other	8 PJ (1%)	• 100% Industrial

Source: Exploring Canada's Energy Future - Canada Energy Regulator

[2] Greenhouse Gas Reduction Regulation Reporting for FortisBC: BC's Energy Transition - BCUC



ENERGY USE AND GREENHOUSE GAS

Energy use currently contributes about 76% of the province's GHG emissions. In 2021 about 50% of all energy in BC was used by industry, with 27% used for transportation and 24% used in residential and commercial buildings.[3]

The industrial, transportation, and buildings sectors all have capacity for GHG emission reductions, with energy use in these sectors contributing 26%, 56%, and 18% respectively to provincial emissions from energy consumption.[4]

[3] Canada's Energy Future 2023: Energy Supply and Demand Projections to 2050, CER 2021 Actual Data
[4] BC GHG Inventory, 2021 Data

Energy Delivery in BC

Different types of energy are delivered throughout the province using several different modes including road, rail and expansive networks of electrical lines, and natural gas and oil pipelines. These wire and pipeline systems require ongoing investments to maintain and operate safely and reliably. As the demand for energy in BC grows, the sources of production and the systems we use to deliver that energy also face pressure to grow and change.

BULK DELIVERY SYSTEMS

Large amounts of electricity, natural gas, and oil are moved across BC through large-scale infrastructure. This includes high-voltage electricity transmission wires and high-pressure natural gas and oil pipelines.

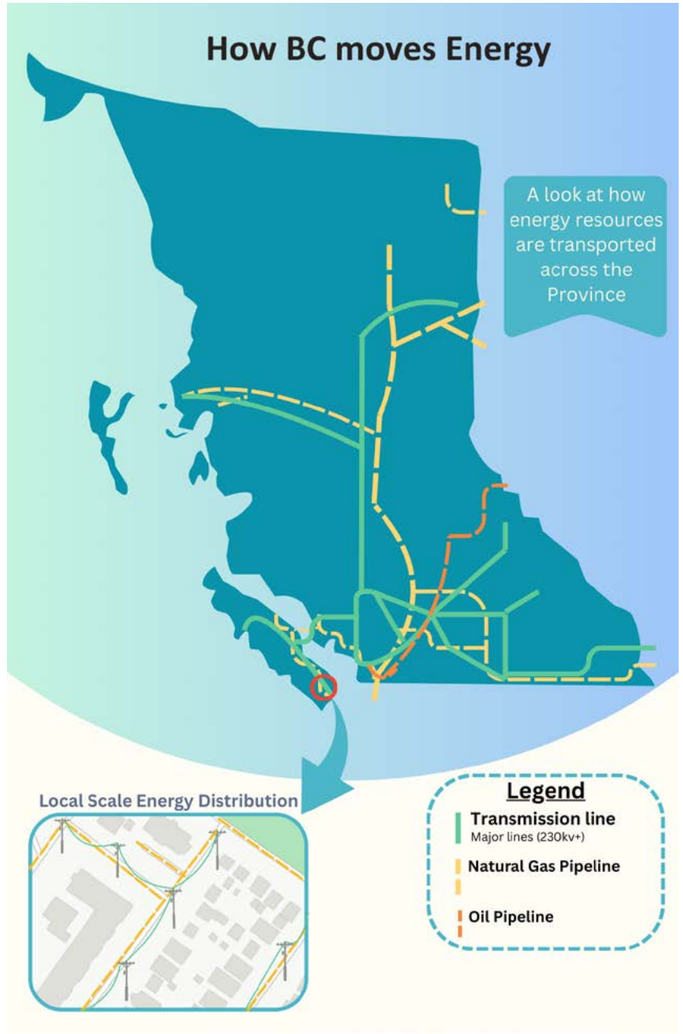
INTERJURISDICTIONAL CONNECTIONS

BC's energy systems are connected to neighboring jurisdictions to both facilitate trade and support mutual reliability. The electrical grid has high-voltage interconnections with Alberta and the state of Washington. All utilities, states and provinces, including BC, are importing and/or exporting power every hour of the year. This is fundamental to the reliable operation of the Western Interconnection – a network of transmission lines connecting BC with utilities in Alberta and 14 western U.S. states.

The Enbridge BC Pipeline is 2,953 kms long and runs from Fort Nelson down to the Canada-USA border near the Hunting-Sumas border crossing, while connecting BC and Alberta in the northeast.

LOCAL DELIVERY SYSTEMS

Expansive networks of small-scale infrastructure deliver electricity and natural gas to individual homes and businesses in BC. This includes low-voltage electricity distribution wires and low-pressure natural gas pipelines.



Source: Exploring Canada's Energy Future - Canada Energy Regulator

SYSTEM SIZE

BC Hydro serves communities throughout the province with an extensive network of approximately 80,000 kms of electrical transmission and distribution lines. FortisBC is the electricity provider in the Okanagan and Kootenay regions, with 7,300 kms of transmission and distribution lines. The province also has an extensive natural gas pipeline system. For example, FortisBC operates 50,500 kms of natural gas transmission and distribution pipelines, and Pacific Northern Gas (PNG) operates about 4,200 kms of pipeline.

Energy Efficiency in BC

Energy efficiency is using less energy to produce the same service (e.g., heat, power, mobility). This is one of the easiest and most cost-effective ways to fight climate change, save money on British Columbians' energy bills, and improve businesses competitiveness. It is also a critical component to emissions reductions that support BC's climate goals.

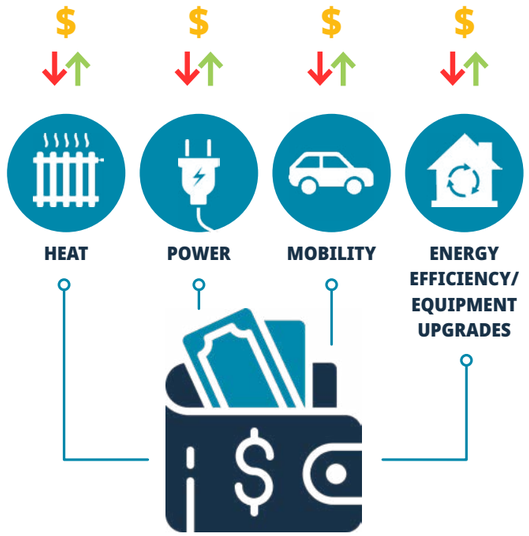
In 2022, BC led Efficiency Canada's energy efficiency scorecard rankings for the fourth year in a row. We continue to be a leader due to our strong climate plan – the Clean BC Roadmap to 2030 – which includes provisions that all new buildings will be zero carbon starting no later than 2030, new space and water heating equipment will be 100% efficient by 2030; all new home sale listings are required to include an energy efficiency label; and an accelerated zero-emission vehicle mandate. Our province has also given consistent support to municipal energy efficiency initiatives with higher efficiency standards.[5]

Our Energy Wallet:

A HOLISTIC LOOK AT USING AND PAYING FOR THE ENERGY SERVICES WE NEED

BC has a diversity of clean energy resources that power different parts of our society and economy. This diversity is one of BC's strengths, and it's an important factor for planning our province-wide energy system. Similarly, on an individual or household level, we use a number of different energy sources to power different things in our homes and lives – from cars to home heating to kitchen appliances.

The concept of an "energy wallet" shifts our focus from the individual energy bills we pay on a daily or monthly basis (like gasoline, natural gas, and electricity) and looks instead at our energy use as a bundle of services used over time – considering not just current energy costs to operate the devices and appliances we rely on but also how these costs may change over time, as well as the cost to buy, maintain and replace them.



[5] Energy efficiency BC - How does your province rank? - Canadian Provincial Energy Efficiency Scorecard (efficiencycanada.org)

Public Utilities in BC

BC Hydro is the largest electricity utility providing service to 95% of the BC's population, while FortisBC is the second largest and provides electrical service to an area in the southern Interior. FortisBC is also the largest natural gas utility and provides service in BC's Interior, Lower Mainland, and Vancouver Island, while Pacific Northern Gas (PNG) provides service to west-central BC. A large portion of the energy used by homes and businesses in BC today is delivered by these three large utilities.

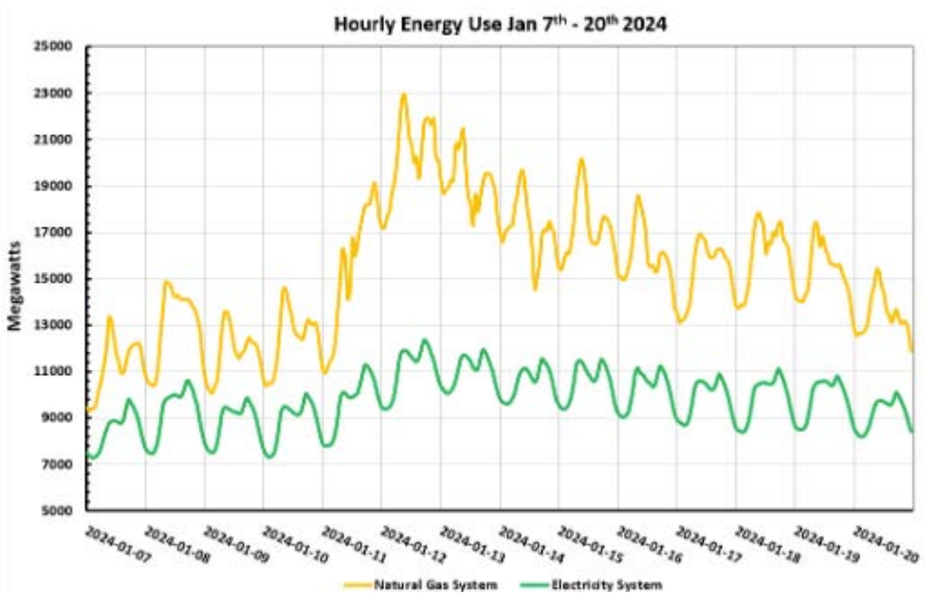
The British Columbia Utilities Commission (BCUC) has the mandate to regulate the province's energy utilities, by reviewing and approving rate applications, rates of return, long-term plans, supply contracts, and the construction and operation of facilities for the safety and interest of the public. In March 2024, the BCUC issued decisions to accept BC Hydro's Integrated Resource Plan and Fortis BC's 2022 Long Term Gas Resource Plan.

Periods When Energy is Needed the Most

Peak demand is the maximum amount of energy that is needed at a certain time and may only occur during a few days or hours each year. However, our electricity and natural gas energy systems are planned and designed to be able to each meet their own hours of highest demand, to ensure that BC's energy needs continue to be met.

A recent example was during the January 2024 cold snap. Despite the record-breaking demand, BC did not require electricity imports from the market, and had enough generating capacity to meet British Columbia's needs and provide support to its neighbours in Alberta and the Pacific Northwest who were experiencing high demand and system challenges.

Natural gas is a significant source of energy for heating buildings in BC, and during the same cold snap, BC's natural gas system delivered about twice the energy as the electricity system. Currently the electricity system and natural gas system plan separately to service each of their peak requirements to ensure energy reliability in BC. Future improvements in energy efficiency measures, and enhanced coordination in planning for both the electricity and natural gas systems will ensure that British Columbians continue to enjoy reliable, safe and affordable energy as BC meets its climate objectives.



Source: BC Hydro Balancing Authority Load Data, and FortisBC / Pacific Northern Gas Load Data

* Data includes all customer types for both the electricity and natural gas systems

Power Imports and Exports

Importing and exporting power helps manage annual variations in water inflows into BC's hydroelectric system, keep rates affordable for people, and reduce greenhouse gas emissions in other jurisdictions in North America still reliant on fossil fuels to generate electricity.

In any given year, the balance between the amount of power available and the amount of power needed can result in a surplus or deficit of power for BC Hydro. Imported electricity comes from our Canadian Entitlement under the Columbia River Treaty, which is considered clean, and market purchases from trading partners throughout the western U.S. and Alberta.

The blend of resources in the market has been trending away from fossil fuels towards cleaner forms of generation as more wind and solar replace retiring coal and natural gas.

With severe drought conditions, BC imported approximately 11,000 gigawatt hours (GWh) or 39.6 petajoules (PJ) of electricity in 2023. However, over the last 15 years, BC Hydro was a net importer in seven years and a net exporter in eight. Imports and exports will continue to be a prominent feature of our evolving energy system due to changes in the magnitude and likelihood of extreme weather events linked to climate change.

Glossary and Abbreviations

BIOFUELS	Solid, liquid and gaseous products derived from biomass including solid biomass, liquid biofuels and biogases. The most common examples are biodiesel and ethanol.
BUILDINGS SECTOR	The buildings sector includes energy used in residential and commercial buildings. Energy is used for various purposes in buildings, including space heating and cooling, water heating, lighting, and powering household appliances.
CANADIAN ENTITLEMENT	Canada's half-share of the downstream power benefits established by the Columbia River Treaty is called the Canadian Entitlement. The benefits are owned by British Columbia.
CAPACITY	The maximum output an electricity generator can physically produce, or a transmission line transmit, under ideal conditions at any instant. Many generators do not operate at their full capacity all the time. Measured in kilowatts (kW), megawatts (MW), or gigawatts (GW).
	BC government's plan to transition the province to a low-carbon economy and reduce greenhouse gas emissions.
CLEAN ENERGY	Includes resources such as hydroelectricity, solar, and wind, biofuels, energy efficiency, low-carbon fuels, and battery storage.
COLUMBIA RIVER TREATY	The Columbia River Treaty is a trans-boundary water management agreement between the United States and Canada that optimizes flood risk management and power generation for the Columbia River and Kootenay River.
DECARBONIZATION	The reduction or elimination of greenhouse gas emissions. Energy sources such as hydroelectricity, solar, wind, hydrogen, battery storage and renewable natural gas are all resources that can decarbonize an energy system.

DEMAND	A customer's requirements for energy, also known as "load."
	Moving power from generation sources to consumers (commercial, residential, transportation, industrial).
ENERGY	Energy is the capacity to perform work and is derived from the utilization of physical or chemical resources, especially to provide light and heat or to power machines. Electrical energy from renewables such as hydroelectric dams can be used to heat and cool our homes, and power our electronic devices, lights, and appliances. Chemical energy from the burning of fossil fuels can be used to heat our homes. Units of energy: Joule (J) • Kilojoule (KJ) = 1 thousand joules • Megajoule (MJ) = 1 million joules • Gigajoule (GJ) = 1 billion joules • Terajoule (TJ) = 1 trillion joules • Petajoule (PJ) = 1 quadrillion joules The average residential electrical customer in BC uses approximately 40 GJ of electrical energy per year. The average residential natural gas customer uses approximately 90 GJ of energy in the form of natural gas per year in Southern BC, and 125 GJ of energy in the form of natural gas per year in Northern BC.
ENERGY SECURITY	The uninterrupted availability of energy sources at an affordable price. Energy security has many aspects: Short-term: ability to react to sudden changes in supply or demand; and Long-term: investments aligned with economic development and environmental needs.
ENERGY SYSTEM	An all-encompassing term for the processes and infrastructure that enable the production, transportation, distribution, and consumption of energy resources.

FOSSIL FUELS	Non-renewable resources found in the Earth's crust that contain carbon and hydrogen, which can be burned for energy. Coal, oil, and natural gas are examples of fossil fuels.
GREENHOUSE GAS	Greenhouse gas or GHG are gases in Earth's atmosphere that trap heat. Increased concentrations of GHGs due to human activities has resulted in climate change.
INDUSTRY SECTOR	The industry sector includes fuel used in key industries in BC including construction, agriculture, forestry, manufacturing, mining, and oil and gas extraction.
JANUARY 2024 COLD SNAP	From January 11 to 17, 2024, British Columbia, Alberta and the U.S. Northwest region experienced a multi-day cold weather event resulting in record breaking levels of electricity demand. The event put severe pressure on the electricity system across western North America, and a large amount of energy trading was necessary for many states in northwestern U.S. and Alberta. BC was able to independently meet its own high demand and also export electricity to Alberta.
LOW-CARBON HYDROGEN	Hydrogen can be produced from hydrocarbon fuels or from the electrolysis of water with electricity. It can be burned or used in fuel cells for electricity and heat in a wide variety of applications. Low-carbon hydrogen requires that either the emissions associated with fossil-based hydrogen production be prevented (for example by carbon capture, utilisation, and storage) or the electricity input to hydrogen produced from water be low-carbon electricity.
	Natural gas is a fossil fuel energy source that can be measured in gigajoules (GJ).

POWER

The rate or speed that energy is consumed by customers or produced by power generators. Units of power: Watt (W) – One watt equals one joule per second.

- Kilowatt (KW): = 1 thousand watts
- Megawatt (MW) = 1 million watts
- Gigawatt (GW) = 1 billion watts
- Terawatt (TW) = 1 trillion watts
- Petawatt (PW) = 1 quadrillion watts

1 Gigawatt hour (GWh) = 3600 Gigajoules (GJ) = 0.0036 Petajoules (PJ)

A 50W LED lightbulb that is left turned on for an entire year will use 1.58 GJ of energy, whereas a 100 W LED lightbulb that is left turned on for the same period of time would use twice as much energy, 3.15 GJ.

REFINED PETROLEUM

Refined petroleum products are derived from crude oil. Refined petroleum products such as gasoline and diesel are used to fuel vehicles with internal combustion engines.

RENEWABLE NATURAL GAS

Renewable natural gas is methane that comes from biological sources, which could include landfills, sewage and food, agricultural or forestry waste. Natural gas and renewable natural gas are practically chemically identical, they can be mixed, processed, stored, transported and used the same way.

TRANSMISSION

Moving electricity over long distances via high-voltage power lines to substations and to some large industrial customers.

TRANSPORTATION SECTOR

The transportation sector includes fuel and electricity delivered to vehicles that travel by road, rail, air, or water.

UTILITY

Utility companies, such as BC Hydro and FortisBC, are regulated by the BCUC and produce, store and transmit energy to customers across BC They also maintain the energy system infrastructure that they own and operate.

ZERO CARBON

No new climate pollution will be added to the atmosphere as a result of zero carbon activities.

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