

The Value of Energy – British Columbia

Canadians for Affordable Energy:
Household Research Series

NOVEMBER 2018



Canadians for Affordable Energy is a national non-profit organization. We promote the benefits of affordable energy by informing Canadians about it, advancing policies that encourage it, and building a national constituency to support it. Keeping energy services affordable must be an ongoing public policy priority.

Household Research Series – British Columbia Notes

The energy price and cost data contained in this British Columbia Household Research Report are approximate and represent how much residential customers might pay for various energy products, using timely data from credible sources, including the British Columbia Utilities Commission, BC Hydro for electricity, FortisBC for natural gas, Statistics Canada for heating oil and Natural Resources Canada for gasoline and propane.

Energy price and cost data include the government of British Columbia's carbon dioxide emissions tax, which has been in place since 2008. On April 1, 2018, the province's carbon tax rate was increased to \$35 per tonne of carbon dioxide equivalent emissions. The tax rate will increase each year by \$5 per tonne until it reaches \$50 per tonne in 2021.

British Columbia's domestic electricity is predominantly (88%) generated from hydropower, but it does import significant

electricity from neighbouring jurisdictions, such as Alberta, which use coal and natural gas to generate power. As a result, the electricity that is used in B.C. households still produce some greenhouse gases (GHGs). However, tracking each kWh and resulting GHGs from the imported electricity can get quite complicated and so the tax calculations on CO₂, which forces hydrocarbon energy prices to rise, in this report are associated with the province's domestic electricity generation only.

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Summary

The British Columbia government's carbon dioxide emissions tax (carbon tax) increased to \$35 a tonne on April 1, 2018. This tax on hydrocarbon energy will rise each year by \$5 per tonne until it reaches \$50 per tonne in 2021. Rising energy prices will have an impact on the pocketbook of B.C. ratepayers: families and businesses.

Typical B.C. families that rely solely on electricity for their household energy needs pay \$4,128 each year. It costs families that purchase oil for heating \$4,228 annually for household energy use. And households that have access to natural gas – representing over 53% of British Columbian homes – spend \$1,958 each year on heat and running appliances.

When the increase in the carbon tax to \$50 per tonne is taken into account, natural gas costs for a typical home in Vancouver will increase 31 percent by 2021. That is the highest increase of any other energy source. Gasoline prices will go up another 8 percent.

These cost increases should concern British Columbians. A typical suburban household already spends approximately \$1,427 on natural gas and another \$2,966 on gasoline. The increase in the carbon tax will mean paying more.

Government policymakers have a significant impact on household energy budgets. Changes to British Columbia's energy infrastructure and mix should be done prudently since decisions made today will have lasting consequences on the supply of energy and its long-term affordability.

British Columbia residents with access to natural gas have the most affordable form of energy, but their pocketbooks could take a hit as a result of annual increases in government-imposed carbon taxes.

The Value of Energy Research Series illustrates energy bills, energy use and energy value for a typical British Columbia household

Values shown are approximate and represent how much a typical residential customer might pay for various energy products, using timely data from credible sources, including BC Hydro, FortisBC, British Columbia Utilities Commission, Statistics Canada and Natural Resources Canada.

To give us an idea of The Value of Energy, let's look at British Columbia's energy uses

The chart shows where a typical customer might get their energy:

- Electricity provides 19%
- Gasoline provides 28%
- Natural gas provides 53%

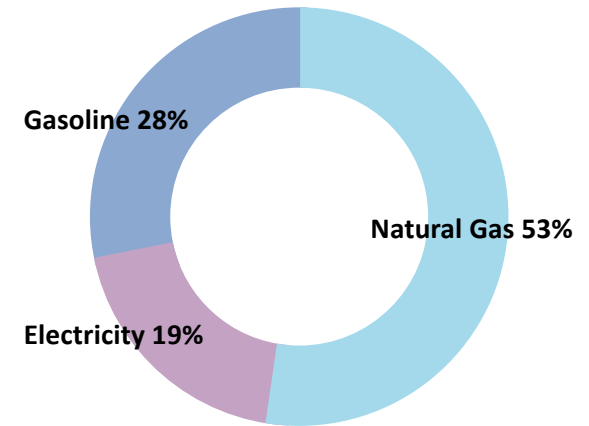
But not every household has this breakdown—this is an estimate based on a household that uses natural gas for heating, drives a car occasionally and uses appliances and electronics.

Approximately 1 million B.C. households, over half of the total, use natural gas for heating. The remaining 1 million homes rely on electricity, oil, propane, coal, wood or some combination for heat.

See page 7 for household figures that heat with electricity and oil.

We use natural gas in

- Furnaces to warm our homes
- Stovetops to cook our food
- Hot water tanks for laundry and showers
- Industries and a key input fuel



We use gasoline to fuel

- Vehicles (cars and trucks) to get around and deliver goods and services
- Recreational motorbikes, boating and skidoos

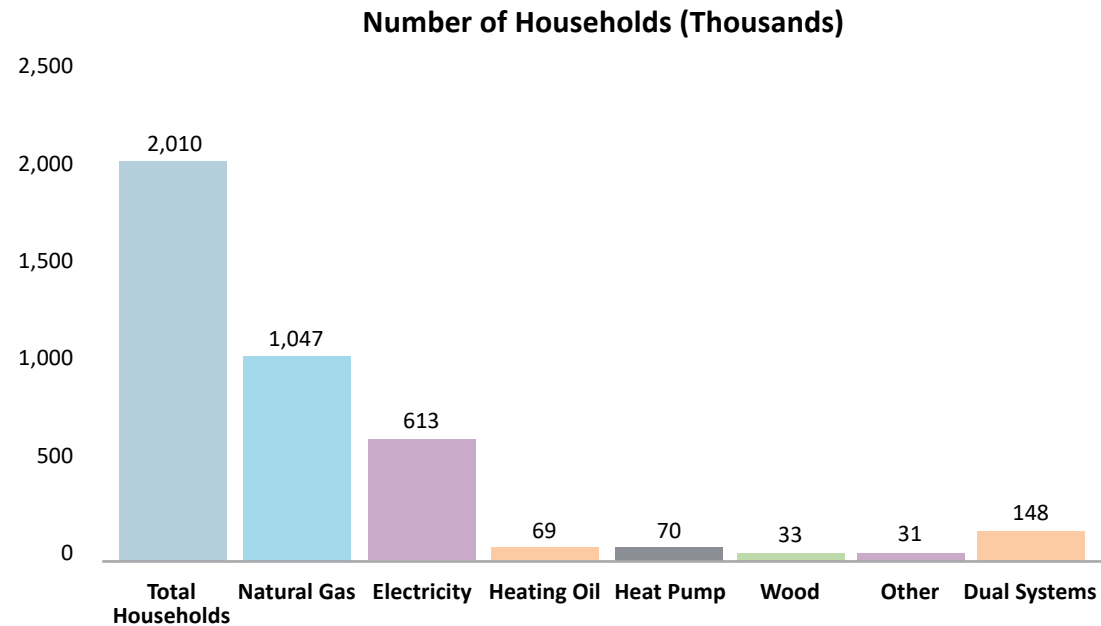
We use electricity to power

- Illumination to light the night
- Appliances for convenience
- Electronics for education and entertainment
- Smartphones to stay connected
- Electric heating in much of rural British Columbia

How do households heat their homes?

Virtually every household uses electricity to power their electronics and appliances—televisions only run on electricity. But when it comes to heating, there's a number of different fuels households put to use.

As shown in the chart, about 613,000 households heat their homes with electricity and 69,000 heat their homes with heating oil. Other households use coal, propane and wood for their heating needs.¹



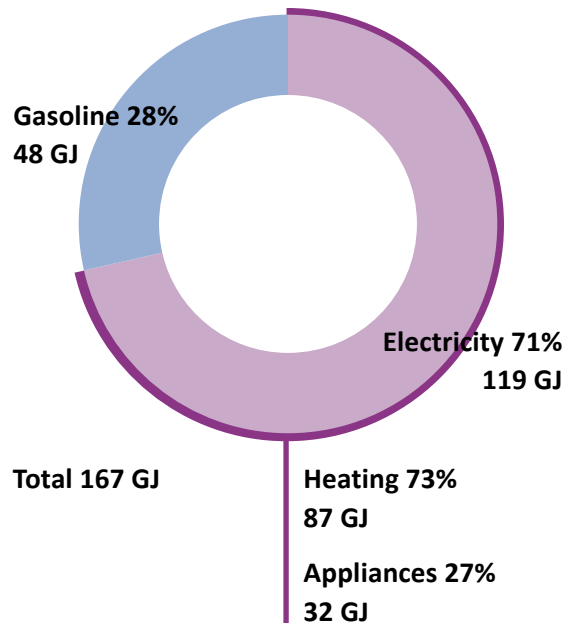
1. NRCAN Comprehensive Energy Use Database, British Columbia, Table 21: Heating System Stock by Building Type and Heating System Type. See <http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP§or=res&juris=bc&rn=21&page=5>.

Energy Use Profiles for households heated with electricity or oil²

The majority of B.C. household energy use is for space and water heating, so how we heat our homes has a big influence on our household energy use profile and household budgets.

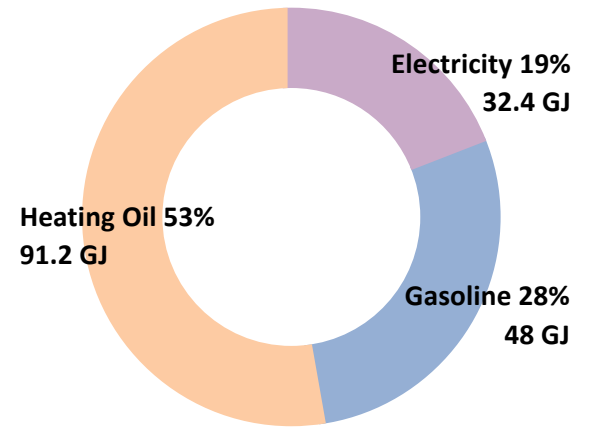
Heating with Electricity:

Over 613,000 B.C. households rely on electricity for heating as well as for their appliances and electronics. A household with baseboard electric heating might have an energy use profile matching the pie chart below, with electricity providing 71% and gasoline 29%.



Heating with Oil:

69,000 B.C. households rely on heating oil to keep their houses warm. A household with an oil furnace might get 53% of energy from heating oil, with electricity providing 19% and gasoline 28%.



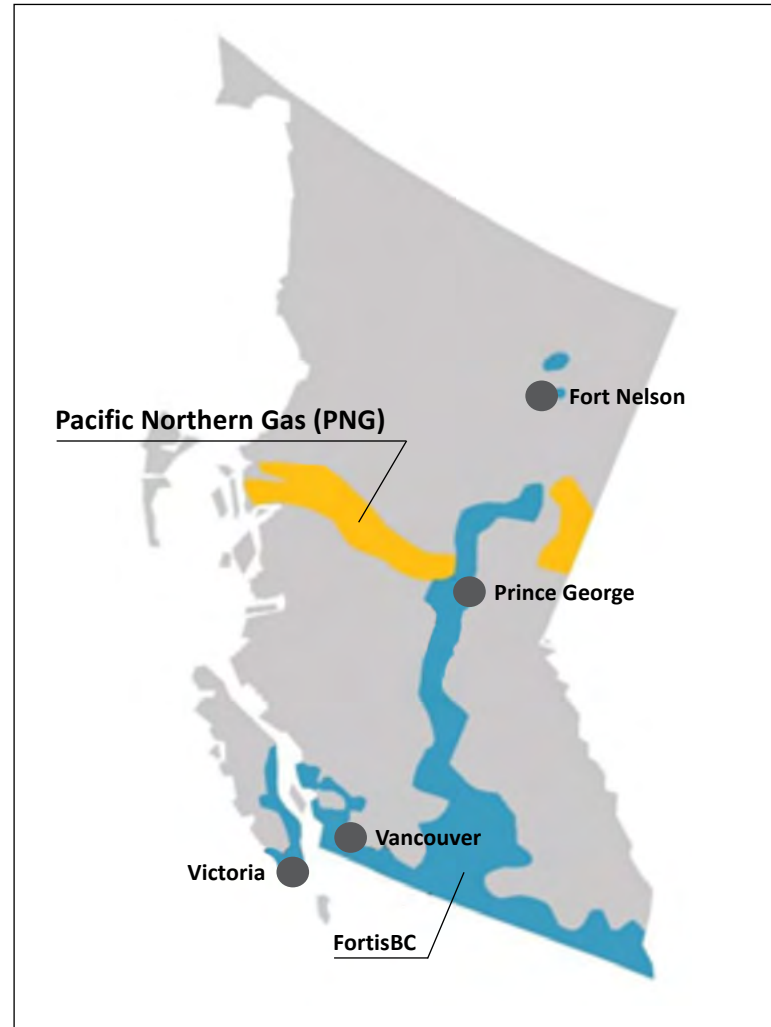
2. NRCan Comprehensive Energy Use Database, British Columbia, Table 21: Heating System Stock by Building Type and Heating System Type, see <http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP§or=res&juris=bc&rn=21&page=5>.

Which households have natural gas service?

Although the majority of B.C. households heat their homes with natural gas, not all households do.

The province's natural gas distribution system covers urban areas and some rural communities, but many agricultural, low density and remote communities do not have natural gas service.

The map of B.C. shows municipalities with and without natural gas service.³



3. FortisBC. See <https://www.fortisbc.com/About/ServiceAreas/>.

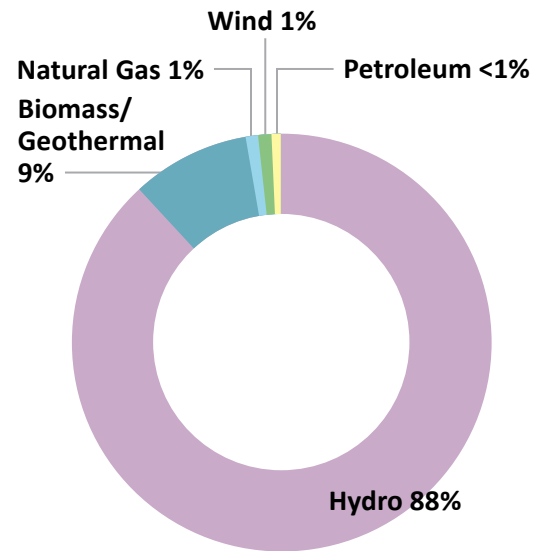
Where does British Columbia's electricity (power) come from?

B.C. households use electricity that is generated mostly by hydropower.

The pie chart shows electricity generation by source in British Columbia: approximately 88% from hydropower, 9% from biomass/geothermal, 1% from wind, and the remainder from fossil fuels.

In 2016, B.C. generated 74.5 terawatt hours (TWh) of electricity, which is approximately 11% of total Canadian generation. The province has a generating capacity of 17,717 megawatts (MW).

The pie chart shows electricity generation by source in British Columbia: approximately 88% from hydropower, 9% from biomass/geothermal, 1% from wind, and the remainder from fossil fuels. ⁴



Hydro	65.56 TWh or 88%
Biomass/ Geothermal	6.71 TWh or 9%
Natural Gas	0.75 TWh or 1%
Wind	0.75 TWh or 1%
Petroleum	.08 TWh or <1%
Total Generation	73.85 TWh

4. See <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/bc-eng.html>.

Typical British Columbia household bills and energy use

Here's the breakdown of how much energy a typical B.C. household might use every year. This works out to be about 200 cubic meters (m³) of natural gas, 750 kilowatt-hours (kWh) of electricity, and 115 litres of gasoline a month.

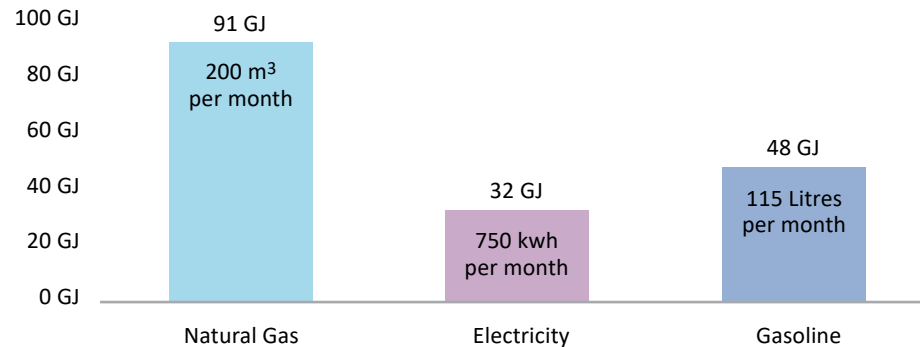
To show them together, we measure the energy used in gigajoules (GJ) per year, a common unit useful for comparing different fuels on an "apples to apples" basis. A gigajoule is equivalent to 1 billion joules, roughly the amount of energy it takes to power a 30 Watt light bulb throughout an entire year.

And here's how much that same typical household might pay for energy every year.

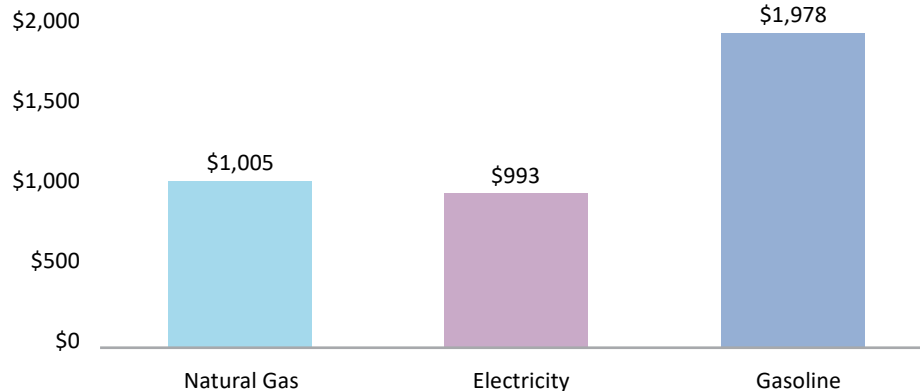
A typical B.C. household spends about the same amount of money on natural gas and electricity, and quite a bit more on gasoline, even though they get more of the energy they use from natural gas.

These bills have been generated using the rate information on FortisBC and BC Hydro's website for a typical BC customer. Some households will pay more and some will pay less.^{5/6/7/8}

Typical Annual Energy Use (GJ)



Typical Customer Annual Energy Bills (\$)



5. Electricity: BC Hydro. See https://www.bchydro.com/search.html?q=What+is+the+average+power+usage+for+a+residential+customer&qid=1429&ir_type=3.

6. Natural Gas: FortisBC. See <https://www.fortisbc.com/NaturalGas/Homes/Rates/Mainland/Pages/default.aspx>.

7. Gasoline Costs: See <https://www.nrcan.gc.ca/energy/fuel-prices/4795>.

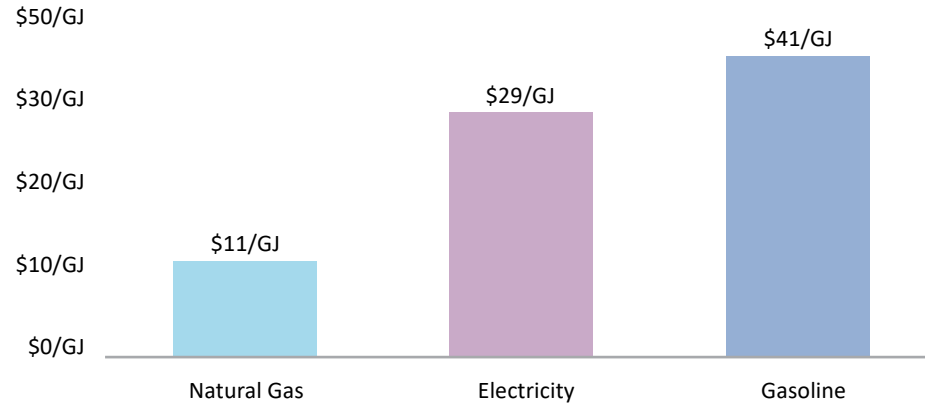
8. Gasoline Costs: See <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000101&pickMembers%5B0%5D=2.7>.

The Value of Energy for British Columbia households

Now that we know how much energy we use and how much we pay for it, we can put together a better picture of the Value of Energy.

The chart shows how much a typical customer pays for each unit of energy—this is the price of energy (in dollars per gigajoule) and helps describe the relative value of different energy sources.

Price of Each GJ of Energy (\$/GJ)

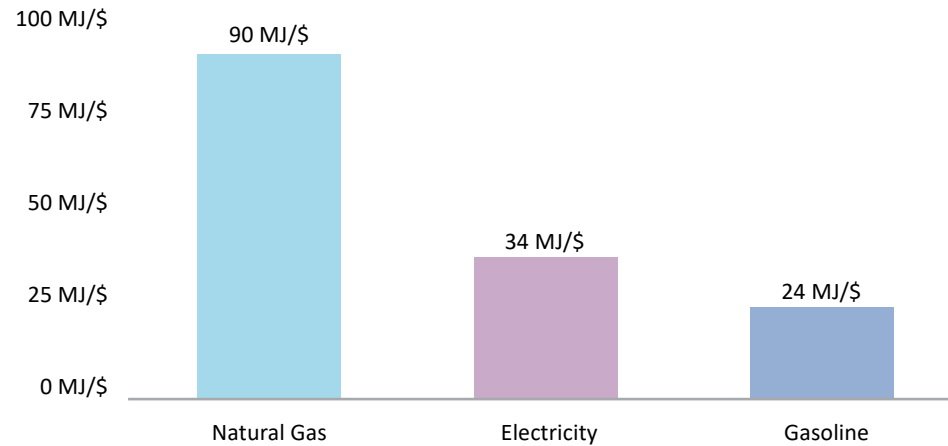


Another way to describe the Value of Energy is to show how much energy a household gets for each dollar spent on their energy bill.

The chart shows the value households get for their energy dollar (in megajoules per dollar).

1 GJ = 1,000 MJ

Energy per Dollar (MJ/\$)

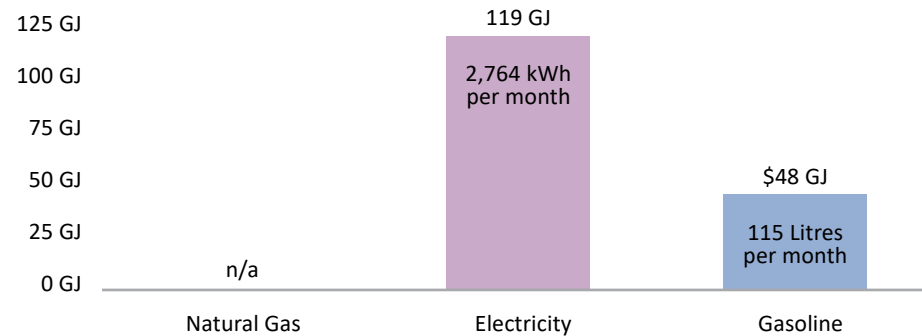


A typical bill and household value of energy for British Columbia's 613,000 families that rely on electricity for heat

B.C. households that rely on baseboard electricity for heating consume a lot of electricity compared to those that heat with natural gas or other fuels. Winter months would be higher but on average a household that heats with electricity might use about 2,764 kWh of electricity and 115 litres of gasoline a month.

The charts describe the energy used in terms of gigajoules (GJ), a common unit useful for comparing fuels.

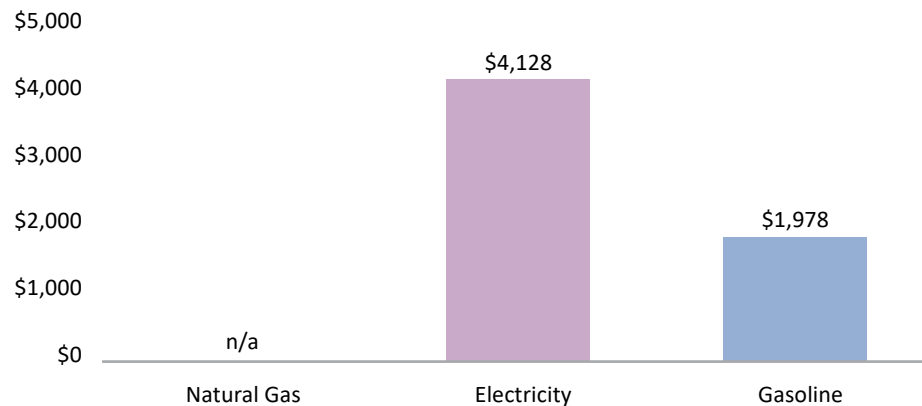
Annual Energy Use (GJ) - with Electric Heat



And here's how much a household with electric heat might pay for energy every year.

A household in B.C. with electric heat would spend a lot on energy bills because heating requires a lot of energy, and because the price of electricity is relatively higher than other fuels.

Annual Energy Bills (\$) - with Electric Heat



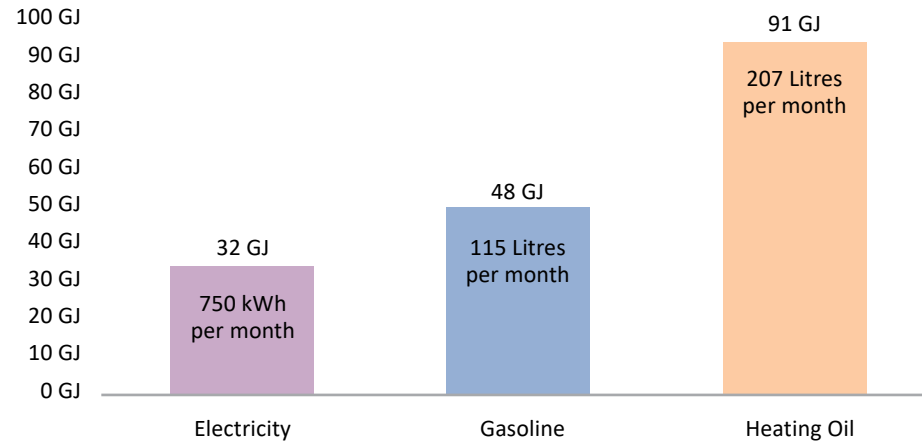
A typical bill and household value of energy for British Columbia's 69,000 families that rely on heating oil for heat

A B.C. household that relies on heating oil would have a similar looking picture to the typical household that relies on natural gas, except their fuels used for heating would be different.

A household that uses heating oil for space and water heating might use an average of about 750 kWh of electricity, 115 litres of gasoline and 207 litres of heating oil a month.

To show them all on the same chart, we've described the energy used in terms of gigajoules (GJ).

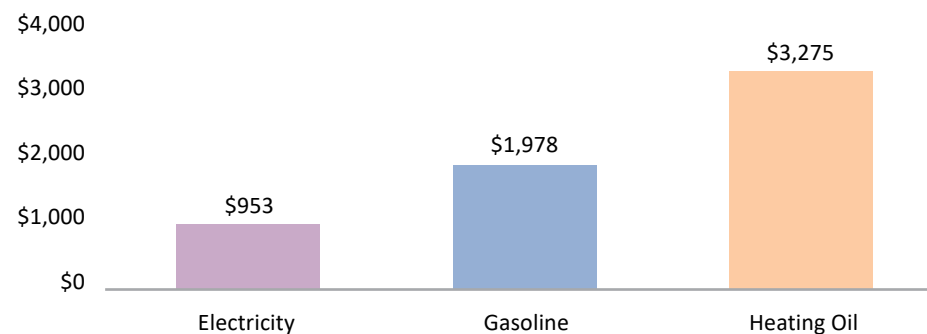
Annual Energy Use (GJ) - with Heating Oil



And here's how much a household that relies on home propane for energy might pay per year.

Heating oil costs about the same per litre as gasoline.

Annual Energy Bills (\$) - with Heating Oil



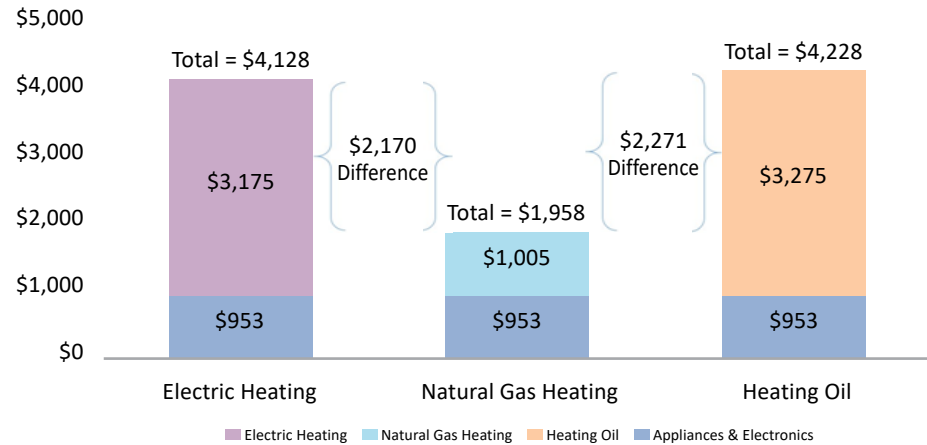
Comparing the costs of different fuels in British Columbia

Not everyone has the same breakdown in fuel use as the typical customer. In fact, some households don't use these fuels at all.

As an example, the chart compares three households that use a similar amount of energy: all use electricity for appliances and electronics, but they heat their houses differently. One house uses electric baseboards, another uses a natural gas furnace, and the third household uses heating oil in a furnace.

The difference in annual bills between the households heated with natural gas and electricity is over \$2,100 due to the fact that the price of each unit of energy supplied with electricity is so much higher than natural gas. The difference with heating oil is just over \$2,200.

Annual Energy Bills
Electric Heating vs. Natural Gas vs. Heating Oil



Value of Energy for different British Columbia customers

Looking at a typical customer is interesting but to get an even better picture of The Value of Energy, let's take a closer look at how much energy different households use and pay for each month.

To do this, presented below are four B.C. customers, representing different demographics and lifestyles, along with a comparison of how much they use and pay for energy.



Young Urban Single

Vancouver

Uses less energy and has lower bills

- Small condo -> less natural gas
- Fewer devices and appliances -> less electricity
- Compact car and occasional driver -> less gasoline



Suburban Family

Whistler

Uses more energy and has higher bills

- Large house -> more natural gas
- More devices and appliances -> more electricity
- Two car commuters -> more gasoline



Small Town Retirees

Fort St. John

Moderate energy use and has moderate energy bills

- Medium sized house -> moderate natural gas
- Some devices and appliances -> moderate electricity
- One car or light truck -> moderate gasoline



Rural Couple

Revelstoke

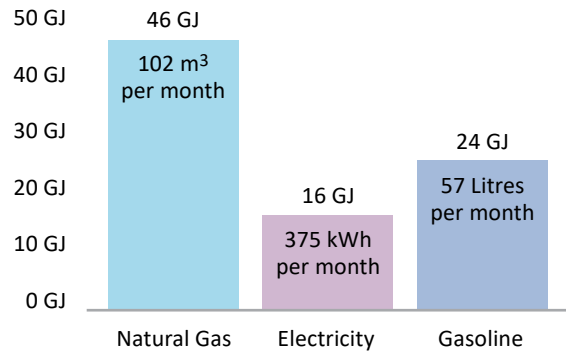
Moderate energy use and has higher energy bills

- Natural gas service unavailable -> electric heating
- Electric heating with some devices and appliances -> very high electricity
- One truck -> more gasoline

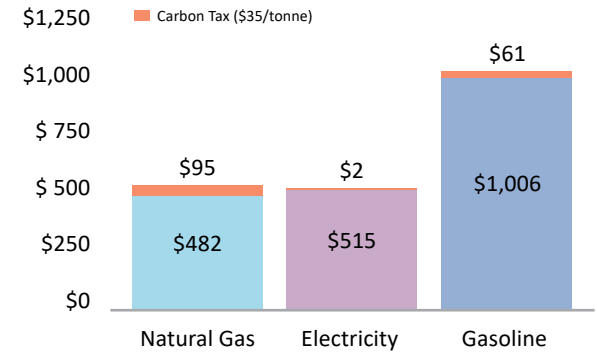
Value of Energy Customer Snapshot (British Columbia), which includes a tax on carbon dioxide emissions (\$35/tonne)

Young Urban Single

Annual Energy Use (GJ/year)

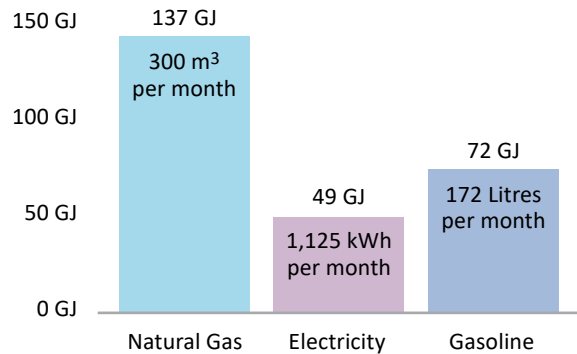


Annual Energy Bills (\$) Total = \$2,161

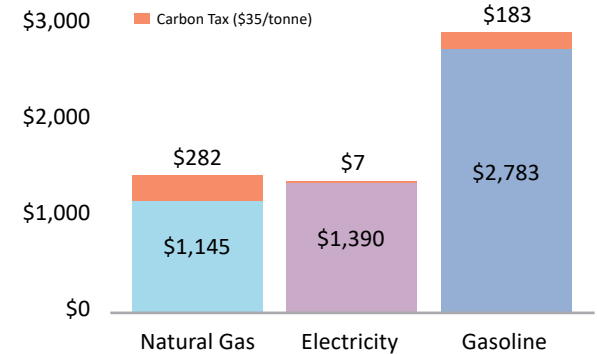


Suburban Family

Annual Energy Use (GJ/year)



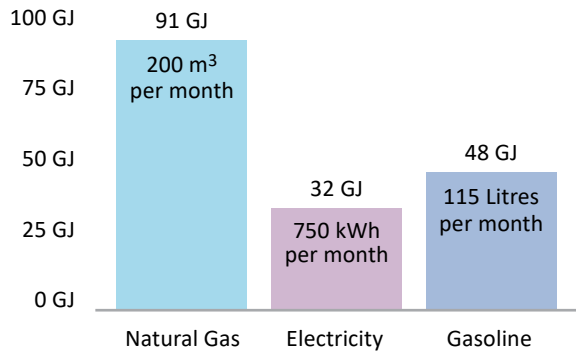
Annual Energy Bills (\$) Total = \$5,789



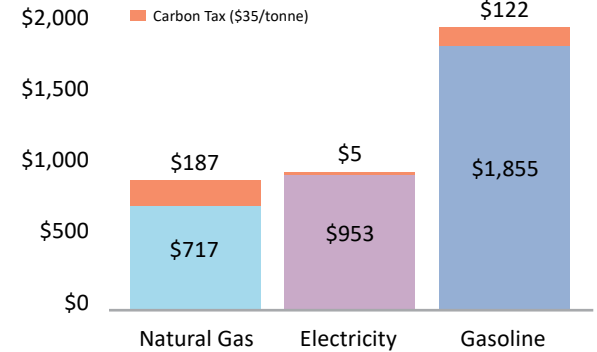
Value of Energy Customer Snapshot (British Columbia)

Small Town Retirees

Annual Energy Use (GJ/year)

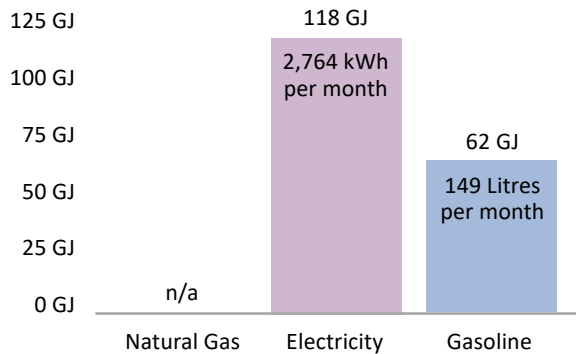


Annual Energy Bills (\$) Total = \$3,839

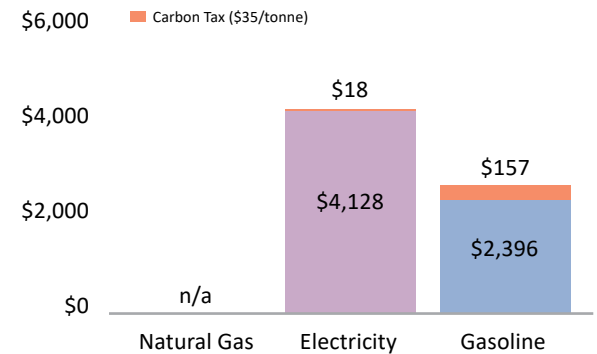


Rural Couple

Annual Energy Use (GJ/year)



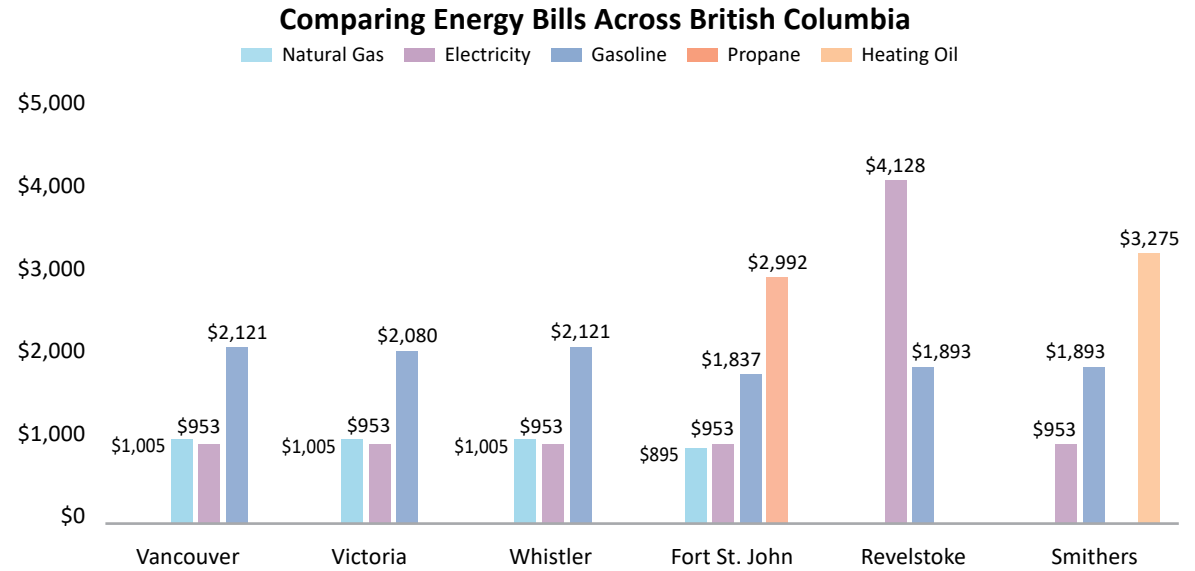
Annual Energy Bills (\$) Total = \$6,699



Value of Energy – Location impacts costs

The following chart shows some of the different annual energy costs depending on location.^{9/10/11/12}

- Electricity in all cities is served by BC hydro with one rate.
- Natural Gas in Vancouver, Victoria, Whistler are served by FortisBC at the same rate.
- Fort St. John is served by Pacific Northwest Gas (PNG)



9. Electricity: <https://www.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/residential-rates.html>, <https://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/ElectricBCUCsubmissions/Rates/Pages/default.aspx>.

10. Natural Gas: <https://www.fortisbc.com/NaturalGas/Homes/Rates/Pages/default.aspx>.

11. Gasoline Costs: <https://www.nrcan.gc.ca/energy/fuel-prices/4795>.

12. Heating Oil Costs: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000101&pickMembers%5B0%5D=2.7>.

13. Propane Prices: <https://www.nrcan.gc.ca/energy/fuel-prices/4801>.

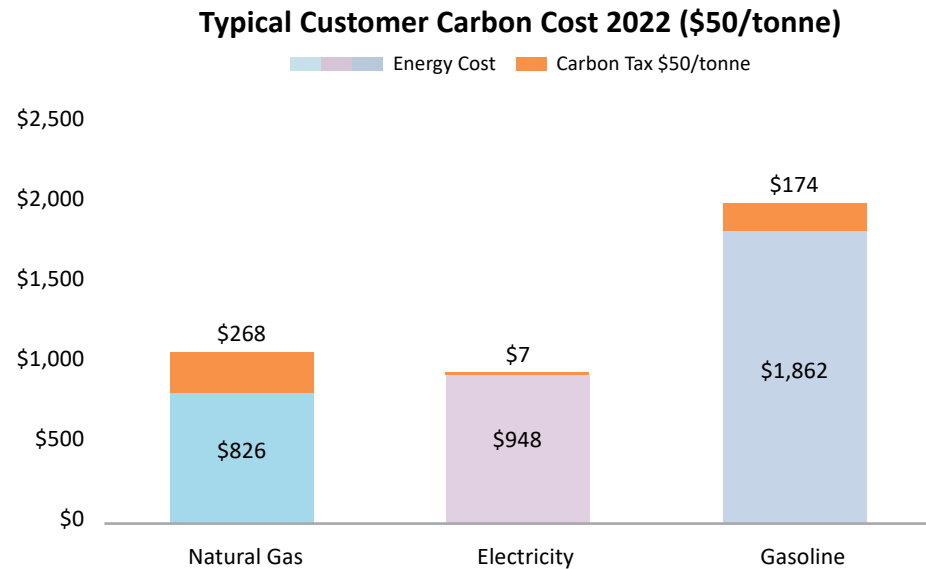
Impact of a national carbon dioxide emissions tax (aka carbon tax, carbon price)

The federal government has announced that they will be introducing a national price on carbon that will gradually reach \$50/tonne of CO₂ in 2022. The B.C. government plans to set its carbon tax at \$50/tonne in 2021.

The chart shows what the impact of a \$50/tonne tax on carbon would be for a typical household in Vancouver.

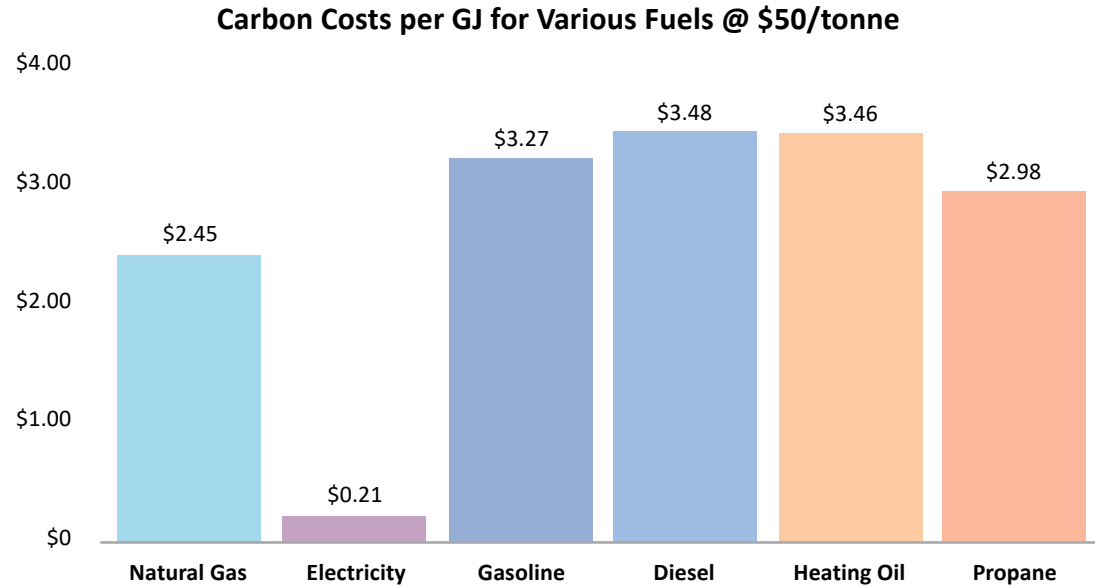
A \$50 tax on carbon dioxide emissions will increase total natural gas costs by 31%, electricity by 0.6% and gasoline by 8%.

Note: The energy prices in this chart assume constant commodity prices.



Carbon dioxide emissions costs for different fuels¹⁴

Fuels vary in their energy and carbon dioxide content. For example, burning a Litre of gasoline will produce a different amount of energy and CO₂ emissions when compared to burning a cubic metre of natural gas. In order to compare carbon costs, the following chart normalizes the most popular fuels on an energy-equivalent basis—that is their carbon dioxide content per gigajoule (GJ) and multiplies this by a carbon tax/price of \$50/tonne of CO₂.



14. Environment and Climate Change Canada, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada: <http://www.publications.gc.ca/site/eng/9.506002/publication.html>.

Conclusion

It should now be apparent that energy comes from a variety of sources, and households consume energy from different sources. Energy prices vary based on geography as well as the type of energy that is available or used. Of British Columbia's two million households, one million heat their homes with natural gas and the other half rely on electricity, heating oil, heat pumps, propane, coal, wood or some combination for heat.

Household budgets are affected by their energy use. B.C. families with the lowest energy prices have access to natural gas.

Typical B.C. households that rely on electricity for heating and appliances as well as electronics pay \$4,128 a year for energy. Those that use a combination of heating oil and electricity for appliances typically pay \$4,228. And households that have access to natural gas – representing half of B.C. homes – spend \$1,958 each year.

Not everyone has the same breakdown in fuel use as the typical customer, but these figures demonstrate the variances within British Columbia.

Government energy policymakers have a significant impact on household energy budgets. Changes to the province's energy infrastructure and mix should be done prudently since decisions made today will have lasting consequences on the supply of energy and its long-term affordability.

The public is concerned about climate change and addressing this challenge requires lawmakers to be honest about mitigation costs and the impact of policies on household budgets and businesses. If we hope to maintain our high quality of life, an all electrical or all renewable energy future remains, at best, an aspirational goal in a distant future. Questioning government policies that could negatively impact Canadians does not make the examiner a climate skeptic, merely a responsible and concerned citizen.

The starting point to any discussion on energy policy begins with measurable facts, which this report hopes to provide and give readers an understanding of the energy landscape in British Columbia.



British Columbia Household Research Report

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