

# The Value of Energy – Alberta

Canadians for Affordable Energy:  
Household Research Series





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 – Alberta Notes**

The energy price and cost data contained in this Alberta 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 Alberta Utilities Commission (ATCOenergy, ENMAX Energy, EPCOR, AESO) and the Ministry of Energy (gasoline).

As of June 1, 2017, the Alberta Government has implemented an electricity rate cap, ensuring Albertans pay no more than \$0.068/kWh. Until May 31, 2021, Albertans on the Regulated Rate Option (RRO) electricity plan will pay the market rate or the government's cap rate – whichever is lower.<sup>1</sup>

Energy price and cost data include Alberta's greenhouse reduction target and carbon dioxide emissions price (tax) of \$30 per tonne of CO<sub>2</sub> equivalent emissions effective January 1, 2018 – up from \$20/tonne of CO<sub>2</sub> in 2017.

1. See <https://www.alberta.ca/electricity-price-protection.aspx>.

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## Summary

Alberta's new United Conservative government led by Premier Jason Kenney has promised to axe the provincial carbon dioxide emissions tax set at \$30 a tonne enacted by the previous NDP administration. But even if this happens the federal government is ready to impose a \$20 a tonne federal carbon price on Alberta that will increase to \$50 per tonne in 2022. This federal carbon tax is going to have a big impact on the pocketbook of Alberta households and businesses.

When the increase in the federal carbon tax is taken into account natural gas costs will increase by 49% per cent by 2022. That is a significant province-wide tax hit when you consider 90% of Alberta homes use natural gas for their heating and appliance use. But even electricity prices will increase by 50% since the province's power is generated with fossil fuels – 47% from natural gas and 40% from coal. Gasoline meanwhile will go up 11%.

This increase in energy costs should concern Albertans because natural gas represents 53% of energy use in a typical household that has access to it. Gasoline represents 28% and electricity is 19% of total energy use. The scheduled increase in the carbon tax will cost households another \$268 to the price of natural gas and \$174 to gasoline pump prices by 2022. Household electricity costs will jump \$355.

Natural gas remains the most abundant, affordable and cleanest form of energy in Alberta. Typical Alberta households that rely on solely on electricity – about 10 per cent – for their energy needs pay \$2,526 a year for energy. Households that have access to natural gas spend \$1,620 each year. Even with carbon taxes applied, natural gas remains a more affordable energy source for families.

It's important that governments recognize the possible impacts of future decisions on the province's energy make up since policymakers have a significant impact on household energy budgets. Changes to Alberta'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 Value of Energy Research Series illustrates energy bills, energy use and energy value for a typical Alberta 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 ATCO, Fortis Alberta, ENMAX, Altagas, EPCOR, AESO and the Alberta Utilities Commission.

## *To give us an idea of The Value of Energy, let's look at Alberta's energy uses*

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

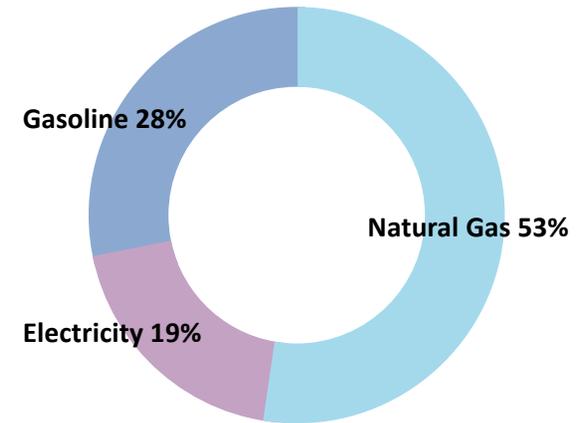
- Electricity provides 19%
- Gasoline provides 28%
- Natural gas provides 53%

**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 1.5 million Alberta households, nearly 90% of the total, use natural gas for heating. The remaining homes rely on electricity, heat pump, wood or some combination for heat.

### **We use natural gas in our**

- 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

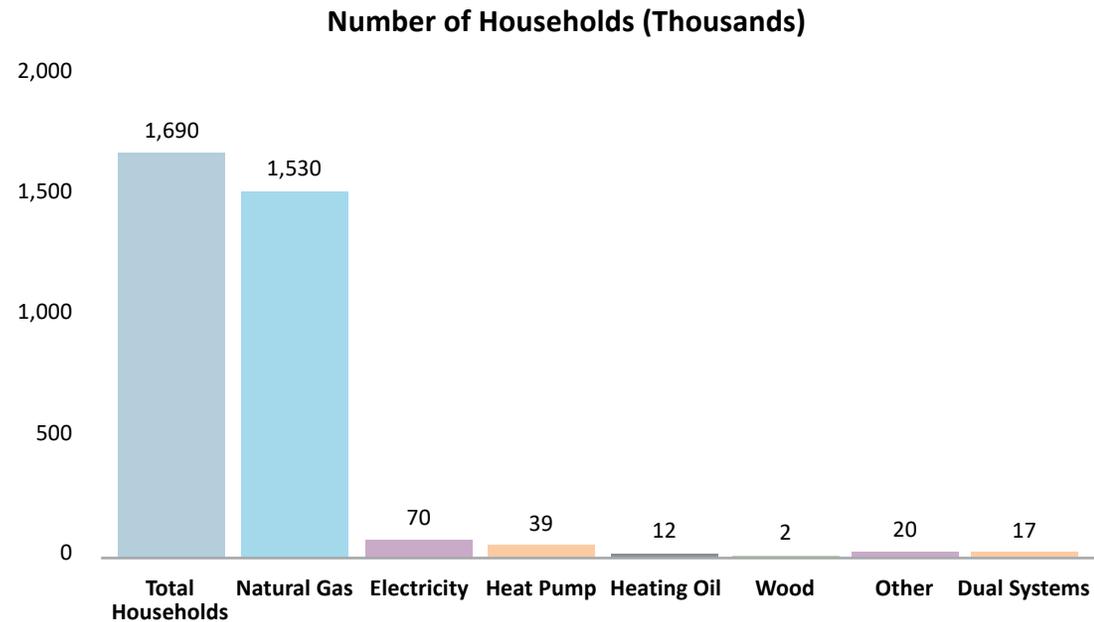
### **We use electricity to power**

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

## 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 1,530,000 households heat their homes with natural gas, 70,000 heat their homes with electric baseboards or boilers, 39,000 heat their homes with heat pumps and 12,000 heat their homes with heating oil. Other households use wood or some combination for their heating needs.<sup>2</sup>



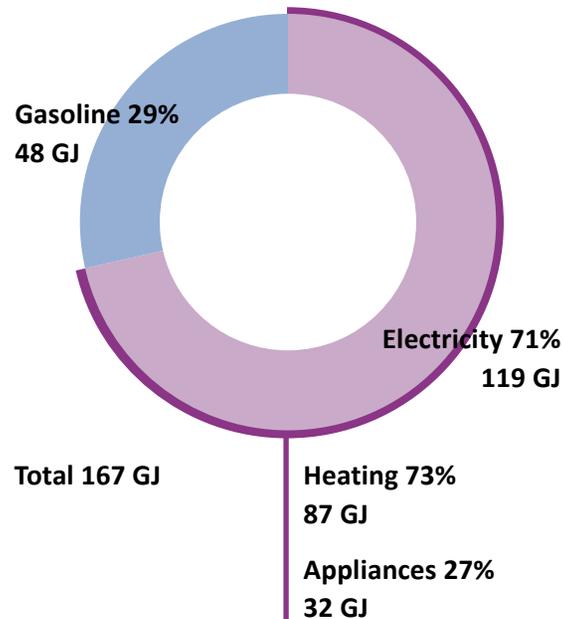
2. NRCAN Comprehensive Energy Use Database, Alberta, Table 21: Heating System Stock by Building Type and Heating System Type. See <http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=ab&rn=21&page=0>.

## Other Energy Use Profiles (without natural gas)<sup>3</sup>

The majority of Alberta 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 Electric Baseboards or Boilers:

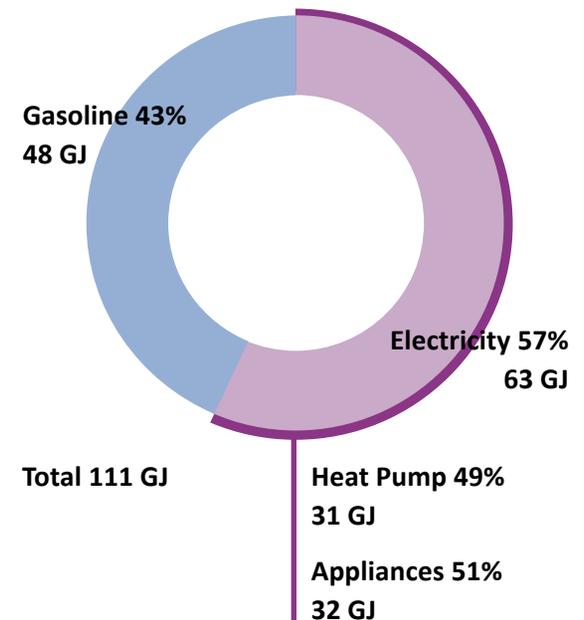
70,000 Alberta households rely on electricity to run their baseboards or boilers for heating, as well as for their appliances and electronics. A household with baseboard electric heating might have an energy use profile matching the pie chart below, with electricity providing 71% and gasoline 29% of a household's energy.



### Heating with Heat Pumps:

40,000 Alberta households rely on heat pumps to keep their houses warm. A household with a heat pump might use 28% of its energy to power the heat pump, with electricity for appliances using up 29% and gasoline 43%.

The total energy used by a household with a heat pump is lower than for households that use other fuels for heating. Because heat pumps are so efficient at concentrating and moving heat, they use a lot less electricity to deliver the same amount of heat as electric baseboards or boilers.



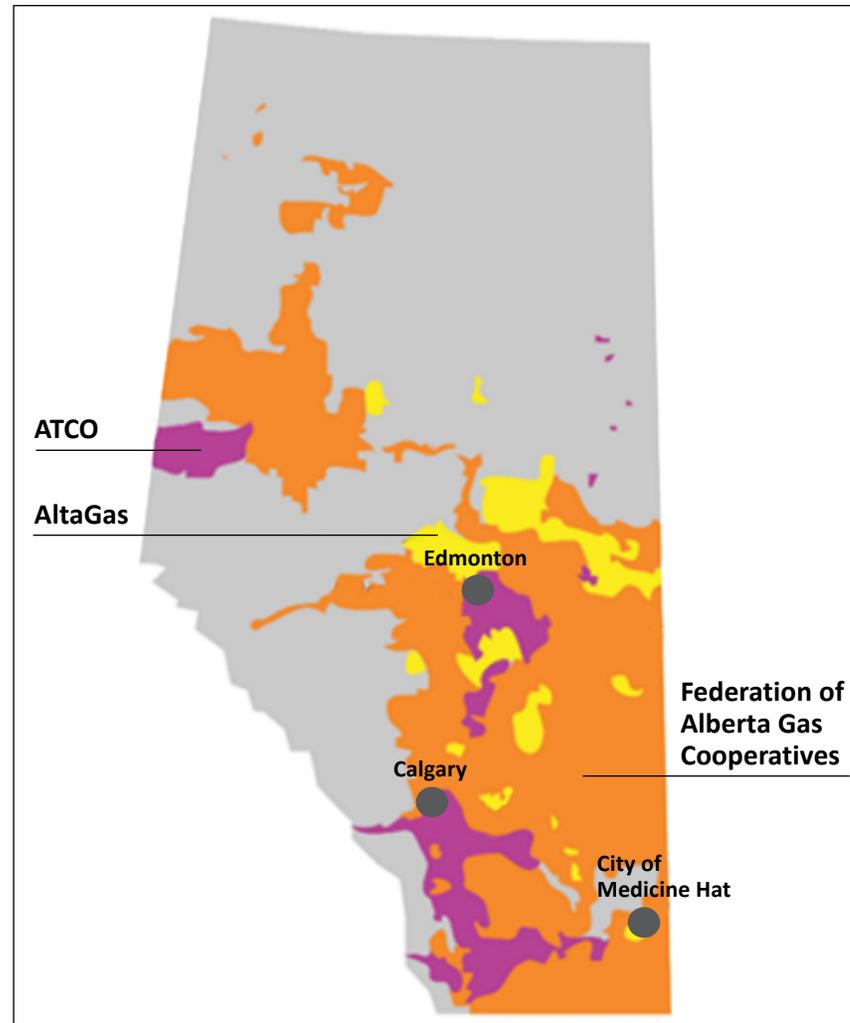
3. NRCAN Comprehensive Energy Use Database, Alberta, Table 21: Heating System Stock by Building Type and Heating System Type. See <http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP&sector=res&juris=ab&rn=21&page=0>.

## Which households have natural gas service?

Around 90% of Alberta households heat their homes with natural gas.

Alberta's natural gas distribution system covers most urban areas and rural communities, but low density and remote communities do not have natural gas service.

The map of Alberta shows geographical areas with and without natural gas service.<sup>4</sup>



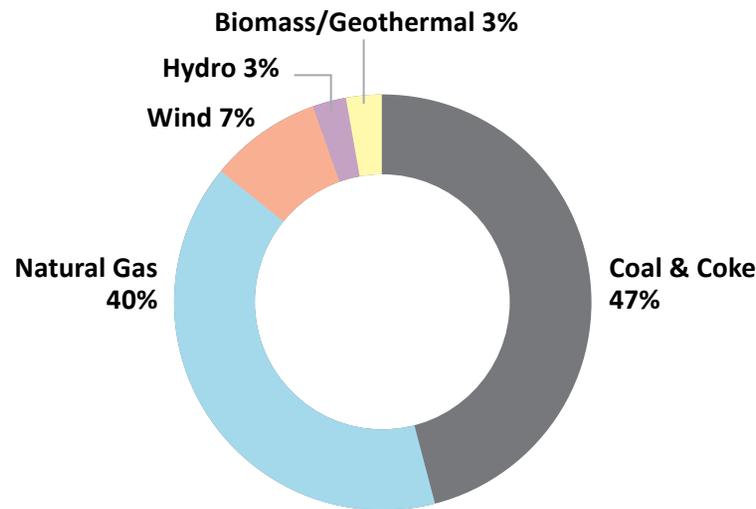
4. See <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/ab-eng.html>.

## Where does Alberta's electricity (power) come from?

Alberta households use electricity that is generated mostly from fossil fuels.

In 2016, Alberta generated 82.3 terawatt hours (TWh) of electricity, which is approximately 13% of total Canadian generation. Alberta is the 3rd largest producer of electricity in Canada and has a generating capacity of 16,602 megawatts (MW).<sup>5</sup>

The pie chart shows electricity generation by source in Alberta: approximately 87% of electricity in Alberta is produced from fossil fuels – 47% from coal and 40% from natural gas. The remaining 13% is produced from renewables, such as wind, hydro, and biomass.



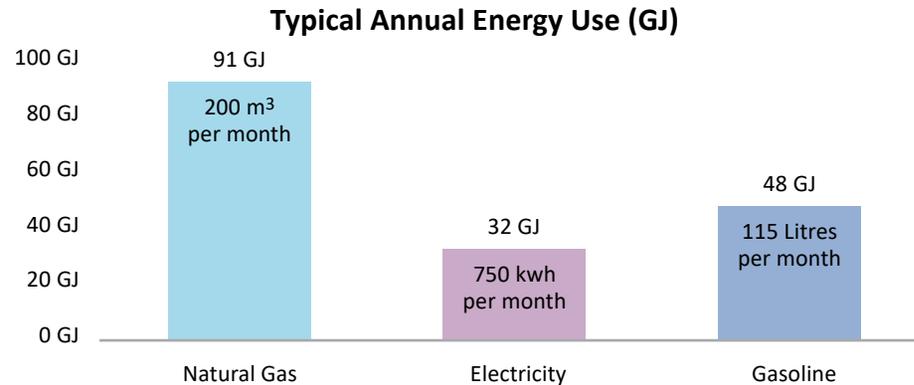
<b>Coal &amp; Coke</b>	38.7 TWh or 47%
<b>Natural Gas</b>	32.9 TWh or 40%
<b>Wind</b>	5.8 TWh or 7%
<b>Hydro</b>	2.5 TWh or 3%
<b>Biomass/ Geothermal</b>	2.5 TWh or 3%
<b>Total Generation</b>	82.4 TWh

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

# Typical Alberta household bills and energy use

Here's the breakdown of how much energy a typical Alberta household might use every year. This works out to be about 200 cubic meters (m<sup>3</sup>) of natural gas, 750 kilowatt hours (kWh) of electricity, and 115 litres of gasoline a month.

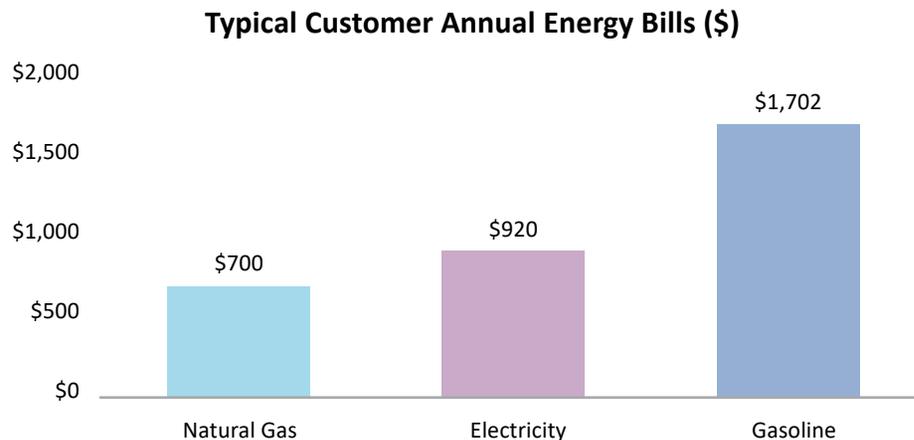
To show them together, we measure the energy used in gigajoules (GJ) per year, a common unit useful for comparing different fuels on an "apples to apples" basis. A gigajoule is equivalent to 1 billion joules, roughly the amount of energy it takes to power a 30 Watt light bulb throughout an entire year.



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

A typical Alberta household spends more money on 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 energy provider websites (ATCO, Enmax, Fortis-Alberta, EPCOR) for a typical Alberta customer.<sup>6/7/8/9</sup>



6. Electricity: [www.fortisalberta.com](http://www.fortisalberta.com), [www.atcoelectric.com](http://www.atcoelectric.com), [www.epcor.com](http://www.epcor.com), [www.enmax.com](http://www.enmax.com).

7. Natural Gas: [www.atcogas.com](http://www.atcogas.com), [www.altagasutilities.com](http://www.altagasutilities.com).

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

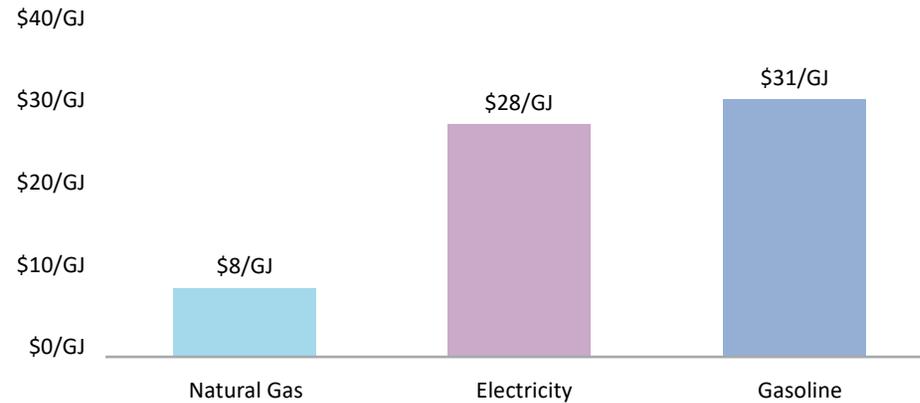
9. Heating Oil Costs: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000101&pickMembers%5B0%5D=2.7>.

# The Value of Energy for Alberta 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)

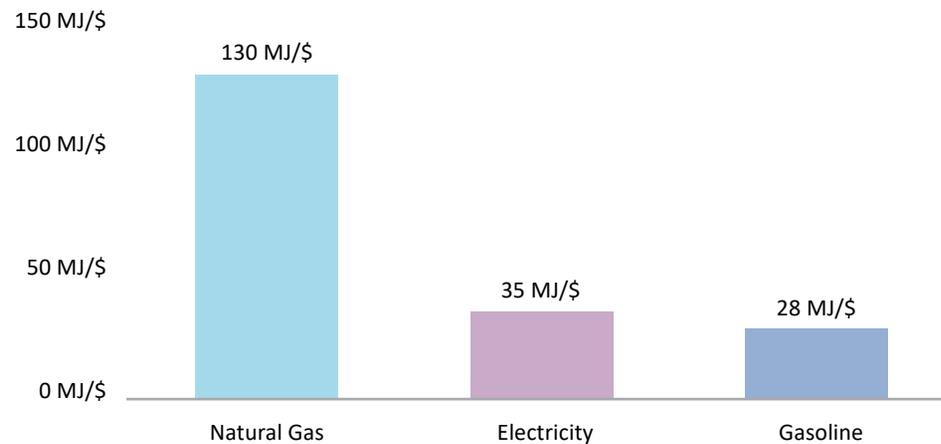


Another way to describe the Value of Energy is to show how much energy a household gets for each dollar spent on their energy bill.

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

1 GJ = 1,000 MJ

Energy per Dollar (MJ/\$)

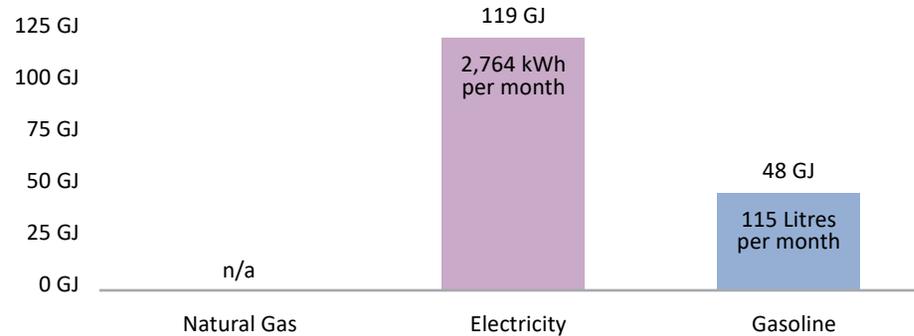


# A typical bill and household value of energy for Alberta's 70,000 families that rely on electricity for heat

Alberta 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.

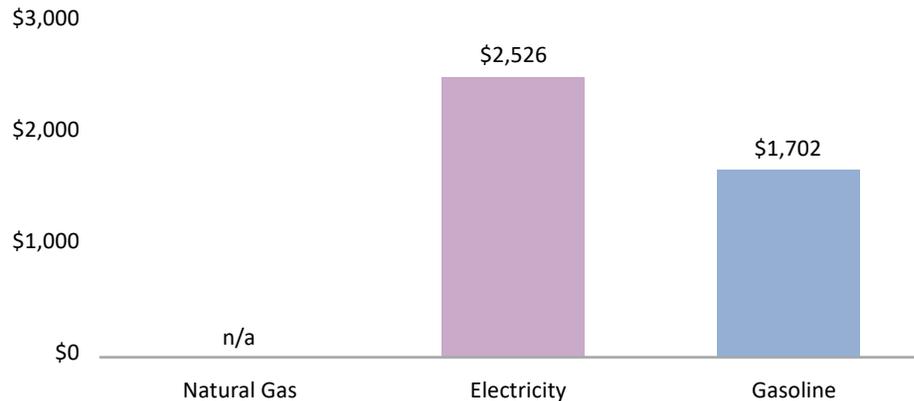
Annual Energy Use (GJ) - with Electric Heat



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

An Alberta household with electric heat would spend a lot on its energy bill because heating requires a lot of energy, and because the price of electricity is relatively higher than other fuels.

Annual Energy Bill (\$) - with Electric Heat



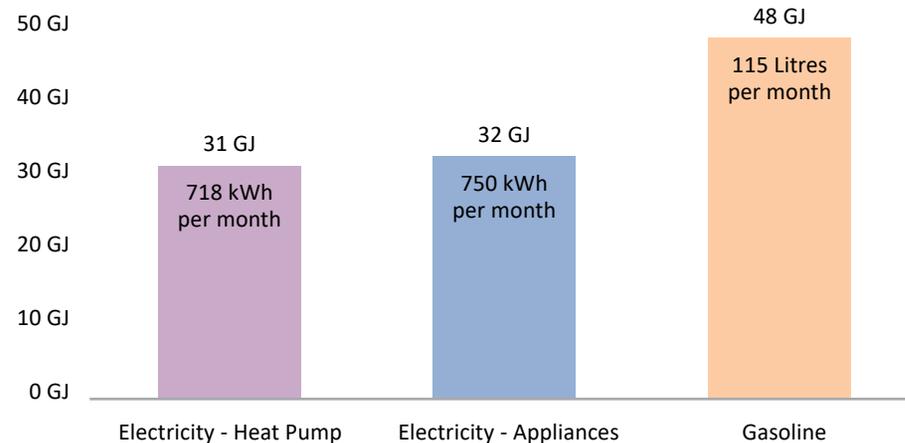
# A typical bill and household value of energy for Alberta's 39,000 families that rely on heat pumps

An Alberta household that relies on a heat pump would have a similar looking picture to the typical household that relies on electricity, except their consumption used for heating would be different.

A household that uses a heat pump for space and water heating might use an average of about 718 kWh of electricity for the heat pump, 750 kWh of electricity for appliances and 115 litres of gasoline a month.<sup>10</sup>

To show them all on the same chart, we've described the energy used in terms of gigajoules (GJ), a common unit useful for comparing fuels.

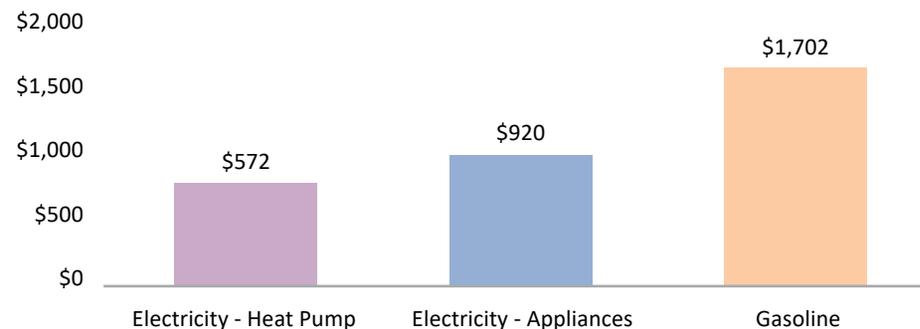
Annual Energy Use (GJ) - with Heat Pump



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

Heat pump costs calculated based on electricity consumption and rates.

Annual Energy Bill (\$) - with Heat Pump



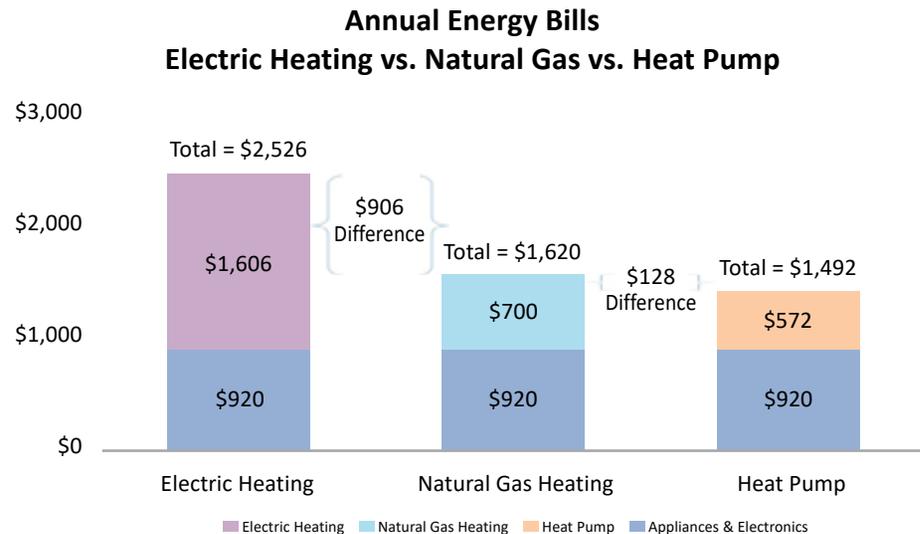
10. HSPF (average)=10 Alberta (Heating and cooling with a heat pump booklet, produced by Nrcan – Energuide).

## Comparing the costs of different fuels in Alberta

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 a heat pump.

The difference in annual bills between the households heated with natural gas and electricity is over \$900 due to the fact that the price of each unit of energy supplied with electricity is so much higher than natural gas. The difference between a heat pump and natural gas is just \$128 since heat pumps are very efficient heating systems.



# Value of Energy for different Alberta 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 are four Alberta customers, representing different demographics and lifestyles, along with a comparison of how much they use and pay for energy.



## Young Urban Single

Calgary (Enmax/ATCO Gas)

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

Edmonton (Epcor/ATCO Gas)

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

Highlevel (ATCO Electric/Altagas)

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

Fox Creek (Fortis Alberta)

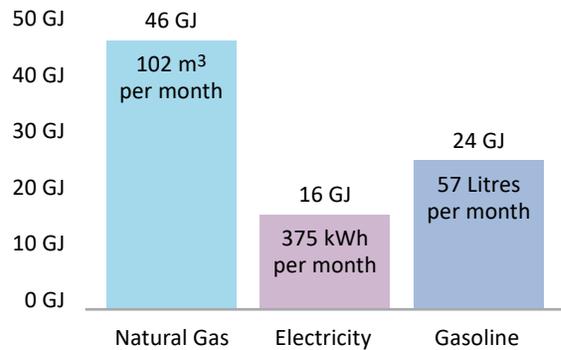
Moderate energy use and has higher energy bills

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

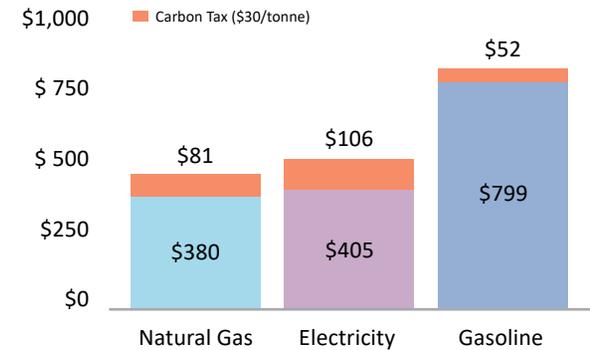
# Value of Energy Customer Snapshot (Alberta), which includes a tax on carbon dioxide emissions (\$30/tonne)

## Young Urban Single

Annual Energy Use (GJ/year)

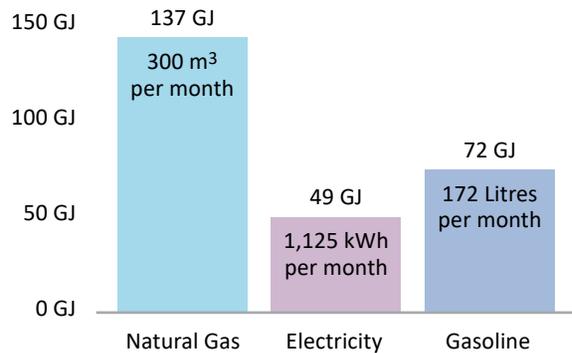


Annual Energy Bills (\$) Total = \$1,823

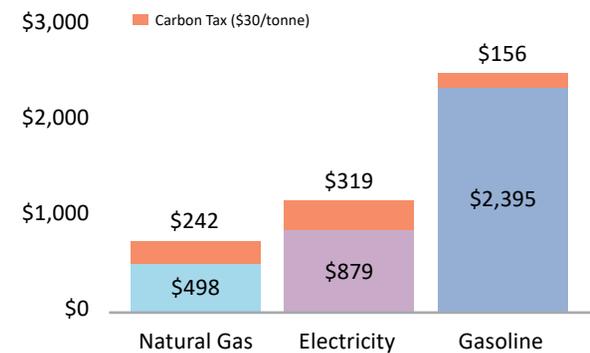


## Suburban Family

Annual Energy Use (GJ/year)



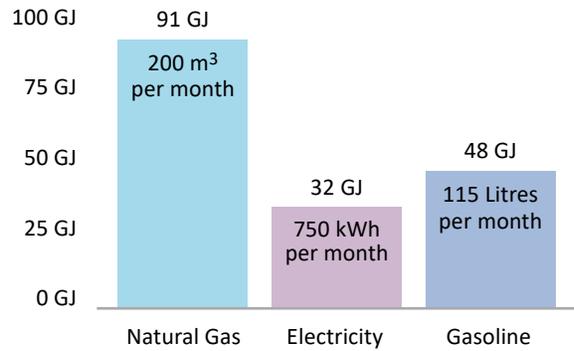
Annual Energy Bills (\$) Total = \$4,490



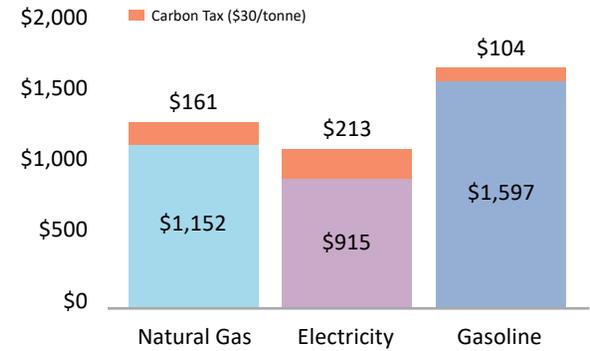
# Value of Energy Customer Snapshot (Alberta)

## Small Town Retirees

Annual Energy Use (GJ/year)

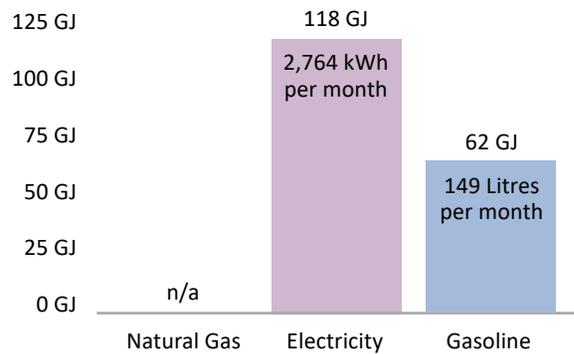


Annual Energy Bills (\$) Total = \$4,142

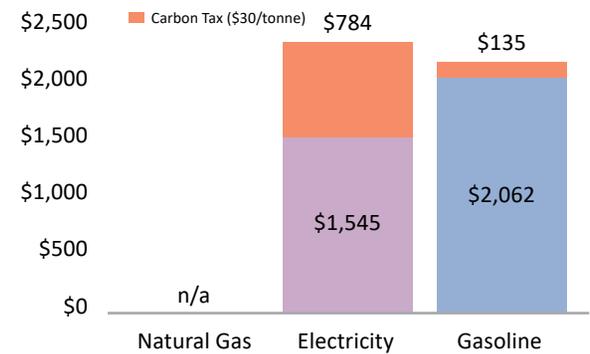


## Rural Couple

Annual Energy Use (GJ/year)



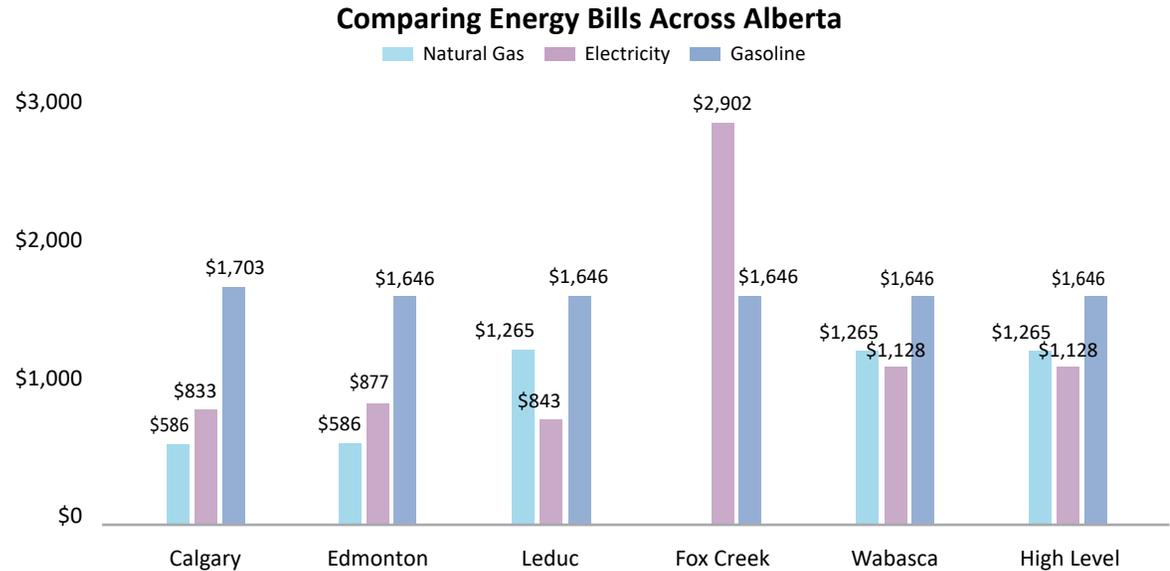
Annual Energy Bills (\$) Total = \$5,231



# Value of Energy – Location impacts costs

The following chart shows some of the different annual energy costs depending on location.<sup>11/12/13/14</sup>

- Calgary is served by Enmax and ATCO Gas
- Edmonton is served by Epcor and ATCO Gas
- Leduc is served by Fortis Alberta and Altagas
- Fox Creek is served by ATCO Electric and without natural gas service
- Wabasca is served by ATCO Electric and Altagas
- High Level is served by ATCO Electric and Altagas.



11. Electricity: [www.fortisalberta.com](http://www.fortisalberta.com), [www.atcoelectric.com](http://www.atcoelectric.com), [www.epcor.com](http://www.epcor.com).  
 12. Natural Gas: [www.atcogas.com](http://www.atcogas.com), [www.altagasutilities.com](http://www.altagasutilities.com).  
 13. Gasoline Costs: <https://www.gasbuddy.com/GasPrices/Alberta/>.  
 14. Heating Oil Costs: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000101&pickMembers%5B0%5D=2.7>.

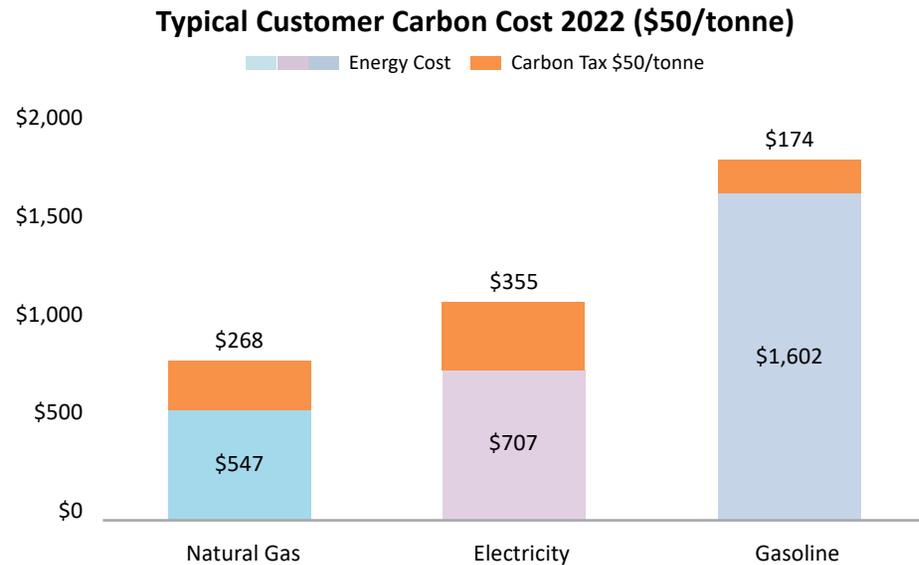
## Impact of a national carbon dioxide emissions tax (aka carbon tax, carbon price)

The federal government has announced that they will enforce a national price on carbon dioxide that will gradually reach \$50/tonne of CO<sub>2</sub> in 2022.

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

**A \$50 tax on carbon dioxide emissions will increase total natural gas costs by 49%, electricity by 50% and gasoline by 11%.**

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



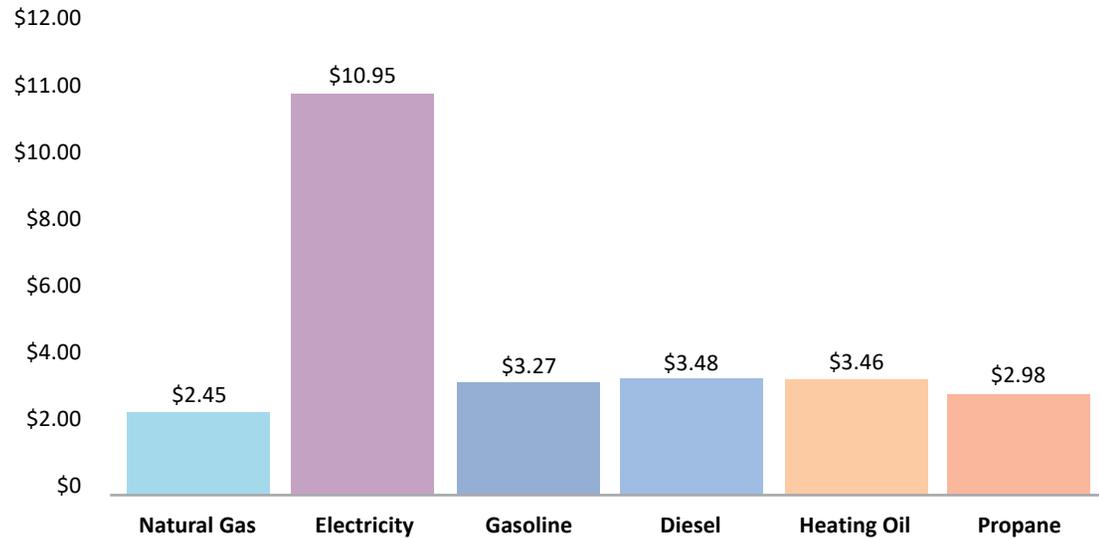
## Carbon dioxide emissions costs for different fuels<sup>15</sup>

Fuels vary in their energy and carbon dioxide content. For example, burning a litre of gasoline will produce a different amount of energy and CO<sub>2</sub> 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 CO<sub>2</sub>.

Carbon costs for electricity are higher due to the fact that about 87% of Alberta's electricity is generated with fossil fuels – 40% with coal and 47% with natural gas.

Carbon Costs per GJ for Various Fuels at \$50/tonne



15. Environment and Climate Change Canada, National Inventory Report, Greenhouse Gas Sources and Sinks in Canada: See <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 Alberta's 1.69 million households, about 1.53 million heat their homes with natural gas, 70,000 homes rely on electric baseboards or boilers, 39,000 use heat pumps, and the remainder use heating oil, wood or some combination for heat.

Household budgets are affected by their energy use. Alberta families with the lowest energy prices have access to natural gas or a heat pump.

Typical Alberta households that rely on electricity for heating and appliances as well as electronics pay \$2,526 a year for energy. Those that use a heat pump plus electricity for appliances typically pay \$1,492. And households that have access to natural gas – representing over 90% of Alberta homes – spend \$1,620 each year.

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

Government energy policymakers have a significant impact on household energy budgets. Changes to Alberta'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 Alberta.



## **Alberta Household Research Report**

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