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Final Paper for POSC370: *National Energy Strategy*

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Comments

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Energy and the politics that surround it are interesting and important in Canada. Canada plays an integral role in the global energy marketplace, and the domestic political battles that are fought around energy can produce shocks around the globe. The energy sector and the production of energy or energy products accounts for over 10% of Canada's total GDP and 5% of its total employment (National Resources Canada 2017). This significant percentage is not spread equally throughout the country, as some provinces (notably Alberta, Saskatchewan, Newfoundland and Labrador) account for almost 60% of total energy production (National Resources Canada 2017). Production inequalities are notable because the regulatory framework in Canada is such that the overlap between provincial and federal governing entities can become complicated and overly complex (Fertel et al. 2013).

Canada's energy policy is to a large extent devised federally and implemented provincially, with energy and climate policy understood as inhabiting the same sphere (Fertel et al. 2013). In practice this means that the federal government is responsible for most sector-wide or inter-provincial aspects of the energy sphere, and the provincial governments are responsible for their specific energy demands and resources. This complicated combination of jurisdiction and authority has created tensions that can produce shifts within the energy sector and can stall advances in clean power. These tensions have become more prominent following the discovery of huge oil sands and the technology that has allowed them to become a proved and viable source of oil extraction.

Canada's role as a global energy producer makes its place in the international marketplace important. Canada is the fourth largest producer of oil in the world (5.1% of global total), fourth largest producer of natural gas (4.8% of global total), and is a net exporter of both oil and natural gas as well as coal (International Energy Agency 2017). While occupying a

central role in the oil and gas space, Canada also produces a vast amount of energy from other sources. Canada is the seventh largest global producer of nuclear energy receiving 15.1% of its domestic total from the source, the second largest user of hydroelectric power (9.6% of the global total), and the seventh largest producer of wind power (3.2% of the global total) (International Energy Agency 2017). Due to its cold winter weather, its large economy and its status as a net exporter with abundant sources for energy, Canadian energy consumption per capita is quite intense (Statistics Canada 2012).

Canada's energy sources are diverse. The country produces vast amounts of energy in the forms of natural gas and oil, but also heavily relies on hydroelectric power for electricity production. Canada consumes 31% of its total domestic energy from oil related sources, 28% from natural gas, 26% from hydroelectric sources, 7% from nuclear, 6% from coal, and only 2% from non-hydro renewable sources (Energy Information Administration 2015). While Canada's consumption of oil accounts for its largest share of total energy usage, it is far below the amount of oil that it produces (Energy Information Administration 2015). This gap between oil produced and oil consumed, combined with Canada's geographic location next to the largest oil consuming country (the United States) has helped make Canada one of the largest exporters of oil products (Energy Information Administration 2015). Canada is also a net exporter of energy of all sources, exporting not just its oil and gas products but electricity and other forms of viable energy, primarily to the United States (National Resources Canada 2017). Canada's total energy export sector is integral to its larger economy, as it accounted for $85.7 billion, good for 18% of all Canadian export merchandise revenue (National Resources Canada 2017).

The relationship between the United States and Canada is especially important, as the two are significant trading partners in the energy sector. With regard to value, the United States

accounts for 92% of Canadian energy exports ($78.2 billion) (National Resources Canada 2017). On the import side, 65% of Canadian energy imports ($23.2 billion) come from the United States (Natural Resources Canada 2017). Broken down by energy sector this means that 79% of crude oil produced in Canada, 53% of natural gas, 31% of uranium, 21% of petroleum products, 11% of all electricity, and 2% of total coal are exported to the United States (National Resources Canada 2017).

The weight and the broader benefits of the energy sector as a whole are not shared equitably among all Canadian provinces. The geographic specificity of energy resources and the regulatory framework that emphasizes provincial control has allowed several regions to occupy the space more than others. As alluded to earlier, this overlapping framework between provincial and federal authority has led to difficulties in implementing broad and long term strategies. Much of this comes from the relative freedom of provinces to pursue and devise objectives that meet goals and needs of their distinct residents rather than Canada as a whole. In this sense, Canadian energy strategy can sometimes appear coherent broadly, but can be implemented rather incoherently.

This tension arises because Canadian federalism is fairly decentralized, especially so with regard to natural resources. Act 109 of the Constitution of Canada gives almost exclusive control of lands, mines, royalties, minerals, etc. within provinces to the respective province that the resources are found in (Constitution Act 1867). This stipulation is integral to the revenue generation and employment of many of the provinces in Canada, and especially with regard to the energy sectors (National Resources Canada 2017). Though much of the control surrounding production and generation is provincial, when energy travels between provinces or is designated for international trade, the federal government is implicated. This complicates the overall ability

to generate strategic plans because the incentives for provinces to generate and export large amounts of energy are significant, but they must include the federal government, an actor with its own goals, if they wish to export their excess production.

The tension between federal and provincial authorities also stems from the incentives each have to pursue distinct sources of energy. Federally, the Canadian government wishes to reduce CO2 emissions and to pursue goals of clean energy for the country as a whole (Canadian Broadcasting Corp. 2015). Provincially, however, certain provinces that have large amounts of proved reserves that could become economically lucrative due to the possible tax revenue and royalties, and thus have an incentive to pursue exploration and extraction of these resources and also to use these resources in energy production more generally (National Energy Board 2015). A broad strategic plan for climate and energy would need to take these factors into account. Strategic goals could be broken down in several ways and a broad plan should incorporate multiple points of contact. The contours of this strategy include: expansion of cleaner energy producing methods involving non-renewable or fossil fuel sources, gains in overall energy efficiency, and an expansion of renewable sources. Mechanisms that could have a place in each broad goal could be: economic incentives, investment in research and development, regulatory alterations, and a development of energy markets.

A significant amount of Canada's energy comes from non-renewable and largely fossil fuel sources (National Energy Board 2015). Improving the cleanliness of these sources is an important strategic objective because it is both achievable and would have wide-ranging impacts. These are important considerations, especially because these goals are achievable on a shorter time horizon. Two major and achievable goals in this area are improving and increasing the usage of natural gas and implementing carbon capture and sequestration technology.

Natural gas already occupies a fairly central role in energy production in Canada (National Energy Board 2015). If the fairly small but remaining reliance on coal were to be swapped for natural gas it could be an achievable and beneficial change that would be relatively painless for the provinces that still use coal. This change would almost necessarily rely on both provincial and federal governing authorities to implement because of the overlap between the two in the realm of energy production. In practice this would mean that a synthesis between the two governing bodies would have to be created prioritizing cleaner fossil fuel usage. The federal government could also have a more active and direct role in the expansion of cleaner technologies by subsidizing research and development into newer technologies and offering tax benefits to companies that implement these technologies. Provincial authorities would obviously have the last say and would often need the costs differences to be minimal in order to pursue such a strategy. This is possible because of the availability of natural gas in Canada and the relatively inexpensive nature of the product.

Carbon capture and sequestration are still relatively recent technological innovations that are difficult to implement on a large scale and thus reliance on government subsidization of research and development is key (MIT Tech Review 2018). The technology would be beneficial, but it may also allow for a future where reliance on fossil fuels more broadly would still be acceptable and thus a full transition to a more renewable future may seem like less of a necessity. It is important to stress that both technologies that promote cleaner usage of fossil fuels are not meant to be static long term strategies, but rather stopgap measures that are achievable at this moment or in the very near future. Sequestration and capture could benefit Canada, though, because the relative abundance of natural gas means that it will most likely remain a prominent source of energy into the future no matter the scenario.

Expanding energy efficiency is an important and viable strategic goal in Canada. The federal government recognized this as a part of a broad energy strategy in 1992 when it passed the Energy Efficiency Act which sought to establish a regulatory framework for the production and implementation of guidelines concerning, "energy efficiency of energy-using products and the use of alternative energy sources," (Energy Efficiency Act 1992).

Possible policy options that Canada could pursue in the realm of energy efficiency are: construction and buildings, transportation, and the industrial sector. Each of these policy areas would overlap between the provincial and federal authorities, with each of these authorities being better suited for certain approaches or mechanisms.

With regard to buildings and construction, energy efficiency can be pursued federally by: creating and implementing detailed building codes with minimum energy performance standards, creating certificates and labels for energy performance, and aiming for net-zero consumption in new buildings. The federal government is best suited for these options because they are broad, require and benefit from consistency across the country, and are longer-term goals. Given the decentralized federal structure in Canada, the federal government is also better-suited for mechanisms like these. The provincial governments are not completely left out of an energy efficiency strategy, however, and have many mechanisms to create a more energy efficient future. Provinces could be most effective in modernizing existing buildings and improving the energy efficiency in existing buildings and their internal components.

The federal government could also use direct and indirect economic incentives and establish regulatory apparatuses to pursue these broader goals. The federal government could offer tax credits to building companies that wish to build new tracts or developments if they follow the energy efficiency guidelines or standards. The federal government could, similarly,

offer direct investment through private-public partnerships with building companies or other mechanisms to implement the more investment-intensive net-zero buildings. In the realm of regulation, the federal government is well-suited to create and implement strict new building codes and standards that have energy efficiency as a core tenet.

The provincial governments, with their limited reach and decentralized nature would be better suited to pursue more localized goals and respond to the specific nature of their region. These factors are why the provincial governments are more able to help modernize and improve the existing structures. Each province has its own history and often different population concentrations and buildings of different ages, so modernization and improvement of existing buildings would be better pursued by more regional authorities. These goals could be achieved through regulatory and economic means similar to those used by the federal government but differing in scope and scale. The provincial governments could similarly offer tax credits to modernization projects and help subsidize improvements that help further energy efficiency. Provincial governments could create particularized time frames and distinct standards for existing structures based on multiple factors like age, building material, structure size, etc. that are better suited for more local or regional authorities.

Transportation is a sector in which a strategy for energy efficiency could have significant gains. The energy consumed in transportation is both intense and comes primarily from fossil fuel sources (Statistics Canada 2012). A strategy for energy efficiency in this area would necessarily include provincial and federal authorities in similar but distinct ways. Provincial authorities would be better suited for transportation that is of exclusively local or regional origin and destination. The most obvious example of this type of transportation is public transit. In this way, provincial authorities could transition public transit systems to more energy

efficient means such as electric or natural gas. Other mechanisms are the improvements of roadways, the creation of more bike paths and walkways, and the implementation of bike share or similar programs the incentivize transportation that does not require energy intensive sources. The federal government can help create a more energy efficient transportation sector by targeting broader goals and types of transportation that are more national in nature. The most obvious example is the automobile. The federal government could create fuel efficiency standards, emissions guidelines, and broader operational efficiency measures. In practice this would mean that the federal government would incentivize the production and purchase of efficient vehicles by offering tax credits to reward fuel efficient vehicles or create a tax to punish inefficient ones. These mechanisms could also be transferred to the regulation of emissions guidelines, in which high-emitting cars would be under scrutiny and low-emitting cars prioritized. Operational efficiency would be achieved through the creation and publication of eco-driving techniques and the manipulation of speed limits and other more direct methods.

The industrial sector is also an area in which the expansion of energy efficiency would have noticeable benefits for the country as a whole. The industrial sector in Canada is large and important and contains corporations that range in size. Given that there are large corporations that occupy multiple provinces and utilize huge amounts of energy inhabiting the same sector as small, single-province companies it is important to create a strategy that uses the strengths of each regulatory body- provincial and federal.

The federal government is best-suited for creating regulations and implementing incentive programs for large corporations that may span multiple provinces. In practice this would mean creating more strict tax-saving programs that shift their emphasis from purely corporate to include aspects of energy efficiency, as well as the broader implementation of

modernization programs that incentivize investment in newer technologies or companies that seek to improve their technology. The federal government could pursue these goals better than provincial authorities because of the expansive nature of the problem and the intensive amount of capital or tax and regulation authority needed. If the federal authorities are better-suited to regulate larger corporations, the provincial authorities could occupy the smaller resulting space within which more regional or local industrial groups fit. The provincial authorities could respond to the more specific problems that arise from the smaller reach and size of these regional or local industrial corporations. Practical measures provincial authorities could pursue include local tax credits for energy efficient equipment, the creation and implementation of energy efficient standards for specific types of industrial companies, and broader education on energy efficiency for the small or medium-sized industrial companies that fit this regulatory niche. Expanding the use of renewable energy resources would have a dramatic positive impact on Canada's climate and energy goals overall, but most obviously in the realm of electricity generation. An achievable strategy in this realm, as with others already discussed, would involve cooperation from both federal and provincial authorities. As a whole Canada receives a fairly significant amount of its domestic electricity (80.3%) from renewables (International Energy Agency 2016). This oversimplifies what the situation looks like from province to province, however. Some provinces, like Newfoundland and Labrador, Quebec, Manitoba, British Columbia, and Yukon receive almost all of their electricity from hydroelectric sources (Valentine 2010). Other heavily used renewable sources are nuclear (especially for Ontario) and wind and tidal generation (for Prince Edward Island) (Valentine 2010).

Although 80.3% of total electricity is received from renewable sources, there is a wide disparity from province to province that could be bridged by centralization from the federal

government. The difficulty here stems from the wide range of control, given in section 92A(1) of the Canadian Constitution Act, that provinces have specifically over electricity generation and resources used to produce electricity (Constitution Act 1867). Given that the final decision-making authority over electricity generation lies with the governing bodies of the provinces, the most effective means that the federal government has to implement policy changes is by incentivizing certain decisions to be made by these authorities. Powerful incentive mechanisms that the federal government has are subsidies for research and development of new renewable technologies and the creation of tax credits that reward the usage of renewable energy in electricity generation.

Canada receives the vast majority of its renewable energy from hydroelectric generation, which is inherently limited to particular geographic regions. Canada, with its swaths of undeveloped land that contain adequate wind sources, has untapped potential in the expansion of wind power as a renewable energy source. Wind power generation has high initial costs, but subsidization and investment by the federal government is an option that could produce success and reduce the high barriers to entry. A similar strategy that, in conjunction, focused on the expansion of solar energy is possible as well. Differences between the two, however, are that solar implementation could be incorporated into building codes and standards that apply on a residential level with more independence than wind power that is connected more directly to the electrical grid and often operated by utilities providers.

Even though Canada produces a significant amount of its electricity from renewable sources, it still has broader energy usage and greenhouse gas (GHG) emissions per capita that are above the average for similarly developed nations and the OECD average (Fertel et al. 2013). This shows the current tensions in Canadian energy policy between electricity generation that is

generally clean, and a massive oil and gas sector and heavy reliance on transportation that continue to produce significant GHG emissions. The political battles contributing to such a tension are primarily due to the significant decentralization in Canadian federalism that gives provincial governments vast autonomy and authority over energy production and resources in their geographical area. The autonomy over energy production at the regional level often clashes with the broad goals that the federal government often has for climate and energy policy. A vivid example of the intractability of this tension is the signing of (and subsequent exit from) the Kyoto protocol.

These tensions are exacerbated by the discovery of rich sands regions throughout parts of the country that have increased the proved reserves and economically recoverable oil and gas (Canadian Assoc. of Petrol. Producers 2018). These recent discoveries, combined with the underlying structure of decentralized federalism that grants provinces primary authority over resource extraction and energy production, provide incentives for individual provinces to maximize royalty and tax bases. These incentives are present regardless of the broader goals that the federal government has in place for energy or climate policy.

To overcome these tensions and implement a coherent and realistic strategy that includes energy and climate policy the federal government and provincial authorities will need to cooperate in at least a limited sense. This is true of the areas already discussed like technology for cleaner fossil fuels, improving energy efficiency, and the expansion of renewable energy; but especially true of oil and gas due to the incentives noted above. A strategy with regard to this area could include similar mechanisms to those above also, combining regulatory powers and incentives of various sorts to enact changes in areas where there may not be consensus. In practice this would mean having the federal government establish standards and regulations

concerning sectors with heavy emissions like the oil and gas sector, transportation, and construction (Environment and Climate Change Canada 2017). These standards could then be selectively implemented by the provinces that choose to follow them. The federal government could incentivize the implementation of these standards by providing selective tax credits or tax exemptions to provinces that meet requirements. The federal government could follow the incentivization program with regulations that punish GHG emissions above certain levels through tax increases or by making the interstate and international exportation of oil and gas more difficult.

With regard to energy security, not many strategic alterations need to be made to ensure independence. As noted above, Canada is a net exporter of energy products as a whole and especially of oil and gas products. Given the massive amounts of energy the the country produces, and the high amount specifically of oil and gas, the country is already in many senses energy independent. Canada's successful investments in hydroelectric electricity generation and the room for expansion with more renewable sources means that domestic energy supply is in no danger of reliance on the whims of outside sources.

Being a net exporter with essentially a single client (this being the United States) does provide some complications, however. It is extremely unlikely that Canada will be in a position that necessitates the import of oil and gas products to fulfill its energy needs; but the centrality of the oil and gas sectors to economic factors of employment, investment, and revenues means that market fluctuations can have wide ranging impacts. If the United States itself were to somehow reach energy independence, as the EIA predicts, it could spell dramatic changes to the Canadian economy (Energy Information Agency 2017). With the United States as its primary customer Canada benefits quite handsomely. The geographic closeness that the two countries share means

the export costs and net losses are low and revenues are maximized. Some groups think that this fear is overplayed because most advances in U.S. oil drilling is for light oil, which U.S. refineries are not yet broadly capable of refining (Oil Sands Magazine 2018). Canadian oil sands produce the heavy oil which most U.S. refineries are designed for and which produce higher yields than light oil (Oil Sands Magazine 2018).

Forecasted energy production is important to incorporate into a viable and realistic energy strategy. Unabated, it is projected that Canadian oil extraction will pick up speed in the next 20 years, increasing from around 4 million barrels per day in 2015 to around 6.5 million by 2040 (National Energy Board 2018). Around 84% of this entire production would come from a single region (Alberta) and the expanding reserves found there (National Energy Board 2018). If technology increases occur, reducing the oil and gas demand, it is possible that oil production would reduce from around 6.5 million barrels per day to just over 5.5 million barrels per day (National Energy Board 2018).

Given that the majority of projected increases in oil and natural gas extraction are limited to a very small subset of regions and provinces, it is more likely that other regions could be incentivized to rely more on renewable energy to meet their needs. The federal government could spur this innovation into the future by offering forms of subsidization to these provinces and by investing in the necessary research and development of these technologies. Transitioning to a more renewable energy sector would have benefits in a future in which energy sources and global energy demands are uncertain. If global demand for oil and gas were to reduce, or global transitions to renewable sources increase Canada would need to be prepared and have responses in place to soften the impact to its oil and gas sectors. In this future it would make sense for Canada to leverage the massive amount of electricity generation it receives from renewable

sources to pursue exporting this green electricity to the neighboring United States. As the U.S. more heavily invests in renewables itself and as climate policy expands, it is possible U.S. utilities would see importing renewable electricity from Canada as a viable option. In this case, provinces in Canada could be rewarded for pursuing excess electricity generation from renewable sources both from initial federal subsidization and export of the finished product to the United States.

Energy policy and broader climate policy are intertwined, and a strategy that includes both must address the conflict between federal goals and provincial realities. As climate policy becomes more of a reality and as the benefits of renewable energy generation are realized and expanded, it may become easier for both sides to cooperate. A major barrier that is quickly being overcome is the cost of renewable sources (National Energy Board 2018). The costs of solar power generation, wind power generation, electric vehicles, electric home heating, among others are falling somewhat dramatically (National Energy Board 2018). Newer technologies and a broadening market have lowered barriers to entry and helped produce competitive markets for more than just fossil fuels. As technological advances pick up speed and access to renewable energy broadens, it is possible that high-emitting and high-consuming sectors like the transportation sector can turn into areas of dramatic change. This sector especially is an area where provincial and federal incentives may align and a cooperative strategy become a real possibility.

Broad political support for an active climate and energy policy is present in Canada. The Canadian public largely supports transitions to renewable sources of energy, implementation of policies that would help reduce fossil fuel reliance, and cooperation between federal and provincial authorities in these areas (Clean Energy Canada 2016; and Mildenberger et al. 2016).

Canadians also are likely to perceive climate change as a threat, and likely to see government action in this area as a favorable development (Clean Energy Canada 2016). With individual public support present homogeneously throughout all provinces, strategies of cooperation between provincial and federal authorities are more likely into the future. If the federal government continues to provide leadership and set broad national goals, then the shifting public opinion within the provinces may eventually give rise to provincial elections swaying toward those who see eye to eye with federal leaders on these issues. Although there are resource heterogeneities between the provinces, this may not directly lead to policy differences. It is imperative that the federal government seek to take the lead in this area, and to implement policies that help spur innovation and expansion of renewable technologies, improve energy efficiency, and (in the short term at least) cleaner fossil fuels.

Appendix

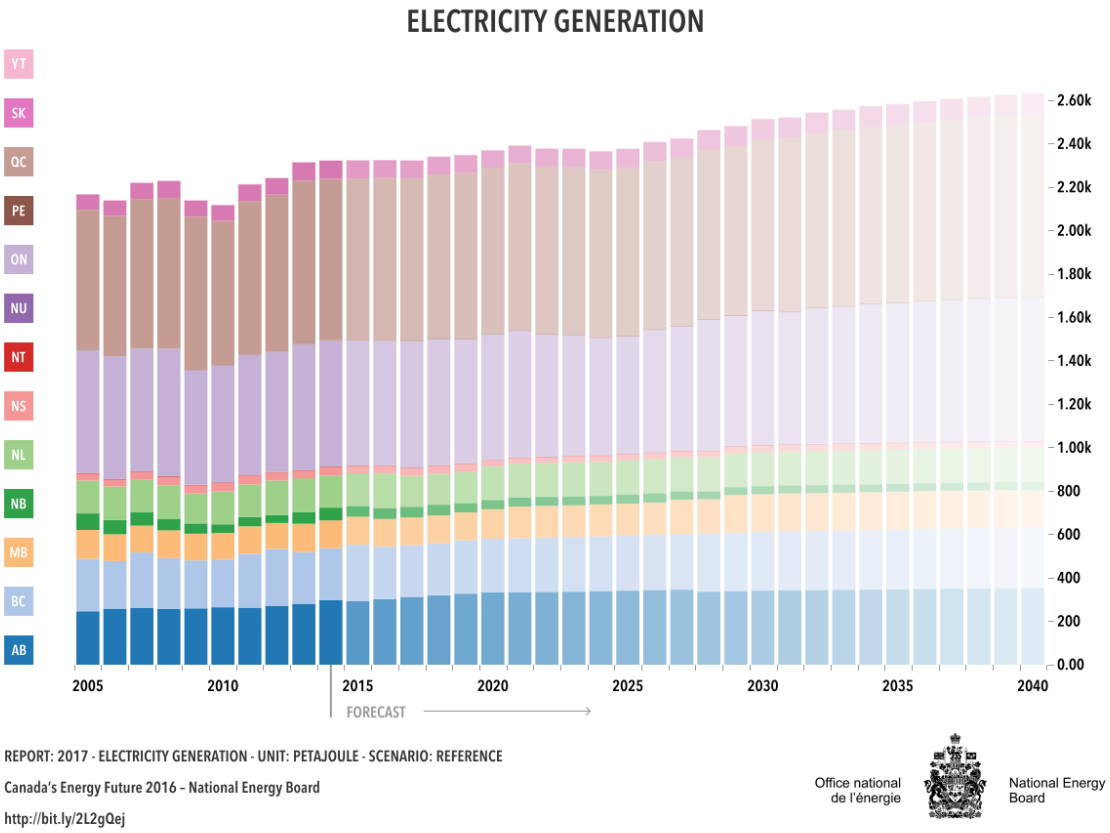

Figure 1: This displays the reference case projection of Canadian electricity generation by province.

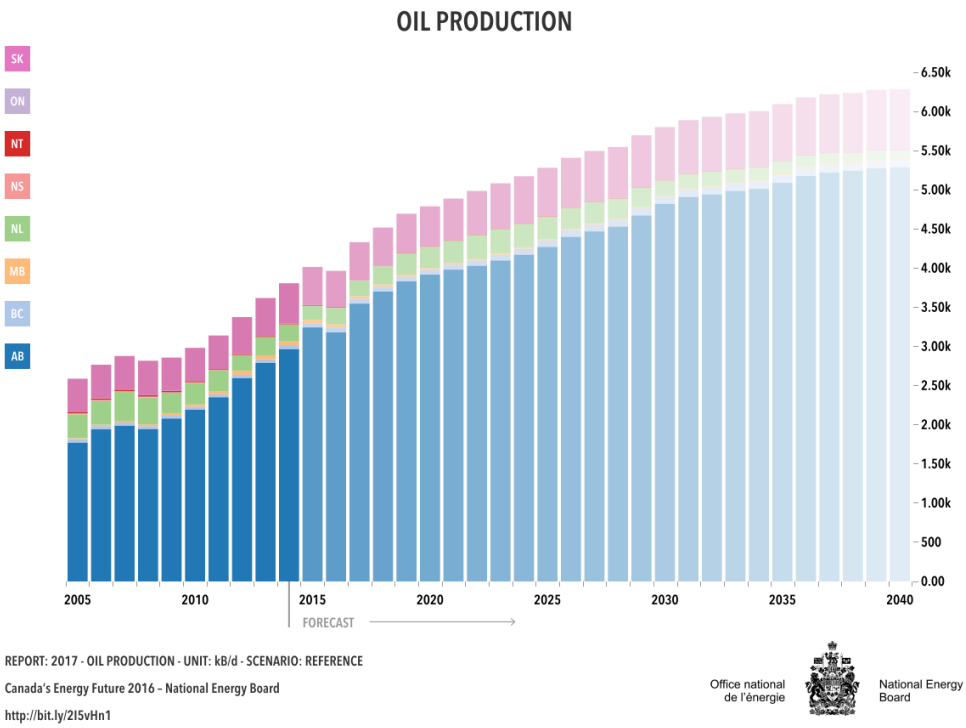

Figure 2: This figure shows the reference case projection for Canadian oil production by province.

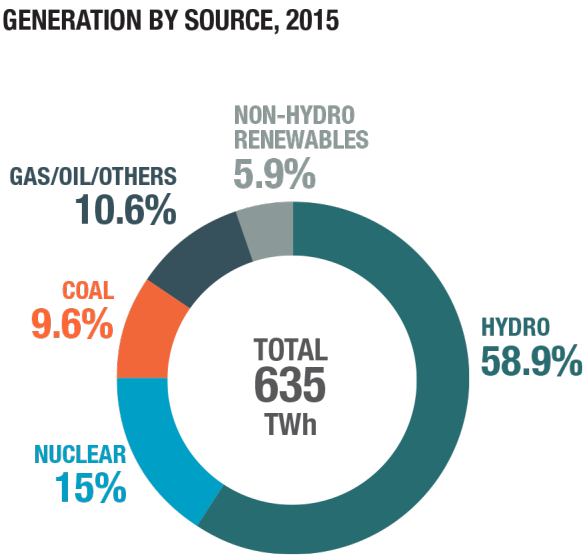

Figure 3: This figure shows the electricity generation by source in 2015 for all of Canada.

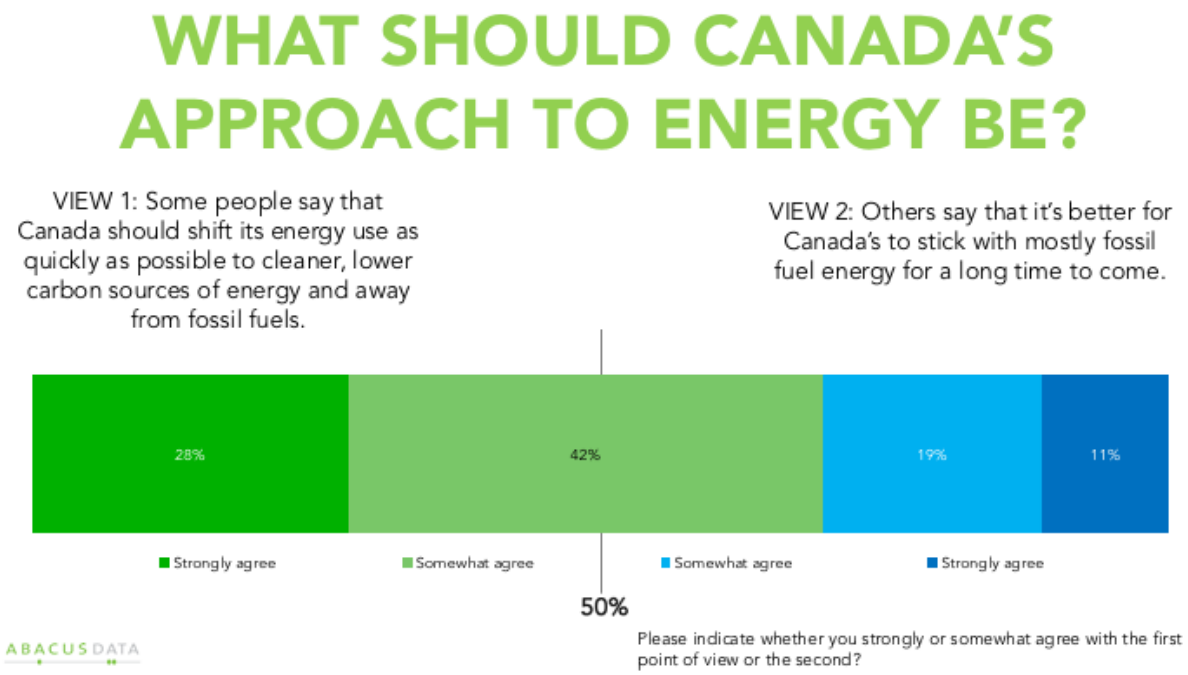

Figure 4: This figure demonstrates public opinion research regarding clean energy in Canada.

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