RESOURCE ECONOMICS AND ENVIRONMENTAL SOCIOLOGY

Citizen Perspectives on Energy Issues in Canada:
A National Survey of Energy Literacy and Energy Citizenship

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Project Report #15-01

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UNIVERSITY OF ALBERTA
DEPARTMENT OF RESOURCE ECONOMICS
AND ENVIRONMENTAL SOCIOLOGY

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Acknowledgement

This national survey was supported through an Insight Grant from the Social Science Research Council (SSHRC), titled “Exploring and transforming a cultural imaginary of energy development in Canada.” The survey was conducted with research ethics certificates from the University of New Brunswick and the University of Alberta. The website for this project is located at energytransitions.ca. Special thanks to Christina Waddy at Corporate Research Associates for helping with the development and pre-testing of the web-based questionnaire, and to Anna Kessler and Victoria Zeppa for editing and preparing tables for this report.

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Abstract

This national survey explores public perspectives on energy issues in Canada with a focus on preferences for energy sources, perceived and actual knowledge of energy systems, trust in energy-related organizations and sources of knowledge about energy issues. The survey also explores willingness to engage in energy related issues and general values and beliefs about energy systems. Conducted in the Fall of 2014, 3,000 respondents were randomly selected from an internet-based panel with quotas for gender, age, region, education, income, language and urban/rural differences. Survey results show that support for renewable energy sources is strong and awareness of energy saving options is also high. Regarding energy citizenship, although awareness of opportunities to participate in energy-related discussions is moderate, levels of participation are very low. Canadians express strong values toward environmental protection compared to explicit utilitarian uses of the environment and they worry that human interference with nature can produce disastrous consequences. Finally, policy considerations are provided to advance literacy and civic engagement on energy issues.

JEL codes: N72, O13, P28, P48, Q40, Q42, Q48

Keywords: energy alternatives, energy transition, public preferences, social values, trust, citizenship, literacy, knowledge, awareness

Executive Summary

Citizen Perspectives on Energy Issues in Canada:
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Introduction

Investments in energy infrastructure and the social, economic and ecological impacts of these investments are among the most critical issues confronting Canadian society today, yet 'energy literacy' and public support for the development of energy alternatives appears to be quite low in some parts of the country (Walker et al., 2015). Policymakers are pushing for more energy development in many regions of Canada and industry is prepared to move forward with new energy projects (McKenna, 2012). But citizens often struggle to understand and accept these projects, especially when they are novel and impacts are unknown. Public resistance to renewable energy infrastructure is often fierce, even when alternatives offer proven advantages over traditional carbon-intensive options (Bell & Weis, 2009); and this resistance comes partly from public perception that such projects will change the essential character of the place and the livelihoods that are derived there (Devine-Wright, 2009; Haggett, 2011).

The objectives of this national survey on energy literacy and citizenship are to establish current baseline information in the following areas:

- Citizen perspectives on energy issues in Canada
- Perceived and actual knowledge of energy sources and technologies, perceived and actual knowledge of energy uses, and personal energy uses
- Experiences with energy infrastructure
    - Attitudes toward energy supply and demand options and energy-related decision-making processes
    - Interest and engagement in energy related issues
    - Levels of trust towards institutional decision-makers
    - Values and beliefs that guide thinking about energy issues

We also sought to understand the influence of demographic variables (age, gender, province/territory, type of community, income, education, political orientation) on the above domains.

In partnership with a polling firm, Corporate Research Associates (CRA), 3,000 Canadian adults completed the survey over a four-week period in the fall of 2014. Respondents were randomly selected from a general population panel of 450,000 Canadians. Quota requirements based on Statistics Canada estimates for age, gender and region were taken into consideration to ensure the sample was representative. We also tracked mother tongue in Quebec and New Brunswick, income, education, and urban/rural distribution for alignment with Statistics Canada national estimates. The survey comprised 45 questions. Analysis reported here includes descriptive statistics and the development of scales and exploratory factor analysis.

Preferences for energy sources

In general, solar, wind and hydroelectricity are the most supported energy sources, while coal and nuclear, followed by oil sands/tar sands are the energy sources most opposed. We also asked Canadians to tell us what they thought the most important energy issue was in their province/territory. The cost of energy was the most cited concern in Alberta, Manitoba, Newfoundland and Labrador, Nova Scotia, Ontario, and Saskatchewan. In each case, except for Alberta, environmental impact/pollution was important after energy costs. Ontario and Quebec both cited long-term impacts on future generations after energy costs and environmental impact/pollution.

Price sensitivity clearly is a concern for Canadians as it relates to energy as a consumer commodity. Health and human safety and the environment, however, are strong concerns when opposing energy development while benefits (to the province/territory, economy and/or consumers) are most important when supporting an energy source, followed by environment and human health and safety. In general, however, results show that Canadians are not significantly engaged as consumers or as citizens on energy issues.

These results point to several avenues for re-engaging Canadians on energy issues. It is often the case that energy project proponents promote the economic benefits of a project. But Canadians are also concerned about the environment, health and safety issues. The need to address these concerns, combined with the need to ensure cautious, fair, transparent and accessible decision-making processes, are consistent with Canadian values regarding energy development.

Energy literacy and citizenship

Canadians show little willingness to engage in actions such as rallies, meetings or groups related to energy issues. More commonly accepted or desired are more informal opportunities for Canadians to seek out information and to share information with friends and family or to undertake activities such as writing letters or posting online comments.

Perceived and actual knowledge of the Canadian energy system is low. Literacy results are consistent with recent studies in Canada (e.g., Moore et al., 2013; Turcotte et al., 2012). Lack of

knowledge and a sense that involvement will make no difference is noted as a barrier to participating in energy-related discussions and decision-making processes. Gender and education are the most important influences on all knowledge-related results.

Given the reticence of many Canadians to become publicly engaged in energy related issues, there is an opportunity to encourage more participation in several ways. This includes enhancing capacities to learn about energy-related information, strengthening factual knowledge about energy sources and energy management options, and energy-decision-making processes (Maio et al., 2006).

Women were far less certain of what they knew about energy development in Canada than men, were less successful answering factual questions, and believed their lack of knowledge was a barrier to participating in energy-related discussions and decision-making processes. Also, younger participants perceived that they knew less about energy sources in Canada.

General values and beliefs

The survey found that Canadians strongly value cautious, fair and inclusive decision-making processes and feel connected to and interdependent with nature. Values and beliefs were also important in determining whether respondents were open to participating in energy-related activities and whether they perceived there were barriers to participating in energy discussions. For instance, participants with stronger climate concerns were somewhat more inclined to say they have or would share information about energy issues with friends and family and to vote for politician with energy considerations in mind.

Project Report

Introduction

Energy policy, investment in energy infrastructure and the social, economic and ecological impacts of energy development are among the most critical issues confronting Canadian society today, yet 'energy literacy' and public support for the development of energy alternatives remains quite low. In some parts of the country policymakers are pushing for more renewable energy development and industry is prepared to move forward with new energy projects (McKenna, 2012), but citizens often resist these projects, especially when projects involve new kinds of technology and impacts are relatively unknown. Public resistance to renewable or alternative energy is often fierce, even when alternatives offer proven advantages over traditional carbon-intensive options (Bell & Weis, 2009). This resistance comes partly from citizens who feel uniformed or who sense that such projects will change the culture of the region, activities that are acceptable and livelihoods that are sustained (Devine-Wright, 2009; Haggett, 2011).

Given the important role that citizens can play in determining the success or failure of new energy developments, transition to renewables and adoption of energy conservation measures at the municipal and household level, *this study assumes that improvements to energy literacy and energy citizenship are critical components to more sustainable energy futures.* We define energy literacy broadly in this study, including an assessment of perceived and actual knowledge of energy systems at the provincial and household scales plus a comprehensive understanding of values and beliefs about energy development. We also pay considerable attention to energy citizenship. Citizenship involves public engagement on energy issues with insights into the willingness of Canadians to become more engaged in everything from public policy debates to home energy conservation initiatives.

Addressing issues of climate change will involve widespread and comprehensive transitions within the energy sector (including electricity and transportation fuels). These transitions can only take place, however, when citizens shift their understanding of what is desirable and what is possible. Envisioning and implementing a new energy system will be an important aspect of energy transition in Canada. As a way to gain insight into this new vision for energy development, we utilized analytical techniques that demonstrate how Canadians cluster around certain ways of thinking on energy issues. In addition to reporting descriptive statistics, this “factor analytic approach” offers insights into the values and beliefs that undergird so much of our thinking about energy futures.

The objectives of this national survey on energy literacy and citizenship are to establish current baseline information in the following areas:

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    - Values and beliefs that guide thinking about energy issues

We also sought to understand the influence of demographic variables (age, gender, province/territory, type of community, income, education, political orientation) on the above domains.

Methods

The polling firm, Corporate Research Associates (cra.ca), secured the sample through bilingual email solicitation to a nation-wide general population sample of over 450,000 Canadians managed by the firm Research Now (www.researchnow.com). Online panels are recruited through multiple channels (e.g., social media, advertising, telephone solicitation, email solicitation) to ensure they are diverse and representative of the general population. No inducements were offered to potential panel participants to entice them to join the online panel but there were small rewards to complete a survey. In the case of Research Now, points were offered for completing surveys that could be redeemed for gift cards or discount coupons.

After extensive pre-testing and a “soft launch”, the survey was administered across Canada. The final survey sample comprised 3,000 respondents. A number of additional reliability assurance steps were utilized, including: ensuring panel respondents were reading survey questions (time monitors); monitoring of email addresses, postal codes, and other factors to ensure panelists were completing surveys and a limit on the total number of surveys from other studies completed by panelists.

Generalizing results to the Canadian population was supported through quotas for age, gender, region, and mother tongue in Quebec and New Brunswick. Income, education and urban/rural distribution data were also collected and tracked for alignment with Statistics Canada national proportions. Online panels are often biased toward overrepresentation of younger female respondents. We managed this potential bias by establishing quotas to ensure that region, age and

gender sample proportions were representative of the Canadian population as measured by Statistics Canada.

To secure 3,000 completed surveys, 46,040 email solicitations were required. The subsequent response rate of 17% fell within the average of 15 to 20% for Corporate Research Associates' online panels and also was consistent with average response rates for random sample telephone surveys. This survey took an average of 23 minutes to complete. The completion rate was 78% (somewhat higher than the average of 75% for online panels), meaning that to secure 3,000 complete surveys 3,851 surveys were started. In summary, methods and response rates for this survey are consistent with the industry norm for online panels.

Several questions in the survey included multiple statements about which participants expressed their views, often rating the degree to which they agreed or disagreed with each statement, or stating how important they felt each statement was. Factor analysis and other statistical tests were used to determine the statements that collectively measured a single concept. In some instances, statements from more than one question were combined, as a summed scale, to represent a single variable. The specifics of these analyses are described further in the results reported for each of the variables of interest. A full version of the study questionnaire is available through the project *Dataverse* site at http://dx.doi.org/10.7939/DVN/10302.

Survey results

The average age of survey participants was 47, where about half were female and approximately 67% of participants were located in metropolitan areas (Table 1). There is noted variation in percentage of participants from metropolitan areas with a high of 75% in Quebec and a low of 21% in Prince Edward Island. On average the participants were well educated, with an average of 64% achieving post-secondary education and an average annual income of about $69,000. We also note some variation in political orientation where a higher percentage of conservatives are located in Alberta and Prince Edward Island and lower percentage of conservatives in New Brunswick and Newfoundland and Labrador. Finally, there is a wide range of exposure to work in the energy industry, where as many as 17% of respondents in Alberta work in the energy industry compared with no such industry affiliations in Prince Edward Island. On a whole, these demographics are consistent with intended quotas to mirror the demographics for Canada as a whole.

We gathered information from respondents about the energy infrastructure that is more present or noticeable to them. In Table 2, respondents indicated the first, second, third and fourth most common energy sources that are seen, heard or smelled. Transmission lines are commonly indicated in all provinces, placing first or second (with the exception of Saskatchewan). In a number of provinces, respondents indicated no noticeable energy source as their most common experience. This was the case for British Columbia, Saskatchewan and Manitoba where sources of energy production may be less common in the everyday lives of most residents.

Table 1 Demographic information on survey participants by province

Province (n)	Age	Female (%)	Metropolitan (%)*	Post-secondary education (%)*	Politically conservative (%)*	Average income (1,000$)*	Work in energy industry (%)*
British Columbia (403)	48.0	51	65.0	61	27	70.3	8.7
Alberta (317)	44.7	50	72.6	67	41	78.7	17.7
Saskatchewan (86)	45.0	53	61.6	62	37	73.8	9.3
Manitoba (108)	48.2	51	75.0	63	35	72.9	5.6
Ontario (1141)	47.1	52	67.9	69	30	71.3	6.1
Quebec (721)	47.5	50	75.0	59	16	60.7	7.1
New Brunswick (71)	47.9	51	43.6	56	15	57.5	11.3
Nova Scotia (83)	47.2	52	39.8	61	23	69.1	8.4
Prince Edward Island (14)	48.1	43	21.4	57	43	67.5	0.00
Newfoundland and Labrador (47)	59.6	49	42.5	64	17	70.2	12.8
Territories** (9)	47.9	44	33.3	56	33	82.4	22.2
Total Sample	47.1	51	67.7	64	27	69.1	N/A

* indicates statistically significant differences between process at p=0.05 using one-way ANOVA
** Territories = Northwest Territories, Yukon and Nunavut.

Table 2 Top-most energy sources seen, heard or smelled

Province (n)	1	2	3	4
British Columbia (403)	None	Transmission lines	Solar panels	Wind turbines
Alberta (317)	Transmission towers	Well heads, pads, or pump jacks	Oil or gas pipelines	Oil refinery
Saskatchewan (86)	None	Oil refinery	Transmission towers	Oil or gas pipeline
Manitoba (108)	None	Transmission towers	Wind turbines	Solar panels
Ontario (1141)	Solar panels	Transmission towers	Wind turbines	None
Quebec (721)	Transmission towers	None	Wind turbines	Solar panels
New Brunswick (71)	Transmission towers	None	Hydroelectric Dam	Wind turbine or Solar panels
Nova Scotia (83)	Wind turbines	Transmission towers	Solar panels	None
Prince Edward Island (14)	Solar panels	Transmission towers or wind turbines	Coal mine	None
Newfoundland and Labrador (47)	Transmission towers	None	Solar panels	Oil refinery
Territories** (9)	Transmission towers or solar panels	Wind turbines	Hydroelectric dam or oil refinery, or oil or gas pipeline, or none	n/a
Total Sample	Transmission towers	Solar panels	None	Wind turbines

* indicates statistically significant differences between process at p=0.05 using one-way ANOVA
** Territories = Northwest Territories, Yukon and Nunavut;

Support / opposition to energy sources

In this section, we explore general support and opposition to renewable and non-renewable energy sources by province. In Figure 1, nationwide figures are illustrated for support and opposition to non-renewable energy sources. This figure also indicates a middle category that neither supports nor opposes the energy source. Results indicate limited support for non-renewable energy sources, with relatively more support for 'oil from sources other than oil / tar sands' and 'natural gas from sources other than shale gas'. It is also important to note the high levels of indecision about these sources where the middle (neutral) category represents a large percentage of the total.

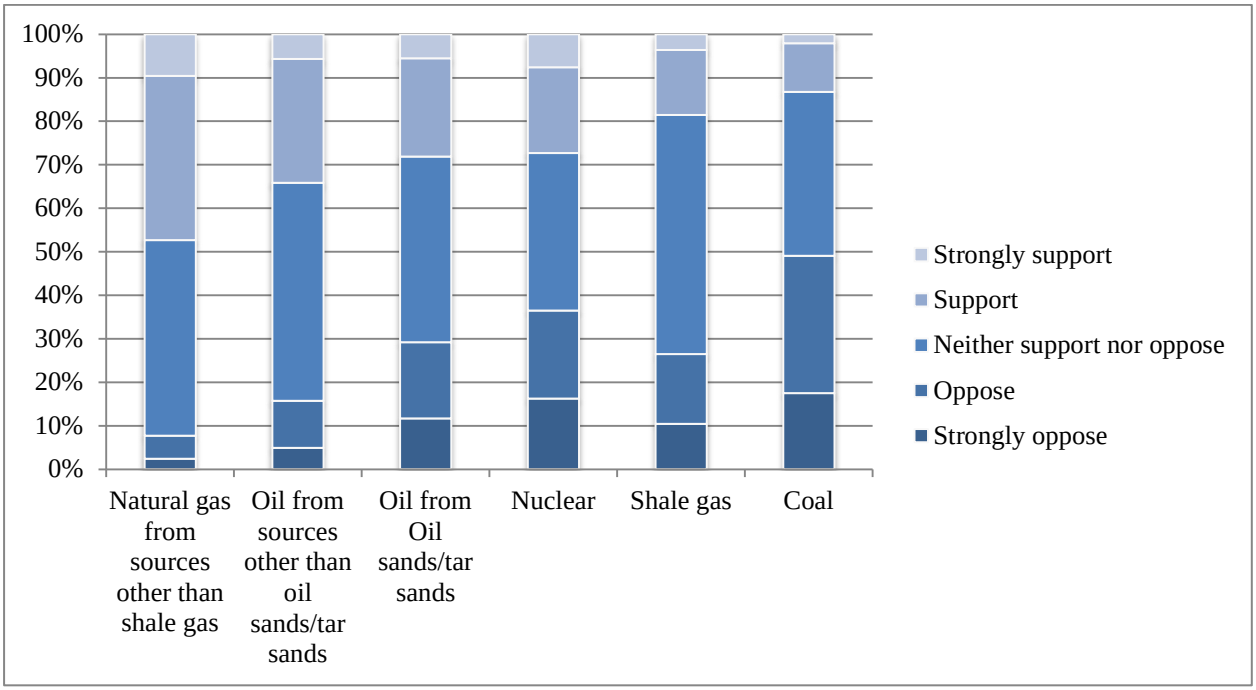

Figure 1 Support and opposition to non-renewable sources nationwide.

Compared to non-renewable energy sources, Figure 2 illustrated much more support for renewable energy sources, with strong support for solar in particular. There is little to no opposition to these energy sources nationwide, and a much smaller percentage of the population that is indecisive (neutral), indicating more defined opinions about these topics. A larger percentage of participants are neutral with respect to opinions about geothermal and bioenergy, likely because these sources of energy are less well known or understood by Canadians.

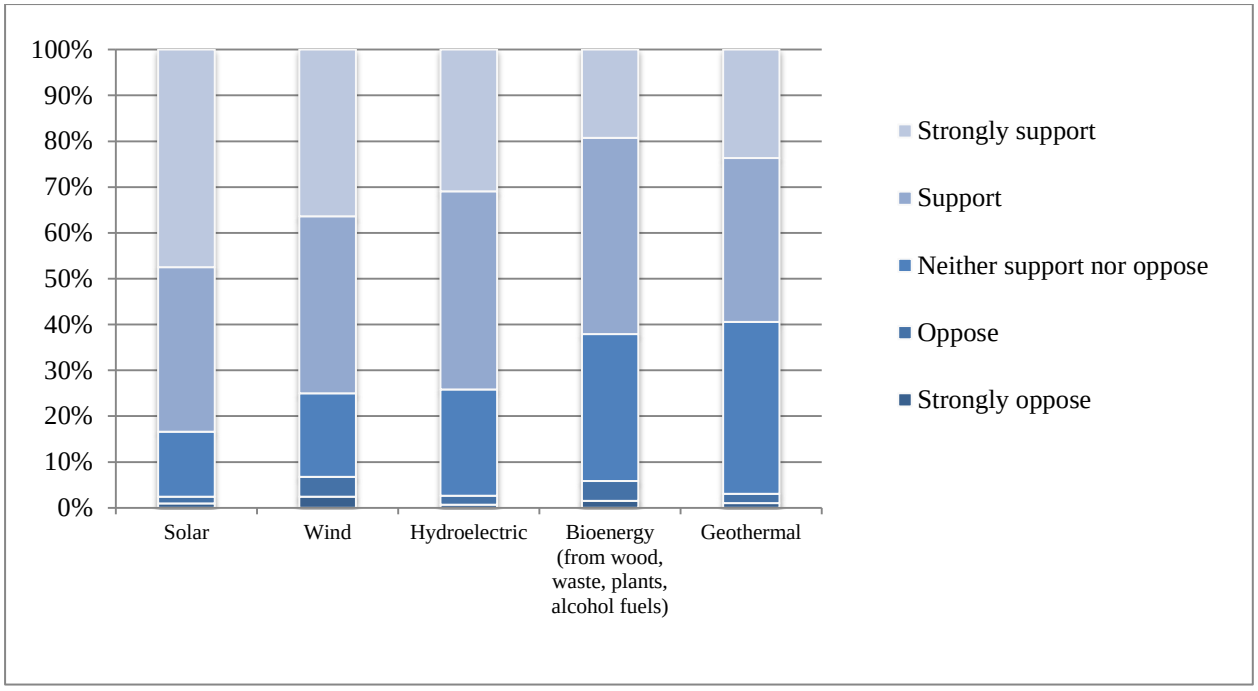

Figure 2 Support and opposition to renewable energy nationwide.

Looking more closely at these numbers by provinces, Tables 3 and 4 provide additional insights into support and opposition to energy source by province. Examining support for renewable energy sources, the highest overall level of support is for solar energy (83%) followed by wind (75%) and hydro (74%) (Table 3). Participants were relatively less supportive of biofuels (62%) and geothermal power (59%). With respect to provincial differences, there is relatively less support for solar in Ontario at 79% compared to other provinces, and support for wind is also lower in Ontario at 71% relative to the national average. Support for geothermal power varies widely with the strongest support in Saskatchewan (74%) and the lowest support in the provinces of Newfoundland and Labrador and New Brunswick (both at 46%).

Overall, there are lower levels of support for renewables in the Territories but with only nine participants in the survey, results from this region are likely not an accurate reflection of the general population in this region. For this reason, although numbers are reported in the tables below, we do not discuss figures from the Territories in detail.

Table 3 Percentage of respondents who support or strongly support renewable energy sources

	Renewable Energy Source				
Province (n)	Wind*	Hydro*	Geothermal*	Solar*	Biofuels
British Columbia (403)	80.7	69.2	64.0	83.6	58.6
Alberta (317)	80.1	73.5	66.3	87.7	63.1
Saskatchewan (86)	84.8	75.6	74.4	89.5	58.2
Manitoba (108)	86.1	83.3	71.3	90.7	64.8
Ontario (1141)	70.6	71.2	54.8	79.7	64.7
Quebec (721)	71.2	81.1	58.3	84.6	59.6
New Brunswick (71)	87.2	70.2	46.8	87.2	63.8
Nova Scotia (83)	79.5	74.7	60.2	81.9	57.8
Prince Edward Island (14)	92.9	85.7	50.0	100.0	78.6
Newfoundland and Labrador (47)	87.2	70.2	46.8	87.2	63.8
Territories* (9)	66.7	33.3	44.4	66.7	55.6
Total Sample	75.0	74.2	59.4	83.4	62.1

* indicates statistically significant differences between process at p=0.05 using one-way ANOVA
** Territories = Northwest Territories, Yukon and Nunavut.

With respect to non-renewable energy sources, across the board there is significant lack of support (Table 4). The lowest level of support is for coal at 13% nationwide, but support varies from a high of 24% in the Saskatchewan to a low of 7% in Prince Edward Island. Oil sands and shale gas are also not popular with some variation in numbers across the country. For instance, the highest level of support for oil sands is in Alberta at 55% and the lowest support is in Quebec at 14%. For shale gas, Alberta and New Brunswick participants are more supportive (36%) whereas Quebec and British Columbia are less supportive (11% and 15% respectively). At a national level, support for nuclear is similar to support for oil sands with the highest level of support for nuclear in Ontario (39%) and the lowest support for nuclear in Quebec (13%). Among these non-renewable energy alternatives, the highest overall level of support is for natural gas. For instance, support for natural gas is at 71% in Prince Edward Island, and 41% in Quebec, much higher than any other source of non-renewable energy. It is important to note, however, that relative support for natural gas does not extend to shale gas development.

In summary, results in Tables 3 and 4 show much stronger support for renewable energy sources than for non-renewable energy sources.

Table 4 Percentage of respondents who support or strongly support non-renewable energy sources

	Non-renewable Energy Source					
Province (n)	Oil/Tar Sands*	Shale Gas*	Nuclear*	Coal*	Oil*	Natural Gas*
British Columbia (403)	26.3	15.4	20.1	11.4	32.3	42.7
Alberta (317)	55.8	36.3	30.0	22.7	55.8	58.4
Saskatchewan (86)	36.1	22.1	31.4	24.4	50.0	54.7
Manitoba (108)	35.2	17.6	25.0	9.3	42.6	53.7
Ontario (1141)	28.6	18.9	38.7	13.4	35.1	49.3
Quebec (721)	14.2	11.1	12.6	9.3	21.6	41.2
New Brunswick (71)	31.0	36.6	36.6	9.9	29.6	43.7
Nova Scotia (83)	25.3	15.7	19.3	13.3	27.7	38.6
Prince Edward Island (14)	28.6	21.4	28.6	7.1	42.9	71.4
Newfoundland and Labrador (47)	31.9	6.4	17.0	12.8	34.0	46.8
Territories** (9)	33.3	11.1	22.2	33.3	55.6	44.4
Total Sample	28.2	18.6	27.3	13.2	34.1	47.4

* indicates statistically significant differences between process at p=0.05 using one-way ANOVA
** Territories = Northwest Territories, Yukon and Nunavut.

Evaluation of energy alternatives

We asked respondents to indicate which energy source they most opposed and supported and to identify the reasons for their choices. Averages for all respondents are reflected in Figures 3 and 4 below. The factors that mattered most to respondents when they were thinking about why they opposed an energy source were ordered slightly differently than reasons for why they supported an energy source. In the case of opposition to energy sources, influential factors, along with percentage of participants who ranked them as important or extremely important were as follows:

- Environment, 90%
- Risk to human and health safety, 89%
- Impact on the landscape, 74%

- Costs and or benefits to the province/territory, 54%
- Costs to the economy and/or consumers, 39%

When thinking about why they supported an energy source, responses were more distributed, with benefits ranking higher, but very close to environment and risk to human and health safety. Proportions for extremely important or important in this case were:

- Benefits to the province/territory, economy and/or consumers, 80%
- Environment, 78%
- Risk to human and health safety, 75%
- Costs to the province/territory, economy and/or consumers, 65%
- Impact on the landscape, 58%

Finally, we asked people to describe in their own words the most important energy issue in their province and why. Written responses were coded and reflected place-based considerations with:

- Alberta most concerned about oil sands/tar sands and the environmental impact/pollution
- British Columbia most concerned about transportation of oil/gas by pipeline
- Manitoba most concerned about hydroelectricity and the price of energy/rising cost of energy
- New Brunswick overwhelmingly citing natural gas/shale gas/fracking
- Newfoundland and Labrador citing price of energy/rising cost of energy followed by hydroelectricity/Muskrat Falls
- Nova Scotia most concerned about energy prices followed by sustainable use of energy/renewable energy
- Ontario most concerned about energy prices, followed by sustainable use of energy/renewable energy and then environmental impact/pollution
- Québec most concerned about energy prices followed by environmental impact/pollution, hydroelectricity and sustainable use of energy/renewable energy

The cost of energy and a desire for cheaper energy was cited as reasons for the most important energy concern in Alberta, Manitoba, Newfoundland and Labrador, Nova Scotia, Ontario, and Saskatchewan. In each case, except for Alberta, environmental impacts and pollution was most important after energy costs. Ontario and Québec both cited long-term impact, impact on the future, and future generations after energy costs and environmental impact and pollution.

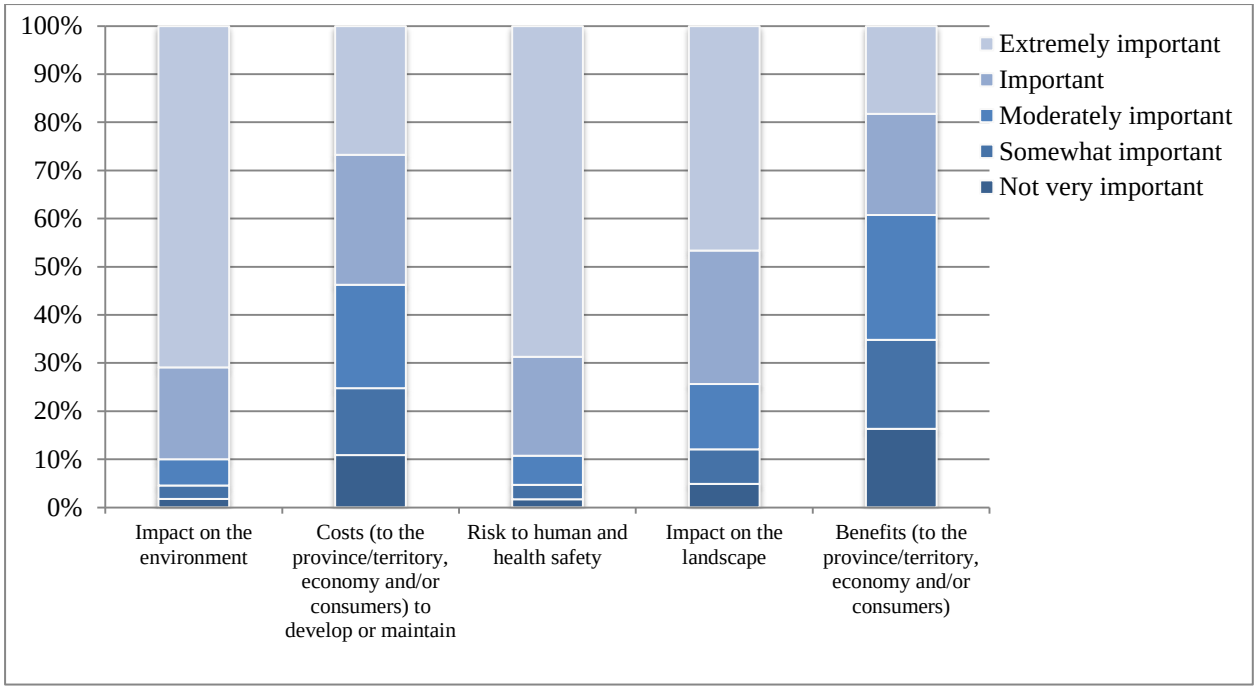

Figure 3 When thinking about the energy source they most opposed, reasons given for this opposition.

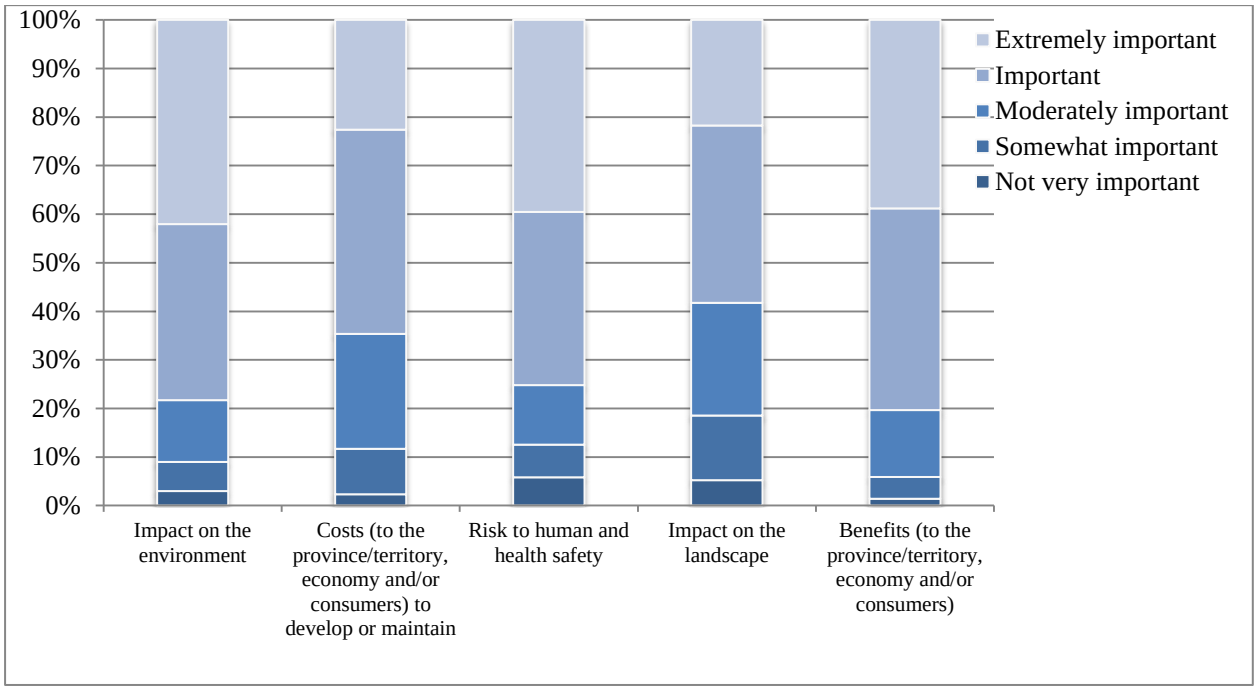

Figure 4 When thinking about the energy sources they supported, reasons given for this support.

Energy awareness and choices in the household

In addition to gauging citizens' perceptions of energy renewable and non-renewable energy alternatives, we explored participants' awareness of energy use options and readiness to participate in several energy related action within the home. In Table 5 we explore a series of ways that energy use can change within the household, including ways to conserve energy, ways to use energy more efficiently, options for transportation, renewable energy technologies and smart meters. In general we note a large majority of Canadians indicate knowing a medium amount or more about these energy use options. Around 90% of respondents indicated knowing ways to conserve energy in the home. There was more variability with knowledge of transportation options, renewables and smart meters. For instance, about 70% of Newfoundland and Labrador respondents indicated knowledge of transportation options compared to 86% of Manitoba residents. Regarding smart meters, those with a medium amount of knowledge or more were lower than the other energy use options. For instance, only 47% of Nova Scotia residents were knowledgeable about smart meters.

We also asked questions about willingness to undertake various home-related changes, such as the installation of rooftop solar, adjusting the timing of energy-intensive chores, and the remote control of water tank temperatures. Examining results to these questions in Table 6, we note that 77% of participants had a strong willingness (responses of probably or definitely) to adjust the timing of day-to-day chores to match lower electricity prices (i.e., time-of-use electricity rates). The highest level of willingness was in Ontario (85%) with the least willingness in Nova Scotia (68%). Fewer participants, 46%, said they would probably or definitely allow the utility to remotely lower the temperature in the home or water tank, with the lowest level of willingness in Prince Edward Island (36%). Finally, even fewer participants, 36%, showed a strong willingness to install solar panels to heat water and/or generate electricity.

The contrast between the 83% support for solar power (Table 3) and the 36% willingness to install solar panels (Table 6) suggests there may be more support for solar and renewables than conviction or means that might lead to action. This result may also reflect more comfort with large-scale solar farms managed by utilities rather than distributed energy system that are relatively uncommon in Canada.

Table 5 Percentage of survey participants who know a medium amount or more about energy use options

Province	Ways to conserve energy in my home	Ways to use the energy you do use more efficiently	Energy reducing options for transportation	Renewable energy technologies	Smart Meters*
British Columbia (403)	90.3	87.6	79.7	72.7	70.0
Alberta (317)	92.4	84.9	85.5	73.5	55.8
Saskatchewan (86)	87.2	83.7	75.6	67.4	64.0
Manitoba (108)	87.0	87.0	86.1	70.4	52.8
Ontario (1141)	90.5	87.1	80.6	73.7	79.5
Quebec (721)	89.9	83.9	82.3	67.8	65.7
New Brunswick (71)	90.1	84.5	76.1	66.2	50.7
Nova Scotia (83)	91.6	81.9	78.3	67.5	47.0
Prince Edward Island (14)	100.0	100.0	78.6	57.1	71.4
Newfoundland and Labrador (47)	91.5	78.7	70.2	57.5	53.2
Territories** (9)	100.0	77.8	100.0	88.9	66.7
Total Sample	90.4	85.7	81.2	71.2	68.9

* indicates statistically significant differences between process at p=0.05 using one-way ANOVA
** Territories = Northwest Territories, Yukon and Nunavut.

Table 6 Percentage of survey participants who would probably or definitely undertake the following home related actions in the next three years

Province (n)	Install rooftop solar panels to heat water or generate electricity	Adjust the timing of day to day chores to match lower energy prices*	Allow utility suppliers to remotely lower home or water tank temperature
British Columbia (403)	38.7	76.2	41.7
Alberta (317)	40.1	74.1	46.1
Saskatchewan (86)	37.2	67.4	39.5
Manitoba (108)	32.4	70.4	48.2
Ontario (1141)	34.1	84.6	47.2
Quebec (721)	36.8	72.0	44.8
New Brunswick (71)	42.3	73.2	54.9
Nova Scotia (83)	41.0	68.7	48.2
Prince Edward Island (14)	50.0	71.4	35.7
Newfoundland and Labrador (47)	34.0	70.2	57.5
Territories** (9)	44.4	66.7	44.4
Total Sample	36.5	77.3	45.9

* indicates statistically significant differences between process at p=0.05 using one-way ANOVA
** Territories = Northwest Territories, Yukon and Nunavut.

Participation in energy discussions

In addition to questions about energy choices in the home, we also asked respondents questions about their willingness to engage in energy-related discussions. With regard to the development of energy infrastructure, survey respondents were largely unaware of meetings, public hearings, surveys, rallies, or other public or formal opportunities to communicate with energy decision-makers in their province/territory over the last three years, with 60% saying they had heard of none; 32% saying they had heard of one or two, and 7% having heard of three or more.

We divided questions about participation into two broad categories, one focused on activities involving other people (i.e., meetings) and one focused on activities involving individual effort (i.e., writing letters). Figure 5 indicates that although many people do not participate in activities of a public nature, there is a considerable willingness to do so. For instance, taking those who "have done it" and those who "haven't but are willing", more than 60% of respondents are willing to attend an information meeting that approves projects or sets prices.

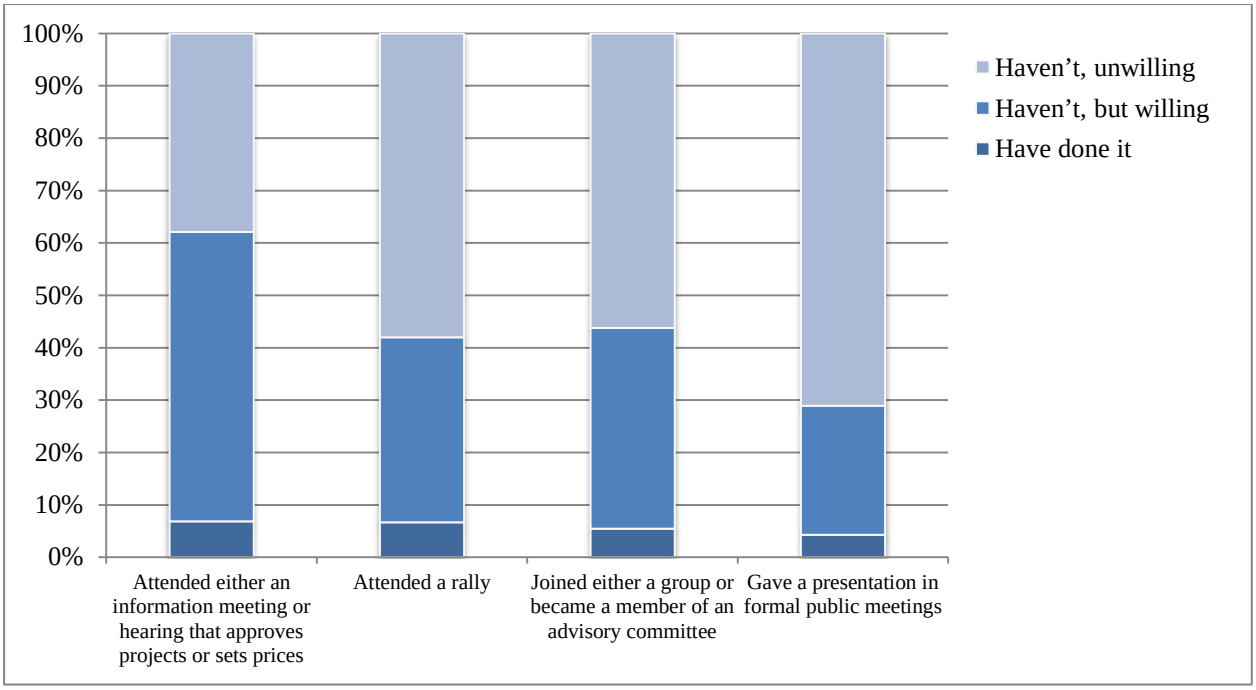

Figure 5 Participation in energy discussions that involve other people.

In contrast to the relative lack of participation in public events illustrated above, respondents are more open to engaging in activities like sharing information with friends and family, completing surveys, or voting for a politician with energy issues in mind (Figure 6). Respondents are also willing to do more of these activities in the future. Note that almost 50% of respondents say they have voted for a politician with energy issues in mind.

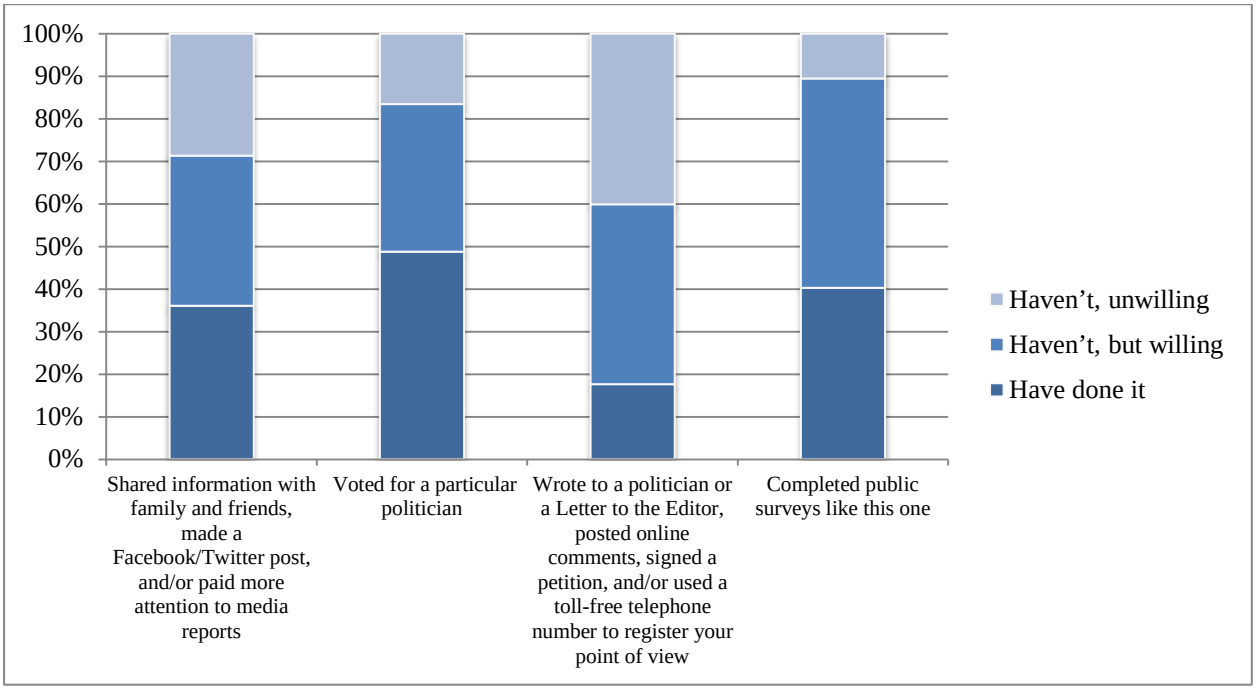

Figure 6 Participation in energy discussions that involve individual effort.

Table 7 Participation in energy related discussion by province, percentage of sample

	Aware of	Activities involving others				Activities involving individual effort			
Province (n)	participation opportunities***	Attend meeting	Attend rally*	Joined group	Present at meeting	Share or follow information*	Vote for politician *	Write letter*	Complete survey*
British Columbia (403)	54.1	8.2	8.4	6.9	5.9	41.2	48.9	20.6	44.2
Alberta (317)	44.5	5.7	3.8	4.7	4.1	38.2	48.9	19.6	48.3
Saskatchewan (86)	33.7	4.7	5.8	4.7	1.2	33.7	39.5	10.5	48.9
Manitoba (108)	37.0	3.7	0.9	3.7	2.8	26.9	39.8	15.7	33.3
Ontario (1141)	36.1	7.5	6.3	5.4	3.9	36.5	49.5	19.1	39.8
Quebec (721)	35.2	5.7	8.0	4.9	4.2	29.7	46.3	13.3	34.7
New Brunswick (71)	53.5	9.9	9.9	9.9	8.5	50.7	60.6	21.1	45.1
Nova Scotia (83)	37.3	7.2	6.0	3.6	3.6	45.8	60.2	15.7	38.6
Prince Edward Island (14)	64.3	0.0	0.0	7.1	0.0	50.0	71.4	14.3	50.0
Newfoundland and Labrador (47)	40.4	14.9	10.6	8.5	6.4	48.9	57.4	23.4	42.6
Territories** (9)	11.1	11.1	11.1	0.0	0.0	33.3	55.6	22.2	33.3
Total Sample	40.0	7.0	7.0	5.0	4.0	36	49	18	40

** Territories = Northwest Territories, Yukon and Nunavut; * indicates statistically significant differences between process at p=0.05 using one-way ANOVA;
*** One or more (q. 17)

Finally, looking at this information on public engagement at the provincial level, Table 7 indicates levels of awareness and levels of engagement by province. Of note in this table is some variation in awareness of participation opportunities between provinces, with much more awareness in Prince Edward Island (64%) and much less awareness in Saskatchewan (33%). Although participation in activities involving others are very low (well below 10% of respondents), there are a few exceptions, such as Newfoundland and Labrador where 15% of respondents attended a meeting and 10% of respondents attended a rally related to energy issues. With regard to activities involving individual effort, again significant variation between provinces is noted with efforts to vote for a politician with energy issues in mind much more likely in New Brunswick, Nova Scotia (approximately 60% in both provinces), and Prince Edward Island (71%).

Trust in energy-related organizations

One aspect of energy citizenship, the acquisition of knowledge and engagement relates to levels of trust in energy-related organizations (Smith et al., 2013). In deciding to engage in energy issues, individuals must consider and reflect on the various parties involved. Two questions explored levels of trust and distrust respondents felt toward agencies, non-government organizations and provincial decision-makers. Factor analysis revealed two distinct groups of trusted and distrusted organizations. We labelled these groups, “insiders” and “outsiders” to reflect their relative closeness or distance to the inner functioning of the energy sector (Figures 7 and 8).

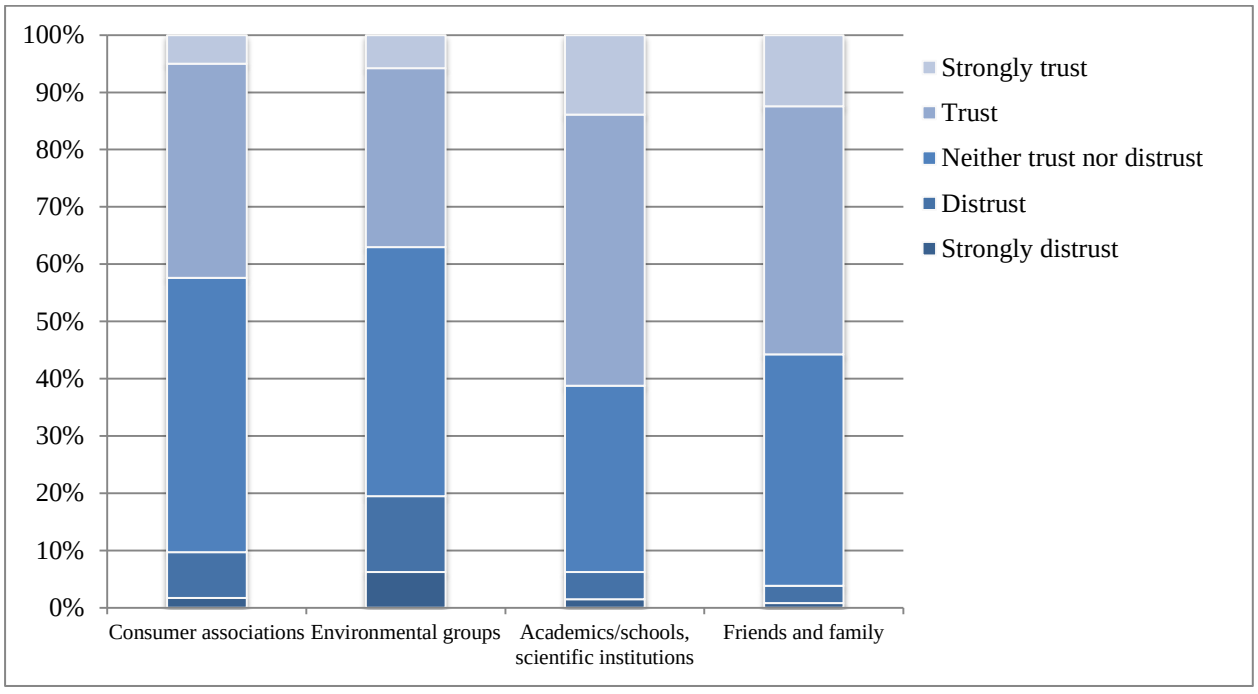

Figure 7 Trust in outsiders as sources of information on energy issues.

Trust in outsiders (α = .537) shows respondents were more trusting of organizations that were outside the industrial and regulatory context of energy development. The percentages of trust or strongly trust responses and neutral responses, respectively, for each of the energy outsiders are as follows:

- Academics/schools and scientific institutions, 61%, 33% neutral
- Friends and family, 55%, 40% neutral
- Consumer associations, 42%, 8% neutral
- Environmental groups, 37%, 44% neutral

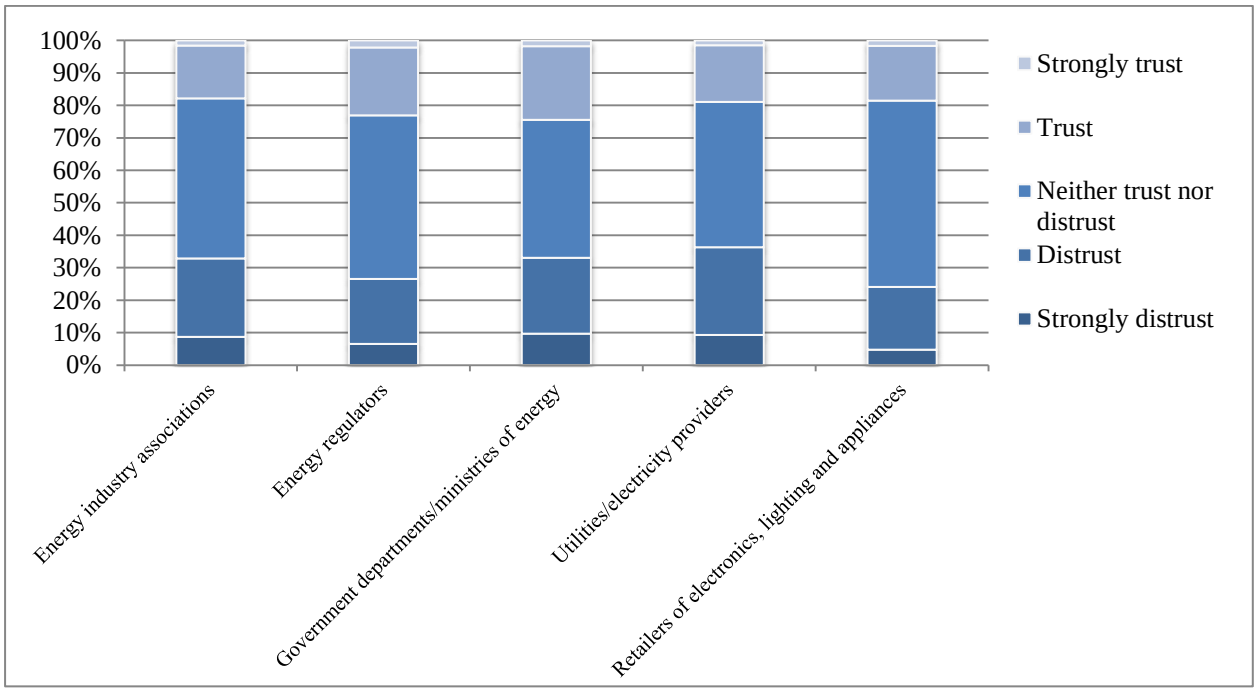

Figure 8 Trust in insiders as sources of information on energy issues.

Trust in Insiders (α = .834) shows lower scores for trust with organizations that were more directly related to industrial activity and regulation of energy development and production. The percentages of trust or strongly trust responses and neutral responses, respectively, for each of the energy insiders are as follows:

- Energy regulators, 23%, 50% neutral
- Government departments/ministries of energy, 24%, 43% neutral
- Energy utilities, 19%, 45% neutral
- Retailers of electronics, lighting and appliances, 19%, 45% neutral
- Energy industry associations, 18%, 49% neutral

We also included questions on how respondents felt about their provincial government and its role in managing energy-related issues. With respect to trust in province governments:

- 44% felt that their province's information about energy development tends to be biased and one-sided (43.4% neutral)
- 46% believed their province was too influenced by the energy industry regarding energy development
- Almost 25% either agreed or strongly agreed that their provincial government had the necessary expertise to manage energy development effectively (42.5% neutral)
- 18% felt the same about their province's ability to consider all relevant points of view (46% neutral)
- Almost 25% agreed or strongly agreed that their province was open to new ideas and alternative points of view on energy development

Barriers to participation

Although a large percentage of respondents indicate a willingness to participate in energy-related discussions, and to some extent there was a lack of trust in energy sector insiders, participants identified a number of barriers to doing so. In particular, lack of knowledge and fear of public speaking were significant barriers for most respondents (Figure 7) where close about 70 to 80% of respondents expressed concern along these lines. Looking more broadly to the most significant barriers, the percentage of participants who saw these factors as somewhat or very much a barrier was as follows:

- Level of knowledge about energy policy, laws, regulations or energy technologies, 77%
- Don't know enough about how energy decisions are made to participate, 75%
- Don't think that my input will make any difference because decision-makers won't listen to what I have to say, 71%
- Don't have time to participate in meetings, 69%
- Uncomfortable with public speaking, 65%
- Negative tone of energy debates, 61%
- Don't have strong views on energy issues was a barrier or very much a barrier, 52%

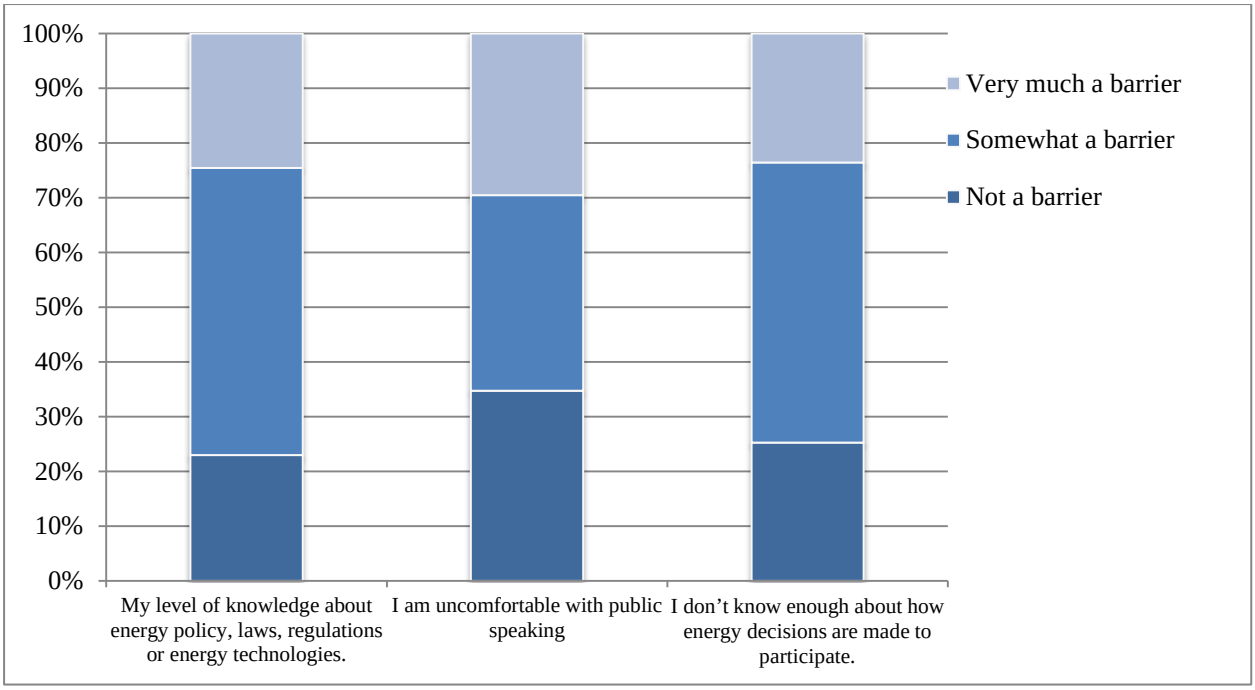

Figure 9 Barriers to participation related to knowledge and fear.

Perceived and factual knowledge

Given that levels of knowledge are closely linked to energy literacy and knowledge was also perceived to be a substantial barrier to participation (Figure 9), in this section we take a close look at the knowledge variables in this survey. Consideration was given to participants' perceptions of their own knowledge, knowledge of energy related facts, and confidence in this factual information.

Participants were asked how much they believed they knew about different energy sources. Factor analysis determined there was no discernable difference in respondents' perception of their energy knowledge by energy source. For example, if a respondent felt they knew a lot about a fossil fuel source of energy, they also believed they knew a lot about renewable energy (α = .943). Almost 82% of participants felt they knew a moderate amount to nothing about how energy is used in Canada (53% knew a medium amount, 26% knew not much, and 3% knew nothing).

Knowledge about in-home energy and transportation energy use options were also measured. Relative to other areas of knowledge, the following items indicate there was stronger confidence in knowledge about energy efficiency and conservation.

- 54% believed they knew (quite a bit; a lot) about ways to conserve energy in my home (36% a medium amount)
- 44% felt they knew about energy efficiency (42% a medium amount)

- 42% said the same about energy reducing options for transportation (40% a medium amount)
- 25% felt confident about what they knew about renewable energy technologies (46%, a medium amount)
- 30% were confident about what they knew about smart meters (digital meters that allow you and the utility to track and manage electricity use (39%, a medium amount)

Five questions explored factual macro-level energy knowledge and practical household knowledge. In this case, instead of perceptions of knowledge we measured knowledge questions that have specific right or wrong answers. Respondents were most successful in defining renewable energy, with 66% answering correctly. The basic laws of thermodynamics (entropy) gave respondents the most difficulty, with only 29% answering correctly. More than 45% knew that household lighting used the least amount of energy in their home over the course of a year compared to some other energy consuming products and 52% knew what it means to say a power plant is 35% efficient. There was wide variation in respondents' knowledge of how much hydroelectricity contributed to their province/territory's total electrical supply. Over 40% of respondents answered correctly in Alberta, Prince Edward Island and Quebec, with less than 20% answering correctly in New Brunswick, Ontario and Saskatchewan.

To gauge confidence, we asked respondents to indicate how sure they were of their answers. Independent sample t-tests showed that respondents with higher means for perceived knowledge and who were confident in their answers were more successful answering the factual questions. In every case but the definition of renewable energy, however, more people had the correct answer than were sure of their answer.

Women were far less certain of what they knew about energy development in Canada than men, were less successful answering factual questions, and believed their lack of knowledge was a barrier to participating in energy-related discussions and decision-making processes. Also, younger participants perceived that they knew less about energy sources in Canada.

Values and beliefs

One of the basic assumptions in this study is that deeply held values and beliefs are important considerations in understanding how people make decisions about energy alternatives. Values are general or "abstract ideals that people consider to be important guiding principles in their lives" (Haddock & Maio, 2006, p. 441). While related, values differ from attitudes. Most simply, attitudes reflect values. Value inclination is more general rather than object focused, such as valuing the importance of protecting the environment or freedom. Attitude inclinations are judgments that are more focused reflections of values, often expressed as tendencies to like or

dislike specific objects, such as not liking interference with one's own private property, or liking conservation efforts for a specific landscape.

Two survey questions, each with several variables, explored participants' values relating to decision-making about energy development and their orientation toward nature. These questions form the basis for exploratory factor analysis where two scales where identified. Components of these two factors are summarized in Figures 10 and 11. Results suggest that Canadians value a *Cautious Fair Process* ($\alpha = .892$) in energy decision-making and governance. Perspectives on the importance of a Cautious Fair Process were measured using five (5) indicators, each of which varied slightly in perceived importance.

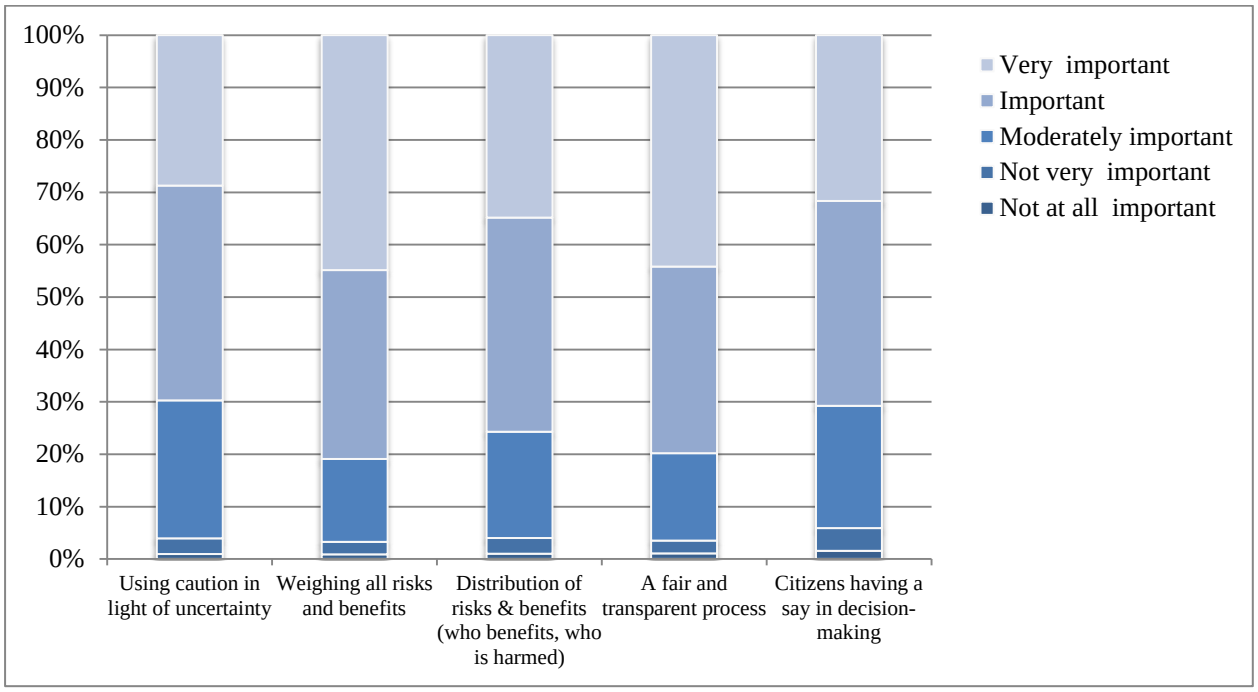

Figure 10 Statements reflecting a value of caution and fairness in energy decision-making.

Another key value reflected in our results is *that nature is fragile and humans are connected* to nature in meaningful ways ($\alpha = .785$). More specifically, there was agreement with statements "I believe that humans, along with all other species, are dependent on the environment and one another to live well" and "I believe that humans are members of the earth's community of life along with all other living things" (83% and 79% agreed or strongly agreed with these statements respectively). Slightly fewer participants agreed with the statement "When humans interfere with nature it often produces disastrous consequences" with 66.5% indicating they agree or strongly agree. This information is summarized in Figure 11.

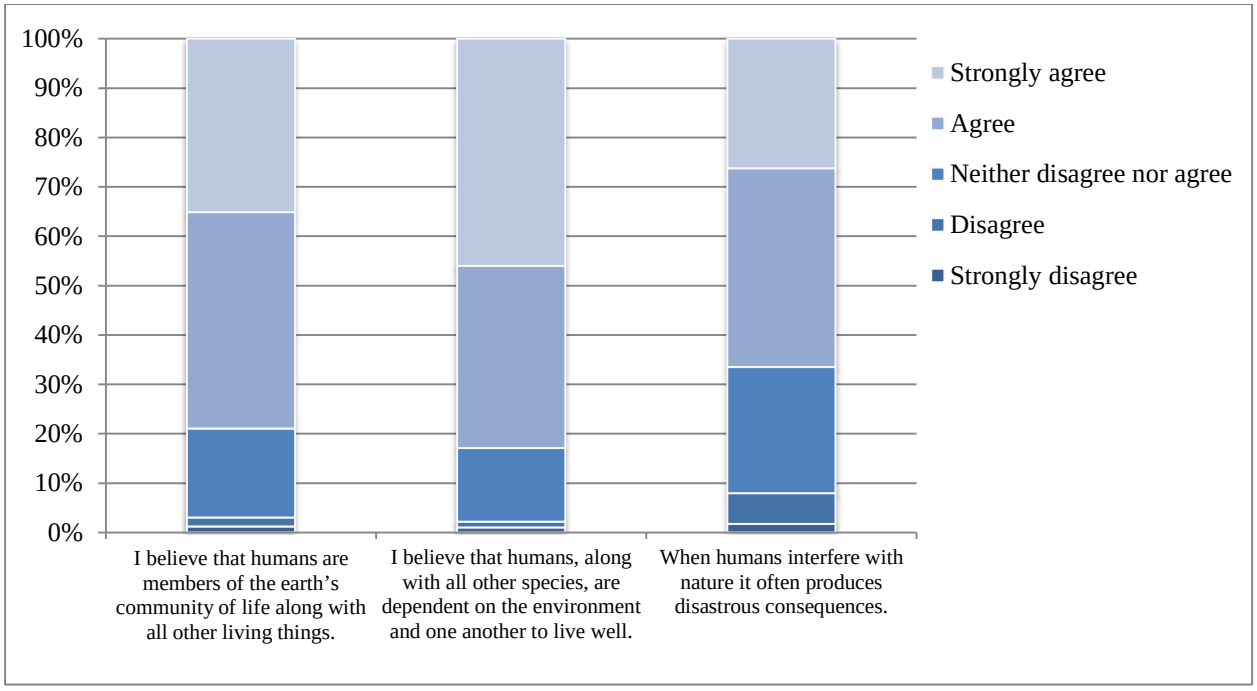

Figure 11 Statements reflecting the value of nature and the connection of humans to the natural world.

In addition to these strong value orientations within our results, we also identified two other value positions that are summarized here. Two questions asked participants to indicate whether they agreed or disagreed (5-point scale, strongly disagree to strongly agree) with a series of belief statements about energy development. Based on the responses from survey participants, factor analysis shows two distinctive groups emerging. The first group reflects a very strong *concern for climate change and an urgent need for action* ($\alpha = .803$). Just over 20% of respondents strongly oriented toward this understanding of climate change as a strong motivator for energy transition, with scores at or above 4.5 (5-point scale). A summary of the items associated with this scale are provided in Figure 12.

The second group reflects a sense that *nature is robust, it is resilient and we need to focus on a business-as-usual economic plan* ($\alpha = .760$). A majority of respondents disagreed or strongly disagreed with the statements in this group (over 50% disagreed for each item). Strongest support (strongly agree or agree) were for the two statements "Market forces, not incentives or taxes, drive development and conservation of energy" and "Growth in energy production is key to Canada's economic progress". A summary of the items associated with the scale are provided in Figure 13.

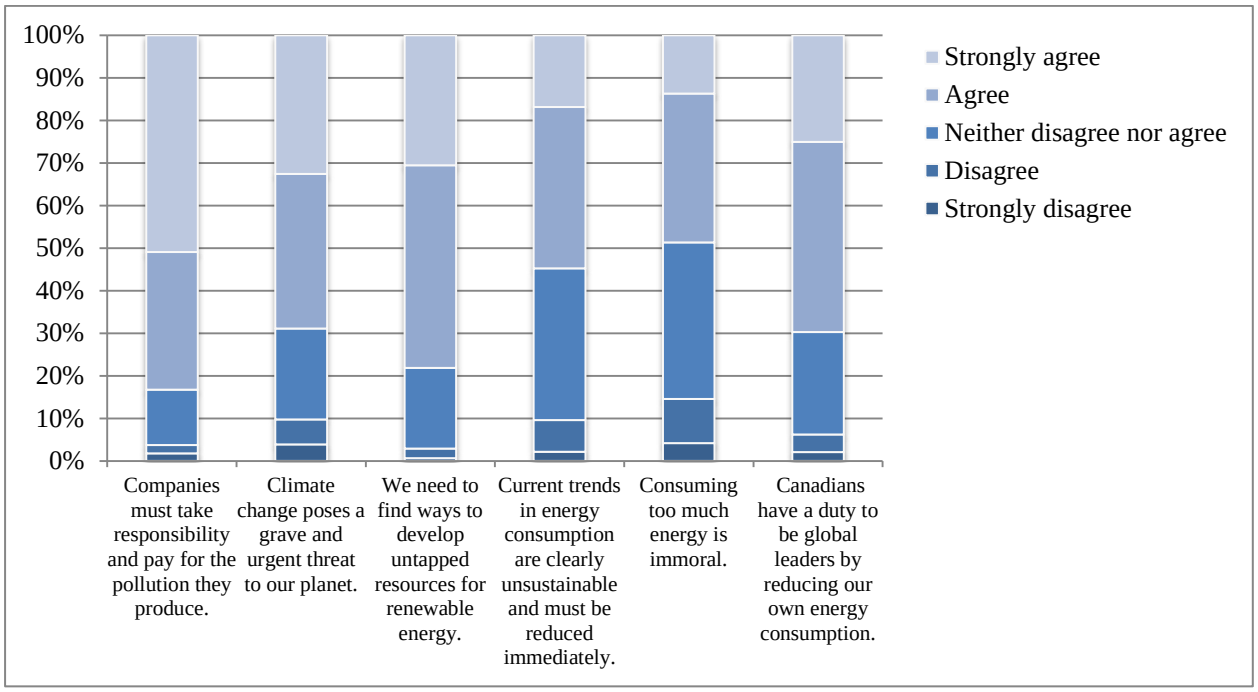

Figure 12 Statements reflecting the urgency of climate change and the need to take action.

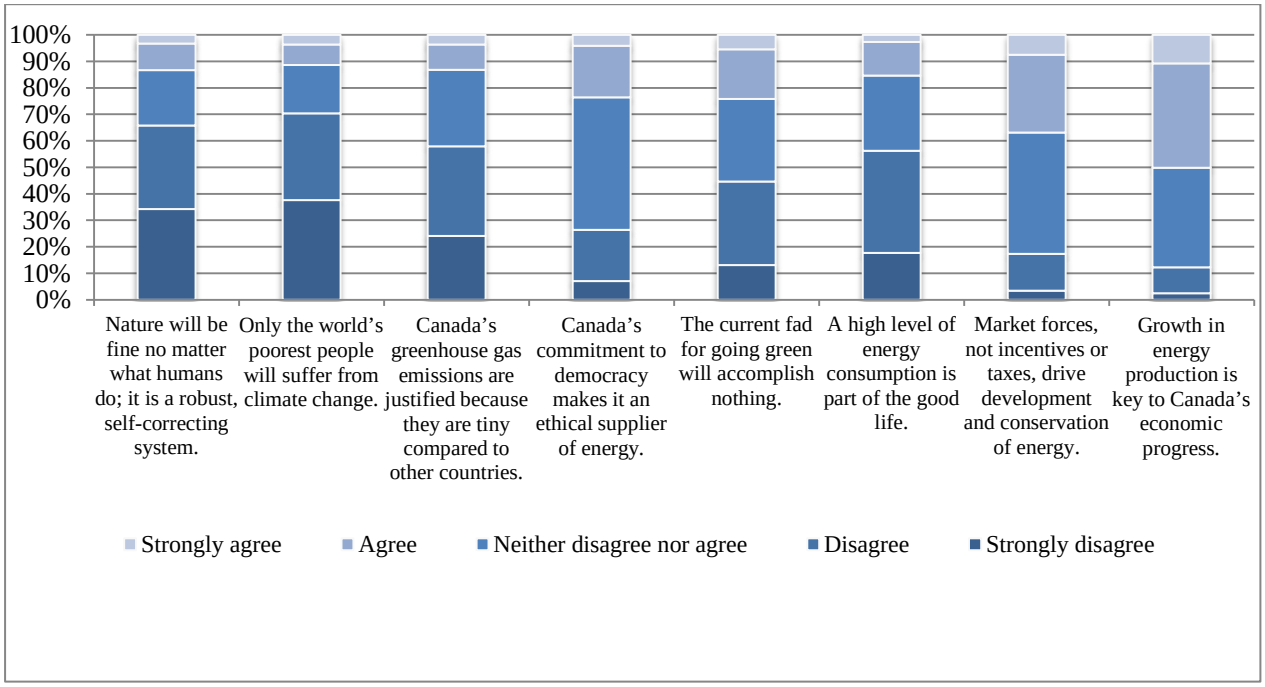

Figure 13 Statements reflecting robustness of nature and business-as-usual-approach to energy development.

Briefly examining the links between values and preferences for energy alternatives, respondents oriented toward the robustness of nature and business as usual approach to energy development (Figure 11), were moderately inclined to support fossil fuels and nuclear energy sources (r = .285, p < .05), and somewhat less inclined to support renewable energy technologies (r = -.165, p < .05). Respondents with a sense of climate urgency (Figure 12) were less inclined to support fossil fuel and nuclear sources of energy supply (r = -.207, p < .05) and moderately inclined to support renewable energy sources of supply (r = .301, p < .05).

Values and beliefs were also important in determining whether respondents were open to participating in energy-related activities and whether they perceived there were barriers to participating in energy discussions. Participants with stronger climate concern beliefs were somewhat more inclined to say they have or would share information about energy issues with friends and family and to vote for politician with energy considerations in mind (r = .169, p < .05), compared to those who though nature was robust who were somewhat negatively inclined (r = -.179, p < .05). Climate concerned participants were also somewhat more inclined to say that they would undertake in-home energy management actions (r = .141, p < .05). Gender differences were also significantly associated with beliefs and values. Women were more inclined toward climate concern (M = 3.93), compared to men (M = 3.78). Males were more inclined toward nature as robust and business as usual (M = 2.77, compared to M = 2.58).

These values and beliefs about energy development provide insight into the ethical stance of Canadians on this issue. For instance, continued public support for energy-related development is likely to require attention to fairness and equity but for many Canadians an ethical stance also includes attention to broader issues of climate change and the need for reduced greenhouse gas emissions. Many Canadians expect companies to act responsibly, to take climate change seriously, and for these companies to take leadership positions in achieving these outcomes.

Summary

Several overriding themes are present within this survey. First, with respect to support and opposition to energy sources nationwide, Canadians show strong support for renewable energy sources. By a wide margin, there is relatively unambiguous support for solar, wind and hydroelectric power, with slightly less support for geothermal and bioenergy resources. Given the persistence of highly documented local pockets of resistance to renewables across the country, this outcome may seem surprising. With respect to non-renewable sources, the story is quite different in part because of the uncertainty expressed by Canadians about these sources. For all of the non-renewable sources identified in this study, a large proportion of Canadians "neither support nor oppose" these sources. Given that many of these energy sources are a backbone to the existing energy system and provide economic benefit to many Canadians, this

result is particularly interesting and may suggest a growing unease or ambiguity about the sustainability of these energy sources and the economic activity derived by them going forward.

When Canadians think about support or opposition to energy sources, a number of issues are top of mind. Concerns about risks to the safety of humans (including their health) and the environment are top of mind when thinking about why they oppose specific sources of energy. When asked about reasons for supporting an energy source, benefits to the province/territory, economy and/or consumers were deemed most important, followed by environment, and then human safety (Figure 14).

Second, most Canadians express an awareness of energy use options but there is less willingness to undertake certain kinds of home-related energy saving actions. For instance, 90% of participants indicate they know ways to conserve energy in the home, but only 46% are willing to allow utility suppliers to remotely lower home or hot water tank temperatures. This trend is also noted with respect to solar power, where there is extremely strong support for solar as an energy source but much less support for installing rooftop solar panels to heat water or generate electricity. There are a number of potential reasons for this lack of connection. Although Canadians support solar energy sources, many are not familiar with such technologies. Therefore a willingness to install solar panels may be weak because this behavior is not frequently observed. Moreover, Canadians may see a role for large utilities and regulators in supporting large-scale solar projects rather than small and distributed power systems.

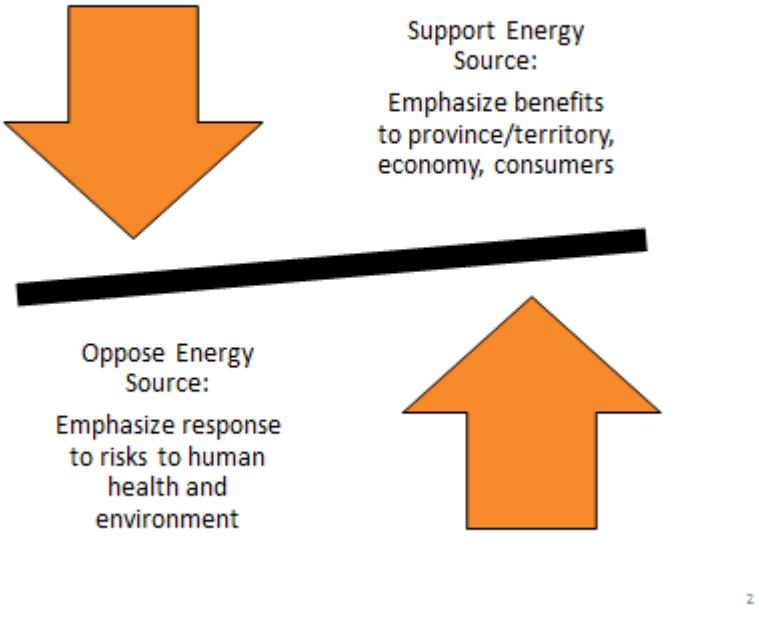

Figure 14 Canadians want to know more about benefits when they are thinking about the energy sources they support.

Third, with regard to energy citizenship, approximately 40% of Canadians are aware of participation opportunities related to energy development. These opportunities may come in the form of public hearings for new projects or local open houses for on-going projects. Yet in spite of this awareness and a general willingness to attend, Canadians remain disengaged. Rates of attendance at meetings are very low at about 7% of the population. Although it is popular to assume that disengagement is attributable to apathy, our results suggest otherwise. Lack of knowledge and a sense that input will probably make no difference to outcomes are two of the main barriers to participation in energy-related discussions. Also, a lack of trust in 'energy insiders' (such as energy regulators and energy industry association) plays a role in limiting participation.

Finally, values and beliefs offer crucial insights into the ethical stance of Canadians and their preferences for energy alternatives. The survey found that 83% of Canadians strongly value cautious, fair and inclusive decision-making processes, while 73% feel connected to and interdependent with nature, and worry that human interference with nature can produce disastrous consequences. These general values are expressed in beliefs about energy and the environment: a majority of Canadians (77%) believe energy should be used responsibly and that the climate should be protected. These values and beliefs influence how Canadians, particularly women, evaluate energy-related information and choices.

Policy considerations

Survey results suggest opportunities for ongoing communications research, but also approaches to energy-related education, and outreach and engagement initiatives. Current results suggest opportunities to encourage Canadian participation in energy discussions, decisions and choices through a comprehensive approach to energy education and engagement. These opportunities include initiatives that consider a full spectrum of values and beliefs with the aim of developing critical thinking skills to wrestle with difficult trade-offs and competing value positions.
To support energy literacy, topics should address system-wide issues such as sources of energy, such as shale deposits or water, commodities, such as natural gas and hydroelectricity, services such as heat and light, and amenities such home heating and the use of electronic appliances. Topics should also aim to improve the capacity for processing energy-related information and strengthening factual knowledge about energy sources, energy management options, and energy-related decision-making processes. These efforts should pay particular attention to noted differences in values of men and women.

Price sensitivity is a concern for Canadians as it relates to energy as a consumer commodity, but so are health and environmental concerns, particularly in opposition to certain types of energy development. Benefits (to the province/territory, economy and/or consumers) are top of mind when Canadians think about why they support an energy source. These results indicate ways of

engaging Canadians in energy discussions and decision-making processes. Energy project proponents often promote the economic benefits of a project but Canadians are also concerned about environmental, health and safety issues. The need to address these concerns, combined with the need to ensure cautious, fair, transparent and accessible decision-making processes, are essential to maintaining ongoing public support for energy projects.

This report, we believe, represents a baseline assessment of Canadians energy literacy, of their energy preferences, and their value orientations related to energy development. It also measures their willingness to engage in energy transition issues, both at home and in the public sphere. We also believe that this information is important to track going forward with attention to energy literacy, trust of energy insiders, willingness to adopt in-home energy technologies, attitude, values and beliefs related to energy issues. Policy makers, developers and energy utility staff have sometimes been caught off guard by opposition or support to various forms of energy development. While this work represents a snapshot of energy preferences, future work should track the evolution of preferences as well as a deeper analysis of the reasons behind them.

References

Bell, J., & Weis, T. (2009). *Greening the grid: Powering Alberta's future with renewable energy*. Drayton Valley, AB: The Pembina Institute.

Devine-Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. *Journal of Community & Applied Social Psychology, 19*(6), 426-441.

Haddock, G., & Maio, G. R. (Eds.). (2006). *Contemporary perspectives on the psychology of attitudes*. New York: Psychology Press Inc.

Haggett, C. (2011). Understanding public responses to offshore wind power. *Energy Policy, 39*(2), 503-510.

Maio, G. R., Esses, V. M., Arnold, K. H., & Olson, J. M. (2006). The function-structure model of attitudes. In G. Haddock & G. R. Maio (Eds.), *Contemporary Perspectives on the Psychology of Attitudes* (pp. 9-33). New York: Psychology Press.

McKenna, B. (2012, June 12). McGuinty's green energy 'explosion' more an implosion. *Globe and Mail*.

Moore, M. C., Turcotte, A., Winter, J., & Walp, P. B. (2013). *Energy and energy literacy in Canada: A survey of busines and policy leadership*. Calgary: University of Calgary.

Smith, J. W., Leahy, J. H., Anderson, D. E., & Davenport, M. A. (2013). Community/agency trust and public involvement in resource planning. *Society & Natural Resources: An International Journal, 26*(4), 452-471.

Turcotte, A., Moore, M. C., & Winter, J. (2012). *Energy literacy in Canada*. Calgary: University of Calgary.

Walker, C., Baxter, J., & Ouellette, D. (2015). Adding insult to injury: the development of psychosocial stress in Ontario Wind Turbine communities. *Social Science & Medicine, 133*, 358-365.