


Prospects for public participation in energy transitions in Canada: Householders' interests in hosting, coordinating, and trading electricity at the local level

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Abstract

In Canada, climate change and the rising cost of fossil fuel-based energy are driving a transition to cleaner local energy systems—combining renewable energy, storage, and smart devices. While these technologies are important, without public support and participation, they will not ensure a just and sustainable transition. In this context, we analyze data from a nationally representative survey (n = 941) of Canadians' views towards local energy system change, with a focus on three actions (hosting generation, agreeing to external control, and trading electricity) that will be vital. We are interested in overall trends across Canada, though given regional differences and the need to understand the people likely to support these actions, we utilize geographic, socio-demographic, and political variables to explore variations. In this, four key distinctions were found: females were more likely to support local generation; Quebec residents were more likely to consider coordination by letting an authority take control of their household's appliances; younger Canadians were more interested in all actions; and there was a left-right divide along political lines, with those supporting left-leaning parties being more interested in energy management. We locate these findings within broader discussions and close our article with recommendations for further research and policy.

KEYWORDS

Canada, energy transitions, household energy, public opinion

Résumé

Au Canada, le changement climatique et le coût croissant de l'énergie à base de combustibles fossiles favorisent une transition vers des systèmes d'énergie locaux plus propres, combinant énergies renouvelables, stockage et appareils intelligents. Bien que ces technologies soient importantes, elles ne permettront pas une transition juste et durable sans le soutien et la participation des populations. Dans ce

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contexte, nous analysons ici les données d'une enquête nationale (n = 941) sur les opinions des Canadiens envers les changements du système d'énergie local, en nous concentrant sur trois éléments essentiels (hébergement de la production, acceptation d'un contrôle externe et échange de l'électricité). Nous nous intéressons aux tendances générales mais nous utilisons différentes variables géographiques, sociodémographiques et politiques pour explorer les différences régionales. Quatre constats clés ont été mis en évidence: les femmes étaient plus enclines à soutenir la production locale; les résidents du Québec étaient plus favorables à laisser une autorité désignée gérer les appareils électroménagers de leur foyer; les jeunes Canadiens étaient plus intéressés par tous les types d'actions possibles et il existait un clivage selon les orientations politiques. Finalement, nous situons ces conclusions dans le cadre de discussions plus larges et concluons notre article par des recommandations en matière de recherche et de politiques publiques.

Key messages

- Transitioning from traditional, centralized energy systems to sustainable and local energy systems will require new, active participation by Canadian householders.
- Some groups (e.g. females, residents of Quebec, youth, those that are left-leaning) have higher levels of interest in hosting local generation, letting an external authority control their energy system, and trading electricity.
- For other characteristics of the Canadian population, there are not statistically-significant differences regarding interests in acting locally to advance the energy transition.

INTRODUCTION

The climate crisis and the rising cost of energy are simultaneously driving interest around the development of clean and local energy systems. Around the world, we are seeing increasing levels of renewable energy, battery storage, smart technology, and the “electrification of everything” (Jones & Ginley, 2021), which, together, are creating local smart grids (Quitow, 2023), smart local energy systems (Bray et al., 2024), or similar terms depending on the geography of interest.

While the technological advancement of these new systems is important, public engagement and participation in this energy transition is also vital (Fiander et al., 2024). Even on the technical side of things, without active citizen engagement, new energy systems cannot be optimized via balancing, storage, and management (Schweiger et al., 2020). Of course, such participation in local energy systems can bring a range of other benefits including more resilient infrastructure, cost savings, increased understandings of energy, and better social relations (Walker, Devine-Wright, et al., 2021). Despite this, there is still a nascent literature focused on the public's expectations and readiness to participate in local energy systems.

In this article, we seek to stimulate thinking around householder participation in the local energy transition in Canada. Drawing upon a 2022 nationally representative survey (n = 941), we analyze householders' potential to participate in three local actions that are expected to be critical: i) hosting generation; ii) coordinating electricity management by agreeing to external control; and iii) trading electricity (International Energy Agency, 2023). We highlight overall trends, but given our reading of the literature and the size of the country, our focus is on examining responses across different geographic, socio-demographic, and political categories.

The article is divided into six main parts. After this introduction, the second section sets the research context across two key dimensions: i) the energy systems landscape in Canada; and ii) the academic literature examining household participation in energy transitions. In the third section, the methodology is introduced, describing the survey that was deployed, outlining the independent and dependent variables, and identifying the statistical techniques used. In the fourth section, results are presented, focusing upon participants' answers to questions regarding their potential participation in a local energy future. A discussion of these results is undertaken in the fifth section. Lastly, the sixth section (Conclusion) summarizes the article and provides recommendations going forward.

RESEARCH CONTEXT

Energy systems in Canada

Energy has long been central to Canadian life in many ways: economic, geopolitical, and even cultural (Dalby, 2019). In this section, we briefly lay out those aspects of Canada's energy systems that are most relevant to households' energy needs and our investigation.

Canadians make use of energy services in all aspects of their lives, though in this article, we focus upon the use of energy in their homes (e.g., heating/cooling, powering lights, appliances and devices). In 2021, Canadians consumed 1.3 million TJ of energy in their homes. For each of Canada's 14.9 million households, this was, on average, 85.4 GJ. The fuel types are predominantly natural gas (51.5%) and electricity (45.8%), with some heating oil (2.7%) (Statistics Canada, 2024b).

Especially relevant context for energy in Canada is Section 92 of the country's Constitution, which grants legislative power concerning "non-renewable natural resources, forestry resources and electrical energy" to provinces (Government of Canada, 2024b). For this reason—as well as the expansive geography of the world's second-largest country—patterns of household energy use have developed in markedly different ways across Canada. These differences include per capita energy consumption across the 10 provinces—highest in Alberta (121.8 GJ) and lowest in New Brunswick (66.4 GJ) (Statistics Canada, 2024a).

Based partly on the kinds of resources available, each Canadian province also differs in terms of fuels being used in households. Figure 1 shows some of the mix of fuels that heat Canadian homes, by province. Going west to east, we see a leading role for natural gas, then electricity, and finally heating oil. Figure 1 also presents information about the provincial electricity supply mixes that serve households. For British Columbia, Manitoba, Quebec, and Newfoundland and Labrador, hydropower leads. For others—like Alberta, Saskatchewan, and Nova Scotia—fossil fuels rank first (Canada Energy Regulator, 2024a).

There are also substantial differences in the cost of household energy across Canada. Residential electricity prices in Canada's major cities ranged from a low of under 8 cents/kWh in Montreal, Quebec to a high of almost 30 cents/kWh in Calgary, Alberta in 2023 (Hydro Quebec, 2023). This helps to explain the ubiquitous use of electricity in Quebec and other lower-cost jurisdictions. Comparing average annual household energy expenses in 2021, they range from a low of \$1,860 in Quebec to a high of \$3,270 in Newfoundland and Labrador (Government of Canada, 2023). Notwithstanding the fact that Canada's household energy costs are relatively low compared to other OECD countries (Department for Energy Security & Net Zero, 2024), a number of Canadians—in all provinces—have unaffordable energy costs that affect their lives (Dionne-Laforest et al., 2024).

It is important to note that provinces organize their energy systems in different ways. They vary in terms of market structure (some are vertically-integrated); enterprise ownership (government-owned utilities and/or competitive markets); and regulatory oversight (some have distinct regulatory bodies) (Winfield et al., 2023). Provinces have also varied policies and programs intended to advance energy goals—be that via financial incentives, product codes, standards, or other approaches (Nippard et al., 2024). Moreover, provincial policies co-exist with both federal policies and municipal initiatives. With respect to the former, national initiatives like closing coal-fired power plants, carbon pricing, and

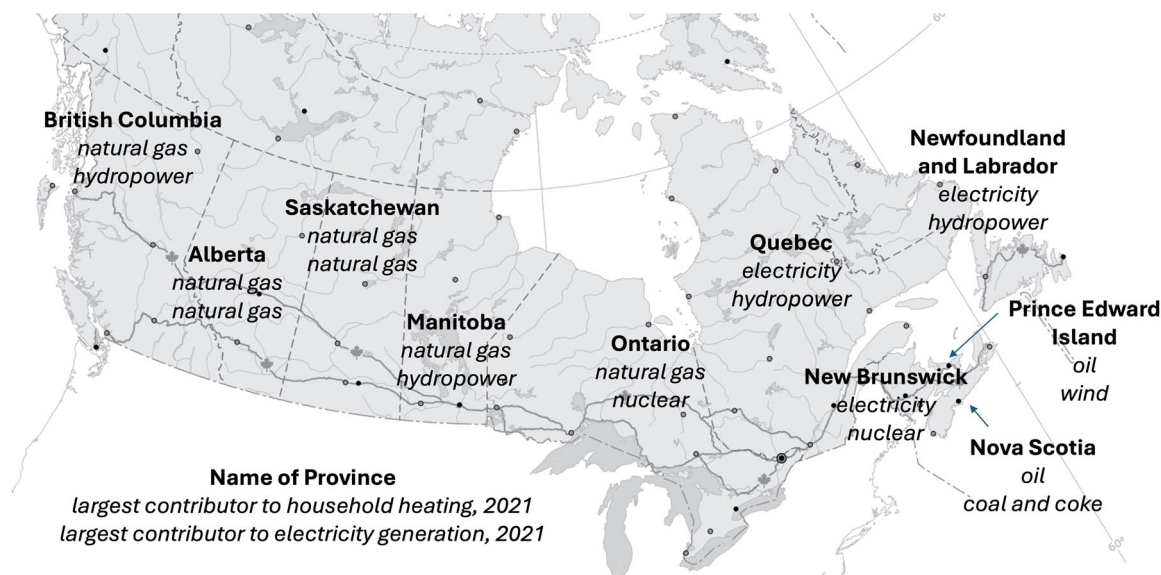


FIGURE 1 Leading household heating system and provincial-level electricity source, by province. Sources: Canada Energy Regulator (2024a, 2024b); Government of Canada (2022).

programs that label the energy efficiency of products and homes, have all been pursued. With respect to the latter, leading municipalities like Toronto and Halifax have been critical pioneers, adopting impactful policies and programs such as TransformTO and HalifACT (Lorinc, 2024).

Given the greenhouse gas-intensive nature of much of Canada's energy system, also of importance is the fact that the country (and many municipalities therein) have declared a climate emergency (Alkhayyat et al., 2023). Additionally, the federal government has written a legislatively enshrined commitment to achieve net-zero greenhouse gas emissions by 2050 (Government of Canada, 2024a). With per capita emissions more than two times the European Union average and nearly three times the world average (Crippa et al., 2024), it is widely accepted that Canada's relatively low-emission electricity grids must form the backbone of any future energy system (The Transition Accelerator, 2024). Further, discussions about how to secure a broadly defined successful energy transition (Electrification and Energy Transition Panel, 2024; Government of British Columbia, 2024)—including questions of political support (MacArthur, 2017; Walker et al., 2018) and equity (Sharma et al., 2025) that lay outside of the present study—abound in Canada. Still, these areas of focus related to equity suggest a need to better understand the views and roles of civil society, businesses, governments, and other groups.

Householder participation in energy transitions

In Canada and many other countries around the world, there is typically a disconnect between peoples' consumption of household energy and their understanding of the energy system that delivered it. This is particularly seen in terms of resources and their origins, quantity of energy consumed, and associated cost (van den Broek, 2019). Consumption occurs virtually unknowingly and even when there is a conscious decision by the householder to access the energy service, there is little understanding of the associated system and its impacts (Das & Richman, 2022). Given the low price of energy in Canada and little attention to energy system impacts, there has been little motivation for many to understand their often distant and veiled energy system. Of course, the impacts of energy development, including growing trends of energy poverty, are not "distant and veiled" for many others in Canada, most notably Indigenous peoples who are experiencing "ongoing colonialism and the lasting effects of resource extraction" (Walker et al., 2019, p. 2; see also Das et al., 2024; Zurba & Bullock, 2020).

Following what is being seen around the world (e.g., MacGill & Smith, 2017), these trends described above are now changing in Canada (Kuznetsova & Anjos, 2021). Indeed, higher prices, greater attention to the harmful impacts of legacy energy systems, and growing recognition of individual agency in the energy transition, have catalyzed researchers to better comprehend householders' understanding of, and attitudes towards, a range of energy issues. Doing so, we argue, is helping to create a better policy landscape and build a more empowered—and transformative—energy system.

Turning to that literature, Huttunen et al. (2021, p. 5), noted that as "sustainability transitions increasingly affect our lives, transition becomes less about technical innovations and diffusion of novel technologies and more about people adopting new practices and ways of life." Similarly, Raven et al. (2021) highlighted the importance of understanding how householders' actions differ across different socio-technical systems and whether households and householders are taking action (see also Chadwick et al., 2022). Bögel (2024, p. 512), moreover, has stated: "Citizen engagement is key to accelerating energy transitions." Additional literatures that help to set the stage here include current discussions around "energy citizenship" (Wahlund & Palm, 2022) and those that consider householders' understandings of and engagement with smart grid elements (Kojonsaari & Palm, 2023).

This article aims to advance the priorities foregrounded in this literature by uncovering the prospects for Canadian householders' participation in a local energy transition. We do so to contribute to global discussions in this field and add to the conversations underway in Canada. Scholarly literature in this regard includes investigations into, for example, technology applications (Hoicka & Das, 2021; McDiarmid & Parker, 2022), infrastructure portfolios (Stringer & Joanis, 2022), political studies (Thompson, 2022), and discursive analyses (Labonte & Rowlands, 2021; Mang-Benza and Hunsberger 2020).

METHODOLOGY

In Spring 2022, an online survey made up of 52 ordinal (Likert-scale) and nominal questions was developed and distributed across Canada. This survey was part of a larger AMTD Global Talent Fellowship project at the University of Waterloo and associated with the EnergyREV program at the University of Exeter—where a nearly identical UK-based survey collected a sample of 3,034 in Spring 2021.

For the Canada survey that is the focus of this research, which was administered by highly respected survey company Dynata, responses (n = 941) were collected online from panels across all 10 Canadian provinces, and the survey data are representative of the 2021 Canadian population by gender, language, age, income, and provincial characteristics. We did not ask for people to identify their ethnicity or Indigenous status. The sample of 941 was likely to be large enough to be representative of the Canadian population, with a confidence level of 95% and a margin of error between 3% and 4%.

Recruitment began with random sampling, though stratified sampling was later employed to ensure we were contacting sets of people that made our survey as representative as possible. Survey responses were not weighted given that the sample was already representative across most variables. The survey was originally written in English, then translated to French (for French-speaking respondents; $n = 231$) with the help of a bilingual energy social scientist. More detail about the survey may be found in our companion papers (Fiander et al., 2024; Walker et al., 2024).

Here, we focus upon the survey questions that generated the data associated with our independent and dependent variables. Regarding the former, we collected information about respondents across three areas to generate seven independent variables: the location of their home (province; and community type, i.e., urban, suburban, or rural); socio-demographic characteristics (gender, age, education level, income); and their political affiliation. Note that for the variable we call “gender,” we asked survey respondents, “Which of the following describes how you think of yourself? 1. Male; 2. Female; 3. In some other way”. With hindsight, we regret not using the categories of man, woman, non-binary—as male, female, and non-binary are more commonly associated with sex. All variables were selected based on our reading of the literature and in particular, research that has shown the importance of geographic (Bridge & Gailing, 2020; Baxter et al., 2020; Sherren et al., 2019), socio-demographic (Chilvers & Longhurst, 2016; Peterson et al., 2015), and political (Clulow et al., 2021; Karakislak & Schneider, 2023) factors in shaping support for, and participation in, energy transitions.

Turning to dependent variables, we draw upon the survey to create three variables and then used these three to make a fourth. More specifically, three questions from the survey were used to determine the extent to which Canadians said they were ready to participate in local energy transitions. Inspired by three of the “4Ds” (see Soutar, 2021) of energy system transformation, we are interested in whether people were keen to: i) host new generation (decentralization); ii) allow for coordination through external control of their energy use (digitalization); and iii) participate in electricity trading (democratization). Questions surrounding the “fourth D” of decarbonization were included in the survey but are not the focus of the analysis here. Together, the “4Ds” have been said to be “four ways in which the energy sector must change, including how we buy energy, who we buy it from, and how we use it” (RenEnergy, 2024). These trends align with similar ideas associated with clean energy transitions including energy communities and energy citizenship (Campos & Marín-González, 2020). For the remainder of this article, we refer directly to the dependent variables in question (i.e., actions) and not the 3Ds that they were inspired by.

Hosting new energy generation

We posed the question, “Where would you prefer the electricity that you use in your home to come from?” We gave seven possible responses from “from own home or building (7)” (high potential participation) to “from outside of Canada (1)” (low potential participation). Then, as part of the task to normalize across these three dependent variables, we re-assigned responses to one of three values: “high level of potential participation” (responses of 7); “medium level of potential participation” (responses of 6 and 5); and “low level of potential participation” (responses of 4, 3, 2, and 1).

Coordinating by allowing external control

For this variable, we posed the question, “Digital technology can help energy supply and use to be more balanced, especially in a local system that uses a lot of renewable energy. For example, it may help by turning on your washing machine earlier (or later) to help with energy system balance and emissions... Thinking about [this idea], how much do you support or oppose [this change] in your local area?” We gave respondents five possible responses from “strongly support (5)” (high potential participation) to “strongly oppose (1)” (low potential participation). To normalize, we re-assigned responses to one of three values: “high level of potential participation” (responses of 5); “medium level of potential participation” (responses of 4); and “low level of potential participation” (responses of 3, 2, and 1).

Trading electricity

We used the question, “Personally, how interested would you be in taking part in an energy trading program with your neighbours?” We gave respondents four possible responses from “very interested (4)” (high potential participation) to “not at all interested (1)” (low potential participation). To normalize, we re-assigned responses to one of three values: “high level of potential participation” (responses of 4); “medium level of potential participation” (responses of 3); and “low level of potential participation” (responses of 2 and 1).

Finally, we created a fourth dependent variable called the “potential participation index value,” which we calculated by assigning values of 2 to each “high level of potential participation” response, 1 to each “medium level of potential participation” response, and 0 to each “low level of potential participation” response. We calculated this index value for every respondent who had a valid response to each of the three survey questions noted above. Consequently, potential participation index values range from 0 to 6.

Data analysis

Our analysis began by looking at overall trends in terms of support across the sample ($n = 941$) for each of the three actions and the combined index (dependent variables). Next, as the main goal here was to determine if any of the independent variables (respondents' characteristics) drive any of the dependent variables (participation), we explored such relationships. More specifically, we tested to see if the independent variables ($n = 7$) appear to be associated with each action and the combined index ($n = 4$), in which we used a combination of T-Tests, one-way ANOVA, and a post hoc test Tukey HSD, across the 28 relationships.

RESULTS

Here we report on the results from the survey and results of the statistical tests we used to investigate significance between the independent variables and dependent variables. In Table 1, we first lay out the results of the survey regarding respondents' geographic, socio-demographic, and political characteristics (and in the Supporting Information, we compare our sample's characteristics with national data). Then, in Figure 2, we present survey responses vis-à-vis the independent variables, showing how low, medium, and high levels of potential participation cut across the hosting, coordinating, and trading dependent variables as well as for the potential participation index.

As a reminder, we wanted to answer the question, "Are there differences in the mean values for any of the four dependent variables, across the seven independent variables?" To answer this, our investigation focused upon pairs of independent ($n = 7$) and dependent variables ($n = 4$), and thus 28 relationships to investigate. The method used was slightly different across the 28, depending on if the independent variable had two options (in the case of gender) or more than two options (all others). Each is described, in turn, below.

To investigate whether the four dependent variables had different mean values for females and for males, SPSS's Independent Samples T-Test was used. This generated a significance value ($p < 0.05$), which we report below. To investigate whether the four dependent variables had different mean values across the other six variables (i.e., when there were more than two options for the independent variable), SPSS's One-Way ANOVA Test was used. If it generated a significance value at a threshold of 0.05, then a subsequent analysis was undertaken. More specifically, a post hoc test Tukey HSD was undertaken, and those pairs of options (two of the choices from amongst the three or more that were part of the independent variable under consideration) with a significance value, $p < 0.05$, were identified and investigated further.

Regarding the Independent Samples T-Test with respect to gender, results were mixed. (For additional results, see Supporting Information.) Across the four dependent variables, there were no significant differences regarding coordinating and trading. Moreover, the means of potential participation index values did not differ significantly as a function of the respondent's gender. There was, however, significance in the responses to hosting: females were more likely to support more locally-sourced electricity generation options. 78% of the female respondents fell into either the "high level of participation" or "medium level of participation" categories in this area, while only 65% of the male respondents did.

We now turn to the six independent variables that had more than two options provided. (Additional results are available in Supporting Information.) Table 2 provides, for the 24 ANOVA tests we undertook, the resultant significance values. Of these, there are nine relationships that have a significance value, $p < 0.05$, and we investigate these relationships further, below.

We begin by investigating the regional differences regarding coordinating, which was the only independent variable that generated a significant difference for this dependent variable. Of six regions investigated (British Columbia; Alberta; Eastern Prairies (Saskatchewan and Manitoba); Ontario; Quebec; and Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador)), it was Quebec that was the significantly different region at the $p < 0.05$ level—different than each of Ontario ($p = 0.002$), British Columbia ($p = 0.030$), and the Eastern Prairies ($p = 0.044$). Making this more tangible, we note that 69% of Quebec's respondents answered either "strongly support" or "tend to support" ("high level of potential participation" and "medium level of potential participation," respectively) for letting an authority take control of the household's appliances for broader social good. By contrast, only 54% of Ontario's respondents, 56% of British Columbia's respondents, and 49% of the Eastern Prairies' respondents said the same.

Turning to age, we see in Table 2 that there are statistically significant differences in the means across all four dependent variables. In Table 3, more detailed results are presented. Matching columns and rows in Table 3, when a dependent variable is identified in the intersection, it denotes a significance of differences between the pairs of group means ($p < 0.05$), and the independent variable category that is the one with the higher level of potential participation is also identified. To elaborate, for two of the four dependent variables (coordinating and index), the 18–34 age group had a significantly higher level of potential participation than the 35–54 age group; additionally, the 18–34 age group had a significantly higher level of potential participation than the 55+ age group across all four dependent variables (hosting, coordinating, trading, and index). Again, to give this some tangibility, note that 34% of the youngest age group's respondents answered, "from own home or building" ("high level of potential participation") to indicate where they would prefer to source their electricity (hosting). By contrast, only 25% of the 55+ age group's respondents said the same.

We now turn to our study of political affiliations. From Table 2, we see that there is much to explore—namely, all four dependent variables we have identified were found to be significant at the $p < 0.05$ level. In Table 4, we present some of the results of the post hoc tests (additional results available in Supporting Information).

TABLE 1 Independent variables and participants' characteristics.

Kind of variables	Variable (number of valid responses)	Survey values
Geographic	Province of residence (n = 941)	British Columbia: 13.2% Alberta: 11.8% Eastern Prairies: 6.7% Ontario: 36.6% Quebec: 24.3% Atlantic Canada: 7.4%
	Urban/rural (n=934)	Urban – downtown/city centre: 23.4% Urban – not downtown: 32.3% Suburban: 29.1% Rural: 14.5% Remote: 0.6%
Socio-demographic	Gender (n=933)	Female: 50.8% Male: 48.4% In another way: 0.9%
	Age (n=941)	18–24: 11.1% 25–34: 16.3% 35–44: 17.6% 45–54: 15.1% 55–64: 17.0% 65–74: 12.8% 75+: 10.2%
	Education (n=941)	No formal schooling: 1.2% Elementary school: 2.2% Secondary or high school diploma: 23.6% Apprenticeship or other trades certificate: 9.0% College diploma: 20.0% University (below bachelor's degree): 7.4% University (bachelor's degree): 24.5% University (higher than bachelor's: e.g., master's, doctorate): 12.0%
	Income (n=906)	Under \$20,000 (including loss): 8.4% \$20,000–\$29,999: 10.2% \$30,000–\$39,999: 8.1% \$40,000–\$49,999: 9.9% \$50,000–\$59,999: 10.4% \$60,000–\$79,999: 14.1% \$80,000–\$99,999: 15.1% \$100,000–\$149,999: 15.3% \$150,000 and over: 8.5%
Political	Party association (n=698)	Bloc Quebecois: 9.0% Conservative or Progressive Conservative: 26.2% Green: 5.2% Liberal: 38.7% New Democratic Party: 17.8% People's Party of Canada: 3.2%

From Table 4, we can see no statistically significant differences in means between the New Democratic Party and the Bloc Quebecois, the New Democratic Party and the Greens, the New Democratic Party and the Liberals, the New Democratic Party and the People's Party, and the Conservatives and the People's Party. By contrast, there are differences between each of the Bloc Quebecois, the Conservatives, the Greens, and the Liberals and four of the other five political party affiliations. The Conservatives and the People's Party are, for the most part, the ones showing the lowest levels of potential participation—though the Bloc Quebecois “compete” with them in some instances. Those affiliated with the Greens are distinctively notable by their high levels of potential participation across all measures except hosting. To give this additional substance, we note that only 12% of the Bloc Quebecois' respondents answered, “very interested” (“high level of potential participation”) in taking part in an energy trading program with their neighbours. By contrast, 54% of the Green's respondents, 31% of the New Democratic Party's respondents, and 22% of the Liberal's respondents said the same.

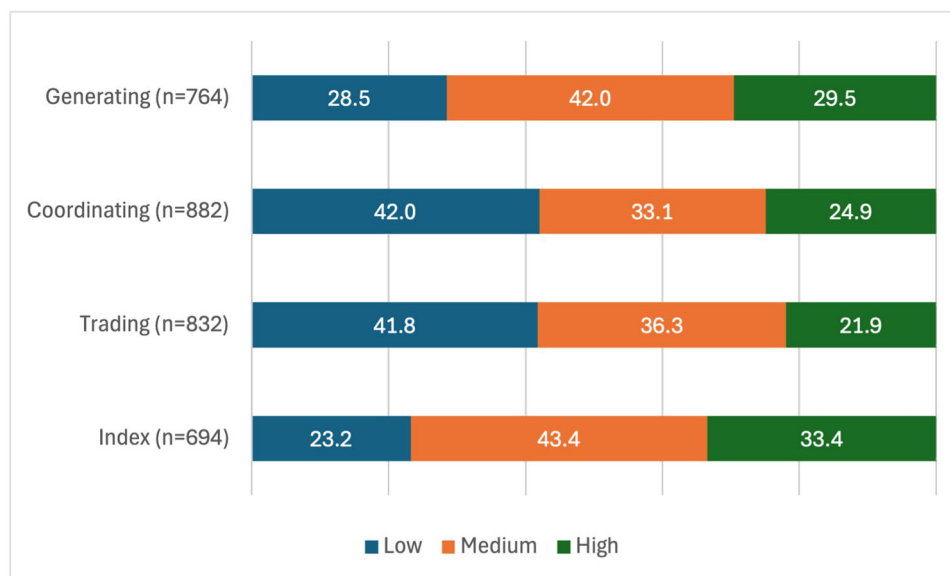


FIGURE 2 Dependent variables and participants' responses, percentage share according to level of potential participation.

TABLE 2 Results from ANOVA tests (significance levels), between selected independent and dependent variables.

	Hosting	Coordinating	Trading	Index
Age	0.029	0.001	<0.001	<0.001
Education	0.386	0.260	0.051	0.566
Income	0.452	0.253	0.241	0.649
Political Party	0.022	<0.001	<0.001	<0.001
Region	0.141	0.016	0.215	0.682
Urban/Rural	0.515	0.149	0.346	0.405

Note: Significant relationships, $p < 0.05$, are **bolded**.

TABLE 3 Significance in means of four dependent variables (with respect to age); independent variable category that is the one with the higher level of potential participation is identified in parentheses.

Age range (in years)	18-34	35-54	55+
18-34			
35-54	Coordinating - 0.002 (18-34 years) Index - 0.018 (18-34 years)		
55+	Hosting - 0.036 (18-34 years) Coordinating - 0.007 (18-34 years) Trading - <0.001 (18-34 years) Index - <0.001 (18-34 years)		

DISCUSSION

In this section, we situate our results within a broader global discussion about individuals' roles in an energy transition. Our reading of the literature suggested it was likely that the geographic, socio-demographic, and political factors chosen as independent variables would help to explain potential participation in energy system change in Canada. Additionally, given that questions of energy are often of provincial authority, we suggest these results are helpful for those interested in differentiated responses to energy transitions, depending on what works best in each place and with each set of people. We close this section by acknowledging some limitations of our work.

TABLE 4 Significance in differences in means of four dependent variables (with respect to political affiliation); independent variable category that is the one with the higher level of potential participation is identified in parentheses.

Political affiliation	NDP	Green	Liberal	Conservative	PPC	BQ
NDP						
Green						
Liberal		Trading - 0.008 (Green)				
Conservative	Index - 0.004 (NDP)	Coordinating - 0.002 (Green) Trading - <0.001 (Green) Index - <0.001 (Green)	Coordinating - <0.001 (Liberal) Index - <0.001 (Liberal)			
PPC		Coordinating - 0.002 (Green) Trading - 0.004 (Green) Index - 0.001 (Green)	Coordinating - 0.005 (Liberal)			
BQ		Trading - <0.001 (Green) Index - 0.008 (Green)	Trading - 0.033 (Liberal)	Coordinating - 0.032 (BQ)	Coordinating - 0.022 (BQ)	

Gender

Investigating the differences in responses from female and male respondents, it was only the degree to which respondents wanted to host new electricity generation locally that had a significant value. There have been many investigations into the ways in which and the extent to which sex and gender perspectives and roles can affect outcomes in household energy management, as well as the reverse (Petrova & Simcock, 2021; Shrestha et al., 2021)—that is, the ways in which and the extent to which household energy management developments affect livelihoods of women (see Lieu et al., 2020). Locating our results within these broader discussions (e.g., Strengers et al., 2022) could potentially yield insights—we return to broader structural issues (the kind of which we hint at here) below.

Province

Given that Quebec residents appear distinctively interested in external agents potentially controlling household energy use, we think of the ways in which the provincial electric utility, Hydro Quebec, may be uniquely influential in the provincial landscape. Connected with ideas about livelihoods and nationhood—and successful in delivering the least expensive electricity in the country—Hydro Quebec holds place of pride amongst many of the province's inhabitants (Bernier & Khelifaoui, 2019). Indeed, the results of Bloc Quebecois respondents (political affiliation) in particular (n=63) found high levels of potential participation in coordinating by allowing external control, but low levels in a desire to host new generation and trading electricity locally. These results relate to similar findings from Haley's (2014) research in Quebec and Gullberg's (2013) study in another hydro-rich jurisdiction, Norway—where both suggested this “hydro context” may create barriers for other energy innovations such as wind energy. We suggest that studies focused on the socio-political power of hydropower in Canada are worthy of further investigation.

Age

Turning to age, the higher degree of interest, across all measures of participation, of the younger respondents, was striking. Though this may relate to certain trends in the literature which show younger people care more about climate change and are willing to act in ways that help (Karytsas & Theodoropoulou, 2014), it may be that other characteristics of this group are worth unpacking: for instance, 31% of the youngest age group had a political affiliation as either New Democratic Party or Green; only 16% of the oldest age group did. From other data we have

available in our survey, 19% of the youngest age group reported they lived with their parents (and thus may not be making energy decisions), while less than 2% of all other respondents were in that position. Nevertheless, in future work, connections to broader discussions about the role of youth in energy transitions (e.g., Jaradat et al., 2024) should be made.

Party association

On the consideration of political affiliation, there was generally a higher level of potential participation amongst left-leaning party supporters—which is not surprising given existing findings from Europe (Hess & Renner, 2019) and Canada (Fobissie, 2019). This was particularly seen of Green Party supporters for electricity trading. Similarly, there was generally lower levels of potential participation amongst right-leaning party supporters—though the People's Party's hosting new generation responses (local sourcing of electricity supply) defied this trend, perhaps reflecting a nationalistic tendency. Not only are there broader discussions with which to engage here (Clulow et al., 2021), but the fact that a federal Canadian election campaign was underway at the time of writing (April 2025), increases its relevance.

Finally, results with no statistical significance are also worth reflecting upon. To review, there were three independent variables (urban/rural, education, and income) in which there were no statistically significant differences in the means across the dependent variables.

Urban/rural

Measured on a range of economic, political, and social axes, some have observed an increasing disconnect between urban and rural communities in Canada (Stirrett, 2024). More detailed investigation into spatial roles in the energy transition may yield insights to catalyze multiple benefits. Indeed, though not statistically significant in our work, the interests of rural respondents to local sources of energy for their homes may be an entry point for further exploration. More specifically, more than any other group, rural and remote respondents demonstrated either high or medium levels of interest in hosting new generation: 79% of those respondents, as compared to, for instance, 68% of the downtown respondents. Inspired by Joshi and Agrawal (2021), we also suggest more work focused on the idea of “uneven geographies” of energy transitions.

Education

While no statistically significant differences were found, that does not mean that additional investigation centred around education is not warranted. Indeed, energy education is a key priority amongst governments and energy transition analysts (Electrification and Energy Transition Panel, 2024; Hu & Yang, 2024). It may be that different people, with different formal levels of education, respond positively to different means of learning. From this survey, there was nearly a significant difference between those with higher and lower levels of education regarding local energy trading. Regarding the respective shares of respondents who demonstrated either high or medium levels of potential participation in response to the electricity trading question, values were: 63% of higher-level education respondents, 58% of middle-level education respondents, and 52% of lower-level education respondents.

Income

Echoing a theme just above, though not statistically significant, in terms of willingness to consider local energy trading, those with higher incomes were more interested. More specifically, regarding the respective share of respondents who demonstrated either high or medium levels of potential participation in electricity trading, values were: 62% of the highest-income respondents (\$100,000 or more), followed by 61% of the next income level of respondents (\$60,000–\$99,999), 59% of the respondents in the next category (\$40,000–59,999), and 52% of the lowest income respondents (below \$40,000). Consideration of this variable opens a discussion about different socio-economic groups' involvement in the energy transition (Carley & Konisky, 2020), but also the extent to which structural factors affect energy participation (Hanke et al., 2023). Robison et al. (2023, pp. 3), for instance, note that “underlying power structures may disadvantage or oppress certain groups” in sustainable energy futures.

Limitations

Despite our best efforts, there are some limitations associated with our work. First, our survey collected perspectives at one single point in time. A survey's validity, moreover, may be weakened by ambiguous wording or respondents' desires to provide “acceptable” answers. Furthermore,

survey work that asks about intentions rather than activities has additional hurdles, given attitude-action barriers that may exist (Palacios-Fenech & Vrain, 2024). The interpretative value of our analysis is also limited by the fact that the sample was not representative along measures of political affiliation or education. Lastly, the three actions of which this work centred around are important, though are of course not the only actions important as local populations participate in energy system change. Simply using less energy, purchasing emission-reducing technologies (e.g., heat pumps), and voting for climate-sincere politicians (Jaccard, 2020) all play important roles as well. Moreover, the ways in which individuals come together outside of their respective households to take collective action—be that in pursuit of energy communities or the like (e.g., Dunphy et al., 2025)—are but some of the additional means by which citizens impact the energy transition.

CONCLUSION

This article has investigated the potential for householder participation in local energy transitions in Canada. Inspired by three of the “4Ds” of energy system transformation, and drawing upon a national survey, we analyzed householders’ potential to engage in three local actions that are critical: hosting new generation, coordinating by agreeing to external control, and trading electricity. Across several geographic, socio-demographic, and political variables, four were found to have means with differences that were statistically significant: gender, region, age, and political affiliation. Three of them did not: urban/rural, education, and income.

Moving forward, we recommend further work along three key axes. First, these results should be used to pursue the connections between our various independent variables (and potentially other ones as well—including Indigenous status, ethnicity, intra-household relations, and home ownership status) through surveys and/or interviews and focus groups. Deeper dives into the potential participation of women, youth, and those in rural areas and in the province of Quebec are thus worth pursuing. Additionally, the views and desires of Indigenous peoples in local energy transitions are vital to better understand and act upon, given the history of energy colonization and exploitation (Stefanelli et al., 2019), as well as obligations under UNDRIP and the TRC Calls to Action (Molander, 2022; Walker, Doucette, et al., 2021). Given that pilot projects experimenting with these energy transition actions (particularly external control) have recently emerged in Canada (Chung, 2024), and that others are being imagined internationally (Murtaugh et al., 2024), these should be investigated in conjunction with the results from this survey. Though pilot projects are small-n populations, their participants’ lived experiences will add to our collective understanding.

In terms of policy and development, we recommend that energy transition innovations involving householder participation should be co-created with communities in “living laboratories” to advance learning. There could be at least two positive outcomes of such initiatives: (i) increased understanding of householders’ knowledge/interest; and (ii) longitudinal studies would allow interventions to heighten engagement, and that could be tested and refined over time (Wanner et al., 2024). Our results here—for instance, the unique positions of younger citizens and the potential differential impacts of alternative information delivery means—should inform design strategies.

One final key takeaway from the emerging literature is that a successful energy transition will require ubiquitous participation across society. Learning more about the Canadian story will hopefully serve to advance sustainability in Canada. However, it is through cross-national work, where we can not only contextualize results, but also contribute to global outcomes. Thus, we call for more research in this area that looks at two or more countries. In the meantime, we hope that our research presented here—though targeted toward a Canadian audience of readers—has value in advancing regional, national, and global understandings.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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