

Residential Home Energy Consumption Survey

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Did you know that buildings are responsible for 40% of global energy use?



Figure 1: Opposite House, designed by Atelier RZLBD, Toronto, Canada

In an effort to combat climate change, this survey attempts to collect data for academic research on building energy consumption in Canada. Data will be used to understand building performance, develop prediction and design models, and lead innovation to reduce building energy consumption. By participation in this survey, your privacy will be protected. To protect individual's data, information will be collected as anonymous and only reported in aggregate form, i.e. by combining large sets of data. By participating in this survey, individuals agree to the consent form provided at the beginning of the survey. This study is organized by Amir A. Aliabadi from Environmental Engineering at the University of Guelph. This project has been reviewed by the Research Ethics Board for Compliance with federal guidelines for research involving human participants (REB No. 23-05-011). Please visit www.aaa-scientists.com/survey.html to complete the survey.



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1 Participant Consent Form

Title of the Study: Residential Home Energy Consumption Survey

Identity of Researcher(s): Professor Amir A. Aliabadi, School of Engineering, University of Guelph, RICH 2515, University of Guelph, Guelph, ON, Canada, N1G 2W1, (519) 824-4120 (ext. 54862), aliabadi@uoguelph.ca
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Introduction: You are being invited to participate in a research project that aims to collect information about your residential home energy consumption. Before you decide whether to participate, it is important that you understand why the study is being conducted, what participation involves, and what risks and benefits are associated with participation. Please take the time to read this consent form carefully and ask any questions you may have before making your decision.

Information to be Collected: The survey will include a questionnaire collecting the first three digits of your postal code and basic information about your residential home, such as building size, number of occupants, energy retrofits, energy systems, and construction/retrofit time. The survey will then collect monthly consumption of fuel (e.g. natural gas) and electricity for up to a full year.

Purpose: The purpose of this study is to collect information about your residential home fuel (e.g. natural gas) and electricity consumption patterns in order to gain a better understanding of how these resources are used in Canada. Data will be used to understand building performance, develop prediction and design models, and lead innovation to reduce building energy consumption.

Access to Identity of Participants: The identity of participants will be unknown since the survey is anonymous.

Research Program and Sponsor: Climate Action and Awareness Fund (CAAF) program by Environment and Climate Change Canada (ECCC).

Inclusion and Exclusion Criteria: To be eligible to participate, you must live in Canada, be a home owner, and be an occupant in the building of interest for which the data is to be submitted. Data will be collected from at least 100 participants (buildings).

Nature of Participation: If you decide to participate, you will be asked to provide information about your fuel (e.g. natural gas) and electricity consumption patterns over a period of up to one year through an online survey. Participation is voluntary and you are free to withdraw before submitting the survey at any time without penalty.

Duration of Participation: Your participation in this study is expected to last for approximately 20 minutes if completed correctly.

Procedures: The survey can be completed in two ways: 1) the fillable PDF can be uploaded to the researcher's website above, and it will be forwarded to Professor Amir A. Aliabadi; 2) the survey can be completed in Qualtrics, and Professor Amir A. Aliabadi will download the submitted information for further processing.

Feedback to Participants: To check the results of the aggregate survey data, participants should refer to the website of the researcher, Professor Amir A. Aliabadi, with the link above, where the research disseminations will be posted.

Risks: There are no anticipated risks associated with participation in this study. Even though energy consumption data is provided, your participation is anonymous, so you cannot be identified.

Responsibilities of the Participants: Participants shall submit information as accurately as possible. The information pertain to the generic building features and monthly consumption of fuel (e.g. natural gas) and electricity.

Direct Benefits for Participants: There is no direct benefits for participants.

Benefits to Society: Climate change is the greatest existential threat to humans. 40% of world energy consumption is by buildings, and thus 40% of greenhouse gas emissions are caused by buildings. Understanding building energy consumption and ways to mitigate harmful environmental impact is of paramount priority.

Obligation to Participate: You are under no obligation to participate in this study.

Withdrawal: You are free to withdraw from the survey prior to submitting the data at any time without prejudice to pre-existing entitlements. Once the survey is submitted, it cannot be withdrawn.

Assurance for Withdrawal: Participants are assured to be able to withdraw from participation throughout completing the survey by not submitting the survey.

Data Withdrawal: Once the survey is submitted, the data cannot be withdrawn.

Commercialization: There is no commercial interest in the study.

Conflicts of Interest: There are no real, potential, or perceived conflicts of interest on the part of the researchers, their institutions or the research sponsors.

Dissemination of Results: The results of this study will be disseminated through research papers, presentations, posters, reports, etc. based on the data collected. Participants will not be identified directly or indirectly in any reports or publications.

Data Deletion: Data will be permanently deleted after 10 years upon submission.

Qualified Designated Representative: If you have any questions about the scientific or scholarly aspects of the research, you may contact Professor Amir A. Aliabadi with contact information above.

Ethical Issues: If you have questions regarding your rights and welfare as a research participant in this study (REB No. 23-05-011), please contact: Manager, Research Ethics; University of Guelph; reb@uoguelph.ca; (519) 824-4120 (ext. 56606)

Protection of Confidentiality: The confidentiality of information will be protected by several means. The survey is anonymous, so the information cannot be associated with participants' identities. The data will be aggregated before scientific analyses and publications. The data will be stored and transferred on safe computers or cloud resources of the University of Guelph.

Anticipated Use of Data: Building energy data will be aggregated for many houses in a region. Then such data will be analyzed on a monthly basis. Data can be used to see which types of houses consume more energy or how well computer models predict actual energy consumption.

Duty to Disclose Information: There is no duty to disclose information.

Participation Incentives: There is no incentive to participate in this survey.

Legal Rights: You do not waive any legal rights by agreeing to take part in this study.

Stopping Rules: There are no stopping rules, and researchers may not remove participants from completing and submitting the survey.

Ethics Review: This project has been reviewed by the Research Ethics Board (REB No. 23-05-011) for compliance with federal guidelines for research involving human participants.

Data Collection Involving the Internet: Please note that confidentiality cannot be guaranteed while data are in transit over the internet.

Printing Consent Information: The consent information is available to participants to be printed either from the PDF survey or from the Qualtrics platform.

Access to Data and Data Storage: Professor Amir A. Aliabadi will have access to data. If the fillable PDF is uploaded to the researcher's website above, it will be transferred to the university computers and backed up on the One Drive cloud storage. If Qualtrics is used, data will be saved on Qualtrics servers, and then the data is transferred to the university computers and backed up on the One Drive cloud storage.

2 Basic Information About Your Residential Home

Q1. The first three digits of your postal code (Example: N1G —):

Q2. Type of your residential home:

Other :

Q3. Number of people living in your home:

Q4. What is the approximate footprint area of your residential home? For multi-storey buildings, the footprint area is only associated with one storey of the building; please exclude garages, yards, and other spaces that are not heated or cooled:

Other:

Q5. How many storeys in your residential home are heated and/or cooled?

Other:

Q6. Type of space heating system:

Other:

Q7. Type of space cooling system:

Other:

Q8. Type of water heating system:

Other:

Q9. Type of stove/oven system:

Other:

Q10. Which one of the uncommon devices below depend on substantial amount of energy in your home (choose as many as may apply)?

1 Electric car charged by electricity

2 Fire place powered by natural gas

3 Swimming pool, sauna, etc.

4 No uncommon devices

Other:

Q11. Approximately when was your residential home built?

Q12. When was your residential home retrofitted for energy efficiency?

Q13. If your home has been retrofitted for energy efficiency, click on all the features that apply to your home. Describe any specifics of the system components (e.g. the size of your photovoltaic panels, etc.)?

1 My home was air-leak tested and now it is leak-proof

Specifics:

2 I replaced my windows with energy efficient windows (e.g. double or tripple-layer)

Specifics:

3 I installed a high efficiency furnace

Specifics:

4 I increased the thermal insulation of my building envelop (e.g. increase R-value, foam spray under roof, etc.)

Specifics:

5 I installed a photovoltaic system

Specifics:

6 I installed a heat pump for home heating

Specifics:

7 I installed a solar thermal collector

Specifics:

8 I installed a thermal energy storage system

Specifics:

9 I have installed a green roof

Specifics:

10 I have installed other systems not described above

Specifics:

3 Natural Gas or Other Fuel Consumption Data

Q14. Would you share your natural gas or other fuel consumption data?

- Yes, I will fill the table below to indicate my natural gas (or other fuel) consumption. Note: the entries below can be populated by referring to your natural gas (or other fuel) bills (e.g. Figure 2 below). Please fill up to 12 entries. It is recommended to consider bills for at least 1 full year of natural gas (of other fuel) consumption. Your bills should come from the utility company in your region, such as Enbridge. If you have consumption data for less than 1 full year, that is still fine.

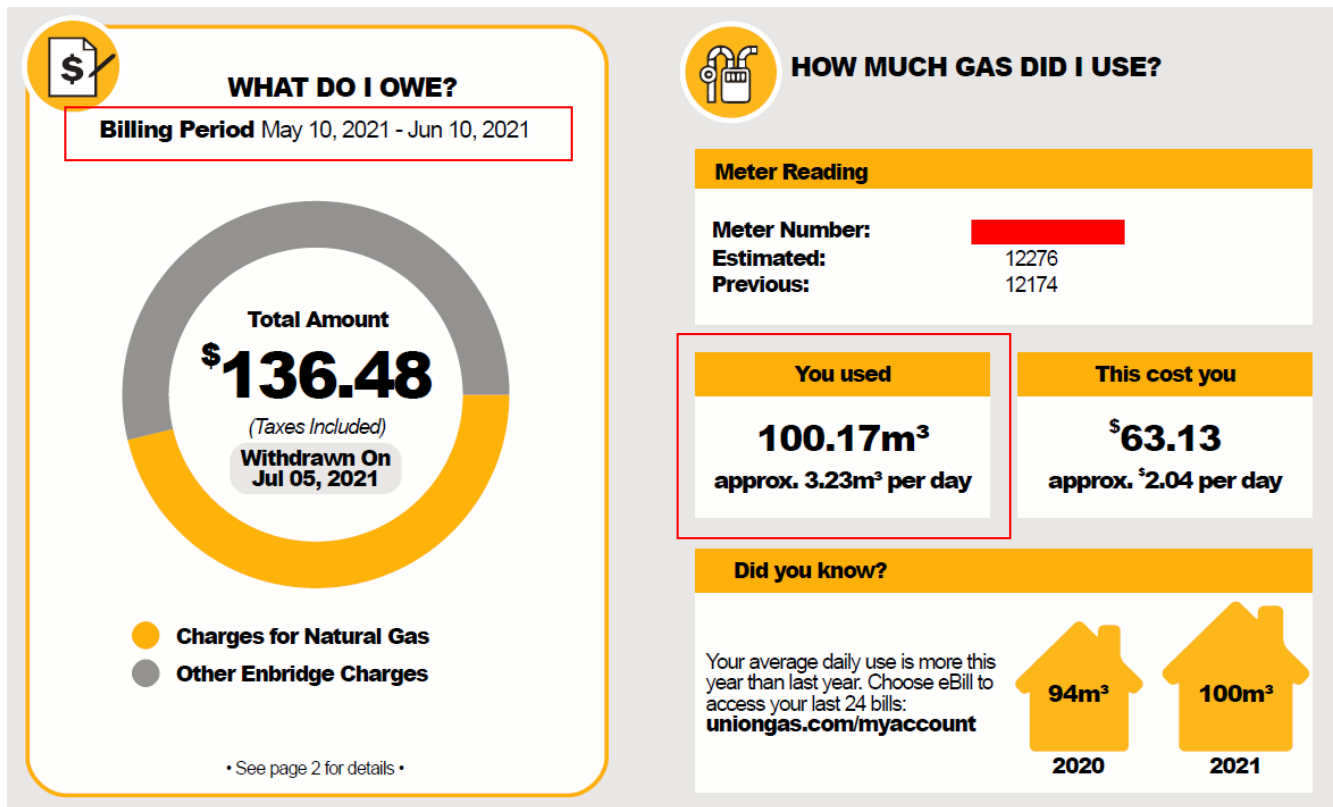


Figure 2: Sample natural gas bill with billing period (May 10, 2021 - Jun 10, 2021) and consumption (100.17 m³) boxed in red

Q15. Provide Information for up to 12 bills: consumption in cubic meters (m³)

Bill 01: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 02: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 03: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 04: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 05: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 06: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 07: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 08: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 09: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 10: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 11: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 12: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption

4 Electricity Consumption Data

Q16. Would you share your electricity consumption data?

- Yes, I will fill the table below to indicate my electricity consumption. Note: the entries below can be populated by referring to your electricity bills (e.g. Figure 3 below). Please fill up to 12 entries. It is recommended to consider bills for at least 1 full year of electricity consumption. Your bills should come from the utility company in your region, such as Toronto Hydro. If you have consumption data for less than 1 full year, that is still fine.

Metering Information

Service	Billing Period	Days	Meter #	Multiplier	Units	Current Reading	Previous Reading	Metered Consumption	Adjustment Factor	Adjusted Consumption
Electric	8/23/21 9/21/21	29		1.0000	KWH	65094.18	64841.77	.00	1.0260	.00
Electric	8/23/21 9/21/21	29		1.0000	10N	.00	.00	52.61	1.0260	53.97
Electric	8/23/21 9/21/21	29		1.0000	2MID	.00	.00	54.65	1.0260	56.07
Electric	8/23/21 9/21/21	29		1.0000	3OFF	.00	.00	145.14	1.0260	148.91
Water	8/24/21 9/23/21	30		1.0000	M3	2019.00	2006.00	13.00	1.0000	13.00

Figure 3: Sample electricity bill with billing period (8/23/21 to 9/21/21) and consumption (53.97 + 56.07 + 148.91 = 258.95 kW – hr) boxed in red; in this example electricity price varies according to time of year and day in three brackets; we consider adding all the consumptions together

Q17. Provide Information on up to 12 bills: consumption in kilo Watt hours (kW-hr); please note that in some regions the electricity price varies according to time of year and day. In such cases, simply report the total electricity used in the billing cycle by adding all the consumptions together.

Bill 01: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 02: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 03: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 04: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 05: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 06: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 07: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 08: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 09: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 10: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 11: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption
Bill 12: Start YYYY	MM	DD	End YYYY	MM	DD	Consumption

5 Other Information

Q18. Please provide any other information that you think may help this survey. Please do not disclose any personal, private, or identifying information about yourself.