REQUEST FOR INFORMATION (RFI)

THE DEVELOPMENT AND IMPLEMENTATION OF VIRTUAL HOME ENERGY ASSESSMENT AND HOMEOWNER ENGAGEMENT PLATFORMS BASED ON DATA ANALYTICS AND MACHINE LEARNING METHODOLOGY

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REQUEST FOR INFORMATION (RFI) REGARDING THE DEVELOPMENT AND IMPLEMENTATION OF VIRTUAL HOME ENERGY ASSESSMENT AND HOMEOWNER ENGAGEMENT PLATFORMS BASED ON DATA ANALYTICS AND MACHINE LEARNING METHODOLOGY

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1. Purpose and Nature of the Request for Information (RFI)

1.1. Introduction

Natural Resources Canada (NRCan) is requesting industry and stakeholder feedback regarding a pilot project to develop and implement two complementary platforms: a virtual home energy assessment and a homeowner engagement platform. The platforms being contemplated are intended to be based on data analytics and a machine learning methodology.

The responses provided to this RFI will contribute to further defining a Statement of Work to advance objectives presented in *Build Smart – Canada's Building Strategy*[1], and the *Pan-Canadian Framework on Clean Growth and Climate Change*[2].

NRCan is partnering with the City of Vancouver and the Province of British Columbia on this RFI to help inform the development of this pilot project. The project partners are seeking specific responses to the questions posed in Appendix A. The areas of interest, intent and conditions of this RFI are detailed in Section 3.

1.2. Background

The EnerGuide for Homes system, currently used by NRCan partners in over 70 programs and regulations across Canada, is currently delivered via onsite home energy evaluations conducted by expert energy advisors who are registered with NRCan. EnerGuide is a trusted nationwide system that provides science-based home energy and emissions information that can be compared for homes across the country, and partners have consistently stated a desire to maintain the federal-government backed brand and services.

Recently, some partners utilizing EnerGuide have recommended the exploration of additional digital tools for engaging homeowners on home energy and emissions performance that could cost homeowners less than the current onsite EnerGuide evaluations. In addition, partners have proposed that such tools could also provide partners with enhanced access to data on home energy and emissions performance in their regions, allowing partners to better identify opportunities for effective program and policy design by using spatial mapping of home energy data and facilitating real-time queries of data.

1.3. Project Overview

The objective of the pilot project is to research, develop and implement all components of two complementary online virtual[3] platforms for existing homes to provide a suite of features for homeowners and occupants. These features would include a data analytics- and machine learning-driven methodology to generate home energy and emissions ratings; detailed energy efficiency upgrade recommendations; and a variety of enhanced, interactive online features, such as tools for exploring the impacts of undertaking different home upgrade options and connecting directly with contractors who can perform selected upgrades. Together, these platforms would achieve three main objectives:

[1] https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/Building_Smart_en.pdf
[2] http://publications.gc.ca/site/eng/9.828774/publication.html
[3] For the purpose of this document, *virtual* means a digital, online tool that involves no onsite, in-home visits by third party energy evaluation professionals to develop energy and emissions ratings and upgrade recommendations

1. Enable homeowners to understand and take voluntary action to improve their homes' energy and emissions performance;
2. Enable homeowners to understand and comply with provincial or municipal regulations and bylaws for mandatory labelling and disclosure, energy/emissions performance, or other legal requirements; and
3. Enable policy makers and program delivery agents to access home energy performance data and mapping information through a new, powerful tool that can support regulatory and program design; regulatory compliance and enforcement; program measurement and verification; and, targeted marketing and outreach campaigns.

The proposed approach is an expansion beyond the current, onsite EnerGuide home energy assessment model, and is being driven by a desire by all project partners to achieve a higher reach of home energy assessments and greater engagement of homeowners, at a lower cost and with seamless integration of the information flow.

1.4. One Request, Two Different Platforms

The two online platforms are intended to perform distinct but interconnected functions.

One platform would be hosted by NRCan to provide homeowners with the following features:

a. foundational home energy and emissions ratings and information, based on EnerGuide modelling and functionality, with options for user input to increase accuracy of the rating and to provide housing data back to NRCan, as well as to a regional energy and emissions database;
b. home performance upgrade recommendations;
c. assistance in understanding and accessing opportunities for more comprehensive, onsite home energy assessments with NRCan-registered energy advisors.

The second platform would be hosted by the City of Vancouver to provide regionally based, interactive information to help homeowners:

a. contextualize and take action on more customized home energy and emissions upgrade recommendations than those provided by the NRCan-hosted platform alone, or by conventional, onsite EnerGuide evaluations a home may have received;
b. discover and participate in voluntary energy/emissions retrofit incentive programs;
c. explore costing estimates and savings potential for various conservation measures they may consider;
d. find and access financing opportunities for their home energy retrofits;
e. locate and engage energy advisors for deeper, more customized, house-as-a-system advice on upgrades and health and safety implications;
f. locate and engage contractors to undertake upgrades; and
g. understand and comply with regulatory requirements related to home energy and emissions labelling, disclosure and performance.

1.5. Vision

The development and piloting of both platforms will support the objective of developing capacity at the provincial and national level:

- Work on the National Data Analytics-Based Home Energy and Emissions Rating and Upgrade Recommendations Platform will help NRCan explore the development of a national virtual offering based on data analytics, applicable to all homes in Canada that are eligible for EnerGuide rating services;
- Work on the Regional Decision Support Tool for Homeowners will support exploring the scaling up of the platform to be capable of serving homes across British Columbia, and, further, to provide a template that can be easily adapted and implemented by other Canadian jurisdictions.

NRCan is still in the early stages of implementing a comprehensive strategy regarding the use of data analytics-driven, machine learning methodology to generate home energy and emissions ratings. This project will assist NRCan in determining an appropriate model to secure access to AI capacity, which may differ from the current ownership model in place under EnerGuide, whereby NRCan owns and manages EnerGuide HOT2000 simulation software.

2. High Level Requirements

2.1. Functional Requirements

A high-level description of the functional requirements is provided in the table below.

PLATFORM 1. National Data Analytics-Based Home Energy and Emissions Rating and Upgrade Recommendations Platform
User login and profile customization: after a secure authentication process, users can access their home asset information and customize their profile by filling in blanks, answering limited questions about the home's energy and emissions-related characteristics. Home Energy and Emissions Ratings calculation: as per current EnerGuide model. Using the EnerGuide Rating System metrics: consumption-based (gigajoules/year and gigajoules/m2/year) and emissions-based (tonnes CO2e/year). Basic upgrade recommendations: as per current EnerGuide model. List upgrade categories and measures, and pre-set information about each measure. Interoperability: Platform 2 seamlessly accesses and leverages information generated by Platform 1.
PLATFORM 2. Regional Decision Support Tool for Homeowners That Utilizes National Energy and Emissions Ratings to Provide Customized Regionally-Appropriate information

User login and profile customization: after a secure authentication process, users can access and customize their home profile and confirm information about their home's energy and emissions-related characteristics.

Decision support: provide educational content and step-by-step technical information on choosing the right equipment, contractor, timing, and prioritization.

Financial analysis: full integration of available BetterHomesBC rebates, financing offers and selected upgrades compared to a base 'do-nothing' case.

Home ratings: EnerGuide ratings imported from Platform 1, optionally compared relative to neighborhood or city-wide averages. Future ratings could additionally consider comfort, resilience and health metrics.

Recommended upgrades: home energy upgrade options presented based on user-input preferences (e.g. comfort, cost, eco-friendly) and budget can be presented for comparison.

Home energy & emissions roadmaps: a 5-20+ year roadmap of optimized retrofit pathways to improve home performance and comply with future regulations.

Energy and Emissions Database and Spatial Mapping Tool:

- Energy and emissions housing database: for City of Vancouver policy and program developers to query;
- Data sources: primarily uses data from the national platform described in Platform 1 above, but has the ability to incorporate additional data sets, for example historical program participation, census data, and tax assessment and census data as needed by each jurisdiction;
- GIS mapping functionality at a Forward Sortation Area (FSA), or parcel, level;
- Data sharing ability to share data at an aggregated level (e.g. FSA) with interested third parties.

2.2. Non-Functional Requirements

The Policy on Service and Digital and supporting instruments serve as an integrated set of rules that articulate how Government of Canada organizations manage service delivery, information and data, information technology, and cyber security in the digital era. Other requirements, including but not limited to, requirements for privacy, official languages and accessibility, also apply to the management of service delivery, information and data, information management and cyber security.

The Government of Canada is increasingly looking to utilize artificial intelligence to make, or assist in making, administrative decisions to improve service delivery. The Government is committed to doing so in a manner that is compatible with core administrative law principles such as transparency, accountability, legality, and procedural fairness.

Platform 1 would have to comply with TBS policies and directives such as the Policy on Service and Digital and the Directive on Automated Decision-Making.

2.3. Operation and Maintenance

It is expected that Operation and Maintenance of each of the two platforms will be subject to separate agreements, e.g., an agreement with NRCan for Platform 1, and the City of Vancouver for Platform 2.

The agreement structure may change depending on the nature of the solutions provided, and the ability of Platform 1 to meet EnerGuide qualification criteria.

3. Objectives

3.1. Issues of Interest

It is expected that the RFI process will result in a better knowledge and understanding of issues of prime interest to the proponents, including:

- To collect information on the operational and logistical considerations necessary to develop and deploy:
  - a federally-supported virtual home energy assessment;
  - a regionally supported homeowner engagement platform.
- To identify the strengths, weaknesses and risks of a virtual, data analytics-based machine learning methodology to generate home energy ratings compared to the current EnerGuide, onsite data collection and energy simulation methodology;
- To identify the level of market and consumer readiness for virtual, data analytics-based machine learning tools for engaging homeowners and moving them to action;
- To gain an understanding of the development and deployment costs of said systems;
- To identify potential opportunities and threats to the current network of NRCan-registered energy advisors from the deployment of virtual home energy and emissions assessment platforms;
- To assist in the development of a potential Supply Arrangement (SA) for the project.

3.2. Intent and Conditions of the RFI

This RFI is neither a call for tender nor a Request for Proposal (RFP). No agreement or contract will be entered into based on this RFI. The issuance of this RFI is not to be considered in any way a commitment by the Government of Canada, nor as authority to potential respondents to undertake any work that could be charged to Canada. This RFI is not to be considered as a commitment to issue a subsequent solicitation or award contract(s) for the work described herein. The procurement of any of the services described in this RFI will not necessarily follow this RFI. This RFI is simply intended to solicit feedback from industry with respect to the matters described in this RFI.

Although the information collected may be provided as commercial-in-confidence (and, if identified as such, will be treated accordingly by Canada), Canada may use the information to assist in drafting performance specifications (which are subject to change) and for budgetary purposes.

Respondents are encouraged to provide succinct background on their organizations' work and accomplishments and identify, in the information they share with Canada, any information that they feel is proprietary, third party or personal information. Please note that Canada may be obligated by law (e.g. in response to a request under the Access of Information and Privacy Act) to disclose proprietary or

commercially-sensitive information concerning a respondent (for more information: http://laws-lois.justice.gc.ca/eng/acts/a-1/).

Respondents are asked to identify if their response, of any part of their response, is subject to the Controlled Goods Regulations.

Participation in this RFI is encouraged, but is not mandatory. There will be no short-listing of potential suppliers for the purposes of undertaking any future work as a result of this RFI. Similarly, participation in this RFI is not a condition or prerequisite for the participation in any potential subsequent solicitation.

Respondents will not be reimbursed for any cost incurred by participating in this RFI.

The RFI closing date published herein is not the deadline for comments or input. Comments and input will be accepted any time up to the time when/if a follow-on solicitation is published.

4. Policy Context

4.1. Federal Government

In December 2016, Canada endorsed the Pan-Canadian Framework on Clean Growth and Climate Change (PCF) – a plan to enable clean economic growth, reduce GHG emissions, and build resilience to a changing climate. The PCF sets Canada on a path to meet its target under the Paris Agreement of reducing emissions by 30% from 2005 levels by 2030. The framework includes a comprehensive strategy called Build Smart – Canada's Building Strategy. Build Smart contains a number of objectives, the following of which are expected to be well served by the tools proposed in this Request for Information:

- To develop a model code for existing buildings by 2022, with the goal that provinces and territories adopt the code;
- Federal, provincial, and territorial governments will work together with the aim of requiring labelling of building energy use by as early as 2019;
- Provincial and territorial governments will work to sustain and expand efforts to retrofit existing buildings by supporting energy efficiency improvements and by accelerating the adoption of high-efficiency equipment while tailoring their programs to regional circumstances;
- The federal government will set new standards for heating equipment and other key technologies to the highest level of efficiency that is economically and technically achievable.

4.2. Province of British Columbia

The Province's CleanBC plan commits to exploring an energy rating requirement for homes and buildings across the province at the point of sale or lease. The process for generating ratings will be developed in consultation with stakeholders, with the goal of making it as simple and inexpensive as possible. The system would make it easier for buyers and renters to factor energy costs into their decisions while giving owners another incentive to make their buildings more efficient

The Province has partnered with NRCan and the City of Vancouver to conduct these explorations, including with the virtual tools contemplated in this RFI.

4.3. City of Vancouver

Nearly 60% of carbon pollution created in Vancouver comes from burning fossil fuels (primarily natural gas), for heat and hot water in buildings.. Of this total, one-third is attributed to existing detached housing.

The City of Vancouver is seeking to initiate an acceleration of deep energy retrofits to reduce carbon pollution and greenhouse gases (GHG's) to meet our Zero Emissions Building Plan, Greenest City Action Plan and Climate Emergency response reduction targets.

The proposed mechanism to transition the existing building stock to low-carbon, renewable energy systems is to set carbon pollution limits that step down over time. This allows for long-term flexibility where homeowners may plan in advance and select upgrades that align with their timelines, budget and preferences. However, in order to be successful, the necessary tools must be developed to provide homeowners with the awareness, resources, benefits and renovation options available to comply with these long-term regulations.

APPENDIX A – Platform Specific Questions

Below is a compilation of questions that are pertinent to the development, deployment, and operation and maintenance, of the platforms. This Appendix is meant to illustrate the framework within which NRCan will analyze and assess how to move forward with the project.

1. Platform 1 - National Home Rating and Upgrade Recommendations Platform

1. What would be reasonable steps and milestones in researching, developing and deploying a pilot platform?
    a. What timeframes would be realistic to achieve those steps?
    b. Could those steps be achieved in time to launch a pilot with the City of Vancouver by mid-2021?
2. What will the costs be to build, maintain and support the system?
3. What are the most effective ways to demonstrate AI model accuracy and perform beta user testing?
    a. How many real-world tests and beta users are needed? How long would this take?
4. What are recommended approaches to data management and flow?
    a. What are known and used available datasets to build this tool?
    b. How should the data architecture be constructed?
    c. What is optimal data flow and ownership for the two complementary systems?
        i. Content and process of homeowner authorization(s)?
        ii. Privacy requirements and protections?
        iii. Optimal database configurations and interactions with current EnerGuide database?
5. Outliers – what are the risks for homes that are not assessed well at any given time by the AI model? What is the recommended approach for these homes and homeowners?
6. Scale-ability
    a. What is possible at the municipal, provincial and federal level?
    b. How do costs and timelines change? What are the approximate economies of scale?
    c. How much and what quality of data is required over a region to support a data analytics approach for that region? What is the minimum data required to reasonably provide data analytics-driven machine learning-based ratings and recommendations for homes in a region?
7. What are the best ways to engage the public to inform the development of the platform?
    a. How best to ensure that the platform is impactful in capturing attention and successfully facilitating action on home energy and emissions upgrades?
8. How can a national data analytics-driven approach be integrated into the current EnerGuide for Homes approach?
    a. What challenges and opportunities would an integrated approach present?”
    b. How might a virtual system enhance or impact the energy advisor service for existing homes?

2. Platform 2 - Regional Decision Support Tool for Homeowners

1. What would be reasonable steps and milestones in researching, developing and deploying a pilot platform?
    a. What timeframes would be realistic to achieve those steps?
    b. Could those steps be achieved in time to launch a pilot with NRCan by mid-2021?
2. What will the costs be to build, maintain and support the system?
3. How can the system architecture best be designed to interact seamlessly with the federal platform?
    a. The regional system should also be capable of utilizing existing conventional EnerGuide ratings, which have been generated by energy advisors performing onsite data collection, energy modelling and customized creation of recommended upgrades for the home. How can integration of conventional EnerGuide ratings best be achieved?
4. Data ownership and access
    a. City of Vancouver (COV) needs access to data (not necessarily ownership) – what is the best way to facilitate this?
    b. COV Information Technology contractual agreement standards require a daily data scrape from the vendor – are there recommendations related to this?
    c. Where does data-sharing end and company Intellectual Property (IP) begin?
5. A regulation based on energy ratings will require validation of virtual or modelled calculations to ensure up-to-date accuracy. How can ratings be best validated for program or regulatory design purposes?
    a. Energy advisors or third-party evaluations (in person or online)?
    b. Via utility bills provided by homeowners?
    c. Verified or registered contractors?
6. How can the system design be optimized as a template that can be adopted and adapted by other municipalities, provinces and territories in Canada?
7. What are the best ways to engage the public to inform the development of the platform?
    a. How best to ensure that the platform is impactful in capturing attention and successfully facilitating action and behavior change on home energy and emissions upgrades?
8. Is there revenue generation potential?
    a. Are these tools reliant on ongoing government funding as the sole source of revenue for ongoing operating costs?
    b. Or are there revenue-generating opportunities?

And specifically for the Energy and Emissions Database and Spatial Mapping Tool for City of Vancouver:

9. What would be reasonable steps and milestones in researching, developing and deploying a pilot platform?
    a. What timeframes would be realistic to achieve those steps?
    b. Could those steps be achieved in time to launch a pilot for NRCan and the City of Vancouver by mid-2021?
10. What will the costs be to build, maintain and support the system?