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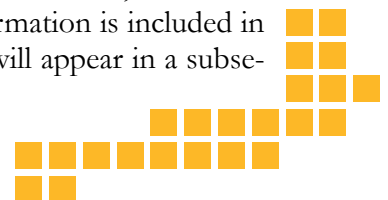
**C A N A D I A N**  
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## On Energy Efficiency Retrofits, Websites and Energy Conferences

Renovating or retrofitting a house is a popular activity for many Canadians, particularly during summer. The many reasons underlying this behavior include a desire to improve one's quality of life, to increase the value of the house, or simply for maintenance purposes. Improved energy efficiency, or a reduction in the energy bill, can also be a common motivation which, if not the primary purpose of the renovation, can be an added benefit of the activity. In many cases, governments offer incentives for households to participate in such activities, and in this regard Canada is no exception. In conjunction with several of these incentive programs, data are collected on house characteristics, recommended retrofits, and the actual retrofits that are undertaken. In this way, information on the energy-efficiency of the housing stock, and on the effect of the incentives, can be examined. However, evaluating the effectiveness of these programs is complicated because energy consumption reported in the data is typically calculated using a technical relationship that does not necessarily reflect actual energy consumption. Details of a CBEEDAC study that addresses this issue are provided in this newsletter.

CBEEDAC is pleased to present its remodelled website, now located at [www.cbeedac.com](http://www.cbeedac.com). The revamped website offers a better reflection of previous and current CBEEDAC research and activities. A description of the new features is provided in this newsletter. Of note, previous research reports and newsletters are now available for downloading, and the metadatabase of energy data sources and literature has been modified to improve access. In addition, classifications have been extended to provide more details and to improve the search facility.

Finally, CBEEDAC continued its co-sponsorship of the International Workshop on Empirical Methods in Energy Economics, which this year was held in Jasper, Alberta. Some general information is included in this newsletter issue; details of some of the papers will appear in a subsequent newsletter.





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## Explaining Energy Savings under the EnerGuide for Houses Home Retrofit Program

David L. Ryan

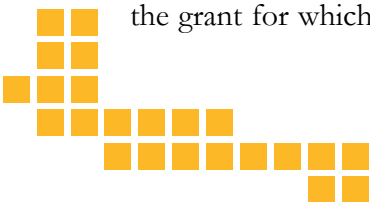
It is generally accepted that one of the best ways to achieve energy efficiency in the residential sector is through retrofitting activities. Although houses built more recently are usually more energy efficient than older houses, even the addition of more energy-efficient new buildings can only gradually improve the energy-efficiency characteristics of the Canadian housing stock as a whole. One means of accelerating this process is through energy-saving renovation, or retrofitting, of older houses.

Although much of the upfront cost of many forms of energy-saving retrofitting is expected to be offset by future savings on energy expenditures, for many reasons households often appear reluctant to undertake major, or in some cases even minor, energy-saving renovations. As a consequence, governments often consider the use of incentives in an attempt to shift the balance toward actually undertaking such renovations. In recent years, federal incentives to households in Canada have included payments under the EnerGuide for Houses (EGH) program and the subsequent EcoEnergy program, as well as a recently-introduced tax credit for home retrofits. The focus of some recent CBEEDAC analysis is on the now discontinued EGH program, in which participants were provided with expert advice, recommendations for appropriate retrofits and, depending on the energy savings that were achieved through retrofits, a grant to offset some of the costs.

Participants in the EGH program underwent a first audit that determined their energy consumption and provided them with a set of recommendations on beneficial retrofits. If a household decided to undertake some or all the recommended retrofits it could choose to undergo a second audit to determine the new energy-efficiency properties of the house and, based on a calculation of the energy savings that were realized, the amount of the grant for which the household was eligible.

Empirical analysis of the two sets of audit data that are collected under the program indicate that particular factors appear to affect household decisions of whether to fully participate in the program by undertaking energy-saving retrofits. As might be expected, these factors include characteristics of the house, such as age, size, current energy efficiency, equipment, and location. Although the EGH data do not include information about household characteristics, by combining the EGH data with census data matched to approximate household locations, factors such as income, number of children, and education, can also be shown to play important roles. This is also to be expected, since these factors affect energy consumption of households, and hence the likely benefits to the household of undertaking energy-saving retrofits.

In the data collected as part of the EGH program, energy consumption of participants is not actually measured. Rather, it is calculated based on the technical features of the house. Since actual household energy consumption depends on both the technological features of the house and socio-economic or behavioral characteristics of the household, the *estimated* value of household energy consumption based purely on technological factors probably does not reflect *actual* energy consumption by the household. Consequently, use of the EGH data to analyze the energy savings, or changes in energy efficiency, resulting from energy-saving retrofits undertaken as part of the program could be misleading. All that would result would be an imprecise estimate of the technical relationship that was used to determine the energy consumption values included in the EGH data, and behavioural factors would appear to play no role. Another limitation to this type of specification is that many of the explanatory variables pertaining to changes in various energy-efficiency characteristics are endogenous, since they, like household energy consumption, result from decisions made by the household.





To overcome these issues, the CBEEDAC study investigates an alternative modelling approach and estimation method that might be used in this context to avoid the direct use of the “imputed” energy consumption data, to deal with the endogeneity problem, and to allow various demographic and socio-economic factors to play a role in energy efficiency decisions.

This new approach is applied using the EGH data along with the matched census data, which unfortunately means that the socio-economic values associated with each house in the EGH data only reflect the average values for households in that general location rather than information for that particular house. Nevertheless, factors other than just the energy efficiency features of the house are shown to have a significant effect on energy efficiency decisions. For example, the probability of retrofitting is found to decrease with the proportion of individuals that have university education, while higher education is generally associated with lower energy savings. Surprisingly, as average income increases, the probability of retrofit-

ting decreases, as do the energy savings realized from the retrofits that were undertaken. The analysis also confirms the important roles of energy efficiency characteristics. For example, the probability of retrofitting increases with the dwelling age, but energy savings decrease as the age of the building decreases, while houses with a higher initial level of energy consumption are more likely to be retrofitted and, like larger houses, to achieve greater energy savings.

These results imply that there is scope for using the EGH data with an appropriately-specified model to ascertain the role of various non-technical factors in energy retrofit and energy consumption decisions. Since the amount of energy consumption in this data set is inferred from technological considerations only, it would be interesting to see if the results would remain same if information on actual energy consumption were to be used. Ultimately, this research shows the importance of collecting household information in addition to technical information as part of the energy audit process.

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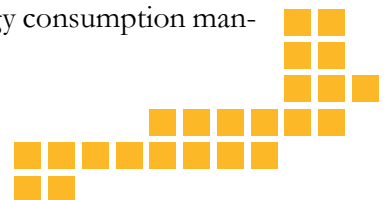
## Revamped CBEEDAC Website

One of CBEEDAC’s objectives is to identify building energy end-use resources and to disseminate information about these to interested parties. An important tool for this activity is our website, now located at [www.cbeedac.com](http://www.cbeedac.com), and its revamped version is certainly a step forward.

The interface of the website has not changed, but it now allows us to upload previously-completed CBEEDAC research reports. These resources, as well as all the newsletters issued in previous years, are now available for downloading directly from the website. The databases component of the website, which provides online access to the metadatabase developed by CBEEDAC, has also undergone some changes. The purpose of the metadatabase is to assemble information on surveys, articles, books, and periodicals pertaining to energy end-use in buildings. The fully searchable metadatabase facilitates access to resources for building energy professionals, government and researchers.

The metadatabase content has been re-organized into a revised classification tree with more sub-classifications in order to offer a more detailed level of search. While content is still divided into the residential, commercial, and institutional sectors, a general section has now been added. This newest section includes information on general measures of energy end-use and energy efficiency, studies on energy policies and energy markets, technologies applicable across sectors, etc.

In the residential section, content is classified according to the various efficiency features of a house, such as the heating system, appliances, or windows. Sub-sections provide information on such topics as energy efficiency measures, retrofit activities, and international comparisons. In the commercial section, new subdivisions distinguish studies on energy consumption and energy efficiency of commercial buildings, their equipment, and the type of fuel used. Another subsection is devoted to resources on energy consumption man-





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## Revamped website (Cont'd)

agement in buildings and on environmental management. Finally, the institutional section is divided between different-purposed buildings, including educational, government, and medical.

The metadatabase already includes more than 500 references, mainly research articles, books and periodicals, although there are also a number of handbooks, energy efficiency guides, and government reports. Identifying and updating the list

of surveys and data pertaining to building energy end-use, and providing a short description of each, is an ongoing task. Although data are not directly available for downloading from our website, in most cases a link to the responsible organization provides access to additional information or to the resource itself. CBEEDAC's mission in this matter is to compile an inventory of the available resources and to facilitate their access by interested parties.

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## Energy Conference

This summer, CBEEDAC was a co-organizer of the 2nd International Workshop on Empirical Methods in Energy Economics (EMEE09) held in Jasper, Alberta, on August 28th and 29th.

A number of papers were presented on topics such as the electricity sector in Alberta, analysis of US energy markets, and forecasts and analysis of energy demand in various countries. Particular importance was given to discussion and exchange

among participants, with an extended time period and a discussant assigned to each presentation. The workshop format allowed time for questions and the possibility for participants to attend every presentation. Papers presented during the conference can be accessed from [www.economics.ualberta.ca/EMEE09.cfm](http://www.economics.ualberta.ca/EMEE09.cfm).

The third edition of this conference is expected to be held in 2010 in Surrey, England.

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## PEOPLE

During the summer, CBEEDAC has been fortunate to be able to employ **Noha Abdel Razek** to provide research assistance for a project examining how consumers might be expected to react to an increase in energy prices resulting from a carbon tax. Noha, who has been in the Department of Economics at the University of Alberta for two

years now, is preparing a PhD thesis concerning demand, supply and cost shocks in energy markets.

Also, we are pleased to welcome back **André Plourde** to a more active role in CBEEDAC following completion of his 5-year term as chair of the Economics Department at the University of Alberta.

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## BUILDING SERVICES

CBEEDAC has the expertise to provide services to the building sector in the area of data storage and analysis. For more information regarding these services, on becoming a sponsor of CBEEDAC, or about the services provided by other Data and Analysis Centres contact CBEEDAC or see our website at our new web address: [www.cbeedac.com](http://www.cbeedac.com).

CBEEDAC reports are available online from our website in PDF format.

If you house and/or collect data that could become a valuable addition to Canada's Building Energy End Use information system please consider contacting the Centre with your data information.

If you find the *enerInfo Building* newsletter informative, please tell your colleagues and direct them to our website or office where they can download or request a copy. If you want to stop receiving this newsletter or have received it in error, please contact us. We respect the privacy of those on our mailing list.

