Advice strategies and the selection of energy efficiency improvements in the Residential Energy Efficiency Project (REEP)

Christina Hoicka and Paul Parker, University of Waterloo

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Overview

• Background on programs and database
• Summary of previous results, research opportunities and questions
• Preliminary results on advice selection: evaluator interview responses, analysis of advice and decisions
• Three decisions: walls, basements and windows
Background

- Residential ~10% Canada’s GHGs (NRCan 2008)
- Household ~1/3 individuals’ GHGs (Sherk 2009)
- Space heating and hot water >60% household GHGs
- EnerGuide for Houses (1998-2006) and ecoEnergy (2007 to 2012) two federal programs launched to address household GHGs
Process

• Initial and follow-up evaluations at homeowner’s discretion for information or grants

• Evaluator uses Hot2000 software to generate a home energy rating and identify opportunities and associated energy savings:
  – EGH: air-sealing, insulation to foundation, ceiling/attic, walls, replace windows and doors, heating and hot water systems
  – ecoEnergy expanded: ground and water source heat pump, solar hot water, heat recovery ventilator

• Presented as advice (verbal and report) to homeowner
Data

- Time-stamped (policy period and timeframe);
- Home energy rating and estimated fuel consumption;
- Initial measurements of performance, whether an improvement was recommended, implemented, and associated energy savings/losses;
- *Does not* measure behaviour, e.g., temperature settings or actual fuel consumption (e.g., Parker et al. 2005)
Data

- May 1999 to March 31, 2011 (program ended with notice)
- >13,000 initial, >6,000 follow-up
- Federal and provincial support varied affecting evaluation price, incentive structure and information format
- Previous paper explored for differences in uptake and advice following up to February 2009 (Hoicka and Parker 2011)

<table>
<thead>
<tr>
<th>Policy Period</th>
<th>N initial</th>
<th>n/ month</th>
<th>Dates</th>
<th>Follow-up</th>
<th>n/ month</th>
<th>Initial Price</th>
<th>Follow-up price</th>
<th>Incentive Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGH</td>
<td>4261</td>
<td>80</td>
<td>May 1999 to September 2003</td>
<td>67</td>
<td>1</td>
<td>$25 to $80</td>
<td>Free (min 3 points)</td>
<td>No incentive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>393</td>
<td>33</td>
<td></td>
<td></td>
<td>Performance based incentive, EHG rating scale</td>
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<tr>
<td>EGH</td>
<td>2947</td>
<td>97</td>
<td>October 2003 to May 12, 2006</td>
<td>1056</td>
<td>35</td>
<td>$75 to $250</td>
<td>$0 to $205</td>
<td>Performance based incentive, EHG rating scale</td>
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<tr>
<td>None</td>
<td>230</td>
<td>20</td>
<td>May 12, 2006 to March 2007</td>
<td>7</td>
<td>1</td>
<td>$100 to $260</td>
<td>$150</td>
<td>No incentive</td>
</tr>
<tr>
<td>ecoEnergy</td>
<td>5991</td>
<td>125</td>
<td>April 2007 to March 31, 2011</td>
<td>4600</td>
<td>96</td>
<td>$100 to $325</td>
<td>$50 to $195</td>
<td>List based incentive</td>
</tr>
</tbody>
</table>
Summary of Previous results

• May 1999 to February 2009 (incomplete)
• Program periods appealed to different types of homes:
  – differences of means of level of energy use, recommended savings, and number of improvements and energy saved
• Homeowners rarely achieved more savings than recommended
  – Agreement with Aydinalp et al. (2001), Fung et al. (2007)
• High achievers (>100%) sometimes made improvements not recommended (Hoicka and Parker 2011)
• Important to understand what advice is being given and how, and to understand the outcome of the advice and the role of program factors.
Research Opportunities

• Factors we can examine:
  1. Impacts of time
  2. Impacts of structure of the program and incentives
     – E.g., Initial and follow-up price
  3. What was recommended and how? Advice selection and communication
     – 17 evaluators had large n returnees in database
     – Interviews with evaluators (8/17 potential, 4 supplementary)
     – Type, number and depth of recommendations and homeowner action
Preliminary Analysis on Advice Selection

More specifically….

1. What was recommended as priority?
2. What was important, but not recommended?
3. What was recommended as information only?

Three advice/decision types

1. Determination (basement)
2. Discouraged (walls)
3. Distraction (windows)
What is the single most important improvement a homeowner typically can make to improve the home’s energy performance?

– Four evaluators mention building envelope, insulation in walls and basement in older homes.
  • (15) 1930s: **Insulation in walls**, single brick, **basement** is a huge opportunity for **insulation**
  • (4) 1970s and older, **insulation and air sealing**, the integrity of the building envelope
  • (9) Older homes, turn of century, **uninsulated walls**
  • (1) **Uninsulated basements**, short of upgrading a very old furnace
In your experience, is there information or advice which is typically more difficult for homeowners to understand? How have you gotten around this communication barrier?

– (15) Walls. Insulation with some insulation is more challenging.
– (4) Building envelope, sometimes a stretch
Do you usually recommend savings in your report which you don’t think are important, or only for information?

• (4) No—I keep the report to what I think is important
• (2) I don’t recommend tearing out plaster to add stuff...
What do you consider to be a successful follow-up home energy evaluation?

• (15) Significant air sealing and insulation makes me happy
Recommended

4.02

4.03

4.04

4.09

4.15
Advice Following: Determined (Basement)

Proportion of Returnees

Evaluator

- Not Recommended Not Achieved
- Not Recommended Achieved
- <=0%
- >0%, <=50%
- >50%, <=75%
- >75%, <=90%
- >90%, <=100%
- >100%
Advice Following: Discouraged (Walls)

![Bar chart showing the proportion of returnees for different evaluators with varying levels of achievement and recommendation.]
Do you usually recommend savings in your report which you don’t think are important, or only for information?

- (2) Windows
- (4) No—I keep the report to what I think is important
- (17) Windows
How important are the following to homeowners to achieve from having a home energy evaluation performed?

- (2) Homeowners want to hear about windows
Do you usually recommend savings in your report which you don’t think are important, or only for information?

(3) Provide information estimating that window replacements save less energy than basement insulation
Summary

• Windows: Is information and explanation better than keeping it off the list? What other strategies effectively divert attention?

• Walls are perceived as more disruptive than basements to insulate, yet, both are poorly done if addressed at all. Is it better to recommend all options, regardless of the perception of disruption/difficulty? (i.e., is it useful to recommend basement more often than walls?)

• Next steps: examine overall strategies of advice and compare these to decisions. Includes number of recommendations, extent of following/demonstration during evaluation process, prioritization of recommendations, etc.
Thank you!

Questions?

Contact:
Christina Hoicka, choicka@uwaterloo.ca
Paul Parker, pparker@uwaterloo.ca

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Process

• Homeowner schedules and pays for initial evaluation
• Evaluator assesses home and uses Hot2000 software:
  – Generates standardized home energy rating, helps identify energy savings associated with potential improvements
  – EGH: air-sealing, insulation to foundation, ceiling/attic, walls, replace windows and doors, heating and hot water systems
  – ecoEnergy expanded: ground and water source heat pump, solar hot water, heat recovery ventilator
• Presented as advice (verbal and report) to homeowner
• Follow-up evaluation at homeowners’ request (within 18 months)
Process

• Initial and follow-up evaluations at homeowner’s discretion for information or rebates

• Evaluator uses Hot2000 software to create a home energy rating and identify opportunities:
  – Generates standardized home energy rating, helps identify energy savings associated with potential improvements
  – EGH: air-sealing, insulation to foundation, ceiling/attic, walls, replace windows and doors, heating and hot water systems
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