2007 ENERGY STAR® FOR NEW HOMES - PILOT EVALUATION – FINAL REPORT

Presented to

Ontario Power Authority™

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EXECUTIVE SUMMARY

Background and Program Overview

Introduced to the Ontario market in April 2005, the Energy Star® for New Homes (ESNH) market transformation program aims to increase the efficiency of new build housing stock in Ontario by increasing the number of homes built to the ESNH standard.

The program has grown appreciably since 2005 with 265 new home builders in Ontario now committed to the initiative (as of December 31, 2007). This level of commitment makes ESNH the largest voluntary energy efficiency labelling program within the new housing sector.

The purpose of this evaluation is to assess EnerQuality Corporation’s 2007 ESNH Pilot program which was funded in part through the OPA’s Conservation Fund. EnerQuality Corporation (EnerQuality) is one of several service providers licensed by Natural Resources Canada to deliver the ESNH program in Ontario.

In 2007 EnerQuality’s ESNH pilot program sought to promote the sale of 1,355 Energy Star® (ES) qualified homes. These 1,355 homes were anticipated to deliver 1,355 kW of demand savings to the province (1 kW per home).

The key goals and objectives of this evaluation are as follows:

- Review and refine the prescriptive per unit input assumptions of the electricity based measures included in the program (Tables 3.11.1 & 3.12.1of Appendix J – Energy Star® for New Homes Technical Specifications);
- Analyse and report on the measures selected by ESNH participants (included in Tables 3.11.1 and 3.12.1 of the OPA’s RFP package) to reach their electricity and appliance savings targets. This research includes an investigation into the motivations behind measure selection as well as builder influence in the selection process;
- Review previous evaluation studies undertaken by EnerQuality to assess the impacts and effectiveness of their ESNH pilot program (Appendix G and Appendix H of the RFP documentation);
- Estimate the gross and net energy savings and peak demand reductions achieved through the initiative (on a per home and aggregate basis);
- Determine the relative impacts of the delivery strategy used to gain program participation (to gain builder participation and home buyer participation);
○ Determine the relative impacts of EnerQuality’s marketing and awareness building efforts in gaining program participation (from home buyers and home builders);

○ Assess the effectiveness of the industry training provided to builders, sales staff, trades and other professionals initiated to effectively deliver the program; and

○ Evaluate homes built through EnerQuality’s ESNH program for compliance with the minimum Natural Resources Canada requirements (i.e., ENERGUIDE rating found in Appendix K in the OPA’s RFP).

Program Impact – Key Findings

1. The total gross energy savings generated by the ESNH program between April 1, 2007 and March 31, 2008 is estimated to be 4,782 MWh/year or 1.253 MW/year in peak demand savings. On a per home basis, an Energy Star® qualified home is estimated to save approximately 2,020 kWh/year in electricity, 0.529 kW in summer peak demand savings, and 99.1 m² in natural gas over a standard “code built” home.

2. The total net annual and summer peak demand savings resulting from the ESNH program between April 1, 2007 and March 31, 2008 is estimated to be 3,602 MWh/year and 0.804 MW/year. On a per home basis, an Energy Star® qualified home is estimated to save approximately 1,522 kWh/year in electricity, 0.340 kW in summer peak demand savings and 61 m² in natural gas over a standard “code built” home.

3. The bulk of the energy savings result from the installation of CFLs and electronically commutated motors (ECMs), representing 63% and 22% of the total net annual energy savings, respectively. Similarly, ECMs make up the majority of the summer peak demand savings, representing 54% of the total net peak demand savings.

4. The gross estimated per house savings of 2,020 kWh/year was determined to be 43% lower than the average per savings reported by EnerQuality’s in Energy Star® for New Homes Aggregate Demand Study. The large difference is likely due to the generous assumptions made in EnerQuality’s demand study.

Recommendations

The following provide a distillation of Navigant Consulting’s recommendations to the OPA based on our evaluation of the ESNH program.

1. Increase awareness of Energy Star® Homes within the general public through a general advertising campaign. If potential home buyers are more aware that
Energy Star® homes are currently available in the market, there would likely be greater demand for them. As mentioned above, only a small proportion of home buyers specifically request an Energy Star® home, however, once they understand the benefits of owning an Energy Star® home, their interest usually increases. Although home builders are promoting Energy Star® homes through their own marketing, a province wide marketing campaign would increase awareness of Energy Star® homes, and correspondingly, overall demand for such homes.

2. **Provide third party literature and studies on energy efficient technologies to home builders and sales teams and more content for promotional materials.** As suggested by a few builders, EnerQuality might consider providing participating home builders with third party literature or studies on the potential energy savings related to each technology or measure so that they may use it as a selling point for their customers. Having the ability to pass along legitimate facts to their customers as proof of potential energy savings will add credence to the program and aid in its effective promotion.

3. **Strengthen the curriculum of the home builder workshops.** A number of the builders suggested that the builder workshop should be more “hands on” by focusing more on the technical details of the construction and less on the administrative requirements of the program. Having the workshops led by field experts and those currently building Energy Star® qualified homes would add value to the workshops and enable builders to gain more knowledge on progressive building practices. One home builder also suggested having separate workshops for “new builders” and “seasoned builders”, allowing the workshops to be tailored to meet the builders specific needs and experience level.

4. **Engage participant home builders in the technical specification process.** Since many of the home builders expressed frustration with the perceived regularity of changes in the technical specification requirements, Navigant Consulting recommends engaging builders more actively in the process. This will enable builders to offer feedback on any proposed new specifications and facilitate a greater understanding of EnerQuality or NRCan’s perspectives vis-à-vis the final specifications. Currently, many participant builders feel disengaged from the process and are anxious to determine what, if any, changes will be brought about in the next version and the impact that said changes will have on their next crop of Energy Star® homes and what impact these changes could have on their supply and materials ordering requirements.
## CONTENTS

**EXECUTIVE SUMMARY** .......................................................................................................................... 1  
  Background and Program Overview ................................................................................................................. i  
  Program Impact – Key Findings ......................................................................................................................... ii  
  Recommendations ......................................................................................................................................... ii

**INTRODUCTION** ................................................................................................................................. 1  
  Scope of Work and Overall Approach .............................................................................................................. 1  
  Report Structure .............................................................................................................................................. 4  
  EnerQuality - Acknowledgement ..................................................................................................................... 5

**PIA REVIEW AND SELECTED MEASURE ANALYSIS** ....................................................................... 6  
  Approach ...................................................................................................................................................... 6  
  Key Findings ................................................................................................................................................ 6  
  Most Commonly Installed Measures .............................................................................................................. 7  
  Review of OPA PIAs and ESNH Technical Specifications – (Tables 3.11.1 & 3.12.1) .................................. 9  
  Review of PIAs from other Evaluations and Jurisdictions ........................................................................... 13  
  Home Buyer Survey - Motivations for Measure Selection & Builder Influences ......................................... 15  
  Energy Star® and Non-Energy Star® Home Buyer Survey: Motivation ......................................................... 17  
  Energy Star® and Non-Energy Star® Home Buyer Survey: Energy Saving Measures and Other Programs ................................................................................................................................................ 21  
  Satisfaction with Home Builders ..................................................................................................................... 23  
  Attitudes Towards Energy Conservation ......................................................................................................... 26

**REVIEW OF PREVIOUS EVALUATION STUDIES UNDERTAKEN BY ENERQUALITY** ................. 30  
  Approach ....................................................................................................................................................... 30  
  Key Findings ................................................................................................................................................ 30  
  Review of Energy Star® for New Homes Aggregate Demand Study ............................................................. 31  
  Review of Energy Star® for New Homes Electricity Reduction Strategy .................................................... 33

**ANALYSIS OF GROSS AND NET ENERGY AND PEAK DEMAND SAVINGS** ........................... 35  
  Approach ....................................................................................................................................................... 35  
  Key Findings ................................................................................................................................................ 35  
  Gross Energy Savings Calculations ................................................................................................................ 36  
  Net Energy Savings Calculations .................................................................................................................... 41  
  Free-Ridership ............................................................................................................................................... 41  
  Spill Over ....................................................................................................................................................... 45  
  Net-to-Gross Ratio ........................................................................................................................................ 47
ESNH HOME BUILDER SURVEY RESULTS ................................................................. 52
    Approach ........................................................................................................... 52
    Participant Home Builder Surveys – Key Findings ........................................... 53
    Non-Participant Home Builder Surveys – Key Findings ..................................... 59
ESNH PROGRAM PROCESS REVIEW ............................................................... 60
    Approach ........................................................................................................... 60
    Key Findings ................................................................................................. 60
    Summary of Industry Best Practices ................................................................. 63
        Program Philosophy and Overview ............................................................... 63
        Program Rationale ....................................................................................... 63
        Market Potential ......................................................................................... 64
    Examples of Best Practices ............................................................................. 73
        Austin Energy Green Building™ ................................................................. 73
        Built Green™ Colorado .............................................................................. 74
PROGRAM DELIVERY AND MARKETING TACTICS ........................................ 75
    Approach ........................................................................................................... 75
    Key Findings ................................................................................................. 75
    Participant Survey: Program Awareness and Marketing Effects ..................... 76
RELATIVE IMPACT OF EXTERNAL FACTORS ON PROGRAM PARTICIPATION ..... 80
    Approach ........................................................................................................... 80
    Key Findings ................................................................................................. 80
    Spillover .......................................................................................................... 80
STAKEHOLDER TRAINING REVIEW ................................................................. 81
    Approach ........................................................................................................... 81
    Key Findings ................................................................................................. 81
NRCAN COMPLIANCE REVIEW ........................................................................ 83
    Approach ........................................................................................................... 83
    Key Findings ................................................................................................. 83
    Natural Resource Canada’s Technical Specifications Compliance Review ........ 83
    Development/Revision of ESNH Technical Specifications .............................. 85
APPENDIX A – ADDITIONAL PIA SHEETS ....................................................... 86
    Duct Sealing .................................................................................................... 86
    Energy Star® Windows ................................................................................... 89
APPENDIX B – HOME BUYER SURVEYS ......................................................... 92
LIST OF TABLES

Table 1: Summary of Builder Option Package (BOP) file analysis 7
Table 2: Summary of qualified installed measures included in Energy Star® Qualified New Homes in Ontario (April 1, 2007 – March 31, 2008) A 8
Table 3: Summary of qualified installed measures included in Energy Star® Qualified New Homes in Ontario (April 1, 2007 – March 31, 2008) B 9
Table 4: Comparison of energy saving credits in ESNH program and OPA and Navigant Consulting revised PIAs 12
Table 5: Comparison Navigant Consulting refined PIAs and Table 3.11.1 for the most commonly installed measures used by ESNH participants 14
Table 6: Key demographics of surveyed homeowners 16
Table 7: Summary of energy efficient measures and corresponding savings and penetration rates used in the overall determination of ESNH energy savings 37
Table 8: Summary of gross energy and peak demand savings for the ENSH program 38
Table 9: Energy Star® Qualified home buyers familiarity with ESNH program. 42
Table 10: Sources of awareness of ESNH program. 42
Table 11: Methodology for assigning free-ridership rate. 43
Table 12: Breakdown in home buyer survey results for determining free-ridership. 43
Table 13: Measure specific free-ridership rate based on home builder survey responses. 45
Table 14: Sources of awareness of ESNH program. 46
Table 15: Summary of Net-to-Gross Factors for all ESNH Program measures. 48
Table 16: ESNH Total Net Annual and Summer Peak Demand Savings Impact 49
Table 17: EnerQuality training activity, FY 2008 81
LIST OF FIGURES

Figure 1: 2007 ESNH Program Logic Model 3
Figure 2: Comparison of home owner new home purchase influences (Energy Star® vs. Non-Energy Star®) 18
Figure 3: Do you believe you paid more, less or about the same for your home because of its Energy Star® rating? 19
Figure 4: How influential was the home builder or sales team in your decision to buy your Energy Star® rated home? 20
Figure 5: Was your average summer electricity bill higher, lower or about the same as what you expected (or were told) when you decided to build an Energy Star® home? 22
Figure 6: How did you find the home builder from whom you ultimately purchased your new home (Energy Star® Qualified home owners)? 24
Figure 7: How did you find the home builder from whom you ultimately purchased your new home (Non-Energy Star® Qualified home owners)? 25
Figure 8: How likely do you think it is that individual consumers can make an important contribution to reducing overall use of electricity in the province? 27
Figure 9: How concerned are you with the environmental impacts of electricity generation? 28
Figure 10: How concerned are you with the environmental impacts of electricity consumption by consumers? 28
Figure 11: How concerned are you with the environmental impacts of electricity consumption by business and industry? 28
Figure 12: To what extent do you agree with the opinion ‘I am prepared to pay more for an environmentally friendly product’? 29
Figure 13: To what extent do you agree with the opinion ‘To preserve people’s jobs in this country, we must accept higher levels of pollution in the future’? 29
Figure 14: To what extent do you agree with the opinion ‘I have enough trouble worrying about my own problems without worrying about others’? 29
Figure 15: Distribution of the total annual gross electricity savings for the ENSH program during the evaluation period 39
Figure 16: Distribution of total annual gross peak demand saving for the ENSH program during the evaluation period 40
Figure 17: Comparison Navigant Consulting and EnerQuality’s annual gross per home energy savings for an Energy Star® Qualified home over a standard home 41
Figure 18: Distribution of the total annual net electricity savings for the ENSH program during the evaluation period 50
Figure 19: Distribution of the total net summer peak demand savings for the ENSH program during the evaluation period 51
Figure 20: Where did you recall seeing marketing and promotions for the program (Participants)? 77

Figure 21: Where did you recall seeing marketing and promotions for the program? (Non-Participants) 78

Figure 22: Example of the ESNH Technical specification version 4.0 development schedule 85
INTRODUCTION

Scope of Work and Overall Approach

The primary purpose of this evaluation is to assess EnerQuality Corporation’s 2007 ESNH Pilot program which was funded in part through the OPA’s Conservation Fund.

The key goals and objectives of the evaluation are as follows:

- Review and refine the prescriptive per unit input assumptions of the electricity based measures included in the program (Tables 3.11.1 & 3.12.1of Appendix J – Energy Star® for New Homes Technical Specifications);

- Analyse and report on the measures selected by ESNH participants (included in Tables 3.11.1 and 3.12.1) to reach their electricity and appliance savings targets. This research will include an investigation into motivations for measure selection as well as builder influence in the selection process;

- Review previous evaluation studies undertaken by EnerQuality to assess the impacts and effectiveness of their ESNH pilot program (Appendix G and Appendix H);

- Estimate the gross and net energy savings and peak demand reductions achieved through the initiative (on a per home and aggregate basis);

- Determine the relative impacts of the delivery strategy used to gain program participation (to gain builder participation and home buyer participation);

- Determine the relative impacts of EnerQuality’s marketing and awareness building efforts in gaining program participation (from home buyers and home builders);

- Assess the effectiveness of the industry training provided to builders, sales staff, trades and other professionals initiated to effectively deliver the program; and

- Evaluate homes built through EnerQuality’s ESNH program for compliance with the minimum Natural Resources Canada requirements (i.e., ENERGUIDE rating found in Appendix K in the RFP).

In order to accomplish this, Navigant Consulting conducted the following tasks:

1. Reviewed the prescriptive per unit input assumptions (PIA) (e.g., energy and peak demand savings) associated with the technologies available to ESNH participants to reach their electricity savings target.
2. Analysed and reported on the measures most commonly selected by ESNH participants to reach their electricity and appliance savings targets. This research included an investigation into motivations for measure selection as well as builder influence in the selection process.

3. Reviewed previous evaluation studies undertaken by EnerQuality to assess the impacts and effectiveness of the ESNH pilot program.

4. Estimated the Gross and Net energy and peak demand savings resulting from EnerQuality’s 2007 ESNH pilot program.

5. Conduct a process review to determine how successfully the 2007 ESNH program was delivered to market.

6. Assessed program impacts and participant motivations:
   
i. Determined the relative impact of various delivery / marketing tactics (e.g. Point of Purchase marketing, program website, home builder staff) on gaining participation in the ESNH program.
   
ii. Determined the relative impact of external factors on participation. Specifically, were there any other factors besides those included in the program which motivated the purchase decision of an ES qualified home? This included an analysis of motivations for participation (e.g., environmental benefits, financial benefit, etc.).
   
iii. Considered whether ESNH program efforts motivated participants to undertake additional energy saving actions not directly promoted through the initiative (e.g., program spill-over effects).

7. Determined the effectiveness of the various new build market actor training materials in developing the necessary market capacity to drive ESNH program participation.

8. Evaluated the homes built through EnerQuality’s ESNH program for compliance with the minimum Natural Resources Canada requirements (i.e. ENERGUIDE rating).
Our analysis evaluated each of the following program elements (as identified in Figure 1: 2007 ESNH Program Logic Model):

- Technical Specifications;
- Builder and Trades Training;
Customer Facing Staff Training;

Enhanced New Home Builder Participation;

Home Buyer Awareness and Education; and

Monitoring and Evaluation.

Please refer to the sections that follow for a further elaboration on the methods and approaches that were used to evaluate the program elements listed above.

Report Structure

This Report is set out as follows:

- Executive summary
- Introduction
- PIA review and selected measure analysis
- Review of previous evaluation studies undertaken by EnerQuality
- Analysis of gross and net energy and peak demand savings
- ESNH home builder survey results
- ESNH program process review
- Program delivery and marketing tactics
- Relative impact of external factors on program participation
- Stakeholder training review
- NRCan compliance review

Appendix A – Additional PIA Sheets, contains the additional PIA sheets prepared by Navigant Consulting for this report, Appendix B - Appendix B – Home Buyer Surveys, contains the Home Buyer surveys used for this report, Appendix C – Home Builder Interview Guides contains the Home Builder Interview Guides used for this report.
EnerQuality - Acknowledgement

Navigant Consulting would like to thank EnerQuality for the co-operation afforded to us during our evaluation of the ESNH Program. Navigant Consulting were provided with access to various members of the EnerQuality Team over a several week period and provided with a great deal of documentation and supporting commentary, all of which proved helpful for the completion of our work.
PIA Review and Selected Measure Analysis

Approach

Navigant Consulting (NCI) adopted a five-stage approach to review the underlying Prescriptive Input Assumptions (PIAs) for the most commonly installed technologies (included in the OPA’s RFP as Appendix J - Energy Star® for New Homes Technical Specifications, Tables 3.11.1 and 3.12.1), NCI:

1. Determined the most commonly installed measures used by ESNH participants to reach their electricity savings target;
2. Reviewed the OPA’s PIAs and ESNH Technical Specifications Table 3.11.1 for commonly installed measures relevant to the program;
3. Reviewed the PIAs and evaluations for similar equipment and measures in other jurisdictions;
4. Analysed stakeholder responses from participant / non-participant surveys (as described in the Energy Star® and Non-Energy Star® Home Buyer Survey section); and
5. Considered other factors identified through our work which may result in significant impacts to the PIAs.

Key Findings

- Based on Navigant Consulting’s analysis of the 2,367 house files (representing the ESNH qualified homes labelled between April 1, 2007 and March 31, 2008), the most commonly installed measures used by ESNH participants to reach their electricity savings targets are (i) electronically commutated motors (ECMs) and (ii) compact fluorescent lights (CFLs).

- The ESNH Technical Specifications (Tables 3.11.1 & 3.12.1) used by participants to meet their required electricity and appliance savings targets vary considerably from the reported savings for similar measures used by the OPA and other jurisdictions. Many of the savings have either been greatly overestimated (e.g., Energy Star® appliances), underestimated (e.g., ECMs), or not included as potential energy saving measures (programmable thermostats and duct sealing).

- Navigant Consulting noted a number of discrepancies between the electricity savings reported in Tables 3.11.1 & 3.12.1 and the savings tabulated in the Builder Option Package (BOP) files submitted by Certified Program Energy Evaluators.
Navigant Consulting recommends that a revised BOP form be issued to all Energy Evaluators to include:

- Specific formats for the insertion of dates (e.g. dd-mm-yyyy);
- Compulsory requirements around which cells must be completed (i.e. all visible cells);
- Addition of the drop down option “N/A” for measures that are not installed thus resolving any ambiguity that could arise in the event that cells are left blank; and
- Updated electricity savings credits applicable to each measure for the corresponding ESNH Technical Specification version.

Most Commonly Installed Measures

EnerQuality provided Navigant Consulting with a summary 3,598 Energy Star® Builder Option Package (BOP) house files which have been submitted by Certified Energy Evaluators since the program’s inception. Excluded from this data was any confidential customer information such as home addresses and house reference numbers. Focusing only on Energy Star® homes labelled within the evaluation period (April 1, 2007 to March 31, 2008), Navigant Consulting filtered and evaluated 2,367 Energy Star® Qualified house files. It should be known that the labelling dates for a number of the BOP files were left blank, listed the wrong year or had an invalid labelling date. A summary of the number of BOP house files analysed has been provided in Table 1.

Table 1: Summary of Builder Option Package (BOP) file analysis

<table>
<thead>
<tr>
<th>Builder Option Package Analysis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of BOP house files provided to Navigant Consulting for data analysis</td>
<td>3,598</td>
</tr>
<tr>
<td>Total number of BOP house files that could be identified as relating to homes labelled between April 1, 2007 and March 31, 2008 (and thus analyzed)</td>
<td>2,367</td>
</tr>
<tr>
<td>Total number of Energy Star® homes labelled (according to EnerQuality)</td>
<td>ESNH v1 = 96</td>
</tr>
<tr>
<td></td>
<td>ESNH v2 = 3,990</td>
</tr>
<tr>
<td></td>
<td>ESNH v3 = 1,554</td>
</tr>
<tr>
<td></td>
<td>Total = 5,640</td>
</tr>
</tbody>
</table>

Based on the 2,367 BOP files analyzed, Table 2 provides a summary of all installed measures by ESNH participants to reach their electricity savings targets of 1kW per home, with the most commonly installed measure in each category bolded.
Table 2: Summary of qualified installed measures included in Energy Star® Qualified New Homes in Ontario (April 1, 2007 – March 31, 2008) A

<table>
<thead>
<tr>
<th>Category</th>
<th>Qualified Installed Measures</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing Mix</td>
<td>• Single Detached</td>
<td>1,628</td>
<td>69%</td>
</tr>
<tr>
<td></td>
<td>• Townhouse</td>
<td>703</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>• Stacked</td>
<td>36</td>
<td>1%</td>
</tr>
<tr>
<td>Heating Distribution Type</td>
<td>• ECM Furnace or Air Handler</td>
<td>1,476</td>
<td>62%</td>
</tr>
<tr>
<td>Ventilation Type</td>
<td>• Interval control/ECM air handler + HRV</td>
<td>992</td>
<td>42%</td>
</tr>
<tr>
<td></td>
<td>• Interval control/ECM air handler + PVC exhaust OR fanless/ECM</td>
<td>294</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>• Conventional HRV w/ dedicated HRV ducting</td>
<td>277</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>• Interval control/ECM air handler + HRV &amp; modulating furnace</td>
<td>158</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>• Modulating furnace</td>
<td>121</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>• Other</td>
<td>44</td>
<td>2%</td>
</tr>
<tr>
<td>Lighting</td>
<td>• Installed CFLs</td>
<td>2307</td>
<td>97%</td>
</tr>
<tr>
<td></td>
<td>• Installed T8s</td>
<td>72</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>• Average number of CFL installed 28 (range 3 to 84)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Central Air Conditioner</td>
<td>• SEER 14 North Zone</td>
<td>73</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>• SEER 14 South Zone</td>
<td>62</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>• SEER 14 South Zone PLUS avg. SHGC of &lt;0.4</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td>Energy Efficient Appliances</td>
<td>• Energy Star® Dishwasher</td>
<td>200</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>• Energy Star® refrigerator</td>
<td>150</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>• Front loading Energy Star® washer</td>
<td>147</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>• Top loading Energy Star® washer</td>
<td>18</td>
<td>1%</td>
</tr>
<tr>
<td>Gas Appliances</td>
<td>• Gas Pre Piped to both dryer &amp; range location</td>
<td>132</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>• Gas clothes dryer installed</td>
<td>53</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>• Gas Pre Piped to range location</td>
<td>26</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>• Both gas dryer &amp; range installed</td>
<td>16</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>• Gas Pre Piped to dryer location</td>
<td>10</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>• Gas kitchen range installed</td>
<td>5</td>
<td>0%</td>
</tr>
<tr>
<td>Drain water Heat Recovery Systems</td>
<td>• DHR unit min. 48” length w/ any gas or oil water heater</td>
<td>69</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>• DHR unit min. 48” length w/ electric water heater</td>
<td>4</td>
<td>0%</td>
</tr>
<tr>
<td>Windows</td>
<td>• Energy Star® qualified windows Canada Zone B</td>
<td>1,456</td>
<td>62%</td>
</tr>
<tr>
<td></td>
<td>• Energy Star® qualified windows Canada Zone C</td>
<td>913</td>
<td>39%</td>
</tr>
<tr>
<td>Ceiling Insulation (with attic)</td>
<td>• R40 nom., insulation at ext. wall reduced &lt;40%</td>
<td>1,629</td>
<td>67%</td>
</tr>
<tr>
<td></td>
<td>• R50 nominal</td>
<td>732</td>
<td>33%</td>
</tr>
<tr>
<td>Ceiling Insulation (without attic)</td>
<td>• R31 nom. (R26.5 min. effective thermal resistance), max 33% total ceiling area</td>
<td>1,821</td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>• Over 33% total ceiling area - + either R-40 nom., OR 55% HRV, OR 0.80 EF DHW</td>
<td>73</td>
<td>3%</td>
</tr>
</tbody>
</table>
Table 3: Summary of qualified installed measures included in Energy Star® Qualified New Homes in Ontario (April 1, 2007 – March 31, 2008) B

<table>
<thead>
<tr>
<th></th>
<th>Min. R17.3 ETR* + 55% eff. HRV</th>
<th>Min. R21.3 effective thermal resistance</th>
<th>Min. R18.75 ETR* + 55% eff. HRV</th>
<th>Min. R18.75 ETR* + ≤ 13.5% Zone B window area</th>
<th>Min. R17.3 ETR* + ≤ 11.5% Zone B window area</th>
<th>Min. R18.75 ETR** + ≤ 15% Zone C window area</th>
<th>Min. R17.3 ETR* + ≤ 13.5% Zone C window area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Walls</td>
<td>1,269</td>
<td>607</td>
<td>275</td>
<td>94</td>
<td>66</td>
<td>36</td>
<td>8</td>
</tr>
<tr>
<td>Exposed Floors</td>
<td>R31 batts or min. R-29 effective thermal resistance</td>
<td>2,262</td>
<td>96%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basement</td>
<td>FH, R10 foam board or R12 batt, or min. R10 ETR*</td>
<td>1,630</td>
<td>69%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td>Min. R10 ETR*(int. max. 12” off floor)+ min. 94% AFUE</td>
<td>342</td>
<td>14%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. R10 ETR*(int. min. 2’ BG)+ R+4 grade to footing</td>
<td>199</td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. R15 ETR*(int. max. 12” off floor) (Zone C ins.)</td>
<td>6</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slab Without in Floor Heating</td>
<td>&gt;2’ below grade, un-insulated</td>
<td>1,313</td>
<td>55%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;2’ below grade, R+10, edge</td>
<td>222</td>
<td>9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space Heating/ Cooling Type</td>
<td>Gas furnace, min. 90 AFUE</td>
<td>928</td>
<td>39%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gas hydronic, min. 85% AFUE boiler or 0.85 EF water heater</td>
<td>225</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>4</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Heating Type</td>
<td>Natural Gas (average volume = 189L)</td>
<td>2,362</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electric</td>
<td>6</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Propane</td>
<td>1</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
Not all categories sum to 100% since several fields were left blank (or marked “not applicable”) by the Energy Evaluators.
ETR* = Effective thermal resistance

Review of OPA PIAs and ESNH Technical Specifications – (Tables 3.11.1 & 3.12.1)

Navigant Consulting reviewed PIA related information provided by the OPA and EnerQuality for the most commonly installed measures covered in the Energy Star® for New Homes Program to assess any gaps or inaccurate assumptions and/or sources which might erroneously impact the program.

Navigant Consulting recently submitted to the OPA revised PIAs for Electronically Commutated Motors, Energy Star® Central Air Conditioners and Programmable Thermostats for the Evaluation of 2007 Hot and Cool Savings Program (July 2008) which are relevant to the ESNH program measures. Thus, the OPA has developed PIAs related to the ESNH program as listed below:

- Energy Star® Central Air Conditioner;
- Energy Star® Refrigerator;
- Energy Star® Dishwasher;
- Energy Star® Clothes Washer;
- Programmable Thermostat (Forced-Air Electric Heating or Natural Gas Heating Only, Forced-Air Electric Heating or Natural Gas Heating and Space Cooling);
- Furnace Equipment with Electronically Commutated Motor (ECM) – (Forced-Air Electric Heating or Natural Gas Heating and Cooling, New Homes);
- Furnace Equipment with Electronically Commutated Motor (ECM) – (Forced-Air Electric Heating or Natural Gas Heating Only, New Homes);
- CFL Screw – In (15W);
- Clothes Dryer (Fuel Switch from Electric to Natural Gas); and
- Gas Range (Fuel Switch from Electric to Natural Gas).

In addition to reviewing these pre-existing PIAs, Navigant Consulting also reviewed the Electricity and Appliance Saving credits found in Table 3.11.1 and Table 3.12.1 (Appendix J of the RFP) which are currently being used by ESNH participants to as the basis for meeting the electricity savings target required for each Energy Star® qualified new home.

Navigant Consulting has identified discrepancies between the electrical savings noted in Table 3.11.1 and Table 3.12.1 and the values tabulated in the BOP form. For example, according to Table 3.11.1, a drain water heat recovery system is worth anywhere between 500 and 800 kWh/year for an electric heating domestic hot water tank. However, EnerQuality’s BOP form assigns a drain water heat recovery system as a 400 kWh/year credit regardless of the fuel source for the hot water tank. As indicated in Table 2, 73 homes were credited for installing a drain water heat recovery system during the evaluation period; however all were installed with homes using natural gas hot water tanks. Finally, some of the energy savings measures included in Table 3.11.1 were not available in the BOP form, notably the monitoring and switching technologies (e.g., in house display, all-off switch).

Based on Navigant Consulting’s analysis of the Table 3.11.1 and Table 3.12.1, many of the listed electricity and appliance savings credits vary considerably from reported savings for similar measures used by the OPA and in other jurisdictions, as shown in
Table 4. For example, savings attributed to Energy Star® labelled appliances range between 200% to 400% higher than the savings reported in the OPA Measures and Assumptions List\(^1\). On the other hand, a furnace equipped with an ECM is considered to save 700 kWh according to Table 3.11.1 (and only 300 kWh on the BOP form). However based on PIAs developed by Navigant Consulting for the OPA’s Hot and Cool Savings Program, an ECM can potentially save between 200 and 2,900 kWh/year for a new home, depending on the fuel source and continuous or non-continuous furnace fan usage\(^2\). It should be noted that Navigant Consulting compared the electricity savings credits found in Table 3.11.1 with existing energy savings values found in the OPA’s measure and assumption list or PIAs developed by Navigant Consulting for the most commonly installed measures not included in the OPA’s Measure and Assumption List (see Table 5 and Appendix A).

\(^1\) OPA Measures and Assumption List, Ontario Power Authority, February 15, 2008

### Table 4: Comparison of energy saving credits in ESNH program and OPA and Navigant Consulting revised PIAs

<table>
<thead>
<tr>
<th>Category</th>
<th>Eligibility</th>
<th>ESNH Tech Specs (kWh/year)</th>
<th>OPA Existing PIA (kWh/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Distribution</td>
<td>• Furnace or air handler with variable speed ECM motor</td>
<td>700</td>
<td>200 – 2,900</td>
</tr>
<tr>
<td></td>
<td>• HRV w/ ECM motor</td>
<td>200</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• Conventional PSC motor forced air system with interval controller max. 50% ventilation on time, low speed</td>
<td>400</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• Conventional PSC motor forced air low speed tap</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• Energy Star® bathroom exhaust fans</td>
<td>50 ea.</td>
<td>19 ea.</td>
</tr>
<tr>
<td></td>
<td>• Dedicated fully-ducted supply and exhaust ventilation system with an HRV or balanced fans, without central forced air furnace or air handler.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Conventional HRV</td>
<td>600</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>o HRV w/ECM motor</td>
<td>800</td>
<td>N/A</td>
</tr>
<tr>
<td>Ventilation Distribution</td>
<td>• Energy Star® CFL or T5 installed in hardwired fixtures.</td>
<td>40 ea.</td>
<td>44 ea.</td>
</tr>
<tr>
<td></td>
<td>• T8 linear fluorescent (LF) bulbs</td>
<td>70 ea.</td>
<td>37 ea.</td>
</tr>
<tr>
<td></td>
<td>• Halogen mr16 lamps less than 50W</td>
<td>20 ea.</td>
<td>N/A</td>
</tr>
<tr>
<td>Lighting</td>
<td>• Energy Star® CAC minimum 14 SEER</td>
<td>100</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>• All CFL lighting w/ eligible AC</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• Air handler w/ ECM motor w/ eligible AC</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• ERV w/ eligible AC</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• Energy Star® qualified windows with an average SHGC of less than 0.40</td>
<td>300</td>
<td>209</td>
</tr>
<tr>
<td>CAC</td>
<td>• Front loading Energy Star® qualified washer</td>
<td>450</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>• Top loading Energy Star® qualified</td>
<td>150</td>
<td>N/A</td>
</tr>
<tr>
<td>Clothes Washer</td>
<td>• Energy Star® qualified refrigerator</td>
<td>150</td>
<td>74</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>• Energy Star® qualified dishwasher</td>
<td>100</td>
<td>23</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>• Gas Pre-Piped to kitchen range location and/or clothes dryer location</td>
<td>100</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• Gas kitchen range installed</td>
<td>400</td>
<td>652</td>
</tr>
<tr>
<td></td>
<td>• Gas dryer installed</td>
<td>600</td>
<td>838</td>
</tr>
<tr>
<td>Gas Appliances</td>
<td>• With electric water heater and DHR unit of minimum 48” length</td>
<td>800</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>o Installed on stack with all showers</td>
<td>800</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>o Installed on stack with most showers</td>
<td>500</td>
<td>1,360</td>
</tr>
<tr>
<td>Drain water Heat Recovery</td>
<td>• Whole house, in home, real time electricity use monitor</td>
<td>800</td>
<td>470</td>
</tr>
<tr>
<td></td>
<td>• All-off switch w/ split green plugs</td>
<td>800</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• All-off switch w/ one receptacle per room</td>
<td>300</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>• All-off lighting switch w/ min. one fixture per room</td>
<td>300</td>
<td>135</td>
</tr>
<tr>
<td>Monitoring &amp; Switching</td>
<td>• 4” pipe leading from roof to basement for future piping or wires, capped</td>
<td>300</td>
<td>N/A</td>
</tr>
<tr>
<td>Solar Ready</td>
<td>• Solar DHW w/ electric DHW, photovoltaic, wind, fuel cell, micro combined heat and power and micro turbine on-site power production systems</td>
<td>Software</td>
<td>N/A</td>
</tr>
<tr>
<td>On-Site Power Production</td>
<td>• Solar DHW w/ electric DHW, photovoltaic, wind, fuel cell, micro combined heat and power and micro turbine on-site power production systems</td>
<td>Software</td>
<td>N/A</td>
</tr>
</tbody>
</table>
EnerQuality was not able to provide documentation explaining the rationale and documentation used to develop the energy savings values found in Table 3.11.1 and Table 3.12.1. EnerQuality reported that specific energy saving values were developed by an external consultant, and were unable to provide clarification or details of any specific sources for the expected savings. Navigant Consulting attempted to contact in an effort to shed some light on the methodology used but were unsuccessful in our attempts to reach him. Navigant Consulting has been informed by EnerQuality that the values were based on “rule of thumb” assumptions and as such, they can not be substantiated and should not be considered robust or reliable without additional clarification or discussion with the parties responsible for developing them.

Review of PIAs from other Evaluations and Jurisdictions

Navigant Consulting’s extensive database of CDM programs, current PIAs, evaluations and technical studies for similar equipment and measures undertaken in other jurisdictions facilitated a further comparison of the OPA’s PIAs against the assumptions and results used in other CDM programs and studies was undertaken to enhance and refine the PIAs used in the ESNH program.


Navigant Consulting reviewed the initial PIA assumptions for the most commonly installed measures used by ESNH participants to reach their electricity saving target based on additional information from the participant home builder survey results and findings from other evaluation and technical studies undertaken in other jurisdictions.

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4 Canadian Centre for Housing Technologies, 'Final Report on the Effects of ECM Furnace Motors on Electricity and Gas Use: Results from the CCHT Research Facility and Projections', NRCC-38500, August 2003
Key revisions to the most commonly installed measures used by ESNH participants from Table 3.11.1 are listed below. Since all of the Energy Star® labelled homes in the evaluation period use natural gas as the main source for space heating and water heating, Navigant Consulting’s refined PIAs have been developed for natural gas homes only.

Table 5: Comparison Navigant Consulting refined PIAs and Table 3.11.1 for the most commonly installed measures used by ESNH participants

<table>
<thead>
<tr>
<th>Most Commonly Installed Measures</th>
<th>Table 3.11.1</th>
<th>OPA/Navigant Consulting Refined PIAs (for Natural Gas homes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECM Furnace or Air Handler</td>
<td>700 kWh</td>
<td>For continuous fan usage • 2,393 kWh/year (with CAC) • 1,403 kWh/year (without CAC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For non-continuous fan usage • 266 kWh/year (with CAC) • 207 kWh/year (without CAC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average home = 835 kWh/year⁸</td>
</tr>
<tr>
<td>Compact Fluorescent Lamps (CFL)</td>
<td>40 kWh per bulb</td>
<td>44 kWh per bulb</td>
</tr>
<tr>
<td>Programmable Thermostat</td>
<td>None</td>
<td>• 44 kWh (space heating) • 134 kWh/year (space cooling)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average home = 110 kWh/year⁹</td>
</tr>
<tr>
<td>Energy Star® Windows (low E) – SHGC less than 0.4</td>
<td>300</td>
<td>82 kWh/year</td>
</tr>
<tr>
<td>Duct Sealing</td>
<td>None</td>
<td>56 kWh/year (with CAC) 29 kWh/year (without CAC)</td>
</tr>
</tbody>
</table>

Not included in the BOP forms or in Table 3.11.1. were:

- Programmable thermostats; and
- Duct sealing.

Based on the results of our home builder survey, these measures are regularly installed in Energy Star® qualified homes. As detailed in Table 5, these measures have associated electricity savings and therefore should be included as part of the electricity and energy savings credits applied to the ESNH program. For example, based on the Canadian Centre for Housing and

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⁸ Average home based on following: 31% of homes running furnace fan continuously and 69% using it intermittently and 74% of Ontario homes with central air condition systems (see PIA sheets for more details)

⁹ Ibid
*Technologies Study*\(^\text{10}\), a 3 degrees daytime temperature set back using a programmable thermostat can save approximately 11% on the space cooling load and approximately 8% for space heating load for a 4 degrees temperature set back. Furthermore, many participant builders stated that they typically sealed their venting ducts; a practice that is estimated to save 49 kWh/year\(^\text{11}\).

**Home Buyer Survey - Motivations for Measure Selection & Builder Influences**

Navigant Consulting conducted a survey of participating ESNH home buyers in order to better understand the motivations behind measure selection and builder influence on their purchase decision. This survey was designed to enable Navigant Consulting to:

- Update / revise PIAs;
- Identify primary motivations for participating in the program;
- Identify the dynamics and attitudes of Energy Star\(^\text{®}\) qualified home purchasers;
- Inform estimates of free-ridership and other net-to-gross factors used to determine the net energy and demand savings attributable to the program;
- Inform the process review;
- Determine ESNH home buyer satisfaction with Energy Star\(^\text{®}\) qualified homes, installed measures and home builders with issues specific to ESNH program;
- Determine the influence of program marketing, outreach and awareness in gaining home buyer participation; and
- Determine if participants undertook additional energy savings actions as a result of the program.

Navigant Consulting originally planned to survey up to 300 purchasers of ESNH new homes (purchased between April 1, 2007 and March 31, 2008). These participants were to be randomly selected from a list of ESNH qualified homes, to be provided by EnerQuality (per the RFP). However, due to reasons beyond Navigant’s control, this approach needed to be modified to broaden the period in question to include ESNH homebuyers in the 3-year period ending September 2008 from a sample based on reverse look-ups from Postal Codes of ESNH homes supplied by EnerQuality. In total, 54 Energy Star\(^\text{®}\) Qualified home owners were interviewed on


behalf of the OPA by Opinion Search. Based on the estimated sample size of 5,630 Energy Star® Qualified homes in Ontario\(^{12}\), Navigant Consulting has 80% confidence that the results are within plus or minus 8.7%, or put another way, Navigant Consulting has 90% confidence that the results are within plus or minus 11.1%.

Navigant Consulting also recommended the deployment of a non-participant survey - of purchases of new non-ESNH homes in the 3-year period ending September 2008 - to facilitate a comparison of home buyer attitudes and energy efficiency awareness. Surveys with non-participating home buyers included many of the same questions as the survey for ESNH home buyers, in addition to some supplementary questions focussed on awareness, reasons for non-participation, primary barriers to participation in the program, circumstances under which they would participate in the program, and so on. In total, 72 non-ESNH home owners were interviewed on behalf of the OPA by Opinion Search. Based on the estimated sample size of 150,200 new homes (single family and town homes) constructed in the past 3 years\(^{13}\), Navigant Consulting has 80% confidence that the results are within plus or minus 7.6%, or put another way, Navigant Consulting has 90% confidence that the results are within plus or minus 9.7%.

### Demographics

Table 6 provides a comparison of key demographics for the surveyed Energy Star® Home buyers and the Non-Energy Star® home buyers. As indicated, there is very little disparity between both surveyed groups, with the greatest divergence being the small difference in household income and the level of completed education.

**Table 6: Key demographics of surveyed homeowners**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Energy Star® Homes</th>
<th>Non-Energy Star® Homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households living in a single family detached home</td>
<td>87%</td>
<td>85%</td>
</tr>
<tr>
<td>Size of home greater than 2,000 sq ft</td>
<td>51%</td>
<td>52%</td>
</tr>
<tr>
<td>Average number of household residents</td>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Households with at least a university/college degree</td>
<td>44%</td>
<td>53%</td>
</tr>
<tr>
<td>Household income above $60,000 per year</td>
<td>58%</td>
<td>64%</td>
</tr>
</tbody>
</table>

\(^{12}\) Based on information provided by Ms. Michele Cote, EnerQuality, September 2008.

Energy Star® and Non-Energy Star® Home Buyer Survey: Motivation

Energy Star® Qualified Home Owners:

<table>
<thead>
<tr>
<th>Survey Issue</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most influential factors in decision to purchase new home</td>
<td>Reputable home builder: 5.8/7 Newly built home: 5.6/7 Location of home: 5.6/7</td>
</tr>
<tr>
<td>Most influential factors in decision to purchase an Energy Star® Qualified Home</td>
<td>Cost savings from energy efficiency: 5.8/7 Environmental benefit: 5.5/7 Resale value: 5.5/7</td>
</tr>
<tr>
<td>Percentage of home buyers who were already planning on purchasing Energy Star® Qualified Home</td>
<td>39%</td>
</tr>
<tr>
<td>Top reason for desiring an Energy Star® Qualified home</td>
<td>Save money/reduce energy bills: 53%</td>
</tr>
<tr>
<td>Homeowners believing they paid more for their Energy Star® Qualified home</td>
<td>50%</td>
</tr>
<tr>
<td>Average price difference homeowners believed they paid between standard and Energy Star® Qualified home</td>
<td>$15,500</td>
</tr>
<tr>
<td>Percentage stating their home builder encouraged them to purchase Energy Star® Qualified home</td>
<td>50%</td>
</tr>
<tr>
<td>Influence of home builder or sales team in decision to purchase Energy Star® Qualified home</td>
<td>Quite influential – 47%</td>
</tr>
</tbody>
</table>

Key Findings (Non-Energy Star® Qualified Home Owners):

<table>
<thead>
<tr>
<th>Survey Issue</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most influential factors in decision to purchase home</td>
<td>Location of home: 6.0/7 Size of Home: 5.4 / 7 Reputable Home builder: 5.4/7</td>
</tr>
<tr>
<td>Percentage of respondents who recall their home builder presenting the option of purchasing an Energy Star® Qualified home</td>
<td>8%</td>
</tr>
<tr>
<td>Likelihood of paying additional $3,000 to $5,000 for an Energy Star® Qualified Home</td>
<td>Average rating: 5.1 / 7</td>
</tr>
</tbody>
</table>

According to Energy Star® Qualified home owners, the reputation of the home builder had the greatest influence in their decision to purchase their new home, with an average rating of 5.8 out of 7. The location of the home and the desire for a newly built home closely followed - each rating on average 5.6 out of 7.
Non ESNH home owners were also asked to rate the influence of many of the same factors, however the location of the home was notably the top rated influence on their ultimate purchase decision, averaging 6.0 out of 7, followed by the size of the home and the reputation of the home builder, both averaging 5.4 out of 7. A comparison of both Energy Star® and non-ESNH home owner responses has been provided in Figure 2.

*Figure 2: Comparison of home owner new home purchase influences (Energy Star® vs. Non-Energy Star®)*

When Energy Star® home owners were asked to rate the influence of various factors in their decision to specifically purchase an Energy Star® Qualified home, the cost savings associated with the energy efficient measures was determined to be the greatest influence, with an average rating of 5.8 out of 7.

Of the 54 surveyed participant home owners, only 21 (39%) stated that they initially planned on purchasing an Energy Star® Qualified home. When questioned as to why they desired an Energy Star® Qualified home, over half stated that they hoped to save money through lower energy bills.

In terms of the difference in cost between their Energy Star® Qualified home and a standard (non-ESNH) home, approximately 50% of ESNH respondents indicated that they paid more for the Energy Star® rated home, with the average difference in price being just over $15,000, as shown in Figure 21. However, it should be noted that based on analysis from the participant Home Builder survey, the average price difference was determined to be $4,750. Clearly, this indicates a significant gap between perception and reality.
Figure 3: Do you believe you paid more, less or about the same for your home because of its Energy Star® rating?

Furthermore, half the respondents who purchased an Energy Star® qualified home stated that their home builder or the home builder’s sales staff encouraged them to purchase an Energy Star® rated home, with just under half indicating that the home builder or sales staff were “quite influential” in their decision. A breakdown of all the responses is provided in Figure 4.
Figure 4: How influential was the home builder or sales team in your decision to buy your Energy Star® rated home?

In terms of non-Energy Star® qualified home owners, less than 10% of surveyed home owners could recall their home builder or sales team presenting the option of purchasing an Energy Star® rated home. However, had the builder given them the option, home owners, on average, rated a 5.1 out of 7 when asked to rate the likelihood of them paying between $3,000 to $5,000 for additional energy saving upgrades and the Energy Star® Certification.
Energy Star® and Non-Energy Star® Home Buyer Survey: Energy Saving Measures and Other Programs

Key Findings:

<table>
<thead>
<tr>
<th>Survey Issue</th>
<th>Energy Star® Home Owner Responses</th>
<th>Non-Energy Star® Home Owner Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of homeowners who recall the energy saving measures installed in their home</td>
<td>41%</td>
<td>53%</td>
</tr>
<tr>
<td>Most recalled energy efficient measures installed in their home</td>
<td>Energy Star® Windows – 50%</td>
<td>Increased insulation - 55%</td>
</tr>
<tr>
<td></td>
<td>Increased insulation – 32%</td>
<td>Energy Star® Windows – 24%</td>
</tr>
<tr>
<td></td>
<td>High efficiency furnace – 23%</td>
<td>High efficiency furnace – 21%</td>
</tr>
<tr>
<td>Percentage of home buyers stating their previous home had energy efficient measures</td>
<td>35%</td>
<td>46%</td>
</tr>
<tr>
<td>Most recalled energy efficient measure in their previous home</td>
<td>Energy Star® Appliances – 68%</td>
<td>Energy Star® Rated Furnace/Central Air Conditioner: 58%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy Star® Appliances: 54%</td>
</tr>
<tr>
<td>Average typical monthly electricity bill in summer 2008</td>
<td>$106</td>
<td>$122</td>
</tr>
<tr>
<td>Percentage who expected their electricity bills to be at this level when they decided to purchase their home</td>
<td>60%</td>
<td>58%</td>
</tr>
<tr>
<td>Percentage of respondents who recently participated in other energy saving programs</td>
<td>19%</td>
<td>19%</td>
</tr>
<tr>
<td>Most commonly participated program</td>
<td>Every Kilowatt Counts: 50%</td>
<td>Every Kilowatt Counts: 36%</td>
</tr>
</tbody>
</table>

In order for a home to receive the Energy Star® certification, a number of energy efficient measures must be installed in the home, most commonly determined by the home builder. However, only 41% of Energy Star® Qualified home owners could recall the energy saving measures that were added to their home to receive the certification. The most commonly recalled measures include Energy Star® rated windows (50%), increased insulation (32%) and high efficiency furnaces (23%). Surprisingly, only 14% of respondents recalled their home builder installing compact fluorescent lamps (CFLs), which was by far the most commonly installed energy efficient measure used by participating home builders to achieve the electricity saving credits required for certification, as previously shown in Table 2.

In terms of the surveyed non-Energy Star® rated home owners; just over half indicated that their home builder included at least one energy saving measure during its construction. The most commonly recalled energy saving measures include increased insulation (55%), Energy Star® rated windows (24%) and high efficiency furnaces (21%).
Survey participants were also questioned on energy efficient measures installed in their previous home. Surprisingly, non-Energy Star® home owners were more likely to have energy saving measure in their previous home in comparison to Energy Star® Qualified home owners (46% vs. 35%, respectively). Furthermore, based on their responses, Energy Star® appliances were the most commonly recalled energy saving measures for ESNH owners, representing 68% of responses, where as non-ESNH home owners were more likely to have Energy Star® rated furnaces and air conditioners (each, 58%).

According to survey responses, the average Energy Star® Qualified home owner paid just over $100 per month for their electricity bill during the summer of 2008, which, according to the non-Energy Star® home owners, is roughly 15% lower than a typical monthly bill for a non-ESNH home owner ($122). Furthermore, as shown in Figure 5, approximately 60% of Energy Star® Qualified home owners commented that their monthly electricity bill was “about the same as I expected/ was told”.

Figure 5: Was your average summer electricity bill higher, lower or about the same as what you expected (or were told) when you decided to build an Energy Star® home?

![Pie chart showing responses to Figure 5]

Don't know 4%
"Lower than expected" 20%
"I wasn't sure what to expect" 7%
"Higher than expected" 9%
"About the same" 60%

Finally, in terms of their participation in other conservation programs, survey results indicate little to no difference between Energy Star® Qualified home owners and non-ESNH home owners. Just fewer than 20% of both groups indicated that they participated in other conservation programs since they have moved into their home, with Every Kilowatt Counts being the most frequently program in which respondents participated.
Satisfaction with Home Builders

Key Findings:

<table>
<thead>
<tr>
<th>Survey Issue</th>
<th>Energy Star® Home Owner Responses</th>
<th>Non-Energy Star® Home Owner Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average rating of home buyer satisfaction for their new home</td>
<td>6.1 out of 7</td>
<td>6.0 out of 7</td>
</tr>
<tr>
<td>Average rating of home buyer satisfaction for the energy savings measures included in their home</td>
<td>6.5 out of 7</td>
<td>5.7 out of 7</td>
</tr>
<tr>
<td>Percentage of respondents indicating their home builder was not able to offer a specific energy saving technology they initially desired</td>
<td>22%</td>
<td>32%</td>
</tr>
<tr>
<td>Top methods for home owners locating the builder whom ultimately built their home</td>
<td>Recommendation from friend: 28%</td>
<td>Recommendation from friend: 13%</td>
</tr>
<tr>
<td></td>
<td>Driving in desired neighbourhoods: 25%</td>
<td>Driving in desired neighbourhoods: 13%</td>
</tr>
<tr>
<td></td>
<td>Model homes: 15%</td>
<td>Local listing directory: 13%</td>
</tr>
<tr>
<td>Top home builder ‘satisfaction’ factors in terms of energy saving measures</td>
<td>Awareness and knowledge: 5.9/7</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Choices in technologies: 5.8/7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competitive prices: 5.7/7</td>
<td></td>
</tr>
<tr>
<td>Home owners who believe that builders registered in the ESNH program are more credible in building energy efficient homes than builders who are not registered in the program</td>
<td>56%</td>
<td>46%</td>
</tr>
</tbody>
</table>

All home owners were asked to rate their overall satisfaction with their new home on a scale of 1 to 7, where 1 means they were very dissatisfied with their home and 7 means they were completely satisfied with their home. On average, both Energy Star® Qualified home owners and non-Energy Star® Qualified home owners appear to be satisfied with their home, with an average rating of 6.1 out of 7 and 6.0 out of 7, respectively. Similarly, when ESNH home owners were questioned on their satisfaction with the energy saving measures included in their Energy Star® Qualified home, home owners appear to be increasingly satisfied, with an average score of 6.5 out of 7. This high satisfaction rating for the included energy saving measures is indicative of the fact that only 22% of home owners stated that their home builder was not able to offer a specific energy saving technology they initially desired. On the other hand, almost one third of non-ESNH home owners indicated that their home builder was not able to offer a specific energy saving technology, with Energy Star® rated windows being the top request (18%).

As indicated in Figure 6, just under 30% of Energy Star® Qualified home owners found the builder who ultimately built their home through recommendations from a friend or colleague.
Driving in desired neighbourhoods (25%) and visiting model homes (15%) were also common means for home buyers to find their home builder.

Figure 6: How did you find the home builder from whom you ultimately purchased your new home (Energy Star® Qualified home owners)?

Don’t know 13%

Driving in desired neighbourhoods 25%

Recommendation from friend 28%

EnerQuality website 2%

General internet search 4%

Local listings directory 13%

Model homes 15%

Non-Energy Star® Qualified home owners typically found their home builder using similar means as ESNH participants, with the exception of increased usage of the local listing directory as opposed to visiting the model homes, as indicated in Figure 7.
Energy Star® Qualified home owners were separately asked to rate their satisfaction with the home builder on specific issues related to the installation of their energy saving measures. In general, Energy Star® home owners were most satisfied with their home builder’s awareness and knowledge of energy saving technologies (average rating of 5.9 out of 7) and the available choice of energy saving measures (average ration of 5.8 out of 7).

Finally, both groups of home owners were asked to comment on the registration of home builders in the ESNH program. Just over half of the Energy Star® Qualified Home owners agree that home builders who are registered in the ENSH program are more credible in terms of their ability to build energy efficient homes than builders who are not registered in the program, whereas less than half of the non-Energy Star® home owners agree with the above statement.
Attitudes Towards Energy Conservation

Key Findings:

<table>
<thead>
<tr>
<th>Survey Issue</th>
<th>Energy Star® Home Owner Responses</th>
<th>Non-Energy Star® Home Owner Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents believing that individual consumers can make an important contribution to reducing overall use of electricity in the Province.</td>
<td>87%</td>
<td>85%</td>
</tr>
<tr>
<td>Respondents stating they are very/somewhat concerned with the environmental impact of electricity generation</td>
<td>89%</td>
<td>80%</td>
</tr>
<tr>
<td>Respondents stating they are very/somewhat concerned with the environmental impact of electricity consumption by consumers</td>
<td>85%</td>
<td>80%</td>
</tr>
<tr>
<td>Respondents who state that they ‘prepared to pay more for an environmentally friendly product’</td>
<td>83%</td>
<td>83%</td>
</tr>
<tr>
<td>Respondents who state that they ‘have enough trouble worrying about my own problems without worrying about others’?</td>
<td>42%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Both Energy Star® Home owners and non-Energy Star® home owners were asked a series of attitudinal questions regarding their opinions and views towards energy conservation. Based on the survey results, Energy Star® home owners have a tendency to hold marginally more favourable opinions on energy conservation than non-Energy Star® home owners. However, in general, both groups have reasonably similar views and opinions.

In terms of their belief that individual consumers can make an important contribution to reducing overall use of electricity in the Province, the majority of Energy Star® home owners and non-Energy Star® home owners (87% and 85% respectively) responded that it is likely/very likely, as shown in Figure 8.
Figure 8: How likely do you think it is that individual consumers can make an important contribution to reducing overall use of electricity in the province?

![Bar chart showing responses to figure 8]

Figure 9 through Figure 11 illustrate the concerns of Energy Star® Home owners and non-Energy Star® home owners with regards to the environmental impact of electricity generation and consumption. As shown, both groups express similar concerns, with the exception of the impact of electricity generation on the environment for which Energy Star® Home owners tend to be slightly more concerned (9% difference).
Figure 9: How concerned are you with the environmental impacts of electricity generation?

Figure 10: How concerned are you with the environmental impacts of electricity consumption by consumers?

Figure 11: How concerned are you with the environmental impacts of electricity consumption by business and industry?

Figure 12 through Figure 13 compare the responses of Energy Star® Home owners and non-Energy Star® home owners with regards to various opinion statements. As previously indicated, both groups express similar opinions, suggesting that there is little to no difference between a home buyer who purchased an Energy Star® Qualified home and a home buyer who purchased a standard home.
Figure 12: To what extent do you agree with the opinion ‘I am prepared to pay more for an environmentally friendly product’?

Figure 13: To what extent do you agree with the opinion ‘To preserve people’s jobs in this country, we must accept higher levels of pollution in the future’?

Figure 14: To what extent do you agree with the opinion ‘I have enough trouble worrying about my own problems without worrying about others’?
Review of Previous Evaluation Studies Undertaken by EnerQuality

Approach

Navigant Consulting reviewed the previous evaluation studies undertaken by EnerQuality to:

- Assess the impacts and effectiveness of ESNH program;
- Assess and comment on the appropriateness of the methodology used to determine program results; and
- Estimate the degree of confidence that the OPA should have in EnerQuality's findings.

The evaluation studies reviewed by Navigant Consulting (per the requirements of the RFP) were:

1. Energy Star® for New Homes Aggregate Demand Study (Appendix G in the original RFP); and
2. Energy Star® for New Homes Electricity Reduction Strategy (Appendix H in the original RFP).

Key Findings

Energy Star® for New Homes Aggregate Demand Study:

- The assumptions used by EnerQuality for the modelling parameters in the HOT2000™ software are often overstated and lacking explanation, resulting in higher potential savings than should be expected from an ESNH qualified home.

- All energy efficient parameters have been modelled as one package using the HOT2000™ software. Very little external published material and few other resources are referenced to determine how savings compare with other jurisdictions or other published evaluations.

- The reported savings are expressed as gross savings and do not take into account free-ridership or current energy efficient building practices used by other home builders.

Energy Star® for New Homes Electricity Reduction Strategy:
Navigant Consulting is concerned by many of the fundamental assumptions used by EnerQuality to estimate potential energy savings, specifically surrounding lighting, for which EnerQuality reports the greatest savings opportunity.

- There are notable discrepancies between assumptions used Energy Star® for New Homes Aggregate Demand Study and Energy Star® for New Homes Electricity Reduction Strategy, including CAC load and capacity.
- The Time of Use (TOU) profiles used by EnerQuality for each of their energy loads do not correspond to the load profiles used by the OPA.
- The implementation of all the best practices is an unlikely scenario, therefore, it would be more practical for EnerQuality to instead include a more realistic scenario for comparison purposes, especially considering their knowledge and close relationship with home builders and their current building practices.

**Review of Energy Star® for New Homes Aggregate Demand Study**

EnerQuality was retained by the Ontario Power Authority to monitor and measure the reduction in electricity demand resulting from builders constructing new homes to meet or exceed EnerQuality’s Energy Star® for New Homes Technical Specifications version 3.0. The methodology used by EnerQuality to calculate the energy savings was to model and then compare the energy consumption of a representative “code” built home and an Energy Star® qualified home using the HOT2000™ software tool version 9.34. Based on their results, EnerQuality reports that an Energy Star® Qualified home will result in an electrical load reduction of 3,570 kWh/year and a heating load reduction of 18.5 MMBtu/year, representing a total energy use reduction of 9,009 kWh/year.

Navigant is concerned by the fact that the reported savings are based only on a “whole house result” from the HOT2000™ software with individual energy saving measures not compared with other sources such as the OPA’s Measures and Assumption List, or similar measures evaluated in other jurisdictions. Although Navigant Consulting believes that this software tool is valuable for modeling parameters surrounding the building shell (e.g., insulation levels, window areas, etc), it is less reliable when attempting to model specific individual changes to lighting, appliances and furnace fan operations.

With regards to the modeling parameters used by EnerQuality, Navigant is also concerned by the following assumptions made by EnerQuality:

1. **Furnace fan operation.** EnerQuality uses a continuous fan operation, which, according to multiple studies and surveys, is only applicable to approximately 30% of households.

2. **Energy savings from lighting.** EnerQuality modelled the improved Energy Star® qualified home to include a 75% decrease in lighting energy consumption, or 2,018
kWh/year. Although there is some description of these assumptions in their Energy Star® for New Homes Electricity Reduction Strategy report (see below) it still remains unclear as to how EnerQuality has derived these savings from CFLs alone. Even if home builders install, on average, 28 CFLs per home at 44 kWh/year savings for each CFL, this would result in an annual savings of only 1,240 kWh/year.

3. **Installation of power monitoring devices and green switches.** EnerQuality estimates between 7% to 10% savings with the installation of “real time” power monitoring devices and green switches for entertainment and computer sensors. Although these potential savings are reasonable, none of the home builders interviewed by Navigant Consulting mentioned the installation of these devices in their homes.

4. **Change in central air conditioner capacity.** EnerQuality fails to report as to why they modify the capacity of the central air conditioner (CAC) in the “code home” from 18,000 Btu/hr to 13,600 Btu/hr in the Energy Star® home. Regardless of the fact that both modelled CAC capacities used by EnerQuality are drastically lower than a typical home (the OPA uses 36,000 Btu/hr in its Measures and Assumption List14 while Navigant Consulting uses 26,000 Btu/hr15), this change in capacity results in a savings of 240 kWh/year.

5. **Change in specified output capacity of furnace and “AirCycler”.** It is unknown as to why the capacity of the furnace was reduced from 52,888 Btu/hr in the “code home” to 47,769 Btu/hr in the Energy Star® home (10% reduction). Also, EnerQuality reports that the duty cycle of the furnace fan can be reduced by 50% through installation of an AirCycler furnace fan timer, however it is unknown:

   i. How many builders typically install these timers since none of the interviewed home builders mentioned this device; and

   ii. How realistic/credible the expected savings attributable to this timer may be.

Navigant is therefore hesitant to accept EnerQuality’ s reported furnace fan savings of almost 2,000 kWh/year.

Navigant Consulting’s other notable observations are as follows:

1. All reported savings represent gross savings estimates since EnerQuality does not take into account any net-to-gross estimates for potential free-riders (e.g., builders who already install energy savings measures and conduct energy efficient building practices).

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14 OPA Measures and Assumption List, Ontario Power Authority, February 15, 2008

2. Very few externally published materials and resources were referenced in the report to determine how their savings estimates compare with other jurisdictions or independently published evaluations.

3. This report was prepared by a full time employee of EnerQuality.

In summary, Navigant Consulting finds that given the many assumptions, many of which overestimate the potential savings associated with the installed measures, the OPA should not rely too heavily on the findings outlined in this document.

**Review of Energy Star® for New Homes Electricity Reduction Strategy:**

EnerQuality was retained by the Ontario Power Authority to develop an Electricity Reduction Strategy to identify ways to increase the electrical savings resulting from houses built to EnerQuality’s Energy Star® for New Homes Technical Specifications. To meet this objective, EnerQuality assessed current residential loads in typical new homes in Ontario, developing a load profile for each load and identifying potential savings from the adoption of best practices from each load category. Based on their findings, EnerQuality reports that the implementation of best practices would result in a per-house savings of 5,043 kWh/year.

Based on Navigant Consulting’s review of the report and EnerQuality’s assumptions, we offer the following observations:

1. **Residential lighting.** EnerQuality assumes that a typical home has 50 interior incandescent bulbs, which is much higher than the number determined by Statistics Canada which reports that on average, Canadian homes have 27 bulbs per home, with only 77% being incandescent\(^\text{16}\). Furthermore, EnerQuality’s assumptions regarding the hours/day usage of interior lights is very high (up to 15 hours per day during the winter -and carries these assumptions across for the 50 interior lights), whereas research conducted by Navigant Consulting and the OPA suggests that, on average, each bulb is used an average of 2.7 hours/day\(^\text{17}\).

2. **Furnace fan operation.** EnerQuality’s savings estimates are based on intermittent fan setting only (as opposed to the continuous fan operation assumed in their Energy Star® for New Homes Aggregate Demand Study report). EnerQuality should have considered using a weighted average to factor in the proportion of home owners who run their furnace fan continuously and the proportion who run their furnace fan intermittently.

\(^\text{16}\) Statistics Canada, Survey of Households and the Environment, 2003

\(^\text{17}\) Ontario Power Authority, OPA Measures and Assumption List, 2008.
3. **Central air conditioner capacity and SEER value.** EnerQuality reports a SEER 17 as best practice, which is much higher than the average Energy Star® CAC considering the minimum SEER level is SEER 14. Furthermore, EnerQuality is assuming a CAC capacity of 36,000 Btu/hr, which is a much higher value than modelled in the *Energy Star® for New Homes Aggregate Demand Study* report.

Navigant Consulting’s other notable observations are as follows:

1. Discrepancies between assumptions used in the *Energy Star® for New Homes Aggregate Demand Study* and the *Energy Star® for New Homes Electricity Reduction Strategy Report* (e.g., CAC load is 1,774 kWh/year in the latter and only 328 kWh/year in the former).

2. The TOU profiles generated for each of the energy loads does not match the load profiles used by the OPA. For example, EnerQuality reports that refrigerators use 19% on peak, 25% mid-peak and 55% off-peak. Firstly, it is unclear which season this profile represents (winter, summer or shoulder) and secondly, assuming the OPA load profile for both summer and winter peak result in 10.8% (4.8% and 5.9%, respectively), this represents half the value EnerQuality is reporting.

3. EnerQuality is not able to clearly explain the details behind their assumptions and expected energy savings.

4. The implementation of all the best practices is an unlikely scenario, therefore, it would be more practical for EnerQuality to instead include a more realistic scenario for comparison purposes, especially considering their knowledge and close relationship with home builders and their current building practices.

In summary, although this report provides a reasonable comparison between current practices and best practices, EnerQuality’s fundamental assumptions portray an unrealistic forecast of potential savings in the new construction industry. Navigant Consulting therefore suggests that the OPA not place too much weight on the reported per-house savings of 5,043 kWh/year outlines in the study.
ANALYSIS OF GROSS AND NET ENERGY AND PEAK DEMAND SAVINGS

Approach

In order to estimate the Gross and Net energy and peak demand savings resulting from EnerQuality’s 2007 ESNH pilot program, Navigant Consulting:

1. Determined the gross energy savings using the estimated per unit savings for each of the electricity saving measures associated with the program and the total number of installed measures per participant.

2. Estimated the net energy and peak demand savings that should be attributable to the ESNH program taking into account the Ontario-specific free-ridership, spill-over, rebound effect in actual consumer behaviour, actual home builder service / installation practices and other market activities to the maximum extent possible given the available information.

3. Compared the results obtained from our analysis with those obtained in the Aggregate Demand Savings study.

Key Findings

5. The total gross energy savings generated by the ESNH program between April 1, 2007 and March 31, 2008 is estimated to be 4,782 MWh/year or 1.253 MW/year in peak demand savings. On a per home basis, an Energy Star® qualified home is estimated to save approximately 2,020 kWh/year in electricity, 0.529 kW in summer peak demand savings, and 99.1 m² in natural gas over a standard “code built” home.

6. The total net annual and summer peak demand savings resulting from the ESNH program between April 1, 2007 and March 31, 2008 is estimated to be 3,602 MWh/year and 0.804 MW/year. On a per home basis, an Energy Star® qualified home is estimated to save approximately 1,522 kWh/year in electricity, 0.340 kW in summer peak demand savings and 61 m² in natural gas over a standard “code built” home.

7. The bulk of the energy savings result from the installation of CFLs and electronically commutated motors (ECMs), representing 63% and 22% of the total net annual energy savings, respectively. Similarly, ECMs make up the majority of the summer peak demand savings, representing 54% of the total net peak demand savings.

8. The gross estimated per house savings of 2,020 kWh/year was determined to be 43% lower than the average per savings reported by EnerQuality’s in Energy Star® for New
Homes Aggregate Demand Study. The large difference is likely due to the generous assumptions made in EnerQuality’s demand study.

Gross Energy Savings Calculations

Based on the review of the Builders Option Packages (BOP) house files and participant home builder interviews, Navigant Consulting estimated the gross energy savings related to the Energy Star® for New Homes Program for all evaluated homes between April 1, 2007 and March 31, 2008. Table 7 provides a summary of the measures included in these energy savings calculations along with the associated per unit energy savings, peak demand savings, penetration rate and number of units per home.
Table 7: Summary of energy efficient measures and corresponding savings and penetration rates used in the overall determination of ESNH energy savings

<table>
<thead>
<tr>
<th>Energy Efficient Measure</th>
<th>Annual Energy Savings (kWh/year)</th>
<th>Summer Peak Demand Savings (kW/year)</th>
<th>Penetration Rate</th>
<th>Units per Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating and cooling)</td>
<td>578</td>
<td>0.504</td>
<td>62%</td>
<td>0.74*</td>
</tr>
<tr>
<td>Gas Dryer</td>
<td>838</td>
<td>0.094</td>
<td>6%</td>
<td>1</td>
</tr>
<tr>
<td>Gas Range</td>
<td>652</td>
<td>0.057</td>
<td>6%</td>
<td>1</td>
</tr>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating only)</td>
<td>578</td>
<td>0.315</td>
<td>62%</td>
<td>0.26*</td>
</tr>
<tr>
<td>Programmable Thermostat (Space Heating and Cooling)</td>
<td>182</td>
<td>0.199</td>
<td>90%</td>
<td>0.74*</td>
</tr>
<tr>
<td>Energy Star® Windows (U-27 low e, insulated)</td>
<td>82</td>
<td>0.090</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Energy Star® Refrigerator</td>
<td>74</td>
<td>0.008</td>
<td>6%</td>
<td>1</td>
</tr>
<tr>
<td>Energy Star® Clothes Washer MEF = 1.72 (NG water heater)</td>
<td>71.4</td>
<td>0.008</td>
<td>6%</td>
<td>1</td>
</tr>
<tr>
<td>Energy Star® CAC (SEER 14)</td>
<td>71</td>
<td>0.078</td>
<td>6%</td>
<td>1</td>
</tr>
<tr>
<td>Duct Sealing (Space heating and Cooling)</td>
<td>56</td>
<td>0.087</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Compact Fluorescent bulbs (CFL 15 W)</td>
<td>44.3</td>
<td>0.001</td>
<td>97%</td>
<td>28</td>
</tr>
<tr>
<td>Programmable Thermostat (Space heating)</td>
<td>44</td>
<td>0.024</td>
<td>90%</td>
<td>0.26*</td>
</tr>
<tr>
<td>Duct Sealing (Space heating Only)</td>
<td>29</td>
<td>0.016</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Energy Star® Dishwasher EF = 0.64 (NG water heat)</td>
<td>23</td>
<td>0.002</td>
<td>8%</td>
<td>1</td>
</tr>
<tr>
<td>Drain Water Heat Recovery (min 48&quot;)- (NG water heater)</td>
<td>0.0</td>
<td>0.000</td>
<td>3%</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTE: * Representing the average penetration rate of central air conditioners in Ontario of 74%.18

Multiplying the estimated energy savings and penetration rate corresponding to each measure, the total gross energy savings generated by the program is estimated to be 4,782 MWh/year or 1.253 MW/year in peak demand savings, as summarized in Table 8.

18 Natural Resource Canada (NRCan,) 2003 Survey of Household Energy Use
Table 8: Summary of gross energy and peak demand savings for the ENSH program

<table>
<thead>
<tr>
<th>Energy Efficient Measure</th>
<th>Annual Energy Savings (MWh/year)</th>
<th>Summer Peak Demand Savings (MW/year)</th>
<th>Percentage of Total Annual Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Fluorescent bulbs (CFL 15 W)</td>
<td>2,848</td>
<td>0.0884</td>
<td>59.6%</td>
</tr>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating and cooling)</td>
<td>1,005</td>
<td>0.5477</td>
<td>21.0%</td>
</tr>
<tr>
<td>Programmable Thermostat (Space Heating and Cooling)</td>
<td>287</td>
<td>0.3138</td>
<td>6.0%</td>
</tr>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating only)</td>
<td>220</td>
<td>0.1202</td>
<td>4.6%</td>
</tr>
<tr>
<td>Energy Star® CAC (SEER 14)</td>
<td>10</td>
<td>0.0110</td>
<td>0.2%</td>
</tr>
<tr>
<td>Gas Dryer (fuel switch)</td>
<td>119</td>
<td>0.0133</td>
<td>1.9%</td>
</tr>
<tr>
<td>Duct Sealing (Space heating and Cooling)</td>
<td>94</td>
<td>0.0766</td>
<td>2.0%</td>
</tr>
<tr>
<td>Gas Range (fuel switch)</td>
<td>93</td>
<td>0.0080</td>
<td>1.9%</td>
</tr>
<tr>
<td>Energy Star® Windows (U-27 - low e, insulated)</td>
<td>49</td>
<td>0.0531</td>
<td>1.0%</td>
</tr>
<tr>
<td>Programmable Thermostat (Space heating only)</td>
<td>24</td>
<td>0.0133</td>
<td>0.5%</td>
</tr>
<tr>
<td>Energy Star® Refrigerator</td>
<td>11</td>
<td>0.0011</td>
<td>0.2%</td>
</tr>
<tr>
<td>Energy Star® Clothes Washer MEF = 1.72 (NG water heater)</td>
<td>10</td>
<td>0.0011</td>
<td>0.2%</td>
</tr>
<tr>
<td>Duct Sealing (Space heating Only)</td>
<td>9</td>
<td>0.0049</td>
<td>0.2%</td>
</tr>
<tr>
<td>Energy Star® Dishwasher EF = 0.64 (NG water heat)</td>
<td>4</td>
<td>0.0003</td>
<td>0.1%</td>
</tr>
<tr>
<td>Drain Water Heat Recovery  (min 48&quot;)- (NG water heater)</td>
<td>0</td>
<td>0.0000</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>4,782</td>
<td>1.253</td>
<td>100%</td>
</tr>
</tbody>
</table>

As shown in Figure 15, CFLs account for the greatest savings attributable to the program, followed by the installation of Electronically Commutated Motors (ECMs) in homes with central air conditioners.
In terms of the summer peak demand savings, Navigant Consulting determined that ECMs and programmable thermostats installed in homes with a central air conditioner represent the largest savings, accounting for 44% and 25% of the total peak demand savings, respectively, as shown in Figure 16 below.
Dividing the total savings of 4,782 MWh/year by the 2,367 NCI evaluated BOF forms (each representing 1 qualified home), on average, an Energy Star® Qualified home saves approximately 2,020 kWh/year in electricity and 0.529 kW in summer peak demand savings over a standard “code built” home. Furthermore, using only the measures listed in Table 8, the annual natural gas savings per home is estimated to be 99 m³.

Figure 17 illustrates the large difference between Navigant Consulting’s estimated per house savings of 2,020 kWh/year and EnerQuality’s per house savings of 3,570 kWh/year reported in Energy Star® for New Homes Aggregate Demand Study, representing a difference of 1,550 kWh/year or 43%.
As discussed in the previous chapter, Navigant Consulting determined that many of EnerQuality’s assumptions were overly generous, which would explain the large discrepancy between the two reports.

**Net Energy Savings Calculations**

**Free-Ridership**

*Program free-ridership based on Home Buyer Survey Results*

The methodology used to determine program free-ridership was based on two approaches:

1. Home buyer awareness of the program and, if applicable, their source of awareness; and

2. Home buyer’s intention to purchase an Energy Star® Qualified home and their desire for an Energy Star® Home builder.

As shown in Table 9, approximately 21 out of the 54 home buyers who initially said they purchased an Energy Star® Qualified home stated they were not aware of program or fell in the “don’t know” category. As a result, Navigant Consulting is assuming that those participants would likely not have purchased an Energy Star® home if the ESNH program was not available, making them 100% non-free riders. In terms of the home buyers who stated they were aware of the program, as shown in Table 10, 20 acknowledged that they first became aware of the program through their home builder, model home display or realtor, indicating that they were directly influenced by the ESNH program, and therefore not a free-rider. Therefore, Navigant Consulting is assuming that 41 (21+20= 41) out of the 54 surveyed home buyers are not considered to be free-riders, (or 76%).
Table 9: Energy Star® Qualified home buyers familiarity with ESNH program.

<table>
<thead>
<tr>
<th>Are you familiar with the Energy Star® for New Homes Program?</th>
<th>Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>33</td>
<td>61%</td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>35%</td>
</tr>
<tr>
<td>DK/Refused</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 10: Sources of awareness of ESNH program.

<table>
<thead>
<tr>
<th>How did you first become aware of the Energy Star® for New Homes Program?</th>
<th>Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newspaper</td>
<td>2</td>
<td>6.3%</td>
</tr>
<tr>
<td>Radio</td>
<td>1</td>
<td>3.1%</td>
</tr>
<tr>
<td>Internet/Own Research</td>
<td>4</td>
<td>12.5%</td>
</tr>
<tr>
<td>Home builder/Model home display</td>
<td>19</td>
<td>59.4%</td>
</tr>
<tr>
<td>Realtor</td>
<td>1</td>
<td>3.1%</td>
</tr>
<tr>
<td>Friend, relative, word of mouth</td>
<td>1</td>
<td>3.1%</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td><strong>3</strong></td>
<td><strong>9.4%</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

The second approach used to determine the program free-ridership was to determine the home buyers’ intention to purchase an Energy Star® home and whether or not they were specifically seeking an Energy Star® Home builder. Navigant Consulting is assuming that all home buyers who originally planned to purchase an Energy Star® home and were actively seeking an Energy Star® home builder can be considered to be free-riders (100% free-riders). On the other hand, home buyers who had no intention to purchase an Energy Star® Qualified home and did not seek out home builders who build Energy Star® homes can be considered as non-free riders (0% free-riders). Navigant Consulting is assuming all homebuyers who do not fall into those two
categories as partial-free riders, assigning them an assumed free-ridership rate of 25%. Table 11 illustrates the breakdown in free-ridership rates, with a summary of the survey results shown in Table 12.

**Table 11: Methodology for assigning free-ridership rate.**

<table>
<thead>
<tr>
<th>When considering the purchase of your new home, did you specifically look for a Home Builder that built Energy Star® Qualified homes?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>100% FR</td>
<td>25%</td>
</tr>
<tr>
<td>No</td>
<td>25%</td>
<td>0% FR</td>
</tr>
</tbody>
</table>

**Table 12: Breakdown in home buyer survey results for determining free-ridership.**

<table>
<thead>
<tr>
<th>When considering the purchase of your new home, did you specifically look for a Home Builder that built Energy Star® Qualified homes?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>28</td>
</tr>
</tbody>
</table>

Based on the above tables, it is determined that 17% (4 x 100% + (4+15) x 25% + 28 x 0% = 17%) of Energy Star® home buyers can be considered as free-riders.

Therefore, based on the two approaches presented above, between 17% and 24% of home buyers can be considered as free-riders. Taking an average result, Navigant Consulting is assuming a program free-ridership rate of 21%.

**Measure Specific Free-Ridership based on Home Builder Survey Results**

Based on the participant home builder survey, Navigant Consulting determined that it is the home builder, and not the home owner, who has the greatest influence in the choice of energy
efficient measures or technologies that are installed in a certified Energy Star® home. Therefore, the methodology used to establish the measure specific free-ridership was to determine which energy efficient measures or technologies home builders are installing in their Energy Star® qualified homes in comparison to their standard non-ESNH homes. Navigant Consulting is assuming that if a home builder achieves certification for their Energy Star® homes by installing a specific energy efficient technology, say a high efficiency furnace with an ECM, but already installs the same measure or technology in their standard homes, then the ESNH program should not take credit for the resulting energy savings. However, if the home builder does not install the energy efficient measure or technology in their standard homes, then the program can take full credit of the resulting energy savings.

Another, albeit less conservative view, would be that the home-builders’ installation of specific measures in standard homes that were also installed in the ESNH program homes could be considered as spill over. While this is possible, Navigant Consulting has not taken this view. In fact, we have taken the opposite view – that measures installed in ESNH program homes that are also installed in the builder’s standard home should be considered toward free-ridership for that particular measure.

Based on the survey results, only three energy efficient measures were reported to have been installed in both Energy Star® Qualified home as well as the builders’ standard homes:

1. Energy Star® Windows (low E);
2. Energy Star® CAC; and
3. Programmable thermostats.

To determine the free-ridership rate of the three measures, the total number of standard homes being built by home builders who already use the technology in their standard homes is compared with the total number of standard homes being built by home builders who only install the technology in their Energy Star® Qualified homes. For example, four participant home builders (Builder A, B, C and D) indicated that they install low E Energy Star® Windows in their Energy Star® Qualified homes, of which one (Builder D) stated that they also include the low E Energy Star® Windows in their standard homes. Therefore, the total number of ESNH homes being constructed on an annual basis by Builder D (the builder installing low E windows in their standard homes) is divided by the total number of ESNH homes constructed by all Builder A, B, C and D to determine a free-ridership rate.

A summary of the free-ridership rates for the three measures has been provided in Table 13. Based on the participant home builder survey results, Navigant Consulting is assuming that all measures not listed below are assumed to have a 0% free-ridership rate since surveyed participant home builders did not indicate they are included in their standard homes.
Table 13: Measure specific free-ridership rate based on home builder survey responses.

<table>
<thead>
<tr>
<th>Energy Efficient Measure or Technology</th>
<th>Free-Ridership Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Star® CAC</td>
<td>5%</td>
</tr>
<tr>
<td>Energy Star® Windows (Low E)</td>
<td>3%</td>
</tr>
<tr>
<td>Programmable Thermostat</td>
<td>56%</td>
</tr>
</tbody>
</table>

**Spill Over**

Spill over refers to energy-efficient equipment installed by a home owner due to program influences without any financial or technical assistance from the program. For example, in cases where an Energy Star® home owner decided to install additional energy efficient measures or technologies in their home as a direct result of being influenced by the ESNH, additional savings can be attributed to the program.

In order to quantify this type of behaviour, interviewed Energy Star® Qualified home owners were asked (a) if they installed any additional energy efficient measures or technologies since they moved into their ESNH certified home, and (b) if their participation in the ESNH program or other conservation programs influenced their decision to install the measure or technology. Just over half of the respondents (52%) indicated that they have purchased and installed a total of 81 additional energy efficient measures or technologies, however only 7 of the purchases were directly influenced by the ESNH program and another 2 purchases were influenced by both the ESNH program and other conservation programs. A summary has been provided in Table 14.
Table 14: Sources of awareness of ESNH program.

| Q30. What energy efficient appliances or features have you installed since you moved into your new home? | Q31 Would you say that having participated in the ESNH Program or other conservation programs has influenced your decision? |
|---|---|---|---|
| Responses | “I would have done so regardless” | “ESNH Program influenced my decision” | “Both ESNH and conservation program influenced my decision” |

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Responses</th>
<th>“I would have done so regardless”</th>
<th>“ESNH Program influenced my decision”</th>
<th>“Both ESNH and conservation program influenced my decision”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Star® ceiling fan</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Energy efficient furnace with ECM</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Energy Star® Central Air Conditioner</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Compact fluorescent lights (CFLs)</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Energy Star® dishwasher</td>
<td>17</td>
<td>16</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Energy Star® clothes washer</td>
<td>14</td>
<td>11</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Energy Star® freezer</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Energy Star® refrigerator</td>
<td>17</td>
<td>15</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Natural gas appliance</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stove (unspecified)</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>81</strong></td>
<td><strong>72</strong></td>
<td><strong>7</strong></td>
<td><strong>2</strong></td>
</tr>
</tbody>
</table>

Navigant Consulting calculated the energy savings associated with the additional energy efficient measures installed as a result of the ESNH program using existing OPA PIAs (attributing 100% of the energy savings to the installed measures influenced by ESNH program and 50% to the installed measures influenced by both the ESNH program and other conservation programs). Averaging the additional savings across all the surveyed Energy Star® home buyers, the spill over factor was determined to be negligible (less than 0.5%). Therefore, Navigant Consulting concludes that based on the survey results, negligible spill over occurred as a result of the ESNH program.

It should be noted that 44% of Energy Star® home owners also reported that they have changed their electricity consumption behaviour since they moved into their new home. However, less than 15% (8 out of the 54) of the behaviour changes were influenced by the ESNH program and since the potential effects from these behaviour changes could not be estimated, but would otherwise contribute to spill over, the net savings reported are conservative.
Navigant Consulting also investigated the potential for spill over with the participant home builders, in such that the ESNH program influenced participant home builders to improve the energy efficiency of their standard homes. However, given the relatively small sample size and survey length limitations, the participant home builder survey results do not provide us with enough confidence to categorically apply a spill over factor.

**Net-to-Gross Ratio**

Once the program free-ridership, the measures specific free-ridership and spill over factors were determined, the net-to-gross ratio for each measure was calculated using the following formula:

\[
\text{Net-to-Gross Ratio} = 1 - \text{Program Free-Ridership} - \text{Measure Specific Free-Ridership} + \text{Spill Over}
\]

Using low E Energy Star® windows as an example, a program free-ridership was calculated to be 21% and the measure specific free-ridership was calculated to be 3% and a 0% spill over rate, the net-to-gross ratio was estimated as follows:

\[
\text{Net-to-Gross Ratio} = 1 - 21\% - 3\% + 0\%
\]

\[
= 76\%
\]

Therefore, the net-to-gross ratio for low E Energy Star® Windows is estimated to be 76%. The same methodology was applied to all the measures and the results are presented below.
Table 15: Summary of Net-to-Gross Factors for all ESNH Program measures.

<table>
<thead>
<tr>
<th>Energy Efficient Measure</th>
<th>Program Free-Ridership</th>
<th>Measure Specific Free-Ridership</th>
<th>Net-to-Gross Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Fluorescent bulbs (CFL 15 W)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Drain Water Heat Recovery (min 48&quot;) - (NG water heater)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Duct Sealing (Space heating and Cooling)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Duct Sealing (Space heating Only)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Energy Star® CAC (SEER 14)</td>
<td>21%</td>
<td>5%</td>
<td>74%</td>
</tr>
<tr>
<td>Energy Star® Clothes Washer MEF = 1.72 (NG water heater)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Energy Star® Dishwasher EF = 0.64 (NG water heat)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Energy Star® Refrigerator</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Energy Star® Windows (U-27 low e, insulated)</td>
<td>21%</td>
<td>3%</td>
<td>76%</td>
</tr>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating and cooling)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating only)</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Gas Dryer</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Gas Range</td>
<td>21%</td>
<td>0%</td>
<td>79%</td>
</tr>
<tr>
<td>Programmable Thermostat (Space Heating and Cooling)</td>
<td>21%</td>
<td>56%</td>
<td>23%</td>
</tr>
<tr>
<td>Programmable Thermostat (Space heating)</td>
<td>21%</td>
<td>56%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Net Energy and Peak Demand Savings

This section presents NCI’s findings on the net energy and peak demand impact for the Energy Star® for New Homes Program between April 1, 2007 and March 31, 2008. In simple terms, the net energy and peak demand impact constitutes the gross energy savings, adjusted to reflect the estimated net-to-gross ratio for each of the measures discussed in the previous chapters. Therefore, continuing with the example of the low E Energy Star® Windows measure used in the previous section, the net annual energy savings is:

\[
\text{Net Annual Energy Savings} = \text{Gross Annual Energy Savings} \times \text{Net-to-Gross Ratio}
\]

\[
= 49 \text{ MWh} \times 76\%
\]

\[
= 36.9 \text{ MWh}
\]
Similarly, the net summer peak demand impact is calculated using the gross energy savings presented in Table 8 multiplied by the estimated net-to-gross ratio presented in Table 15. As shown in Table 16, the total net annual and summer peak demand savings resulting from the ESNH program is estimated to be 3,602 MWh/year and 0.804 MW/year.

Table 16: ESNH Total Net Annual and Summer Peak Demand Savings Impact

<table>
<thead>
<tr>
<th>Energy Efficient Measure</th>
<th>Net Annual Energy Savings (MWh/year)</th>
<th>Net Summer Peak Demand Savings (MW/year)</th>
<th>Percentage of Total Net Annual Energy Savings</th>
<th>Percentage of Total Peak Demand Energy Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Fluorescent bulbs (CFL 15 W)</td>
<td>2250</td>
<td>0.070</td>
<td>62.5%</td>
<td>8.7%</td>
</tr>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating and cooling)</td>
<td>794</td>
<td>0.4327</td>
<td>22.0%</td>
<td>53.8%</td>
</tr>
<tr>
<td>Furnace with ECM Motors (90% AFUE) (Space heating only)</td>
<td>174</td>
<td>0.095</td>
<td>4.8%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Gas Dryer (fuel switch)</td>
<td>94</td>
<td>0.011</td>
<td>2.6%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Duct Sealing (Space heating and Cooling)</td>
<td>74</td>
<td>0.061</td>
<td>2.1%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Gas Range (fuel switch)</td>
<td>73</td>
<td>0.006</td>
<td>2.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Programmable Thermostat (Space Heating and Cooling)</td>
<td>66</td>
<td>0.072</td>
<td>1.8%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Energy Star® Windows (U-27 - low e, insulated)</td>
<td>37</td>
<td>0.040</td>
<td>1.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Energy Star® Refrigerator</td>
<td>8</td>
<td>0.001</td>
<td>0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Energy Star® Clothes Washer MEF = 1.72 (NG water heater)</td>
<td>8</td>
<td>0.001</td>
<td>0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Duct Sealing (Space heating Only)</td>
<td>7</td>
<td>0.004</td>
<td>0.2%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Energy Star® CAC (SEER 14)</td>
<td>7</td>
<td>0.008</td>
<td>0.2%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Programmable Thermostat (Space heating only)</td>
<td>6</td>
<td>0.003</td>
<td>0.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Energy Star® Dishwasher EF = 0.64 (NG water heat)</td>
<td>3</td>
<td>0.000</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Drain Water Heat Recovery (min 48&quot;)- (NG water heater)</td>
<td>0</td>
<td>0.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3,602</td>
<td>0.804</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
As shown in Figure 18, CFLs account for the greatest savings attributable to the program, followed by the installation of Electronically Commutated Motors (ECMs) in homes with central air conditioners.

*Figure 18: Distribution of the total annual net electricity savings for the ENSH program during the evaluation period*

![Energy Savings Chart]

In terms of the summer peak demand savings, Figure 19 illustrates that ECMs installed in homes with a central air conditioner represent the largest savings, accounting for 63% of the total peak demand savings.
Dividing the total savings of 3,602 MWh/year by the 2,367 NCI evaluated BOP forms (each representing 1 qualified home), on average, an Energy Star® qualified home was estimated to save approximately 1,522 kWh/year in electricity and 0.340 kW in summer peak demand savings over a standard “code built” home. Furthermore, using only the measures listed in Table 16, the annual natural gas savings per home is estimated to be 54 m³.

Navigant Consulting was not able to compare the estimated per home net energy savings for an Energy Star® Qualified home over a standard “code built” home with EnerQuality’s reported savings in the *Energy Star® for New Homes Aggregate Demand Study*, since net savings was not included in their report.
ESNH Home Builder Survey Results

Approach

Home builders and sales staff are in a strong position to provide information on a range of issues key to the process evaluation (some of which only participating or only non-participating home builders can provide). These include:

- Motivation for participating or not participating in the program;
- Awareness of the program and program requirements;
- Understanding the program participation process and strategies used by builder sales staff to market the program to potential ESNH home-buyers;
- Home owner’s perceived value and knowledge of program measures (Energy Star® appliances, light fixtures, insulation, high performance windows, HVAC equipment, etc.);
- Home owner’s primary motivations for purchasing an Energy Star® qualified home;
- Effectiveness of:
  - (i) outreach and training efforts performed by ESNH;
  - (ii) EnerQuality’s role in the program; and
  - (iii) Point-of-Sales (POS) displays and sales “tool kit”.
- Extent to which the outreach and training workshops offered by EnerQuality resulted in higher customer satisfaction than otherwise would have been the case; and
- Understanding of NRCan’s minimum technical specifications for Energy Star® qualified new homes.

In addition, builder sales staff typically play a key role in the decisions by home owners to purchase an Energy Star® qualified home. This phenomenon has implications for free-ridership and spill-over, with respect to customer behaviour in the absence of the program. For this reason, Navigant Consulting asked home builders to report on:

1. The range of equipment efficiencies and extent to which high efficiency HVAC equipment and Energy Star® appliances and lighting fixtures are currently installed in new homes; and
2. The level to which they automatically insulate and tightly seal new homes, both for program participants and for program non-participants.

These results serve as one of several inputs used to triangulate a net-to-gross estimate for each installed measure.
EnerQuality provided Navigant Consulting with a directory of all the home builders who are currently enrolled in the ESNH Program with the corresponding number of Energy Star® homes currently enrolled and/or labelled in 2007. Based on this database, a sample of approximately 60 active participant home builders was prepared as follows:

- Selection of the top 20 most active home builders in the program, with roughly half located in the Greater Toronto Area;
- Selection of approximately 20 medium sized builders, labelling between 5 and 20 Energy Star® homes in the program in 2007, with roughly half located in the Greater Toronto Area; and
- Selection of approximately 20 home builders who have enrolled or labelled less than 5 Energy Star® homes in 2007, with roughly half located in the Greater Toronto Area.

Navigant Consulting also prepared a sample of approximately 75 non-participant home builders as follows:

- Random sample of licensed home builders across Ontario who have not registered in the ESNH program; and
- Larger home builders identified by EnerQuality who are currently not enrolled in program.

Our findings from these interviews are outlined below.

**Participant Home Builder Surveys – Key Findings**

Participant home builder surveys were conducted between September 9th and September 19th, 2008. In total, 10 participating home builders were successfully interviewed, of which four are considered to be “large” volume builders, three of whom are considered to be “medium” and three of which are considered to be “low” volume builders.

Some key takeaways from the participant home builder survey are as follows:

1. **Motivations for participating in the program.** Just over half the home builders stated the primary reason for joining the ESNH was to gain a competitive edge over other non-Energy Star® qualified builders in the residential construction market. Likewise, some of the builders felt it was necessary to join to program and remain competitive since other home builders were beginning to offer Energy Star® homes.

2. **Satisfaction with EnerQuality.** Builders appear to be satisfied with the support and/or assistance they have required from EnerQuality during the program with the average

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19 Note: the total combined number of Energy Star® labelled homes constructed between the four “large” volume builders represented just over 50% the Energy Star® homes labelled in the evaluation period.
rating being 6 out of 7. A few builders mentioned how EnerQuality was prompt to return their calls and how they were able to answer and resolve any questions or issues they had with the program.

3. **Overall satisfaction with training activities.** Home builders were relatively satisfied with the training activities, with builders reporting an average of 5.3 out of 7 for both the usefulness and completeness of the training curriculum, and 5.5 out of 7 for the overall relevance of the training curriculum. However, builders outside of the Greater Toronto Area were dissatisfied that most of the training activities were held in Toronto.

4. **Effectiveness of outreach and training efforts performed by ESNH.**
   
i. *Home builder’s Workshop* - Only a few builders believed the training they received from the home builder’s workshop has lead to a better understanding of construction practices required for Energy Star® homes than otherwise would have been the case without the training. Most builders stated that their construction staff were already well aware of the techniques and approaches covered in the workshop since many of the builders have previously been working with some of the workshop facilitators (e.g., Gordon Cooke).

   ii. *Technical Sales Workshop* - All of the builders who participated in the technical sales workshop agreed that the training they received has increased their knowledge and experience with Energy Star® homes enabling them to better respond to home buyers questions and demands than otherwise would have been the case without the training. A few builders commented how this workshop enabled their sales teams to become comfortable with using specific energy efficient terms and better understand the energy saving measures and technologies they are offering to potential home buyers.

5. **Effectiveness of Point-of-Sales (POS) displays and sales “tool kit”.** All but one builder recalled receiving marketing or promotional materials for the program, with the brochures and posters being the most notable materials. Overall, builders were satisfied with the provided material, however some builders have their own “in-house” material and used only the Energy Star® logo for marketing purposes. Furthermore, all of the builders stated that they regularly note their participation in the Energy Star® for New Homes program in the advertising material they produce in order to promote the quality of their homes and for brand name recognition purposes.

6. **Frustrations over the variation/changes in technical specifications.** The perceived “continuous change” in technical specifications is a common frustration amongst home builders. Many feel that there is a lack of communication as to when the new specifications will be released, what they will contain and how they will have to modify their homes to continue to qualify for the program.
7. Customers not inquiring about Energy Star® Homes become increasingly interested once benefits are explained. For home builders who offer Energy Star® homes as an added package, only a small portion of their customers (between 5% and 10%) specifically inquire about Energy Star® qualified homes or equivalent “green homes”. However, once the benefits of the Energy Star® home have been explained to the potential home buyer by the sales staff, builders state that on average, 70% of their customer express interest in upgrading to an Energy Star® qualified home.

8. Strategies used by builder sales staff to market the program to potential ESNH homebuyers. The most common benefit of an Energy Star® qualified home promoted by home builder sales staff to potential customers is the financial benefit of owning an energy efficient home. The high quality of the construction and the improved air quality associated with Energy Star® homes are also regularly promoted by the sales staff to potential customers.

9. Promotion of Energy Star® Homes by Home Builders. With the exception of one participant builder, all of the home builders stated that they regularly promote and describe their Energy Star® qualified homes as a potential option to their customers.

10. Home owner’s motivations for purchasing Energy Star® Homes. According to the interviewed home builders, the primary motivation for home owners to purchase of an Energy Star® qualified home is the desire to have an energy efficient home. Other motivations included reduction in energy bills, having a superior quality home and the investment opportunity or resale value of an Energy Star® quality home.

The participant home builders interviewed also provided a number of other interesting observations:

1. Top three methods builders became aware of program.
   i. Home Builders Association;
   ii. Other builders; and
   iii. Through their own research.

2. EnerQuality’s role in promoting the program. A few builders mentioned that EnerQuality has done an excellent job selling the program to the building community by communicating the potential benefits of being a participant builder and the competitive advantage it brings to the company.

3. Reducing home energy consumption. Proper insulation and tightness of construction (wrap/sealing) were considered by builders as being the most important components for reducing home energy consumption.
4. **Homeowners rarely choose which energy efficient technologies will be installed.** Other than the few builders who build 100% Energy Star® qualified homes, most home builders stated that they offer standard upgrade packages for an Energy Star® home. Although customer demand may influence their decision in what ultimately goes in future upgrade packages, customers in general have very little to no choice in the decision of which technologies are installed to achieve the Energy Star® rating.

5. **Most commonly installed (builder reported) technologies used to meet Energy Star® specifications:**
   - i. High efficiency furnaces, with approximately half equipped with electronically commutated motors (ECM);
   - ii. Low E Energy Star® rated windows in the qualified homes;
   - iii. CFLs;
   - iv. Programmable thermostats;
   - v. Drain water heat recovery systems;
   - vi. Energy Star® central air conditioners (SEER 14) - usually offered as an upgrade option or installed at a later date by the home owner.

6. **Most commonly installed energy efficient technologies used in enrolled builder non-ESNH homes:**
   - i. Programmable thermostats;
   - ii. Low E Energy Star® rated windows;
   - iii. High efficiency furnaces; and
   - iv. Increased levels of foundation, wall and attic insulation.

7. **Customers seldom request additional energy efficient technologies not offered in the Energy Star® package.** Customers rarely inquire about additional energy efficient technologies not offered in the Energy Star® qualified homes. However, some customers have recently been inquiring about instant hot water tanks, geothermal heat pumps and grey water recovery systems.

8. **Top three things Home Builders like the most about the program:**
   - i. Availability and contact with EnerQuality;
ii. The marketing and promotional material made available to home builders (especially smaller home builders);

iii. The ability to use the Energy Star® logo in their own marketing materials; and

iv. The ability to choose which energy efficient technologies they will install in their homes to achieve the Energy Star® qualification.

9. **Top three things Home Builders dislike the most about the program**

i. The registration process - some builders question why it can’t be completed online;

ii. The fact that there is no distinction between a Energy Star® Builder who constructs only a small portion of their homes as Energy Star® vs. other Energy Star® Builders who build 100% Energy Star® qualified homes; and

iii. EnerQuality’s discontinuation of plaques that were formerly installed in Energy Star® qualified homes.

With respect to the potential for incentives to be included in the program, the interviewed home builders were very enthusiastic and provided some additional observations:

1. **Incentives should be provided to home builders.** Three quarters of the builders (mostly larger builders) suggested that if the program were to include incentives or rebates, they should ultimately be passed along to the builder. The main reasons were as follows:

   i. Rebates would entice builders to construct Energy Star® homes;

   ii. Since it is the home builder who decides whether or not to build a standard or an Energy Star® qualified home, knowing in advance that rebates are available to offset some of the incremental costs will persuade them to install energy efficient technologies; and

   iii. A subsidised development fee for building an Energy Star® home rather than a non-ESNH home would help persuade builders to increase the number of Energy Star® homes offered to potential homebuyers.

2. **Offering rebates to customers would be problematic for the building process.** Home builders argue that if the customers were the ones to receive the rebates, it would be very difficult to qualify “spec” homes in the program. This is because it is the builder who determines which energy efficient technologies will be included in the home and it is almost impossible to “customize” each home per the customer’s request once the construction has already been completed. They warn that customers would complain as
to why they did not receive the maximum amount of eligible rebates if their builder decided not to install a specific technology during the initial construction phase. However, some builders noted that giving the incentives to customers would be practical for custom built homes or for energy efficient technologies which can be installed after the home in constructed (i.e. Energy Star® appliances, light fixtures, programmable thermostats, etc.).

Navigant Consulting’s key recommendations are as follows:

5. **Increase awareness of Energy Star® Homes within the general public through general advertising campaign.** If potential home buyers are more aware that Energy Star® homes are currently available in the market, there would likely be greater demand for them. As mentioned above, only a small proportion of home buyers specifically request an Energy Star® home, however, once they understand the benefits of owning an Energy Star® home, their interest usually increases. Although home builders are promoting Energy Star® homes through their own marketing, a province wide marketing campaign would increase awareness of Energy Star® homes, and correspondingly, overall demand for such homes.

6. **Provide third party literature and studies on energy efficient technologies to home builders and sales teams and more content for promotional materials.** As suggested by a few builders, EnerQuality might consider providing participating home builders with third party literature or studies on the potential energy savings related to each technology or measure so that they may use it as a selling point for their customers. Having the ability to pass along legitimate facts to their customers as proof of potential energy savings will add credence to the program and aid in its effective promotion.

7. **Strengthen the curriculum of the home builder workshops.** A number of the builders suggested that the builder workshop should be more “hands on” by focusing more on the technical details of the construction and less on the administrative requirements of the program. Having the workshops led by field experts and those currently building Energy Star® qualified homes would add value to the workshops and enable builders to gain more knowledge on progressive building practices. One home builder also suggested having separate workshops for “new builders” and “seasoned builders”, allowing the workshops to be tailored to meet the builders specific needs and experience level.

8. **Engage participant home builders in the technical specification process.** Since many of the home builders expressed frustration with the perceived regularity of changes in the technical specification requirements, Navigant Consulting recommends engaging builders more actively in the process. This will enable builders to offer feedback on any proposed new specifications and facilitate a greater understanding of EnerQuality or NRCan’s perspectives vis-à-vis the final specifications. Currently, many participant
builders feel disengaged from the process and are anxious to determine what, if any, changes will be brought about in the next version and the impact that said changes will have on their next crop of Energy Star® homes and what impact these changes could have on their supply and materials ordering requirements.

Non-Participant Home Builder Surveys – Key Findings

Multiple attempts were made to schedule non-participant home builder phone interviews from the sample of 75 non-participant home builders, however only one successful interview was able to be completed. The low participation rate was likely due to the small staff size of the non-participant builders who were not available during the day to respond to phone calls. Furthermore, many home builders were not able and/or willing to commit the time required to respond to questions about the program.
ESNH Program Process Review

Approach

The program process review that follows is intended to provide insight into program design, administration, implementation/delivery, and the market impacts of the ESNH program in order to determine how the efficiency and effectively the program has been delivered to market and how program design and delivery mechanisms might be enhanced going forward. In addition to a thorough review of program materials supplied by the OPA and EnerQuality, Navigant Consulting also conducted interviews with:

- **OPA staff** - Navigant Consulting conducted detailed discussions with members of the OPA staff in regular interaction with the various program stakeholders. These interviews helped inform our evaluation of the program’s management and EnerQuality’s responsiveness to its program sponsors.

- **EnerQuality** - Navigant Consulting conducted detailed discussions with key EnerQuality staff associated with the program to gain a comprehensive understanding of EnerQuality’s role, the recruitment and training methods used, how the program is managed, how stakeholder relationships are maintained, and so on.

- **ESNH Registered Verification/Evaluation specialists** – Navigant Consulting conducted several detailed interviews with experiences ESNH Evaluators to gathers their perspectives on the program and its delivery.

These information sources provided useful inputs for our program assessment and review against best practices. They also informed our consideration of:

- The accuracy and effectiveness of the program’s processes and the extent to which systems and staffing levels are sufficient to effectively administer the program;

- The effectiveness of the program’s delivery system, including the roles played by EnerQuality and the OPA, related marketing and trade outreach and training effectiveness, and quality control measures being utilized;

- The impact of the program on the home builder community and its typical practices; and

- The market’s satisfaction with the various program elements.

Key Findings

- **Lack of process and procedure documentation** – While EnerQuality has established a framework for its administrative policies “Energy Star® for New Homes, Administrative Procedures”, this high level document would benefit from being supplemented with more detailed processes and procedures.
Staff and program automation - EnerQuality has not yet sufficiently automated the elements of the ESNH program that would benefit from so doing. As a lean operation, there is an indication that they may lack the staff required to manually administer all aspects of the ESNH Program. While EnerQuality recognizes the importance of robust processes and procedures in the effective delivery of the ESNH program, it has struggled to automate many of the more basic operations involved (e.g. online electronic BOP form submission, uploading of files to NRCan, and issuance of ESNH labels to qualified homes). In the absence of effective automation, EnerQuality has struggled to manage some of the administrative functions of the program. Navigant Consulting would recommend that EnerQuality review its program management functions and either staff-up appropriately or re-consider the automation of suitable program processes.

EnerQuality is actively promoting the ESNH program - EnerQuality is actively engaged with the market through its numerous sales, marketing and communications and outreach activities.

EnerQuality’s outreach activities include:

- Builder Updates – mandatory for builders to attend once a year;
- Workshop presentations;
- HBA presentations;
- Attendance at industry events, including industry dinners, trade shows, conferences, golf tournaments etc;
- Support of builder events including media opportunities/community launches;
- Partner meetings;
- Partner and Builder sales channel consultant info/update sessions;
- Builder sales calls/meetings/trouble shooting sessions;
- Building Canada meeting attendance;
- Sponsorship of industry events ;
- Habitat for Humanity enrollment fees waived for ESNH promo/EQ support;
- Charity homes enrollments waived;
- Engagement of builders with partners for additional support;
- Sales calls – territory trips i.e. Ottawa region, SWO;
- Engagement of partner channel representatives to support prospect and existing clients/builders;
- Awards of Excellence; and
- Builder Bulletins

EnerQuality’s Marketing support activities include:
- Energy Star® website
- Energy Star® builder toolkits including call-outs, brochures, posters
- NRCan marketing support (flags, brochures) and brand standards communications
- JD Power survey
- Media monitoring/clippings distribution
- Media support for community launches
- Event Management/PR consultations
- Artwork approvals/review
- Sales Staff support – ESNH program overview
- ESNH media relations, editorial distribution, interviews etc
- Introduce builders to partners for additional marketing support
- OHBA magazine contributions
- BILD contributions/editorial submissions
- Awards of Excellence winner media support
- Training activities

  - The home builder community is generally positive towards EnerQuality vis-à-vis the ESNH program – However, the evaluators with whom Navigant Consulting spoke did raise some concern as to how easy it is for homes to meet the certification requirements for the program. This is not necessarily a criticism of EnerQuality however, rather something that NRCan might want to consider as it seeks to refine the ESNH program and “raise the bar” in terms of energy efficiency goals in new home construction.
Builder concerns over Technical Specification version changes – As already discussed, EnerQuality might benefit from more frequent communication with builders around program changes and might seek to involve them more where possible.

Summary of Industry Best Practices

The sections that follow outline the current “best Practices” approach to New Home Construction Green Build Programs in North America and are provided to offer some practical guidelines to the OPA as it seeks to refine its involvement with existing programs in Ontario and as a practical

Program Philosophy and Overview

The program should seek to educate the residential new construction market actors in sustainable design, green building practices, and energy efficiency. It should promote the incorporation in residential new construction sustainable design, green building practices, energy efficient design and construction. It also needs to assist builder in communicating the benefits of these elements to their home buyers. And finally, through a strong marketing effort the program needs to create consumer demand for these elements.

Program Rationale

The residential new construction market segment has long been recognized as a potential lost opportunity and a viable source of energy savings. Building energy efficiency into new homes and apartments makes sense not only in the context of the environment but also from a cost perspective. It is far more costly and time consuming to retrofit single family and multifamily buildings than to incorporate energy efficiency measures during initial construction. New construction also offers the opportunity of a fully integrated sustainable design that includes green building practices and materials, resource conservation and efficiency, and attention to environmental quality. A Green Building Program offers a holistic approach and solution to incorporating these concepts in three key elements of Green building:

- Energy efficiency;
- Resource management; and
- Environmental quality.

To achieve success a program needs to not only have beneficial components and rewards but it also needs a management process. This report details a potential best practice for program implementation. Throughout the document we have used the term ‘developer’ and ‘program management’. ‘Developer’ is used to collectively include a master-plan developer, production builder or owner built custom home builder. ‘Program management’ is used to collectively include commissions, utilities, third-party implementers, government or a combination of such.
Market Potential

The program should perform an initial market potential study. This study should determine the current baseline practices and requirements for the building industry. What is the homebuyer market requesting? What existing programs are they aware of? What market segment offers the greatest potential? What is the metric of success? Finally, should the program be customized for different market segments?

1. **Green Building Program** - A Green Building Program needs to be robust and focus not only on energy efficiency but must also include water efficiency, resource efficiency and indoor environmental quality. The program must take an integrated approach and not be merely prescriptive elements joined together. It also needs to be flexible and utilize a regional appropriate approach that takes into account local issues, architecture and geographic differences. Program Components should revolve around:

   i. **Efficiency** - To address the efficient use of energy two principle components need to be incorporated into a program; the building envelope and the mechanical systems. The envelope is composed of the foundation, walls, roofing system, and fenestration. Unless the actual architectural design can also be influenced, the envelope measures are limited to the level of insulation and its efficiency. Insulation should be installed properly to avoid a thermal bypass. Windows should be an efficiency that is appropriate for the location. The mechanical systems are composed of the heating and cooling systems and the water heating system. While there are many solutions to heating and cooling a building the principle component is that the system is properly sized for the area it serves. Distribution systems, if they exist should be sealed with a preference that they actually reside in the conditioned space of the dwelling. The water heating system should be designed to avoid heat losses and of high efficiency. Efficient light and appliances should be installed throughout the building. In addition, All-Off (Green) Switches should be wired into the construction to control the plug load.

   ii. **Resources** - Some estimates place the waste that is developed in a standard single family home at over two tons. On site waste should be controlled, recycled materials used whenever possible and rapidly renewable materials should be specified whenever possible. Efficiency fixtures to conserve water should be incorporated and landscaping should be appropriate for the area and either utilize recycled water or be minimally water intensive.

   iii. **Environmental Quality** - As home construction has become tighter health concerns have increased. Many materials and finishes contain chemical compounds that are irritants. Reducing or eliminating these materials used in construction should be a component of the program. Indoor air quality should be addressed through proper ventilation and sealing from areas such as the garage such be incorporated into the design and construction.
2. **Processes and Procedures** - This section details the steps necessary for a project to be accepted into the program and paid incentives. This model assumes that some form of financial incentive is paid to the builder or developer.

i. **Design Assistance** - Design assistance provides technical advice and analyses that enables a developer’s project to increase its potential for program participation by performing a project review and develop recommendations that could be incorporated in the design and construction. The level of detail and recommendation potential depends upon the stage of the project. Documents necessary to perform this activity include architectural plans for all product type, any energy efficiency analyses completed, proposed schedules and mechanical systems. At the deepest level this can take the form of a design Charrette that could take the form of a collaborative design and planning workshop that includes all the stakeholders. While most successful in the early design development of a project, they can occur at any stage and even during construction.

ii. **Application Procedure** - Once a project has been preliminarily qualified for the program, the developer completes the program application and submits the required documentation to program management. Program management will contact the applicant for any necessary clarifications or corrections.

iii. **Design Review** - This initial step determines if a project should be moved through the complete review and acceptance process. Management reviews the submission for completeness and accuracy and that the project will meet the program timeframe guidelines for participation. At this point, management has the discretion to move the submittal back to the original submitter based on inaccurate or incomplete information. All items received are organized and date stamped. The application is given a preliminary reviewed for accuracy. Architectural plans are reviewed to determine if they are sufficient for a plan review to occur.

iv. **Design Analysis** - Design Analysis is the secondary review of project eligibility and occurs following Design Review. Design Analysis is preparatory to Plan Review. It establishes a project in the database and begins the building of all the project components. The following elements and tasks are accomplished during Design Analysis:
   a. Application reviewed in detail.
   b. Project is created in the database.
   c. Energy analysis documents review.
   d. Architectural plans reviewed to determine if the energy analyses performed account for all permutations of the design.
   e. Communications are created. Acceptance letters, etc.
   f. A project folder is created both electronically and hard copies.
Project status is determined at this point to establish if the project can continue through to plan review or if additional information or documents are necessary.

- **Plan Review** - Plan Review is utilized to validate any analyses that were performed that consisted of the building elements such as dimensions, envelop features and mechanical features. It also establishes that an analysis exists for each variation of floor plan designed. In the absence of any analyses a complete modeling of the design plan would need to be created.

- **Final Review** - A list of floor plans/building types is created and documented in the application and database. The energy savings and incentives associated with each plan type are entered. Project data is entered into the database and a review of the database is made to ensure all information is correctly entered.

- **Acceptance**
  - Pre-construction Requirements - The developer receives final approval from program management via an acceptance letter and copy of the approved application. This should take place before construction has commenced. Participates must upgrade all homes within the same project, built after the date the application is executed. All units within that phase must adhere to the program standards. The developer hires a certified HERS Rater to provide field verification that all measures have been installed. Developer is to ensure that all applicable certificates are available for inspection by the HERS Rater.
  - An alternative to this is that program management hires the rater/field inspector. This will depend on the strength of the HERS industry and the potential participation level.
  - Construction Requirements - The developer must notify program management of any changes that will affect total energy use of the home, such as added or relocated windows, addition of bonus rooms or other areas not shown on the documentation, changes in proposed HVAC or water heating equipment, and/or changes to building insulation. The developer must obtain the appropriate HERS rating certificates for each home upon completion of field verification; certificates must be submitted for the tested home and for the non-tested homes in the same sampling group. Prior to payment of incentives, program management will review all inspection documents to ensure program compliance. Program management retains final authority to determine program compliance and eligibility for incentives.
  - A methodology should be developed that deals with any buildings that fail verification. A definition of failure should also be developed
to set policy as to tolerance if failure, percentage that is allowed, if any, and next steps.

v. **Quality Control and Verification** - Field verification is necessary to ensure that the project is constructed and elements are installed as agreed upon in the application. This service should engage a Canadian Residential Energy Services Network (CRESNET) HERS rater for verification of the energy related elements. Most programs require that a portion of all buildings built are completely inspected and verified and the remaining is included as a sample group. The standard is that all unique floor plans receive a complete verification, such as all of the models or unique building types. Following this a portion of each phase is sampled, such as fifteen per cent or one in seven buildings to ensure that a random inspection is performed and to guarantee quality control of the construction. These inspections will take place throughout the life of the project.\(^{20}\)

The verification should consist of validating that the following are consistent with the architectural plans, application and mechanical systems:

a. The dimensions of the structure.

b. Location and dimensions of the fenestration.

c. Insulation installed as specified and follows best practices to avoid voids, gaps and compressions. (See the California Energy Commission Quality Insulation Installation Check List/Environmental Protection Agency (EPA) Energy Star\(^{\circledast}\) consolidated Thermal Bypass Checklist as reference.)

d. Fenestration efficiency is consistent with original specifications.

e. Heating/Cooling systems are properly sized, installed correctly, and the ducting system is sealed.

f. Heating/Cooling efficiency is consistent with original specifications.

vi. **Payment** - The developer notifies program management that a phase/building has been verified and is ready for payment. Field results and related data are recorded in the database. Payment activity is recorded in the database and a check is requested. Upon receipt, incentive payment is reviewed versus project file to ensure accuracy in amount and payable party. The payment address is reviewed versus application to ensure proper transmission if the payment is to be mailed directly to the developer. The incentive payment and along with the appropriate payment letter (partial payment versus full payment) is sent to the

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\(^{20}\) The HERS rater is currently only focused on energy efficiency elements. “Green” verifications should be performed by a separate individual familiar with the program. Green elements will also require greater on-site activity if elements such as material management are included in the program. RESNET is currently developing a Green Rater Training protocol. Once this is established HERS raters will be able to perform all field verifications, diagnostic testing and certification of projects both from the perspective of energy efficiency and green programs.
developer.

If verification and payment covers the entire project submittal or the portion being submitted finals the project’s verification the project can be considered closed. Before a final payment is made the project’s records are reviewed to ensure that all buildings have been accounted for and paid. This prevents under or over payment. Once this review has been completed the final payment can be made, the project closed in the database and all other related documents filed.

3. Documentation

i. Program Data Tracking - A well managed program needs to ensure that all participation in the program is tracked. This is most easily accomplished through a database. The database should include all information regarding the participating project, the developer and any other parties that are engaged. It should track the field verification results and the payments made to the project. It should also database the project features and energy savings. Additionally, all documents for each application should be stored in a project folder.

ii. Program Participation Documents - Documentation requirements for program participation:
   a. Program Application.
   b. Energy efficiency documents.
   c. Electronic input files for energy analysis.
   d. Complete set of plans.
   e. Subdivision lot map for production home projects.
   f. Site plan with North arrow for custom homes.
   g. Copies of all tract maps for the project, either tentative or recorded.
   h. Construction sequencing or phasing documents.
   i. Detailed building construction schedule.
   j. Address list with lot numbers.
   k. Other program participation agreement as required.

4. Implementation - A successful program is managed on two levels, at a staff level and at a field level. Staff is responsible for program management, policy, review, analysis and recommendations, and processing. Field is responsible for developer and project identification, review and recommendations, and field verification.

   i. Program Management Qualifications and Responsibilities
      a. Manager - This individual has over sight for program and policy, budget review, and incentive approval.

   21 Electronic submission of documents and archiving should be considered to reduce paper and facilitate processing of documents.
b. Analyst - This individual is responsible for design assistance and plan review.
c. Processor - This individual is responsible for review of the project, database maintenance and incentive processing.

ii. Field
   a. Field Representative (Account Manager) - These individuals should be knowledgeable regarding the building industry and have or develop industry contacts. They should have a basis understanding of sustainable design, green building practices, and energy efficiency to present the program to the developer. The field representative is responsible for identifying potential project candidates, presenting recommendations to the developer, and ensures that the application process is successful.
   b. HERS Rater, Green Rater - Beyond performing the field verification components that are crucial to the program the rater serves key role as a building science consultant. As an expert in this area he should be utilized in the field to train and advise the trades on best practices in construction.

5. Training - Training programs should be developed to support not only the developers and their staff but also for the program management team, staff and field.
   i. Program Management Training - This training should focus on general management of the program. It should address processes and procedures of the program, how plan review is performed and how energy analyses are generated.
   ii. Program Training - This training should be targeted to the developer and his team on program requirements, processes and documentation.
   iii. Green Building Training
   iv. Design Charrettes
   v. Field Staff Training - This training should focus on program implementation from the field perspective and what they should be communicating to their developers, what their responsibilities are for the program, and train in a general level of sustainable design and energy efficiency.
   vi. Sales Agent Training - This training should target the sales agent and focus on the program benefits that the homebuyer would receive from their product.

6. Outreach
   i. Stakeholder Identification and Campaign - The term stakeholder refers to persons, groups, or organizations that must be taken into consideration during program develop and implementation. Stakeholder engagement is crucial to the success of a green building program and identification of the groups, their interactions and decision making potential is important. Also, it is important to
remember that not all stakeholders in a group will have the same priorities or concerns or even have a unified opinion. Elements to consider when stakeholder identification is being made:

a. Stakeholders should not be identified in a vacuum.
b. Identify individuals or groups and their interrelationships.
c. Identify individuals or groups that may have special needs to ensure they receive direct attention in the identification process. These special needs may need education or training.
d. Identify individuals or groups that may not fall within the traditional stakeholder categories.

ii. Participants
   a. Construction
   b. Marketing
   c. Sales
   d. Purchasing

iii. Related Trades

iv. Community

v. Homebuyer

vi. Government

vii. Utility regulating Agencies

viii. Utilities

7. Marketing Plan

i. Advertising Campaign - The basic essentials of marketing and advertising are defining your products or services and matching them up with customers who will benefit by using those products or services. In marketing an energy efficiency program for new construction the target market becomes broader and is driven by the group the program will be interacting with. Additionally, how a program is marketed is directly related to how it is implemented. Traditionally residential new construction programs were geared to the building industry. This is an industry that received much of its information about products through direct contact with a manufacturer’s representative and industry shows. This is the most effective means of generating program participation. To support this activity, advertisements that feature the programs key elements and contact methodologies should be placed in industry journals such as publications of the Canadian Home Builders’ Association.

ii. Presentations:
   a. Participant - A participant presentation is necessary to review the program requirements to multiple individuals. The presentation should detail the participation requirements and any timeframes, program elements and cases studies.
b. Industry - To stimulate interest in the program, presentations at industry events and conferences is essential. The presentation should detail the participation requirements and any timeframes, program elements and cases studies.

iii. Collateral Pieces - Supporting print or electronic materials allow the participant to have some documentation that further informs regarding the program. Pieces could include, application, program brochure that details participation requirements, timeframe, program elements, case studies, etc. A brief handout sheet, useful at industry events to quickly inform and lead to next steps, should also be developed.

8. Reporting and Tracking - Program management needs to be aware of the program status on a regular basis. This can be on a weekly, monthly or quarterly basis with an annual and program cycle report cumulating. The report(s) should detail the following areas:

   i. Budget status. The expenditures in administration and marketing in additional to the incentive commitment and payment to date.

   ii. Goal status. The report should detail the program energy savings goals (greenhouse gas reductions), the commitment to date as a percentage of that goal and the actual installations as a percentage of commitment and goal.

   iii. Market saturation. The report should detail the program saturation in market segments. This is useful to determine how the program is performing in the market and the success rate in a segment.

9. Polices

   i. Participation Requirements - The participation requirements should detail:
      a. Timeframe of the program
      b. Requirements
      c. Documents
      d. Incentives

   ii. Eligible Product
      It is important to clearly define the product that is eligible for participation in the program and that the definition is current with the language used in the industry. For example:

      a. The program is open to all residential new construction that receives electric distribution and/or natural gas distribution service from Program Management.

      b. Qualifying single family homes must be detached dwellings or two dwelling buildings (duplex) of any number of stories, and on a utility residential rate schedule. Structures that are detached from the primary
residence that are residential living areas must also meet all program criteria but are not eligible for a separate incentive.

c. Multifamily construction can consist of condominiums, town homes (3 or more units) or a low rise apartment building (3 stories or less). Community facilities qualify only if they contain at least one dwelling unit and that unit must be included in the project submittal.

d. For multifamily residential new construction projects that do not fall into any of these described categories, program participation is at program management’s sole discretion and may be considered on a case by case basis.

e. The following facilities do not qualify: remodels, additions, manufactured housing, mobile homes, residential care facilities and dormitories, hotels, and motels.

10. Project Viability

Funding for projects can be significant and can also be encumbered for a long period of time, often many years as the project moves through development. To prevent incentive funds being encumbered and lost if construction does not proceed, a project viability clause should be incorporated into the application. Example language would be:

To afford an even distribution of funds for projects, applicants for the program may be required to demonstrate the viability of the project for which they are applying. Following the approval of the applications and within a three month period, the developer may be asked to supply documents that reflect a commitment to timely construction. The following documents may be required:

i. Grading Permit

ii. Building Permit

iii. Approved Construction Schedule from the governing entity

iv. Financing documentation

v. Other documentation as required

If, after review of these documents, program management determines that the project is not progressing, program management reserves the right to cancel this agreement. If these documents are not available the applicant must demonstrate that the project is in the process of obtaining construction permits. If the agreement is cancelled, the applicant may reapply at a later date. Applications will be accepted and incentives will be committed based upon the funds available at the time of reapplication.

11. Communications - It is important to ensure that project status is communicated to the developer and related program participants. For example the following communications should occur:

i. Application received and processing timeframe.
ii. Application approval that details number of lots/buildings and incentive amount.

iii. Application updated changes.

iv. Incentive payment report that details the lots/buildings included in the payment.

v. Final payment report.

vi. Additionally cancellation communications or program change communications should also be created.

12. Documentation Retention - A documentation retention policy should be developed. Due to the nature of these types of programs, a significant amount of documentation can be generated, especially if field verifications documents are only available in paper format. Additionally, the nature of architectural plans can create an impact on storage.

13. Accountability

i. Program Management Responsibilities - It is program management’s responsibility to communicate to the participant any changes in the program funding or participation requirements that would impact construction of the project.

ii. Participant Responsibilities - It is the participant’s responsibility to supply to program management field verification results in a timely manner, ideally following the completion of a phase of construction. The participant should also keep program management aware of any changes in construction that would impact the calculation of the incentive. The participant should notify each of their contractors and subcontractors of any special construction requirements that have been agreed upon.

Examples of Best Practices

Austin Energy Green Building™

The Austin green building program is an outgrowth of the Energy Star® Homes Program that the city of Austin, Texas and Austin Energy initiated in 1985. The program was expanded in 1990 to become the first residential green building rating system and became the basis for the Austin Energy Green Building™ Program. Homes are rated in six areas: energy efficiency, water efficiency, materials efficiency, health and safety, and community. The program now addresses commercial and residential, both single and multiple family dwellings.

Austin Energy Green Building™ promotes green building through education and marketing. Building professionals work with the organization to identify the goals for the project. Builders participate in the program by having their projects rated. The rating system is similar to the United States Green Building Council’s LEED® programs. There are no incentives offered.
The elements that are specific to energy are proper construction of the thermal envelope, proper sizing and installation of the HVAC system with a minimum SEER of 14.0. A minimum of 75% of all lamps/bulbs must be Energy Star® compliant.

Following conditional approval for participation the program requires third party inspection at rough and final and documentation of those elements that are not verified by inspection, such as shower-head flow rate.

Austin provides a significant amount of support for participation in the program. The forms and guides are detailed and the Sustainable Building Sourcebook has additional resources for materials, strategies and practices. Free seminars are offered monthly on building topics. Their Green by Design workshop is tailored to the custom home owner to assist in understanding the green program. The program is administered by the utility.

The utility also offers a consulting service to other cities and utilities to assist in the development of green building programs. Manage it Green offers construction and operation guidelines, educational material, a green-rating system and marketing plans. Clients of the consulting service include Pacific Gas & Electric, Memphis Light, Gas and Water, and the United States Green Building Council.

**Built Green™ Colorado**

Built Green™ Colorado was introduced in 1995 and is also one of the earliest green home building programs. It is a program of the Home Builders Association of metropolitan Denver bur offered to builders throughout the state. The program utilizes a check list of more than 180 features in 22 categories with 8 prerequisites. The categories cover energy efficiency, material, health and safety and resource conservation.

There are four different options to meeting the minimum energy efficiency requirement of which one is meeting Energy Star® criteria either by the Prescriptive or Performance paths. The other options utilize either the RESNET rating or meeting the 2005 Federal Residential Energy Efficiency Tax Credit.

The program does not offer any incentives and is self certifying but does have quality control that five per cent of all homes registered are inspected on a random basis by a rater. The program also provides technical support and training. There is a fee for registering each home.
PROGRAM DELIVERY AND MARKETING TACTICS

Approach

Navigant Consulting assessed the relative impact of various delivery / marketing tactics (e.g. Point of Purchase marketing, program website, home builder staff) on gaining participation in the ESNH program.

Our review of the effectiveness of program delivery and marketing tactics is based on an analysis of responses from the participant and non-participant home buyer survey and the participant and non-participant home builder surveys. Navigant Consulting used this information to offer insights into why home builders and home buyers who had the opportunity to participate in the ESNH program chose not to, as well what might have made the ESNH program more appealing to non-participants.

Key Findings

- **Awareness of the ESNH remains low amongst homebuyers.** Just over 60% of the homebuyers who purchased an Energy Star® Qualified home and 40% of homebuyers who purchased a non-Energy Star® Qualified home were familiar with the ESNH Program.

- **Home builders and their display homes were central in promoting the program.** Almost 60% of ESNH participants learned about the program through the home builder or model display home and just under half the respondents recall seeing marketing or promotions for the program, most notably at the builder’s site or display home.

- **Program marketing and promotional materials had little to no effect for most Energy Star® homebuyers.** 8 out of 10 participants surveyed indicated that the marketing or promotions were “not very influential” or “not at all influential” on their decision to enquire about Energy Star® Qualified homes.

- **Most non-ESNH home buyers were not given the option of purchasing an Energy Star® Qualified home.** Less than 10% of non-Energy Star® home buyers recall being presented with an option to purchase an Energy Star® Qualified home.
Participant Survey: Program Awareness and Marketing Effects

Key Findings (Energy Star® Home Buyers):

<table>
<thead>
<tr>
<th>Survey Issue</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of ESNH Program</td>
<td>61% aware</td>
</tr>
<tr>
<td>Top sources of awareness</td>
<td>Homebuilders/ Model Home Display: 59%</td>
</tr>
<tr>
<td></td>
<td>Internet / Own research: 13%</td>
</tr>
<tr>
<td>Recall seeing marketing or promotions</td>
<td>48%</td>
</tr>
<tr>
<td>Location of marketing or promotions</td>
<td>Homebuilders/ Model Home Display: 38%</td>
</tr>
<tr>
<td>Responses indicating marketing or promotions were “not very influential” or</td>
<td>81%</td>
</tr>
<tr>
<td>“not at all influential” in decision to look further into Energy Star® homes</td>
<td></td>
</tr>
</tbody>
</table>

Although all 54 respondents indicated they purchased an Energy Star® Qualified home, only 61% stated they were aware of the ESNH Program. This is likely due to the fact that:

- Some respondents may have purchased their home up to three years ago and may not remember the program;
- The homeowner may have purchased their Energy Star® Qualified home without knowing it was part of a larger program; or
- The surveyed individual was not the most knowledgeable person in the home about the purchase of the Energy Star® Qualified home.
Of the 33 respondents who were aware of the program, almost 60% of indicated that the Home Builder/Model Home display was the main source for learning about the program, followed by 13% who researched it on their own, most notably from the internet. Similarly, roughly half the respondents recall seeing marketing or advertisements promoting the ESNH Program, with 38% indicating they recall seeing it at the home builder’s site/model home.

Figure 20: Where did you recall seeing marketing and promotions for the program (Participants)?

In terms of the effectiveness of the marketing and promotional material, 81% of the surveyed respondents indicated that the marketing or promotional materials were “not very influential” or “not at all influential” in their decision to look into Energy Star® Qualified homes further.
Key Findings (Non-Energy Star® Home Buyers):

<table>
<thead>
<tr>
<th>Survey Issue</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of ESNH Program</td>
<td>40% aware</td>
</tr>
<tr>
<td>Top sources of awareness</td>
<td>Newspaper: 33%</td>
</tr>
<tr>
<td></td>
<td>Homebuilders/ Model Home Display: 22%</td>
</tr>
<tr>
<td>Recall seeing marketing or promotions</td>
<td>53%</td>
</tr>
<tr>
<td>Location of marketing or promotions</td>
<td>Newspaper: 36%</td>
</tr>
<tr>
<td></td>
<td>Homebuilders/ Model Home Display: 25%</td>
</tr>
<tr>
<td>Percentage of Home buyers who were presented the option to purchase an Energy Star® Qualified home by home builder or sales team</td>
<td>8%</td>
</tr>
<tr>
<td>Average influence rating (out of 7) of potential incentive programs that might may have increased the likelihood of purchasing an Energy Star® Qualified home.</td>
<td>Reduced cost difference in homes: 5.6</td>
</tr>
<tr>
<td></td>
<td>Incentives for energy efficient upgrades: 5.3</td>
</tr>
<tr>
<td></td>
<td>Reduced mortgage rate financing: 5.2</td>
</tr>
</tbody>
</table>

Of the 72 survey respondents who recently purchased a non-Energy Star® Qualified Home, only 40% indicated they were aware of the ESNH program, with the newspaper being the main source of awareness at 33%, followed by the Home Builders/Model home displays, with 22%.

Figure 21: Where did you recall seeing marketing and promotions for the program? (Non-Participants)
Only 8% of the surveyed homeowners recall being presented with the option of purchasing an Energy Star® Qualified home by the home builder or Sales team. Unfortunately, due to this low response rate, a meaningful explanation as to why they did not purchase an Energy Star® Qualified home and the persuasiveness of the sales tactics used by home builders or their sales teams in encouraging the purchase of Energy Star® Qualified homes, is not possible.

Not surprisingly, home owners stated that a reduced cost differential between a non-ESNH home and an Energy Star® Qualified home would have had the greatest influence in their likelihood of purchasing an Energy Star® Qualified, with an average rating of 5.6 out of 7. Incentives for energy efficient upgrades and reduced mortgage rate financing would also have increased their interest in Energy Star® homes, with an average rating of 5.3 and 5.2, respectively.

**Energy Star® Qualified Home Builders**

As previously mentioned, the top three avenues through which home builders became aware of the ESNSH program were as follows:

- Home Builders Association;
- Other builders; and
- Through their own research.

In terms of the effectiveness of Point-of-Sales (POS) displays and sales “tool kits”, all but one participant home builder recalled receiving marketing or promotional materials for the program, with the brochures and posters being the most memorable materials. Overall, builders were satisfied with the materials provided, however some builders have their own “in-house” materials and only used the Energy Star® logo for marketing purposes. Furthermore, all of the builders stated that they regularly note their participation in the Energy Star® for New Homes program in the advertising material they produce in order to promote the quality of their homes and for brand name recognition purposes.

With regards to EnerQuality’s role in promoting the program, a number of builders mentioned that EnerQuality has done an excellent job selling the program to the building community by communicating the potential benefits of participation and the competitive advantage confers on participant companies.
RELATIVE IMPACT OF EXTERNAL FACTORS ON
PROGRAM PARTICIPATION

Approach

Participant and non-participant survey results from both home buyers and home builders were used to determine the impact of external factors which may have motivated or influenced their participation in the program e.g., environmental benefits, financial benefit, etc such as other conservation initiatives sponsored by the OPA (e.g., Every Kilowatt Counts Program, Cool Savings Program, etc.) or specific attitudinal behaviours which may have prompted participation in the ESNH program.

Our analysis specifically considered whether any other factors besides those included in the program motivated the purchase decision of an ESNH qualified home?

Key Findings

Results have been reported in Home Buyer Survey - Motivations for Measure Selection & Builder Influences and Analysis of Gross and Net Energy and Peak Demand Savings sections. Please refer back to said sections of this report for the key findings.

Spillover

Spillover results have been reported in the Analysis of Gross and Net Energy and Peak Demand Savings section. Please refer back to said section of this report for more information.


**Stakeholder Training Review**

**Approach**

Navigant Consulting reviewed and compare all training materials and initiatives provided to new build market actors from EnerQuality against industry best practices. Home builders and their sales staff’s perception and satisfaction of the training sessions were addressed in the home builder survey, in addition to their opinion on the relevance and applicability of the training curriculum for its intended purposes. Navigant Consulting also identified and reached out to other market actors who attended the training sessions in order to relay their comments and feedback on the sessions. Finally, recommendations as to how training sessions and materials might be improved were prepared.

**Key Findings**

- **EnerQuality conducted 51 ESNH related courses in FY 2008, with over 1,000 participants.**

  Table 17: EnerQuality training activity, FY 2008

<table>
<thead>
<tr>
<th>FY 2008</th>
<th>ESNH Sales</th>
<th>ESNH Builder</th>
<th>Evaluator</th>
<th>Trades</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses</td>
<td>16</td>
<td>31</td>
<td>4</td>
<td></td>
<td>51</td>
</tr>
<tr>
<td>Participants</td>
<td>360</td>
<td>605</td>
<td>40</td>
<td></td>
<td>1,005</td>
</tr>
</tbody>
</table>

- **The Builder and Sales training course materials appear robust and in-line with leading industry materials** – Developed by seasoned professionals in the field of Energy Efficiency, the training courses developed by EnerQuality and their corresponding materials are well developed and thorough. It should be noted that the more experienced Evaluators with whom Navigant Consulting consulted noted that many of the individuals taking the courses – particularly the Evaluator Training course, appeared to have very limited knowledge of the construction industry or building practices in general. This could be a concern if said individuals are involved with the ESNH certification process.

- **Overall satisfaction with training activities is high.** Home builders were relatively satisfied with the training activities, with builders reporting an average of 5.3 out of 7 for both the usefulness and completeness of the training curriculum, and 5.5 out of 7 for the overall relevance of the training curriculum. However, builders outside of the Greater Toronto Area were dissatisfied that most of the training activities were held in Toronto.

- **Effectiveness of outreach and training efforts performed by ESNH.**
i. **Home builder’s Workshop** - Only a few builders believed the training they received from the home builder’s workshop has lead to a better understanding of construction practices required for Energy Star® homes than otherwise would have been the case without the training. Most builders stated that their construction staff were already well aware of the techniques and approaches covered in the workshop since many have previously worked with some of the workshop facilitators (e.g., Gordon Cooke).

ii. **Technical Sales Workshop** - All of the builders who participated in the technical sales workshop agreed that the training they received has increased their knowledge and experience with Energy Star® homes enabling them to better respond to home buyers questions and demands than otherwise would have been the case without the training. A few builders commented how this workshop enabled their sales teams to be comfortable using specific energy efficient terms and better understand the energy saving measures and technologies they are offering to potential home buyers.

- **Effectiveness of Point-of-Sales (POS) displays and sales “tool kit”**. All but one builder recalled receiving marketing or promotional materials for the program, with the brochures and posters being the most notable materials. Overall, builders were satisfied with the provided material, however some builders have their own “in-house” material and used only the Energy Star® logo for marketing purposes. Furthermore, all of the builders stated that regularly note their participation in the Energy Star® for New Homes program in the advertising material they produce in order to promote the quality of their homes and for brand name recognition.

- **Key Recommendation - Strengthen the curriculum of the home builder workshops**. A number of the builders suggested that the builder workshop should be more “hands on” by focusing more on the technical details of the construction and less on the administrative requirements of the program. Having the workshops led by field experts and those currently building Energy Star® qualified homes would add value to the workshops and enable builders to gain more knowledge on progressive building practices. One home builder also suggested having separate workshops for “new builders” and “seasoned builders”, allowing the workshops to be tailored to meet the builders specific needs and experience level.
NRCan Compliance Review

Approach

Navigant Consulting worked closely with the OPA and EnerQuality to gather necessary documents to verify compliance with the minimum NRCan requirements for Energy Star® qualified homes. Navigant Consulting reviewed the evaluation practices of the ESNH program against industry best practices and made recommendations for program enhancements.

Key Findings

- In general, the Energy Star® for New Homes Program is in compliance with NRCan’s technical specifications, however not all qualified homes receive an Energuide for New Houses (EGNH) rating of 80 or higher. EnerQuality reports that the average rating of all their qualified homes was determined to be 80, however some of the larger homes were slightly below the requirements (EGNH rating of 78), while smaller homes achieved a EGNH rating of 82.

- There appears to be no formalized structure or timeframe for the development of revised Technical Specifications which has, in turn, contributed to delays in the development and roll-out of V4 and corresponding frustration in the ESNH enrolled builder community.

Natural Resource Canada’s Technical Specifications

Compliance Review

Natural Resources Canada’s (NRCan) specified the following minimum technical specifications for all Energy Star® Qualified New Homes effective April, 2007.

1. When Energy Star® technical specifications exist in Canada for any given product that is installed in the house at the time of sale including appliances, windows, and the installed space heating and space cooling equipment (examples: forced air furnaces, central air conditioners, thermostats), the product must be Energy Star® qualified.

   Note: Based on the NCI’s review, the ESNH program delivered by EnerQuality appears to be in compliance with this stipulation.

2. Obtain an approximate EnerGuide for New Houses (EGNH) rating of 80 or higher.

   Note: Based on communications with EnerQuality, it is not a requirement for each Energy Star® Qualified home to achieve an EnerGuide for new Houses (EGNH) rating of 80 or higher, but instead, achieve an average rating of 80 across all homes labeled under the program.

EnerQuality report that they have preformed an “audit” on a random sample of qualified homes and determined that the average rating of all the qualified homes is 80, however some of the larger homes are slightly below the requirements (EGNH rating of 78), while some smaller homes achieve an EGNH rating of 82. Unfortunately, the EGNH ratings on the BOP forms were not completed and therefore, the specific EGNH rating of each qualified home can not be assessed independently by Navigant Consulting.

3. A house file for each house that is Energy Star® labeled must be submitted to NRCan’s EGNH database as described in the Energy Star® File Submission Protocol dated January 26, 2006.

Note: Navigant Consulting can confirm that house files completed by Certified Evaluators are gathered by EnerQuality and then submitted to NRCan for final review. However, as discussed in Table 1, EnerQuality only provided Navigant Consulting with a summary of 3,598 house files where as a total of 5,640 homes have been labeled in the program. The difference of 2,042 house files cannot be confirmed by Navigant Consulting.

4. The builder must hold a valid Energy Star® Builder Participant Administrative Arrangement with NRCan, be active in NRCan’s EGNH database, and be trained and certified by EnerQuality Corporation to build Energy Star® Qualified New Homes.

Note: Based on the NCI’s review, all ESNH participant home builders meet the certification terms outlined in the Energy Star® for New Homes Administrative Procedure Manual to be registered in the program. It should be noted however that EnerQuality is currently reviewing the training requirements and reserves the right to scale back or discontinue training related to the ESNH program in order to remain competitive with other ESNH program providers in Ontario.

5. The rater must hold a valid Energy Star® Participant Administrative Arrangement – General version with NRCan, be active in NRCan’s EGNH database, and be trained and certified by EnerQuality Corporation to evaluate and certify Energy Star® Qualified New Homes.

Note: Based on NCI’s review, all Certified Energy Evaluators registered in the program, meet the certification terms outlined in the Energy Star® for New Homes Administrative Procedure Manual. It should be noted however that there appears to be a significant gap in terms of the experience and associated qualifications of enrolled evaluators – with some only completing the 3 day EnerQuality organized training seminar and others with decades of experience in the home building and energy efficiency sector.
Development/Revision of ESNH Technical Specifications

As previously noted, home builders have been frustrated with the delay in issuance of the new technical specifications for version 4.0. However, it appears that EnerQuality is also frustrated and reports that there is less structure around the development of technical specifications than they would like. A work-back schedule outlining the timing of the development of the technical specifications for version 4.0 has been provided by EnerQuality to Navigant Consulting and is shown in Figure 22.

Figure 22: Example of the ESNH Technical specification version 4.0 development schedule

<table>
<thead>
<tr>
<th>Task #</th>
<th>Task</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 7</th>
<th>Week 8</th>
<th>Week 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NRCan provides EQ with protocol and 10 complete house files</td>
<td>Sep 1 - 5</td>
<td>Sep 8 - 12</td>
<td>Sep 15 - 19</td>
<td>Sep 22 - 26</td>
<td>Sep 29 - Oct 3</td>
<td>Oct 6 - 18</td>
<td>Oct 13 - 17</td>
<td>Oct 20 - 24</td>
<td>Oct 27 - 31</td>
</tr>
<tr>
<td>2</td>
<td>EQ provides NRCan with analysis of 10 house files, revised BOPs and screens</td>
<td>5-Sep</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17-Oct</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NRCan provides feedback and/or approval for V4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24-Oct</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>EQ finalizes v4 for release Nov 108</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31-Oct</td>
<td></td>
</tr>
</tbody>
</table>

This document illustrates the rather long lead time and somewhat limited structure around development of the technical specifications. Therefore, much of the delay in issuing the new version 4.0 technical specifications can be attributed to a lack of structure in NRCan’s development process rather than inefficiencies on the part of EnerQuality. More transparency around timing, expectations, guidelines and deadlines would be to the benefit of NRCan, EnerQuality and the builder community as revised Technical Specifications are developed in the future.
APPENDIX A – ADDITIONAL PIA SHEETS

Insert refined PIAs – Energy Star® Window Upgrades and Duct Sealing.

Duct Sealing

<table>
<thead>
<tr>
<th>Revision #</th>
<th>Description/Comment</th>
<th>Date Revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>New residential gas heated homes</td>
<td>01/10/2008 9:24 AM</td>
</tr>
</tbody>
</table>

Efficient Equipment and Technologies Description
Foil tape used to seal ducts for forced hot air furnaces.

Base Equipment and Technologies Description
Leaky and unsealed residential air ducts.

Codes, Standards, and Regulations
N/A

<table>
<thead>
<tr>
<th>Decision Type</th>
<th>Target Market(s)</th>
<th>Load Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>New Construction - Residential</td>
<td>OPA Res Space Heating SF and OPA Res Space Cooling - Central</td>
</tr>
</tbody>
</table>

Resource Savings Table for Homes Using Electricity

<table>
<thead>
<tr>
<th>Year (EUL= )</th>
<th>Electricity</th>
<th>Natural Gas</th>
<th>Water</th>
<th>Equipment &amp; O&amp;M Costs of Conservation Measure ($)</th>
<th>Equipment &amp; O&amp;M Costs of Base Measure ($)</th>
<th>Peak Demand Savings</th>
<th>Summer Capacity</th>
<th>Winter Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(kWh)</td>
<td>(m³)</td>
<td>(L)</td>
<td></td>
<td></td>
<td>(kW)</td>
<td>(kW)</td>
<td>(kW)</td>
</tr>
<tr>
<td>1</td>
<td>49.4</td>
<td>92.4</td>
<td>0</td>
<td>90</td>
<td>0</td>
<td>0.014</td>
<td>0.011</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>49.4</td>
<td>92.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.014</td>
<td>0.011</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>49.4</td>
<td>92.4</td>
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</table>
Resource Savings Assumptions

Annual Electricity Savings

- Average saving for duct sealing is 5%\(^{22}\).
- Annual space heating and space cooling consumption for furnace fan based on Canadian Centre for Housing Technologies study\(^{23}\).

<table>
<thead>
<tr>
<th>Space Heating Only</th>
<th>Annual Furnace Fan Consumption</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous Fan Use (kWh/year)</td>
<td>Intermittent Fan Usage (kWh/year)</td>
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<tr>
<td>PSC</td>
<td>2,008</td>
<td>515</td>
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<tr>
<td>ECM</td>
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<td>308</td>
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<table>
<thead>
<tr>
<th>Space Heating and Cooling</th>
<th>Annual Furnace Fan Consumption</th>
<th>Savings</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Continuous Fan Use (kWh/year)</td>
<td>Intermittent Fan Usage (kWh/year)</td>
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<tr>
<td>PSC</td>
<td>3,545</td>
<td>935</td>
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<tr>
<td>ECM</td>
<td>908</td>
<td>679</td>
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</table>

- Continuous fan usage and intermittent fan usage is estimated to be 26% and 69%, respectively, based on 2008 customer survey results\(^{24}\).
- ECM penetration is estimated to be 62% based on analysis of Builder Option Package house files.
- Average Savings for typical home with space heating only (based on fan usage and ECM penetration) = 29.4 kWh/year.
- Average Savings for typical home with space heating and cooling (based on furnace fan usage and ECM penetration) = 56.4 kWh/year.
- The penetration rate (R) for central air conditioning systems in Ontario is assumed to be 74%\(^{25}\).
- Typical Ontario home savings = Savings space heating and cooling x (R) + Savings space heating only (1-R).
  - 56.4 x 74% + 29.4 x (100%-74%) = 49.37


\(^{23}\) Canadian Centre for Housing Technologies, "Final Report on the Effects of ECM Furnace Motors on Electricity and Gas Use: Results from the CCHT Research Facility and Projections", NRCC-38500, August 2003


Peak Demand Savings

The average peak demand savings was calculated using the OPA end use load shapes (OPA Res Furnace Fan) and the OPA’s average peak demand savings methodology and coincident factors\(^{26}\) to be 0.014 in the winter and 0.011 in the summer.

Other Resource Savings

- Average new home space heating consumes 1,750 m\(^3\)/year (with ECM) and 1,909 m\(^3\)/year with PSC motor in natural gas based on Canadian Centre for Housing Technologies study\(^{27}\).
- Using the 5% savings estimate based on Efficiency Vermont and ECM penetration, typical Ontario home natural gas savings is 92.4 m\(^3\)/year.

Other Input Assumptions

**Effective Useful Life (EUL)**

The EUL is reported to be 15 years according to Efficiency Vermont\(^{28}\).

**Base & Conservation Measure Equipment and O&M Costs**

The incremental cost is estimated to be $90 based on home builder interviews.

Measure Assumptions Used by Other Jurisdictions

<table>
<thead>
<tr>
<th>Source</th>
<th>Annual Electricity Savings (kWh)</th>
<th>On-Peak Demand Reduction</th>
<th>Effective Useful Life (yrs)</th>
<th>Incremental Cost ($)</th>
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</thead>
<tbody>
<tr>
<td>Efficiency Vermont Technical Reference Manual(^{29})</td>
<td>91 - 553</td>
<td>N/A</td>
<td>N/A</td>
<td>15</td>
</tr>
</tbody>
</table>

Comments:

Savings from duct sealing is estimated to be 5%, based on annual gas usage of 1,000 therms and 375 CAC hours.

---

\(^{26}\)Ontario Power Authority, OPA Measures and Assumptions List, Appendix A: Average Peak Demand Savings Methodology and Coincident Factors, February 2008.

\(^{27}\)Canadian Centre for Housing Technologies, “Final Report on the Effects of ECM Furnace Motors on Electricity and Gas Use: Results from the CCHT Research Facility and Projections”, NRCC-38500, August 2003


\(^{29}\)Ibid.
## Energy Star® Windows

<table>
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<th>Revision #</th>
<th>Description/Comment</th>
<th>Date Revised</th>
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<tr>
<td>1</td>
<td>New residential natural gas heated homes</td>
<td>01/10/2008 9:24 AM</td>
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### Efficient Equipment and Technologies Description

Energy Star® Low Emulsion coated glazing with argon gas injection, insulated spacers (U=0.27).

### Base Equipment and Technologies Description

Energy Star® low Emulsion coated glazing with argon gas injection, wood/vinyl (U=0.37).

### Codes, Standards, and Regulations

Minimum ENERGY STAR® requirements to qualify for their energy efficiency are based on their either a U-value or Energy Rating (ER) for each of the four Canadian zones.30

<table>
<thead>
<tr>
<th>Zone</th>
<th>Maximum U-values and Minimum R-Values</th>
<th>Minimum Energy Rating (ER) Values (Maximum U-value 2.00 W/m²·K)</th>
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<tr>
<td></td>
<td>U-value (W/m²·K)</td>
<td>U-value (Btu/h·ft²·°F)</td>
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<tr>
<td>B</td>
<td>1.8</td>
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<tr>
<td>C</td>
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<tr>
<td>D</td>
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### Decision Type, Target Market(s), Load Type

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<th>Decision Type</th>
<th>Target Market(s)</th>
<th>Load Type</th>
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<tr>
<td>New</td>
<td>New Construction - Residential</td>
<td>OPA Res Space Cooling - Central</td>
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</table>

Resource Savings Table for Homes Using Electricity

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<thead>
<tr>
<th>Year (EUL=)</th>
<th>Electricity (kWh)</th>
<th>Natural Gas (m³)</th>
<th>Water (L)</th>
<th>Equipment &amp; O&amp;M Costs of Conservation Measure ($)</th>
<th>Equipment &amp; O&amp;M Costs of Base Measure ($)</th>
<th>Peak Demand Savings Summer Capacity (kW)</th>
<th>Peak Demand Savings Winter Capacity (kW)</th>
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<tbody>
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<td>107</td>
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<tr>
<td><strong>TOTALS</strong></td>
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<td><strong>0.094</strong></td>
<td><strong>0.000</strong></td>
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Resource Savings Assumptions

**Annual Electricity Savings**

Electricity savings based on REFREN 5.0 modeling using the following assumptions: new construction 2,000 ft² 2-storey residential home, with a gas furnace, central air conditioner, 300 ft² in windows (15% floor area) and Rochester NY weather.

**Peak Demand Savings**

The average peak demand savings was calculated using the OPA end use load shapes (OPA Res Space cooling) and the OPA’s average peak demand savings methodology and coincident factors\(^{31}\) to be 0.0 in the winter and 0.094 in the summer.

**Other Resource Savings**

Using RESFEN, the annual natural gas savings was determined to be 107 m³/year.

---

\(^{31}\) Ontario Power Authority, OPA Measures and Assumptions List, Appendix A: Average Peak Demand Savings Methodology and Coincident Factors, February 2008.
Other Input Assumptions

**Effective Useful Life (EUL)**
The EUL is reported to be 25 years based on The New England State Program Working Group (SPWG)\(^{32}\), and 20 years based on NYSERDA\(^{33}\). Navigant Consulting is assuming 20 years.

**Base & Conservation Measure Equipment and O&M Costs**
The incremental cost is estimated to be $200 based on home builder interviews.

Measure Assumptions Used by Other Jurisdictions

<table>
<thead>
<tr>
<th>Source</th>
<th>Annual Electricity Savings (kWh)</th>
<th>On-Peak Demand Reduction</th>
<th>Effective Useful Life (yrs)</th>
<th>Incremental Cost ($)</th>
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</tbody>
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\(^{33}\) NYSERDA, New York Energy Smart Programs, Deemed Savings Database, August 2006
See following pages.
Energy Star® for New Homes Program –
Participant Home Buyer Survey

INTRODUCTION
Create a custom code for each possible energy saving measure that could have been installed in an Energy Star® qualified home. (e.g. – WINDOWS for Energy Star® Windows, etc…) along with the COST of each measure (supplied by Navigant Consulting)

SECTION 1: SCREENER
Good morning/afternoon/evening.

[IF CONTACT NAME IS AVAILABLE] May I please speak with [INSERT NAME]?

[IF CONTACT NAME IS UNAVAILABLE] I’d like to speak with the person most knowledgeable about the details of your recently constructed home. Would that be you?

[IF NO / REFUSED] Could I please speak with the person that is most knowledgeable about the details of your recently constructed home?

[If appropriate person is not available, schedule call-back]

[ONCE APPROPRIATE PERSON IS ON THE PHONE] My name is______. I’m calling from Harris/Decima, a public opinion and marketing research firm, on behalf of the Ontario Power Authority. Our firm has been commissioned to conduct an important survey. The information you provide will help the Ontario Power Authority to evaluate the effectiveness of the Energy Star® for New Homes Program and improve services to residential customers like you.

Please, be assured that we are not selling anything. Your participation in the study will in no way result in sales or solicitation calls.

PARTICIPANT SCREENING QUESTIONS
1. Have you purchased a newly constructed home during the period of April 1, 2007 and March 31, 2008?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

[IF NO – THANK AND TERMINATE]

2. Did you purchase an Energy Star® Certified home? [Note, an Energy Star® qualified home is a home that has been built by a licensed Energy Star® builder and incorporates energy efficient features into the home so that it can meet the Energy Star® technical specifications which is approximately 30 percent more energy efficient then those built to minimum code levels.]
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

[IF YES – PROCEED WITH PARTICIPANT HOME BUYER SURVEY, IF NO OR DON’T KNOW– PROCEED WITH NON-PARTICIPANT HOME BUYER SURVEY]

PROGRAM AWARENESS
3. Are you familiar with the Energy Star® for New Homes Program?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

4. [If Yes] How did you first become aware of the Energy Star® for New Homes Program?
   [OPEN END, DO NOT READ]
   1. Newspaper
   2. Radio
   3. TV
   4. Internet/own research
   5. Home builder/Model home display
   6. Realtor
   7. Friend, relative, word of mouth
   8. Utility bill insert
   9. Announcement by public official
   10. School, church, community group
   11. Other (please specify) _______________________
   88 Refused
   99 Don’t know

5. Do you recall the energy savings measures that were added to your home to reach the electrical savings requirements for certification? [IF NECESSARY “Possible energy saving measures may have
included Energy Star® qualified windows, increased insulation, high efficiency furnace, Energy Star® central air conditioners, compact fluorescent light bulbs (CFLs), etc…”

6. [IF YES] Can you please specify the energy savings measures which were added to your home? [USE SPECIFIC Navigant Consulting SUPPLIED MEASURE CODES, IF CODE NOT AVAILABLE – IE NOT ON THE Navigant Consulting LIST, USE FULL MEASURE NAME]
   1. ________
   2. ________
   3. ________
   4. ________
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

7. [IF AWARE OF PROGRAM Q3=1] Do you recall seeing any marketing or advertisements promoting for the program?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

8. [IF YES] Please identify where you saw promotions for the program (select all that apply) [DO NOT READ]
   1. Newspaper
   2. Radio
   3. TV
   4. Internet
   5. Home builder/Model home display
   6. Utility bill insert
   7. Convention/conference
   8. Other (please specify)________________________
   88 Refused
   99 Don’t know

9. [IF RECALL SEEING PROMOTIONS – Q7=1] How influential were these promotions in your decision to look further into Energy Star® qualified homes?
   1. Very influential
   2. Somewhat influential
   3. Not very influential
   4. Not at all influential
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

MOTIVATIONS
10. Please rate the influence of each of the following factors had in your decision to purchase your home, where 1 means the factor had no influence at all and 7 means the factor had a large influence:

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
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<td>Size of Home</td>
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<td>Proximity to work/school</td>
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<td></td>
</tr>
<tr>
<td>Investment Opportunity</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</tr>
</tbody>
</table>

11. Please rate the influence of each of the following factors had in your decision to purchase an Energy Star® Qualified Home, where 1 means the factor had no influence at all and 7 means the factor had a large influence:

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Refused</th>
<th>D/K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Savings associated with energy saving measures</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental benefit associated with energy saving measures</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resale value of home with energy saving measures</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verification of Energy Star® certification by third party</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Were you planning on purchasing an Energy Star® qualified home when you first decided to buy a new home?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

13. [IF YES] – Why did you want an Energy Star® qualified home?
   a. __________________________________________________________
14. [IF ABLE TO RECALL WHICH ENERGY SAVING MEASURES THEN CONTINUE (Q4=1), ELSE SKIP] ASK THE FOLLOWING QUESTION FOR EACH ENERGY SAVING MEASURE THE BUILDER INSTALLED IN THEIR HOME] Let’s assume for a moment that your home builder did not include any energy savings measures installed in your home during its construction. Assuming you were able to freely choose your upgrades, how likely would you have been to request [INSERT MEASURE] and pay an additional [INSERT COST OF MEASURE] as a feature of your new home?

   1. Extremely likely
   2. Very likely
   3. Somewhat likely
   4. Not very likely
   5. Not at all likely
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

[REPEAT FOR EACH MEASURE INSTALLED, “HOW ABOUT FOR (MEASURE)”, ETC.]
[IF MEASURE NOT ON NAVIGANT CONSULTING SUPPLIED “MEASURE LIST”, OMIT “AND PAY AN ADDITIONAL $XXX” SINCE YOU DO NOT HAVE MEASURE COST”

15. Do you believe you paid more, less or about the same for this house because of the Energy Star® rating and if so, by approximately how much?

   1. I paid $_____ more
   2. I paid $_____ less
   3. I paid about the same
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

16. Did your home builder or sales staff encourage you to purchase an Energy Star® Qualified home?

   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

17. How influential was the home builder or sales team in your decision to buy your Energy Star® home?

   1. Very influential – I went with what was recommended to me
   2. Quite influential – I considered their recommendations and also did some independent research
   3. Not very influential – I did the research on my own
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

18. You stated earlier that your new home came with a package of installed energy saving measures which made your home eligible for the Energy Star® rating, did the home builder allow you to choose all, some or none of the energy savings measures that were installed as a part of this package? [DO NOT READ]

   1. I was able to choose all the installed energy saving measures
   2. I was able to choose some of the installed energy saving measures
3. I was able to choose none of the installed energy saving measures
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

19. [IF SOME] Which energy saving measures did the home builder allow you to choose? [USE CODES FROM Q6]
   a. _____
   b. _____
   c. _____
   d. _____
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

EXPECTED SAVINGS/ADDITIONAL SAVINGS
20. What type of home did you previously have?
   1. Single family detached house
   2. Single family semi-detached house
   3. Townhouse or row house
   4. Duplex, triplex, four-plex
   5. Condominium/apartment
   77 Other (please specify)________________
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

21. What was the approximate square footage of your previous home? Please include the basement in the estimate if it is a finished living space. [IF CLARIFICATION IS NEEDED - including kitchen, bedrooms, bathrooms, foyers, dens and hallway] [PROMPT IF NECESSARY]
   1. Less than 1000 sq ft
   2. 1001 to 1500 sq ft
   3. 1501 to 2000 sq ft
   4. 2001 to 2500 sq ft
   5. 2501 to 3000 sq ft
   6. 3001 to 3500 sq ft
   7. 3501 to 4000 sq ft
   8. more than 4000 sq ft
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

22. Did your last home have any of Energy Star® rated appliances, heating or ventilation equipment, lighting or energy saving technologies?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

23. [If yes] Which features did your previous home have? [PROMPT IF NECESSARY]

<table>
<thead>
<tr>
<th>Feature</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Star® Rated appliances (refrigerators, dishwashers, washing machines)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Energy Star® Rated furnace/air conditioner</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Energy Star® Rated Windows</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Energy Star® rated lighting (light fixtures, CFLs, ceiling fans)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Increased insulation in floors, walls, attics and foundations</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Programmable thermostat</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

24. Would you say your monthly electricity costs in your NEW home are much less, somewhat less, about the same, somewhat higher or much higher in comparison to your old home? [PROMPT IF NECESSARY]
1. Energy cost are much less
2. Energy cost are somewhat less
3. Energy costs are about same
4. Energy cost are somewhat higher
5. Energy costs are much higher
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

25. Thinking of this past summer, how much on average do you typically pay for your ELECTRICITY bill on a per month basis in your new home? Just to clarify, we are only asking about your monthly electricity (i.e. hydro bill) and not your total energy bill ($/month)
   1. On average, I paid $______ per month during the summer.
      88 Refused [DO NOT READ]
      99 Don’t know [DO NOT READ]

26. Is this amount higher, lower or about the same as what you expected (or were told) when you decided to build an Energy Star® home? [DO NOT READ]
   1. Higher than expected/was told
   2. Lower than expected/was told
   3. About the same as I expected/was told
   4. I wasn’t sure what to expect/wasn’t told an amount
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

27. Since you have moved into your new home, have you participated in other energy saving programs recently?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

28. [IF YES] And which energy savings programs have you participated in: [PROMPT IF NECESSARY]

[ROTATE]

<table>
<thead>
<tr>
<th>Program</th>
<th>Yes</th>
<th>No</th>
<th>Refused</th>
<th>D/K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every Kilowatt Counts coupon program offering rebates for compact fluorescent lights, outdoor solar lights, LED Christmas lights and other energy saving products</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Summer Savings or Summer Sweepstakes Programs</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Great Refrigerator Round-Up / fridge pick-up and recycling program</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Hot or Cool Savings Program</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Enbridge / Union Gas programmable thermostat program</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
29. Have you installed or added any new energy efficient appliances or features on your own since you have moved into your new home?
1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

30. [IF YES] More specifically, which energy efficient appliances or features did you install since you moved into your new home? [PROMPT IF NECESSARY]

<table>
<thead>
<tr>
<th>Installed Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed Energy Star® ceiling fan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a new Energy Star® Central Air Conditioner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed an energy efficient furnace with ECM motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed compact fluorescent lights (CFLs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed Energy Star® qualified light fixtures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a new Energy Star® dishwasher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a new Energy Star® clothes washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a new Energy Star® freezer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a new Energy Star® refrigerator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a new Energy Star® dehumidifier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a new Energy Star® room air conditioner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed Natural Gas range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed a programmable thermostat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed Natural gas clothes dryer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed Energy Star® rated home electronics (TV, DVD, phon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other: (Specify)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other: (Specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

31. (ASK IF AT LEAST ONE ITEM IS “YES”) Would you say that having participated in the Energy Star® Qualified Homes Program [IF PARTICIPATED IN OTHER OPA PROGRAMS – “or having participated in other conservation programs”] has influenced your decision to [ACTION] or would you have done so regardless of having participated in the program(s)? (REPEAT FOR EACH “YES” ITEM – “How about for [ACTION], etc.)

1. The Energy Star® program influenced my decision
2. The conservation program(s) influenced my decision
3. Both the Energy Star® and conservation program(s) influenced my decision
4. I would have done so regardless of having participated in the program(s)  
   88 Refused [DO NOT READ]  
   99 Don’t know [DO NOT READ]  

32. Have you changed your electricity consumption behaviour since you have moved into your new home?  
   1. Yes  
   2. No  
   88 Refused [DO NOT READ]  
   99 Don’t know [DO NOT READ]  

33. [IF YES] More specifically, what have you done differently? [PROMPT IF NECESSARY]  

<table>
<thead>
<tr>
<th>Action</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce power used for air conditioning (less usage, higher temperature setting)</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Improve efficiency of your home’s shell (added insulation, closed drapes during the day to block sun)</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Reduce water heater or dryer usage (cold water laundry, dried clothes outdoors on a rack, ran dishwasher only when full)</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Reduce usage of lights (turn off more frequently, dimmer/motion sensor)</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Reduce usage of home electronics (turn off more frequently, power strips)</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Disconnect or get rid of any appliances or electronics</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Other</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

34. (ASK IF AT LEAST ONE ITEM IS “YES”) Would you say that having participated in the Energy Star® Qualified Homes Program [IF PARTICIPATED IN OTHER OPA PROGRAMS – “or having participated in other conservation programs”] influenced your change in behaviour [ACTION] or would you have done so regardless of having participated in the program(s)? (REPEAT FOR EACH “YES” ITEM – “How about for (ACTION)”, etc.)  

1. The Energy Star® program influenced my decision  
2. The conservation program(s) influenced my decision  
3. Both the Energy Star® and conservation program(s) influenced my decision  
4. I would have done so regardless of having participated in the program(s)  
   88 Refused [DO NOT READ]  
   99 Don’t know [DO NOT READ]  

HOME BUYER SATISFACTION  

35. Please rate your overall satisfaction with your new Energy Star® Qualified home on a scale of 1 to 7, where 1 means you are very dissatisfied with your home and 7 means you are completely satisfied with your home.  

   1. ________ [RECORD NUMBER 1 to 7]  
   88 Refused [DO NOT READ]  
   99 Don’t know [DO NOT READ]  

36. [IF ANSWERED “YES” TO RECALLING INSTALLED MEASURES – Q5 = YES] Please rate your satisfaction with the energy saving measures included with the purchase of your new home, again
using a scale of 1 to 7, where 1 means you are very dissatisfied with the installed measures and 7 means you are completely satisfied with the installed measures?

1. [RECORD NUMBER 1 to 7]
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

37. [IF ANSWERED “YES” TO RECALLING INSTALLED MEASURES – Q5= YES] Which of the installed measures are you most satisfied with? [USE CODES]

1. 
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

38. Why are you most satisfied with this measure?

1. ________________________________
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

39. [IF ANSWERED “YES” TO RECALLING INSTALLED MEASURES – Q5 = YES] Which of the installed measures are you least satisfied with? [USE CODES]

1. 
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

40. Why are you least satisfied with this measure?

1. ________________________________
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

41. Were there any energy saving technologies that you would have liked to have been included in your construction package but was not available through your home builder?

1. Yes
2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

42. [IF YES] Which ones? [DO NOT READ] [INCLUDE CODE IF AVAILABLE ON Navigant Consulting LIST, IF NOT, USE FULL MEASURE NAME]

1. Solar hot water tank
2. Geothermal heat pump
3. Solar panels on roof
4. Wind turbines
5. Natural Gas appliances
6. Drain water Heat Recovery system
7. High Efficiency/Energy Star® Central Air Conditioner
8. High Efficiency furnace with ECM motor
9. Compact fluorescent lights (CFLs)
10. Energy Star® qualified light fixtures
11. Programmable thermostat
12. Energy Star® appliances (dishwasher, clothes washer, freezer, refrigerator, etc…)
13. Increased insulation
14. Other (Specify) ___
88 Refused
99 Don’t know

43. How many separate Home Builders did you consult with before you decided to buy your new home?
   1. __________ [RECORD NUMBER]
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

44. When considering the purchase of your new home, did you specifically look for a Home Builder that built Energy Star® Qualified homes?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

45. How did you find the Home Builder from whom you ultimately purchased your new home? [PROMPT IF NECESSARY]
   1. General internet search
   2. Recommendation from friend/relative/colleague
   3. Local listings directory
   4. EnerQuality website
   5. Driving in desired neighbourhoods
   6. Model homes
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

46. What was the name of the Builder from whom you ultimately purchased your new home?
   1. ______________ (SPECIFY NAME)
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

47. Does the location of your new home have a specific community name?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

48. [IF YES] What is the name of your community?
   1. ______________ (SPECIFY NAME)
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

49. On a scale of 1 to 7, please rate your satisfaction with your home builder on the following issues:
50. Do you feel that builders who are registered in the Energy Star® for New Homes program are often more credible in building Energy Efficient homes than say, builders who are not registered in the program?

1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

GENERAL INFORMATION AND DEMOGRAPHICS & ATTITUDES
51. Which of the following type of home do you currently live in?
   1. Single family detached house
   2. Single family semi-detached house
   3. Townhouse or row house
   4. Duplex, triplex, four-plex
   5. Condominium/apartment
   77 Other (please specify)________________
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

52. What is the approximate square footage of your home. Please include the basement in the estimate if it is a finished living space. [IF CLARIFICATION IS NEEDED - including kitchen, bedrooms, bathrooms, foyers, dens and hallway]
   1. Less than 1000 sq ft
   2. 1001 to 1500 sq ft
   3. 1501 to 2000 sq ft
   4. 2001 to 2500 sq ft
   5. 2501 to 3000 sq ft
   6. 3001 to 3500 sq ft
   7. 3501 to 4000 sq ft
   8. more than 4000 sq ft
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

53. Would you say you are very concerned, somewhat concerned, not very concerned or not at all concerned about each of the following issues:

READ AND ROTATE
   1. Very concerned
   2. Somewhat concerned
   3. Not very concerned
   4. Not at all concerned

   (1)  (2)  (3)  (4)  Refused  D/K
       (88)  (99)

   The environmental impacts of electricity generation

   The environmental impacts of electricity consumption by consumers

   The environmental impacts of electricity consumption by business and industry

54. Do you think that individual consumers such as yourself can definitely, likely, likely not or definitely not make an important contribution to reducing the overall reduction of electrical energy use in the province?
1. Definitely
2. Likely
3. Likely not
4. Definitely not
5. Depends [DO NOT READ]
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

55. Are you familiar with any standards or ratings currently in place that rate the energy efficiency of appliances? [OPEN END, DO NOT READ]
1. Energuide
2. Energy Star
3. Canadian Standards Association standards
4. Other (SPECIFY ________________)
88 Refused
99 Don’t know

56. Have you ever heard the term “conservation culture”?
1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

57. I’d like to read you a list of opinions that we often hear expressed. For each one, please tell me whether you totally agree, somewhat agree, somewhat disagree or totally disagree.
1. Totally agree
2. Somewhat agree
3. Somewhat disagree
4. Totally disagree
5. Neither agree nor disagree
6. Depends [DO NOT READ]
88 REFUSED [DO NOT READ]
99 DK [DO NOT READ]

READ AND ROTATE

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>Refused</th>
<th>D/K</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am prepared to pay more for an environmentally friendly product</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>(88)</td>
<td>(99)</td>
</tr>
<tr>
<td>To preserve people’s jobs in this country, we must accept higher levels of pollution in the future I have enough trouble worrying about my own problems without worrying about others</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

58. Is your house currently equipped with a central ventilation system or central exhaust fan (also known as a central air exchanger) OR a Heat Recovery Ventilator (HRV) system, which provides fresh air for the entire house?
   1. Central Air Exchanger
   2. Heat Recovery Ventilator (HRV)
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

59. What time of the year do you generally use your air exchanger or HRV?
   1. All year long
   2. Heating season only
   3. Cooling Season only
   4. Occasionally (to alleviate humidity and/or odour problems)
   5. Never
   6. Other (specify – i.e. open windows)
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

60. Does your furnace operate in one-stage, two-stage or variable speed mode?
   1. One Stage
   2. Two Stage
   3. Variable Speed
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

61. Do you ever set your furnace/air conditioner thermostat to run continuously (set to “on” at the thermostat in air circulation mode) rather than “auto” which makes it run intermittently?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

62. [IF YES] What time of the year do you generally set the furnace or air conditioner thermostat to “on” rather than “auto”?
   1. All year
   2. Heating season
   3. Cooling Season
   4. Only occasionally
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

63. How many people, including children, other family members and permanent guests, currently live in your home?
   1. _______ people [RECORD NUMBER]
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]
64. What is the highest level of education that you have completed? [DO NOT READ]
   1. Grade school or less
   2. Some high school
   3. High school grad
   4. Vocational/Technical school
   5. Some university
   6. University grad
   7. Postgraduate degree
   88 Refused
   99 Don’t know

65. For statistical purposes only, please tell me which of the following categories applies to your total household income for the year 2007? [READ - CODE ONE ONLY – STOP ONCE RESPONDENT CONFIRMS CATEGORY]
   1. Under $20,000
   2. $20,000 to under $40,000
   3. $40,000 to under $60,000
   4. $60,000 to under $80,000
   5. $80,000 to under $100,000
   6. $100,000 and over
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

Thank you very much. Your answers will help Ontario Power Authority and EnerQuality evaluate their energy efficiency efforts to better serve customers.
Energy Star® for New Homes Program –
Non-Participant Home Buyer Survey

INTRODUCTION
Create a custom code for each possible energy saving measure that could have been installed in their home (e.g., – WINDOWS for Energy Star® Windows, etc…)

SECTION 1: SCREENER
Good morning/afternoon/evening.

[IF CONTACT NAME IS AVAILABLE] May I please speak with [INSERT NAME]?

[IF CONTACT NAME IS UNAVAILABLE] I’d like to speak with the person most knowledgeable about the details of your home. Would that be you?

[IF NO / REFUSED] Could I please speak with the person that is most knowledgeable about the details of your home?

[If appropriate person is not available, schedule call-back]

[ONCE APPROPRIATE PERSON IS ON THE PHONE] My name is________. I’m calling from Harris/Decima, a public opinion and marketing research firm, on behalf of the Ontario Power Authority. Our firm has been commissioned to conduct an important survey. The information you provide will help the Ontario Power Authority to evaluate the effectiveness of the Energy Star® for New Homes Program and improve services for residential customers like you.

Please, be assured that we are not selling anything. Your participation in the study will in no way result in sales or solicitation calls.

PARTICIPANT SCREENING QUESTIONS
1. Have you purchased a newly constructed home during the period of April 1, 2007 and March 31, 2008?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

[IF NO – THANK AND TERMINATE]

2. Did you purchase an Energy Star® Certified home? [Note, an Energy Star® qualified home is a home that has been built by a licensed Energy Star® builder and incorporates energy efficient features into the home so that it can meet the Energy Star® technical specifications which is approximately 30 percent more energy efficient than those built to minimum code levels.]
   1. Yes
   2. No
   88 Refused [DO NOT READ]
PROGRAM AWARENESS

3. The Energy Star® for New Homes program promotes energy efficiency guidelines that enables a licensed Energy Star® for New Homes builder to construct an Energy Star® home that is approximately 30 percent more energy efficient than those built to minimum Ontario Building codes. Are you familiar with the Energy Star® for New Homes Program?

1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

4. [If Yes] How did you first become aware of the Energy Star® for New Homes Program?

[OPEN END, DO NOT READ]
1. Newspaper
2. Radio
3. TV
4. Internet/own research
5. Home builder/Model home display
6. Realtor
7. Friend, relative, word of mouth
8. Utility bill insert
9. Announcement by public official
10. School, church, community group
11. Other (please specify)________________________
88 Refused
99 Don’t know

5. [IF AWARE OF PROGRAM Q1=1] Do you recall seeing any marketing or advertisements promoting for the program?

1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

6. [IF YES] Please identify where you saw promotions for the program (select all that apply) [DO NOT READ]

1. Newspaper
2. Radio
3. TV
4. Internet
5. Home builder/Model home display
6. Utility bill insert
7. Convention/conference
8. Other (please specify)________________________
88 Refused
99 Don’t know

7. Do you recall if your builder included any energy savings measures in your home during its construction? [IF NECESSARY “Possible energy saving measures may have included Energy Star® qualified windows, increased insulation, high efficiency furnace, Energy Star® central air conditioners, compact fluorescent light bulbs (CFLs), etc...”]
   1. Yes
   2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

8. [IF YES] Can you please specify the energy savings measures which were included to your home? [USE SPECIFIC Navigant Consulting SUPPLIED MEASURE CODES, IF CODE NOT AVAILABLE – IE NOT ON THE Navigant Consulting LIST, USE FULL MEASURE NAME]
   1. _________
   2. _________
   3. _________
   4. _________
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

MOTIVATIONS
9. Please rate the influence each of the following factors had in your decision to purchase your home, where 1 means the factor had no influence at all and 7 means the factor had a large influence:

[ROTATE]

<table>
<thead>
<tr>
<th>factor</th>
<th>1</th>
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<th>6</th>
<th>7</th>
<th>Refused</th>
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<td>Cost of Home</td>
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<td>Newly Built home</td>
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<td>Availability of energy saving upgrades</td>
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</tbody>
</table>

10. When you were looking to purchase your new home, do you recall if your home builder or sales team presented you the option of purchasing an Energy Star® Qualified home?
1. Yes
2. No – SKIP TO Q15
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

11. [IF YES] Did your home builder or sales staff encourage you to purchase an Energy Star® Qualified home?

1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

12. [IF YES] How persuasive were the sales tactics used by the builder or sales team to encourage you to purchase an Energy Star® Home? Please use a scale of 1 to 7, were 1 means the sales tactics were not persuasive at all and 7 means they were very persuasive?

1. ___________ [number 1 to 7]
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

13. [IF YES] – Why did you decide not to purchase an Energy Star® Qualified Home? [Choose all that apply] [DO NOT READ]

1. Too expensive
2. Energy savings not worth the extra cost
3. Energy Star® option not offered in the location/subdivision I wanted
4. Did not understand the value of an Energy Star® Home
5. Did not understand the process of certification
6. Preferred the home that I purchased instead
7. None were available for the time frame I was looking to buy
8. Builder did not offer Energy Star® homes
9. Other ___________________
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

14. [IF MORE THAN ONE] – What was the main reason why you decided not to purchase an Energy Star® Qualified Home? [Choose only one] [DO NOT READ]

1. Too expensive
2. Energy savings not worth the extra cost
3. Energy Star® option not offered in the location/subdivision I wanted
4. Did not understand the value of an Energy Star® Home
5. Did not understand the process of certification
6. Preferred the home that I purchased instead
7. None were available for the time frame I was looking to buy
8. Builder did not offer Energy Star® homes
9. Other ___________________
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]
15. **[IF NOT GIVEN OPTION]** How likely would you have been to pay between $3,000 to $5,000 for additional energy saving upgrades and receive the Energy Star® Certification for your home had your builder given you the option? Please use a scale of 1 to 7, where 1 means you would have been very unlikely and 7 means you would have been very likely.

1. __________ [number 1 to 7]
   
88  Refused [DO NOT READ]

99  Don’t know [DO NOT READ]

16. **[ALL]** Please rate the influence of each of the following initiatives which might have increased your likelihood of purchasing an Energy Star® Qualified home over a non-Energy Star® home, where 1 means the initiative would have had no influence at all and 7 means the initiative would have had a large influence:

[ROTATE]

<table>
<thead>
<tr>
<th>Initiative</th>
<th>1</th>
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<th>6</th>
<th>7</th>
<th>Refused</th>
<th>D/K</th>
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<tbody>
<tr>
<td>Incentives or rebates for energy efficient upgrades for the homeowner</td>
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<td>Reduced rate mortgages financing</td>
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<tr>
<td>Reduced cost difference between Energy Star® homes and Non-ESNH homes</td>
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</tbody>
</table>

17. **[IF RECALLED BUILDER INSTALLING ENERGY EFFICIENT MEASURES – ELSE SKIP]** You stated earlier that your new home came with a package of installed energy saving measures, did the home builder allow you to choose all, some or none of the energy savings measures that were installed as a part of this package? [DO NOT READ]

1. I was able to choose all the installed energy saving measures
2. I was able to choose some of the installed energy saving measures
3. I was able to choose none of the installed energy saving measures

88  Refused [DO NOT READ]

99  Don’t know [DO NOT READ]

18. **[IF SOME]** Which energy saving measures did the home builder allow you to choose?

a. __________

b. ________

c. __________

d. __________

88  Refused [DO NOT READ]

99  Don’t know [DO NOT READ]

**EXPECTED SAVINGS/ADDITIONAL SAVINGS**

19. What type of home did you previously have?
1. Single family detached house
2. Single family semi-detached house
3. Townhouse or row house
4. Duplex, triplex, four-plex
5. Condominium/apartment
77 Other (please specify)________________
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

20. What was the approximate square footage of your previous home? Please include the basement in the estimate if it is a finished living space. [IF CLARIFICATION IS NEEDED - including kitchen, bedrooms, bathrooms, foyers, dens and hallway] [PROMPT IF NECESSARY]
   1. Less than 1000 sq ft
   2. 1001 to 1500 sq ft
   3. 1501 to 2000 sq ft
   4. 2001 to 2500 sq ft
   5. 2501 to 3000 sq ft
   6. 3001 to 3500 sq ft
   7. 3501 to 4000 sq ft
   8. more than 4000 sq ft
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

21. Did your last home have any of Energy Star® rated appliances, heating or ventilation equipment, lighting or energy saving technologies?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

22. [If yes] Which features did your previous home have? [PROMPT IF NECESSARY]

   Yes | No
   --- | ---
   Energy Star® Rated appliances (refrigerators, dishwashers, washing machines) | ☐ | ☐
   Energy Star® Rated furnace/air conditioner | ☐ | ☐
   Energy Star® Rated Windows | ☐ | ☐
   Energy Star® rated lighting (light fixtures, CFLs, ceiling fans) | ☐ | ☐
   Increased insulation in floors, walls, attics and foundations | ☐ | ☐
   Programmable thermostat | ☐ | ☐
   Other________________ | ☒ | ☐

23. Would you say your monthly electricity costs in your NEW home are much less, somewhat less, about the same, somewhat higher or much higher in comparison to your old home? [PROMPT IF NECESSARY]
   1. Energy cost are much less
   2. Energy cost are somewhat less
3. Energy costs are about same
4. Energy cost are somewhat higher
5. Energy costs are much higher
88 Refused
99 Don’t know

24. Thinking of this past summer, how much on average do you typically pay for your ELECTRICITY bill on a per month basis in your new home? Just to clarify, we are only asking about your monthly electricity bill (i.e. hydro bill) and not your total energy bill ($/month).
1. On average, I paid $____ per month during the summer.
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

25. Is this amount higher, lower or about the same as what you expected (or were told) when you decided to purchase your new home? [DO NOT READ]
1. Higher than expected/was told
2. Lower than expected/was told
3. About the same as I expected/was told
4. I wasn’t sure what to expect/ wasn’t told an amount
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

26. Since you have moved into your new home, have you participated in any energy saving programs recently?
1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

27. [IF YES] And which energy savings programs have you recently participated in: [PROMPT IF NECESSARY]

[ROTATE]

<table>
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<tr>
<th>Yes</th>
<th>No</th>
<th>Refused</th>
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<td>(1)</td>
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</table>

Every Kilowatt Counts coupon program offering rebates for compact fluorescent lights, outdoor solar lights, LED Christmas lights and other energy saving products

Summer Savings or Summer Sweepstakes Programs

Great Refrigerator Round-Up / fridge pick-up and recycling program

Hot or Cool Savings Program

Enbridge / Union Gas programmable thermostat program
28. Have you installed or added any new energy efficient appliances or features on your own since you have moved into your new home?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

29. [IF YES] More specifically, which energy efficient appliances or features did you install since you moved into your new home? [PROMPT IF NECESSARY]
   Yes   No
   Installed Energy Star® ceiling fan
   Installed a new Energy Star® Central Air Conditioner
   Installed an energy efficient furnace with ECM motor
   Installed compact fluorescent lights (CFLs)
   Installed Energy Star® qualified light fixtures
   Installed a new Energy Star® dishwasher
   Installed a new Energy Star® clothes washer
   Installed a new Energy Star® freezer
   Installed a new Energy Star® refrigerator
   Installed a new Energy Star® dehumidifier
   Installed a new Energy Star® room air conditioner
   Installed Natural Gas range
   Installed a programmable thermostat
   Installed Natural gas clothes dryer
   Installed Energy Star® rated home electronics (TV, DVD, phon
   Other: (Specify)____________________

30. Have you changed your electricity consumption behaviour since you have moved into your new home?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

31. [IF YES] More specifically, what have you done differently? [PROMPT IF NECESSARY] Yes   No
Reduce power used for air conditioning (less usage, higher temperature setting, etc...) □ □
Improve efficiency of your home’s shell (added insulation, closed drapes during the day to block sun) □ □
Reduce water heater or dryer usage (cold water laundry, dried clothes outside or on rack, r. dishwasher only when full) □ □
Reduce usage of lights (turn off more frequently, dimmer/motion sensor) □ □
Reduce usage of home electronics (turn off more frequently, power strips) □ □
Disconnect or got rid of any appliances or electronics □ □
Other_________________

HOME BUYER SATISFACTION
32. Please rate your overall satisfaction with your new home on a scale of 1 to 7, where 1 means you are very dissatisfied with your home and 7 means you are completely satisfied with your home.
1. _________[RECORD NUMBER 1 to 7]
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

33. [IF ANSWERED “YES” TO RECALLING BUILDER INSTALLING ENERGY EFFICIENT MEASURES – Q7 = YES] Please rate your satisfaction with the energy saving measures included with the purchase of your new home, again using a scale of 1 to 7, where 1 means you are very dissatisfied with the installed measures and 7 means you are completely satisfied with the installed measures?
1. _________[RECORD NUMBER 1 to 7]
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

34. [IF ANSWERED “YES” TO RECALLING BUILDER INSTALLING ENERGY EFFICIENT MEASURES – Q7 = YES] Which of the installed measures are you most satisfied with? [USE CODES]
1. __________
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

35. Why are you most satisfied with this measure?
1. __________________________
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

36. [IF ANSWERED “YES” TO RECALLING BUILDER INSTALLING ENERGY EFFICIENT MEASURES – Q7 = YES] Which of the installed measures are you least satisfied with? [USE CODES]
1. __________
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

37. Why are you least satisfied with this measure?
1. __________________________
88 Refused [DO NOT READ]
38. Were there any energy saving technologies that you would have liked to have been included in your construction package but was not available through your home builder?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

39. [IF YES] Which ones? [DO NOT READ] [INCLUDE CODE FOR ONES WHICH CODES EXIST ALREADY]
   1. Solar hot water tank
   2. Geothermal heat pump
   3. Solar panels on roof
   4. Wind turbines
   5. Natural Gas appliances
   6. Drain water Heat Recovery system
   7. High Efficiency/Energy Star® Central Air Conditioner
   8. High Efficiency furnace with ECM motor
   9. Compact fluorescent lights (CFLs)
   10. Energy Star® qualified light fixtures
   11. Programmable thermostat
   12. Energy Star® appliances (dishwasher, clothes washer, freezer, refrigerator, etc…)
   13. Increased insulation
   14. Other (Specify) ________
   88 Refused
   99 Don’t know

40. How many separate Home Builders did you consult with before you decided to buy your new home?
   1. __________ [RECORD NUMBER]
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

41. How did you find the Home Builder from whom you ultimately purchased your new home?
   [PROMPT IF NECESSARY]
   1. General internet search
   2. Recommendation from friend/relative/colleague
   3. Local listings directory
   4. EnerQuality website
   5. Driving in desired neighbourhoods
   6. Model homes
   7. Other ______ (specify)
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

42. What was the name of the Builder from whom you ultimately purchased your new home?
   1. ________________ (SPECIFY NAME)
43. Do you feel that builders who are registered in the Energy Star® for New Homes program are often more credible in building Energy Efficient homes than say, builders who are not registered in the program?
   1. Yes
   2. No

44. Which of the following type of home do you currently live in?
   1. Single family detached house
   2. Single family semi-detached house
   3. Townhouse or row house
   4. Duplex, triplex, four-plex
   5. Condominium/apartment
   77 Other (please specify)________________

45. What is the approximate square footage of your current home. Please include the basement in the estimate if it is a finished living space. [IF CLARIFICATION IS NEEDED - including kitchen, bedrooms, bathrooms, foyers, dens and hallway]
   1. Less than 1000 sq ft
   2. 1001 to 1500 sq ft
   3. 1501 to 2000 sq ft
   4. 2001 to 2500 sq ft
   5. 2501 to 3000 sq ft
   6. 3001 to 3500 sq ft
   7. 3501 to 4000 sq ft
   8. more than 4000 sq ft

46. Would you say you are very concerned, somewhat concerned, not very concerned or not at all concerned about each of the following issues:

READ AND ROTATE
   1. Very concerned
   2. Somewhat concerned
   3. Not very concerned
   4. Not at all concerned

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</table>

88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]
The environmental impacts of electricity generation

The environmental impacts of electricity consumption by consumers

The environmental impacts of electricity consumption by business and industry

47. Do you think that individual consumers such as yourself can definitely, likely, likely not or definitely not make an important contribution to reducing the overall reduction of electrical energy use in the province?

1. Definitely
2. Likely
3. Likely not
4. Definitely not
5. Depends [DO NOT READ]
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

48. Are you familiar with any standards or ratings currently in place that rate the energy efficiency of appliances? [OPEN END, DO NOT READ]

1. Energuide
2. Energy Star
3. Canadian Standards Association standards
4. Other (SPECIFY ________________)
88 Refused
99 Don’t know

49. Have you ever heard the term “conservation culture”?

1. Yes
2. No
88 Refused [DO NOT READ]
99 Don’t know [DO NOT READ]

50. I’d like to read you a list of opinions that we often hear expressed. For each one, please tell me whether you totally agree, somewhat agree, somewhat disagree or totally disagree.

1. Totally agree
2. Somewhat agree
3. Somewhat disagree
4. Totally disagree
5. Neither agree nor disagree
6. Depends [DO NOT READ]
88 REFUSED [DO NOT READ]
99 DK [DO NOT READ]
I am prepared to pay more for an environmentally friendly product

To preserve people's jobs in this country, we must accept higher levels of pollution in the future
I have enough trouble worrying about my own problems without worrying about others

51. Is your house currently equipped with a central ventilation system or central exhaust fan (also known as a central air exchanger) OR a Heat Recovery Ventilator (HRV) system, which provides fresh air for the entire house?
   1. Central Air Exchanger
   2. Heat Recovery Ventilator (HRV)
   89 Refused [DO NOT READ]
   99 Don't know [DO NOT READ]

52. What time of the year do you generally use your air exchanger or HRV?
   1. All year long
   2. Heating season only
   3. Cooling Season only
   4. Occasionally (to alleviate humidity and/or odour problems)
   5. Never
   6. Other (specify – i.e. open windows)
   89 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

53. Does your furnace operate in one-stage, two-stage or variable speed mode?
   1. One Stage
   2. Two Stage
   3. Variable Speed
   89 Refused [DO NOT READ]
   99 DK/Refused [DO NOT READ]

54. Do you ever set your furnace/air conditioner thermostat to run continuously (set to “on” at the thermostat in air circulation mode) rather than “auto” which makes it run intermittently?
   1. Yes
   2. No
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]
55. **[IF YES]** What time of the year do you generally set the furnace or air conditioner thermostat to “on” rather than “auto”?
   1. All year
   2. Heating season
   3. Cooling Season
   4. Only occasionally
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

56. How many people, including children, other family members and permanent guests, currently live in your home?
   1. _______ people [RECORD NUMBER]
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

57. What is the highest level of education that you have completed? [DO NOT READ]
   1. Grade school or less
   2. Some high school
   3. High school grad
   4. Vocational/Technical school
   5. Some university
   6. University grad
   7. Postgraduate degree
   88 Refused
   99 Don’t know

58. For statistical purposes only, please tell me which of the following categories applies to your total household income for the year 2007? [READ - CODE ONE ONLY – STOP ONCE RESPONDENT CONFIRMS CATEGORY]
   1. Under $20,000
   2. $20,000 to under $40,000
   3. $40,000 to under $60,000
   4. $60,000 to under $80,000
   5. $80,000 to under $100,000
   6. $100,000 and over
   88 Refused [DO NOT READ]
   99 Don’t know [DO NOT READ]

Thank you very much. Your answers will help Ontario Power Authority and EnerQuality evaluate their energy efficiency efforts to better serve customers.
APPENDIX C – HOME BUILDER INTERVIEW GUIDES

See following pages.
Energy Star® for New Homes

Participant Home Builder Interview Guide

Home Builder Company

Home Builder Representatives and Titles:

Home Builder Telephone Number

Date and Time of Interview:

INTRODUCTION (Survey initiation) ****************************
Identify yourself, Navigant Consulting and our work for the OPA in evaluating the Energy Star® for New Homes Program

Explain that we’re calling a number of participating home builders at random in order to gather their input on the program so that we can make some recommendations to the OPA and EnerQuality for program enhancements

Date to call back    ______________

Number to call back on    ______________

PROGRAM AWARENESS QUESTIONS

1. How would you characterize your company knowledge on advanced energy efficient technologies and practices, specifically the ones that apply to single family homes? (On a scale of 1 to 7 where 1 is not knowledgeable at all, and 7 is very knowledgeable)
   1. _________________(1 to 7)
   99 DK/Refused

2. How did you first become aware of this program?
   1. Other Home Builders
   2. EnerQuality
   3. Online
   4. Customers recommendation
   5. Utility Company
   6. Home Builders Association
   7. Other
   99 DK/Refused

3. What were your motivations for joining the program?
1. Attract more home buyers
2. To be recognized for existing energy efficiency practices
3. Increased profits
4. Competitive edge in market
5. Home buyers were asking about it
6. Corporate (company) philosophy
7. No reason
8. Other
99 DK/Refused

4. [If more than one] What was your PRIMARY motivation for joining the program?
   1. Attract more home buyers
   2. To be recognized for existing energy efficiency practices
   3. Increased profits
   4. Competitive edge in market
   5. Home buyers were asking about it
   6. Corporate (company) philosophy
   7. No reason
   8. Other
   99 DK/Refused

5. Were there any specific actions/techniques/statements employed by EnerQuality which influenced you to participate in the program?
   1. Yes
   2. No
   99 DK/Refused

6. [IF YES] Which actions/techniques/statements?
   1. ______________________________

7. Were you previously building Energy Star® Homes (or equivalent Energy Efficient homes) before you joined the program?
   1. Yes
   2. No
   99 DK/Refused

8. [IF YES] Why? What types of homes?
   ______________________________

TRAINING INITIATIVES QUESTIONS
9. Did anyone from you company participate in any training activities hosted by EnerQuality for this program?
   1. Yes
   2. No
   99 DK/Refused
[IF YES – Continue, IF NO – skip to next section]

10. [If yes] Which training activities did you participate in?
   1. Builder Workshop
   2. Technical Sales Workshop
   3. Certified Evaluator Workshop
   4. Other______ (specify)
   99 DK/Refused

11. [If Builder/Construction] Do you believe the training you received from the workshop has lead to a better understanding of construction practices required for Energy Star® homes and thereby providing higher levels of satisfaction to the home buyer with their home than otherwise would have been the case without the training?
   1. Yes
   2. No
   99 DK/Refused

12. [If Sales] Do you believe the training you received from the workshop has increased your knowledge and experience with Energy Star® homes enabling you to better respond to home buyers questions and demands than otherwise would have been the case without the training?
   1. Yes
   2. No
   99 DK/Refused

13. Please rate your satisfaction of the training in relation to the following criteria (on a 7 point scale, 1 being completely dissatisfied and 7 being very satisfied)
   1. Usefulness of the training curriculum________ (1 to 7)
   2. Completeness of the training curriculum________ (1 to 7)
   3. Information provided to you in the curriculum______ (1 to 7)
   4. Relevance of training curriculum_______ (1 to 7)
   5. Frequency of training sessions___________(1 to 7)
   6. Convenience of location of training sessions_______ (1 to 7)
   99 DK/Refused

14. Please provide one suggestion to improve the training?
   1. ____________________________________________________________

MARKETING AND PROMOTIONS INITIATIVES
[ASK ONLY TO SALES STAFF]
15. Did EnerQuality supply you with any marketing or promotional materials for the program? (Point-of-Sales [POS] displays and sales “tool kit”)
   1. Yes
   2. No
   99 DK/Refused
16. Which marketing or promotional materials were provided for you?
   1. Posters
   2. Brochures
   3. Lawn Signs
   4. Call-Outs, stickers
   5. Features sheets
   6. Other __________
   99 DK/Refused

17. [Ask for each marketing or promotional materials provided]:
   a. How effective was [material] in informing the Home Buyer on Energy Star® qualified homes and the certification process (1-7)
      i. _______ ii)_____________ iii)_____________
   b. How effective did the [material] integrate into your own marketing and promotional material?
      i. _______ ii)_____________ iii)_____________

18. Have you been provided with enough marketing or promotional materials to meet your need?
   1. Yes
   2. No
   99 DK/Refused

19. Please provide one suggestion to improve the marketing and promotional material?
   1. ____________________________

   Have you been provided with enough marketing or promotional materials to meet your need?
   2. Yes
   3. No
   99 DK/Refused

20. How often do you note your participation in the Energy Star® program within the advertising material you produce?
   1. Always
   2. Most of the time
   3. Sometimes
   4. Rarely
   5. Never
   99 DK/Refused

21. [IF Includes] – Why do you note it within the advertising material you produce? (e.g., does it attract more interest?)
22. [IF NEVER] – Why don’t you note it within the advertising material you produce?

23. Are you satisfied with the support and/or assistance you have required from EnerQuality during the program? (7 point scale, 1 extremely dissatisfied, 7 being extremely satisfied)
   1. _____ (1-7)
   99 DK/Refused

24. Please provide one program feature which you liked?
   a. ____________________________

25. Please provide one program feature which you disliked?
   a. ____________________________

HOME BUYER PARTICIPATION/DRIVER QUESTIONS
[Ask only to Sales Staff for this ENTIRE SECTION]

26. Before you talk to your customers about the Energy Star® homes, approximately what percentage of your customers specifically enquire about Energy Star® Qualified homes or “Green Homes”? (Check all that apply)
   1. ____________% are asking for Energy Star® or “Green” homes
   99 DK/Refused

27. Do you promote/describe the benefits of an Energy Star® Qualified home to all your customers as a potential option? (7 point scale, 1 being never, 7 being always)
   1. ____________(1 to 7)
   99 DK/Refused

28. [IF NOT “NEVER”] Once your customers have been informed about Energy Star® Homes, is there a change in their interest with regards to upgrading to an Energy Star® home? (7 point scale, 1 being never, 7 being always)
   1. ____________(1 to 7)
   99 DK/Refused

29. What do you believe are the primary motivators behind your customers’ decision to purchase an Energy Star® qualified home? (Check all that apply)
   1. Having an energy efficient home
   2. Resale value/Investment opportunity
   3. Reduction in energy bills
   4. Being “green”/energy conscious
   5. Getting the best deal
   6. Incentives/rebates?
   7. Other________________________
30. [IF MORE THAN ONE] What do you think is the PRIMARY motivator? (choose one only)
   1. Having an energy efficient home
   2. Resale value/Investment opportunity
   3. Reduction in energy bills
   4. Being “green”/energy conscious
   5. Getting the best deal
   6. Other_________
   99 DK/Refused

31. How much choice does a home buyer have when it comes to purchasing an Energy Star®
    Qualified home?
   1. We offer a only 1 style of Energy Star® qualified home with no custom choices in
      terms of EE technologies
   2. We offer a only 1 style of Energy Star® qualified home to customers with some
      custom choices in terms of EE technologies
   3. We offer multiple types of Energy Star® qualified homes but no custom choices in
      terms of EE technologies
   4. We offer multiple types of Energy Star® qualified homes with some custom choices in
      terms of EE technologies
   5. We have no packages - customers are free to pick the energy efficient appliances and
      features they desire
   6. Other_________
   99 DK/Refused

32. What specific benefits, if any, do promote about your Energy Star® homes?
   1. Financial benefit/Energy Savings
   2. Better air quality
   3. Comfort
   4. Resale value of home/Investment opportunity
   5. Smaller ecological footprint/Environmental impact
   6. Predictability in energy bills
   7. Quality / Whole house design
   8. Overall construction
   9. Other (specify)_________
   99 DK/Refused

33. On average, how much extra do you think customers are prepared to pay to achieve an Energy
    Star® rating for their new home over a non-Energy Star® rated home?
   1. ____________$ extra
   99 DK/Refused

34. And on average, how much does it cost for a home buyer to upgrade to Energy Star® rating over
    a non-Energy Star® rated home?
   1. ____________$ extra
HOME BUILDER TECHNOLOGY PRACTICES
[ASK ONLY TO BUILDERS/CONSTRUCTION PERSONNEL]

35. What components of the home do you consider most important for reducing home energy consumption?
   1. Insulated walls
   2. Insulated roof
   3. Furnace
   4. Windows
   5. Appliances
   6. Water Heater
   7. Construction Tightness
   8. Central Air Conditioner / HVAC
   9. Lighting
   10. Doors
   11. Whole house design
   12. Floor insulation
   13. Ducts
   14. Ventilation
   15. Using more Gas
   16. Other

99 DK/Refused

36. Which energy efficient technologies or features are typically included in your Energy Star® rated homes?
   1. Energy Star® Furnace (min 90% AFUE – nat gas, oil =min 85%) with ECM motor
   2. HRV with ECM motor
   3. Efficient ventilation distribution systems
   4. Energy Star® CAC (min 14 SEER)
   5. Energy Star® bathroom exhaust fans
   6. Drainwater Heater Recovery system
   7. Energy Star® appliances (refrigerators, dishwashers, washing machines)
   8. Water heater (EF greater than 0.6; _ [specify])
   9. Energy Star® windows, sliding glass doors and skylights
   10. Sealed ductwork (unfinished basement)
   11. Energy Star® lighting (fixtures, CFL, T5/T8, halogen mr16)
   12. Programmable thermostats
   13. Increased insulation (walls and boards, attic, basement)
   14. Increased weatherproofing
   15. Gas appliances (range, clothes dryer)
   16. Monitoring and switching (whole house, real time use display, all off switch)
   17. Solar Ready
   18. Other

99 DK/Refused

37. Are any of these energy efficient technologies or features typically installed in your standard non-Energy Star® rated homes?
   1. Yes
2. No
99 DK/Refused

38. IF YES- Which ones?

i)_____________ ii) __________ iii)_____________ iv)_____________

39. On average, what is the difference in total project costs for you to construct a typical Energy Star® Qualified home cost over a standard non-Energy Star® Qualified home?

1. __________$ extra (or $/sq ft?)
99 DK/Refused

40. Are there any energy efficient technologies that your customers are specifically asking for but your model homes do not currently offer?

1. Yes
2. No
99 DK/Refused

41. If yes – which technologies or features are they asking for? Any renewables?

1. __________________________________________________________________________
99 DK/Refused

42. Do any of your current building practices or commonly installed energy efficiency technologies for your STANDARD single family homes exceed any of the requirements for the fully implemented 2006 Ontario Building Code (current building code)?

1. Yes
2. No
99 DK/Refused

43. [If yes ] Which energy efficient technologies or building practices exceed the fully implemented 2006 Code (current code)?

<table>
<thead>
<tr>
<th>Exceed Future Code</th>
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<th>No</th>
</tr>
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<tbody>
<tr>
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<td>High performance windows</td>
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</tr>
<tr>
<td>ECM motors (furnace, HRV)</td>
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<td>☐</td>
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<tr>
<td>Water heaters</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Improved insulation (attic, wall, basement)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Improved ventilation</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Tighter seals and ducts (decrease in air leaks)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other ________________</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

44. Why have you decided to exceed the code for these technologies or building practices?
45. What percentage of home builders do you believe are building above 2006 Code (standard homes)?

46. As you are aware, in 2012, the Building Code will be changing to meet EnerGuide 80 standards. Are you doing anything now to meet these changes?
   1. Yes
   2. No
   99 DK/Refused

47. [IF YES] What?
   1. ________________________________________________________________

48. Will you continue your participation in the Energy Star® for New Homes Program with the change in code?
   1. Yes
   2. No
   99 DK/Refused

49. What do you forecast the growth rate for new homes starts in Ontario to be for the next five years?
   1. Increase by ____________%
   2. Decrease by ____________%
   3. Remain constant
   99 DK/Refused

50. If the Energy Star® for New Homes program were to include incentives or rebates, where do you think they should be placed as to maximize their effect?

____________________________________________________________

NEW TECHNOLOGIES AND DRIVERS FOR ENHANCED ELECTRIC EFFICIENCY APPLICATIONS

51. Which of the following are most/least likely to influence your company’s decision to adopt electric efficiency technologies that are currently not popular or part of typical new home packages offered to customers? (On a scale of 1 to 7, 1 being no influence at all, 7 very influential)
   1. Customer requests for technology? ____ (1-7)
   2. Cost to implement new technology/approach? ____ (1-7)
   3. Forecasted energy and material cost increases? ____ (1-7)
   4. Forecasted downturns or upturns in market? ____ (1-7)
   5. Widely publicized market or societal trends, e.g., “Green” market or “sustainability” trends? ____ (1-7)
6. Expected increases in Codes and Standards? ____ (1-7)
7. Other (specify) __________ ____ (1-7)
99 DK/Refused

52. How long does it usually take for your company to incorporate new technologies into your construction processes?

a. ________________ (months)

53. Which 3 technologies are you most likely (least likely) to integrate into your new home packages in the next five years?

<table>
<thead>
<tr>
<th>likely in next years</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient furnaces (greater than 90 AFUE) and furnace fans with ECM motors</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Enhanced Lighting (whole house, fixtures, etc..)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Smart Systems (timers, sensors, dimmers, all-off switches, programmable thermostats)</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Renewable Energy Systems (solar hot water/therma photovoltaic; solar ready houses)</td>
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<tr>
<td>Enhanced Building Envelope Improvements</td>
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<tr>
<td>New or Enhanced Energy Efficient Appliances</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Drainwater Heat Recovery Systems</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Ground source heat pumps

Other ________________

1. Other comments______________________________________________

54. What are some of the main barriers for not being able to offer/or choosing not to offer specific energy efficient technologies in your homes?

1. Customer demand is low
2. Availability of energy efficient technology
3. Cost of energy efficient technology
4. Lack of knowledge on energy efficient technology
5. Lack of scientific data/testing on the energy efficient technology
6. No partnership with supplier/manufacturer
7. Lack of training for trades regarding installation
8. Other (specify)
99 DK/Refused

55. (IF MORE THAN ONE) What is the MAIN barrier for not being able to offer/ or choosing not to offer specific energy efficient technologies in your homes?

1. Customer demand is low
2. Availability of energy efficient technology
3. Cost of energy efficient technology
4. Lack of knowledge on energy efficient technology
5. Lack of scientific data/testing on the energy efficient technology
6. No partnership with supplier/manufacturer
9. Lack of training for trades regarding installation
7. Other (specify)
99 DK/Refused

HOME BUILDER CHARACTERISTICS

56. Approximately how many residential homes do you construct a year (Detached, semi-detached and row/town houses)?
   1. __________________ per year
   99 DK/Refused

57. What percentage of those homes are Energy Star® Qualified homes?
   1. ________________% are Energy Star® Qualified
   99 DK/Refused

58. Have you ever enrolled a home in the program which, ultimately, never ended up being certified?
   1. Yes_________ Why?
   2. No
   99 DK/Refused

59. Finally, what single aspect of the Energy Star® for New Homes Program have you found the most helpful?
   1. Education/training
   2. Marketing/promotions
   3. Energy Star® Label
   4. Staff
   5. Nothing
   6. Other_____________
   99 DK/Refused

60. And what single aspect of the Energy Star® for New Homes Program have you found the least helpful?
   1. Education/training
   2. Marketing/promotions
   3. Change in specifications
   4. Support staff
   5. Nothing
   6. Other_____________
   99 DK/Refused

61. Any other comments?
   1. ___________________________________________________________________________________
      ___________________________________________________________________________________
Thank you very much. Your answers will help Ontario Power Authority and EnerQuality Corporation evaluate its energy efficiency efforts to better serve customers. Remember: your answers to this survey are confidential and will be used only for this research.
**Energy Star® for New Homes**

**Non-Participant Home Builder Interview Guide**

<table>
<thead>
<tr>
<th>Home Builder Company</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Builder Representatives and Titles:</td>
<td></td>
</tr>
<tr>
<td>Home Builder Telephone Number</td>
<td></td>
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**INTRODUCTION (Survey initiation) **************************************

Identify yourself, Navigant Consulting and our work for the OPA in evaluating the Energy Star® for New Homes Program

Explain that we’re calling a number of participating home builders at random in order to gather their input on the program so that we can make some recommendations to the OPA and EnerQuality for program enhancements

Date to call back  ________________

Number to call back on  ________________

**PROGRAM AWARENESS QUESTIONS**

1. How would you characterize your company knowledge on advanced energy efficient technologies and practices, specifically the ones that apply to single family homes? (On a scale of 1 to 7 where 1 is not knowledgeable at all, and 7 is very knowledgeable)
   1. ______________________(1 to 7)
   99 DK/Refused

2. Are you aware of the Energy Star® for New Homes Program?
   1. Yes
   2. No
   99 DK/Refused

3. How did you first become aware of this program?
   1. Other Home Builders
   2. EnerQuality
   3. Online
   4. Customers recommendation
   5. Utility Company
   6. Home Builders Association
7. Other
99 DK/Refused

4. Why did you decide not to join the program?
   1. Customers weren’t asking about it
   2. Not sold on program/not enough information
   3. Not interested in building Energy Star® Homes
   4. Adds to home price
   5. Never contacted by program
   6. Too expensive to join program
   7. Needs to be hassle free
   8. No benefit for builders
   9. Technical specification keep changing
   10. Haven’t heard of it
   11. Thinking about it – just haven’t done paperwork
   12. I already offer energy efficient homes to my customers
   13. Enrolled in another Energy Efficiency building program (specify____)
   14. No reason
   15. Other_______________________
99 DK/Refused

5. [If more than one] What was your PRIMARY reason for not joining the program?
   1. Customers weren’t asking about it
   2. Not interested in building Energy Star® Homes
   3. Too expensive to build
   4. Program is too confusing
   5. No benefit for builders
   6. Technical specification keep changing
   7. Thinking about it – just haven’t done paperwork
   8. We already build energy efficient homes – just not Energy Star®
   9. Enrolled in another Energy Efficiency building program (specify____)
   10. No reason
   11. Other
99 DK/Refused

6. Are you currently enrolled in other energy efficiency home builder programs?
   1. Yes
   2. No
99 DK/Refused

7. [IF YES] Which ones?
   1. Energuide
   2. R-2000
   3. GreenHouse
   4. LEED
99 DK/Refused
TRAINING INITIATIVES QUESTIONS
8. Are you aware that EnerQuality offers a range of workshops and training sessions for builders, subcontractors, sales teams on building and selling energy efficient homes?
   1. Yes
   2. No
   99 DK/Refused

9. [IF YES] Has anyone from your company participated in any training activities hosted by EnerQuality?
   1. Yes
   2. No
   99 DK/Refused

HOME BUYER PARTICIPATION/DRIVER QUESTIONS
10. Approximately what percentage of your customers specifically enquire about Energy Star® Qualified homes or “Green Homes”?
    1. ____________% are asking for Energy Star® or “Green” homes
    99 DK/Refused

11. Are there any energy efficient technologies that your customers are specifically asking for but your model homes do not currently offer?
    1. Yes
    2. No
    99 DK/Refused

12. If yes – which technologies or features are they asking for? Any renewables?
    1. ________________________________________________________________
       ________________________________________________________________

HOME BUILDER TECHNOLOGY PRACTICES
[ASK ONLY TO BUILDERS/CONSTRUCTION PERSONNEL]
13. What components of the home do you consider most important for reducing home energy consumption?
    1. Insulated walls
    2. Insulated roof
    3. Furnace
    4. Windows
    5. Appliances
    6. Water Heater
    7. Construction Tightness
    8. Central Air Conditioner / HVAC
    9. Lighting
    10. Doors
    11. Whole house design
    12. Floor insulation
13. Ducts
14. Ventilation
15. Using more Gas
16. Other__________
99 DK/Refused

14. Do you currently offer any energy efficient technologies or measures as an upgrade option or package in any of your homes?
   1. Yes - Continue
   2. No – **Skip to Q20**
99 DK/Refused

15. [IF YES] Which energy efficient technologies or features do you typically offer?
   1. Energy Star® Furnace (min 90% AFUE – nat gas, oil =min 85%) with ECM motor
   2. HRV with ECM motor
   3. Efficient ventilation distribution systems
   4. Energy Star® CAC (min 14 SEER)
   5. Energy Star® bathroom exhaust fans
   6. Drainwater Heater Recovery system
   7. Energy Star® appliances (refrigerators, dishwashers, washing machines)
   8. Water heater (EF greater than 0.6; _ [specify])
   9. Energy Star® windows, sliding glass doors and skylights
   10. Sealed ductwork (unfinished basement)
   11. Energy Star® lighting (fixtures, CFL, T5/T8, halogen mr16)
   12. Programmable thermostats
   13. Increased insulation (walls and boards, attic, basement)
   14. Increased weatherproofing
   15. Gas appliances (range, clothes dryer)
   16. Monitoring and switching (whole house, real time use display, all off switch)
   17. Solar Ready
   18. Other__________

16. Are any of these energy efficient technologies or features typically installed in your standard homes?
   1. Yes
   2. No
99 DK/Refused

17. IF YES- Which ones?
   i)________________ ii)________________ iii)________________ iv)________________

18. How much choice does a home buyer have when it comes to upgrading their home to include the energy efficient upgrade or package?
   1. We offer a only 1 style of Energy Efficient package with no custom choices in terms of EE technologies
2. We offer a only 1 style of Energy Efficient package to customers with some custom choices in terms of EE technologies
3. We offer multiple types of Energy Efficient packages but no custom choices in terms of EE technologies
4. We offer multiple types of Energy Efficient packages with some custom choices in terms of EE technologies
5. We have no packages - customers are free to pick the energy efficient appliances and features they desire
6. Other_________
99 DK/Refused

19. On average, what is the difference in total project costs for you to construct a home with an energy efficient upgrade or package over a standard home?
   1. ___________$ extra (or $/sq ft?)
99 DK/Refused

20. Do any of your current building practices or commonly installed energy efficiency technologies for your STANDARD single family homes exceed any of the requirements for the fully implemented 2006 Ontario Building Code (current building code)?
   1. Yes
   2. No
99 DK/Refused

21. [If yes ] Which energy efficient technologies or building practices exceed the fully implemented 2006 Code (current code)?

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<tr>
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22. Why have you decided to exceed the code for these technologies or building practices?
   ________________________________

23. As you are aware, in 2012, the Building Code will be changing to meet EnerGuide 80 standards. Are you doing anything now to meet these changes?
   1. Yes
   2. No
24. [IF YES] What?
   1. _____________________________________________________________

25. What do you forecast the growth rate for new homes starts in Ontario to be for the next five years?
   1. Increase by __________%
   2. Decrease by __________%
   3. Remain constant
   99 DK/Refused

26. If the Energy Star® for New Homes program were to include incentives or rebates, where do you think they should be placed as to maximize their effect?
   _____________________________________________________________

NEW TECHNOLOGIES AND DRIVERS FOR ENHANCED ELECTRIC EFFICIENCY APPLICATIONS

27. Which of the following are most/least likely to influence your company’s decision to adopt electric efficiency technologies that are currently not popular or part of typical new home packages offered to customers? (On a scale of 1 to 7, 1 being no influence at all, 7 very influential)
   1. Customer requests for technology? ____ (1-7)
   2. Cost to implement new technology/approach? ____ (1-7)
   3. Forecasted energy and material cost increases? ____ (1-7)
   4. Forecasted downturns or upturns in market? ____ (1-7)
   5. Widely publicized market or societal trends, e.g., “Green” market or “sustainability” trends? ____ (1-7)
   6. Expected increases in Codes and Standards? ____ (1-7)
   7. Other (specify) __________ ____ (1-7)
   99 DK/Refused

How long does it usually take for your company to incorporate new technologies into your construction processes?

   a. ____________________________ (months)

28. Which 3 technologies are you most likely (least likely) to integrate into your new home packages in the next five years?

   LIKELY IN NEXT YEARS

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient furnaces (greater than 90 AFUE) and furnace fans with ECM motors</td>
<td>☐</td>
</tr>
<tr>
<td>Enhanced Lighting (whole house, fixtures, etc.)</td>
<td>☐</td>
</tr>
<tr>
<td>Smart Systems (timers, sensors, dimmers, all-off)</td>
<td>☐</td>
</tr>
</tbody>
</table>
switches, programmable thermostats)
Renewable Energy Systems (solar hot water/thermal\non-potovoltaic; solar ready houses)  
Enhanced Building Envelope Improvements  
New or Enhanced Energy Efficient Appliances  
Drainwater Heat Recovery Systems  
Ground source heat pumps  
Other

1. Other comments

29. What are some of the main barriers for not being able to offer/or choosing not to offer specific energy efficient technologies in your homes?
   1. Customer demand is low
   2. Availability of energy efficient technology
   3. Cost of energy efficient technology
   4. Lack of knowledge on energy efficient technology
   5. Lack of scientific data/testing on the energy efficient technology
   6. No partnership with supplier/manufacturer
   7. Lack of training for trades regarding installation
   8. Other (specify)
   99 DK/Refused

30. **(IF MORE THAN ONE)** What is the MAIN barrier for not being able to offer/ or choosing not to offer specific energy efficient technologies in your homes?
   1. Customer demand is low
   2. Availability of energy efficient technology
   3. Cost of energy efficient technology
   4. Lack of knowledge on energy efficient technology
   5. Lack of scientific data/testing on the energy efficient technology
   6. No partnership with supplier/manufacturer
   7. Lack of training for trades regarding installation
   8. Other (specify)
   99 DK/Refused

**FUTURE ENROLLMENT**

31. Has EnerQuality approached you in the past to enroll in the program?
   1. Yes
   2. No
   99. DK/Refused

32. What would it take for you to begin offering Energy Star® homes as an option in the homes you build?
   1. More information
   2. Cost effectiveness
   3. Contact from EnerQuality
   4. More customer demand
5. Cheaper enrolment
6. Hassel free enrolment
7. Broader program advertising/public awareness
8. Nothing – not interested
9. Other __________
99 DK/Refused

33. How likely are you to enroll in the program in the next year? (Use a scale of 1 to 7, where 1 is very unlikely, and 7 is very likely)
   1. ________ (Record number 1 – 7)
   99. DK/Refused

HOME BUILDER CHARACTERISTICS
34. Approximately how many residential homes do you construct a year (Detached, semi-detached and row/town houses)?
   1. ______________ per year
   99. DK/Refused

35. Any other comments?
   1. ___________________________________________________________________

Exit ****************************

Thank you very much. Your answers will help Ontario Power Authority and EnerQuality Corporation evaluate its energy efficiency efforts to better serve customers. Remember: your answers to this survey are confidential and will be used only for this research.