FINAL EVALUATION REPORT

High Performance New Construction and Residential New Construction Initiatives

November 2014
AKNOWLEDGEMENTS

Frontier Associates would like to thank Alice Herrera and Kausar Ashraf at the Ontario Power Authority (OPA), for their assistance in coordinating this evaluation effort. We would also like to thank OPA staff for their willingness to provide information and assistance in a timely and organized manner. With this support, we were able to complete this evaluation report successfully and efficiently.

Frontier Associates would also like to thank the staff at the Local Distribution Companies (LDCs) for providing their insight on the HPNC and RNC Initiatives.

Finally, we thank the participants who participated in our telephone surveys. The data provided in these surveys helped our effort to provide quality feedback on the OPA’s new construction initiatives that will help improve program delivery and administration.
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EXECUTIVE SUMMARY

Ontario Power Authority (OPA) hired Frontier Associates to conduct this impact and process evaluation of the OPA’s 2013 High Performance New Construction (HPNC) and Residential New Construction (RNC) initiatives. The HPNC initiative is designed to encourage the construction of energy efficient buildings exceeding the requirements of the Ontario Building Code (OBC). Participants are facilities managers and owners. The RNC initiative is designed to encourage residential homebuilders to construct energy efficient homes. Participants in the RNC are homebuilders.

Frontier’s goals and objectives of the evaluation are to (1) perform an impact evaluation, verifying net energy and demand savings attributed to the initiatives, and (2) perform a process evaluation to determine the overall effectiveness and comprehensiveness of the initiatives.

Summary of Impact Evaluation Results

HPNC

Frontier was tasked to review HPNC savings for projects completed in 2013. The table below provides the summary of the impact evaluation results. The table also compares the impact evaluation results from PY 2011-2012 with PY 2013.

<table>
<thead>
<tr>
<th>Initiative Metric – HPNC</th>
<th>PY 2011-2012</th>
<th>PY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Participants</td>
<td>63</td>
<td>87</td>
</tr>
<tr>
<td>Initiative Realization Rate (% kWh)</td>
<td>98%</td>
<td>76%</td>
</tr>
<tr>
<td>Initiative Realization Rate (% kW)</td>
<td>96%</td>
<td>68%</td>
</tr>
<tr>
<td>Gross Verified Demand Savings (MW)</td>
<td>3.5</td>
<td>2.934</td>
</tr>
<tr>
<td>Gross Verified Annual Energy Savings (GWh)</td>
<td>11.73</td>
<td>9.18</td>
</tr>
<tr>
<td>Gross Verified Lifetime Energy Savings (GWh)</td>
<td>175.48</td>
<td>124.28</td>
</tr>
<tr>
<td>Net to Gross Ratio</td>
<td>0.49</td>
<td>0.54</td>
</tr>
<tr>
<td>Net Peak Demand Savings (MW)</td>
<td>1.84</td>
<td>1.58</td>
</tr>
<tr>
<td>Net Annual Energy Savings (GWh)</td>
<td>6.16</td>
<td>4.96</td>
</tr>
<tr>
<td>Net Lifetime Energy Savings (GWh)</td>
<td>92.15</td>
<td>67.11</td>
</tr>
</tbody>
</table>
Table 2 provides the gross demand and energy savings attributed to each track in the initiative. The HPNC initiative is largely dominated by the custom track, which contributed 67 percent of the total gross demand savings, and 54 percent of the total gross energy savings.

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Track</th>
<th>Gross Demand Savings (kW)</th>
<th>Gross Energy Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPNC</td>
<td>Prescriptive</td>
<td>943</td>
<td>3,987,386</td>
</tr>
<tr>
<td>HPNC</td>
<td>Engineered</td>
<td>36</td>
<td>265,669</td>
</tr>
<tr>
<td>HPNC</td>
<td>Custom</td>
<td>1,955</td>
<td>4,930,772</td>
</tr>
</tbody>
</table>

Table 3 shows the breakdown of realization rates for each track within the HPNC initiative. The prescriptive track’s lower realization rates are a result of adjustments made to the prescriptive HVAC baseline efficiencies and implementation of agribusiness ventilation recommendations from a previous program evaluation.

<table>
<thead>
<tr>
<th>Realization Rates by Initiative Track</th>
<th>% kWh</th>
<th>% kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescriptive</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Engineered</td>
<td>73%</td>
<td>56%</td>
</tr>
<tr>
<td>Custom</td>
<td>99%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4: HPNC Net-to-Gross Ratio

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Free Ridership</th>
<th>Spillover</th>
<th>NTGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPNC</td>
<td>46%</td>
<td>0%</td>
<td>54%</td>
</tr>
</tbody>
</table>

**RNC**

Frontier was tasked to review RNC savings for projects completed in 2013. Table 5 provides the summary of the impact evaluation results. This table also compares the impact evaluation results from PY 2011-2012 with PY 2013.
Table 5: RNC Impact Evaluation Results, 2011-2013

<table>
<thead>
<tr>
<th>Initiative Metric - RNC</th>
<th>PY 2011-2012</th>
<th>PY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Participants</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Initiative Realization Rate (% kWh)</td>
<td>586%</td>
<td>309%</td>
</tr>
<tr>
<td>Initiative Realization Rate (% kW)</td>
<td>803%</td>
<td>87%</td>
</tr>
<tr>
<td>Gross Verified Demand Savings (MW)</td>
<td>0.006</td>
<td>0.029</td>
</tr>
<tr>
<td>Gross Verified Annual Energy Savings (GWh)</td>
<td>0.06</td>
<td>0.259</td>
</tr>
<tr>
<td>Gross Verified Lifetime Energy Savings (GWh)</td>
<td>0.81</td>
<td>3.62</td>
</tr>
<tr>
<td>Net to Gross Ratio</td>
<td>0.49</td>
<td>0.63</td>
</tr>
<tr>
<td>Net Peak Demand Savings (MW)</td>
<td>0.003</td>
<td>0.02</td>
</tr>
<tr>
<td>Net Annual Energy Savings (GWh)</td>
<td>0.03</td>
<td>0.16</td>
</tr>
<tr>
<td>Net Lifetime Energy Savings (GWh)</td>
<td>0.43</td>
<td>2.28</td>
</tr>
</tbody>
</table>

Table 6 provides the gross demand and energy savings attributed to each track in the initiative. Demand savings in the RNC initiative are dominated by the prescriptive track, while energy savings are dominated by the performance track. Performance track projects contributed 62 percent of the total RNC energy savings, and 36 percent of the total RNC demand savings. Prescriptive track projects contributed to 38 percent of the total RNC energy savings, and 64 percent of the total RNC demand savings.

Table 6: RNC Savings by Track

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Track</th>
<th>Gross Demand Savings (kW)</th>
<th>Gross Energy Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNC</td>
<td>Prescriptive</td>
<td>18.4</td>
<td>98,581</td>
</tr>
<tr>
<td>RNC</td>
<td>Performance</td>
<td>10.6</td>
<td>161,245</td>
</tr>
</tbody>
</table>

Table 7 shows a breakdown of realization rates for each track within the RNC initiative. Performance track projects had very high realization rates. Frontier found that the OPA’s current method underestimates the energy and demand savings for Performance projects. This process resulted in high realization rates for the Performance track and the RNC initiative.
Frontier performed a free ridership analysis of the RNC initiative by conducting a survey of participants. The Evaluation Team found 37 percent of participants self-reported some indication of free ridership. The Evaluation Team was unable to contact non-participants, and did not calculate spillover. The net-to-gross ratio (NTGR) calculated for the RNC initiative was 0.63.

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Free Ridership</th>
<th>Spillover</th>
<th>NTGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNC</td>
<td>37%</td>
<td>0%</td>
<td>63%</td>
</tr>
</tbody>
</table>

Summary of Process Evaluation Results

Frontier evaluated the satisfaction of participating homebuilders and facility managers and LDCs with the HPNC and RNC initiative. Participating homebuilders and facility managers in the initiatives reported high levels of satisfaction. However, LDCs continue to be dissatisfied with the initiatives. With changes to Ontario Building Code and a new Directive from the Ministry of Energy in place, the Evaluation Team believes that program design changes made incrementally and with stakeholder input could transform the HPNC and RNC initiatives into successful and valuable initiatives.

**HPNC**

*Market Delivery Effectiveness*

- 100% of participants involved in the application process found the process to be reasonable and understandable. The application process is expensive relative to the size of the incentives.
- When asked about general satisfaction with the HPNC initiative, most participants rated their level of satisfaction as “moderately to greatly satisfied” with the program.
- While the incentive was the most important factor, survey responses of participants found that communications, whether by an LDC or OPA customer representative were also effective in motivating customers to participate in the initiative.

*Customer Motivation*

- The most important factor to participants in deciding to install energy efficient measures was the initial project cost; followed closely by electricity costs and expected energy savings.
Executive Summary

- 50% of participants said the incentive was a very important factor in their decision to include energy efficient measures; only 13% indicated that the incentive did not influence their desire to include energy efficient measures in their new construction project.
- Majority of the surveyed participants (11 out of 16) also reported having corporate energy efficiency policies in place for new construction projects for their companies.

Incentive Levels
- Incentive levels are average compared to similar programs in North America.

New Construction Market
- A geographic analysis of the HPNC projects shows that the initiative is not penetrating Ontario’s new construction market and therefore presents further opportunities for the LDCs in the next few years.
- Most projects continue to occur outside of the Census Metropolitan Areas (CMAs) that show the most growth in commercial new construction. Program participation seems disconnected from Ontario’s significant new construction market.

RNC

Market Delivery Effectiveness
- 100% of builders interviewed found the application process to be fairly easy and reasonable. The application process is expensive relative to the size of the incentives.

Customer Motivation
- Electricity costs and energy savings and maintenance requirements are very important to builders, less so are the building aesthetics and environmental or emission concerns.
- Majority of the builders interviewed would have become EnerGuide builders without the program. This may indicate a level of free-ridership.

Incentive Levels
- All builders surveyed found the incentive level too low.
- Several of the builders that participated in the RNC program mentioned that they received an additional incentive from another stakeholder, which made their project more cost-effective.
- The RNC initiative offers an incentive level on par with other similar residential new construction programs in North America.

New Construction Market
- A geographic analysis of the RNC projects shows that the initiative is not penetrating Ontario’s new construction market.
Most RNC projects continue to occur outside of the Census Metropolitan Areas (CMAs) that show the most growth in residential new construction. Program participation seems disconnected from Ontario’s significant new construction market.

Key Findings

Impact Evaluation

HPNC

- Realization rates for the HPNC initiative were 76 percent for kWh and 68 percent for kW. The measures with the greatest impact on the realization rates were prescriptive agribusiness and prescriptive HVAC measures.
- Custom and prescriptive lighting projects made up the majority of energy and demand savings for the HPNC.
- Compared with HPNC in PY 2011-2012, agribusiness ventilation continues to be a significant contributor to HPNC savings, although not as significant in PY 2013. Custom projects continue to dominate HPNC savings.

RNC

- A typical performance track project provided more energy savings and less demand savings, relative to a typical prescriptive measure. More details provided about fan usage patterns and other measure-level relevant data would help the evaluator refine energy and demand savings estimates.
- Realization rates for the performance track were 1,194% for kWh and 1,200% for kW. These realization rates were high because Frontier found that the OPA’s method for calculating savings underestimated the savings per performance track home.
- Gas furnace with ECM provides the most of the savings for both the prescriptive and performance track.

Process Evaluation

HPNC

- Incentives are the most important factor to program participants in the HPNC initiative. Survey responses also show that communication to participants whether by LDC or OPA were also effective in outreach efforts.
- 100% of program participants found the application processes to be reasonable and understandable. This is an improvement over PY2011-2012.
- Incentive levels are average for similar programs in North America. However, stakeholders found the incentive levels too low relative to cost of application.
Executive Summary

- Initiative is still missing an effective tracking system for documentation and tracking.
- HPNC initiative is not penetrating the new construction market. In 2013, out of 84 HPNC projects completed, 37 (44 percent) were implemented in the three CMAS (Toronto, Ottawa-Gatineau, and Hamilton) with the highest concentration of non-residential construction activity.
- There were no direct employment benefits as a direct result of the HPNC initiatives, but rather any employees hired were in response to all energy efficiency programs that are available in the province.

RNC
- Electricity costs and energy savings are most important to builders participating in the RNC initiative; less so are the building aesthetics and environmental or emission concerns.
- 100% of program participants found the application processes to be reasonable and understandable. This is an improvement over PY2011-2012.
- Incentive levels for both initiatives are average for similar programs in North America. However, stakeholders found the incentive levels too low relative to cost of application.
- Initiative is still missing an effective tracking system for documentation and tracking.
- The RNC initiative is also not penetrating the new construction market. In 2013, Ontario had over 61,000 new housing starts, including over 23,000 single-family homes, however the RNC program had only 25 project sites.
- There were no direct employment benefits as a direct result of the RNC initiatives, but rather any employees hired were in response to all energy efficiency programs that are available in the province.

Recommendations
The HPNC and RNC initiatives have great potential to reduce energy consumption and on-peak demand in Ontario. Frontier believes that OPA should implement incremental changes to the design of both initiatives based on stakeholder inputs and undertake an increased marketing effort focusing on areas of higher intensity of new construction activity to stimulate participation in the initiatives.

Impact Evaluation
HPNC

Recommendations for the HPNC impact evaluation are described in
Table 9. Recommendations include creating additional deemed savings for building-specific operating hours and adding a Retail building type to the prescriptive track, and requiring additional documentation for custom projects.

Table 9: HPNC Impact Evaluation Recommendations

| Prescriptive Track | • Adopt specific, measure-level recommendations on input assumptions as listed in the appendices. Create additional deemed savings to make use of building-specific operating hours. Currently, the Lighting and the Unitary AC measures only reference the Office or Warehouse building-types.  
• Consider adding a Retail building type (hours are already available in the MAL and will improve the accuracy of savings estimates). |
| Custom Track | • Consider requiring the submission of the following additional documents for custom projects:  
  o The final commissioning report  
  o The as-built control diagrams from the building automation contractor to assist in the customer savings estimations. |

RNC
Recommendations for RNC impact evaluation are compiled in Table 10. Frontier suggests providing project-specific information on fan usage and space heating and cooling for gas furnace with ECM measures. Because the OPA is underestimating savings when reporting for performance track projects, Frontier recommends updating the performance track deemed savings to a more accurate value. Frontier also suggests revisiting the EnerGuide ratings acceptable for incentive in the performance track, in anticipation of the Ontario Building Code changes that will occur on January 1, 2017.

Table 10: RNC Impact Evaluation Recommendations

| Prescriptive Track | • Require LDC’s to submit project-specific information regarding fan usage and space heating and cooling types. Move away from using the weighted average usage patterns for these measures.  
• Adopt specific, measure-level recommendations on input assumptions as provided in the appendices.. |
| Performance Track | • Frontier suggests updating the deemed savings values used for the performance track projects to a more accurate savings value.  
• EnerGuide ratings will need to be revised after the Ontario Building Code changes go into effect on January 1, 2014. |
Process Evaluation

Program Design Recommendations

The OPA should begin planning the next generation of new construction energy efficiency programs for Ontario. The Ministry of Energy’s 2014 Directive and changes in Ontario’s Building Code should be carefully considered when implementing any changes to current programs. Among the parties involved in the existing new construction initiatives, there is a general consensus that the programs should be improved; however, there is no consensus over what the future structure should be.

1. Some parties would favor a structure employing a limited number of province-wide program implementers, similar to the design of the first generation of the HPNC. This approach would make the initiatives easier for national or regional chain accounts to participate, and would result in a more uniform marketing message.

2. Other LDCs would prefer a more decentralized program approach, which would offer the LDCs greater flexibility in program design and management. This approach would enable LDCs to better tailor their programs to local needs and the local customer base and alter some of the program features that have proved an impediment in their service areas (e.g., minimum project sizes).

3. Other proposals from the LDCs include merging the new construction initiatives with other programs that have enjoyed greater success (e.g., a merger of the RNC with the Residential HVAC program or combining the HPNC with the Commercial Retrofit program), or converting these programs into simple prescriptive rebate programs for the key stand-alone measures.

4. Finally, there is interest in branding the RNC program with a more recognizable name, such as EnergyStar New Homes or a similar recognition program like LEED Certification.

General Recommendations

While the future direction of new construction energy efficiency initiatives is debated, a number of near-term steps are possible to improve the present HPNC and RNC initiatives.

Incentive Levels

- Consider raising the incentive levels, especially to increase participation in the RNC. Several HPNC and RNC participants surveyed would have included the energy efficient measures if incentives had not been available, indicating that the incentive levels are not motivating participants who had no original intention to install the energy efficiency measures.

- Allow certain efficiency measures presently eligible for a prescriptive incentive in the HPNC program to be eligible for an incentive through the Commercial Retrofit Program. For these new construction measures, current code baselines would need to be used as the basis for calculating savings and incentive levels for certain measures within the expanded retrofit program.
Executive Summary

**Project Sizes**
- Consider lowering minimum project size requirements, so that smaller projects (and smaller commercial or business energy consumers) can receive an incentive through the HPNC.

**Program Design**
- Consider alternative approaches to promoting the RNC. For example, providing payments to home energy raters, rather than home builders, has proven effective in some other markets.

**Program Outreach**
- Consider sponsoring events for modellers, and provide continuous training for architects and project evaluators.

**Tracking System**
- Consider investing in a tracking system that is streamlined with a clearly outlined process that both LDCs and the OPA can use to track applications. Consider requiring periodic reporting from the LDCs on projects underway to assist OPA in anticipating program activity levels.
- Assign Project IDs to each project.

**Document Requirements**
- Create a standard folder structure for a custom project with ‘read me’ instructions in each folder to guide uploads of documents by LDC’s to the ftp site. Recommend the following file structure for uploads:
  - Application forms and agreements
  - Custom Project Worksheet and supporting documents (e.g. breakdown of incremental costs for ‘proposed’ versus ‘reference’ designs)
  - Simulation files (working project models for ‘reference’ and ‘proposed’ designs, output files)
  - Custom Project Worksheet and supporting documents (e.g. breakdown of incremental costs for ‘proposed’ versus ‘reference’ designs)
- Provide baseline and change case energy consumptions and housing characteristics (square footage, number of floors, heating type and capacity, HVAC type and capacity, insulation levels, water heating type and capacity) in order to provide additional assistance with verifying energy and demand savings.
INTRODUCTION

Evaluation Goals and Objectives

The overall goals of the evaluation are to assess the savings impacts and delivery effectiveness of the OPA’s HPNC and RNC initiatives. Specifically, the goals and objectives of this evaluation are as follows:

- Impact Evaluation
  - Assess the gross and net energy and demand savings attributed to the Initiatives through verification of gross savings.
- Process Evaluation
  - Determine the overall effectiveness and comprehensiveness of the Initiatives by assessment of the effectiveness of the initiatives’ market delivery, audit of OPA’s program tracking systems, review of customer motivations, and assessment of direct employment effects.

Initiative Descriptions

The following sections provide a brief overview of the initiatives. A more detailed description of the initiatives can be found in the appendices, including a process diagram for each initiative.

High Performance New Construction

The HPNC initiative is designed to encourage the construction of energy efficient buildings above the Ontario Building Code (OBC) by allowing commercial customers to participate in three incentive tracks. Participants in this initiative are facility managers and owners. There are three incentive tracks: Prescriptive, Engineered and Custom. Prescriptive incentives are set incentives for pre-approved technologies. Engineered incentives require the use of preset calculation worksheets for a variety of measures to calculate incentives. Finally, the custom track provides incentives to participants who develop energy and demand savings using approved modelling software. A detailed description of the measures and incentives available can be found in Appendix F.

Residential New Construction

The RNC initiative is designed to encourage residential homebuilders to construct energy efficient buildings by participating in one of three tracks. Participants in this initiative are homebuilders. The three tracks are prescriptive, performance, and custom. Prescriptive incentives are set incentives for pre-approved technologies. The performance track provides set incentives to homebuilders who build project to reach EnerGuide83 or better. Custom track incentives require the use of preset calculation worksheets for a variety of measures to calculate incentives. Finally, the custom track provides incentives to participants on a sliding scale based on the level of energy performance improvement of the project design versus the code compliant reference design. A detailed description of the measures and incentives available can be found in Appendix G.
Report Overview

The Executive Summary provides a summary description of the initiatives and its impacts, as well as the key findings and recommendations from this evaluation. The report itself includes an Introduction, Impact Evaluation, Process Evaluation, Key Findings and Recommendations, and Appendix. The Process Evaluation is organized to focus on the following:

1. Assessment of the Effectiveness of the Programs’ Market Delivery
2. Review of Customer Motivations
3. Audit of the OPA’s Program Tracking Systems
4. Assessment of Direct Employment Effects

In addition, the Process Evaluation includes sections that cover Incentives Analysis, the New Construction Market, and Program Design. The Appendices provide the surveys used to get feedback from participants, updated and suggested adjustments to the prescriptive input assumptions, program design and a glossary of terms.
IMPACT EVALUATION

This Impact Evaluation serves to describe the methodologies used to estimate the average per project reduction in electricity demand as well as the overall gross and net energy and demand savings delivered through the High Performance New Construction (HPNC) and Residential New Home Construction (RNC) Initiatives.

Methodology

Frontier Associates (“Frontier” or “The Evaluation Team”) employed the steps below in conducting the Impact Evaluation for both HPNC and RNC initiatives. Specific details of Frontier’s methodologies for each initiative and track (prescriptive, performance, engineered, or custom) are given in the succeeding sections.

1. The Evaluation Team gathered project information from the OPA, the local distribution companies (LDCs), and participants.
2. Frontier reviewed and performed savings calculations for the different tracks within each initiative:
   a. For each HPNC and RNC prescriptive and engineered measure, Frontier reviewed the project information and established appropriate baselines and per unit input assumptions.
3. For each RNC performance project, Frontier mapped energy consumption using the EnerGuide formula and reports. The EnerGuide reports provided the new home’s energy use. Using the EnerGuide formula, Frontier was able to reverse calculate the baseline energy use. The next step calculated the energy savings by subtracting the new home’s energy use from the baseline energy use. On-peak demand was then calculated using a weighted average mix of the OPA’s 2012 residential load profiles.
4. For the HPNC custom projects, Frontier reviewed primarily the computer modelling summary reports for reasonableness of the modelling rationale and the calculated reductions in demand and consumption for the reference design versus proposed design.
   a. Frontier reviewed the Simulation Summary Report, code compliance checklists and Project Evaluator’s Reports for correctness of modelling inputs.
   b. Frontier examined whether the savings generated by the working simulation models substantiate the savings claimed. The models were opened, did simulation runs and the resulting hourly output files compared to the Energy and Demand Savings Summary. In cases of conflict between the model output and the various documents (sometimes because the model files were outdated), Frontier compared the several documents containing savings results and looked at dates of the documents and the Project Evaluator’s reports to ascertain which were the correct values.
5. Frontier used the OPA’s definition of peak demand savings\(^1\) and OPA’s latest load profiles to estimate peak demand savings.

6. The Evaluation Team summed the savings estimates for individual projects to obtain initiative-level gross savings.

7. For projects that provided no documentation that could be used to calculate savings, Frontier applied realization rates. Frontier calculated an average percentage of the evaluator’s savings estimate divided by the original savings claimed for projects that provided documentation. For calculating savings for projects with documentation, Frontier used appropriate realization rates that were specific to the measure type (if the measure was known) or weighted according to frequency of measure types installed in other projects.

8. Net savings were calculated using the net-to-gross ratios (NTGRs) developed by Frontier.

Review of Inputs Assumptions and Algorithms

**HPNC Initiative**

**Prescriptive Track**

Frontier was tasked to review prescriptive savings for projects completed in 2013, including assumed baselines and efficiency cases, savings calculation methodologies, and associated assumptions. Key changes to assumptions are outlined as follows:

**ENERGY STAR Refrigerators**

Energy savings were determined using the calculation methodology and associated assumptions from the current (updated May 2014) ENERGY STAR appliance calculator.

Peak demand savings were calculated by multiplying the energy savings against the total peak load percentage divided by total peak hours as defined in the OPA EM&V Protocols and Requirements. Total peak load percentages were extracted from OPA load profiles for the hours of 1-7 PM, excluding weekends.

The Estimated Useful Life (EUL) was updated from 18 to 17 years based on the DOE 76 Final Rule 57516 Technical Support Document for refrigerators.

**Lighting**

Savings were calculated as specified in the 2011 Quasi-Prescriptive Measures and Assumptions List (MAL) Version 1.0 and HPNC Prescriptive Input Assumptions Version 2.0.

Summer peak demand savings calculated using the OPA load profiles were deemed to be too low, resulting in realization rates of less than 30% when compared to prescriptive assumptions. Instead, the Evaluation Team divided energy savings by measure specific run hours and multiplied against a 0.77 coincidence factor, as specified for a 4 hours summer peak period (1-5 PM) for office buildings in the

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\(^1\) Frontier followed the OPA’s EMV Protocols and Requirements, 2011-2014 definition of peak. This definition of peak is 1pm-7pm, weekdays, June-August.
2007 coincidence factor study final report prepared for the New England State Program Working Group (SPWG) by RLW Analytics. This is reasonably consistent with OPA’s summer peak period of 1-7 PM during the months of June-August and allows for a more reasonable magnitude of lighting demand savings when compared to the lighting demand savings that result from using the lighting load profile provided by the OPA.

The Estimated Useful Life (EUL) for each lighting measure was updated as specified:

- Integrated-Ballast LED Lamps (Commercial): 12 year EUL – 30,000 hour rated life ÷ 2,545 hours
  - Excluding recessed LED lamps
- Linear Fluorescent Measures: 15 year EUL – DEER 2014
  - Excluding high bay applications
- Linear Fluorescent Measures (High Bay): 10 year EUL – 50,000 hour rated life ÷ 4,792 hours
- Non Integrated-Ballast LED Fixture: 20 year EUL – 50,000 hour rated life ÷ 2,545 hours
- Recessed LED Lamps: 14 years – 35,000 hour rated life ÷ 2,545 hours
- Occupancy Sensors: 8 year EUL – DEER 2014

Note: The 2011 Quasi-Prescriptive MAL assumes 2,594 annual run hours for the office building type, as referenced in DEER 2008. This evaluation uses the updated value of 2,545 annual run hours for the office building type, as referenced in DEER 2011.

**Pin Socket CFLs/GU-24 Lamps**

Savings specified for this measure in the HPNC Prescriptive Input Assumptions Version 1.0 were later removed in version 2.0 of the prescriptive assumptions because CFLs were determined to be the accepted best practice. Frontier agrees that CFLs should be the assumed baseline for this measure, so no savings were claimed for this measure. This is consistent with the evaluation for the PY 2011-2012 initiatives.

**Recirculation Ventilation HVLS Fans**

Savings were calculated as specified in the 2011 Quasi-Prescriptive Measures and Assumptions List (MAL) Version 1.0 and HPNC Prescriptive Input Assumptions Version 2.0, however the Evaluation Team accepted adjustments specified in the Nexant evaluation of 2011 business incentive initiatives from September 2012. Primary adjustments include the reduction of baseline CFM assumption from 500 to 140 CFM and the application of a 60% load factor to the efficiency case. Additionally, installed CFM has been updated from 165 CFM to a weighted average value of 264 CFM based on Frontier review of fan models reported as part of the 2013 initiative.

Summer peak demand savings were calculated by multiplying the energy savings against the total peak load percentage divided by total peak hours as defined in the OPA EM&V Protocols and Requirements.
Total peak load percentages were extracted from OPA load profiles for the hours of 1-7 PM, excluding weekends.

**Unitary AC Equipment**

Savings were calculated as specified in the 2011 Quasi-Prescriptive Measures and Assumptions List (MAL) and HPNC Prescriptive Input Assumptions Version 2.0 with a few discrepancies. EFLHs were determined by building type (if specified) rather than using the assumed value of 1,000 EFLH specified for the office building type. Baselines efficiencies were updated to reflect ASHRAE 90.1-2010. Additionally, CEE Tier 1 and Tier 2 efficiency standards were updated to reflect current CEE requirements.

Summer peak demand savings were calculated by multiplying the energy savings against the total peak load percentage divided by total peak hours as defined in the OPA EM&V Protocols and Requirements. Total peak load percentages were extracted from OPA load profiles for the hours of 1-7 PM, excluding weekends.

**Engineered Track**

**Lighting**

Savings were calculated using values and assumptions specified in submitted Commercial Lighting Engineering Worksheets:

- Commercial Interior Lighting Engineering Worksheet Versions 2.0, 3.0, and 3.1
- Commercial Directional Lighting Engineering Worksheet Version 3.0
- Commercial High Bay Lighting Engineering Worksheet Versions 2.0 and 3.1
- Commercial Exterior Lighting Engineering Worksheet Version 3.1

For Engineered track lighting measures, baseline and efficiency case wattages and reported run hours were reviewed for each project. Reported wattages and run hours were largely accepted in most cases. The only exception is that baseline wattages for reported integrated-ballast LED lamps were updated to align with recommended equivalent incandescent and halogen lamps from the current ENERGY STAR Light Bulb Calculator. Furthermore, calculator entries were compared and updated to align with project completion reports, where available.

**Custom Track**

Frontier was tasked with reviewing the computer modelling and associated backup files for conformance to program requirements and overall reasonableness of claimed reductions in demand and consumption for the reference (code compliant) design versus proposed design.

These “custom projects” required computer simulation modelling utilizing approved software to demonstrate the difference in annual energy consumption between the OBC-compliant reference building design and the proposed design with energy efficiency improvements. The project participants

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are required to submit the project documents linked at the web page below, but not all these documents were provided by the LDC’s to OPA:


The following project documents were most important to Frontier for use in the review:

1. Pre- and Post-Project Submission Forms
2. Custom Project Worksheet
3. Simulation Summary Report (with most important appendices listed below; appendices usually NOT provided):
   a. Summary Compliance Report
   b. Code compliance checklists
   c. Reference Building Modelling Information
   d. Notes on Inputs (building, plant, system)
4. Working energy simulation files and hourly output files (.csv)
5. Energy & Demand Savings Summary (.xls)
6. Project Evaluator review reports (not required but very useful, sometimes provided)
7. Drawings, specs, product data
8. Building control sequences are required and needed for review, but were NOT provided
9. Backup for incremental cost entered on Custom Project Worksheet (required but often NOT provided)
   a. For three of the eight projects, incremental cost backup was provided in the form of an equipment/system breakdown in a separate file or email from the architect/engineer, estimator or other consultant. For the five other projects, Frontier found entries for incremental costs on the custom project worksheet or completion report, with no supplemental breakdown provided.

One area of concern was the submittal of outdated model files. These files are refined as the project proceeds, often as a result of reviewer comments, design evolution, final selection of major equipment and approved supplier submittals. The participants should be instructed to always submit the ‘final’ model files at project completion.

Another area of concern is the varying level of backup provided for incremental costs across all the projects. Initiative guidelines require backup for the line items entered on the Custom Project Worksheet, but backup was provided for only three of the eight projects. For the largest project, which claimed a $4.2M incremental cost, the backup provided was based on a high level gross percentage cost premium for engineering (25%), HVAC (25%), Electrical UPS (15%) and building envelope (15%). For the project with the second highest increment cost ($1.2M), there was NO backup provided.
RNC Initiative

Prescriptive Track

The Evaluation Team’s review of the available documents indicates that most of the calculation methodologies and assumptions listed in the 2011 Quasi-Prescriptive Measures and Assumptions List Version 1.0 and HPNC Prescriptive Input Assumptions Version 2.0 were reasonable. Where applicable, Frontier made adjustments to baselines and efficiency cases, as specified in the previous section. The table of changes is available in Appendix D. Site specific metering may be used to validate various measures in future evaluations.

There were 79 projects completed under the HPNC Prescriptive track. Due to missing data in the information provided, Frontier was unable to identify which measures were installed and those savings are reported with a blank measure type.

All Off Switch

Savings were calculated as specified in the 2014 Measures and Assumptions List (MAL).

Demand Savings were calculated by multiplying the energy savings against the total peak load percentage divided by total peak hours as defined in the OPA EM&V Protocols and Requirements. Total peak load percentages were extracted from OPA load profiles for the hours of 1-7 PM, excluding weekends.

The Estimated Useful Life (EUL) was updated from 13 to 8 years based on DEER 2014 EUL for lighting controls measures.

Electric/Gas Furnace with ECM

In the 2014 Prescriptive Measures and Assumptions List (MAL), deemed Gas Furnace with ECM savings are presented for continuous and non-continuous fan usage. Savings are also specified for space heating only or for space heating and cooling. OPA provided weighted energy and demand savings that were derived using 2011 retrofit participation values. These weighted averages were accepted as part of the current program evaluation. However, due to the small number of measures completed in the Residential New Construction initiative, these weighted savings will not be applicable in future evaluations. Instead, LDCs should collect information specifying continuous/non-continuous fan usage and space heating/space heating and cooling for each project.

Demand Savings were calculated by multiplying the energy savings against the total peak load percentage divided by total peak hours as defined in the OPA EM&V Protocols and Requirements. Total peak load percentages were extracted from OPA load profiles for the hours of 1-7 PM, excluding weekends.
**ENERGY STAR Qualified LED**

Energy savings were calculated based on updates made to the ENERGY STAR Integral LED Lamps measure substantiation sheet. The measure was reconfigured for all omni-directional LEDs using a baseline of 40, 60, 75, and 100 W incandescent lamps. The 75 and 100 W baseline wattages were further reduced based on current Canadian energy efficiency regulations for general service lamps as specified at [http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6869](http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6869). 40 and 60 W baseline wattages are scheduled to be reduced in 2015. Average equivalent LED lamp wattages and annual run hours were extracted from the current (updated November 2013) ENERGY STAR savings calculator.4

Demand Savings were calculated by multiplying the energy savings against the total peak load percentage divided by total peak hours as defined in the OPA EM&V Protocols and Requirements. Total peak load percentages were extracted from OPA load profiles for the hours of 1-7 PM, excluding weekends.

**Performance Track**

In PY 2013, 81 homes participated in the OPA’s New Home Construction initiative within the Performance initiative. Of those 81 homes, 73 provided complete EnerGuide report documentation. Frontier used the energy savings data provided by those 73 homes to estimate kW and kWh savings for each home. For homes without a complete report, Frontier used the realization rates calculated from the homes with complete data to calculate the savings.

Frontier calculated benchmark energy consumption by applying the Energy Efficiency Rating Calculation Procedure from the EnerGuide New Homes Administrative and Technical Procedures Manual and solving for the benchmark total energy consumption.5 The value for benchmark total energy consumption was used to represent the total baseline energy consumption for each project.

\[
\text{Energy efficiency rating} = 100 - \left( \frac{\text{Estimated Total Energy Consumption}}{\text{Benchmark Total Energy Consumption}} \right) \times 20
\]

Each EnerGuide report provided a breakdown of energy savings according to how much of that energy use was electric (kWh) or gas (MJ). In order to use the EnerGuide equation above, Frontier converted all energy use into MJ units. After that conversion, Frontier then used the above equation to reverse calculate the benchmark total energy consumption in MJ. Subtracting the estimated total energy consumption from the benchmark total energy consumption provides total energy savings for the home. Frontier then calculated the percentage of energy use that is consumed in the current house by electricity or gas, according to the data provided in the EnerGuide reports. Using that breakdown, Frontier determined the proportion of savings that could be attributed to electricity consumption.

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To calculate summer peak demand savings, the Evaluation Team followed the OPA’s formula for calculating peak demand savings, described in Figure 1. Frontier used 8760-load profiles (2012) from the OPA for residential clothes dryers, clothes washers, dishwashers, lighting, refrigerators, freezers and space heating for ECM replacements in gas furnaces. Space heating for ECM replacements in gas furnaces was weighted by the 2011-2013 participation data from the HVAC Initiative, another OPA saveONenergy Program for new homes. Frontier used the energy saving percentages in the profiles that occurred during the summer on-peak hours as specified by the definition of on-peak demand in the OPA’s EMV Protocols and Requirements. This created an energy saving percentage (SESP) for each measure. The SESP for each measure was then combined together through a weighted average of kWh savings for each measure, as seen in Table 11. The source of the kWh savings used to create the weighted average were the ENERGY STAR calculators available on the ENERGY STAR website.

According to the OPA’s EMV Protocols and Requirements, the standard definition of peak is the average load reduction over an entire block hours. Frontier used the load reduction over summer weekdays from 1pm – 7pm in June, July, and August, using the OPA’s latest load profiles.

\[ \Delta P_{avg} = \frac{AES (kWh) \cdot % SESP}{H_{period}} \]

where:
- AES (kWh): Annual energy savings
- % SESP: Percentage of energy savings estimated to occur in the specific time-of-use period
- \( H_{period} \): No. of hours for the specific time-of-use period

Figure 1: Formula for Summer Peak Demand Savings

6 According to the OPA’s EMV Protocols and Requirements, the standard definition of peak is the average load reduction over an entire block hours. Frontier used the load reduction over summer weekdays from 1pm – 7pm in June, July, and August, using the OPA’s latest load profiles.
Table 11: Weighted Average SESP Used for Average Demand Savings Calculation

<table>
<thead>
<tr>
<th>Measure Type</th>
<th>SESP</th>
<th>kWh</th>
<th>%kWh</th>
<th>Wtd Avg SESP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothes Dryers</td>
<td>6.194%</td>
<td>110</td>
<td>4%</td>
<td>0.221%</td>
</tr>
<tr>
<td>Clothes Washers</td>
<td>4.976%</td>
<td>27</td>
<td>1%</td>
<td>0.044%</td>
</tr>
<tr>
<td>Dishwashers</td>
<td>4.817%</td>
<td>58</td>
<td>2%</td>
<td>0.091%</td>
</tr>
<tr>
<td>Lighting</td>
<td>2.653%</td>
<td>2,111</td>
<td>69%</td>
<td>1.824%</td>
</tr>
<tr>
<td>Refrigerators</td>
<td>5.208%</td>
<td>128</td>
<td>4%</td>
<td>0.217%</td>
</tr>
<tr>
<td>Freezers</td>
<td>5.383%</td>
<td>41</td>
<td>1%</td>
<td>0.071%</td>
</tr>
<tr>
<td>Gas Furnace with ECM</td>
<td>0.644%</td>
<td>596</td>
<td>19%</td>
<td>0.125%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>3,070</td>
<td></td>
<td><strong>2.595%</strong></td>
</tr>
</tbody>
</table>

Frontier then calculated average summer peak demand savings for each PY 2013 performance new home project by multiplying the percentage of energy savings that occurred during the summer on-peak time period against each home’s energy savings and dividing by the number of hours that occurred during that summer on-peak time period (396 hours).

**Impact Evaluation Results**

**HPNC**

Frontier’s evaluation of the HPNC Initiative consisted of 87 projects completed in the 2013 program year. Of those projects, 70 submitted applications under the prescriptive track, seven submitted projects under the engineered track, and seven submitted applications under the custom track.

Figure 2 shows the breakdown of demand savings for the HPNC initiative. Custom projects contributed the majority of demand savings in the HPNC initiative.
Prescriptive Track

As one can see in Table 12, the Prescriptive track, lighting and agribusiness measures provided the majority of energy and demand savings. A significant number of the projects did not provide sufficient documentation to determine the measure, and were deemed “unknown.” Frontier developed the appropriate verified savings for the “unknown” projects by applying a weighted average realization rate. Frontier calculated this realization rate by using assumptions weighted by the other known prescriptive projects that had appropriate documentation.
Table 12: Impact Evaluation – HPNC Prescriptive – Gross Energy and Demand Savings by Measure

<table>
<thead>
<tr>
<th>Measure</th>
<th>Gross Demand Savings (kW)</th>
<th>Gross Energy Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agribusiness: HVLS Fans</td>
<td>218.7</td>
<td>640,820</td>
</tr>
<tr>
<td>Appliances: Refrigerators</td>
<td>3.7</td>
<td>28,298</td>
</tr>
<tr>
<td>Lighting</td>
<td>415.5</td>
<td>2,509,894</td>
</tr>
<tr>
<td>Lighting Controls</td>
<td>9.8</td>
<td>32,296</td>
</tr>
<tr>
<td>Unitary AC</td>
<td>60.8</td>
<td>105,732</td>
</tr>
<tr>
<td>Unknown</td>
<td>234.3</td>
<td>670,348</td>
</tr>
<tr>
<td>Total</td>
<td>942.9</td>
<td>3,987,388</td>
</tr>
</tbody>
</table>

Engineered Track

All seven of the projects that participated in the engineered track were lighting projects. Table 13 shows the verified gross demand and energy savings calculated by Frontier.

Table 13: Impact Evaluation - HPNC Engineered - Gross Energy and Demand Savings by Measure

<table>
<thead>
<tr>
<th>Measure</th>
<th>Gross Demand Savings (kW)</th>
<th>Gross Energy Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>35.8</td>
<td>265,669</td>
</tr>
<tr>
<td>Total</td>
<td>35.8</td>
<td>265,669</td>
</tr>
</tbody>
</table>

Custom Track

Table 14 shows the verified gross demand and energy savings that Frontier calculated for the seven projects submitted under the custom track.

Table 14: Impact Evaluation - HPNC Custom - Gross Energy and Demand Savings

<table>
<thead>
<tr>
<th>Track</th>
<th>Gross Demand Savings (kW)</th>
<th>Gross Energy Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom</td>
<td>1,955</td>
<td>4,930,772</td>
</tr>
</tbody>
</table>

Realization Rates

Realization rates are the ex-post estimated savings that Frontier has calculated divided by the ex-ante project savings, which were the original savings values provided by the OPA. The realization rates for each track are provided in the following table.
Table 15: HPNC Realization Rates

<table>
<thead>
<tr>
<th>Realization Rates by Initiative Track</th>
<th>% kWh</th>
<th>% kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescriptive</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Engineered</td>
<td>73%</td>
<td>56%</td>
</tr>
<tr>
<td>Custom</td>
<td>99%</td>
<td>100%</td>
</tr>
<tr>
<td>All Projects</td>
<td>76%</td>
<td>68%</td>
</tr>
</tbody>
</table>

The measures with the greatest impact on the realization rates were prescriptive agribusiness and prescriptive HVAC measures. For the prescriptive agribusiness measures, the evaluation team was requested to review Nexant’s evaluation of the 2011 Business Incentive program from September 2012 for its appropriateness for HPNC. These primary adjustments include the reduction of baseline CFM assumption from 500 to 140 CFM and the application of a 60% load factor to the efficiency case. Additionally, installed CFM has been updated from 165 CFM to a weighted average value of 264 CFM based on Frontier review of fan models reported as part of the 2013 program.

For prescriptive HVAC measures, the primary factor leading to decreased realization rates for this measure was that baseline efficiency values were increased to align with ASHRAE 90.1-2010, as required by Canada’s Office of Energy Efficiency (OEE). This change resulted in decreased savings for prescriptive HVAC measures, causing a lower realization rate.

These adjustments were also included as suggested changes to the measure substantiation sheets. The suggested changes to the measure substantiation sheets are included in Appendix E.
**RNC**

Frontier’s evaluation of the RNC Initiative consisted of 14 applications for the Performance track and six applications for the Prescriptive track completed in 2013 program years. Figure 3 shows the contribution to RNC demand savings by track.

*Figure 3: Impact Evaluation - RNC Gross kW Savings by Track*

![Pie chart showing Performance and Prescriptive track contributions]

### Prescriptive Track

There were six projects submitted under the RNC Prescriptive track. Table 16 summarizes the total savings for projects completed under the RNC Prescriptive track.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Gross Demand Savings (kW)</th>
<th>Gross Energy Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Off Switch</td>
<td>1.4</td>
<td>21,515</td>
</tr>
<tr>
<td>Electric Furnace with ECM</td>
<td>0.09</td>
<td>307</td>
</tr>
<tr>
<td>ENERGY STAR Qualified LED</td>
<td>1.6</td>
<td>23,354</td>
</tr>
<tr>
<td>Gas Furnace with ECM</td>
<td>15.4</td>
<td>53,405</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18.4</strong></td>
<td><strong>98,581</strong></td>
</tr>
</tbody>
</table>
Performance Track

Performance projects submitted ranged in EnerGuide score from 83 to 85, with the majority falling at a score of either 83 or 84 which are the minimum score thresholds to receive an incentive. Savings results for the RNC performance track are presented in Table 17.

Table 17: Impact Evaluation - RNC Performance - Gross Energy and Demand Savings by EnerGuide Score

<table>
<thead>
<tr>
<th>EnerGuide Score</th>
<th>Project Count</th>
<th>Gross Demand Savings (kW)</th>
<th>Gross Energy Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>83</td>
<td>38</td>
<td>4.0</td>
<td>60,549</td>
</tr>
<tr>
<td>84</td>
<td>36</td>
<td>5.2</td>
<td>78,979</td>
</tr>
<tr>
<td>85</td>
<td>7</td>
<td>1.4</td>
<td>21,717</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
<td>10.6</td>
<td>161,245</td>
</tr>
</tbody>
</table>

Realization Rates

Realization rates are the ex-post estimated savings that Frontier has calculated divided by the ex-ante project savings, which were the original savings values provided by the OPA. The realization rates for each track are provided in the following table.

Table 18: RNC Realization Rates

<table>
<thead>
<tr>
<th>Realization Rates by Initiative Track</th>
<th>% kWh</th>
<th>% kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescriptive</td>
<td>140%</td>
<td>57%</td>
</tr>
<tr>
<td>Performance</td>
<td>1194%</td>
<td>1200%</td>
</tr>
<tr>
<td>Custom</td>
<td>No projects</td>
<td>No projects</td>
</tr>
<tr>
<td>All Projects</td>
<td>309%</td>
<td>87%</td>
</tr>
</tbody>
</table>

Differing fan usage patterns between prescriptive and performance track homes with the gas furnace with ECM measure created a difference in the relative kW and kWh savings. The fan usage pattern affects the load profile selected and, therefore, the kWh savings.

The prescriptive track homes were weighted using fan usage patterns derived from the OPA HVAC Initiative participation data. The load profile applied was for space heating and cooling for new homes with continuous or non-continuous fan usage. However, for the performance track homes, savings data
indicated that most homes installed a gas furnace with an ECM with one specific fan usage pattern. A weighted load profile was applied for space heating only with continuous or non-continuous fan usage. The weighted fan usage pattern was derived from OPA HVAC Initiative participation data.

These different fan usage patterns impact the kW savings, which reduced kW savings for prescriptive track homes. But for performance track homes that were using deemed savings that significantly underestimated both kW and kWh savings, the realization rate continued to be high.

For performance track homes, the realization rates were high because Frontier found that the OPA’s method for calculating savings underestimated the savings per performance track home. Using the EnerGuide formula, Frontier was able to reverse calculate the baseline energy use. The next step calculated the energy savings by subtracting the new home’s energy use from the baseline energy use. On-peak demand was then calculated using a weighted average mix of the OPA’s 2012 residential load profiles. The resultant savings estimates were substantially higher than the OPA’s current deemed savings values. Frontier’s method for evaluating the savings for each home is described more thoroughly under “Review of Inputs and Algorithms” → “RNC Initiative” → “Performance Track” section above.

**Net to Gross Evaluation**

**Method**

Frontier sought to adjust gross energy and demand savings estimates by applying a set of net-to-gross “adjustment factors”. These factors typically include free ridership rates and spillover effects, although we were not able to conclude spillover effect during this evaluation. The aggregate of these factors are the “net-to-gross ratio” (NTGR). In order to calculate these NTGRs to apply to the gross evaluated impacts, Frontier followed the OPA’s EM&V Protocols and Requirements – STG-12 Net-to-Gross Adjustment.

According to OPA’s EM&V Protocols and Requirements, “free ridership” measures the program participants that would have implemented the measure in the absence of the program. The savings attributed to the implementation of this measure are not be included as part of overall program savings, because the savings were not caused by the program. “Spillover effects” occur when an energy efficiency program influences customers to reduce energy consumption or demand, but the savings are not a direct result of the program.

Due to the small number of participants in the initiatives, Frontier chose to use a self-reporting method for determining NTGR. Frontier surveyed participants with series of questions to ascertain whether the actions they had taken would have been performed in the absence of the initiative. The survey questions provided an answer scale that was used in conjunction with a probability matrix to estimate free ridership. The questions, answers, probability scale, and results are described in the following sections.
Free Ridership Method

For each question, participants were able to choose from a range of responses. Each response was linked with a free ridership probability score, provided in Table 19. Frontier averaged the score probabilities together to calculate an estimate of free ridership for each initiative.

<table>
<thead>
<tr>
<th>Did you learn about the OPA’s Program BEFORE or AFTER you decided to build or renovate?</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Table 19: Free Ridership Probability Matrix

<table>
<thead>
<tr>
<th>How important or not important was the payback period as a factor in the decision-making process?</th>
<th>Very Important</th>
<th>Fairly Important</th>
<th>Either Important or Unimportant</th>
<th>Fairly Unimportant</th>
<th>Very Unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>30%</td>
<td>50%</td>
<td>70%</td>
<td>90%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How important was the desire to be energy efficiency or “green” in your decision to include energy efficiency measures in your new construction project?</th>
<th>Very Important</th>
<th>Fairly Important</th>
<th>Either Important or Unimportant</th>
<th>Fairly Unimportant</th>
<th>Very Unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>30%</td>
<td>50%</td>
<td>70%</td>
<td>90%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Only for Commercial Custom projects: How important was the incentive for modeling or design assistance in your decision to include energy efficiency measures in your new construction project?</th>
<th>Very Important</th>
<th>Fairly Important</th>
<th>Either Important or Unimportant</th>
<th>Fairly Unimportant</th>
<th>Very Unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>30%</td>
<td>50%</td>
<td>70%</td>
<td>90%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How important was the incentive in your decision to include energy efficiency measures in your new construction project?</th>
<th>Very Important</th>
<th>Fairly Important</th>
<th>Either Important or Unimportant</th>
<th>Fairly Unimportant</th>
<th>Very Unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>30%</td>
<td>50%</td>
<td>70%</td>
<td>90%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To what extent did the incentive for energy efficiency measures influence your building design or the level of energy efficiency included in your project?</th>
<th>A Great Deal</th>
<th>A Fair Amount</th>
<th>Somewhat</th>
<th>Just a Little</th>
<th>Not At All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>30%</td>
<td>50%</td>
<td>70%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Spillover Method

Frontier was unable to contact non-participants in order to gauge the existence of any true spillover effects. However, Frontier’s discussions with participants did indicate the possibility of some spillover within the participant group. But this positive response was small, and Frontier did not consider the results conclusive enough to include as true spillover.
Table 20 shows the questions and answer scale that was used in surveys to HPNC and RNC participants for gauging participant spillover.

**Table 20: Spillover Questions for HPNC and RNC Participants**

<table>
<thead>
<tr>
<th>Question</th>
<th>Available Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since participating in the High Performance New Construction/Residential New Construction program, have you included any additional energy efficient measures in project(s) that have gone through the program, but for which you did not receive an incentive?</td>
<td>Yes, No, Don't Know</td>
</tr>
<tr>
<td>Do you think your experience participating in the program has changed the way you do business in any way?</td>
<td>Yes, No, Don't Know</td>
</tr>
</tbody>
</table>

**Results**

Frontier attempted to contact all participants who took part in the OPA’s PY 2013 New Construction initiatives. Table 21 below provides an overview of the number of participants surveyed for the NTGR analysis:

**Table 21: PY 2013 HPNC and RNC Participants Surveyed**

<table>
<thead>
<tr>
<th>Total # of Participants</th>
<th>Total Surveyed</th>
<th>Percentage of Total Contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPNC</td>
<td>84</td>
<td>16</td>
</tr>
<tr>
<td>RNC</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

Frontier also asked some of the same NTGR questions to HPNC participants in the PY 2011-2012 evaluation. Frontier included those HPNC responses in the analysis, in order to increase the significance of the results. Frontier did not include the survey responses for RNC participants from PY 2011-2012 evaluation, because they included the same respondents surveyed in PY 2013.

**HPNC Free Ridership**

For the HPNC initiative, Table 22 shows the number of participants that chose a particular answer in response to a survey question. Frontier also included the percentage (provided in parentheses) of total participants that chose that answer.
As one can see, each answer was attributed a percentage that indicated free ridership. For example, respondents were asked whether they had learned about the OPA’s new construction initiative before or after they had decided to build or renovate. About 44 percent, or 11 out of the 25 responses, indicated they learned about the initiative after they had decided to build or renovate. This response indicates a moderate amount of free ridership.

In addition, most respondents indicated that being energy efficient or “green” was an important factor in deciding to include energy efficiency measures in their project. Of the responses, 56 percent (or 14 responses) indicated that being “green” was “Very Important,” and 20 percent (or 5 responses) to be “Fairly Important.” This desire to be energy efficient or “green” shows interest in energy efficiency that may have resulted in high efficiency renovations, had the initiative not existed.

Other responses indicate that the availability of the incentive played an important role in convincing participants to install high efficiency measures. The majority of respondents indicated that the availability of the incentive affected their decision making “A Great Deal” (5 respondents, or 31 percent) or “A Fair Amount” (6 respondents, or 38 percent). Only three participants (19 percent) indicated that the availability of the incentive affected their decision making “Not At All” or “Just a Little.”

Using the probability matrix in Table 19 and the survey results in Table 22, Frontier averaged all participants’ probability scores together for the HPNC initiative and found a free ridership percentage of 46 percent.
HPNC Spillover

For the HPNC initiative, Table 23 shows the responses to participant spillover questions.

### Table 23: HPNC Participant Spillover Responses

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Don’t Know</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since participating in the High Performance New Construction program, have you included any additional energy efficient measures in project(s) that have gone through the program, but for which you did not receive an incentive?</td>
<td>6 (24%)</td>
<td>14 (56%)</td>
<td>5 (20%)</td>
<td>n = 25</td>
</tr>
<tr>
<td>Do you think your experience participating in the program has changed the way you do business in any way?</td>
<td>4 (16%)</td>
<td>19 (76%)</td>
<td>2 (8%)</td>
<td>n = 25</td>
</tr>
</tbody>
</table>

Because Frontier did not contact non-participants, no analysis of true spillover was conducted. Frontier did ask participants about the effect of the initiative on whether they installed additional energy efficient equipment outside of the initiative. About 24 percent of the respondents indicated that they included additional energy efficient measures that did not receive incentive. These responses indicate some small spillover within the participant population. But these responses are not conclusive enough to include a percentage of true spillover within the net-to-gross ratio.

RNC Free Ridership

For the RNC initiative, Table 24 below shows the number of participants that chose a particular answer in response to a survey question. Frontier also included the percentage (provided in parentheses) of total participants that chose that answer.

### Table 24: RNC Responses to Free Ridership Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Before</th>
<th>After</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you learn about the OPA’s Program BEFORE or AFTER you decided to build or renovate?</td>
<td>4 (80%)</td>
<td>1 (20%)</td>
<td>n = 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How important or not important was the payback period as a factor in the decision-making process?</th>
<th>Very Important</th>
<th>Fairly Important</th>
<th>Either Important or Unimportant</th>
<th>Fairly Unimportant</th>
<th>Very Unimportant</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 (20%)</td>
<td>4 (80%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>n = 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How important was the desire to be energy efficiency or “green” in your decision to include energy efficiency measures in your new construction project?</th>
<th>Very Important</th>
<th>Fairly Important</th>
<th>Either Important or Unimportant</th>
<th>Fairly Unimportant</th>
<th>Very Unimportant</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>3 (60%)</td>
<td>2 (40%)</td>
<td>n = 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How important was the incentive in your decision to include energy efficiency measures in your new construction project?</th>
<th>Very Important</th>
<th>Fairly Important</th>
<th>Either Important or Unimportant</th>
<th>Fairly Unimportant</th>
<th>Very Unimportant</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 (20%)</td>
<td>4 (80%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>n = 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To what extent did the incentive for energy efficiency measures influence your building design or the level of energy efficiency included in your project?</th>
<th>A Great Deal</th>
<th>A Fair Amount</th>
<th>Somewhat</th>
<th>Just a Little</th>
<th>Not At All</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 (40%)</td>
<td>3 (60%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>n = 5</td>
</tr>
</tbody>
</table>
For the RNC, the responses indicated less free ridership than for the HPNC initiative. When asked whether they learned about the initiative before or after the decision to build or renovate, 4 participants (or 80 percent) indicated that they learned about the initiative before the decision. These responses suggest that the initiative bore some influence on the high efficiency measure decision making.

The responses also indicated that the desire to be energy efficient or “green” was not very important, suggesting that respondents were not self-motivated to implement high efficiency measures. Three participants (60 percent) and 2 participants (40 percent) selected “Fairly Unimportant” and “Very Unimportant” respectively, when asked about the motivating factor of a desire to be considered green or “energy efficient.”

Using the probability matrix in Table 19 and the survey results in Table 24, Frontier averaged all participants’ probability scores together for the RNC program and found free ridership percentage of 37 percent.

**RNC Spillover**

For the RNC initiative, Table 25 shows the responses to participant spillover questions.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Don't Know</th>
<th># Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since participating in the High Performance New Construction program, have you included any additional energy efficient measures in project(s) that have gone through the program, but for which you did not receive an incentive?</td>
<td>1 (20%)</td>
<td>4 (80%)</td>
<td>0 (0%)</td>
<td>n = 5</td>
</tr>
<tr>
<td>Do you think your experience participating in the program has changed the way you do business in any way?</td>
<td>2 (40%)</td>
<td>3 (60%)</td>
<td>0 (0%)</td>
<td>n = 5</td>
</tr>
</tbody>
</table>

Because Frontier did not contact non-participants, no analysis of true spillover was conducted. In Frontier’s survey of participants, Frontier found that one respondent out of the five total indicated that they included additional energy efficient measures that did not receive incentive. These responses do not suggest a significant amount of spillover within the participant population. As a result, Frontier did not include any spillover within the net-to-gross ratio.
HPNC and RNC Net-to-Gross Ratios

Based on the above analysis, Frontier calculated the NTGRs in Table 26. These percentages were used to calculate net savings for Frontier’s impact evaluation of the PY 2013 initiatives.

Table 26: HPNC and RNC Net-to-Gross Ratios

<table>
<thead>
<tr>
<th></th>
<th>Free Ridership</th>
<th>Spill Over</th>
<th>NTGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPNC</td>
<td>46%</td>
<td>0%</td>
<td>54%</td>
</tr>
<tr>
<td>RNC</td>
<td>37%</td>
<td>0%</td>
<td>63%</td>
</tr>
</tbody>
</table>

Key Findings

**HPNC**

Table 27 shows the number of participations, the program realization rates, the gross verified savings, the NTGRs, and the net verified savings for the HPNC initiative. This table also compares those results with the initiative’s performance in PY 2011-2012.

Table 27: HPNC Initiative Results

<table>
<thead>
<tr>
<th>Initiative Metric – HPNC</th>
<th>PY 2011-2012</th>
<th>PY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Participants</td>
<td>63</td>
<td>87</td>
</tr>
<tr>
<td>Initiative Realization Rate (% kWh)</td>
<td>98%</td>
<td>76%</td>
</tr>
<tr>
<td>Initiative Realization Rate (% kW)</td>
<td>96%</td>
<td>68%</td>
</tr>
<tr>
<td>Gross Verified Demand Savings (MW)</td>
<td>3.5</td>
<td>2.9</td>
</tr>
<tr>
<td>Gross Verified Annual Energy Savings (GWh)</td>
<td>11.73</td>
<td>9.18</td>
</tr>
<tr>
<td>Gross Verified Lifetime Energy Savings (GWh)</td>
<td>175.48</td>
<td>124.28</td>
</tr>
<tr>
<td>Net to Gross Ratio</td>
<td>0.49</td>
<td>0.54</td>
</tr>
<tr>
<td>Net Peak Demand Savings (MW)</td>
<td>1.84</td>
<td>1.58</td>
</tr>
<tr>
<td>Net Annual Energy Savings (GWh)</td>
<td>6.16</td>
<td>4.96</td>
</tr>
<tr>
<td>Net Lifetime Energy Savings (GWh)</td>
<td>92.15</td>
<td>67.11</td>
</tr>
</tbody>
</table>
Realization rates for the HPNC initiative were 76 percent for kWh and 68 percent for kW. The measures with the greatest impact on the realization rates were prescriptive agribusiness and prescriptive HVAC measures.

- **Prescriptive agribusiness measures**
  - Per OPA’s instruction, the evaluation team reviewed Nexant’s evaluation of the 2011 Business Incentive program from September 2012. Savings for these measures were revised using adjustments specified in that evaluation and an updated efficiency case CFM/W fan efficiency based on a weighted average of HVLS fans installed in PY 2013.

- **Prescriptive HVAC measures**
  - The primary factor leading to decreased realization rates for this measure was that baseline efficiency values were increased to align with ASHRAE 90.1-2010, as required by Canadian OEE.

- **Demand savings realization**
  - PY 2011-2012 evaluation used Seasonal Energy Savings Patterns (SESP) from Prescriptive and Quasi-Prescriptive Measures and Assumptions List (MALs). OPA instructed the evaluation team to use load profiles (provided by OPA) for PY 2013 evaluation.

- **Custom and prescriptive lighting projects**
  - Custom and prescriptive lighting projects made up the majority of energy and demand savings for the HPNC
    - Top three contributors to demand savings:
      - Custom: 67% of total demand savings
      - Prescriptive lighting: 14% of total demand savings
      - Prescriptive agribusiness: 7% of total demand savings

- **Net-to-gross ratio**
  - Frontier’s survey of participants found 46% indicated some free ridership. Frontier did not survey non-participants to ascertain spill over.
  - The NTGR for the HPNC initiative was 0.54.

- **Compared with HPNC in PY 2011-2012**
  - Agribusiness ventilation continues to be a significant contributor to HPNC savings, although not as significant in PY 2013:
    - In PY 2011-2012, agribusiness ventilation made up 24% of kW savings
    - In PY 2013, agribusiness ventilation made up 7% of kW savings
  - Custom projects continue to dominate HPNC savings:
    - In PY 2011-2012, custom projects made up 66% of HPNC kW savings
    - In PY 2013, custom projects made up 67% of HPNC kW savings
Table 28 shows the number of participations, the program realization rates, the gross verified savings, the NTGRs, and the net verified savings for the RNC initiative. This table also compares those results with the initiative’s performance in PY 2011-2012.

<table>
<thead>
<tr>
<th>Initiative Metric – RNC</th>
<th>PY 2011-2012</th>
<th>PY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Participants</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Program Realization Rate (% kWh)</td>
<td>586%</td>
<td>309%</td>
</tr>
<tr>
<td>Program Realization Rate (% kW)</td>
<td>803%</td>
<td>87%</td>
</tr>
<tr>
<td>Gross Verified Demand Savings (MW)</td>
<td>0.006</td>
<td>0.029</td>
</tr>
<tr>
<td>Gross Verified Annual Energy Savings (GWh)</td>
<td>0.06</td>
<td>0.259</td>
</tr>
<tr>
<td>Gross Verified Lifetime Energy Savings (GWh)</td>
<td>0.81</td>
<td>3.62</td>
</tr>
<tr>
<td>Net to Gross Ratio</td>
<td>0.49</td>
<td>0.63</td>
</tr>
<tr>
<td>Net Peak Demand Savings (MW)</td>
<td>0.003</td>
<td>0.02</td>
</tr>
<tr>
<td>Net Annual Energy Savings (GWh)</td>
<td>0.03</td>
<td>0.16</td>
</tr>
<tr>
<td>Net Lifetime Energy Savings (GWh)</td>
<td>0.43</td>
<td>2.28</td>
</tr>
</tbody>
</table>

- A typical performance track project provided more energy savings and less demand savings, relative to a typical prescriptive measure.
  - Differing fan usage patterns between prescriptive and performance track homes with the gas furnace with ECM measure created a difference in the relative kW and kWh savings. The fan usage pattern affects the load profile selected and, therefore, the kW savings.
    - For the prescriptive track homes, gas and electric furnace with ECM assumptions were weighted using fan usage patterns derived from OPA HVAC Initiative participation data. The load profile applied was for space heating and cooling for new homes with continuous or non-continuous fan usage.
    - For performance track homes, savings data indicated that most homes installed a gas furnace with an ECM with one specific fan usage pattern. A weighted load profile was applied for space heating only with continuous or non-continuous fan usage. The weighted fan usage pattern was derived from OPA HVAC Initiative participation data.
The different fan usage patterns between prescriptive and performance track homes resulted in dramatically different kW and kWh savings patterns between prescriptive and performance homes.

Collecting data on the fan usage patterns for gas furnaces with ECM will help address this issue in the future.

- This issue resulted in the following realization rates: 309% for kWh and 87% for kW savings.
  - 62% of RNC kWh savings came from the performance track projects.
  - 64% of RNC kW savings came from the prescriptive track projects.

- Realization rates for the performance track were 1,194% for kWh and 1,200% for kW. These realization rates were high because Frontier found that the OPA’s method for calculating savings underestimated the savings per performance track home.
  - The EnerGuide reports provided the new home’s energy use. Using the EnerGuide formula, Frontier was able to reverse calculate the baseline energy use. The next step calculated the energy savings by subtracting the new home’s energy use from the baseline energy use. On-peak demand was then calculated using a weighted average mix of the OPA’s 2012 residential load profiles.

- Compared with RNC in PY 2011-2012:
  - PY 2011-2012 saw only 3 prescriptive track participants, 2 of which also participated under the performance track. In PY 2011-2012, savings from the prescriptive track was negligible for the RNC initiative.
  - In PY 2013, the biggest contributor to kW savings within the RNC initiative was the gas furnace with ECM prescriptive measure. The biggest contributor to kWh savings was the performance track homes.

Recommendations

**HPNC**

Frontier’s suggested HPNC impact evaluation recommendations have been compiled in Table 29. High level recommendations include creating additional deemed savings for building-specific operating hours, adding a Retail building type to the custom track, and requiring additional documentation for custom project such as the final commissioning report and (2) the as-built control diagrams from the building automation contractor.

**Table 29: Impact Evaluation Recommendations for the HPNC Initiative**

| Prescriptive Track | • Adopt updated input assumptions as indicated in Appendix D: Updated Prescriptive Assumptions, and Appendix E: Suggested Adjustments to Measures.
| | o Create additional deemed savings or prescriptive assumptions to make use of building-specific operating hours. Currently, the Lighting and the Unitary AC measures only reference the Office or Warehouse building-types. The project application already collects |

building type. The MAL already specifies different operating hours per building type for these measures. At a minimum, consider adding a Retail building type, as a majority of projects are covered by the Office and Retail building types. This would improve the accuracy of savings estimates and minimize impact on realization rates during program evaluations, as savings will continue to be adjusted based on building specific operating hours when the building type is specified.

### Custom Track

- A review of the available documents for other custom projects indicates that the modellers used good practice in modelling architectural and mechanical, electrical and plumbing systems for energy consumption, yielding reasonable energy and demand savings. Based on available information, the Evaluation Team does not recommend any changes to the custom savings estimations.
- Consider requiring the submission of the following additional documents for custom projects:
  - The final commissioning report
  - The as-built control diagrams from the building automation contractor. These documents would be submitted when the project is complete and would allow reviewers to confirm that the building automation contractor had furnished controls implementing the specified sequence of operations and that the facility operated as designed when placed in service.

### RNC

Recommendations for the RNC impact evaluation are compiled in Table 30. Frontier suggests providing project-specific information on fan usage and space heating and cooling for gas furnace with ECM measures. Because the OPA is underestimating savings when reporting for performance track projects, Frontier recommends updating the Performance track deemed savings to a more accurate value. Frontier also suggests revisiting the EnerGuide ratings acceptable for incentive in the Performance track, in anticipation of the Ontario Building Code changes that will occur on January 1, 2017.
| Prescriptive Track | Current Electric/Gas weighting assumptions are based on 2011 OPA HVAC Initiative participation data. Additional participation data has been submitted for program years 2012-2013. While existing measure weighting assumptions were allowed for the Electric and Gas Furnace with ECM measure as part of this year’s initiative evaluation, the Evaluation Team recommends that the LDCs collect project-specific information regarding fan usage and space heating and cooling type for these measures. The weighting assumptions are deemed to be a reasonable representation of electric/gas furnace with ECM usage patterns. However, the weighting assumptions should not be applied to the RNC prescriptive track if participation levels from 2011-2013 persist in future program years. For example, in 2013, these measures were only included for six projects. The application of the weighted average usage patterns is not appropriate for such a small project sample size. If these recommendations cannot be implemented as part of the 2014 program year, the evaluation team will allow the weighting approach but will update the weighting assumptions to incorporate the recently submitted participation data from program years 2012-2013.  
• Adopt the specific, measure-level recommendations on input assumptions as provided in Appendix D: Updated Prescriptive Assumptions, and Appendix E: Suggested Adjustments to Measures. |
| Performance Track | Update the deemed savings values used for the performance track projects to a more accurate savings value.  
• Current Ontario Building Code requires that new homes must at minimum meet an EnerGuide rating of 80. On January 1, 2017, new homes will have to meet an energy efficiency level that is 15 percent higher than the current standard. In anticipation of that code change, the OPA will need to revisit the EnerGuide ratings acceptable for incentive and their associated energy and demand savings. |
Frontier Associates assessed the delivery effectiveness of the OPA’s HPNC and RNC initiatives. The goals and objectives of this process evaluation are to determine the overall effectiveness and comprehensiveness of the Programs by assessment of the effectiveness of the programs’ market delivery, audit of OPA’s program tracking systems, review of customer motivations, and assessment of direct employment effects. This section is divided into the following high-level sections:

1. High Performance New Construction
   a. Assessment of the Effectiveness of the Programs’ Market Delivery
   b. Review of Customer Motivations
   c. Incentive Levels Analysis
   d. New Construction Market
2. Residential New Construction
   a. Assessment of the Effectiveness of the Programs’ Market Delivery
   b. Review of Customer Motivations
   c. Incentive Levels Analysis
   d. New Construction Market
3. Audit of the OPA’s Program Tracking Systems (Both HPNC and RNC)
4. Assessment of Direct Employment Effects (Both HPNC and RNC)
5. Program Design & Other Recommendations (Both HPNC and RNC)

The two program-specific sections cover topics including Assessment of the Effectiveness of the Programs’ Market Delivery, Review of Customer Motivation, and Incentive Level Analysis. Those sections include methods, results, discussions, and recommendations as applicable. The three final sections address special topics with relevance to both the HPNC and the RNC.

**High Performance New Construction**

Frontier’s process evaluation covers four dimensions of HPNC program performance: Program Market Delivery Effectiveness, Customer Motivation, Incentive Levels, and Penetration of the New Construction Market.

**Assessment of the Effectiveness of the Initiative’s Market Delivery**

The Evaluation Team conducted a comprehensive process review to provide feedback on the design, delivery, and quality of the HPNC initiative. This review included surveys of participants, key OPA staff and interviews with LDCs.
Methodology

Frontier assessed the delivery of the HPNC program by interviewing LDCs, participants, modellers or salesperson involved in the application process and key OPA staff. Frontier interviewed representatives from nine LDCs. Eight of the interviews were conducted in-person, while the remaining interview was conducted via telephone.

Frontier also conducted sixteen surveys of participants in the 2013 HPNC program. The survey instruments are available in Appendices A and B. These surveys were administered over the phone by Frontier personnel. Table 31 shows the total number of participants surveyed compared to the total number in the program.7

<table>
<thead>
<tr>
<th>Survey Recipients</th>
<th>Number Surveyed</th>
<th>Total Number in Program</th>
<th>Percentage Surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>16</td>
<td>84</td>
<td>19%</td>
</tr>
</tbody>
</table>

Similar to PY2011-2012, lighting projects made up the majority of measures installed in the HPNC program in 2013. Figure 4 shows that lighting measures made up 44 percent of measures installed. Recirculation ventilation fans measures make up the second greatest portion of measures installed, and HVAC measures are third. A breakdown of the specific measures installed is provided in Table 32.

Figure 4: Process Evaluation - HPNC Measures Installed in PY 2013

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7 Many of the HPNC projects were agribusiness customers, and spring was an inconvenient time to be surveyed.
Table 32: Process Evaluation - HPNC Measures Installed PY 2013

<table>
<thead>
<tr>
<th>Measure</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-Cooled Unitary AC Equipment, 17-25 ton</td>
<td>8</td>
</tr>
<tr>
<td>Air-Cooled Unitary AC Equipment, 3-15 ton</td>
<td>45</td>
</tr>
<tr>
<td>Custom Measures</td>
<td>8</td>
</tr>
<tr>
<td>ENERGY STAR® Refrigerator</td>
<td>2</td>
</tr>
<tr>
<td>Lighting: High Performance T8 Fixtures</td>
<td>17</td>
</tr>
<tr>
<td>Lighting: LED</td>
<td>16</td>
</tr>
<tr>
<td>Lighting: Occupancy Sensors</td>
<td>7</td>
</tr>
<tr>
<td>Lighting: Pin Socket CFL - 4-Pin Lamps</td>
<td>4</td>
</tr>
<tr>
<td>Lighting: T5 Medium and High Bay Fixtures</td>
<td>13</td>
</tr>
<tr>
<td>Lighting: Induction Lighting</td>
<td>4</td>
</tr>
<tr>
<td>Recirculation Ventilation Fans: HVLS Fans</td>
<td>35</td>
</tr>
<tr>
<td>(Measure not Provided)</td>
<td>16</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>173</strong></td>
</tr>
</tbody>
</table>

Results

Survey participants rated the importance of various program design factors in encouraging program participation. Figure 5 shows the importance of contact from the OPA, contact from the LDC, OPA and LDC informational literature, and the availability of the incentive as factors in deciding to participate in the HPNC initiative. Survey participants were asked to rate these factors on a scale of 1 to 5 with a 5 representing a great impact and 1 representing a negligible impact.

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8 Please note that these numbers may not add up to the number of projects. Participants often selected more than one building type.
While the incentive was the most important factor, survey responses also show that communications, whether by an LDC or OPA customer representative were also effective.

When asked whether they found the application process to be reasonable and understandable, 100 percent of participants involved in the application process agreed. Figure 6 illustrates this achievement, while also showing that several respondents did not respond since they were not the responsible party for filling out the paperwork.
Survey recipients were asked to rate their satisfaction with the application process and the ease of completing the application on a scale of 1 to 5, with one representing dissatisfaction and five representing the highest level of satisfaction. Figure 7 shows the responses of participants that have filled out the applications for the HPNC program.

While some respondents did complain about the complexity of the application process (as discussed below), overall the survey indicates satisfaction with the application process. This is a significant improvement from PY2011-2012.
Discussion
The LDCs and participants reported the following key concerns with the 2013 design of the HPNC:

Minimum Project Size
• The minimum project size requirements still preclude a number of smaller projects and smaller businesses from participating in the program.

Application Process
• Participants found the application forms to be fairly reasonable and easy to understand. This is an improvement from the 2011-2012 program years. There were no complaints on the amount of “legal language” involved in the application, only one comment on the “complexity” of the application.
• Stakeholders are still concerned with the timing of the pre-approval applications and the likelihood that the project design may change as the project undergoes construction. Previous program years were not as flexible in allowing significant changes; however, in 2013 project designs were allowed to deviate from the pre-application form up to 30%. LDC’s seemed to appreciate this change in program design.
• LDCs still find that the application is difficult to amend to reflect changes implemented by the builder, tenant, or owner once the application has been completed.
• One LDC noted that there were too many qualifying software applications for modellers to use. This can create inconsistencies in the application process.

Incentive Processing
• Participants are overall satisfied with the length of time they received their incentive checks. Most participants reporting receiving checks in the four to six week range.

Incentive Levels
• The incentive levels are average for similar programs in North America, and almost 80% of participants claimed that the incentive level was important in their decision to install energy efficiency measures. However, several stakeholders still found the incentive levels are too low, relative to the cost of completing and understanding the application process.

Tracking System
• OPA staff finds that the absence of a working tracking system makes it difficult for the OPA to monitor the level of activity in the program.
• From an evaluator’s perspective, the lack of unique site and project IDs made the applications and associated paperwork difficult to track down. Inconsistencies in the labeling of project paperwork added work to the process and often created challenges for the evaluators.
**Overall Program Satisfaction**

- When asked about general satisfaction with the HPNC program, most participants rated their level of satisfaction as “moderately to greatly satisfied” with the program.
- Only one participant was dissatisfied. This participant was highly dissatisfied with how long it took for the application process to be completed. The participant stated that he spent about 6 hours working on the application. He also said that he possibly would have participated more if the incentives had been adequate to cover the expenses of participating in the program.

**Waivers**

- LDC staff has seen an improvement in requesting waivers from the OPA. While it was slow at first, the waiver process has become more efficient.

**Program Staff Interaction**

- LDC’s have noted that dialogue with the OPA has improved, and there has been opportunity for stakeholder input while discussing program design and processes.
- Most participants claimed that they were able to complete their applications through help from the LDC’s.

**Program Future**

- LDCs are concerned about the transition to the next generation of this program. The LDC cannot guarantee an incentive if the new building or project may not be completed until 2016.
- The 2012 Ontario Building Code changes go into effect on January 1, 2014 and states that the Code promotes energy conservation through building design and construction by requiring that large buildings for which building permits are applied, on or after January 1, 2017, meet an energy efficiency level that is 13% higher than that required in 2012.
- The March 2014 Ministry of Energy Directive changes the framework of energy efficiency goals for LDC’s programs in 2015.
Review of Customer Motivations

Methodology
The Evaluation Team analyzed survey results related to participants’ motivations in participating in the program. The Team also compared the incentive levels of HPNC with other similar programs to determine the adequacy of the incentive levels for motivating participation.

Results and Discussion
Participants were asked to rate the importance of a number of factors in deciding to install energy efficient measures on a scale of 1 to 5 (with 5 being very important and 1 being not very important): Maintenance, Building Aesthetics, Rebates, Environmental or Emission Concerns, Initial Project Cost, and Electricity Costs and Expected Energy Savings. Figure 8 shows the importance of these decision making factors to participants when deciding on how to proceed with an energy efficiency project. The most important factor to participants was initial project cost, followed closely by electricity costs and expected energy savings associated with the project.

Figure 8: Process Evaluation – HPNC – Importance of Decision Making Factors to Participants

Majority of the surveyed participants (11 out of 16) also reported having corporate energy efficiency policies in place for new construction projects for their companies. The number of participants is illustrated in Figure 9 below.
Participants were also asked whether the desire to be perceived as “energy efficient” or “green” was an important factor in deciding to include energy efficient measures. Figure 10 shows the responses to this question. According to the results, all of the survey respondents are conscious of community perception and reported that being perceived as “energy efficiency” or “green” was a “very” or “fairly” important factor in deciding to include energy efficiency measures in the new construction project.

Participants were asked to what extent did the incentive for energy efficiency measures influence the level of energy efficiency included in their project. According to results, free-ridership is not a huge concern: only 13 percent indicated that the incentive did not influence their desire to include energy efficiency measures in their project.
efficient measures in the project, and 38 percent said the incentive was influential in their desire to pursue energy efficient measures. Results are shown in the chart below.

**Figure 11: Process Evaluation – HPNC – Necessity of Incentive or Program to Participants**

![Pie chart showing the necessity of incentive or program to participants](chart11)

Figure 12 shows how participants responded when asked how important the incentive was in their decision to include energy efficiency measures in the new construction projects. 50% said the incentive was a very important factor, while only 6% said it was a very unimportant factor in their decision.

**Figure 12: Process Evaluation – HPNC – Participant Responses to Scenarios with No Available Incentives**

![Pie chart showing participant responses](chart12)
Incentive Level Analysis

Survey results indicate that most participants in the program are already motivated to install energy efficient measures due to corporate energy policies or an interest in being perceived as “green.” All of the businesses stated that they would have had the funds to install these measures in the absence of the program. Seventy-five percent of survey respondents would have committed to the same project in absence of the program, which indicates a high level of free-ridership. These results indicate that the HPNC initiative is not motivating many customers that would not have installed measures without the program.

Table 33 compares OPA’s HPNC initiative to similar programs in other jurisdictions. As listed below, in some cases, OPA pays the HPNC incentives according to the kW saved per project. Because the other utility incentives are in dollars per kWh saved, Frontier Associates calculated what OPA would have paid as a $/kWh incentive per project, both prescriptive and custom. Frontier performed this calculation by dividing each project’s total incentive paid by the project’s kWh saved. This calculation provided an imputed $/kWh incentive to compare the incentive levels with other programs. The highest was a data center project, where the equivalent of $80.39 was paid per kWh saved. However, removing this outlier, the second highest was $3.24 per kWh saved. The lowest was $0.01 per kWh saved. The average was $0.30 per kWh saved.

As detailed in Table 33, comparisons with the other three commercial new construction programs indicate that the HPNC initiative offers an incentive level on par with other programs. However, because the HPNC is focused on demand reduction as opposed to energy reduction, in contrast to these other programs that offer incentives based on energy reduction, the energy reduction per measure in the HPNC may be less than other programs, therefore driving up the average dollar per kWh paid by the OPA.

The Evaluation Team recommends that the OPA consider raising the incentive levels and increasing outreach to encourage greater participation among participants that are not already considering energy efficient measures.

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9 The methodology for calculating free-ridership is discussed on page 36.
### Table 33: Process Evaluation – HPNC Benchmarking of Incentive Levels

<table>
<thead>
<tr>
<th>Utility</th>
<th>Description</th>
<th>Incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPA 2011/2012/2013 HPNC</strong></td>
<td>Four tracks based on a specified incentive level, % over code, or cost:</td>
<td>(1) Prescriptive: Lighting: up to $400/kW; Non-lighting: up to $800/kW; Appliances: $75/unit (2) Engineered: Lighting: up to $400/kW or $0.05/kWh; Non-lighting: up to $800/kW or $0.10/kWh (3) Custom Design: &lt; 25% above Code: $50/kW or $0.00625/kWh; &gt; 25% above Code: $100/kW or $0.0125/kWh; &gt; 50% above Code: $150/kW or $0.01875/kWh (4) Custom Modeling: Lesser of $10,000 or 100% of third costs to prepare the Simulation Summary Report</td>
</tr>
<tr>
<td></td>
<td>(1) Prescriptive: $/kW, $/kWh, or $/unit payment (2) Engineered: $/kW or $/kWh (3) Custom Design: % above Code (4) Custom Modeling: Based on cost of Simulation Summary Report</td>
<td></td>
</tr>
<tr>
<td><strong>DTE Energy</strong></td>
<td>Three tracks based on a specified % over baseline energy savings:</td>
<td>(1) 10%-20% over baseline (2) 20%-30% over baseline (3) &gt; 30% over baseline (4) Custom Modeling: Lesser of $10,000 or 100% of third costs to prepare the Simulation Summary Report</td>
</tr>
<tr>
<td></td>
<td>(1) 10% to 20% over baseline energy savings: $0.08 per kWh and $4.00 per Mcf (2) &gt; 20%, up to 30%, energy savings: $0.10 per kWh and $6.00 per Mcf (3) &gt; 30% energy savings: $0.12 per kWh and $8.00 per Mcf</td>
<td></td>
</tr>
<tr>
<td><strong>AEP Ohio</strong></td>
<td>Three tracks based on project type:</td>
<td>(1a) Whole Building - Design: Range $0.02 - $0.04/kWh (incentives increase as % over ASHRAE increases) (1b) Whole Building - Owners: Range $0.08 - $0.12/kWh (incentives increase as % over ASHRAE increases) (2) Prescriptive - Lighting: $0.40/watt below ASHRAE standard (3) Custom: $0.08/kWh</td>
</tr>
<tr>
<td></td>
<td>(1) Whole Building Performance: Minimum 10% &gt; ASHRAE 90.1-2007 (2) Prescriptive - Lighting: Power Density must be 10% lower than wattage in ASHRAE 90.1-2007 (3) Custom: Custom requirements</td>
<td></td>
</tr>
<tr>
<td><strong>MidAmerican Energy</strong></td>
<td>Two Tracks based on specified % over Iowa energy code:</td>
<td>Incentives range from $0.06 to $0.19/kWh and $0.60 to $1.90/therm</td>
</tr>
<tr>
<td></td>
<td>(1) Custom: At least 15% &gt; code (2) Custom Plus: At least 40% &gt; code</td>
<td></td>
</tr>
</tbody>
</table>
**Penetration of the New Construction Market**

The Evaluation Team conducted a geographical analysis comparing the location of HPNC projects with estimates of investment in commercial new construction projects by Census Metropolitan Area (CMA).\(^{10}\) Figure 13 shows where HPNC projects were implemented. This figure also highlights the amount of investment in non-residential construction in the same CMAs in 2013.\(^{11}\)

Certain areas of Ontario show a high level of investment in commercial new construction, particularly in the Census Metropolitan Areas (CMAs) of Toronto, Ottawa – Gatineau, and Hamilton (the same three areas as 2011-12). In 2013, out of 84 HPNC projects completed, 37 (44 percent) were implemented in the three CMAS (Toronto, Ottawa-Gatineau, and Hamilton) with the highest concentration of non-residential construction activity.

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\(^{10}\) A Census Metropolitan Area, or CMA, is defined as an area of one or more neighboring municipalities situated around a core. A CMA must have a total population of at least 100,000, of which 50,000 or more live in a core.

Figure 13: HPNC Projects and Investment in Non-Residential Construction in 2013
Table 34 provides a breakdown of the number of measures implemented according to LDC and CMA. Hydro One Networks has some of the largest reach with measures implemented (38 of 84); however, many of them fall outside of the CMAs, indicating perhaps agribusiness measures in rural areas. Hydro Ottawa is the LDC with the next highest level of participation, with 13 measures implemented in PY2013.

<table>
<thead>
<tr>
<th>LDC</th>
<th>CMA</th>
<th>Measures Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brant County Power Inc</td>
<td>Brantford</td>
<td>4</td>
</tr>
<tr>
<td>Brantford Power Inc.</td>
<td>Brantford</td>
<td>1</td>
</tr>
<tr>
<td>Burlington Hydro Inc.</td>
<td>Hamilton</td>
<td>1</td>
</tr>
<tr>
<td>Enersource Hydro Mississauga Inc.</td>
<td>Toronto</td>
<td>1</td>
</tr>
<tr>
<td>EnWin Utilities Ltd.</td>
<td>Niagara on the Lake</td>
<td>1</td>
</tr>
<tr>
<td>Horizon Utilities Corporation</td>
<td>Hamilton</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Kingston</td>
<td>1</td>
</tr>
<tr>
<td>Hydro One Brampton Networks Inc.</td>
<td>Toronto</td>
<td>3</td>
</tr>
<tr>
<td>Hydro One Networks Inc.</td>
<td>Centre Wellington</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Kawartha Lakes</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>London</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Niagara on the Lake</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Ottawa</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Not in a CMA</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Timmins</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ottawa</td>
<td>13</td>
</tr>
<tr>
<td>Kingston Hydro Corporation</td>
<td>Kingston</td>
<td>1</td>
</tr>
<tr>
<td>Lakeland Power Distribution Ltd.</td>
<td>Kingston</td>
<td>1</td>
</tr>
<tr>
<td>London Hydro Inc.</td>
<td>London</td>
<td>1</td>
</tr>
<tr>
<td>Niagara-on-the-Lake Hydro Inc.</td>
<td>Niagara on the Lake</td>
<td>1</td>
</tr>
<tr>
<td>Oakville Hydro Electricity Distribution Inc.</td>
<td>Toronto</td>
<td>2</td>
</tr>
<tr>
<td>Peterborough Distribution Incorporated</td>
<td>Toronto</td>
<td>1</td>
</tr>
<tr>
<td>PowerStream Inc.</td>
<td>Toronto</td>
<td>3</td>
</tr>
<tr>
<td>Toronto Hydro-Electric System Limited</td>
<td>Toronto</td>
<td>6</td>
</tr>
<tr>
<td>Veridian Connections Inc.</td>
<td>Toronto</td>
<td>1</td>
</tr>
<tr>
<td>Westario Power Inc.</td>
<td>Not in a CMA</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>84</strong></td>
</tr>
</tbody>
</table>
Residential New Construction

This section covers RNC performance relative to four topics: Program Market Delivery Effectiveness, Customer Motivation, Incentive Levels, and Penetration of the New Construction Market.

Assessment of the Effectiveness of the Programs’ Market Delivery

The Evaluation Team conducted a comprehensive process review to provide feedback on the design, delivery, and quality of the RNC initiative. This review included surveys of participants and modelling firms and interviews with LDCs.

Methodology

Frontier surveyed RNC participants and firms involved in the application process, as well as LDC staff, to assess the effectiveness of the RNC initiative.

Frontier interviewed representatives from 9 LDCs. Eight of the interviews were conducted in-person, while the other was conducted via telephone.

Eight builders participated in the RNC initiative in program year 2013. Three of these eight builders also participated in the program in 2011-2012. These eight builders were responsible for all 25 projects in the program. The Evaluation Team interviewed five of the builders in the program to gauge current effectiveness of program delivery. Figure 14 shows the breakdown in builder participation and the number of projects in the 2013 RNC program.

Figure 14: Process Evaluation - RNC - Builder Participation in PY 2013
Results
Most RNC builders participated via the Performance track; there were 25 projects in the Performance track and six in the Prescriptive track with some projects overlapping both tracks. In the Performance track, participants built houses to meet certain EnerGuide performance ratings. Figure 15 shows the breakdown of total measures installed.

![Figure 15: Process Evaluation - RNC Project Participation in PY 2013](image)

Builders were asked to rate their satisfaction with the application process. Since three of the eight builders participated in the program last year, they found the application process to be fairly easy. The other two builders surveyed, also found the application process to be fairly reasonable.

Discussion
While the interviewed builders overall indicated high satisfaction with the program, the LDCs reported the following key concerns with the present design of the RNC:

- The application process remains cumbersome and costly for applicants. The application forms are too long and complicated and contain too much “legal language”. The incentive level is too low in relation to the application process.
- One LDC stated that the initiative does not align with a builder's goals i.e. a builder does not pay the energy bill and the initiative should instead target end users.
- Program implementers noted that the initiative also is not compatible with larger scale homebuilders in the province since there can be different requirements for each LDC.
- There are concerns about the transition to the next generation of this program. The LDCs cannot guarantee an incentive if the new home may not be completed until 2016.

In contrast to the RNC initiative, the Residential HVAC initiative is viewed as successful based on participation numbers as reported by several LDC’s and the ease of participation in the HVAC program.
One LDC suggested simply establishing appropriate new home construction baselines within the Residential HVAC program and allowing new home construction projects to apply for HVAC-related incentives in the HVAC program. The Evaluation Team notes that this might discourage “comprehensiveness” in the promotion of energy efficiency in new home construction, but this is a concept that should be further considered. Another recommendation is to implement a program under a more recognizable brand such as the Energy Star® New Homes Program in the United States. These programs have been proven successful in other parts of North America, and have effective consumer awareness.

**Application Process**

- Builders find the process for resubmitting documents when measures have changed difficult. Frequently, a house’s EnerGuide rating may change during the building process, but the process for resubmitting a house’s new EnerGuide rating is difficult and may not be eligible.
- Builders cite a steep learning curve required for participating, but once the builder has learned how to submit the forms, the process becomes much easier. After learning how to process the forms, builders noted that it took about one to three hours to complete.

**Permit Requirements**

- Builders find that the requirements for participation in each LDC are different, there is no uniformity to aspects such as building and site permits. This can be a barrier for larger tract builders in the RNC program, as all of the 2013 RNC participants were smaller builders (1-10 homes tracts).

**Incentive Levels**

- The incentive levels remain too low relative to the cost of completing the application process, unless the builder/developer operates on a large scale and intends to apply for incentives for many new homes.

**Tracking System**

- The absence of a working tracking system makes it difficult for the OPA to monitor the level of activity in the program.
- From an evaluator’s perspective, the lack of unique site and project IDs made the applications and associated paperwork somewhat confusing to track down. Inconsistencies in the labeling of project paperwork received from the OPA added work to the process and often lead to confusion for the evaluators.

**LDC Consistency**

- Builders find a lack of consistency in requirements across the territory—some LDCs require preliminary forms, or have their own form to fill out, and some do not use OPA forms at all.
Program Future

- There are concerns about the transition to the next generation of this program. The LDC cannot guarantee an incentive if the new home may not be completed until 2016.
- The 2012 Ontario Building Code changes go into effect on January 1, 2017 and states that houses for which building permits are applied, on or after January 1, 2017, meet an energy efficiency level that is 15% higher than that required in 2012.\(^\text{12}\)
- The March 2014 Ministry of Energy Directive changes the framework of energy efficiency goals for LDC’s programs in 2015.

Review of Customer Motivations

Method

The Evaluation Team analyzed responses to survey questions about participants’ motivations in participating in the program. The team also compared the RNC initiative incentive levels with those of similar programs to assess the adequacy of the incentive levels for motivating participation.

Results and Discussion

Survey Results

The five builders were asked to rate the importance of the factors listed in Figure 16 towards their decision in choosing the type of equipment to install in new construction programs. The results show that electricity costs and energy savings and maintenance requirements are very important to builders, less so are the building aesthetics and environmental or emission concerns.

Figure 16: Process Evaluation – RNC – Importance of Factors to Builders’ Decision Making

![Figure 16: Process Evaluation – RNC – Importance of Factors to Builders’ Decision Making](http://www.mah.gov.on.ca/AssetFactory.aspx?did=10201)
The builders were asked if they would have become EnerGuide builders without the program, and all five builders responded affirmatively. Three of the builders participated in the program in PY2011-2012, had already achieved the EnerGuide building status.

Finally, builders were asked whether they found the financial incentive satisfactory. All builders surveyed found that the prescriptive track incentives were too low. Several of the builders that participated in the RNC program mentioned that they received an additional incentive from another stakeholder, which made their project more cost-effective.

**Incentive Levels Analysis**

Similar to last year, the Evaluation Team heard from LDCs that the incentive levels for the RNC were too low to encourage participation by home builders. While higher incentive levels may encourage greater participation, a review of similar programs suggests that the incentives provided through the RNC are about average. Utilities in Massachusetts and New Jersey offer higher incentives through their programs. Utilities in Texas, Missouri, and New Mexico generally offer lower incentive levels. It is important to note that both the efficiency thresholds (participation requirements) and baseline conditions (driven by differences in regional building codes, etc) may differ across programs, which makes apples-to-apples program comparisons difficult. However, some high level comparisons can provide good insight into how residential new construction programs are implemented in different jurisdictions. Table 35 provides an overview of similar programs across North America.

### Table 35: Benchmarking RNC Incentives

<table>
<thead>
<tr>
<th>Program Administrator</th>
<th>Efficiency Standards</th>
<th>Incentive Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPA RNC</td>
<td>Energuide 83 2011</td>
<td>$500</td>
</tr>
<tr>
<td>OPA RNC</td>
<td>Energuide 85 2011</td>
<td>$1,000</td>
</tr>
<tr>
<td>Massachusetts (Single Family)</td>
<td>Tier I</td>
<td>improvement over baseline</td>
</tr>
<tr>
<td></td>
<td>Tier II</td>
<td>improvement over baseline</td>
</tr>
<tr>
<td></td>
<td>Tier III</td>
<td>45% improvement over baseline MA home</td>
</tr>
<tr>
<td>New Jersey</td>
<td></td>
<td>$2,250 - $4,000</td>
</tr>
<tr>
<td>Single Family</td>
<td>HERS Rating IECC 2006</td>
<td>$2,250 - $4,000</td>
</tr>
<tr>
<td></td>
<td>HERS Rating IECC 2009</td>
<td>$2,250 - $3,501</td>
</tr>
<tr>
<td>Multifamily Single Level</td>
<td>75% of single family incentive</td>
<td>75% of single family incentive</td>
</tr>
<tr>
<td>Multifamily Multi Level</td>
<td>50% of single family incentive</td>
<td>50% of single family incentive</td>
</tr>
<tr>
<td>New York</td>
<td>Energy Star Standards</td>
<td>$1,250-$1,501</td>
</tr>
<tr>
<td>CPS Energy (Texas)</td>
<td>Energy Star Standards or Utility Standards</td>
<td>up to $1,500</td>
</tr>
<tr>
<td>Oncor (Texas)</td>
<td>HERS Rating</td>
<td>$945/home</td>
</tr>
</tbody>
</table>
Program success does not necessarily increase with higher incentive levels. Some of the utility programs offering relatively low incentives are very successful. For example, Oncor and CenterPoint Energy in Texas offer relatively-low incentives through their award-winning programs, but serve markets with a lot of new home construction activity and large-volume home builders. In addition, some of North America’s better new home construction programs focus on certification, rather than incentives, including Austin Energy’s Green Building program and Wisconsin Focus on Energy. Some programs involve incentives to raters, while some provide incentives to both builders and raters, including programs in Connecticut.

Increases in program incentives must be balanced against the need to make the RNC cost-effective. Based on the results of Frontier’s impact evaluation, OPA’s performance incentives per home are very high compared to the prescriptive rebates. Some adjustments may be necessary to create optimal incentive levels that encourage participation and ensures cost-effectiveness for all tracks of the RNC initiative.

### Penetration of the New Construction Market

The Evaluation Team conducted a geographical analysis comparing the location of RNC projects with estimates of investment in new housing starts. Figure 17 shows where participating RNC projects were implemented. This figure also shows residential new housing starts in 2013 by Census Metropolitan Area (CMA).

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15 The rater incentives offered by Texas-New Mexico Power Company is $341/home. The raters are project evaluators. http://www.texasefficiency.com/images/documents/RegulatoryFilings/EEPRs/2013_EEPRs/tnmp%202013%20eepr%2041196.pdf


17 Housing starts is an economic indicator specifically referring to the number of housing units on which actual construction has begun (as opposed to simply having permits issued) in a given period.

18 A Census Metropolitan Area, or CMA, is defined as an area of one or more neighboring municipalities situated around a core. A CMA must have a total population of at least 100,000, of which 50,000 or more live in a core.
The most new housing starts in 2013 were in the Toronto CMA, followed by Ottawa – Gatineau and then the Hamilton, London, and Kitchener-Cambridge-Waterloo CMAs. The 630 RNC measures implemented in 2013 were implemented at 25 project sites. Of these, only two were in the Toronto CMA, two in Ottawa-Gatineau, and eight were in Kitchener-Cambridge-Waterloo. As in program years 2011 and 2012, participation in the RNC program is limited in the areas of most significant residential construction activity, representing missed opportunities for the RNC program.

The RNC program remains unsuccessful at engaging the residential construction market, as evidenced by the general lack of participation. In 2013, Ontario had over 61,000 new housing starts,\(^{20}\) including over 23,000 single-family homes. With measures implemented at only 25 sites, the RNC program continues to have a very low incidence in the new home construction market in Ontario.

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\(^{20}\) Ibid.
Figure 17: RNC Projects and Housing Starts by CMA in 2013
Eight LDCs reported RNC projects in seven CMAs, in addition to projects outside the CMAs, as listed in Table 36. The measures implemented in Ontario CMAs include both homes doing prescriptive measures and performance track homes. Table 36 displays the number of RNC projects in Ontario's CMAs. This table shows that the largest number of RNC projects occurred in Kitchener-Cambridge-Waterloo CMA.

**Table 36: Residential New Construction Projects by LDC and CMA, 2013**

<table>
<thead>
<tr>
<th>LDC</th>
<th>CMA</th>
<th>Measures Implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toronto Hydro</td>
<td>Toronto</td>
<td>1</td>
</tr>
<tr>
<td>Norfolk</td>
<td>Norfolk</td>
<td>3</td>
</tr>
<tr>
<td>Greater Sudbury Hydro</td>
<td>Greater Sudbury</td>
<td>2</td>
</tr>
<tr>
<td>Lakeland Utilities</td>
<td>not in CMA</td>
<td>2</td>
</tr>
<tr>
<td>Lakefront</td>
<td>Kitchener-Cambridge-Waterloo</td>
<td>8</td>
</tr>
<tr>
<td>Hydro Ottawa</td>
<td>Ottawa</td>
<td>3</td>
</tr>
<tr>
<td>Hydro One</td>
<td>Oshawa</td>
<td>3</td>
</tr>
<tr>
<td>E.L.K Energy</td>
<td>Windsor</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>
Audit of the OPA’s Program Tracking Systems (HPNC and RNC)

**Methodology**

The OPA uses a Microsoft Dynamics Customer Relationship Management (CRM) software application for program tracking. The CRM is cloud-based, with the capability for multiple user access rights. The OPA and LDC staff has access rights to create projects and enter project information into the CRM. The system tracks customer contact information, general project information, and workflows.

Frontier interviewed OPA staff members involved with processing applications using the audited tracking system.

**Discussion**

OPA staff continues to report a great deal of frustration with the CRM tool. Although LDCs have the ability to submit applications, the process is too complicated, and LDCs have resorted to supplying the documentation to the OPA via e-mail, ftp site, CD, or USB drive.

The LDCs submit applications via a template called the Preliminary Billing Report (PBR). The application itself is a hard copy of a PBR report. Participants fill out the hard copy of the application, and LDCs are re-entering the same information into the PBR, and delivering the PBR to the OPA via e-mail, ftp site, CD, or USB drive. Then, the PBR and supporting documents are uploaded into the tracking system by the OPA.

According to system users, the disconnection between the participants, LDCs, and OPA staff within the tracking system creates a frustrating impression that many tasks are unnecessarily repetitive. A well-designed tracking system would be able to integrate all of these steps, remove redundant tasks, and provide the parties involved a communication tool to interact regarding the status of applications. Additionally, evaluating programs would be more efficient with all documents in one place.

Similar to the 2011-2012 programs, OPA staff continues to report that the CRM is not intuitive and does not provide a clear process to follow. OPA staff find that the CRM’s many idiosyncrasies are a hindrance when trying to evaluate the status of an application. For example, when clicking on various links in the system, the CRM will automatically open a new window. OPA staff also finds that the CRM operates very slowly. The CRM also does not clearly delineate the status of applications. As a result, the system provides users with no assistance in “tracking” applications.
Assessment of Direct Employment Effects (HPNC and RNC)

**Methodology**
Participants were asked whether they hired additional employees as a result of participating in the program. If the answer to the question was “yes”, the survey recipient was asked to quantify the number of employees hired.

**Results**
According to survey results, five participants hired additional seven employees in 2013. The other ten participants had current employees work on the program. Of the additional seven that were hired, one was full-time, one participant hired a consulting firm, and three were hired, but didn’t specify if they were full or part-time. One was hired on as contract staff, and worked for a total of two weeks, and the last three were hired, but the participant didn’t specify if they were full or part-time or how many hours were dedicated to the program.

The Evaluation Team believes that no net jobs were hired as a direct result of the HPNC and RNC programs, but rather these employees were hired in response to all energy efficiency programs that are available in the province, including the Retrofit Initiative.

Of the participants that didn’t hire any additional employees, one company spent 40 hours on the program, another spent a total of 50 hours between two current employees, and another company said many employees spent many hours on the program, but it was hard to narrow it down to the number of employees and hours dedicated to the program.

![Figure 18: Process Evaluation – HPNC & RNC - Firms that Hired Additional Personnel in Response to Utility Energy Efficiency Programs](image)
Program Design & Other Considerations (HPNC and RNC)

Future Program Design Options

The Evaluation Team received similar feedback from LDC’s, program participants, and other stakeholders as they did in PY2011-2012. Each of these stakeholders proposed a wide variety of redesign solutions for the HPNC and RNC initiatives. This section describes those proposals and highlights the advantages and disadvantages of each.

As discussed in the previous report and based on Frontier’s experience implementing similar programs in the United States, many of these proposals could indeed prove effective for future program years. Nonetheless, this report does not endorse any particular proposal. Frontier does believe that there is a need to improve or re-design these underperforming programs, particularly the RNC. The key program design issue involves striking an appropriate balance between province-wide consistency and local control by the LDCs, while engaging in effective marketing of the programs.

National chain accounts, large-scale home builders, and commercial construction companies operating in numerous LDC service areas hope to see greater consistency in programs across the province. They would prefer to work with a single point of contact for the programs, rather than multiple contacts in multiple utility service areas. Dealing with multiple LDCs – each with slightly different interpretations of the program rules and local practices – discourages participation in the programs.

Most – though, not all – of the LDCs would prefer much greater local control over the programs. They prefer to maintain direct contact with builders constructing new homes and commercial developments within their service areas. These LDCs have the best understanding of local energy efficiency opportunities. Many LDCs view inflexible province-wide program guidelines, application forms, and approval processes as impediments to meeting the needs of their customers.

This perspective is further complicated by the resources and expertise of the LDCs. Some of the LDCs have the knowledge and resources to successfully implement energy efficiency programs with no outside help. Many of those LDCs that do not possess such expertise presently outsource many of their program marketing and implementation activities to Enbridge Gas and would not be opposed to the establishment of province-wide program implementers.

A further consideration is the effect that any dramatic program design changes would have on program activity. The transition from the earlier new home construction program – implemented by the Canadian Homebuilders Association – and the earlier HPNC program – implemented jointly by Enbridge Gas, Union Gas, and Toronto Better Buildings – to the present program model with greater LDC control, led to great confusion, branding issues and lost opportunities to promote energy efficiency.
These factors contribute to a wide spectrum of proposals to change the two initiatives, including the following:

1. Centralized programs with a province-wide third-party implementer selected through a competitive solicitation. The implementer would market the program, enroll participants, enforce program guidelines, and provide uniform program design and administration across LDC territories. Advocates of this proposal point to the success of the previous residential new construction under the Canadian Homebuilders Association’s guidance, and the previous HPNC implemented through three organizations.

2. Allow LDCs to design and implement their own unique programs, provided they are consistent with a general program template, evaluation guidelines, cost-effectiveness requirements, and reporting guidelines approved by the OPA. Under this approach, each LDC could design its own program requirements, application forms, contracts with applicants, and incentive levels. This is the model in many U.S. states, including Texas.

3. Combine the HPNC and RNC initiatives with higher participation programs, such as the Commercial Retrofit program and the Residential HVAC program. This would require the expansion of existing programs to accommodate new construction baselines and savings calculations.

4. Hybrid approaches whereby one or more province-wide program implementers could market the program to national or province-wide chain accounts or larger builders, while the LDC’s marketing and outreach could focus on potential participants with a local presence and focus.

5. Focus on recommendations and gradual improvements to the existing HPNC and RNC initiatives.

Some of the advantages and disadvantages of each of these proposals are presented in Table 37.
Table 37: Design Options Matrix

<table>
<thead>
<tr>
<th>Design Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Centralized programs with a province-wide third-party implementer selected through a competitive solicitation.</td>
<td>This would facilitate greater participation by potential participants active in numerous service areas. Greater consistency in the program guidelines across the province would be achieved. More-effective province-wide marketing could be conducted.</td>
<td>Smaller projects and smaller potential participants may receive less attention. Another organization may alter the direct relationship between an LDC and its retail customers.</td>
</tr>
<tr>
<td>2. Allow LDCs to design and implement their own unique programs, provided they are consistent with a general program template, evaluation guidelines, cost-effectiveness requirements, and reporting guidelines approved by the OPA.</td>
<td>Greater flexibility would lead to greater participation, at least in the service areas of the LDCs with the higher levels of expertise and resources.</td>
<td>This may lead to less consistency across the province in project eligibility, incentive levels, timelines, and application procedures. Greater differences among the LDCs would further frustrate chain accounts and the national or province-wide potential participants.</td>
</tr>
<tr>
<td>3. Combine the HPNC and RNC programs with more-successful programs, such as the Commercial Retrofit program and the Residential HVAC program.</td>
<td>This would take advantage of the some of the other programs’ superior infrastructure.</td>
<td>Some of the more-comprehensive features of the RNC (e.g., incentives based on EnerGuide ratings) might be lost. New baselines and savings calculations would need to be added to the other programs.</td>
</tr>
<tr>
<td>4. Hybrid approaches whereby one or more province-wide program implementers could market the program to national or province-wide chain accounts or larger builders, while the LDC’s marketing and outreach could focus on potential participants with a local presence and focus.</td>
<td>This could facilitate participation by chain accounts and larger builders, while meeting the needs of the LDCs.</td>
<td>Delineating the responsibilities of the province-wide implementer vis a vis the LDCs could be complicated.</td>
</tr>
<tr>
<td>5. Focus on gradual improvements to the existing HPNC and RNC initiatives.</td>
<td>This would reduce confusion in the market place and perhaps avoid many of the transitional problems that adversely affect efficiency initiatives during previous transitions.</td>
<td>At least for the RNC, a major overhaul may be necessary.</td>
</tr>
</tbody>
</table>
Other Considerations

Government Buildings

One LDC who was interviewed suggested that the province should require new government facilities to participate in the HPNC; suggesting that such a requirement could be part of the RFP or tendering process. Frontier believes that while this would encourage participation, there is a chance that this would increase free-rider participation in the programs. Also to note is the Green Energy Act which requires municipal facilities to meet renewable energy and energy efficiency goals, so there is potential for these facilities to participate in the HPNC initiative in future program years.

Increase the Number of Prescriptive Measures

Since evaluation costs can be high for these initiatives, a solution may be to include more measures in the prescriptive track of the programs. Currently, the custom and engineering reports are a barrier to participation due to expense, so if deemed savings could be developed for similar engineered or custom projects, this may increase participation, and decrease expense for participants.

Marketing Strategy

Consistent and recognizable branding of the programs would create more customer awareness. Since the programs were initially marketed through the Canadian Home Builders Association, there may still be some lingering recognition issues. Clear, visible branding of participating projects and program documents would help establish these programs as viable options in the marketplace.

One LDC mentioned that they increased their success in the programs by having the program administer “add-on” to the incentive. While the Evaluation Team does not know the exact amount, this added incentive using non-program funds, increased participation in the RNC initiatives.

Finally, another successful marketing strategy involved promoting the RNC initiative to HVAC contractors or product suppliers in the province. When HVAC contractors showed interest in the program, builders began to take notice of the incentives available. Similarly, product suppliers are knowledgeable about where their inventory is installed, and can promote the program to builders through this channel. This strategy opens up the customer base in the RNC initiative, which in the past has only marketed to home builders through direct mailings and advertisements in association publications.
Key Findings

**HPNC**
- Incentives are the most important factor to program participants in the HPNC initiative. Survey responses also show that communication to participants whether by LDC or OPA were also effective in outreach efforts.
- 100% of program participants found the application processes to be reasonable and understandable. This is an improvement over PY2011-2012.
- Incentive levels for both initiatives are average for similar programs in North America. However, stakeholders found the incentive levels too low relative to cost of application.
- Both initiatives are still missing an effective tracking system for documentation and tracking.
- HPNC initiative is not penetrating the new construction market. In 2013, out of 84 HPNC projects completed, 37 (44 percent) were implemented in the three CMAS (Toronto, Ottawa-Gatineau, and Hamilton) with the highest concentration of non-residential construction activity.
- There were no direct employment benefits as a direct result of the HPNC initiatives, but rather any employees hired were in response to all energy efficiency programs that are available in the province.

**RNC**
- Electricity costs and energy savings are most important to builders participating in the RNC initiative; less so are the building aesthetics and environmental or emission concerns.
- 100% of program participants found the application processes to be reasonable and understandable. LDCs still felt that the application was too long and cumbersome. This is an improvement over PY2011-2012.
- Incentive levels for both initiatives are average for similar programs in North America. However, stakeholders found the incentive levels too low relative to cost of application.
- Initiative is still missing an effective tracking system for documentation and tracking.
- The RNC initiative is also not penetrating the new construction market. In 2013, Ontario had over 61,000 new housing starts, including over 23,000 single-family homes, however the RNC program had only 25 project sites.
- There were no direct employment benefits as a direct result of the RNC initiatives, but rather any employees hired were in response to all energy efficiency programs that are available in the province.

Recommendations

The HPNC and RNC initiatives have great potential to reduce energy and demand savings in the province of Ontario. Frontier believes that incremental changes made to program design with stakeholder input as well as an increased marketing effort made to pierce the new construction market in Ontario will likely result in a very successful program.
## Program Design Recommendations

The table below provides an overview of the recommendations made in this Final Evaluation Report.

### Table 38: Process Evaluation Recommendations

<table>
<thead>
<tr>
<th>Program Aspects</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incentive Levels</strong></td>
<td>• Allow certain efficiency measures presently eligible for a prescriptive incentive in the HPNC program to apply for an incentive through the retrofit program. This change would require new construction or building code baselines to be used as the basis for calculating savings and incentive levels for certain measures within the expanded retrofit program.</td>
</tr>
<tr>
<td><strong>Project Sizes</strong></td>
<td>• Consider lowering minimum project sizes, so that smaller projects (and smaller commercial or business energy consumers) can receive an incentive through the HPNC.</td>
</tr>
</tbody>
</table>
| **Program Design**     | • Consider alternative approaches to promoting the RNC. For example, providing payments to home energy raters, rather than home builders, has proven effective in some other markets.  
• Alternative marketing strategies to HVAC contractors or product manufacturers but retaining consistent branding.  
• With stakeholder input, consider the advantages and disadvantages of different program design options. These options include: (1) centralizing the programs with a province-wide third party implementer; (2) decentralizing and allowing the LDCs to design and implement their own unique programs; (3) combining the program with more successful OPA programs; (4) hybrid approaches that include both a province-wide implementer for chain accounts and local LDC marketing and outreach; or (5) focus on gradual improvements to the programs. |
| **Tracking System**    | • Consider investing in a tracking system for both programs that is streamlined with a clearly outlined process that both LDCs and the OPA can use to track applications. OPA should also consider implementing a periodic reporting requirement in order to determine what applications the LDCs may soon be submitting to the OPA. This requirement would assist OPA in anticipating program activity levels.  
• Assign Project IDs and Site IDs to each project. |
| **Document Requirements** | • Completeness of documentation for HPNC custom projects by creating a standard folder structure with ‘read me’ instructions to guide uploads of documents to the ftp site.  
Recommend the following file structure for uploads:  
  ➢ Application forms and agreements  

<table>
<thead>
<tr>
<th>Program Aspects</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➢ Custom Project Worksheet and supporting documents such as backup and breakdown of incremental costs for proposed versus code compliant designs</td>
</tr>
<tr>
<td></td>
<td>➢ Simulation files (working project models for ‘reference’ and ‘proposed’ designs, output files)</td>
</tr>
<tr>
<td></td>
<td>➢ Reports (Simulation Summary Report with ALL appendices, initial and final Project Evaluator Reports, Project Completion Report)</td>
</tr>
<tr>
<td></td>
<td>• For the RNC program, provide baseline and change case energy consumptions and housing characteristics for each home (square footage, number of floors, heating type and capacity, HVAC type and capacity, insulation levels, water heating type and capacity) in order to provide additional assistance with verifying energy and demand savings.</td>
</tr>
<tr>
<td>Permit Requirements</td>
<td>• Clarify the building and occupancy permit requirements from the very beginning of the application process. Make these requirements uniform across all LDC territories. Present clear timelines to meet program requirements.</td>
</tr>
<tr>
<td>Information Materials</td>
<td>• Provide contact list for each LDC to participants. Larger track builders in the RNC Initiative may also use this list to each out to LDCs in different territories for larger projects.</td>
</tr>
<tr>
<td></td>
<td>• Provide training sessions or webinars with larger tract builders and create a single checklist for documents and participation requirements.</td>
</tr>
<tr>
<td></td>
<td>• Additional communications from OPA (or the LDCs) to participants, such as:</td>
</tr>
<tr>
<td></td>
<td>➢ Webinar styled video</td>
</tr>
<tr>
<td></td>
<td>➢ A pre-set folder structure with ‘read me’ instructions in each folder to guide uploads of documents to the ftp site</td>
</tr>
<tr>
<td>Marketing Strategies</td>
<td>• Provide sales and technical training courses, as well as marketing materials for qualified builders to increase participation.</td>
</tr>
<tr>
<td></td>
<td>• Develop brand recognition of builders that participate in the initiative. This will create additional incentive for builders to participate.</td>
</tr>
</tbody>
</table>
Appendix A: Glossary

Census Metropolitan Area (CMA): An area of one or more neighbouring municipalities situated around a core. A CMA must have a total population of at least 100,000, of which 50,000 or more live in a core.

Energy Efficiency: The use of less energy to provide the same or an improved level of service to the energy consumer in an economically efficient way. “Energy conversation” is a term that has also been used, but it has the connotation of doing without in order to save energy rather than using less energy to perform the same or better function.

Evaluation, measurement, and verification (EM&V): The process of determining and documenting the results, benefits, and lessons learned from an energy efficiency program. The term “evaluation” refers to any real time and/or retrospective assessment of the performance and implementation of a program. “Measurement and verification” is a subset of evaluation that includes activities undertaken in the calculation of energy and demand savings from individual sites or projects.

Housing starts is an economic indicator that reflects the number of privately owned new houses (technically housing units) on which construction has been started in a given period.

Free rider: A program participant who would have implemented the program measure or practice in the absence of the program.

Impact Evaluation: Used to determine the actual savings achieved by different programs and specific measures.

Measures: Installation of equipment, installation of subsystems or systems, or modification of equipment, subsystems, systems, or operations on the customer side of the meter, in order to improve energy efficiency.

Net-to-gross ratio: A key requirement for program-level evaluation, measurement, and verification. This ratio accounts for only those energy efficiency gains that are attributed to, and the direct result of, the energy efficiency program in question. It gives evaluators an estimate of savings that would have occurred even without program incentives.

Participant: In the HPNC program, a participant is a building or facility owner or manager that receives an incentive for energy efficient measures in a new construction project. In the RNC program, a participant is a home builder that receives an incentive for energy efficient measures in a new construction project.

Portfolio: Either (a) a collection of similar programs addressing the same market, technology, or mechanisms or (b) the set of all programs conducted by one organization.
**Process Evaluation:** This form of evaluation assesses the extent to which a program is operating as it was intended. It typically assesses program activities’ conformance to statutory and regulatory requirements, program design, and professional standards or customer expectations.

**Project:** A project is any one energy efficiency new construction plan that involves one application for an incentive to the OPA.

**Program:** Any activity, project, function, or policy that has an identifiable purpose or set of objectives.

**Program Administrators:** Typically procure various types of energy efficiency services from contractors (e.g., consultants, vendors, engineering firms, architects, academic institutions, community-based organizations), as part of managing, implementing, and evaluation their portfolio of energy efficiency programs. Program administrators in many states are the utilities; in some states they are state energy agencies or third parties.

**Sources:**


Appendix B: HPNC Participant Survey

High Performance New Construction Survey

Business: Call attempt 1
Customer Name: «Customer» Call attempt 2
Phone: «Customer_Phone» Call attempt 3
Phone2: Call attempt 4
«HOMEPHONE» E-mail:
LDC:

Background/Experience of the Firm Module: Introduction and Qualifications

Hello, my name is __________, from Frontier Associates. I am calling on behalf of the Ontario Power Authority as my firm has been contracted to conduct the High Performance New Construction Program evaluation. Your opinions are important to the OPA and it would only take around twenty minutes. Do you have time to talk today?

☐ No, Too Busy Right Now  ☐ Yes (GO TO QA)
(IF NO) Is there another time I can call you for a short interview?
(SCHEDULE ALTERNATE INTERVIEW TIME: ________________________)

1. Our records indicate that you participated in OPA’s High Performance New Construction Program in <Program Year>. Are you the best person to talk to about the participation in the program?

☐ No
☐ Yes (GO TO Q1)

I. If NO: is there someone else I can talk to about the projects that were completed through the Program?

☐ No (THANK AND QUIT)
☐ Yes: NAME: ______________________ PHONE: ______________________
(ASK IF THAT PERSON IS AVAILABLE. THANK AND CONTINUE FROM BEGINNING OR QUIT)
Marketing Module

1. What is your role as a participant in the HPNC program? Are you a facilities manager or facilities owner?

2. How did you become aware of the Program?
   - OPA Staff
   - Mailing
   - Enbridge Gas Distribution
   - Advertising
   - Bill Insert
   - Word-of-mouth
   - Location Distribution Company (LDC) ____________
   - Other: ________________________________

3. What do you think is the best way to reach potential program participants?

4. How useful were the OPA’s/LDCs website materials for supplying you with the necessary information? (Were they not useful, somewhat useful, very useful).
   a. If possible, provide justification/reason why they were useful, somewhat useful, or very useful?
   b. Any suggestions on how to make the program materials more useful?
   c. Did OPA or the LDC provide any additional materials aside from those available on the website?

Participant Motivation Module/Measure-Specific Motivation

5. At what stage in the project did you and your customer decide on which equipment to install?

6. When your business is deciding what type of equipment to install in new construction or major retrofit projects, how important are the following factors to you, on a scale of 1 to 5, with 5 being extremely important.

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity costs and expected energy savings</td>
<td></td>
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<td></td>
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<tr>
<td>Initial project cost</td>
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<tr>
<td>Environmental or emission concerns</td>
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<tr>
<td>Rebates or discounts</td>
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<tr>
<td>Building aesthetics</td>
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<tr>
<td>Maintenance requirements</td>
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<tr>
<td>Any Other Factors? (SPECIFY AND RATE)</td>
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</tbody>
</table>
7. Do you have corporate policies or goals pertaining to energy management and cost reduction?

8. How concerned is your company with operating costs? (scale of 1 to 5, with 5 being extremely important)

9. With respect to the specific measures you chose for your project, can you rank the importance of the following factors on a scale of 1 to 5, with 5 being extremely important?

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
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<tbody>
<tr>
<td>Electricity costs and expected energy savings</td>
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<tr>
<td>Initial measure cost</td>
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<tr>
<td>Rebate level</td>
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<td>Aesthetics</td>
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<td>Maintenance requirements</td>
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<tr>
<td>Difficulty of Installation</td>
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<tr>
<td>Any Other Factors? (SPECIFY AND RATE)</td>
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<td></td>
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</tbody>
</table>

10. On a scale of 1 to 5, with 5 being Most Impact and 1 being the Least Impact, did any of the following factors motivate you to participate in the program?

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact by OPA’s customer representatives</td>
<td></td>
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<tr>
<td>OPA informational literature and advertising</td>
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<tr>
<td>Contact from your LDC’s customer representatives</td>
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<tr>
<td>LDC informational literature and advertising</td>
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<tr>
<td>Availability of an incentive</td>
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<tr>
<td>Other: ____________________________</td>
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</tbody>
</table>

11. Were there other energy efficiency features you were interested in pursuing in your project(s), but you didn’t pursue them because they wouldn’t qualify under the program or the program’s incentives were insufficient?
Program Delivery Effectiveness Module

For Prescriptive Track:

12. Can you please confirm that Prescriptive-based is the type of incentive track you participated in?

13. Did you consider the Engineered incentive track?
   a. If so, why didn’t you choose that track?

14. Did you consider the Custom incentive track?
   a. If so, why didn’t you choose that track?

15. Did prescriptive incentive levels influence the types of measures you installed in your projects? (NTG)
   a. If yes, how so?
   b. If no, why not?

16. How easily were you able to complete the Prescriptive Worksheets?
   a. Can you rank its ease of use on a scale of 1 to 5. (where 5 means VERY EASY and 1 means VERY DIFFICULT)

<table>
<thead>
<tr>
<th>Ease of Working With Online Prescriptive Worksheets</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

For Custom Track (only one participant):

17. I see you applied for and received a Design Decision Maker Incentive.
   a. Would you have been able to complete this project without the design decision maker incentive?
   b. Did you find the incentive to be adequate?
   c. Who was your design decision maker? (architect, engineer, consultant)

18. I see you applied for and received a Modeling Incentive grant.
   a. Would you have been able to complete this project without the modeling incentive grant?
   b. Did you find the incentive grant to be adequate?
   c. Did you work with a third party to model the project?
      i. Who did you work with to model the project? (architect, engineer, consultant)
19. How easily were you able to complete the Custom worksheets?
   a. Can you rank its ease of use on a scale of 1 to 5. (where 5 means VERY EASY and 1 means VERY DIFFICULT)

<table>
<thead>
<tr>
<th>Ease of Working With Online Custom Worksheets</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All Tracks:

20. Are you satisfied with the amount of the financial incentive you received? (YES/NO) If no, why not?

21. After you submitted your application, how long did it take until you received your rebate check?
   - 0 to 2 weeks
   - 2 to 4 weeks
   - 4 to 6 weeks
   - 6 to 8 weeks
   - 8 to 10 weeks
   - 10 to 12 weeks
   - more than 12 weeks
   Was that an acceptable amount of time?  NO  YES

22. Did you fill out the program application for the project? If so, what do you think of it? (If NO, skip to Q11).
   a. Please rank ease of completion of the application on a scale of 1 to 5. (where 5 means VERY SATISFIED and 1 means VERY DISSATISFIED)

<table>
<thead>
<tr>
<th>Ease of Application Completion</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. How did you find the application process?
   A. Please rank your satisfaction with this process on a scale of 1 to 5.

<table>
<thead>
<tr>
<th>Satisfaction with payment process</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

24. Was the application process reasonable and understandable?
25. Was your facility inspected by the LDC after completion?
   a. Please rank your satisfaction with this process on a scale of 1 to 5.

<table>
<thead>
<tr>
<th>Satisfaction with verification process</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

   Comments:

26. Was the contract that you had to sign in order to participate in the program understandable? Were the contractual requirements reasonable?

27. Did you encounter any difficulties in meeting the program’s requirements for applying and receiving an occupancy/building permit? Did you encounter any difficulties supplying the LDC with a copy of the occupancy/building permit? Could this process be improved upon?

28. Do you have any suggestions for improving the program?

29. How did you submit the application?
   a. Mail
   b. E-mail
   c. Web portal
   d. Other ___________

30. How did you check on the status of your application?

31. Throughout your involvement with the program, regarding communication with program staff [DETERMINE WHETHER PARTICIPANT WORKED WITH OPA/LDC OR ANOTHER ENTITY BEFORE MAKING THE CALL]
   A. When you called or emailed staff, did they get back with you quickly? (YES/NO)
      i. If no, how long did you have to wait?
   B. Were they able to effectively communicate with you? (YES/NO)

Participant NTG Module/Market Effects

32. Did you learn about the OPA’s Program BEFORE or AFTER you decided to build or renovate?

33. How important was the payback period as a factor in the decision making process?
   a. Very Important
   b. Fairly Important
   c. Either Important or Unimportant
   d. Fairly Unimportant
   e. Very Unimportant
Appendix B: HPNC Participant Survey

34. How important was the desire to be energy efficient or “green” in your decision to install measures?  
   a. Very Important  
   b. Fairly Important  
   c. Either Important or Unimportant  
   d. Fairly Unimportant  
   e. Very Unimportant

35. (only for Commercial Custom projects): How important was the incentive for modeling  
   a. Very Important  
   b. Fairly Important  
   c. Either Important or Unimportant  
   d. Fairly Unimportant  
   e. Very Unimportant

36. How important was the incentive in your decision to include energy efficiency measures  
   a. Very Important  
   b. Fairly Important  
   c. Either Important or Unimportant  
   d. Fairly Unimportant  
   e. Very Unimportant

37. To what extent did the incentive for energy efficiency measures influence your building?  
   a. A great deal  
   b. A fair amount  
   c. Somewhat  
   d. Just a little  
   e. Not at all

38. Have you participated in any other OPA SaveOnenergy programs?

Participant Spillover/Market Effects Module

39. Since participating in the High Performance New Construction program, have you included any additional energy efficient measures in project(s) that have gone through the program, but for which you did not receive an incentive? (YES, NO, don’t know - If NO/don’t know, go to Q2, If YES continue)

40. Do you think your experience participating in the program has changed the way you do business in any way?
Employment Effects Module

41. Did you hire any additional employees to complete projects associated with this program?
42. Were these employees contract staff? Part-time staff? Or Seasonal Staff?
   a. If not, how many of your current employees devoted time to work on these projects?
   b. Could you estimate how many hours or days full-time employees worked on these projects?

Conclusion

43. How would you rate your overall satisfaction with the program, on a scale of 1 to 5?

<table>
<thead>
<tr>
<th>Overall program satisfaction</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

44. Is there anything else that you would like to let us know based on the topics we covered today, including any ways to improve the program if possible or how the program has affected your use of energy efficient measures or design in projects?

Thank you for your time! Your feedback will be used to improve the program and provide new opportunities for builders to save money on energy efficient projects.
Appendix C: RNC Participant Survey

Residential New Construction Participant Survey

Business: 
Customer Name: «Customer» 
Phone: «Customer_Phone» 
Phone2: 
«HOMEPHONE» 
E-mail: 
LDC:

Background/Experience of the Firm Module: Introduction and Qualifications

Hello, my name is ___________, from Frontier Associates. I am calling on behalf of the Ontario Power Authority as my firm has been contracted to conduct the New Home Construction Program evaluation. Your opinions are important to the OPA and it would only take around twenty minutes. Do you have time to talk today?

- No, Too Busy Right Now
- Yes (GO TO QA)

(IF NO) Is there another time I can call you for a short interview?
(SCHEDULE ALTERNATE INTERVIEW TIME: __________________________)

II. Our records indicate that you participated in OPA’s New Home Construction Program in <Program Year>. Are you the best person to talk to about the participation in the program?

- No
- Yes (GO TO Q1)

III. If NO: is there someone else I can talk to about the projects that were completed through the Program?

- No (THANK AND QUIT)
- Yes: NAME: ______________________ PHONE: __________________________

(ASK IF THAT PERSON IS AVAILABLE. THANK AND CONTINUE FROM BEGINNING OR QUIT)
Appendix C: RNC Participant Survey

Marketing Module

1. How did you become aware of the Program?
   - OPA Staff
   - Enbridge Gas Distribution
   - Bill Insert
   - Mailing
   - Advertising
   - Word-of-mouth
   - Location Distribution Company (LDC) _________________
   - Other: ________________________________

2. What do you think is the best way to reach potential program participants?

3. How useful were the OPA’s/LDCs website materials for supplying you with the necessary information? (Were they not useful, somewhat useful, very useful).
   A. If possible, provide justification/reason why they were useful, somewhat useful, or very useful?
   B. Any suggestions on how to make the program materials more useful?
   C. Did OPA or the LDC provide any additional materials aside from those available on the website?

Participant Motivation Module/Measure-Specific Motivation

4. When your business is deciding what type of equipment to install in new construction or major retrofit projects, how important are the following factors to you, on a scale of 1 to 5, with 5 being extremely important.

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity costs and expected energy savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial project cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental or emission concerns</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rebates or discounts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building aesthetics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Other Factors? (SPECIFY AND RATE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. With respect to the specific measures chosen for your project, can you rank the important to the primary decision-maker (Homeowner? Developer?) to the following factors on a scale of 1 to 5, with 5 being extremely important?

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity costs and expected energy savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial measure cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rebate level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty of Installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Other Factors? (SPECIFY AND RATE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. On a scale of 1 to 5, with 5 being Most Impact and 1 being the Least Impact, did any of the following factors motivate you to participate in the program?

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact by OPA’s customer representatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPA informational literature and advertising</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact from your LDC’s customer representatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDC informational literature and advertising</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of an incentive</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>
</tr>
</tbody>
</table>

7. Were there other energy efficiency features you were interested in pursuing in your project(s), but you didn’t pursue them because they wouldn’t qualify under the program or the program’s incentives were insufficient?

*Program Delivery Effectiveness Module*

**For Performance-based Track:**

8. Can you please confirm that Performance-based is the type of incentive track you participated in?

9. Did you consider participating in the Prescriptive-based incentive track?
   A. If so, why didn’t you pursue the Prescriptive-based incentive track?
10. Did you consider the Custom-based incentive track?
   A. If so, why didn’t you pursue the Custom-based incentive track?

11. Would you have become an EnerGuide builder in absence of the program? How difficult is the process to become an EnerGuide builder?

12. I see your project achieved an (83 or 84 performance rating)/(85 or higher performance rating). Did the Performance-based incentive levels influence the types of measure you installed in your projects? (NTG)
   A. If yes, how so?
   B. If no, why not?

For the Prescriptive-based Track:

13. Can you please confirm that Prescriptive is the type of incentive your received?

14. Did you consider the Performance-based incentive track?
   A. If so, why didn’t you pursue the Performance-based incentive track?

15. Did you expect to receive an incentive for another measure that was not on the prescriptive list of measures?

16. Did you consider the Custom-based incentive track?
   A. If so, why didn’t you pursue the Custom-based incentive track?

17. **If furnace was a measure:** Did you receive any additional incentive from Enbridge?

All Tracks:

18. Are you satisfied with the amount of the financial incentive you received? (YES/NO) If no, why not?

19. After you submitted your application, how long did it take until you received your rebate check?
   - 0 to 2 weeks
   - 2 to 4 weeks
   - 4 to 6 weeks
   - 6 to 8 weeks
   - 8 to 10 weeks
   - 10 to 12 weeks
   - more than 12 weeks
   Was that an acceptable amount of time?  NO  YES

20. Were the homes inspected by the LDC after completion?
A. Please rank your satisfaction with this process on a scale of 1 to 5.

<table>
<thead>
<tr>
<th>Satisfaction with inspection process</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21. Did you or an employee fill out the preliminary and final applications for the incentive?
   A. If so, can you rank its ease of use on a scale of 1 to 5. (where 5 means VERY EASY and 1 means VERY DIFFICULT)

<table>
<thead>
<tr>
<th>Ease of Working With Online Application Worksheets</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

22. How did you find the application process?
   A. Please rank your satisfaction with this process on a scale of 1 to 5.

<table>
<thead>
<tr>
<th>Satisfaction with payment process</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. Was the application process reasonable and understandable?

24. Was the contract that you had to sign in order to participate in the program understandable? Were the contractual requirements reasonable?

25. Did you encounter any difficulties in meeting the program’s requirements for applying and receiving an occupancy/building permit? Did you encounter any difficulties supplying the LDC with a copy of the occupancy/building permit? Could this process be improved upon?

26. Do you have any suggestions for improving the program?

27. How did you submit the application?
   A. Mail
   B. E-mail
   C. Web portal
   D. Other ___________

28. How did you check on the status of your application?
29. Throughout your involvement with the program, regarding communication with program staff
   [DETERMINE WHETHER PARTICIPANT WORKED WITH OPA/LDC OR ANOTHER ENTITY BEFORE
   MAKING THE CALL]
   C. When you called or emailed staff, did they get back with you quickly? (YES/NO)
      i. If no, how long did you have to wait?
   D. Were they able to effectively communicate with you? (YES/NO)

**Participant NTG Module/Market Effects**

30. Did you learn about the OPA’s Program BEFORE or AFTER you decided to build or renovate?

31. How important was payback period as a factor in the decision making process?
   A. Very Important
   B. Fairly Important
   C. Either Important or Unimportant
   D. Fairly Unimportant
   E. Very Unimportant

32. How important was the desire to be energy efficient or “green” in your decision to install
   measures?
   A. Very Important
   B. Fairly Important
   C. Either Important or Unimportant
   D. Fairly Unimportant
   E. Very Unimportant

33. How important was the incentive in your decision to include energy efficiency measures
   A. Very Important
   B. Fairly Important
   C. Either Important or Unimportant
   D. Fairly Unimportant
   E. Very Unimportant

34. To what extent did the incentive for energy efficiency measures influence your building?
   A. A great deal
   B. A fair amount
   C. Somewhat
   D. Just a little
   E. Not at all

35. Have you participated in any other OPA SaveOnEnergy programs? (Peaksaver, coupons etc)
36. Since participating in the New Homes Construction program, have you included any additional energy efficient measures in project(s) that have gone through the program, but for which you did not receive an incentive? (YES, NO, don't know - If NO/don’t know, go to Q2, If YES continue)

37. Do you think your experience participating in the program has changed the way you do business in any way?

**Employment Effects Module**

38. Did you hire any additional employees to complete projects associated with this program?
   A. If not, how many of your current employees devoted time to work on these projects?
   B. Could you estimate how many hours or days full-time employees worked on these projects?

**Conclusion**

39. How would you rate your overall satisfaction with the program, on a scale of 1 to 5?

<table>
<thead>
<tr>
<th>Overall program satisfaction</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

40. Is there anything else that you would like to let us know based on the topics we covered today, including any ways to improve the program if possible or how the program has affected your use of energy efficient measures or design in projects?

Thank you for your time! Your feedback will be used to improve the program and provide new opportunities for builders to save money on energy efficient projects.
<table>
<thead>
<tr>
<th>Track</th>
<th>Measure</th>
<th>Assumption Description</th>
<th>Existing Value</th>
<th>Updated Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNC</td>
<td>All Off Switch</td>
<td>EUL</td>
<td>13 years</td>
<td>8 years</td>
</tr>
<tr>
<td>RNC</td>
<td>All Off Switch</td>
<td>kWh savings per switch</td>
<td>53 kWh</td>
<td>430.3 kWh</td>
</tr>
<tr>
<td>RNC</td>
<td>ENERGY STAR Qualified LED</td>
<td>Daily operating hours</td>
<td>Not specified</td>
<td>3.0 hours</td>
</tr>
<tr>
<td>RNC</td>
<td>ENERGY STAR Qualified LED</td>
<td>Baseline wattage</td>
<td>75 watts</td>
<td>53 watts</td>
</tr>
<tr>
<td>RNC</td>
<td>ENERGY STAR Qualified LED</td>
<td>Baseline wattage</td>
<td>100 watts</td>
<td>72 watts</td>
</tr>
<tr>
<td>RNC</td>
<td>ENERGY STAR Qualified LED</td>
<td>kWh savings per lamp</td>
<td>32 kWh</td>
<td>52.6 kWh</td>
</tr>
<tr>
<td>HPNC</td>
<td>Agribusiness: Recirculation Ventilation HVLS Fan</td>
<td>Installed CFM</td>
<td>165 CFM</td>
<td>264 CFM</td>
</tr>
<tr>
<td>HPNC</td>
<td>Agribusiness: Recirculation Ventilation HVLS Fan</td>
<td>Load factor</td>
<td>None</td>
<td>60%</td>
</tr>
<tr>
<td>HPNC</td>
<td>Air Cooled Unitary AC Equipment</td>
<td>Annual operating hours (if Retail)</td>
<td>1,000 hours</td>
<td>800 hours</td>
</tr>
<tr>
<td>HPNC</td>
<td>Air Cooled Unitary AC Equipment</td>
<td>Baseline Efficiencies</td>
<td>Ref. 2011 MAL</td>
<td>Ref. Recommendations</td>
</tr>
<tr>
<td>HPNC</td>
<td>Air Cooled Unitary AC Equipment</td>
<td>CEE Tier 1 and CEE Tier 2 Efficiencies</td>
<td>Ref. 2011 MAL</td>
<td>Ref. Recommendations</td>
</tr>
<tr>
<td>HPNC</td>
<td>ENERGY STAR Clothes Washers</td>
<td>Capacity</td>
<td>45 liters</td>
<td>88 liters</td>
</tr>
<tr>
<td>HPNC</td>
<td>ENERGY STAR Clothes Washers</td>
<td>Cycles per year</td>
<td>392 cycles</td>
<td>312 cycles</td>
</tr>
<tr>
<td>HPNC</td>
<td>ENERGY STAR Clothes Washers</td>
<td>kWh savings per clothes washer</td>
<td>182.68 kWh</td>
<td>284.42 kWh</td>
</tr>
<tr>
<td>HPNC</td>
<td>ENERGY STAR Dishwashers</td>
<td>EUL</td>
<td>13 years</td>
<td>15 years</td>
</tr>
<tr>
<td>HPNC</td>
<td>ENERGY STAR Refrigerators</td>
<td>kWh savings per refrigerator</td>
<td>112.8 kWh</td>
<td>118.4 kWh</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------</td>
<td>----------------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting (Excluding High Bay Applications)</td>
<td>Annual operating hours</td>
<td>2,594 hours</td>
<td>2,545 hours</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting: High Performance Medium Bay T8 Fixtures</td>
<td>EUL</td>
<td>5 years</td>
<td>10 years</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting: LED Recessed Downlights</td>
<td>EUL</td>
<td>16 years</td>
<td>14 years</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting: Reduced Wattage T8 Fixtures</td>
<td>EUL</td>
<td>9 years</td>
<td>15 years</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting: T5 Fixtures</td>
<td>EUL</td>
<td>8 years</td>
<td>15 years</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting: T5 Medium and High Bay Fixtures</td>
<td>EUL</td>
<td>4 years</td>
<td>10 years</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting Occupancy Sensors</td>
<td>Annual Operating Hours</td>
<td>2,594 hours</td>
<td>2,545 hours</td>
</tr>
<tr>
<td>HPNC</td>
<td>Lighting Occupancy Sensors</td>
<td>EUL</td>
<td>10 years</td>
<td>8 years</td>
</tr>
</tbody>
</table>
Appendix E: Suggested Adjustments to Measures

A review of the available documents indicated that the most of the calculation methodologies and assumptions listed in the 2011 Quasi-Prescriptive Measures and Assumptions List (MAL) Version 1.0 were reasonable. Where applicable, Frontier made adjustments to baselines change cases, and assumptions to improve the accuracy of prescribed savings estimations. This document serves as an overview of all changes Frontier recommends. The majority of these changes have also been included in the redlined Measure Substantiation Sheets and Appendix D: Updated Prescriptive Assumptions. However, this section provides and measure-by-measure analysis of suggested changes.

1. HPNC Measures:
   a. Agribusiness Measures – HVLS Fans:
      i. Savings were calculated as specified in the 2011 Quasi-Prescriptive Measures and Assumptions List (MAL) Version 1.0 and HPNC Prescriptive Input Assumptions Version 2.0, however the Evaluation Team accepted adjustments specified in the Nexant evaluation of 2011 business incentive programs from September 2012. Primary adjustments include the reduction of baseline CFM assumption from 500 to 140 CFM and the application of a 60% load factor to the efficiency case. Additionally, installed CFM has been updated from 165 CFM to a weighted average value of 264 CFM based on Frontier review of fan models reported as part of the 2013 program.

   b. Electric Auxiliary Measures:
      i. Premium Efficiency Motors:
         1. Update efficiency table in measure substantiation sheet to include complete set of horsepower levels (e.g. 4, 5, and 175 hp).
         2. Clarify source of operating hour assumptions. Additionally, specify that heating hours are 2/3 of fan hours and cooling hours are 1/3 of fan hours.
         3. Loading assumption is an oversimplification, but it is reasonable. An example loading distribution from Bonneville Power Administration calculator (available for download on DOE) creates a deemed low and high loading assumption: Low loading assumption establishes 30% load 15% of the time, 50% load 55% of the time, 70% loading 25% of the time, and 90% loading 5% of the time. High loading assumption establishes 50% loading 20% of the time, 70% loading 60% of the time, and 90% loading 20% of the time. These assumptions result in average loading of 54% for low loading applications and 70% for high loading.
Appendix E: Suggested Adjustments to Measures

applications. OPA may want to consider adding a high and low loading recommendation for this measure.

ii. Synchronous Belts:
   1. Consider including horsepower levels up to 200 hp to align with premium efficiency motors measure.
   2. Consider updating baseline efficiency to 92.5%. A DOE reference sheet claims that V-belt drives operate at a peak efficiency of 95% at the time of installation. Efficiency can deteriorate by as much as 5% over time if slippage occurs because the belt is not periodically re-tensioned. A 92.5% efficiency is derived by averaging these two values.
   3. Consider updating synchronous belt efficiency to 98%. A DOE reference sheet claims that synchronous belts operate with a consistent efficiency of 98% and maintain their efficiency over a wide load range.
   4. Consider using the same 75% load factor for the base and conservation cases and instead calculating the energy savings based solely on the efficiency increase.
   5. Align operating hour assumption with premium efficiency motors measure or specify an applicable reference.

iii. Variable Frequency Drives:
   1. Consider including horsepower levels up to 200 hp to align with premium efficiency motors measure.
   2. The premium efficiency motors measure includes a note that specifies that “motors with variable speed drives operate on average at approximately 50% load”, while the VFD measure substantiation sheet specifies a 66% load factor. The measure should either be updated to align with the premium efficiency motor measure, or an appropriate source should be listed for this value.
   3. Consider using a more detailed loading distribution. An example loading distribution from Bonneville Power Administration calculator (available for download on DOE) creates a deemed low and high loading assumption: Low loading assumption establishes 30% load 15% of the time, 50% load 55% of the time, 70% loading 25% of the time, and 90% loading 5% of the time. High loading assumption establishes 50% loading 20% of the time, 70% loading 60% of the time, and 90% loading 20% of the time. These assumptions result in average loading of 54% for low loading applications and 70% for high loading applications. OPA may want to consider adding a high and low loading recommendation for this measure.

4. Consider updating the EUL from 10 years to 15 years. DEER 2014 specifies a 15 year EUL for VFD applications.

c. ENERGY STAR Appliance Measures:
   i. Utilize updated assumptions and savings for ENERGY STAR Ceiling Fans, Clothes Washers, Dishwashers, and Refrigerators from the latest May 2014 version of the ENERGY STAR appliance calculator. Reference redlined measure substantiation sheets. The U.S. Department of Energy has raised the minimum efficiency for clothes washers, dishwashers, and refrigerators. The existing measure substantiation sheet is based on ENERGY STAR efficiency standards, and ENERGY STAR has updated or will update their standards to align with the DOE update.
   
   
   

d. Lighting Measures:
   i. Because this is a prescriptive measure, the 2014 MAL assumes 2,594 run hours (from DEER 2008), corresponding to the Office building type. While it may not be possible to utilize project specific run hours, OPA should develop a second set of deemed values using run hours specified for the Retail building type. Most lighting projects reviewed as part of this evaluation fell into one of these two building type categories.
   
   ii. Run hour assumptions for the Office building type from DEER 2008 have been updated to 2,545 in DEER 2011. OPA should adopt the updated value and should reference DEER 2011 if any building types are added to this prescriptive measure.
Appendix E: Suggested Adjustments to Measures

iii. Do not claim savings for CFL measures in the HPNC program. OPA removed this measure from Version 2 of the prescriptive assumptions, which is used for projects applying for permits on or after January 1, 2012.

iv. The Estimated Useful Life (EUL) for each lighting measure were updated as specified:
   1. Induction Lamps: 20 year EUL – 100,000 hour rated life ÷ 4,792 hours (capped at 20 years)
   2. Integrated-Ballast LED Lamps (Commercial): 12 year EUL – 30,000 hour rated life ÷ 2,545 hours (excluding recessed LED lamps)
   3. Linear Fluorescent Measures: 15 year EUL – DEER 2014 (excluding high bay applications)
   4. Linear Fluorescent Measures (High Bay): 10 year EUL – 50,000 hour rated life ÷ 4,792 hours
   5. Non Integrated-Ballast LED Fixture: 20 year EUL – 50,000 hour rated life ÷ 2,545 hours
   6. Recessed LED Lamps: 14 years – 35,000 hour rated life ÷ 2,545 hours

e. Lighting Controls:
   i. Consider updating EUL from 10 years to 8 years. The current measure substantiation sheet references that DEER 2008 (now DEER 2014) specifies an 8 year measure life for lighting controls. This is consistent with what we have seen in other jurisdictions.
   ii. Run hour assumptions for the Office building type from DEER 2008 have been updated to 2,545 in DEER 2011. OPA should adopt the updated value and should reference DEER 2011 if any building types are added to this prescriptive measure.

f. Unitary AC Measures:
   i. Because this is a prescriptive measure, the 2014 MAL assumes 1,000 run hours, corresponding to the Office building type. While it may not be possible to utilize project specific run hours, OPA should develop a second set of deemed values using 800 run hours, corresponding to the Retail building type. Most unitary AC projects reviewed as part of this evaluation fell into one of these two building type categories.
   ii. Update baseline efficiency values to align with ASHRAE 90.1-2010, as required by Canadian OEE.
   iii. The U.S. Department of Energy has raised the minimum efficiency for systems less than 65,000 Btu/hr to 14 SEER, effective January 1, 2015. The existing measure substantiation sheet is based on ENERGY STAR and CEE efficiency standards, which will likely update their standards to align with the DOE update. OPA should consider raising the baseline efficiency for systems less than 65,000 Btu/hr to 14 SEER.
iv. Update CEE Tier 1 and Tier 2 efficiency value to align with updated requirements.

v. Calculate energy savings for systems less than 65,000 Btu/hr (5.4 tons) using SEER rather than EER efficiency values. SEER is more representative of the system efficiency over the entire cooling season. If this recommendation is adopted, EER should continue to be used for demand savings, as EER is more representative of the system efficiency during peak conditions.

vi. Consider incorporating heating energy savings into the measure if Heat Pumps are expected to make up a statistically significant sample of future project submittals.

Table 39: Updated Baseline, CEE Tier 1, and CEE Tier 2 Efficiency Values

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Capacity Category (Tons)</th>
<th>Capacity Category (Btu/hr)</th>
<th>Heat Type</th>
<th>Baseline Eff</th>
<th>CEE Tier 1 Eff</th>
<th>CEE Tier 2 Eff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Cooled</td>
<td>&lt; 5.4 split</td>
<td>&lt; 65000 split</td>
<td>ER</td>
<td>13 SEER</td>
<td>14 SEER</td>
<td>15 SEER</td>
</tr>
<tr>
<td></td>
<td>&lt; 5.4 split</td>
<td>&lt; 65000 split</td>
<td>All Other</td>
<td>13 SEER</td>
<td>14 SEER</td>
<td>15 SEER</td>
</tr>
<tr>
<td></td>
<td>&lt; 5.4 packaged</td>
<td>&lt; 65000 packaged</td>
<td>ER</td>
<td>13 SEER</td>
<td>14 SEER</td>
<td>15 SEER</td>
</tr>
<tr>
<td></td>
<td>&lt; 5.4 packaged</td>
<td>&lt; 65000 packaged</td>
<td>All Other</td>
<td>13 SEER</td>
<td>14 SEER</td>
<td>15 SEER</td>
</tr>
<tr>
<td></td>
<td>&gt; 5.4-11.25</td>
<td>&gt; 65000-135000</td>
<td>ER</td>
<td>11.2 EER</td>
<td>11.7 EER</td>
<td>12.2 EER</td>
</tr>
<tr>
<td></td>
<td>&gt; 5.4-11.25</td>
<td>&gt; 65000-135000</td>
<td>All Other</td>
<td>11 EER</td>
<td>11.5 EER</td>
<td>12 EER</td>
</tr>
<tr>
<td></td>
<td>&gt; 11.25-20</td>
<td>&gt; 135000-240000</td>
<td>ER</td>
<td>11 EER</td>
<td>11.7 EER</td>
<td>12.2 EER</td>
</tr>
<tr>
<td></td>
<td>&gt; 11.25-20</td>
<td>&gt; 135000-240000</td>
<td>All Other</td>
<td>10.8 EER</td>
<td>11.5 EER</td>
<td>12 EER</td>
</tr>
<tr>
<td></td>
<td>&gt; 20-63.3</td>
<td>&gt; 240000-760000</td>
<td>ER</td>
<td>10 EER</td>
<td>10.5 EER</td>
<td>10.8 EER</td>
</tr>
<tr>
<td></td>
<td>&gt; 20-63.3</td>
<td>&gt; 240000-760000</td>
<td>All Other</td>
<td>9.8 EER</td>
<td>10.3 EER</td>
<td>10.6 EER</td>
</tr>
<tr>
<td></td>
<td>&gt; 63.3</td>
<td>&gt; 760000</td>
<td>ER</td>
<td>9.7 EER</td>
<td>9.9 EER</td>
<td>10.4 EER</td>
</tr>
<tr>
<td></td>
<td>&gt; 63.3</td>
<td>&gt; 760000</td>
<td>All Other</td>
<td>9.5 EER</td>
<td>9.7 EER</td>
<td>10.2 EER</td>
</tr>
<tr>
<td>Water Cooled</td>
<td>&lt; 5.4</td>
<td>&lt; 65000</td>
<td>ER</td>
<td>12.1 EER</td>
<td>14 EER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt; 5.4</td>
<td>&lt; 65000</td>
<td>All Other</td>
<td>12.1 EER</td>
<td>14 EER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 5.4-11.25</td>
<td>&gt; 65000-135000</td>
<td>ER</td>
<td>11.5 EER</td>
<td>14 EER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 5.4-11.25</td>
<td>&gt; 65000-135000</td>
<td>All Other</td>
<td>11.3 EER</td>
<td>13.8 EER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 11.25-20</td>
<td>&gt; 135000-240000</td>
<td>ER</td>
<td>11 EER</td>
<td>14 EER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 11.25-20</td>
<td>&gt; 135000-240000</td>
<td>All Other</td>
<td>10.8 EER</td>
<td>13.8 EER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 20</td>
<td>&gt; 240000</td>
<td>ER</td>
<td>11.5 EER</td>
<td>14 EER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 20</td>
<td>&gt; 240000</td>
<td>All Other</td>
<td>11.3 EER</td>
<td>13.8 EER</td>
<td></td>
</tr>
</tbody>
</table>
2. RNC Measures:
   a. Central Air Conditioner – SEER 15:
      i. Develop additional savings tiers for higher efficiencies
      ii. Heat pumps are currently included in the existing measure substantiation sheet for this measure. However, no heating savings are specified. Consider heating energy savings into the measure if Heat Pumps are expected to make up a statistically significant sample of future project submittals.
      iii. The U.S. Department of Energy has raised the minimum efficiency for this measure to 14 SEER, effective January 1, 2015. The existing measure substantiation sheet is based on ENERGY STAR efficiency standards, and ENERGY STAR will likely update their standards to align with the DOE update. OPA should consider raising the baseline efficiency to 14 SEER.
      iv. Consider increasing EUL from 18 years to 19 years for air conditioners. If heating savings for heat pumps are incorporated into the measure, EUL should be 16 years for heat pumps. The U.S. Department of Energy Technical Support Document for this measure recommends a 19 year measure life for air conditioners and 16 year measure life for heat pumps. The DOE TSD is a more recent and more comprehensive analysis of product measure life, and DOE has not updated their measure life since DEER 2008. OPA may choose to continue to use DEER 2008, but should update source to DEER 2014.
   b. Electric/Gas Furnace with ECM:
      i. In the 2014 Prescriptive Measures and Assumptions List (MAL), deemed Gas Furnace with ECM savings are presented for continuous and non-continuous fan usage. Savings are also specified for space heating only or for space heating and cooling. OPA provided weighted energy and demand savings that were derived using 2011 retrofit participation values. These weighted averages were accepted as part of the current program evaluation. However, due to the small sample size of project in the Residential New Construction program, these weighted savings will not applicable in future evaluations. Instead, LDCs should collect information specifying continuous/non-continuous fan usage and space heating/space heating and cooling for each project.
   c. Lighting:
      i. Consider reorganizing existing measures into the following:
         1. Standard CFLs
         2. Omni-Directional LEDs
         3. Directional LEDs.
      ii. Existing incandescent/halogen lamp baseline wattages (40, 60, 75, and 100 W) should be updated to align with current Canadian energy efficiency regulations for general service lamps as specified at [http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6869](http://www.nrcan.gc.ca/energy/regulations-codes-standards/products/6869).
The 75 and 100 W baseline wattages have already been reduced. 40 and 60 W baseline wattages are scheduled to be reduced in 2015.

iii. Consider allowing integrated-ballast CFLs if installed with a “permanent installation disk” to prevent use of incandescent bulbs.

iv. Consider updating average equivalent CFL and LED lamp wattages and annual run hours to align with those specified in the current ENERGY STAR savings calculator available at http://www.energystar.gov/certified-products/detail/light_bulbs.

v. The 2014 Prescriptive Measures and Assumptions List (MAL) specifies a 16 year EUL for CFL lamps, which matches DEER 2014 for indoor residential CFL fixtures. However, the appropriate EUL for a CFL lamp with an 8,000 hour rated life from DEER 2014 is 7.73 (or 8) years.


d. Lighting Controls:

i. Consider updating EUL from 10 years to 8 years. The current measure substantiation sheet references that DEER 2008 (now DEER 2014) specifies an 8 year measure life for lighting controls. This is consistent with what we have seen in other jurisdictions.
## Appendix F: HPNC Overview and Process Diagram

### Table 40: HPNC Overview

<table>
<thead>
<tr>
<th>HPNC Track</th>
<th>Description</th>
<th>Incentives</th>
<th>Eligible Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescriptive</td>
<td>Set incentive for pre-approved technologies</td>
<td>Lighting: up to $400/kW&lt;br&gt;Non-lighting: up to $800/kW&lt;br&gt;Appliances: $75/unit</td>
<td>· Lighting&lt;br&gt;· Unitary AC Equipment&lt;br&gt;· Hot Water Alternative Energy Measures&lt;br&gt;· Motors&lt;br&gt;· Multi-Residential In-Suite Appliances&lt;br&gt;· Synchronous Belts&lt;br&gt;· Variable Frequency Drives&lt;br&gt;· Agribusiness specific measures</td>
</tr>
<tr>
<td>Engineered</td>
<td>Preset calculation worksheets for a variety of measures</td>
<td>Lighting: up to $400/kW or $0.05/kWh&lt;br&gt;Non-lighting: up to $800/kW or $0.10/kWh</td>
<td>· Directional Lamps&lt;br&gt;· Exterior Lighting&lt;br&gt;· High Bay Lighting&lt;br&gt;· Interior Lighting&lt;br&gt;· Unitary AC Equipment</td>
</tr>
<tr>
<td>Custom (Design)</td>
<td>Provides incentives to participants who develop energy and demand savings from modelling software</td>
<td>Sliding scale based on level of energy performance improvement of the project design versus code compliant reference design:&lt;br&gt;&lt; 25% better than Code&lt;br&gt;&gt; 25% better than Code&lt;br&gt;&gt; 50% better than Code&lt;br&gt;Amount of incentives varies based on project application date.&lt;br&gt;Design Decision Maker incentive and Modelling incentive also available</td>
<td>All energy efficient measures included in energy simulation model; savings calculated from hourly energy profiles</td>
</tr>
<tr>
<td>Custom (Modelling)</td>
<td>Provides incentives to participants who develop energy and demand savings from using modelling software</td>
<td>The lower of either $10k or 100% of the cost to perform energy simulations, not to exceed the estimated project incentive amount.</td>
<td>Mix of measures; savings determined via using modelling software</td>
</tr>
</tbody>
</table>
Figure 19: HPNC Initiative Process Diagram

Legend:
- Participant Action
- Optional - Participant Action
- LDC Action
- Optional - LDC Action
- OPA Action
- Optional - OPA Action
- Required
- Optional

Sometimes AFTER the participant has submitted the pre-project forms, the participant submits the building permit, which will serve as a binding commitment between the participant and the OPA and LDC. If a building permit is not suitable to the project, a purchase order can serve as a binding commitment.
### Table 41: RNC Initiative Overview

<table>
<thead>
<tr>
<th>Prescriptive Track</th>
<th>Description</th>
<th>Prescriptive Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prescriptive Measures</strong></td>
<td><strong>Description</strong></td>
<td><strong>Incentive</strong></td>
</tr>
<tr>
<td>All Off Switch</td>
<td>Master switch that controls multiple electrical sockets in multiple locations in the home (hard wired)</td>
<td>$50</td>
</tr>
<tr>
<td>ENERGY STAR® Qualified Central Air Conditioner (CAC)</td>
<td>Minimum 15 SEER and 12.5 EER as identified by the OPA</td>
<td>$30</td>
</tr>
<tr>
<td>High efficiency furnace with a fully variable speed electronically commutated motor (ECM)</td>
<td>High efficiency as identified by the OPA</td>
<td>$50</td>
</tr>
<tr>
<td><strong>Lighting Control Products</strong></td>
<td><strong>Description</strong></td>
<td><strong>Incentive</strong></td>
</tr>
<tr>
<td>• Hard-wired indoor and outdoor timers and motion sensors</td>
<td>$3</td>
<td></td>
</tr>
<tr>
<td>• Hard-wired dimmer switches</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ENERGY STAR® Qualified Niche Lighting</strong></td>
<td><strong>Description</strong></td>
<td><strong>Incentive</strong></td>
</tr>
<tr>
<td>• ENERGY STAR Qualified recessed lighting – must have GU24 replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ENERGY STAR Qualified under the counter lighting</td>
<td>$15</td>
<td></td>
</tr>
<tr>
<td>• ENERGY STAR Qualified LED lighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ENERGY STAR® Qualified indoor light fixtures (hard-wired)</strong></td>
<td><strong>Description</strong></td>
<td><strong>Incentive</strong></td>
</tr>
<tr>
<td>• 1 or 2 sockets</td>
<td>$3</td>
<td></td>
</tr>
<tr>
<td>• 3 or more sockets</td>
<td>$10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Track</th>
<th><strong>Description</strong></th>
<th><strong>Incentive</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
<td>EnerGuide 83 or 84 rating</td>
<td>$500</td>
</tr>
<tr>
<td>Performance</td>
<td>EnerGuide 85 or better</td>
<td>$1,000</td>
</tr>
</tbody>
</table>
## Custom Track

<table>
<thead>
<tr>
<th>Custom Measures</th>
<th>Description</th>
<th>Incentive</th>
</tr>
</thead>
</table>
| Custom          | Projects not eligible for Prescriptive or Performance incentives. Measures must meet following criteria:  
• Target space heating, space cooling, building envelope or water heating end uses; lighting and appliance projects are excluded  
• Must be more efficient than Ontario Building Code  
• All machinery, equipment, parts, fixtures, and any other accessories or items associated with the custom measure are commercially reasonable equipment and the costs thereof are commercially reasonable  
• Have a positive Total Resource Cost (TRC) test  
• Cannot be a pilot or demonstration project of unproven results.  
• Cannot be part of OPA’s Feed-In Tariff Program. | Sliding scale based on level of energy performance improvement of the project design versus code compliant reference design:  
< 25% better than Code  
> 25% better than Code  
> 50% better than Code |
|                 | Amount of incentives varies based on project application date. Design Decision Maker incentive and Modelling incentive also available |
Appendix G: RNC Overview and Process Diagram

Figure 20: RNC Initiative Process Diagram

Legend:

- Participant Action
- LDC Action
- OPA Action

Required →
Optional →