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Joint Residential New Construction Program

FINAL
Energy Efficiency/Demand Response Plan:
Gas Plan Year 4
Electric Plan Year 7
(6/1/2014-5/31/2015)

Presented to
Nicor Gas
Commonwealth Edison Company

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E. Executive Summary

This report presents a summary of the findings and results from the impact and process evaluation of the GPY4/EPY7 [1] Residential New Construction Program. The Residential New Construction (RNC) Program is jointly offered by Nicor Gas and Commonwealth Edison (ComEd). Nicor Gas is the lead utility as the majority of the avoided costs are from natural gas savings. Residential Science Resources (RSR) implements the program for both utilities. GPY4/EPY7 is the first year with 100 percent of program homes built under the IECC 2012 energy code, which came into effect in January 2013. The program also updated participation requirements for this program year, raising the minimum efficiency for each home from 10 percent above code to 20 percent above code and implementing three tiers of homes:

- Tier 1: 20.00-24.99 percent above code
- Tier 2: 25.00-29.99 percent above code
- Tier 3: 30 percent or more above code

E.1. Program Savings

Table E-1 summarizes the natural gas and electricity savings from the RNC Program.

Table E-1. GPY4/EPY7 Total Program Savings

Savings Category	Energy Savings (therms)	Energy Savings (kWh)	Average Demand Savings (kW)	Peak Demand Savings (kW)
Ex Ante Gross Savings	304,729	527,108	-	-
Verified Gross Savings	232,651	647,072	73.9	351
Verified Net Savings	186,121	517,658	59.1	281.1

Source: Utility tracking data and Navigant team analysis.

E.2. Program Savings by Home Type

Navigant built four aggregate models for the impact analysis, grouping homes into the following categories: single-story detached, two or more story detached, single-story attached, and two or more story attached. The following two tables summarize the program natural gas and electric savings by home type.

[1] The GPY4/EPY7 program year began June 1, 2014 and ended May 31, 2015.

Table E-2. GPY4/EPY7 Program Results by Home Type: Therms

Research Category	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Gross Realization Rate	NTGR	Verified Net Savings (therms)
Detached 1 Story	44,961	37,892	84% ‡	0.8 †	30,313
Detached 2+ Story	226,616	182,498	81% ‡	0.8 †	145,998
Attached 1 Story	464	663	143% ‡	0.8 †	530
Attached 2+ Story	32,688	11,599	35% ‡	0.8 †	9,279
Total	304,729	232,651	76% ‡	0.8 †	186,121

Source: Utility tracking data and Navigant team analysis.
† A deemed value. Source: ComEd PY5-PY7 Proposal Comparisons with SAG.xls, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html
‡ Based on evaluation research findings.

Table E-3. GPY4/EPY7 Program Results by Home Type: Electric

Research Category	Ex Ante Gross Savings (kWh)	Ex-Ante Gross Demand Reduction (kW)	Verified Gross Savings (kWh)	Verified Gross Peak Demand Reduction (kW)	Verified Gross Realization Rate	NTGR	Verified Net Savings (kWh)	Verified Net Peak Demand Reduction (kW)
Detached 1 Story	49,137	-	59,465	35.4	121%	0.8 †	47,572	28
Detached 2+ Story	397,852	-	546,915	296	137%	0.8 †	437,532	236
Attached 1 Story	496	-	256	0.1	52%	0.8 †	204	0
Attached 2+ Story	79,623	-	40,437	20.3	51%	0.8 †	32,349	16
Total	527,108	-	647,072	351	123%	0.8 †	517,658	281

Source: Utility tracking data and Navigant team analysis.
† A deemed value. Source: ComEd PY5-PY7 Proposal Comparisons with SAG.xls, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html
‡ Based on evaluation research findings.

E.4. Program Volumetric Detail

The program incented 874 homes in GPY4/EPY7.

Table E-4. GPY4/EPY7 Volumetric Findings Detail

Participation Category	Joint ComEd Homes	Nicor Gas Homes	All Homes
Tier 1	375	65	440
Tier 2	225	48	273
Tier 3	128	33	161
Total	728	146	874

E.5. Results Summary

The following table summarizes the key metrics from GPY4/EPY7.

Table E-5. GPY4/EPY7 Results Summary

Participation	Units	GPY4/EPY7
Net Savings	Therms	186,121
Gross Savings	Therms	232,651
Program Realization Rate (gas)	%	76
Program NTG Ratio (gas)	#	0.8
Net Savings	kWh	517,658
Net Peak Demand Reduction	kW	281
Gross Savings	kWh	647,072
Gross Peak Demand Reduction	kW	351
Program Realization Rate (electric)	%	123
Program NTG Ratio(electric)	#	0.8
Total Homes	#	874
Joint ComEd Homes	#	728
Participating Builders*	#	48
Participating Raters*	#	10

*Enrolled or completed homes in GPY4/EPY7. Source: Utility tracking data and Navigant team analysis.

E.6. Findings and Recommendations

The following provides insight into key program findings and recommendations.[2] The program continues to have strong participation even with higher participation requirements, including in higher efficiency tiers. Builders and raters are largely satisfied with the program. Navigant offers the following findings and recommendations to further improve the program in the future.

[2] Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

Evaluation Research Gross Impacts

Finding 1. The program achieved a gross savings realization rate of 76% for natural gas and 123% for electricity. The resulting researched gross savings for GPY4/EPY7 are 232,651 therms and 647,072 kWh.

Finding 2. The evaluation team estimated peak demand impacts of 351 kW for GPY4/EPY7.

Finding 3. Although program homes all exceeded code on a performance basis by at least 20 percent, Navigant observed that on average certain characteristics met individual code requirements more consistently than others.

Recommendation 1. Work with builders and raters to improve areas below code, such as wall and foundation insulation levels, as well as those that are at or just above code, such as window U-values, major appliances, and cooling equipment. Specific actions could include RSR directing raters to focus on these areas or offering targeted builder trainings on these topics. These actions could help builders improve practices in these areas and achieve higher participation tiers, and may also reduce free-ridership.

Evaluation Research Net Impacts

Finding 4. The evaluation research NTGR for GPY4/EPY7 found a range of 0.39 – 0.65 for natural gas and 0.35 – 0.63 for electricity, which are lower than the current SAG recommendation. Navigant recommends using prospective NTGRs of 0.65 for natural gas and 0.63 for electricity in GPY6/EPY9 due to ongoing program updates noted in the findings and recommendations below.

Finding 5. Navigant's research on other RNC programs indicates that in jurisdictions with high NTG results, programs generally offer more training to all builders in their market (and some trades), not just to program builders. This can lead to market effects from non-participants.

Finding 6. Code enforcement is high in the Chicago area, leading to generally high efficiency levels in average building practices. Builders and raters both noted their expectations for continuing increases in code stringency and a need to look ahead to keep up.

Recommendation 2. RSR should continue its new broader builder training offerings to increase exposure beyond program participants and attract a wider cross-section of the market. This could lead to market effects from non-participants, which if measured could increase spillover and NTG.

Recommendation 3. Program marketing and RSR outreach to individual raters and builders should emphasize higher efficiency tiers in the new tiered program structure to move away from low-hanging fruit. This could push builders to go beyond "easy" improvements to their homes and reduce free-ridership for the higher efficiency tiers.

Process Evaluation

Finding 7. Builders and raters noted that the program could improve on supporting their marketing efforts through educating customers on the benefits of energy efficient homes; one customer fact sheet is available to builders upon request but is not widely distributed.

Recommendation 4. Expand on current efforts to educate consumers directly, specifically to the benefits of energy efficiency in new homes. This could include advertising through traditional and social media as well as educating the real estate community or supporting efforts to promote recognition of efficient homes. ComEd and Nicor Gas should also consider including information on the RNC program on their residential rebate web pages, and encouraging builders and raters to become trade allies.[3]

Finding 8. Builders who interact with program staff and most raters report excellent technical support and training, but some builders still do not engage much if at all with the program directly and do not always associate their raters' support with the program.

Finding 9. The program has historically relied on raters to bring builders into the program. This approach may mean the program is more likely to reach builders who are already working with raters and/or using efficient practices.

Recommendation 5. RSR should continue work to foster improved relationships with a larger fraction of participating builders and the building community at large. The new Build Smart newsletter which began toward the end of GPY4/EPY7 and the new broad-based training offerings are good starts to this effort. RSR should consider establishing a target number of outreach efforts for each builder rather than holding one-on-one meetings "as needed," using the new local liaison on the team.

Tracking System

Finding 10. Three out of five raters interviewed were dissatisfied with the tracking system, citing issues with blower door test software compatibility and difficulty with REM/Rate updates.

Recommendation 6. RSR should investigate whether there are any opportunities to reduce manual data entry into HouseRater and communicate with builders about progress to keep HouseRater compatible with REM/Rate updates in a timely manner.

[3] For example, the Green Resource Council offers a guide for "greening" local Multiple Listing Services (MLS). http://greenresourcecouncil.org/sites/default/files/2014%20NAR%20Green%20MLS%20Implementation%20Guide.pdf

1 Introduction

1.1 Program Description

This report presents a summary of the findings and results from the impact and process evaluation of the GPY4/EPY7 [4] Residential New Construction Program. The Residential New Construction (RNC) Program is jointly offered by Nicor Gas and Commonwealth Edison (ComEd). Nicor Gas is the lead utility as the majority of the avoided costs are from natural gas savings. Residential Science Resources (RSR) implements the program for both utilities. The program launched in early 2012 and grew rapidly to exceed savings and completed homes goals in recent program years. GPY4/EPY7 is the first year with 100% of program homes built under the IECC 2012 energy code, which came into effect in January 2013. The program also updated participation requirements for this program year, raising the minimum efficiency for each home from 10 percent above code to 20 percent above code and implementing three tiers of homes:

- Tier 1: 20.00-24.99 percent above code
- Tier 2: 25.00-29.99 percent above code
- Tier 3: 30 percent or more above code

RSR uses completed REM/Rate files for each home to calculate whole-house savings. The program relies on networks of builders and HERS raters to garner participation and continues to attract raters and builders to the program.

1.2 Evaluation Objectives

The GPY4/EPY7 evaluation sought to answer the key researchable questions indicated in the sections below.

1.2.1 Impact Questions

1. What is the program's verified gross savings?
2. What is the program's verified net savings? What is the level of free ridership associated with this program? What is the level of spillover associated with this program?
3. Is a code baseline appropriate for this program or should a below-code baseline be used? If a below code baseline should be used, is there sufficient data to implement this?[5]

1.2.2 Process Questions

1. Are builders and raters satisfied with the program? What improvements, if any, would builders and raters like to see implemented?

[4] The GPY4/EPY7 program year began June 1, 2014 and ended May 31, 2015.

[5] MEEA was expected to release a new report on code compliance with IECC 2012 during the evaluation period for GPY3/EPY6, but it is not yet available. If it becomes available, Navigant will review this report to determine whether the underlying data can influence below-code savings claims for the Nicor Gas and ComEd program for homes permitted under IECC 2012. If sufficient data is available, Navigant will detail a proposed approach for quantifying these saving in a separate memorandum to Nicor Gas and ComEd.

2. Are the QA/QC activities adequate and unbiased (including procedures for incentive approval, complaints, assuring product quality, etc.)?
3. How do builders view their relationship with the program? Do builders rely on program staff and/or program raters for assistance in reaching program efficiency levels in new homes? Do builders recognize raters as part of the program?
4. Does the program help builders achieve code compliance in program and/or non-program homes?
5. How can the program be improved?

2 Evaluation Approach

Navigant conducted in-depth interviews with program builders and raters to inform the process and net impact evaluation. The team also used data from the program tracking system and REM/Rate files to conduct a calibrated simulation analysis for the gross impact evaluation.

2.1 *Overview of Data Collection Activities*

The core data collection activities included builder and rater interviews and leveraging program and utility billing data from both Nicor Gas and ComEd. The full set of data collection activities is shown in the following tables.

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	Completes Achieved	When	Comments
In-Depth Interviews	Nicor Gas, ComEd and RSR Staff	3	2	January-March 2015	ComEd residential meetings; Informal conversations with RSR at AESP conference; email correspondence with Nicor Gas and ComEd
Telephone Interviews	GPY3 and GPY4 Participating Builders	10-15	12	February-March 2015	
Telephone Interviews	GPY3 and GPY4 Participating Raters	5-8	6		
BEopt Calibrated Simulation	GPY3 and GPY4 Homes	634	575	Fall 2015	All homes built to IECC 2012 code and at least 20% above code from GPY3/EPY4, as well as all GPY4/EPY7 homes with sufficient billing data. Some homes discarded from sample due to unusable billing data.
Tracking Data Review	GPY4 Tracking Data	Census		Fall 2015	
Program Materials Review	Operations Manual, QA/QC Processes, Marketing Materials	All	All	Fall 2015	

Table 2-2. Additional Resources

Reference Source	Author	Application	Gross Impacts	Process
International Energy Conservation Code 2012		Reference for code baseline	X	

2.1.1 Verified Gross Program Savings Analysis Approach

Navigant used data from program REM/Rate files to build four energy models which represent average program homes: detached single story, detached two or more story, attached single story, and attached two or more story. For each category, Navigant compiled average home characteristics from all homes to determine the correct model inputs.

Navigant used the Building Energy Optimization interface tool (BEOpt, version 2.5) created by the National Renewable Energy Laboratory (NREL) to build these models in EnergyPlus (version 8.4), a modeling software also developed by NREL. For each "energy efficient" model built using program data, Navigant developed a corresponding "base case" scenario based on Illinois energy code.

Once the models were built, Navigant used actual billing data from program homes to calibrate the "energy efficient" home scenario to consumption to date and then ran the "base case" scenario to determine therm and kWh savings. The team used billing data from all homes in each category to calibrate the models. For example, the single-story detached model incorporated characteristics and billing data from all single-story detached homes in the program. Navigant extrapolated the results to the rest of the GPY4/EPY7 population using HERS score and square footage.

2.1.2 Verified Net Program Savings Analysis Approach

Verified net savings are calculated by applying the deemed GPY4/EPY7 NTG ratio of 0.8 to the evaluation-adjusted gross savings. The NTG value was deemed through the SAG consensus process.[6]

2.1.3 Researched Net-To-Gross Approach

The evaluation also performed research to develop NTG values for future use. That research included builder and rater interviews. Research for both groups uses a self-report method where participants and trade allies answer questions about the program. The interview guides ask about builders' use of high-efficiency building practices which can improve home efficiency performance and their inclination to use these practices absent the program.

2.1.3.1 Free-Ridership

For the NTG research, Navigant asked builders and raters about builders' efficient building practices in three areas, shown in Table 2-3. Interviewers asked questions for each measure area, using the individual practices and measures listed as examples and prompts for interviewees. Please see the appendix for the detailed methodology, including complete builder and rater interview guides.

[6] Source: ComEd PY5-PY7 Proposal Comparisons with SAG.xls, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

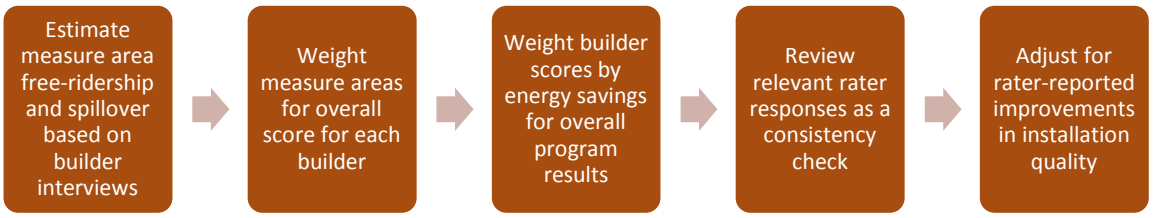
Table 2-3. Measure Areas Covered in In-depth Interviews with Builders and Raters

Measure Area	Specific Building Practices/Measures
Framing & Insulation	Air Sealing all Penetrations
	Capping Chases
	Using 2x6 framing and/or rigid foam insulation
	Backing Knee Walls
	Insulation in Full Contact w/ Air Barrier
HVAC	Proper Sizing
	Duct Leakage / Sealing, Duct Tightness Testing
	Pressure Balancing
	Proper RC&AF
Other Equipment	High Efficiency Central Air Conditioning (SEER ≥ 14.5)
	ECM Furnace Fan
	ENERGY STAR® Refrigerator or Exhaust Fan
	100% CFL Lighting
	Power-vented Water Heater (EF ≥ 0.62)
	High Efficiency Furnace (AFUE ≥ 92%)

Source: Navigant analysis

The methodology to estimate a program level NTG estimate used the steps shown in Figure 2-1.

Figure 2-1. Residential New Construction NTG Methodology



2.1.3.2 Spillover

The NTG battery also asked builders about their use of efficient home practices outside of the program to estimate spillover.

2.2 Process Evaluation

Builder and rater in-depth interviews were the primary data collection activity for the process evaluation. The team also interviewed program staff and reviewed program files provided by Nicor Gas including the program operations manual, marketing materials, QA/QC procedures and program description.

3 Gross Impact Evaluation

The RNC Program achieved researched gross savings realization rates of 76 percent for natural gas savings and 123 percent for electricity savings and also accrued 351 kW of coincident demand savings. The resulting researched gross savings for GPY4/EPY7 are 232,651 therms and 647,072 kWh. The tracking system is collecting all of the data necessary to support program operations, quality assurance and quality control (QA/QC) procedure, and evaluation activities.

3.1 Program Volumetric Findings

The RNC Program completed a total of 874 homes in GPY4/EPY7, exceeding the overall goal of 732 homes set for this program year. Of these homes, 83 percent were in joint Nicor Gas and ComEd service territory, while the remaining 17 percent were in Nicor Gas territory only. Forty-eight builders and ten HERS rating companies were active in the program year, with 38 builders and all ten raters completing homes. Figure 3-1 shows the number of homes in each home category and Figure 3-2 shows the number of homes in each tier.

Key findings include:

1. There was not a significant difference in the percent of homes adopting electric prescriptive measures between the joint and Nicor Gas-only territories. ComEd stopped offering incentives for these measures in GPY4/EPY7.
2. The percent of attached homes fell from 42 percent in GPY3/EPY6 to 18 percent in GPY4/EPY7. Single-story attached homes were less than one percent of GPY4/EPY7 homes, compared to nine percent in GPY3/GPY6.
3. In the first year of a tiered incentive system, nearly 50 percent of homes were in the higher two efficiency tiers (at least 25 percent above code).

Table 3-1. GPY4/EPY7 Volumetric Findings Detail: Former Prescriptive Electric Measures

	Participation	Joint Homes	Nicor Gas Homes
Count of Homes	ECM Furnace Fans	78	11
	Air Conditioner SEER >13	31	14
	Energy Star Refrigerator	83	19
	100% Energy Star Lighting	0	0
Percent of Homes	ECM Furnace Fans	10.7%	7.5%
	Air Conditioner SEER >13	4.3%	9.6%
	Energy Star Refrigerator	11.4%	13.0%
	100% Energy Star Lighting	0.0%	0.0%

Source: ComEd tracking data and Navigant team analysis.

Table 3-2. GPY4/EPY7 Volumetric Findings Detail: Whole House Tiers (Gas and Electric)

Participation	Joint Homes	Nicor Gas Homes	All Homes
Tier 1	375	65	440
Tier 2	225	48	273
Tier 3	128	33	161
Total	728	146	874

Figure 3-1. Number of Homes by Home Type

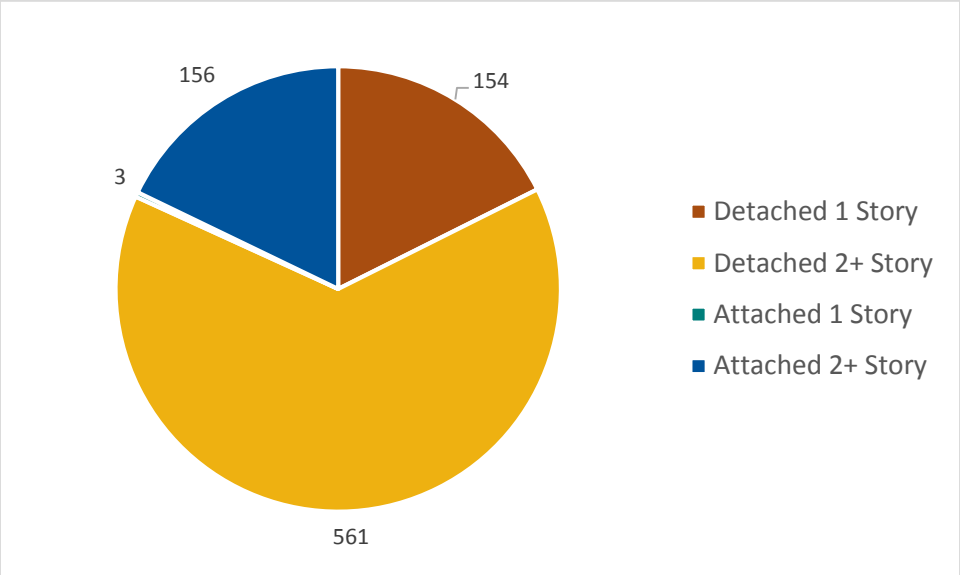
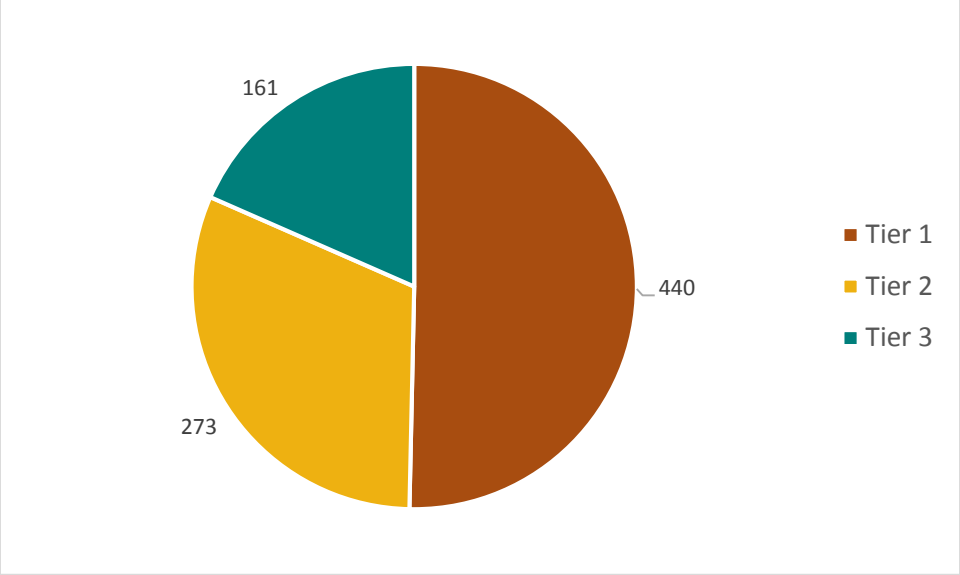


Figure 3-2. Number of Homes by Tier



3.2 *Verified Gross Program Impact Results*

Table 3-3 and Table 3-4 show the resulting gas and electric calibrated model outputs for the program homes and corresponding IECC 2012 baseline models. These results reflect the use of a Typical Meteorological Year 3 (TMY3) weather file for the Chicago O'Hare airport. The weighted average results reflect the contribution of each model bin to the total program savings. The 24 percent ex post gas percent savings are slightly higher than the ex ante average percent savings for the sampled homes of 22 percent. Navigant included lights and appliances in the electric total consumption in both the baseline and efficient model case. All savings values account for interactive effects.

Table 3-3. Average Gross Ex Post Therm Savings per Home by Model Bin

Model Bin	Baseline Model Gas Consumption (TMY)	Efficient Model Gas Consumption (TMY)	Gross Ex Post Therm Savings	Gross Ex Post Percent Savings
Detached 1 Story	1,028	791	236	23%
Detached 2+ Story	1,266	947	319	25%
Attached 1 Story	755	613	141	19%
Attached 2+ Story	584	507	77	13%
Weighted Average	1,101	840	261	24%

Source: Evaluation Team analysis.

Table 3-4. Average Gross Ex Post kWh Savings per Home by Model Bin

Model Bin	Baseline Model kWh Consumption (TMY)	Efficient Model kWh Consumption (TMY)	Gross Ex Post kWh Savings	Gross Ex Post Percent Savings
Detached 1 Story	7,606	6,882	724	10%
Detached 2+ Story	10,483	9,406	1,077	10%
Attached 1 Story	6,248	5,900	348	6%
Attached 2+ Story	6,184	5,870	314	5%
Weighted Average	9,342	8,450	892	10%

Source: Evaluation Team analysis.

Table 3-5 shows the ex-ante savings, realization rates, and researched gross savings for GPY4/EPY7. The overall realization rate was 76 percent for therm energy savings and 123 percent for kWh energy savings. ComEd did not claim any ex ante demand savings; Navigant estimated coincident peak demand savings using hourly model outputs.

Table 3-5. GPY4/EPY7 Verified Gross Impact Savings Estimates

	Sample Size	Gross Energy Savings (therms)	Gross Energy Savings (kWh)	Gross Peak Demand Savings (kW)
Detached 1 Story				
Ex-Ante Gross Savings		44,961	49,137	-
Verified Gross Realization Rate	98	84%	121%	-
Verified Gross Savings		37,892	59,465	35.4
Detached 2+ Story				
Ex-Ante Gross Savings		226,616	397,852	-
Verified Gross Realization Rate	389	81%	137%	-
Verified Gross Savings		182,498	546,915	296
Attached 1 Story				
Ex-Ante Gross Savings		464	496	-
Verified Gross Realization Rate	56	143%	52%	-
Verified Gross Savings		663	256	0.1
Attached 2+ Story				
Ex-Ante Gross Savings		32,688	79,623	-
Verified Gross Realization Rate	91	35%	51%	-
Verified Gross Savings		11,599	40,437	20.3
Total				
Ex-Ante Gross Savings		304,729	527,108	-
Verified Gross Realization Rate	634	76%	123%	-
Verified Gross Savings		232,651	647,072	351

Source: Evaluation Team analysis.

The following factors likely contribute to the results:

- As in GPY2/EPY5, billing data annual gas consumption for the sampled homes was lower than the ex ante models predicted. This led to lower gas savings despite the evaluation team's models' similar percent therm savings results.
- The variable realization rates for electric savings may be a result of the ex ante savings calculation methodology, which uses modeled savings for heating, cooling and water heating end uses but prescriptive savings estimates for lighting and appliances. The evaluation team estimates are based entirely on modeling. For example, the electric tracking data adds savings for lighting only if homes meet the 100 percent CFL or ENERGY STAR® lighting requirement, but the evaluation team models used the actual percent CFL reported in REM/Rate.
- The program saw a decrease in attached homes in GPY4/EPY7. The small number of EPY4/GPY7 homes in the billing data sample (most were from EPY3/GPY6) may reduce the accuracy of the extrapolation method Navigant used to estimate GPY4/EPY7 savings. The team did not pursue an alternative approach due to the small size of these model bins, and if this participation trend continues in the future Navigant will likely change the modeling bin breakdown to better align with the program's mix of homes.

Although program homes all exceeded code on a performance basis by at least 20 percent, Navigant observed that on average certain characteristics met individual code requirements more consistently than others. These average trends are shown in Table 3-6, where "above" code means more efficient than code and "below" code means less efficient than code. Well above and well below code areas are indicated

with green and red shading, respectively. Program homes gained the most savings from air sealing, duct sealing, and heating equipment efficiency, but on average were below code for wall and foundation insulation. The gains from above-code characteristics exceeded the losses from below-code components enough for all homes to still achieve net energy savings of at least 20 percent beyond code.

Table 3-6. Average Program Home Characteristics[7]

Category	Program Homes Relative to IECC 2012 and Current Standards
Wall Insulation	Well below code
Ceilings/Roofs	At or just below code
Foundation/Floor Insulation	Well below code
Window U-values	Equal to code
Air Sealing	Well above code
Major Appliances	At or just above standards
Lighting	At or just above code
Heating Equipment	Well above standard
Cooling Equipment	At or just above standard
Duct Sealing	Well above code
Duct Insulation	At or just above code
Water Heating	Above standard

Source: Navigant Analysis. Code reference is IECC 2012 with Illinois modifications.

[7] These averages are based on the evaluation team's gross impact modeling sample, which was drawn from the first half of GPY4/EPY7.

4 Net Impact Evaluation

SAG determined[8] that the NTG values for this program should be deemed prospectively and used to calculate verified net savings. The table below shows the deemed NTG values and the GPY4/EPY7 verified net savings. Navigant applied the deemed NTG of 0.8 to determine net savings for GPY4/EPY7.

As described in Section 2, the team also estimated NTG through builder and rater interviews. Navigant calculated free-ridership and spillover for each builder interview and then savings-weighted free-ridership and spillover for the program with adjustments from rater interviews. Detailed findings for this analysis are included in section 7.1.3.

Table 4-1. GPY4/EPY7 Verified Net Impact Savings Estimates

	Energy Savings (therms)	Energy Savings (kWh)	Coincident Peak Demand Savings (kW)
Ex-Ante GPY4/EPY7 Gross Savings	304,729	527,108	-
Realization Rate	76%	123%	-
Verified Gross Savings	232,651	647,072	351
Free Ridership			
Spillover			
NTG	0.8	0.8	0.8
Verified Net Savings	186,121	517,658	281

Source: Evaluation Team analysis.

[8] Source: ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

5 Process Evaluation

Navigant reviewed program materials provided by the program, communicated with program staff, and interviewed builders and raters. The completed builder and rater interviews represented a large share of program homes as shown in
Table 5-1.

Table 5-1. Builder and Rater Interview Completes

	GPY4/EPY7 Population	Completed Interviews	Share of GPY4/EPY7 Homes Represented
Builders	38	12	45%
Raters	11	6	67%

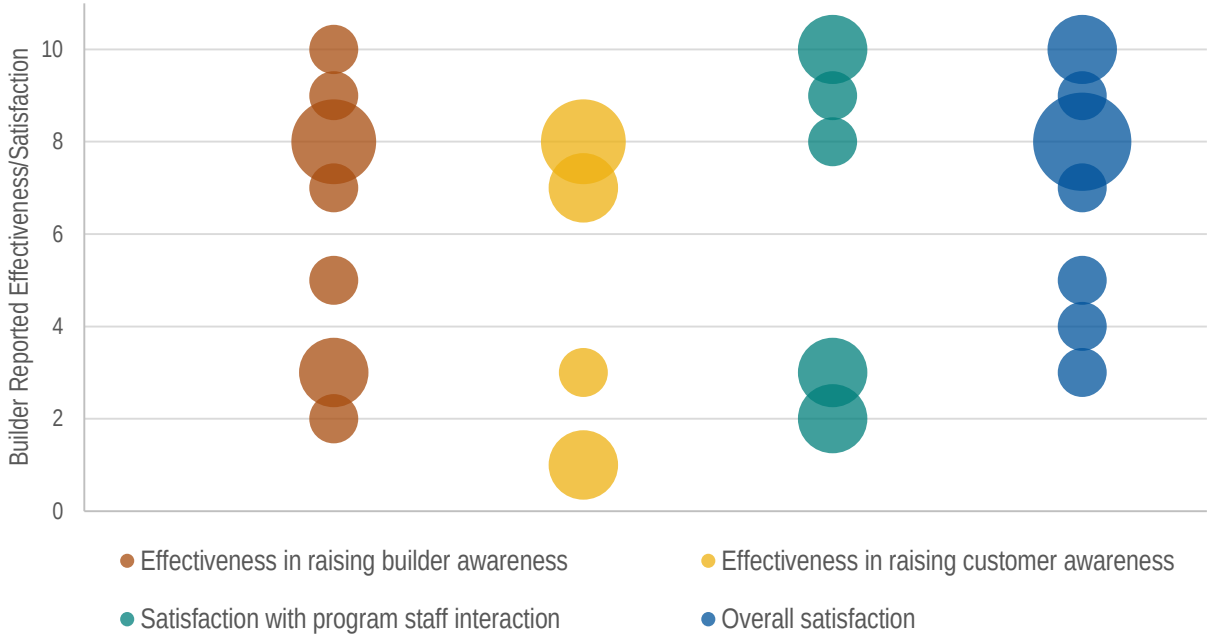
The process evaluation specifically sought to investigate five questions:

1. Are builders and raters satisfied with the program? What improvements, if any, would builders and raters like to see implemented?
2. Are the QA/QC activities adequate and unbiased (including procedures for incentive approval, complaints, assuring product quality, etc.)?
3. How do builders view their relationship with the program? Do builders rely on program staff and/or program raters for assistance in reaching program efficiency levels in new homes? Do builders recognize raters as part of the program?
4. Does the program help builders achieve code compliance in program and/or non-program homes?
5. How can the program be improved?

5.1 Builder and Rater Satisfaction and Relationship to Program

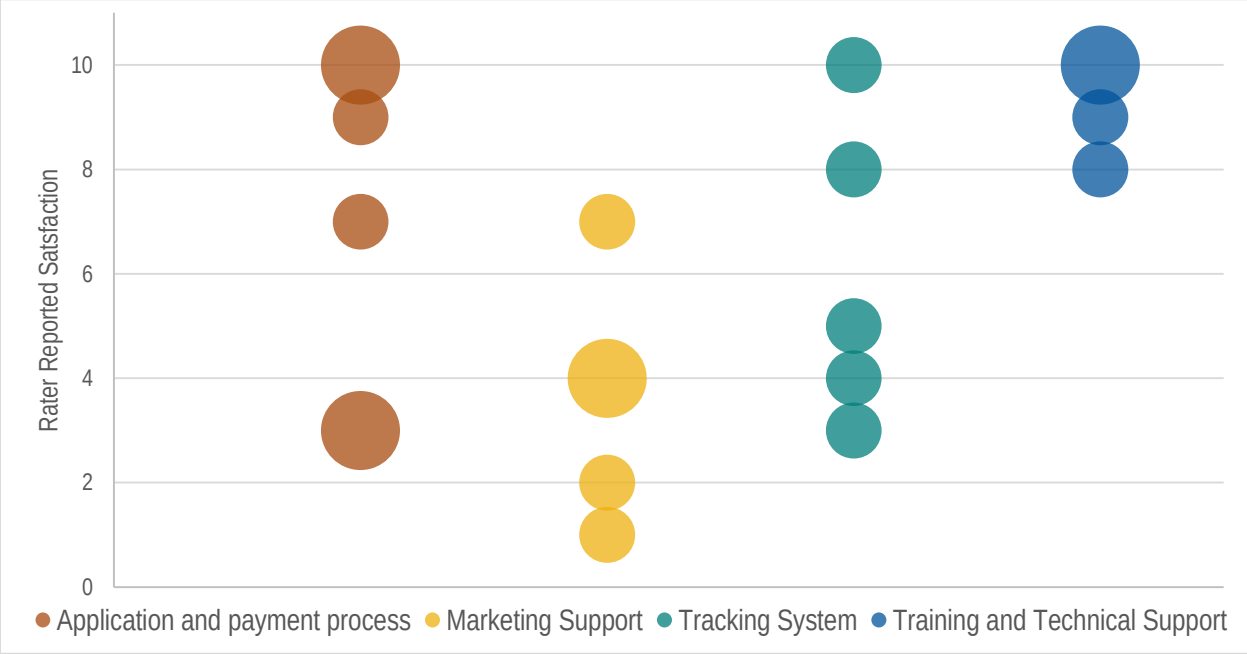
Most builders reported being satisfied with the program: 73 percent gave at least a seven out of ten rating for overall satisfaction. Raters were most satisfied with the program's training and technical support but gave varied responses on the tracking system, marketing support and application process. Builders were least satisfied with the program's effectiveness at raising homeowner awareness. Figure 5-1 and Figure 5-2 summarize builder and rater satisfaction ratings, respectively.

Figure 5-1. Distribution of Builder Satisfaction Levels



Responses on a zero to ten scale where zero is not at all effective/very dissatisfied and ten is very effective/satisfied. Left to right: n = 10, n = 8, n = 8, n = 11.

Figure 5-2. Distribution of Rater Satisfaction Levels



Responses on a zero to ten scale where zero is very dissatisfied and ten is very satisfied. Left to right: n = 6, n = 5, n = 5, n = 4

These findings are described in greater detail below.

Program staff and technical support: Builders who had interacted with program staff reported that RSR was very responsive and helpful; however, three of the eight respondents reported that they had very little interaction with program staff and thus gave low satisfaction ratings. All rater respondents reported high (at least eight out of ten) satisfaction with the program's training and technical support. These findings show that the program does offer top notch technical support and although raters and some builders get value from the program, not all builders take full advantage of this offering. The program is working to increase training sessions and recently held a session on selling high-performance homes.

Customer awareness and marketing: Builders found the program moderately effective at building homeowner awareness and gave varied responses on the effectiveness of the program at raising awareness of energy efficiency among other builders. All but one rater were dissatisfied with the level of marketing support and three raters recommended increasing marketing support by educating customers and prospective homebuyers about the program and energy efficiency in general. One rater made a specific recommendation to provide utility customers with a list of program builders to improve awareness. Builders who gave low ratings in this area noted that they do a lot of work to educate prospective homebuyers and would like the program to relieve this burden by doing more to boost general awareness of high efficiency homes. Likewise, one rater noted that there is "no marketing support" and felt that the program "depends on raters to sell the program." The program does offer a customer fact sheet for participating builders; this fact sheet has been distributed directly to homeowners once. The fact sheet highlights the benefits of efficient homes, although the first page focuses on the steps a program home goes through. Builders have access to this fact sheet by request. Wider distribution of this fact sheet to builders—and directly to customers—could improve awareness of the program. RSR, Nicor Gas and ComEd should also consider other channels such as online, radio or television advertising to market the benefits of program homes directly to customers. Nicor Gas and ComEd could also raise awareness through more prominent placement of RNC Program information on their residential rebate web pages.

Application, payment process and tracking system: Most raters were satisfied with the application and payment process, but three out of five were dissatisfied (rating of five out of ten or below) with the tracking system. Only one builder commented on these processes, indicating that the program generally operates smoothly but with some exceptions (this participant reported a long wait period for a statement and homeowner recognition letter). Specific complaints included that the RNC Program is very "in depth" compared to other programs and requires "unnecessary paperwork" to get data into HouseRater, such as having to manually enter test results from a software not compatible with HouseRater or having trouble with version changes in REM/Rate. Navigant recognizes the value HouseRater provides in both quality control and reporting for the program but recommends investigating any opportunities to reduce manual data entry and compatibility issues.

Builder engagement and rater relationships: The majority of builders (60 percent) heard about the program through their HERS raters; 20 percent reported that their insulation or air sealing contractor brought them into the program and 20 percent sought the program opportunity on their own. One builder expressed frustration that the program communicated directly with raters and less with builders, noting that at one point requirements changed "mid-construction." While one rater reported that all

builders he worked with participated in the program, another rater said that the majority of builders they work with—over 100—do not participate. This rater stated that builders who are incorporating energy efficiency will continue to do so, but that current incentives are not large enough to sway those who are only doing "the bare minimum for energy efficiency;" the rater suggested that an incentive of $1,500 would be required to motivate this group.

5.2 QA/QC Procedures

Navigant has reviewed RSR's QA/QC procedures in previous years and verified that the procedures for file review and field inspection are sufficient and unbiased. RSR made one update to the QA/QC procedures for the RNC Program in GPY4/EPY7. Previously, RSR conducted field inspections for the larger of one home or one percent of homes for each rating company annually. With the new protocol, RSR conducts field inspections at one home per individual HERS rater (i.e. each staff member conducting field visits for each company). This change allows RSR to use the QA field visits as an outreach opportunity to connect with individuals working with the program. Navigant believes that this new protocol will meet the program's QA/QC needs.

5.3 Effects of program requirements and code changes

The program has shifted from the IECC 2009 code to IECC 2012 code over the past two years, and for this program year also increased the participation requirement to at least 20% above IECC 2012 code (from 10% in the previous program year). Most builders reported that both of these transitions have been smooth, although some noted challenges detailed below. Raters indicated that most builders did need to make some changes to their designs due to the code change.

5.3.1 Code changes

One third of builders reported that the program helped them adjust to the new code; however, all builders seemed comfortable with the transition in code. When asked specifically about this transition, builders characterized it as "not too bad," "relatively smooth," "easy," and "not an issue," though noted air sealing, insulation, and equipment as three areas of increased stringency. Two builders mentioned that the new code—along with the program—pushed towards more of a "whole house" perspective on code compliance. Of the 67 percent of builders who did not report support on code adjustments from the program, two said they did not need assistance, two relied on their raters (agents of the program) and two relied on their contractors (e.g. air sealing and insulation contractors) to keep them informed and caught up with changes. It is difficult to gauge how much prior years' participation may have shaped some builders' responses: it is possible that this smooth transition was in part due to builders' growing accustomed to high efficiency building practices since they began participating.

Raters had mixed perspectives on builders' needs through this transition. Some reported that builders were generally close to meeting the new code, but needed to make certain tweaks to individual practices to meet code. One rater noted that a simple way to do this for many builders was to shift to a higher efficiency HVAC system (i.e. 90 percent AFUE up from 80 percent AFUE). This rater and others noted that they work with builders in the early stages of design (or for production builders, setting specifications) to make sure home designs will meet code and/or program specifications. Once this is done, most report few if any changes needed once construction begins. This theme of up front education

and planning may contribute to why builders, when asked about changes to their practices, may become accustomed to the "new normal" relatively quickly and discount program influence on these changes.

5.3.2 Program changes

Only 30 percent of builders said that the change in program requirements affected their ability to participate. One builder expressed frustration that the program did not communicate updates clearly enough directly to builders. One builder specifically noted that the change made it more difficult for small multifamily homes to qualify; this appears in the tracking data as well: the program had 82 single-story attached homes in GPY3/EPY6 and just three in GPY4/EPY7.

5.3.3 Code enforcement

The majority of builders (67 percent) reported that code enforcement is strong or very strong in the Chicago area, noting that this can vary by area. One builder reported that their homes are "policed" in some locations, and another confirmed that they cannot get a certificate of occupancy until code reports are in. Another observed that although he did not find the shift to the IECC 2012 code a technical challenge, the enforcement was much stricter than in previous years. One builder felt that inspections were weak and two others considered code enforcement as moderately strong.

6 Findings and Recommendations

This section summarizes the key impact and process findings and recommendations for the joint RNC program. The program continues to have strong participation even with higher participation requirements, including in higher efficiency tiers. Builders and raters are largely satisfied with the program. Navigant offers the following findings and recommendations to further improve the program in the future.

Evaluation Research Gross Impacts

Finding 1. The program achieved a gross savings realization rate of 76% for natural gas and 123% for electricity. The resulting researched gross savings for GPY4/EPY7 are 232,651 therms and 647,072 kWh.

Finding 2. The evaluation team estimated peak demand impacts of 351 kW for GPY4/EPY7.

Finding 3. Although program homes all exceeded code on a performance basis by at least 20 percent, Navigant observed that on average certain characteristics met individual code requirements more consistently than others.

Recommendation 1. Work with builders and raters to improve areas below code, such as wall and foundation insulation levels, as well as those that are at or just above code, such as window U-values, major appliances, and cooling equipment. Specific actions could include RSR directing raters to focus on these areas or offering targeted builder trainings on these topics. These actions could help builders improve practices in these areas and achieve higher participation tiers, and may also reduce free-ridership.

Evaluation Research Net Impacts

Finding 4. The evaluation research NTGR for GPY4/EPY7 found a range of 0.39 – 0.65 for natural gas and 0.35 – 0.63 for electricity, which are lower than the current SAG recommendation. Navigant recommends using prospective NTGRs of 0.65 for natural gas and 0.63 for electricity in GPY6/EPY9 due to ongoing program updates noted in the findings and recommendations below.

Finding 5. Navigant's research on other RNC programs indicates that in jurisdictions with high NTG results, programs generally offer more training to all builders in their market (and some trades), not just to program builders. This can lead to market effects from non-participants.

Finding 6. Code enforcement is high in the Chicago area, leading to generally high efficiency levels in average building practices. Builders and raters both noted their expectations for continuing increases in code stringency and a need to look ahead to keep up.

Recommendation 2. RSR should continue its new broader builder training offerings to increase exposure beyond program participants and attract a wider cross-section of the market. This could lead to market effects from non-participants, which if measured could increase spillover and NTG.

Recommendation 3. Program marketing and RSR outreach to individual raters and builders should emphasize higher efficiency tiers in the new tiered program structure to move away from low-hanging fruit. This could push builders to go beyond "easy" improvements to their homes and reduce free-ridership for the higher efficiency tiers.

Process Evaluation

Finding 7. Builders and raters noted that the program could improve on supporting their marketing efforts through educating customers on the benefits of energy efficient homes; one customer fact sheet is available to builders upon request but is not widely distributed.

Recommendation 4. Expand on current efforts to educate consumers directly, specifically to the benefits of energy efficiency in new homes. This could include advertising through traditional and social media as well as educating the real estate community or supporting efforts to promote recognition of efficient homes. ComEd and Nicor Gas should also consider including information on the RNC program on their residential rebate web pages, and encouraging builders and raters to become trade allies.[9]

Finding 8. Builders who interact with program staff and most raters report excellent technical support and training, but some builders still do not engage much if at all with the program directly and do not always associate their raters' support with the program.

Finding 9. The program has historically relied on raters to bring builders into the program. This approach may mean the program is more likely to reach builders who are already working with raters and/or using efficient practices.

Recommendation 5. RSR should continue work to foster improved relationships with a larger fraction of participating builders and the building community at large. The new Build Smart newsletter which began toward the end of GPY4/EPY7 and the new broad-based training offerings are good starts to this effort. RSR should consider establishing a target number of outreach efforts for each builder rather than holding one-on-one meetings "as needed," using the new local liaison on the team.

Tracking System

Finding 10. Three out of five raters interviewed were dissatisfied with the tracking system, citing issues with blower door test software compatibility and difficulty with REM/Rate updates.

Recommendation 6. RSR should investigate whether there are any opportunities to reduce manual data entry into HouseRater and communicate with builders about progress to keep HouseRater compatible with REM/Rate updates in a timely manner.

[9] For example, the Green Resource Council offers a guide for "greening" local Multiple Listing Services (MLS). http://greenresourcecouncil.org/sites/default/files/2014%20NAR%20Green%20MLS%20Implementation%20Guide.pdf

7 Appendix

7.1 Evaluation Research Impact Approaches and Findings

7.1.1 Rationale for Use of BEopt in Gross Impact Evaluation

Navigant typically uses hourly simulation software for evaluations that require building modeling, both residential and commercial. In recent evaluations we have used the EnergyPlus engine with NREL's Building Energy Optimization (BEopt) software as a front end. BEopt allows us to run multiple building scenarios simultaneously and simplifies the data entry process. BEopt can also be used with the DOE-2 engine, which is used in many industry standard tools such as eQuest.

Navigant believes that the implementation team is fully justified in using REM/Rate as a tool to estimate ex ante savings for homes in the Residential New Construction Program: it is the industry standard for home rating, is widely used by HERS raters across the country, and provides reasonably accurate savings estimates. However, as an evaluator, Navigant's aim is to provide the most accurate savings estimates possible, and we believe that using software which is capable of hourly simulation is the best option for our impact analysis. The Department of Energy's Building America Research program gives the following explanation for using an hourly simulation:

> *An hourly simulation is often necessary to fully evaluate the time-dependent energy impacts of advanced systems used in Building America houses. Thermal mass, solar heat gain, and wind-induced air infiltration are examples of time-dependent effects that can be accurately modeled only by using a model that calculates heat transfer and temperature in short time intervals. In addition, an hourly simulation program is necessary to accurately estimate peak energy loads.*[10]

7.1.2 Evaluation Research Gross Impact Findings

Navigant analyzed homes by grouping them into four "model bins." Table 7-1 shows the total number of homes and gross ex ante savings associated with each bin, as well as the number of homes included in the analysis. Navigant included all homes from GPY3/EPY6 and GPY4/EPY7 which meet the following criteria:

1. **Homes must be completed by July 2014**. This ensured that all homes in the calibration sample had one year of billing data available for the calibration analysis.
2. **Homes must be built to IECC 2012**. This eliminated GPY3/EPY6 homes built to IECC 2009 and made the sample more representative of future participants.
3. **Homes must meet or exceed the GPY4/EPY7 requirement of 20 percent above code**. This made the sample more representative of GPY4/EPY7 and future years' participation. *Note: Navigant did include homes below this requirement in the Attached Single Story bin due to the low number of homes completed in GPY4/EPY7.*

[10] Hendron, Robert and Cheryn Engebrecht. "Building America House Simulation Protocols." National Renewable Energy Laboratory, October 2010.
http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/house_simulation_revised.pdf

Table 7-1. Distribution of Total Program Homes and Analysis Sample by Model Bin

Model Bin	Total GPY4/EPY7 Homes	Total Sampled Homes	Total Sampled GPY4/EPY7 Homes	Total Ex Ante Gross Therms	Mean Ex Ante Gross Therms per Home	Total Ex Ante Gross kWh	Mean Ex Ante Gross kWh per Home
Detached 1 Story	154	98	20	44,961	292	49,137	607
Detached 2+ Story	561	389	102	226,616	404	397,852	783
Attached 1 Story	3	56	1	464	155	496	496
Attached 2+ Story	156	91	12	32,688	210	79,623	577
Total	874	634	135	304,729	349	527,108	724

Source: Program tracking data and Navigant analysis

Navigant extracted all home characteristics for the sampled homes from the final REM Rate files. The team then built models for each bin incorporating average home characteristics such as floor area, R-values, infiltration rates, and equipment specifications. Where REM Rate did not contain data on the characteristics needed for the BEopt model inputs, Navigant defaulted to built-in Building America Benchmark data for new construction. Navigant calibrated each model to the corresponding billing data from program homes in each bin, excluding the consecutive "zero" readings prior to each home becoming occupied.

Table 7-2 shows the results of the calibration adjustments for therms for each model bin. Navigant calibrated each model to within less than 0.5 percent of the billing data total therms. For the calibration modeling, Navigant used an actual weather file for Chicago O'Hare airport for October 2014 - September 2015.

Table 7-2. Calibrated Gas Results by Model Bin

Model Bin	Billed Calibration Period Therms	Modeled Calibration Period Therms	Modeled - Billed Therms	Percent Difference
Detached 1 Story	875	876	0.5	0.06%
Detached 2+ Story	1,054	1,054	0.1	0.01%
Attached 1 Story	670	671	0.3	0.05%
Attached 2+ Story	575	576	1.4	0.23%

Source: Navigant analysis

Table 7-3 and Table 7-4 show the resulting gas and electric calibrated model outputs for the program homes and corresponding IECC 2012 baseline models. These results reflect the use of a Typical Meteorological Year 3 (TMY3) weather file for Chicago O'Hare airport. The weighted average results reflect the contribution of each model bin to the total program savings.

Table 7-3. Average Gross Ex Post Therm Savings per Home by Model Bin

Model Bin	Baseline Model Gas Consumption (TMY)	Efficient Model Gas Consumption (TMY)	Gross Ex Post Therm Savings	Gross Ex Post Percent Savings
Detached 1 Story	1,028	791	236	23%
Detached 2+ Story	1,266	947	319	25%
Attached 1 Story	755	613	141	19%
Attached 2+ Story	584	507	77	13%
Weighted Average	1,101	840	261	24%

Source: Evaluation Team analysis

Table 7-4. Average Gross Ex Post kWh Savings per Home by Model Bin

Model Bin	Baseline Model kWh Consumption (TMY)	Efficient Model kWh Consumption (TMY)	Gross Ex Post kWh Savings	Gross Ex Post Percent Savings
Detached 1 Story	7,606	6,882	724	10%
Detached 2+ Story	10,483	9,406	1,077	10%
Attached 1 Story	6,248	5,900	348	6%
Attached 2+ Story	6,184	5,870	314	5%
Weighted Average	9,342	8,450	892	10%

Source: Evaluation Team analysis.

To calculate the overall gross savings realization rate, Navigant adjusted the gross savings by HERS score and square footage in order to account for differences in efficiency at the individual home level. Table 7-5 shows the average HERS score and floor area for both the sample and the program overall; the average HERS score for the overall program was better than the sample average, yielding higher per home savings at the program level than for the sample.

Table 7-5. Average HERS Scores and Square Footages by Model Bin, Sample and Program

Model Bin	Sample Average HERS Score	Program Average HERS Score	Sample Average Area (ft^2)	Program Average Area (ft^2)
Detached 1 Story	55.2	55.7	3,719	3,870
Detached 2+ Story	54.2	54.0	4,261	4,294
Attached 1 Story	65.3	58.3	1,883	2,277
Attached 2+ Story	58.3	59.2	2,433	2,381
Total	55.1	55.2	3,831	3,871

Navigant found overall gross realization rates of 76% for natural gas and 123% for electric energy savings. Table 7-6 and Table 7-7 show these results as well as the calculated realization rates for each model bin.

Table 7-6: Ex Ante and Ex Post Gross Therm Savings by Model Bin

Model Bin	Ex Ante Gross Therm Savings per Home	Ex Post Gross Therm Savings per Home	Ex Ante Total Gross Therm Savings	Gross Realization Rate	Ex Post Total Gross Therm Savings
Detached 1 Story	292	246	44,961	84%	37,892
Detached 2+ Story	404	325	226,616	81%	182,498
Attached 1 Story	155	221	464	143%	663
Attached 2+ Story	210	74	32,688	35%	11,599
Total	349	266	304,729	76%	232,651

Source: Utility tracking data, Navigant analysis

Table 7-7. Ex Ante and Ex Post Gross kWh Savings by Model Bin

Model Bin	Ex Ante Gross kWh Savings per Home	Ex Post Gross kWh Savings per Home	Ex Ante Total Gross kWh Savings	Gross Realization Rate	Ex Post Total Gross kWh Savings
Detached 1 Story	607	734	49,137	121%	59,465
Detached 2+ Story	783	1,077	397,852	137%	546,915
Attached 1 Story	496	256	496	52%	256
Detached 2+ Story	577	293	79,623	51%	40,437
Total	724	889	527,108	123%	647,072

Source: Utility tracking data, Navigant analysis

7.1.3 Evaluation Research Net Impact Findings

The below NTGR memo details the methodology used to quantify free-ridership and spillover, and includes both builder and rater interview guides.

NAVIGANT

To: **Jim Jerozal, John Madziarczyk, Steve Grzenia, Bridgid Lutz, Nicor Gas; Scott Dimetrosky, Apex Analytics; Ted Weaver, First Tracks Consulting; Vincent Gutierrez, Jacob Stoll, Julie Hollensbe, ComEd; Jennifer Hinman Morris, David Brightwell, ICC Staff**

From: **Laura Tabor, Navigant Consulting**

CC: **Randy Gunn, Charley Budd, Laura Agapay-Read, Kevin Grabner, Jeff Erickson, Rob Neumann, Josh Arnold, Navigant**

Date: **February 10, 2016**

Re: **Joint Residential New Construction Program Net-to-Gross Results**

This memorandum presents the net-to-gross (NTG) findings from the Joint Nicor Gas/ComEd Residential New Construction (RNC) program evaluation for gas program year 4 and electric program year 7 (GPY4/EPY7) to be applied in GPY6/EPY9.

Summary of Findings

Navigant conducted interviews with builders and raters who participated in GPY4/EPY7 and GPY3/EPY6 in the winter of 2015 and used data from these interviews to estimate free-ridership, spillover, and NTG for the program. Research included three measure areas: framing and insulation, HVAC, and other. As the table below demonstrates, this resulted in an overall range of NTG estimates from 0.39 to 0.65 for gas and 0.35 to 0.63 for electric, with weighted averages of 0.52 and 0.49, respectively. Table 8 and Table 9 present these results. Given the uncertainty around self-reported NTG results and ongoing program efforts to reduce free-ridership,[11] Navigant recommends using the maximum NTG values for prospective application.

Table 8. RNC NTG Findings for GPY4/EPY7: Nicor Gas

Measure Area	Participant Spillover	Minimum NTG	Average NTG	Maximum NTG
Framing & Insulation	0.08	0.39	0.51	0.63
HVAC	0.00	0.51	0.66	0.81
Other	0.00	0.34	0.48	0.61
Weighted Average	0.04	0.39	0.52	0.65

Source: Navigant analysis

[11] As documented in memorandum from Nicor Gas January 6, 2016.

Table 9. RNC NTG Findings for GPY4/EPY7: ComEd

Measure Area	Participant Spillover	Minimum NTG	Average NTG	Maximum NTG
Framing & Insulation	0.08	0.36	0.48	0.60
HVAC	0.00	0.46	0.63	0.80
Other	0.00	0.30	0.44	0.58
Weighted Average	0.02	0.35	0.49	0.63

Source: Navigant analysis

The gas and electric results differ for two reasons: first, not all builders interviewed work in the ComEd service territory, changing respondent weights. Second, the weight of the different measure areas differs for gas and electric. The weighting methodology is discussed in greater detail below.

These results are lower than the deemed GPY4/EPY7 NTG value of 1.00, which was based on secondary research and approved through a consensus process by the Illinois Stakeholder Advisory Group.[12] The following factors may have led to a lower NTG for this program than what was found in the secondary research:

Findings

- Finding 1. RNC programs in jurisdictions with high NTG results generally offer more training to all builders in their market (and some trades), not just to program builders
  - This can lead to market effects from non-participants
- Finding 2. Code enforcement is high in the Chicago area, leading to generally high efficiency levels in average building practices
  - Builders and raters both noted their expectations for continuing increases in code stringency and a need to look ahead to keep up
- Finding 3. The program has historically relied on raters to bring builders into the program. This approach may mean the program is more likely to reach builders who are already working with raters and/or using efficient practices
- Finding 4. Builders may underestimate program influence if they have learned gradually from their raters over time: Many reported a smooth transition to new code and program requirements, but may not have accounted for the fact that raters' support in prior year likely helped prepare them for these transitions.

Based on these findings, Navigant offers the following recommendations for the program to consider to improve NTG in the future:

[12] ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html. Previously for GPY1/EPY4 through GPY3/EPY6, the NTG recommendation was based on a planning value of 0.80.

- » Recommendation 1. The program may want to consider offering broader builder trainings to get exposure beyond program participants and attract a wider cross-section of the market. Doing so could lead to market effects from non-participants, which if measured would increase spillover and NTG.
- » Recommendation 2. The program should continue to emphasize higher efficiency tiers in the new tiered program structure to move away from low-hanging fruit. This could push builders to go beyond "easy" improvements to their homes and reduce free-ridership for the higher efficiency tiers.
- » Recommendation 4. Consider alternative evaluation approaches such as a Delphi panel or incorporating non-participant interviews in future NTG research.

Methodology

Navigant interviewed a total of twelve builders and six raters representing 45 percent and 67 percent of homes in the GPY4/EPY7 program, respectively (Table 10). Three of the builder interviewees represented nearly 80 percent of the interviewed builders' homes; however, the overall program participation is heavily skewed towards a small number of builders as well. In GPY4/EPY7, the top five (of 38) builders represented 80 percent of program homes.

Table 10. Sample Summary

	GPY4/EPY7 Population	Completed Interviews	Share of GPY4/EPY7 Homes Represented
Builders	38	12	45%
Raters	11	6	67%

Source: Navigant analysis of program tracking data

For the NTG evaluation, Navigant asked builders and raters about builders' efficient building practices in three areas, shown in Table 2-3. Interviewers asked questions for each measure area, using the individual practices and measures listed as examples and prompts for interviewees. Please see the appendix for complete builder and rater interview guides.

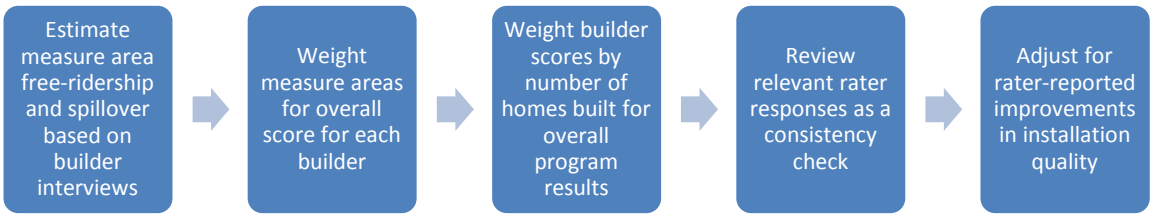
Table 11. Measure Areas Covered in In-depth Interviews with Builders and Raters

Measure Area	Specific Building Practices/Measures
Framing & Insulation	Air Sealing all Penetrations
	Capping Chases
	Using 2x6 framing and/or rigid foam insulation
	Backing Knee Walls
	Insulation in Full Contact w/ Air Barrier
HVAC	Proper Sizing
	Duct Leakage / Sealing, Duct Tightness Testing
	Pressure Balancing
	Proper RC&AF
Other Equipment	High Efficiency Central Air Conditioning (SEER ≥ 14.5)
	ECM Furnace Fan
	ENERGY STAR® Refrigerator or Exhaust Fan
	100% CFL Lighting
	Power-vented Water Heater (EF ≥ 0.62)
	High Efficiency Furnace (AFUE ≥ 92%)

Source: Navigant analysis

The methodology to estimate a program level NTG estimate used the following steps, as described in Figure 2-1 below.

Figure 3. Residential New Construction NTG Methodology



Builder Interview Analysis

Navigant used the following questions—within a NTG battery including additional questions to provide context—to estimate the market share of homes using certain high efficiency practices both inside and outside of the program.

- Question 1:
  - (If builder reports all homes built to significantly exceed IECC 2012) What percent of homes built by other builders to meet but not significantly exceed IECC 2012 do you estimate use this measure/technique?
  - (If builder reports some or no homes built to significantly exceed IECC 2012): Think about your homes that are built to meet but not significantly exceed code. In how many of them do you incorporate this measure?
- Question 2: What percent of the homes that you submitted to the program in the past year used this practice/measure?
- Question 3: What percent of the homes you've built in the past year that you did not submit to the program used this practice/measure?

These questions, in combination with asking builders what share of their homes go through the program, allowed the team to calculate both the "naturally occurring" share of high-efficiency for a given measure group (Question 1)—which serves as an estimate for the level of efficiency which would occur throughout the market without the program—and the share of high efficiency occurring in the program and outside of the program in the present market.

Table 12. Mapping of NTG Questions to Market Share Estimates, With and Without Program

Percent of Sales	Without Program	With Program
Standard Efficiency	1 – Question 1	Calculated based on Questions 2 & 3, and percent of homes in program
High Efficiency, *Outside Program*	Question 1	
High Efficiency, in Program	n/a	

Source: Navigant analysis

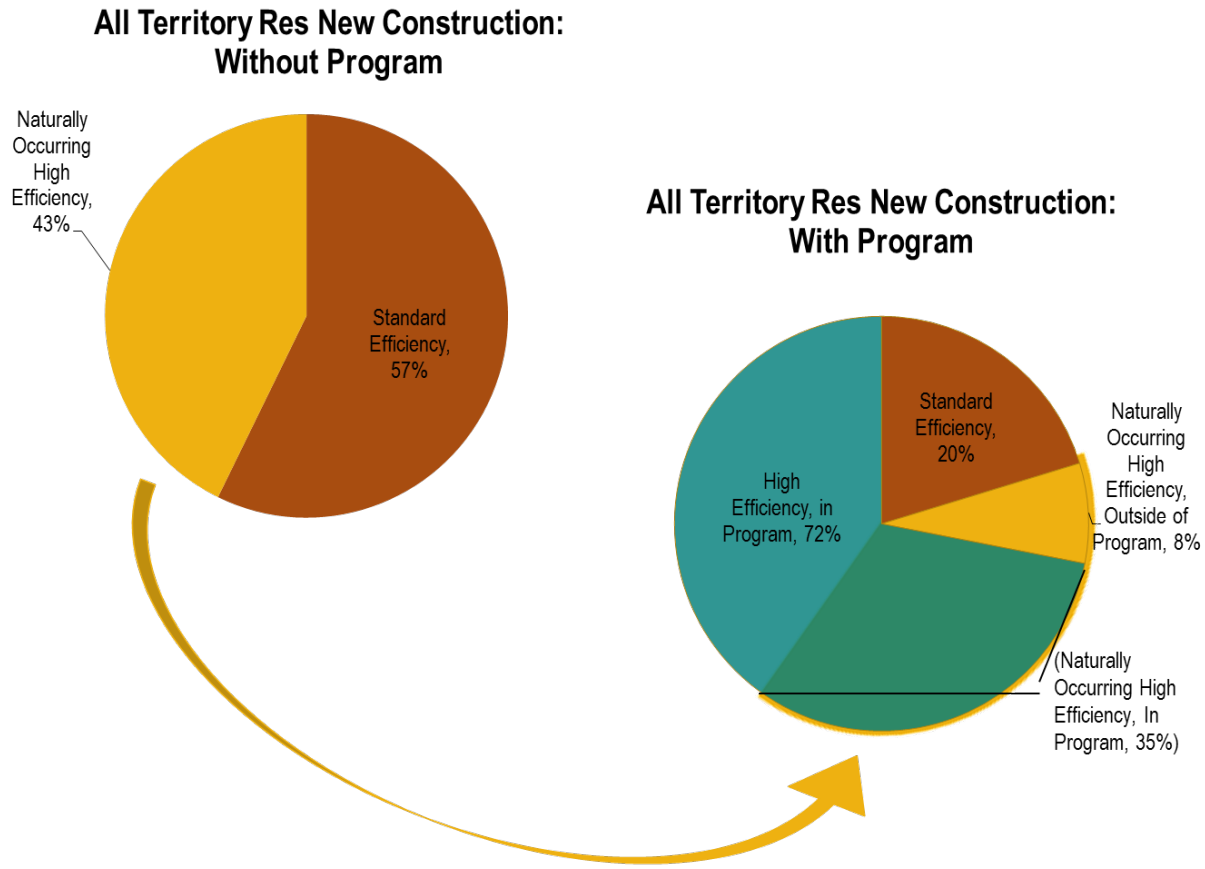
If the total amount of high efficiency measures outside of the program *increases* with the program, there may be spillover: the program may have influenced this change. A decrease in high efficiency measures outside of the program indicates free ridership (previously unincented activity becoming incented). Assuming that the program is the sole influence of the increase in high efficiency seen within the program, the minimum free-ridership (FR) is calculated as the portion of "naturally occurring" high efficiency measures absorbed by the program divided by the total amount of high efficiency in the program:

$$Estimate\ of\ Minimum\ FR = \frac{Change\ in\ High\ Efficiency\ Outside\ of\ Program}{High\ Efficiency\ Homes\ in\ Program}$$

This is shown visually in Figure 4 with example data: The yellow portion of the left-hand chart represents the naturally occurring level of high efficiency in the absence of the program; some portion of this (yellow-green) is absorbed by the program, additional high efficiency adoption occurs within the program (green), and some naturally occurring high efficiency remains outside of the program. If the

share of high efficiency outside of the program *grows* between the "without program" case and the "with program" case, the equation above becomes one for maximum spillover.

Figure 4. Illustration of Free-Ridership Calculation



Source: Navigant analysis. Note: "Naturally Occurring High Efficiency, In Program" is a subset of "High Efficiency, in Program."

As noted above, this calculation represents the minimum free-ridership because it assumes that the program is the sole cause for any increases in high efficiency practice adoption. Navigant estimated the maximum free-ridership using builders' reported influence from the program through the following questions:

- Question 4: On a scale from 0 to 10, where 10 is very influential and 0 is not at all influential, how important would you say the program was in your decision to use this measure/practice in homes you submitted to the program
- Question 8: On a scale from 0 to 10, where 10 is very influential and 0 is not at all influential, how important would you say the program was in your decision to use this measure/practice in more homes outside of the program?

The evaluation team used a series of runs with the gross impact simulation models to estimate the share of savings for each measure area. The team used the model for the most common home type, a two-story detached home for the following runs:

- Final model with code level insulation and infiltration (estimates framing and insulation savings as percent of total)
- Final model with code level duct sealing and insulation (estimates HVAC savings as percent of total)

The team allocated the remaining share of savings to the Other category.

Table 13 and Table 14 summarize the free-ridership results for builders.

Table 13. Builder Free-Ridership Findings: Nicor Gas

Measure	Minimum FR	Maximum FR	Average FR	Measure Weight
Framing & Insulation	0.50	0.75	0.63	56%
HVAC	0.23	0.53	0.38	15%
Other	0.39	0.66	0.52	29%
Weighted Average	**0.43**	**0.69**	**0.56**	**100%**

Source: Navigant analysis

Table 14. Builder Free-Ridership Findings: ComEd

Measure	Minimum FR	Maximum FR	Average FR	Measure Weight
Framing & Insulation	0.53	0.77	0.65	31%
HVAC	0.26	0.59	0.43	22%
Other	0.42	0.70	0.56	47%
Weighted Average	**0.42**	**0.70**	**0.56**	**100%**

Source: Navigant analysis

In addition, one builder reported spillover in the framing and insulation area, yielding seven percent spillover in that measure area.

Rater Interview Analysis

The team reviewed the rater responses for each of the measure responses and compared to the builder responses to parallel questions. Rater responses were generally consistent with builder responses.

Navigant also asked raters whether builders' implementation of high efficiency practices had improved in the framing and insulation and HVAC measure areas using the following questions:

"Now I want you to think about how well the builders you work with implemented these techniques prior to their experience in the program, and now that they have participated in the program.

a. At the beginning would you say their implementation was…
    i. Excellent
    ii. Good
    iii. Fair
    iv. Poor
    v. Not using technique
b. Now, would you say their implementation was…
    i. Excellent
    ii. Good
    iii. Fair
    iv. Poor
    v. Not using technique"

No raters reported "not using technique;" thus the team assigned scores to the four remaining response options as follows:

Table 15. Rating Scale for Builder Implementation

Rating	Score
iv. Poor	0.00
iii. Fair	0.33
ii. Good	0.67
i. Excellent	1.00

Source: Navigant analysis

Navigant used the building simulation impact models to estimate the impact of improved installation quality for both framing and insulation and HVAC:

- Framing insulation: Modeled effect of improving from Grade 3 to Grade 1 insulation[13] as a percentage of overall savings.
- HVAC: Modeled effect of limiting duct sealing to code maximum leakage

Navigant did not make an adjustment for the Other category as it includes mostly prescriptive equipment measures for which savings do not vary with installation practices as much. The team then used the weighted average pre-and post-program implementation scores to determine the percent savings to add to the program NTG.

[13] Standard insulation installation grades range from one to three, with Grade 1 insulation being the highest quality installation.

Table 16. Summary of Rater Adjustment Calculations: Nicor Gas

Measure Area	Estimated Installation Quality Savings	Weighted Average Score Before Program	Weighted Average Score After Program	Weighted Average Improvement	Net Improvement Savings
Framing & Insulation	12%	0.28	0.81	0.53	6.3%
HVAC	14%	0.43	0.72	0.29	4.1%

Source: Navigant analysis

Table 17. Summary of Rater Adjustment Calculations: ComEd

Measure Area	Estimated Installation Quality Savings	Weighted Average Score Before Program	Weighted Average Score After Program	Weighted Average Improvement	Net Improvement Savings
Framing & Insulation	10%	0.28	0.82	0.54	5.3%
HVAC	21%	0.45	0.72	0.27	5.7%

Source: Navigant analysis

The team added this net improvement savings to the NTG by subtracting the percentages from the weighted average builder free-ridership scores for these measure areas, reducing gas free-ridership by 6.3 percent and 4.1 percent, respectively and electric free-ridership by 5.3% and 5.7%, respectively.

Table 18. Free-ridership Findings with Rater Adjustment: Nicor Gas

Measure	Minimum FR	Average FR	Maximum FR	Measure Weight
Framing & Insulation	0.44	0.56	0.68	56%
HVAC	0.19	0.34	0.49	15%
Other	0.39	0.52	0.66	29%
Weighted Average	**0.39**	**0.52**	**0.65**	**100%**

Source: Navigant analysis

Table 19. Free-ridership Findings with Rater Adjustment: ComEd

Measure	Minimum FR	Average FR	Maximum FR	Measure Weight
Framing & Insulation	0.47	0.60	0.72	31%
HVAC	0.20	0.37	0.54	22%
Other	0.42	0.56	0.70	47%
Weighted Average	**0.39**	**0.53**	**0.67**	**100%**

Source: Navigant analysis

Final Results

Using the adjusted free-ridership results and spillover findings, Navigant estimated the following NTG for the program.

Table 20. RNC NTG Findings for GPY4/EPY7: Nicor Gas

Measure Area	Participant Spillover	Minimum NTG	Average NTG	Maximum NTG
Framing & Insulation	0.08	0.39	0.51	0.63
HVAC	0.00	0.51	0.66	0.81
Other	0.00	0.34	0.48	0.61
Weighted Average	0.04	0.39	0.52	0.65

Source: Navigant analysis

Table 21. RNC NTG Findings for GPY4/EPY7: ComEd

Measure Area	Participant Spillover	Minimum NTG	Average NTG	Maximum NTG
Framing & Insulation	0.08	0.36	0.48	0.60
HVAC	0.00	0.46	0.63	0.80
Other	0.00	0.30	0.44	0.58
Weighted Average	0.02	0.35	0.49	0.63

Source: Navigant analysis

NAVIGANT

7.2 Nicor Gas and Commonwealth Edison Joint Residential New Construction Program Builder Interview Guide – GPY4/EPY7

Nicor Gas and Commonwealth Edison
Joint Residential New Construction Program
Builder Interview Guide—GPY4/EPY7

Screener

Hi, may I please speak to _____? My name is ____ and I'm calling from Navigant Consulting on behalf of Nicor Gas and ComEd and their Residential New Construction program that is implemented by Residential Science Resources (RSR). We are talking to builders who participated in the Residential New Construction program to gather feedback on the program. This is not a sales call. I would like to talk with you for about 20 minutes to help assess the program based on your experience with it. We are hoping you can give us insights on your experience that will help identify improvements in the program and its support to you as a participating builder in the program.

[*If needed*: We received your name from RSR and are authorized to make these calls. You can verify our credentials by contacting Mike Topitzhofer at RSR at 651-200-3417.]

Would you like to do the interview now or is there a better time that we can schedule for this?

Date: _____ **Time**: _____

And should we call you back at the same phone number?
IF NO → **Alternate Phone #**: _____

First, I'd like to confirm that you are a primary decision maker for your firm. Is that correct?

Yes ____
No ____
Refused/unsure/don't know ___

[*If No or Refused/unsure/don't know:*]
We need to speak with a primary decision maker who determines whether to participate in the program, and is responsible for incorporating energy efficiency improvements into your company's new home projects. Would you please put me in touch with that person?

[*If willing to refer to other person, get that person's contact information and restart the interview process with that other person. Acknowledge you were referred by the initial contact person.*]
[*Confirm name and title; proceed to Introduction*]

[*If directed to a voice mail system:*]

Hello, my name is ____. I'm calling from Navigant Consulting on behalf of Nicor Gas and ComEd and their Residential New Construction program that is implemented by Residential Science Resources (RSR). We are talking to builders who participated in the Residential New Construction program to gather feedback on the program. I would like to talk with you for about 20 minutes to help assess the program based on your experience with it. I will continue trying to get hold of you directly, but meantime if you wish, feel free to call me back at your earliest convenience to schedule the interview. My phone number is _____ [*repeat phone number for clarity*]. Thank you in advance for your cooperation, as we greatly value your thoughts on the program. I look forward to talking with you. Goodbye.

I. INTRODUCTION

Ok, thanks for taking time to talk with me about the program. We'll discuss your experience during the current program year which began in June 2013, so keep that in mind as we talk.

1. Since June 1, 2014, roughly how many homes **in total** did your company build altogether? [*An approximate number is ok*.]
   # _____

2. I realize that you may not build only in Nicor Gas and ComEd service territory. About what percentage of that total, roughly, was built in Nicor Gas and ComEd territory?

   % ____ Nicor Gas and ComEd
   % ____ Nicor Gas only
   %_____ComEd only
   [*Calculate #*: _____]

[IF RESPONDENT BUILDS HOMES OUTSIDE OF NICOR GAS / COMED TERRITORY] For the remainder of our conversation, please do your best to keep your responses focused only on your company's activity in the Nicor Gas / ComEd service territory. [INTERVIEWER SHOULD BE PREPARED TO SUMMARIZE WHAT THE TERRITORY INCLUDES.]

3. About what percentage of the homes your company built in this program year to date were production (spec-built) homes, and what percentage were custom-built homes?
   % Production/Spec ____
   % Custom ____

4. Before participating in the program, did you have any homes rated by a HERS rater?
   a. If yes, what percent? About what HERS score did they typically achieve? A range or average value is ok.

5. Our records show that you built [xx] homes through the program so far this year. Approximately what % of all the homes you built in the Nicor/ComEd service territories does this represent?

II. NET-TO-GROSS

Next I'd like to talk about how your participation in the program has affected your building practices. Remember to think specifically about homes that you have built in the Nicor Gas and ComEd service territories. For these questions, I'd also like you to focus on homes you've built under the IECC 2012 code.

1. Overall, how important is the Nicor Gas and ComEd New Construction program, including rebates and program technical support, in your decision to build homes at least 20% more efficiently than code?
    a. 1 Very important
    b. 2 Somewhat important
    c. 3 Not too important
    d. 4 Not at all important

2. If Nicor Gas and ComEd did not offer the New Construction program, would you build the same number of homes at least 20% more efficient than code, fewer homes, or more homes? [double check if same or more]
    a. Same
    b. Fewer
    c. More

3. If you would not have built homes to qualify for an incentive through the program, how would the homes you built have been different? [PROBE FOR SPECIFIC CONSTRUCTION PRACTICES THAT DIFFER]
    a. Less efficient
    b. Meeting other energy efficient certification (Energy Star, etc.)

Now I'd like to ask some questions about specific energy saving building practices and measures that you may be using in your homes, including framing, insulation, HVAC and some additional equipment categories.

4. Before we get into the details, would you say that all, some, or none of the homes you build outside the program exceed the IECC 2012 code? [Clarify if necessary: building specifically to exceed code, rather than just trying to meet it]

[Repeat for each major section. Use detailed measures as prompts for examples of advanced framing techniques, insulation levels, HVAC installation techniques, and high-efficiency equipment.]

	Measure Type
Framing & Insulation	Air Sealing all Penetrations
	Capping Chases
	Using 2x6 framing and/or rigid foam insulation
	Backing Knee Walls
	Insulation in Full Contact w/ Air Barrier
HVAC	Proper Sizing
	Duct Leakage / Sealing, Duct Tightness Testing
	Pressure Balancing
	Proper RC&AF
Other Equipment	High Efficiency Central Air Conditioning (SEER ≥ 14.5)
	ECM Furnace Fan
	ENERGY STAR® Refrigerator or Exhaust Fan
	100% CFL Lighting
	Power-vented Water Heater (EF ≥ 0.62)
	High Efficiency Furnace (AFUE ≥ 92%)

For each measure category: I'd like you to think about how often you incorporated these measures/techniques in your homes, both before and after you started participating in the program.

5. [If II.4 = All] Think about the typical home you built before the IECC 2012 code came into effect.
    a. Would these homes have met IECC 2012 code without any changes to your building practices for this measure/area?
    b. What percent of homes built outside the program by other builders to meet but not significantly exceed IECC 2012 do you estimate use this measure/technique?

    [If II.4 = Some or None]
    a. For your non-program homes that don't significantly exceed code, did you have to change your typical practices in this area to consistently meet the new code?
    b. Thinking about your non-program homes that are built to meet but not significantly exceed code, in how many of them do you incorporate this measure/practice?

6. Of the homes that you **submitted** to the program this year, in what percent did you incorporate these practices/measures?

7. [Skip this question if I5 = 100%] Of the homes that you did **not submit** to the program this year, in what percent did you incorporate these practices/measures?

8. [Skip this question if I5 = 100%] Based on those answers, it sounds like you used these measures/practices in about XX% of all of the homes you built this year. Does that sound about right? *If not, adjust answers to #2 and #3 accordingly.*

9. Did the program increase your knowledge of how to implement these measures/practices?

10. *If #2 > #1:* On a scale from 0 to 10, where 10 is very influential and 0 is not at all influential, how important would you say the program, including your HERS rater, was in your decision to the these measures/practices in homes that you submitted to the program? [If necessary, clarify that you mean use beyond "just meeting code" as specified in #1]

11. *If #3 > #1:* On a scale from 0 to 10, where 10 is very influential and 0 is not at all influential, how important would you say the program, including your HERS rater, was in your decision to use these measures/practices in more homes outside of the program?

12. What other factors, if any, contributed to the increase of your use of these measures/practices?

13. *If decrease calculated:* It sounds like you have decreased your use of these measures/practices in your homes. What factors have caused this decrease?

14. Have you had any problems with your subcontractors getting up to speed on this measure? Please describe:

IV. MARKET FACTORS

Now I'll ask how the program got you involved through its builder development effort, and your experience with the marketing and sales training and support the program has provided.

1. What was the main reason you got involved in the program? Was there a recruitment tactic the program used that was particularly compelling to you? Are there any program outreach and recruitment strategies the program uses that you think could benefit from improvement?

2. How **effective** has the program been overall in raising builders' awareness about strategies and opportunities for achieving significantly higher efficiency in new homes? *[Probe: How about your company's awareness of these strategies?]* **Please rate the program on a scale from zero to ten, where zero is very ineffective and ten is very effective.**

3. To the best of your knowledge, how **effective** has the program been overall in raising ***customers'*** awareness about achieving significantly higher efficiency in new homes? **Please rate the program on a scale from zero to ten, where zero is very ineffective and ten is very effective.**

    a. What things stand out to you in saying that (good or bad)? [*Probe for additional.*]

    b. What barriers has the program addressed most effectively – including both barriers to builders participating in the program as well as barriers to customers buying homes built by participating builders like you? [*Probe for additional.*]

4. [if I5 < 100%,] What would it take for you to build 100% of your IECC 2012 homes to program specifications?

5. Do you see your company's efforts to build high efficiency, program-eligible homes as a competitive differentiator between you and other builders? Why or why not? Do you have any thoughts on the advantages or disadvantages of advertising a home as energy efficient?
    a. How would you describe the level of customer demand for higher efficiency new homes? *[Probe: high, low, moderate]*
    b. If you have participated in the program previously, would you say demand for higher efficiency homes has increased, decreased, or stayed the same?
    c. [If I6c < 100%] For homes that are not custom-built, do you find that there is any difference in time on the market between standard homes and high-efficiency program homes? If so, what are typical times on the market for each?
    d. From your perspective, how receptive are realtors and appraisers to attributing added value to high-efficiency, program-qualified homes (e.g., lower energy bills, comfort or other benefits the program promotes)? Have you observed changes in the level of knowledge and awareness of the realtor and appraiser community during the last year, and to what extent would you attribute that change to the program's efforts?

V. RELATIONSHIP WITH HERS RATERS

1. Do you work with any HERS raters on homes outside of the program?

2. Do you feel that you are better qualified to build program-eligible homes as a result of your interactions with ***program*** HERS raters?

    a. What areas do program HERS raters help you the most with? Where have you learned the most from them?
    b. [if I6c < 100%,] Have program HERS raters helped you to meet the new IECC 2012 code in homes outside of the program?

3. Overall, how satisfied have you been with your relationship with HERS raters in the program? **Please rate your experience on a scale from zero to ten, where one is very ineffective and four is very effective.**

VI. PROGRAM REQUIREMENTS AND TECHNICAL SUPPORT

Let's talk about your experience with the program's technical requirements and technical support.

1. Do you feel that the program has clearly communicated participation requirements to you?

2. How has the change in the program's efficiency requirements from 10% above code to 20% above code affected your participation?

3. What do you think of the program's eligibility requirements for construction standards and quality assurance? Do you have any major concerns or insights? Please explain.

4. What strengths and weaknesses have you experienced with the program's inspection processes? Have any inspections caused delays in the construction schedule?

5. Have you attended any program trainings or made use of program technical support? If no, why not? If yes, what have you been able to learn from the program technical training and/or support?

6. What was your experience with Illinois' residential energy code moving from IECC 2009 to IECC 2012?
    a. Has the program helped you to learn about IECC 2012?
    b. How has the new code changed the extent to which the program drives incremental improvements in energy efficiency? Are there certain areas (e.g., building envelope or HVAC) in which the code is particularly lax or stringent, and where the program makes a big difference in improving efficiency over code?
    c. How strong do you think energy code enforcement is in the area(s) where you work?
    d. Outside of the program, do you typically use the prescriptive or performance path for compliance?

7. How satisfied have you been with your interaction with program staff? *Clarify if needed: RSR staff, not your HERS rater.* **Please rate your experience on a scale from zero to ten, where zero is very ineffective and ten is very effective.**

VIII. WRAP UP

1. Overall, how satisfied are you with the program at this point? Please rate your experience on a scale from zero to ten, where zero is very dissatisfied and ten is very satisfied. Why did you give that rating?

2. From your perspective, what changes can be made to improve the program or to make participation in program more compelling for you and other builders?

Those are all the questions I have. Thank you very much for your time and help! Have a good day.

NAVIGANT

7.3 Nicor Gas and Commonwealth Edison Joint Residential New Construction Program Rater Interview Guide – GPY4/EPY7

Nicor Gas and Commonwealth Edison
Joint Residential New Construction Program
Rater Interview Guide—GPY4/EPY7

Screener

Hi, may I please speak to _____? My name is ____ and I'm calling from Navigant Consulting on behalf of Nicor Gas and ComEd and their Residential New Construction energy efficiency program. We are talking to HERS raters who participated in the Residential New Construction program to gather feedback on the program. This is not a sales call. I would like to talk with you for about 20 minutes to help assess the program based on your experience with it. We are hoping you can give us insights on your experience that will help identify improvements in the program and its support to you as a participating rater in the program.
[*If needed*: We got your name from Residential Science Resources (RSR) and are authorized by Nicor Gas and ComEd to make these calls. You can verify our credentials by contacting Mike Topitzhofer of Residential Science Resources at 651-200-3417.]

Would you like to do the interview now or is there a better time that we can schedule for this?

Date: _____ **Time**: _____
And should we call you back at the same phone number?
IF NO → **Alternate Phone #**: _____

[*Confirm name and title; proceed to Introduction*]
[*If directed to a voice mail system:*]

Hello, my name is ____. I'm calling from Navigant Consulting on behalf of Nicor Gas and ComEd and their Residential New Construction energy efficiency program. We are talking to HERS raters who participated in the Residential New Construction program to gather feedback on the program. I would like to talk with you for about 20 minutes to help assess the program based on your experience with it. I will continue trying to get hold of you directly, but meantime if you wish, feel free to call me back at your earliest convenience to schedule the interview. My phone number is _____ [*repeat phone number for clarity*]. Thank you in advance for your cooperation, as we greatly value your thoughts on the program. I look forward to talking with you. Goodbye.

I. Introduction/Program Satisfaction

1. How long have you participated in the NICOR GAS AND COMED program for residential new construction? When did you first get involved?

2. What percent of your business occurs in the Nicor Gas and ComEd service territory?

    a. Nicor Gas and ComEd:
    b. Nicor Gas only:
    c. ComEd only:

3. Of the work you do in the Nicor Gas and ComEd service territory, what percent is through the program? Do you work with builders who do not participate in the program?

4. Do you participate in other utility energy efficiency programs? If yes, which ones?

II. Experience with builders in program

1. At what point in the plan development process do you typically begin interacting with builders for each home?

    PROBE FOR % of cases in which they get involved:

    a. During the initial design phase
    b. During the design review phase, prior to design completion
    c. After the design is finalized
    d. Is this different for custom vs. production homes?

2. In your experience, what percentage of home plans submitted by builders participating in the program achieve a program-qualifying level of efficiency upon your initial review of the plan and through actual construction? If you are familiar with markets in other parts of the country, how do you think this compares to experiences in other regions of the country? Use probes below as needed:

    a. What percentage of initial home plans do you estimate would initially pass IECC 2012?

    b. In the cases where a home does not achieve a qualifying level of efficiency (for the program or IECC 2012 code) upon your initial review, how would you characterize the extent to which plans require revisions? [PROBE: Significant revisions required, moderate revisions required, minor revisions required] What are the most common plan failings? [PROBE: Thermal bypass checklist issues, Window to wall ratio, Insulation levels, HVAC system, etc.] How many iterations of the plan/phases of construction are typically needed?

    c. To what degree do home builders use you as a resource for addressing issues associated with meeting the requirements specified in approved plans? Specifically, after the plans

are approved how frequently do you interact with the builder during the construction phase? Is it more than just during the inspections? Is there regular consultation provided to builders on each home design? What is the nature of these interactions?

d. What percentage of the builders that participate in the program needed to make changes to their standard/established construction practices to build homes that meet program standards? What about to meet IECC 2012 code alone? *[Probe for code compliance of builders outside program as well]* Excluding changes to the original plans, how would you characterize the magnitude of the changes to construction practices that builders must make to build homes that meet program standards? (Major, minor, none) *[Keep this discussion short and high-level; if needed say that we will discuss specifics of these changes in the next section]*

3. Are there areas the program could focus on encouraging more substantial changes in building practices (e.g., insulation, air sealing, ducts, etc.) that would help position the builders to keep pace with and go beyond the new IECC 2012 code and program requirements through additional trainings, relationships with trade allies, etc.?
4. Do the builders who work with you through the program recognize your support as a benefit of participating in the program?

III. Net-to-Gross

I'd like to talk now about some specific building practices that you might be helping program-participating builders with. I want you to think about how often and how well the builders that you work with used these practices when you first started working with them in the program, and how often and how well they are using them today after the first program year, on program homes and non-program homes. Remember to think about just builders that you work with in the Nicor Gas and ComEd program territory.

Framing & Insulation

2. Now I'd like to talk about framing, air sealing and insulation.
    a. In what percent of homes do you see builders using advanced framing and proper air sealing and insulation techniques consistent with the Thermal Bypass Checklist outside of the program? Is this different for program and non-program builders?[*If needed, prompt with practices below]*)
    b. In what percent of program homes do you see them using these techniques now?
    c. What are typical insulation R-values in builders' homes outside of the program? *Probe for walls, attic, foundation, 2x6 vs 2x4 framing.*
    d. What are typical R-values in program homes? Has installation of insulation improved?

Framing, Air Sealing & Insulation	Air Sealing all Penetrations
	Capping Chases
	Using 2x6 framing and/or rigid foam insulation
	Backing Knee Walls
	Insulation in Full Contact w/ Air Barrier

3. Now I want you to think about how well the builders you work with implemented these techniques prior to their experience in the program, and now that they have participated in the program.
    a. At the beginning would you say their implementation was…
        i. Excellent
        ii. Good
        iii. Fair
        iv. Poor
        v. Not using technique
    b. Now, would you say their implementation was…
        i. Excellent
        ii. Good
        iii. Fair
        iv. Poor
        v. Not using technique
4. (If noted improvement and/or increase in use of techniques) On a scale from 0 to 10, where 0 is not at all influential and 10 is very influential, how important do you think the program was in this improvement in advanced framing and air sealing techniques among the builders you work with? [PROBE FOR SPECIFIC WAYS IN WHICH THE PROGRAM HAD AN INFLUENCE, E.G., INCREASED KNOWLEDGE THROUGH TRAININGS, EDUCATIONAL MATERIALS, EXPOSURE TO VENDORS OFFERING EFFICIENT PRODUCTS, ETC.]

HVAC

1. Now I'd like to talk about HVAC.
    a. In what percent of homes do you see builders using the following practices when specifying and installing HVAC systems outside the program? Is this different for program and non-program builders?
    b. In what percent of homes do you see them using these practices in the program?

HVAC	Proper Sizing
	Duct Leakage / Sealing, Duct Tightness Testing
	Pressure Balancing
	Proper RC&AF

2. Now I want you to think about how well the builders you work with implemented these practices prior to their experience in the program, and how well they implement them now.
    a. At the beginning, would you say their implementation was…
        i. Excellent
        ii. Good

iii. Fair
iv. Poor
v. Not using technique

b. Now, would you say their implementation was…
i. Excellent
ii. Good
iii. Fair
iv. Poor
v. Not using technique

3. (If noted improvement and/or increase in use of practices) On a scale from 0 to 10, where 0 is not at all influential and 10 is very influential, how important do you think the program was in this improvement in HVAC installation practices and duct sealing among the builders you work with? [PROBE FOR SPECIFIC WAYS IN WHICH THE PROGRAM HAD AN INFLUENCE]

Other Equipment

1. Now I'd like to talk about some other high-efficiency equipment.
   a. In what percent of homes do you see builders installing the following high-efficiency equipment when they first entered the program? Is this different for program and non-program builders?
   b. In what percent of homes do you see them installing this equipment in the program?

Equipment
High Efficiency Central Air Conditioning (SEER 14.5)
ECM Furnace Fan
ENERGY STAR® Refrigerator or Exhaust Fan
100% CFL Lighting
Power-vented Water Heater (0.62 EF or higher)
High Efficiency Furnace (92% AFUE or higher)

2. (If noted increase in use of equipment) On a scale from 0 to 10, where 0 is not at all influential and 10 is very influential, how important do you think the program was in this improvement in high efficiency equipment installations among the builders you work with? [PROBE FOR SPECIFIC WAYS IN WHICH THE PROGRAM HAD AN INFLUENCE]

5. If the program was not available now, do you think builders would construct homes equal to the program's standards? If no, how close do you think they would come? Once involved in the program, do you see builders translating these building practices to non-program homes? If yes, which ones and to what extent?

IV. Wrap Up

1. I'd like you to rate your satisfaction with the following aspects of Nicor Gas and ComEd program on a scale from zero to ten, where zero is dissatisfied and ten is satisfied.

a. Application and payment process
b. Marketing support
c. Tracking system (HouseRater)
d. Training and technical support

2. [FOR ANY EXTREMELY HIGH OR LOW VALUES] Can you comment on why you gave the ratings that you did?

3. From your perspective, what changes can be made to improve the program?

Those are all the questions I have. Thank you very much for your time and help! Have a good day.