

HOME ENERGY SAVINGS PROGRAM – NICOR/COMED  
FULL PARTICIPANT SURVEY

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**SAMPLE VARIABLES MAP TO TRACKING DATABASE VARIABLES**

- EI2P
  - *Identifies whether a customer was an EI2 House Party referral participant or not (if EI2P=1, participant was referred by the EI2 House Party)*
- CUSTNAME
  - *Contact name in tracking database: NAME FIRST + NAME LAST*
- ADDRESS
  - *Customer address for confirmation if phone number used to contact customer is different than the one in the sample file/tracking system (when call rescheduled)*
- PHONE NUMBER
  - *(Primary; use Phone\_Number\_Secondary if unable to contact primary # after 4 attempts)*
- AUDIT\_DATE
  - *date audit performed (ex. July 1, 2011)*
- AFEE
  - *Audit fee paid by customer; if 1=\$99, if 2=\$49*
- C\_FLAG
  - *this was flagged if MEASURE ID = 1 OR 2 OR 3 OR 4 OR 19 OR 20 installed (0,1)*
- CFL\_QTY
  - *MEAS\_QTY (quantity of measure) in tracking system for all CFL measures installed*
- SH\_FLAG
  - *this was flagged if MEASURE ID = 5 OR 20 installed (0,1)*
- KA\_FLAG
  - *this was flagged if MEASURE ID = 6 installed (0,1)*
- BA\_FLAG
  - *this was flagged if MEASURE ID = 7 installed (0,1)*
- HWT\_FLAG
  - *this was flagged if MEASURE ID = 8 installed (0,1)*
- PI\_FLAG
  - *this was flagged if MEASURE ID = 9 installed (0,1)*
- PT\_FLAG
  - *this was flagged if MEASURE ID = 10 installed (0,1)*
- PTE\_FLAG
  - *this was flagged if MEASURE ID = 11 installed (0,1)*
- AI\_FLAG
  - *this was flagged if MEASURE ID = 12 installed (0,1)*
- WI\_FLAG
  - *this was flagged if MEASURE ID = 13 installed (0,1)*
- OTHER\_FLAG
  - *this was flagged if MEASURE ID = 14 installed (0,1)*
- AS\_FLAG
  - *this was flagged if MEASURE ID = 16 installed (0,1)*

## Measure ID Codes

MEASURE_ID	MEASURE_ID_NAME
1	9 Watt CFL
2	14 Watt CFL
3	19 Watt CFL
4	23 Watt CFL
5	Shower Head
<u>6</u>	<u><i>Kitchen Aerator</i></u>
7	Bathroom Aerator
<u>8</u>	<u><i>Hot Water Temperature Setback</i></u>
9	Pipe Insulation
10	Programmable Thermostat
11	Programmable Thermostat Education
12	Attic Insulation
13	Wall Insulation
14	Floor Insulation (Other)
<u>15</u>	<u><i>Duct Insulation &amp; Sealing</i></u>
16	Air Sealing
19	9 Watt Globe CFL
20	Showerhead Handheld

**Note: Underlined and italicized entries above indicate non-key measures -those contributing <5% of DI or weatherization measures' total savings- that were omitted in spillover questions (but not installation and persistence rate questions).**

## INTERVIEWER INSTRUCTIONS

1. Call is to be placed asking to speak to the individual named in the customer contact information obtained from program records.
2. If that individual no longer has the phone number of record, ask the respondent if they live at [customer address of record].
3. If the individual of record no longer lives at address of record thank and terminate.
4. Make at least 5 attempts to each customer at different times of the day/week.
5. The purpose of the introductory script is to ensure the survey is answered by the primary decision maker involved in enrolling in the Nicor Gas and ComEd Home Energy Savings program and who was present during the home energy assessment (audit).

6. The program is jointly run by Nicor Gas and ComEd, so the customer will have accounts with both utilities.
7. Initial questions are to qualify the respondent.

### **PROGRAM INTRODUCTION**

Hello, this is [INTERVIEWER'S NAME] from Blackstone Group, calling on behalf of Nicor Gas and ComEd. This is not a sales call. We are contacting customers who have participated in Nicor Gas and ComEd's *Home Energy Savings Program*. May I please speak with [CUSTNAME]? [IF NEEDED: This program provided an on-site home energy assessment (energy audit) and follow-up weatherization actions, including educational information, free installation of energy efficient upgrades such as CFL light bulbs and high-efficiency showerheads and faucet aerators, and incentives for various energy efficiency actions that were installed by a program contractor. I'd like to assure you that your responses will be kept confidential and your individual responses will not be revealed to anyone.]

Were you the person that was at home and present during the home energy assessment (energy audit) and the person most familiar with the work done by the program? (IF NOT: May I please speak with the person who was present during the home energy assessment (energy audit) and who is most familiar with the work done by the program?)

CONTINUE WITH RIGHT PERSON: Hello, this is [INTERVIEWER'S NAME] from Blackstone Group, calling on behalf of Nicor Gas and ComEd. This is not a sales call. We are contacting customers who have participated in Nicor Gas and ComEd's *Home Energy Savings Program*. We are conducting a study to evaluate Nicor Gas and ComEd's *Home Energy Savings Program* and would like to include your opinions. [IF NEEDED: This program provided an on-site home energy assessment (energy audit) and follow-up energy saving actions, including educational information, free installation of energy efficient upgrades such as CFL light bulbs and high-efficiency showerheads and faucet aerators, and incentives for various weatherization actions that were installed by a weatherization contractor. I'd like to assure you that your responses will be kept confidential and your individual responses will not be revealed to anyone. This study is required by the Illinois Commerce Commission and will be used to verify the effectiveness of the program and to make improvements.]

(IF NEEDED: It will take about 20 minutes)

(IF VERIFICATION IS NEEDED: TELL THEM THEY CAN CALL TERRI BURNS OF NICOR GAS AT 630 – 388 – 2380. [IF PROMPTED: TERRI IS AN ADMINISTRATIVE ASSISTANT SERVING THE ENERGY EFFICIENCY DEPARTMENT.]

### **Cell Phone Safety**

- C1. Are you currently talking to me on a regular landline phone or a cell phone?
1. Regular landline phone
  2. Cell phone
  98. (Don't Know)
  99. (Refused)

**[ASK IF C1= 2]**

C2. Are you currently in a place where you can talk safely and answer my questions?

1. Yes
2. (No, schedule a callback)
3. (No, do not call back)
98. (Don't know, schedule a callback)
99. (Refused, schedule a callback)

**Participation Verification**

V1. Our records indicate that you received a home energy assessment through Nicor Gas and ComEd's Home Energy Savings program, where an energy assessor identified opportunities to improve the energy efficiency of your home. Then, after the assessment, the recommended energy efficiency upgrades were installed at your home. Is that correct?

1. Yes
2. (No, I did not have a home energy assessment) [\[NOTE AND TERMINATE\]](#)
3. (No, I had a home energy assessment but did not have the follow-up energy efficiency work done through the program) [\[NOTE AND TERMINATE\]](#)
98. Don't know [\[TERMINATE\]](#)
99. Refused [\[TERMINATE\]](#)

*To start, we have several questions regarding the energy efficiency upgrades that were installed in your home. The answers to these questions are very important so Nicor Gas and ComEd can determine how much energy is being saved by the program.*

**Direct Install Measure Installation and Persistence Rates (excluding CFLs)**

Our records show that the following instant upgrades were installed through the *Home Energy Savings Program* during the initial energy assessment (energy audit) done at the home. [\[READ EACH INSTANT UPGRADE PER PROGRAM RECORD AND VERIFY WITH CUSTOMER:\]](#) Is this correct?

- DIMV2. [if SH\_FLAG=1] Efficient Showerhead
- DIMV3. [if BA\_FLAG=1] Bathroom Faucet Aerator(s)
- DIMV4. [if PI\_FLAG=1] Pipe Insulation
- DIMV5. [if PT\_FLAG=1] A Programmable Thermostat
- DIMV6. [if PTE\_FLAG=1] Programmable Thermostat Temperature Setting and Programming
- DIMV7. [if KA\_FLAG=1] Kitchen Faucet Aerator(s)
- DIMV8. [if HWT\_FLAG=1] Hot Water Heater Temperature Setback

1. (Yes, upgrade was installed/action taken)
2. (No, upgrade was not installed/action not taken)
98. (Don't know)
99. (Refused)

**[IF RESPONDENT STATES NO NON-CFL DIRECT INSTALL UPGRADES WERE INSTALLED, SKIP TO CFLMV1]**

DIMP1. Since participating in the program, have you since removed or undone any of those items [IF DIMV6=1, “including resetting the programmable thermostat settings that were programmed during the home energy assessment?”]

1. Yes
2. No
98. Don't know
99. Refused

**[ASK DIMP1a IF DIMP1=1]**

DIMP1a. What did you uninstall or undo? [ACCEPT MULTIPLE]

1. Efficient showerhead
2. Bathroom faucet aerator
3. Pipe insulation
4. Hot water temperature setback
5. Programmable thermostat settings
6. Programmable thermostat
7. Kitchen faucet Aerator
- 98 Don't know
99. Refused

**[ASK DIMP1b IF DIMP1=1]**

DIMP1b. Why did you uninstall/undo the item(s)? [ASK FOR EACH MEASURE IN DIMP1a]

RECORD BERBATIM- OPENEND

98. Don't know
99. Refused

**[ASK DIMP2a and DIMP2b IF DIMV6=1]**

DIMP2a. Prior to having had your thermostat programmed during the home energy assessment, did you regulate your thermostat manually to turn your heating and cooling up and down?

1. Yes
2. No
98. Don't know
99. Refused

**[IF DIMV6=1 AND DIMP1a=5, SKIP TO CFLMV1]**

DIMP2b. Have you since changed the settings that were programmed into the thermostat during the home energy assessment?

1. Yes
2. No
98. Don't know
99. Refused

## CFL Installation and Persistence Rates

[IF C\_FLAG=1 ASK, ELSE SKIP TO DIM21]

CFLMV1. [Wording if CFL\_QTY=1] Our records show that [CFL\_QTY] compact fluorescent lamp, also known as a CFL, was installed during the Home Energy Savings visit to your home. Is this correct?

[Wording if CFL\_QTY>1] Our records show that [CFL\_QTY] compact fluorescent lamps, also known as CFLs, were installed during the Home Energy Savings visit to your home. Is this correct?

1. Yes, quantity is correct
2. No, quantity is incorrect
98. Don't know [SKIP TO DIM21]
99. Refused [SKIP TO DIM21]

[ASK CFLMV2 IF CFLMV1=2]

CFLMV2. How many CFLs do you recall were installed during the Home Energy Savings visit? [Prompt for best guess.] [USE AS CFL\_QTY FOR REMAINDER OF SURVEY UNLESS DK OR REF THEN SKIP TO DIM21]

NUMERIC OPEN END up to 999

95. None [SKIP to DIM21]
98. Don't know [SKIP TO DIM21]
99. Refused [SKIP TO DIM21]

DIM2. Did you have any CFLs installed BEFORE participating in the program?

1. Yes
2. No
98. Don't know
99. Refused

[ASK DIM3 IF DIM2=1]

DIM3. About how many CFLs did you have installed BEFORE participating in the program?

NUMERIC OPEN END up to 999

98. Don't know
99. Refused

**[ASK HC8 IF DIM2=1]**

HC8. Before participating in the program, approximately what percent of the screw-in light bulb sockets in your home were already equipped with CFL bulbs?

NUMERIC OPEN END up to 99

- 98. Don't know
- 99. Refused

CFLMV5. Of the CFLs you received during the program, how many did you use to replace other CFLs you already had previously installed?

NUMERIC OPEN END up to CFL\_QTY

- 98. Don't know
- 99. Refused

CFLMV5a. **[ASK IF CFLMV5>0]** Why did you choose to remove an existing CFL and replace it with a program CFL? **(DO NOT READ; MULTIPLE RESPONSE, PROMPT FOR ADDITIONAL)**

- 1. THE NEW CFL WAS BRIGHTER
- 2. THE NEW CFL WOULD LAST LONGER
- 3. THE NEW CFL WAS MORE EFFICIENT
- 4. SIMPLY BECAUSE THE NEW CFL IS NEWER
- 5. THE NEW CFL DID NOT TAKE AS LONG TO GET BRIGHT
- 6. BETTER FIT IN FIXTURE
- 7. IT WAS FREE
- 97. OTHER - SPECIFY
- 98. DON'T KNOW
- 99. REFUSED

CFLMV6. **[Wording if CFL\_QTY=1]** Is the CFL you received from the program still installed somewhere in your home?

**[Wording if CFL\_QTY>1]** Are all of the CFLs you received from the program still installed somewhere in your home?

- 1. Yes **[SKIP TO DIM21]**
- 2. No
- 98. Don't know **[SKIP TO DIM21]**
- 99. Refused **[SKIP TO DIM21]**

[ASK CFLMV7 IF CFLMV6 =2 AND CFL\_QTY=1]

CFLMV7. Which of the following best describes what happened to the CFL that was removed? (READ LIST AND RECORD ONE RESPONSE)

1. It was thrown away
2. It is in storage
3. It was sold or given away
97. Other, specify
98. Don't know
99. Refused

[ASK CFLMV8 IF CFLMV6 =2 AND CFL\_QTY>1]

CFLMV8. How many of the CFLs you originally received from the program have you taken out and are no longer installed in any light fixture?

NUMERIC OPEN END up to 999 [NUMBER REPORTED = CFLS\_REMOVED]

98. Don't know[SKIP TO DIM21]
99. Refused [SKIP TO DIM21]

[ASK CFLMV11 IF CFLMV6 =2 AND CFL\_QTY>1]

CFLMV11. How many PROGRAM bulbs have been sold to someone else, given away or thrown away?

NUMERIC OPEN END up to CFLS\_REMOVED

98. Don't know
99. Refused

[IF CFLMV11 = CFLS\_REMOVED, THEN SKIP TO DIM21]

[ASK CFLMV12 IF CFLMV6 =2 AND CFL\_QTY>1]

CFLMV12. How many are in storage?

NUMERIC OPEN END up to CFLS\_REMOVED

98. Don't know
99. Refused

[IF CFLMV12+CFLMV11= CFLS\_REMOVED, THEN SKIP TO DIM21]

[IF CFLMV11 OR CFLMV12 = 98 or 99 THEN SKIP TO DIM21]

[CLFS REMOVED check]

IF CFLMV11+ CFLMV12 = CFLS\_REMOVED

then proceed to DIM21.

ELSE IF CFLMV11+ CFLMV12 > CFLS\_REMOVED

then read “I must have made a mistake, those quantities add up to more CFLs than you said were removed. Let me read through the last few questions again” and skip back to CFLMV8

ELSE IF CFLMV11+ CFLMV12 < CFLS\_REMOVED

then proceed to CFLMV14]

CFLMV14. What was done with the remaining [CFLS\_REMOVED – (CFLMV11+ CFLMV12)] CFLs?

RECORD VERBATIM OPEN END

98. Don't know

99. Refused

## Direct Install Measure Spillover

DIM21. Have you installed any more CFLs, Efficient Showerheads, Bathroom Aerators, or Pipe Insulation since you received the one(s) through the program?

1. Yes

2. No

98. Don't know

99. Refused

**[ASK IF DIM21 =1, OTHERWISE SKIP TO WM21]**

DIM21a. What did you install? [Check all that apply]

1. CFLs

2. Pipe Insulation

3. Bathroom Aerator

4. Efficient Showerhead

98. Don't Know

99. Refused

**[ASK DIM22 and DIM23 FOR EACH DIM21a=1, 2, 3, 4; IF 98 or 99, SKIP TO WMV1]**

DIM22. How many [IF DIM21a = 2, “How many feet of...”] additional [INSERT MEASURE] have you installed?

NUMERIC OPEN END up to 999

98. Don't know

99. Refused

DIM23. How influential was the program in encouraging you to install the additional [INSERT MEASURE DIM21a]? Please rate this on a 0-10 scale, where 0 means not at all influential and 10 means very influential.

NUMERIC OPEN END from 0 to 10

- 98. Don't know
- 99. Refused

## Weatherization Measure Verification

Our records show that the following weatherization upgrades were installed through the *Home Energy Savings Program* after your home energy assessment. [READ EACH WEATHERIZATION UPGRADE PER PROGRAM RECORD AND VERIFY WITH CUSTOMER:] Is this correct?

- WMV1. [if AS\_FLAG=1] Air Sealing
- WMV2. [if AI\_FLAG=1] Attic Insulation
- WMV3. [if WAL\_FLAG=1] Wall Insulation
- WMV4. [if OTHER\_FLAG=1] Other Insulation

- 1. Yes, item was installed
- 2. No, item was not installed
- 98. Don't know
- 99. Refused

## Weatherization Measure Spillover

WM21. Were there any other energy efficiency upgrades that were recommended to you as part of the *Home Energy Savings Program* that you didn't have installed?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

### [ASK WM22 IF WM21=1]

WM22. What upgrades did you choose to not have completed? [ACCEPT MULTIPLE OPTIONS]

- 1. Air Sealing
- 2. Wall insulation
- 3. Attic Insulation
- 4. Other Insulation
- 97. OTHER [Record]
- 98. Don't know
- 99. Refused

**[ASK WM23 IF WM21=1]**

WM23. Why did you choose not to have these additional recommended upgrades completed?

1. Too expensive
2. The payback would take too long
3. The work would involve modifications to my home I would prefer not done
4. Haven't gotten around to it yet/too busy
97. OTHER [Record]
98. Don't know
99. Refused

WM24. Have you installed any more of the weatherization energy efficiency items you got through the program on your own or through a contractor outside of the program since participating?

1. Yes
2. No
98. Don't know
99. Refused

WM24a. **[ASK IF WM24 = 1]** What additional insulation work did you have done after participating in the program? **[Check all that apply]**

1. Air Sealing
2. Wall insulation
3. Attic Insulation
4. Other Insulation
98. Don't know
99. Refused

**5. [IF WM24a=1, 2, 3, 4 ASK WM24b THROUGH WM24c FOR EACH CHECK ABOVE, OTHERWISE, SKIP TO P1]**

WM24b. How influential was your earlier participation in the program in encouraging you to install the additional **[INSERT MEASURE WM24a]**? Please rate this on a 0-10 scale, where 0 means not at all influential and 10 means very influential.

**NUMERIC OPEN END from 0 to 10**

98. Don't know
99. Refused

WM24c. Why didn't you do the work through the program?

1. (More time-consuming to perform the work through the program)
2. (Program is more expensive)
3. (Program doesn't offer the measure)
97. OTHER [Record]
98. Don't know
99. Refused

## Process Questions

### Marketing and Outreach

P1. Which best describes you?

1. Before learning about the Home Energy Savings program, I did not think about energy efficiency changes in my home.
2. Before learning about the Home Energy Savings program, I thought about energy efficiency changes in my home, but did not do anything.
3. Before learning about the Home Energy Savings program, I already made some changes in my home to save energy.
4. Before learning about the Home Energy Savings program, I already made major changes in my home to save energy.
98. Don't Know
99. Refused

P2. How did you *first* hear about the Home Energy Savings program? [\[DO NOT READ LIST \]](#)

1. BROCHURE/FLYER THROUGH DIRECT MAIL
2. INTERNET
3. CUSTOMER CALLED COMED TO ASK ABOUT REDUCING ENERGY BILL
4. COMED REPRESENTATIVE – OTHER
5. CUSTOMER CALLED NICOR TO ASK ABOUT REDUCING ENERGY BILL
6. NICOR REPRESENTATIVE – OTHER
7. WORD-OF-MOUTH
8. CONTRACTOR REFERRAL
9. COMMUNITY EVENT
10. E12 HOUSE PARTY
97. OTHER, SPECIFY
98. DON'T KNOW
99. REFUSED

P3. Before participating, did you have any concerns or skepticism about the program and its offerings?

1. Yes
2. No
98. Don't know
99. Refused

**[SKIP P4 IF P2=8]**

P4. Did you reach out to the program to participate because the contractor that ultimately did your work recommended it to you?

1. Yes
2. No
98. Don't know

99. Refused

**[IF EI2P=1 ASK P5-P6a]**

P5. Where you a host for an informational house party where a contractor and program staff presented information on the program?

1. Yes
2. No
98. Don't know
99. Refused

P6. On a scale of 0-10, where 10 is very influential, how influential was the house party informational session in encouraging you to participate in the program?

**[RECORD SCORE 0-10]**

98. Don't know
99. Refused

**[IF P6 > 4, ASK P6a]**

P6a. What made the house party informational session influential in encouraging you to participate in the program?

**[DO NOT READ LIST , ACCEPT MULTIPLE RESPONSES]**

1. UNDERSTANDING THE EXTENT OF THE WORK THE PROGRAM WOULD INVOLVE
2. IT WAS FREE
3. OVERCOMING SKEPTICISM ABOUT PROGRAM
4. LEARNING ABOUT THE INCENTIVES AVAILABLE THROUGH THE PROGRAM
5. THIS WAS THE FIRST TIME I HEARD ABOUT THE PROGRAM
6. LEARNING ABOUT THE MONEY SAVING AND COMFORT BENEFITS OF CONDUCTING ENERGY EFFICIENCY WORK
7. RECEIVING PROGRAM LITERATURE AND WAYS TO FIND OUT MORE INFORMATION ABOUT THE PROGRAM
8. INFLUENCE FROM SEEING POSITIVE REACTION TO THE PROGRAM FROM FRIENDS/NEIGHBORS/OTHER ATTENDEES – INCLUDING
9. MEETING THE CONTRACTOR THAT WOULD DO THE WORK ON OUR HOME
97. OTHER: **[RECORD]**
98. DON'T KNOW
99. REFUSED

P7. After your home energy assessment, did you have any concerns over...?

**READ LIST, ACCEPT MULTIPLE RESPONSES**

1. Financial planning/affording the work/cost of the work
2. Finding a convenient time to do the work

- 3. Shopping around for better prices or other incentive opportunities
- 4. Waiting to see how a friend/other participant's work turned out and their satisfaction
- 97. Other, [specify]
- 98. Don't know
- 99. Refused

**Pre-Assessment EE Commitment, Knowledge, and Assessment Pricing**

P8a. Thinking back to when you signed up for the home energy assessment, on a scale of 0 to 10, where 10 means very committed, how committed were you to doing some sort of energy efficiency work on your home?

**RECORD SCORE 0-10**

- 98. Don't know
- 99. Refused

P8b. On a scale of 0 to 10, where 10 is very knowledgeable, how knowledgeable were you about the energy efficiency work that could be done on your home prior to participating in a home energy assessment?

**RECORD SCORE 0-10**

- 98. Don't know
- 99. Refused

**[ASK IF AFEE=2, OTHERWISE SKIP TO P8cc]**

P8ca. Looking back to the home energy assessment and the value it provided you, would you have been willing to pay \$75 for the assessment?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

**[IF P8ca = 1, CONTINUE TO P8cb, OTHERWISE SKIPE TO P8ce]**

P8cb. Would you have been willing to pay \$99 for the assessment?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

**[IF P8cb = 1, CONTINUE TO P8cc, OTHERWISE SKIPE TO P8ce]**

P8cc [IF AFEE=1, "Looking back to the home energy assessment and the value it provided you"] would you have been willing to pay \$150 for the assessment?

- 1. Yes
- 2. No
- 98. Don't know

99. Refused

[IF P8cc = 1, CONTINUE TO P8cd, OTHERWISE SKIPE TO P8ce]

P8cd. How about \$200?

1. Yes
2. No
98. Don't know
99. Refused

P8ce. What is the most you would have paid for the assessment?

RECORD DOLLAR AMOUNT

98. Don't know
99. Refused

### Satisfaction

SA1. On a scale of 0 to 10, where 0 is very dissatisfied and 10 is very satisfied, how would you rate your satisfaction with... [SCALE 0-10; 96=not applicable, 98=Don't know, 99=Refused][ROTATE ITEMS]

- a. The process to sign up for the program
- b. The instant rebate you received for the weatherization work
- c. The measures you received through the program?
- d. The time it took to schedule the Home Energy Savings program assessment (energy audit)?
- e. The time it took to schedule the insulation work after the home energy assessment (energy audit) was done?
- f. The representative that visited your home to conduct the home energy assessment (energy audit)?
- g. The contractor who installed the weatherization upgrades?
- h. Information you received about the program
- i. [IF E12P=1] The House Party program informational session you attended
- j. The Home Energy Savings program overall?

### ASK SA2 IF ANY SA1<=4]

SA2. What are the reasons for your dissatisfaction with any aspect of the program?

Record verbatim – OPEN END

98. Don't know
99. Refused

SA3. How could the program be improved, if at all, from your perspective?

Record verbatim – OPEN END

98. Don't know
99. Refused

### Demographic Questions

D1. Do you own or rent your home?

1. Own
2. Rent/lease

- 97. Other, specify
- 98. Don't know
- 99. Refused

D2. In order to help us understand our survey findings factoring in customer age ranges, would you please tell me your age range from the following list? [ [READ LIST](#)]

- 1. 18-30
- 2. 31-40
- 3. 41-50
- 4. 51-60
- 5. 61-70
- 6. 71-80
- 7. 80+
- 98. DON'T KNOW/NOT SURE
- 99. REFUSED

D3. In order to help us understand our survey findings better, could you please tell us what your income level is? Please stop me when I say the range that includes your total family income in 2012 before taxes.

- 1. UNDER \$15,000
- 2. \$15,000 to LESS THAN \$30,000
- 3. \$30,000 to LESS THAN \$50,000
- 4. \$50,000 to LESS THAN \$75,000
- 5. \$75,000 to LESS THAN \$100,000
- 6. Over \$100,000
- 98. DON'T KNOW/NOT SURE
- 99. REFUSED

**CLOSING**

Those are all the questions I have. On behalf of Nicor Gas and ComEd, thank you very much for your time. Your input will be valuable to the program in the future!

**7.4.2 Joint HES PY2 Partial Participant Survey**

## Home Energy Savings Program – Nicor/ComEd Assessment-Only Participant Survey

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**SAMPLE VARIABLES MAP TO TRACKING DATABASE VARIABLES**

- PYEAR
  - *Identifies whether a customers participated in GPY1/EPY4 or GPY2/EPY5*
- EI2P
  - *Identifies whether a customer was an EI2 House Party referral participant or not (if EI2P=1, participant was referred by the EI2 House Party)*
- CUSTNAME
  - *Contact name in tracking database: NAME FIRST + NAME LAST*
- ADDRESS
  - *Customer address for confirmation if phone number used to contact customer is different than the one in the sample file/tracking system (when call rescheduled)*
- PHONE NUMBER
  - *(Primary; use Phone\_Number\_Secondary if unable to contact primary # after 4 attempts)*
- AUDIT\_DATE
  - *date audit performed (ex. July 1, 2011)*
- AFEE
  - *Audit fee paid by customer; if 1=\$99, if 2=\$49*
- C\_FLAG
  - *this was flagged if MEASURE ID = 1 OR 2 OR 3 OR 4 OR 19 installed (0,1)*
- SH\_FLAG
  - *this was flagged if MEASURE ID = 5 OR 20 installed (0,1)*
- KA\_FLAG
  - *this was flagged if MEASURE ID = 6 installed (0,1)*
- BA\_FLAG
  - *this was flagged if MEASURE ID = 7 installed (0,1)*
- HWT\_FLAG
  - *this was flagged if MEASURE ID = 8 installed (0,1)*
- PI\_FLAG
  - *this was flagged if MEASURE ID = 9 installed (0,1)*
- PT\_FLAG
  - *this was flagged if MEASURE ID = 10 installed (0,1)*
- PTE\_FLAG
  - *this was flagged if MEASURE ID = 11 installed (0,1)*

Measure ID Codes	
MEASURE_ID	MEASURE_ID_NAME
1	9 Watt CFL
2	14 Watt CFL
3	19 Watt CFL
4	23 Watt CFL
5	Shower Head
<u>6</u>	<u><i>Kitchen Aerator</i></u>
7	Bathroom Aerator
<u>8</u>	<u><i>Hot Water Temperature Setback</i></u>
9	Pipe Insulation
10	Programmable Thermostat
11	Programmable Thermostat Education
19	9 Watt Globe CFL
20	Showerhead Handheld

**Note: italicized and underlined entries above indicate non-key measures -those contributing <5% of DI or weatherization measures’ total savings- that were omitted in spillover questions where applicable (but not installation and persistence rate questions).**

**INTERVIEWER INSTRUCTIONS**

Call is to be placed asking to speak to the individual named in the customer contact information obtained from program records.

If that individual no longer has the phone number of record, ask the respondent if they live at [customer address of record].

If the individual of record no longer lives at address of record thank and terminate.

Make at least 5 attempts to each customer at different times of the day/week.

The purpose of the introductory script is to ensure the survey is answered by the primary decision maker involved in enrolling in the Nicor Gas and ComEd Home Energy Savings program and who was present during the home energy assessment (audit).

The program is jointly run by Nicor Gas and ComEd, so the customer will have accounts with both utilities.

Initial questions are to qualify the respondent.

**PROGRAM INTRODUCTION**

Hello, this is [INTERVIEWER'S NAME] from Blackstone Group, calling on behalf of Nicor Gas and ComEd. This is not a sales call. We are contacting customers who have participated in Nicor Gas and ComEd's *Home Energy Savings Program*. May I please speak with [CUSTNAME]? [IF NEEDED: This program provided an on-site home energy assessment (energy audit) and follow-up weatherization actions, including educational information, free installation of energy efficient upgrades such as CFL light bulbs and high-efficiency showerheads and faucet aerators, and incentives for various energy efficiency actions that were installed by a program contractor. I'd like to assure you that your responses will be kept confidential and your individual responses will not be revealed to anyone.]

Were you the person that was at home and present during the home energy assessment (energy audit) and the person most familiar with the work done by the program? (IF NOT: May I please speak with the person who was present during the home energy assessment (energy audit) and who is most familiar with the work done by the program?)

**CONTINUE WITH RIGHT PERSON:** Hello, this is [INTERVIEWER'S NAME] from Blackstone Group, calling on behalf of Nicor Gas and ComEd. This is not a sales call. We are contacting customers who have participated in Nicor Gas and ComEd's *Home Energy Savings Program*. We are conducting a study to evaluate Nicor Gas and ComEd's *Home Energy Savings Program* and would like to include your opinions. [IF NEEDED: This program provided an on-site home energy assessment (energy audit) and follow-up energy saving actions, including educational information, free installation of energy efficient upgrades such as CFL light bulbs and high-efficiency showerheads and faucet aerators, and incentives for various weatherization actions that were installed by a weatherization contractor. I'd like to assure you that your responses will be kept confidential and your individual responses will not be revealed to anyone. This study is required by the Illinois Commerce Commission and will be used to verify the effectiveness of the program and to make improvements.]

(IF NEEDED: It will take about 10 to 15 minutes)

(IF VERIFICATION IS NEEDED: INTERVIEW NOTE: TELL THEM THEY CAN CALL TERRI BURNS OF NICOR GAS AT 630 – 388 – 2380. [IF PROMPTED: TERRI IS AN ADMINISTRATIVE ASSISTANT SERVING THE ENERGY EFFICIENCY DEPARTMENT.]

## CELL PHONE SAFETY

C1. Are you currently talking to me on a regular landline phone or a cell phone?

1. Regular landline phone
2. Cell phone
98. Don't Know
99. Refused

### [ASK IF C1= 2]

C2. Are you currently in a place where you can talk safely and answer my questions?

1. Yes
2. No, schedule a callback
3. No, do not call back
98. Don't know, schedule a callback
99. Refused, schedule a callback

## PARTICIPANT TYPE VERIFICATION

V1. Our records indicate that you received a home energy assessment through Nicor Gas and ComEd's Home Energy Savings program, where an Energy Advisor identified opportunities to improve the energy efficiency of your home. The Energy Advisor may have also installed some efficient items for you that day such as CFLs, faucet aerators, and pipe insulation. However, after the home energy assessment, you did not have additional recommended weatherization upgrades installed through the program such as air sealing and wall insulation. Is that correct?

1. (Yes) [CONTINUE]
2. (No, I did not have a home energy assessment) [NOTE AND TERMINATE]
3. (No, I had a home energy assessment and also did the follow-up energy efficiency work through the program) [NOTE AND TERMINATE]
4. (I had a home energy assessment through the program but I then installed the recommended energy efficiency upgrades outside of the program on my own or through my own contractor) [CONTINUE]
98. (Don't know) [TERMINATE]
99. (Refused) [TERMINATE]

*To start, we have several questions regarding the energy efficiency products that were installed in your home. The answers to these questions are very important so Nicor Gas and ComEd can determine how much energy is being saved by the program.*

**DIRECT INSTALL MEASURE INSTALLATION VERIFICATION AND SPILLOVER**

Our records show that the following instant upgrades were installed through the *Home Energy Savings Program* during the initial energy assessment (energy audit) done at the home. [[READ EACH INSTANT UPGRADE PER PROGRAM RECORD AND VERIFY WITH CUSTOMER:](#)] Is this correct?

- DIMV1. [IF C\_FLAG=1] CFLs
- DIMV2. [if SH\_FLAG=1] Efficient Showerhead
- DIMV3. [if BA\_FLAG=1] Bathroom Faucet Aerator(s)
- DIMV4. [if PI\_FLAG=1] Pipe Insulation
- DIMV5. [if PT\_FLAG=1] A Programmable Thermostat
- DIMV6. [if PTE\_FLAG=1] Programmable Thermostat Temperature Setting and Programming
- DIMV7. [if KA\_FLAG=1] Kitchen Faucet Aerator(s)
- DIMV8. [if HWT\_FLAG=1] Hot Water Heater Temperature Setback

- 1. (Yes, upgrade was installed/action taken)
- 2. (No, upgrade was not installed/action not taken)
- 98. (Don't know)
- 99. (Refused)

**[IF RESPONDENT STATES NO DIRECT INSTALL UPGRADES WERE INSTALLED WHATSOEVER, SKIP TO PP1]**

DIM21. Since receiving the instant upgrades we just discussed through the program, have you installed any more on your own?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[ASK IF DIM21 =1, OTHERWISE SKIP TO PP1]**

DIM21a. What did you install? [[MULTIPLE ANSWERS](#)]

- 1. CFLs
- 2. Efficient Showerhead
- 3. Pipe Insulation
- 4. Bathroom Aerator
- 5. Kitchen Aerator
- 98. (Don't Know)
- 99. (Refused)

**[ASK DIM22 and DIM23 FOR EACH DIM21a=1, 2, 3, 4, 5; IF 98 or 99, SKIP TO PP1]**

DIM22. How many [IF DIM21a = 2, "How many feet of..."] additional [INSERT MEASURE DIM21a] have you installed?

**NUMERIC OPEN END up to 997**

- 998. (Don't know)
- 999. (Refused)

DIM23. How influential was the program in encouraging you to install the additional [INSERT MEASURE DIM21a]? Please rate this on a 0-10 scale, where 0 means not at all influential and 10 means very influential.

**NUMERIC OPEN END from 0 to 10**

- 98. (Don't know)
- 99. (Refused)

**WEATHERIZATION MEASURE SELF-INSTALL SPILLOVER**

PP1. After completing the home energy assessment through the program and receiving energy efficiency recommendations, did you do any wall insulation, attic insulation, air sealing, or other energy efficiency work on your own outside of the program to make your home more energy efficient? -this includes paying someone outside of the program to do the work.

- 1. Yes [SKIP TO PP1a]
- 2. No [CONTINUE TO PP1Na]
- 98. (Don't know) [SKIP TO P1]
- 99. (Refused) [SKIP TO P1]

**[ASK PP1Na-PP1Nd IF PP1=2]**

PP1Na. Why did you decide to not install the recommended energy efficiency upgrades on your own or through the program?

**[RECORD VERBATIM]**

- 98. (Don't know)
- 99. (Refused)

PP1Nb. Do you still plan to do the recommended energy efficiency work in the future even though you haven't gotten around to it yet?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

**[ASK PP1Nc IF PP1Nb=1]**

PP1Nc. When do you think you will do the recommended energy efficiency work? **[DO NOT READ LIST]**

1. (WITHIN THE NEXT 6 MONTHS)
2. (WITHIN 6 MONTHS TO A YEAR)
3. (1-2 YEARS FROM NOW)
4. (2 OR MORE YEARS FROM NOW)
98. (DON'T KNOW)
99. (REFUSED)

PP1Nd. Is there anything the program can do to help you follow-through and install the energy efficiency upgrades that were recommended to you after your home energy assessment (audit)?

**[RECORD VERBATIM]**

98. (Don't know)
99. (Refused)

**[ASK IF PP1=1]**

PP1a. What additional insulation or air sealing work did you have done after participating in the program? **[MULTIPLE RESPONSES]**

1. Air Sealing
2. Wall insulation
3. Attic Insulation
4. Other Insulation **[RECORD VERBATIM]**
98. (Don't know)
99. (Refused)

**[IF PP1a=1,2,3, 4 ASK PP1b FOR EACH CHECK ABOVE BEFORE CONTINUING TO PP1c, OTHERWISE, SKIP TO P1]**

PP1b. How influential was your participation in the program in encouraging you to install the additional **[INSERT MEASURE PP1a]**? Please rate this on a 0-10 scale, where 0 means not at all influential and 10 means very influential.

**NUMERIC OPEN END from 0 to 10**

98. (Don't know)
99. (Refused)

PP1c. Why did you decide to do the work on your own without participating in the program and receiving the program's rebate money? [**ACCEPT MULTIPLE RESPONSES**]

1. (More time-consuming to perform the work through the program)
2. (Program is more expensive)
3. (Program doesn't offer the measure)
4. (I wanted to use my own contractor)
5. (I wanted to do the work myself)
6. Other [**RECORD VERBATIM**]
98. (Don't know)
99. (Refused)

## PROCESS QUESTIONS

### Marketing and Outreach

P1. Which best describes you?

1. Before learning about the Home Energy Savings program, I did not think about energy efficiency changes in my home.
2. Before learning about the Home Energy Savings program, I thought about energy efficiency changes in my home, but did not do anything.
3. Before learning about the Home Energy Savings program, I already made some changes in my home to save energy.
4. Before learning about the Home Energy Savings program, I already made major changes in my home to save energy.
98. Don't Know
99. Refused

P2. How did you *first* hear about the Home Energy Savings program? [**DO NOT READ LIST**]

1. (BROCHURE/FLYER THROUGH DIRECT MAIL)
2. (INTERNET)
3. (CUSTOMER CALLED COMED TO ASK ABOUT REDUCING ENERGY BILL)
4. (COMED REPRESENTATIVE – OTHER)
5. (CUSTOMER CALLED NICOR TO ASK ABOUT REDUCING ENERGY BILL)
6. (NICOR REPRESENTATIVE – OTHER)
7. (WORD-OF-MOUTH)
8. (CONTRACTOR REFERRAL)
9. (COMMUNITY EVENT)
10. (EI2 HOUSE PARTY)
97. (OTHER, SPECIFY)
98. (DON'T KNOW)
99. (REFUSED)

P3. Before participating, did you have any concerns or skepticism about the program and its offerings?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

**[SKIP P4 IF P2=8]**

P4. Did you reach out to the program to participate because the contractor that ultimately did your work recommended it to you?

1. Yes
2. No
98. (Don't know)
99. (Refused)

**[IF E12P=1 ASK P5-P6a]**

P5. Where you a host for an informational house party where a contractor and program staff presented information on the program?

1. Yes
2. No
98. (Don't know)
99. (Refused)

P6. On a scale of 0-10, where 10 is very influential, how influential was the house party informational session in encouraging you to participate in the program?

**[RECORD SCORE 0-10]**

98. (Don't know)
99. (Refused)

**[IF P6 > 4, ASK P6a]**

P6a. What made the house party informational session influential in encouraging you to participate in the program?

**[DO NOT READ, ACCEPT MULTIPLE RESPONSES]**

1. (UNDERSTANDING THE EXTENT OF THE WORK THE PROGRAM WOULD INVOLVE)
2. (IT WAS FREE)
3. (OVERCOMING SKEPTICISM ABOUT PROGRAM)

4. (LEARNING ABOUT THE INCENTIVES AVAILABLE THROUGH THE PROGRAM)
  5. (THIS WAS THE FIRST TIME I HEARD ABOUT THE PROGRAM)
  6. (LEARNING ABOUT THE MONEY SAVING AND COMFORT BENEFITS OF CONDUCTING ENERGY EFFICIENCY WORK)
  7. (RECEIVING PROGRAM LITERATURE AND WAYS TO FIND OUT MORE INFORMATION ABOUT THE PROGRAM)
  8. (INFLUENCE FROM SEEING POSITIVE REACTION TO THE PROGRAM FROM FRIENDS/NEIGHBORS/OTHER ATTENDEES – INCLUDING )
  9. (MEETING THE CONTRACTOR THAT WOULD DO THE WORK ON OUR HOME)
- 97OTHER: **[RECORD VERBATIM]**
98. (DON'T KNOW)
  99. (REFUSED)

P7. What were your main considerations before deciding to follow-through with energy efficiency work on your home through the program after having had a home energy assessment?

**[DO NOT READ, ACCEPT MULTIPLE RESPONSES]**

1. (Financial planning/affording the work/cost of the work)
  2. (Finding a convenient time to do the work)
  3. (Shopping around for better prices or other incentive opportunities)
  4. (Waiting to see how a friend/other participant's work turned out and their satisfaction)
97. (Other, specify)
  98. (Don't know)
  99. (Refused)

### **PRE-ASSESSMENT EE COMMITMENT, KNOWLEDGE, AND ASSESSMENT PRICING**

P8a. Thinking back to when you signed up for the home energy assessment, on a scale of 0 to 10, where 10 means very committed, how committed were you to doing some sort of energy efficiency work on your home?

**[RECORD SCORE 0-10]**

98. (Don't know)
99. (Refused)

P8b. On a scale of 0 to 10, where 10 is very knowledgeable, how knowledgeable were you about the energy efficiency work that could be done on your home prior to participating in a home energy assessment?

**[RECORD SCORE 0-10]**

98. (Don't know)

99. (Refused)

**[ASK IF AFEE=2, OTHERWISE SKIP TO P8cc]**

P8ca. Looking back to the home energy assessment and the value it provided you, would you have been willing to pay \$75 for the assessment?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

P8cb. Would you have been willing to pay \$99 for the assessment?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

P8cc **[IF AFEE=1, "Looking back to the home energy assessment and the value it provided you"]** would you have been willing to pay \$150 for the assessment?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

P8cd. How about \$200?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

P8ce. What is the most you would have paid for the assessment?

**[RECORD DOLLAR AMOUNT]**

- 98. (Don't know)
- 99. (Refused)

**SATISFACTION**

SA1. On a scale of 0 to 10, where 0 is very dissatisfied and 10 is very satisfied, how would you rate your satisfaction with... **[SCALE 0-10; 96=not applicable, 98=Don't know, 99=Refused][ROTATE ITEMS]**

- a. The process to sign up for the program

- b. The time it took to schedule the Home Energy Savings program assessment (energy audit)?
- c. The representative that visited your home to conduct the home energy assessment (energy audit)?
- d. Information you received about the program
- e. **[IF EI2P=1]** The House Party program informational session you attended
- f. The Home Energy Savings program overall?

**[ASK SA2 IF ANY SA1<=4]**

SA2. What are the reasons for your dissatisfaction with any aspect of the program?

**RECORD VERBATIM- OPEN END**

98. (Don't know)
99. (Refused)

SA3. How could the program be improved, if at all, from your perspective?

**RECORD VERBATIM- OPEN END**

98. (Don't know)
99. (Refused)

**DEMOGRAPHIC QUESTIONS**

D1. In order to help us understand our survey findings factoring in customer age ranges, would you please tell me your age range from the following list? **[READ LIST]**

1. 18-30
2. 31-40
3. 41-50
4. 51-60
5. 61-70
6. 71-80
7. 80+
98. [DON'T KNOW/NOT SURE]
99. [REFUSED]

D2. Do you own or rent your home?

1. Own
2. Rent/lease
97. (Other, specify)
98. (Don't know)
99. (Refused)

D3. In order to help us understand our survey findings better, could you please tell us what your income level is? Please stop me when I say the range that includes your total family income in 2012 before taxes.

1. UNDER \$15,000
2. \$15,000 to LESS THAN \$30,000
3. \$30,000 to LESS THAN \$50,000
4. \$50,000 to LESS THAN \$75,000
5. \$75,000 to LESS THAN \$100,000
6. Over \$100,000
98. [DON'T KNOW/NOT SURE]
99. [REFUSED]

#### **CLOSING**

Those are all the questions I have. On behalf of Nicor Gas and ComEd, thank you very much for your time. Your input will be valuable to the program in the future!

### 7.4.3 Joint HES PY2 TA Interviews

**Nicor Gas/ComEd Evaluation  
for the Home Energy Savings Program – PY2/5**

**Trade Ally Interview Guide**

FINAL September 12, 2013

Name of Interviewee: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_ Company: \_\_\_\_\_

Note: Light blue text indicates notes for interviewer.

**Depth Interview Guide – Nicor Gas/ComEd Home Energy Savings Program**

*[Note to Interviewer] The Interview Guide is a tool to guide process evaluation interviews. This guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in the program’s design and operation, i.e., where they have significant experiences for meaningful responses. The interviews may be audio recorded and transcribed.*

**Introduction**

Hi, may I please speak with [NAME]?

My name is \_\_\_ and I’m calling from Navigant Consulting, we are part of the team hired to conduct an evaluation of the Nicor Gas/ComEd Home Energy Savings Program. We’re currently in the process of conducting interviews with the program’s weatherization contractors to help improve our understanding of the program.

Our records show you are a weatherization contractor for the Nicor Gas/ComEd Home Energy Savings Program. May I speak with [PERSON LISTED AS THE PRIMARY CONTACT for the program]? *[WHEN CONTACT PERSON ANSWERS, CONFIRM THAT THIS IS THE PERSON MOST KNOWLEDGEABLE AT THEIR BUSINESS, OR GET ALTERNATE NAME AND ASK TO SPEAK WITH THAT PERSON. RESTART SCRIPT AS APPROPRIATE].*

I’d like to ask for about forty five minutes to an hour of your time to discuss your experience with the program during the past year. The information you provide

will be kept anonymous in our reports. General observations and findings will appear in our final report, but they will not be attributed to any named person or company. Is this a good time to talk? [IF NOT, SCHEDULE A CALL BACK.]

### **Company Background**

1. Can you briefly describe the company you work for and the type of business it conducts? *Potential probing questions:*
  - a. *How many are employed at the company?*
  - b. *Who are your primary business customers?*
2. Can you briefly summarize your personal roles and responsibilities at your company? For how long have you carried these out?

### **Program Influence/Sales Volume Net to Gross**

4. What effect—if any—has the low natural gas prices has on customers' willingness to participating in the program?"  
RECORD VERBATIM - CLARIFY AS NECESSARY  
888. Don't Know  
999. Refused
5. What is your sense of the size of the Do-It-Yourself Market (meaning potential participants installing weatherization measures themselves rather than calling a contractor) in the Chicagoland area? Are you aware of any assessment-only participants that may have pursued the weatherization work on their own rather than through the program?  
RECORD VERBATIM - CLARIFY AS NECESSARY  
888. Don't Know  
999. Refused

### **Baseline**

*I'm going to ask you some questions about your sales of energy-efficient equipment prior to your involvement with the program.*

B1. Prior to your involvement with the Home Energy Savings Program, did your business recommend and conduct attic insulation, air sealing, and wall insulation weatherization work?

1. (Yes, all of these)
2. (Yes, but only conducted some of the above [[RECORD WHICH AND CONTINUE TO B2 IN REFERENCE TO MEASURES THEY DID OFFER](#)])
3. (Did not conduct any of the above weatherization work prior to program participation) – SKIP TO B7
888. (Don't Know) – SKIP TO B7
999. (Refused) – SKIP TO B7

B1a. Prior to your involvement with the program, were you following BPI (Building Performance Institute) standards?

[IF B1= "Yes"]

B2. Again, thinking about work completed **prior to your involvement with the program**, about what percent of potential customers or customer leads actually followed through on implementing the following measures?

RECORD PERCENTAGE FOR EACH APPLICABLE MEASURE TYPE

888. Don't Know
999. Refused

Air Sealing:

Wall Insulation:

Attic Insulation:

Other Insulation:

B3. **Since your involvement in the program**, about what percent of your potential customers or customer leads actually choose to *implement* the following measures I will list? Please think about all your customers *including* participants in the Home Energy Savings Program as well as customers outside of the program.

RECORD PERCENTAGE FOR EACH APPLICABLE MEASURE TYPE

888. Don't Know
999. Refused

Air Sealing:

Wall Insulation:

Attic Insulation:

Other Insulation:

B4. Of those customers who implement these weatherization measures, about what percent of them are **not participants** in the Home Energy Savings Program?

RECORD PERCENTAGE FOR EACH APPLICABLE MEASURE TYPE

888. Don't Know

999. Refused

Air Sealing:

Wall Insulation:

Attic Insulation:

Other Insulation:

B4a. Why aren't they participating in the program?

B5. Using a 0 to 10 likelihood scale where 0 is NOT AT ALL LIKELY and 10 is EXTREMELY LIKELY, *if the program had not been available*, what is the likelihood that you would have implemented the same number of measures?

ENTER RATING 0 - 10

888. Don't Know

999. Refused

[IF B5 >5, ASK B5a]

B5a. Can you tell me a little bit more about what factors outside of the program are driving your weatherization work sales? [PROBE TO UNDERSTAND WHY SALES MAY BE HIGHER REGARDLESS OF THE PROGRAM]

RECORD VERBATIM - CLARIFY AS NECESSARY

888. Don't Know

999. Refused

B6. Has the total number of [air sealing/wall insulation/attic insulation] projects completed per year increased since you started participating in the program? [IF NO TO ALL MEASURES, SKIP TO C1; OTHERWISE CONTINUE FOR MEASURES THAT ARE "YES" - IT MAY BE THE SAME % ESTIMATE FOR ALL MEASURES]

Air Sealing:

Wall Insulation:

Attic Insulation:

Other Insulation:

B7. If yes - do you believe that increase in the number of projects is due to:

- a) An increased volume of potential customer leads?
- b) An increased conversion rate (i.e., more customer leads turn into actual customers doing projects)?
- c) Both of the above?
- d) Another factor (specify: \_\_\_\_\_)

**[IF B7 = A OR C, ASK B8; IF B7 = B OR C, ASK B9]**

B8. Compared to pre-program levels, how much has the volume of customer leads increased for [measure]? *[look for a % increase, if they have trouble providing an estimate explain that a 100% increase would mean that the # of leads has doubled, 50% increase would mean that for every 100 pre-program leads, they have 150 now, etc.]*

Air Sealing:

Wall Insulation:

Attic Insulation:

Other Insulation:

B9. What percentage of customer leads actually implement [measure]? *[this is the during-program conversion rate]*

Air Sealing:

Wall Insulation:

Attic Insulation:

Other Insulation:

### **Project Level Free Ridership**

C1. On a scale of 0 to 10, with 10 being the most influential, how much influence do you think *your and CSG's Energy Advisor (auditor) recommendations and technical assistance* have on your customers' decisions to select which weatherization measures to implement? Is this different for customers that you bring into the program vs. customers generally assigned to you by the program?

ENTER RATING 0 - 10 [Note differences between tagged and generally assigned customers.]

888. Don't Know

999. Refused

C2. On a scale of 0 to 10, with 10 being the most influential, how much influence do you think the *Home Energy Savings program and its incentives* have on your customers' decision to implement weatherization measures?

Is this different for customers that you bring into the program vs. customers generally assigned to you by the program?

ENTER RATING 0 - 10 [Note differences between tagged and generally assigned customers.]

888. Don't Know

999. Refused

C3. What is your best estimate of the percent of energy savings that would have been achieved, even without the program? Is this different for customers that you bring into the program vs. customers generally assigned to you by the program? [IF DIFFERENT, probe for tagged vs not tagged percentages]. [If needed for clarification] "For example, 50% means that half of the savings from the Home Energy Savings Program weatherization measures would have been achieved anyway, even if the program did not exist.]

RECORD PERCENTAGE [Note differences between tagged and generally assigned customers.]

888. Don't Know

999. Refused

### **Program Spillover**

[IF B4 < 3% FOR ALL MEASURES, SKIP TO D4, OTHERWISE CONTINUE TO D0 FOR APPLICABLE MEASURES]

D0. Earlier you had indicated that some of your customers who implement air sealing, attic insulation, and wall insulation weatherization measures do not

participate in the program. Why didn't some of your customers participate in the program?

D1a. Did your experience with the program in any way influence you to install energy efficiency measures to higher standards? [This applies to both program and out-of-program projects]

1. (Yes)
2. (No)
000. Other: (verbatim)
888. Don't Know
999. Refused

If D1a = "Yes" ask D2a – D3a]

D2a. What additional standards did you adopt?

[DO NOT READ LIST, CHECK ALL THAT APPLY, RECORD VERBATIM  
[RECORD VERBATIM]

888. Don't Know
999. Refused

D3a. On a scale of 0 to 10, where 10 is very influential, how influential was the program in encouraging you to install energy efficiency measures to higher standards.

RECORD NUMBER, 0-10

888. Don't Know
999. Refused

D1b. Did your experience with the program in any way influence you to install more energy efficient measures in your work outside of the program beyond what you would have done otherwise? I'm asking specifically about additional measures that did not receive a utility program incentive. [This applies to both program and out-of-program projects]

3. (Yes)
4. (No)
000. Other: (verbatim)
888. Don't Know
999. Refused

[If D1b = "Yes" ask D2b – D3b]

D2b. What additional efficiency measures did you implement?

[DO NOT READ LIST, CHECK ALL THAT APPLY, RECORD VERBATIM  
FOR ANYTHING NOT ON LIST]

1. Pipe Insulation
2. Attic Insulation
3. Air Sealing
4. Wall Insulation
5. Other [SPECIFY, OPEN ENDED]:
  888. Don't Know
  999. Refused

D3b. On a scale of 0 to 10, where 10 is very influential, how influential was the program in encouraging you to install additional high-efficiency measures.

RECORD NUMBER, 0-10

888. Don't Know
999. Refused

### **Non-participant Contractor Program Spillover**

E1. Do you believe that the program with its incentives is putting competitive pressure on the prices that other contractors that are not part of the program are able to charge?

1. (Yes)
2. (No)
000. Other: (verbatim)
888. Don't Know
999. Refused

[If E1 = "yes"]

E1a. [IF YES] Can you tell me what kind of effect the program is having on your competitors' pricing? [POTENTIALLY PROBE ABOUT WHETHER DROPPING PRICES EQUIVALENT TO PROGRAM INCENTIVE OF \$1750]

### **Marketing and Promotion to Customers**

7. What has worked best to attract people to participate in the program? Are there other marketing approaches you think also would be effective?
8. Do you think the program marketing and promotion efforts are reaching the right audience? [If not, why not and how to better target the right audience?]

9. Did you “tag” any participants this year, that is, were you assigned any weatherization work this year due to your direct referrals of customers to the program? How about through presenting at EI2’s informational parties? What was your experience with those approaches to program participation?
10. How were the EI2 Informational (House) Parties? –[Probe for feedback on how those worked & ways to improve \(including cost reduction opportunities, different approaches to promoting, other?\)](#). What do you think will be the effect of EI2 involvement being discontinued (impact on participation rates, depth of participation, etc.)?
11. Have you been involved in any “Reach-back” marketing to increase audit-to-project conversion rate by reaching out to customers previously audited that never took further program action? What was your experience with that effort, if any?

### **Customer Participation**

12. What do you think are some of the reasons for customers not going ahead with weatherization projects, or delaying going ahead with projects? Are there ways to improve conversion success rates and to increase project sizes? Are there any other ways Nicor Gas and ComEd get more customers to participate?
13. Do customers understand the participation process? What improvements can be made?
14. Do you have a sense of whether participants that go through the home assessment understand the reports with recommended efficiency improvements they are given? Are there any ways to improve the recommendation process for them?
15. Do customers complain about any particular aspects of the program? Do customers cancel their participation or drop out of this program? If so, why?
16. Did customers ever ask you to not install something that was in your work order for weatherization measures that could have been installed? What do you do in that situation?
17. Do you see opportunities to include other kinds of efficiency improvements in the program beyond what was available in the last program year?

18. What is your opinion of the program's invoicing and measure installation documentation practices? Are there any areas that you think could use improvement, especially to improve accurate data tracking?

### **Incentives**

19. What is your opinion of the \$1,750 incentive amount that was introduced between June 2012 and June 2013 from the original \$1250 incentive amount—Has the increase led to significantly more, some more, or the same level of interest in the program? What is the right rebate amount in your opinion to drive the most participation in a cost effective manner?
20. Audit discounting – What is the effect of discounting the cost of the program audit (from \$99 to \$49) on audit participation rates, effect on conversion to weatherization projects, and size of projects. Is there a “right” price for audits [did customers say anything about it affecting their decision to participate]?

### **Program Adjustments and Enhancements**

21. Are there elements in design, structure, and/or operation that should be modified to make the program work better (e.g., [incentive levels](#), [eligible equipment](#), etc.)? If so, what would you recommend? Why do you think this change is needed?
22. Have you had any issues installing the program's qualifying products? Please describe any issues that you think need to be addressed to improve the program in any way.
23. Are there strengths in the program that you think could be more fully exploited? [\[IF SO,\]](#) What could be done to better capitalize on the program's strengths?

### **Success and the Future of These Efforts**

24. In your summary opinion, how successful is the program? Why? What are the strengths? What are the weaknesses? Do you have any other comments or suggestions for us?

*Thank you very much for taking the time in assisting us with this evaluation. Your contribution is a very important part of the process.*

*We might follow-up with you by phone later, if additional questions arise. Would that be ok with you?*

7.5 QAQC Ride-Along Memo

## Navigant Summary of Nicor/ComEd GPY2/EPY5 HES Program QAQC Ride-Along Finding Notes

Navigant conducted two QAQC ride-alongs with two different CSG QAQC staff (different weatherization contractors, and both a new auditor and an experienced auditor) in order to verify QAQC practices and to determine how CSG's installation and persistence rate data if applicable will be used for PY2 impact calculations.

**Navigant determined that while contractor weatherization work and measures were sufficiently QAQC checked according to and as defined by the program manual, direct install measure installation verification was less consistent and not a priority during the QAQC visit.** This is actually in accordance with the program manual where there appears to be ambiguity as to when DI measures should be checked. The program manual defines two QAQC types: the assessment QAQC, and the contractor QAQC. The assessment QAQC is either done as a ride-along with new auditors, or as part of the contractor QAQC, and emphasizes review of home assessment procedures and/or verification of direct install measure installation. However, given that there is a separate outline in the manual of the contractor QAQC procedures that does not outline direct install measure verification as a priority, it is not immediately clear as to when a contractor QAQC effort should verify DI measures. That is, it's not clear when a contractor QAQC is defined as one where assessment work including DI measures should be reviewed in addition to contractor work verification procedures. As such, DI measure verification appears to not be strongly and clearly emphasized in the post-installation (contractor) QAQC effort both in the program manual, and as observed in Navigant's ride-along.

### Recommendations:

- Identify opportunities to clarify when DI measure verification should be happening during post-installation QAQCs (during all inspections? During some inspections- and, if so, during which?).

**The less thorough review of DI measures was evident in Navigant's ride-alongs with post-installation (contractor) QAQCs, which resulted in potential lost opportunities for program improvement.** QAQC staff relied on memory to recall what DI measures were installed in the particular home, and one auditor reported that they do not always check for DI measures. One of the auditors made notes on DI measures, while the other did not during the audit (but may have in the car after the audit). Both auditors found pipe insulation DI measure errors.<sup>1</sup> The first did not seem to make note of it on a form, while the other intended to fix the error before the end of the inspection, but given the other priorities, he forgot and Navigant staff did not see him take note of the error on the forms. These are both examples of the potential for making program improvements that can be lost due to some inconsistencies in defining DI measure verification procedures.

---

<sup>1</sup> In the first pipe insulation error, the auditor found that the pipe insulation was installed on the wrong portion of the pipe which made the insulation less effective- it wasn't installed on the first nine feet of pipe. In the second pipe insulation error, the auditor found that the pipe insulation was installed too close to the flue- it should not be within six inches of the flue.

### **Recommendations:**

- Have post-installation QAQC auditors review Direct Install measures against a checklist that is printed and brought on site during QAQC audit. Ensure that auditors track discrepancies such as installation errors and opportunities for education on appropriate forms.
- It appears that given the short time-frame for the QAQC visit, auditors may not have enough time to fill out the various QAQC forms they have; as a result, they may be skipping certain sections. Simplifying the forms may help (or using tablet computers to create time efficiencies, as noted by one of the auditors).

**Navigant will use CSG’s installation rate findings data for reporting; however, Navigant will also gauge direct install measure installation rates in the survey to have a comparative reference point (weatherization will be assumed to be 100%, given uninstillation is unlikely).**

If we find that there are large (>25%) discrepancies between survey installation rate findings and CSG’s reported installation rates for particular measures, there may be opportunity to further verify QAQC procedures for these measures. In particular, we would like to review the programmable thermostat education measure installation rates. Navigant’s GPY1/EPY5 survey installation rate findings were very low (about 30-40%) compared to CSG’s findings, which may have been due to customer recollection error; however, in discussing the measure with QAQC staff (one of which was an auditor as well), they reported that they either do not do the measure unless they’re installing a programmable thermostat (the QAQC staff that’s also an auditor said this) and that they wouldn’t want to program with an existing programmable thermostat for liability reasons and because of time constraints. One auditor also noted that customer engagement varies, which affects the ability to implement the measure. Thus there appears to be potential for misunderstanding for auditors as to when and how to conduct the measure, as it’s intended to be done on homes with a programmable thermostat already existing. Given that it makes up a large portion of therm savings (~20%) in PY2, it is important that we review this measure.

**Navigant will use survey findings to establish persistence rates for both DI and weatherization measures.** CSG conducts QAQC inspections too soon to use findings to establish appropriate persistence rates.

### **Summary of field observations:**

#### Ride-along #1 Summary of Relevant Findings:

- Conducted combustion analyzer and blower door tests and noted findings on QAQC forms
- Auditor noted priority in QAQC checks is doing the combustion analyzer (CAZ) checks and verifying contractor work
- Auditor inspected contractor work quality and gave immediate feedback (contractor was on site)
- Auditor did not have direct install measure list to check against (relied on memory)
- Direct Install measure verification not noted on any forms during time of audit

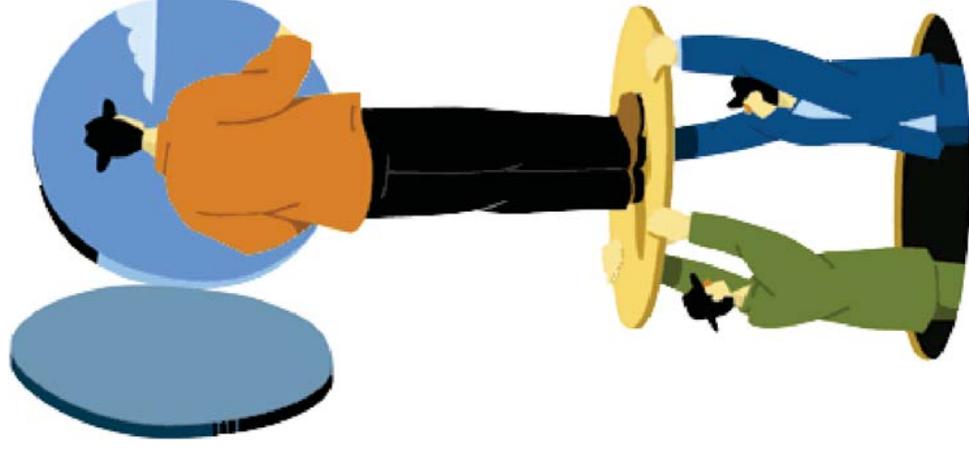
- Direct Install measure error found (pipe insulation), not noted on forms during audit (auditor said will remember to bring up in future trainings)
- Auditor said that he wouldn't want to reprogram a homeowner's existing programmable thermostats because 1) for liability reasons, and 2) they don't have enough time on the jobs to spend time explaining to a home owner how a programmable thermostat works and how to set it. [May be less familiar with it because they're not auditor staff]

#### Ride-along #2 Summary of Relevant Findings:

- Conducted combustion analyzer and blower door tests and noted findings on QAQC forms
- Inspected contractor weatherization work quality
- Auditor reports that doesn't check DI measures in every QAQC visit
- Auditor reports that doesn't go through a specific paper-based checklist of DI measures; relies on memory of what was installed upon reviewing EM Home in the car prior to visiting a site. Reports that sometimes asks homeowner if they uninstalled any items
- Auditor reviewed DI measures and took notes on QAQC form
- Auditor found pipe insulation installation error; was going to fix it before leaving but forgot
- Auditor reports that he does not enter information from QAQC form into a tracking system. Reports that if he finds a discrepancy, he makes note in QAQC form and gives it to the Field Manager
- Auditor reports homes are inspected from within a few days of the contractor work to a month or so after; this is too soon to properly gauge persistence
- Auditor reports programmable thermostat education doesn't happen often, isn't done unless programmable thermostat is installed

**7.6 Audit Pricing Data Request Presentation**

# **Nicor Gas/ComEd HES GPY2/EPY5 Audit Pricing Analysis**



January 27, 2014

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## **Navigant reviewed tracking system data to determine the comparative cost per unit of energy saved between \$99 and \$49 assessment participants to determine which pricing is more cost effective.**

- The analysis included only incentive costs - both utility and EI2 contributions - and the program management fee associated with the conversions, both of which were pulled from the tracking system extract.
- Navigant allocated EI2 incentive funding to Nicor and ComEd based on their comparative MMBTU savings ratio.
- Navigant's analysis excludes fourth quarter assessment participants because their conversions would not all have occurred in the program year.
- Two snapshots of the costs are presented:
  - ✓ Nine months GPY2/EPY5 showing EI2 contributions separately.
  - ✓ DI and weatherization-specific results for GPY2/EPY5.
- All analyses and utility-specific costs assume the current cost allocation between ComEd and Nicor Gas as reflected in the tracking system data.

**In total, the participant \$49 assessments appear more cost effective for both utilities (looking at tracking data costs only), while the \$99 assessment delivers higher conversion rates and higher per participant savings.**

### Nine Months GPY2/EPY5 Overall Assessment Cost Comparison

Participant Audit Cost	\$99	\$49	% Diff
<b>Participation</b>			
Participation (Assess-only and Full P)	1419	201	
Full Participants	571	60	
Assessment Only	848	141	
Conversion Rate *	40%	30%	
Nicor Cost	\$ 840,386	\$ 104,392	
ComEd Cost	\$ 180,236	\$ 24,136	
EI2 Cost Nicor Allocation	\$ 209,463	\$ 11,155	
EI2 Cost ComEd Allocation	\$ 25,326	\$ 1,490	
Total Nicor Cost (Nicor + EI2 Allocation)	\$ 1,049,849	\$ 115,548	
Total ComEd Cost (ComEd + EI2 Allocation)	\$ 205,562	\$ 25,626	
Therms Saved	179,067	21,617	
kWh Saved	634,916	84,661	
<b>Savings</b>			
Therms Saved per Participant	126.19	107.55	-15%
kWh Saved per Participant	447.44	421.20	-6%
<b>Nicor \$/Therm</b>	<b>\$ 4.69</b>	<b>\$ 4.83</b>	<b>3%</b>
<b>ComEd \$/kWh</b>	<b>\$ 0.28</b>	<b>\$ 0.29</b>	<b>0%</b>
EI2 \$/Therm	\$ 1.17	\$ 0.52	-56%
EI2 \$/kWh	\$ 0.04	\$ 0.02	-56%
<b>Nicor \$/Therm with EI2 Allocation</b>	<b>\$ 5.86</b>	<b>\$ 5.35</b>	<b>-9%</b>
<b>ComEd \$/kWh with EI2 Allocation</b>	<b>\$ 0.32</b>	<b>\$ 0.30</b>	<b>-7%</b>
<b>Costs per Unit of Energy Saved</b>			

\*Overall \$99 conversion rate includes some \$99 audits that occurred during the \$49 audit promotion period

\*\*Includes Nicor, Comed, and EI2 Incentive Costs and a Program Management Fee

\*\*\*Incentives and Program Management Fee

Looking separately at direct install and weatherization costs per therm saved, the assessment/direct install measures cost less per unit saved for \$49 assessments relative to \$99 audits, while weatherization measures cost more.

Nine Months GPY2/EPY5 DI and Weatherization by Assessment Cost Comparison

Participant Audit Cost		\$99	\$49	% Diff
<b>Incentive Costs</b>	DI and Assess Measure Cost Nicor	\$ 172,144	\$ 32,078	
	DI and Assess Measure Cost ComEd	\$ 62,311	\$ 11,375	
	DI and Assess Measure Cost EI2	\$ -	\$ -	
	Weath Measure Cost Nicor	\$ 668,242	\$ 72,314	
	Weath Measure Cost ComEd	\$ 117,925	\$ 12,761	
	Weath Measure Cost EI2	\$ 234,789	\$ 12,645	
	Nicor EI2 Allocation Ratio	0.89	0.88	
	ComEd EI2 Allocation Ratio	0.11	0.12	
	Weath Measure Cost Nicor with EI2 alloc	\$ 877,706	\$ 83,469	
	Weath Measure Cost ComEd with EI2 alloc	\$ 143,251	\$ 14,251	
<b>Savings</b>	DI Measure Savings therms	51,480	8,530	
	DI Measure Savings kwh	438,948	61,387	
	Weath Measure Savings therms	127,588	13,088	
	Weath Measure Savings kwh	195,968	23,274	
	Overall Savings therms	179,067	21,617	
	Overall Savings kWh	634,916	84,661	
	DI Participants	1419	201	
	Avg DI Savings/DI Participant therms	36	42	17%
	Avg DI Savings/DI Participant kWh	309	305	-1%
	Total/Full Participants	1419/571	201/60	
	<b>Avg W Savings/Total and Full Participants - therms</b>	<b>90/223</b>	<b>65/218</b>	<b>-28%/-2%</b>
	<b>Avg W Savings/Total and Full Participants - kWh</b>	<b>138/343</b>	<b>116/388</b>	<b>-16%/13%</b>
	DI + Assess \$/DI Therm Savings	\$ 3.34	\$ 3.76	12%
	DI + Assess \$/DI kWh Savings	\$ 0.14	\$ 0.19	31%
	<b>Weath \$/Weath Therm Savings</b>	<b>\$ 6.88</b>	<b>\$ 6.38</b>	<b>-7%</b>
<b>Weath \$/Weath kWh Savings</b>	<b>\$ 0.73</b>	<b>\$ 0.61</b>	<b>-16%</b>	

## **Nine months of GPY2/EPY5 data suggest that promoting the HES program with a \$49 (participant) cost is a cost-effective way to bring participants into the HES program.**

- Promoting the program with a \$49 audit offering will yield additional savings at lower cost than the \$99 price, but deliver fewer conversions with their deeper savings.
- It must be kept in mind that the data are not definitive, and repeating and expanding this analysis may make sense once the program marketing and operations are largely stable.
  - ✓ The data only reflect incentive costs and program management fees and do not include full marketing and implementation costs.
  - ✓ The program was ramping up its delivery and marketing capabilities during this period so other factors than the assessment cost may have influenced the conversion rate differences.
  - ✓ The \$49 audit offering occurred during the summer only, a traditionally low period for this program. Consequently the results could be unrepresentative of year-round results.
  - ✓ EI2 house parties were underway over this period and will not necessarily be active going forward.



#### *4.4 Multifamily Home Energy Savings*

# **Multi-Family Home Energy Savings Program GPY2 Evaluation Report**

**Final**

**Energy Efficiency Plan:  
Nicor Gas Plan Year 2  
(6/1/2012-5/31/2013)**

**Presented to  
Nicor Gas Company**

**February 26, 2014**

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**Acknowledgements**

This report includes contributions from Jeff Erickson, Kevin Grabner, Rob Neumann, Jennifer Barnes, Laura Agapay-Read and Mary Thony in addition to those individuals listed above.

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## E. Executive Summary

This report presents a summary of the findings and results from the impact evaluation of the Nicor Gas Multi-Family Home Energy Savings (MFHES) program.<sup>1</sup> The MFHES program is in the second year of joint implementation with Commonwealth Edison Company (ComEd), which is ComEd electric program year 5 (EPY5) and Nicor Gas program year 2 (GPY2).<sup>2</sup> The MFHES program achieves natural gas energy savings for Nicor Gas customers and electric energy savings for ComEd customers. This evaluation report includes program impacts for the Nicor Gas program. Separate evaluation reports include total ComEd electric impacts from all of the jointly implemented programs and natural gas impacts from the Peoples Gas and North Shore Gas programs.

The MFHES program is designed to secure energy savings through direct installation of low-cost efficiency measures, such as CFLs, water efficient showerheads and faucet aerators in residential dwelling units of eligible multi-family residences. During EPY5/GPY2, the MFHES program expanded its scope to offer direct installation measures in common areas (i.e. hallways or exterior locations) of eligible multi-family properties. The program added assisted living, senior housing and public housing market segments to eligible properties.

In March 2013, the ComEd/Nicor Gas program transitioned to a new design and delivery structure, called the Multi-Family Comprehensive Energy Efficiency Program (MCEEP).<sup>3</sup> The MCEEP provides direct install measures in residential dwelling units and common areas, as before. In addition, the new program offers technical services and financial incentives to install whole-building energy efficient measures at eligible multi-family properties. Such whole-building measures may include upgrades or improvements to central plant and HVAC systems and controls, central lighting systems and building shell improvements, among others. Honeywell Smart Grid Solutions (Honeywell) implemented the program from the beginning of the program year until the program's transition in March 2013. In March 2013, Franklin Energy Services, LLC (Franklin Energy) became the primary implementation contractor for the ComEd/Nicor Gas program. Franklin Energy is also the implementation contractor for the ComEd/Peoples Gas and North Shore Gas programs.

### E.1. Program Savings

Table E-1 includes GPY2 Nicor Gas Multi-Family program savings.

---

<sup>1</sup> In March 2013, the program expanded its scope and changed its name to the Multi-Family Comprehensive Energy Efficiency Program. For purposes of this evaluation report, the program is referred to as the Multi-Family Home Energy Savings program.

<sup>2</sup> The EPY5/GPY2 program year began June 1, 2012 and ended May 31, 2013.

<sup>3</sup> In practice, the MCEEP program continued to implement existing MFHES measures through the end of the EPY5/GPY2 program year as new MCEEP program components were being developed. Therefore, this report presents results from the complete program year in one section.

**Table E-1. GPY2 Multi-Family Program Savings**

Savings Category	Residential Units	Common Areas	Total Program
Ex-Ante Gross Savings (Therms)	602,173	25,915	628,088
Verified Gross Realization Rate	100%‡	100% ‡	100% ‡
Verified Gross Savings (Therms)	602,173	25,899	628,071
Net to Gross Ratio (NTGR)	0.96†	0.93†	0.96‡
Verified Net Savings (Therms)	578,086	24,086	602,171

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract).

† Deemed value, except for program level NTGR, which is verified net savings/verified gross savings.

‡ Based on evaluation research findings. The value of 100 is rounded.

## E.2. Program Savings by Equipment End-Use Type

Table E-2 summarizes GPY2 Nicor Gas Multi-Family Home Energy Savings Program energy savings results by measure or equipment end-use type. Water efficiency measures installed in residential dwelling units, which includes showerheads, kitchen aerators and bathroom aerators, were the measure category with the largest savings.

**Table E-2. GPY2 Multi-Family Program Savings by Measure Type**

Measure Type	Ex-Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Gross Realization Rate‡	Net-to-Gross Ratio†	Verified Net Savings (therms)
Water Efficiency Measures Residential Units	407,142	407,142	100%	0.96	390,856
Water Efficiency Measures Common Areas	3,719	3,702	99%	0.93	3,443
Programmable Thermostats Residential Units	194,780	194,780	100%	0.96	186,989
Programmable Thermostats Common Areas	1,068	1,068	100%	0.93	993
Water Heater Temperature Setback Residential Units	307	307	100%	0.96	295
Hot Water Pipe Wrap Insulation	10,122	10,122	100%	0.93	9,413
Boiler Pipe Wrap Insulation	11,007	11,007	100%	0.93	10,236
<b>TOTALS</b>	<b>628,088</b>	<b>628,071</b>	<b>100%</b>	<b>0.96</b>	<b>602,171</b>

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract).

† Deemed value, except for program level NTGR, which is verified net savings/verified gross savings.

‡ Based on evaluation research findings. The value of 100 is rounded.

### E.3. Impact Estimate Parameters

To estimate verified gross and net savings, the evaluation team used a variety of parameters in its calculations. Some of those parameters were deemed for this program year and others were adjusted based on evaluation research. The key parameters used in the analysis are shown in Table E-3.

**Table E-3. GPY2 Multi-Family Program Verified Gross and Net Savings Parameter Data Sources**

Parameter	Data Source	Deemed or Evaluated?
Measure-level NTGR	Illinois Stakeholder Advisory Group Consensus Process †	Deemed
Program-level NTGR	Calculation of Verified Net Savings/Verified Gross Savings	Evaluated
Realization Rate	Evaluation research	Evaluated
Number of measures installed	Program tracking system	Evaluated
Direct Install Showerhead	Illinois TRM, version 1.0, section 5.4.5.‡	Deemed
Direct Install Bathroom and Kitchen Aerator	Illinois TRM, version 1.0, section 5.4.4.‡	Deemed
Direct Install Programmable and Setback Thermostat	Illinois TRM, version 1.0, section 5.3.10.‡	Deemed
Water Heater Temperature Setback	Illinois TRM, version 1.0, section 5.4.6.‡	Deemed
Direct Install Hot Water Pipe Wrap Insulation	Illinois TRM, version 1.0, section 5.4.1.‡	Deemed
Common Area Showerhead	Illinois TRM, version 1.0, section 4.3.3.‡	Deemed
Common Area Bathroom and Kitchen Aerator	Illinois TRM, version 1.0, section 4.3.2.‡	Deemed
Common Area Programmable Thermostat	Implementation Contractor Records & Evaluation Research	Evaluated
Common Area Hot Water Pipe Wrap Insulation & Boiler Pipe Insulation	Implementation Contractor Records & Evaluation Research	Evaluated

† Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013.

[http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas Net-to-Gross Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/Nicor%20Gas%20Net-to-Gross%20Results%20and%20Application%20GPY1-3.pdf).

‡ State of Illinois Technical Reference Manual, final as of September 14, 2012, effective June 1, 2012;

[http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Illinois\\_Statewide\\_TRM\\_Version\\_1.0.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Illinois_Statewide_TRM_Version_1.0.pdf)

#### E.4. Impact Estimate Parameters For Future Use

Navigant conducted evaluation research into two measures that may assist the Illinois TRM Technical Advisory Committee annual updating process: steam pipe insulation and showerhead restriction valves. Additional details are included in Section 7.1 of this evaluation report.

#### E.5. Participation Information

In GPY2, Nicor Gas program participation included 15,801 residential dwelling units and 102 common areas. Overall, the program installed a total of 46,402 measures in residential dwelling units and common areas (excluding common area pipe insulations). A total of 45,961 measures were installed in residential dwelling units, including 40,221 water efficiency measures, 5,692 programmable thermostats and performed 48 water heater temperature turndowns. The program installed 441 measures in common areas, including 435 water efficiency measures and 6 programmable thermostats. In addition, the program installed 9,253 linear feet of hot water pipe wrap insulation (including all types and sizes of hot water pipe wrap and/or boiler pipe insulation) primarily in common areas. Program participation totals are shown in Table E-4.

**Table E-4. GPY2 Multi-Family Program Primary Participation Detail**

Participation	Residential Units	Common Areas	Total Program
Participants	15,801	102	15,903
Water Efficiency Measures (units)	40,221	435	40,656
Thermostats (units)	5,692	6	5,698
Water Heater Temperature Setback (units)	48	-	48
<i>Total Direct Installed Measures (w/o pipe insulation)</i>	45,961	441	46,402
Hot Water Pipe Wrap Insulation & Boiler Pipe Insulation (linear feet)	-	9,253	9,253

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract).

#### E.6. Conclusions and Recommendations

Overall, the GPY2 Multi-Family program tracking system is accurately recording measure savings and counts. The majority of program savings were from direct install measure installations in residential dwelling units, as opposed to common areas. Although the program fell short of its energy savings and participation goals in GPY2, the GPY3 program’s expanded design and delivery may enable it to achieve a higher percentage of planned energy savings.

##### Program Savings Attainment

**Finding 1.** The GPY2 Multi-Family program achieved evaluation verified net savings of 602,171 therms, which was approximately 27 percent of the program’s original net

savings target of 2,225,025 therms.<sup>4</sup> The GPY2 program achieved approximately 31 percent of the program’s revised net savings target of 1,973,894 therms<sup>5</sup>. Of the total program savings in GPY2, approximately 96 percent (578,086 verified net therms) were from measures installed in residential dwelling units.

**Recommendation 1.** None. As already planned in GPY3 to increase energy savings, the program has expanded its scope and added new offerings designed to encourage participants to implement common area measures. The implementation contractor should continue to identify common area and whole-building measure energy savings opportunities for participants.

### Verified Gross Realization Rates

**Finding 2.** The program is accurately tracking measure counts. Appropriate quality control and quality assurance procedures are in place. With minor exceptions as identified in the report, the program tracking system is accurately recording measure savings estimates based on deemed or partially deemed values from the Illinois TRM. The GPY2 Multi-Family program verified gross realization rate was 100 percent.<sup>6</sup>

**Recommendation 2.** As detailed below, Navigant recommends making minor adjustments to ex-ante measure savings for kitchen aerators and bathroom aerators installed in common areas.

### Savings Estimates

**Finding 3.** Kitchen aerators and bathroom aerators installed in common areas were the only measures with savings estimates that the evaluators changed. These measures accounted for all of the differences in the program’s ex-ante gross savings and verified gross savings.

**Recommendation 3.** The implementation contractor should make minor adjustments to ex-ante measure savings for kitchen aerators and bathroom aerators installed in common areas.

### Future Evaluation Risk

**Finding 4.** The GPY2 Multi-Family program achieved a 100 percent verified gross realization rate,<sup>7</sup> but the program design is changing in GPY3.

**Recommendation 4.** Based on GPY2 program evaluation findings, evaluation risk associated with the direct installation portion of the program is relatively limited. The GPY3 program is expanding its scope to include additional measures that have not been evaluated under the Multi-Family program, which carries some risk associated with new design and delivery mechanisms. However, this risk is somewhat mitigated by the fact that most of the measures associated with the GPY3 program have been evaluated as part of other Nicor Gas programs, including the Business Energy Efficiency Rebate program and the Business Custom program

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<sup>4</sup> The GPY2 MFHES program goals as filed in the Nicor Gas Energy Efficiency Plan 2011-2014 (Revised Plan Filed Pursuant to Order Docket No. 10-0562, Dated: May 24, 2011)”.

<sup>5</sup> Nicor Gas provided to Navigant a revised GPY2 operational goal of 1,973,894 net therms (source: Nicor Gas GPY2 Revised Goals for Evaluation, received on December 20, 2013).

<sup>6</sup> The value of 100 percent is rounded.

<sup>7</sup> Id.

and/or included in the Illinois Technical Reference Manual (IL TRM). The related measure research in the Illinois TRM, evaluation research realization rates and NTG ratios are available to calibrate ex ante savings to assure realistic projections.

## 1. Introduction

### 1.1 Program Description

This report presents a summary of the findings and results from the impact evaluation of the GPY2 Nicor Gas Multi-Family Home Energy Savings (MFHES) program.<sup>8</sup> The Multi-Family Home Energy Savings (MFHES) program is in the second year of joint implementation with Commonwealth Edison Company (ComEd), which is ComEd electric program year 5 (EPY5) and Nicor Gas program year 2 (GPY2).<sup>9</sup> This evaluation report includes total Nicor Gas impacts from the jointly implemented program. Separate evaluation reports include the electric impacts from the jointly delivered ComEd programs and the natural gas impacts of the Peoples Gas and North Shore Gas programs.

The MFHES program achieves electric energy and demand savings for ComEd customers and natural gas energy savings for customers of Nicor Gas. The MFHES program secures energy savings through direct installation of low-cost efficiency measures, such as water efficient showerheads, faucet aerators, programmable thermostats, water heater temperature setbacks and hot water pipe wrap insulation at eligible multi-family residences. A secondary objective of the program is to identify energy saving opportunities in the common areas of multi-family buildings through a brief visual inspection of common area lighting and/or central plant locations to channel customers to other programs offered by the utilities. Primary target markets for the program include property management firms, trade and professional organizations, building owners and contractors who service multi-family buildings. During EPY5/GPY2, the MFHES program expanded its scope to offer direct installation measures in common areas of eligible multi-family properties. Eligible buildings may have individual meters or master-metered systems.

In March 2013, the ComEd/Nicor Gas program transitioned to a new design and delivery structure, called the Multi-Family Comprehensive Energy Efficiency Program (MCEEP).<sup>10</sup> The MCEEP provides direct install measures in residential dwelling units and common areas, as before. In addition, the new program offers technical services and financial incentives to install whole-building energy efficient measures at eligible multi-family properties. Such whole-building measures may include upgrades or improvements to central plant and HVAC systems and controls, central lighting systems and building shell improvements, among others. These measures may be installed by contractors or by a participant's own maintenance staff. Honeywell Smart Grid Solutions (Honeywell) implemented the program from the beginning of the program year until the program's transition in March 2013. In March 2013, Franklin Energy Services, LLC (Franklin Energy) became the primary implementation

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<sup>8</sup> In March 2013, the program expanded its scope and changed its name to the Multi-Family Comprehensive Energy Efficiency Program. For purposes of this evaluation report, the program is referred to as the Multi-Family Home Energy Savings program. In EPY6/GPY3, the ComEd, Peoples Gas and North Shore Gas program expanded its scope and changed its name to the Multi-Family Comprehensive Energy Efficiency Program.

<sup>9</sup> The EPY5/GPY2 program year began June 1, 2012 and ended May 31, 2013.

<sup>10</sup> In practice, the MCEEP program continued to implement existing MFHES measures through the end of the EPY5/GPY2 program year as new MCEEP program components were being developed. Therefore, this report presents results from the complete program year in one section.

contractor for the ComEd/Nicor Gas program. Franklin Energy is also the implementation contractor for the ComEd/Peoples Gas and North Shore Gas programs.

## 1.2 Evaluation Objectives

Navigant conducted a limited verified gross impact evaluation in GPY2 because most of the MFHES program's savings were deemed based on the Illinois TRM. Navigant's previous evaluation of the jointly implemented multi-family program included a detailed review of the programs' tracking system.<sup>11</sup>

Navigant identified the following key researchable questions for the GPY2 Multi-Family program evaluation:

### 1.2.1 Impact Questions

1. What is the status of the implementation of Navigant's recommendations detailed in the team's Verification, Due Diligence and Tracking System Review memo dated May 21, 2012 (revised November 2, 2012) for ComEd/Nicor Gas?
2. What is the MFHES program's verified net and gross savings?
3. Are TRM algorithms appropriately applied and are the programs' tracking system correctly calculating and tracking deemed measure values?
4. What are the energy savings associated with new program measures, such as Showerstart™ devices or electric savings from programmable thermostats installed in residential dwelling units?<sup>12</sup>

### 1.2.2 Process Questions

Process research related to the EPY5/GPY2 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

The program evaluation plan for GPY2 included a review or development of a program logic model and program theory for the new program component implemented in GPY2,<sup>13</sup> as well as a review of multi-family program best practices. Navigant's multi-family program best practices research is presently underway and will be reported on separately in a memo and incorporated into the GPY3 evaluation report.

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<sup>11</sup> Navigant, *EPY4-GPY1 ComEd, Nicor Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL* (June 5, 2013).

<sup>12</sup> Navigant's research memorandum on Showerstart™ devices was delivered on September 6, 2013 and is included in Section 7.2.1.2. Navigant is in the process of researching potential electric savings associated with programmable thermostats installed in residential dwelling units. Evaluation research will be delivered in a separate memorandum.

<sup>13</sup> ComEd developed a program logic model and program theory for the new ComEd-Nicor Gas MCEEP program component implemented in GPY2.

## 2. Evaluation Approach

Navigant conducted a verified gross impact evaluation in GPY2 through an engineering review of per unit savings parameters and the program tracking system and data. Navigant interviewed utility program staff, consultants, and implementation contractors to verify information about the program and review the tracking system. In GPY2, the Net-to-Gross Ratio (NTGR) estimates used to calculate the Net Verified Savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG)<sup>14</sup> based on GPY1 evaluation research. The Net-to-Gross Ratio for gas measures installed in residential dwelling units was 0.96 and for measures installed in common areas was 0.93. Navigant applied the deemed program NTGR to obtain verified net savings for each program component. The program-level NTGR was obtained through evaluation research by dividing verified net savings/verified gross savings based on evaluation research findings.

### 2.1 Primary Data Collection

#### 2.1.1 Overview of Data Collection Activities

The core data collection activity was reviewing the programs' tracking system to verify that all fields are appropriately populated, as shown in the Table 2-1.

**Table 2-1. Core Data Collection Activities**

N	What	Who	Target Completes	Completes Achieved	When	Comments
<i>Impact Assessment</i>						
1	Measure Savings Review	Program Tracking System	All	All	July-August 2013	Source of information for verified gross analysis
<i>Process Assessment</i>						
2	Interviews	Program Managers/Implementer Staff	4	4	July 2013	Includes interviews with staff from ComEd, Nicor Gas and Franklin Energy

Source: Navigant

#### 2.1.2 Verified Savings Parameters

Navigant estimated verified per unit savings for each program measure using impact algorithm sources found in the Illinois TRM for deemed measures, and evaluation research for non-deemed

<sup>14</sup> Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013. [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas Net-to-Gross Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/Nicor%20Gas%20Net-to-Gross%20Results%20and%20Application%20GPY1-3.pdf).

measures. Table 2-2 below presents the sources for parameters that were used in verified gross savings analysis indicating which were examined through GPY2 evaluation research and which were deemed. For measures not included in the Illinois TRM, Navigant reviewed ex-ante values and engineering assumptions provided by the implementation contractor, including hot water pipe wrap insulation measures and boiler pipe insulation measures in building common areas.

**Table 2-2. Verified Gross and Net Savings Parameter Data Sources**

Parameter	Data Source	Deemed or Evaluated?
Measure-level NTGR	Illinois Stakeholder Advisory Group Consensus Process †	Deemed
Program-level NTGR	Calculation of Verified Net Savings/Verified Gross Savings	Evaluated
Realization Rate	Evaluation research	Evaluated
Number of measures installed	Program tracking system	Evaluated
Direct Install Showerhead	Illinois TRM, version 1.0, section 5.4.5.‡	Deemed
Direct Install Bathroom and Kitchen Aerator	Illinois TRM, version 1.0, section 5.4.4.‡	Deemed
Direct Install Programmable and Setback Thermostat	Illinois TRM, version 1.0, section 5.3.10.‡	Deemed
Water Heater Temperature Setback	Illinois TRM, version 1.0, section 5.4.6.‡	Deemed
Direct Install Hot Water Pipe Wrap Insulation	Illinois TRM, version 1.0, section 5.4.1.‡	Deemed
Common Area Showerhead	Illinois TRM, version 1.0, section 4.3.3.‡	Deemed
Common Area Bathroom and Kitchen Aerator	Illinois TRM, version 1.0, section 4.3.2.‡	Deemed
Common Area Programmable Thermostat	Implementation Contractor Records & Evaluation Research	Evaluated
Common Area Hot Water Pipe Wrap Insulation & Boiler Pipe Insulation	Implementation Contractor Records & Evaluation Research	Evaluated

† Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013.

[http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas Net-to-Gross Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/Nicor%20Gas%20Net-to-Gross%20Results%20and%20Application%20GPY1-3.pdf).

‡ State of Illinois Technical Reference Manual, final as of September 14, 2012, effective June 1, 2012;

[http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Illinois\\_Statewide\\_TRM\\_Version\\_1.0.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Illinois_Statewide_TRM_Version_1.0.pdf)

### 2.1.3 Verified Gross Program Savings Analysis Approach

Navigant reviewed the programs' tracking systems and procedures to verify that the program accurately reported measure counts. The majority of program savings were derived based on deemed values and algorithms from the State of Illinois Energy Efficiency Technical Reference Manual (Illinois TRM v1.0).<sup>15</sup> For Nicor Gas, the Illinois TRM provides the per unit savings for gas measures, with some exceptions for measures that were not included in the applicable TRM version. For measures not included in the Illinois TRM, Navigant reviewed ex-ante values and engineering assumptions provided by the implementation contractor, including steam pipe insulation measures. Verified per unit savings reflect evaluation adjustments to per unit savings values based on Navigant measure review. The verified gross savings are the product of verified per unit savings and verified measure quantities.

### 2.1.4 Verified Net Program Savings Analysis Approach

Verified net energy savings were calculated by multiplying the Verified Gross Savings estimates by a deemed Net-to-Gross Ratio (NTGR). In GPY2, the NTGR estimates used to calculate the Net Verified Savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG)<sup>16</sup> based on GPY1 evaluation research. The Net-to-Gross Ratio for gas measures installed in residential dwelling units was 0.96 and for measures installed in common areas was 0.93. Navigant applied the deemed program NTGR to obtain verified net savings for each program component. The program-level NTGR is verified net savings/verified gross savings based on evaluation research findings.

#### 2.1.4.1 Free-Ridership

The GPY2 free-ridership estimate used to calculate the NTGR was deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG) based on GPY1 evaluation research. The program evaluation plan did not include new free-ridership research during the GPY2 program year.

#### 2.1.4.2 Spillover

The GPY2 spillover estimate used to calculate the NTGR was deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG) based on GPY1 evaluation research. The program evaluation plan did not include new spillover research during the GPY2 program year.

### 2.1.5 Process Evaluation

Process research related to the EPY5/GPY2 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

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<sup>15</sup> State of Illinois Technical Reference Manual, final as of September 14, 2012, effective June 1, 2012; [http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Illinois\\_Statewide\\_TRM\\_Version\\_1.0.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Illinois_Statewide_TRM_Version_1.0.pdf)

<sup>16</sup> Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013. [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August\\_5-6,\\_2013\\_Meeting/Nicor\\_Gas\\_Net-to-Gross\\_Results\\_and\\_Application\\_GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August_5-6,_2013_Meeting/Nicor_Gas_Net-to-Gross_Results_and_Application_GPY1-3.pdf).

The program evaluation plan for GPY2 included a review or development of a program logic model and program theory for the new program component implemented in GPY2,<sup>17</sup> as well as a review of multi-family program best practices. Navigant’s multi-family program best practices research is presently underway and will be reported on separately in a memo and incorporated into the GPY3 evaluation report.

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<sup>17</sup> ComEd developed a program logic model and program theory for the new ComEd-Nicor Gas MCEEP program component implemented in GPY2.

### 3. Gross Impact Evaluation

Navigant determined that the GPY2 Multi-Family program achieved verified gross savings of 628,071 therms and a 100 percent verified gross realization rate.<sup>18</sup>

#### 3.1.1 Tracking System Review

For this evaluation, Navigant verified that the GPY2 Multi-Family program tracking system (using the Bensight Data Management platform) continued to capture relevant data required to track the program’s actions for reporting and evaluation activities. Navigant found that the programs had implemented quality assurance and quality control procedures to minimize the likelihood of data entry errors and that the programs continued to maintain or improve upon these procedures.

Over the course of the GPY2 program year, Navigant and the program implementation contractor maintained close contact regarding program tracking system updates to follow up from previous program evaluation recommendations. The implementation contractor granted Navigant direct access to the program tracking system, enabling Navigant to obtain real-time information from the tracking system. Navigant verified that the program tracking system was accurately recording measure counts. Except for a minor adjustment for programmable and setback thermostats savings values, Navigant verified that measure savings values were accurately recorded in the tracking system. Navigant’s previous evaluation of the jointly implemented multi-family programs included a detailed review of the programs’ tracking system.<sup>19</sup>

#### 3.1.2 Program Volumetric Findings

In GPY2, the Nicor Gas program participation included 15,801 residential dwelling units and 102 common areas. Overall, the program installed a total of 46,402 measures in residential dwelling units and common areas (excluding common area pipe insulations). A total of 45,961 measures were installed in residential dwelling units, including 40,221 water efficiency measures, 5,692 programmable thermostats and performed 48 water heater temperature turndowns. The program installed 441 measures in common areas, including 435 water efficiency measures and 6 programmable thermostats. In addition, the program installed 9,253 linear feet of hot water pipe wrap insulation (including all types and sizes of hot water pipe wrap and/or boiler pipe insulation) primarily in common areas. Program participation totals are shown in Table 3-1 below.

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<sup>18</sup> The value of 100 percent is rounded.

<sup>19</sup> Navigant, *EPY4-GPY1 ComEd, Nicor Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL* (June 5, 2013).

**Table 3-1. GPY2 Multi-Family Program Primary Participation Detail**

Participation	Residential Units	Common Areas	Total Program
Participants (residential dwelling units)	15,801	102	15,903
Water Efficiency Measures (units)	40,221	435	40,656
Thermostats (units)	5,692	6	5,698
Water Heater Temperature Setback (units)	48	-	48
<i>Total Direct Install Measures</i>	<i>45,961</i>	<i>441</i>	<i>46,402</i>
Hot Water Pipe Wrap Insulation & Boiler Pipe Insulation (linear feet)	-	9,253	9,253

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract).

Table 3-2 below includes GPY2 Multi-Family program volumetric detail by measure.

**Table 3-2. GPY2 Multi-Family Program Verified Quantities**

Detail	Verified Quantities
Participants (residential dwelling units and common areas)	15,903
Showerhead (Residential Unit)	12,580
Kitchen Aerator (Residential Unit)	12,111
Bathroom Aerator (Residential Unit)	15,530
<i>Sub-Total Water Efficiency Measures (Residential Units)</i>	<i>40,221</i>
Programmable Thermostat (Residential Unit)	5,692
Water Heater Temperature Setback	48
Showerhead (common area)	101
Kitchen Aerator (common area)	63
Bathroom Aerator (common area)	271
<i>Sub-total Water Efficiency Measures (common area)</i>	<i>435</i>
Programmable Thermostat (common area)	6
<i>Sub-total Direct Install Measures</i>	<i>46,402</i>
Hot Water Pipe Wrap Insulation (all types) (linear ft.)	5,379
Boiler Insulation Measures (all types) (linear ft.)	3,874
<i>Sub-total Pipe Insulation Measures (all types) (linear ft.)</i>	<i>9,253</i>
<b>Total</b>	<b>55,655</b>

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract)

Table 3-3 compares GPY2 Multi-Family program ex-ante measure counts with verified measure counts.

**Table 3-3. GPY2 Multi-Family Program Ex-Ante and Verified Measure Count**

Measure	Unit	Ex-Ante Measure Count	Verified Measure Count
Showerheads – Residential Units	Unit	12,580	12,580
Kitchen Aerators – Residential Units	Unit	12,111	12,111
Bathroom Aerators – Residential Units	Unit	15,530	15,530
Programmable Thermostat – Residential Units	Unit	5,692	5,692
Hot Water Temperature Setback	Unit	48	48
Showerheads - Common area	Unit	101	101
Kitchen Aerators - Common area	Unit	63	63
Bathroom Aerators - Common area	Unit	271	271
Programmable Thermostat - Common area	Unit	6	6
Hot Water Pipe Wrap Insulation	Linear Ft	15	15
Hot Water Pipe Wrap Insulation (Large) Common area	Linear Ft	483	483
Hot Water Pipe Wrap Insulation (Medium) Common area	Linear Ft	1,739	1,739
Hot Water Pipe Wrap Insulation (Small) Common area	Linear Ft	3,142	3,142
Boiler Pipe Wrap Insulation (Large)	Linear Ft	360	360
Boiler Pipe Wrap Insulation (Medium)	Linear Ft	1,371	1,371
Boiler Pipe Wrap Insulation (Small)	Linear Ft	2,143	2,143
<b>GPY2 Nicor Gas Total</b>		<b>55,655</b>	<b>55,655</b>

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract)

### 3.1.3 Gross Program Impact Parameter Estimates

As described in Section 2, Navigant calculated verified gross energy savings (therms) using Illinois TRM methodology and algorithms for deemed measures. Navigant verified that ex-ante measure savings were accurately recorded in the tracking system.

Navigant conducted research to validate engineering assumptions for parameter values not specified in the Illinois TRM, including programmable thermostats installed in building common areas, hot water pipe wrap insulation measures and boiler pipe wrap insulation measures in building common areas, which were supplied by the program’s implementation contractor.<sup>20</sup> Navigant reviewed the implementation contractor’s engineering input assumptions and determined that these engineering

<sup>20</sup> Integrys\_Master\_Measure\_Document 010213.xls (see spreadsheet Tab 31: MF Common Area Pipe Wrap).

assumptions were reasonable. While Navigant made no adjustments to ex-ante savings for hot water pipe wrap insulation measures and boiler pipe wrap insulation measures in building common areas, Navigant recommends further research to validate engineering assumptions, as documented in this report's findings and recommendations. Additional evaluation research is included in Section 7.2.1.1.

Navigant's research indicates that installing a thermostatically initiated shower restriction valve (i.e. Showerstart™ device) on a showerhead can potentially save an additional 4.2 therms/yr in multi-family homes, although additional research is required. Additional evaluation research is included in Section 7.2.1.2.

Navigant calculated verified gross energy savings (therms) using measure savings values identified in Table 3-4 below. Navigant made minor adjustments to ex-ante measure savings values for bathroom and kitchen aerators installed in common areas, which accounted for the entire difference between ex-ante gross savings and verified gross savings.<sup>21</sup>

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<sup>21</sup> Ex-ante measure savings values for bathroom and kitchen aerators installed in common areas was 4.59 therms/unit. Navigant calculated verified gross savings of 4.54 therms/unit. The difference in these measure savings values accounted for the entire difference between ex-ante gross savings and verified gross savings, which was 17 therms.

**Table 3-4. GPY2 Multi-Family Program Ex-Ante and Verified Gross Savings Parameters**

Measure	Ex-Ante Gross Savings (Therms/Unit)	Verified Gross Savings (Therms/Unit)	Method	Source (IL-TRM)
Showerheads	26.21	26.21	Deemed	v1.0 section 5.4.5
Kitchen Aerators	2.52	2.52	Deemed	v1.0 section 5.4.4
Bathroom Aerators	3.02	3.02	Deemed	v1.0 section 5.4.4
Hot Water Pipe Wrap Insulation	0.91	0.91	Deemed	v1.0 section 5.4.1
Programmable Thermostat	34.21	34.21	Deemed	v1.0 section 5.3.10
Water Heater Temperature Setback	6.40	6.40	Deemed	v1.0 section 5.4.6
Common Area Showerheads	21.64	21.64	Deemed	v1.0 section 4.3.3
Common Area Kitchen Aerators	4.59	4.54	Deemed	v1.0 section 4.3.2
Common Area Bathroom Aerators	4.59	4.54	Deemed	v1.0 section 4.3.2
Common Area Programmable Thermostat	178.00	178.00	Evaluated	engineering inputs from implementation contractor
Hot Water Pipe Wrap Insulation (Large) Common area	4.49	4.49	Evaluated	
Hot Water Pipe Wrap Insulation (Medium) Common area	2.56	2.56	Evaluated	
Hot Water Pipe Wrap Insulation (Small) Common area	1.11	1.11	Evaluated	

Measure	Ex-Ante Gross Savings (Therms/Unit)	Verified Gross Savings (Therms/Unit)	Method	Source (IL-TRM)
Boiler Pipe Wrap Insulation (Large)	6.59	6.59	Evaluated	
Boiler Pipe Wrap Insulation (Medium)	3.75	3.75	Evaluated	
Boiler Pipe Wrap Insulation (Small)	1.63	1.63	Evaluated	

Source: State of Illinois Technical Reference Manual, final as of September 14, 2012, effective June 1, 2012; [http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Illinois\\_Statewide\\_TRM\\_Version\\_1.0.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Illinois_Statewide_TRM_Version_1.0.pdf)

### 3.1.4 Development of the Verified Gross Realization Rate

The verified gross realization rate is the ratio of verified gross savings to ex-ante gross savings from the program tracking system. Navigant calculated verified gross energy savings (therms) using Illinois TRM methodology and algorithms and engineering analysis. Navigant applied verified measure quantities found in the program tracking systems in Table 3-3 to per unit measure savings values as displayed in Table 3-4 to calculate verified gross savings.

As shown in Table 3-5, Nicor Gas GPY2 program achieved verified gross energy savings of 628,071 therms and a realization rate of 100 percent.<sup>22</sup> Verified gross savings were the same as ex-ante gross savings with the exception of kitchen aerators and bathroom aerators installed in common areas, as described in Section 3.1.3.

<sup>22</sup> Realization rate = verified gross / ex-ante gross from the tracking system. The value of 100 is rounded.

**Table 3-5. GPY2 Multi-Family Program Ex-Ante and Verified Gross Savings by Measure**

Measure	Ex-Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Gross Realization Rate
Showerheads (IU)	329,722	329,722	100%
Kitchen Aerators (IU)	30,520	30,520	100%
Bathroom Aerators (IU)	46,901	46,901	100%
Programmable Thermostat (IU)	194,723	194,723	100%
Hot Water Temperature Setback	307	307	100%
Showerheads - common area	2,186	2,186	100%
Kitchen Aerators - common area	289	286	99%
Bathroom Aerators - common area	1,244	1,230	99%
Programmable Thermostat - common area	1,068	1,068	100%
Hot Water Pipe Wrap Insulation	14	14	100%
Hot Water Pipe Wrap Insulation (Large) Common area	2,169	2,169	100%
Hot Water Pipe Wrap Insulation (Medium) Common area	4,452	4,452	100%
Hot Water Pipe Wrap Insulation (Small) Common area	3,488	3,488	100%
Boiler Pipe Wrap Insulation (Large)	2,372	2,372	100%
Boiler Pipe Wrap Insulation (Medium)	5,141	5,141	100%
Boiler Pipe Wrap Insulation (Small)	3,493	3,493	100%
<b>GPY2 Nicor Gas Total</b>	<b>628,088</b>	<b>628,071</b>	<b>100%</b>

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract).

### 3.1.5 Verified Gross Program Impact Results

As shown in Table 3-6 below, the GPY2 Multi-Family program reported ex-ante gross energy savings of 628,088 therms. Evaluation adjustments described in the sections above resulted in evaluation verified gross energy savings of 628,071 therms. Savings by program measure end-use are included in the following table.

**Table 3-6. GPY2 Multi-Family Program Verified Gross Impact Savings by End-Use**

	Sample	Gross Energy Savings (Therms)	90/10 Significance?
<b>Residential Unit Measures</b>			
Ex-Ante Gross Savings		602,173	
Verified Gross Realization Rate‡	NA†	100%	NA†
Verified Gross Savings		602,173	
<b>Common Area Measures</b>			
Ex-Ante Gross Savings		25,915	
Verified Gross Realization Rate‡	NA†	100%	NA†
Verified Gross Savings		25,899	
<b>GPY2 Multi-Family Program Total</b>			
Ex-Ante Gross Savings		628,088	
Verified Gross Realization Rate‡	NA†	100%	NA†
Verified Gross Savings		628,071	

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract).

†NA when the TRM determines the gross savings.

‡ Based on evaluation research findings. The value of 100 is rounded.

#### 4. Net Impact Evaluation

Navigant calculated verified net savings of 602,171 therms for the GPY2 Multi-Family program. The Net-to-Gross Ratio (NTGR) estimates used to calculate the Net Verified Savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG)<sup>23</sup> based on GPY1 evaluation research. The Net-to-Gross Ratio for gas measures installed in residential dwelling units was 0.96 and for measures installed in common areas was 0.93. Navigant applied the deemed program NTGR to obtain verified net savings for each program component. The program-level NTGR is verified net savings/verified gross savings based on evaluation research findings. As noted in Section 2.1.4, the GPY2 evaluation plan did not include new free-ridership or spillover research.

Navigant calculated verified net savings of 602,171 therms for the GPY2 Multi-Family program, as indicated in Table 4-1 below. As indicated in the table below, measure savings are derived from the Illinois TRM and engineering analysis of program population-level data, so sample size and statistical significance are not applicable. The table presents savings at the measure group level including groups where the NTGR estimate is not statistically significant at the 90/10 level.

**Table 4-1. GPY2 Multi-Family Program Savings by End-Use Type**

	Sample	Energy Savings (Therms)	90/10 Significance?
<b>Residential Unit Installation</b>			
Ex-Ante Gross Savings	NA†	602,173	NA†
Verified Gross Realization Rate‡		100%	
Verified Gross Savings		602,173	
Net-to-Gross Ratio (NTGR)*		0.96	
Verified Net Savings		578,086	
<b>Common Area Installation</b>			
Ex-Ante Gross Savings	NA†	25,915	NA†
Verified Gross Realization Rate‡		100%	
Verified Gross Savings		25,899	
Net-to-Gross Ratio (NTGR)*		0.93	
Verified Net Savings		24,086	
<b>GPY2 Multi-Family Program Total</b>			
Ex-Ante Gross Savings	NA†	628,088	NA†
Verified Gross Realization Rate‡		100%	
Verified Gross Savings		628,071	
Net-to-Gross Ratio (NTGR)*		0.96	
Verified Net Savings		602,171	

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract). †NA when the TRM determines the gross savings.

‡ Based on evaluation research findings. The value of 100 is rounded.

\* Deemed values, except for program level NTGR, which is verified net savings/verified gross savings.

<sup>23</sup> Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013.

[http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas Net-to-Gross Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/Nicor%20Gas%20Net-to-Gross%20Results%20and%20Application%20GPY1-3.pdf).

Ex-Ante Gross, Verified Gross savings and Verified Net savings by measure type are included in Table 4-2 below.

**Table 4-2. GPY2 Multi-Family Program Savings by Measure Type**

Measure Type	Ex-Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Gross Realization Rate <sup>‡</sup>	Net-to-Gross Ratio <sup>†</sup>	Verified Net Savings (therms)
Water Efficiency Measures Residential Units	407,142	407,142	100%	0.96	390,856
Water Efficiency Measures Common Areas	3,719	3,702	99%	0.93	3,443
Programmable Thermostats Residential Units	194,780	194,780	100%	0.96	186,989
Programmable Thermostats Common Areas	1,068	1,068	100%	0.93	993
Water Heater Temperature Setback Residential Units	307	307	100%	0.96	295
Hot Water Pipe Wrap Insulation	10,122	10,122	100%	0.93	9,413
Boiler Pipe Wrap Insulation	11,007	11,007	100%	0.93	10,235
<b>TOTALS</b>	<b>628,088</b>	<b>628,071</b>	<b>100%</b>	<b>0.96</b>	<b>602,171</b>

Source: Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract).

<sup>†</sup> Deemed value, except for program level NTGR, which is verified net savings/verified gross savings.

<sup>‡</sup> Based on evaluation research findings. The value of 100 is rounded.

#### 4.1.1 Program Planned v. Actual Accomplishments

The GPY2 Multi-Family program achieved evaluation verified net savings of 602,171 therms, which was approximately 27 percent of the program’s filed net savings target of 2,225,025 therms.<sup>24</sup> Table 4-3 below includes GPY2 planned and actual detail.

<sup>24</sup> The GPY2 MFHES program goals as filed in the Nicor Gas Energy Efficiency Plan 2011-2014 (Revised Plan Filed Pursuant to Order Docket No. 10-0562, Dated: May 24, 2011)”.

**Table 4-3. GPY2 Multi-Family Program Planned v. Actual Detail**

Detail	GPY2 Planned	GPY2 Actual	Planned v. Actual
Participants (residential dwelling units)	55,000	15,801	29%
Verified Net Savings (therms)	2,225,025	602,171	27%

Source: Nicor Gas Rider 30 EEP Program Portfolio Operating Plan, 1/24/2013; Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract); ICC Quarterly Report 4th Quarter PY2 Final

The GPY2 Multi-Family program achieved evaluation verified net savings of 602,171 therms, which was approximately 31 percent of the program’s revised filed net savings target of 1,973,894 therms.<sup>25</sup> Table 4-4 below includes GPY2 planned and actual detail.

**Table 4-4. GPY2 Multi-Family Program Planned (Revised) v. Actual Detail**

Detail	GPY2 Planned (Revised)	GPY2 Actual	Planned v. Actual
Participants (residential dwelling units)	n/a	15,801	n/a
Verified Net Savings (therms)	1,973,894	602,171	31%

Source: Rider 30 EEP Program Portfolio Operating Plan, v1.1; Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract); ICC Quarterly Report 4th Quarter PY2 Final

Table 4-5 below includes a comparison of GPY1 Multi-Family program detail against GPY2 Multi-Family program detail. The program installed measures at 15,801 residential dwelling units, approximately 36% fewer units than the previous year. In GPY2, the volume of participating residential dwelling units decreased by approximately one-third. Participation decreased from 24,744 residential dwelling units in GPY1 to 15,801 residential dwelling units in GPY2. The program saw a similar drop in the number of energy efficiency measures installed.

**Table 4-5. Multi-Family Program Yearly Comparison**

Detail	GPY1	GPY2	Year over Year Difference
Participants (Residential Dwelling Units)	24,744	15,801	64% (-36%)
Total Installed Measures	80,541	55,655	69% (-31%)
Verified Net Savings (therms)	959,087	602,171	63% (-37%)

Source: Nicor Gas Rider 30 EEP Program Portfolio Operating Plan, 1/24/2013; Navigant analysis of GPY2 Multi-Family program tracking data (August 27, 2013 data extract); Navigant EPY4-GPY1 ComEd, Nicor Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL (June 5, 2013)

<sup>25</sup> Nicor Gas provided to Navigant a revised GPY2 operational goal of 1,973,894 net therms (source: Nicor Gas GPY2 Revised Goals for Evaluation, received on December 20, 2013).

## 5. Process Evaluation

Process research related to the EPY5/GPY2 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

The program evaluation plan for GPY2 included a review or development of a program logic model and program theory for the new program component implemented in GPY2,<sup>26</sup> as well as a review of multi-family program best practices. Navigant's multi-family program best practices research is presently underway and will be reported on separately in a memo and incorporated into the GPY3 evaluation report.

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<sup>26</sup> ComEd developed a program logic model and program theory for the new ComEd-Nicor Gas MCEEP program component implemented in GPY2.

## 6. Conclusions and Recommendations

Overall, the GPY2 Multi-Family program tracking system is accurately recording measure savings and counts. The majority of program savings were from direct install measure installation in residential dwelling units, as opposed to common areas. Although the program fell short of its energy savings and participation goals in GPY2, the GPY3 program's expanded design and delivery may enable it to achieve a higher percentage of planned energy savings. In GPY2, the Net-to-Gross Ratios used to calculate the Net Verified Savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group<sup>27</sup> based on GPY1 evaluation research. The Net-to-Gross Ratio for gas measures installed in residential dwelling units was 0.96 and for measures installed in common areas was 0.93. Navigant applied the deemed program NTGR to obtain verified net savings for each program component. The program-level NTGR is verified net savings/verified gross savings based on evaluation research findings.

### Program Savings Attainment<sup>28</sup>

**Finding 1.** The GPY2 Multi-Family program achieved evaluation verified net savings of 602,171 therms, which was approximately 27 percent of the program original savings goal of 2,225,025 net therms.<sup>29</sup> The program achieved approximately 31 percent of the program revised savings goal of 1,973,894 net therms<sup>30</sup>. Of the total program savings in GPY2, approximately 96 percent (578,086 verified net therms) were from measures installed in residential dwelling units.

**Recommendation 1.** None. As already planned in GPY3 to increase energy savings, the program has expanded its scope and added new offerings designed to encourage participants to implement common area measures. The implementation contractor should continue to identify common area and whole-building measure energy savings opportunities for participants.

### Verified Gross Realization Rates

**Finding 2.** The program is accurately tracking measure counts. Appropriate quality control and quality assurance procedures are in place. With minor exceptions as identified in the report, the program tracking system is accurately recording measure savings estimates based on deemed or partially deemed values from the Illinois TRM. The GPY2 Multi-Family program verified gross realization rate was 100 percent.<sup>31</sup>

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<sup>27</sup> Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013. [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August\\_5-6,\\_2013\\_Meeting/Nicor\\_Gas\\_Net-to-Gross\\_Results\\_and\\_Application\\_GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August_5-6,_2013_Meeting/Nicor_Gas_Net-to-Gross_Results_and_Application_GPY1-3.pdf).

<sup>28</sup> Findings and recommendations 1, 2, 3, 5 and 6 also appear in the Executive Summary.

<sup>29</sup> The GPY2 MFHES program goals as filed in the Nicor Gas Energy Efficiency Plan 2011-2014 (Revised Plan Filed Pursuant to Order Docket No. 10-0562, Dated: May 24, 2011)".

<sup>30</sup> Nicor Gas provided to Navigant a revised GPY2 operational goal of 1,973,894 net therms (source: Nicor Gas GPY2 Revised Goals for Evaluation, received on December 20, 2013).

<sup>31</sup> The value of 100 percent is rounded.

**Recommendation 2.** As detailed below, Navigant recommends making minor adjustments to ex-ante measure savings for kitchen aerators and bathroom aerators installed in common areas.

### Savings Estimates

**Finding 3.** Kitchen aerators and bathroom aerators installed in common areas were the only measures with savings estimates that the evaluators changed. These measures accounted for all of the differences in the program’s ex-ante gross savings and verified gross savings.

**Recommendation 3.** The implementation contractor should make minor adjustments to ex-ante measure savings for kitchen aerators and bathroom aerators installed in common areas.

**Finding 4.** Navigant’s research indicates that installing a thermostatically initiated shower restriction valve (i.e. Showerstart™ device) on a showerhead can potentially save an additional 4.2 therms/yr in multi-family homes, although additional research is required.

**Recommendation 4.** Additional evaluation research findings detailed recommendations are included in Section 7.2.1.2.

### Future Evaluation Risk

**Finding 5.** The GPY2 Multi-Family Program achieved a 100 percent verified gross realization rate,<sup>32</sup> but the program design is changing in GPY3.

**Recommendation 5.** Based on GPY2 program evaluation findings, evaluation risk associated with the direct installation portion of the program is relatively limited. The GPY3 program is expanding its scope to include additional measures that have not been evaluated under the Multi-Family program, which carries some risk associated with new design and delivery mechanisms. However, this risk is somewhat mitigated by the fact that most of the measures associated with the GPY3 program have been evaluated as part of other Nicor Gas programs, including the Business Energy Efficiency Rebate program and the Business Custom program and/or included in the Illinois Technical Reference Manual (IL TRM). The related measure research in the Illinois TRM, evaluation research realization rates and NTG ratios are available to calibrate ex ante savings to assure realistic projections.

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<sup>32</sup> The value of 100 percent is rounded.

## 7. Appendix

### 7.1 Glossary.

#### High Level Concepts

##### Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 through May 31, 2009, EPY2 is June 1, 2009 through May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 through May 31, 2012, GPY2 is June 1, 2012 through May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

##### Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY5/GPY2 the Illinois TRM was in effect and was the source of most deemed parameters. Some of ComEd's deemed parameters were defined in its filing with the ICC but the TRM takes precedence when parameters were in both documents.

**Application:** When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retrocommissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

##### Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

**Application:** When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retrocommissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in

the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

### Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times research NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ “Energy” and “Demand” may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.

§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the “Terms to be Used in Reports” column).

## Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

**Deemed Value** – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a deemed measure shall use the superscript “D” (e.g., delta watts<sup>D</sup>, HOU-Residential<sup>D</sup>).

**Non-Deemed Value** – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript “E” for “evaluated” (e.g., delta watts<sup>E</sup>, HOU-Residential<sup>E</sup>).

**Default Value** – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript “DV” as in X<sup>DV</sup> (meaning “Default Value”).

**Adjusted Value** – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript “AV” as in X<sup>AV</sup>.

## Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012<sup>33</sup>.

**Evaluation:** Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification, measure level research, and program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

*Synonym:* **Evaluation, Measurement and Verification (EM&V)**

**Measure Level Research:** An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific

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<sup>33</sup> IL-TRM\_Policy\_Document\_10-31-12\_Final.docx

research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

**Program Level Research:** An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

**Savings Verification:** An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

**Measure Type:** Measures are categorized into two subcategories: custom and prescriptive.

**Custom:** Custom measures are not covered by the TRM and a Program Administrator’s savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator’s business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

**Prescriptive:** The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

**Fully Deemed:** Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

**Partially Deemed:** Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

**Customized basis:** Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

## 7.2 Detailed Impact Research Findings and Approaches

Navigant conducted evaluation research into two measure categories: 1) steam pipe insulation measures and 2) a thermostatically initiated shower restriction valve on a showerhead. Navigant is including this information in evaluation reports to ComEd, Nicor Gas and Peoples Gas and North Shore Gas for their reference.

### 7.2.1 Gross Impact Results

#### 7.2.1.1 Steam Pipe Insulation Measures

As written in Section 3.1.3, Navigant conducted research to validate engineering assumptions for parameter values not specified in the IL TRM, including steam pipe insulation measures in building common areas, which were supplied by the program’s implementation contractor.<sup>34</sup> Navigant used the algorithm presented in Figure 7-1 below to calculate verified gross savings for steam pipe insulation measures.

#### Figure 7-1. Verified Gross Savings Algorithm – Steam Pipe Insulation

$$\begin{aligned} \text{Verified Gross Annual Therm Savings per Foot} \\ = ((Q_{\text{base}} - Q_{\text{eff}}) * \text{HOURS}) / (100,000 * \eta_{\text{Boiler}}) * \text{CF} \end{aligned}$$

**Where:**

- $Q_{\text{base}}$  = Heat Loss from Bare Pipe (Btu/hr/ft). See Table 7-1 below.
- $Q_{\text{eff}}$  = Heat Loss from Insulated Pipe (Btu/hr/ft). See Table 7-1 below.
- Hours = Annual operating hours (actual or defaults by piping use and building type)
- 100,000 = conversion factor (1 Therm = 100,000 Btu)
- $\eta_{\text{Boiler}}$  = Efficiency of the boiler being used to generate the hot water or steam in the pipe (=80.7% for steam boilers)
- CF = Heat loss correction factor of 0.67

Navigant reviewed steam pipe insulation measure savings inputs from the program implementation contractor. The implementation contractor developed heat loss estimates ( $Q_{\text{base}}$  and  $Q_{\text{eff}}$ ) using the 3E Plus v4.0 software program<sup>35</sup>. The energy savings analysis is based on engineering assumptions using an average of 1.5-inch insulation around bare pipe. Details of the input parameters to 3E plus used to develop savings estimates are shown in Table 7-1 below.

<sup>34</sup> Integrys\_Master\_Measure\_Document 010213.xlsx (see spreadsheet Tab 31: MF Common Area Pipe Wrap).

<sup>35</sup> 3E Plus is a heat loss calculation software provided by the NAIMA (North American Insulation Manufacturer Association).

**Table 7-1. Steam Pipe Insulation Savings Parameters**

Parameter	Value	Data Source
R value of pipe insulation	5.0 (1.5 inches of insulation with K of 0.27)	IECC 2009
DI-R value of pipe insulation	3.0 (1.5 inches of insulation with K of 0.28)	IECC 2009
Linear feet of pipe	1	Standard value
Pipe temperature	225 F	Engineering assumption
Ambient temperature	75F	Engineering assumption
Combustion Efficiency	80.7%	Engineering assumption
Nominal Pipe Size	Varies	Engineering assumption
BTU loss/hr, uninsulated	Varies	Calculation using 3E Plus
BTU loss/hr, insulated	Varies	Using 3E Plus
BTU loss/hr, savings	Varies	Using 3E Plus
Hours of Operation/year	4,963	TMY3 Weather Data from O'Hare Int'l Airport
Heat Loss Correction Factor	0.67	Engineering Assumption
BTU/therm Conversion Factor	100,000	Standard value
Therms/year saved	Varies	Calculation
DI-Therms/year saved	Varies	Calculation
Nominal Therms/year saved	Varies (Average of all pipe sizes)	Calculation
DI-Nominal Therms/year saved	Varies (Average of all pipe sizes)	Calculation

Source: Navigant analysis of Integrys\_Master\_Measure\_Document 010213.xlsx

### 7.2.1.2 Thermostatically Initiated Shower Restriction Valve

Navigant conducted research to identify possible energy savings associated with installing a thermostatically initiated shower restriction valve on a showerhead.<sup>36</sup> The specific device with shower restriction valve technology available in the retail market is under the trademarked name “ShowerStart™.” Navigant’s research indicates that installing ShowerStart devices can potentially save an additional 4.2 therms/yr or 84 kWh/yr in multi-family homes. Presuming that the installation of a 1.5 GPM water efficient showerhead provides a baseline case for the ShowerStart device, Navigant’s estimates in the table below do not include water/energy savings from installing a 1.5 GPM water efficient showerhead at the water source.

<sup>36</sup> Navigant’s evaluation research was distributed to interested parties in a separate memorandum dated September 6, 2013. The memorandum includes research into both electric and natural gas savings associated with the measure. The entire memorandum is replicated in this section.

**To:** Interested Parties in Illinois  
**From:** Multi-Family Program Evaluation Team  
**Date:** September 6, 2013  
**Subject:** Research Energy Savings From Thermostatic Shower Restriction Valves

### Executive Summary

The purpose of this memo is to present research on potential energy and water savings from installing a thermostatically initiated shower restriction valve on a showerhead. Navigant’s research focused on a unique and patented shower restriction valve technology available in the retail market called ShowerStart™ [1]. This device has been tested to provide energy and water savings in other jurisdictions, and thus serves as a basis for preliminary research on the device’s operation and potential savings for Illinois utility energy efficiency programs.

The Table 7-2 below presents a summary of potential savings from installing ShowerStart on a previously installed 1.5 gallons per minute (GPM) water efficient showerhead. Presuming that the installation of a 1.5 GPM water efficient showerhead provides a baseline case for the ShowerStart device, Navigant’s estimates in the table below do not include water/energy savings from installing a 1.5 GPM water efficient showerhead at the water source. Navigant’s research indicates that installing ShowerStart devices can potentially save an additional 3.2 therms/yr or 75 kWh/yr in single family homes and 4.2 therms/yr or 84 kWh/yr in multi-family homes. These additional savings can result in a 2.3 year simple payback for electric water heat and a 4.6 year simple payback for gas water heat in multi-family homes.

**Table 7-2. Potential Savings from Installing ShowerStart on 1.5 GPM Showerhead**

ShowerStart Savings Calculations	Single Family	Multi-Family
Water savings (gallons/yr/ShowerStart)	588	664
Electric Energy Savings (kWh/yr/ShowerStart)	75	84
Peak Demand savings (kW/yr/ShowerStart)	0.005	0.007
Gas energy savings (therms/yr/ShowerStart)	3.2	4.2
Simple Payback Period	2.3 years electric water heater 4.6 years gas water heater	

*Source: Navigant*

### ShowerStart™ Technology Description

As illustrated in Figure 7-2 below, the ShowerStart device is described by the manufacturer as a “compact, thermostatic valve that automatically pauses a shower’s water flow once it reaches bathing temperature” [2]. The thermostatic valve can be installed in-between the shower arm and existing showerhead, and it is expected to detect when near-bathing-temperature water (95F/35C) arrives at the shower head.

**Figure 7-2. Depiction of ShowerStart Device**



Source: [www.showerstart.com](http://www.showerstart.com)

Once installed and operational, the device is expected to automatically reduce the showerhead’s flow to a trickle, and as a result prevent hot water from unintentionally running down the drain while the user is away. When ready to begin showering, the user can pull the thermostatic valve’s fob to resume normal showerhead flow [3].

**Water Savings Potential and Calculation**

The potential to reduce hot water waste and produce energy savings from a shower restriction device depends primarily on accurate estimation of the time hot water arrives at the shower and the time an individual enters the shower. Limited information exists on how much hot water is avoided or wasted before a user gets into the shower after installing the device, and accordingly how long the wasted hot water is left to run. From a few available surveys and research studies on the functions of shower restriction devices, we can estimate the total time that passes between turning on the shower and entering the shower (pre-retrofit warm up wait time out of the shower spent on bathroom activities), and how much time it takes before the hot water arrives at the shower (cold water warm-up time). The difference between these two estimates represents the hot water wait time that could be prevented due to installation of the shower restriction device.

Table 7-3 below provides average estimates of the hot water wait time deduced from residential shower behavior studies. ShowerStart LLC estimates that total warm-up wait activities will take about 106 seconds to complete, while it takes 46 seconds for warm water to arrive at the shower, resulting in 60 seconds of hot water waste time that could have been prevented with the use of the ShowerStart device. Based on the results from a pilot study conducted by California’s City of San Diego Water Department, an average of 52 seconds of hot water waste time can be deduced [4]. The Pacific Gas and Electric Company (PG&E) relied on what they considered to be a conservative value of 34 seconds hot water waste time to calculate the potential savings from shower restriction devices in their service territory [5].

**Table 7-3. Estimates of Avoided Shower Hot Water Waste Time**

Study Type	Hot Water Waste Time (sec)	Sources (See reference section for study reports)
Survey	60	ShowerStart LLC
Survey	52	City of San Diego Water Department
Work Paper PGECODHW113	34	Pacific Gas and Electric Company (PG&E)

Sources: please see reference section

ShowerStart LLC estimated each ShowerStart installed in a typical single family home with 3 persons could yield up to 2700 gallons of water savings annually (assuming a 2.5 GPM showerhead). The City of San Diego estimated 2400 gallons annual savings for a similar household size. The PG&E conducted a more in depth analysis and came up with estimates for low flow 1.6 GPM showerheads, and estimated 296 gallons annual water savings for single family homes, and 435 gallons for multi-family homes.

It is important to note that it is possible the ShowerStart device may not realize any savings. A typical example would be a situation where an individual has a habit of opening the bath faucet during the warm up time, such that the showerhead is used immediately when the water temperature is deemed warm enough to start shower.

**Engineering Estimate of Water Savings from Using ShowerStart**

Using the Illinois TRM section 5.4.5, Navigant applied savings assumptions and algorithm for the showerhead replacement measure to estimate potential water and energy savings from installing a ShowerStart device. As shown in Table 7-4 below, savings estimates have been provided for both 2.67 GPM base flow showerheads and 1.5 GPM low flow efficient showerheads in single family and multi-family homes [6].

**Calculations:**

Annual Water Savings from ShowerStart = Avoided annual water use from showerhead

Water savings for 2.67gpm showerhead installed with ShowerStart = [((GPM\_base\_SS \* L\_showerstart) \* Household \* SPCD \* 365.25 / SPH) \* ISR\_ss]

Avoided water savings for 1.5gpm low flow showerhead installed with ShowerStart = [((GPM\_low\_SS \* L\_showerstart) \* Household \* SPCD \* 365.25 / SPH) \* ISR\_ss]

Where:

GPM\_base\_SS= Flow rate of the base case showerhead with ShowerStart (2.67 for direct install)

GPM\_low\_SS= As-used flow rate of the low-flow showerhead with ShowerStart (used 1.5GPM)

Household= Average number of people per household (2.56 for single family, and 2.1 for multi-family)

SPCD= Showers Per Capita Per Day (0.75)

365.25= Days per year, on average.

SPH= Showerheads Per Household (1.79 for single family, and 1.3 for multi-family)

ISR<sub>ss</sub>= In Service Rate of ShowerStart device (assumed 100%)

L<sub>showerstart</sub>= Hot water waste time avoided due to ShowerStart (60 seconds) per shower

For the purpose of this engineering estimate, we assumed on average 60 seconds of hot water waste time is avoided for installing thermostatic shower restriction device. This value is subject to review upon further detailed studies conducted within Illinois residential facilities to understand household shower behavior and the amount of water and energy that can be saved by installing shower restriction devices. This water savings estimate is applied for both electric water heaters and natural gas water heaters.

From Table 7-4, a ShowerStart device installed on a 1.5GPM low flow showerhead could save additional 588 gallons annually in a typical single family home and 664 gallons annually in a multi-family home in Illinois. These savings represent additional 16% and 17% increase respectively, given that the TRM estimated annual savings for installing low flow showerhead is 3,684 gallons for single family, and 3,948 gallons for multi-family home.

**Table 7-4. Potential Water Savings for ShowerStart Device in Illinois**

Water Savings Calculations	Single Family	Multi-Family
Water savings from installing ShowerStart on 2.67 GPM base showerhead (gallons/yr/ShowerStart)	1,046	1,182
Water savings from installing ShowerStart on 1.5 GPM low flow showerhead (gallons/yr/ShowerStart)	588	664
Percent increase in water savings on a 1.5 GPM low flow showerhead retrofit	16%	17%

Source: Navigant analysis

### Energy Savings Potential and Calculation

Navigant estimated energy savings potential for both 2.67 GPM base flow showerheads and 1.5 GPM low flow showerheads installed with a ShowerStart device in a single family and multi-family homes.

#### *Engineering Estimate of Electric Energy Savings from ShowerStart*

As shown in Table 7-5 below, a ShowerStart device installed on a 2.67 GPM base flow showerhead could save an additional 133 kWh annually in a typical single family home and 150 kWh annually in a multi-family home in Illinois. A ShowerStart device installed on a 1.5 GPM low flow showerhead could save an additional 75 kWh annually in a typical single family home and 84 kWh annually in a multi-family home in Illinois. These savings represent additional 16% and 16% increase respectively, given that the TRM estimated annual energy savings for installing a 1.5 GPM low flow showerhead is 468 kWh for single family, and 528 kWh for a multi-family home.

**Calculations:**

Annual Electric Energy Savings from ShowerStart = Avoided annual electrical energy use from showerhead

Avoided electrical energy savings for 1.5 GPM low flow showerhead installed with ShowerStart =

$$\%ElectricDHW * (GPM\_low\_SS * L\_showerstart) * Household * SPCD * 365.25 / SPH) * EPG\_electric] * ISR\_ss$$

Where:

- %ElectricDHW = proportion of water heating supplied by electric resistance heating (100%)
- EPG\_electric = Energy per gallon of hot water supplied by electric (0.127 kWh/gallon)
- Other variables as defined above.

**Table 7-5. Potential Electric Energy Savings for ShowerStart Device in Illinois**

Electric Energy Savings Calculations	Single Family	Multi-Family
Electric Water Heater savings from installing ShowerStart on 2.67 GPM base showerhead (kWh/yr/ShowerStart))	133	150
Electric Water Heater savings from installing ShowerStart on 1.5 GPM low flow showerhead (kWh/yr/ShowerStart)	75	84
Percent increase in electrical energy savings on a 1.5 GPM low flow showerhead retrofit	16%	16%

Source: Navigant analysis

**Engineering Estimate of Electrical Demand Savings**

As shown in Table 7-6 below, annual peak demand savings for ShowerStart device installed on a 2.67 GPM base flow showerhead could be 0.009 KW in a typical single family home and 0.012 KW in a multi-family home in Illinois. Annual peak demand savings for ShowerStart device installed on a 1.5 GPM low flow showerhead could be 0.005 KW in a typical single family home and 0.007 KW in a multi-family home in Illinois.

**Calculations:**

Annual Peak Demand Savings from ShowerStart = Avoided annual peak demand from showerhead

$$\Delta kW = \Delta kWh/Hours * CF$$

Where:

- $\Delta kWh$  = calculated kWh value in Table-3 above
- Hours = Annual electric DHW recovery hours for showerhead use (431 for SF DI; 354 for MF DI)
- CF = Coincidence Factor for electric load reduction (=0.0278)

**Table 7-6. Potential Demand Savings for ShowerStart Device in Illinois**

Electric Demand Savings Calculations	Single Family	Multi-Family
Electric Water Heater savings from installing Peak Demand savings from installing ShowerStart on 2.67GPM base showerhead (KW/yr/ShowerStart)	0.009	0.012
Peak Demand savings from installing ShowerStart on 1.5GPM low flow showerhead (KW/yr/ShowerStart)	0.005	0.007

Source: Navigant analysis

**Engineering Estimate of Natural Gas Energy Savings**

As shown in Table 7-7 below, a ShowerStart device installed on a 2.67 GPM base flow showerhead could save an additional 5.6 therms annually in a typical single family home and 7.4 therms annually in a multi-family home in Illinois. A ShowerStart device installed on a 1.5 GPM low flow showerhead could save an additional 3.2 therms annually in a typical single family home and 4.2 therms annually in a multi-family home in Illinois. These savings represent additional 16% and 17% increase respectively, given that the TRM estimated annual energy savings for installing a 1.5 GPM low flow showerhead is 19.9 therms for single family, and 24.9 therms for a multi-family home.

**Calculations:**

Natural gas energy savings from ShowerStart = Avoided annual therms energy use from showerhead

$$\text{Avoided therms energy savings for 1.5gpm low flow showerhead installed with ShowerStart} = \%FossilDHW * ((GPM\_low\_SS * L\_showerstart) * Household * SPCD * 365.25 / SPH) * EPG\_gas * ISR\_ss$$

Where:

- %FossilDHW = proportion of water heating supplied by natural gas heating (100%)
- EPG\_gas = Energy per gallon of hot water supplied by gas (0.0054 therm/gal SF, 0.0063 Therm/gal MF)
- Other variables as defined above.

**Table 7-7. Potential Gas Therms Savings for ShowerStart Device in Illinois**

Gas Therm Savings Calculations	Single Family	Multi-Family
Natural gas energy savings from installing ShowerStart on 2.67 GPM base showerhead (therms/yr/ShowerStart)	5.6	7.4
Natural gas energy savings from installing ShowerStart on 1.5 GPM low flow showerhead (therms/yr/ShowerStart)	3.2	4.2
Percent increase in natural gas therms savings on a 1.5 GPM low flow showerhead retrofit	16%	17%

Source: Navigant analysis

### Cost Savings

The national average cost of water is approximately \$0.002/gallon, according to the United States Environmental Protection Agency [7]. The average cost to heat water from a standard gas water heater is estimated as \$0.008/gallon, and \$0.017 for an electric water heater [8]. Assuming that users typically turn their mixing valve all the way to the hot position in the warm-up process, and the average hot water cost savings for an electric water heater is \$0.02/gallon, gas water heating is \$0.01 per gallon, and the unit cost of ShowerStart is \$29.95, we can estimate the net savings in utility bills for each ShowerStart installed. Table 7-8 and Table 7-9 below illustrate potential cost savings for installing thermostatic shower restriction valves in multi-family and single family residences.

**Table 7-8. Potential Cost Savings from Installed ShowerStart device (Multi-family)**

Cost Savings for Multi-family	ShowerStart with 2.67 GPM base showerhead	ShowerStart with 1.5 GPM low flow showerhead
Water Savings (gallons/yr/ShowerStart)	1,182 gallons	664 gallons
Utility Bill Savings (\$/yr/ShowerStart)	\$23.64 Electric WH \$11.82 Gas WH	\$13.28 Electric WH \$6.64 Gas WH
Net Savings (bill savings - unit cost)	(\$6.31) Electric WH (\$18.13) Gas WH	(\$16.67) Electric WH (\$23.31) Gas WH
Simple Payback	1.3 years (Elec.) 2.6 years (Gas)	2.3 years (Elec.) 4.6 years (Gas)

Source: Navigant analysis

**Table 7-9. Potential Cost Savings from Installed ShowerStart device (Single Family)**

Cost Savings for Single Family	ShowerStart with 2.67 GPM base showerhead	ShowerStart with 1.5 GPM low flow showerhead
Water Savings (gallons/yr/ShowerStart)	1,046 gallons	588 gallons
Utility Bill Savings (\$/yr/ShowerStart)	\$20.92 Electric WH \$10.46 Gas WH	\$11.76 Electric WH \$5.88 Gas WH
Net Savings (bill savings - unit cost)	(\$9.03) Electric WH (\$19.49) Gas WH	(\$18.19) Electric WH (\$24.07) Gas WH
Customer Payback Period	1.4 years (Elec.) 2.9 years (Gas)	2.5 years (Elec.) 5.1 years (Gas)

Source: Navigant analysis

### Conclusion

As discussed above, additional 16 percent of water and energy savings may be realized from installing a ShowerStart device on a 1.5 GPM efficient showerhead. Additional cost savings ranging from an estimated \$6.00 to \$24.00 may be accrued from installing a ShowerStart device in single family and multi-family homes.

### Suggested Additional Research

- Further studies are required to understand users' shower behavior, and to enable accurate determination of the pre-shower hot water wait time in the State of Illinois.
- Further research is necessary to investigate the showerhead flow rate during trickling due to operation of the shower restriction valve.
- Further research is necessary to investigate how much hot water is wasted before a user enters into the shower when a shower restriction valve is installed, and how long this wasted hot water is left to run.
- Further studies could focus on investigating whether shower restriction valves interfere with the flow rate and consequently affect the energy savings from a low flow showerhead, causing savings estimates to be revised for one or both devices.
- Research on shower behaviors should include the impact of situations where users normally open the faucet tap during the warm up time. Such discussion was lacking in the reference materials, but the possibility could render the thermostatic restriction valve virtually non-operational, and thus produce zero savings. Alternatively, if the pre-retrofit scenario involved hot water waste through the faucet and post-retrofit behavior changed to using the showerhead for warm up time, savings could be greater.

### References

- [1] ShowerStart LLC ([www.showerstart.com](http://www.showerstart.com))
- [2] "Simply & Cost Effectively Reducing Shower Based Warm-Up Waste: Increasing Convenience & Conservation by Attaching ShowerStart to Existing Showerheads" (ShowerStart LLC, 2008).
- [3] "Identifying, Quantifying and Reducing Behavioral Waste in the Shower: Exploring the Savings Potential of ShowerStart" (ShowerStart LLC, May 2013).
- [4] "Water Conservation Program: ShowerStart Pilot Project White Paper", (City of San Diego, CA, August 2008).
- [5] Pacific Gas and Electric Company (Work Paper PGECODHW113, Low Flow Showerhead and Thermostatic Shower Restriction Valve, Revision # 4, August 2012).
- [6] Illinois Statewide Technical Reference Manual for Energy Efficiency (June 2013, Version 2.0, section 5.4.5).
- [7] [www.epa.gov/safewater](http://www.epa.gov/safewater), "Water on Tap, What You Need to Know", 2009.
- [8] Smart Energy Design Assistance Center, University of Illinois, Urbana, Champaign; Newsletter Vol. 6, No. 6, June 2010, ([www.sedac.org](http://www.sedac.org)).

### 7.2.2 Net Program Impact Results

In GPY2, the Net-to-Gross Ratio (NTGR) estimates used to calculate the Net Verified Savings were deemed through a negotiation process by the Illinois Stakeholder Advisory Group (SAG)<sup>37</sup> based on GPY1 evaluation research. The Net-to-Gross Ratio for gas measures installed in residential dwelling units was 0.96 and for measures installed in common areas was 0.93. Navigant applied the deemed program NTGR to obtain verified net savings for each program component. The program-level NTGR is verified net savings/verified gross savings based on evaluation research findings. As noted in Section 2.1.4, the GPY2 evaluation plan did not include new free-ridership or spillover research.

### 7.3 Detailed Process Results

Process research related to the EPY5/GPY2 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

The program evaluation plan for GPY2 included a review or development of a program logic model and program theory for the new program component implemented in GPY2,<sup>38</sup> as well as a review of multi-family program best practices. Navigant's multi-family program best practices research is presently underway and will be reported on separately in a memo and incorporated into the GPY3 evaluation report.

### 7.4 TRM Recommendations

As detailed in Section 7.2.1 above, Navigant conducted evaluation research into two measures that may assist the Illinois TRM Technical Advisory Committee annual updating process.

Steam Pipe Insulation Measures – Heat Loss Correction Factor

Please see Section 7.2.1.1 of this report.

Thermostatically Initiated Shower Restriction Valve

Please see Section 7.2.1.2 of this report.

### 7.5 Data Collection Instruments

The GPY2 evaluation plan did not include developing new data collection instruments for this program evaluation.

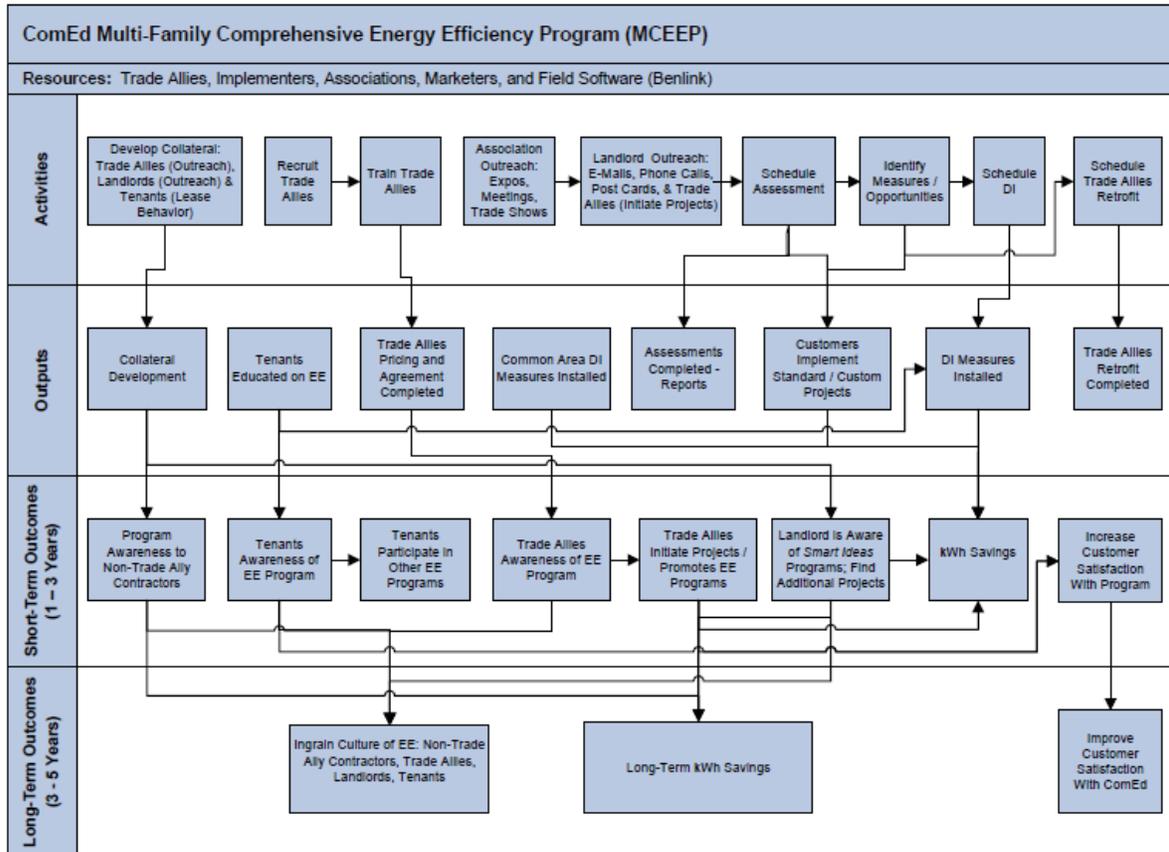
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<sup>37</sup> [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas Net-to-Gross Results and Application GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/Nicor%20Gas%20Net-to-Gross%20Results%20and%20Application%20GPY1-3.pdf), which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework-1.html>.

<sup>38</sup> ComEd developed a program logic model and program theory for the new ComEd-Nicor Gas MCEEP program component implemented in GPY2.

## 7.6 EPY6-GPY3 Program Logic Model – Preliminary Program Document

The EPY6-GPY3 program logic model below was developed by ComEd for the jointly implemented MCEEP program and provided to Navigant in June 2013. This program logic model is a preliminary program document from ComEd program staff. Navigant has not reviewed this EPY6-GPY3 logic model.





#### **4.5 Residential New Construction**

# Joint Residential New Construction Program GPY2/EPY5 Evaluation Report

Final

Energy Efficiency / Demand Response Plan:  
Nicor Gas Plan Year 2  
Commonwealth Edison Company Plan Year 5  
(6/1/2012-5/31/2013)

Presented to  
Nicor Gas  
Commonwealth Edison Company

February 21, 2014

Prepared by:

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**Acknowledgements**

This report has benefited strongly from the contributions of Mike Topitzhofer (RSR), Danielle Vitoff, Brian Kim, Katherine Wolf, David Basak, and Justin Spencer (Navigant).

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for ComEd and Nicor Gas based upon information provided by ComEd, Nicor Gas and from other sources. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Navigant nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

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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 GPY2/EPY5<sup>1</sup> Joint Residential New Construction Program (RNC Program). The RNC Program is jointly offered by Nicor Gas and Commonwealth Edison (ComEd). The program provides incentives to builders and HERS raters for building new homes at least 10% more efficient than current code and installing qualifying energy efficiency equipment in new homes. The RNC program launched in GPY1/EPY4, but this is the first program year where it is claiming savings.

### E.1. Program Savings

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

**Table E-1. GPY2/EPY5 Total Program Savings**

Savings Category †	Energy Savings (therms)	Energy Savings (kWh)	Average Peak Demand Savings (kW)	Coincident Peak Demand Savings (kW)
Ex Ante Gross Savings	242,112	279,042*	-	-
Verified Gross Savings	220,300	250,645	29.3	66.6
Verified Net Savings	176,240	200,516	23.5	53.3

Source: Utility tracking data and Navigant analysis.

† See the Glossary in the Appendix for definitions

\*Based on tracking data; ComEd reported net savings of 30 MWh

### 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.

<sup>1</sup> The GPY2/EPY5 program year began June 1, 2012 and ended May 31, 2013.

**Table E-2. GPY2 Program Results by Home Type: Therms**

Research Category	Ex Ante Gross Savings (therms)	Verified Gross Realization Rate	Verified Gross Savings (therms)	Free Ridership	Spillover	NTG	Verified Net Savings (therms)
Detached 1 Story	53,567	104% ‡	55,674	0.2 †	0 †	0.8 †	44,539
Detached 2+ Story	122,729	86% ‡	105,185	0.2 †	0 †	0.8 †	84,148
Attached 1 Story	18,300	100% ‡	18,258	0.2 †	0 †	0.8 †	14,607
Attached 2+ Story	47,516	87% ‡	41,183	0.2 †	0 †	0.8 †	32,946
<b>Total</b>	<b>242,112</b>	<b>91% ‡</b>	<b>220,300</b>	<b>0.2 †</b>	<b>0 †</b>	<b>0.8 †</b>	<b>176,240</b>

Source: Utility tracking data and Navigant analysis.

† A deemed value.

‡ Based on evaluation research findings.

**Table E-3. EPY5 Program Results by Home Type: kWh**

Research Category	Ex Ante Gross Savings (kWh)	Verified Gross Realization Rate	Verified Gross Savings (kWh)	Free Ridership	Spillover	NTG	Verified Net Savings (kWh)
Detached 1 Story	42,460	112% ‡	47,532	0.2 †	0 †	0.8 †	38,026
Detached 2+ Story	141,658	83% ‡	117,562	0.2 †	0 †	0.8 †	94,050
Attached 1 Story	26,069	84% ‡	21,821	0.2 †	0 †	0.8 †	17,457
Attached 2+ Story	68,855	93% ‡	63,730	0.2 †	0 †	0.8 †	50,984
<b>Total</b>	<b>279,042</b>	<b>90% ‡</b>	<b>250,645</b>	<b>0.2 †</b>	<b>0 †</b>	<b>0.8 †</b>	<b>200,516</b>

Source: Utility tracking data and Navigant analysis.

† A deemed value.

‡ Based on evaluation research findings.

### E.3. Impact Estimate Parameters

The evaluation team used a custom calibrated modeling approach to evaluate the gross energy savings from the RNC program, which was not covered by the Illinois TRM. The models drew on numerous inputs from program home and code building characteristics, none of which are deemed. The net-to-gross value was deemed for this program year, and the gross realization rate is based on this evaluation research, as shown in the following table.

**Table E-4. Impact Estimate Parameters**

Parameter	Data Source	Deemed or Evaluated?
NTG	SAG Spreadsheet †	Deemed
RR	GPY2/EPY5 Research	Evaluated

† [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas GPY2-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas GPY2-PY6 Proposal Comparisons with SAG.xls)

[http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls)

#### **E.4. Participation Information**

The program had 29 active builders and five active HERS raters in GPY2/EPY5 and paid incentives on a total of 688 homes, as shown in the following table.

**Table E-5. GPY2/EPY5 Primary Participation Detail**

Participation	Nicor Gas Only	Nicor Gas and ComEd
Completed Homes	196	492
Active* Builders	29	
Active* HERS Rating Companies	5	

Source: Utility tracking data and Navigant analysis.

\*One or more homes completed

#### **E.5. Conclusions and Recommendations**

The following provides insight into key program findings and recommendations.

##### **Impact Evaluation**

**Finding 1.** The program exceeded its gross therm and kWh energy savings goals by 23% and 18%, respectively, despite a gross realization rate of less than 100%. These goals were surpassed because the program completed more homes than targeted for Nicor Gas and because kWh savings per home exceeded planning estimates.

**Finding 2.** The program achieved a gross savings realization rate of 92% for both gas and electricity.

**Finding 3.** The evaluation team estimated coincident demand impacts of 66.6 kW for GPY2/EPY5.

**Finding 5.** Although program homes all exceeded code on a performance basis by at least 10%, Navigant observed that on average certain characteristics met individual code requirements more consistently than others.

**Recommendation.** 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. Since IECC 2012 has stricter requirements for air sealing and duct sealing, efficiency in these areas alone may not bring homes up to program standards as reliably as in GPY2/EPY5.

### Process Evaluation

**Finding 10.** Raters were satisfied with the program, specifically with their interactions with program staff and the application process. Given the recent launch of the program (Spring 2012), it is operating smoothly and has been able to move on from early roadblocks.

**Finding 11.** Builders were satisfied with their interaction with HERS raters, but many builders did not have significant interaction with the program and did not view their HERS raters as agents of the program. This lack of connection to the program could lead to low self-reported attribution in future evaluations.

**Recommendation.** Increase direct builder outreach in order to build stronger relationships with them through the following avenues:

- One-on-one meetings with builders
- Builder training sessions for both technical skills and marketing techniques
- Having a clear “go-to” person or contact list for builders seeking technical support or looking for guidance on program requirements

**Finding 12.** Builders and raters both expressed a desire for marketing materials to help them spread program awareness and explain the benefits of program homes.

**Recommendation.** Create separate marketing materials for both builders and prospective homeowners, tailored to the needs of each group. For example:

- Builder materials should advertise the program and provide clear examples of ways to qualify for the program
- Customer materials should help builders market to their clients by explaining the benefits of a program home in terms the average prospective homeowner can understand

Overall, the program performed well in its first full year, exceeding energy and participation targets and enrolling several new builders and raters with homes in the pipeline moving into GPY3/EPY6. The program has moved well beyond just “getting off the ground” and is looking forward to increasing marketing and outreach to expand the program. As described above, the program will benefit from increasing direct outreach to builders and developing additional marketing materials and support.

### Future Evaluation Risk

Although the GPY2/EPY5 evaluation did not produce a net-to-gross value, with the IECC 2009 code in place and code shifting to IECC 2012, it was clear that several factors were contributing to changes in builders’ practices. Raters indicated that most of the builders they worked with were typically meeting code or exceeding it by up to 6-8%: they confirmed that the program was definitely influential in getting builders to make the necessary changes to meet the program threshold of 10% savings, but this means that the program’s actual net savings could be limited to the savings beyond 6-8% above code. While the evaluation team expects that with the IECC 2012 code in place the program is likely playing a larger role in driving efficiency levels beyond code, if Illinois continues to increase code requirements regularly the program could see an ongoing issue with code being a “competing” driver of efficiency improvements.

## 1. Introduction

### 1.1 Program Description

The Residential New Construction Program is jointly offered by Nicor Gas and Commonwealth Edison (ComEd). Nicor Gas is the lead utility as the majority of the avoided cost benefits are from natural gas. Residential Science Resources (RSR) implements the program for both utilities. The program launched in early 2012 and did not claim any savings in the first plan year but met or exceeded gas and electric savings goals for GPY2/EPY5 and the planning goal of completing 600 homes. RSR uses completed REM/Rate files for each home to calculate whole-house savings. In addition, ComEd incentivizes several ENERGY STAR electric appliances and claims savings from these installations.

The program relies on networks of builders and HERS raters to garner participation and has already attracted several raters and builders to the program. The current program structure relies heavily on raters to recruit builders to the program, and the current incentives are as such weighted towards raters. The Residential New Construction Program pays incentives of \$500 per home to raters and \$300 per home to builders; builders receive additional incentives from ComEd for installing program-qualified ENERGY STAR electric appliances. To qualify for the program, homes must achieve savings of at least 10% over an equivalent code-compliant new home based on REM/Rate modeling. The residential energy code in Illinois changed mid-program year: homes permitted through December 2012 were under IECC 2009, and homes permitted in 2013 were under IECC 2012. Due to the length of construction, this resulted in just five of the 688 GPY2/EPY5 homes being permitted under IECC 2012.

### 1.2 Evaluation Objectives

The objectives of the Nicor Gas Plan Year 2 and ComEd Plan Year 5 (GPY2/EPY5) Residential New Construction Program evaluation were to (1) identify ways in which the program can be improved; (2) determine process-related program strengths and weaknesses; and (3) verify the gross and net kilowatt-hour (kWh), kilowatt (kW), and therm impacts of the program.

The Evaluation Team identified the following key researchable questions for GPY2/EPY5:

#### 1.2.1 Impact Questions

1. What are the gross annual energy and demand savings induced by the program?
2. What are the net impacts from the program? What is the level of free ridership associated with this program? What is the level of spillover associated with this program?
3. Did the program meet its energy and demand savings goals? If not, why not?
4. What is the current level of energy efficient home building education among participating and non-participating builders? How has the program changed this to date?
5. Are the program's due diligence and verification procedures designed and implemented effectively?
6. Does the tracking system meet the program's needs?

## 1.2.2 Process Questions

### 1.2.2.1 *Marketing and Participation*

1. Is the marketing effort sufficient to meet current and future program participation goals?
2. How do participating builders and raters become aware of the program?
3. Is the program outreach to participating builders, raters and customers effective in increasing awareness of the program opportunities?
  - a. What is the format of the outreach?
  - b. How often does the outreach occur?
  - c. Are the outreach messages clear and actionable?
  - d. What marketing strategies could be used to boost program awareness?
4. What has been the effect on builders of the transition to the new IECC 2012 residential energy code?

### 1.2.2.2 *Program Characteristics and Barriers*

1. What are the key barriers to participation in the program for builders, raters and customers, and how can these be addressed by the program?
2. How do builders perceive the incentives and costs related to this program?
  - a. Are program incentives sufficient to encourage participation?
  - b. Are there particular program characteristics that could be changed to improve builder satisfaction while maintaining program effectiveness?

### 1.2.2.3 *Administration and Delivery*

1. Has the program as implemented changed from the original plan? If so, how, why, and was this an advantageous change?
2. Is program administration being documented and program tracking being conducted in a way that makes the program evaluable?
3. Is the program efficient and well managed? How are problems resolved?
4. Are program tracking data being used to both assess program effectiveness in meeting program savings goals, and inform adjustments to program delivery?
5. What influence does program administration and delivery have on program participation? What could be done to improve program administration and delivery?

### 1.2.2.4 *Participant Satisfaction*

1. Overall, are participant builders and raters satisfied with this program?
2. Are participating buildings and raters satisfied with the following program components:
  - Application, home submission and payment processes
  - Interactions with program raters
  - Marketing
  - Education and training

### **1.2.3 Selected GPY1/EPY4 Evaluation Follow-Up Questions**

1. What is the status of the implementation of Navigant's recommendations detailed in the team's Verification, Due Diligence and Tracking System Review memo dated September 14, 2102?
2. What is the status of the implementation of Navigant's recommendations for key performance indicators (KPIs) detailed in Navigant's GPY1/EPY4 Logic Model and Program Theory memo? What are the tracked results for each KPI?

## 2. Evaluation Approach

Given the program’s growth, Navigant expanded on the high-level process evaluation conducted in GPY1/EPY4 by including builder and rater interviews. The evaluation team completed seven builder interviews and four rater interviews. Navigant conducted the impact evaluation in GPY2/EPY5 using calibrated simulation models to estimate both gas savings for Nicor Gas and electric savings for ComEd.

### 2.1 Overview of Data Collection Activities

The core data collection activities included in-depth interviews and aggregating home characteristics data. The full set of data collection activities is shown in the following table.

**Table 2-1. Core Data Collection Activities**

N	What	Who	Target Completes	Completes Achieved	When	Comments
<i>Impact Assessment</i>						
1	REM/Rate Data Collection	Completed Homes*	326	326	June 2013	Extracted model inputs from REM/Rate files
2	Gas Billing Data Request	Completed Homes*	326	326	June 2013	Billing data supporting calibrated simulation
3	Electric Billing Data Request	Completed Homes in ComEd Service Territory*,**	92	92	August 2013	Billing data supporting calibrated simulation
<i>Process Assessment</i>						
5	In Depth Interviews	Program Managers/Implementer Staff	3	3	April 2013	Includes staff from Nicor Gas, ComEd, and RSR
6	In Depth Interviews	Program Builders	10-12	7	July-October 2013	Supporting process evaluation and qualitative net-to-gross research
7	In Depth Interviews	Program HERS Raters	3-5	4	July 2013	Supporting process evaluation and qualitative net-to-gross research

\*Sample only included homes inspected by November 2012 in order to ensure sufficient billing data. This total includes homes in joint territory as well as homes in Nicor Gas territory only.

\*\*Of the 126 joint homes completed by November 2012, ComEd provided billing data for 92.

## 2.2 Verified Savings Parameters

The RNC program uses a custom modeling approach to determining whole-home savings which is not covered by the Illinois TRM. The evaluation team also used a whole-home modeling approach and did not rely on any deemed algorithms or savings parameters in the gross savings analysis.

The only deemed parameter for the RNC program is the net-to-gross value of 0.80. This value was the planning value for both natural gas and electric savings and the SAG consensus has deemed this value for GPY2/EPY5 and GPY3/EPY6.

## 2.3 Verified Gross Program Savings Analysis Approach

Navigant used data from program REM/Rate files to build four energy models which represent average program homes: attached single story, attached two or more story, detached 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 2.0) created by the National Renewable Energy Laboratory (NREL) to build these models in EnergyPlus (version 7.2), a modeling software also developed by NREL.<sup>2</sup> For each “energy efficient” model built using program data, Navigant developed a corresponding “base case” scenario based on Illinois energy code. All but six homes in GPY2/EPY5 were built under IECC 2009, and so the evaluation team built the baseline home using specifications from this 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 single-family detached model incorporated characteristics and billing data from all single-story single-family homes in the program.

## 2.4 Verified Net Program Savings Analysis Approach

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the Verified Gross Savings estimates by a net-to-gross ratio (NTGR). In GPY2/EPY5, the NTGR estimates used to calculate the Net Verified Savings were based on past evaluation research and defined through a negotiation process through SAG as documented in a spreadsheet for each utility.<sup>3</sup>

Although the NTGR is deemed for GPY2/EPY5, the evaluation team used rater and builder interviews to collect some qualitative feedback on free-ridership and spillover levels. This methodology and the accompanying results are presented in the appendix (Sections 7.2.3 and 7.2.4).

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<sup>2</sup> For a full discussion of modeling options, see the appendix (Section 7.2.1)

<sup>3</sup> [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas GPY2-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas GPY2-PY6 Proposal Comparisons with SAG.xls)  
[http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls)

## **2.5 Process Evaluation**

In the process evaluation, the Navigant team analyzed four key sources of data:

- In-depth interviews with program staff
- In-depth interviews with participating builders
- In-depth interviews with participating HERS raters
- Program literature (tracking system, marketing and training materials)

Navigant used these data sources to gather information and inform conclusions on the following key aspects of the program:

- Marketing and Participation
- Program Characteristics and Barriers
- Administration and Delivery
- Rater and Builder Satisfaction

### **2.5.1 Program Staff Interviews**

Navigant conducted interviews with the Nicor Gas and ComEd program managers as well as with the RSR implementation staff in June 2013. These interviews discussed the program's progress towards energy savings and participation, as well as changes that occurred in GPY2/EPY5 or were planned for GPY3/EPY6.

### **2.5.2 Builder Interviews**

Navigant conducted in-depth interviews with seven active builders in the program. Unfortunately, the timing of the interviews in the summer and fall coincided with peak construction season and contributed to a low response rate (24%). Although this response rate is not significantly lower than typical interviews with builder and contractor populations, Navigant was unable to reach many of the most active builders, with the result that the respondents only represented 16% of program therm savings and 10% of program kWh savings.

### **2.5.3 Rater Interviews**

Navigant completed in-depth interviews with four of the five HERS rating companies that completed homes in GPY2/EPY5. These raters represented over 90% of the homes and energy savings claimed by the program this year.

### 3. Gross Impact Evaluation

The RNC program achieved researched gross savings realization rates of 92% for both natural gas and electricity savings, and also accrued 66.6 kW of coincident demand savings. The resulting researched gross savings for GPY2/EPY5 are 221,865 therms and 250,801 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 688 homes in GPY2/EPY5, exceeding the overall goal of 600 homes set for this program year. Of these homes, 72% were in joint Nicor Gas and ComEd service territory, while the remaining 28% were in Nicor Gas territory only. These homes were submitted by 29 builders working with five HERS rating companies. In addition to these active participants, the program has enrolled 13 builders and 12 rating companies for future participation. As of the end of GPY2/EPY5, the program had enrolled a total of 834 homes.<sup>4</sup> This exceeded the goal of 750 first-year enrollments by 11%.

Key findings include:

1. Enrollment and completion totals exceeded goals for Nicor Gas, but fell short for ComEd due to the number of homes outside of ComEd service territory.<sup>5</sup>
2. High builder and rater enrollment numbers indicate that the program is growing quickly
3. Uptake has been low on electric prescriptive measures. As shown in Table 3-1, most electric measures were installed in 1% of program homes or fewer. The exception is ENERGY STAR® refrigerators, which were installed in 9.5% of joint homes.

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<sup>4</sup> Enrollments represent the total number of homes that builders and raters have submitted through the program, including those which are not yet completed.

<sup>5</sup> Although the program initially intended to only incent homes in joint service territory, the implementation team decided to allow Nicor Gas only homes to participate. This change allowed the program to capitalize on some areas with high new construction rates which do not fall in ComEd service territory. Due to the greater than expected electric savings per home, the program still met electric savings targets.

**Table 3-1. GPY2/EPY5 Volumetric Findings Detail**

	Detail	Joint Homes	Nicor Gas Only Homes
Completed Home Data	Completed Homes	492	196
	Active* Builders	29	5
	Active* Raters		
Prescriptive Electric Measure Data (Completed Homes)	ECM Furnace Fans	5	2**
	Central Air Conditioners $\geq$ 14.5 SEER	2	3**
	ENERGY STAR® Refrigerators	64	16**
	ENERGY STAR® Exhaust Fans	1	0**
Enrollment Data	Homes with 100% CFL Lighting	3	1**
	Enrolled Homes		
	Enrolled Builders		42
	Enrolled Raters		17

Source: Program tracking data, EM&V analysis

\*Completed one or more homes in GPY2/EPY5

\*\* Electric prescriptive measures installed in Nicor Gas only homes did not receive incentives.

## 3.2 Tracking System Review

Navigant worked with the tracking system in three different ways over the course of the GPY2/EPY5 evaluation:

- The evaluation team was given read-only access to the HouseRater database. Navigant used this access to download REM/Rate files for sampled homes in the impact analysis.
- RSR provided two different tracking system data extracts:
  - The original “Dashboard” extract developed for Nicor Gas and ComEd
  - A new extract for Nicor Gas’ TrakSmart system, which will be updated automatically from HouseRater

### 3.2.1 HouseRater Online Database

Navigant found the HouseRater database fairly easy to navigate. The system contained complete file documentation for all program homes, which was invaluable to the evaluation effort for collecting household characteristics. However, not all functionality was complete. For example, the evaluation team could not filter results by date although the system appeared to have the capability. One disadvantage to the database structure was that the evaluation team could not “batch” download REM/Rate files, instead needing to download them individually.

### 3.2.2 Tracking Data Extracts

Initially, Navigant received “Dashboard” extracts from RSR. These extracts provided critical information such as home addresses, builder and rater contact information, home gas and electric consumption data by high-level end-use (heating, cooling, lights and appliances, etc.), and data on the presence of electric prescriptive measures. The program then transitioned to a new extract template designed to automatically export to Nicor Gas’ TrakSmart system. This extract contained most of the same information, although it only provides consumption data at the home level and does not indicate the presence of electric prescriptive measures since it was designed for Nicor Gas.

### 3.2.3 Key Findings

Key findings include:

1. HouseRater is collecting sufficient data to meet the needs of the program and evaluation.
2. Electric savings are not tracked consistently across the Dashboard and TrakSmart data extracts, making it difficult to analyze the entire program through one set of tracking data.
3. RSR could improve HouseRater by enabling batch downloads of REM/Rate files and correcting date filtering functionality for all users.

## 3.3 Verified Gross Program Impact Results

Table 3-2 and Table 3-3 show the resulting gas and electric calibrated model outputs for the program homes and corresponding IECC 2009 baseline models.<sup>6</sup> 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 3-2. 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	1149	831	318	28%
Detached 2+ Story	1563	1138	425	27%
Attached 1 Story	869	676	193	22%
Attached 2+ Story	750	549	201	27%
<b>Weighted Average</b>	<b>1135</b>	<b>832</b>	<b>303</b>	<b>27%</b>

Source: Evaluation Team analysis

<sup>6</sup> There were five homes in GPY2/EPY5 built under the IECC 2012 code; none of these homes were included in the evaluation sample because they had not been completed prior to the heating season. Navigant applied the same realization rate to these homes for this year given their small contribution to overall gross savings.

**Table 3-3. 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	7201	6700	501	7%
Detached 2+ Story	9279	8664	615	7%
Attached 1 Story	6111	5721	390	6%
Attached 2+ Story	6852	6342	510	7%
<b>Weighted Average</b>	<b>7790</b>	<b>7255</b>	<b>535</b>	<b>7%</b>

Source: Evaluation Team analysis.

Table 3-4 shows the ex-ante savings, realization rates, and researched gross savings for GPY2/EPY5. The overall realization rate was 91% for therm energy savings and 90% for kWh energy savings. ComEd did not claim any demand savings; Navigant estimated coincident peak demand savings using hourly model outputs.

**Table 3-4. GPY2/EPY5 Research Gross Impact Savings Estimates**

		Sample Size	Energy Savings (therms)	Energy Savings (kWh)	Coincident Peak Demand Savings (kW)
<b>Detached 1 Story</b>	Ex-Ante Gross Savings		53,567	41,069	-
	Realization Rate	59	104%	116%	-
	Research Gross Savings		55,674	47,532	14.3
<b>Detached 2+ Story</b>	Ex-Ante Gross Savings		122,729	138,027	-
	Realization Rate	102	86%	85%	-
	Research Gross Savings		105,185	117,562	28.5
<b>Attached 1 Story</b>	Ex-Ante Gross Savings		18,300	24,587	-
	Realization Rate	53	100%	89%	-
	Research Gross Savings		18,258	21,821	6.4
<b>Attached 2+ Story</b>	Ex-Ante Gross Savings		47,516	67,943	-
	Realization Rate	112	87%	94%	-
	Research Gross Savings		41,183	63,730	17.4
<b>Total</b>	Ex-Ante Gross Savings		242,112	279,042	-
	Realization Rate	326	91.0%	89.8%	-
	Research Gross Savings		220,300	250,645	66.6

Source: Evaluation Team analysis.

Although program homes all exceeded code on a performance basis by at least 10%, Navigant observed that on average certain characteristics met individual code requirements more consistently than others. These average trends are shown in Table 3-5, 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 10% beyond code.

**Table 3-5. Average Program Home Characteristics<sup>7</sup>**

Category	Program Homes Relative to IECC 2009 and Current Standards
Wall Insulation	Well below code
Ceilings/Roofs	At or just above code
Foundation/Floor Insulation	At or below code
Window U-values	Equal to code
Air Sealing	Well above code
Major Appliances	At or just above standards
Lighting	Mostly at or 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 2009.*

### 3.3.1 Estimated Electric Prescriptive Measure Savings

Navigant analyzed the electric tracking data to provide an estimate of the savings from prescriptive measures only. The team used the Illinois TRM to estimate these values, using actual model-specific data where possible for both refrigerators and air conditioners. Due to the interactive nature of some of these measures with other residential end uses, Navigant does not consider these estimates verified savings, and recommends claiming the whole-house savings produced by the energy models.

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<sup>7</sup> These averages are based on the evaluation team’s gross impact modeling sample, which was drawn from the first half of GPY2/EPY5. Tracking data shows that HERS scores did improve throughout the rest of the program year, indicating that builders may already have increased efficiency levels in some of these areas.

**Table 3-6. Electric Prescriptive Savings Estimates**

	Ex Ante Quantity	Verified Quantity	Ex Ante Per Unit Savings	Ex Post Per Unit Savings	Ex Ante Total Savings	Ex Post Total Savings
ECM Furnace Motor	5	5	732	732	3,660	3,660
Air Conditioner $\geq$ 14.5 SEER	2	2	152	304	304	609
ENERGY STAR <sup>®</sup> Refrigerator	46	64	114	147	5,244	9,395
ENERGY STAR <sup>®</sup> Exhaust Fan	1	1	89	89	89	89
100% CFL Lighting	3	3	593	1,612	1,779	4,837
<b>Total</b>					11,076	18,588

Source: Navigant Analysis.

## 4. Net Impact Evaluation

SAG<sup>8</sup> deemed the NTG value of 0.80 to be used to calculate PY5 verified net savings.

The evaluation calculated verified net savings of 176,240 therms, 201 MWh and 0.05 MW, as shown in the following table.

**Table 4-1. GPY2/EPY5 Verified Net Impact Savings Estimates by Measure Type**

	Sample Size	Energy Savings (therms)	Energy Savings (kWh)	Coincident Peak Demand Savings (kW)
Ex-Ante GPY2/EPY5 Gross Savings	688	242,112	279,042	-
Realization Rate	326	91.0%	89.8%	-
Verified Gross Savings	688	220,300	250,645	66.6
Free Ridership	n/a	0.20	0.20	0.20
Spillover	n/a	0.00	0.00	0.00
NTG	n/a	0.80	0.80	0.80
Verified Net Savings	688	176,240	200,516	53.3

Source: Evaluation Team analysis.

Although Navigant did not conduct a full net-to-gross analysis, the team did collect information on attribution through the builder and rater interviews. A discussion of this analysis can be found in the appendix (Section 7.2.4).

<sup>8</sup> [http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas GPY2-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor Gas GPY2-PY6 Proposal Comparisons with SAG.xls)  
[http://ilsagfiles.org/SAG\\_files/Meeting\\_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls)

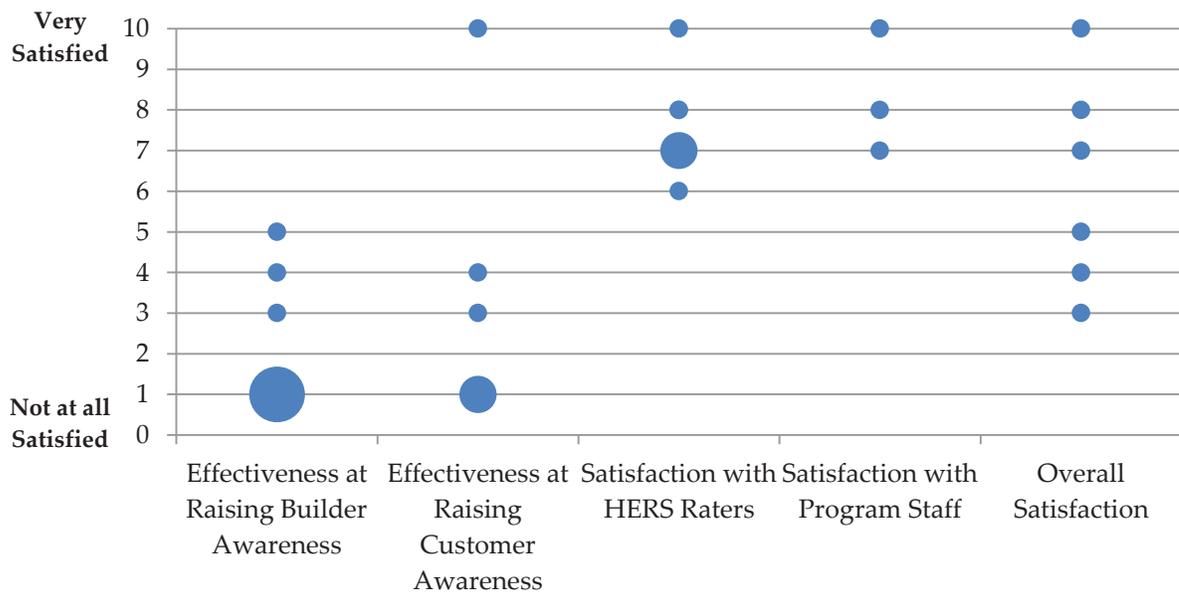
## 5. Process Evaluation

This section describes high-level findings from Navigant’s in-depth interviews with program staff, HERS raters, and builders. This is the first year that the program has completed homes. Overall, Navigant found that the program experienced some process difficulties as it launched, but has greatly improved in many areas over the course of GPY2/EPY5 and continues to work on additional process improvements. For a more thorough discussion of process findings, please see the appendix (Section 7.3).

### 5.1 Participant Satisfaction

As shown in Figure 5-1, builders were generally satisfied with their interactions with HERS raters, and those who had interactions with program staff were very satisfied. Additionally, four of the seven respondents said that they felt better qualified to build program-eligible homes as a result of their interactions with their HERS raters. The size of each circle indicates the number of raters giving a single response.

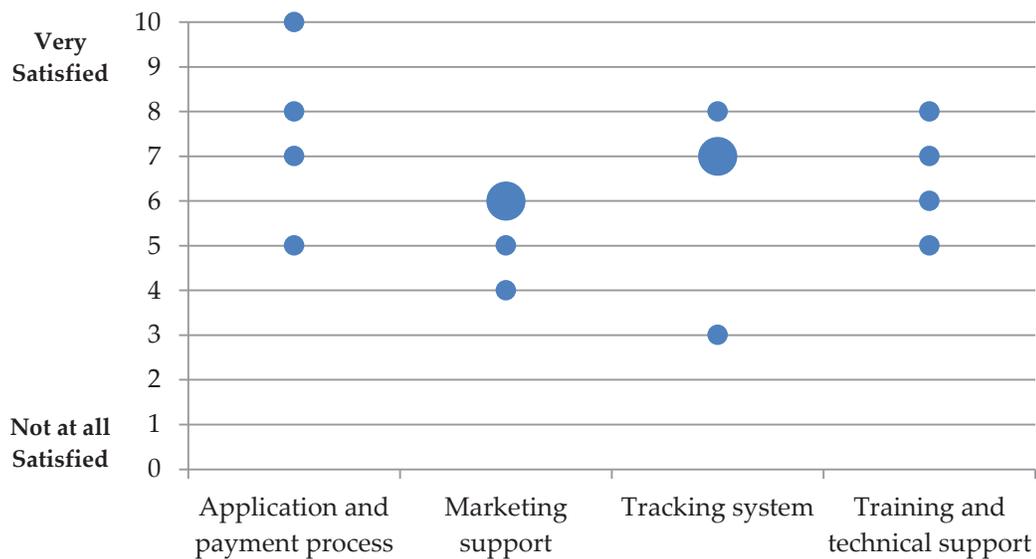
**Figure 5-1. Builder Satisfaction and Program Effectiveness Ratings**



Source: Navigant analysis

As shown in Figure 5-2, raters were most satisfied with the application and payment process and least satisfied with marketing support. Some were very satisfied with the HouseRater tracking system, but others felt it was cumbersome and required more time and data entry than other programs.

**Figure 5-2. Rater Satisfaction with Program (Score out of 10)**



Source: Navigant analysis

## 5.2 Marketing and Participation

In PY2, the program succeeded in enrolling and completing enough homes to exceed the implementation contractor’s participation and savings goals for Nicor Gas,<sup>9</sup> exceed savings goals for ComEd, and achieve over 70% of the joint home participation goal. The program’s approach of leveraging raters to recruit builders has been effective, as several builders heard about the program through their raters. However, this approach has kept some builders from interacting directly with program staff, and many do not credit the program for the assistance that they get from their raters.

As shown above in Figure 5-1, builders did not feel that the program has been effective to date at raising customer or builder awareness of the program and energy efficient building practices. Some indicated that this was because many builders and customers already knew about energy efficient building practices, but others felt that program awareness was low among customers and that the program could do more to help builders market the program. Raters also noted that marketing was a weak area for the program: one rater described the marketing support as “light” and another indicated that while the program has “been there for whatever they have needed, [they] would like to have some marketing material in hand.”

## 5.3 Program Characteristics and Barriers

Builders cited the cost of participation relative to the incentives offered as the most common barrier to participation. Two builders also indicated that they did not understand program requirements; one rater also commented on this, saying that builders needed concrete examples of steps they could take in order to meet the program’s requirements.

<sup>9</sup> The program also exceeded the original savings goals filed in Nicor Gas’ Energy Efficiency Plan filed in 2011 for GPY2.

For some raters, glitches and the amount of information required by the tracking database presented another barrier. One large rater indicated that sometimes the effort to provide all of the documentation was not worth the time, and that this aspect of the program could be streamlined.

#### **5.4 Administration and Delivery**

Program staff, raters and builders all confirmed that although early in the program year the program was not delivered smoothly, program staff had increased the level of service throughout the year and made significant progress. Over the course of GPY2/EPY5, the following changes have contributed to this improvement:

- RSR increased the frequency of payments to raters and builders from monthly to bi-weekly.
- The program elected to pay incentives on homes outside of the ComEd electric service territory (Nicor Gas only homes) in order to capitalize on construction “hot spots” in some areas of Nicor Gas-only service territory.
- RSR brought on additional staff dedicated to the program.

One rater said that “the program has come a long way,” and one builder said that although his first interaction with the program was “less than satisfactory, the second was beyond [his] wildest dreams.” This shows that the program is working hard to learn from early challenges and keep participants satisfied. In addition, program staff reported that rater and builder trainings were well attended and that raters were generally satisfied with the training offerings. Utility staff also noted that a next step for the program should be to extend more formal and one-on-one training offerings to builders, and that the program has already begun to work more closely with some of the larger builders.

## 6. Conclusions and Recommendations

This section summarizes the key impact and process findings and recommendations.

Overall, the program performed well in its first full year, exceeding energy and participation targets and enrolling several new builders and raters with homes in the pipeline moving into GPY3/EPY6. The program has moved well beyond just “getting off the ground” and is looking forward to increasing marketing and outreach to expand the program in future years. The following findings and recommendations provide additional suggestions for how to improve the program as it grows.

### Gross Impact Findings

**Finding 1.** The program exceeded RSR’s GPY2/EPY5 gross therm and kWh energy savings goals by 23% and 18%, respectively, despite a gross realization rate of less than 100%.<sup>10</sup> These goals were surpassed because the program completed more homes than targeted for Nicor Gas and because kWh savings per home exceeded planning estimates. The program devised successful outreach strategies such as identifying and targeting areas with high construction rates to gain new participants.

**Finding 2.** The program achieved a gross savings realization rate of 92% for both gas and electricity. The gross impact evaluation was limited by the amount of billing data available.

**Finding 3.** The evaluation team estimated demand impacts of 66.6 kW for GPY2/EPY5.

**Finding 4.** A 2011 study for the Midwest Energy Efficiency Alliance (MEEA) and the Illinois Department of Commerce and Economic Opportunity (DCEO) indicated that compliance with IECC 2009 is below 100% in Illinois.<sup>11</sup> Unfortunately, the study did not provide data in a format that could support evaluation adjustments to the code baseline.

**Recommendation.** Conduct or leverage further research on regional compliance with IECC 2012 in order to determine whether the baseline should be adjusted in future evaluations.

**Finding 5.** Although program homes all exceeded code on a performance basis by at least 10%, Navigant observed that on average certain characteristics met individual code requirements more consistently than others.

**Recommendation.** 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. Since IECC 2012 has stricter requirements for air sealing and duct sealing, efficiency in these areas alone may not bring homes up to program standards as reliably as in GPY2/EPY5.

<sup>10</sup> The program also exceeded the gas savings goals for GPY2 as filed in Nicor Gas’ Energy Efficiency Plan by 286%.

<sup>11</sup> “Measuring the Baseline Compliance Rate for Residential and Non-Residential Buildings in Illinois Against the 2009 International Energy Conservation Code.” Association of Professional Energy Consultants, Inc. June 30, 2011.

**Finding 6.** Although whole-home electric savings exceeded expectations, uptake has been low on electric prescriptive measures. Most electric measures were installed in 1% of program homes or fewer. The exception is ENERGY STAR® refrigerators, which were installed in 9.5% of joint homes.

**Recommendation.** Provide additional marketing material or sales pitch ideas to help builders and raters to increase the prevalence of these measures.

**Recommendation.** Estimate savings for all electric measures through whole-home models in order to more accurately capture whole-home savings and interactive effects.

**Finding 7.** Raters described that achieving 100% CFL lighting is very difficult due to the popularity of specialty fixtures which may not have CFL options.

**Recommendation.** Consider changing this requirement to 90% or 95%, or require ENERGY STAR® lighting not limited to CFLs (e.g. LED).

### Net Impact Findings

**Finding 8.** Navigant’s qualitative analysis of rater interview data indicated that free-ridership could be as high as 33% to 67% for homes built under IECC 2009 code.

**Recommendation.** Increase educational opportunities for builders and raters in order to increase the program’s influence on building practices

**Finding 9.** Code enforcement is reportedly high in this region and meeting code is a clear area of influence for many builders.

### Process Findings

**Finding 10.** Raters were satisfied with the program, specifically with their interactions with program staff and the application process. Given the recent launch of the program (Spring 2012), it is operating smoothly and has been able to move on from early roadblocks.

**Finding 11.** Builders were satisfied with their interaction with HERS raters, but many did not have significant interaction with the program and did not view their HERS raters as agents of the program. This lack of connection to the program could lead to low self-reported attribution in future evaluations.

**Recommendation.** Increase direct builder outreach in order to build stronger relationships with them through the following avenues:

- One-on-one meetings with builders
- Builder training sessions for both technical skills and marketing techniques
- Having a clear “go-to” person or contact list for builders seeking technical support or looking for guidance on program requirements

**Finding 12.** Builders and raters both expressed a desire for marketing materials to help them spread program awareness and explain the benefits of program homes.

**Recommendation.** Create separate marketing materials for both builders and prospective homeowners, tailored to the needs of each group. For example:

- Builder materials should advertise the program and provide clear examples of ways to qualify for the program

- Customer materials should help builders market to their clients by explaining the benefits of a program home in terms the average prospective homeowner can understand

## 7. Appendix

### 7.1 Glossary

#### High Level Concepts

##### Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 to May 31, 2009, EPY2 is June 1, 2009 to May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 to May 31, 2012, GPY2 is June 1, 2012 to May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

##### Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY5 ComEd's deemed parameters were defined in its filing with the ICC. The Gas utilities agreed to use the parameters defined in the TRM, which came into official force for EPY5/GPY2.

**Application:** When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retro-commissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

##### Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

**Application:** When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retro-commissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

## Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports†	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ “Energy” and “Demand” may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.

§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the “Terms to be Used in Reports” column).

## Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

**Deemed Value** – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a deemed measure shall use the superscript “D” (e.g., delta watts, HOU-Residential).

**Non-Deemed Value** – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript “E” for “evaluated” (e.g., delta watts<sup>E</sup>, HOU-Residential<sup>E</sup>).

**Default Value** – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript “DV” as in X<sup>DV</sup> (meaning “Default Value”).

**Adjusted Value** – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript “AV” as in X<sup>AV</sup>

## Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012<sup>12</sup>.

**Evaluation:** Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification, measure level research, and program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

*Synonym:* **Evaluation, Measurement and Verification (EM&V)**

**Measure Level Research:** An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

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<sup>12</sup> IL-TRM\_Policy\_Document\_10-31-12\_Final.docx

**Program Level Research:** An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

**Savings Verification:** An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

**Measure Type:** Measures are categorized into two subcategories: custom and prescriptive.

**Custom:** Custom measures are not covered by the TRM and a Program Administrator’s savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator’s business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

**Prescriptive:** The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithms and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

**Fully Deemed:** Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

**Partially Deemed:** Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

**Customized basis:** Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

## 7.2 Detailed Impact Analysis

### 7.2.1 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.<sup>13</sup>*

### 7.2.2 Gross Impact Results

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 only included homes inspected by November 2012 in order to ensure that there would be sufficient heating season billing data available to calibrate the models.

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<sup>13</sup> 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](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 GPY5/EPY2 Homes	Sampled 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	156	59	53,567	343	41,069	399
Detached 2+ Story	236	102	122,729	520	138,027	715
Attached 1 Story	91	53	18,300	201	24,587	424
Attached 2+ Story	205	112	47,516	232	67,943	492
<b>Total</b>	<b>688</b>	<b>326</b>	<b>242,112</b>	<b>352</b>	<b>271,626</b>	<b>552</b>

Source: RSR TrakSmart export, Navigant analysis

Navigant extracted all home characteristics for the sampled homes from the final REM Rate files stored in the HouseRater system. 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. One example of this is electric plug loads. Navigant incorporated the characteristics of the prescriptive electric measures in the models, such that the model output results include savings from these measures. 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.

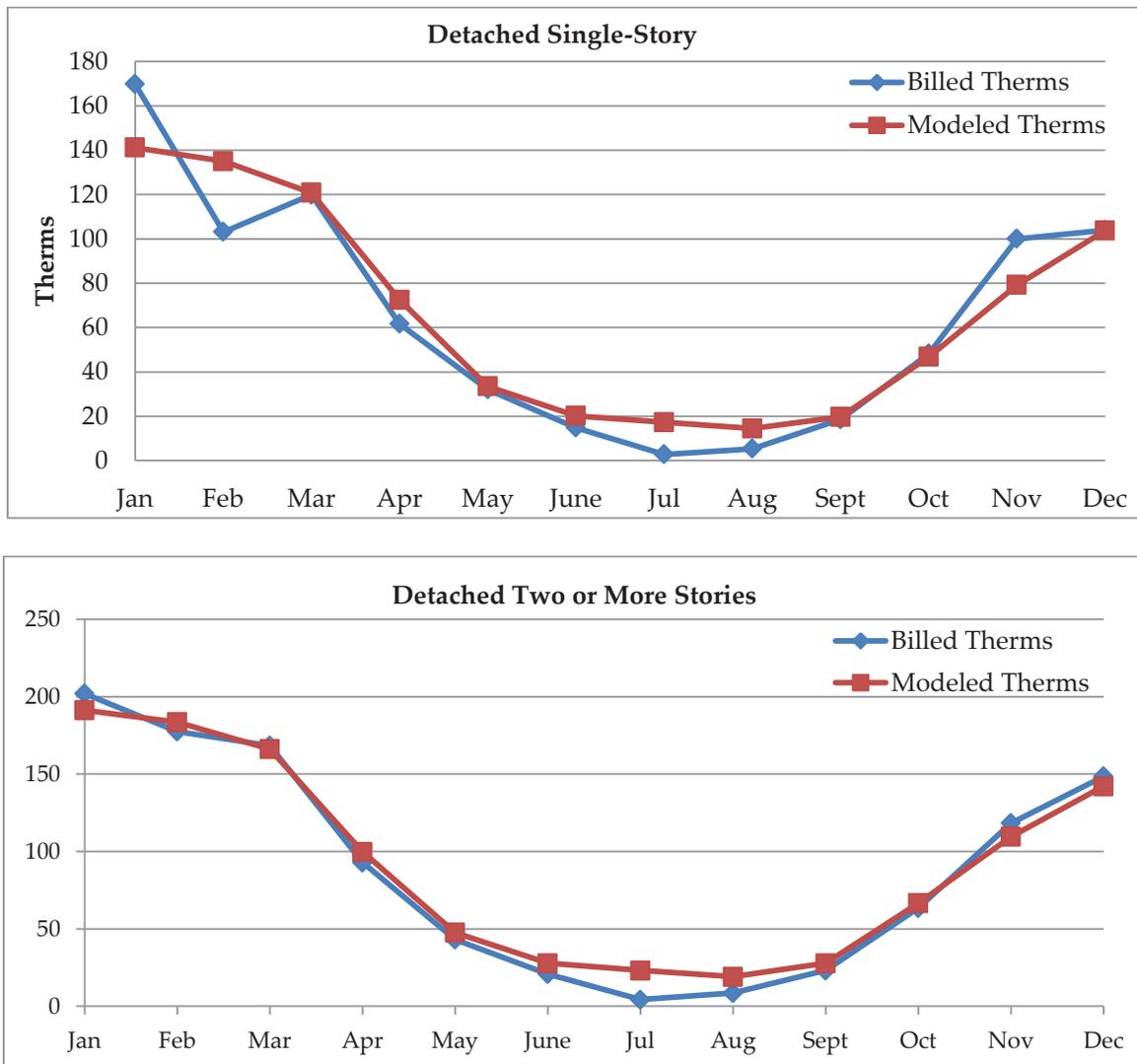
Navigant typically calibrates models to match monthly loads, but the accelerated evaluation timeline and resulting limited amount of billing data made this infeasible for two reasons. First, without a full summer of data, Navigant could not accurately calibrate the “base” or non-heating load, which is an important part of characterizing monthly use. Second, the fact that Nicor Gas does not read residential meters every month resulted in some billing records having unusual spikes and dips that may not reflect when the home actually consumed the therms billed.<sup>14</sup> In a larger sample these irregularities often average out, but with the limited number of homes available this was not the case. Navigant thus elected to calibrate based on the total therms billed for all months where at least 90% of homes showed non-zero billing records (October 2012 through June 2013). This period covered the majority of the heating season, when the bulk of residential gas use occurs. Navigant calibrated each model to within 1% of the total therms billed for this period.

Figure 7-1 shows the billed therms and modeled therms for two of the four model bins; the billing data is smoother for the two or more story bin, which had a larger sample size (n = 102) than the single-story bin (n = 59). Both billed consumption trends reflect little or no billing data available for

<sup>14</sup> For example, if Nicor Gas bills 200 therms for a December to January period based on predictive algorithms, but finds that by a meter read in February that a total of only 240 therms have been consumed over the two months since the last meter read, the data will show 200 therms for January and only 40 for February. In reality, the consumption is likely closer to 50% of the total in each month.

July through September; these months were not included in the calibration totals.<sup>15</sup> Although ComEd provided billing data as well, Navigant determined that the sample size was too small for this program year to calibrate the electric usage as well (n = 92 homes across all four models for electric instead of n = 326 for gas), and furthermore due to the timeline of the evaluation data was not available for all homes for the full cooling season. Navigant used the electricity consumption outputs from the calibrated gas models to estimate electric savings; the model output for months with usable billing data ranged from 9% below billing data totals to 11% above billing data totals, indicating additional uncertainty in the electric results.

**Figure 7-1. Example Calibration for Detached Single and Two or More Story Models**



Source: Navigant analysis

<sup>15</sup> Navigant believes that the BEopt load shapes are more realistic than the limited billing data for these months; savings are still captured from water heater efficiency improvements for this period although the exact “base load” could not be calibrated.

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% of the billing data total therms. For the calibration modeling, Navigant used an actual weather file for Chicago O’Hare airport for July 2012 - June 2013.

**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	753	753	-0.4	-0.1%
Detached 2+ Story	1035	1034	-0.7	-0.1%
Attached 1 Story	604	603	-1.2	-0.2%
Attached 2+ Story	479	478	-0.8	-0.2%

Source: Navigant analysis

Table 7-3 and Table 3-3 show the resulting gas and electric calibrated model outputs for the program homes and corresponding IECC 2009 baseline models.<sup>16</sup> 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	1149	831	318	28%
Detached 2+ Story	1563	1138	425	27%
Attached 1 Story	869	676	193	22%
Attached 2+ Story	750	549	201	27%
<b>Weighted Average</b>	<b>1135</b>	<b>832</b>	<b>303</b>	<b>27%</b>

Source: Navigant analysis

<sup>16</sup> There were five homes in GPY2/EPY5 built under the IECC 2012 code; none of these homes were included in the evaluation sample because they had not been completed prior to the heating season. Navigant applied the same realization rate to these homes for this year given their small contribution to overall gross savings.

**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	7201	6700	501	7%
Detached 2+ Story	9279	8664	615	7%
Attached 1 Story	6111	5721	390	6%
Attached 2+ Story	6852	6342	510	7%
<b>Weighted Average</b>	<b>7790</b>	<b>7255</b>	<b>535</b>	<b>7%</b>

Source: Navigant 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 <sup>2</sup> )	Program Average Area (ft <sup>2</sup> )
Detached 1 Story	63.9	60.8	3,180	3,135
Detached 2+ Story	62.8	60.3	4,267	4,224
Attached 1 Story	66.3	65.7	2,379	2,283
Attached 2+ Story	61.0	60.9	2,245	2,225
<b>Total</b>	<b>63.0</b>	<b>61.3</b>	<b>3,168</b>	<b>3,125</b>

Source: RSR TrakSmart export

Navigant found overall gross realization rates of 91% for natural gas and 90% 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	343	357	53,567	104%	55,674
Detached 2+ Story	520	446	122,729	86%	105,185
Attached 1 Story	201	201	18,300	100%	18,258
Attached 2+ Story	232	201	47,516	87%	41,183
<b>Total</b>	<b>352</b>	<b>320</b>	<b>242,112</b>	<b>91%</b>	<b>220,300</b>

Source: RSR TrakSmart export, 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	399	461	42,460	112%	47,532
Detached 2+ Story	715	609	141,658	83%	117,562
Attached 1 Story	424	376	26,069	84%	21,821
Detached 2+ Story	492	462	68,855	93%	63,730
<b>Total</b>	<b>552</b>	<b>509</b>	<b>279,042</b>	<b>90%</b>	<b>250,645</b>

Source: RSR Dashboard export, Navigant analysis

### 7.2.2.1 Electric Prescriptive Measure Inputs

Navigant used the following algorithms and inputs from the Illinois TRM to estimate savings.

#### ECM Furnace Fans

The Illinois TRM specifies the following algorithm and inputs for ECM furnace fans:

$$\Delta \text{kWh} = \text{Heating Savings} + \text{Cooling Savings} + \text{Shoulder Season Savings}$$

Where:

Heating Savings	= Blower motor savings during heating season = 418 kWh
Cooling Savings	= Blower motor savings during cooling season
If Central AC	= 263 kWh
If No Central AC	= 175 kWh
If unknown (weighted average)	= 241 kWh

Shoulder Season Savings = Blower motor savings during shoulder seasons  
= 51 kWh

Since program homes with furnace fans had central AC, Navigant calculated the total savings per home as follows:

$$\Delta kWh = 418 \text{ kWh} + 263 \text{ kWh} + 51 \text{ kWh} = 732 \text{ kWh}$$

### Central Air Conditioning

Navigant used the Illinois TRM algorithm with the following inputs for central air conditioners:

$$\Delta kWh = (FLH_{cool} * BtuH * (1/SEER_{base} - 1/SEER_{ee}))/1000$$

**Table 7-8. Central Air Conditioning Inputs**

Input	Value	TRM Default or Actual
FLHcool	570	Default: Single Family Zone 2
BtuH	Variable	Actual
SEERbase	13	Default
SEERee	Variable	Actual

*Source: 2012 Illinois TRM, Navigant Analysis*

### Refrigerators

Navigant used the Illinois TRM algorithm to determine refrigerator savings:

$$\Delta kWh = UEC_{BASE} - UEC_{EE}$$

Navigant then verified the adjusted volume (AV) of the incented refrigerators and calculated the appropriate baseline and efficient usage. In some cases, Navigant verified lower efficient energy usage than required by ENERGY STAR® using the ENERGY STAR® list of qualified units. In these cases Navigant used the higher efficiency verified values. Navigant also used the ENERGY STAR® revision which added category 5a for bottom-mounted freezer units with through-the-door ice service. Navigant observed in the tracking data that the implementation contractor did not incent some qualified units installed in homes in ComEd service territory.

**Table 7-9. Illinois TRM Refrigerator Inputs**

Product Category	UEC <sub>BASE</sub>	UEC <sub>EE</sub> (Maximum)
1. Refrigerators and Refrigerator-freezers with manual defrost	8.82*AV+248.4	7.056*AV+198.72
2. Refrigerator-Freezer--partial automatic defrost	8.82*AV+248.4	7.056*AV+198.72
3. Refrigerator-Freezers--automatic defrost with top-mounted freezer without through-the-door ice service and all-refrigerators--automatic defrost	9.80*AV+276	7.84*AV+220.8
4. Refrigerator-Freezers--automatic defrost with side-mounted freezer without through-the-door ice service	4.91*AV+507.5	3.928*AV+406
5. Refrigerator-Freezers--automatic defrost with bottom-mounted freezer without through-the-door ice service	4.60*AV+459	3.68*AV+367.2
6. Refrigerator-Freezers--automatic defrost with top-mounted freezer with through-the-door ice service	10.20*AV+356	8.16*AV+284.8
7. Refrigerator-Freezers--automatic defrost with side-mounted freezer with through-the-door ice service	10.10*AV+406	8.08*AV+324.8

Source: 2012 Illinois TRM

**ENERGY STAR® Exhaust Fans**

Navigant used the deemed TRM savings of 88.6 kWh per fan.

**100% CFL Lighting**

For per CFL savings, Navigant used the TRM to estimate impacts for each lamp. None of the homes which received incentives for 100% CFL lighting provided a count of lamps per home. Navigant used the average number of lamps per home reported in the GPY2/EPY5 tracking data to estimate whole-home lighting savings (36.4).

$$\Delta kWh = ((WattsBase - WattsEE) / 1000) * ISR * Hours * WHFe$$

**Table 7-10. CFL Algorithm Inputs and Assumptions**

Input	Value	Source & Notes
WattsEE	14	Assumed
CFL Lumens	800	Estimated based on assumed wattage
Lumen Bin	750 - 1049	Illinois TRM
WattsBase	60	Illinois TRM
WHFe	1.06	Illinois TRM
Hours	938	Illinois TRM, Single-family
ISR	0.969	Illinois TRM, Direct-install
ΔkWh per CFL	44.3	Calculated per Illinois TRM
Total ΔkWh	1,618	Based on 36.4 lamps per home (program average)

Source: 2012 Illinois TRM

### 7.2.3 Net Impact Evaluation Methodology

The evaluation team used rater and builder interviews to collect some qualitative feedback on free-ridership and spillover levels.

#### 7.2.3.2 Free-Ridership

The methodology for the RNC program net-to-gross analysis centered on the following questions:

- In what percentage of homes did builders incorporate high-efficiency practices prior to participating in the program?
- In what percentage of program homes did builders incorporate high-efficiency practices during GPY2/EPY5?
- In what percentage of non-program homes did builders incorporate high-efficiency practices during GPY2/EPY5?
- How much did the program influence any increase in the incorporation of high-efficiency practices inside and/or outside of the program?
- How effectively did builders incorporate high-efficiency practices before and after joining the program?

Navigant asked both builders and raters about the following high-efficiency building practices which the program encourages. For complete builder and rater interview guides, please see Section 0.

**Table 7-11: High-Efficiency Practices Included in Builder and Rater Interview Guides**

Category	Practice
Framing & Insulation	Air Sealing all Penetrations
	Capping Chases
	Floors (insulating conditioned to unconditioned space, insulating basement walls)
	Backing Knee Walls
	Insulation in Full Contact w/ Air Barrier
HVAC	Proper Sizing
	Duct Leakage / Sealing
	Pressure Balancing
	Proper RC&AF
Other Equipment	High Efficiency Central Air Conditioning (SEER $\geq$ 14.5)
	ECM Furnace Fan
	ENERGY STAR® Refrigerator or Exhaust Fan
	100% CFL Lighting
	Power-vented Water Heater (EF $\geq$ 0.62)
	High Efficiency Furnace (AFUE $\geq$ 92%)

For builders, Navigant asked about the percent of homes in which builders used each technique before and during participation in the program. If the percentage during participation increased from the percentage before participation, the interviewer asked about program influence and other factors which may have contributed to the change.

For raters, Navigant also asked about the builders’ implementation of these practices and whether their ability to successfully use these techniques had improved as a result of working with the program.

### 7.2.3.3 Spillover

The free-ridership methodology described above also sought to capture participant spillover. Navigant did not investigate non-participant spillover at this time since the program is still ramping up and has not had much time to influence the broader market.

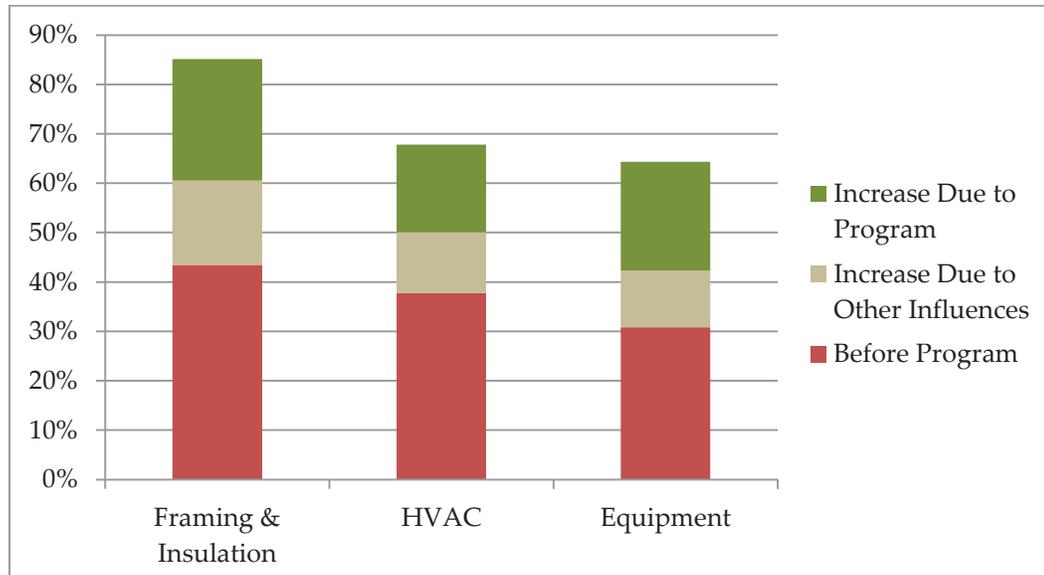
### 7.2.4 Net Program Impact Results

Although Navigant did not conduct a full net-to-gross analysis, the team did collect information on attribution through the builder and rater interviews. With the IECC 2009 code in place and code shifting to IECC 2012, it was clear that several factors were contributing to changes in builders’ practices. Raters indicated that most of the builders they worked with were typically meeting code or exceeding it by up to 6-8%: they confirmed that the program was definitely influential in getting builders to make the necessary changes to meet the program threshold of 10% savings, but this means that the program’s actual net savings could be limited to the savings beyond 6-8% above code.

The evaluation team asked raters about the prevalence of high-efficiency building practices in their homes before and after participating in the program. For practices where raters reported an increase in implementation, the team asked them to rate program influence on that increase. The results in

Figure 7-2 show that while the percent of homes using these practices did increase significantly over the first year of the program, the program was not solely responsible for these improvements. Raters cited already strict code enforcement of IECC 2009 and the upcoming changes required by IECC 2012 as the main other source of influence. Raters also estimated that of the program homes reviewed in GPY2/EPY5, 10% or fewer would have met IECC 2012 requirements. This indicates that the program may have greater influence on efficiency improvements above the IECC 2012 code in future program years.

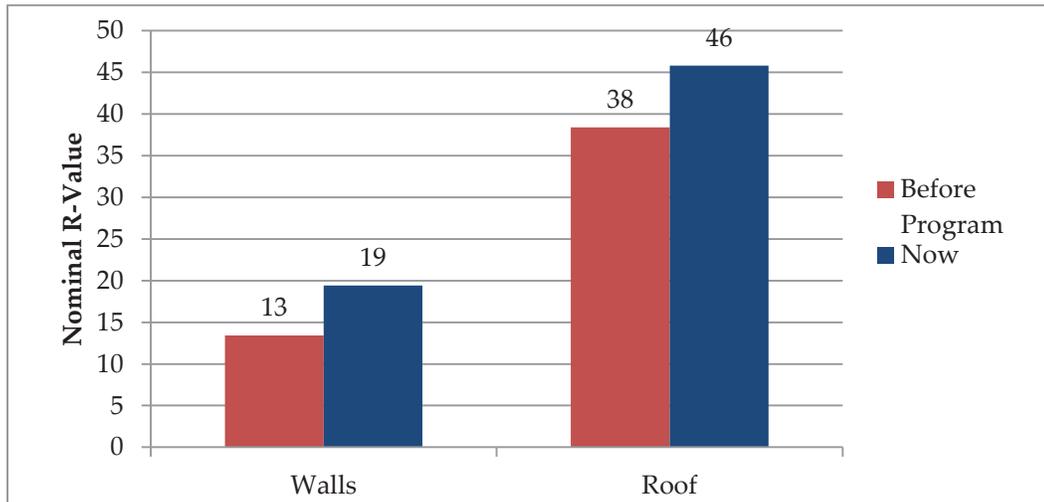
**Figure 7-2. Percent of Program Builder Homes Using Efficient Practices  
(As Reported by HERS Raters, n=4)**



Source: Navigant Analysis

For insulation and framing, interviewers also asked raters for the typical nominal wall and roof insulation R-values builders they worked with used at the beginning of the program compared to the values they are using now. Figure 7-3 shows that raters reported a notable increase in R-values, especially on wall insulation.

**Figure 7-3. Average Nominal R-values Before and During Program Participation  
(As Reported by HERS Raters, n=4)**



Source: Navigant Analysis

Navigant used this data to calculate rough estimates of minimum and maximum net-to-gross. The maximum net-to-gross reflects a minimum free-ridership case, in which all of the increase in efficiency in program homes is attributed the program. This is calculated as follows:

$$FR_{min} = \frac{\% \text{ Efficient, pre - program} - \% \text{ Efficient outside, during}}{\% \text{ Efficient inside, during}}$$

Where:

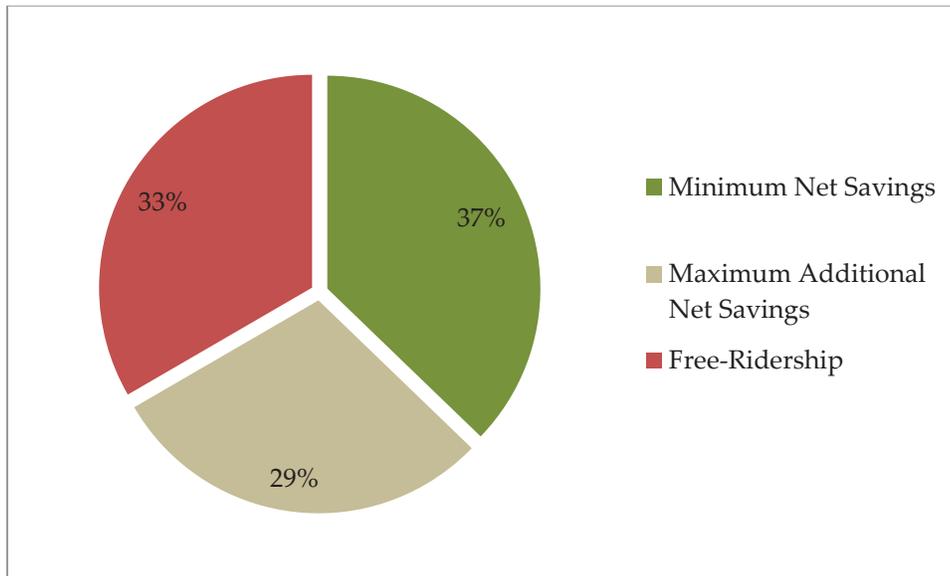
- *% Efficient, pre-program* is the percent of all program builders' homes using the measure prior to the program's launch
- *%Efficient outside, during* is the percent of all program builders' homes using the measure in non-program homes during the program year
- *%Efficient inside, during* is the percent of all program builders' homes using the measure in program homes

The minimum net-to-gross reflects the raters' influence scores, which increased the free-ridership estimate because they did not attribute all increases in efficiency to the program:

$$FR_{max} = FR_{min} + (1 - FR_{min}) \times (1 - Influence)$$

The overall results for the RNC program are shown below in Figure 7-4, where the minimum net-to-gross is 37%, and the maximum net-to-gross is 67%: the sum of the minimum net savings (37%) and the maximum additional net savings (29%).

**Figure 7-4. Rough Estimates of Net-to-Gross**



Source: Navigant Analysis

The evaluation team also asked raters about how well the program builders they work with implemented advanced framing, insulation, and HVAC installation practices before and after working with the program. Navigant asked raters to rank average builder implementation on the following scale:

Score	Description
1	Not Using
2	Poor
3	Fair
4	Good
5	Excellent

Raters observed a shift from an average ranking of 3.78 to 4.78 for builders that they worked with in the program. This difference is not accounted for in the rough NTGR estimate shown above.

Overall, this analysis showed that while the program is definitely causing program builders to change their practices, other influences such as code enforcement and custom homeowner demand for efficient homes are also contributing to this shift and reducing the program’s net savings potential. It is likely that some of the code influence on program home efficiency gains may lessen once IECC 2012 is in place and builders must go beyond it in order to qualify.

### 7.3 Detailed Process Results

This section contains the complete process analysis for the GPY2/EPY5 RNC program.

#### 7.3.1 Marketing and Participation

The program’s recruitment strategy has been successful to date in enrolling enough builders and raters to fulfill program goals. However, builders and raters both identified marketing support as a weak point in the program. One rater described the marketing support as “light” and another

indicated that while the program has “been there for whatever they have needed, [they] would like to have some marketing material in hand.”

Builders found out about the program through program staff, HERS raters, subcontractors, clients, and their own research. Four of the seven respondents had worked with their HERS raters prior to working with the program, and these respondents also indicated that they work with HERS raters on non-program homes. One other custom builder reported working with another HERS rater on a LEED project outside of the program. Three out of four raters were recruited directly by the program; the fourth heard about it through a builder that was trying to build an ENERGY STAR® home.

Overall, builders did not feel that the program has been effective to date at raising customer or builder awareness of the program and energy efficient building practices: some indicated that this was because many builders and customers already knew about energy efficient building practices, but others felt that program awareness was low among customers and that the program could do more to help builders market the program. Only one builder felt that customer demand for high efficiency homes was high, and others indicated that customers either were not aware of the benefits of energy efficiency or only valued energy efficient appliances. One builder expressed specific interest in “how to better communicate with clients about the benefits of an energy efficient home.”

### 7.3.2 Program Characteristics and Barriers

Program raters indicated that in GPY2/EPY5 with the IECC 2009 code in place, most builders were already meeting and exceeding code on a performance basis, and only required “tweaks” to their practices in order to achieve the program requirement of 10% savings above code. Ratets cited equipment efficiency increases as the most common adjustment to hit the 10% threshold. However, when asked about the incentive levels, builders felt that the cost of complying with the program was far more than the incentive they got from the program. Two builders indicated that equipment costs to comply with program requirements were typically \$1,000 per home above their standard practices.

With the upcoming change to IECC 2012, one builder indicated that they would no longer participate in the program because the costs of reaching 10% above the higher standard would not be cost effective. One rater echoed this, saying that “the impending 2012 code change took a lot of builders out of the program.” Other raters felt that while most builders would need the program’s assistance to still meet and exceed code, some were already looking ahead to above-code practices and would not have trouble participating with the new code.

Another barrier for some builders was lack of certainty around program requirements. Two of the seven builders interviewed said that they were not sure what program requirements were. One rater agreed that builders needed more direction from the program. This rater suggested creating a brochure with “simple benchmarks that need to be hit,” or showing builders a sample process or options of ways to meet program requirements. For example, some builders may not understand what steps they have to take or what tests they need to have performed in order to meet program air tightness requirements.

### 7.3.3 Administration and Delivery

Over the course of GPY2/EPY5, the program made three significant changes:

- Increased frequency of payments to raters and builders from monthly to bi-weekly

- Elected to pay incentives on homes outside of the ComEd electric service territory (Nicor Gas only homes)
- Increased the number of RSR staff dedicated to the program.

Builders and raters both indicated satisfaction with the increased payment frequency. Changing the program requirements to allow homes outside of the ComEd service territory allowed the program to complete additional homes and exceed therm savings goals, although it led to the program falling short of the goal of 600 joint homes completed. Both utilities noted that their satisfaction with the program’s implementation increased once RSR added new staff to the program. Both raters and builders also noted that the program has improved significantly since they began participating; one rater said that “the program has come a long way,” and one builder said that although his first interaction with the program was “less than satisfactory, the second was beyond [his] wildest dreams.” This shows that the program is working hard to learn from early mistakes and keep participants satisfied.

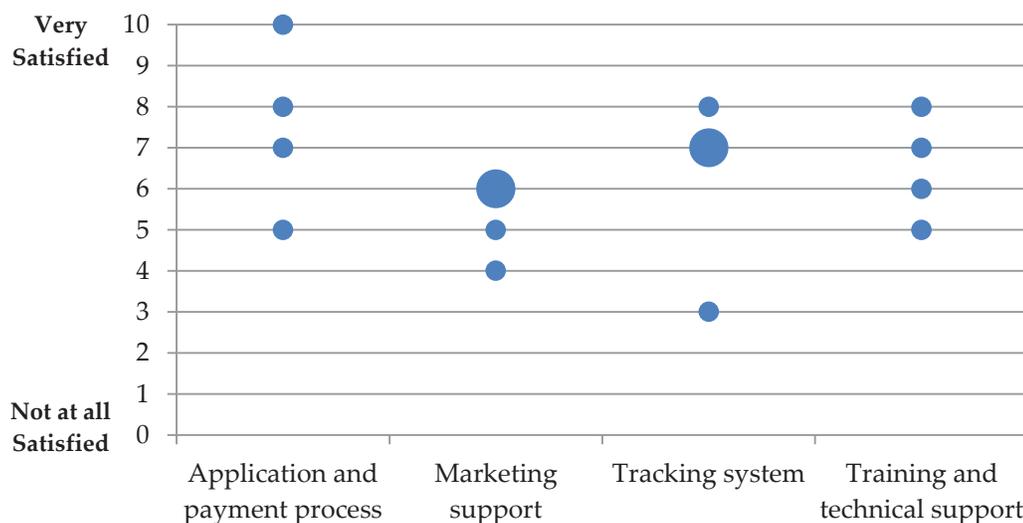
As discussed in the tracking system review, HouseRater collects extensive data on all program homes and allows the program to conduct comprehensive QA/QC reviews of submitted homes. While some raters indicated frustration with the level of detail required in HouseRater, the availability of this data benefits both the program’s internal due diligence processes as well as the evaluation effort.

### 7.3.4 Participant Satisfaction

Overall, raters and builders seemed satisfied with the program, although many offered suggestions for improvement.

As shown in Figure 7-5, raters were most satisfied with the application and payment process, and least satisfied with marketing support. Some were very satisfied with the HouseRater tracking system, but others felt it was cumbersome and required more time and data than other programs.

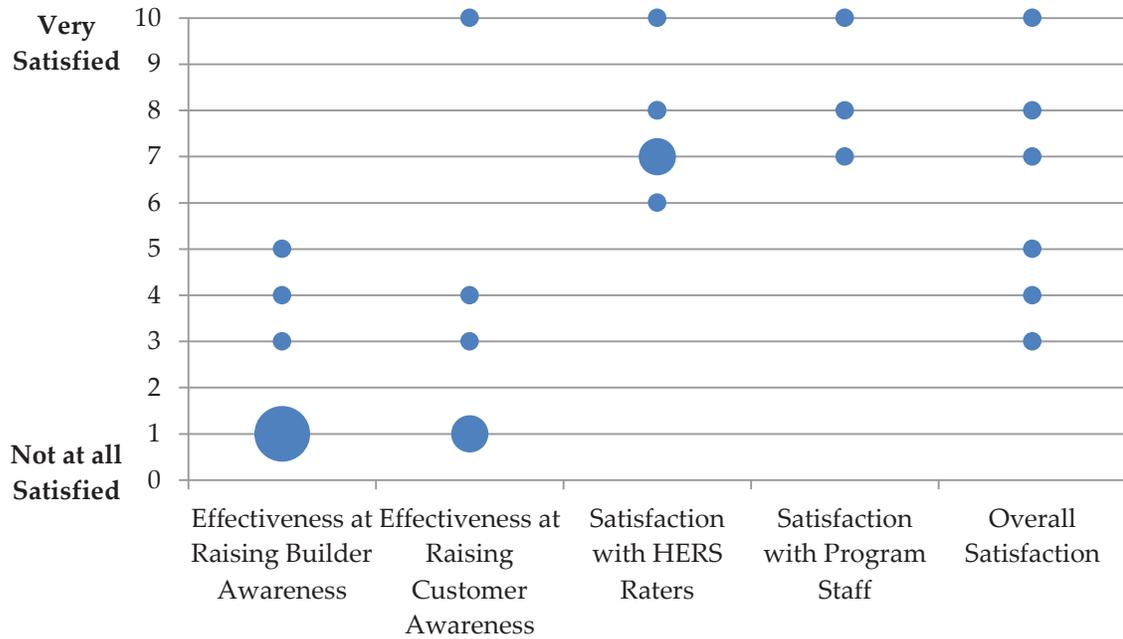
**Figure 7-5. Rater Satisfaction With Program (Score out of 10, n = 4)**



Source: Navigant analysis

Overall, the builders who responded to the interview were fairly satisfied with the program. Only three out of seven respondents had significant interactions with program staff, but those who had were very satisfied. Satisfaction with HERS Raters was also high. Builders did not think that the program had been successful to date at raising builder or customer awareness of the benefits of energy efficient homes.

**Figure 7-6. Builder Satisfaction and Program Effectiveness Ratings (Score out of 10)**



Source: Navigant Analysis

#### 7.4 PJM Data and Findings

Residential New Construction Program EPY5

Coincident Peak Demand = 0.067 MW

Estimate based on average demand savings between baseline and efficient home model hourly output during PJM peak hours.

Realization Rate on Demand Savings: N/A, no demand savings claimed.

Precision Estimate on Demand Savings (90% confidence, two-tail): Not calculated; estimate based on calibrated aggregate models rather than a sample of homes.

Non-Peak Demand or Non-Coincident Peak Demand: Not estimated.

7.5 Data Collection Instruments

7.5.1 Nicor Gas and ComEd Joint Residential New Construction Program Builder Interview Guide

Nicor Gas and Commonwealth Edison  
 Joint Residential New Construction Program  
 Builder Interview Guide  
 FINAL

**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 #:** \_\_\_\_\_

1. 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 recently completed program year which spanned the last 12 months, so keep that in mind as we talk. I will ask questions in three topic areas:

1. Program incentives,
  2. Marketing and sales
  3. Technical requirements and technical support
2. In the past year (June 1, 2012-May 31, 2013), roughly how many homes **in total** did your company build altogether? *[An approximate number is ok.]*
- # \_\_\_\_\_
3. 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.]

4. About what percentage of the homes your company built in PY2 were production (spec-built) homes, and what percentage were custom-built homes?
- % Production/Spec \_\_\_\_  
 % Custom \_\_\_\_
5. 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.

6. Our records show that you built [xx] homes through the program during the last year. Approximately what % of all the homes you built in the Nicor/ComEd service territories does this represent?
7. We'll get into more specifics, but 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.

## II. PROGRAM INCENTIVES

Now I'd like to get your thoughts on the program incentives.

1. Are the incentives, as **currently** structured, sufficient to offset a meaningful fraction of the incremental cost of building to the program's standards? [PROBE FOR ACTUAL INCREMENTAL COSTS, IN TERMS OF % ADDITIONAL COSTS OVER AND ABOVE STANDARD PRACTICE.]
2. From your perspective is the program's design achieving a good balance of incentives and information and technical support? That is, if you were to trade off the program's resources between incentives and field support, including marketing and technical support, what trade-offs would you suggest, if any, that would improve the program's performance?  
*[If needed:]* Think about the situation in this way: The program budget is capped. Thus, changing the program design by shifting its limited resources in various ways to try and increase its impact and productivity – say to increase incentives, for example – likely means having to reduce other support the program provides. Marketing and technical support likely would have to be reduced. What insights do you have about shifting resources either toward higher incentives with less information, marketing and field support, or lower incentives with greater information, marketing and field support?
3. Have you been satisfied with the timeliness of incentive payments?

## III. NET-TO-GROSS

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. Remember to think specifically about homes that you have built in the Nicor Gas and ComEd service territories.

*[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
	Floors (insulating conditioned to unconditioned space, insulating basement walls)
	Backing Knee Walls
	Insulation in Full Contact w/ Air Barrier
HVAC	Proper Sizing
	Duct Leakage / Sealing
	Pressure Balancing
	Proper RC&AF
Other Equipment	High Efficiency Central Air Conditioning (SEER $\geq$ 14.5)
	ECM Furnace Fan
	ENERGY STAR® Refrigerator or Exhaust Fan
	100% CFL Lighting
	Power-vented Water Heater (EF $\geq$ 0.62)
	High Efficiency Furnace (AFUE $\geq$ 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.

1. Before participating in the program, in what percent of your homes did you incorporate these practices/measures?
2. Of the homes that you **submitted** to the program this year, in what percent did you incorporate these practices/measures?
3. [Skip this question if I6c = 100%] Of the homes that you did **not submit** to the program this year, in what percent did you incorporate these practices/measures?
  -
4. [Skip this question if I6c = 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.*
  -
5. *If calculated % increase with measure:* It sounds like you have increased your use of these measures/practices since participating in the program. Did the program increase your knowledge of how to implement these measures/practices?
  -
6. *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 was in your decision to increase the use of these

- measures/practices in homes that you submitted to the program? [If necessary, clarify that you mean an increase above pre-program levels as specified in #1]
- - 7. *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 was in your decision to increase the of use these measures/practices in more homes outside of the program, compared to your standard practices prior to participating in the program?
    -
  - 8. What other factors, if any, contributed to the increase of your use of these measures/practices?
    -
  - 9. Just to confirm that I've interpreted your responses correctly, it sounds like the program had a low/high/moderate influence on your decision, and <other factors> also had some influence/did not affect your decision. I'd like to ask this in a different way: if you had a total of 10 points that reflect the importance in your decision to increase your use of these measures/practices, and you had to divide those 10 points between the program and these other factors, how many points would you give to the program?
    - 
    - a. *If answer inconsistent with #6/7, read back both answers and ask if one should be changed.*
    -
  - 10. *If decrease calculated:* It sounds like you have decreased your use of these measures/practices in your homes. What factors have caused this decrease?
  - 11. Have you had any problems with your subcontractors getting up to speed on this measure? Please describe:

#### IV. MARKETING AND SALES

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?
2. 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?
3. How **effective** has the program been overall in raising builders' awareness about strategies and opportunities for 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 I4 custom home % is significant, i.e. >30%,] What percentage of the custom home plans that you receive from architects already meet the requirements of the program? Who would you say is primarily responsible for encouraging these custom homes to meet the project requirements: you [the builder], the architect or the client?
5. Are there any areas in which the program could improve that would make it easier or more compelling for you and other builders to participate?
6. [if I6c < 100%,] What would it take for you to build 100% of your homes to program specifications?
7. 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.**
8. 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 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?
9. 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?
10. Do you have any other thoughts about the program's marketing and sales effectiveness and support to you as a builder? Are there any lessons you learned that the program staff should consider for improving the program's marketing and sales efforts, either in the form of recruiting new builders, or generating more consumer demand for energy-efficient new homes?

## V. RELATIONSHIP WITH HERS RATERS AND PROGRAM STAFF

1. Please describe how you began your relationship with HERS rater(s) that you work with through the program.
2. Do you work with any HERS raters outside of the program?

3. 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 HERS raters help you the most with? Where have you learned the most from them?
  - b. Are there areas where you would like additional technical support, either from HERS raters or program staff?
  - c. Have you been satisfied with the quality and type of feedback you have gotten from your HERS rater? [Probe for written vs. verbal feedback, if needed]
  
4. 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.**
  
5. 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.**

## VI. TECHNICAL REQUIREMENTS AND 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. 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.
3. What are your thoughts regarding Illinois' residential energy code moving from IECC 2009 to IECC 2012? Has the program helped you to learn about what changes to expect with the new code?
  - a. How will the new code change 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 will make a big difference in improving efficiency over code?
4. What strengths and weaknesses have you experienced with the program's inspection processes? Have any inspections caused delays in the construction schedule?
  -
5. Do you have any other thoughts on technical requirements and support? Please describe:

## VIII. WRAP UP

1. And in closing, do you have any last thoughts on any aspect of the program, insights or lessons learned that would help improve it, or that would 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.**

**7.5.2 Nicor Gas and ComEd Joint Residential New Construction Program Rater Interview Guide**

**Nicor Gas and Commonwealth Edison  
Joint Residential New Construction Program  
Rater Interview Guide  
FINAL**

**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. How did you first hear about the program? Why did you want to get involved?

3. 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:
  
4. Of the work you do in the Nicor Gas and ComEd service territory, what percent is through the program?
  
5. Do you participate in other utility energy efficiency programs? If yes, which ones?
  
6. Please describe your participation in the Residential New Construction program. Would you say you are very active, moderately active, or not very active with the program?
  - 
  -
7. 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
  
8. [FOR ANY EXTREMELY HIGH OR LOW VALUES] Can you comment on why you gave the ratings that you did?
  
9. What do you think the Nicor Gas and ComEd program does well?
  
10. Are there any areas in which the program could improve, that would make it easier for you to participate?
  -

## 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? 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?
  
3. In the cases where a home plan does not achieve a qualifying level of efficiency 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 are typically needed?

Of the HERS rated plans that move forward to the construction phase, about what percentage actually adhere strictly to the construction plans? In other words, are there many instances where the final plan is strong but the actual building, as constructed, falls short of the design in the plan? [PROBE: Does it take builders a while to learn how to build a home such that it will pass your inspections?]

4. 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?
  -
5. 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? 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]*
  -
6. 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 the new IECC 2012 code and program requirements through additional trainings, relationships with trade allies, etc.?

### 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.

## Framing & Insulation

1. Now I'd like to talk about framing and insulation.
  - a. In what percent of homes did you see builders using advanced framing and proper insulation techniques consistent with the Thermal Bypass Checklist when they first entered the program? *[If needed, prompt with practices below]*
  - b. In what percent of homes do you see them using these techniques now?
  - c. What were typical insulation R-values in builders' homes when they first entered the program? *Probe for walls, attic, foundation.*
  - d. What are typical R-values now?

Framing & Insulation	Air Sealing all Penetrations
	Capping Chases
	Floors (insulating conditioned to unconditioned space, insulating basement walls)
	Backing Knee Walls
	Insulation in Full Contact w/ Air Barrier

2. 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 of the program year, would you say their implementation was...
    - i. Excellent
    - ii. Good
    - iii. Fair
    - iv. Poor
    - v. Not using technique
  - b. At the end of the program year, 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 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 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 did you see builders using the following practices when specifying and installing HVAC systems when they first entered the program?
  - b. In what percent of homes do you see them using these practices now?

HVAC	Proper Sizing
	Duct Leakage / Sealing
	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 of the program year, would you say their implementation was...
    - i. Excellent
    - ii. Good
    - iii. Fair
    - iv. Poor
    - v. Not using technique
  - b. At the end of the program year, 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 insulation levels and advanced insulation techniques 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 did you see builders installing the following high-efficiency equipment when they first entered the program?
  - b. In what percent of homes do you see them installing this equipment now?

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 insulation levels and advanced insulation techniques among the builders you work with? [PROBE FOR SPECIFIC WAYS IN WHICH THE PROGRAM HAD AN INFLUENCE]

7. Thinking back to when IECC 2009 was code, if the program was not available, 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?
  - a. How do you think this situation will change when IECC 2012 is code?
  - b. Have you seen homes coming through prior to the code change that you think would meet the program's requirements under IECC 2012?

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

## **7.6 Follow-up on GPY1/EPY4 Recommendations**

This section provides the results of Navigant’s review of the status of GPY1/EPY4 recommendations on key performance indicators (KPIs) and the verification, due diligence and tracking system review (VDDTS).

### **7.6.1 KPI Evaluation**

Table 7-12 below lists the current implementation status of key performance indicators that Navigant recommended in the GPY1 memo reviewing the program’s logic model.

**Table 7-12. Status of Implementation of KPIs from GPY1 Program Logic Model Review**

KPI Recommendations			
Outputs	Indicators	Data Sources and Potential Collection Approaches	Status of Implementation June 2013
Program secures working contracts with RESNET certified HERS raters	Number of raters contracting with program	Interviews with program staff, program implementers	Implemented: Program tracks number of raters enrolled
Raters are well equipped to sell program and provide technical support to builders	Number of training sessions held for raters, number of raters able to successfully support builders without assistance from implementation contractor	Interviews with program staff	Implemented. Program staff able to provide list of training events and describe level of assistance given to raters.
Program “brand” is developed and publicized, gains consumer awareness	Level of homebuyer awareness	Homebuyer surveys, market research, builder and rater surveys	Not implemented; too early in program and may require evaluation research
Program supports participating builders and raters, maintaining satisfaction of both groups	Training sessions held, marketing materials held, level of positive feedback from program surveys.	Interviews with program staff, print or digital copies of marketing materials, surveys conducted by implementation contractor, builder and rater surveys conducted in evaluation.	Implemented. Program staff able to provide list of training events and marketing materials. Evaluation surveys will determine satisfaction levels.
Rebates for builders and raters reduce cost of building and rating more energy efficient homes	Number of rebates offered and amount of each rebate	Program tracking data	Implemented. Data available in tracking database extracts.
Growing population of program HERS raters available to recruit and support builders	Number of active HERS raters in program	Interviews with program staff, program tracking data	Implemented. Program staff able to provide number of raters with enrolled and submitted homes

KPI Recommendations			
Homebuyers purchase program homes	<b>Purchase rate or time to purchase</b> for program homes, program homes' <b>market share</b> in target area	Program tracking data, residential new construction market data	Implementation in progress. Program staff have discussed options for estimating this metric and are working with evaluation team to determine the best approach.
Raters and builders submit homes through the program	Number of homes rebated by the program	Program tracking data	Implemented. Data available in program tracking database extracts.
Builders learn to build homes meeting program requirements	Level of assistance required by builders in program	Rater interviews, interviews with program staff	Implemented. Program staff work closely with raters and builders. Evaluation will also assess with rater interviews.
Program achieves energy savings	Therms, kWh, and kW saved by program homes	Program tracking data	Implemented. Data available in tracking database extracts.
Homebuyer demand for energy efficient homes rises	Level of demand observed by builders and realtors, comparative time to purchase (program and non-program homes)	Builder surveys, homeowner surveys, market data	Not implemented. Will require evaluation research.

### 7.6.2 VDDTS Evaluation

Table 7-13 below lists the current implementation status of recommendations related to the verification, due diligence, and tracking system (VDDTS) review that Navigant conducted in GPY1/EPY4.

**Table 7-13. Status of Implementation of Recommendations from GPY1/EPY4 Review of VDDTS**

VDDTS Recommendation	Status of Implementation June 2013
<b>QUALITY ASSURANCE AND VERIFICATION RECOMMENDATIONS</b>	
<p>Navigant recommends continuing to follow well-defined quality assurance and verification procedures including the following:</p> <ul style="list-style-type: none"> <li>• Random sampling for field and paper inspections by both the HERS Providers and RSR staff</li> <li>• Review of data submitted to HouseRater</li> <li>• Formalizing protocols for “problem” raters or builders</li> </ul>	<p>Implemented.</p>
<b>DATA TRACKING SYSTEM AND REPORTING RECOMMENDATIONS</b>	
<p>We recommend linking HouseRater to utility customer databases so that Nicor Gas and ComEd customers living in Program homes can be identified.</p>	<p>No Implementation Planned. However, program can link participating homes to homeowner account information, which is the primary reason for this recommendation.</p>
<p>Navigant recommends that the Program identify key <b>market transformation</b> metrics to track in HouseRater such as <b>time to purchase</b> and <b>market share</b> (percentage of new construction homes in service territory participating in program).</p>	<p>Implementation Pending. The program is subscribing to new construction market reports and looking into methods for tracking <b>time to purchase</b>, but still lacks formal market transformation goals.</p>
<p>Navigant recommends developing a detailed <b>data dictionary</b> with the following information:</p> <ul style="list-style-type: none"> <li>• For each table: <ul style="list-style-type: none"> <li>○ Summary of fields included</li> <li>○ Purpose of table</li> </ul> </li> <li>• For each field: <ul style="list-style-type: none"> <li>○ Definition of field</li> <li>○ Field type, e.g. string, integer, number</li> <li>○ Data validation rules, e.g. range restrictions</li> <li>○ Method of entry, e.g. entered by builder/rater or pulled from REM/Rate file</li> </ul> </li> </ul>	<p>Not implemented.</p>
<p>Navigant recommends that the Program start to collect and track home cost and price data</p>	<p>Partially implemented. The program has developed incremental capital cost estimates but does not plan to collect actual home cost or price data as it is not cost effective to do so.</p>



#### 4.6 *Elementary Energy Education*