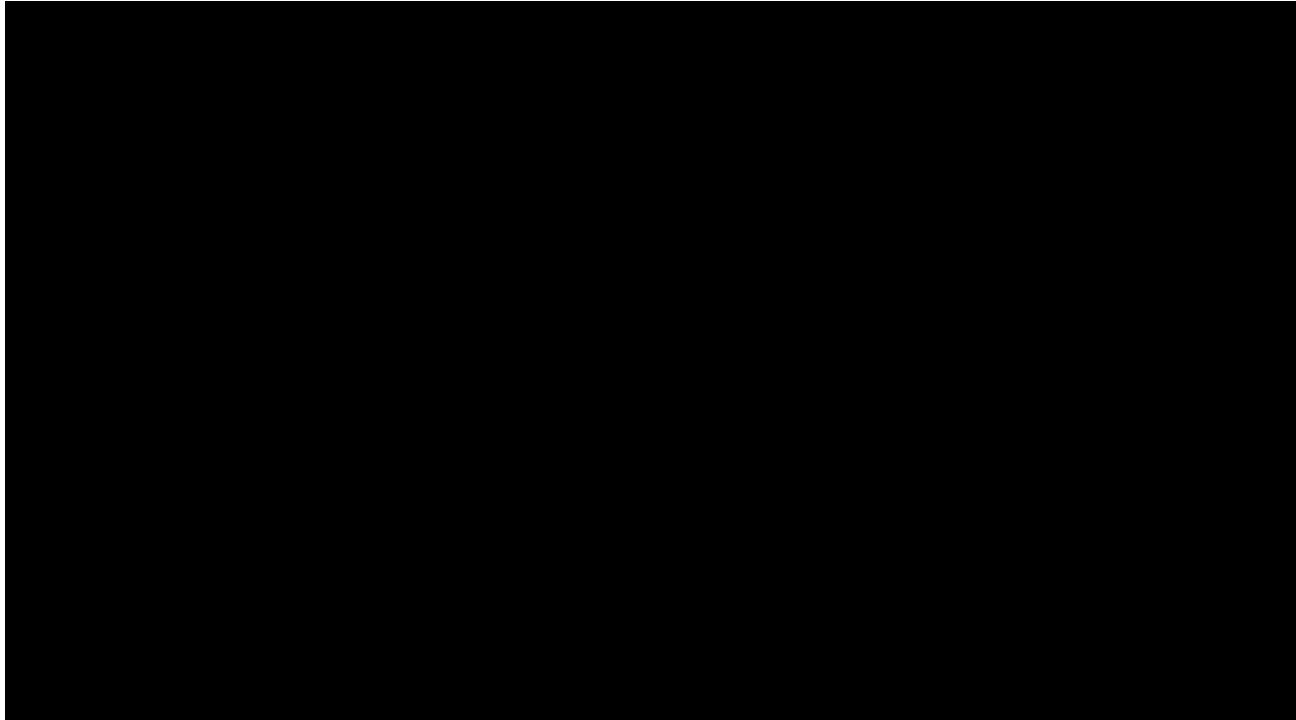


PROGRAM DESCRIPTION

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3.3 PROGRAM DELIVERY AND IMPLEMENTATION

Implementation responsibilities (contracted to CSG) include:

1. Performing contractor recruitment, outreach, and training
2. Processing incentive applications and contractor reimbursements
3. Planning the marketing approach and design of materials
4. Maintaining a customer call center
5. Conducting quality control activities
6. Overall management of program operations and performance

CSG began contractor recruitment and outreach efforts in August of 2013, and the program was launched to customers in September. The program is primarily [REDACTED] with CSG working with COH to establish [REDACTED] and offering [REDACTED] to [REDACTED] through an instant discount and marketing materials.

Customers who have a [REDACTED] and are [REDACTED] are eligible to participate in the program. [REDACTED] are also allowed. Equipment eligibility requirements and instant discount amounts provided to the customer are shown in the table below.

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Table 1: Program Measures Offered

Measure Type	Efficiency Requirement	Instant Discount Offered
Natural Gas Furnace	96%+ AFUE	\$300
Natural Gas Boiler	90%+ AFUE	\$350

4. EVALUATION METHODS

The evaluation findings and recommendations are based on interviews and a review of program data and materials.

4.1 PROGRAM STAFF INTERVIEWS

In September and October 2014, ILLUME conducted interviews with the COH HEHSR program manager and evaluation team leader, and [REDACTED] implementation staff at CSG. Interviews with COH and CSG staff covered program goals and objectives, program delivery, operations and processes, strengths of the program, marketing and outreach strategies, and opportunities for improvement.

4.2 PROGRAM PARTICIPANT INTERVIEWS

In October of 2014, [REDACTED] interviews were completed with program participants. The sample was designed to detect significance at the 90/10 confidence level. Interviews explored [REDACTED]

[REDACTED]
as well as [REDACTED] and the [REDACTED] the [REDACTED]
[REDACTED] and [REDACTED] on the actual purchase decision, and [REDACTED]

To develop the sample population, COH provided ILLUME with a database containing participant information since the beginning of the program (September 2013) through August 2014. The data was reviewed and [REDACTED] (customers who [REDACTED] and [REDACTED]
[REDACTED] leaving [REDACTED] participating customers available for random selection into a sample.

Random sampling attempts to eliminate self-selection bias (overrepresentation of individuals who seek participation) and guard against under-coverage bias (missing key parts of the population). However, as in any survey, other biases may still be experienced. These potential biases are listed below:

- [REDACTED]
- [REDACTED]
- [REDACTED]

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be lessened by reducing the [REDACTED] of time back that respondents have to recall, and designing questions [REDACTED] a way to prompt better recall.

The complete participant survey instrument is provided in Appendix A.

4.3 CONTRACTOR INTERVIEWS

In October and November of 2014, ILLUME interviewed [REDACTED] program allies and [REDACTED] inactive contractors. Program allies have met all [REDACTED] and are approved to offer instant discounts on qualified equipment to eligible customers. Inactive contractors have attended an [REDACTED] and have submitted at least some of the [REDACTED], but have not completed their [REDACTED] within [REDACTED] or voluntarily withdrew the application. CSG notes that prior to adding a contractor to the inactive category, they attempt to contact the contractor at least [REDACTED]

Columbia Gas provided ILLUME with a spreadsheet containing [REDACTED] program ally and [REDACTED] inactive contractor names with contact information. Prior to calling, CSG sent an email to program allies about the process evaluation, how to schedule an interview, and when they may expect a call from ILLUME.

The table below shows the number of program allies interviewed by volume of instant discounts processed through August 2014. A mix of [REDACTED] were reached to ensure that multiple contractor viewpoints were represented.

Table 2: Number of Contractors Interviewed by Volume of Instant Discounts

Number of Discounts Offered	Number of Program allies Interviewed
[REDACTED]	[REDACTED]

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4.4 REVIEW OF PROGRAM DATA AND MATERIALS

In addition to interviews, ILLUME also included a review of program data and materials provided by COH and CSG, including the following:

- Program participant data, including [REDACTED] and [REDACTED]
[REDACTED] and [REDACTED]
- [REDACTED] and [REDACTED]
- [REDACTED], and [REDACTED]
- [REDACTED]
- December 2013 [REDACTED]

5. EVALUATION RESULTS

The following section presents the results of our evaluation efforts. Within each subsection, key findings and recommendations, if applicable, are offered first, followed by more detailed information.

5.1 PROGRAM PARTICIPATION

Key Findings and Recommendations:

- * **The program appears on-track to meet its energy savings and unit goals for 2014.** A total of [REDACTED] boiler and [REDACTED] furnace instant discounts have been provided to customers during the first eleven months of the program (September 2013 through August 2014). The highest months of production were [REDACTED] and [REDACTED]
- * **The program targets [REDACTED] counties identified as having lower penetration levels of highly efficient furnaces.** Approximately [REDACTED] of instant discounts were provided to customers living in the targeted counties. However, a [REDACTED] of the activity [REDACTED] Within targeted counties, [REDACTED] makes up [REDACTED] of instant discounts.
 - o **Recommendation:** The program should consider [REDACTED]
[REDACTED]
- * **A [REDACTED] has been created to reach the program goals and objectives.** Almost [REDACTED] submitted incentive applications over the first ten months of program operations. Program staff believes that its current [REDACTED] is sufficient to meet its goals.

Program Production

Since program inception, a total of [REDACTED] instant discounts have been provided to participants for purchases of qualified furnaces and boilers³. [REDACTED] boilers were discounted, while the remainder were furnaces. While the 2013 goal was not met due

³ COH provided participant data with invoice dates October 2013 to August 2014 for applications received starting in September 2013.

EVALUATION RESULTS

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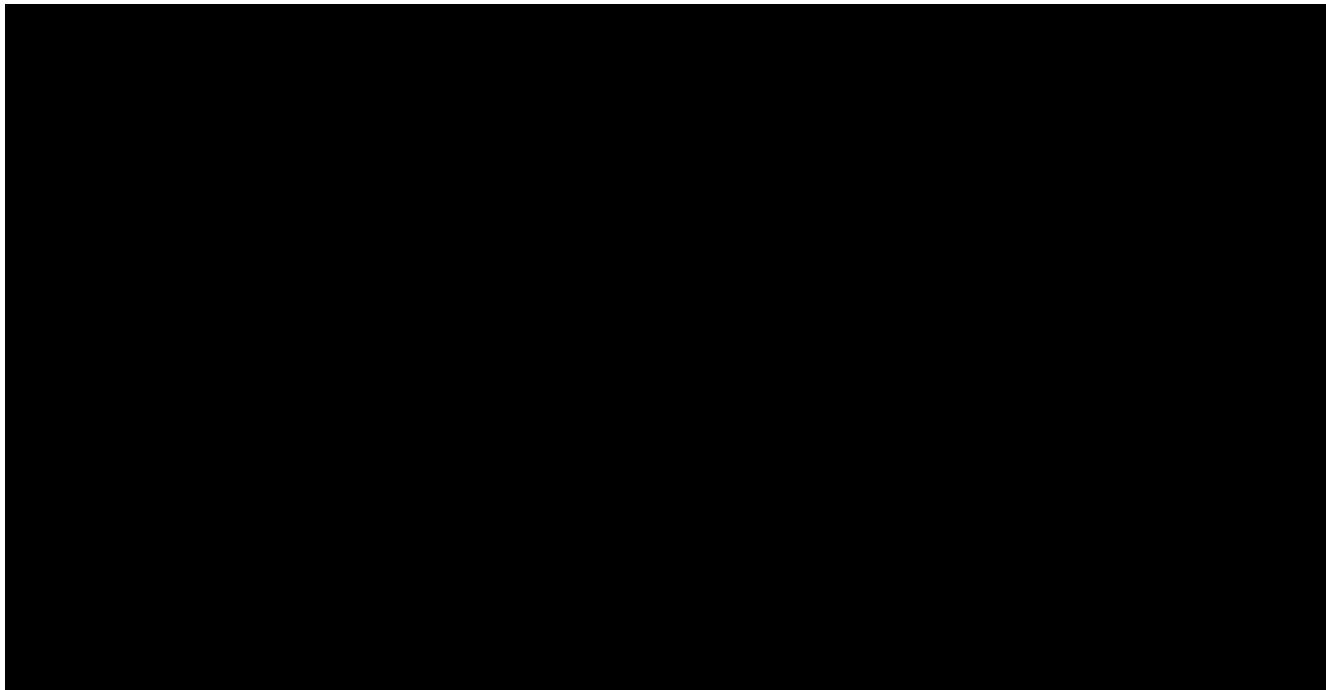
to a late start in the program year (discounts were not offered until September), production now seems to be on track, and CSG staff note that they expect to meet or exceed the goal for 2014. Table 3 shows program-reported achievement by year so far.

Table 3: Program Participation by Year

Year	Annual Unit Target	Units Achieved	Percent of Target
2013	3,250	973	30%
2014 (as of 8/14)			

Figure 2 shows how the incentive dollars and program-reported savings break down by month invoiced. [REDACTED] and [REDACTED] were the highest production months. High [REDACTED] may be related to CSG marketing efforts to promote [REDACTED] at the same time.

Figure 2: Incentive and Program-Reported Savings Totals by Month Invoiced

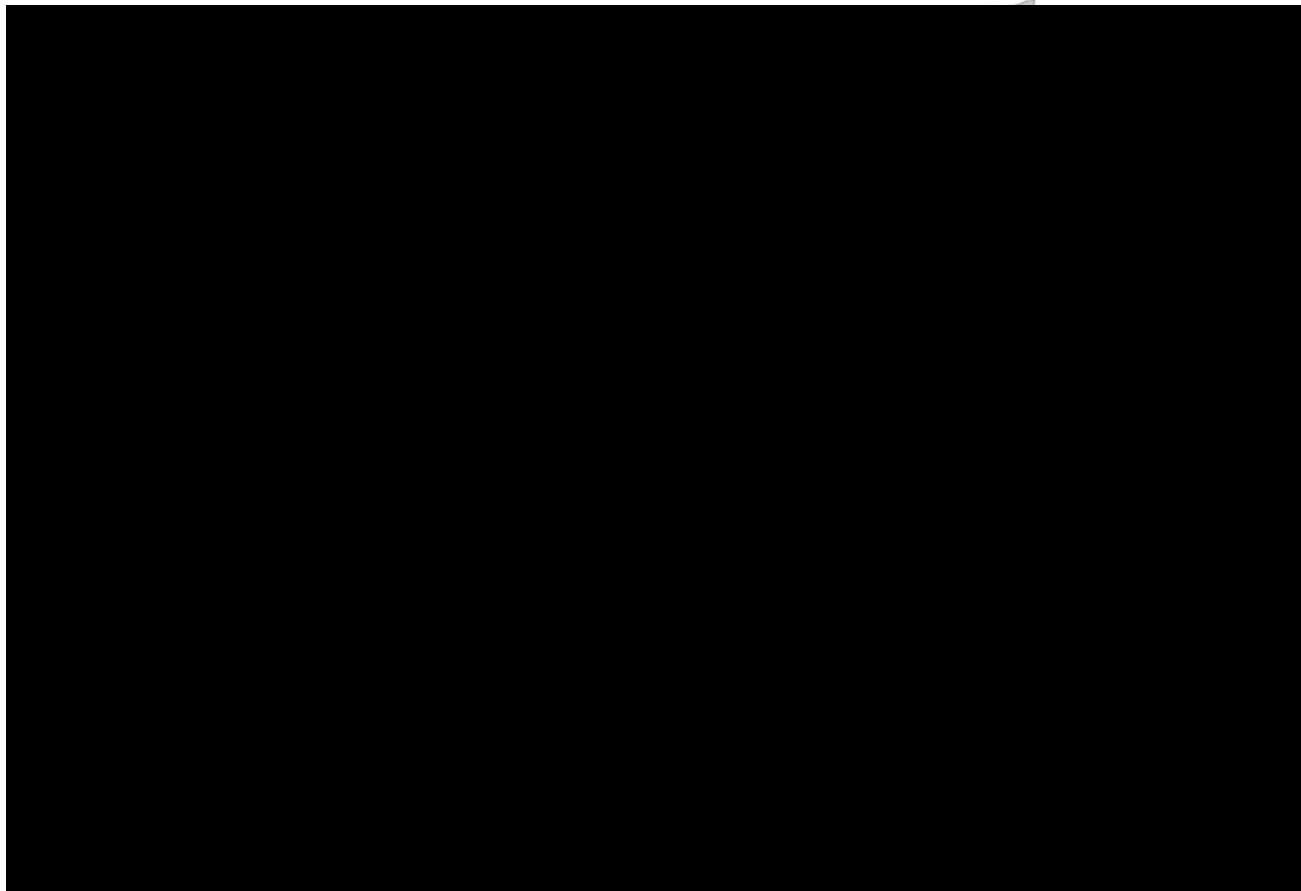


Targeted Counties and the Rental Market

In 2011, COH completed a study to explore the high efficiency residential furnace market within its territory, and areas of COH's territory with lower penetration of high efficiency furnaces were identified. Using this information, the program has targeted [REDACTED] counties that could benefit from additional program focus.

The following map and table show program participation levels by county. Program participation in targeted counties accounts for [REDACTED] of program participation overall, with the most participation occurring in [REDACTED] (almost [REDACTED] across all counties, and [REDACTED] across just targeted counties). [REDACTED] received the highest amount of rebates on a per capita basis. Most of the low penetration counties had at least some program participation, though [REDACTED] counties did not have any. It is important to note, however, that COH does not serve all households in each of these counties. As such, the graphical representation below and the per capita calculations serve only as a proxy of overall county participation levels.

Figure 3: Participation by County



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Table 4: Participation* in Targeted Low-Penetration Counties

County	Number of Instant Discounts	Percent of Total Discounts	Discount Dollars per Capita**
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
<i>Total Targeted Counties</i>	[REDACTED]	[REDACTED]	-
<i>Non-targeted Counties</i>	[REDACTED]	[REDACTED]	-
Grand Total	[REDACTED]	[REDACTED]	[REDACTED]

*Participation from September 2013 to August 2014.

**U.S. Census County Populations (2013 estimates) divided by total instant discount dollars received from September 2013 to August 2014. Note that COH does not serve all residents in these counties.

The program also targets outreach and marketing towards the rental market, which was identified in the Navigant study as a market with traditionally lower levels of high efficiency furnaces. From September 2013 to August 2014, sales to rental homes made up [REDACTED] percent of program participation.

Measure Characteristics

Additional details were provided by CSG on measures rebated from September 2013 through September 2014, including the [REDACTED]

and the [REDACTED]

, and the [REDACTED]

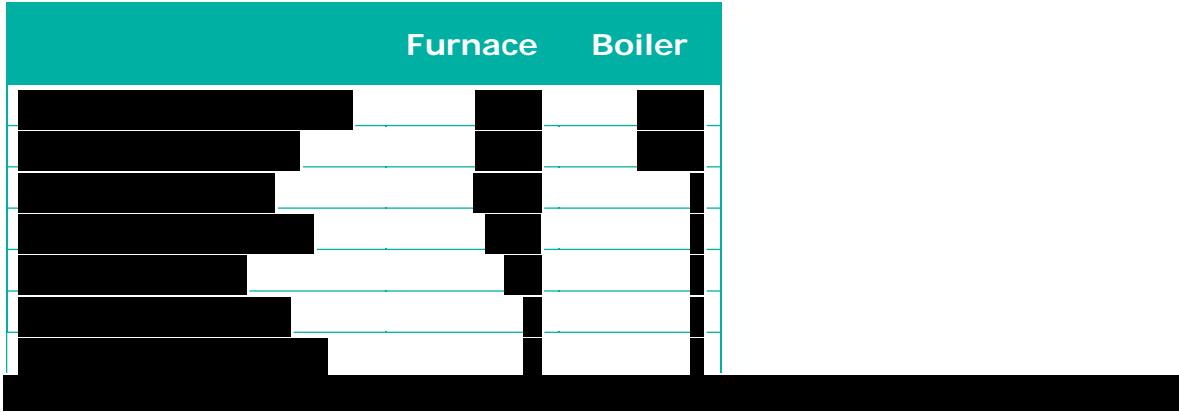
These details

are shown in Table 5 below.

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On average, the [REDACTED] being replaced is [REDACTED] for furnaces and [REDACTED] for boilers, while the average [REDACTED] are [REDACTED] AFUE and [REDACTED] respectively. Over 70% of new furnaces have ECM fans⁴, which contribute to [REDACTED] for the customer. A total of [REDACTED] occurred over this period, with the majority of them going from [REDACTED]

Table 5: Equipment Characteristics*



Program Ally Participation

From September 2013 to August 2014, [REDACTED] different program allies submitted incentive applications, averaging [REDACTED] applications per ally. [REDACTED] program allies accounted for almost [REDACTED] of the incentive applications with over [REDACTED] installations each.

Table 6: Program Ally Participation

Number of Discounts	Number of Allies	Percent of Sales Represented
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
Total	128	100%

5.2 PROGRAM PROCESSES AND PROCEDURES

Key Findings:

- * [REDACTED] identified [REDACTED] to participation. The program identified potential [REDACTED] early on, like the need for [REDACTED], the [REDACTED] [REDACTED] and [REDACTED], and has either resolved the issues or is working towards resolving them. As such, [REDACTED] reported [REDACTED] to their participation.
- * [REDACTED] allies find the [REDACTED] to be [REDACTED] giving it a mean score of [REDACTED] on a five-point scale (1 being very difficult and 5 being very easy).
- * [REDACTED] are [REDACTED] with key elements of the [REDACTED] indicating that the program has created a simple and straightforward process for [REDACTED] to navigate. [REDACTED] gave a mean score of [REDACTED] in response to their satisfaction with the [REDACTED], and mean scores of [REDACTED] for satisfaction with the [REDACTED] and the [REDACTED]
- * [REDACTED] are also [REDACTED] with program communications, giving a mean score of [REDACTED] for satisfaction with the level of [REDACTED] and a mean score of [REDACTED] for their [REDACTED]

Program Ally Enrollment and Training

CSG primarily recruits program allies through [REDACTED], using a variety of networking opportunities such as [REDACTED] [REDACTED]. CSG reports that most ally outreach takes place in the counties that have been targeted as having a lower penetration of high efficiency furnaces. Since the program's inception, CSG reports that they have performed the following outreach activities:

- Used [REDACTED] (such as [REDACTED] [REDACTED] and [REDACTED]) to contact and enroll as many contractors as possible, and performed [REDACTED]

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- Held a [REDACTED] [REDACTED] with [REDACTED] to discuss the program offerings and participation requirements, and each [REDACTED] and [REDACTED] was contacted [REDACTED]
- Sent [REDACTED] [REDACTED] in counties identified as low penetration, and including [REDACTED]
[REDACTED]
- [REDACTED] with the [REDACTED] and [REDACTED] on the program to other [REDACTED], such as the [REDACTED]
[REDACTED] and [REDACTED]

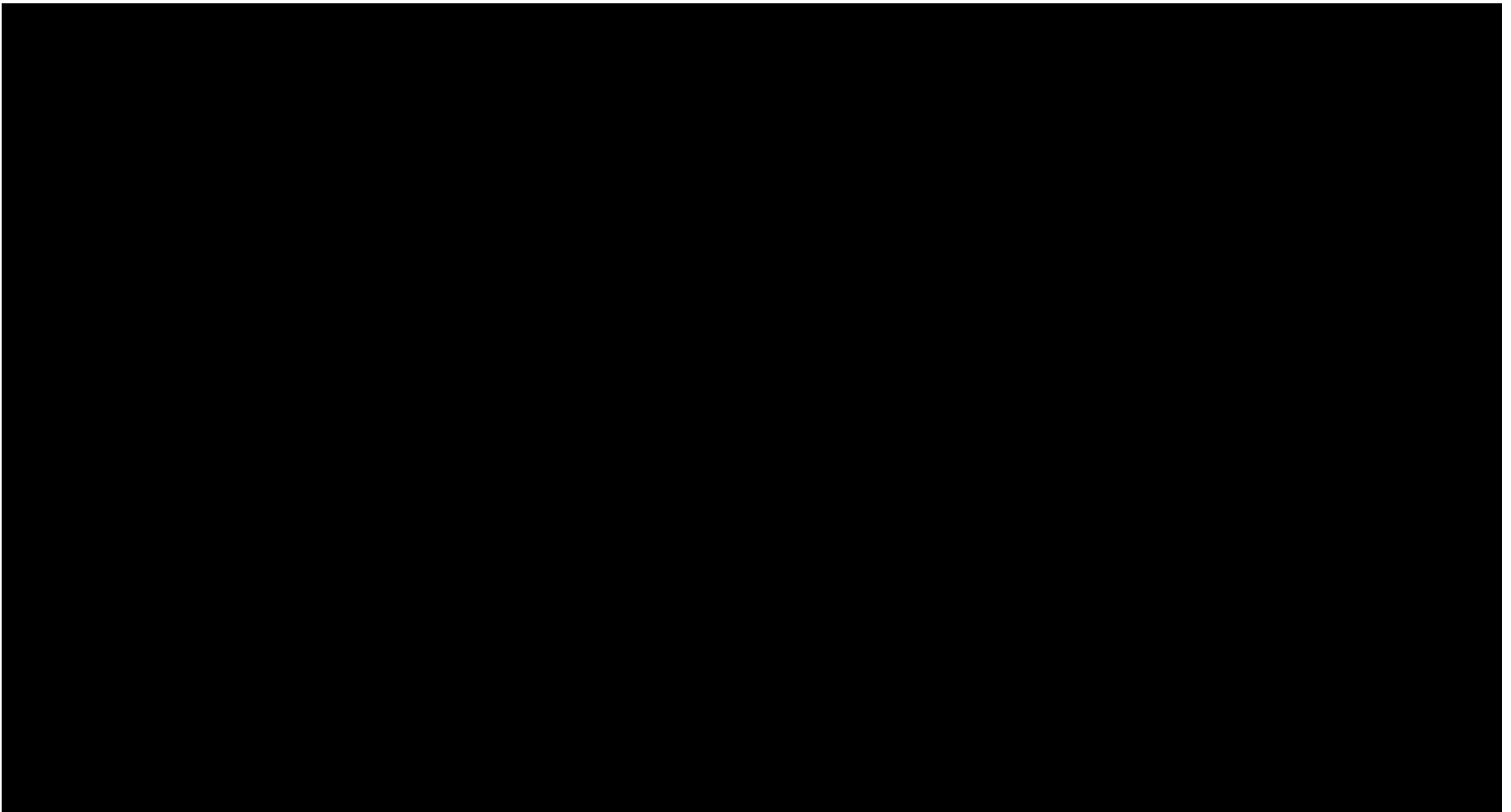
The program notes that [REDACTED] have been [REDACTED] at generating interest, though [REDACTED] with [REDACTED] has been the most effective at [REDACTED] into the program. CSG believes that they currently [REDACTED] to reach the energy savings goals. The figure below shows how contractors [REDACTED] Both program allies and inactive contractors [REDACTED]

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Figure 4: How Contractors [REDACTED]



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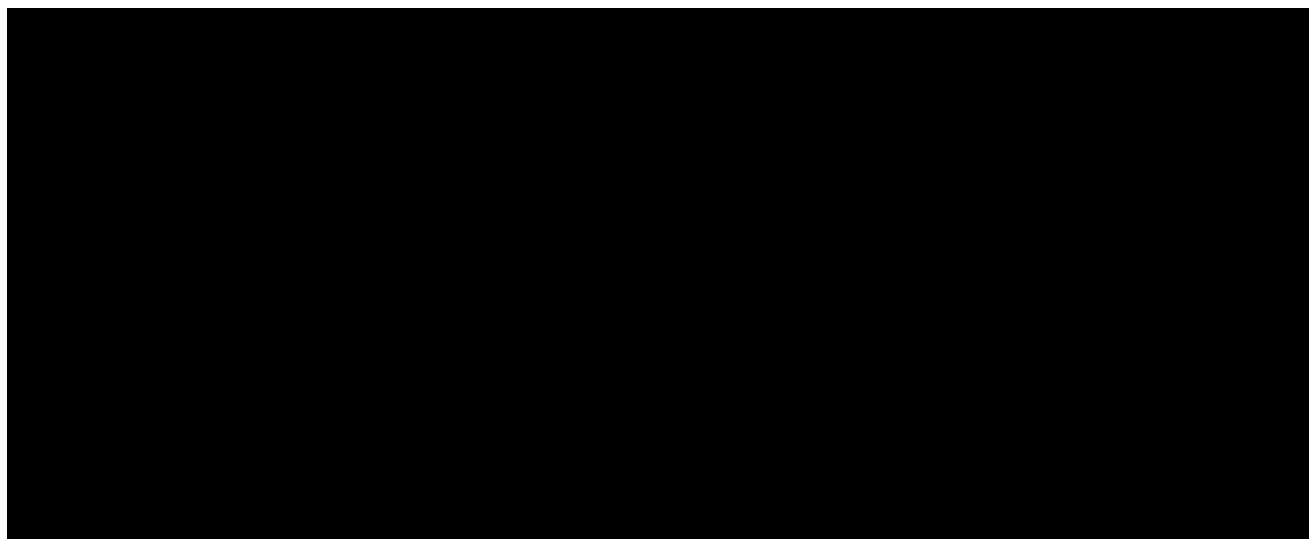
EVALUATION RESULTS

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Program allies were also asked [REDACTED]
allies [REDACTED] stated that they [REDACTED]

[REDACTED] and [REDACTED]
Other reasons included: [REDACTED]

Table 7: Why did you [REDACTED]



Once a contractor has expressed interest in the program, CSG [REDACTED]

[REDACTED] If it is determined that there is need for [REDACTED]
the upcoming year, CSG will [REDACTED] in the [REDACTED]
[REDACTED] on a first-come, first-served basis, giving priority to [REDACTED]

Contractors must meet the following requirements to be eligible for program participation:

- [REDACTED]
- Have an [REDACTED]
- Achieve [REDACTED]
- [REDACTED]
- Meet [REDACTED]
- Have [REDACTED]

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After the contractor has [REDACTED] with the program and supplied all [REDACTED]
[REDACTED] they attend [REDACTED] and [REDACTED]. This meeting
covers the [REDACTED]

[REDACTED] Contractors that still meet all [REDACTED]
and [REDACTED]. For further details, a process diagram created by CSG for enrolling new program allies is included in Appendix D.

CSG also provides ongoing [REDACTED] and [REDACTED] as needed.
As the program progresses, CSG intends to offer [REDACTED] and [REDACTED]
[REDACTED] each year. To date, [REDACTED] and [REDACTED]
have been offered.

Overall, program allies believe the [REDACTED] is [REDACTED]. Interviewed allies
gave the [REDACTED] a mean score of [REDACTED] on a five-point scale (one being
very difficult and five being very easy). Interviewed program allies also rated the
[REDACTED]. As the program is still young and [REDACTED]
[REDACTED] have been offered, [REDACTED] allies noted that they had [REDACTED]
[REDACTED] and therefore could [REDACTED]. A mean score of [REDACTED] was provided
for the remainder of allies [REDACTED] (Figure 5).

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Figure 5: Program Ally Ratings for [REDACTED]



Despite the relative [REDACTED] reported by program allies, CSG states that some contractors, especially in low penetration counties, have found it [REDACTED]. In comparison, a contractor must [REDACTED] to have an HVAC license. CSG states that most contractors in low penetration areas [REDACTED]. Increasing [REDACTED] can be [REDACTED] resulting in up to [REDACTED] per CSG discussions with contractors. [REDACTED] inactive contractors interviewed by ILLUME also noted that the [REDACTED] are a barrier to participation. CSG notes that they are currently working with COH to reduce this barrier, and may utilize a [REDACTED]

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with the amount of [REDACTED] based on the [REDACTED]
[REDACTED]

Obtaining a [REDACTED] was also identified by the program as a barrier for certain allies due to [REDACTED]. The program reduced this barrier by allowing allies with a [REDACTED] to have an [REDACTED] until the [REDACTED] to receive an [REDACTED] is achieved.

[REDACTED] allies noted that [REDACTED] can be [REDACTED] and [REDACTED] believed that the program should rely on the [REDACTED]. [REDACTED] allies did not believe that any [REDACTED] though [REDACTED] said that the [REDACTED] should be offered as [REDACTED] and another said that [REDACTED] should be offered. While [REDACTED] may be beneficial for allies who [REDACTED], [REDACTED] is likely outside the scope of the program.

Other potential barriers to participation noted by inactive contractors (besides the [REDACTED] noted by [REDACTED] contractors) included the [REDACTED], [REDACTED], and [REDACTED]. [REDACTED] inactive contractor cited a [REDACTED] as a barrier, and [REDACTED] other contractors [REDACTED] contractors still have plans to participate in the program. [REDACTED] inactive contractors plan to join the program if the [REDACTED], and [REDACTED] plans to join when he has the [REDACTED]. [REDACTED] other contractor is in the [REDACTED] and [REDACTED] other contractors are still interested and want more information about the program or need more time to think about it.

Rebate Processing and Payment

As noted, program allies provide customers with an instant discount on their invoice, and then receive reimbursement from the program by submitting an application. Program allies have [REDACTED] from the furnace or boiler installation date to submit the incentive application and [REDACTED] through [REDACTED]. CSG notes that initially the application was not available in a [REDACTED] which several allies identified as a barrier. CSG has since resolved this issue and began offering a [REDACTED] during the summer of 2014.

Once the application is received, the [REDACTED] from the application is [REDACTED] and a [REDACTED]. If a [REDACTED] is required for the program ally, the project status is changed to [REDACTED] at this time. An [REDACTED] is performed to ensure that the [REDACTED] and [REDACTED]

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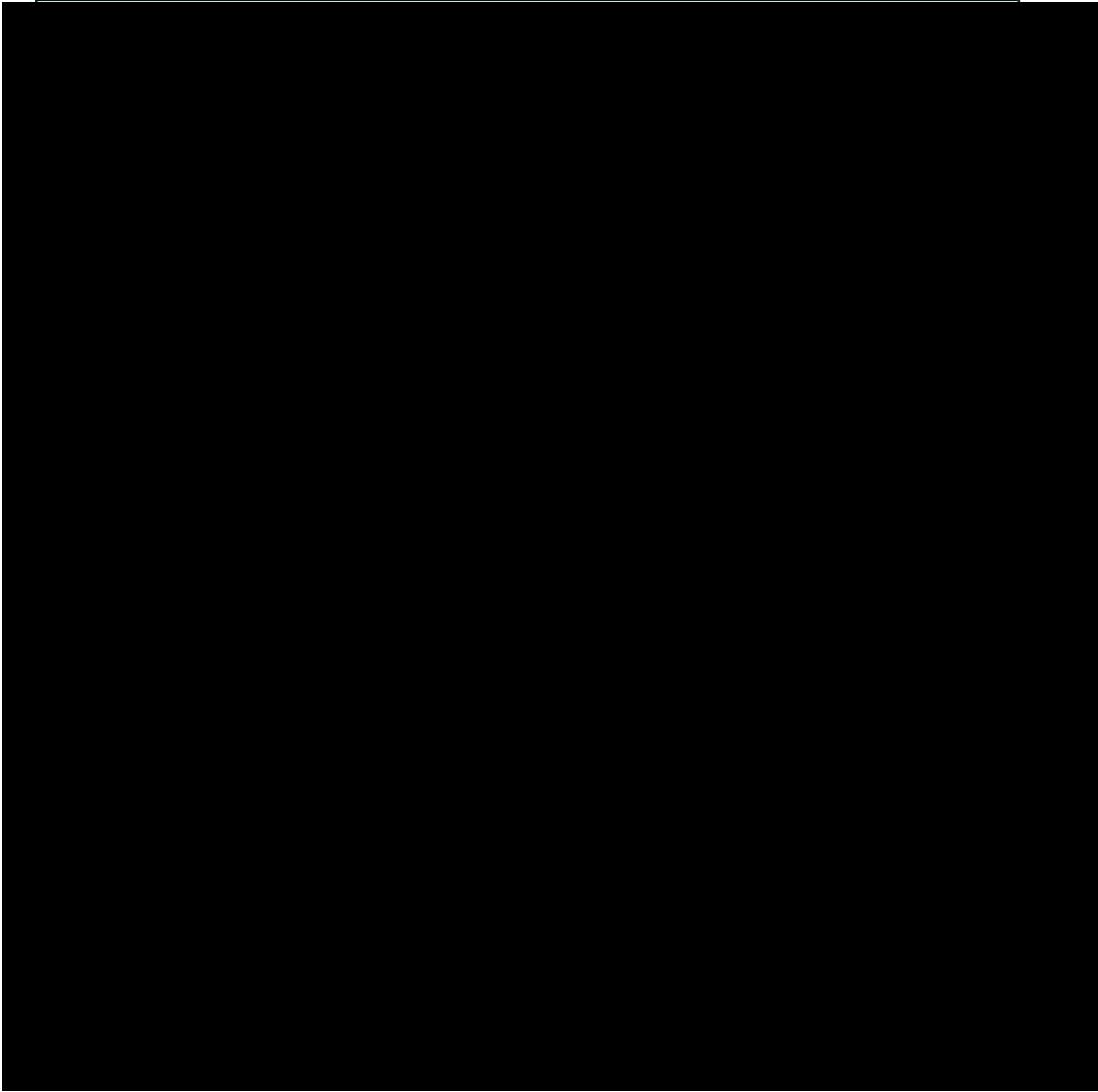
[REDACTED] have been met, including [REDACTED], and [REDACTED]. If all requirements are met, the application status is updated to be [REDACTED]. A check request is sent to CSG's corporate office, and the check is printed and mailed to the program ally with an accompanying letter.

For further details, a rebate fulfillment process diagram created by CSG is also included in Appendix D.

On average, reimbursement checks to program allies were mailed [REDACTED] after the installation date. The average from both the [REDACTED] date to the date the [REDACTED] and the date the [REDACTED] to the date the [REDACTED] is [REDACTED] which is less than the stated goal of [REDACTED] in the [REDACTED]

Program allies were asked to rate the [REDACTED] on a five-point scale, with one being very difficult and five being very easy. Allies provided a mean score of [REDACTED] indicating that most believe the [REDACTED] to be [REDACTED]. Program allies are also [REDACTED] with the [REDACTED] by the program, giving a mean score of [REDACTED]. Additionally, program allies report [REDACTED] with the [REDACTED] with a mean score of [REDACTED] on a five-point scale.

Figure 6: Program Ally Perspectives on [REDACTED]



[REDACTED] allies had suggestions for improvements to the [REDACTED] including allowing [REDACTED] rather than [REDACTED] and [REDACTED] (instead [REDACTED]) to [REDACTED]

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Quality Control (QC)

In order to ensure that projects are completed in [REDACTED] [REDACTED] CSG [REDACTED] completes site inspections on [REDACTED] of all work done under the program. Site inspections for a particular program ally begin once that ally has [REDACTED] CSG aims to inspect at least [REDACTED] of all work completed by each program ally.

The QC process begins during the [REDACTED] where any [REDACTED] are flagged immediately. Remaining applications become part of the [REDACTED] [REDACTED] then attempt to schedule the QC appointments for the selected applications.

The QC inspector arrives at the appointment with an [REDACTED] in which to [REDACTED] [REDACTED] The details captured include [REDACTED]

[REDACTED]. The inspector also notes if the [REDACTED] and if any necessary [REDACTED] This information is later entered into the program database. If any issues were found, the [REDACTED] and [REDACTED] and the [REDACTED]. Upon completion of the QC and any necessary repairs, the [REDACTED]

A QC inspection process diagram created by CSG is included in Appendix D for further details.

Customer and Contractor Communications

CSG operates a [REDACTED] which provides support to [REDACTED] as part of program delivery. CSG reports that since the program is primarily [REDACTED] the majority of [REDACTED] are from [REDACTED] Occasionally the program will also receive [REDACTED] or [REDACTED]

CSG notes that they [REDACTED] about the program. However, if [REDACTED] do arise, they first attempt to [REDACTED] Most issues can be resolved [REDACTED], though some [REDACTED] may require a [REDACTED]. If the issue is beyond CSG's scope or it does not come to resolution, the [REDACTED] is [REDACTED]

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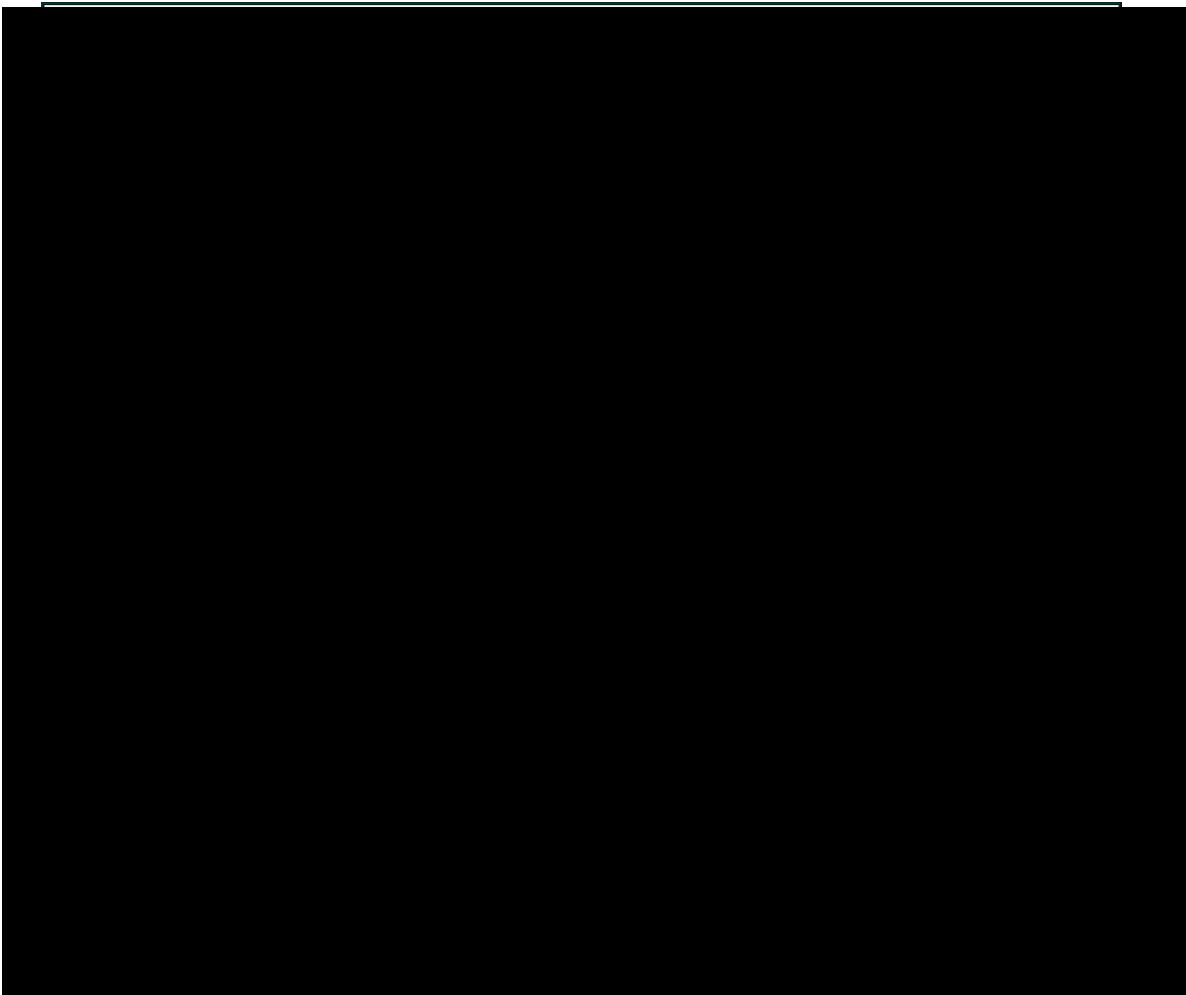
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Aside from the [REDACTED], CSG also [REDACTED] with [REDACTED] through [REDACTED] that is [REDACTED] containing information on program [REDACTED] and other relevant information. [REDACTED] with contractors may be [REDACTED]

During program ally interviews, ILLUME asked contractors about their [REDACTED] Program allies were asked to rate their satisfaction with the [REDACTED] and their [REDACTED] [REDACTED] Overall, allies are [REDACTED] with program communications, giving a mean score of [REDACTED] for the [REDACTED] and a mean score of [REDACTED] for [REDACTED]. The figure below details ally responses.

Figure 7: Program Ally Perspectives on [REDACTED]



5.3 CUSTOMER AWARENESS AND MARKETING EFFORTS

Key Findings and Recommendations:

- * [REDACTED] customers surveyed [REDACTED] were [REDACTED] indicating that program and program ally efforts have been effective in ensuring that program participants are [REDACTED]
- * Program marketing efforts are [REDACTED] so that they can [REDACTED] and [REDACTED]. This is consistent with other heating and cooling programs across the nation, and takes advantage of [REDACTED] with the customer that are occurring anyway.
 - Recommendation: As the program becomes more established in the marketplace and program ally recruitment has settled, consider undertaking more [REDACTED]. [REDACTED] could be used as a way to persuade inactive contractors to get involved, as it may cause their [REDACTED]
- * [REDACTED] customers [REDACTED] are [REDACTED] (rated [REDACTED]) percent of customers are most motivated by [REDACTED] followed by [REDACTED]
 - Recommendation: Include information on [REDACTED] in program materials developed for the [REDACTED], as this is an important motivator. Current marketing materials focus more on [REDACTED]

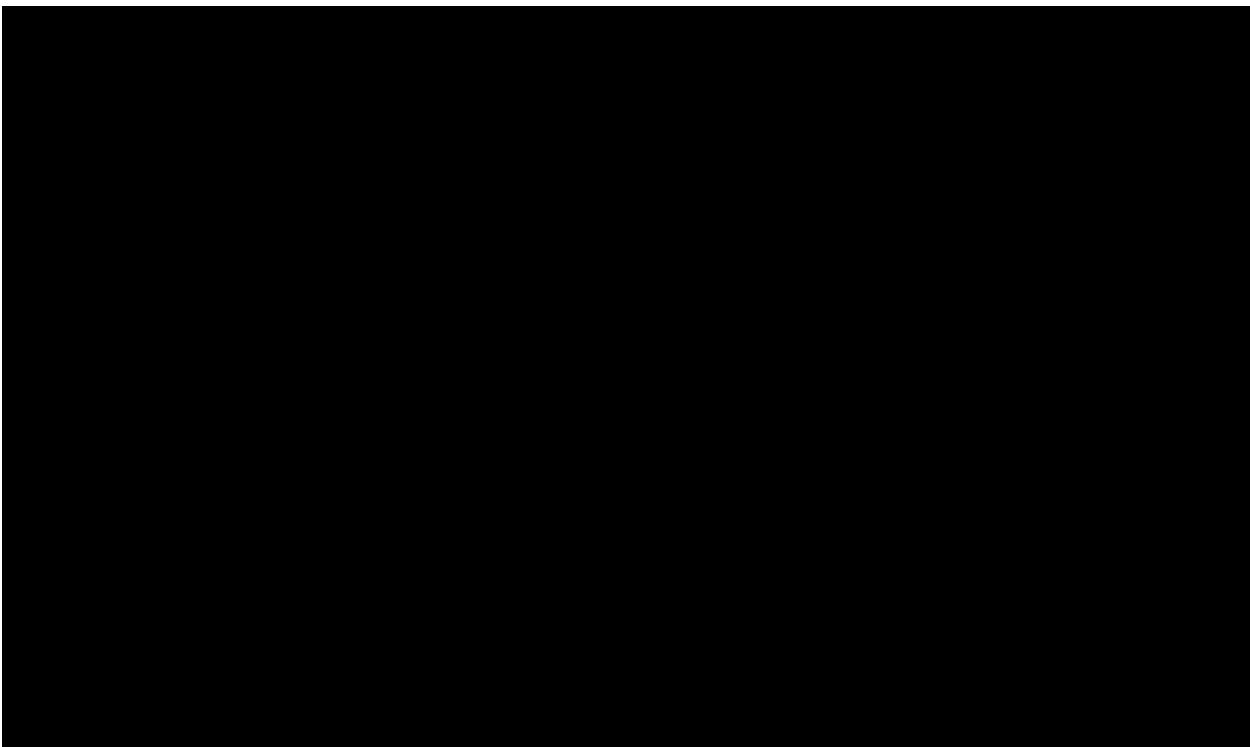
Program Awareness

[REDACTED] customers interviewed reported that they were [REDACTED] as shown in the figure below. In fact, [REDACTED] customer was [REDACTED] while [REDACTED] customer was [REDACTED].

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Figure 8: Customer Awareness of [REDACTED]



This information is consistent with our interviews with program allies. [REDACTED] program ally stated that they [REDACTED]

[REDACTED] The [REDACTED] program ally that [REDACTED] noted that sometimes they do, but it depends on whether they think they can [REDACTED] in time to meet the [REDACTED] from the [REDACTED] However, CSG noted that they do allow [REDACTED] to program allies around this [REDACTED] when additional time is needed. CSG stated that during the program ally orientation, program allies are asked to [REDACTED] if they know that they will not be able to [REDACTED] Additionally, CSG reviews each application received [REDACTED] as appropriate.

Program Marketing and Motivations to [REDACTED]

As a part of the process evaluation, we reviewed program marketing materials and strategies. CSG reports that the program is primarily [REDACTED] This means that it falls largely on the [REDACTED] by [REDACTED]

[REDACTED] This approach is also taken by numerous other heating and cooling energy efficiency programs across the country, as the [REDACTED] can more cost-effectively reach the customer on a [REDACTED] basis through [REDACTED] and [REDACTED] As such, the majority of marketing activities have been directed at [REDACTED] and [REDACTED] (discussed previously in Section 5.2).

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Aside from [REDACTED] the program provides [REDACTED] several tools to encourage program participation as they reach out to [REDACTED]. The primary tool, of course, is the [REDACTED]. Other tools or materials include the following:

- [REDACTED]
- [REDACTED]
- [REDACTED]

CSG reports that they also have reserved some marketing dollars for [REDACTED] to encourage program participation. In October to December of 2013, the program offered allies [REDACTED] to induce program activity. The program also offered a [REDACTED] during the summer of 2014 to encourage activity in an otherwise slow time of year. CSG believes that the [REDACTED] have been effective, and plans to consider them again in the future. As previously noted, the highest activity months occurred in [REDACTED] [REDACTED] indicating that the [REDACTED] may have had [REDACTED].

While the program is primarily [REDACTED] some [REDACTED] efforts have been undertaken. The following [REDACTED] activities have been completed:

- [REDACTED]
- [REDACTED]

To understand the effectiveness of the program's marketing approaches, we asked customers [REDACTED] The majority of customers [REDACTED] or from [REDACTED]

[REDACTED] customers [REDACTED] These findings are consistent with [REDACTED] which are [REDACTED]. Additionally, CSG indicated the [REDACTED] from COH have generated a good customer response.

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Figure 9: How Customers [REDACTED]



Customers were then asked [REDACTED]

[REDACTED]
customers found the [REDACTED] was at [REDACTED] in [REDACTED]
[REDACTED] Almost [REDACTED] found it [REDACTED] and [REDACTED]
said it was [REDACTED] When asked what was [REDACTED] about the [REDACTED]

responded that [REDACTED]

This is the [REDACTED]

[REDACTED] were the next [REDACTED]
figure below for more detail on what [REDACTED]

See the [REDACTED]

Only a few customers had suggestions for other information that could have been provided to help with their heating equipment purchase. Suggestions included [REDACTED]

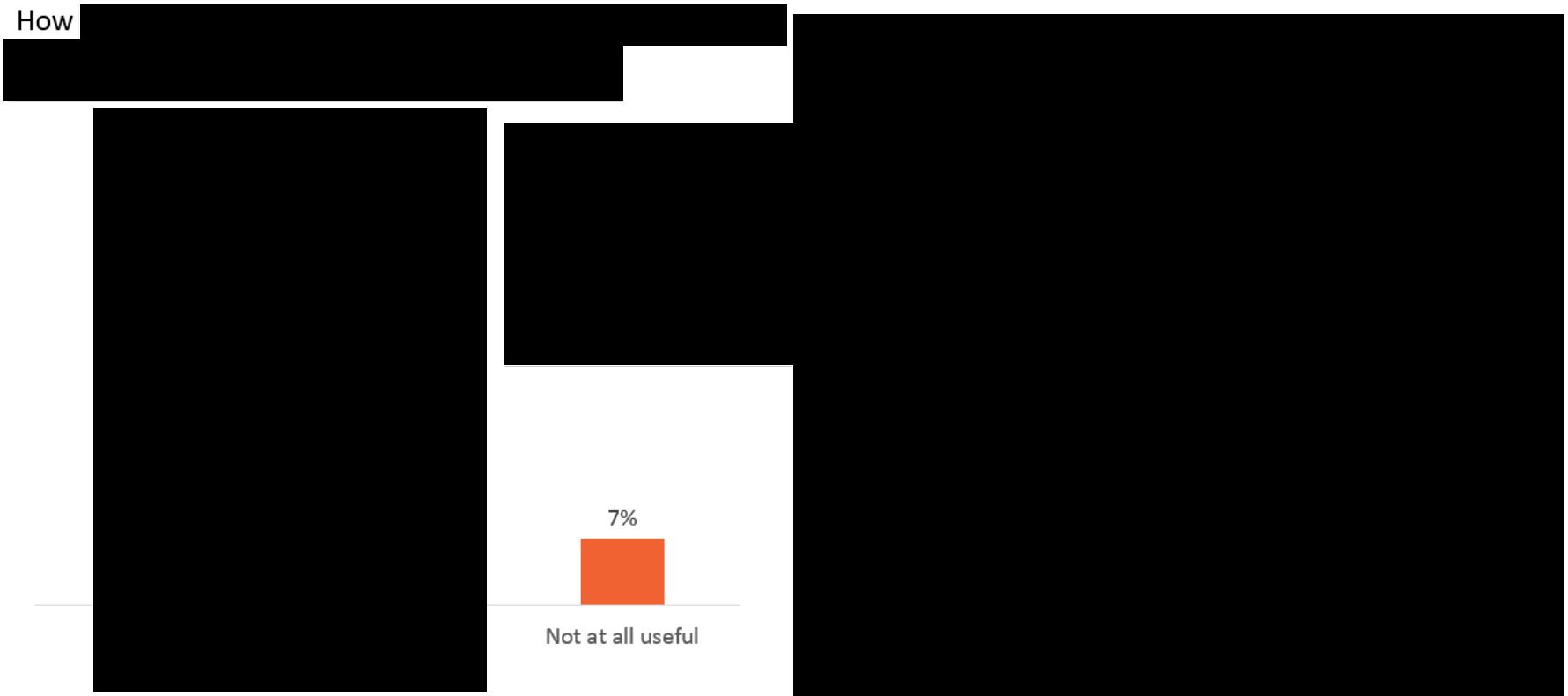
PUBLIC VERSION - REDACTED

EVALUATION RESULTS

ILLUMI

Figure 10: [REDACTED]

How

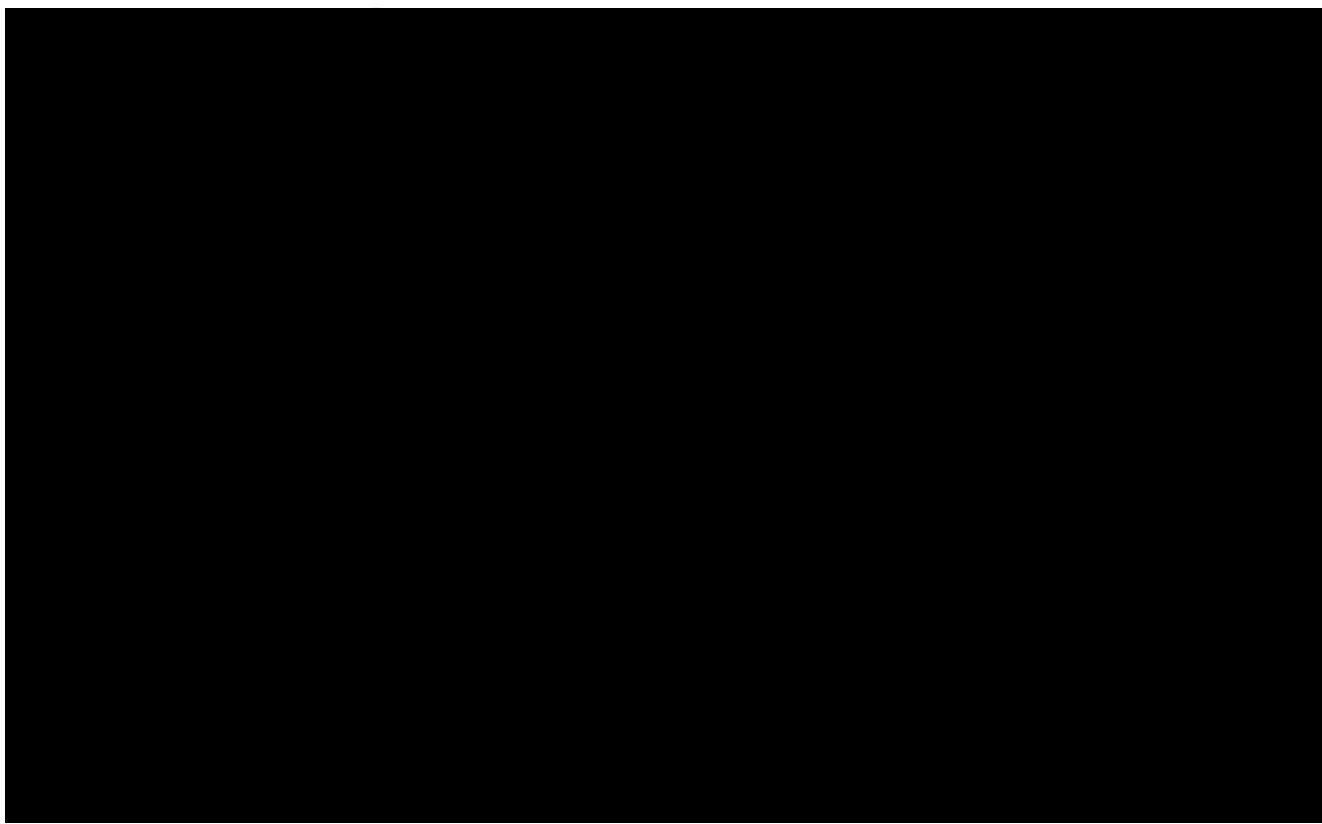


EVALUATION RESULTS

ILLUME

We also asked customers [REDACTED] As shown in the figure below, about [REDACTED] of the customers have [REDACTED] Customers also cited [REDACTED] through [REDACTED] via [REDACTED]

Figure 11: How [REDACTED]



ILLUME also explored customer [REDACTED] Participants were first asked [REDACTED] Next, they were read [REDACTED]

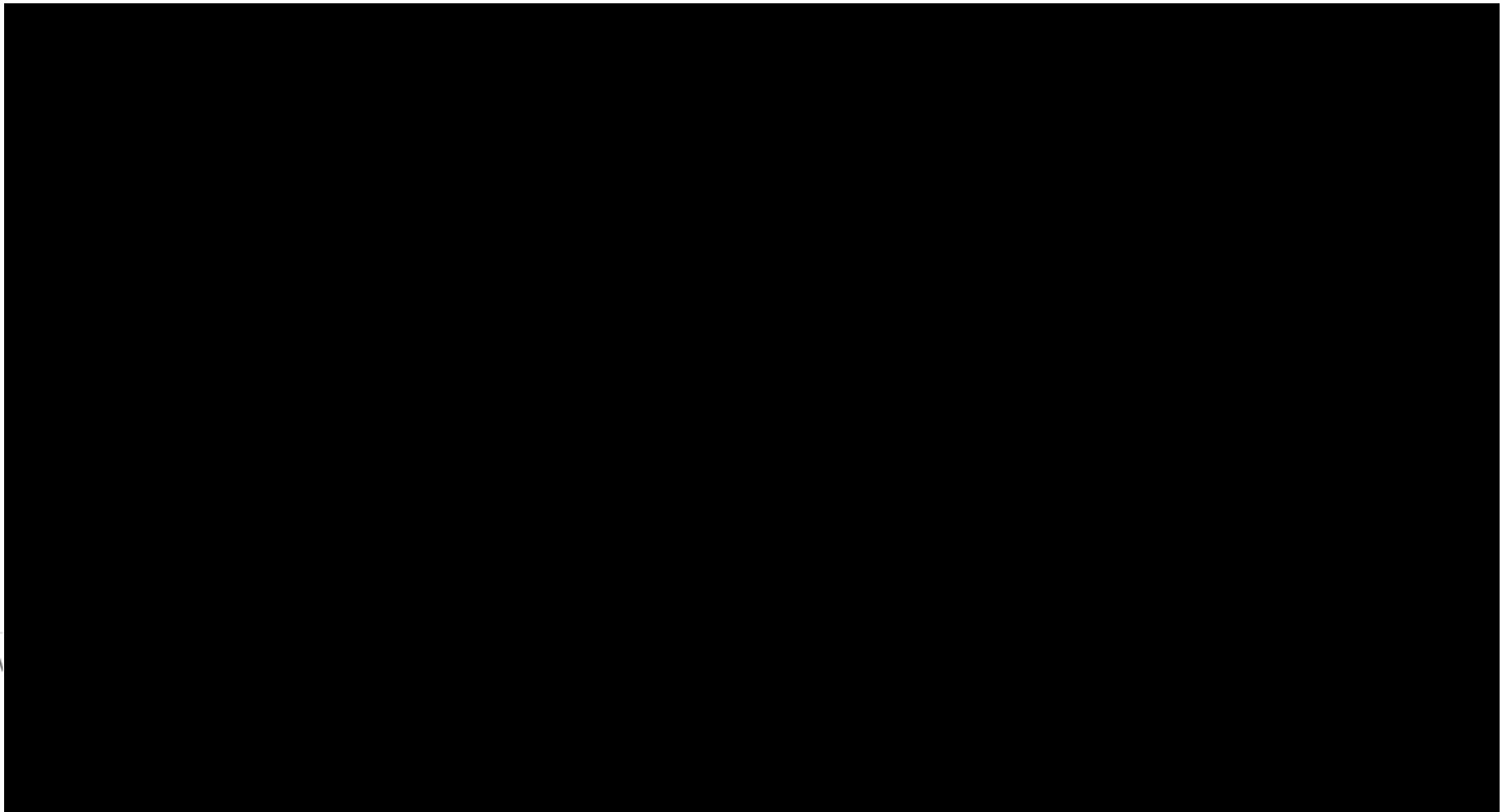
[REDACTED] or [REDACTED] Nearly [REDACTED] (rated [REDACTED] is by far the [REDACTED] for customers to [REDACTED] of customers consider this the [REDACTED] whereas the next most commonly cited reason, [REDACTED] is the [REDACTED] for [REDACTED] of the customers. [REDACTED] customers are [REDACTED] simply to [REDACTED] or to [REDACTED]

PUBLIC VERSION - REDACTED

EVALUATION RESULTS

ILLUMI

Figure 12: Customer [REDACTED]



5.4 PROGRAM INFLUENCES ON CUSTOMER PARTICIPATION

Key Findings and Recommendations:

* **The information provided by program allies about the [REDACTED]**

[REDACTED] The [REDACTED] received a mean rating [REDACTED]
of [REDACTED] compared to [REDACTED] for the [REDACTED] program ally reported
always [REDACTED] [REDACTED] and [REDACTED] always [REDACTED]

- **Recommendation:** Share this information with the program allies so they are aware of [REDACTED]

* **The [REDACTED] discussed [REDACTED] of installing a high efficiency heating system were [REDACTED] and [REDACTED]**

- **Recommendation:** As noted in Section 5.3, [REDACTED] is the [REDACTED] for people to [REDACTED]. With this in mind, program allies should include this in every discussion of the [REDACTED]

The program attempts to influence customers' heating system purchase decisions primarily through two methods, including (1) [REDACTED] and (2) [REDACTED]

[REDACTED] We explored these methods as part of our survey efforts and as a part of our interviews with contractors. During the participant survey, customers were asked [REDACTED]

[REDACTED] While most customers [REDACTED] customers [REDACTED]

[REDACTED] than [REDACTED]

PUBLIC VERSION - REDACTED

EVALUATION RESULTS

ILLUMI

Results from the participant survey are consistent with findings from the contractor interviews. Out of the [] program allies interviewed, [] said that they [] [] while [] new to the program and had not had [], and [] said that sometimes [] []

[] of the program allies also said they [] [] while the [] ally said that []

Inactive contractors were also asked if they [] with their customers, and

[] out of [] reported that they do.

Next, customers were asked []

[] Compared to the []

[] customers found the [] to be []

[] rated the [] as being []

[] to only [] rating the [] as being [] in the []

Furthermore, the mean score of [] is [] than the mean score of [] for the [] See the figure below for more details.

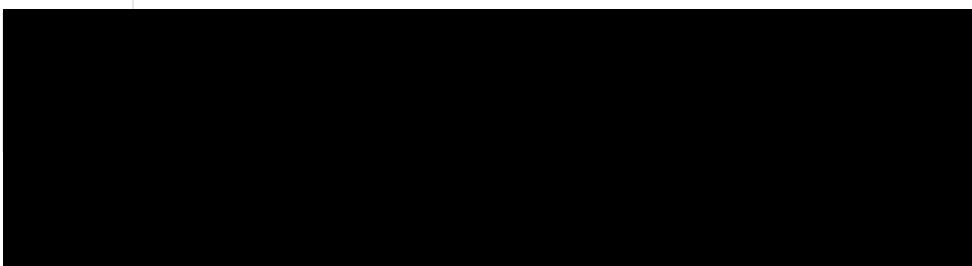
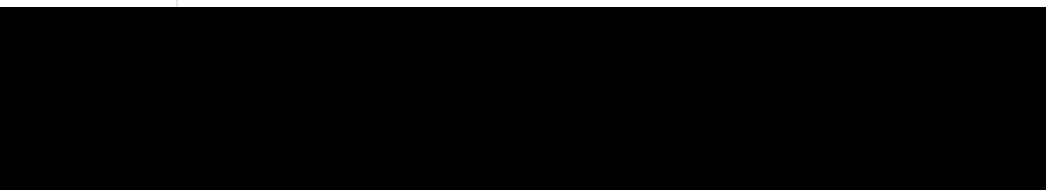
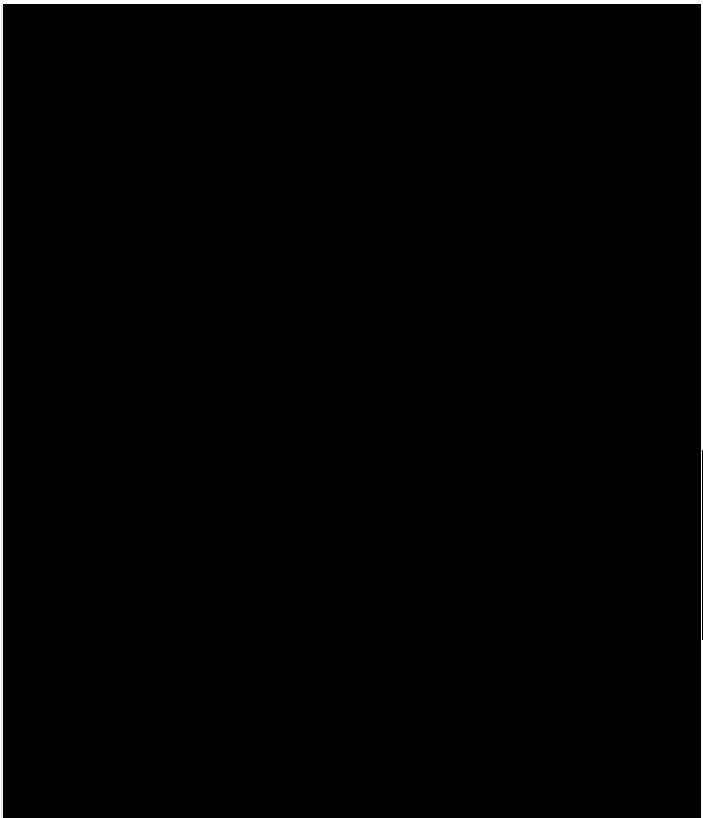
PUBLIC VERSION - REDACTED

EVALUATION RESULTS

ILLUMI

Figure 13: Influence of the [REDACTED] and the [REDACTED]

How [REDACTED]

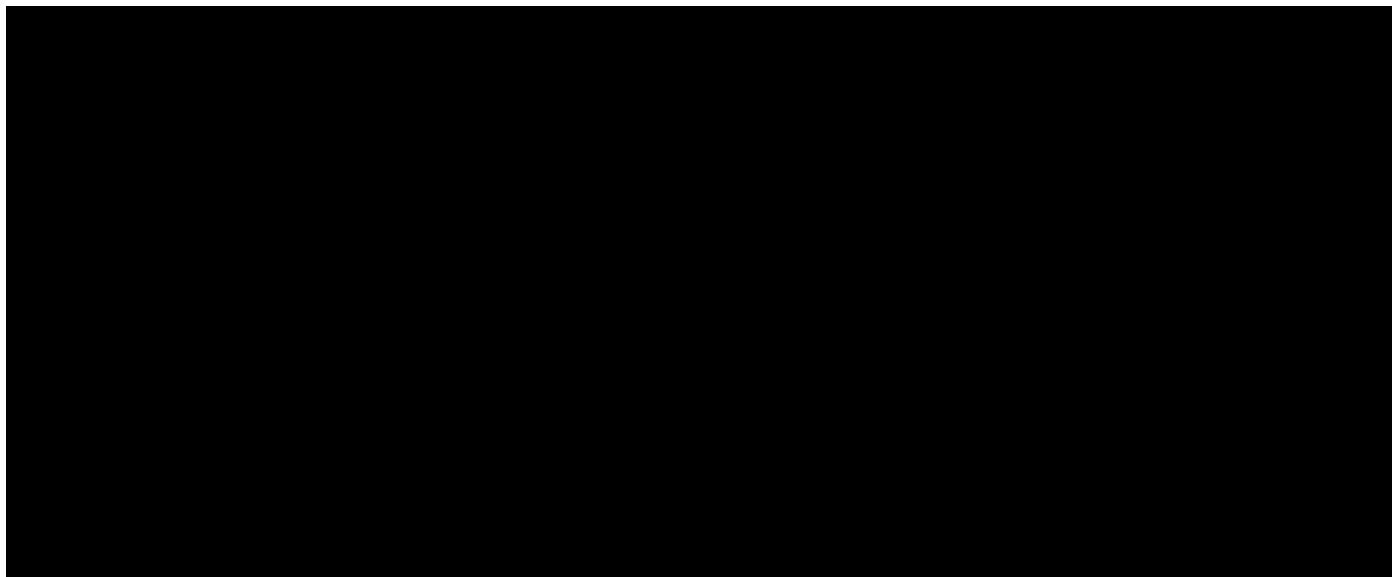


EVALUATION RESULTS

ILLUMI

Participants reported that the discussion of the [REDACTED] most often included the [REDACTED] and [REDACTED] [REDACTED] were discussed next most frequently [REDACTED] and [REDACTED], respectively. Of the other benefits discussed, [REDACTED] was the [REDACTED] mentioned by [REDACTED]

Figure 14: [REDACTED]



Program allies were also asked about the [REDACTED] out of the [REDACTED] program allies [REDACTED] interviewed reported [REDACTED] followed by [REDACTED] and [REDACTED]
The [REDACTED] were mentioned by [REDACTED] program allies each, and [REDACTED]

5.5 CUSTOMER AND CONTRACTOR SATISFACTION

Key Findings:

- * [REDACTED], especially with the [REDACTED] was [REDACTED] and [REDACTED] were [REDACTED] with the [REDACTED] with the [REDACTED]
- * [REDACTED] with the program overall, rating their [REDACTED] with a mean score of [REDACTED]

PUBLIC VERSION - REDACTED**EVALUATION RESULTS****ILLUMI****Customer Satisfaction**

Customers were asked how [REDACTED] they were with the [REDACTED] the [REDACTED] and [REDACTED], as shown in the figure below. Overall, customers are [REDACTED] and [REDACTED]

The mean [REDACTED] rating with the [REDACTED] of the [REDACTED] customers indicating they were [REDACTED] with the [REDACTED] [REDACTED] customer indicated that they were [REDACTED] with the [REDACTED] overall. Customers were [REDACTED] with the [REDACTED] with a mean rating of [REDACTED]. Still, [REDACTED] of the customers were [REDACTED] and [REDACTED] were [REDACTED]

Customers were [REDACTED] with their [REDACTED] The [REDACTED] received a mean rating of [REDACTED] for [REDACTED] and [REDACTED] for [REDACTED]. Again, [REDACTED] customer indicated that they were [REDACTED] with either of these areas.

The [REDACTED] also received [REDACTED] ratings with a mean score of [REDACTED] and [REDACTED] of customers stating they were [REDACTED] customer indicated that they were [REDACTED] with this aspect of their experience.

PUBLIC VERSION - REDACTED

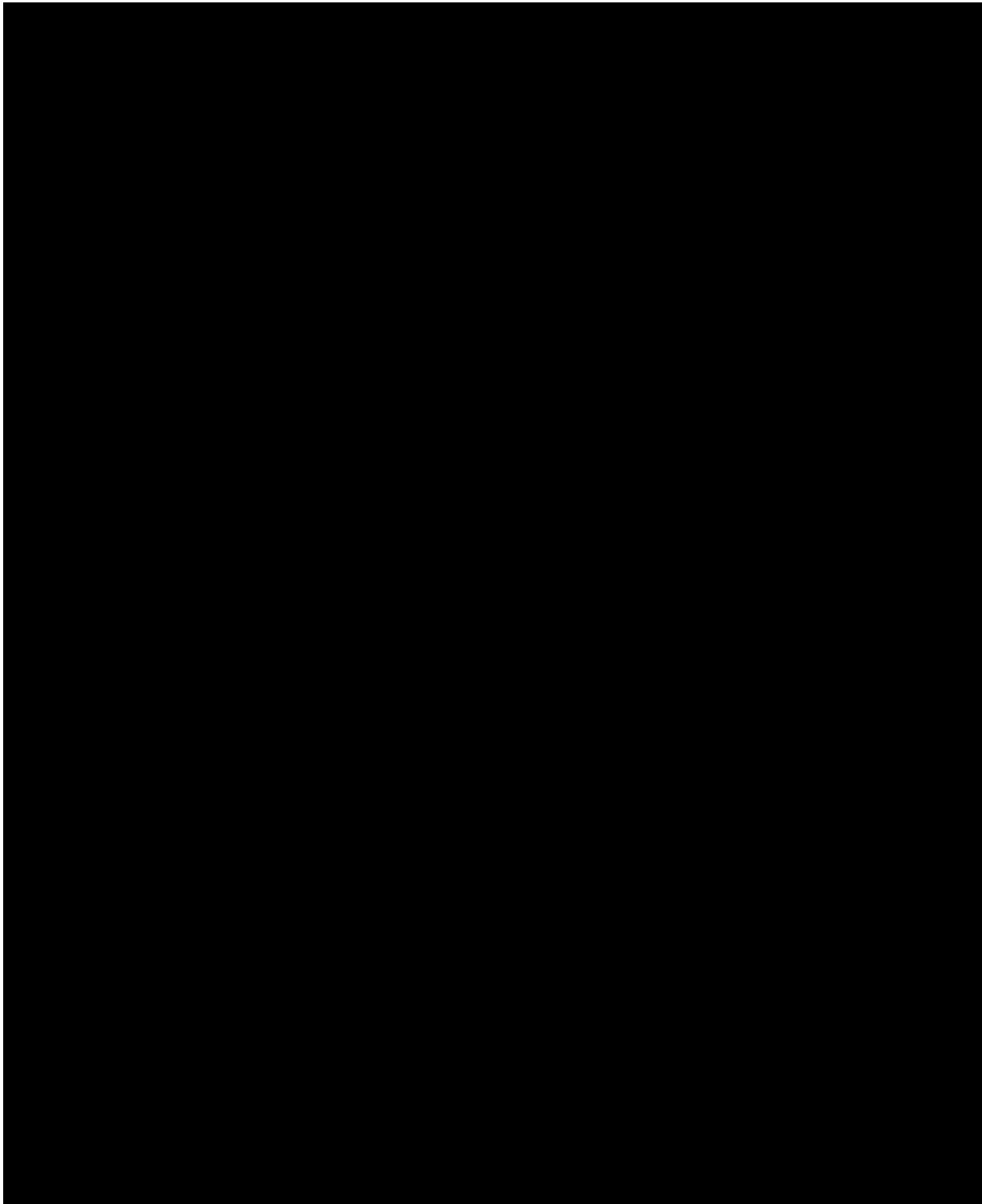
Attachment A

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EVALUATION RESULTS

ILLUMI

Figure 15: Customer Satisfaction



Program Ally Satisfaction

Program allies were also asked to rate their [REDACTED] with the program. [REDACTED] among contractors is [REDACTED] with a mean score of [REDACTED] on a five-point scale. [REDACTED] out of the [REDACTED] allies interviewed reported that they are very satisfied, while [REDACTED] gave a [REDACTED] and [REDACTED] was [REDACTED]

Figure 16: Program Ally [REDACTED]



5.6 NON-NATURAL GAS BENEFITS

Key Findings and Recommendations:

- * Participating [REDACTED] have resulted in non-natural gas benefits for the program. Benefits include a [REDACTED]
[REDACTED]

As part of the process evaluation, ILLUME identified and calculated non-natural gas benefits associated with the program from September 2013 to September 2014. [REDACTED] and [REDACTED] were identified as non-natural gas benefits as a result of [REDACTED]. As shown in the table below, during this period the program has accumulated non-natural gas benefits equivalent to almost [REDACTED], in addition to over [REDACTED] and [REDACTED]
[REDACTED]

EVALUATION RESULTS

ILLUMI

Table 8: Non-Natural Gas Benefits from [REDACTED] (for furnace discounted from September 2013 to September 2014)

Type of Savings	Per Unit Savings	Total Program Savings
[REDACTED]	Ohio TRM algorithm with inputs from the program	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

*See Appendix C for calculation inputs and sources.

A. PARTICIPANT SURVEY

ILLUME

Columbia Gas of Ohio High Efficiency Heating System Rebate Program Participant Survey Instrument

FINAL October 16, 2014

This is a telephone survey that will be conducted with [REDACTED] High Efficiency Heating System Rebate program participants. The objectives of the survey include the following: explore [REDACTED]

Introduction

Hello, my name is [INTERVIEWER NAME] with the Blackstone Group calling on behalf of Columbia Gas of Ohio. We are conducting a survey of customers who have received a furnace or boiler rebate through the High Efficiency Heating System Rebate program. This is not a sales call, and responses will be used to inform Columbia Gas about your experience and to evaluate the program's effectiveness. This interview will only take about 5 to 10 minutes of your time, and it will be recorded for quality assurance purposes.

[INTERVIEWER: If customer asks about how their information is kept secure, please use the following response,

"We maintain safeguards to protect survey responses. These include, for example, physical security of our facilities, technical safeguards to protect electronic data, and manager supervision."]

Are you the person who is most familiar with your most recent furnace or boiler purchase?

[CONTINUE WITH THE APPROPRIATE CONTACT PERSON]

Screening Questions

PARTICIPANT SURVEY

ILLUMI

I1. Are you currently talking to me on a regular landline phone or a cell phone?

1. (Landline phone)
2. (Cell Phone)
98. (Don't know)
99. (Refused)

[ASK IF I1 = 2, 98, 99]

I2. Are you currently somewhere safe and not driving a motorized vehicle?

1. (Yes)
2. (No) [Schedule call back]
98. (Don't know) [Schedule call back]
99. (Refused) [Schedule call back]

First, I'd like to ask you a few questions about your household.

I3. Are you, or is anyone in your household, a current or former employee of an electric or gas utility company?

1. (Yes) [THANK & TERMINATE]
2. (No)
98. (Don't know) [THANK & TERMINATE]
99. (Refused) [THANK & TERMINATE]

I4. Are you or one of the heads of your household retired?

1. (YES)
2. (NO)
98. (DON'T KNOW)
99. (REFUSED)

Customer Awareness and Attitudes

A1. Before this call today, were you [REDACTED]

1. (YES)
2. (NO)
3. (Other: specify _____)
98. (DON'T KNOW)
99. (REFUSED)

A2. Did you [REDACTED]

1. (YES)
2. (NO)
98. (DON'T KNOW)
99. (REFUSED)

A3. On a scale of 1-5 with 1 being [REDACTED] and 5 being [REDACTED]
how [REDACTED] **[RECORD NUMBER, 98=Don't know,
99=Refused]**

PARTICIPANT SURVEY

ILLUMI

A4. I am going to read a list of reasons [REDACTED]
[REDACTED] Which of the following is most [REDACTED] for you?

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]

Program Marketing and Messaging

[ASK IF A1=1]

M1. How did you [REDACTED] **[DON'T READ LIST]**

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
9. [REDACTED]
10. [REDACTED]
11. [REDACTED]
12. [REDACTED]
13. (Online)
00. (Other) [Specify _____]

98. (Don't know)

99. (Refused)

[ASK IF A1=1]

M2. How [REDACTED] Would you say it was...
[REDACTED]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
98. [REDACTED]
99. (Refused)

[ASK IF M2=1 OR 2]

M3a. What did you find the [REDACTED] **[OPEN END]**

[ASK IF A1=1]

M3b. What [REDACTED] could have been [REDACTED]
[OPEN END]

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Attachment A

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PARTICIPANT SURVEY

ILLUMI

Interactions with contractors and the Program

Now I have a few questions about your [REDACTED] and the [REDACTED]
[REDACTED]

C1. How did you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
00. (Other) [Specify _____]

98. (Don't know)

99. (Refused)

C2. Prior to making a purchase decision, did your contractor [REDACTED]
[REDACTED]

1. (YES)
2. (NO)
98. (DON'T KNOW)
99. (REFUSED)

C3. On a scale of 1 to 5, where 1 means [REDACTED] and 5 means [REDACTED]
how [REDACTED] **[RECORD NUMBER, 98=Don't know, 99=Refused]**

C4. Prior to making a purchase decision, did your contractor [REDACTED]
[REDACTED]

1. (YES)
2. (NO)
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF C4=1]

C5. On a scale of 1 to 5, where 1 means [REDACTED] and 5 means [REDACTED]
how [REDACTED] **[RECORD NUMBER, 98=Don't know, 99=Refused]**

[ASK IF C4=1]

C6. What [REDACTED] **[MULTIPLE RESPONSE]**

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]

PARTICIPANT SURVEY

ILLUMI

7. [REDACTED]
8. [REDACTED]
9. [REDACTED]
00. (Other) [Specify _____]

98. (Don't know)

99. (Refused)

C7. On a scale of 1 to 5, where 1 means not satisfied at all and 5 means very satisfied, how satisfied were you with the following areas? **[RECORD NUMBER, 98=Don't know, 99=Refused]**

- a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. [REDACTED]

Household Demographics

We are almost done; I just have a few final questions.

D1. Do you rent or own your home?

1. (RENT)
2. (OWN)
00. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

D2. Which of the following best describes your home?

1. A mobile home
2. A single-family detached residence
3. A single-family attached residence (for example, a townhouse)
4. An apartment or condominium in a building with 2-4 units
5. An apartment or condominium in a building with 5 or more units
00. (Other – Please specify: _____)
98. (Don't know)
99. (Refused)

D3. What is the approximate square footage of your home?

1. [NUMERIC OPEN END]
98. (Don't know)
99. (Refused)

D4. When was your home built?

PARTICIPANT SURVEY

ILLUMI

1. Before 1900
2. 1900 to 1939
3. 1940 to 1959
4. 1960 to 1979
5. 1980 to 1989
6. 1990 to 1999
7. 2000 to 2004
8. 2005 or later
98. (Don't know)
99. (Refused)

D5. Including yourself, how many people live in your household full time (full-time year-round)?

1. (1)
2. (2)
3. (3)
4. (4)
5. (5)
6. (6)
7. (7)
8. (8)
9. (9)
10. (9 OR MORE)
98. (DON'T KNOW)
99. (REFUSED)

D6. Which of the following categories best represents your total annual household income before taxes? Please tell me when I get to your range.

1. Up to \$50,000
2. Over \$50,000
98. (Don't know)
99. (Refused)

D7. What is your age?

1. (24 YRS OR YOUNGER)
2. (25 TO 44 YRS)
3. (45 TO 64 YRS)
4. (65 YEARS AND OVER)
98. (DON'T KNOW)
99. (REFUSED)

Thank you and Closing

*Those are all the questions I have for you today. Thank you so much for your time.
Columbia Gas of Ohio appreciates your participation in this survey.*

B. CONTRACTOR INTERVIEW GUIDE



Columbia Gas of Ohio High Efficiency Heating System Rebate Program Contractor Interview Guide

[NOTE: This document will be used as a guide to conduct in-depth interviews with participating contractors. Questions listed will be used to learn more about the contractors' experience with the program, areas of strength or success, areas for improvement, and satisfaction with various aspects of the program and the program overall.]

Introduction & Warm Up

Hello, may I please speak with [CONTACT NAME]? My name is [INTERVIEWER NAME]. I am calling on behalf of the Columbia Gas of Ohio's High Efficiency Heating System Rebate program.

We are evaluating this program and would like to ask you a few questions about your company's experience with the program. Are you familiar with your company's participation in the High Efficiency Heating System Rebate program? [IF NO, ASK IF CAN SPEAK WITH SOMEONE FAMILIAR WITH THE PROGRAM.]

This interview should take approximately 15 minutes of your time and all of your responses will remain confidential and will help us improve the program for the future. Is now a good time, or is there a more convenient time for me to call you back? [CONTINUE WITH SURVEY OR MAKE AN APPOINTMENT TO CALL BACK.]

Before we start, I would like to ask for your permission to record this interview, so that I won't have to take notes while we talk. I would like to once again assure you that all of your responses will remain confidential.

1. First, what is your title and role within the company?

- a. (President/CEO)
- b. (Vice President)
- c. (Treasurer/Secretary, or other Executive)

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CONTRACTOR GUIDE

ILLUMI

- d. (Field Manager/Crew Leader or Supervisor)
- e. (J Journeyman)
- f. (Crew member/Installer)
- g. (Other: specify)

Program Participation

1. How did [REDACTED]
[REDACTED]
a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. [REDACTED]
f. [REDACTED]
g. (Other: specify)
2. Why did [REDACTED] (Check all that apply)
a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. (Other: specify)
3. In 2014 so far, about what [REDACTED]
[REDACTED]
Would you say....
a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. [REDACTED]
4. [ASK IF RESPONDED [REDACTED] TO QUESTION 3] For what [REDACTED]
[REDACTED]
5. In 2014 so far, about what [REDACTED]
[REDACTED]
6. On a scale of 1 to 5, with 1 being [REDACTED] and 5 being [REDACTED], how [REDACTED]

Program Processes and Communications

Now I have some questions about program requirements and operations.

Contractor Enrollment and Training

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Attachment A

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CONTRACTOR GUIDE

ILLUMI

1. On a scale of 1-5, with 1 being [REDACTED] and 5 being [REDACTED], how would you rate the [REDACTED]

[REDACTED]
 - a. (ASK IF RATED 1-3) How could the program have [REDACTED] [REDACTED] Do you think any of the requirements should be changed?
2. Have you [REDACTED]
 - a. [IF YES] On a scale of 1 to 5, with 1 being [REDACTED] and 5 being [REDACTED], how [REDACTED]
 - i. (ASK IF RATED 1-3) How could the program [REDACTED]
 - b. [IF NO] Why have you [REDACTED]
3. Are there any other [REDACTED]
[REDACTED]

Program Communications

Next I have a few questions about program communications and your interactions with the program.

4. How do you typically [REDACTED]
 - a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
 - d. [REDACTED]
 - e. (Other: specify _____)
5. On a scale of 1 to 5, with 1 being [REDACTED] and 5 being [REDACTED], how [REDACTED]

[REDACTED]
 - a. [REDACTED]
 - b. [REDACTED]
6. Could these [REDACTED] How?

Incentive Paperwork, Processing, and Incentives

Now I have some questions about the program's incentive offerings and paperwork requirements.

7. On a scale of 1 to 5, with 1 being [REDACTED] and 5 being [REDACTED], how would you rate the following....
 - a. The [REDACTED]
 - b. The [REDACTED]
 - c. The [REDACTED]

CONTRACTOR GUIDE

ILLUMI

(ASK IF 7 a-b RATED 1-3) How could the program [REDACTED]
[REDACTED]

(ASK IF 7 c RATED 1-3) How could the [REDACTED]

Customer Interactions, Barriers and Benefits

Next I have a few questions about customer interactions, benefits and barriers.

1. Prior to the customer making a purchase decision, do you [REDACTED]
a. [IF NO, Why do you] [REDACTED]
2. Prior to the customer making a purchase decision, do you [REDACTED]
a. [IF YES, What] [REDACTED]
b. [IF NO, Why do you] [REDACTED]
3. What are the [REDACTED] How could the [REDACTED]
4. What are the [REDACTED] (other than those mentioned previously?)
5. Are there any types of [REDACTED]
[REDACTED]

Contractor Barriers and Benefits

Now I have just a few more questions about your experience overall and the key barriers and benefits of your participation in the program.

1. On a scale for 1 to 5, where 1 is [REDACTED] and 5 is [REDACTED], how would you rate your [REDACTED]
2. What are the [REDACTED]
a. What could the program [REDACTED]
3. What are the [REDACTED]

Closing

1. Is there anything else that you would like to share that we have not already discussed?

That is all I have for today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation.

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NON-GAS BENEFITS

ILLUMI

C. NON-NATURAL GAS BENEFITS CALCULATION

From the Ohio TRM, August 2010, p. 285

If furnace equipped with ECM fan motors, the following algorithm can be used to calculate energy savings; otherwise, electric energy savings are zero:

$$\Delta \text{kWh} = (5) \times (\text{CAP}) \times (\text{EFLH}_h) \times (\eta_{\text{base}}/\eta_{\text{ee}})$$

Where:

5 = annual kWh savings per MMBtu of heating fuel consumption⁶⁹⁷

CAP = equipment heating capacity (MMBtu/hr)

EFLH_h = equivalent full load heating hours

= 2,408⁶⁹⁸

η_{ee} = installed equipment efficiency; expressed as AFUE, Combustion Efficiency (E_c), or Thermal Efficiency (E_t).

η_{base} = Assume 80%⁶⁹⁹.

Notes:

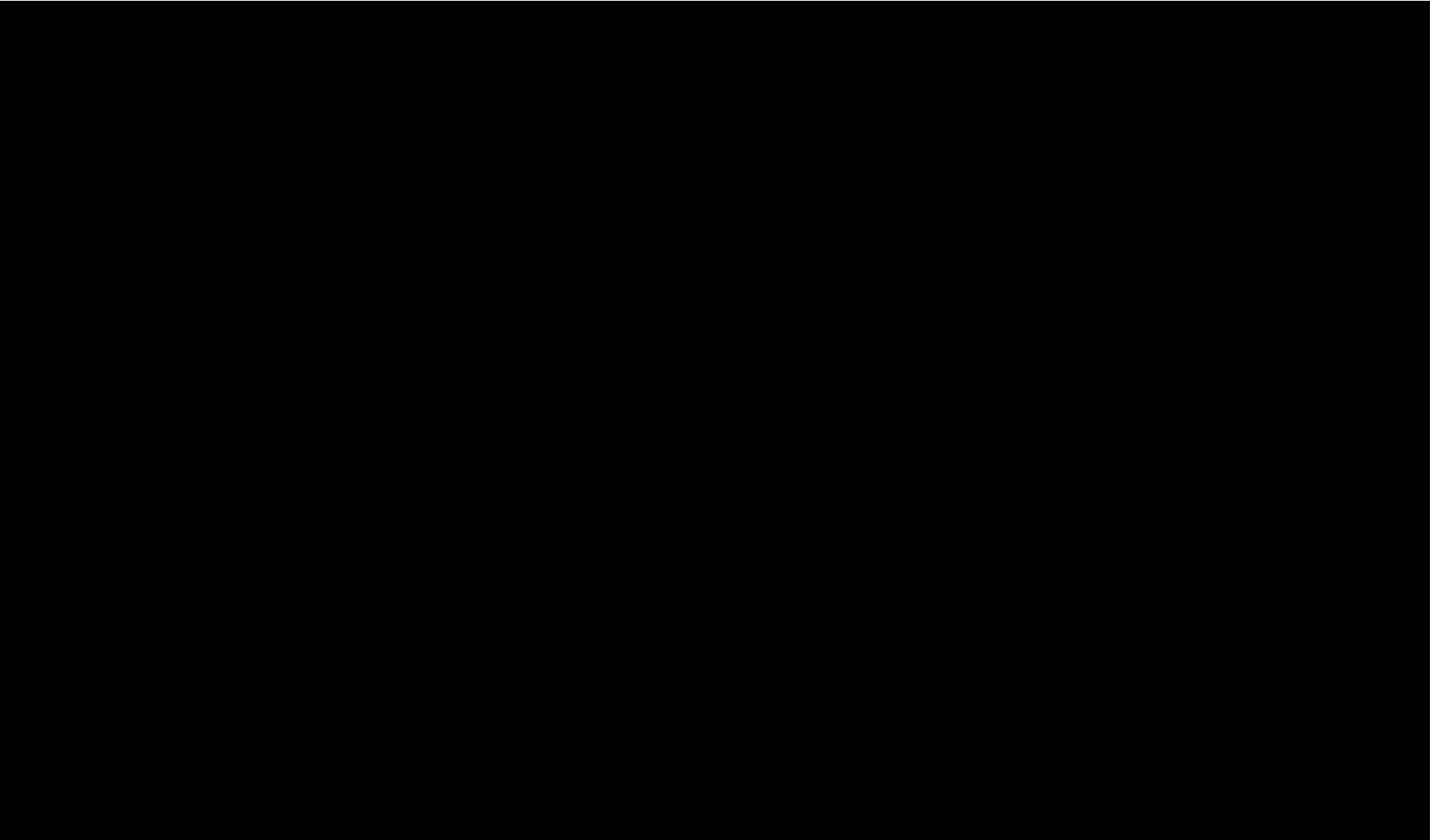
1) CSG [REDACTED]

2) All other inputs assumed Ohio TRM default values expressed in the above entry.

3) AEP Electric Rate from [<http://energychoice.ohio.gov/ApplesToApplesComparision.aspx?Category=Electric&TerritoryId=2&RateCode=1>]

4) Tons of Carbon per kWh from [<http://blueskymodel.org/kilowatt-hour.html>]

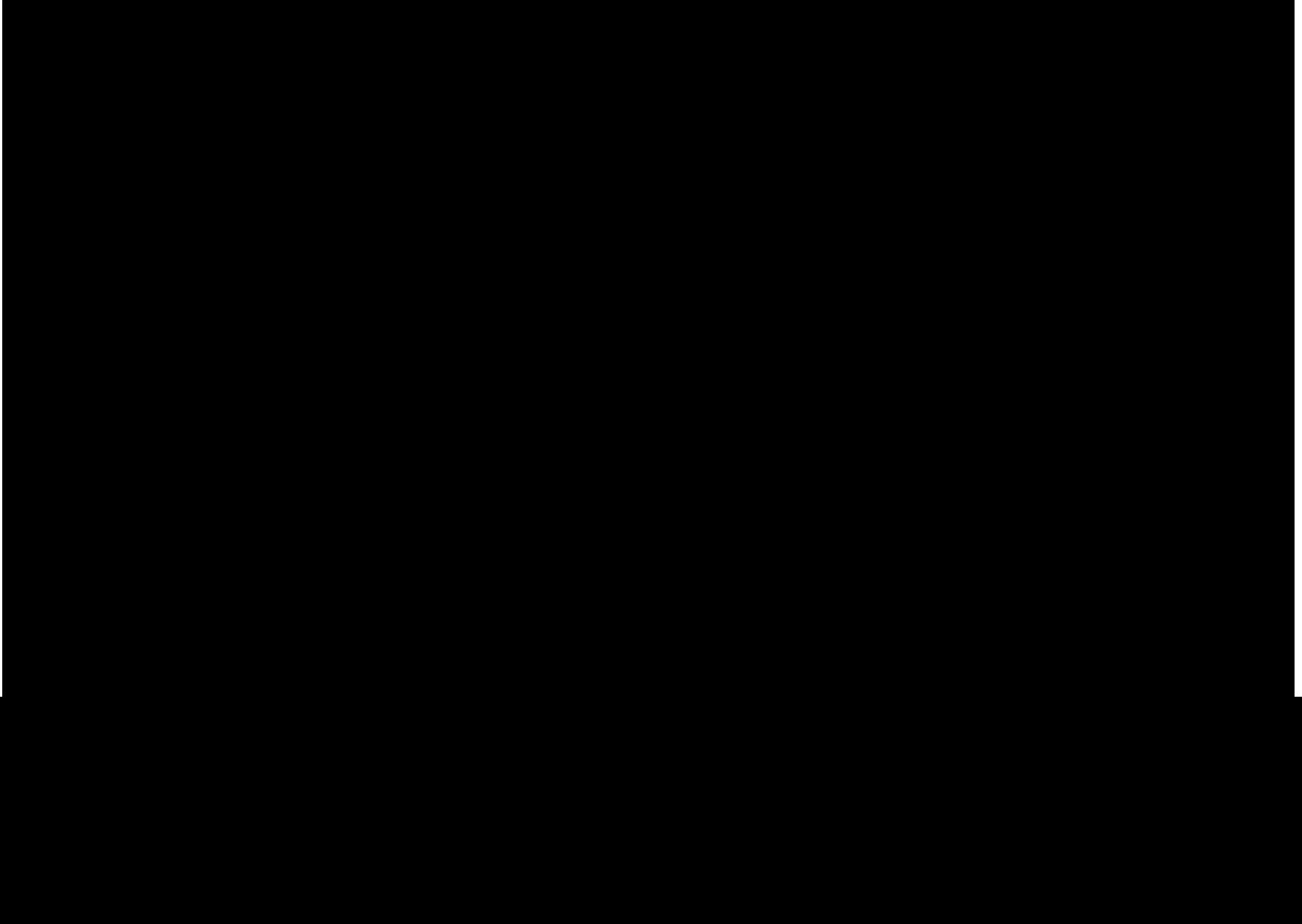
D. PROGRAM PROCESSES



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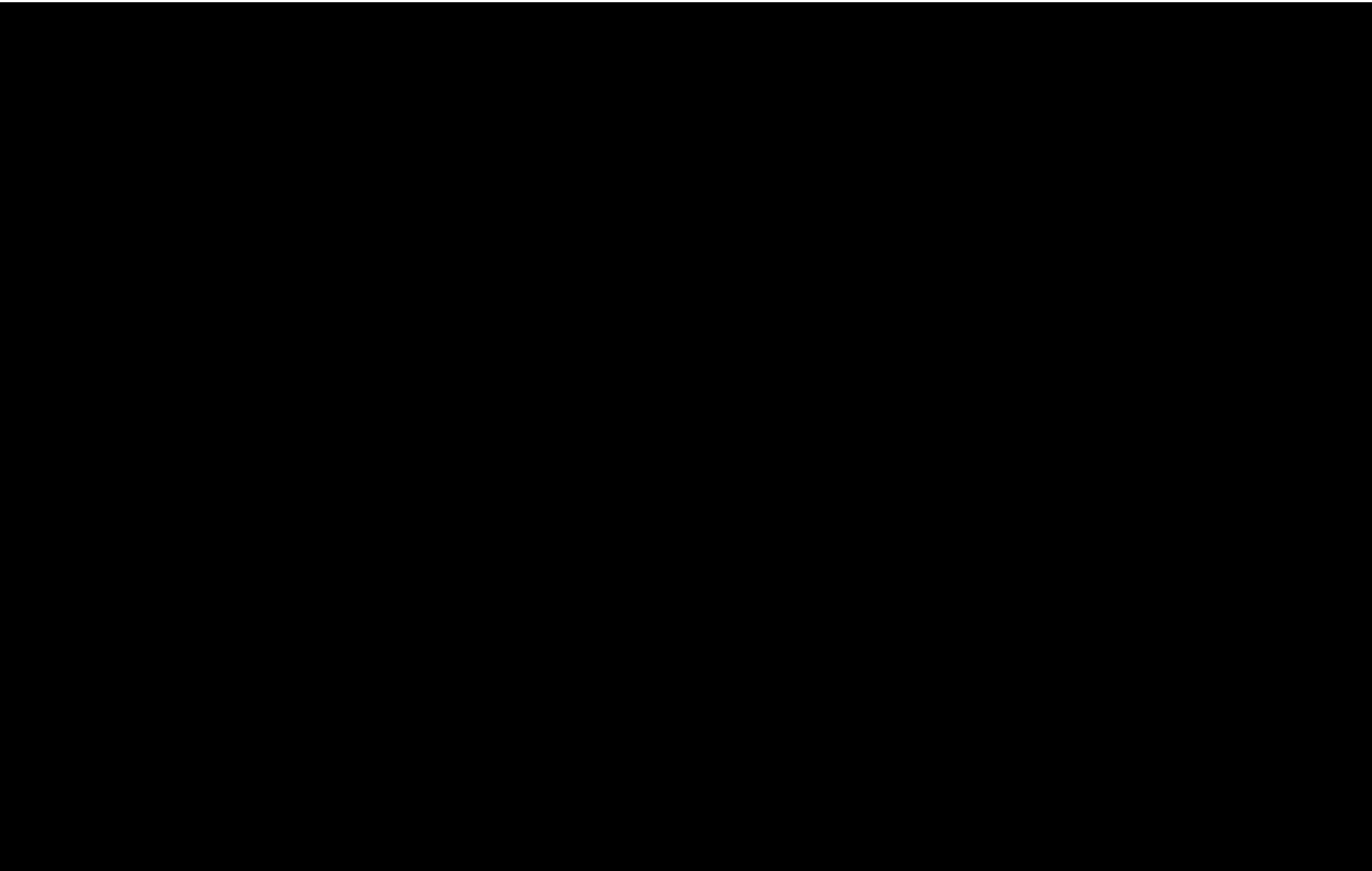
COH HEHSR Flow – Rebate Fulfillment



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COH HEHSR Flow – QC



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Attachment A
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ILLUME

Columbia Gas of Ohio Home Energy Reports

Final Report

Prepared for:

Columbia Gas of Ohio

December 1, 2014

Contact Name:

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1. EXECUTIVE SUMMARY

1.1 Introduction and Program Overview

ILLUME Advising, LLC (ILLUME) was commissioned by Columbia Gas of Ohio (COH) to conduct a process evaluation of the Home Energy Reports program.

The Home Energy Reports (HER) program provides customers with a report that describes their natural gas usage and tips to save natural gas through a comparison to their personal past usage as well as that of similar homes. The HER program is implemented by Opower and the first reports were sent to customers in September and October, 2013. In addition, COH holds a direct contract with NCO to maintain a customer call center. COH works closely with Opower and NCO to oversee the program's administration and delivery.

The overall goals of this process evaluation included the following: (1) assessing overall satisfaction with COH, (2) assessing treatment participants' experience and satisfaction with the reports; (3) reviewing program procedures and processes; (4) identifying potential barriers of the reports and ways to approach these barriers; and (5) identifying and quantifying any non-natural gas benefits that occurred as a result of the HER program.

1.2 Evaluation Methods

ILLUME developed our evaluation findings and recommendations based on interviews with utility staff, implementation staff, and customers from both the treatment and control groups. Both treatment and control customers were asked about [REDACTED] while treatment customers were also asked about their [REDACTED]

[REDACTED] In addition, the ILLUME team reviewed program data and processes, sample paper and email reports, the program website, program segmentation and messaging documentation, along with other program-related materials.

1.3 Key Findings and Recommendations

The majority of treatment customers are [REDACTED] with the [REDACTED]
[REDACTED] and have [REDACTED]
[REDACTED] Opportunities still exist to [REDACTED] and [REDACTED]
Below we present key findings from the evaluation, along with related recommendations where applicable.

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- * **Both treatment and control customers are [REDACTED] with the [REDACTED]**
Each group was asked [REDACTED] on a one to five scale, with five being very satisfied. [REDACTED] of treatment customers and [REDACTED] of control customers were [REDACTED] (giving a ranking of 4 or 5). While it appears that [REDACTED] treatment customers are [REDACTED] than control customers, these differences cannot be detected with the current sample design.¹
- * **With the exception of a [REDACTED] [REDACTED] our survey work [REDACTED]**
[REDACTED] in the [REDACTED] (since last fall) between treatment and control customers². However, we did find a [REDACTED] in the [REDACTED] (43% treatment vs. control).
- o **Recommendation:** Survey treatment and control customers [REDACTED] As the program [REDACTED] will have more time to [REDACTED] and [REDACTED] may become more apparent in the data.
- * [REDACTED] of treatment customers have [REDACTED] through the reports, suggesting that the report is having [REDACTED]. However, [REDACTED] than [REDACTED] of treatment customers report [REDACTED]
- o **Recommendation:** Consider [REDACTED] section of the paper report. Customers suggested that the [REDACTED] include information [REDACTED], such as [REDACTED]. As [REDACTED] customers are currently engaged in the [REDACTED] ([REDACTED] have [REDACTED] or [REDACTED]). This detail could be provided in the paper reports to increase customer action.
 - o **Recommendation:** [REDACTED] to ensure that [REDACTED] receive [REDACTED] instead of [REDACTED], which may be [REDACTED]

¹ The survey sample was designed to detect differences at the 90/10 confidence level.

² Ibid.

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- [REDACTED]. Opower reports that they currently select the [REDACTED], or [REDACTED]
- * The [REDACTED] and [REDACTED] modules received the [REDACTED] ratings for usefulness (mean score of [REDACTED] each on a 5-point scale), [REDACTED] by the [REDACTED] (mean score of [REDACTED]). While a larger portion of customers found the modules [REDACTED] additional opportunities exist to strengthen them.

- o **Recommendation:** Customers are [REDACTED] within the [REDACTED] and [REDACTED] language [REDACTED] customers suggested that [REDACTED] to provide a more useful [REDACTED] While the [REDACTED] provided in the [REDACTED] is already [REDACTED] it is not noted in the reports. This information should be highlighted to make customers aware. Additionally, 78 customers suggested that the [REDACTED] be improved. While the report notes that [REDACTED] are included in the [REDACTED] customers want to know [REDACTED]

- * Several challenges were experienced during program planning and management. Opower [REDACTED] the original first year savings targets, resulting in the [REDACTED] in subsequent years to [REDACTED]. Additionally, Opower did not [REDACTED] and [REDACTED] needed for [REDACTED] which led to a process that was more difficult than anticipated.

- o **Recommendation:** Consider [REDACTED] that encompasses a [REDACTED] an [REDACTED] (including any [REDACTED] This [REDACTED] will ensure that COH is informed on [REDACTED] or any [REDACTED] and also allow COH and Opower to [REDACTED], as necessary.

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- o **Recommendation:** Allow [REDACTED] to implement any new [REDACTED] or segmentation for the planning cycle, and [REDACTED] upfront. This will ensure that [REDACTED] for each [REDACTED] and [REDACTED] is available for report [REDACTED]
- * **Non-natural gas benefits from the program were found of [REDACTED]**, along with modest monetary savings and reductions in [REDACTED]. These benefits were a result of a [REDACTED] of [REDACTED] their homes compared to control households.

INTRODUCTION

ILLUME

2. INTRODUCTION

ILLUME Advising, LLC (ILLUME) was commissioned by Columbia Gas of Ohio (COH) to conduct a process evaluation of its Home Energy Reports (HER) program. The major tasks and goals of the evaluation were:

- 1) Document program processes and procedures to identify and recommend potential improvements.
- 2) Conduct interviews with utility and program staff, and treatment and control group customers to [REDACTED] and the treatment group's [REDACTED]
- 3) Determine the [REDACTED] what [REDACTED] and [REDACTED]
- 4) Identify and quantify any non-natural gas benefits resulting from the HER program.

3. PROGRAM DESCRIPTION

3.1 Overview

The HER program presents treated customers with a mailed report that includes a [REDACTED]

[REDACTED] and a [REDACTED] Paper reports are sent during the heating season from [REDACTED] of each year. Customers may also elect to receive emailed reports or create an online account on the report's website.

During the first year of program operation (July 2013-June 2014), the implementation budget was [REDACTED]

3.2 Program Objectives and Goals

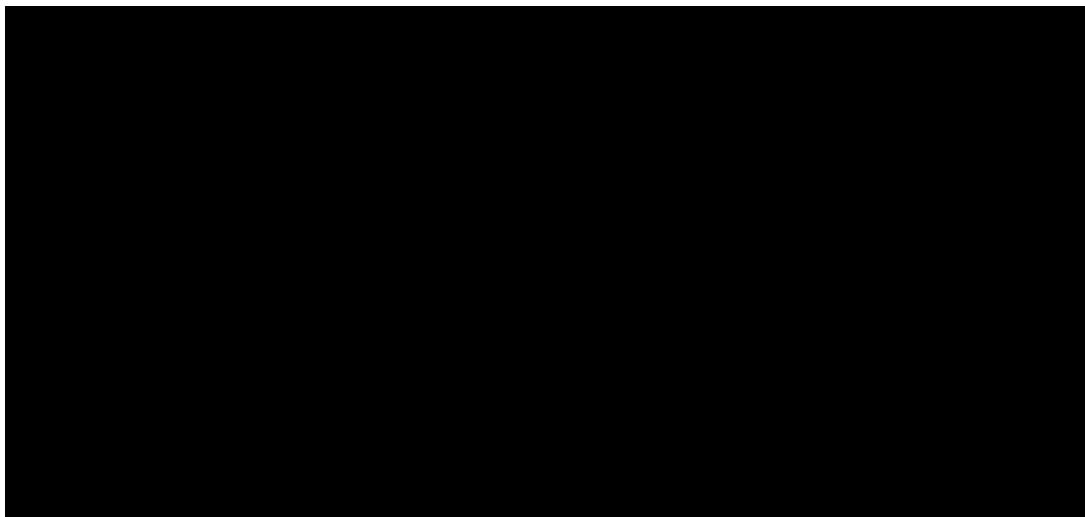
The primary objective of the HER program is to provide just over 114,000⁴ residential households with information on their natural gas usage and tips on how to save energy to prompt them to take action to reduce their natural gas usage. Program theory references research in psychology and behavioral economics which suggests that behavioral approaches, such as appealing to people's social norms through energy usage comparisons to their neighbors, can be cost-effective ways to get customers to take energy-saving actions.

The program has annual natural gas savings goals that have been set over the three year period from July 2013 to June 2016. These goals were revised to reflect achievement in PY 2013-2014, which was [REDACTED]. As such, goals in PY 2014-2015 and PY 2015-2016 [REDACTED] so that [REDACTED] annual goals for the three year period are reflected in the figure below.

⁴ An additional 315,000 households were also added during PY 2014-2015.

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Figure 1: Annual MCF Savings Goals



A secondary objective of the program is to drive customers to participate in other COH energy efficiency programs.

3.3 Program Delivery and Implementation

Implementation responsibilities (contracted to Opower) include:

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]

In addition, NCO is contracted with COH to maintain a customer call center for the HER program. NCO's key responsibilities include [REDACTED]

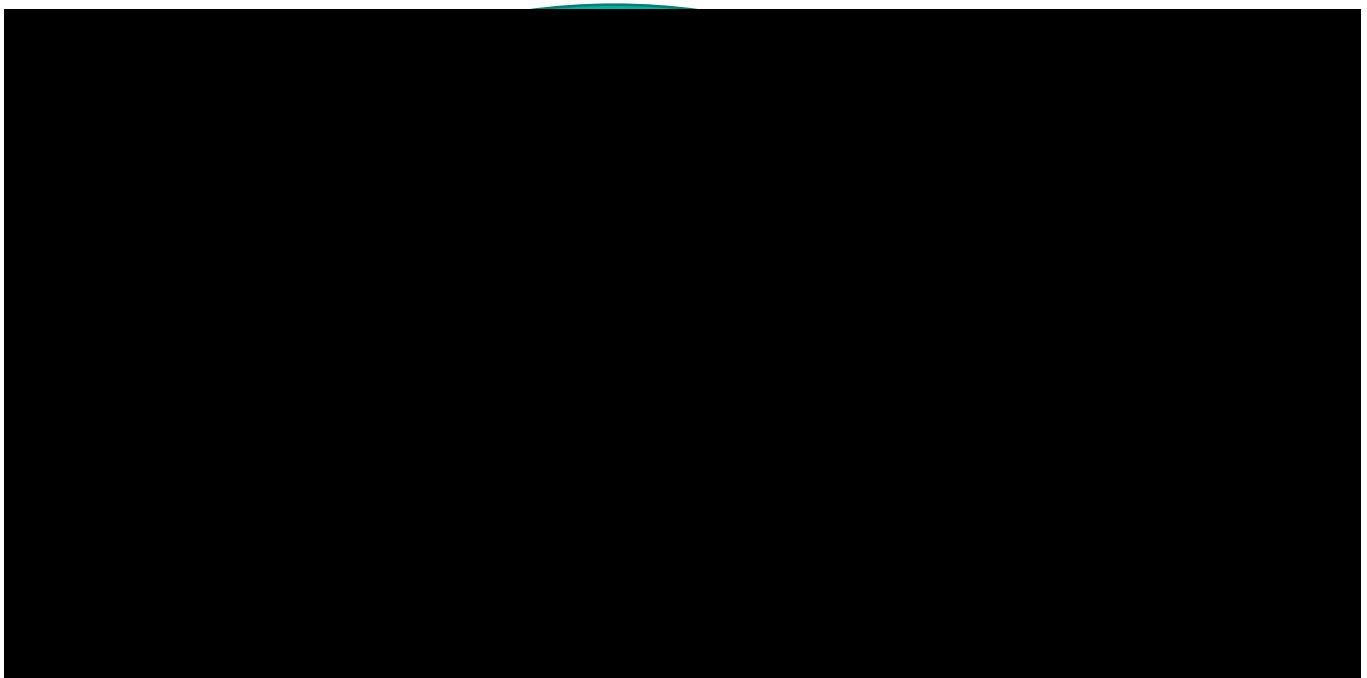
Program Design

Natural gas savings values from the HER program are based on a randomized control trial, where any differences in savings from the pre-program period to the program period between those customers receiving the reports (the treatment group) and those customers not receiving the reports (the control group) are assumed to be due to the program, all else being equal.

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To establish the treatment and control groups for PY 2013-2014, COH provided Opower with its residential customer billing data. Customers are then tested by Opower to ensure both [REDACTED] For example, to be included in either the treatment or control group, the [REDACTED] must [REDACTED] and the [REDACTED] After establishing [REDACTED] criteria is set to determine report eligibility. For PY 2013-2014, COH and Opower decided to send reports to the top 30% of natural gas users (about 90,000 customers) and the next 25,000 middle users (below the top 30%). Eligible customers were then randomly assigned to the treatment group and a separate control group that did not receive any reports. This process is illustrated below.

Figure 2: Home Energy Report Customer Selection Process



In total, just over 114,000 customers were included in the treatment group for PY 2013-2014. An additional 315,000 customers will receive reports in PY 2014-2015 to [REDACTED]

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Table 1: Customer Treatment and Control Groups

Treatment Group	Start Date	Number of Customers Receiving Reports	Number of Control Customers	Treatment Dates/Frequency
Wave 1 *	Sept/Oct 2013	114,353	[REDACTED]	Sept/Oct Nov/Dec January February
Wave 2 **	Sept/Oct 2014	~315,000	[REDACTED]	Sept/Oct Nov/Dec January February

* Customer counts from 2013-2014 participant data provided by Columbia Gas. Inactive and opt-out customers removed.

** These numbers are approximations from Opower and account for attrition. We did not obtain data for the second wave of customers.

[REDACTED] customers [REDACTED], or less than [REDACTED]) have discontinued the reports (opt-outs).

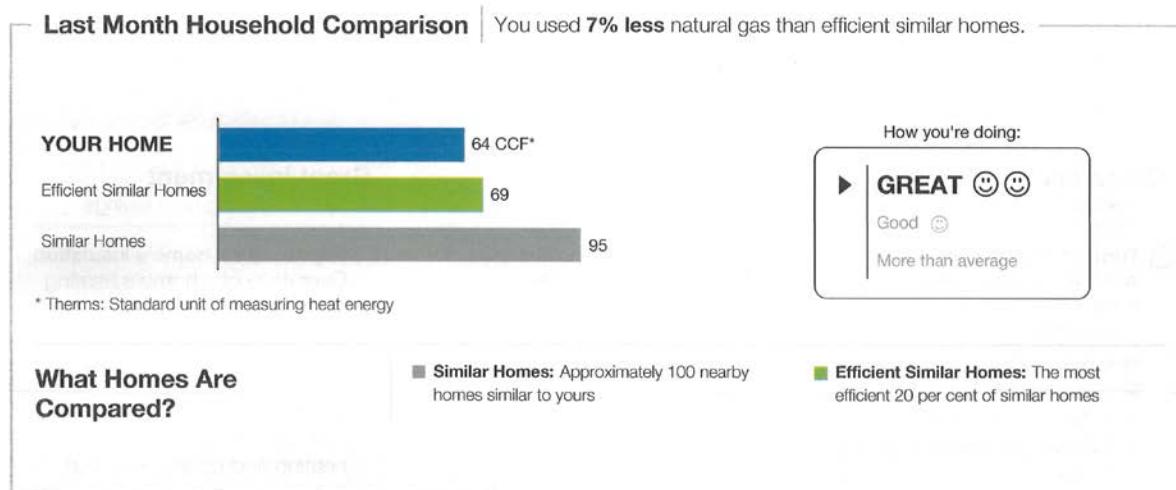
Report Design and Frequency

The first reports were sent in [REDACTED], and continued on a [REDACTED] through [REDACTED] to align with the [REDACTED] Reports were [REDACTED] during the [REDACTED] and picked up again in [REDACTED]. In addition to paper reports, customers may [REDACTED] During PY 2013-2014, [REDACTED] were sent on a [REDACTED] and also in [REDACTED] In PY 2014-2015, [REDACTED] will be sent from [REDACTED] to [REDACTED] on a [REDACTED] Customers can visit the [REDACTED] and [REDACTED] to access additional information on [REDACTED]
[REDACTED]

The reports consist of [REDACTED] informational modules that interpret household natural gas usage and communicate tips to save energy. The [REDACTED] module includes a [REDACTED] An example is shown below.

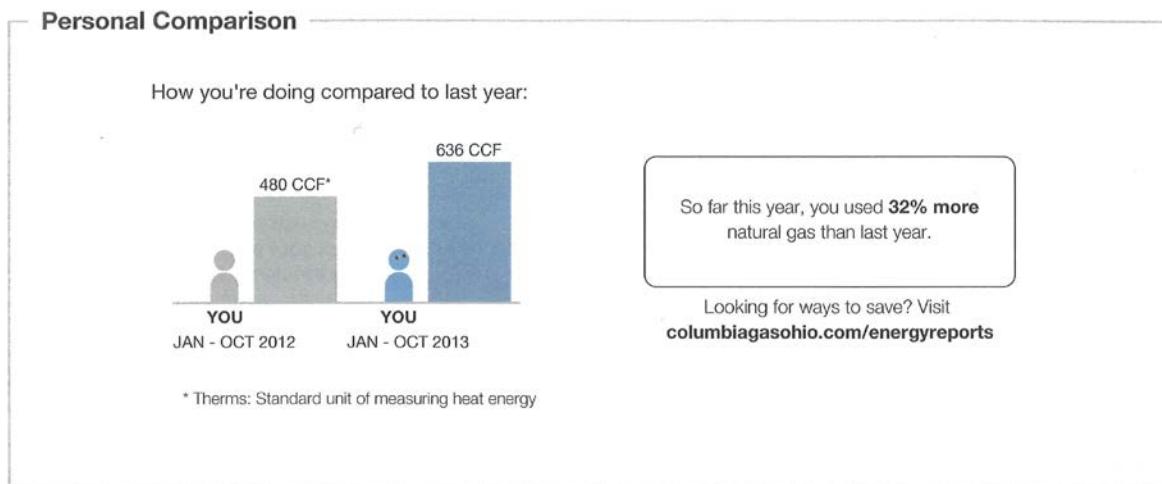
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Figure 3: Similar Homes Module Example



The [REDACTED] module is a [REDACTED]

Figure 4: Personal Comparison Module Example



[REDACTED], the [REDACTED] module includes [REDACTED]

Figure 5: Tips Module Example

Action Steps | Personalized tips chosen for your home

Quick Fix	Smart Purchase	Great Investment
Something you can do right now	An affordable way to save more	A big idea for long-term savings
<input type="checkbox"/> Turn down your thermostat when using your fireplace A fireplace can add charm to your home, but is an inefficient way of heating it. Many fireplaces consume more heat than they produce, since they draw warm air out through the chimney. To waste less energy, turn your thermostat down when you're using your fireplace and keep the flue or damper closed the rest of the time. If you use your fireplace often, consider installing a fireplace insert, tight-fitting glass doors, or an outdoor air supply.	<input type="checkbox"/> Program your thermostat to reduce heating costs A programmable thermostat can automatically turn down your heating system when you're away, then return to your preferred temperature when you're home. Decrease the temperature by at least 10°F when you're away or asleep, and set it to a comfortable level for when you're home: 68°F or lower is recommended. We're offering a \$25 rebate on programmable thermostats. Visit columbiagasohio.com or call 1-866-542-4767 for details.	<input type="checkbox"/> Improve your home's insulation Over 45% of a home's heating and cooling can be lost through the walls, roof, and floor. If you improve your home's insulation in these areas, you can substantially reduce your heating and cooling bills and keep comfortable all year round. In some cases, you may be able to install insulation in your attic and other areas yourself. In other cases, you may want to hire a professional to help.
SAVE UP TO \$10 PER YEAR	SAVE UP TO \$65 PER YEAR	SAVE UP TO \$125 PER YEAR

Additional messaging may also be included in the reports depending on the customer's eligibility status. Report messaging in PY 2013-2014 promoted participation in either the WarmChoice (for income-qualified households) or Home Performance Solutions programs.

4. EVALUATION METHODS

Our evaluation findings and recommendations are based on customer interviews, utility and implementer staff interviews, and a review of program data and materials.

4.1 Program Staff Interviews

In August through October of 2014, ILLUME conducted interviews with the COH HER program manager and evaluation team leader, and the Opower program manager and NCO call center manager. Interviews with COH and Opower staff covered program goals and objectives, program delivery, operations and processes, strengths of the program, and opportunities for improvement. An interview with NCO explored customer call center processes, types of customer concerns, and frequency of calls.

4.2 Treatment and Control Group Interviews

In October of 2014, [REDACTED] interviews were completed with treatment group participants and [REDACTED] interviews were completed with customers in the control group. The sample was designed to detect differences between treatment and control customers at the 90/10 confidence level⁵. Control group interviews included questions related to [REDACTED]

[REDACTED] Treatment group interviews included the same questions that were asked of the control group, but also questions to [REDACTED]
[REDACTED]

To develop the sample population, COH provided ILLUME with a database containing treatment and control customer information from PY 2013-2014.

[REDACTED] and [REDACTED] were eliminated from the sample file. The data was then further reviewed for [REDACTED] (some customers with [REDACTED]
[REDACTED] and [REDACTED], leaving 109,708 treatment group customers and [REDACTED] control group customers available for random selection into a sample.

⁵ 90% likelihood that the true mean lies within 10 percentage points of a particular value.

Random sampling attempts to eliminate self-selection bias (overrepresentation of individuals who seek participation) and guard against under-coverage bias (missing key parts of the population). However, as in any survey, other biases may still be experienced. These potential biases are listed below:

- Social desirability bias: Customers may respond to a question in a way that they think the interviewer wants them to respond.
- Interviewer bias: The interviewer may unknowingly ask a question in a way that prompts a certain type of response. This bias is lessened by training the interviewer and good survey design (avoiding leading questions, etc.).
- Recall bias: When asking about a past event, individuals may have difficulty recalling what happened. Some individuals may remember good events more completely, while others may better remember negative ones. This bias can be lessened by reducing the amount of time back that respondents have to recall, and designing questions in a way to prompt better recall.

The complete treatment and control survey instrument is provided in Appendix A.

4.3 Review of Program Data and Materials

In addition to interviews, the evaluation also included a review of program data and materials provided by COH, Opower, and NCO, including the following:

- A list of PY 2013-2014 treatment and control group customers, including names, phone numbers, and what type of treatment they are receiving
[REDACTED]
- Program objectives and logic documentation
- Sample [REDACTED]
- Report [REDACTED] and [REDACTED]
- [REDACTED] and [REDACTED] documentation
- Website and call center statistics

5. EVALUATION RESULTS

The sections below present the results from our evaluation efforts. Key findings and recommendations, where applicable, are offered at the start of each section and then are followed by more detailed information.

5.1 Program Processes and Procedures

Key Findings and Recommendations:

- **The program faced several challenges in planning and management.** Opower did [REDACTED] its original first year savings targets, resulting in the [REDACTED]
[REDACTED] Additionally, Opower did [REDACTED] for [REDACTED] and [REDACTED] which caused a more difficult process than anticipated.
 - **Recommendation:** Consider revising [REDACTED] to allow for a [REDACTED] that includes a [REDACTED] during the [REDACTED] and [REDACTED] (including any [REDACTED]) This will ensure that COH is informed on [REDACTED] or any [REDACTED] and also allow COH and Opower to [REDACTED] and [REDACTED] towards [REDACTED]
 - **Recommendation:** [REDACTED] needed for report messaging should be [REDACTED] by Opower. Additionally, these planning efforts should be given [REDACTED] in the future. This would allow [REDACTED] for COH and Opower to [REDACTED], [REDACTED]
- **Messaging about [REDACTED] was sent to all non-low income treatment customers during the 2013-2014 heating season,** regardless of whether they [REDACTED] This caused [REDACTED] Additional [REDACTED] has been completed by the program for the 2014-2015 heating season to ensure that [REDACTED] is considered in report messaging.
- **Call center abandonment rates range from [REDACTED] ([REDACTED], a high volume month) to [REDACTED] ([REDACTED], a low volume month),** and averaged [REDACTED] from October 2013 to October 2014.

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- **Recommendation:** While there is not a specific industry standard for this metric, efforts should be made to [REDACTED] especially [REDACTED]. The program should consider working with NCO to [REDACTED] and [REDACTED]. Additionally, COH should consider working with NCO to [REDACTED] to help inform the program on customer barriers.

Program Planning and Management

During the program planning stage and into the first year of operations, several challenges were encountered. Challenges faced spanned from the [REDACTED] to the [REDACTED]. Here, we discuss challenges cited by COH and Opower, along with actions taken in attempt to resolve them.

Major challenge areas are listed below:

- **Challenge:** Initially, [REDACTED] were not included by Opower in [REDACTED]. When added, the program was [REDACTED].
 - Action taken: Opower [REDACTED]
- **Challenge:** First year savings achievement was [REDACTED] original annual target. COH notes that Opower [REDACTED]
 - Action taken: [REDACTED] in PY 2014-2015 to [REDACTED]
 - Action taken: The [REDACTED] and [REDACTED] so that the [REDACTED]
 - Action taken: Opower [REDACTED] in PY 2014-2015.
- **Challenge:** [REDACTED] and [REDACTED] has [REDACTED] and [REDACTED] than anticipated.
 - *This area is discussed in more detail below.*

Customer Segmentation and Messaging

Columbia Gas and Opower worked together prior to the start of each heating season to segment customers into specific groups and to formulate messaging for these groups in the reports. During PY 2013-2014, customers were [REDACTED], households identified as [REDACTED]

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[REDACTED] received a [REDACTED], COH's [REDACTED] received a [REDACTED]
[REDACTED] program, as shown in the figure below.

Figure 6: Home Performance Solutions Messaging

Discover your home's energy efficiency potential

Join your neighbors and schedule an in-home energy audit. For just \$50, a Home Energy Auditor will inspect your home and identify your biggest savings opportunities.

You'll learn how you can qualify for generous discounts on weatherizing your home to improve your comfort, reduce your home's energy use, and save on your bill.



This messaging went generally to [REDACTED], and customers who had [REDACTED]. As a result, COH and NCO report that the [REDACTED] from customers who had [REDACTED]

Prior to mailing reports in the second year, Opower and COH worked together to plan for [REDACTED]. However, [REDACTED]

[REDACTED] in the [REDACTED] COH requested guidance from Opower on the criteria [REDACTED] needed so that they could formulate potential customer messages. However, these [REDACTED] and later [REDACTED]

[REDACTED] COH notes that the data requirements [REDACTED] changed over the course of planning.

Opower noted that [REDACTED] Likewise, COH staff [REDACTED] want to ensure that the [REDACTED] is appropriate and applicable to their customers. Future efforts may benefit from (1) [REDACTED] and (2) [REDACTED]

In PY 2014-2015, messages will be [REDACTED] and customers will be [REDACTED]. Program databases were obtained by Opower to [REDACTED]

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identify customers that have [REDACTED] which the program hopes will address the [REDACTED] previously noted. Columbia Gas will send Opower updated [REDACTED] prior to the mailing of each report.

Customer segmenting and messaging in PY 2014-2015 is listed in the following table. Messaging primarily focuses on [REDACTED]

[REDACTED] depending on [REDACTED]

Table 2: PY 2014-2015 Customer Segmenting and Messaging

Segment	Messaging Focus	Action Items
Segment 1	Focus 1	Action 1
Segment 1	Focus 2	Action 2
Segment 2	Focus 1	Action 3
Segment 2	Focus 2	Action 4
Segment 3	Focus 1	Action 5
Segment 3	Focus 2	Action 6
Segment 4	Focus 1	Action 7
Segment 4	Focus 2	Action 8
Segment 5	Focus 1	Action 9
Segment 5	Focus 2	Action 10
Segment 6	Focus 1	Action 11
Segment 6	Focus 2	Action 12
Segment 7	Focus 1	Action 13
Segment 7	Focus 2	Action 14
Segment 8	Focus 1	Action 15
Segment 8	Focus 2	Action 16
Segment 9	Focus 1	Action 17
Segment 9	Focus 2	Action 18
Segment 10	Focus 1	Action 19
Segment 10	Focus 2	Action 20
Segment 11	Focus 1	Action 21
Segment 11	Focus 2	Action 22
Segment 12	Focus 1	Action 23
Segment 12	Focus 2	Action 24
Segment 13	Focus 1	Action 25
Segment 13	Focus 2	Action 26
Segment 14	Focus 1	Action 27
Segment 14	Focus 2	Action 28
Segment 15	Focus 1	Action 29
Segment 15	Focus 2	Action 30
Segment 16	Focus 1	Action 31
Segment 16	Focus 2	Action 32
Segment 17	Focus 1	Action 33
Segment 17	Focus 2	Action 34
Segment 18	Focus 1	Action 35
Segment 18	Focus 2	Action 36
Segment 19	Focus 1	Action 37
Segment 19	Focus 2	Action 38
Segment 20	Focus 1	Action 39
Segment 20	Focus 2	Action 40
Segment 21	Focus 1	Action 41
Segment 21	Focus 2	Action 42
Segment 22	Focus 1	Action 43
Segment 22	Focus 2	Action 44
Segment 23	Focus 1	Action 45
Segment 23	Focus 2	Action 46
Segment 24	Focus 1	Action 47
Segment 24	Focus 2	Action 48
Segment 25	Focus 1	Action 49
Segment 25	Focus 2	Action 50
Segment 26	Focus 1	Action 51
Segment 26	Focus 2	Action 52
Segment 27	Focus 1	Action 53
Segment 27	Focus 2	Action 54
Segment 28	Focus 1	Action 55
Segment 28	Focus 2	Action 56
Segment 29	Focus 1	Action 57
Segment 29	Focus 2	Action 58
Segment 30	Focus 1	Action 59
Segment 30	Focus 2	Action 60
Segment 31	Focus 1	Action 61
Segment 31	Focus 2	Action 62
Segment 32	Focus 1	Action 63
Segment 32	Focus 2	Action 64
Segment 33	Focus 1	Action 65
Segment 33	Focus 2	Action 66
Segment 34	Focus 1	Action 67
Segment 34	Focus 2	Action 68
Segment 35	Focus 1	Action 69
Segment 35	Focus 2	Action 70
Segment 36	Focus 1	Action 71
Segment 36	Focus 2	Action 72
Segment 37	Focus 1	Action 73
Segment 37	Focus 2	Action 74
Segment 38	Focus 1	Action 75
Segment 38	Focus 2	Action 76
Segment 39	Focus 1	Action 77
Segment 39	Focus 2	Action 78
Segment 40	Focus 1	Action 79
Segment 40	Focus 2	Action 80
Segment 41	Focus 1	Action 81
Segment 41	Focus 2	Action 82
Segment 42	Focus 1	Action 83
Segment 42	Focus 2	Action 84
Segment 43	Focus 1	Action 85
Segment 43	Focus 2	Action 86
Segment 44	Focus 1	Action 87
Segment 44	Focus 2	Action 88
Segment 45	Focus 1	Action 89
Segment 45	Focus 2	Action 90
Segment 46	Focus 1	Action 91
Segment 46	Focus 2	Action 92
Segment 47	Focus 1	Action 93
Segment 47	Focus 2	Action 94
Segment 48	Focus 1	Action 95
Segment 48	Focus 2	Action 96
Segment 49	Focus 1	Action 97
Segment 49	Focus 2	Action 98
Segment 50	Focus 1	Action 99
Segment 50	Focus 2	Action 100
Segment 51	Focus 1	Action 101
Segment 51	Focus 2	Action 102
Segment 52	Focus 1	Action 103
Segment 52	Focus 2	Action 104
Segment 53	Focus 1	Action 105
Segment 53	Focus 2	Action 106
Segment 54	Focus 1	Action 107
Segment 54	Focus 2	Action 108
Segment 55	Focus 1	Action 109
Segment 55	Focus 2	Action 110
Segment 56	Focus 1	Action 111
Segment 56	Focus 2	Action 112
Segment 57	Focus 1	Action 113
Segment 57	Focus 2	Action 114
Segment 58	Focus 1	Action 115
Segment 58	Focus 2	Action 116
Segment 59	Focus 1	Action 117
Segment 59	Focus 2	Action 118
Segment 60	Focus 1	Action 119
Segment 60	Focus 2	Action 120
Segment 61	Focus 1	Action 121
Segment 61	Focus 2	Action 122
Segment 62	Focus 1	Action 123
Segment 62	Focus 2	Action 124
Segment 63	Focus 1	Action 125
Segment 63	Focus 2	Action 126
Segment 64	Focus 1	Action 127
Segment 64	Focus 2	Action 128
Segment 65	Focus 1	Action 129
Segment 65	Focus 2	Action 130
Segment 66	Focus 1	Action 131
Segment 66	Focus 2	Action 132
Segment 67	Focus 1	Action 133
Segment 67	Focus 2	Action 134
Segment 68	Focus 1	Action 135
Segment 68	Focus 2	Action 136
Segment 69	Focus 1	Action 137
Segment 69	Focus 2	Action 138
Segment 70	Focus 1	Action 139
Segment 70	Focus 2	Action 140
Segment 71	Focus 1	Action 141
Segment 71	Focus 2	Action 142
Segment 72	Focus 1	Action 143
Segment 72	Focus 2	Action 144
Segment 73	Focus 1	Action 145
Segment 73	Focus 2	Action 146
Segment 74	Focus 1	Action 147
Segment 74	Focus 2	Action 148
Segment 75	Focus 1	Action 149
Segment 75	Focus 2	Action 150
Segment 76	Focus 1	Action 151
Segment 76	Focus 2	Action 152
Segment 77	Focus 1	Action 153
Segment 77	Focus 2	Action 154
Segment 78	Focus 1	Action 155
Segment 78	Focus 2	Action 156
Segment 79	Focus 1	Action 157
Segment 79	Focus 2	Action 158
Segment 80	Focus 1	Action 159
Segment 80	Focus 2	Action 160
Segment 81	Focus 1	Action 161
Segment 81	Focus 2	Action 162
Segment 82	Focus 1	Action 163
Segment 82	Focus 2	Action 164
Segment 83	Focus 1	Action 165
Segment 83	Focus 2	Action 166
Segment 84	Focus 1	Action 167
Segment 84	Focus 2	Action 168
Segment 85	Focus 1	Action 169
Segment 85	Focus 2	Action 170
Segment 86	Focus 1	Action 171
Segment 86	Focus 2	Action 172
Segment 87	Focus 1	Action 173
Segment 87	Focus 2	Action 174
Segment 88	Focus 1	Action 175
Segment 88	Focus 2	Action 176
Segment 89	Focus 1	Action 177
Segment 89	Focus 2	Action 178
Segment 90	Focus 1	Action 179
Segment 90	Focus 2	Action 180
Segment 91	Focus 1	Action 181
Segment 91	Focus 2	Action 182
Segment 92	Focus 1	Action 183
Segment 92	Focus 2	Action 184
Segment 93	Focus 1	Action 185
Segment 93	Focus 2	Action 186
Segment 94	Focus 1	Action 187
Segment 94	Focus 2	Action 188
Segment 95	Focus 1	Action 189
Segment 95	Focus 2	Action 190
Segment 96	Focus 1	Action 191
Segment 96	Focus 2	Action 192
Segment 97	Focus 1	Action 193
Segment 97	Focus 2	Action 194
Segment 98	Focus 1	Action 195
Segment 98	Focus 2	Action 196
Segment 99	Focus 1	Action 197
Segment 99	Focus 2	Action 198
Segment 100	Focus 1	Action 199
Segment 100	Focus 2	Action 200
Segment 101	Focus 1	Action 201
Segment 101	Focus 2	Action 202
Segment 102	Focus 1	Action 203
Segment 102	Focus 2	Action 204
Segment 103	Focus 1	Action 205
Segment 103	Focus 2	Action 206
Segment 104	Focus 1	Action 207
Segment 104	Focus 2	Action 208
Segment 105	Focus 1	Action 209
Segment 105	Focus 2	Action 210
Segment 106	Focus 1	Action 211
Segment 106	Focus 2	Action 212
Segment 107	Focus 1	Action 213
Segment 107	Focus 2	Action 214
Segment 108	Focus 1	Action 215
Segment 108	Focus 2	Action 216
Segment 109	Focus 1	Action 217
Segment 109	Focus 2	Action 218
Segment 110	Focus 1	Action 219
Segment 110	Focus 2	Action 220
Segment 111	Focus 1	Action 221
Segment 111	Focus 2	Action 222
Segment 112	Focus 1	Action 223
Segment 112	Focus 2	Action 224
Segment 113	Focus 1	Action 225
Segment 113	Focus 2	Action 226
Segment 114	Focus 1	Action 227
Segment 114	Focus 2	Action 228
Segment 115	Focus 1	Action 229
Segment 115	Focus 2	Action 230
Segment 116	Focus 1	Action 231
Segment 116	Focus 2	Action 232
Segment 117	Focus 1	Action 233
Segment 117	Focus 2	Action 234
Segment 118	Focus 1	Action 235
Segment 118	Focus 2	Action 236
Segment 119	Focus 1	Action 237
Segment 119	Focus 2	Action 238
Segment 120	Focus 1	Action 239
Segment 120	Focus 2	Action 240
Segment 121	Focus 1	Action 241
Segment 121	Focus 2	Action 242
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Segment 175	Focus 2	Action 350
Segment 176	Focus 1	Action 351
Segment 176	Focus 2	Action 352
Segment 177	Focus 1	Action 353
Segment 177	Focus 2	Action 354
Segment 178		

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Data Tracking and Integrity

Opower conducts several [REDACTED] in the treatment and control groups upon program launch, as described in 3.3. Opower notes that they also [REDACTED] on a [REDACTED] as [REDACTED] is obtained from COH. [REDACTED]

[REDACTED] These more frequent checks examine the following:

- Has there [REDACTED]
- Is the [REDACTED] [REDACTED]
- Has the [REDACTED] [REDACTED]
- Are there [REDACTED] [REDACTED]
- Has the [REDACTED] [REDACTED]

In addition, Opower looks at [REDACTED] for natural gas usage and [REDACTED] [REDACTED] These customers [REDACTED] as their historical usage may result in a [REDACTED] These [REDACTED] are appropriate and necessary to ensure that [REDACTED]

ILLUME also performed a review of control and treatment customer data provided by COH. As a part of this review we found [REDACTED] (a mix of control and treatment) with customer names that appeared to be [REDACTED], such as [REDACTED], and the like. COH confirmed that [REDACTED] of these accounts are under a [REDACTED] but the remainder of accounts are under a [REDACTED]. Since the majority of these records are under a [REDACTED] they [REDACTED]. While this is [REDACTED] and the [REDACTED] Opower should [REDACTED] and [REDACTED] found.

Customer Communications

Customers receiving reports may contact the call center operated by NCO with [REDACTED] or to [REDACTED]. Call center representatives are

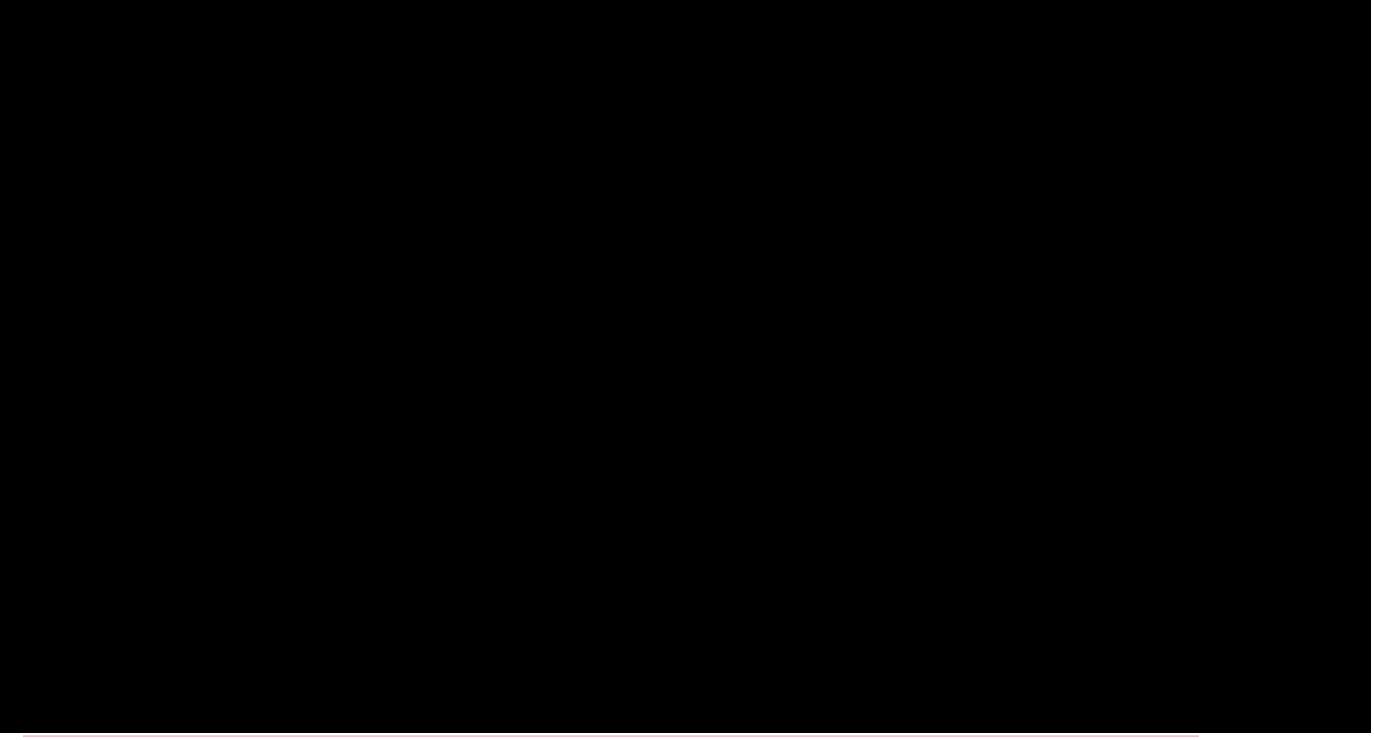
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trained to [REDACTED] and also have [REDACTED]
[REDACTED]

[REDACTED] were obtained from NCO since the beginning of their contract with COH. As shown below, call activity [REDACTED] after the month in which a report is sent. Also not surprisingly, call rates [REDACTED] [REDACTED] during the non-heating season as reports are not sent during these months. [REDACTED] in call activity occurred in [REDACTED] representing the [REDACTED] (an additional [REDACTED])

Call abandonment rates [REDACTED] and did not show a considerable [REDACTED] Call abandonment can happen for a number of reasons, including [REDACTED] the [REDACTED] among other reasons. While there is no clear industry standard for call abandonment rates, NCO should [REDACTED] and [REDACTED] to determine whether [REDACTED]



Reasons for calls are not tracked, but NCO noted anecdotally that they receive the following types of calls:

- [REDACTED]

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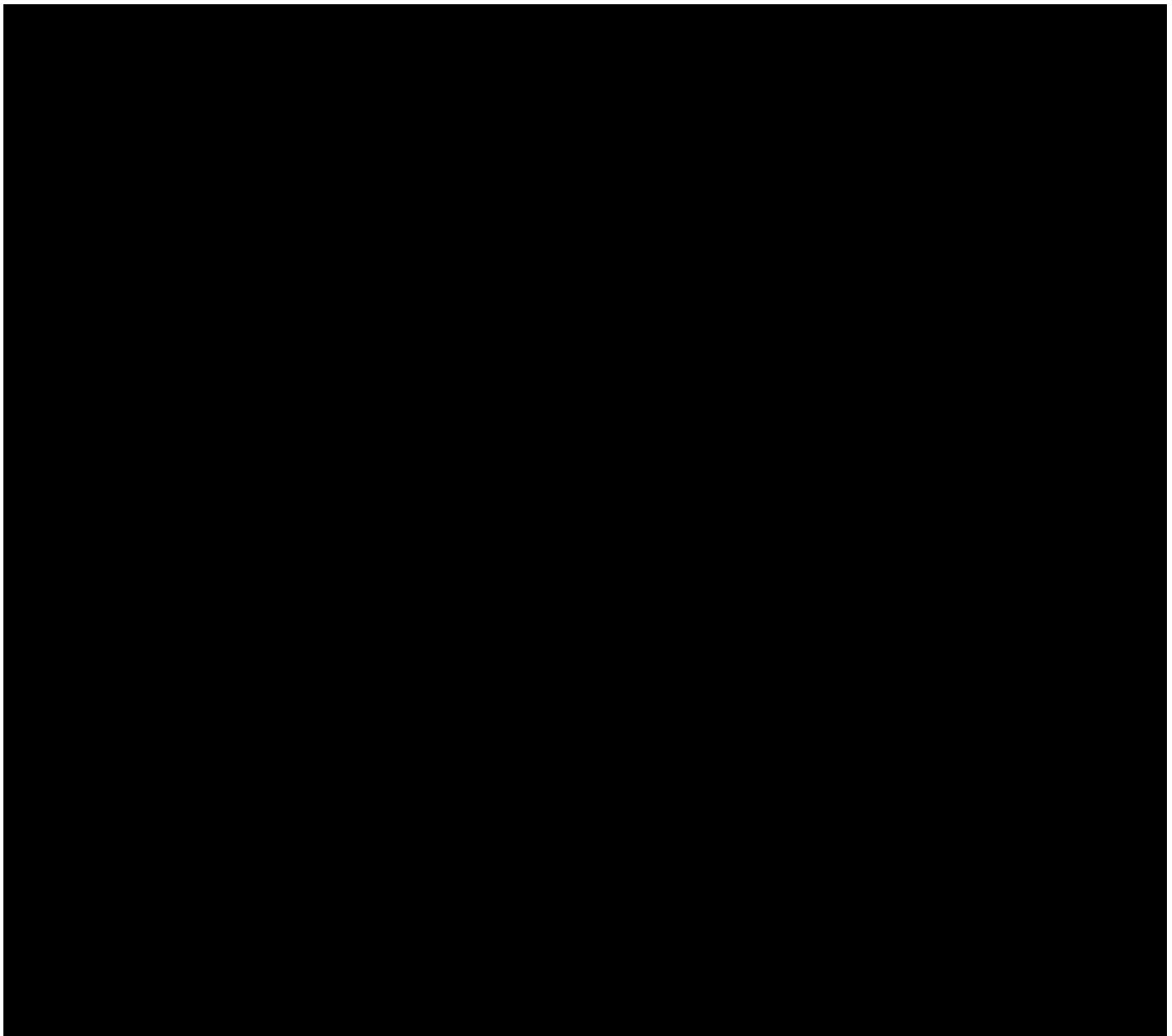
- [REDACTED]
- [REDACTED]

NCO notes that [REDACTED]

[REDACTED] especially the [REDACTED] Additionally, the majority of calls received following the launch of a new wave of treatment customers are from people who want to know [REDACTED]
[REDACTED] or about [REDACTED]

The figure below outlines the different steps taken by NCO Customer Service Representatives (CSR) for common types of customer contacts.

Figure 8: Customer Contacts and Steps Taken



5.2 Customer Satisfaction

Key Findings:

- Nearly [REDACTED] of treatment customers report that they are [REDACTED] with [REDACTED] while [REDACTED] are [REDACTED] and fewer than [REDACTED] are [REDACTED]. Control customers are also [REDACTED]
- Currently, there is [REDACTED] in the [REDACTED] of treatment and control customers, indicating that the program is not [REDACTED]

The majority of both treatment and control customers are [REDACTED] with [REDACTED]. However, [REDACTED] for treatment customers [REDACTED] differ from control customers under the study's sample design. This may partly be due to the fact that the program is [REDACTED] having only [REDACTED]. However, it looks like there may be a trend in that direction, as a [REDACTED] in the treatment group indicated they were [REDACTED] with their natural gas utility.

Table 3: [REDACTED] with [REDACTED]

Category	Treatment Group	Control Group
Customer Satisfaction	[REDACTED]	[REDACTED]
Program Participation	[REDACTED]	[REDACTED]
Energy Usage	[REDACTED]	[REDACTED]
Total	[REDACTED]	[REDACTED]

As the reports continue into the second year and treatment customers learn more about their natural gas usage and how to save energy, future survey efforts should again explore [REDACTED] to [REDACTED] between groups.

5.3 Actions Taken to Save Natural Gas

Key Findings and Recommendations:

- While [REDACTED] percentages of treatment [REDACTED] and control [REDACTED] customers reported that they [REDACTED] treatment [REDACTED] than control [REDACTED] customers' report that they are [REDACTED]
[REDACTED]
- **Recommendation:** Future survey efforts should explore whether [REDACTED] by treatment customers compared to controls came to fruition.
- [REDACTED] treatment customers [REDACTED] than control [REDACTED] reported that they have [REDACTED] since last fall. Other [REDACTED] between treatment and control customers for [REDACTED] at the 90% level.
Recommendation: Similar to the recommendation above, future survey efforts should explore the types of actions taken by treatment and control customers, including the [REDACTED] and the [REDACTED] to see if the reports [REDACTED]
- The [REDACTED] reported reason for [REDACTED] is that customers [REDACTED]
- The top reasons reported for [REDACTED] is that customers [REDACTED]

As a part of our survey efforts, we asked both treatment and control customers to tell us if anyone in their household has [REDACTED] [REDACTED] which coincided with mailing of the first report. We found that roughly half of each group reported that they has [REDACTED], or [REDACTED] of treatment customers and [REDACTED] of control customers.

At this time, it [REDACTED] that treatment customers are [REDACTED] [REDACTED] than control customers based on the survey results. Treatment and control customers report that they are [REDACTED] After [REDACTED] and [REDACTED] were the most frequently

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cited actions. The [REDACTED] found between the two groups was that [REDACTED] treatment customers reported that they had [REDACTED]. Average reported [REDACTED] are also [REDACTED] with [REDACTED] treatment household and [REDACTED] per control household.

To explore the [REDACTED], we also asked if anyone in a customer's household planned to [REDACTED]. [REDACTED] treatment than control customers [REDACTED] with [REDACTED] of treatment of control customers. The top three [REDACTED] treatment and [REDACTED] control), [REDACTED] treatment and [REDACTED] control). These [REDACTED] treatment and [REDACTED] control).

Other [REDACTED] mentioned by more than one person include [REDACTED]

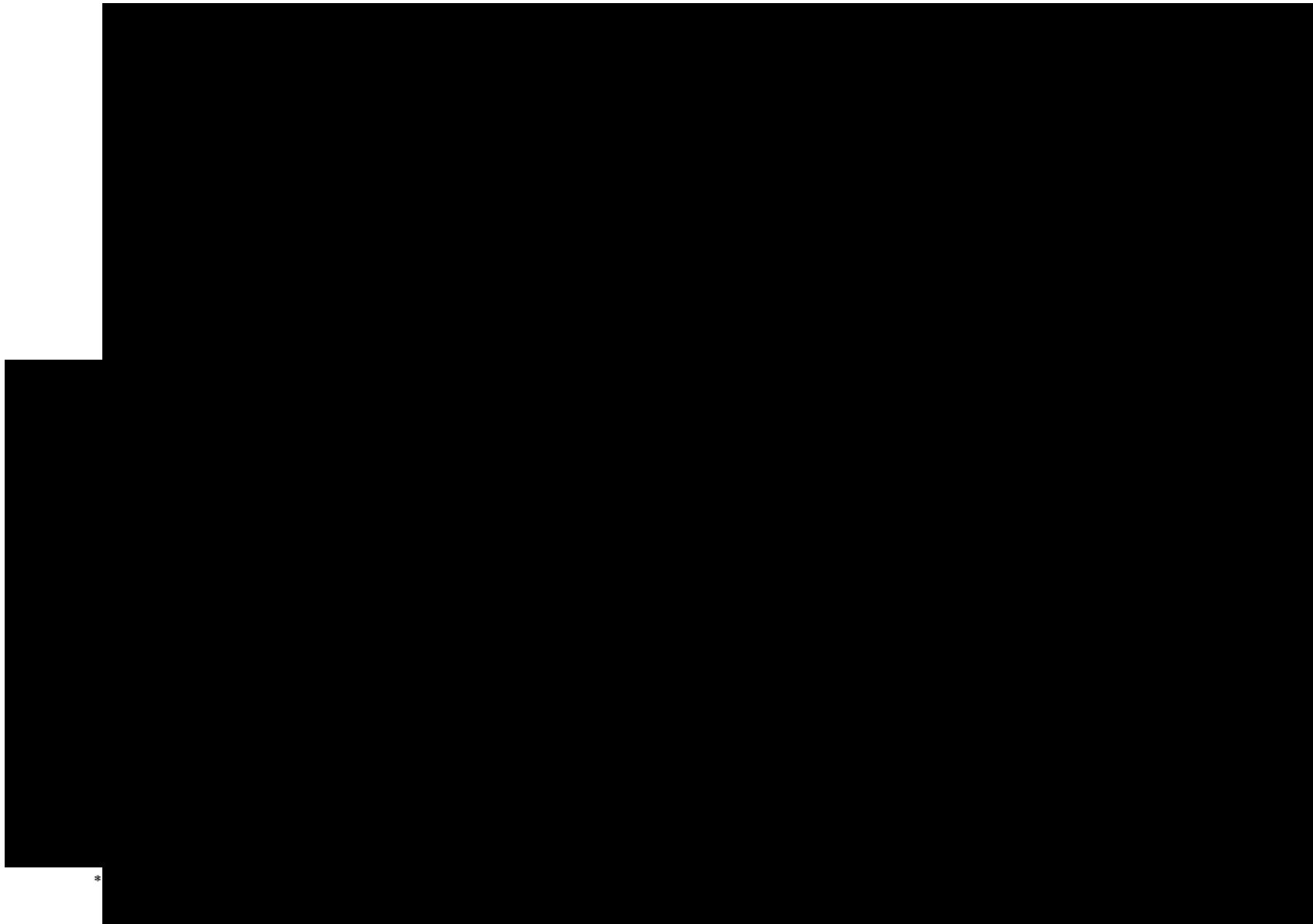
[REDACTED] and [REDACTED] by treatment and control customers.

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EVALUATION RESULTS

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Figure 9: Natural Gas [REDACTED] by Treatment and Control Customers



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Customers who have [REDACTED] and those who are [REDACTED] were then asked if there was a [REDACTED] Most frequently cited reasons for [REDACTED] were that [REDACTED] The top reason for [REDACTED] Among both customers who [REDACTED] and those who are [REDACTED] likely to state that they were [REDACTED] This may be because control customers are [REDACTED]

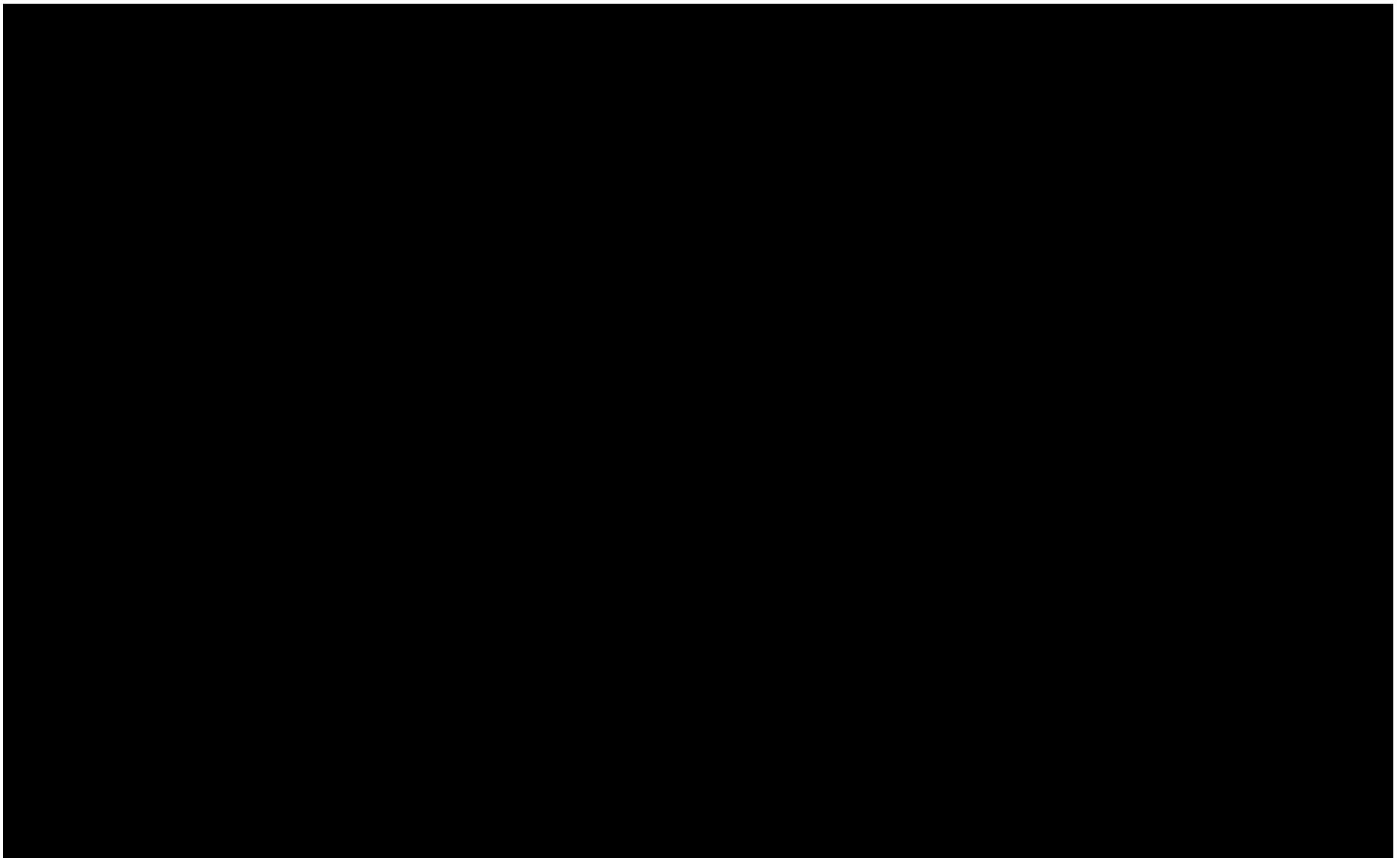
The figure below shows greater detail on the [REDACTED] or [REDACTED]

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Figure 10: [REDACTED] Natural Gas [REDACTED]



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Both treatment and control customers were asked if [REDACTED]

[REDACTED] As shown in the following figure, [REDACTED] for both customer groups. However, it should be noted that the number of respondents to this group of questions is small, therefore the results should be used cautiously. Only a [REDACTED] of treatment, [REDACTED] of control) [REDACTED]

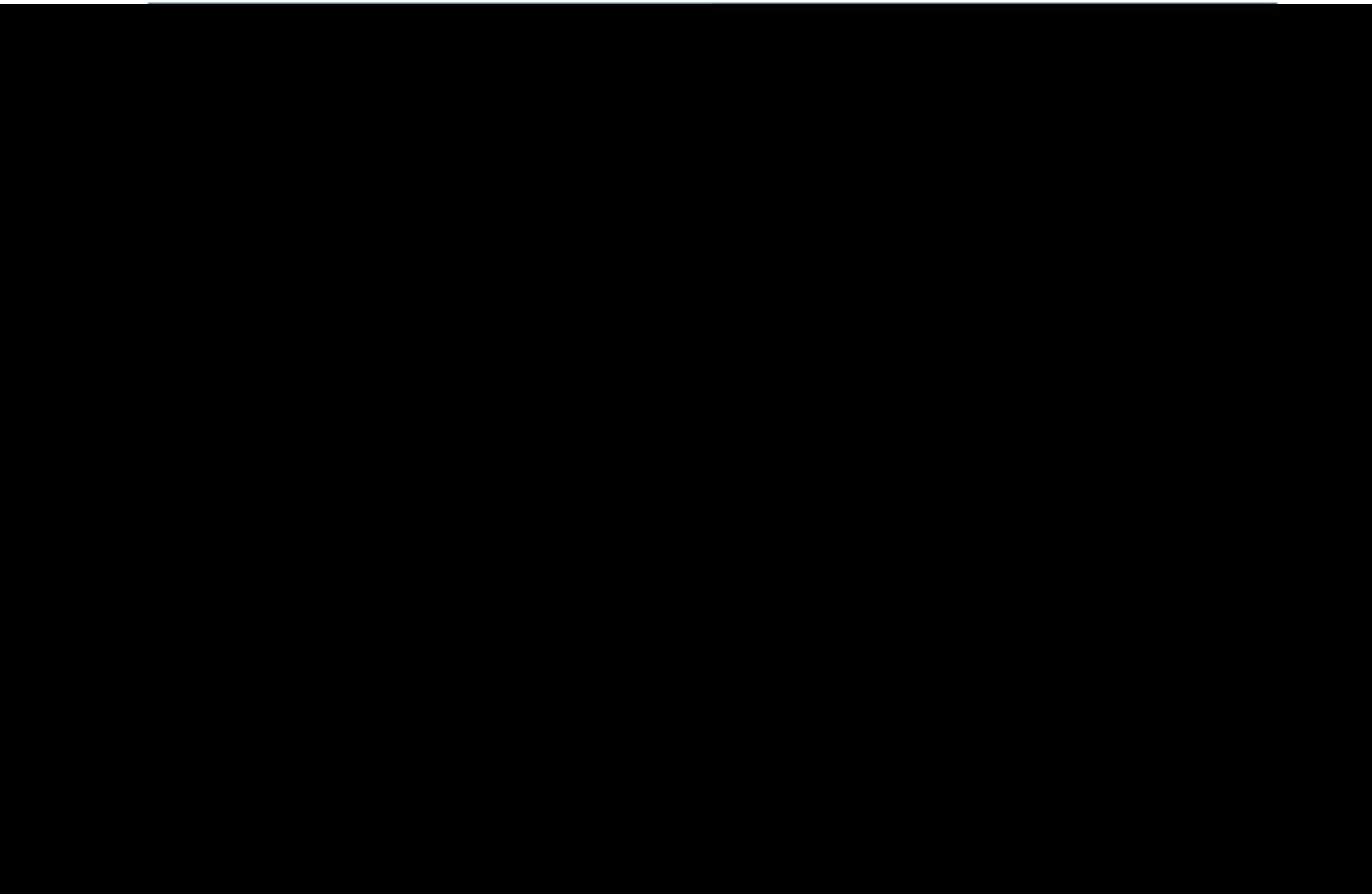
[REDACTED] Interestingly, even though [REDACTED] control customers are [REDACTED] or [REDACTED]

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EVALUATION RESULTS

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Figure 11: COH [REDACTED]



5.4 Customer Engagement with the Home Energy Reports

Key Findings and Recommendations:

- [REDACTED] customers [REDACTED] reported that they [REDACTED] of the customers that [REDACTED]
- The [REDACTED] of customers [REDACTED] feel they have a [REDACTED]
[REDACTED] but [REDACTED] said they [REDACTED]
- **Recommendation:** Consider [REDACTED] Many customers suggested [REDACTED] and [REDACTED] As [REDACTED] customers are [REDACTED] could be provided in the paper reports to provide more insights to customers.
- **Recommendation:** [REDACTED] to ensure that [REDACTED] may not be able to [REDACTED], and [REDACTED]
- **Customers rated the [REDACTED] as the [REDACTED]** (mean score of [REDACTED] out of 5), [REDACTED] (mean score of [REDACTED]) and [REDACTED] (mean score of [REDACTED]). While [REDACTED] of customers consider the report sections [REDACTED] opportunities for improvement remain.
 - **Recommendation:** Include the [REDACTED] in the [REDACTED] section of the report. Despite that information being provided on the [REDACTED] some customers do not think their [REDACTED]
 - **Recommendation:** Indicate in the [REDACTED] that [REDACTED] Customers were [REDACTED] and [REDACTED]
- **Customers are [REDACTED]** [REDACTED] respondents have [REDACTED] or [REDACTED] COH has taken steps to [REDACTED]

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(have [REDACTED]
[REDACTED] which could [REDACTED]

Treatment customers were asked a series of questions to explore their [REDACTED]
[REDACTED] In the sections below we review
specific areas of [REDACTED]

What do customers do with the reports?

As shown in Figure 12, [REDACTED] of treatment customers have [REDACTED]
[REDACTED] and [REDACTED] have [REDACTED] Of the customers who reported
to [REDACTED] the [REDACTED] percentage
of those customers are [REDACTED] but [REDACTED] of those
and [REDACTED]

When customers are [REDACTED] are [REDACTED]
[REDACTED] Customers are [REDACTED] to indicate that they
Roughly [REDACTED]
and [REDACTED]

How do customers [REDACTED]

A [REDACTED] of customers are [REDACTED] indicated they were
or [REDACTED] and [REDACTED] made [REDACTED]

After rating the [REDACTED], customers were asked to rate the [REDACTED]
[REDACTED], as shown in Figure 13. The [REDACTED]
and the [REDACTED] received the [REDACTED] mean usefulness score of [REDACTED]
however the [REDACTED] received [REDACTED] ratings of [REDACTED] or
[REDACTED] When asked how the [REDACTED]
most frequent suggestion.

The feedback on the [REDACTED] varied with some customers
suggesting [REDACTED]
[REDACTED] others suggesting more detail in how to implement the tips. For
example, one customer wanted to [REDACTED]
Another customer wanted [REDACTED]

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The [REDACTED] received the [REDACTED] mean score [REDACTED] and the [REDACTED] or [REDACTED] ratings [REDACTED]. It also received the [REDACTED] suggestions for improvement. Despite the fact that [REDACTED], customers are [REDACTED]. Many believed it was a [REDACTED]. The most frequent suggestions centered on [REDACTED]. Even though the report already does this, several suggestions were made to [REDACTED]. Additionally, customers would like to see the [REDACTED] the [REDACTED] and [REDACTED].

Are customers [REDACTED]

[REDACTED] percent of customers report that they are [REDACTED] but [REDACTED] about [REDACTED] state that they are learning new ways to save natural gas, as shown in Figure 14. While about [REDACTED] (n=[REDACTED]) of these customers that said they did [REDACTED] but [REDACTED] other customers noted that they [REDACTED] the [REDACTED] or [REDACTED] among others.

[REDACTED] respondents have [REDACTED]

One mentioned [REDACTED]

and one [REDACTED]

Are customers [REDACTED]

As shown in Figure 15 and Figure 16, [REDACTED] customers surveyed have [REDACTED]. This is consistent with our review of treatment and control data, which shows [REDACTED] customers have created [REDACTED] customers have [REDACTED] (together, [REDACTED] than [REDACTED] of treatment customers). Columbia Gas notes that they are currently pursuing a way to make the [REDACTED] so that if they [REDACTED]

For the most part, customers have not [REDACTED] because they are [REDACTED] or they [REDACTED] respondents noted [REDACTED]. There is potential to gain

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[REDACTED] with the [REDACTED] of customers that [REDACTED] or [REDACTED]
[REDACTED] and the [REDACTED] that [REDACTED]

Additional opportunities to [REDACTED] through [REDACTED] exist, though
some customer segments do not [REDACTED] and [REDACTED]

[REDACTED] percent of customers [REDACTED]

[REDACTED], while other customers are [REDACTED]

[REDACTED] or [REDACTED]

likely lies with the [REDACTED] that [REDACTED] and the [REDACTED] that [REDACTED]

[REDACTED] In future research efforts, the program may also want to
explore the [REDACTED]

[REDACTED] as some
customers may have [REDACTED] but [REDACTED]

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EVALUATION RESULTS

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Figure 12: Customer [REDACTED]

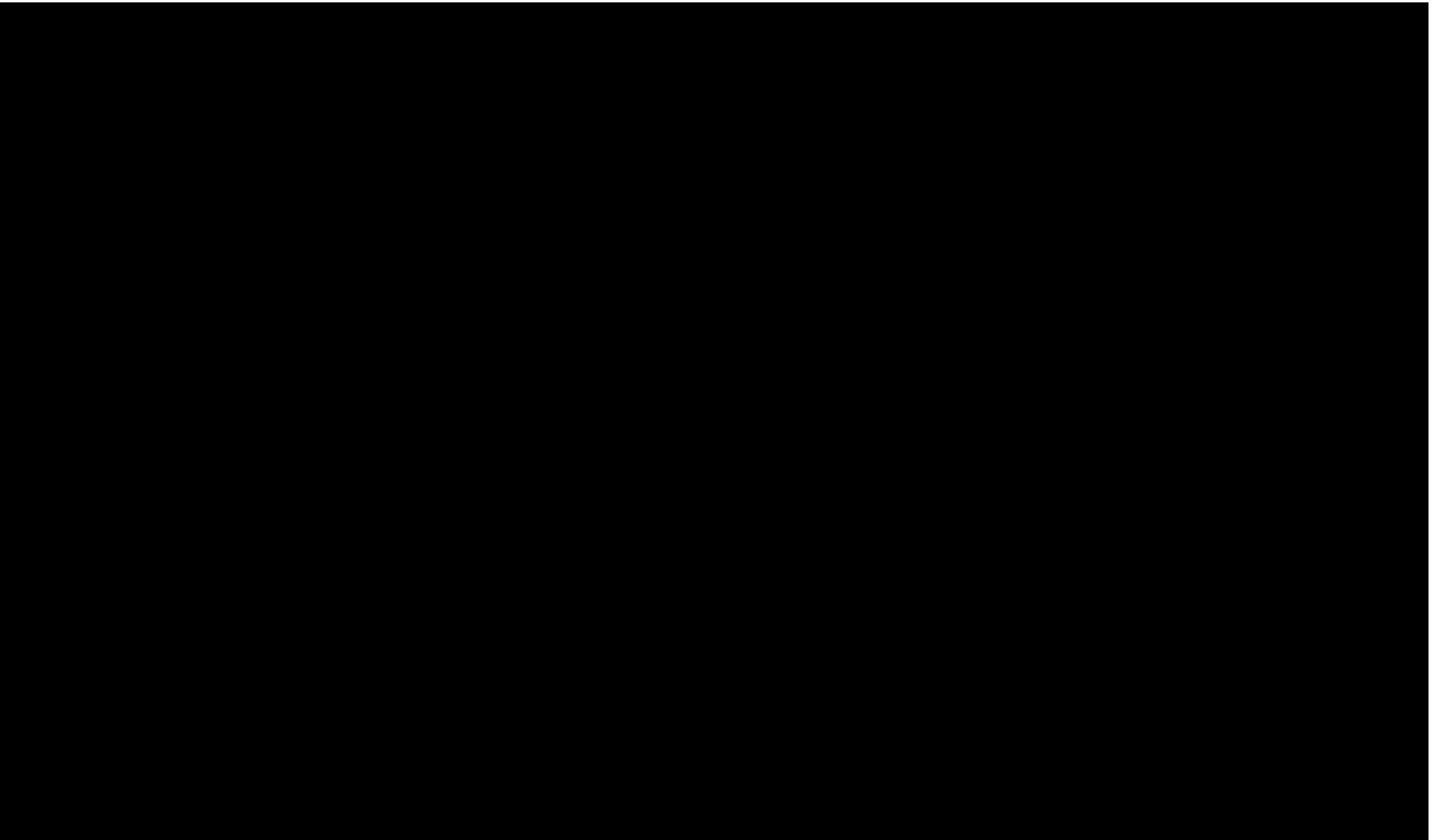


PUBLIC VERSION - REDACTED

EVALUATION RESULTS

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Figure 13: Customer [REDACTED] and [REDACTED]

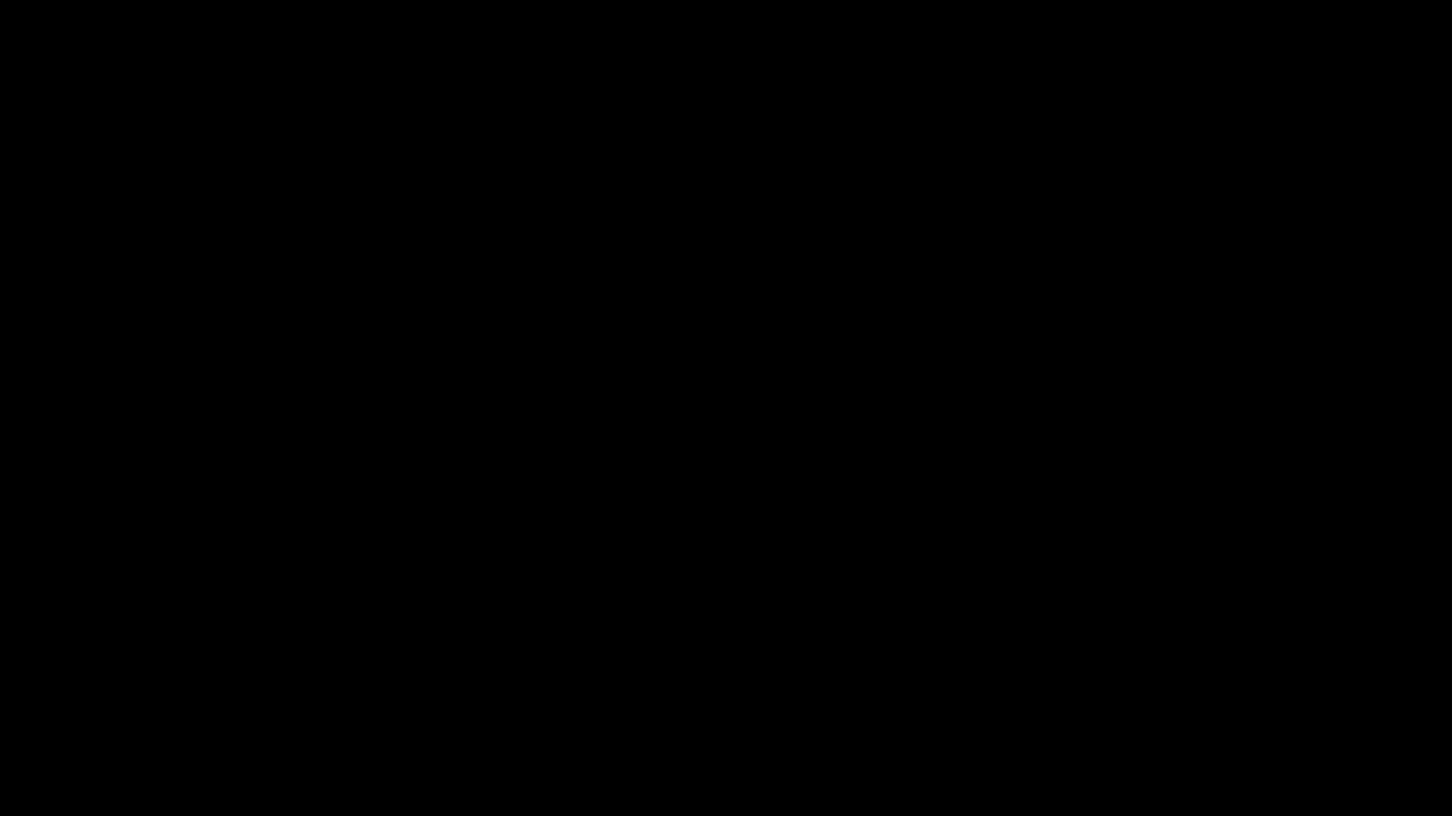


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Figure 14: [REDACTED] Home Energy Report

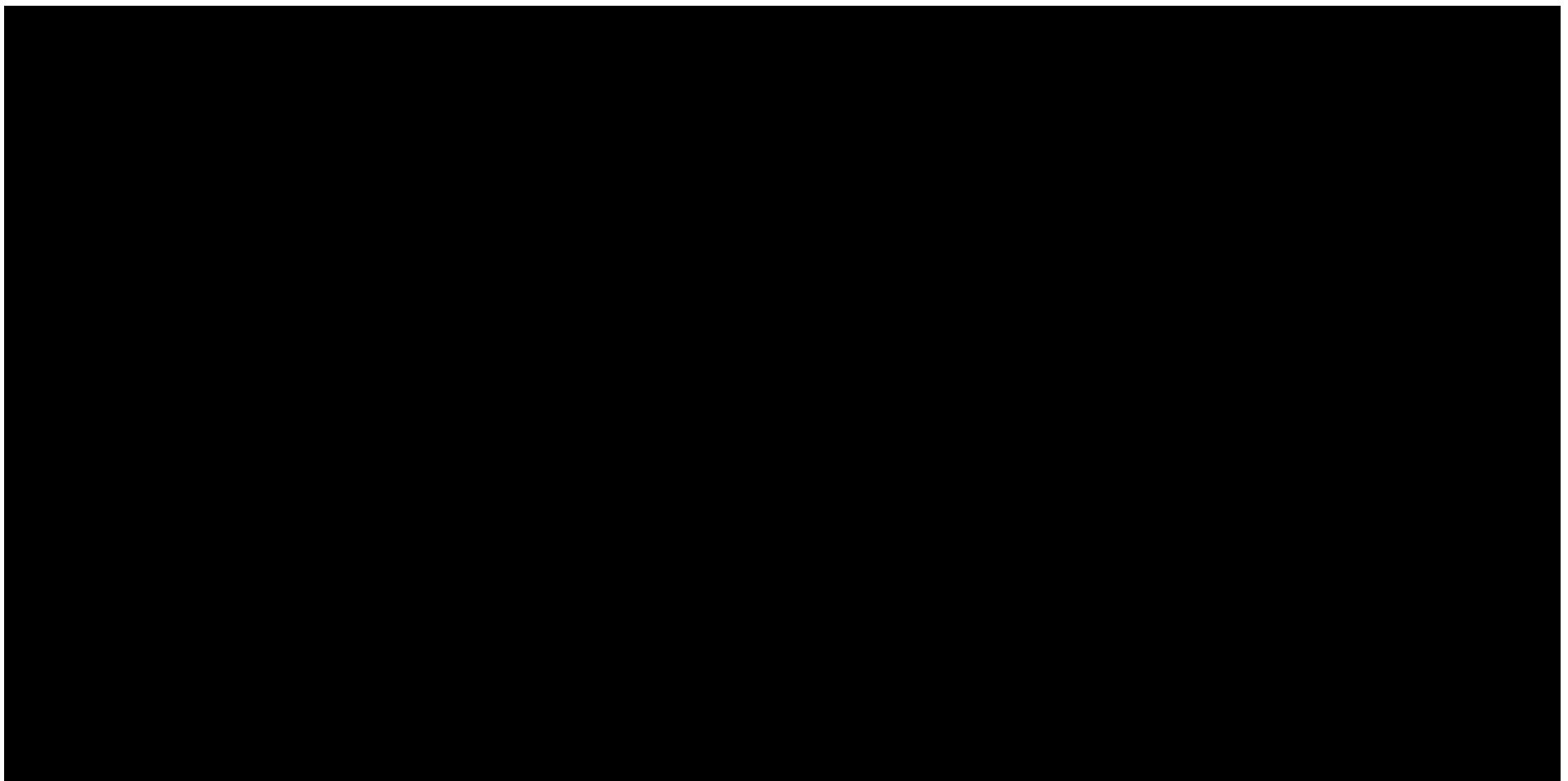


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EVALUATION RESULTS

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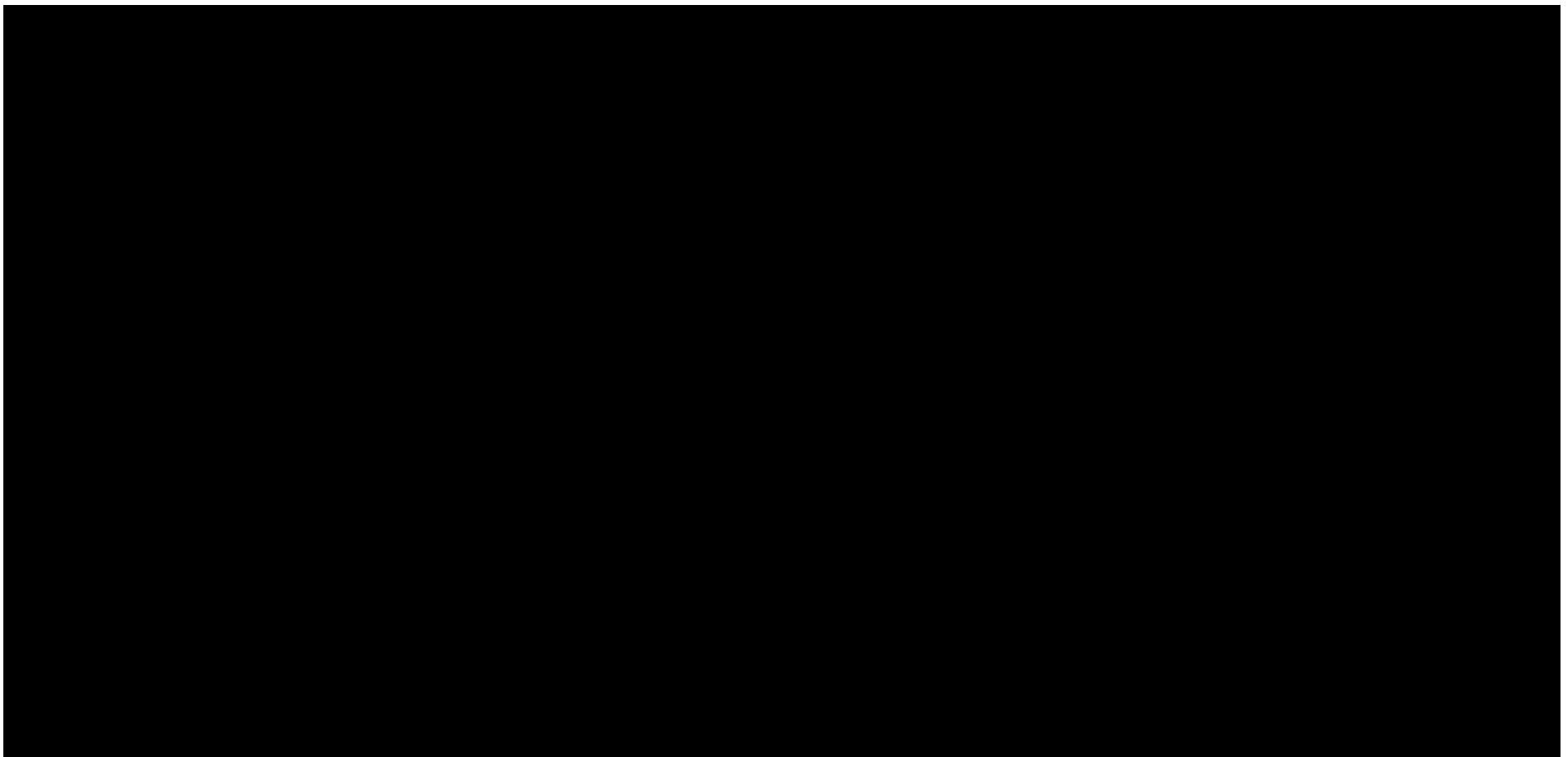
Figure 15: Customer [REDACTED]



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Figure 16: Customer [REDACTED]



6. NON-NATURAL GAS BENEFITS

Key Findings and Recommendations:

- A [REDACTED] was found in the percent of treatment customers versus control customers who [REDACTED]. This resulted in non-natural gas benefits of over [REDACTED] and [REDACTED], in addition to [REDACTED] and [REDACTED]
- [REDACTED] between treatment and control groups were [REDACTED] taken in the last year. For this reason, we [REDACTED]
 - **Recommendation:** Use future survey efforts to [REDACTED]
 - **Recommendation:** Continue to [REDACTED]
 - [REDACTED]

As previously noted, as a part of our survey efforts we asked treatment and control customers what [REDACTED]. Some of these [REDACTED] potentially included [REDACTED] in addition to a [REDACTED]. Additional information on actions taken can be found in Section 5.3. As previously discussed, a [REDACTED] was found in the percent of treatment customers who [REDACTED]. We estimated the net non-gas savings (treatment over control) associated with this measure.

Table 4: Non-Natural Gas Savings from [REDACTED]

Type of Savings	Per Unit Savings	Total Program Savings
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

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I L L U M I N A T E

*See Appendix B for calculation inputs and sources.

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A. TREATMENT AND CONTROL GROUP CUSTOMER SURVEY

ILLUME

Columbia Gas of Ohio Home Energy Report Survey Instrument

FINAL September 19, 2014

This is a telephone survey that will be conducted with [REDACTED] Home Energy Report program participants (treatment group), and [REDACTED] non-participants (control group). The objectives of the survey include the following: to compare overall satisfaction and the natural gas saving actions taken by participants and non-participants, to understand participants' reactions to the Home Energy Report's format and content, to explore the effectiveness of the report's messaging, and identify potential barriers and strengths of the program.

Introduction

Treatment Group Introduction:

Hello, my name is [INTERVIEWER NAME] with the Blackstone Group calling on behalf of Columbia Gas of Ohio. We are conducting a survey of customers who have received a Home Energy Report. This is not a sales call, and responses will be used to inform Columbia Gas about your experience with the report and to evaluate its effectiveness. This interview will only take about 10 to 15 minutes of your time, and it will be recorded for quality assurance purposes.

Columbia Gas sent out Home Energy Reports to households in your area last heating season (2013-2014). These reports are separate from your heating bill, and provide a [REDACTED]

[REDACTED] a [REDACTED], and [REDACTED]

[INTERVIEWER: If customer asks about how their information is kept secure, please use the following response,

"We maintain safeguards to protect survey responses. These include, for example, physical security of our facilities, technical safeguards to protect electronic data, and manager supervision."

First, do you remember receiving at least one of these Home Energy Reports? [IF NO, THANK AND TERMINATE]

Are you the person in your household who is most familiar with the Home Energy Reports?

[CONTINUE WITH THE APPROPRIATE CONTACT PERSON]

Control Group Introduction:

Hello, my name is [INTERVIEWER NAME] with the Blackstone Group calling on behalf of Columbia Gas of Ohio. We are conducting a survey of customers about actions they may have taken or plan to take to save natural gas in their household. This is not a sales call, and responses will be used to help inform Columbia Gas' energy efficiency offerings. This interview will only take about 5 minutes of your time, and it will be recorded for quality assurance purposes.

[INTERVIEWER: If customer asks about how their information is kept secure, please use the following response,

"We maintain safeguards to protect survey responses. These include, for example, physical security of our facilities, technical safeguards to protect electronic data, and manager supervision."

SCREENING QUESTIONS

[BOTH TREATMENT AND CONTROL GROUPS]

I1. Are you currently talking to me on a regular landline phone or a cell phone?

- 1. (Landline phone)
- 2. (Cell Phone)
- 98. (Don't know)
- 99. (Refused)

[ASK IF I1 = 2, 98, 99]

I2. Are you currently somewhere safe and not driving a motorized vehicle?

- 1. (Yes)
- 2. (No) [Schedule call back]
- 98. (Don't know) [Schedule call back]
- 99. (Refused) [Schedule call back]

First, I'd like to ask you a few questions about your household.

I3. Are you, or is anyone in your household, a current or former employee of an electric or gas utility company?

- 1. (Yes) [THANK & TERMINATE]
- 2. (No)
- 98. (Don't know) [THANK & TERMINATE]
- 99. (Refused) [THANK & TERMINATE]

I4. Are you or one of the heads of your household retired?

1. (YES)
2. (NO)
98. (DON'T KNOW)
99. (REFUSED)

Customer Satisfaction

[BOTH TREATMENT AND CONTROL GROUP CUSTOMERS]

S1. On a scale of 1 to 5 where 1 is very dissatisfied and 5 is very satisfied, how satisfied are you with [REDACTED] [RECORD NUMBER 1-5; 98=DON'T KNOW; 99=REFUSED]

Actions

[BOTH TREATMENT AND CONTROL GROUP CUSTOMERS]

Now I have some questions about actions that your household may have taken to [REDACTED] in your home.

B1. Thinking about since LAST fall, has your household [REDACTED]

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

[ASK IF B1=1]

B2. What [REDACTED] [MULTIPLE RESPONSE]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
9. [REDACTED]
10. [REDACTED]
11. [REDACTED]
12. [REDACTED]
13. [REDACTED]
14. [REDACTED]
15. [REDACTED]
16. [REDACTED]
17. [REDACTED]
18. [REDACTED]

I L L U M I N A T E

19. [REDACTED]
00. (Other: Specify)
98. (Don't know)
99. (Refused)

[ASK IF B1=2]

B2a. Was there a reason why [REDACTED] [OPEN END]

B3. Again thinking about **since LAST fall**, has your household [REDACTED]

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

[ASK IF B3=1]

B4. What [REDACTED] did your household [REDACTED] [MULTIPLE RESPONSE]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]

00. (Other: Specify)
98. (Don't know)
99. (Refused)

B5. Now thinking about the **NEXT 12 months starting this fall**, does your [REDACTED]

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

[ASK IF B5=1]

B6. What [REDACTED] does your household [REDACTED] [MULTIPLE RESPONSE]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
9. [REDACTED]
10. [REDACTED]
11. [REDACTED]
12. [REDACTED]
13. [REDACTED]

I L L U M I N A T E

14. [REDACTED]
15. [REDACTED]
16. [REDACTED]
17. [REDACTED]
18. [REDACTED]
19. [REDACTED]

00. (Other: Specify)
98. (Don't know)
99. (Refused)

[ASK IF B5=2]

B6a. Is there a reason why [REDACTED]

[OPEN END]

B7. Thinking again about the **NEXT 12 months starting this fall**, does your household [REDACTED]

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

[ASK IF B7=1]

B8. What does your household [REDACTED] [MULTIPLE RESPONSE]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
00. (Other: Specify)
98. (Don't know)
99. (Refused)

Reader Engagement

[TREATMENT GROUP ONLY]

Next I have a few questions about how you [REDACTED]

R1. About [REDACTED]
Would you say....

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
98. (Don't know)
99. (Refused)

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I L L U M I N A T E

[ASK IF R1=3]

R1a. Why did you [REDACTED] [OPEN END, THEN SKIP TO SECTION 8,
HOUSEHOLD DEMOGRAPHICS]

R2. When [REDACTED] what did you [REDACTED] Did you...
[MULTIPLE RESPONSE]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]

00. (Other, specify: _____)

98. (Don't know)

99. (Refused)

R3. In thinking about the last report that you received, [REDACTED]

[REDACTED] [MULTIPLE RESPONSE]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]

00. (Other: Specify: _____)

98. (Don't know)

99. (Refused)

Report Content & Usefulness

[TREATMENT GROUP ONLY]

Now I'd like to ask your opinion about some of the [REDACTED]

C1. The reports [REDACTED]

[REDACTED] On a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how would you rate the [REDACTED] [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

C2. How could the [REDACTED] [OPEN END, 98=Don't know, 99=Refused]

C3. The reports also [REDACTED]

[REDACTED] On a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how would you rate the [REDACTED] [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

C4. How could this [REDACTED]

[OPEN END, 98=Don't know, 99=Refused]

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C5. [REDACTED] were also provided in the Home Energy Report. Again on a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how would you rate the [REDACTED] [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

C6. How could the [REDACTED] [OPEN END, 98=Don't know, 99=Refused]

C7. How satisfied are you with the [REDACTED]? Please use a scale of 1 to 5, where 1 is not at all satisfied and 5 is very satisfied. [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

C8. Are there [REDACTED] [OPEN END, 98=Don't know, 99=Refused]

C9. After receiving the Home Energy Report, do you [REDACTED]

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

C10. After reviewing the Home Energy Report, did you [REDACTED]

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

[ASK IF C10=1]

C11. What did you [REDACTED]

- 1. [REDACTED]
 - 2. [REDACTED]
 - 3. [REDACTED]
 - 4. [REDACTED]
 - 5. [REDACTED]
 - 6. [REDACTED]
 - 8. [REDACTED]
 - 9. [REDACTED]
 - 10. [REDACTED]
 - 11. [REDACTED]
00. (Other: Specify: _____)
- 98. (Don't know)
 - 99. (Refused)

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Website and Email reports

[TREATMENT GROUP CUSTOMERS ONLY]

Now I have a few questions about actions you may have taken after reviewing the report.

W1. Have you [REDACTED]
[REDACTED]

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

[ASK IF W1=2]

W2. Why haven't you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
00. (Other, Specify: _____)
98. (Don't know)
99. (Refused)

[ASK IF W1=1]

W3. How [REDACTED] Have you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
00. (Other, Specify: _____)
98. (Don't know)
99. (Refused)

[ASK IF W1=1]

W4. How do you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
00. (Other, Specify: _____)
98. (Don't know)
99. (Refused)

[ASK IF W1=1]

W5. On a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how useful do you find [REDACTED] [RECORD NUMBER 1-5, 98=DON'T KNOW, 99=REFUSED]

[ASK IF W1=1]

W6. Is there any way the [REDACTED] [OPEN END, 98=DON'T KNOW, 99=REFUSED]

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W7. Have you [REDACTED]

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

[ASK IF W7=2]

W8. Why haven't you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
00. (Other, Specify: _____)
98. (Don't know)
99. (Refused)

[ASK IF W7=1]

W9. On a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how useful do you find [REDACTED] [RECORD NUMBER 1-5, 98=DON'T KNOW, 99=REFUSED]

[ASK IF W7=1]

W10. Is there any way the [REDACTED] [OPEN END, 98=DON'T KNOW, 99=REFUSED]

W11. Since receiving the Home Energy Reports, [REDACTED]

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

[ASK IF W11=1]

W12. What [REDACTED] [MULTIPLE RESPONSE]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
6. (Other: specify _____)
98. (Don't know)
99. (Refused)

Household Demographics

[BOTH TREATMENT AND CONTROL GROUP CUSTOMERS]

Columbia Gas of Ohio Home Energy Reports

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We are almost done; I just have a few final questions.

D1. Do you rent or own your home?

- 1. (RENT)
- 2. (OWN)
- 00. (OTHER, SPECIFY: _____)
- 98. (DON'T KNOW)
- 99. (REFUSED)

D2. Which of the following best describes your home?

- 1. A mobile home
- 2. A single-family detached residence
- 3. A single-family attached residence (for example, a townhouse)
- 4. An apartment or condominium in a building with 2-4 units
- 5. An apartment or condominium in a building with 5 or more units
- 00. (Other – Please specify: _____)
- 98. (Don't know)
- 99. (Refused)

D3. What is the approximate square footage of your home?

- 1. [NUMERIC OPEN END]
- 98. (Don't know)
- 99. (Refused)

D4. When was your home built?

- 1. Before 1900
- 2. 1900 to 1939
- 3. 1940 to 1959
- 4. 1960 to 1979
- 5. 1980 to 1989
- 6. 1990 to 1999
- 7. 2000 to 2004
- 8. 2005 or later
- 98. (Don't know)
- 99. (Refused)

D5. Including yourself, how many people live in your household full time (full-time year-round)?

- 1. (1)
- 2. (2)
- 3. (3)
- 4. (4)
- 5. (5)
- 6. (6)
- 7. (7)
- 8. (8)
- 9. (9)

I L L U M E

- 10. (9 OR MORE)
- 98. (DON'T KNOW)
- 99. (REFUSED)

D6. Which of the following categories best represents your total annual household income before taxes? Please tell me when I get to your range.

- 1. Up to \$50,000
- 2. Over \$50,000

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

D7. What is your age?

- 1. (24 YRS OR YOUNGER)
- 2. (25 TO 44 YRS)
- 3. (45 TO 64 YRS)
- 4. (65 YEARS AND OVER)
- 98. (DON'T KNOW)
- 99. (REFUSED)

Thank you and Closing

Those are all the questions I have for you today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation in this survey.

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B. NON-GAS SAVINGS CALCULATIONS

Category	Measure Type	Value
Left Cluster	1	10
	2	10
	3	10
	4	10
	5	10
	6	10
	7	10
	8	10
	9	10
	10	10
Right Cluster	1	10
	2	10
	3	10
	4	10
	5	10
	6	10
	7	10
	8	10
	9	10
	10	10

*Per unit savings multiplied by net number of measures (8)

**Total saved divided by [REDACTED] which is the number of treatment customers surveyed

***Per household savings multiplied by the number of treatment households (114,353)

Notes

- 1) [REDACTED]
2) [REDACTED]
3) [REDACTED]
4) [REDACTED]

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I L L U M E

Impact Evaluation of Columbia Gas of Ohio's Home Performance Solutions Program

Final Report

June 18, 2014

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Executive Summary

This report to Columbia Gas of Ohio’s (“Columbia”) Demand Side Management (“DSM”) team provides impact evaluation results of the company’s Home Performance Solutions (“HPS”) program.

Home Performance Solutions is an energy efficiency program offered to all Columbia residential natural gas heating customers. The program provides diagnostic energy audits and offers rebates for specific energy efficiency improvements including attic and wall insulation, air sealing, and high efficiency heating systems¹. The rebates [REDACTED]

[REDACTED] insulation, [REDACTED] air sealing work, and per heating system replaced and bonus rebates were offered [REDACTED] for various promotional purposes.

Customers with incomes at or below 80% of median income but greater than 150% of the Federal Poverty Guidelines (“FPG”) (which is the threshold that qualifies for the WarmChoice® low income program) were offered much larger rebates. The purpose of HPS is to help Columbia’s customers manage their natural gas usage and save on utility bills. Conservation Services Group (“CSG”) is Columbia’s implementation contractor for HPS and performs the energy audits and oversees the work performed by the various insulation, air sealing, and HVAC contractors who installed the energy efficiency improvements/measures.

This report assesses the energy savings achieved by HPS based on an analysis of customer natural gas usage from before and after program participation for customers who had energy efficiency improvements installed in 2011 and the first quarter of 2012. Variations in natural gas usage due to weather and other non-program factors were addressed in the analysis by employing weather normalization and by analyzing changes in natural gas usage over the same period for a comparison group composed of non-participating customers and also for a comparison group of later participating customers. The comparison groups were [REDACTED] to [REDACTED]. The evaluation also included an assessment of natural gas savings for different groups of customers and a statistical analysis to estimate natural gas savings by major program measure and to explore other factors that may be related to program impacts.

¹ Additional information on the program design may be found in Columbia’s DSM Action Plan.

A key objective of the impact evaluation is to assess how the natural gas savings impacts found from the billing analysis compare to program design projections and engineering estimates of savings and to identify areas that may need improvement. An earlier impact evaluation² that assessed savings for work completed at the start of the program (through 2010) found average annual net savings of [REDACTED] ccf per participant – [REDACTED] ccf for customer who just received an energy audit and minor measures installed during that visit and [REDACTED] ccf for customers who received major retrofits such as attic and wall insulation. These savings equaled [REDACTED] % of the projected savings from the original DSM Action plan and [REDACTED] % of the savings based on calculations using the Public Utilities Commission of Ohio (“PUCO”) draft Technical Reference Manual (“TRM”)³. The previous evaluation indicated that natural gas savings from [REDACTED]
[REDACTED] – appeared to be [REDACTED] and that [REDACTED]
[REDACTED]. Columbia quickly responded to those findings and [REDACTED]
[REDACTED]
[REDACTED] Columbia worked with CSG to address these problems through a combination of [REDACTED]
[REDACTED]. These changes occurred during the first half of 2012. The timing of the prior evaluation and Columbia’s response indicates that most of the work covered in this current evaluation was completed before the program improvements were made.

Results

Overall, [REDACTED] Columbia customers participated in HPS and had work completed in 2011⁴ – [REDACTED] participants projected in the original DSM plan. Major program measures such as insulation and heating system replacements were completed for [REDACTED] % of these participants (as of April 2013) – exceeding the projection of [REDACTED] % in the plan.

The natural gas savings analysis used data about participants from CSG’s program tracking system and customer natural gas usage from monthly billing data provided by Columbia.

² “Impact Evaluation of Columbia Gas of Ohio’s Home Performance Solutions and Simple Energy Solutions Programs,” M. Blasnik & Associates, July, 2012.

³ “State of Ohio Energy Efficiency Technical Reference Manual”, prepared by Vermont Energy Investment Corporation for the Public Utilities Commission of Ohio, August 6, 2010.

⁴ The [REDACTED] participants is the total number where the retrofits were completed in 2011. This total includes some customers that had audits performed in 2010 but the work wasn’t completed until 2011. Similarly, the total does not include customers that received an audit in 2011 if they had work completed in 2012 or later.

Table 1 summarizes the average natural gas usage and savings for HPS participants from the billing data analysis and also shows the projections based on the TRM.

Table 1. Summary of Natural Gas Usage and Savings: average ccf/yr per participant

	# Homes	Pre-Retrofit Natural Gas Usage	Natural Gas Savings		Projected Savings TRM
			Gross	Net	
All Participants					
- Major Program Measures					
- No Major Program Measures					

Notes: Major program measures include attic insulation, wall insulation, air sealing, and heating system replacement. Net savings were calculated by subtracting the average savings found in the comparison group and [REDACTED]. Statistical uncertainty is shown by [REDACTED] confidence intervals.

HPS produced average annual net natural gas savings of [REDACTED] ccf, equal to about [REDACTED] % of pre-program natural gas usage. Savings averaged [REDACTED] % of natural gas usage for participants who completed one or more major program measures (insulation, air sealing, or heating system replacements) and averaged [REDACTED] % for those who just had an energy audit visit and minor measures installed during the energy audit (e.g., programmable thermostat or energy efficient showerheads). Natural gas savings averaged [REDACTED] % of usage for participants who installed attic and wall insulation, received air sealing, and replaced their heating system.

The average natural gas savings are [REDACTED] similar programs, but [REDACTED]. The analysis concluded that the [REDACTED] – the projected savings based on the Ohio TRM [REDACTED] about existing insulation and efficiency levels, and the actual savings were [REDACTED]. The prior impact evaluation [REDACTED] in savings which [REDACTED] [REDACTED] – after most of the cases in this analysis were treated. An analysis of savings compared to TRM projections by contractor and by auditor [REDACTED]

Program cost-effectiveness was assessed using the Total Resource Cost (TRC) test and the Utility Cost Test (UCT) using assumptions about natural gas costs and other financial factors from the DSM Action Plan as filed. The TRC benefit/cost ratio was [REDACTED] – indicating that program [REDACTED]. The UCT [REDACTED]. The

TRC and UCT results [REDACTED] "Assisted" customer component of the program which provided large rebates in 2011. The Assisted program included [REDACTED] % of all participants and [REDACTED] % of all rebates. The program measures themselves were cost-effective, with benefit/cost ratios of [REDACTED] (TRC) and [REDACTED] (UCT) implying that a program based on the current measures at current performance levels [REDACTED]
[REDACTED]
[REDACTED]. If the analysis [REDACTED] natural gas cost projections [REDACTED]
[REDACTED], but if the assumed discount rate used to value future savings [REDACTED]

Conclusions and Recommendations

The 2011 Home Performance Solutions program provided [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED].

The following recommendations should be considered based on the findings:

1. [REDACTED]
[REDACTED]
[REDACTED]
2. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
3. [REDACTED]
[REDACTED]
4. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Methodology

The natural gas savings achieved by HPS was evaluated using a pre/post analysis of weather adjusted natural gas usage for participants and for two matched comparison groups. Program savings were calculated as the change in weather normalized natural gas usage for the participants minus the change found for the comparison group.

The Comparison Groups

The weather normalization process described later in this section adjusts customer natural gas usage for differences in heating degree days between the billing analysis period and average annual weather. But natural gas usage varies from year to year due to other factors such as:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

Some of these factors may “even out” when averaging results across a large group of customers, but some factors may reflect systematic trends that could bias the evaluation results. The role of the comparison group is to reflect the impact these other factors may have had on the natural gas usage of the participants in the absence of the program. The evaluation design included two comparison groups – one composed of customers that [REDACTED] and one composed of a [REDACTED]

[REDACTED] In each comparison group, cases were [REDACTED] [REDACTED] have the advantage that they are also customers who [REDACTED] – [REDACTED] [REDACTED]. Using [REDACTED] as a comparison group [REDACTED] until more than 12 months after the participants [REDACTED]. In addition, if the decision to participate in HPS was associated with [REDACTED]

[REDACTED] The

[REDACTED] comparison group has the advantage of providing a very large sample and allowing impact evaluation to occur more quickly – potentially less than 12 months after treatment. The evaluation also examined the consistency of savings estimates using [REDACTED]
[REDACTED].

Data Collection

The primary data sources for the analysis were extracts from the program tracking system and monthly customer natural gas usage data. The HPS tracking system data provided by CSG was composed of a series of related data tables. The tracking system included data on:

Columbia provided the monthly natural gas usage data

This dataset allowed for the selection of a large comparison group.

Data Preparation

The first step in the weather normalization process was to prepare the natural gas usage data provided by Columbia. This process involved the following steps:

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The resulting dataset included natural gas usage data for about 1.1 million premises including about 7,400 participants and about 7,500 customers in the later-participant comparison group.

Weather Normalization

The weather normalization analysis employed a variable-base heating degree day [REDACTED]⁵ model. The model fits usage per day as a function of heating degree days per day for each billing period and weights each period based on the number of days elapsed. The heating degree day base temperature was statistically estimated for each customer and period using a modified version of the [REDACTED] algorithms⁶. This analysis was performed separately for the [REDACTED]. Weather normalization results were classified as reliable if they met the following criteria:

⁶The selection of the heating degree day balance point temperature was not simply the temperature that provided the

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

This screening process ended up eliminating about [REDACTED] % of participants and [REDACTED] % of the [REDACTED] comparison group. Most attrition was caused by having [REDACTED].

The cases that passed the weather normalization reliability criteria were further screened to [REDACTED]. This screening involved removing some customers with pre-program usage that [REDACTED] [REDACTED] (defined as annual usage less than [REDACTED] ccf for heating or less than [REDACTED] ccf total). This screen removed less than [REDACTED] % of participants. Cases from the [REDACTED] comparison group were then screened out if their pre-program natural gas usage was [REDACTED]. Overall, [REDACTED] % of the [REDACTED] comparison cases were screened out due to [REDACTED].

[REDACTED]
[REDACTED] [REDACTED]. This screening resulted in defining outliers as having savings [REDACTED]
[REDACTED]
[REDACTED] Overall, [REDACTED] % of participants, [REDACTED] % of the [REDACTED] comparison group, and [REDACTED] % of the [REDACTED] comparison group were classified as [REDACTED]. The exclusion of these cases had a trivial impact on the net savings [REDACTED]

Potential Biases

The evaluation was designed to reduce sources of bias, but no observational study based on voluntary participation can control for all potential biases. Three main sources of potential bias include:

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1. [REDACTED]
2. [REDACTED]
3. [REDACTED]

Term	Percentage (%)
Climate change	95
Global warming	92
Green energy	98
Sustainable development	99
Environmental protection	97
Recycling	98
Organic food	99

In this evaluation, the overall effect of the potential biases appears more likely to lead to an underestimation of the true program impacts than an overestimation, although more specific research and evaluation activities could be pursued at additional cost to better quantify these types of impacts.

Home Performance Solutions Impacts

Home Performance Solutions is an energy efficiency program offered to all Columbia residential natural gas heating customers that provides diagnostic energy audits and offers rebates for specific energy efficiency improvements including attic and wall insulation, air sealing, and high efficiency furnaces (hereafter referred to as “major program measures”). The program primarily targets [REDACTED].

Program Participation

The original Columbia DSM plan covered program operations from 2009 through 2011. HPS began work in late 2009 and ramped up program operations throughout 2010. Program procedures and incentive levels continued to evolve over time.

Table 2 summarizes HPS participation and major program measures for participants completed in 2011 (including work started in 2010) and also for the target population of the evaluation analysis which was defined as participants with all work performed from January 2011 through March 2012 (i.e., excluding 2011 completions that were started in 2010, but including Q1 2012 participants if all work were completed by March 31, 2012).

Table 2. HPS Participation: 2011 completions and analysis population (all work performed Jan11-Mar12)

	DSM Action Plan	Actual 2011 completions	Analysis Population
All Participants			
-Energy Audit Only (may include showerhead, thermostat)			
-Energy Audit w/ Major program measures			
Conversion rate: % of jobs with major program measures			
Measure Installations			
Wall Insulation			
Attic Insulation			
Air Sealing			
Heating System Replacement			
Thermostat			
Showerhead			
Assisted Home Performance: #			
% Assisted			

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The program had nearly [REDACTED] the planned participation rate in 2011 – [REDACTED] customer had an energy audit or had and energy audit and major program measures completed in 2011 compared to the [REDACTED] participants originally planned. The overall conversion rate of [REDACTED] % [REDACTED] % rate in the original DSM Action Plan. Measure installation rates were [REDACTED] but were [REDACTED]. The original program design expected [REDACTED] participation but several factors, including [REDACTED] [REDACTED] [REDACTED] were not actually expected to be a large source of net program savings (due to [REDACTED]) but instead [REDACTED] [REDACTED].

Instead of relying on [REDACTED], the program design [REDACTED] participation. In addition, in 2011 there was special additional funding that became available through an unrelated regulatory settlement that led to a significant boost in rebate levels that included successful campaigns such as providing a “kicker” rebate for customers who acted quickly in moving forward with the installation of energy efficiency measures.

Assisted Home Performance Solutions

HPS includes a special effort to encourage participation from customers with low or moderate incomes referred to as “Assisted” Home Performance Solutions. These customers have incomes that are [REDACTED] [REDACTED] [REDACTED]. This same demographic may live in [REDACTED] [REDACTED]. Assisted customers receive larger rebates and special marketing efforts are made to encourage participation.

Assisted participants accounted for [REDACTED] % of all HPS participants who participated in the program in 2011. This [REDACTED] was due to a combination of factors, including [REDACTED] [REDACTED]

One special initiative in 2011 was to identify small cities with demographics consistent with the Assisted program guidelines and automatically pre-qualify the entire city as eligible for the Assisted Home Performance Solutions program. The cities of [REDACTED] were selected for that effort. The approach was designed to reduce barriers to participation [REDACTED]

[REDACTED] while also taking advantage of the potential [REDACTED]
[REDACTED] This effort proved to be successful. The pilot cities were responsible for more than [REDACTED] Assisted participant completions in 2011 (more than [REDACTED] of the Assisted total) and more than [REDACTED] completion in 2012 (nearly [REDACTED] of the total).

The billing analysis focused on the [REDACTED] HPS participants where work was started by January 1, 2011 and completed by March 31, 2012. The weather normalization results passed the reliability screening criteria for [REDACTED] of these participants [REDACTED].

Natural Gas Savings

Table 3 summarizes the billing data analysis results and [REDACTED]
[REDACTED] – insulation, air sealing, or heating system replacement -- and for homes that [REDACTED] (which may include [REDACTED]
[REDACTED]

Table 3. Home Performance Solutions Natural Gas Savings Results (ccf/yr)

	Homes	Natural Gas Usage		Natural Gas Savings			Projected Savings	
		Pre	Post	Gross	Net	%	Plan	TRM
Participants - All	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Comparison Groups								
Later Part - Raw								
Later Part- Matched								
Random - Raw								
Random - Matched								

Notes: Net savings are calculated using the later-participant matched comparison group. Matching was [REDACTED]
[REDACTED]

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Table 3 shows that HPS participants' annual natural gas usage [REDACTED] by an average of [REDACTED] ccf while the [REDACTED] comparison groups' natural gas usage [REDACTED] ccf, yielding net program savings of [REDACTED] ccf.

Savings averaged [REDACTED] ccf [REDACTED] for participants who [REDACTED] and [REDACTED] ccf [REDACTED] for those who [REDACTED]. The savings for participants who received [REDACTED] are substantial, but are about [REDACTED] [REDACTED] in the original DSM Action Plan and [REDACTED] calculated based on the Ohio TRM.

The [REDACTED] in weather normalized natural gas usage for both comparison groups (and each raw and weighted) is a [REDACTED]. But the consistency of this estimate across the two different groups lends support to its reliability. This [REDACTED] [REDACTED] may be due in part to [REDACTED] [REDACTED] and perhaps also due to customer response to the [REDACTED]

[REDACTED] The reliability of the comparison adjustment was also confirmed using alternate approaches⁸ for the timing of pre and post periods and finding similar net results.

The matching/weighting procedure [REDACTED] – implying that any [REDACTED] and pre-retrofit natural gas usage differences [REDACTED]. The similarity of results for the two comparison groups [REDACTED]
[REDACTED]
[REDACTED]. This finding supports the alternate approach of using the [REDACTED] comparison group and should allow for quicker impact evaluation results in the future.

The net savings of [REDACTED] ccf overall and [REDACTED] ccf for the [REDACTED] are similar to the [REDACTED] ccf overall and [REDACTED] ccf [REDACTED] found in the 2010 impact evaluation. The results also show that participants who received [REDACTED] actually had slightly higher pre-program natural gas usage than those who went on to [REDACTED]. A comparison between the [REDACTED] and [REDACTED] found that [REDACTED] of Assisted participants received [REDACTED] compared to [REDACTED] of regular participants.

[REDACTED]

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This higher rate of [REDACTED] is likely due to the larger incentives for Assisted participants, especially during the time when additional rebate funds were temporarily available.

Table 4 summarizes natural gas usage and savings along with measure installation rates and participant characteristics broken out by [REDACTED] and Assisted vs. regular.

Table 4. Savings, Measures, and Participant Characteristics:

[REDACTED], Assisted vs. Regular

	All Participants	[REDACTED]		[REDACTED]	
		Assisted	Regular	Assisted	Regular
# Participants (analysis)	[REDACTED]				
Natural Gas Savings					
Natural Gas Usage: pre (ccf/yr.)	[REDACTED]				
Net Savings (ccf/yr.)	[REDACTED]				
% Net Savings	[REDACTED]				
TRM-projected Savings	[REDACTED]				
Realization Rate (Measured/Projected)	[REDACTED]				

[REDACTED]

Table 4 reveals some [REDACTED] between Assisted and regular participants in terms of [REDACTED]. The four groups of homes had

similar levels of pre-program natural gas usage but the Assisted homes [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

The regular participants who received [REDACTED]

[REDACTED] lived in much newer homes – nearly half were built in 1980 or later -- but had [REDACTED]
[REDACTED] than the regular participants that had [REDACTED]
[REDACTED] installed. Only about [REDACTED] of all participants in homes built in
[REDACTED]
[REDACTED]

[REDACTED] and Natural Gas Savings

Figure 1 explores this [REDACTED] effect by graphing net natural gas savings for homes that installed major program measures summarized by the decade when the house was built (with uncertainty shown by 90% confidence intervals lines through each point) .

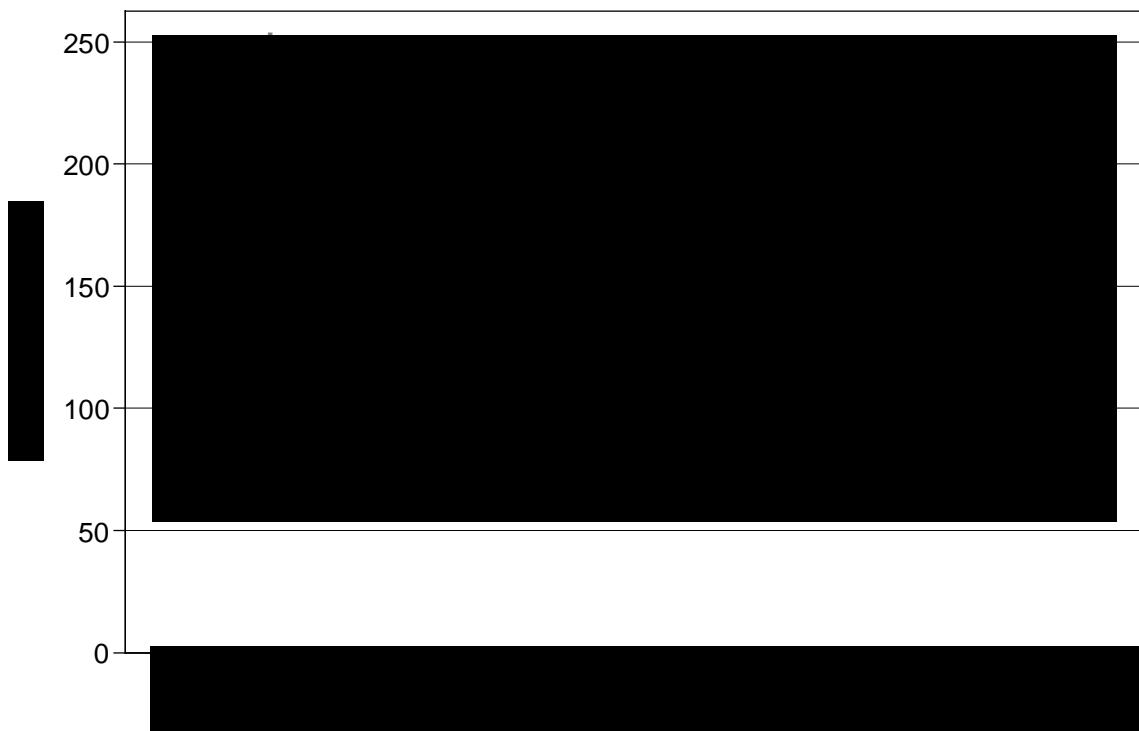


Figure 1. Net Natural Gas Savings [REDACTED]

Savings were [REDACTED]. Savings drop off for [REDACTED] and then drop dramatically starting in the [REDACTED] after the energy crises of the 1970s and the [REDACTED]. Using [REDACTED] as the cut point, Table 5 summarizes savings for [REDACTED] that received major program measures. The [REDACTED].

Table 5. Natural Gas Savings by [REDACTED]

#	[REDACTED]	Pre Usage	Net Savings	% Savings	% of TRM
Major Program Measures: all					
[REDACTED]	Regular	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	Assisted	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	Regular	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	Assisted	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

To examine whether the lower savings in [REDACTED] may be explained simply by the measures installed, the last column of the table shows the savings results expressed as a percentage of the savings projected using the TRM (i.e., the savings realization rate). These values are all within a [REDACTED] implying that most of the differences in savings between the groups [REDACTED] assisted/regular) can be explained by [REDACTED]

Natural Gas Savings vs. [REDACTED]

The [REDACTED] of the savings realization rate is further explored in Figure 2 and Table 6, which show the net savings and realization rate for [REDACTED] classified [REDACTED]. The graph shows the net savings (with a [REDACTED] confidence interval on the mean) for participants that are within a series of [REDACTED] ccf wide bins of projected savings – the left-most data point is for the lowest bin of projected savings. The data point is located at actual savings of [REDACTED] ccf and projected savings of [REDACTED] ccf (the average projected savings for participants with projected savings of [REDACTED]). The points generally line up closely

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with the gray line that [REDACTED] realization rate. The black sloped line is the line of agreement – a [REDACTED] realization rate. The table provide more details about these groups.

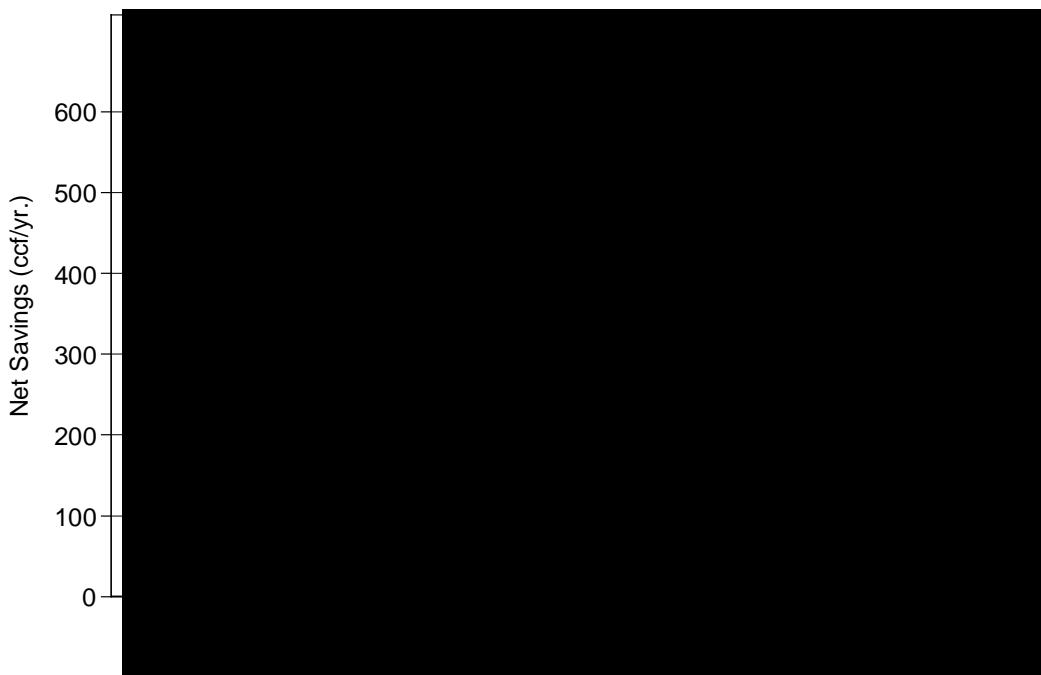


Figure 2. Savings by [REDACTED]

Table 6. Natural Gas Savings by [REDACTED]

Savings Range	# Homes	Pre Usage	Net Savings	% Savings	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

The savings generally grow as the projected savings increase, but with a [REDACTED] across the range of [REDACTED] ccf to [REDACTED] ccf (which includes about [REDACTED] of all participants). The realization rate is [REDACTED] when the projected savings are less than [REDACTED] ccf and drops below [REDACTED] when the projected savings are greater than [REDACTED] ccf. The realization rates appear to [REDACTED]
[REDACTED]

The [REDACTED] across the range of projections provides further evidence that the [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Figure 3 shows the [REDACTED]
[REDACTED] The graph shows that [REDACTED]
Realization rates for homes using less than [REDACTED] ccf are below [REDACTED] % while realization rates for homes using more than [REDACTED] ccf are [REDACTED]. [REDACTED]

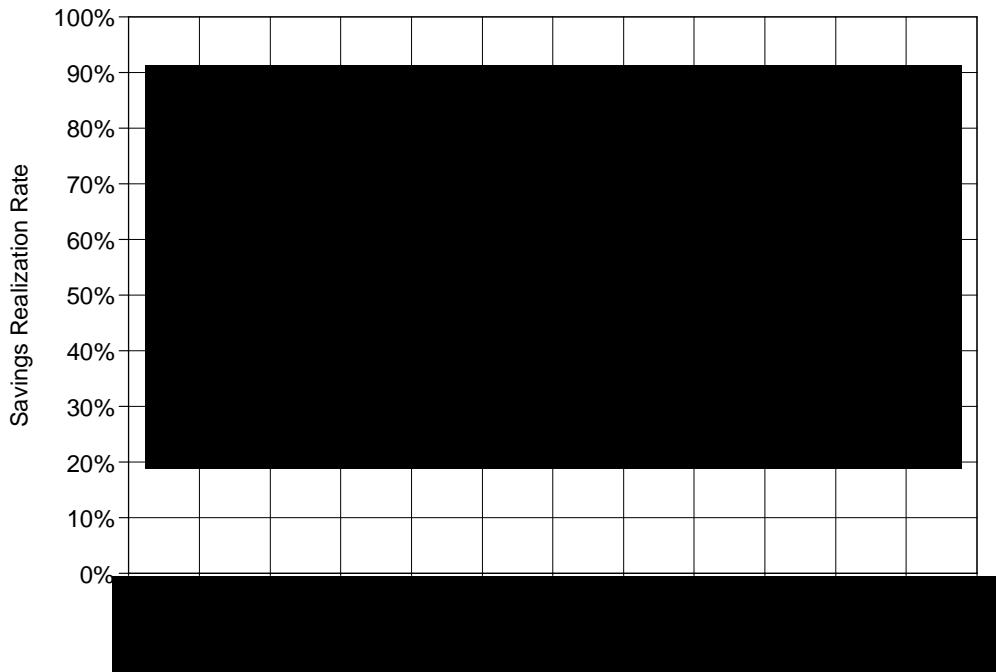


Figure 3. Savings Realization Rate by [REDACTED]

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Figure 4 uses the same grouping by [REDACTED] but plots net savings versus projected savings. Each point is labeled by the [REDACTED]. This figure shows the same pattern in a different way to highlight how [REDACTED]

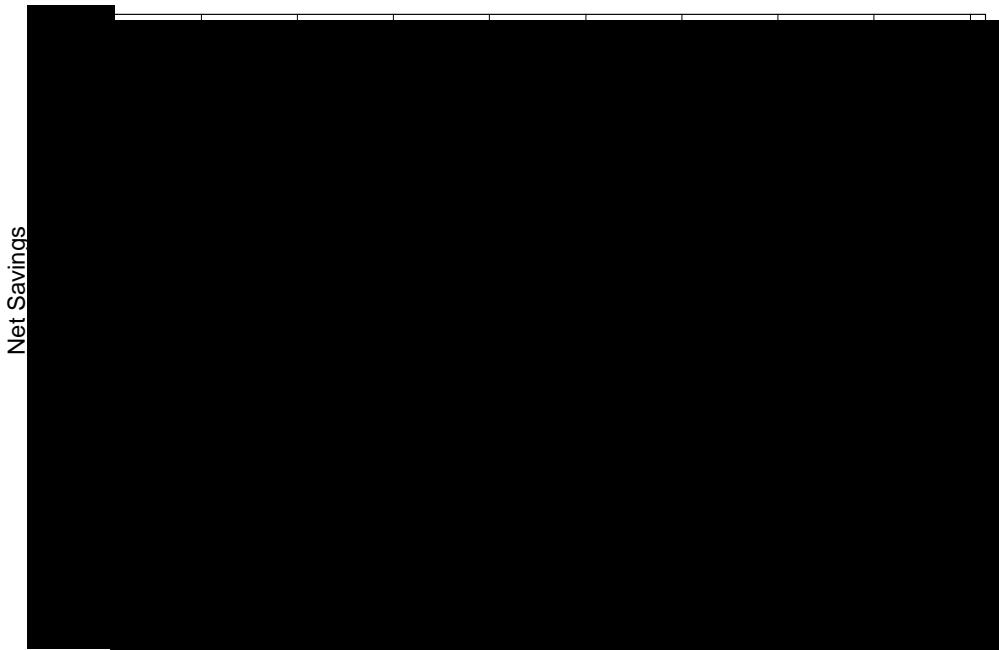


Figure 4. Net Savings vs. [REDACTED] (ccf/yr)

Figure 5 shows [REDACTED]

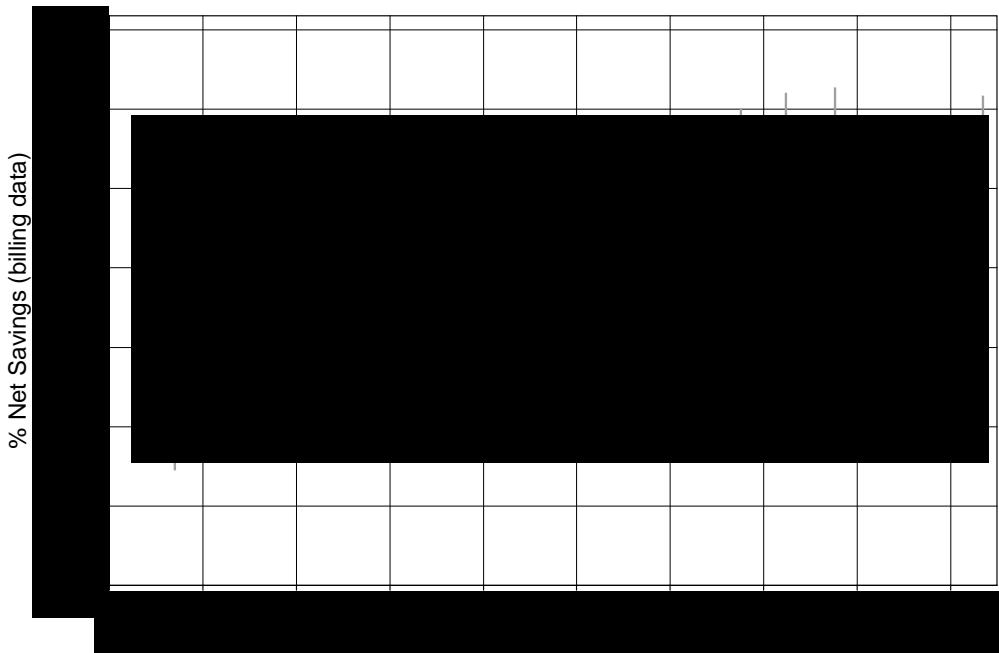


Figure 5. % Savings: [REDACTED]

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Measure Savings

The performance of the [REDACTED] was further assessed using simple break-outs of savings and with regression modeling. There were [REDACTED] participants in the analysis group that had [REDACTED]. [REDACTED] are shown in Table 7 along with the frequencies for the [REDACTED] of all jobs completed in 2011 (which would include cases begun in 2010 but completed in 2011 and exclude cases that weren't completed until 2012).

Table 7. Frequencies: Participants With

[REDACTED] participants that installed [REDACTED]
[REDACTED] and about [REDACTED] but fewer than [REDACTED]
[REDACTED]. The program population completed in 2011 had [REDACTED]
[REDACTED] as the analysis sample for the [REDACTED]
[REDACTED];

Table 8 summarizes savings and projections for participants based on the [REDACTED] isn't listed because it was provided to nearly all participants. The list is limited to measures expected to [REDACTED] and that were found in [REDACTED].

Table 8. Average Savings for [REDACTED] (ccf/yr/participant)

Measures Installed	# Homes	Pre Usage	Net Savings	% Savings	TRM Projected	% of TRM
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Note:

Table 8 shows that the [REDACTED] of homes are in the Attic Insulation and Attic & Wall Insulation groupings. The [REDACTED]¹⁰ may provide some indication of measure performance -- homes installing [REDACTED] had an average realization rate of [REDACTED] and [REDACTED] for homes installing a [REDACTED]. Homes that received [REDACTED] of their natural gas usage on average, which is close to the [REDACTED]. Homes that received [REDACTED] of their natural gas usage on average which is just [REDACTED] of the TRM projection. These homes were expected [REDACTED] air sealing along with [REDACTED] from thermostats, showerheads, and minor insulation work. Homes that [REDACTED]

Regression modeling was used to better estimate [REDACTED] [REDACTED]. The effects of each category of [REDACTED] were estimated using several alternative approaches:

- [REDACTED]
- [REDACTED]
- [REDACTED]

The latter approach, commonly referred to as [REDACTED]

[REDACTED], has the potential advantage of [REDACTED]

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[REDACTED]

[REDACTED] Another [REDACTED] approach is that the [REDACTED]
[REDACTED] such as blower door measured leakage reductions, [REDACTED]
[REDACTED]

[REDACTED]

The fact that [REDACTED] air sealing and [REDACTED] attic
insulation [REDACTED]. Given these issues
and the potential for biases from [REDACTED], regression analysis
estimates of measure savings [REDACTED]. With this
caveat in mind, the measure savings estimates are summarized in Table 9.

Table 9. Measure Savings Estimates (ccf/yr/installation)

Measure	Average Measure Savings	Realization Rate	Projected Savings TRM
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Notes: Savings estimates based on regression model of natural gas savings as a function of measure indicator variables
for all measures [REDACTED]

The regression analysis estimates that all [REDACTED]
[REDACTED] of the projected savings, while [REDACTED]
projected savings. [REDACTED] regression estimates of savings and engineering-based
calculations [REDACTED]
[REDACTED]. Some potential explanations for the findings in the table include:

Attic Insulation: [REDACTED]

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Wall Insulation:

Air Sealing:

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Heating System Replacement:

Programmable Thermostats:

Showerheads: [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Other Factors Associated with Savings: The program measure savings regression model was used to explore for other factors that may affect savings [REDACTED]

[REDACTED] were found to have statistically significant but generally modest impacts on savings. Assisted participants [REDACTED]
[REDACTED] regular participants [REDACTED], but differences in [REDACTED] explain most of this.

Savings by [REDACTED]

The realization rates ranged from [REDACTED] for the insulation and air sealing measures. If the shortfall in savings is due to [REDACTED]
[REDACTED]
[REDACTED] then the [REDACTED] realization rates [REDACTED]
[REDACTED]. Similarly, if the savings shortfalls are due to some [REDACTED]
realization rates than others. Of course, if the [REDACTED]
[REDACTED] the variations in realization rates may [REDACTED]
[REDACTED]

To explore these possibilities, Figure 3 plots the net savings [REDACTED] against the [REDACTED]. The lines extending from each point show the [REDACTED] % confidence interval on the savings. Only [REDACTED] with at least [REDACTED] jobs are included. The three sloped lines show realization rates of [REDACTED] for reference.

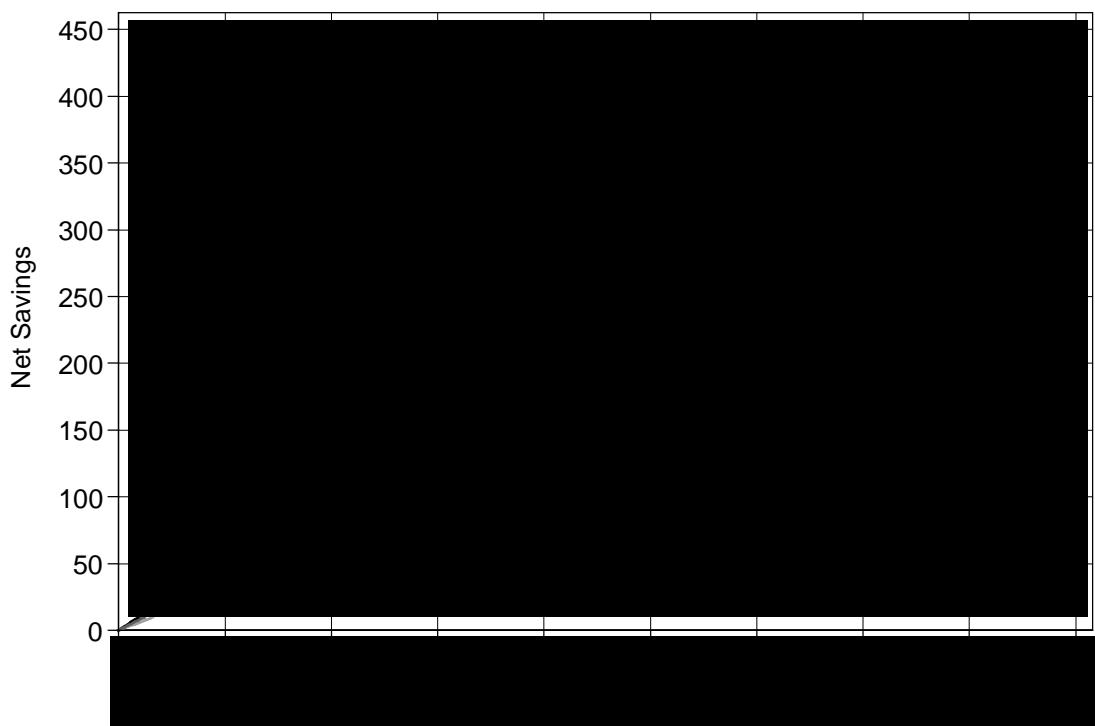


Figure 5. Measured vs. Projected Savings [REDACTED]

The figure shows [REDACTED] in realization rates [REDACTED]. Just one [REDACTED] had a realization rate greater than [REDACTED] a few [REDACTED] had realization rates around [REDACTED], and a [REDACTED] had realization rates under [REDACTED]. Overall, the [REDACTED] realization rate suggest that [REDACTED] performance may be responsible [REDACTED] the difference between savings and projections.

Figure 4 shows the same graph but with savings and projections summarized by [REDACTED]

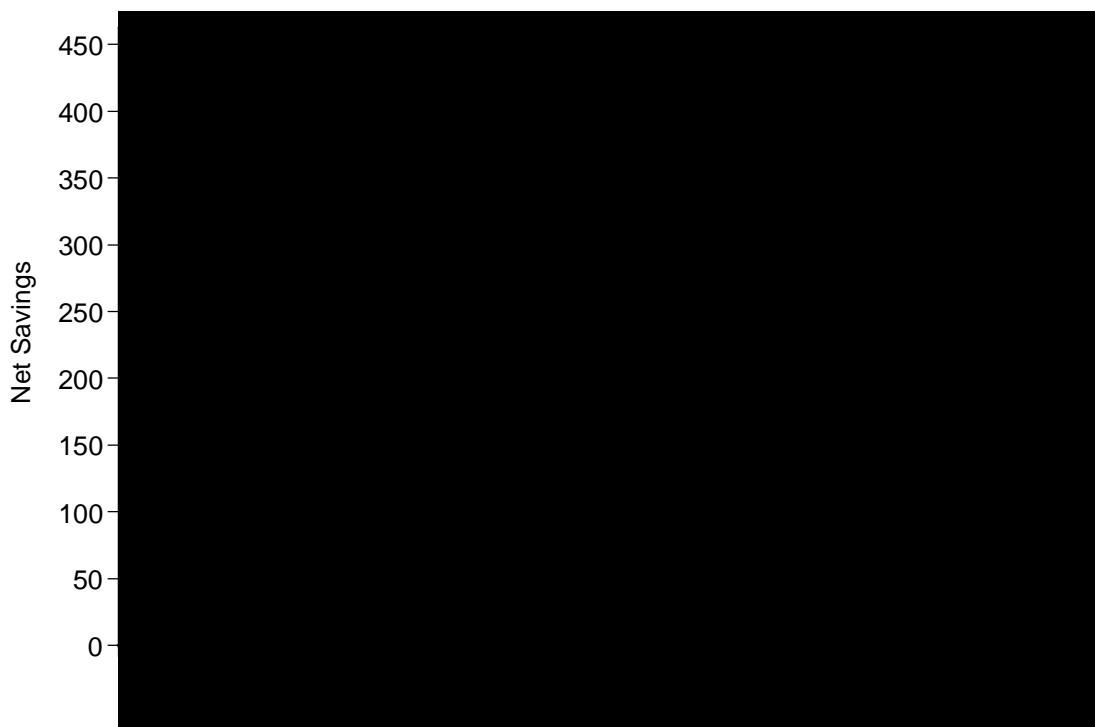


Figure 6. Measured vs. Projected Savings [REDACTED]

None of the [REDACTED] had savings realization rates [REDACTED] but several had rates of [REDACTED] or more that are estimated fairly precisely while others have rates [REDACTED]. It appears that there are substantial differences [REDACTED] suggesting that a portion of the [REDACTED]
[REDACTED]
[REDACTED]

The savings and realization rates by [REDACTED] may be helpful in trying to improve the program performance. [REDACTED]
[REDACTED]

[REDACTED] In addition, the overall levels of average savings and projected savings by [REDACTED] may be useful for assessing performance differences and perhaps the comprehensiveness [REDACTED]. More details from this analysis have been provided to Columbia for use in program quality control.

Program Changes and [REDACTED]

The relatively low realization rates [REDACTED] explored in the prior section could have been [REDACTED] The 2010 evaluation results found an even lower [REDACTED] realization rate [REDACTED] and [REDACTED]. Columbia and

CSG responded to those findings in early 2012. Field inspections identified some [REDACTED]

The vast majority of homes in the current analysis were treated [REDACTED] [REDACTED], but some of the [REDACTED] participants with work completed in [REDACTED] may have started to benefit from these efforts. Table 10 summarizes the savings by [REDACTED] and also shows results for an [REDACTED] [REDACTED] used the [REDACTED] comparison group approach.

Table 10. Average Savings by [REDACTED] (ccf/yr/participant)

[REDACTED]	# Homes	Pre Usage	Net Savings	% Savings	TRM Projected	% of TRM
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

The net savings for [REDACTED] completions averaged [REDACTED] ccf compared to [REDACTED] ccf for [REDACTED] completions. These [REDACTED] are mostly explained by the [REDACTED]
[REDACTED]
[REDACTED] included participants completed as late as [REDACTED] and found average savings of [REDACTED] % and a further modest increase in realization rate to [REDACTED] %. These differences suggest that [REDACTED]
[REDACTED].

[REDACTED]
A total of [REDACTED] participants in the analysis [REDACTED]
[REDACTED] and may have received a programmable thermostat and/or showerhead.
Table 11 shows savings for these [REDACTED]
[REDACTED]

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Table 11. Savings for

Measures Installed

Measures	# Homes	Pre Usage	Net Savings	% Savings	TRM Projected	% of TRM

The savings averaged █ ccf for █ which is larger than the █ ccf projected savings from the TRM. Participants who had a █ ccf, while participants that had just a █ ccf in savings. Participants that had █ ccf. The pattern of results actually implies that █ and also implies that there are █ Two potential explanations include:

The 2010 evaluation found even larger savings for [REDACTED] [REDACTED] ccf on average. Without further research on these [REDACTED] [REDACTED] and their actions, perhaps via surveys, it seems sensible to maintain these savings as part of the program impacts.

Aggregate Program Savings

The savings in the billing analysis group were used to estimate the overall HPS savings for the program in 2011 using a three step approach:

1. The regression model of measure savings was used to impute the savings for each of the participants completed during 2011 [REDACTED]. This analysis estimated that the average natural gas savings for all [REDACTED] completed in 2011 would be [REDACTED] ccf -- [REDACTED] ccf less than the savings found from [REDACTED]
[REDACTED].
2. The billing analysis savings for the [REDACTED]
[REDACTED] were then each assigned to the population of participants in each group. This approach led to a [REDACTED] because the 2011 population [REDACTED] of major program measure jobs than the analysis sample.
3. The [REDACTED]
[REDACTED]
[REDACTED]. Because there were just [REDACTED]
[REDACTED] for completed jobs in 2011 and the regression analysis indicated [REDACTED]
[REDACTED] this adjustment was very small.

The adjusted savings and incremental program impacts from the above steps are summarized in Table 12 along with program aggregate impact totals and the corresponding projected values from the original DSM Action Plan filing.

Table 12. HPS Program Impacts and Natural Gas Savings Projections (ccf/yr)

	# Participants	Net Savings	Incremental Savings
Per Participant:			
[REDACTED]			

The net savings [REDACTED] plan projection due to the [REDACTED]

[REDACTED]. The incremental savings [REDACTED] projection because of the [REDACTED]
[REDACTED]
[REDACTED]

Cost Effectiveness

The evaluation examined program cost-effectiveness using the Total Resource Cost (TRC) test and the Utility Cost Test (UCT -- also known as the Program Administrator Cost Test or PACT). The cost effectiveness analysis is based on the billing analysis results combined with the financial assumptions and projections that were employed in the original 2009-2011 DSM Action Plan. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] Another aspect of the cost-effectiveness analysis that may warrant revision is the [REDACTED] used to calculate the [REDACTED]. Some analysts¹¹ have pointed out that differences between the financing of DSM programs and [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

The TRC compares the total costs of the program and energy efficiency measures to the present value of the lifetime energy savings. It includes the entire incremental¹² cost of the measures and not just the cost of the rebates. The UCT compares the total cost to the utility of operating the program against the reduction in operating costs associated with the savings. The

¹¹ See, for example “Best Practices in Energy Efficiency Program Screening”, Synapse Energy Economics, 2012.
[REDACTED]

primary difference compared to the TRC is that the UCT uses the cost of the rebates rather than the incremental cost of the measures.

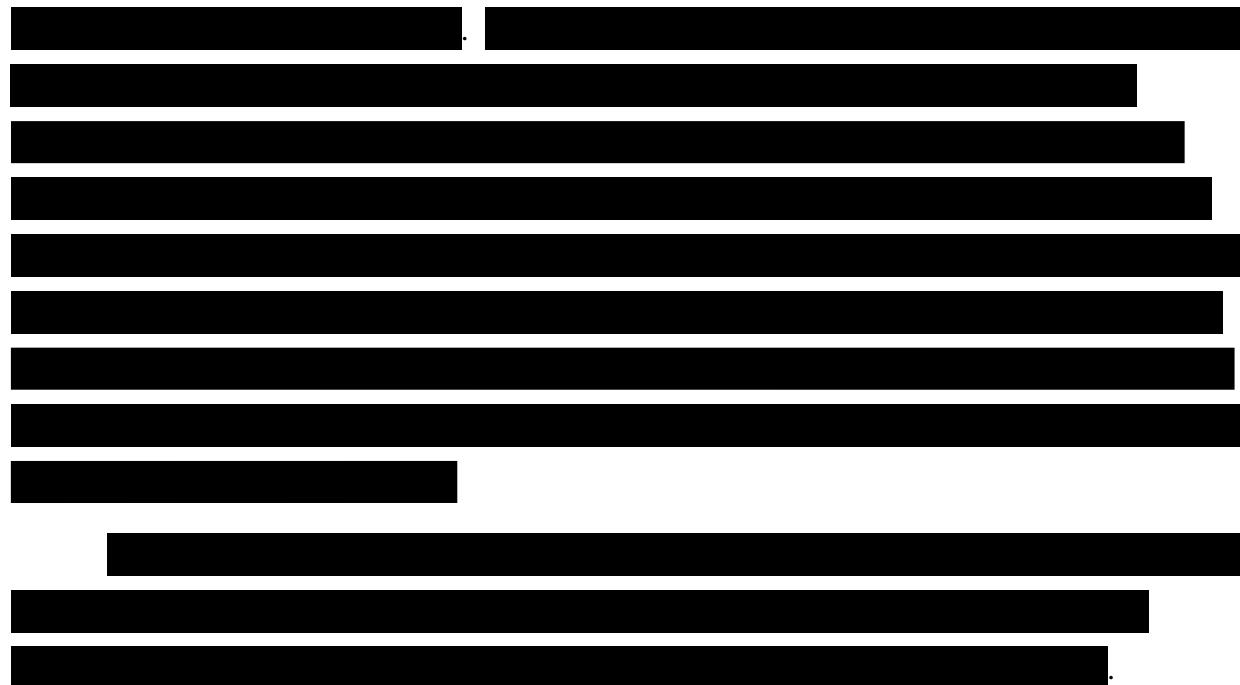
In addition to the natural gas savings, the TRC included the estimated value of electricity savings calculated from the reduced furnace fan run-time as well as some small reduction in estimated cooling loads due to insulation and air sealing measures.

Table 13 summarizes the results of the cost-effectiveness analysis of HPS.

Table 13. HPS Cost/Benefit Analysis

Cost/Benefit Category	TRC	UCT
Measure Costs		
Program & Other Costs		
Total Costs		
Benefits – Present Value		
-Gas Savings		
-Electric savings		
Benefit / Cost Ratio		
Benefit / Cost Ratio: measures only		

Based on the billing data analysis results, the program [REDACTED]



It should also be noted that the TRC calculation does not include any valuation of non-energy benefits such as the value of job creation and economic development impacts as well as greenhouse gas reductions. These non-energy benefits have been valued at levels comparable to the value of the energy savings in some studies of low income programs¹³ and a significant fraction of HPS costs are devoted to the higher rebates provided to Assisted participants.

Conclusions and Recommendations



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ILLUME

Columbia Gas of Ohio Home Performance Solutions

Final Report

Prepared for:

Columbia Gas of Ohio

June 25, 2014

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EXECUTIVE SUMMARY

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1. EXECUTIVE SUMMARY

1.1 Introduction and Program Overview

Illume Advising, LLC (ILLUME) was commissioned by Columbia Gas of Ohio (COH) to conduct a process evaluation of the Home Performance Solutions program.

Home Performance Solutions (HPS) offers participants a comprehensive energy audit, including an internal and external review of the home, a safety check of natural gas appliances, and an assessment of air sealing and insulation needs using diagnostic tools. Each customer who receives an energy audit is presented with an energy audit report with eligible recommendations that may include air sealing, attic insulation, wall insulation, or an energy efficient heating system. Customers are offered program rebates on these measures, which vary based on income level and age.

The HPS program is implemented by Conservation Services Group (CSG) and was first offered to the market in 2009. COH works closely with CSG to oversee the program's administration and delivery.

The major tasks and goals of this process evaluation included interviewing program participants and contractors about their experience and satisfaction with the program, reviewing program procedures and processes, identifying potential barriers to program participation and ways to approach those barriers, and identifying and quantifying any non-energy benefits that occurred as a result of the HPS program.

1.2 Evaluation Methods

ILLUME developed our evaluation findings and recommendations based on [REDACTED], along with secondary data sources. We also reviewed [REDACTED], including [REDACTED]

[REDACTED] Secondary data reviewed included the Ohio Technical Reference Manual (TRM) and deemed savings calculations from other states.

1.3 Key Findings and Recommendations

Overall contractors and participants are satisfied with the HPS program, and its processes and procedures appear well documented and are managed efficiently and effectively.

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EXECUTIVE SUMMARY

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Key Findings:

- Program participants and qualified contractors are [REDACTED] with the program. Participants [REDACTED] rated their satisfaction as a [REDACTED]. Contractors [REDACTED] rated their overall satisfaction with the program as a [REDACTED]
- The program has achieved a [REDACTED]. This is high compared to most other jurisdictions where information was available. Additionally, [REDACTED] of customers who [REDACTED]
[REDACTED]
- Participants are [REDACTED] with various aspects of the [REDACTED]
[REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED] are thoroughly documented through [REDACTED]. This makes program [REDACTED].

The program is [REDACTED] its natural gas savings goal and has [REDACTED]. To build on these successes, it may need to consider additional ways to [REDACTED].
[REDACTED].

Key recommendations:

- [REDACTED]

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EXECUTIVE SUMMARY

ILLUME

- [REDACTED]

INTRODUCTION

ILLUME

2. INTRODUCTION

Illume Advising, LLC (ILLUME) was commissioned by Columbia Gas of Ohio (COH) to conduct a process evaluation of its Home Performance Solutions (HPS) program. The major tasks and goals of the evaluation were:

- 1)
- 2)
- 3)
- 4)
- 5)

3. PROGRAM DESCRIPTION

3.1 Overview

The HPS program offers eligible customers a comprehensive home energy audit and substantial program rebates to complete recommended natural gas-saving measures, along with free installs and information on ways to save energy. A customer is eligible if they are a Columbia Gas of Ohio customer and their home is heated with natural gas.

PROGRAM DESCRIPTION

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In 2013 the program had a total administrative budget of [REDACTED] million, including just under \$[REDACTED] [REDACTED] million [REDACTED]. The 2013 customer rebates budget was [REDACTED] million.¹

3.2 Program Objectives and Goals

The primary objective of the HPS program is to encourage energy efficiency improvements in existing homes by providing customers with information and education through a comprehensive energy audit and the recommendation of cost-effective major measures that save natural gas. Major measures include air sealing, attic insulation, wall insulation, and high-efficiency heating systems. Additional savings are achieved through the direct installation of programmable thermostats and energy efficient showerheads.

Program natural gas savings goals are set over the five-year period from 2012 to 2016, and include annual targets. In 2013, the program reported saving [REDACTED] thousand cubic feet (MCF) of natural gas, [REDACTED] annual natural gas-savings target by [REDACTED].²

The program also tracks additional metrics, including the number of energy audits performed, thermostat and showerhead installations, and the customer conversion rate for installing major measures. In 2013³, the program completed [REDACTED] [REDACTED]. Thermostat and showerhead installation targets were both [REDACTED], respectively. Program staff stated that they aim to achieve a [REDACTED] conversion rate of customers who receive energy audits installing major measures. Over time program staff notes the program has consistently achieved a conversion rate close to [REDACTED].

3.3 Program Delivery and Implementation

Implementation responsibilities (contracted to CSG) include:

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]

¹ CSG Home Performance Solutions Program Activity Report, December 2013 revised.

² Ibid.

³ Ibid.

PROGRAM DESCRIPTION

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6. [REDACTED]

7. [REDACTED].

CSG employees conduct the energy audits, while program-qualified contractors are hired directly by customers to install the recommended major energy conservation measures. Currently there are [REDACTED] CSG energy auditors, along with [REDACTED] qualified independent contractors. Both energy auditors and qualified contractors must meet specific skill levels and training requirements.

Customers schedule an energy audit through CSG's customer call center. As another option, customers may also email the program to schedule the energy audit. During the call, customers are screened for eligibility and to determine what program "track" they may qualify under. The program offers three different program tracks, based on income level and age of homeowner. These tracks and incentive offerings are listed in the table below.

Table 1: Program Rebate Levels by Eligibility

Targeted Group	Eligibility Criteria	Cost of the Audit	Program Rebate Levels
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Assisted Track	[REDACTED]	[REDACTED]	[REDACTED]
Gold Track	[REDACTED]	[REDACTED]	[REDACTED]

To maintain cost-effectiveness, the program aims for [REDACTED] % of energy audits conducted to be from the Standard Track, and the remaining [REDACTED] % from the Assisted or Gold Tracks. Program staff state that rebates will [REDACTED] - [REDACTED] for Standard Track participants. Standard Track rebates are offered on [REDACTED]

If a customer completes [REDACTED] (air sealing, insulation, and furnace/boiler), [REDACTED]

Energy auditors perform a comprehensive energy audit of the customer's home, which includes:

EVALUATION METHODS

- A thorough visual inspection of the home
- Safety tests on gas appliances
- Tests to assess insulation levels and air leaks
- Tests to determine gas heating equipment efficiency
- Free programmable thermostat and energy efficient shower head (where needed)

The program coordinates with electric utilities that also serve customers in COH's territory, such as AEP-Ohio. For example, if the participant is also an AEP-Ohio electric customer, electric direct install measures will also be installed at the time of the energy audit at no additional charge to the customer.

Energy audit information is [REDACTED]. At the end of the energy audit, customers are presented with a folder that contains a detailed energy audit report with recommendations and eligible financial incentives, a list of qualified contractors to do the work, information on financing available, a receipt, and any pertinent disclaimers. Energy auditors also share information on estimated utility bill savings with the customer.

4. EVALUATION METHODS

The evaluation findings and recommendations are based on interviews and a review of program data and materials.

4.1 Program Staff Interviews

In February of 2014, Illume conducted interviews with the COH HPS program manager and evaluation team leader [REDACTED] and the CSG program manager [REDACTED]

4.2 Participating Homeowner Interviews

In March and April of 2014, [REDACTED] interviews were completed with HPS participants. The survey included questions related to [REDACTED]

To develop the sample population, COH provided Illume with a database containing customer information from the last two years of program participation. The sample frame for the survey was [REDACTED] 2013 calendar year [REDACTED]. The data was also reviewed and scrubbed, leaving [REDACTED]

[REDACTED] so that the sample reasonably represented the [REDACTED] (Assisted and Standard) and geographical [REDACTED]. The table below breaks out participants interviewed [REDACTED]. Additionally, [REDACTED] Assisted Track customers were interviewed and [REDACTED] Standard Track customers.

Table 2: Participants Interviewed by Home Performance Solutions Region

Home Performance Region	Number of Participants Interviewed	Percent of Total Interviewed	Percent of Energy Audits Conducted in 2013
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total	*Includes the following [REDACTED]		

*Includes the following [REDACTED]

The complete participant survey instrument is provided in Appendix A.

4.3 Participating Contractor Interviews

In March and April of 2014, Illume completed [REDACTED] with participating HPS contractors. The interviews explored several topics, including [REDACTED]

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A list of [REDACTED] participating contractors was provided by CSG, which included [REDACTED] insulation and air sealing companies and [REDACTED] heating and cooling companies.

The tables below show the number of contractor interviews performed [REDACTED]

Table 3: Type of Contractor Interviewed

Contractor Type	Number of Contractors
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
Total Contractors	[REDACTED]

Table 4: Contractors Interviewed by Home Performance Solutions Region

Home Performance Region	Number of Contractors Interviewed*	Percent of Audits Conducted in 2013	Number of Total Contractors*
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

*Does not add to total as several contractors serve more than one region.

The complete contractor interview guide is provided in Appendix B.

4.4 Review of Program Data and Materials

In addition to interviews, the evaluation also included a review of program data and materials provided by COH and CSG, including the following:

[REDACTED]

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- A scatter plot illustrating the relationship between the number of species (S) on the x-axis and the number of individuals (N) on the y-axis. The x-axis is labeled "Number of species" and ranges from 0 to 100. The y-axis is labeled "Number of individuals" and ranges from 0 to 1000. A dashed diagonal line represents the 1:1 relationship. The data points, shown as small black squares, generally fall below this line, indicating that the number of individuals is typically less than the number of species. There are several outliers above the line, particularly at higher species counts.

5. EVALUATION RESULTS

5.1 Program Participation

Key Findings:

- The image consists of five identical horizontal bars arranged vertically. Each bar is black with a thin white border on its right side. To the left of each bar is a small, solid teal square. The bars are evenly spaced and extend across most of the width of the frame.

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- [REDACTED]

Recommendations:

- [REDACTED]
- [REDACTED]

Geographic Dispersion of HPS Participation

Columbia Gas of Ohio serves cities and townships in 61 out of 88 different counties in the state. For the HPS program, its territory is divided into six different regions based on the major metropolitan areas in the state and the areas that qualified contractors serve. These regions include the following (please note some counties overlap into multiple regions):

- Toledo, serving municipalities in 12 counties in northwestern Ohio;
- Cleveland, serving municipalities in 9 counties in northeastern Ohio;
- Mansfield, serving municipalities in 4 counties in north central Ohio;
- Columbus, serving municipalities in 21 counties in central Ohio;
- Springfield, serving municipalities in 4 counties in west central Ohio; and,
- South/Southeast Ohio, serving municipalities in 16 counties in southeastern Ohio.

PUBLIC VERSION - REDACTED

Attachment A

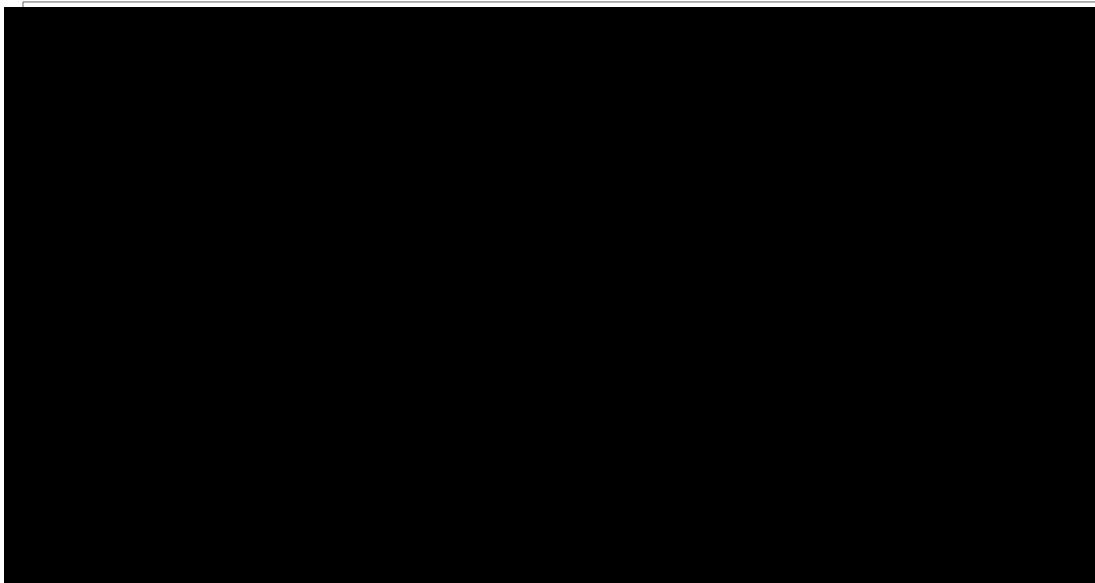
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EVALUATION RESULTS

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ILLUME reviewed the [REDACTED] of energy audits taking place across COH's territory in 2013. As shown in the figure below, energy audits are [REDACTED]

Figure 1: Number of Energy Audits in 2013 by HPS Region



We also plotted energy audits taking place in 2013 [REDACTED]

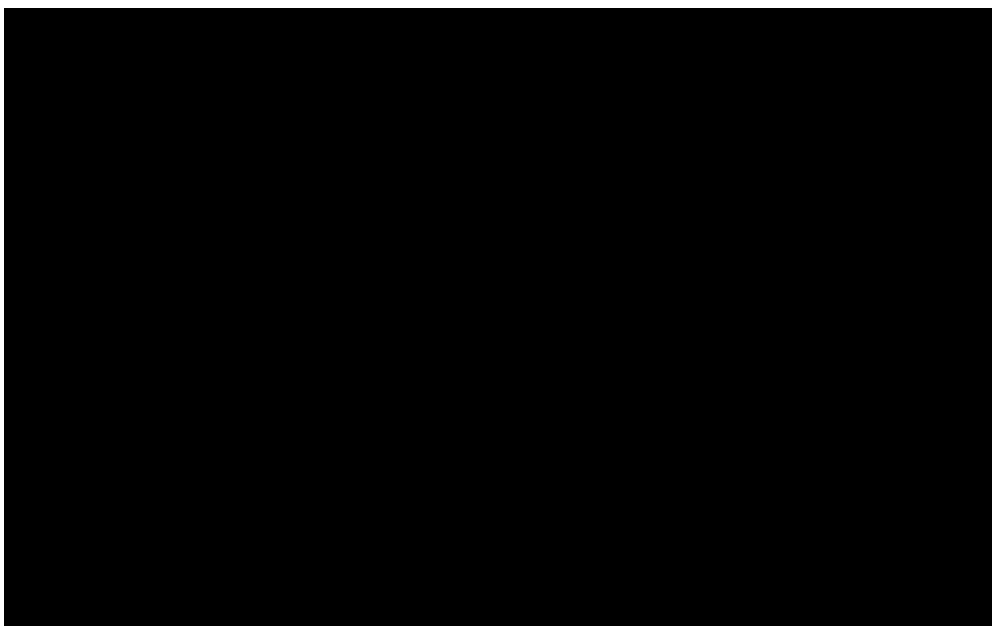
[REDACTED] the COH territory. One

can [REDACTED]

EVALUATION RESULTS

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Figure 2: Geographical Dispersion of 2013 Energy Audits



*Note that COH serves municipalities within counties, but may not serve entire counties. This map is meant to illustrate the geographical reach of HPS regions and projects.

[REDACTED] of energy audits in 2013 were [REDACTED]
[REDACTED].

Table 5: 2013 Energy Audit Participation in Top 10 Municipalities

Municipality	HPS Region	Number of 2013 Energy Audits	Percent of Total
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Subtotal		[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Grand Total		[REDACTED]	[REDACTED]

PUBLIC VERSION - REDACTED

EVALUATION RESULTS

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The drivers behind the [REDACTED]
[REDACTED] appear to be a combination of both [REDACTED]

⁴ Based on population alone,

[REDACTED]
of around 50,000 to 60,000, [REDACTED]
by the program's Neighborhood Home Performance Solutions efforts, which are described in more detail in section 5.3, and are also a part of the greater Cleveland area.⁵

Participation levels in [REDACTED] highlight [REDACTED]
Neighborhood Home Performance Solutions [REDACTED]

[REDACTED].

Participation by Program Track

In 2013 the program completed [REDACTED] energy audits, just below the [REDACTED] completed in 2012. The program aims to have about [REDACTED] of energy audits be performed for Standard customers, and [REDACTED] for Assisted or Gold customers to maintain cost-effectiveness. In 2013, this target [REDACTED] of energy audits coming from Standard customers.

⁴ Based on 2010 U.S. Census population figures.

⁵ COH does not serve the city of Cleveland.

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Table 6: Participation by Program Track

Customer Type	Number of 2012 Participants	2012 Percent of Total	Number of 2013 Participants	2013 Percent of Total
Standard Track				
Assisted Track				
Gold Track				
Total				

Participant Conversion Rates

Program staff report that the conversion rate (the percent of customers receiving energy audits who complete at least one major measure through the program) is [REDACTED]%. ILLUME was provided program information for customers receiving audits in 2012, 2013, and the first month of 2014. We reviewed the energy audit-only versus installing customer records over the 2012 to 2013 time period and calculated [REDACTED].

The calculated conversion rate in 2012 was [REDACTED], while the 2013 rate was [REDACTED], as shown in the table below. However, the conversion rate in 2012 is [REDACTED]

2013 calendar year [REDACTED]

[REDACTED] Program staff notes that it typically takes a participant [REDACTED], but some participants may take longer. When customers receiving energy audits in the last three months of the year were [REDACTED] conversion rate calculation for 2013, it [REDACTED]. Program staff report a busy first quarter in 2014, which may move this rate even higher. In fact, at the time of the participant survey [REDACTED] customers initially identified through program records as [REDACTED] stated that they had since [REDACTED].

Table 7: HPS Customer Conversion Rates

Time Period	Number of Energy Audits	Number of Installing Customers	Conversion Rate
January – December 2012			
January – December 2013			
January – September 2013*			

*Provided to show the comparison of 2013 conversion rates to 2012, those participants who had audits in the Oct-Dec timeframe were unlikely to have completed work before the end of the program

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year. This shows that without those customers still in process conversion rates were in line to 2012 in 2013.

A conversion rate of [REDACTED] compared to other Home Performance-type programs across the country. The table below lists conversion rates in other jurisdictions where information was available. Only one other jurisdiction was found that had a conversion rate [REDACTED]. This program used a hybrid model that [REDACTED]

[REDACTED]. Those homes with a modeled savings potential of [REDACTED].

Table 8: Customer Conversion Rates in Other Jurisdictions

Jurisdiction	Conversion Rate	Year
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

*Program ended in 2012 with ARRA funding. [REDACTED]

A review of program data shows that Assisted customers [REDACTED] Standard customers. [REDACTED] percent of Assisted customers who received an energy audit in 2012 followed through with the energy audit [REDACTED] of Standard customers. A similar trend is seen thus far for customers who received an energy audit in 2013, with [REDACTED] of Assisted [REDACTED] and [REDACTED] of Standard customers. This trend is likely based on several factors; the largest of which may be that Assisted customers [REDACTED] Standard customers. Our survey efforts showed that Assisted customers [REDACTED] were somewhat more satisfied [REDACTED] with a mean score of [REDACTED] versus [REDACTED] on a [REDACTED].

Program staff stated that they use data to try to [REDACTED] of natural gas per year, and were [REDACTED]. Staff also notes that a prior study indicated that those customers [REDACTED]

PUBLIC VERSION - REDACTED**EVALUATION RESULTS****ILLUME**

[REDACTED], had an annual household income of [REDACTED] or more, and [REDACTED].

Our survey data shows that on average the program is clearly meeting these criteria, as shown in the table below.

Table 9: [REDACTED]

Housing/Demographic Characteristic	Mean Value
[REDACTED]	[REDACTED]

These data points were also compared between [REDACTED]. The data showed that [REDACTED] tended to have [REDACTED]. However, caution should be used when comparing these differences due to the [REDACTED].

Participants [REDACTED]

Survey efforts show that some participants may be [REDACTED] which could result in [REDACTED]⁶ surveyed said that they (or someone in their household) [REDACTED]. While this is a relatively sizable portion of the [REDACTED], caution should be used when reviewing these results, as the [REDACTED].

The [REDACTED] participants claim to have installed the following recommendations:

- [REDACTED] installed air sealing;

⁶ For the purposes of this study, we still include these [REDACTED] participants in [REDACTED]. [REDACTED], but upon a closer look these participants were removed from this total, reducing the number of participants [REDACTED].

The other participant discussed [REDACTED]

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- [REDACTED] installed attic insulation;
- [REDACTED] installed wall insulation;
- [REDACTED] installed a new heating system; and,
- [REDACTED] reported running their exhaust fan more often.

Of the [REDACTED] respondents who claim to have installed air sealing [REDACTED], [REDACTED] also installed insulation at the same time. Under the program, [REDACTED]. While we did not further probe in the interviews, this may mean that rather than [REDACTED], these participants [REDACTED].
[REDACTED]

Of the [REDACTED] participants who went [REDACTED] claim to have installed attic insulation, [REDACTED] wall insulation, and [REDACTED] a new heating system.

Upon further review of program and survey data available, no distinct differences between these [REDACTED] participants and [REDACTED]. The program could consider performing additional research to further explore the prevalence of [REDACTED]
[REDACTED]

5.2 MEASURE INSTALLATIONS

Key Findings:

- [REDACTED] percent of customers receiving an energy audit in 2013 [REDACTED], while [REDACTED] % had at least [REDACTED] thermostat [REDACTED].

PUBLIC VERSION - REDACTED**EVALUATION RESULTS****ILLUME**

- In 2013, [REDACTED] customers received rebates for at least one major measure, [REDACTED]. A total of [REDACTED] major measures received rebates in 2013, with the [REDACTED]

Recommendations:

- [REDACTED]
- [REDACTED]

The tables below represent the measures installed through the program.

Table 10: Direct Install Measures in 2013

Measure	Number of Measures*
Energy Efficient Showerhead	[REDACTED]
Programmable Thermostat	[REDACTED]

*The number of measures in this table may differ slightly from reported numbers due to differences in timing for reporting.

Table 11: Number Major Measure Rebates Paid in 2013

Measure	Number of Measures*
Air Sealing	[REDACTED]
Attic Insulation	[REDACTED]
Wall Insulation	[REDACTED]
High Efficiency Heating System	[REDACTED]
Total Major Measures	[REDACTED]

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*The number of measures in this table may differ slightly from reported numbers, based on dates used to count a measure as completed.

5.3 Program Marketing and Outreach

Key Findings:

- [REDACTED] family member, or contractor. Just under an additional one [REDACTED]
[REDACTED].
- [REDACTED]
- [REDACTED]
- [REDACTED]

Recommendations:

- [REDACTED]
- [REDACTED]

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- [REDACTED]
- [REDACTED]

Current Marketing and Outreach Efforts

The program is promoted to eligible COH customers in several different ways. Program marketing efforts in 2013 included utility bill inserts, targeted direct mail (postcards and letters), customer and contractor referrals, and advertising in select news prints. Non-traditional ways to promote the program are also used, including [REDACTED]

The program tracks the effectiveness of its marketing and outreach efforts [REDACTED]
[REDACTED]
[REDACTED]

Marketing and Outreach Strategies

In general, program staff believes that mass marketing efforts, such as radio and print, [REDACTED]
[REDACTED]

[REDACTED], as illustrated in the figure below.

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Figure 3: [REDACTED]

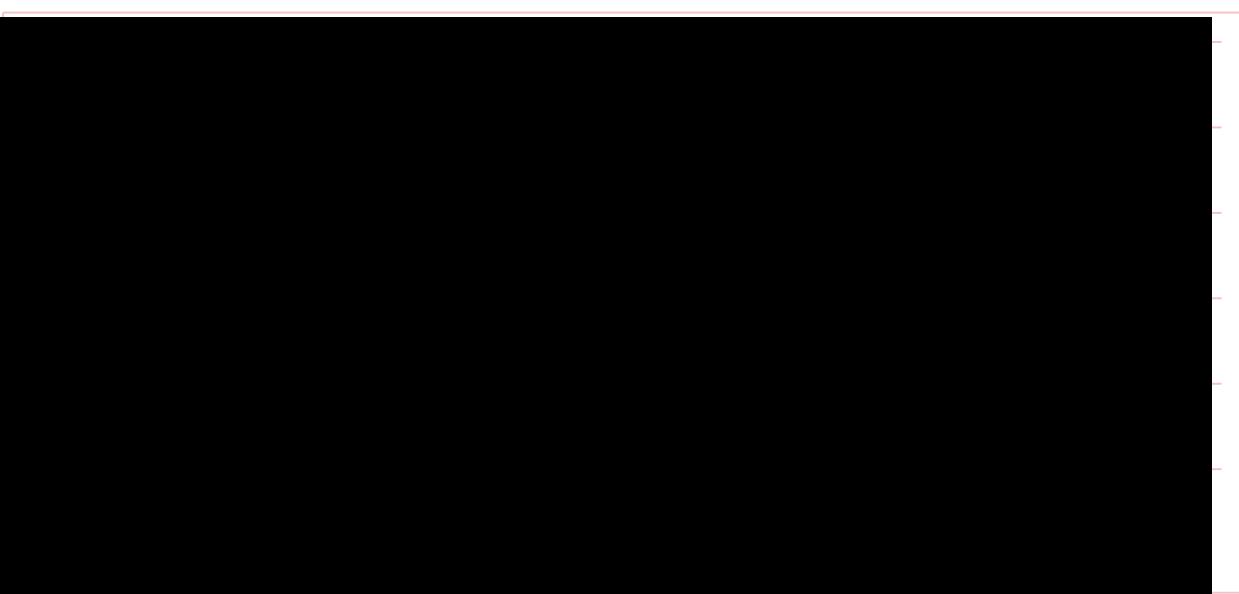


A closer look at the data reveals that [REDACTED]

Similarly, [REDACTED]

strategies [REDACTED]. The program may want to prioritize these

Figure 4: [REDACTED]



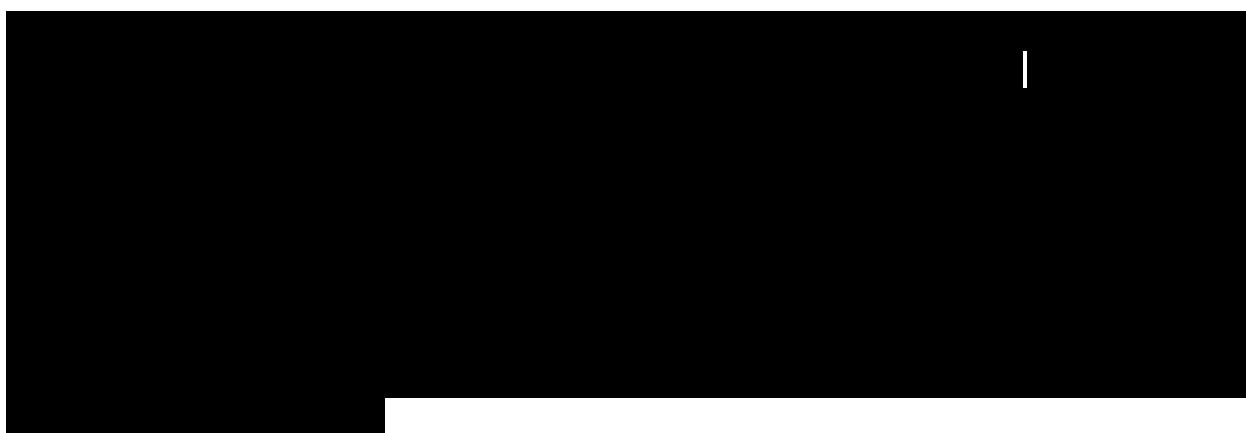
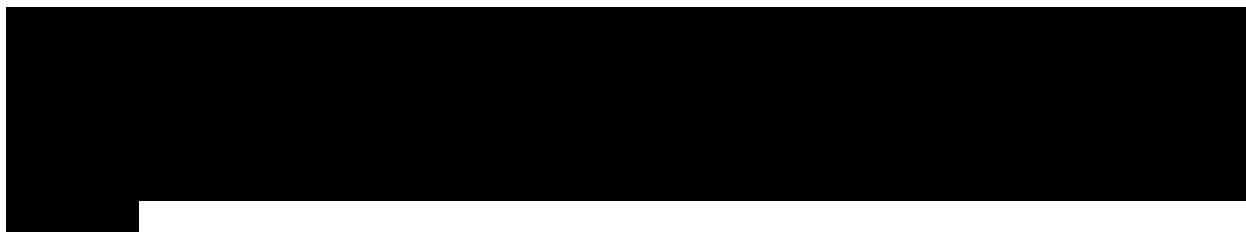
PUBLIC VERSION - REDACTED

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Customer Messaging and Motivations

Program staff state that previously conducted focus groups indicated that marketing to customers should be [REDACTED]

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[REDACTED] Since then, the majority of marketing materials have made the [REDACTED], though some case studies and customer testimonials have [REDACTED]. Rebate amounts and [REDACTED] are then presented to the customer at the time of the energy audit.



Figure 5: [REDACTED]



* [REDACTED].

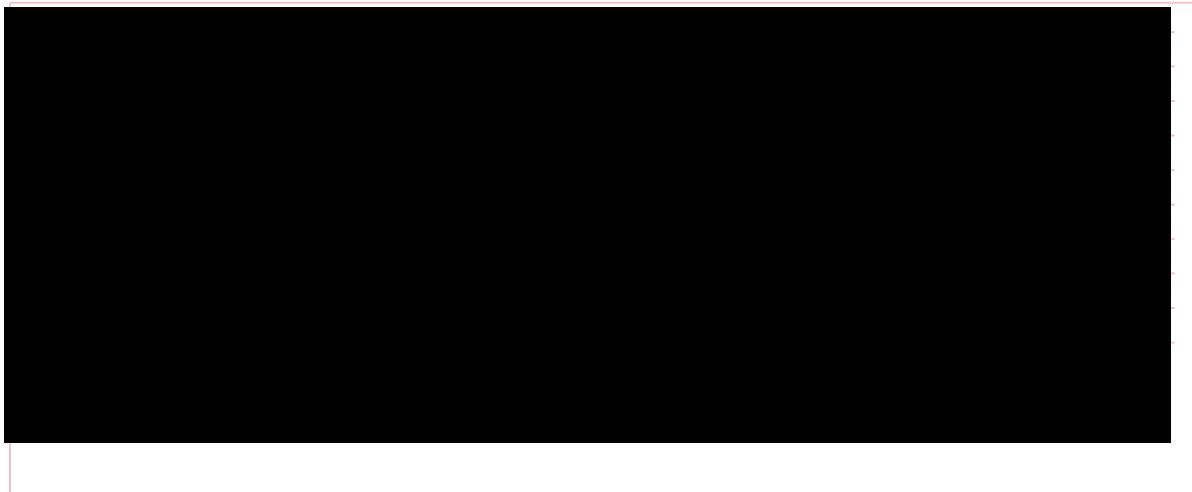
Most HPS participants report being [REDACTED]. When asked to rate their [REDACTED] on a scale of one to five, with five being extremely motivated, survey respondents gave a mean score of [REDACTED]. [REDACTED], with a mean score of [REDACTED], compared to [REDACTED] who had a mean score of [REDACTED].



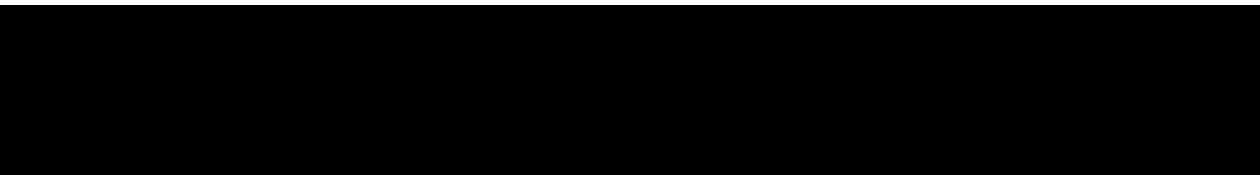
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Figure 6: [REDACTED]



Participating contractors interviewed were also asked [REDACTED] [REDACTED]. Contractors were [REDACTED], with a mean score of [REDACTED] on a five-point scale (a score of one being very dissatisfied and five being very satisfied). [REDACTED] contractors stated that [REDACTED] to their company, though [REDACTED] contractors [REDACTED] program awareness.

Table 12: [REDACTED]
[REDACTED]

Benefit Mentioned	Number of Contractors*
[REDACTED]	

5.4 Program Processes and Procedures

Key Findings:

- [REDACTED]

Recommendations:

- [REDACTED]
- [REDACTED]

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■

■

roviding lower subsidies (or none at all) for the energy audit. Contractor

Energy Audit Materials and Information

We asked survey participants whether they

survey respondents⁹ stated that

to do the work, and other related program information.

stated that their

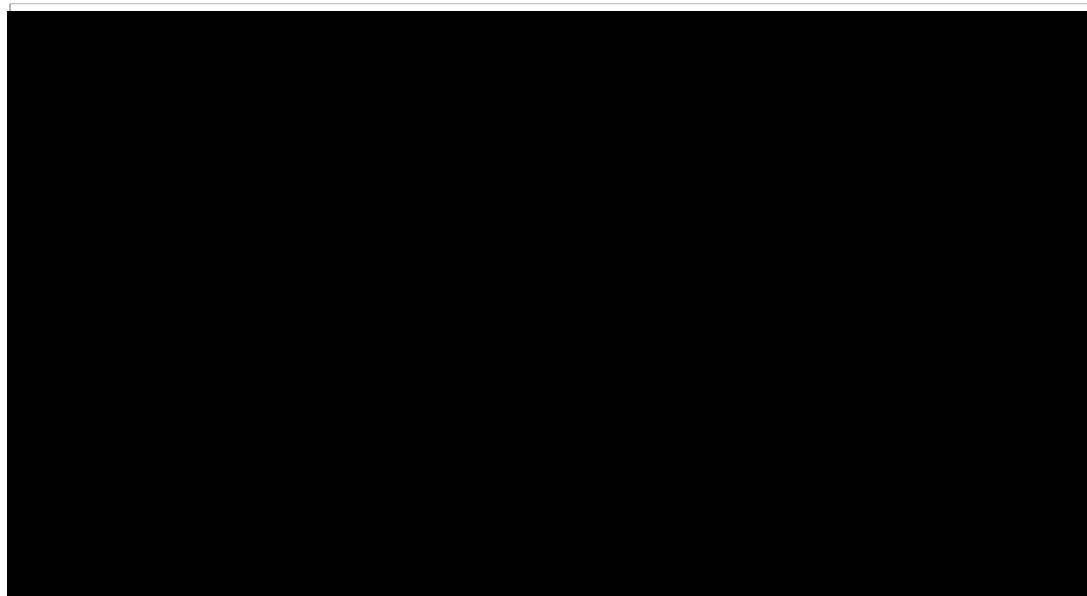
Respondents were then asked

, with results illustrated in the table below.

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Figure 7: [REDACTED]



If participants answered "somewhat" or "not at all" [REDACTED], they were also asked how the program [REDACTED]. Of the 36 participants answering, the majority [REDACTED] could not think of anything [REDACTED] know what would make the information more useful to them. Of these, seven stated that the [REDACTED]

[REDACTED] Specific ideas from other participants included the following:

- [REDACTED];
- [REDACTED];
- [REDACTED].



Surveyed participants were asked how satisfied they were with [REDACTED] Participants [REDACTED], though [REDACTED], as shown in the figure below.

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Attachment A

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Figure 8: How satisfied were you with...



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Attachment A

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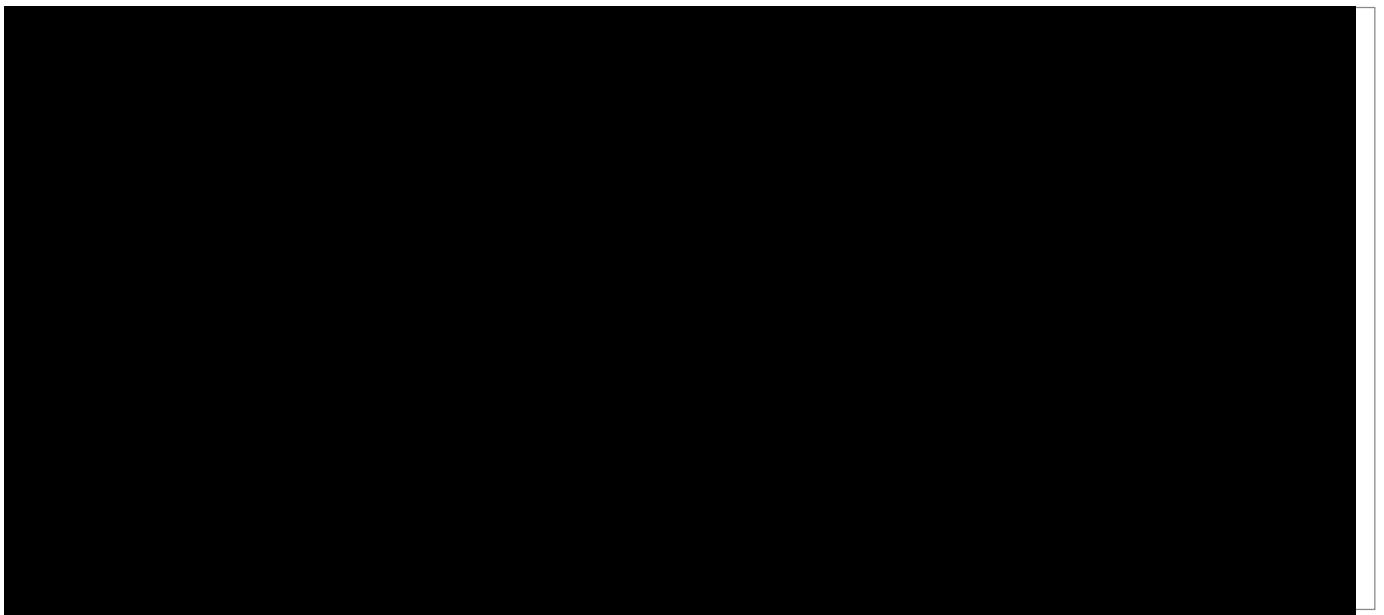
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Figure 9: [REDACTED]

[REDACTED] ?



Measure Installation

After the energy audit is completed, [REDACTED]

Please see Appendix E for further details.

Installing Customers

If a customer [REDACTED]

[REDACTED]. A review of program data of participants [REDACTED] in 2012 and 2013

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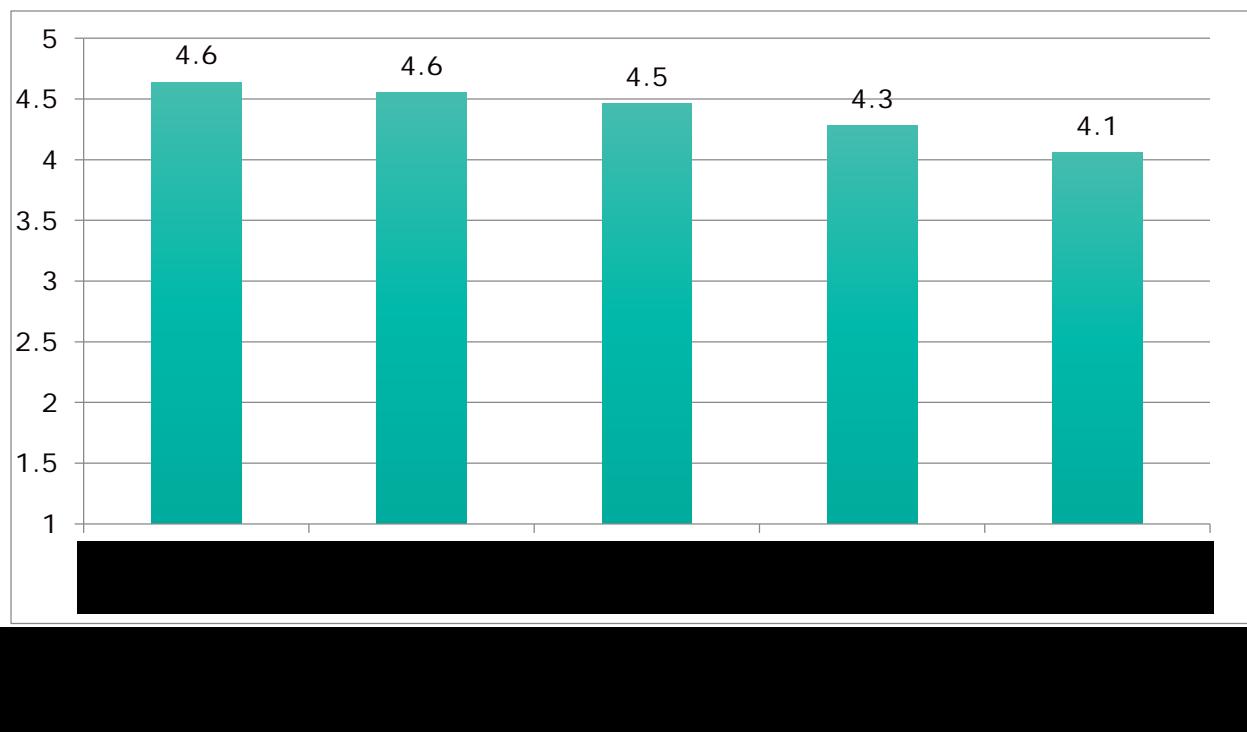
ILLUME

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shows that, on average, it takes a participant [REDACTED]¹² [REDACTED]

Through our survey efforts we asked installing customers how satisfied they were [REDACTED] on a five-point scale. Installing participants are overall most satisfied with the [REDACTED] and the [REDACTED] this was followed by satisfaction with the [REDACTED]

Figure 10: How satisfied were you with... [REDACTED]



Contractors also provided feedback on [REDACTED] contractor noted that [REDACTED]

[REDACTED]. The contractor will call the program [REDACTED] However, once the application is submitted [REDACTED]

[REDACTED] Program staff note that they are currently in [REDACTED]

¹² Based on program data of customers receiving audits from January 2012 to December 2013. Calculation omits [REDACTED]

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the process of implementing new Sales Force software, [REDACTED]

[REDACTED]

We asked participants [REDACTED]

and the following responses were given¹³:

- [REDACTED]
- [REDACTED];
- [REDACTED];
- [REDACTED];
- [REDACTED].

Other participants noted that they were [REDACTED]

Another participant also stated that they were now moving forward with [REDACTED]

We also asked [REDACTED] if they thought they would [REDACTED]. Not surprisingly, this proved to be a [REDACTED]. As the figure below shows, the majority of respondents [REDACTED]. However, there is still potential for some of the [REDACTED] believed they would [REDACTED].

¹³ Multiple responses were allowed per participant (up to 3).

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Figure 11: Do you think [REDACTED]



[REDACTED] participants were then asked if the program [REDACTED] Of the respondents asked, [REDACTED] said "no" and [REDACTED] did not know [REDACTED] [REDACTED]. Ten participants said [REDACTED], and the following ideas were shared:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED] Standard customers are [REDACTED] of insulation costs and [REDACTED] of air sealing costs [REDACTED] respectively, i [REDACTED]¹⁴. The table below shows incentive levels for other Home Performance-type programs across the country, ranging from 10% to 75% of project costs.

¹⁴ Columbia Gas of Ohio 2011 DSM Application.

Table 13: Home Performance Incentives in Other Jurisdictions

Jurisdiction	Incentive Level
Consumers Energy MI	Up to \$3,500
New Jersey	Up to 50% of cost or \$5,000
NYSERDA	Up to 10% of cost or \$3,000; for Assisted program – up to 50% of cost or \$5,000
PEPCO Maryland	Up to 50% of cost or \$2,750
Efficiency Vermont	Up to \$2,100
MassSAVE	Up to 75% of cost or \$2,000
Wisconsin Focus on Energy	Up to 33% of cost or \$1,500; if income below 80% SMI, up to 75% of cost or \$2,000
Xcel Energy MN	Up to \$1,000

[REDACTED] customers also requested more information or assistance. [REDACTED]

Rebate Fulfillment Process

We reviewed the program's rebate fulfillment procedures and asked participating contractors and customers about their satisfaction with specific areas of the process. A detailed process flow diagram of the rebate fulfillment process completed by CSG is included in Appendix C with narrative information included in Appendix E. Below we discuss feedback received from contractors and customers.

Application Submittal and Review

Contractors rated their satisfaction with the [REDACTED] on a five-point scale. In a review of program data from the last two years (2012-2013), it was found that the average [REDACTED]

[REDACTED] contractors noted that the [REDACTED]

¹⁵ Based on program data of customers receiving audits from January 2012 to December 2013. Calculation omits [REDACTED]

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Rebate Payment

A review of program data over the last two years showed that it takes an [REDACTED] days for contractors to receive their rebate payment. Contractors were satisfied with the [REDACTED], giving a mean score of [REDACTED] on a five-point scale. Participants receiving [REDACTED] from the program, with a mean score of [REDACTED] on a five-point scale.

Program Communications with Contractors

The program interacts and communicates with qualified contractors at multiple levels. These communications include the following mediums:

- [REDACTED];
- [REDACTED];
- [REDACTED];
- [REDACTED];
- [REDACTED];
- [REDACTED].

[REDACTED] contractors interviewed mentioned [REDACTED], and contractors rated their satisfaction with [REDACTED] as a mean score of [REDACTED] on a five-point scale, with 5.0 being extremely satisfied. One contractor stated that during the program's [REDACTED]

¹⁶ Based on program data of customers receiving audits from January 2012 to December 2013. Calculation omits [REDACTED] records where a negative value was calculated (i.e. check mail date was before application received date).

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[REDACTED] with program staff, and suggested that a [REDACTED]

Contractors were also [REDACTED] satisfied with their interactions with CSG or other program staff and energy auditors, as shown in the figure below.

Figure 12: How satisfied are you with.... [REDACTED]



[REDACTED], some contractors also noted areas that could be improved. Four contractors stated that [REDACTED] would be appreciated. [REDACTED] noted that it could sometimes [REDACTED]

[REDACTED] Sometimes they have to [REDACTED]. The program notes that they communicate to contractors [REDACTED]

[REDACTED] The program may also want to provide additional reminders to contractors of this, such as in [REDACTED].

Other contractors had general suggestions on [REDACTED]. One contractor mentioned that when [REDACTED]

Contractor and Energy Auditor Requirements and Training

Energy auditors and participating contractors both have their own program requirements and training commitments that must be met. Details can be found in Appendix F.

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Participating Contractors

[REDACTED] contractors interviewed [REDACTED]. Contractors were also asked to rate the ease of the [REDACTED] on a five-point scale, with one being very easy and five being very difficult. A mean score of 3.2 was given, indicating that the [REDACTED] Some contractors spoke to this effect:

- [REDACTED]
- [REDACTED].
- [REDACTED].

[REDACTED] contractors remarked that the [REDACTED]; however COH notes that these are [REDACTED].

The program also offers [REDACTED]. Contractors rated the value of the [REDACTED] as a mean score of [REDACTED] on a five-point scale. Contractors believed that the program [REDACTED]

Other contractors had suggestions [REDACTED]
[REDACTED] contractors requested [REDACTED]

Some contractors also suggested [REDACTED]

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A sample of these jurisdictions are named in the table below, along with customer conversion rates as available.

Table 14:

the first time in the history of the world, the people of the United States have been called upon to determine whether they will submit to the law of force, or the law of the Constitution. We consider the contest as open, and are prepared to meet it at any point. We are determined to defend our rights, and to maintain our institutions.

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Benefits to using a [REDACTED] may include the following:

- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED] without challenges. However, these can be avoided by strong program requirements and implementation. Two primary concerns and potential solutions are noted below:

- [REDACTED]
- [REDACTED]

Quality Control

The program utilizes a scoring system created by CSG to evaluate the quality of work performed by participating contractors. The scoring system is intended to offer a [REDACTED].

Contractors are scored in four areas, described in the table below.

Table 15: Contractor Scoring Areas (proprietary to CSG)

Category	Description	Score Range	Comments
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

The total points for each score [REDACTED] with final scores for each area. Finally, an overall job score [REDACTED]

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distinct statuses are listed below:

1.

2.

3.

4.

Four

During contractor interviews we asked contractors whether they were familiar with [REDACTED] insulation and air sealing contractors²⁰ noted that they [REDACTED], while [REDACTED] HVAC contractors [REDACTED] HVAC contractors [REDACTED].

Contractors [REDACTED] were asked to rate their satisfaction on a five-point scale, and a mean score of [REDACTED] was given. One contractor noted that the [REDACTED] contractors believed that the [REDACTED]. One of these contractors noted that they have [REDACTED]. ILLUME reviewed the [REDACTED]

²⁰ Includes three contractors who perform both HVAC and air sealing/insulation services.



Please see Appendices C and E for additional details of the quality control process.

5.5 Review of Previous Process Recommendations

Key Findings:

Several recommendations were made in the previous HPS process evaluation. These recommendations are listed below, along with notes whether the program has implemented them.

Table 16: Previous Process Evaluation Recommendations

Recommendation	Implementation Status
1. Increase communication and collaboration between the field and office teams.	In Progress
2. Improve data collection and reporting processes.	Completed
3. Establish clear performance metrics and goals for the program.	In Progress
4. Implement a more systematic approach to quality control and inspection.	Completed
5. Provide regular training and support to field staff.	Completed
6. Develop a standardized protocol for handling customer complaints and issues.	In Progress
7. Improve the overall efficiency and timeliness of the program's operations.	In Progress
8. Ensure that all program activities are aligned with best practices and industry standards.	Completed
9. Implement a more structured approach to program evaluation and continuous improvement.	In Progress
10. Establish a formal feedback loop between customers and the program to inform improvements.	In Progress



5.6 Non-Energy Benefits

Key Findings:

- ■ ■ installed during energy audits taking place in 2013 resulted in ■ ■ ■ based on OH TRM assumptions. The

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EVALUATION RESULTS

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value of these [REDACTED] equates to [REDACTED]
[REDACTED].²¹

- Electricity savings from [REDACTED]
OH TRM, due to the [REDACTED]
- [REDACTED] savings from [REDACTED] installed in 2013 saved over [REDACTED]. The value of these savings equates to [REDACTED]²²
- The [REDACTED] savings for the program including benefits from [REDACTED]²³
- Both participants and contractors attribute other [REDACTED],
[REDACTED].

Recommendations:

- [REDACTED]
- [REDACTED]

The table below outlines the [REDACTED] associated with the HPS program and provides some insight into [REDACTED] that we [REDACTED] through this scope of work, along with suggestions for how COH could further explore these potential benefits.

²² Based on residential rates from [REDACTED].

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Attachment A

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EVALUATION RESULTS

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Table 17: Total Non-Energy (Non-Gas) Benefits*

Category	Description	Value
1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22	23	24
25	26	27
28	29	30
31	32	33
34	35	36
37	38	39
40	41	42
43	44	45
46	47	48
49	50	51
52	53	54
55	56	57
58	59	60
61	62	63
64	65	66
67	68	69
70	71	72
73	74	75
76	77	78
79	80	81
82	83	84
85	86	87
88	89	90
91	92	93
94	95	96
97	98	99
100	101	102
103	104	105
106	107	108
109	110	111
112	113	114
115	116	117
118	119	120
121	122	123
124	125	126
127	128	129
130	131	132
133	134	135
136	137	138
139	140	141
142	143	144
145	146	147
148	149	150
151	152	153
154	155	156
157	158	159
160	161	162
163	164	165
166	167	168
169	170	171
172	173	174
175	176	177
178	179	180
181	182	183
184	185	186
187	188	189
190	191	192
193	194	195
196	197	198
199	200	201
202	203	204
205	206	207
208	209	210
211	212	213
214	215	216
217	218	219
220	221	222
223	224	225
226	227	228
229	230	231
232	233	234
235	236	237
238	239	240
241	242	243
244	245	246
247	248	249
250	251	252
253	254	255
256	257	258
259	260	261
262	263	264
265	266	267
268	269	270
271	272	273
274	275	276
277	278	279
280	281	282
283	284	285
286	287	288
289	290	291
292	293	294
295	296	297
298	299	300
301	302	303
304	305	306
307	308	309
310	311	312
313	314	315
316	317	318
319	320	321
322	323	324
325	326	327
328	329	330
331	332	333
334	335	336
337	338	339
340	341	342
343	344	345
346	347	348
349	350	351
352	353	354
355	356	357
358	359	360
361	362	363
364	365	366
367	368	369
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379	380	381
382	383	384
385	386	387
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391	392	393
394	395	396
397	398	399
400	401	402
403	404	405
406	407	408
409	410	411
412	413	414
415	416	417
418	419	420
421	422	423
424	425	426
427	428	429
430	431	432
433	434	435
436	437	438
439	440	441
442	443	444
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448	449	450
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454	455	456
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463	464	465
466	467	468
469	470	471
472	473	474
475	476	477
478	479	480
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484	485	486
487	488	489
490	491	492
493	494	495
496	497	498
499	500	501
502	503	504
505	506	507
508	509	510
511	512	513
514	515	516
517	518	519
520	521	522
523	524	525
526	527	528
529	530	531
532	533	534
535	536	537
538	539	540
541	542	543
544	545	546
547	548	549
550	551	552
553	554	555
556	557	558
559	560	561
562	563	564
565	566	567
568	569	570
571	572	573
574	575	576
577	578	579
580	581	582
583	584	585
586	587	588
589	590	591
592	593	594
595	596	597
598	599	600
601	602	603
604	605	606
607	608	609
610	611	612
613	614	615
616	617	618
619	620	621
622	623	624
625	626	627
628	629	630
631	632	633
634	635	636
637	638	639
640	641	642
643	644	645
646	647	648
649	650	651
652	653	654
656	657	658
659	660	661
662	663	664
665	666	667
668	669	670
671	672	673
674	675	676
677	678	679
680	681	682
683	684	685
686	687	688
689	690	691
692	693	694
695	696	697
698	699	700
701	702	703
704	705	706
707	708	709
710	711	712
713	714	715
716	717	718
719	720	721
722	723	724
725	726	727
728	729	730
731	732	733
734	735	736
737	738	739
740	741	742
743	744	745
746	747	748
749	750	751
752	753	754
756	757	758
759	760	761
762	763	764
765	766	767
768	769	770
771	772	773
774	775	776
777	778	779
780	781	782
783	784	785
786	787	788
789	790	791
792	793	794
795	796	797
798	799	800
801	802	803
804	805	806
807	808	809
810	811	812
813	814	815
816	817	818
819	820	821
822	823	824
825	826	827
828	829	830
831	832	833
834	835	836
837	838	839
840	841	842
843	844	845
846	847	848
849	850	851
852	853	854
856	857	858
859	860	861
862	863	864
865	866	867
868	869	870
871	872	873
874	875	876
877	878	879
880	881	882
883	884	885
886	887	888
889	890	891
892	893	894
895	896	897
898	899	900
901	902	903
904	905	906
907	908	909
910	911	912
913	914	915
916	917	918
919	920	921
922	923	924
925	926	927
928	929	930
931	932	933
934	935	936
937	938	939
940	941	942
943	944	945
946	947	948
949	950	951
952	953	954
956	957	958
959	960	961
962	963	964
965	966	967
968	969	970
971	972	973
974	975	976
977	978	979
980	981	982
983	984	985
986	987	988
989	990	991
992	993	994
995	996	997
998	999	999

*Assumptions:

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Contractors were asked to rate the value of [REDACTED], in addition rating the value of the [REDACTED]. These ratings are summarized below:

- [REDACTED]
- [REDACTED]

Contractors also noted additional benefits to participating in the program. The table below summarizes these additional benefits.

Table 18: Contractor Benefits [REDACTED]

Benefit Mentioned	Number of Contractors*
[REDACTED]	[REDACTED]

*Total does not add up to [REDACTED], as some contractors listed multiple benefits.

While all of the aforementioned benefits clearly hold value for participants and contractors, [REDACTED]

CONCLUSIONS

ILLUME

6. CONCLUSIONS

The HPS program has demonstrated its ability to reach its energy savings goals and a [REDACTED]. Both participants and contractors express satisfaction with the program, and processes and procedures are [REDACTED]

Recommendations are meant to [REDACTED]
[REDACTED].

Key recommendations include:

▪ **Marketing:**

- [REDACTED]
- [REDACTED]
- [REDACTED]

▪ **Process:**

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

▪ **Players:**

- [REDACTED]
- [REDACTED]

These refinements may help the program continue to deliver reliable energy savings, [REDACTED], and improve satisfaction among participants and contractors.

ILLUME

A. PARTICIPATING CUSTOMER SURVEY

ILLUME

Columbia Gas of Ohio Home Performance Solutions Participant Survey Instrument

A.1 INTRODUCTION & WARM UP

Hello, my name is [INTERVIEWER NAME] with the Blackstone Group and we are calling recent participants of the Home Performance Solutions program on behalf of Columbia Gas of Ohio to learn about their experiences and satisfaction with the program.

This is not a sales call, and responses will be used for program evaluation purposes.

INTERVIEWER: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

May I please speak with [customername] or someone in your household who is familiar with the home energy audit that you received through Columbia Gas of Ohio? [IF THE PERSON WHO RECEIVED THE AUDIT IS NO LONGER THERE, THANK AND TERMINATE].

This survey will take about [REDACTED] minutes.

I1. [REDACTED]

1. [REDACTED]
2. [REDACTED]
98. [REDACTED]
99. [REDACTED]

[ASK IF I1 = 2, 98, 99; ELSE GO TO I3]

I2. [REDACTED]

1. (Yes)
2. (No) [Schedule call back]
8. (Don't know) [Schedule call back]

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9. (Refused) [Schedule call back]

First, I'd like to ask you a few questions about your household.

I3.

1. (Yes)
2. (No) [THANK & TERMINATE]
98. (Don't know) [THANK & TERMINATE]
99. (Refused) [THANK & TERMINATE]

I4. Are you, or is anyone in your household,

1. (Yes) [THANK & TERMINATE]
2. (No)
3. (Don't know) [THANK & TERMINATE]
4. (Refused) [THANK & TERMINATE]

I5. Are you or one of the heads of your household

1. (Yes)
2. (No)
8. (Don't know)
9. (Refused)

A.2 PROGRAM MARKETING AND MESSAGING

M1.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
00.
98.
99.

M2.

?

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

[ASK IF M2=1, ELSE SKIP TO M4]

M3. [REDACTED]

1. Very useful
2. Somewhat useful
3. Not very useful
4. Not at all useful
98. (Don't know)
99. (Refused)

[ASK IF M3=1 OR 2]

M3a. [REDACTED]

[ASK IF M3=3 OR 4]

M3b. [REDACTED]

M4. [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 5.
- 7.
- 8.
- 00.
- 98.
- 99.

M5. On a scale of 1-5 with 1 being "not at all" [REDACTED] and 5 being "extremely" [REDACTED]
[RECORD NUMBER, 98=Don't know, 99=Refused]

M6. [REDACTED]

- 1.
- 2.
- 3.
- 4.

A.3 AUDIT PROCESS AND SATISFACTION

Now I would like to talk with you about the energy audit process.

A1.

- 1. Nothing
- 2. Very little
- 3. Some
- 4. A lot
- 98. (Don't know)
- 99. (Refused)

A2.

- 1. Nothing
- 2. Very Little
- 3. Some
- 4. A lot
- 98. (Don't know)
- 99. (Refused)

A3.

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

A4.

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

[SKIP A5 IF A3<>1]

A5. How useful was this information to you? Was it...

- 1. Very useful
- 2. Somewhat useful
- 3. Not at all useful
- 98. (Don't know)
- 99. (Refused)

[ASK IF A5=2 or 3, ELSE SKIP TO A6]

A5a.

A6.

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

A7. On a scale of 1 to 5, where 1 means not satisfied at all and 5 means extremely satisfied, how satisfied were you with the [REDACTED]

- a.
- b.
- c.
- d.
- e.
- f.
- g.

A8. [REDACTED]

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

[ASK IF A8=1, ELSE SKIP TO NEXT SECTION]

A9. [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 98.
- 99.

A.4 AUDIT FOLLOW-THROUGH

Now I have a few more questions about your experience with the program.

For Installing Participants

IN1. Our records show that you received [REDACTED]

[REDACTED]. On a scale of 1 to 5, where 1 means not satisfied at all and 5 means extremely satisfied, how satisfied were you with the following areas?

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- a.
- b.
- c.
- d.
- e.
- f.

For [REDACTED]

[ASK QUESTIONS IN SECTION 4.2 ONLY IF [REDACTED]]

AO1. [REDACTED]

- 1. (Yes)
- 2. (No) [SKIP TO AO5]
- 98. (Don't know) [SKIP TO SECTION 5]
- 99. (Refused) [SKIP TO SECTION 5]

[ASK IF AO1=1]

AO2. [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 00
- 98
- 99

[Ask if AO1=1]

AO3. [REDACTED]

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

[Ask if AO3=2 OR 98]

AO4. [REDACTED]

- 1. (Yes) [IF YES, ASK THE RESPONDENT QUESTION IN1 b-f]
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

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Attachment A

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ILLUME

[Ask if AO1=2]

AO5.

1.
2.
3.
4.
5.
6.

00
98
99

[Ask if AO5=5]

AO5a.

1.
2.
3.
4.
5.
98
99

[Ask if AO5=5]

AO5b.

1.
2.
3.

00.
98.
99.

[ASK IF AO1=2]

AO6.

1.
2.
3.
4.
98
99

[ASK IF AO1=2]

AO7.

1. (Yes)

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

[Ask if AO7=1]

AO8. [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 5.
- 00
- 98
- 99

A.5 [REDACTED]

We are almost done; I just have a few final questions.

D1. [REDACTED]

- 1.
- 2.
- 00.
- 98.
- 99.

D2. [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 00
- 98
- 99

D2a. [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 5.
- 00
- 98
- 99

D3. [REDACTED]

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1. [NUMERIC OPEN END]
98. (Don't know)
99. (Refused)

D4. [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 98
- 99

D4a. [REDACTED]

D5. [REDACTED] time year [REDACTED]

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 98
- 99

D6. Which of the following categories best represents your annual household income from all sources in 2013, before taxes? Please tell me when I get to your range.

1. Less than \$25,000
2. Between \$25,000 and \$50,000
3. \$50,000 to \$100,000
4. Over \$100,000
98. (Don't know)
99. (Refused)

D7. What is your age?

1. (24 yrs or younger)
2. (25 to 34 yrs)
3. (35 to 44 yrs)
4. (45 to 54 yrs)

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- 5. (55 to 64 yrs)
- 6. (65 years and over)
- 98. (Don't know)
- 99. (REFUSED)

D8. [REDACTED]

1.
2.
3.
4.
5.
6.
98
99

A.6 THANK YOU AND CLOSING

Those are all the questions I have for you today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation in this survey.

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B. PARTICIPATING CONTRACTOR INTERVIEW GUIDE

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Columbia Gas of Ohio Home Performance Solutions Participating Contractor Interview Guide

[NOTE: This document will be used as a guide to conduct in-depth interviews with participating contractors. Questions listed will be used to learn more about the contractors' experience with the program, areas of strength or success, areas for improvement, and satisfaction with various aspects of the program and the program overall.]

B.1 INTRODUCTION & WARM UP (1-3 MIN)

Hello, may I please speak with [CONTACT NAME]? My name is [INTERVIEWER NAME]. I am calling on behalf of the Columbia Gas of Ohio's Home Performance Solutions program.

We are evaluating the Home Performance Solutions program and would like to ask you a few questions about your company's participation in the program. Are you familiar with your company's participation in the Home Performance Solutions program? [IF NO, ASK IF CAN SPEAK WITH SOMEONE FAMILIAR WITH THE PROGRAM.]

This interview should take approximately [REDACTED] minutes of your time and all of your responses will remain confidential and will help us improve the program for the future. Is now a good time, or is there a more convenient time for me to call you back? [CONTINUE WITH SURVEY OR MAKE AN APPOINTMENT TO CALL BACK.]

Before we start, I would like to ask for your permission to tape-record this interview, so that I won't have to take notes while we talk. I would like to once again assure you that all of your responses will remain confidential.

1. [REDACTED]

- a.
- b.
- c.
- d.
- e.
- f.

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g. [REDACTED]

2. [REDACTED]
[REDACTED]

a. [REDACTED]
b. [REDACTED]
c. [REDACTED]

B.2 PROGRAM PARTICIPATION (3-5 MIN)

1. [REDACTED]

a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. [REDACTED]
f. [REDACTED]

2. [REDACTED]

a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. [REDACTED]

3. [REDACTED].

a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]

4. [REDACTED]
[REDACTED]

a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. [REDACTED]

5. On a scale of 1 to 5, with 1 being not at all valuable and 5 being extremely valuable,
[REDACTED]

6. [REDACTED]

a. [REDACTED]

- b. [REDACTED]
- c. [REDACTED]
- d. [REDACTED]

B.3 PROGRAM PROCESSES AND COMMUNICATIONS (10 MIN)

Now I have some questions about program requirements and operations.

Contractor Enrollment and Training

1. On a scale of 1-5, with 1 being very difficult and 5 being very easy, how would you rate the process [REDACTED]
[REDACTED]
a. [REDACTED]
2. [REDACTED]
3. On a scale of 1 to 5, with 1 being not at all valuable and 5 being extremely valuable, how valuable [REDACTED]
[REDACTED]
a. [REDACTED]
4. [REDACTED]

Program Communications

Next I have a few questions about program communications and your interactions with the program.

5. [REDACTED]
a. [REDACTED]
b. [REDACTED]
c. [REDACTED]
d. [REDACTED]
e. [REDACTED]
6. On a scale of 1 to 5, with 1 being very dissatisfied and 5 being very satisfied, how satisfied are you with the following:
a. [REDACTED]
b. [REDACTED]
c. [REDACTED]

[REDACTED] How could these [communications/ interactions] be improved?

Incentive Paperwork, Processing, and Incentives

Now I have some questions about the program's incentive offerings and paperwork requirements.

7. On a scale of 1 to 5, with 1 being very dissatisfied and 5 being very satisfied, how would you rate the following....

- a. [REDACTED]
- b. [REDACTED]
- c. [REDACTED]
- d. [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

Program QA/QC

8. [REDACTED]
9. (ASK IF 18=YES) On a scale of 1 to 5, where 1 is very dissatisfied and 5 is very satisfied, how satisfied are you [REDACTED]
- a. [REDACTED]
10. Is there anything the program could do to better help you meet [REDACTED]
[REDACTED]

B.4 CUSTOMER MARKETING AND PERCEPTIONS (5 MIN)

Next I have a few questions about program marketing and customer benefits and barriers.

1. On a scale of 1 to 5, with 1 being very dissatisfied and 5 being very satisfied, how would you rate the program's [REDACTED]
- a. [REDACTED]
2. [REDACTED]

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- a. [REDACTED]
3. [REDACTED] communicate to customers in their marketing materials?

B.5 CONTRACTOR BARRIERS AND BENEFITS (5 MIN)

Now I have just a few more questions about your experience overall and the key barriers and benefits of your participation in the program.

1. On a scale for 1 to 5, where 1 is extremely dissatisfied and 5 is extremely satisfied, how would you rate [REDACTED]?
2. [REDACTED]
a. [REDACTED]
3. [REDACTED]?

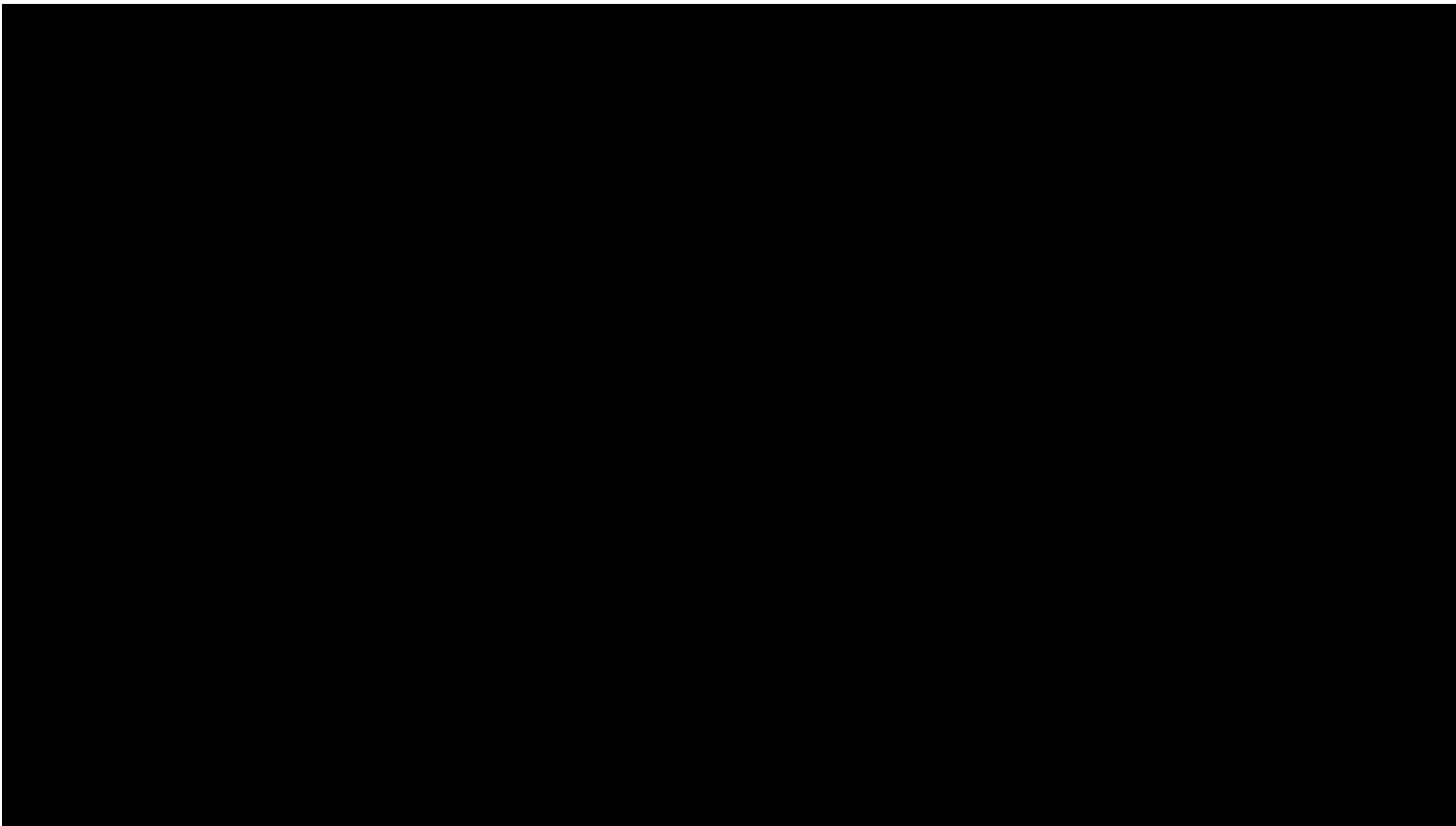
B.6 CLOSING (1-5 MIN)

1. Is there anything else that you would like to share that we have not already discussed?

That is all I have for today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation.

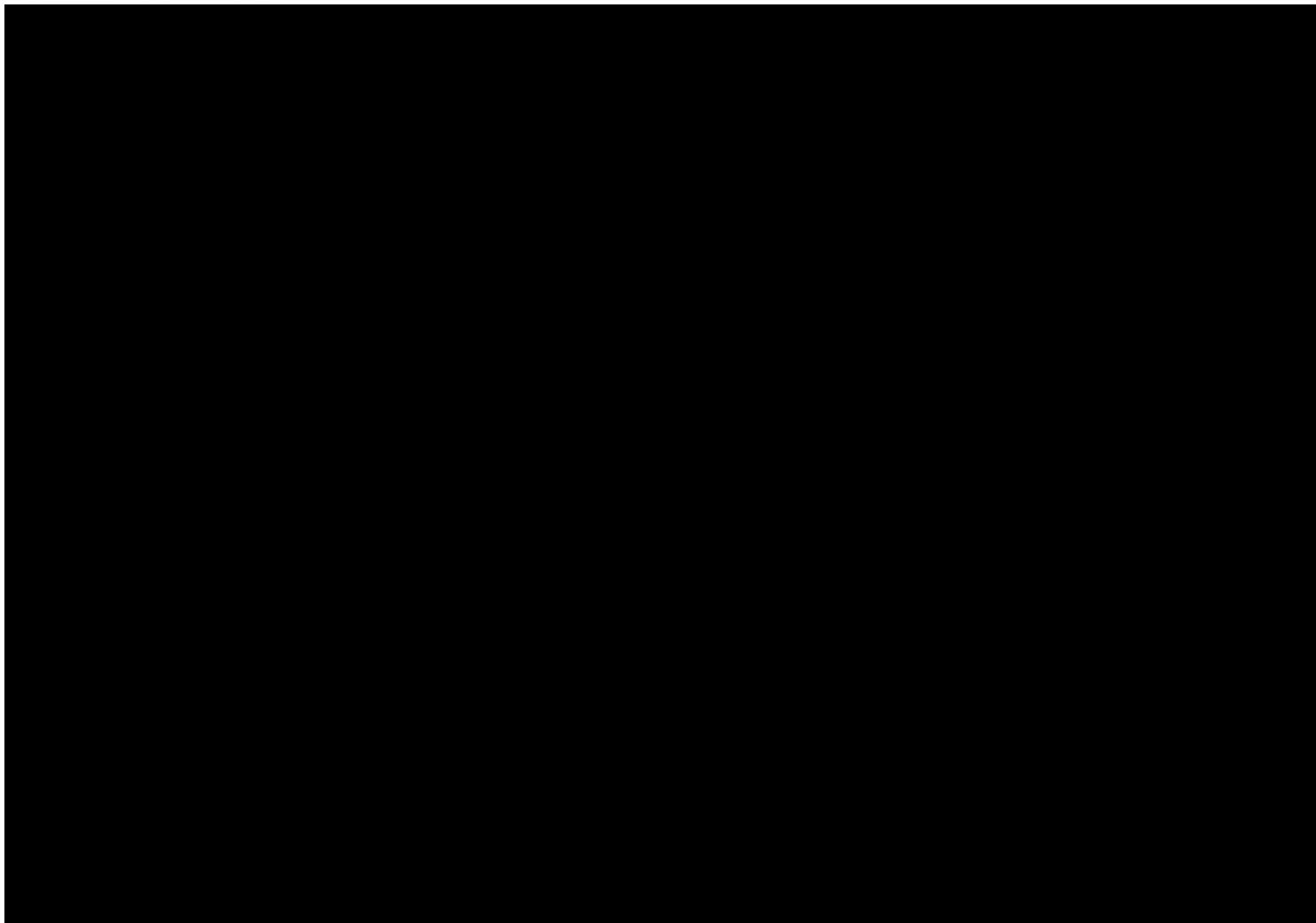
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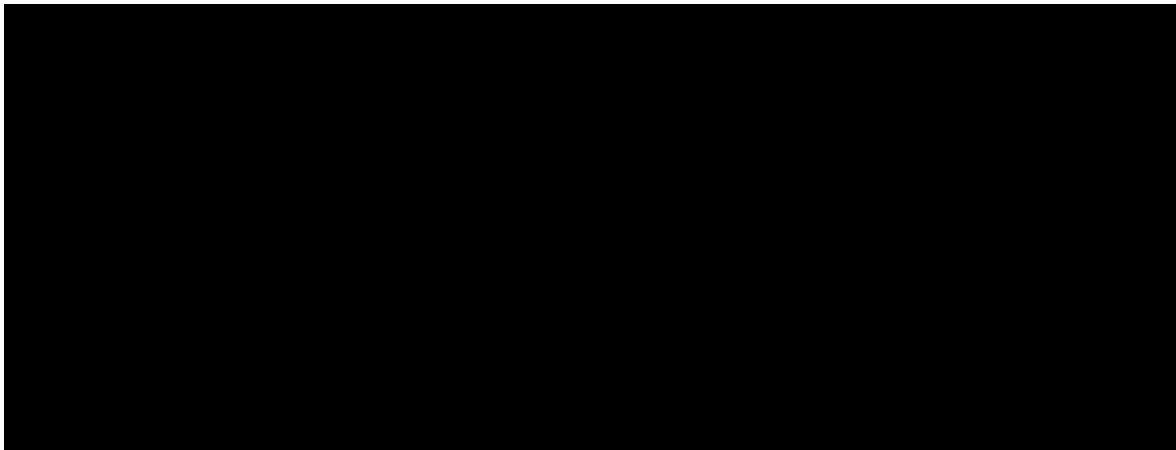
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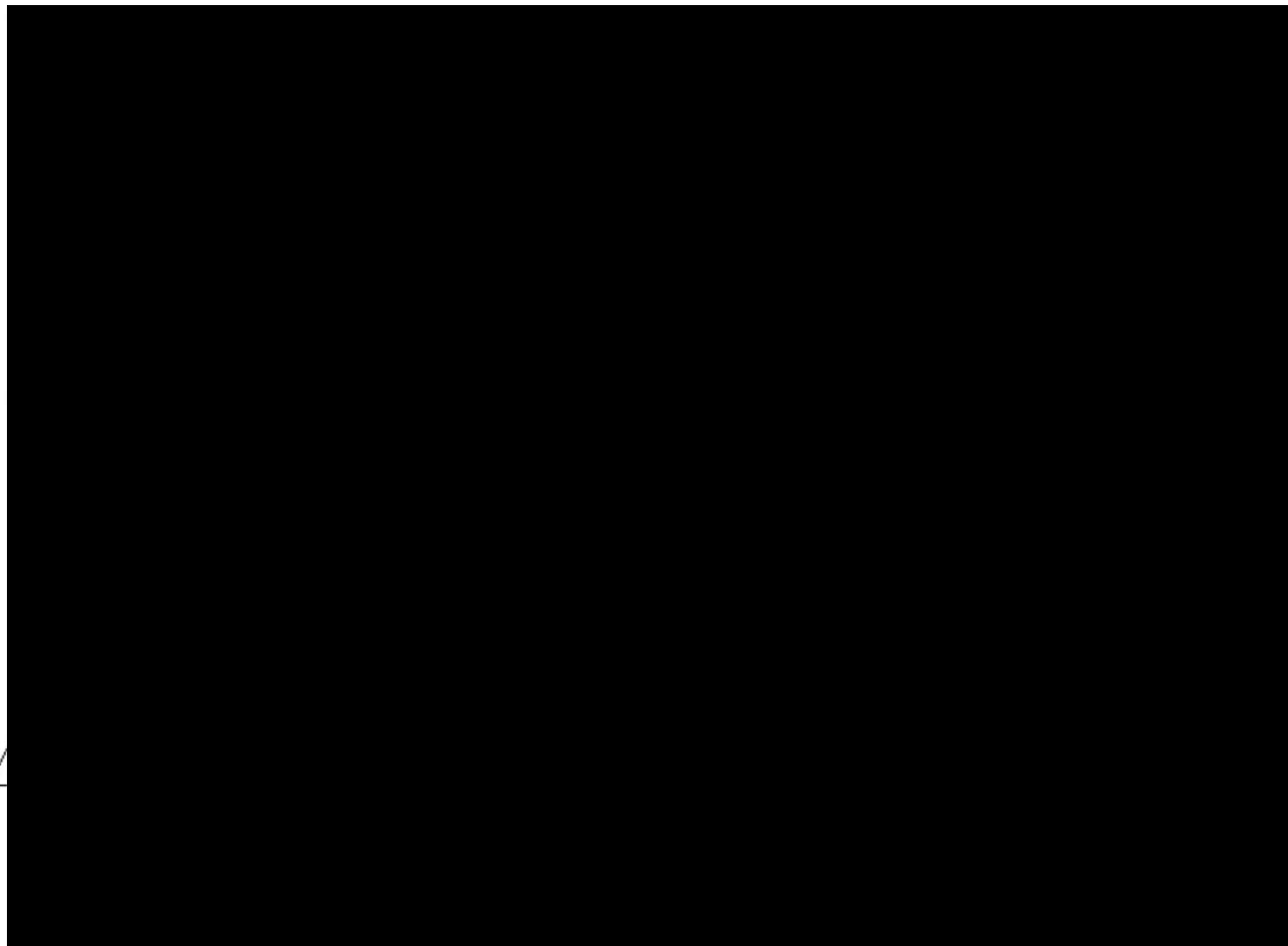
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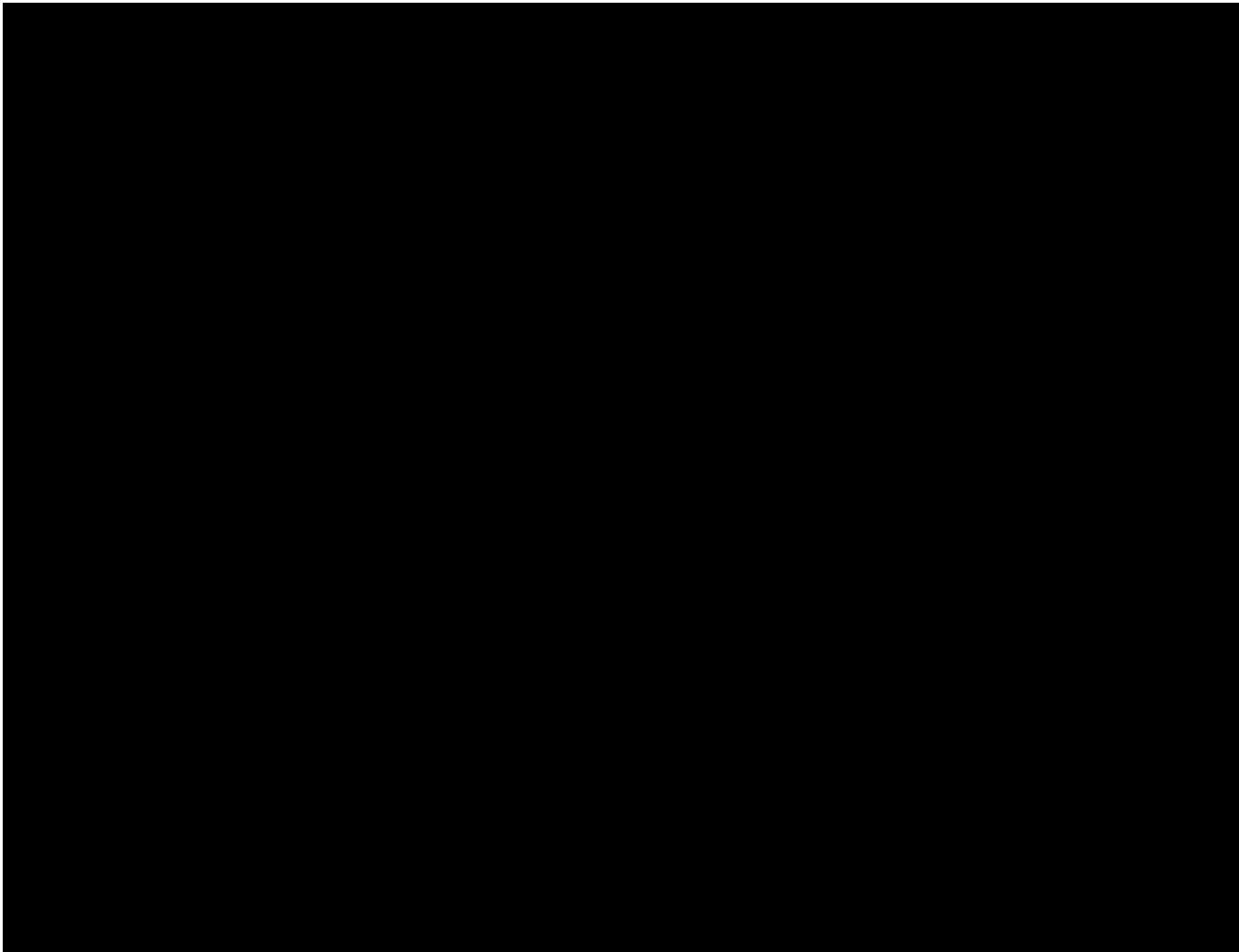
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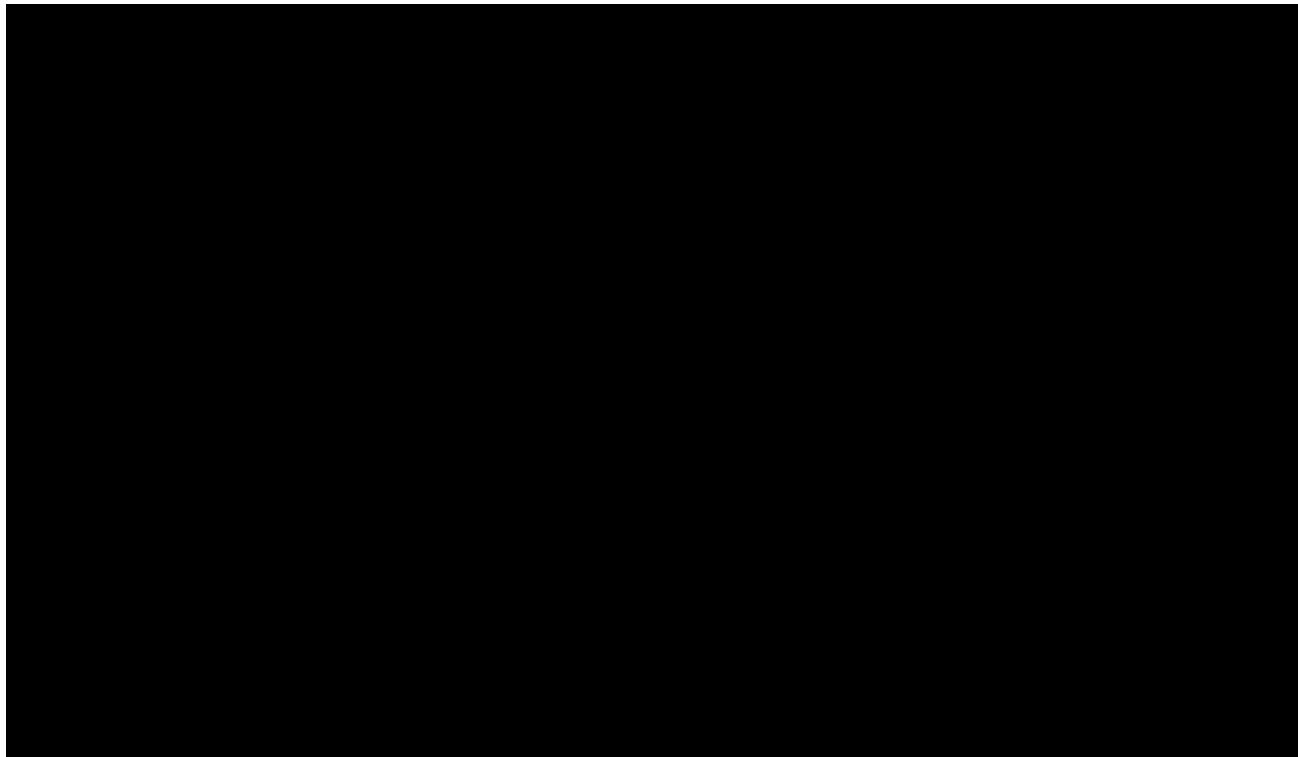
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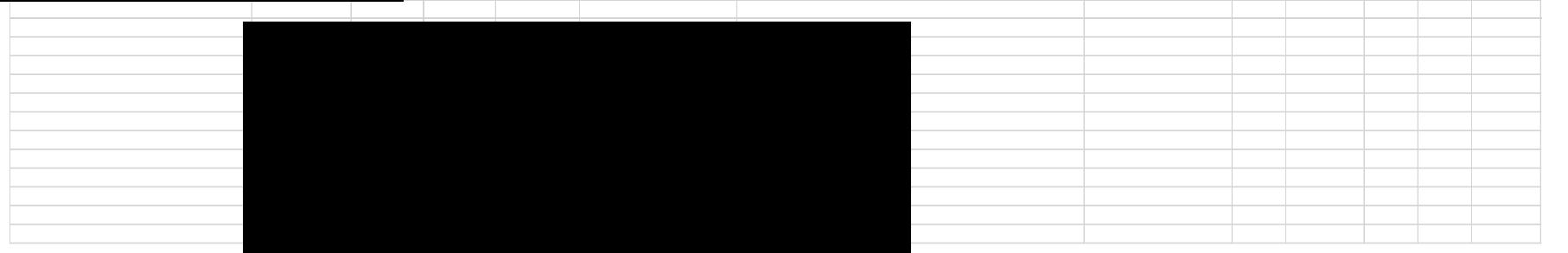
COH HPS Flow – New Contractors



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D.



E. HPS PROCESS

E.1 Energy Audit and Measure Installation Process

We reviewed the program's energy audit and measure installation process, in addition to discussing various parts of the process and gauging satisfaction levels with both program participants and qualified contractors. Detailed process flow diagrams of the pre-energy audit process (sign-up and scheduling), the income verification process, the energy audit process, and post-energy audit steps have been completed by CSG and referential copies are included in Appendix C. Below we describe these processes at a higher level and discuss feedback received from contractors and customers.

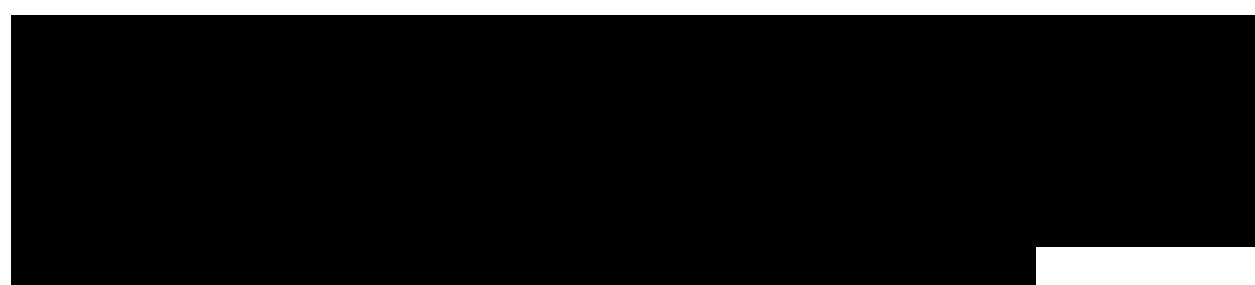
E.2 Energy Audit Sign-up and Scheduling

- [REDACTED]
- [REDACTED];
- [REDACTED]
- [REDACTED].

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Attachment A
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E.3 The Energy Audit

1.

2.

3.

4.

5.

6.

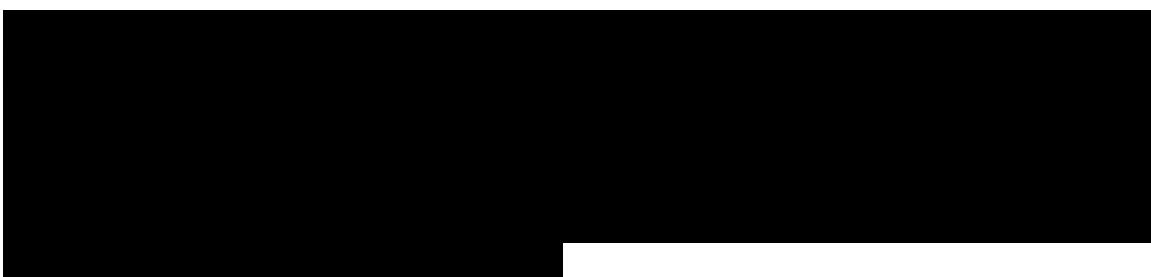
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Attachment A

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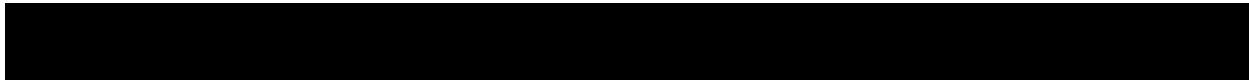
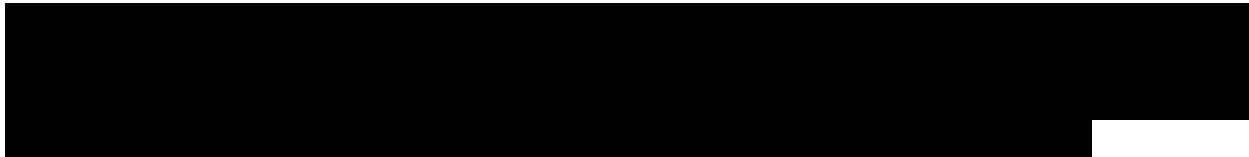
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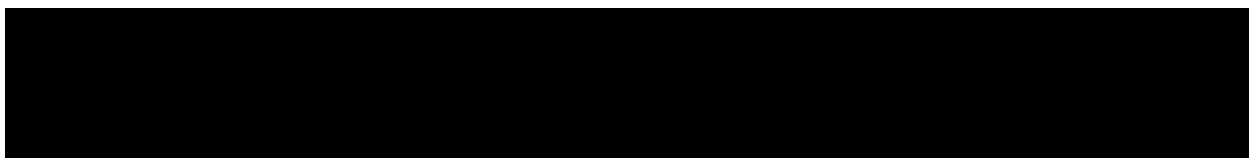


8.

uditor will also discuss with the customer any potential roadblocks (knob



E.4 Application Submittal and Review



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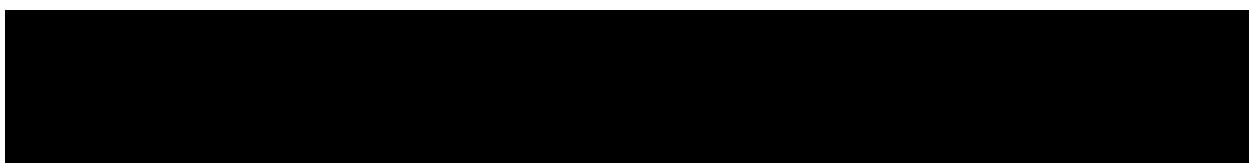
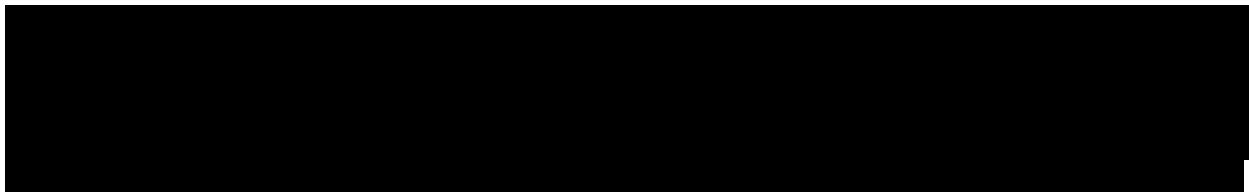
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E.5 Rebate Payment



E.6 Quality Control



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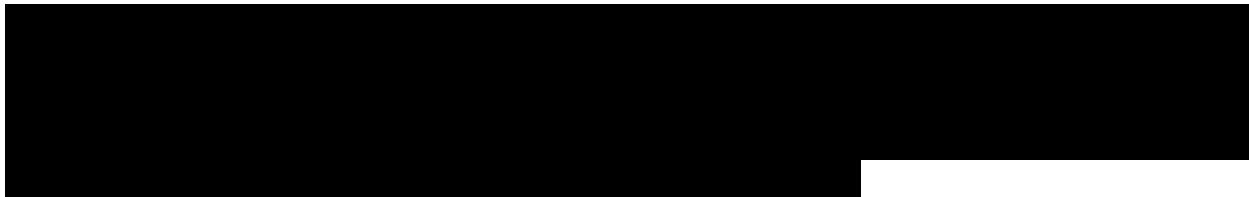
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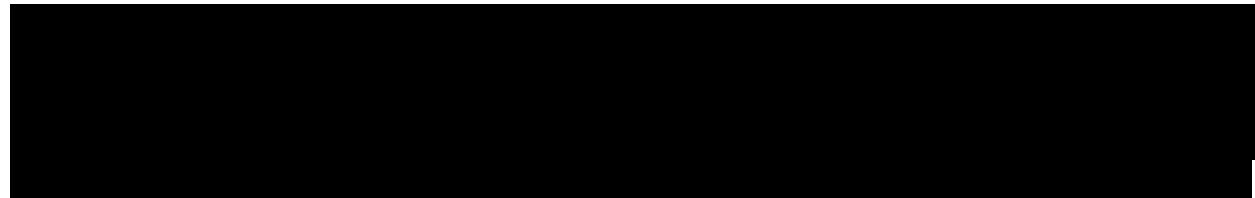


- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]



F. CONTRACTOR AND ENERGY AUDITOR REQUIREMENTS & TRAINING

F.1 Participating Contractors



Some contractor requirements are for all contractors, while others are specifically for either insulation/air sealing or HVAC contractors. These requirements are summarized in the table below.

Table 19: Contractor Requirements for Participation

Requirement Description
All Contractors:
1. Demonstrate capacity to conduct business successfully for program.
2. Review and sign Contractor Participation Agreement.
3. Submit quality control procedures.
4. Submit customer complaint resolution procedures.
5. Be in good standing with the Better Business Bureau.
6. Provide at least three trade references.
7. Provide five customer references that agree to QC inspection.
8. Conduct and pass background checks for all named employees.
9. Procure and maintain worker's compensation insurance, comprehensive general liability insurance, and automotive liability insurance at specified levels.
10. Maintain relevant licenses for work in the trades undertaken in program.
11. Agree to set pricing schedule for Assisted customers.
12. Attend program orientation (4 hours).
13. Attend training on materials and installation standards (3 days, \$750).
Insulation/Air Sealing Contractors:
14. BPI Building Analyst Certification and Residential Building Envelope Whole House Air Leakage Control Installer certifications for employees acting as supervisors.
15. EPA Lead-Safe Certified and a Certified Renovator must perform or direct each program job.
16. Purchase the following equipment: - Blower door - Digital pressure differential gauge - Infrared thermal camera
HVAC Contractors:
14. NATE Installation certified crew lead on every program job with emphasis on natural gas furnace replacement.
16. Purchase the following equipment: - Combustion analyzer - Digital pressure differential gauge - Combustible gas detector

If a contractor meets the requirements above, they attend a program orientation and training session. CSG has also created a process map detailing the enrollment process for new contractors in Appendix C.

ILLUME

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

F.2 Energy Auditors

Energy auditors are employees of CSG and must adhere to CSG's specific organizational requirements. Additional program-specific requirements must be met as well, and include the following:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

Energy auditors also attend several trainings throughout the year. Quarterly full

Impact Evaluation of Columbia Gas of Ohio's Simple Energy Solutions Program

Final Report

February 13, 2014

Prepared by:

Michael Blasnik
M. Blasnik & Associates Boston, MA
mb@michaelblasnik.com

Executive Summary

This report to Columbia Gas of Ohio's ("Columbia") Demand Side Management ("DSM") team provides impact evaluation results of the company's Simple Energy Solutions ("SES") program.

Simple Energy Solutions is a DSM program that provides Columbia's residential customers with rebates of \$10 toward the purchase of energy efficient showerheads and \$25 towards the purchase of programmable thermostats¹ with the purpose of helping Columbia's customers manage their natural gas usage and bills.

This report assesses the energy savings achieved by SES based on [REDACTED]

[REDACTED]. A prior impact analysis² [REDACTED]

Variations in [REDACTED]

A key objective of the impact evaluation [REDACTED]

The [REDACTED]
provided by Columbia's [REDACTED]

Results

Table 1 summarizes the [REDACTED]

[REDACTED] based on the DSM Action Plan [REDACTED]

Homes [REDACTED]

Participants

Thermostat



Showerhead

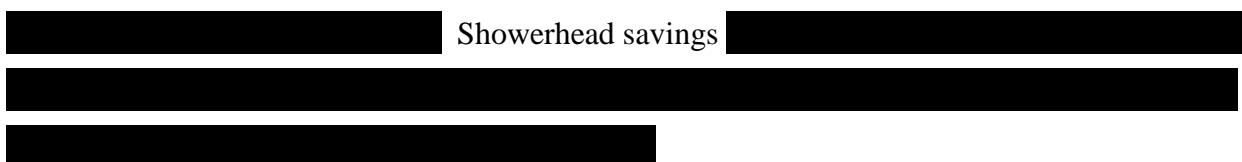


SES participants who received thermostat rebates [REDACTED]



SES

showerhead [REDACTED]



Program cost-effectiveness was assessed using the Total Resource Cost (“TRC”) test and the Utility Cost Test (“UCT”, also known as the Program Administrator’s Cost Test or “PACT”)



The analysis [REDACTED]



Conclusions and Recommendations

Overall, SES [REDACTED]

Showerhead [REDACTED]

The following recommendations should be considered based on the analysis:

1. [REDACTED]

2. [REDACTED]

Methodology

The natural gas savings achieved by SES [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED].

The Comparison Group

The [REDACTED] described [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

- [REDACTED]
- [REDACTED],
- [REDACTED]
- [REDACTED]
[REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]

Some of [REDACTED]

[REDACTED], but some [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Data Collection

The primary data sources [REDACTED]

[REDACTED]
[REDACTED]

EFI [REDACTED]

[REDACTED]
[REDACTED]

The tracking system [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Columbia provided [REDACTED]

[REDACTED]
[REDACTED]

Data Preparation

The first step in the [REDACTED]

[REDACTED] This process involved:

- Identify [REDACTED] based on [REDACTED]
[REDACTED] Successful [REDACTED] were [REDACTED]
[REDACTED].
- The [REDACTED] started [REDACTED]
[REDACTED] Customers [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
- The natural gas [REDACTED]
[REDACTED].

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- [REDACTED]
[REDACTED].

The resulting dataset included [REDACTED] for about [REDACTED] participants in the [REDACTED]
[REDACTED] and [REDACTED].

Weather Normalization

The weather normalization [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED].

Weather normalization [REDACTED]:

- [REDACTED]
[REDACTED]

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- [REDACTED]
 - [REDACTED],
 - [REDACTED]

This [redacted]

A horizontal bar chart comparing various weather parameters. The y-axis lists the parameters: 'weather normalization', 'temperature', 'humidity', 'precipitation', 'wind', 'cloudiness', and 'atmospheric pressure'. The x-axis represents the magnitude of each parameter. The bars are black, except for the 'weather normalization' bar which is highlighted in yellow.

Parameter	Value (approximate)
weather normalization	1.0
temperature	0.8
humidity	0.7
precipitation	0.6
wind	0.5
cloudiness	0.4
atmospheric pressure	0.3

Potential Biases

The evaluation was designed to reduce potential bias [REDACTED] [REDACTED] potential [REDACTED] ses. [REDACTED] bias – [REDACTED].

Three main sources of potential bias include:

1. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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Addressing these [REDACTED] in greater detail through [REDACTED]
[REDACTED] – although the [REDACTED]

Natural Gas Savings Impacts

Simple Energy Solutions (SES) launched in 2009 and provides rebates to Columbia customers for purchasing very energy efficient (≤ 1.8 gallons per minute) showerheads and programmable thermostats. SES involved [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED].

SES Participation

Table 2 summarizes SES program participation for 2011 [REDACTED]

Table 2. SES Program Participation in 2011

	2011		
	Plan	[REDACTED]	[REDACTED]
Thermostat Total	[REDACTED]	[REDACTED]	[REDACTED]
Showerhead Total	[REDACTED]	[REDACTED]	[REDACTED]
All Units/Participants	[REDACTED]	[REDACTED]	[REDACTED]

Participation levels [REDACTED] for [REDACTED]. Overall, SES distributed [REDACTED]. [REDACTED]
[REDACTED]
[REDACTED].

SES Natural Gas Savings Results

The natural gas savings analysis [REDACTED] for [REDACTED] – showerheads and thermostats. Of the [REDACTED] [REDACTED] with [REDACTED]

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[REDACTED]. To provide [REDACTED] of savings [REDACTED], the analysis focused on [REDACTED]
[REDACTED]. Savings appeared to [REDACTED]
[REDACTED]

Table 3. Simple Energy Solutions Natural Gas Savings Results (ccf/yr)

The figure is a treemap visualization showing the distribution of participants across different energy efficiency measures. The total area is divided into three main sections: Participants (top left), # Homes (top center), and Projected Savings (top right). The Participants section is further divided into Thermostat and Showerhead categories. Each category is represented by a large black rectangle, which is subdivided into smaller rectangles representing individual participants. The # Homes section shows a similar hierarchical structure. The Projected Savings section is mostly white with a few small black rectangles.

Category	Sub-Category	Count
Participants	Thermostat	~100
	Showerhead	~50
# Homes	~100	
Projected Savings	Plan	~10

The overall weather normalized natural gas usage [REDACTED]
[REDACTED]
[REDACTED] The net savings were [REDACTED]
[REDACTED]
[REDACTED]. The net savings [REDACTED]
[REDACTED]. The analysis was designed to [REDACTED] as similar to the [REDACTED]
[REDACTED]
[REDACTED]
The thermostat [REDACTED] net savings of

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purchased t [REDACTED]

[REDACTED] The [REDACTED]

[REDACTED]. In contrast, customers who [REDACTED]

[REDACTED] thermostat – [REDACTED].

The [REDACTED]

For showerheads, the [REDACTED]

SES Cost-Effectiveness

The evaluation examined program cost-effectiveness using the Total Resource Cost (“TRC”) test and the Utility Cost Test (“UCT”) based on the [REDACTED]

The appropriate [REDACTED] to use for [REDACTED]

[REDACTED] The approach in the [REDACTED]

[REDACTED], to some extent, [REDACTED]
[REDACTED]. Some [REDACTED] [REDACTED]

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employing a [REDACTED]
[REDACTED]

The TRC [REDACTED] to the [REDACTED]
[REDACTED]

[REDACTED] These [REDACTED].

The UCT [REDACTED]

[REDACTED] to the TRC [REDACTED]
[REDACTED] UCT [REDACTED].

The [REDACTED] (for showerheads)

[REDACTED] It also

[REDACTED] such as [REDACTED]
[REDACTED]

Table 4 summarizes the [REDACTED] of SES and the [REDACTED]
[REDACTED]
[REDACTED].

Table 4. SES Cost/Benefit Analysis

[REDACTED]

The program appears to have been [REDACTED]
[REDACTED] From a UCT perspective, [REDACTED]. If the [REDACTED]
[REDACTED].

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The [REDACTED] using [REDACTED]
[REDACTED] indicated that this [REDACTED] overall
but [REDACTED]
[REDACTED]
Updated [REDACTED] on the [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Conclusions and Recommendations

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

The following recommendations should be considered based on the analysis:

1. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
2. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

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ILLUME

Columbia Gas of Ohio Simple Energy Solutions

Final Report

Prepared for:

Columbia Gas of Ohio

June 26, 2014

Contact Name:

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EXECUTIVE SUMMARY

ILLUME

1. EXECUTIVE SUMMARY

1.1 Introduction and Program Overview

Illume Advising, LLC (ILLUME) was commissioned by Columbia Gas of Ohio (COH) to conduct a process evaluation of the Simple Energy Solutions program.

Simple Energy Solutions (SES) offers rebates on energy efficient showerheads, faucet aerators, and programmable thermostats to eligible customers. The program [REDACTED] Energy Federation Incorporated (EFI) [REDACTED] the SES program, with [REDACTED] by Conservation Services Group (CSG). Columbia Gas of Ohio (COH) [REDACTED] with EFI and CSG [REDACTED].

The major tasks and goals of this process evaluation included [REDACTED]

1.2 Evaluation Methods

ILLUME developed our evaluation findings and recommendations based on [REDACTED], along with [REDACTED].

We also [REDACTED]

included the Public Utilities Commission of Ohio (PUCO) [REDACTED]

1.3 Key Findings and Recommendations

Overall [REDACTED]

Key Findings

- Participants thought it was [REDACTED] through the COH [REDACTED], [REDACTED]
- Participants were [REDACTED] with the rebates they received, giving them a [REDACTED].

EXECUTIVE SUMMARY

ILLUME

- Participants were [REDACTED]
[REDACTED] participants rated [REDACTED]
[REDACTED] participants [REDACTED].
- The program has [REDACTED]
[REDACTED] In 2013, the program accomplished [REDACTED]
of its [REDACTED]

The following recommendations are meant to [REDACTED] the SES program and [REDACTED]

Key recommendations:

- [REDACTED]
- [REDACTED].
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

INTRODUCTION

ILLUME

2. INTRODUCTION

Illume Advising, LLC (ILLUME) was commissioned by Columbia Gas of Ohio (COH) to conduct a process evaluation of its Simple Energy Solutions (SES) program. The major tasks and goals of the evaluation were:

- 1) [REDACTED]
- 2) [REDACTED]
- 3) [REDACTED]
- 4) [REDACTED]
- 5) [REDACTED]
- 6) [REDACTED]

3. PROGRAM DESCRIPTION

3.1 Overview

The SES program provides rebates on energy efficient showerheads, faucet aerators, and programmable thermostats to eligible customers. To be eligible, customers must be natural gas water-heating customers for showerheads and aerators and natural gas space-heating customers for thermostats. [REDACTED]

[REDACTED] Energy Federation Incorporated (EFI) for Columbia Gas of Ohio (COH). [REDACTED]

In 2013, the EFI [REDACTED] for the year were about [REDACTED] of which was [REDACTED] through CSG [REDACTED].

3.2 Program Objectives and Goals

The primary objective of the SES program is to encourage customers to save natural gas through low-cost measures that are also cost-effective.

[REDACTED]

Program goals are set over a five-year period (2012 to 2016) with

[REDACTED]

3.3 Program Delivery and Implementation

[REDACTED]

Customer rebates for the three products are:

Table 1: SES Measures and Rebate Levels

Measure	Rebate Amount per Unit
Energy Efficient Showerheads (max flow 1.8 gallons per min)	\$10.00
Energy Efficient Faucet Aerators (max flow 1.5 gallons per min)	\$0.50
Programmable Thermostats	\$25.00

On the Columbia Gas of Ohio [REDACTED] are also offered either

[REDACTED] for a
[REDACTED]
Customers may also [REDACTED]

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ILLUME

EVALUATION METHODS

Product limits include [REDACTED]

[REDACTED].

4. EVALUATION METHODS

The evaluation findings and recommendations are based on staff and participant interviews and a review of program data and materials.

4.1 Program Staff Interviews

In February and March of 2014, ILLUME conducted interviews with the COH SES program manager and evaluation team leader [REDACTED] and the EFI program manager and CSG marketing manager [REDACTED]. Interviews with COH, EFI, and CSG staff [REDACTED]

4.2 Participant Interviews

In April of 2014, [REDACTED] interviews were completed with COH [REDACTED]. Prior to launching the survey, approval was given by COH to [REDACTED].

The survey included [REDACTED]

To develop the sample population, COH provided ILLUME [REDACTED]

To ensure a [REDACTED]

below shows the [REDACTED] The table
to the [REDACTED] the survey compared

EVALUATION RESULTS

Page 6

Table 2: SES Participants Interviewed

10. The following table summarizes the results of the study. The first column lists the variables, the second column lists the estimated coefficients, and the third column lists the standard errors.

4.3 Review of Program Data and Materials

In addition to staff and participant interviews, the evaluation also included a review of program data and materials provided by COH, EFI, and CSG, including the following:

5. EVALUATION RESULTS

5.1 Program Participation Summary

Key Findings:

- **1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11** **12** **13** **14** **15** **16** **17** **18** **19** **20** **21** **22** **23** **24** **25** **26** **27** **28** **29** **30** **31** **32** **33** **34** **35** **36** **37** **38** **39** **40** **41** **42** **43** **44** **45** **46** **47** **48** **49** **50** **51** **52** **53** **54** **55** **56** **57** **58** **59** **60** **61** **62** **63** **64** **65** **66** **67** **68** **69** **70** **71** **72** **73** **74** **75** **76** **77** **78** **79** **80** **81** **82** **83** **84** **85** **86** **87** **88** **89** **90** **91** **92** **93** **94** **95** **96** **97** **98** **99** **100** **101** **102** **103** **104** **105** **106** **107** **108** **109** **110** **111** **112** **113** **114** **115** **116** **117** **118** **119** **120** **121** **122** **123** **124** **125** **126** **127** **128** **129** **130** **131** **132** **133** **134** **135** **136** **137** **138** **139** **140** **141** **142** **143** **144** **145** **146** **147** **148** **149** **150** **151** **152** **153** **154** **155** **156** **157** **158** **159** **160** **161** **162** **163** **164** **165** **166** **167** **168** **169** **170** **171** **172** **173** **174** **175** **176** **177** **178** **179** **180** **181** **182** **183** **184** **185** **186** **187** **188** **189** **190** **191** **192** **193** **194** **195** **196** **197** **198** **199** **200** **201** **202** **203** **204** **205** **206** **207** **208** **209** **210** **211** **212** **213** **214** **215** **216** **217** **218** **219** **220** **221** **222** **223** **224** **225** **226** **227** **228** **229** **230** **231** **232** **233** **234** **235** **236** **237** **238** **239** **240** **241** **242** **243** **244** **245** **246** **247** **248** **249** **250**

EVALUATION RESULTS

ILLUME

- [REDACTED]
- [REDACTED]

Recommendations:

- [REDACTED] o non
- [REDACTED]
- [REDACTED]

Geographic Dispersion of SES Participation

Columbia Gas of Ohio serves cities and townships in 61 out of 88 different counties in the state. ILLUME reviewed the geographical dispersion of SES customer participation taking place across COH's territory in 2013. As shown in the map below, the heaviest participation is primarily clustered in the Columbus and Toledo areas.

¹ [REDACTED]

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Attachment A

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EVALUATION RESULTS

ILLUME

Figure 1: Geographical Dispersion of 2013 SES Customers



[REDACTED] of SES customers in 2013 were [REDACTED]
shown in the table below. [REDACTED]

Table 3: 2013 Participation in [REDACTED]

Category	Count
Category 1	1000
Category 2	900
Category 3	800
Category 4	700
Category 5	600
Category 6	500
Category 7	400
Category 8	300
Category 9	200
Category 10	100
Category 11	50
Category 12	25
Category 13	10
Category 14	5
Category 15	2
Category 16	1

EVALUATION RESULTS

ILLUME

These geographic trends [REDACTED]

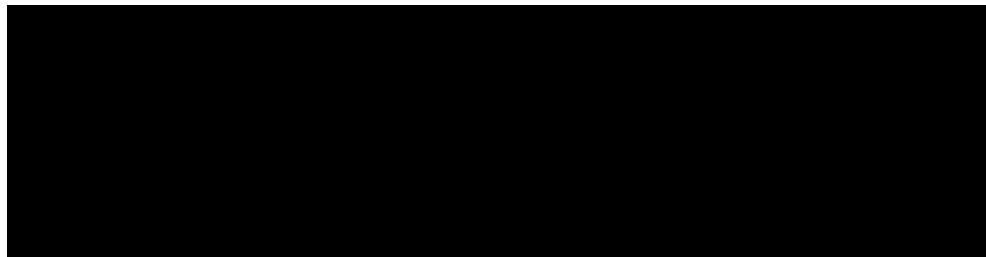
To [REDACTED]

Participation by Delivery Mechanism

Customers can purchase qualifying products [REDACTED]

Additionally, the program may [REDACTED] during the year at which [REDACTED].

Table 4: Number of Customers by [REDACTED]



Participation by Measure Type

Table 5 below shows the participation by measure type. Faucet aerators [REDACTED]

in 2013; however, program staff [REDACTED]

Table 5: Number of Measures Purchased in 2013



Several customers also [REDACTED]

[REDACTED]. The [REDACTED] customers [REDACTED]

However, [REDACTED]

The most popular measure [REDACTED]

PUBLIC VERSION - REDACTED**EVALUATION RESULTS****ILLUME**

Table 6: 2013 Customers Buying [REDACTED]

Measure	[REDACTED]
Showerheads	[REDACTED]
Programmable Thermostats	[REDACTED]
Faucet Aerators	[REDACTED]
<i>Customers Buying</i> [REDACTED]	
[REDACTED]	[REDACTED]

Table 7: Number of [REDACTED]

Measure	[REDACTED]
Showerheads	[REDACTED]
Faucet Aerators	[REDACTED]
Total Measures	[REDACTED]
[REDACTED]	

5.2 Program Marketing and Outreach

Key Findings:

- [REDACTED]
- [REDACTED]

EVALUATION RESULTS

ILLUME

Recommendations:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

Current Marketing and Outreach Efforts

Current marketing and outreach efforts for the SES program are [REDACTED]. The program [REDACTED] for showerheads and programmable thermostats [REDACTED]
[REDACTED].

Marketing and Outreach Strategies

Current customer messaging [REDACTED] (showerheads and thermostats), [REDACTED]. In 2013, program staff report that marketing efforts included the following:

- [REDACTED]
- [REDACTED]

EVALUATION RESULTS

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- [REDACTED]
- [REDACTED]

Specific to events, program staff report [REDACTED] the number of [REDACTED].

Customers were asked [REDACTED], with the results shown in Figure 2 below.

Figure 2: [REDACTED]



[REDACTED] believed that the [REDACTED]
[REDACTED]

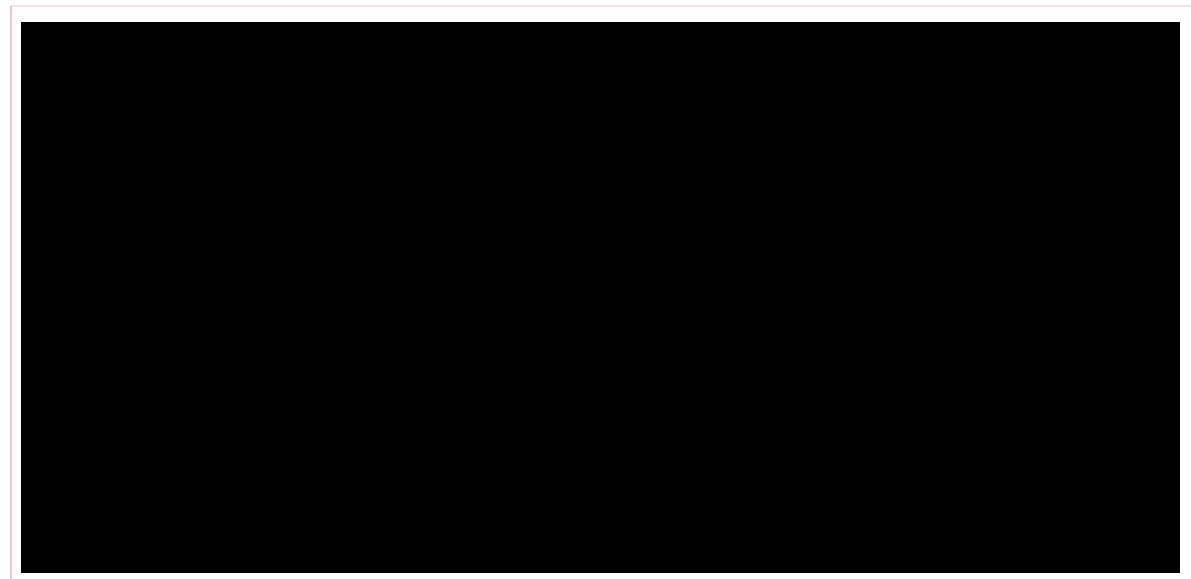
These participants were also [REDACTED]
[REDACTED].

² Three said they did not know.

EVALUATION RESULTS

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Figure 3: [REDACTED]



Customer Messaging and Motivations

Customer messaging [REDACTED]

[REDACTED]. Additionally,

[REDACTED] at the

[REDACTED]

messaging also [REDACTED]

The [REDACTED] noted by [REDACTED] to [REDACTED]
[REDACTED]. This was [REDACTED], and [REDACTED] shown
below.

PUBLIC VERSION - REDACTED

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EVALUATION RESULTS

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Figure 4:



Most SES participants report [REDACTED]. When asked to [REDACTED]

were also [REDACTED]

and then [REDACTED]

The figure below shows that [REDACTED]

was [REDACTED], followed by [REDACTED]

Figure 5:



5.3 Program Processes and Procedures

Key Findings:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

Recommendations:

- [REDACTED]

EVALUATION RESULTS

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- [REDACTED]
- [REDACTED]
- [REDACTED]

In the sections below we outline and discuss key findings related to program processes [REDACTED]

[REDACTED] Additionally, we discuss key findings [REDACTED]

COH [REDACTED] Customer [REDACTED]

Survey efforts explored [REDACTED] with their [REDACTED]
[REDACTED]. Customers were asked [REDACTED]

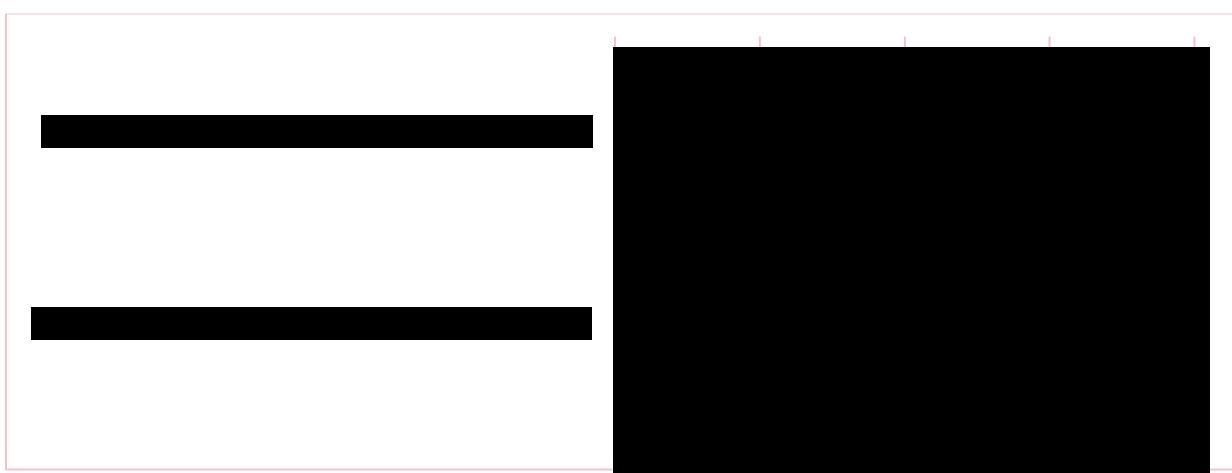
[REDACTED] Responding customers [REDACTED].

[REDACTED] customers were [REDACTED]

EVALUATION RESULTS

ILLUME

Figure 6:



Only [REDACTED] and were asked [REDACTED], if any, [REDACTED]. [REDACTED] noted the following:

- [REDACTED]
- [REDACTED]

Since just [REDACTED] and overall satisfaction levels [REDACTED], [REDACTED]. Additionally, if a customer is [REDACTED]

All customers were then [REDACTED]

Product [REDACTED]

Once a customer buys their showerhead, aerator, or thermostat, it is expected that [REDACTED]. Our survey efforts [REDACTED], including whether they [REDACTED], and [REDACTED].

Each measure is discussed in the sections below.

EVALUATION RESULTS

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Showerheads and Faucet Aerators

The [REDACTED] of customers [REDACTED] report that they [REDACTED], as shown in the figure below.

Figure 7: Did you [REDACTED]



[REDACTED] faucet aerators [REDACTED], as the program just began [REDACTED]

[REDACTED] Of [REDACTED]
these [REDACTED] reported that they [REDACTED]
[REDACTED] said that they [REDACTED]
[REDACTED]; see Table 8 below for [REDACTED] aerators [REDACTED]. This resulted in a [REDACTED] [REDACTED] This is a [REDACTED]
therefore the [REDACTED] [REDACTED]. However, the [REDACTED] The

[REDACTED]
program should [REDACTED] into their [REDACTED]

Of those participants who [REDACTED] stated [REDACTED]
that [REDACTED]. This [REDACTED]

³ [REDACTED]

PUBLIC VERSION - REDACTED

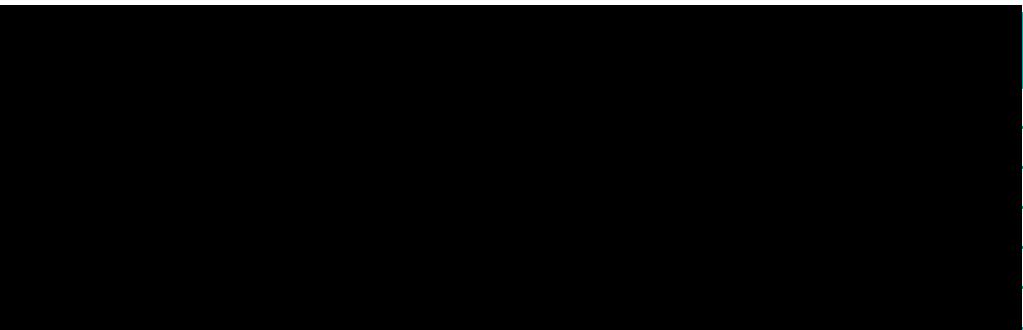
EVALUATION RESULTS

ILLUME

[REDACTED] This result is similar, [REDACTED]

The table below notes [REDACTED]

Table 8: [REDACTED]?



After [REDACTED] of showerhead respondents [REDACTED] reported [REDACTED]. [REDACTED] stated that they [REDACTED] and [REDACTED] noted that [REDACTED]

We also asked participants [REDACTED] how [REDACTED] participants who responded [REDACTED] rated [REDACTED] participants [REDACTED] rated [REDACTED].

Showerhead participants with a [REDACTED]

Programmable Thermostats

[REDACTED] of thermostat customers interviewed [REDACTED], as indicated in the figure below.

4 [REDACTED]

EVALUATION RESULTS

Page 6

Figure 8:



The table below notes r

response was that

Table 9:

A scatter plot showing the relationship between the number of species (S) on the x-axis and the number of individuals (N) on the y-axis. The x-axis ranges from 0 to 1000 with major ticks every 200 units. The y-axis ranges from 0 to 1000 with major ticks every 200 units. Data points are represented by small black dots. A red curve, labeled "Fit", starts at approximately (0, 100), peaks around (500, 700), and then declines towards (1000, 100). A blue horizontal line is drawn at $N = 100$, and a green vertical line is drawn at $S = 500$.

Of those who said that they

A B C

⁵ The installation rate was calculated by dividing the number of thermostats participants reported installing and that remain installed █ by the total number of thermostats that were purchased █ as indicated in program records.

PUBLIC VERSION - REDACTED

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EVALUATION RESULTS

ILLUME

but [REDACTED] this [REDACTED] should [REDACTED].

Thermostat [REDACTED]

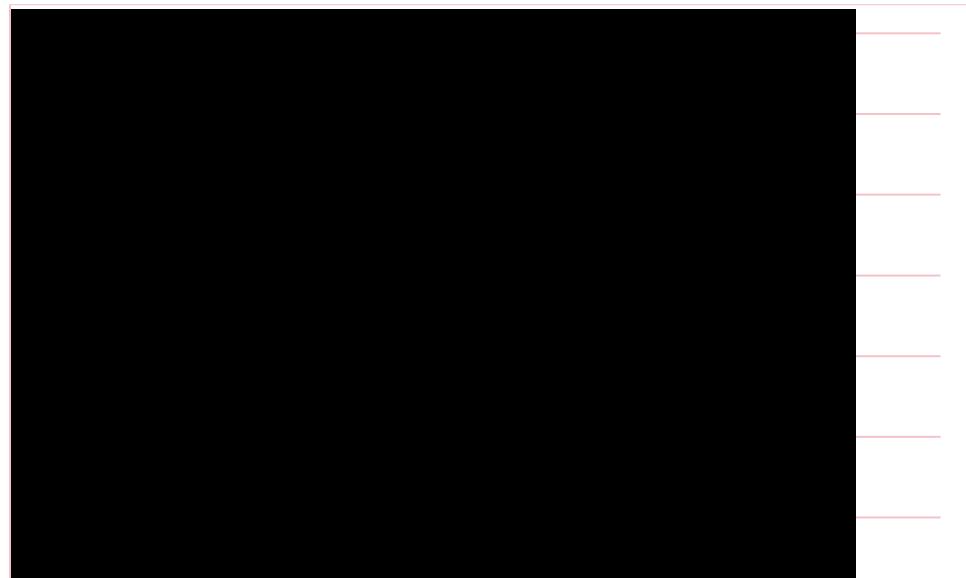
We asked [REDACTED] thermostat participants a [REDACTED]
about how they [REDACTED]

We asked thermostat customers whether [REDACTED]

figure below, [REDACTED] of respondents did report [REDACTED]

As shown in the

Figure 9: [REDACTED]



We then asked [REDACTED] thermostat customers whether [REDACTED]
[REDACTED] to set [REDACTED]

PUBLIC VERSION - REDACTED

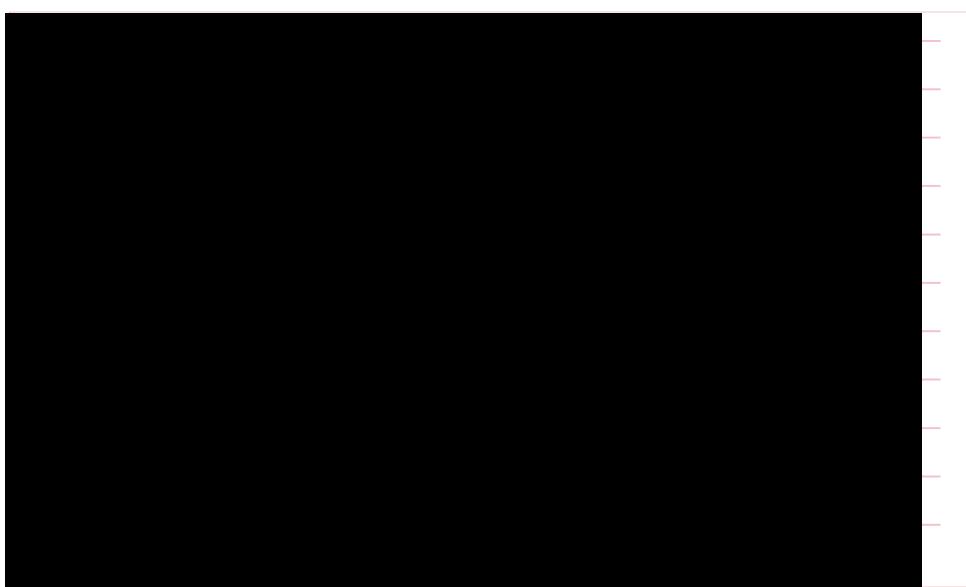
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EVALUATION RESULTS

ILLUME

Figure 10:



While a [REDACTED] customers who [REDACTED] using the [REDACTED]

customers [REDACTED]

We also asked [REDACTED] customers who said they [REDACTED]

[REDACTED] said that they [REDACTED]

[REDACTED] as shown in the figure below.

EVALUATION RESULTS

ILLUME

Figure 11:



Making [REDACTED] thermostat [REDACTED] may also [REDACTED]
[REDACTED] for [REDACTED] While [REDACTED] [REDACTED]. When asked for
[REDACTED] the following responses were given:

- To make [REDACTED]
- [REDACTED]
- Changes [REDACTED]
- When [REDACTED]
- When [REDACTED]

We also asked participants who [REDACTED] how
[REDACTED]

To learn [REDACTED]

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EVALUATION RESULTS

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- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

The [REDACTED] of programmable thermostats may [REDACTED]. For example, [REDACTED] is [REDACTED]. When the [REDACTED], it is [REDACTED].

Additional Program [REDACTED]

The program may [REDACTED] and [REDACTED] such as [REDACTED]. While [REDACTED] rates for [REDACTED] is usually assumed [REDACTED]. While [REDACTED], the [REDACTED]

[REDACTED] are [REDACTED] for the [REDACTED] program, and [REDACTED]. For example, the [REDACTED] program could have [REDACTED]. This would require a [REDACTED].

The [REDACTED] notes that the [REDACTED] or for [REDACTED] are common parts of [REDACTED], and have been [REDACTED] programs with [REDACTED], to name a few. In addition to [REDACTED]

PUBLIC VERSION - REDACTED

EVALUATION RESULTS

ILLUME

[REDACTED] are identified [REDACTED] within the [REDACTED]
[REDACTED]

The program has a number of [REDACTED] in place to [REDACTED] that
customers are [REDACTED] and that [REDACTED]
These efforts are discussed as a part of the COH [REDACTED].

The program itself [REDACTED]

Columbia Gas of Ohio also [REDACTED]

We believe this is a [REDACTED]

Using [REDACTED]

for the program [REDACTED]

5.4 [REDACTED] Natural Gas

Key Findings:

- About [REDACTED] of COH [REDACTED] reported taking [REDACTED]
[REDACTED].
- The most common actions included [REDACTED]
[REDACTED].

Recommendations:

- [REDACTED]

[REDACTED] participants [REDACTED] if they had [REDACTED]
in their home as a result of [REDACTED]

PUBLIC VERSION - REDACTED

ILLUME

EVALUATION RESULTS

[REDACTED] through the COH [REDACTED]. Of the 7 [REDACTED] noted that they [REDACTED]. These ranged from [REDACTED]

Participants noted [REDACTED]:

- [REDACTED]

[REDACTED] noted that they bought [REDACTED]. While this may

The program could consider [REDACTED]

[REDACTED] to save natural gas. A

[REDACTED] in a [REDACTED] may be a [REDACTED]

5.5 Review of Previous Process Recommendations

Key Findings:

- The program [REDACTED]
[REDACTED].

Recommendations:

- [REDACTED]

EVALUATION RESULTS

Page 6

Several [REDACTED] were made in the [REDACTED].
These [REDACTED] are listed below and [REDACTED].

Table 10:

This image is a solid black rectangle with no visible content or features.

5.6 [REDACTED] Natural Gas)

Key Findings:

- showerheads
 - faucet aerators

PUBLIC VERSION - REDACTED

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EVALUATION RESULTS

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- [REDACTED] for both showerhead and aerators [REDACTED]
[REDACTED].
- Total [REDACTED] for the program's natural gas savings [REDACTED]
[REDACTED]
- [REDACTED] from programmable thermostats are [REDACTED]
[REDACTED]
- Participants [REDACTED]
[REDACTED]

Recommendations:

- [REDACTED]
- [REDACTED]

CONCLUSIONS

ILLUME

6. CONCLUSIONS

The SES program offers a low-cost way for customers to engage in energy efficient practices at home. Participants are [REDACTED] and find the [REDACTED] Program [REDACTED] operate [REDACTED].

Recommendations [REDACTED] are meant to [REDACTED] the program, [REDACTED].

Key recommendations include:

- [REDACTED]:
 - Offer [REDACTED] to participants to [REDACTED]
 - [REDACTED]
 - Provide [REDACTED]
- **Process:**
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]

These refinements may assist the program in continuing to [REDACTED] as the program [REDACTED] and [REDACTED] realized among participants.

ILLUME

A. PARTICIPATING CUSTOMER SURVEY

ILLUME

Columbia Gas of Ohio Simple Energy Solutions Participant Survey Instrument

A.1 INTRODUCTION & WARM UP

Hello, my name is [INTERVIEWER NAME] with the Blackstone Group calling on behalf of Columbia Gas of Ohio. We are speaking with recent Columbia Gas of Ohio [REDACTED]

This is not a sales call, and responses will be used to tell Columbia about your experience with the program and to [REDACTED]

INTERVIEWER: If customer asks about how their information is kept secure, please use the following response,

"We maintain safeguards to protect survey responses. These include, for example, physical security of our facilities, technical safeguards to protect electronic data, and manager supervision."

May I please speak with [cust_name] or someone in your household who is familiar with [REDACTED] Columbia Gas of Ohio's [REDACTED]?

This survey will take about 10 minutes.

I1. Are you currently talking to me [REDACTED]

1. [REDACTED]
2. [REDACTED]
98. (Don't know)
99. (Refused)

[ASK IF I1 = 2, 98, 99; ELSE GO TO I3]

I2. Are you currently [REDACTED]

1. (Yes)

PUBLIC VERSION - REDACTED

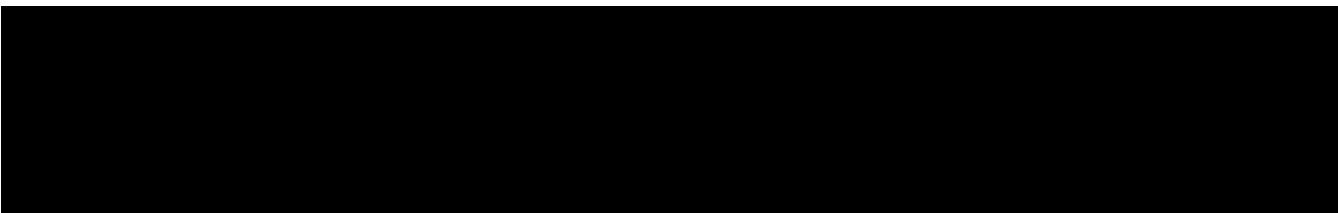
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ILLUME

2. (No) [Schedule call back]
8. (Don't know) [Schedule call back]
9. (Refused) [Schedule call back]

First, I'd like to ask you a few questions about your household.



I3. According to our records, in [REDACTED] [TEXT 1], [TEXT 2], and [TEXT 3] through Columbia Gas of Ohio's [REDACTED] Is this correct?

1. (Yes) [GO TO I4]
2. (No) [GO TO I3a]
98. (Don't know) [GO TO I3a]
99. (Refused) [THANK & TERMINATE]

I3a. Did you [REDACTED] through Columbia Gas of Ohio's [REDACTED]?

1. (Yes) [GO TO I3b]
2. (No) [THANK AND TERMINATE]
98. (Don't know) [THANK AND TERMINATE]
99. (Refused) [THANK AND TERMINATE]

I3b. Of the [TEXT 1], [TEXT 2], and [TEXT 3] we have on record, what ones did you [REDACTED] [CHECK ALL THOSE THAT APPLY]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. (Other) [THANK AND TERMINATE]
5. (None of them) [THANK AND TERMINATE]
98. (Don't know) [THANK AND TERMINATE]
99. (Refused) [THANK AND TERMINATE]

I4. Are you, or is anyone [REDACTED]

1. (Yes) [THANK & TERMINATE]
2. (No)
3. (Don't know) [THANK & TERMINATE]
4. (Refused) [THANK & TERMINATE]

I5. Are you or one of the [REDACTED]?

1. (YES)
2. (NO)
8. (DON'T KNOW)

PUBLIC VERSION - REDACTED

ILLUME

9. (REFUSED)

A.2 PROGRAM MARKETING AND MESSAGING

M1. How did you [REDACTED]

Columbia Gas of Ohio's [REDACTED] ? **[DON'T READ LIST]**

1. (COLUMBIA GAS OF OHIO/[REDACTED])
2. (COLUMBIA GAS OF OHIO/[REDACTED])
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
9. [REDACTED]
10. [REDACTED]
11. (COLUMBIA GAS OF OHIO/[REDACTED])
12. (A [REDACTED])
13. (AT A [REDACTED])
14. (THROUGH A [REDACTED])
15. (THROUGH A [REDACTED])
16. ([REDACTED])
00. (OTHER) [SPECIFY _____]

98. (DON'T KNOW)

99. (REFUSED)

M2. How useful was [REDACTED]

Columbia Gas of Ohio's [REDACTED] Would you say it was...?

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
98. (Don't know)
99. (Refused)

[ASK IF M2=1 OR 2]

M3a. What did you [REDACTED] **[OPEN END]**

[ASK IF M2=3 OR 4]

M3b. What did you [REDACTED] **[OPEN END]**

M4. What motivated you to [REDACTED] that you did through Columbia Gas of Ohio's [REDACTED] **[MULTIPLE RESPONSE; UP TO 3][DO NOT READ LIST]**

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]

ILLUME

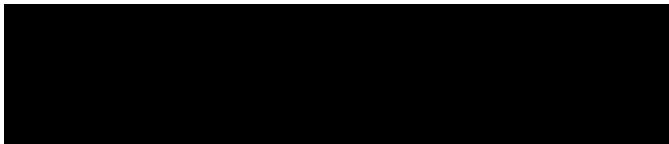
- 00. (OTHER, SPECIFY)
- 98. (DON'T KNOW)
- 99. (REFUSED)

M5. On a [REDACTED]

[RECORD NUMBER, 98=Don't know,
99=Refused]

M6. I am going to read a list of reasons why [REDACTED]

?



A.3 SHOWERHEAD [REDACTED]

[CONTINUE IF [REDACTED] AND I3=1; OR CONTINUE IF I3B=1; ELSE SKIP TO NEXT SECTION]

Now I would like to talk with you [REDACTED]

[FOR SA1, [REDACTED]

SA1. Did you [REDACTED] in your home? (INTERVIEWER: IF NEEDED, CAN STATE THAT OUR RECORDS SHOW [REDACTED]
[DO NOT READ LIST]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
98. (DON'T KNOW) [SKIP TO NEXT SECTION]
99. (REFUSED) [SKIP TO NEXT SECTION]

[IF SA1=1 OR 2, ASK SA1a]

SA1a. Is/are that/those [REDACTED] ? [IF SA1=2, INTERVIEWER: IF NEEDED, TELL RESPONDENT TO ANSWER [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
98. (DON'T KNOW)
99. (REFUSED)

[ASK SA1b IF SA1a=2 or 3]

SA1b. Why did you [REDACTED] ?

1. [REDACTED]

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ILLUME

2. [REDACTED]
5. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF SA1=3]

SA1c. Why have you [REDACTED] **[DO NOT READ LIST]**

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK SA1d IF SA1=2 AND]

SA1d. Why have you [REDACTED]
[DO NOT READ LIST]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK SA2 IF SA1=1 OR 2]

SA2. On a [REDACTED] you purchased? [RECORD 1-5, 98=Don't know, 99=Refused] (INTERVIEWER: IF NEEDED AND CUSTOMER [REDACTED] TELL THEM TO ANSWER FOR [REDACTED])

[IF SA2=1, 2, OR 3, ASK SA3]

SA3. What do you [REDACTED]

1. [REDACTED]
2. [REDACTED]
3. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

A.4 FAUCET AERATOR [REDACTED]

[CONTINUE IF [REDACTED] AND I3=1; OR CONTINUE IF I3B=2; ELSE SKIP TO NEXT SECTION]

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ILLUME

Now I have some questions [REDACTED]

[FOR FA1, if [REDACTED], language in brackets should read [REDACTED]
and if [REDACTED] bracketed language should read [REDACTED]

FA1. Did you [REDACTED] in your home? (INTERVIEWER: IF NEEDED, CAN STATE THAT OUR RECORDS [REDACTED])

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
98. (DON'T KNOW) [SKIP TO NEXT SECTION]
99. (REFUSED) [SKIP TO NEXT SECTION]

[IF FA1=1 OR 2, ASK FA1a]

FA1a. Is/are those [REDACTED] [IF FA1=2, INTERVIEWER: IF NEEDED, TELL RESPONDENT TO ANSWER [REDACTED] IN THE PREVIOUS QUESTION]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
98. (DON'T KNOW)
99. (REFUSED)

[ASK FA1b IF FA1a=2 or 3]

FA1b. Why did you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
5. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK IF FA1=3]

FA1c. Why have you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
7. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK FA1d IF FA1=2 AND

FA1d. Why have you [REDACTED]

1. [REDACTED]
2. [REDACTED]

3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
 7. (OTHER, SPECIFY: _____)
 98. (DON'T KNOW)
 99. (REFUSED)

[ASK FA2 IF FA1=1 OR 2]

FA2. On a [REDACTED] [RECORD 1-5,
 98=Don't know, 99=Refused] (INTERVIEWER: IF NEEDED AND
 TELL THEM TO ANSWER [REDACTED])

[IF FA2=1, 2, OR 3, ASK FA3]

FA3. What do you [REDACTED]
 1. [REDACTED]
 2. [REDACTED]
 3. (OTHER, SPECIFY: _____)
 98. (DON'T KNOW)
 99. (REFUSED)

A.5 PROGRAMMABLE THERMOSTAT [REDACTED]

[CONTINUE IF [REDACTED] AND I3=1; OR CONTINUE IF I3B=3; ELSE SKIP TO NEXT SECTION]

Now I have a few questions [REDACTED].

**[FOR T1, if [REDACTED], language in brackets should read [REDACTED],
 and if [REDACTED], bracketed language should read [REDACTED].]**

T1. Did you [REDACTED] in your home? (INTERVIEWER: IF
 NEEDED, CAN STATE THAT OUR RECORDS [REDACTED]
 [REDACTED]
 1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 98. (DON'T KNOW) [SKIP TO NEXT SECTION]
 99. (REFUSED) [SKIP TO NEXT SECTION]

[IF T1=1 OR 2, ASK T1a]

T1a. [REDACTED] [IF T1=2, INTERVIEWER: IF
 NEEDED, TELL RESPONDENT TO [REDACTED]
 [REDACTED]]

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1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
98. (DON'T KNOW)
99. (REFUSED)

[ASK T1b IF T1a=2 or 3]

T1b. Why did you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. (OTHER: SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK T1c IF T1=3]

T1c. Why have you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
6. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK T1d IF T1=2 AND

T1d. Why have you [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
6. (OTHER, SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[IF T1=1 OR 2, ASK T2]

T2. On a [REDACTED] (INTERVIEWER: IF
[REDACTED] NEEDED AND CUSTOMER [REDACTED] TELL THEM TO
ANSWER [REDACTED])

[ASK T3 IF T2=1, 2, or 3]

T3. Is there [REDACTED] [OPEN END]

T4. Prior to [REDACTED] during the [REDACTED] did you [REDACTED]
[REDACTED]

1. (YES)

ILLUME

- 2. (NO)
- 98. (DON'T KNOW)
- 99. (REFUSED)

[IF T1a=1 or 2, ASK T4a]

T4a. Do you [REDACTED]

(INTERVIEWER: IF NEEDED AND CUSTOMER [REDACTED], TELL THEM TO ANSWER [REDACTED])

- 1. (YES)
- 2. (NO)
- 98. (DON'T KNOW)
- 99. (REFUSED)

T5. Prior to [REDACTED]

[REDACTED]?

- 1. (YES)
- 2. (NO)
- 98. (DON'T KNOW)
- 99. (REFUSED)

[IF T1a=1 or 2, ASK T5a]

T5a. Do you [REDACTED]

(INTERVIEWER: IF NEEDED AND CUSTOMER [REDACTED], TELL THEM TO ANSWER [REDACTED])

- 1. (YES)
- 2. (NO)
- 98. (DON'T KNOW)
- 99. (REFUSED)

[ASK T6 IF T4a=2 or T5a=2]

[IF T4a=2 AND T5a=2, [REDACTED] IF T4a=2 AND T5a=1,98,99,
[REDACTED] IF T4a=1,98,99 AND T5a=2, [REDACTED]]

T6. Why do you [REDACTED]

[OPEN END]

[ASK T7 IF T4a=1 AND/OR T5a=1]

T7. Which of the following [REDACTED]

[REDACTED] Would you say you....

- 1. [REDACTED]
- 2. [REDACTED]
- 3. [REDACTED]
- 4. [REDACTED]
- 5. [REDACTED]
- 6. [REDACTED]
- 7. (Other: specify) [REDACTED]

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

[ASK T8 IF T7=2, 3, 4, 5, 6, OR 7]

T8. For what reasons do you [REDACTED]
[REDACTED] (MULTIPLE RESPONSE, UP TO 3)

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
5. (OTHER: SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK T9 IF T1=1 OR 2]

T9. [REDACTED] [REDACTED]
[REDACTED], 98=Don't know, 99=Refused]

[ASK T10 IF T9=1, 2, OR 3, ASK T9]

T10. What do you [REDACTED] [OPEN END]

1. [REDACTED]
 2. [REDACTED]
3. (OTHER: SPECIFY: _____)
98. (DON'T KNOW)
99. (REFUSED)

A.6 PURCHASE EXPERIENCE AND SATISFACTION

Now I have a few more questions about [REDACTED].

P1. [REDACTED] [REDACTED], 98=Don't know,
99=Refused]

[ASK P2 IF P1=1, 2, OR 3]

P2. What [REDACTED], if any, [REDACTED]
[OPEN END, 98=Don't know, 99=Refused]

P3. Is there [REDACTED]
[REDACTED] [OPEN END, 98=Don't know, 99=Refused]

P4. [REDACTED]
[REDACTED]
[RECORD 1-5, 98=Don't know, 99=Refused]

P5. Have you [REDACTED]

1. (YES)

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- 2. (NO)
- 98. (DON'T KNOW)
- 99. (REFUSED)

[ASK P6 IF P5=1]

P6. What other [REDACTED]

(MULTIPLE RESPONSE)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6. (OTHER: SPECIFY) _____
- 98. (DON'T KNOW)
- 99. (REFUSED)

A.7 [REDACTED]

We are almost done; I just have a few final questions.

D1. Do you [REDACTED]

- 1. [REDACTED]
- 2. [REDACTED]
- 00. (OTHER, SPECIFY: _____)
- 98. (DON'T KNOW)
- 99. (REFUSED)

D2. Which of the following [REDACTED]?

- 1. [REDACTED]
 - 2. [REDACTED]
 - 3. [REDACTED]
 - 4. [REDACTED]
 - 5. [REDACTED]
00. (Other – Please specify: _____)
98. (Don't know)
99. (Refused)

D3. What is the [REDACTED]

- 1. [REDACTED]
- 98. (Don't know)
- 99. (Refused)

D4. When was your [REDACTED]

- 1. [REDACTED]
- 2. [REDACTED]

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3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]

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

D5. Including [REDACTED] time year [REDACTED]
[REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
 7. [REDACTED]
 8. [REDACTED]
 9. [REDACTED]
 10. [REDACTED]
98. (DON'T KNOW)
99. (REFUSED)

D6. Which of the [REDACTED]
[REDACTED] Please tell me [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
98. (Don't know)
99. (Refused)

D7. What [REDACTED] [REDACTED]

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
98. (DON'T KNOW)
99. (REFUSED)

D8. What is the [REDACTED]

- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.
98. (DON'T KNOW)
99. (REFUSED)

A.8 THANK YOU AND CLOSING

Those are all the questions I have for you today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation in this survey.

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C. PROCESSES

C.1 COH [REDACTED]

1.

[REDACTED]

[REDACTED]

2.

[REDACTED]

[REDACTED]

[REDACTED]

3.

[REDACTED]

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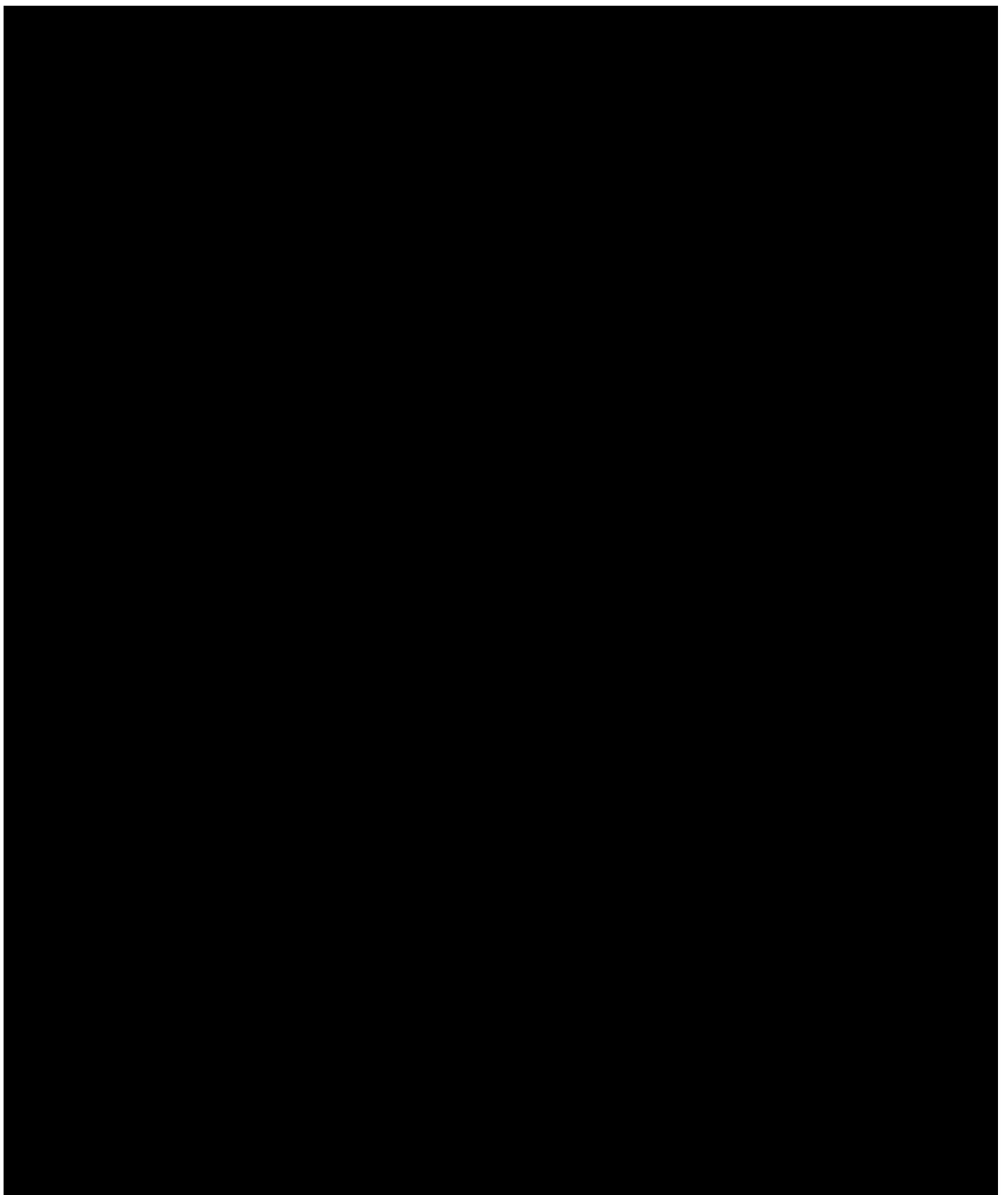


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Figure 6: [REDACTED]



C.2 [REDACTED] APPLICATION

1.

[REDACTED]
local retailer may hear about the program rebates through advertising, on [REDACTED]

The customer [REDACTED]

The SES program is [REDACTED]

[REDACTED] is performed [REDACTED]

[REDACTED]
[REDACTED] isplays in retail stores. However, they found that this was not a cost [REDACTED]

2.

[REDACTED] can be [REDACTED] or at a [REDACTED]

, as noted above. The customer then [REDACTED]

The customer's [REDACTED]

3.

If the [REDACTED]

Program [REDACTED]

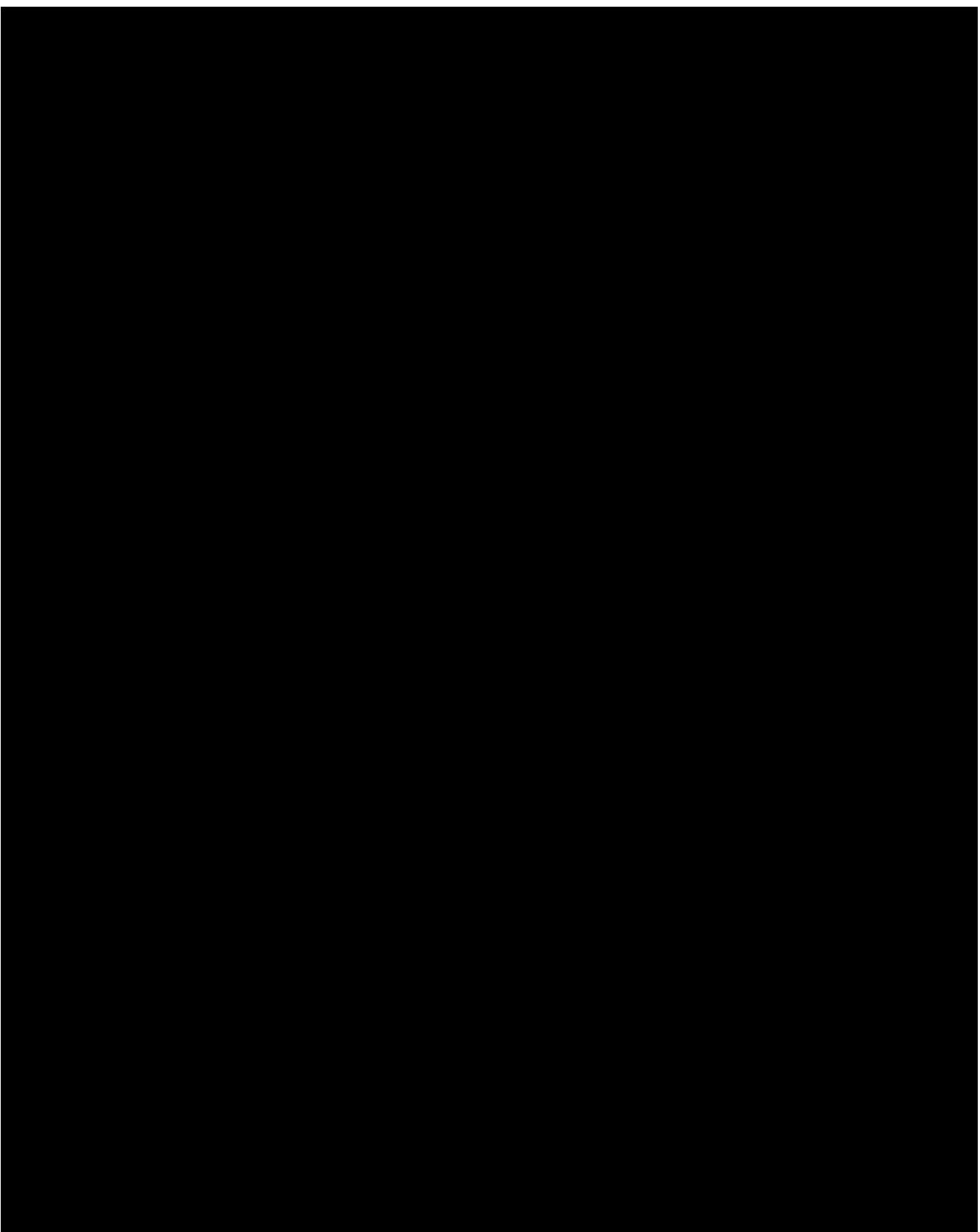
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Figure 12: [REDACTED]



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Columbia Gas of Ohio EfficiencyCrafted® Homes Program

FINAL Report

Prepared for:
Columbia Gas of Ohio

June 30, 2015

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1. EXECUTIVE SUMMARY

1.1 INTRODUCTION AND PROGRAM OVERVIEW

ILLUME Advising, LLC (ILLUME) was commissioned by Columbia Gas of Ohio (COH) to conduct a process evaluation of the EfficiencyCrafted® Homes program.

The EfficiencyCrafted Homes program provides financial incentives to builders to construct homes that exceed Ohio energy building code. In 2014, there were two levels of tiered incentives offered. The first level, EfficiencyCrafted Homes (formerly Energy Path) is based on the [REDACTED], and the second level, EfficiencyCrafted Homes Plus, meets the [REDACTED] [REDACTED] in addition to other requirements. The program is implemented by MaGrann Associates, with marketing services performed by Burkholder Flint.

The major goals of this process evaluation included: (1) exploring participating homebuyer [REDACTED] with the program, as well as program benefits and barriers; (2) understanding non-participating recent and potential homebuyer [REDACTED] and their responses to program [REDACTED]; (3) exploring participating builder and home energy rater [REDACTED] with the program, [REDACTED] of participation, and determining barriers for non-participating builders; (4) reviewing program [REDACTED]; and (5) identifying and quantifying non-natural gas benefits that occurred as a result of the program.

1.2 EVALUATION METHODS

ILLUME developed our evaluation findings and recommendations based on interviews with homebuyers who recently purchased an EfficiencyCrafted Home, non-participating recent and potential homebuyers, participating builders and home energy raters, non-participating builders, and program staff. We also reviewed program data and program materials, such as [REDACTED] [REDACTED] materials, and [REDACTED], among others.

1.3 KEY FINDINGS AND RECOMMENDATIONS

COH has offered a residential new construction program since 2010. In 2014, the program exceeded participation and natural gas savings goals by [REDACTED], respectively, and is meeting its primary objective of building homes that surpass current energy building codes. During the summer of 2014, it underwent a rebranding effort, which included a new and more streamlined program name and launched a [REDACTED]

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Below we present key findings and recommendations, as applicable, organized by key research areas. Note that a primary purpose of the study was to evaluate the effectiveness of program re-branding efforts, therefore many of the recommendations target how to improve [REDACTED] levels.

Are homebuyers, builders, and raters [REDACTED]

- * Overall, participating homebuyers, builders, and raters are [REDACTED] percent of homebuyers said that they were [REDACTED] giving a rating of [REDACTED] on a five-point scale, where five is [REDACTED]. Builders and raters are also [REDACTED] participating builders and raters interviewed gave the program a rating of [REDACTED] out of five.

Are homebuyers [REDACTED] and of [REDACTED]

- * About [REDACTED] of participating homebuyers were [REDACTED] though [REDACTED] would like to [REDACTED]. On a related note, [REDACTED] participating builders interviewed said that they [REDACTED], and [REDACTED] builders said that they [REDACTED]. Several noted interest in [REDACTED].

- **Recommendation:** The program should consider additional ways to [REDACTED]. The program notes that a [REDACTED] will be distributed over the summer of 2015. To ensure that it reaches all builders, the program should consider performing additional outreach, such as [REDACTED] to [REDACTED].

Additionally, a [REDACTED] could be offered focusing on the [REDACTED].

- **Recommendation:** The program could also consider [REDACTED]. This would serve the purpose of ensuring that, if not already communicated, [REDACTED], and also serve to [REDACTED]. Alternatively, the builder could provide the [REDACTED].

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- * [REDACTED] percent of non-participating homebuyers were [REDACTED]. This [REDACTED] is less than a year old and this is the program's first non-participant survey, as such there is not yet a baseline to compare this result.

- **Recommendation:** Test [REDACTED] among non-participants in future process evaluations as a way to measure progress. In the meantime, consider additional ways to [REDACTED]. The program has already achieved good traction with its [REDACTED]. As time and budget allow, [REDACTED]

- * [REDACTED] participating homebuyers or non-participating recent and prospective homebuyers were [REDACTED]. This is not a surprising finding considering the program is [REDACTED], and the [REDACTED]. In addition, as mentioned above several builders report [REDACTED] with their customers.

- **Recommendation:** In addition to [REDACTED]

[REDACTED]
the program could also consider [REDACTED], such as a [REDACTED], which [REDACTED]

What is the [REDACTED]?

- * [REDACTED] of participating homebuyers [REDACTED], indicating that individuals who [REDACTED] [REDACTED]. This suggests that there is room to [REDACTED].

- * [REDACTED] is was most often the first consideration participating homebuyers thought of in building their new home, with [REDACTED] stating that it was their first consideration. [REDACTED] and [REDACTED] [REDACTED] with were mentioned far less as first considerations.

- * [REDACTED] percent of participating homebuyers cited [REDACTED] in their decision to [REDACTED]. This finding emphasizes the importance of [REDACTED] and [REDACTED] came in second, with just over [REDACTED] of homebuyers saying

it was very important. While this is a distant second from [REDACTED] as a source of information, it does speak to the growing importance of [REDACTED]

- * [REDACTED] percent of non-participating recent and prospective homebuyers rated [REDACTED] as their [REDACTED]. This was closely followed by [REDACTED] and [REDACTED] in order of importance. Of the [REDACTED] non-participants who built a new home, all said [REDACTED]

- **Recommendation:** To increase its reach, the program should consider [REDACTED]. Additionally, the program should consider placing more emphasis on testimonials from participating homebuyers as other homebuyers' opinions ranked highly in importance.

How effective is [REDACTED] and [REDACTED]

- * Program messaging that describes the [REDACTED] was found to be the most compelling message offered to non-participating recent and prospective homebuyers. [REDACTED] percent stated that this message was the most compelling of the [REDACTED] key program messages currently used in marketing materials. This was followed by [REDACTED] of respondents who said that the message related to [REDACTED] most compelling.

- **Recommendation:** Program marketing and messaging should [REDACTED]
[REDACTED] respondents found these ideas most compelling.

- * After learning about the program, [REDACTED] of non-participants say they will [REDACTED], and an additional [REDACTED] are [REDACTED]. This speaks to the effectiveness of the new brand's messaging and its ability to communicate program benefits to potential homebuyers.

- * Builders note that the [REDACTED]. Of the [REDACTED] builders interviewed, [REDACTED] thought the [REDACTED]. This is in contrast to the last process evaluation, which found that [REDACTED] of the [REDACTED] builders interviewed [REDACTED]. This was because these [REDACTED] builders [REDACTED] and believed the [REDACTED]. The [REDACTED]

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How useful is the [REDACTED]

* **Homebuyers find the [REDACTED]**

[REDACTED] interviewed) said that they [REDACTED] builders [REDACTED] out of [REDACTED], and [REDACTED] of participating homebuyers said they [REDACTED]. Of those [REDACTED] found it [REDACTED]. Additionally, [REDACTED] of non-participants thought the [REDACTED].

- **Recommendation:** To continue to encourage builders to [REDACTED]

[REDACTED], the program should [REDACTED]

[REDACTED]. The program should also [REDACTED]

consider [REDACTED].

Would homeowners and builders find [REDACTED]?

* **Participating builders and homebuyers, and non-participating prospective homebuyers thought an [REDACTED]**

[REDACTED] The program is currently investigating offering an [REDACTED] percent of participating homebuyers said that it would have been [REDACTED]. [REDACTED] of non-participating potential homebuyers said that a [REDACTED] participating builders thought an [REDACTED].

- **Recommendation:** The program should continue to consider offering an [REDACTED] as there is interest from both builders and homebuyers. However, caution must be given to [REDACTED]. If offered, the program must [REDACTED] for both builders and homebuyers so that [REDACTED].

How [REDACTED]?

* **Overall [REDACTED] are working well; however, some builders and raters may need [REDACTED]**

[REDACTED] builders reported [REDACTED]. For example, [REDACTED] builder noted that he is often [REDACTED].

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Additionally, [REDACTED] other builders noted [REDACTED], with [REDACTED] specifically mentioning the [REDACTED].

- **Recommendation:** The program already provides builders with [REDACTED], [REDACTED] and [REDACTED]. This should provide the builder with sufficient information to [REDACTED]. To complement this, the program should consider producing a [REDACTED] along with [REDACTED]. This added [REDACTED] may help to [REDACTED]. The program might also consider ensuring that the [REDACTED], as builders seemed to be [REDACTED].

- * **Participating builders** [REDACTED], with [REDACTED] out of [REDACTED] mentioning them as one of the primary reasons they joined the program. [REDACTED] builders (out of [REDACTED]) noted [REDACTED] or the [REDACTED] as a potential barrier to participation. Of these, [REDACTED] builders specifically said that [REDACTED] may affect their ability to participate. Since [REDACTED], this will continue to be an issue for careful consideration in the future.

- **Recommendation:** The program should consider [REDACTED]. The program is already pursuing this through [REDACTED] and its [REDACTED]. Other [REDACTED] could be considered, such as [REDACTED] or [REDACTED], etc. The program should also consider having a [REDACTED] and [REDACTED] on [REDACTED] on this subject and encourage dialog.

- **Recommendation:** The program should also [REDACTED]. As noted above, [REDACTED] builders interviewed said they [REDACTED] consider [REDACTED] to [REDACTED].

- * **Builders and raters would like to see** [REDACTED] out of [REDACTED] builders and raters said that they were [REDACTED] in their [REDACTED] (on a scale of one to five, with

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five being very satisfied). However, [REDACTED] (who responded) said that they were [REDACTED] with the [REDACTED] builders also specifically noted that they would [REDACTED]
[REDACTED]

- **Recommendation:** Several options could be considered for [REDACTED]. For example, a [REDACTED] which includes [REDACTED], plus a [REDACTED], such as [REDACTED], [REDACTED], etc.

How has the program [REDACTED]?

- * **Most participating builders think that the program has [REDACTED]** builders responding believed that since joining the program their [REDACTED]. Builders noted that [REDACTED], including [REDACTED]
[REDACTED].

- * [REDACTED] percent of participating homebuyers said that [REDACTED].
Of those homebuyers who said [REDACTED], the most common [REDACTED] included [REDACTED]
[REDACTED].

- **Recommendation:** Within its [REDACTED], the program could [REDACTED]
[REDACTED].
- **Recommendation:** The program should also consider including a [REDACTED]
[REDACTED] emphasizing that [REDACTED].

What are non-natural gas program benefits?

- * In 2014, the program accumulated non-natural gas benefits equivalent to [REDACTED]. Builders also received over [REDACTED] Homebuyers were [REDACTED] with the benefits of [REDACTED]
[REDACTED] than a code-built home (mean scores of [REDACTED], respectively, on a five point scale where five is very satisfied). Additionally, [REDACTED] of participating

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homebuyers think that [REDACTED]
[REDACTED]

- **Recommendation:** In future evaluations, consider exploring how [REDACTED].

2. INTRODUCTION

ILLUME Advising, LLC (ILLUME) was hired by Columbia Gas of Ohio (COH) to conduct a process evaluation of its EfficiencyCrafted Homes program. The major tasks of the evaluation included the following:

- 1) Review program processes and procedures, including marketing materials and strategies, to determine their effectiveness and recommend potential improvements.
- 2) Conduct interviews with utility and program staff, builders (participating and non-participating) and raters, and homebuyers (participating and non-participating) to measure satisfaction with the program and identify potential barriers and benefits to participation.
- 3) Evaluate the effectiveness of the newly re-branded “EfficiencyCrafted” program name, marketing materials, and the newly designed website in generating awareness of the program.
- 4) Identify and quantify non-energy (non-natural gas) benefits resulting from the EfficiencyCrafted Homes program.

3. PROGRAM DESCRIPTION

3.1 OVERVIEW

The EfficiencyCrafted Homes program offers incentives to builders who construct new homes that exceed Ohio energy code and meet specific technical criteria. The program provides builders with technical training, marketing support, and third-party verification of building efficiency in order to assist them in promoting efficient homes to potential homebuyers.

Since the program's launch in 2010, it has undergone several changes. The program first began under the name "AEP Ohio/Columbia Gas of Ohio ENERGY STAR® New Homes program". In 2010, the program adopted a [REDACTED] [REDACTED], while still allowing it to work with builders who either faced challenges in building to [REDACTED] or did not have an interest in building to such standards. In 2012, the program modified the incentive structure to tie incentives to the [REDACTED] [REDACTED] in addition to [REDACTED]. In July 2014, the umbrella brand "EfficiencyCrafted New Homes" was introduced with AEP Ohio to [REDACTED].

3.2 PROGRAM OBJECTIVES AND GOALS

The primary objective of the EfficiencyCrafted Homes program is to move the new homes market towards more efficient construction practices that both exceed the current energy code and attain a lower HERS score. The 2014 program design offered two levels of tiered incentives: EfficiencyCrafted Homes, which is based on the [REDACTED], and EfficiencyCrafted Homes Plus, for which homes meet [REDACTED]. Incentive amounts within these two levels are tied to [REDACTED].

According to program staff, participation and energy savings goals are being met and exceeded. MaGrann staff note that an uptick in the building market and new builder registrations with the program have had a positive impact on participation levels and goal achievement. In 2014, the program exceeded participation goals by [REDACTED] with 1,991 completed units, and exceeded natural gas savings goals by [REDACTED], with savings

¹ Note that in 2014, EfficiencyCrafted Plus homes were also required to [REDACTED] [REDACTED], even though this is not required of [REDACTED]. In 2015, this requirement was removed as it was identified as a barrier by builders.

PROGRAM DESCRIPTION

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of [REDACTED] MCF². The program looks on track to achieve similar participation levels in 2015, with [REDACTED] projects being completed as of March 11, 2015.

3.3 PROGRAM DELIVERY AND IMPLEMENTATION

Implementation responsibilities (contracted to MaGrann Associates) include:

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]

As mentioned above, the program also works with a marketing subcontractor, Burkholder Flint. Burkholder Flint provided [REDACTED] during the rebranding of the program in 2014, and also [REDACTED] for the program. Burkholder Flint continues to provide marketing guidance and support to the program.

The program is primarily builder-focused. MaGrann recruits new builders and raters and provides them with the support necessary to meet program requirements. MaGrann and Burkholder Flint also perform [REDACTED]. While primarily builder-driven, steps were also taken in concert with the [REDACTED].

Builders are eligible to participate in the program if they meet specific qualifications as set by the program. Builders receive incentives from COH for each home meeting program requirements. Incentive levels offered in 2014 are displayed below. As shown, [REDACTED] In 2015, [REDACTED]

² These numbers represent program tracked values, and have not yet been verified.

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PROGRAM DESCRIPTION

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Table 1. Program Incentives Offered in 2014

the first time in the history of the world, the people of the United States have been called upon to determine whether they will submit to the law of force, or the law of the Constitution. We consider the question to be, whether the Southern Slaveholding States have a right to secede from the Federal Union; and, if so, whether the Federal Government has a right to suppress them by force.

4. EVALUATION METHODS

The evaluation findings and recommendations are based on interviews and a review of program data and materials.

4.1 PROGRAM STAFF INTERVIEWS

In March 2015, ILLUME conducted interviews with the COH program manager and evaluation manager, implementation contractor (MaGrann) staff, and the marketing subcontractor, Burkholder Flint. Interviews with staff covered program objectives and goals, rebranding efforts, outreach and marketing, delivery and implementation, internal processes, participation rates, and program strengths and opportunities for improvement.

4.2 PARTICIPATING HOMEBUYER INTERVIEWS

In May 2015, [REDACTED] interviews were completed with COH customers who purchased an EfficiencyCrafted Home. The sample was designed to detect significance at the $90\% \pm 10\%$ confidence level. Interviews explored [REDACTED]

To develop the sample population, COH provided ILLUME with homebuyer information from January 2014 through March 2015. Records with enrollment dates prior to August 2014, were removed from the sample to line up with the program's rebranding launch in July 2014. The data was then reviewed for incomplete information (missing phone numbers or homebuyer names, etc.), leaving [REDACTED] participating customers available for random selection into a sample.

Random sampling attempts to eliminate self-selection bias (overrepresentation of individuals who seek participation) and guard against under-coverage bias (missing key parts of the population). However, as in any survey, other biases may still be experienced. These potential biases are listed below:

- Social desirability bias: Customers may respond to a question in a way that they think the interviewer wants them to respond. To mitigate this, we formulated our questions as neutrally as possible and avoided leading questions or too much prompting.
- Interviewer bias: The interviewer may unknowingly ask a question in a way that prompts a certain type of response. This bias is lessened by training the interviewer and good survey design (avoiding leading questions, etc.). To mitigate this, all interviewers are trained on the survey instrument and testing and monitoring is performed as the surveys are launched.

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EVALUATION METHODS

- Recall bias: When asking about a past event, individuals may have difficulty recalling what happened. Some individuals may remember good events more completely, while others may better remember negative ones. This bias was mitigated by reducing the amount of time back that respondents have to recall, and designing questions in a way to prompt better recall.

Key respondent demographics are included in Appendix A, and a complete participating homebuyer survey instrument is provided in Appendix C.

4.3 WEB PANEL OF NON-PARTICIPATING CUSTOMERS

In April 2015, [REDACTED] online panel interviews were completed with recent and prospective home buyers. The survey explored [REDACTED]
[REDACTED]

Web panel respondents meeting specific survey criteria were retained through Leede Research. Survey respondents had to be a COH customer, and have bought a home in the past three years or planned to buy a home in the next five years. Respondents were also screened to ensure that they did not purchase an EfficiencyCrafted home³.

Of the non-participating respondents, [REDACTED] had bought or built a home in the last 3 years and [REDACTED] were planning to buy or build a home in the next 5 years. Other key demographics are provided in Appendix A.

The complete web panel survey instrument is provided in Appendix D.

4.4 BUILDER INTERVIEWS

In April 2015, ILLUME interviewed [REDACTED] participating builders. Interviews explored participating builder [REDACTED]

[REDACTED]. Note that due to the [REDACTED] of participating builders interviewed, the results of this effort are [REDACTED].

³ [REDACTED] respondents were screened out of the survey because they reported building an EfficiencyCrafted Home.

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COH provided ILLUME with a spreadsheet containing [REDACTED] participating builder names with contact information. Prior to calling, ILLUME worked with MaGrann to send an email to participating builders about the process evaluation, how to schedule an interview, and when they may expect a call from ILLUME. Interviews covered a mix of [REDACTED] builders [REDACTED] home builders [REDACTED], and builders offering a mix of [REDACTED]. Additionally, interviews included a range of builders producing a [REDACTED] number of homes per year.

Table 2. Participating Builders Interviewed by Number of Homes Built Annually

Number of Homes Built Annually	Number of Interviews
[REDACTED]	[REDACTED]

ILLUME also completed [REDACTED] interviews with non-participating builders. Similar to the participating builder interviews, the results of this effort are [REDACTED] due to the [REDACTED]. This included [REDACTED] builder, [REDACTED] builder who develops [REDACTED] and [REDACTED] homes, and [REDACTED] home builders. Partial interviews were also completed with [REDACTED] builders who did not have time for a full interview, but still provided some insights into why they were not participating.

To develop the sample list for non-participating builders, MaGrann provided ILLUME with the names and contact information (if any) of builders that either had never participated in the program or were no longer active in the program. ILLUME also performed an internet search to identify any additional builders within COH's service territory who were not captured on MaGrann's list. The final list included [REDACTED] builders. During fielding, it was also discovered that [REDACTED] of these builders were either no longer building or only built one home, typically their own.

The participating and non-participating builder interview guides are included in Appendices E and F.

4.5 RATER INTERVIEWS

In April 2014, ILLUME interviewed [REDACTED] participating raters. Interviews explored [REDACTED] with the program, [REDACTED]

Columbia Gas provided ILLUME with a spreadsheet containing [REDACTED] participating rater companies with contract information. Prior to calling, ILLUME worked with MaGrann

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to send an email to raters about the process evaluation, how to schedule an interview, and when they may expect a call from ILLUME.

The participating rater interview guide is included in Appendix G.

4.6 REVIEW OF PROGRAM DATA AND MATERIALS

In addition to interviews, ILLUME also included a review of program data and materials provided by COH, MaGrann and Burkholder Flint, including the following:

- Program participant data, including [REDACTED]
[REDACTED]
[REDACTED]
- Builder data, including [REDACTED]
[REDACTED]
- Home Energy Rater data, including [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- Implementer [REDACTED] in 2014, [REDACTED], and other implementer
[REDACTED]

5. EVALUATION RESULTS

The following section presents the results of our evaluation efforts.

5.1 PROGRAM PARTICIPATION SUMMARY

This section provides an overview of program participation in 2014, builder participation, and HERS scores achieved.

A review of program data shows that in 2014, the program approved 1,991 homes in total, with [REDACTED] homes achieving the EfficiencyCrafted tier and [REDACTED] at the EfficiencyCrafted Plus tier⁴. This is consistent with our builder interviews. Of the [REDACTED] participating builders interviewed, [REDACTED] built EfficiencyCrafted Plus Homes.

Table 3. Number of Program Homes in 2014 by Tier

Home Type	Number of Homes Approved	Percent of Homes Approved
EfficiencyCrafted	[REDACTED]	
EfficiencyCrafted Plus	[REDACTED]	
Grand Total	[REDACTED]	100%

Both builders and raters described building to the EfficiencyCrafted Plus tier as [REDACTED]. As noted by one builder, "It's [REDACTED] to do these homes great. [REDACTED]" In 2014, the EfficiencyCrafted Plus tier required not only [REDACTED], but also [REDACTED], which was not a prerequisite for the [REDACTED]. Program staff note that these [REDACTED] created a barrier for some builders, and as a result a change was made in 2015 so that the EfficiencyCrafted Plus tier aligns exactly with [REDACTED].

MaGrann staff noted that by the end of 2014, [REDACTED] builders were participating in the program. MaGrann staff stated that of the [REDACTED] participating builders, [REDACTED] were added to the program during the course of the 2014 program year, and most of these have now completed at least one program home.

⁴ Note that in 2014 the program transitioned to the EfficiencyCrafted brand and tier names, therefore the program data records included a mix of old tier names and new ones. The Energy Path tier level is now the EfficiencyCrafted tier level, and the former ENERGY STAR tier level became EfficiencyCrafted Plus in 2014. For simplicity, we have the paired equivalent tiers together under the EfficiencyCrafted tier names.

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Our review of program data shows that in 2014, a total of [REDACTED] builders had at least one home approved through the program. The table below shows that almost [REDACTED] of homes in 2014 were built by the top ten builders. This breakout is consistent with our experience with and knowledge of the residential new construction market. However, as the program matures MaGrann should continue to monitor builder production and seek out ways to boost participation levels of existing builders that may not be building many or any program homes.

Table 4. Top Ten Builders in 2014

Builders	Number of projects	% of Total Projects
Top 10 Builders		
Builder A	[REDACTED]	[REDACTED]
Builder B	[REDACTED]	[REDACTED]
Builder C	[REDACTED]	[REDACTED]
Builder D	[REDACTED]	[REDACTED]
Builder E	[REDACTED]	[REDACTED]
Builder F	[REDACTED]	[REDACTED]
Builder G	[REDACTED]	[REDACTED]
Builder H	[REDACTED]	[REDACTED]
Builder I	[REDACTED]	[REDACTED]
Builder J	[REDACTED]	[REDACTED]
Sub-total for Top Ten	[REDACTED]	[REDACTED]
Remaining [REDACTED] Builders	[REDACTED]	[REDACTED]
Total 2014 Homes	1,991	100%

The program provides incentives for single family (one or two units), multiple-single family (three or more units with separate entrances), and multifamily new homes (up to three floors and three or more units that share a common entrance). The table below shows the number of each dwelling type that were completed through the program in 2014. Not surprisingly, [REDACTED] make up the dominant share with [REDACTED]. [REDACTED] multifamily buildings went through the program in 2014.

Table 5. Number of Homes by Type

Building Type	Number of Homes	Percent of Total Homes
Single Family	[REDACTED]	[REDACTED]
Multiple Single Family	[REDACTED]	[REDACTED]
Total	1,991	100%

PUBLIC VERSION - REDACTED**EVALUATION RESULTS****ILLUME**

To better accommodate multifamily buildings, in 2015 the program will [REDACTED]
[REDACTED]. MaGrann staff note that it is often [REDACTED] to get a [REDACTED] due to the [REDACTED]
[REDACTED] and offer a [REDACTED]. This new approach is appropriate and consistent with other multifamily new construction programs across the nation.

As previously discussed, the program seeks to encourage builders to increase the energy efficiency levels of their homes by offering higher incentives the lower the HERS score. For homes approved in 2014, the average HERS score was [REDACTED]. The figure below shows that [REDACTED] of homes qualified for the lowest, or most efficient, HERS score range.

Figure 1: Percent of Homes by HERS Score Range



5.2 PROGRAM PROCESSES AND PROCEDURES

The following section includes a review of program processes, including builder and rater enrollment and training, incentive fulfillment, quality control, and communications.

Builder and Rater Outreach, Enrollment, and Training

Program staff note that there are currently a sufficient number of builders and raters to keep up with program demand. The sections below discuss program outreach and enrollment for builders and raters, followed by program training.

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Program Outreach and Enrollment

The EfficiencyCrafted Homes program is open to all builders of eligible residential building types. Builders must [REDACTED], select [REDACTED]

[REDACTED], and [REDACTED]

[REDACTED] in order to participate in the program. Builders wishing to participate at the ENERGY STAR level must all enroll with EPA as an ENERGY STAR Builder Partner on the EPA's website and complete the necessary ENERGY STAR requirements.

Program representatives deliver [REDACTED] through the following channels:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

MaGrann reaches builders through [REDACTED], such as [REDACTED]

[REDACTED] They also recruit builders through [REDACTED]

The program also holds a [REDACTED]. A [REDACTED] is organized, where [REDACTED]

[REDACTED] In 2014, the event was held at the [REDACTED]
builders were presented with an [REDACTED]

[REDACTED] of the builders interviewed were not able to attend the 2014 event, citing that they either had a conflict or that the distance was too far away. Additional builder perspectives on the [REDACTED] event are described below:

- [REDACTED] **may be an issue for some builders.** [REDACTED] builders stated that [REDACTED], and [REDACTED] others noted that in order to be [REDACTED].
- **Builders who attend the [REDACTED]** builders who attended [REDACTED] said they [REDACTED], citing that it was [REDACTED] and that the event is also a [REDACTED]
- **Builders are using the [REDACTED]** of the builders interviewed [REDACTED] through the program, and [REDACTED] noted that they [REDACTED], with most stating that they [REDACTED]

PUBLIC VERSION - REDACTED**EVALUATION RESULTS****ILLUME**

In 2014, [redacted] raters were enrolled in the program. Participating raters must be a [redacted]

[redacted]. Additionally, participating rating companies must [redacted]
the purpose of which may be to [redacted]

, and the like.

Raters are recruited by the program through [redacted]

and through [redacted].

During our interviews we asked builders and raters how they [redacted]

Raters most frequently [redacted] through a [redacted]
[redacted]. Raters typically decide to participate in the
program because they view it as an [redacted]. In
addition, [redacted] raters noted that they [redacted] in the program in order to
[redacted].

Builders [redacted] from a variety of sources. Approximately [redacted] of
builders stated that they had [redacted] through [redacted]
such as through a [redacted] builders had [redacted]

[redacted] from [redacted], and [redacted] builders had [redacted]
[redacted], such as their [redacted]. Most frequently,
builders [redacted] in the program because of the [redacted].
Builders also [redacted] because they [redacted]

[redacted], and because their [redacted]
builders also referred to their [redacted] as a way to
[redacted], and emphasized the importance of their [redacted] from a
[redacted]. According to one builder, [redacted]

All raters described the [redacted] as [redacted], rating it between a [redacted]
on a five-point scale (with five meaning [redacted]). Of the [redacted] raters stated
that they currently, or have in the past, participated in the [redacted].
Among these, [redacted] stated that the [redacted]. As described by one rater:
[redacted]

More than [redacted] of builders interviewed [redacted] also described the [redacted] as
[redacted]. [redacted] builders were not employed at their companies during the
[redacted]. Among the remaining [redacted] builders, [redacted]

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by [REDACTED] as an [REDACTED]. One of these builder noted that, [REDACTED]

Program Trainings

The program offers builders and raters several different training opportunities throughout the year, including a [REDACTED]

[REDACTED] to builder staff is also offered. MaGrann notes that the frequency of trainings varies depending on what is needed. Builder and rater trainings are offered free-of-charge and are publicized to all stakeholders, including subcontractors to builders such as HVAC companies.

[REDACTED] builders have attended program trainings, while [REDACTED] stated that they have never attended trainings. Among those who have attended trainings, [REDACTED] builders rated the trainings as [REDACTED] on a five-point scale, with five meaning "very useful".) As stated by one builder, [REDACTED]
[REDACTED] For builders who [REDACTED] the most frequent reasons were that they either [REDACTED], or were [REDACTED]

[REDACTED] of these builders had specific recommendations to improve the trainings. For those builders who have not attended trainings, they are either [REDACTED] (their primary reason for participating in the program are [REDACTED]
[REDACTED].

About [REDACTED] of all builders [REDACTED] stated that they would like to see [REDACTED]
Desired topics mentioned include [REDACTED]
[REDACTED]

Rebate Processing and Payment

In order to qualify for an incentive, builders must [REDACTED]
[REDACTED] ensures the [REDACTED]
, including that [REDACTED] . The [REDACTED] and [REDACTED] as well. Homes [REDACTED] are then eligible for [REDACTED]
a [REDACTED] that are approved through the [REDACTED] incentive payments. Homes must be [REDACTED]
[REDACTED]. Homes must also be [REDACTED]. Following construction,

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[REDACTED] must be [REDACTED]

In 2013, in an effort to [REDACTED]

MaGrann notes that [REDACTED] from the time an [REDACTED] MaGrann requests [REDACTED] batched on a [REDACTED]

[REDACTED] are administered each month. As a result, times were [REDACTED] to an average of [REDACTED] is received to the time the [REDACTED] from COH as needed. [REDACTED] are [REDACTED] and a backup report with [REDACTED]. Following [REDACTED]

[REDACTED] of the [REDACTED] raters stated that they complete and submit program [REDACTED]. The other [REDACTED] raters noted that their builders complete this paperwork. Among the [REDACTED] raters that do complete this paperwork, [REDACTED] described the [REDACTED] (giving scores of [REDACTED] on a five-point scale, with five being very easy), and stated that they were satisfied with the paperwork required. As stated by one rater, [REDACTED] other rater described the process as [REDACTED], giving a score of [REDACTED] on the five point scale. The remaining [REDACTED] builders thought the [REDACTED] was [REDACTED] (scores or [REDACTED] on a five-point scale, with one being very difficult). One of these builders said that the [REDACTED] but it appears that the issue for him has been resolved, noting that he [REDACTED]

[REDACTED] The [REDACTED] builder said that he would prefer a [REDACTED], and has run into occasional issues in [REDACTED]. Program staff note that they have investigated a [REDACTED], but at this time [REDACTED].

[REDACTED] builders stated that they complete [REDACTED]. For those builders who do not complete these forms, their rater typically processes this paperwork for them. Nearly all builders who complete the site [REDACTED] forms described these as [REDACTED], and noted [REDACTED]

As described by one builder, [REDACTED] However, [REDACTED] builders noted that they are [REDACTED]

All builders were asked about their satisfaction (on a scale of one to five, with five being very satisfied) related to the [REDACTED]. Of the [REDACTED] builders who provided a rating, [REDACTED] were satisfied or [REDACTED] (giving a rating of [REDACTED]), while [REDACTED] were [REDACTED] and [REDACTED] was [REDACTED]. [REDACTED]

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builders also commented on the [REDACTED]. Of these, [REDACTED] builders indicated that they [REDACTED] builder would just like to [REDACTED], but could offer no suggestions for improvement, and another builder said that a [REDACTED] would be faster. On a [REDACTED], MaGrann provides a [REDACTED] which includes [REDACTED]. This report should provide sufficient information to builders so they can determine what may be the [REDACTED], if any, and [REDACTED]. However, [REDACTED] builders seemed [REDACTED] and asked for the [REDACTED]. The program should consider [REDACTED].

While [REDACTED] and [REDACTED] is generally going smoothly, the program might [REDACTED] and perhaps offer a [REDACTED]. This may help to [REDACTED] noted above by some builders, and [REDACTED] that some builders may run into when working with their raters.

As noted previously, the program has had to [REDACTED] over the past two years in response to [REDACTED] were of particular interest for builders, and [REDACTED] builders out of the [REDACTED] who gave a rating said that they were [REDACTED] (giving a rating of [REDACTED] on a five-point scale, with five being very satisfied). [REDACTED] builders were [REDACTED] about the [REDACTED] (rating of [REDACTED], and three were [REDACTED] (rating of [REDACTED]). [REDACTED] builders who did not offer a rating said that they would like [REDACTED]. Builders discussed the [REDACTED] in relation to the [REDACTED], and in the context of historically [REDACTED]. As described by one builder, "*I just don't get back what I put into it.*" Another builder stated that, [REDACTED]

[REDACTED] builders noted that if [REDACTED], it may affect their ability to participate in the program.

[REDACTED] will continue to be an important topic to the program and to builders. As [REDACTED], the program will need to balance [REDACTED] and [REDACTED] with the [REDACTED]. The program should consider finding ways to [REDACTED]. The program already offers marketing support, trainings, and an annual recognition event, and should ensure that builders [REDACTED] in addition to [REDACTED]

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Quality Control (QC)

We also reviewed the program's quality assurance processes, which have largely remained the same over the last two years. The program's quality assurance process encompasses both [REDACTED] are performed on [REDACTED]

[REDACTED] This ensures that [REDACTED]

[REDACTED] Any discrepancies are resolved with the relevant parties.

The program also performs [REDACTED] of rater processes. On an [REDACTED] basis MaGrann inspects at least [REDACTED] of each rating company's participating homes [REDACTED], either by [REDACTED]

[REDACTED]. Additionally, each year a quality assurance/quality control check is done on at least [REDACTED] of each rating company's [REDACTED]. This check focuses on [REDACTED] and [REDACTED]

[REDACTED] For new rating companies or rating companies where issues have been identified, at least [REDACTED] must be approved before the rating company is reviewed at the standard [REDACTED] of homes rate. While not specifically asked, builders and raters did not cite any specific concerns regarding the program's quality assurance processes.

Builder and Rater Communications

MaGrann staff note that program updates and changes are typically communicated via [REDACTED]. [REDACTED] are also sent out to program stakeholders during the year with [REDACTED] and [REDACTED]. The program also holds periodic [REDACTED] to gain feedback from builders on program processes and performance to identify areas that may need change or improvement. [REDACTED] with builders and raters also take place as needed.

During builder and rater interviews, ILLUME asked about their communications with the program. Both builders and raters were asked to rate their [REDACTED] and their [REDACTED]

Builders and raters were [REDACTED] with their [REDACTED] with [REDACTED] out of [REDACTED] who responded giving a rating of [REDACTED] on a five-point scale, with five being very satisfied. Builders and raters were [REDACTED] with the [REDACTED] who rated it giving a rating of [REDACTED] builders noted specifically that they would

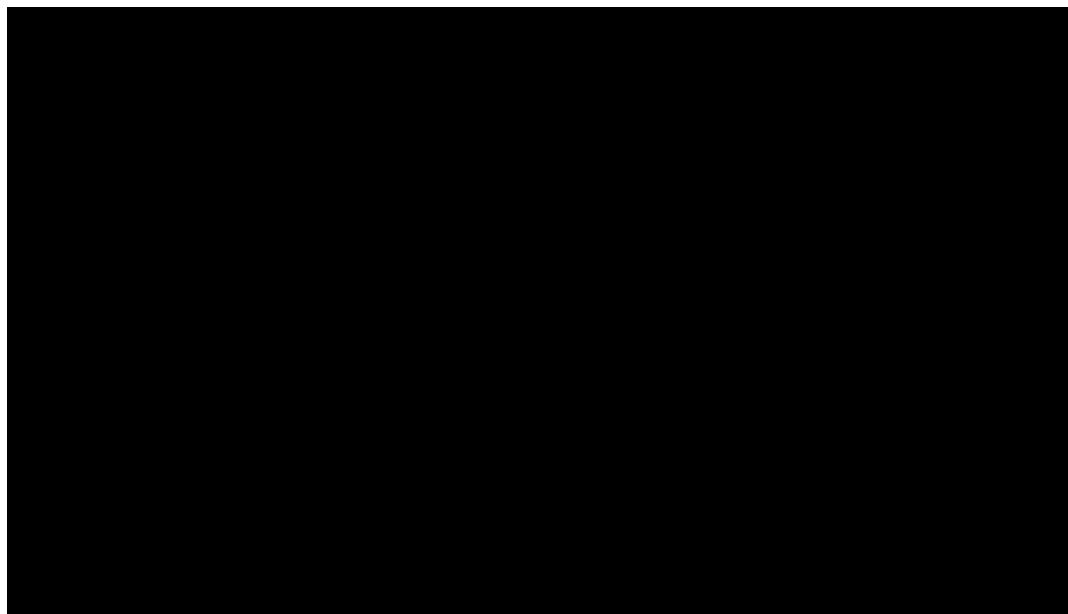
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like to [REDACTED]. To address this, the program should consider ways to [REDACTED], such as through a [REDACTED] which might include a [REDACTED] and a [REDACTED]

The figure below details builder and rater responses related to communications.

Figure 2: Builder and Rater Perspectives on Program Communications



Builders were also asked to rate [REDACTED] builders interviewed were [REDACTED] with these [REDACTED]. [REDACTED] builders noted that their [REDACTED], which can [REDACTED].

5.3 ENERGY EFFICIENT BUILDING PRACTICES

The following section discusses builder and rater perspectives on energy efficient building practices.

Building Practices and the [REDACTED]

In our interviews with participating builders, we explored whether the program has [REDACTED] builders out of the [REDACTED] asked said that the program has [REDACTED] their energy efficient [REDACTED]. Builders noted that [REDACTED] including [REDACTED].

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One builder said that it's an [REDACTED]. Meanwhile, [REDACTED] builders noted that they [REDACTED] of these builders said that he was [REDACTED].

Builders and raters did not show strong consensus around [REDACTED].

[REDACTED] Approximately [REDACTED] of participating builders and raters believe that the [REDACTED] during the past two years, while [REDACTED] believe that this [REDACTED]. Among those builders who have [REDACTED], they attribute this to [REDACTED], a [REDACTED]. Similarly, raters [REDACTED]. For builders who have [REDACTED], they note that it is [REDACTED]. As stated by one builder, [REDACTED].

Non-participating builders generally believe that the [REDACTED]. These builders attributed the [REDACTED] to a variety of reasons, including a [REDACTED] of energy efficient practices, a [REDACTED], and that the [REDACTED].

Homebuyer Demand for Energy Efficiency

About [REDACTED] of participating builders [REDACTED] and raters [REDACTED] interviewed believe that the [REDACTED], and that this trend will continue into the next two years. [REDACTED] builders and [REDACTED] raters think that [REDACTED]. The builders who perceived [REDACTED] energy efficient homes noted an [REDACTED].

Builders and raters [REDACTED] to a [REDACTED]. Of the [REDACTED] builders providing responses, [REDACTED] believe that [REDACTED] energy efficiency [REDACTED] as compared to [REDACTED], primarily because energy efficiency [REDACTED]. Builders said that [REDACTED] said that they [REDACTED].

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In contrast to participating builders and raters, the majority of non-participating builders stated that the [REDACTED] energy efficiency

[REDACTED] builders attribute this to [REDACTED]. As described by one builder, [REDACTED]

[REDACTED] Most non-participating builders were unsure if this trend will continue over the upcoming years.

5.4 PROGRAM REBRANDING AND MARKETING EFFORTS

In July of 2014, the program rolled out a new name and logo to the public at the Parade of Homes, launched a new [REDACTED], and began a [REDACTED] aimed at potential homebuyers. This followed an unveiling of the new program brand to builders and raters at the annual Builders' and Raters' Recognition Lunch several months earlier in February, 2014.

Program staff note that the program was rebranded for several reasons, including the following:

- The previous program name, "AEP Ohio/Columbia Gas of Ohio ENERGY STAR New Homes" was [REDACTED]
- The previous name was [REDACTED]
- Builders were [REDACTED] and the previous process evaluation found that they [REDACTED]
- [REDACTED]

COH and AEP Ohio contracted with Burkholder Flint to provide support and guidance during the rebranding effort. Burkholder Flint reviewed previous program evaluations and other relevant publications, and spoke with builders, raters, and homeowners to gain feedback on the program and its name. Several different names were proposed to COH, with the aim of creating something that was more consumer-friendly and identifiable, and spoke to the program's key messages of building homes that offer more [REDACTED], better [REDACTED] better [REDACTED], and better [REDACTED] than code-built homes. Ultimately, the "EfficiencyCrafted" name was chosen.

During our interviews, we asked participating builders to [REDACTED] Builders stated that the [REDACTED] This [REDACTED] with the current program brand is an important indicator that the change was a positive move for the program to make, because the previous process evaluation found that [REDACTED] builders interviewed [REDACTED],

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as they thought it [REDACTED]
[REDACTED].

Current Marketing Efforts

Marketing efforts in 2014 predominately included two different strategies, [REDACTED] and a [REDACTED]
[REDACTED].

The [REDACTED] was first launched in July of 2014, and includes a [REDACTED]
[REDACTED] and a [REDACTED]. This [REDACTED] brings up [REDACTED]
[REDACTED] such as "energy efficient" or "homebuilding". Burkholder Flint notes that the [REDACTED] has performed [REDACTED], and as of February of 2015 has achieved [REDACTED] (Burkholder notes that the national average is [REDACTED]). A [REDACTED] was also created, which the program notes has received almost [REDACTED] since its launch last summer. Based on these statistics, the [REDACTED] has thus far [REDACTED]. As time and budget allow, the program might also consider [REDACTED].

The [REDACTED] was provided to builders via email in July of 2014, and included several [REDACTED] with [REDACTED], in addition to [REDACTED]. Builders can [REDACTED] and [REDACTED]. During the launch of the new brand, the program also created [REDACTED] which was distributed to builders, explaining the [REDACTED]. Burkholder Flint notes that they are currently making updates to the [REDACTED] and [REDACTED] and plan to distribute these updates to builders later in the summer of 2015.

We spoke with builders and raters about the program's marketing efforts. [REDACTED] of the [REDACTED] builders stated that they had [REDACTED] builders specifically stated that they [REDACTED] and the [REDACTED] builders spoken with [REDACTED] co. [REDACTED], and wanted [REDACTED]. Builders also expressed [REDACTED]. The program should consider [REDACTED]

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[REDACTED]
For example,

5.5 PROGRAM MESSAGING TO HOMEBUYERS AND THE HERS INDEX

As a part of this evaluation we explored the effectiveness of program messaging and homebuyer awareness and perspectives on the HERS index, which is used as a marketing and educational tool.

Importance of [REDACTED] in Home Search

Participating homebuyers were asked to rate the importance in their [REDACTED]

[REDACTED] and on the [REDACTED] website. As shown in Figure 3, a number of [REDACTED] were rated as being important or very important (rated a [REDACTED] on a five point scale, with five being very important) by participating homebuyers. In fact, [REDACTED] was the [REDACTED] by fewer than [REDACTED] of the participating homebuyers at [REDACTED]

Figure 3: Importance of [REDACTED]

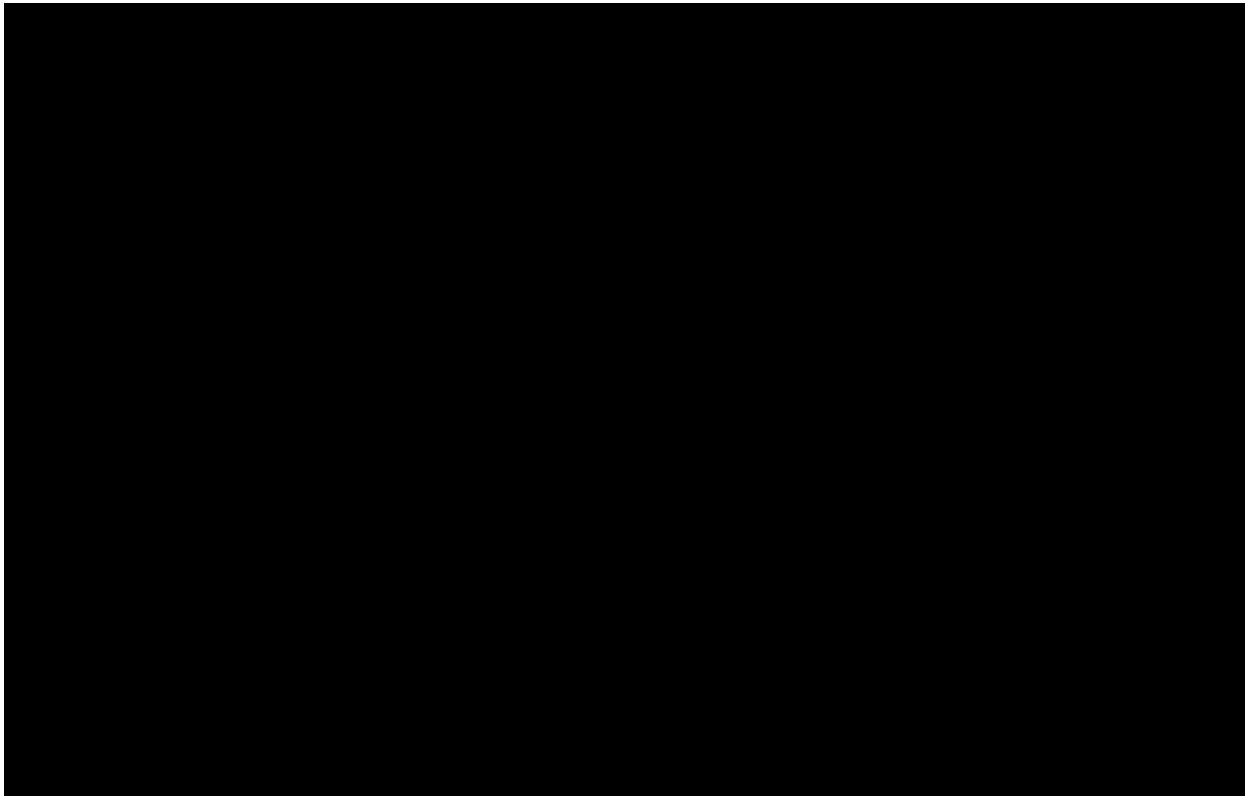
We also explored non-participating homebuyer perspectives on how [REDACTED]. Non-program [REDACTED], such as [REDACTED], were also explored in our surveys with non-participants to gauge how these items [REDACTED]. Respondents were asked to [REDACTED], and to rate [REDACTED] on a five-point scale, with one being not at all important and five being very important.

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Non-participating homebuyers scored [REDACTED] as the most important factor. [REDACTED] was second most important, followed very closely by [REDACTED] and a [REDACTED]. However, as shown, [REDACTED] were not observed in how much importance potential homebuyers place on [REDACTED]. While respondents were not [REDACTED] these results indicate that [REDACTED] homebuyers may [REDACTED]. For example, [REDACTED], and that is [REDACTED] scored the same levels of importance.

Figure 4. Non-participant scores for the [REDACTED]



[REDACTED] Messaging

Non-participating recent and prospective homebuyers were also asked a series of questions to [REDACTED]

Recent and prospective homebuyers were asked to [REDACTED], and [REDACTED] A

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Attachment A

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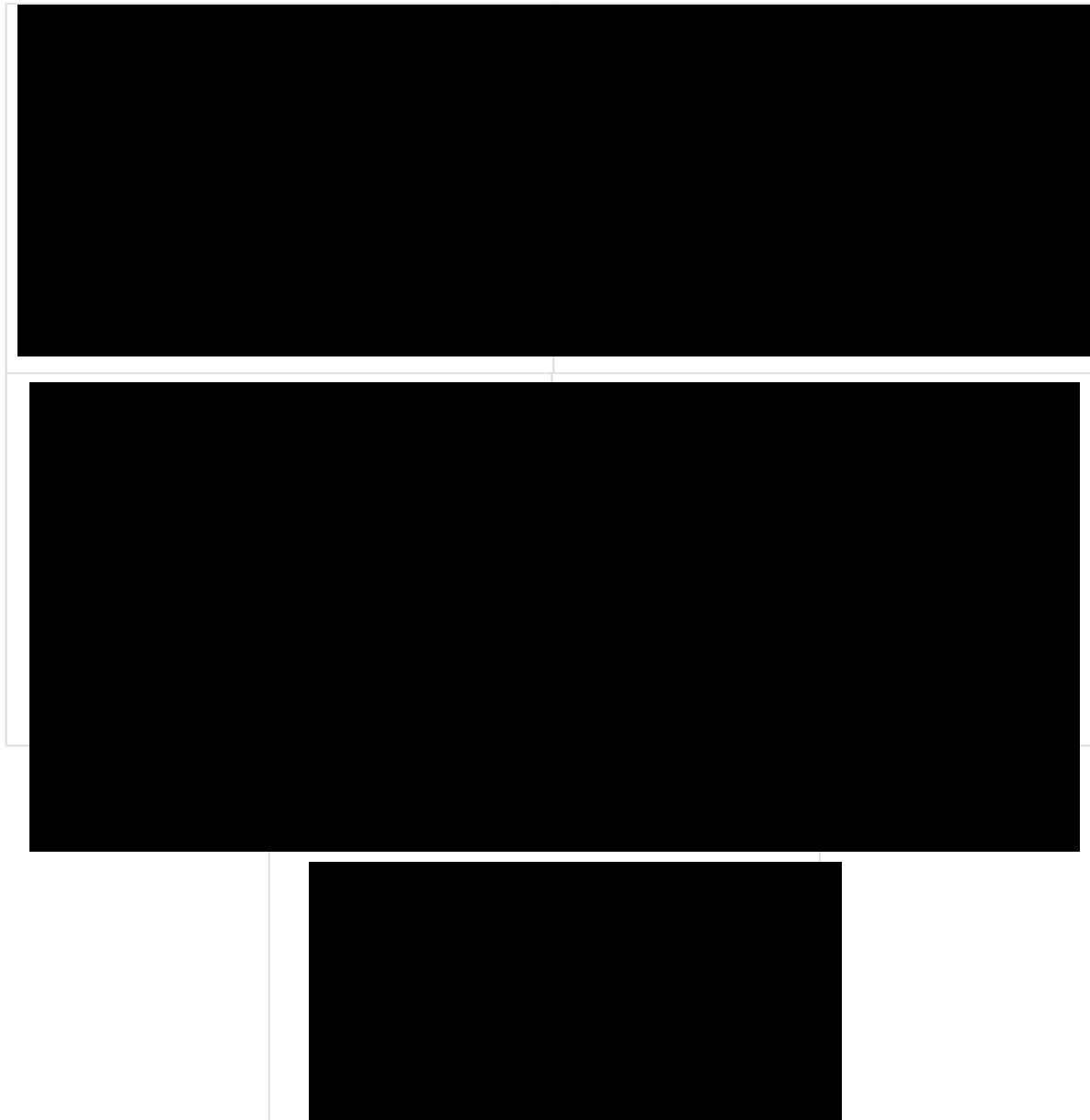
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[REDACTED] and an open-end response could also be provided.

The figure below includes five program messages, each followed by a chart showing [REDACTED]. Some messages appear to [REDACTED] while others, such as the third statement about [REDACTED], communicate [REDACTED]. In all cases, it appears that [REDACTED]

Figure 5: Non-participating homebuyer response to [REDACTED]



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Attachment A

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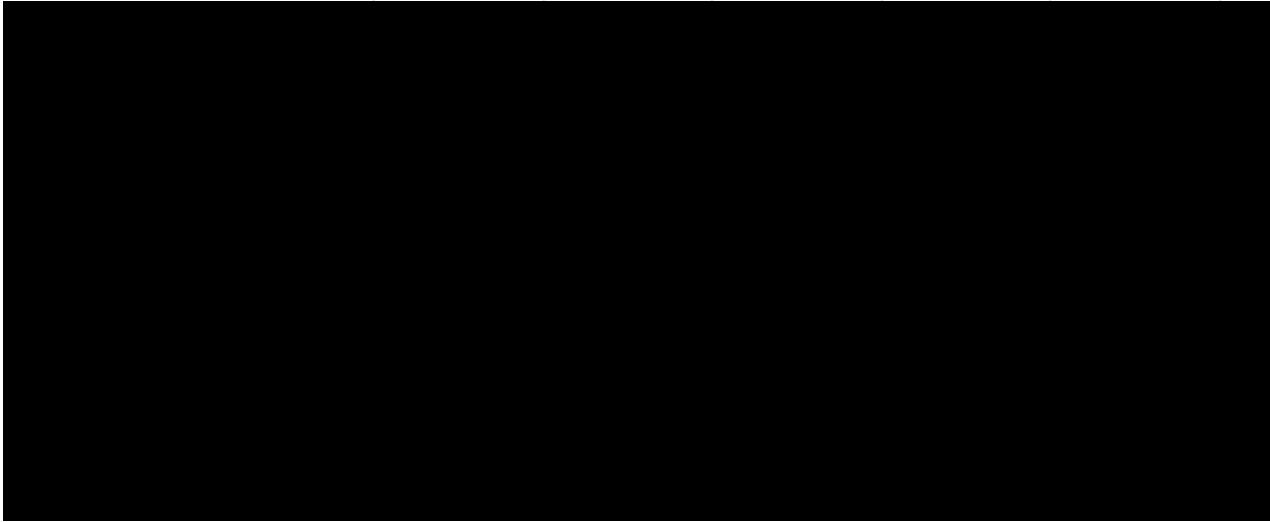
After reading all of the program messages, respondents were then asked to [REDACTED]

Non-participants selected [REDACTED]
(tied with [REDACTED])

[REDACTED] as the top characteristics that they [REDACTED]

[REDACTED] These qualities are also consistent with the intent of program messaging.

Figure 6: [REDACTED]



Finally, non-participants were asked to [REDACTED]
[REDACTED] of customers indicated that they [REDACTED]

[REDACTED] for considering an EfficiencyCrafted home, followed [REDACTED].

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Table 6. [REDACTED] to non-participants

After completing the questions about messaging, web panel respondents were asked that in

[REDACTED] of respondents indicated they would [REDACTED] of respondents indicated they were [REDACTED] demonstrating that current program messaging is [REDACTED]

HERS Index

The program uses the HERS index as a visual way of communicating and marketing the energy efficiency of a program home to the homebuyer. To [REDACTED] [REDACTED] we spoke with participating homebuyers, non-participating homebuyers, and participating builders to [REDACTED]

[REDACTED] said that they [REDACTED] noted that homebuyers are [REDACTED], and thus, As described by one builder, [REDACTED] Some builders also noted that they would like [REDACTED]

PUBLIC VERSION - REDACTED

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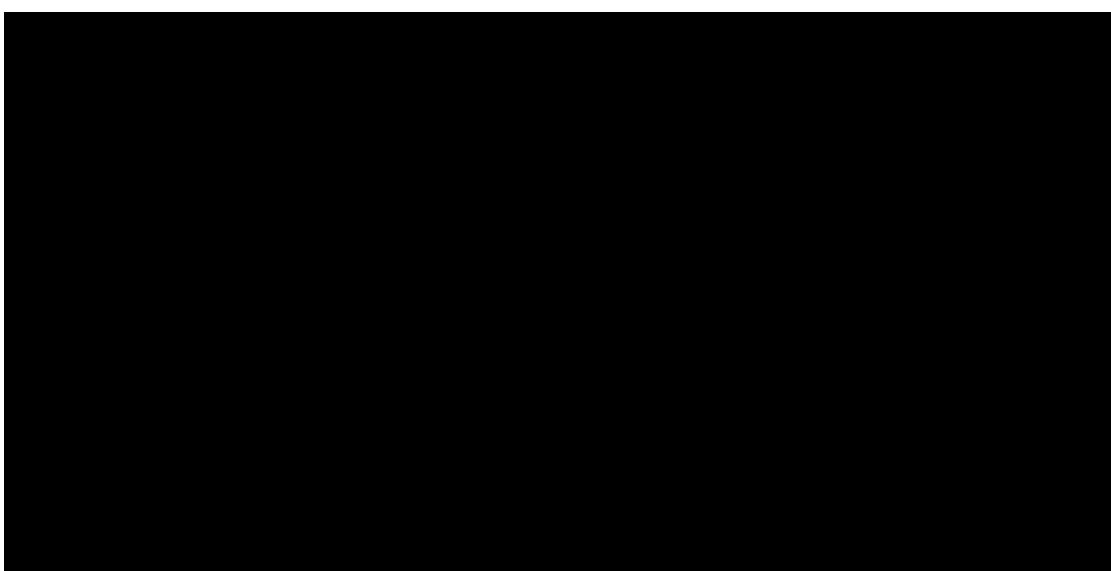
EVALUATION RESULTS

[REDACTED]. For those builders who [REDACTED] it is typically because they [REDACTED].

[REDACTED] of participating homebuyers said that they were [REDACTED]. Of those who were [REDACTED], [REDACTED] found it [REDACTED].

People who [REDACTED] or [REDACTED] were asked [REDACTED] [REDACTED] suggestions were given on [REDACTED]. Those suggestions include [REDACTED]

Figure 7. [REDACTED]

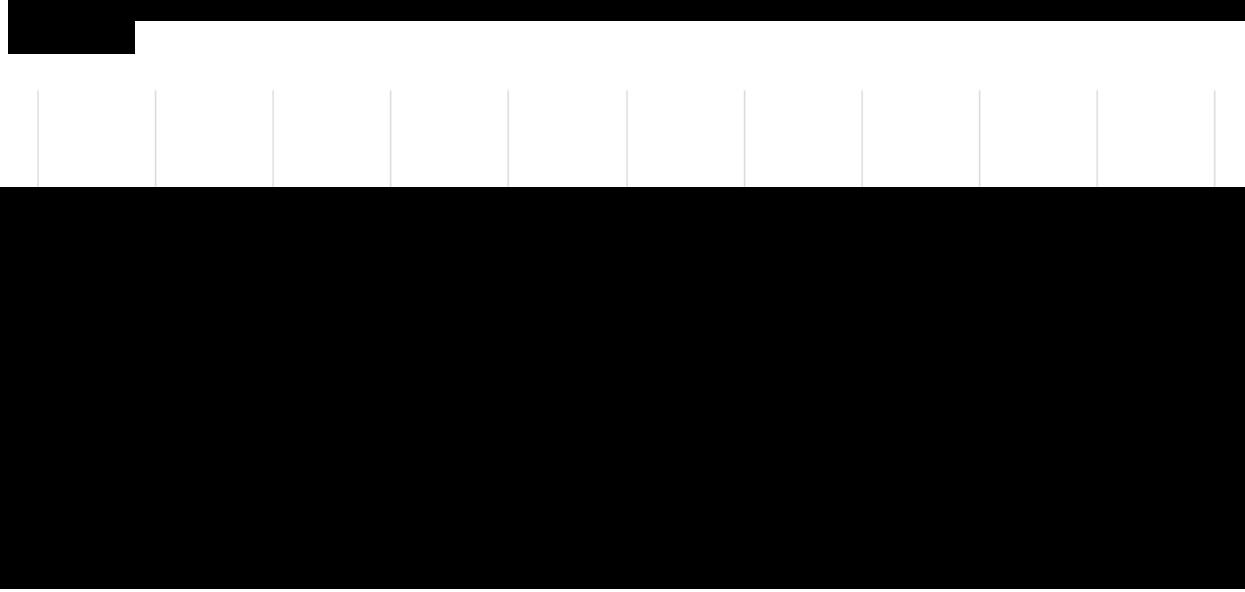


As a part of the web panel survey of non-participants, respondents [REDACTED] and were [REDACTED]. This graphic was the same one used on the program's website and in program materials. [REDACTED] percent of non-participants said they [REDACTED]. [REDACTED] said they [REDACTED].

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Figure 8: [REDACTED] helpful is the Home Energy Rating System (HERS) in helping non-



When asked if there were [REDACTED], of the [REDACTED] non-participants who provided feedback, [REDACTED] stated that [REDACTED]. The most popular [REDACTED] were [REDACTED] (requested by [REDACTED] of respondents) or [REDACTED] (requested by [REDACTED] of respondents). Other [REDACTED] included [REDACTED].

The HERS Index appears to be [REDACTED]. To encourage more builders to [REDACTED] the program should consider [REDACTED]. The results of this study might also be shared with builders to [REDACTED].

5.6 AWARENESS OF PROGRAM AND SPONSORSHIP

Several questions to assess program awareness were asked during our interviews with homebuyers and builders. The sub-sections below present our results from these efforts.

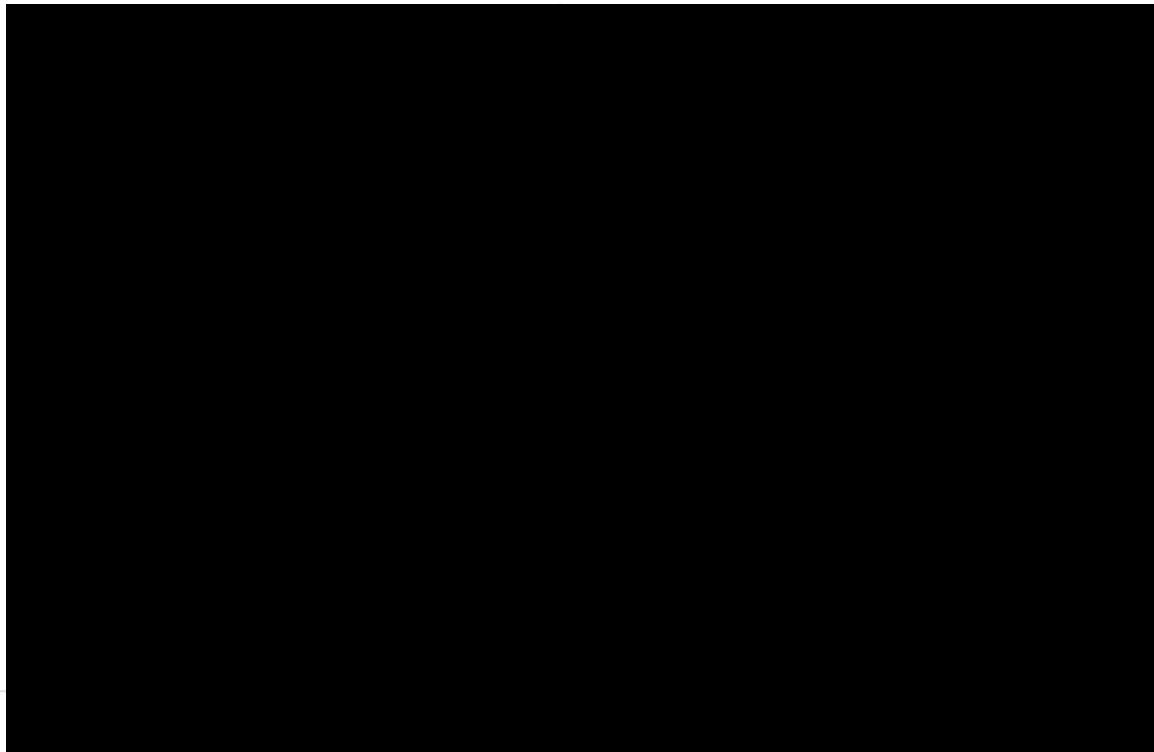
Participating Homebuyers

Participating homebuyers were asked if they were aware [REDACTED]. If aware, they were also asked who [REDACTED]. As shown in Figure 9, [REDACTED] of participating homebuyers were [REDACTED].

EVALUATION RESULTS

However, of those that were aware that [REDACTED] respondents said they were aware of [REDACTED] of them [REDACTED] program sponsors. Participating homebuyers most frequently [REDACTED].

Figure 9: Participating Homebuyer Awareness of the Program and COH Sponsorship



Participating homebuyers were also asked [REDACTED] percent of participating homebuyers reported that [REDACTED] of homebuyers said that this [REDACTED], while the remainder [REDACTED].

Related to this, [REDACTED] builders stated that they [REDACTED] Builders noted that they are trying to figure out [REDACTED] as stated by one builder, [REDACTED] of these builders also noted that they [REDACTED] This is usually a [REDACTED] For builders who [REDACTED] they [REDACTED] because they think [REDACTED], that it [REDACTED] that the [REDACTED] or because they [REDACTED]

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The program should consider [REDACTED]

[REDACTED], both through [REDACTED] and also though [REDACTED]. While [REDACTED] of participating homebuyers were [REDACTED] of respondents said that they [REDACTED]

The program should ensure that [REDACTED] perhaps offering [REDACTED] The program should also [REDACTED]

consider [REDACTED]

[REDACTED]. Additionally, a [REDACTED]

[REDACTED] could be [REDACTED]
including a [REDACTED]

Non-participant Recent and Prospective Homebuyers

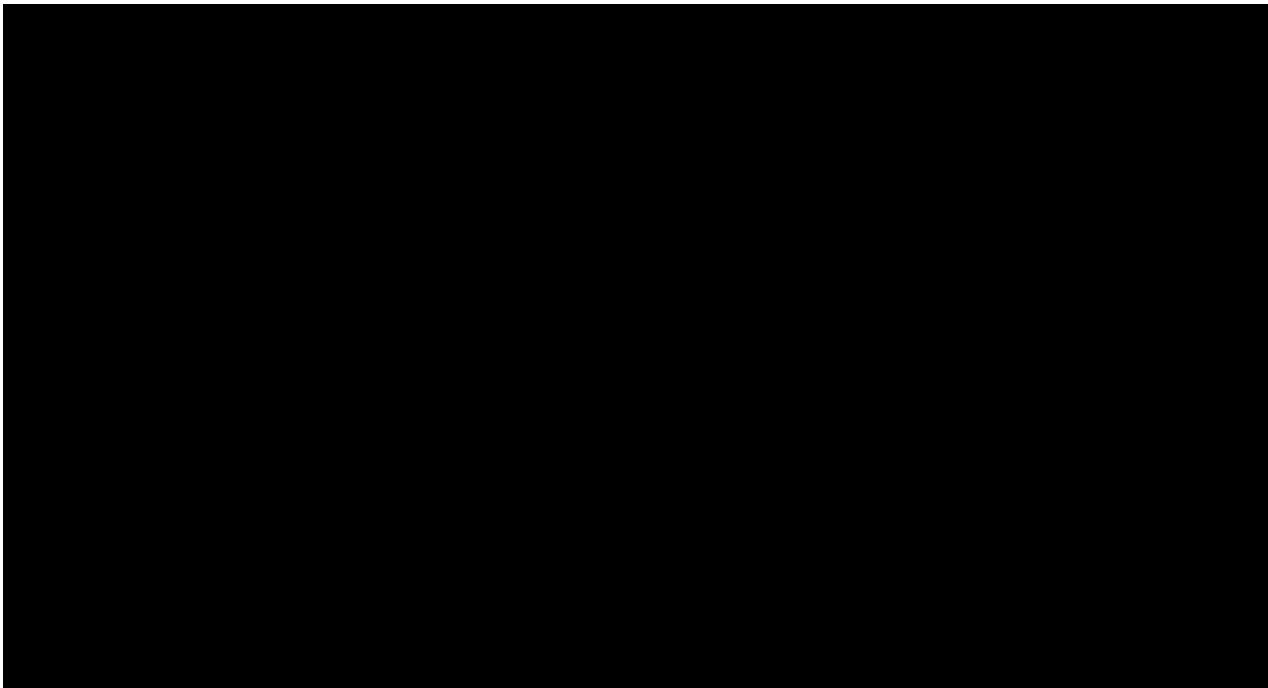
[REDACTED] were also explored in the non-participant web panel survey. Recent and prospective homebuyers were asked if they [REDACTED], and if so, [REDACTED] percent of non-participating homebuyers had [REDACTED]. This differed slightly between recent and prospective homebuyers, with [REDACTED] of recent homebuyers [REDACTED] of prospective homebuyers [REDACTED]. Because this was the first time a non-participant survey was conducted [REDACTED] this should be considered the baseline, and future evaluations should consider re-testing non-participant [REDACTED] to measure progress that is made related to [REDACTED] as time goes on.

The homebuyers [REDACTED] listed a range of responses about [REDACTED] [REDACTED]. The [REDACTED] most commonly cited [REDACTED] [REDACTED] were [REDACTED]. Respondents who were [REDACTED] [REDACTED] were also asked if they [REDACTED] [REDACTED]. Like participating homebuyers, [REDACTED] among non-participants is [REDACTED]. When asked, [REDACTED] participants could [REDACTED] [REDACTED] respondents thought [REDACTED] of the [REDACTED] respondents [REDACTED].

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Figure 10: Non-Participant Web Panel



Non-participating Builders

[REDACTED] was also explored as a part of our non-participating builder interviews. Of the [REDACTED] non-participating builders interviewed, [REDACTED] were [REDACTED]. Of these [REDACTED] was [REDACTED], while [REDACTED] builder was [REDACTED], but had not [REDACTED].

5.7 INFORMATION RESOURCES AND PATHS TO THE PROGRAM

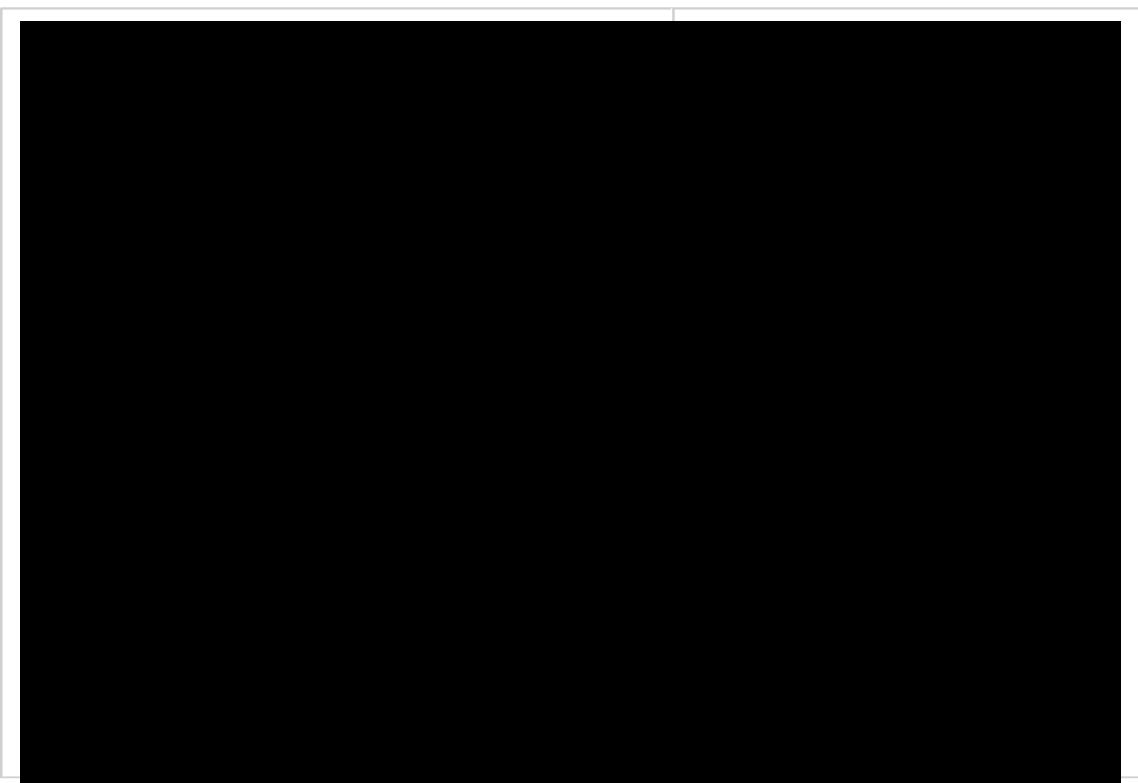
The following section explores how participating and non-participating homebuyers came to participate in the program, and different decision points along the way. Important sources of information in the search for a home were also investigated. Participating homebuyers were asked questions to explore the path they followed in building an EfficiencyCrafted home and the sources of information that they relied on. These questions were meant to gain a deeper understanding of the thought process that a homebuyer goes through prior to deciding to build a program home. Through the web panel survey, non-participating recent and prospective homebuyers were also asked a subset of these questions.

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We asked participating homebuyers what their [REDACTED] [REDACTED]. Participants were asked if they [REDACTED] and if so, did they [REDACTED]

[REDACTED] was the [REDACTED] for nearly [REDACTED] of the participating homebuyers. From the onset, approximately [REDACTED] of participating homebuyers [REDACTED] of participating homebuyers [REDACTED] Figure 11 provides additional detail on the thought process of the participating homebuyers.

Figure 11: [REDACTED] among participating homebuyers



Participating homebuyers who were [REDACTED] were asked to [REDACTED] [REDACTED]. Similarly, in the web panel survey, recent and prospective homebuyers were asked to [REDACTED] [REDACTED].

As depicted in Figure 12, participating homebuyers cited [REDACTED] [REDACTED] percent rated [REDACTED] on a five-point scale where five is very important). The next most important factor, [REDACTED] received very important ratings from [REDACTED] of respondents. [REDACTED] was least important with [REDACTED]

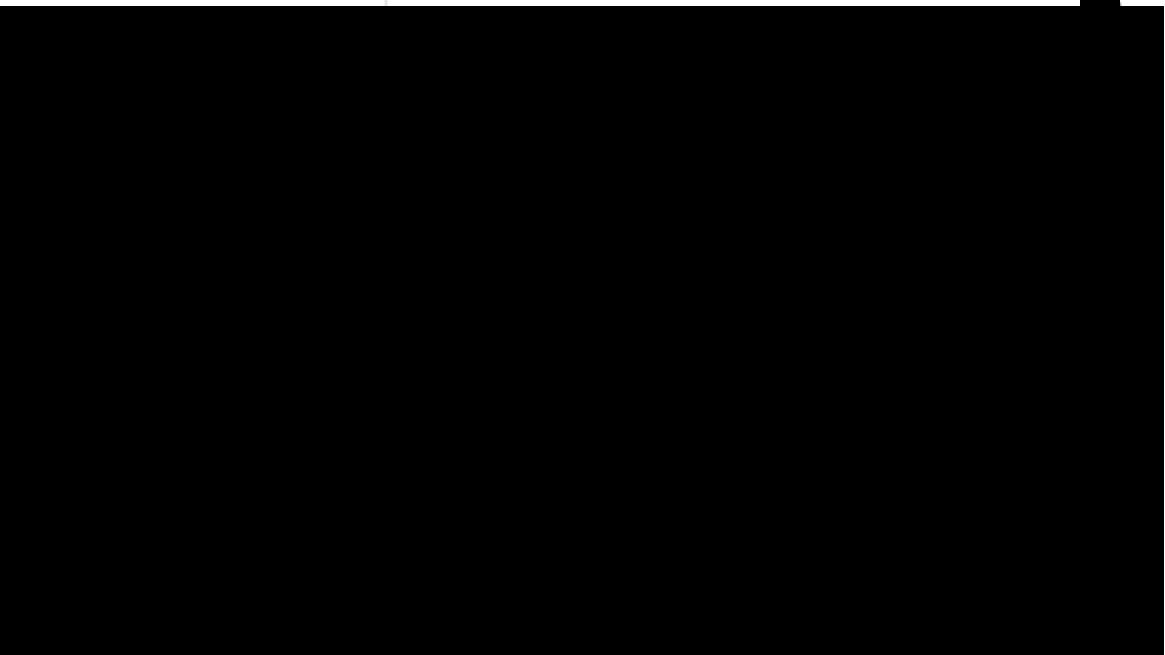
PUBLIC VERSION - REDACTED

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[REDACTED] rating it as very important. Participating homebuyers were also asked if there were any sources besides those listed in Figure 12 that were important in [REDACTED]. However, [REDACTED] stated there [REDACTED]

Figure 12: Importance of [REDACTED]



Non-participating homebuyers who had purchased a newly constructed home [REDACTED] also [REDACTED] as the most important [REDACTED]. When considering all non-participants, [REDACTED] was considered the most important [REDACTED] [REDACTED] of respondents ranking it as a four or five (with five being very important). Because of this, the program may want to consider [REDACTED]

came close in importance with [REDACTED] of non-participants noting it as very important, following by [REDACTED] scored as very important) and [REDACTED] scored as very important). The most commonly referenced [REDACTED] were [REDACTED].

5.8 PROGRAM SATISFACTION

The following sections discuss satisfaction among homebuyers, builders, and raters.

Participating Homebuyer Satisfaction

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Participating homebuyers were asked to [REDACTED], along with [REDACTED] as well as their [REDACTED]

As illustrated in Figure 13, participating homebuyers are [REDACTED]. The mean [REDACTED] with the [REDACTED] is [REDACTED] of the participating homebuyers indicating they were [REDACTED] (rated a [REDACTED] on a five point scale, with five being very satisfied). [REDACTED] participating homebuyers indicated that they [REDACTED] (rated a [REDACTED]). Homebuyers were [REDACTED], with a mean rating of [REDACTED]. While [REDACTED] of the homebuyers were [REDACTED] were not [REDACTED].

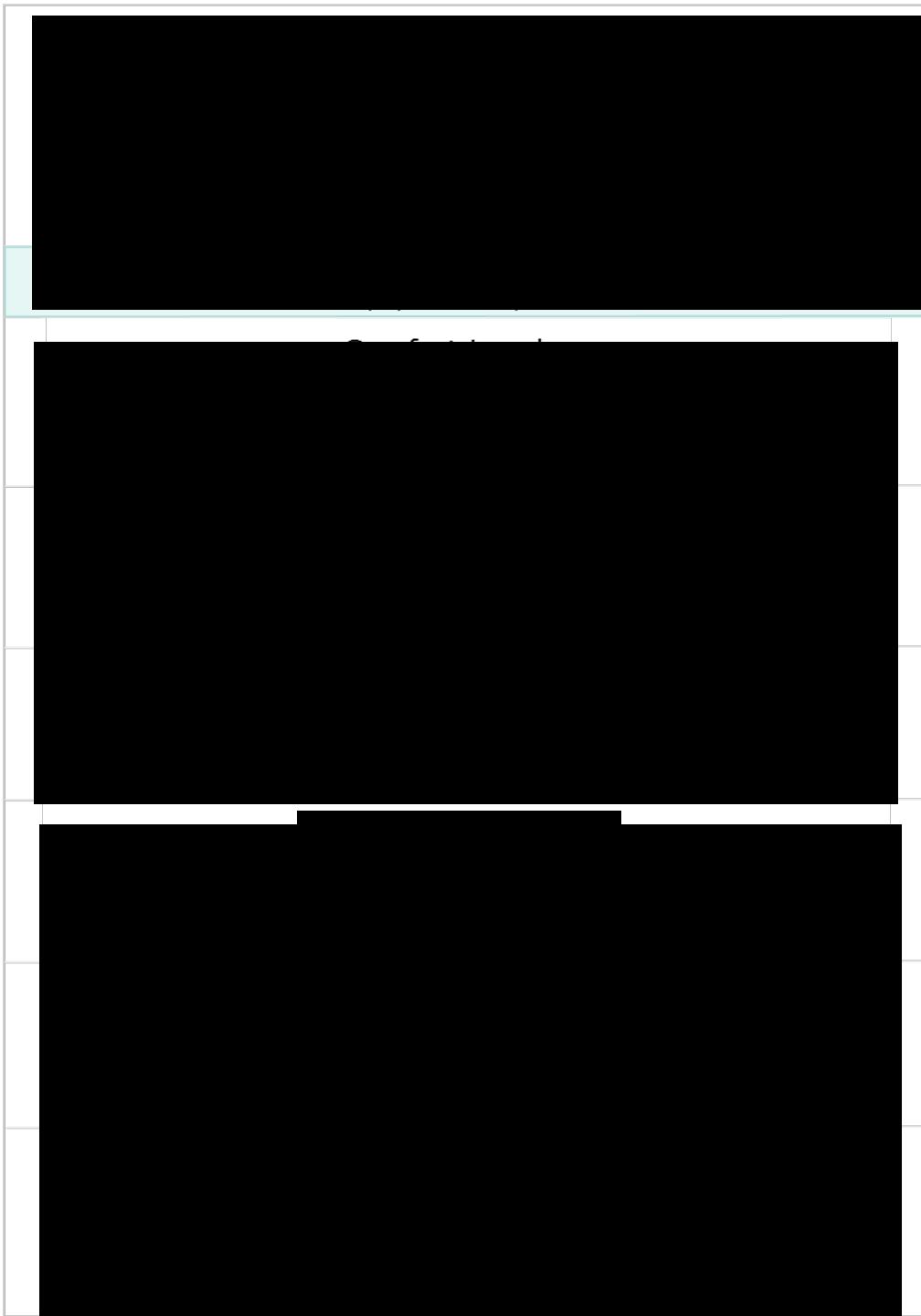
Participating homebuyers were [REDACTED] with the [REDACTED]. Each of these features received a mean [REDACTED] or more reporting [REDACTED] or [REDACTED] ([REDACTED] on a five point scale, with five being very satisfied).

Participating homebuyers were [REDACTED]. This aspect of the new home received the [REDACTED] ratings at [REDACTED] and the [REDACTED] responses at [REDACTED]. Since there are [REDACTED] responses, [REDACTED] Homeowners may be [REDACTED], which might have been [REDACTED], and therefore not different due to [REDACTED]. Additionally, it is possible that since homebuyers have [REDACTED] they are [REDACTED].

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Figure 13: Participating homebuyer [REDACTED]



Participating homebuyers were also asked what [REDACTED]

[REDACTED] The most commonly cited

[REDACTED], mentioned by [REDACTED] respondents, was to [REDACTED]

[REDACTED] of those

respondents specifying there is a particular need for [REDACTED]

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[REDACTED] Customer comments such as [REDACTED]

[REDACTED] indicate that many home buyers felt they were [REDACTED]

Other [REDACTED] offered by more than one person include [REDACTED]

[REDACTED].

Participating Builder and Rater Satisfaction

Participating builders and raters were also asked to [REDACTED] of the [REDACTED] builders and raters interviewed were [REDACTED], giving a rating of [REDACTED] on a five-point scale, where [REDACTED] builders cited [REDACTED], while [REDACTED] said that that the [REDACTED] other builders mentioned the [REDACTED]. Raters describe their [REDACTED] as the [REDACTED].

For non-participating builders, the [REDACTED] in the EfficiencyCrafted Homes program is [REDACTED]. Non-participating builders described the need to [REDACTED], and noted that the [REDACTED] As described by one builder, [REDACTED] Despite this, [REDACTED] non-participating builders said that they [REDACTED]. These builders stated a [REDACTED] and would also like to [REDACTED].

5.9 HOMEBUYER ENERGY EFFICIENCY PRACTICES AND KNOWLEDGE LEVEL

Our participating homebuyer and builder interviews investigated what conversations are occurring about [REDACTED] Knowledge levels of [REDACTED] were also explored with participating and non-participating homebuyers.

Knowledge Level of Energy Efficiency

We explored both participating and non-participating homebuyers' knowledge levels [REDACTED].

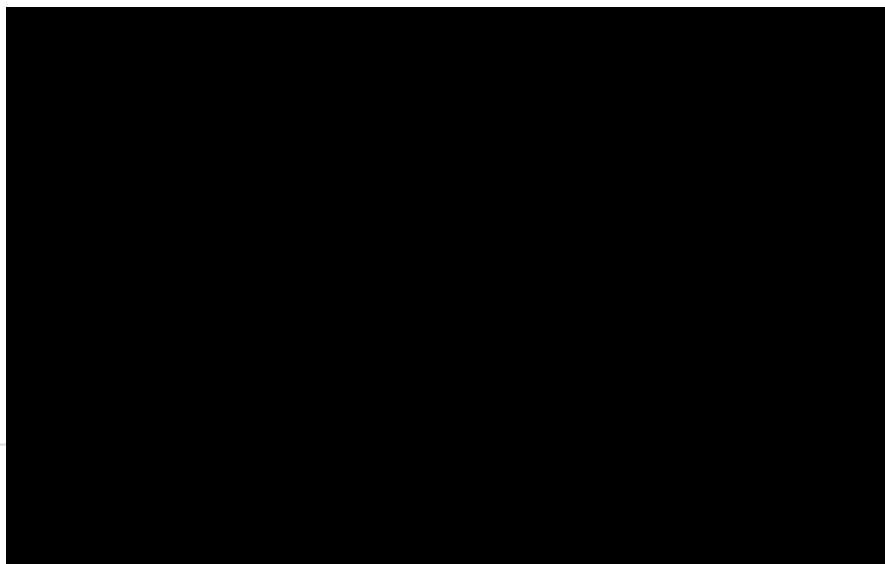
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When asked how knowledgeable they were about [REDACTED] [REDACTED] of participating homebuyers and nearly [REDACTED] of non-participating homebuyers ranked themselves a [REDACTED], on a scale where one is not at all knowledgeable and five is very knowledgeable. [REDACTED] percent of participating homebuyers and [REDACTED] of non-participating homebuyers ranked themselves as a [REDACTED] indicating that the [REDACTED] homebuyers feel that they are [REDACTED] whereas participating homebuyers are [REDACTED]. However, as noted, comparisons between these two groups should be [REDACTED] because the intent of the non-participant research was to test messaging with a wider net of customers.

Figure 14: Participating [REDACTED] and Non-participating [REDACTED] homebuyers' self-reported [REDACTED]



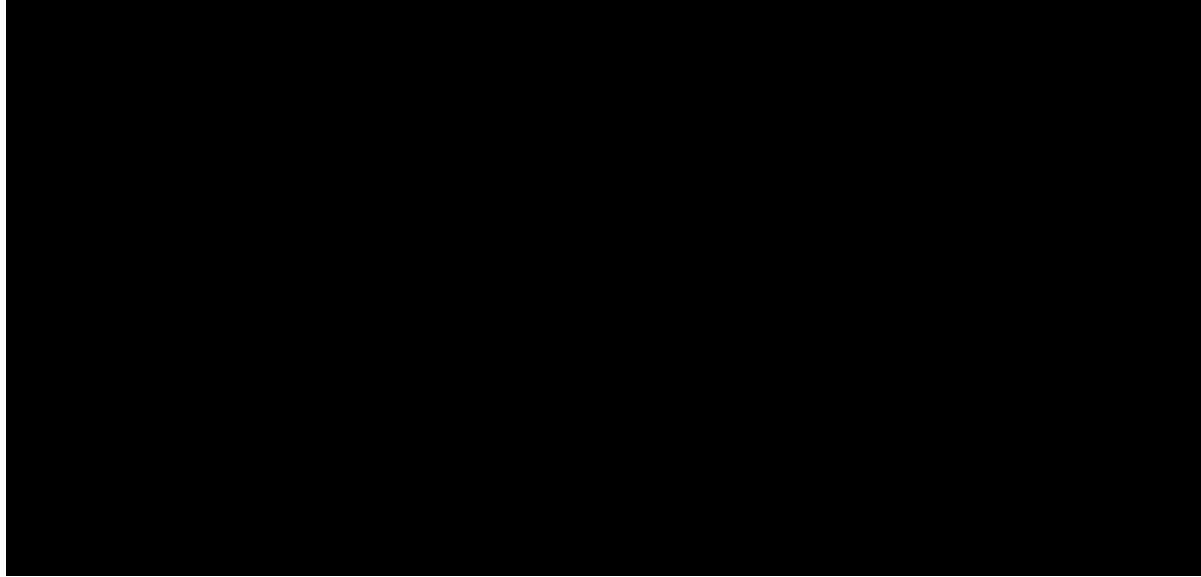
Energy Efficient Practices

Efficient building practices ensure that energy consumption is minimized through high performance design and materials. Once the home is built and moved into, the occupants of the home also drive consumption levels through their energy usage practices and behaviors. Participating builders and homebuyers were asked specific questions to [REDACTED]

About [REDACTED] of participating homebuyers say their builder [REDACTED] [REDACTED] were the actions mentioned most often,

cited by [REDACTED] respondents respectively. Figure 15 shows some of the additional [REDACTED].

Figure 15: [REDACTED] with participating homebuyers



Because [REDACTED] has a significant impact on home energy intensity, participating homebuyers were also asked about their [REDACTED] [REDACTED]. As shown in Figure 16, [REDACTED] of participating homebuyers are [REDACTED] [REDACTED] are the most commonly used at all times with an average [REDACTED]

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Figure 16: [REDACTED] of participating homebuyers [REDACTED]



Approximately [REDACTED] of builders stated that they [REDACTED]. Builders specifically [REDACTED]. Among non-participating builders, [REDACTED] stated that they [REDACTED]. In addition, [REDACTED] non-participating builders noted that they [REDACTED], though [REDACTED].

The program should consider providing participating builders and homebuyers with [REDACTED], such as a [REDACTED].

Energy [REDACTED]

Program staff noted that in future years, they may consider adding [REDACTED] to the program to [REDACTED]. An [REDACTED] would ensure a [REDACTED], and the homebuyer would [REDACTED]. To explore this, as a part of our surveys we asked builders and homebuyers tell us how [REDACTED]
[REDACTED]
[REDACTED] builders said that [REDACTED] both for the [REDACTED], and also because [REDACTED]

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[REDACTED] As described by one builder, [REDACTED]. Similarly, another builder stated that [REDACTED] and that [REDACTED] of non-participating builders [REDACTED] stated that an [REDACTED]. According to one non-participating builder, the [REDACTED] non-participating builder also noted that [REDACTED], though he noted anecdotally that he is not sure [REDACTED].

Participating homebuyers viewed this [REDACTED] stating that this would have been [REDACTED]. Additionally, [REDACTED] percent of non-participants stated that an [REDACTED] indicating that this may be a [REDACTED].

Based on builder and homebuyer responses, an [REDACTED]. However, caution should be used if this is to be rolled out to homebuyers. The [REDACTED]

The program should consider [REDACTED]

5.10 NON-NATURAL GAS BENEFITS

As part of the process evaluation, ILLUME identified and calculated non-natural gas benefits associated with the program in 2014. Carbon emissions savings were identified as a non-natural gas benefit resulting from the program and was quantified. As shown in the table below, in 2014 the program accumulated non-natural gas benefits equivalent to about [REDACTED].

Table 7: Annual Non-Natural Gas Benefits in 2014

Type of Savings	Per Unit Savings	Annual Program Savings in 2014
[REDACTED]	[REDACTED]	[REDACTED]

The program also creates additional non-energy benefits to participating builders in the form of support, incentives [REDACTED] paid in 2014), and training in building practices. Builders described the primary benefit to their participation in the program as the [REDACTED] (mentions). [REDACTED] builders also noted that the program helps them [REDACTED], and [REDACTED] noted that the program can be [REDACTED]. As described by one builder, [REDACTED]

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[REDACTED] For raters, the primary benefits to participating in the program are that they [REDACTED] and that they are able to [REDACTED]
[REDACTED].

While not monetized, homebuyers also benefit from [REDACTED] to program [REDACTED] and [REDACTED] as compared to a code-built home. These qualities were explored through the satisfaction questions included in Section 5.8.

The final non-energy benefit explored was how the program affects home values. In our participating homebuyer survey, we asked whether participants believed that [REDACTED]

percent of respondents strongly agreed with this statement, while 24% were neutral and [REDACTED] did not agree. Determining exactly how [REDACTED]

[REDACTED] may be a point of future evaluation research.

ILLUME

A. SURVEY DEMOGRAPHICS

Participating Homebuyers Phone Survey

Table 8. Key Demographic Characteristics of Participating Homebuyers

Demographic characteristic	Status	Percent respondents
Home Size [REDACTED]	<=1500 sq ft	[REDACTED]
	1600 – 2000 sq ft	[REDACTED]
	2100 – 2500 sq ft	[REDACTED]
	2600 – 3000 sq ft	[REDACTED]
	>=3100 sq ft	[REDACTED]
Age [REDACTED]	Under 55	[REDACTED]
	Over 55	[REDACTED]
Income [REDACTED]	Up to \$50,000	[REDACTED]
	Over \$50,000	[REDACTED]

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Non-Participating Homebuyers Web Panel

Table 9. Home Purchasing Status

Have you/Are you...	Percent respondents	Type of home	Percent respondents	Total
Bought or built a home in the last 3 years		A newly constructed home		100%
		An existing home		
Planning to buy/build home in the next 5 years		Likely to build new home		100%
		Unsure		
		Unlikely to build new home		

Table 10. Key Demographic Characteristics

Demographic characteristic	Status	Percent respondents
Tenure	Own	
	Rent	
House type	Single-family (4 or fewer units)	
	Multifamily (5 or more units)	
Age	Mobile home	
	Under 55	
Income	Over 55	
	Up to \$50,000	
	Over \$50,000	

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B. NON-NATURAL GAS BENEFITS CALCULATIONS

Non-natural Gas Benefits - Calculations Worksheet

Non-natural Gas Benefits - Calculations Worksheet

C. PARTICIPATING HOMEBUYER SURVEY



Columbia Gas of Ohio Efficiency Crafted Homes Program Participating Homebuyer Survey Instrument

FINAL April 21, 2014

This is a telephone survey that will be conducted with █ EfficiencyCrafted® Homes homeowners. The objectives of the survey include the following: (1) assessing homeowner awareness of the program and COH sponsorship, (2) exploring the effectiveness of program marketing, messaging, and homebuyer understanding of the HERS Index, (3) determining homebuyer satisfaction levels with the home and its features, and (4) assessing how customers are using their new home's efficiency features.

1. INTRODUCTION

Hello, my name is [INTERVIEWER NAME] with the Leede Research Group calling on behalf of the EfficiencyCrafted Homes program (*IF NEEDED: EfficiencyCrafted Homes are built using advanced construction practices and design to meet a higher standard of energy performance*). We are conducting a survey of customers who recently built an EfficiencyCrafted home. This is not a sales call, and responses will be used to inform the program about your experience and to evaluate current program offerings. This interview will only take about 10 minutes of your time.

[INTERVIEWER: If customer asks about how their information is kept secure, please use the following response,

"We maintain safeguards to protect survey responses. These include, for example, physical security of our facilities, technical safeguards to protect electronic data, and manager supervision."]

Are you the person who is most familiar with the purchase or building of your new home?

Screening Questions

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[CONTINUE WITH THE APPROPRIATE CONTACT PERSON]

2. SCREENING QUESTIONS

I1. Are you currently talking to me on a regular landline phone or a cell phone?

1. (Landline phone)
2. (Cell Phone)
98. (Don't know)
99. (Refused)

[ASK IF I1 = 2, 98, 99]

I2. Are you currently somewhere safe and not driving a motorized vehicle?

1. (Yes)
2. (No) [Schedule call back]
98. (Don't know) [Schedule call back]
99. (Refused) [Schedule call back]

First, I'd like to ask you a few questions about your household.

I3. Are you, or is anyone in your household, a current or former employee of an electric or gas utility company?

1. (Yes) [THANK & TERMINATE]
2. (No)
98. (Don't know) [THANK & TERMINATE]
99. (Refused) [THANK & TERMINATE]

3. PROGRAM AWARENESS

A1. Before this call today, were you [REDACTED]

1. (YES)
2. (NO)
3. (Other: specify _____)
98. (DON'T KNOW)
99. (REFUSED)

[ASK A2 IF A1=1]

A2. Are you [REDACTED] (IF
NEEDED: [REDACTED] .)

1. (YES)
2. (NO)
3. (Other: specify _____)

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Program Marketing and Messaging

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- 98. (DON'T KNOW)
- 99. (REFUSED)

[IF A2=1, ASK A2a]

A2a. Who [REDACTED] ? [DO NOT LIST,
MULTIPLE RESPONSE, UP TO 3]

- 1. [REDACTED]
- 2. [REDACTED]
- 3. [REDACTED]
- 4. [REDACTED]
- 5. [REDACTED]
- 6. (Other, SPECIFY: _____)

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

A3. On a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree", how much do you agree with the following statement? [REDACTED]

[REDACTED]. [RECORD NUMBER, 98=don't know,
99=refused]

4. PROGRAM MARKETING AND MESSAGING

Now I have a few questions about the process you went through in purchasing your home.

M0. When you [REDACTED], which of the following, if any, was your [REDACTED]

- 1. [REDACTED]
 - 2. [REDACTED]
 - 3. [REDACTED]
00. (Other: Specify _____)
- 98. (Don't know)
 - 99. (Refused)

M1. When you [REDACTED], did you [REDACTED] ?

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

[ASK M2 IF M1=1 AND A1=1]

M2. Did you [REDACTED] ?

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Program Marketing and Messaging

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

M2a. Did your [REDACTED]
[REDACTED]

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

[ASK M2b if M2a=1]

M2b. At what [REDACTED]
[REDACTED] ? Did your [REDACTED]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]

00. (Other: specify)
98. (Don't know)
99. (Refused)

[ASK M3 IF A1=1]

M3. How did you [REDACTED] [DON'T
READ LIST]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. [REDACTED]
8. [REDACTED]
9. [REDACTED]
10. [REDACTED]
11. [REDACTED]
12. [REDACTED]
13. [REDACTED]
14. [REDACTED]
15. [REDACTED]
16. [REDACTED]
17. [REDACTED]
18. [REDACTED]

Program Marketing and Messaging

Page

00. (Other) [Specify _____]
98. (Don't know)
99. (Refused)

[ASK M5 IF AI=1]

M5. On a scale of 1 to 5, where 1 is not important at all and 5 is very important, how important were the following sources in [REDACTED]

[ROTATE LIST]

M6. Besides those just listed, were any other sources important in

? [MULTIPLE RESPONSE, UP TO THREE]

1. [REDACTED]

2. [REDACTED]

3. [REDACTED]

4. [REDACTED]

5. [REDACTED]

6. [REDACTED]

6. (No other sources/Nothing else)

00. (Other: specify: _____)

98. (Don't know)

99. (Refused)

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Program Marketing and Messaging

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M7. Now I'm going to read a list of reasons [REDACTED]

[REDACTED] As I read

[REDACTED] the list, please tell me how important the following reasons [REDACTED]

[REDACTED] where 1 is "not at all important" and 5 is "very important". [ROTATE LIST, RECORD NUMBER, 98=Don't know, 99=Refused]

a. [REMINDED OF SCALE IF NEEDED] [REDACTED]

b. [REMINDED OF SCALE IF NEEDED] [REDACTED]

c. [REMINDED OF SCALE IF NEEDED] [REDACTED]

d. [REMINDED OF SCALE IF NEEDED] [REDACTED]

e. [REMINDED OF SCALE IF NEEDED] [REDACTED]

f. [REMINDED OF SCALE IF NEEDED] [REDACTED]

g. [REMINDED OF SCALE IF NEEDED] [REDACTED]

M8. Are you [REDACTED]

(IF NEEDED: [REDACTED])

1. (YES)

2. (NO)

98. (DON'T KNOW)

99. (REFUSED)

[ASK M9 IF M8=1]

M9. How [REDACTED]

[REDACTED] ? Please rank this on a scale of 1 to 5, with 1 being not at all helpful and 5 being very helpful. [RECORD NUMBER, 98=Don't know, 99=Refused]

[ASK M10 IF M9=1,2,3]

M10. What would [REDACTED] ? Please note any other information you would need to make this information more helpful. [OPEN END]

M11. Now think back to when you were deciding whether or not to build your new home. Would [REDACTED] have

been [REDACTED] ?

1. (YES)

2. (NO)

98. (DON'T KNOW)

PUBLIC VERSION - REDACTED

Attachment A

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Energy Efficient Practices

ILLUME

99. (REFUSED)

5. ENERGY EFFICIENT PRACTICES

Next I would like to ask you a few questions about ways to save energy in your home.

S1. Did [REDACTED]

?

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

[ASK S2 IF S1=1]

S2. What [REDACTED] ? [MULTIPLE RESPONSE]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. [REDACTED]
7. (Don't remember)
8. (Other, specify: _____)
98. (Don't know)
99. (Refused)

S3. Your [REDACTED]

. Do you [REDACTED] ?

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

S4. What [REDACTED]

	[REDACTED]	Don't know (98)	Refused (99)
a.	[REDACTED]		
b.	[REDACTED]		
c.	[REDACTED]		

PUBLIC VERSION - REDACTED

Attachment A

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Program Satisfaction

ILLUME

6. PROGRAM SATISFACTION

Now, I'd like to ask you about your satisfaction with your new home.

PS1. On a 1 to 5 scale, where 1 is "very dissatisfied" and 5 is "very satisfied," how satisfied are you with the following: [ROTATE LIST; RECORD NUMBER, 98=Don't know, 99=Refused]

- a. [REMIND OF SCALE IF NEEDED] [REDACTED]
- b. [REMIND OF SCALE IF NEEDED] [REDACTED]
- c. [REMIND OF SCALE IF NEEDED] T [REDACTED]
- [REDACTED]
- d. [REMIND OF SCALE IF NEEDED] [REDACTED]
- [REDACTED]
- e. [REMIND OF SCALE IF NEEDED] [REDACTED]
- f. [REMIND OF SCALE IF NEEDED] [REDACTED]
- [REDACTED]
- g. [REMIND OF SCALE IF NEEDED] [REDACTED]
- [REDACTED]

PS2. Please tell me how much you agree or disagree with the following statement, where 1 means strongly disagree and 5 means strongly agree. [REDACTED]

[RECORD NUMBER, 98=Don't know, 99=Refused]

PS3. What is one thing you would [REDACTED]
[REDACTED] [OPEN-ENDED]

- 00. [OPEN END]
- 96. (Nothing)
- 98. (Don't know)
- 99. (Refused)

7. KNOWLEDGE OF [REDACTED] AND DEMOGRAPHICS

Thank you for your time, I just have a few more questions.

D1. On a scale of 1 to 5, where 1 is not at all knowledgeable and 5 is very knowledgeable, how would you rate [REDACTED]
[REDACTED]? [RECORD NUMBER, 98=Don't know, 99=Refused]

D3. What is the approximate square footage of your home?

- 1. [NUMERIC OPEN END]
- 98. (Don't know)

8. Thank you and Closing

ILLUME

99. (Refused)

D4. Now I am going to read a list of age ranges. Please stop me when I get to your age.

- 1. 24 YRS OR YOUNGER
- 2. 25 TO 44 YRS
- 3. 45 TO 54 YRS
- 4. 55 to 64 YRS
- 4. 65 YEARS AND OVER
- 98. (DON'T KNOW)
- 99. (REFUSED)

D5. Which of the following categories best represents your total annual household income before taxes? Please tell me when I get to your range.

- 1. Up to \$50,000
- 2. Over \$50,000
- 98. (Don't know)
- 99. (Refused)

8. THANK YOU AND CLOSING

[ASK C1 IF "ESTARVERSION" = 3]

C1. The program is gathering testimonials from customers about the benefits of living in an EfficiencyCrafted Home. These testimonials will be used as a promotional and educational tool for future homebuyers. Would you be interested in having a program representative reach out to you to provide a testimonial?

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

Those are all the questions I have for you today. Thank you so much for your time. The EfficiencyCrafted Homes program appreciates your participation in this survey.

PUBLIC VERSION - REDACTED

Survey Introduction

ILLUME

D. NON-PARTICIPATING HOMEBUYER WEB PANEL SURVEY

ILLUME

Columbia Gas of Ohio Efficiency Crafted Homes Program Homebuyer Web Panel Survey

FINAL April 21, 2014

This is an online survey that will be conducted with [REDACTED] recent or prospective non-participating homebuyers through a web panel of customers that have agreed to periodically take surveys. The objectives of the survey include assessing homeowner awareness of the program, COH sponsorship, and exploring the effectiveness of program marketing, messaging, and homebuyer understanding of the HERS Index.

1. SURVEY INTRODUCTION

Dear Customer,

ILLUME Advising, LLC is surveying recent and prospective homebuyers to understand what types of characteristics they seek in a home, what resources they use in their home search, and to test specific brand awareness and messaging.

If you have any questions, please contact ILLUME at research@illumeadvising.com.

Please click here to access the survey. It will only take about 10 minutes.

Thank you,

ILLUME Advising, LLC

[Screen break]

2. BASIC SCREENING

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Attachment A

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Basic Screening

ILLUME

S1. Who is your natural gas utility?

1. Columbia Gas of Ohio
2. Dominion East Ohio [THANK & TERMINATE]
3. Duke Energy [THANK & TERMINATE]
4. Vectren Energy [THANK & TERMINATE]
5. Other [THANK & TERMINATE]
6. Don't Know [THANK & TERMINATE]

[Screen break]

S1a. Are you, or is anyone in your household, a current or former employee of an electric or gas utility company?

1. Yes [THANK & TERMINATE]
2. No

[Screen break]

S2. Have you [REDACTED]

1. Yes
2. No

[ASK S2a IF S2=1]

S2a. What [REDACTED]

1. [REDACTED]
2. [REDACTED]

[ASK S2b if S2a=1]

S2b. Did you [REDACTED]

1. [REDACTED]
2. [REDACTED]
3. Don't know

[ASK S2c if S2a=1]

S2c. Did you [REDACTED]

1. Yes [THANK AND TERMINATE]
2. No
3. Don't know

[Screen break]

[ASK S3 IF S2=2]

S3. Do you [REDACTED]?

1. Yes

PUBLIC VERSION - REDACTED

HomeBuyer Resources and Brand Awareness

ILLUME

2. No [THANK & TERMINATE]

[ASK S3a IF S3=1]

S3a. How likely are you to [REDACTED]

1. Definitely [REDACTED]
2. Very likely [REDACTED]
3. Unsure [REDACTED]
4. Very unlikely [REDACTED]
5. Definitely will [REDACTED]

[Screen break]

3. HOMEBUYER RESOURCES AND BRAND AWARENESS

Now I have some questions about information you [REDACTED]

[REDACTED] IF S3=1; [REDACTED]

[REDACTED] IF S2a=2; [REDACTED]

[REDACTED] IF S2a=1]

H1. On a scale of 1 to 5, where 1 is not important at all and 5 is very important,

how important are/were the following sources in influencing your [REDACTED]

[REDACTED] IF S3=1 or S2a=2; [REDACTED] IF S2a=1] [ROTATE LIST]

	Not at all important				Very Important	Not Applicable	Don't Know
	1	2	3	4	5		
[REDACTED]							
[REDACTED]							
[REDACTED]							
[REDACTED]							
[REDACTED]							

PUBLIC VERSION - REDACTED

Attachment A

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HomeBuyer Resources and Brand Awareness

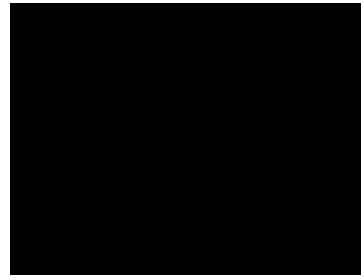
ILLUME

H2. Besides those just listed, are/were any other sources important in influencing your [REDACTED]? Please choose up to three other sources and rank them in order of importance (1 is the most important).

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. No other sources
6. Other: specify: _____
7. Other: specify: _____
8. Other: specify: _____

[Screen break]

A1. Are you aware of the [REDACTED] [Insert logo below]



1. Yes
2. No

[Screen break]

[ASK A1a if A1=1]

A1a. How did you first hear about [REDACTED]?

19. [REDACTED]
20. [REDACTED]
21. [REDACTED]
22. [REDACTED]
23. [REDACTED]
24. [REDACTED]
25. [REDACTED]
26. [REDACTED]
27. [REDACTED]
28. [REDACTED]
29. [REDACTED]
30. [REDACTED]
31. [REDACTED]
32. [REDACTED]
33. [REDACTED]

PUBLIC VERSION - REDACTED

Program Marketing and Messaging

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34. [REDACTED]
35. [REDACTED]
00. Other [Specify] _____]

[Screen break]

[ASK A2 IF A1=1]

- A2. To the best of your knowledge, [REDACTED]
[REDACTED] Please list up to [REDACTED] that you are aware of.
1. [REDACTED] : _____
2. [REDACTED] : _____
3. [REDACTED] : _____
4. I am not aware [REDACTED]

[Screen break]

4. PROGRAM MARKETING AND MESSAGING

M1. Now we want to get your perspective on the EfficiencyCrafted Homes program [“, which is a program offered in your area that certifies the energy efficiency of newly constructed homes” IF A1=2].

For the following section, we will ask you to read five different statements about the program. After each statement, we will ask you to tell us what program quality or feature most comes to mind after reading it.

[Screen break]

M1a. Please read the following program description:

[REDACTED]

[Screen break]

What program quality or feature most comes to mind after reading the previous statement? [ROTATE LIST]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. Other, specify: _____

[Screen break]

M1b. Please read the following description:

PUBLIC VERSION - REDACTED

Program Marketing and Messaging

ILLUME

[Screen break]

What program quality or feature most comes to mind after reading the previous statement? [ROTATE LIST]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. Other, specify: _____

[Screen break]

M1c. Please read the following description:

[REDACTED]

[Screen break]

What program quality or feature most comes to mind after reading the previous statement? [ROTATE LIST]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. Other, specify: _____

[Screen break]

M1d. Please read the following description:

[REDACTED]

[Screen break]

What program quality or feature most comes to mind after reading the previous statement? [ROTATE LIST]

1. [REDACTED]
2. [REDACTED]
3. [REDACTED]
4. [REDACTED]
5. [REDACTED]
6. Other, specify: _____

PUBLIC VERSION - REDACTED

Program Marketing and Messaging

ILLUME

[Screen break]

M1e. Please read the following description:



What program quality or feature most comes to mind after reading the previous statement? [ROTATE LIST]

1. _____
2. _____
3. _____
4. Other, specify: _____

[Screen break]

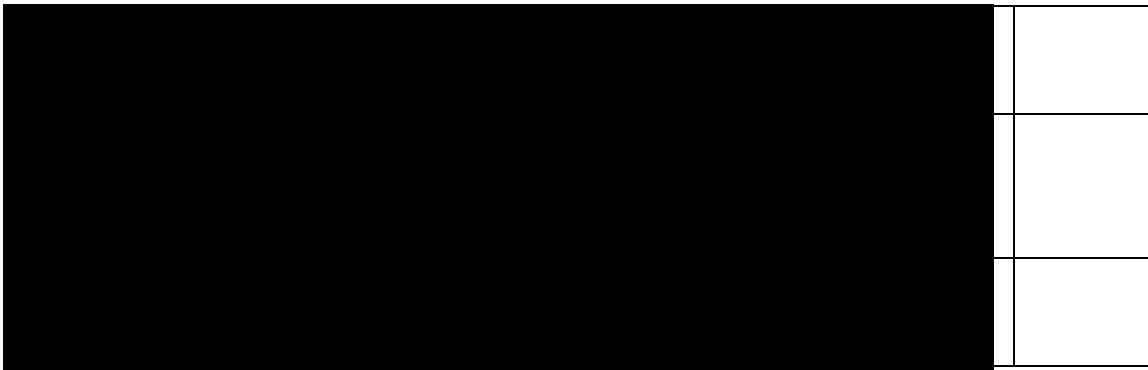
M2. After reading all of these statements, now please choose the top three program qualities or features that come to mind when you think of an EfficiencyCrafted home. Please rank your choices, with 1 being the first quality or feature that comes to mind. [ROTATE LIST]

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. Other, please specify: _____

[Screen break]

M3. Next, please choose which statement would be _____.

	Choose one
_____	_____
_____	_____

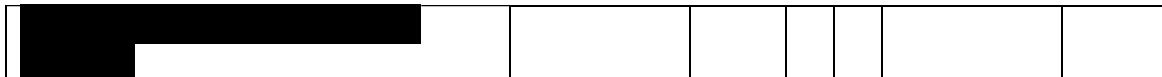


[Screen break]

M4. Now imagine your next home was a newly constructed home. Please consider the level of importance that each of the elements below would have in your decision, where 1 is not at all important and 5 is very important. [ROTATE LIST]

Program Marketing and Messaging

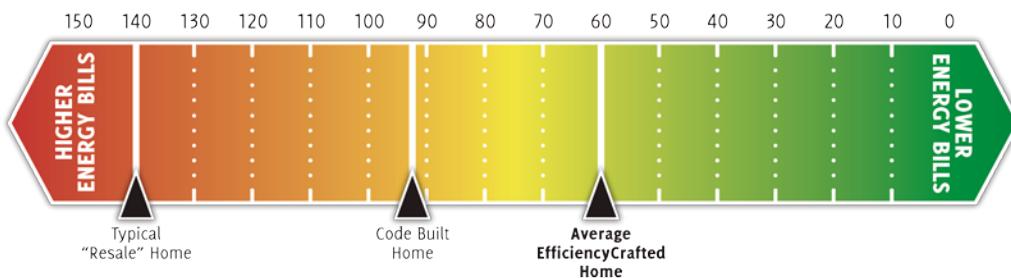
ILLUME



[Screen break]

M5. Each EfficiencyCrafted home receives a score for its level of energy efficiency compared to that of a typical new home built to code, also known as a Home Energy Rating System (HERS) score. The lower the score, the more energy efficient the home. Please review the graphic below.

Home Energy Rating System



M6. On a scale of 1 to 5, with 1 being not at all helpful and 5 being very helpful, how helpful is the Home Energy Rating System (HERS) in [REDACTED]

1 2 3 4 5 Don't Know

[Screen break]

[ASK M7 IF M6=1, 2, 3]

M7. What would [REDACTED] Please note any other information you would need to [REDACTED] [OPEN END]

M8. Would you be [REDACTED] ?

1. Yes
 2. No

[Screen break]

M9. In considering the next home you purchase or build, how likely is it that you will [REDACTED]?

- ## 1. Definitely will consider

PUBLIC VERSION - REDACTED

Attachment A
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Knowledge of Energy efficiency, Satisfaction, and

Demographics

ILLUME

2. Very likely to consider
 3. Unsure
 4. Very unlikely to consider
 5. Definitely will not consider

[Screen break]

M10. Now imagine that you are deciding whether to build an EfficiencyCrafted home, and learn that it will [REDACTED]—meaning that if

[REDACTED] . Would having an [REDACTED] make you more likely to consider building an EfficiencyCrafted home?

1. Yes
 2. No
 3. Unsure

[Screen break]

5. KNOWLEDGE OF ENERGY EFFICIENCY, SATISFACTION, AND DEMOGRAPHICS

Thank you for your time, just a few more questions.

D1. On a scale of 1 to 5, where 1 is not at all knowledgeable and 5 is very knowledgeable, how would you rate your knowledge level of the [REDACTED]

1 2 3 4 5 Don't Know

[Screen break]

D2. How would you rate your satisfaction with the [REDACTED]
[REDACTED], where 1 is very dissatisfied and 5 is very satisfied? Please indicate your level of satisfaction below.

1 2 3 4 5 Don't Know

[Screen break]

PUBLIC VERSION - REDACTED

Thank you and Closing

ILLUME

D3. Do you currently rent or own your home?

1. Rent
2. Own

D4. Which of the following best describes your home?

1. A mobile home
2. A single-family detached residence
3. A single-family attached residence (for example, a townhouse)
4. An apartment or condominium in a building with 2-4 units
5. An apartment or condominium in a building with 5 or more units
6. Other – Please specify: _____
7. Don't know

D5. What is the approximate square footage of your home?

1. Under 1,000 square feet
2. 1,001 to 2,000 square feet
3. 2,001 to 3,000 square feet
4. 3,001 to 4,000 square feet
5. 4,001 to 5,000 square feet
6. Over 5,000 square feet
7. Don't know

D6. What is your age?

1. 24 YRS OR YOUNGER
2. 25 TO 44 YRS
3. 45 TO 54 YRS
4. 55 to 64 YRS
4. 65 YEARS AND OVER
98. Don't know
99. Refused

D7. Which of the following categories best represents your total annual household income before taxes?

1. Up to \$50,000
2. Over \$50,000
98. Don't know
99. Refused

[Screen break]

6. THANK YOU AND CLOSING

PUBLIC VERSION - REDACTED

Attachment A

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Thank you and Closing

ILLUME

*Those are all the questions I have for you today. Thank you so much for your time.
We appreciate your participation in this survey.*

E. PARTICIPATING BUILDER INTERVIEW GUIDE



Columbia Gas of Ohio EfficiencyCrafted Homes Program Builder Interview Guide

[NOTE: This document will be used as a guide to conduct in-depth interviews with participating builders. Questions listed will be used to learn more about the builders' experience with the program, areas of strength or success, areas for improvement, and satisfaction with various aspects of the program and the program overall.]

1. INTRODUCTION & WARM UP

Hello, may I please speak with [CONTACT NAME]? My name is [INTERVIEWER NAME] from ILLUME Advising. I am calling on behalf of the Columbia Gas of Ohio's EfficiencyCrafted Homes program.

We are evaluating this program and would like to ask you a few questions about your company's experience with the program. Are you familiar with your company's participation in the EfficiencyCrafted Homes program? [IF NO, ASK IF CAN SPEAK WITH SOMEONE FAMILIAR WITH THE PROGRAM.]

This interview should just take approximately 15 minutes of your time.

We appreciate your willingness to participate and to recognize the value of your time, we're offering a \$40 Visa gift card. Is now a good time, or is there a more convenient time for me to call you back? Your responses will help us to evaluate the program and recommend potential improvements.

[CONTINUE WITH SURVEY OR MAKE AN APPOINTMENT TO CALL BACK.]

Before we start, I would like to ask for your permission to record this interview, so that I won't have to take notes while we talk. Is it ok that I record our interview? [CONFIRM PERMISSION TO RECORD]

PUBLIC VERSION - REDACTED

Builder Background Information and
Participation

ILLUMINE

2. BUILDER BACKGROUND INFORMATION AND PARTICIPATION

First, I have some general questions about you and your company.

1. What is your title and role within the COMPANY?
2. Does your company specialize in production or custom-built homes?
3. How many homes does your company typically build annually?
4. How did your company [REDACTED]
 - a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
 - d. [REDACTED]
 - e. [REDACTED]
 - f. [REDACTED]
 - g. [REDACTED]
 - h. (Other: specify) [REDACTED]
5. Why did your company [REDACTED] (Check all that apply)
 - a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
 - d. [REDACTED]
 - e. [REDACTED]
 - f. [REDACTED]
6. How [REDACTED] participating in the program?
7. Are you aware that the program has two different participation levels?
 - a. (Yes)
 - b. (No)
 - c. (Don't know)
 - d. (Refused)
8. (Ask only if 7=a) In your own words, can you tell me what the difference is between the two levels?
9. [ASK IF 7=a] Do you build any EfficiencyCrafted Plus homes?

PUBLIC VERSION - REDACTED

Program processes and communications

ILLUME

10. In 2014, about what percent of the homes your company built were EfficiencyCrafted or EfficiencyCrafted Plus Homes?
11. On a scale of 1 to 5, with 1 being very easy and 5 being very difficult, how would you rate the difficulty in [REDACTED]:
 - a. An EfficiencyCrafted Home
 - b. [ASK IF 7=YES] An EfficiencyCrafted Plus Home
12. [IF 11a=3-5] What [REDACTED] cause you the most difficulty and why?
13. [ASK IF 11b=3-5] What [REDACTED] cause you the most difficulty and why?

3. PROGRAM PROCESSES AND COMMUNICATIONS

Now I have some questions about program requirements and operations.

Builder Enrollment and Training

1. On a scale of 1-5, with 1 being very easy and 5 being very difficult, how would you rate the [REDACTED] in the program to become a qualified builder?
 - a. (ASK IF RATED 1-3) How could the program have made [REDACTED] go more smoothly for your company? What changes would you recommend?
2. Have you [REDACTED]?
 - a. [IF YES] On a scale of 1 to 5, with 1 being not at all useful and 5 being very useful, how useful have the [REDACTED] been to your company?
 - i. (ASK IF RATED 1-3) How could the program improve the [REDACTED]?
 - b. [IF NO] What would you like to see [REDACTED]
3. What other types of [REDACTED] would you like to see offered to qualified builders?
4. In the past year the program has [REDACTED]
[REDACTED]. Has your company [REDACTED]?
 - a. If yes, what is most valuable?

PUBLIC VERSION - REDACTED

Program processes and communications

ILLUME

- b. If no, why aren't they valuable?
5. Have the [REDACTED] ? What would you suggest as [REDACTED] ?
6. [IF AN AWARDS WINNER] Did you find value in the [REDACTED] ? If not, why? What other type of [REDACTED] would you prefer?

Program Communications

Next I have a few questions about program communications and your interactions with the program.

7. How do you [REDACTED] the program?
(Check all that apply)
- a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
 - d. [REDACTED]
 - e. [REDACTED]
e. (Other: specify _____)
8. On a scale of 1 to 5, with 1 being very dissatisfied and 5 being very satisfied, how satisfied are you with the following:
- a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
9. [IF RATED 1-3 FOR ANY] Could these [REDACTED] be improved at all? How?

Incentive Paperwork, Processing, and Incentives

Now I have some questions about the program's incentive offerings and paperwork requirements.

10. Does your company [REDACTED]?
- a. Yes
 - b. No
11. [ASK IF 10=YES]On a scale of 1 to 5, with 1 being very dissatisfied and 5 being very satisfied, how would you rate the following....
- a. The [REDACTED]
 - b. [REDACTED]

PUBLIC VERSION - REDACTED

Customer Interactions and Marketing

ILLUME

c. [REDACTED]

d. [REDACTED]

(ASK IF 11 a-c RATED 1-3) How could the program make the [REDACTED]
[REDACTED]

(ASK IF 11 d RATED 1-3) Why were you not satisfied with the [REDACTED]
[REDACTED]

4. CUSTOMER INTERACTIONS AND MARKETING

Next I have a few questions about your interactions with customers and program marketing efforts.

1. As you are aware, the program was rebranded in early 2014 and is now called, "EfficiencyCrafted Homes". Do you feel that this new branding resonates more, less, or about the same as the prior program brand? (IF NEEDED: the prior program name was "AEP Ohio/Columbia Gas of Ohio ENERGY STAR Homes Program")
 - a. [IF RESONATES LESS] Why does it resonate less?
 2. Has the rebranding of the program [REDACTED] If so, what?
 3. Do you [REDACTED]?
Do you [REDACTED]?
 - b. [IF YES] Typically, is this a [REDACTED]
[REDACTED]
 - c. [IF YES] At what [REDACTED]
[REDACTED]
 - i. [REDACTED]
 - ii. [REDACTED]
 - iii. [REDACTED]
 - iv. [REDACTED]
 - v. (Other: specify _____)
 - d. [IF NO] Why don't you [REDACTED]? Is there anything the program could do to make it easier for you to [REDACTED]
[REDACTED]
4. Do you [REDACTED] If not, why?

PUBLIC VERSION - REDACTED

Builder and Homebuyer Energy Efficient

Practices

ILLUME

5. Do you [REDACTED]
If not, why?
6. How has the [REDACTED]
[REDACTED]?
7. The program's marketing focuses on the following benefits to homebuyers in purchasing an EfficiencyCrafted Home. Which do you think is the most compelling to your customers?
 - a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
 - d. [REDACTED]
 - e. [REDACTED]
 - f. [REDACTED]
8. Have you received a [REDACTED] from the program?
 - a. [IF YES] Are you using the [REDACTED] If so, how? If not, what could be done to improve the [REDACTED] so you would use it?
9. Do you think there are different marketing approaches that the program should try? If so, what are your recommendations? Why?
10. If the program offered an [REDACTED] on EfficiencyCrafted Homes—meaning that [REDACTED]—would this be valuable to you in your [REDACTED] Why/why not?
11. Do you speak with your customers about [REDACTED]
[REDACTED]?
 - b. [IF YES] Is there more that could be done to [REDACTED] and its value to homebuyers? If so, what?
 - c. [IF NO] Why don't you speak with them about this?

5. BUILDER AND HOMEBUYER ENERGY EFFICIENT PRACTICES

Now I have a few questions about building practices and housing market trends.

1. In the past two years in the Ohio market overall, do you think the [REDACTED]
[REDACTED] has:
 - a. Increased?
 - b. Decreased?

PUBLIC VERSION - REDACTED

Attachment A

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BUILDER Barriers and Benefits

ILLUME

- c. Remained about the same?
2. What do you think this is attributable to?
Probe for:
- i.
 - ii.
 - iii.
 - iv.
3. Since joining the program, have your company's [REDACTED]
[REDACTED]?
- a. [ASK IF 3=yes] How have your [REDACTED]?
4. In the past two years, do you think there has been an increase or decrease in [REDACTED]
a. [IF INCREASE] What specific [REDACTED]
- b. Now let's talk about the next two years, do you see this trend continuing or changing in any way?
5. In your experience, how much would you say first time home buyers [REDACTED] [REDACTED] Would you say more, less, or about the same as other homebuyers?
- a. More
 - b. Less
 - c. About the same
6. Do you talk to homebuyers about how to [REDACTED]
[REDACTED]?
- a. [IF YES] What different [REDACTED] do you discuss with them? Check all that apply.
 - i.
 - ii.
 - iii.
 - iv.
 - v.
 - vi.
 - vii. (Other: specify)

6. BUILDER BARRIERS AND BENEFITS

Now I have just a few more questions about your experience overall and the key barriers and benefits of your participation in the program.

PUBLIC VERSION - REDACTED

Attachment A

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Closing & Address Confirmation

ILLUME

1. On a scale for 1 to 5, where 1 is very dissatisfied and 5 is very satisfied, how would you [REDACTED] satisfaction with [REDACTED]
2. What are the [REDACTED] to you as a builder in participating in the program, if any?
 - b. What could the program do to [REDACTED]
3. What are the [REDACTED] to you as a builder in participating in the program?
4. What do you think are the [REDACTED] for homebuyers in purchasing a program home?
 - a. What could the program do to [REDACTED]

7. CLOSING & ADDRESS CONFIRMATION

1. Finally I would like to confirm your address so we can send you your \$40 Visa gift card. Here is the address we have on file. Is this correct?

ADDRESS: _____

2. Is there anything else that you would like to share that we have not already discussed?

That is all I have for today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation.

F. NON-PARTICIPATING BUILDER INTERVIEW GUIDE



Columbia Gas of Ohio EfficiencyCrafted Homes Program Non-Participating Builder Interview Guide

[NOTE: This document will be used as a guide to conduct in-depth interviews with non-participating builders. Questions listed will be used to learn more about the builders' experience with the market, the existing program, and areas where the program may expand to increase future participation.]

1. INTRODUCTION & WARM UP

Hello, may I please speak with the company owner or manager most familiar with energy efficient building practices? My name is [INTERVIEWER NAME] from ILLUME Advising. I am calling on behalf of the Columbia Gas of Ohio's EfficiencyCrafted Homes program. [IF NEEDED: This program provides incentives to builders for following energy efficient building practices that exceed building code standards.] We are evaluating this program and are speaking with area builders to get their feedback.

1. Have you ever built homes through the EfficiencyCrafted Homes program?
 - a. (If YES) About how many have you built through the program?
 - b. (If YES) Could we schedule a time to speak with you about your experience with the program? The interview will take approximately 10 minutes. We appreciate your time and to recognize this we are offering a \$40 Visa gift card.
 - c. (If NO, continue with non-participating builder interview below or schedule a time to complete non-participating guide)

This interview should take approximately 10 minutes of your time.

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Builder Background Information and Program

Awareness

ILLUME

We appreciate your willingness to participate and to recognize the value of your time, we're offering a \$40 Visa gift card. Is now a good time, or is there a more convenient time for me to call you back? Your responses will help us to evaluate the program and recommend potential improvements.

[CONTINUE WITH SURVEY OR MAKE AN APPOINTMENT TO CALL BACK.]

Before we start, I would like to ask for your permission to record this interview, so that I won't have to take notes while we talk. Is it ok that I record our interview?
[CONFIRM PERMISSION TO RECORD]

2. BUILDER BACKGROUND INFORMATION AND PROGRAM AWARENESS

First, I have some general questions about you and your company.

5. What is your title and role within the COMPANY?
6. Does your company specialize in production or custom-built homes?
7. How many homes does your firm typically build annually?
8. Before this call today, were you aware that Columbia Gas works with area builders and provides them incentives to build homes that exceed energy codes?
 - a. Yes
 - b. No
9. Before this call today, had you heard of the EfficiencyCrafted Homes program? [IF NEEDED: This program is sponsored by Columbia Gas of Ohio and provides incentives to builders for following energy efficient building practices that exceed building code standards.]
 - a. Yes
 - b. No
10. [IF 5=YES] How did you first hear about the program?
 - a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
 - d. [REDACTED]
 - e. [REDACTED]
 - f. [REDACTED]
 - g. [REDACTED]
 - h. [REDACTED]
 - i. [REDACTED]
 - j. (Other: specify)

PUBLIC VERSION - REDACTED

Builder and Homebuyer Energy Efficiency

Practices

ILLUMINE

11. [IF 5=YES] Why are you [REDACTED]

12. Would you [REDACTED] If not, why?

13. Do you [REDACTED]

a. [REDACTED]

b. [REDACTED]

c. (Other: specify _____)

14. What kind of [REDACTED] from the program that might help you [REDACTED]

3. BUILDER AND HOMEBUYER ENERGY EFFICIENCY PRACTICES

Now I have a few questions about building practices and housing market trends.

1. In building a new home, do you [REDACTED]

a. (IF [REDACTED]) What are the reasons your company doesn't typically [REDACTED]

b. (IF [REDACTED]) What specific things do you do that are [REDACTED]

2. What [REDACTED] do you typically partner with to build your homes?

3. What [REDACTED] do you typically partner with to build your homes?

4. In the past two years in the Ohio market, do you think the [REDACTED]

:
a. Increased?
b. Decreased?
c. Remained about the same?

5. What do you think this is attributable to?

Probe for:

i. [REDACTED]

ii. [REDACTED]

iii. [REDACTED]

iv. [REDACTED]

6. In the past two years, do you think there has been an increase or decrease in [REDACTED]

a. [IF INCREASE] What [REDACTED]

Closing

ILLUMINE

7. Let's now talk about the next two years, do you see this trend continuing or changing in any way?
8. In general, what are the main reasons that keep your company from [REDACTED] (at all/even more than you currently do)?

Probe for:

- a.
- b.
- c.
- d.
- e.
- f.
- g.

9. Have you sought out or received [REDACTED] [REDACTED] ? If so, what type of [REDACTED] ?
 - a. (IF YES) What did you [REDACTED] [REDACTED] ? What did you find the most valuable? The least valuable?
10. Do you talk to homebuyers about how to [REDACTED]
[REDACTED] ?
 - a. [IF YES] What different [REDACTED]
[REDACTED] ? Check all that apply.
 - i.
 - ii.
 - iii.
 - iv.
 - v.
 - vi.
 - vii.
11. If the program offered an [REDACTED] —meaning that [REDACTED] —would this be valuable to you in your [REDACTED] to potential homebuyers? Why/why not?

4. CLOSING

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Closing

ILLUME

- Finally I would like to record your address so we can send you your \$40 Visa gift card. What is your address?

ADDRESS _____

- Is there anything else that you would like to share that we have not already discussed?

That is all I have for today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation.

G. HOME ENERGY RATER INTERVIEW GUIDE



Columbia Gas of Ohio EfficiencyCrafted Homes Program Rater Interview Guide

[NOTE: This document will be used as a guide to conduct in-depth interviews with participating raters. Questions listed will be used to learn more about the raters' experience with the program, areas of strength or success, areas for improvement, and satisfaction with various aspects of the program, the program overall and the market more broadly.]

1. INTRODUCTION & WARM UP

Hello, may I please speak with [CONTACT NAME]? My name is [INTERVIEWER NAME]. I am calling on behalf of the Columbia Gas of Ohio's EfficiencyCrafted Homes program.

We are evaluating this program and would like to ask you a few questions about your company's experience with the program. Are you familiar with your company's participation in the EfficiencyCrafted Homes program? [IF NO, ASK IF CAN SPEAK WITH SOMEONE FAMILIAR WITH THE PROGRAM.]

This interview should take approximately 10-15 minutes of your time.

We appreciate your willingness to participate and to recognize the value of your time, we're offering a \$40 Visa gift card. Is now a good time, or is there a more convenient time for me to call you back? Your responses will help us to evaluate the program and recommend potential improvements.

[CONTINUE WITH SURVEY OR MAKE AN APPOINTMENT TO CALL BACK.]

Before we start, I would like to ask for your permission to record this interview, so that I won't have to take notes while we talk. Is it ok that I record our interview? [CONFIRM PERMISSION TO RECORD]

Introduction & Warm UP

ILLUME

2. RATER BACKGROUND INFORMATION AND PARTICIPATION

First, I have some general questions about you and your company.

1. How long have you been providing rating services for the program?
2. How did your company first hear about of the program?
 - a. [REDACTED]
 - b. [REDACTED]
 - c. [REDACTED]
 - d. [REDACTED]
 - e. [REDACTED]
 - f. [REDACTED]
 - g. [REDACTED]
 - h. (Other: specify) [REDACTED]
3. Why did your company decide to participate in the program? (Check all that apply)
 - g. [REDACTED]
 - h. [REDACTED]
 - i. [REDACTED]
 - j. (Other: specify) [REDACTED]
4. What percentage of builders you work with participate in the EfficiencyCrafted Homes program? For those who don't participate, do you know why?

3. PROGRAM PROCESSES AND COMMUNICATIONS

a. *Program Enrollment, Communications, and Requirements*

Next I have a few questions about program requirements and communications.

5. On a scale of 1-5, with 1 being very difficult and 5 being very easy, how would you rate the [REDACTED]
[REDACTED]
 - a. (ASK IF RATED 1-3) How could the program have made the [REDACTED] go more smoothly for your company? What changes would you recommend?
6. Does your company attend [REDACTED] for the program?
7. [ASK IF 6=YES] Is the right level of [REDACTED] provided during the [REDACTED] for you to perform your job? What suggestions do you have for [REDACTED]

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Introduction & Warm UP

ILLUME

8. How do you typically [REDACTED]
 - a. [REDACTED] [REDACTED]
 - b. [REDACTED]
 - c. (Other: specify _____)

9. On a scale of 1 to 5, with 1 being very dissatisfied and 5 being very satisfied, how satisfied are you with the following:
 - d. The level of [REDACTED]
 - e. Your [REDACTED]

10. [IF RATED 1-3 FOR ANY] Could these [REDACTED] be improved at all? How?

11. On a scale of 1 to 5, with 1 being very difficult and 5 being very easy, how would you rate the difficulty for [REDACTED]
[REDACTED]
 - a. An EfficiencyCrafted Home
 - b. An EfficiencyCrafted Plus Home

12. [IF 11a=1-3] What [REDACTED] cause builders the most difficulty and why?

- 13.[ASK IF 11b=1-3] What [REDACTED] cause builders the most difficulty and why?

Incentive Paperwork

Now I have some questions about the program paperwork.

14. Does your company [REDACTED]?
 - a. Yes
 - b. No

15. [ASK IF 14=YES] On a scale of 1 to 5, with 1 being very dissatisfied and 5 being very satisfied, how would you rate the following....
 - e. The [REDACTED] ?
 - f. The [REDACTED] ?

(ASK IF RATED 1-3 for either) How could the program [REDACTED]
[REDACTED] easier/faster?

4. BUILDER PRACTICES AND MARKET TRENDS

Now I have a few questions about building practices and housing market trends.

16. In the past two years in the Ohio market overall, do you think the number of builders [REDACTED]
[REDACTED] has:

- d. Increased?
- e. Decreased?
- f. Remained about the same?

17. What do you think this is attributable to?

g. Probe for:

- i. [REDACTED]
- ii. [REDACTED]
- iii. [REDACTED]
- iv. [REDACTED]

18. Do you think participating builder [REDACTED] have changed since the start of the program?

- a. [IF YES] How have participating builder [REDACTED] changed?

19. In the past two years, do you think there has been an increase or decrease in [REDACTED]

- h. [IF YES] What specific [REDACTED] you heard that [REDACTED]

20. In the next two years, do you see this trend continuing or changing in any way?

5. PROGRAM MARKETING

Next I have a couple questions about program marketing efforts.

21. As you are aware, the program was rebranded in early 2014 and is now called, "EfficiencyCrafted Homes". Do you feel that this new branding resonates more, less, or about the same as the prior program brand? (IF NEEDED: the prior program name was "AEP Ohio/Columbia Gas of Ohio ENERGY STAR Homes Program")

- a. [IF RESONATES LESS] Why do you rate it this way?

22. The program's marketing focuses on the following benefits to homebuyers in purchasing an EfficiencyCrafted Home. Which do you think is the most compelling to your customers?

- a. [REDACTED]
- b. [REDACTED]

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Introduction & Warm UP

ILLUME

- c. [REDACTED]
- d. [REDACTED]
- e. [REDACTED]
- f. [REDACTED]

23. Do you think there are different marketing approaches that the program should try to reach out to homebuyers? If so, what are your recommendations? Why?

6. SATISFACTION, BARRIERS AND BENEFITS

Now I have just a few more questions about your experience overall and the key barriers and benefits of your participation in the program.

1. On a scale for 1 to 5, where 1 is very dissatisfied and 5 is very satisfied, how would you rate your [REDACTED]
2. What are the [REDACTED] to you as a rater in participating in the program, if any?
 - a. What could the program do to [REDACTED]
3. What are the [REDACTED] to you as a rater in participating in the program?
4. What do you think are the [REDACTED] for builders in participating in the program? What are the [REDACTED] to homebuyers?
5. What are the [REDACTED] to builders? What are the [REDACTED] to homebuyers?

7. CLOSING

1. Finally I would like to confirm your address so we can send you your \$40 Visa gift card. Here is the address we have on file. Is this correct?

ADDRESS: _____

2. Is there anything else that you would like to share that we have not already discussed?

That is all I have for today. Thank you so much for your time. Columbia Gas of Ohio appreciates your participation.

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PREPARED BY
Energy Center of Wisconsin

An Assessment of Gas Savings from Columbia Gas of Ohio's Energy Star New Homes Program

2013 Program Impacts

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May 13, 2015

An Assessment of Gas Savings from Columbia Gas of Ohio's ENERGY STAR® New Homes Program

2013 Program Impacts

Draft: May 13, 2015

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Project Manager

Scott Pigg

DRAFT

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AT A GLANCE

- As with the prior impact evaluation, actual natural gas consumption for 2013 program homes [REDACTED] with modeled consumption on average.
- As found in the prior impact evaluation, average natural gas consumption was [REDACTED] than projected for homes in the Energy Path program track, and at about the [REDACTED] for homes in the ENERGY STAR track.
- Analysis using property-tax data in [REDACTED] showed [REDACTED] in natural gas consumption between program and non-program homes. There are a number of possible [REDACTED]
[REDACTED], but the results do suggest that [REDACTED]
[REDACTED]
[REDACTED] it is also possible that the program has had a [REDACTED]
[REDACTED], which could explain why program and non-program homes [REDACTED]. If that is the case, consumption trends for the two groups indicate that [REDACTED]
[REDACTED]

DRAFT

EXECUTIVE SUMMARY

This report to Columbia Gas of Ohio's ("Columbia") Demand Side Management ("DSM") team provides impact evaluation results of the company's ENERGY STAR New Homes ("ESNH") program in 2013. The ENERGY STAR New Homes program is an energy efficiency program launched by Columbia in 2010 to promote the construction of energy efficient new homes in Columbia's service territory. The program provides technical assistance and rebates to builders that build homes exceeding the efficiency of standard construction practices.

The ESNH program design has shifted over time to reflect changes in the national ENERGY STAR certified-homes program design and, more recently, changes in the Ohio residential energy code. In 2013, the program comprised of two participation levels – ENERGY STAR and Energy Path. The Energy Path tier does not require ENERGY STAR 3.0 compliance but shares many of the same features. The program responded to the enactment of more stringent energy codes in Ohio by requiring higher levels of performance for program qualification, starting in the middle of 2013. Most recently (2014), the program was re-branded as the EfficiencyCraftedSM New Homes Program, though it retains the two compliance paths.

This report summarizes the characteristics of the 1,996 program homes from 2013, assesses the construction features that lead to the projected energy savings, and compares the natural gas usage projections from the HERS rating software to the actual natural gas usage of program homes. Because ESNH is a new construction program, natural gas savings can't be calculated based on an analysis of the pre and post program participation natural gas usage but must be estimated based on the difference between the natural gas consumption of participating homes compared to an assumed standard-practice version of the same home. The Public Utilities Commission of Ohio ("PUCO") Technical Reference Manual ("TRM")¹ has defined the baseline home characteristics for this analysis, which are mostly based on the International Energy Conservation Code ("IECC") 2006 and 2009 energy codes.² The program savings depend strongly on the assumptions about how the homes would have been built if there were no program. To provide insight into this, this evaluation compares natural gas usage for ESNH and non-ESNH homes in Franklin County, where readily-available property-tax records could be used to identify a larger proportion of all new homes.

¹ "State of Ohio Energy Efficiency Technical Reference Manual", prepared by Vermont Energy Investment Corporation for the Public Utilities Commission of Ohio, August 6, 2010.

² Due to a concurrent tightening of the state energy code, the baselines for 2013 program participants was about an equal mix of IECC 2006 and IECC2009 code levels.

RESULTS

Actual versus projected natural gas consumption

Actual natural gas consumption for program homes in 2013 compared [REDACTED] with projected usage from the HERS rating software. On average, program homes use about [REDACTED] percent of the natural gas that they are projected to use from the modeling (Table 1). Homes in the Energy Path program track clearly use [REDACTED] natural gas than projected, while homes in the ENERGY STAR track use [REDACTED] the projected amount. One small-volume builder had 2013 homes that used [REDACTED] than projected, but one large production builder produced homes in 2013 that averaged about [REDACTED] percent of projected. Otherwise, there [REDACTED] in actual versus projected natural gas consumption among builders and raters, and the software appears to [REDACTED] actual natural gas consumption on average.

Table 1. Projected and actual natural gas consumption for 2013 participants.

2013 Program	# Homes	Natural Gas Usage (ccf/yr)		Actual/Projected	Projected Savings (ccf/yr)*
		Projected*	Actual		
All homes	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Energy Path	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
ENERGY STAR	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Note: Analysis excludes homes with inadequate billing data or unreliable estimates of actual natural gas consumption.
*from REM/Rate

Natural gas consumption for program and non-program homes

The current impact evaluation for the first time compared natural gas usage for program and non-program homes using readily available property-tax records for Franklin County, which comprises [REDACTED] [REDACTED] of all program participants. After controlling for home size, we found [REDACTED] [REDACTED] in overall natural gas consumption between the two groups. Consumption for space heating was [REDACTED] for program participants, and was [REDACTED] for non-space-heating use. [REDACTED] [REDACTED], could at [REDACTED] the space-heating difference. The fact that the [REDACTED] the [REDACTED] Other non-program confounding factors could also be a factor, since both builders and home buyers self-select into the two groups, and thus may be different in unobserved ways that affect natural gas consumption.

Finally, it is possible that [REDACTED]
thus [REDACTED] between direct program participants and non-participants.
Nonetheless, the results suggest that the [REDACTED]
[REDACTED] in that particular county.

Cost-Effectiveness

When measured against the TRM assumption of a code-minimum baseline, the program is cost effective from the Utility Cost Test perspective, with benefit/cost ratio of about [REDACTED]

DRAFT

BACKGROUND

The ENERGY STAR New Homes program is an energy efficiency program launched by Columbia Gas of Ohio in 2010 to promote the construction of energy efficient new homes in Columbia's service territory. The program provides technical assistance and rebates to builders that build homes that exceed the efficiency of standard construction practices. Columbia collaborates with AEP-Ohio to share incentive costs for new homes built in the overlapping areas of their service territories. About █ of all ESNH homes are located in AEP-Ohio service territory.

The ESNH program design has shifted over time to reflect changes in the national ENERGY STAR certified homes program design and, more recently, changes in the Ohio residential energy code. The national ENERGY STAR certified homes program transitioned from version 2.0 to 2.5 to 3.0 during 2011 and 2012. The version 3.0 criteria are more stringent than prior versions and include extra certification steps that add costs, leading many builders and utility programs across the country to reconsider formal participation and certification under the national ENERGY STAR certified homes program.

Rebate amounts have also varied over time to reflect new requirements and to encourage higher levels of performance. The availability of incentives from AEP has also had an impact on program participation and construction approaches.

Columbia's ESNH design in 2011 involved three levels of participation which generally reflected the three versions of ENERGY STAR certified homes. The 2012 program transitioned to two levels – ENERGY STAR and Energy Path – and shifted the incentive structure to vary with level of efficiency based on the HERS score. The Energy Path level does not require ENERGY STAR 3.0 compliance but shares many of the same features. The program shifted again in July 2013 to reflect the enactment of more stringent energy codes in Ohio, by reducing the maximum HERS score eligible for incentives from 80 to 70. The incentive structure was also changed at this time. In 2014, the program was re-branded as the EfficiencyCraftedSM New Homes Program (though it retains the two compliance paths), and incentive levels were changed.

Table 2 summarizes the program requirements and rebate amounts for the program between 2011 and 2013.

Table 2. Natural-Gas related program requirements.

	2011 Program			2012 Program		2013 Program	
	Level 1	Level 2	Level 3	Energy Path	ENERGY STAR	Energy Path	ENERGY STAR
ENERGY STAR Level	2.0	2.5 or 2.0	3.0	2.0	3.0	3.0*	3.0
HERS Rating	<85	<65 (2.0) custom (2.5)	Custom	<80	Custom	<70	Custom
Heating Efficiency	92% Furnace (85% boiler)						
Duct leakage	Sealed or 3.0 compliant	<4 CFM25 per 100ft ² leakage to outside; <8 CFM25 per 100 ft ² total leakage	<6 CFM25 per 100ft ² leakage to outside	<4 CFM25 per 100ft ² leakage to outside; <8 CFM25 per 100 ft ² total leakage	<6 CFM25 per 100ft ² leakage to outside	<4 CFM25 per 100ft ² leakage to outside; <8 CFM25 per 100 ft ² total leakage	
Envelope Leakage	<5 ACH50, thermal bypass checklist						
HVAC Design	ENERGY STAR 3.0 compliant using ACCA Manuals J, S, D						
HVAC QC checklists	Contractor	Contractor + Rater	Contractor	Contractor + Rater	Contractor	Contractor	Contractor + Rater
Ventilation	ASHRAE 62.2 compliant						
Water Heater	No atmospheric gas (must be direct vent, power vent, or electric)						
Rebate: Columbia only	\$750	\$1,200	\$1,600	\$350 - \$3,000	\$850 - \$3,500	\$450 - \$1,500	\$575 - \$1,625
Rebate: Joint with AEP (Columbia's share)	\$450	\$750	\$1,000	half above	half above	Same as above	Same as above
*ENERGY STAR certification is not required under the Energy Path program track.							

ENERGY STAR compliance involves some additional requirements not shown in the table, especially for ENERGY STAR 3.0, where additional rater and contractor checklists and HVAC contractor certification is required. ENERGY STAR 3.0 also introduced a varying HERS rating requirement that depends on site specific circumstances and requires better scores for larger homes. There were also requirements related to electricity savings, not shown in the table, including air conditioner efficiency, ENERGY STAR lighting and appliances.

The key program requirements beyond ENERGY STAR include slightly higher heating system efficiency, HVAC design following industry standards manuals, installation of mechanical ventilation and a prohibition on atmospheric gas water heaters.

METHOD

The analysis focused on comparing the actual natural gas usage of ESNH participating homes to the natural gas usage modeled by the HERS rating software REM/Rate and exploring patterns in the results. In addition, a comparison of program and non-program natural gas consumption was made for new homes in Franklin County, using readily-available property-tax records to control for square footage.

DATA COLLECTION

The primary data sources for the comparison of actual to modeled natural gas consumption were the program tracking system, an exported database of the detailed REM/Rate files for all homes, and monthly customer natural gas usage data. The tracking system data from MaGrann provided information on participating homes, their participation level/type and dates, the HERS rating score, the projected energy savings, and builder and rater information. The REM/Rate export database contained 63 data tables of relational data providing hundreds of fields of detailed data about each home's construction characteristics and features. Columbia Gas also provided the monthly natural gas usage data for all homes in its service territory through December 2014.

The comparison of natural gas consumption for program and non-program homes in Franklin County involved [REDACTED], then [REDACTED] [REDACTED] was obtained, of which more than [REDACTED], and [REDACTED] [REDACTED], meaning there were [REDACTED] for [REDACTED]. In all cases, [REDACTED] were required to [REDACTED]

WEATHER NORMALIZATION

Natural gas usage data for calendar year 2014 were analyzed to identify any off-cycle meter readings or adjustments (setting usage to missing for these periods) and to combine any estimated readings into the next actual reading. Each customer was then assigned to one of ten weather stations for weather normalization.

Weather normalization involves adjusting consumption to a typical weather year using the typically-strong relationship between monthly natural gas consumption and heating degree days. The analysis used here employed a variable-base heating degree day regression model similar to [REDACTED]
[REDACTED] The model fits usage per day as a function of heating degree days per day for each billing period

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and weights each period based on the number of days elapsed. The heating degree day base temperature was statistically estimated for each customer and period using a modified version of the [REDACTED]

In addition to providing a weather-corrected estimate of overall natural gas usage, the technique also provides the estimated split between consumption for space heating and that for water heating and other end uses.

Weather normalization results were considered reliable if they met the following criteria:

The screening process eliminated [REDACTED] of the 2013 homes from the pool of 1,996 homes, [REDACTED] and the screening [REDACTED]

POTENTIAL BIASES

The evaluation was designed to reduce sources of bias, but no observational study based on voluntary participation can control for all potential biases. Four main sources of potential bias identified for this study include:

A horizontal bar chart displaying survey results across three main categories, each containing multiple items. The categories are labeled 2., 3., and 4. on the left side. Each category has a varying number of horizontal bars extending to the right, representing different responses or items. Category 2. has approximately 10 bars, Category 3. has approximately 8 bars, and Category 4. has approximately 12 bars. The bars are black and have thin white outlines.

Category	Item Number	Response
2.	1	Bar 1
	2	Bar 2
	3	Bar 3
	4	Bar 4
	5	Bar 5
	6	Bar 6
	7	Bar 7
	8	Bar 8
	9	Bar 9
	10	Bar 10
3.	1	Bar 1
	2	Bar 2
	3	Bar 3
	4	Bar 4
	5	Bar 5
	6	Bar 6
	7	Bar 7
	8	Bar 8
4.	1	Bar 1
	2	Bar 2
	3	Bar 3
	4	Bar 4
	5	Bar 5
	6	Bar 6
	7	Bar 7
	8	Bar 8
	9	Bar 9
	10	Bar 10
	11	Bar 11
	12	Bar 12

In this evaluation, the overall effect of the potential biases is hard to assess and could lead to true savings being higher or lower than reported. Free riders and spillover could each have significant impacts in opposite directions while the baseline home bias could have an even larger effect.

RESULTS

CHARACTERISTICS OF PROGRAM PARTICIPANTS

Three types of homes are eligible for rebates under the program:

- (1) detached single-family homes and attached single-family duplexes;
- (2) multi single-family homes with separate entrances, such as townhomes and condominiums); and,
- (3) multifamily apartments with common entrances, provided these have individual heating and cooling systems.

In 2013, 1,996 homes were completed through the ESNH program, of which █ percent were single-family homes and █ percent were multi-single family homes. █ multifamily properties were certified by the program in 2013.

Table 3 summarizes ESNH participation and housing characteristics for 2013 certified homes by program level, and includes some information on baseline assumptions from the TRM. In comparison to the assumed characteristics of baseline homes, ESNH homes have █ heating system and duct efficiency levels, █ air leakage and █ insulation levels, yielding an estimated average savings of about █ percent. As we will discuss later, these assumptions █

In 2013, differences between ENERGY STAR and Energy Path homes lead to projected natural gas savings that average about █ percent █ for the former compared to the latter. This differential is █ than seen in 2012, where ENERGY STAR homes had projected natural gas savings █ ccf/yr) that were █ than Energy Path homes █ ccf/yr).

Table 3. Characteristics of 2013 program participants.

	Energy Path	ENERGY STAR	All 2013	
Characteristics				
Number of homes	[REDACTED]	[REDACTED]	[REDACTED]	
HERS Score	[REDACTED]	[REDACTED]	[REDACTED]	
Columbia Rebate	[REDACTED]	[REDACTED]	[REDACTED]	
Conditioned area (ft ²)	[REDACTED]	[REDACTED]	[REDACTED]	
Number of stories	[REDACTED]	[REDACTED]	[REDACTED]	
Gas water heater saturation	[REDACTED]	[REDACTED]	[REDACTED]	
Building insulation levels				Baseline
Window R-value	[REDACTED]	[REDACTED]	[REDACTED]	2.9
Wall assembly R-value	[REDACTED]	[REDACTED]	[REDACTED]	17
Attic assembly R-value	[REDACTED]	[REDACTED]	[REDACTED]	33
Foundation wall R-value	[REDACTED]	[REDACTED]	[REDACTED]	17
Furnace efficiency (AFUE)	[REDACTED]	[REDACTED]	[REDACTED]	80%
Duct system efficiency	[REDACTED]	[REDACTED]	[REDACTED]	80%
% supply ducts inside	[REDACTED]	[REDACTED]	[REDACTED]	
Total leakage CFM25	[REDACTED]	[REDACTED]	[REDACTED]	
Total leakage: CFM25/100 ft ²	[REDACTED]	[REDACTED]	[REDACTED]	
Overall heating efficiency	[REDACTED]	[REDACTED]	[REDACTED]	64%
Heating efficiency % save	[REDACTED]	[REDACTED]	[REDACTED]	
Heating efficiency savings ccf/yr	[REDACTED]	[REDACTED]	[REDACTED]	
Air infiltration				
ACH50	[REDACTED]	[REDACTED]	[REDACTED]	
CFM50	[REDACTED]	[REDACTED]	[REDACTED]	
Baseline CFM50	[REDACTED]	[REDACTED]	[REDACTED]	
Usage and savings projections				
Projected gas total use (ccf)	[REDACTED]	[REDACTED]	[REDACTED]	
Projected natural gas usage - baseline home	[REDACTED]	[REDACTED]	[REDACTED]	
Projected natural gas savings	[REDACTED]	[REDACTED]	[REDACTED]	
Projected electric savings (kWh)	[REDACTED]	[REDACTED]	[REDACTED]	
Projected electric savings - nonAEP	[REDACTED]	[REDACTED]	[REDACTED]	

NATURAL GAS CONSUMPTION

Homes in the 2013 pool with adequate billing data were projected by REM/Rate to use [REDACTED] ccf per year on average (Table 4). These homes actually used an average of [REDACTED] ccf per year, equal to [REDACTED] percent of the projected amount. As one might expect, single-family homes use [REDACTED] natural gas than do multi single-family townhomes and condominiums. The ratio of actual to projected natural gas appears to be [REDACTED] for the multi-single-family homes than for the [REDACTED] single-family homes (Table 4).

Table 4. Natural gas usage: actual vs. projected (ccf/yr)

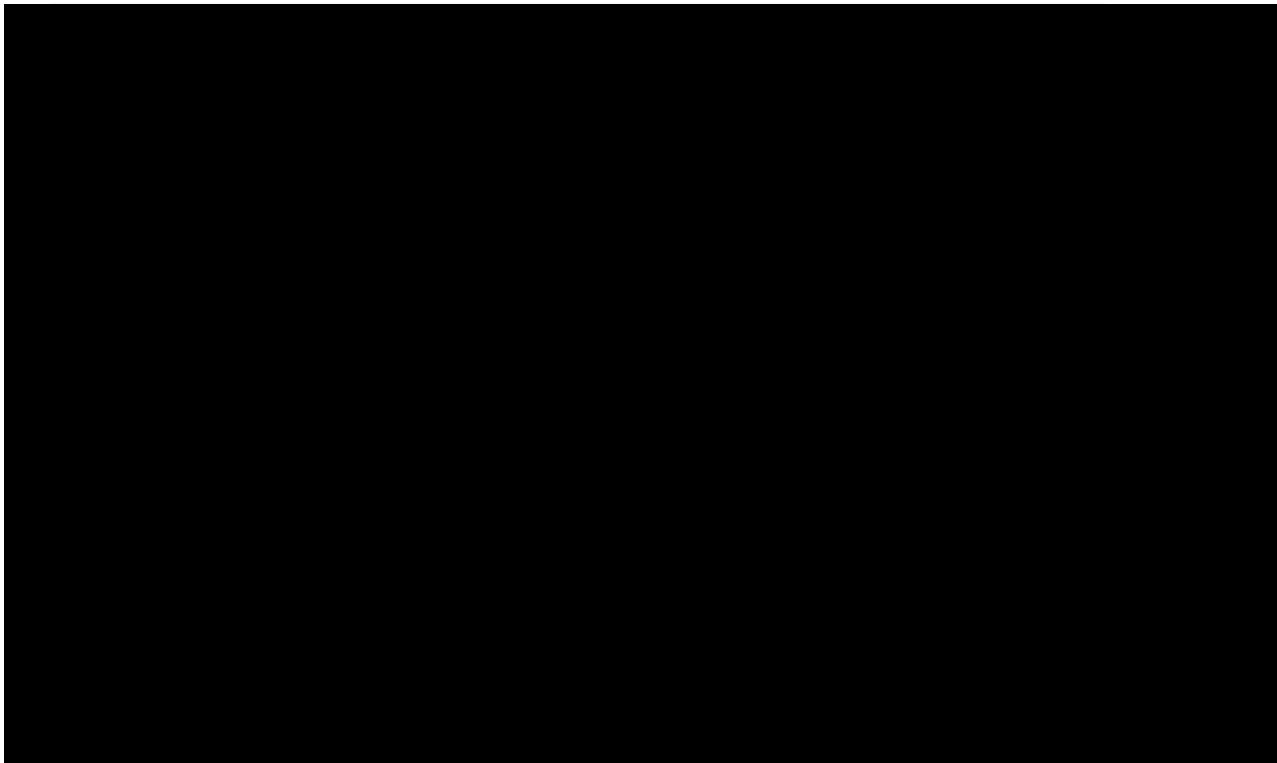
Characteristics	Building type		Program level		
	Single-family	Multi Single-family	Energy Path	ENERGY STAR	All
# Homes	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Heated area	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total Usage: Projected	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total Usage: Actual	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Ratio: actual/projected	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Projected Gas Savings	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Modeling Discrepancies					
Mean error	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Mean absolute error	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Median abs. % error	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
% within ±25%	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
% outside ±50%	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Note: restricted to homes with both REM/Rate projected gas consumption and reliable weather normalization results for actual natural gas consumption

While actual natural gas consumption tracks projected consumption [REDACTED], there are [REDACTED], as Figure 1 shows. These discrepancies are likely a combination of [REDACTED]. The median absolute percent error represents the typical size of the discrepancy between the modeled and actual usage and was

about [REDACTED] percent (Table 4). About [REDACTED] of all homes had actual natural gas usage within [REDACTED] of the model prediction and about [REDACTED] had a [REDACTED] of [REDACTED]. Modeling appears to be [REDACTED] for the ENERGY STAR homes.

Figure 1. Actual versus projected natural gas consumption.



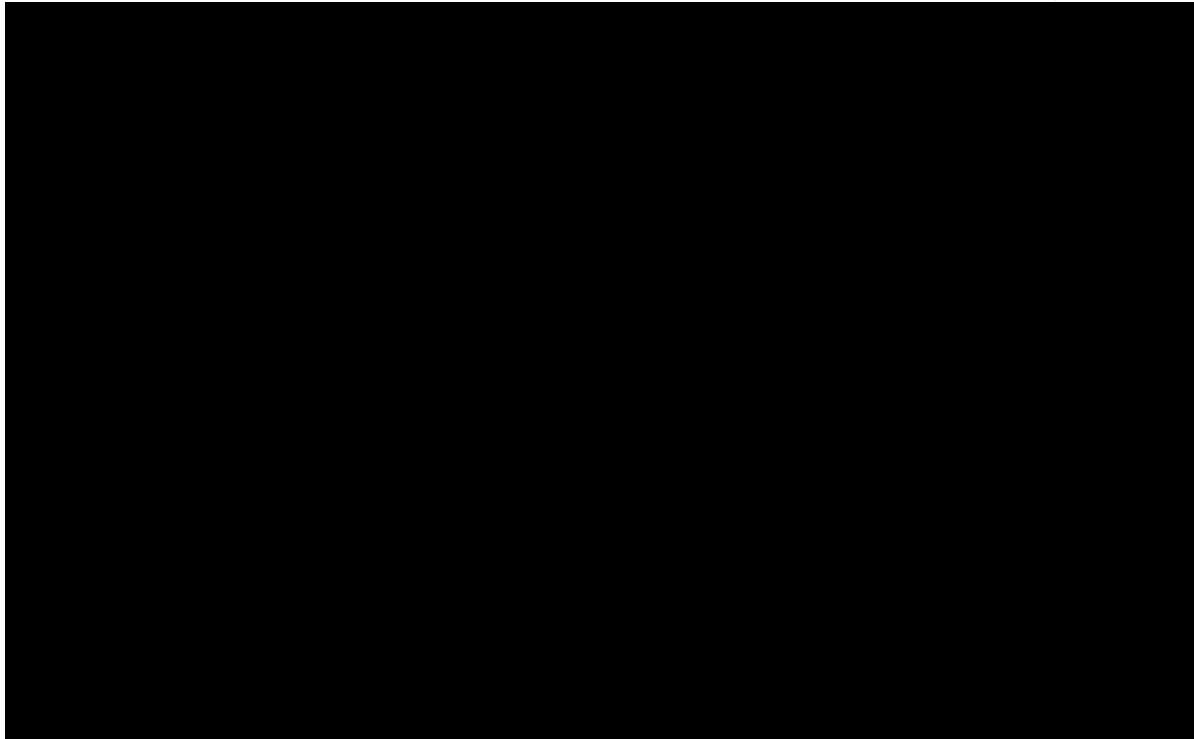
Natural Gas Consumption and HERs Index Score

Homes at the ENERGY STAR program level also tend to use [REDACTED] of natural gas as projected, while Energy Path homes tend to use [REDACTED] than projected. In the 2012 impact evaluation, a clear relationship was seen between [REDACTED] and the [REDACTED] natural gas consumption. In 2013, this relationship is [REDACTED], as Table 5 and Figure 2 show. Homes with [REDACTED] use [REDACTED] of natural gas as projected, while homes in the rest of the [REDACTED] use [REDACTED] than projected.

Table 5. Actual vs. Projected Usage by [REDACTED]

[REDACTED]	# Homes	Area (ft ²)	Actual (ccf /yr)	Projected (ccf/yr)	Ratio Act./Proj.
Total					

Figure 2. Actual vs. Projected Natural Gas Usage by [REDACTED]



One factor that complicates this comparison is that the size of the homes varies widely across categories: homes with the [REDACTED] are [REDACTED] on average than homes with the [REDACTED] (This also explains why the homes with the [REDACTED] have the [REDACTED] projected and actual gas usage.)

To control for home size and other potential confounding variables, we employed a regression analysis to model actual usage as a function of the projected usage and several other factors for homes certified in 2013. The results are summarized in Table 6.

Table 6. Natural Gas Usage Regression Model

Explanatory Variable	Coefficient
[REDACTED]	[REDACTED]
Model R-squared	[REDACTED]
# Homes	[REDACTED]
*	[REDACTED]

The analysis indicates that the [REDACTED] score is a statistically significant predictor of natural gas usage. The regression model suggests that [REDACTED] is associated with a [REDACTED] ccf/yr higher actual natural gas consumption, though with uncertainty of nearly [REDACTED] ccf/yr. In other words, if two homes are each projected to use 600 ccf but one home has a [REDACTED] and the other has a [REDACTED], the home with the [REDACTED] can be expected to use somewhere between [REDACTED] less than the one with the [REDACTED]. Note however that the [REDACTED] effect size found here for the 2013 homes is [REDACTED] that seen for the same regression model applied to 2011 and 2012 homes [REDACTED]

The model also included a term to assess the degree to which [REDACTED] (which involves compliance with additional [REDACTED]) is associated with differences in actual natural gas consumption. The prior impact evaluation found [REDACTED] relationship between this [REDACTED] and natural gas consumption, though the result was based on [REDACTED] of [REDACTED]. In 2013, about [REDACTED] percent of program participants ([REDACTED] homes) received [REDACTED]. As Table 6 shows, the regression results for the 2013 cohort indicate a [REDACTED]

relationship, but one that [REDACTED] is associated with [REDACTED] natural gas consumption of [REDACTED] ccf/yr.

To be sure, [REDACTED] and [REDACTED] tend to go hand in hand: [REDACTED] of the homes with a [REDACTED] of [REDACTED] received [REDACTED], but [REDACTED] of homes with a [REDACTED] of [REDACTED] received [REDACTED]. This makes it [REDACTED] with statistical techniques. Nonetheless, it seems safe to conclude that homes with [REDACTED] and that are [REDACTED] to have [REDACTED] certification tend to use [REDACTED] for a given home size and projected natural gas consumption. What we do not know is whether there is a causal relationship between the two, or whether the association is simply an artifact of other unaccounted-for differences between homes at [REDACTED] spectrum.

Natural Gas Consumption by Builder and Rater

Figure 3 and Figure 4 explore how actual and projected natural gas usage vary by builder and rater. Each “bubble” in the figures shows how average actual natural gas consumption compares to REM/Rate-projected consumption for a particular builder/rater, housing type and program level, with bubble size representing the number of participant homes in 2013.⁴ The figures are similar, because raters tend to work with particular builders, so some of the points on the two graph represent the same—or nearly the same—set of homes.

In all but one case, actual average natural gas consumption is within [REDACTED] percent of projected average consumption. The exception is a builder (and rater) with a small number of [REDACTED] homes that have actual consumption that [REDACTED] projected natural gas usage by about [REDACTED] percent on average. Also noteworthy is one large builder of [REDACTED] homes with average projected natural gas consumption of about [REDACTED] ccf per year where actual consumption averages [REDACTED] ccf per year, or about [REDACTED] percent of projected.

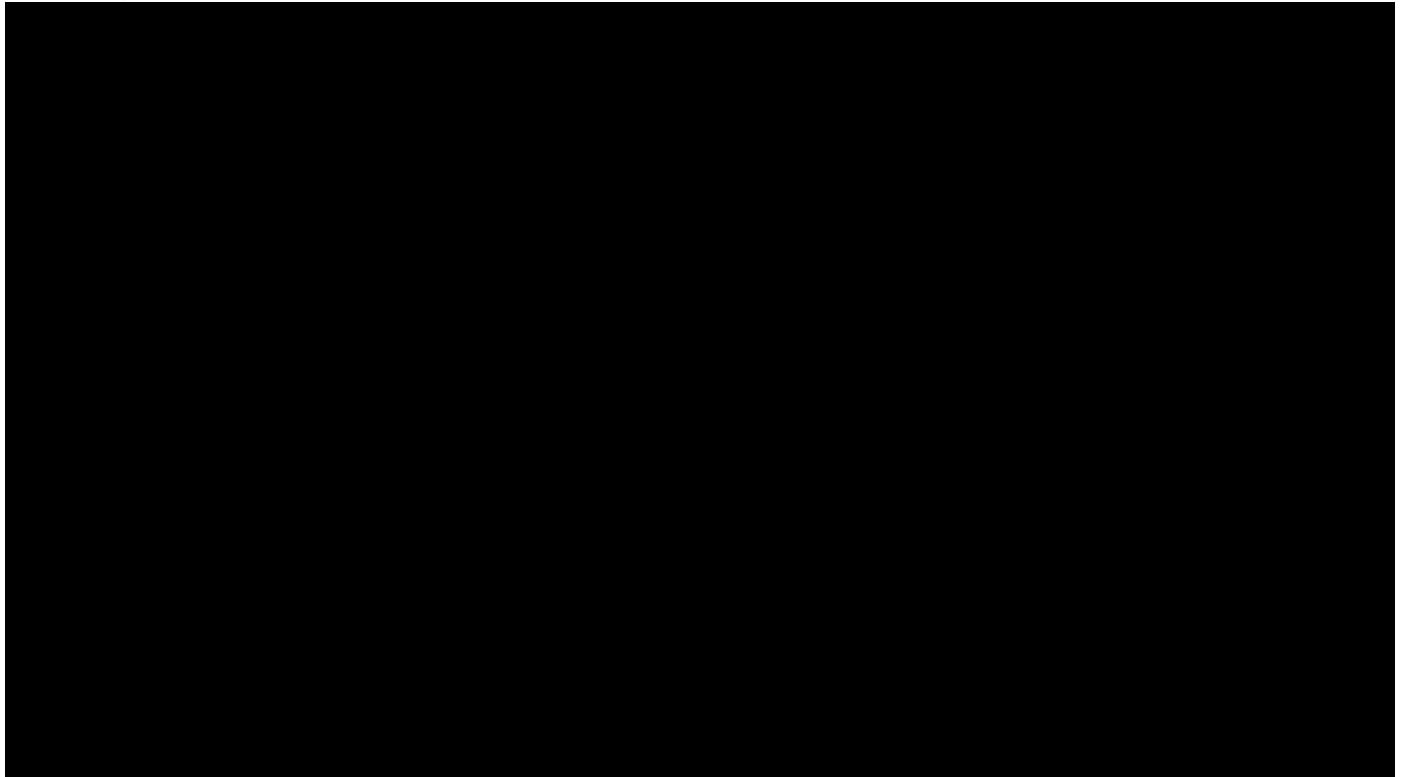
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Figure 3. Average actual versus projected natural gas use by builder, housing type and program level.



Figure 4. Average actual versus projected natural gas use by rater, housing type and program level.



Natural Gas Consumption by Code Level

About [REDACTED] of the homes in the program were qualified using an IECC-2006 baseline, and about [REDACTED] were qualified using IECC-2009. Overall, there is [REDACTED] difference in the ratio of actual to projected natural gas consumption between the two code years (Table 7).

Energy Path homes qualified using the IECC 2009 baseline do have [REDACTED] consumption than those qualified using the IECC 2006 baseline, while the opposite is true of ENERGY STAR homes, where IECC-2009 homes use [REDACTED] than IECC-2006 homes. These differences appear to be driven by [REDACTED]. Among the Energy Path homes, IECC-2009 homes are about [REDACTED] percent [REDACTED] than IECC-2006 homes. Conversely, IECC-2009 ENERGY STAR homes are [REDACTED] percent [REDACTED] on average than IECC-2006 ENERGY STAR homes.

Table 7. Projected and actual natural gas consumption for 2013 participants, by IECC code year.

Program Path	IECC Year	# Homes	Natural Gas Usage (ccf/yr)		Actual/Projected	Projected Savings (ccf/yr)*
			Projected*	Actual		
All homes	2006	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
	2009	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Energy Path	2006	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
	2009	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
ENERGY STAR	2006	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
	2009	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Note: Analysis excludes homes with inadequate billing data or unreliable estimates of actual natural gas consumption.

*from REM/Rate

ANALYSIS OF NATURAL GAS CONSUMPTION FOR PROGRAM AND NON-PROGRAM HOMES IN FRANKLIN COUNTY

To gain additional insight into savings from the program, we analyzed natural gas consumption for ESNH and non-ESNH homes in Franklin County, which comprises [REDACTED] percent of program homes. We selected this county both because it represents [REDACTED] of the program activity, and because a property-tax database with home square footage is readily available.⁵ Because code

⁵ See <http://www.franklincountyoh.metacama.com/altIndex.jsp>.

enforcement and other factors can vary significantly from one area to another, we cannot extend the findings for this county to other areas.

We used a [REDACTED] to link [REDACTED] in the database of [REDACTED]
[REDACTED] to [REDACTED] in the Columbia Gas billing system. Overall, the [REDACTED]
[REDACTED] was successful in [REDACTED]
[REDACTED] [REDACTED] percent of the [REDACTED] were [REDACTED] on all [REDACTED], and [REDACTED]
percent were [REDACTED], meaning there were [REDACTED]
[REDACTED] In all cases, [REDACTED] were required to [REDACTED]

Based on the year-built field in the database, it appears that the new construction market in Franklin County has cooled considerably from the pace in the first part of the 2000s. ESNH homes began to appear on the market in earnest in 2010, and appear to have captured a significant fraction of the market (Figure 5).

Figure 5. Franklin County single-family homes built by year (2000-2013).



Although our primary interest is in new homes, it is useful to first look at how [REDACTED]
[REDACTED]—and home size—varies across the full span of home age in Franklin County. As Figure 6 shows, there is a [REDACTED] in [REDACTED] with [REDACTED], despite newer homes generally being [REDACTED] than older homes. On a [REDACTED], homes built since the start of the 21st century use [REDACTED] as much natural gas for space-heating as those built early in the 20th century (Figure 7).

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Figure 6. Mean Franklin County natural gas consumption and [REDACTED] per home, by decade built.

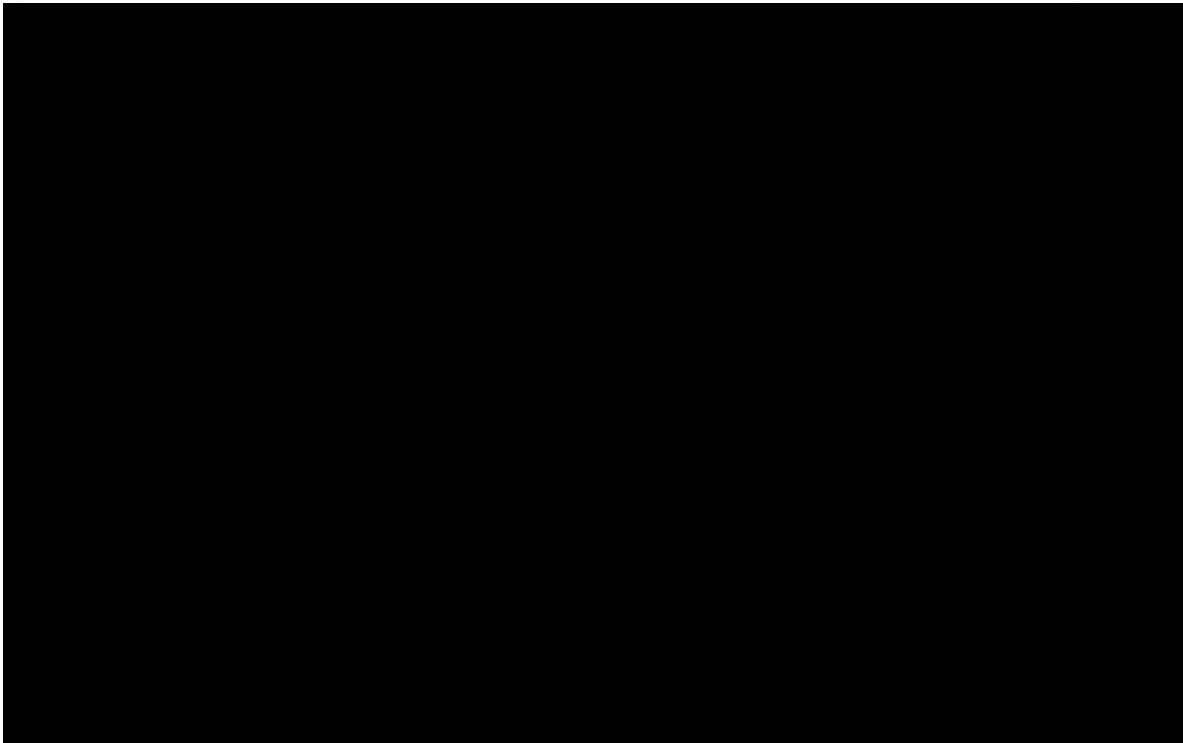
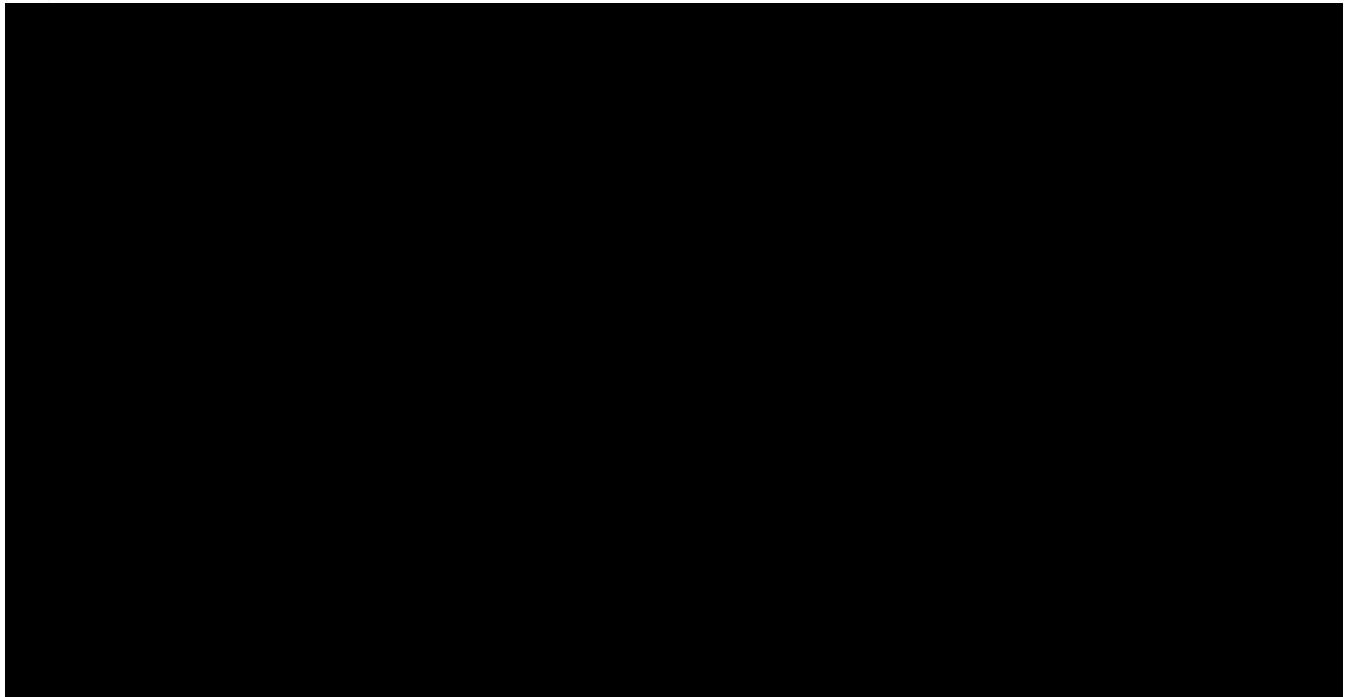


Figure 7. Median Franklin County natural gas consumption for space heating per [REDACTED], by decade built.



The analysis here focuses on differences in natural gas consumption between ESNH and non-ESNH homes built between 2010 and 2013 using weather-normalized natural gas consumption for calendar year 2014. We were able to identify about [REDACTED] homes with [REDACTED] and reasonably [REDACTED], about equally divided between the two groups. We further confined the analysis to homes with listed [REDACTED] in the range of [REDACTED]. This restriction eliminates [REDACTED] from the analysis.

As Table 8 shows, the [REDACTED] for ESNH homes tends to be [REDACTED] than that of the non-ESNH homes, and more so in the most recent years compared to the earliest years of the program.⁶ To put natural gas consumption on a more equal footing, we therefore divided the homes into [REDACTED] for program homes, and weighted the non-ESNH homes by [REDACTED] to match the distribution of ESNH homes in each year. In other words, when averaging energy use for non-program homes in a given year, [REDACTED] homes are given [REDACTED] and [REDACTED] homes are [REDACTED] weight, so that the weighted distribution of [REDACTED] for non-program homes more closely matches that of the program homes. With this weighting, the overall [REDACTED] of non-ESNH homes is within about [REDACTED] a percent of the ESNH group.

⁶ Subsequent analysis of the data revealed that this phenomenon is mostly due to the increasing program share of one large production builder that constructs homes that are [REDACTED] on average (about [REDACTED]) than other program homes. This builder's share of program homes [REDACTED] from [REDACTED] percent in 2010 to about [REDACTED] percent in 2013.

Table 8. [REDACTED] for non-ESNH and ESNH homes, by year.

Year built (tax database)	Mean square footage		
	non-ESNH (n=[REDACTED])	ESNH (n=[REDACTED])	Difference
2010	[REDACTED]	[REDACTED]	[REDACTED]
2011	[REDACTED]	[REDACTED]	[REDACTED]
2012	[REDACTED]	[REDACTED]	[REDACTED]
2013	[REDACTED]	[REDACTED]	[REDACTED]
Overall	[REDACTED]	[REDACTED]	[REDACTED]

The weighted analysis indicates that 2010 and 2011 ESNH homes use [REDACTED] natural gas than non-ESNH homes, while 2012 and 2013 homes use [REDACTED] (Figure 8). Across all four years of homes, the ESNH homes had total natural gas consumption that was [REDACTED] from non-ESNH homes [REDACTED ccf/year), as Table 9 shows. A more detailed analysis indicates that the distribution of natural gas consumption is [REDACTED] for the two groups.

Figure 8. Mean natural gas consumption for non-ESNH and ESNH homes, by year built (2010-2013).

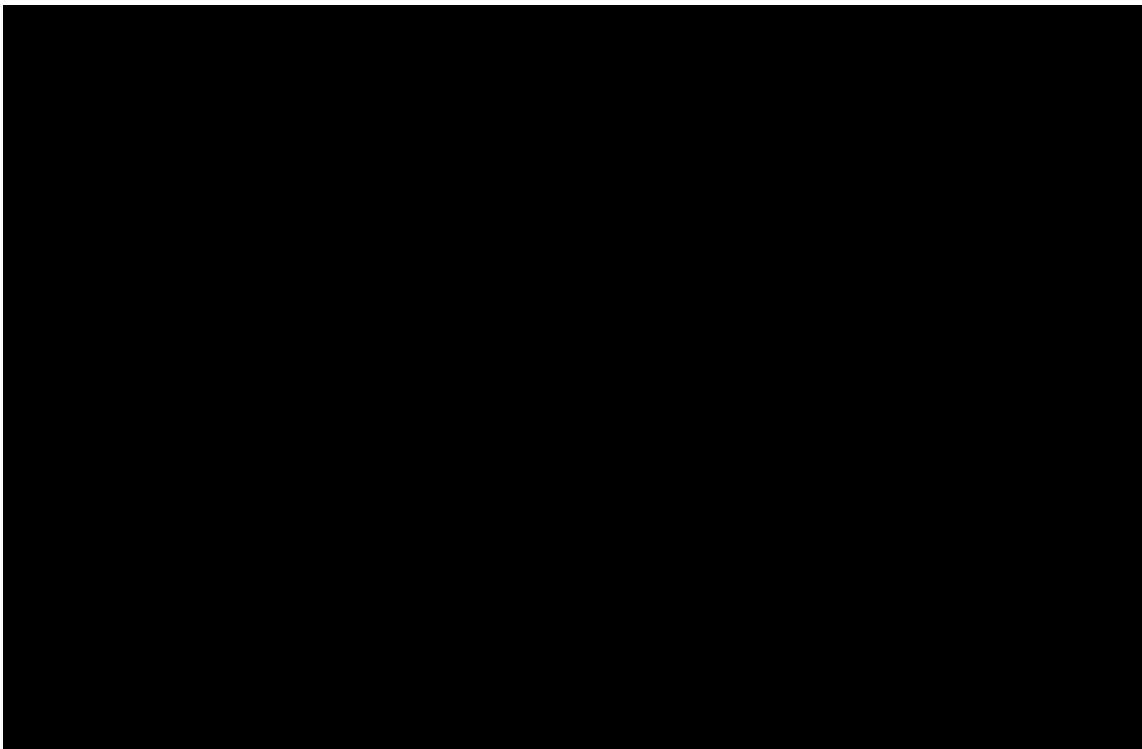


Table 9. [REDACTED] and natural gas consumption for non-ESNH and ESNH homes, by year built (2010-2013).

		Year	non-ESNH		ESNH		ESNH Difference	
[REDACTED]		2010	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2011	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2012	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2013	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		Combined	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Natural gas consumption (ccf/year)	Total	2010	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2011	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2012	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2013	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		Combined	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
	Space heating	2010	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2011	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2012	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2013	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		Combined	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
	Other uses	2010	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2011	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2012	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		2013	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
		Combined	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED] in total natural gas consumption between ESNH and non-ESNH homes is [REDACTED] of consumption—space-heating and non-space-heating consumption—[REDACTED]. ESNH homes have [REDACTED] consumption for space heating (which dominates overall consumption) and [REDACTED] natural gas consumption for other uses, such as water heating.

The [REDACTED] gas consumption for non-space-heating uses is likely a reflection of the [REDACTED] of an ESNH home having [REDACTED]. Explaining why ESNH homes would use [REDACTED] however, is [REDACTED]. It is [REDACTED] that participating in ESNH would [REDACTED] cause [REDACTED]. Possible explanations include:

- [REDACTED] This is because all [REDACTED] is eventually [REDACTED] which [REDACTED]. The observed [REDACTED] percent overall [REDACTED] natural gas consumption for [REDACTED] could be expected to occur if ESNH homes use [REDACTED]

[REDACTED] or perhaps [REDACTED] annually for [REDACTED]
[REDACTED] of this magnitude are [REDACTED], and are in fact
[REDACTED].

- There could be [REDACTED] between ESNH and non-ESNH homes. For example,
[REDACTED]
[REDACTED]
- There may be other [REDACTED] between ESNH and non-ESNH homes.
For example, ESNH homes may be [REDACTED] to be [REDACTED] with [REDACTED]
[REDACTED] Analysis of the limited information contained in the property-tax data indicate that the two groups are [REDACTED] in terms of [REDACTED], but that program homes are [REDACTED] to have a [REDACTED] and [REDACTED] to have [REDACTED] than non-program homes. However, a more detailed regression analysis to control for these factors did not alter the conclusion that there is [REDACTED]
[REDACTED]
[REDACTED]

In addition, because the program appears to represent a [REDACTED] of the new-home market in Franklin County, there may well be [REDACTED] such that non-ESNH homes are [REDACTED]

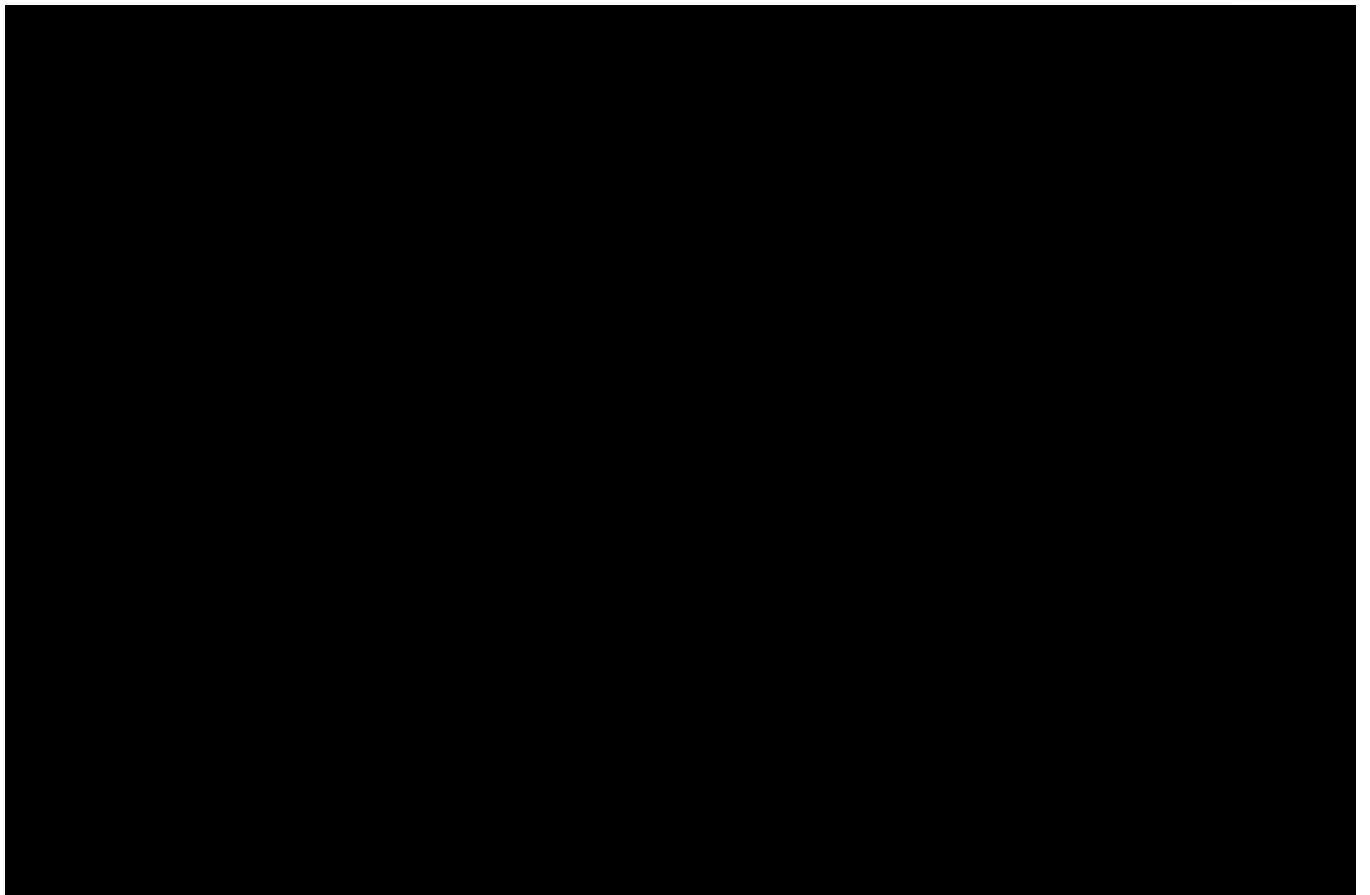
Looking at a slightly longer period of time (Figure 9), suggests that there have [REDACTED] particularly for [REDACTED]—among non-ESNH homes. However, these generally [REDACTED] and may reflect [REDACTED]

Also, [REDACTED] natural gas consumption for program homes was [REDACTED] and [REDACTED] thereafter. It would seem [REDACTED] to be manifest in [REDACTED]
[REDACTED] followed by a [REDACTED]
[REDACTED]

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Figure 9. Natural gas consumption for Franklin County homes, by year built (2000-2013).



DK

COST EFFECTIVENESS

Program cost-effectiveness was assessed using the Utility Cost Test (UCT) based on TRM-specified assumptions and methods. Natural gas costs and projections from the 2012-2016 DSM program plan filed by Columbia were used in the analysis to provide consistency in comparing projections to actual experience. The UCT compares the total cost to the utility of operating the program against the reduction in operating costs associated with the savings. A discount rate of [REDACTED] based on [REDACTED] was used in the analysis.

Table 10 summarizes the results of the cost-effectiveness analysis of ESNH.

Table 10. Program Cost/Benefit Analysis

Cost/Benefit Category	UCT
Measure Costs	[REDACTED]
Program & Other Costs	[REDACTED]
Total Costs	[REDACTED]
Benefits – Present Value	[REDACTED]
Benefit / Cost Ratio	[REDACTED]
Benefit / Cost Ratio: measures only	[REDACTED]

The table shows that the program was cost-effective with a benefit/cost ratio of [REDACTED]

CONCLUSIONS AND RECOMMENDATIONS

Consistent with the prior impact evaluation of the program, Columbia's ENERGY STAR New Homes Program is producing homes with natural gas usage levels that are [REDACTED] with the projections from the energy rating software on average. When based on Ohio TRM assumptions and methods, overall program savings and cost-effectiveness are [REDACTED] tracking-system based reports produced by Columbia Gas. Since the modeling [REDACTED]

[REDACTED] it is [REDACTED] that the [REDACTED] are a [REDACTED] of [REDACTED]
[REDACTED] and that [REDACTED]

[REDACTED] natural gas compared to that baseline. [REDACTED] the comparison of natural gas consumption for program and non-program new homes in Franklin County, suggests that (at least for that county) non-program homes are [REDACTED]
[REDACTED] so the TRM savings estimates [REDACTED]
[REDACTED] practice in Franklin County.

Key TRM assumptions about baseline practices in Ohio that are [REDACTED]

- 1. [REDACTED]
- 2. [REDACTED]
- 3. [REDACTED]

The [REDACTED] assumption of [REDACTED] effectively assumes that [REDACTED] are installed in new homes outside the program. The [REDACTED]
[REDACTED] essentially says that [REDACTED]
[REDACTED] And the [REDACTED]
[REDACTED] implies that homes [REDACTED]
[REDACTED] All of these assumptions [REDACTED], though we have [REDACTED]
[REDACTED] Assessing their [REDACTED]
[REDACTED]
[REDACTED]

While a [REDACTED] homes would go a long way toward [REDACTED]
[REDACTED], it would not address the question of [REDACTED]
[REDACTED]—essentially the question of whether [REDACTED] With about [REDACTED] percent
market share in the residential new-construction market, the notion of [REDACTED]
[REDACTED]

But [REDACTED]—let alone [REDACTED]—is another matter. Interviews with market actors may be able to shed some light on this issue. But if [REDACTED]
[REDACTED]

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[REDACTED], the Franklin County analysis suggests it [REDACTED]
[REDACTED]. Obtaining accurate information about factors [REDACTED]
[REDACTED] Moreover, the program's history [REDACTED]
[REDACTED]: disentangling the [REDACTED]
[REDACTED]

Overall, while the evidence points to the current TRM-based savings estimates being a

[REDACTED], getting a [REDACTED]
[REDACTED]

DRAFT

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MEMO

DATE May 22, 2015

TO Sarah Poe, Andrew Metz, Megan Melby, Columbia Gas of Ohio

FROM Scott Pigg

SUBJECT *Third-party review of Opower estimated savings for Home Energy Reports*

I have completed a third-party review of Opower's reported savings for the Home Energy Reports program through March 2015.¹ To conduct the review, I independently built an analytic dataset from our own set of billing-system records, and then applied the specified "post-only" model to the data to verify the savings reported by Opower, following Opower's M&V specifications as best I could. Two differences between my dataset and Opower's analysis are worth noting:

1. I did not have access to participant opt-out dates (though I did have a dataset of all opt-out customers). My analytic dataset likely varies from Opower's in this regard. However, the number of opt-outs is quite small, so I would not expect this to have any significant influence on the results.
2. Due to temporary issues on our end with accessing billing system data, I could not process April 2015 meter-read data, which are needed in order to properly assess March 2015 savings. Therefore, I confined my comparison to savings for the period October 2013 through February 2015.

Result

My results match the Opower figures quite closely in aggregate:

	Wave 1	Wave 2
Period of comparison	Oct 2013 – Feb 2015	Sep 2014 – Feb 2015
Opower-estimated cumulative savings (Mcf)	[REDACTED]	[REDACTED]
Seventhwave-estimated cumulative savings (Mcf)	[REDACTED]	[REDACTED]
Difference (%)	[REDACTED]	[REDACTED]

¹ Specifically, I am referring to results in a spreadsheet titled "Mar 2015 Results - COH.xlsx", provided to me by Sarah in an April 30, 2015 e-mail.

Results by month are shown in the table below

	Month	Savings (Mcf)	
		Opower	Seventhwave
Wave 1	Oct-13	[REDACTED]	[REDACTED]
	Nov-13	[REDACTED]	[REDACTED]
	Dec-13	[REDACTED]	[REDACTED]
	Jan-14	[REDACTED]	[REDACTED]
	Feb-14	[REDACTED]	[REDACTED]
	Mar-14	[REDACTED]	[REDACTED]
	Apr-14	[REDACTED]	[REDACTED]
	May-14	[REDACTED]	[REDACTED]
	Jun-14	[REDACTED]	[REDACTED]
	Jul-14	[REDACTED]	[REDACTED]
	Aug-14	[REDACTED]	[REDACTED]
	Sep-14	[REDACTED]	[REDACTED]
	Oct-14	[REDACTED]	[REDACTED]
	Nov-14	[REDACTED]	[REDACTED]
	Dec-14	[REDACTED]	[REDACTED]
Wave 2	Jan-15	[REDACTED]	[REDACTED]
	Feb-15	[REDACTED]	[REDACTED]
Total		[REDACTED]	[REDACTED]
Wave 2	Sep-14	[REDACTED]	[REDACTED]
	Oct-14	[REDACTED]	[REDACTED]
	Nov-14	[REDACTED]	[REDACTED]
	Dec-14	[REDACTED]	[REDACTED]
	Jan-15	[REDACTED]	[REDACTED]
	Total	[REDACTED]	[REDACTED]

I also calculated the statistical uncertainty in the Seventhwave-estimated cumulative savings for each wave:

Wave	Point estimate (Mcf)	90% confidence interval*	
		Mcf	Percent
1	[REDACTED]	[REDACTED]	[REDACTED]
2	[REDACTED]	[REDACTED]	[REDACTED]

*based on standard deviation from 100 bootstrap re-samples clustered on premise and stratified by treatment/control

Finally, I also reviewed treatment- and control-group pre-participation consumption distributions for the two waves back to 2010, and satisfied myself that the randomization process appears to have worked well in terms of producing statistically comparable treatment and control groups.

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PREPARED BY
Energy Center of Wisconsin

An Assessment of Gas Savings from Columbia Gas of Ohio's Home Performance Solutions Program

2012 Impacts

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March 11, 2015

An Assessment of Gas Savings from Columbia Gas of Ohio's Home Performance Solutions Program

2012 Impacts

March 11, 2015

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Project Manager

Scott Pigg

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EXECUTIVE SUMMARY

This report to Columbia Gas of Ohio's ("Columbia") Demand Side Management ("DSM") team provides impact evaluation results of the company's Home Performance Solutions ("HPS") program.

Home Performance Solutions is an energy efficiency program offered to all Columbia Gas residential natural gas heating customers. The program provides diagnostic energy audits and offers rebates for specific energy efficiency improvements including attic and wall insulation, air sealing, and high efficiency heating systems. The rebates were set at [REDACTED] of insulation, [REDACTED] air sealing work, [REDACTED] and bonus rebates were offered for [REDACTED] multiple measures and for various promotional purposes. Customers with incomes at or below 80% of area median income (AMI) but greater than 150% of the Federal Poverty Guidelines (FPG) (which is the threshold that qualifies for the WarmChoice® low income program) [REDACTED] of \$250 for the installation of recommended measures. In addition, a "gold" program qualification criterion was added in 2012 for customers age 60 or above with income at or below 100 percent of AMI: these customers [REDACTED] for recommended measures. The purpose of HPS is to help Columbia's customers manage their natural gas usage and save on utility bills. Conservation Services Group ("CSG") is Columbia's implementation contractor for HPS and performs the energy audits and oversees the work performed by the various insulation, air sealing, and HVAC contractors who installed the energy efficiency improvements/measures.

This report assesses the energy savings achieved by HPS based on an analysis of customer natural gas usage from before and after program participation for customers who had energy audits performed on their homes in 2012 and energy efficiency improvements installed in 2012. Variations in natural gas usage due to weather and other non-program factors were addressed in the analysis by employing weather normalization and by analyzing changes in natural gas usage over the same period for a comparison group composed of non-participating customers. The comparison group was stratified to match participants in terms of geography and pre-program natural gas usage. The evaluation also included an assessment of natural gas savings for different groups of customers and a statistical analysis to estimate natural gas savings by major program measure and to explore other factors that may be related to program impacts.

A key objective of the impact evaluation is to assess how the natural gas savings impacts found from the billing analysis compare to program design projections and engineering estimates of savings and

to identify areas that may need improvement. An earlier impact evaluation¹ that assessed savings for work completed at the start of the program (through 2011) found average annual net savings of [REDACTED] ccf per participant – [REDACTED] ccf for customer who [REDACTED] that visit and [REDACTED] ccf for customers who [REDACTED]. These savings equaled [REDACTED] of the savings based on calculations using the Public Utilities Commission of Ohio (“PUCO”) draft Technical Reference Manual (“TRM”)².

The previous evaluation indicated that natural gas savings from [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

RESULTS

Overall, [REDACTED] customers received an energy audit in calendar 2012, which is [REDACTED]. There were [REDACTED] participants that installed major measures in calendar year 2012. [REDACTED] customers who were audited in 2012 went on to install major measures in 2013. These customers are [REDACTED]

[REDACTED] There were [REDACTED] customers who received an energy audit in calendar 2012 and [REDACTED]

[REDACTED]

The natural gas savings analysis used data about participants from CSG’s program tracking system and customer natural gas usage from monthly billing data provided by Columbia. Table 1 summarizes the average natural gas usage and savings for HPS participants from the billing data analysis and also shows the projected savings based on the TRM.

¹ “Impact Evaluation of Columbia Gas of Ohio’s Home Performance Solutions Program,” M. Blasnik & Associates, June, 2014

² “State of Ohio Energy Efficiency Technical Reference Manual”, prepared by Vermont Energy Investment Corporation for the Public Utilities Commission of Ohio, August 6, 2010.

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Table 1. Summary of Natural Gas Usage: average ccf/yr per participant

A horizontal bar chart comparing Natural Gas Savings and Projected Savings for All Participants. The chart is divided into two main sections: Pre-Retrofit (left) and Post-Retrofit (right). Each section contains three bars: # of homes, Usage, and TRM. The bars are stacked, with the bottom segment representing Pre-Retrofit values and the top segment representing Post-Retrofit values.

Category	Natural Gas Savings			Projected Savings		
	# of homes	Usage	TRM	# of homes	Usage	TRM
All Participants	[Pre-Retrofit Bar]	[Post-Retrofit Bar]	[Post-Retrofit Bar]	[Pre-Retrofit Bar]	[Post-Retrofit Bar]	[Post-Retrofit Bar]

CONCLUSIONS AND RECOMMENDATIONS

The 2012 Home Performance Solutions program

A horizontal bar chart illustrating the percentage of respondents who have heard of different topics. The y-axis lists the topics, and the x-axis represents the percentage from 0% to 100%. The bars are black.

Topic	Percentage
Healthcare	95%
Technology	92%
Finance	88%
Politics	85%
Entertainment	82%
Science	78%
Sports	75%
Food & Beverage	72%
Automotive	68%
Real Estate	65%
Automotive	62%
Automotive	58%
Automotive	55%
Automotive	52%
Automotive	48%
Automotive	45%
Automotive	42%
Automotive	38%
Automotive	35%
Automotive	32%
Automotive	28%
Automotive	25%
Automotive	22%
Automotive	18%
Automotive	15%
Automotive	12%
Automotive	8%
Automotive	5%
Automotive	2%
Automotive	1%

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METHODOLOGY

The natural gas savings achieved by HPS were evaluated using a pre/post analysis of weather adjusted natural gas usage for participants and a matched comparison group. Program savings were calculated as the change in weather normalized natural gas usage for the participants minus the change found for the comparison group.

THE COMPARISON GROUP

The weather normalization process described later in this section adjusts customer natural gas usage for differences in heating degree days between the billing analysis period and average annual weather. But natural gas usage varies from year to year due to other factors such as:

- | Category | Number of Samples |
|----------|-------------------|
| 1 | 1 |
| 2 | 10 |
| 3 | 100 |
| 4 | 100 |
| 5 | 100 |
| 6 | 100 |
| 7 | 100 |
| 8 | 100 |
| 9 | 100 |
| 10 | 100 |

DATA COLLECTION

The primary data sources for the analysis were extracts from the program tracking system and monthly customer natural gas usage data. The HPS tracking system data provided by CSG was composed of a series of related data tables. The tracking system included data on:

- [REDACTED]
 - [REDACTED]
 - [REDACTED]

DATA PREPARATION

The first step in the weather normalization process was to prepare the natural gas usage data provided by Columbia. This process involved the following steps:

The resulting dataset included natural gas usage data for an analysis group including participants [REDACTED]

WEATHER NORMALIZATION

The weather normalization analysis employed a variable-base heating degree day regression model

[REDACTED] The model fits usage per day as a function of heating degree days per day for each billing period and weights each period based on the number of days elapsed. The heating degree day base temperature was statistically estimated for each customer and period using [REDACTED]
[REDACTED]. This analysis was performed separately for the pre and post treatment periods.

Weather normalization results were classified as reliable if they met the following criteria:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

The cases that passed the weather normalization reliability criteria were [REDACTED] screened [REDACTED]

[REDACTED] This screening involved [REDACTED]
[REDACTED] some customers with pre-program usage that [REDACTED]
[REDACTED] Cases from the random comparison group were then [REDACTED]

The table below shows total number of households that were screened out of the weather normalization process and provides the reasons why they were screened out.

3	[REDACTED]
4	[REDACTED]
5	[REDACTED]

	Analysis group		Comparison Group	
	% analysis	# analysis	% comparison	# comparison
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

POTENTIAL BIASES

The evaluation was designed to reduce sources of bias, but no observational study based on voluntary participation can control for all potential biases. Three main sources of potential bias include:

1. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
2. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
3. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Term	Percentage
Climate change	100%
Global warming	98%
Green energy	95%
Sustainable development	92%
Environmental protection	90%
Recycling	88%
Organic food	75%

In this evaluation, the overall effect of the potential biases appears [REDACTED] although more specific research and evaluation activities could be pursued to better quantify these types of impacts.

HOME PERFORMANCE SOLUTIONS IMPACTS

Home Performance Solutions is an energy efficiency program offered to all Columbia residential natural gas heating customers that provides diagnostic energy audits and offers rebates for specific energy efficiency improvements including attic and wall insulation, air sealing, and high efficiency furnaces (hereafter referred to as “major program measures”). The program primarily targets [REDACTED]

[REDACTED] Columbia DSM plan covered program operations from 2009 through 2011, with updates to the DSM made for program operations from 2012 through 2016. HPS began work in late 2009 and ramped up program operations throughout 2010. In early 2012, program changes were made to address [REDACTED] previous evaluations. These include:

- [REDACTED]
 - [REDACTED]
 - [REDACTED]

• [REDACTED]
• [REDACTED]
• [REDACTED]
• [REDACTED]
• [REDACTED]
• [REDACTED]

These changes should be reflected in the current evaluation. Program procedures and incentive levels continue to evolve over time.

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Table 3. HPS participation: 2012 DSM Plan, Analysis Group and Program Population

	DSM Action Plan	Program Population*	Analysis Group**
All Households	[REDACTED]	[REDACTED]	[REDACTED]
Measure Installations			
Wall Insulation	[REDACTED]	[REDACTED]	[REDACTED]
Attic Insulation	[REDACTED]	[REDACTED]	[REDACTED]
Air sealing	[REDACTED]	[REDACTED]	[REDACTED]
Heating System Replacement	[REDACTED]	[REDACTED]	[REDACTED]
Thermostat***	[REDACTED]	[REDACTED]	[REDACTED]
Showerhead ***	[REDACTED]	[REDACTED]	[REDACTED]
Assisted Home Performance #	[REDACTED]	[REDACTED]	[REDACTED]
* [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
** [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
*** [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

The program [REDACTED] in the 2012 program population as [REDACTED] customers had an energy audit in 2012 or had major program measures completed in either 2012 or 2013, compared to the [REDACTED] participants originally planned. The overall conversion rate of [REDACTED] in the DSM Action Plan. Measure installation rates [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] The “kicker” rebates of 2011 that increased the rebates for participants who act within a limited time period were rolled into the incentive structure of 2012, [REDACTED]
[REDACTED]

ASSISTED HOME PERFORMANCE SOLUTIONS

HPS includes a special effort to encourage participation from customers with low or moderate incomes referred to as “Assisted” Home Performance Solutions. These customers have incomes that are [REDACTED]
[REDACTED]
[REDACTED]

Assisted customers receive larger rebates and special marketing efforts are made to encourage participation.

Assisted participants accounted for [REDACTED] HPS participants who participated in the program in 2012. [REDACTED]
[REDACTED]

One special initiative that began in 2011 and continued into the 2012 program year was to identify small cities with demographics consistent with the Assisted program guidelines and automatically pre-qualify the entire city as eligible for the Assisted Home Performance Solutions program. [REDACTED]
[REDACTED]
[REDACTED]



NATURAL GAS SAVINGS

The billing analysis focused on the [REDACTED] HPS participants where work was started by January 1, 2012 and completed by December 31, 2012. The weather normalization results passed the reliability screening criteria for [REDACTED] of these participants [REDACTED]

Table 4 summarizes the billing data analysis results and breaks out savings for homes that



Table 4. Home Performance Solutions Natural Gas Savings Results (ccf/yr)

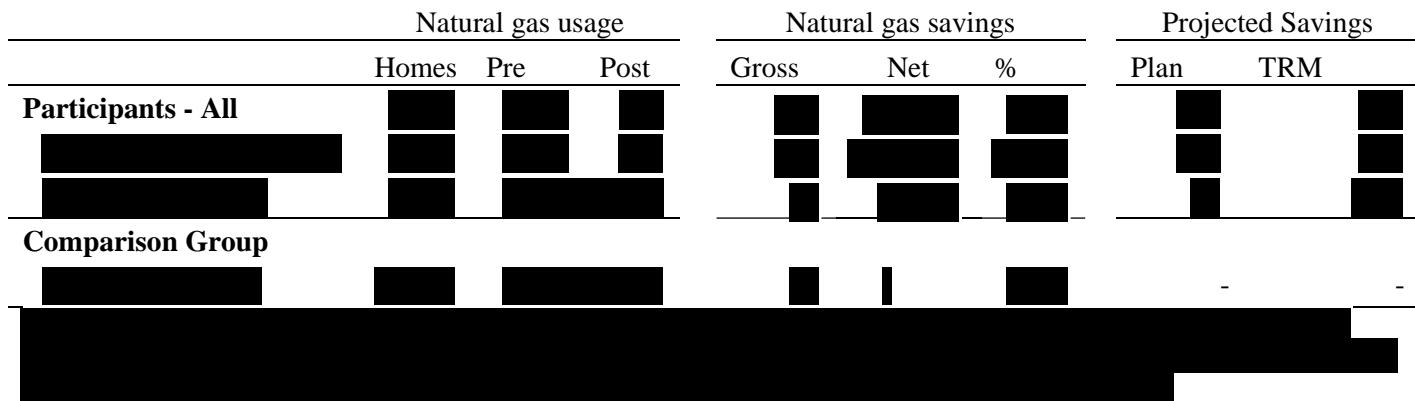


Table 4 shows that HPS participants' annual natural gas usage [REDACTED] ccf while the comparison group's natural gas usage [REDACTED] ccf, yielding net program savings of 89 ccf.

Savings averaged [REDACTED] ccf ([REDACTED]) for participants who [REDACTED] for those who just received an energy audit with minor measures. The savings for participants who received major program measures are substantial, but are about [REDACTED] in the original DSM Action Plan and [REDACTED] calculated based on the Ohio TRM.

The net savings of [REDACTED] ccf overall and [REDACTED] ccf for the major measure group [REDACTED] 2011 impact evaluation which showed [REDACTED] ccf savings overall and [REDACTED] ccf savings for the major measure group. [REDACTED]

[REDACTED]; in 2011, [REDACTED] of participants were energy

audit only, while in 2012, the energy audit only group increased to █ %

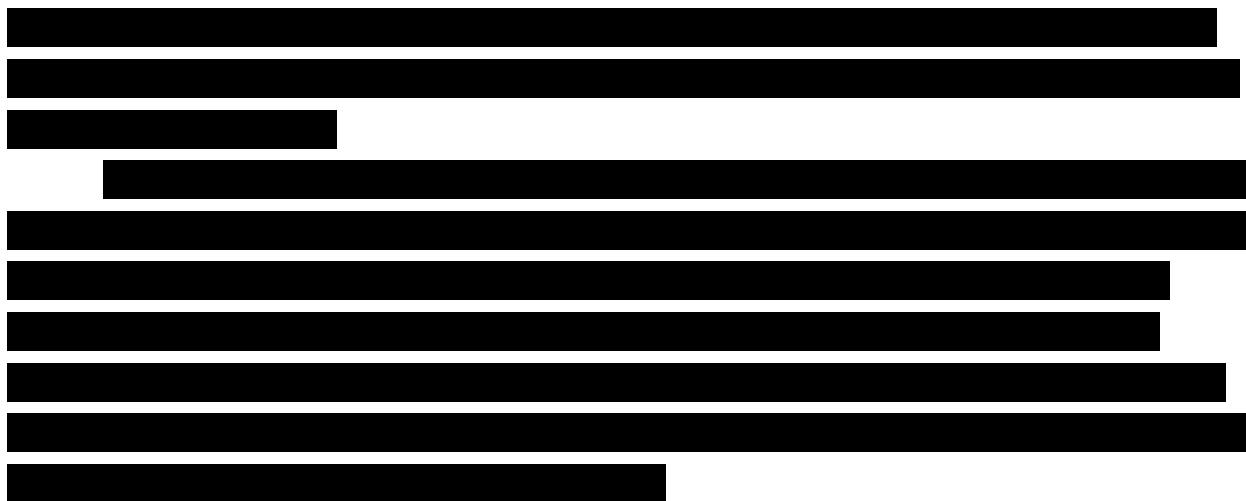
A comparison between the [REDACTED] of Assisted participants [REDACTED] of regular participants. This higher rate of

Table 5 summarizes natural gas usage and savings along with measure installation rates and participant characteristics broken out for the [REDACTED] in the Analysis Group, and further broken down by Assisted vs. regular participants.

Table 5. Savings, Measures and Participant Characteristics:

	All participants	Assisted Regular	Assisted	Regular
# of participants (analysis)				
Natural Gas Savings				
Natural Gas Usage: pre (ccf/yr)				
Net Savings (ccf/yr)				
% net savings				
TRM-projected savings				
Realization rate (measured/projected)				

Table 5

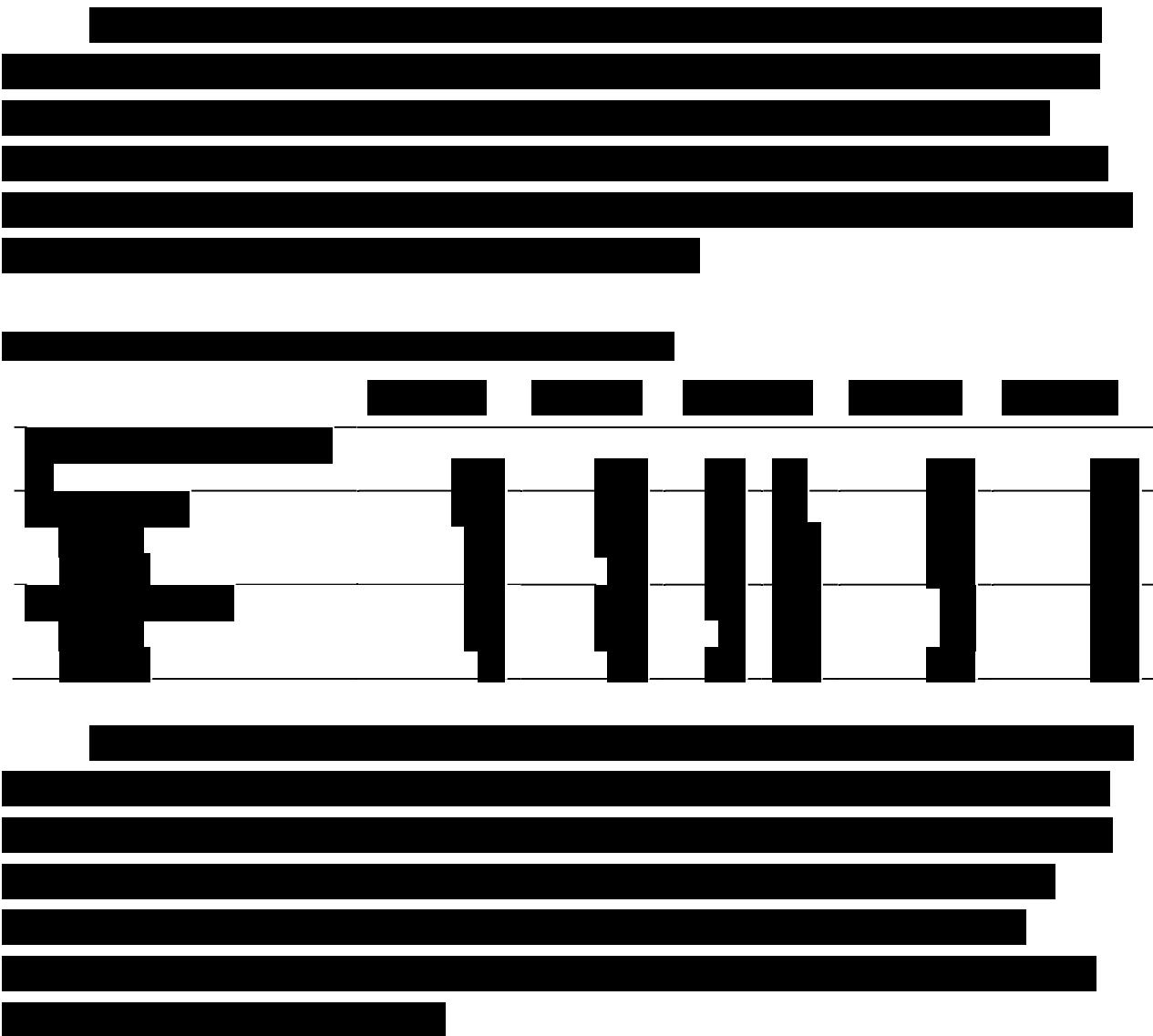


[REDACTED] AND NATURAL GAS SAVINGS

Figure 1 explores [REDACTED] effect by graphing net natural gas savings for homes that installed major program measures summarized by the decade when the house was built (with uncertainty shown by 90% confidence intervals lines through each point).



Figure 1. Net Natural Gas Savings [REDACTED]



NATURAL GAS SAVINGS [REDACTED]

The [REDACTED] of the savings realization rate is further explored in Figure 2 and Table 7, which show the net savings and realization rate for [REDACTED] classified into groups of [REDACTED]

[REDACTED] The points generally hover around a [REDACTED] realization rate. The table provides more details about these groups.

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Figure 2. Savings by Level of Project Savings

Table 7. Natural Gas Savings by Level of Projected Savings

Savings range	# of homes	Pre-Usage	Net Savings	% Savings	% of
0-100	100	100	0	0%	0%
100-200	100	100	0	0%	0%
200-300	100	100	0	0%	0%
300-400	100	100	0	0%	0%
400-500	100	100	0	0%	0%
500-600	100	100	0	0%	0%
600-700	100	100	0	0%	0%
700-800	100	100	0	0%	0%
800-900	100	100	0	0%	0%
900-1000	100	100	0	0%	0%
1000-1100	100	100	0	0%	0%
1100-1200	100	100	0	0%	0%
1200-1300	100	100	0	0%	0%
1300-1400	100	100	0	0%	0%
1400-1500	100	100	0	0%	0%
1500-1600	100	100	0	0%	0%
1600-1700	100	100	0	0%	0%
1700-1800	100	100	0	0%	0%
1800-1900	100	100	0	0%	0%
1900-2000	100	100	0	0%	0%
2000-2100	100	100	0	0%	0%
2100-2200	100	100	0	0%	0%
2200-2300	100	100	0	0%	0%
2300-2400	100	100	0	0%	0%
2400-2500	100	100	0	0%	0%
2500-2600	100	100	0	0%	0%
2600-2700	100	100	0	0%	0%
2700-2800	100	100	0	0%	0%
2800-2900	100	100	0	0%	0%
2900-3000	100	100	0	0%	0%
3000-3100	100	100	0	0%	0%
3100-3200	100	100	0	0%	0%
3200-3300	100	100	0	0%	0%
3300-3400	100	100	0	0%	0%
3400-3500	100	100	0	0%	0%
3500-3600	100	100	0	0%	0%
3600-3700	100	100	0	0%	0%
3700-3800	100	100	0	0%	0%
3800-3900	100	100	0	0%	0%
3900-4000	100	100	0	0%	0%
4000-4100	100	100	0	0%	0%
4100-4200	100	100	0	0%	0%
4200-4300	100	100	0	0%	0%
4300-4400	100	100	0	0%	0%
4400-4500	100	100	0	0%	0%
4500-4600	100	100	0	0%	0%
4600-4700	100	100	0	0%	0%
4700-4800	100	100	0	0%	0%
4800-4900	100	100	0	0%	0%
4900-5000	100	100	0	0%	0%
5000-5100	100	100	0	0%	0%
5100-5200	100	100	0	0%	0%
5200-5300	100	100	0	0%	0%
5300-5400	100	100	0	0%	0%
5400-5500	100	100	0	0%	0%
5500-5600	100	100	0	0%	0%
5600-5700	100	100	0	0%	0%
5700-5800	100	100	0	0%	0%
5800-5900	100	100	0	0%	0%
5900-6000	100	100	0	0%	0%
6000-6100	100	100	0	0%	0%
6100-6200	100	100	0	0%	0%
6200-6300	100	100	0	0%	0%
6300-6400	100	100	0	0%	0%
6400-6500	100	100	0	0%	0%
6500-6600	100	100	0	0%	0%
6600-6700	100	100	0	0%	0%
6700-6800	100	100	0	0%	0%
6800-6900	100	100	0	0%	0%
6900-7000	100	100	0	0%	0%
7000-7100	100	100	0	0%	0%
7100-7200	100	100	0	0%	0%
7200-7300	100	100	0	0%	0%
7300-7400	100	100	0	0%	0%
7400-7500	100	100	0	0%	0%
7500-7600	100	100	0	0%	0%
7600-7700	100	100	0	0%	0%
7700-7800	100	100	0	0%	0%
7800-7900	100	100	0	0%	0%
7900-8000	100	100	0	0%	0%
8000-8100	100	100	0	0%	0%
8100-8200	100	100	0	0%	0%
8200-8300	100	100	0	0%	0%
8300-8400	100	100	0	0%	0%
8400-8500	100	100	0	0%	0%
8500-8600	100	100	0	0%	0%
8600-8700	100	100	0	0%	0%
8700-8800	100	100	0	0%	0%
8800-8900	100	100	0	0%	0%
8900-9000	100	100	0	0%	0%
9000-9100	100	100	0	0%	0%
9100-9200	100	100	0	0%	0%
9200-9300	100	100	0	0%	0%
9300-9400	100	100	0	0%	0%
9400-9500	100	100	0	0%	0%
9500-9600	100	100	0	0%	0%
9600-9700	100	100	0	0%	0%
9700-9800	100	100	0	0%	0%
9800-9900	100	100	0	0%	0%
9900-10000	100	100	0	0%	0%

The savings generally grow as the projected savings increase as seen in Figure 2, but the realization rates shown in Table 7 [REDACTED] The realization rates exceed [REDACTED] with the smallest projected savings ranges, but [REDACTED] line and [REDACTED] [REDACTED] This may suggest [REDACTED]

Figure 3 shows the savings realization rate broken out by pre-program natural gas usage (in 100 ccf-wide bins). The graph shows that realization rates [REDACTED] [REDACTED] Realization rates for homes using less than [REDACTED] ccf are below [REDACTED] while realization rates for homes using [REDACTED] For the households with the highest pre-program natural gas usage ([REDACTED]

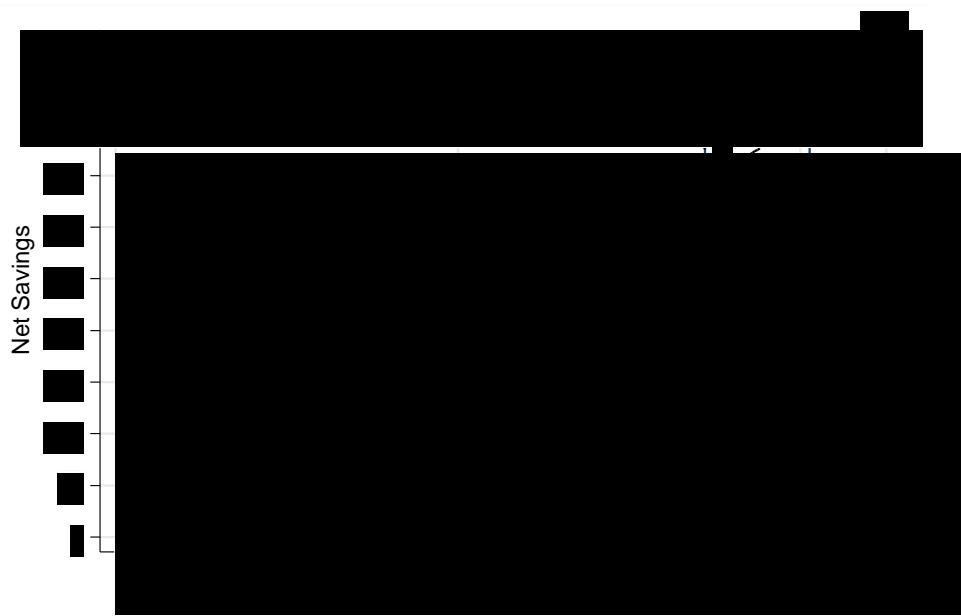


Figure 3. Savings Realization Rate by Pre-Program Natural Gas Use (ccc/yr)

Figure 4 uses the same grouping by pre-program natural gas usage level [REDACTED] [REDACTED] This figure shows the same pattern in a different way to highlight how both [REDACTED]

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Note: vertical lines show [REDACTED] confidence intervals
Each point is labeled by usage level [REDACTED]

Figure 4. Net Savings vs. TRM Projected Savings by Pre-Program Natural Gas Usage Level (ccf/yr)

Figure 5 shows measured [REDACTED]



Note: vertical lines show [REDACTED] confidence intervals

Figure 5. Percent Net Savings: Measured vs. Projected

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MEASURE SAVINGS

The performance of [REDACTED] was further assessed using simple break-outs of savings and with regression modeling. There were [REDACTED] participants in the analysis group that had [REDACTED]. [REDACTED] are shown in Table 8 along with the frequencies for the [REDACTED] of all jobs [REDACTED] in 2012 (which includes cases begun in 2012 but completed in 2013).

Table 8. Measure Installation Frequencies: Participants with Major Program Measures

Measures	Analysis Group	Program Population
[REDACTED]	[REDACTED]	[REDACTED]

Table 9. Average Savings (ccf/yr/participant)

Measures Installed	# of homes	Pre Usage	Net Savings	% savings	TRM Projected	% of TRM
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Term	Percentage
Climate change	100%
Global warming	98%
Green energy	95%
Sustainable development	92%
Carbon footprint	88%
Environmental protection	85%
Recycling	82%
Organic food	75%

Regression modeling was used to better estimate measure-specific savings and explore other factors that may affect savings. The regression model used, commonly referred to as [REDACTED]

[REDACTED] has the potential advantage [REDACTED]
[REDACTED], but has the [REDACTED]
Another [REDACTED] approach is that the [REDACTED]
[REDACTED] such as blower door measured leakage reductions,

The fact that [REDACTED] air sealing and [REDACTED] attic insulation [REDACTED] Given these issues and the [REDACTED] regression analysis estimates of measure savings [REDACTED] With this caveat in mind, the measure savings [REDACTED]

Table 10. Measure Savings Estimates (ccf/yr/installation)

The figure is a horizontal waterfall chart with four columns. The first column, 'Measure', lists six categories: 'Favorable Weather', 'Supply Chain Delays', 'Employee Turnover', 'Equipment Malfunction', 'Raw Material Costs', and 'Market Demand'. The second column, 'Average Measure Savings', shows values of \$-100, \$-150, \$-200, \$-100, \$-250, and \$-150 respectively. The third column, 'Realization Rates', shows rates of 0.8, 0.7, 0.6, 0.8, 0.9, and 0.7. The fourth column, 'Projected Savings TRM', shows values of -\$80, -\$105, -\$120, -\$80, -\$225, and -\$105. The bars are black with white outlines.

Measure	Average Measure Savings	Realization Rates	Projected Savings TRM
Favorable Weather	\$-100	0.8	-\$80
Supply Chain Delays	\$-150	0.7	-\$105
Employee Turnover	\$-200	0.6	-\$120
Equipment Malfunction	\$-100	0.8	-\$80
Raw Material Costs	\$-250	0.9	-\$225
Market Demand	\$-150	0.7	-\$105

The regression analysis estimates suggest that

while [redacted] projected savings

[REDACTED] regression estimates of savings and engineering-based calculations [REDACTED]

Some potential explanations for the

Attic Insulation:

Term	Percentage (%)
Climate change	100
Global warming	98
Green energy	95
Carbon footprint	92
Sustainable development	88
Renewable energy	85
Emissions reduction	82
Low-carbon economy	78
Green economy	75

Wall Insulation:

[REDACTED]

[REDACTED]

[REDACTED]

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Term	Percentage
Climate change	100%
Global warming	98%
Green energy	98%
Carbon footprint	95%
Sustainable development	92%
Renewable energy	90%
Eco-friendly	90%

Heating System Replacement:

The figure shows a horizontal bar chart with six black bars of decreasing length from left to right. The first bar is the longest, followed by the second, then a shorter one, then another short one, then a medium-length one, and finally the shortest bar at the bottom. The bars are set against a white background.

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Term	Percentage
GMOs	~95%
Organic	~90%
Natural	~85%
Artificial	~75%
Organic	~80%
Natural	~70%
Artificial	~60%
Organic	~85%
Natural	~75%
Artificial	~65%

A horizontal bar chart titled "Programmable Thermostats" showing the percentage of programmable thermostats by age group. The y-axis lists age groups from 18-24 to 65+ and over. The x-axis represents the percentage, with major ticks at 0%, 25%, 50%, 75%, and 100%. Each bar's length corresponds to its percentage value.

Age Group	Percentage
18-24	~10%
25-34	~15%
35-44	~20%
45-54	~25%
55-64	~30%
65+	~35%
Over	~40%

Showerheads: [REDACTED]

A horizontal bar chart comparing energy audit participation across four household categories. The y-axis labels are 'Energy-audit-only households', 'Low-income households', 'All households', and 'High-income households'. The x-axis represents the percentage of households surveyed, ranging from 0% to 100%. The bars show participation rates of approximately 10%, 20%, 30%, and 40% respectively.

Household Type	Percentage
Energy-audit-only households	~10%
Low-income households	~20%
All households	~30%
High-income households	~40%

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- | Term | Percentage |
|------------|------------|
| GMOs | 100% |
| Organic | 3% |
| Natural | 10% |
| Artificial | 10% |
| GMOs | 100% |
| Organic | 100% |
| Natural | 100% |
| Artificial | 100% |
| GMOs | 100% |
| Organic | 100% |
| Natural | 100% |
| Artificial | 100% |
| GMOs | 100% |
| Organic | 100% |
| Natural | 100% |
| Artificial | 100% |
| GMOs | 100% |
| Organic | 100% |
| Natural | 100% |
| Artificial | 100% |

Other Factors Associated with Savings: The program measure savings regression model was used to explore for other factors that may affect savings

were found to have statistically significant but generally modest impacts on savings. Assisted participants

SAVINGS BY

The realization rates ranged from [REDACTED] for the insulation and air sealing measures. If the shortfall in savings is due to [REDACTED]

[redacted] then the [redacted] realization rates [redacted]
[redacted] Similarly, if the savings shortfalls are due to [redacted]
[redacted] larger realization rates than others. Of course, [redacted]
[redacted], the variations in

realization rates may be [REDACTED]. To explore these possibilities, Figure 6 plots the net savings [REDACTED] against the [REDACTED]



Figure 6. Measure vs. Projected Savings [REDACTED]

The figure shows [REDACTED] realization rates [REDACTED] met or exceeded the realization rate [REDACTED] while most contractors had realizations rates between 60% and 80%. Overall, the variation in realization rate suggests that [REDACTED] performance may be responsible for a [REDACTED] of the difference between savings and projections.

Figure 7 shows a similar plot [REDACTED] Like the measured and projected savings [REDACTED] realization rate; most [REDACTED] demonstrated realization rates [REDACTED] This suggests that a portion of the [REDACTED]

The savings and realization rates [REDACTED] may be helpful in trying to improve the program performance. [REDACTED]

[REDACTED] In addition, the overall levels of average savings and projected savings [REDACTED]

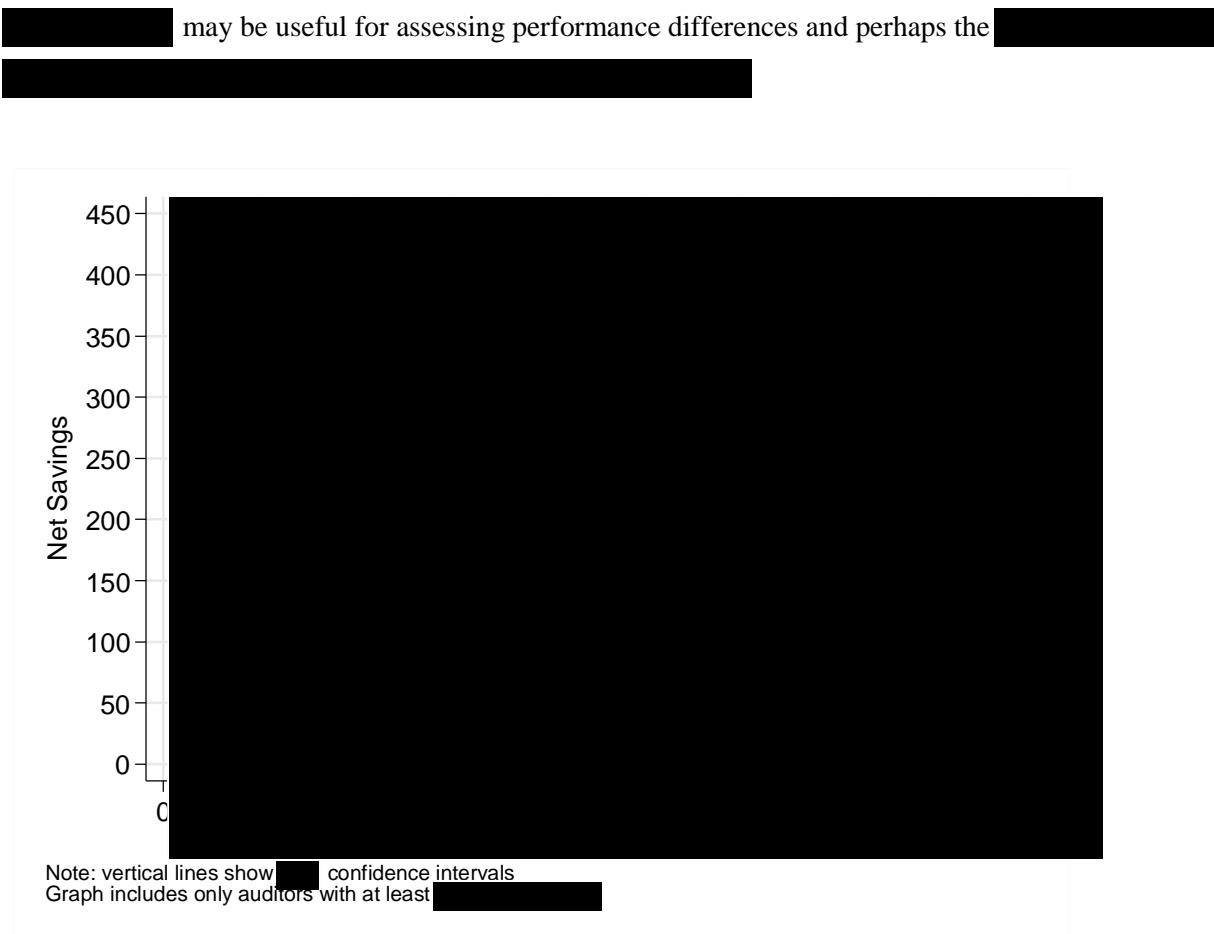


Figure 7. Measured vs. Projected Savings by Energy Auditor

AGGREGATE PROGRAM SAVINGS

The savings in the billing analysis group were used to estimate the overall HPS savings for the program in 2012 using a two-step approach:

1. The regression model of measure savings was used to estimate the realization rates for each measure [REDACTED] and applied the regression estimates to the measures installation [REDACTED]
2. The program net savings were then [REDACTED]
[REDACTED]
[REDACTED] Because there were just [REDACTED] for completed jobs in 2012 and the regression analysis indicated [REDACTED]
[REDACTED]

The adjusted savings and incremental program impacts from the above steps are summarized in Table 11 along with program aggregate impact totals and the corresponding projected values from the original DSM Action Plan filing.

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Table 11. HPS Program Impacts and Natural Gas Savings Projections (ccf/yr)

The TRC compares the total costs of the program and energy efficiency measures to the present value of the lifetime energy savings. It includes the entire incremental cost of the measures and not just the cost of the rebates. The UCT compares the total cost to the utility of operating the program against the reduction in operating costs associated with the savings. The primary difference compared to the TRC is that the UCT uses the cost of the rebates rather than the full incremental cost of the measures.

In addition to the natural gas savings, the TRC included the estimated value of electricity savings calculated from the reduced furnace fan run-time as well as some small reduction in estimated cooling loads due to insulation and air sealing measures.

Table 12 summarizes the results of the cost-effectiveness analysis of HPS.

Table 12: HPS cost-effectiveness analysis

A horizontal bar chart comparing two methods, TRC and UCT, across various cost and benefit categories. The categories are listed on the left, and the bars extend to the right. The length of each bar represents the value for that category under each method.

Cost/ Benefit Category	TRC	UCT
Measure Costs	Very Long Bar	Very Long Bar
Program and Other Costs	Very Long Bar	Very Long Bar
Total Costs	Very Long Bar	Very Long Bar
Benefits - Present Value	Very Long Bar	Very Long Bar
Gas Savings	Medium Bar	Medium Bar
Electric Savings	Medium Bar	Medium Bar
Benefit / Cost Ratio	Very Short Bar	Very Short Bar
Benefit / Cost Ratio: measures only	Very Short Bar	Very Short Bar

CONCLUSIONS AND RECOMMENDATIONS

⁶ See "Nonenergy Benefits From The Weatherization Assistance Program: A Summary Of Findings From The Recent Literature", M Schweitzer and B. Tonn, Oak Ridge National Laboratory ORNL/CON-484, 2002.

Term	Percentage (%)
Global warming	98
Green energy	95
Sustainable development	92
Renewable energy	90
Clean energy	88
Carbon footprint	85
Green technology	82
Environmental conservation	80
Renewable resources	78
Green economy	75
Carbon emissions	72
Renewable energy sources	68
Green building	65
Renewable power	62
Green infrastructure	58
Renewable electricity	55
Green energy source	52
Renewable energy source	48
Green energy source	45
Renewable energy source	42
Green energy source	38
Renewable energy source	35
Green energy source	32
Renewable energy source	28
Green energy source	25
Renewable energy source	22
Green energy source	18
Renewable energy source	15
Green energy source	12
Renewable energy source	8
Green energy source	5
Renewable energy source	2
Green energy source	1

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PREPARED BY
Seventhwave

An Assessment of Gas Savings from Columbia Gas of Ohio's Home Performance Solutions Program

2013 IMPACTS

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Summary: Text Public Version/Redacted Impact and Process Evaluations Part 2 of 3
electronically filed by Cheryl A MacDonald on behalf of Columbia Gas of Ohio, Inc.