Energy Trust of Oregon New Homes Air Sealing Pilot II Evaluation Report

Submitted by Evergreen Economics and SBW Consulting, Inc.

Final Report – April 21, 2016

1 Pilot Description and Goals

In 2014 and 2015 the New Homes program implemented an Air Sealing Pilot ("the pilot") to assess the impacts of two different air sealing strategies in new homes. The two air sealing strategies that were tested were whole home air sealing and attic "blackout." The whole home treatment used a latex sealant to seal individual wall cavities, the top plate and the junction between the baseplate and subfloor, before wall insulation and drywall were installed. The attic blackout treatment was performed after drywall installation but prior to attic insulation and required an installer to use spray foam to seal all attic penetrations, such as can lights, duct boots and exhaust fans. During blackout application and testing, the installer periodically shuts off his or her headlamp to find light (and therefore air) leakage. The two treatments were applied to homes sequentially and the impacts of each on air infiltration were measured using repeated blower door tests. Section 3 provides additional details about the blower door testing, and Section 2 provides additional information about the different air sealing treatment methods.

CLEAResult implemented the pilot on behalf of Energy Trust. Latex whole home air sealing was applied to 37 treatment homes, and was omitted for 39 control homes, for a total of 76 pilot homes. The attic blackout method did not require a control group. All of the homes were constructed by DR Horton in a single subdivision, and were very similar in design.[1] All of the homes were narrow three-story homes, with floor area ranging from 1,400-2,300 square feet and a concrete slab under the first floor garage. A small crawl space was under the remaining area. All homes had a condensing gas furnace in the attic providing heat to the second and third floors. Appendix A includes additional details on the home designs.

The field phase of the pilot began in the fall of 2014 and ended in November 2015. The pilot was delayed when the original developer sold the lots to DR Horton. This caused several construction delays including re-approval of all house plans. All of the treatment and control homes were going through Energy Trust's New Homes program to get an Energy Performance Score (EPS). Performance Insulation was the insulation and air sealing subcontractor for all of the homes.

Energy Trust contracted with Evergreen Economics (Evergreen) and SBW Consulting (SBW) (the Evaluation Team) to provide key findings from the pilot implementation and

[1] The builder volunteered to participate in the Pilot and received no incentives beyond those that would normally be given for EPS homes.

evaluate the energy savings associated with the air sealing measures. Energy Trust's primary goals for the pilot included:

- Determining if the air sealing strategies can produce measurable savings and be cost-effective;
- Determining if the measures can be adopted widely by the market; and
- Determining if the new methods should be integrated into EPS homes and/or be eligible for standalone incentives (for code home builders).

The remainder of this report documents the estimated energy savings resulting from the pilot measures, and summarizes the successes and challenges associated with the measures installation.

1.1.1 Evaluation Information Sources

In developing this report the Evaluation Team drew from the following resources:

- A site visit with CLEAResult's field manager in July 2015 to observe recently applied air sealing latex and discuss current installation challenges;
- A phone call with CLEAResult staff on the pilot implementation status and current issues in August 2015;
- A report submitted by CLEAResult to Energy Trust summarizing their activities and findings. We reviewed the report and integrate key findings herein. The original report is included in Appendix A;
- A spreadsheet containing home dimensions, blower door measurements, indications of penetrations sealed, and installer notes.[2] These data formed the basis of our energy savings estimate;
- A formal interview with the CLEAResult pilot manager in January 2016 after the pilot was completed; and
- A follow up interview with the CLEAResult pilot manager in April 2016 to review the estimated attic blackout treatment costs.

A planned interview with DR Horton's overall site supervisor was dropped due to multiple staff replacements (i.e., no one person would have a good understanding of the entire pilot process).

[2] Bruce Manclark and Lucinda Gilman, *Energy Trust of Oregon Whole-House Air Sealing Report*, CLEAResult, December, 2015. Supplemented by Air Sealing Pilot_010516.xlsx.

2 Findings – Measures Application

In this section we summarize key findings about the air sealing installation processes. Appendix A provides additional details about the installation locations and procedures within the treatment homes.

2.1 Knauf EcoSeal

Of the 37 whole home treatment homes, 20 homes were treated with an EcoSeal product manufactured by Knauf.

2.1.1 Application Process

EcoSeal is applied using an airless sprayer operating at a minimum of 1700 PSI powered by an electric brushless DC motor. The machine is capable of running two 100′ hoses and sprayers simultaneously, however only one sprayer was used at a time during the pilot. The sprayer intake is placed in a bucket of EcoSeal and system pressure can be adjusted using a turn dial on the side of the machine. Because of the length of the intake pipe, the machine is only able to use three-quarters of the material in a bucket. Once the pump can no longer draw material, a new bucket of material is used. Once the new bucket is partially used, the remaining unused material from the previous bucket is poured and scraped (with a wooden stick) into the new bucket to minimize wasted material. This can result in small particulates being introduced into the EcoSeal, increasing the chances of clogging the sprayer tube, internal machine mechanisms, and/or the sprayer nozzle. Airborne particulates getting into the material buckets are also a risk.

2.1.2 Application Problems

In addition to the material transfer issues noted above, the following issues were noted about the EcoSeal product:

- Variations in the consistency of the material were common, even among buckets from the same pallet of material.
- Material that was too watery was much more difficult to apply and "messy." The material would not adhere well to the wall, and would splatter and run down vertical surfaces more than the thicker batches of material.
- Some crew staff did not apply the sealant thick enough on the wall studs.
- The product takes awhile to harden, delaying sheet rocking over the studs.
- Clogging of the applicator tip was the most common problem, resulting in more than one hour of lost productivity for 7 of the EcoSeal jobs. Clogging problems continued intermittently day-to-day, even after initial size adjustments by the manufacturer's trainer, and job-to-job up until the end of the pilot. The most likely cause of consistent and regular clogging was inadequate or improper clean up and storage of the applicator hose, sprayer, and machine.

- Proper clean up after use, proper storage, and priming the machine with mineral spirits before storage are required if the machine is going to sit unused for more than 48 hours. The sprayer required at least 45 minutes of clean up each day to properly prepare the machine for storage.
- Machine cleanup requires a plumbed water source that a garden hose can be attached to for cleanup outside. Although EcoSeal is a water-based material, it easily stains materials it comes into contact with, and some garage floor slabs were stained during the pilot.

2.1.3 Application Benefits

The following benefits were noted about the EcoSeal product:

- The EcoSeal machine has a sprayer extension. This allowed the installers to reach the top plates without having to use a small step stool, which the installers noted multiple times. (The required cleaning time, however, somewhat negated these application timesavings).
- Insulation batts can be placed in the wall cavities while the product is still wet.

2.2 Owens Corning Energy Complete

Of the 37 whole home treatment homes, 17 homes were treated with the Energy Complete product manufactured by Owens Corning.

2.2.1 Application Process

Energy Complete is applied using a proprietary machine designed and manufactured by Owens Corning. It uses a series of pumps to squeeze two separate types of material through tubes where they mix in a nozzle on the tip of the applicator "wand." Nozzles inside the machine open to allow it to pump material and purge air simultaneously and excess material is purged into a container that one holds below the purging nozzle. This excess material cannot be reused.

2.2.2 Application Problems

The following issues were noted about the Energy Complete product:

- The product is sensitive to ambient temperature. If the temperature of the material and the temperature inside the applicator machine drop below 60 degrees, the material will not flow properly and application becomes difficult.[3] Using a portable

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[3] The manufacturer recommends that the product be stored in a heated warehouse.

heater can rectify this, but can introduce other risks such as carbon monoxide exposure and fire danger, and increase fuel costs.

- The machine had numerous breakdowns, which had to be repaired by factory representatives. Towards the end of the pilot, the machine could not be repaired and was abandoned.
- Air in the lines or elsewhere in the system most likely caused the machine failures. Excess air created a composite material that was generally too thin and runny. The only way to fix this issue was to purge the machine of air, replace the applicator tip, and try again. Repeatedly purging the system wasted large amounts of material.
- During an average whole home air sealing project the machine needed to be purged of air 2 to 3 times, taking 5 to 15 minutes.
- A typical house required the applicator tip to be replaced 3 to 4 times.
- Machine problems resulting in at least one hour of lost productivity occurred at 33 percent of the Energy Complete homes.

2.2.3 Application Benefits

One benefit of the applicator wand is having a flexible air-spraying nozzle. Installers used the applicator wand to blow compressed air in the bottom plates to clear sawdust and debris before applying the Energy Complete material. Compared to using a shop vacuum to clear the bottom plates of debris, this is a faster method.

2.3 Attic Blackout

2.3.1 Application Summary

All homes in both the latex-sealant treatment group and control group received the attic blackout treatment. Blackout air sealing consisted of spray-foam filling of attic penetrations, cracks and leaks. Typical areas sealed were penetrations from can lights, duct boots, bath fans, and junction boxes.

Blower-door testing occurred with the interior drywall at various levels of finishing in different homes. Most of the time pre and post blackout testing occurred with houses at level 2 drywall with mud drying from application the previous day. It was not uncommon for drywall workers to be actively sanding drywall or applying additional coats of finish mud as work crews were insulating and air sealing the attic.

The initial blower door tests were conducted before any penetrations were sealed. The blower door was set on the first floor, either at the main entrance door to the outside or in the door to the garage, with the garage door open. Which door that was used depended on site conditions at the time of testing. After the initial blower door test, field staff went into the attic with the insulating crew to ensure that all necessary penetrations were sealed. The insulating crews would then turn their headlamps on and off intermittently to see if they had completely "blacked out" can lights, junction boxes, duct boots, and bathroom fans. According to interviewed implementation staff, this process of observing light from below proved to be a practical and accurate test for attic blackout inspection.

For every home, the second blower door test occurred immediately after the insulators installed the blown-in insulation. For a team of two people the entire process of test-in, blackout of penetrations, insulation installation, and test-out took approximately 2 to 3 hours per home. The time spent to seal penetrations was approximately 15 to 30 minutes on average, or a total 0.5 to 1 man hours. In addition, an estimated $50 to $75 worth of spray foam was used per application.

It is important to distinguish between contractor costs and the prices they charge for the installation of various measures and other services.[4] Like all businesses, contractors will mark up their costs to ensure a profit margin, and contractors may also re-allocate various costs to appear to be more competitive and/or maximize available incentives. In addition, contractors must also consider their opportunity costs for adding new measures. In this case, the time that a contractor spends doing attic blackout cannot be used to install insulation, and over time may increase the number of days that installers need to be onsite. The insulation contractor for the pilot told CLEAResult staff that going forward, attic blackout costs – to the builder – would likely range from $250 to $350 per home. It is possible that other contractors, particularly those not getting EPS incentives, would offer lower bid prices to builders for attic blackout (and not increase their other prices), but we cannot confirm this.

[4] For instance, in the 2014-2015 New Homes Program Process Evaluation, Evergreen found that one verification company reduces the verification fee it charges builders for EPS homes, but recovers these costs in its insulation work.

3 Findings – Air Leakage and Energy Savings

CLEAResult measured the reductions in air leakage due to the air sealing with blower door testing. The blower door equipment pressurizes the house to 50 pascals and reports the number of cubic feet per minute (CFM) of air blown into the house required to maintain that pressure. This is a measure of air leakage at 50 pascals, referred to as CFM50. In the pilot, a blower door test was performed prior to the blackout treatment, after the blackout treatment, and after insulation (at completion of construction). Test results before and after blackout treatment were used to assess the impact of attic blackout air sealing.

The whole home latex sealing could not be tested with pre and post blower door tests at the site, since the blower door test cannot be applied at the early stage of construction prior to latex sealing. To determine the impacts of the two latex sealing products, blower door tests were conducted on the group of 39 similarly constructed control homes that did not receive the whole home latex sealant at completion of construction during the EPS verification process. Blower door test results from the treatment and control homes were then compared.

CLEAResult reported that latex wall sealing had no effect on air leakage. The average final tested ACH50 was 2.98 in the control group, and 3.05 in the treatment group; the data provide no evidence of energy savings due to latex wall sealing. Moreover, additional labor and material costs for latex air sealing were estimated to be $1,250 to $1,750 per home.

The remainder of this section focuses on the attic blackout sealing, which did show evidence of leakage reduction. Energy savings associated with air conditioning were not included in our assessment, since these savings would be electric, and the purpose of the pilot was to determine gas savings.

3.1 Attic Blackout Data Review

The CLEAResult blower door test results showed larger reductions in air leakage due to attic blackout sealing. All homes showed an improvement, with reductions ranging from 125 to 779 CFM50. The reductions were not strongly related to home size. This section describes the Evaluation Team's review of CLEAResult's data. SBW did not observe the blower door data collection, and is relying on CLEAResult's experience in this field. According to CLEAResult, all of the testing equipment was calibrated during the pre and post blackout testing, and the equipment was re-calibrated for final home testing during EPS verification. A single verifier conducted all of the testing.

Blower-door testing occurred with the interior drywall at various levels of finishing in different homes. Most of the time, pre and post blower door testing occurred while the homes were at Level 2 drywall finishing, with joint compound drying from application the previous day. In some cases, however, the attic air sealing occurred prior to Level 2 drywall finishing. Due to concerns that the incomplete application of drywall tape and joint compound would affect blower door measurements of the true air leakage reduction from attic air sealing, the Evaluation Team dropped these sites from the analysis. The Team excluded 15 of the 42 blackout sites from the analysis, leaving 27 homes. Three of the sites were excluded by CLEAResult in their analysis due to lack of data for those sites. The Team excluded an additional 12 sites for the following reasons, as indicated in notes made by the CLEAResult testers:

- Interior walls were not at Level 2 drywall finish at the time of the pre-sealing blower door test;
- Exterior door was not foamed around yet at time of blackout testing; and
- Two outlier sites stood out as not credible: pre and post blackout ACH50 were more than double the average while the final ACH50 was under average.

The following table shows the test results in terms of CFM50. The standard deviation is provided to show the variance in the data (68% of data points in a normal, bell-shaped, distribution lie within plus or minus one standard deviation from the mean). The table also shows the small variance in home sizes in this sample of new construction homes, with the great majority of homes having a floor area of less than 1,900 sq. ft.

Table 1: Attic Blackout Sealing Reduction in CFM50

	Floor area (sq. ft.)	Pre blackout CFM50	Post blackout CFM50	Reduction in CFM50
Average (n=27)	1,643	1,202	951	251
Standard deviation	215	281	254	124

Infiltration values are also reported in terms of ACH50 (air changes per hour at 50 pascals), and ACHn ("natural" ACH, at normal conditions). The conversion of ACH50 to ACHn is problematic in that the conversion requires a conversion factor whose true value depends on site conditions.[5] However, this factor can be estimated, and ACHn is the traditional way of describing home ventilation level.[6] The following table shows the test results in terms of ACH. A reduction of one (1) ACH50 is a significant reduction in infiltration.

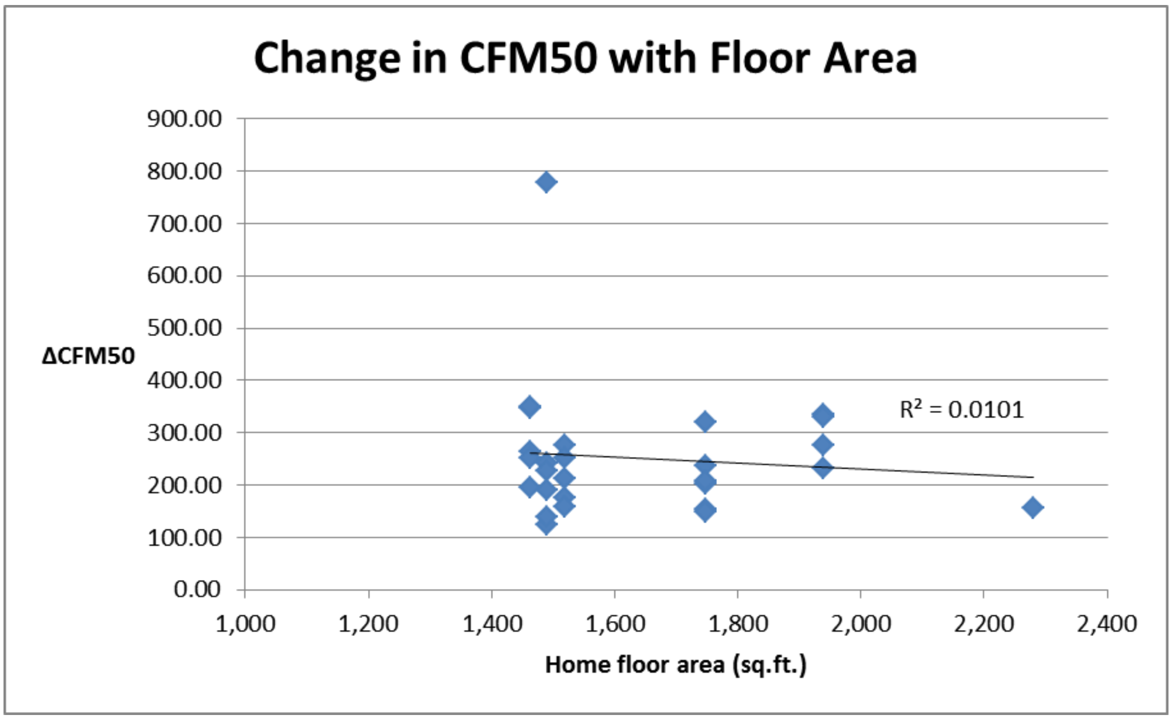
[5] The factors are described here: http://www.builditsolar.com/Projects/Conservation/BlowerDoor/FlowRates.htm
[6] http://gothermalstar.com/resources/ConvertingBetweenCFMAndNaturalFlow-GreenSheet.pdf

Table 2: Attic Blackout Sealing Reduction in ACH

	Pre blackout ACH50	Post blackout ACH50	Reduction in ACH50	Reduction in ACHn
Average	4.70	3.71	0.99	0.06
Standard deviation	1.20	1.01	0.55	0.03

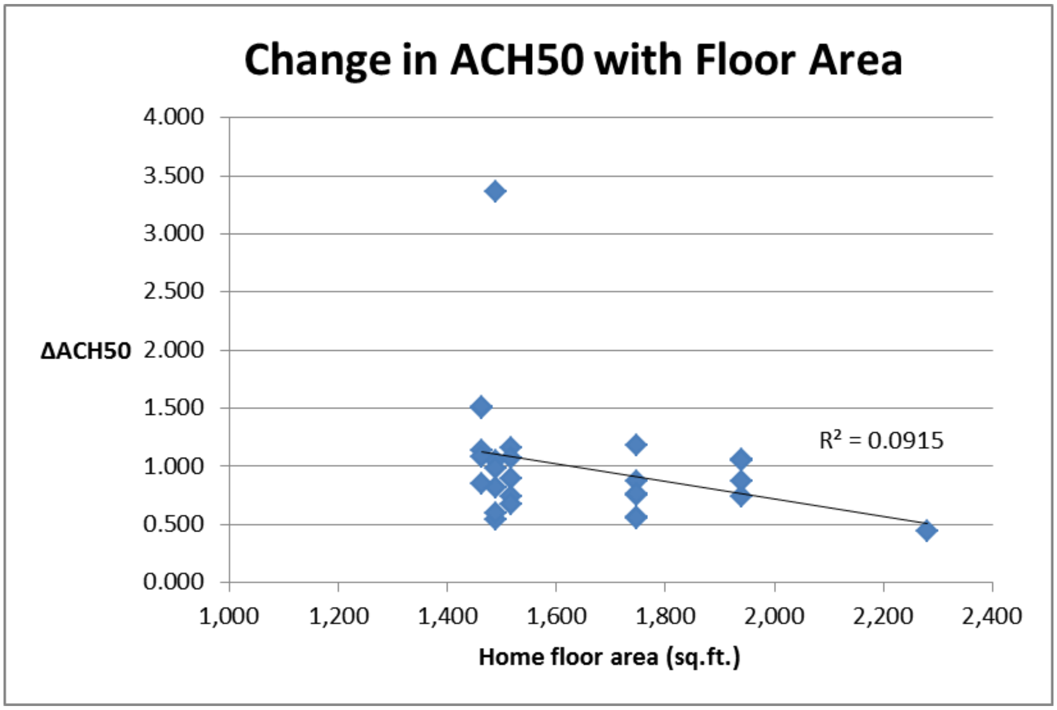
As shown in the chart below, the reduction in CFM50 (ΔCFM50) does not vary with the home floor area. The CLEAResult report, however, noted that reductions in infiltration rates did increase as the number of sealed penetrations increased.

Figure 1: Dependence of ΔCFM50 on Floor Area



Although CFM50 reductions do not increase with floor area, we expect ACH50 reductions to decrease as home area (and volume) increases, because the number of home air changes per hour goes down as home volume goes up. The following chart shows that while this relationship may exist, it is a weak relationship.

Figure 2: Dependence of ΔCFM50 on Floor Area



3.2 Attic Blackout Energy Savings

It is generally considered impractical to measure the energy savings from this type of weatherization measure directly. As a result, building energy simulation software is typically used to estimate energy usage of buildings at various levels of insulation and air leakage. The Evaluation Team considered two simulation programs: 1) the BEopt™ program,[7] developed by the National Renewable Energy Lab (NREL) as a front-end to the Department of Energy's (DOE) EnergyPlus simulation engine, and 2) the Simplified Energy Enthalpy Model (SEEM) residential simulation package supported by the Northwest Power and Conservation Council (NWPCC) and its Regional Technical Forum (RTF).[8]

Using SEEM, the RTF has an infiltration reduction measure for existing residential, single-family construction.[9] This measure is not really appropriate in this case, since the baseline home for the measure is not a code-built new construction home – it is a weighted mix of a number of existing construction simulations. The RTF also models new construction

[7] https://beopt.nrel.gov/
[8] http://rtf.nwcouncil.org/measures/support/SEEM/Default.asp
[9] http://rtf.nwcouncil.org/measures/res/ResSFWx_v3_4.xlsm

homes in Oregon with SEEM. However, the savings values are for whole house savings rather than broken out by individual measures such as infiltration reduction. It would be possible to investigate savings with custom SEEM modeling, but we elected to use BEopt for this project instead. BEopt allowed us to quickly create a broader range of prototype homes than are used in RTF's SEEM modeling.

Our goal was to estimate the natural gas savings that occur from attic blackout air sealing in a typical gas-heated new construction home. Based solely on the pilot results, these savings are difficult to estimate with high confidence for a number of reasons. The test results are uniformly from very similar home designs, with three stories and an unheated garage on the bottom floor. The height of the building means that a given leakage area in the attic would pull in more air than the same leakage area in a one-story building, due to an increased stack effect.[10] On the other hand, the stacked design leads to a relatively small attic area compared with the floor area. Presumably a larger attic area would present more opportunities for leak sealing. These two factors offset each other, though it is unknown to what degree.

New homes are built with many designs, and it is cost-prohibitive to attempt to create model prototypes that capture the complete mix of new homes. Environmental factors also play a role in infiltration. These factors include the proximity of other houses and trees, and prevailing wind conditions. In addition to these building differences, the pilot homes are relatively "tight" homes, with potentially lower-than-average infiltration rates. As a result, the attic air sealing might have a different impact on a more typical home.

Nevertheless, the Evaluation Team's judgment is that we can put bounds on the savings, and derive a reasonable average estimate of the gas savings based on the pilot data.

3.2.1 Approach

The RTF uses five prototypes to model new construction homes in Oregon, as shown in the table below. The table shows the weighting applied by the RTF to derive average savings.

[10] https://energy.ces.ncsu.edu/stack-effect-defined/

Table 3: RTF New Construction Prototype Homes

Foundation type	Floor area (square feet)	Prototype weighting
Crawl space	1,344	14%
Slab	1,344	3%
Crawl space	2,200	65%
Slab	2,200	12%
Basement	2,688	6%

Using BEopt, we created seven prototypes as shown in the next table, in order to provide a larger range of home types than the RTF prototypes. The prototypes are weighted to approximately match the RTF weightings. All prototype homes included an unheated garage, and were heated with a condensing gas furnace, consistent with the characteristics of the pilot homes. Two of the prototypes are very similar in design to the pilot homes – narrow 3 story construction with an unheated garage on the ground floor. These prototypes are the 3-story homes of 1,275 and 2,000 square feet shown in the table below. The pilot homes range in floor area from 1,400-2,300 square feet, so the single prototype which most closely represents the pilot homes would be the 2,000 square foot home with 3 stories.

Envelope parameters were set to be consistent with 2014 Oregon Energy Code as follows:[11]

- The unfinished attic ceiling insulation level was set to R-38;
- The 2x6 wood walls were insulated to R-21;
- The underfloor was insulated to R-30; and
- Total window area was 15 percent of wall area, with a U-value of 0.35.

Roofs were pitched, with composition shingles. A slab was under the garage, with crawlspace elsewhere. Neighboring homes were modeled at 15 feet on two sides. Default values were used for appliance types and schedules. A nighttime thermostat setback was assumed. All simulations were run with TMY3 weather data from Portland International Airport.[12]

[11] http://codes.iccsafe.org/app/book/content/PDF/2014/2014_Oregon/14_Residential/PDFs/Chapter%2011%20-%20Energy%20Efficiency.pdf

[12] "TMY" denotes typical meteorological year. These data are produced by NREL.

Table 4: BEopt Prototype Homes

Prototype number	Number of floors	Conditioned square footage	Prototype weighting
1	3	2,000	21%
2	3	1,275	7%
3	Split level	2,500	15%
4	2	2,400	21%
5	1	1,400	10%
6	1	2,000	21%
7	3	3,100	5%

The impact of the attic air sealing was modeled as an improvement from five (5) ACH50 to four (4) ACH50 in all homes. This approximates the improvement achieved in the pilot, where attic sealing reduced average ACH50 from 4.70 to 3.71. Note that additional work, including attic insulation, reduced the infiltration in the pilot further to an average of 3.0 ACH50. We would expect the larger homes to see a greater reduction in ACH, but in the absence of strong data supporting this, we elected to use the average reduction in all cases.

3.2.2 Results

Simulation results are shown in the following table. Energy savings for blackout attic air sealing can be expected to range from 3-27 therms per year, depending on the size of the home. Average annual savings are 0.54 therms per 100 sq. ft. or 12 therms for the average home. The savings constitute a reduction in heating energy use of 4 percent. The variance in savings is relatively large, ranging from 0.21 to 1.02 therms per 100 square feet. However, savings are grouped more tightly about the average for the common multi-story homes with floor area of 2,000-2,500 square feet. Savings for the model which most closely resembles the pilot homes were greater than the average savings – 15 therms compared with the average of 12 therms.

Table 5: Attic Sealing Energy Savings

Prototype	Annual heating usage @ 5 ACH50 (therms)	Annual heating usage @ 4 ACH50 (therms)	Savings (therms)	Savings per 100 square feet (therms)	Prototype weighting
3-story 2,000 sf	318	303	15	0.75	21%
3-story 1,275 sf	205	192	13	1.02	7%
Split level 2,500 sf	378	364	14	0.56	15%
2-story 2,400 sf	340	327	13	0.54	21%
1-story 2,000 sf	298	293	5	0.25	21%
1-story 1,400 sf	174	171	3	0.21	10%
3-story 3,100 sf	469	442	27	0.87	5%
Weighted Average	**313**	**301**	**12**	**0.54**	

All modeling shown above was done using Portland weather. Portland is one of the reference cities for RTF Heating Zone (HZ) 1. SEEM existing construction measures indicate 20 percent greater savings in Heating Zone (HZ) 2 than in HZ 1 for infiltration reduction. Given that the great majority of Oregon homes are in HZ1, combined with the uncertainty in the estimate of savings discussed in Section 3.2, the Evaluation Team's judgment is that the value derived with Portland weather is adequate for Oregon as a whole.

4 Recommendations

Given the results, we do not recommend that the New Homes program move forward with the whole home and attic sealing measures tested in this pilot.

Neither of the two whole home latex products – EcoSeal and Energy Complete – produced meaningful air leakage reductions. Notably, the final air leakage in the treatment homes measured an average of 3.0 ACH50. By comparison, new construction ENERGY STAR homes require 4.0 ACH50 in eastern Oregon, and 5.0 ACH50 in western Oregon.[13] The attic blackout accounted for about 1.0 ACH50, so these were very tightly constructed homes, even without the extra attic air sealing.[14]

These data suggest that there were few leakage reductions to be realized, for these particular homes. That said, the significant application problems noted in Section 2 indicate that these measures are not yet suitable for widespread market adoption. Although some insulation subcontractor staff became more proficient with the equipment, frequent crew turnover, as is typical in the industry, would require constant training and application problems would likely persist.

Going forward, Energy Trust may want to explore exterior air sealing options as a program measure. According to CLEAResult staff that recently attended the 2016 International Builders Show in Las Vegas, builders are showing increasing interest in air sealing by placing rigid foam board over exterior walls and sealing the seams with very durable, self-adhesive European air sealing tapes, which can be applied to wide range of exterior materials. According to CLEAResult staff, walls with higher insulation R-values are also less moisture tolerant and dew points are reached more easily. Moving the air barrier to the outside provides a good air barrier and an improved weather barrier.[15]

While the attic blackout produced larger energy savings, averaging 12 therms across a range of home types, the measure is not cost effective with estimated installation costs (i.e., price to the builder) of $250 to $350 per home. Few application challenges were noted, so it is unlikely that installation costs would decrease significantly. In addition, if the measure was added to the program with a prescriptive/standalone approach, additional quality assurance checks would likely be required. While this would likely cost less than conducting blower door testing, it would still be an additional cost incurred by the program to ensure that the work is performed according to specifications and that the

[13] http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/National_Program_Requirements.pdf
[14] Homes with this low level of infiltration require mechanical heat recovery ventilation (HRV), and these homes indeed had HRV installed.
[15] For a video demonstration of these types of tapes, see: http://www.smallplanetworkshopstore.com/siga-wigluv-60-2-1-4-all-around-exterior-air-sealing-tape/

energy savings are reliable. Other contractors may be willing to install attic blackout for less than $250 per home, and this may be something Energy Trust continues to research. That said, in the current environment of low gas prices the measure is still likely to not be cost effective to Energy Trust.

MEMO

Date: May 10, 2016
To: Board of Directors
From: Mark Wyman, Residential Sector Program Manager
Dan Rubado, Evaluation Project Manager
Subject: Staff Response to the New Homes Air Sealing Pilot II Evaluation

This report summarizes a pilot study conducted by Energy Trust's New Homes program to test two different air sealing strategies during construction. As noted in the report, the whole home latex air sealing products that were tested had a host of technical challenges, were expensive and did not result in measurable reductions in air leakage. As a result, Energy Trust will not be pursuing this measure any further. The attic blackout air sealing strategy appeared to be much more promising because it did not have any significant installation barriers and produced modest but significant reductions in air leakage. However, the energy savings associated with this reduction was relatively low, and is not nearly enough to justify the additional cost of $250 to $350 per home. Based on Energy Trust's screening criteria, this measure is not currently cost-effective and is unlikely to be in the near future. As a result, Energy Trust will not be pursuing this measure, although it may be incorporated into the program's Energy Performance Score (EPS) homes, as part of a larger strategy to achieve very air tight homes. This is in line with the program's move away from standalone air sealing measures. The New Homes program will continue to test new air sealing strategies and other efficient construction techniques and incorporate them into its EPS homes.