



MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

Rely on us.

TO: Commissioners Helgeson, Brown, Mital, Simpson and Carlson
FROM: Matthew Lutter, Customer Solutions Specialist III; Kathy Grey, Customer Solutions Supervisor
DATE: August 25, 2017
SUBJECT: Results of recent Home Energy Score program for rental housing
OBJECTIVE: Information Only

Issue

This report provides an overview of the Home Energy Score program, to inform and to help make decisions about the program's future.

Background

People often move into a home without any idea how much the home costs to operate. If the home is poorly weatherized or has an inefficient heating system, they may be in for a big surprise. In the case of rental properties, in addition to utility cost surprises, there are issues of empowerment and inequity because renters pay for energy efficiency in their rates, but often cannot receive energy efficiency services or benefits since they do not own the home.

It is estimated that between 48-50% of all housing units in Eugene are rental units. The 2010 EWEB Conservation Potential Assessment listed approximately 6,800 electrically-heated rental units in EWEB's service territory that had no record of participating in energy conservation programs. This number was recently verified by a consulting groupⁱ. It is assumed that the majority of rental households are considered limited incomeⁱⁱ. Getting rental property owners to take action to upgrade this remaining housing stock has proven challenging. Energy efficiency incentives offered since 2010, as well as focus groups and targeted direct mail campaigns in 2013-2015 have encouraged many property owners to participate in EWEB programs, but several thousand rental units remain untouched.

To help address these issues, EWEB partnered with the University of Oregon (UO) and the City of Eugene to deliver a Home Energy Score (HES) program, where UO students were trained to assess the energy efficiency of a rental home. The program was developed to (1) encourage landlords to make energy efficiency upgrades to their rental properties, (2) recognize energy efficiency upgrades already made by landlords, (3) help renters understand their energy consumption, (4) help renters shop for affordable housing, and (5) provide a valuable learning experience for UO students.

A Home Energy Score is similar to a vehicle's miles-per-gallon rating. It allows you to compare the energy performance of a home to other homes nationwide on a scale of 1 to 10. Home Energy Score is known as an asset rating because it only considers a home's fixed attributes (e.g. structure, heating, cooling, and hot water systems) and applies standard assumptions about occupant behavior, making the score independent of actual energy consumption. In order to generate a Home Energy Score, a qualified Home Energy Assessor collects approximately 40 data points during an in-home walk-through assessment of a site-built homeⁱⁱⁱ. Data is

entered into a web-based software tool maintained by the U.S. Department of Energy. An energy “scorecard” is then generated by partners such as EWEB, as shown below in Figure 1.

Energy labelling for homes is a growing movement in real estate^{iv}. For example, Portland will be requiring a Home Energy Score for every home sold, starting in 2018. EWEB’s experience with energy labeling in recent years^v has been valuable in delivering Home Energy Scores in 2017 and growing the energy labeling movement locally.

Discussion

See report below.

TBL Assessment

The Home Energy Score provides home energy cost transparency that can help customers plan and manage their bills. The Home Energy Score is also a way to measure the carbon footprint of a home, which is a high-priority action in the *City of Eugene’s Climate and Energy Action Plan*. The program encourages energy efficiency investments in rental properties, which creates local jobs, healthier homes and reduced energy burden for some customers. For homes that use fossil fuels, low-carbon heat pumps are encouraged over fossil fuels, which reduces greenhouse gas emissions. Reducing energy burden keeps families in homes which benefits the community overall. Program delivery costs to EWEB were relatively low.

Overall, the use of Home Energy Scores specifically for rental stock appears consistent with EWEB’s overall strategic direction towards improving affordability and reducing the energy burden for limited income customers.

Requested Board Action

Informational only

2017 Home Energy Score Report

Program Development

An agreement was made between the University of Oregon (UO) and EWEB prior to the launch of the program^{vi}. A separate agreement was made between UO and the City of Eugene where the City would provide funding for student assessor wages. A promotional campaign was initiated in September 2017 that involved EWEB, UO, and US DOE^{vii}. A promotional flyer was developed with a paper application on the back side (see Figures 2 & 3). An online application with a custom header was developed and posted on a webpage on eweb.org. A tool was developed to create a “scorecard” that met Oregon’s Home Energy Performance Score standard^{viii}. Support materials were prepared to help the student assessors, including a data sheet for use in the field, and informational references for use at EWEB. Business cards and T-shirts were designed and printed. The program launched January 5, 2017, with an initial email to a list of ~7000 potentially-eligible tenants and rental owners^{ix}. In the following months, a second email was sent to those on that list who had not yet responded. There was also outreach to rental owners at two Rental Owners Association meetings, and some outreach at campus events. Rental owners were also encouraged to apply if they were considering energy efficiency upgrades with EWEB. Tenants who contacted EWEB about high bill concerns were also encouraged to apply.

Student Assessor Preparation

Students who had completed UO architecture courses (Energy Control Systems and/or Building Construction) were invited to explore a job opportunity during an overview meeting at EWEB held November 7 & 8, 2016. The overview discussed the job duties and background, as well as the significant amount of unpaid homework that was required before the job begins. Job benefits included a certification recognized by the Construction Contractors Board (CCB) at no cost and some good paid work experience. The homework involved taking an online building science class and passing a test, then taking an online video-game-style simulation training and passing a second test. Eight interested students were able to quickly pass the two tests (and negotiate end-of-term stress) and get hired by UO on December 5, 2016. Students then were screened by EWEB so they could have access to EWEB facilities as volunteer EWEB interns. All students were certified with the CCB and finished with their in-the-field mentorships by January 17, 2017. Students continued with on-the-job learning until they finished in June.

Program Work Flow

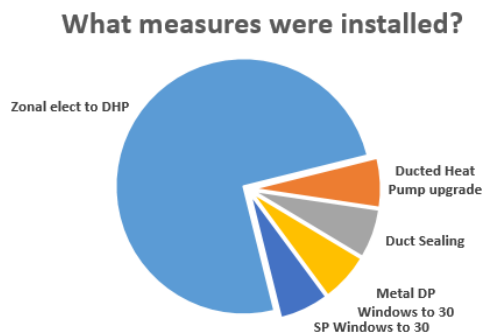
The Home Energy Score process began when a customer completed an application for the Home Energy Score program, either online or by submitting a paper application to EWEB. Application data was pulled into a cloud-based Google spreadsheet shared with EWEB and UO staff. Applicants were contacted by UO. Assessments were scheduled according to the applicant’s preferred days of the week. Every home required a site visit. In general, two student assessors were scheduled to perform each site visit for safety and support reasons. Student assessors first would go to EWEB to research their assigned homes using EWEB and RLID records^x, which typically provided most of the home energy information that was needed. Student assessors would then visit the homes within the assigned windows of time and complete the assessments, generally within an hour or so. After the in-home assessments, assessors returned to EWEB and entered the data into a cloud-based software tool developed by the US Department of Energy called the Home Energy Score Tool. Data was reviewed for quality by EWEB. Corrections were made as needed by either the assessor or EWEB. Finally, EWEB generated a report and provided it to the tenant and/or the rental property owner, either by email or mail. See example report in Figure 4. The report included a description of any recommended energy upgrades. For property owners, a reference was also provided that summarized current incentives that may help with the costs of upgrades. See Figure 5 for the reference. Later in the program (after May 15, 2017), in response to tenant questions about their consumption, tenants also received with their report some information on their actual consumption to provide some context to the estimated consumption. An example of the email

is shown in Figure 6. The last assessment was completed and the last report was delivered to customers on June 30, 2017.

Program Results

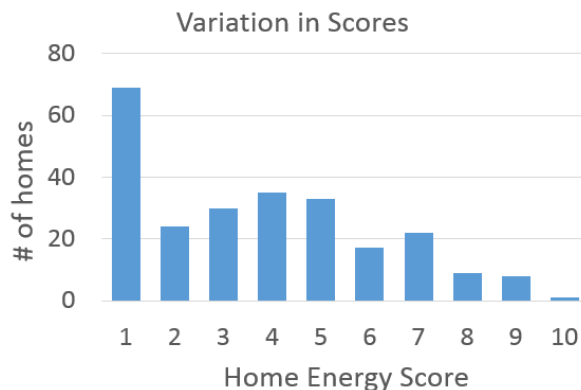
Applications were received from 328 customers. The percentage of applications that came from tenants (75%) was similar to the percentage of tenants who were invited to participate (79%). The program resulted in 248 homes being scored. UO student assessors completed 217 of those homes. Some of the homes did not get properly screened as rental properties, resulting in 229 rentals being scored.

An important metric by which to measure program success is the number of rental owners who took action toward the recommended upgrades. As of 7/18/17, there were 7 rental property owners that applied for an energy efficiency project after receiving a Home Energy Score. There were an additional 14 rental property owners that had already applied for an energy efficiency project, but only completed their projects after receiving a Home Energy Score. The measures that were installed most often were ductless heat pumps. There will likely be additional projects started and completed with EWEB as a result of the Home Energy Score program, based on responses in the post-participation survey and improved awareness about EWEB’s programs. It is hard to assign credit for these projects to the Home Energy Score program, but using the above numbers, about 9% of the rental owners seem to have been influenced to take action by the Home Energy Score. Rental owners have invested about \$73,000 in the community, getting back \$10,000 in rebates from EWEB, and saving 23,000 kWh per year. This is encouraging.



The Home Energy Scores for these homes spread across the entire 1 to 10 range. The median score was a 4. The most common Home Energy Score was a 1. This is in part a reflection of the rental property building stock, which does not tend to be very energy efficient.

However, this is also a reflection of the scoring methodology that in a way penalizes homes with electric resistance heat compared to gas heat^{xi}. Most homes had electric resistance heat (58% had zonal electric heat and 4% had electric forced air furnaces), and those homes tended to score a 1. Homes with heat pumps (23%) or gas furnaces (11%) tended to score a 3 or higher. However, other variables besides the heating system made significant impacts to the score, including home size, insulation levels, and window area. The larger the home, the lower it tended to score. Most of these rental properties were relatively small, with the median home size being 1125 square feet. Homes that scored 7 and above were generally smaller weatherized homes without electric resistance heat.



Customers who participated in the program were generally satisfied and pleased with the services. For tenants who responded to a post-participation survey, 89% either agreed or strongly agreed that the in-home assessment and report “helped me determine the efficiency of my rental”, “helped me better understand my energy consumption”, and “helped me determine if my energy bills are normal”. 100% of tenants either agreed or strongly agreed that “when moving into a future rental, it would be helpful to have the information provided in a Home Energy Score report to help make a more informed decision”. Only 33% of tenants discussed the assessment and/or report with their landlord, largely because they didn’t think it would matter. Other tenant comments included “they may upgrade and increase my rent”, “a great experience and

thoughtful program long overdue”, and “the young ladies who came out to do the report were very professional”, and “happy with the results and format in which the information came to me”, and “now I understand why the heat and AC bills are so high – they have no insulation in this place!”. There was one tenant who responded “I would have wanted the suggestions be geared to something I could do.” In addition to the survey results, several emails were received by tenants with appreciation or follow up questions. One email said “This is great – thank you! I don’t know if the home owner will do any of it, but it is great that they will know about it. I can totally see why our heat bill is so high. I wish these were provided when renters were looking at a property! And I would certainly want one if considering buying a house.”

Rental owners also found the service valuable according to the post-participation survey, but their responses were more varied. 80% of rental owners agreed or strongly agreed that the assessment and report “helped me determine the efficiency of my rental”. 60% of rental owners agreed that “it helped me better understand the energy consumption in my rental”, and 50% agreed that “it helped me determine the best ways to make my rental more energy efficient”. Only 3 out of 10 responses agreed that “publishing the information provided in a Home Energy Score report may be helpful for me to attract tenants”, while 5 responses were neutral and 2 either disagreed or strongly disagreed about publishing. Out of 10 responses, only one was likely to make the recommended improvements in the next year, and the others were not going to because of timing, cost, and the rental market. 70% of rental owners said that the Home Energy Score program increased their awareness of EWEB’s other energy efficiency programs. Comments from rental owners were varied, including: “very nice service, it was worth doing!”, “their inspection was very superficial”, “helped me realize the value of some of the previous changes that I’d made the year before (...insulation, ductless system...)”, “I did not get an infrared report on thermal leakage, which would help”, “we were already fully aware of many of the recommendations in your report”, “we are concerned about how the inspectors communicated with our tenant and how our tenant views your recommendations. Does our tenant now think they live in a sub-standard unit?”, and “the two women who came to my house to do the site analysis were professional, knowledgeable, and friendly.”

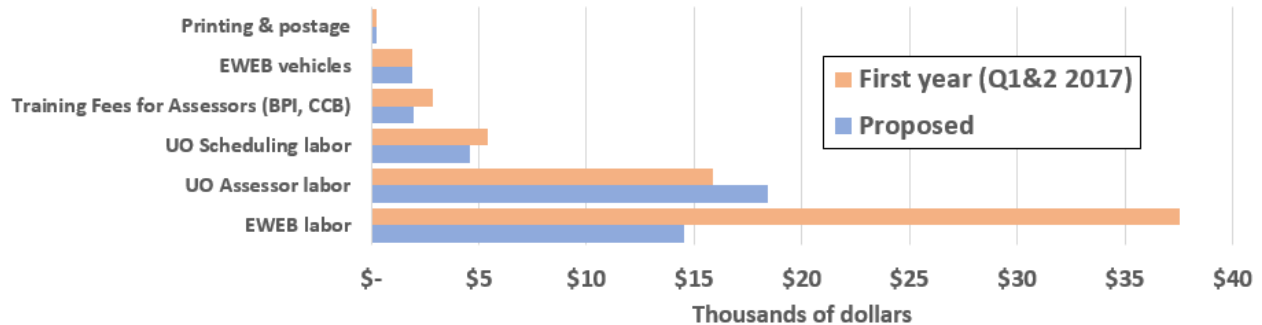
The student assessors were also generally satisfied with their experience as home energy assessors. Four out of the 5 students who responded to the exit survey said they would be interested in participating again, with one student responding “maybe”. Three students did not respond to the survey. The survey revealed that the training took a long time. For the simulation training, all 5 students took over 8 hours, and two of them took over 16 hours. Several comments on the training mentioned the poor timing, “because it fell during finals week”. Comments also emphasized the value of experience in the field and from experienced employees over the online training. Their favorite parts of the job included “seeing different home construction types and heating systems. I feel like this is very important as someone going into Architecture”, and “I liked being able to get a more hands on, realistic interaction with residential architecture”, and “seeing the inside of everyone’s homes and how they lived”. The worst parts of the job were “all of the mistakes while learning in the field”, “when a house was exceptionally dirty or the residents were unwelcoming”, “seeing what conditions some people were stuck in because of the owner’s lack of care for a living facility”.

The approximate cost for the program was estimated to be about \$63,000. The City of Eugene provided \$10,000 toward student labor costs. The contribution from UO was about \$11,000 and EWEB provided the remaining \$42,000. A summary is shown below. The bulk of the costs were for labor, which included overhead. Assumptions for EWEB labor costs were about 16 hours per week for program management and delivery, plus an initial investment of ~220 hours for program development. Also shown below are program costs after some proposed changes are implemented. Proposed labor costs would go down significantly for

EWEB but up slightly for UO. Further discussion about how to improve program costs in the future can be found in the following section. Additional assumptions about costs can be found later in Figure 7.

Approximate Home Energy Score Program Costs

Total ~\$63K at \$258/home
(proposed 2nd year: \$42K at \$168/home)

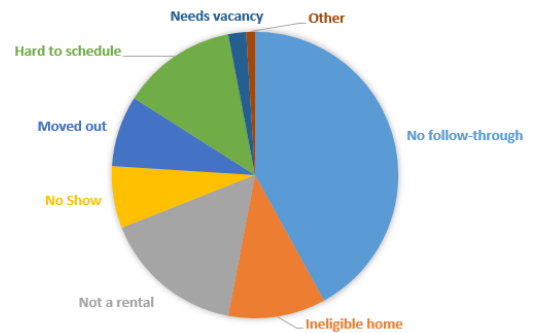


Opportunities for Improvement

There were many aspects of the program that could be improved upon in the future.

One aspect of the program needing improvement was the large number of applications that did not lead to a completed Home Energy Score. There were 100 applications where a Home Energy Score did not get completed. According to an informal tally, the biggest reason for non-completion was lack of follow through on the part of tenants, but other reasons included ineligible homes, or the tenant moving out. One idea to improve in this area is to respond to the applications more promptly, before customers lose interest or move out. For example, a large number of customers applied in January in response to the first outreach email, but many were not contacted for a month or more after they applied. This was simply due to the large volume of applicants that needed to be contacted. A better approach would have been to send outreach emails to smaller groups (such as 500 instead of 7000 all at once), which would minimize any backlog.

REASONS FOR NON-COMPLETIONS



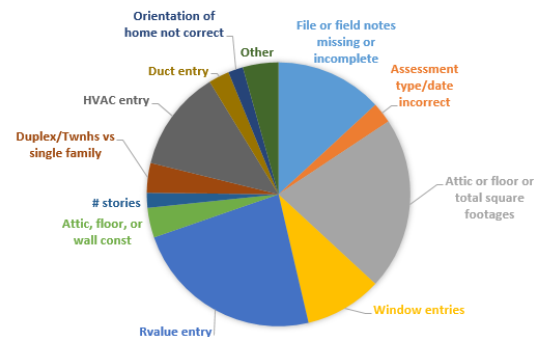
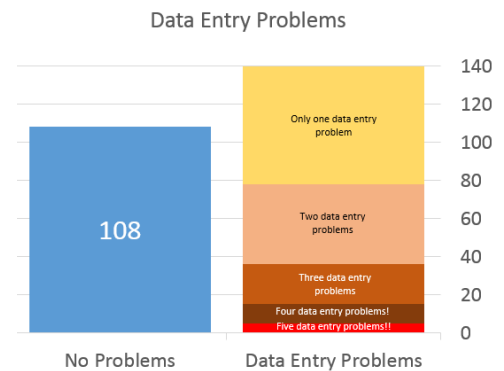
To avoid non-completions due to home ineligibility and to avoid mistakenly assessing ineligible homes, the description about what homes are eligible should be improved in the application and program descriptions. Based on a few conversations with customers, one source of confusion was that some people apparently did not know the meaning of the word “tenant”. This led to incorrect answers to the question: “Please indicate your relationship with the property. (Reminder: You may not be able to apply for a Home Energy Score if you are not the property owner or tenant.)”. Customers also explained that since they received an email invitation to participate in the program, they assumed they were eligible even if they applied for their owner-occupied home. Before future email outreach, it may be worth taking additional time to better screen potentially eligible customers to avoid applications for ineligible homes.

The process for scheduling the home energy assessments was also a problem, but fortunately it was improved soon after the program was launched. Assessments were initially scheduled for a specific time with the customer. However, that created problems if a prior appointment finished early or late. The process was changed after a few weeks so that assessments were scheduled to occur within a several hour window of time. This allowed some flexibility for the student assessors to show up a little early or a little late, depending on the time taken during their prior assessments. Other potential improvements to the scheduling process might

be to confirm the home eligibility before scheduling the assessment to avoid scheduling ineligible homes, and to try different ways to confirm appointments to avoid no-shows.

The post-participation surveys could be improved upon in the future as well. One question (“Would you like us to send the report again?”) required knowledge of the survey respondent, such as the home address or email address, but that information was not collected in the survey. Another question for tenants was set incorrectly so that it ended the survey after they only answered the first question. It was fixed, but not until 20 tenants had completed the abbreviated survey. Also, since most property owners did not have email addresses in our records, they received a paper mailing that directed them to the online survey. The process to mail surveys to about 100 rental owners was time consuming. To avoid outsourcing and multiple bids, this was done internally by EWEB. Next time this could be done faster by EWEB using more automated tools.

Ensuring that student assessors correctly entered the home energy data was a significant ongoing challenge during the program. For each completed Home Energy Score, a variety of data entry problems were tracked, as seen in the charts on the right. To improve data quality, a peer review process could be implemented. The process might involve one student assessor reviewing the data entries for their peers and generating the scorecard using the same tools used by EWEB. This process can be implemented and tracked relatively easily within EWEB’s database. Another task that could be moved to the assessor could be the generation of an Alternative Energy Efficiency Measure for those homes with non-electric heating or water heating. This involves re-scoring those homes with the recommended heat pump and any other measures. A final task that could be moved to the assessor is comparing the actual electricity consumption with the estimated consumption and drafting the letters to send to customers. EWEB would then do a final review before the reports and letters are sent to the customers. Shifting these tasks will require additional student training time, and it would take student time away from more assessments, but it would result in less time spent by EWEB and a lower cost program, as well as a more in-depth understanding by the student assessors of the process and energy consumption. In addition to implementing a peer review process, data quality could be improved with more mentored field work where new assessors go along with experienced assessors on their first several homes. Also, scheduling students so they overlap with EWEB staff during the week, instead of only working on the weekends, could lead to more training opportunities.



Fortunately, the number of problems went down over time because the assessors learned how to do things right. Some assessors had more attention to detail than others. Some assessors also chose to do more of the data entry than others. A summary of the assessor completions and quality is below.



Outreach will need to be done differently in the future. The list of potentially-eligible customers was used heavily. It should not be expected that future email blasts using the same list of emails would result in many new applicants. Future outreach could be done at low cost using the City's neighborhood association publications. Also, identification of potentially-eligible rental properties could be simpler and more reliable if the City's list of rental properties were used.

The Home Energy Score is also a good tool to measure a home's carbon footprint. It could be marketed to rental owners looking to promote the low carbon footprint of their rentals. It could be eventually offered to owner-occupied homes, to help measure progress toward the City's climate goals, while promoting EWEB's low-carbon electricity.

Another improvement that could be made to the program is to implement a publication option for sharing the information found in the Home Energy Score report. There has already been some exploration regarding publication. One option is an online tool called Rent Rocket which is being piloted in a few cities across the country. It provides a way to search for rentals based on a number of criteria, including energy scores and energy costs, and allows users to browse rentals on a map. Another publishing option is to use Earth Advantage's Green Building Registry tool, which is a tool that being developed for the Portland Home Energy Score market. This will allow the public to search the database for Green Home Info and then open a home's energy scorecard. The Regional Multiple Listing Service (RMLS) would also have a link to the scorecard. This tool will be available for demonstration in September 2017. The costs for Portland organizations will be \$25 per home, which includes scorecard generation and quality assurance services, plus a varied initial set up cost. EWEB is interested only in the public-facing search functionality if possible. These options will be analyzed in coming months.

Extending this service to multifamily housing is being explored as another future improvement. This would involve using a different modeling tool and a different process for multifamily housing, but a number of unknowns still remain.

A final improvement to the program in the future is to expand the scope of the data collection to also include some water efficiency information such as gallons per flush for toilets and number of water leaks. This would involve additional training for the students and additional time per home, but it would address a common concern with rentals and provide another customer service while the student assessors are in the home.

Conclusions

The Home Energy Score program was able to meet its goals. Over 240 homes were scored. The program helped tenants and rental owners better understand the energy consumption in their rentals. It encouraged some rental owners to make energy upgrades. It provided a valuable learning experience for UO students. Initial steps were taken toward publishing rental energy information to help renters shop for affordable housing. The program appeared to be good for EWEB customers and good for the utility. It helped underserved customers who may be struggling to afford their bills, strengthening relationships with those customers and with local community partners, at a reasonable cost. The City of Eugene and UO have offered their continued support for the program but only if EWEB is willing. EWEB should consider continuing the program for the upcoming 2017-2018 school year.



Home Energy Score

Address: 1234 Main Street, Eugene, OR, 97405
 Year built: 1952
 Home size: 1080 square feet
 Assessment date: 2015-05-18
 Assessor entity: EWEB

Your home's current score **2**

Score with improvements **9**
 Estimated annual savings **\$641**



The U.S. Department of Energy's **Home Energy Score** assesses the energy efficiency of a home based on its structure and heating, cooling, and hot water systems.
 Learn more at homeenergyscore.gov

OFFICIAL ASSESSMENT
 ID#80696

Estimated Energy Use

Energy costs for this home: **\$148** /month After improvements: \$94 /month

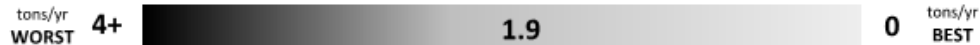
Fuel Type	Annual Energy Use	Annual On-site Renewable Generation	Annual Net Costs	Energy Provider
Electric	9,679 kWh	Solar electric; 1,000 kWh	\$1,054	EWEB: \$0.093/kWh, \$20.5/mo
Gas	667 therms	none	\$720	NW Natural: \$0.935/therm, \$8/mo

Carbon Footprint

Your home's carbon footprint: **3.80** Tons of CO2 equivalent emissions per year

Your home's carbon footprint **3.80**

Footprint with improvements **1.62**



Oregon's climate goal

Fuel Type	Annual emissions by fuel type	Carbon intensity by fuel type
Electric	0.17 metric tons of CO2 equivalent	EWEB: 0.00002 mtCO2e/kWh
Gas	3.63 metric tons of CO2 equivalent	NW Natural: 0.0054 mtCO2e/therm

This report meets Oregon's Home Energy Performance Score standard.

Figure 1: An example of the Home Energy Score single-page "scorecard" report that meets Oregon requirements.

Receive a FREE home energy assessment to find out:

How energy efficient is your rental home?

Have energy upgrades made the home more affordable to live in?

Are the bills normal?



The Eugene Water & Electric Board, University of Oregon and the City of Eugene are working together to help tenants and rental owners better understand the energy consumption in their rental properties and possibly help lower monthly utility bills. If you live in or own a single-family or a townhome rental, you are eligible for a free Home Energy Score.

The Home Energy Score is similar to a vehicle's miles-per-gallon rating. The score, developed and administered by the U.S. Department of Energy, allows you to compare the energy performance of your home to other homes nationwide. The process starts with a Qualified Assessor collecting energy information about your home during a brief home walk-through. Assessments take about one hour and can be scheduled Thursday through Sunday. In addition to scoring your home, we will provide you with your average monthly energy costs along with a list of recommended energy improvements and their estimated cost savings.



If you are a tenant or rental property owner and are interested in a free Home Energy Score, apply online at <http://bit.ly/heseweb>, or deliver an application to EWEB at 500 East 4th Ave, Eugene, OR 97401, or mail it to PO Box 10148, Eugene, OR 97440. You can find an application on the other side of this flyer.

541-685-7000

eweb.org/saveenergy/rental

rentals@eweb.org



Home Energy Score Program 2017



Figure 2: Flyer developed for program outreach.



Home Energy Score

Step 1: Please provide us with some information so we can process your application for a free Home Energy Score.

Name _____

Property Address _____

Mailing Address _____

Primary phone number _____ Is this a cell phone? Yes No

Secondary phone number _____ Is this a cell phone? Yes No

Email _____ (EWEB will not solicit or share your email with any third party)

What times of the week are best for scheduling a home energy assessment? Please check all that apply.

Thurs AM Thurs PM Fri AM Fri PM Sat AM Sat PM Sun AM Sun PM

Step 2: Please select your relationship with the above property.

I am a tenant and an EWEB account-holder at the above property address.

I am the owner of the above property, and I am currently renting it. See below for my scheduling preference.

Please contact me for scheduling the home energy assessment using my information above.

The tenant has been notified and has agreed to be contacted in order to schedule the assessment. Please contact the tenant directly: Tenant name _____ tenant phone number _____

Other: _____ (Offer may not apply if you are not the property owner or tenant)

Step 3: Please tell us how you heard about the Home Energy Score program.

- | | | |
|--|---------------------------------------|--|
| <input type="checkbox"/> Ad – online | <input type="checkbox"/> EWEB website | <input type="checkbox"/> News story |
| <input type="checkbox"/> Ad – print | <input type="checkbox"/> Referral | <input type="checkbox"/> Social Media (Facebook, Twitter, YouTube) |
| <input type="checkbox"/> Email or mail from EWEB | <input type="checkbox"/> Event | <input type="checkbox"/> Other: _____ |

Terms and Conditions

PROPERTY ELIGIBILITY: The property must have EWEB electric service. The home must be single-family, or townhouse-style where only walls are shared. Manufactured homes and multi-family homes where housing units with unique addresses stacked one on top of another are not currently eligible.

PARTICIPANT ELIGIBILITY: The participant must either be a current EWEB account holder and tenant at the above property, or be an owner of the above property and operating it as a rental property.

ELIGIBILITY PERIOD: This offer applies through June 2017.

DISCLAIMER/NO LIABILITY: The participant assumes the risk of any loss or damage in connection with the assessment.

ACCESS AND EVALUATION: The participant agrees to provide reasonable access to the property for the sole purpose of generating a Home Energy Score. The Assessor will need to easily access attics, under floor crawlspaces, and heating and water heating systems. At least one participant needs to be present during the assessment, but the whole household is welcome. EWEB may make reasonable use of any information in its possession concerning the home energy assessment. Such use may include, but is not limited to, general energy usage for the purpose of evaluation and reporting.

HOME ENERGY SCORE: Per OAR 330-063-0030, EWEB must report home energy assessment data to the Oregon Department of Energy by city and zip code only, without the street address.

SHARING: Property owners give authorization for EWEB to publically share the Home Energy Score Report (in full or in part). Such use may include, but is not limited to, sharing with the local Multiple Listing Service and displaying Home Energy Score information by address on EWEB's website. The owner can opt out of voluntary automatic sharing at any time. Personal identifiers on this application including name, phone, or email will not be shared with third parties.

By signing this application I agree to the following:

- I give EWEB and its representatives express permission to contact me using the information I have provided on this application.
- I certify that if I provided a cellular phone number above as my contact number that I am an owner of the cellular device and the cellular service contract.
- I have read and understand the details of the terms and conditions on this form.

Participant's Signature _____ Date: _____

(This signature is required; an Authorized Representative with appropriate title will also be accepted.)



Home Energy Score Program 2017



Figure 3: Back side of the promotional flyer, which serves as a paper application.

Better Buildings **EWEB** **Home Energy Score**

Address: [redacted] Street, Eugene, OR, 97405
 Year built: 1948
 Home size: 1306 square feet
 Assessment date: 2017-06-16
 Assessor entity: University of Oregon

Score with improvements: **7**
 Estimated annual savings: **\$477**

Your home's current score: **2**

Uses more energy: 1 2 3 4 5 6 7 8 9 10 Uses less energy

The U.S. Department of Energy's Home Energy Score assesses the energy efficiency of a home based on its structure and heating, cooling, and hot water systems. Learn more at homeenergyscore.gov

Estimated Energy Use

Energy costs for this home: **\$155** /month After improvements: \$115 /month

Fuel Type	Annual Energy Use	Annual On-site Renewable Generation	Annual Net Costs	Energy Provider
Electric	1,628 kWh	none	\$1,143	EWEB \$0.169/kWh, E30 Solar
Gas	663 therms	none	\$716	NR Natural \$0.105/therm, E30 Solar

Carbon Footprint

Your home's carbon footprint: **3.81** Tons of CO₂ equivalent emissions per year

Your home's carbon footprint: **3.81** Tons of CO₂ equivalent emissions per year

Worst 4+ 1.9 0 Best

Fuel Type	Annual emissions by fuel type	Carbon intensity by fuel type
Electric	0.19 metric tons of CO ₂ equivalent	EWEB: 0.0002 mCO ₂ /kWh
Gas	3.61 metric tons of CO ₂ equivalent	NR Natural: 0.002 mCO ₂ /therm

This report meets Oregon's Home Energy Performance Score standard.

Better Buildings **EWEB** **Home Energy Score**

About Home Energy Score

The Home Energy Score is a national rating system developed by the U.S. Department of Energy. It is similar to a vehicle's miles-per-gallon rating. The Score reflects the energy efficiency of a home based on the home's structure, and heating, cooling and hot water systems. Energy usage is estimated by a software tool in units of British Thermal Units (BTU), converted to source energy (in MBTU), and assigned a Score between 1 and 10. On the scale, a Score of 2 corresponds to the average home energy use for the location, a 1 is a home that needs significant energy improvements, and a 10 is a highly energy-efficient home. A large home will have a worse (lower) Score than a small home, given similar home characteristics. EWEB is a partner with the U.S. Department of Energy. EWEB administers the delivery of the Score on a local level so that it also complies with Oregon's Home Energy Performance Score standard, as defined by House Bill 2801.

About the estimated energy use

Energy costs and usage are estimated based on the home's observed structure and heating, cooling and hot water systems on the date assessed, and uses assumptions about lighting and plug-in devices based on the size of the home. Studies from the U.S. Department of Energy show that actual energy use is within 25% of estimated energy use, 65% of the time. Actual energy costs and usage may vary and will be based on many factors such as occupant behavior and weather.

About the carbon footprint

The net carbon footprint of this home is measured in metric tons of carbon dioxide equivalent emissions per year (mCO₂e/y). One ton = 2,000 miles driven by one 21 mpg car. Emissions estimates are based on the electricity and other fuels used in the home, any on-site renewable generation, and the carbon intensity of those fuels according to the Oregon Department of Energy. Note: the carbon intensity of electricity in Oregon tends to be low due to widespread hydropower generation. Oregon's climate goals are to bring statewide emissions down to 75% below 1990 levels by 2050, which is roughly equivalent to bringing household emissions down to 1.9 tons/y. The carbon footprint as displayed does not consider carbon emissions related to household transportation, waste, food, water, and purchases of products and services, although the emissions related to these activities are significant. To learn more, see the Oregon Carbon Calculator at <http://www.deq.state.or.us/caprgp/energy/sustainability/carboncalculator.htm>.

About the recommended improvements

Recommendations show how to improve the energy efficiency of the home to achieve a higher score and save money. Recommended improvements are shown below. Improvements are selected for cost-effectiveness and generally have a payback period of 10 years or less, before utility rebates and/or tax credits.

EWEB may be able to help with the cost of improvements

EWEB offers rebates or 0% interest loans to help EWEB customers with the cost of many home energy efficiency improvements. State and federal tax credits may also be available. For further details, see thisweek.org/energy/finance.

Recommended improvements for your home

- (1) Ducted heat pump and duct sealing - Install a system through EWEB's program
- (2) Heat pump water heater - Install through EWEB's program

After the above improvements are made, it is estimated that the household would save \$477 annually. Actual savings will vary and will be based on many factors such as occupant behavior and weather.

Better Buildings **Home Energy Score**

Eugene OR 97405 **SCORE TODAY 2**

Home Facts

The Home Energy Score's Home Facts includes details about the home's current structure, systems, and estimated energy use. For more information about how the score is calculated, visit our website at HomeEnergyScore.gov.

About This Home

ASSESSMENT
 Official Type: Official
 Assessor name: DR-EWEB-0007
 Scoring tool version: v0217

HOME CONSTRUCTION
 Year built: 1948
 Number of bedrooms: 3
 Stories above ground level: 1
 Interior floor to ceiling height: 9' 9"
 Conditioned floor area: 1,306 ft²
 Direction faced by front of house: West
 Air sealed? No

Estimated Annual Energy Use

ENERGY USE TYPE
 Total: 160 MBtus
 Score basis: 108 MBtus
 Electricity: 9.63 kWh
 Natural gas: 663 therms

COST BASIS
 Electricity: \$0.091 /kWh
 Natural gas: \$1.004 /therm
 Energy cost per square foot: \$1.27 /ft²

DEFINITIONS & CONVERSIONS
 MBtu: Million British Thermal Units; generic energy unit
 kWh: Thousand British Thermal Units; generic energy unit
 kWh: Kilowatt hour; electricity unit
 Tera: 100,000 Btu; heat energy unit
 Electricity conversion: 1 MBTU = 293 kWh
 Heat conversion: 1 MBTU = 10 therms

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Roof / Attic

ROOF / ATTIC 1
 Attic floor area: 442 ft²
 Roof construction: Standard / Composition Shingles or Metal / R-0
 Roof color: Medium
 Attic / ceiling type: Unconditioned attic
 Attic floor insulation: R-19

ROOF / ATTIC 2
 Attic floor area: 864 ft²
 Roof construction: Standard / Composition Shingles or Metal / R-0
 Roof color: Medium
 Attic / ceiling type: Unconditioned attic
 Attic floor insulation: R-30

Foundation

FOUNDATION / FLOOR 1
 Floor area: 1,306 ft²
 Foundation type: Vented crawlspace / R-19
 Foundation walls insulation: R-0

Walls

WALL CONSTRUCTION	TYPE / EXTERIOR FINISH	INSULATION VALUE
All	Wood frame / Wood siding	R-11

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Windows & Skylights

WINDOW AREA

Front	Back	Left	Right
50 ft ²	66 ft ²	21 ft ²	30 ft ²

WINDOW CONSTRUCTION

PANES	FRAME	GLAZING
Front: Double	Wood or vinyl	Clear
Back: Single	Wood or vinyl	Clear
Left: Double	Wood or vinyl	Clear
Right: Double	Wood or vinyl	Clear

SKYLIGHTS ROOF / ATTIC 1
 Present? Yes
 Area: 14 ft²
 Type: Single Aluminum Clear

SKYLIGHTS ROOF / ATTIC 2
 Present? No

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Systems

HVAC SYSTEM 1
 Percent conditioned area served: 100%
 Heating type: Central gas furnace
 Heating installation year: 2013

DUCT SYSTEM 1
 Insulated? Yes
 Sealed? No
 Percent of ducts in this location: 100%
 Vented crawlspace: No

HEAT WATER
 System type: Electric storage
 Efficiency value: 0.87 EF

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Figure 4: Example of a 6-page Home Energy Score report provided to participants.

EWEB 2017 Residential Customer Solutions Programs – Rebates and Loans					
Program	Rebates Available	Program Requirements	Loans Available (Zero percent interest)	Loan Limit per Customer	Loan Term
Ducted Heat Pump	\$1,000 in lieu of loan	EWEB customers eligible for loan OR rebate. Air-source heat pumps only. Learn more at bit.ly/EWEBductedhp	Up to \$12,000 for site-built homes	\$20,000	Up to 60 months
			Up to \$7,000 for manufactured homes		
Ductless Heat Pump (DHP)	\$650 in lieu of loan	EWEB customers eligible for loan OR rebate. Learn more at bit.ly/EWEBdhp	Up to \$4,000, plus \$1500 per add'l head installed	\$20,000	48 – 60 months
Insulation	\$0.40/Sq. ft. of insulation, up to 50% of job cost in lieu of loan	Home must have electric heat and be poorly insulated. EWEB customers eligible for loan OR rebate. Learn more at bit.ly/EWEBwindowsinsul	\$4,000	\$20,000	48 – 60 months
Windows	\$4.00/Sq. ft. of glass with U-factor ≤ 0.22* in lieu of loan	Home must have electric heat and have single pane wood windows, single pane metal windows, or double pane metal windows. EWEB customers eligible for loan OR rebate. Learn more at bit.ly/EWEBwindowsinsul	\$4,000 for U-factor ≤ 0.25*	\$20,000	48 – 60 months
			\$6,000 for U-factor ≤ 0.22*		
Heat Pump Water Heater	\$300 for Tier 2 units	Install a qualified heat pump water heater and submit the required documentation. Learn more at bit.ly/EWEBhpwh	\$1,500 (only available for conversions from an existing gas system to a heat pump system)	\$20,000	48 months, or \$25 payment minimum
	\$400 for Tier 3 units				
Solar Electric Net Metering	\$0.40/AC output watt up to \$2,500	Must be an EWEB electric customer. Site must have at least an 85% total solar resource fraction to receive rebate. Learn more at bit.ly/EWEBsolar	N/A	N/A	N/A
New Construction	\$800 + \$ for upgrades + FREE verification	EWEB offers incentives and free expert services to help you design and build new efficient homes. Learn more at bit.ly/EWEBnewconst	N/A	N/A	N/A
	\$1500 for ENERGY STAR				

* See program information sheet on website for details on window performance requirements.

- All programs require that the homeowner submit an application. For Customer Solutions programs, apply online at <https://secure.eweb.org/ProgramApp.aspx>
- Program restrictions may apply. Rebate and loan amounts are subject to change at any time, please contact EWEB at 541-685-7000 for the most current program information.
- Loan funding may be used to cover costs of labor from participating contractors. See lists of contractors online at bit.ly/EWEBcontractor
- Information about all of EWEB's rebate and loan offerings can be found at www.eweb.org/residential-customers/rebates-loans-and-conservation

EWEB Rebate and Loan Doc June 2017

EWEB 2017 Residential Customer Solutions Programs – Rebates and Loans					
Program	Rebates Available	Program Requirements	Loans Available (Zero percent interest)	Loan Limit per Customer	Loan Term
EWEB Greenpower	N/A	Sign up to support clean, sustainable energy and encourage renewable energy projects in the local community. You can assign 100% of your electricity use to Greenpower with an extra one cent per kilowatt-hour, or you can choose blocks of Greenpower for as little as \$1.50 per month. Learn more at bit.ly/EWEBgp	N/A	N/A	N/A
Sprinkler Timers	\$25 per home	Timer must be on list of eligible products. Learn more at bit.ly/EWEBwater	N/A	N/A	N/A
Toilets	\$35 bill credit for the first toilet and \$15 for each additional toilet	Toilet must be labeled WaterSense and must replace an existing toilet using more than 1.28 gallons per flush. Learn more at bit.ly/EWEBwater	N/A	N/A	N/A
Hand Valve	Free valve (or \$75 bill credit) and \$75 bill credit for installation	Shut-off valve to be installed on customer side of water meter by a plumber. Valves may be provided by plumber or EWEB. Learn more at bit.ly/EWEBwater	N/A	N/A	N/A
Service Line Replacement	N/A	Replacement of a leaking water service line between the meter and the house only. Must be done by a qualifying plumber. Learn more at bit.ly/EWEBwaterloan	\$5,000	\$20,000	48 months

State Tax Credits (www.oregon.gov/energy/At-Home/Pages/RET.C.aspx)					
Ductless Heat Pump: \$1,200-1,300		Heat Pump Water Heater: \$300-\$600		Solar Electric PV: \$1.30/W(DC), up to \$6,000	
Ducted Heat Pump: \$800-1,125		Duct Sealing: \$250		Solar Water Heating: \$2/kWh savings, up to \$6,000	
Also, for rentals only: Insulation: \$0.37-0.55 per sq ft Duct Insulation: \$1.50 per foot Windows: \$1.63-7.92 per sq ft Plus more, search "Small Premium Projects"					

Federal Tax Credits (www.energystar.gov/about/federal_tax_credits)	
Solar Electric & Water Heating: 30% of cost (no upper limit, for owner-occupied only)	Other residential tax credits are currently expired

EWEB Rebate and Loan Doc June 2017

Figure 5: Reference for property owners that describes EWEB incentives and Oregon tax credits that help with the cost of energy upgrades.

Dear David,

Please find the attached Home Energy Score for your home, based on the recent home energy assessment performed by Jenefer & Emily. I am mailing this report to the property owner as well, with recommendations for a ductless heat pump and a heat pump water heater, which would make the home more comfortable and affordable to live in. I also provided information to the owner about EWEB's programs and Oregon's tax credits, which would both help bring down the cost for the owner.

I looked up your actual bills as well, and over the last 12 months your average electric bills were \$151 per month. This is slightly higher than the \$145 as estimated in the attached report, but that may be related to the colder-than-usual winter we just had.

Thank you for your participation. If you have any questions please let me know.

Have a good day,

Matt Lutter

Customer Solutions Specialist

Eugene Water & Electric Board (EWEB)

(541) 685-7545

matt.lutter@eweb.org

www.eweb.org

Figure 6: Example email to a tenant with their actual consumption to provide context.

Assumptions for cost estimates		Resources, Department	Personnel involved	Comments	
Cost Assumptions	EWEB staff cost (\$/hr):	\$70	EMS	Matt	Includes overhead of 58%
	Cost for EWEB vehicle use (\$/hr):	\$20	EMS	Matt	per Kathy
	Cost for EWEB vehicle use (\$/mi):	\$0.54	EMS	Matt	per Kathy
	T-shirts & business cards costs:	\$317.65	PA	Cindee	Per invoices from Cindee
	Printing & mailing costs per home, for report & surveys:	\$2	EMS	Matt & Admin	Matt's estimate
	Fraction of homes that need paper mail (no email):	50%			Matt's estimate
	Student intern wage (\$/hr):	\$19	UO/CoE	Kim/Steve	\$12/hr with 58% overhead
	UO Scheduler wage (\$/hr):	\$44	UO/CoE	Kim/Steve	\$27.7/hr prevailing wage, with 58% overhead
	Cost for training (low-cost BPI BSP):	\$99	EMS/UO		Per BPI
	Hours of training time for assessors:	16	EMS/UO		12-16 hrs (SIM), 4-8hrs (BPI)
	Percent of returning assessors:	50%			Survey results: ~half might return
	Initial cost for CCB certificate:	\$100	EMS/UO		
Annual cost for CCB certificate:	\$100	EMS/UO			
Time Estimations	Time for assessment, hrs per home:	0.75	EMS/UO	Matt/UO students	Matt's estimate
	Time for data entry, hrs per home:	0.25	EMS/UO	Matt/UO students	Matt's estimate
	Time for assessment travel, hrs per home:	0.6	EMS/UO	Matt/UO students	Matt's estimate
	Total time required per assessment:	1.6	EMS/UO	Matt/UO students	Calculated
	Miles driven per assessment:	13			Matt's estimate
	Frequency of QA visits, one out of how many?	20	EMS	Matt	USDOE requirement
	Time for QA site visit, hrs per QA home:	1.6	EMS	Matt	Matt's estimate
	Time for preparing & delivering each training session:	8	EMS	Matt	Matt's estimate
	Time for mentoring, hrs per assessor:	3.2	EMS	Matt	Matt's estimate
	EWEB time spent on applicant intake, hrs per home:	0.05	EMS	Matt	Matt's estimate
	Time spent on scheduling assessment, hrs per home:	0.5	UO	Kim	Matt & Kim's estimate
	Time spent on data review, hrs per home:	0.94	EMS	Matt	Matt's estimate
	Time spent on report delivery, hrs per home:	0.20	EMS	Matt	Matt's estimate
	Time spent on surveying participants, hrs per home:	0.20	EMS	Matt & Kristen	Matt's estimate, including paper mailings
	Total UO time, hrs per home:	2.10	UO		Calculated
	Total EWEB time, hrs per home:	1.47	EMS		Calculated
	Total time, hrs per home:	3.57	Various	Various	Calculated
	Percent improvement, future years compared to first yr:	15%			Less time spent on data review, scheduling
	Time spent on scheduling assessment, hrs per home:	0.425	UO	Kim	Matt & Kim's estimate
	Proposed UO time spent on data review, hrs per home:	0.80	UO	Kim/UO students	Proposed
	Proposed EWEB time spent on data review, hrs per home:	0.14	EMS	Matt	Proposed
	Proposed UO time spent on report delivery, hrs per home:	0.15	UO	Kim/UO students	Proposed
	Proposed EWEB time spent on report delivery, hrs per home:	0.05	EMS	Matt	Proposed
	Proposed time spent on surveying participants, hrs per home:	0.10	EMS	Matt & Kristen	Proposed
	Proposed Total UO time, hrs per home:	2.98	UO		Calculated
	Proposed Total EWEB time, hrs per home:	0.42	EMS		Calculated
	Proposed Total time, hrs per home:	3.40	Various	Various	Calculated
	Program development	Time to develop an application process:	6	EMS/CMR	Matt & Kristen
Time to create program in Energy Insight:		1	EMS	Matt	
Time to create measure in Energy Insight:		1	EMS	Matt	
Time to create approval letter:		2	EMS	Matt	
Time to develop a feedback survey for tenants:		8	EMS/UO	Matt/Kathy/Steve/Kristen	A few meetings
Time to develop a feedback survey for landlords:		8	EMS/UO	Matt/Kathy/Steve/Kristen	A few meetings
Time to create outreach plan, branding, logos:		12	EMS/CMR/USDOE	Matt/Cindee	A few meetings
Time to create target property owner group for mailing/emailing:		6	EMS/CMR	Matt/Kristen	
Time to query for rental properties that already have Score:		6	EMS	Matt & Jess	
Time to query for rental properties w/EWEB upgrades since '06:		4	EMS/S	Matt & Jess	
Time to create contract for non-EWEB assessors:		20	EMS/CMR/Risk	Matt/Kathy/Steve/Sarah	A conservative estimate
Time for survey review, post-program evaluation:		10	EMS	Matt	A conservative estimate
Percent improvement in program development time, over first yr:	70%			Matt's estimate, mostly re-using prior program	

Figure 7: Assumptions made to help calculate the costs for the program.

ⁱ Recent work by the Oregon Consulting Group confirmed these numbers, and even suggests in 2017 there are now more rentals in need of weatherization than in 2010. For further discussion on rental support initiatives, see EWEB board memo: http://www.eweb.org/Documents/board-meetings/2014/01-07-14/Corr_EMSLimitedIncome.pdf

ⁱⁱ The 2015 Eugene-Springfield Consolidated Plan says there are over 43,800 rental housing units in Eugene-Springfield, and 38,390 of those rental households are considered low-income. See here: <http://www.eugene-or.gov/DocumentCenter/View/25200>

ⁱⁱⁱ Manufactured homes and multi-family housing units are housing types that are currently not able to be modeled using the Home Energy Score Tool, due to limitations within the software. Townhouse-style homes qualified where units share only walls. Housing units that are stacked one over another did not qualify.

^{iv} Home Energy Score is being recognized nationally by financing institutions such as Fannie Mae (<https://www.fanniemae.com/singlefamily/homestyle-energy>) and FHA (<http://betterbuildingssolutioncenter.energy.gov/beat-blog/doe%E2%80%99s-home-energy-score-and-fha-mortgages-new-tools-help-you-shop-and-buy-energy-efficient>). Portland has approved a Home Energy Score ordinance, which will

go into effect Jan 1, 2018 (<https://www.portlandoregon.gov/bps/71421>). Also, a Chicago study shows that homes that disclose their energy costs sell faster and for more money than those that do not disclose energy costs (http://www.elevateenergy.org/wp/wp-content/uploads/ECD_Analysis_YEAR21.pdf).

^v EWEB has been a Home Energy Score partner with the U.S. Department of Energy since 2012. For initial delivery in 2012, EWEB opted for a small HES pilot, due to higher certification costs and limited staff availability. After ~100 homes were scored, post-participation survey results revealed lukewarm interest in the Home Energy Scores. Participants found the site visit and face-to-face conversation and recommendations most valuable, but found the Home Energy Score less valuable, due to few comparison homes and a lack of utility-specific cost information. EWEB continued to be involved with Home Energy Score. EWEB provided support to the Oregon Department of Energy (ODOE) during the 2013 Administrative Rulemaking (see http://arcweb.sos.state.or.us/pages/rules/oars_300/oar_330/330_063.html) and currently sits on the ODOE stakeholder panel for Home Energy Performance Scores (see <http://www.oregon.gov/energy/At-Home/Pages/HEPS-Stakeholder-Panel.aspx>).

^{vi} The agreement was first drafted on 8/18/17 and finally executed on 11/21/17 with UO. It required approval first within EWEB, and involved many departments, including Human Resources, Fleet, Purchasing, Information Services, Enterprise Risk Management, and Communications, Marketing, & Research (CMR).

^{vii} Program outreach was initiated on September 9, 2017, and a plan was developed with the help of the EWEB CMR department.

^{viii} The EWEB tool that generates the single-page “scorecard” report that meets Oregon’s Home Energy Performance Score standard is a Microsoft Excel-based tool. It uses data exported from the US DOE’s Home Energy Score Tool. The Excel tool also does some data entry validation and quality screening. Both these tools have no cost for their use. The “scorecard” from the Excel tool then gets merged with the 6-page auto-generated report from the Home Energy Score Tool using a software called Bluebeam. This resulted in a 6-page or 7-page PDF report that was provided to customers.

^{ix} EWEB’s current customer information system does not have a reliable way to identify rental properties. For these purposes, a query was done to look for email addresses associated with properties that had an automatic hook-up agreement with EWEB. This is common for rental properties so that they can avoid gaps in service between frequent move-ins/move-outs. Some apartments and manufactured homes were filtered out since they are not eligible home types. The results were a list of 270 emails for rental owners who completed energy efficiency projects in the last couple of years, a list of 1315 emails for other rental owners, and a list of 5966 emails for tenants, for a total of 7551 emails.

^x EWEB records include historical energy audits and energy upgrade information. This information goes back to around 1980. EWEB has detailed information on the majority of homes in the territory, probably upwards of 80% of homes, including insulation levels, floorplan drawings, window sizes & types, and heating system and water heating system information. RLID is the Regional Lane Information Database that includes tax assessment records. The RLID database has some inaccuracies, but could generally be relied on for information such as the number of bedrooms, square footage, year built, number of stories, and ownership information. Often, RLID included an assessor sketch for the property as well.

^{xi} Homes with electric resistance heating score poorly compared to gas heated homes because the scoring bins are set up to use “source energy”. To determine the source energy, or how much energy is needed at the power source, the software uses a site-to-source conversion factor of 2.76 for electricity and 1.05 for natural gas. This converts the electric energy into a fossil fuel equivalency. For example, one ceiling heated home uses 67 MBTUs of site energy (19,000 kWh), and a similar home with gas heat uses more site energy at 88 MBTUs (654 therms + 6500 kWh). After converting to source energy, the electric home uses 210 MBTUs of source energy and the gas home uses 139 MBTUs of source energy. So the gas home scores a 5 and the electric home scores a 1. This is a reasonable methodology for much of the country which relies heavily on fossil fuels to generate electricity. However, in Eugene, where the electricity is generated largely without fossil fuels, this site-to-source conversion leads to scores that favor natural gas and penalize the low-carbon electric resistance heating we have. You can read more about this here: <https://energy.gov/sites/prod/files/2016/10/f33/Source%20Energy%20Report%20-%20Final%20-%202010.21.16.pdf>