Energy Performance Score (EPS): A Path Forward

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On January 23rd, 2012 Energy Trust convened a stakeholder group to discuss the development of an EPS for existing homes. At this meeting Energy Trust identified a number of issues associated with providing an EPS to existing homes and requested that key stakeholders comment on these issues. After receiving comments, Energy Trust agreed to develop a recommendation for moving forward.

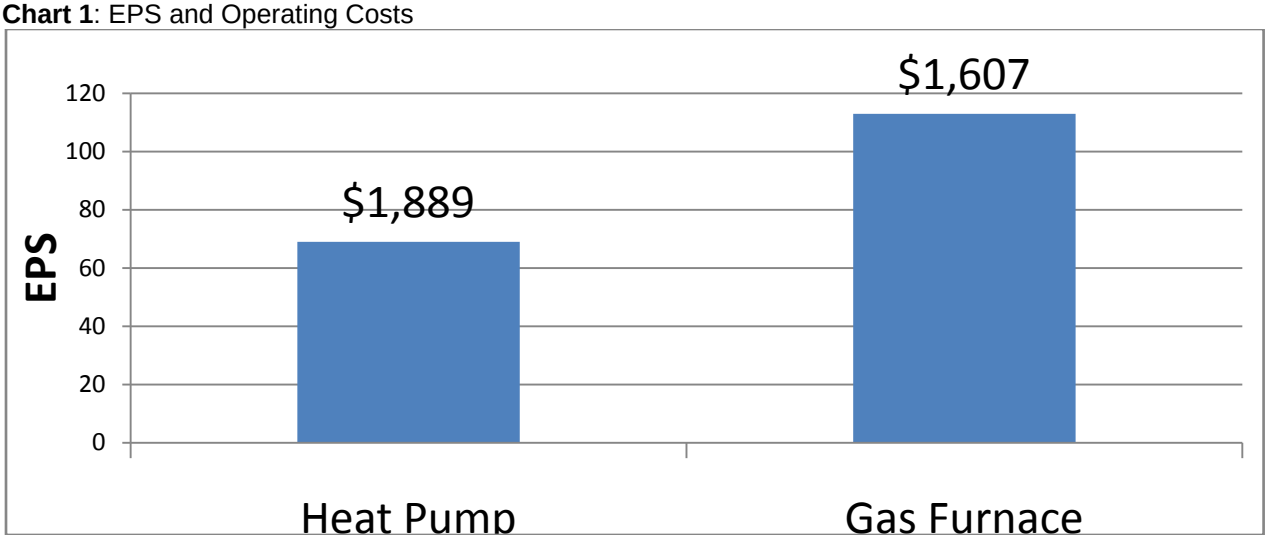
This paper summarizes the next steps in the development of an EPS for existing homes. Sections 1-3 describe a modification to the EPS metric itself in order to normalize for fuel source. Section 4 describes how an EPS could be phased into the existing homes market and Energy Trust's role relative to the EPS.

1) The Issue

There are two main issues arising from using a site based "pure" BTU metric. The first issue is that this metric potentially confuses the message that most resonates with customers thinking about energy-related home improvements: "save energy, save money". This is shown in *Chart 1* below where the EPS score and the home's operating costs move in different directions. The lower EPS score indicates that the heat pump is "more efficient" based on site energy. Yet the home's operating costs are lower with a gas furnace.

The second issue, which can also be seen in *Chart 1*, is that the "pure" BTU metric is not fuel neutral. Consequently, a lower score can be obtained by switching heating sources under an unadjusted BTU-based model.

Chart 1: EPS and Operating Costs



Current Metric – Pure BTUs
Historically an EPS has been calculated by modeling the home's site-based energy usage under average operating conditions and then converting the kWh and Therms (if applicable) to MM BTU's. The total MM BTU's represents the score. Table 1 shows the calculation for a typical gas furnace home and Table 2 shows the calculation for the same home with a heat pump instead of a gas furnace. The difference in scores for the two fuel scores is significant.

Equation (1):
Total kWh * (.003412) + Total therms * (.1) = EPS

Table 1: Gas Furnace Home

	Usage	MM BTU Mult.[1]	MM BTUs
SPHT (Therms)	464	0.1	46
DHW (Therms)	194	0.1	19
Other (kWh)	5,996	.003412	20
EPS Score			**86**

Table 2: Heat Pump Home

	Usage	MM BTU Mult.	MM BTUs
SPHT Electric	6,694	.003412	23
DHW Electric	3,380	.003412	12
Other Electric	6,074	.003412	20
EPS Score			**55**

Because of this bias Energy Trust staff recommends modifying the pure BTU score, creating an "adjusted" BTU metric. The following section describes a simple way to adjust the score in order to normalize for fuel source on average for typical heating systems.

2) Proposed Solution

The solution described below would address both of these issues while maintaining the original intent of the EPS – a miles-per-gallon type of rating enabling consumers to compare houses, and where zero is good. Under this system, smaller and newer homes would score better (lower). While a certain amount of immersion in the details is required to convey and consider the solution we are proposing, we want to underscore two points: it would be simple to implement with any of the modeling tools being considered for generating an EPS, and it would not change the way EPS is communicated to customers.

New Metric – Adjusted BTUs
In order to understand the cause of the difference in the scores created with the pure BTU metric, one has to understand the on-site efficiencies of the space- and water-heating equipment being assumed by the modeling software (shown in Table 3). For purposes of illustration, we established a rough estimate of equipment efficiencies representing the situations where competing systems are most likely to be compared—when a customer is considering purchase

[1] These are the standard kWh and Therm MM BTU conversion factors

of new space or water heating equipment. Water heating efficiencies were selected to consider the typical new electric tank water heater, and for a gas unit a blend of standard tank and tankless units.

Fuel weights, presented in Table 4 for illustration purposes, can be created for space and water heating using the ratio of the electric equipment efficiency to gas equipment efficiency. These weights can then be applied in the calculation of the EPS as an added adjustment to normalize scores for fuel source. The factor would be used on an electrically heated home to bring it in alignment with a gas home.

Table 3: Equip. Efficiency Assumptions

Assumptions	
Space Heating Efficiencies	
Heat Pump	200%
Gas Furnace	92%
Water Heating Efficiencies	
Electric	92%
Gas	65%

Table 4: Fuel Weights

Fuel Weights	
Space Heat	217%
Water Heat	141%

Equation (2):
SPHT kWh * (.003412) * 217% + DHW kWh * (.003412) * 141% + Other kWh * (.003412) = EPS

Table 5: Heat Pump Home w/ Fuel Weight

	Usage	BTU Mult.	Fuel Weight	MM BTUs
SPHT Electric	6694	3,412	217%	50
DHW electric	3380	3,412	141%	16
Other electric	6074	3,412		21
EPS Score				**86**

Table 5 shows that after the fuel weights have been applied the fuel bias has been removed from the score.

Moving forward with this “adjusted” BTU metric would require agreement on the average equipment efficiencies and acknowledgement that the scores would be equal on average for typical heating systems. Energy Trust could potentially hire an independent 3rd party to generate the fuel weights. For the third party to pick the estimated efficiencies the parties would need to agree on the situation it represents. Energy Trust is proposing that the weights represent a comparison between the new systems we see coming into our programs. Any modeling software that is used to generate an EPS in Energy Trust territory would have to apply the weights when generating a score for a home with electric space or water heating. In addition, these fuel weights would have to be periodically reviewed to ensure a reasonable level of accuracy.

3) Implementation and Energy Trust's Role

Energy Trust recognizes the demand in the market for a home energy rating system, but at the same time acknowledges there remains uncertainty as to the influence a score will have on the adoption of energy efficiency measures. We also recognize it will be new to the market and contractors may have limited experience with it or the technical ability to deploy it. For these reasons, Energy Trust is proposing a phased approach to introducing an EPS to the existing homes market. This phased approached is designed to quickly introduce an EPS into a segment of the existing homes market, while using minimal program resources, and providing a clear exit strategy for Energy Trust if the score does not gain market support.

Phase 1 involves an initial roll out of an EPS to Energy Trust customers[2] during a comprehensive audit delivered through the existing Trade Ally Network of Home Performance Contractors. This contractor group is uniquely qualified to provide an EPS because they have been highly trained in building science and whole home energy modeling. These contractors should be able to easily incorporate the delivery of an EPS into their audits. In addition, using an established network of contractors reduces the administrative costs to Energy Trust.

Providing an EPS would be optional and there would be a fee associated with each official EPS delivered. Phase 1 is expected to start in July and last approximately one year. It is expected that an EPS will be delivered to 500-1000 existing homes during Phase 1. Energy Trust proposes to take on the following responsibilities in Phase 1:

- Develop modeling requirements for CSG and Earth Advantage
- Develop Fuel Weights and vet them
- Allow use of co-op trade ally development funds to help offset training cost
- Facilitate quality control and quality assurance services
- Support modifications to existing market based EPS trainings to comply
- Facilitate stakeholder engagement group to plan for Phase 2
- Conduct process evaluation and customer feedback surveys

At the end of Phase 1 Energy Trust's role and resources will be evaluated. It is important to recognize that Phase 1 of the EPS roll out does not provide a comprehensive home energy rating system for homes for the entire state of Oregon. To accomplish this goal other market actors will need to play a significant role and dedicate the necessary resources. Phase 1 will introduce a rating system into the market while minimizing Energy Trust resources necessary for implementation. Phase 1 will lay the groundwork for further development extensions as demanded by the market or public policy.

Phase 2 will involve a range of stakeholders and will require positive evaluation findings in order to maintain significant Energy Trust support. Early in Phase 1 Energy Trust will solicit interest from stakeholders to participate in a working group which will plan for Phase 2. This working group will be convened by Energy Trust through Phase 1; however, it is possible that other stakeholders may be bettered suited to serve this role in Phase 2. It is expected that this later phase will address the expansion of the EPS delivery network beyond Home Performance

[2] Energy Trust is open to expanding in non Energy Trust territory in Oregon with utility support

contractors, the inclusion of additional software tools, use in other utility service territories and the roles that key stakeholders will play moving forward.

4) Phase 1 Implementation and Cost Details

Software Tools and Modeling Requirements

At this early stage in the development of home energy scoring systems Energy Trust feels that it is important to support multiple software tools in the market. A variety of modeling tools will allow the free market to decide which tool(s) best meet the needs of homeowners and policy makers and will make home energy scoring services available to a larger portion of the market. In Phase 1 Energy Trust will work with the CSG and EAI models. Both of these tools demonstrated the ability to consistently rank homes against a reference and will be able to quickly get into the market.

In order to provide an EPS in Energy Trust service territory CSG and EAI must meet the following requirements:

1) Engage in final review of the latest version of the software
2) Utilization of Fuel Weights and SEEM calibration factor
3) Provide Energy Trust with data for each EPS
4) Demonstrate ability to populate the new proposed EPS visual scorecard

For multiple modeling tools to be used in the same market it is important that the scores are consistent for each home regardless of the modeling tool used. Recognizing that no modeling tools are perfect, and not wanting to decide which one tool is “correct”, we propose another adjustment per each tool so that the final EPS score is as close as possible to the region’s reference tool, SEEM. To do this a specific Calibration Factor (CF) will be developed for each modeling tool. The calibration factor will calibrate the results for each tool to SEEM (the regional reference tool in the NW). For example, if one tool is on average 10% above SEEM, than the correction factor for that tool would be 90%. Unlike the fuel weights, which would just be applied to homes with electric space and water heating, the calibration factor would be applied to gas and electric homes. Equation 3 shows the final equation for calculating an EPS.

Equation (3):

$$(\text{SPHT kWh}*(.003412)*217\% + \text{DHW kWh}*(.003412)*141\% + \text{Other kWh}*(.003412))*CF_x = \text{EPS}$$

While Phase 1 will not be open to other modeling tools, the stakeholder group will address the best way to integrate additional modeling tools into Phase 2. Energy Trust does not expect to use ratepayer funds to vet and approve modeling software, but could potentially provide these services for a fee if stakeholders felt that was the best option. There are also conversations at a national level for other groups such as the Home Performance Council taking on this role nationally for Home Performance administrators and this could be an option. Another option would be to have a central platform that connects various modeling tools and runs the inputs through one central engine to calculate all EPS scores.

Contractor Recruitment and Training

As mentioned earlier, the first phase of an EPS for existing homes will be delivered exclusively through Energy Trust's existing network of Home Performance with ENERGY STAR contractors. Many of these contractors have been trained on how to use modeling software and should be able to easily incorporate the delivery on an EPS into their audits. A preliminary EPS can be made available to a homeowner at the time of an audit and a final EPS at the final test out. During Phase 1 the only way to get an EPS will be at the time of a Home Performance audit. In addition to being a Home Performance Trade Ally, contractors will be required to attend an additional EPS training. This 2-3 hour training will focus on how to deliver an EPS to a homeowner. Energy Trust will work with market actors to ensure the appropriate trainings are available and will support these trainings by allowing the use of trade ally development funds.

EPS Delivery

The contractor will be able to include a preliminary EPS as part of the test in process. The preliminary report will provide the homeowner with the current score and what the score would be if they followed the selected recommendations. Delivery of the final EPS will be made by Energy Trust to the homeowner after the project has been verified by program staff.

Costs

Energy Trust is proposing a cost structure that includes the market paying a portion of the costs of providing each EPS. By charging a small fee, Energy Trust will be able to provide the necessary oversight to ensure that each EPS is delivered to a high standard while minimizing the budgetary impact to the program. Ultimately, if the market values the score, it should be willing to pay a price for it. This will also level the playing field for new and existing scoring systems. It is expected that contractors would pay about $40-$60 for each final EPS delivered. Assuming that 500 -1000 final scores were delivered in Phase 1, revenue would be in the range of $20,000 to $60,000. These dollars could be used to cover the QA/QC, tracking, and delivery costs to the program for Phase 1. Evaluation costs of about $50,000 would be a direct cost to the program.

Evaluation Plan

The evaluation goals will be to:

1. Gain insight on how homeowners and contractors value the EPS
2. Obtain feedback on the marketing materials and messages
3. Determine if the EPS is having any impacts

Homeowners and contractors will be surveyed to gather data to inform the first two goals. Homeowner surveys will be designed to understand how homeowner's value and understand an EPS, as well as their perceptions of the marketing materials and contractor's marketing of an EPS. Contractor surveys will gain insights into challenges associated with implementing and marketing the EPS as well as the how the contractor values the EPS and overall impact on business. These contractor surveys will begin early in Phase 1 so that they inform any needed changes in the implementation or design of the EPS. Following the conclusion of Phase 1, Energy Trust will conduct an analysis of follow through rates for participating and non participating contractors. Analysis of Energy Trust participation data will help determine the impact of an EPS on homeowners' efficiency decisions. This analysis will seek to understand if the delivery of an EPS impacts program follow through rates and/or the size of the projects. The ability to drive additional projects or larger projects is how an EPS will drive savings, which are necessary for continued Energy Trust support.