How to Show Carbon on the EPS: A Decision Primer

Summary

Staff seeks input on which data source to use to calculate the carbon footprint of electricity for a home getting an Energy Performance Score (EPS). Should the score be based on the specific mix of resources and purchases for each, specific utility or should we use an average?

Background

The EPS is a performance metric for single family homes in the same way a miles-per-gallon rating is a performance metric for cars, consisting of modeled energy consumption and carbon emissions. Energy Trust of Oregon currently offers an EPS through its new construction program, and has scored over 800 homes since 2009. Energy Trust is currently piloting an expansion of the EPS into the existing homes market.

The EPS shows the expected average energy consumption for a home, based on the home's condition in terms of primary assets (e.g. insulation levels, efficiency of heating system, type of windows, condition of ducting and observed air leakage).

For a new home the EPS is compared to what a code-built home would score and to an average Oregon home[1]. For an existing home the EPS will show a home's energy consumption compared to two benchmarks: (1) the average home in Energy Trust service territory; (2) an average-sized home in Energy Trust territory. For the upcoming pilot the benchmarks were developed using only single family homes in the Portland and Salem metro areas that heat with NWN and have PGE or PAC as their electric utility[2].

The EPS also shows the carbon footprint associated with the rated energy consumption for the home and compares that footprint to the same two benchmark homes described above. To get a carbon footprint for a home, the expected gas use (if any) is multiplied by an accepted factor that measures pounds of CO2 per therm. The electric use is multiplied by a pound of CO2 per kWh factor. The two are combined for a total footprint shown in tons per year. If there is a renewable system installed, the consumption is reduced by the amount of power expected to be generated, and the carbon footprint drops accordingly. This methodology looks at the site energy (only what is used or produced on site) and does not add additional multipliers to convert to source energy, which would account for transmission and distribution losses and generating plant efficiencies.

The goal of including the carbon on the EPS is to respond to consumers' questions about the connection between their energy use and their carbon footprint. It also helps to reinforce the

[1] The average Oregon home EPS is based on the 300 homes that were modeled in the initial 2008/9 existing homes EPS Pilot.

[2] Care was taken to eliminate non-single family homes, homes smaller than 500 SQFT, or homes that had space heating loads less than 100 therm or greater than 4000 kWh.

energy score and thereby serve as illustration of how improvements to their house and choosing green power options can help meet the state's 2020 carbon goal.

The carbon impacts are not intended to be used for reporting carbon reductions to voluntary carbon registries. We do recognize that some customers will be comparing the information to other sources and it would be good to be consistent with similar reporting to ratepayers.

Issue

The question with providing a carbon score is what basis is most relevant for calculating the score. There are currently two sources of information, each with multiple levels of granularity:

1. Compiled by the EPA, the **Emissions and Generation Resource Integrated Database (eGRID)** is a comprehensive source of data on the environmental characteristics of almost all electric power generated in the United States. Emissions data is available at the national, regional, and state level.
2. Utilizing reports from utilities on power generation, sales and purchases, the **Oregon Department of Energy (ODOE)** collaborates with the Washington Department of Commerce and Washington State University (WSU) Energy Extension to produce a net system power mix report. This data is available at the state (OR and WA only), power pool (NWPP), and utility level.

Table 1 below illustrates the differences in generation mix and average lbs of CO2/MWh for various sources and regions across the Northwest. The maps at the end of this document define the borders of the regional data. The EPA eGRID data is current through 2007 (eGRID 2010 Version 1.0 became available Feb. 23rd, 2011); The ODOE data is current through 2009.

Table 1: lbs of CO2/MWh and generation mixes from various sources

		Average lbs CO2/MWh	Generation mix					
Region	Source		Coal	Nat. Gas	Bio	Hydro	Nuclear	Wind
WECC	eGRID	**1019**	30%	31%	1.2%	23%	9.6%	1.7%
Sub region NWPP	eGRID	**859**	32%	13%	1.1%	48%	3.0%	1.9%
Oregon (no imports)[3]	eGRID	**401**	7%	28%	1.8%	62%	0.0%	1.5%
PGE	ODOE	**953**	30%	21%	0.3%	36%	0.3%	4.3%
PAC	ODOE	**1,884**	65%	17%	1.4%	11%	0.0%	4.4%
Oregon mix	ODOE	**1,149**	42%	9.8%	2.8%	41.6%	3.2%	1.1%
BPA mix	ODOE	**122**	4.7%	1.6%	0.3%	82.5%	10.9%	0.0%

[3] This accounts for in-state generation only.

Discussion

Using utility-specific information would be consistent with how electric utilities report to customers in Oregon and Washington for other purposes. The states of Oregon and Washington require electric utilities to report to customers the "price, power source, and environmental impact" for each product the company offers. In Oregon *(*OAR 860-038-0300), the requirement specifically directs utilities to report data on power supplied from the company's generating resources, which includes company owned resources and wholesale purchases from specific generating units, as well as information on net market purchases.

Conversely, using regional average carbon data from eGRID would be consistent with the voluntary rules developed by the SB79 task force, stating that kWh carbon emissions "should" be calculated by aggregating eGRID sub-region NWPP data. The use of the NWPP average also provides a common value for the entire Northwest. Nationally, eGRID data is currently the adopted norm by the World Resources Institute in their GHG Protocol and other organizations reporting on carbon emissions. Many cities, counties and businesses who report into the national carbon registry voluntarily also use eGRID data.

While it might be easiest to remain consistent with how the data for utility customers is already reported, this creates some communication issues for an EPS and coordination issues for cities reporting to EPA. Utility specific numbers highlight the differences among utilities and would show the same house's energy usage trends under the same conditions would have wildly different carbon footprints between different utilities. Such variances could raise questions and might confuse the message if an EPS is to motivate and describe the benefits of efficiency and clean energy action.

The point of the carbon portion of the EPS is not to aid consumers in picking a home by the utility serving it, but rather to encourage energy-saving actions. In terms of calculation it is certainly easier to have one, per KWh value across all homes. However, utility specific values can be calculated and comparisons made to the average home (in terms of carbon) on a utility basis. In fact this is how the EPS has been administered for Energy Trust's New Homes Program.

The data from ODOE appears to have the most robust methodology for handling power sales and exchanges because it more directly accounts for all of the utility claims in OR and WA, while not being as reliant on monthly samples as the EPA is when creating the eGRID data. Because of this the ODOE methodology is more accurately able to account for peaker plants, whose capacity factors can vary wildly depending on how often they are used and under what conditions.

The eGRID data is closer to accurate for Oregon if the eGrid data is taken at the regional level. But the eGRID NWPP data deviates from what is considered the appropriate power pool for NW utilities, which is the western interconnected system (WECC). By taking a narrower approach eGRID, while closer, still underestimates the carbon footprint from electricity use. The maps at the end of this paper show the differences in regions and why calculations differ.

Table 2 below compares utility specific data and eGRID. Fair arguments support using either the utility specific information provided by ODOE, the state average from ODOE or the eGRID sub-region data.

Table 2: Summary of Utility Specific and eGRID data

	Utility Specific	**eGRID Sub region (NWPP)**
Source	From ODOE, WA Commerce, WSU. Received 2009 data	From eGRID database (U.S. EPA), 2007
Stakeholders who use this methodology	Oregon and Washington utilities use this info to report to customers the mix of energy as generated by the utility	OR SB 79 voluntary rules for energy labeling that were developed by ODOE recommend using eGRID NWPP. In addition the City of Portland, GHG registries, ICLEI, US DOT, and NGO carbon footprint tools all use eGRID data
Power pool	Utility Specific	WECC Northwest (NWPP) – Does not include the vast majority of California. See maps of power pools at end of paper.
Reliability	Consistent methodologies applied to utilities in OR and WA, regularly updated with up-to-date fuel mixes.	Consistent methodologies applied to all utilities, updated occasionally, published publically.
Protocols/ Methodology	ODOE, in conjunction with WA Commerce and WSU, follow protocols similar to those developed by the EPA in order to produce the eGRID data, but are better able to account for market purchases.	Nationally, eGRID data is currently the adopted norm by the World Resources Institute in their GHG Protocol and other organizations voluntarily reporting on carbon emissions. Many cities, counties and businesses who report into the national carbon registry voluntarily also use eGRID data.
Data	The reporting process that culminates in a net system mix report which ensures market purchases are appropriately accounted for.	Does not account for trading outside of NWPP. i.e. California, eastern Wyoming and Arizona
ETO Programs	New Homes program uses utility specific values.	Existing homes pilot is using eGRID temporarily. Software is still developing capability to use utility specific information for a larger launch
Homeowner Perspective	Will show differences between electric utilities. Could encourage purchase of green power, particularly in the coal-heavy utilities. Is consistent, and from the same source, as what is reported on utility bills for IOU's in Oregon.	Will be a uniform multiplier for all homes. Consumers don't shop for homes by utility territory. Carbon footprints will still be high compared to 2020 goals even if lower, average numbers are used rather than higher, actual numbers.

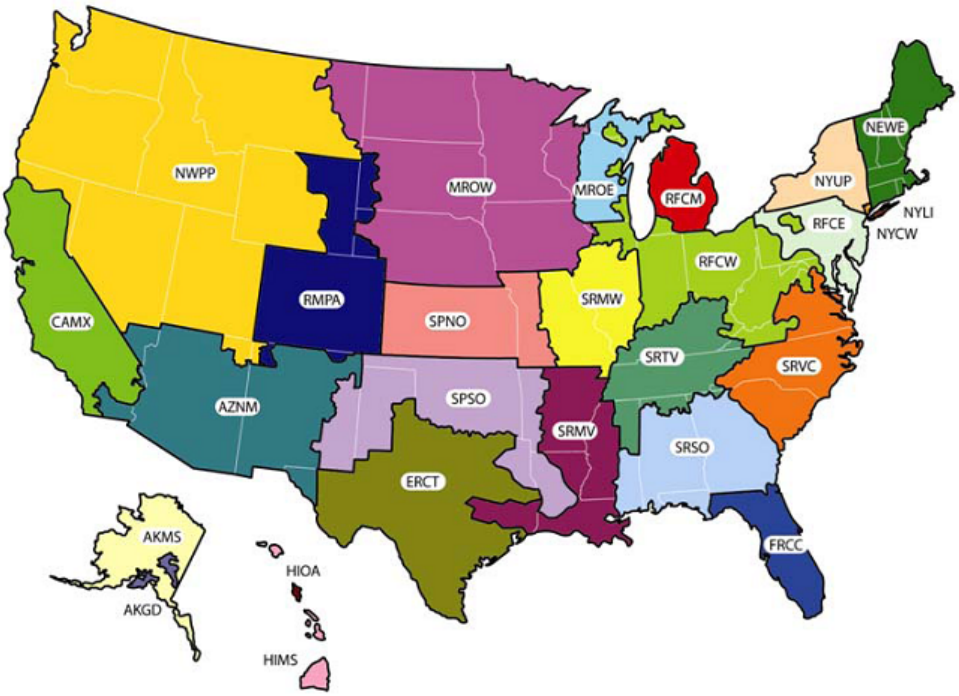
Recommendations

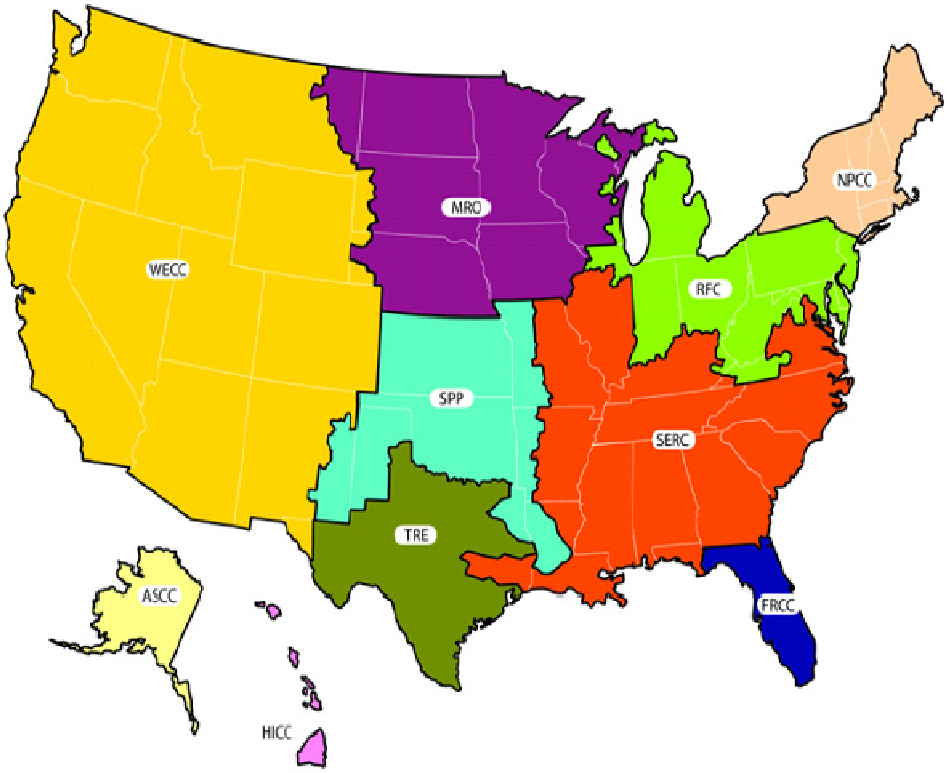
Staff proposes to use the data from ODOE, even though the task force recommendation coming out of SB79 was to use eGRID sub region NWPP data. The information provided by ODOE is readily available, up to date, is better able to account for market purchases, and consistent with other legislative and regulatory requirements. In addition this would be consistent with how carbon has been reported on the EPS for Energy Trust's New Homes program

We feel that a case can be made to go with the utility specific data. From a homeowner's perspective, consistency with reports on utility bills and green power products appears the key factor. While this may confuse an occasional homeowner comparing, we think very few will be comparing PGE to Pacific in selecting a home to purchase or a remodel to undertake.

Alternatively we could use ODOE's calculation of the Oregon average but this would not be consistent with the rest of the region or with a customer's utility bill.

Staff seeks input on these recommendations.


NWPP
MROW
MROE
RFCM
NEWE
NYUP
NYLI
NYCW
RFCE
RFCW
CAMX
RMPA
SPNO
SRMW
SRTV
SRVC
AZNM
SPSO
SRMV
SRSO
ERCT
FRCC
AKMS
HIOA
AKGD
HIMS


NPCC
MRO
WECC
RFC
SPP
SERC
TRE
ASCC
FRCC
HICC