HERS Ratings with Lighting, Appliances and PV

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Topics of Discussion

Policy issues
Technical issues
A pilot study
Next steps

Should the basis of the HERS score be locked and never allowed to change?

Changes that add value to the score should be allowed. For example, expanding the list of rated features could provide valuable information and encourage additional energy savings.

How valid is the view that only features covered by an energy code should be rated?

It does not matter whether a feature is covered by code or not. Any feature for which a cost-effective method exists to measure performance and for which we can collectively agree upon a reference level should be considered.

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✓Rate the home, not the occupants



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✓ Rate the home, not the occupants

It is important that features included in the rating persist in the home. If we expect HERS ratings to be used for the purposes of establishing the value of the home and securing mortgages, it is important that those features used in calculating the rating remain in the home and continue to function as intended.

Rationale for expanding list of rated features

Energy use associated with lighting and appliances represents a significant percentage of the total annual energy cost for a home, especially in newer energy-efficient construction (47%, 1997 RECS).



Rationale for expanding list of rated features



Source: Energy Information Administration, 1993 Residential EnergyConsumption Survey. Household Energy Consumption and Expenditures 1993, Table 3.1.

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Rationale for expanding list of rated features

Many utilities have programs that encourage and/or finance the installation of energyefficient lighting and appliances. Some of these programs use HERS as part of their program delivery process.

Should new rated features expand the denominator or should they be treated as bonus points?

Adding new rated features to the reference and design home energy use is consistent with the current methodology.

Current scoring method Based on comparison of design to reference

 $\begin{aligned} &\text{Score} = 100 - (\text{TnML/TRL}) * 20) \\ &\text{TnML} = \text{nMEUL}_{\text{htg}} + \text{nMEUL}_{\text{clg}} + \text{nMEUL}_{\text{dhw}} \\ &\text{TRL} = \text{REUL}_{\text{htg}} + \text{REUL}_{\text{clg}} + \text{REUL}_{\text{dhw}} \end{aligned}$

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Rating method with lighting and appliances

 $\begin{aligned} &\text{Score} = 100 - ((\text{TnML/TRL}) * 20) \\ &\text{TnML} = \text{nMEUL}_{\text{htg}} + \text{nMEUL}_{\text{clg}} + \text{nMEUL}_{\text{dhw}} + \text{EC}_{\text{rated, I&a}} \\ &\text{TRL} = \text{REUL}_{\text{htg}} + \text{REUL}_{\text{clg}} + \text{REUL}_{\text{dhw}} + \text{EC}_{\text{reference, I&a}} \end{aligned}$

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How should the PV contribution be credited in the rating method -- against the whole home or just the rated features?

PV system should be a rated feature in itself. Credit for the total annual production of the system should be given in the rating method.

How should the PV credits be counted with respect to non-electric fuel uses?

The method should not include energy costs because those change over time. PV should be handled in the same way as lighting and appliances. Convert to Btus.

Rating method with lighting and appliances and PV

 $\begin{aligned} &\text{Score} = 100 - (\text{TnML/TRL}) * 20) + \text{BP}_{I\&a} \\ &\text{TnML} = \text{nMEUL}_{htg} + \text{nMEUL}_{clg} + \text{nMEUL}_{dhw} + \text{EC}_{rated, I\&a} - \text{PV}_{rated, I\&a} \\ &\text{TRL} = \text{REUL}_{htg} + \text{REUL}_{clg} + \text{REUL}_{dhw} + \text{EC}_{reference, I\&a} \end{aligned}$

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What to include
 Permanent lighting
 Do not include table lamps
 Refrigerators
 Often left in home
 Dishwashers
 Permanently installed

Collectable data

Permanent lighting

Number of fixtures, fluorescent/incandescent

Kefrigerators

Make and model number

Z Dishwashers

Make and model number

«REM/Rate? software input data

- Zermanent lighting
 - Number of fixtures, fluorescent/incandescent

Refrigerators

- ∠ DOE EnergyGuide annual kWh
- Z Dishwashers
 - ∠ DOE EnergyGuide annual kWh

Reference home

- Lighting average values developed from literature research
 - ✓ Fluorescent fixtures
 - 37 W/lamp
 - 139 Wh/day/fixture
 - 12% of installed fixtures
 - ∠ Non-fluorescent fixtures
 - 62 W/lamp
 - 234 Wh/day/fixture
 - 88% of installed fixtures

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Reference home

- ∠ Refrigerators
 - ≤ 1150 kWh/year.
 - Value from National Home Energy Rating Technical Guidelines.
 - Appears consistent with published data regarding installed base.

Reference home

Z Dishwashers

MAECA minimum efficiency of 0.46 cycles/kWh

27% is appliance consumption, 73% is hot water

Hot water converted to gallons/day, HERS nominal value adjusted

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Pilot Study

Pilot study funded by the Joint Management Committee, a consortium of New England electric and gas utilities that sponsor the EPA Energy Star Homes Program.

Architectural Energy Corporation working in concert with Conservation Service Group.

Pilot Study

119 previously rated homes

- Single-family, multi-family units, multi-family buildings
- \leq Average rating score = 87.9

Surveyed Conditioned Floor Area New England Lighting and Appliance Pilot Study - *Preliminary Results*



Surveyed Lighting Fixtures New England Lighting and Appliance Pilot Study - *Preliminary Results*



Surveyed Lighting Power Density New England Lighting and Appliance Pilot Study - *Preliminary Results*



Surveyed Fluorescent Fixtures New England Lighting and Appliance Pilot Study - *Preliminary Results*



Surveyed Refrigerators
New England Lighting and Appliance Pilot Study - Preliminary Results



Surveyed Dishwashers New England Lighting and Appliance Pilot Study - Preliminary Results





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Rating Scores - Expanded Denominator

New England Lighting and Appliance Pilot Study - Preliminary Results



Rating Scores - Expanded Denominator

New England Lighting and Appliance Pilot Study - Preliminary Results



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PV System Output

New England Lighting and Appliance Pilot Study - Preliminary Results



Change in Rating Scores w/ PV Systems Installed New England Lighting and Appliance Pilot Study - Preliminary Results 1.4 1.2 Rating Score w/ PV - Rating Score w/o PV 9.0 8.0 8.0 8.0 0.84 Mean Standard Error 0.01 Median 0.80 0.13 Standard Deviation Minimum 0.5 Maximum 1.2 0.2 119 Count Confidence Level(95.0%) 0.02 0 0 20 40 60 80 100 120

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Next Steps

Initiate dialog within HERS industry Develop consensus Modify technical guidelines