Turn on the Lights and Let the Sun Shine In -

Incorporating Lighting, Appliances and Renewable Sources into the Rating Method

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Topics of Discussion

- Background
- History
- Process
- Guiding Principles
- Current L&A Proposal
- Impact on Rating Scores
- On-Site Power Generation
- Questions and Discussion

Background

- HERS Council Technical Guidelines
  - Heating, cooling, hot water
  - No data and limited support for lighting and appliances
- National Home Energy Rating Technical Guidelines
  - NASEO
  - September 1999 adoption

Background

- Mass. Lights and appliances study in 2001
- FSEC White Paper in January 2002
- RESNET Conference sessions on L&A in 2001 and 2002

Recent History

- NASEO gave up Guidelines to RESNET in summer 2002
- RESNET HERS Technical Standards Drafting Committee (Dave Roberts, AEC & Philip Fairey, FSEC)
  - **L&A Subcommittee**
    - Richard Faesy, VEIC
  - **Renewables Subcommittee**
    - Philip Fairey
  - **QA Subcommittee**
    - Barb Collins, ERH Alaska

Recent History con't

- EPA interest in L&A in homes
  - ENERGY STAR Lighting Housepacks
  - L&A in HERS
- DOE interest in Building America Program
  - Benchmarking (i.e. HERS)
  - Expanding to include L&A
- Home Energy Magazine article
  - "Lights, Appliances and Sunshine: A New HERS?"
  - Nov./Dec. 2002
  - by Adam Gifford, CSG
- RESNET solicited comments

RESNET Comments

Organization Type	**# of Comments**
State Energy Office	5
Hers Raters/Providers	6
Trade Group	2
Engineering/Consulting Firm	2
Builder	1
Total	**16**

Summer 2002

RESNET Comments

Supporters	Opponents	Non-Committal
10	4	2

- No consensus
- Concerns:
  - Changing scores could be problematic
  - Keep the HERS process simple
  - Focus on the major end-uses only
  - Only include code-covered items

Process

- October 9, 2002 - L&A Subcommittee Meeting at EEBA
- November 1 - HERS amendments submitted
- December-April, 2003 - RESNET Standards Committee reviews 60 submitted amendments
- Spring 2003 - Draft amendments posted
- Summer 2003 - Public comments due
- Late Summer - Amendments adopted
- by January 2004 - New HERS rating standards

L&A Subcommittee Members

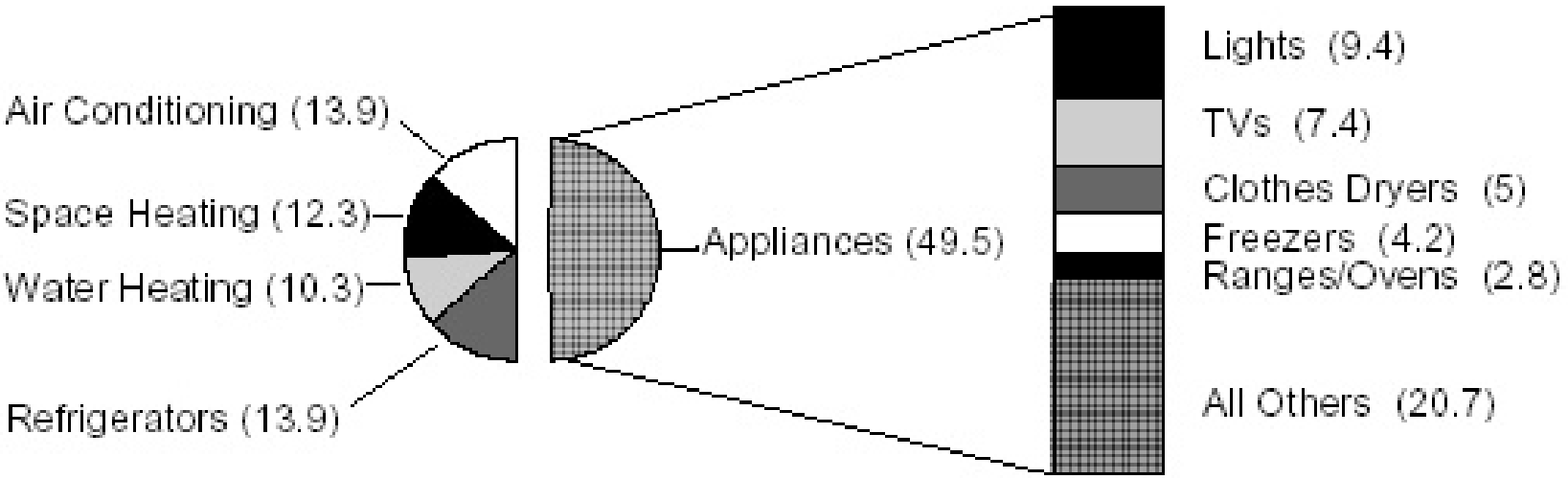
- Richard Faesy, VEIC/ERH-VT, Chair
- Ben Adams, MaGrann Assoc.
- Charles Segerstrom, PSE&G
- Danny Parker, FSEC
- Don Swift, MaGrann Assoc.
- Glenn Chinnery, EPA
- John Ashe, ICF Consulting
- Lee O'Neal, Nspects
- Megan Hoye, ICF Consulting
- Pat Haller, VEIC/ERH-VT
- Paul Vrabel, ICF Consulting
- Sue Bryant, Rater

Guiding Principles

1. The feature has to be one for which a reference level of efficiency can be defined.
2. A way must exist to cost-effectively measure the performance efficiency of the feature.
3. Rate the home, not the occupants (as much as possible)
4. Recognize and reward as much energy efficiency as possible
5. Provide a means to support programs and initiatives that promote efficiency and renewables
6. Remain as consistent as possible with current scoring methodologies

Rationale for More Rated Features

Electricity Consumption By End-Use



(About the same in 1997 RECS: 47%)

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

Current Proposal

- End-Uses to Include:
  - Heating
  - Cooling
  - Hot water
  - Refrigerator(s)
  - Dishwasher(s)
  - Ventilation fan(s)
  - Lighting
  - On-site power generation

Rating Score Presentation

- Two Scores
  - Classic HERS Score
  - Expanded HERS Score
- All ratings to include Classic Score
- Presentation of Expanded Score is optional, to be determined by:
  - Program sponsor (e.g. utility, EPA, etc.)
  - HERS provider
  - HERS rater (if not specified by either above)

Score Calculation

- Based on comparison of design to reference in both cases
- Classic: as-is currently

  Score = 100 - (TnML/TRL) * 20)

  $TnML = nMEUL_{htg} + nMEUL_{clg} + nMEUL_{dhw}$

  $TRL = REUL_{htg} + REUL_{clg} + REUL_{dhw}$

- Expanded:

  Score = 100 - ((TnML/TRL) * 20)

  $TnML = nMEUL_{htg} + nMEUL_{clg} + nMEUL_{dhw} + EC_{rated,\ l\&a}$

  $TRL = REUL_{htg} + REUL_{clg} + REUL_{dhw} + EC_{reference,\ l\&a}$

Which Lights Will Be Counted?

- All fixtures
  - Not just “high use” areas
  - 79% of lighting kWh (Heshong Mahone Group 1997)
- CFL screw-ins and fluorescent pin-based
  - not just “hard wired” fixtures
  - Could be controversial with EPA, other fixture programs
- Count bulbs
  - # of fluorescent & # of incandescent
  - not fixtures or sq. ft. of floor area lit

Outstanding Issue

79% of lighting load (all fixtures) vs. 100% (including all portables).

Options:

1. 100% option:
   - builder signs affidavit that all portables will have fluorescent CFLs or be ENERGY STAR
   - Encourages best practices
2. Only count portables in place when the rater is in the home inspecting.
3. Only count hard-wired fixtures, not portables.

Appliances - Refrigerator

- 951 kWh/Year in reference home
- Gain or loose points depending on kWh rating of rated home refrigerator

Appliances - Dishwasher

If present:

Bedrooms	Reference Home KWh / Year	Rated Home Cycles / Year
1	90	154
2	126	214
3,4	145	247
5+	203	345

Appliances - Mechanical Ventilation

- If present, reference consumption of .45 watt / cfm
- Exhaust rate based on ASHRAE 62.2P:

$$Q_{fan}=0.01A_{floor}+7.5(N_{br}+1)$$

where:

Q_{fan} = fan flow rate in cubic feet per minute (cfm).

A_{floor} = floor area in square feet.

N_{br} = number of bedrooms; not to be less than 1.

- 62.2P requires operation for each hour

Mechanical Ventilation in Reference Home

Bedrooms	Sq. Ft.	CFM	Annual KWh
2	1,500	37.5	148
3	2,000	50	197
4	3,000	67.5	266
5	4,000	85	335

Appliances - General

- Adjust for internal gains
- Account for increased ventilation loads on heating and cooling energy

Score Impacts

- So, how does all of this affect rating scores?
- Dave Roberts sensitivity analysis