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Expanded Rating Score: Background

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2006- Next Generation of HERS

- New Reference Home = 2004 IECC
 - Performance method
- Expanded Rating Score
 - Lights, Appliances, On-site generation
- “Score” to “Index”
 - HERS upside-down cake

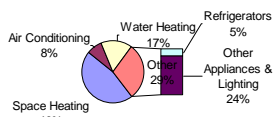
Three *separate* changes that have
separate effects on the results!

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Rationale for Adding Rated Features


Total Energy Consumption in U.S. Households, 2001
Residential Energy Consumption Survey (Tbl. CE1-1c.)



Feature	Percentage
Space Heating	46%
Appliances & Lighting	24%
Water Heating	17%
Air Conditioning	8%
Other	2%
Refrigerators	5%

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Expanded HERS Score

- HERS “Expanded” score based on
 - Heating, cooling, hot water (as always)
 - **Plus:** Lighting and (some) appliances
 - On-site power generation
- A little history...

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Background

- HERS Council Technical Guidelines
 - No data, limited support for lighting & appliances
- National Home Energy Rating Technical Guidelines
 - NASEO, September 1999
- Mass. Lights and Appliances Study in 2001
- FSEC White Paper in January 2002
- RESNET Conference sessions on L&A in 2001, 2002, 2003 & 2004
- Pilot tested expanded score, side-by-side with classic score in Massachusetts in 2004

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RESNET History on L&A


- RESNET solicited comments in 2002
- October 9, 2002 - L&A Subcommittee Meeting at EEBA
- November 2002 - HERS amendments submitted
- Weekly in 2003 - RESNET Standards Drafting Committee reviewed 60+ submitted amendments, including lighting & appliances
- February 2004 - Draft amendments posted
- Spring 2004 - 75 day public comment period
- April – November 2004 - Standards Drafting Committee reviewed all comments and made adjustments
- Approved by RESNET Board in November 2004 and Standards Revisions Committee in December 2004
- November 2005 - RESNET Board approves additional amendments
- July 2006 - New HERS rating technical standards go into effect

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- ADMIN-2005-01 - Effective Date of Chapter Three, RESNET Standards
- TECH-2005-01 - Discontinue Use of the "Classic HERS Score"
- TECH-2005-02 - Modify the Expanded Score to Account for Total Home Energy Use
- **TECH-2005-03 - Amend the List of Minimum Rated Features to Include the Expanded Score Items**
- TECH-2005-04 - Update the "a" and "b" Coefficient Values
- TECH-2005-05 - Update the ANSI Standard Referred to in Measuring Floor Dimensions to ANSI Z765-2003
- **TECH-2005-06 - Update mechanical ventilation specifications**
- **TECH-2005-07 - Ceiling Fan Ratings**
- TECH-2005-08 - Specifications for Vented Crawlspace in the Reference and Rated Homes
- **TECH-2005-09 - Modify the HERS Score Calculation and Change its Nomenclature from "HERS Score" to "HERS Index"**
- QA-2005-01 - Quality Assurance of Raters That Complete a Small Volume of Ratings

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Expanded Rating Score

- Adds allowance for standard consumption to reference home
 - Efficient lighting (10% of qualifying locations)
 - Refrigerator (775 kWh/year)
 - Dishwasher (0.46 EF)
 - Ventilation fan energy (If rated home has ventilation system) at 0.45 W/CFM
 - Assuming $(7.5 \times (\text{Nbr} + 1) + 0.01 \times \text{CFA})$ CFM
 - Ceiling fan (if in rated home) at 23.5 CFM/W



Expanded Rating Score:


- *If you want to do better than the reference home by x%, you must do x% better than the defaults with lighting and appliances*
- *Adds allowance for "all" typical non-heating, cooling or water heating energy uses to both rated and reference home*



Appliances - General

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

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Score Calculation

- Based on comparison of design to reference home
- Current HERS standard

$$\text{Score} = 100 - (\text{TnML} / \text{TRL}) \times 20$$

$$\text{TnML} = \text{nMEUL}_{\text{htg}} + \text{nMEUL}_{\text{clg}} + \text{nMEUL}_{\text{dhw}}$$


$$\text{TRL} = \text{REUL}_{\text{htg}} + \text{REUL}_{\text{clg}} + \text{REUL}_{\text{dhw}}$$
- **Expanded:**

$$\text{Score} = 100 - ((\text{TnML} / \text{TRL}) \times 20)$$

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

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

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On site power production

- On-site Power Production (OPP): Net electric power produced at the Rated Home
- OPP = gross electrical power production minus purchased fossil fuel energy used to produce the on-site power
 - Converted to "Equivalent Electric" at 40% effi'cy
- Examples: PV, fuel cell, propane generator
 - If conversion efficiency exceeds 40%, will increase score (less will decrease)

HERS Score becomes an Index

- Reference home defined as 100 points
 - Used to be 80
- A net Zero Energy Home, Index = 0
 - Used to be 100, *but was H, C & DHW only*
- ENERGY STAR 2006 limit:
 - Climate zones 6-8 - Index of 80 (or less)
 - Climate zones 1-5 - Index of 85 (or less)

$$\text{Index} = 100 - [(\text{Score} - 80) \times 5]$$

$$\text{Score} = 80 + [(100 - \text{Index}) / 5]$$
