About EEBA

For over 35 years, EEBA has provided the most trusted resources for building science information and education in the construction industry. EEBA delivers turn-key educational resources and events designed to transform residential construction practices through high performance design, marketing, materials, and technologies. Through our educational events, annual Summit and various publications and resources, EEBA reaches thousands of key decision makers and other important industry players each year.

I wish we had more of these!

I’m so glad this is the last one of these!

Introductions

Mike Barcik – Technical Principal
• mikeb@southface.org
About Southface

• Building a Regenerative Economy, Responsible Resource Use & Social Equity Through a Healthy Built Environment for All
  www.southface.org

AIA CES-approved course

• EEBA is a registered provider of AIA-approved continuing education under Provider Number G138. All registered AIA CES Providers must comply with the AIA Standards for Continuing Education Programs. Any questions or concerns about this provider or this learning program may be sent to AIA CES (cessupport@aia.org or (800) AIA 3837, Option 3).

• This learning program is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Poll: Who Are You?
The house as a system

A house is a system made up of interrelated parts:
- The site and neighboring homes
- The weather barrier
- The building thermal envelope
- Space conditioning
- Lighting & appliances & plumbing
- Ventilation

All efficiency measures should take occupants into account (e.g., air sealing & ventilation)

Building Science:

- Employ scientific principles from a variety of fields that govern building performance
- Optimize building performance and understand, predict, prevent and correct building failures
- Systems approach to houses
- Physics of:
  - **Heat:** Flows from hot to cold
  - **Air:** Flows from high pressure to low
  - **Moisture:** Flows from wet to dry (liquid and vapor)

A. Hot-Humid
B. Mixed-Humid
C. Cold & Colder
D. Hot-Dry
E. Mixed-Dry
F. Marine
Module Learning Objectives

• Top Ten Design consideration list
• Home energy bill analysis
• RESNET
• HERS Rater training
  • Concepts
  • Math (take-offs & calculations)
  • Diagnostic/performance testing (BD, db, flow hood, etc.)
  • House as a system (combustion safety)
  • Exams

Design Approach for a High-Performance Home

• Building Science as guide
  Understand physics of heat air and moisture flow
• High Performance Enclosure
  Sound structure, shell is tight, well-insulated and resilient
• Air Distribution
  Sealed & insulated ducts – located inside building envelope, intentional fresh air delivered to occupants
• Reduced Equipment & Loads
  Efficient Heating, Cooling, Hot Water, Lights, Appliances
• Plan for Renewables
  Solar array, energy storage, solar ready design

The Key: It’s not necessarily the stuff in the building — it’s how it’s all put together! (The house is a system)
High Performance Top Ten List

1. Pay Attention to the Sun
2. Ductwork
3. Thermal Package
4. Equipment
5. Bulk Moisture & Cladding
6. Humidity Control
7. Indoor Air Quality
8. Appropriate Ventilation
9. Lighting and Plug Loads
10. Production for Zero Energy

Use Tools and Technology to help us!

Top Ten List – the Sun

1. Pay Attention to the Sun
   - Glazing on South and North (minimize East/West) –
   - Overhangs, exterior shading
   - Glazing – DP low-e with wood, vinyl, Extruded Fiberglass frame
   - Sun tubes vs. big skylights.
   - Minimize Window Wall Ratio
   - High SHGC on south?
Top Ten List – Ducts

2. Ductwork
   Ducts located inside building envelope – sealed with mastic
   Returns – path from every room; upsized over supplies
   Consider ductless?

   “According to NREL researchers David Roberts and Jon Winkler, moving the ducts from a vented attic to a new location inside the conditioned space will reduce electricity used for cooling by 15% to 20%, and will reduce the size of the needed air conditioning equipment by 0.5 to 1 ton.”

Top Ten List – Insulation

3. Thermal Package
   Exceed R-values from 2015/18 IECC prescriptive chart Walls ~R-20+
   – prefer thermal break with rigid insulation (rock wool) & efficient framing
   Insulate foundation walls versus floors – basements, conditioned crawlspaces
   Biogenic materials, cellulose
   (not all continuous insulation created =)
Top Ten List – Mechanical

4. Equipment
Heating – gas 95%, Cooling – Variable Speed – Right Sized furnaces & Heat Pumps, mini-splits
Hot Water – safe gas units, HP electric – insulate lines, distribution
Should you go all electric?

Top Ten List – Water

5. Bulk Moisture and Cladding
Sheathing seams sealed – air barrier and weather barrier – (ZIP, fluid applied, peel&stick)
Drainage plane behind all cladding. Foundation drainage details Flashing integrated with WRB
Top Ten - Humidity

6. Humidity Control
   Variable speed equipment
   Dedicated dehumidifier

Top Ten List - IAQ

7. Indoor Air Quality
   Material selection –
   Salvaged, Recycled content
   EPP, avoid Red List chemicals
   Thick (deep) pleated filters
   Tight envelope with Fresh Air system
**Top Ten List – Fresh Air**

8. **Appropriate Ventilation**
   - Positive / Balanced strategy
   - Local Exhaust for kitchens & baths
   - Smart Controls and sensors, ERV, Ventilation Dehumidifiers
   - Accessible controls + operable windows

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**Top Ten List – Plug Loads**

9. **Lighting and Plug Loads**
   - 100% good quality LED’s – economic no-brainer
   - ENERGY STAR appliances – manage this (5 refrigerators?!) 
   - Smart power strips and vampire loads
Top Ten List – Renewables

10. Production for Zero Energy
   At least make the home solar ready – (structure, conduit)
   Solar PV is much more affordable - don’t rely on solar to offset poor design
   New technologies include on-site storage (PowerWall) and EV’s

Technology / Programs Can Help

• Use the Tools
  • Energy Modeling – target EUI’s, Performance Monitoring, IAQ Sensors, IR Camera, Blower Door and Duct Leakage Testing, Inspections and Certifications
  • Beyond Code Programs

HERS Raters support these programs!!
Analyzing Energy Bills

Common Energy Units

- Purchased energy is usually a quantity
  - Electricity is purchased in units of kWh
  - Gas fuel such as natural gas is purchased in therms
  - Natural gas is metered in CF (cubic feet of gas), usually CCF or MCF
  - Propane & Heating Oil are purchased by the gallon
    - 1 kWh = 3.6 Million Joules = 3,413 BTU
    - 1 therm = 100,000 BTU
    - 1 MMBTU = 10 therms = 1,000,000 BTU
    - MCF = 1000 CF ~ 10 therms
    - CCF = 100 CF ~ 1 therm
    - 1 CF of nat. gas ~ 1020 BTU
    - 1 gallon of LP ~ 91,000 BTU
    - 1 gallon of heating oil ~ 139,000 BTU
**Base Load**

**Base Load:**
The energy used by electric or gas appliances in a home that is not used for space conditioning, thus not a seasonal load.

**Typical Base Load Reduction Measures Include:**
- Lighting Retrofits (LED)
- Refrigerator Replacement (5 refrigerators?)
- Water Heater Modification (blanket & pipe insulation, timers)
- Low-flow Fixtures (showerheads)
- Appliance upgrade (ENERGY STAR)
- Control appliance vampire loads

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**Simple Bill Analysis Method**

**Bill Analysis**

1. Review previous 12 months.
2. Average three lowest months and add 10%
3. Multiply by 12 to estimate annual base load usage.
### Bill Analysis—Example

<table>
<thead>
<tr>
<th>Month</th>
<th>Bill kWh</th>
<th>Ave. Base Load</th>
<th>Heat?</th>
<th>Cool?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb</td>
<td>537</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar</td>
<td>382</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apr</td>
<td>284</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>356</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>411</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>890</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug</td>
<td>779</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept</td>
<td>559</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct</td>
<td>343</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov</td>
<td>528</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec</td>
<td>502</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6321</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| % Base Load Use | 284       | 343       | 356     | 983/3   = 328 |

328 \times 1.1 \times 12 = 4330 \text{ kWh annual estimated baseload consumption}
60W Incandescent vs. 14W CFL vs. 9W LED

60 watts x 10 hrs x 365 days x 1 kwh = 219 kwh/year

Cost @ $0.12/kWh:
$26.28

14 watts x 10 hrs x 365 days x 1 kwh = 51.1 kwh/year

$6.13

9 watts x 10 hrs x 365 days x 1 kwh = 32.9 kwh/year

$3.94
Energy Cost of a 75W Incandescent Light Bulb

Assume electric rate: $0.12 / kWh

• 75 Watt **incandescent** bulb burns 10 hrs a day – how much electricity does it use and how much would it cost?

• 75 Watts x 10 hours = 750 Watt-hour = 0.75 kWh each day

• Cost is 0.75 kWh x $0.12 / kWh = $0.09 or ~9 cents each day

• This is about **$33 / year**! (0.09 x 365 = $32.85)

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Simple Payback of an LED Bulb

Assume electric rate: $0.12 / kWh

• Simple payback of an LED Bulb

• If the 75 Watt incandescent bulb is replaced with a 12 Watt **LED** that costs $3, what is the simple payback?
  • 12 Watts x 10 hours = 120 Watt-hour = 0.12 kWh a day
  • Cost is 0.12 kWh x $0.12 / kWh = $0.0144 or 1.4 cents each day
  • This is about **$5.26 / year**! ($0.0144 x 365 = $5.26)

• First year savings is **$27.59** ($32.85 - $5.26 = $27.59)
• Simple Payback= Upgrade Cost / Annual Energy Savings
  • $3/$27.59 = 0.11 years ~ 1.3 months
Simple Payback – Water Heater Upgrade
Assume gas rate: $1.00 / therm

Water Heater Replacement Scenario
• “Suppose your neighbor’s 15 year-old 40 gallon gas tank water heater dies and they want to replace it with another tank water heater. They are considering two options – a standard and a high efficiency tank water heater...”

<table>
<thead>
<tr>
<th>Water Heater</th>
<th>First Cost</th>
<th>Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Ef = 0.59</td>
<td>$398</td>
<td>$254</td>
</tr>
<tr>
<td>Hi Efficiency Ef = 0.65</td>
<td>$458</td>
<td>$230</td>
</tr>
</tbody>
</table>

[Difference] [ $60 ] [ $24 ] [ $12 ]

Simple Payback Formula:
$ Cost of Upgrade / $ Annual Energy Savings

• What is the Simple Payback (in years) for the Hi Efficiency model?
  • Simple Payback: $60 / $24 = ____ years

• What if gas was 50¢/therm?
  Simple Payback: $60 / $12 = 5.0 years

Quiz Question
• Which of these is not likely to be a seasonal load?
  A. Continuous operation of an ERV
  B. Air conditioning during warm and humid months
  C. Space heating during winter season
  D. Holiday lights during December
Part 2 – RESNET and the HERS Industry

HERS - EnergyGuide Label for Homes

• Rates the energy efficiency of a home
HERS - Energy Label for Homes

• Which home is energy efficient?

HERS - Features

Components of HERS Rating
1. Assessment of Building Components
2. Diagnostic / Verification Testing and Inspection
3. Software Modeling
4. Reporting

[Energy Star Rating Chart]

[Energy Star House Image]
HERS - Features

- Assessing Building Components

HERS - Features

- Diagnostic / Performance Testing and Verification
HERS - Features

• Software Modeling

Determining the HERS Index

1. Simulate two homes
   • **Rated** Home – what will be built
   • **Reference** Home – same home but exactly meets ‘06 code

2. Compare Annual Energy
   • Space Heating & Cooling, Hot Water, Lighting and some Appliances
   • Multiply by 100 (lower w/ renewables)

\[
\text{Index} = 100 \times \text{PE}_{\text{fraction}} \times \frac{\text{Rated Home's Htg + Clg + WtrH + L.A.}}{\text{Refer. Home's Htg + Clg + WtrH + L.A.}} = 75
\]
HERS Index – What does it mean?

- **HERS Index** (lower is better)
- Rated home with Index of 100 = Reference home exactly meeting 2004/06 IECC
- Net Zero Energy Home = HERS Index of 0

\[
\text{Index} = \text{PE}_{\text{fraction}} \times 100 \times \left[ \frac{\text{Rated Home's Htg + Clg + WtrH + L.A.}}{\text{Ref. Home's Htg + Clg + WtrH + L.A.}} \right] = 75
\]

**PE\text{fraction}** is ratio of renewables to purchased energy
(e.g., a home that produces 20% of its annual energy would have a **PE\text{fraction}** of 0.8)
In this example, 0.8 \times 75 = 60

**HERS - Features**

- Reporting

<table>
<thead>
<tr>
<th>ANNUAL ENERGY COSTS</th>
<th>Home</th>
<th>Home_2004/06</th>
<th>Diff</th>
<th>%Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>$717</td>
<td>$751</td>
<td>$34</td>
<td>4.5%</td>
</tr>
<tr>
<td>Cooling</td>
<td>$187</td>
<td>$192</td>
<td>$5</td>
<td>2.6%</td>
</tr>
<tr>
<td>Water Heating</td>
<td>$213</td>
<td>$179</td>
<td>$34</td>
<td>19.4%</td>
</tr>
<tr>
<td>Lights &amp; Appliances</td>
<td>$919</td>
<td>$939</td>
<td>$20</td>
<td>2.1%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>Service Charges</td>
<td>$338</td>
<td>$338</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$1,958</td>
<td>$1,976</td>
<td>$18</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

**ENERGY FEATURES**

- *Brady Base Case*
  - Air Foil, Add: 6000 ft
  - R-19 Roof, Add: 6000 ft
  - R-11 Unit: 9,000 ft
  - R-18 Unit: 9,000 ft
  - R-19 Unit: 9,000 ft
  - R-16 Unit: 9,000 ft
  - R-15 Unit: 9,000 ft
  - R-14 Unit: 9,000 ft
  - R-13 Unit: 9,000 ft
  - R-12 Unit: 9,000 ft

- *Brady Improved*
  - Air Foil, Add: 6000 ft
  - R-19 Roof, Add: 6000 ft
  - R-11 Unit: 9,000 ft
  - R-18 Unit: 9,000 ft
  - R-19 Unit: 9,000 ft
  - R-16 Unit: 9,000 ft
  - R-15 Unit: 9,000 ft
  - R-14 Unit: 9,000 ft
  - R-13 Unit: 9,000 ft
  - R-12 Unit: 9,000 ft

**Rating Comparison**

<table>
<thead>
<tr>
<th>HERS Index</th>
<th>Brady Base Case</th>
<th>Brady Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>
HERS – Software Reports

RESNET – Oversight from above...

www.resnet.us

- Responsible for revising standards
- Oversees quality control
- Resource for raters, trainers, providers

Creators: Mortgage Industry and NASEO – (National Association of State Energy Offices)
RESNET
www.resnet.us

What Is RESNET?

- The Residential Energy Services Network or RESNET is a not-for-profit, membership corporation that is governed by a board of 20 (who are elected by membership).
- RESNET is a recognized national standards-making body for building energy efficiency rating and certification systems in the United States involving:
  - A consensus based standard development and amendment process
  - Transparent review / adoption process
  - Formal public review / comment process

RESNET's Mission
To make the energy use of all homes transparent, thereby driving residential sector energy use toward net zero.

2020 Goals and Priorities
Adopted by the RESNET Board of Directors
September 10, 2019

Steve Baden
Executive Director
Email: sbaden@natresnet.org
Steve Baden has worked in the residential energy efficiency field for over twenty five years, including eighteen years with home energy ratings and energy mortgages on both the state and national levels, and ten years administering a state energy office. Mr. Baden initiated the "Warm Homes for Alaskans Initiative" which received the "1993 National Award for the Most Outstanding State Housing Program" from the National Council of State Housing Agencies. Steve was also awarded "Lifetime Achievement Awards" from the U.S. Department of Energy and RESNET.

Cardice Howard
Deputy Director
Email: cardice@resnet.us
Cardice Howard brings 27 years of operations management experience as an insulation contractor in the Dallas/Fort Worth, Texas market along with her passion as an insulation industry advocate to the RESNET team.

Learn About HERS® | Blog
Home Energy Rating System (HERS) – Structure of the Industry

**RESNET**
Residential Energy Services Network

- Responsible for revising standards
- Oversees quality control
- Resource for raters, trainers, providers

**Training Providers**

- Creators: Mortgage Industry and NASEO (National Association of State Energy Offices)
- www.resnet.us

**Rating Providers**

**Raters**

**Field Inspectors**

**HERS Raters**

- Must meet rigorous standards and maintain continuing education
- Abide by the RESNET Code of Conduct
- Undergo regular Quality Assurance by their Rating Provider (Provider QA is performed by RESNET)
- Provide objectivity, technical proficiency and abide by ethical standards
- Can offer innovative insights to high performance construction
- Can provide valuable quality assurance to builder / clients
HERS Standards

- Home Energy Ratings Systems Standards
- Roadmap
  - Chapter 1 – Standard for Home Energy Ratings
  - Chapter 2 – Rater Training & Certification
  - Chapter 3 – Rating Technical Standards *(rules for rated and reference homes)*
  - Chapter 4 – Design Reference (BOP) Standards
  - Chapter 5 – Revisions of Standards
  - Chapter 6 – Sampling Standards
  - Chapter 7 – Home Energy Audit Standards
  - Chapter 8 – Performance Testing & Work Scope
  - Chapter 9 – Quality Assurance
  - Chapter 10 – EnergySmart Projects and Contractors
  - Appendix A – Inspection Procedures

RESNET Standards

- Continuously maintained
- Mobile-friendly
- 10 Chapters
- Appendices
- Addenda

RESNET Standards - Continuous Maintenance Version

Table of Contents

- Chapter 1 - RESNET National Standard for Quality Assurance Providers
- Chapter 2 - RESNET National Standard for Instruction, Assessment and Certification
- Chapter 3 - National Home Energy Rating Technical Standards
- Chapter 4 - Builder Option Packages
- Chapter 5 - Revision of Standards
- Chapter 6 - RESNET National Standard for Sampled Ratings
- Chapter 7 - RESNET National Standards for Home Energy Audits
- Chapter 8 - RESNET Standard for Performance Testing and Work Scope
- Chapter 9 - RESNET National Standard for Quality Assurance
- Chapter 10 - RESNET Standard for Energy Smart Projects and Energy Smart Contractors
- Appendix A
- Appendix B - Glossary of Terms
Ch.3 HERS – Rated vs. Reference Home

- Same shape and size as Rated Home
- Reference Home components just meet code
- Rates house, not people living in the house

Actual

Window area, Window distribution, Component R-values, Infiltration, ducts, & Equipment efficiencies

Rated Home (as is)

HERS Index - Ref Home

Window area:________ distribution:________ R-values:________ Infiltration:____ Efficiencies:____

Htg + Clg + Wtr + L&A

IECC 2004/06 Energy Code
– defines Ref home used in HERS Ratings

- Prescriptive chart – Chapter 4 of IECC
- Chart $U_{\text{factors}}$ are used to define the Reference home components

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION $U_{\text{factor}}$</th>
<th>SKYLIGHT $U_{\text{factor}}$</th>
<th>CEILING $U_{\text{factor}}$</th>
<th>FRAME WALL $U_{\text{factor}}$</th>
<th>MASS WALL $U_{\text{factor}}$</th>
<th>FLOOR $U_{\text{factor}}$</th>
<th>BASEMENT WALL $U_{\text{factor}}$</th>
<th>CRAWL SPACE WALL $U_{\text{factor}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.2</td>
<td>0.75</td>
<td>0.035</td>
<td>0.082</td>
<td>0.197</td>
<td>0.064</td>
<td>0.360</td>
<td>0.477</td>
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<td>2</td>
<td>0.75</td>
<td>0.75</td>
<td>0.035</td>
<td>0.082</td>
<td>0.165</td>
<td>0.064</td>
<td>0.360</td>
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<td>3</td>
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<td>0.65</td>
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<td>0.141</td>
<td>0.047</td>
<td>0.360</td>
<td>0.136</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.40</td>
<td>0.60</td>
<td>0.030</td>
<td>0.082</td>
<td>0.141</td>
<td>0.047</td>
<td>0.059</td>
<td>0.065</td>
</tr>
<tr>
<td>5 and Marine 4</td>
<td>0.35</td>
<td>0.60</td>
<td>0.030</td>
<td>0.060</td>
<td>0.062</td>
<td>0.033</td>
<td>0.059</td>
<td>0.065</td>
</tr>
<tr>
<td>6</td>
<td>0.35</td>
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<td>0.026</td>
<td>0.060</td>
<td>0.06</td>
<td>0.033</td>
<td>0.059</td>
<td>0.065</td>
</tr>
<tr>
<td>7 and 8</td>
<td>0.35</td>
<td>0.60</td>
<td>0.026</td>
<td>0.057</td>
<td>0.057</td>
<td>0.033</td>
<td>0.059</td>
<td>0.065</td>
</tr>
</tbody>
</table>

a. Nonfenestration $U_{\text{factors}}$ shall be obtained from measurement, calculation or an approved source.
HERS Rating Software:

- REM/Rate is a software modeling program that estimates the energy consumption of homes.
- The individual components of the home are entered into the program and are compared to a standard home constructed to meet the minimum standards of the 2004/06 International Energy Conservation Code.
- The HERS rater can compare completely different homes on a level playing field.

HERS Standards – Chapter 8

- Equipment maintenance and calibration

803.9 Equipment Accuracy and Requirements

Duct testing fans used for determining either total leakage or leakage to outside shall measure airflow with an accuracy of +/-5%. Pressure gauges shall measure pressure differences with a resolution of 0.1 Pa and have an accuracy of +/-1% of the reading or 0.5 Pa, whichever is greater.

Blower doors, duct testers, and associated pressure testing instruments shall be field-tested annually for calibration. The calibration procedure shall follow the equipment manufacturer’s recommendations.

The HERS Rating Provider or Certified Rater shall maintain a written log of the annual calibration check to verify all equipment accuracy for a period of three (3) years. These records shall be made available within 3 business days to the RESNET Quality Assurance Administrator upon request.
Rater Standards

- RESNET Code of Ethics
  1. Professional Conduct
  2. Representation of Services & Fees
  3. Conflicts of Interest

- Disclosure form for each home

- Certified rater linked to each rating
  - Field data testing and collection
  - Software data entry

- Must use accredited software
  - Projected rating – based only on plans
  - Confirmed rating – based on actual house data & uploaded to RESNET Building Registry

- Must pass core national exam
  - 18 CEUs required over three years
    - Via RESNET Conference or
    - Via Accredited HERS Training Provider (e.g., webinars)
    - Retake Rater test every three years

Accreditation Criteria for HERS Providers

- Certification and Professional Development for HERS Raters
- Ensure accurate & consistent ratings
- Record keeping standards for Provider
- Providers track complaints about Raters
- Written Quality Assurance process
- Provide latest version of accredited software
- Provisional review period (two ratings in class + minimum three probationary ratings)
- Provide documentation link to ENERGY STAR

HERS Standards – Chapter 9

- Quality Assurance for the HERS Industry

- Review 10% of data files, 1% “field monitoring” for quality assurance

904.4.2 On-site verification of ratings.

904.4.2.1 For each Rater, the Provider’s QA Designee shall be responsible for an annual onsite field evaluation of the greater of one (1) home or one percent (1%) of the Rater’s annual total of homes for which confirmed or sampled ratings and diagnostic testing services were provided. When determining the number of onsite evaluations to complete for a Rater, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 homes x 1% = 1.01 means that 2 onsite evaluations shall be completed.

904.4.2.2 For Raters utilizing Rating Field Inspectors (RFI’s), the QA Designee shall ensure that an annual onsite field evaluation of the greater of one (1) home or one percent (1%) of the RFI’s annual total of homes for which data was collected are subject to evaluation. The RFI evaluations may fulfill all or a portion of the Provider’s annual onsite QA requirement. When determining the number of onsite evaluations to complete for an RFI, round up to the next whole number when the percentage calculation yields a decimal point, e.g. 101 homes x 1% = 1.01 means that 2 onsite evaluations shall be completed.
HERS - A Powerful Tool

• Homeowners
  • improvements
  • increase resale value
  • educated decision on home purchase
  • HERS index in FMLS
  • energy efficient mortgages

• Builders
  • quality control
  • marketing edge
  • increase customer base
  • utility rebates
  • tax incentives
  • reduced risk
  • code compliance
The rated design must have an ERI less than or equal to the above table to comply with 2015 IECC

NOTE: GA amended to match 2018 numbers!

HERS - A Popular Tool

• Marketing Programs
  • Government
    • US EPA ENERGY STAR
    • DOE Zero Energy Ready
      (formerly Builder’s Challenge)
  • Utility-based programs
  • Green builder programs

• Tax Incentives
  • Federal / state
45L - EE Homes Tax credit – still in effect

- Tax CREDIT (not deduction) to builder of energy efficient homes - $2,000 per home!
- Home must use 50% less energy for Heating & Cooling (only) than IECC 2006
- At least 10% improvement must be due to better envelope
- Third party validation (HERS rater)
  - must do software analysis, inspections, and performance testing

PROPOSED for 2020
- Extends the credit to December 31, 2025
- Changes the benchmark from 50% more efficient than the 2006 IECC to 15% more efficient than the 2018 IECC
- Increases the credit from $2,000 to $2,500

Economics of Energy Efficiency

Energy Efficient Mortgage Example

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Energy Efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase Price</td>
<td>$250,000</td>
<td>$257,500*</td>
</tr>
<tr>
<td>20% Down Payment</td>
<td>$50,000</td>
<td>$51,500</td>
</tr>
<tr>
<td>Loan Amount</td>
<td>$200,000</td>
<td>$206,000</td>
</tr>
<tr>
<td>Interest</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Monthly P&amp;I</td>
<td>$1,136</td>
<td>$1,166 (+$30)</td>
</tr>
<tr>
<td>Energy Cost</td>
<td>$250</td>
<td>$167 (-$83)</td>
</tr>
<tr>
<td>Monthly Expenses</td>
<td>$1,386</td>
<td>$1,328 (-$53)</td>
</tr>
</tbody>
</table>

($53 x 12 = $636 / year!)

* $7,500 includes $6,700 of improvements + $800 Rater Fee

- A study published in the Appraisal Journal documented that the market value of a home increases $20 for every $1 decrease in the annual energy costs.
- According to Pacific Northwest National Laboratory, building a home to exceed the Energy Code would result in an annual savings of $170 to $425. According to the Appraisal Journal this equates to an increased home market value of between $4,250 to $10,625. (www.resnet.us/ratings/mortgages/default.htm)
HERS - A Powerful Tool

• NEW HOMES:
  Energy Efficiency Mortgages
  • FHA limit is now 5% of total mortgage up to $31k
  • energy savings added to borrower income
  • option for no additional down payment
  • cost of energy upgrades & HERS rating can all be rolled into mortgage
  • market interest rate (not necessarily a lower interest rate)

• EXISTING HOMES:
  • Energy improvements to make home 30% more efficient than home “as is”
  • At time of sale or refinancing
  • Energy improvements up to 15% of home’s value
  • Cost of improvements included in mortgage – pay off with mortgage payment
  • www.myenergyloan.com
  • www.ecolend.com

INCREASED DEBT-TO-INCOME RATIO:
Buyer of an efficient home can “stretch” and get a bigger loan and more easily afford their better home

<table>
<thead>
<tr>
<th>Monthly Income</th>
<th>Regular Mortgage</th>
<th>Energy Efficient Mortgage</th>
<th>Increased Purchase Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2,000</td>
<td>$62,500</td>
<td>$66,933</td>
<td>$4,433</td>
</tr>
<tr>
<td>$3,000</td>
<td>$93,678</td>
<td>$100,400</td>
<td>$6,722</td>
</tr>
</tbody>
</table>

HERS Business Opportunities

• ENERGY STAR certification for builders
  • Prescriptive inspections
  • Software analysis
  • Performance verification

• Energy audits and improvement recommendations for homeowners

• Inspections for other programs
  • Energy code compliance
  • DET verifier
  • Utility rebates
  • Green building programs
  • Tax credit verification

• Bundle HERS with other energy / construction / inspection / training services
After completing the grueling, 7-day HERS course....

• To become a certified rater:
  • Find a provider (www.resnet.us)
  • Probation period (minimum 3 additional ratings and possibly more testing with blower door, etc.)
  • Provider performs quality control and oversight, offers marketing assistance, provides software, & represents rater to EPA ENERGY STAR
  • Track CEU’s – 18 hours in 3 years

SOUTHFACE ENERGY RATED HOMES (SERH)

• Southface’s RESNET-Accredited HERS QA Providership

<table>
<thead>
<tr>
<th>Who is SERH?</th>
<th>How SERH Serves You</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best-in-class quality assurance</td>
<td>Help you conduct quality work</td>
</tr>
<tr>
<td>Intuitive credential management</td>
<td>Make your credential maintenance easy and efficient</td>
</tr>
<tr>
<td>Innovative software solutions and services</td>
<td>Help you grow your rating business</td>
</tr>
</tbody>
</table>

What You Can Expect from Us:
  • Fast, friendly service
  • High-quality resources (Ekotrope, CEUs, rating resources, informative updates)
  • Your biggest advocate

Learn More:
  • https://www.southface.org/our-work/programs/southface-energy-rated-homes/
  • serh@southface.org
  • Nathan Bessette – 404.604.3618
Marketing and the HERS Index

• Energy efficiency measures and the HERS Index can be used as a marketing tool
• The HERS Index is already a widely recognized mark of high performance building
• Market data indicate that energy efficient homes spend less time on the market and have a higher selling price

[Image of a neighborhood with HERS Index numbers]

The Gold Standard in Home Energy Efficiency

2,829,601 Homes HERS-rated to date

141,496 Number of homes HERS-rated this year

[Button to join RESNET]

Marketing and the HERS Index

[Image of a HERS index chart]

HERS Index

Zero Energy Home  Reference Home  Existing Homes

Less Energy  More Energy

This Home

[Color bar indicating energy efficiency levels]
Benefits of the ERI / HERS Index

- Increased quality of homes
- More cost-effective options available to builders
- More opportunities for success in the industry
- Market differentiation with 3rd party validation

Marketing and the HERS Index

Figure 1. The “Most Wanted” List
(Percent of Respondents)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Essential/Must Have</th>
<th>Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy-Star rated appliances</td>
<td>94%</td>
<td>93%</td>
</tr>
<tr>
<td>Laundry room</td>
<td>57%</td>
<td>36%</td>
</tr>
<tr>
<td>Energy-Star rating for whole home</td>
<td>28%</td>
<td>63%</td>
</tr>
<tr>
<td>Exhaust fan in bathroom</td>
<td>53%</td>
<td>37%</td>
</tr>
<tr>
<td>Exterior lighting</td>
<td>41%</td>
<td>49%</td>
</tr>
<tr>
<td>Bathroom linen closet</td>
<td>39%</td>
<td>51%</td>
</tr>
<tr>
<td>Energy-Star rated windows</td>
<td>35%</td>
<td>54%</td>
</tr>
<tr>
<td>Ceiling fan</td>
<td>48%</td>
<td>40%</td>
</tr>
<tr>
<td>Garage storage</td>
<td>32%</td>
<td>54%</td>
</tr>
<tr>
<td>Table space for eating in kitchen</td>
<td>36%</td>
<td>49%</td>
</tr>
<tr>
<td>Walk-in kitchen pantry</td>
<td>31%</td>
<td>54%</td>
</tr>
</tbody>
</table>

Source: NAHB “What Homebuyers Want”
Southface HERS Trainings

https://www.southface.org/ourwork/education/courses/rating-system-training/


Thoughts / Questions?

- June 4: It All Begins with Building Science
- June 11: Cracking the Building Energy Code
- June 18: Demystifying Energy Modeling
- June 25: Healthy Homes Matter - Understanding IAQ & Ventilation
- July 2: An Industry That Puts It All Together: The World of HERS Raters

Thank you!
Mike Barcik

Southface Applied BS Webinars
Third Thursdays! 11 a.m. ET
- June 18th - Combustion Safety
- July 16th - HVAC Load Calcs
- Aug 20th - High Performance Design

https://www.southface.org/resources/building-science-webinars/

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