Performance Driven: Perspectives on the DOE Zero Energy Ready Home

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Pat Huelman
University of Minnesota
NorthernSTAR – Guiding Principles

• Exploring the next generation of high performance homes for cold climates, using
  – building science as our compass
  – research as our guide.

• Using a total systems approach
  – House (physical) system
  – Construction delivery system
  – Market (consumer-user) system
DOE Zero Energy Ready Homes

• Why build to DOE ZERH?
  – Consumer motivations
  – Builder motivations

• What does DOE ZERH require?
  – Overall a performance-based approach
  – With some prescriptive components

• How do you get there?
  – Strategic partners and resources
Why DOE ZERH?

Consumer Value Proposition

Lives Better
- Engineered Comfort
- Healthier Living
- Solar Ready
- Long-Term Warranty

Works Better
- Ultra-Low Utility Bills
- Advanced Technology
- Water Efficient
- Black-Out Power

Lasts Better
- Quality Construction
- More Durability
- Disaster Resistant
- Lower Cost Insur./Mort.
Why DOE ZERH?
Builder Business Case

• Business Metrics
  – Competitive advantage
  – Reduced callbacks & warranty
  – Improved sales and referrals

• Harvesting the Value Innovation Premium
  – If you can successfully communicate,
  – the innovation and the value,
  – the market leader can command better margins.
What is DOE ZERH?

• In my view, this program is ...
  – Built on a technically superior platform
  – Focused on the right things (not just energy)
  – In the right way (performance-based)
  – At the right level (strategic differentiation)
  – With a delivery process that is credible, but not onerous.
What is DOE ZERH?
Solid Program Platform

• High-performance homes so energy efficient, most or all annual energy consumption can be offset by renewable energy.
What is DOE ZERH?

Systems-Based Program Requirements

Encouraged:
- EPA’s WaterSense and Indoor airPLUS (full compliance)
- Quality Management and Disaster Resistance (IBHS Fortified Home)
What is DOE ZERH?
Performance-Based Approach

### Exhibit 2: DOE Challenge Home Target Home

<table>
<thead>
<tr>
<th>HVAC Equipment</th>
<th>Hot Climates (2012 IECC Zones 1,2)</th>
<th>Mixed Climates (2012 IECC Zones 3,4)</th>
<th>Cold Climates (2012 IECC Zones 5,6,7,8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFUE</td>
<td>80%</td>
<td>90%</td>
<td>94%</td>
</tr>
<tr>
<td>SEER</td>
<td>18</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>HSPF</td>
<td>8.2</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Geothermal Heat Pump</td>
<td>1.4 cfm/W; no heat exchange</td>
<td>1.4 cfm/W; no heat exchange</td>
<td>1.2 cfm/W; heat exchange with 60% SRE</td>
</tr>
<tr>
<td>ASHRAE 62.2 Whole-House MV System Performance</td>
<td></td>
<td></td>
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</tbody>
</table>

**Insulation and Infiltration**
- Insulation levels shall meet the 2012 IECC and achieve Grade 1 Installation, per RESNET standards.
- **Infiltration** (ACH50): 3 in CZ’s 1-2 | 2.5 in CZ’s 3-4 | 2 in CZ’s 5-7 | 1.5 in CZ 8

**Windows**
- **SHGC**: 0.25 | 0.27 | any
- **U-Value**: 0.4 | 0.3 | 0.27

**Water Heater**
- **ENERGY STAR minimum**
  - Programmable thermostat (except for zones with radiant heat)
What is DOE ZERH?
Other Program Requirements

**Note:** Renewable energy systems may not be used to qualify for the Zero Energy Ready Home HERS Index Target Score, but may be used for the incremental HERS Index points needed for the Size Adjustment Factor.
What is DOE ZERH?
Third Party Certification
How to do DOE ZERH?
Rally Your Partners

• Energy Raters
• Home Performance Consultants
• Renew/Review/Revisit your Trade Allies
  – Design
  – Subs
  – Supply chain
• Other Resources
  – Link up with a Building America Team
How to do DOE ZERH?
Gather Your Resources

• Start by “Mining” the Building America Resources
  – General Energy Information (EERE Buildings)
    • http://energy.gov/eere/buildings/residential-buildings-integration
  – DOE Zero Energy Ready Home
    • http://energy.gov/eere/buildings/zero-energy-ready-home
  – Top Innovations “Hall of Fame”
    • http://energy.gov/eere/buildings/building-america-top-innovations
  – Building America Solutions Center
    • http://energy.gov/eere/buildings/building-america-solution-center
Minnesota’s 1st DOE Challenge Home

• Amaris Custom Homes
  – Ray Pruban

• Debuted in 2013 BATC Fall Parade of Homes
  – Rambler with full walkout basement
  – 3,542 sq. ft. conditioned
  – 5 bedrooms, 4 baths
  – St. Paul, MN (CZ=6)

• HERS = 41 w/o PV
• HERS = 4 w/ 10 KW PV
Amaris Custom Homes

- BASELINE certified ENERGY STAR for Homes v3.0
- ENVELOPE meets or exceeds 2012 IECC levels
- DUCT SYSTEM within home’s thermal boundary
- WATER EFFICIENCY (WaterSense Section 3.3 specs)
- LIGHTING & APPLIANCES ENERGY STAR qualified
- INDOOR AIR QUALITY (EPA IndoorairPLUS Checklist)
- RENEWABLE READY chaseway built-in for PV array
Amaris Custom Homes

- ICF foundation
- 2x6 w/ ccSPU + 1” XPS
- Raised heel truss w/ 2” ccSPU + R-48 fiberglass
- Windows: U = 0.25
- Airtightness = 465@50PA
- 95% AFUE furnace & boiler
- 16 SEER AC
- ERV & source exhausts
- ENERGY STAR Appliances
- 90% LED; 10% CFL

- Good shape & orientation
- Passive solar design
- In-floor heating w/ tile
- No/Low VOC materials
Amaris Custom Homes

• **Specific Home Certifications**
  – DOE Challenge Home (now ZERH)
  – ENERGY STAR Version 3
  – MN GreenPath - Emerald
  – LEED for Homes v4 Beta – Silver

• **Builders Association of the Twin Cities**
  Reggie℠ Award of Excellence
Amaris Custom Homes

• Challenges
  – Exterior foam
  – Mechanical systems
  – Water distribution

• Key Lessons
  – “Green” is challenging to sell because it is poorly defined
  – “Healthier living is built-in” resonated very well with his market segment
  – DOE Challenge Home label was his “best bang for the buck”
  – Has committed to 100% ZERH
A Builder’s Perspective

• It is my pleasure to introduce another of our DOE Zero Energy Ready Home Builder Partners

• 2014 “Housing Innovation Award” winner
  – Melissa Wahl
  – Cobblestone Homes
  – Saginaw, Michigan
Challenges

Forms needed and pre-planning
Met with Energy Rater and ran through the home’s specifications right on REMRATE
Figuring what is best so that we could replicate and do over and over cost effectively.

Water Delivery
Webinars, conference calls with Building Knowledge and University of Minnesota, and conferences with our plumbers.
Melissa Wahl
Cobblestone Homes
Cobblestonelifestyle.com
melissa@cobblestonelifestyle.com
In Summary

• **How does this support Zero Energy Ready Homes?**
  – The BA team support can help identify and resolve key technical issues related to the delivery of ZERHs.
  – These BA demonstration projects and educational efforts blaze a pathway for leading-edge builders.
  – ZERH requires a push-pull strategy.
    • Transaction success improves when a knowledgeable buyer intersects with a capable builder.
Consumer-Oriented Resources

Lives Better

HEALTHFUL ENVIRONMENT
Every DOE Zero Energy Ready Home offers a comprehensive package of measures to reduce harmful pollutants, provide continuous fresh air and effectively filter the air you breathe.

Works Better

ADVANCED TECHNOLOGY
Every DOE Zero Energy Ready Home begins with the building science specified by ENERGY STAR for homes, and then adds advanced technologies and practices from DOE’s world-class research programs, Building America.

Lasts Better

QUALITY BUILT
Advanced construction practices and technologies are specified for every DOE Zero Energy Ready Home. They are enforced by independent third parties with detailed checklists and periodic inspections.

The Future of Housing—Today

Only a select group of the top builders in the country meet the rigorous levels of excellence and quality specified by U.S. Department of Energy guidelines.

A Symbol of Excellence

| HEALTHFUL ENVIRONMENT |
| COMFORT PLUS |
| ADVANCED TECHNOLOGY |
| ULTRA EFFICIENT |
| QUALITY BUILT |
| DURABILITY |

KEY
- DOE Zero Energy Ready Home
- ENERGY STAR Certified Home
- Existing Home
-

NEW TOWN
Call us at: 503-331-4687
NewTown@net.com

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy
Building America
NorthernSTAR
University of Minnesota
Driven to Discover
Building Consumer Interest

• All housing market transformation requires a push-pull strategy.
  – A knowledgeable buyer must intersect with a capable builder.
  – In new construction, the builder may have a better position in the transaction.
    • However, it still takes an interested buyer who is receptive to learning.
  – So I believe we must also “soften the ground” for the builders through public awareness and education.
Building Consumer Interest

• Generating Consumer Interest and Demand
  – We developed an anchor exhibit focused on high-performance homes for the Minnesota State Fair.
  – Funded by the MN DER (State Energy Office)
  – Located in MPCAs Eco Experience Building
    • 2\textsuperscript{nd} largest educational draw at the Fair
    • The focus is engagement and education
    • 265,000 visitors went through this building in 12 days
      – Approximately 100,000 visited our exhibit
      – We estimate 1 in 10 stopped to explore at some depth
  • The reviews and feedback have been very encouraging
Building Consumer Interest
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Building Consumer Interest
A Crazy Year in the Life of …

• Developing students with building science knowledge and skills for the market.
  – Started last Fall with the DOE “Race to Zero” Student Design Competition.
  – University of Minnesota’s “Team Opti-MN” won 4 awards
    • receive multiple requests to present their project to the academic, building, and affordable housing communities.
  – Then shifted their focus to the MN State Fair to be fully engaged in design, development oversight, and staffing.
  – All of the graduating students (undergrad & grad) landed high-quality, well-paying jobs.
In Closing

• What’s in a Name?
  – DOE Challenge Home
    => DOE Zero Energy Ready Home
  – DOE “Goldilock’s Program” for High Performance Homes
    • It’s not too hard;
    • It’s not too soft;
    • It’s just right!
• Thank you for your attention!

• Questions will be at the end of the session.

• Contact information:
  – Patrick H. Huelman
  – 203 Kaufert Lab; 2004 Folwell Ave.
  – St. Paul, MN  55108
  – 612-624-1286
  – phuelman@umn.edu