BGE Smart Energy Savers Program™

BGESmartEnergy.com
Baltimore Gas and Electric
ENERGY STAR® v.3 Pilot Study
Agenda

• **Safety Message** – Heather Anderson, Baltimore Gas and Electric
• **Pilot Study Overview** – Heather Anderson
• **Lessons Learned from the Field** – Rick Gazica, ICF
  – Building Science Methods
  – Costs comparisons
  – Energy Savings
• **Training for Program Participants** – Rick Gazica
• **Q&A**
Spring is finally here! Spring cleaning is an annual event for many people. Here are some safety tips:

- **Remove all hazards**
  - Frayed or damaged appliance cords, wiring, fuses or breakers.
  - Piles of rubbish, trash and yard debris.
  - Remove stacks of paper and magazines; take them to recycling centers.
  - Check for water leaks, especially near electrical appliances.
  - Check for good clearance between heating appliances and combustibles.

- **Properly Store Flammable Liquids and Home Chemicals**
  - Make sure that gasoline and cleaning fluids are well marked and are out of the reach of children and pets. Store in a cool, dry place outside the house.

- **Check Fire Protection and Safety Equipment**
  - Check your smoke and CO detector. Change the batteries.
  - Check fire extinguishers for proper type and placement.
  - Check and make sure you have a working flashlight and battery-powered radio for the approaching storm season.
Pilot Study Overview
Baltimore Gas and Electric

- Constellation Energy Group: BGE
  - Customers: 1.8 million
Current Program

**ENERGY STAR Qualified Homes:**
- $400 for an ENERGY STAR qualified home with a HERS Index of \( \leq 85 \).
- $800 for an ENERGY STAR qualified home with a HERS Index of \( \leq 80 \).
- $1,000 for an ENERGY STAR qualified home with a HERS Index of \( \leq 75 \).

**Advanced Lighting Package (ALP):**
- $325 for completion of the ALP in *attached* homes.
- $525 for completion of ALP in *detached* homes.

**Marketing support/training**
- Model home sales and marketing kits
- In person training for sales agents

**Technical support/training**
- In field training on issues in local market
- Training on changes to ENERGY STAR specification
- Limited plan reviews
Pilot Study Objectives and Design

• **Goal: To proactively prepare for ENERGY STAR for v.3.**
  – Minimize program disruptions and ensure program goal achievement.
  – Assess implementation strategies and develop transition guidance and training materials.
  – Evaluate incremental costs and savings associated with the new guidelines.
  – Obtain feedback from builders, subcontractors, and raters on best practices for specific details and for transitioning organizational processes to the 2011 Guidelines.
  – Quantify the increase in energy savings compared to ENERGY STAR v.2.

• **Design:**
  – Incentivized pilot study builders with an additional $2,000 incentive.
  – Selected a cross section of builders and home types.
  – Homes constructed to the draft specification released in October.
  – Developed pilot study metrics to ensure that necessary data is collected.
  – Held an open house for each pilot home to allow other program participants and industry allies to “kick the tires”.
  – Develop pilot home case studies that address both rather and builder training needs.
Lessons Learned from the Field
Better Building Science: Thermal Enclosure Checklist

- Dow SIS Board used in place of OSB for exterior sheathing.
- R-value rating of R-3 for ½ inch and R-5.5 for 1 inch. It is American Plywood Association (APA) approved for structural sheathing.
- Eliminates the need for house wrap.
- Costs are estimated at an additional $.05 per square foot for ½ inch and $.25 per square foot for 1 inch when compared to traditional OSB and house wrap.
- Reduces thermal bridging.
Better Building Science: Thermal Enclosure Checklist

- Advanced Framing techniques such as “California Corners” allow insulation to be placed along the entire wall

- Spacing 2” x 4” @ 16” on center using only one “king stud” on each side of the windows to decrease thermal bridging
Better Building Science:
Thermal Enclosure Checklist

- Using “Ladder” construction allows insulation to be placed where interior walls intersect with exterior walls.

- Using a “warm corner”, insulating with rigid insulation behind an interior wall intersecting with the exterior.
Better Building Science:
Thermal Enclosure Checklist

• Change in specification requiring Grade 1 insulation installation to exterior walls.
• Example: Grade 2 insulation
The new specification requires air barriers at all rim joists in the house. This can be achieved with closed cell foam, or traditional air barriers such as thermal-ply or rigid insulation.
Better Building Science: Thermal Enclosure Checklist

- Requirement that windows are ENERGY STAR rated with Low-E.

- Utilization of “Raised Heel Trusses” to allow for full depth insulation at the edge of the attic.
Better Building Science: HVAC

- Utilization of 90+ Annual Fuel Utilization Efficiency (AFUE) furnaces to increase energy efficiency.
- The incremental cost for a higher efficiency unit will be slightly offset since it eliminates the need for b-vent installation.
Better Building Science: HVAC

- Using UL 181 mastic as a duct sealer decreases duct leakage.
- Also use mastic to seal the air-handler since a majority of conditioned air loss occurs here.
Better Building Science: Water managed construction

- Proper flashing of windows and “back caulking” will prevent airflow and moisture from getting into the home.
Better Building Science: 
Energy efficient Lighting and Appliances

• The reference house for the new 3.0 Specifications require 80% of all lighting installed to be energy efficient.

• All appliances must have the ENERGY STAR Label.
## Cost Comparisons

<table>
<thead>
<tr>
<th>Item Changed</th>
<th>Material Cost</th>
<th>Labor Cost</th>
<th>Total Cost per house</th>
</tr>
</thead>
</table>
| Exterior Sheathing Dow SIS Board ½ inch = R-3  
  1 inch = R-5.5                        | $.05 per square foot for ½ inch  
  $.25 per square foot for 1 inch     | Decreases need for exterior house wrap          | $160 per house for ½ inch and $800 per house for 1 inch |
| Framing members (studs)               | (-$2.50) for every exterior corner  
  -$(5) for every window  
  -$(5) for every interior wall intersect | No change in labor costs                        | ($25) per house  
  ($75) per house  
  ($40) per house |
| Furnace                               | Between $700 and $900 more than 80% furnaces | ($150) less because do not have to install b-vent | $550 more per house                       |
| Duct distribution system (transfer grilles) | $10 per bedroom                      | $6 per bedroom                                  | $16.00 per bedroom                       |
| Grade 1 insulation for walls          | No addition                           | $.05 more for Grade 1 installation with fiberglass batt | $225.00 per house                       |
## Cost Comparisons (cont)

<table>
<thead>
<tr>
<th>Item Changed</th>
<th>Material Cost</th>
<th>Labor Cost</th>
<th>Total Cost per house</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air barriers at all rim joists</td>
<td>$120 dollars for foam and thermal ply</td>
<td>$100</td>
<td>$220 per house</td>
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<tr>
<td>80% energy efficient lighting</td>
<td>$2 dollars more per bulb</td>
<td>No addition</td>
<td>$80</td>
</tr>
<tr>
<td>Fresh air ventilation</td>
<td>$200 for continuous running fan</td>
<td>$50 dollars for installation</td>
<td>$250</td>
</tr>
<tr>
<td>ACCA Manual J, D, and S HVAC contractors checklist</td>
<td>No increase</td>
<td>$250 for testing</td>
<td>$250</td>
</tr>
<tr>
<td>Windows ENERGY STAR rated</td>
<td>$5 per window</td>
<td>No addition</td>
<td>$100</td>
</tr>
<tr>
<td>Rater costs</td>
<td>No increase</td>
<td>$100 more for equipment and extra paperwork</td>
<td>$100</td>
</tr>
</tbody>
</table>

**Total Costs**  
$1860 to $2340
Energy Savings from 2006 ENERGY STAR Home

- Craftstar Homes
- 2300 Square Foot Home
- HERS Index = 83
- Estimated KwH Savings = 677 KwH
- Estimated Electric Bill Savings per year = $101.55
- Estimated Therm Savings = 100 Therms
- Estimated Gas Bill Savings per year = $92.14
Version 3.0 Pilot

- Jenkins Builders Pilot Home
- 2200 Square Foot Two Story Home
- HERS index = 62
- Estimated KwH Savings = 2,378 KwH
- Estimated Electric Bill Savings per year = $356.85
- Estimated Therm Savings = 121 Therms
- Estimated Gas Bill Savings per year = $112.53
Energy Savings from 2006 ENERGY STAR Home

- Bob Ward Homes
- 4300 Square Foot Home
- HERS Index = 78
- Estimated KwH Savings = 1244 KwH
- Estimated Electric Bill Savings per year = $186.55
- Estimated Therm Savings = 202 Therms
- Estimated Gas Bill Savings per year = $187.86
Version 3.0 Pilot

- Columbia Builders Pilot Home
- 4200 Square Foot Home
- Hers Index = 59
- Estimated KwH Savings = 5,799 KwH
- Estimated Electric Bill Savings per year = $869.85
- Estimated Therm Savings = 331 Therms
- Estimated Gas Bill Savings per year = $307.83
Training for Program Participants
Builder Training

- Three pilot study open houses at pre-dry wall open to all program participants.
- Three trainings scheduled for 2010 on ES v.3 that will educate builders on the final specification and utilize information garnered from the pilot study to assist in smoothing the transition.
  - Will include an overview of how the specification changes affect building practices and the energy savings of the home.
  - It will also present estimated costs for both material and labor.
- BGE will also facilitate training with participating HVAC contractors regarding compliance with the new HVAC contractors checklist.
- Quarterly training is also being anticipated for 2011.
Rater Training

Will focus on new requirements for qualifying a home under V.3 as well as strategies for accomplishing inspections in two trips.

Pre-drywall

• Thermal Enclosure System Rater Checklist
  – Windows shall meet or exceed 2009 IECC requirements
  – Quality-installed insulation
  – Fully aligned air barriers
  – Reduced thermal bridging
  – Air sealing*

• Water Management System Rater Checklist
  – Interior surface of below-grade walls not finished with continuous vapor barrier
  – Water-managed wall assembly - flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding system
  – Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in water managed wall assembly
  – Window and door openings fully flashed
  – Building materials with visible signs of water damage or mold not installed at time of inspection
Pre-drywall, Cont.

- HVAC System Quality Installation Rater Checklist
  - Duct Quality Installation
  - Duct Insulation
  - Duct Leakage
  - Air Inlets & Ventilation Source Air inlets located > 10 ft. from contamination sources such as stack, vent, exhaust hood, or vehicle exhaust
  - Air inlets > 2 ft. above grade in Climate Zones 1-3 or > 4 ft. above grade in Climate Zones 4-8 and not obstructed by snow, plantings, or other material at time of inspection
  - Ventilation air comes directly from outdoors and not from adjacent dwelling units, garages, unconditioned crawlspaces, or attics
  - If fans share common exhaust duct, back-draft dampers installed
  - Common exhaust duct not shared by fans in separate dwellings
  - Clothes dryers exhaust vented directly to outdoors
  - Combustion & Non-Combustion Pollutants
  - Filter accessible for maintenance by owner
Post Construction

• Thermal Enclosure System Rater Checklist
  – Attic access panels and drop down stairs insulated and fully gasketed or sealed.
  – Recessed lighting fixtures ICAT labeled and fully gasketed, caulked, or otherwise sealed
  – Bathroom and kitchen exhaust fans sealed to drywall using caulk or foam
  – Whole-house fans equipped with insulated cover gasketed to opening

• Water Management System Rater Checklist
  – Patio slabs, walks, and driveways sloped > 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less.
  – Final grade sloped > 0.5 in. per ft. away from home for > 10 ft. and back-fill tamped to prevent settling
  – Sump pump covers shall be air-sealed (i.e., mechanically attached with full gasket seal or equivalent)
  – Water-Managed Roof Assembly
  – Wall-to-wall carpet not installed within 2.5 feet of toilets and bathing fixtures (e.g., tubs and showers)
Post Construction, Cont.

- HVAC System Quality Installation Rater Checklist
  - Whole-Building Delivered Ventilation
  - Ventilation Controls
  - Air inlets provided with mesh rodent / insect screen with mesh < 0.5 in.
  - Doors to garage gasketed or made substantially airtight
  - Filtration - MERV 6 or better filter installed in ducted mechanical systems
  - Filter located so that return and ventilation air pass filter prior to conditioning
  - Filter access panel includes gasket or comparable sealing mechanism and fits snugly against the exposed edge of filter when closed to prevent bypass
Conclusion

• Four other collaborative utility program pilot studies across the nation:
  – Public Service Company of New Mexico
  – Joint Management Committee (MA)
  – AEP Texas Central Co.
  – Public Service Company of Oklahoma

• Once homes from all pilot studies are complete we will synthesize data and develop a generalized framework for responding to v3 that can be applied to any market. Some initial findings include:
  – Some guidelines were less challenging for builders than they initially predicted.
  – Builders and raters needed more assistance understanding and troubleshooting the guidelines than anticipated.
  – Pre-construction meetings or mini-charettes were critical to identifying problems early and communicating expectations.
  – Stick framing alternatives to raised heel trusses are easy to do and preferable for some builders.
  – It can be challenging to fulfill the TEC using Grade II cavity insulation and rigid insulation due to product thicknesses and insufficient racking strength for nonstructural products.
Q&A

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