BetterBuildings Initiative & SmartRegs Ordinance, Boulder, CO

August 2011

Lois B. Arena
Steven Winter Associates, Inc.
Presentation Overview

- Program Explanations
- Reasons for BA Involvement
- On-going and Proposed Work
- Barriers to Success & Solutions
SmartRegs vs. BetterBuildings?

- **SmartRegs Ordinance**
  - Rental Properties
  - Compliance required for renewal of rental property license by 2019

- **BetterBuildings: 10,000 home target**
  - Residential buildings – rental & owner occupied
  - Commercial buildings – 3,000 goal
  - Goal: create targeted audit that can be completed in two hours and move homeowners to action

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SmartRegs Overview

- SmartRegs Ordinance – Rental Properties
  - Adopted by City of Boulder, CO in 2010
  - ≈ 20,000 rental units, ≈ 50 percent of Boulder’s housing stock
  - Owners have little incentive to improve efficiency
  - Prescriptive or performance path:
    - rental property must achieve >=100 on SmartRegs checklist or
    - HERS index of <=120 points.

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## SmartReggs Checklist

### Proposed Prescriptive Pathway

#### WALLS

<table>
<thead>
<tr>
<th>R-VALUE</th>
<th>25%</th>
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<td>12</td>
<td>15</td>
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<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>R-19 or Better</td>
<td>5</td>
<td>11</td>
<td>16</td>
<td>21</td>
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<tr>
<td>Shared Wall or Insulated Basement Wall</td>
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<td>13</td>
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#### WINDOWS/FENESTRATION

<table>
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<tr>
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<td>13</td>
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<td>0.30 U-Value</td>
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<td>0.25 U-Value or Better</td>
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<td>7</td>
<td>11</td>
<td>14</td>
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</table>

### SLAB / FOUNDATION

#### SLAB ON GRADE

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<tr>
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<td>3</td>
<td>5</td>
<td>6</td>
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<tr>
<td>Slab Edge: R-5</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Slab Edge: R-10 or Better</td>
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<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Slab Edge R-10 plus Under Slab-10 or Better</td>
<td>3</td>
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#### BELOW GRADE SLAB (Basement Slab)

<table>
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<tr>
<th>TYPE</th>
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#### FOUNDATION WALLS (Crawlspace)

<table>
<thead>
<tr>
<th>TYPE</th>
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<th>50%</th>
<th>75%</th>
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<tr>
<td>R-0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>R-2</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>R-11</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>R-19 or Better</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>9</td>
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</tbody>
</table>

#### FLOOR

(Only Available if No Ducts or HVAC Equipment are Located in Uninsulated Crawlspace Below Floor)

<table>
<thead>
<tr>
<th>TYPE</th>
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<th>50%</th>
<th>75%</th>
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<tr>
<td>Floor Over Crawl: R-0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>Floor Over Crawl: R-25</td>
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<tr>
<td>Floor Over Crawl: R-38</td>
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<td>7</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Shared Floor</td>
<td>4</td>
<td>8</td>
<td>11</td>
<td>15</td>
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</tbody>
</table>
SmartRegs Status

- Seven months since implementation
- More than 1,500 rental properties have signed up through EnergySmart.
- 505 properties have achieved compliance.
- Numbers indicate that the city has exceeded its first-year benchmarks for SmartRegs compliance.

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BetterBuildings Initiative

Objectives:

- Test innovative marketing tactics
- Help build a professional workforce to complete building upgrades
- Evaluate building improvement impacts
- Assist in providing cost-effective financing programs for building owners.

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BetterBuildings Goals

- Boulder, CO:
  - $12 million grant
  - Improve 10,000 homes and 3,000 businesses by May 2013
  - Stimulate economic growth and investment in energy efficiency in the state of Colorado

*Result of this funding is the EnergySmart Program*
EnergySmart Services

- Developed by the City of Boulder and Boulder County under BetterBuildings Grant
  - Provides a Home Energy Assessment for $120 (prescriptive checklist)
  - Free Energy Advisors
    - help make decisions on the most cost-effective energy efficiency measures;
    - direct installation of energy efficiency measures, CFL’s, low-flow showerheads, water heater pipe insulation, programmable thermostats, air sealing
    - Assistance with rebate paperwork and contractor selection

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BetterBuildings/EnergySmart Status

- Over 2,550 homes enrolled to date
- 58% of the total homes that have received energy advisor services have undertaken or scheduled a major energy upgrade.
Reasons for BA Involvement

- **SmartRegs**
  - Evaluate actual energy savings compared to the predicted savings.
  - Determine most effective and durable improvements for rentals in this climate.
  - Determine barriers to success and develop solutions.
  - Evaluate secondary effects: i.e., increased comfort and reduced occupancy turnover.
  - Analyze prescriptive checklist – alignment with HERS Index and effectiveness in influencing most beneficial upgrades.

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Reasons for BA Involvement

- BetterBuildings
  - Support program administrators
  - Assess training needs
  - Development of training materials
  - Evaluate success of program
  - Identify barriers to success
Training Needs

- Basic building science
- Diagnostic testing – blower door, duct blaster, CAZ
- Identification of insulation, mechanical systems, potential problems/hazards
Training Materials Needed

- Presentation slides and handouts
- Speakers Notes
- Train-the-Trainer Material
  - Classroom content
  - Hands-on field training
- Spanish versions of the above
Cold Climate Region: Case Study #3
City of Boulder, SmartRegs Ordinance
Single Family Detached, 1960’s Vintage

Boulder, CO

The southeastern section of Boulder, CO is an area well known for its small, ranch style homes very often used as rental property. This single family detached home is typical of homes built in the 1950’s and 1960’s in that section of Boulder. It is a 3 bedroom, 2 bathroom single-story house approximately 1,262 SF built over a crawl space foundation.

The property owner for this rental became involved in the SmartRegs process early on for a few reasons. First, her rental license was due for renewal, and she reasoned this was a good time to go through the process. Second, she was hoping to bring the property into compliance sooner rather than later in case the city made the requirements even stricter over time. Lastly, she is the editor of a newspaper in a nearby town and was interested in sharing her experience with her readers.

Efficiency levels in this property were consistent with the age of construction (see table at right). Although the owner is diligent about keeping the property in good condition and performing upgrades as components wear out, other than a couple of window replacements, few energy improvements appear to have been made to date.

This is not uncommon when the renters are responsible for the utility bills. There is little incentive for property owners to make the homes more efficient if they are not responsible for the energy costs. Owner occupants are more likely to insulate and air seal their homes than are rental property owners as it directly affects their comfort and monthly finances.

Energy Efficient Features

- Attic: R-11 batts
- Windows: Combination of double metal, low-e double wood
- Foundation: Crawl space ceiling R-19, 20% vent
- Heating: Forced air, natural gas, 80 AFUE in unconditioned crawl space
- Air Leakage: 16.4 ACH50 @50 pascals, 0.80 ACH

Additional SmartRegs Features

- Low-flow fixtures and shower heads

SmartRegs Checklist Score*: 62 points

HERS Index: 180

*100 points on the SmartRegs checklist should approximately equate to a HERS index of 120.

**Original score of 64 was adjusted for a volume correction; the result is a SmartRegs score of 62.

Utility Bill Analysis

Boulder, CO

SmartRegs requirements were adopted to meet the city’s sustainability objectives including environmental health, economic viability and social equity. According to current statistics, rental properties comprise approximately 50 percent of Boulder’s housing stock. Therefore, by requiring property owners to upgrade rental properties, the SmartRegs program aids in advancing Boulder’s community sustainability objectives, and will hopefully result in lower utility bills for tenants.

Predicted monthly utility bills for this property as of the time of the initial inspection are displayed in the graph to the right. REMRate predicts an annual utility bill of $3,862, about 57%, $1,044, is attributed to heating.

Utility bill savings for the first option package discussed on the previous page—encapsulating and conditioning the crawl space and insulating the attic and isolating the walls (HERS index of 144) —results in predicted energy savings of $446 per year.

The second option—encapsulating and conditioning the crawl space, insulating the attic and replacing the furnace and refrigerator (HERS index of 121)—results in predicted energy savings of $951 per year.

Predicted emissions reductions are significant as well. Both upgrade packages are predicted to reduce NOx, SO2, and CO2 emissions between 9% to 30%, with Package 1 resulting in the greatest savings.

To better analyze programs like SmartRegs, comparison to actual utility bills are critical. Unfortunately, obtaining utility bills from major providers has been and remains incredibly difficult, even with signed consent forms from homeowners or renters. While this is not necessarily a barrier to program implementation, it is a barrier to improving these programs and ensuring that the upgrades being recommended are effective from an energy reduction and cost-effectiveness standpoint. Removing this barrier is essential in meeting long term program goals.

*2011 SmartRegs Handbook, City of Boulder
Case Studies/Spot Audits

- 5 Studies conducted in June 2011
  - 4 single family detached, 1 multi-family
  - Full audit conducted
  - Comparison of results to auditor’s evaluation
  - Interviews with property owners
  - Evaluation of HERS Index with respect to SmartRegS prescriptive checklist
  - All results to be compiled in BA final report
## Case Study Results – As-Is

<table>
<thead>
<tr>
<th>Case Study #</th>
<th>Year Built</th>
<th>Type</th>
<th>SmartRegs Score(s)</th>
<th>HERS Index</th>
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<tr>
<td>#1</td>
<td>1960</td>
<td>Detached</td>
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<td>100</td>
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<tr>
<td>#2</td>
<td>1960</td>
<td>Detached</td>
<td>76</td>
<td>192</td>
</tr>
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<td>#3</td>
<td>1965</td>
<td>Detached</td>
<td>62</td>
<td>180</td>
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<td>#4</td>
<td>1911</td>
<td>Detached</td>
<td>87</td>
<td>155</td>
</tr>
<tr>
<td>#5</td>
<td>1966</td>
<td>Multi-family</td>
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<td>112-128</td>
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<td>114</td>
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<td>Detached</td>
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<tr>
<td>Case Study #5</td>
<td>1966</td>
<td>Multi-family</td>
<td>106-109</td>
<td>&lt;106</td>
</tr>
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</table>
Case Studies Results - Summary

- Good agreement between SmartRegs score and HERS Index
- General feeling that compliance wasn’t as hard as anticipated
- EnergySmart Advisor was seen as extremely beneficial
- Administrators making recommendations to Council for minor changes
- Additional training for auditors being offered
Barriers to Success

- Auditor experience
- Difficulty in getting utility bills for comparison to predictions
- Desire of homeowners to get several bids
- Lack of marketing tools/educational materials for property managers to present to owners
Keys to Success

- Energy Advisor Service
- Rebates & Incentives:
  - SmartRegs (City of Boulder) - $300/attached, $500/detached unit
  - EnergySmart - $250/home
  - Water Conservation, Utilities Division
  - State of Colorado Governor’s Energy Office
  - Xcel Energy
Ongoing Work

- Acquire utility bills for comparison to predicted values.
- Several more case studies.
- Follow up interviews to evaluate secondary effects:
  - increased comfort
  - reduced occupancy turnover
  - most effective and durable improvements in this climate and building type
Questions?
Thank You

- Department of Energy, Building America Program
- City of Boulder
- Populus, LLC
- Case study participants