Invest in Energy Efficiency?
Homeowner Decision Making and Major Energy Retrofits

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Today’s talk—what affects homeowners’ decisions during a “deep” home retrofit?

• What are “deep” home retrofits and why are they important?
• What did our project involve?
• What did we find?
• Why are the findings important?
What is a “deep” home retrofit?

A 40-50% energy savings, but not all about energy:

• “The Deep Energy retrofit - cost-effective, affordable, and serious…[reduces] home energy use by 50% or greater, dramatically improving energy performance, health and comfort for the present and future”

  —Energy Circle

• “A deep energy retrofit is really a modernization of the building envelope — it brings benefits in noise reduction, temperature stability, indoor air quality and durability — as well as saving energy”

  —Owner of a retrofitted home in MA
Why are “deep” home retrofits important?

• “Retrofitting existing homes has the potential to cut more than $21 billion a year annually in our energy cost. There are more than 100 million homes in America. In the last year, only 40,000 took advantage of the energy-saving retrofits. It’s not that homeowners don’t want to lower their energy bills; it’s just that they found that the process was too difficult, from accessing energy audits to finding skilled retrofit workers to simply being able to afford it”

--Vice-President Joe Biden (April 21, 2010)
Our work is associated with another research project

• To learn how to apply retrofit programs more broadly and encourage greater participation rates among homeowners, we examine:
  
  – What affects homeowners’ decisions?
    • What attracted them to the program?
    • What choices do they make?
  
  – What were their experiences?
    • With contractors
    • With the measures installed
    • With the retrofit process
  
  – What do homeowners recommend?
    • To homeowners, contractors, and utilities/government agencies
What’s involved in the associated “deep” home retrofit project?

- Multiple audits
  - Basic utility audit + detailed audit
- Blower-door test(s)
  - Envelope leakage
- Duct-blaster test
- Home Energy Rating System (HERS)—‘pre’ and ‘post’ retrofit
- Owens Corning Energy Bill analysis
- Post-retrofit measurements

Start: ~138  Prediction: ~83
...from the homeowners’ perspectives?

- **Decision to participate in the program**

- **Discoveries**
  - Air leakage, indoor air, insufficient insulation, wrong-sized HVAC...

- **Recommendations from experts**

- **Decisions about what measures to install or not**
  - Seal lighting/electrical penetrations, exterior doorways, and rim joists
  - Seal the duct system with liquid mastic
  - Increase attic insulation
  - Replace HVAC
  - Replace hot water heater
  - Replace incandescent lights with CFLs

- **Installation process**

- **Outcomes**
Deep retrofit project consisted of 11 houses of different ages and sizes

- 1 house owned by a historic preservation organization
- 1 house owned by a national park
- 19 to 109 years old
- 1800 sq. ft. to 4400 sq. ft.

Homes had to be old enough to need renovations

Homeowners had to be able to pay the sometimes significant costs of their retrofit
Why did homeowners participate in this project?

• Homeowners heard of project
  – Presentation at ORNL
  – Article in the *Knoxville News Sentinel*
  – Community presentations
  – Word-of-mouth

• Project fit with their goals
  – Planning renovations
  – Comfort issues
  – Value-based desires
Despite motivation, the level of retrofit activity varied widely

• 5 households installed all recommended measures either in total or with some variation
  – 1 homeowner went well beyond recommendations
    – But did not implement every recommendation

• 2 households installed some measures

• 4 households have done nothing to date

WHY?
Factors underlying homeowners’ choices

- Framing and alignment with other goals
- Information
- Access to unbiased expertise
Choices involve energy efficiency, but may not be framed as investments in energy efficiency.

- Some view retrofit from a financial perspective
  - “Our retrofit work is mainly for resale value of the house”
- BUT, others have a different frame
  - Prepare for retirement
  - Patriotic duty
  - Greener life
  - Comfort
  - Health
Personal values influence, but do not dictate decisions

• Values matter, but do not determine outcomes
  – “Dirt infiltrated the living space and affected air quality, so air sealing the crawl space was most important. The health of my family matters to me”
  – “I didn’t want to remove the siding. This is the original aluminum siding on one of the first houses to have it. I want to preserve the historical integrity of my house”

• The same value can lead to different outcomes
  – “It is the patriotic duty of all citizens to aim for zero energy use”
  – “The cost savings were good, but I want to live a greener life”
Why do homeowners’ perspectives matter?

• Enhance effectiveness of “deep” home retrofit initiatives
  – Most retrofit programs currently focus advertising primarily on energy savings
  – “[Advertising] initiatives should emphasize non-energy benefits—such as reduced greenhouse gas emissions and enhanced thermal comfort and indoor air quality—in addition to the long-term energy cost savings that result from energy improvements. Programs also should educate consumers about the performance advantage that whole-house retrofits offer as compared with single-measure or product-based solutions”
    --Marketing Recommendations, Home Performance Resource Center (March 2010)

• Identify other avenues for engaging homeowners
  – While renovating, why not

• Cautions against notion that information leads to action
Retrofit choices align with other goals

• Major home renovations shift homeowners’ thinking
  – The decision to retrofit is easier when energy-efficient changes are a marginal cost
    • “The retrofit costs were minimal in comparison to the total costs”
  – Common sense
    • “We had a giant hole in our roof. It only made sense to insulate the inaccessible space while the ceiling was removed”

• Comfort
  – One homeowner refused basement insulation since “it was the most comfortable room in the house,” but did extensive retrofits elsewhere

• Draftiness

• Indoor air quality

• Retain historic character of house
Information alone is insufficient to spur action

- Decision-making was sometimes negotiated
  - Close collaboration among contractors, building scientists, and homeowners

- Information provided did not always meet homeowners’ needs
  - Recommendations may suggest insulating the attic to R-50, but what type of insulation? And where should it go? And who should I hire?
  - “I would rather do nothing and know I’m wrong than invest a fortune and still be wrong”
Why does unbiased expertise matter?

• 100% of interviewed homeowners identified the importance of the unbiased expertise of a renowned professional in their decision process

• Outside this retrofit project, who plays the role of unbiased “retrofit expert”?

• Does the expert have to be a person/organization?
  – Would a website suffice?

• “Consumers do not have access to straightforward and reliable information on home energy retrofits that they need to make informed decisions”
  – *Recovery Through Retrofit*
Some (interim) thoughts on how to expand the reach of “deep” home retrofits

• Appeal to multiple motivations
  – Especially home renovations via the renovation market

• Cultivate credible sources of *unbiased* expertise and guidance

• Provide actionable information to homeowners
  – Audits are insufficient
  – Non-specific recommendations are insufficient

• Do not forget contractors…
Thank you.

Questions?

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