CRAKING THE CODE
Impact Evaluation Methods for
ARRA-Funded Energy Code Initiatives

IEPEC – Long Beach
August 2015
Presented by Jeff Perkins
AUTHORS

Michael Rovito,
ERS, North Andover, MA

Tim Pettit,
DNVGL, Washington, DC
BACKGROUND

- Under ARRA, the U.S. DOE allocated funding to State Energy Offices for activities to advance code adoption and/or enhance code compliance.
  - The funding was contingent upon the states adopting the most recent national model code (2009).

- The paper discusses the program impact evaluation overseen by the authors.

- The BIG picture is a Broad Programs And Categories (BPAC) review of energy savings, GHG reduction, job creation, and cost benefit.
EVALUATION CONSTRAINTS

- Limited budget
- No fieldwork
CODE ADVANCEMENT

- Resources to adopt a new code, included:
  - Technical advisors
  - Cost-benefit studies
  - Experts to customize state specific codes
  - Outreach to community-level code bodies
Resources to improve compliance and enforcement, included:

- “Best practice” studies
- Code manuals & equipment rental programs
- General building science training
- Code training for enforcers and the public
- Train-the-trainer programs
- Online webinars for code requirements
- Statewide code conferences
How to deal with scope and scale?
## States, Starting Points, Activities

<table>
<thead>
<tr>
<th>Programs</th>
<th>Residential</th>
<th>Commercial</th>
<th>Advancement</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>State 1</td>
<td>2000</td>
<td>2000</td>
<td>na</td>
<td>√</td>
</tr>
<tr>
<td>State 2</td>
<td>2006</td>
<td>2006</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>State 3</td>
<td>2003</td>
<td>2003</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>State 4</td>
<td>2000</td>
<td>2006</td>
<td>na</td>
<td>√</td>
</tr>
<tr>
<td>State 5</td>
<td>None</td>
<td>None</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>State 6</td>
<td>None</td>
<td>2000</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>State 7</td>
<td>2003</td>
<td>2006</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>
POSSIBLE APPROACHES

- Attributing Building Energy Code Savings; NEEP/IEE/IMT/Cadmus; Feb 2013
  - Direct Empirical
    - Modeling & billing analysis
    - Tons of field work & lots of money
POSSIBLE APPROACHES

- Attributing Building Energy Code Savings; NEEP/IEE/IMT/Cadmus; Feb 2013
  - Direct Empirical
    - Modeling & billing analysis
    - Tons of field work & lots of money
POSSIBLE APPROACHES

- Attributing Building Energy Code Savings; NEEP/IEE/IMT/Cadmus; Feb 2013
  - Direct Empirical
    - Modeling & billing analysis
    - Tons of field work & lots of money
  - Indirect Estimates
    - Challenging
    - Inexpensive, may be inaccurate
POSSIBLE APPROACHES

- Attributing Building Energy Code Savings; NEEP/IEE/IMT/Cadmus; Feb 2013
  - Direct Empirical
    - Modeling & billing analysis
    - Tons of field work & lots of money
  - Indirect Estimates
    - Challenging
    - Inexpensive, may be inaccurate

- Other Literature…
THE WISDOM OF CROWDS
THE WISDOM OF CROWDS

Human Judgement Aggregation*

* The Wisdom of Crowds: Methods of Human Judgement Aggregation
Aidan Lyon, Eric Pacuit; University of Maryland; July 2014
THE WISDOM OF CROWDS

Human Judgement Aggregation*

- You need a crowd
  - The right experts
  - Recruitment
- You need opinions
  - Surveys
  - Elicitation
- You need answers
  - Evaluation
  - Aggregation

* The Wisdom of Crowds: Methods of Human Judgement Aggregation
Aidan Lyon, Eric Pacuit; University of Maryland; July 2014
GETTING THE CROWD

- Target: Fifteen Experts Per State
  - Building associations
  - Industry/Trade groups
  - Interest groups
  - Code officials

- Recruitment
  - Direct outreach
  - Word of mouth
  - Friends of friends

- Nothing in Return
GETTING THE OPINIONS

- Delphi Method
  - Direct questions
  - Specific measures
  - 2 rounds
    - Managing bias
    - Absolute vs Delta

- Credibility...
GETTING THE ANSWERS

- Evaluation & Aggregation

- Expert Opinion Credibility Score
  - Consistency (internal/external)
  - Credentials, experience, perspective

- Tweaking Score & Store
  - Getting the WEC (weighted energy compliance)
  - PNNL process and algorithms were critical
  - Adjustments to the relative weights
Calculating Impacts

Attributing Building Energy Code Savings; NEEP/IEE/IMT/Cadmus; Feb 2013
WHAT IS THE FINAL ANSWER?

- Results still under embargo
- Due to be released in a matter of weeks

- Stay Tuned…
THANK YOU!

CONTACTS:

- **Jeff Perkins**
  Sr. Director Project Development
  jperkins@ers-inc.com
  +1-978-521-2550 x207

- **Jon Maxwell**
  Vice President
  jmaxwell@ers-inc.com
  +1-978-521-2550 x205

Download these slides at www.zondits.com