FINAL EXPERT MEETING REPORT

GTI PROJECT NUMBER 20970

Building America Industrialized Housing Partnership II

Subtask 1.8: Building America Expert Meeting

Report Issued:
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Meeting Overview

Title

Building America Program: Delivering Better, Cheaper, and Faster Retrofits through Stakeholder-focused Research

Who

Industry experts from Building America and energy efficiency programs including U.S. Department of Energy, national laboratories, Building America teams, electric and gas utilities, energy efficiency program contractors, and related organizations.

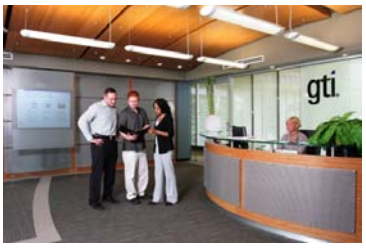
What

Building America forms research partnerships with all facets of the residential building industry to improve the quality and energy efficiency of homes. With its expanded focus on existing homes, Building America focuses on developing measures that will cost effectively reduce source energy use in existing homes in all major U.S. climate regions. Gas Technology Institute (GTI), on behalf of Florida Solar Energy Center (FSEC), engaged energy efficiency program stakeholders to identify opportunities that address key barriers to achieving large savings in existing homes, while identifying opportunities for collaboration.

When

November 16, 2010 (USGBC GREENBUILD begins the 17th in Chicago)

- 8:30 AM: Continental breakfast
- 9:00 AM – 3:00 PM: Expert Meeting including lunch
- 3:15 PM – 4:30 PM: Optional Gas Technology Institute laboratories tour
- Dinner hosted November 15th for interested attendees, roughly 10 attended



Where

The meeting was held at the Gas Technology Institute (GTI), 1700 S Mount Prospect Road Des Plaines, IL 60018. GTI is located on an 18-acre site near O'Hare International Airport, in the Chicago suburb of Des Plaines, Illinois. About half of GTI's 280,000-square-foot headquarters building is dedicated to modern laboratory and research facilities, including a wide range of specialized equipment for design, testing and analysis. Offices, training facilities and an extensive library occupy the remainder. Over twenty-eight specialized laboratory facilities on the GTI campus are used to develop and test advanced energy technologies.

Why

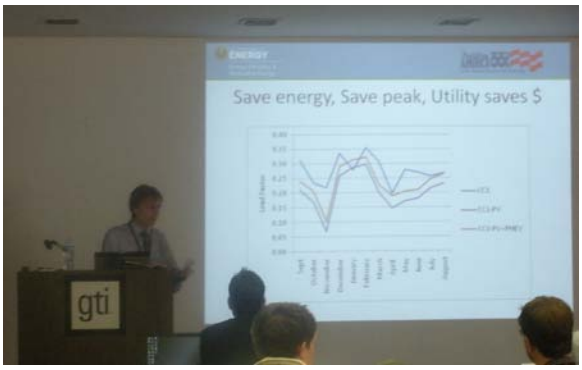
Building America's relationship with utility programs will become increasingly important with the increased focus on residential retrofit. As the BA program progressed, it targeted deeper new construction energy savings goals (e.g. 50% whole house energy savings (WHES)), generally leaving traditional utility new construction programs behind. Although still striving to maximize cost-effective energy savings, BA is entering a new era targeting more homes at more modest savings levels. In this environment, retrofit EE programs are in the sweet spot.

Simultaneously, as Building America begins earnest retrofit research, regulators and utilities across the country are targeting similar goals, more homes with more savings. Many regulators and utilities are in the formative stages of developing whole house programs, or augmenting existing programs to target better market penetration. As such, there is a real opportunity to help shape programs through technical and research support. Rate payer energy efficiency programs will be a critical driver toward meeting future BA retrofit community scale goals. Through better coordination, BA research can help utilities improve whole house programs, while helping BA meet, and exceed, program goals.

How

Expert Meetings are designed to be an interactive experience, where all participants contribute in substantive ways. To frame the day's activities GTI planned preliminary presentations representing the views of both building scientists and efficiency program stakeholders. Representatives from the U.S. DOE and National Renewable Energy Laboratory (NREL) provided a Building America overview including the new retrofit focus, multi-year goals, research scope, and expected 2011 activities. Val Jensen, ComEd's Vice President of Marketing and Environmental Programs, provided an overview of ComEd's large energy efficiency program portfolio, discussed how residential programs are selected, and outlined ComEd's efforts to deliver a comprehensive retrofit program. Finally, Jeff Christian presented a case study highlighting Oak Ridge National Laboratory's research with Tennessee Valley Authority to address both energy efficiency program and peak electricity demand.

After the morning presentations, participants discussed critical challenges and research opportunities in four breakout sessions. Each breakout group elected a presenter to highlight the critical findings of the group during a discussion with all the attendees.



Jeff Christian presenting TVA research

Attendees

Attendees	Organization
Annette Beitel	Future Energy Enterprises
Bill Liss	Gas Technology Institute
Bob Fegan	DTE Energy
Carter Dedolph	Wisconsin Energy Conservation Corp
Craig Savage	Building Media Inc
David Lee	U.S. Department of Energy
David Nestor	Piedmont Natural Gas
Denise Munoz	ComEd
Doug Kosar	Gas Technology Institute
Ed Carroll	Franklin Energy Services, LLC
Guenter Conzelmann	Argonne National Laboratory
Iain Walker	Lawrence Berkeley National Laboratory
Jack Laverty	Columbia Gas
Janet McIlvaine	Florida Solar Energy Center
Jason (J) West	Community and Economic Development Association of Cook County(CEDA)
Jay Wrobel	Midwest Energy Efficiency Alliance
Jeff Christian	Oak Ridge National Laboratory
Jim Jerozal	Nicor
John Hamilton	CEDA
Karen Sutherland	Florida Solar Energy Center
Kathryn Eggers	CNT Energy
Kevin Dick	Resource Solutions Group
Larry Brand	Gas Technology Institute
Lynne Martinez	ConSol
Merry Tondro	Gas Technology Institute
Mike Butkus	ComEd
Neil Leslie	Gas Technology Institute
Patrick Michalkiewicz	Peoples Gas
Peter Ludwig	CNT Energy
Ren Anderson	National Renewable Energy Laboratory
Rob Hammon	ConSol
Robbie Sears	Vectren
Ryan Kerr	Gas Technology Institute
Shaun Dentice	Resource Solutions Group
Stacey Rothgeb	National Renewable Energy Laboratory
Subrato Chandra	Pacific Northwest National Laboratory
Val Jensen	ComEd
Valerie Von Schramm	CPS Energy

Agenda

Summary

Time	Item	Presenter/Facilitator
8:30-9:00	Continental Breakfast	NA
9:00-9:10	Welcome	Bill Liss, Managing Director End Use Solutions, GTI
9:10-9:20	Meeting Overview and Objectives	Ryan Kerr, PARR Program Manager, GTI
9:20-9:30	Introductions	NA
9:30-10:00	U.S. Department of Energy Residential Buildings Program: Residential Retrofit Activities	David Lee, Residential Supervisor EERE Building Technologies Program, U.S. DOE
10:00-10:30	Building America Program: Existing Homes Research	Dr. Ren Anderson, Manager Residential Building Research Group, NREL
10:30-11:00	Residential Energy Efficiency Programs: Utility Perspective	Val Jensen, Vice President Marketing and Environmental Programs, ComEd
11:00-11:15	Coffee and Tea Break	
11:15-11:35	Research in Action: Building America and Tennessee Valley Authority partner to perform residential buildings research	Jeff Christian, Director Building Technologies Center, ORNL
11:35-11:40	Breakout Session Assignments	Ryan Kerr
11:40-1:00	Breakout Sessions A: Implementation Tools B: Health, Safety, and Liability Issues C: Measure Guidelines D: Data supporting retrofits	
1:00-1:30	Lunch	
1:30-2:45	Breakout Session Reports and Discussion	TBD
2:45-3:00	Closing Remarks and Next Steps	Ryan Kerr
3:15-4:30	Optional Laboratories Tour (Begins in Auditorium)	Larry Brand, R&D Manager, GTI

Welcome

Bill Liss, Managing Director End Use Solutions GTI, welcomed the group to Gas Technology Institute with a short presentation including an organizational overview focused on residential and commercial market end use activities. To view the presentation, please double click on the object below the Welcome – Bill Liss (GTI) heading in Appendix I: Meeting Presentations.

Meeting Overview and Objectives

Ryan Kerr, PARR Program Manager GTI, discussed the format for the day and outlined the meeting objectives.

Meeting Objectives:

- Review Building America's expanded focus on existing homes, including goals and context with other U.S. DOE programs
- Enhance Building America researchers' understanding of energy efficiency program structure and goals
- Identify key shared opportunities and barriers to retrofitting more homes, for more savings
- Characterize important research questions/projects
- Identify opportunities for collaboration, while defining role for Building America and EE programs

To view the presentation, please double click on the object below the Meeting Overview and Objectives – Ryan Kerr (GTI) heading in Appendix I: Meeting Presentations.

U.S. DOE Residential Retrofit Activities

Presenter Bio: David Lee is the Residential Supervisor for U.S. Department of Energy's Energy Efficiency and Renewable Energy Building Technologies Program. Mr. Lee oversees several programs including Building America and the Better Buildings grantees. David was formerly at the Environmental Protection Agency (EPA), serving as Director for the Residential Branch, overseeing the ENERGY STAR New and Existing Homes Program. Prior to this, David was the branch chief responsible for the regulatory program to phase out the use of ozone depleting chemicals at EPA. Over his career, he has worked in several policy offices within EPA, DOE, and the Department of Health and Human Services.

David Lee discussed the following issues and answered the following questions (paraphrased below):

- Presentation Title "Goals and Priorities: Building America Residential Integration Program"
- Retrofit 1.3 million homes by the end of 2013; provide research that demonstrates possibility to increase code stringency for new homes.
- These retrofits can be achieved through a range of platforms:
    - Better Building Grant Program
    - Better Buildings become self-sustaining
    - Home Performance with ENERGY STAR
    - Utility Programs
    - Private Sector – e.g. see large manufacturers below
- Electric Utilities – paying $3.5 billion annually toward efficiency programs; Gas Utilities – paying $1 billion annually toward efficiency programs. Although government funding may waiver, the utilities will remain, which makes them an excellent, stable funding source.
- Significant and growing interest from large manufacturers including Sears, Lowes, and Home Depot. The latter two have approached DOE about piloting an effort with the new home rating program.
- The Home Energy Score: a request by the US VP Biden that the DOE put together an inexpensive and reliable diagnostic tool for evaluating home energy. Technicians will

need to be certified to perform these audits. They're currently developing a number of pilots to establish the performance and quality of this tool across different regions in the US.

- Q: John Hamilton, CEDA - Why is it when people talk about making these cheaper, they always get rid of the blower door and the duct blaster?
- A: David Lee – We're talking simply about measuring the energy efficiency of the home. If the homeowner then decides to go ahead with retrofits, then these procedures are very important and should be done with the contractor.
- Q: Does the new rating system require access to the homeowner's utility data?
- A: David Lee - Does not require that the utility bill data be available. But this is the first version, I believe in later versions there will be a place for this.

David Lee discussing DOE activities

- Q: Annette Beitel, Futures Energy Consultant - I noticed that your list of action items does not include behavioral changes – any interest in that?
- A: David Lee - There is a lot of interest in behavioral studies. My personal feeling is that we probably already know enough. We have lots of knowledge of marketing, education, and so forth. However, as we become more sophisticated, we will need to follow up on some of this and stay current. There are projects underway regarding meter feedback and that's clearly important.
- Q: Jay Wrobel, MEEA – From DOE's standpoint, what are the top 3 barriers
- A: David Lee - 1. It's such a hassle; 2. They have so many competing concerns, they're barraged with so many marketing messages and they're not thinking about the long-term; 3. You have a disjointed sales force, window people, insulation contractors, HVAC contractors, which means that things are often done piecemeal. Plus it's often not in the contractor's interest to get too involved. Ex. A SEER 15 AC is installed, but the contractor won't touch the ducts.

To view the presentation, please double click on the object below the U.S. DOE Residential Retrofit Activities – David Lee (U.S. DOE) heading in Appendix I: Meeting Presentations.

Building America Existing Homes Research

Presenter Bio: Dr. Anderson currently leads the residential research group at the National Renewable Energy Laboratory (NREL), including the U.S. DOE's Building America Program. Dr. Anderson joined NREL in 1983 to develop methods to predict thermal transport in passive solar buildings.

Dr. Ren Anderson, Manager Residential Building Research Group NREL, discussed the following issues and answered the following questions (paraphrased below):

- Presentation Title "Technical Approach Overview: Building America Technology Pathways"

- Focus #1 - Solutions that can be implemented on a production, mass-market basis: cost effective, least cost, highest value solutions must be risk free, reliable, durable, and clearly understood energy savings and performance benefits.
- Focus #2 - Development of whole systems knowledge: clearly understood cost/performance trade-offs, identification and resolution of knowledge gaps, and a clear definition of the needs of a range of stakeholders, including contractors, utilities, realtors, etc.
- Focus #3 - Continuous evaluation and performance feedback: measures guidelines, measures database, accurate audit and analysis tools, and well-characterized test house and pilot community performance data.
- Ren noted the Building America website is an excellent source for this information as well as the education/training programs they offer. Additionally, NREL will be publishing the results of their analysis.
- There will be a spring stakeholder meeting, week of March 14th. Location TBD.
- Q: Annette Beitel– I noticed that regulators are not on your list of stakeholders
- A: We would be happy to be more involved in those processes. We are meant to be a source of analysis and information, but we would likely not testify as part of that process. David Lee – there is a sister DOE division that works with state energy offices on the development of a blueprint for state/local energy offices to put together EE programs. That would be the means through which the federal level would weigh in on these state issues. We're mostly in the "unbiased counsel" category.
- Q: Ed Carroll, Franklin Energy – Is part of your research to put together program models that utilities could use?
- A: Absolutely, least-cost solutions are fundamental to our approach. A classic example, the emphasis on the electric side on plug load reduction has a side effect on space heating load. Wouldn't it be great if you could have a combined program that built some gas efficiency into the program, so you would get reduction across both loads? One of our areas of research is identifying the source of the cost. Is it scalability? Risk? Perceived risk?
- Comment: Rob Hammon, ConSol - Val and I spoke and we agree that the potential savings of these EE programs could be higher if we stuck to KW and not KWH for savings.

To view the presentation, please double click on the object below the Building America Existing Homes Research – Dr. Ren Anderson (NREL) heading in Appendix I: Meeting Presentations.

Residential Energy Efficiency Programs

Presenter Bio: Val Jensen is Vice President of Marketing and Environmental Programs for ComEd. He oversees a variety of marketing and environmental initiatives including the utility's energy efficiency portfolio, which is designed to place Illinois second only to California in the amount of energy saved through voluntary customer reductions. Mr. Jensen joined ComEd after eight years at ICF Consulting, where he served as senior vice president. Previously, he worked for the U.S. Department of Energy and was responsible for the overall management of close to $100 million in grants and contracts to organizations involved in technology development and deployment.

Val Jensen discussed the following issues and answered the following questions (paraphrased below):

- Presentation Title "The Arithmetic of Utility Energy Efficiency Programs"
- Context: A utility's EE portfolio will tell you a lot about what that portfolio looks like: Resource plan drive? Portfolio standard – cost caps? Competitive market or not? Integrated utility or not? Cost recovery structure? Single or dual-fuel? Because ComEd is a "wires only" company, their motivation is different from other utilities that may own generation.
- Conviction of vision vs. the arithmetic of the business
- Objectives are wide-ranging: achieve savings targets, catalyze transformation (build awareness and demand, build the sell-side). Constraints include total cost and risk, amongst others.
- If savings targets are set on an annual basis, the largest share of the portfolio is represented by the programs with the lowest first-year costs.
- The first year is critical for the numbers, lower makes things easier, larger makes things harder.
- A utility needs to spend twice in revenue what it has to hit in savings target. This seems pretty average across the country.
- The relative value of a program to the portfolio is a function of its scalability.
- Val included a few sample slides of a recent portfolio rate case.
- One of the key drivers for why ComEd stays away from whole-house retrofits is that, on average, retrofits can take about 200kWh out of a home, but by comparison about 800kWh can be taken out of a home by removing a second, inefficient refrigerator. Additionally, the retrofit requires more work and is more difficult to scale.
- One-on-one conversations are not cost-effective. So if I have to send a person to a house, then I immediately lose interest. It's too expensive.
- "How this looks to me"
    - Hard to Sell
        - Long sales cycle
        - Multiple opportunities to lose a customer
        - Complicated value proposition
    - Many moving parts
- What can building science do? Building science is already far ahead of delivery science. Knowing more about how many kwh/therms can be extracted from a home is not the issue. We need to understand scalability. Find more kwh/therms per dollar.
- Q: Does peak reduction play into your plan?
- A: Val Jensen – Yes, we're focused on peak reductions that are associated with efficiency.
- Q: Doug Kosar, GTI – What do you have to do currently for verification?
- A: Val – Once AMI systems roll out, verification will be critical. We have a third party evaluator that determines our regulatory compliance for this.
- Q: Patrick Michalkiewicz, Peoples Gas - In terms of the value chain, you said you don't care about the cost of constructing new plants. But they have to pass that along, don't they?
- A: Yes, but from a business perspective, it's not a key concern for planning.

- Q: Shaun Dentice, RSG - Do you feel a performance-based earning mechanism would have an impact of EE portfolios?
- A: As you can imagine, that's a big deal for us. We have spending caps, and we will hit it next year. There's a potential for us to be interested in raising the spending caps. For a 4 year period, we'll lose $40-50 million as a result of these programs.

To view the presentation, please double click on the object below the Residential Energy Efficiency Programs – Val Jensen (ComEd) heading in Appendix I: Meeting Presentations.

Research in Action: ORNL and TVA

Presenter Bio: Jeff Christian is a researcher at the Building Technologies Research and Integration Center at the ORNL. Jeff's 36 years at ORNL span zero energy residential and commercial buildings; advanced appliances; cooling, heating and solar power integrated systems; and whole building design and performance. He has written more than 140 technical publications in the area of building energy efficiency. He established a residential research park near ORNL in 1999, which now has 9 test houses.

Jeff Christian discussed the following issues and answered the following questions (paraphrased below):

- Presentation Title "TVA/DOE Building American Retrofit Research Houses with Transforming Impacts", Utility-Focused Research
- Target: 1. Inform TVA's residential retrofit incentive program to help attain 1,400 MW of peak power savings by 2010. 2. Accelerate Coal Plant Layups, 4,730 MW by 2015. 3. Delay need for new nuclear power, 2,018 by 2022.
- TVA directed residential research collaboration with ORNL: Past projects - 10 Habitat for Humanity research homes (3 months – 1 year unoccupied, and 1-3 years occupied). Present projects – three TVA simulated occupancy Campbell Creek research homes and 10 deep occupied retrofits. Future projects – 50% occupied retrofits.
- First year; sealed and insulated attic with single stage two zoned heat pump system.
- TVA three research houses; 1.5 years of detailed measurements collected. This slide includes the specs for the builder house and the retrofit house.
- Includes multiple slides on lessons learned and research findings.
- Evaluations and inspections up almost 400% from last year.
- Q: Iain Walker LBL - Are TVA's rates tiered at all?
- A: At this point, they aren't. They're very modest, nearly flat. But TVA has been saying for a long time that they might tier them.

To view the presentation, please double click on the object below the Research in Action: ORNL and TVA – Jeff Christian (ORNL) heading in Appendix I: Meeting Presentations.

Breakout Sessions

Before the meeting, GTI asked the attendees to address the most pertinent and timely technical issues related to whole house retrofits by selecting topics from the RSVP form (see Appendix II: Meeting RSVP Form). The top four vote getters represented the breakout session groups. During his meeting overview presentation, Mr. Kerr asked the attendees to self select into breakout sessions. After the morning presentations, each group was asked to follow this outline:

Implementation tools breakout session

- *10 minutes:* Discuss and agree on topic
- *20 minutes:* Brainstorm mutual gaps and barriers
- *15 minutes:* List research needs/opportunities
- *30 minutes:* Vote on research needs/opportunities
    - Describe top 3 projects
    - Identify role for BA researchers and energy efficiency programs/utilities

The outcomes from each session are presented below.

Group A: Implementation Tools

Basic description:

- Audit/assessments (including simulation software)
- Contractor work orders
- Consumer information (energy, non-energy benefits)

Facilitator: Annette Beitel, Future Energy Enterprises

Participants: Lynne Martinez/ConSol, Bob Fegan /DTE, Robbie Sears/Vectren, Jack Laverty/Columbia Gas, Valerie von Schramm/CPS Energy, Katherine Eggers/CNT Energy, Ren Anderson/NREL, Craig Savage/Building Media).

- Priority Project Ideas
    - 1. *Audit Tools* – tools currently on the market over-predict the savings, which can lead to customer dissatisfaction. We need tools that are **usable**, **predictive**, and allow for comparisons from house-to-house. Energy Trust of Oregon studied a number of current tools, not sure if those results have been released yet. There are some current attempts to address these short falls. It would be great if there was one national standard or tool, but it will need to be in the public domain not proprietary.
    - 2. *Blower Door Substitute* – These tests are being done pre- and post-retrofit, which adds cost and customer touches. Why can't we come up with a simple, diagnostic tool that can measure air leakage in a home?

- 3. *Leaking Ducts* – Simplify when to address ducts and what to do about poorly installed ducts. Even with a high-performing mechanical, a poor duct system can reduce the efficiency of this system. Participants are seeing many examples of poorly installed ducts. Columbia Gas reported that sealing ducts in a conditioned space only led to 2% improvement in the ducts (though it should be noted that this was within the error range, so it was not statistically strong enough to demonstrate a relationship between the sealing of the ducts and improved performance).
- 4. *Customer Communication/Market Education* – How do we get customers to see value? Some participants are saying that contractors were having to go out 5-6 times even to high-income, highly-motivated, and green customers before they were willing to sign on to the retrofits. This does not bode well for broader retrofit programs.
- *Other, non-priority project ideas* - Cracked heat exchangers (in the low-income programs, 50% of the furnaces they see have cracked heat exchangers, it's not clear if this is a H&S risk, but in the absence of info, they're replacing the costly mechanics), combustion appliances safety testing (Should CAZ standard be modified to be less stringent – spillage alarms? How best to deal with CAZ? Failed CO tests don't necessarily mean that they will be fixed, one participant said they simply placed CO monitors to try to mitigate the legal risk).
- Discussion with group during reporting:
  - Q: Rob Hammon – Our experience in new construction is that the models can predict pretty well the savings. How much do you think the over prediction is due to operational schedules by the homeowner? And how much is due to poor computations?
  - A: Dr. Ren Anderson – We think it's both. It's a function of input errors, occupant model assumptions not tracking with actual behavior, and it's a function of modeling errors.
  - Q: Iain Walker - What's the concept for replacing blower door testing? Nothing's as easy and as fast as doing a blower door test. How much improvement can we realistically expect?
  - A: Annette Beitel - I think the $125/test is impacting the overall cost of the audit. I think it's more of a cost issue than a time issue.
  - Comment: Jeff Christian – The key question is, is it something that we could simplify it to an extent that the homeowner could do? That would eliminate the trip, which would be a huge expense savings. That seems the best next step.

Group B: Health, Safety, and Liability Issues

Basic description:

- What are principal technical risks affecting programs (e.g. asbestos, lead, moisture)?
- Codes, standards, and mitigation guidelines
  - Availability
  - Sufficiency, completeness, appropriateness
- How to best address as part of implementation process

Facilitator: Doug Kosar, GTI

Participants: Mike Butkus/ComEd, Kevin Dick/RSG, Jason West/CEDA, Subrato Chandra/PNNL

- Retrofit Screening
  - Demographics (income levels)
  - Mold presence
  - Water Damage (roofs, roofs vs. basements, active water intrusion)
  - CO Levels (threshold?)
  - Radon gas leaks
  - Structural Faults
  - Lifestyle (medical conditions, set points → T * RH)
  - Lead paint (EPA)
  - Asbestos (do not disturb?)
  - Knob and Tube Wiring
  - Accessibility to execute retrofit (attic storage)
- Retrofit Process
  - Fixed $ per house (city vs. rural)
  - Envelope
    - Lead abatement (windows, doors, porches → homeowner exposure)
    - Worker exposure (blown in insulation) NIOSH approved mask
    - ACUTE and long-term exposures
  - HVAC
    - Code/Standard venting (intake, exhaust, back draft)
    - Blower door test (upon completion)
    - HDL test
    - Consensus thresholds
    - Mechanical ventilation
- Post Retrofit
  - Homeowners education regarding tight home operation
  - Maintenance requirements for higher efficiency equipment
  - Mismatches with HVAC under lower load envelope retrofit
  - Moisture problems (misuse of humidifier)
  - Air quality indicators
- Priority Project Ideas
  - 1. *Long-Term Case Study for Sick Building Syndrome (SBS)* – We'd like to see some of these weatherization houses where people are getting sick to see what's really going on and why people are really getting sick, rather than simply postulating. Comment Doug Kosar - ASHRAE updated standard 62 to reduce the amount of air taken into a building in response to the energy crisis back in the 70s and 80s. Are we setting ourselves up for issues with these long-term retrofit programs? How far can we go before we're setting ourselves up for these issues again?
  - 2. *Screening Criteria Documentation* – Initial screening is key. H&S issues need to be identified immediately. Nationally recognized document that gives specific screening criteria. Comment Ryan Kerr – A good point was brought up in breakout- most if not all houses have mold, but at what degree is it a "problem"? How much is too much?

- 3. *Homeowner Feedback Measure Evaluation/Verification* – Gain feedback from homeowners not only on the H&S of the home post-retrofit, but also their broader experiences with the retrofit. Comment Doug Kosar – There is common ground with the first group's ideas, we want a mechanism for getting feedback from the customer base and how homeowners' feedback may be affecting the penetration of the programs. Comment Jeff Christian – We should differentiate between sick houses and people who are chemically sensitive and happen to be responding to normal levels of chemicals in their homes. He's not sure how we would be able to separate these groups, but it's still something worth considering. Comment Peter Ludwig - At CNT we're involved in a number of on-going studies, to do occupant interviews and air testing pre and post retrofit. We're also doing a study on the health of some people that have moved from less-healthy housing to more-healthy housing. Comment Jay Wrobel MEEA – One of the big drivers here is comfort, a way to quantify the comfort gain would be a huge selling point in sales take-off.
- 4. *Case studies of cost effectiveness*
- *Other, non-priority project ideas* - Air sealing effect on radon, metric development (mold presence, etc.), air sealing training, HVAC contractors (certification, sizing and system performance), and expanding foam (PELs for workers, off-gassing in homes).

Group C: Measure Guidelines

Basic description:

- Technology and design guidelines: measure definition, availability, contractor acceptance, installation protocols
  - Key measures, measure attributes, stakeholders to consider

Facilitator: Larry Brand, GTI

Participants: David Lee/DOE, Jay Wrobel/MEEA, Carter Dedolph/WECC, Janet McIlvaine/FSEC, Iain Walker/LBL, Peter Ludwig/CNT Energy, Stacey Rothgeb/NREL, John Hamilton/CEDA

- Better, Cheaper, Faster Retrofits
- Priority Project Ideas
  - 1. *Gap - Barrier to information, services, and financing.* Need – "Builder option packages" for retrofit from ENERGY STAR for new homes program.
  - Q: Lynne Martinez - Were you discussing lack of options? Or because we're in a difficult financing environment given today's circumstances?
  - A: Peter Ludwig - It's hard for the average consumer to know what's available to them or where to find it. The issue of knowing where to go and making it easy for people. Larry Brand – If you want a bank to finance your whole home retrofit, what documentation do you need to bring to adequately make the case to the bank.
  - 2. *Gap – Lack of understanding of the benefits.* Some standard of showing the benefits of the different technologies. Need – Data on benefits of air sealing vs. other measures.
  - 3. *Gap – No sales force for whole building measures*. Associated with different messages from different organizations. The confusion from what their utility is

saying, vs. what your contractor is saying, vs. what your auditor is saying. Need – training of utility/contractor participating in this market.

Lunch and networking before breakout reporting

- *Other, non-priority project ideas* – Occupants are not a high priority, Hassle reduction, minimal resale value when compared to other amenity updates, and development of a market transformation model (iPhone, Prius, "Bling"), code and code enforcement (inc. local codes), utility programs and whole-building performance, no market for some retrofits, need for data on the benefit of air sealing, contractor training, good/better/best packages from a DOE-type 'brand,' language standardization between auditor and contractor, impact of measures and the development of a technical resource manual, educate the PUCs about the costs/benefits, and connectivity issues (it was brought up that Google is rumored to be entering the power reporting business, they could monitor and report electric energy consumption per household in 15 min increments).

Group D: Data Supporting Retrofits

Basic description:

- Data type
  - Energy use (e.g. whole house, monthly data)
  - Cost (e.g. audits, measures)
- Data analysis goals
- Analysis methodologies
  - Protecting privacy
  - Statistical strategies

Facilitator: Dr. Rob Hammon, ConSol

Participants: Denise Munoz/ComEd, Shaun Dentice/RSG, Jeff Christian/ORNL, Karen Sutherland/FSEC, Guenter Conzelmann/Argonne, David Nestor/Piedmont

- The group was unable to narrow their list down to three priority projects.
- Who drives data collection and analysis? Utility, consumer, and financial are the big three.
- What are the data gaps/barriers?
  - For the utility: kW, kWh, therms, house characteristics, end user info, and risk reduction

    - For the consumer: cash flow, cost, appraisal – value proposition (MLS), safety & health. What the neighbor is doing is also a driver. It can go viral with neighbors sharing their knowledge and experiences, and thus reduce the number of touch points needed by contractors.
    - For the financial: cash flow - savings, costs, LCC, appraisal, risk reduction. Comment: Jeff Christian – has seen examples of certified green homes selling 4-5 months faster and for $30-40k more than other homes. Comment: Dr. Rob Hammon – there also needs to be training for home appraisers, so they know what to look for in EE upgrades and retrofits and know how to value it appropriately.
- Kinds of Data: Story behind data, improved quality of data, must be suitable for collection and analysis techniques. Key questions include: how do we collect this? Who is responsible for managing it? How do we plan to use this? What privacy issues are at play?
- How do we get certain data: EM&V data for modeling, pre vs. post performance, house characteristics, costs of retrofit, method of financing, utility storage of data (2 years). Specifically data for house leakage, duct leakage, census data (GIS), low income (free audit) vs. paying consumer.
- Uses of Data: Helps to gauge customer satisfaction (comfort, investment, timescale, timeliness of retrofit, etc.), basis for justifying financing, real time data, argument to sell consumer (KISS → needs to have financial impact), db for labeling, how to get customers to care (green label – faster resale?), standardization of labeling, consumers entering their own data (how valuable is this option?)
- Development of neighborhood averages: how do we get the data? Do we aggregate it by neighborhoods? Blocks? Individual homes? What specific data are needed (Btu, $, carbon, etc.).
- NSP Program: Value of pre vs. post? Audit data – unverified. Whole house retrofit vs. replacement – homeowner as customer, who administers the program, who did/did not participate, survey data biased?
- Priority Project Ideas – Primarily Data Collection Driven
    - 1. Utilities need:
        - Case studies, including surveys from consumers (temporally later, so that the consumers have adjusted to living with the benefits upgrades for a little while, not just remembering hassle with contractor in home)
        - Billing analyses
        - Improved knowledge of consumer savings
    - 2. Consumers/Financial Institutions need:
        - Surveys of customer satisfaction
        - Bill analyses
        - Case studies regarding regional studies and the issue of neighbor influence
        - Costs/financing that lead to a better understanding of cash flow (this is more desirable than payback, which with deep retrofits can often look dismal to a consumer).
        - Feedback to homeowners – contractors/auditors rarely go back, tend to only track rebate-supported improvements
        - We should be striving for sustainable retrofits → sell good packages and educate the consumer on how to make it cost-effective.

- Comment: Jeff Christian – There was a feeling that we want to do this on a standardized, national basis to promote clarity and understanding. You could also compare information even across zip code slots. Comment: Doug Kosar – We've heard from your group about the value of EE in a house selling faster, but what about the flip-side of property taxes? If renewable energy or EE upgrades were tax exempt then it could add another financial incentive to making the retrofits.

Conclusions

- Q: Rob Hammon - What happens next with the results?
- A: Ryan Kerr – We're going to put all this information into a report, along with the contacts, and we will send out the presentations to those who would like them. There is also the opportunity to include what we've discussed today in our 2011 research plans. Building America's increased focus on existing homes means many energy efficiency programs are now closely aligned with the Building America's goals. Our respective stakeholder groups have complementary skill sets and resources, which if leveraged, can bare mutually beneficial fruit… Additionally, a carry-on meeting with regulators is a definite possibility.

Meeting Aftermath and Next Steps

The feedback from meeting participants was decidedly positive. The meeting turnout was impressive, with great and diversified representation from the two key stakeholder groups. There have been several positive steps since the meeting. GTI has been discussing its 2011 research scope with several meeting participants, continuing conversations which began at the expert meeting. GTI, through PARR and BA-PIRC, is using the information gained from this meeting to shape its 2011 draft research plan.

Research topics identified during expert meeting and under consideration for 2011 research include:

- Enhanced audit and assessment tools; (1) streamlined and standardized audit documents and work orders, and (2) better calibrated energy simulation tools
- Ducts, research toward standardized guidance for what to do and when (e.g. when in conditioned space, when replacing furnace)
- Furnaces, general research including what to do with cracked heat exchangers (safety hazard or not?)
- Improved retrofit risk screening criteria document (conditions assessment form)
- Energy use data for individual measures and packages for multiple stakeholders (e.g. regulators, consumers, utilities). This research is ideal for coordination with energy efficiency programs.
- A meeting with utility regulators to address barriers to whole house programs and policies which can promote comprehensive programs. There may be the opportunity to provide technical support to regulatory community through research dissemination (e.g. community scale projects)

Acknowledgments

On behalf of FSEC, we would like to thank all the attendees for their participation in the meeting, especially our speakers and facilitators. We also want to thank the National Energy Technology Laboratory, NREL, and U.S. DOE for support and input.

Appendix I: Meeting Presentations

Please note that PDF version of report does not contain embedded PDF presentations, only WORD version. For presentations, please email Ryan Kerr (ryan.kerr@gastechnology.org)

Welcome – Bill Liss (GTI)

GTI Overview

William E. Liss
Managing Director
End Use Solutions

gti

Meeting Overview and Objectives – Ryan Kerr (GTI)

Building AMERICA
U.S. Department of Energy

Delivering Better, Cheaper, and Faster Retrofits through Stakeholder-focused Research

Expert Meeting
November 16, 2010
9 AM – 3 PM

Gas Technology Institute I 1700 S Mount Prospect Lane I Des Plaines, IL 60018

gti

U.S. DOE Residential Retrofit Activities – David Lee (U.S. DOE)

Goals and Priorities

Building America
Residential Integration Program

Building America Existing Homes Research – Dr. Ren Anderson (NREL)

Residential Energy Efficiency Programs – Val Jensen (ComEd)

ComEd
An Exelon Company

November 16, 2010

The Arithmetic of Utility Energy Efficiency Programs

Building America Residential Retrofit Roadmap Meeting

| CONFIDENTIAL |

Research in Action: ORNL and TVA – Jeff Christian (ORNL)

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy
Building America U.S. Department of Energy

TVA/DOE Building America Retrofit Research Houses with Transforming Impacts

Utility Focused Research
November 16, 2010

Jeff Christian
Oak Ridge National Laboratory

Appendix II: Meeting RSVP Form

Building America Expert Meeting
RSVP Form

Building America Residential Retrofit Roadmap: Delivering Better, Cheaper, and Faster Retrofits through Stakeholder-focused Research

Name:

Organization:

Role (Title, brief description):

I plan to attend Expert Meeting?

I plan to attend no-host dinner?

I plan to attend labs tour?

Topic Areas for Discussion:

Please rate the following topics 0 – 5. 5 = Highly Important; 0 = Unrelated or Unimportant

	Health, safety, and financial risks: techniques for cost-effective identification, mitigation (e.g. post-retrofit mold issues)
	Technology and design guidelines: measure definition, availability, contractor acceptance, installation protocols, availability, costs…
	Strategies for moving from single to multi-measure or comprehensive programs
	Implementation infrastructure costs: training, QC, contractor aggregation
	Poor consistency: diagnostic tests, work orders, measure installation, costs, certifications
	Robust data supporting energy savings for measures (e.g. duct repair), measure packages
	Unsophisticated distribution: models using 'general contractors', turnkey programs, etc
	Multi-family specific audit, design, and technology solutions
	Co-delivered programs: techniques for partnering with gas or electric utility
	Energy simulation software tools: do we use them, do we need them, and do they work?
	Understanding homeowner decision-making, what will encourage participation?
Fill in the blank: please enter topic areas of most interest to you and your organization below	

To RSVP, please return this form to Ryan Kerr at Ryan.Kerr@gastechnology.org

For questions, comments, and to RSVP please contact:
Ryan Kerr * Gas Technology Institute * ryan.kerr@gastechnology.org * 847.768.0941