Residential Building Integration Program An Overview of RBI



ENERGY Energy Efficiency & Renewable Energy

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RBI Program Overview - Agenda

1. Introduction to RBI

- Context within the BTO Ecosystem
- Potential Opportunities of Residential Building Energy Efficiency

2. Program Overview

- Building America Research-to-Market Plan
- Better Buildings Residential Program Overview
- 3. Historical Budget Information
- 4. RBI Program Logic Model
- 5. Program Goals Overview



Introduction to RBI





Potential Opportunities of Residential Building Energy Efficiency

Residential Energy (Single Family, All Regions)



Efficiency Scenario



*Energy Savings %

"Other" dominates in the future: Small electric devices, heating elements, outdoor grills, exterior lights, pool/spa heaters, etc.

Best available does not consider cost ET 2020 includes cost effectiveness



Program Strategy Overview





Building America Target Challenges



Building America Research-to-Market Plan

The Building America strategy focuses on developing and demonstrating solutions to the following three critical technology challenges, and on improving the ability of the housing market infrastructure to adopt these innovations:

- High-Performance, Moisture-Managed Envelope Solutions.
- Optimal Comfort Systems for Low-Load Homes.
- Optimal Ventilation and Indoor Air Quality (IAQ) Solutions.

Current FOA Projects

- Gas Technology Institute
- Home Innovation Research Labs
- IBACOS
- The Levy Partnership, Inc.
- University of Central Florida



Building America Technology-to-Market Roadmap High Performance Moisture Managed Envelope Solutions

A. High-Performance, Moisture-Managed Envelope Solutions





Building America Technology-to-Market Roadmap Optimal Comfort Systems for Low-Load Homes

B. Optimal Comfort Systems for Low-Load Homes



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C. Optimal Ventilation and IAQ Solutions





RBI Program Tools and Resources









Guidelines for Building Science Education

November 2015

CE Metzger P Huelman S Rashkin



Better Buildings Residential for Existing Homes





Historical Program Budget

2014	2015	2016	2017
\$21,722,460	\$21,283,240	\$20,637,000	\$19,652,000

Funding Opportunities:

> Building America Partnerships for High Performance Housing Innovation - \$5.5M

Major Performers

Project Size

National Labs	Support Contractors	Performer	Range/Average
NREL	Catalyst	National Laboratories	\$280,000 - \$2,100,000
LBNL	Allegheny Science and Technology	2015 FOA Awardees	\$600,000 - \$1,000,000
ORNL	Newport Partners	Support Contractors	\$700,000
PNNL	Elevate Energy		



The Residential Integration Program accelerates energy improvements in existing and new residential buildings by reducing technical and market barriers to spur investment and achieve high performance homes.

External Influences: DOE budget, Construction industry, Energy prices, Real estate market, Market incentives, State/local policies, Regulation

Dec. 2015

Objectives	Activities / Partners	Outputs	Short Term Outcome	Mid-Term Outcome	Long Term Outcome
Demonstrate & Comp integrate energy efficient technologies & nat practices in representative homes Reso nation & ser	Competitive R&D funding focused on demo, testing & validation by Building America & national lab researchers in field homes	Space conditioning, water heating & IAQ focused Building America upgrade packages & techniques for existing & new homes across climates	Innovator building professionals equipped with validated energy saving solutions for integrating highly energy efficient tech or practices	Leading building professionals improve or construct high performance homes above model energy codes	The building industry regularly constructs high performance homes that are ready for renewable
	Resources development with national labs for building prof. & service providers	Guidance for energy savings beyond recent building energy codes & industry standards for stakeholders	Industry standard orgs. & voluntary programs equipped with validated technical specs & guidelines to make homes highly efficientIndustry standard orgs ado technical specs to accelerate new tech & practices in building energy codesEnergy efficiency programs & building urgrams & buildingEnergy efficiency & foster markets that value energy efficiency	Industry standard orgs adopt technical specs to accelerate new tech & practices in building energy	
Prove energy saving solutions & programmatic designs on a national scale with market partnersSupport business model demo to upgrade or construct high perf. homes with market partners across climatesOutreach to stakeholders on a national scale to increase adoption of energy efficiency solutions in common transactions.Outreach to stakeholders on a national scale to increase adoption of energy efficiency solutions in common transactions.Accelerate market adoption by increasing understanding of effective energy saving solutionsTool development & demo of the value of energy efficiency in the market with market partnersEducational support to promote quality workforceEducational support to promote quality workforce	Support business model demo to upgrade or construct high perf. homes with market	Best practice online Better Buildings & Buildings America Solution Centers		or significantly improves the energy efficiency	
	partners across climates Outreach to stakeholders on a national scale to increase	Demonstrated home upgrades & new construction in HPwES & ZER Homes		energy efficiency & foster markets that value energy efficiency	of existing homes across climates.
	Peer sharing via Better Building Residential Network	professionals have access to resources & model business practices to increase scale of energy	Building professionals install proven energy saving solutions in the broader	Homeowners are motivated to invest in more	
	Tool development & demo of the value of energy efficiency in the market with market	adoption of low cost home upgrade improvements	Wide array of industry stakeholders & building professionals aware of strategies to increase energy efficiency	Industry stakeholders widely promote value of energy efficiency in products, services, & typical market transactions with homeowners	energy efficient homes spurred by increased value in the residential market.
	Educational support to promote quality workforce	Home Energy Score tool Building science curriculum, student competitions & workforce development			
40% savings in existing homes demo'd 60% savings in new homes demo'd 10% savings thru individual measuresProved in 1 million existing homes & 50K ZFR new homesMarket Partnerships reach 90% of homes 5% savings thru individual measures with partnersReduce the energy used for space conditioning & water heating in single family homes by 40% by 2025 from 2010 levelsReduce 2020					Reduce avg. EUI in all bldgs. 30% by 2030

Residential Buildings Integration Program Logic Model

OBJECTIVE	ACTIVITIES	KEY OUTPUT	SHORT-TERM OUTCOME	MID-TERM OUTCOME	LONG-TERM OUTCOME
Demo tech & solutions	Demo, test, & validate energy efficient practices in field homes	Tech integration solutions Industry guidance	Industry- validated solutions	Solutions standard in industry	New &
Prove savings at scale	Develop tools & resources Demo program business models	Solution centers and forums Home upgrades & new construction	Proven savings & reduced program cost	Increased market demand	existing homes highly energy efficient on
Accelerate market adoption	National outreach Develop tools that value efficiency	Widespread staged upgrades Energy assessment tool	Industry aware of efficiency value & strategies	Widesprea d adoption of efficiency strategies	scale
	workforce	competitions	• DOE Budget • Construction Inc • Market Incentive	RNAL INFLUE • Legislati lustry • Energy F • Real Esta	ONCES on / Regulation Prices ate Market

• Real Estate Market



2020 **Program Performance**

Interim Outcome

2030

U.S. DEPARTMENT OF

NERGY

Market Outcome Energy Efficiency & **Renewable Energy**

By 2025, reduce the energy used per sq. ft. for space conditioning and water heating in single-family homes by 40% from 2010 levels.

- Connections Between Interim Goal and Program Strategy
 - RBI is focused on addressing the market segments with the greatest energy savings potential that are not being addressed by other government or market based programs.
- Current Status
 - EIA's most recent estimate of EUI in the residential sector for space heating & cooling and water heating in 2014 was: 54 kBtu per sq. ft. which is about 4% lower than the EUI for these end uses in 2010.



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RBI's Program Performance Goal: Demonstrate Cost-Effective Deep Energy Savings

By 2020, develop cost-effective technologies and practices that can reduce the energy use intensity of new single family homes by at least 60% and existing single family homes by at least 40% relative to a 2010 baseline while maintaining performance in all major climate regions with a focus on reducing heating, cooling, and water heating loads, and demonstrate performance of individual technologies and solutions that provide at least 10% energy savings relative to a 2010 baseline.

- Connections Between Goal and Program Strategy
 - Before construction firms or contractors will integrate new energy efficiency measures into their practices thy need to be confident that they will perform well.
 - RBI's demonstrations on new and existing homes will help resolve integration questions and increase the likely hood of later adoption.
- Current Status
 - DOCUMENTATION UNDERWAY, ASSESSMENT WILL FOLLOW



RBI's Program Performance Goal: Prove Retrofit Solutions at Scale

Between 2010 and 2020, prove to homeowners that it is possible to cost effectively reduce the average energy use intensity of homes by at least 25% by upgrading in at least 1 million single family homes covering every major climate zone, with a focus on heating, cooling, and water heating loads.

- Connections Between Goal and Program Strategy
 - RBI will help prove the scalability of both technologies and market transformation solutions through programs like Home Performance with Energy Star and the Better Buildings Residential Network.
- Current Status
 - DOCUMENTATION UNDERWAY, ASSESSMENT WILL FOLLOW



RBI's Program Performance Goal: Prove Solutions for New Construction at Scale

Between 2010 and 2020, prove to market leading energy efficiency programs that it is possible to cost effectively reduce the average energy use intensity of new homes by at least 40% relative to the average home in 2010 while still maintaining performance by certifying at least 50,000 single family homes as "zero energy ready," with a focus on very low heating, cooling, and water heating loads in every climate zone.

- Connections Between Goal and Program Strategy
 - In order to affect a new construction in a substantial way, BTO must prove that cost-effective deep energy savings are possible to programs such as Energy Star New Homes (which were nearly 10% of the new construction market in 2014).
 - Affecting these kinds of broadly accepted labeling programs is a critical step toward influencing the minimum building code.
 - To achieve these objectives RBI has developed its Zero Energy Ready Homes program.
- Current Status
 - DOCUMENTATION UNDERWAY, ASSESSMENT WILL FOLLOW



RBI's Program Performance Goal: Partnerships on Individual Measures

By 2020, establish partnerships with states, utilities, manufacturers, distributors and installers, serving at least 75% of U.S. households, in each major climate zone, to expand the purchase of a variety of high efficiency technologies and services capable of cost effectively reducing the energy use intensity of existing homes by at least 5%.

- Connections Between Goal and Program Strategy
 - While deep energy upgrades offer one pathway to substantial energy savings individual measures offer another.
 - Link to "Staged Measures" activities
- Current Status
 - DOCUMENTATION UNDERWAY, ASSESSMENT WILL FOLLOW



RBI's Program Performance Goal: Establish Broad Partnerships

By 2020, partner with a variety of state, local, and utility stakeholders as well as other market actors, who have the ability to reach at least 90% of single family homes.

- Connections Between Goal and Program Strategy
 - To have a transformative impact RBI cannot focus its activities on selective states or localities but needs to build partnerships across the nation.
- Current Status
 - DOCUMENTATION UNDERWAY, ASSESSMENT WILL FOLLOW

