

Building America Program Overview



U.S Department of Energy
Eric Werling, Program Director
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Happy Anniversary, Building America!



February 2001
Information Bulletin
Number 3

Developments

New American Home Showcases Energy Efficiency and Durability

The New American Home for 2001 was a once-in-a-lifetime project for Hedgewood Properties. The New American Home is an annual showcase project sponsored by the National Association of Home Builders' National Council of the Housing Industry (NCHI). To design and build a home that is attractive as well as energy efficient, Hedgewood teamed up with Building America's IBACOS consortium, and the Southface Energy Institute, a nonprofit environmental building group based in Atlanta. The goal was to achieve a rating of 90 on the Home Energy Rating System scale. To achieve this high level of energy efficiency, Hedgewood integrated many advanced building technologies, including two high efficiency furnaces, an energy recovery ventilator, low-e argon-filled windows, and improved insulation.

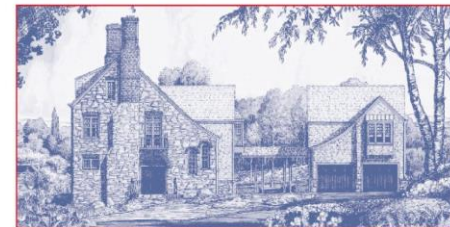
In addition to these energy-efficient technologies, many durability-related improvements were added to the home's design. Among these improvements: an airtight

cathedral ceiling to prevent condensation inside the ceiling during the winter, and close attention to drainage control details that allow the walls to dry properly. It is likely that because of these investments, the entire building assembly will be more durable and long-lasting, helping to ensure that the New American Home will remain energy efficient for years to come.

Hedgewood should benefit from reduced warranty and liability claims as a result of these additional technologies. They also learned several important construction lessons in the areas of airtightness and moisture control in the project and IBACOS recommended that Hedgewood incorporate each lesson in future projects.

The New American Home will be monitored extensively for one year while it is occupied. Monitoring data will be posted at a special Internet site and will be accessible to individuals and organizations involved in the project.

For more information on NCHI's New American Home, please contact John Broniek at (412) 765-3021 or jbroniek@ibacos.com.★



Hedgewood Properties' New American Home in Atlanta is a model of energy efficiency.

Ground-Breaking News

- 1 New American Home Showcases Energy Efficiency and Durability
- 2 Champion Enterprises Debuts New Modular Line at Builders Show
- 2 'SIPs' House to Demonstrate Advanced Technologies
- 2 Green Builder Program Aids Atlanta Builders
- 3 Building America News in Brief

Buildings for the 21st Century



U.S. Department of Energy
Office of Energy Efficiency and
Renewable Energy
Office of Building Technology,
State and Community Programs

- **Affordability**
- **Integration**
- **Security**

Affordability



THEN (1994)

Building America Goals:

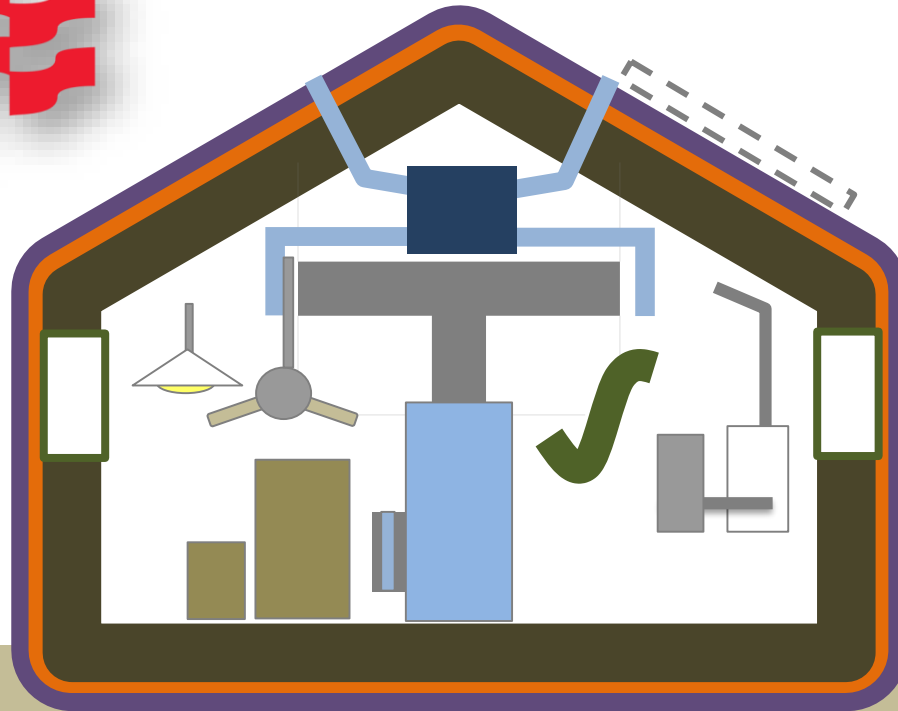
- 50% Energy Savings
- No Increased Cost

NOW (2019)

Building America Goals:

- “Zero Energy Ready”
- No Increased Cost

Building America aims to ***Cut Energy Use of U.S. Homes in Half***
without increasing building construction costs



Zero Energy Ready Homes,

so energy efficient that all or most annual energy use
can be offset by renewable energy.



We already know how to
build Zero Energy Homes



“In theory, there is no difference between theory and practice. In practice, there is.”

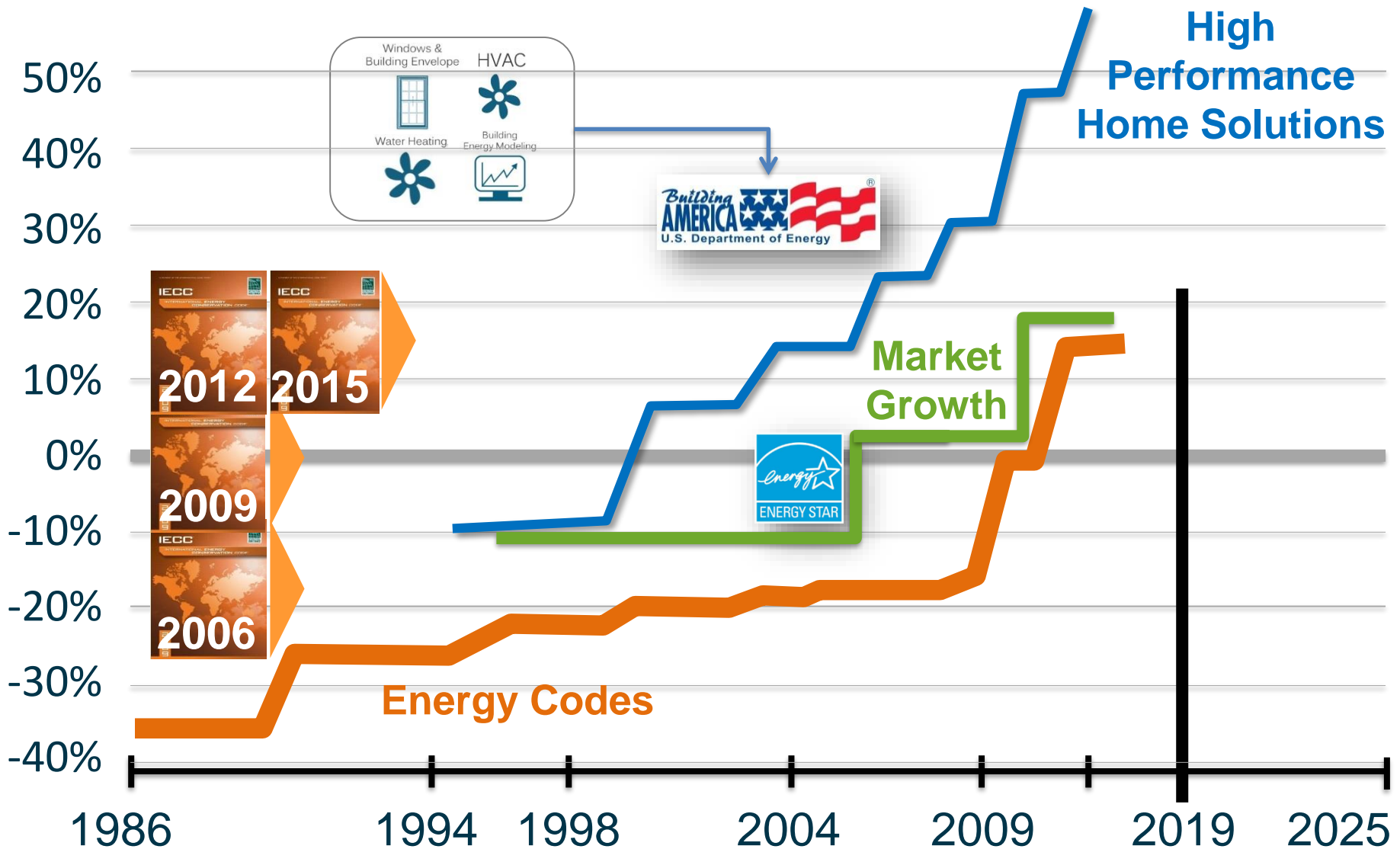
Yogi Berra



Housing Industry Problems/Barriers (Opportunities)

- **Housing industries under-invest in R&D:**
 - <0.4% of Industry Revenue goes to R&D and
 - virtually 0% private investment in integrated whole house performance improvement solutions
- **Perceived risks of innovation are high:**
 - Uncertainty about envelope moisture durability of houses built to current standards with modern building materials
 - System integration and cost tradeoff challenges
 - Indoor air quality and ventilation system performance concerns
- **Housing infrastructure lacks sufficient resources to effectively manage performance risks:**
 - No/Low-tech performance measurement technologies; inability to measure/predict/manage installation quality & operational performance
 - Lack of consistent code approval for proven innovations
 - Insufficient training & education for trades

Research to Market to Standard Practice



Integration



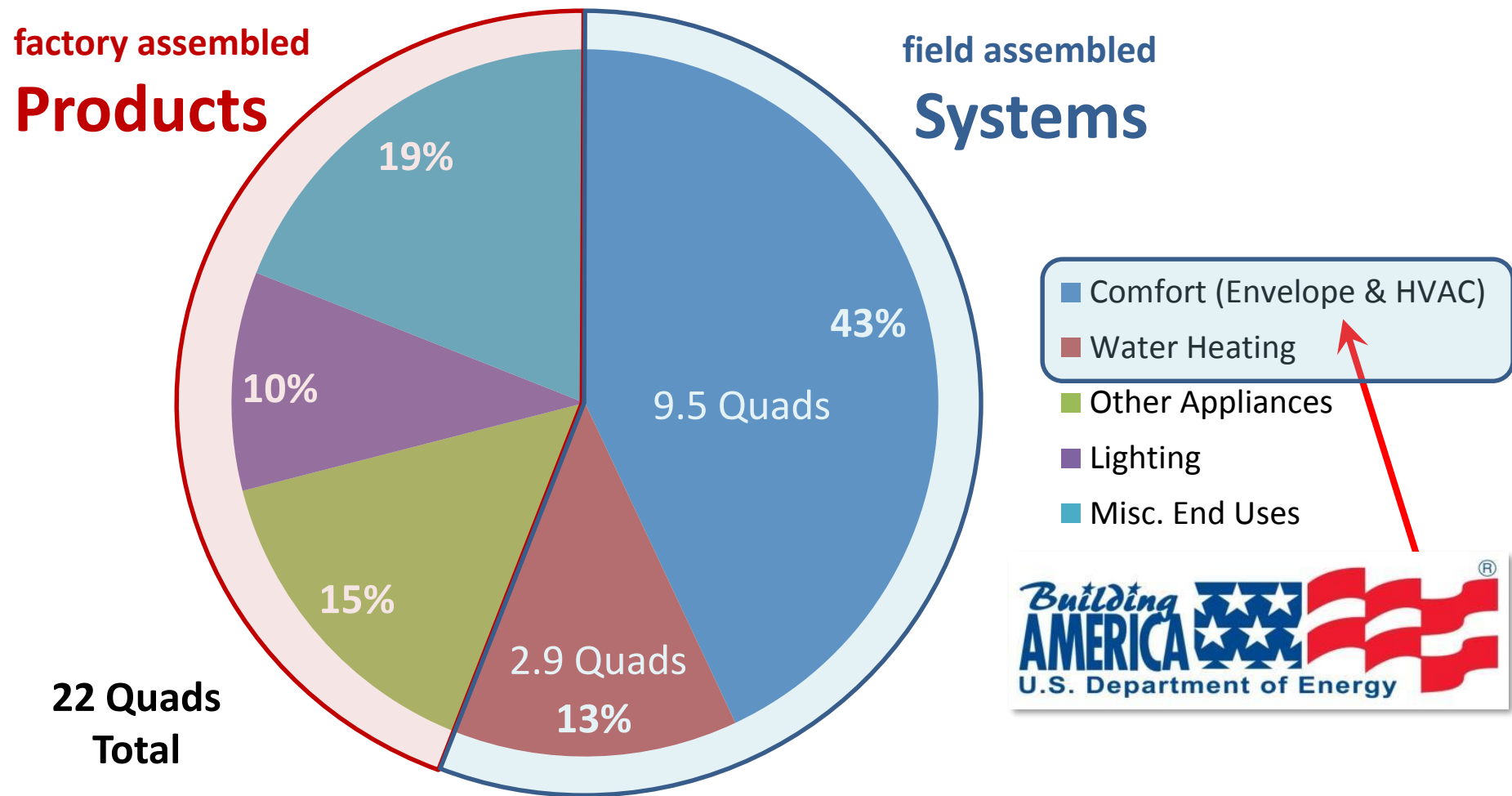
THEN (1994)

- Cost savings through integrated design
- “House as a System”

NOW (2019)

- Building Science +
- “High Performance”
- “Connected” technology
- Advanced Construction

Building America Aims to *Cut Energy Use of U.S. Homes in Half* by Helping Industry Improve “Integrated” (Field Assembled) Systems



U.S. Residential Buildings Primary Energy Consumption

* Source: U.S. EIA



Security (Risk Management)



THEN (1994)

Achieve EE goals with ...

- Indoor Air Quality (IAQ)
- Comfort

NOW (2019)

Achieve EE goals with ...

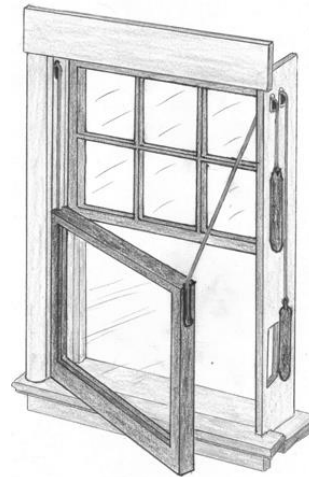
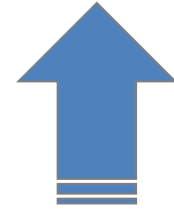
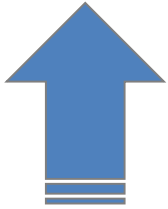
- IAQ & Comfort +
- Moisture Control
- Construction/Installation Quality (Cx & AFDD)

Reduce Your

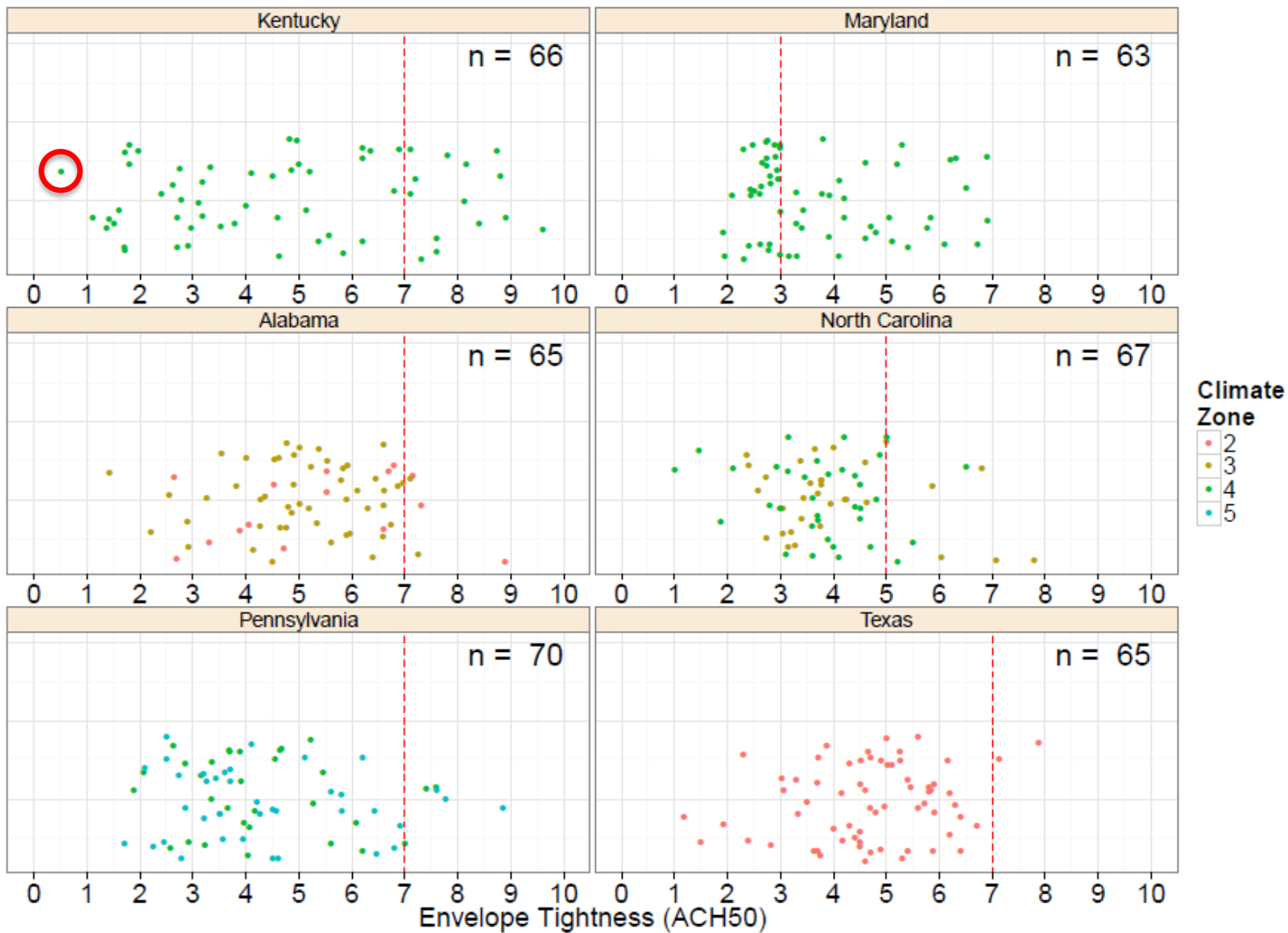
RISK



Building Materials Are Changing



Average New Homes are Tighter



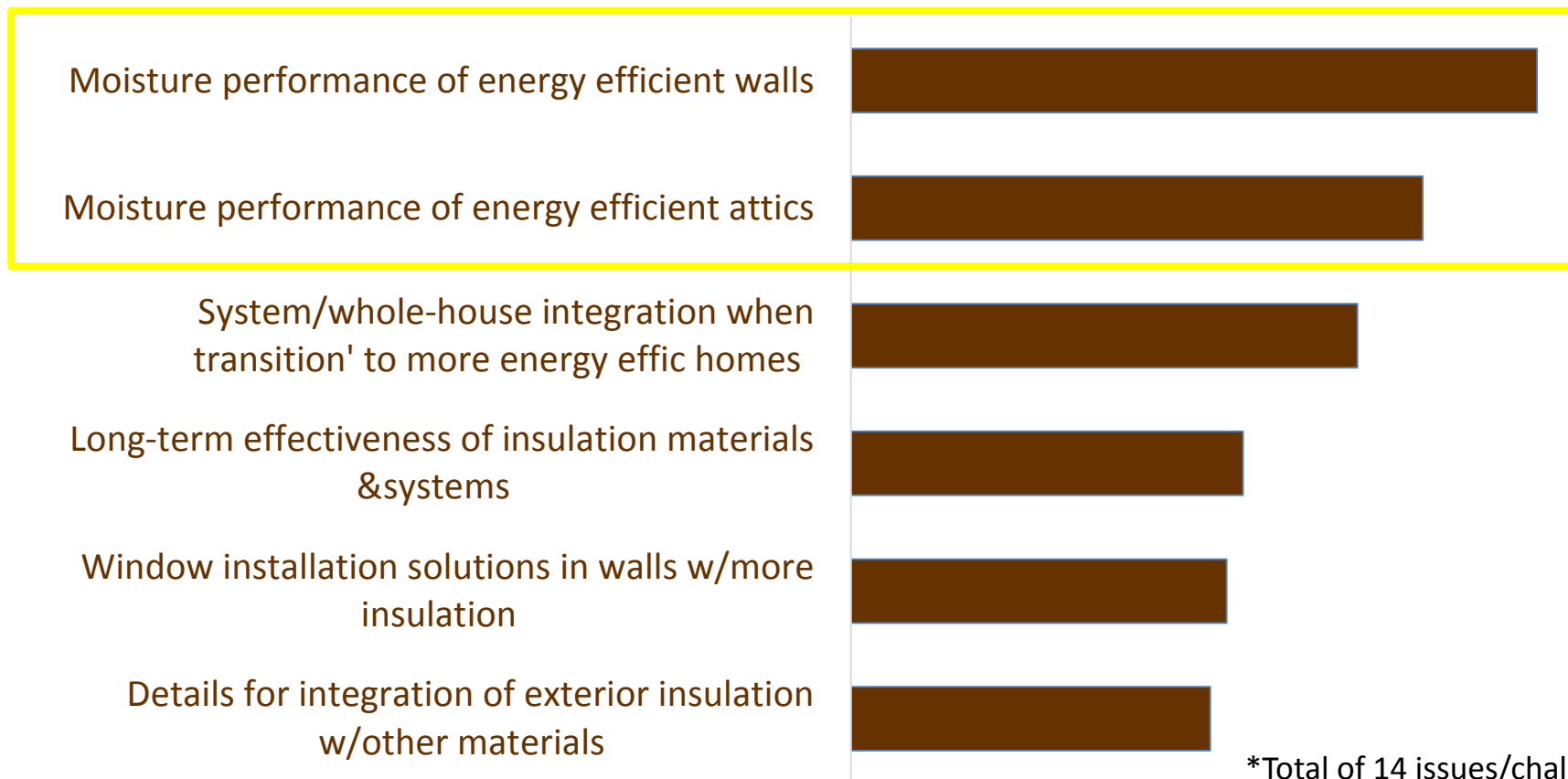
Technology & Expectations are Changing



Anyone who looks can find defects

Building Industry Concerns

Top Challenges in Energy Efficiency



*Total of 14 issues/challenges presented to respondents

The Top 3 Technical Challenges

1. Moisture Durability Risks of Insulated Envelopes

Risk of condensation & inadequate drying potential inside building assemblies

2. Comfort Risks in Low-Load Homes

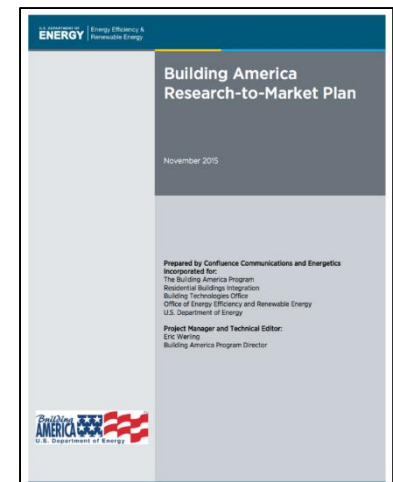
Risk of inadequate air flow and RH control at part load conditions

3. Indoor Air Quality Risks in Tight Homes

Risk of poor indoor air quality in tight homes

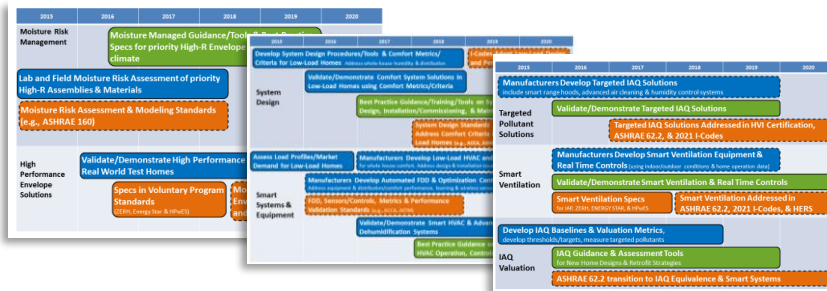


2015 - 2020

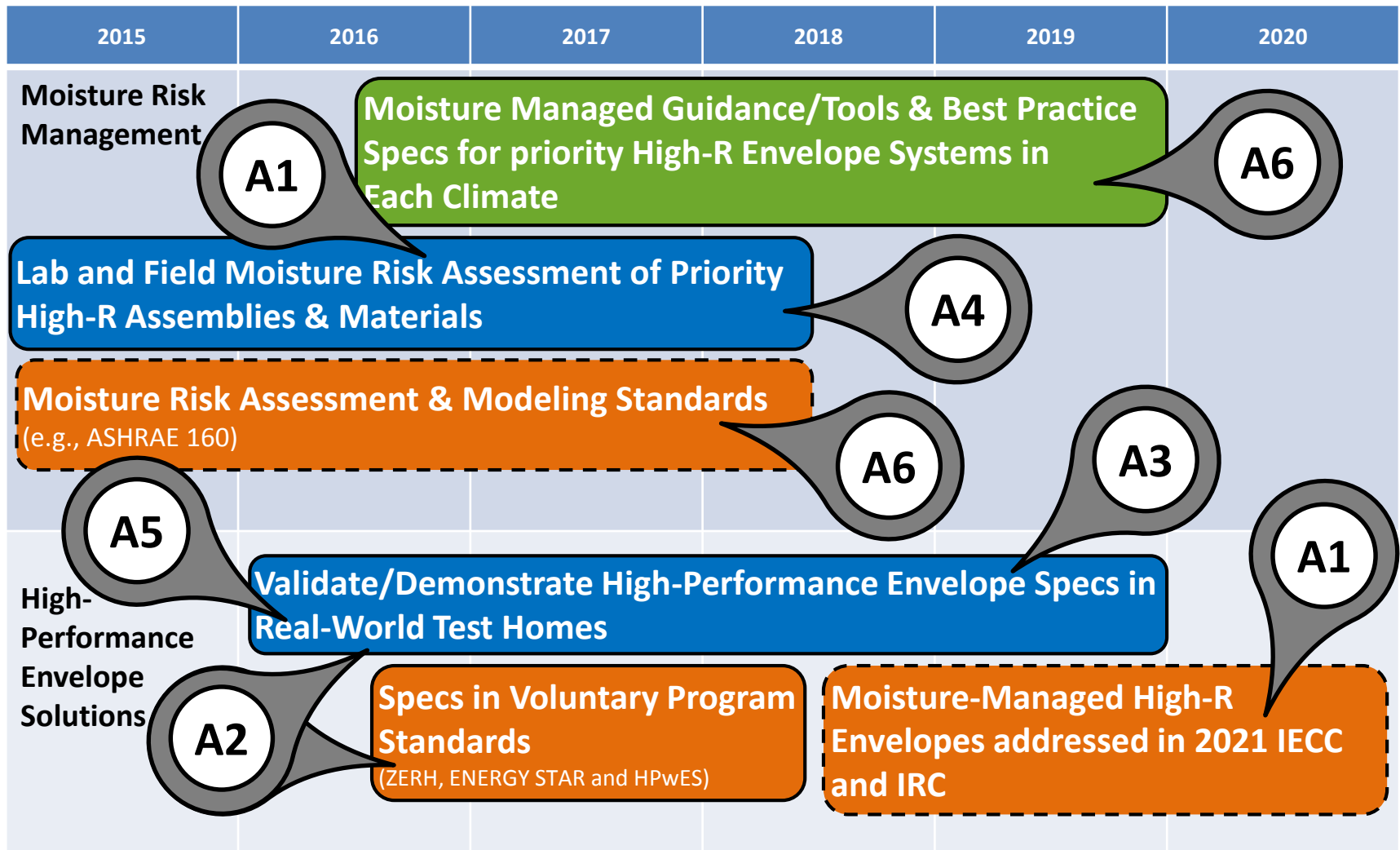


Research-to-Market Plan and Technology-to-Market Roadmaps

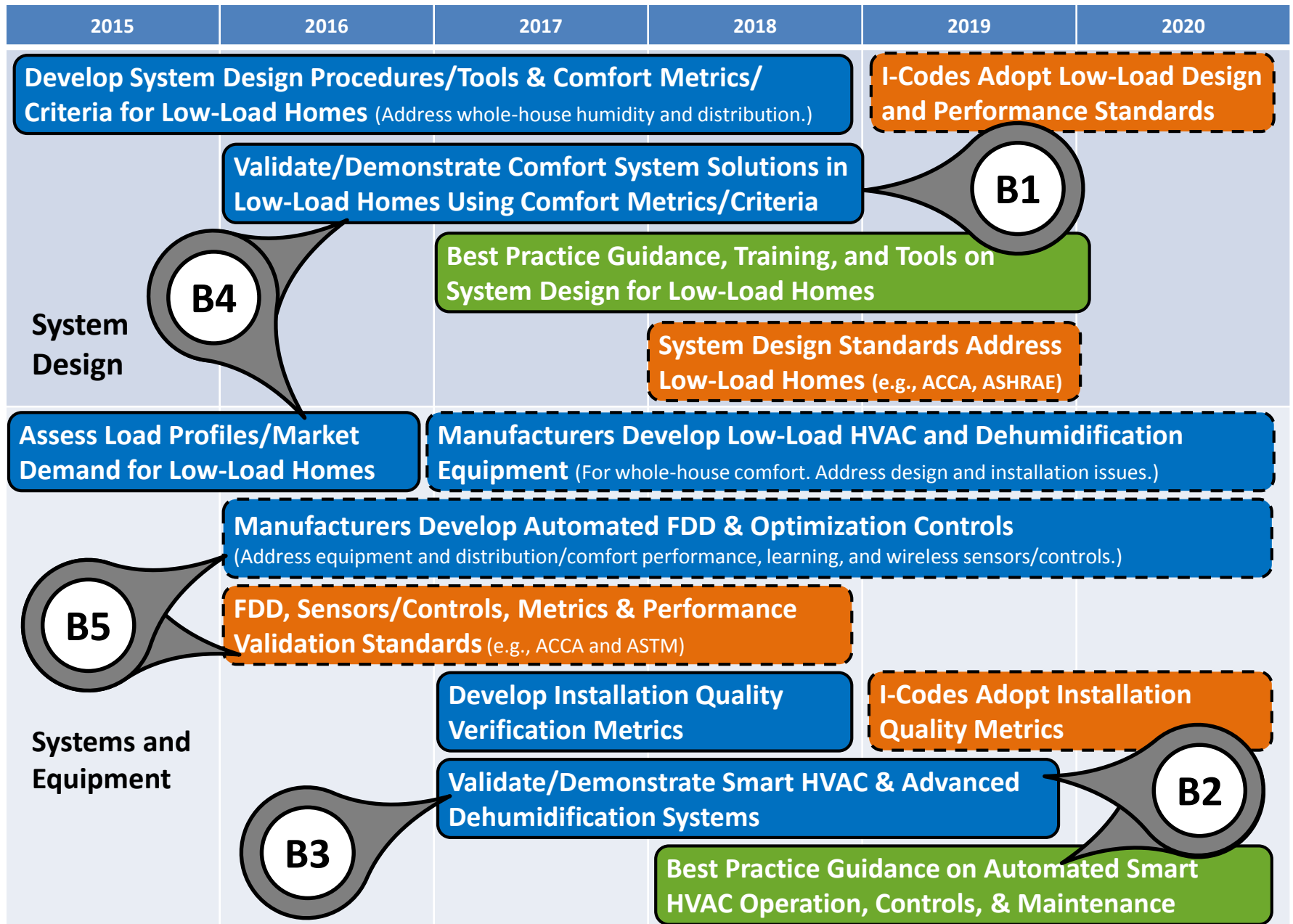
- Published in late 2015
- Guides Building America's research activities with specific & strategic objectives
- Fills critical research and information gaps that prevent wide adoption of High Performance Homes
- Validates cost-effective solutions that are practical and profitable for builders and home improvement contractors



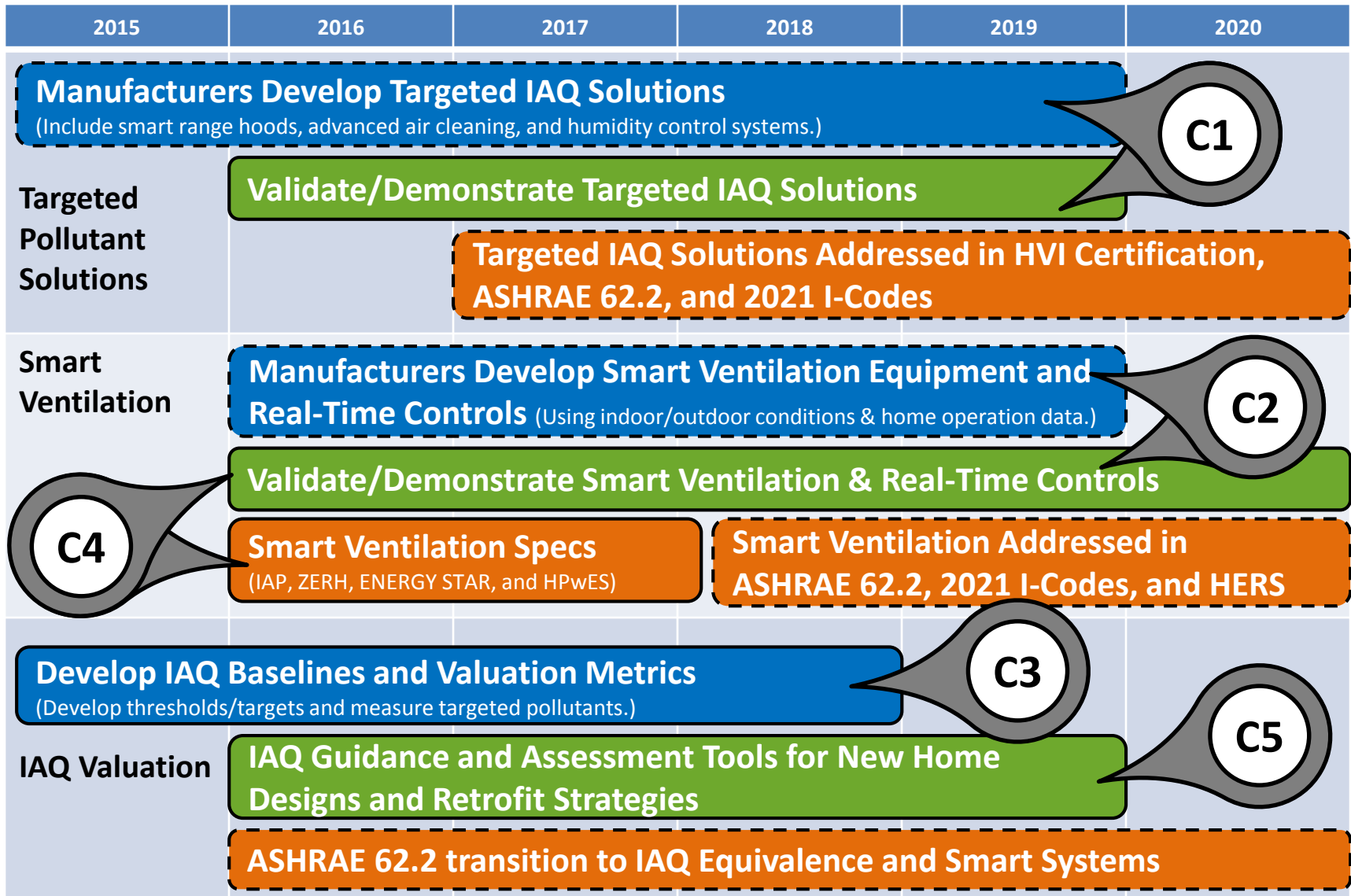
A. High-Performance Moisture-Managed Envelopes



B. Optimal Comfort Systems (Revised)



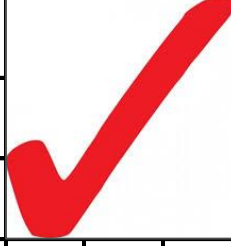



C. Optimal Ventilation & IAQ Solutions



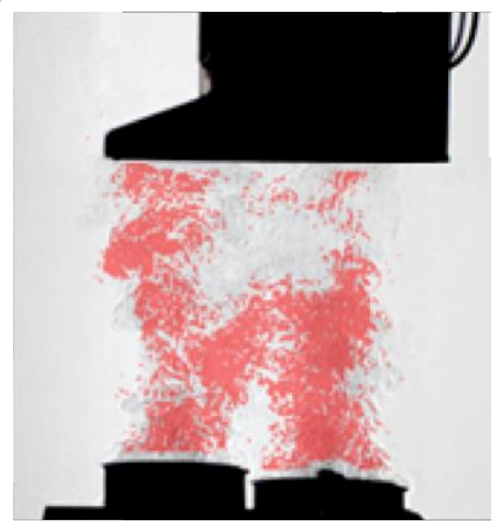
Building America Multi-Year FOA Schedule

(subject to appropriations)

FY2015				FY2016				FY2017				FY2018				FY2019				FY2020			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
				FY15 FOA Award #1																			
				FY15 FOA Award #1																			
				FY15 FOA Award #2, etc.																			
								FY16 FOA Award #1															
								FY16 FOA Award #2															
								FY16 FOA Award #3, etc.															
												FY17 FOA Award #1											
				FY17 FOA Award #2																			
				FY17 FOA Award #3, etc.																			
																FY18 FOA Award #1							
				FY18 FOA Award #2																			
				FY18 FOA Award #3, etc.																			



Building America Project Photo Album



2018

2017

2016

2015

Summary: Building America TODAY

Building America 2015-2020:

Building Science & Systems Engineering for High Performance Homes

**BA is
Watching ...**

Smart Home Technologies:

- Connected Thermostats & IAQ Sensors
- Performance Measurement Technologies
- Building Integrated Renewables

Current BA Strategy



**Moisture
Managed
High
Performance
Envelopes**

**Optimal
Ventilation
& IAQ
Solutions**

**Optimal
Comfort (H/AC)
Systems for
Low-Load
Homes**

**Building Science and Systems Engineering
Knowledge, Tools, & Analysis**

Where to Next?

Building America & RBI Next Up:

Building Science and Advanced Construction/Renovation Research

Updated BA Strategy



Smart Home Technology Integration:
Building Energy Savings Validation, Integration Solutions, & Performance Optimization

Durable High Performance Envelopes & Advanced Construction/Renovation Technologies

Advanced Mechanical Systems Integration & Installation:
HVAC, IAQ, & DHW

Building Science and Systems Engineering
Knowledge, Tools, & Analysis

Resources from Building America



World Class Guidance & Research for High-Performance Homes...

... at Your Finger Tips

2,700,000 Served!

>350,000 users




Building Science Advisor v1.0

Climate Cladding Structure Insulation Water Control Interior Control Results

Map Location	Atlanta, GA
Exterior Cladding	Brick
Structure	2 x 4 16" o.c.
Cavity Insulation	Medium Performance Fiberglass
Continuous Insulation	None
Insulation Thickness	0 in
Air Space	None
Water/Air Barrier	Housewrap
Exterior Sheathing	Oriented Strand Board
Vapor Retarder	Kraft Paper
Interior Finish	Latex Paint
Air Tightness	3 ACH50
ID	14382

Moisture Durability Performance



Thermal Performance R-value



Poor Below Code

- Quick easy Expert answers & guidance
- User friendly input
- “What if” learning

Home Improvement Expert



- For homeowners
- 21 contract checklists



[View Checklists](#)

ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY

Home Improvement Expert™ Factsheet Attic Air Sealing and Insulation

WHY HOME IMPROVEMENT EXPERT?
An easy way to get a quality job. Research findings reveal significantly reduced energy savings and potential performance risks when home improvements are not properly installed. To help homeowners address this challenge, the U.S. Department of Energy has compiled evidence-based expert guidance from industry leaders and national laboratories in factheets and checklists under the name Home Improvement Expert. Homeowners can leverage these expert recommendations to help ensure quality installation by attaching Home Improvement Expert checklists to vendor contracts and ensuring the vendor completes and signs the checklist before accepting the work.

READY TO DO MORE?
This factheet and accompanying checklist cover one of more than 20 home improvements covered by the U.S. Department of Energy Home Improvement Expert. Use them to help optimize energy savings and improve performance related to comfort, health, safety, and durability. [To download other checklists, visit: basc.pnnl.gov/homeimprovementexpert](#)

For more customized home improvement recommendations:
• Get your Home Energy Score from a qualified assessor ([assesshomeenergy.com](#))
• Schedule an expert assessment through Home Performance with ENERGY STAR™ ([homeperformance.gov](#))

RELATED HOME IMPROVEMENT CONSIDERATIONS
Before air sealing and insulating your home's attic, consider working with a qualified home energy assessor to help ensure combustion safety and sufficient fresh air since the home is made more airtight. They will check for:
• required combustion air for any natural draft combustion equipment (e.g., if the home has a natural draft furnace, boiler, or water heater);
• adequate fresh air throughout the home;
• exhaust fans in bathrooms to remove moisture; and
• an exhaust fan in the kitchen to remove cooking emissions.

For more information on attic air sealing, please search the Building America Solution Center: [basc.pnnl.gov](#)

TIPS FOR HIRING A CONTRACTOR

- Look for licensed, insured, and certified contractors.
- Check references and reviews on home improvement web sites.
- Get multiple bids in writing.
- Check with your utility and state, local, and federal weatherization programs for rebates and incentives.
- Include the Home Improvement Expert™ checklist in bids and contracts to ensure quality installation.
- Consider using a Residential Energy Services Network (RESNET) certified Home Energy Rating System (HERS) rater, Building Performance Institute (BPI) certified Building Analyst, or other qualified professional (e.g., licensed engineer or architect) to inspect the work.

DEFINITIONS
Done correctly, attic air sealing and insulation can reduce utility costs while improving comfort, indoor air quality, and durability.

In older homes, attics may have extensive holes, cracks, and missing air barriers and insufficient insulation that allow unwanted heat loss in cold weather, heat gain in hot weather, and infiltration of contaminants year-round. Air sealing uncontrolled leaks and adding insulation between the attic and the home is one of the most cost-effective measures to improve your home's performance. It can reduce your heating and cooling bills, improve comfort by stopping drafts, keep contaminants such as moisture, dust, and pests from entering your home, and reduce moisture-related durability problems.

OF HOME IMPROVEMENTS
If of Energy's Building America Alliance has been developed for energy efficiency upgrades. This process for home improvements homeowners get the most out of the remaining potential gains from moisture issues.

AND DURABLE
Supplies to improve energy loss, moisture management, and indoor air quality.

F AIR
before increasing air tightness.

TURE CONTROL
portion before reducing the ability of washing and insulation.

FREEE
policy not accessible after

MAL COMFORT
if national code recommendations being related safety, indoor air quality issues.

ANYTIME EQUIPMENT UPGRADES
Replace heating and cooling equipment, water heaters, windows, appliances, lighting, fans, and electronics when they fail or become out of date with ENERGY STAR qualified products or better, and improve systems to operate more efficiently.

ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY

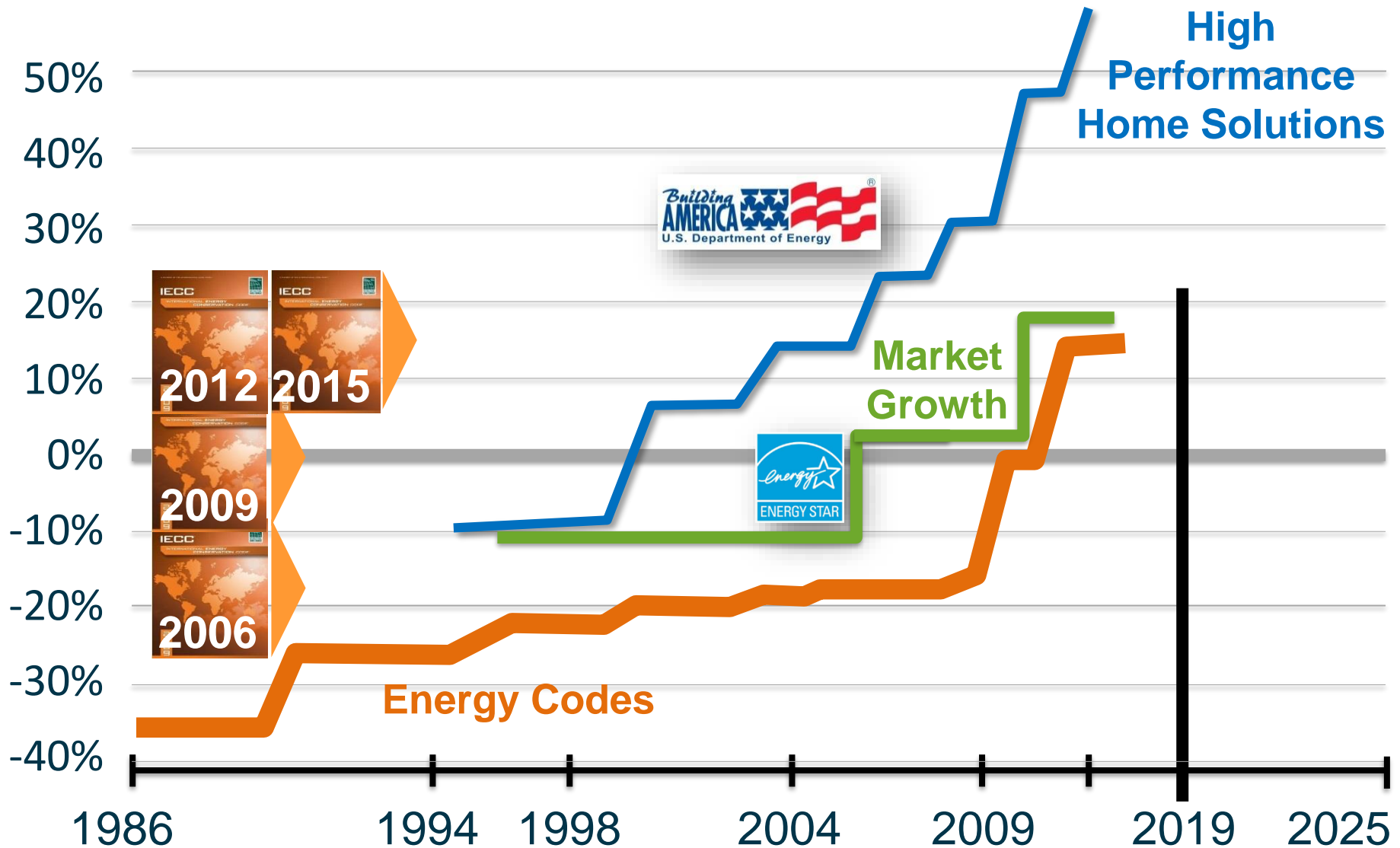
For more resources, visit: [basc.pnnl.gov/homeimprovementexpert](#)
PHOTO: SA - 1992 • March 2019



Measuring Progress



High Performance Homes have arrived!



Independent Program Evaluation: March 3rd, 2018

- \$700 million in estimated energy cost savings (2006-2015) from 4 studied innovations:
 - Air Sealing
 - Duct Sealing
 - Insulation
 - Thermal Bridging
- Lifetime **program benefits estimated at \$2.3 B**
- Up to **\$30 in energy savings for every \$1 spent** by Building America

Another measure of success ...

The Building America Program is filling an essential role in the marketplace—one that would be extremely difficult for the private sector to perform. I believe that investments by the federal government in this program reap huge rewards at the local level in terms of energy savings, comfort, and consumer protection.

—**Ron Flax**, Sustainability Examiner for Boulder County Land Use (Colorado)

*“Pulte has been working with the Building America Program since it began. **Building America has helped our business** research and develop strong new high-performance products that keep us competitive and offer our homebuyers exceptional efficiency and quality.”*

—**Robert Broad**, PulteGroup Southern California/Southern Nevada Division

*“We used the U.S. Department of Energy’s Building America program and its work with the energy efficiency industry to **bring state-of-the-art construction innovations and resources to the public.**”*

—Carolyn G. Goodman, Mayor of Las Vegas, Nevada

“Building America provides a much needed resource to our business and the industry. As a new home builder, we rely on the program to develop and demonstrate innovative technologies before we take the risk of putting them into our construction practices. Without Building America, the construction industry would have great difficulty adopting new practices.”

—Tom Wade, Palo Duro Homes

Questions?

Thank You



Email me (I ran out of business cards):

eric.werling@ee.doe.gov