Building America Meeting

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy


# Customer-Focused Deployment

**SAM RASHKIN**
Chief Architect
Building Technologies Program
February 29, 2012

# ‘Good Government’ As-A-System

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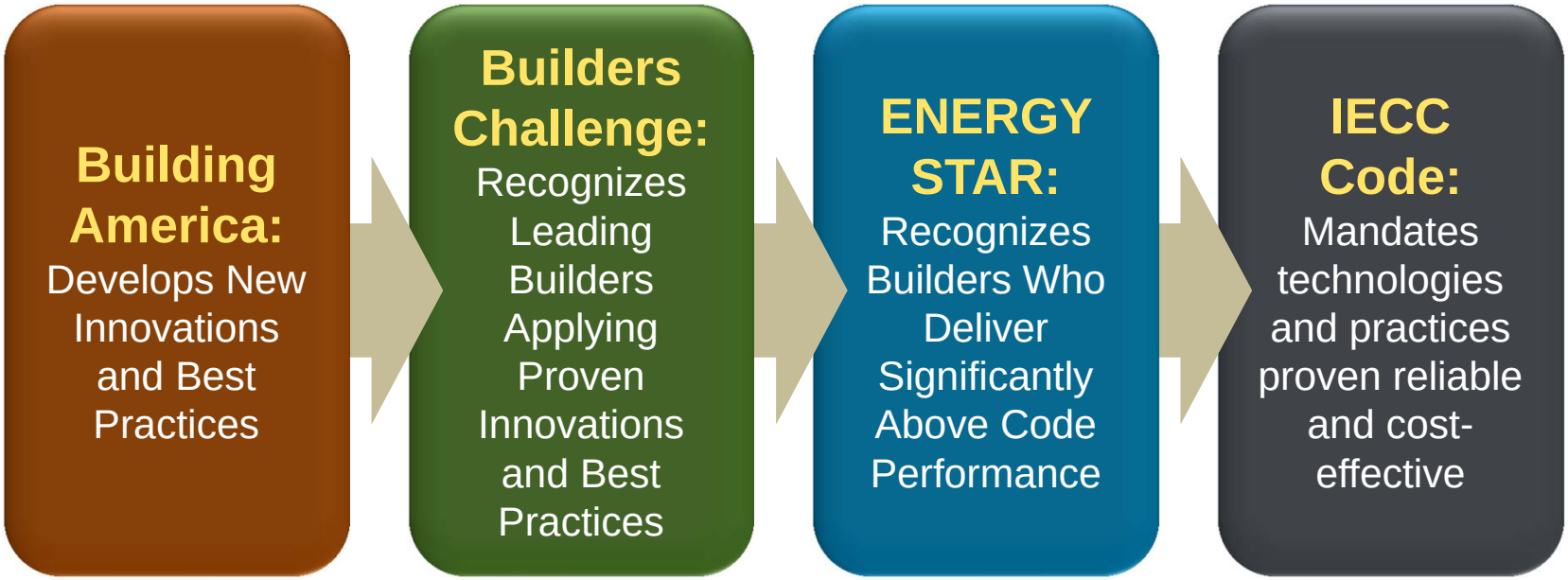

# Disseminating Research Results: Building America Resource Tool

# World-Class Research At Your Finger Tips

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# High Performance Home Dewey Decimal System

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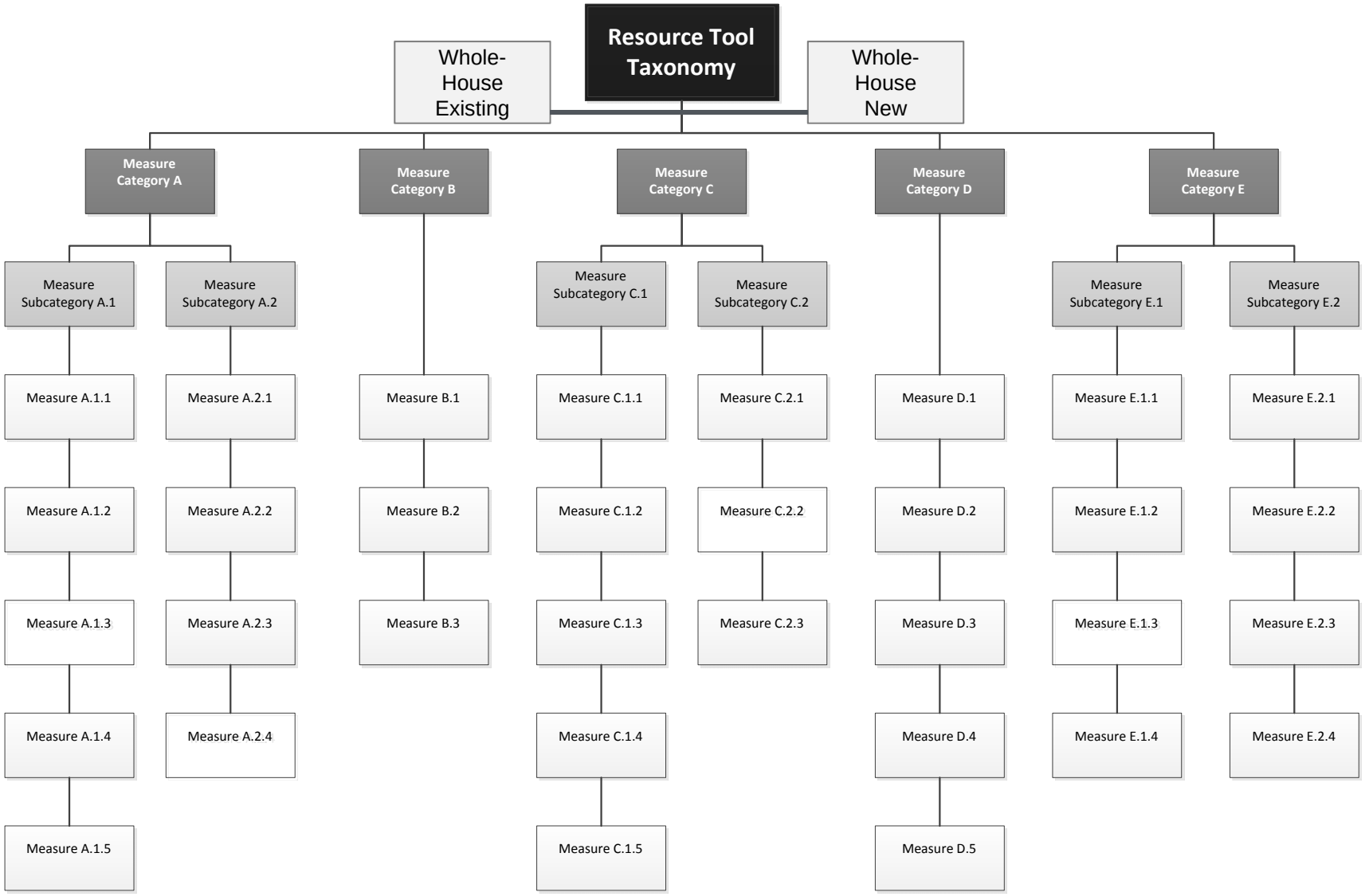

# Building America Baseline

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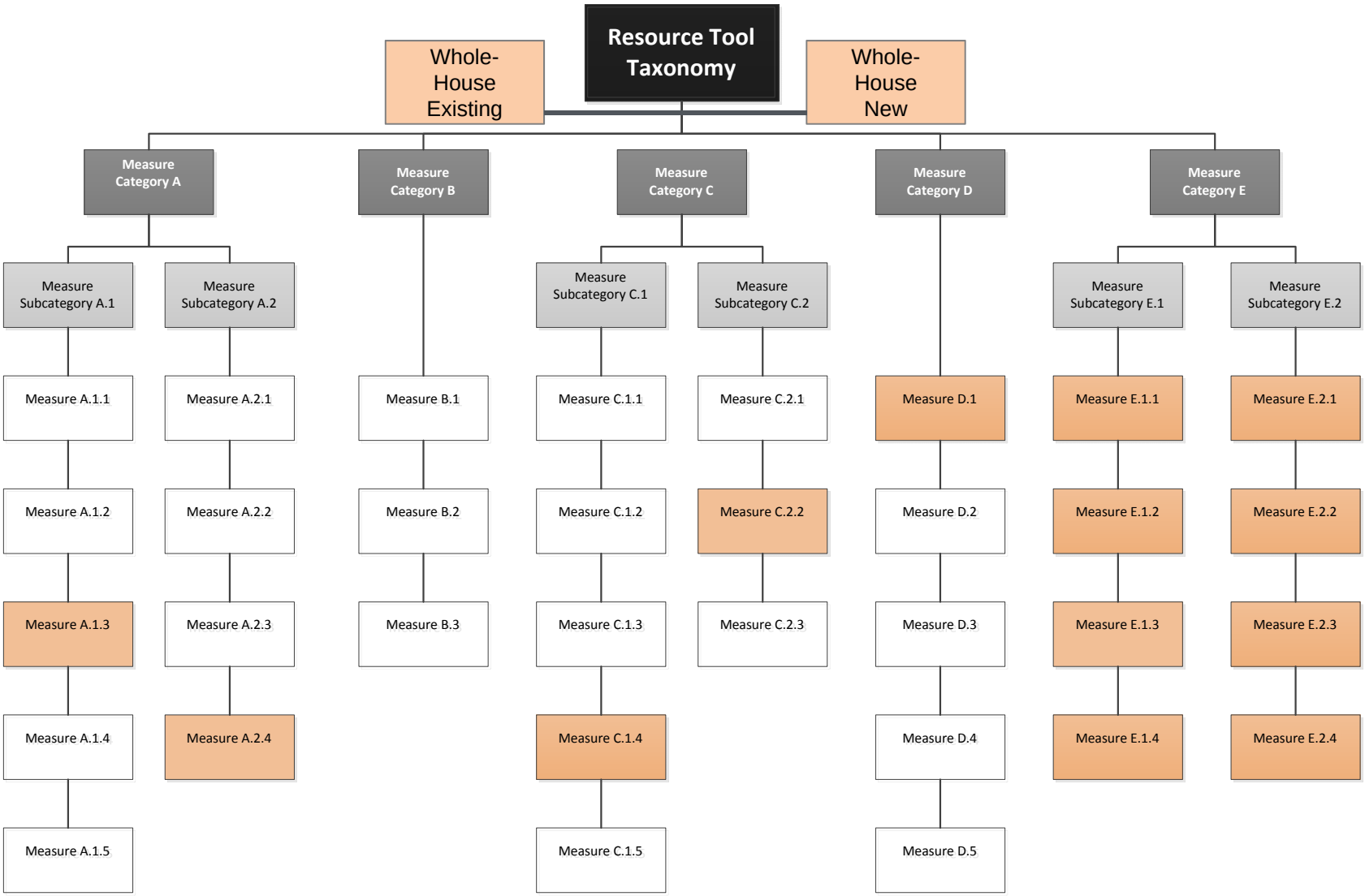

# Energy Star Field Guide Baseline

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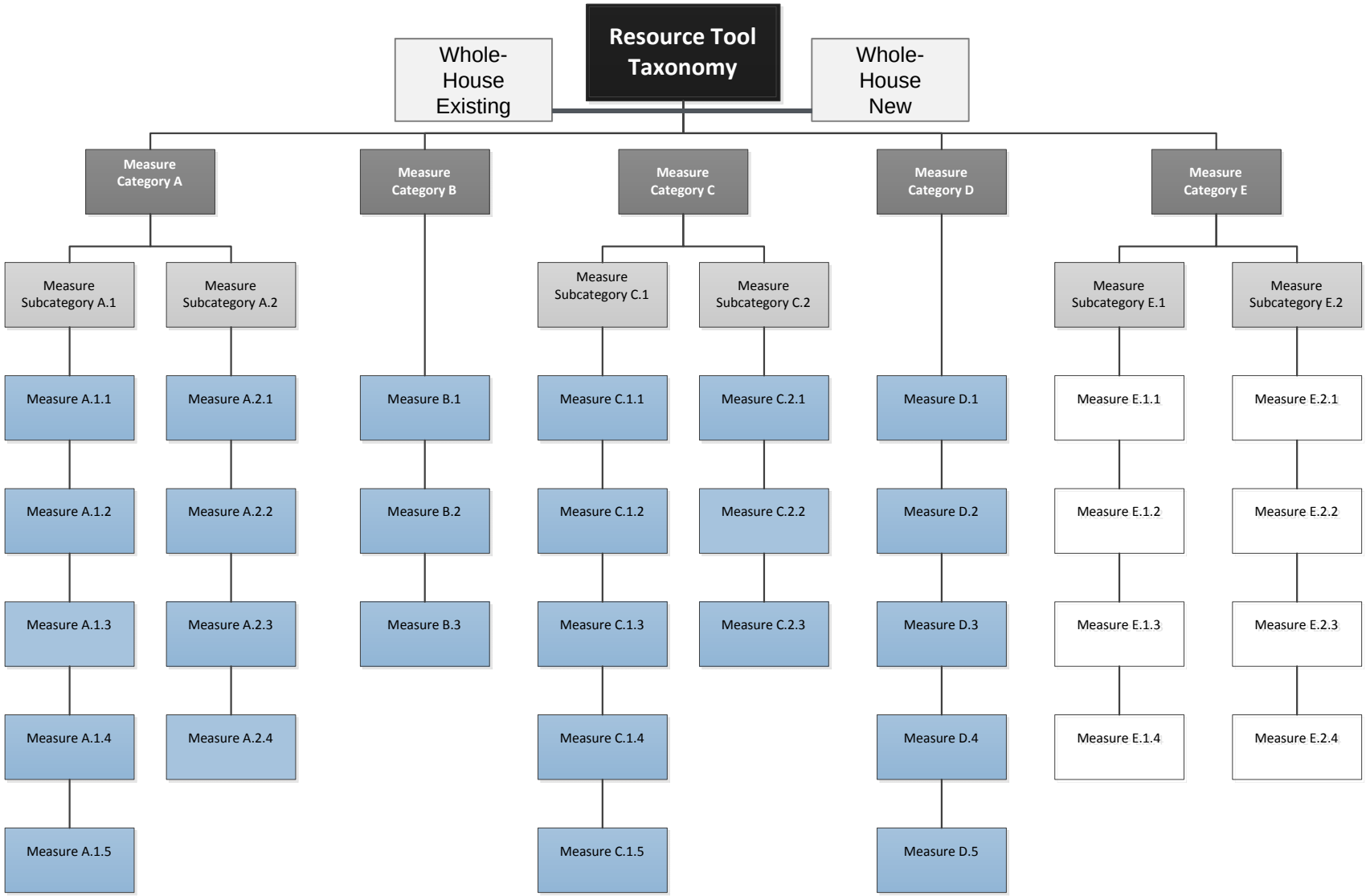

# Comprehensive Resource Tool

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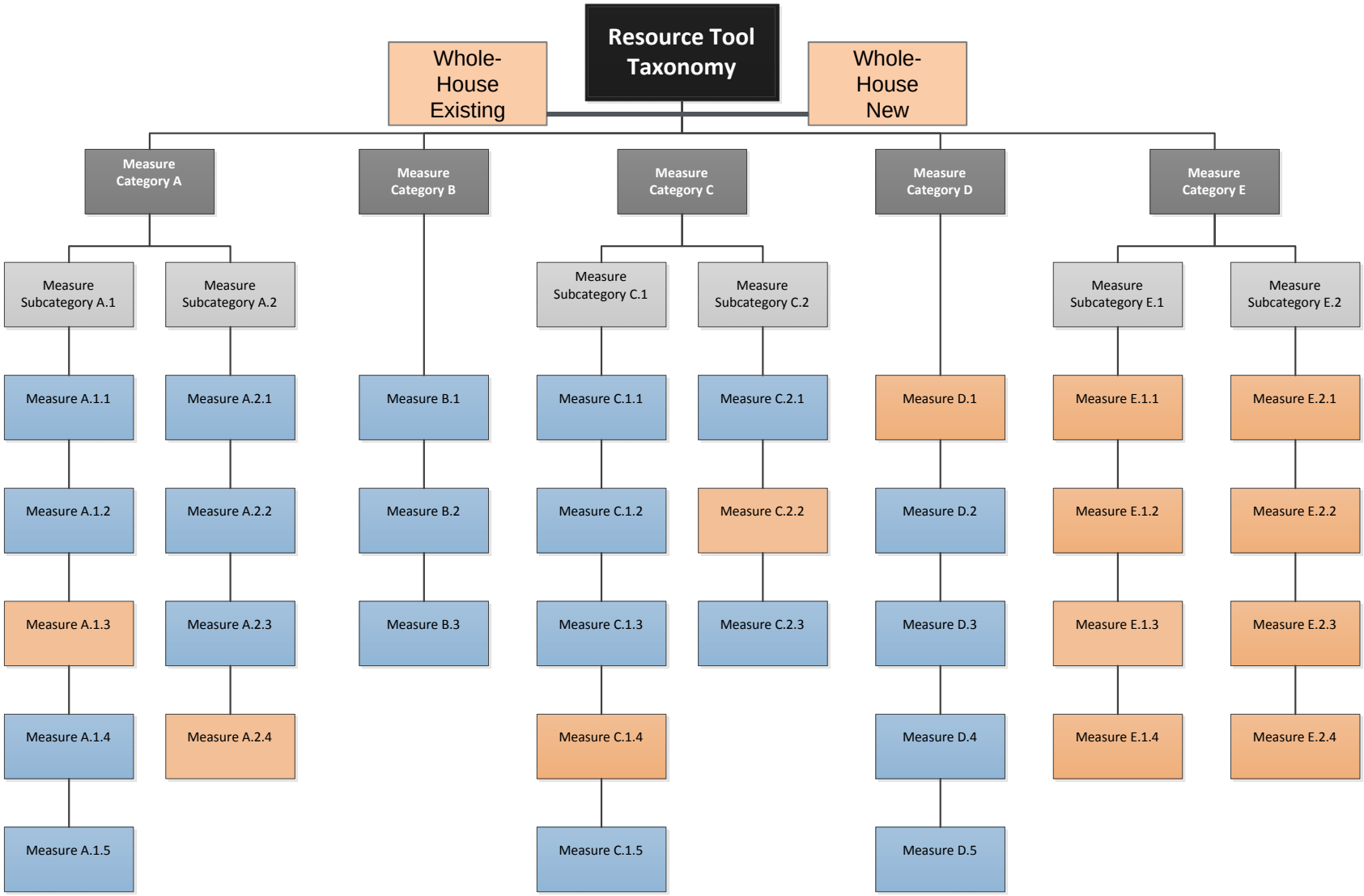

# Navigation Paths

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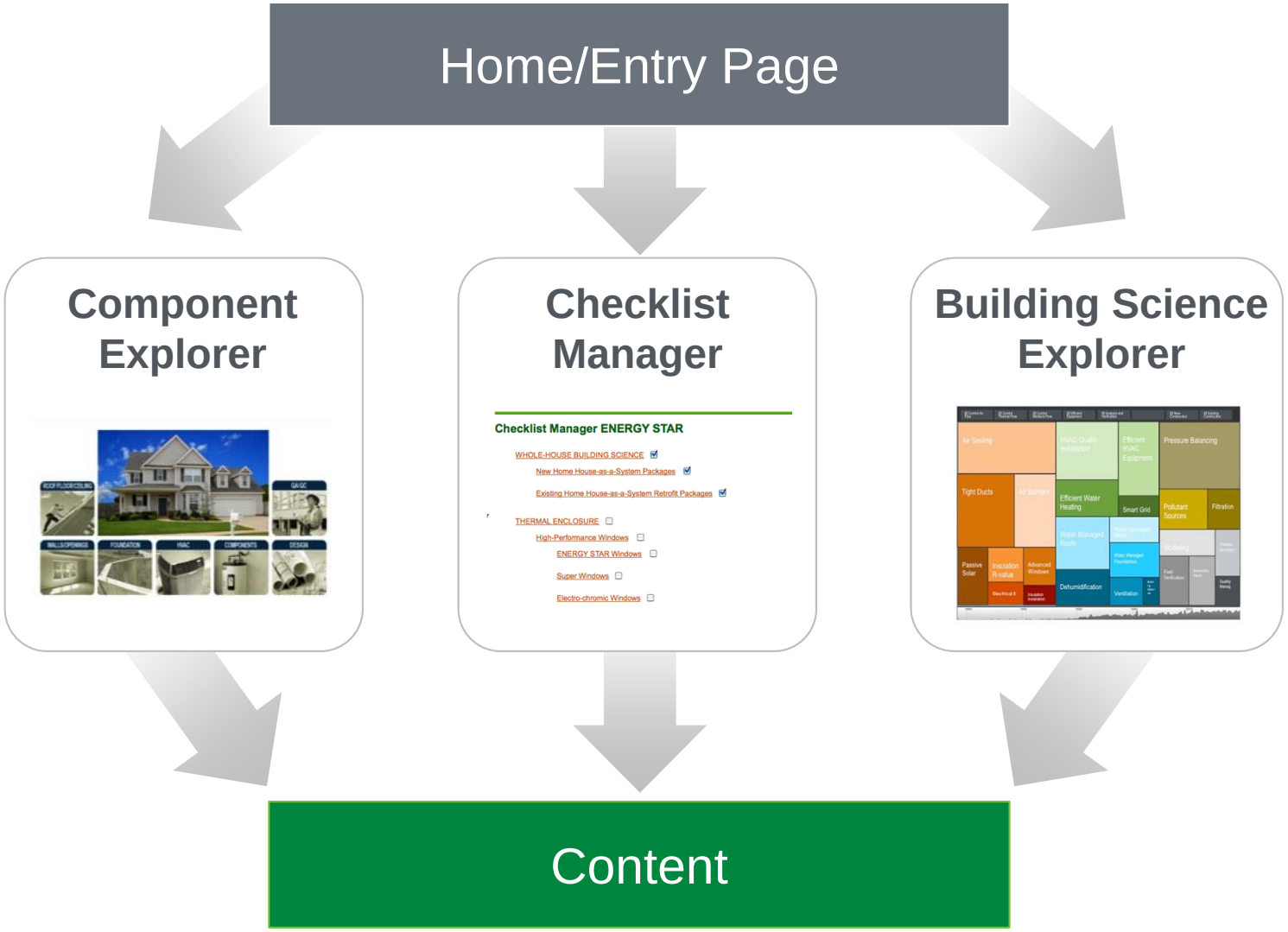

# Building America Resource Tool

Building America Resource Tool

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- Home
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- Building Science Explorer
- Home Explorer
- Checklist Manager
- ENERGY STAR
- Builder's Challenge
- Other

## Component Explorer

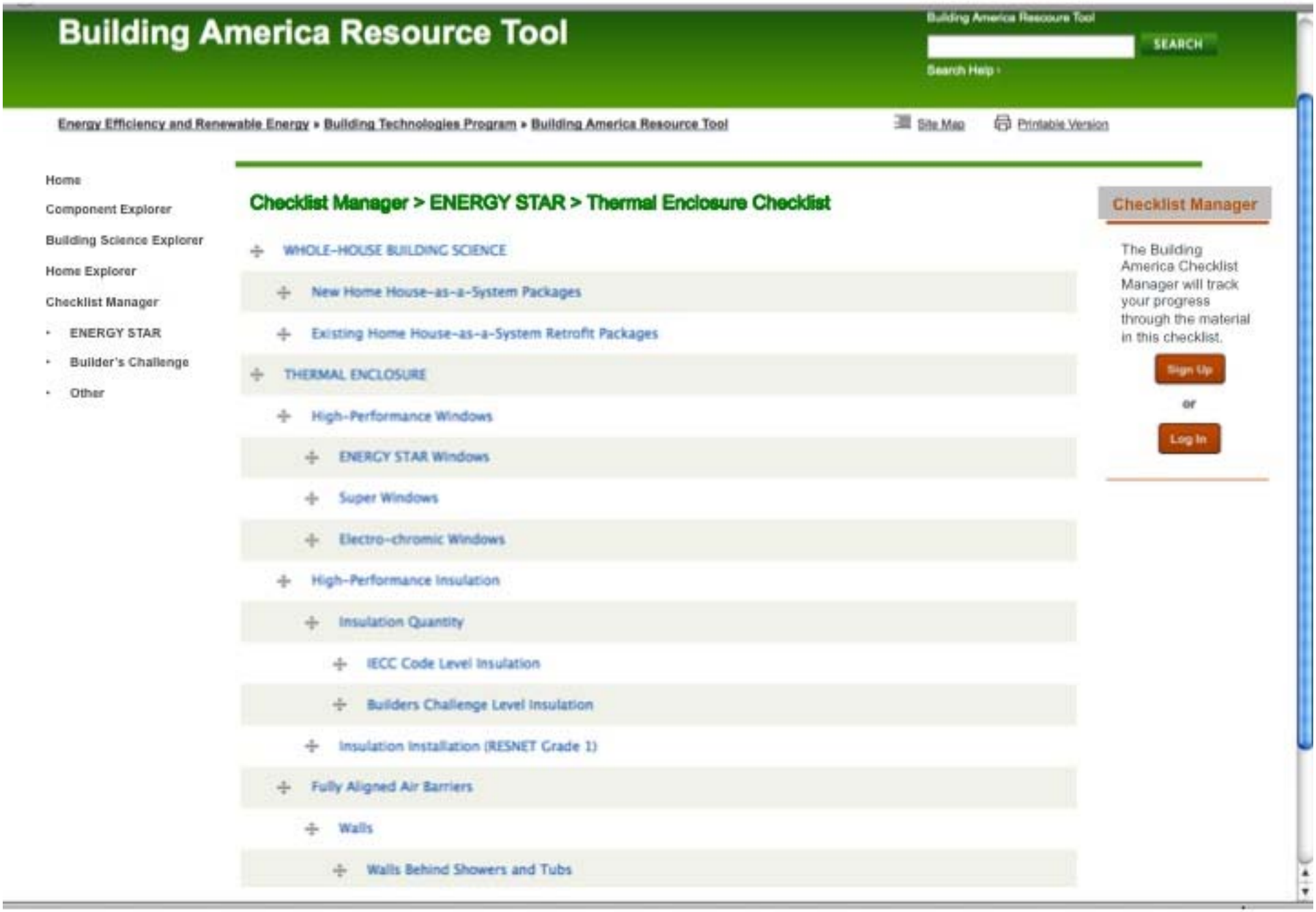







### Roof/Floor/Ceiling

Air Barriers
Air Seal
Insulation Installation
Insulation R-Values
Min. Therm. Bridging
Water Man. Roofs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Other
Checklist Manager > ENERGY STAR > Thermal Enclosure Checklist
WHOLE-HOUSE BUILDING SCIENCE
New Home House-as-a-System Packages
Existing Home House-as-a-System Retrofit Packages
THERMAL ENCLOSURE
High-Performance Windows
ENERGY STAR Windows
Super Windows
Electro-chromic Windows
High-Performance Insulation
Insulation Quantity
IECC Code Level Insulation
Builders Challenge Level Insulation
Insulation Installation (RESNET Grade 1)
Fully Aligned Air Barriers
Walls
Walls Behind Showers and Tubs
Checklist Manager
The Building America Checklist Manager will track your progress through the material in this checklist.
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Building Science Explorer
Home Explorer

Thermal Enclosure > Fully Aligned Air Barriers > Walls > Walls behind showers and tubs

# 3.1.1 Walls behind showers and tubs

Scope | Description | Logistics | Climate | Training | CAD | Resources | Compliance

- Install insulation without misalignments, compressions, gaps, or voids in all exterior wall cavities behind all tubs and showers.
- Back with a rigid air barrier or other supporting material to prevent insulation from sagging and create a continuous thermal barrier.*
- Seal all seams, gaps, and holes of the air barrier with caulk or foam before tub/shower installation.

* ENERGY STAR recommends using a rigid air barrier, but it is not a requirement.

**Notes:**

An air barrier is defined as any durable solid material that blocks air flow between conditioned space and unconditioned space, including necessary sealing to block excessive air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage …

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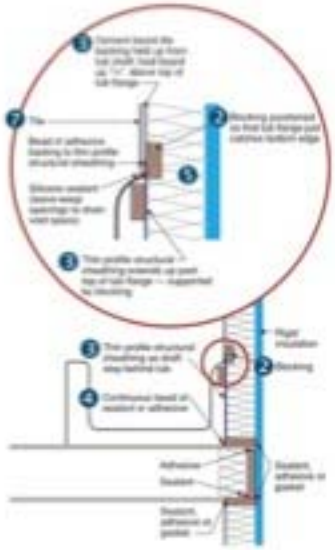
Thermal Enclosure > Fully Aligned Air Barriers > Walls > Walls behind showers and tubs

# 3.1.1 Walls behind showers and tubs

Scope | Description | Logistics | Climate | Training | CAD | Resources | Compliance

Install air barriers behind tubs and showers on exterior walls after installing insulation, but before the tub or shower is installed. An air barrier is defined as any durable solid material that blocks air flow between conditioned space and unconditioned space, including necessary sealing to block excessive air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. Air barrier material behind showers and tubs must tolerate moisture and include thin sheet goods, such as rigid insulation, expanding foam, and well-sealed concrete fiber sheets. These materials may be installed by insulators, framers, or plumbers. This task should be included in the contract for the appropriate trade depending on the workflow at specific job sites.



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# 3.1.1 Walls behind showers and tubs

Scope | Description | Logistics | Climate | Training | CAD | Resources | Compliance

## Right and Wrong Images

Air Barrier installed behind shower stall.

Insulation meets RESNET Grade I prior to air barrier installation.

Insulation has compression and misalignment.

No air barrier installed prior to tub installation.

## Videos



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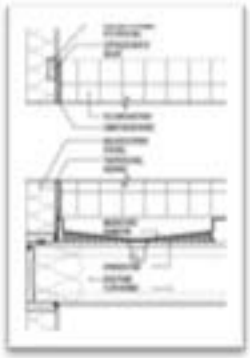
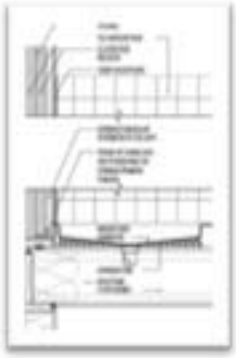
# 3.1.1 Walls behind showers and tubs

Scope | Description | Logistics | Climate | Training | CAD | Resources | Compliance

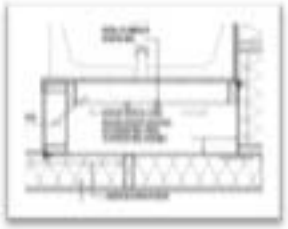
## CAD Files



Air sealing behind shower with thin profile sheathing
Download as pdf or dwg



Air sealing behind shower with cavity rigid insulation Download as pdf or dwg



Air sealing at corner vertical bathtub chase
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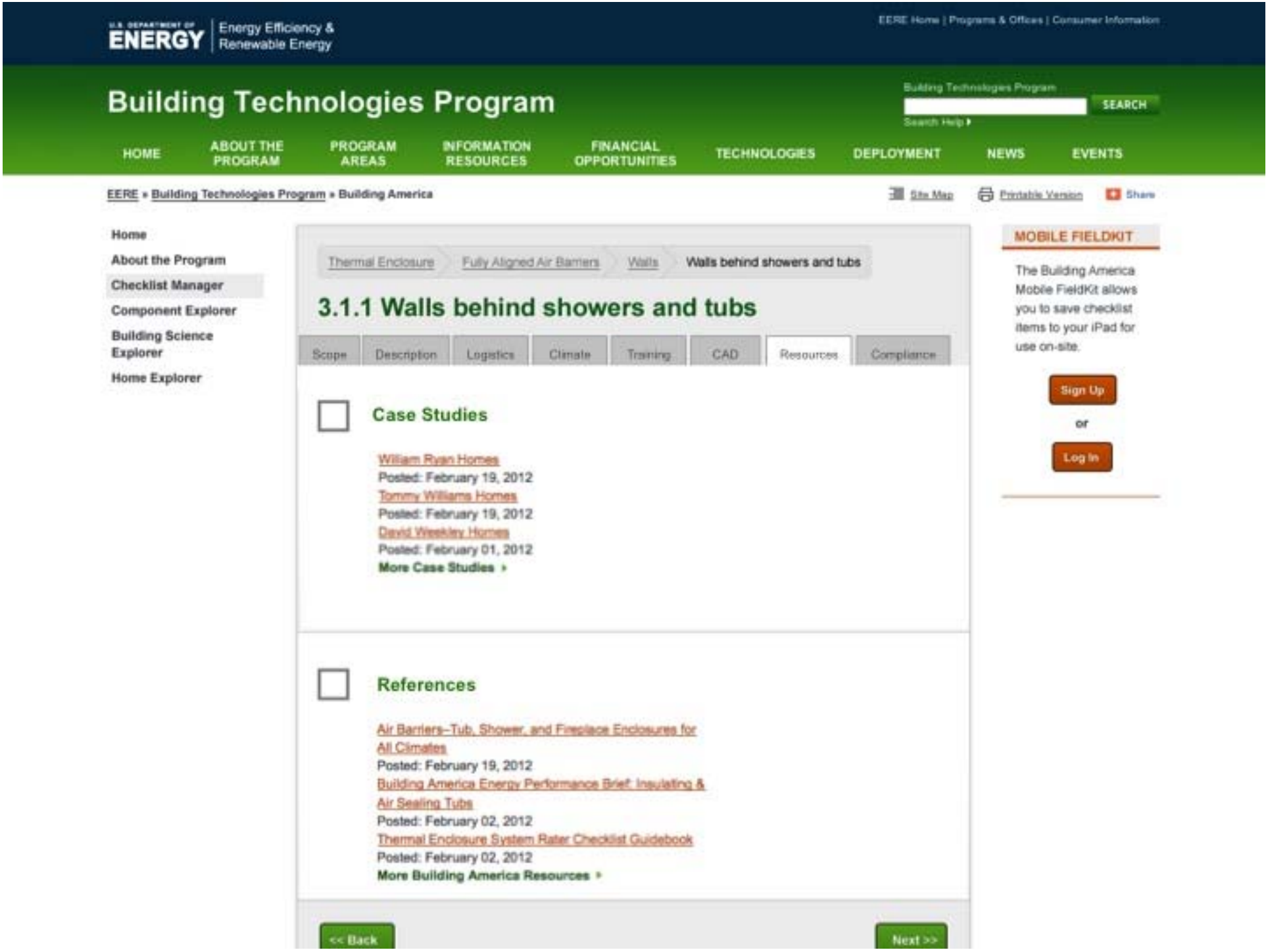
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Compliance
Case Studies
William Ryan Homes
Posted: February 19, 2012
Tommy Williams Homes
Posted: February 19, 2012
David Weekley Homes
Posted: February 01, 2012
More Case Studies
References
Air Barriers–Tub, Shower, and Fireplace Enclosures for All Climates
Posted: February 19, 2012
Building America Energy Performance Brief: Insulating & Air Sealing Tubs
Posted: February 02, 2012
Thermal Enclosure System Rater Checklist Guidebook
Posted: February 02, 2012
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Thermal Enclosure > Fully Aligned Air Barriers > Walls > Walls behind showers and tubs

# 3.1.1 Walls behind showers and tubs

Scope | Description | Logistics | Climate | Training | CAD | Resources | Compliance

**ENERGY STAR Version 3 (Rev. 04)**
Prescriptive Path (Exhibit 1: ENERGY STAR Reference Design)
Whole house infiltration rates shall be less than or equal to the following values:

- Climate zones 1-2 ≤ [less than or equal to] 6 ACH50
- Climate zones 3-4 ≤ 5 ACH50
- Climate zones 5-7 ≤ 4 ACH50
- Climate zone 8 ≤ 3 ACH50

Footnote 20: Envelope leakage shall be determined by a Rater using RESNET-approved testing protocol.

**Builder Challenge Draft Quality Criteria**
Whole house Infiltration rates [shall be less than or equal to the following values]:

- Climate zones 1-2 ≤ [less than or equal to] 3 ACH50
- Climate zones 3-4 ≤ 2.5 ACH50
- Climate zones 5-7 ≤ 2 ACH50
- Climate zone 8 ≤ 1.5 ACH50

(Footnote 10: Envelope leakage must be determined by an approved verifier using RESNET-approved testing protocol.]

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# Builders Challenge Version 2 Specification Strategy

# Strategy #1:

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**Don’t compete with ENERGY STAR**;
instead complement and align with ENERGY STAR.
Thus, it all begins with ENERGY STAR v3 prerequisite.

# Strategy #2:



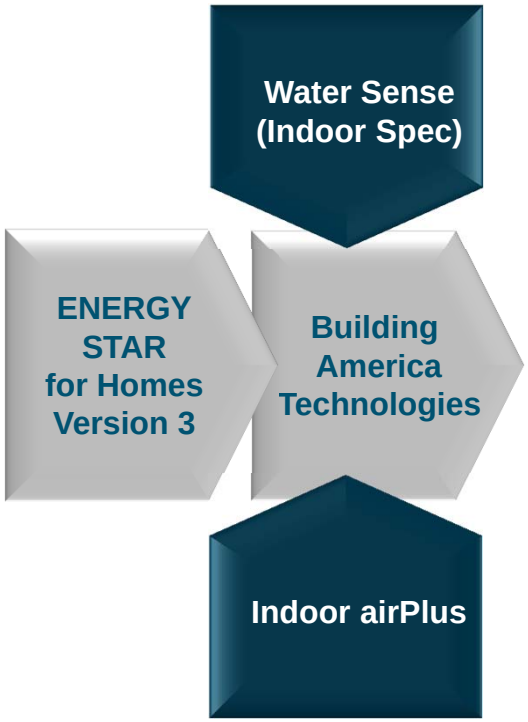
With ENERGY STAR ensuring complete building science, make homes ready for Net-Zero performance by **adding proven technologies and practices.**

# Strategy #3:



Homes this tight and well-insulated

**demand more vigilant pollutant control and attention to related water efficiency issues.**

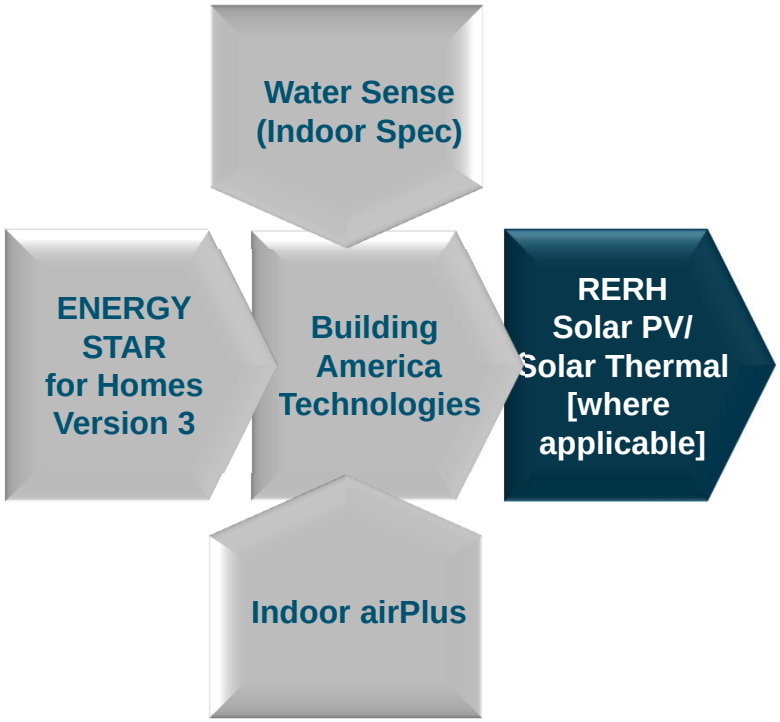


# Strategy #4:

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Since home performance is ready for net zero,

**ensure low-cost details that can save $1,000's downstream to install solar.**

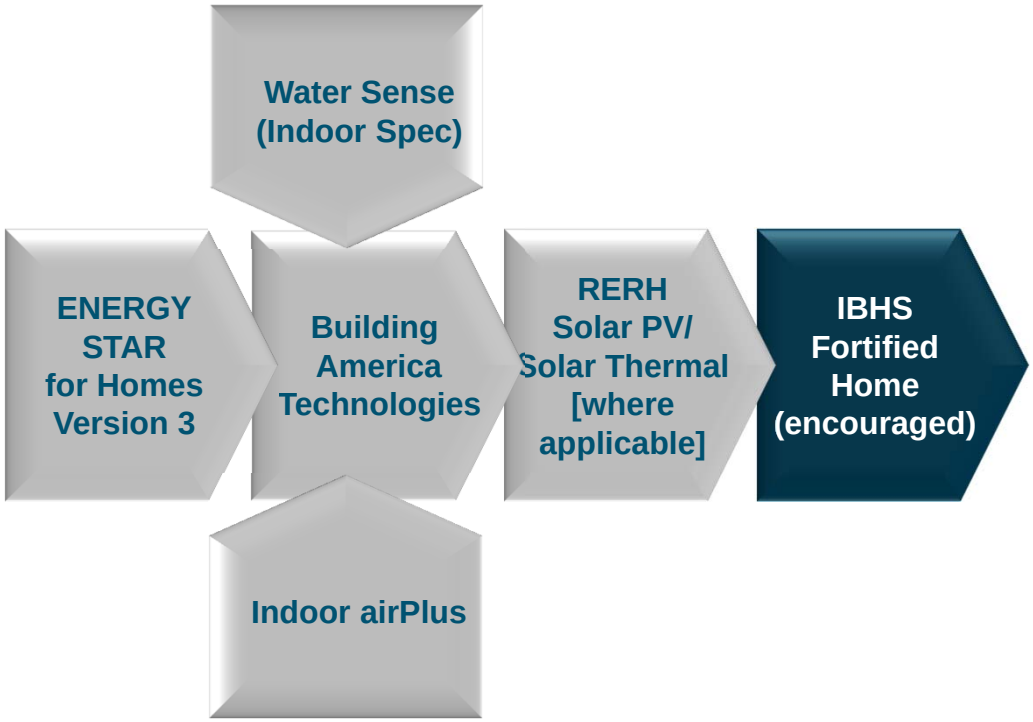


# Strategy #5:

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Homes built this well and this affordable should last 100's of years, so

**don't ignore disaster resistance.**



# Strategy #6:

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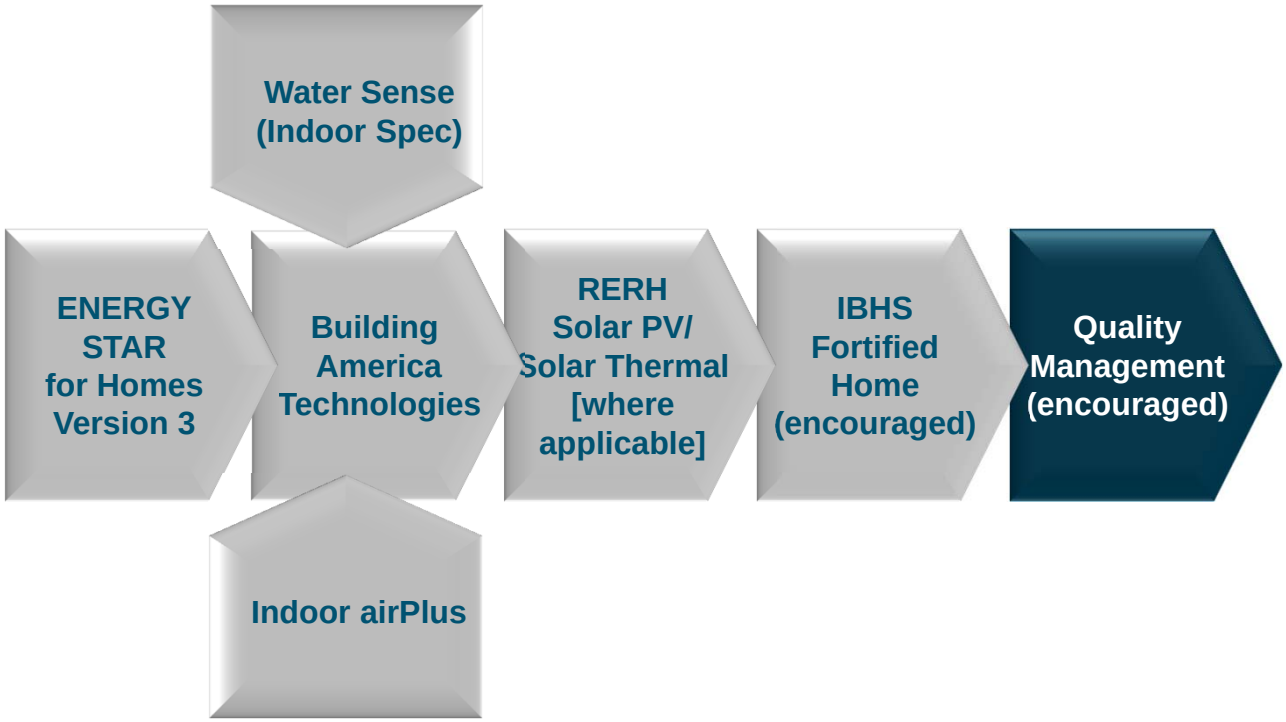
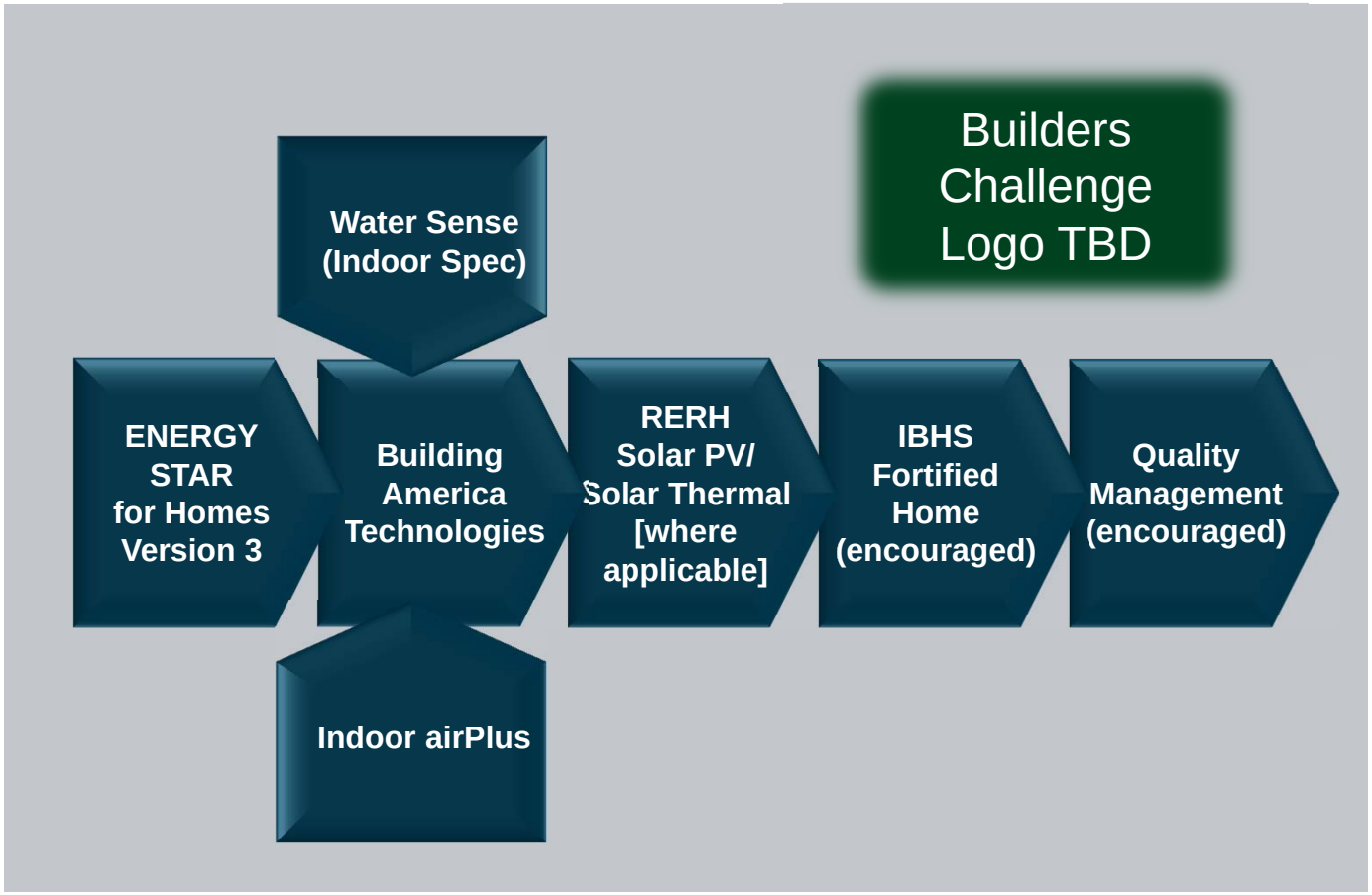
To ensure the success of builder partners,
it's important to
**encourage QA/QC practices.**



# Strategy Summary:

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

## All the pieces add up to Builders Challenge v2...



# Strategy Summary:

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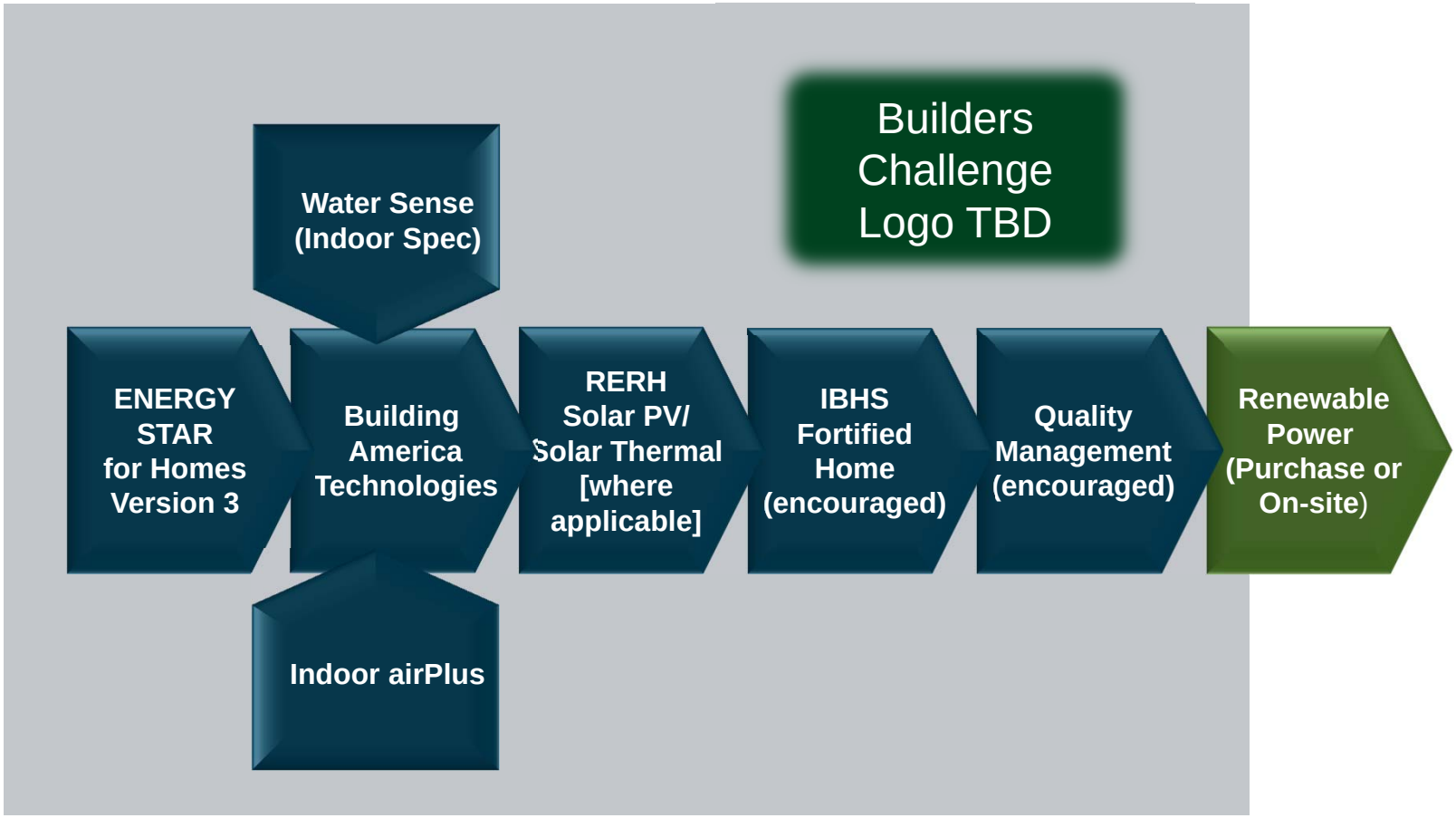
## …and now homes are ready for renewable power.



# Builders Challenge Version 2
# Builder Business Case

# How to Minimize Cost

NAHB estimates for every **$1,000 increase** in sales price, nearly **250,000 households** fail to qualify for a mortgage on a typical new home.

[http://www.nahb.org/fileUpload_details.aspx?contentTypeID=3&contentID=40372&subContentID=112293]

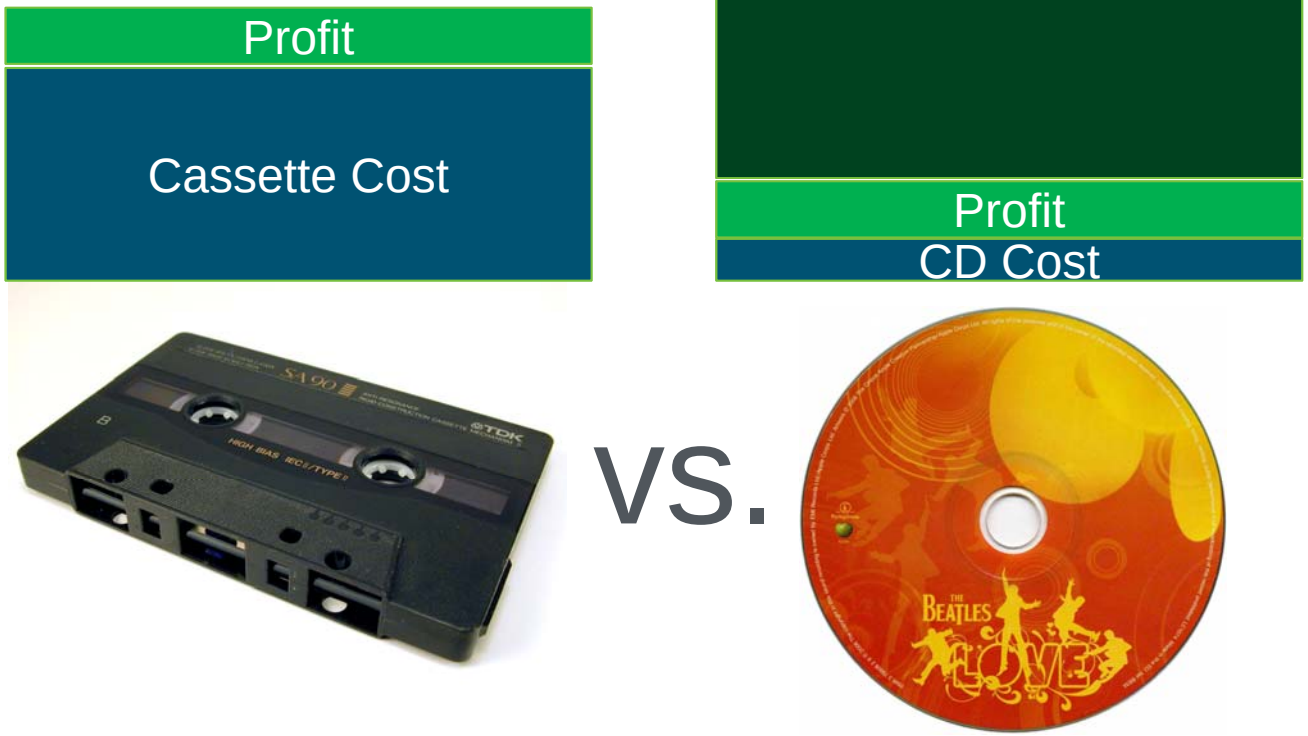
# How to Maximize Value

so homebuyers are compelled
to want new housing again.

# Innovation/Value Premium



Price Based on 'Value', NOT Cost



# Home Innovation Business Case

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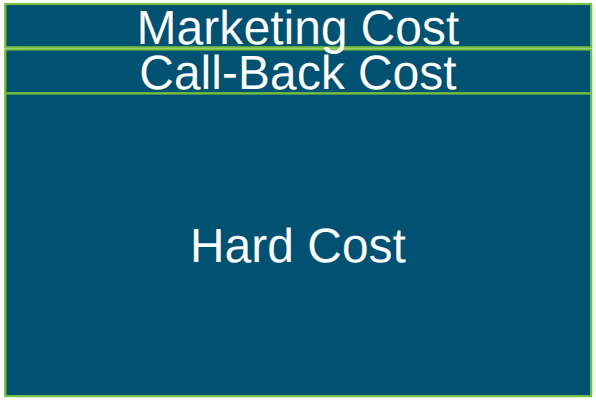
Standard Home

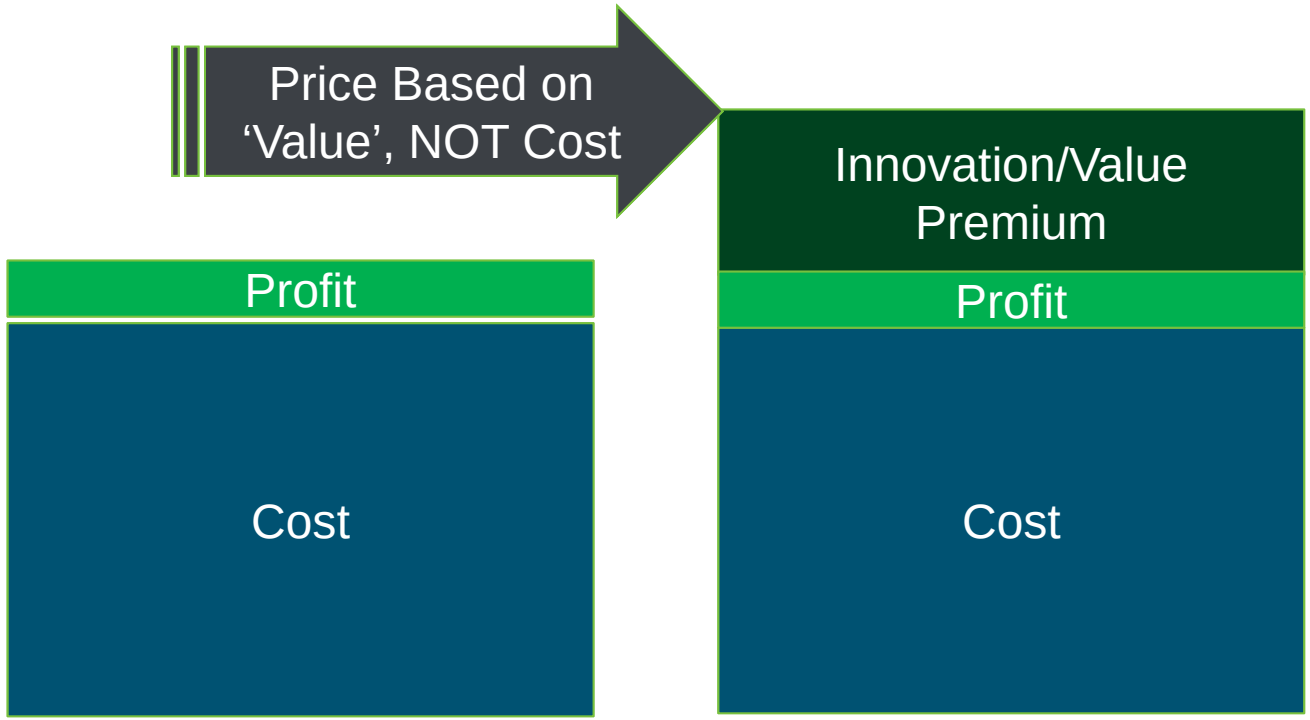
VS.




Builders Challenge Home

# Home Innovation/Value Premium






Standard Home

VS.

Builders Challenge Home

# Sam's 1st Law of Innovation

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The closer link to leadership,

the higher the innovation/value premium.

# Innovation Leadership Example

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# Sam's 2nd Law of Innovation

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Innovation option
can't look the same
as the standard option.

# What Were They Thinking?

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2001 Toyota Corolla

2001 Toyota Prius

# Getting Innovation 'Look' Right

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2005 Toyota Corolla

2005 Toyota Prius

# Personal Experience

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Low-Performance Home

High-Performance Home

# Working with Production Builders

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- Work the ‘Sweet Spot’
  [5-20 homes; most not ready for wholesale change]
- Measure Profit Metrics:
  - Call-Backs
  - Marketing Costs
  - Profit Margins
- High-Performance Looks Different!

# Builders Challenge Version 2 Consumer Message

# The Builders Challenge Story

Builders Challenge
Logo TBD

## Symbol of Excellence

This logo means your home was designed, engineered, and constructed in conformance to U.S. Department of Energy (DOE) guidelines for extraordinary levels of excellence and quality.

**Feel great knowing you choose a home earning a label only offered by leading edge builders.**



## Strong Heritage

Builders Challenge technical specifications are derived from world-class research conducted under the U.S. DOE Building America Program and every home meets ENERGY STAR for Homes Version 3 requirements.

**Look for the most effective and proven innovations in every labeled home.**

## Sustained Value

Since you only have one chance to build quality into a new home, every Builders Challenge qualified home is constructed to meet forthcoming code requirements.

**It's great peace-of-mind to know the largest investment of a lifetime won't be obsolete in a few years!**

# No or Ultra-Low Utility Bills

Every Builders Challenge Qualified Home is so energy efficient, a small solar system can often offset most, or all, of your utility bills. Look for important details that can save $1,000's of dollars installing a solar system in the future.

**Enjoy watching your home's value rise as utility rates steadily increase.**

# Breathe Better

Since we spend about two-thirds of our time each day inside our homes, every Builders Challenge qualified home has a comprehensive package of measures that control dangerous pollutants, provide continuous fresh air, and effectively filter the air you breathe.

**Now you can provide a healthier home for your family.**

# Water Smart

Every Builders Challenge home is equipped with the latest hot water distribution technology and often water saving fixtures. Save as much as 10,000 gallons or more wasted water down the drain each year and enjoy near-instant hot-water.

**Save water with no sacrifice in performance.**

# Engineered to Last

Comprehensive water protection and superior air-flow management can eliminate moisture-related problems. In addition, builders are encouraged to include regionally appropriate disaster-resistant construction practices.

**A home built to Builders Challenge quality standards is designed to last hundreds of years.**

# Future Performance Available Today

The U.S. DOE believes the advanced levels of affordability, comfort, quiet, health, durability, and quality delivered in your Builders Challenge qualified home is where all housing is headed in the future.

**Now you can feel confident before making such a large purchase decision.**

Builders Challenge Logo
TBD

# For More Information

Visit the Builders Challenge web site to learn more and find approved builder partners:

**http://www1.eere.energy.gov/buildings/challenge/**

# Builders Challenge Version 2 Draft Specifications

# Alignment with ENERGY STAR v3

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

**Builders Challenge Mandatory Reqts.**

**Builders Challenge Reference Design**

**Size Adjustment Factor**

DRAFT Builders Challenge
National Program Requirements
December 12, 2011

**Exhibit 1: Builders Challenge Mandatory Requirements for All Labeled Homes [4]**

| Area of Improvement | Mandatory Requirements |
|---|---|
| 1. Overall Home | ☐ Compliance with all ENERGY STAR Qualified Homes Version 3 requirements and checklists |
| 2. Envelope[5] | ☐ Fenestration shall meet or exceed latest ENERGY STAR requirements<br>☐ Ceiling, wall, floor, and slab insulation shall meet or exceed 2012 IECC levels |
| 3. Cooling & Heating System | ☐ Ducts inside conditioned space or alternative ductless HVAC system<br>☐ Total duct leakage is ≤ 4 CFM per 100 sq. ft. of conditioned floor area. [6] |
| 4. Water Efficiency | ☐ Plumbing fixtures, toilets, and hot water distribution shall meet EPA Water Sense requirements |
| 5. Lighting & Appliances[7] | ☐ All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified.<br>☐ ENERGY STAR qualified fixtures or bulbs in minimum 80% of sockets<br>☐ All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified |
| 6. Indoor Air Quality | ☐ EPA Indoor airPLUS Verification Checklist |
| 7. Renewable Ready[8] | ☐ EPA Renewable Energy Ready Home Solar Electric Checklist<br>☐ EPA Renewable Energy Ready Home Solar Thermal Checklist |

**Exhibit 2: Builders Challenge Target Home [2,4]**

| HVAC Equipment | | | |
|---|---|---|---|
| | Hot Climates (2009 IECC Zones 1,2)[9] | Mixed Climates (2009 IECC Zones 3,4,5)[9] | Cold Climates (2009 IECC Zones 6,7,8)[9] |
| AFUE | ≥80% | ≥90% | ≥94% |
| SEER | ≥18 | ≥15 | ≥13 |
| HSPF | ≥8.2 | ≥9 | ≥10[10] |
| Geothermal Heat Pump | 1.25 x ENERGY STAR EER and COP Criteria | | |
| ASHRAE 62.2 Ventilation | Any | any | HRV or ERV[11] |
| **Insulation and Infiltration** | | | |
| • Insulation levels shall meet the 2012 IECC and achieve Grade 1 installation, per RESNET standards.[12]<br>• Minimum R-4 insulation on heating and cooling system ducts<br>• Infiltration[13] (ACH50): 3 in CZ's 1-2 \| 2.5 in CZ's 3-4 \| 2 in CZ's 5-7 \| 1.5 in CZ 8 | | | |
| **Windows**[14,15,16] | | | |
| | Hot Climates (2009 IECC Zones 1,2,)[9] | Mixed Climates (2009 IECC Zones 3,4,5)[9] | Cold Climates (2009 IECC Zones 6,7,8)[9] |
| SHGC | ≤.25 | ≤.27 | any |
| U-Value | ≤.4 | ≤.3 | ≤.27 |
| Where Window to floor area (WFA) > 15%, SHGC's and U-values specified above shall be modified by: *[0.15/WFA] x value* | | | |
| **Water Heater** | | | |
| ENERGY STAR minimum | | | |
| **Thermostat[17] & Ductwork** | | | |
| • Programmable thermostat (except for zones with radiant heat) | | | |
| **Lighting & Appliances** | | | |
| • For purposes of calculating the Builders Challenge HERS Target, homes must be modeled with an ENERGY STAR dishwasher, ENERGY STAR refrigerator, ENERGY STAR ceiling fans, and ENERGY STAR bulbs in 80% of sockets. | | | |

DRAFT Builders Challenge
National Program Requirements
December 12, 2011

**Exhibit 3: Benchmark Home Size[18]**

| Bedrooms in Home to be Built | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Conditioned Floor Area Benchmark Home | 1,000 | 1,600 | 2,200 | 2,800 | 3,400 | 4,000 | 4,600 | 5,200 |

# Reference Design

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

**Higher Eff. HVAC Equip.**

**2012 vs. 2009 IECC Insul.**

**More Eff. Windows**

**Half ACH50**

**ENERGY STAR Water Htg.**

**Exhibit 2: Builders Challenge Target Home [2,4]**

| HVAC Equipment | | | |
|---|---|---|---|
| | **Hot Climates** (2009 IECC Zones 1,2) [9] | **Mixed Climates** (2009 IECC Zones 3,4,5) [9] | **Cold Climates** (2009 IECC Zones 6,7,8) [9] |
| AFUE | ≥80% | ≥90% | ≥94% |
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| ASHRAE 62.2 Ventilation | Any | any | HRV or ERV [11] |
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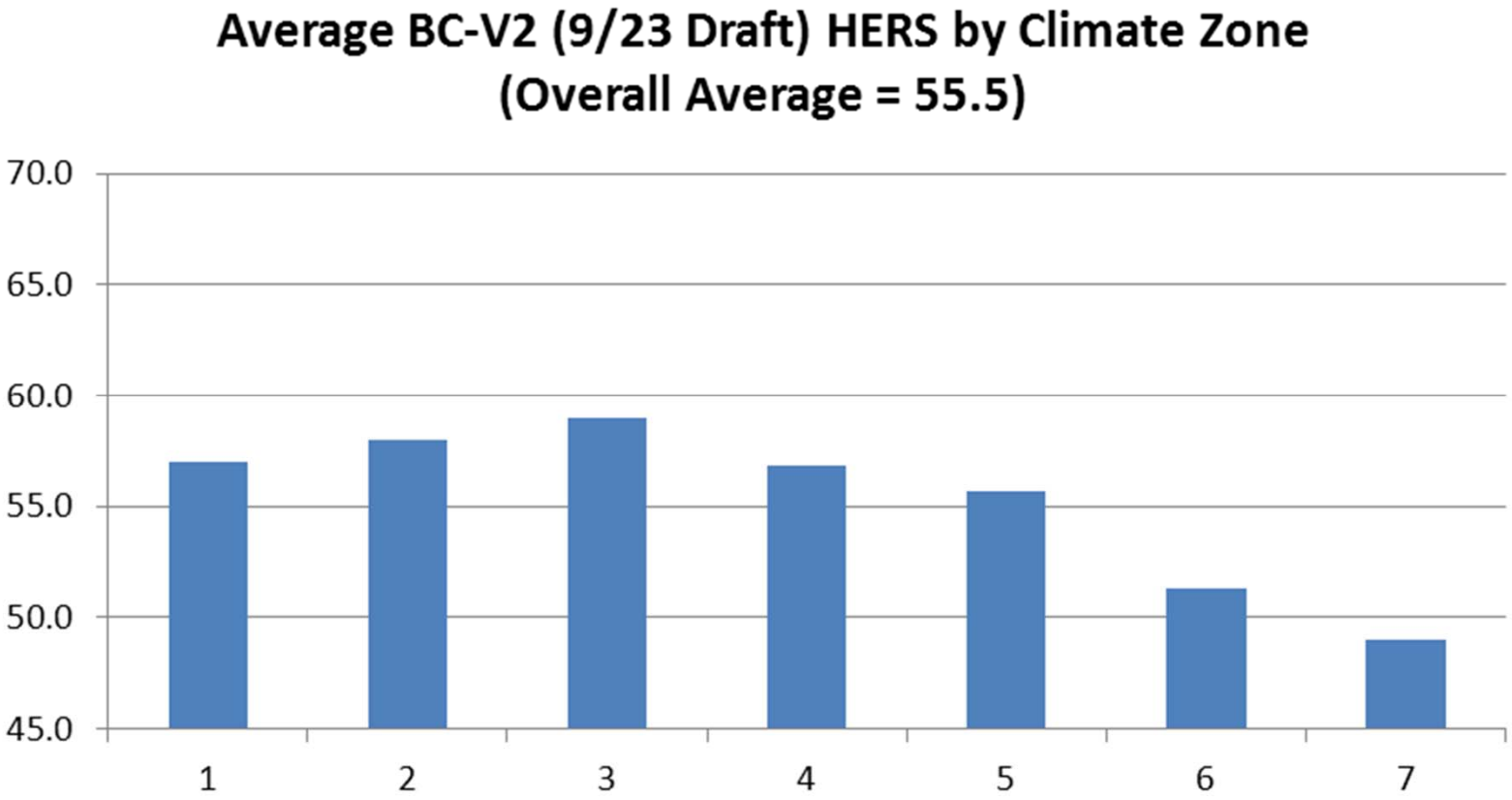
| **Windows** [14,15,16] | | | |
| | **Hot Climates** (2009 IECC Zones 1,2,) [9] | **Mixed Climates** (2009 IECC Zones 3,4,5) [9] | **Cold Climates** (2009 IECC Zone |
| SHGC | ≤.25 | ≤.27 | any |
| U-Value | ≤.4 | ≤.3 | ≤.27 |
| here Window to floor area (WFA) > 15%, SHGC's and U-values specified above shall be modified by: *[0.15/WFA] x* | | | |
| **Water Heater** | | | |
| ENERGY STAR minimum | | | |
| **Thermostat** [17] **& Ductwork** | | | |
| • Programmable thermostat (except for zones with radiant heat) | | | |
| **Lighting & Appliances** | | | |
| • For purposes of calculating the Builders Challenge HERS Target, homes must be modeled with an ENERGY STAR dishwasher, ENERGY STAR refrigerator, ENERGY STAR ceiling fans, and ENERGY STAR bulbs in 80% of sockets. | | | |

# Performance





# Mandatory Requirements

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

**Exhibit 1: Builders Challenge Mandatory Requirements for All Labeled Homes [4]**

| Area of Improvement | Mandatory Requirements |
|---|---|
| 1. Overall Home | ☐ Compliance with all ENERGY STAR Qualified Homes Version 3 requirements and checklists |
| 2. Envelope[5] | ☐ Fenestration shall meet or exceed latest ENERGY STAR requirements<br>☐ Ceiling, wall, floor, and slab insulation shall meet or exceed 2012 IECC levels |
| 3. Cooling & Heating System | ☐ Ducts inside conditioned space or alternative ductless HVAC system<br>☐ Total duct leakage is ≤ 4 CFM per 100 sq. ft. of conditioned floor area. [6] |
| 4. Water Efficiency | ☐ Plumbing fixtures, toilets, and hot water distribution shall meet EPA Water Sense requirements |
| 5. Lighting & Appliances[7] | ☐ All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified.<br>☐ ENERGY STAR qualified fixtures or bulbs in minimum 80% of sockets<br>☐ All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified |
| 6. Indoor Air Quality | ☐ EPA Indoor airPLUS Verification Checklist |
| 7. Renewable Ready[8] | ☐ EPA Renewable Energy Ready Home Solar Electric Checklist<br>☐ EPA Renewable Energy Ready Home Solar Thermal Checklist |

## Encouraged:

- Quality Management
- WaterSense Label (indoor and outdoor)
- Disaster Resistance (IBHS Fortified Home)

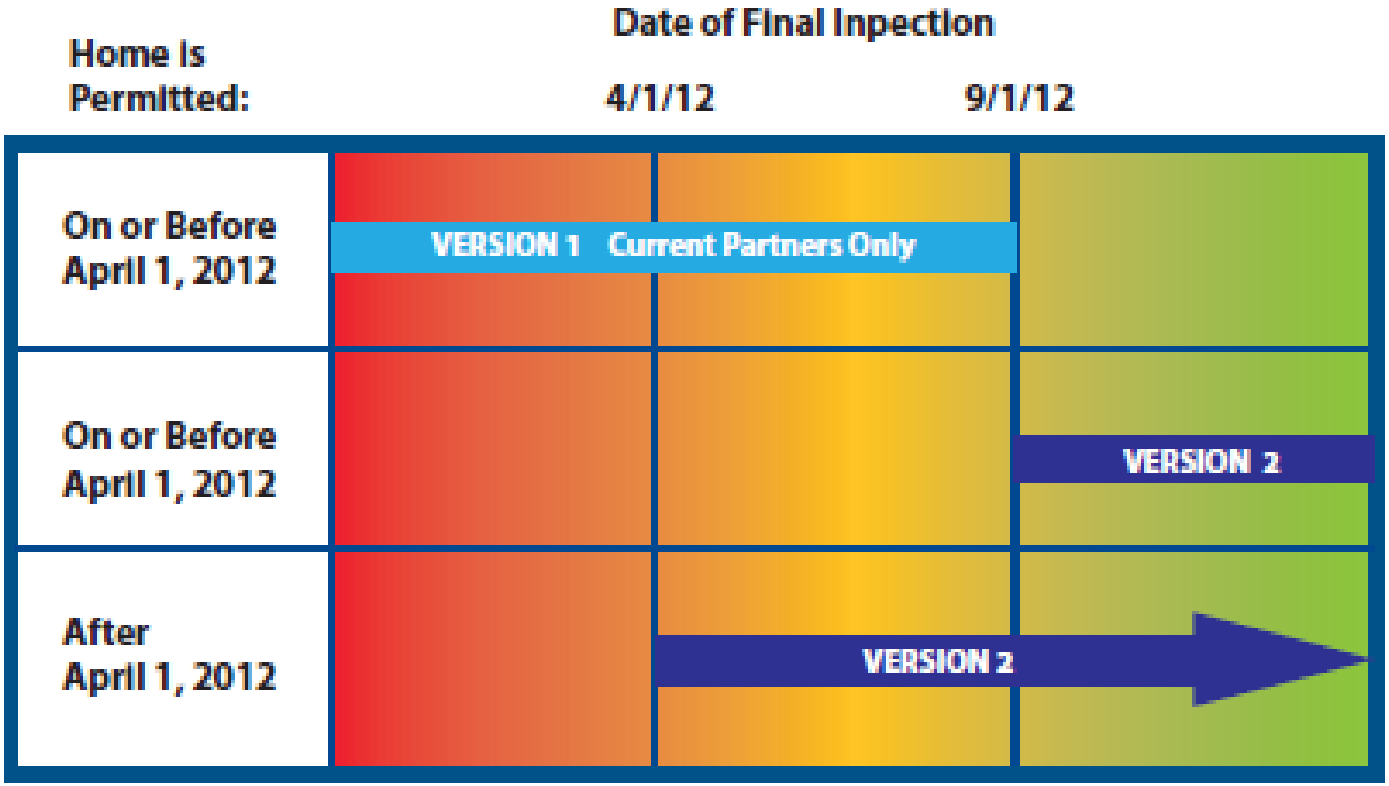
# Verifying Homes



- Framework: Same as ENERGY STAR Homes
- New: Indoor airPLUS; Renewable Energy Ready Home checklists
- Software: compliance reporting to be built within EnergyGauge and REM/Rate
- Submissions: National Homes Registry

# Schedule




Date of Final Inpection
Home is Permitted:
4/1/12
9/1/12
On or Before April 1, 2012
VERSION 1 Current Partners Only
On or Before April 1, 2012
VERSION 2
After April 1, 2012
VERSION 2

# Key Steps Ahead

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

- Finalize v2 Specification
  [March, 2012]
- Develop ‘Brand’ Architecture
  [March, 2012]
- Builder Training
  [April, 2012]
- Revise Web and Other Communications
  [April, 2012]
- Launch Version 2
  [April, 2012]

# Thank You

Questions?

**For More Information:**

http://www1.eere.energy.gov/buildings/challenge/

**e-mail Contact:**

builderschallenge@newportpartnersllc.com