U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Building America
U.S. Department of Energy
Research Toward Zero Energy Homes

Builders Challenge

Recognizing Energy Leadership in Homebuilding

2009 RESNET Building Performance Conference

Tuesday, February 17th

U.S. DEPARTMENT OF ENERGY

Ed Pollock, US DOE
Joe Nebbia, Newport Partners
Dave Roberts, NREL

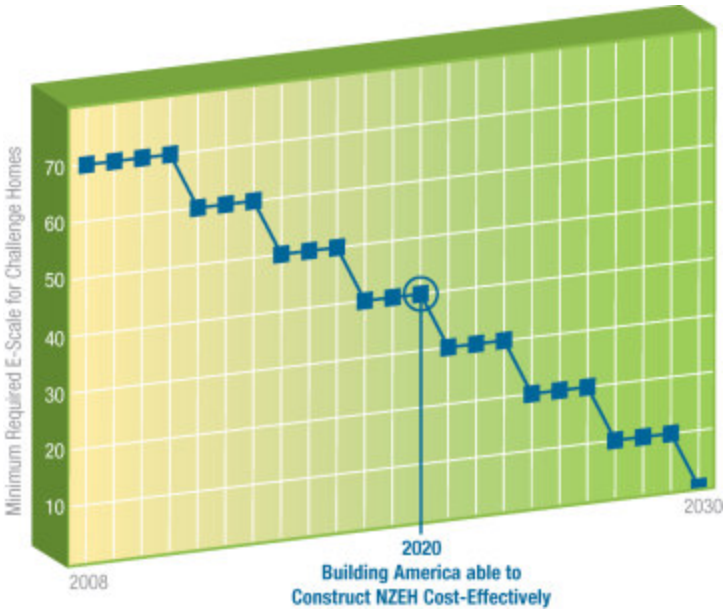
RESNET
Residential Energy Services Network

What is the Purpose?

Transform the market and give all Americans the opportunity to purchase the best homes that technology allows and save an estimated $1.7 billion dollars (cumulative) on energy bills.

What is the goal?

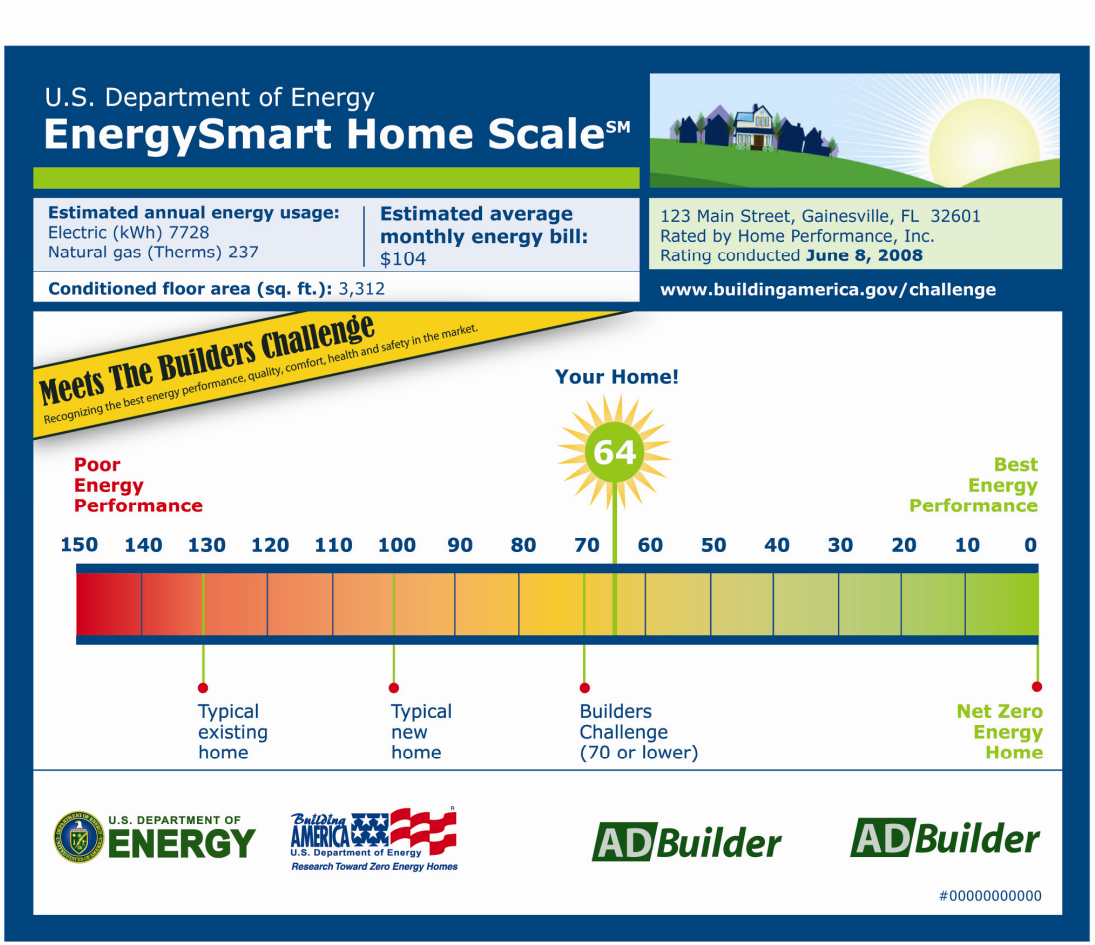
- Cost-neutral Net-Zero Energy Home (NZEH) anywhere in the United States by 2030
- 15,000 high performance homes this year
  - 70 threshold on the E-Scale
  - Meet the Builders Challenge Quality Criteria
- Incremental increases after 2012 to reach 2030



Why is DOE doing this?

- Reduce U.S. residential energy consumption
- Utilize over a decade of market-tested Building America research
- Allow differentiation and increased recognition for increased energy efficiency and quality
- Promote a national metric equivalent to an MPG for cars to reduce consumer confusion

Overview



Drive demand:
Help homebuyers recognize that homes that meet the Builders Challenge represent the best energy performance, quality, comfort, health and safety available in the current housing market.

Builders Challenge launched at 2008 International Builders Show in Orlando

By 2030, new home buyers will have the option to buy a cost-neutral Net-Zero Energy Home (NZEH) anywhere in the United States.

Initiative Goals	2012	2030
EnergySmart Home Scale (E-Scale)	70	0
Cumulative # of Homes from 2008	220K	1.3M
Cumulative Energy Savings (Quads, Primary)	0.015	0.178
Cumulative Energy Cost Savings	$143M	$1.7B
Cumulative Carbon Savings (Million Metric Tons)	0.231	2.799

February 14, 2008, Orlando , FL*—U.S. DOE Secretary Bodman posed a challenge to the homebuilding industry – to build 220,000 high performance homes by 2012.*

Overview

- Not a new program, not the competition: reinforces and leverages existing programs
  - Relies heavily on RESNET Standards and procedures
  - E-Scale utilizes the HERS Index
  - QC requirements embody Building America research
  - ENERGY STAR product labeling

How does the Builders Challenge differ from ENERGY STAR Qualified Homes?

- Builds on ENERGY STAR and uses same rating infrastructure
- Point of differentiation for those who want recognition for increased energy efficiency
- Higher level of energy efficiency (approximately 30% above 2004 IECC v. 15%)
- Recognition for actual levels of efficiency rather than pass/fail
  - Will help pave the way towards Net-Zero Energy Homes
- Quality criteria for health, durability, and IAQ

Overview

- Complying with a Program Partner at a certain equivalent level = Meeting the Builders Challenge.
  - DOE's E-Scale on the home
  - Additional market recognition for the builder
- Initial Program Partners include EarthCraft and Environments for Living, with several other discussions underway.

EARTH CRAFT HOUSE™

ENVIRONMENTS FOR Living®
CERTIFIED GREEN

Partnering Opportunities

- **Raters/verifiers** provide services to builders and increase consumer confidence
- Builder partners can make the Challenge part of their portfolio for recognition at higher levels
- Resource partners provide training and outreach
- National, regional and local energy efficiency and green partner programs and HERS Providers provide infrastructure.
- Manufacturer partners support marketing
- Lending institutions, utilities, and others all can leverage more efficient homes

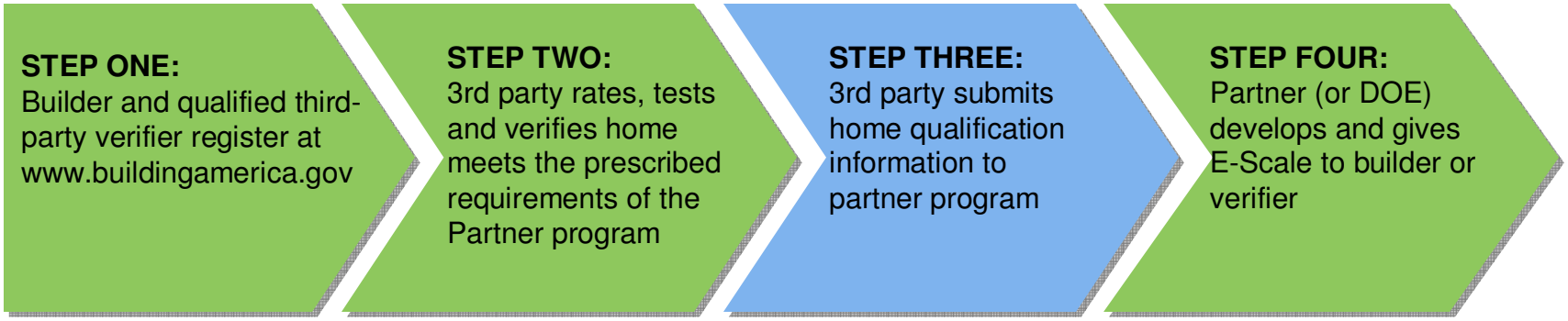
How does it work?

Three pathways to meet every builder's needs:

1. Partner Program
2. Performance
3. Prescriptive

How does it work?

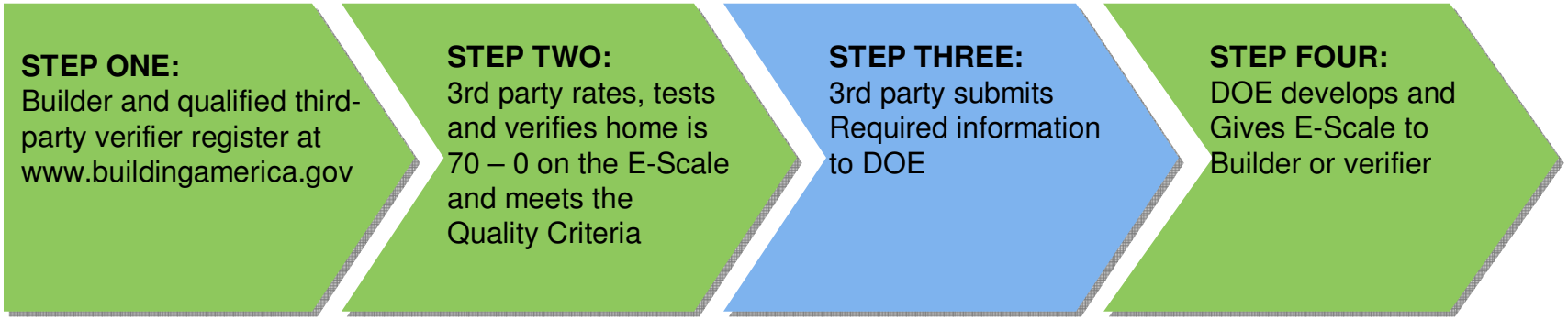
1. **Partner Program - establishes equivalency and operations with DOE**
2. Performance
3. Prescriptive



Examples:
- *Environments for Living Diamond Level*
- *Earthcraft Homes - Tier II Level*

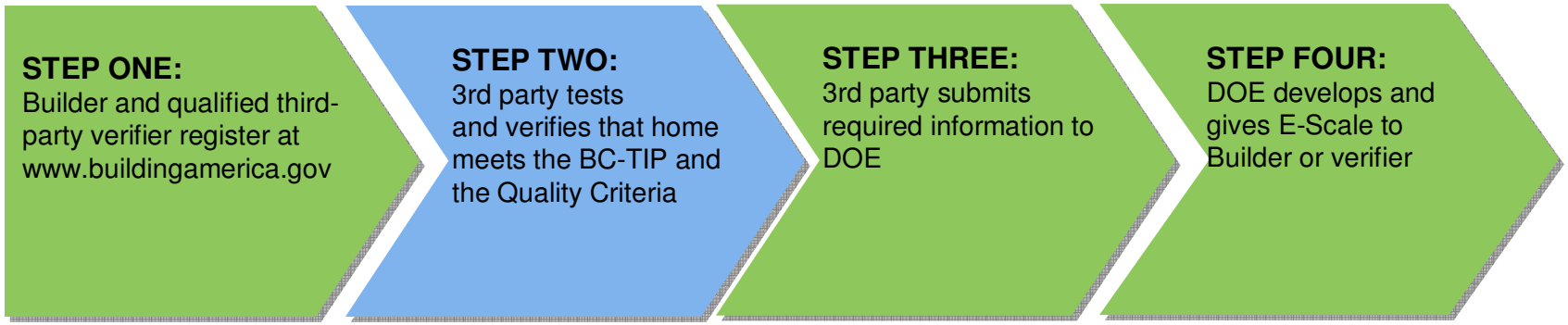
How does it work?

1. Partner/HERS Provider—establishes equivalency and operations with DOE
2. **Performance**
3. Prescriptive



How does it work?

1. Partner/HERS Provider—establishes equivalency and operations with DOE
2. Performance
3. **Prescriptive–Builder chooses a Builders Challenge Technology Information Package (BC-TIP)**



BC-TIP for New Orleans, LA

BC-TIP for New Orleans, LA

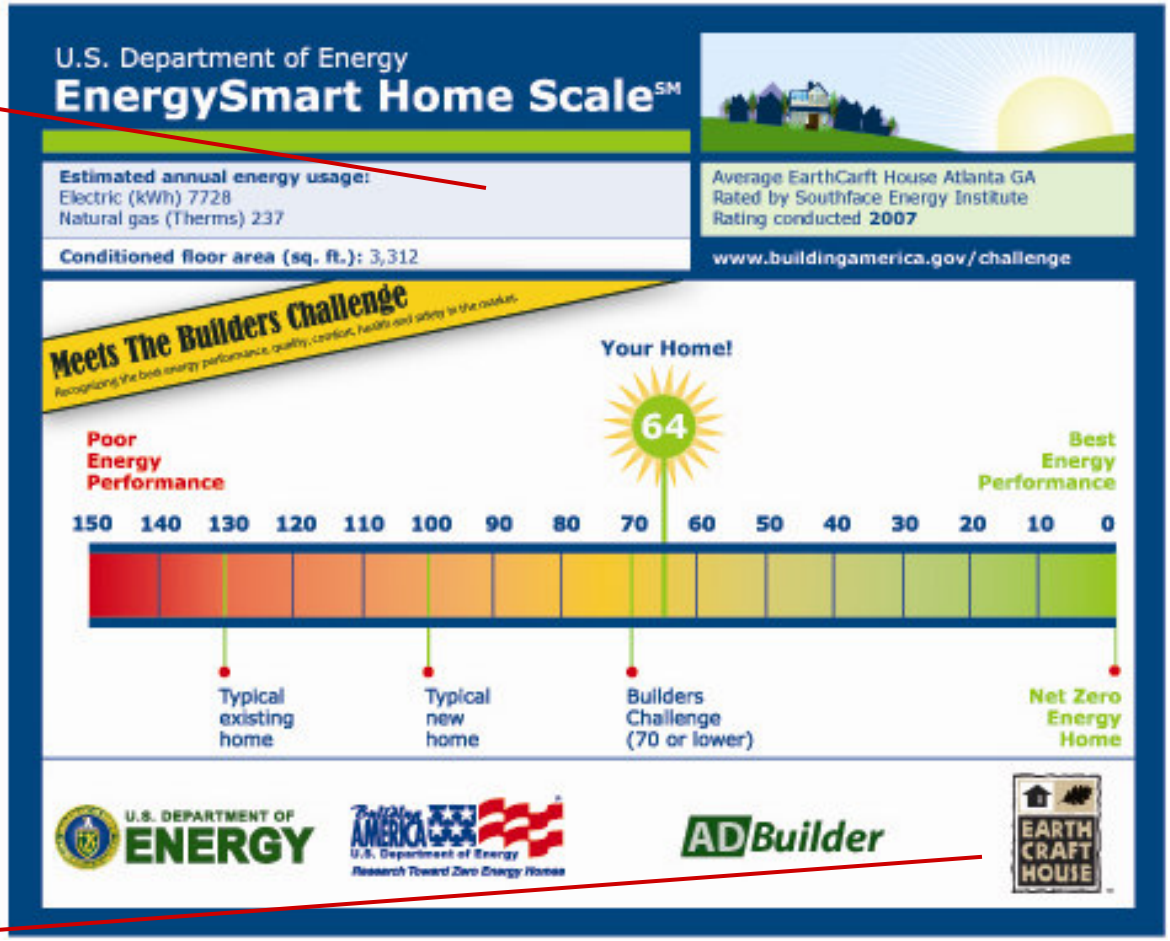
Climate Region: Hot-Humid Location: New Orleans Foundation Type: Crawlspace	Minimum Builders Challenge Level		Premium Efficiency Level	
Heating Fuel	**Gas**	**Electric**	**Gas**	**Electric**
Insulation				
Walls[1]	2x4 R-15	2x4 R-15	2x4 R-15	2x4 R-15
Roof	R-30	R-30	R-30	R-30
Crawlspace	Sealed, R-10/R-13[4]	Sealed, R-10/R-13[4]	Sealed, R-10/R-13[4]	Sealed, R-10/R-13[4]
Windows[2]				
	Double-Glazed, Low-E	Double-Glazed, Low-E	Double-Glazed, Low-E	Double-Glazed, Low-E
U-Factor	0.35	0.35	0.32	0.32
Solar Heat Gain Coefficient	0.35	0.35	0.27	0.27
Lighting				
% Fluorescent Fixtures[3]	90%	90%	100%	100%
Heating				
Furnace, Efficiency Rating, AFUE	82		92.5	
Air-Source Heat Pump, HSPF		8.8		8.8
Air Conditioning				
Efficiency Rating, SEER	14		17	
Air-Source Heat Pump, SEER		15		15
(Builder-Supplied) Appliances				
	ENERGY STAR®	ENERGY STAR®	ENERGY STAR®	ENERGY STAR®
Water Heater				
	Tankless/Gas	Tank/Electric	Tankless/Gas	Tank/Electric
Energy Factor, EF	0.77	0.95	0.77	0.95
Solar				64sf Closed-Loop
Air Tightness				
ACH50	5.0	5.0	3.0	3.0
Ducts				
Location	Sealed Crawlspace	Sealed Crawlspace	Sealed Crawlspace	Sealed Crawlspace
Insulation	R-4.2	R-4.2	R-4.2	R-4.2
Leakage	10%	10%	10%	10%

[1] Framing factor shall not exceed 25%.
[2] Window area shall not exceed 18% of conditioned, above-grade floor area.
[3] Pin-based fluorescent fixtures or compact fluorescent lamps.
[4] The first R-value applies to continuous insulation, the second to framing cavity insulation; either meets the requirement.

Partner Program Label

Cost data optional

Additional information on label may be added in accordance with the E-Scale usage guidelines.

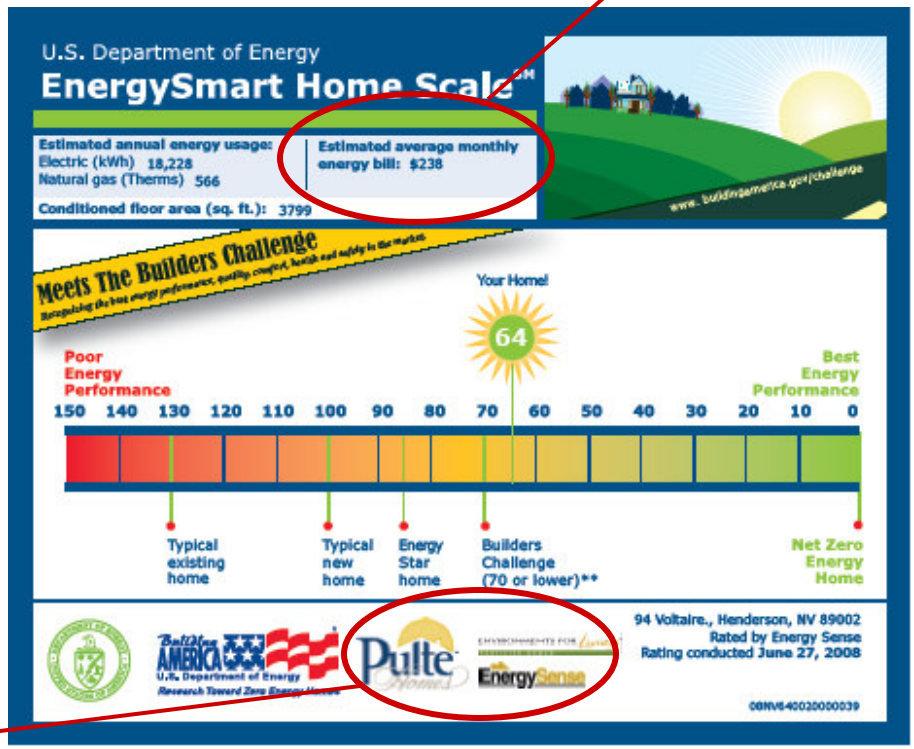


Partner program logo

EnergySmart Home Scale with banner

- Permanent sticker on the utility panel
- PDF for marketing

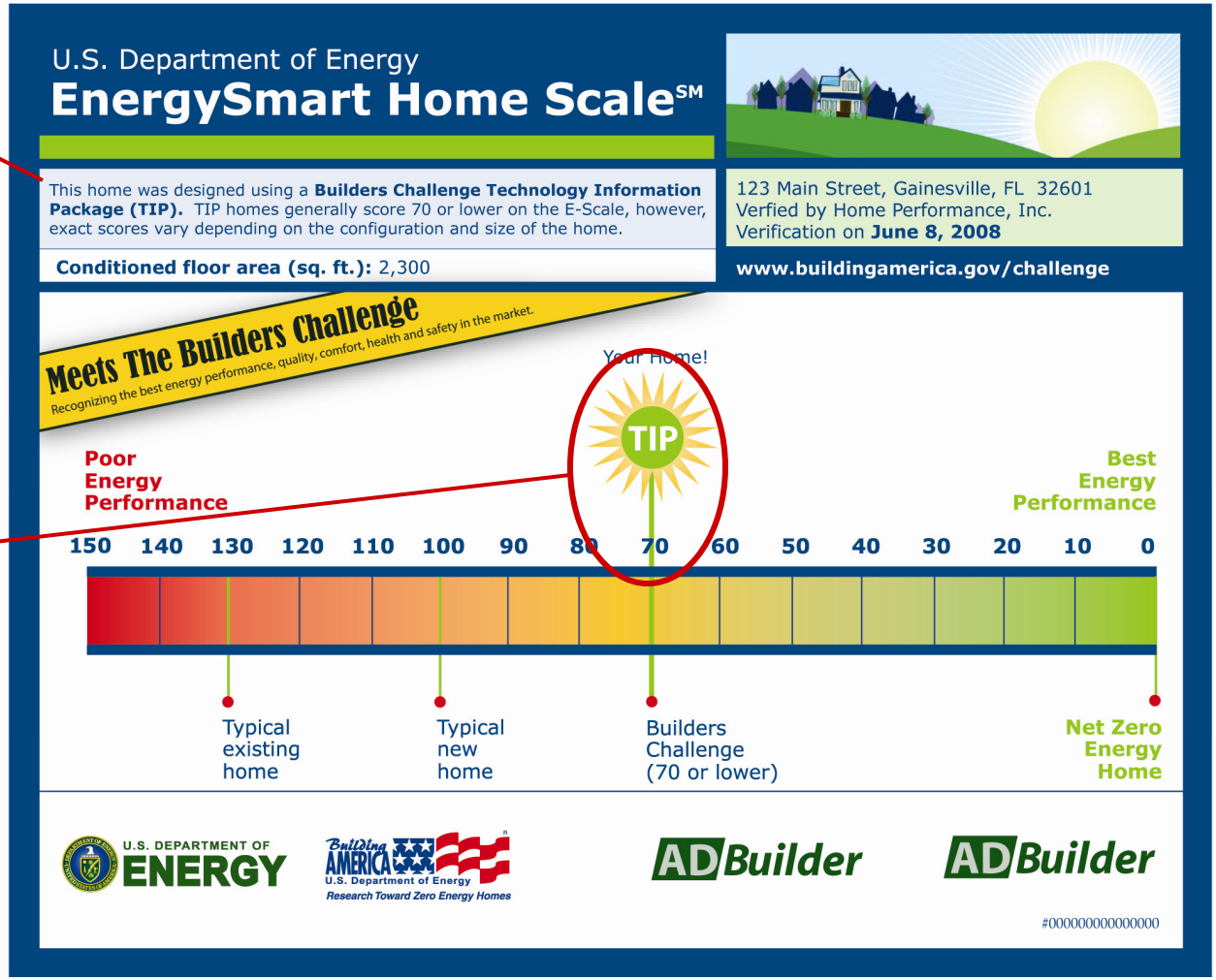
- *Features sunburst with HERS Score*
  - *Energy use*
    - *Conditioned floor area*



Prescriptive Label

Identified as meeting the requirements of a Builders Challenge Technology Package

Sunburst always at 70 default to relate a conservative estimate for home's performance

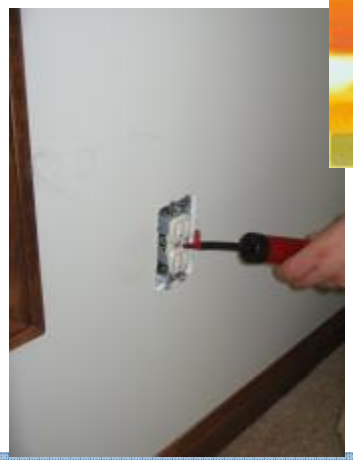


The Role of Verifiers

Verifiers are a critical component of the Builders Challenge

- Consulting
- Educating
- Verifying
- Documenting
- Marketing

Raising awareness and growing the market for high performance homes



What is a verifier?

BC provides the bar - third-party verifiers provide the guidance to get over it!

- Provide builders with expert advice
- Model options for optimal design and performance
- Rate performance and provides guidance on documentation
- Verify implementation of Quality Criteria through visual inspection and testing
- And qualifies homes….

Who can be a verifier?

RESNET-certified HERS raters and DOE Building Consortia team members qualify as third-party verifiers for the Builders Challenge.

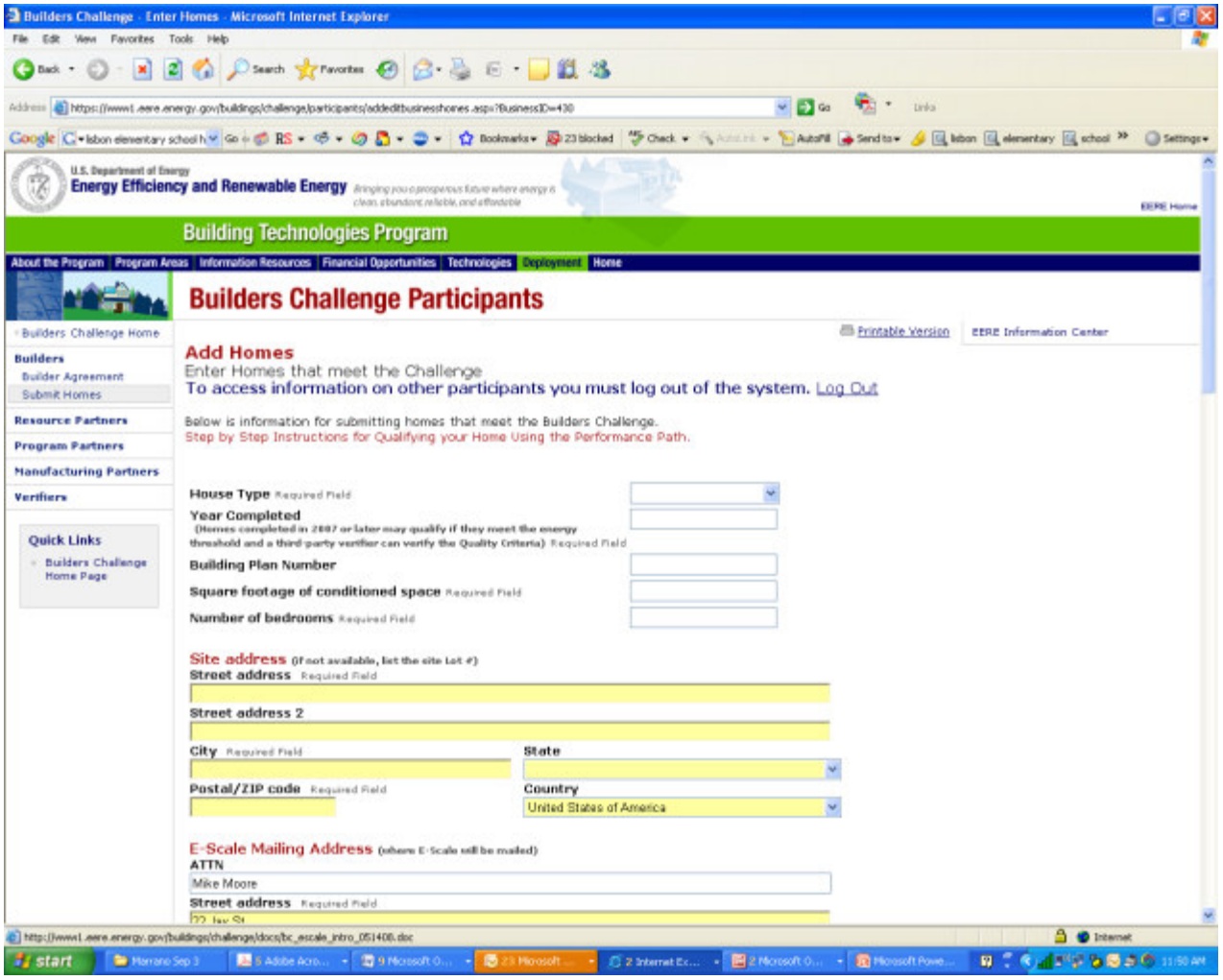
Other professionals may be eligible to serve as verifiers, if they have adequate training and credentials and are approved by DOE.

All verifiers must register with the Challenge online before qualifying homes.

Submitting Homes

- To qualify homes, the registered verifier logs in at www.buildingamerica.gov/challenge and goes to "Qualify Homes"
  - Chose the registered builder
  - Enter data REM/Rate and EnergyGauge™ Compliance Reports
  - Submit
- Verifier will receive customized E-Scale electric panel sticker (mailed) and .pdf file (emailed) within 5-10 business days

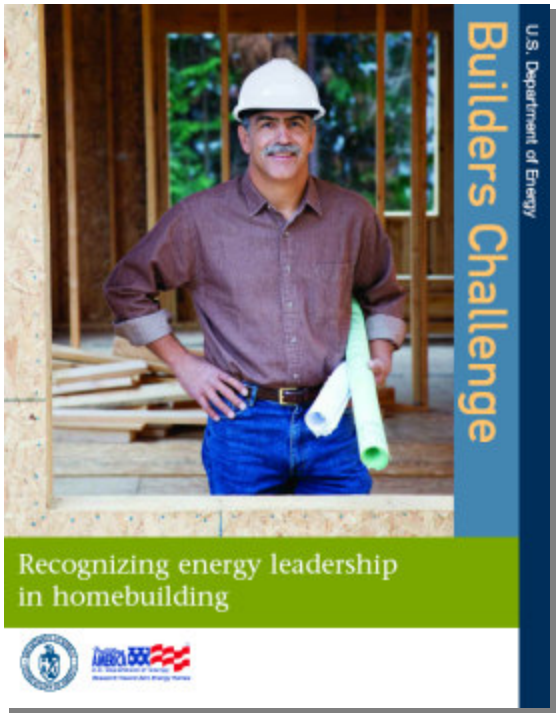
Submitting Homes



- Web-based submission tools
- Email or fax submission
- Submission of batches of homes with large-volume raters

Core messages for Raters to take to builders:

- Take the challenge to build more energy efficient homes.
- Be recognized for building the best new homes on the market.
- The E-Scale is becoming the MPG sticker for America's homes
- Differentiate and meet customer demand.



Builders Challenge Marketing Resources:

- Marketing Tool Kit (available online)
  - Logos
  - Overview Brochure
  - Buyer-Focused Brochure
  - Usage guidelines
  - Sample press release
  - Consumer ads

Building AMERICA
U.S. Department of Energy
Research Toward Zero Energy Homes

Builders Challenge Partner

Sample Resources

Buyer-Focused Brochure

Take Control of Your Energy Future

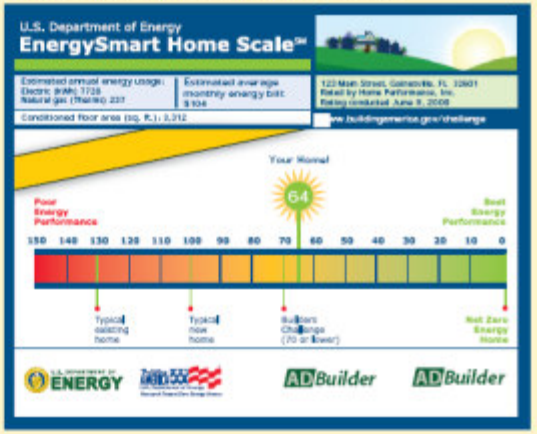
Choosing a new home is all about making the right decisions for you and your loved ones — selecting a neighborhood, a high-quality builder, and the features you value. You compare, ask questions, and make informed decisions about what matters most to you.

But what about energy? Today, more and more buyers value energy efficiency in their new homes – as a way to control their energy bills, reduce carbon emissions, and help preserve our natural environment. Yet, until now, there has been no easy way to compare the energy performance of different homes.

That is where the EnergySmart Home Scale (E-Scale) comes in. Brought to you by the U.S. Department of Energy, the E-Scale lets you compare the energy performance of homes on the market, simply by comparing a number rating. And like your car's MPG, it is a number worth knowing – a number that can put you in control of your energy future.

Make smart choices with the E-Scale

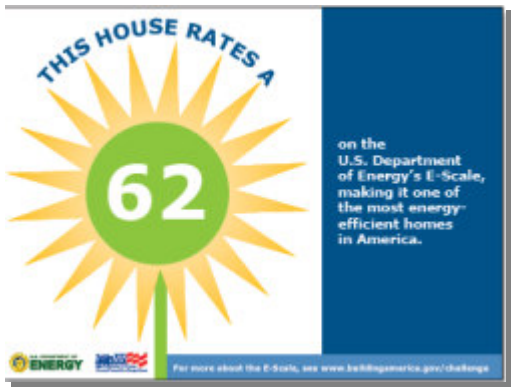
Look for the EnergySmart Home Scale (E-Scale) to compare the energy performance of home models. The lower the number, the more energy – and energy dollars – you'll save.

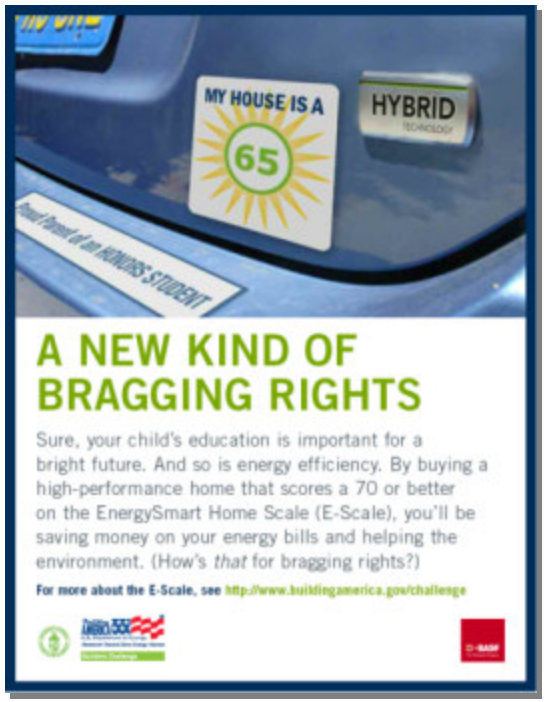


Sample Consumer Ad

Why will builders be interested?

- Differentiation
- Meeting demand
- DOE recognition





Builders Challenge Awards

- BASF bestows first BC awards at IBS
  - Pulte Del Webb for the ***most*** homes qualified to meet the Challenge
  - John Wesley Miller Companies for achieving the ***first net-zero energy*** home
  - Artistic Homes for the ***first cost-effective net-zero energy*** home

Quality Criteria Overview

Why have Quality Criteria in an energy program?

- Promote continuous improvement
- Reduced callbacks
- Enhanced comfort
- Better indoor environmental quality (health and safety)
- Durability

Sample of required Quality Criteria provisions:

- Whole-house mechanical ventilation
- Building envelope moisture management practices
- HVAC sizing and design criteria
- Duct sealing and leakage testing
- CO alarms (most houses)
- Minimum HVAC filtration specifications
- Reliable documentation of specifications in plans and design documents

Builders Challenge Quality Criteria Support Document

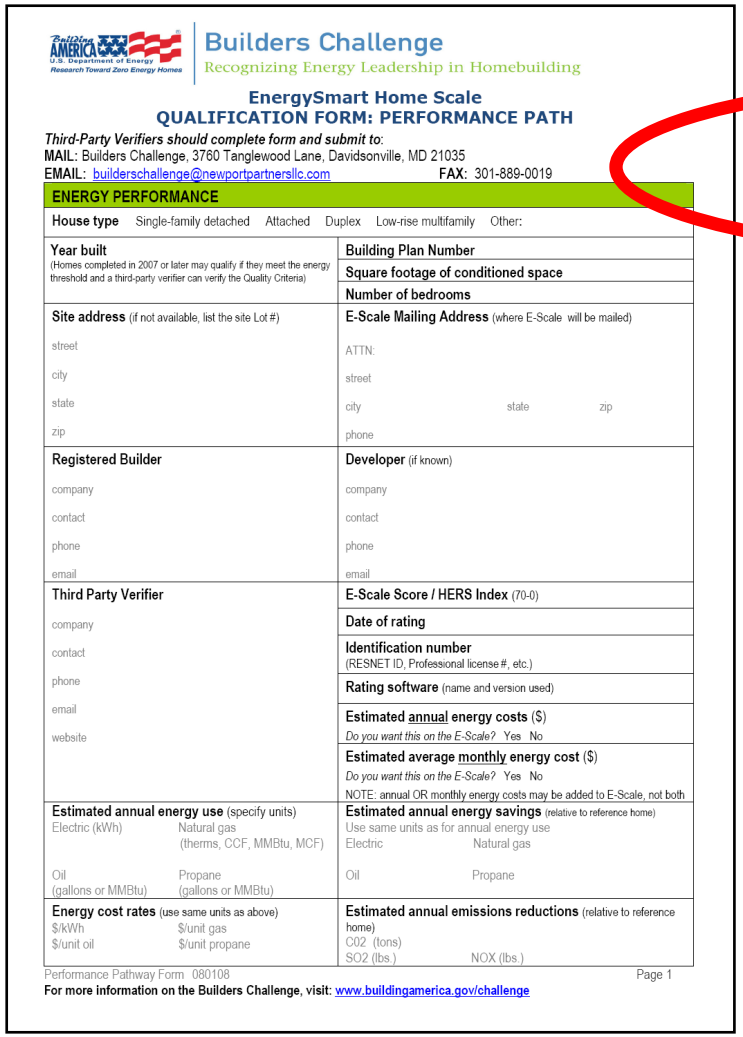
Roles/Responsibilities

- ***Builders*** must establish the expectations for quality practices, oversee their implementation, and keep records to confirm what was done
- ***Trade contractors*** must implement quality practices in accordance with their scope of work
- ***Third-party verifiers*** must verify the implementation of the QC either directly, or by confirming that the builder implemented the QC

Verification Process

- Designed to minimize additional site visits for a rater to a site
- Shifts the responsibility for record-keeping and inspection to the builder for some items

Quality Criteria Overview



Builders Challenge
Recognizing Energy Leadership in Homebuilding

EnergySmart Home Scale
QUALIFICATION FORM: PERFORMANCE PATH

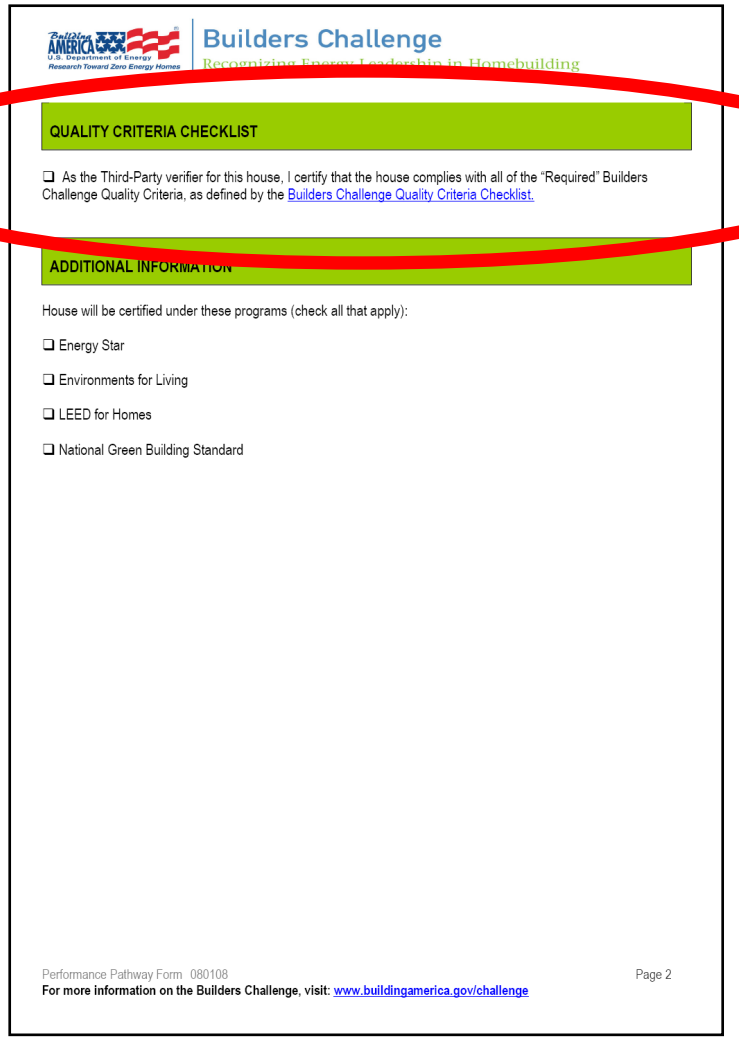
Third-Party Verifiers should complete form and submit to:
MAIL: Builders Challenge, 3760 Tanglewood Lane, Davidsonville, MD 21035
EMAIL: builderschallenge@newportpartnersllc.com **FAX:** 301-889-0019

ENERGY PERFORMANCE

House type Single-family detached Attached Duplex Low-rise multifamily Other:

Year built (Homes completed in 2007 or later may qualify if they meet the energy threshold and a third-party verifier can verify the Quality Criteria)	**Building Plan Number** **Square footage of conditioned space** **Number of bedrooms**
Site address (if not available, list the site Lot #) street city state zip	**E-Scale Mailing Address** (where E-Scale will be mailed) ATTN: street city state zip phone
Registered Builder company contact phone email	**Developer** (if known) company contact phone email
Third Party Verifier company contact phone email website	**E-Scale Score / HERS Index** (70-0) **Date of rating** **Identification number** (RESNET ID, Professional license #, etc.) **Rating software** (name and version used) **Estimated annual energy costs** ($) *Do you want this on the E-Scale?* Yes No **Estimated average monthly energy cost** ($) *Do you want this on the E-Scale?* Yes No NOTE: annual OR monthly energy costs may be added to E-Scale, not both
Estimated annual energy use (specify units) Electric (kWh) Natural gas (therms, CCF, MMBtu, MCF) Oil (gallons or MMBtu) Propane (gallons or MMBtu)	**Estimated annual energy savings** (relative to reference home) Use same units as for annual energy use Electric Natural gas Oil Propane
Energy cost rates (use same units as above) $/kWh $/unit gas $/unit oil $/unit propane	**Estimated annual emissions reductions** (relative to reference home) C02 (tons) SO2 (lbs.) NOX (lbs.)

Performance Pathway Form 080108 Page 1
For more information on the Builders Challenge, visit: www.buildingamerica.gov/challenge



Builders Challenge
Recognizing Energy Leadership in Homebuilding

QUALITY CRITERIA CHECKLIST

❑ As the Third-Party verifier for this house, I certify that the house complies with all of the "Required" Builders Challenge Quality Criteria, as defined by the Builders Challenge Quality Criteria Checklist.

ADDITIONAL INFORMATION

House will be certified under these programs (check all that apply):

❑ Energy Star

❑ Environments for Living

❑ LEED for Homes

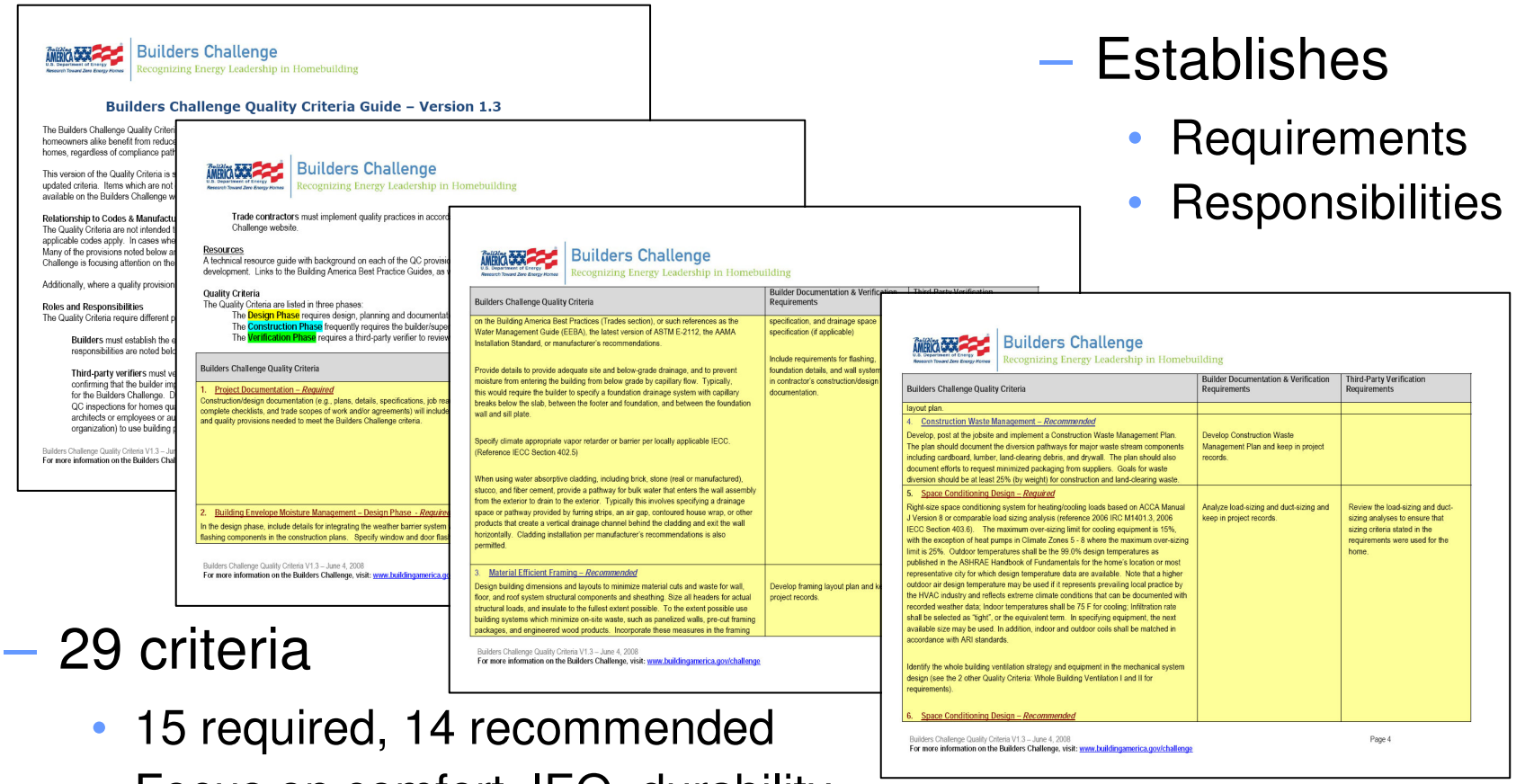
❑ National Green Building Standard

Performance Pathway Form 080108 Page 2
For more information on the Builders Challenge, visit: www.buildingamerica.gov/challenge

QC Interpretation & Waiver Process

- Standard process is in place
- Form for submitting requests
  - Issue, rationale for request, etc.
- Committee review
  - Represents broad expertise
  - Will review/respond to requests for interpretations, waivers and policy change
- Response within 30 days
- Interpretations will be posted to website

Quality Criteria Overview



- Establishes
  - Requirements
  - Responsibilities

- 29 criteria
  - 15 required, 14 recommended
  - Focus on comfort, IEQ, durability
  - Organized by design/construction phase
  - Developed by industry experts under DOE leadership

Quality Criteria Overview

Requirements	Recommendations
1. Project Documentation	3. Material Efficient Framing
2. Building Envelope Moisture Management	4. Construction Waste Management
5. Space Conditioning Design (Manual J)	6. Space Conditioning Design (Manual D)
10. Energy Star Windows	7. Dehumidification
11. Whole-Building Ventilation	8. ACCA Quality Install
12. Kitchen Ventilation	9. Building Envelope Pressurization Test
13. Bathroom Ventilation	20. Carbon Monoxide Alarms (All)
14. Clothes Dryer Venting	21. Garage Exhaust Ventilation
15. Minimize Duct Leakage	24. Energy Star Equipment/Appliances
16. Energy Star Thermal Bypass Checklist	25. Whole-Building Ventilation per ASHRAE 62.2
17. High Quality Air Filtration	26. Pressure Balancing
18. Sealed Combustion Systems	27. Low VOC Interior Coatings
19. Carbon Monoxide Alarms (Some)	28. Low VOC Adhesives
22. No Air Handler in Garage	29. Low Emission Cabinets
23. Moisture Management Field Verification	

Required Quality Criteria

1. Project Documentation

- Construction/design documentation (e.g., plans, specifications, trade scopes of work, checklists) will include energy and quality provisions needed to meet the Builders Challenge criteria
- Builder to develop and retain
- Reviewed by third party

Required Quality Criteria

2. Building Envelope Moisture Management

23. Moisture Management Field Verification

- Window and door flashing
- Site/grade drainage
- Capillary breaks
- Vapor retarder
- Drainage planes
- Builder certifies implementation
- Third-party reviews plan, builder certification documents

5. Space Conditioning Design (Manual J)

- Size cooling equipment per Manual J
- Limited to 15% over-sizing
- Builder/trade responsible for calculations and proper specification
- Third party verifies calculations were done, equipment installed per calculations/specification
- Consistent with Energy Star Homes requirement

10. Energy Star Windows

- Install Energy Star qualified windows
  - Must be **labeled** windows
  - Not just performance, but quality
- Builder specifies windows, retains documentation
- Third party verifies installation

11. Whole-Building Mechanical Ventilation

- Design and install a mechanical system to provide outside air to the indoor environment through either exhaust, supply, or balanced ventilation.
- Builder specifies in plans, retains documentation
- Third party verifies installation

Required Quality Criteria

12. Kitchen Ventilation

13. Bathroom Ventilation

14. Clothes Dryer Venting

- Provide adequate spot ventilation per QC specifications (e.g., 100 cfm kitchen, 50 cfm bathrooms.)
- All venting to outdoors
- Builder to specify in plans, retain documentation
- Third party verifies

15. Minimize Duct Leakage

- Comply with 15A **or** 15B, **and** 15C
  - 15A: Duct leakage to outdoors is less than 5% of conditioned floor area (cfm25/cfa < 0.05)

    - or -
  - 15B: All duct work is located within the conditioned envelope

    - and -
  - 15C: Total duct leakage is less than 10% of conditioned floor area

- Third party performs leakage test, verifies location

16. Energy Star Thermal Bypass Checklist

- Complete the Energy Star Thermal Bypass Checklist
- Either builder or third-party verifier may complete the checklist
- Builder must retain checklist, third-party must verify signed checklist

17. High Quality Air Filtration

- Equip the central air handler(s) with a MERV 8 filter or higher
- Builder specifies, accounting for the associated pressure drop from the filter in the design and sizing of the duct work
- Third-party to verify installation

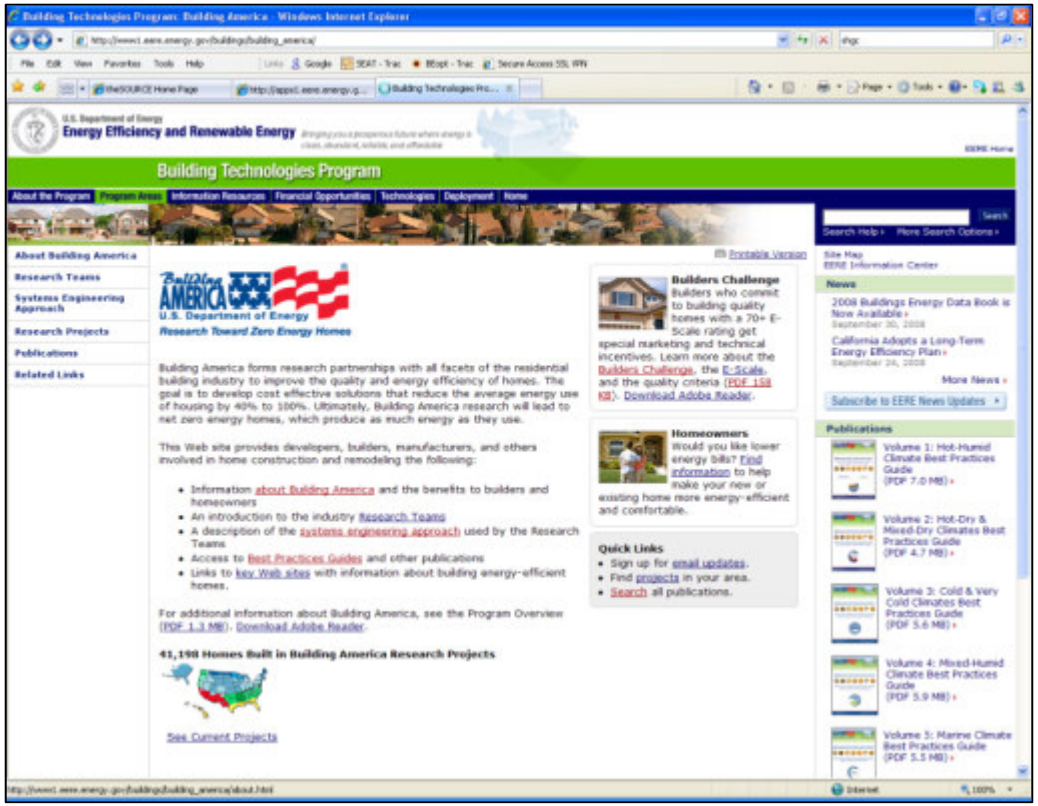
18. Sealed Combustion Systems

- Fossil-fuel-fired furnaces or water heaters installed in conditioned spaces must be sealed combustion, direct vented, or power-vented units
- Third-party to verify

19. Carbon Monoxide Alarms

- For homes with combustion appliance(s) or an attached garage, install at least one carbon monoxide (CO) alarm in a central location outside of each separate sleeping area
- Third-party to verify installation

Resources



www.buildingamerica.gov

Resources

- BCQC Support Document
  - Detailed guide to implementing Quality Criteria
  - Coming soon

- BA Best Practices Guides, Case Studies
  - Guides to implementing Building America practices embodied in Quality Criteria
  - Detailed, climate specific
  - Available online now

Resources

- **Builders Challenge FAQs on Website**
- **Some newer, Rater-specific questions…**
  - Does a certified rater need any BC-specific verification training? *RESNET Certified HERS raters do not need any further training to register as Verifiers with the Builders Challenge*
  - Do Verifiers need to be lined up with Builder Partners before registering? *No.*
  - Can Builders link up with Verifiers through website? *Builders (and others visitors to the website – like home buyers) can view the registered Verifiers on the Challenge website. Contact information (website, email, phone, etc.) is available*.
  - "Enter data from REM/*Rate* and EnergyGauge™ Compliance Reports" – Is a specific output report required? Or are the inputs required? *A specific data submission for a given home is required to qualify the home with the Builders Challenge. The software compliance reports offer this report (b/c it pulls data from the energy model for the home). Verifiers can also email or fax in the qualification form.*

What's next?

- Automated E-Scale Printing
- More marketing tools
- Consumer campaign
- Design competition
- More awards
- Preparing for 2012

"Take the Challenge"

1. Register online at www.buildingamerica.gov/challenge
2. Work with your builders to submit the Builders Challenge Qualification Form
   - HERS Rating between 70 and 0
   - Builders Challenge Quality Criteria
3. Use E-Scale and other marketing materials to differentiate home from the competition

Contact Information

Builders Challenge Website

- Register, submit homes, review Quality Criteria, etc.
- www.buildingamerica.gov/challenge

Questions

- Technical, marketing, or general
- Builderschallenge@newportpartnersllc.com