

Zero Energy Ready Homes



**Meet the Home of the Future:
U.S. DOE Zero Energy Ready Homes**

**Jamie Lyons, P.E
DOE Zero Energy Ready Home
&
Robby Schwarz
EnergyLogic**

I remind myself every morning: Nothing I say this day will teach me anything.... So if I'm going to learn, I must do it by listening.

Larry King

Good morning is a contradiction of terms.

Jim Davis

- Definition / Why Build
- DOE Zero Energy Ready Specs
 - National
 - CA Specific
- Rater Perspectives
- How to Move Forward

RELATED SESSIONS

**Efficient Hot Water Distribution -
2/16 @ 3:30 pm**

**Ducts in Conditioned Space –
2/17 @ 10:30 am**

**IAQ & WaterSense-
2/17 @ 10:30 am**

**Ventilation –
2/17 @ 1:30 pm**

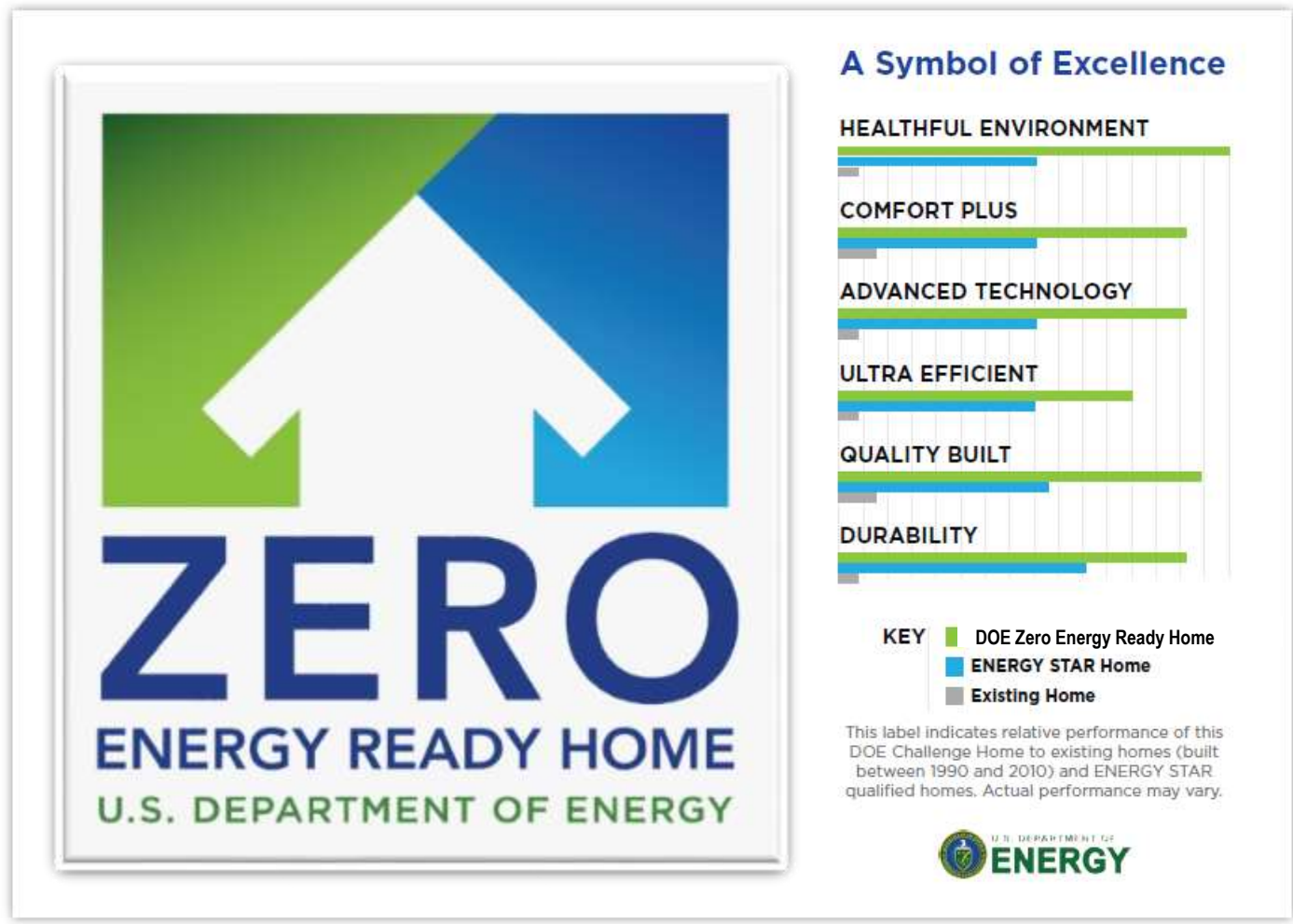
**Marketing & Sales Strategies for
DOE Zero Energy Ready Homes –
2/17 @ 3:30 pm**

**High R Assemblies –
2/18 @ 8:30 am**



Zero Energy Ready Homes **Defined**

High-performance home
so energy efficient,
all or most annual energy consumption
can be offset by renewable energy.



**Ultra-High
Efficiency
Systems**

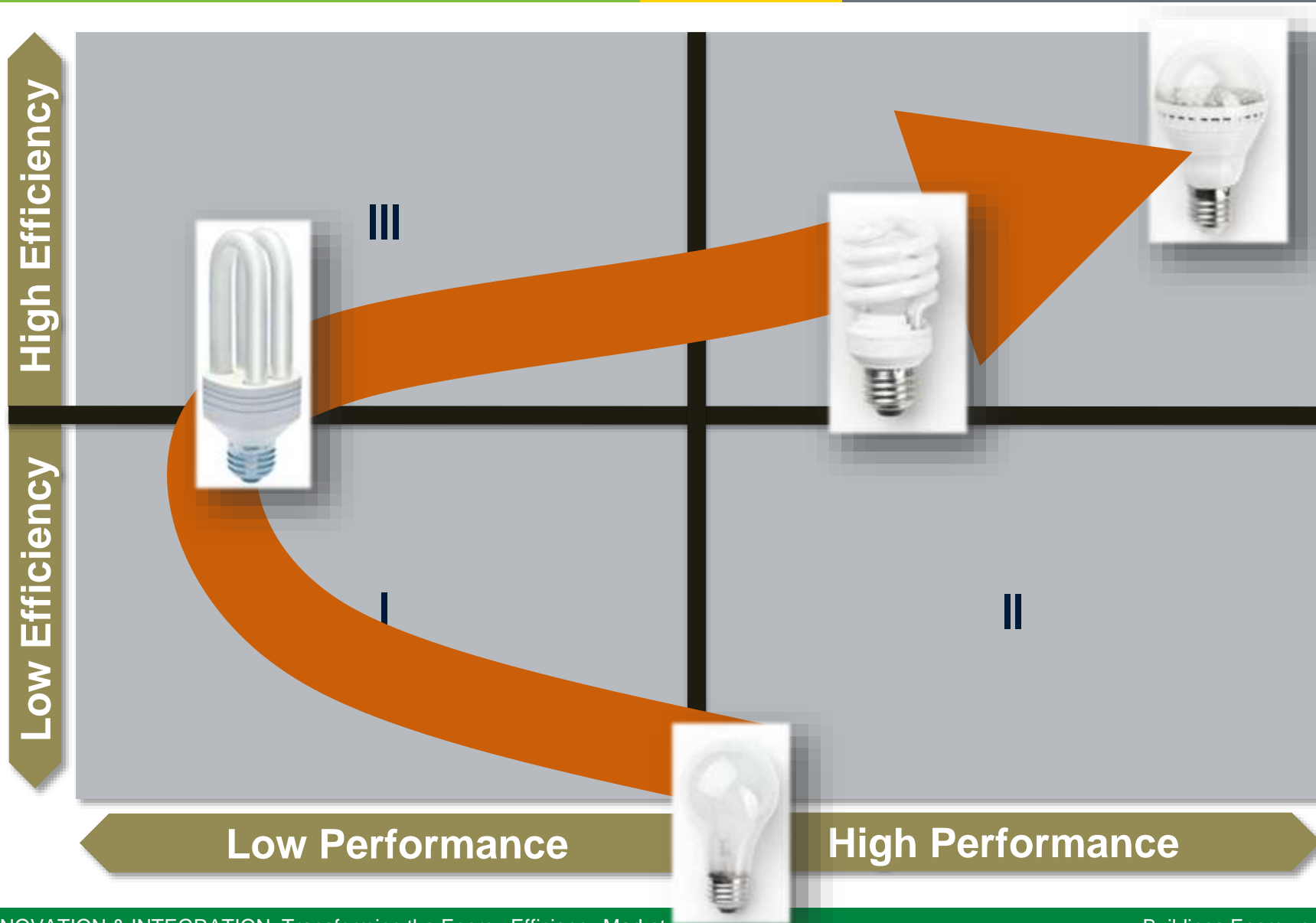
that optimizes
cost-effectiveness

+

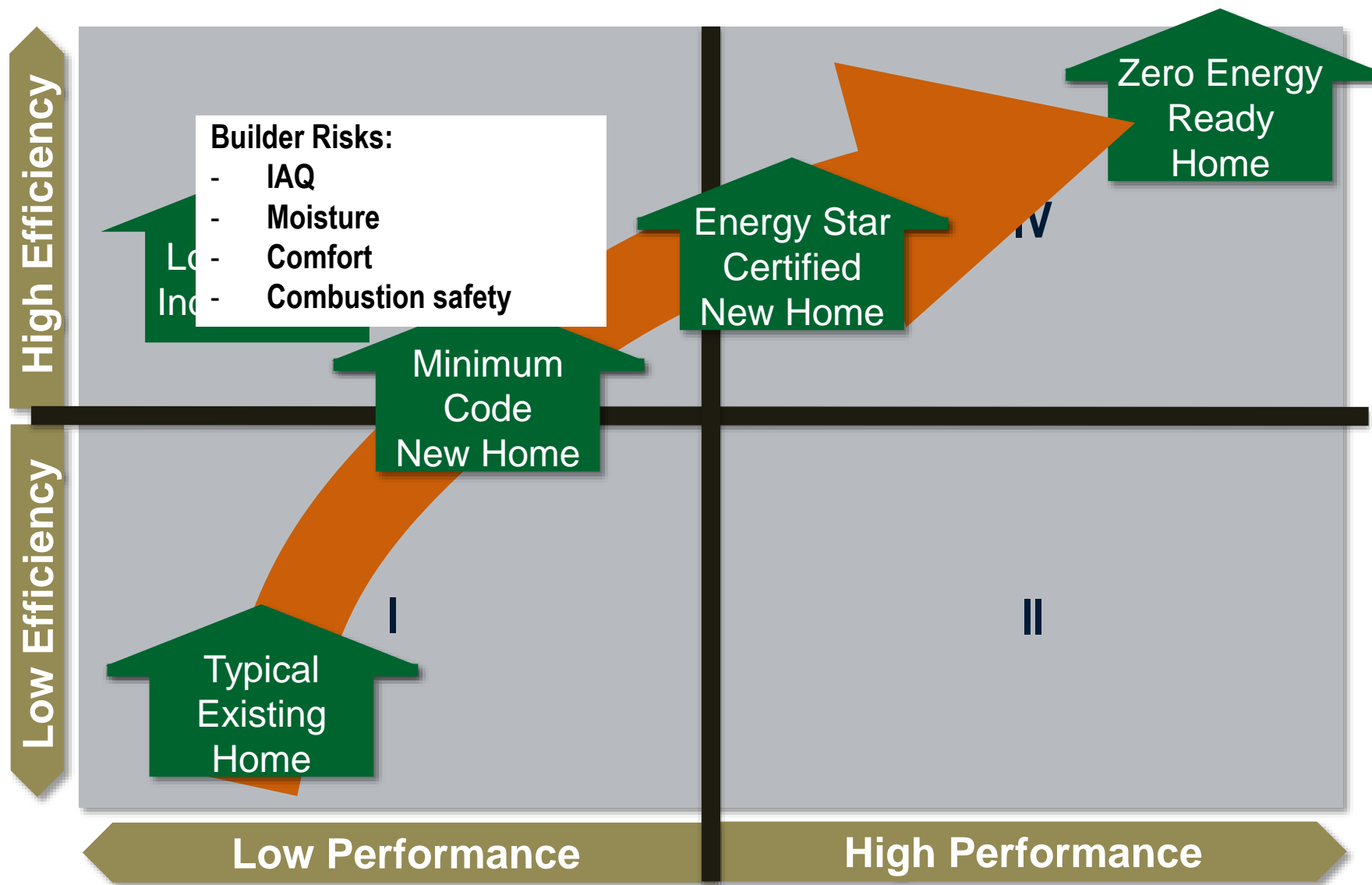
**Assured
Performance
Systems**

that exceeds
consumer expectations

Why Efficiency + Performance



ZERH Efficiency + Performance



Risk Management

Zero Differentiation

Innovation Imperative



Zero Energy Ready Home **Technical Specifications**

- **ENERGY STAR Certified Homes v3**

- Advanced Windows
- Air-Tight Construction
- 2012 IECC Insulation
- Energy Efficient Components
- Efficient Hot Water Distribution
- Optimized Duct System
- Indoor Air Quality
- Renewable Ready Construction
- Efficiency Threshold (HERS Index)



Exhibit 1: DOE Challenge Home Mandatory Requirements for All Labeled Homes

Area of Improvement	Mandatory Requirements
1. ENERGY STAR for Homes Baseline	<input type="checkbox"/> Certified under ENERGY STAR Qualified Homes Version 3 ⁵
2. Envelope ⁶	<input type="checkbox"/> Fenestration shall meet or exceed latest ENERGY STAR requirements ^{7, 8} <input type="checkbox"/> Ceiling, wall, floor, and slab insulation shall meet or exceed 2012 IECC levels ⁹
3. Duct System	<input type="checkbox"/> Ducts located within the home's thermal and air barrier boundary ¹⁰
4. Water Efficiency	<input type="checkbox"/> Hot water delivery systems shall meet efficient design requirements ¹¹
5. Lighting & Appliances ¹²	<input type="checkbox"/> All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified. <input type="checkbox"/> 80% of lighting fixtures are ENERGY STAR qualified or ENERGY STAR lamps (bulbs) in minimum 80% of sockets <input type="checkbox"/> All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified
6. Indoor Air Quality	<input type="checkbox"/> EPA Indoor airPLUS Verification Checklist and Construction Specifications ¹³
7. Renewable Ready ¹⁴	<input type="checkbox"/> EPA Renewable Energy Ready Home Solar Electric Checklist and Specifications ¹⁵ <input type="checkbox"/> EPA Renewable Energy Ready Home Solar Thermal Checklist and Specifications ¹⁶

Mandatory Reqts.

Must Comply

Exhibit 2: DOE Challenge Home Target Home^{3, 17}

HVAC Equipment ¹⁸	Hot Climates (2012 IECC Zones 1,2) ¹⁹	Mixed Climates (2012 IECC Zones 3, 4 except Marine)	Cold Climates (2012 IECC Zones 4 Marine 5,6,7,8)
AFUE	80%	90%	94%
SEER	18	15	13
HSPF	8.2	9	10 ²⁰
Geothermal Heat Pump	ENERGY STAR EER and COP Criteria		
ASHRAE 62.2 Whole-House Mechanical Ventilation System	1.4 cfm/W; no heat exchange	1.4 cfm/W; no heat exchange	1.2 cfm/W; heat exchange with 60% SRE
Insulation and Infiltration			
<ul style="list-style-type: none"> Insulation levels shall meet the 2012 IECC and achieve Grade 1 installation, per RESNET standards. Infiltration²¹ (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^{22, 23, 24}			
	Hot Climates (2012 IECC Zones 1,2)	Mixed Climates (2012 IECC Zones 3, 4 except Marine)	Cold Climates (2012 IECC Zones 4 Marine 5,6,7,8)
SHGC	0.25	0.27	any
U-Value	0.4	0.3	0.27
Homes qualifying through the Prescriptive Path with a total window-to-floor area greater than 15% shall have adjusted U-values or SHGCs. ²⁵			
Water Heater			
ENERGY STAR minimum; for heating oil water heaters use EF = 0.60			

'Target Home' Specs

Trade-Off Flexibility

Effective for Homes: Revised 07/01/2012 Page 2 of 8
Permitted Starting 4/1/2012

Exhibit 3: Benchmark Home Size²⁶

Bedrooms in Home to be Built	1	2	3	4	5	6	7	8
Conditioned Floor Area ²⁷ Benchmark Home	1,000	1,800	2,200	2,800	3,400	4,000	4,600	5,200

Size Adjust. Factor

Identical to Energy Star



Zero Energy Ready Home

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7. Renewable Ready ¹⁴	<input type="checkbox"/> EPA Renewable Energy Ready Home Solar Electric Checklist and Specifications ¹⁵ <input type="checkbox"/> EPA Renewable Energy Ready Home Solar Thermal Checklist and Specifications ¹⁶

Encouraged:

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



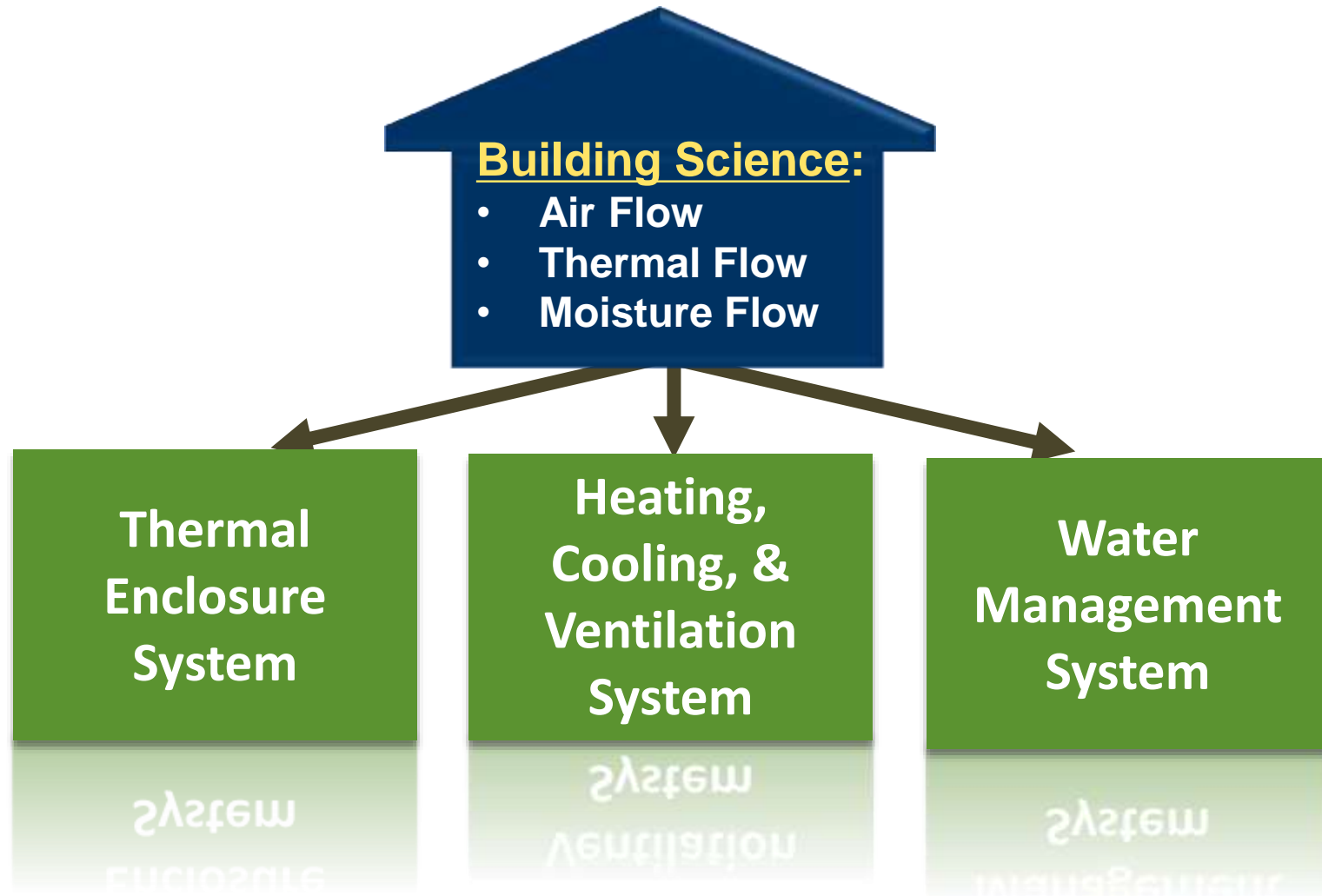
Zero Energy Ready Home

Technical Specifications Mandatory Requirements: **ENERGY STAR for Homes** Version 3 Baseline

Align with ENERGY STAR for Homes v3:

- Comprehensive Building-Science System
- Variable vs. Fixed HERS Index Score
- House Size Adjustment to HERS Score





**Thermal
Enclosure**

**Heating, Cooling
& Ventilation**

**Water
Management**

ENERGY STAR for Homes v3:

- ✓ Thermal Enclosure Checklist
- ✓ HVAC QI Checklist - Contractor
- ✓ HVAC QI Checklist - Rater
- ✓ Water Management Checklist

Note: Keep an eye on REV08 changes...



Zero Energy Ready Home

Technical Specifications
Mandatory Requirements
Envelope:
Advanced Windows

- Assures beyond-code window performance
- Fenestration used for passive solar design are exempt from the U-factor and SHGC requirements
- Area-weighted averages for U-factor, SHGC permitted

ENERGY STAR® Qualified in All 50 States



World's Best Window Co.
Millennium 2000+
Vinyl-Clad Wood Frame
Double Glazing • Argon Fill • Low E
Product Type: Vertical Slider
(per NFRC 100-97)

ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	0.27
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance	Air Leakage (U.S./I-P)
0.51	0.2

Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. Consult manufacturer's literature for other product performance information.
www.nfrc.org

ENERGY STAR Windows

- 8-Month Phase-In for Updated Specs

Window Specs to Apply to DOE Zero Energy Ready Home Projects	Hot Climates IECC CZ 1-2		Mixed Climates IECC CZ 3-4 except Marine		Cold Climates IECC CZ 5-8 and 4 Marine*	
	U-Value	SHGC	U-value	SHGC	U-Value	SHGC
ENERGY STAR Window Specs v5.0 - for projects permitted up to 8/31/2015**	0.60	0.27	[3] 0.35 [4] 0.32	[3] 0.30 [4] 0.40	0.30 0.31 0.32	Any ≥0.35 ≥0.40
ENERGY STAR Window Specs V6.0 - for projects permitted after 8/31/2015**	0.40	0.25	[3] 0.30 [4] 0.30	[3] 0.25 [4] 0.40	0.27* 0.28* 0.29*	Any* ≥0.32* ≥0.37*

*For Cold Climate Zones, the revised specs are applicable to DOE Zero Energy Ready Homes permitted after **8/31/2016**

** Note that DOE Zero Energy Ready Home offers multiple compliance paths. See the National Program Requirements, Exhibit 1 with footnotes, for details.



Zero Energy Ready Home

Technical Specifications: Best Practices Air-Tight Construction

- 16 to 50% of HVAC Loads
- Moisture Problems
- Comfort Problems
- Indoor Air Quality

Target Home Air-Tightness

	ACH50 Requirements/Targets			
Climate Zones	Zero Energy Ready Home	ENERGY STAR V3	2012 IECC	Passive House
1-2	3.0	6.0	5.0	0.6
3-4	2.5	5.0	3.0	0.6
5-7	2.0	4.0	3.0	0.6
8	1.5	3.0	3.0	0.6

Penetrations:

- Plumbing
- Wiring
- Recessed Lights
- Vents
- HVAC Duct Boots

Shafts:

- Flues
- Ducts
- Plumbing

Cracks:

- Sill Plates
- Windows & Doors
- Drywall at Top Plate
- Access Panels
- Sheathing Joints
- Foundation/Framing



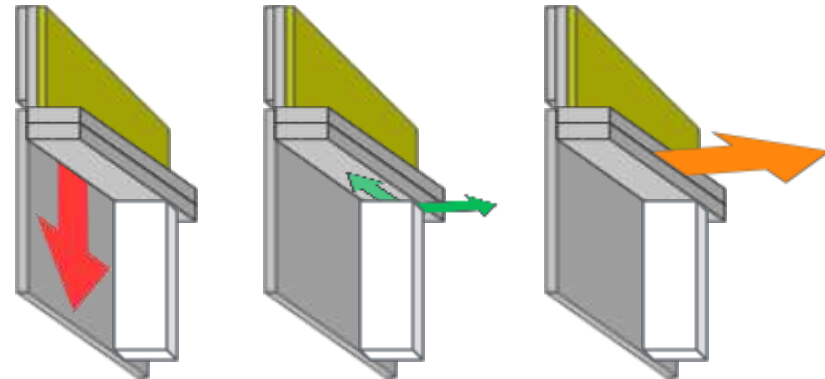
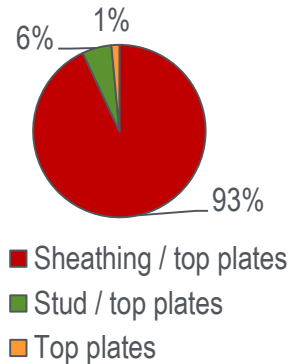
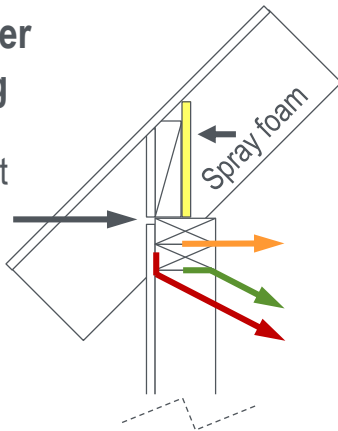
Odd Geometry:

- Cantilevers
- Knee-walls

Air Leakage Distribution

Exterior air barrier Cathedral ceiling

Sheathing / roof joint
1.1 cfm/ft @ 50 Pa



2-Story house (Floor area = 2,000 ft²)
Sheathing / roof joint unsealed $\cong 0.5 \text{ ACH}_{50}$

Zones	DOE Zero Energy Ready Home		IECC 2012	
	Requirement	Contribution to requirement (%)	Requirement	Contribution to requirement (%)
1 – 2	3	17	5	10
3 – 4	2.5	20	3	17
5 – 7	2	25	3	17
8	1.5	33	3	17

Examples



Examples



Source: Building America Solution Center; www.basc.pnnl.gov



Zero Energy Ready Home

Technical Specifications
Mandatory Requirements:
Envelope:
2012 IECC Insulation

- Compliance with next generation code
- Three Options:
 - ✓ Prescriptive
 - ✓ Alternative equivalent U-factor
 - ✓ Total UA calculation
[allows window to be included]
- REM/Rate / EnergyGauge both calculate this

Prescriptive Requirements

Climate Zone	Fenestration	Skylight U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value
1	NR	0.75	0.25	30	13
2	0.40	0.65	0.25	38	13
3	0.35	0.55	0.25	38	20 or 13+5 ^h
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 ^h
5 & Marine 4	0.32	0.55	NR	49	20 or 13+5 ^h
6	0.32	0.55	NR	49	20+5 or 13+10 ^h
7 & 8	0.32	0.55	NR	49	20+5 or 13+10 ^h

Prescriptive Requirements (cont.)

Climate Zone	Mass Wall R-Value ⁱ	Floor R-Value	Basement ^c Wall R-Value	Slab ^d R-Value, Depth	Crawl Space ^c Wall R-Value
1	3/4	13	0	0	0
2	4/6	13	0	0	0
3	8/13	19	5/13 ^f	0	5/13
4 except Marine	8/13	19	10 /13	10, 2 ft	10/13
5 & Marine 4	13/17	30 ^g	15/19	10, 2 ft	15/19
6	15/20	30 ^g	15/19	10, 4 ft	15/19
7 & 8	19/21	38 ^g	15/19	10, 4 ft	15/19

- Advanced Framing with Thicker Wall
- Rigid Insulation Exterior Sheathing
- Structural Insulated Panels (SIPs)
- Insulated Concrete Forms (ICFs)
- Double Wall



Zero Energy Ready Home

Technical Specifications Mandatory Requirements: Ducts in Conditioned Spaces

- **Significant Thermal Losses:**
 - Thermal losses triple for ducts in unconditioned vs. conditioned space
 - Total thermal losses can range from 10-45%
 - Extensive unconditioned space penetrations
- **Significant Performance Impacts:**
 - IAQ
 - Comfort
 - Durability

- **Short Duct Run**

up to 10' of total length is permitted to be outside of the home's thermal and air barrier boundary.

- **Jump Ducts**

may be located in attics if all joints, including boot-to-drywall, are fully air sealed with mastic

- **Ductless HVAC system**

e.g. mini-splits can offer a non-ducted alternative

- **Conditioned Floor Space**
 - Dropped ceiling
 - Modified Attic Truss
 - Between floors
- **Unvented Crawl Space/Conditioned Basement**
which is within the home's thermal boundary
- **Unvented Attic**
regardless of whether conditioned with a supply register
- **Vented Attic**
equivalent option where other locations in conditioned space are impractical, expensive, don't work well in specific climates, or increase envelope loads



Zero Energy Ready Home

Technical Specifications
Mandatory Requirements:
Efficient Hot Water
Distribution

- **Indoor Fixtures**
 - Plumbing Fixtures
 - Appliances and Other Equipment
- **Distribution**
 - Service Pressure
 - Metering (for Multi-Family Homes)
 - Leak Prevention
 - **Hot Water Distribution**
- **Outdoor**
 - Landscape Design
 - Irrigation (if installed)



- “Must Have” for Zero Energy Ready Homes
- Based on EPA WaterSense Specifications:
 - ≤ 0.5 gallons of water between the hot water source and any hot water fixture.
 - ≤ 0.6 gallons of water shall be collected from the hot water fixture before hot water (+ 10 °F) is delivered
 - Timer- and temperature-based recirculating systems shall not be used to meet the criteria.

- Core Plumbing Layout (wet wall)
- Manifold System
- Demand Pumping System
 - Pump Options
 - Integrated within tankless units
 - External pumps
 - Control Options
 - adaptive (smart) scheduling
 - occupant sensors trigger recirc.
 - Manual switches
 - Plumbing Options
 - Dedicated return line
 - Crossover valve



Zero Energy Ready Homes

Technical Specifications
Mandatory Requirements:
Efficient Components:
Lighting, Appliances, & Fans

Components and MEL's are increasingly Important in Low-Load Homes (~25 to 40%). Therefore, DOE ZERH requires:

- **ENERGY STAR Certified Appliances*:**
refrigerators, dishwashers, clothes washers
- **ENERGY STAR Certified Fans*:**
bathroom ventilation, ceiling fans
- **ENERGY STAR Certified Lighting:**
Min. 80% of fixtures or lamps (CFL or LED)

*Only where installed by builder



Zero Energy Ready Home

Technical Specifications Mandatory Requirements: Indoor Air Quality

Increasing Health Concerns



\$40 Billion



\$20 Billion

Indoor vs. Outdoor Air Pollutants:

On average **2-5 times greater**

Up to **100 times greater**

While Americans Spend

90% of time indoors

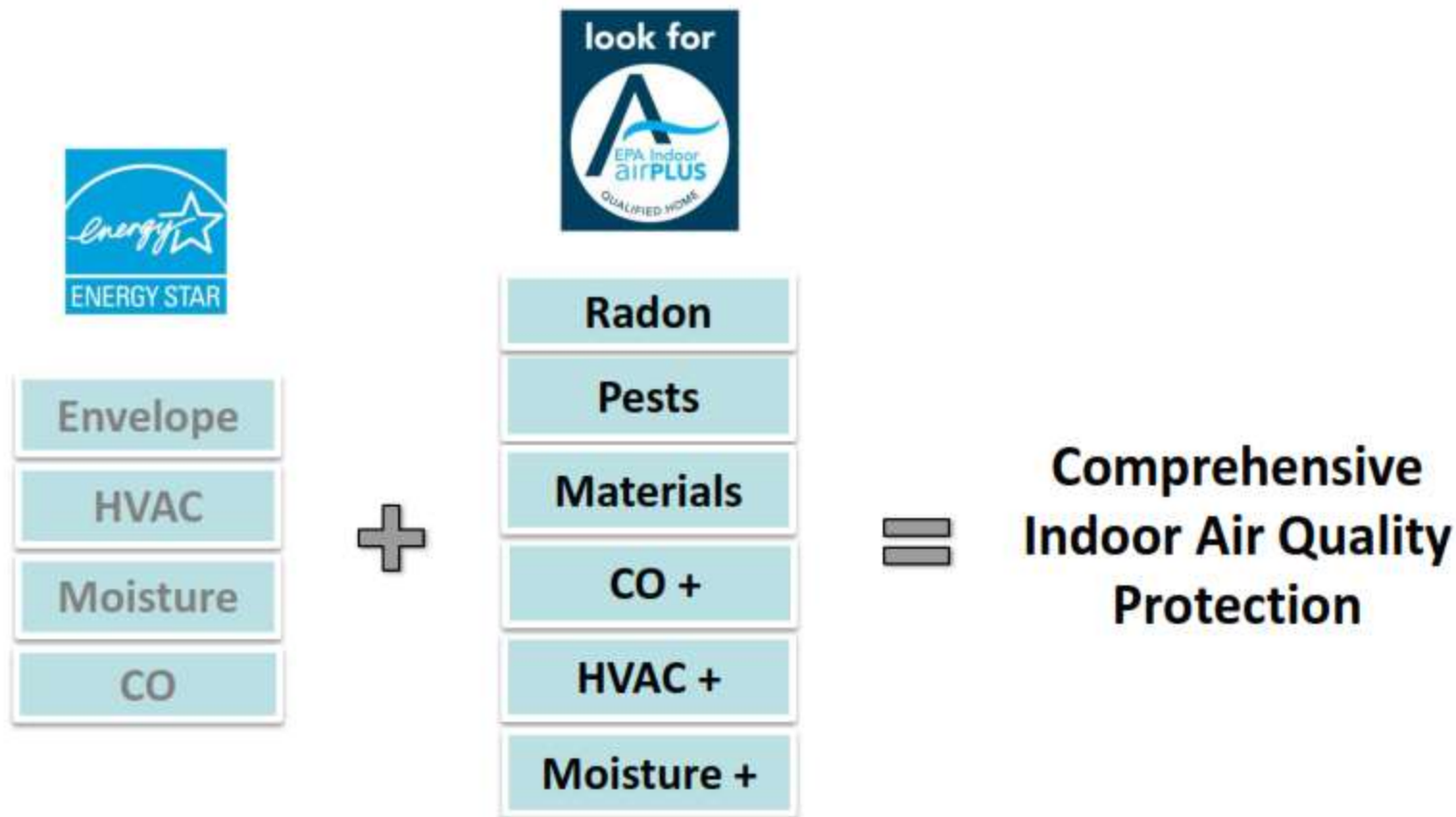
Source: EPA

“If your child doesn’t use an inhaler,
consider yourself a lucky parent because,

**1 in 10 children in the U.S.
suffers from asthma.”**

Source: Remarks for Administrator McCarthy, Announcement of Clean Power Plan,
Washington, DC, June 2, 2014

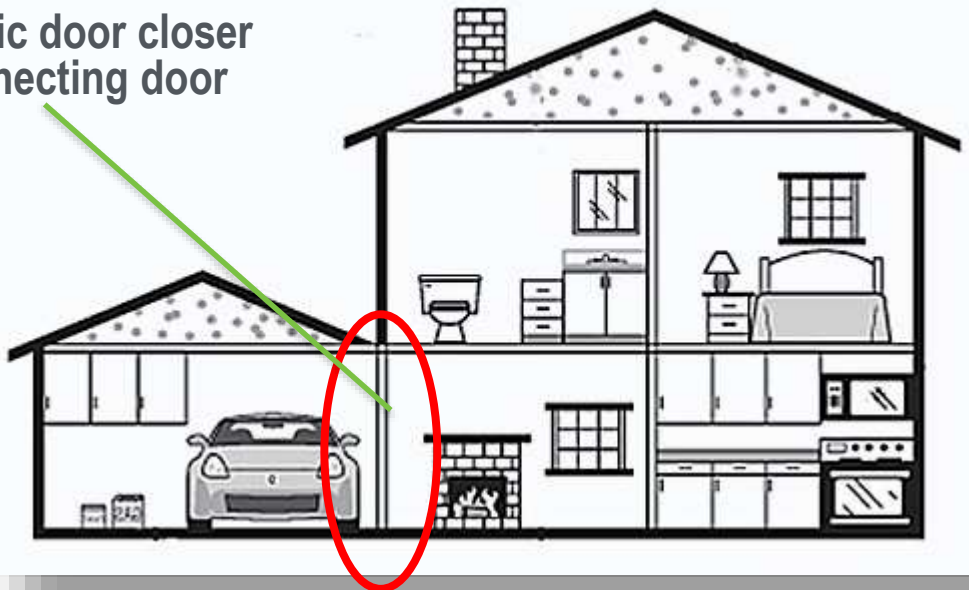
ENERGY STAR + Indoor airPLUS



In homes with exhaust-only whole-house ventilation:

- Garage exhaust fan, OR
- Pressure test
 - When house is +50 Pa wrt outdoors
 - House is \geq +45 Pa wrt garage

Automatic door closer
on connecting door



Air Sealing & Gasketed Door

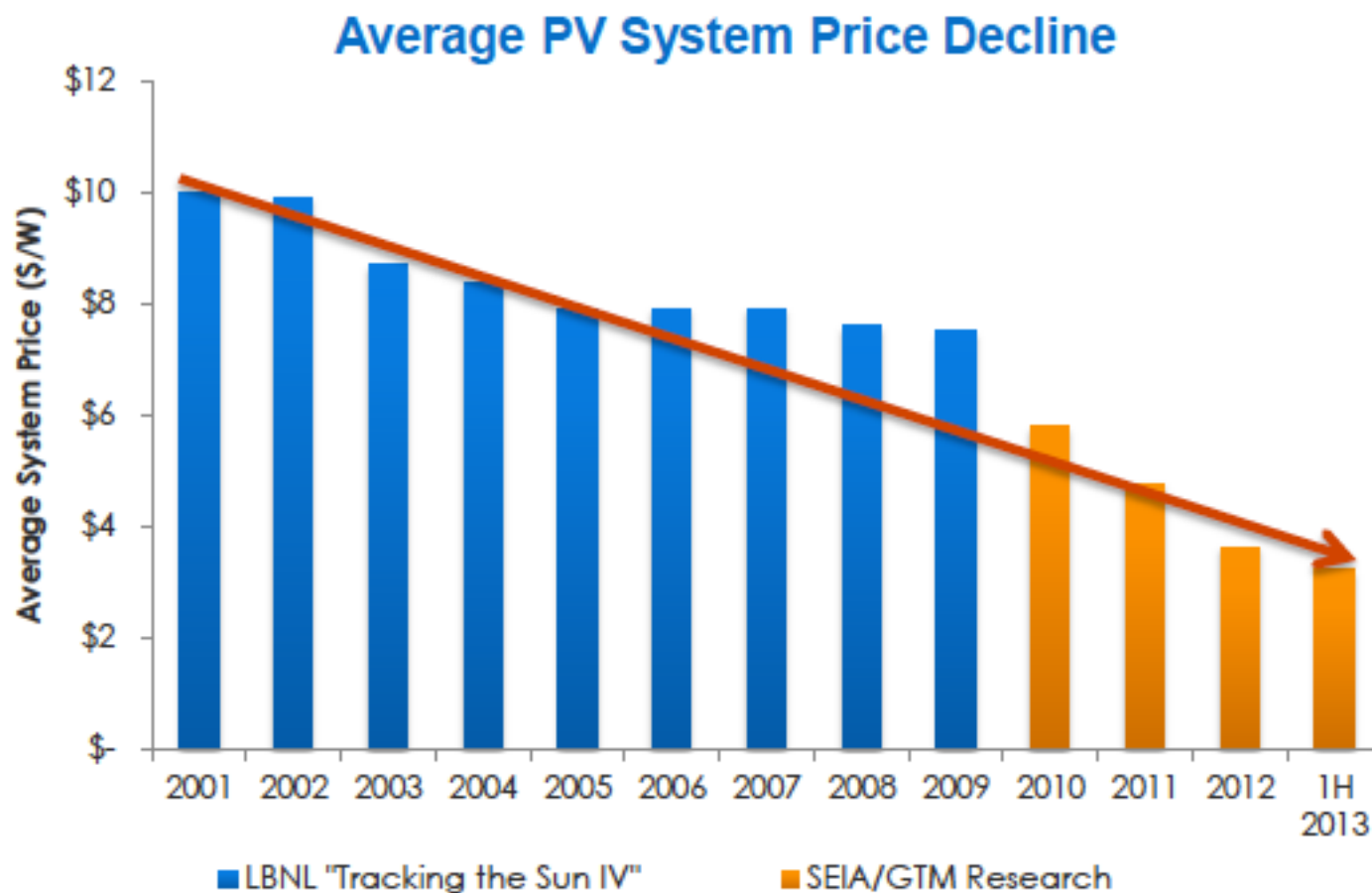




Zero Energy Ready Home

Technical Specifications
Mandatory Requirements:
Renewable Ready
[Where Applicable]

Decreasing Renewable Cost



More than half of all U.S. homebuilders are expected to offer solar PV energy systems as an option in new single-family homes by 2016, up from just 12 percent in 2013.

Source:

Green Multifamily and Single Family Homes: Growth in a Recovering Market, McGraw Hill, NAHB, 2014

RERH Applicability

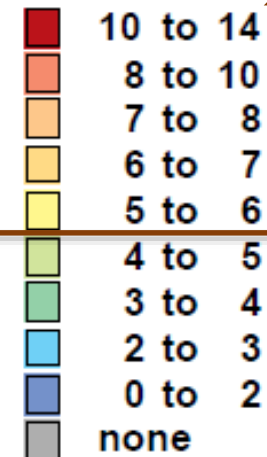
Average Daily Solar Radiation Per Month

ANNUAL

PV Ready Encouraged



kWh/m²/day



Required

Encouraged

***Solar Hot Water Ready
Encouraged Nationally**

PV Ready Required

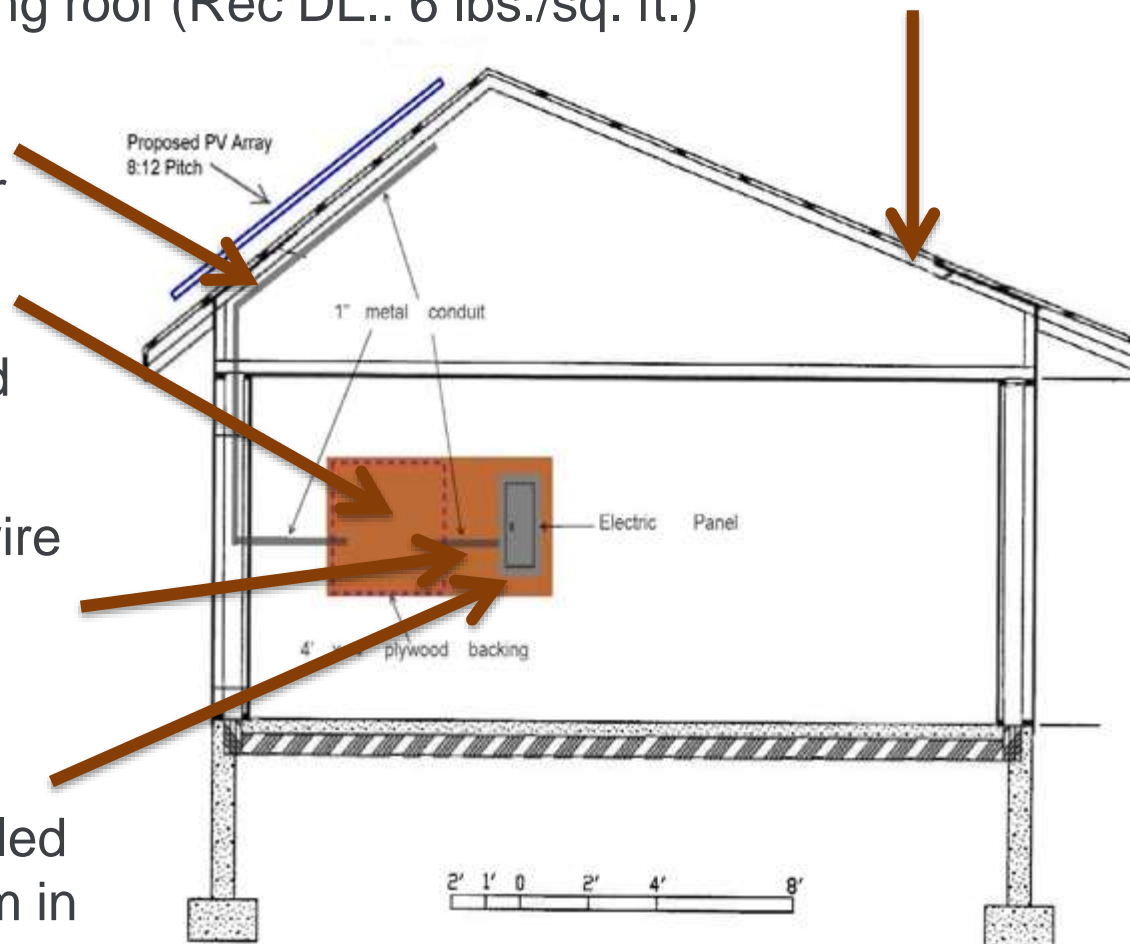
Documentation of the maximum allowable dead load and live load ratings of the existing roof (Rec DL.: 6 lbs./sq. ft.)

Conduit to run DC wire from roof to inverter

Dedicated Area for installing inverter and balance of system

Conduit to run AC wire from inverter location to electric panel

Circuit Breaker designated and/or installed for use by the PV system in the electric panel

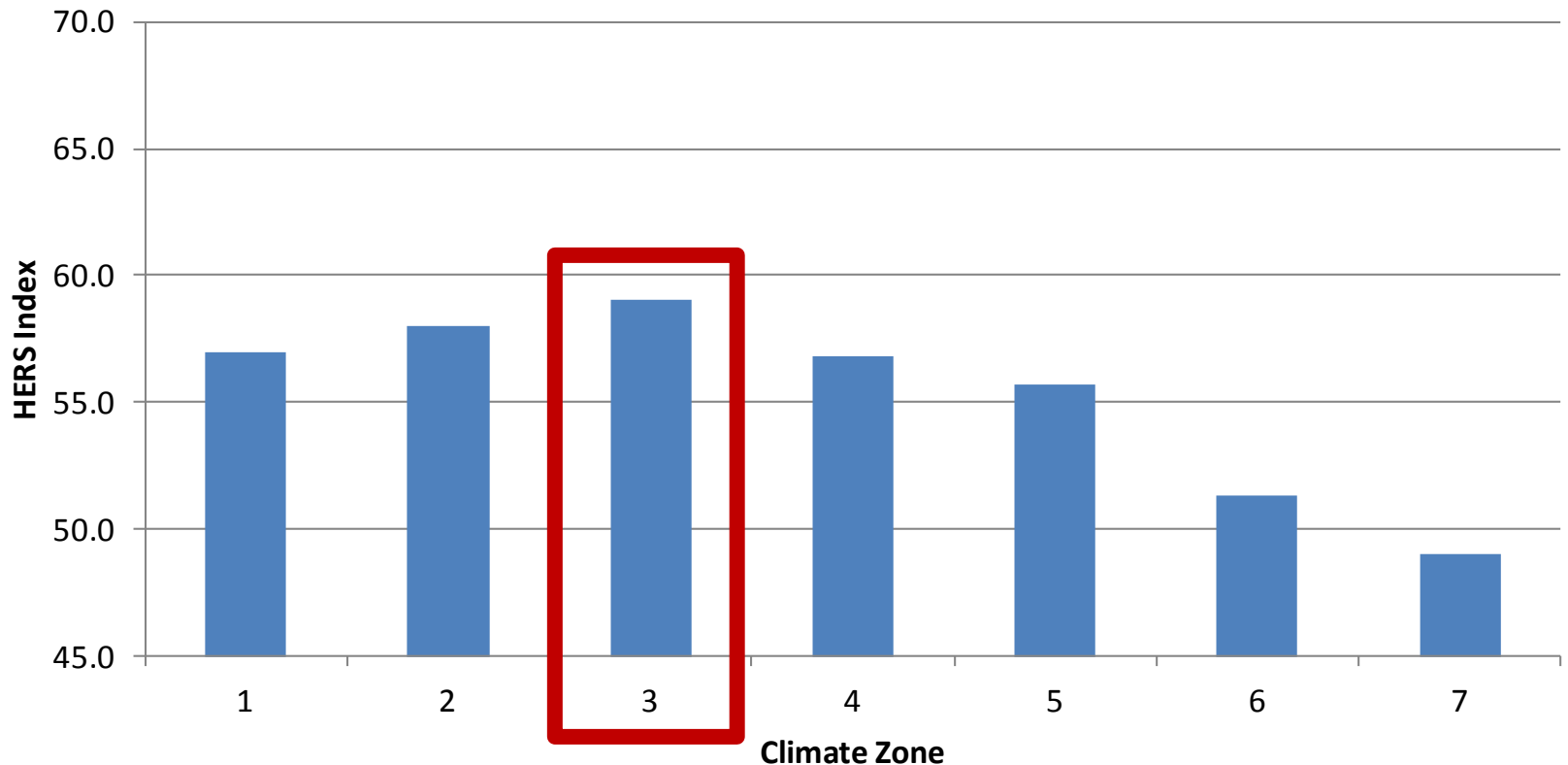




Zero Energy Ready Home **Performance Threshold**

Target Home HERS Scores to Qualify

**Average DOE Zero Energy Ready Home HERS Index by Climate Zone
(Overall Average = 55.5)**



Based on 1800, 2400, and 3600 ft² prototypes on climate-appropriate foundations.



Zero Energy Ready Home

California Compliance Options

Prescriptive Path

- California Mandatory Items (Exhibit 1)
- DOE ZERH National Program Requirements Prescriptive Path (Exhibit 2)

Performance Path A

- California Mandatory Items (Exhibit 1)
- Performance path using national software

Performance Path B

- California Mandatory Items (Exhibit 1)
- 25% better than 2013 Title 24

Performance Path C

- California Mandatory Items (Exhibit 1)
- Side by Side comparison in Title 24

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3. Duct System	<input type="checkbox"/> Ducts located within the home's thermal and air barrier boundary ¹⁵
4. Water Efficiency	<input type="checkbox"/> Hot water delivery systems shall meet efficient design requirements ¹⁶
5. Lighting & Appliances¹⁷	<input type="checkbox"/> All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified. <input type="checkbox"/> 90% of lighting fixtures are ENERGY STAR qualified or ENERGY STAR lamps (bulbs) in minimum 90% of sockets <input type="checkbox"/> All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified
6. Indoor Air Quality	<input type="checkbox"/> Certified under EPA Indoor airPLUS ¹⁸
7. Renewable Ready¹⁹	<input type="checkbox"/> Consolidated Renewable Energy Ready Home (RERH) Checklist
8. Air Infiltration	<input type="checkbox"/> For all CA Climate Zones 1-16, must be tested to achieve air infiltration levels at or below: 3 ACH50 for single family detached dwellings, or 4 ACH50 for attached single-family dwellings and dwellings in multifamily buildings ²⁰

EnergyLogic Presents

Meet the Home of the Future: Zero Energy Ready Homes

Robby Schwarz
RESNET 2015



Engaging Builders

- A Builder wants it
- Quest for differentiation
- Marketing
 - HERS Index, Code, Energy Star, IAP, WaterSense(?), DOE
ZERH
- Better Performance
- Builder Risk Management
- The next step is small



Boil it Down

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7. Renewable Ready¹⁹	<input type="checkbox"/> Consolidated Renewable Energy Ready Home (RERH) Checklist



In This Case

- Foundation R-11
- Slab R-0
- Floor Blown R-50
- Rim R-19
- Walls blown R-23
- Windows **U-30/SHGC.30**
- Doors R-5/ R-2.2
- Attic R-38
- Furnace 93.5 AFUE
- 100% Duct inside
- Water Heater 62 EF
- AC 13 Seer
- 3.5 ACH50
- Ventilation ASHRAE 62.2
- Energy Star Appliance 80% CFL
- HERS 59



Interesting Findings



- REM Modeling
 - Mandatory 2012 IECC insulation levels
 - you can pass DOE ZERH but not 2012 IECC
 - Air leakage rate Duct leakage Rate
- Mandatory
 - Windows
 - UA Trade offs allowed in REM but Window U-value is Mandatory
 - Rem models the UA trade off and .34 windows passed in the REM model
 - 100% Duct inside envelope
 - REM will demonstrate compliance with duct located outside
- You need to know this or you will be out of compliance



Marking any given checkbox certifies that the home complies with all mandatory requirements referenced by that checkbox. Needed for showing compliance on various reports.

REM

IECC - Mandatory Requirements

- 2004 IECC
- 2009 IECC
- 2015 IECC
- 2006 IECC
- 2012 IECC
- NY-ECCC 2010

ENERGY STAR Version 2.5, 3.0 and 3.1

Checklists Fully Enforced for 3.0 and 3.1

- Thermal Enclosure Rater Checklist
- HVAC System Quality Installation Contractor
- HVAC System Quality Installation Rater
- Water Management System Builder

ENERGY STAR Product Count

- # Refrigerators
- # Ceiling Fans
- # Exhaust Fans
- # Dishwashers

Conditioned Basement Exclusion

- Basement Qualifies for SAF exclusion?

Basement Conditioned Floor Area:

- Slab Insulation exemption from Thermal Enclosure Rater Checklist

- Indoor airPLUS - can no longer substitute for Water Management Checklist



Marking any given checkbox certifies that the home complies with all mandatory requirements referenced by that checkbox, per the DOE Zero Energy Ready Home National Program Requirements.

DOE Zero Energy Ready Home

Home Builder ID#:

Mandatory Requirements

- | | | |
|--|---|--|
| <input checked="" type="checkbox"/> Fenestration | <input checked="" type="checkbox"/> Appliance | <input checked="" type="checkbox"/> EPA Indoor airPLUS |
| <input checked="" type="checkbox"/> Insulation | <input checked="" type="checkbox"/> Lighting | <input checked="" type="checkbox"/> Fan Efficiency |
| <input checked="" type="checkbox"/> Renewable Energy Ready Solar Electric | <input checked="" type="checkbox"/> Duct Location | |
| <input checked="" type="checkbox"/> Renewable Energy Ready Solar Hot Water | | |

Optional Home Builder Commitments for Recognition

- | | |
|-----------------------------------|--|
| <input type="text" value="No"/> ▼ | Certified under the EPA WaterSense for New Homes Program |
| <input type="text" value="No"/> ▼ | Certified under the IBHS fortified for Safer Living Program |
| <input type="text" value="No"/> ▼ | Followed the DOE Zero Energy Ready Home Quality Management Guidelines |
| <input type="text" value="No"/> ▼ | The buyer of this home signed a waiver giving DOE Zero Energy Ready Home access to utility bill data for one year. |



Interesting Findings

■ Constructability

- Mandatory items

- Raised Heel Truss

- Energy Star requires $\geq R-21$ over the top plate

- DOE ZERH requires $\geq R-30$ over the top plate

- 100% ducts inside the envelope

- Inside, outside, or within?

- All four Energy Star Checklists

- IAP qualified

- MERV 8

- Renewable ready



ZERH Builder Sticking Points

■ IAP (Rev2)

- **Moisture control** – Aggregate under slabs
- **Radon Systems**
- **Duct system**
 - Protection / Cleaning
 - No HVAC Building cavities used per IAP
 - 100% in conditioned space
- **Attached garages**
- **Materials**
 - Dimensional woods, Particle boards, paints, carpets



Indoor Air Plus

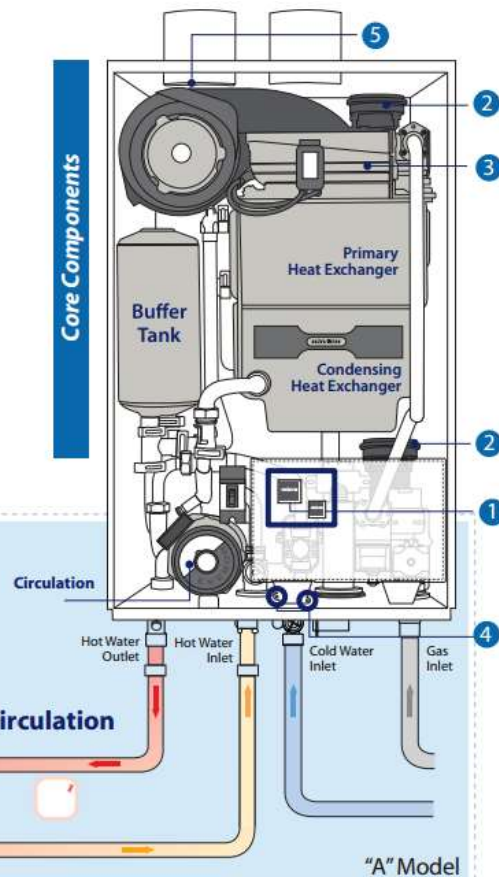


- **Moisture control**
 - **Water Managed site & foundation**
 - Drainage, Capillary break, damp proofed, Etc.
 - **Water managed Wall assemblies**
 - Drainage plane, flashing details
 - **Water managed Roof assemblies**
 - Gutters and flashing
 - **Interior water management**
 - Moisture resistant materials
- **Radon control**
 - Radon resistant features including at least a passive radon system
- **Pest Barriers**
 - Minimize pathway for pests
- **HVAC Systems**
 - **Heating & Cooling equipment**
 - Sizing and design
 - **Ventilation**
 - ASHREA 62.2
 - **Air cleaning and filtration**
 - **Dehumidification**
- **Combustion pollutant control**
 - **Combustion source Controls**
 - Sealed or power vented equipment
 - Attached garages
 - Insolated
- **Low emission materials**
 - Engineered woods, Paints, Carpets
- **Home commissioning**
 - **Duct testing, Pressure balancing, Flows, Etc.**

ZERH Builder Sticking Points

Hot water circulation systems

- No more than 0.5 gallons of water can be stored within the pipe between the heater and any fixture
- No more than 0.6 gallons of water can go down the drain before hot water is delivered.
- The water temperature must be 10° or more higher than when the water first came out of the faucet
- Recirculation systems must have occupant control switch or adaptive learning technology



ZERH Builder Sticking Points

Solar Electric Ready Checklist

- Install a 1" conduit
- Designate ***proposed*** array location and square footage
- Identify orientation (azimuth) ***of proposed location***
- Blocking is permitted to be used as an alternative to the 4' x 4' or 3'x2' wood panel
- 70 Amp double-pole breaker in electrical service panel or a labeled slot Solar Thermal Checklist



DOE Zero Energy Ready Home

Projected Rating: Based on Plans - Field Confirmation Required.

Energy Performance	
House Type	DOE Zero Energy Ready Home Builder Partner ID#
Single-family detached	210
Year built	Square footage of Conditioned Space including Basement
2015	2800.0
Number of Bedrooms	Square footage of Conditioned Space without Basement
3	1953.0
Site address (if not available, list the site Lot #)	Registered Builder
1887 Place to live	
Denver	Certified Rater
CO, 80221	Robby Schwarz
HERS Index without On-site Generation	Date of Rating
58	2/10/2015
HERS Index with On-site Generation	Rating Software
58	REM/Rate - v14.6
HERS Index of the Target Home using size adjustment factor	Estimated annual energy costs(\$)
59	1487
Estimated annual energy use	Estimated annual energy savings
Electric: 6858 kWh \ Natural Gas: 723 Therms	Electric: 4101 kWh \ Natural gas: 417 Therms
Energy cost rates	Estimated annual emissions reductions
Electric: 0.11 \$/kWh \ Natural Gas: 0.98 \$/Therms	CO2: 6.1 tons / SO2: 7.8 lbs / NOx: 16.6 lbs



DOE Zero Energy Ready Home Certification

As the certified Rater for this house, I certify this house meets/complies with all mandatory requirements of the DOE Zero Energy Ready home guidelines, including the following:

X	Compliance with all ENERGY STAR Qualified Homes Version 3 requirements and checklists
X	Compliance with Mandatory Fenestration Requirements
X	Compliance with Mandatory Insulation Requirements
X	Compliance with Mandatory Duct Location Requirements
X	Compliance with Mandatory Appliance Requirements
X	Compliance with Mandatory Lighting Requirements
X	Compliance with Mandatory Fan Efficiency Requirements
X	Compliance with Mandatory EPA Indoor airPLUS
X	Compliance with Mandatory Renewable Energy Ready Solar Electric Requirements
X	Compliance with Mandatory Renewable Energy Ready Solar Hot Water Requirements
	This home was qualified via sampling in lieu of testing, in accordance with allowable sampling provisions as stated in the DOE Zero Energy Ready Home National Program Requirements

Optional Compliance for Builder Recognition

I further certify that the following also apply to this house:

YES	NO	DONT KNOW	Optional Home Builder Commitments for Recognition
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*Certification under the DOE Zero Energy Ready Home permits limited exceptions to full compliance with Indoor airPLUS. Builders seeking the Indoor airPLUS label must achieve full compliance with the Indoor airPLUS Verification Checklist.

REM/Rate - Residential Energy Analysis and Rating Software v14.6

This information does not constitute any warranty of energy cost or savings.

© 1985-2015 Noresco, Boulder, Colorado.



DOE Zero Energy Ready Home

Projected Rating: Based on Plans - Field Confirmation Required.

Optional Compliance for Builder Recognition

I further certify that the following also apply to this house:

YES	NO	DONT KNOW	Optional Home Builder Commitments for Recognition
	X		Certified under the EPA WaterSense for New Homes Program
	X		Certified under the IBHS Fortified for Safer Living Program
	X		Followed the DOE Zero Energy Ready Home Quality Management Guidelines
	X		The buyer of this home signed a waiver giving DOE Zero Energy Ready Home access to utility bill data for one year

*Certification under the DOE Zero Energy Ready Home permits limited exceptions to full compliance with Indoor airPLUS. Builders seeking the Indoor airPLUS label must achieve full compliance with the Indoor airPLUS Verification Checklist.



Indoor airPLUS Qualified Home

This home built at
1887 Place to live
Denver, CO 80221
was verified by
Robby Schwarz

to meet Indoor airPLUS construction
specifications as established
by the
U.S. Environmental Protection Agency.



Indoor airPLUS qualified homes are
designed to contribute to improved
indoor air quality.

2/10/2015



Indoor airPLUS Features

- Moisture and Mold Control
- Radon Resistant Construction
- Pest Barriers
- Effective Heating, Ventilating,
and Air-Conditioning Systems
- Safe Combustion
- Healthier Building Materials

Not all features are required in all cases. To learn more about
indoor air quality features in your home, ask your builder to
review the Indoor airPLUS verification checklist with you, or visit
www.epa.gov/indoorairplus.



YOUR HOME WAS DESIGNED, ENGINEERED,
AND CONSTRUCTED IN CONFORMANCE TO
U.S. DEPARTMENT OF ENERGY (DOE)
GUIDELINES FOR EXTRAORDINARY
LEVELS OF EXCELLENCE AND QUALITY.

**Projected Rating: Based on Plans -
Field Confirmation Required.**

This home built at 1887 Place to live
By Robby Schwarz
Verified by Robby Schwarz
an independent professional
organization, to meet or exceed
strict home performance
guidelines set by
The U.S. Department of Energy
on 2/16/2015

THIS HOME MEETS OR EXCEEDS THE MINIMUM
CRITERIA FOR THE FOLLOWING:

REM/Rate - Residential Energy Analysis and
Rating Software v14.6



SAM RASHKIN, CHIEF ARCHITECT
BUILDING TECHNOLOGIES
U.S. DEPARTMENT OF ENERGY



Robby Schwarz

Energylogic

robby@nrglogic.com

720-838-0677



JOIN THE ADVENTURE.

7th Annual RaterFest!
September 18-20, 2015
Estes Park, Colorado



Keynote: Mark LaLiberte

Register Online
EnergyLogicAcademy.com



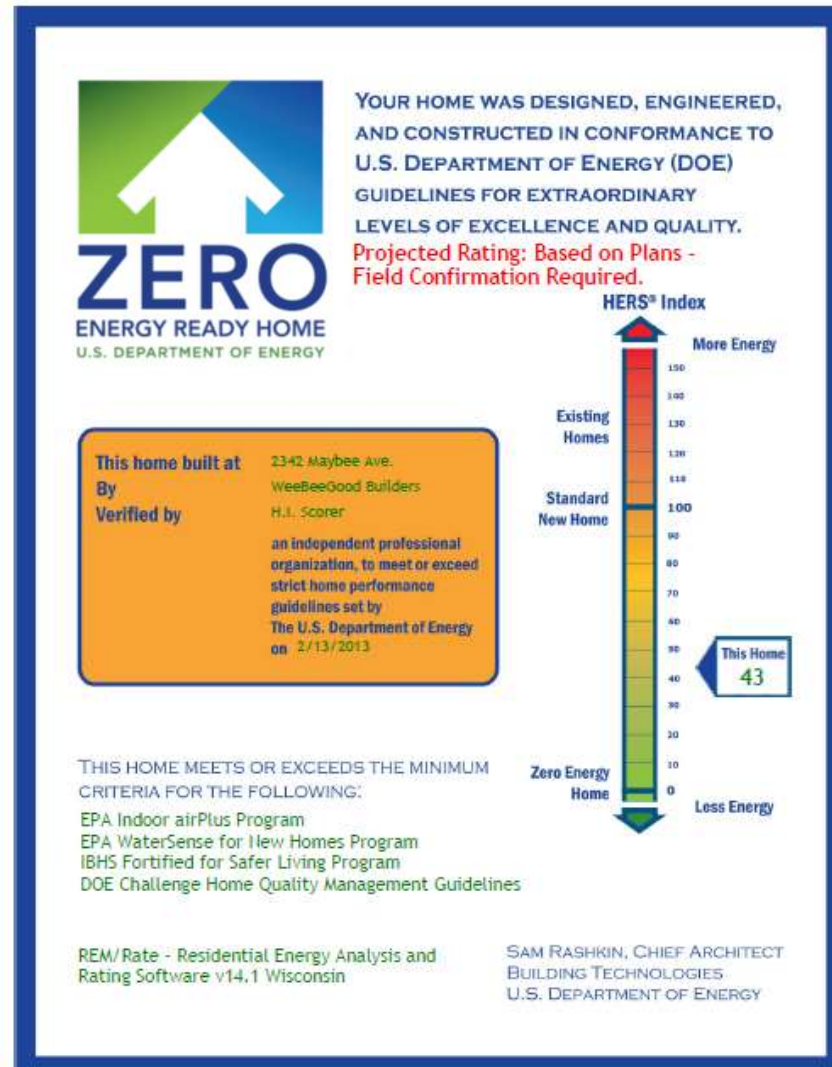


Zero Energy Ready Homes

Verifying & Labeling Homes

- Same: ENERGY STAR Homes framework
- New:
 1. Indoor airPLUS Checklist;
 2. Renewable Energy Ready Home Checklist (where applicable)
 3. Hot Water Distribution test
- Submissions:
 - Send “DOE Zero Energy Ready Verification Summary” electronically to zero@newportpartnersllc.com
 - Otherwise builders will not receive “credit” on DCH website
 - Considering RESNET National Homes Registry for future

- Provide software-generated DOE Zero Energy Ready Home Certificate to builder/home buyer
- Submit software-generated DOE Zero Energy Ready Home Compliance Report to zero@newportpartnersllc.com



- Partnership Categories
 - Builder
 - Verifier
 - Training Partner
 - Designer/Architect
 - Lender
- Review & Sign Online Agreement
- Be listed...be active!



Thank You

Questions?

To Become a Rater or Builder Partner:

www.buildings.energy.gov/zero

E-mail Contact:

zero@newportpartnersllc.com (Jamie)

robby@nrglogic.com

RELATED SESSIONS

**Efficient Hot Water
Distribution - 2/16 @ 3:30 pm**

**Ducts in Conditioned Space –
2/17 @ 10:30 am**

**IAQ & WaterSense -
2/17 @ 10:30 am**

**Ventilation –
2/17 @ 1:30 pm**

**Marketing & Sales Strategies
for DOE Zero Energy Ready
Homes – 2/17 @ 3:30 pm**

**High R Assemblies –
2/18 @ 8:30 am**