Zero Energy Ready Homes

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

Zero Energy Ready Made Simple Part II:
X's & O's of Rating Zero Energy Ready Home

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DOE Zero Energy Ready Home
&
Robby Schwarz
EnergyLogic

Zero Energy Ready Home:

- Zero Made Easy
- Zero Value Translated
- Zero Builders in Action
- Zero Specifications
  - I: Specs Explained
  - II: Rating & Verifying
- Zero Recognition

Zero Energy Ready Home

Technical Specifications Overview

Zero Energy Ready Home Spec

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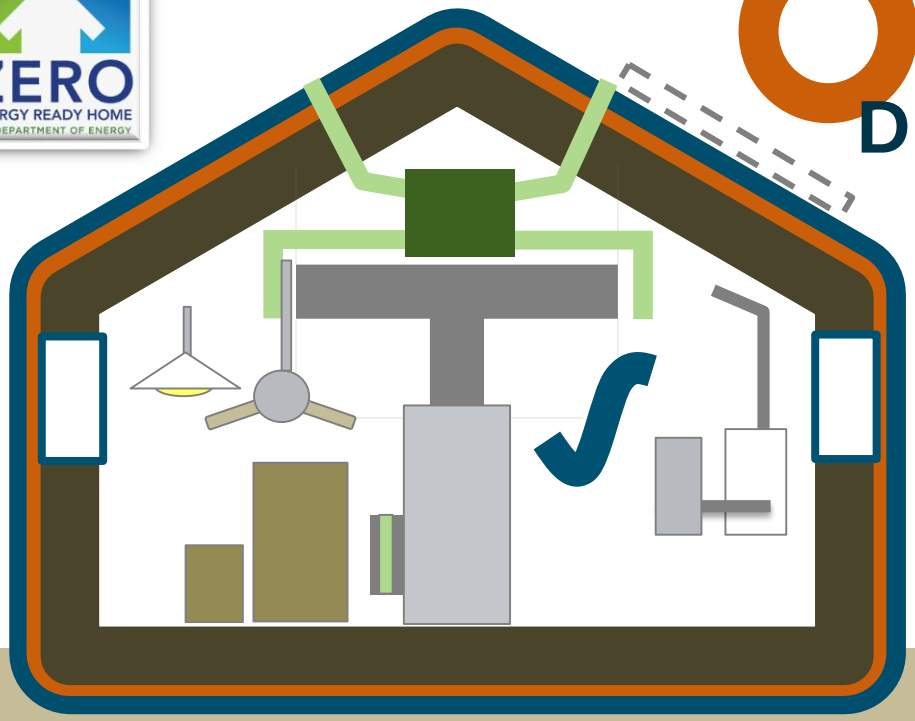
Risk Man:

Low-Loads

Less Drying

Less Fresh Air



Differentiation:

Future Ready

Health Ready

Advanced Tech

Zero Ready

Optimized Enclosure System	Optimized Comfort System	Water Protection System	Complete IAQ System	Efficient Comps System	Solar Ready System

Zero Energy Ready Home Spec

Optimized Enclosure System

ZERO ENERGY READY HOME
U.S. DEPARTMENT OF ENERGY

ENERGY STAR QUALIFIED NEW HOME

+ 2012 / 2015 IECC Envelope Insulation Levels + ENERGY STAR Windows

Zero Energy Ready Home Spec

Optimized Comfort System

ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

ENERGY STAR QUALIFIED NEW HOME

+ **Optimized Duct Location**

Zero Energy Ready Home Spec

Water Protection System

ZERO ENERGY READY HOME
U.S. DEPARTMENT OF ENERGY

ENERGY STAR QUALIFIED NEW HOME

+

look for EPA Indoor airPLUS QUALIFIED HOME

- sump pumps
- flooring materials
- sub-slab aggregate
- RH control in hot/humid

Zero Energy Ready Home Spec

Complete IAQ System

ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

ENERGY STAR QUALIFIED NEW HOME

+

look for EPA Indoor airPLUS QUALIFIED HOME

- Radon
- Low emission materials
- Combustion safety
- Better filtration

Zero Energy Ready Home Spec

Efficient Comps System

- Appliances
- Exhaust Fans
- Ceiling Fans
- Water Heating (target)

+

- High efficient lighting
- Efficient hot water distribution

Zero Energy Ready Home Spec

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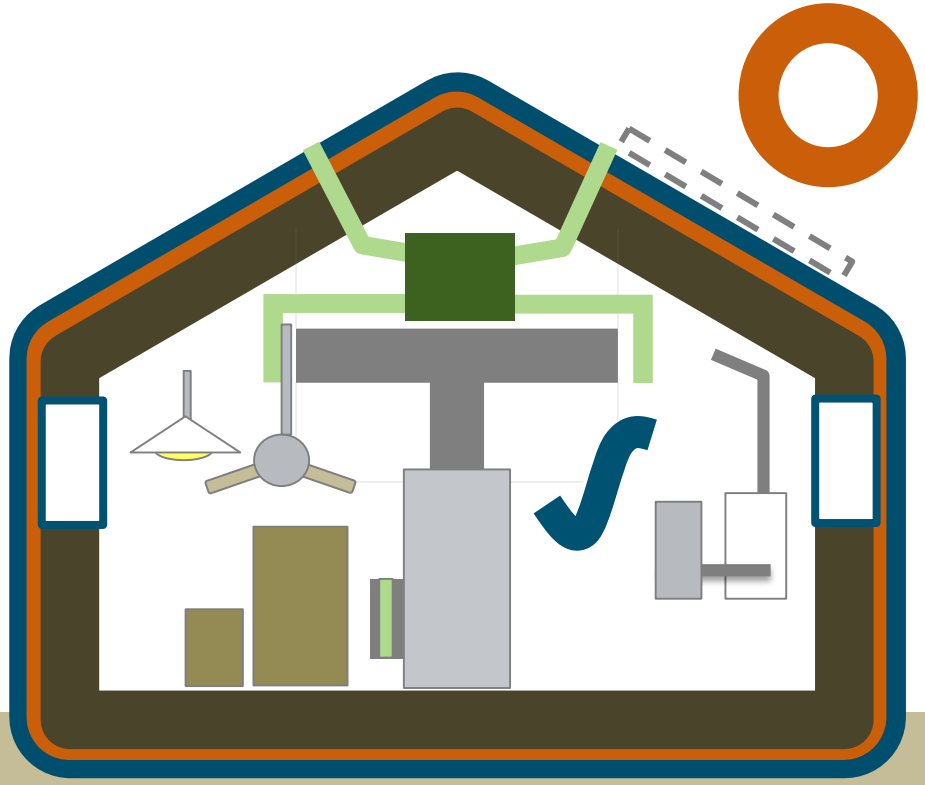
Solar Ready System



- **DOE ZERH PV-Ready Checklist**

Zero Energy Ready Home Spec

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Risk Man:

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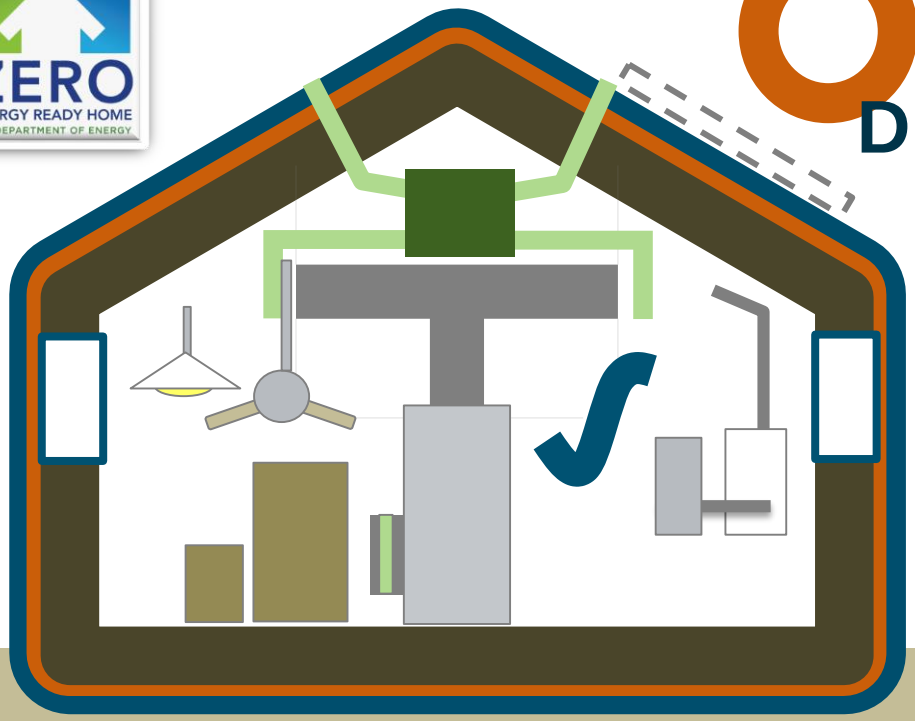

Differentiation:

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Optimized Enclosure System	Optimized Comfort System	Water Protection System	Complete IAQ System	Efficient Comps System	Solar Ready System

ZERH Spec = Clear Definition & National Framework

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Risk Man:

Low-Loads

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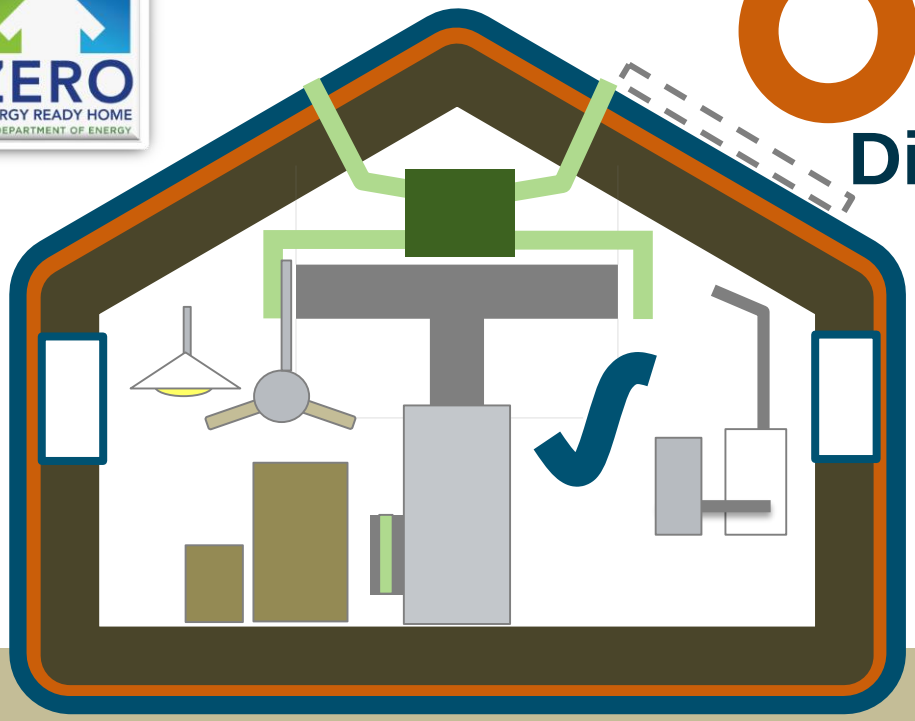
Less Fresh Air



Differentiation:

Future Ready

Health Ready

Advanced Tech

Zero Ready

A Zero Energy Ready Home is a **high-performance home, so energy efficient,** all or most annual energy consumption can be offset by renewable energy.

DOE ZERH Framework

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Mandatory Reqts.

Must Comply

'Target Home' Specs

Trade-Off Flexibility

Size Adjust. Factor

Identical to Energy Star

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

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

Exhibit 2: DOE Challenge Home Target Home [3, 17]

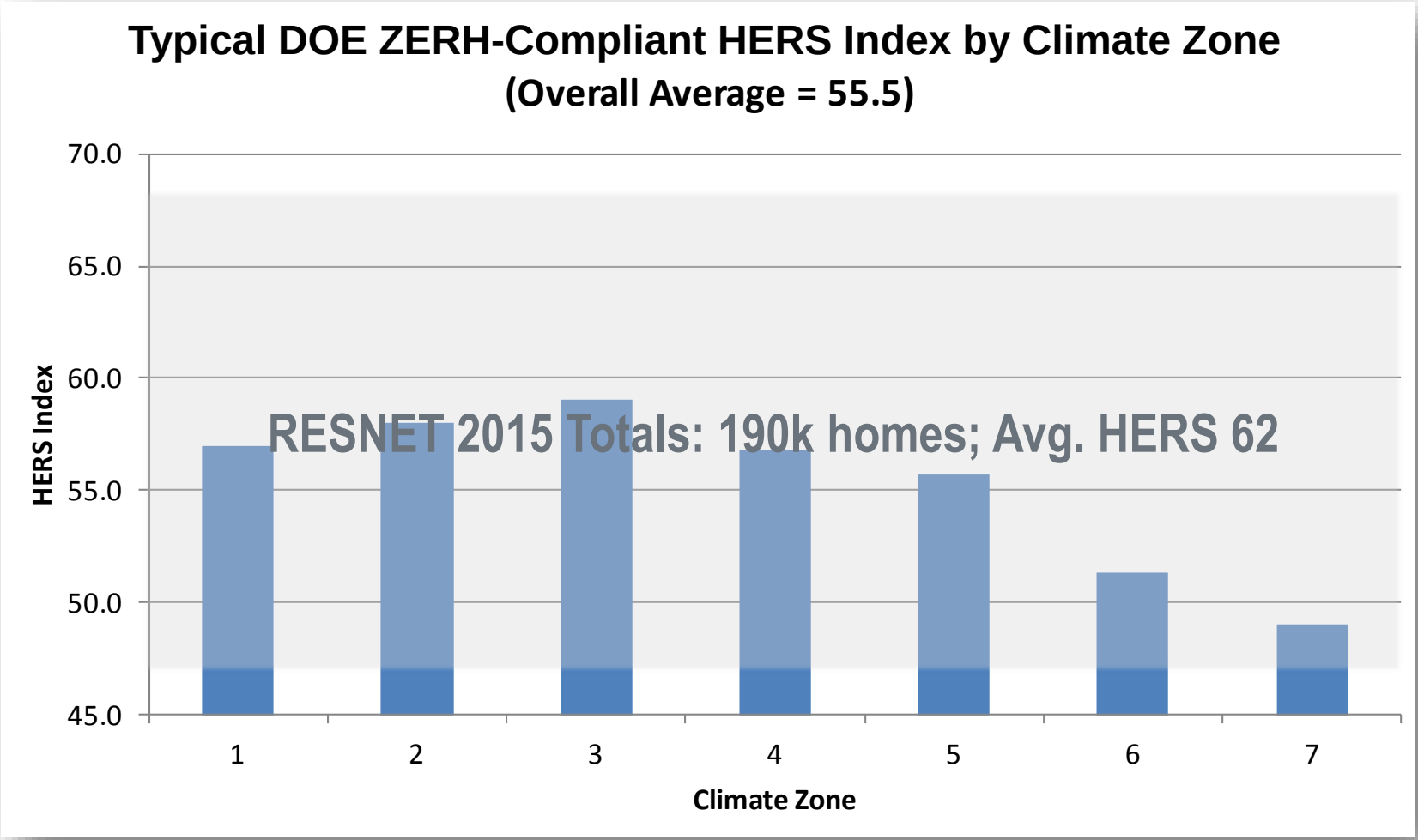
HVAC Equipment[18]	Hot Climates (2012 IECC Zones 1,2)[19]	Mixed Climates (2012 IECC Zones 3, 4 except Marine)	Cold Climates (2012 IECC Zones 4 Marine 5,6,7,8)
AFUE	80%	90%	94%
SEER	18	15	13
HSPF	8.2	9	10[20]
Geothermal Heat Pump	ENERGY STAR EER and COP Criteria		
ASHRAE 62.2 Whole-House Mechanical Ventilation 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			
• Insulation levels shall meet the 2012 IECC and achieve Grade 1 installation, per RESNET standards. • Infiltration[21] (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			

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

Exhibit 3: Benchmark Home Size[26]

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

Target Home Avg. HERS Scores



Based on 1800, 2400, and 3600 ft ^{2} prototypes on climate-appropriate foundations.

Zero Energy Ready Home

Recent Spec Updates

Technical Specification Updates

1. Solar hot water ready
2. ACH50 Target – Attached
3. ENERGY STAR Windows
4. “How to Find” Low Emission Products
5. Alignment with ENERGY STAR 3.1 in Specific States
6. Recognition of “Adaptive Scheduling” hot water circulation systems
7. Alignment of DOE ZERH Target with HERS Reference Home for Hot Water
8. Change in leakage spec for ducts in vented attics

1. Solar Hot Water-Ready → Encouraged

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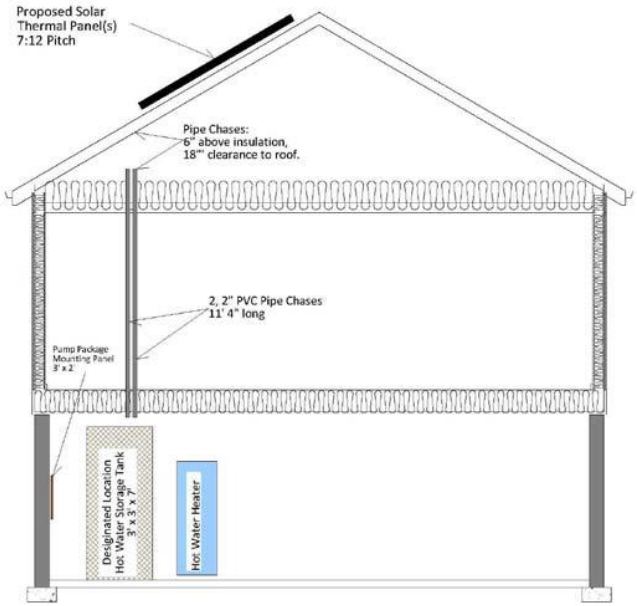
Change:

- DOE encourages, but does not require, the use of the Solar Water Heating-Ready provisions
- PV-Ready provisions are still required, subject to the allowances in the specs



Rationale:

- Cost-effectiveness of SHW
- Overall hot water energy load

Part of DOE ZERH Rev.05 Spec (May 2015)

2. Target Home Air-Tightness for Attached Dwellings

	ACH50 Requirements/Targets				
Climate Zones	**Zero Energy Ready Home Target - Detached**	**Zero Energy Ready Home Target – Attached***	**ENERGY STAR V3**	**2012 & 2015 IECC**	**Passive House**
1-2	3.0	3.0	6.0	5. 0	0.6
3-4	2.5	3.0	5.0	3.0	0.6
5-7	2.0	3.0	4.0	3.0	0.6
8	1.5	3.0	3.0	3.0	0.6

*** Built into REM/Rate v15.1 & EnergyGauge EGUSA5 update (expected mid-March 2016)**

3. ENERGY STAR Windows

- *Updated Specs*

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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
Projects permitted up to 8/31/2016	0.40	0.25	[3] 0.30 [4] 0.30	[3] 0.25 [4] 0.40	0.30 0.31 0.32	Any ≥0.35 ≥0.40
Projects permitted ***after*** 8/31/2016*					0.27* 0.28* 0.29*	Any* ≥0.32* ≥0.37*

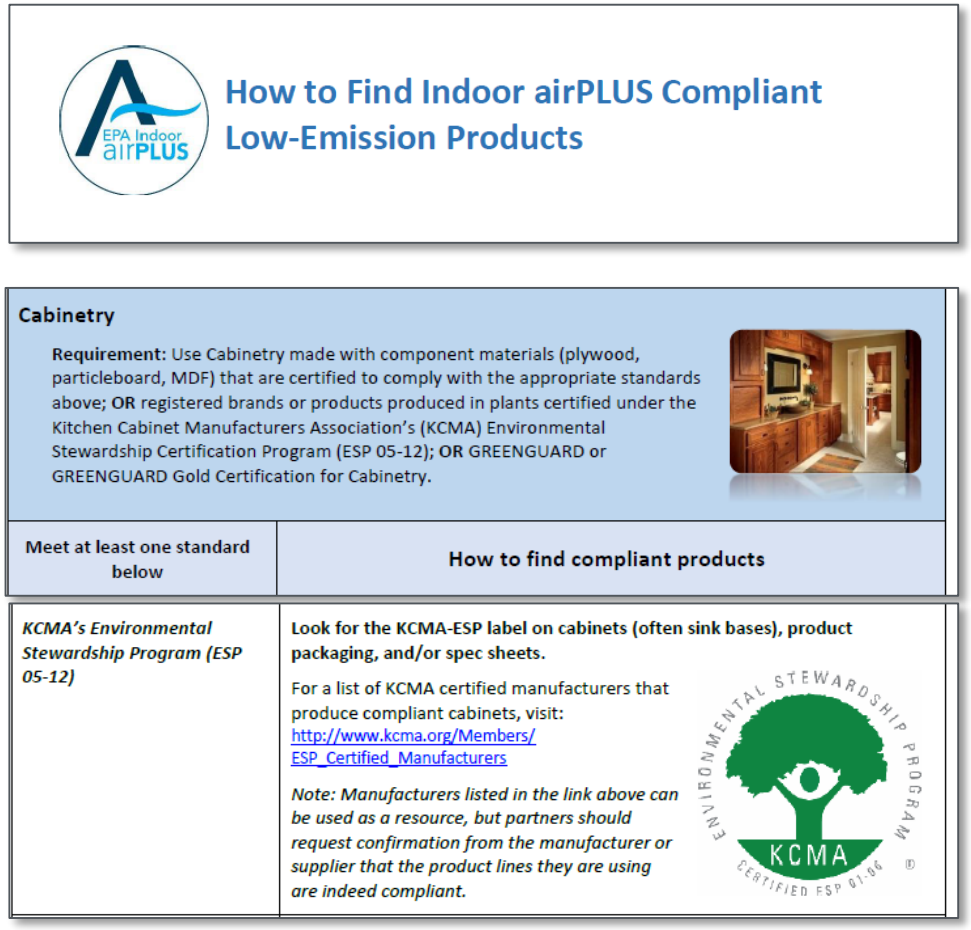
*For Cold Climate Zones, the revised specs are applicable to DOE Zero Energy Ready Homes permitted after **8/31/2016**

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

4. "How to Find" Guidance on Identifying Low-Emission Solutions

- Low emission materials and products are rapidly evolving, gaining market share & recognition
- Standards, labels, certification agencies can be challenging to navigate
- To help partners identify sources and spec products, a new IAP resources is available:

How to Find Indoor airPLUS Compliant Low-Emission Products



EPA Indoor airPLUS

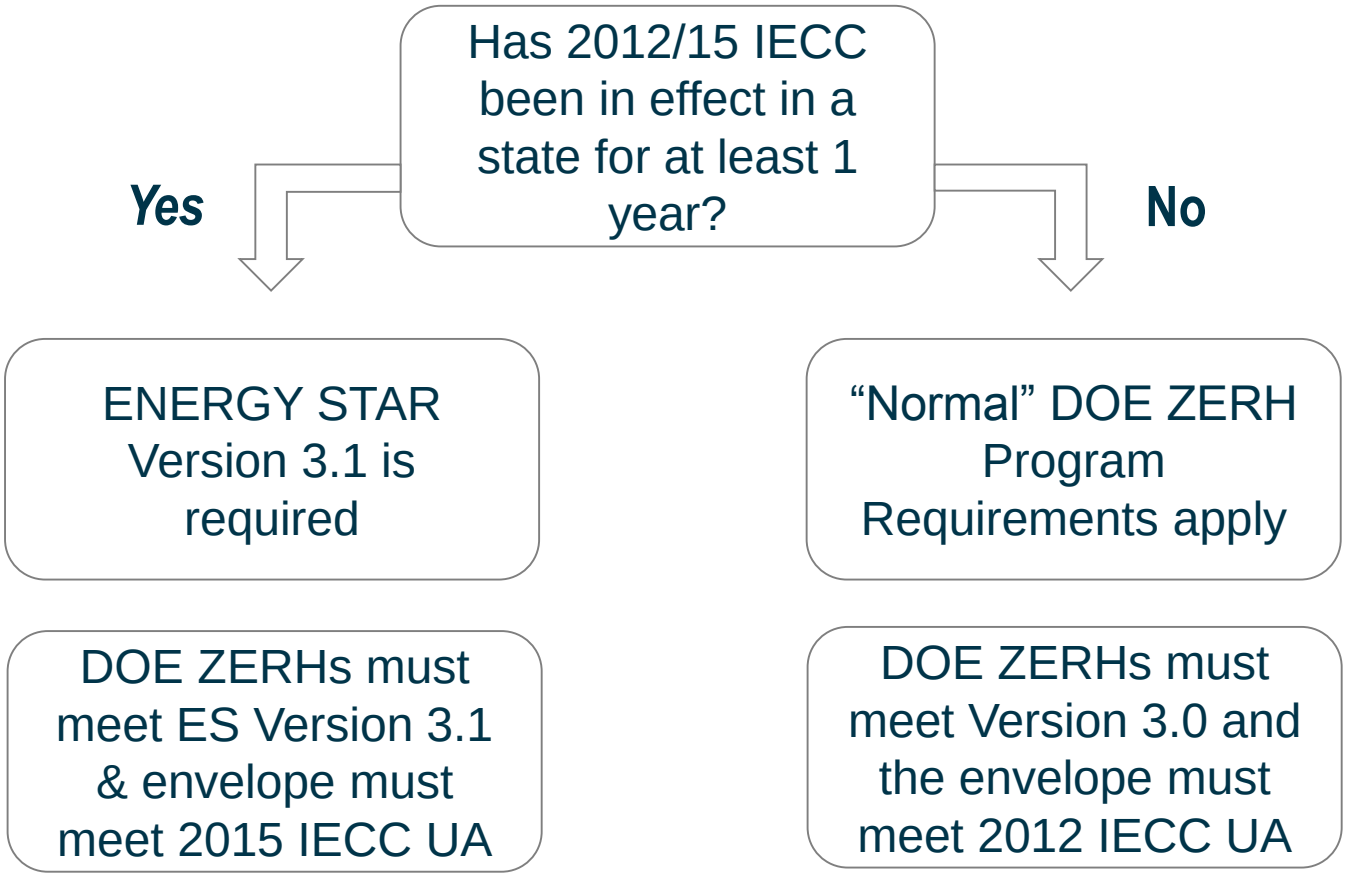
How to Find Indoor airPLUS Compliant Low-Emission Products

Cabinetry

Requirement: Use Cabinetry made with component materials (plywood, particleboard, MDF) that are certified to comply with the appropriate standards above; **OR** registered brands or products produced in plants certified under the Kitchen Cabinet Manufacturers Association's (KCMA) Environmental Stewardship Certification Program (ESP 05-12); **OR** GREENGUARD or GREENGUARD Gold Certification for Cabinetry.

Meet at least one standard below	How to find compliant products
KCMA's Environmental Stewardship Program (ESP 05-12)	**Look for the KCMA-ESP label on cabinets (often sink bases), product packaging, and/or spec sheets.** For a list of KCMA certified manufacturers that produce compliant cabinets, visit: http://www.kcma.org/Members/ESP_Certified_Manufacturers ***Note: Manufacturers listed in the link above can be used as a resource, but partners should request confirmation from the manufacturer or supplier that the product lines they are using are indeed compliant.***

5. ENERGY STAR v3.1 and 2015 IECC Insulation for States with Advanced Codes



Part of DOE ZERH Rev.05 Spec (May 2015)

Phase-In of New Requirements

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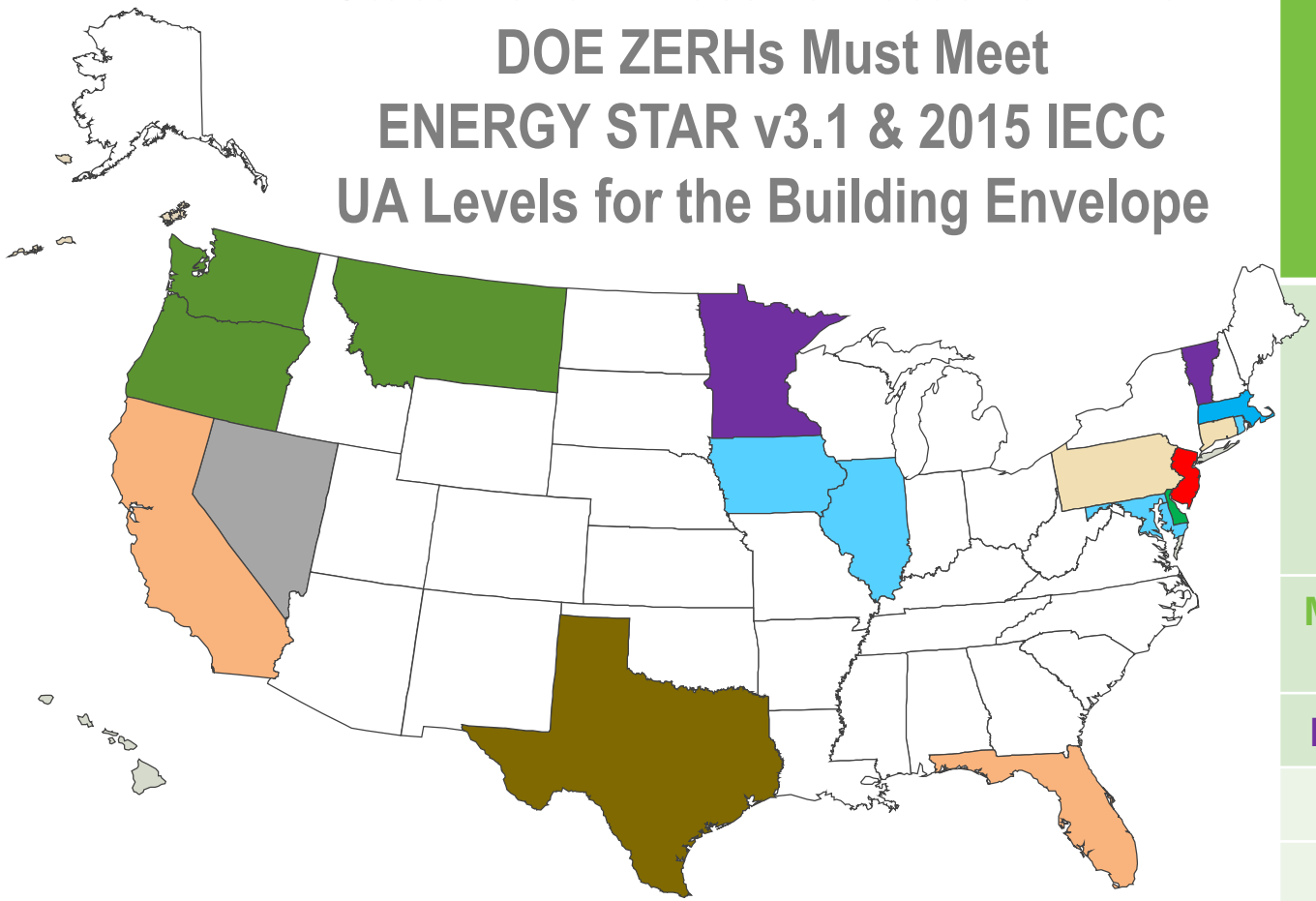
State-Level Effective Dates for When DOE ZERHs Must Meet ENERGY STAR v3.1 & 2015 IECC UA Levels for the Building Envelope



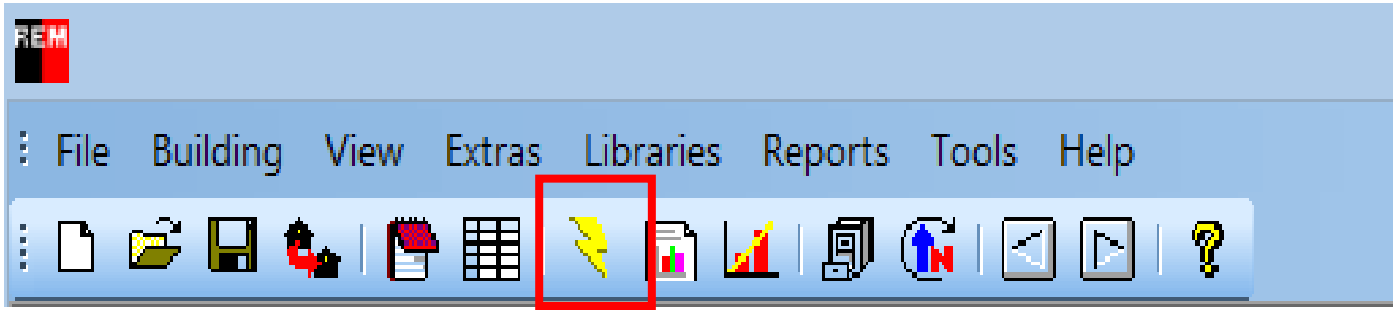
State	New reqmnt.'s apply for projects permitted after:
MA DC, IL, MD, RI IA DE	V3.1 and 2015 IECC Insulation Levels in Effect
MT, OR, WA	1/1/16
MN, VT	4/1/16
NV	7/1/16
NJ	4/1/17
TX	10/1/17

CA & FL have regional variations of 3.1

Impacts of Meeting Energy Star v3.1

- For homes meeting DOE Zero Energy Ready Home:
  - **Achieving Version 3.1 compliance imposes little/no additional builder burden**
  - HERS Target for DOE ZERH is already low enough such that homes will achieve Version 3.1 compliance by default in most/all cases

- Easy to assess compliance with Version 3.1 using Quick Compliance tool



Impacts of Meeting 2015 IECC UA Levels

- **No additional burden for most designs**

- In Climate Zones 1 – 5, meeting 2015 IECC via a whole-building UA tradeoff will be *very slightly* less stringent
  - Required Frame Wall U-Factor is 2 to 5% less stringent
  - Frame Walls might comprise ~ 20% – 40% of total shell area...

6. Hot Water Recirc Systems w/ Adaptive Scheduling – controls

Part of DOE ZERH Rev.05 Spec (May 2015)

Change:

- Clarification:
  - "Adaptive" scheduling recirc systems are now recognized in ZERH Specs
  - Do not require the use of occupant-controlled switches or occupancy sensors.

Rationale:

- DOE ZERH receives frequent questions on switch requirements for the Efficient Hot Water Distribution provision. Because the ZERH specs recognize adaptive scheduling recirc. systems and their ability to provide hot water efficiently in an automated manner, this clarification was made.

7. Alignment of DOE ZERH Target Home with the HERS Reference for Hot Water Amendments

Will take effect when RESNET Amendments take effect

Change:

- In terms of hot water efficiency…..
  - DOE ZERH Target Home = HERS Reference Home

- ZERH projects will “get credit” for the efficient hot water distribution.

Rationale:

- This counters any HERS target decrease created by the more efficient ENERGY STAR windows.

- Gives partners added flexibility in how they reach the required HERS threshold.

8. Buried/Encapsulated Ducts – Leakage Limit

Change:

- The 3 CFM25 per 100 ft^2 of CFA leakage limit for buried/encapsulated ducts has been changed from Total Duct Leakage, to Leakage to Outdoors (LTO)

Rationale:

- Some duct systems have buried/encapsulated ducts in attic + ducts within conditioned spaces
- We really care about the leakage to outdoors
- Duct systems must still meet the Total Duct Leakage limit per ENERGY STAR.

Zero Energy Ready Home

Rating & Verifying Homes

Rating & Verifying Homes

- Same: ENERGY STAR Homes framework
- New:
  - Indoor airPLUS Checklist;
  - DOE ZERH PV-Ready Checklist (where applicable)
  - Hot Water Distribution test
- Submissions:
  - Send “DOE Zero Energy Ready Home Verification Summary” electronically to zero@newportpartnersllc.com
  - Moving to RESNET National Homes Registry in 2016

Verifying Homes – Indoor airPLUS

- 1-page checklist
- Builder or Rater may verify
- Permissible methods:
  - Visual verification on site during construction
  - Reviewing photos taken during construction
  - Checking documentation
  - Equivalent methods as appropriate
- Sampling permitted per RESNET protocol

Verifying Hot Water Distribution

1. Initiate operation of occupant-controlled or occupancy sensor-based recirculation systems, if present,
2. Place bucket or flow measuring bag (pre-marked for 0.6 gallons) under the hot water fixture. Only fixture with greatest stored volume of hot water needs to be tested.
3. Turn on hot water; place digital thermometer into the stream of water just where it meets the water being collected; record starting temperature.
4. When water reaches 0.6 gallons record temperatures again. The temperature must increase by 10 F.

Verifying Homes – PV-Ready Checklist

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- RERH checklist for DOE ZERH Home - builder or rater may verify

DOE ZERH Certificate

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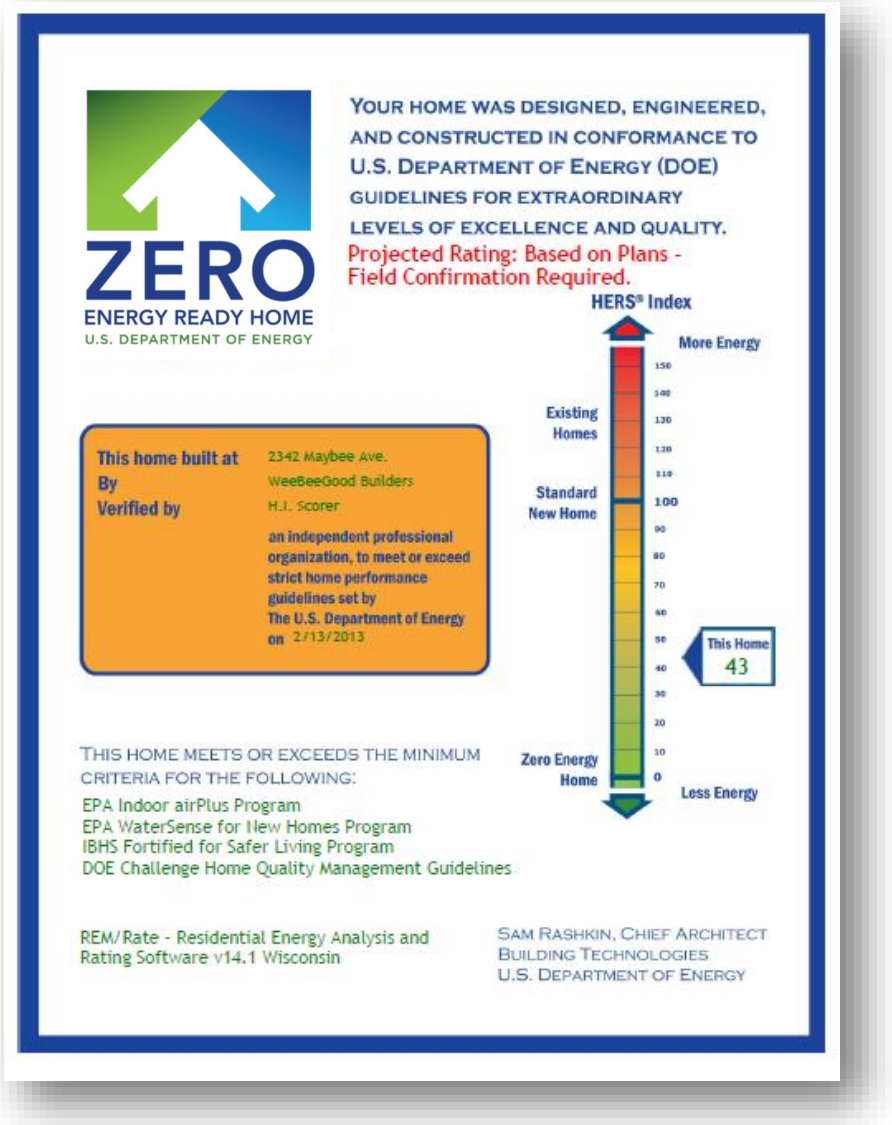
- **Rater Prints Certificate** directly from rating software
- **Certificate Includes:**
  - Rating Details
  - Graphic HERS Index
  - Optional Programs



Zero Energy Ready Home

Opportunity to "Upserve" Builder Clients

Rater – Builder Engagement

- Identify leading builders:
  - HERS < 60
  - ENERGY STAR
  - ENERGY STAR + IAP
- Help qualify for incentives:
  - Energy Efficient Home builder tax credit
  - Utility incentives
- Set up joint ZERH Training webinar w/DOE
- Set up joint ZERH recruiting trips
- Invite production builder to do “Limited Edition”

Thank You

Questions?

For More Information:

www.buildings.energy.gov/zero

E-mail Contact:

zero@newportpartnersllc.com