## **Marshall Fire Incentives**

**Department of Energy:** 

Zero Energy Ready Homes v2





## Agenda

- Introductions
- Program Participation Process
- DOE Zero Energy Ready Homes v2
- Q&A
- Survey





## Introductions

- Rob Buchanan
- Michael Resech
- Erik Straite
- Robby Schwarz



## **Builder Incentives**

• Baselined to 2018 IECC

COMBO HOMES – 2012 IECC OR HIGHER AND PERCENT BTC			
Percent BTC	Rebate		
10% – 14.999%	\$250		
15% – 19.999%	\$400		
20% - 24.999%	\$600		
25% – 29.999%	\$900		
30% - 34.999%	\$1,300		
35% – 39.999%	\$2,000		
40% and higher	\$2,550		

#### ELECTRIC ONLY HOMES – REBATE LEVELS – 2012 IECC OR HIGHER AND PERCENT BTC

Percent BTC	Rebate
10% – 14.999%	\$500
15% – 19.999%	\$800
20% - 24.999%	\$1,200
25% - 29.999%	\$2,800
30% - 34.999%	\$3,900
35% – 39.999%	\$5,200
40% and higher	\$6,700





### **MARSHALL FIRE REBUILDING REBATES**





An Xcel Energy Community Collaboration



## **Prequalification**\*

ENERGY STAR v3.2, New Certification Program, DOE ZER v2, Passive House

- Prequalification form
- ENERGY STAR v3.2 National Rater Design Review Checklist\*\* (draft version prior finalization)

\*Optional, but strongly encouraged, Requirements subject to change

**\*\***Most recent draft version if prior to program finalization





## Submission

Department of Energy Zero Energy Ready Homes v2:

- Homeowner claim form
- ENERGY STAR v3.2 National Rater Field Checklist\*
- Zero Energy Ready Homes v2 National Program Requirements Checklist\*
- Zero Energy Ready Homes v2 PV-Ready Checklist\*
- Blower door test file<sup>\*\*</sup>
- Energy modeling file<sup>\*\*</sup>

\* Most recent draft version if prior to program finalization
\*\*Also part of builder rebate submission requirements





## **Requirements – Zero Energy Ready v2**

- ERI w/o PV <= 50 (for homes permitted prior to rating software support for ENERGY STAR v3.2 or Zero Energy Ready v2)
- Meet the requirements of the draft or finalized version at the time home was permitted



# DOE Zero Energy Ready Homes Version 2 Overview

Presented By Robby Schwarz





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### Who's in the audience today?

- a. Builder
- b. Designer
- c. Energy Rater / Consultant

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- d. Utility or EE Program
- e. Other



To what extent have you been involved with DOE Zero Energy Ready Home projects?

- a. No experience
- b. No experience, but considering ZERH for an upcoming project
- c. Involved with ZERH on a few projects
- d. Involved with ZERH on many projects



### U.S. DOE Zero Energy Ready Home Why Version 2?

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## **How Times Have Changed?**

Ten people building a balloon frame house in 1877 Nebraska

### 300 people building a modern-day house in 2020 (NAHB Research)





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## Labor & Material Issues

## **BŮILDÊ**Ř



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#### **Midweek Break**

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5 strategies to retain construction workers in a competitive labor market



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### Times and Expectations Have Changed 1900's housing vs. 2019 housing



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## Why Version 2? Why Now?

- New residential construction matters
- 2021 IECC & ENERGY STAR Homes
- HERS score trend towards greater efficiency
- Technology innovations and ZERH Cost Effectiveness
- ZERHs pave the way to the clean energy economy
- Increasing demand for ZERH in programs, policies, and incentives

### **HERS Trends** - Lower Scores & More Ratings

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## **U.S. Residential Buildings**



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# The Apocalypse is Coming

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The Apocalypse is Coming - Again



# ZERH Base Building Envelope Insulation Levels



### **Code Improvement**

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http://bcapcodes.org/compliance-portal/design/energy-modeling/

## Risk #1: Moisture Damage

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### What does ZERH Mean? Technical Strategy

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Step One:	Step Two:	Step Three:
Optimize	Do No	Ensure
Efficiency	Harm	Future Ready
Energy Efficient	Comprehensive	Solar Ready
Enclosure	Water Protection	Construction
Energy Efficient Components	Ensured Comfort System	
Systems Thinking Applied Building Science	Comprehensive Indoor Air Quality	



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## **ZERH Defined**

"A high-performance home which is so energy efficient, that a renewable energy system can offset all or most of its annual energy consumption."

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## What does the ZERH Definition Mean?

- A pathway to achieve Zero Energy
- At a minimum every home is "future proofed" to be able to achieve zero net energy as technology advances
- For example, we see PV panel generation and efficiency improve
  - Therefore, we know that in the future, small roof areas will be able to generate more power to achieve this goal



## Zero Energy Ready Home Spec

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## ZERH is the Home of the Future Available Now

- Future Ready Optimized Thermal Protection that meets and exceeds code
- Moisture Ready Whole-House Water Protection
- Comfort Ready High-Performance Heating and Cooling Systems
- Tech Ready High-Efficiency Components
- Health Ready Comprehensive Indoor Air using EPA Indoor airPLUS
- Zero Ready Solar Ready Construction minimizes the cost of adding it in the future

## Zero Ready vs. Zero



#### A Symbol of Excellence



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https://www.24hplans.com/cost-to-build-a-net-zero-energy-home/

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## **ZERH Cost Effectiveness**

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ZEB Incremental Cost	Houston (CZ2)	Atlanta (CZ3)	Baltimore (CZ4)	Chicago (CZ5)
	\$2,065	\$6,094	\$5,993	\$5,368
Mortgage Threshold (30 Years)	\$10,980	\$15,563	\$23,305	\$20,619
<b>O</b> ~~	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Resale Threshold (12 Years)	\$5,576	\$7,903	\$11,835	\$10,472
475 <b>5</b> 1	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Consumer WTP (4%)	\$9,139	\$9,690	\$10,130	\$13,874
<b>ľn</b> ŕr	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
First Cost Threshold (0%)	\$0	\$0	\$0	\$0
. <b>Ú</b>	×	×	×	×
7E Incremental Cost	Houston (CZ2)	Atlanta (CZ3)	Baltimore (CZ4)	Chicago (CZ5)
	\$15,488	\$20,069	\$18,674	\$23,125
Mortgage Threshold (30 Years)	\$26,715	\$35,927	\$49,118	\$45,414
9	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Resale Threshold (12 Years)	\$13,567	\$18,245	\$24,945	\$23,063
	×	×	~	$\checkmark$
Consumer WTP (4%)	\$9,139	\$9,690	\$10,130	\$13,874
<b>ŤŤ</b> ∗	×	×	×	×
First Cost Threshold (0%)	\$0	\$0	\$0	\$0
		1	1	1

Source: 'The Economics of Zero Energy Homes: Single Family Insights,' Rocky Mountain Institute, 10/18

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## **Market-Ready Innovations**





Testing and validation of smart ventilation controls



Validation and application guidance for High-R wall systems



Heat Pump Water Heater field testing and application guidance



Aerosol envelope sealing for new construction

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"Plug-n-Play" Air Delivery Systems

### Increasing Demand for ZERHs in Programs, Policies, and Incentive Programs

Affordable Housing	State & Utility Rebates	Codes	<b>Green Financing</b>
Colorado	CenterPoint (TX)	Many CO jurisdictions going to the 2021	Fannie Mae
Connecticut	Dominion Energy (UT)	Oregon 2023	Federal Home Loan Bank of NY
Delaware	Eversource (CT)	RI Stretch Code	
Maryland	NJ (statewide)	Summit County, CO	
Minnesota	Oncor (TX)		
New Jersey	Rhode Island (statewide)		
Pennsylvania			
Virginia	Xcel Energy		
Washington D.C.			BUILDTank

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Integrated Design Process

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## **Integrated Design Process**

- Change is hard / Change is good
- Start Early
- Opportunity Costs
- What does integration mean?
  - Applied Building Science
  - Systems Thinking
    - Air control
    - Thermal Control
    - Moisture Control
  - Program Requirements



https://caddispc.com/our-integrated-design-p

## **Integrated Design Process**

Define the project

- Zero Energy Ready Home
  - Integration of four programs
- Share responsibility
  - Bring the right team together
  - Architect, Builder, Trade Partners, Energy Rater
- Viewing things Holistically at one time
- Information sharing
  - Research materials, building practices
- Integration

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Structure, Systems, Enclosure, Climate, Occupant

### Integrated Design Process



## **ZERH Program resources**

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https://www.energy.gov/eere/buildings/doe-zero-energy-ready-home-resources

Getting Enclosures Right, Joe Lstiburek, Building Science Corp.

Low Load HVAC, Greg Cobb, Energy Inspectors

Lazy Air Conditioning: HVAC & Humidity Control, Ken Gehring, Therma-Stor

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Best Practices for Ventilation, Paul Raymer, ICF

Indoor airPLUS Revision 4 Updates, Nick Hurst, EPA

## 3<sup>rd</sup> Party Verification

- Provide third-party verification that homes meet DOE Zero Energy Ready Home National Program Requirements
- Program requirement
- Adds value to the process and legitimacy to the label
  - Independence
  - Government back label / Proof of compliance



https://sunridgegroup.ca/home-owners/home-energy-audits.php

## Verification by approved agency

- Verification of compliance with Energy Code may be completed by an approved third party
- Often this party is also a RESNET Energy Rater
- Partnered with the DOE Zero Energy Ready Home Program


### 3<sup>rd</sup> Party Serwices

- Consulting and participation in Intergrade Design Process
  - Knowledgeable about:
    - Program requirements
    - Applied building science
    - Assemblies and materials
    - Construction Schedule impacts
- Proposed and Confirmed Energy Modeling
- Field Inspection
  - Verification
  - Quality Assurance
- Trade Partner recommendation
- Possible other services
  - HVAC Design or consulting
  - Control layer management
  - Material specification recommendations







https://homesmsp.com/2019/01/should-home-inspectors-trample-insulation-no.htm



## **RESNET Quality Assurance**

- Quality of standard creation and maintenance
- Rating Providers employ Q.A.D.'s to perform QA on their certified raters
  - 10% of all building software file inputs review
  - 1% of each certified Raters' homes are recreated and reviewed for accuracy
- RESNET performs QA on Rating Providers
  - Annual quality assurance report and review
  - RESNET enhanced quality assurance
    - 50% of all rating providers each year receive either online reviews and/or in-field site visits
- Tracking QA reviews in real time in the RESNET Registry



https://<u>www.resnet.us</u>

### https://www5.eere.energy.gov/buildings/residential/locator

#### DOE Zero Energy Ready Home Partner Locator

Builders across the United States are building DOE Zero Energy Ready Homes. The interactive map below highlights the number of partners in each state. You can search for partners using the text box or find partners by state and type using the drop down menus below.

#### Ready to Take the Zero Energy Ready Challenge?

Builders interested in learning more about DOE Zero Energy Ready Home can view the requirements or start the sign up process.

Search Partners:

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### https://www1.resnet.us/registry/raters.aspx

RESNET. RESIDENTIAL ENERGY SERVICES NETWORK	👚 LEARN ABOUT HERS®	🛛 💻 ASK AN EXPERT	RESNET PROFESSIONALS	g+	y
Home Energy Efficiency	Financial Benefits	Ratings & Audits	Use a RESNET Profes	ssional	

#### **Certified RESNET HERS Raters**

Enter a rater's first and/or last name to look up his/her certification information:

Rater Name \*

**Q** LOOKUP

#### **Certified RESNET HERS RFIs**

#### Rating Field Inspector (RFI)

A Field Inspector is the entry level of Rater certification. A Field Inspector under the direct supervision of a certified home energy Rater may conduct the inspections and necessary basic performance tests (blower door & duct blaster) to produce a home energy rating. This category requires the ability to identify and quantify building components and systems.

Enter an RFI's first and/or last name to look up his/her certification information:

**RFI Name \*** 

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https://www.resnet.us

### **Transparency Public Access to RESNET National Registry**

- The public can now access the following information on rated homes:
  - Address of Home Rated
  - Rating Company Name That Rated the Homes
  - Date That Rating was Completed
  - HERS Index Score of Home



https://www.resnet.us

### https://www.hersindex.com/hers-rated-home-search/

### Looking for a HERS Rated Home?

Homes with HERS Index scores are more energy efficient, resulting in lower energy bills and higher home comfort.

To find out if a home has been HERS-rated, enter its full address in fields below.

Enter an Address

A Find a HERS Rated Home



https://www.resnet.us



### ZERH v2 Compliance

**Prescriptive Compliance** 

### <u>Moving to Sunset</u> <u>the Prescriptive Compliance Option</u>



 Least use and least flexible compliance option

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#### Performance



## Eligible Building Types – Looking Ahead

### Single-Family Detached

Single-Family Attached

### Multifamily (Any Height)



- Performance Compliance
- ESSFNH Version 3.2 & IAP as prerequisites



- ERI or Prescriptive Compliance
- ESMFNC & IAP as prerequisites

#### **DOE ZERH – Version 2**

#### **DOE ZERH – Multifamily V1**

## Step 1 demonstrate projected compliance



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### WHAT is **HERS**?

#### HERS = Home energy rating system

HERS is the most well known and nationally recognized energy rating system for residential construction builders. It was established in 2006 by Residential Energy Services Network (RESNET).

#### How it works



A rating of **100 is referred to** as the HERS Reference Home baseline and is based on the 2006 International Energy Conservation Code (IECC)

The lower the score the more efficient the home



A certified RESNET Home Energy Rater determines a home energy rating



http://www.resnet.us



### ENERGY STAR & DOE ZERH

Same rater network

 Same modeling software (at least 3 different options)

Same plan review & site inspection protocol



### **IECC & Energy Star used as foundation**

			-	Solar Ready
				Eff. Comps.& H <sub>2</sub> O Distrib.
				EPA Indoor Air Package EPA Indoor Air Package
				Optimized Duct Location Optimized Duct Location
ZERO ENERGY READY HOME	HVAC QI with WHV	HVAC QI with WHV	HVAC QI with WHV	
	Water Management	Water Management	Water Management	
		Independent Verification	Independent Verification	Independent Verification
	IECC 2015 Enclosure	IECC 2009 Enclosure	IECC 2021 Enclosure	IECC 2021 Enclosure +
	HERS <b>70-80</b>	HERS 65-75	HERS 55-65	HERS 40-55
IECC 2015		ENERGY STAR v3	ENERGY STAR v3.2	ZERH
	Tate         # 1990         III           1778         108.8         III         IIII           1778         108.9         IIII         IIIIIII         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			BU

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## Minimum Required Energy Efficiency Threshold

### Version 1 ZERH ERI Target Home specifications

Energy Rating Index (ERI) scores to qualify for ZERH in the 50s

- V2 ZERH Target Home achieves increased energy savings
- Resulting ERI Targets to qualify for ZERH in the 40s



## **EnergyStar Single Family New Homes V3.2**

1. Colorado will transition to version 3.2

2. Same program structure designed to achieve 10% savings over 2021 IECC

- 3. EnergyStar companion labels
  - Electrification Technologies
  - Technologies that are impactful today and tomorrow



### **Efficiency Target Updates**

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
Minimum Required Energy Efficiency Threshold	Based on the Version 1 ZERH ERI Target Home specifications - circa 2013. <b>ERI scores</b> <b>in the 50s.</b>	Updated ZERH Target Home achieves increased energy savings of 20% beyond 2021 IECC. <b>Resulting ERI Targets in</b> the 40s.	Reflect recent innovations in the ZERH efficiency threshold.





- SAF will sunset
- EnergyStar v3.1 has eliminated SAF
- EnergyStar v3.2 will not include SAF
- Homes built under ZERH v2 will be efficient regardless of SAF
- Removing SAF simplifies program requirements
- Homes under ZERH V2 will be very efficient regardless of SAF.

Bedrooms in Home to be Built	0	1	2	3	4	5	6	7
Conditioned Floor Area Benchmark Home	1,000	1,000	1,600	2,200	2,800	3,400	4,000	4,600

#### Exhibit 3: Benchmark Home Size<sup>29</sup>





# Energy Star v3.2 Revision ANSI 310

- Indoor airPLUS v1 revision 4
   Moving to v2 maybe in 2022
- ZERH will phase it
  - Balanced ventilation in cold climates (6-8)
  - MERV 13 filtration



### Mandatory Requirements

#### ZERH v1 rev7

#### ZERH v2

Are	ea of Improvement	Mandatory Requirements
1.	ENERGY STAR for Homes Baseline	<ul> <li>Certified under ENERGY STAR Qualified Homes Program Version 3, 3.1, or 3.2 (depending on state), or under ENERGY STAR Multifamily New Construction program Version 1.0 or 1.1 (depending on state)<sup>8, 9, 10</sup></li> </ul>
2.	Envelope	<ul> <li>Fenestration shall meet or exceed ENERGY STAR requirements. See End Note for specific U, SHGC values, and exceptions.<sup>11</sup></li> <li>Ceiling, wall, floor, and slab insulation shall meet or exceed 2015 IECC levels<sup>12,13</sup></li> </ul>
3.	Duct System	<ul> <li>Duct distribution systems located within the home's thermal and air barrier boundary or an optimized location to achieve comparable performance.<sup>14</sup></li> <li>HVAC air handler is located within the home's thermal and air barrier boundary.</li> </ul>
4.	Water Efficiency	<ul> <li>Hot water delivery systems (distributed and central) shall meet efficient design requirements<sup>15</sup>     or</li> <li>Water heaters and fixtures shall meet efficiency criteria<sup>16</sup></li> </ul>
5.	Lighting & Appliances	<ul> <li>All installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified. <sup>17</sup></li> <li>80% of lighting fixtures are ENERGY STAR qualified or ENERGY STAR lamps (bulbs) in minimum 80% of sockets</li> <li>All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified</li> </ul>
6.	Indoor Air Quality	Certified under EPA Indoor airPLUS <sup>10</sup>
7.	Renewable Ready	Provisions of the DOE Zero Energy Ready Home PV-Ready Checklist are Completed <sup>18</sup>

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Area of Improvement		Mandatory Requirements
1.	ENERGY STAR Single Family New Homes Baseline	Certified under ENERGY STAR Single Family New Homes Version 3.2 <sup>11</sup>
2.	Envelope	<ul> <li>Ceiling, wall, floor, &amp; slab insulation meet or exceed 2021 IECC R, U, or UA levels <sup>12,13</sup></li> <li>Above Grade Walls in Mixed and Cold Climates provide thermal breaks <sup>14</sup></li> <li>Windows meet high performance requirements based on climate zone <sup>15</sup> Advisory: DOE is monitoring the development of the planned update to the ENERGY STAR product specifications for residential windows (V7.0), and plans to adopt these in a future program update <sup>16</sup></li> </ul>
3.	Duct System	All ducts and heating and cooling air-handling equipment are located within the thermal and air barrier boundary <sup>17</sup>
4.	Water Heating Efficiency	<ul> <li>Hot water delivery systems meet efficient design requirements <sup>18</sup></li> <li><i>or</i></li> <li>Water heater and fixtures meet efficiency criteria<sup>19</sup></li> </ul>
5.	Lighting & Appliances	<ul> <li>All installed refrigerators, dishwashers, clothes washers, and clothes dryers are ENERGY STAR qualified <sup>20, 21</sup></li> <li>95% of builder-installed lighting fixtures are ENERGY STAR qualified or ENERGY STAR lamps (bulbs) in minimum 95% of sockets</li> <li>All installed bathroom ventilation and ceiling fans are ENERGY STAR qualified</li> </ul>
6. Indoor Air Quality		<ul> <li>Certified under EPA Indoor airPLUS <sup>22</sup></li> <li>MERV 13 (minimum) filter is installed on all ducted heating and cooling systems and accounted for in system design <sup>23</sup></li> <li>Energy efficient balanced ventilation (HRV or ERV) is provided in Climate Zones 6-8 <sup>24</sup></li> </ul>
7.	Renewable Ready	Provisions of the <u>DOE Zero Energy Ready Home PV-Ready Checklist Version</u> 2 are Completed <sup>25</sup>

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### 1. Building Envelope Updates

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
Building Envelope Insulation Levels	2015 IECC insulation levels for opaque areas	<b>2021 IECC insulation levels</b> for opaque areas. Thermal breaks in walls in CZs 4-8.	Deliver most robust code-based building envelope with an additional, targeted provision for Above Grade Walls.

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### 2021 IECC Insulation Values

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BUILD Tanking.

CZ	Ceiling	Wood-framed Wall	Mass Wall	Floor	Basement	Slab	Crawl Space Wall
1	30	13 or 0+10	3/4	13	0	0	0
2	49	13 or 0+10	4/6	13	0	0	0
3	49	20 or 13+5 or 0+15	8/13	19	5/13	10, 2ft	5/13
4	60	20+5 or 13+10 or 0+15	8/13	19	10/13	10, 4ft	10/13
5	60	30 or 20+5 or 13+10 or 0+15	13/17	30	15/19 or 13+5	10, 4ft	15/19 or 13+5
6	60	20+5 or 13+10 or 0+20	15/20	30	15/19 or 13+5	10, 4ft	15/19 or 13+5
7/8	60	20+5 or 13+10 or 0+20	19/21	38	15/19 or 13+5	10 <i>,</i> 4ft	15/19 or 13+5

## **Envelope Efficiency Improvements**



Climate Zone	2021 IECC UA Stringency Company DOE ZERH V1 UA Requirement	red to ts <sup>A</sup>
1	+ 0%	
2	+ 5%	
3	+16%	
4	+8%	
5	+8%	Warm-Humid Below White Line
6	+1%	All of Alaska in Zone 7 except for the following Boroughs in Zone 8: Bethelman Nerthwest Arctic Dethelman Nerthwest Genteentee
7	+1%	Zone 1 includes Fairbanks N. Star Wede Hampton Norme North Stope Vukon-Köyükük North Stope 1

A. Based on 4 prototype models per Climate Zone: 1-story slab (CZ 1-3) or basement (CZ4+) foundation; 1-story crawlspace; 2-story slab or basement foundation (depending on CZ); 2-story interior TH unit on slab or basement foundation (depending on CZ)

### Thermal Breaks

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### Above Grade Walls Climate Zones 4-8 Must provide thermal breaks

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Windows meet high performance requirements based on climate

- Based on ENERGY STAR v6.0 specs
- Advisory: DOE is monitoring the development of the planned update to the ENERGY STAR product specifications for residential windows (v7.0), and plans to adopt these in a future program update

Windows					
	2021 IECC Climate Zones				
	1 – 2	3	4 (except Marine)	4 Marine and 5	6 – 8
U-Value	0.40	0.30	0.30	0.27	0.25
SHGC	0.23	0.25	0.40	Any	Any

### Window Updates

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
Window U/SHGC Values	Based on ENERGY STAR V5.0 or V6.0 specs	Based on ENERGY STAR V6.0 specs; Very Cold Climates (6-8) more rigorous at U 0.25	Updates minimum window requirements. Higher performance windows will likely be used as part of UA tradeoff strategies.

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### **UA Tradeoffs Offer Flexibility**

ZERH allows the use of a UA tradeoff



https://www.viprealtyinfo.com/blog/pros-and-cons-of-a-pre-listing-home-inspection.htm

### Tradeoff

- A trade off refers to putting something more in one assembly so you can put something less in another
- HOWEVER, in the IECC's case the energy performance scale remainsbalanced
- You can tradeoff R-values, U-values, air tightness, duct leakage, etc. depending on the compliance path you are using

- The blue ball is attic insulation R38
- The prescriptive R-value path says it must be R60 in CZ5
- The 3 silver balls balanced the energy equation because they represent better windows, air tightness, and reduced duct leakage than is required by the IECC
- Therefore, I traded off less attic R-value for better windows, air tightness and duct leakage





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Indoor Air Quality

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### **Duct Systems** – no significant change

All ducts and heating and cooling air-handling equipment are located within the thermal and air barrier boundary

Some exceptions apply





### **HVAC Design Updates**

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
HVAC and Duct Location	Requires ducts & HVAC equipment to be located in an optimized location	Same as V1. Clarification: only applies to equipment & ducts serving heating/cooling systems.	Improve HVAC efficiency, reduce demand, and improve comfort.

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### 4. Water Efficiency - no significant change

Hot water delivery systems meet efficient design requirements

or

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Water heater and fixtures meet efficiency criteria







## Water Efficiency Mandatory

ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY

Hot water circulation systems requirements

- Based on EPA WaterSense Specifications:
  - ≤ 0.5 gallons of water in any piping/manifold between hot water source and any hot water fixture
- Tested:
  - By the time the flow at the furthest fixture has + 10F temp increase, no more than 0.6 gallons of water has been delivered

### OR

- Water heaters and fixtures shall meet efficiency criteria
  - Gas water heaters Energy Factor ≥ 0.90 or a Uniform Energy Factor ≥ 0.87
  - Electric water heaters Energy Factor ≥ 2.2 or a Uniform Energy Factor ≥ 2.2
  - All Water fixtures shall be WaterSense labeled
  - The hot water distribution system shall store no more than 1.2 gallons between the hot water source and the furthest fixture

### **Demand Pumping System**



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### Verifying Efficient Hot Water Distribution



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### 5. Lights and Appliances





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Efficient

Comps

#### **ENERGY STAR:**

- Appliances
- Exhaust Fans
- Ceiling Fans
- Water Heating\*

#### Efficient:

- Lighting
- Hot Water Distribution
  - Equipment\*



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## **Efficient Components**



- Zero Energy Ready Home requires:
- ENERGY STAR Certified Appliances:\* refrigerators, dishwashers, clothes washers <u>& Dryers</u>
- ENERGY STAR Certified Fans\*: bathroom ventilation, ceiling fans
- ENERGY STAR Certified Lighting: Min. <u>95%</u> of fixtures or lamps (CFL or LED)
  - 2015 IECC requires 75%
  - 2018 IECC requires 90%
  - 2021 IECC requires 100%
- \*Only when installed by builder



## **Lighting Updates**

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
High Efficiency Lighting	80% requirement	95% requirement	Recognize cost-effectiveness of LEDs and increase ZERH efficiency, while providing a little flexibility.Note that the Target Home assumes 100% high efficiency lighting.

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#### **Appliance Updates**

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
Energy Efficient Appliances	All builder-installed refrigerators, dishwashers, and clothes washers are ENERGY STAR qualified	All builder-installed refrigerators, dishwashers, clothes washers, <u>and</u> <u>clothes dryers</u> are ENERGY STAR qualified	Recognize ENERGY STAR labeling of clothes dryers and increase ZERH efficiency

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#### 6. Indoor Air Plus

Indoor Air

Quality



----energy **ENERGY STAR** 

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- Low Emission
- Materials
- Combustion Safe
- High MERV Filter



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### Indoor Air Quality Updates

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
Indoor Air Quality	Certify under Indoor airPLUS (IAP) V1	Phase in certification under an updated IAP version over time. IAP Version 1 will be allowed through 2022. H/ERVs in Very Cold Climates (6-8) MERV 13 (minimum) filter installed on ducted heating and cooling	Maintain requirement to certify under the federal government's residential IAQ label for new homes. Accelerate the MERV 13 filter requirement (likely to appear in the updated IAP specs)

#### 7. Renewable Ready

Solar Ready

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https://rmi.org/zero-energy-homes/



DOE ZERH PV-Ready Checklist





### ZERH v2 PV-Ready Checklist

- ZERH v2 eliminates the exception for sites with lower annual solar resources
- Also updates provisions based on current technologies
- Increases PV Readiness in ZERH homes
- Recognizes the major increases in PV cost effectiveness



#### **PV Ready Updates**

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Program Component	ZERH Version 1	ZERH Version 2.0 Proposed	Rationale
Photovoltaic (PV) Readiness	Implement the ZERH PV-Ready Checklist	Same as V1, but eliminates the exception for sites with lower annual solar resources. Also updates provisions based on current technologies.	Increase PV Readiness in ZERH homes and recognize the steady increases in PV cost effectiveness.

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#### Residential PV System Costs Down 64%

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Source: NREL Documenting a Decade of Cost Decline for PV Systems, 2021.

#### **Expand PV-Readiness**

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Average Daily Solar Radiation Per Month



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## **Update PV Ready Requirements**

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## Integration of Clean Energy Technologies

- The ZERH program is committed to working with the EPA to ensure that all home and equipment certification programs continue to evolve towards zero-emission
- They are committed to providing value to both builders and homebuyers in the market



## **H/ERVs in Cold Climates**

- Required in Very Cold Climates
  Zones 6 8
- Provide whole-house ventilation while reducing impact on heating load
- Numerous technology options available



#### **ERV or HRV**

### **ZERH Multifamily Certification**

#### ZERH v1

 Like EnergyStar multifamily 5 stories and less may be certified/labeled



#### ZERH v2

- Multifamily buildings will migrate to a new ZERH Multifamily spec
- Currently under development to be more efficient than ESMFNC
- When released it will be phased in
- Anticipated to be used for any size multifamily project
- Anticipated to release same time as single family v2.



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#### Possible 45L changes

- The current credit expired on December 31, 2020
- The 45L Credit allowed Builders to claim a \$2,000 tax credit for each newly constructed residence that was 50% more efficient than the 2006 IECC
- It applies to single family homes, apartments, condominiums, assisted living homes, student housing, and other types of residences



https://www.dpis.com/45l-energy-efficient-tax-credit

## Possible 45L changes

- Extend the credit from December 31, 2020, to December 31, 2025
- Changes the benchmark from 50% more efficient than the 2006 IECC to 15% more efficient than the 2018 IECC
- Increases the credit from \$2,000 to \$2,500
- Single family and manufactured homes.
  - Single-family homes could demonstrate that they meet the most recent EnergyStar Single-Family New Homes Program requirements
  - Manufactured homes could demonstrate they meet the most recent EnergyStar Manufactured Home National Program requirements







# Possible 45L changes (DOE ZERH)

- This provision would provide a higher tier credit of \$5,000
  - For eligible single-family and manufactured new homes certified as zero-energy ready under the Department of Energy Zero Energy Ready Home Program



# Possible 45L changes Multi Family

- Multifamily homes eligible to participate in the ENERGY STAR Multifamily New Construction Program could receive a base credit of \$500 and a bonus credit of \$2,500 for multifamily units that meet:
  - The most recent EnergyStar multifamily New Construction Program
- DOE ZERH higher tier:
  - Base credit of \$1,000 or a bonus credit of \$5,000 for eligible multifamily units certified as a zero-energy ready under the U.S. Department of Energy Zero Energy Ready Home Program



http<u>s://w</u>ww.usgbc.org/education/sessions/how-use-energy-star-multifamily-new-construction-program-12233028

## How to Communicate Zero?

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Marketing benefits



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#### Leverage ZERH 'Brand'

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#### **Customize Marketing Resources**

#### Homes to the Power of **ZERO**



#### What is the DOE Zero Energy Ready Home<sup>™</sup> Label?

It is a Symbol of Excellence for energy savings, comfort, health, quality, and durability met by a select group of leading builders meeting U.S. Department of Energy Guidelines.

#### What is a Zero Energy **Ready Home?**

It is a high-performance home so energy efficient, all or most annual energy consumption can be offset with renewable energy. In other words, it is the Home of the Future



A Symbol of Excellence HEALTHFUL ENVIRONMENT

DOE Zero Energy Ready Home KFY ENERGY STAR® Certified Home Existing Home

This graphic comparison chart demonstrates relative performance of this DOE Zero Energy Ready Home to existing homes (built between 1990 and 2010) and ENERGY STAR Certified Homes. Actual performance may vary.



#### **Tim O'Brien Homes** DOE Zero Energy Ready Home Partner

(262) 328-6032 http://www.timobrienhomes.com/ N27 W24075 Paul Court, WI 53072



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#### The Future of Housing-Today

Only a select group of the top builders in the country meet the extraordinary levels of excellence and quality specified by U.S. Department of Energy guidelines.



TIM BRIEN DOE Zero Energy Ready Home Partner (262) 328-6032 http://www.timobrienhomes.com/



KEY DOE Zero Energy Ready Home

DOE Zero Energy Ready Home to existing

homes (built between 1990 and 2010) and

ENERGY STAR Certified Homes.

Actual performance may vary.

Existing Home

ENERGY STAR Certified Home

ZERO

HEALTHFUL ENVIRONMENT

ADVANCED TECHNOLOGY

COMFORT PLUS

**ULTRA EFFICIENT** 

QUALITY BUILT

DURABILITY



Every Zero Energy Ready Home offers a cost-effective, high performance package of energy savings, comfort, health, and durability unparalleled in today's marketplace.

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### **ZERH Partner Process**



- Become a partner online (builder/developer or rater)
- Identify potential verifier partners at ZERH website
- No pre-registration of projects
- No program certification fees
- Recommend integrated design process (MEPs)
- Rater: plan review & site inspections
- Project Certification generated by the Rater's modeling report, once it is uploaded to the RESNET Registry
- Builder credited with certified home on DOE website



For further information visit: <u>www.buildings.energy.gov/zero</u>

- Draft Version 2 Program Requirements
- "Tour of Zero" 100s of award-winning ZERH profiles
- Become a partner
- Find builders, verifiers

Email: <a href="mailto:zero@newportpartnersllc.com">zero@newportpartnersllc.com</a>



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# Thank you!

#### Robby Schwarz



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#### @ buildtankinc

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Services



From Inspection and diagnostics, to IECC or program compliance, our applied building science approach in the field influences everything we do.



**Think Tank** 

We learn from our field work to effect meaningful change in the construction industry in order to take sustainable building to mainstream building.



About

out more ....

Spending time outside rejuvenates the soul and is part of my story. Find

Thinking ZERO to 360°

All slides in this presentation © 2021

