



ENERGY STAR Certified Homes

The Year Ahead

October 23, 2017





Consistency

Stability

Refinement



2016



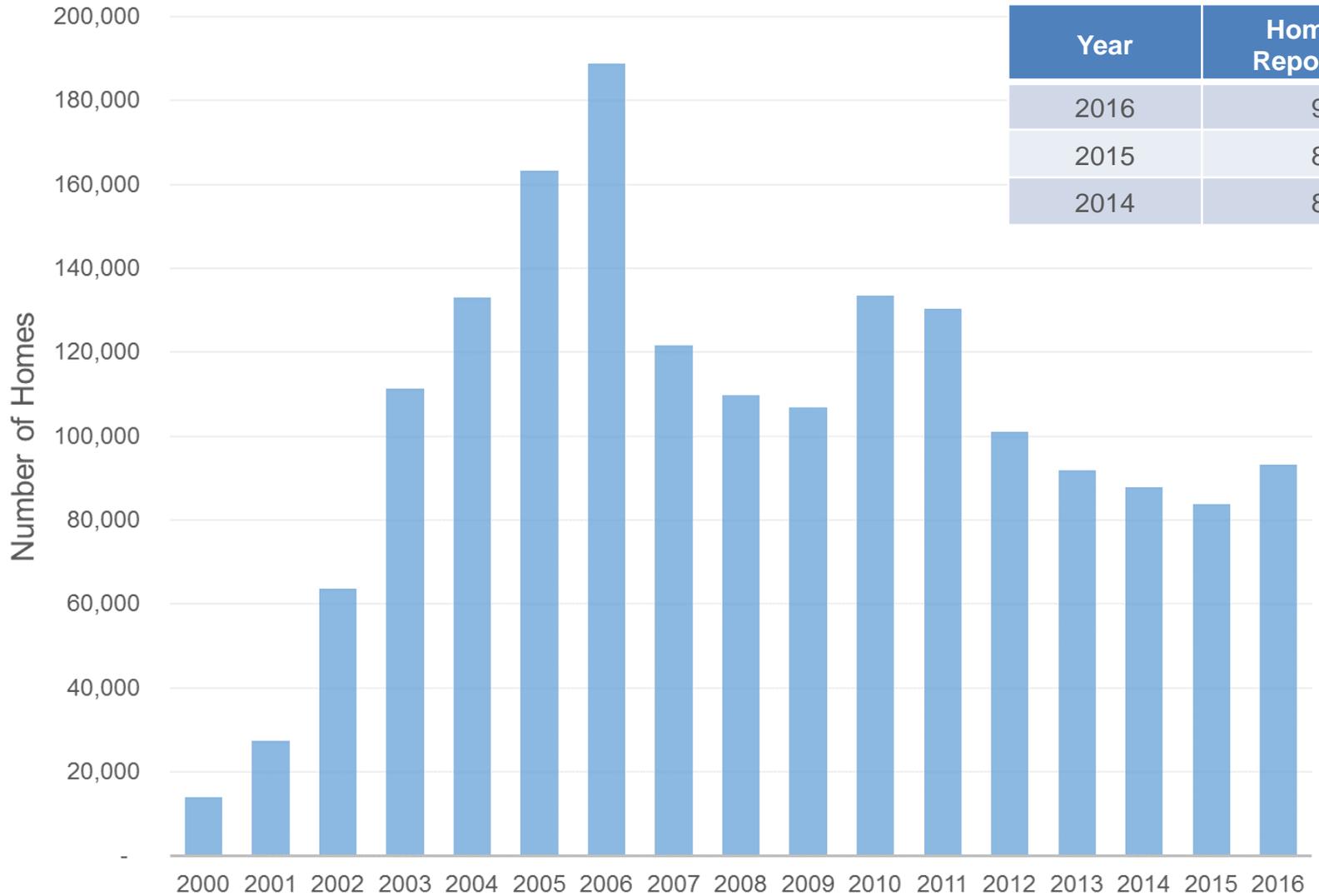
2017

The Numbers





Annual ENERGY STAR Certified Homes Built



Year	Homes Reported
2016	93,249
2015	83,899
2014	87,813

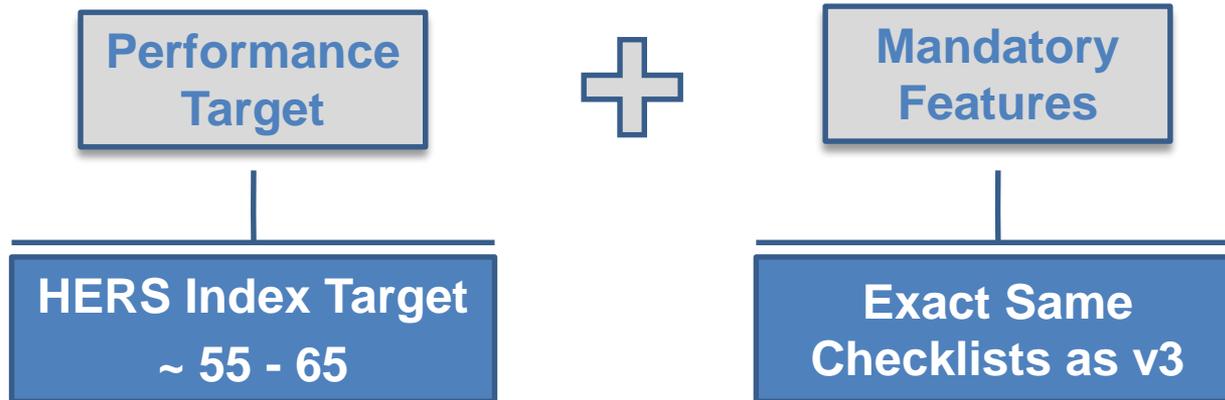
Checking in on Program Requirements: Version 3.1





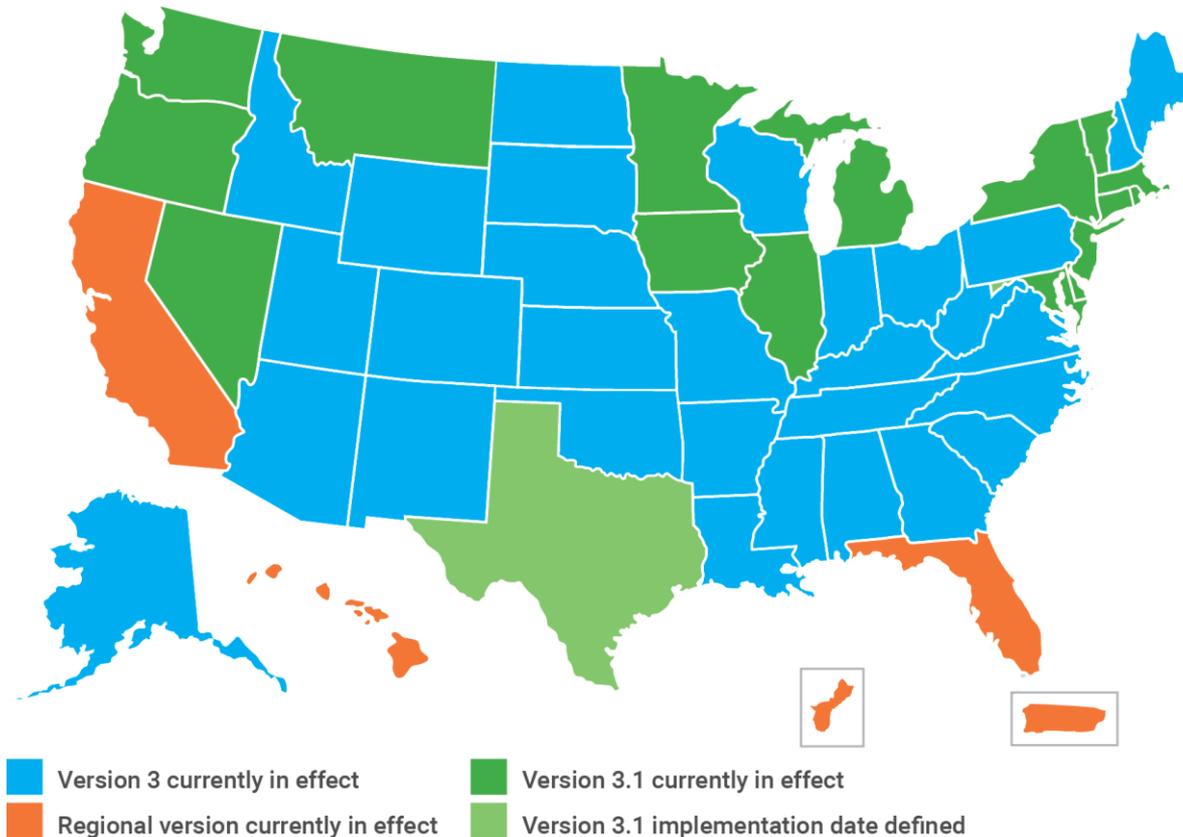
Version 3.1: Overview

- Maintains meaningful savings in states that adopt the 2012 IECC or equivalent.



Version 3.1: Implementation

- There are now **17** states, plus D.C., for which the v3.1 implementation date has been defined, plus regional v3.1 requirements for CA and FL.



Version 3.1: TX

- Proactive outreach to partners starting in the Spring.

CZ 2

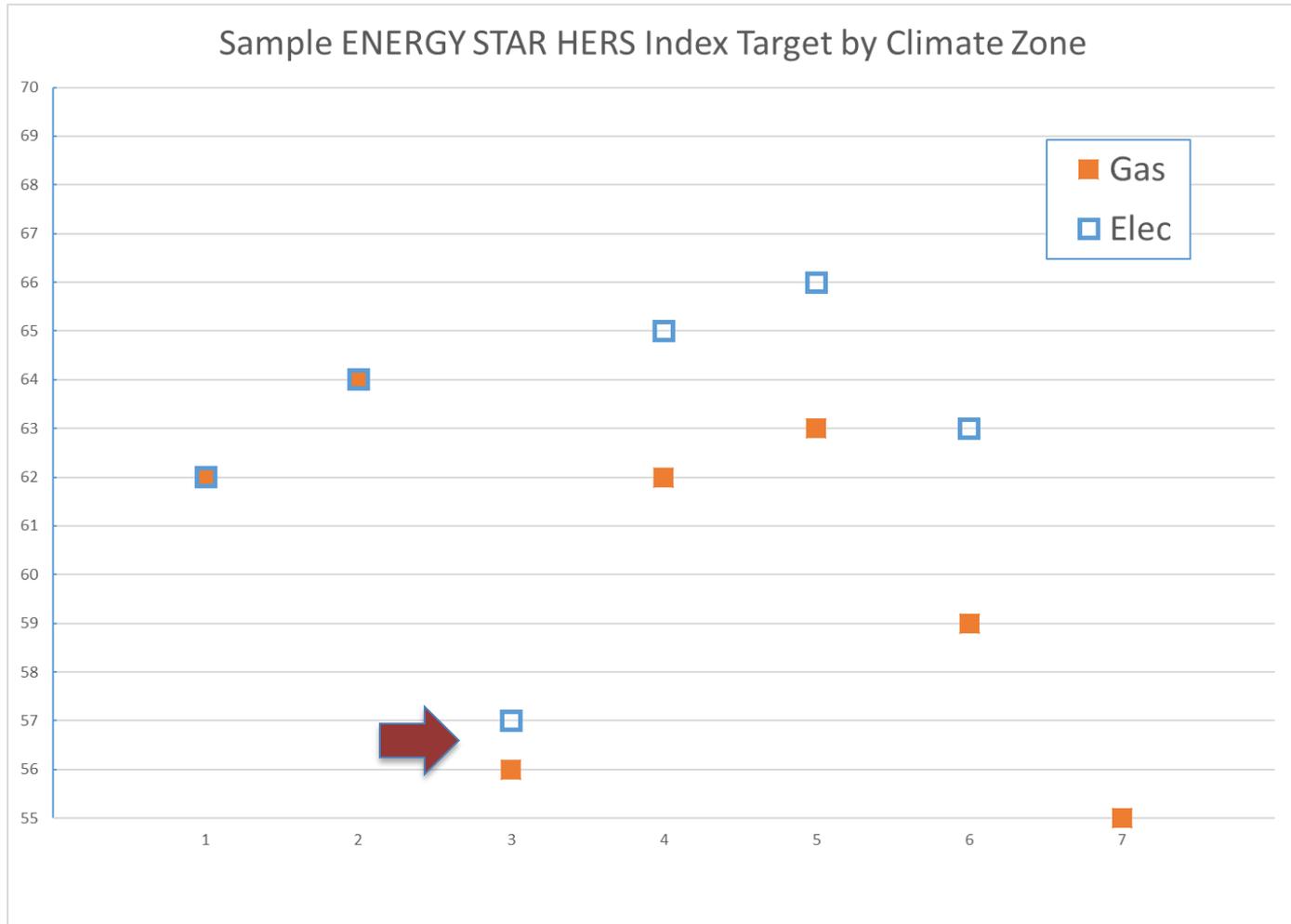


CZ 3





Version 3.1: TX





Version 3.1: TX

- Furnace Efficiency:
 - In CZ 3, for v3.1, furnace efficiency reduced to 80 AFUE.
- Size Adjustment Factor:
 - In all CZ's, for National & FL v3.1, Size Adjustment Factor eliminated.
- Water Heater Tank Size:
 - In all CZ's, for both v3 and v3.1, ES Reference Design configured with a 50 gallon 0.59 EF gas tank, when rated home has instant gas water heater.
- Extended v3.1 implementation timeline for TX from 10/01/17 to 07/01/18.



Version 3.1: Key Takeaways

- For FL and the 17 national v3.1 states, ENERGY STAR will get a bit easier, particularly in CZ 3.
- We're reasonable, collaborative, people.
- Don't hesitate to reach out to us.

Checking in on Program Requirements: Version 3.2



Version 3.2



- These two states now have the most stringent energy codes in the country.
- In response, we're developing a brand-new Version 3.2.
- Same concept as Version 3.1 –
 - More aggressive performance target
 - Exact same mandatory features
- Comment period underway for WA v3.2.
- Comment period in early November for CA v3.2.
- Propose to implement both for homes permitting starting July 1, 2018.

Revision 09..





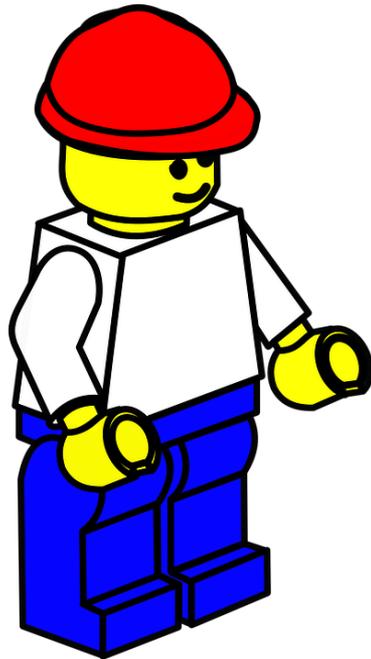
Revision 09..

- Since the release of Rev. 08 in July 2015, we've only made a handful of small policy adjustments.
- Eventually we'll want to roll these improvements into the program documents, which will result in the creation of Rev. 09.
- No set timeline yet. It's not imminent, but will occur before we meet next year.
- In summary, Rev. 09 is shaping up to be a very minor revision.

Builder Recruitment

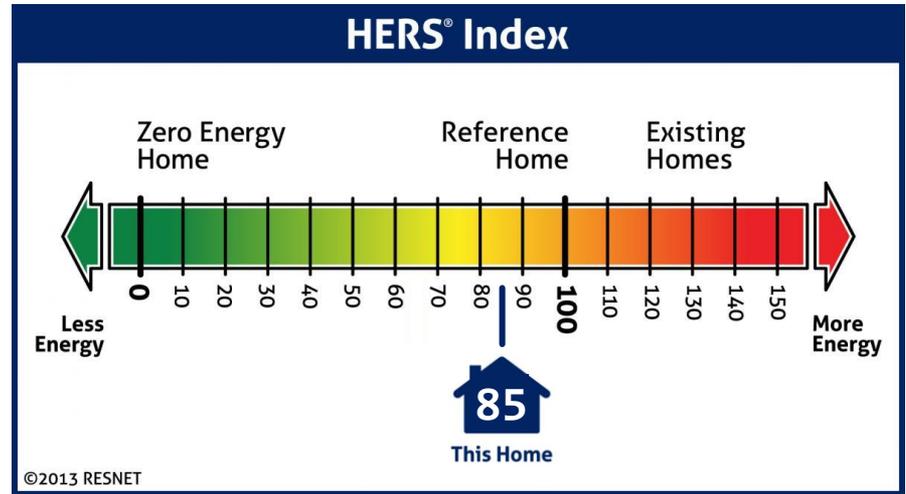
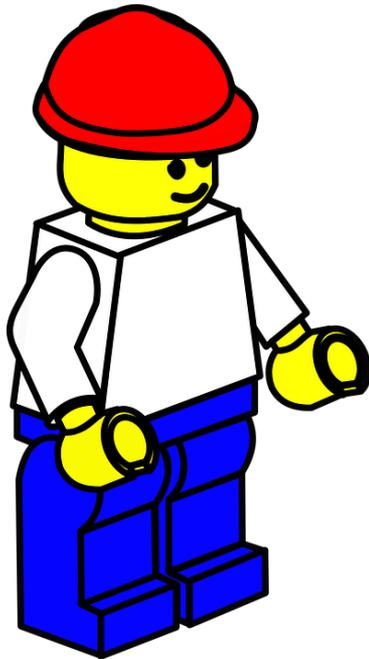


Builder Recruitment



2012

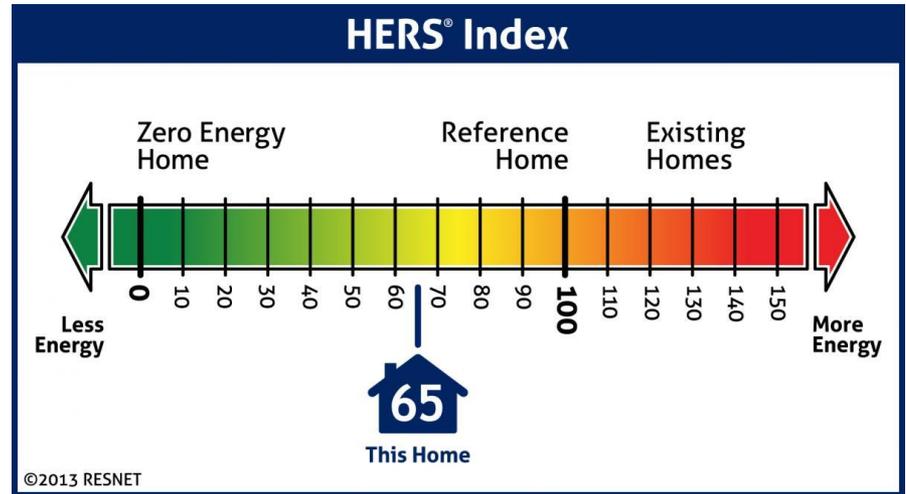
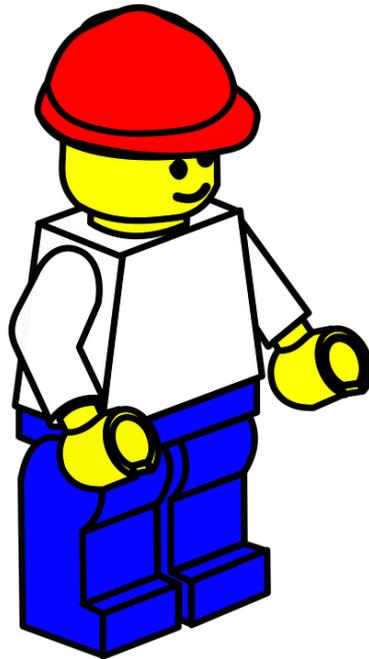
Builder Recruitment



ENERGY STAR Qualified Homes
Thermal Bypass Inspection Checklist

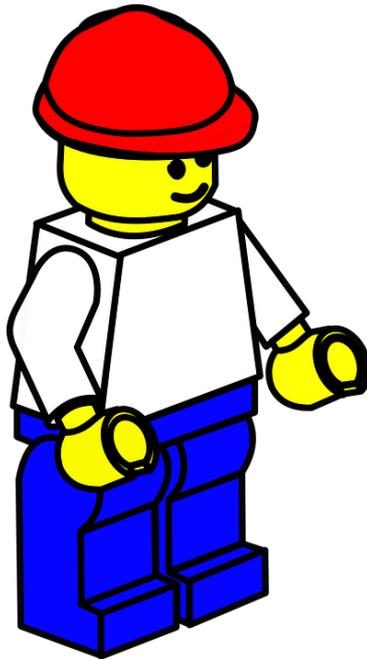
2012

Builder Recruitment



2017

Builder Recruitment

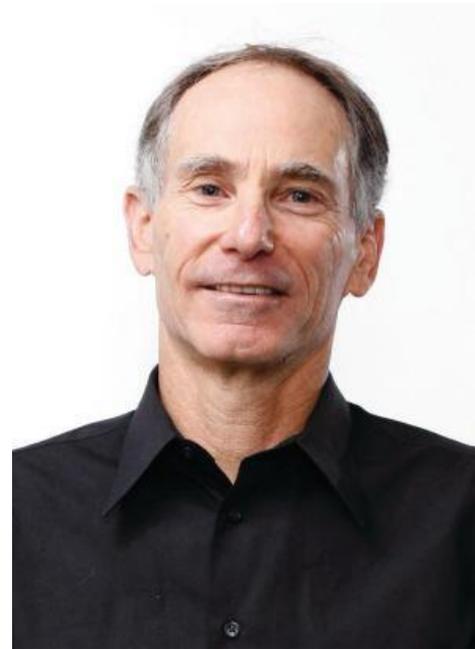
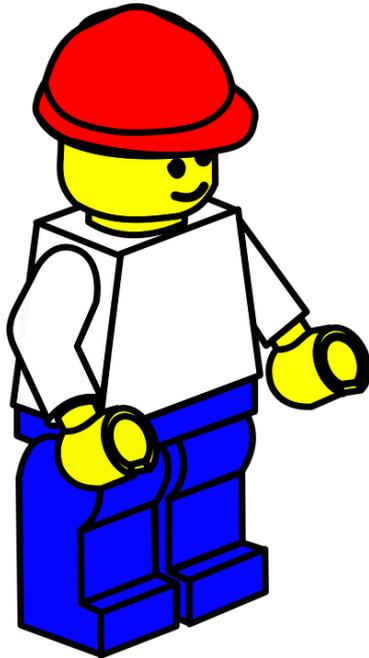


What's Left to Reach ENERGY STAR?

- HVAC Design & Commissioning
- Bedroom pressure balancing

2017

Builder Recruitment



2017



Builder Recruitment

- Offer gap analysis.
- Educate about new resources.
- Provide hands-on support.
- Outreach to willing Raters to collaborate and identify potential builders.

HERS Credit for HVAC Quality Design & Installation





Installation defects in HVAC systems are commonplace





Installation defects in HVAC systems are commonplace

- Improper airflow:
 - Average airflow ~20% below target. Blasnik et al. (1995)
 - Average airflow 14% below design. Proctor (1997)
 - Measured airflow ranging from 130 - 510 CFM / ton. Parker (1997)
 - 70% of units had airflow < 350 CFM / ton. Neme et al. (1999)
 - Improper airflow in 44% of systems. Mowris et al. (2004)



Installation defects in HVAC systems are commonplace

- Incorrect refrigerant charge:
 - In 57% of systems. Downey/Proctor (2002)
 - In 62% of systems. Proctor (2004)
 - In 72% of systems. Mowris et al. (2004)
 - In 82% of systems. Proctor (1997)



Installation defects in HVAC systems are commonplace

Study Author	State	Existing or New Home?	Sample Size	Average Airflow	Airflow <350 cfm	Airflow w/in 10% of 400/ton	Energy Savings Potential	Notes
Blasnik et al. 1995a	NV	New	30	345	50%		8%	Est @ 33% combined charge/air flow correction benefits
Blasnik et al. 1995b	CA	New	10	319	90%			
Blasnik et al. 1996	AZ	New	22	344	64%	29%	10%	Est @ 33% combined charge/air flow correction benefits
Hammarlund et al. 1992	CA	New	12					
Hammarlund et al. 1992	CA	New	66					
Neme et al. 1997	MD	New	25					
Palani et al. 1992	n.a.	n.a.	n.a.					
Parker et al. 1997	FL	Both	27					
Proctor & Pernick 1992	CA	Existing	175					
Proctor 1991	CA	Existing	15					
Proctor et al. 1995a	CA	Existing	30					
Rodriguez et al. 1995	n.a.	n.a.	n.a.					
Rodriguez et al. 1995	n.a.	n.a.	n.a.					
VEIC/PEG 1997	NJ	New	52					
Average								

Study Author	State	Existing or New Homes?	Sample Size	Charge correct to mfg spec	% over charge	% under charge	Energy Savings Potential	Notes
Blasnik et al. 1995a	NV	New	30	35%	5%	59%	17%	Est @ 67% combined charge/air flow correction benefits
Blasnik et al. 1995b	CA	New	10				8%	Est @ 67% combined charge/air flow correction benefits
Blasnik et al. 1996	AZ	New	22	18%	4%	78%	21%	Est @ 67% combined charge/air flow correction benefits
Farzad & O'Neal 1993	n.a.	n.a.	n.a.				5%	Lab test of TXV; 8% loss @20% overchg; 2% loss @20% underchg
Farzad & O'Neal 1993	n.a.	n.a.	n.a.				17%	Lab test of Orifice; 13% loss @20% overchg; 21% loss @ 20% underchg
Hammarlund et al. 1992	CA	New	12				12%	Single family results
Hammarlund et al. 1992	CA	New	66	31%	61%	8%	12%	Multi-family results
Katz 1997	NC/SC	New	22	14%	64%	23%		Charge measured in 22 systems in 13 homes
Proctor & Pernick 1992	CA	Existing	175	44%	33%	23%		Results from PG&E Model Energy Communities Program
Proctor 1991	CA	Existing	15	44%				Fresno homes
Proctor et al. 1995a	CA	Existing	30	11%	33%	56%		
Proctor et al. 1997a	NJ	New	52				13%	Est @ 67% combined charge/air flow correction benefits
Rodriguez et al. 1995	n.a.	n.a.	n.a.				6%	Lab test of TXV EER; 5% loss at both 20% overchg & 20% underchg
Rodriguez et al. 1995	n.a.	n.a.	n.a.				15%	Lab test of Orifice EER; 7% loss @20% overchg, 22% loss @ 20% underchg
Average				28%	33%	41%	12%	

Overview of Grading Concept





Guiding Principles

- Take a 'carrot' rather than a 'stick' approach.
- Reward incremental improvement by HVAC professionals and Raters.
- Rely upon procedures that:
 - Can be performed by both HVAC professionals and Raters.
 - Favor consistency over breadth.
 - Provide value in and of themselves.



Grading Concept

- Follow the insulation quality-installation model:
 - Grade III: The default. No QI is done. No penalty and no credit.
 - Grade II: Rater reviews key design parameters for accuracy and takes accurate measurements of key installation parameters. The resulting values indicate that the system is not great, but not terrible.
 - Grade I: Rater duplicates the tasks in Grade II, but the resulting values indicate that the system falls within tolerance of ACCA's QI Std.



Potential Workflow:

Step 1: Collection of HVAC Design Documents

- Rater collects standardized HVAC design documentation.
- While this makes the workflow more complex, it's absolutely necessary.
- Without knowing the design intent, not enough information is available to properly assess the installation.



Potential Workflow:

Step 2: Review of HVAC Design Documents

- Rater reviews HVAC design documentation to ensure that:
 - It reflects the rated home.
 - Meets minimum requirements.



Potential Workflow:

Step 3: Completion of Diagnostic Tests in the Field

- Rater completes diagnostic tests on the installed equipment in the following areas:
 - Total airflow of HVAC system
 - Refrigerant charge of HVAC system
 - Wattage of HVAC fan



Potential Workflow:

Step 4: Rater Enters Field Results in HERS Software

- Rater enters field data into HERS software, which:
 - Uses the field data to apply an installation adjustment factor to the HVAC equipment.
 - Generates the HERS index with this factor applied.
 - Assigns an installation grade to the system.

Diagnostic Tests Under Consideration





Total HVAC Airflow

- Five test procedures under consideration.
- All but #5 have been incorporated into CA code:
 1. Fan flowmeter / Pressure Matching
 2. Flow grid
 - 3 & 4. Powered or Passive Flow Capture Hood
 5. Static pressure + fan-speed setting



Refrigerant Charge

- Working on one test procedure that uses refrigerant line temperatures as a proxy for refrigerant charge.
- Raters would not need to connect gauges directly to the refrigerant system.
- Would avoid needing EPA training for refrigerant handling.



Fan Wattage

- Three procedures are under consideration:
 1. Watt meter for direct measurement
 - 2 & 3. Reading digital whole-house utility meter or clocking analog whole-house utility meter

Diagnostic Tests Converted to Credit





Potential HERS Impact

- Potential for HERS points will depend on efficiency of house as well as climate.
- Current analysis suggests, for an ENERGY STAR Home:
 - CZ 2: ~ 3 points
 - CZ 4: ~ 2 points
 - CZ 6: ~ 1 point

Alternative Compliance Paths





Possible Alternative Compliance Paths

- On-board diagnostics
- Third-party oversight organization

Summary & Next Steps





Summary

- A major step towards unifying ENERGY STAR and HERS ratings.
- For Raters - provide additional value during site visits.
- For ENERGY STAR builders - earn HERS points for things they're basically already investing in.
- For utilities – quantify savings from proper HVAC design and installation.
- Overall, will help slowly transform HVAC design and installation.



Next Steps

- Q1 18: Finish drafting standard.
- Q2 18 – Q1 19: Public comment process.
Develop training and certification.
HERS software modifications.
- Q2/Q3 19: Begin using standard?

ENERGY STAR Certified Homes RaterPRO App





Goal of RaterPRO

- Provide a tool that facilitates the collection of high-quality field data during the pre-drywall and final inspections.
- This helps increase the value, and reduce the cost, of a high-quality third-party rating.
- Promote increased adoption of high-quality ratings across the industry.



What key features will be included in the app?

- Ability to verify both ENERGY STAR and HERS homes.
- Cloud-based, but with the ability to work offline.
- Able to import proposed ratings from HERS software.
- Able to export confirmed ratings back to HERS software.
- Capable of capturing robust data.
- Voluntary and freely available.



When will you get your hands on RaterPRO?

- Core functionality is almost complete.
- Additional features being added every two weeks.
- Aiming to release a public beta the first half of 2018.
- We'll drop the 'beta' label after gaining experience and completing jobs.

Grab Bag





Status of Automated HVAC Design Report

- Wrightsoft – 03 / 2016
- Energy Gauge USA – In progress
- Elite RHVAC – In progress



Overhaul of ENERGY STAR Technical Website

The screenshot displays the ENERGY STAR website interface. At the top, there are navigation links for "ABOUT ENERGY STAR" and "PARTNER RESOURCES", along with a search bar. Below this, a main navigation bar features four categories: "ENERGY EFFICIENT products", "ENERGY SAVINGS at home", "ENERGY EFFICIENT new homes", and "ENERGY STRATEGIES FOR buildings & plants".

The main content area is titled "Version 2.5 and 3 Training Resources" and includes a breadcrumb trail: "Home > Partner Resources > For New Home Construction Professionals > Version 3 Guidelines > Training Requirements and Resources".

On the left side, there is a vertical navigation menu with the following items: Partner Resources, Product Brand Owners, Retailers, New Home Industry, Next Generation Resources, Affordable Housing, RE Ready Home, Utilities/EEPS, Residential & Commercial Programs, Service & Product Providers, Buildings & Plants, Small Business, Congregations, For Contractors, For Federal Agencies, and a "Join ENERGY STAR" button.

The main content area is divided into two sections:

- Training Presentations**
 - [Webinars](#) — ENERGY STAR offers free webinars to help you get the most out of your partnership and prepare for Version 3.
 - [How to Measure Whole-House Ventilation Airflow \[EXIT\]](#) (< 5 minutes each) — Watch these four short videos to see how to measure whole-house ventilation airflow— one critical commissioning task for ENERGY STAR certified homes.
- Technical Guidance Documents**
 - [Slab Edge Insulation Exemption Details](#) (207KB) — This document provides explanations and illustrations of slab edge insulation exemptions.
 - [Kitchen Exhaust Guidance](#) (121KB) — This document provides guidance on alternative compliance options for meeting the kitchen mechanical exhaust requirements.
 - [Attic Hatch Details](#) (139KB) — This document provides explanations and illustrations of insulation details for attic entrances.
 - [HVAC Design Temperatures \[EXIT\]](#) — This document lists the 1% and 99% ACCA Manual J outdoor design conditions that HVAC designers are required to use and Raters are required to verify per the Version 3 guidelines.
 - [ENERGY STAR Version 3 HERS Index Target Procedure](#) (221KB) — This document provides detailed instructions for manually determining the ENERGY STAR HERS Index Target.

At the bottom of the page, there is a section titled "Inspection Checklist Technical Guides" with a link to [Technical guides](#) for the ENERGY STAR Inspection Checklists, available at the [Building America Solutions Center](#), created by the U.S. Department of Energy. It notes that these guides replace EPA's Inspection Checklist Field Guidebooks and provide a wealth of building science and energy-efficiency information. It also states that they are intended to be aligned with, and used as a supplemental resource to, the [Version 3 guidelines](#) but do not represent the official policy of the ENERGY STAR Certified Homes Program. Where questions arise, please contact energystarhomes@energystar.gov.



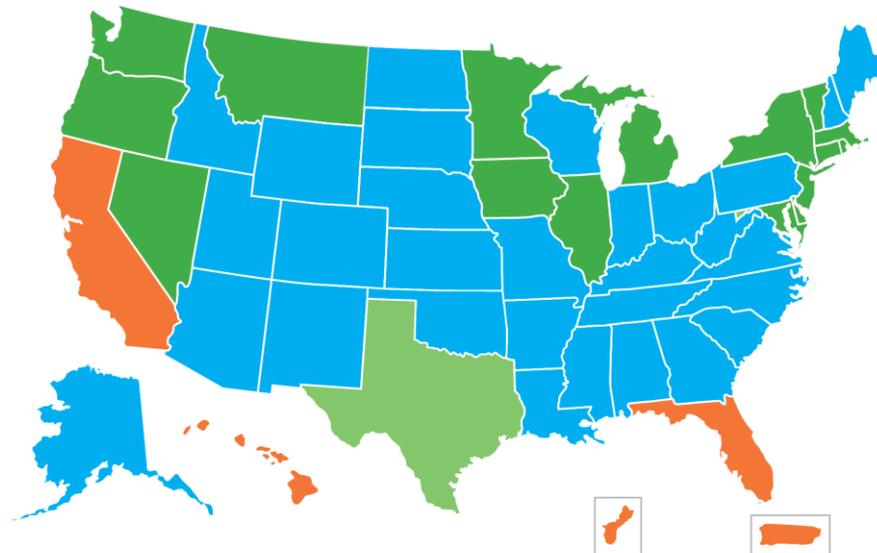


Overhaul of ENERGY STAR Technical Website

ENERGY STAR CERTIFIED HOMES PROGRAM REQUIREMENTS

PROGRAM VERSIONS AT A GLANCE

Select State or Territory ▼



- Version 3 currently in effect
- Version 3.1 currently in effect
- Regional version currently in effect
- Version 3.1 implementation date defined

PROGRAM REQUIREMENTS

- [Version 3 \(PDF, 182 KB\)](#)
- [Version 3.1 \(PDF, 195 KB\)](#)
- [Tropics Version 3 \(PDF, 151 KB\)](#)
- [California Version 3.1 \(PDF, 129 KB\)](#)
- [Florida Version 3.1 \(PDF, 144 KB\)](#)
- [Rater Design Review & Rater Field Checklist \(PDF, 634 KB\)](#)
- [Rater Design Review & Rater Field Checklist \(Tropics\) \(PDF, 474 KB\)](#)
- [HVAC Design Report \(PDF, 339 KB\)](#)
- [HVAC Commissioning Checklist \(PDF, 184 KB\)](#)
- [Water Management System Builder Requirements \(PDF, 121 KB\)](#)

ADDITIONAL RESOURCES

- [ENERGY STAR Policy Record](#)
- [ENERGY STAR Training & Education](#)
- [Building America Solutions Center](#)
- [Version 3 Cost & Savings Document \(PDF, 2.2 MB\)](#)
- [Version 3 ENERGY STAR Reference Design \(PDF, 221 KB\)](#)



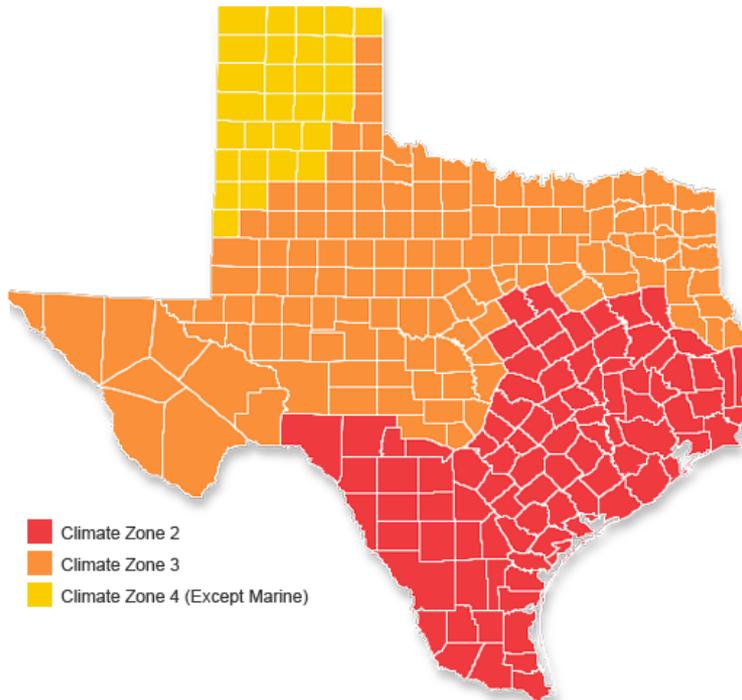
Overhaul of ENERGY STAR Technical Website

ENERGY STAR CERTIFIED HOMES PROGRAM REQUIREMENTS

< Back to National view

TEXAS AT A GLANCE

Select a County 



PROGRAM REQUIREMENTS

[National Program Requirements Version 3.1 \(PDF, 195 KB\)](#)

[Rater Design Review & Rater Field Checklist \(PDF, 634 KB\)](#)

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ADDITIONAL RESOURCES

[ENERGY STAR Policy Record](#)

[ENERGY STAR Training & Education](#)

[Building America Solutions Center](#)

[Version 3.1 Cost & Savings Document \(PDF, 2.0 MB\)](#)

[Version 3.1 ENERGY STAR Reference Design \(PDF, 166 KB\)](#)

IMPLEMENTATION TIMELINE

Homes in Texas must be certified using the [National Program Requirements Version 3 \(PDF, 182 KB\)](#) if permitted on or after 01/01/2012 but before 07/01/2018. Homes in TX must be certified using the [National](#)



Overhaul of ENERGY STAR Technical Website

COUNTY-LEVEL DESIGN TEMPERATURE LIMITS

Below are the heating and cooling design temperature limits for the selected state and country. These limits generally must not be exceeded in the HVAC design for a home that will be certified in this location. See the Design Temperature Limit Reference Guide for exceptions and details.

1% Cooling Limit 99°F 99% Heating Limit 26°F

EFFICIENCY FEATURES AT A GLANCE

2009 IECC Climate Zone 3

Below is the set of efficiency features modeled to determine the ENERGY STAR HERS Index Target for homes in Climate Zone 3. While the features are not mandatory, if they are not used then other measures will be needed to achieve the target. See [National Program Requirements v3.1](#) (PDF, 195 KB) for complete details.

Envelope, Windows, & Doors	
Radiant Barrier?	n/a
Insulation Install. Quality	Grade I
Ceiling Insulation	R-38
Wall Insulation	R-20 cavity or R-13 cavity + 5 cont.
Mass Wall Insulation	R-8 ext or R-13 int
Floor Insulation	R-19
Basement Wall Insulation	R-5 cont. or R-13 cavity
Crawlspace Wall Insulation	R-5 cont. or R-13 cavity
Slab Insulation	0
Infiltration Rate	3 ACH50
Windows	U-factor: 0.30 / SHGC: 0.25
Door: Opaque	U-factor: 0.17 / SHGC: Any

Water Heating Equipment	
Efficiency varies by tank size. Common sizes shown below.	
Gas Water Heater	40 gal: 0.61 EF; 60 gal: 0.57 EF
Electric Water Heater	40 gal: 0.93 EF; 60 gal: 0.91 EF
Oil Water Heaters	40 gal: 0.53 EF; 60 gal: 0.49 EF
Solar Water Heater	n/a

Thermostats & Ductwork	
Thermostat Type	Programmable
Location of Ducts and Air Handlers	All within conditioned space
Duct Insulation for Ducts In Unconditioned Space	n/a

Trends





Trends

- Better whole-house ventilation, particularly in CZ 1-3.
 - In-line fans.
 - In-line fans with built-in dehumidification.
 - Builder-grade ERV's
- Centralized HVAC Designs
 - More consistent results
 - Allows for strategic improvements
- Instant gas water heaters
- LED lighting
- Smart thermostats



ENERGY STAR Certified Homes

Web & Email:

Main: www.energystar.gov/newhomespartners
Technical: www.energystar.gov/newhomesguidelines
Training: www.energystar.gov/newhomestraining
HVAC: www.energystar.gov/newhomesHVAC
Email: energystarhomes@energystar.gov

Social Media:



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