



Setting the Standards for
Home Energy Efficiency

How Was It Done? Local and State Adoption of the 2015 IECC Energy Rating Index Compliance Option

Richard Faesy

Energy Futures Group

Anthony Floyd

City of Scottsdale

Clayton Traylor

Leading Builders of America

Daran Wastchak

D.R. Wastchak, LLC

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Presentation Outline

- ✓ The Builder's Perspective
- ✓ Overview of Vermont's code adoption and ERI
- ✓ Review of code adoption in Phoenix metro area
- ✓ Overview of Scottsdale's code adoption ERI/HERS
- ✓ Q & A

How Was It Done? Local and State Adoption of the 2015 ERI



The Builder's Perspective

✓ Performance Matters

- ERI path an important step in restoring performance back into the energy code
- Reduces bias on how to meet efficiency target
- Builder receives credit for all energy saving features

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The Builder's Perspective

✓ Consumer Alignment

- Nearly half of all new homes are being HERS rated
- Consumers understand and value HERS rating and annual energy use estimates
- HERS/ERI helps consumers understand that house operates as a "system"

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The Builder's Perspective

✓ An Efficient Energy Code

- ERI allows builders to leverage HERS report spend as a compliance tool
- Gives builder credit for market driven efficiency features
- Encourages innovation
- Introduces renewables as a code compliance tool

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The Builder's Perspective

✓ Case Study: Texas Model Energy Code Adoption

- Legislature adopted 2015 IECC effective 9-16 in effect for 6 years
- Modified ERI target of 65 sloping to 59 over 6 years
- 21% increase in minimum efficiency requirements over 6 years
- Cost to move from 2009 prescriptive to 2015 prescriptive is \$2,680
- Cost to move from 2009 prescriptive to 2015 ERI is \$0 to \$1,105

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Vermont's IECC Adoption and the ERI

✓ Vermont:

- Population ~625k
- Largest city - Burlington ~42k
- Small towns
- Small homebuilders
- ~1,000 (1-4 unit) building permits issued annually
- Most cities/towns without a Code Official
- Certificate of Occupancy not required in all towns
- Self-Certification
- "Owner/builder" provision
- Efficiency Vermont



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A Brief History of Vermont Programs & Codes

<p>1987 Vermont issues first HERS Rating (Energy Rated Homes of VT)</p>	<p>1997 Consolidated statewide utility program created (Vermont Star Homes)</p>	<p>2005 RBES updated to include mechanical ventilation and combustion safety requirements</p>	<p>2015 Efficiency Vermont continues to deliver HERS based programs & code support services</p>
<p>● 1997 First statewide energy code (RBES) adopted *Includes HERS compliance option</p>	<p>● 2000 Efficiency Vermont, nation's first energy efficiency utility, begins delivering program services including Vermont ENERGY STAR Homes</p>	<p>● 2011 RBES updated to 2009 IECC with Vermont amendments</p>	<p>● 2015 RBES updated to 2015 IECC with Vermont amendments</p>

2015 IECC Adoption - Road to Implementation in Vermont

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Efficiency Vermont - Key Program Statistics

	2008	2009	2010	2011	2012	2013	2014	2015
Number of Builder Partners	277	319	355	371	392	403	424	445
% EVT RNC Program Market Share	32%	36%	29%	31%	29%	34%	36%	27%
Average EVT RNC program participant HERS Index	60	58	58	56	51	50	47	48

Builder Type	Percent of Total
Custom	46%
Developer	26%
Homeowner	16%
Modular	10%
Other	2%

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Average HERS by Tier (2015 data)

Efficiency Vermont Program Tier	Average HERS Index	Participants
Efficiency Vermont Certified	48	77%
ENERGY STAR	46	14%
High Performance Homes	32	7%

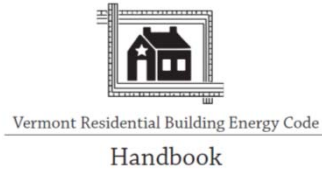
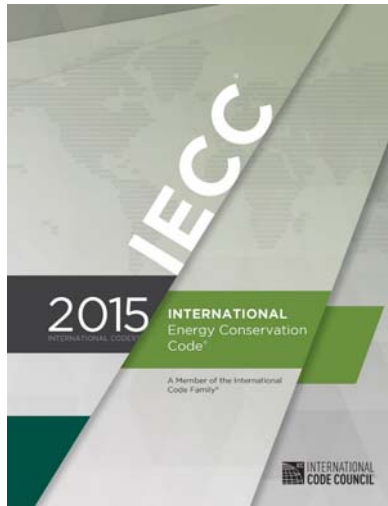
Avg. for all EVT Certified is 48, the breakout below for ENERGY STAR and HPH is just for the subset that met those respective criteria

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From There.

to Here



A Guide to Complying with
Vermont's Residential Building Energy Standards (Act 20, 1997 & Act 45, 2009)

8th Edition
Base Code Effective March 15, 2015
Stretch Code Effective December 1, 2015

Energy Code Assistance Center
128 Lakeside Ave., Suite 401
Burlington, VT 05401
802-487-8673 - toll free
802-458-1443 - fax

Vermont Department of Public Service
Planning & Energy Resources Division
112 New Street
Montpelier, VT 05620-2001
802-426-2611



This publication was prepared with the support of the U.S. Department of Energy



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Vermont's Code Cycle

- ✓ Energy code update required by Vermont Law
- ✓ Every 3 years +/- (follows IECC updates)
- ✓ Adopted via state rulemaking process
- ✓ Process managed by Public Service Department
- ✓ Stretch code new in 2015
 - For developments that need to comply with "Act 250"
 - Optional for local jurisdictions

How Was It Done? Local and State Adoption of the 2015 ERI



Key Stakeholders and Contributors to RBES 2015

- ✓ Vermont Public Service Department
- ✓ Energy Futures Group
- ✓ Navigant Consulting
- ✓ Vermont Energy Investment Corporation
- ✓ Efficiency Vermont
- ✓ Britt Makela Group
- ✓ New Buildings Institute
- ✓ Northeast Energy Efficiency Partnerships (NEEP)
- ✓ Mike DeWein
- ✓ Public Stakeholders

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Vermont's RBES 2015 Adoption Process



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What are the Prescriptive Packages?

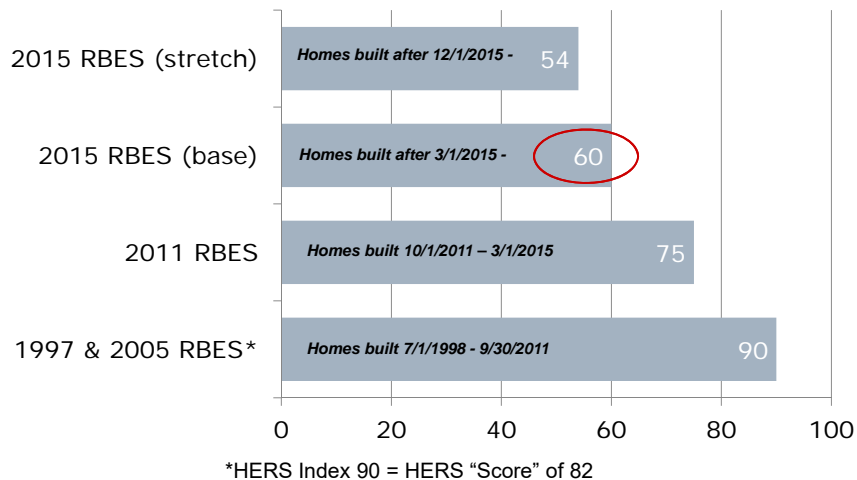
Table 5-1

Prescriptive Requirements Base Code ~ Single-Family and Multi-Family Homes					
Component	Package 1	Package 2	Package 3	Package 4	Package 5
1. Ceiling R-Value	R-49	R-49	R-28 cont.	R-60 attic / R-49 slope	R-49
2. Above-Grade Wall R-value	R-13+10	R-25 cav.	R-21 cont.	R-20	R-13+10
3. Floor R-value	R-30	R-30	R-30	R-30	R-30
4. Basement/Crawl Space Wall R-value	R-15/20	R-15/20	R-15/20	R-15/20	R-15/20
5. Slab Edge R-value	R-15, 4ft.	R-15, 4ft.	R-15, 4ft	R-15, 4 ft	R-10, 4 ft
6. Heated Slab R-value (Edge and Under)	R-15	R-15	R-15	R-15	R-15
7. Window and Door U-value	0.32	0.28	0.32	0.28	0.28
8. Skylight U-value	0.55	0.55	0.55	0.55	0.55
9. Maximum Air Leakage	Complete Air Sealing Checklist or <3 ACH50				
10. Maximum Duct Leakage	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA	4 CFM25/ 100 CFA

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HERS Code Compliance Thresholds



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The Renewables Adder

	Base Code	Stretch Code	
Code Target	60	54	Max HERS Index to demonstrate code compliance
Sub-Target	65	65	Max HERS Index without renewables
Renewables Adder	5	11	Max allowable HERS points that can be counted toward Code target

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Lessons Learned

- ✓ Wait until the IECC has issued their model code before starting the adoption process (VT doesn't *always* have to be first...)
- ✓ Allow for more time for stakeholder outreach and input
- ✓ Engage more builders
- ✓ Potentially delay effective date to coincide with RES/COMcheck update
- ✓ Thorough cost-benefit analysis makes it much easier to justify more stringent levels
- ✓ A history of HERS in codes make each upgrade cycle easier

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Thank You

Richard Faesy
Energy Futures Group
rfaesy@energyfuturesgroup.com
802-482-5001 x2



Thanks to Leslie Badger for the slides!

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Review of code adoption in Phoenix metro area

Municipal Code Adoption Overview

✓ Municipalities who have adopted the Residential IECC 2012

- Avondale
- Buckeye +
- Chandler +
- El Mirage
- Glendale
- Gilbert* +
- Goodyear +
- Marana
- Maricopa County*
- Pima County
- Paradise Valley
- Peoria
- Phoenix +
- Queen Creek +
- Sahuarita
- Scottsdale +
- Surprise +
- Tucson



+ HERS compliance option included

*Compliance with the 2012 IECC is voluntary

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✓ AMENDMENT TEXT

R401.2.1 Alternative approach for compliance. A Home Energy Rating System (“HERS”) Index of 73 or less, confirmed in writing by a Residential Energy Services Network certified energy rater may be used in place of the approach described in section 401.2 above. Compliance may be demonstrated by sampling in accordance with Chapter 6 of the Mortgage Industry National Home Energy Rating Systems Standard as adopted by the Residential Energy Services Network.

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MAG Standard Language for IECC 2012

R102.1.2 RESNET Testing & Inspection Protocol. The Residential Energy Services Network (RESNET) Mortgage Industry National Home Energy Rating System Standards Protocol for third party testing and inspections, shall be deemed to meet the requirements of sections R402.4.1.1, R402.4.1.2 and R403.2.2. and shall meet the following conditions:



1. Third Party Testing and Inspections shall be completed by RESNET certified Raters or Rating Field Inspectors and shall be subject to RESNET Quality Assurance Field Review procedures.
2. Sampling in accordance with Chapter 6 of the RESNET Standards shall be performed by Raters or Rating Field Inspectors working under a RESNET Accredited Sampling Provider.
3. Third Party Testing is required for the following items:
 - a. R402.4.1.1 – Building Envelope – Thermal and Air Barrier Checklist
 - b. R402.4.1.2 – Testing – Air Leakage Rate
 - c. R403.2.2 – Sealing – Duct Tightness
4. The other requirements identified as “mandatory” in Chapter 4 shall be met.
5. Alternate testing and inspection programs and protocols shall be allowed when approved by the Code Official.

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Above Code Programs

R102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as "mandatory" in Chapter 4 shall be met.



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ENERGY STAR for Homes In Lieu of Jurisdiction Inspection and Testing

- This form provides proof of compliance with certain provisions of the International Residential Code Chapter 11 and Chapter 15.
- This form shall be submitted prior to final inspection as noted below.
- Applicant is responsible for engaging a qualified HERS Rater with current certification. Improper certification will result in rejection of this submittal and re-inspection and testing.

The following home has passed all requirements of the ENERGY STAR for Homes program Version 3 and has been certified using a sampling protocol in accordance with Chapter 6 of the RESNET Standards (see www.resnet.us/standards).

Permit Activity Number:		Date:	
Builder Name:			
Builder Phone Number:			
Project Address:			
Project Subdivision:			
Lot Number:			
Air Leakage test results in ACH50: (If this was the tested home in the sample set)	_____ ACH50		
Duct Tightness Test Result in CFM25/100 sf: (If this was the tested home in the sample set)	_____ CFM25/100 sf		
Test was performed at:	<input type="checkbox"/> rough-in <input type="checkbox"/> final		
I (the below named HERS Rater) certify that the above home has passed all requirements of the ENERGY STAR for Homes program Version 3 and has been certified in accordance with Chapter 6 of the RESNET Standards.			
HERS Rater Name:			
HERS Rater Phone Number			
RESNET Rater ID Number			
Provider Name:			

This form shall be submitted to the permit issuing jurisdiction

Review of code adoption in Phoenix metro area

Municipal Code Adoption Overview

✓ Municipalities who are planning adoption of the IECC 2015

- Apache Junction
- Cave Creek
- Chandler
- Paradise Valley
- Peoria
- Scottsdale



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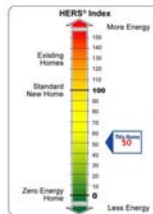


2015 IECC ENERGY RATING INDEX REPORT

Property
Opulent Homes
Plan 900 @ Fincher Fields
Gilbert, AZ

Organization
D.R. Waschak, LLC
480.350.9274
Tom Gray

HERS
Projected/WorstCase
April 18, 2014
Rating No: DRW 2014-04-18
04TRG



Annual Energy Consumption	HERS Reference Home (MBTU)	Rated Home nMUE/L (MBTU)	Rated Home Cost (\$/yr)
Heating	16.7	9.7	90
Cooling	77.9	40.4	520
Water Heating	10.5	10.6	323
Lights & Appliances	29.7	28.4	799
Photovoltaics	0	-16.1	-454
Total	129.7	73.0	1482

Annual Estimates	Electric(kWh):	CO2 Emissions(Tons):	Energy Savings (\$/yr):
	12743	7	1698

*Based on standard operating conditions
**Based on U.S. DOE designation of a HERS Index of 130 as the "Typical Existing Home"

TARGET INDEX: 52 **HERS INDEX: 50** **PASS**
This home **MEETS** the RESNET Home Energy Rating Index requirements of Sections 406.3 and 406.4 of the 2015 International Energy Conservation Code based on a climate zone of 2B.

Name: Tom Gray
Organization: D.R. Waschak, LLC

Signature:
Date: 25 February 2016

Mandatory Requirements

HERS Target	PASS	Duct Insulation (Ducts outside R-6, inside is R-0)	PASS
2009 IECC UA	PASS	Maximum Fenestration U-factor (2012)	PASS
Duct Sealing (2012)	PASS	Maximum Fenestration SHGC (2012)	PASS
Mechanical Ventilation	PASS	Air Leakage (5 ACH50 for C21-2, 3 ACH50 for C23-8)	PASS
Mechanical Ventilation Efficacy	PASS		

Emissions Data	Provider Data and Seal
Pollution Prevented	
Carbon Dioxide (CO2) - tons/year	5.3 D.R. Waschak, LLC
Sulfur Dioxide (SO2) - lbs/year	6.3 40 West Baseline Road, Suite 102
Nitrogen Oxides (NOx) - lbs/year	11.5 Tempe, Arizona 85283
	(480) 350-9274

RESNET - Residential Energy Analysis and Rating Software v14.6.2.1
This information does not constitute any warranty of energy cost or savings.
© 1989-2015 Horeco, Boulder, Colorado.

Overview of Scottsdale's code adoption ERI /HERS

Scottsdale Building Trends (1998 – 2015)

- **Energy Efficiency**
 - Cathedralized attic insulation
 - Above code programs and HERS compliance path
 - Amended 2006 IECC with 15% improved efficiency (HERS 85)
 - Energy Star certified products and LED lighting
 - Adopted 2012 IECC (HERS 70)
- **Indoor Environmental Quality**
 - Outside fresh air intake for whole-house mechanical ventilation
- **Water Efficiency**
 - Efficient hot water delivery systems
 - High efficiency plumbing fixtures
 - Xeriscaping and efficient irrigation systems
- **Solar PV Systems**

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Overview of Scottsdale's code adoption ERI /HERS

- ✓ Scottsdale's proposed amendments to the 2015 IECC

TABLE R406.4
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX
1	52
2	52 59 ¹
3	51
4	54
5	55
6	54
7	53
8	53

¹Energy generated from *on-site renewable energy* shall not be included in the calculation of the Energy Rating Index value.

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