



Houston Green Building Resource Center

National Energy Efficiency Practices
Field Study;

Initial Results and Next Steps

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Energy Codes Manager
07/27/2016

Who is SPEER

- REEO – Regional Energy Efficiency Organization
- Member-based, non-profit 501(c)3 organization
- 50 members from wide cross section of E.E. industries



BASF
We create chemistry

SPEER Members

Texas Gas Service™
A Division of ONE Gas



Johnson Controls

SYLVANIA



American Chemistry Council

NAIMA
NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION



SIERRA CLUB



MITSUBISHI ELECTRIC
COOLING & HEATING
Live Better

ecova®
CARLISLE
HVAC PRODUCTS



PHILIPS



TexEnergy
Solutions

energy institute
THE UNIVERSITY OF TEXAS AT AUSTIN

CPS
ENERGY

WSP + **ccrd**
A WSP | PARSONS BRINCKERHOFF COMPANY

OKLAHOMA
DEPARTMENT OF COMMERCE



City of Dallas



ENERGY SYSTEMS LABORATORY
TEXAS A&M ENGINEERING EXPERIMENT STATION

EnergySavvy

Franklin Energy



FRONTIER ASSOCIATES

lime

EDF
ENVIRONMENTAL DEFENSE FUND
Finding the ways that work



WeatherBug Home®

SmarterBuilding
Knowledge = Power



RENOVATEAMERICA™

GREEN ZONE HOME
Efficiency Specialists

TEXAS ENERGY ENGINEERING SERVICES, INC. (TEESI)
(teesi.com)
Facilities-Energy, MEP & Commissioning Engineering



Performance Services

IE
INTELLIGENT ENERGY SOLUTIONS LLC



RENEW FINANCIAL

pepco Energy Services



JOULE ASSETS



ENTEGRAL SOLUTIONS



Affiliated Engineers

FACILITY PERFORMANCE ASSOCIATES

ENVIRONMENTS FOR

Living®

Good Company
ASSOCIATES

CLEARResult



Residential Energy Code Field Study

- Goals:
 - Three year study to quantify the impact of an intensive education and outreach effort on energy efficiency construction practices in new homes
 - To establish a baseline for energy efficient practices in new home construction
 - To provide the business case for private sector investment in energy efficiency



Texas Field Study Team



Making Texas Energy Efficient





Field Study States

Alabama

Arkansas

Georgia

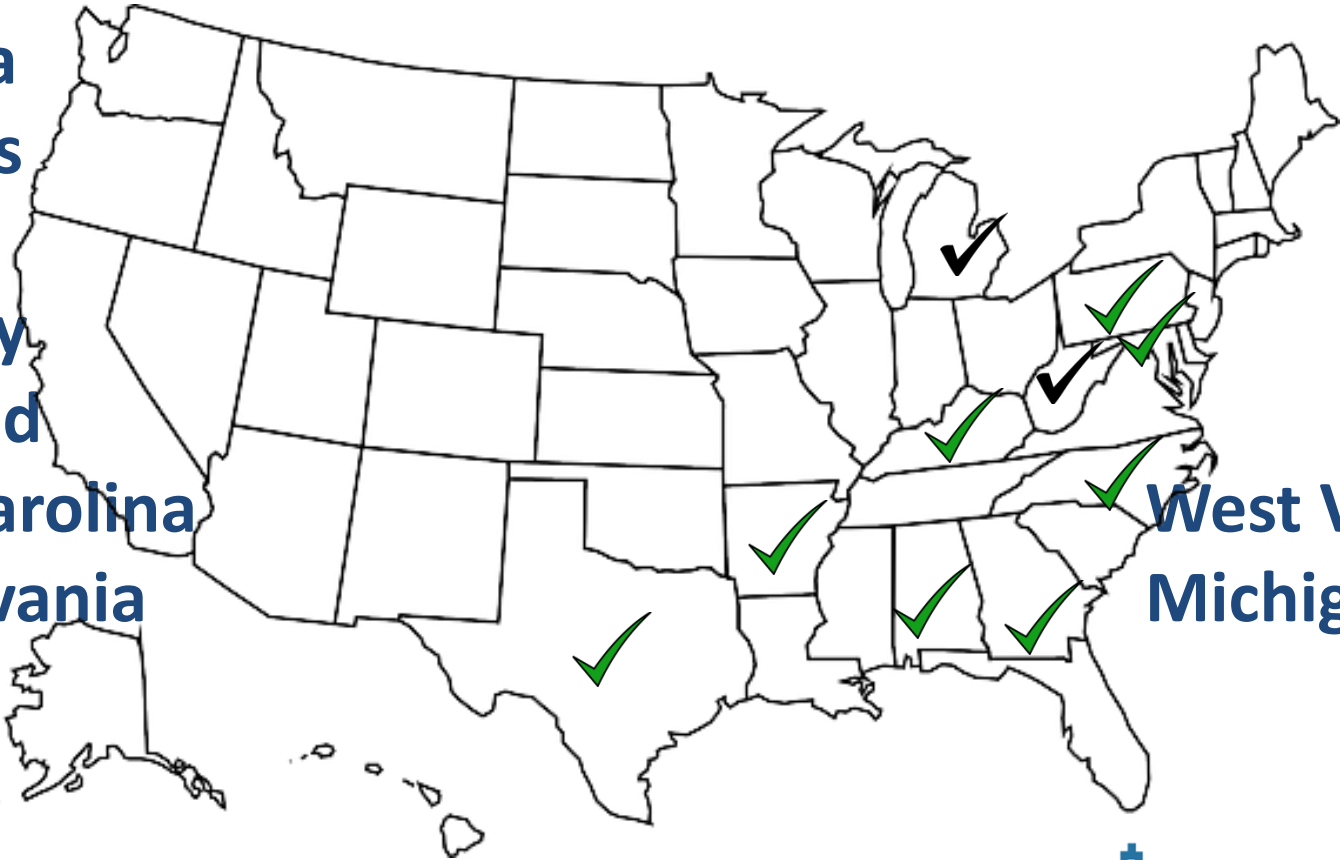
Kentucky

Maryland

North Carolina

Pennsylvania

Texas



West Virginia

Michigan

Texas Field Study Area

Counties with about 1/3 of state population

30 Counties with about 25% of state population





Field Study Phasing

Ph 1

- October, 2014 – October, 2015
- Initial Data Collection

Ph 2

- October, 2015 – October, 2017
- Outreach, Education & Collaboration

Ph 3

- Final Data Collection
- Analyze and Report Impacts



Texas Sampling Plan

Place, County	Sample
Houston, Harris	17
Pearland, Brazoria	5
League City, Galveston	3
College Station, Brazos	2
Fulshear, Fort Bend	1
Conroe, Montgomery	2
Beaumont, Jefferson	3
Galveston, Galveston	1
Port Arthur, Jefferson	1
Texas City, Galveston	1
Baytown, Harris	1
Katy, Harris	1
Alvin, Brazoria	1
Dickinson, Galveston	1
Lumberton, Hardin	1
Pasadena, Harris	1
Total	42

Place, County	Sample
Harris County Unincorporated Area, Harris	13
Fort Bend County Unincorporated Area, Fort Bend	5
Montgomery County Unincorporated Area, Montgomery	3
Total	21



Data Collection Process

Process

- Outreach to builders
- Outreach to building officials
- Request permit data
- Randomize permit data
- Call builders for homes at right stage and permission
- Data Collection
- Repeat as often as it takes

Barriers

- Non-responsive permit offices
- Incomplete permit data
- Builders unwilling to participate
- Finding houses at the right stage
- Communication between builders and supers



Data Collection

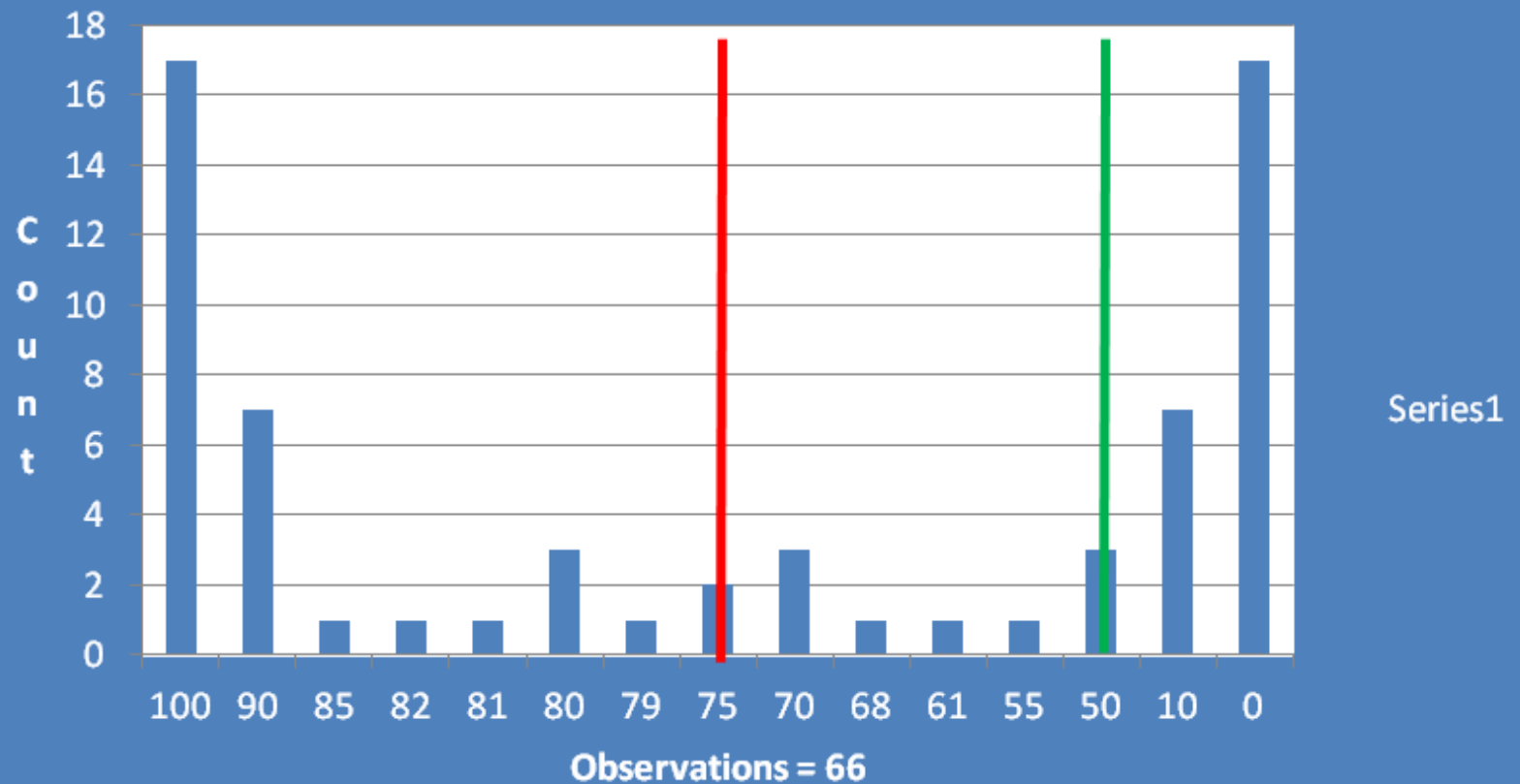
- Spreadsheet with about 150 items
- 9 Critical Measures
- 63 Independent observations of each Critical Measure
- 1 visit per house, rough mechanical or final
- Duct and envelope leakage tests performed by data collection teams
- Collect data on all measures until 63 x 9 is complete



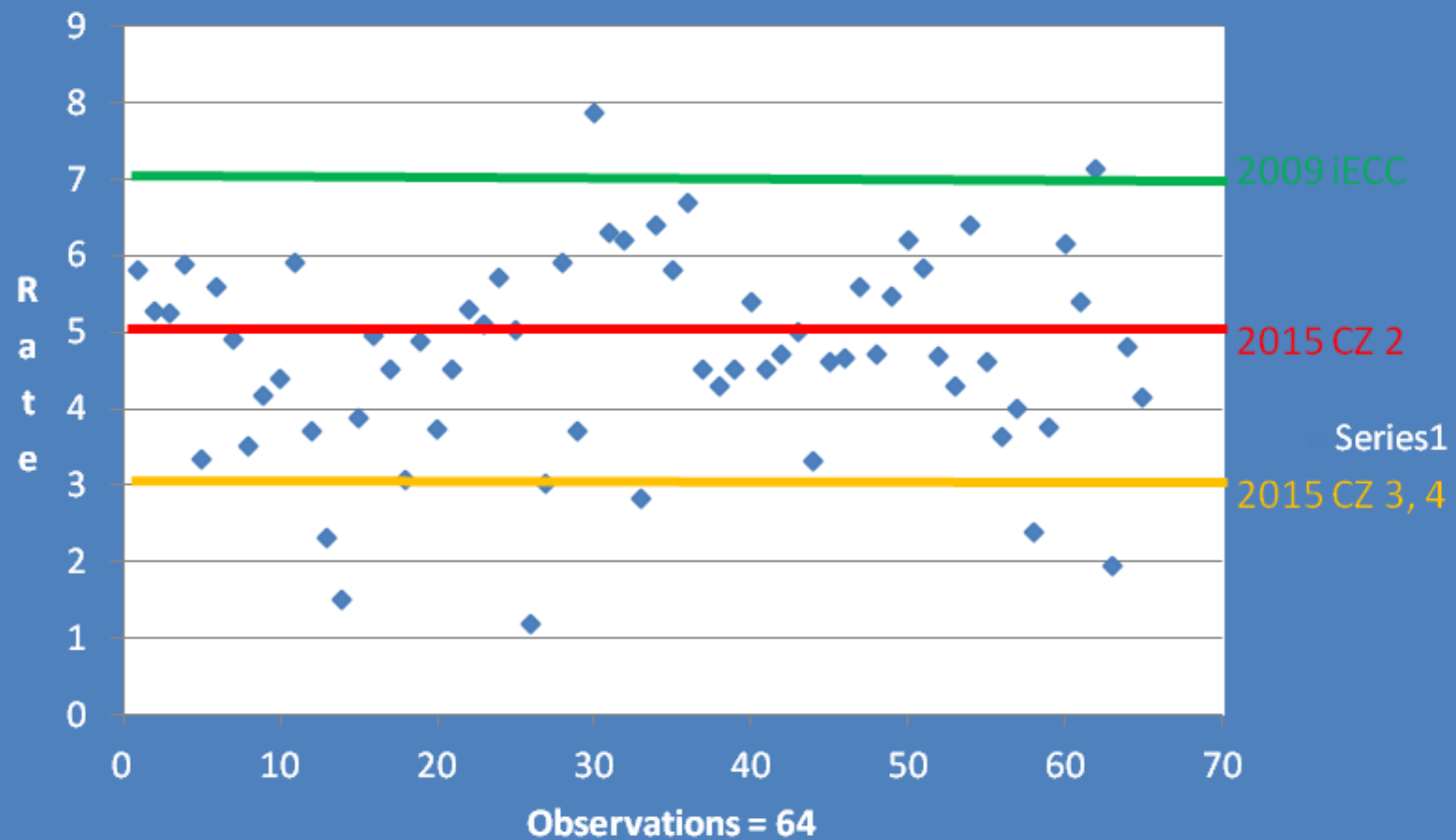
What We Found

- Texas builders (and builders in most states studied) are generally meeting or exceeding the requirements of the 2009 IECC.
- There are areas for improvement
- On September 1, 2016 the 2015 IRC Energy Provisions (IECC) become the state residential code
- With the new code, there is significant additional savings potential

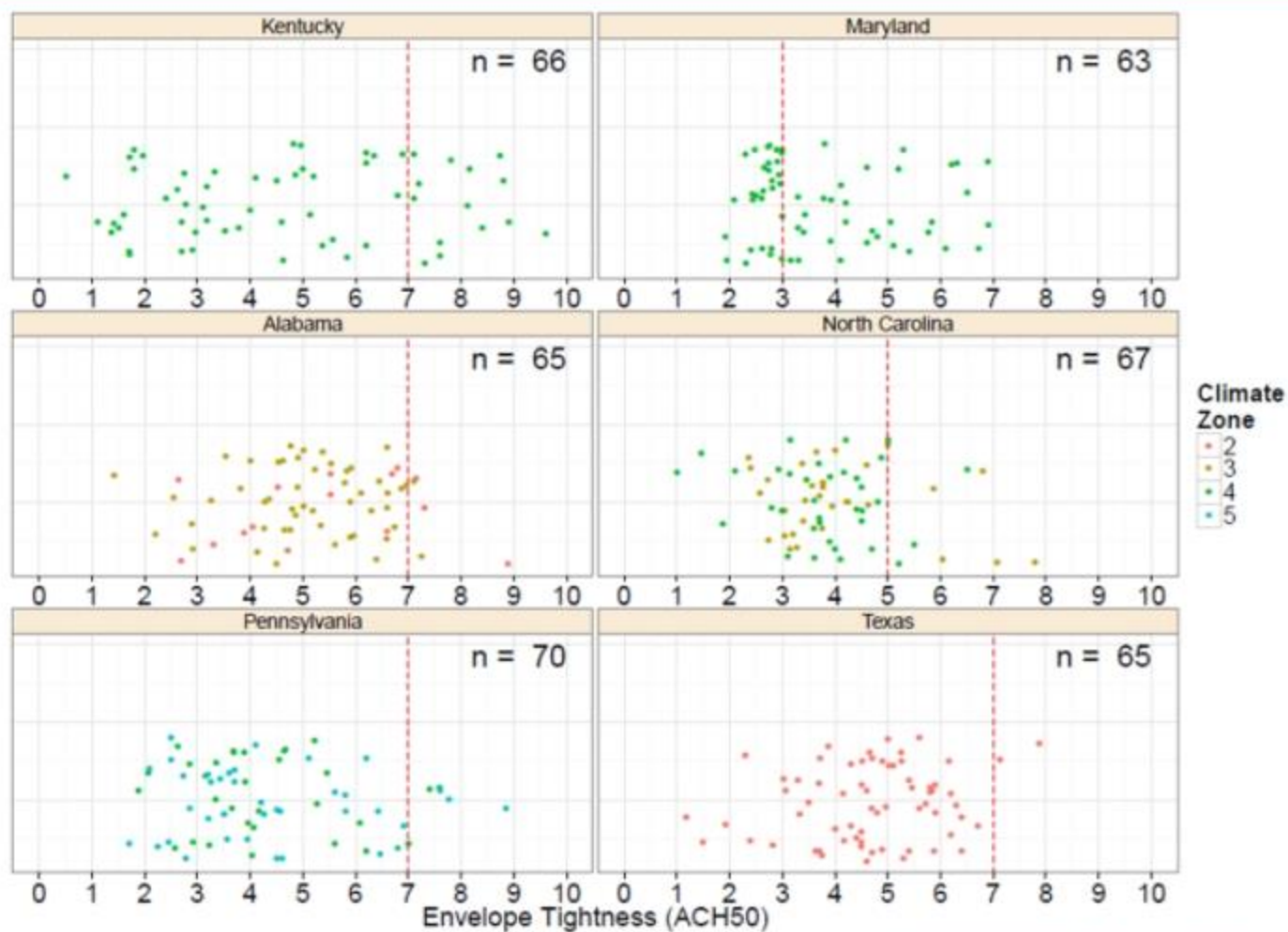
Lighting % High Efficacy



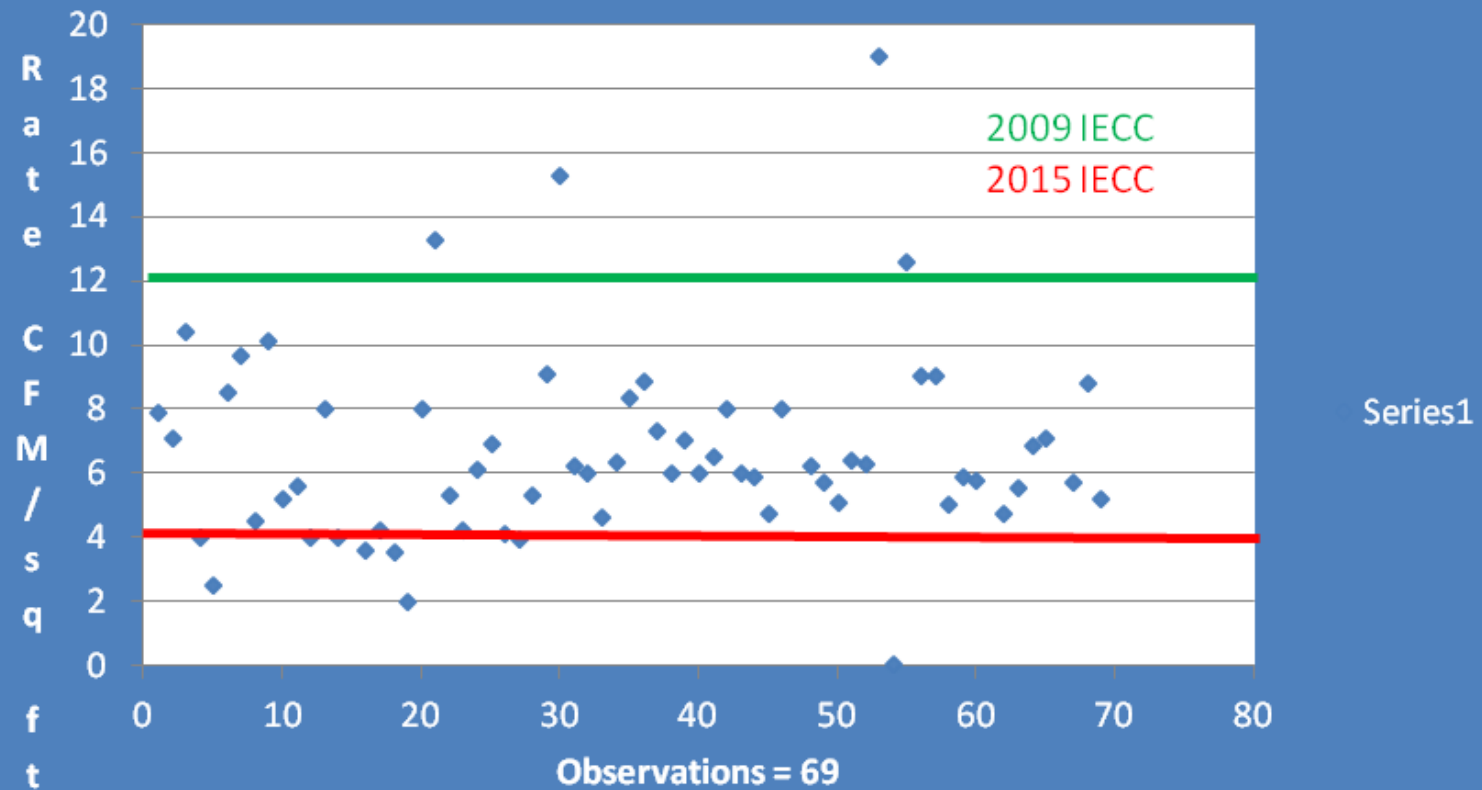
Envelope Leakage - ACH 50



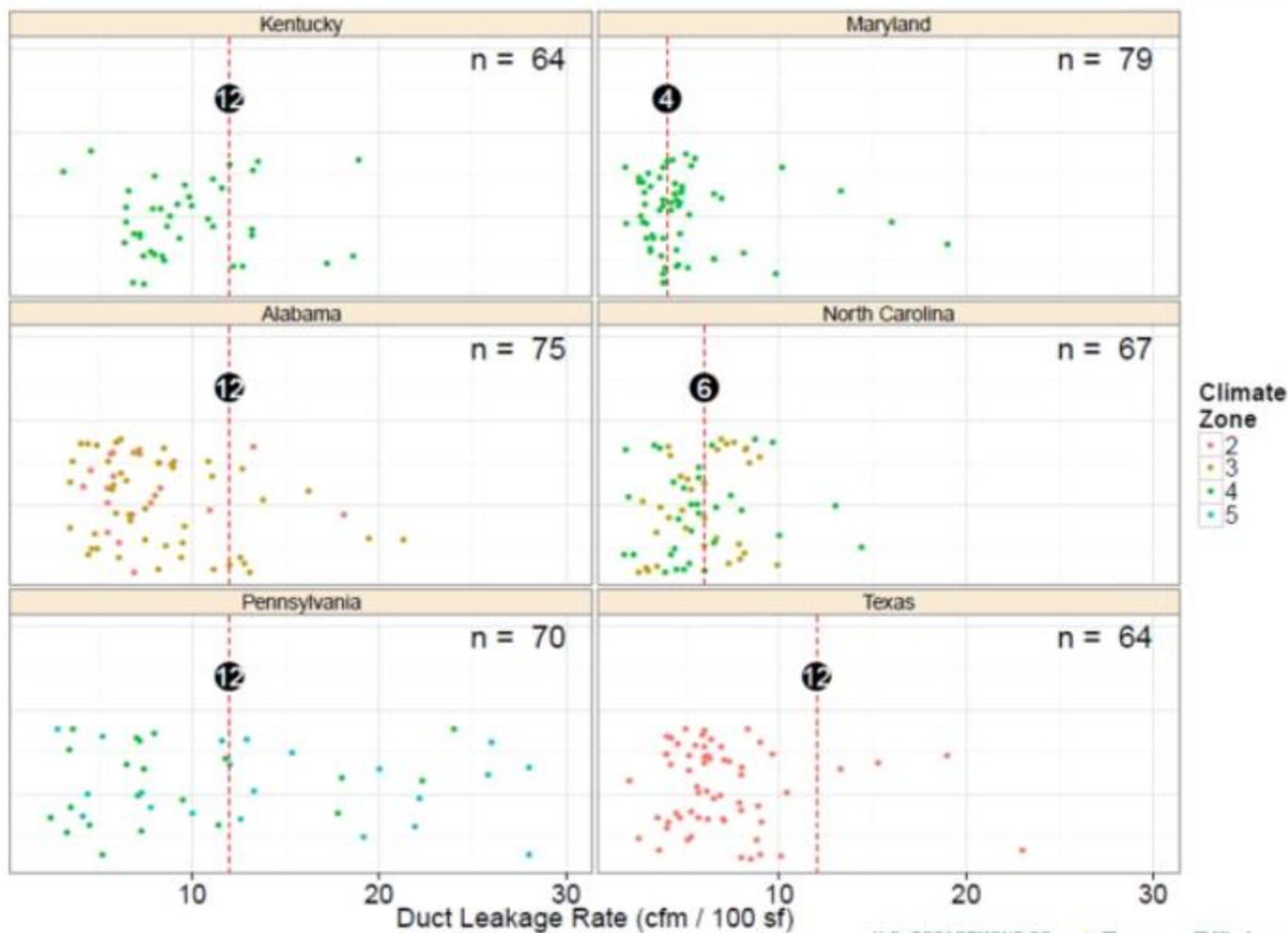
Envelope Tightness



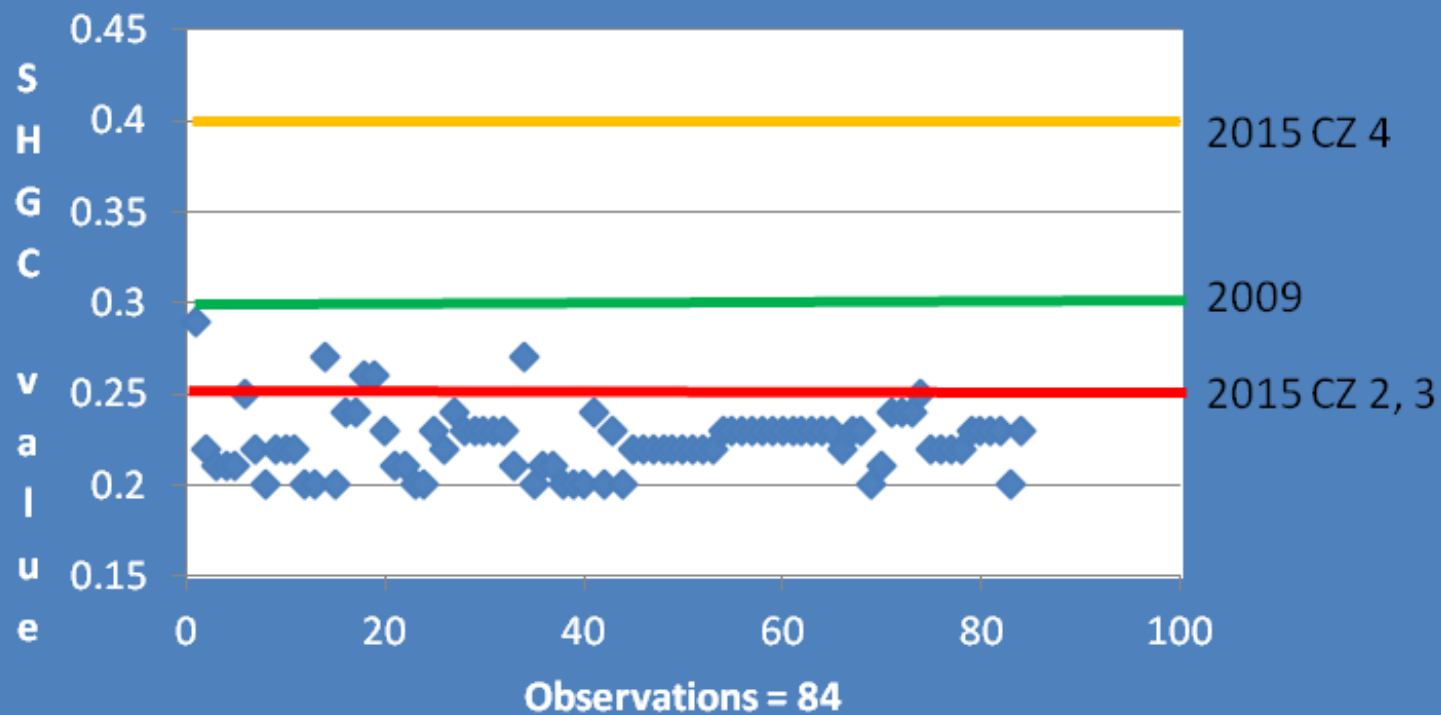
Duct Leakage



Duct Leakage

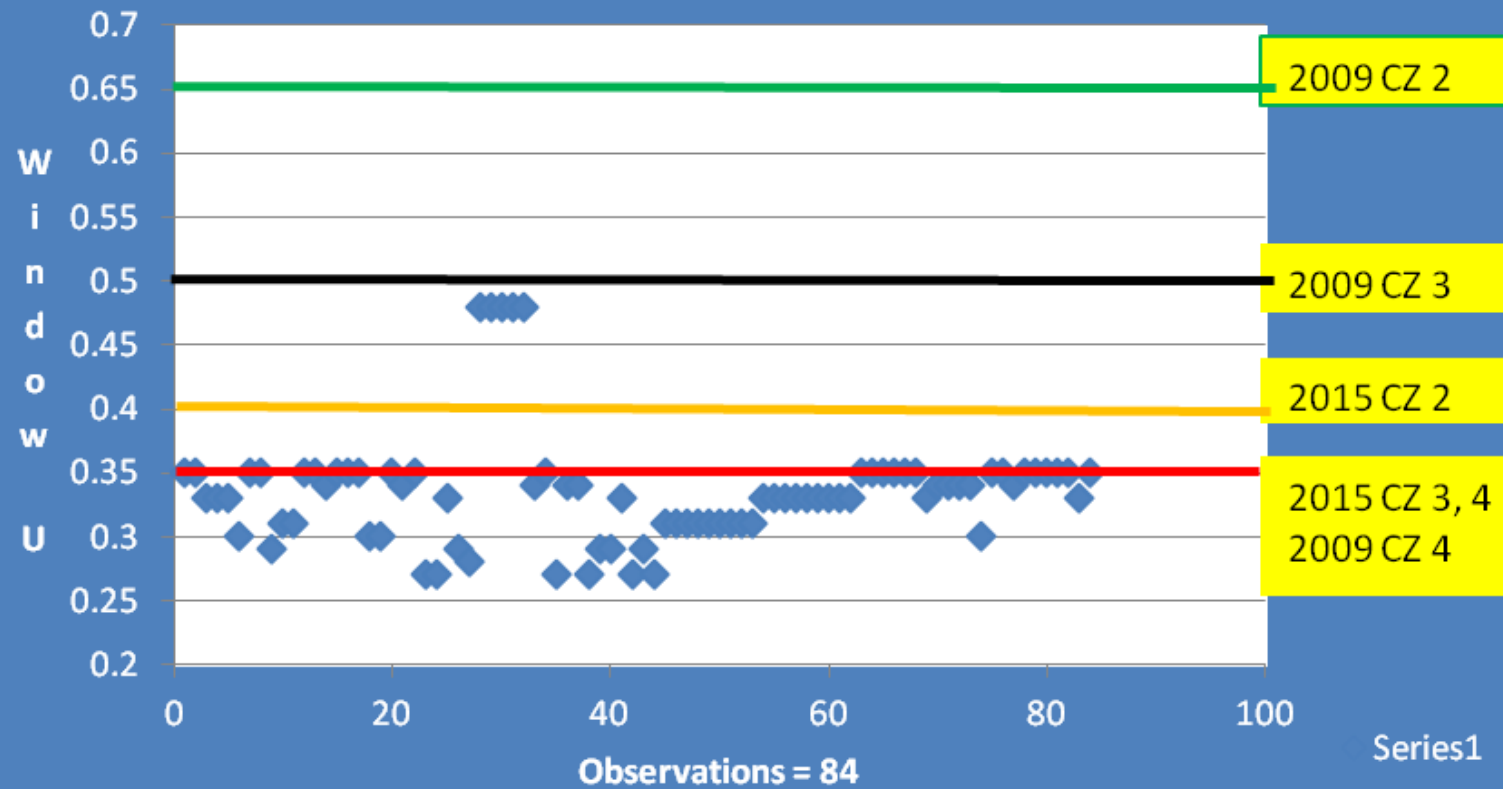


Window SHGC

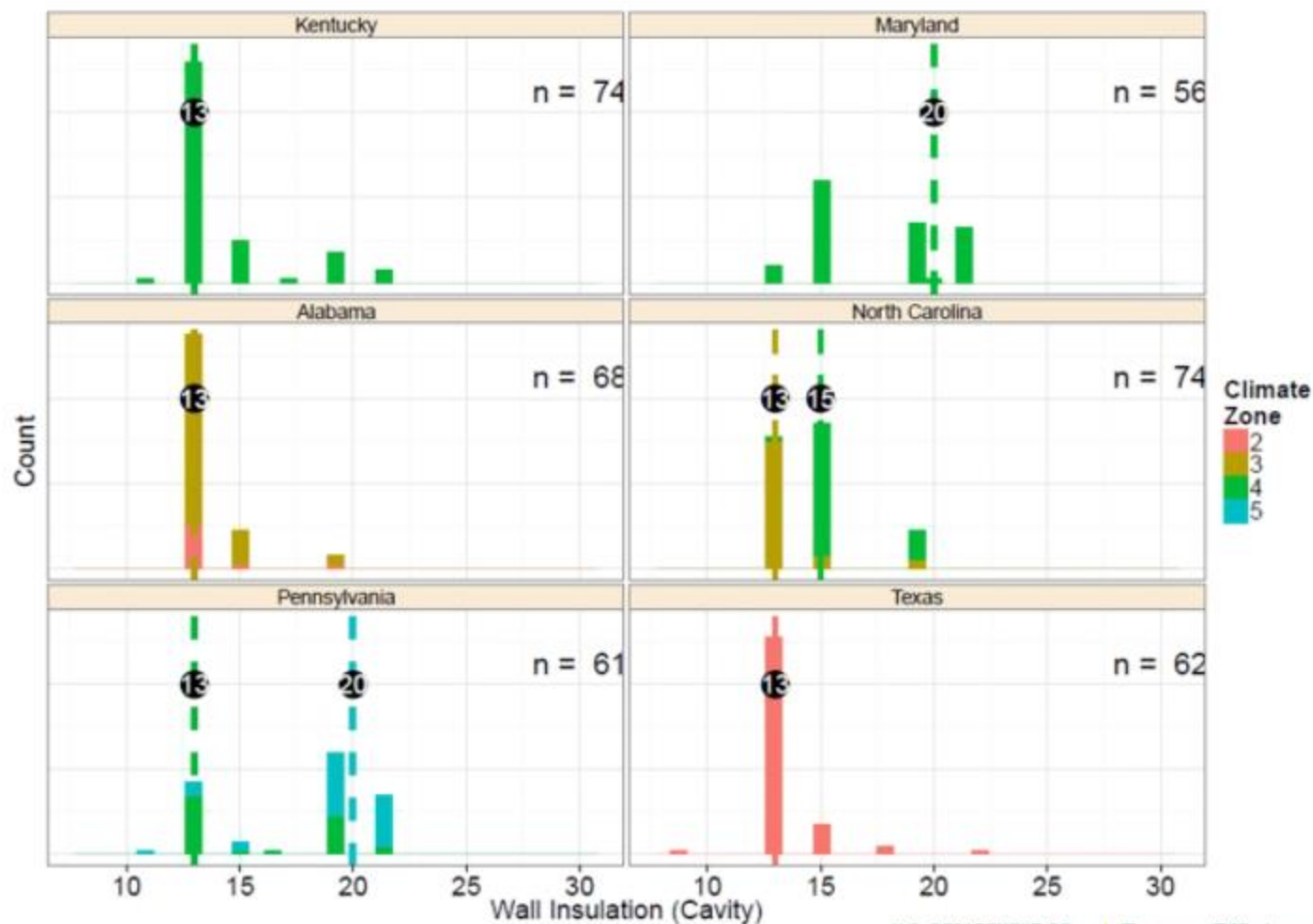


Series1

Window U-Factor

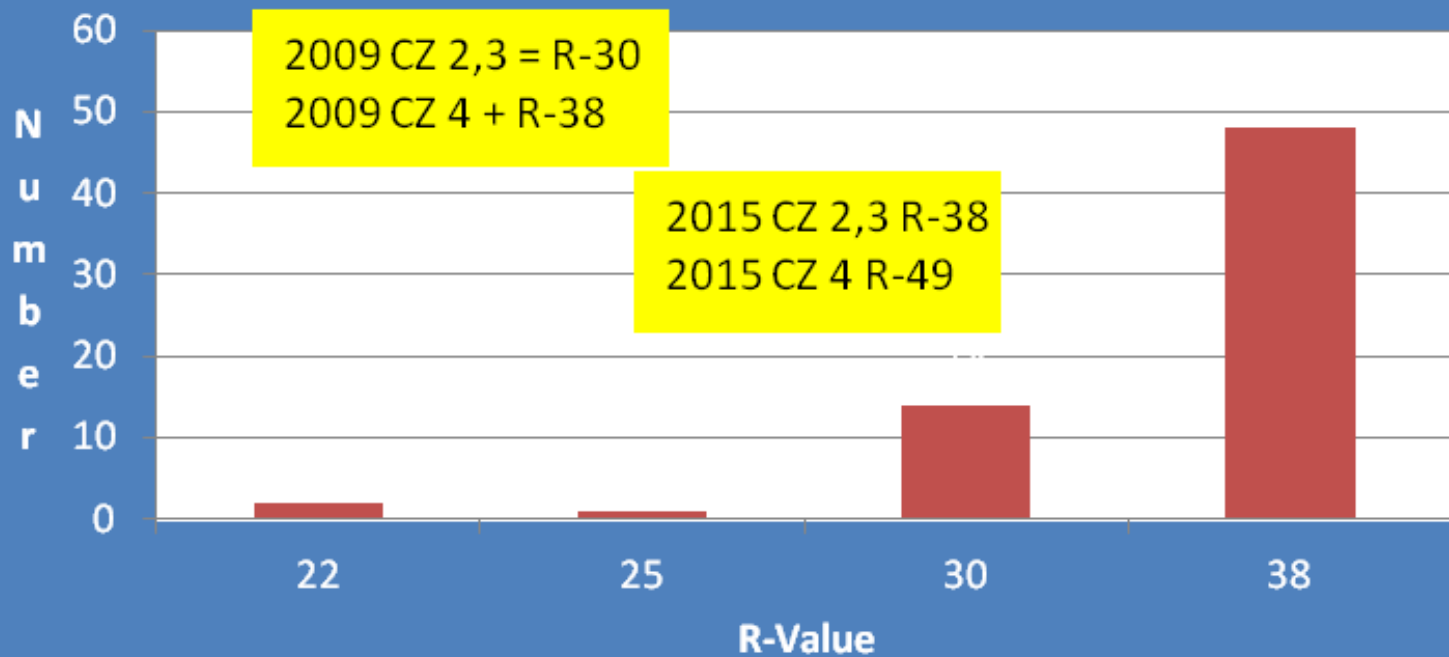


Above-Grade Frame Walls (Cavity)



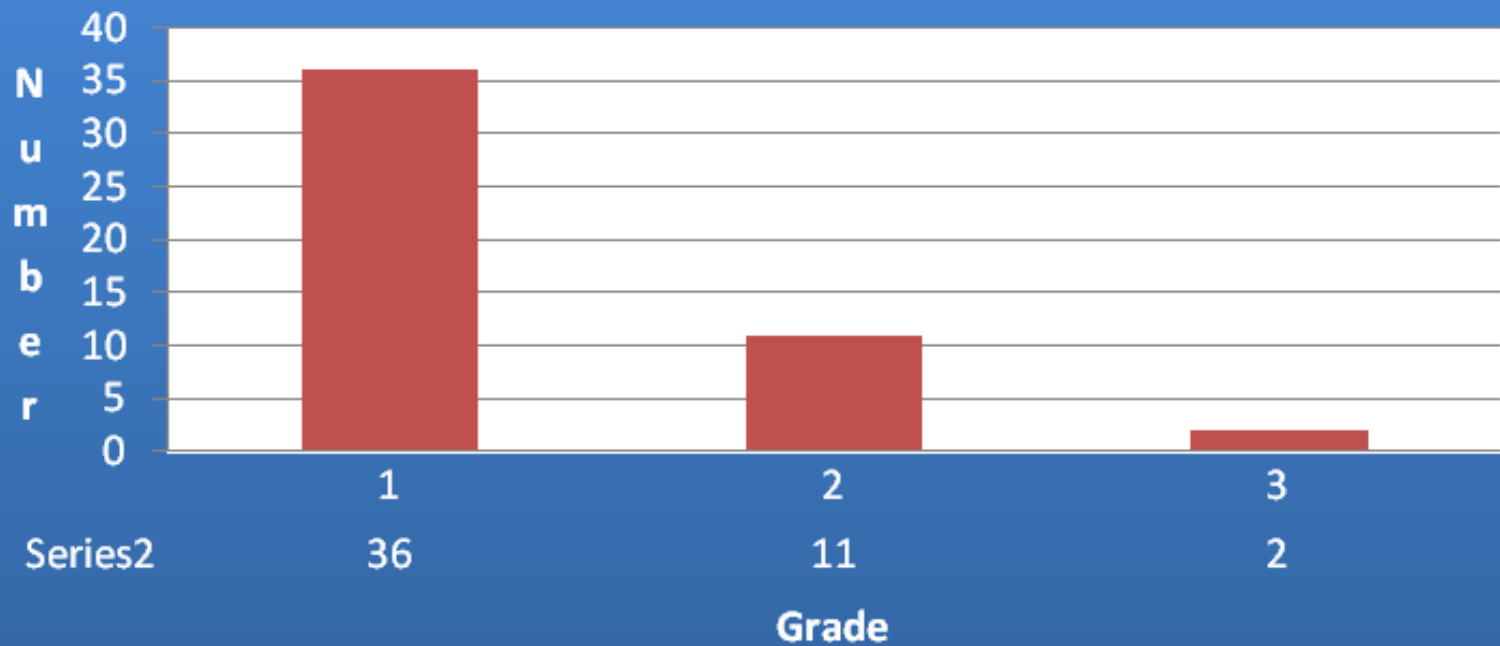
Ceiling R-Value

Observations 65

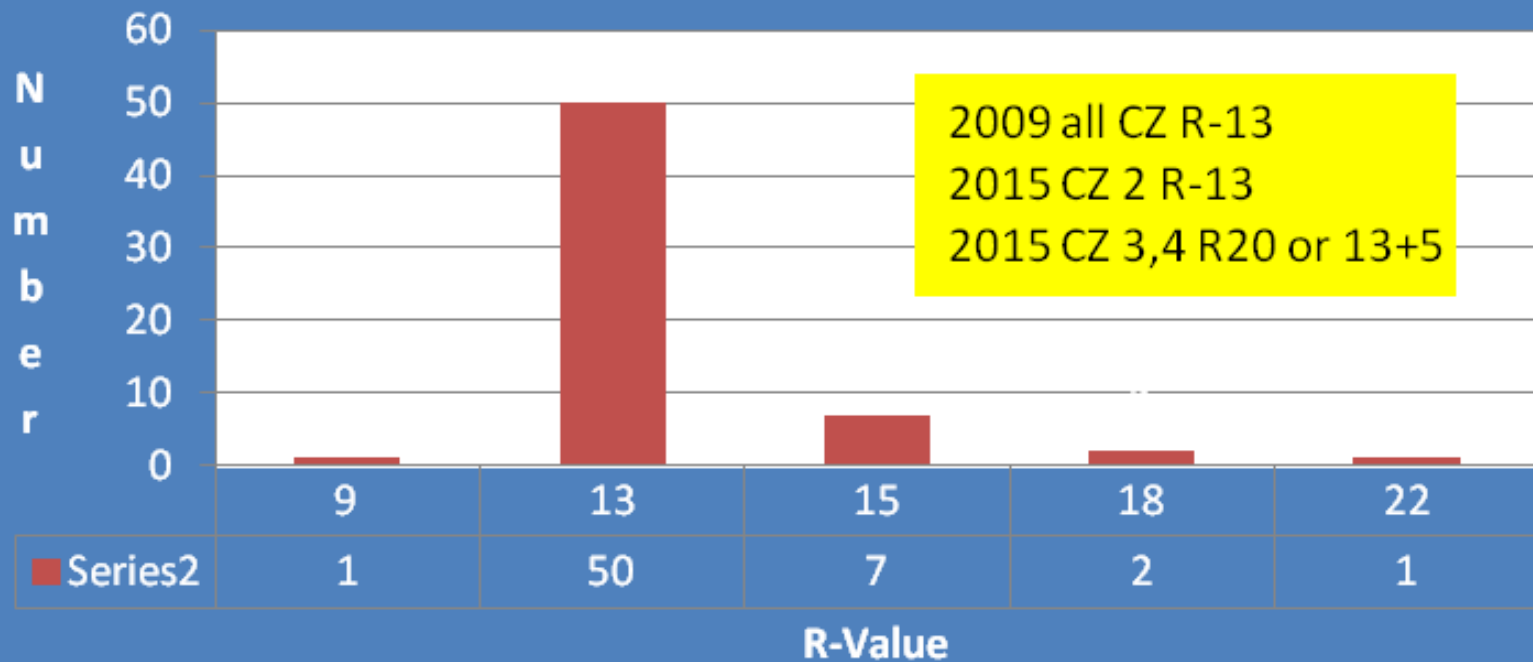


Ceiling Insulation Grade

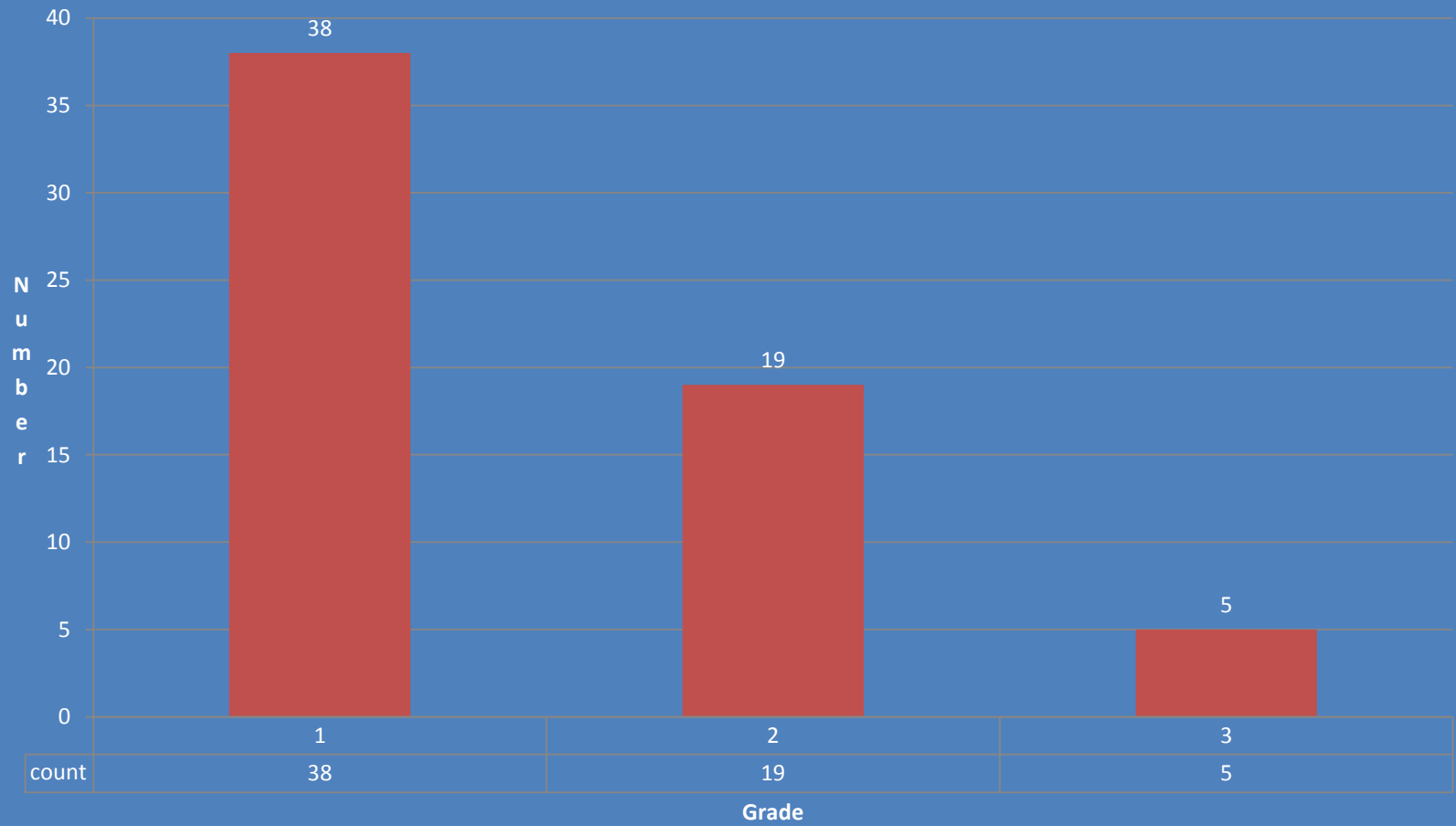
Observations = 49



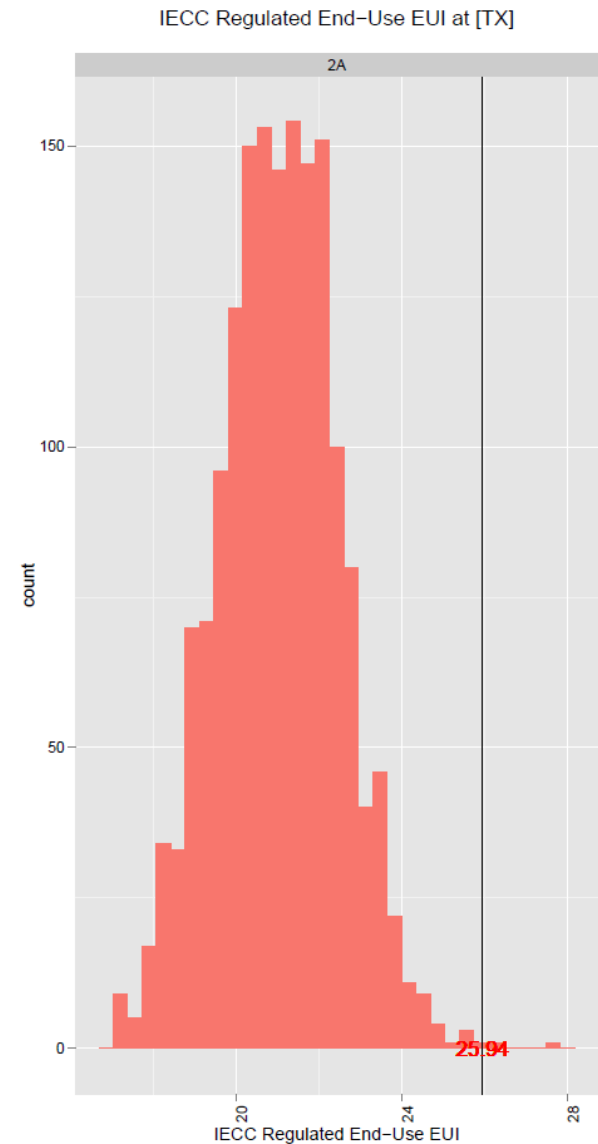
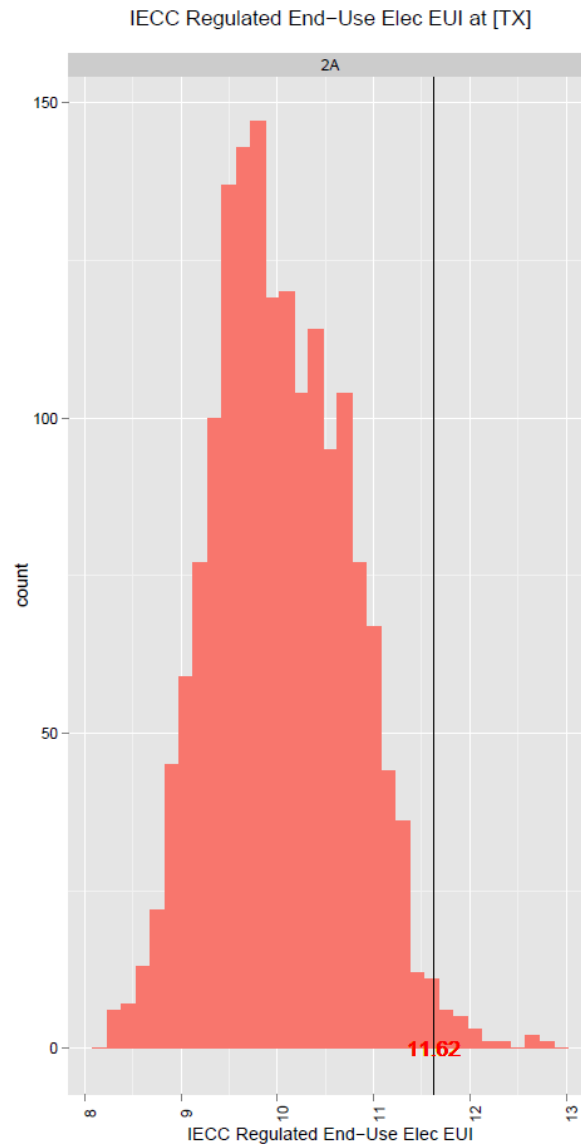
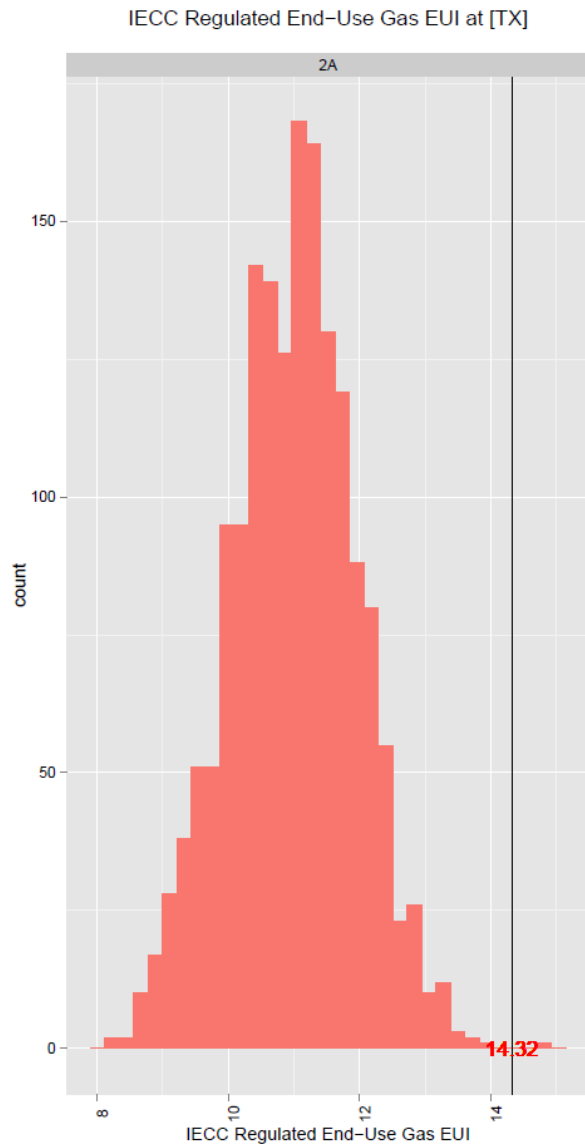
Wall Insulation R-Value Observations = 61



Wall Insulation Grade Observations = 62

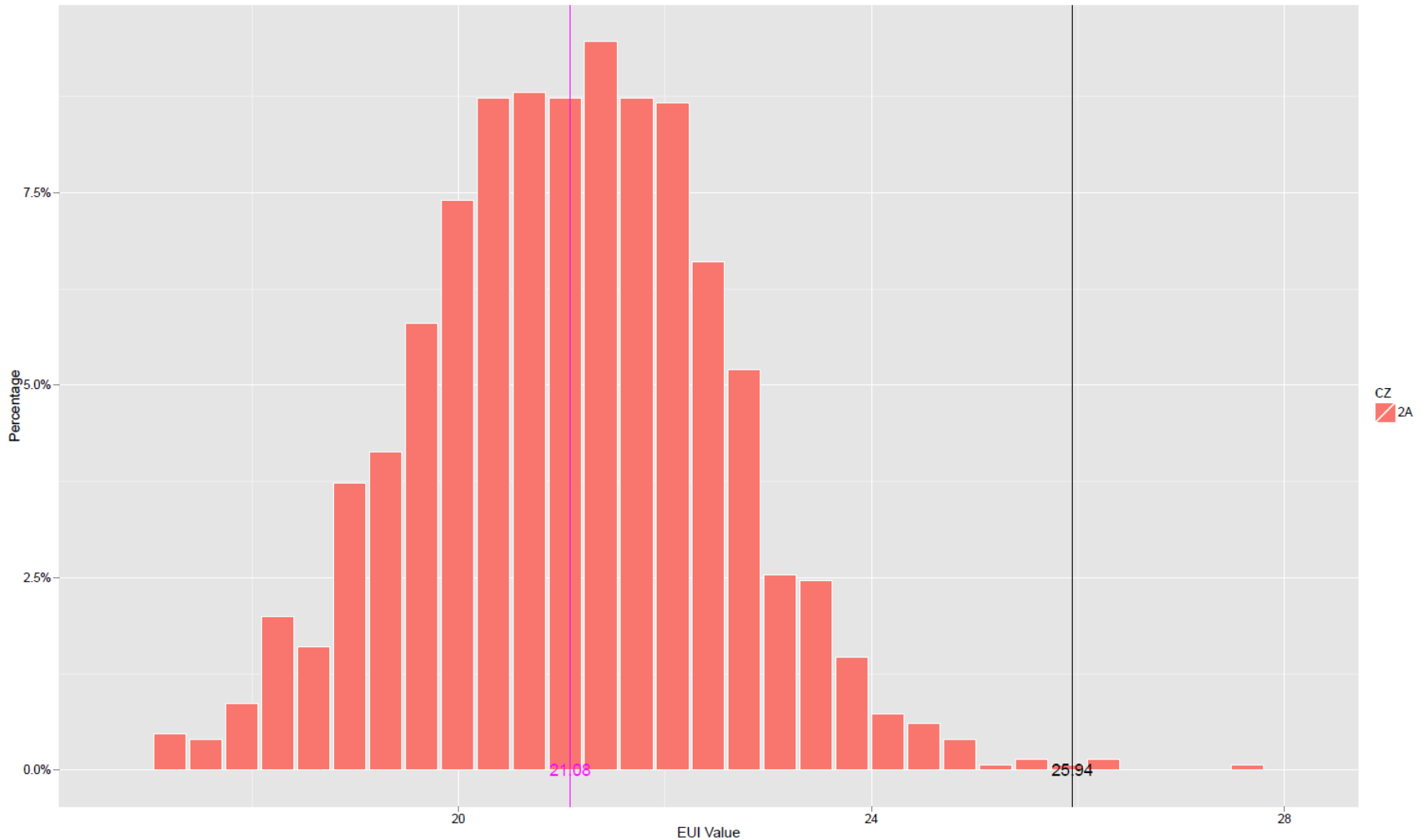


EUI – Natural Gas and Electric



EUI – Statewide

Vertical black line indicates the weighted average of EUI for a 2009 IECC prescriptive code-compliant prototype
Vertical magenta line indicates the weighted average of simulated EUI of the state





Data Summary

- Texas builders (and builders in most states studied) are meeting the requirements of the 2009 IECC
- In TX the 2009 IECC has been the state energy code since 2011
 - In 2013 40% of large jurisdictions had not yet adopted the 2009, so uptake was slow



Data Summary

- On September 1, 2016 the 2015 IRC (Ch. 11) becomes the state residential code
- Between the Field Study baseline and the 2015 IECC we have identified five areas with high energy savings potential (at least 15% savings).



Potential Savings Estimates – Texas (2015 IECC)

Annual-First Year Savings

Measure	Electricity Savings (kWh/home-yr)	Natural Gas Savings (therms/home-yr)	No. of homes	Total State Energy Savings (MMBtu/yr)	Total State Energy Cost Savings (\$/yr)	Total State Emissions Reduction (MT CO2e/yr)
Lighting	261.02	-1.89	100,608	70,571	\$2,774,421	17,100
Envelope Air Leakage	161.70	25.78	100,608	314,889	\$4,656,869	24,969
Ceiling Insulation	24.22	1.53	100,608	23,677	\$443,058	2,496
Duct Leakage	210.36	10.83	100,608	181,188	\$3,582,893	20,371
Exterior Wall Insulation	240.89	20.91	100,608	293,040	\$5,029,864	27,865

U.S. Department of Energy

Ext. Wall Insulation – Install quality



High Potential Savings Measures - Cumulative

Year	Cumulative Energy Savings (MMBtu)	Cumulative Energy Cost Savings (\$)	Cumulative Emissions Reduction (MT CO2e)
1	883,365	\$16,487,106	92,801
5	13,250,479	\$247,306,585	1,392,013
10	48,585,089	\$906,790,813	5,104,048
20	185,506,702	\$3,462,292,195	19,488,185
30	410,764,841	\$7,666,504,146	43,152,410

Pacific Northwest National Lab



Field Study Phasing

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Ph 2

- October, 2015 – July, 2017
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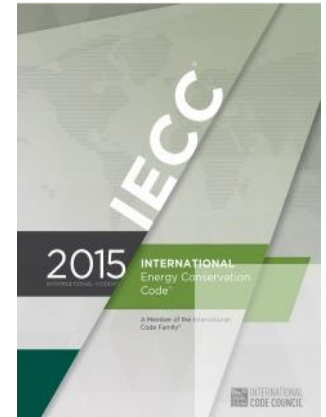
Phase II Strategies

1. Expedite 2015 code adoption
2. Create and deliver education campaign on 5 high savings potential measures
 1. Lighting
 2. Duct Leakage
 3. Envelope Leakage
 4. Insulation quantity and quality
3. Provide code officials and stakeholders with compliance tools



Strategy I, 2015 Energy Code Adoption

- Expedite the adoption process for local jurisdictions
- Make the adoption process as easy as possible for all stakeholders
- SPEER – 2015 Energy Code Adoption Toolkit
 - Energy Code in State Law
 - Local Adoption
 - Resources and Training
- Online tool for Code Officials and policy makers





Local Adoption Timeline

Compliance starts with local adoption and implementation of the state code.

220 of the Largest Cities	2013	2015	2016
Earlier than 2009 E-code	98	28	25
Adopted 2009 E-code	101	98	92
Adopted 2012 E-code	18	86	81
Adopted 2015 E-code		8	22
Increase in ICC Certified Individuals	891	1861	

2015 – Nov
2016 - March



Energy Code Training Collaborative

- Members

- SPEER
- SECO
- ICC
- Apple Energy Group
- TX A&M ESL
- Sierra Club
- Cities

- Activities

- Coordinate Training Schedules & Messages
- Promote all training
- Promote & disseminate resources
- Share information, FAQs




Strategy II

Provide Education on High Potential Measures

- Lighting
- Envelope Leakage
- Duct Leakage
- Exterior Wall Insulation
- Ceiling Insulation





Example - Lighting

- Create campaign image and tag line
 - Multiple channels
 - Raise Awareness
 - Drive to Training & Resources
- Work with industry partners to develop in depth training materials
- Deliver through webinars, in-person training and technical resources





Strategy 3, Local Level Compliance

- Education and training
 - Bi-weekly webinars
 - In-person training
 - Training Collaborative

Visit SPEER at **EEPartnership.org** to:



Access our Code Adoption Toolkit and resources for municipalities



Schedule free trainings and webinars designed for builders, contractors and code officials



Earn CEUs



Contact our expert code professionals with any questions



Strategy 3, Local Level Compliance

- Code Official Certification and CEUs
- Webinars and In-person training
- Third Party Agencies
 - Certifications and Registrations
 - Forms and Documentation
- Energy Code Ambassador Program
 - Peer to Peer Support
 - Outreach to local networks



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Summary

- Code compliance is better than we thought
- Still significant savings potential
- SPEER is providing intensive outreach and training of the code and the high potential savings measures
- Phase 3 will evaluate the effectiveness of the outreach and education efforts
- Direction for future programs/efforts



Questions

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