



HERS® Index

More Energy

150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

Existing Homes

Standard New Home

This Home
65

Zero Energy Home

Less Energy

Midwest Trends: *Using Big (HERS) Data to Understand Residential Construction & Energy Codes*

National Energy Codes Conference
Ian Blanding



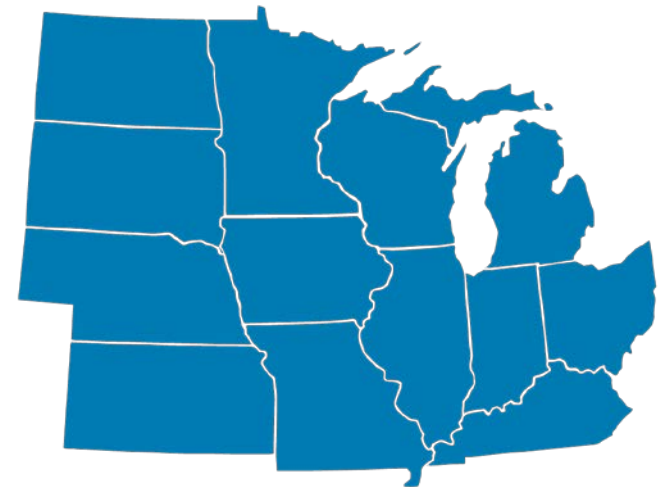
About MEEA

The Trusted Source on Energy Efficiency

We are a nonprofit membership organization with **160+ members**, including:

- Utilities
- Research institutions and advocacy organizations
- State and local governments
- Energy efficiency-related businesses

As the key resource and champion for energy efficiency in the Midwest, MEEA helps a diverse range of stakeholders understand and implement cost-effective energy efficiency strategies that provide economic and environmental benefits.



Agenda

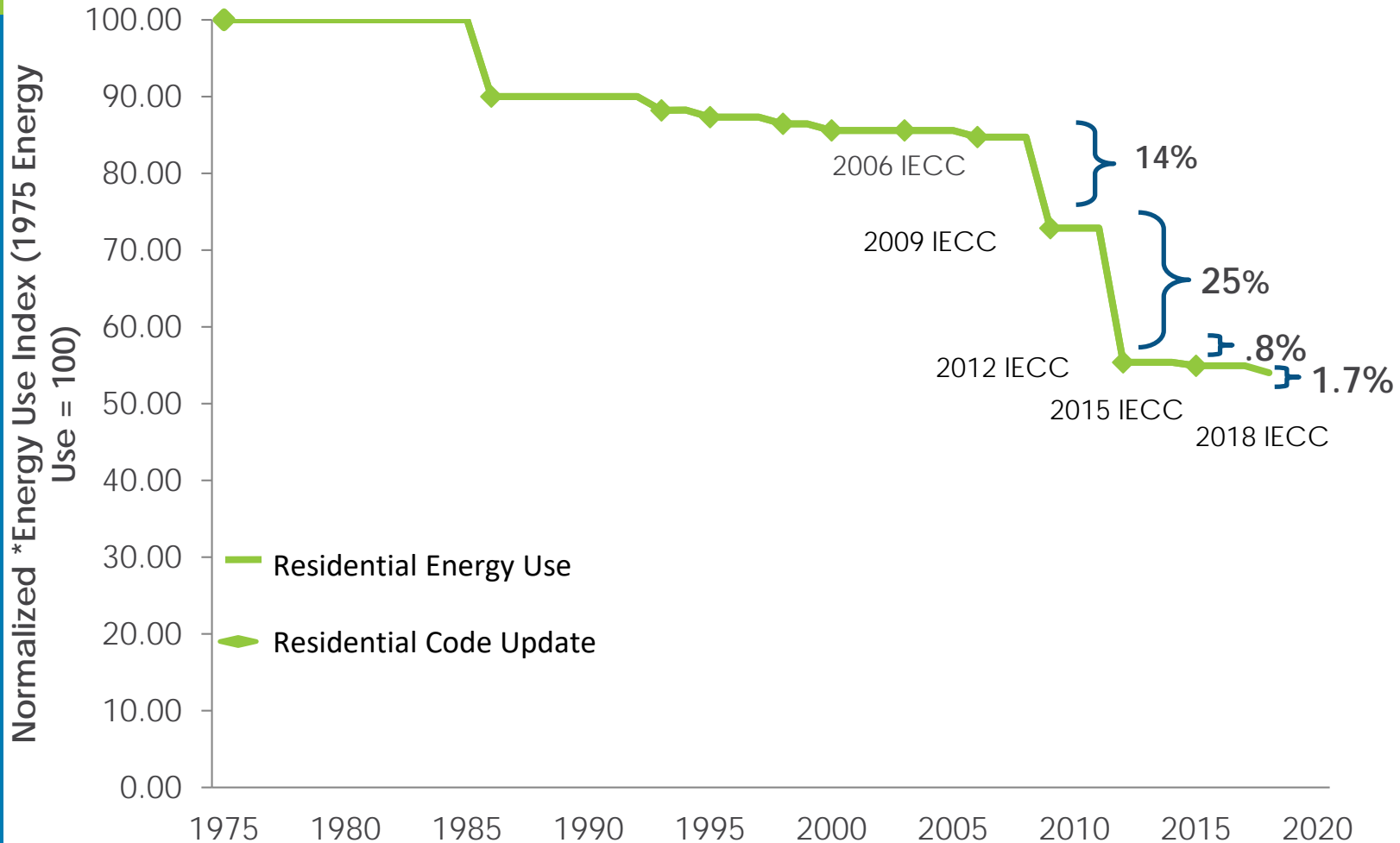
- Midwest Building Policies
- HERS data background
- Midwest HERS Overview
 - Trends by Energy Code
 - Opportunities to Track Compliance
- Key Takeaways
- Questions

Midwest Residential Policies

Codes and Utility Program

Residential Building Energy Code

Energy Use as Code Improves (1975-2018)



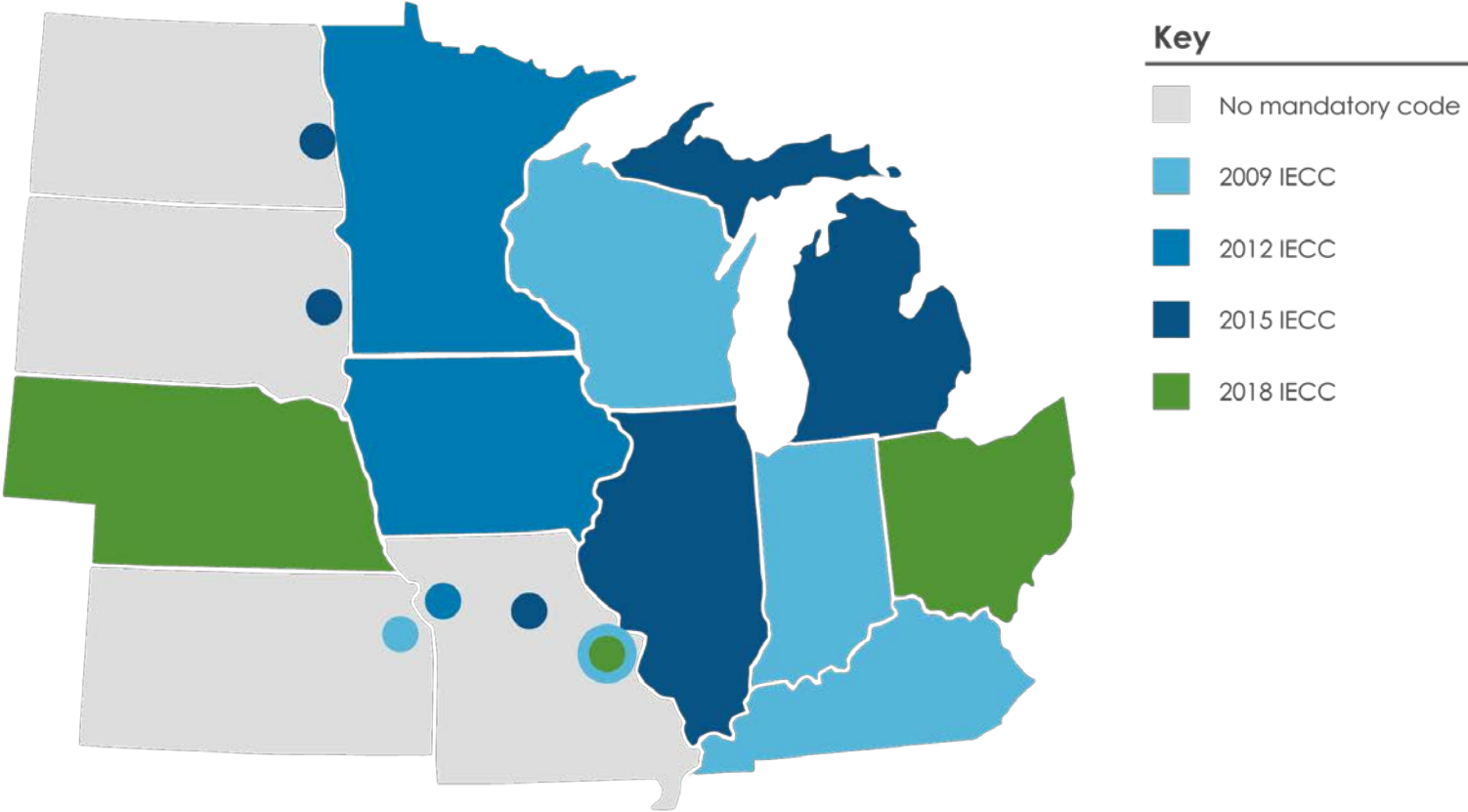
* Energy Use Index: National average energy use by building type and size.

Source: MEEA based on PNNL



Residential Code

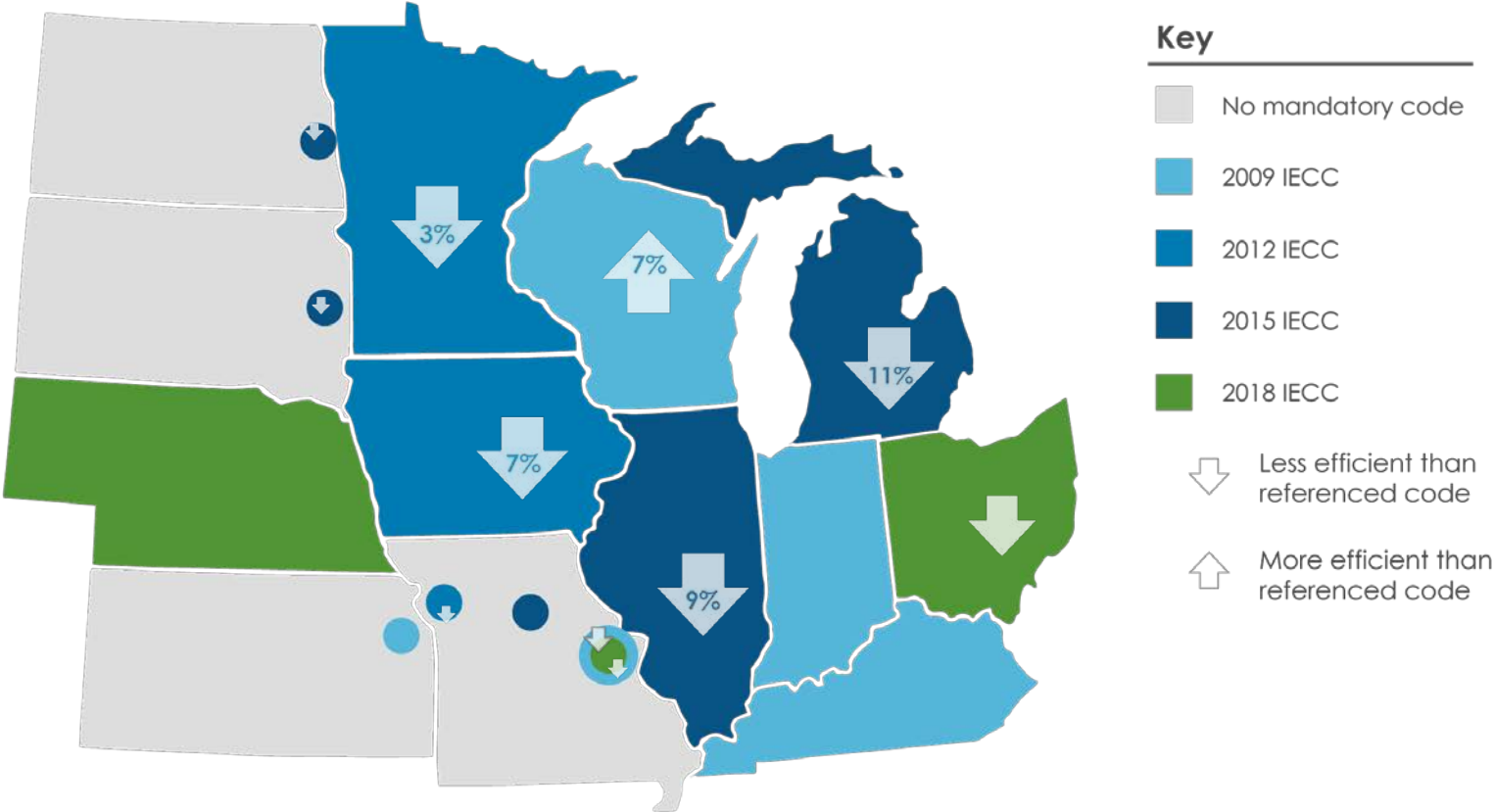
Code Level



As of May 2019

Residential Code

Amended Vs. Referenced Code



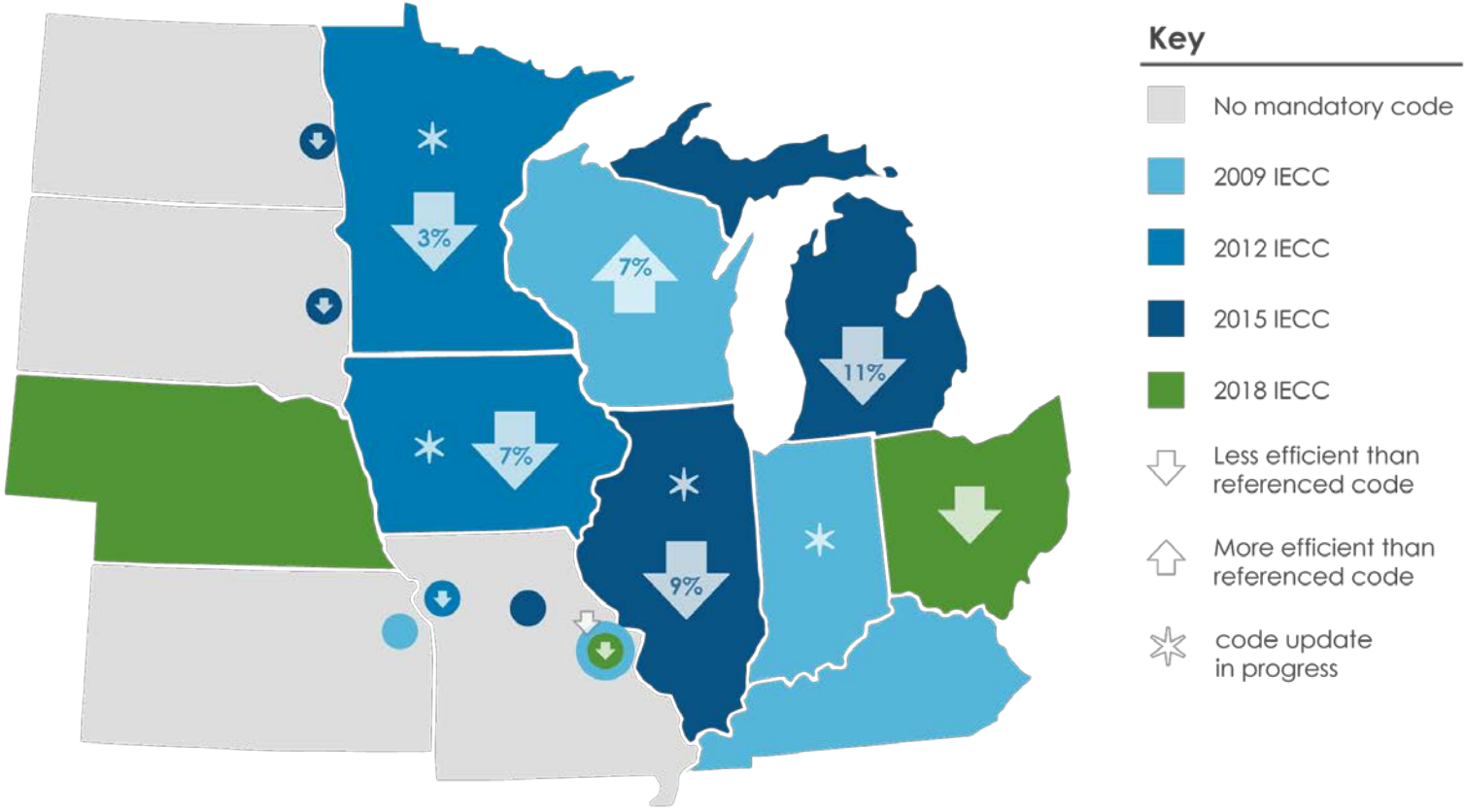
As of May 2019

Percentage change is based on EUI of adopted code



Residential Code

Code Updates in Progress



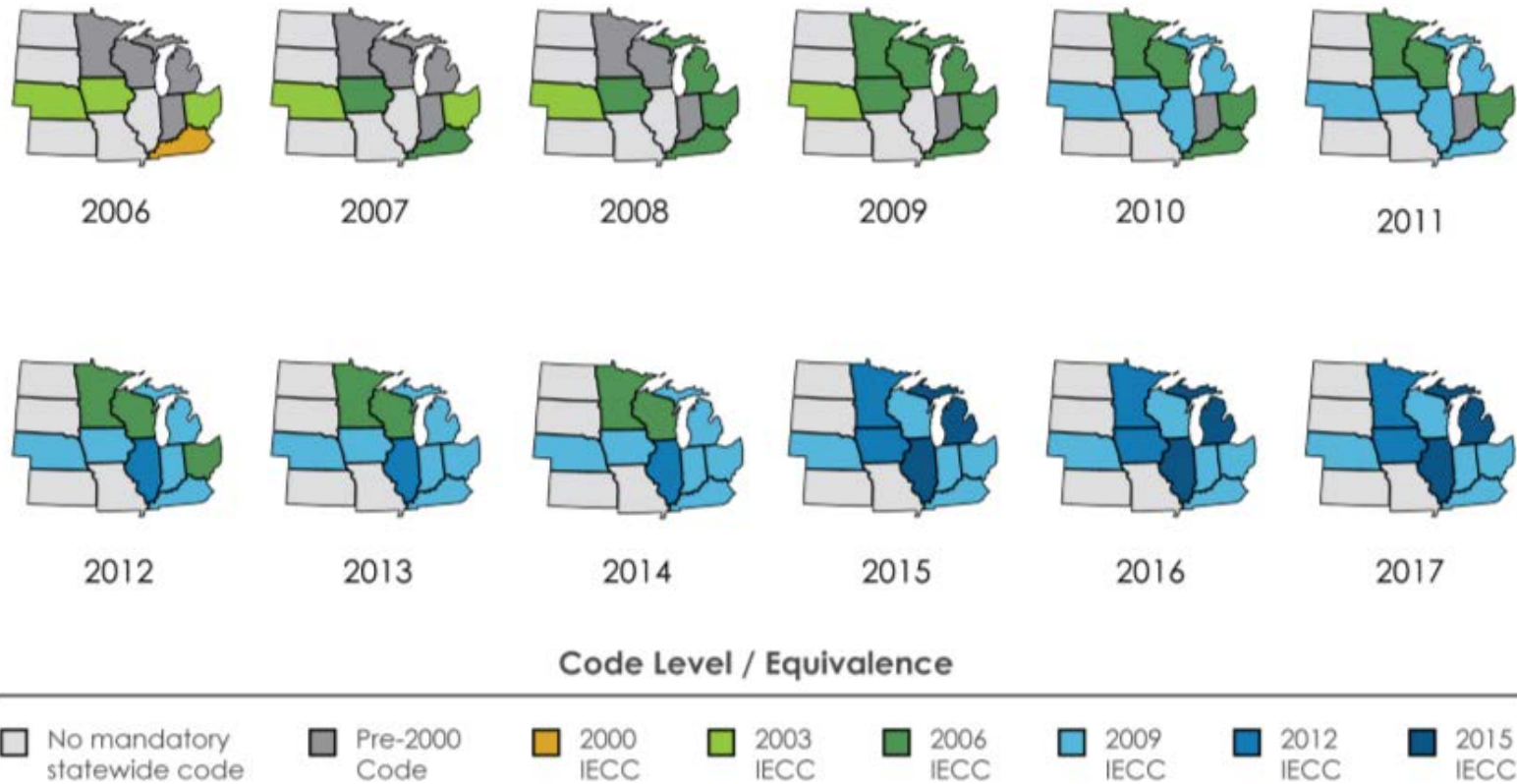
As of May 2019

Percentage change is based on EUI of adopted code



Residential Building Energy Codes

Adoption Timeline



HERS Dataset

Background

Midwest HERS Data Set

Background

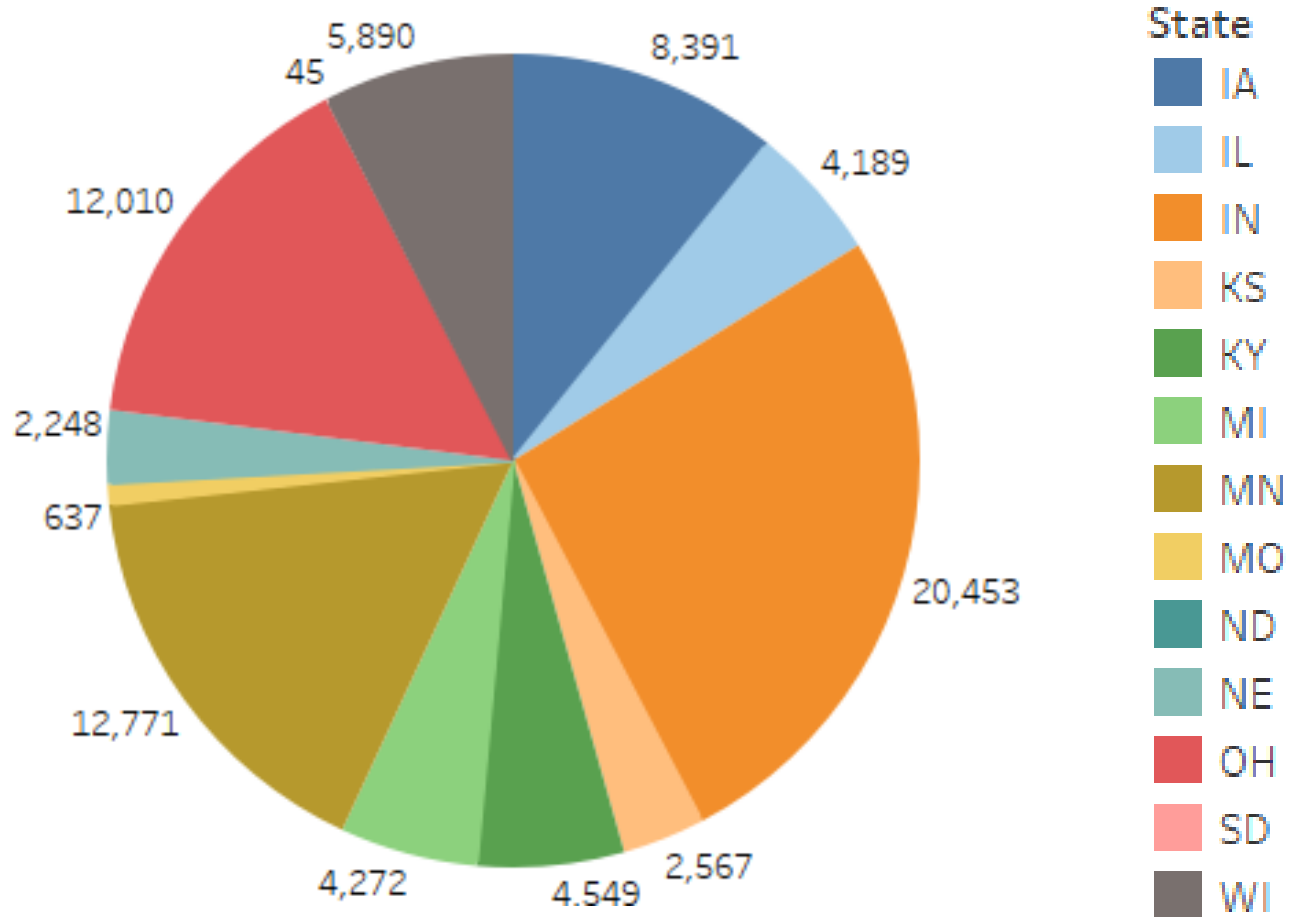
- MEEA received a dataset for all **HERS rated homes in the Midwest** from RESNET which spans **2014 - 2016**
- Dataset includes **HERS scores**, plus most features that impact building efficiency (**minimum rated features**)
- Although dataset includes single, duplex and low-rise multifamily – **the analysis only focuses on new single family**

Midwest HERS Data Set

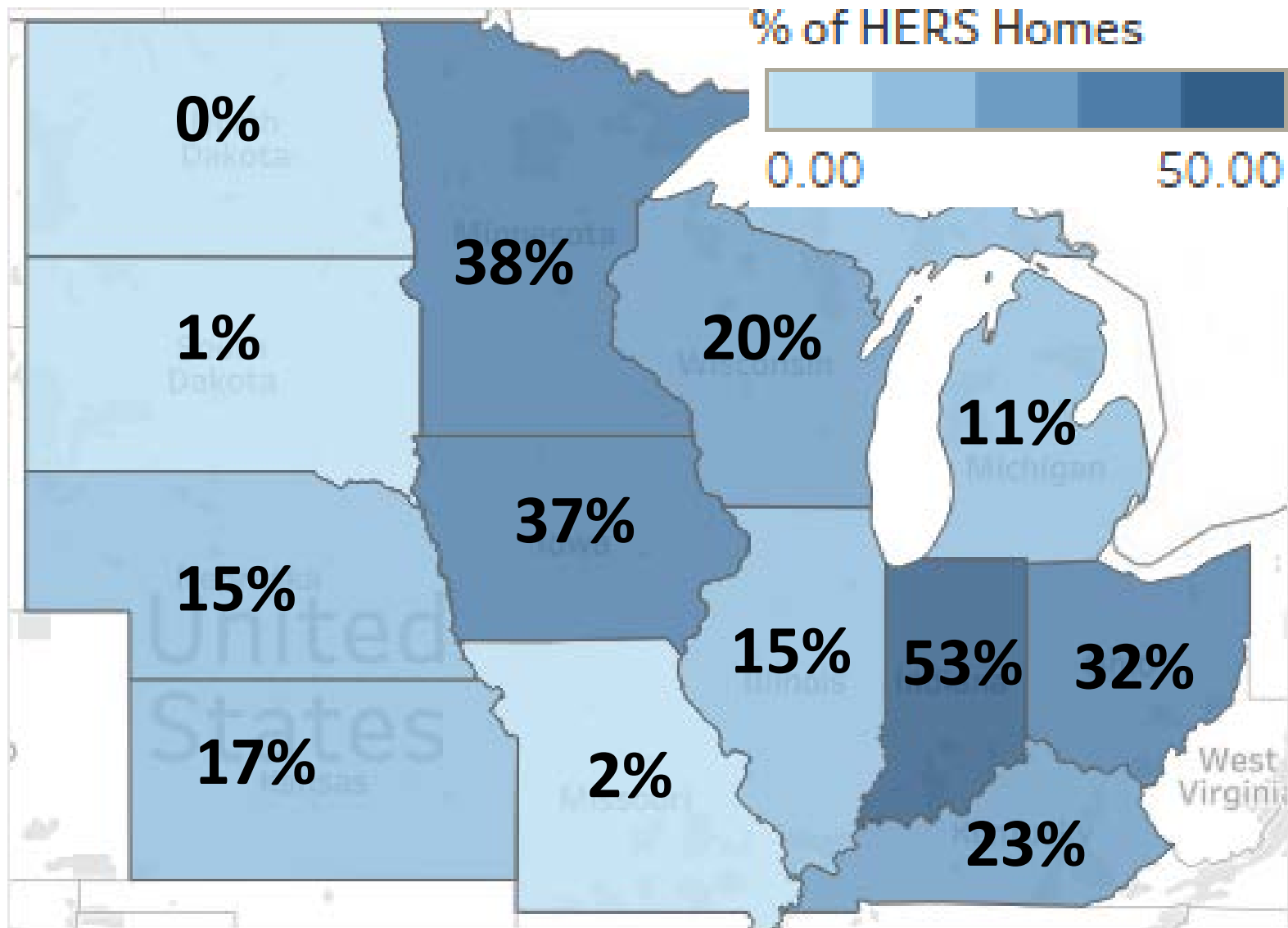
Background

- New Construction (2014 – 2016)
- Single Family
- # of homes analyzed: 78,000
- Confirmed Ratings
- Software: REM/Rate < v.15
- HERS Rated vs. 1-family permits in Midwest
 - 2014: 24%
 - 2015: 25%
 - 2016: 22%

Breakdown of HERS Homes *By State*



Percentage of HERS Homes Based on Census New Construction



HERS Comparison

Policies and Programs

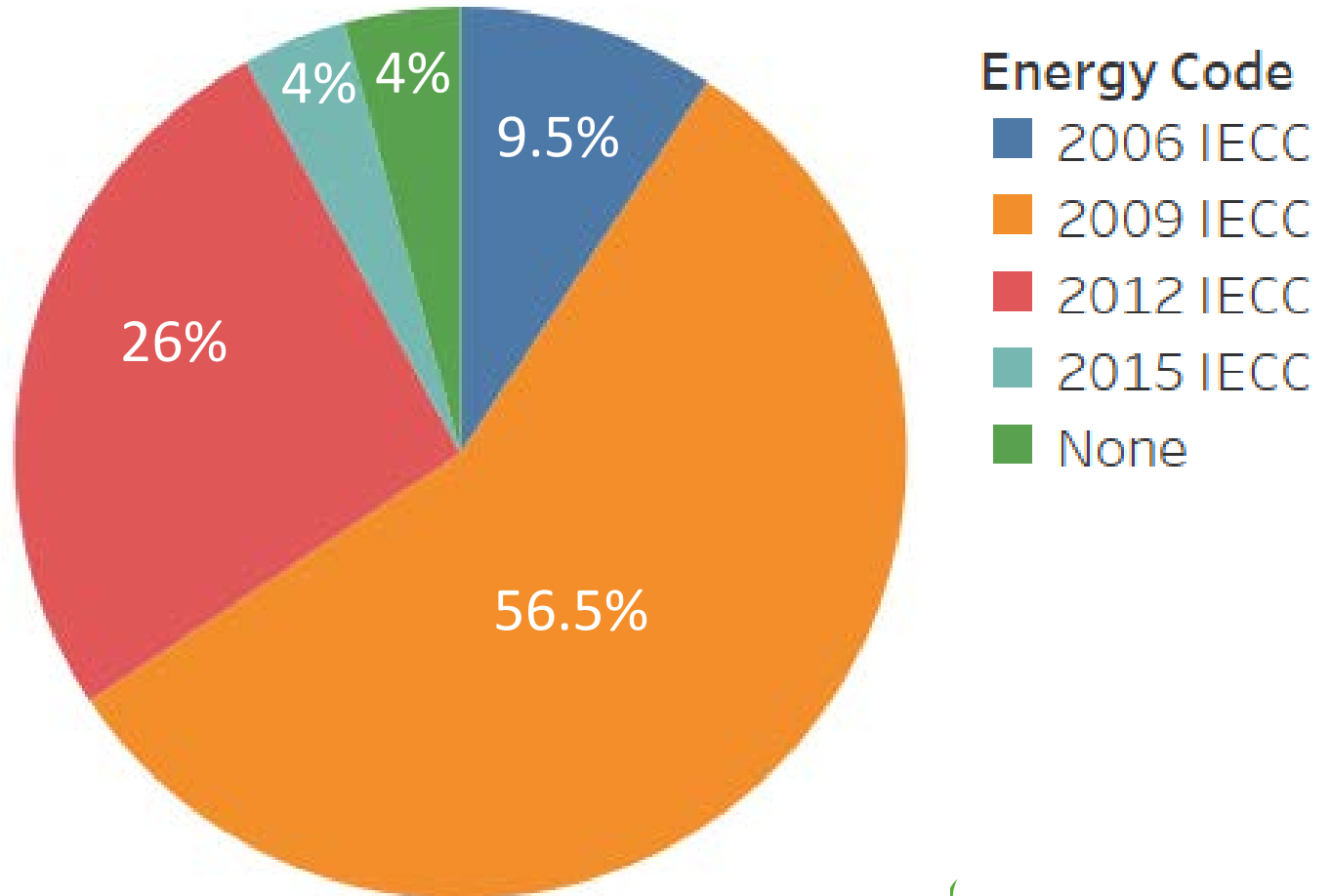
State	% of HERS homes	Avg. HERS Score	Primary CZ	State IECC	State IMC	Utility Program
IN	53%	66.0	5	2009	2012 IMC	Y
MN	38%	52.0	6	2012+	2012 IMC	Y
IA	37%	55.0	5	2012+	2015 IMC	Y
OH	32%	59.0	5	2009	2015 IMC	Y
KY	23%	65.0	4	2009	2012 IMC	Y
WI	20%	55.0	6	2009	2015 IMC	Y
KS	17%	70.0	4	None	None	N
NE	15%	52.5	5	2009	None	Y
IL	15%	55.0	5	2012+	None	Y
MI	11%	55.0	5	2009	2015 IMC	Y
MO	2%	62.5	4	None	None	Y
SD*	1%	51.5	6	None	None	N
ND*	0%	58.5	6	None	None	N

Midwest HERS Homes

Comparison to Energy Code

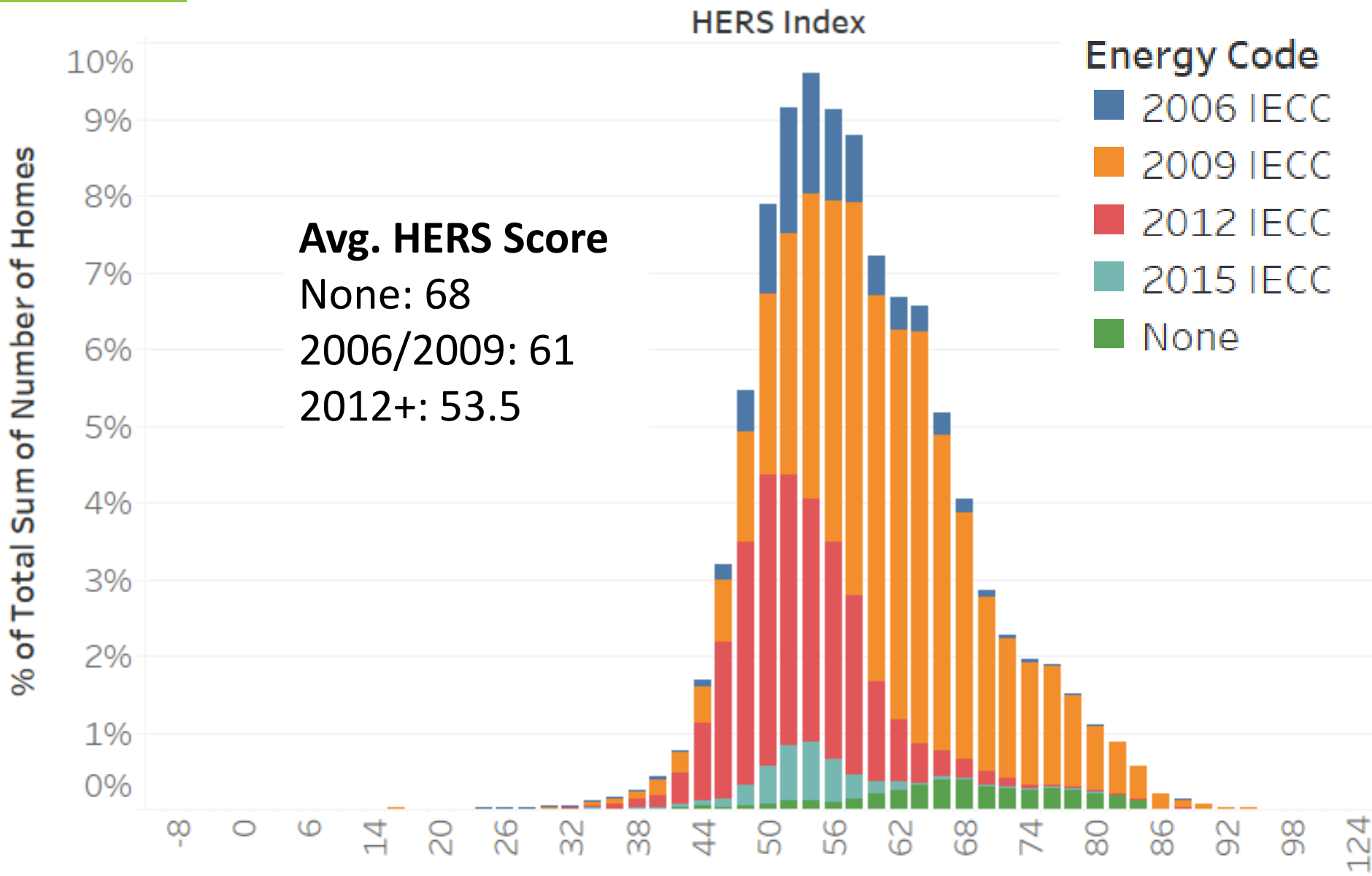
Energy Code

Breakdown by HERS Home



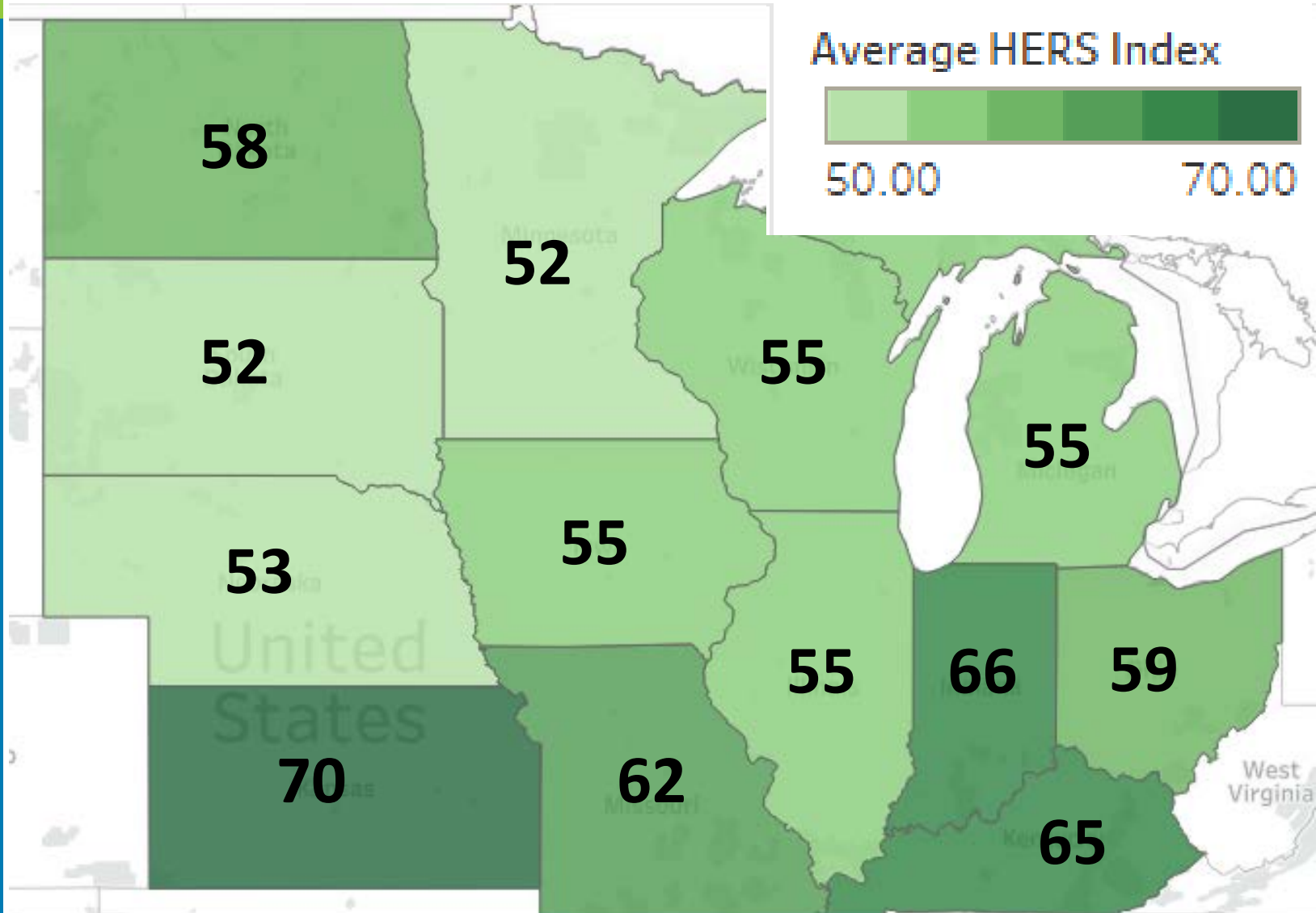
HERS Score by Energy Code

All Midwest



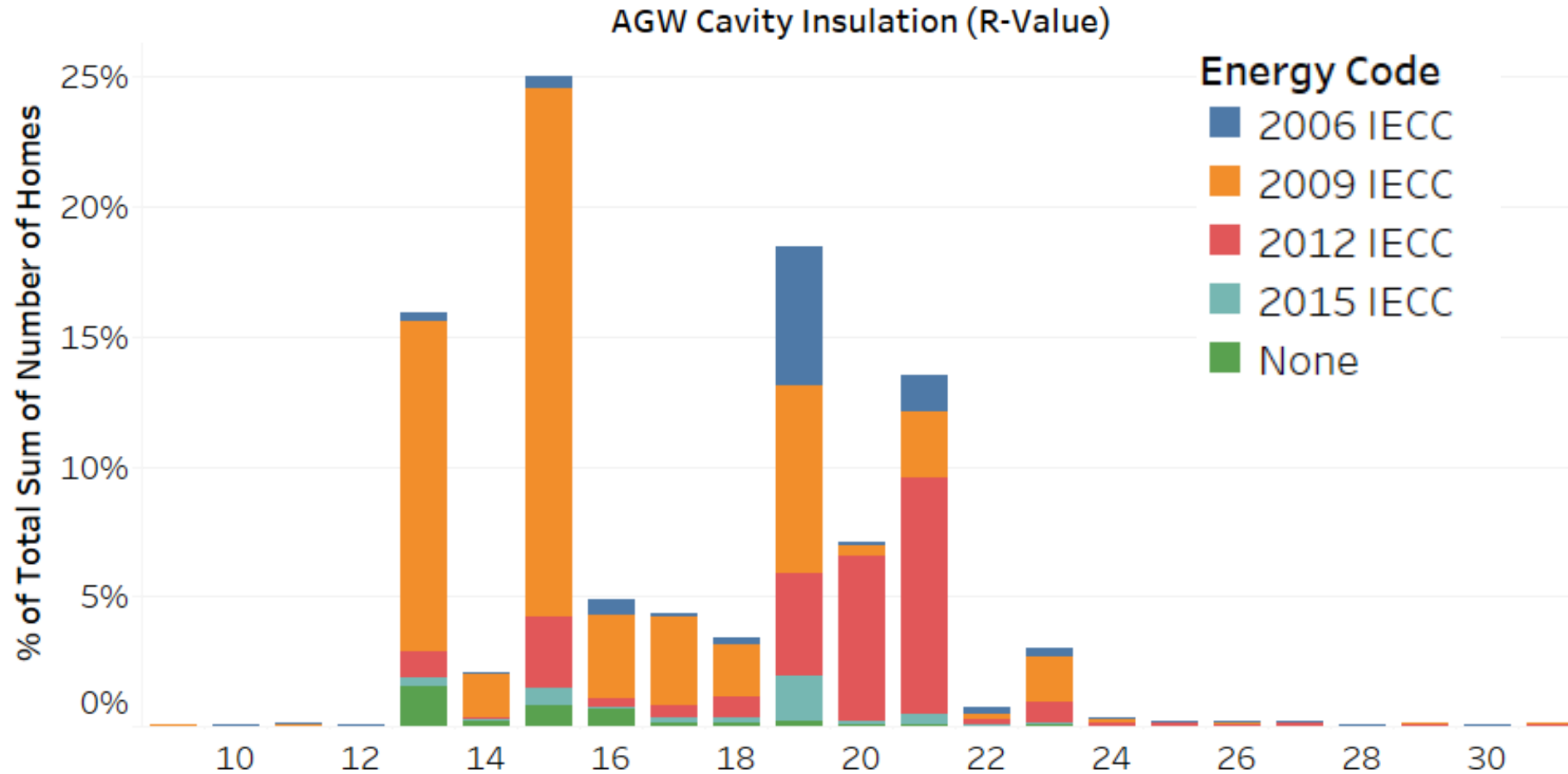
Average HERS score

By State



Above Grade Wall Insulation

By Energy Code

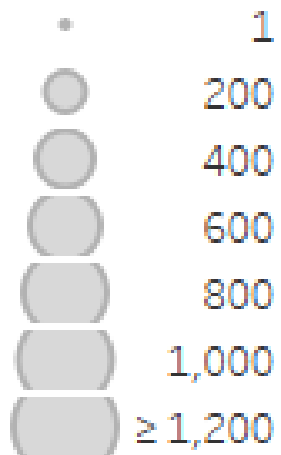


Above Grade (R-Value)

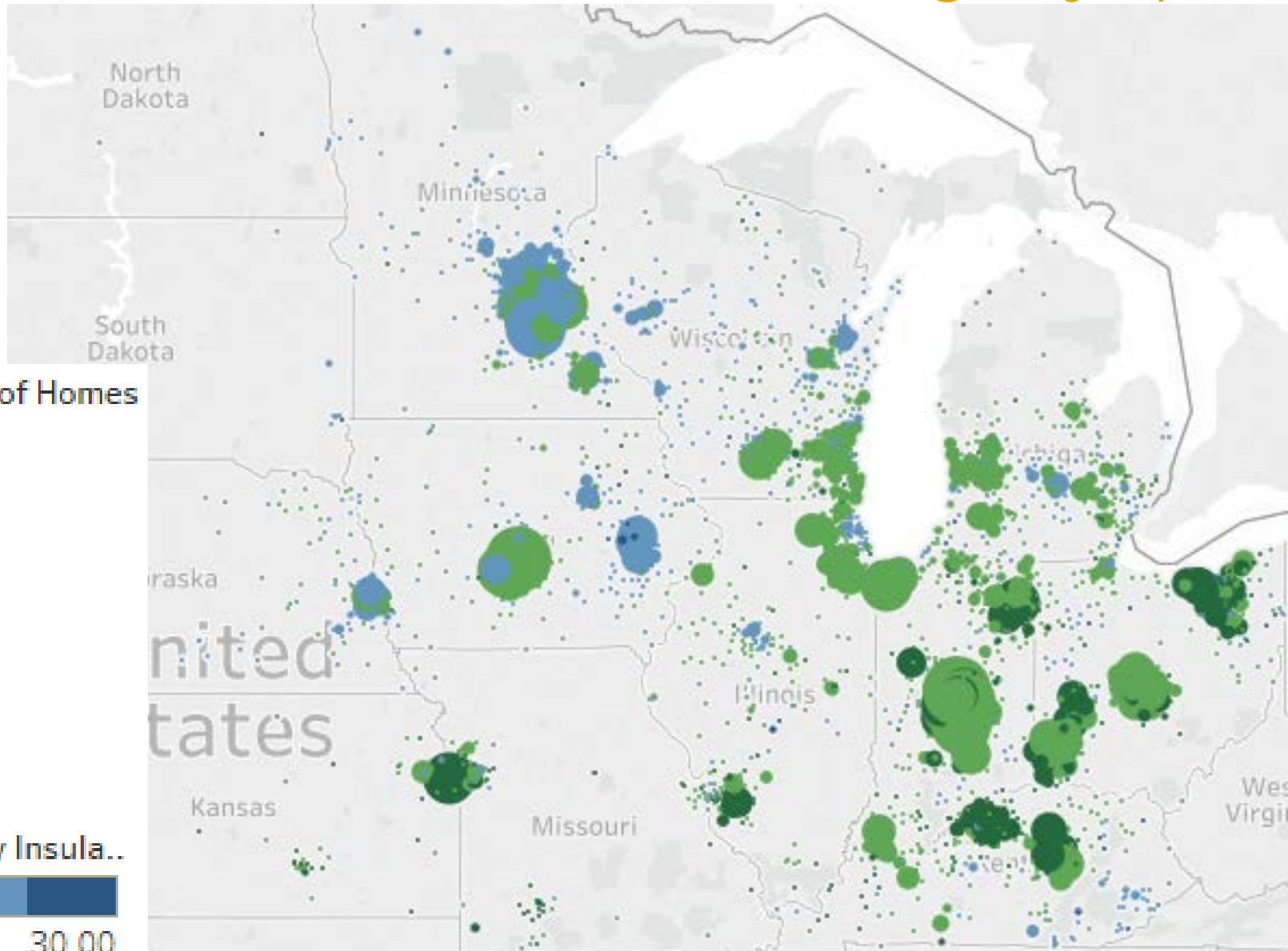
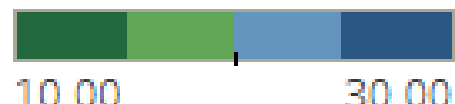
Average by Zip



Sum of Number of Homes



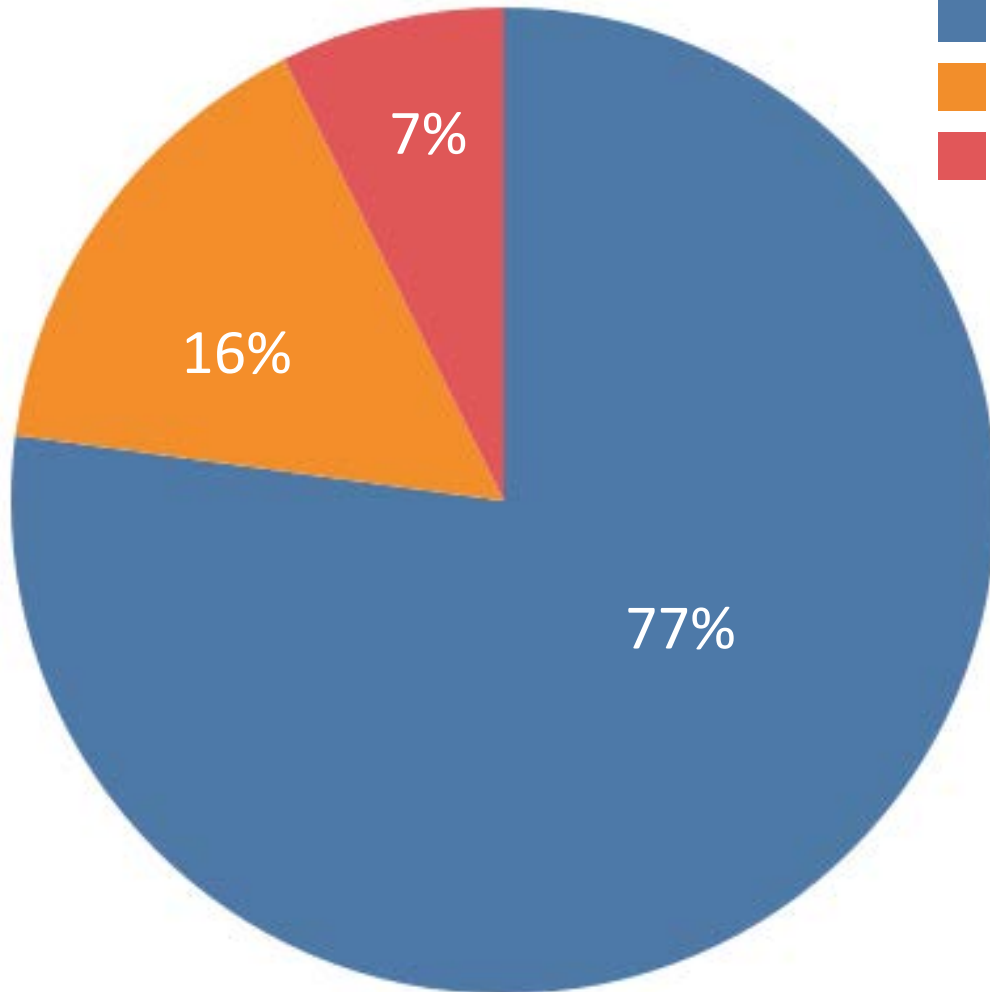
Avg. AGW Cavity Insula..



Insulation Installation

All Midwest

Insulation Installation Quality

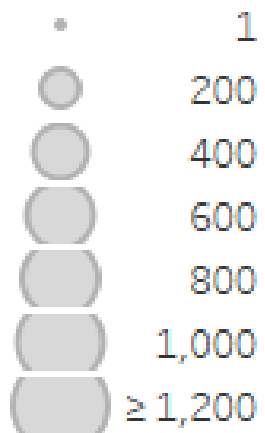


AGW Insulation Installation

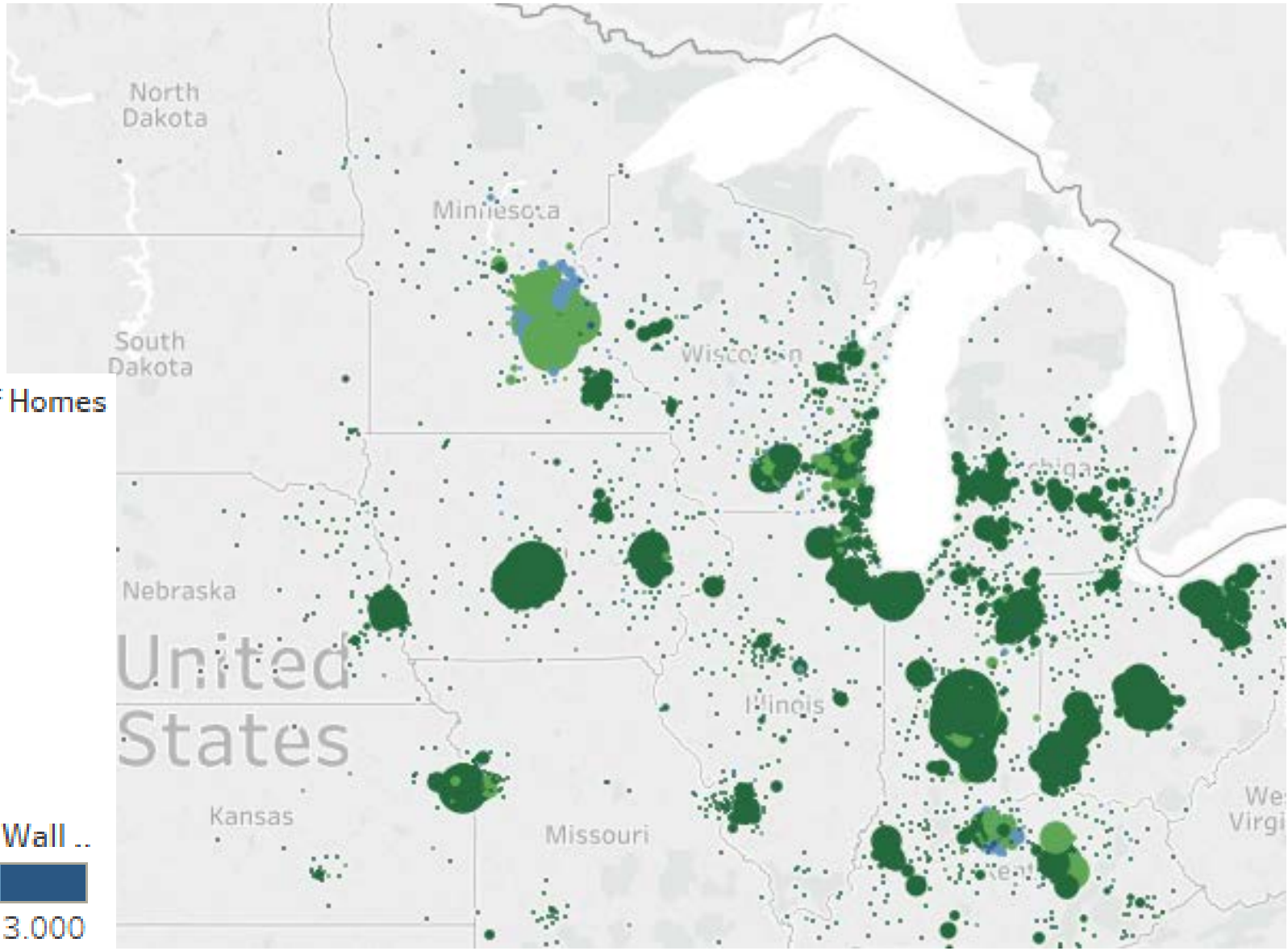
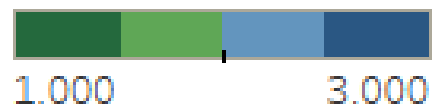
Average by Zip



Sum of Number of Homes



Avg. Above Grade Wall ...

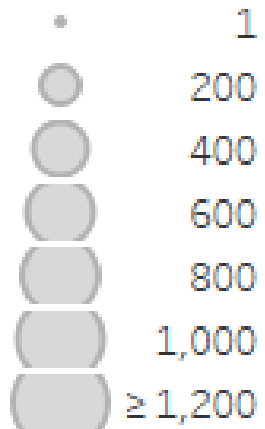


AGW Insulation Installation

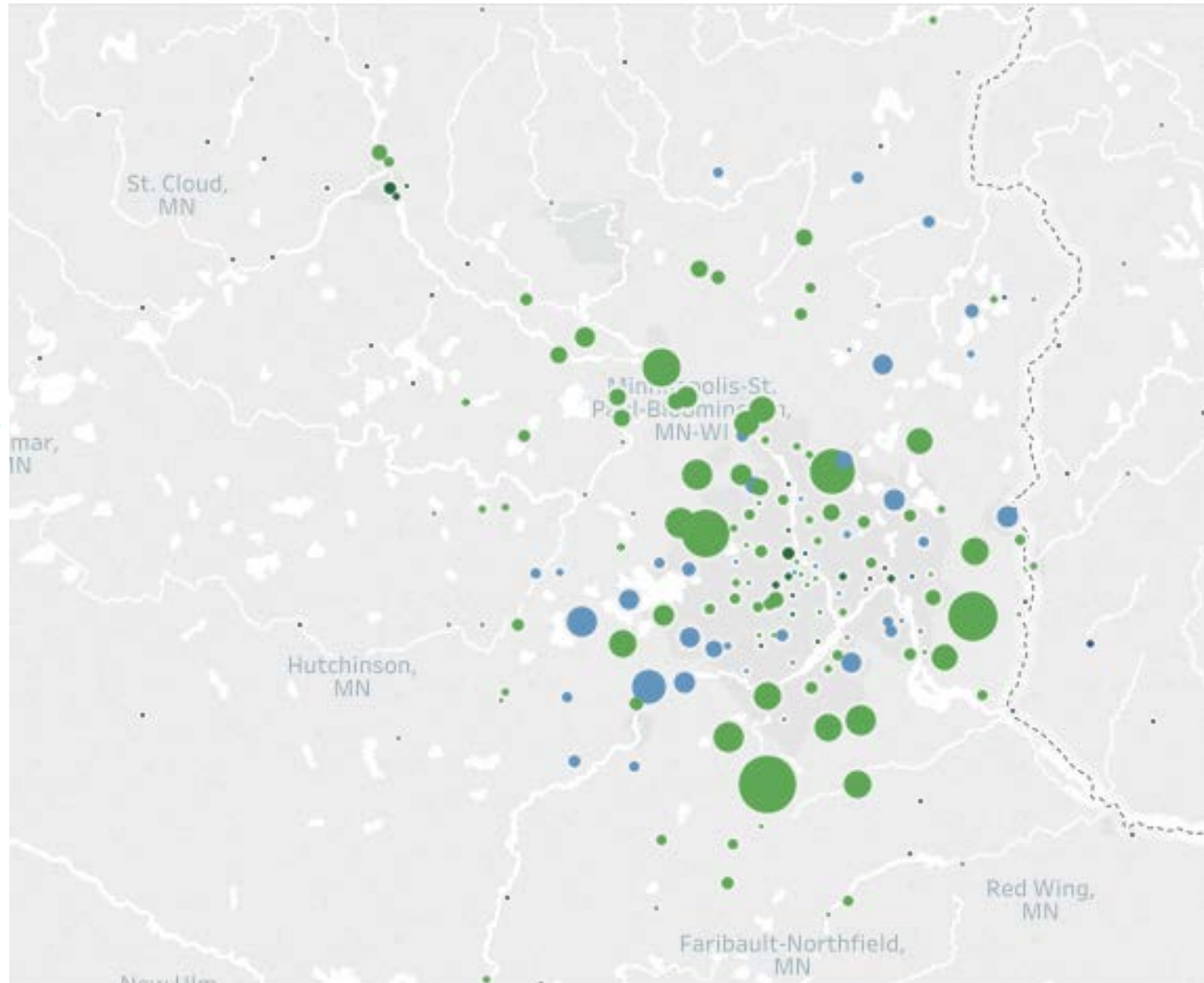
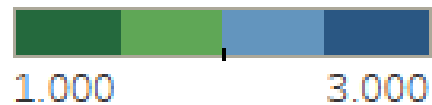
Areas of Non-Compliance



Sum of Number of Homes



Avg. Above Grade Wall ..



Ceiling Insulation

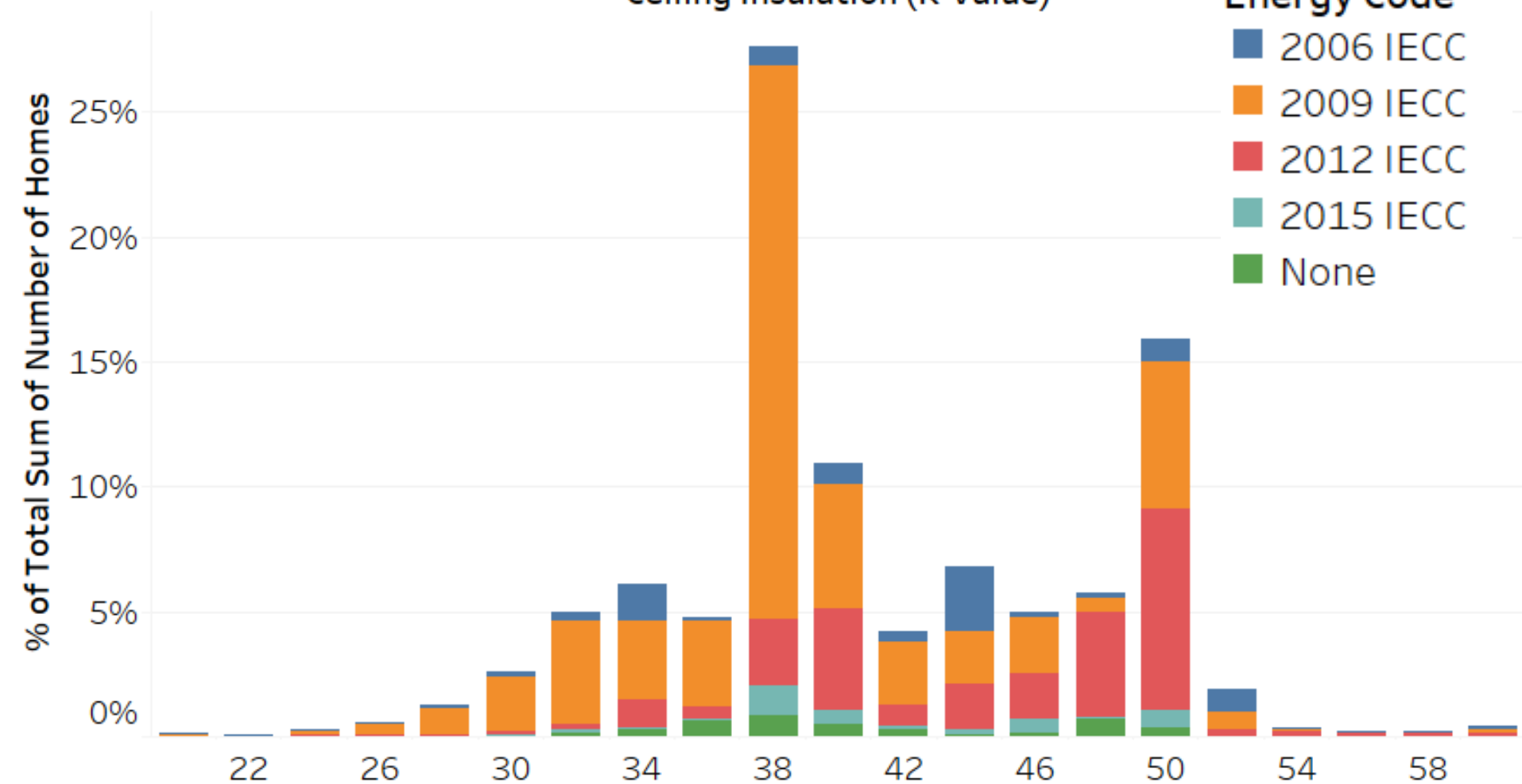
By Energy Code



Ceiling Insulation (R-Value)

Energy Code

- 2006 IECC
- 2009 IECC
- 2012 IECC
- 2015 IECC
- None

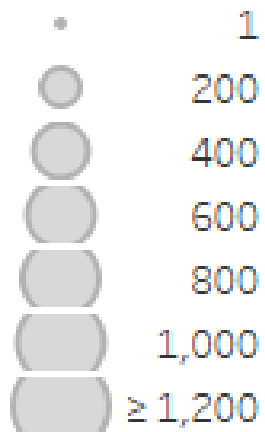


Ceiling Insulation (R-Value)

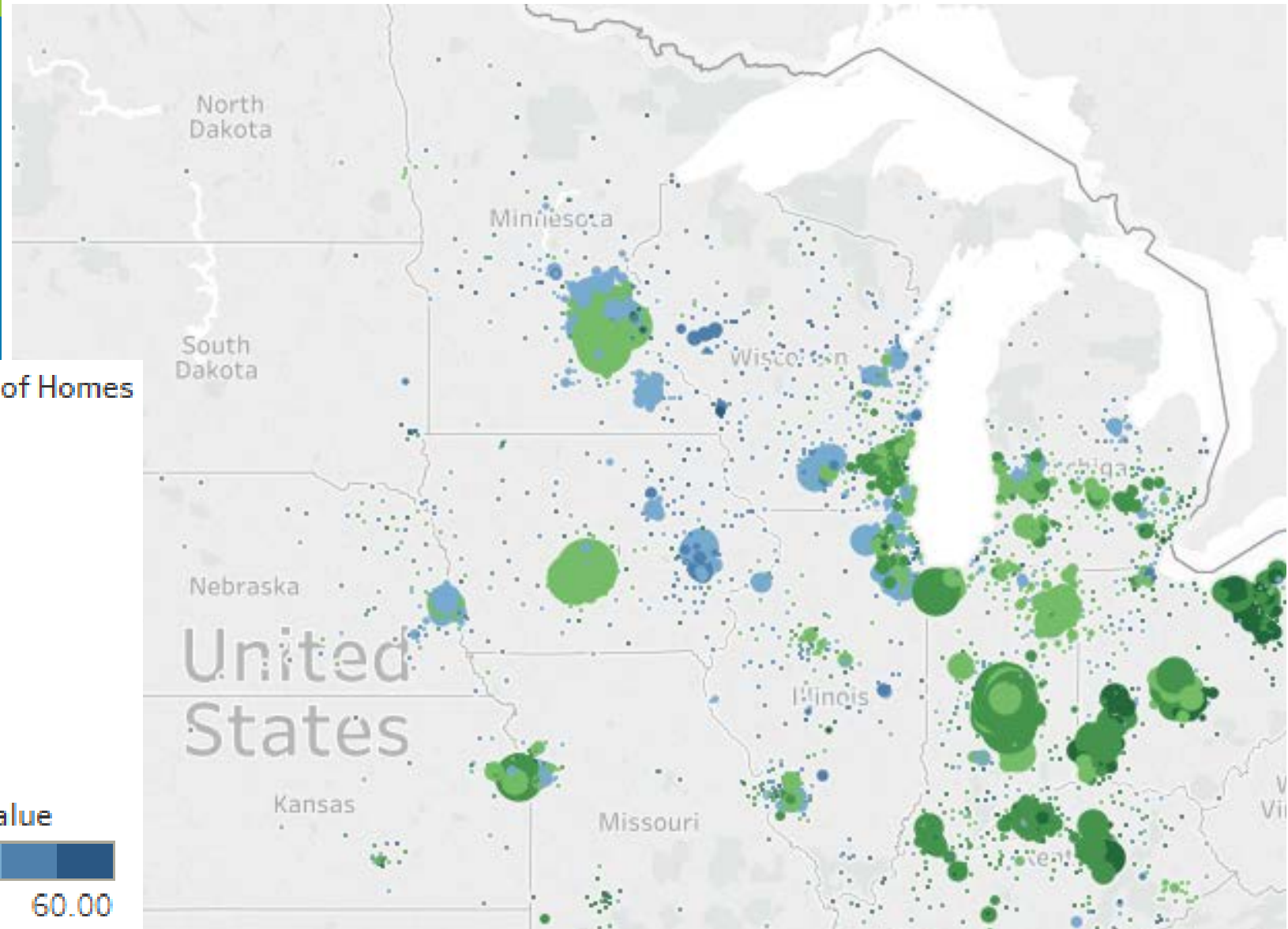
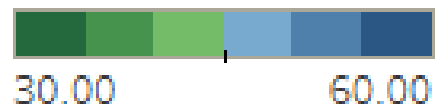
Average by Zip



Sum of Number of Homes



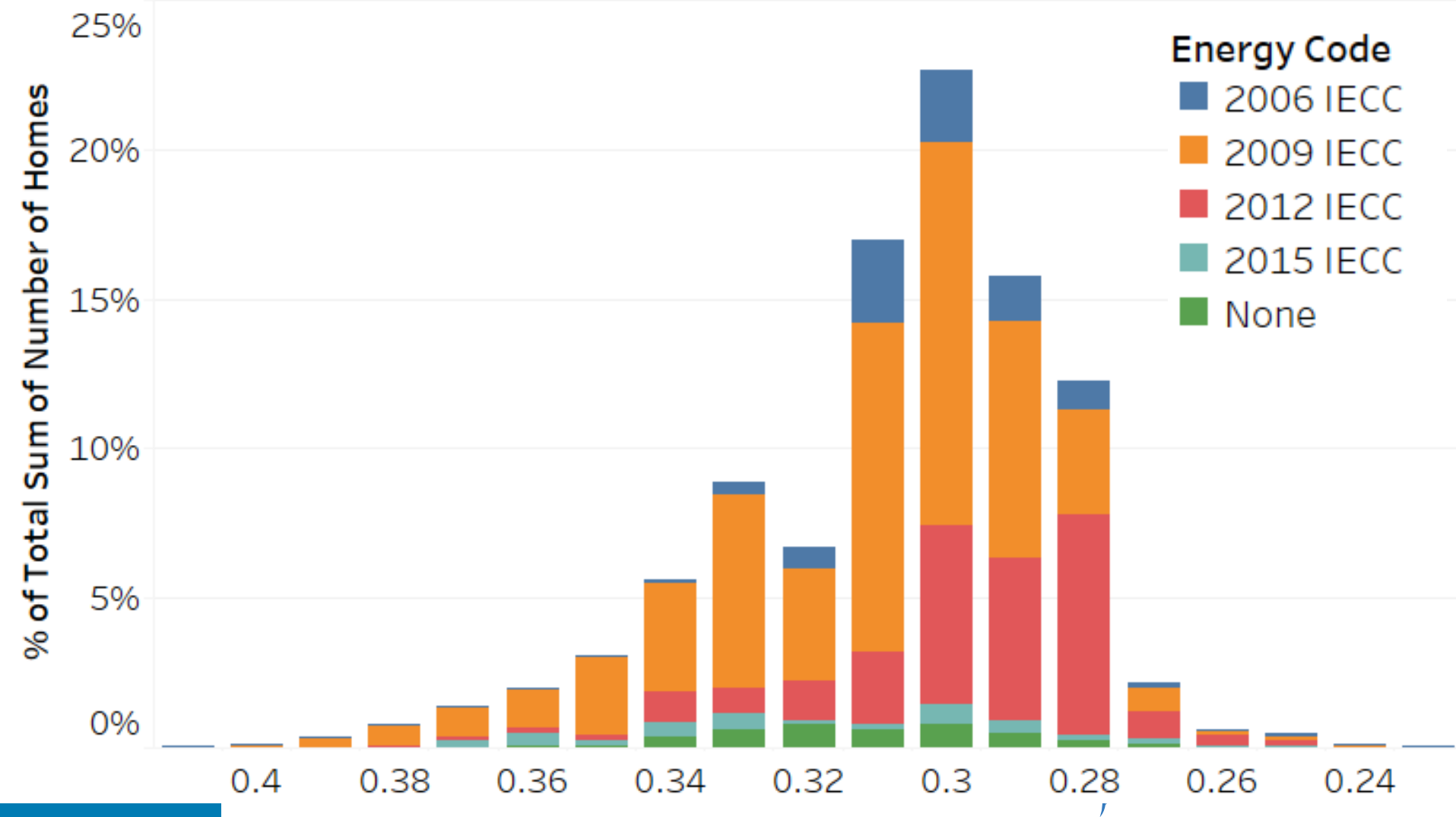
Avg. Ceiling R Value



Window Efficiency (U-Factor)

By Energy Code

Window Efficiency (U-Factor)

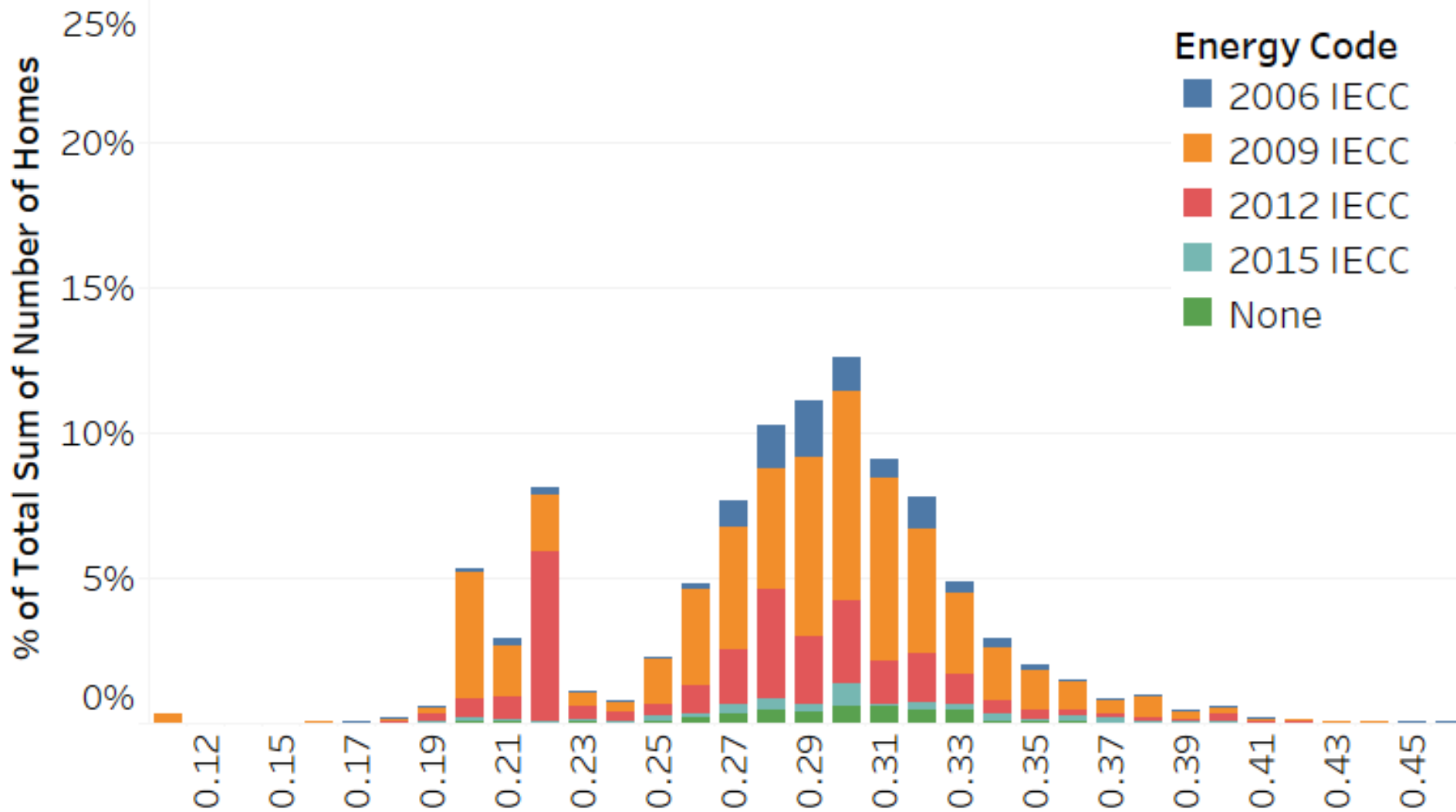


Window Efficiency (SHGC)

By Energy Code



Window Efficiency (SHGC)

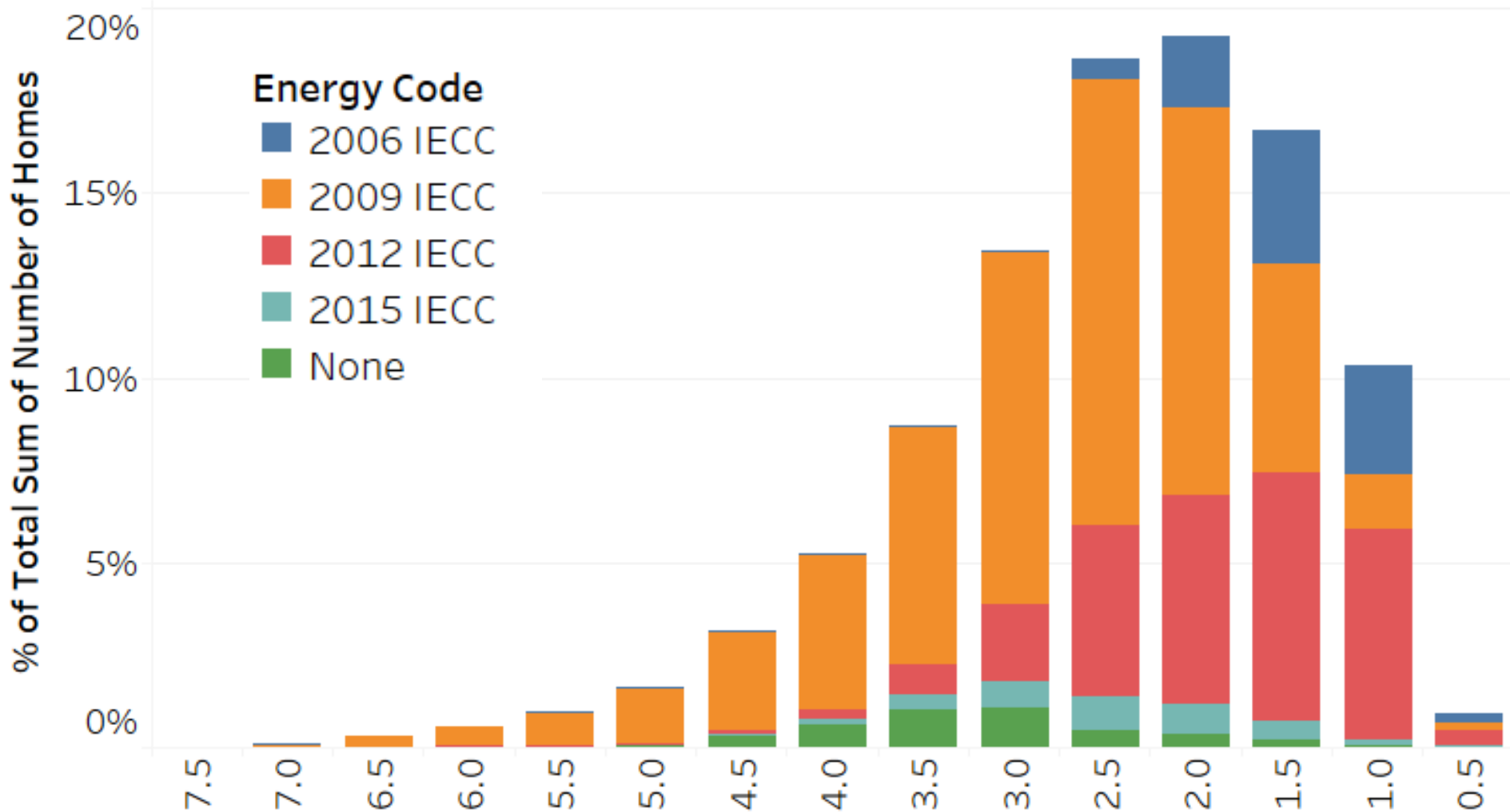


ACH50

By Energy Code



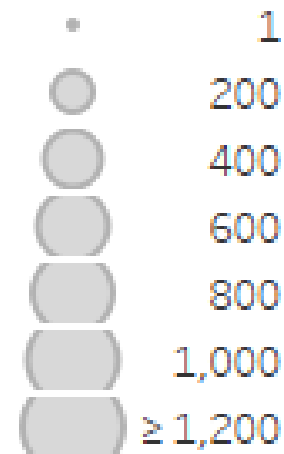
ACH50



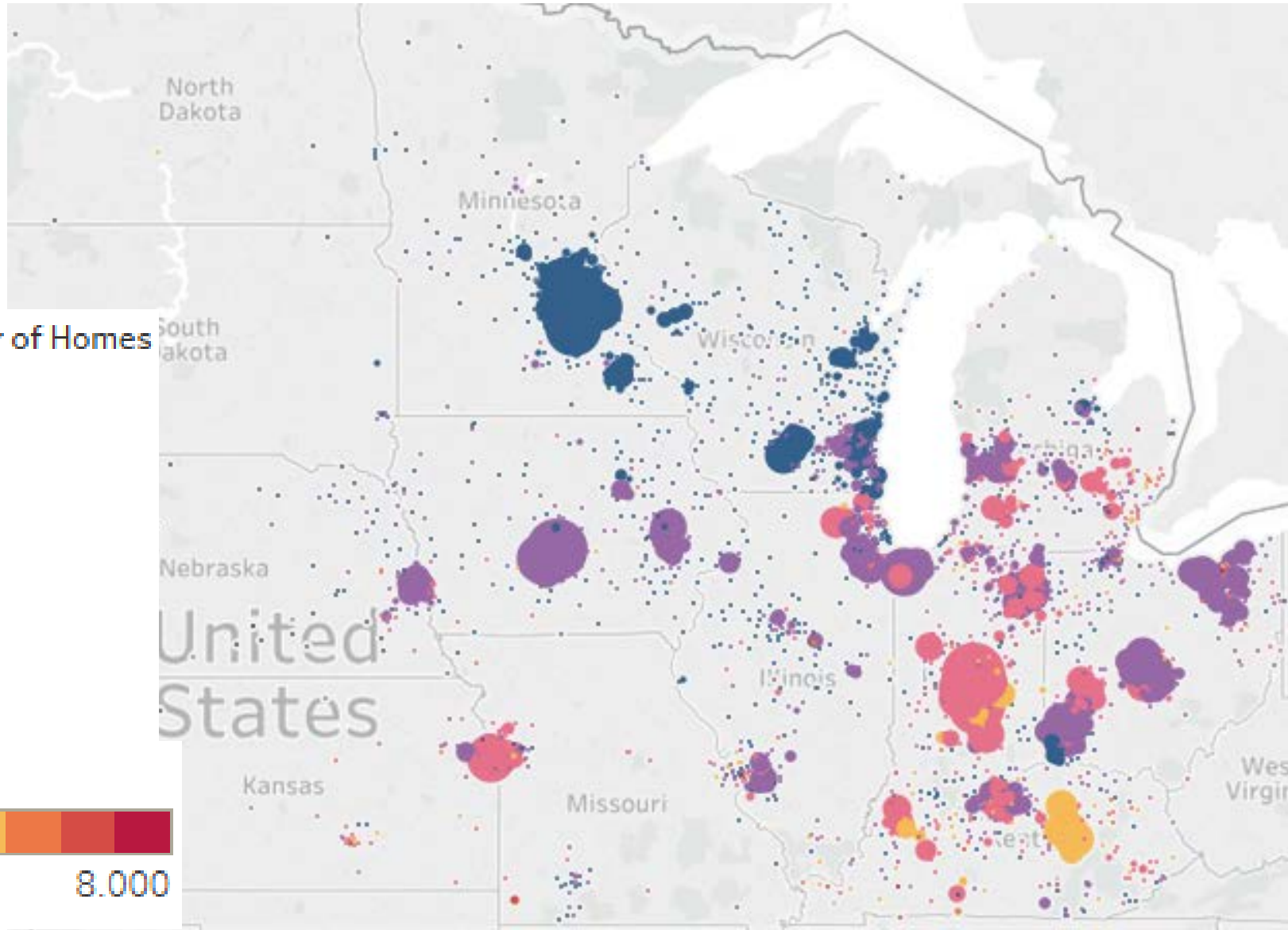
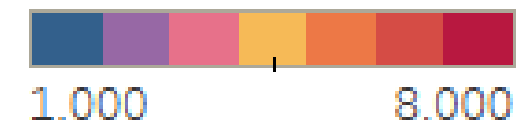
Air Sealing (ACH50) *Average by Zip*



Sum of Number of Homes

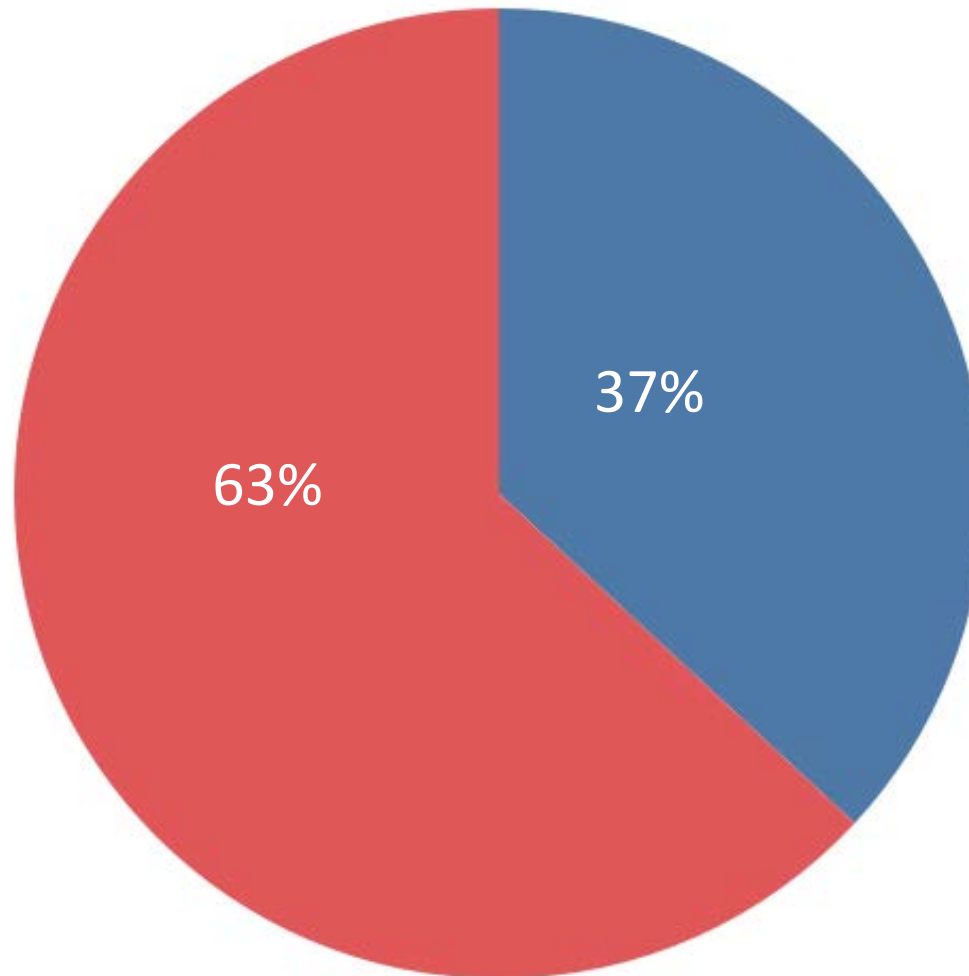


Avg. ACH50



Duct Location

All Midwest



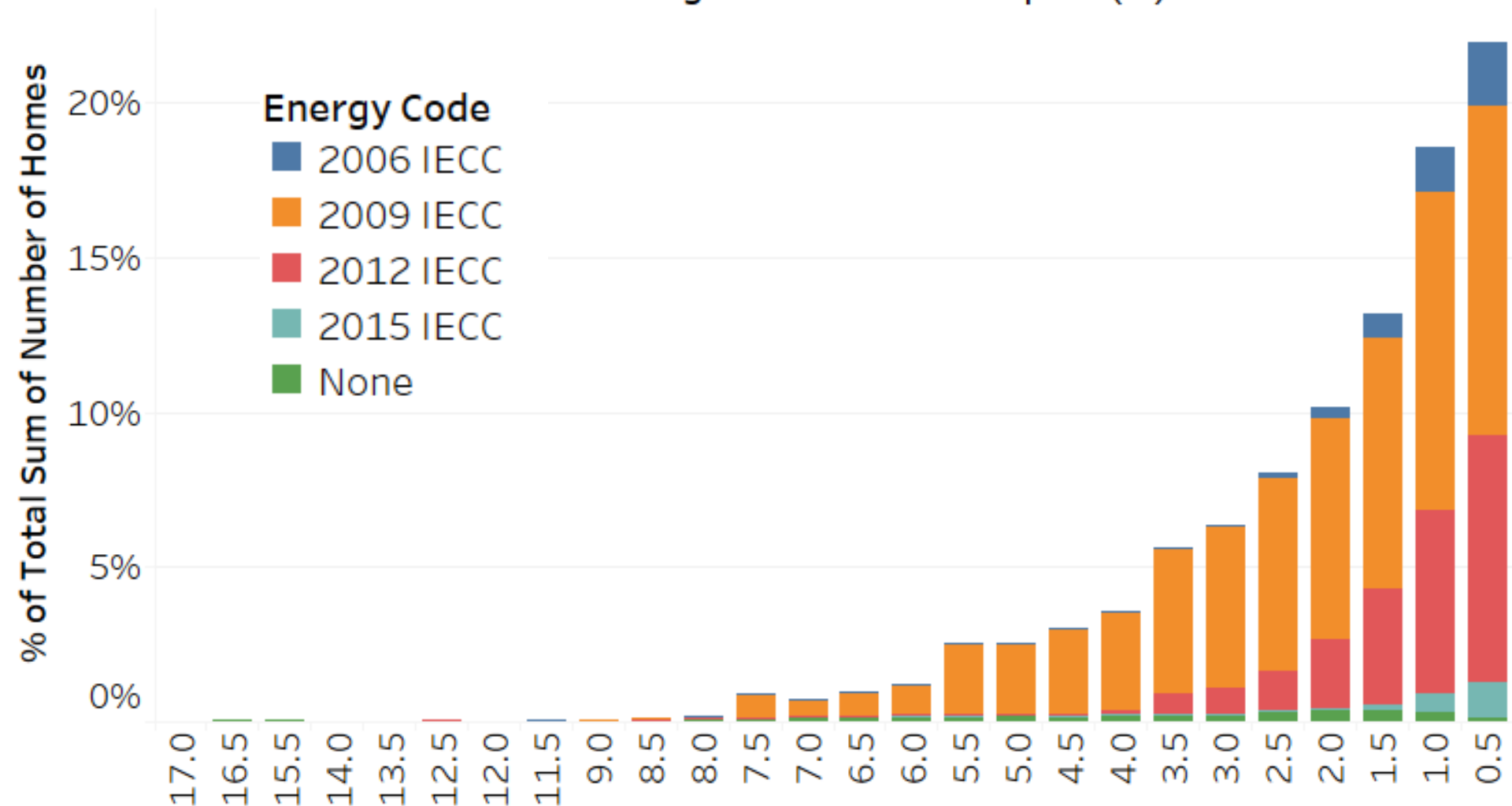
Ducts Conditioned

- Conditioned
- Unconditioned

Duct Leakage (Unconditioned)

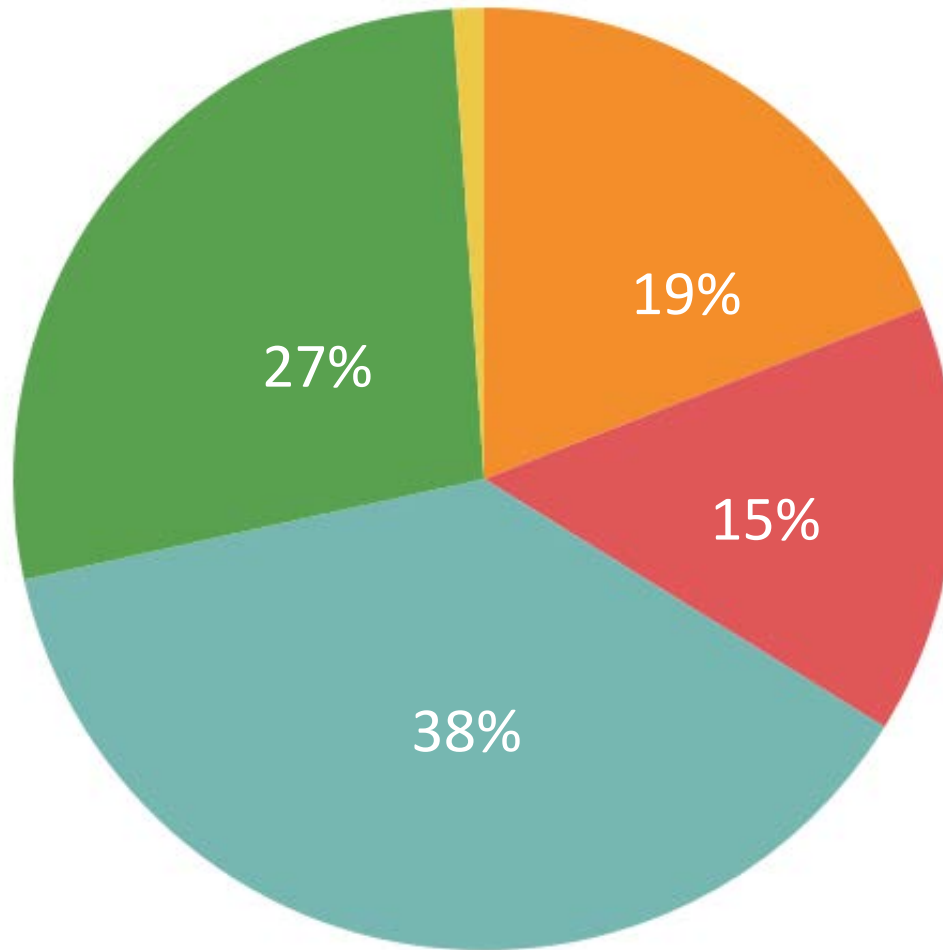
By Energy Code

Duct Leakage - Unconditioned Space (%)



Ventilation Type

Midwest



Ventilation Type

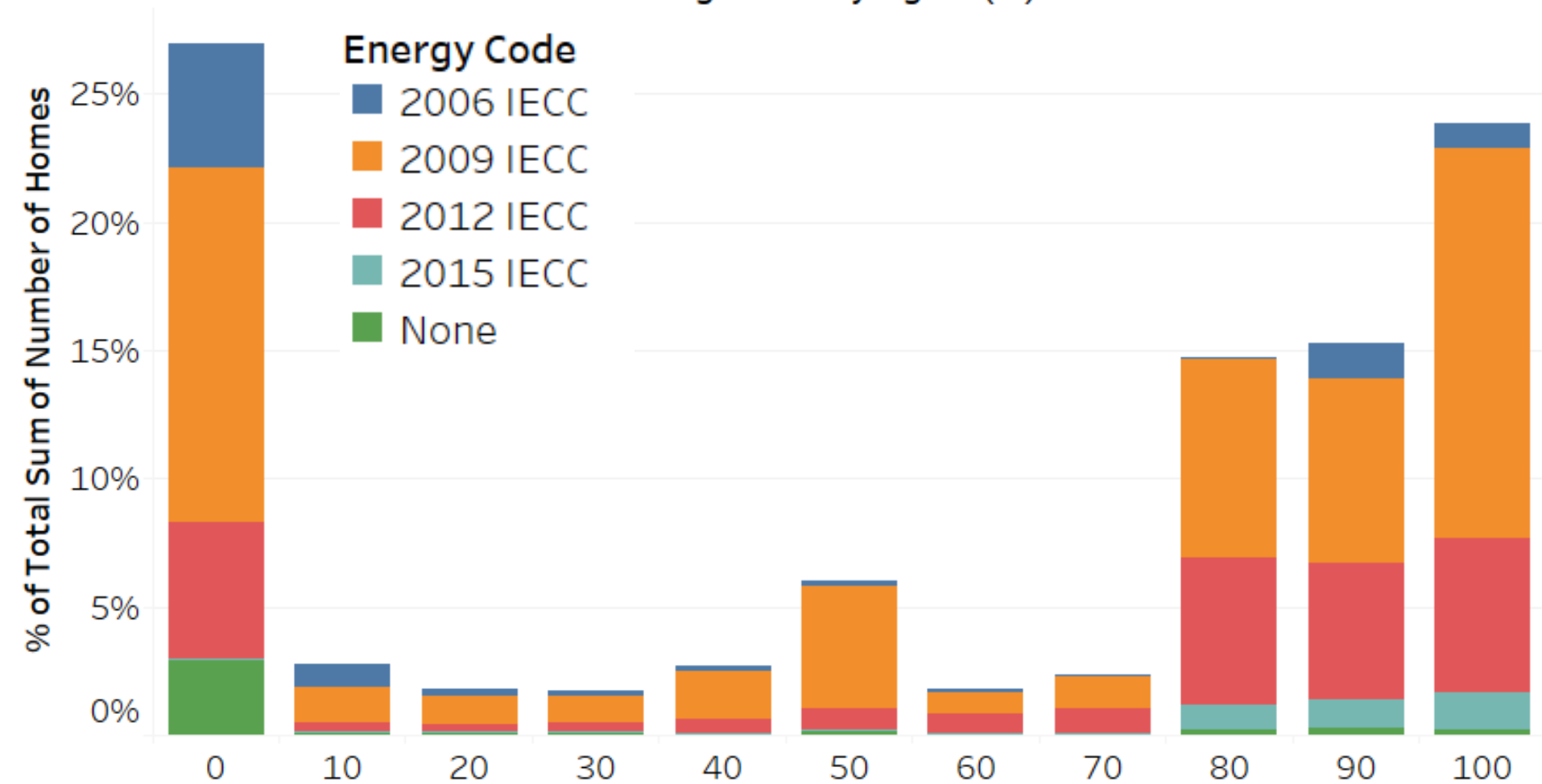
- Air Cycler
- Balanced
- Exhaust Only
- None
- Supply Only

High Efficacy Lighting (%)

By Energy Code



High Efficacy Lights (%)

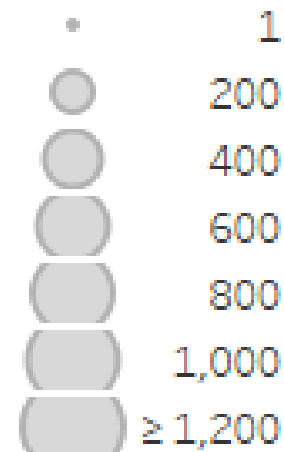


High Efficacy Lighting (%)

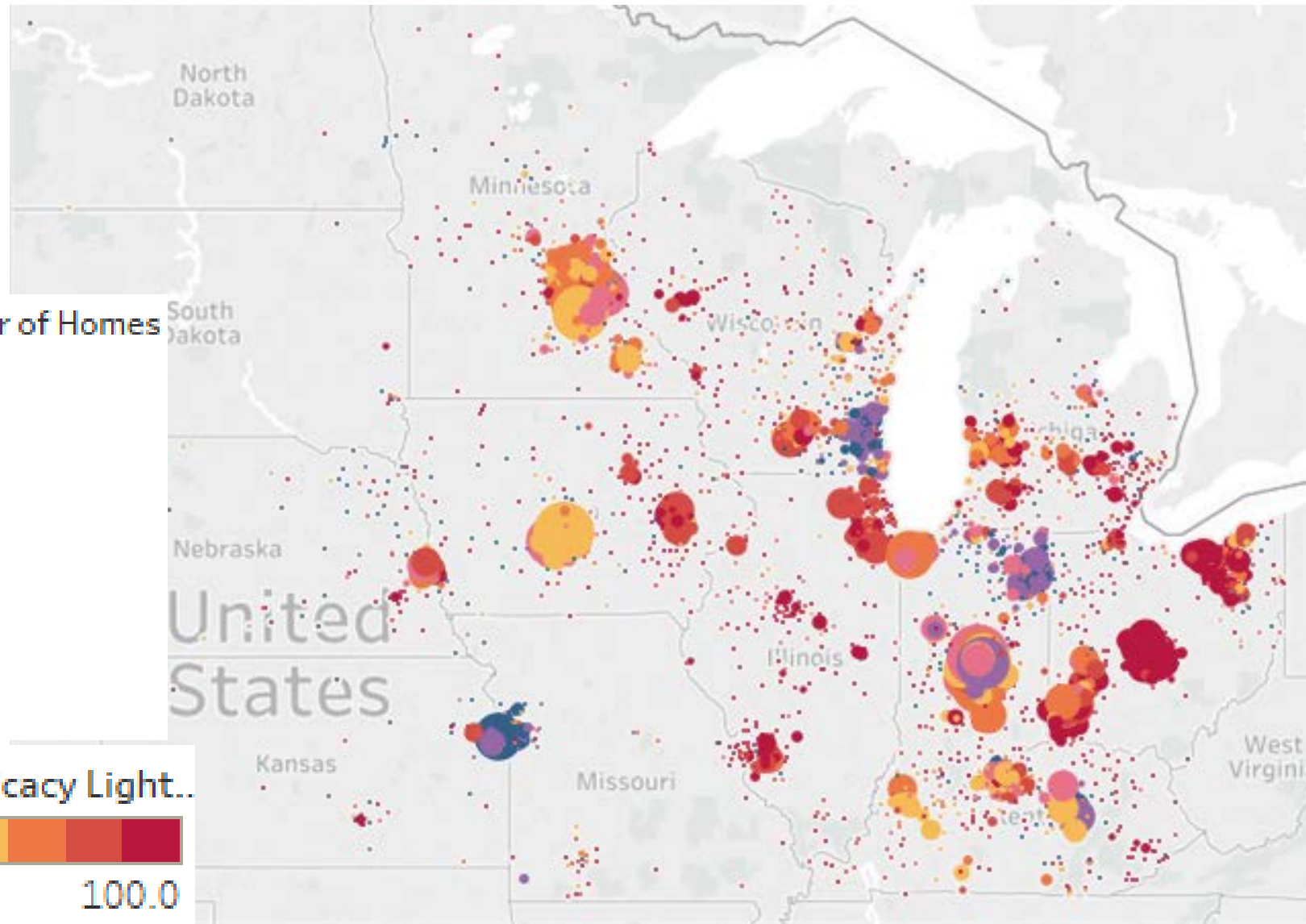
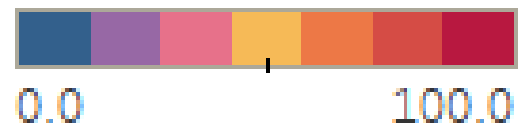
Average by Zip



Sum of Number of Homes



Avg. High Efficacy Light..

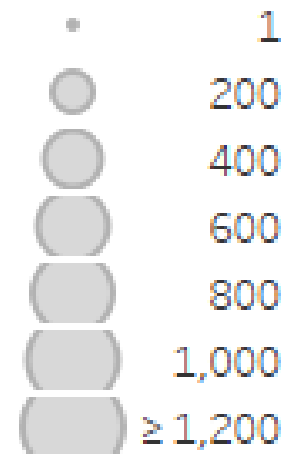


High Efficacy Lighting (%)

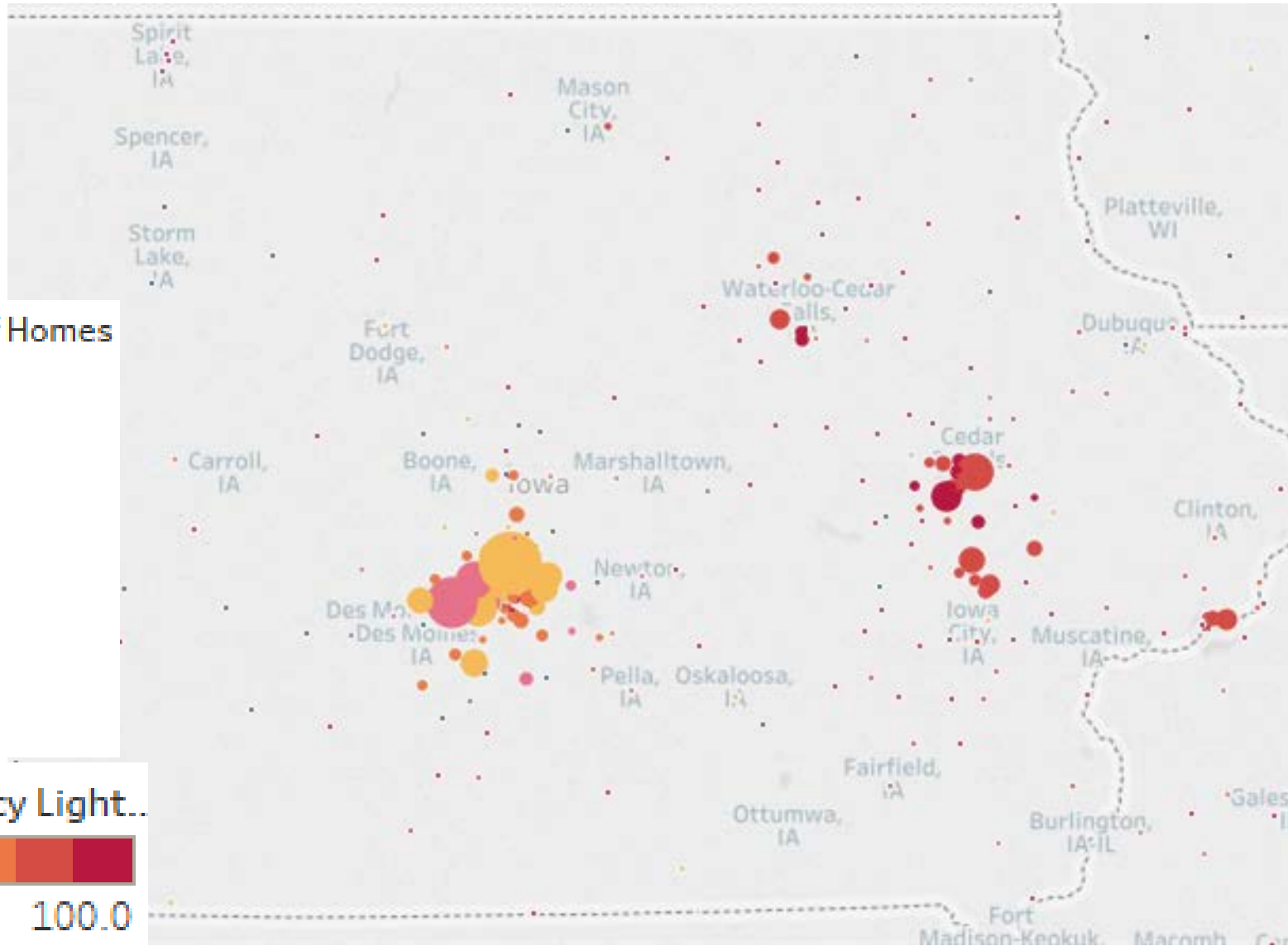
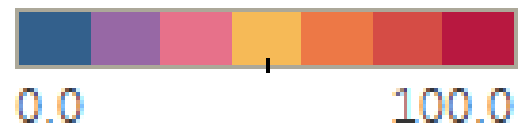
Areas of Non-compliance



Sum of Number of Homes



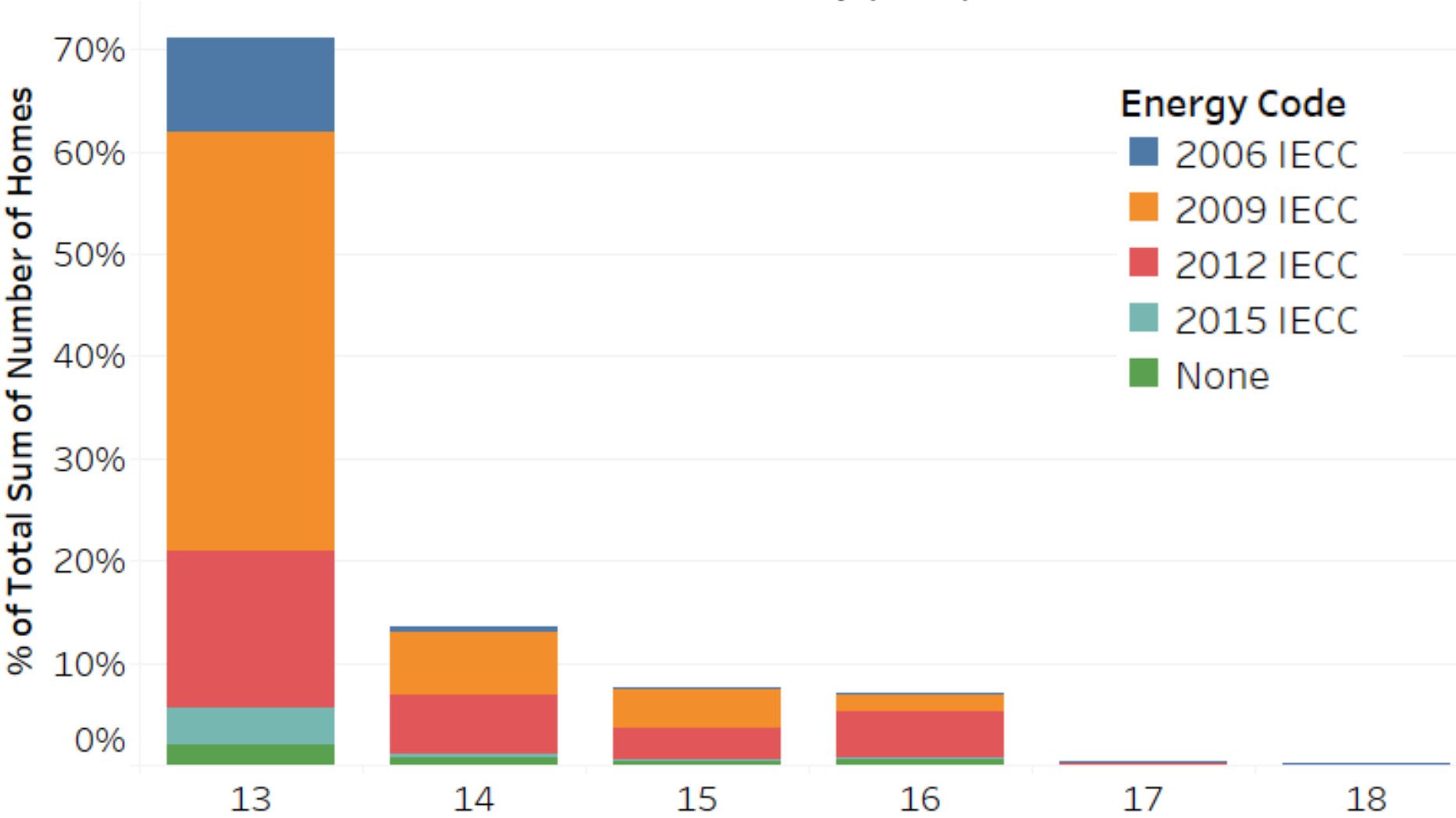
Avg. High Efficacy Light..



AC Efficiency

By Energy Code

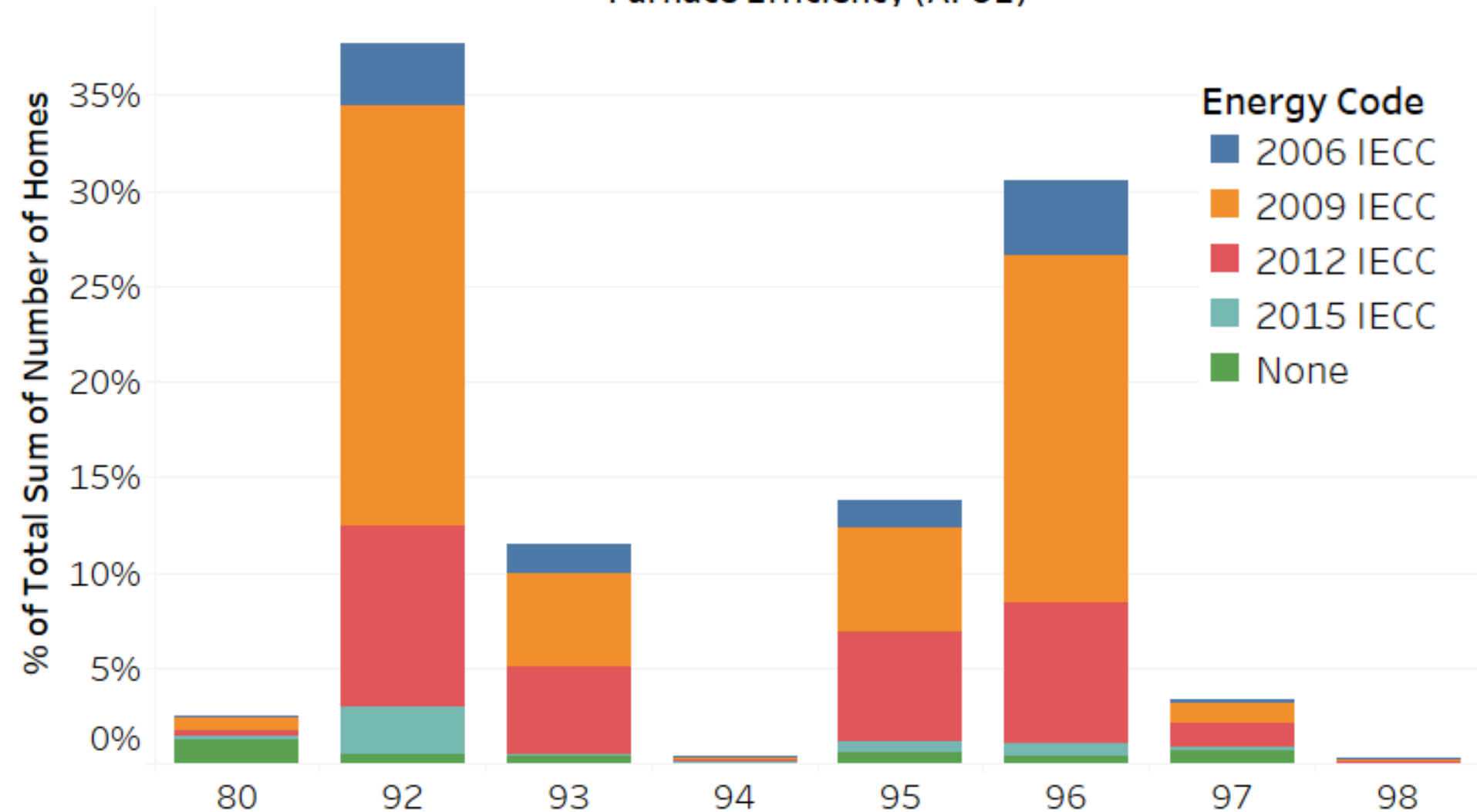
AC Efficiency (SEER)



Furnace Efficiency

By Energy Code

Furnace Efficiency (AFUE)



Conclusions

Key Takeaways

- Energy codes broadly impact efficiency measures in HERS rated homes
- HERS data can be very useful to understand code compliance – especially mandatory measures
- Data could help inform compliance studies

Conclusions

Key Takeaways

- How can jurisdictions use this data to address compliance challenges?
- Provides opportunity to geotarget compliance training or programs
- Lighting & Ventilation are key opportunity areas
- How can we work with RESNET to improve QC and make this data available for use?

Thank you!

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