

# Commercial Field Study



**Start:** October 2016

**Focus:** Office and Retail

**Major Milestones:**

- Completion of Sampling Plan
- Completion of data collection methodology, protocol and forms.
- Pilot of protocol
- Commence data collection

**Current Progress:** 50% data collected.

**Next Steps:** Analyze data, continue data collection and draft education materials

# Goals of the Field Study



Develop a replicable, cost and time effective methodology for states to evaluate code compliance in commercial buildings.

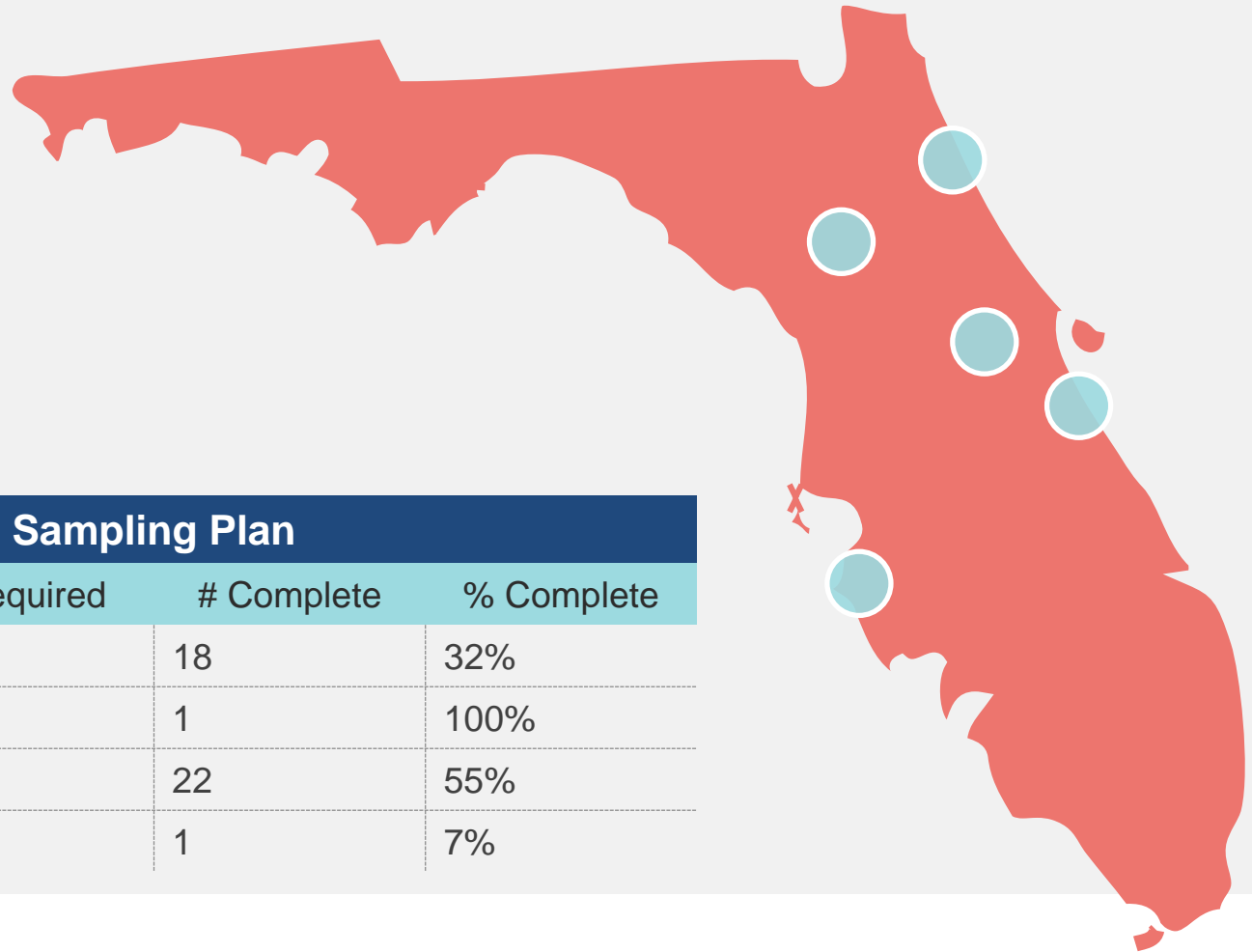


Construct a data set across target climate zones and states to test and refine the methodology.



Develop training materials based on findings that can be leveraged by future education and outreach activities.

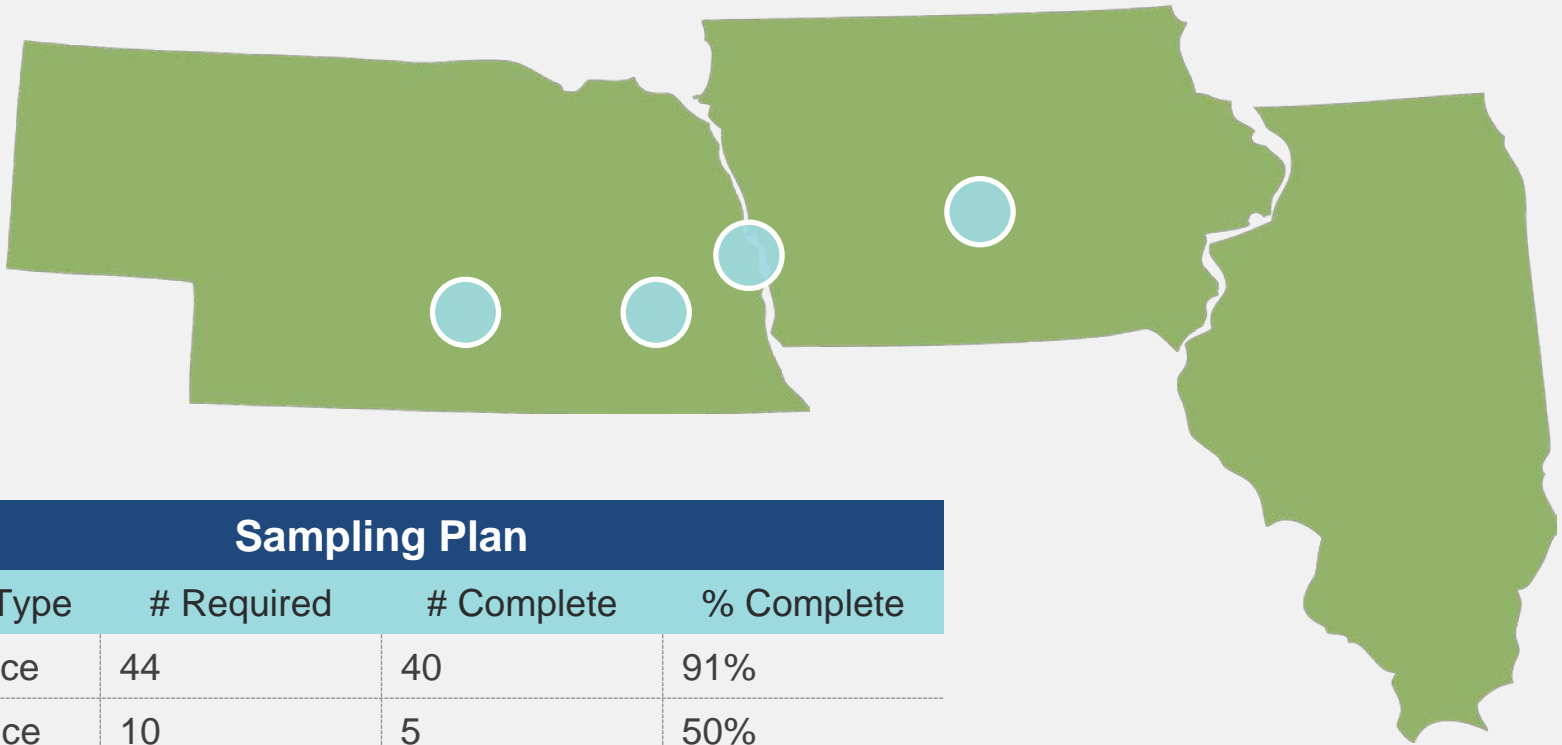
# Study Areas : CZ2A



## Sampling Plan

Building Type	# Required	# Complete	% Complete
Small Office	56	18	32%
Large Office	1	1	100%
Small Retail	40	22	55%
Large Retail	14	1	7%

# Study Areas : CZ5A



## Sampling Plan

Building Type	# Required	# Complete	% Complete
Small Office	44	40	91%
Large Office	10	5	50%
Small Retail	46	21	45%
Large Retail	8	3	37%

# 50% Data Collection



**Data Collection Start:** July 2018

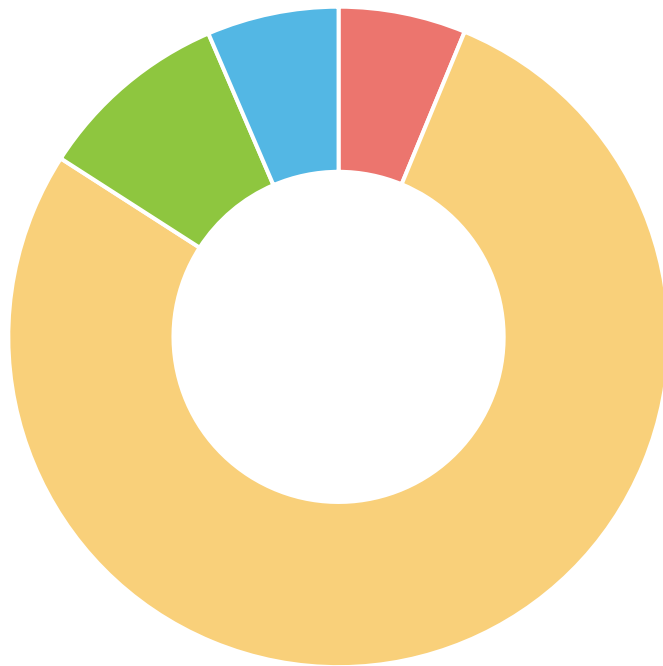
## **Continuing Work:**

- Work to fulfill sample
- Refine data collection protocol document with lessons learned

## **Major Hurdles Identified:**

- Data Entry time after site visit
- Gaps in protocol based on primary build to 2012 IECC
- Gaps in protocol based on primary build to prescriptive compliance
- Lack of specificity in protocol

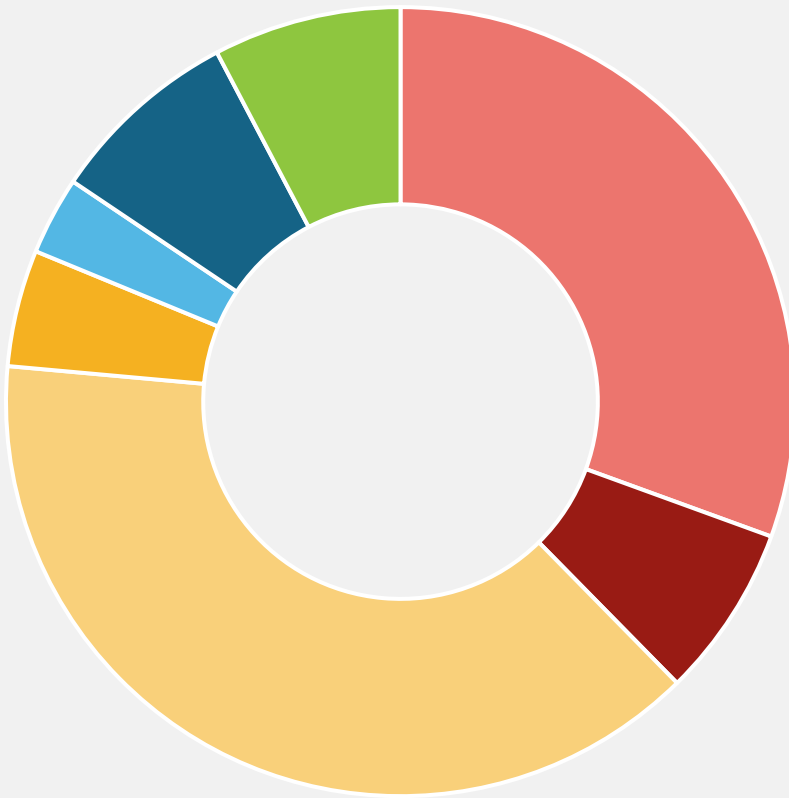
# Time/Task Breakdown



- Recruitment
- Review/Data
- Site Visit
- Other

Time Breakdown				
	2A	5A	Total	/Bldg
Recruitment	1.1	3.9	285	2.9
Review/Data Entry	22.9	44.7	1955	36.2
Site Visit	3.1	5.1	422	4.4
Other	3	3	289	3
Total	30.1	56.7	2952	46.6

# A Glimpse at PV Savings



**SQFT: 278,232**

**PV Lost: 1,271,144**

**PV/1,000 sqft: 4,568**

- Envelope
- Windows
- HVAC
- Controls
- Lighting
- Controls
- Hot Water



## What's Next?

**End:** March 2020

**Major Milestones:**

- Complete 100% data collection
- Draft and pilot education materials
- Revise protocol based on lessons learned
- Analyze data

**Questions We're Asking:**

- Is there a “top ten”?
- Are there regional variations?
- Are there code variations (IECC/90.1)?
- Does energy modeling have a disproportionate impact?
- What else is in the data?



# Residential Field Study



**Start:** Anticipated June 1, 2019

## **Baseline Assessment:**

- Define Sample
- Collect Data
- Analysis with PNNL

## **Education + Training:**

- Review and Adapt available content
- Develop Approach + Curriculum
- Implement Training
- Assess and Adjust (mid-stream where necessary)

**First Step:** Kick off Meetings in AZ + UT

# Goals of the Field Study



Collect field data to generate baseline compliance rate across two states (Arizona and Utah)

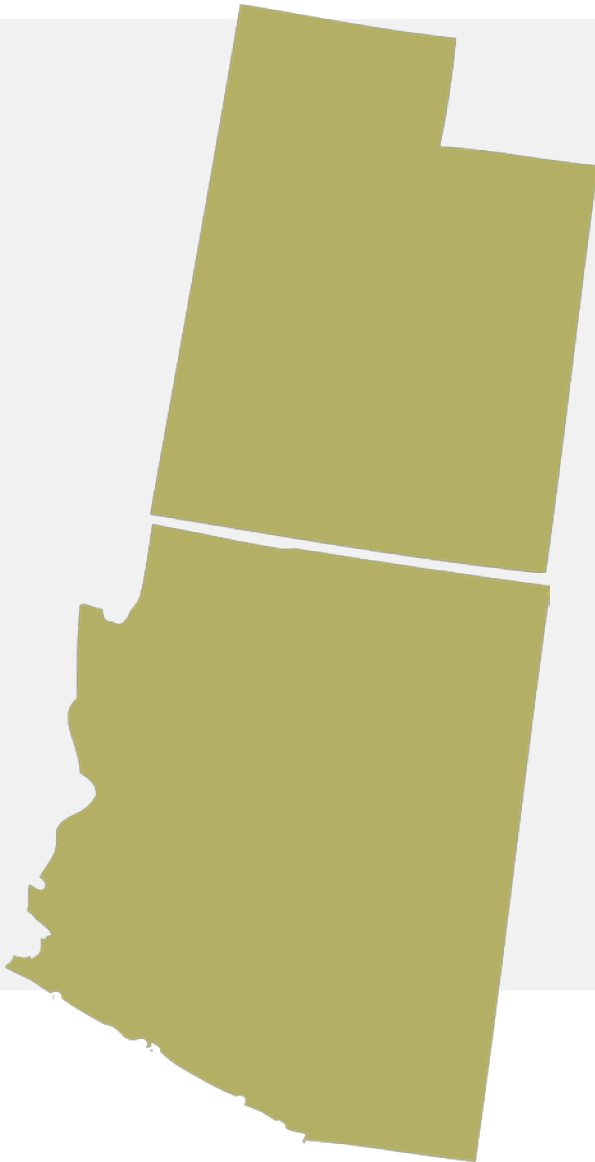


Develop targeted education programs to address key measures that will result in the largest savings



Pilot jurisdictional administrative enforcement mechanisms that may increase compliance without education

# Study Areas : Arizona and Utah



## Sampling Plan

Stage	# Required
Insulation	63
Final	63
Total	126
Full Homes	63

# Identified Key Measures

1. Envelope tightness (ACH50)
2. Window SHGC
3. Window U-factor
4. Exterior wall insulation
5. Ceiling insulation
6. High-efficiency lighting
7. Foundation insulation
8. Duct leakage

## QUESTION:

Are there other measures we want to add for Arizona and/or Utah?

# Construction Methods



Are there construction practices that are different in the west/southwest that we didn't see in the first set of studies that are important/prevalent enough to drive focus on?




STANDARD:

Wood frame cavity insulation construction.

# HVAC Sizing

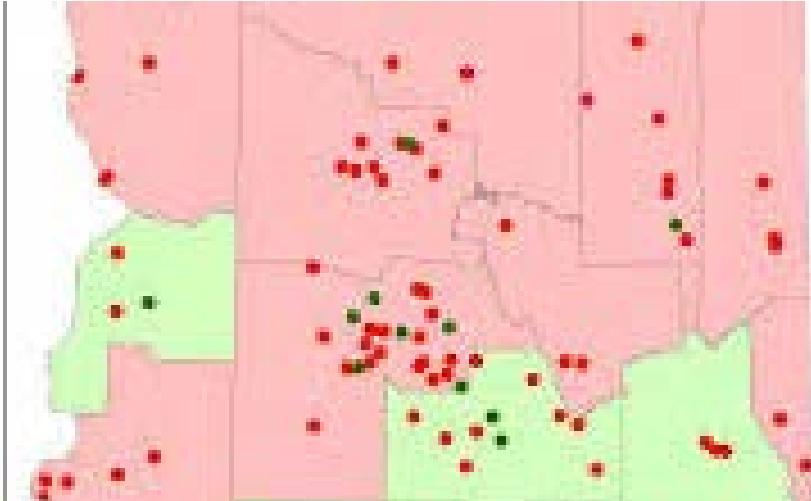


Do we have enough information on dry and hot climates enforcement and right sizing of equipment? All previous states were moist climates (A)

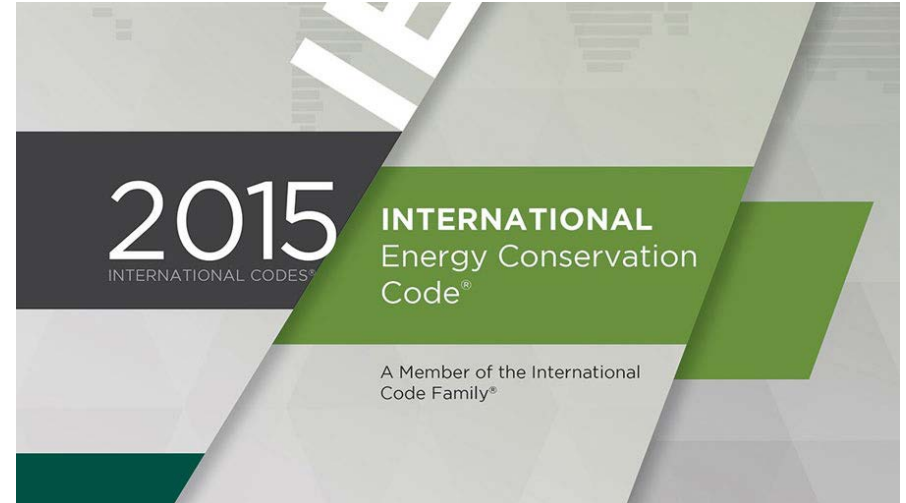
Right-J Worksheet							<<		<		prev zone	
1	 Room name Exposed wall Ceiling height Room dimensions Room area						Entire House					
2							240.0 ft					
3							8.0					
4												
5							1750.0 ft <sup>2</sup>					
Ty	Construction number <small>Select any cell then click here</small> ...	U-value	Or ...	HTM (Btu/ft <sup>2</sup> )		Area (ft <sup>2</sup> ) or perimeter (ft)		Load (Btu/h)				
				Heat	Cool	Gross	N/P/S	Heat	Cool			
6	W	15B-10afc-2	0.083	n	0.305	1.129	560	492	189	397		
		D	1D-c2ow	0.570	n	2.850	19.32	40	0	114	773	
		D	11D0	0.390	n	1.950	11.19	28	28	55	313	
		W	15B-10afc-2	0.083	e	0.305	1.129	400	368	142	303	
11		D	1D-c2ow	0.570	e	2.850	21.39	32	0	91	1965	
		W	15B-10afc-2	0.083	s	0.305	1.129	560	484	185	388	
		D	1D-c2ow	0.570	s	2.850	21.64	48	0	137	1039	

STANDARD:  
Manual J Calculation

# Impact of Home Rule



What happens when adoption is variable? Does a rising tide lift all boats?



STANDARD:

Single State Wide Code Adoption;  
Variable enforcement