



Moving Beyond Adoption : Are Buildings at 100% Compliance?

March 14 2018

A nighttime photograph of a resort building with a prominent clock tower and a large fountain in the foreground. The scene is illuminated by warm lights, and palm trees are visible in the background.

About IMT

VISION: A world in which buildings are efficiently and positively transforming our physical, social and economic well-being.

MISSION: Catalyze widespread and sustained demand for high-performing buildings.

About the Field Study



Start: October 2016

Major Milestones:

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

Current Progress: About 50% data collected.

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



Project Partners

US Department of Energy
Pacific Northwest National Lab
Institute for Market Transformation
Cadmus
University of Central Florida
Florida Solar Energy Center
Mozingo Code Group
Colorado Code Consulting
Nebraska Energy Office
University of Nebraska at Lincoln
Midwest Energy Efficiency Alliance
Southface

Goals of the Field Study



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



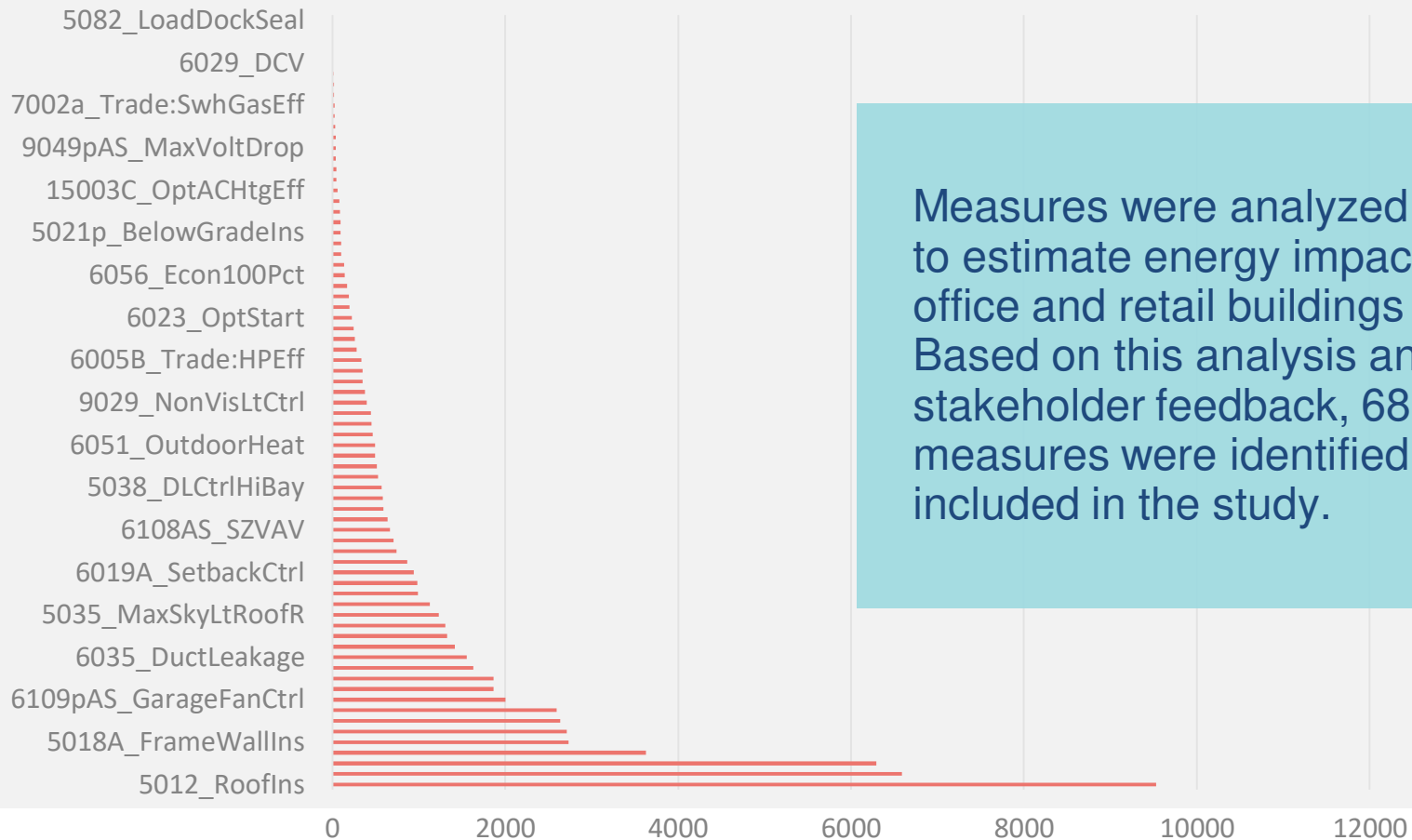
Construct a data set across target climate zones and states to test and refine the methodology.



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

Expected Measure Impact

PV of Lost Cost Savings per 1,000 ft2



Measures were analyzed by PNNL to estimate energy impact on office and retail buildings in CZ 2A. Based on this analysis and stakeholder feedback, 68 measures were identified to be included in the study.

**Roof
Insulation:**
\$9,525

**Interior
LPD:**
\$6,587

**Automatic
Lt Controls:**
\$6,294

**Add'tl
Retail LPD:**
\$3,628

**Frame Wall
Insulation:**
\$2,729

**Duct
Insulation:**
\$2,714

**Equipment
Sizing:**
\$2,635

**Window to
Wall Area:**
\$2,594



**Interior
LPD:
\$3,636**

**Automatic
Lt Controls:
\$2,974**

**Roof
Insulation:
\$2,873**

**Equipment
Sizing:
\$2,536**

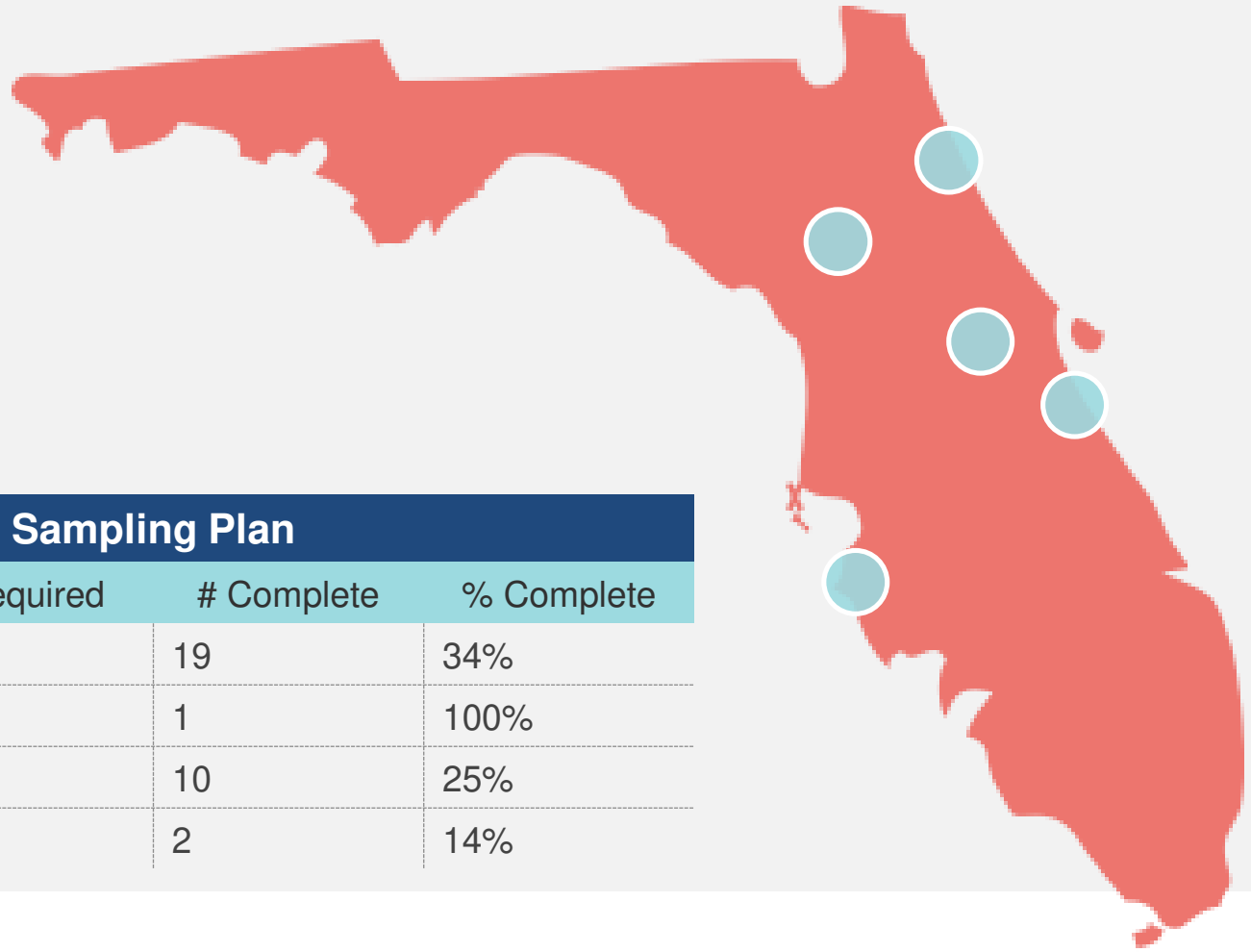
**Night Fan
Control:
\$2,065**

**Window to
Wall Area:
\$1,689**

**Manual Lt
Controls:
\$1,498**

**HVAC Pipe
Insulation:
\$1,406**

Study Areas : CZ2A



Sampling Plan

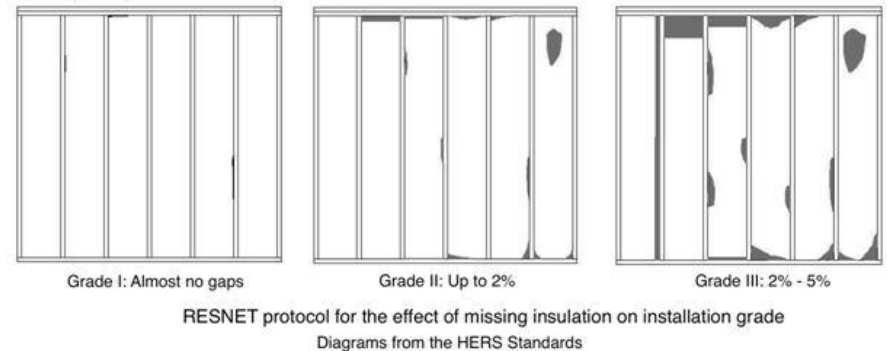
Building Type	# Required	# Complete	% Complete
Small Office	56	19	34%
Large Office	1	1	100%
Small Retail	40	10	25%
Large Retail	14	2	14%

Insulation Installation



IECC 2012 §C402.2.3

The minimum thermal resistance of the insulating materials installed in the wall cavity between framing members shall be as specified in Table C402.2



ISSUE:

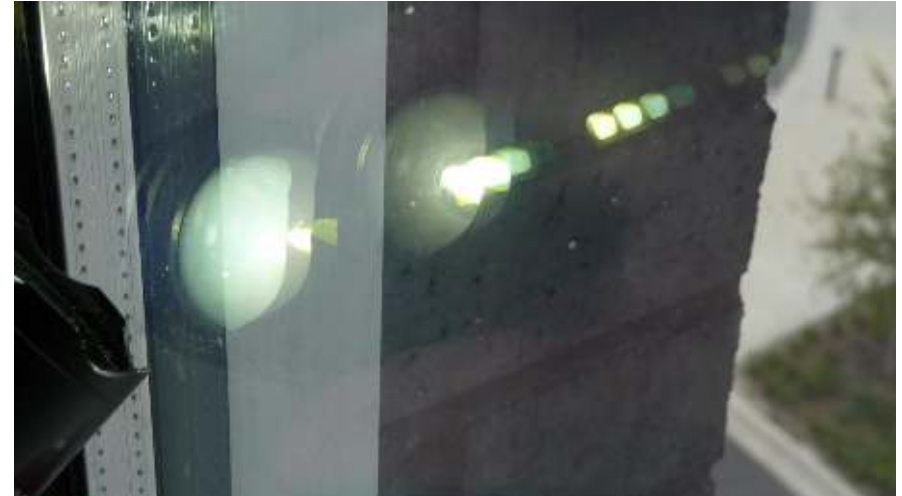
When insulation is installed with gaps, the thermal resistance (R-value) is reduced from the value listed on the material.

Fenestration Product Rating (NFRC)



IECC 2012 §C303.1.3

U-factors and SHGC of fenestration products shall be determined in accordance with NFRC and labeled by the manufacturer.



ISSUE:

Many commercial windows are field fabricated. Without a label (or a certificate) verifying the U-factor and SHGC is difficult.

HVAC Controls



IECC 2012 §C403.2.4

Each heating and cooling system shall have set point overlap restriction, setback, automatic shutdown and start up capabilities, and damper controls.



ISSUE:

Different system types allow for varying degrees of sophistication. All need to be programmed properly at building turn over to be code compliant.

Protection of HVAC Pipe Insulation



IECC 2012 §C403.2.8.1

Piping insulation exposed to weather shall be protected from damage, including that due to sunlight, moisture, equipment maintenance and wind.



ISSUE:

When insulation isn't protected from UV, it deteriorates quickly. The thermal resistance of the insulation is reduced – in some places to zero.

Automatic Lighting Controls



IECC 2012 §C405.2.2.2

Occupancy sensors shall be installed in all classrooms, conference rooms, employee break rooms, private offices, restrooms, storage rooms...



ISSUE:

When lights aren't automatically controlled, they often don't get turned off. Does the bathroom light need to be on if no one is in there?

Exterior Lighting



IECC 2012 §C405.2.4

Lighting not designated for dusk-to-dawn operation shall be controlled by a photosensor and time switch or an astronomical time switch.



IECC 2012 §C405.6.2

The total exterior lighting power allowance for all exterior building applications is the sum of the base allowance plus individual allowances.

Energy Model Coordination

Expectations



IECC 2012 §C407.5.1

The standard reference design and proposed building shall be configured and analyzed as specified in Table C407.5.1(1).

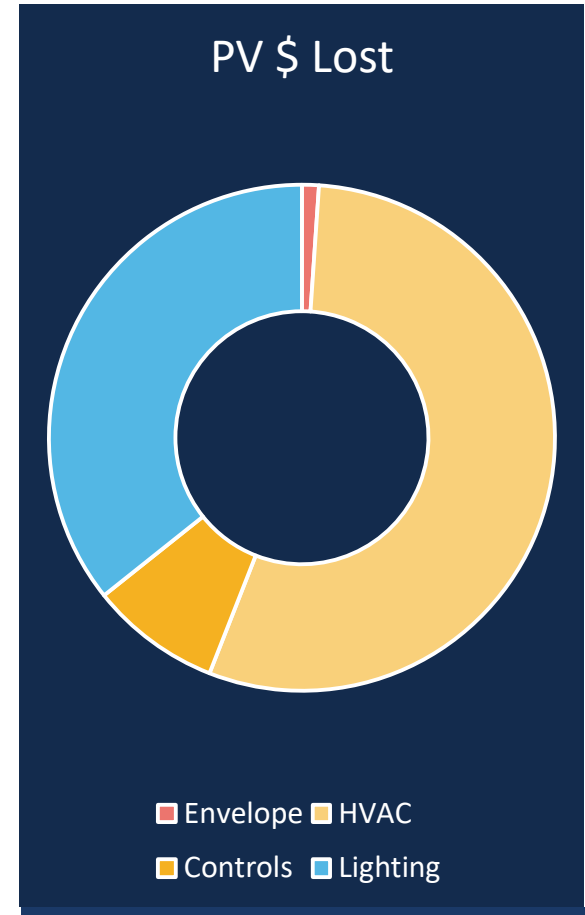
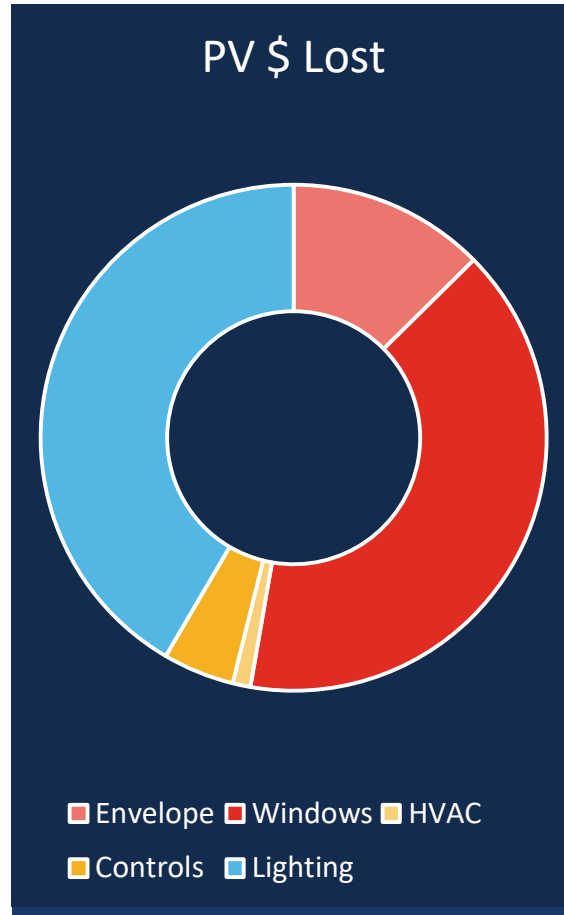
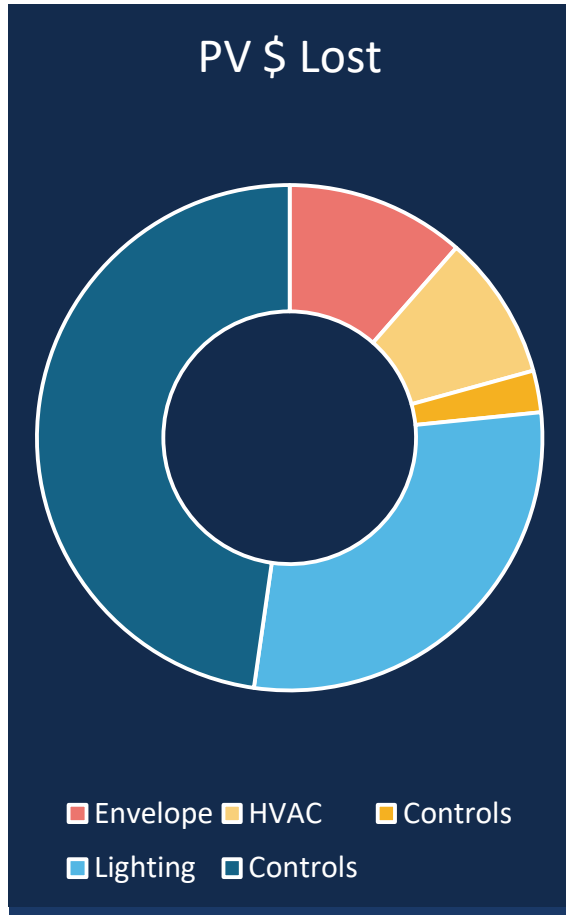
Reality



ISSUE:

Table C407.5.1(1) includes a number of references to “as designed”. Where the model and the drawings diverge, the energy model is no longer valid.

What Does This Mean for Savings?



What Does This Mean for Moving Beyond the Model Code?



The potential to realize the full savings of an updated energy code is diminished. The promise of savings to owners will not be achievable.



Energy savings and associated carbon emissions reductions in buildings relied upon for climate goals cannot be verified in city calculations.



Tools, training, and political will to enforce code measures that aren't understood or popular are needed in our building departments to fix this.

What key resilience items may need additional focus?

ENVELOPE:

- Window Area
- Passive Survivability

HVAC EFFICIENCY & CONTROLS:

- Allow for longer use of solar or back up energy source





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?

2021 IECC Development



MARCH 29, 2019

Deadline to join or
renew your ICC
membership.



April 28 – May 8

Committee Action
Hearings in
Albuquerque, NM



October 23 – 30

Public Comment
Hearings in Clark
County, NV

An aerial photograph of a city skyline featuring several modern skyscrapers and a bridge crossing a wide river. The sky is blue with light clouds. A semi-transparent teal box is overlaid on the right side of the image, containing text.

Questions?

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