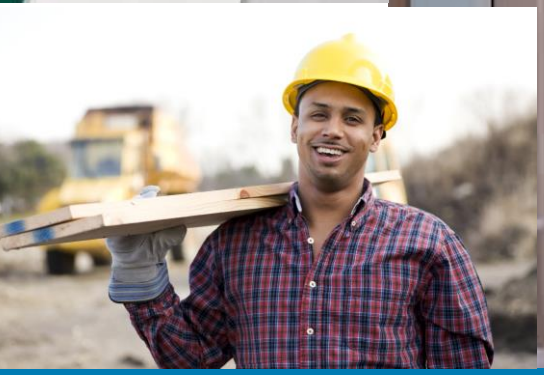

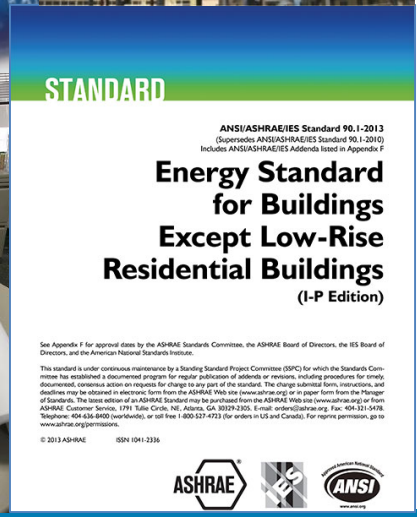

Midwest Energy Code Utility Programs

Improving Energy Code Compliance

Alison Lindburg | November 27, 2018

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Agenda

- Energy code compliance opportunity
- Benefits
- Program framework example
- Potential savings
- Midwest Project Progress
- Similar Program Examples

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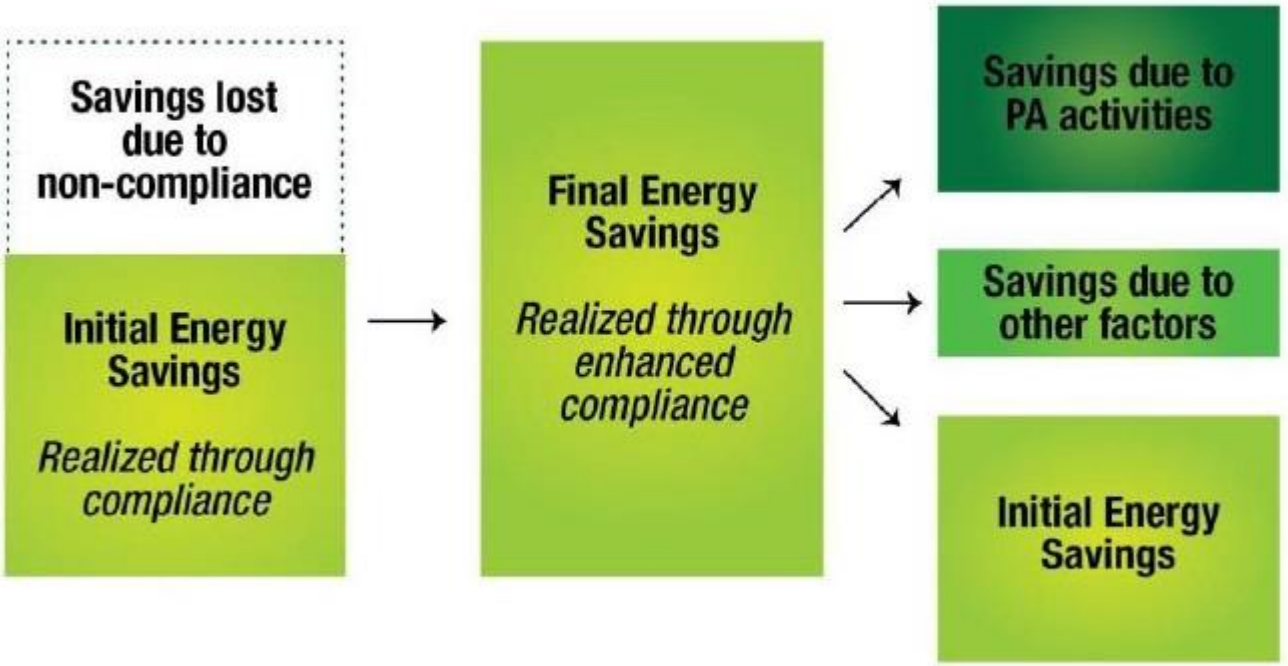
Opportunities for Claimed Savings

Energy Code Compliance



Source: Attributing Building Energy Code Savings to Energy Efficiency Programs (2013), Institute for Market Transformation, Institute for Electric Innovation, Northeast Energy Efficiency Partnerships

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Energy Code Compliance
Opportunities for Claimed Savings

- Improved energy code compliance offers **significant savings** potential
- Solid **evidence of non-compliance** in many buildings
- Unique opportunity for utilities to support improved compliance and **claim resultant savings**

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Benefits

Why utilities are interested in energy codes

- **Short term**
  - Portfolio savings
  - Less low-hanging fruit
- **Long term**
  - Ever-accruing demand savings
  - Less stress on the grid
  - Better buildings
  - Opportunity to engage customers in a new way

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Non-Energy Benefits

Opportunities for Engagement

Building Industry Engagement

- Code Officials
- Home Builders
- Subcontractors
- Manufacturers
- Supply Houses
- Homeowners
- Real Estate Community
- Architects
- Engineers

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Kentucky Program Framework

Energy Code Compliance

1. Residential Baseline Study
   - Basis for measuring improvement
   - Identifies specific compliance improvement opportunities
2. Integrated Compliance Support Program
   - Develop a suite of programs targeted at identified compliance improvement opportunities
3. Post Program Study
   - Positive results from Kentucky

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Residential Study

KY Measure-Level Analysis

Measure	Phase I Non-Compliance	Phase III Non-Compliance	*Percentage Point Improvement*
Envelope Air Leakage	32%	2%	***+30***
Ceiling Insulation (quality)	58%	40%	***+18***
Exterior Wall Insulation (quality)	66%	58%	***+8***
Foundation Insulation (R-value)	19%	30%	***-11***
Foundation Insulation (quality)	86%	76%	***+10***
High Efficacy Lighting	67%	60%	***+7***
Duct Leakage (conditioned space)	80%	65%	***+15***
Duct Leakage (unconditioned space)	32%	39%	***-7***

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KY Residential Study – Results

Measure	Phase I			Phase III		
	Total Energy Savings (MMBtu)	Total Energy Cost Savings ($)	Total State Emissions Reduction (MT CO2e)	Total Energy Savings (MMBtu)	Total Energy Cost Savings ($)	Total State Emissions Reduction (MT CO2e)
Envelope Air Leakage	27,182	484,314	3,092	581	$10,321	65
Ceiling Insulation	11,372	215,656	1,080	4,835	$91,786	595
Exterior Wall Insulation	9,277	171,044	1,102	8243	$151,974	976
Foundation Insulation	6,800	108,156	668	11,676	$178,905	1,075
Lighting	5,742	197,544	1,427	4,454	$153,383	1,130
Duct Leakage	2,135	43,142	284	17,151	$342,217	2,251
TOTAL	62,508	$1,219,856	7,653	46,941	$928,585	6,093
SAVINGS				**25%**	**24%**	**20%**

*Based on 7,345 annual new homes

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KY Residential Study

Cumulative Potential Savings

Total Energy Savings (MMBtu)		
5yr	***10yr***	30yr
937,620	***3,437,939***	29,066,211

Total Cost Savings ($)		
5yr	***10yr***	30yr
$18,297,844	***$67,092,095***	$567,233,170

*Based on 7,345 annual new homes

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AC Right-Sizing

KY Potential Analysis Results

- An ACCA **Manual J analysis** was performed on homes and the design unit compared to the installed unit
- The average installed unit was **oversized by 159%**
- Annual potential demand savings from right-sizing was **~2.4 MW**
  - An additional **~2.9 MW** of savings potential from key item compliance
- Annual unnecessary consumer expense was estimated at about **$30 million dollars annually**

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What and Why

Understanding Energy Code Compliance

√	**What**		Why	**Residential Baseline Field Study**
√	**What**		Why	**Commercial Baseline Field Study**
	What	**√**	**Why**	**Energy Codes Compliance Collaborative**

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What and Why

Understanding Energy Code Compliance

√	**What**		Why	**Residential Baseline Field Study**
√	**What**		Why	**Commercial Baseline Field Study**
	What	**√**	**Why**	**Energy Codes Compliance Collaborative**

√ Who

√ How

√ How Much

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Code Compliance Collaborative
What and Why

- *What*: A **group of stakeholders** that come together on a regular basis to explore common interests and **address barriers** related to energy code compliance

- *Why*: To establish **a forum for** identifying and tackling obstacles to **improving energy code compliance**

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Codes Compliance Collaborative

Benefits

- **Identification** of compliance barriers and mitigation options
- Exchange and **coordination** of support activities and incentives
  - Education/training opportunities
- Opportunity to learn from **shared experiences**
- **Collective understanding** of code interpretations and compliant practices

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Utility Programs Underway

Energy Code Compliance

Illinois

- Funded by major utilities; Future Energy Jobs Act (FEJA)
- Statewide
- Residential Field Study*
- Commercial Field Study*
- Collaborative*
- Statewide code:

  -2015 IECC, moving to the 2018 IECC

*Recommendations for potential future program

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IL Codes Compliance Collaborative
Progress to Date

- **Six in-person** Collaborative meetings
  - East Peoria
  - O'Fallon
  - Oak Park
  - Oak Brook
- **Two web-based** Collaborative meetings
  - 1 residential meeting
  - 1 commercial meeting
- Conducted **survey of members** to identify biggest issues

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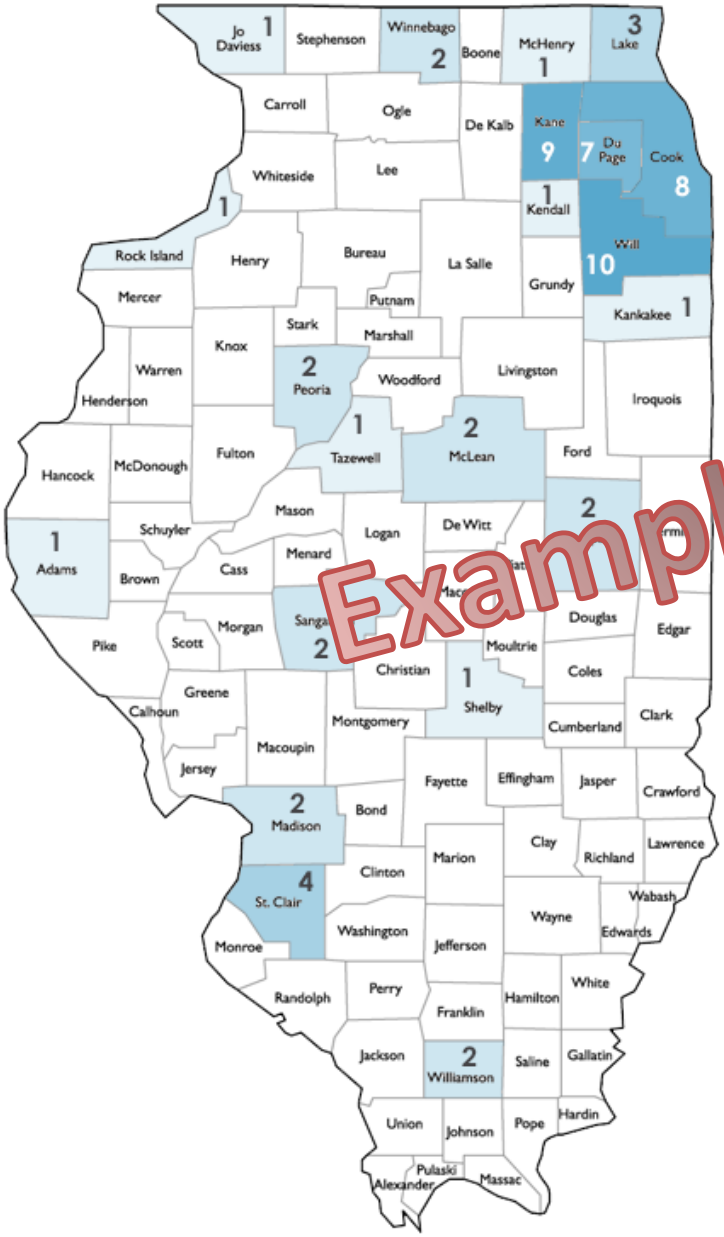
Residential Study

Sampling Plan



- Survey team is currently **recruiting buildings** by contacting jurisdictions and scheduling site visits
- Data collection **underway**
- Targeting data collection completion for **Fall 2019**

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Residential Study
Key Items

- **Envelope Tightness** (ACH50)
- **Window Solar Heat Gain Coefficient**
- **Window U-factor**
- **Wall Insulation** (R-value and Quality)
- **Ceiling Insulation** (R-value and Quality)
- ***Mechanical Ventilation*** *(not a DOE key item)*

- **Foundation Insulation** (R-value and Quality)
- **High Efficacy Lighting**
- **Duct Leakage** (CFM25)
- ***Manual J Data*** *(not a DOE key item)*
- ***Manual D Data*** *(not a DOE key item)*

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Residential Study
Methodology

- Homes will be visited **either** at insulation stage or just before Certificate of Occupancy

- A complete data set can **not be collected from any single home** – data will be aggregated in order to be analyzed

- Minimal interference with ongoing operations - typically **on site for less than an hour**

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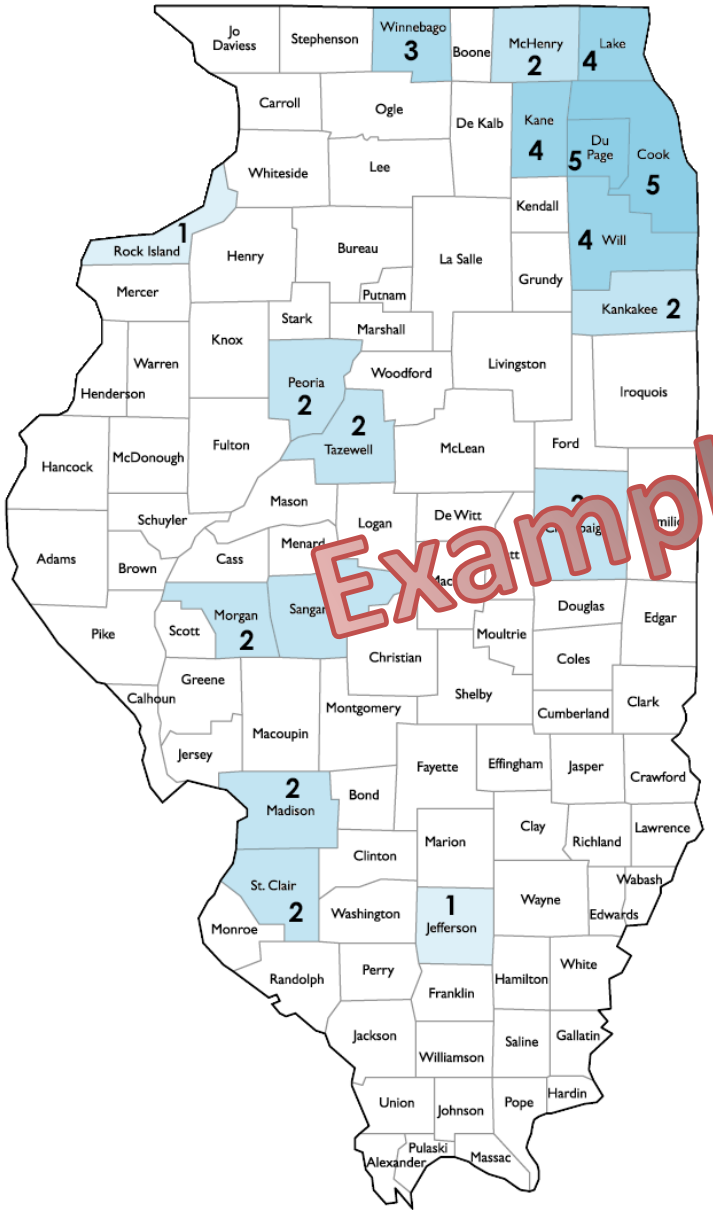
Commercial Study

Sampling Plan



- ~40 buildings
- 6 building types
- Survey team is currently **recruiting buildings** by contacting jurisdictions and scheduling site visits
- Targeting data collection completion for **October 2019**

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Commercial Survey
Overview

- Similar to the residential study, the commercial study will **survey high impact measures** and analyze the results
- Unlike the residential survey, the commercial survey is **not intended** to achieve the "statistical significance" label
  - **Too much variation** in use types and size to cost effectively survey
- Will survey around 40 of the **most common and highest energy-using** building use types
- Analysis is designed to identify **measure-level savings opportunities**

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Commercial Survey
Data Collection Overview

- **Same key items** will be surveyed for all building types will be gathered
- Buildings will typically be visited just **before certification of occupancy**
- May conduct **multiple site visits** if required to accurately capture the key items
- Minimal interference with ongoing operations – **on site around two hours**
- Collected data will be **scrubbed of identifying information** prior to analysis

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Commercial Overview

Commercial Building Type Selection

- Sampling plan is roughly proportional to the percentage of buildings per use type
  - **Educational**: College/University, Elementary/Preschool, Jr/Sr High School
  - **Healthcare**: Nursing Homes, Hospitals and Clinics
  - **Lodging and Residential**: Hotels, Dormitories, Mid- and High-Rise Multifamily
  - **Office**: Offices/Government Offices
  - **Retail**
  - **Warehouse/Garage**
- These building use types represent ~80% of total commercial square footage

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Commercial Study
Data Collection

- Review Building Plans and Specs
  - Record values for ~35 key items
- Identify Compliance Path
- Collect Field Data (~35 Key Items)
  - Building Insulation and Fenestration
  - Mechanical System and Controls
  - Lighting and Controls
- Blower door tests for smaller buildings (< 4,000 sf)

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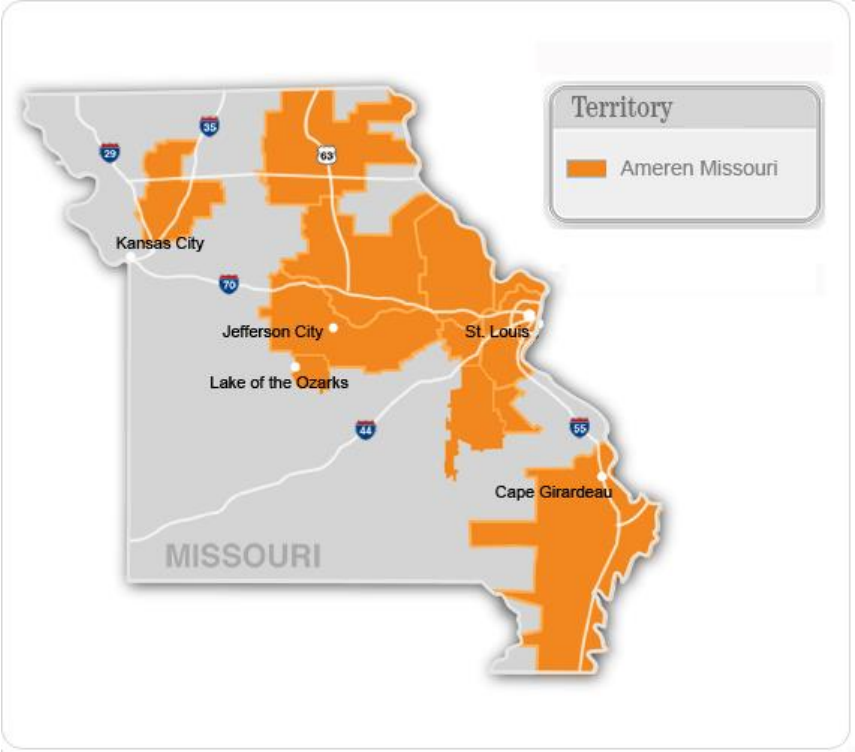
Utility Programs Underway

Energy Code Compliance

Missouri

- Funded by Ameren MO; Missouri Energy Efficiency Investment Act (MEEIA)
- Ameren MO territory
- Residential baseline study completed
- Residential Compliance Program 2019
- Collaborative
- Homerule state; no statewide code



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Program Elements

Residential

Core Programs

- Collaborative
- Circuit rider
- In-person training
- Administrative assistance

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Energy Codes Utility Programs

Other States and Utilities

Rhode Island and Massachusetts

- National Grid

Arizona

- Salt River Project

Iowa

- Cedar Falls Utility

California

- Pacific Gas and Electric Company
- San Diego Gas and Electric
- Southern California Edison
- Southern California Gas

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Energy Code Compliance

Benefits from utility programs

- Resources - utilities can provide assistance with energy code compliance
- Increased compliance =
  - Better buildings,
  - better health,
  - more energy savings,
  - more carbon reduction
- Can potentially assist with adoption efforts

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Questions?

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Thank you!

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