

# Overcoming Persistent Barriers to Energy Efficiency in Multifamily Housing through Partnerships

January 30<sup>th</sup>, 2014

Molly Lunn  
DOE's State and Local  
Technical Assistance  
Team

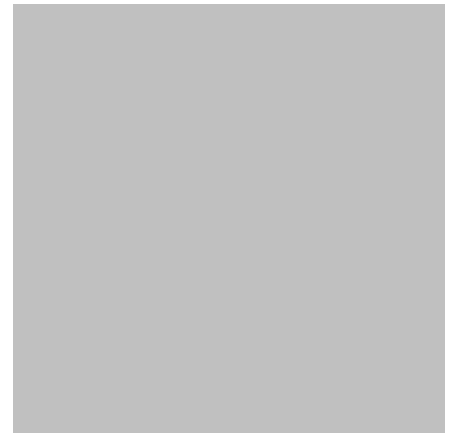
# DOE's State & Local Technical Assistance



# How to Tap into These and Other TAP Offerings

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- Visit the ***Solution Center***  
[www.eere.energy.gov/wip/solutioncenter/](http://www.eere.energy.gov/wip/solutioncenter/)
- Submit an ***application*** for assistance  
[www.eere.energy.gov/wip/solutioncenter/technical\\_assistance.html](http://www.eere.energy.gov/wip/solutioncenter/technical_assistance.html)
- Sign up for ***TAP Alerts***, the TAP mailing list, for updates on our latest and greatest  
[TechnicalAssistanceProgram@ee.doe.gov](mailto:TechnicalAssistanceProgram@ee.doe.gov)



# Leveraging State Policies and Programs to Advance Multifamily Energy Efficiency

Mark Wolfe, Executive Director, Energy Programs Consortium (EPC)

Sandy Fazeli, Program Manager, National Association of State Energy Officials

*Department of Energy (DOE) Technical Assistance Project (TAP) Webinar, January 2014*

# + Presentation Overview

- About NASEO and EPC
- Reported opportunities, barriers, and solutions
- Role of state policies and programs
- State energy office progress and examples



# About NASEO

- National non-profit representing the 56 governor-designated energy officials from each state/territory. State Energy Offices develop policies and programs at the direction of governors and/or legislators.
- SEOs invest \$4 billion annually. Funds are derived from state/federal appropriations (U.S. State Energy Program) and system benefit charges, and cover:
  - Energy efficiency in manufacturing and residential, multifamily, and commercial buildings
  - Renewable energy, such as solar, wind, geothermal, and biomass
  - Oil, gas, electricity production and distribution
  - New and emerging high efficiency technologies and services
  - Energy emergency preparedness and resiliency
- Energy Foundation-funded project to increase and leverage coordination between energy offices and housing finance agencies to advance multifamily energy efficiency (ongoing effort since 2012)

## + About EPC

- Joint venture of NASCSP (weatherization/ community service programs) , NASEO (state energy directors), NARUC (public service commissions), and NEADA (energy assistance directors)
- Foster coordination and cooperation among state and federal agencies in the areas of energy policy and program development

# + The Need

Multifamily efficiency can reduce costs, promote affordability, and enhance tenant health and comfort

- Utility costs represent the single largest controllable expense in multifamily housing communities—usually between 25% and 35% of operating budgets <sup>(EPA)</sup>
- 83% of all multifamily buildings are renter-occupied, and renters have considerably lower incomes than owners. Multifamily buildings house 48.9% of all very low income renters. <sup>(ACS)</sup> Energy costs can account for as much as 21% of their income. <sup>(JCHS)</sup>
- Energy costs per square foot in rented multifamily units are:
  - 37% higher than in owner-occupied multifamily;
  - 41% higher than renter-occupied single family detached; and
  - 76% higher than owner-occupied single family detached. <sup>(RECS)</sup>

*Sources:*

*U.S. Environmental Protection Agency (EPA), "Multifamily ENERGY STAR Fact Sheet"*

*American Community Survey (ACS), U.S. Census Bureau, 2010.*

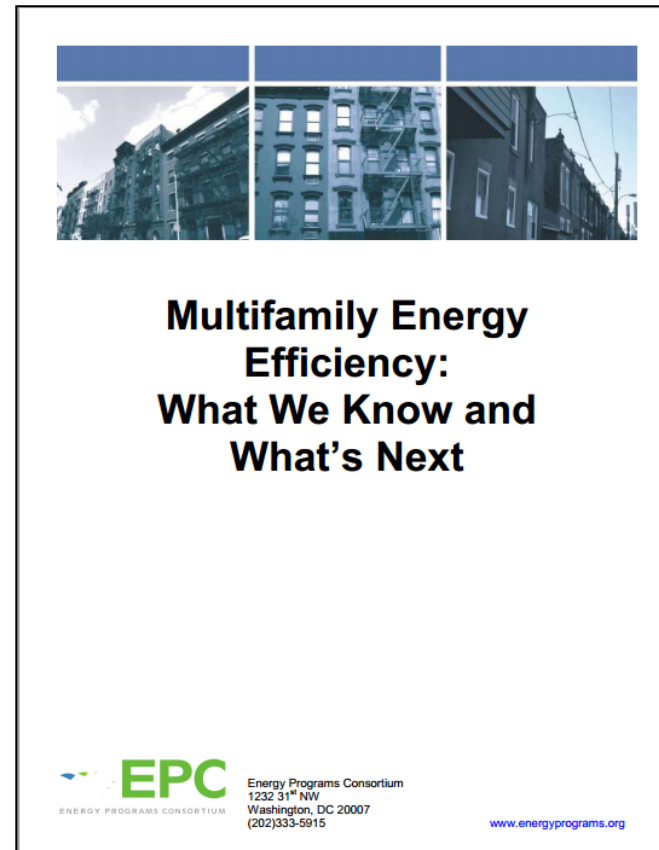
*Joint Center for Housing Studies, "Reducing Energy Costs in Rental Housing," 2013.*

*Residential Energy Consumption Survey (RECS), U.S. Energy Information Administration, 2005.*



# + Barriers

- Dispersed/complex building ownership
- Split incentives
- Lack of data about energy use and performance
- Lack of access to financing
- Legal/regulatory barriers



Available at:  
[http://  
www.energyprograms.org/  
category/publications/](http://www.energyprograms.org/category/publications/)

# + Triggers

What circumstances prompt low-income multifamily building owners to invest in energy efficiency?

- Time of property purchase or refinancing
- HVAC replacement
- Utility, tax, government incentives
- Real estate appreciation and demand

# + Finance Tools

- On Bill financing (or On Bill Repayment) from investor-owned utilities or public utilities,
- Commercial Property Assessed Clean Energy (PACE) financing,
- Housing Finance Agency (HFA) energy efficiency mortgages and stand-alone financing
- Energy Performance Contracting
- Flexible, affordable gap financing



+ State Multifamily Energy  
Efficiency Policies and Programs

Key Motivators, Responses, and Examples

## + Policy Direction from Governor and/or Legislature

- **Pennsylvania House Bill 2200/Act 129 of 2008**
  - Expanded Public Utility Commissions' oversight, requirements on electric distribution companies with overall goal of reducing energy consumption and demand
  - Creation of On-Bill Financing Working Group and coordination among PUC, Pennsylvania Housing Finance Agency, and Pennsylvania energy office
- **Multifamily Energy Efficiency and Housing Affordability Program (MEEHA)**
  - Administered by Maryland Department of Housing & Community Development as part of an MOU with the Maryland Energy Administration (the state energy office), in support of Governor O'Malley's "emPOWER Maryland" initiative
  - \$12.5 million through State Energy Program for loans and grants for energy efficiency improvements in affordable multifamily rental housing developments
  - As of June 2012: 49 projects in 5,196 units completed, received \$8.9 million in funding

## + Planning and target-setting

- Statewide Comprehensive Energy Planning
  - **Massachusetts's Clean Energy and Climate Plan** for 2020 sets a climate-related goal of reducing the state's GHG emissions by 25% below 1990 levels by 2020, outlines specific state energy goals and recommendations for buildings, electricity, and transportation sectors.
- Energy savings targets
  - In response to state's ambitious goal targeting zero-net-energy use in all new homes by 2020 and 2005 Title 24 energy efficiency standards, the California energy office (the **California Energy Commission**) has been funding pilots and projects for multifamily energy efficiency. See Global Green USA Case Study at [http://www.esource.com//system/files/files/2011-01/CEC-TB-48\\_FINAL\\_5.pdf](http://www.esource.com//system/files/files/2011-01/CEC-TB-48_FINAL_5.pdf).
- National Ambient Air Quality Standards (NAAQs)
  - Energy efficiency and renewable energy offer a multi-pollutant, cost-effective approach to attain and maintain compliance with NAAQs; multifamily energy efficiency can fit into a state's air quality strategy. More information about NAAQs at <http://www.epa.gov/air/criteria.html>.

# + Funding Pools and Financing Mechanisms

## ■ Florida Energy Office-Florida Housing Financing Corporation

- MOU with Florida Housing Finance Corporation. Creation of a revolving loan fund for multifamily retrofits using State Energy Program (SEP) dollars

## ■ Qualified Energy Conservation Bonds (QECBs)

- Local example: Boulder Housing Partners \$1.45 million issuance to finance multifamily energy improvements through an energy savings performance contracting with Johnson Controls

## ■ DC PACE (Property Assessed Clean Energy)

- 2013: country's first use of PACE for an affordable multifamily project
- 139-unit, 7 year-old property, part of HOPE VI development
- \$5 million revolving line of credit from regional bank



*Photos courtesy of:  
District Department of the Environment*



Questions?  
Thank you!

Mark Wolfe, Executive Director, EPC: [mwolfe@energyprograms.org](mailto:mwolfe@energyprograms.org)  
Sandy Fazeli, Program Manager, NASEO: [sfazeli@naseo.org](mailto:sfazeli@naseo.org)





## Presentation Overview:

- Describe the Weatherization Assistance Program's (WAP) approach to multifamily energy upgrades
- Provide an update on the DOE WAP Suite of Multifamily Technical Tools and Resources
- Inform how these tools and resources can assist in the various stages of the multifamily energy upgrade process



## ● Building Selection & Eligibility Assessment

## ● Pre-Site Visit Activity

- Owner and Staff Interviews
- Pre-Site Visit Data Collection
- Utility Bill Benchmarking
- Determine Incentive Qualifications and Program Resources

## ● Site Visit

- Building and System Data Collection
- Diagnostic Measurements
- Confirmation of Pre-Site Visit Information
- Resident Interviews

## ● Energy Modeling & Data Analysis

- Energy Modeling & Calibration
- Energy & Cost Savings Analysis
- Economic Calculations

# Intake & Analysis

# Work & Follow Up

## ● Work Scope & Audit Report

- Measure Selection & Specifications
- Owner Follow-Up
- Construction, Inspection, & Training Guidelines
- Contract Development
- Implementation Roles & Responsibilities

## ● Perform Work

- Contractor Selection
- Measure Installation
- Staff Training
- Tenant Education

## ● Final Inspection & Quality Assurance

## ● Post-Construction Monitoring & Tracking

- Monitor System Performance
- Verify Energy Savings

## Available Now!

### Standard Work Specifications for Multifamily Energy Upgrades

- SWS are a comprehensive set of work quality guidelines.
- The SWS are a detailed and comprehensive catalog of energy efficiency upgrade measures containing the minimum technical specifications required for those measures to achieve their intended outcomes.
- <http://sws.nrel.gov>

**NREL**  
NATIONAL RENEWABLE ENERGY LABORATORY

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Standard Work Specifications Tool

Search All Topics [Go]

Health & Safety | Air Sealing | Insulation | Heating & Cooling | Ventilation | Baseload

### Standard Work Specifications for Home Energy Upgrades

Standard Work Specifications (SWS) define the minimum requirements to ensure that the work performed during energy upgrades in single-family, multifamily, and manufactured homes is effective, durable, and safe. The SWS can be used as an industry guide for workers, training instructors, homeowners, and program administrators involved in the home performance industry.

**Learn**  
how to use this tool

**Read**  
an introduction to the Standard Work Specifications

**Get Certified**  
[Home Energy Professional Certifications](#)  
A Certification Program Established by the U.S. Department of Energy

**News & Updates**  
October 18, 2013  
**Content Update: 6.9901.1 Supplemental Ventilation Information—ASHRAE 62.2**

October 15, 2013  
**Accredited Home Energy Professional Certifications Assure Quality within the Industry**

[Read all News & Updates](#)

**Download the Documents**

- [SWS for Single Family Homes](#) [En Español](#)
- [SWS for Manufactured Housing](#) [En Español](#)
- [SWS for Multifamily Homes](#) [En Español](#)

### Multifamily Job Task Analyses (JTA)

- Retrofit Project Manager, Energy Auditor, Building Operator, and Quality Control Inspector.
- [http://www1.eere.energy.gov/wip/guidelines\\_accredited\\_training.html#jta](http://www1.eere.energy.gov/wip/guidelines_accredited_training.html#jta)

### Weatherization Training Centers

- <http://www.waptac.org/State-WAP-Training-Centers.aspx#State>

# Guidelines for Home Energy Professionals



**Goal:** Collaborate with industry to develop the tools needed for a high-quality residential energy upgrade industry, supported by accredited training programs and a skilled and credentialed workforce.

## Define the Work

- SWS define the minimum requirements for high-quality, safe, and durable installations
- References to industry technical standards and codes

## Validate the Training

- JTAs for four common single-family and multifamily job classifications
- Outlines key tasks and knowledge, skills, and abilities needed
- Voluntary training program accreditation through IREC

## Certify the Worker

- Certifications accredited under ANSI ISO 17024 standard – Energy Auditor, Crew Leader, Quality Control Inspector, Installer
- Based on JTAs and KSAs; also incorporates SWS
- BPI selected to initially administer certifications
- Competency-based; only home energy upgrade certifications supported by DOE accredited by ANSI

Learn more at [wip.energy.gov/guidelines.html](http://wip.energy.gov/guidelines.html) or [workforce.guidelines@nrel.gov](mailto:workforce.guidelines@nrel.gov)

There is still an opportunity for **Multifamily Quality Control Inspectors** to get involved:

- Do you inspect installed energy conservation measures in multifamily buildings?
- Do you observe and measure building systems and components?
- Do you analyze building performance data to verify that project requirements are met?

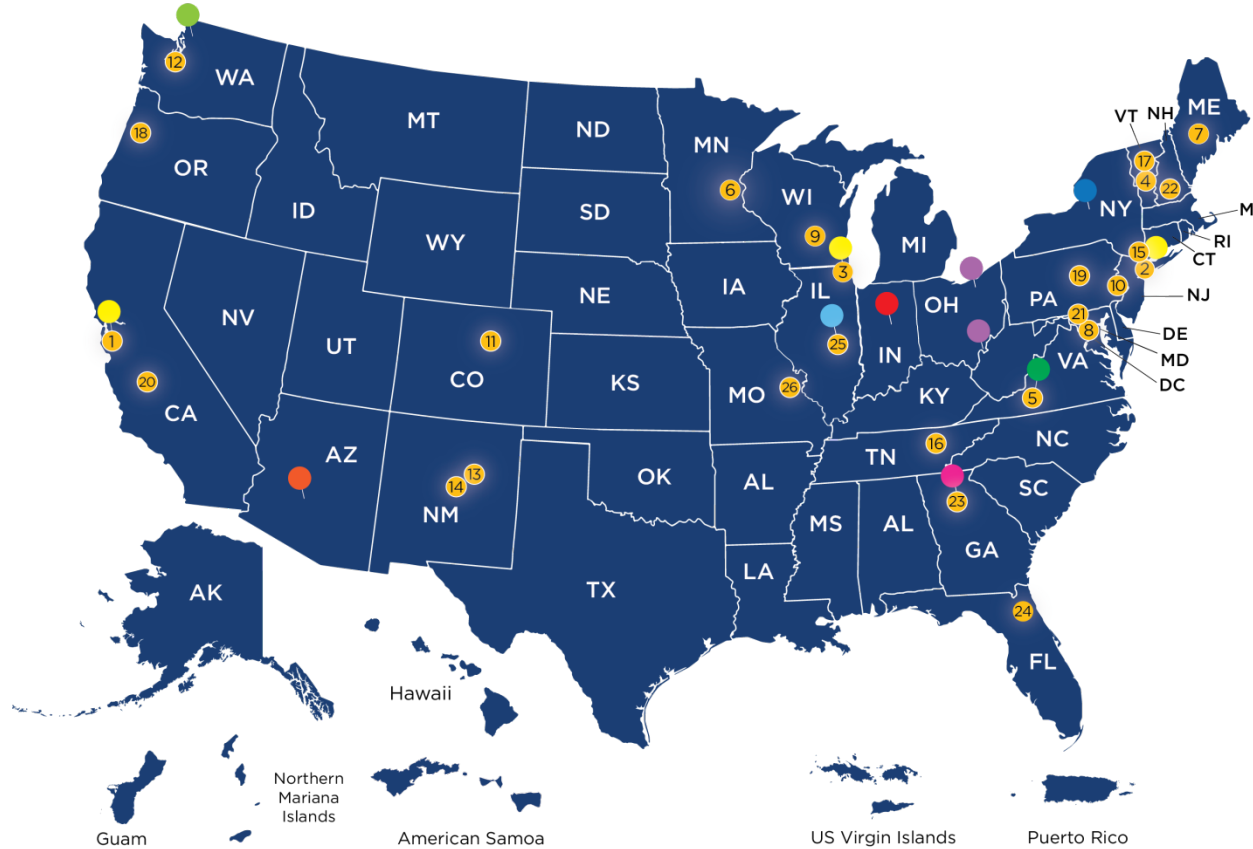
**Submit** your application today for the ***Multifamily Quality Control Inspector*** certification scheme committee

**Applications due Friday, January 31, 2014 at**  
[http://www.nrel.gov/ap/multifamily\\_certification/](http://www.nrel.gov/ap/multifamily_certification/)

# Multifamily Training & Delivery Resources



## MULTIFAMILY TRAINING AND DELIVERY RESOURCES



	REACH	TRAINING	AUDITS	PROGRAM MGT	INSTALLATION	BUILDING OPERATOR CERTIFICATION TRAINING	CLIENT/TENANT EDUCATION	NETWORKED TRAINING CENTERS
1	R							
2	N							
3	R							
4	L							
5	N							
6	L							
7	L							
8	N							
9	S							
10	S							
11	S							
12	L							
13	S							
14	S							
15	L							
16	N							
17	S							
18	S							
19	S							
20	N							
21	N							
22	S							
23	R							
24	L							
25	N							
26	L							

REACH    **N** NATIONAL    **R** REGIONAL    **S** STATE    **L** LOCAL

**NETWORKED TRAINING CENTERS**

- Association for Energy Affordability, Inc. | NY/CA/IL
- Foundation for Senior Living | AZ
- NYSWDA | NY
- Building Performance Center | WA
- Indiana Community Action Association | IN
- Southface Institute | GA
- Corporation for Ohio Appalachian Development | OH
- CHP Energy Solutions Research & Training | VA
- University of Illinois | IL

## Coming Soon!









### Multifamily Tool for Energy Audits (MulTEA)

- MulTEA will produce an investment grade audit and provide auditors with an improved energy simulation and weatherization measure selection tool for multifamily buildings.
- A major innovation of the tool is building energy use can be calibrated against historical weather data that prevailed during that utility billing period.

### Technical Guidelines for Multifamily Building Energy Audits

- The Technical Guidelines tell the energy auditor what the data-gathering and energy-auditing process should entail.
- The guidelines facilitate uniformity in multifamily energy audit methods, to lead to more accurate predictions of energy and cost savings.

# Tools for Every Step of the Process

		WEATHERIZATION ASSISTANCE PROGRAM TOOLS						
		Multifamily Audit Protocol	Multifamily Tool for Energy Audits	Multifamily Standard Work Specifications	Project Management Job Task Analysis	Energy Auditor Job Task Analysis	Quality Control Inspector Job Task Analysis	Building Operator Job Task Analysis
<b>INTAKE &amp; ANALYSIS</b>								
   	Building Selection & Eligibility Assessment							
	Background Data Collection / Preliminary Site Assessment							
	Site Assessment/ Field Data Collection							
	Computer Modeling and Audit							
<b>WORK &amp; FOLLOW UP</b>								
   	Develop Work Scope							
	Contractor Selection Contract Development							
	Perform Work							
	Final Inspection and Quality Assurance							



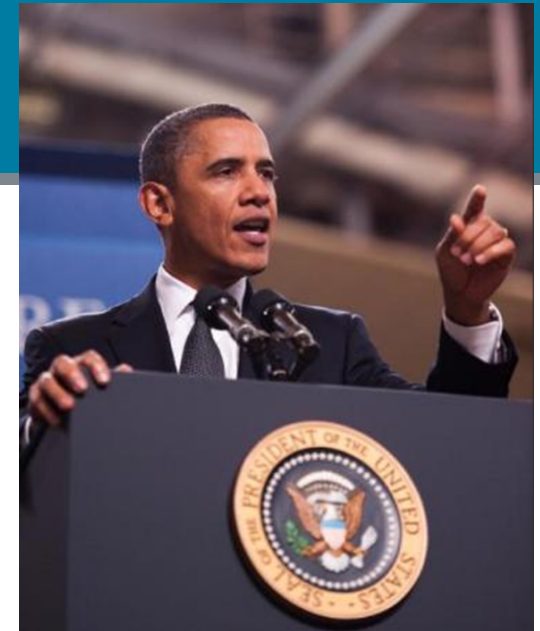
## The WAP Multifamily Energy Upgrade Core Principles

1. Select the correct improvements for the individual building to maximize energy savings and ensure occupant comfort and health

**...Doing the Right Things**

2. Ensure that the selected improvements are installed by qualified contractors according to nationally accepted standards

**...Doing Things Right**



## Goals:

- Buildings 20% more efficient within 10 years
- Save more than \$80B annually
- Create American Jobs

## How:

- Leadership
- Results
- Transparency
- Best practice models
- Recognition
- Catalyzing action

## Better Buildings Challenge to date:

120+ Partners

(commercial, industrial, public, private)

Represent:

2B+ square feet

\$2B private sector financing

300+ manufacturing plants

\$2B Federal commitment



# Opportunities for Multifamily Energy Efficiency in Tennessee

Luke Gebhard

Tennessee Department of Environment and Conservation  
Office of Energy Programs

Amy Bunton

Senior Vice President  
Pathway Lending





## The Demographic Case for Multifamily Energy Efficiency in Tennessee

- According to the ACEEE, approximately 18% of households in Tennessee live in multifamily buildings of at least 2-4 units, and the share is growing steadily.
- Low rates of single-family home ownership in 25-34 age cohort.
- The difficulty in securing a mortgage makes renting a more viable housing option.

Sources: Freeman Webb Companies; "Renter Nation," Gene Epstein, Barron's Magazine.





## The Business Case for Multifamily Energy Efficiency in Tennessee

- Reduced operations and maintenance costs typically result in higher property cash flow and investor yields.
- Reduced turn-over/vacancy rates due to lower tenant utility expenses.
- Low-Income Housing Tax Credits provide equity to incorporate energy efficiency projects.

Sources: American Council for an Energy Efficient Economy; Lawler Wood Housing, LLC; 2011 American Community Survey; Gary Pivo, Energy Efficiency and its Relationship to Housing Income in Multifamily Rental Housing (2012).





## Potential for Low-Income Housing Tax Credit Development in Tennessee

	New Construction	Acquisition/Rehab
Estimated Projects	21/year	7/year
Estimated Units	74/year	148/year
Estimated Costs	\$77,000,000	\$51,800,000
Tax Credits at 65%	\$50,505,000	\$33,670,000
Amount of Permanent Financing Required	\$26,495,000	\$18,130,000

Source: Pathway Lending





# Engagement Opportunities



TENNESSEE  
**ENERGY  
EDUCATION**  
INITIATIVE

*Power. Positive. Progress.*





## Tennessee Energy Education Initiative (TEEI)

- The Office of Energy Programs (OEP) launched the Tennessee Energy Education Initiative in the Spring of 2013 in conjunction with statewide energy resource providers.
- Focus on providing in-depth training and educational tools to support the implementation of energy efficiency, renewable energy, and energy management projects.
- Highlights included delivery of two stand-alone MF workshops and dedicated MF sessions at key regional symposium.





## Tennessee Energy Education Initiative (TEEI)

- Funding for Phase 1 of TEEI was provided by the U.S. Department of Energy through the American Reinvestment and Recovery Act. As a result, TEEI was able to provide “tuition paid” workshops and conferences at many locations throughout the State.
- Presentations, materials and other resources are available on the Initiative's Online Resource Center at [tnenergy.org/resources](http://tnenergy.org/resources).
- Series of issue-specific webinars.





## Tennessee Energy Education Initiative (TEEI): Online Multifamily Resources

- TEEI launched an Online Resource Center in July 2013 that contains content devoted specifically to the multifamily sector
  - 13 presentations from TEEI events relevant to multifamily
  - Links to federal incentives and local utility incentive programs
  - Webinar on ENERGY STAR® Portfolio Manager,™ September 18

[tenergy.org/resources/multi-family/](http://tenergy.org/resources/multi-family/)



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# Financing Opportunities



## Pathway Lending

- A Private, Non-Profit Economic Development Lender certified by the U.S. Department of Treasury.
- Mission: Providing underserved small businesses with lending solutions and educational services that result in job creation and economic development.
- **Energy Efficiency and Renewable Energy Project Lender:** Operates the Tennessee Energy Efficiency Loan Program in conjunction with the State of Tennessee, the Tennessee Valley Authority and Pinnacle Bank.





## Energy Efficiency Loan Program

- A \$50M low-interest, revolving loan fund to finance energy efficiency and renewable energy projects in Tennessee.
- Target markets are commercial, industrial and private non-profit sectors.
- Eligible projects: any investment in a fixed asset that provides significant reductions in energy, emissions, and/or utility consumption.



Pathway  
Lending

Financing Businesses. Strengthening Communities.



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# Energy Efficiency Loan Program

- Loans range from \$20,000 to \$5M.
- Below market rates and 100% financing for:
  - ✓ Energy assessments
  - ✓ Engineering
  - ✓ Purchasing and Installation
- Leveraged opportunities through TVA's EnergyRight Solutions for Business Program, federal tax credits and other incentives.



Financing Businesses. Strengthening Communities.





## Energy Efficiency Loan Program: Multifamily Option

- Minimum of 20 units.
- Eligible improvements include high efficiency HVAC, lighting, water, appliances, controls, building envelope improvements, and renewables.
- Required pre-project assessment demonstrating modeled energy savings of at least 10%.



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INITIATIVE

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## Energy Efficiency Loan Program: Multifamily Option

- Required verification of installation
- Terms:
  - 3.5% for 10 years
  - 4.0% for 15 years
- Portfolio concentration not to exceed \$10M
- Expected demand for 2014: \$4M





## Conclusion

- The Tennessee Energy Efficiency Initiative is engaging businesses, developers, property managers, governments and other organizations to drive demand for energy efficiency, energy management and renewable energy projects.
- As a partner with the State and other stakeholders, Pathway Lending is providing a viable financing mechanism to drive demand for multifamily energy efficiency in Tennessee.



Financing Businesses. Strengthening Communities.





# ACEEE's Multifamily Energy Savings Project

*DOE TAP Webinar*

*"Energy Efficiency Opportunities in Multifamily Housing"*

*January 30, 2014*



# The American Council for an Energy-Efficient Economy (ACEEE)

Nonprofit 501(c)(3) dedicated to advancing energy efficiency through research and dissemination.

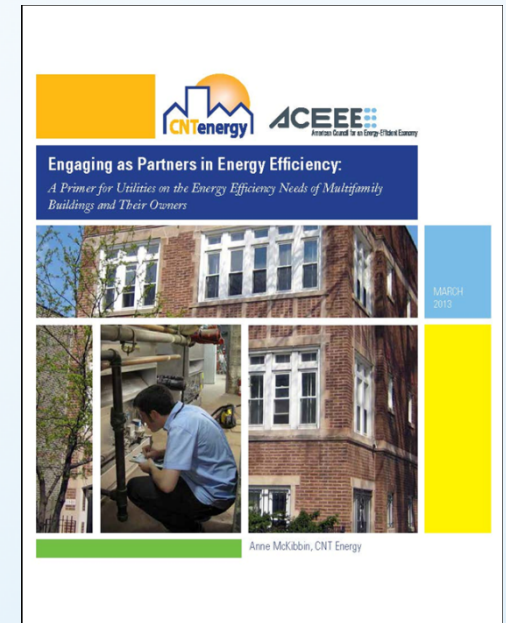
- Established in 1980
- Focus on end-use efficiency in industrial, building, utility, and transportation sectors
- Local, state, and federal policy development, economic analysis, and behavioral programming
- Knowledge sharing: conferences, publications, and working groups



# Multifamily Energy Savings Project

- Three-year project to improve the energy efficiency of multifamily housing nationwide
- GOAL: Expand the number of utilities offering multifamily energy efficiency programs and increase spending and savings for these programs by at least **25% by the end of 2015**
- Focus on building partnerships between the housing community, utilities, and state and local governments

[www.aceee.org/multifamily-project](http://www.aceee.org/multifamily-project)



**Partnering for Success:**  
An Action Guide for Advancing Utility Energy Efficiency Funding for Multifamily Rental Housing

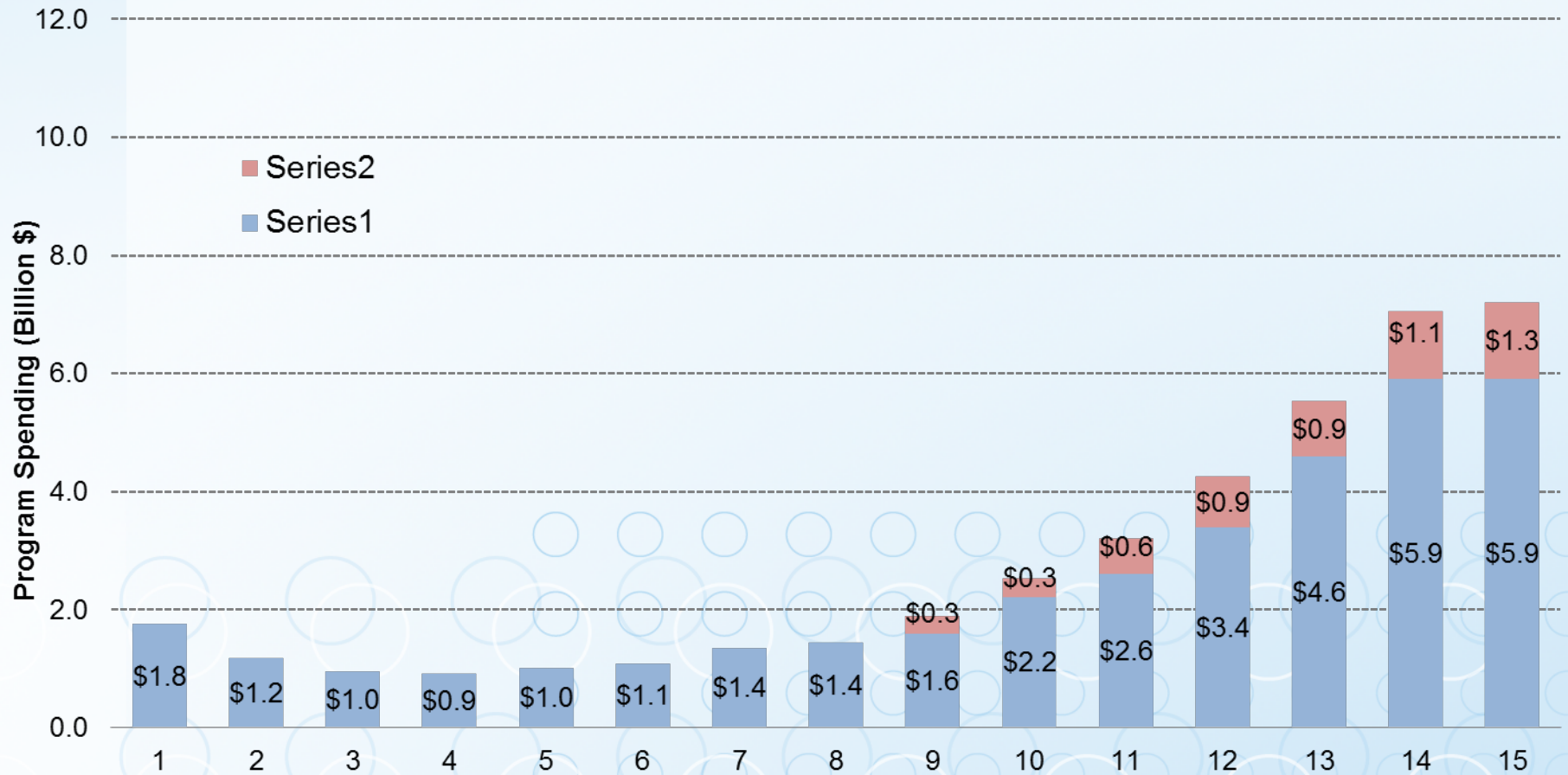


IN PARTNERSHIP WITH:  
**ACEEE**  
American Council for an Energy-Efficient Economy



# The Role of Utility Programs

## Customer-funded Energy Efficiency Program Spending

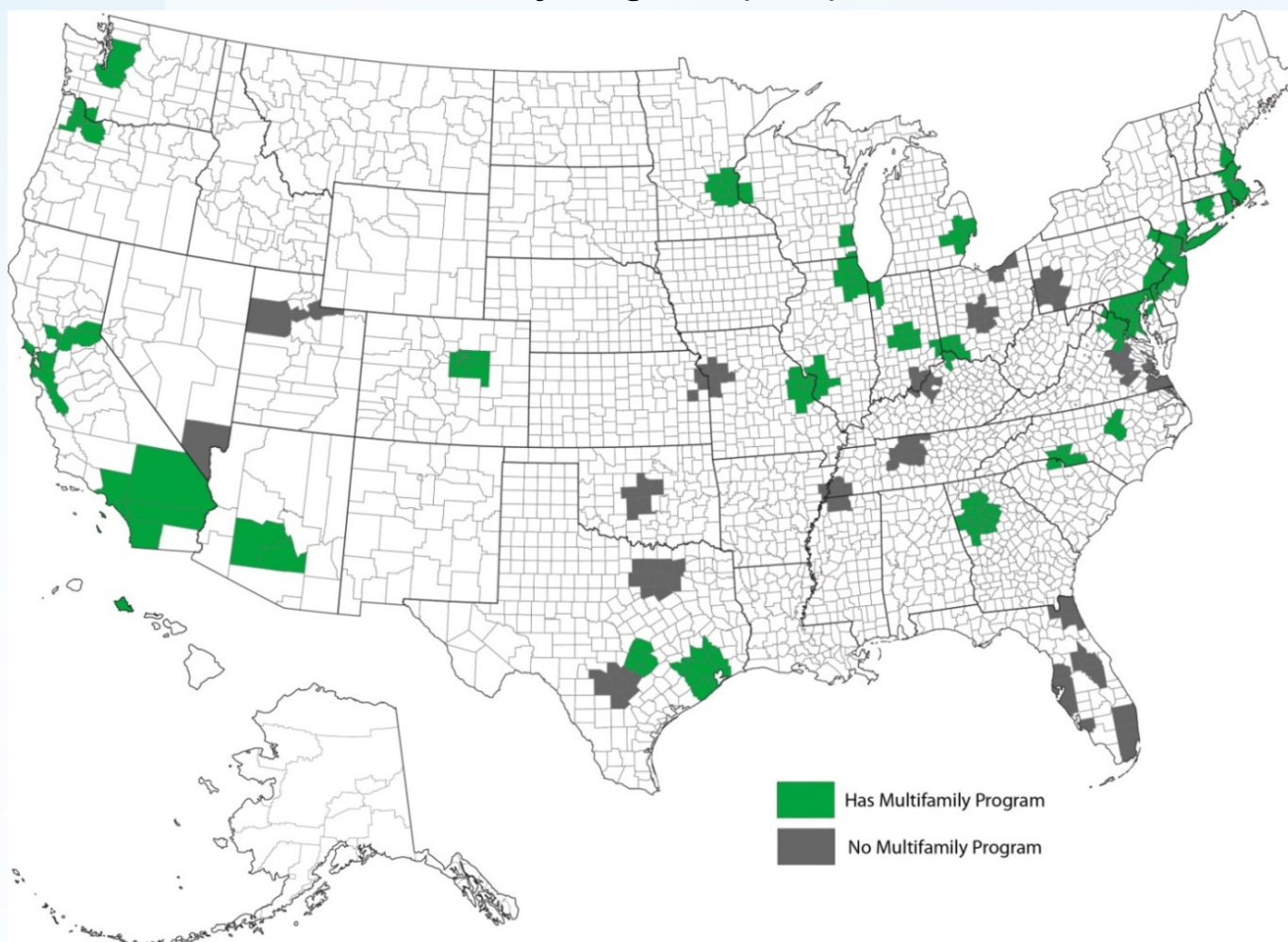


\*2009-2012 are budgets, 1993-2008 actual spending

Source: 2013 State Energy Efficiency Scorecard

# Current Landscape of Multifamily Programs

## Major Metropolitan Areas With One or More Multifamily Energy Efficiency Programs (2012)



40% of the 50 metropolitan areas analyzed are *not* served by utility customer-funded multifamily energy efficiency programs

# Multifamily Program Types

Direct Install

Prescriptive &  
Custom  
Rebates

Comprehensive  
Retrofits & New  
Construction

Low-Income  
Qualified



# Current Landscape of Multifamily Programs

In the 50 metropolitan areas with the largest multifamily housing markets, ACEEE identified 50 targeted multifamily programs.



16 direct installation of no-cost measures



38 prescriptive and custom rebates for individual measures



20 comprehensive whole-building new construction & retrofit programs



28 integrate both electric & gas saving measures

# ACEEE Multifamily Utility Working Group

## Goals

- Provide peer learning and technical assistance to utilities actively considering or currently implementing multifamily energy efficiency programs
- Identify and address common challenges for designing and implementing effective multifamily programs
- Connect members with leaders from the housing community and related multifamily initiatives

Launched in 2013, group currently includes:

- 27 utilities & program administrators from 22 states
- Members that serve an estimated 40% of multifamily households nationwide

# Programmatic Challenges Identified by Working Group Members



Meeting cost effectiveness testing requirements and quantifying non-energy benefits



Coordinating programs and sharing savings across electric, gas, and water utilities



Marketing & outreach to diverse multifamily markets and multiple decision makers (owners, managers, etc.)



Aligning utility programs with state housing program timelines and requirements

# Opportunities to Engage with Utilities to Support Multifamily Energy Efficiency Programs





**For more information:**

**[www.aceee.org/multifamily-project](http://www.aceee.org/multifamily-project)**

**Contact:**

Kate Johnson

**[kjohnson@aceee.org](mailto:kjohnson@aceee.org)**

**(202) 507-4039**



# Whole Building Energy Upgrades: Opportunities and Strategies

Presentation by David Hepinstall, Executive Director, AEA



# Diverse Opportunities in Multifamily Buildings Based on Various Factors

- Building Vintage (1900 to present day, changes in construction)
- Low-rise, Mid-rise, and High-Rise Buildings
- Regional Building Stock and Climate Variations
- Central Systems (heating, cooling, hot water and/or ventilation utilities paid by owner but provided to tenants)
- In-Unit Systems (often including heating, hot water and cooling, as well as other utility bills paid for by tenants)
  - Results in split incentive when equipment and appliances are property of the owner but utility bills paid by resident
- Master metered buildings where all utilities are paid by owner



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# Collaborative Program Design Options

- Tenant measures at low or no-cost to owner or as requirement for owner access to program incentives for common area measures
- Comprehensive set of cost effective energy upgrade measures that can be completed concurrently or staged in phases over time and in multiple buildings in a portfolio
- Completion of related measures maximizing energy use reduction
  - Energy Management Systems (EMS)
  - Thermostatic Radiator Valves (TRV)
  - Master Venting
  - Low-flow domestic hot water (DHW) devices





# Cost Effective Upgrade Opportunities – Central Systems

- Retro-commissioning, retuning and repairs of existing equipment (including controls adjustment, pipe insulation)
- New controls on existing equipment to minimize waste and maximize efficiency (such as Energy Management Systems, central heating boiler controls based on indoor and outdoor temperatures, and remote monitoring of performance)
- Distribution system controls (Thermostatic Radiator Valves to reduce apartment overheating and assist in system balancing)
- Replacement with high efficiency equipment (cost effective when existing equipment is at end of useful life)
- Underutilized but potential increase in adoption:
  - Central Domestic Hot Water Recirculation Controls
  - Variable Speed Drive Circulators and ECMs for Heating Systems



# Cost Effective Upgrade Opportunities – In-Unit Systems

- In-Unit Heating and Cooling Systems tend to be less cost effective due to less use and load per equipment. However, when equipment is at end of useful life, recommended options are:
  - High Efficiency Direct Vent Furnaces
  - High Efficiency Air Conditioning
- Programmable thermostats savings can be minimal
  - Tenant education is key to success.
- Underutilized but potential increase in adoption
  - Heat Pumps
  - Mini-Split Systems - provide very high efficiency cooling and heating and allow for room specific control



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# Cost Effective Upgrade Opportunities – In-Unit Direct Install

- Free Installation of up to 2 Smart Strips per apartment can be an effective way to address the expanding plug load and provide large tenant benefit in cost savings
- Direct install programs that include free CFLs, LEDs and low-flow showerheads and faucet aerators can provide both owner and tenant benefits, when the owner pays the central hot water cost and the tenant pays for the electric use



# Cost Effective Upgrade Opportunities – Lighting and Appliances

- Lighting systems can be in common areas (lobbies, stairwells, common corridors) and on exterior of building
  - Typically owner paid utilities
  - Highest paybacks because of 12-24 hour operation, even with small wattage reductions
- In-unit residential lighting upgrades often need to focus on improved aesthetic quality and tenant satisfaction, in addition to energy savings
  - Often needs to be free or highly competitive incentives to entice owner investment
  - LEDs: Better light quality, long life, “cool” early adopter factor
- Refrigerator replacement
  - Education on Incentives



# Overcoming the Split Incentive

- When the purchaser of the equipment does not pay the energy costs of its use, the owner and resident have “split incentives,” their self-interests collide both in what to purchase and how their behavior may create energy waste
- Although savings from some in-unit measures paid for by the owner may accrue to tenants, such actions lead to other benefits to both owner and residents, including improved living experience, marketability and tenant retention.
  - Comfort (steadier heating and cooling) and
  - Improved air quality for residents and building staff
  - Reduced recurring maintenance costs and
  - Early adopter – cutting edge image for the owner.



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# The “Whole Building” Program Model

- States throughout the country are experimenting with variations on the Whole Building Program theme
- In California alone:
  - PG&E
  - Southern California Edison and Gas Company
  - Bay Area Regional Energy Network
  - Southern California Regional Energy Network Rater
  - Marin Clean Energy
  - San Diego Gas & Electric
  - Sacramento Municipal Utility District
  - Rate Payer On-bill Re-payment Pilot



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# The “Whole Building” Program Model

- By coupling a minimum % savings requirement with strong rebates, and in some cases, streamlined access to EE financing, owners are driven to engage in comprehensive common area *and* in-unit work.
- Programs leverage trigger events such as window or water heater replacements to go deeper.



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# Multifamily Weatherization Model

- Energy audit driven scope of work requires completion of measures with higher Savings to Investment Ratio (SIR) before those with lower SIR's.
- Ban on re-weatherization stimulates completion of comprehensive scope of work in a building during a single program year
- Tenant benefit requirement stimulates whole building scope of work and collaboration.





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# Cost-Effectiveness Testing: Project vs. Single Measure

- WAP requires energy audit calculation of overall project SIR with measure interactivity
- NYSERDA's Multifamily Performance Program initially focused on total project TRC.
- Energy Efficiency Portfolio Standard programs promulgated by Public Utility Commissions often base incentives on single measure cost-effectiveness



# Sample Upgrade Scope 1

Building Type	Garden-style	Climate Zone	3	Year Built	1965
Floor Area	35,412	Units	40	Stories	2
				<b>Savings</b>	
<b>Windows</b> – Replace windows with double pane (U-Factor = 0.350 SHGC = 0.4)				1.5%	
<b>Upgrade Existing Attic Insulation to R-38</b>				1.9%	
<b>Install Low-Flow Showerheads and Aerators</b>				6.8%	
<b>Replace Halogen and Incandescent Lighting with CFL's and LED's</b>				2.3%	
<b>Total for All Improvements</b>				<b>12.5%</b>	



# Sample Upgrade Scope 2

Building Type	Garden-style	Climate Zone	12	Year Built	1970
Floor Area	5,775	Units	5	Stories	2
Improvements				Estimated % Savings	
<b>Windows</b> – Replace windows with double pane (U-Factor = 0.340 SHGC = 0.31)				5.8%	
<b>Appliances</b> – Replace Washing Machines with CEE Tier III				7.3%	
<b>Install Low Flow Showerheads and Aerators</b>				.4%	
<b>Add Sensors to Exterior Lighting and Laundry Room</b>				.2%	
<b>Total for All Improvements</b>				<b>13.7%</b>	



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# Market Transformation, Work Quality Standards and Certification

- Whole building energy efficiency upgrades still rarely occur without some form of program incentive stimulating or rewarding the behavior and investment of funds in the work.
- Work Quality standards (the DOE/NREL Standard Work Specifications) and a trained and certified work force are key ingredients to successful market transformation in multifamily housing



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# Thank You

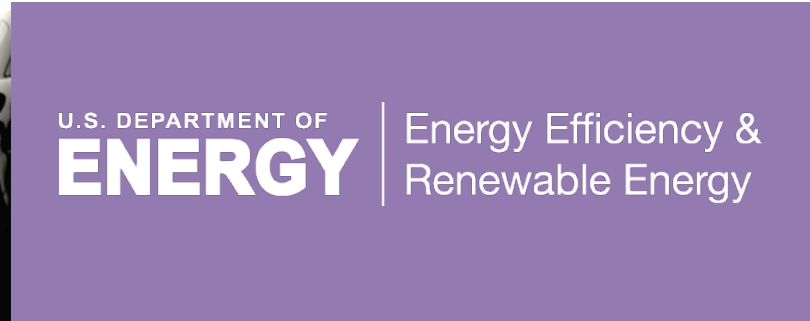
## Association of Energy Affordability

### New York City

Presentation by David Hepinstall  
Executive Director  
AEA

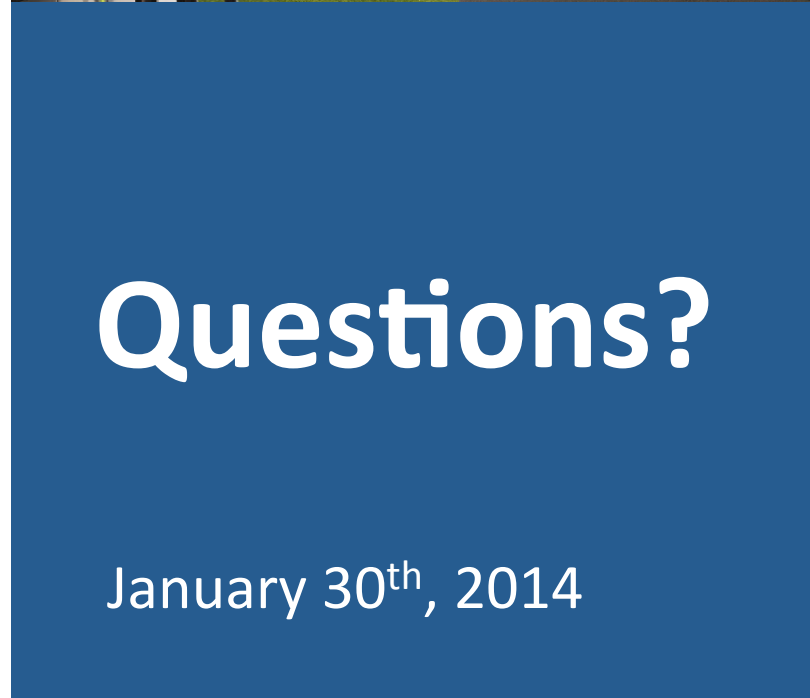
[hepinstall@aea.us.org](mailto:hepinstall@aea.us.org)





# Multifamily Presenters

- Molly Lunn of DOE
- Jen Somers of DOE
- Sandy Fazeli of NASEO
- Mark Wolfe of EPC
- Luke Gebhard of the State of Tennessee
- Amy Bunton of Pathway Lending
- Kate Johnson of ACEEE
- Dave Hepinstall of AEA



# Questions?

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