



Better Buildings

U.S. DEPARTMENT OF ENERGY

Better Buildings Residential Network Peer Exchange Call Series: *Oh, the Weather Outside is Frightful: Energy Efficient Manufactured Homes (301)*

December 8, 2016

Call Slides and Discussion Summary



Agenda

- Agenda Review and Ground Rules
- Opening Polls
- Brief Residential Network Overview and Upcoming Call Schedule
- Featured Speakers
 - **Pat Keegan**, Owner and Principal, Collaborative Efficiency
 - **Shannon Stendel**, Behavior Program Manager, Wisconsin Energy Conservation Corporation (WECC) (*Network Member*)
 - **Scott Drake**, Manager, Corporate Technical Services, East Kentucky Power Cooperative
- Discussion
 - What strategies could be used to promote energy efficiency programs for manufactured homes?
 - What are the challenges in marketing energy efficiency programs for manufactured homes and how can they be addressed?
 - Are there geographic differences in programs needs and opportunities for the manufactured home market and how can these be tackled?
 - Are there other questions, best practices, or lessons learned that you would like to share?
- Closing Poll

Better Buildings Residential Network

Better Buildings Residential Network: Connects energy efficiency programs and partners to share best practices and learn from one another to increase the number of homes that are energy efficient.

Membership: Open to organizations committed to accelerating the pace of home energy upgrades.

Benefits:

- Peer Exchange Calls 4x/month
- Tools, templates, & resources
- Recognition in media, materials
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Residential Program Solution Center guided tours

Commitment: Provide DOE with annual number of residential upgrades, and information about associated benefits.

For more information or to join, email bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn and click Join

Peer Exchange Call Series

We hold one Peer Exchange call the first four Thursdays of each month from 1:00-2:30 pm ET

Calls cover a range of topics, including financing & revenue, data & evaluation, business partners, multifamily housing, and marketing & outreach for all stages of program development and implementation

Upcoming calls:

- January 5, 2017: *No call – Winter break*
- January 12: Home Improvement Catalyst: Engaging Trades in Optimizing HVAC System Performance
- January 19: State of the Union: Best Practices from “Most Improved” Energy Efficient States in 2016

Send call topic ideas to peerexchange@rossstrategic.com

See the Better Buildings Residential Network Program [website](#) to register

Market Context: Collaborative Efficiency

Manufactured Homes Overview

Patrick Keegan

Better Buildings Webinar

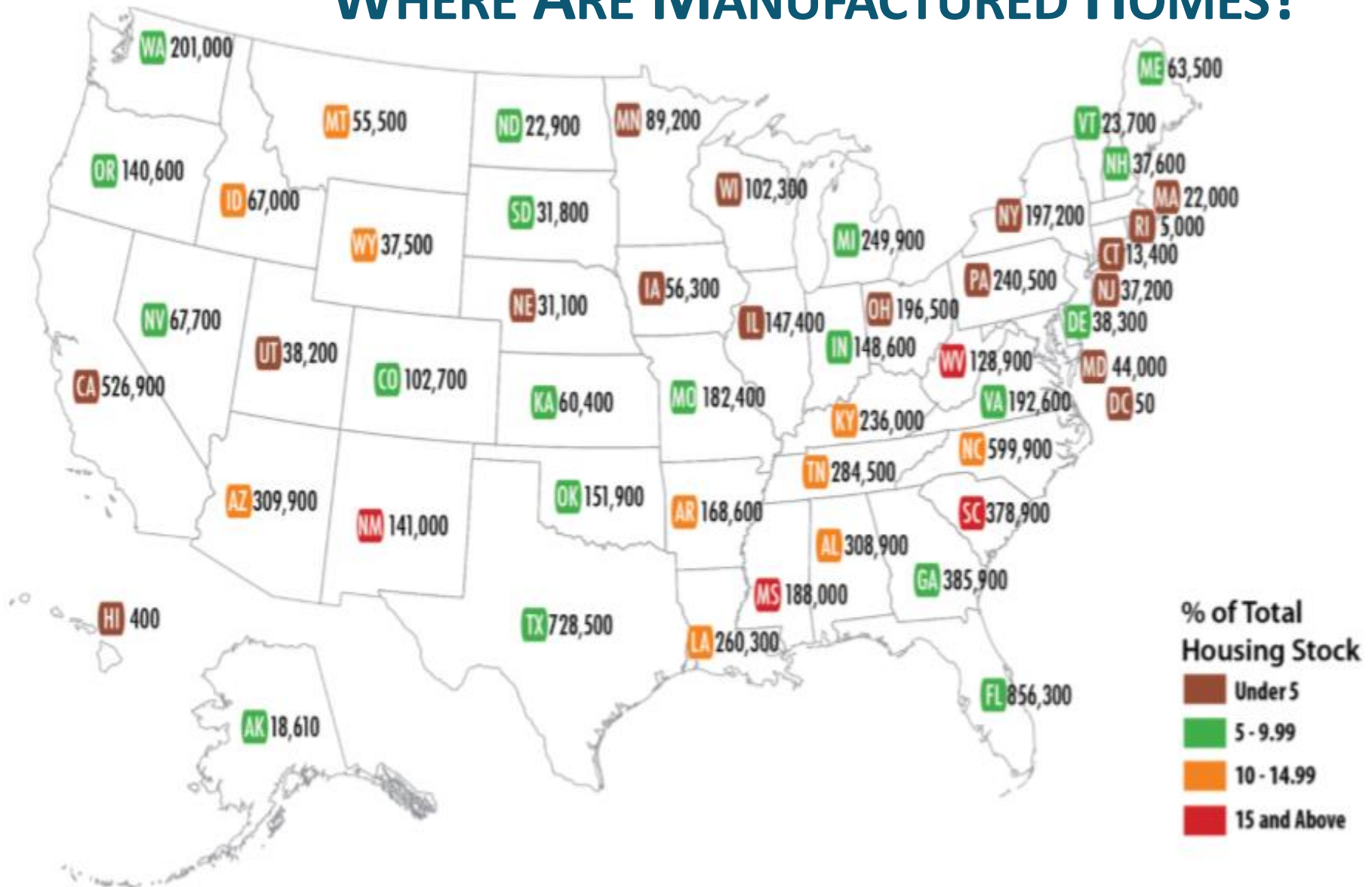
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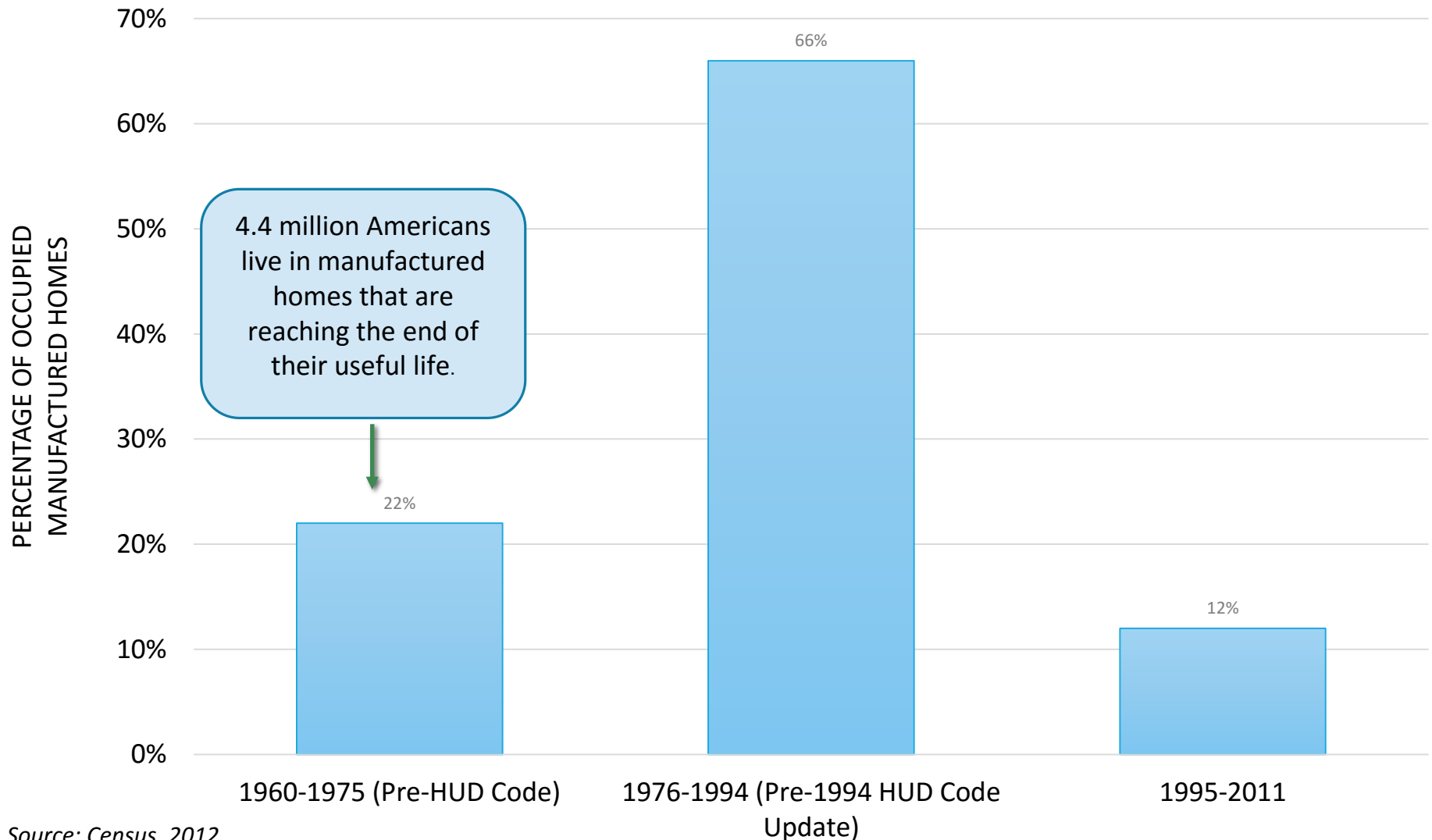
WHO IS COLLABORATIVE EFFICIENCY?

- EE, demand response, solar, electric vehicles
- Constant focus on co-op, municipal utilities
- Projects in SC, KS, NC, CO, WA, MI, OR, TN
- More than 20 EE related publications since 2013
- Hot Topics Lately:
 - Financing EE and solar
 - Electric vehicles and utilities
 - Beneficial Electrification

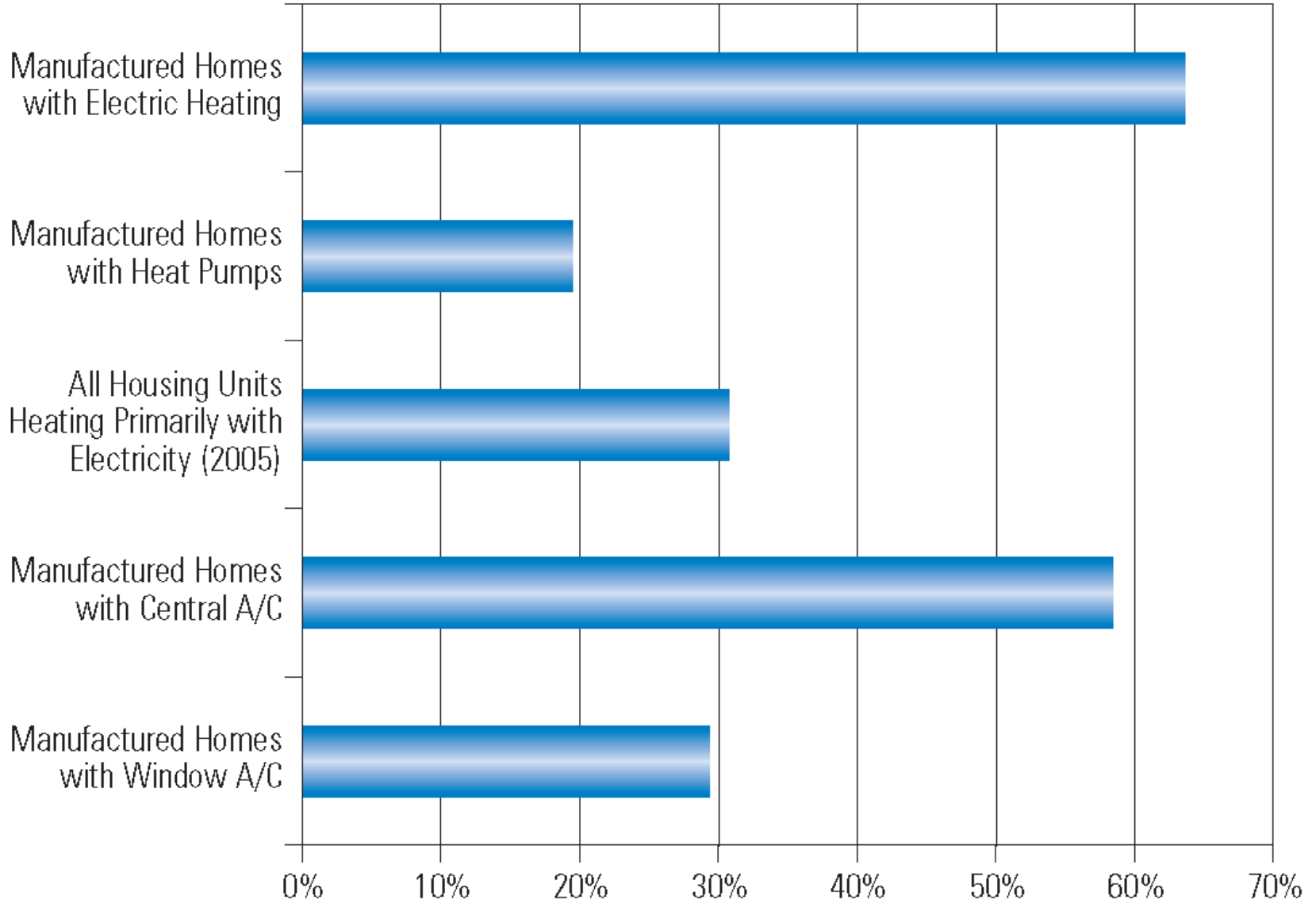
WHERE ARE MANUFACTURED HOMES?



MH STANDARDS HAVE CHANGED



HEATING AND AC IN MANUFACTURED HOMES



EE MEASURES IN MANUFACTURED HOMES

- Marriage wall
- Less cavity space in ceiling, walls, underfloor
- Many MHs sit on blocks
- Ducts can be leaky, especially at 'crossover duct'
- May have less efficient heating systems

SAVINGS POTENTIAL

Manufactured Homes can have:

- Higher energy use/ft
- High peak use

Savings can be dramatic

- SC Help My House

SOLUTION CHALLENGES

- Specialized expertise for MH retrofit not always available
- Financing can be difficult
 - Credit problems
 - MH may not be 'real property'
- Utilities wary of measure life in aging MHs
- Replacement expensive, includes demolition cost

ENERGY EFFICIENCY APPROACHES FOR MANUFACTURED HOMES

Retrofits

- Rebates
- Financing (free assistance may be available!)

Performance Tested Comfort Systems (duct sealing)

New Standards

ENERGY STAR

Replacing Aging MHs

WHY WE SHOULD SOLVE THIS PROBLEM

Utilities:

- Customer satisfaction
- Reduce High Bill Complaints
- Reduce Peak
- Help low-income and near low-income

Government

- Make affordable housing affordable
- Carbon emission reduction

Questions?

Pat Keegan



Presentation Highlights: Collaborative Efficiency

- **Manufactured homes (MH) have a high social and economic potential:**
 - 20 million people are currently living in MH, most of them having a limited income.
 - MHs have much higher energy use per square foot. For utilities that means that MHs account for a much greater share of high bill complaints.
 - A significant share of high peak energy use comes from MH's electric heat. One Alabama co-op found that 30% of system peak was electric heat in MHs.
- **MHs in the South Carolina's Program 'Help My House' achieved savings of almost 40% through upgrades like heat pumps, air sealing and improved insulation.**
- **There are many opportunities to make MHs more energy efficient by utilizing existing retrofit programs, as well as focusing on homes built before 1976, which are not very efficient.**
- **The most successful approach in solving the MH issue in the future will involve some collaboration between utilities, government and non-profit organizations.**

Lessons Learned: Wisconsin Energy Conservation Corporation (WECC)

Delivering Energy Savings to Residents of Manufactured Homes

**Presented by Shannon Stendel
Product Manager -Homes**



Mission

WECC champions and delivers innovative energy initiatives that produce enduring economic and environmental benefits for all.

Who We Work With

ComEd.

An Exelon Company

powering lives



TRAVERSE CITY
LIGHT & POWER

Investing Our Energy In You



SOUTHERN MINNESOTA
MUNICIPAL POWER AGENCY



NEWBERRY
WATER & LIGHT BOARD



Manufactured Homes Overview

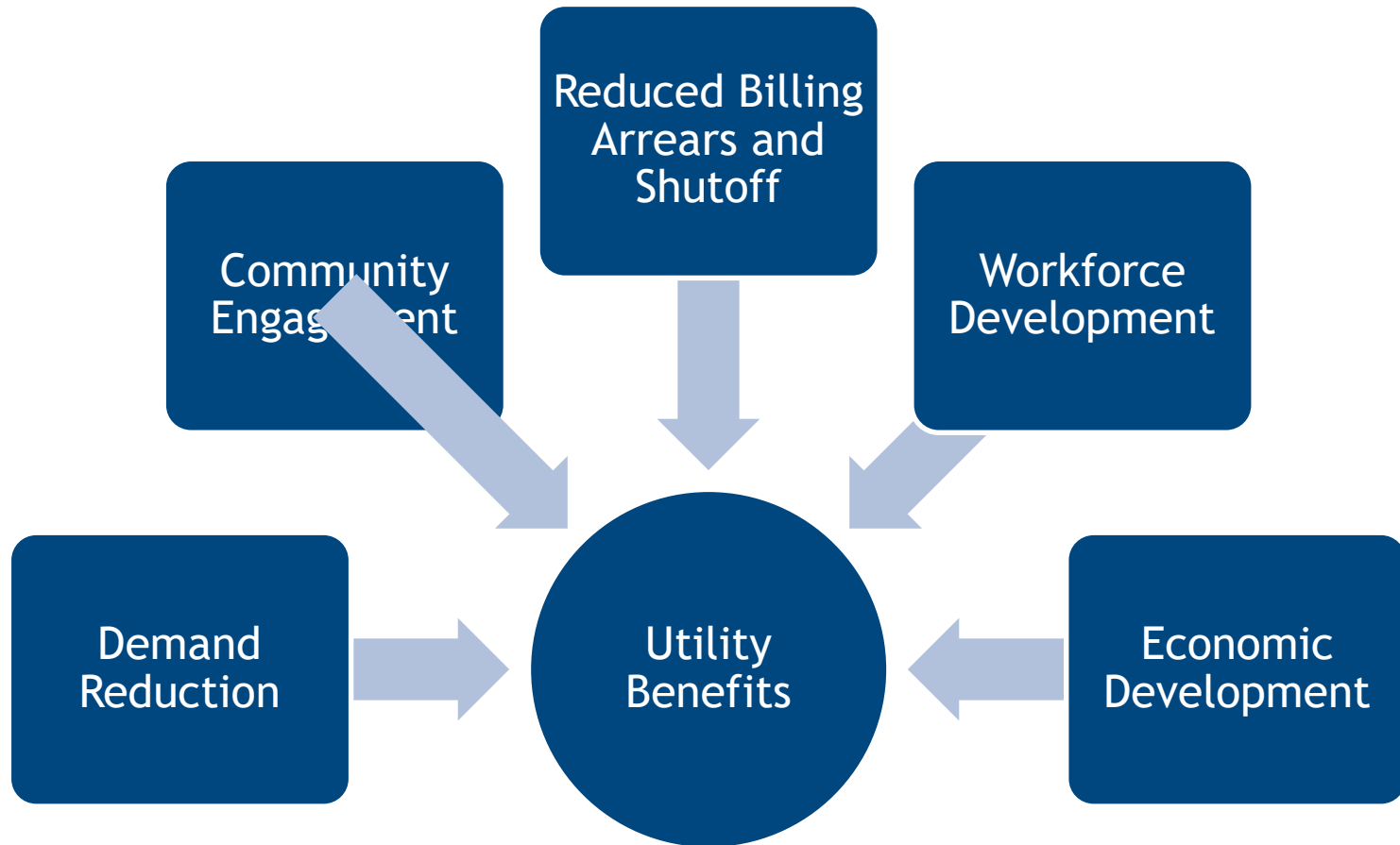
Definition: Single-story, constructed in a factory, wood-frame bolted to steel chassis, designed to be transported.



Why Target Manufactured Homes?



Benefits



Michigan Market Analysis

Regions	Total MH Homes	% MH Homes	Avg Age	Median MH Value	Average owner income	Average renter income
Eastern Upper and Northern Lower Michigan	39,910	10%	1978	\$43,450	\$42,983	\$23,586
Michiana Counties	13,088	8%	1972	\$33,700	\$50,010	\$26,456
Southeast Lower Michigan	98,274	4%	1982	\$28,300	\$52,569	\$32,829
Southwest Lower Michigan	87,713	7%	1979	\$39,700	\$48,059	\$26,679
Upper Central and Western Michigan	10,163	7%	1968	\$37,950	\$48,328	\$22,566
Statewide	249,148	5%	1980	\$35,900	\$49,729	\$29,090

Source: US Census Bureau American Community Survey State and Local Areas

Wisconsin Market Analysis

Regions	Total MH Homes	% MH Homes	Avg Age All Homes	Median MH Value	Median Owner Income All Homes	Median Renter Income All Homes
Southern Wisconsin	22,693	5%	1972	\$24,500	\$59,902	\$28,886
Southeastern Wisconsin	9,725	1%	1973	\$27,650	\$69,183	\$32,313
Northeastern Wisconsin	23,916	4%	1975	\$25,600	\$58,250	\$29,829
Northern Wisconsin	16,355	6%	1974	\$41,700	\$50,420	\$24,755
Western Wisconsin	23,305	6%	1975	\$29,500	\$58,085	\$28,518
Statewide	95,799	4%	1974	\$30,300	\$58,197	\$28,146

Source: US Census Bureau American Community Survey

Manufactured Homes Pilot Overview

- Free Energy Assessment and Direct Install with Duct Sealing
- Electric and gas utilities/statewide program
- 2015 pilots in Wisconsin and Michigan
- Train contractors and provide QA/QC
- Collected market characterization data

Direct Install Measures

Measure	Quantity
Interior Lighting CFL or LED	10-Max 15
Low Flow Showerhead	1
Kitchen Aerator	1
Bath Aerator	1-2
Water Heater Pipe Wrap 6 feet	1
Duct Sealing	1
Belly Insulation (WI only)	1
Exterior LED (WI only)	Max 4
Water Heater Temperature Adjustment (WI only)	1
ECM Replacement (WI only)	1
Refrigerator Replacement (WI only)	1
Air Sealing (WI only)	1

Marketing and Outreach



SEMCO ENERGY Gas Company and Energy Optimization are joining together to offer a special Manufactured Homes Program at no cost to eligible customers.

A professional, trained contractor will come to your home to:

- Test and seal your home's heating and cooling system ductwork
- Install up to 10 Compact Fluorescent Light Bulbs
- Install water- and energy-saving items

Plus, provide valuable information on how to save energy along with energy-saving ideas. All work completed in a quality manner in one day or less, at no cost to you.

Act now! This offer is available for a limited time. Contact the Energy Optimization program to sign up today. Call 877.296.4319 today.

EFFICIENCY. SAVINGS. COMFORT.

SEMCO ENERGY Gas Company and Energy Optimization are joining together to offer a special Manufactured Homes Program at no cost to eligible customers.

ACT NOW! This offer is available for a limited time.

A professional, trained contractor will come to your home to:

- ✓ Test and seal your home's heating and cooling system ductwork
- ✓ Install up to 10 Compact Fluorescent Light Bulbs
- ✓ Install water- and energy-saving items

Contact the **Energy Optimization** program to sign up for this special program:

Call: 877.296.4319 Email: info@michigan-energy.org

OR provide contact information here:

Name: _____
Address: _____
City: _____
State: _____ Zip code: _____
Daytime Phone: _____
Email: _____



CONGRATULATIONS!

WITH THE HELP OF FOCUS ON ENERGY'S MANUFACTURED HOMES EFFICIENCY PILOT PROGRAM, YOU WILL IMMEDIATELY BEGIN SAVING WATER AND ENERGY.

The following efficiency measures were completed in your home today:

WHOLE-HOME ENERGY AUDIT

We evaluated your home to assess how much energy it uses, and which measures will be most effective in making your home more energy efficient.

BLOWER DOOR AND DUCT LEAKAGE TESTING

Air leakage in your home can increase heating and cooling costs by more than 30 percent, and can contribute to comfort, health, and safety problems. We tested your home to evaluate the rate at which air leaks to the outside, as well as how much air leaks

INSTALLATION OF:

CARBON MONOXIDE DETECTOR

Carbon monoxide is a deadly gas which is without the use of an electronic detecting device. We installed a carbon monoxide detector to protect your family from this colorless, tasteless, odorless gas which can develop from sources such as gas water heaters, blocked chimneys, or open to the product manual for operating instructions.

CFL AND LED BULBS

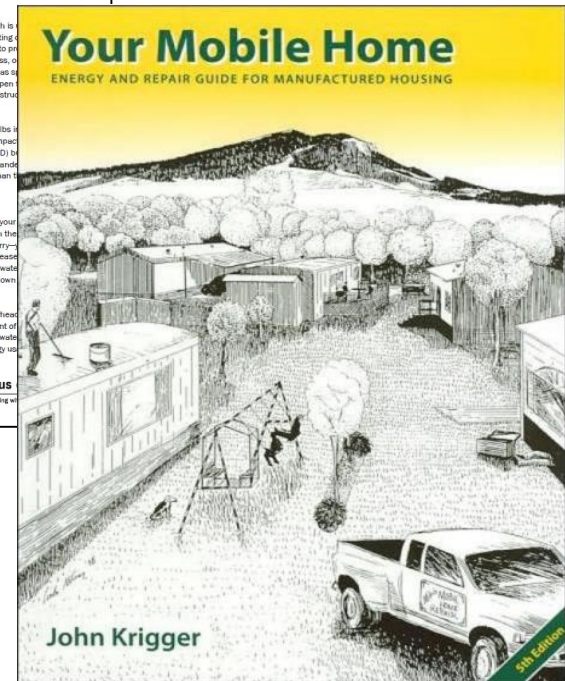
The incandescent (traditional) light bulbs were replaced with highly efficient compact fluorescent (CFL) and light-emitting diode (LED) bulbs. CFLs use about 70 percent less energy than incandescent bulbs and last up to 25 times longer than incandescent bulbs they replaced.

FAUCET AERATORS

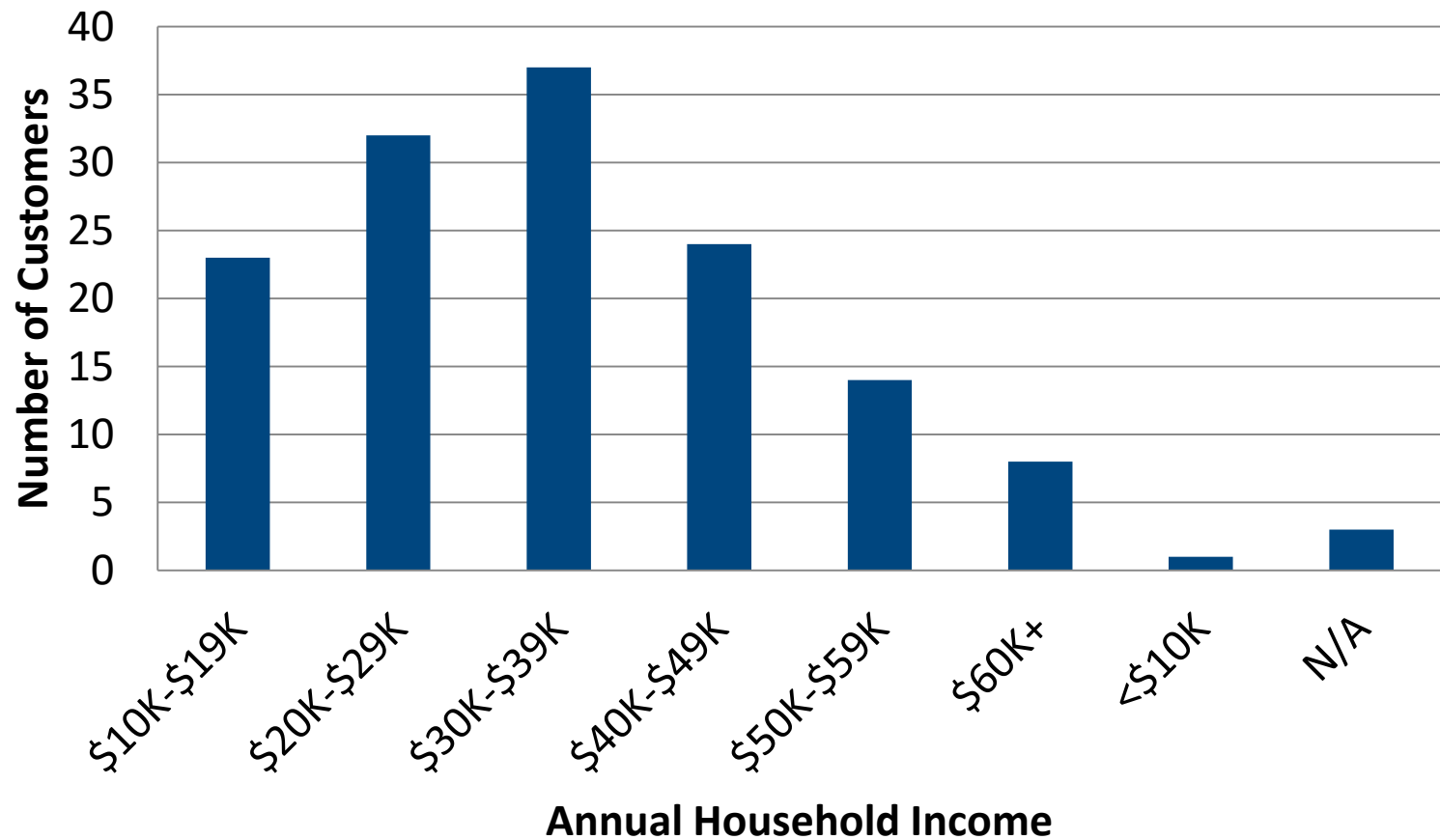
We installed water-saving aerators on your faucets. Aerators limit the flow of water through the faucet while maintaining the same water pressure. This will remain the same (or increase) while using only 1.5 gallons of water per minute. This means you will use 31 percent less water going down the drain.

SHOWERHEAD

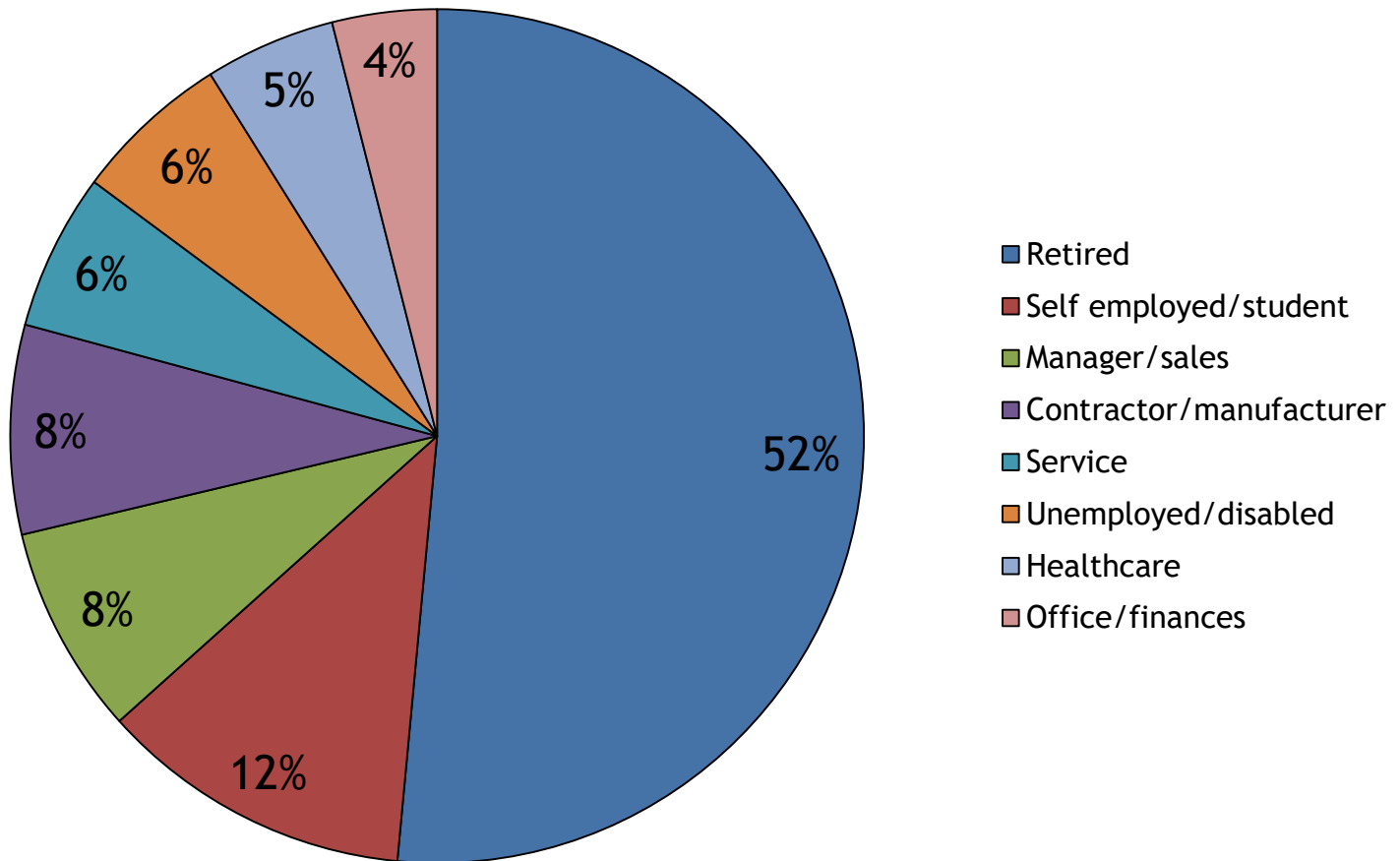
We installed a low-flow showerhead on your shower. A low-flow showerhead reduces water usage while limiting the amount of water that goes down the drain. When you use less water, you use less energy to heat it—reducing your energy costs.



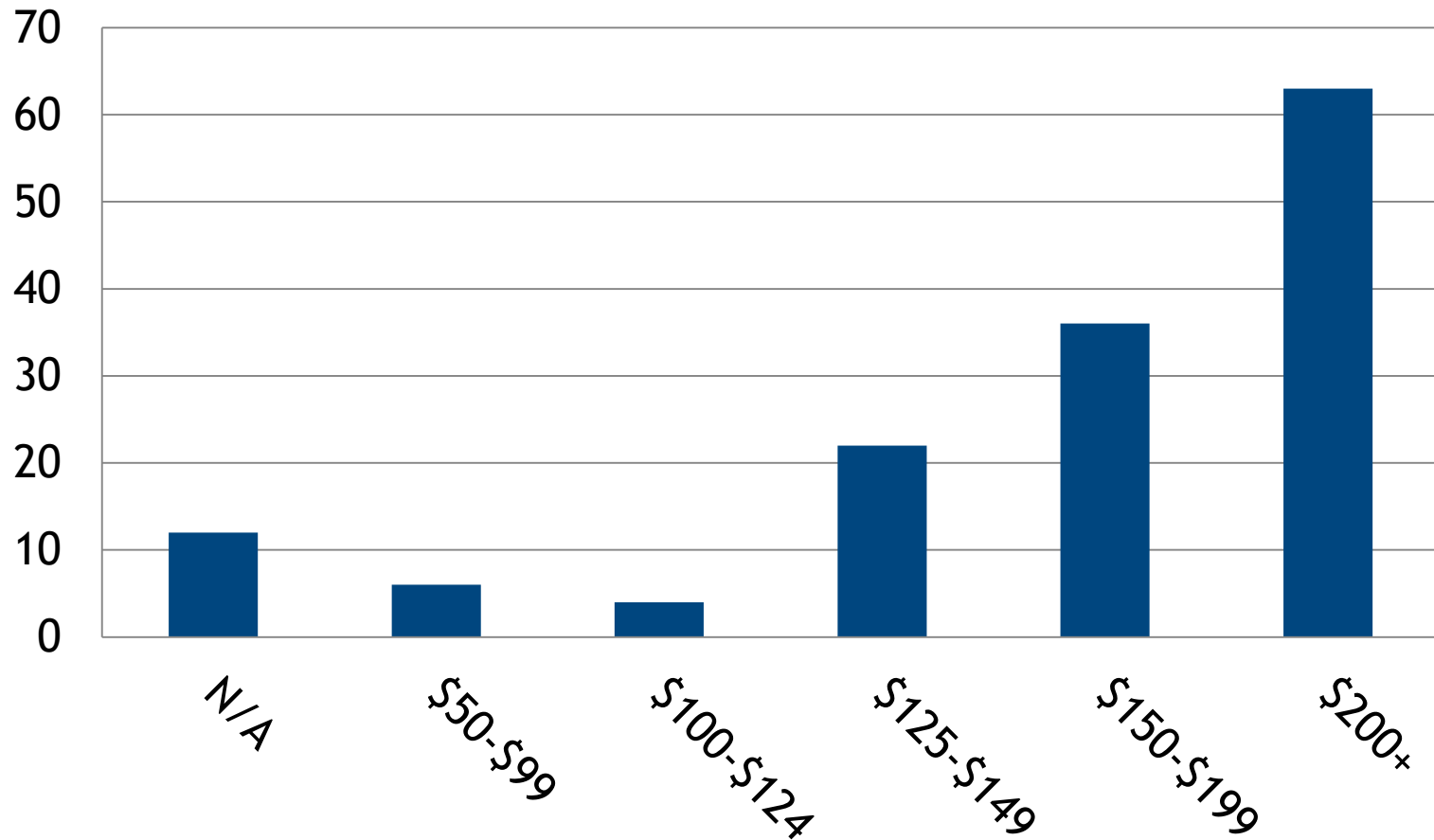
Low Income Customer Base



Fixed Income - Retired



High Utility Bill Perception



Customer Feedback

- “My furnace doesn’t run so much, and the heat seems to be more evenly spread out.
- “I keep the heat set at 68 degrees and the house feels warmer.”
- “Instant relief from the dust and cold.”
- “Much warmer with the heat turned down.”
- “The new showerheads they put in are nice.”
- “Bills went down!”
- “Light bill”

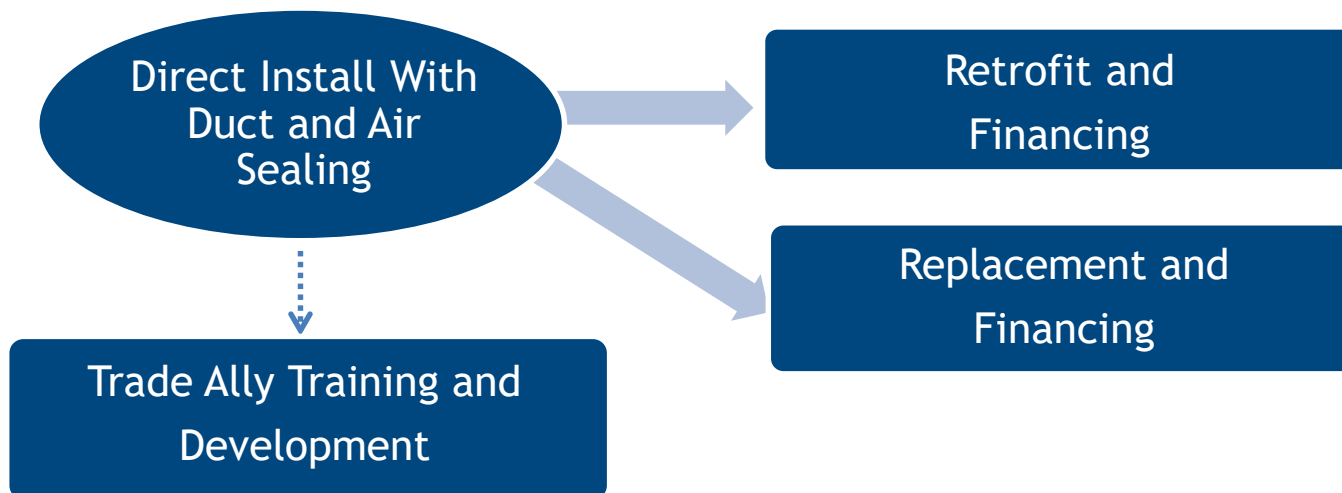
Pilot Results

	Michigan (MECA/SEMCO)	Wisconsin (Focus on Energy)
Participants	63 - met goal	79 - exceeded goal
No duct sealing	5	2
Total Annual kWh	41,818 kWh	117,020 kWh
Total Annual therms	9,603 therms	3,823 therms
Avg Annual kWh/home	664 kWh	1,481 kWh
Avg Annual therms/home	152 therms	48 therms

Note: Billing analysis to be completed Q1 2017.

Program Approach

Customer-Focused Program



Retail/Wholesaler Program



Future Considerations

- Community engagement and recruitment
- Contractor training is valuable
- Customer intake/scheduling process
- Homes have multiple bathrooms
- Geography differences

Questions?

Shannon Stendel
Product Manager - Homes



Presentation Highlights: Wisconsin Energy Conservation Corporation (WECC)

- **Different specific upgrade measures are needed** for MHs, especially when taking into account the geographic differences.
 - For example, MHs using electric heat have a higher peak demand.
 - Market characterization data helps identify some of these opportunities.
- The two WECC pilots conducted in Michigan and Wisconsin had different results due to differences in the MHs (e.g. age, region) and in the upgrade measures implemented.
- The lower utility bills and energy savings in the pilots were mainly attributed **to duct sealing**.
- Making sure that your program/pilot offers a **good customer experience** for people is one of the key lessons learned through the pilots; 94% of participants were satisfied with the WECC pilots.

Program Experience: East Kentucky Power



Kentucky's Touchstone Energy Cooperatives

Better Building

Presented by: Scott Drake

December 8, 2016

East Kentucky Power Cooperative

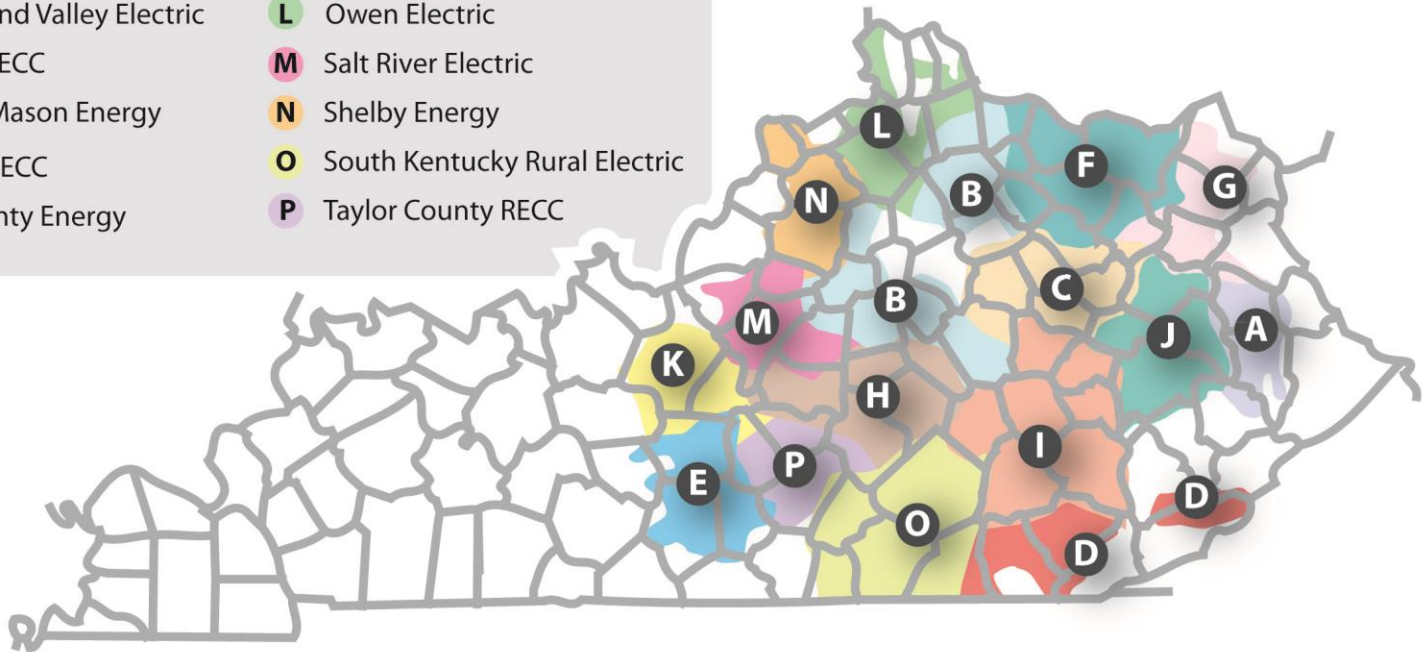
- Not-for-profit, member-owned G&T
- Provide wholesale power to 16 owner-member cooperatives
- 3,500 MW of generation capacity
- Centralize some services for the 16 co-ops
 - Energy Efficiency programs
 - Button-up Weatherization
 - Heat Pump Retrofit



Kentucky's Touchstone Energy Cooperatives

- | | |
|-------------------------------------|--|
| A Big Sandy RECC | I Jackson Energy |
| B Blue Grass Energy | J Licking Valley RECC |
| C Clark Energy | K Nolin RECC |
| D Cumberland Valley Electric | L Owen Electric |
| E Farmers RECC | M Salt River Electric |
| F Fleming-Mason Energy | N Shelby Energy |
| G Grayson RECC | O South Kentucky Rural Electric |
| H Inter-County Energy | P Taylor County RECC |

Over 530,000 members



Button-up Weatherization

- Rebates available to all residential members
- Level 1 – sliding scale
 - \$40/1000 Btus reduced, maximum of \$750
- Level 2 - \$1,060 for minimum of 26,500 Btus reduced
- Level 3 - \$1,370 for minimum of 34,250 Btus reduced
- Levels 2 and 3 are whole home programs
- 1,073 rebates total YTD saving 1,457 MWhs
- 73 rebates are manufactured home

Heat Pump Retrofit

- Rebates for replacing existing electric resistive heat with a heat pump
- Site-built homes must be 2 years old
- Manufactured homes can be new
- 14 SEER/8.0 HSPF \$750 rebate
- 15 SEER/8.5 HSPF or higher \$1,000 rebate
- 1,117 rebates total YTD saving 8,659 MWhs
- 340 rebates manufactured homes

Foaming Bellies Pilot

- Removed underbelly of 23 manufactured homes
 - Single and double-wides
- Sprayed 6" of open-cell foam
 - Seals the duct and the floor
 - Provides R-19
- Measured 3,100 kwhs saved annually per home
- \$4,197 per home
- Results failed TRC
- Lessons Learned
 - Installed electrical outlets for heat tape, flagged drains, vapor barrier
 - Participants comfortable and no call-backs



Questions and Discussion

Presentation Highlights: East Kentucky Power Cooperative (EKPC)

- Some of the energy efficiency programs in which manufactured homes (MH) often participate are:
 - **Button-up weatherization:** offered either for specific energy efficiency measures such as insulation and air sealing or for whole-home upgrades.
 - **Heat pump retrofits:** through which MHs can convert **from electric resistance heat to a high efficiency heat pump**. A high percentage of rebates offered through this kind of program apply to MHs.
- A key barrier with Kentucky MHs is that they **generally come with electric furnaces, but not a heat pump**, seen as an extra expense.
- While the **EKPC's Foaming bellies pilot** resulted in energy and financial savings, a dedicated rebate program was not pushed forward to the California Utility Commission for approval, as it did not pass the Total Resource Cost (TRC) Test.
 - Energy savings were measured by comparing whole-homes data from previous years to post upgrade periods.
 - EKPC evaluates the TRC at the measures level, but tends to file it at program level for the California Utility Commission.

Discussion Highlights

- **Cold climate heat pumps can work well in all parts of the country.**
 - In some places a dual-fuel system might be needed.
 - Upstate New York has had some successful programs with heat pumps.
 - Proper installation, air sealing and insulation are critical components to this.
 - Cold climate heat pumps that can deliver down to -18° F are also available.
- **Client education is the cheapest measure to be implemented.**
Heat tapes that are left on all summer can have significant savings.
- Vermont's **modular homes** were **developed as an alternative to MHs**, after the 2011 Tropical Storm Irene destroyed many MHs.
 - The houses are built to 0 energy standards and should preserve their value over time.
 - Typical mortgage products are offered for modular homes with low interest and long-term loan. The houses are also offered on lease plans: the homeowners pay rent but do not own the land underneath their homes.

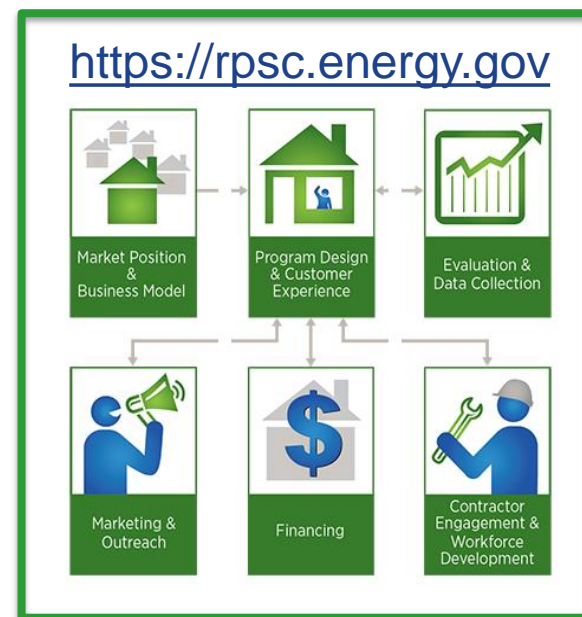
Additional Resources and Examples

- Puget Sound Energy: [Mobilizing Energy Efficiency in the Manufactured Housing Sector](#) report
- Michigan Electric Cooperative Association (MECA): [Training for Mobile Home Residents](#) blog post
- NRECA: [Lessons Learned: Energy Efficiency in Manufactured Homes](#) presentation
- ACEEE: [Mobile Homes Move Toward Efficiency](#) article

Related Resources in the Residential Program Solution Center

Explore resources related to energy efficient manufactured homes:

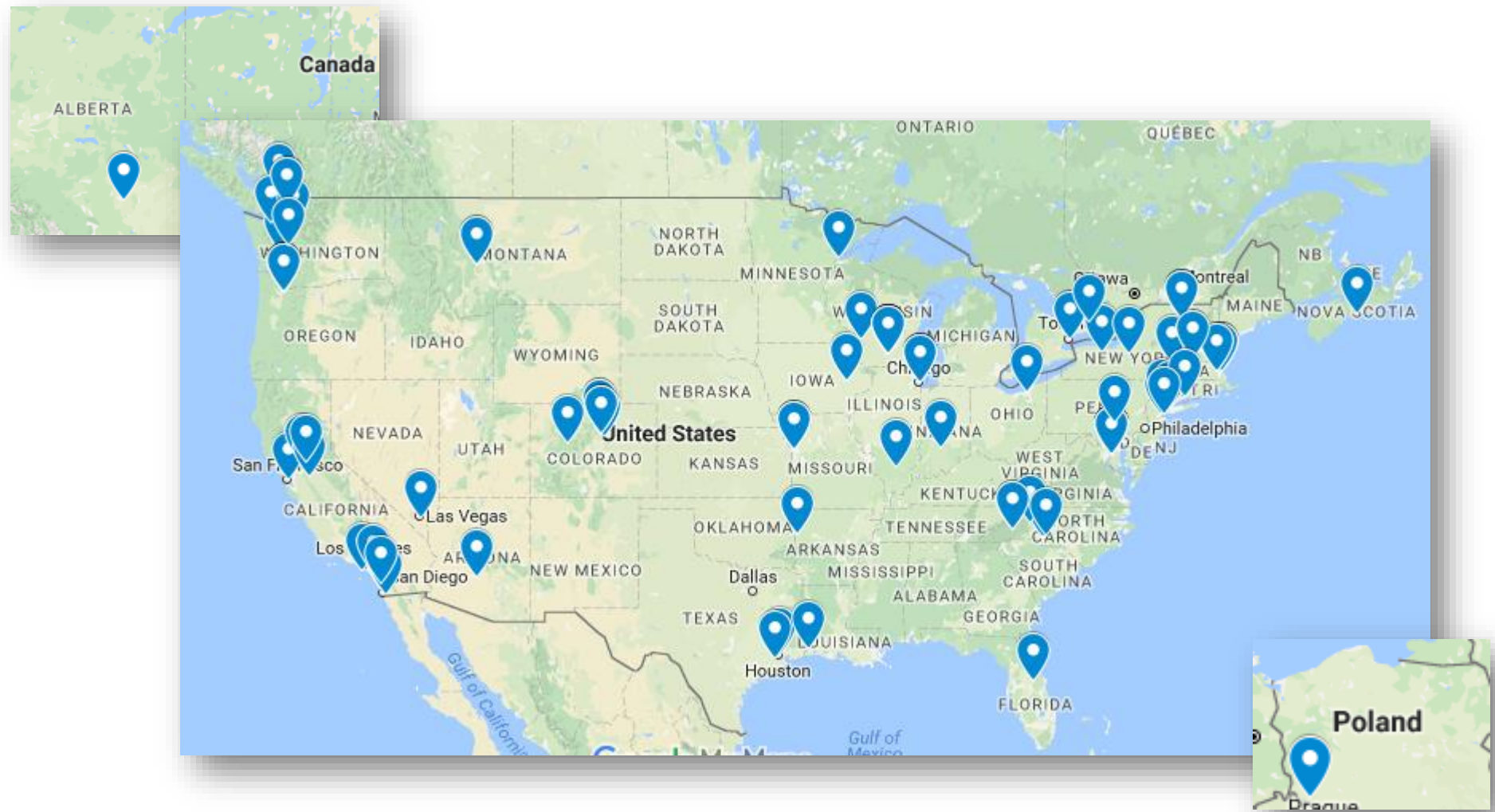
- Explore this recent study on advances in energy efficient manufactured home design in this [Building America report](#) and [presentation](#).
- Read the [Residential Building Stock Assessment report](#) on manufactured home characteristics and energy use throughout the Northwest.
- Identify manufactured home owners' interests and motivations with broader insights from the [Program Design & Customer Experience –Assess the Market handbook](#).



- Check out the latest [Proven Practices](#) post on [Incentivizing Home Upgrade Actions](#).
- The Solution Center is continually updated to support residential energy efficiency programs—[member ideas are wanted](#)!

Addenda: Attendee Information and Poll Results

Call Attendee Locations



Call Attendees: Network Members

- American Council for an Energy-Efficient Economy (ACEEE)
- AppleBlossom Energy Inc.
- Boulder County (CO)
- Bridging The Gap
- California Energy Commission
- Center for Sustainable Energy
- City of Chula Vista (CA)
- City of Kansas City (MO)
- Enhabit
- CLEAResult
- Cleveland Public Power
- Davis Energy Group
- Ecolibrium3
- Ecolighten Energy Solutions Ltd.
- Efficiency Nova Scotia
- Elevate Energy
- Fujitsu General America Inc.
- National Housing Trust
- Seventhwave
- United Illuminating Company
- Vermont Energy Investment Corporation (VEIC)
- Windham & Windsor Housing Trust
- Wisconsin Energy Conservation Corporation (WECC)

Call Attendees: Non-Members (1 of 3)

- Association of Polish Electrical Engineers
- BlueRidge Electric Membership Corporation
- Brand Cool
- Cadmus Group
- Carolina Smart Homes
- Cascade Natural Gas
- The Community and Economic Development Association of Cook County, Inc. (CEDA)
- Consortium for Energy Efficiency (CEE)
- City of Bloomington (IN)
- City of Houston (TX)
- City of Mount Vernon (WA)
- City of Orlando (FL)
- Clallam County (WA)
- Clean Air Partnership
- Collaborative Efficiency
- Couleecap
- Commonwealth of Pennsylvania
- Dow Corning
- East Kentucky Power Cooperative
- The University of Kansas
- Enbridge Gas Distribution Inc.
- Energetics Incorporated

Call Attendees: Non-Members (2 of 3)

- Environmental and Energy Study Institute (EESI)
- GoodCents
- Greenergy Chicago, Inc
- Home Office Training & Technology
- U.S. Department of Housing and Urban Development (HUD)
- Johnson Home Performance
- Legrand Wattstopper
- Mainstream Architectural Group
- Mathis Consulting Company
- Mercy Housing Management Group (MHMG)
- Modular Lifestyles, Inc
- Montana Department of Environmental Quality
- National Association for State Community Services Programs (NASCCSP)
- National Grid
- New Ecology, Inc.
- National Renewable Energy Laboratory (NREL)
- The New York State Department of Environmental Conservation (NYSDEC)

Call Attendees: Non-Members (3 of 3)

- New York State Weatherization Directors Association (NYSWDA)
- Opportunity Council
- Pacific Gas and Electric Company
- Rheem
- Rocky Mountain Institute
- Scott Donovan Architect
- Snohomish County (WA)
- State of Wisconsin Department of Administration
- Studio Jack Rees
- Sustainable South Bronx
- Systems Building Research Alliance
- Transition Living
- Washington State University Energy Program

Opening Poll #1

- Which of the following best describes your organization's experience with energy efficiency programs for manufactured homes?
 - Limited experience/familiarity – **34%**
 - Very experienced/familiar – **23%**
 - Some experience/familiarity – **23%**
 - No experience/familiarity – **15%**
 - Not applicable – **5%**

Closing Poll

- After today's call, what will you do?
 - Seek out additional information on one or more of the ideas – **66%**
 - Consider implementing one or more of the ideas discussed – **18%**
 - Make no changes to your current approach – **13%**
 - Other (please explain) – **3%**