SUSTAINABLE SOLAR EDUCATION PROJECT

Low-Income Solar, Part 1: Lessons Learned from Low-Income Energy Efficiency Programs

March 23, 2017

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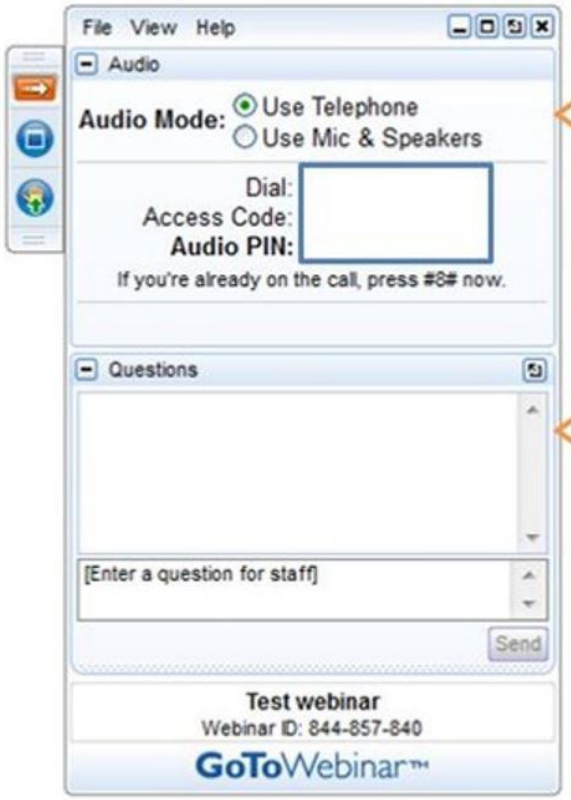
CleanEnergy States Alliance

Housekeeping



All participants are in "Listen-Only" mode. Select "Use Mic & Speakers" to avoid toll charges and use your computer's VOIP capabilities. Or select "Use Telephone" and enter your PIN onto your phone key pad.

Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

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Upcoming Webinars

Interactions between Wind Turbines and Wildlife, Part 2
Wednesday, March 29, 1-2pm ET

Low-Income Solar, Part 2: Using the Tools of Low-Income Energy Efficiency Financing
Thursday, March 30, 1-2pm ET

NYC's Policy Target and Roadmap for Resilient Solar+Storage
Tuesday, April 4, 1-2pm ET

Tools for Building More Resilient Communities with Solar+Storage
Thursday, April 6, 1-2pm ET

The Solar Massachusetts Renewable Target (SMART) Program
Wednesday, April 12, 1-2pm ET

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Sustainable Solar Education Project

- Provides information and educational resources to state and municipal officials on strategies to ensure distributed solar electricity remains consumer friendly and benefits low- and moderate-income households.
- The project is managed by the CESA and is funded through the U.S. Department of Energy SunShot Initiative's Solar Training and Education for Professionals program.
- Sign up for the Sustainable Solar mailing list to receive our free monthly newsletter and announcements of upcoming events

www.cesa.org/projects/sustainable-solar

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Panelists

Ian Hoffman, Senior Scientific Engineering Associate, Electricity Markets & Policy Group, Lawrence Berkeley National Laboratory

Warren Leon, Executive Director, Clean Energy States Alliance (Moderator)

Low- and Moderate-Income Energy Efficiency: Demographics, Challenges, New Approaches

March 23, 2017

Ian M. Hoffman

Electricity Markets and Policy Group

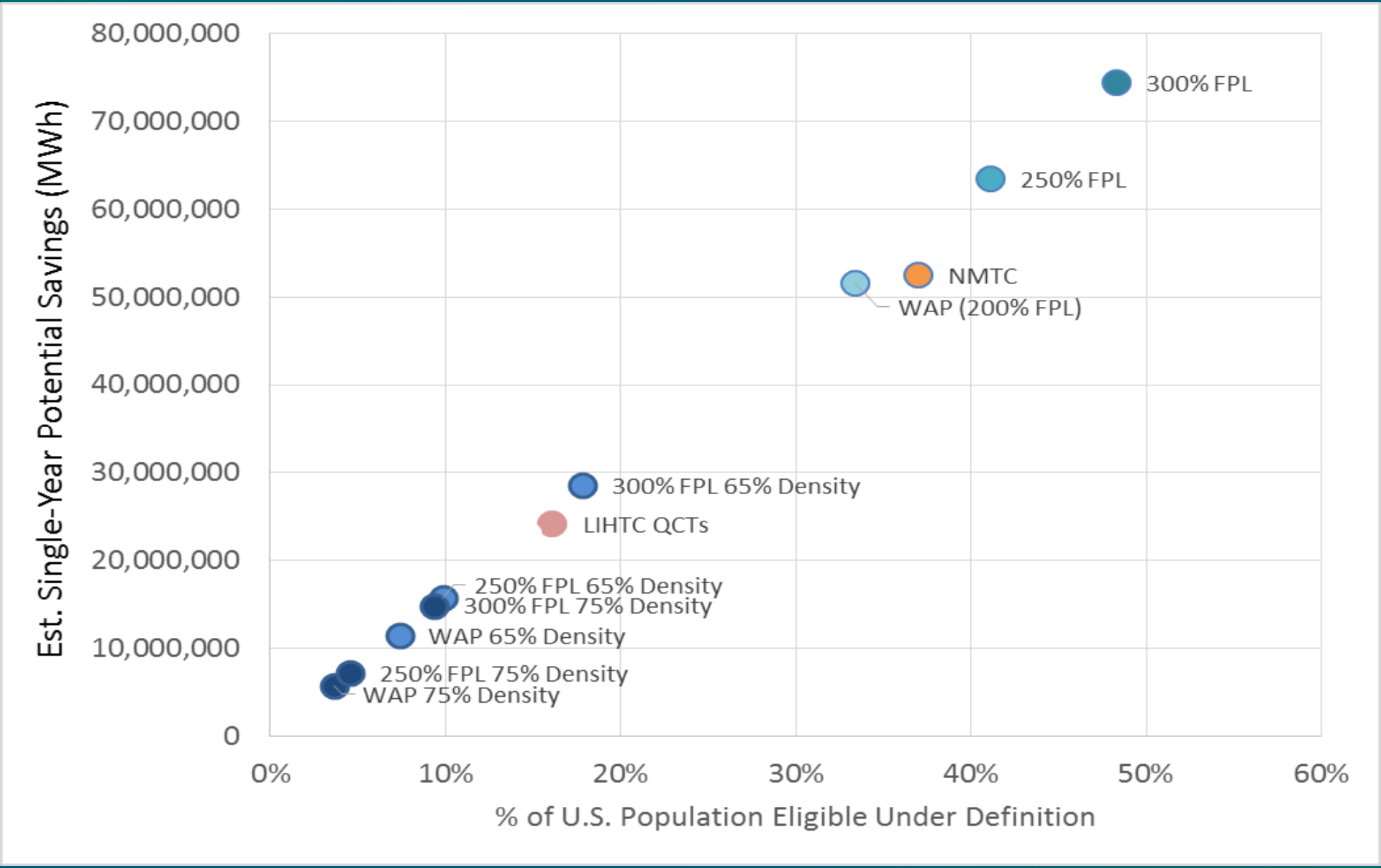
Agenda

- Defining the low- and moderate-income population
  - Eligibility and geography
  - Demographics
  - Housing characterization
- “Standard” approaches to low-income energy efficiency
- Challenges
- Emerging implementation & program models
- Q&A

Is a household low- or moderate-income? Depends.

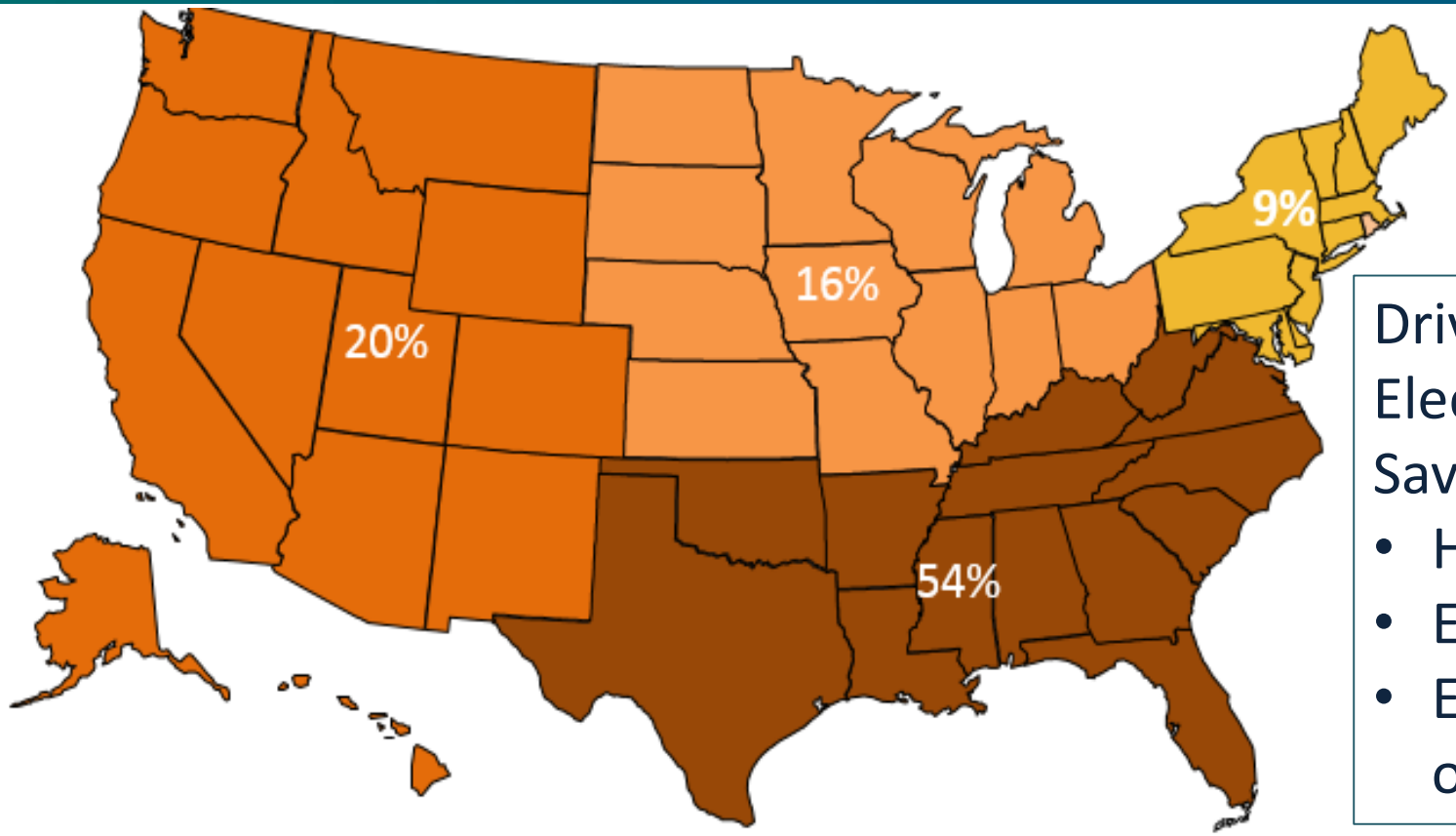
- Where they are
  - Some states use different income thresholds
- What program or initiative we're talking about
  - Utility low-income EE and the Weatherization Assistance Program (WAP): 200% of the federal poverty level (FPL)
  - LIHEAP (federal heating assistance): 150% FPL
  - Medicaid: 100% or 138% FPL
  - Utility EE for moderate income households: 200-300% FPL but some define moderate as reaching to 400% of FPL
  - Housing tax credits
- At what geographic resolution is eligibility assessed
  - National for federal poverty level
  - State/county/census tract for area median income
  - Apartment complex for WAP 50%/65% density threshold

Eligibility, geography, housing & heating drive energy impacts



Source: LBNL, "Gauging the Impact of Various Definitions of Low- and Moderate-Income Communities on Possible Electricity Savings From Weatherization," 2017; U.S. Census, American Community Survey, 5-year data through 2014

Regional Shares of Est. 1st-Year LI Electricity Savings



Drivers of High LI Electricity Savings Potential

- Hot, humid
- Electric HVAC
- Elevated levels of LMI hhlds

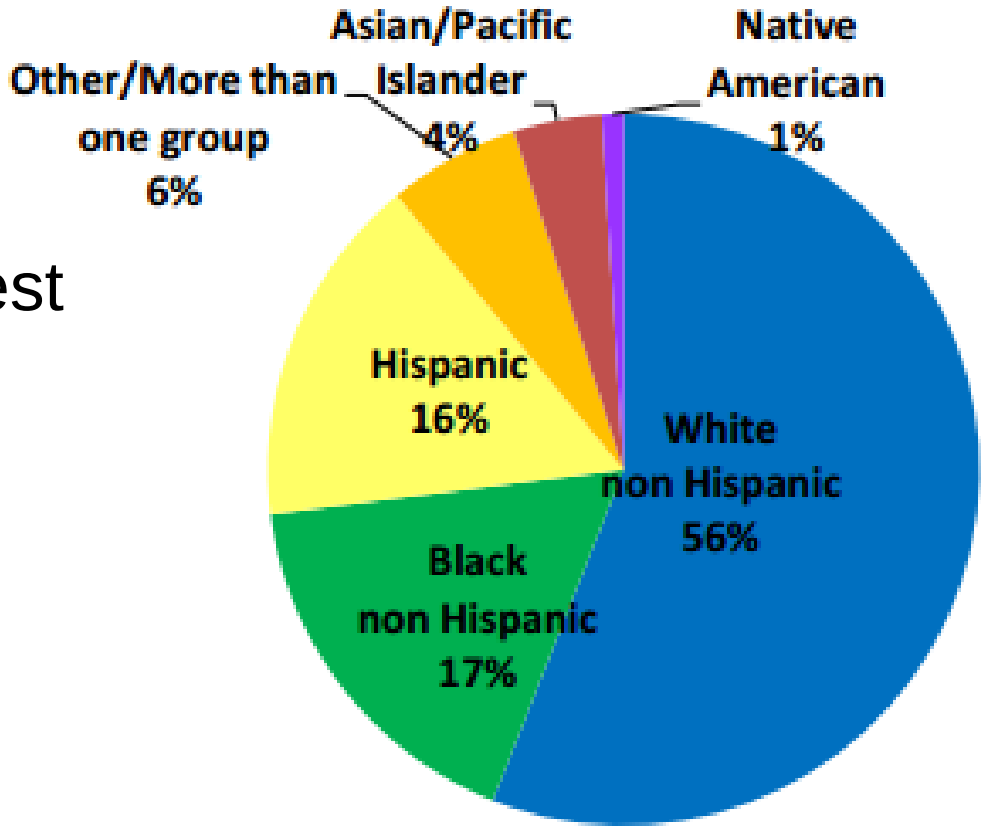
Approximation of national and regional savings for DOE, premised on:

- Household-by-household qualification
- No previous weatherizations
- Full participation

Source: LBNL for U.S. DOE; LBNL, "Gauging the Impact of Various Definitions of Low- and Moderate-Income Communities on Possible Electricity Savings From Weatherization," 2017; American Community Survey, 5-year data

Portrait of LI Households

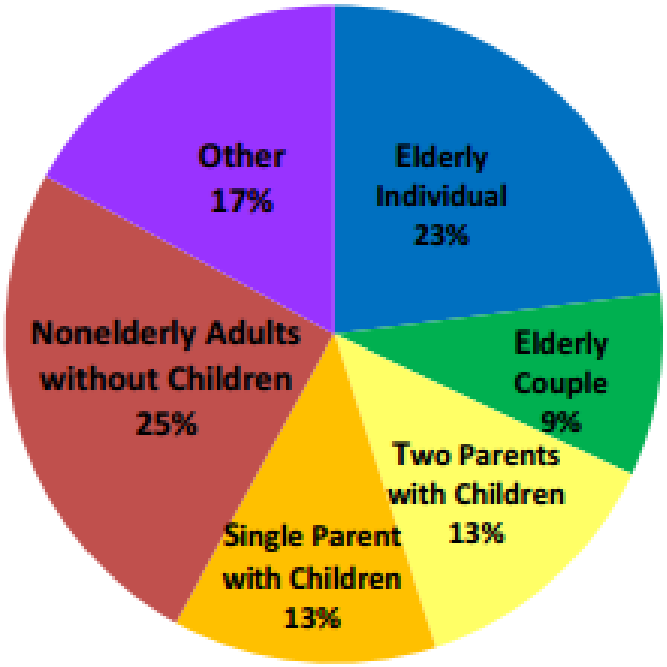
- More than a third of U.S. households are LI
- Largest LI numbers in moderate & hot, humid climates in the South & cold climate of the urban Northeast, central Midwest
- Mostly white; a third split between black and Hispanic

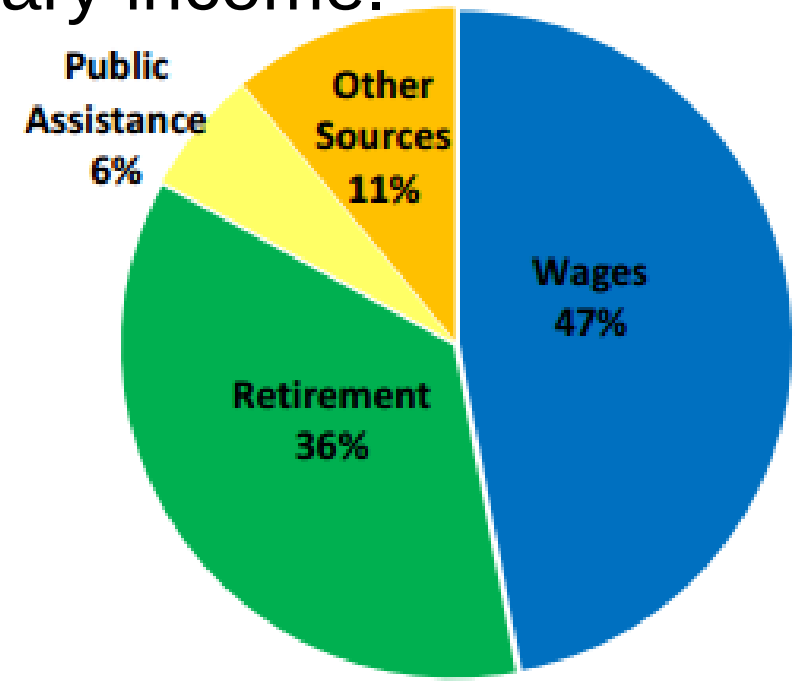


Source: LBNL; ORNL, WAP Evaluation, Eligible Population Report, 2014; http://weatherization.ornl.gov/Retrospectivepdfs/ORNL_TM-2014_312.pdf

Portrait of LI Households: Type & Income

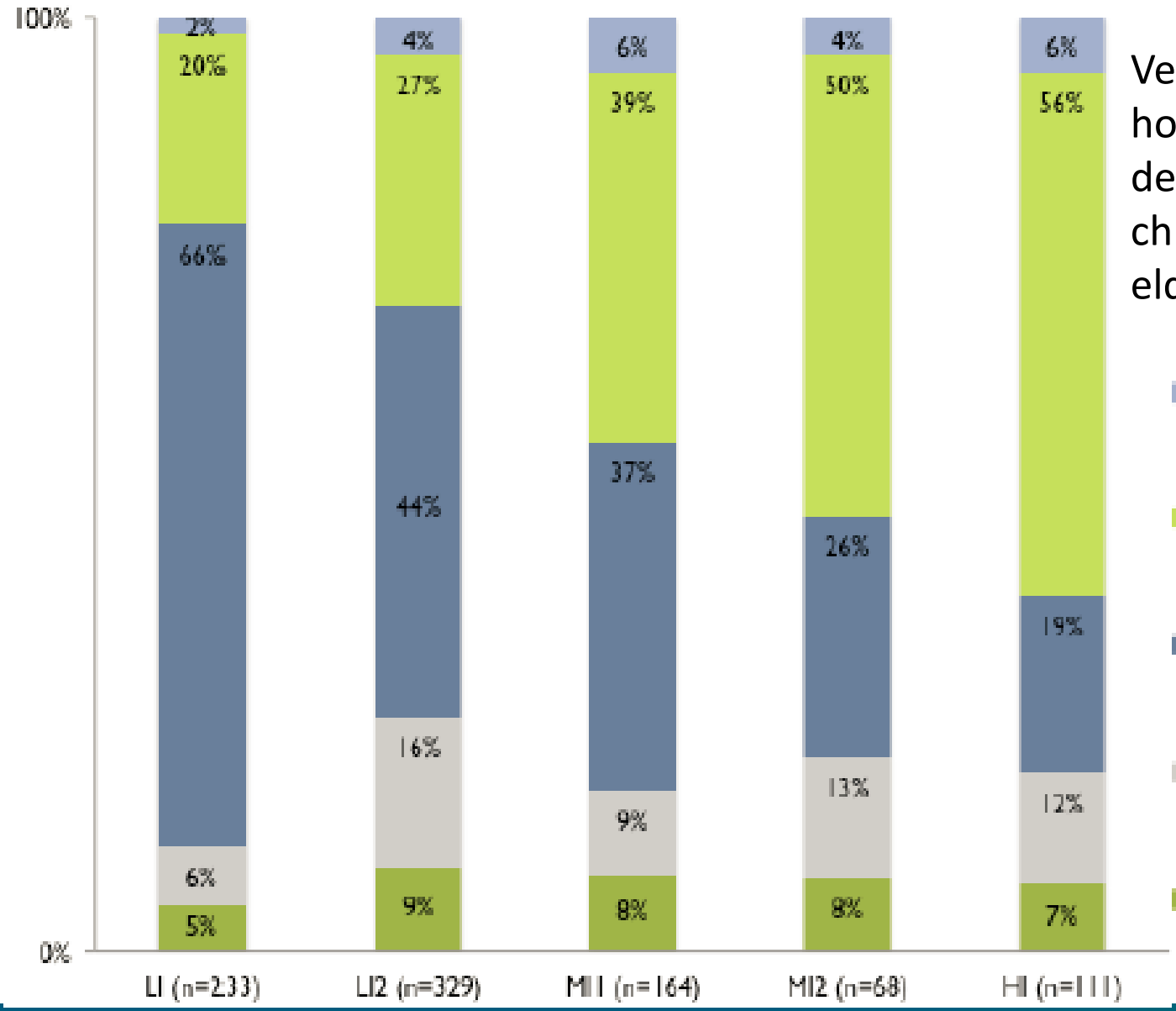
- Many are single parents or retirees (36%), many are elderly (32% older than 60); disabilities (33%)
- Most living primarily on wages (47%) or Social Security/retirement income (36%). Only 6% rely on public assistance for primary income.





Source: ORNL, WAP Evaluation, Eligible Population Report, 2014; http://weatherization.ornl.gov/Retrospectivepdfs/ORNL_TM-2014_312.pdf

Portrait of LI Households: Dependents

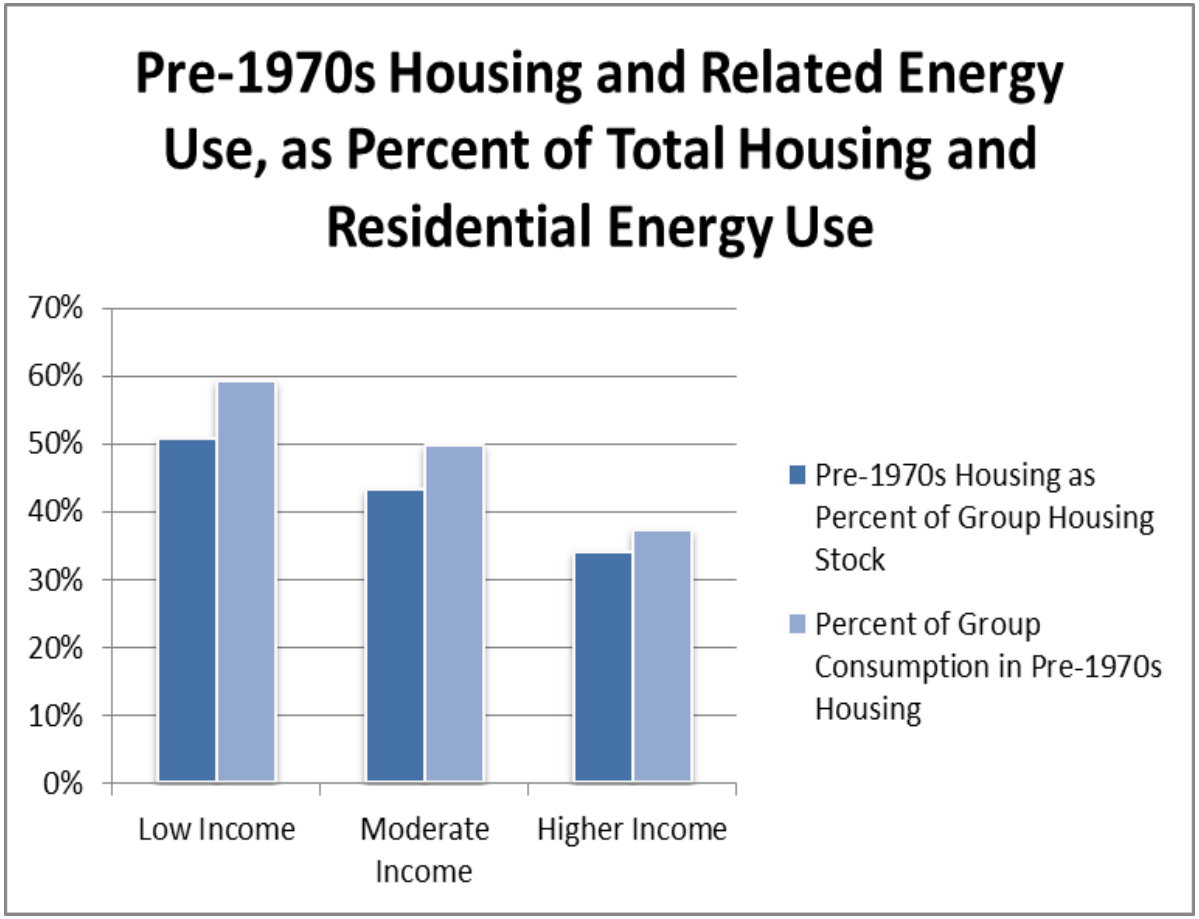


Very low and low income households often have dependents – usually children, sometimes elderly

Source: Evergreen Economics for CPUC, "Needs Assessment for the Energy Savings Assistance and California Alternative Rates for Energy Programs," 2016

Portrait of LMI housing, consumption

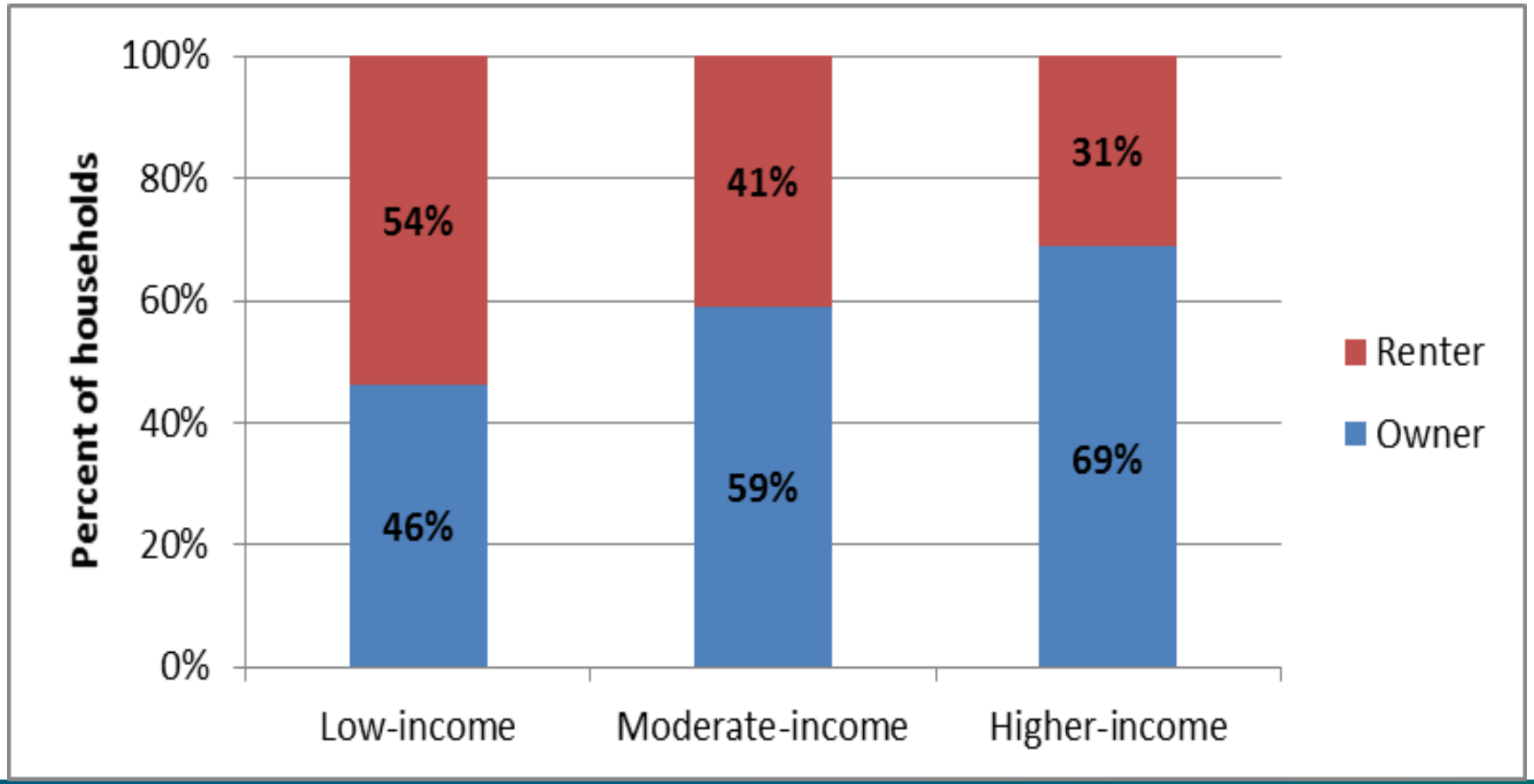
- Housing stock and consumption for low vs. moderate income households are alike in some ways…
  - Older & more likely to have defects that impact EE, RE
    - Leaky or structurally unsound roofs, windows
    - Other deferred maintenance
    - Safety, health – mold; asbestos; knob-and-tube wiring; ventilation



Source: LBNL, "Delivering Energy Efficiency to Middle Income Single Family Households," 2011; U.S. EIA, Residential Energy Consumption Survey

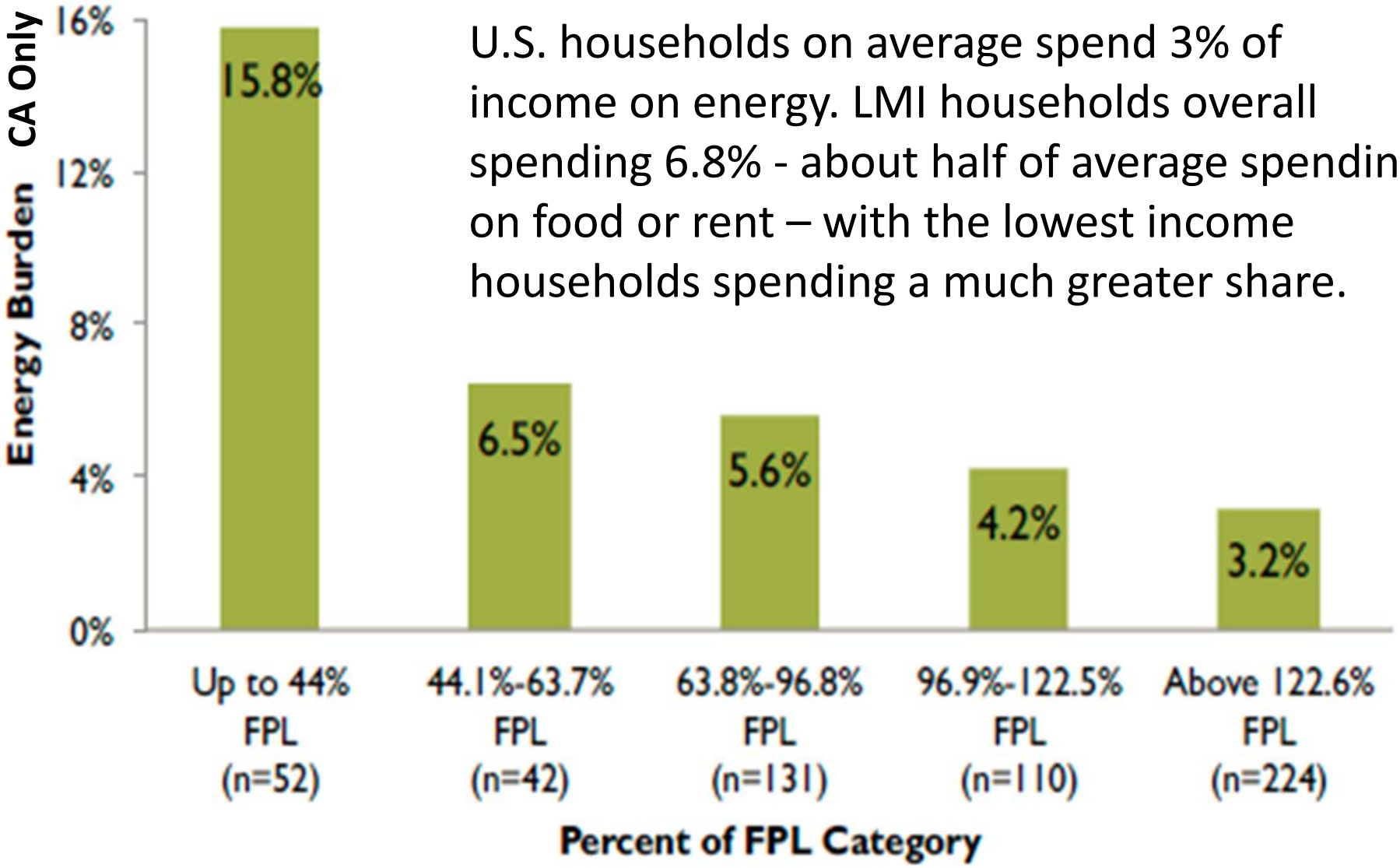
Portrait of LMI housing

- But different in other important ways…
  - LI: more MF, mobile homes; renting; urban/rural; heating
  - MI: More SF, ownership; suburban/urban; plug loads



Source: U.S. Bureau of Labor Statistics, 2016

Energy burden for LMI households



U.S. households on average spend 3% of income on energy. LMI households overall spending 6.8% - about half of average spending on food or rent – with the lowest income households spending a much greater share.

Sources: LBNL, "Energy Efficiency Financing for Low – and Moderate-Income Households," forthcoming; U.S. BLS, Consumer Expenditure Survey, 2015; CPUC, Needs Assessment for ESAP and CARE, December 2016

Core LMI markets & "typical" approaches

Single family

- **Single-family weatherization**:
  - Income qualification and implementation by a community action agency or contractor for a utility
  - Contractors perform an energy audit, prioritize measures by cost effectiveness and then schedule a retrofit with the householder
  - Measures: lighting, air sealing, insulation, water heater wrap, door or envelope repairs, HVAC/evap. cooler replacement
- **Direct-install kits:**
  - Household receives inexpensive measures that may be installed by the householder or a contractor on delivery
  - Measures: lighting, faucet aerators, low-flow shower heads, weather stripping. Often paired with energy education.

Core LMI markets & "typical" approaches

- **Multi family**
  - **Multi-family weatherization:** Program administrator or implementer tries to "sell" building owner/manager
    - Measures: Major HVAC system repair/replacement and retrofit of common areas and possibly individual units
  - **Appliance swapouts**
    - Contractor replaces old, inefficient refrigerators and freezers with more efficient models

Challenges

- Awareness
- “Free” or “no cost” ≠ willing
- Transaction costs of qualification for households and weatherization providers
- Householders cannot afford, or are otherwise unable, to take time off work for income verification, retrofit and pre/post inspections
- Distrust of offers of “free” services; wary of being charged later
- Reluctance to provide income or accept “free” services; pride
- Misalignment of tenant vs. landlord interests on energy bills or householder unwillingness to ask for improvements
- Poor condition of housing, incl. structural, health, safety issues
- Cost effectiveness – program usually pays the full cost of securing energy and bill savings

Challenges

- Common hard-to-reach segments within LI
  - Renters in multifamily properties
  - Rural households
  - Foreign language-only households
  - Undocumented immigrants
  - Seniors
  - People with disabilities

Improved LI EE implementation models

- Using a capped share of project costs for fixing structural, health, safety issues
- Aggregation of multiple funding sources – incl. healthy homes, lead/asbestos abatement
- Prioritizing high-use, high energy-burden households
- Trusted community partners
- Area-wide income eligibility screening
- Categorical qualification and “one-stop shop”
- Online scheduling and project management tools

Sources: LBNL, “Keys to the House,” forthcoming; “Energy Efficiency Financing for Low- and Moderate-Income Households: Current State of the Market, Issues, and Opportunities,” forthcoming

Emerging program models

- Tiered or phased project implementation
  - SF – start with the basics and a time line
  - MF – building by building or measure by measure
- Expanding focus to plug loads, consumer electronics – full spectrum of savings opportunities
- Mobile and manufactured homes
  - Park-wide qualification
  - Direct install
- Novel delivery and recruitment channels
  - Food banks, churches
- Targeting of private subsidized housing market
  - Less split-incentive problem

Source: LBNL, "Keys to the House: Unlocking Residential Savings With Program Models for Home Energy Upgrades," *forthcoming*

"Atypical" approach: EE & SWH in Hawaii

- 30 years
- Priority for LI elderly and disabled
- Qualified contractors
- Measures: SWH, room AC, fridge replacement, lighting, low-flow shower heads, water heater timers
- Very accessible marketing – translation of savings into palpable goods, e.g., family of four saves enough to buy X amount of food, clothing.
- Average of $7,000/project. Shifting to low-interest loans.
- Small yearly penetration (49 units last year) but sizable market penetration, esp. in Hawai'i Homelands

Summary

- LI and MI households are similar in some ways, different in others (single vs. married; dependents; elderly & disabled; ownership/means)
- Long established approaches but tough markets to crack – poor housing, distrust, work conflicts, split incentives – typically low market penetration
- New approaches aimed at streamlining qualification, expansion of markets and delivery mechanisms, and some combination of efficiency with customer-sited renewables

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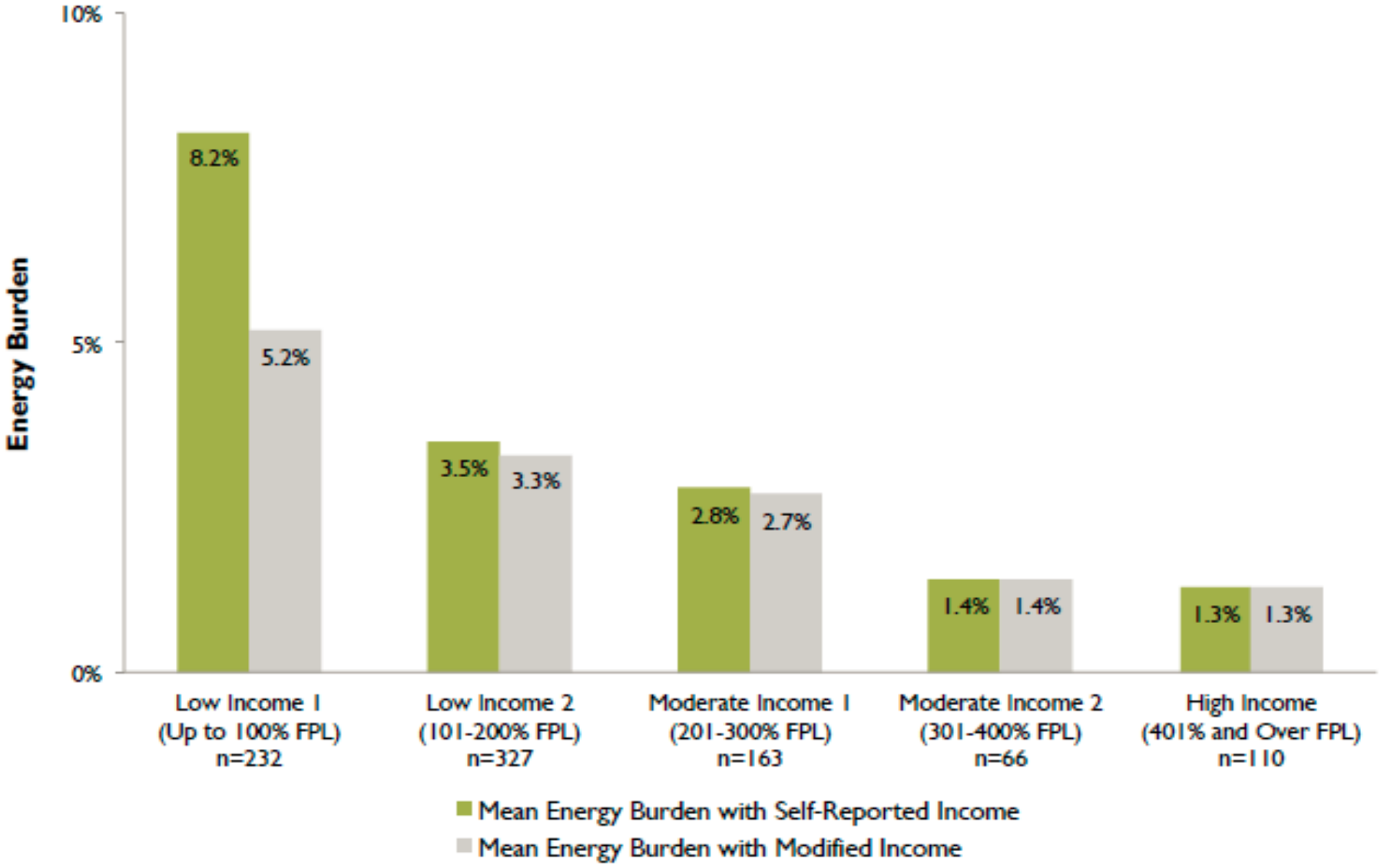
Additional Slides

Energy burden



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