Harnessing the Clean Energy Revolution to Improve Public Health:

Inclusive Financing for Distributed Clean Energy Solutions

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Clean Energy Works

Prepared for the National Academy of Sciences
Population Health Roundtable

October 19, 2016

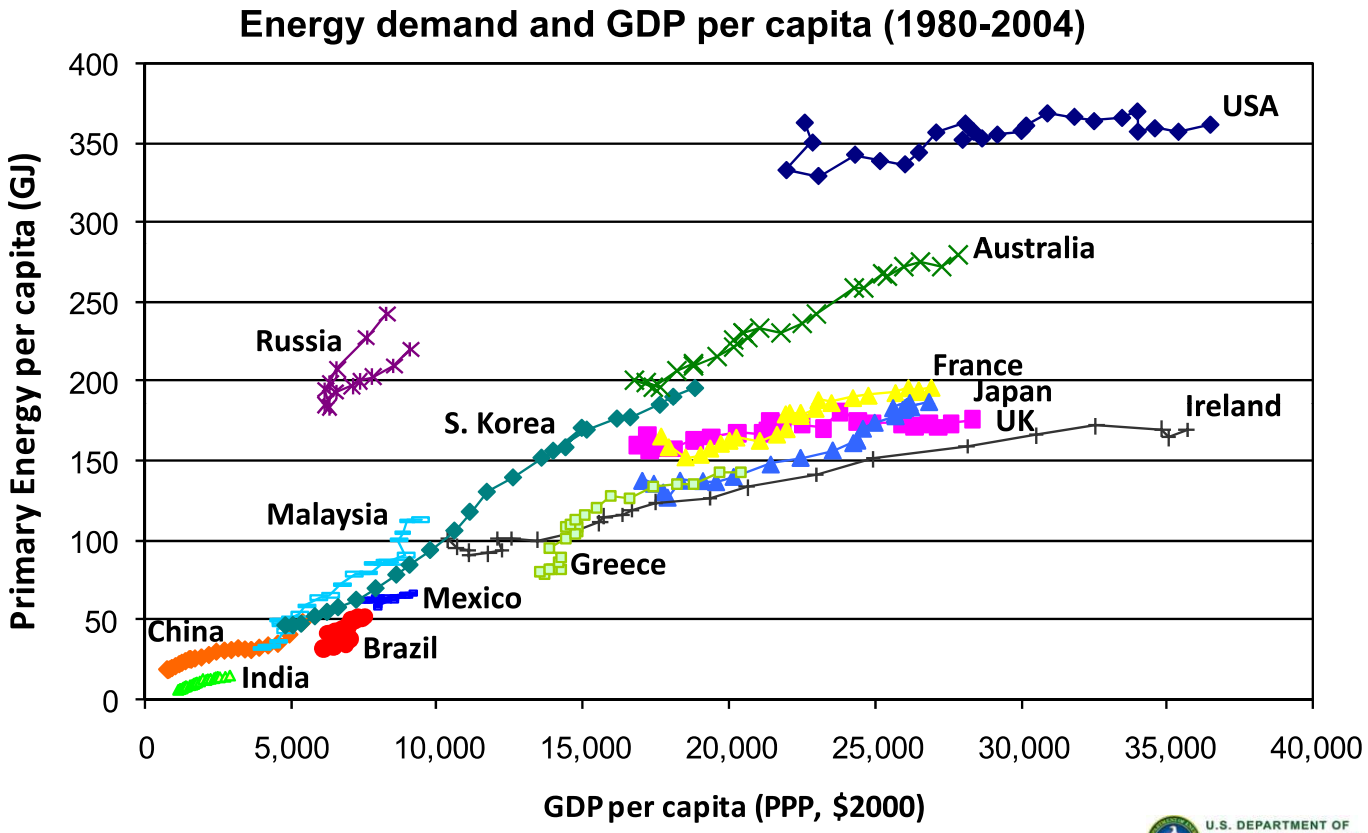
Harnessing the Clean Energy Revolution to Improve Population Health

- Industrial Revolution & Climate Change
- Recovering Social Costs & Harnessing Public Spending
- Contours of the Clean Energy Divide
- Inclusive Financing for Distributed Energy Solutions

Industrialization has enabled vast improvements to population health….

Metrics for energy development are used as indicators for human development

Energy consumption has historically increased with development



Source: UN and DOE EIA, Russia data 1992-2004 only

U.S. DEPARTMENT OF ENERGY

More than 80% of the energy in the global economy is fossil fueled, a profound hazard to population health.

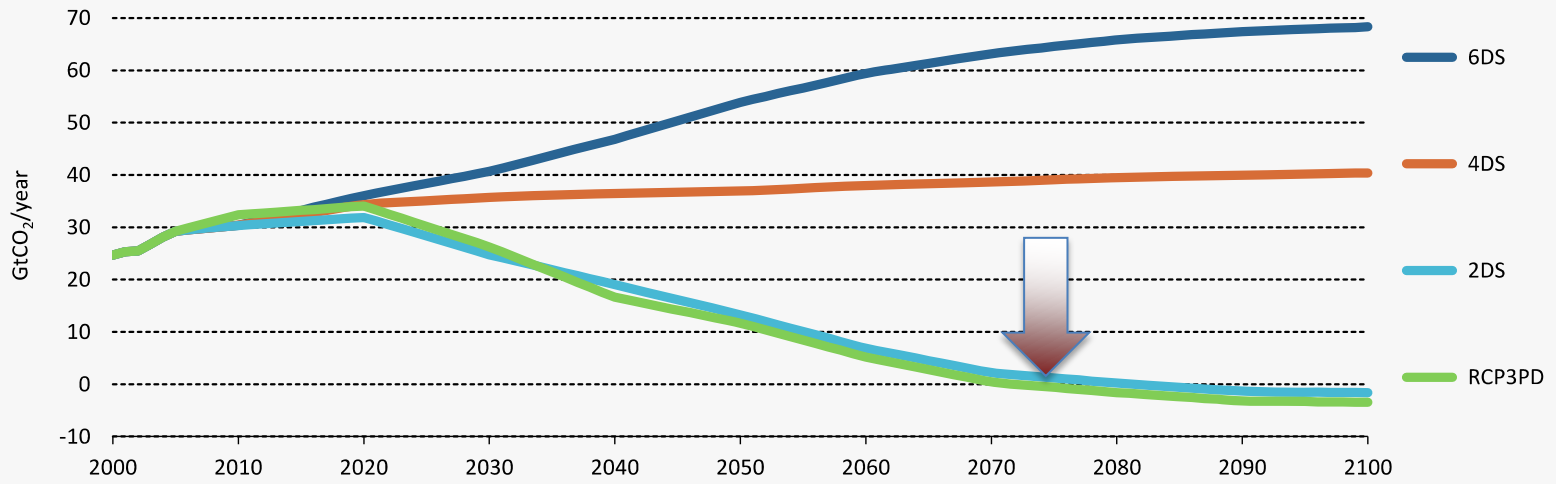
Changes to the chemistry of the atmosphere and oceans are creating hazards to health that stressing life support systems around the world.

Source: Intergovernmental Panel on Climate Change (2014), Fifth Assessment Report (WG II and III).

International Energy Agency finding in 2012:

Energy-related CO2 emissions need to be ***completely eliminated by 2075*** in order to limit global temperature rise to 2 deg C.

Figure 16.1 Long-term energy-related CO_2 emissions derived from ETP scenarios and compared with RCPs.

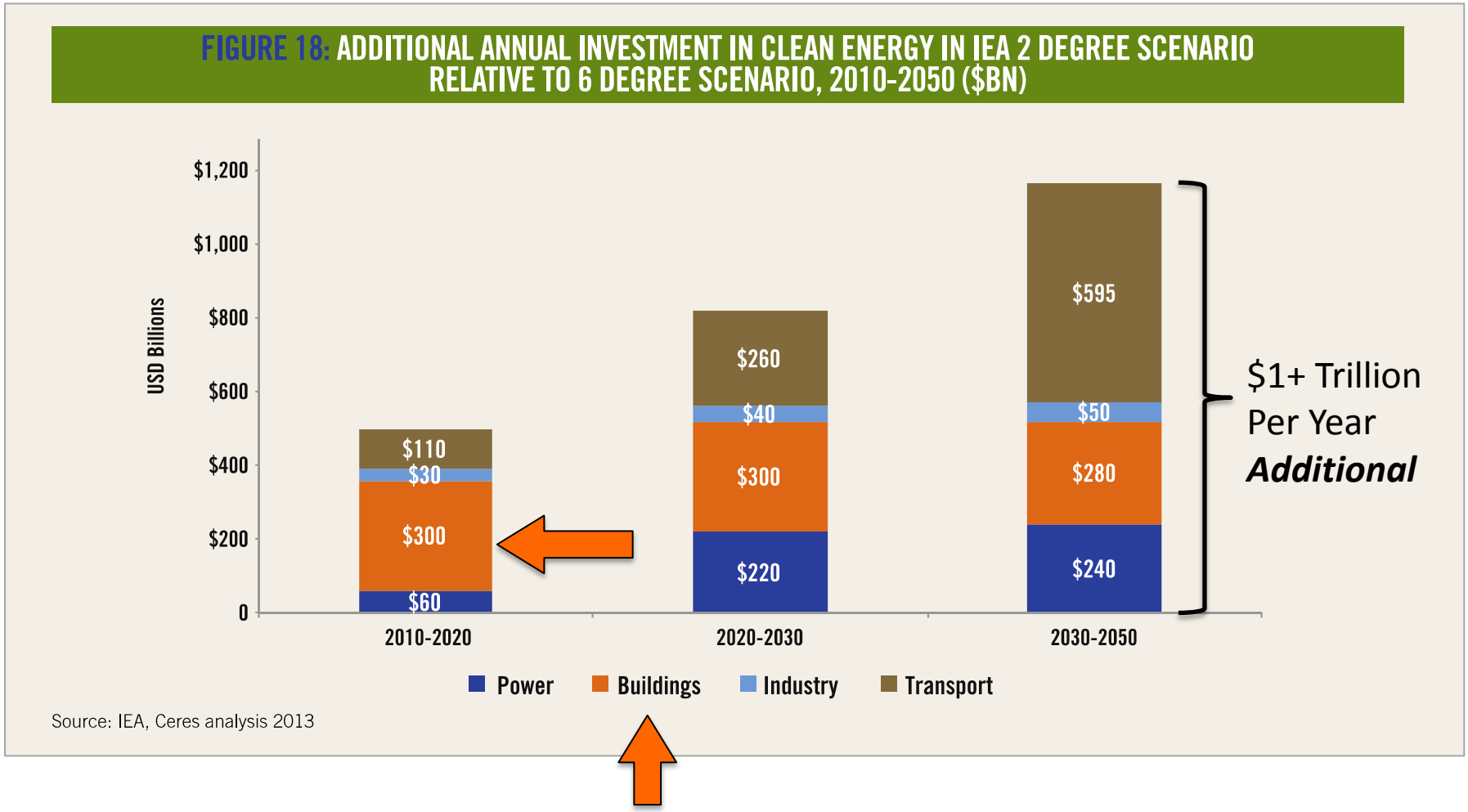


Source: Unless otherwise noted, all tables and figures in this chapter derive from IEA data and analysis.

Key point *Energy-related CO_2 emissions need to be completely eliminated by 2075 in order to limit global temperature rise to 2°C.*

Source: International Energy Agency (2012), Energy Technology Perspectives.

For a 2 degree stabilization target, IEA found need for large scale additional annual investment.



Source: CERES (2014), Clean Trillion Report.

U.S. federal assessment of the science found clear connections between population health and mitigation.

Key Findings:

1. Wide-ranging health impacts
2. Most vulnerable are at most risk
3. Prevention provides protection
4. Responses have multiple benefits

"Climate change will, absent other changes, amplify some of the existing health threats the nation now faces. Certain people and communities are especially vulnerable, including children, the elderly, the sick, the poor, and some communities of color."

Source: Global Change Research Program (2014), National Climate Assessment for the U.S.

U.S. federal assessment of the science found clear connections between population health and mitigation.

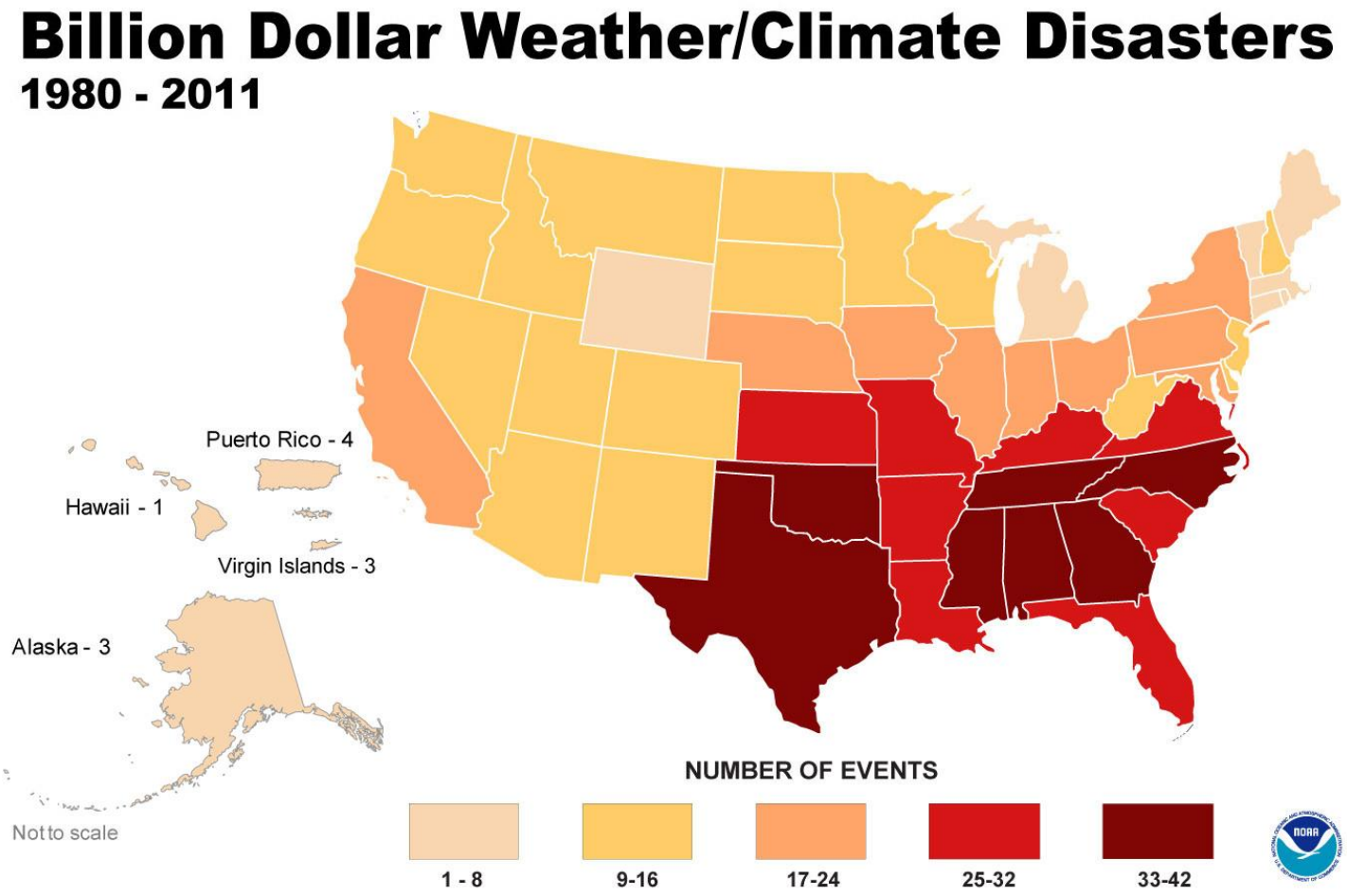
Key Findings:

1. Wide-ranging health impacts
2. Most vulnerable are at most risk
3. Prevention provides protection
4. Responses have multiple benefits

"Responding to climate change provides opportunities to improve human health and well-being across many sectors, including energy, agriculture, and transportation. Many of these strategies offer a variety of benefits, protecting people while combating climate change and providing other societal benefits."

Source: Global Change Research Program (2014), National Climate Assessment for the U.S.

People in Southern states are on the frontline, already incurring huge losses



Source: National Oceanic and Atmospheric Administration.

U.S. federal government has also assessed a Social Cost of Carbon

The U.S. federal government applies the values below to every regulation affecting GHG emissions. Figures are declared to be underestimates.

Social Cost of CO_2, 2015-2050 [a] (in 2007 Dollars per metric ton CO_2)

Source: Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (May 2013, Revised July 2015)

	Discount Rate and Statistic			
Year	**5% Average**	**3% Average**	**2.5% Average**	**3% 95th percentile**
2015	$11	$36	$56	$105
2020	$12	$42	$62	$123
2025	$14	$46	$68	
2030	$16	$50	$73	$152
2035	$18	$55	$78	$168
2040	$21	$60	$84	$183
2045	$23	$64	$89	$197
2050	$26	$69	$95	$212

Social Cost of Carbon, December 2015

[a] The SC-CO_2 values are dollar-year and emissions-year specific.

Source: U.S. EPA

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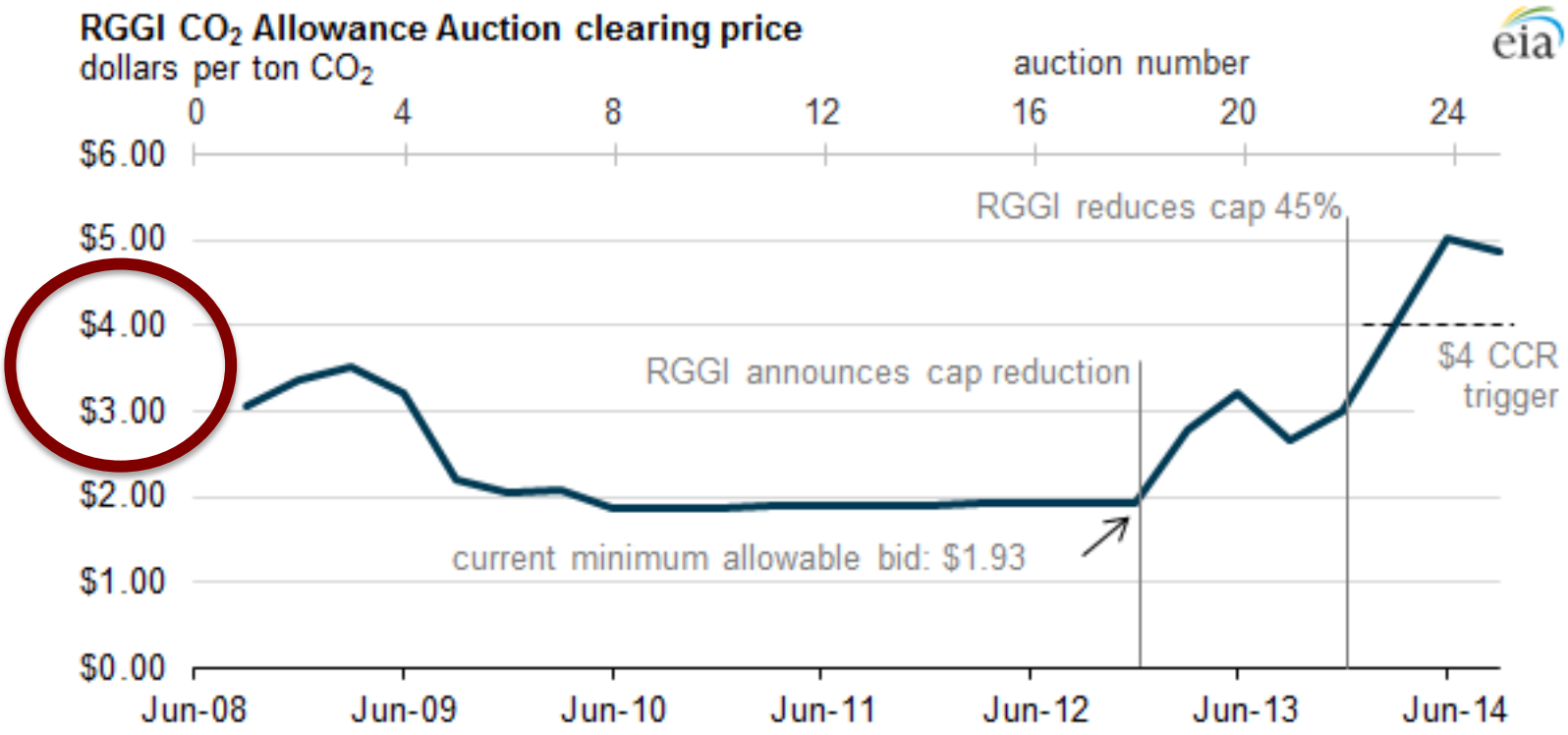
Carbon pricing policy in the Northeast has generated more than $1.5 billion, or ~10% of the social cost of carbon

Regional Greenhouse Gas Initiative: Carbon Price Generated through Cap & Trade

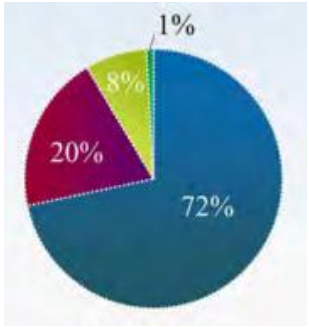


Source: U.S. Energy Information Administration

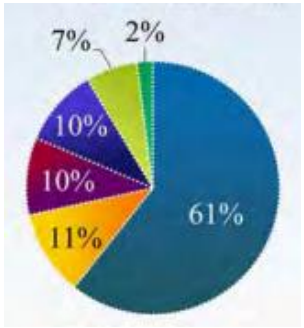
Investments Vary by State

- Energy Efficiency
- Direct Bill Assistance
- GHG Abatement
- Clean & Renewable Energy
- Administration
- RGGI, Inc.

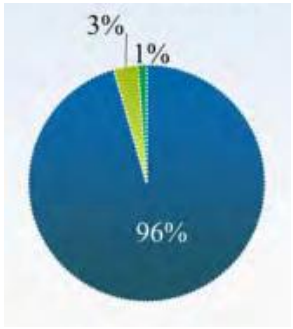
Connecticut



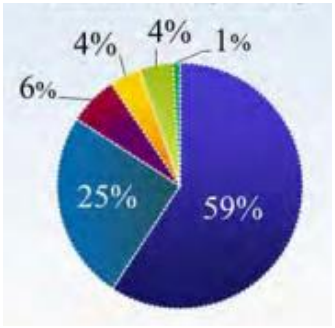
Delaware



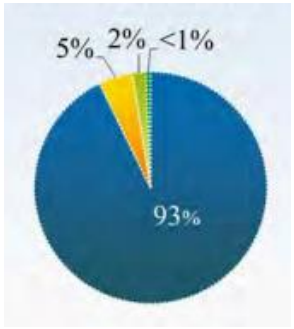
Maine



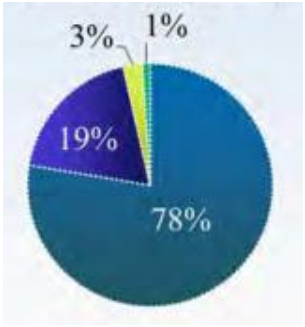
Maryland



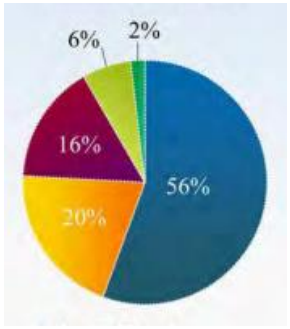
Massachusetts



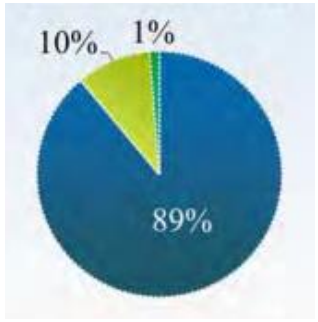
New Hampshire



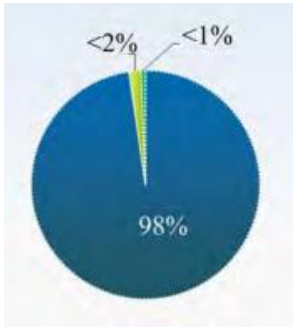
New York



Rhode Island



Vermont



Source: Investment of RGGI Proceeds Through 2013

Investment Allocations Affect Impact

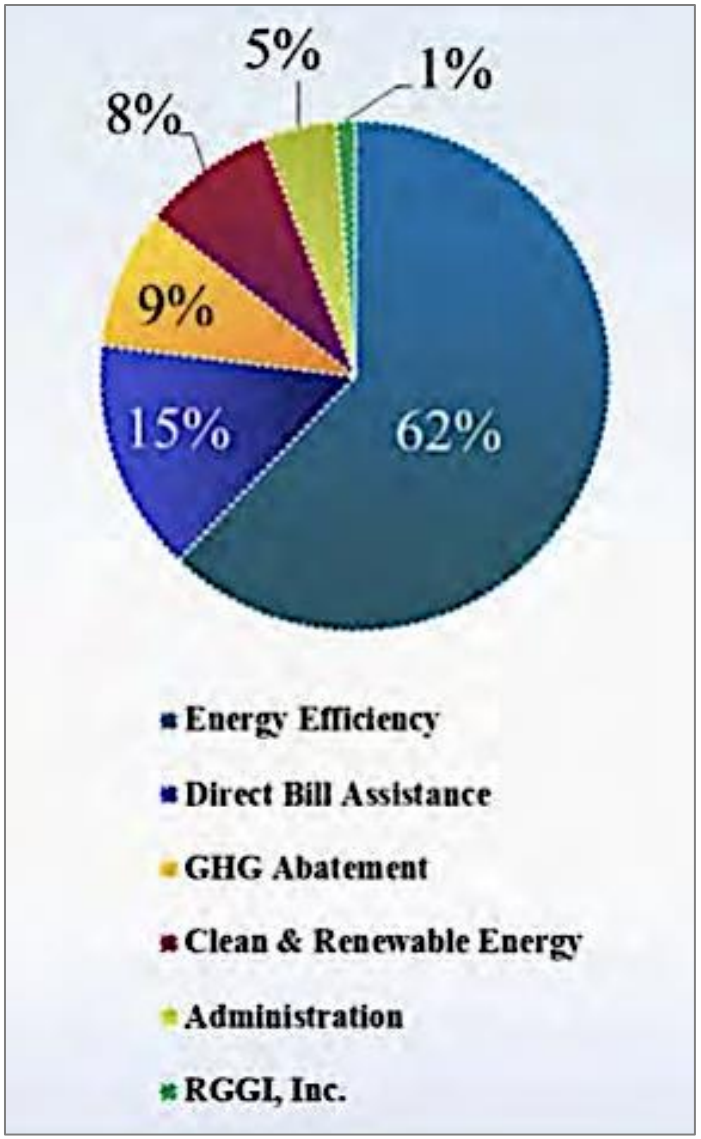
Energy Efficiency accounted for:

- **4/5** of Lifetime Bill Savings
- **3/4** of Lifetime Carbon Savings
- **1/3** of Participating Households
- **99%** of Participating Businesses
- **100%** of Workers Trained

Direct Bill Assistance accounted for:

- **2/3** of Participating Households
- **<5%** of Lifetime Bill Savings

RGGI Investments by Category
Cumulative-to-Date (2008-2013)



Source: Investment of RGGI Proceeds Through 2013

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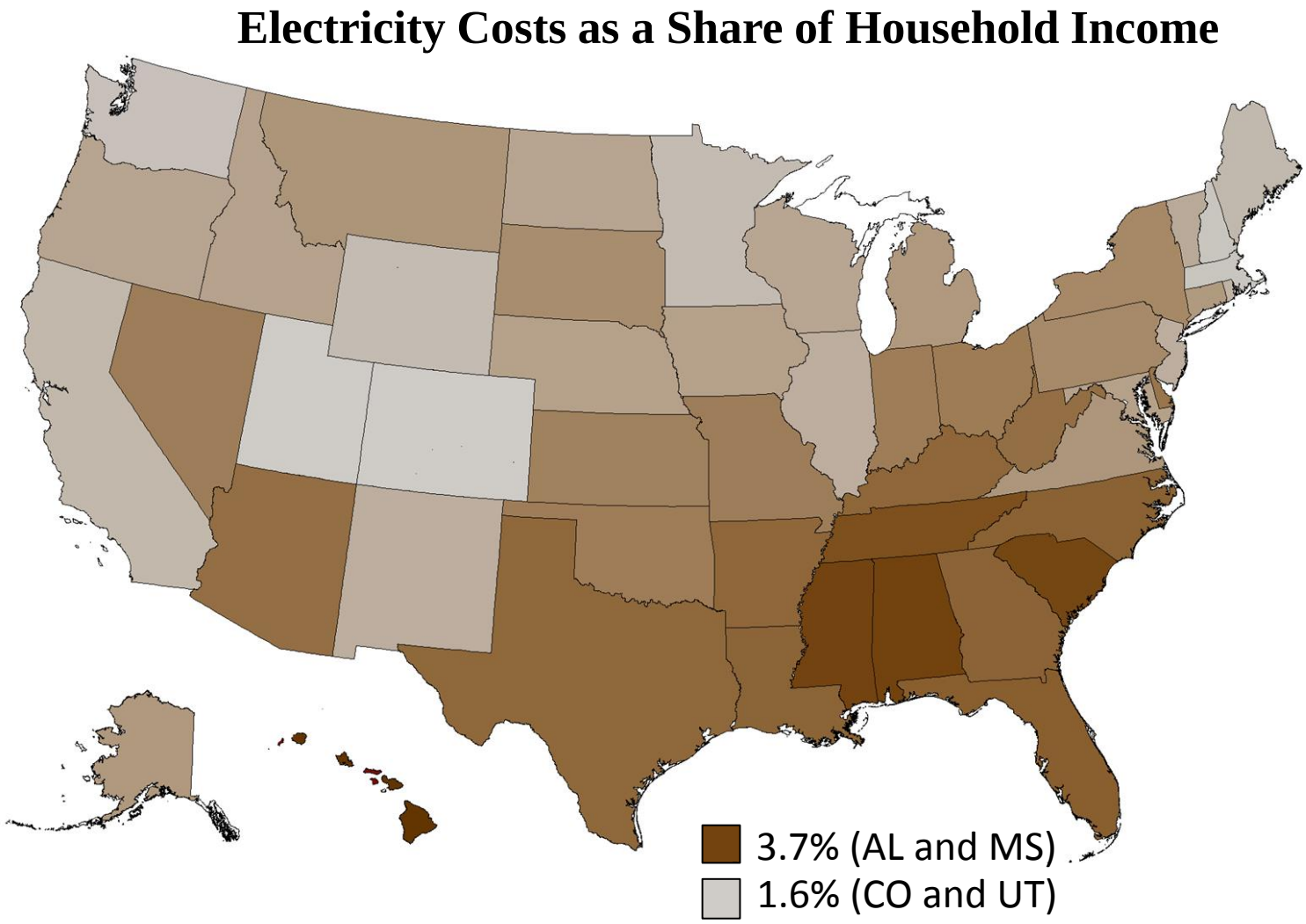
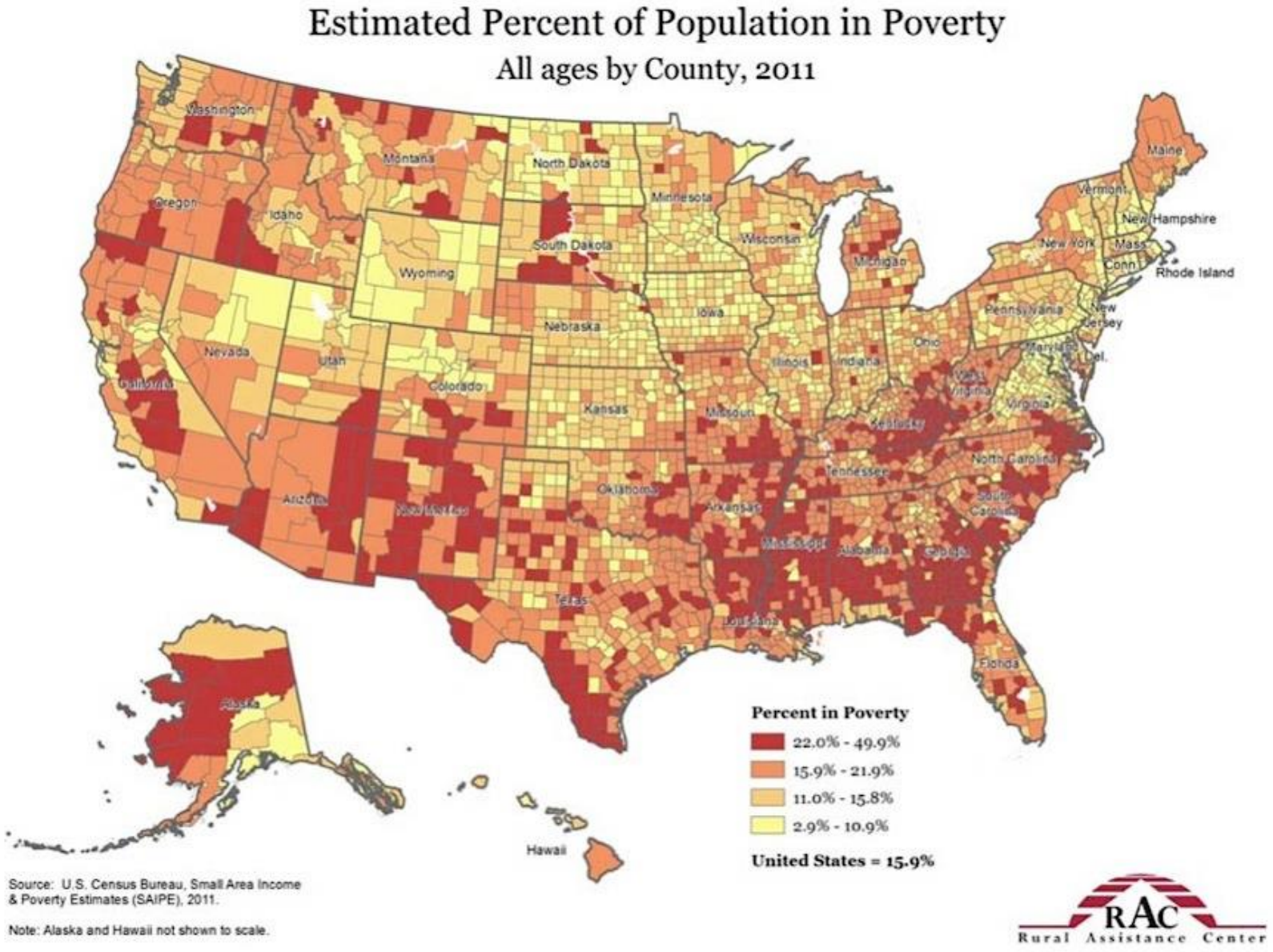
Multiple factors have affected the pace at which mitigation policies are being adopted – including sensitivity to price impacts



Average electricity cost (EIA form 861) as a share of median household income (Census Table H-8B), indexed to highest state (HI, 4.1%) and shaded to show relative level among states.

Underlying conditions of inequality affect distribution of impacts



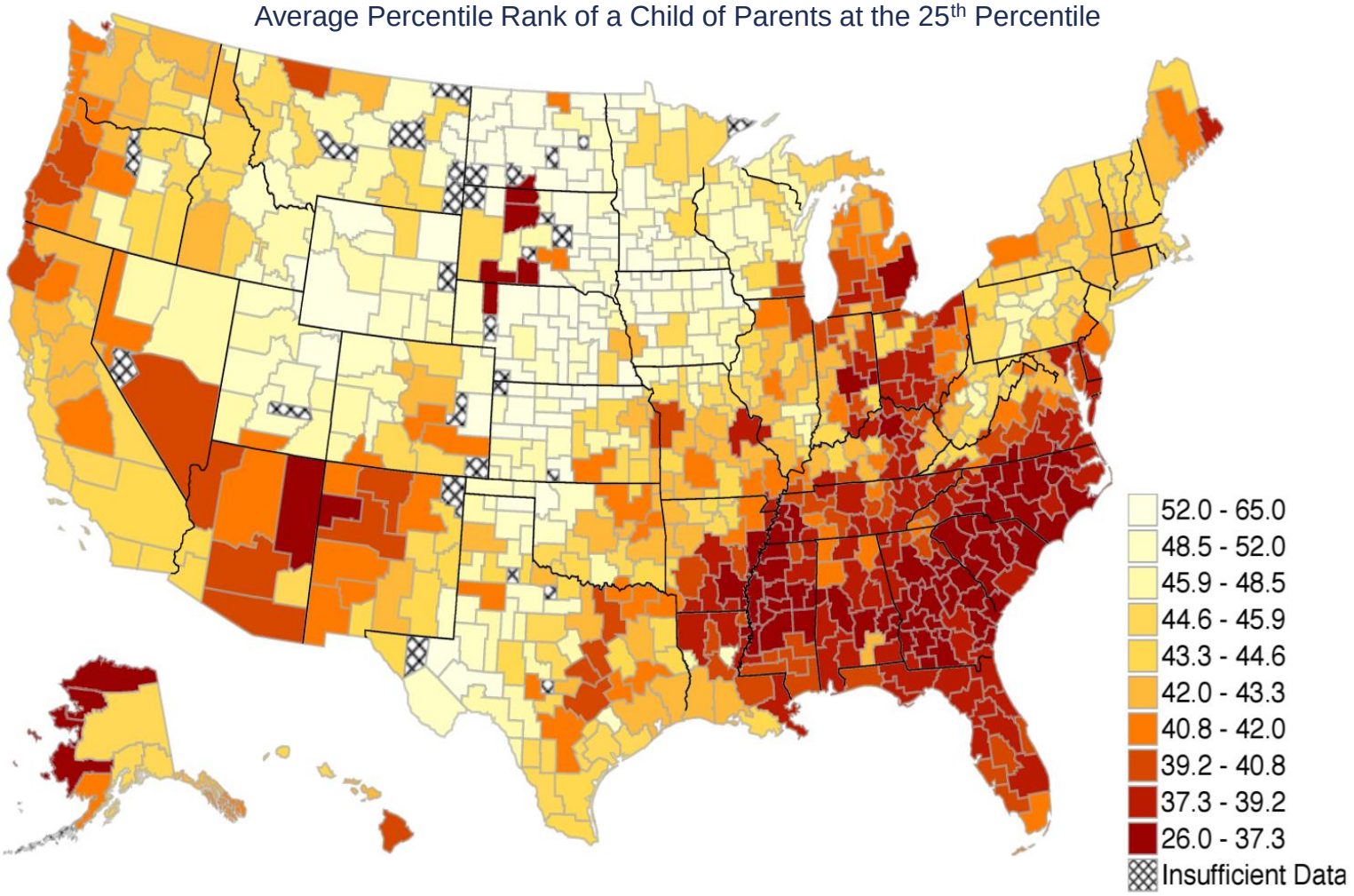
Source: Rural Assistance Center with data from U.S. Census Bureau

Persistence of poverty amplifies barriers and vulnerability…

Intergenerational Upward Mobility in the U.S.

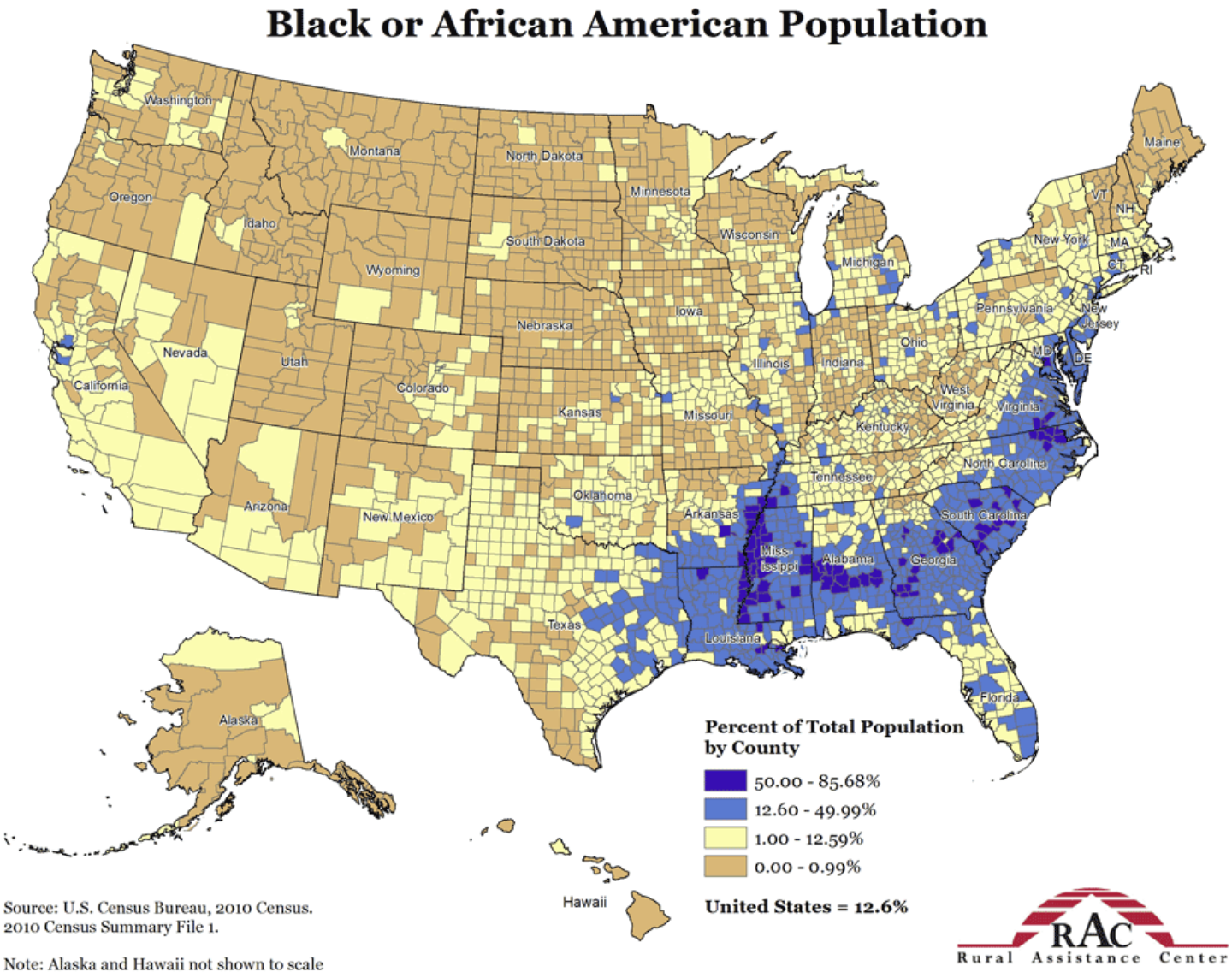
Darker Color = Less Absolute Upward Mobility

Average Percentile Rank of a Child of Parents at the 25th Percentile



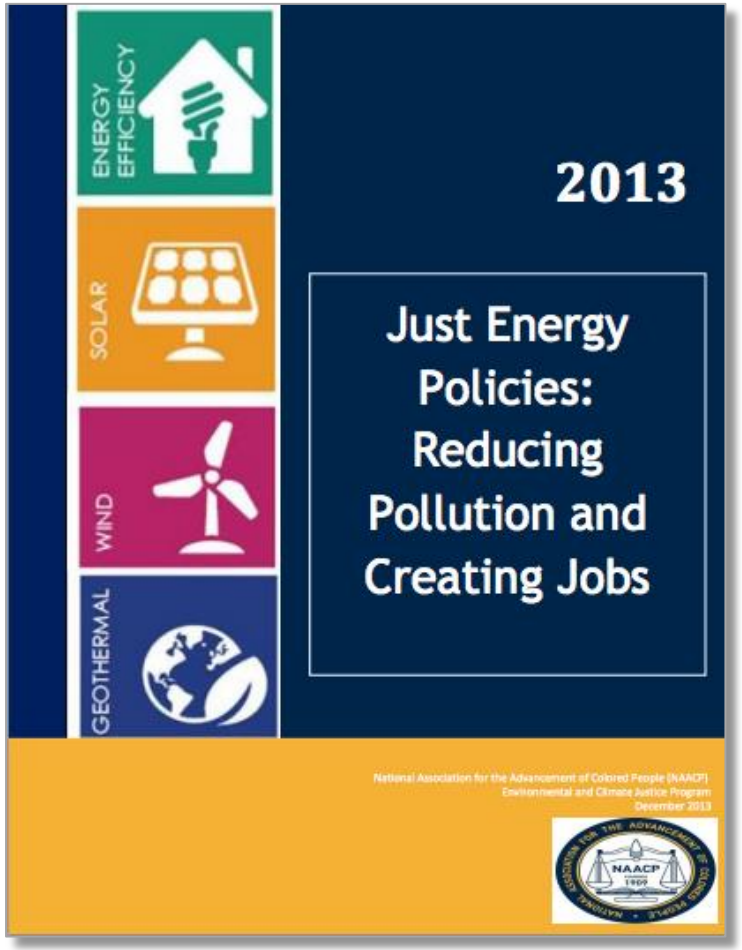
Source: Equality of Opportunity Project, Harvard University and UC-Berkeley; www.equality-of-opportunity.org.

… and persistent poverty is not an equal opportunity experience.



Source: Rural Assistance Center with data from U.S. Census Bureau

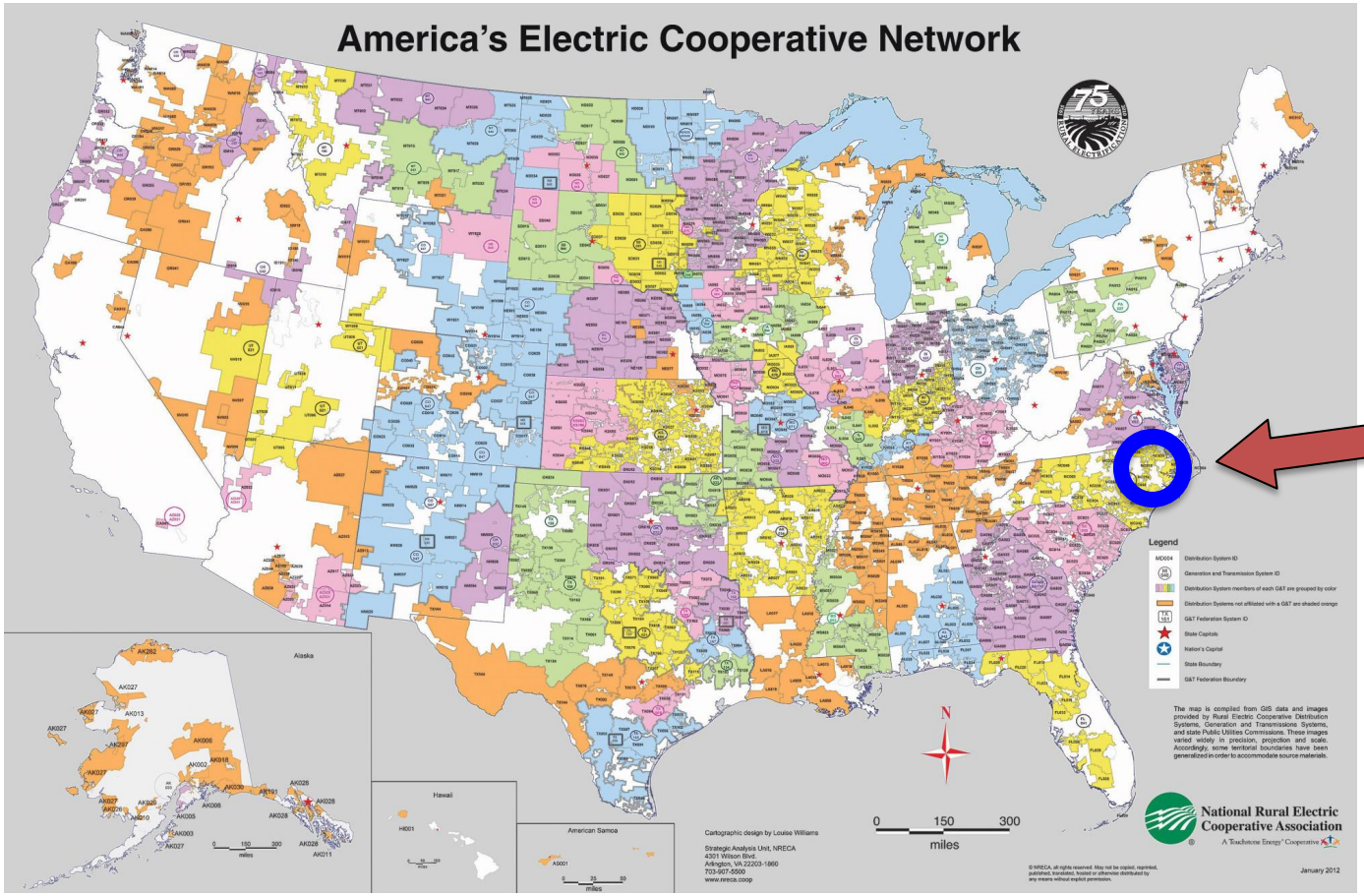
Calls for action have highlighted need for directed investment to address long-standing environmental injustice and open opportunity.



Even where some directed investment policies are in place, barriers to investment persist – producing a clean energy divide.

Source: NAACP

Leadership by electric cooperatives provides context innovation by affected communities



Electric cooperatives are utilities owned by customers.

Co-ops cover **3/4** the continental U.S., serve **42M people**, and sell **$40 billion / year**.

90% of the persistent poverty counties in the U.S. are served by electric cooperatives.

Common qualifying criteria for loans and leases:

"Do you own your own home?"

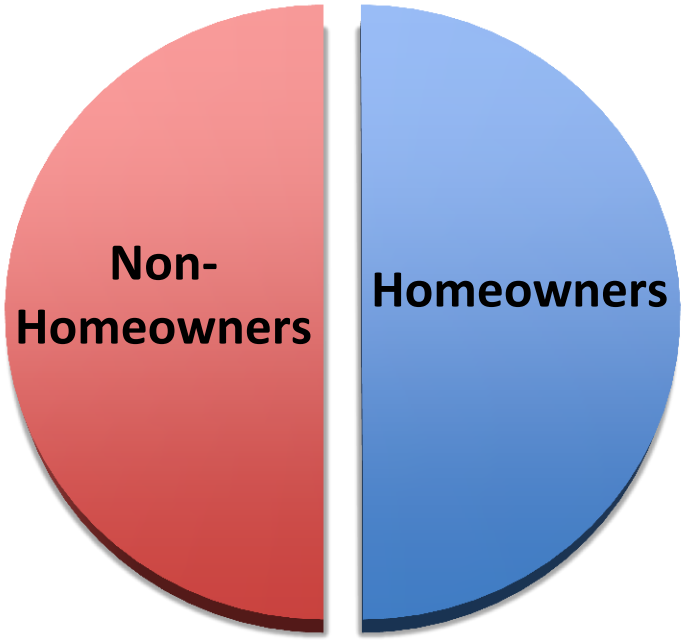
"Do you have a good credit score?"

"Do you have sufficient income…?"

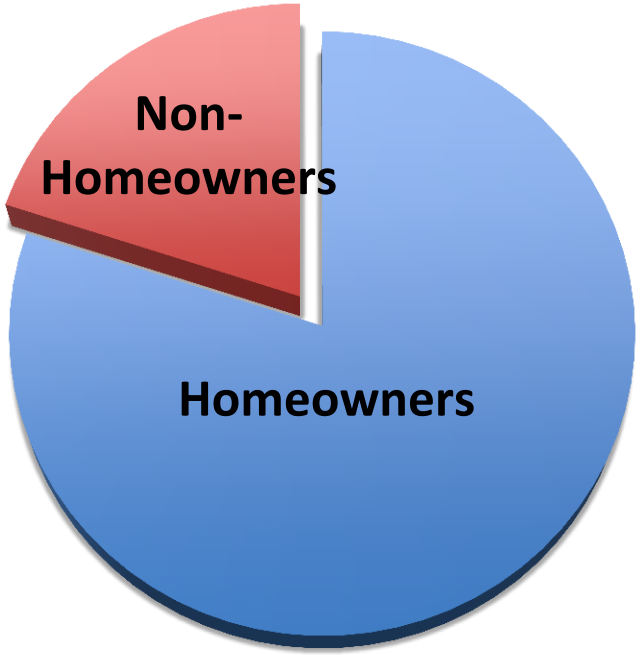
Barriers to Financing in the Clean Energy Economy:

Example - Property Ownership

Below Median Income



Above Median Income



More than **1/3** of all U.S. households are not in a home they own.

Source: U.S. Census, 2015

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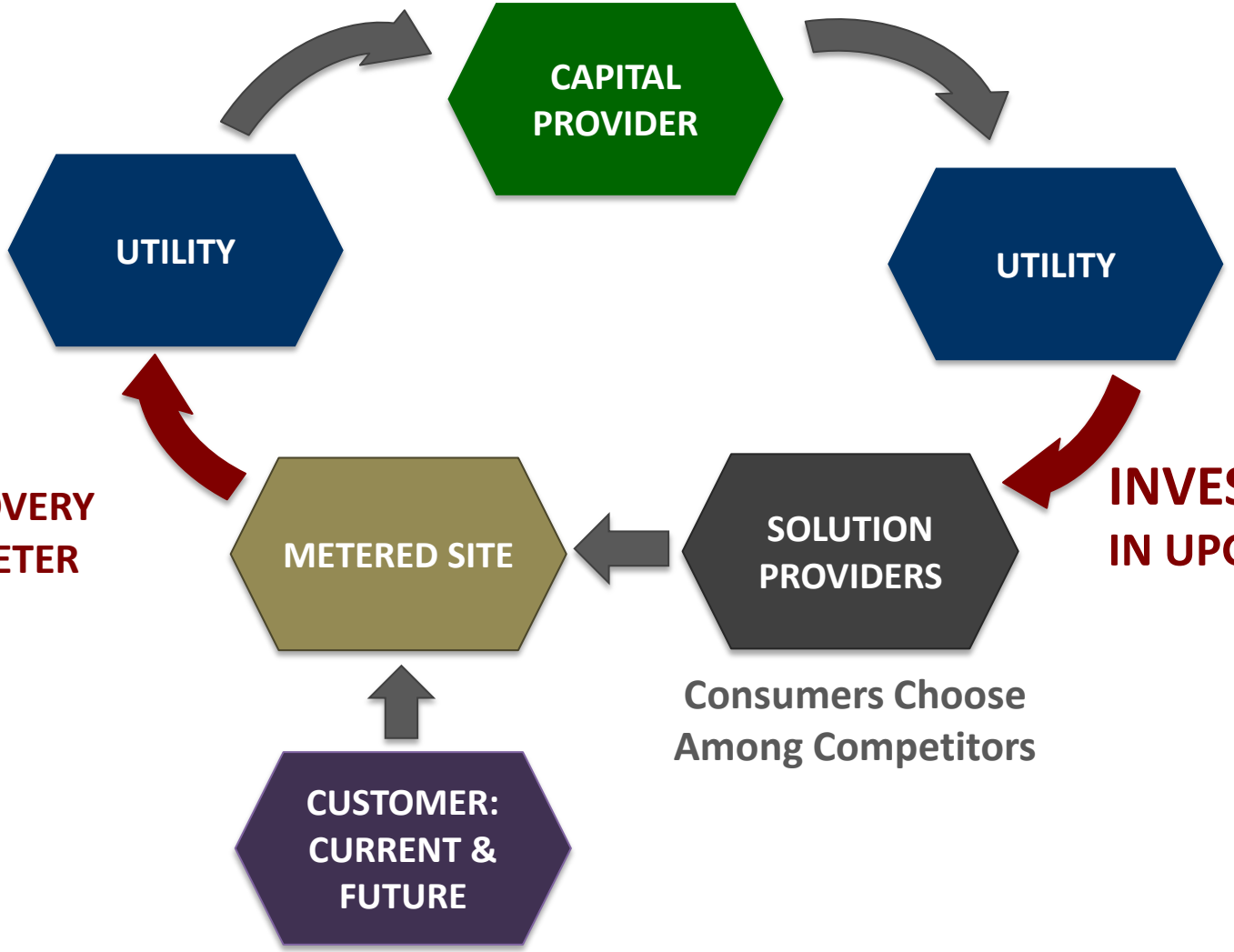
PAY AS YOU SAVE® (PAYS®)

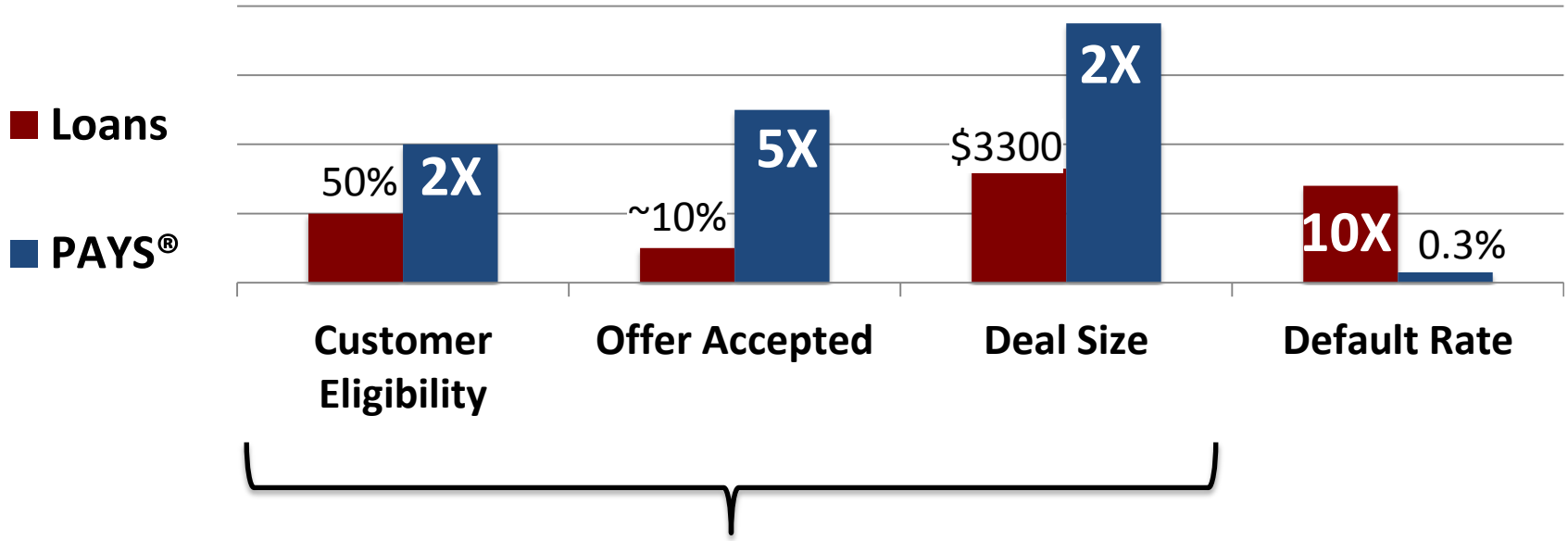
PAYS offers all utility customers the option to access cost effective energy upgrades using a proven investment and cost recovery model that benefits both the customer and utility.



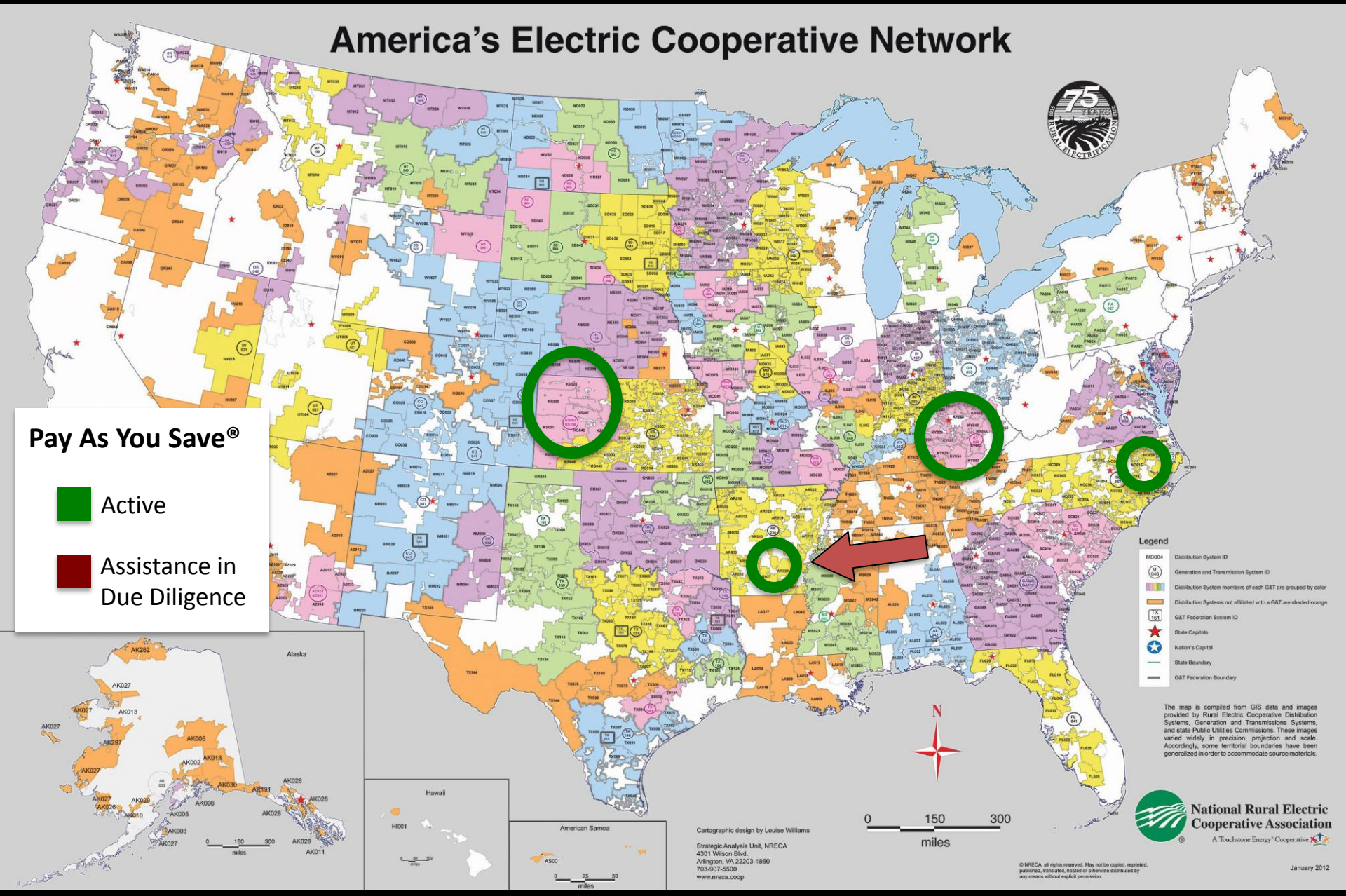
PAY AS YOU SAVE® (PAYS®)

- ✓ No consumer loan, lien, or debt
- ✓ Reaches renters and low-income
- ✓ Higher uptake rates
- ✓ Deeper energy & carbon savings

Comparison for building efficiency upgrades



Investment acceleration is a product of these multiples.


America's Electric Cooperative Network
Pay As You Save®
Active
Assistance in Due Diligence
Alaska
Hawaii
American Samoa
Legend
Distribution System ID
Generation and Transmission System ID
Distribution System members of each G&T are grouped by color
Distribution Systems not affiliated with a G&T are shaded orange
G&T Federation System ID
State Capitals
Nation's Capital
State Boundary
G&T Federation Boundary
The map is compiled from GIS data and images provided by Rural Electric Cooperative Distribution Systems, Generation and Transmissions Systems, and state Public Utilities Commissions. These images varied widely in precision, projection and scale. Accordingly, some territorial boundaries have been generalized in order to accommodate source materials.
N
0 150 300
miles
Cartographic design by Louise Williams
Strategic Analysis Unit, NRECA
4301 Wilson Blvd.
Arlington, VA 22203-1860
703-907-5500
www.nreca.coop
National Rural Electric Cooperative Association
A Touchstone Energy® Cooperative
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January 2012

Result: Immediate Surge in Investment

Comparing last (and best) 3 months of **HELP** **(Loan)**
with first 3 months of **HELP PAYS®**: **(Tariff)**

- **Doubled** customers seeking assessments (from 73 to 162), and *more than a third* were multi-family (compared to 0 previously.)
- Among customers receiving assessments, achieved 100% opt-in for multi-family rental units, and >80% for single family.
- **Doubled** the scale of capital improvements from an average of $3000 to above $6000 to get deeper energy savings (~30%).

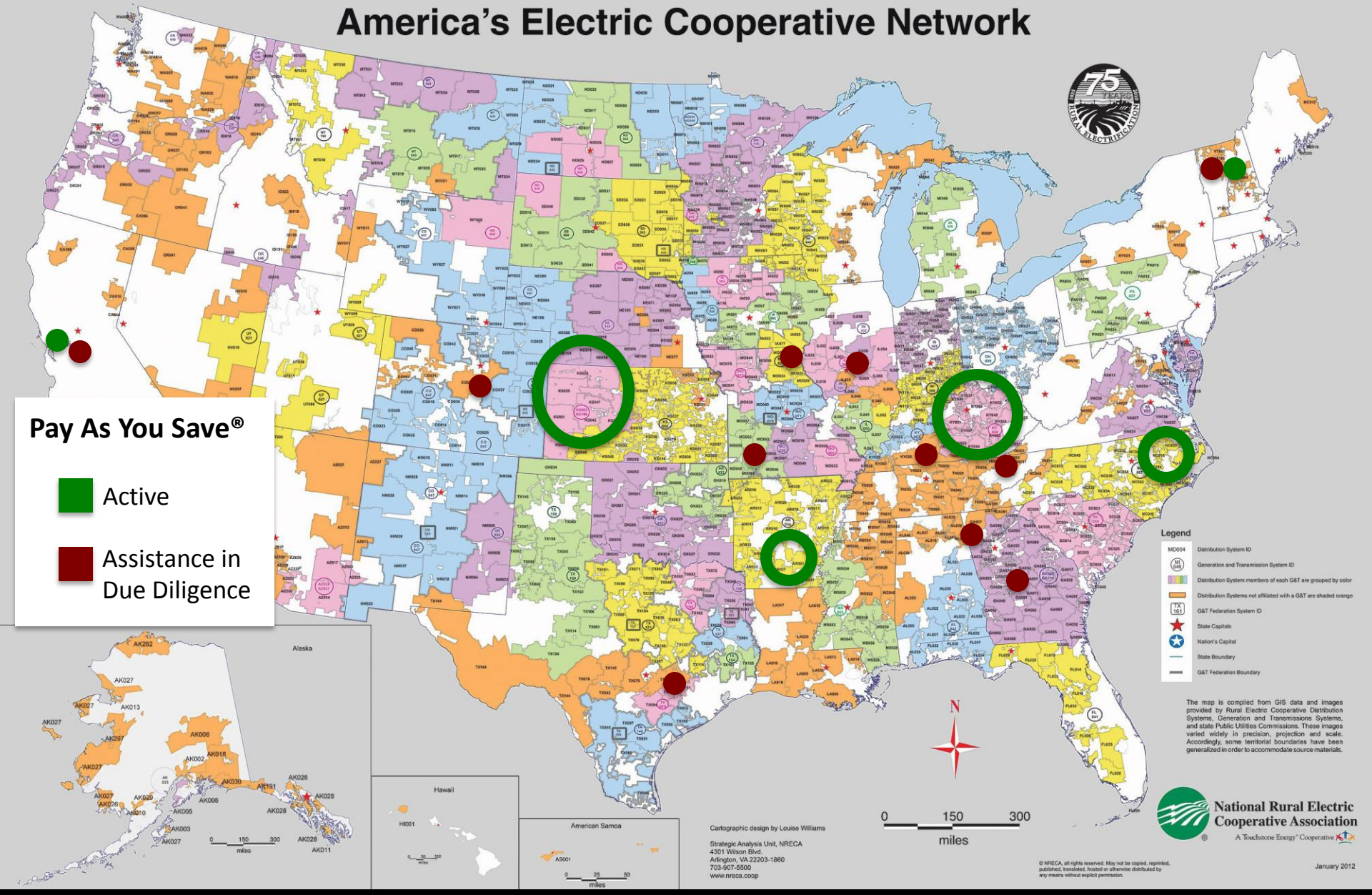
Double customers X Double project size =

- **Quadrupled** investment, soaring from $225k to **$1 million.**

Source: EEtility, program operator for HELP PAYS®

Ouachita Electric Cooperative

America's Electric Cooperative Network



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