
Climate Policy & Local Initiatives

MIT Joint Program on the Science and Policy of Global Change

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Overview

Local governments are uniquely positioned to curb greenhouse gas emissions. This discussion will review policies and programs in energy efficiency and their important role in mitigating climate change, with a particular focus on demand-side energy management in buildings

- Energy use in buildings
- Why local?
- Sample policies and programs

Global Carbon Budget for $< 2^{\circ}\text{C}$

- Deep reductions in GHG emissions necessary (80x50); a multifaceted strategy required

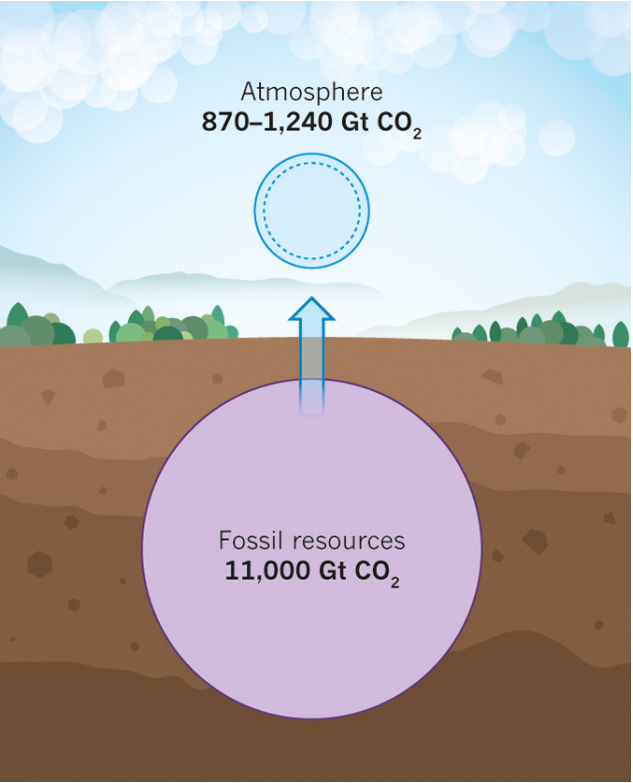


Figure: UN Habitat

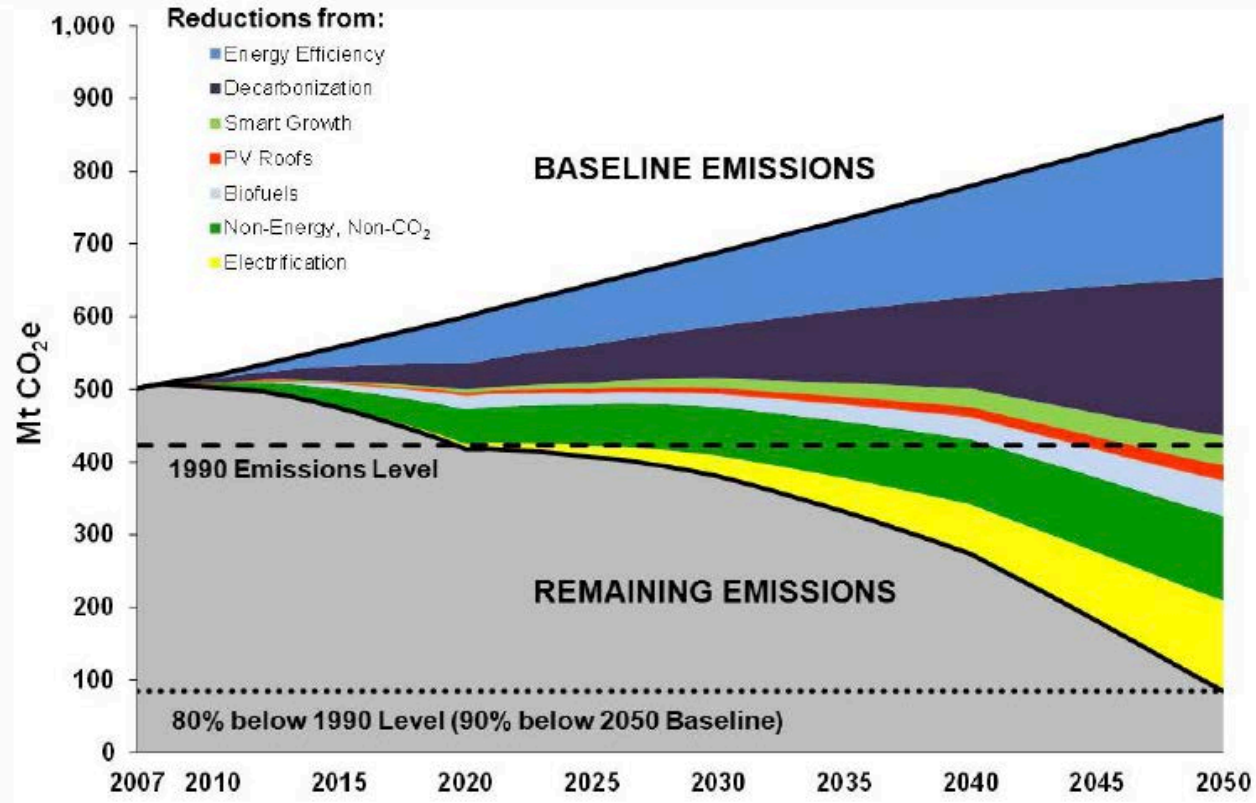


Figure: LBNL, 2011

Energy in buildings

- Large fraction of energy use, cost, & emissions
 - Energy use: 40% global, 39% U.S.
 - GHG emissions: 30% of global, 36% U.S.
 - \$409B in energy costs in the U.S. (2016)
- Relative impact is larger in cities
 - 50% to 75% of GHG emissions in U.S. metropolises
- *Strategies for energy conservation in buildings are critical to curbing GHG emissions*

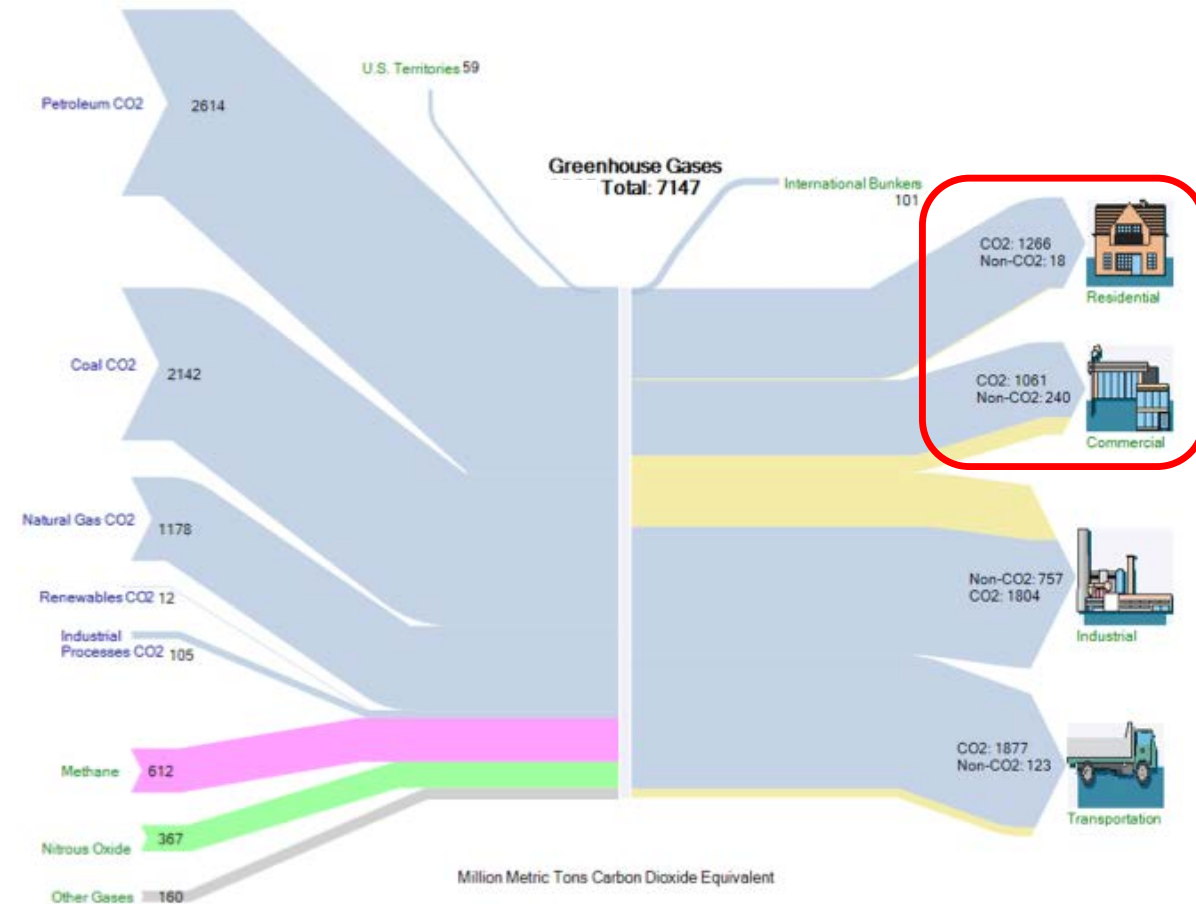


Figure: EIA, sankey-diagrams.com

Sources: Meng et al 2017, U.S. EIA 2017, NRDC and IMT 2013

Value of Energy Efficiency

- Changing energy supply vs. demand-side management; efficiency is more cost-effective

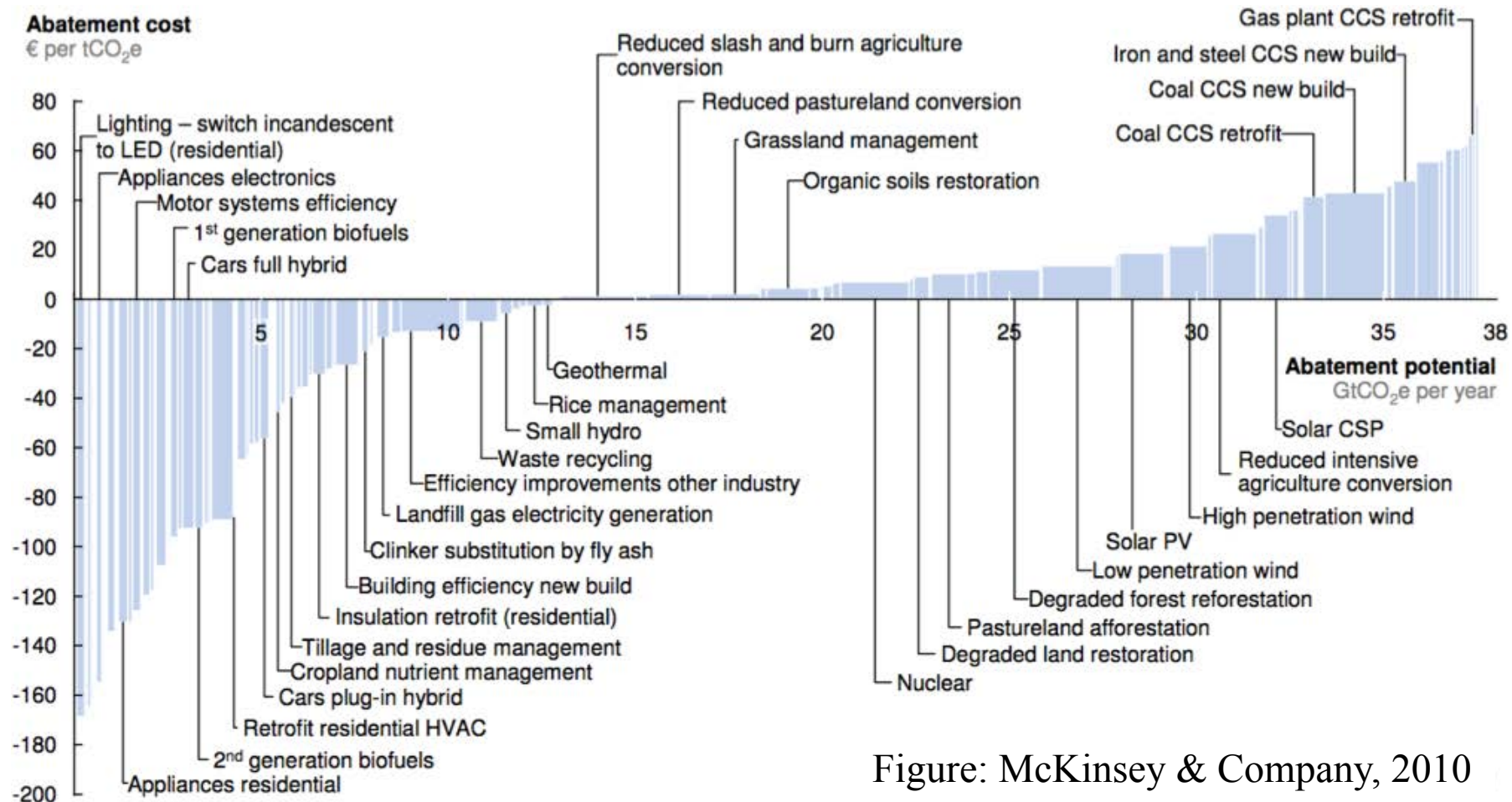


Figure: McKinsey & Company, 2010

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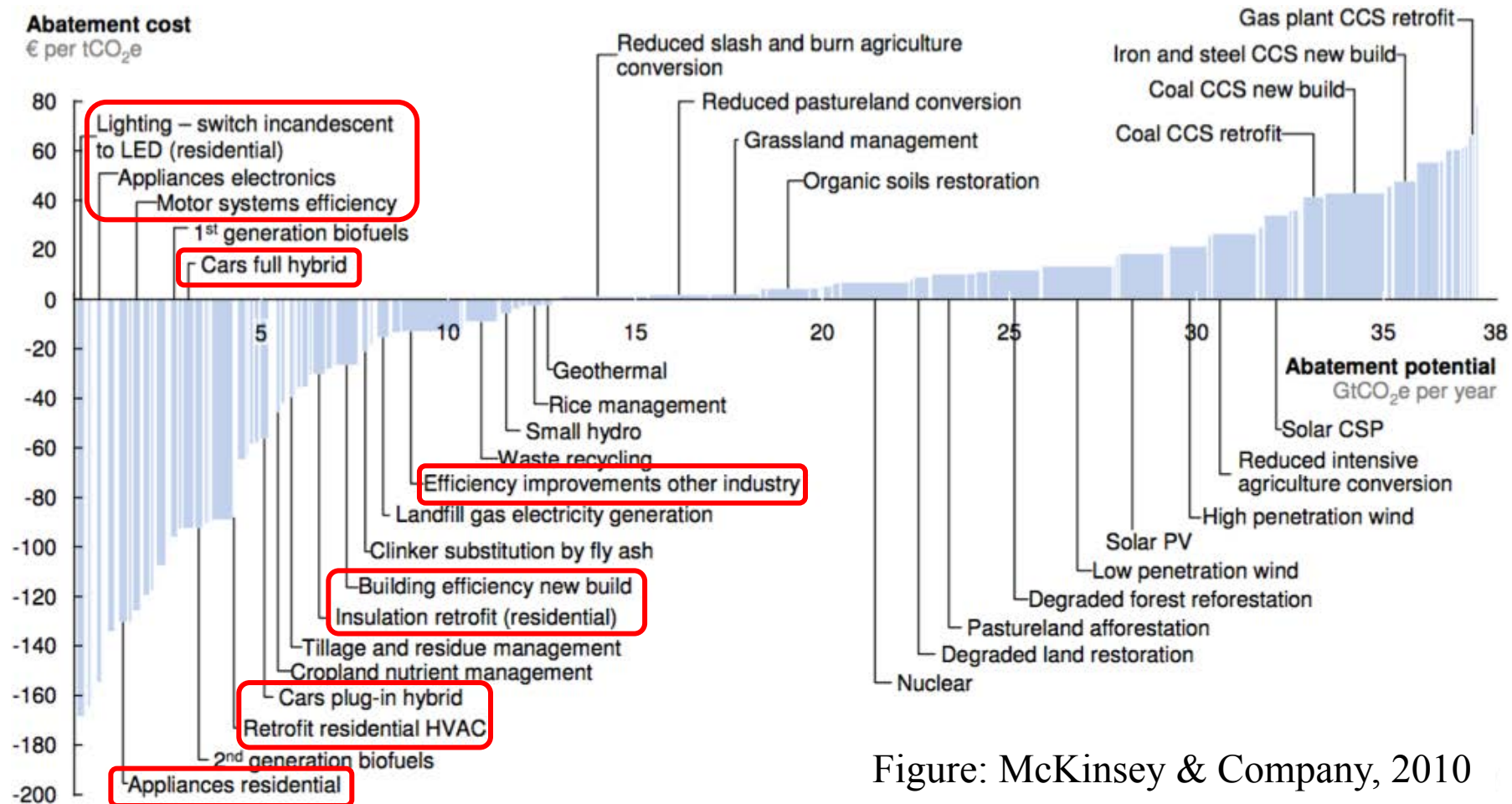


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Value of Energy Efficiency

- U.S. investment potential of \$279B
- Savings > \$1 trillion over ten years
- 3.3 million job-years
- Reduce the U.S. GHG emissions ~10%

	Residential	Commercial	Institutional	Total
Economic/Financial Impact				
Energy Savings (Trillion Btu)	1,892	848	293	3,033
Total Investment (\$ Bn)	182	72	25	279
Social Impact				
Cumulative Job Years Created (# FTEs over course of investment program, '000s)	2,152	857	296	3,305
Environmental Impact				
Greenhouse Gas Emission Reduction (million metric tons of CO ₂ mitigated per year)	382	175	59	616

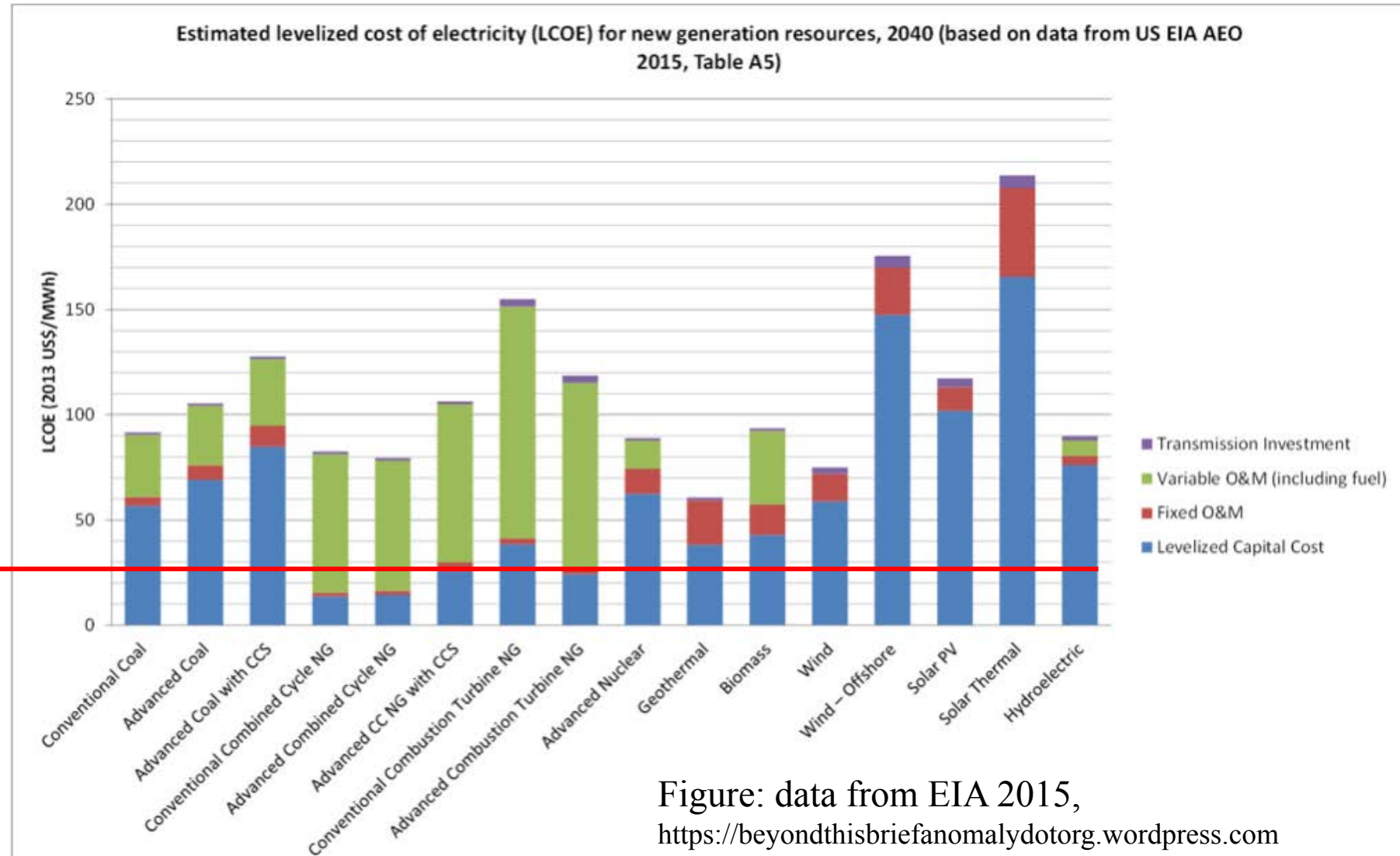
Figure: Rockefeller Foundation & Deutsche Bank (2012)

Value of Energy Efficiency

- Prioritize: mitigation value is greatest now (current energy mix)
- Less costly than new generation

\$28/MWh avoided ←

Energy efficiency (City of San Antonio experience)



Why Local Government?

- To tackle anthropogenic climate change, follow the people
- The world is urbanizing: 51% in 2010, 70% by 2050

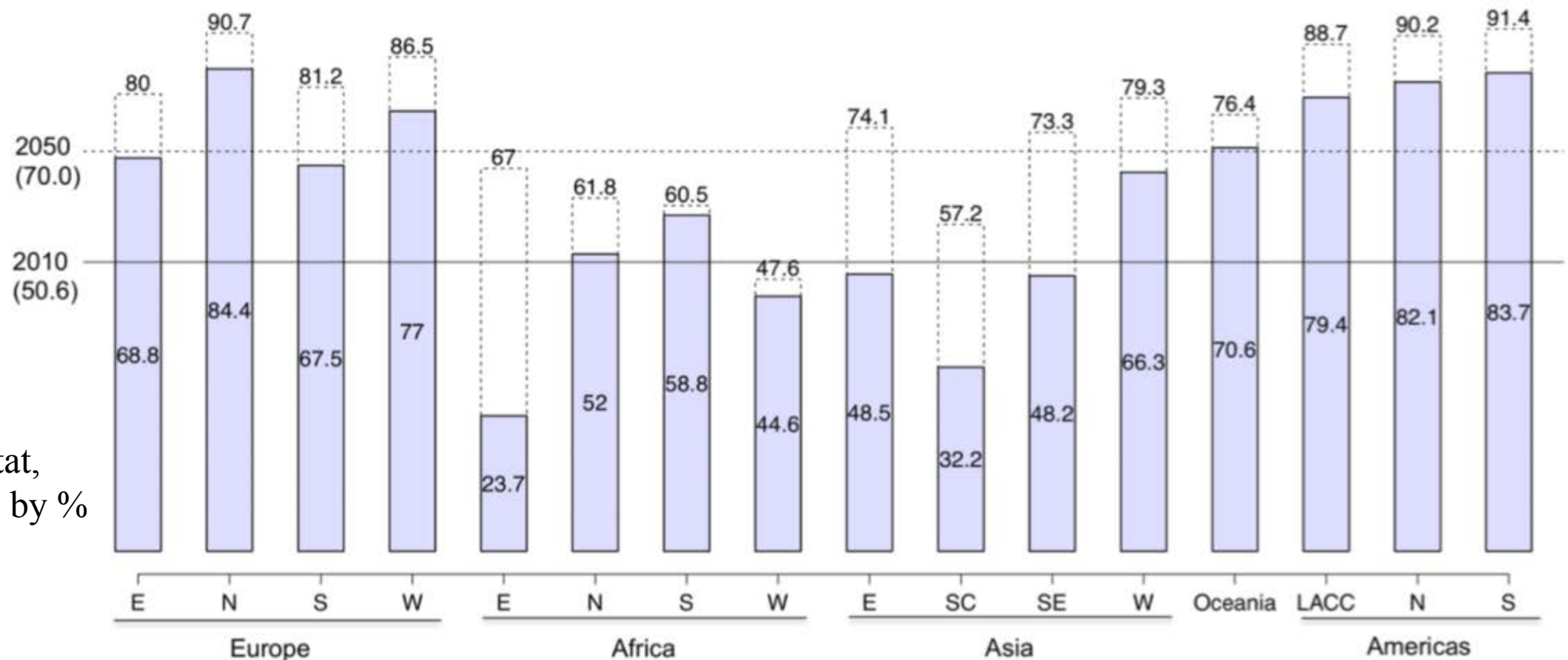


Figure: UN Habitat, Urbanization rate by %

Why Local Government?

- Cities: density of infrastructure & concentration of energy use

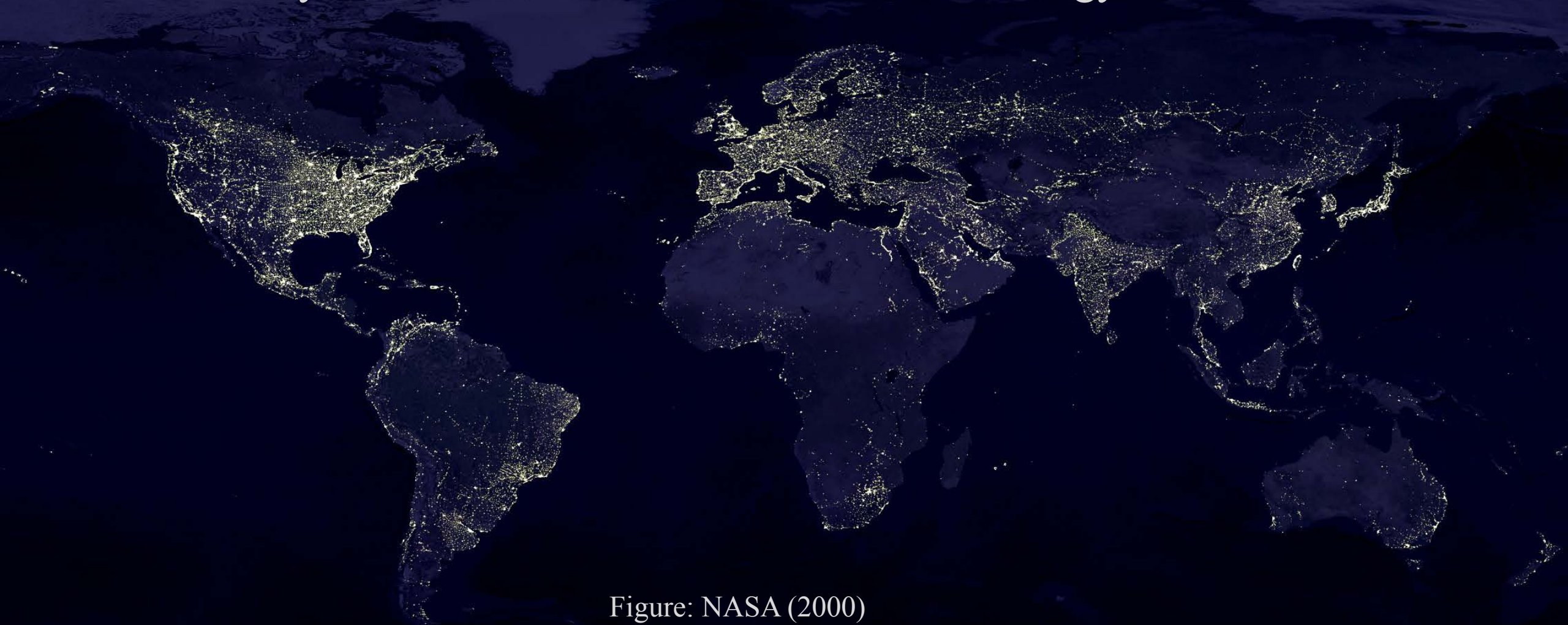
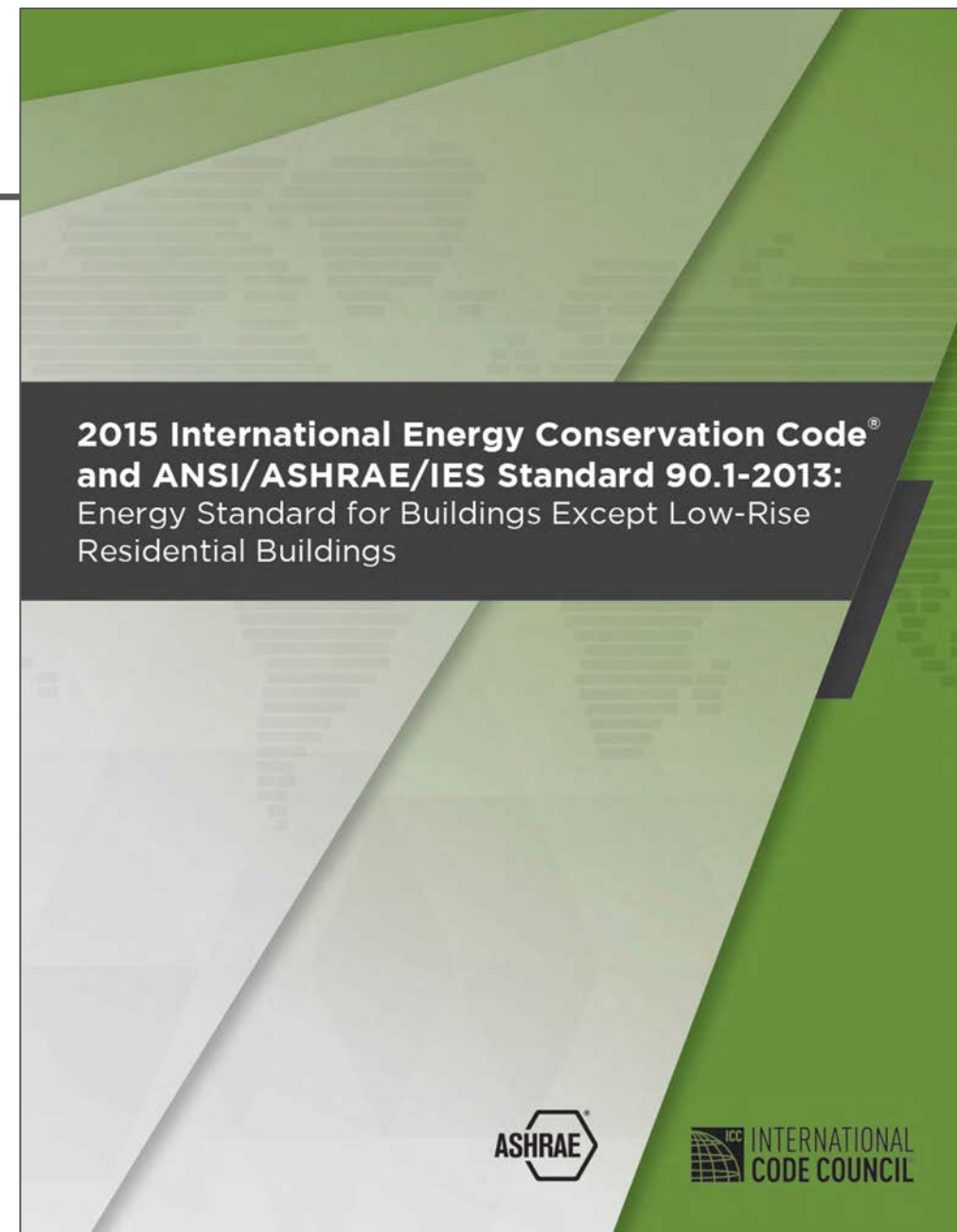


Figure: NASA (2000)

Why Local Government?

- Regulatory authority
 - Building permits
 - Building codes*
 - Urban planning
- Continuity
 - R.I.P. NOAA, DOE, and EPA climate initiatives
- Local services
 - Public transportation
 - Roads
 - Energy utilities (or PPA)



Local Government Initiatives (not buildings)



Figures: Tessman road landfill PV (above) and cycle initiatives (below)

Biogas recovery (above), traffic synch. (below)



Building Energy Codes

- #1 historic strategy
- Critically important
- Shortcomings:
 - Prescriptive
 - Only for fixed assets
 - Existing buildings
 - Often low compliance

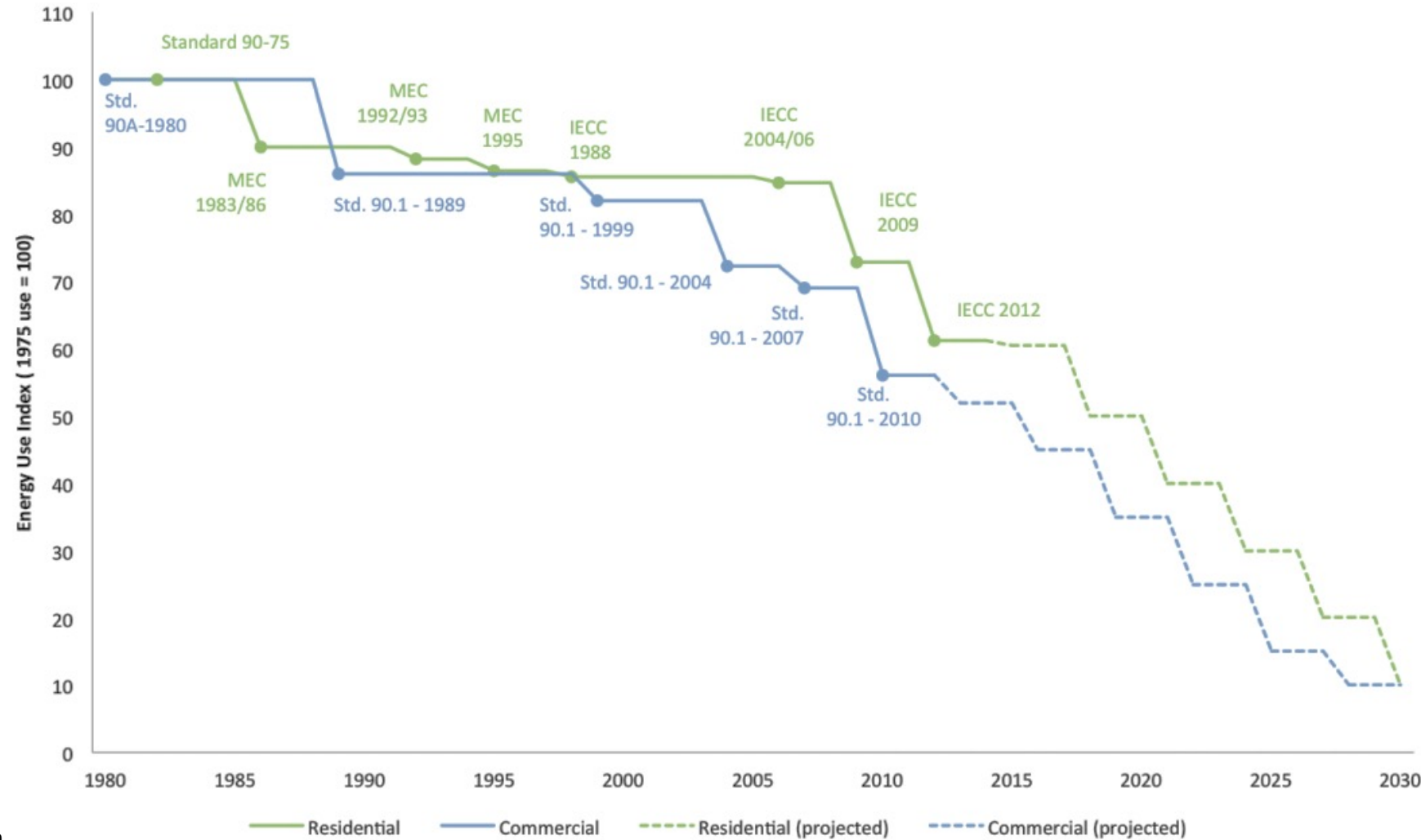


Figure: BCAP,
U.S. DOE data

Local Government Initiatives (buildings)

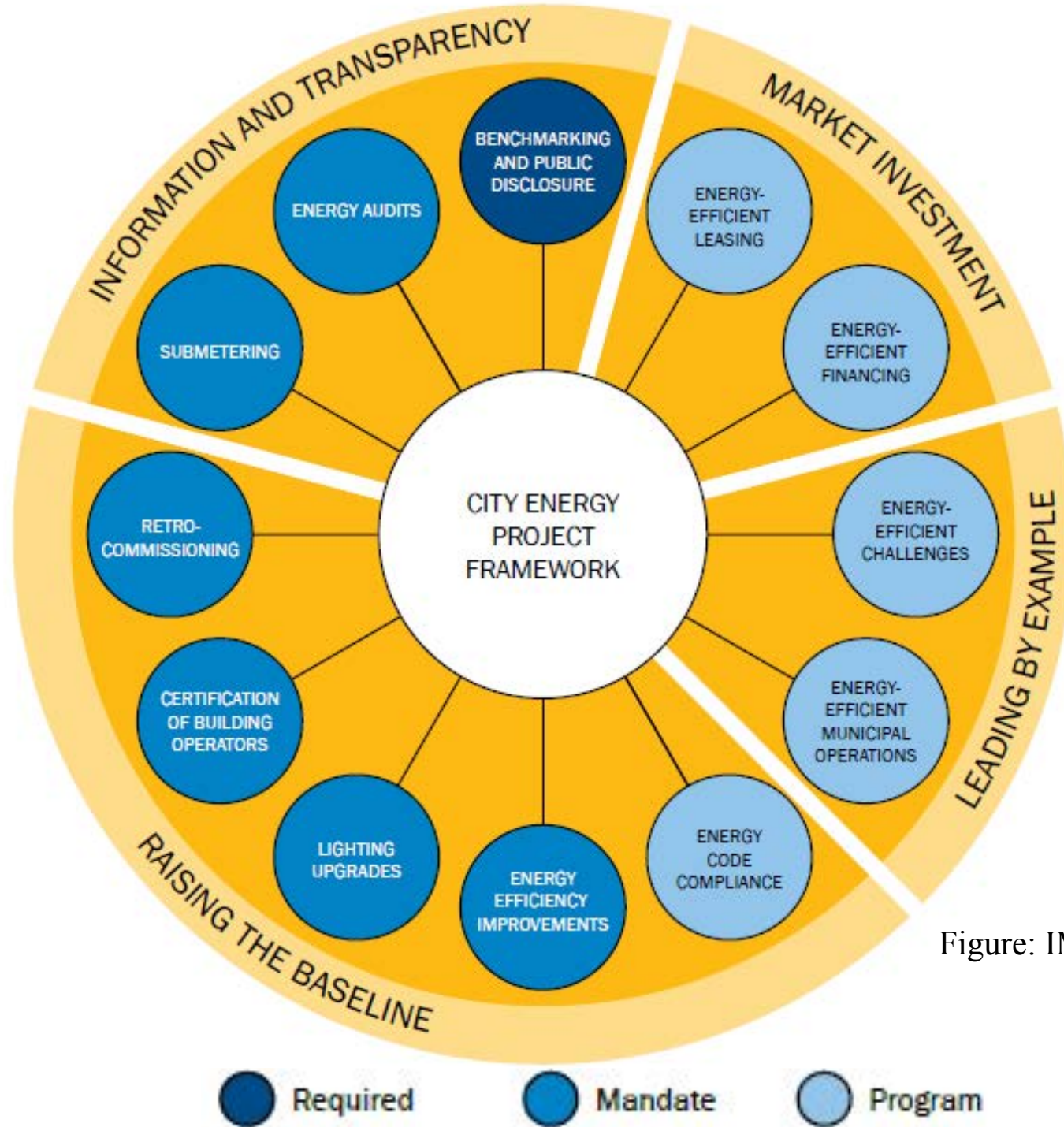


Figure: IMT & NRDC

Energy Benchmarking and Disclosure

- “Labeling” initiative to overcome market barriers to energy efficiency
- Requires owners of large buildings to track & report energy use annually
- Evaluates performance & compares to other buildings by type (EUI)
- Adoption: 30+ cities, 2 counties, 2 states

Is 80 kBtu/SF/YR high or low for a building?

Statement of Energy Performance

A sample Statement of Energy Performance form for a building. It includes fields for building name, address, and energy use data. The form is titled "STATEMENT OF ENERGY PERFORMANCE" and "Marjorie High School".

Building Name	Address	City	State	Year
Marjorie High School	1000 1st St	Seattle	WA	2017

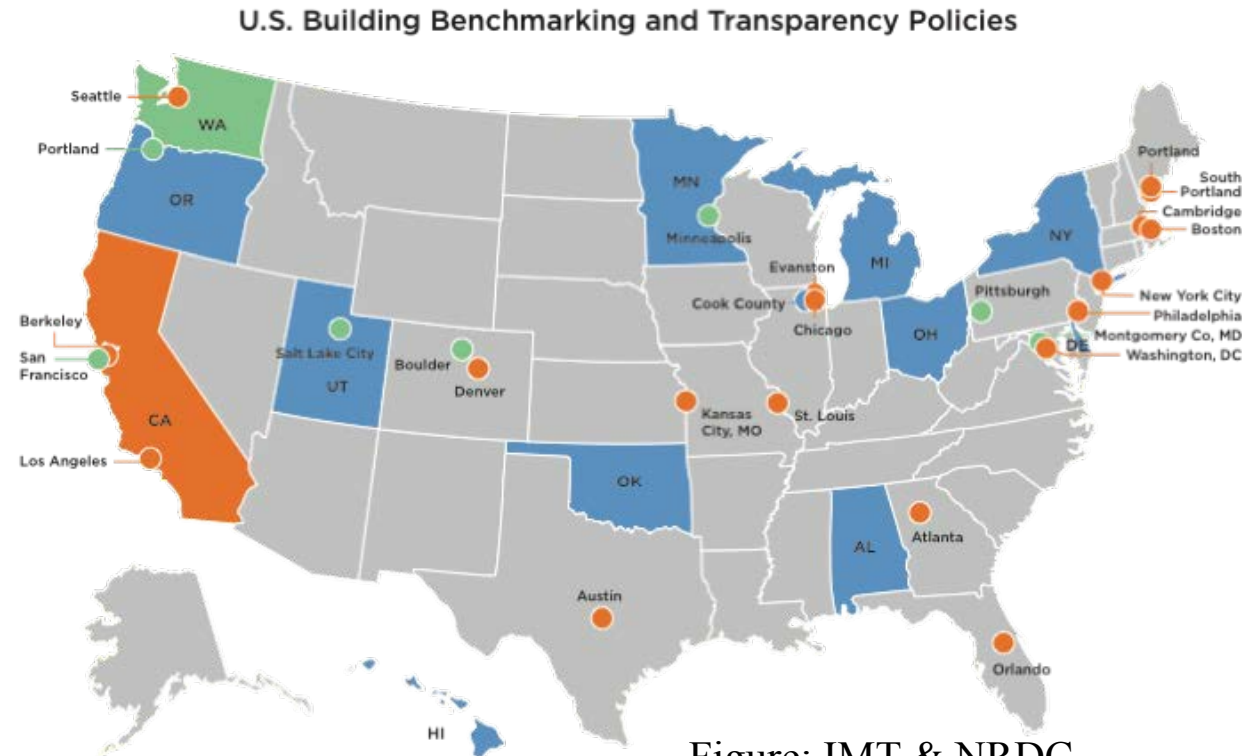
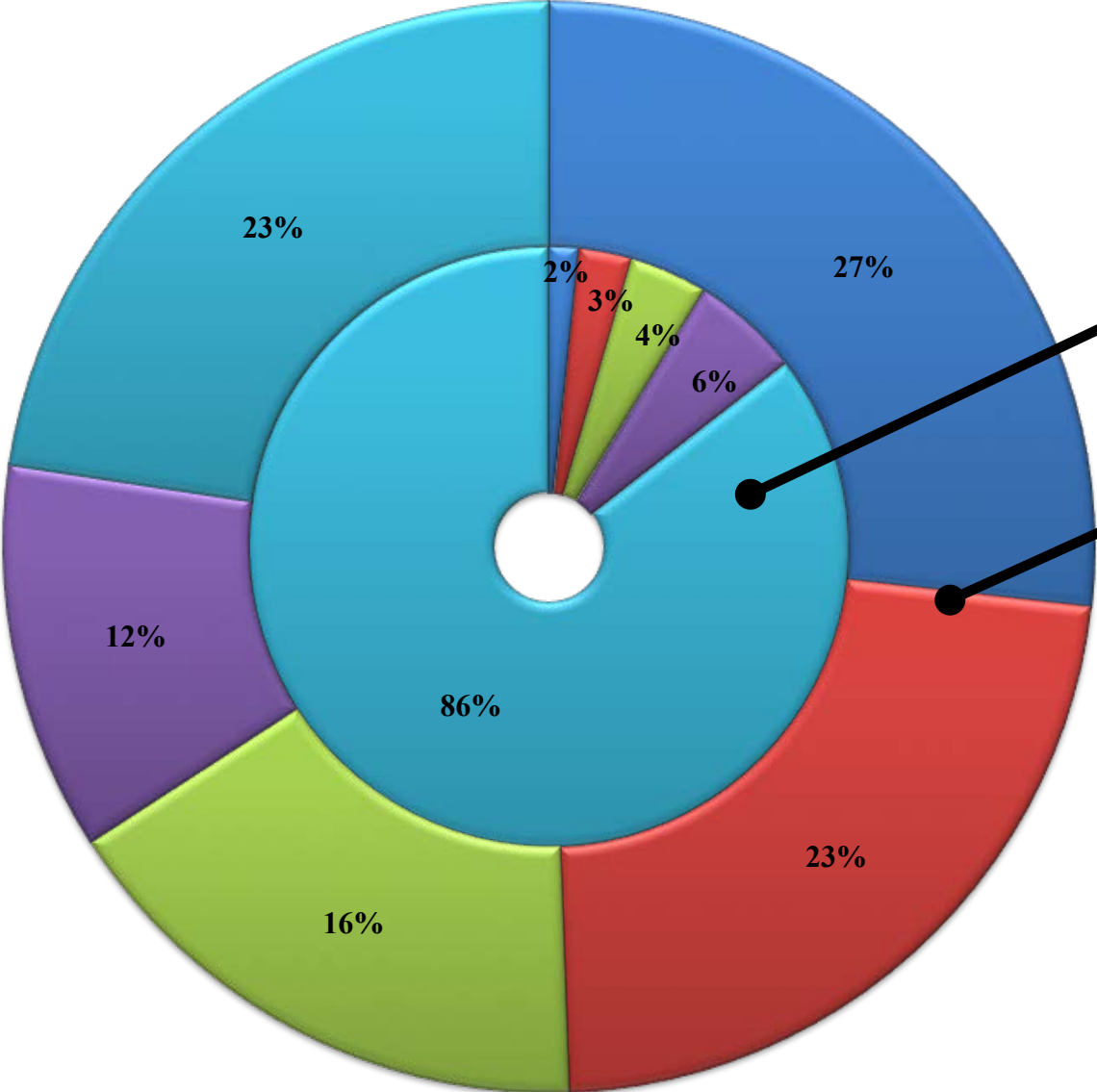


Figure: IMT & NRDC

Building Stock Analysis: Affected Buildings

5% of the buildings in San Antonio account for 50% of the building area



Number of Buildings

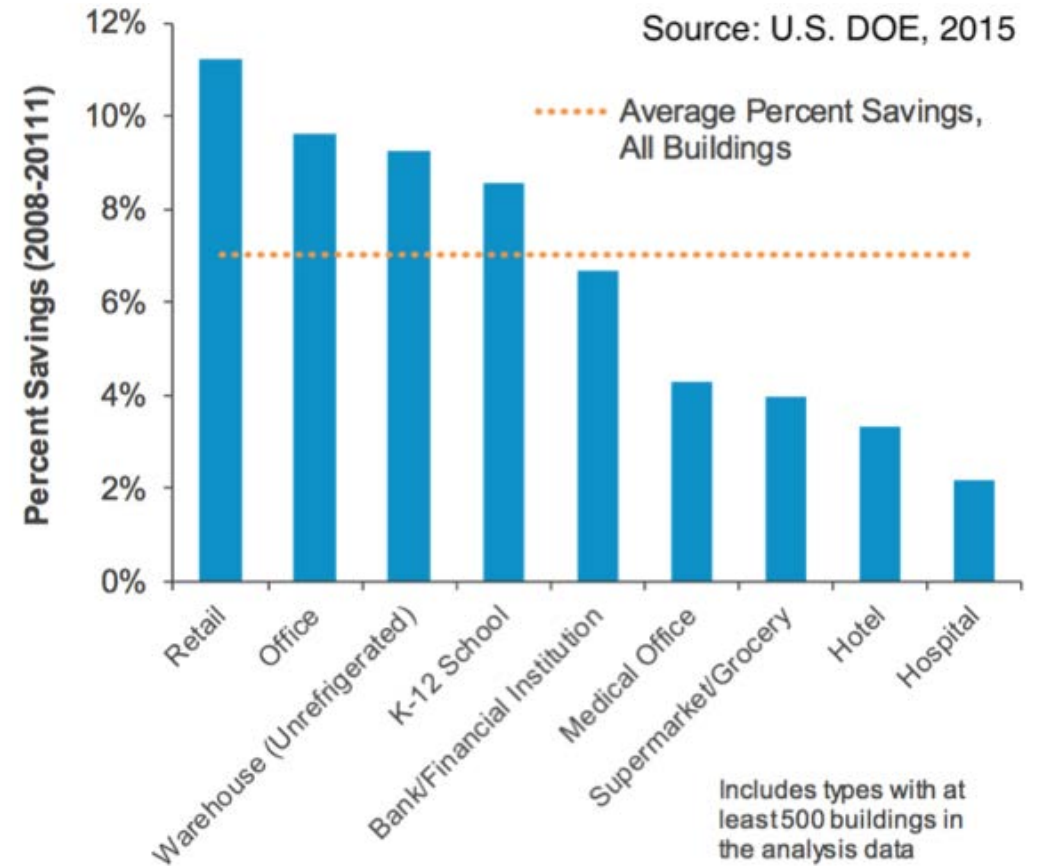
Amount of Building Area

- 200,000+ sqft
- 100,000 to 199,999 sqft
- 50,000 to 99,999 sqft
- 25,000 to 49,999 sqft
- 1 to 24,999 sqft



Energy Benchmarking and Disclosure

- Low-cost, high impact
- DOE study: 2 to 11% reduction 3 years
- MIT research: 14% reduction in 4 years (New York City office buildings)
- Foundational for energy efficiency programs



Financing and Incentives

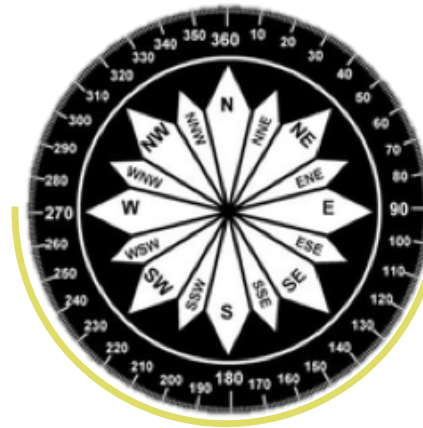


- Pay as you go financing
- Property Assessed Clean Energy (PACE) to align incentives
- Revolving energy efficiency fund
- Utility rebates aligned with positive externalities
- Net metering policy for PV
- Low-income cross-subsidies against distribution inequalities

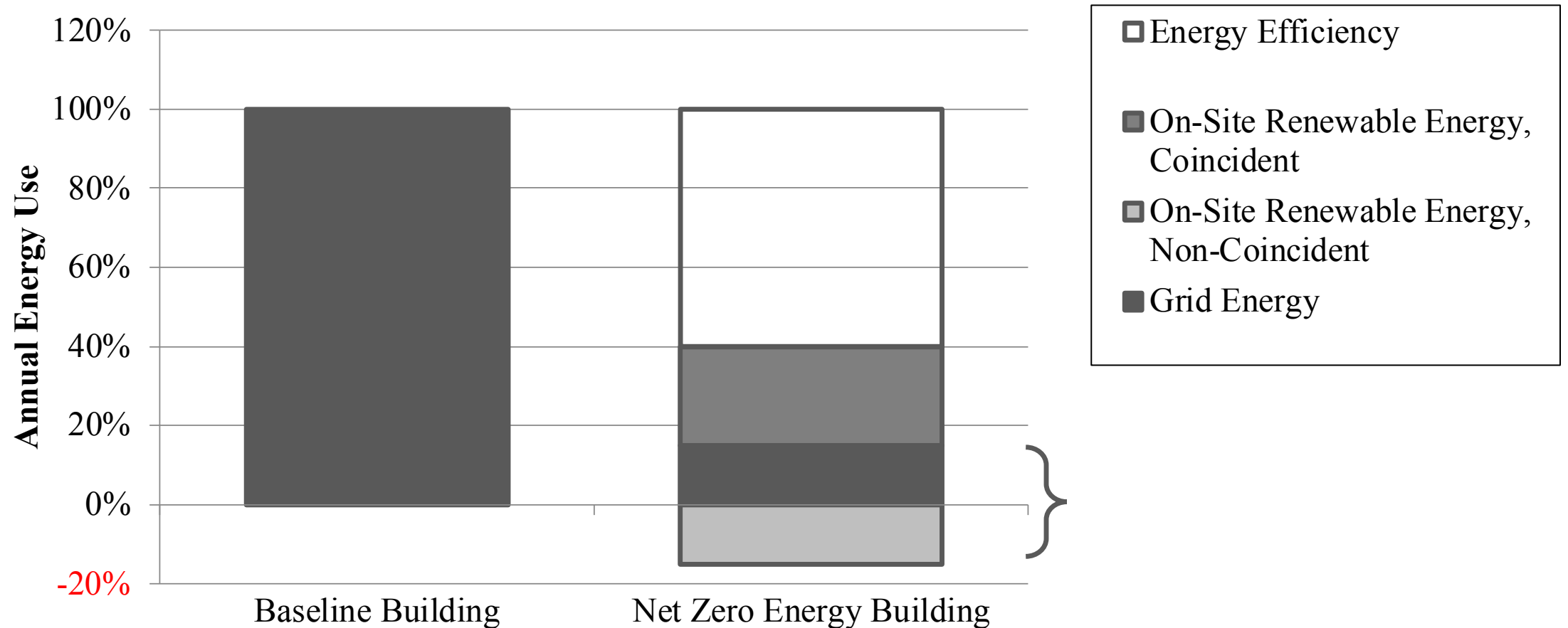


Energy Codes: Solar Ready

- 2015 IECC voluntary residential measure
- Minimum area thresholds (e.g. 600 ft²) of clear roof, properly-oriented
- Provide structural design load of roof
- Pathways for electrical conduit (PV) or plumbing (solar thermal)
- Electrical panel designed to accommodate future PV



Net Zero Energy Buildings



Tree Rebate Program

- Large species deciduous trees to shade buildings
- \$50 utility rebate per tree
- Annual program benefits (7,600 trees):
 - Energy savings: 2.3M kWh
 - Utility savings: \$225K
 - GHG emissions reduction: 1,400 tons CO₂e
- Additional benefits: improved air and water quality, storm water control, reduced temperatures, enhanced quality of life, and improved property value



PLANT A TREE. SAVE ENERGY. SAVE MONEY.

TREES TO CHOOSE FROM

 Mexican Sycamore Large, spreading tree with white bark and heart-shaped leaves.	 Arizona Cypress Small, upright tree with blue-green foliage.	 Montezuma Cypress Small, upright tree with dense, green foliage.	 Texas Red Oak Medium-sized tree with red autumn foliage.	 Cedar Elm Medium-sized tree with green foliage and red autumn color.	 Mexican White Oak Medium-sized tree with green foliage.
 Bur Oak Large, spreading tree with green foliage.	 Chinquapin Oak Medium-sized tree with green foliage.	 Anasua Medium-sized tree with green foliage.	 Live Oak Large, spreading tree with green foliage.	 Lucy Oak Medium-sized tree with green foliage.	 Pecan Large, spreading tree with green foliage.

Save on your energy bill and add beauty to your home with a **Tree Rebate**. Ask any sales associate for an application and information on how to qualify for your treebate on any of these native trees.

Central Communities
PLANT TREES
Local Landscaping
Available in Texas
cps

This program is funded in part by the American Recovery and Reinvestment Act through the U.S. Department of Energy.

Low-Income Weatherization



- Install cost-effective efficiency measures
- Average annual utility savings:
 - \$600 and 5,200 kWh per home
 - \$2.0M and 17.3 million kWh total
- 3,320 low-income households
- Comfort and quality of life improvements
- Supported 130 jobs



Parting Thoughts on Energy in Buildings



Questions & Discussion

Thank you!