

# Green Savings: How Policies and Markets Drive Energy Efficiency

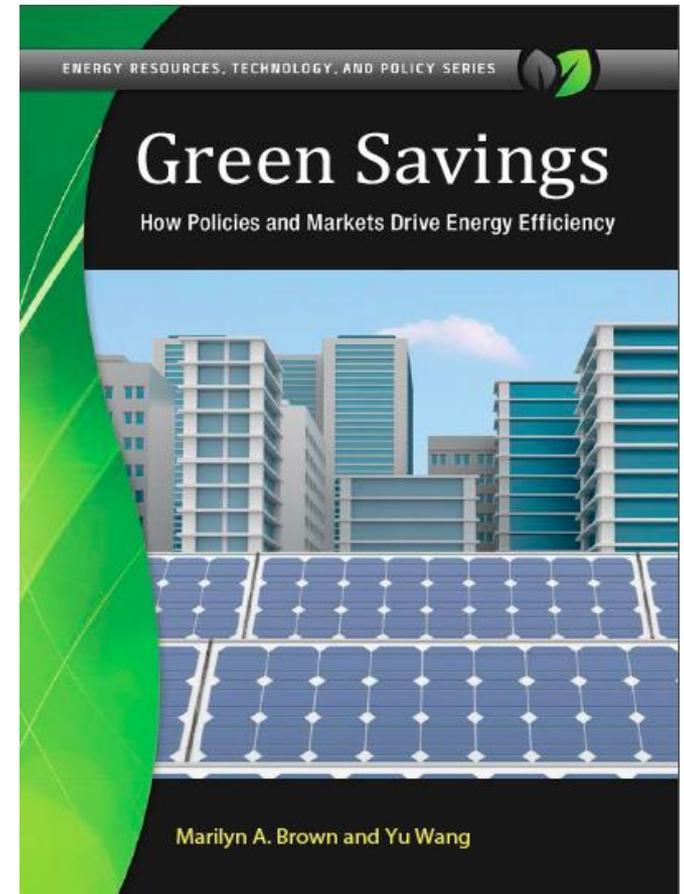
**Marilyn A. Brown**

Brook Byers Professor of Sustainable  
Systems

School of Public Policy  
Georgia Institute of Technology

Community Workshop on Energy Efficiency

**Atlanta, GA  
August 3, 2015**



Marilyn Brown and Yu Wang. *Green Savings* (Praeger Press), September, 2015.

# Georgia Tech and Synapse Reports Show How EE Reduces CO<sub>2</sub> and Electricity Bills

## Clean Power Electricity

States can lower electric bills with clean power plan

July 28, 2015

Reducing greenhouse gas emissions from power plants — a requirement of the EPA's proposed Clean Power Plan — could be done cost-effectively through a combination of renewable energy and energy efficiency policies as well as a modest carbon price. [↗](#)



**PHOTO:** The Environmental Protection Agency is due to finalize the Clean Power Plan this summer, and two new reports find lower electricity rates for consumers, and reduced emissions could be the result. Photo credit: MRBECK/Flickr.



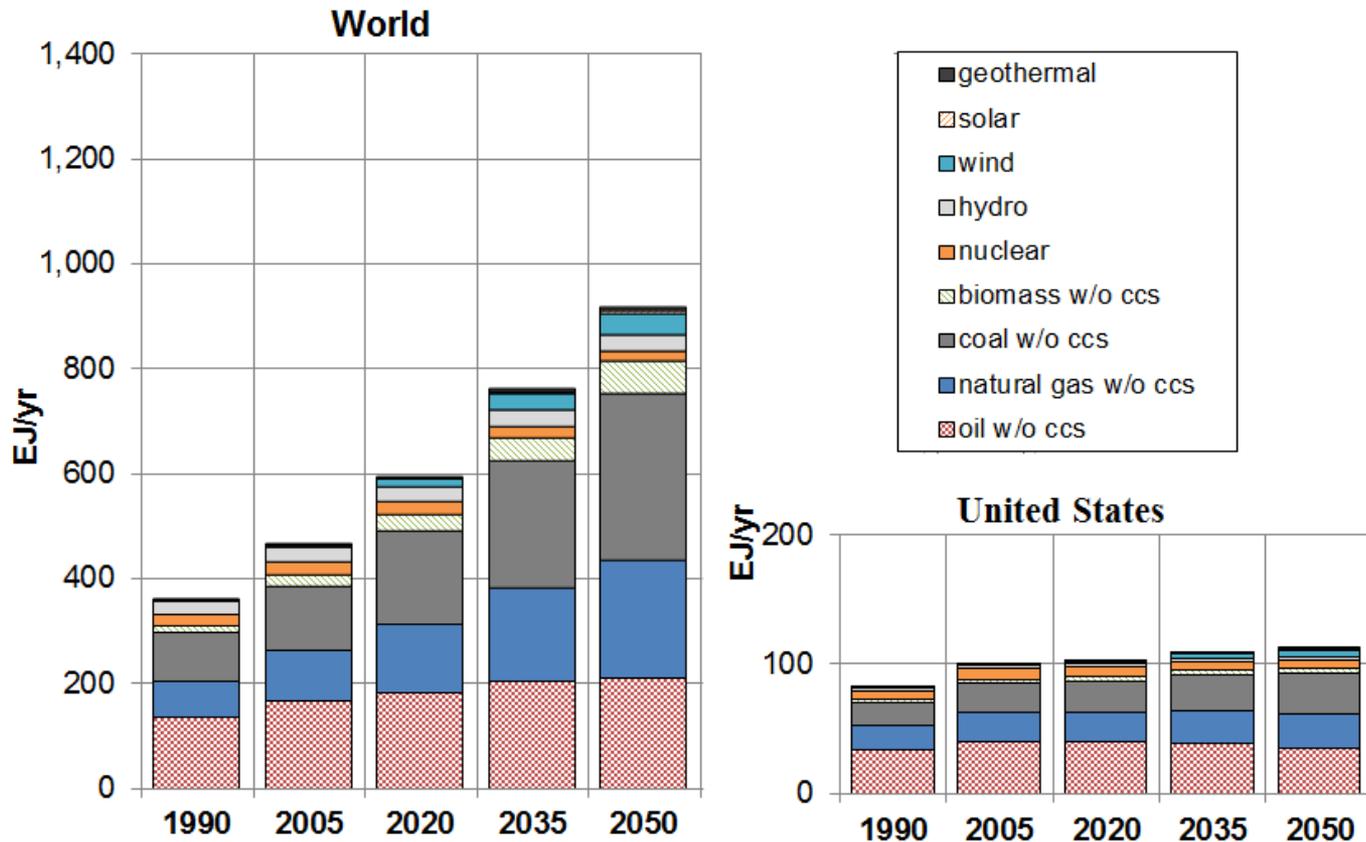
**PHOTO:** In direct contradiction to charges by many energy corporations, research is finding an EPA plan to reduce carbon emissions should actually cut electricity bills, if it's implemented using energy efficiency as well as renewables. Photo courtesy of World Resource Insitute.

# **Motivation for Writing** ***Green Savings***

# Energy Consumption is Increasing

4

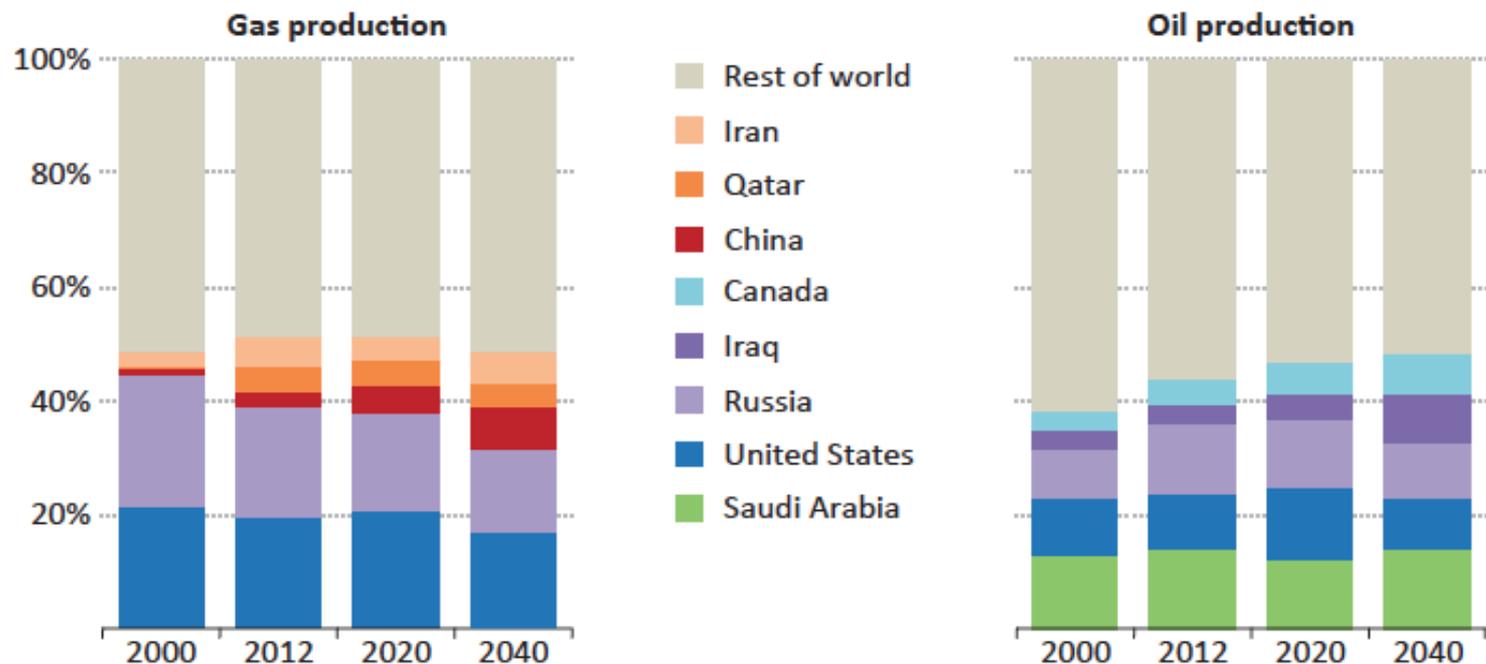
Global energy demand could rise by one-third over the next 25 years, driven by rising living standards in China, India & the Middle East.



# Will the Gas Bonanza be a Bridge or a Barrier to Sustainability

5

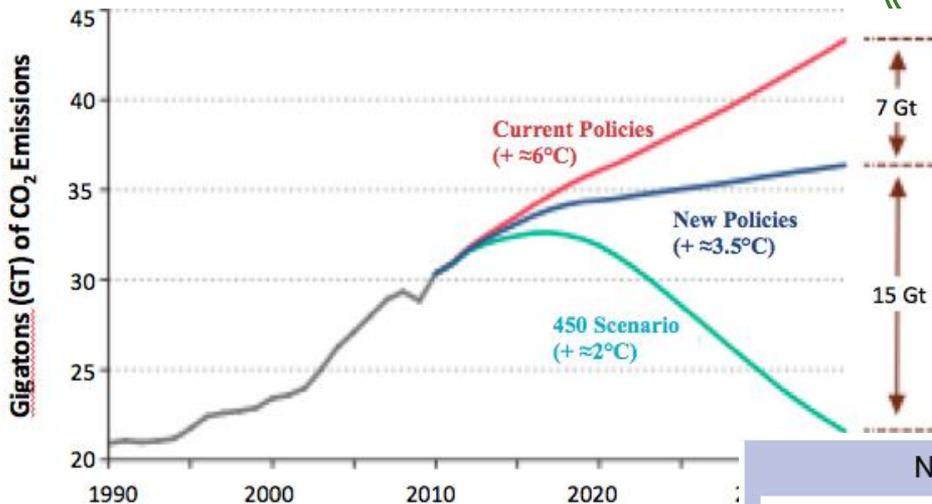
- The U.S. may become a major gas exporter and nearly self sufficient in oil.
- What will be the fate of alternative energy markets in the U.S., with such a glut of low-cost fossil fuels?



Shares of Top Five Producers of Natural Gas and Oil

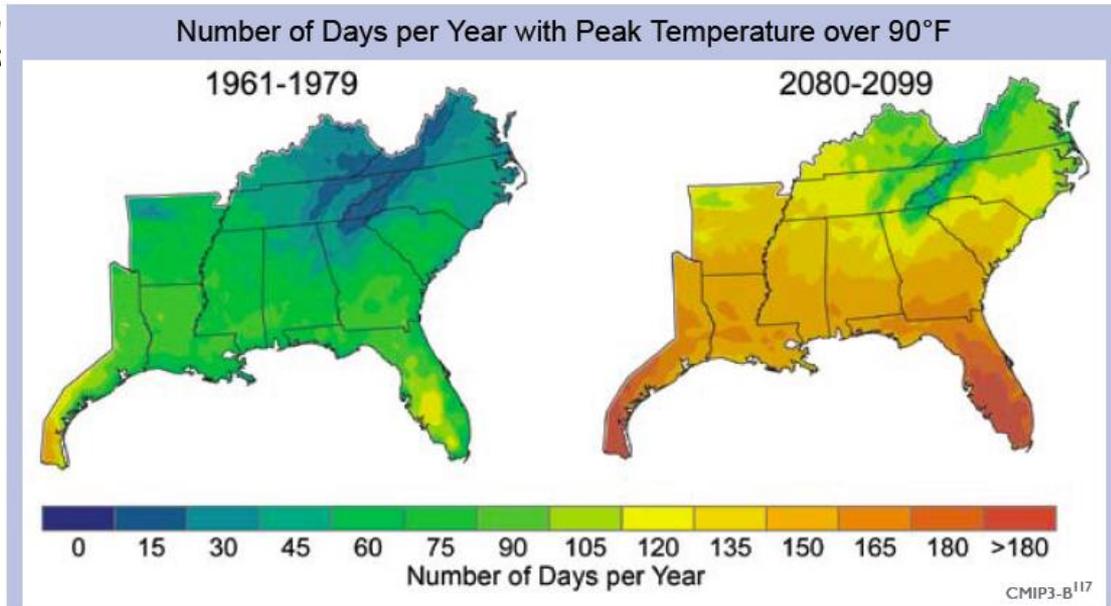
# Energy Efficiency is a Dilemma Wrapped in a Paradox

6



World CO<sub>2</sub> emissions are on the rise.

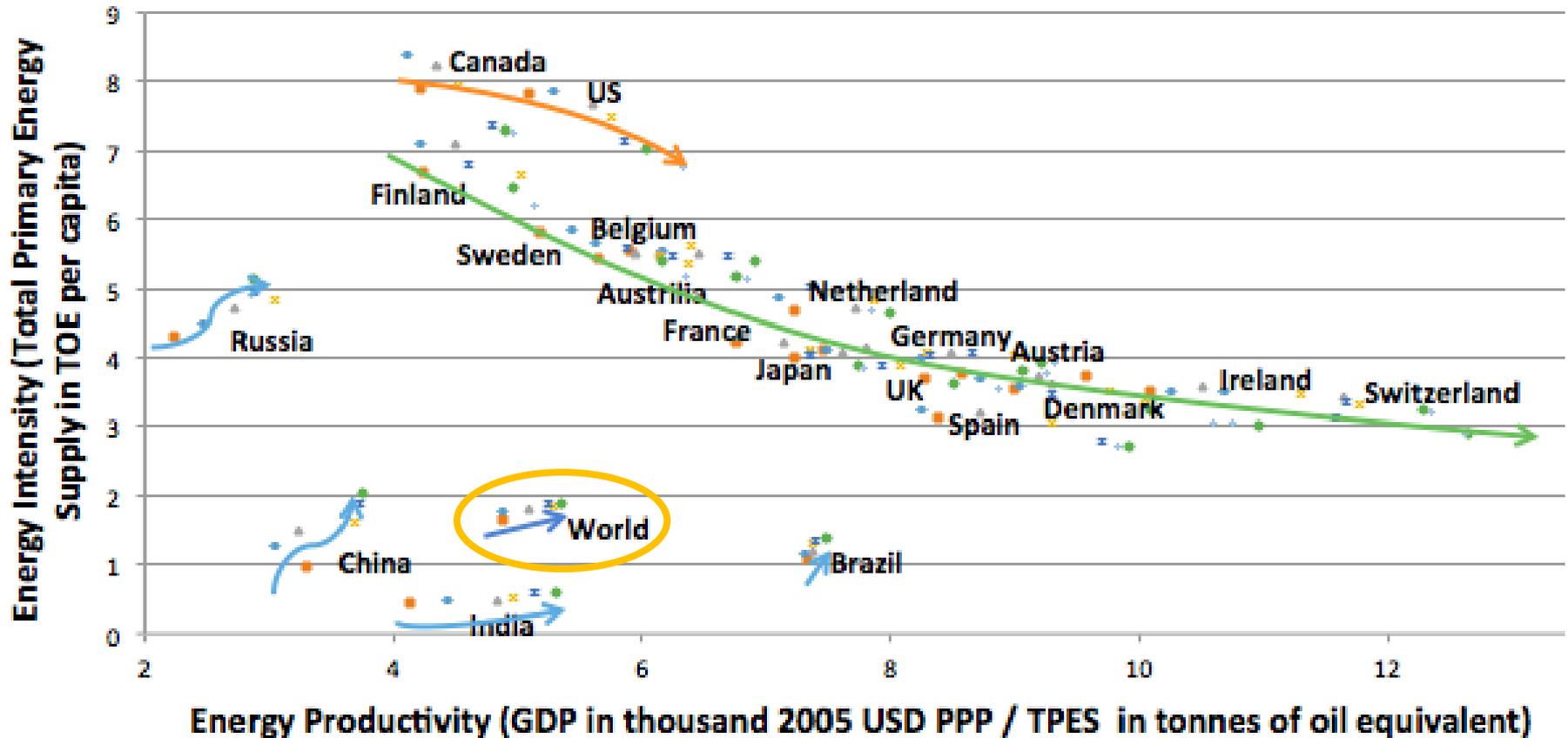
Accelerated warming is forecast for the Southeast.



Source: International Energy Agency. 2011. *World Energy Outlook*.

# Energy Productivity is Increasing, but So is Energy Consumption

7

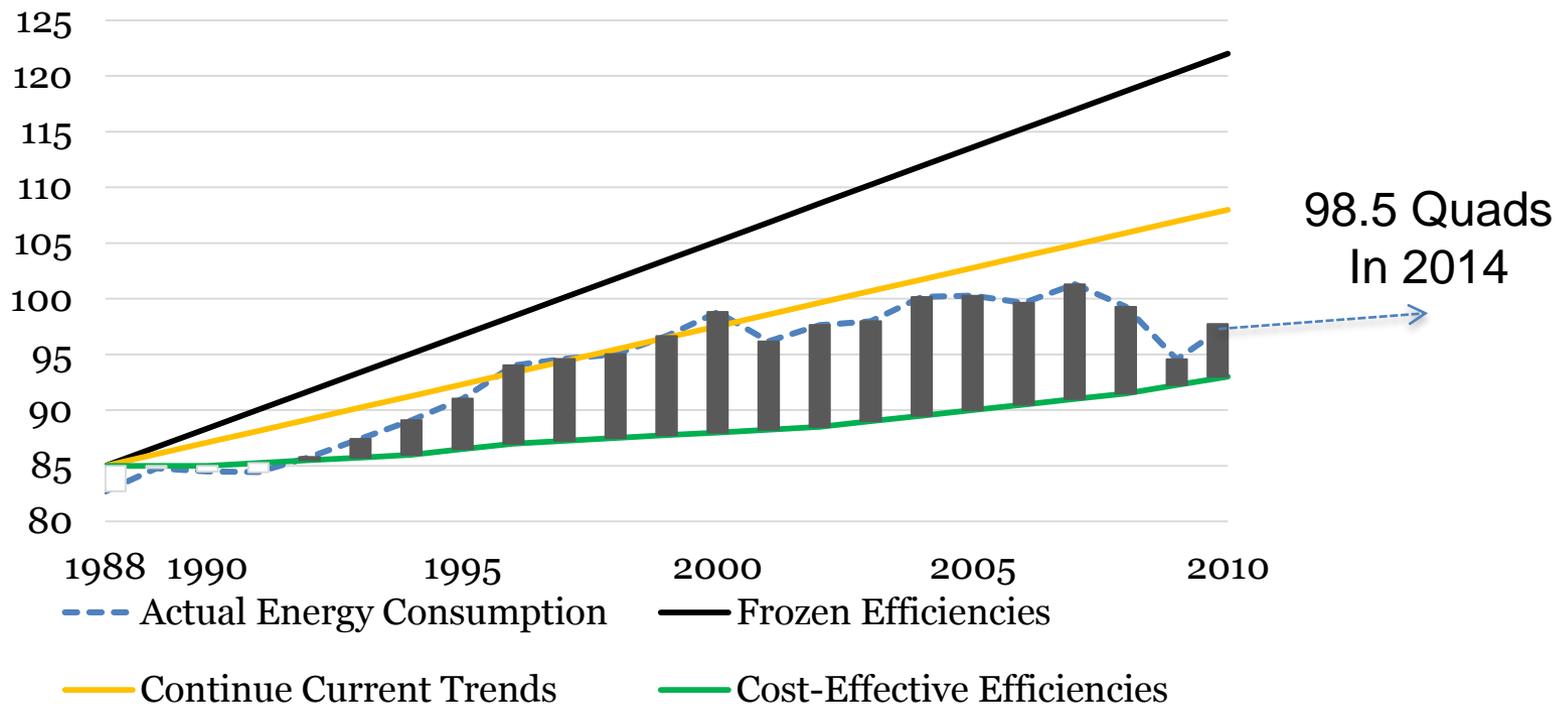


# The “Energy-Efficiency Gap” – A Lighting Rod for Debate

8

The term was first coined in 1990, with a prediction that mostly came true.

Energy Consumption in Quads:  
Frozen–Forecast–Actual–Potential

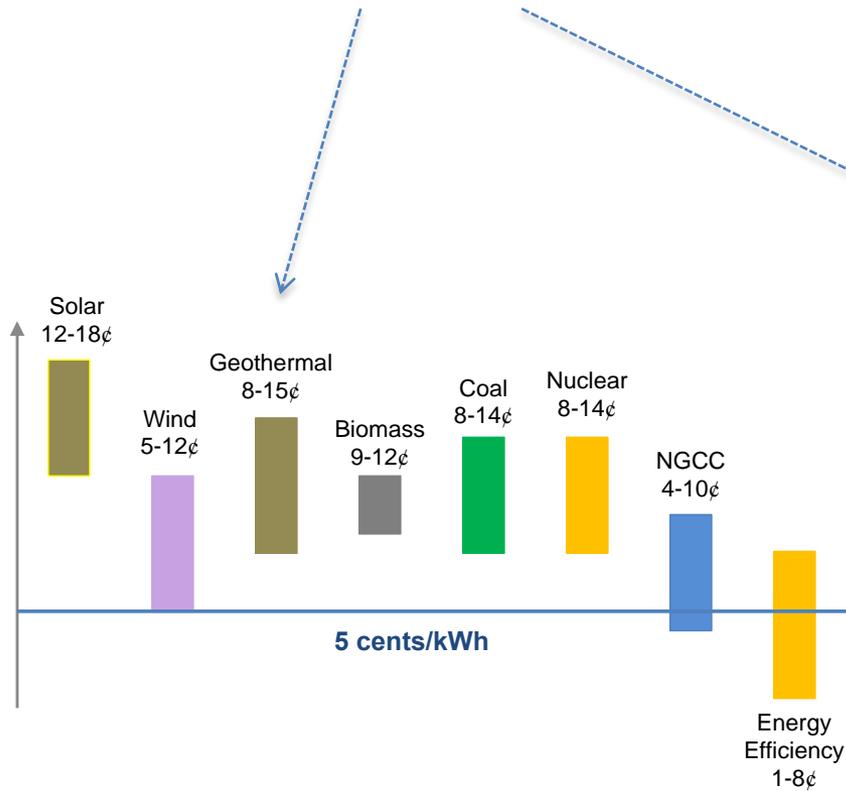


Source: Eric Hirst and Marilyn Brown. “Closing the Efficiency Gap” (1990).

# Levelized Cost of Electricity is Useful; Integrated Resource Planning is Better

9

## From LCOEs to IRPs



Data source: Bloomberg's *Sustainable Energy in America 2014 Factbook*.

### Box 1. TVA's Modeling of a Virtual Power Plant



Building Block Design	Additional Specifications
Three pricing tiers: 1.16 ¢/kWh to 2.74 ¢/kWh	Limited number of total blocks for each tier
Maximum of 58 blocks annually: 32 residential, 15 commercial, 11 industrial	No reserve credit
Service life defined by existing programs and industry standards	Growth rate maximum of 25% first five years, 20% next ten, 15% for remaining duration
Capacity factors: 65% residential, 80% industrial, 79% commercial	Risk adjusted for LPC delivery risk: 10% per year first five years, then declining to 2% per year
Hourly fixed shape	Risk adjusted for program uncertainty: 0% for first five years, 4% annually after year five, capped at 30%

# **The Debate: Skeptics Versus Advocates**

# The Views of Skeptics and Advocates: Is EE Real or is it Overstated?

## Skeptics

Failures in energy markets are insignificant: energy prices reflect total producer costs and consumer demand.

Because of the rebound effect, engineering spreadsheets typically overestimate energy savings.

EE achievements are often over-estimated, attributing too much of the change in total energy consumption to efficiency.

## Advocates

Energy prices do not fully reflect the cost of a range of significant negative externalities including climate change.

Models are increasingly accounting for the rebound effect and various behavioral “wrinkles.” Also, the takeback effect can be reduced.

Decomposition methods are now available to isolate the EE effect, and experience with them is growing.

# The Views of Skeptics and Advocates: Can we Measure It?

<b>Skeptics</b>	<b>Advocates</b>
Double counting occurs when program evaluators and modelers fail to account for “natural” efficiency improvements.	Naturally occurring EE is now routinely acknowledged in program evaluations and forecasts.
There are hidden costs that models often overlook (program administration, the effort required by participants to find and install new equipment and process rebates).	These hidden costs are increasingly considered in program evaluations; program designs are also being developed to minimize these costs.
Modelers underestimate the discount rates used by consumers and firms.	Discount rates can be lowered by reducing market uncertainties e.g., with benchmarking and labeling.

# The Views of Skeptics and Advocates: How Hard is It to Deliver?

## Skeptics

Models don't always reflect how hard it is to deliver energy efficiency.

EE should be seen as a customer service and not as a utility resource.

Most of the cost-competitive EE has been fully exploited.

## Advocates

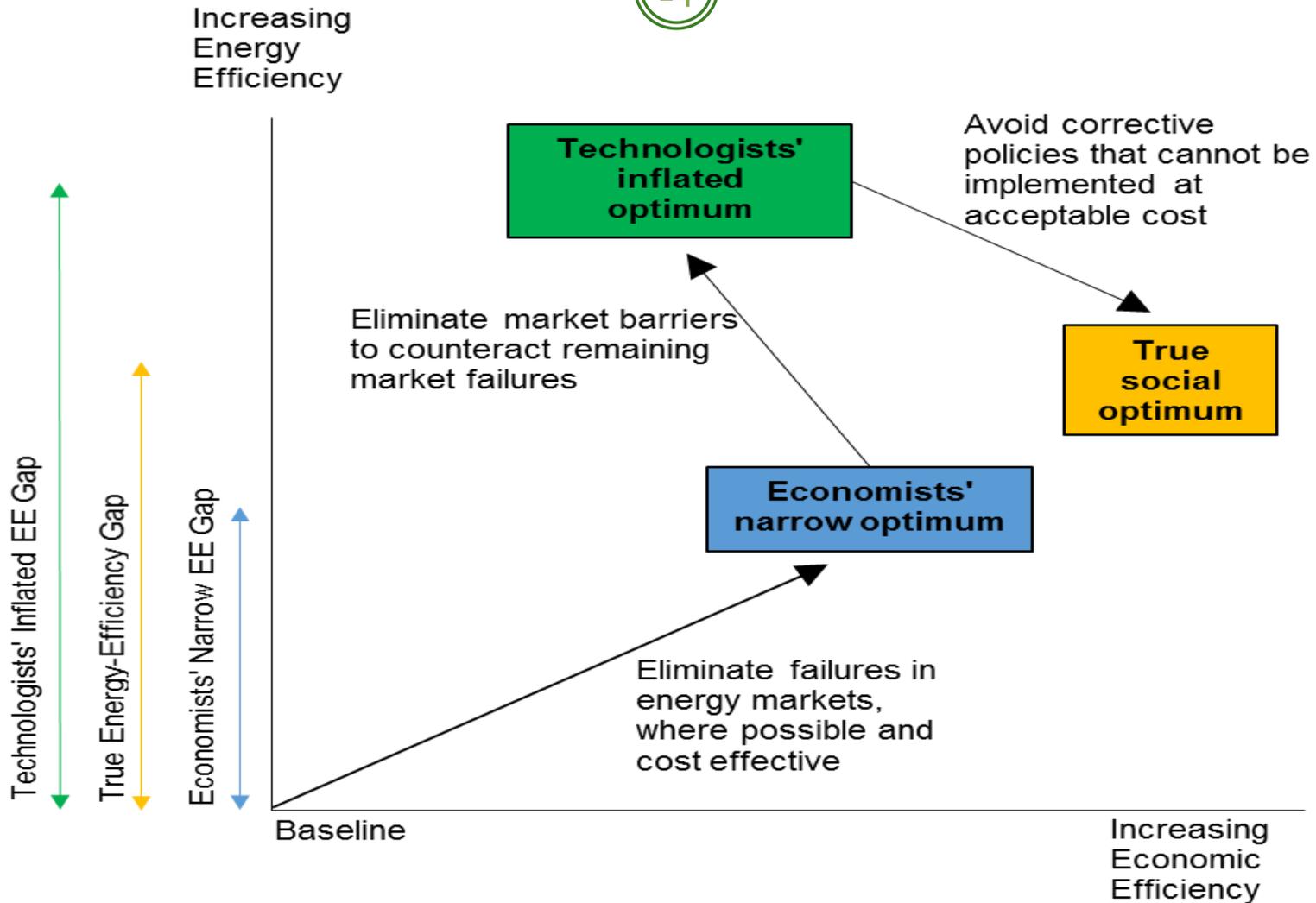
Experience with EE policies and programs is growing rapidly.

New business models are able to integrate EE into utility resource planning

New opportunities for low-cost energy savings are being invented every day.

# Alternative Views of the EE Gap: Economists, Technologists,...

14

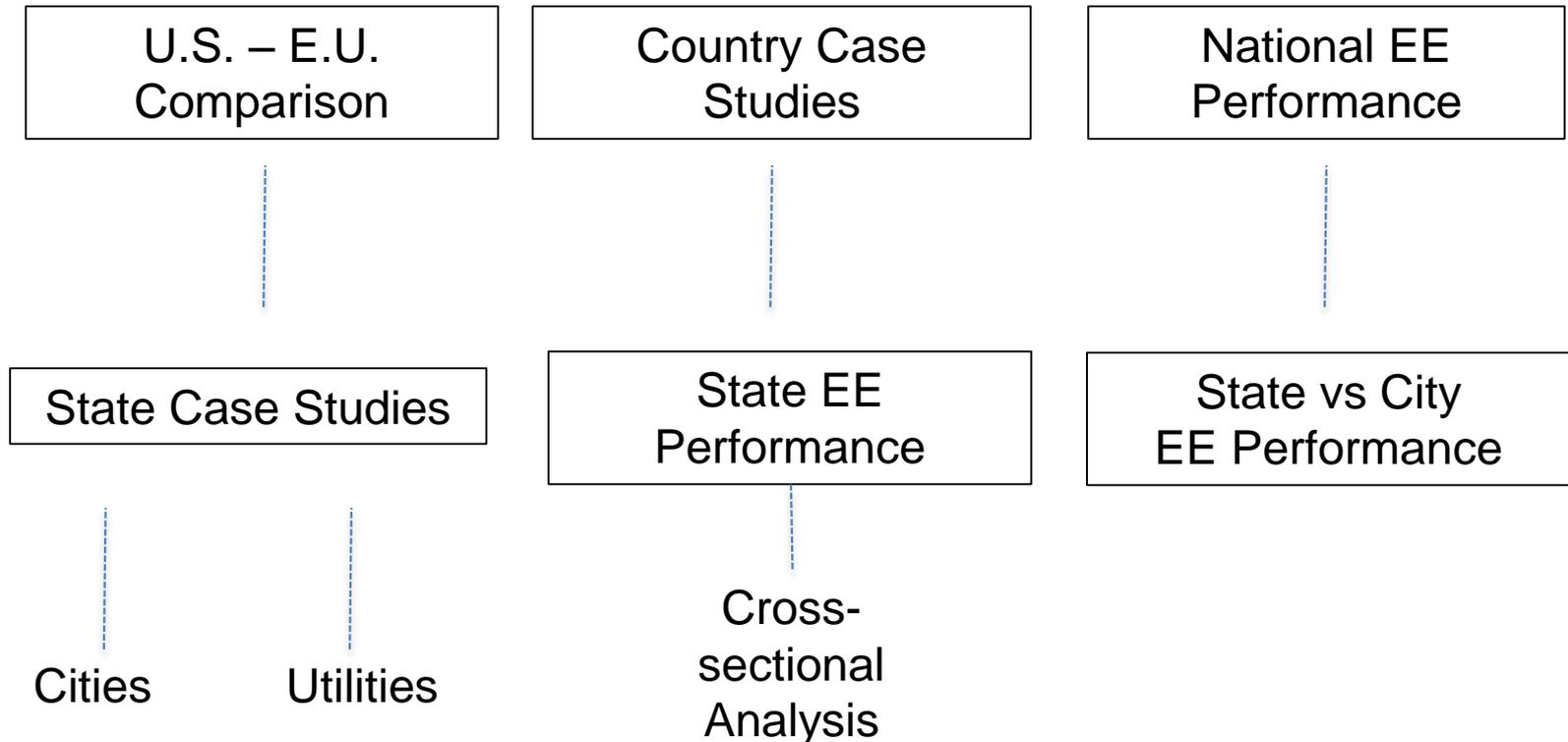


# **Nested and Entwined Policies: The Value of “Polycentrism”**

# Polycentric Analysis of EE Policies

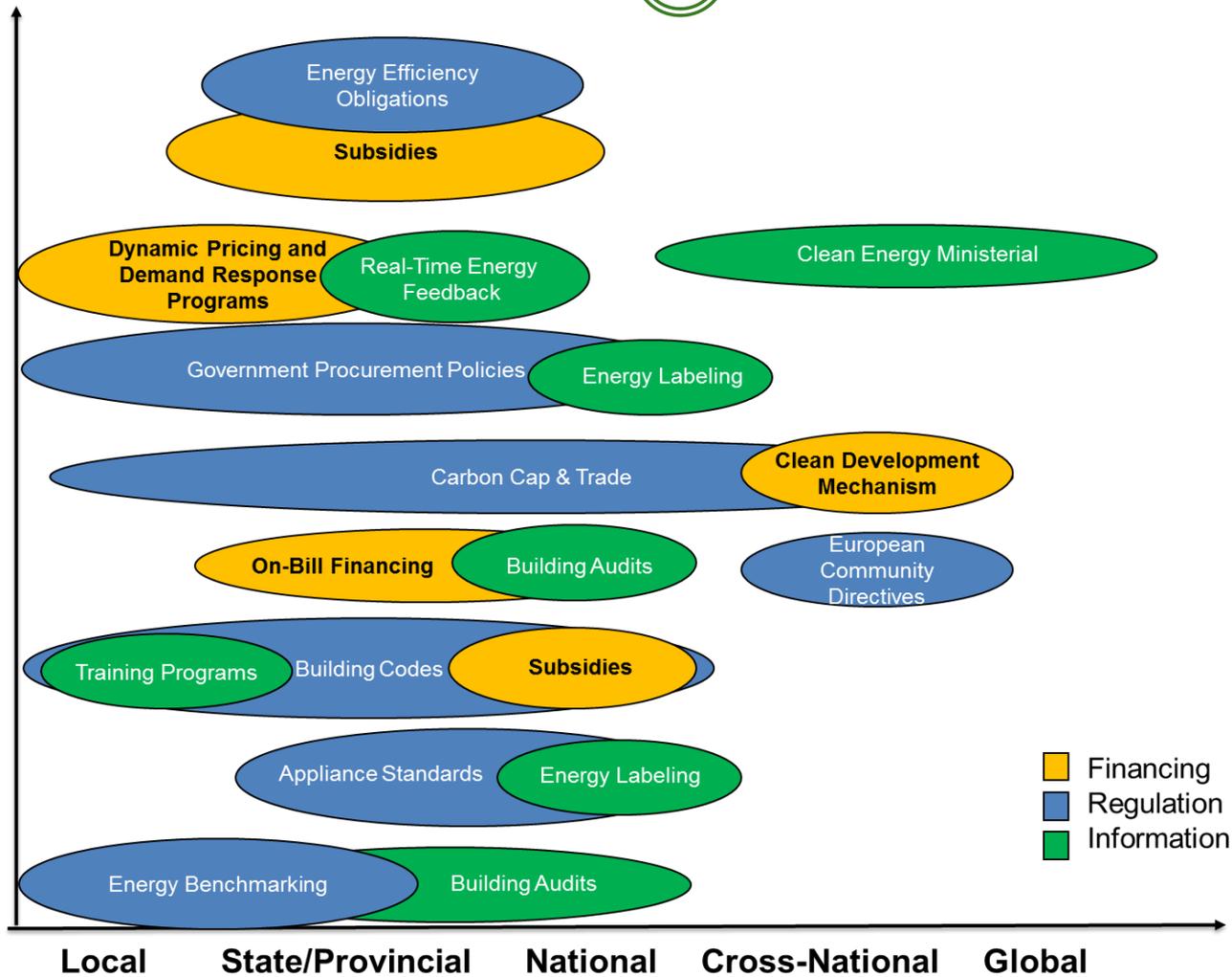
16

Polycentrism incorporates multiple scales and multiple stakeholder groups in the resolution of a policy problem, making it possible to harness the benefits of global and local action together instead of having them tradeoff.

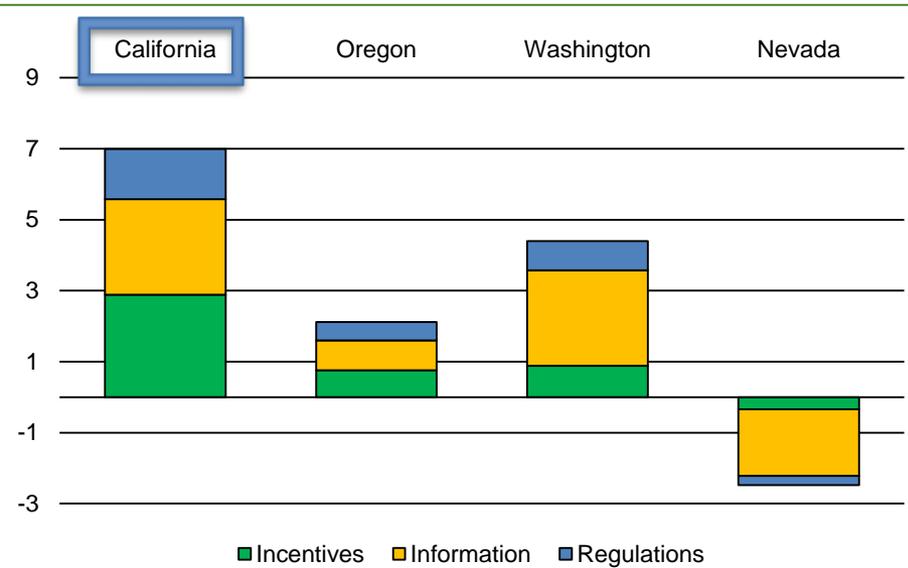
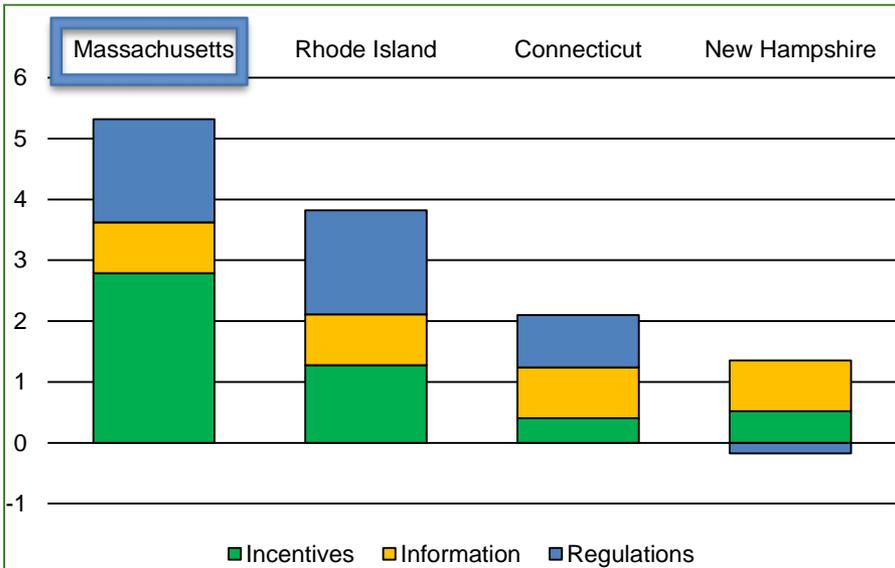


# EE Policies: From the Local to the National – But Little Global Action

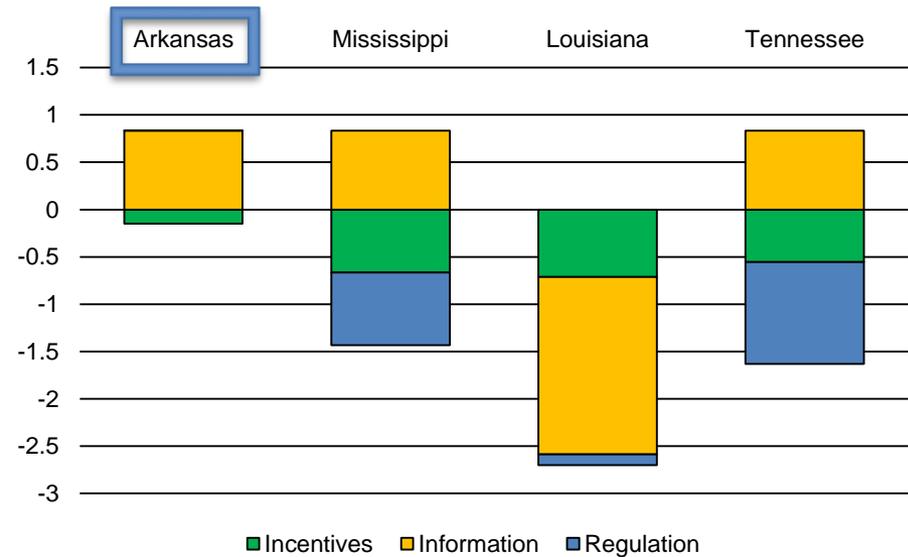
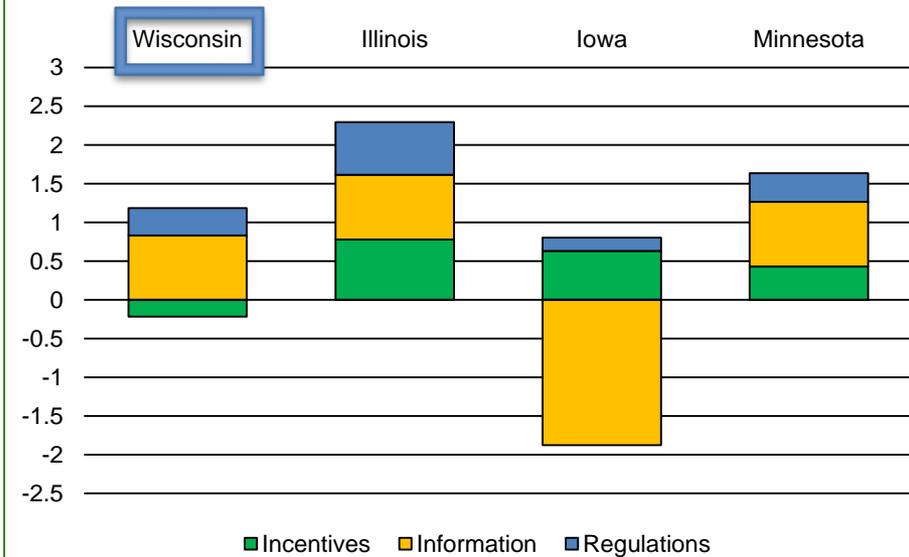
17



# Following the Leaders



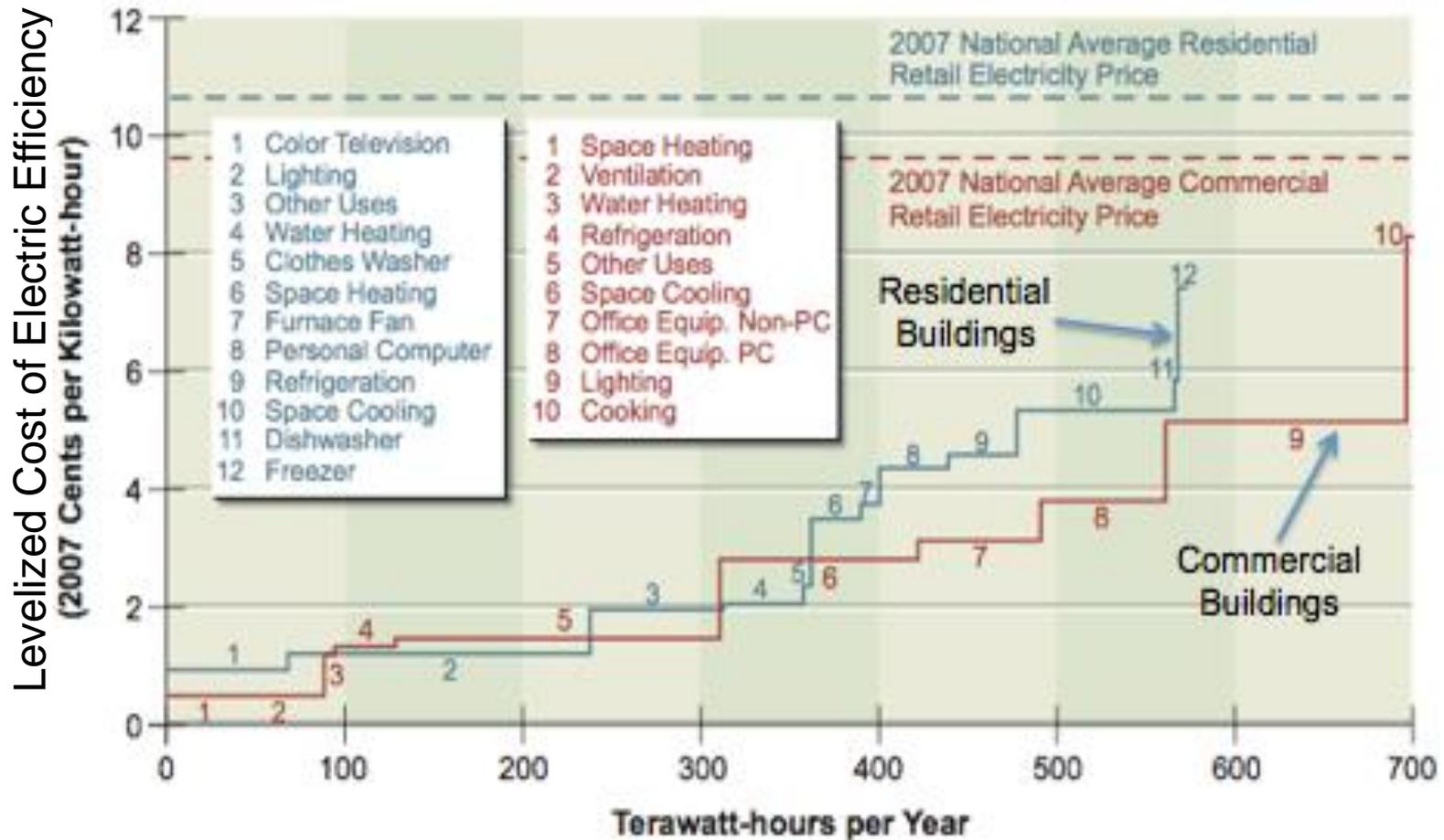
## Policies of Two State Leaders ↑ & Two Improving States ↓



# Potential for the Future

# Efficiency Appears to Remain A Cost-Competitive Electricity Resource

21

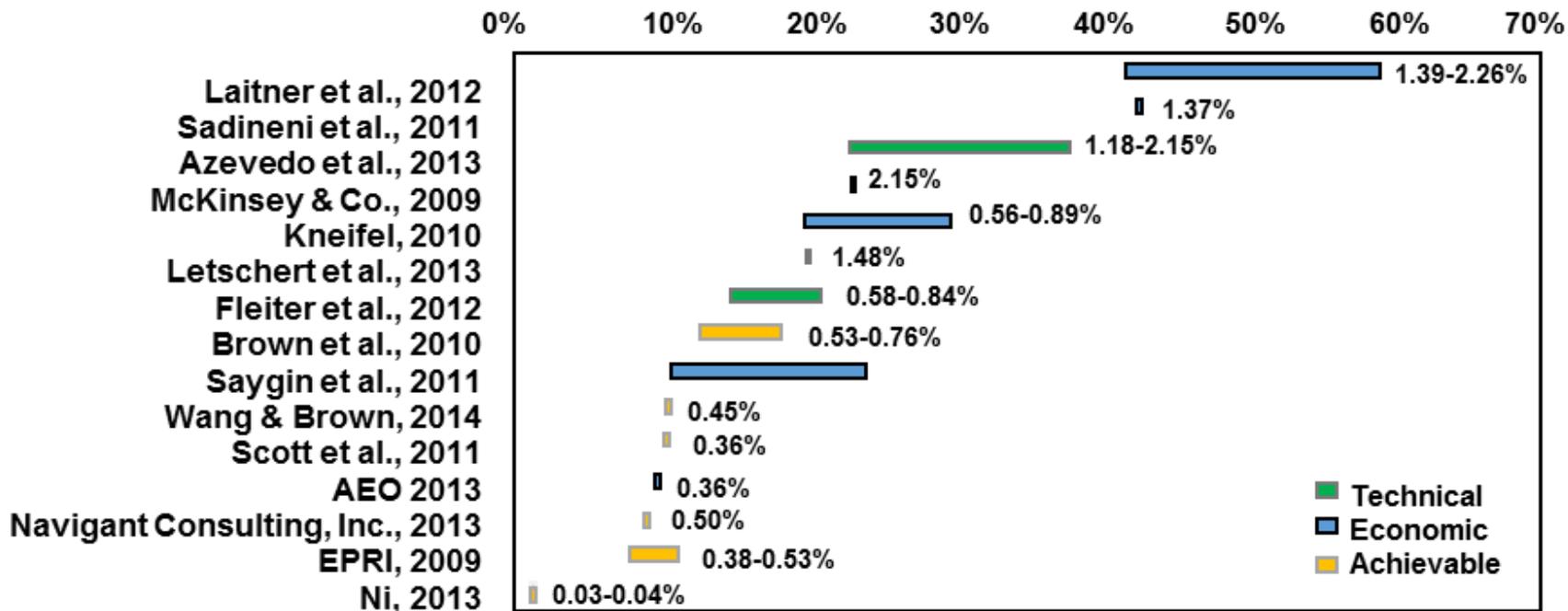


Source: National Academy of Sciences. 2009. *America's Energy Future*.

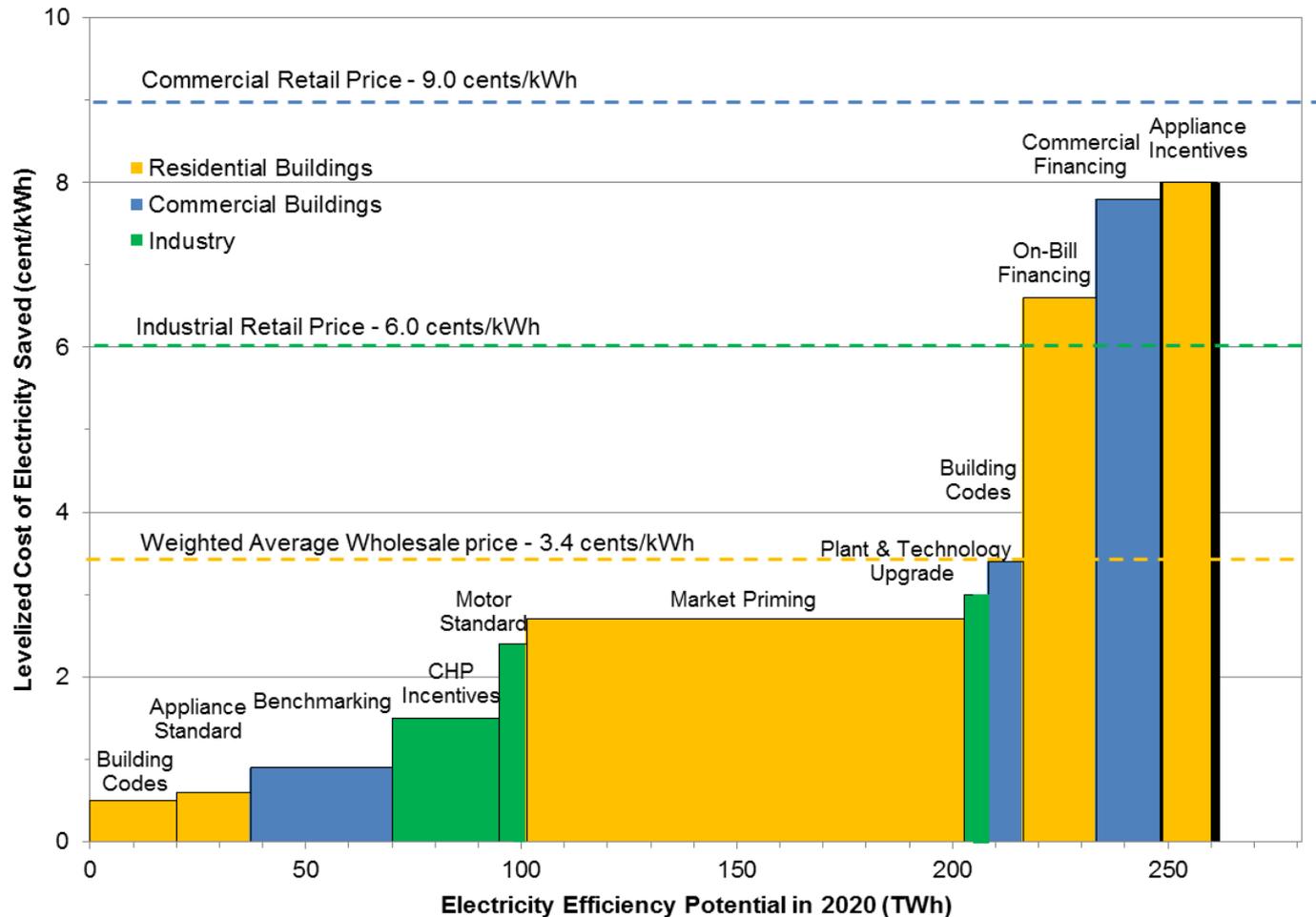
# Estimates of EE Potential: Annual Savings Rates

22

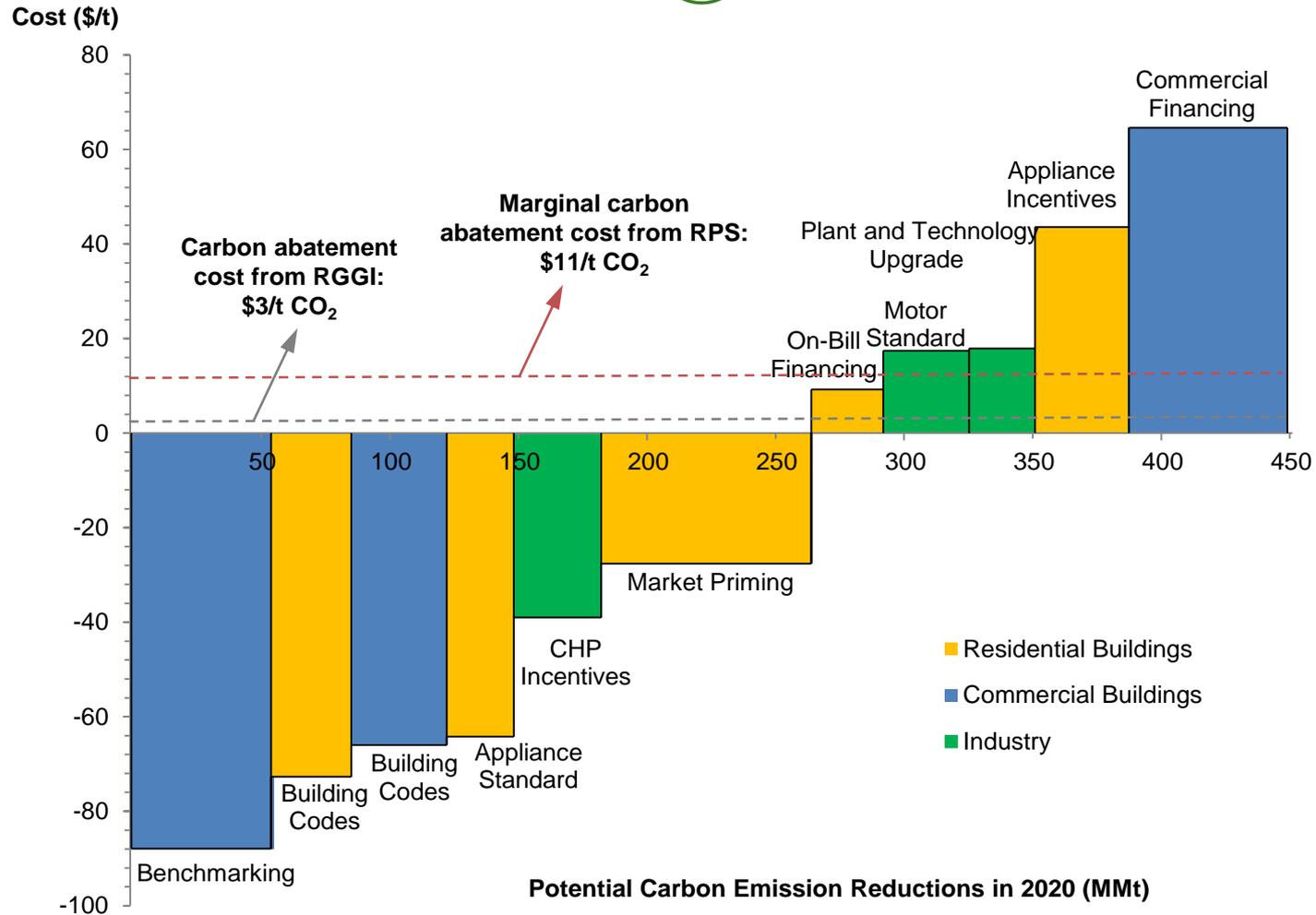
Energy-Efficiency Potential at End Year of Projection



# U.S. Policy Supply Curve for EE Resources in 2020



# Policy Supply Curve for CO<sub>2</sub> Reductions in 2020



# Policy Recommendations

25

- Keep Up with Technology Assets
  - Engaging in public-private partnership on R&D
  - Periodically updating standards and mandates
- Conduct Defensible EM&V
- Employ Polycentric Policy Systems
  - Turning multi-scale governance into policy synergies
- Follow the Leaders
  - Learning from “best practices”
  - Adjusting to local conditions
- Exploit the Energy-Efficiency Gap

# Book Endorsements

26

"Green Savings combines the theories, data and policy analysis needed to understand energy efficiency. The case studies offer practical insights for entrepreneurs, as well as policy makers at a range of scales on how to promote energy-efficiency."

**Nick Eyre**, Program Leader in Energy, Environmental Change Institute, Oxford University

"A very useful book. Green Savings provides a thorough inquiry into energy efficiency, from market to policy, from technologies to productivity, from past performance to further potential, and from American states to global leaders. Its section responding to the views of skeptics is particularly strong."

**Steve Nadel**, Executive Director, American Council for an Energy-Efficient Economy

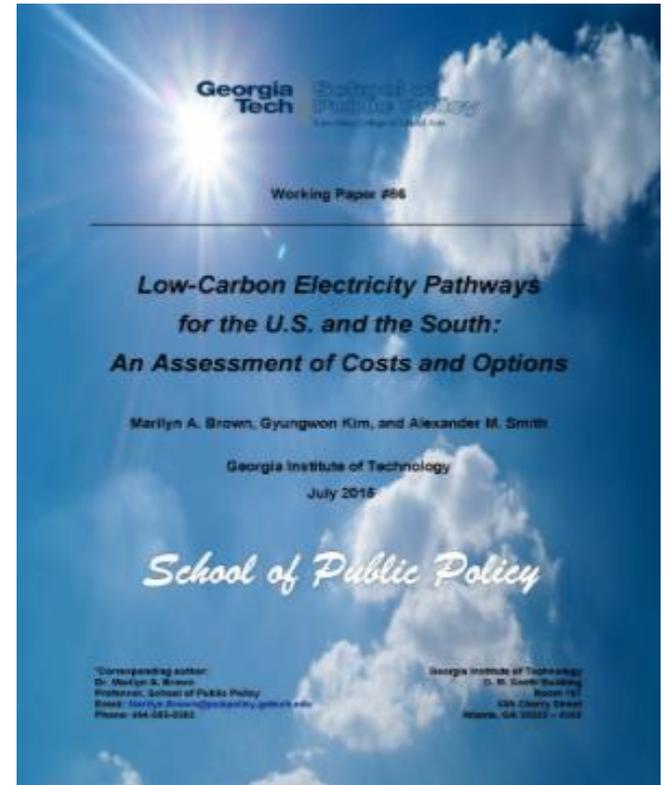
"A comprehensive and in-depth analysis of energy efficiency policies with intriguing state and country case studies. Considering energy efficiency as an important resource, Green Savings provides the insights and fundamentals you'll need as utility planners, city and state energy officers, and national leaders."

**Clark Gellings**, Fellow, Electric Power Research Institute

# For More Information

27

**Dr. Marilyn A. Brown,**  
Brook Byers Professor of Sustainable Systems  
Georgia Institute of Technology  
School of Public Policy  
Atlanta, GA 30332-0345  
[Marilyn.Brown@pubpolicy.gatech.edu](mailto:Marilyn.Brown@pubpolicy.gatech.edu)  
Climate and Energy Policy Lab:  
<http://www.cepl.gatech.edu>



**CLIMATE AND ENERGY  
POLICY LABORATORY**

**SCHOOL OF PUBLIC POLICY**