

Selling Energy Efficiency in a Climate-Conscious World

Marilyn A. Brown
Presentation at Georgia Tech's Scheller School
February 20, 2017

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ENERGY RESOURCES, TECHNOLOGY AND POLICY SERIES
Green Savings
How Policies and Markets Drive Energy Efficiency
Marilyn A. Brown and Yu Wang

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Marilyn Brown @Marilyn_Brown1 · 24m
The U.S. economy grew by 10 percent since 2007, while energy consumption fell by 2.4% and GHG emissions by 12%.
breakingenergy.com/2017/02/13/the...

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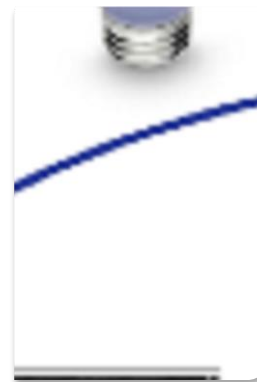
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Two Key Definitions

- **Energy Conservation** – Consuming less energy
- **Energy Efficiency Improvement** – Increasing the services provided per unit of energy consumed.



Incandescent



Compact Fluorescent



Light Emitting Diode (LED)



Watts	60	14	11
Lumens per Watt	14	64	84

LEDs Pay for Themselves in ~300 Days

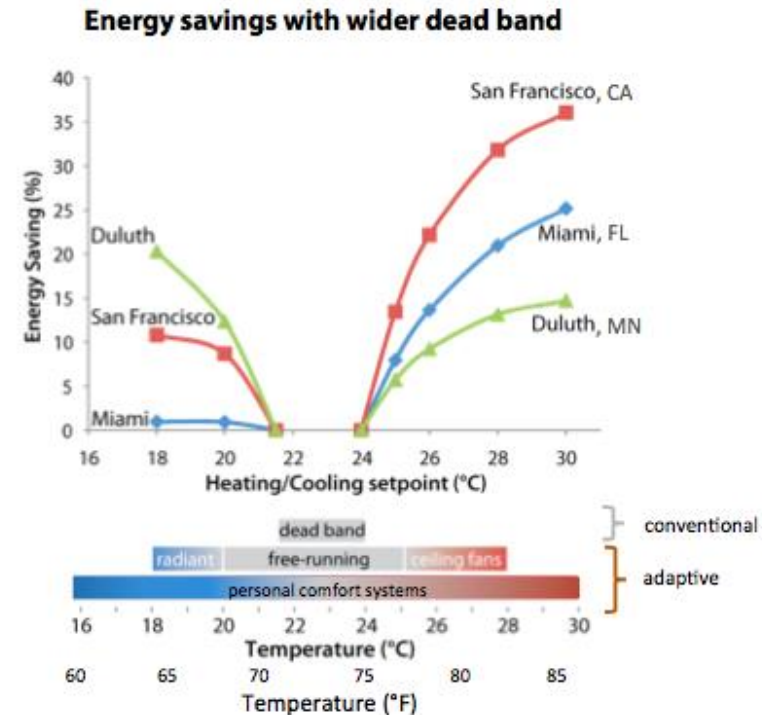
	LED	Incandescent
Upfront cost	\$8	\$1
Energy	11 watts	60 watts
Lifetime (hours)	50,000	1,200
Power @ 6 hours per day	66 Wh/day	360 Wh/day
Cost per day @ 7 ¢ per kWh	0.46 ¢	2.52 ¢
Cost per year @ 7 ¢ per kWh	\$1.69	\$9.20

Over the lifetime of an LED (~23 years) you could save \$205.

Source: Adapted from Ryan Murphy (2017)

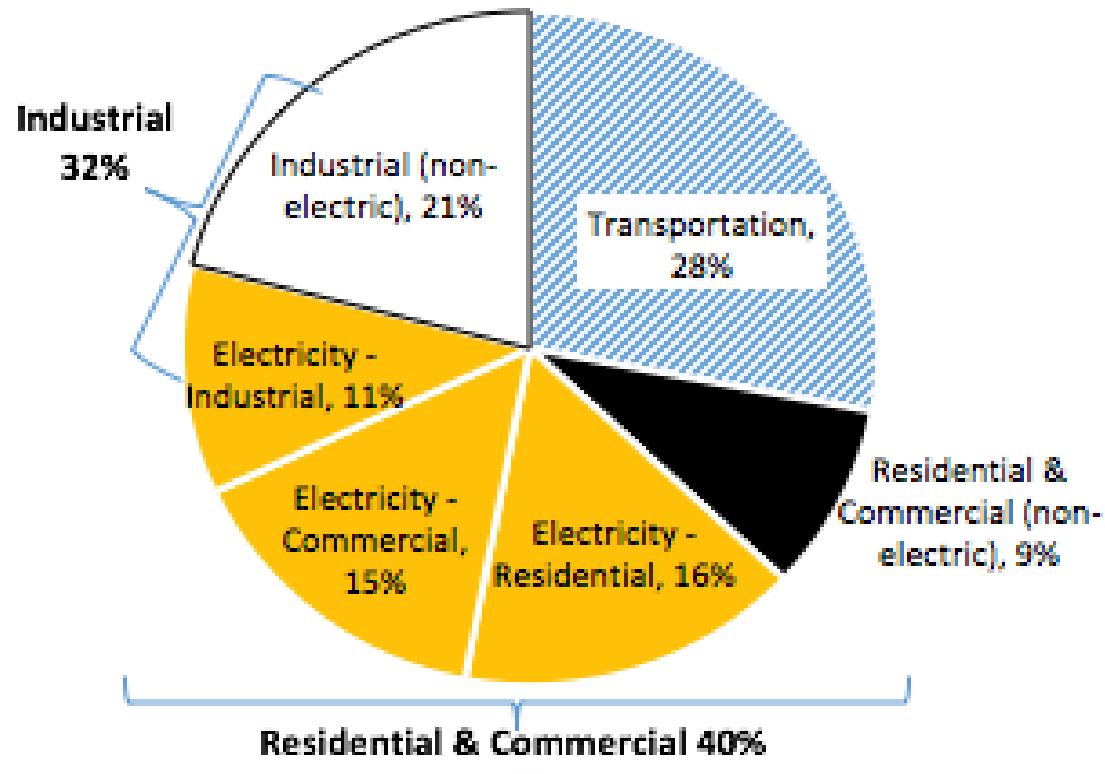
Part-Time and Part-Space Approaches

Avoiding the ubiquitous use of fully lit and conditioned spaces

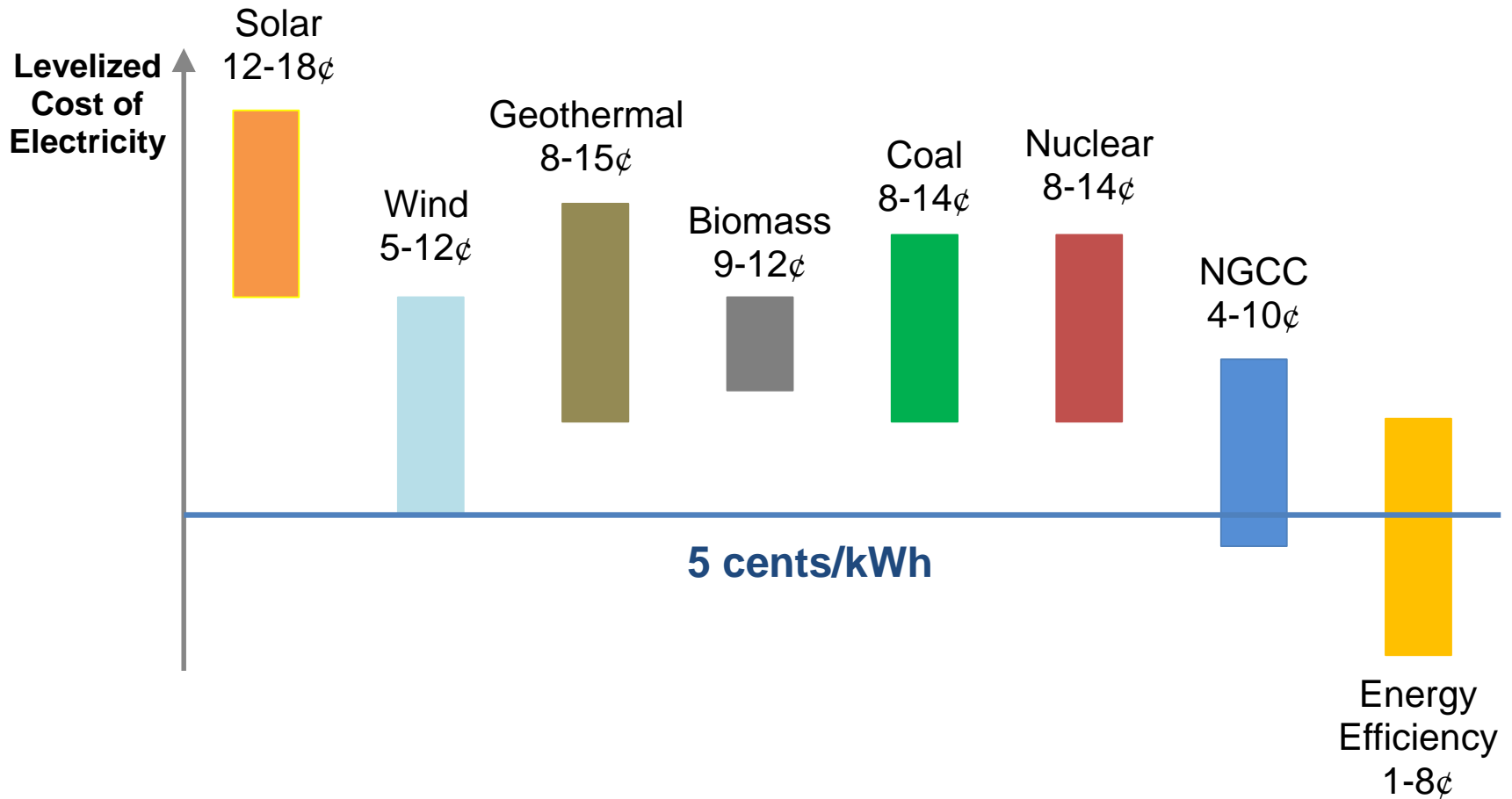


- Widening the “dead band” with personal comfort systems
- Acceptable comfort from 64-84°F?

U.S. Energy “End Use”: 40% is Electricity, and it is Growing

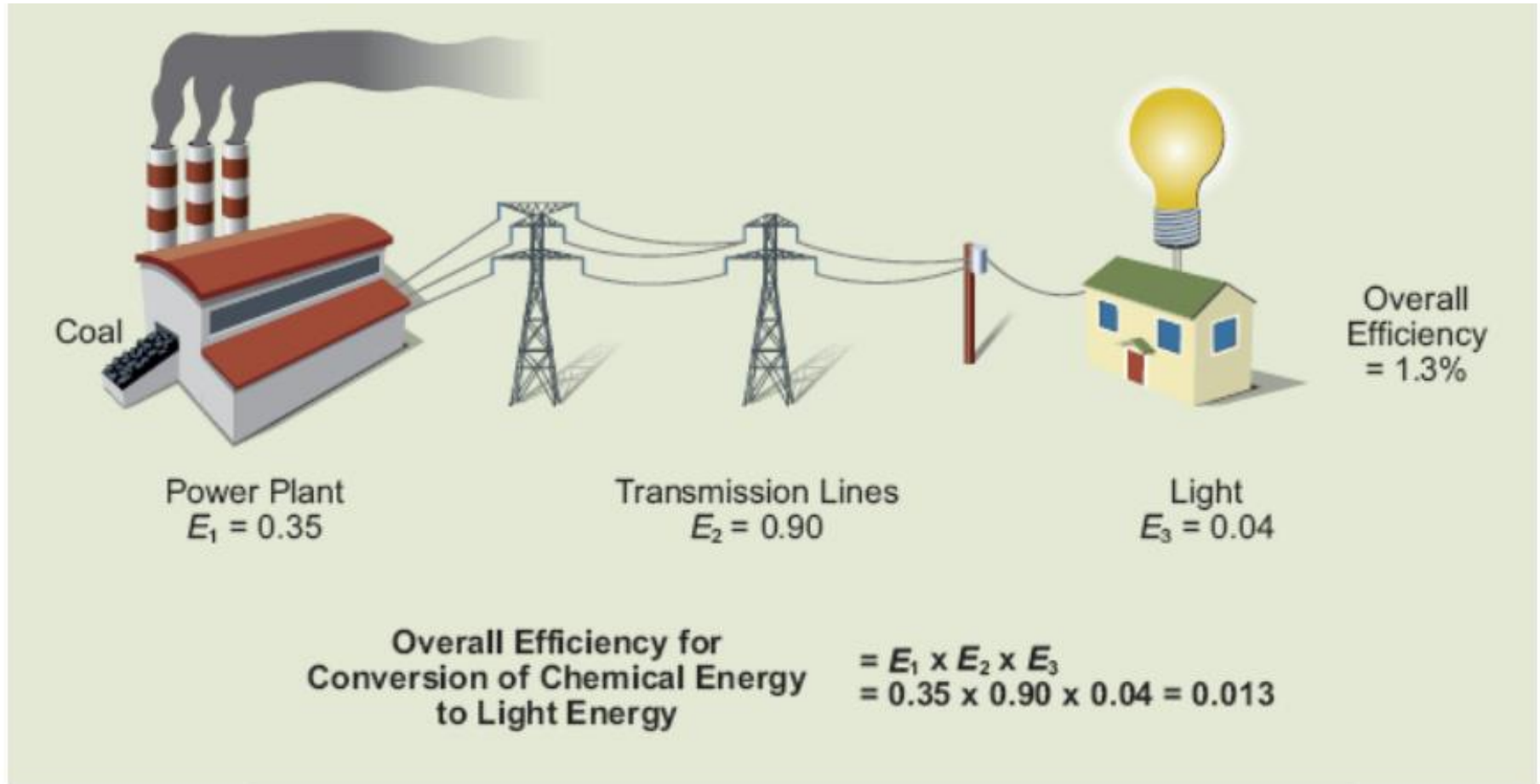


The Levelized Cost of Supply- and Demand-Side Electricity “Resource” Options



Source: *Green Savings*, Figure 2.10

Ten Years Ago, Much of the U.S. Grid was 1.3% Efficient



Source of calculations: Suplee, Curt, Allen Bard, Marilyn Brown, Mike Corradini, and Jeremy Mark. 2008. "What you Need to Know About Energy," National Academy of Sciences, http://sites.nationalacademies.org/energy/Energy_043338

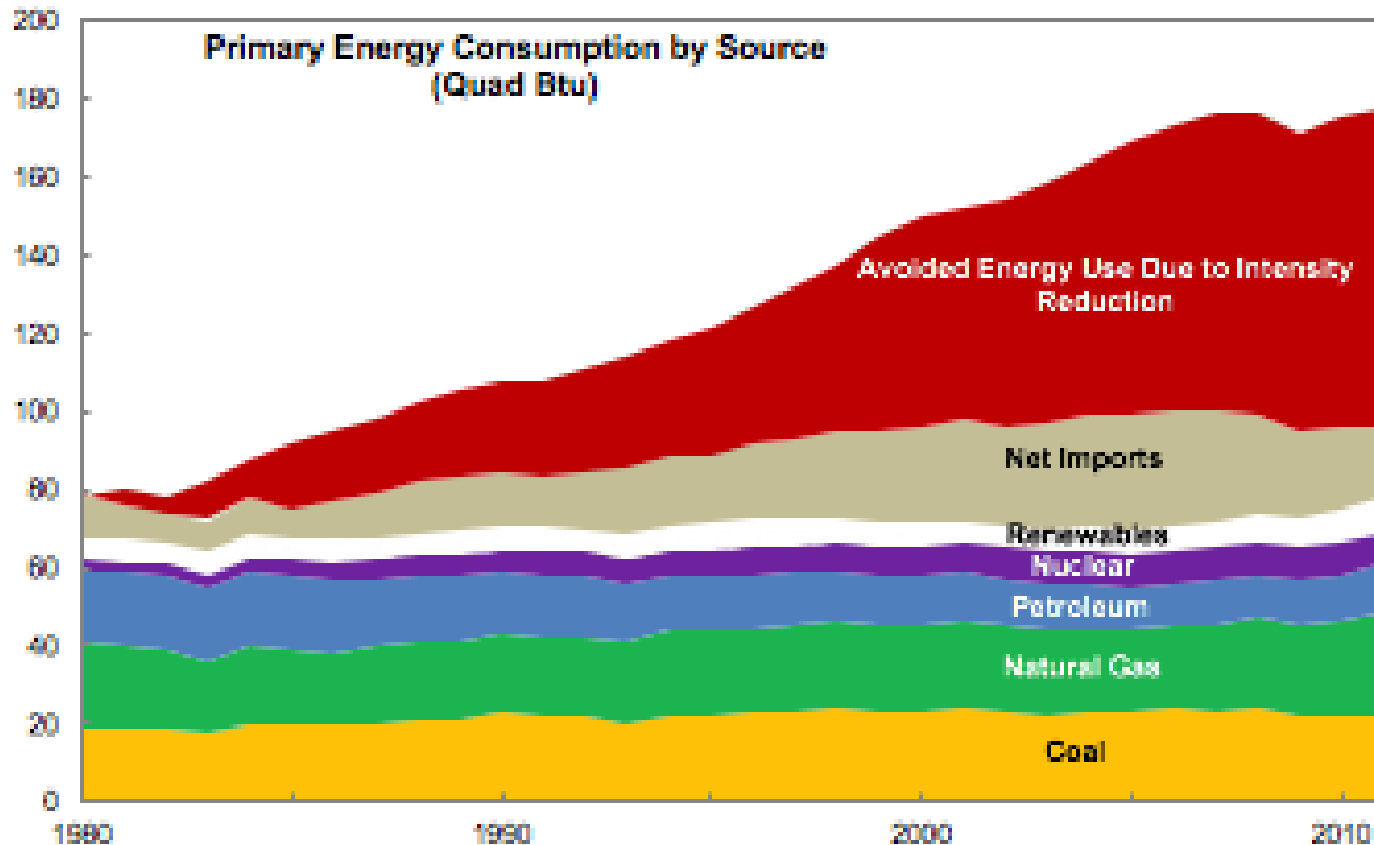
What's Happened Since 2007 (When U.S. CO₂ Emissions Peaked)

- The U.S. economy grew by 10 percent since 2007
- Energy consumption fell by 2.4%
- GHG emissions declined by 12%.

The 'New Normal' In America? Natural Gas and Renewables Boom, Emissions Plunge And Consumers Save More Than Ever

[Source: 2017 Sustainable Energy in America Factbook, compiled by Bloomberg New Energy Finance \(BNEF\) for the Business Council for Sustainable Energy \(BCSE\).](#)

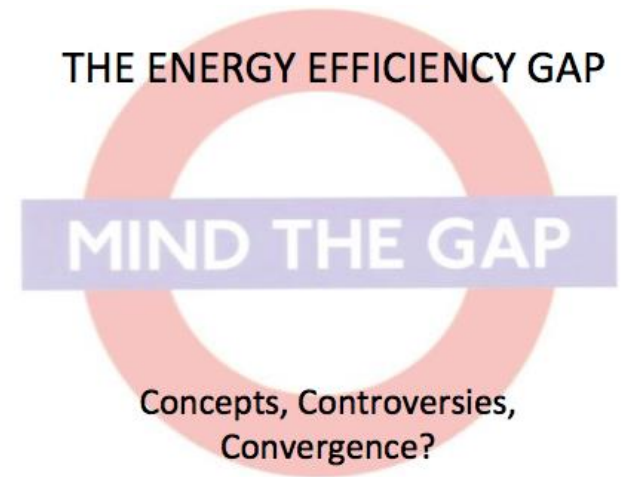
The U.S. Energy Efficiency Wedge



How Big is the Energy Efficiency Gap?

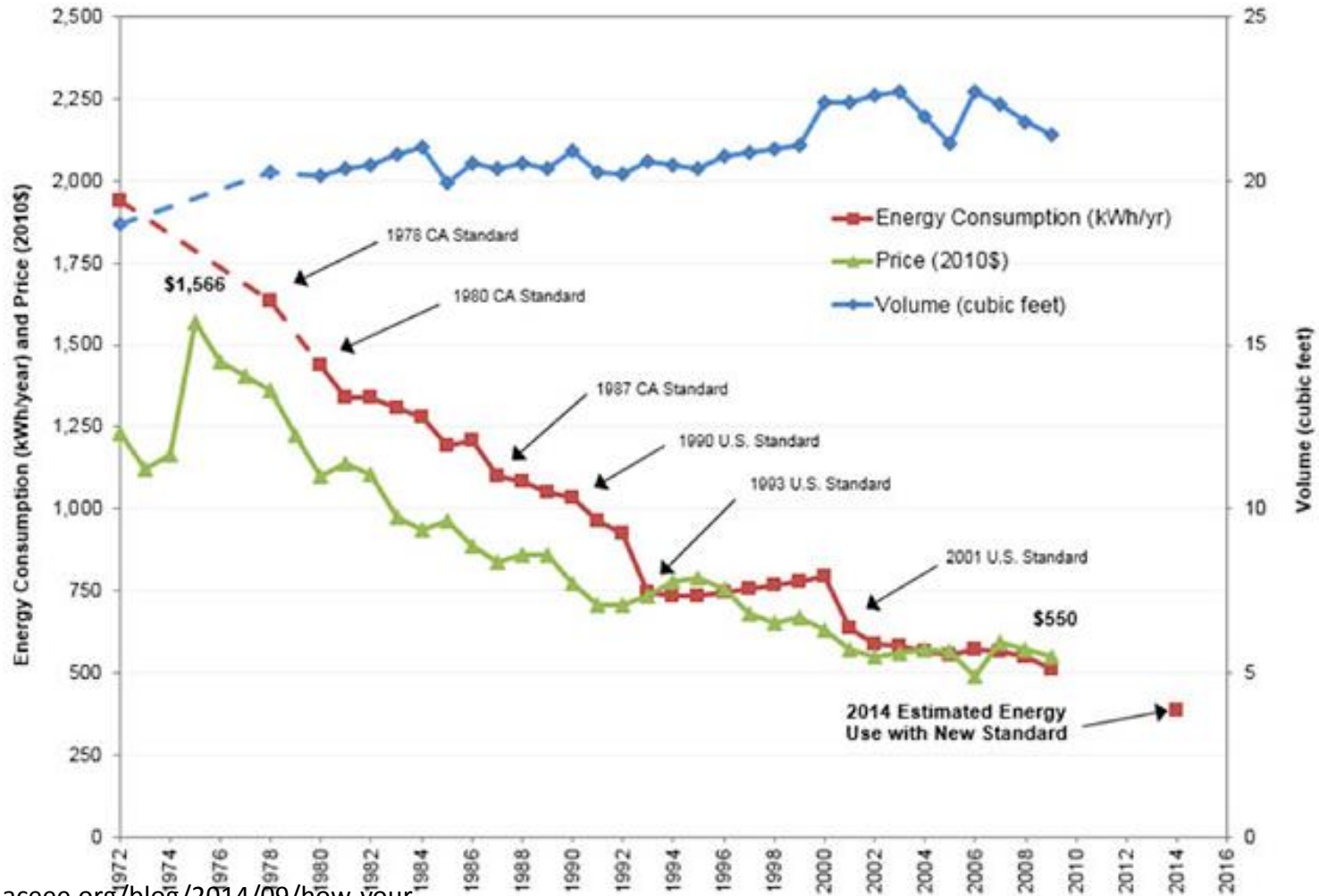
- How many \$20's on the sidewalk?
- More than a free lunch?

- Consider the potential impact of supportive policies:
 - Regulations
 - Information
 - Financing



Regulation: How Your Refrigerator Has Kept Its Cool for 40 Years

Average Household Refrigerator Energy Use, Volume, and Price Over Time



Source:

<http://www.aceee.org/blog/2014/09/how-your-refrigerator-has-kept-its-cool>

Information: Mandated Energy Benchmarking

Benchmarking the energy consumption of buildings has the potential to:

- Reduce information asymmetries in the marketplace and
- Allow real estate markets to operate more efficiently.



Mandated Disclosure and Benchmarking Efforts in the United States

Atlanta is now on this map!

Source: Cox, Matt, Marilyn A. Brown, and Xiaojing Sun. 2013. "Energy Benchmarking of Commercial Buildings: A Low-cost Pathway for Urban Sustainability," *Environmental Research Letters*, Vol. 8, (12 pp).

Financing: Intermediaries and New Business Models

- An emerging alternative to deliver ratepayer funded energy efficiency is the use of **independent, third-party entities** that deliver products and services financed by the pooling of utility ratepayer funds:
 - ✓ **Vermont, Oregon, Hawaii, and Wisconsin.**

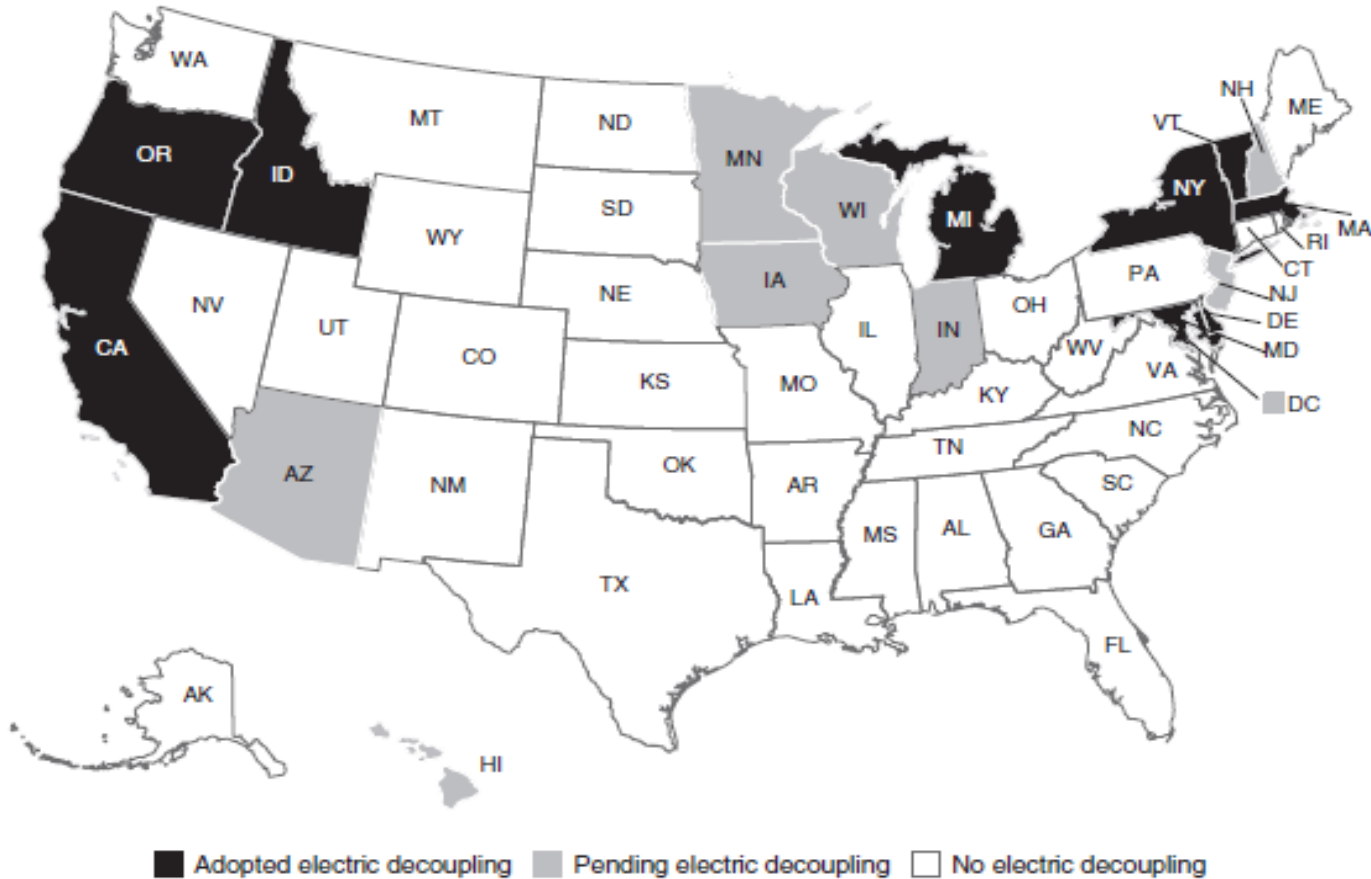
“Decoupling” Utility Profits from Electric Sales

Traditionally, profits are “coupled” to how much electricity distributors sell to their customers.

Rates are set by regulatory commissions on the basis of estimated sales, so if sales are less (as the result of increased energy efficiency or other causes), the utility will earn a lower return on its investment.

Thus, there is a “throughput” incentive. Decoupling provides an ROI for energy efficiency.

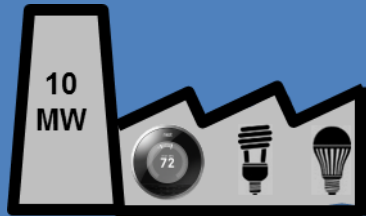
Electric Decoupling in the U.S.



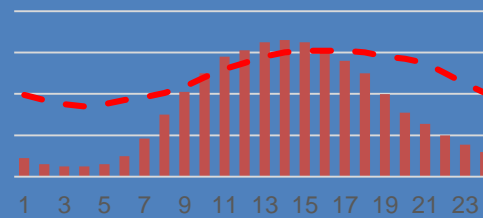
In 2013, 22 states had natural gas decoupling and 16 had electric decoupling, up from 17 and 9 in 2009.

Sources: Brown and Sovacool. (2001) and DSIRE Database (2013)

TVA has Developed a Way of Modeling Energy Efficiency as an Energy Resource



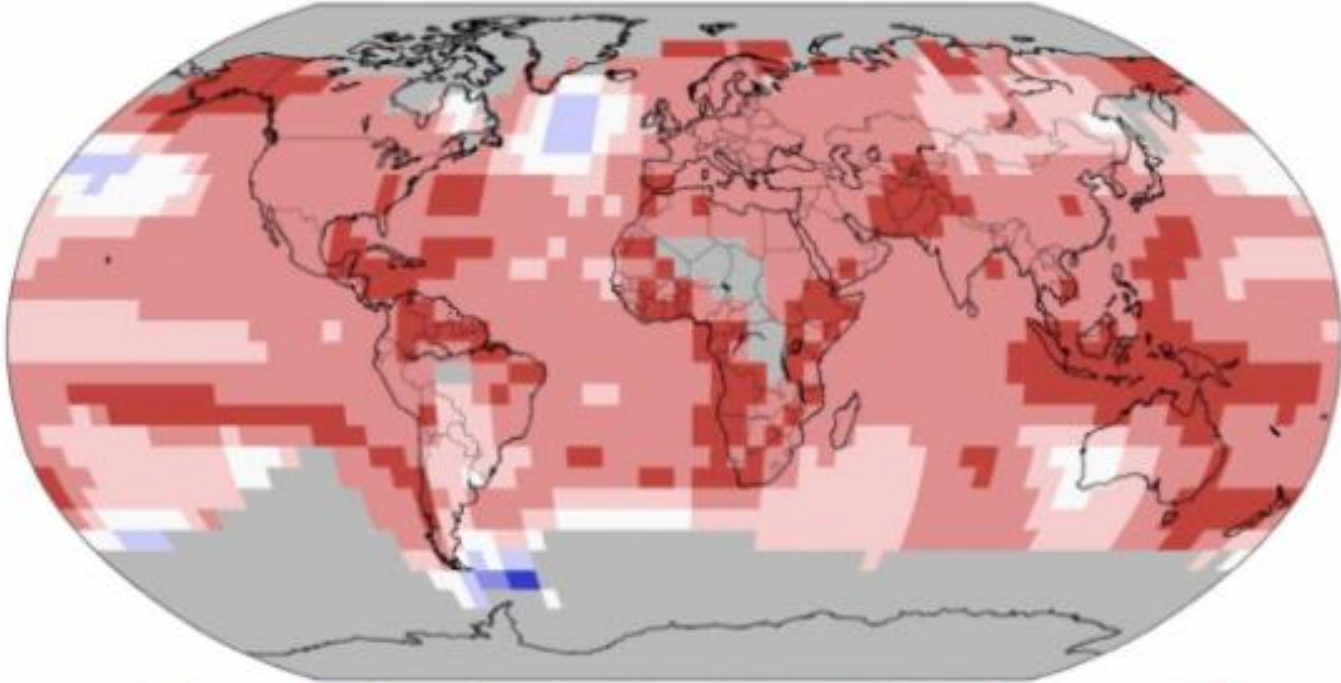
Summer Residential Savings



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 years first five years, then declining 2% per year
Hourly fixed shape	Risk adjusted for program uncertainty 0% for first five years, 4% annually after year five, capped at 30%

2016: Hottest Year on Global Record (Third in a Row)

Land & Ocean Temperature Percentiles Jan–Dec 2016
NOAA's National Centers for Environmental Information
Data Source: GHCN–M version 3.3.0 & ERSST version 4.0.0



Wed Jan 11 07:07:38 EST 2017

2016 temperatures compared to normal around the globe. (NOAA)

The Southeast is no longer an "anomaly".



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“\$180 billion worth of new power plants just to meet this load,” Brown said. “I’d rather shrink that by managing...”



Peak Temperatures Will Push Electric Grid to the Brink in an Ever-Warming W...

Rising temperature could cost U.S. utilities as much as \$180 billion this century due to greater electricity demand.

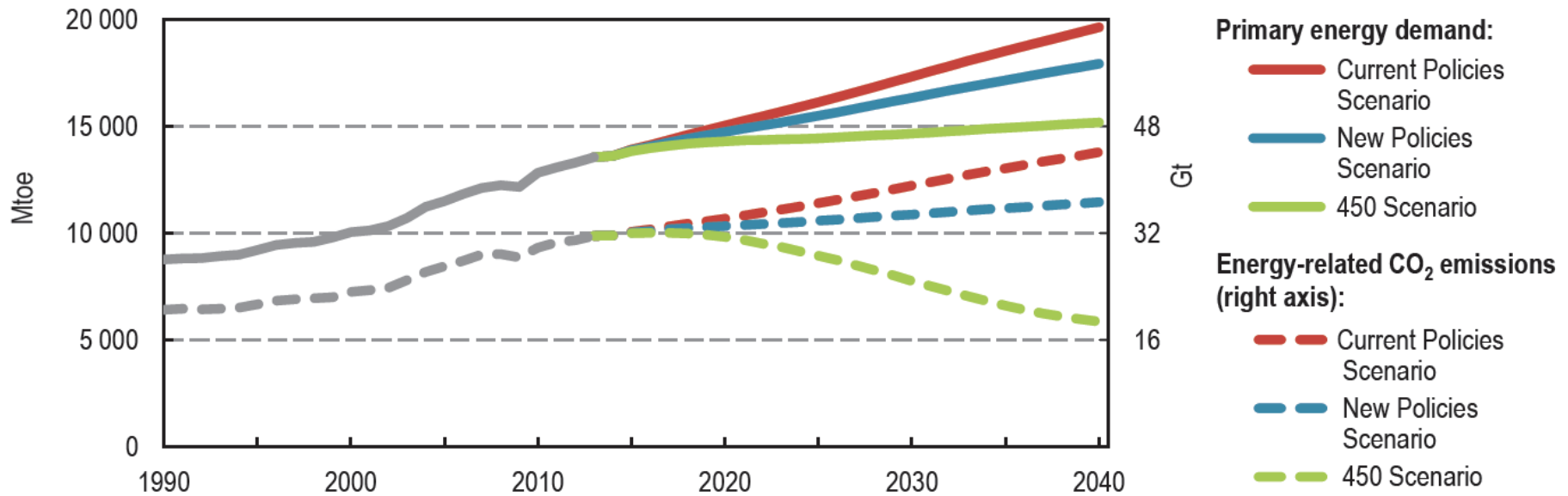
seeker.com

What Might a 2°C Scenario Look Like?

Red ~ Current Policies Scenario

Blue ~ The Paris Accord (New Policies Scenario)—The "First Pivot"

Green ~ 2°C global temperature increase above pre-industrial revolution

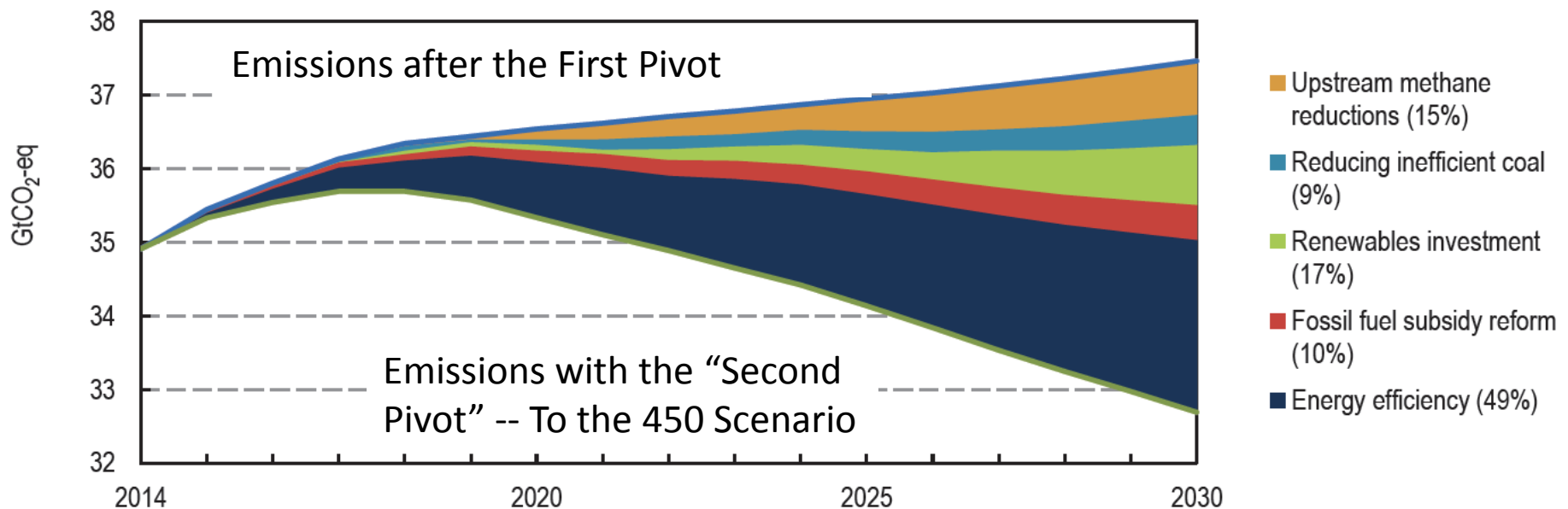


The Paris Accord will not achieve the 2°C goal.

Energy Efficiency Mitigates Climate Change and Can Save \$

- The “Second Pivot” to the 450 ppm Scenario could be 49% energy efficiency and 17% renewables.

Share of Emissions Savings by Measure by 2030



Changing the Narrative on Jobs: e.g., Solar Projects in Georgia

FORT BENNING



HAZLEHURST II



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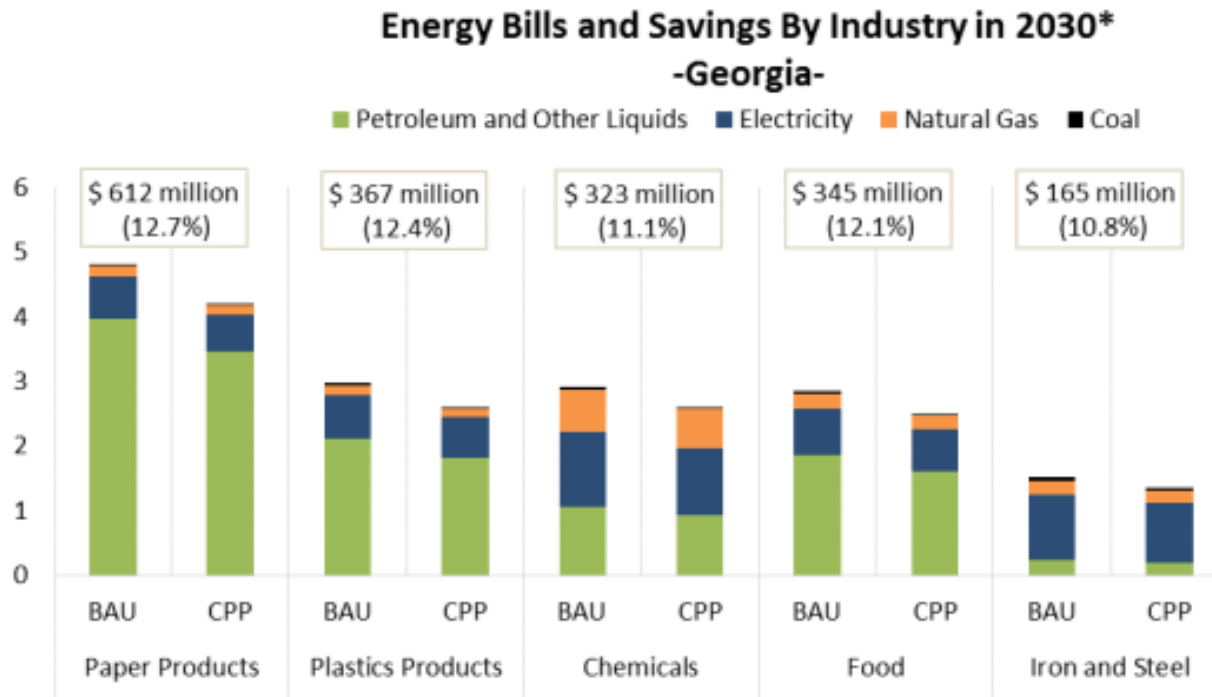
 Marilyn Brown @Marilyn_Brown1 · 12h
See Jimmy Carter's "Stand for Solar" in Plains, GA, in today's NY Times.



Georgia had 3,924 solar jobs in 2016, 23% more than in 2015.

https://cepl.gatech.edu/sites/default/files/attachments/CEPL_Presentation_GAsolar_Jan13.pdf#

Energy Efficiency, Competitiveness, and Jobs in Georgia



About 66,200 Georgians work in energy efficiency related businesses. The state's energy efficiency economy includes traditional HVAC, efficient lighting, and advanced materials and insulation.

Socio-Technical Approach to Sustainable Business and Policy Analysis

- Can the world have secure, reliable and affordable supplies of energy while also transitioning to a low-carbon energy system?
- Solutions at scale require:
 - a deep understanding of markets and policies
 - socio-technical perspectives

Gigaton Problems Need Gigaton Solutions¹

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Achieving sustainability requires commanding the whole problem, not just iterative efforts that barely strike a moving target.



For More Information

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