Office of the Governor

DuPont

delmarva power

GORE

SELECT GREATER PHILADELPHIA

Department of Labor – Keeping Delaware First

Pennoni

Delaware Sustainable Chemistry Alliance

Delaware State Chamber of Commerce

Delaware Public Policy Institute

The News Journal

Delaware State University

Delaware Tech

University of Delaware

CREATING *the* CLEAN ENERGY ECONOMY

IN DELAWARE, THE REGION AND THE NATION

John Byrme

Director, Center for Energy and Environmental Policy

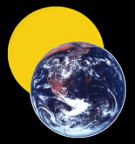
University of Delaware

University of Delaware

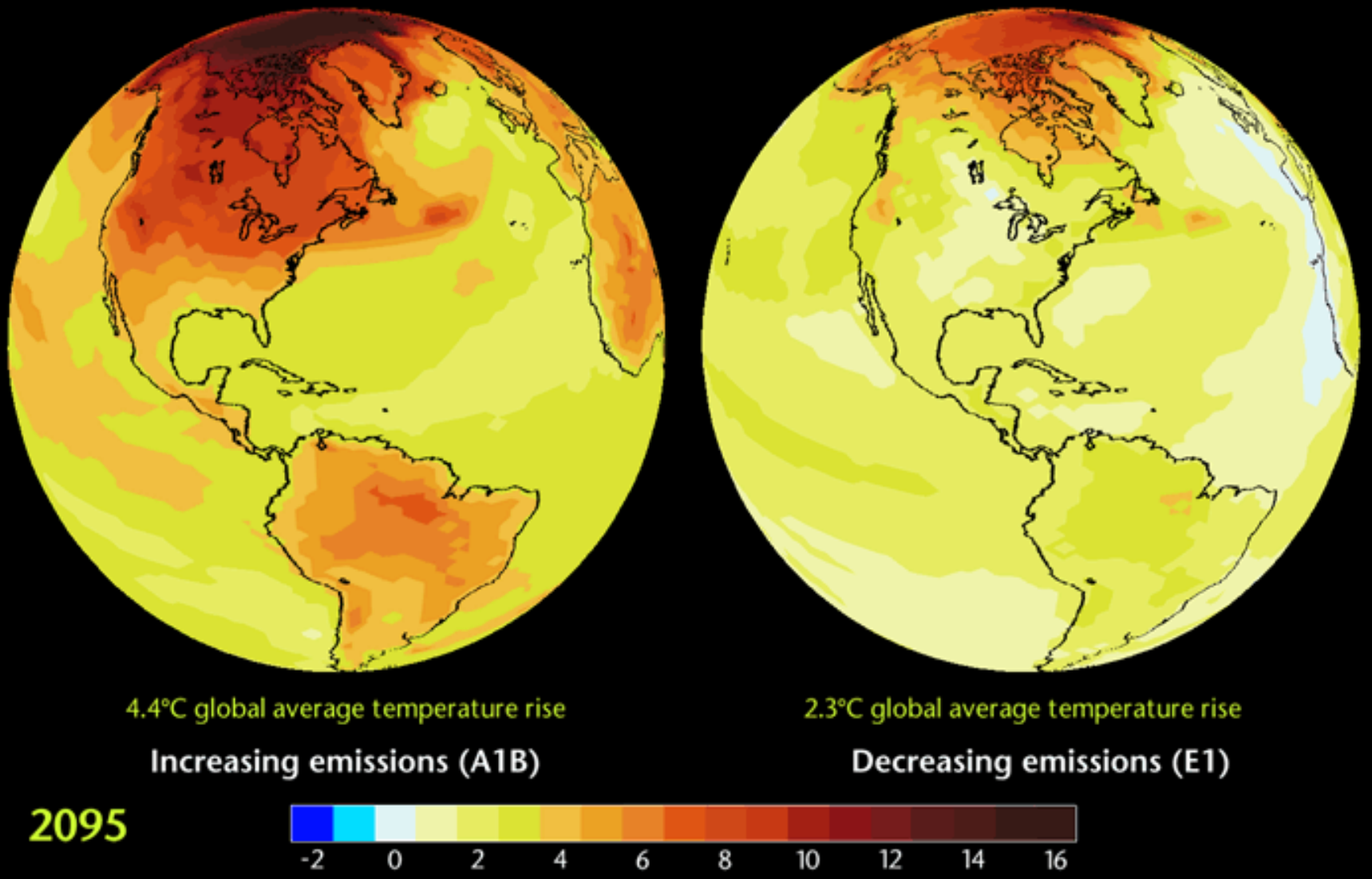
Creating Knowledge-Based Partnerships

THE CLEAN ENERGY ECONOMY
…IF WE TRY

John Byrne
December 13, 2010



Center for Energy and Environmental Policy

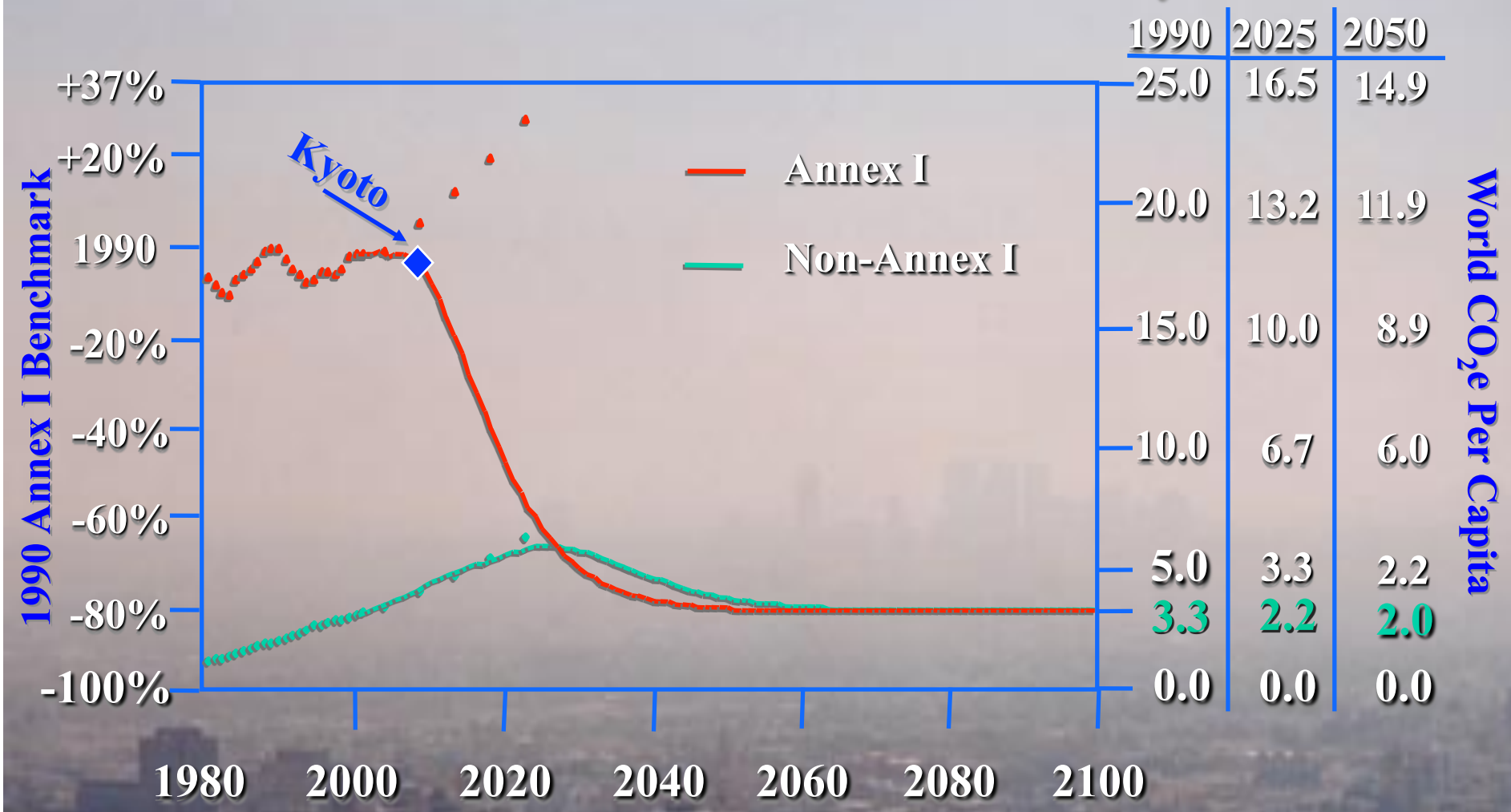


A 4°C rise threatens permafrost across the Northern Hemisphere, the Greenland ice sheet is under pressure, the Amazon faces twin threats of fire and drought, and sea levels could be up by 80cm (4°C scenario) putting coastal populations at greater risk of flooding.

Sources: IPCC (scenarios); UK Meteorological Office (maps)

World GHG Emissions Reduction Scenario

60% Reduction from World 1990 Levels by 2050



Source: Based on John Byrne et al (2008) Undoing Atmospheric Harm: Civil Action to Shrink the Carbon Footprint." In *Urban Energy Transition: From Fossil Fuels to Renewable Power.* P. Droege ed. Oxford, UK: Elsevier. Pp. 27-54. See also Byrne et al (2004) "Reclaiming the atmospheric commons: Beyond Kyoto." In V.I. Grover (ed.), *Climate Change: Perspectives Five Years After Kyoto.* Chapter 21. Plymouth, UK: Science Publishers, Inc.

Center for Energy and Environmental Policy

Cost > $110 million

United Nations
Climate Change Conference
Cancún, Quintana Roo

Agree …to "a non-binding recognition" of individual country targets…

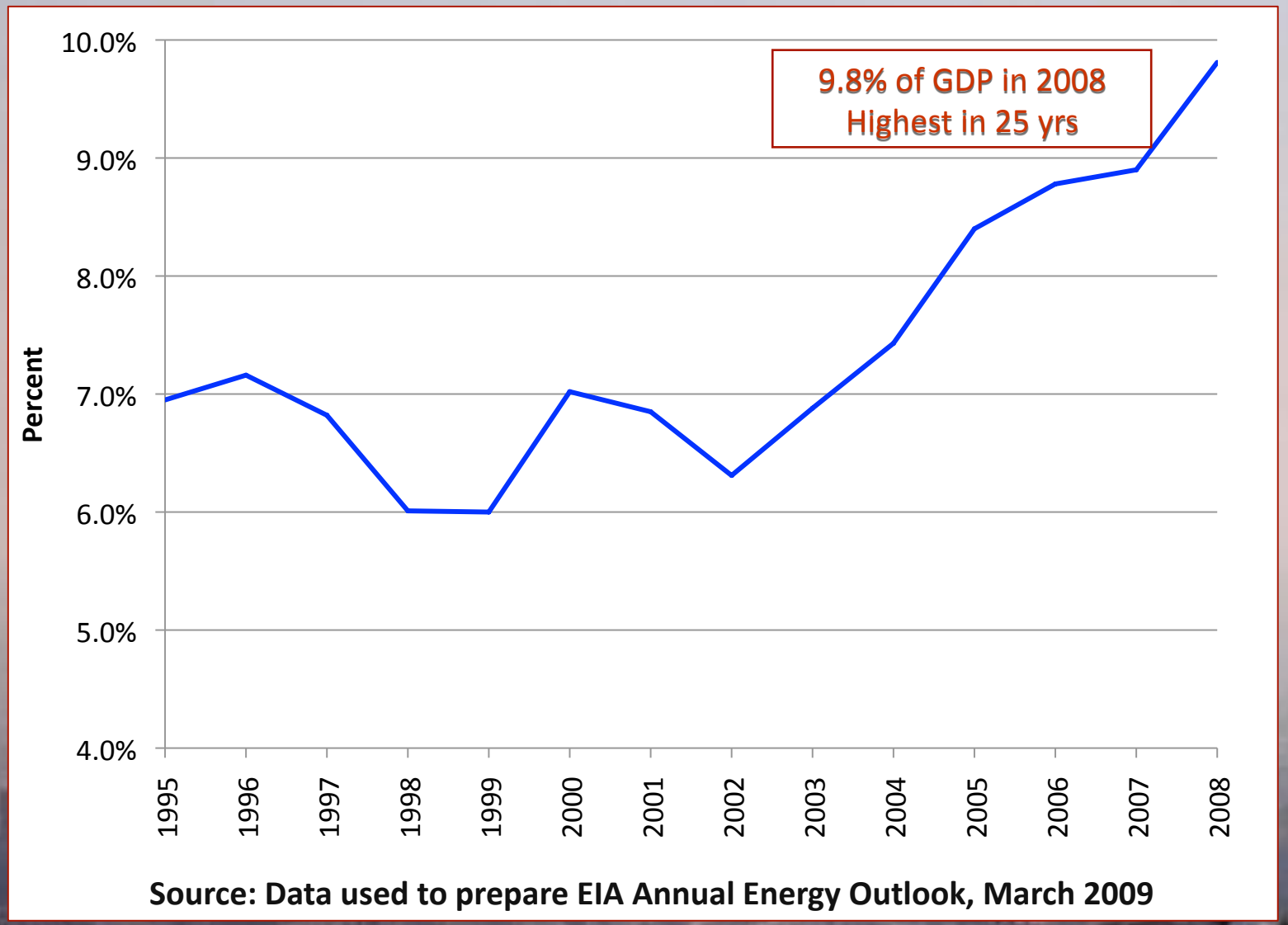
Commit …the "Parties meeting under the Kyoto Protocol…to continue negotiations with the aim of completing their work…"

Agree …to "design a Green Climate Fund with a board with equal representation from developed and developing countries…"

Aspire …to raise "$30 billion in fast start finance from industrialized countries to support climate action in the developing world up to 2012 and…$100 billion…by 2020"

Agree "…it is not what is ultimately required… but it is a new beginning…"

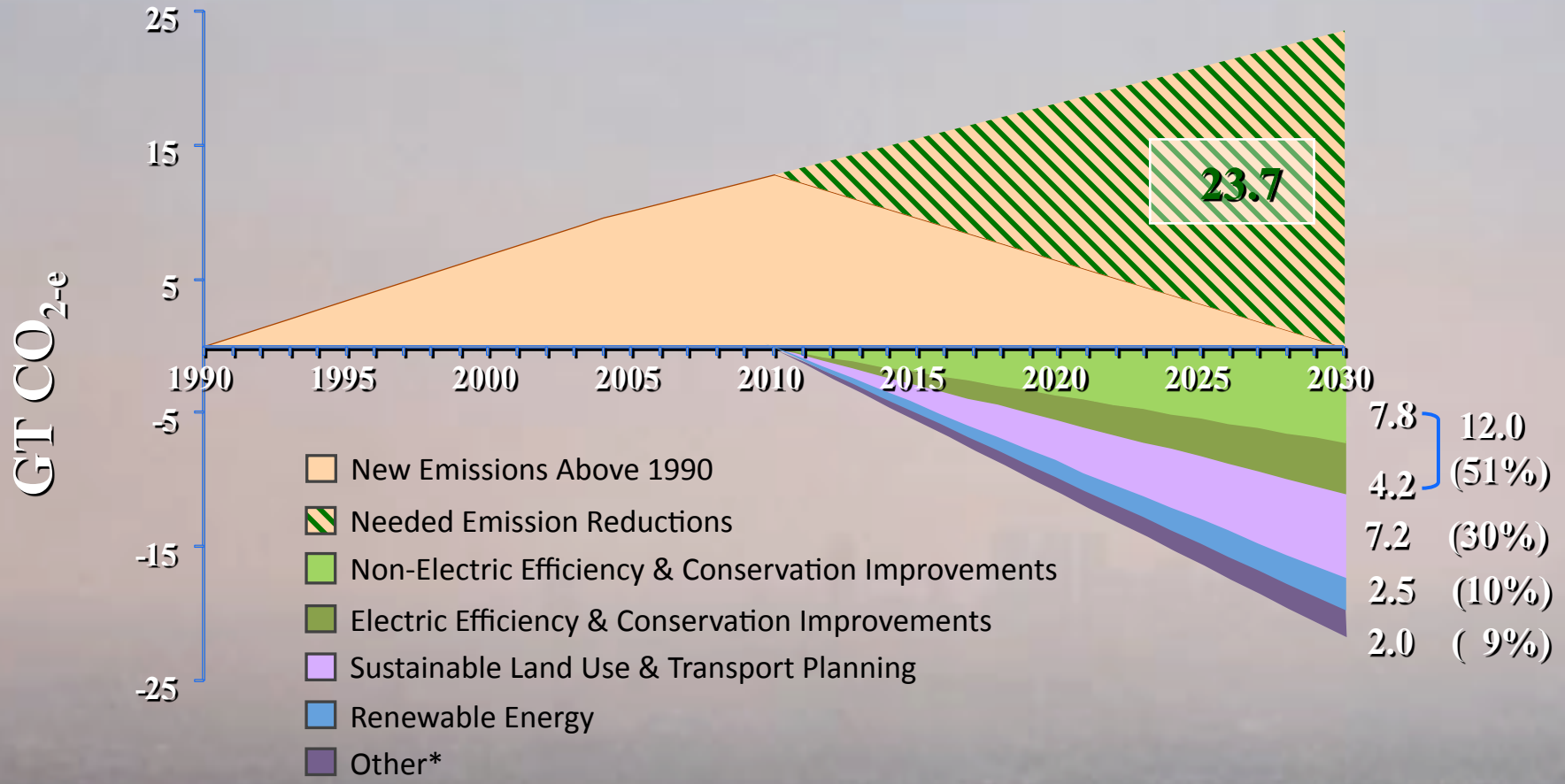
Energy Expenditures as % of US GDP



Source: Data used to prepare EIA Annual Energy Outlook, March 2009

Center for Energy and Environmental Policy

IPCC Assessment of Principal Mitigation Options



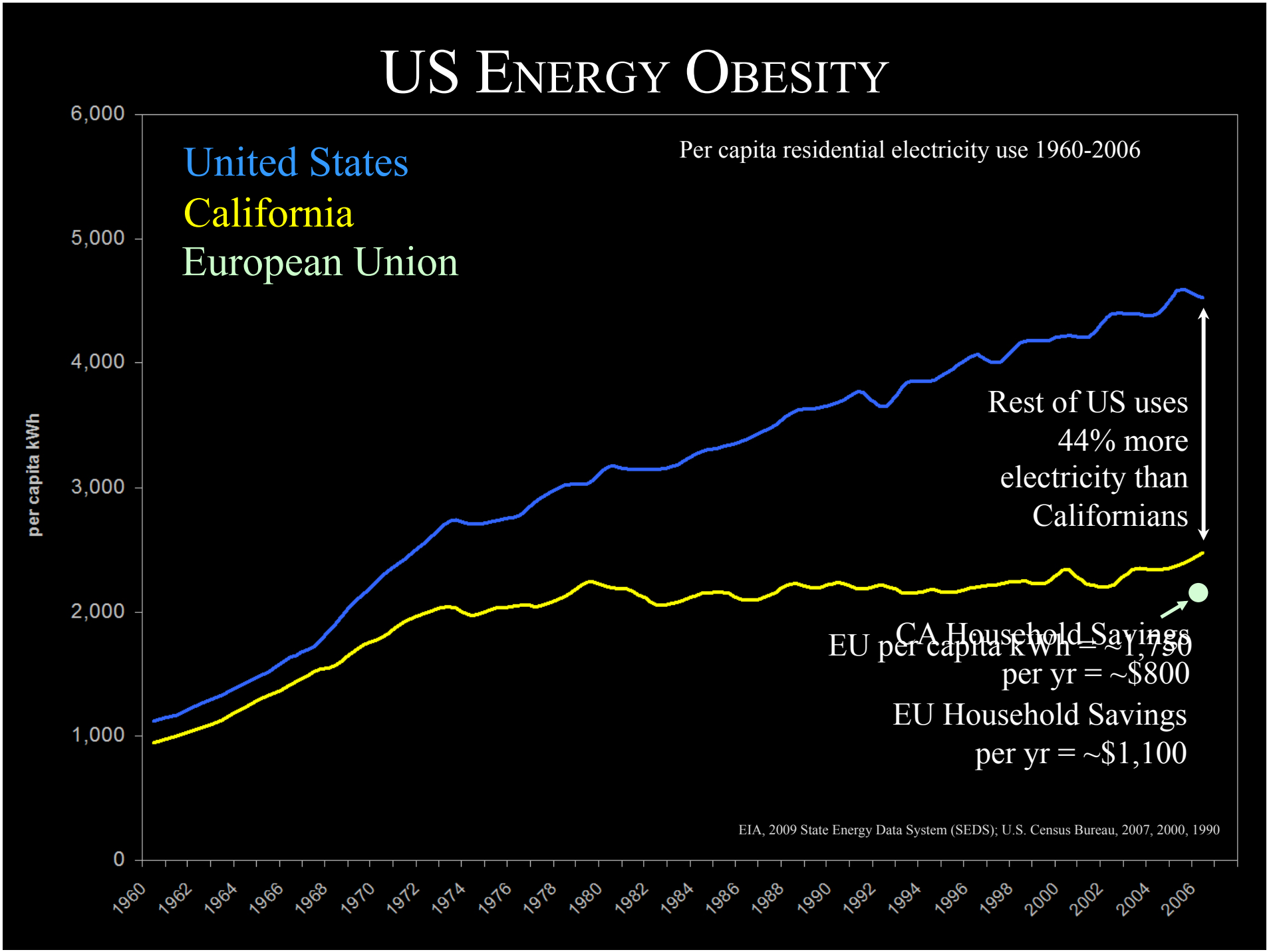
* Other includes 1.1 Gt CO_{2-e} reduced through several options including: carbon capture & storage; waste & wastewater management; new nuclear power plant designs.

Source: IPCC 2007. Fourth Assessment Report, WG III Report, Mitigation of Climate Change.

Supporting Sources: Olivier et al 2005 & 2006; WBCSD 2004.

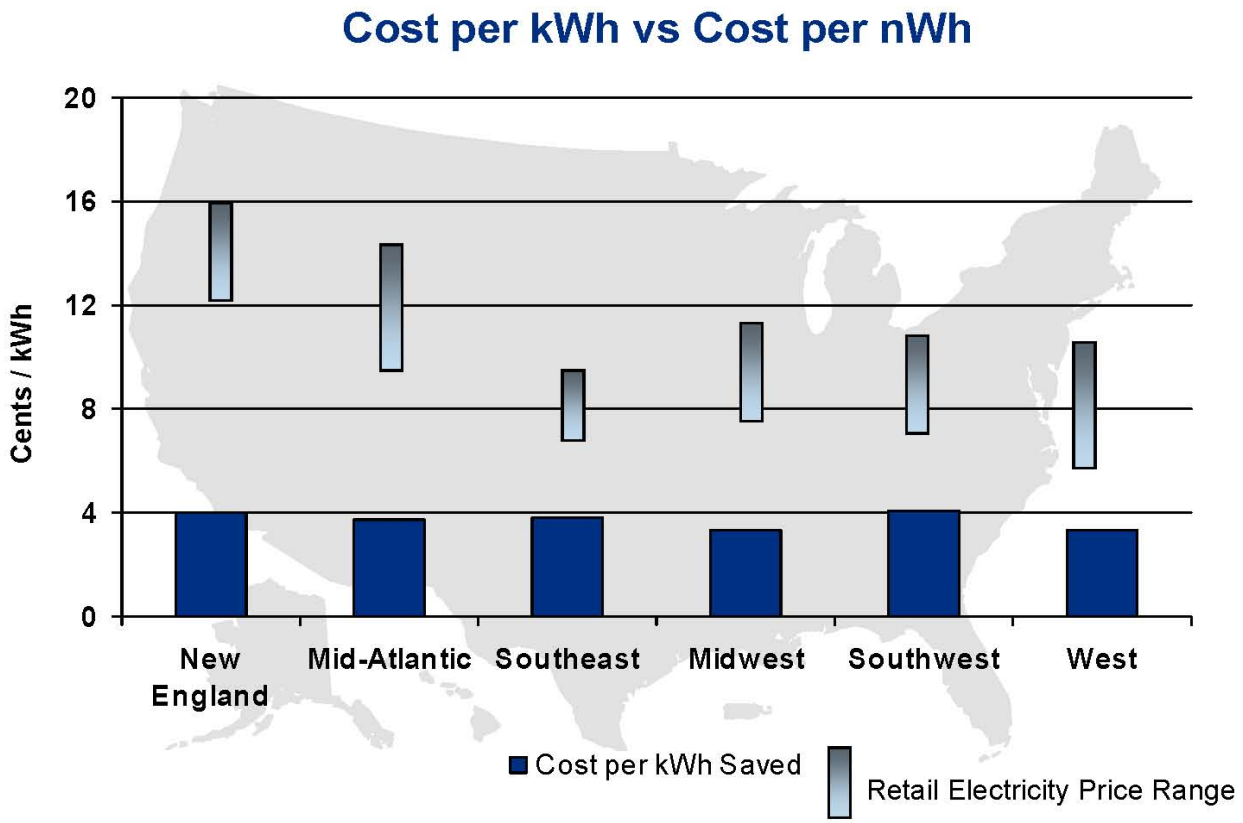

GRAND
ALADDIN

US Energy Obesity



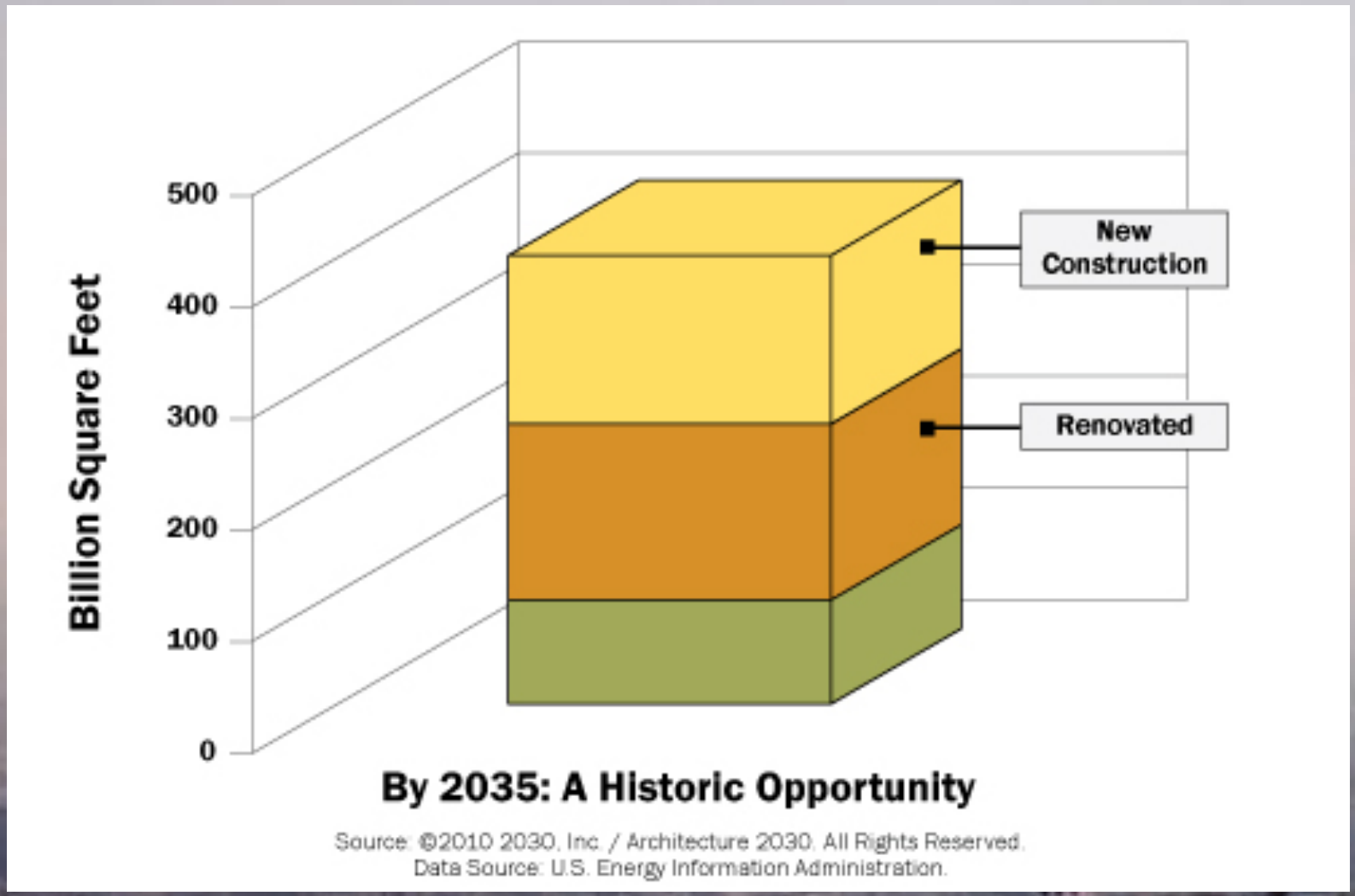
The "Negawatt" – not consuming

The cost of saving energy is significantly less than electricity rates throughout the U.S.

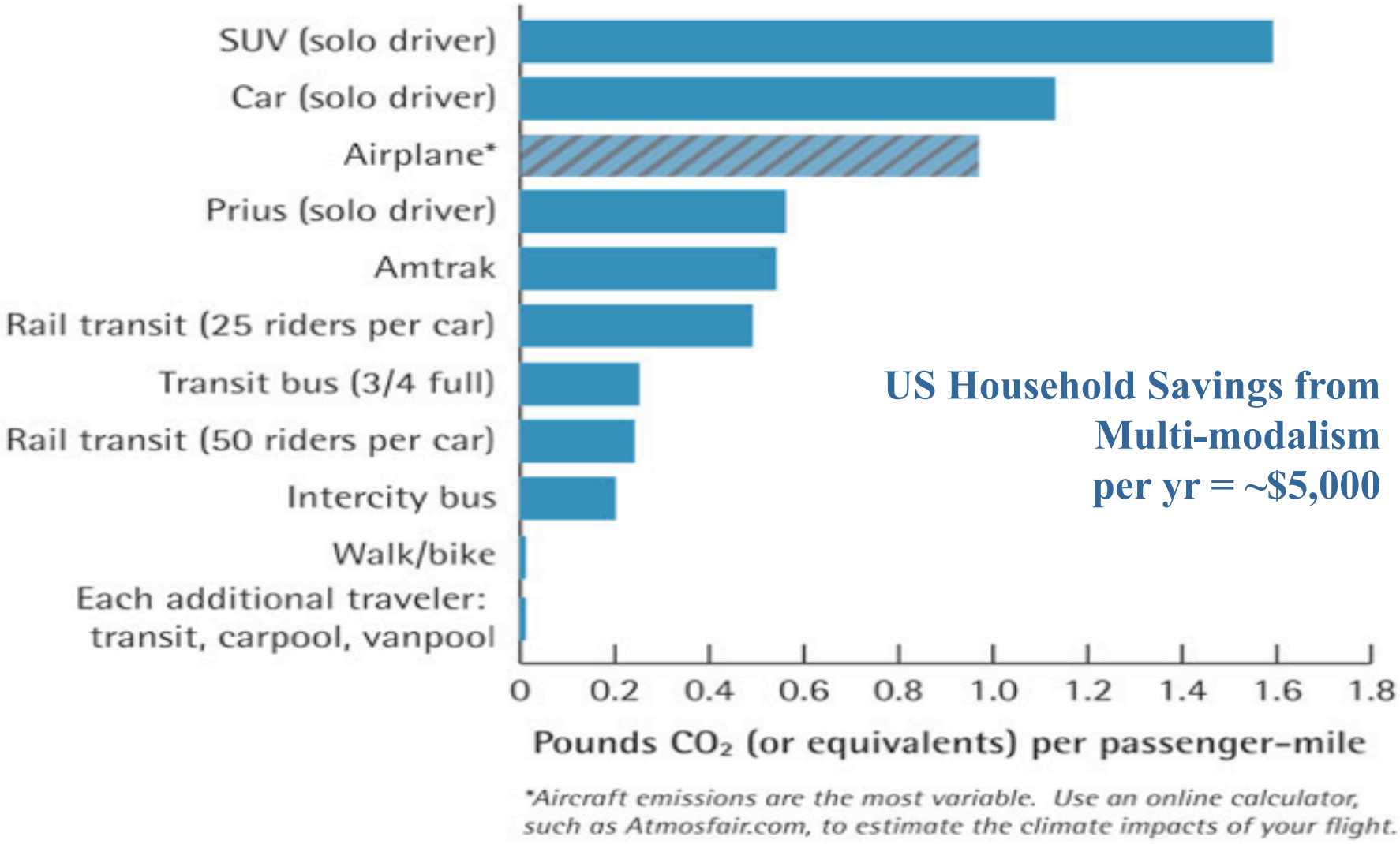


Source: Erhardt-Martinez & Laitner (2008) *The Size of the U.S. Energy Efficiency Market*. ACEEE.

Changing Built Environment Obesity



COP15
COPENHAGEN

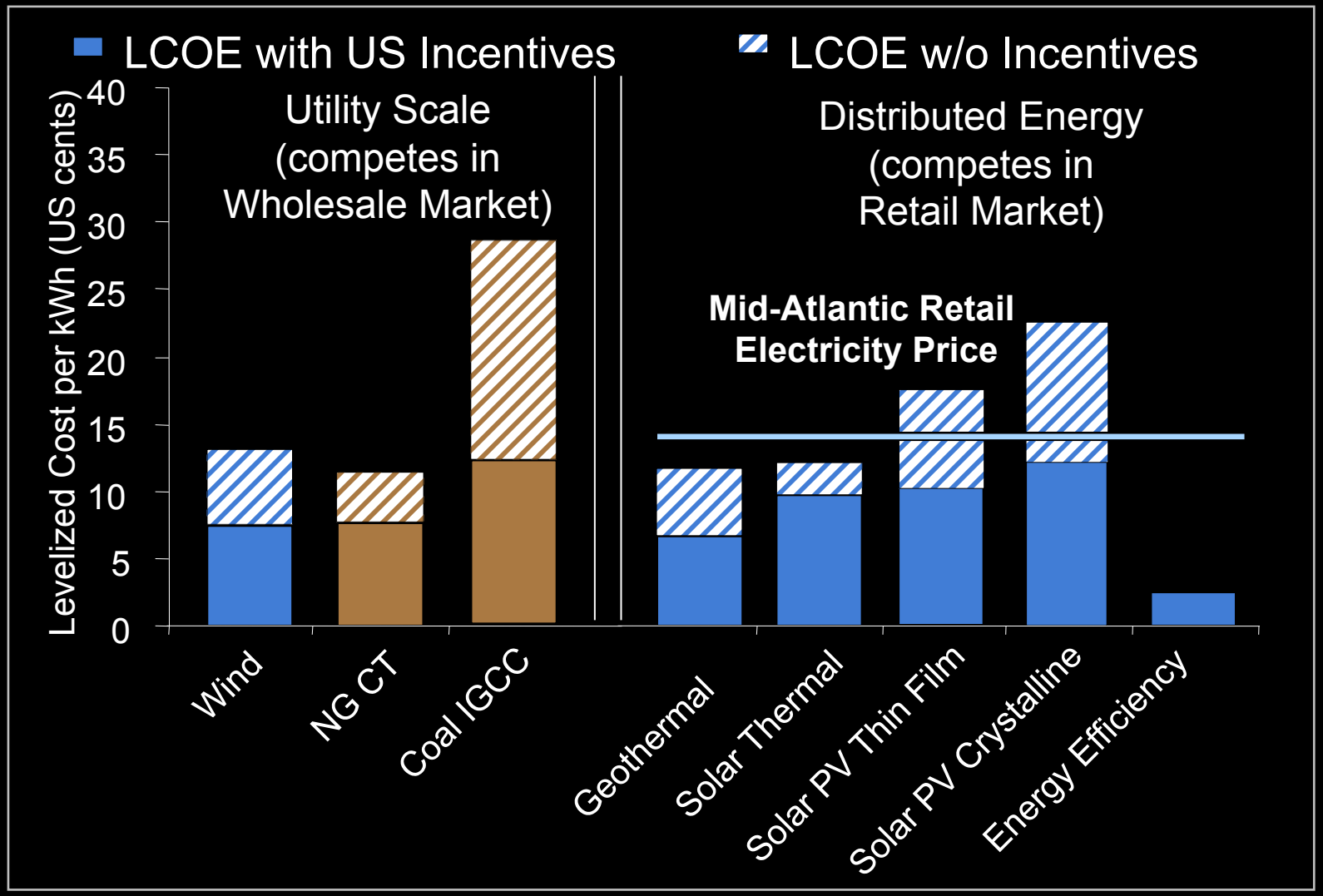


US Household Savings from Multi-modalism per yr = ~$5,000

Sightline INSTITUTE

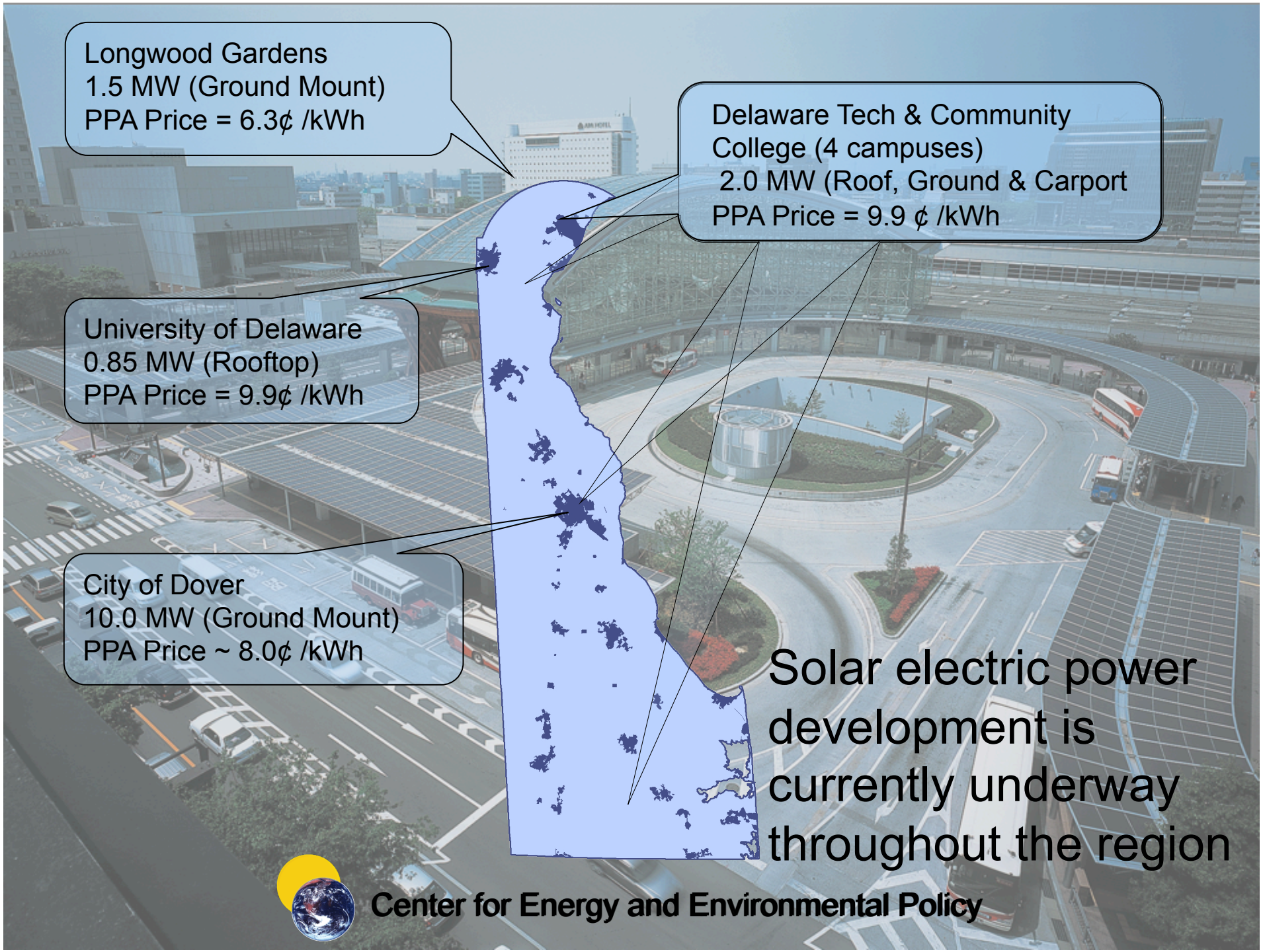
Todd Litman, Victoria Transport Policy Institute. 2010. *Evaluating Public Transit Benefits and Costs*

Renewables – Approaching Parity



Data Source: Lazard 2008-09; CEEP (2010)

Center for Energy and Environmental Policy


Longwood Gardens
1.5 MW (Ground Mount)
PPA Price = 6.3¢ /kWh
Delaware Tech & Community College (4 campuses)
2.0 MW (Roof, Ground & Carport
PPA Price = 9.9 ¢ /kWh
University of Delaware
0.85 MW (Rooftop)
PPA Price = 9.9¢ /kWh
City of Dover
10.0 MW (Ground Mount)
PPA Price ~ 8.0¢ /kWh
Solar electric power development is currently underway throughout the region
Center for Energy and Environmental Policy

CREATING A SOLAR CITY

Determining the Potential of Solar Rooftop Systems in the City of Newark

FINAL REPORT

A Renewable Energy Applications for Delaware Yearly (READY) Project

Center for Energy and Environmental Policy
University of Delaware

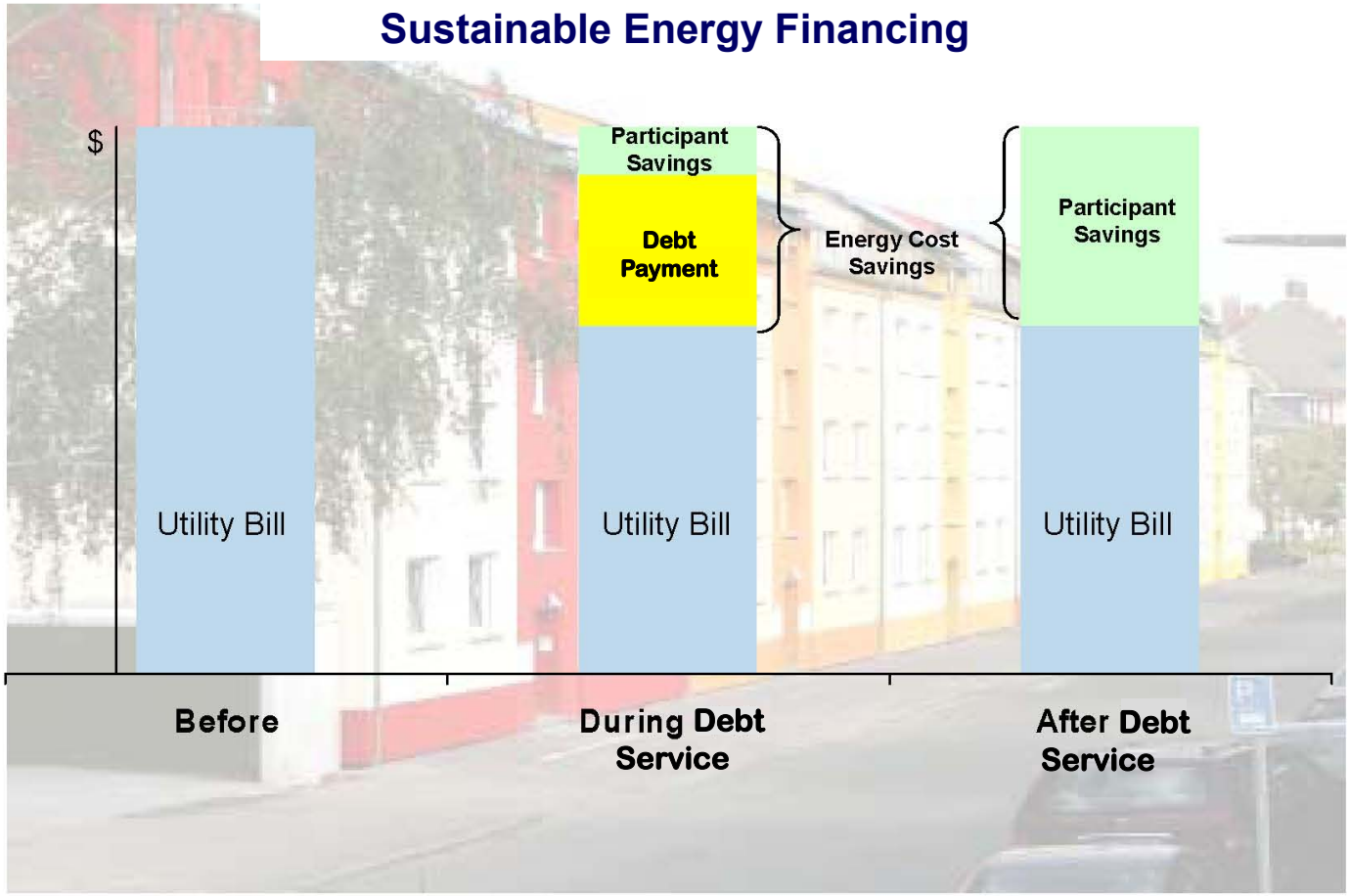
August 2009

Center for Energy and Environmental Policy

http://ceep.udel.edu/energy/publications/2009_es_READY_SolarCityNewark_report.pdf

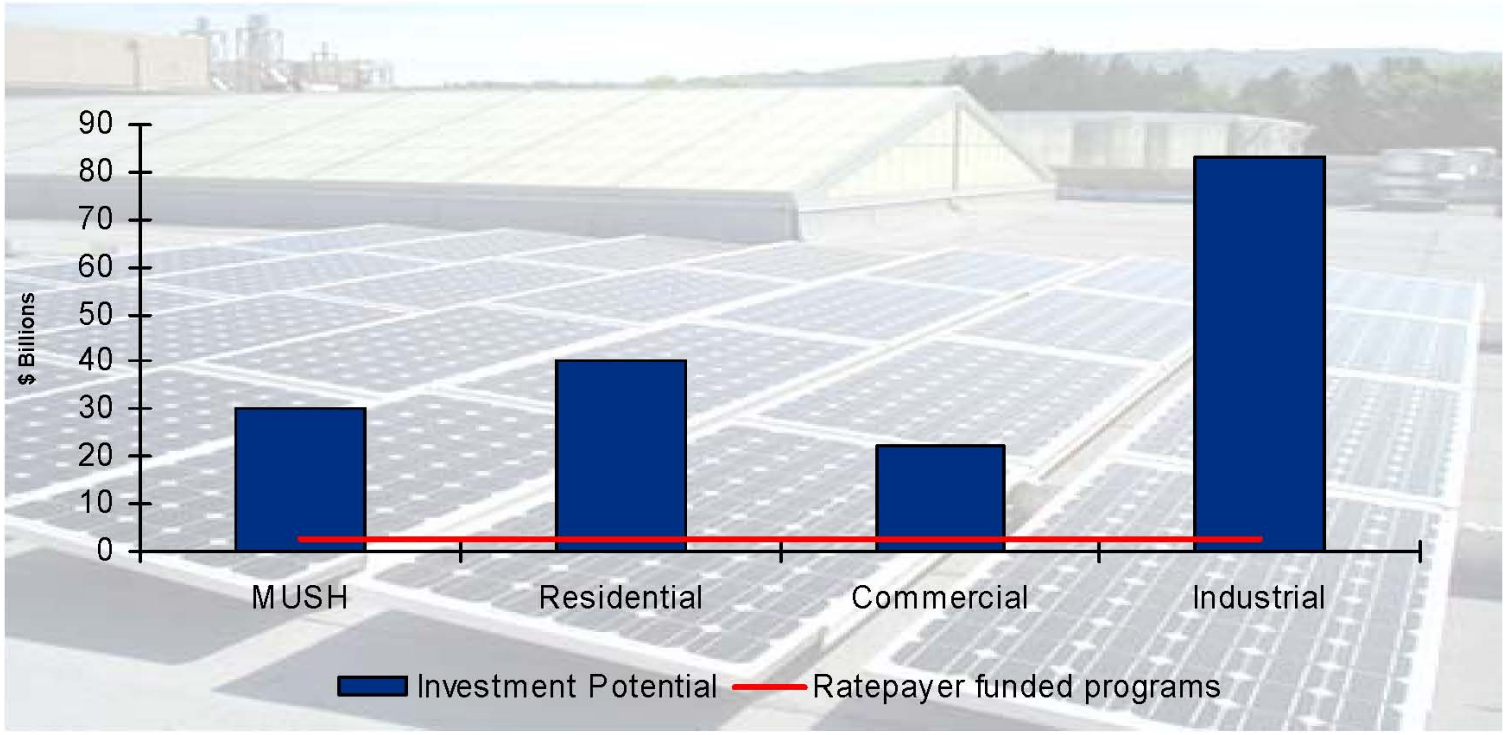
Monetizing Clean Energy Savings

By pledging cash flow earnings from sustainable energy projects, participants can fund all improvements at NO upfront capital expense



Seizing the Energy Efficiency & Distributed Renewables Potential

Investment needs are staggering



Source: McKinsey Global Institute, The Case for Investing in Productivity
Berkeley National Laboratory, "A Survey of the US ESCO Industry: Market Growth and Development from 2000 to 2006

SEU Cited as a National Model

The New York Times

State and Local Governments Innovate to Cut Energy Waste
February 11, 2010

An alternative plan

Delaware's Sustainable Energy Utility fits into a larger national movement away from the traditional way of doing programs with utilities in charge. The alternative plan…is to reshape the business: Make it possible…to profit from efficiency, not just from selling electrons… The model also works for renewable energy.

RENEWABLE ENERGY WORLD.COM

Shifting from the Economics of Obesity to Sustainability
February 22, 2010

Clean energy, green jobs

The SEU is uniquely suited to create sustainable jobs. Investments in onsite renewables can produce 2-5 times as many new, permanent jobs as those in conventional energy. Invest-ments in energy efficiency and conservation could generate 3-4 times as many new jobs.

Center for American Progress

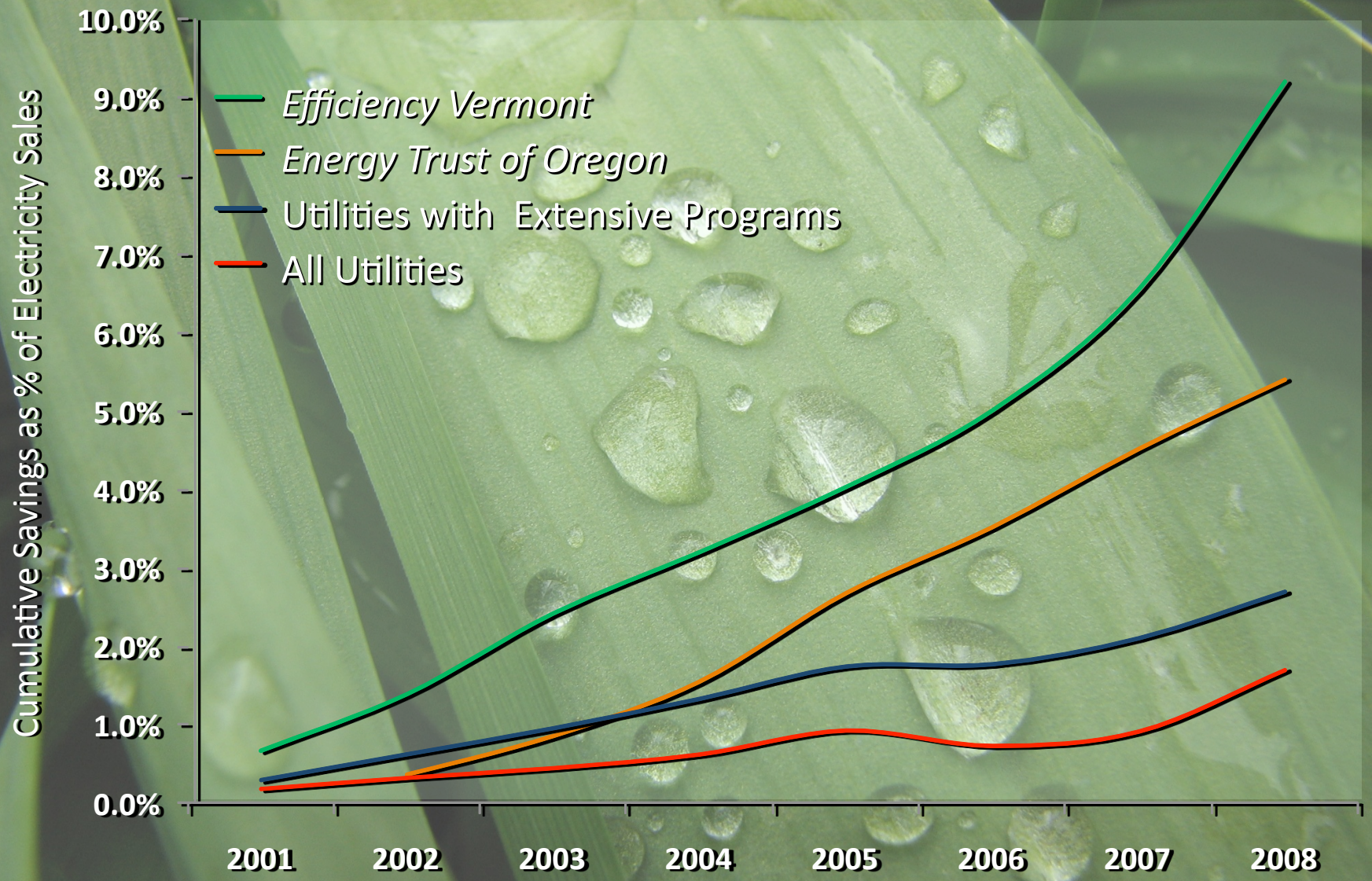
Testimony of John D. Podesta before Vice President Biden's Middle Class Task Force February 27, 2009

What can we do today

In Delaware, a "Sustainable Energy Utility" can meet energy needs, not by building new power plants but by weatherizing homes [and installing solar panels]…creating a market…for the verifiable energy savings they produce.

Center for Energy and Environmental Policy

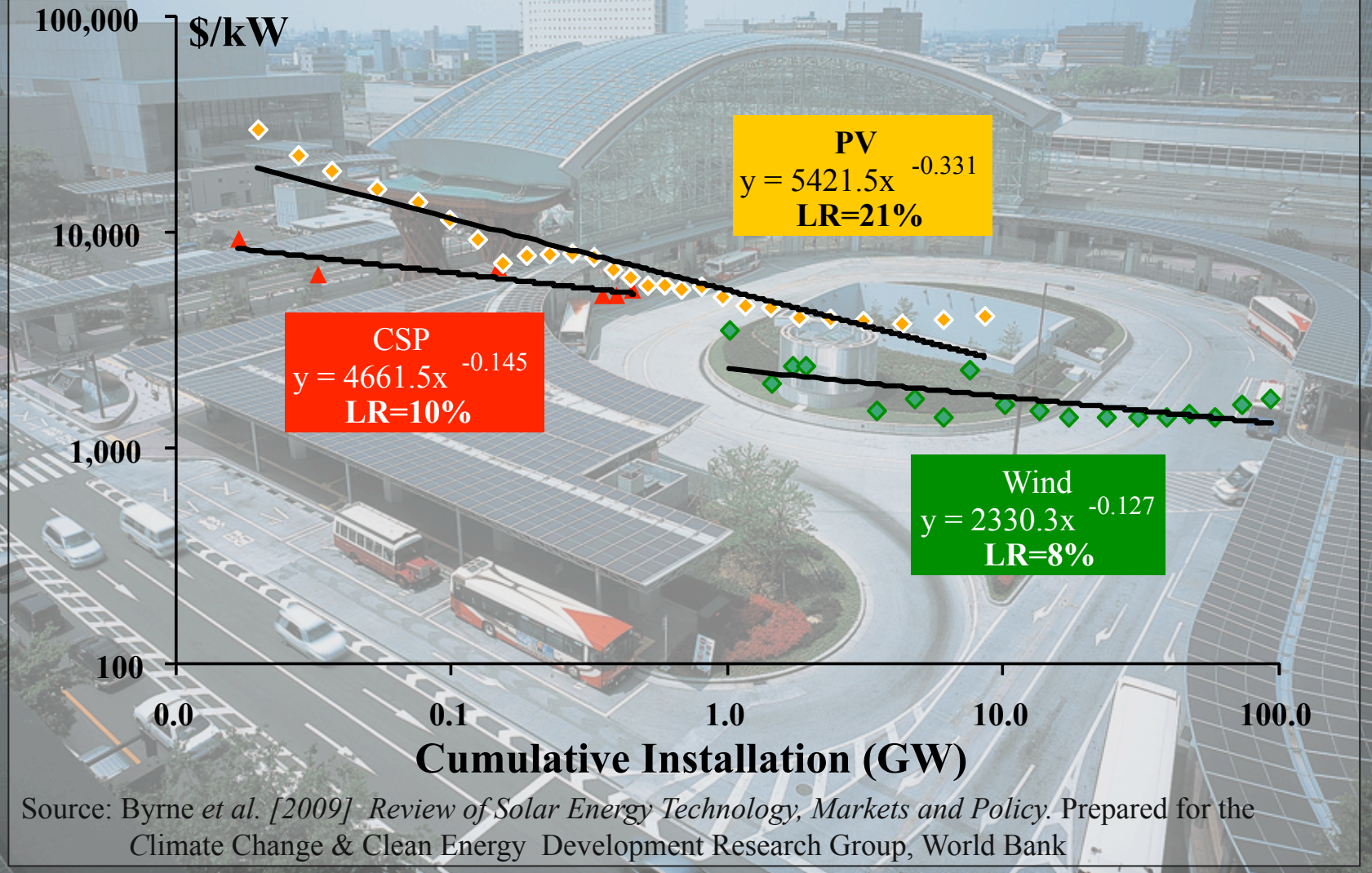
Cumulative Energy Efficiency Savings 2001-2008



Source: Efficiency Vermont; Oregon Energy Trust; US Energy Information Administration

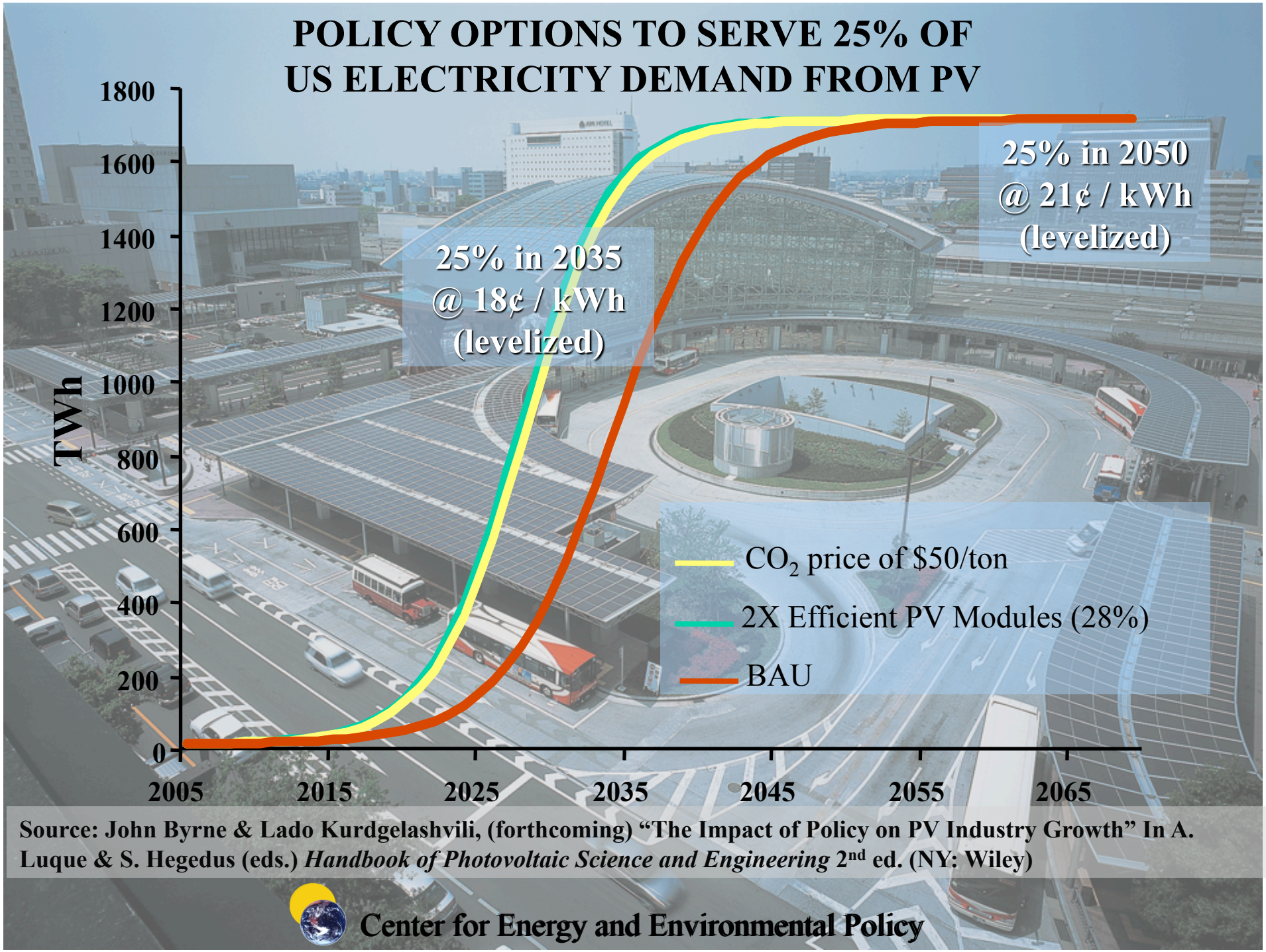
Center for Energy and Environmental Policy

EXPERIENCE CURVES FOR SELECTED RENEWABLE ELECTRIC POWER TECHNOLOGIES



Source: Byrne *et al. [2009] Review of Solar Energy Technology, Markets and Policy.* Prepared for the Climate Change & Clean Energy Development Research Group, World Bank

Center for Energy and Environmental Policy


POLICY OPTIONS TO SERVE 25% OF US ELECTRICITY DEMAND FROM PV
TWh
1800
1600
1400
1200
1000
800
600
400
200
0
2005
2015
2025
2035
2045
2055
2065
25% in 2035 @ 18¢ / kWh (levelized)
25% in 2050 @ 21¢ / kWh (levelized)
CO_2 price of $50/ton
2X Efficient PV Modules (28%)
BAU
Source: John Byrne & Lado Kurdgelashvili, (forthcoming) "The Impact of Policy on PV Industry Growth" In A. Luque & S. Hegedus (eds.) *Handbook of Photovoltaic Science and Engineering* 2nd ed. (NY: Wiley)
Center for Energy and Environmental Policy

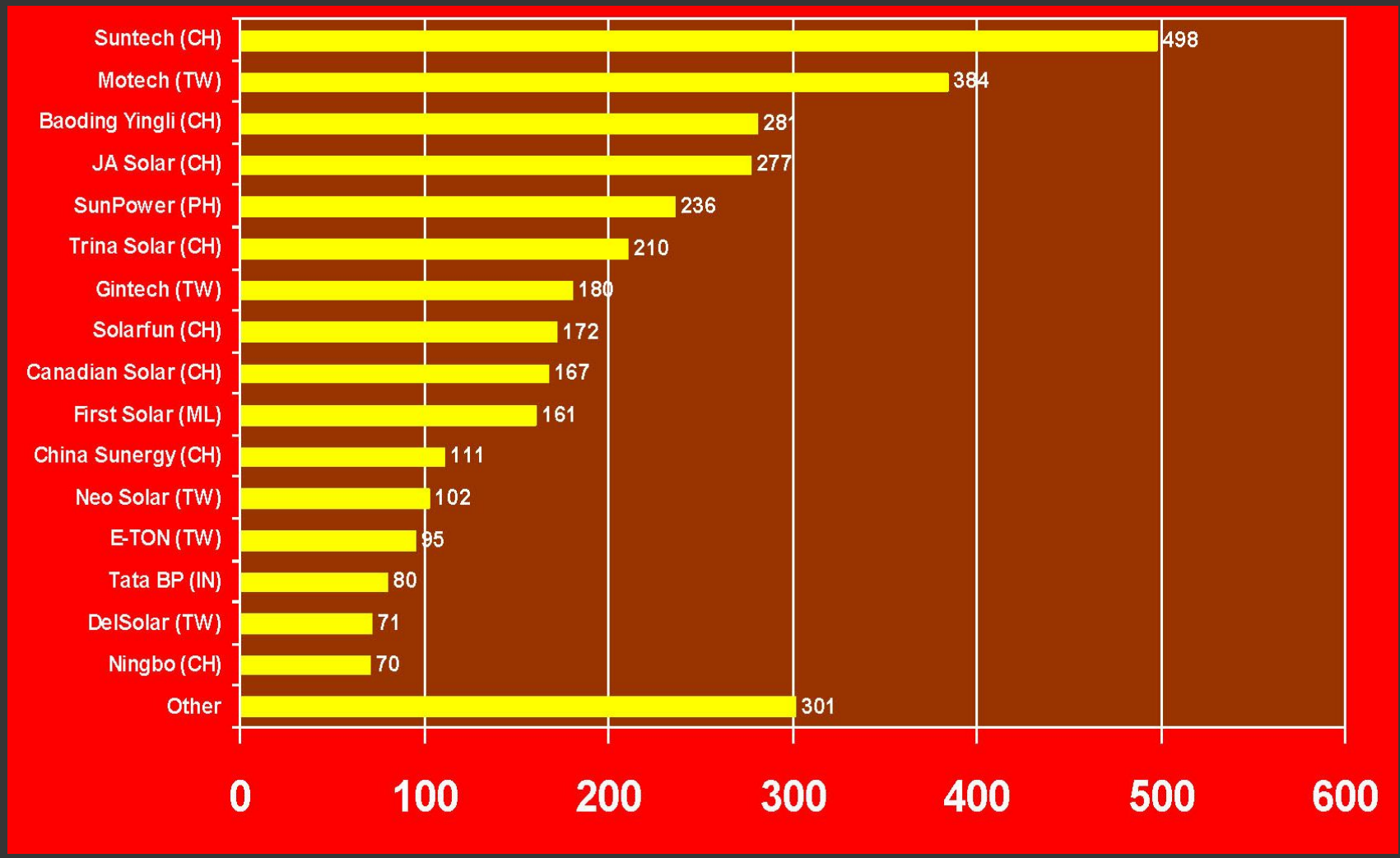
Green Jobs: The Sustainable Energy & ICT Advantage

Permanent Jobs Created per Million US$ Invested		
COAL PLANTS		**4**
ENERGY EFFICIENCY & CONSERVATION		**12-15**
Smart/Green Buildings	**14.7**	
Air Sealing / Insulation	**12.0**	
RENEWABLE ENERGY		**10-19**
Solar Thermal	**19.0**	
Solar Electric (PV)	**15.7**	
Wind	**11.9**	
Geothermal	**10.5**	
INFORMATION & COMMUNICATION TECHNOLOGY		**18-26**
High-Speed Broadband	**26.4**	
Smart Grid	**21.7**	
Intelligent Transport	**17.7**	

Sources: Erhardt-Martinez & Laitner, *The Size of the U.S. Energy Efficiency Market*. ACEEE. 2008. American Solar Energy Society (ASES). Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century. 2007.Singh & Fehrs, *The Work that Goes into Renewable Energy*. REPP. 2001. London School of Economics (LSE) and the information Technology and Innovation Foundation (ITIF). *The UK's Digital Road to Recovery*. 2009. ICT job creation does not include 'network effects.'


ChengTu.com 成都

Leading PV Manufacturers



Sources: Prometheus Institute, 2009, *PV News* (April); Japan PV Energy Association, 2010; IEA PVPS, 2010.