



EMPOWERED

The Peabody Plan and the Social Benefits of Coal – A Model for the World

*6th Annual Energy Supply Forum
The U.S. Energy Association (USEA)*

Fredrick D. Palmer
Senior Vice President of
Government Relations





“The top-rated improvement to the life of earthlings in the 20th Century was electrification. If anything shines as an example... it is clearly the power that we use in our homes and businesses.”

– Neil Armstrong
*U.S. Astronaut,
National Academy of
Engineering*



Electrification is Life; Coal is Electricity



“High rates, of course, bear hard on the individual. But from a social standpoint they are chiefly to be regretted because they restrict the use of electricity.”

– Franklin D. Roosevelt, 1930

“As a country with coal dominating its energy structure, China still has a huge potential. We will... put in place a system that supplies stable, economical and clean energy.”

– President Hu Jintao, PRC, 2009

Only Universal Electrification Can Eradicate Energy Poverty



First, the United States

“I had seen first hand the grim drudgery and grind which had become the common lot of American farm women... growing old prematurely; dying before their time.”

- Senator George Norris, sponsor, Rural Electrification Act of 1936

Then China

“Electrification in China is a remarkable success story... the most important lesson for other developing countries [is] that electrified countries reap great benefits, both in terms of economic growth and human welfare.”

- IEA, 2007

And Now India

“India has more people without adequate access to energy than any country in the world.”

- *National Resources Forum*, 2008

The Primary Challenge of the 21st Century: Eradicating Energy Poverty



“ The greatest crisis we confront in the 21st Century is not an environmental crisis predicted by computer models... but a human crisis fully within our power to solve.

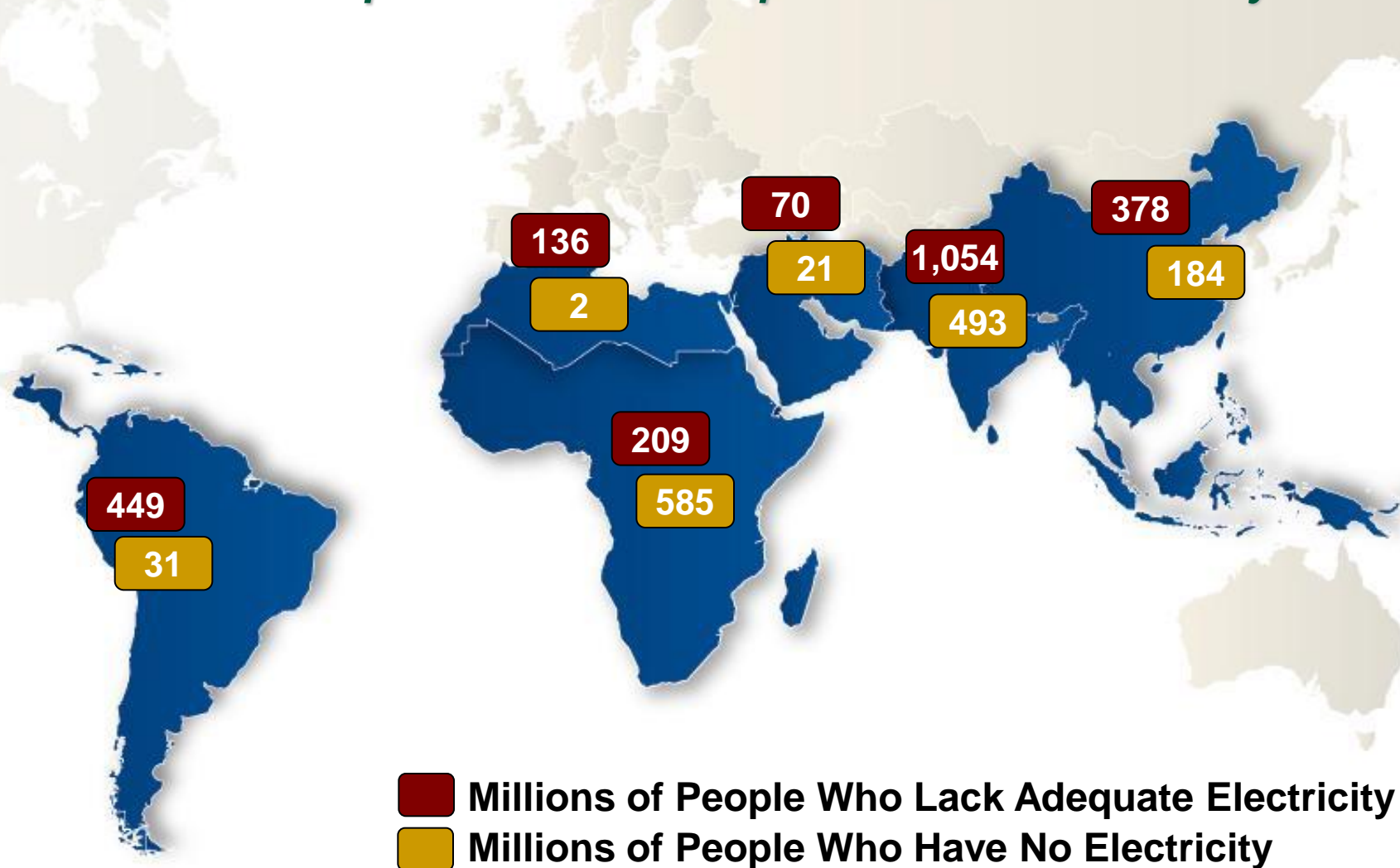
Study after study – and pure common sense – tells us that access to electricity helps people live longer and better. For every agency voicing a 2050 GHG goal... we need 10 working toward the goal of broad energy access to reduce global poverty. ”

— Gregory H. Boyce,
Peabody Energy
Chairman and CEO



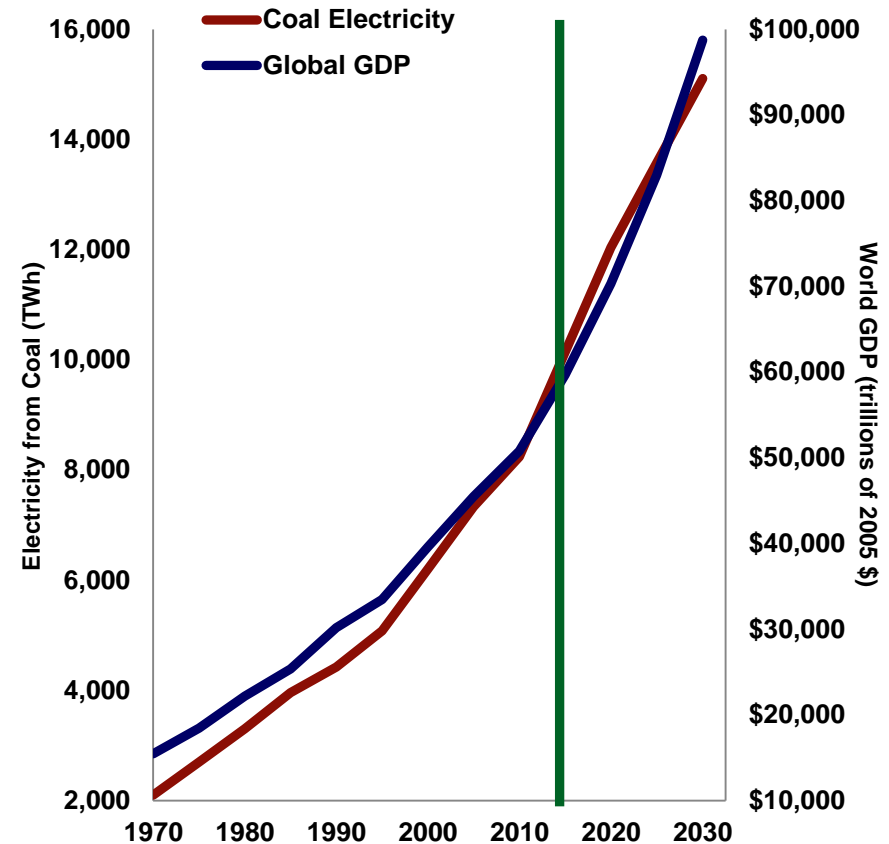
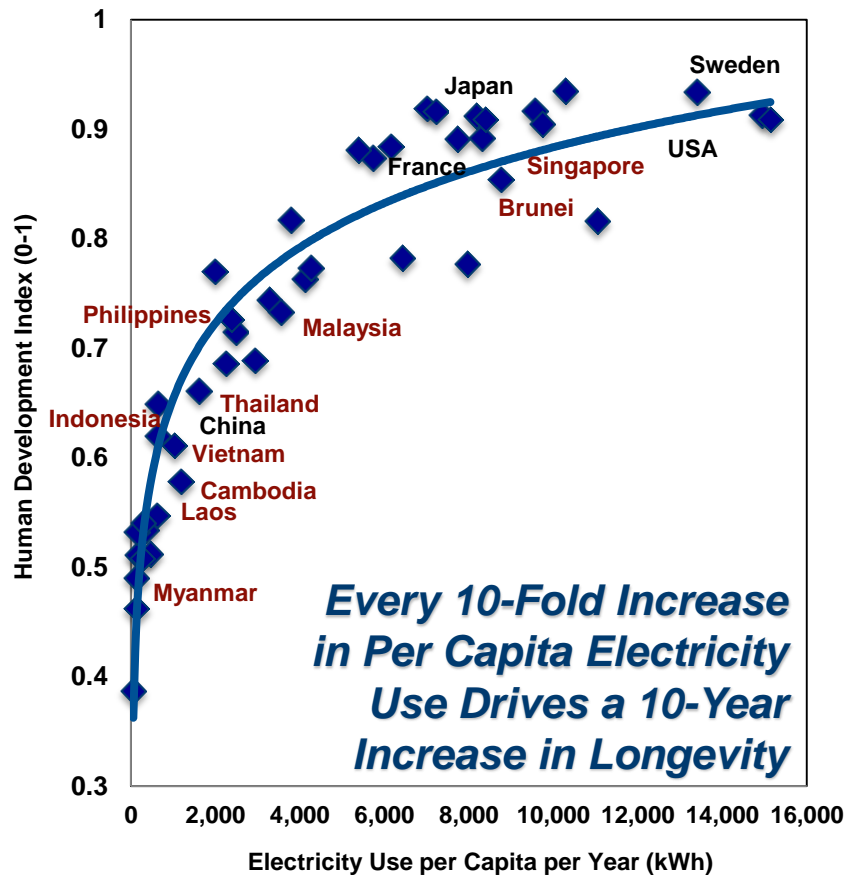
Energy Is a Human Right and Rapidly Rising Need

Half the World's Population Lacks Proper Access to Electricity



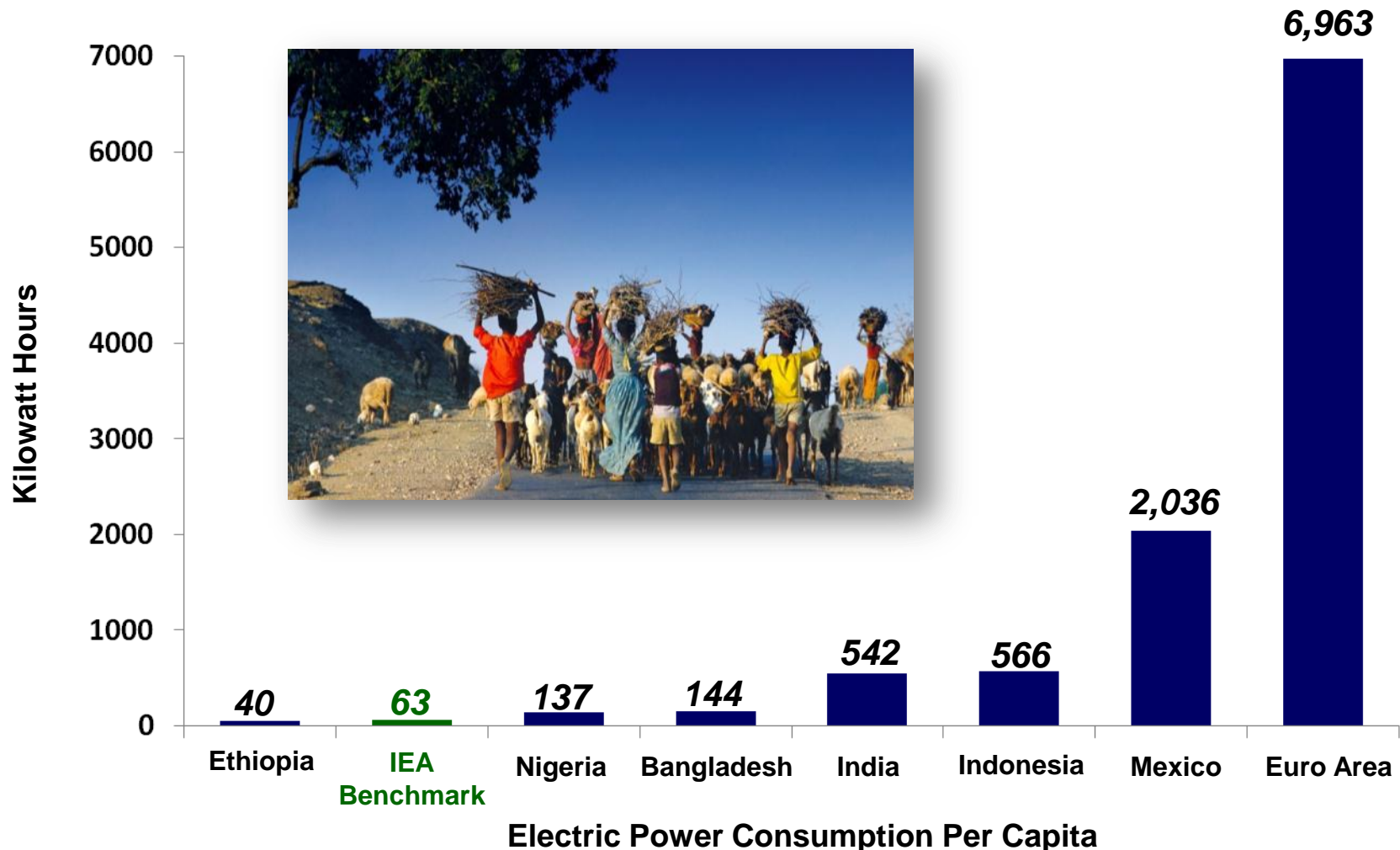
Electricity Enables People to Live Longer and Better

United Nations Links Affordable Energy to Quality of Life



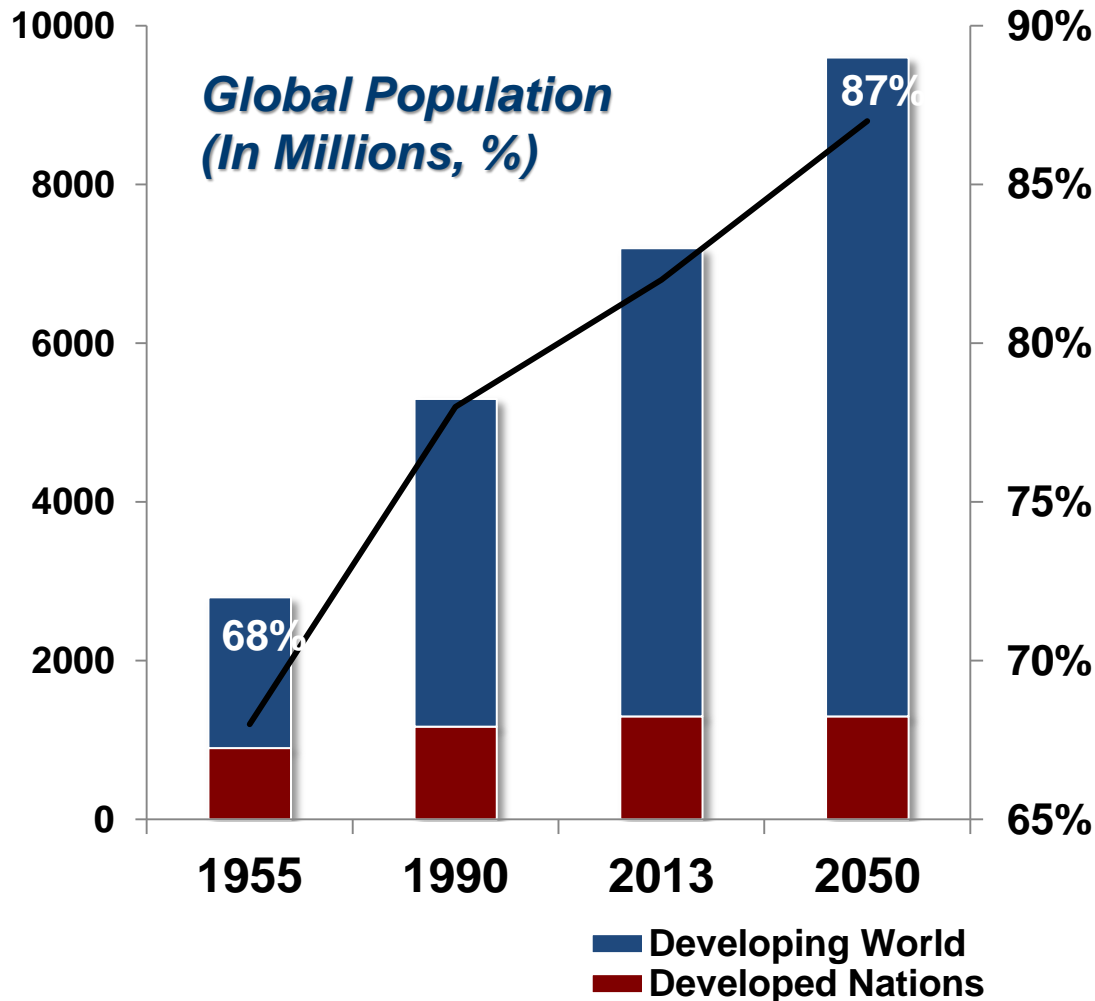
Do We Recognize the Enormity of the Challenge?

Citizens Need 60+ Times IEA Benchmark for Human Development



Population Growth Greatest In Developing World

By 2050, 87% of ~9.6 Billion Global Population in Developing World



“Developing countries, especially in Africa, are still growing rapidly.”

– UN Under-Secretary-General Wu Hongbo

Coal Is The Solution To Energize The World

The World Needs More Energy

Extraordinary Global Growth by 2050...

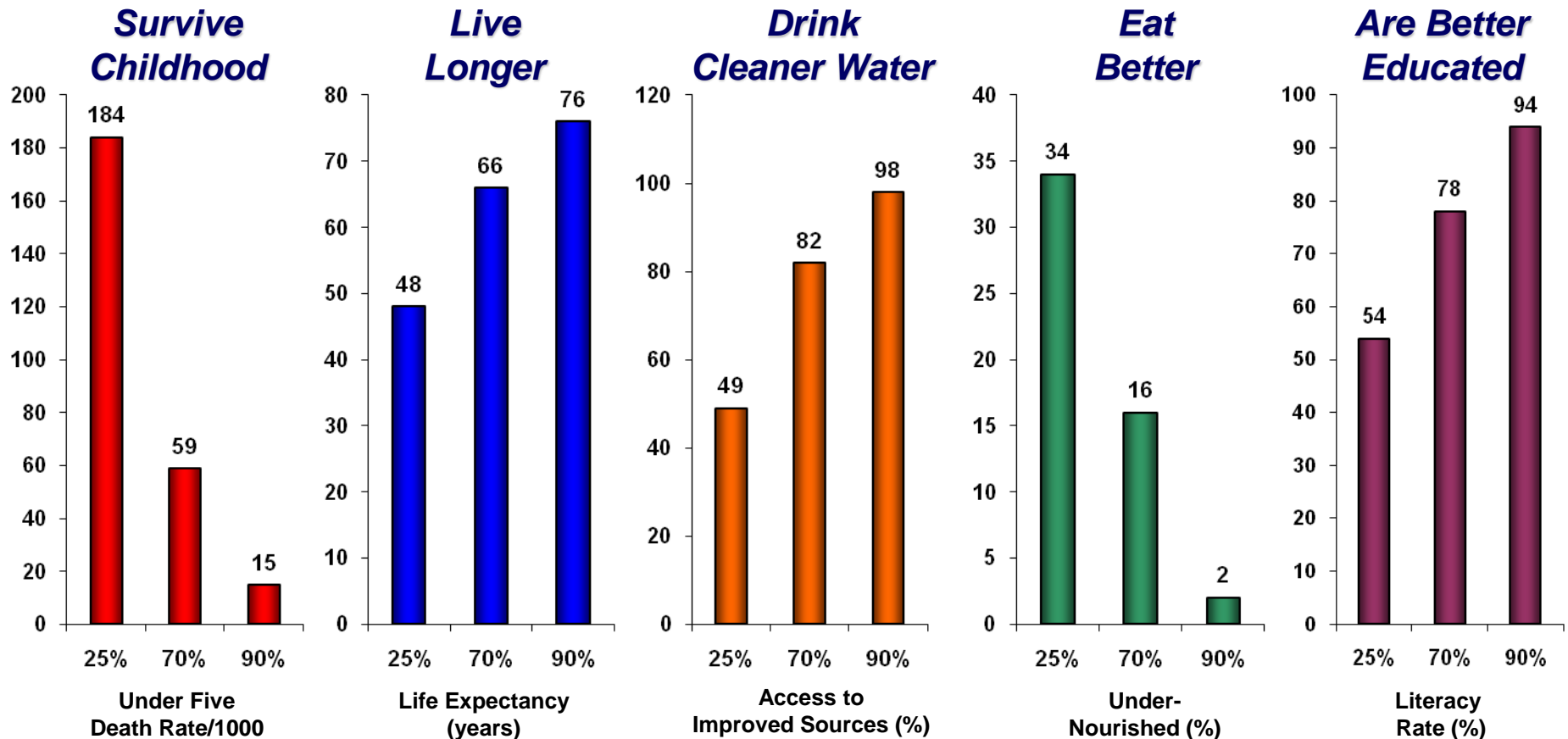
- Global GDP up 285%
- Electricity generation up 130%
- Steel production up 125%
- World population exceeds 9.3 billion
- 15 billion tons of coal used annually



Hong Kong

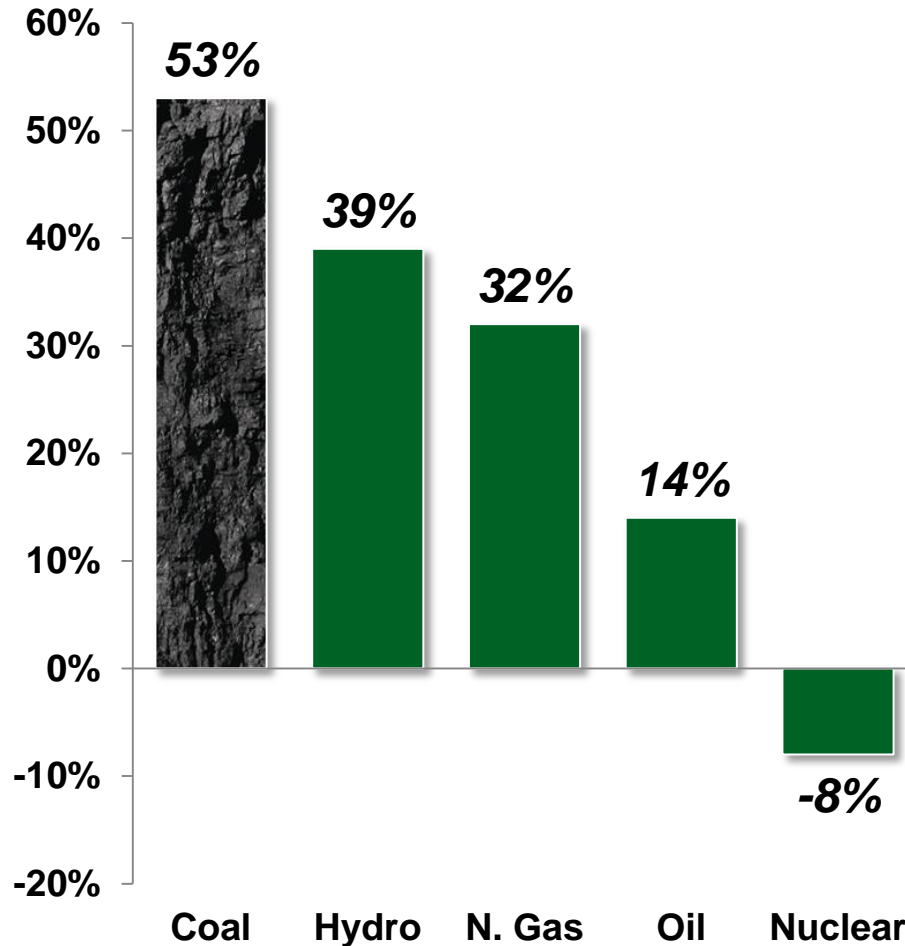
China is the Model: Coal Fuels Social Development

China Out of Poverty Study: Energy & Progress Closely Linked



Coal: The World's Fastest Growing Major Fuel

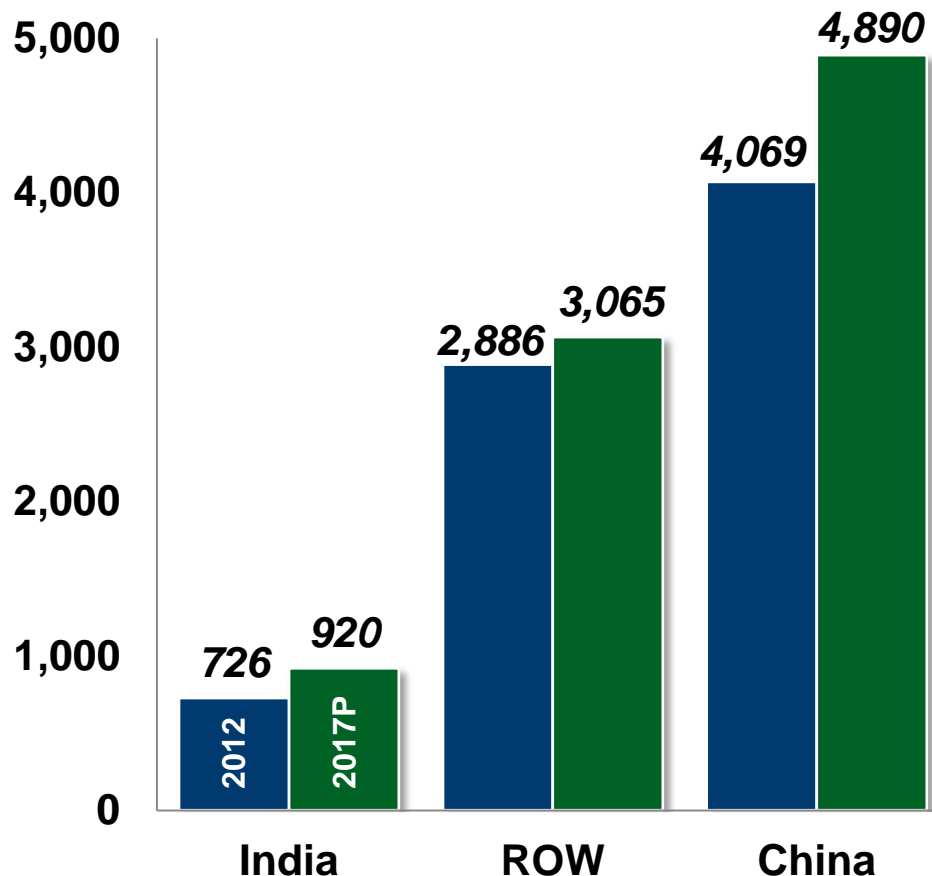
Growth 2002 – 2012



- Coal grows twice as fast as average of other major fuels in past decade
- Coal expected to pass oil as world's largest energy source in coming years
- New IEA report increases global coal growth projections to 47% by 2035

Annual World Coal Demand to Grow 1.2 Billion Tonnes in Five Years

*Expected Global Coal Demand
(Tonnes in Millions)*



- New coal-fueled generation of ~425 GW by 2017
- Steel production growth requires additional 150 MTPY of metallurgical coal in 2017
- More than 80% of projected global demand growth in China/India

No Energy Alternative Can Replace Coal



To Replace Coal Generation by 2035, the World Would Need...

NUCLEAR *2,200 New Nuclear Plants*

NAT. GAS *165 Trillion Cubic Feet
>7x Current Russian Gas Production*

HYDRO *215 new Three Gorges Dams*

WIND* *6 Million Wind Turbines*

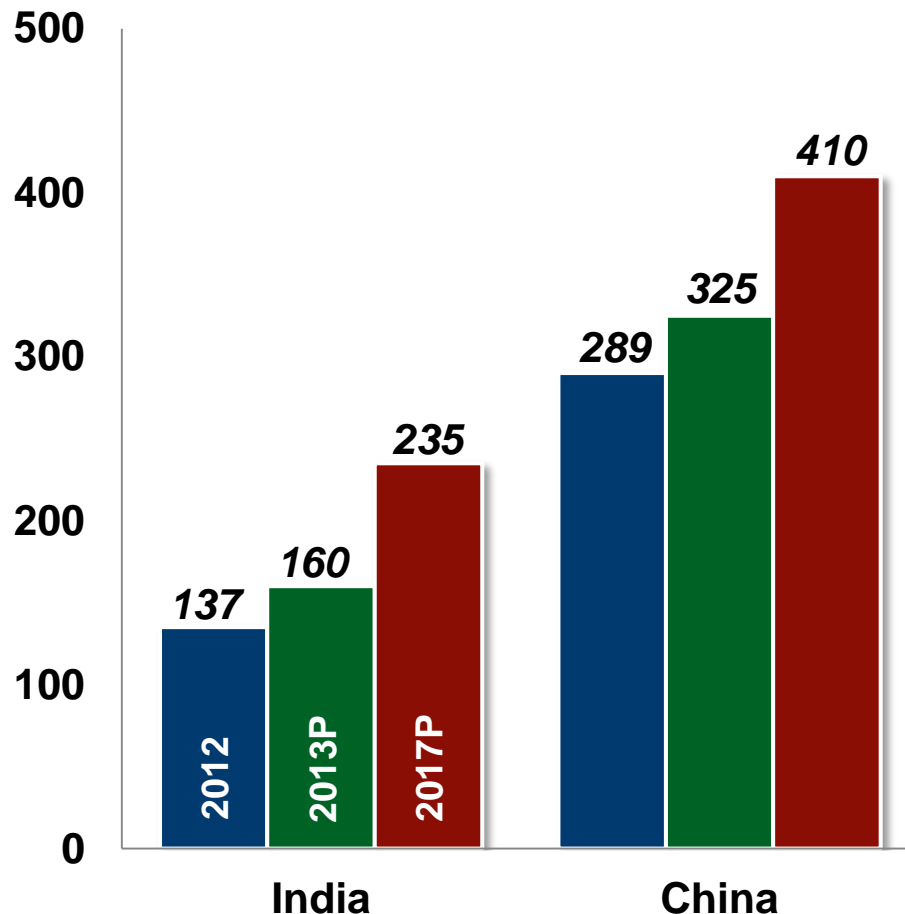
SOLAR* *500x Current Solar Generation*

* Requires backup generation.

Source: International Energy Agency World Energy Outlook 2012; U.S. Energy Information Administration International Energy Outlook 2012.

China, India to Account for 85% of Global Coal Demand Growth

China and India Coal Imports
(Tonnes in Millions)



- China and India coal imports expected to grow 220 million tonnes by 2017
- Significant new coal generation driving demand
 - ~225 GW in China
 - ~70 GW in India
- China closing marginal cost production
 - Costs rising >10% per year
- New port projects underway to enable greater imports

U.S., Too, is a Young and Developing Nation

- The U.S. population expands by 3.3 million people per year and will exceed 430 million in 35 years
- Urbanization proceeds apace and will reach 90% in the next generation
- Economic growth linked with this continuing rise of cities will spur the demand for energy – especially electricity



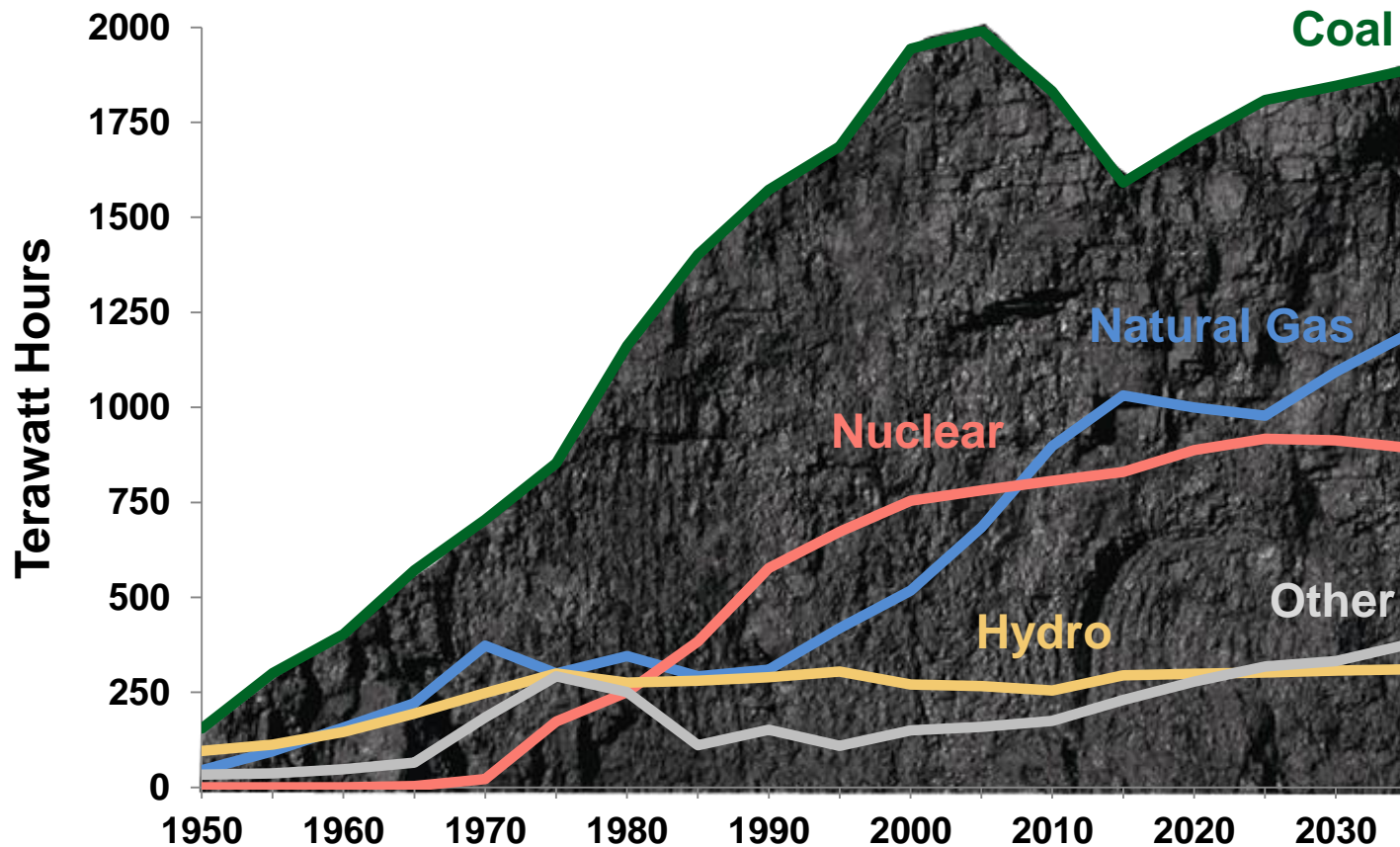
U.S. History Proves Social Benefits of Electricity from Coal



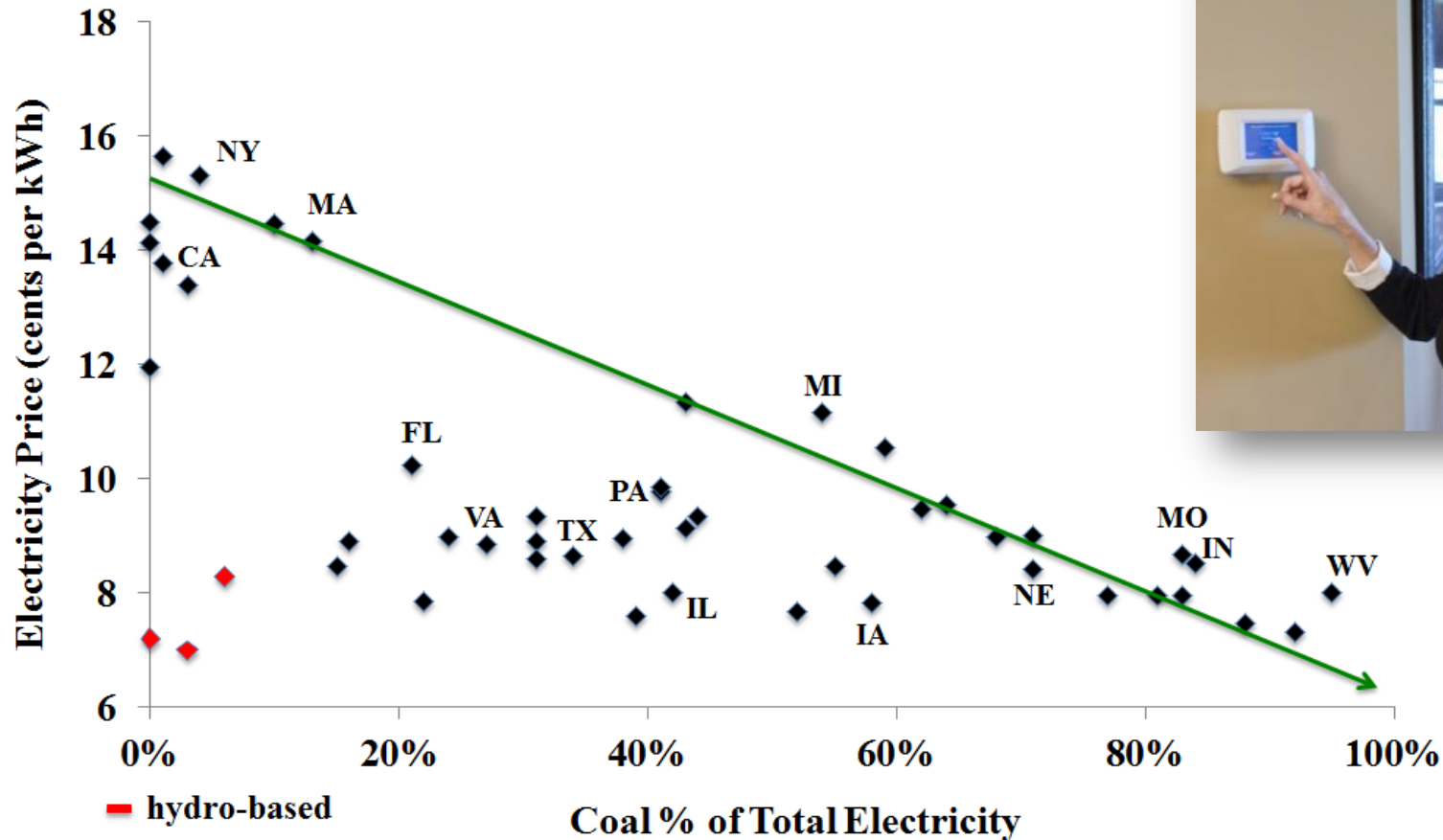
- Low-cost coal-based energy is engine for jobs, growth and prosperity
- Coal fuels 40% of power; America has 27% of global reserves
- Clean coal technologies work, lead to near zero emissions
- Beneficial electrification is the foundation of modern life: the positive externalities of coal overwhelm “cost of carbon”
- EPA’s plan to artificially increase the price of electricity is adverse to human health and welfare
- Coal is the only energy source that can meet the scale of future demand

Coal is the Cornerstone of America's Energy System

U.S. Has World's Largest Coal Supply – Secure and Accessible



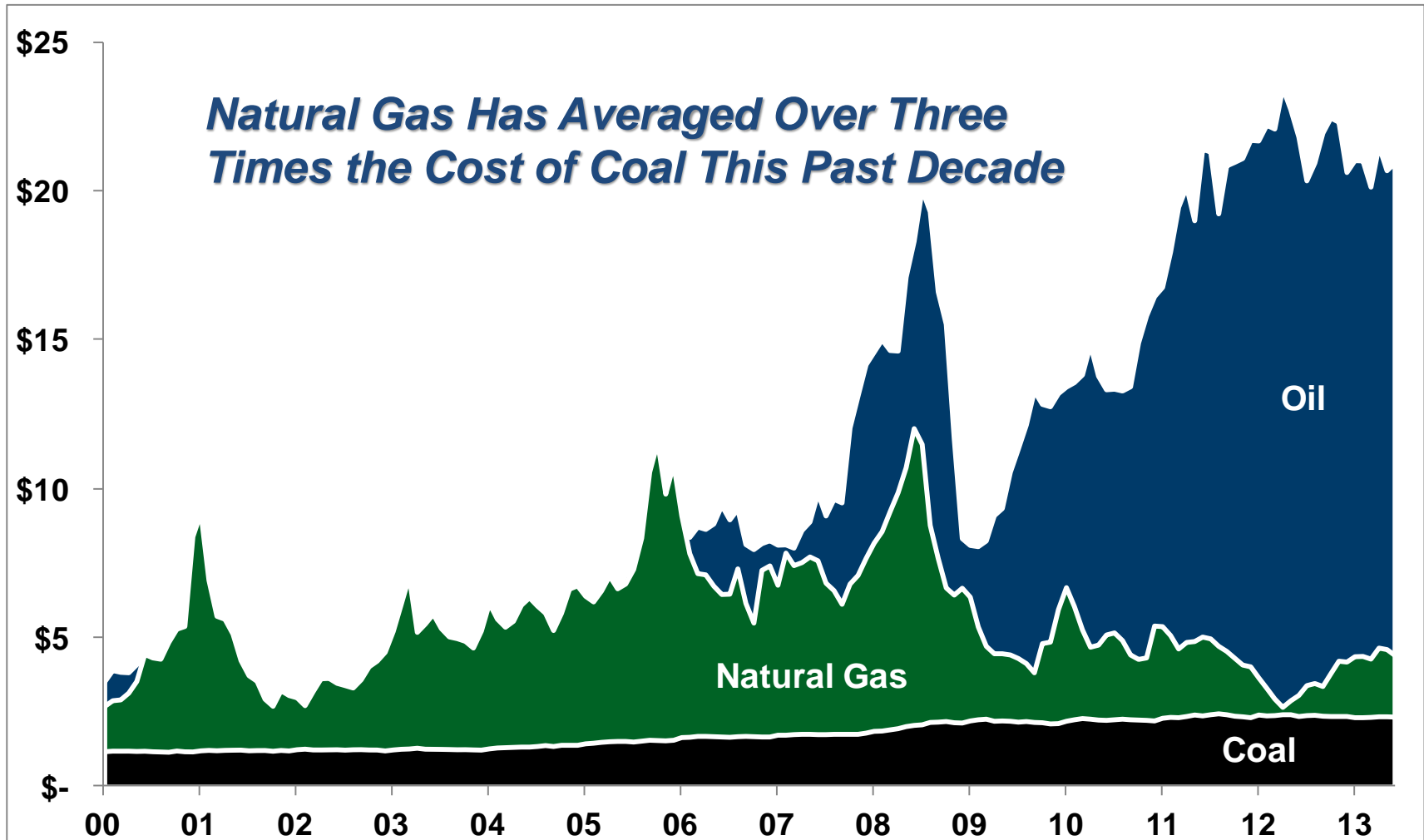
Coal Means Affordable Electric Rates



Note: for first half of 2013

Rising Natural Gas Prices Drive Switching Back to Coal

U.S. Natural Gas Cost Almost 2x Coal, Oil Cost 9x Coal in 2013



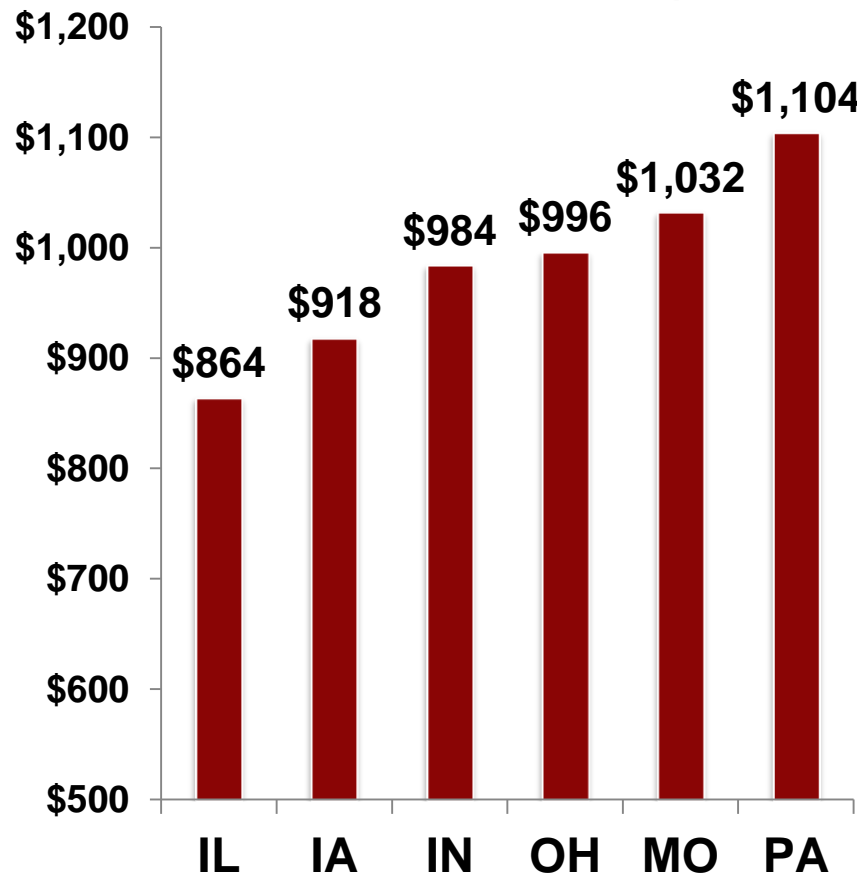
Price of fuel delivered to the plant includes all commodity, freight, taxes and other costs incurred in the delivery of the fuel.

Source: EIA Electric Power Monthly, Table 4.1. Receipts, Average Cost, and Quality of Fossil Fuels: Total (All Sectors) Jan 2000 – June 2013 (monthly).

EPA Plan Dramatically Increases Electricity Costs for U.S. Families

Annual Household Electricity Cost Hikes >\$1,000 in Some States

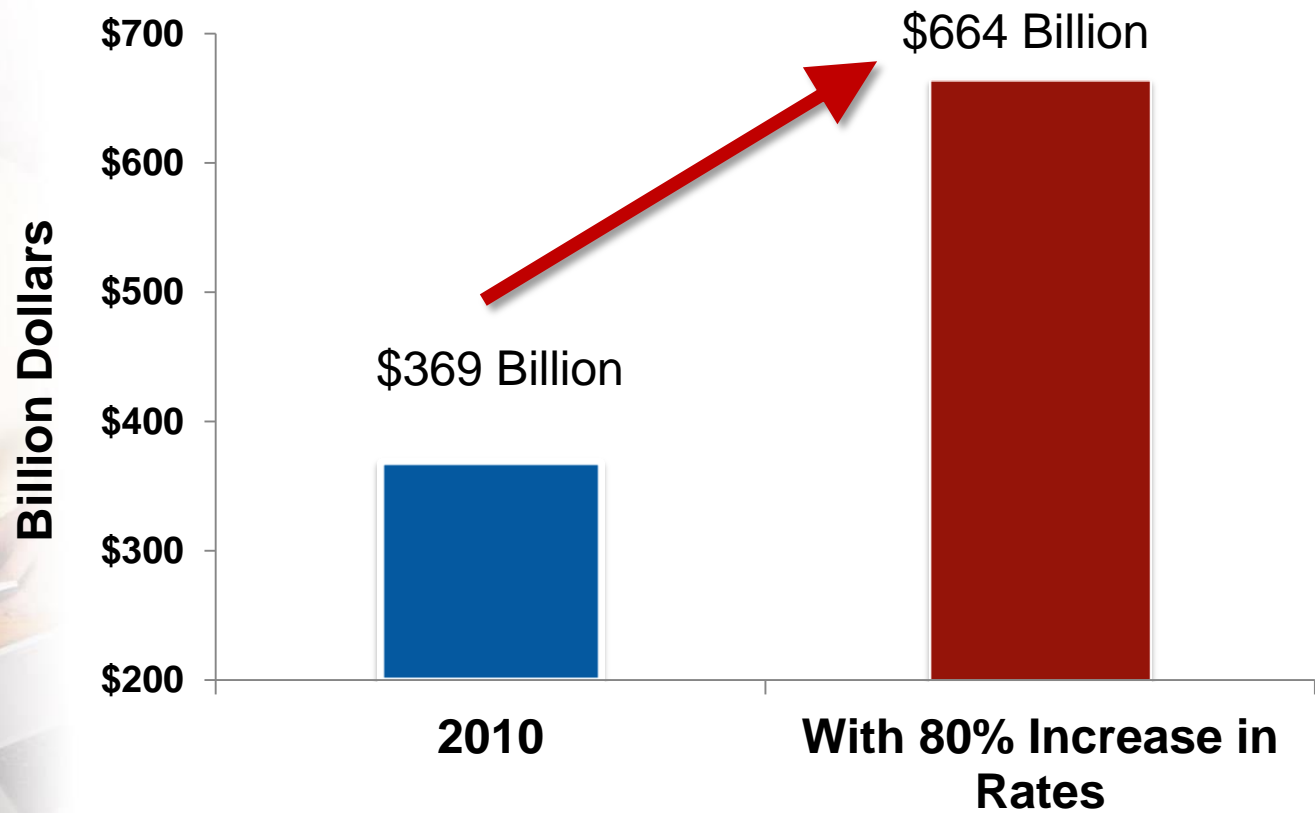
EPA Projections: Annual Increase in Household Electricity Bill



- Americans pay the price for EPA policy; estimated 80% annual electricity cost increase per family
- NERC: EPA regulations could result in 77 GW of lost coal power causing “significant impact” to electric reliability
- EPA’s approach similar to using an electric car to set emissions standards for new vehicles

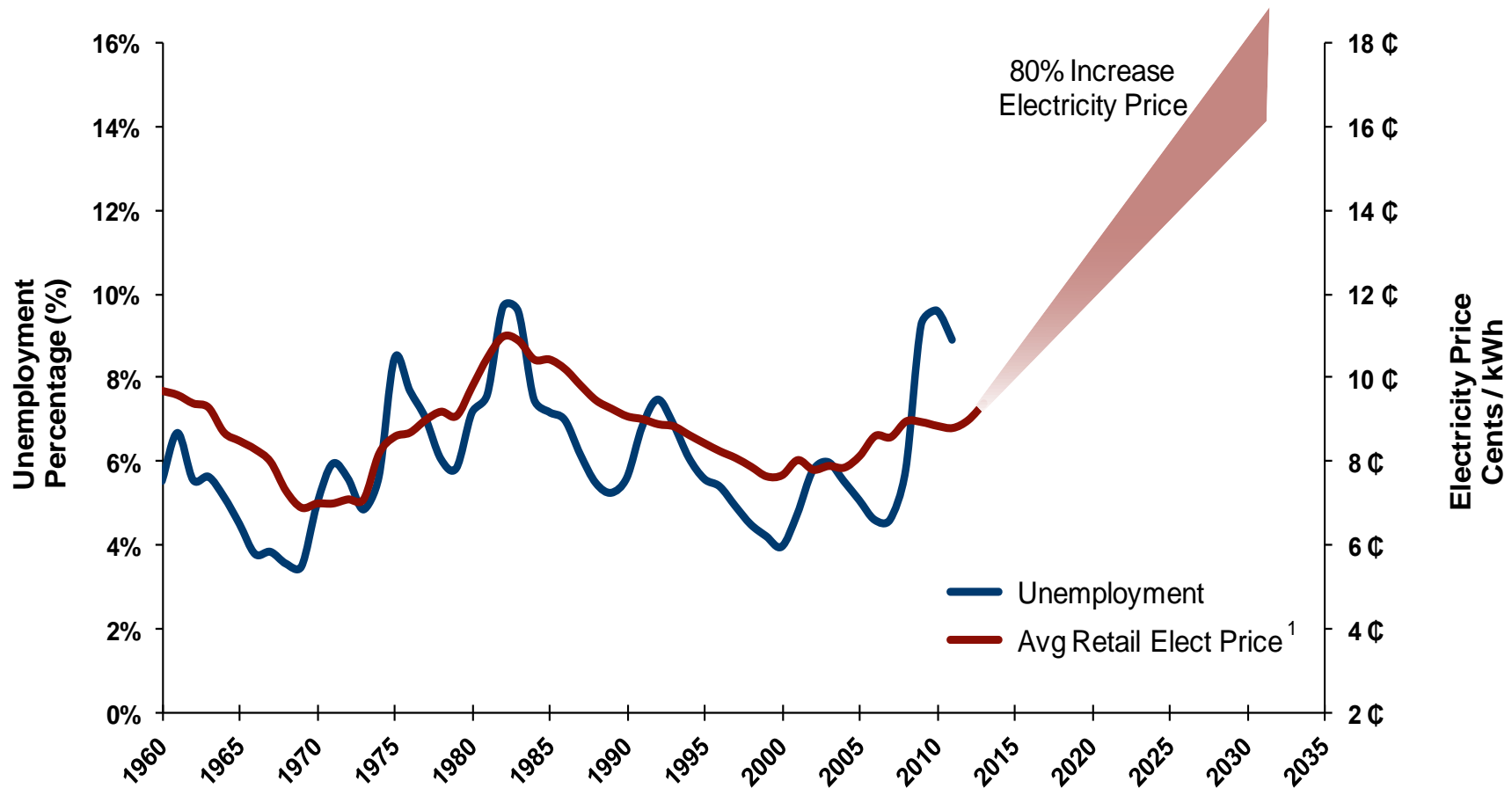
Sticker Shock: EPA Energy Experiment Causes National Electric Bill to Soar

National Electric Bill



Rising Electricity Prices Are Closely Correlated with Unemployment

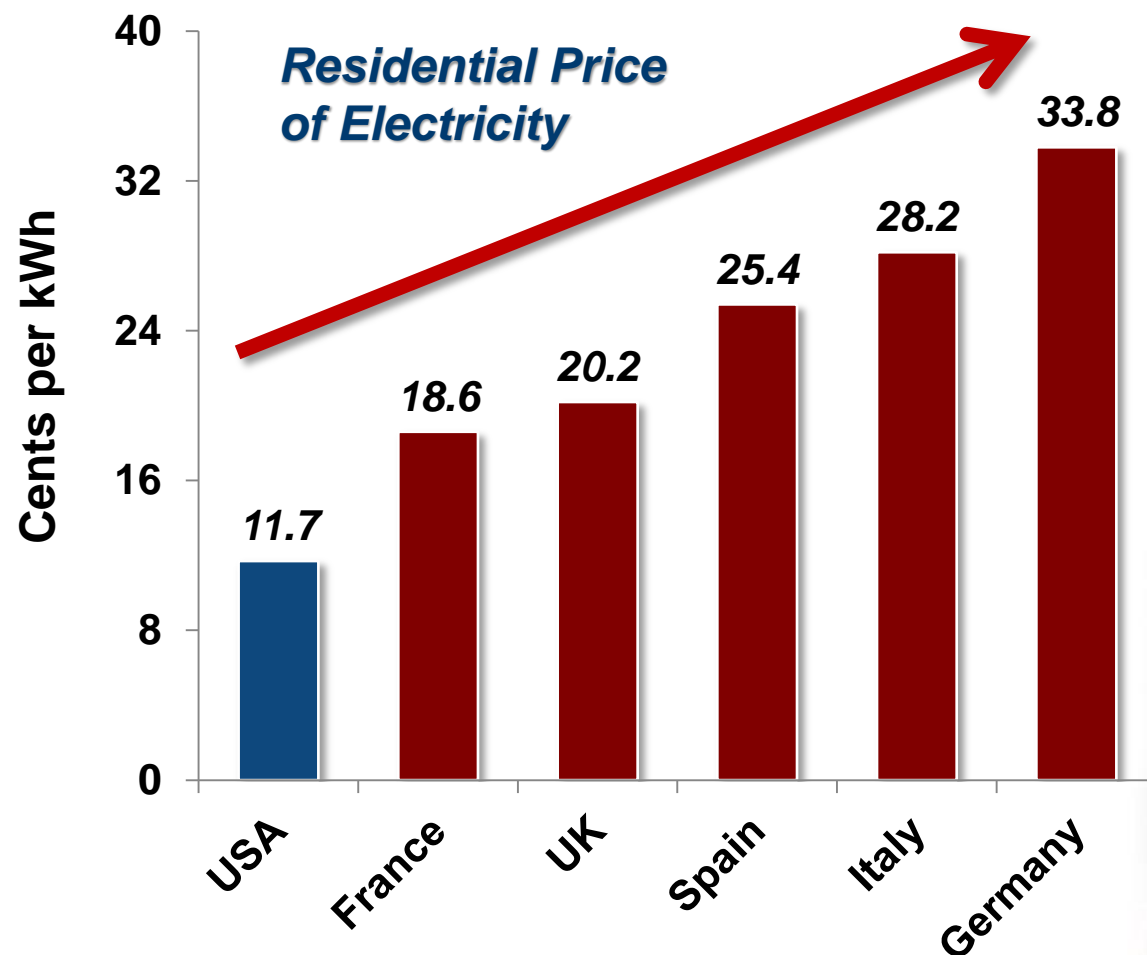
Faltering Economy Greatest Threat to People – Not Flawed Models



¹ Average Retail Electricity Price is shown in Real terms (2005\$)

Europe's Disastrous Carbon Emissions Trading System Sent Prices Soaring

"Instead of a model for the world to emulate, Europe has become a model of what not to do." – The Washington Post, April 21, 2013

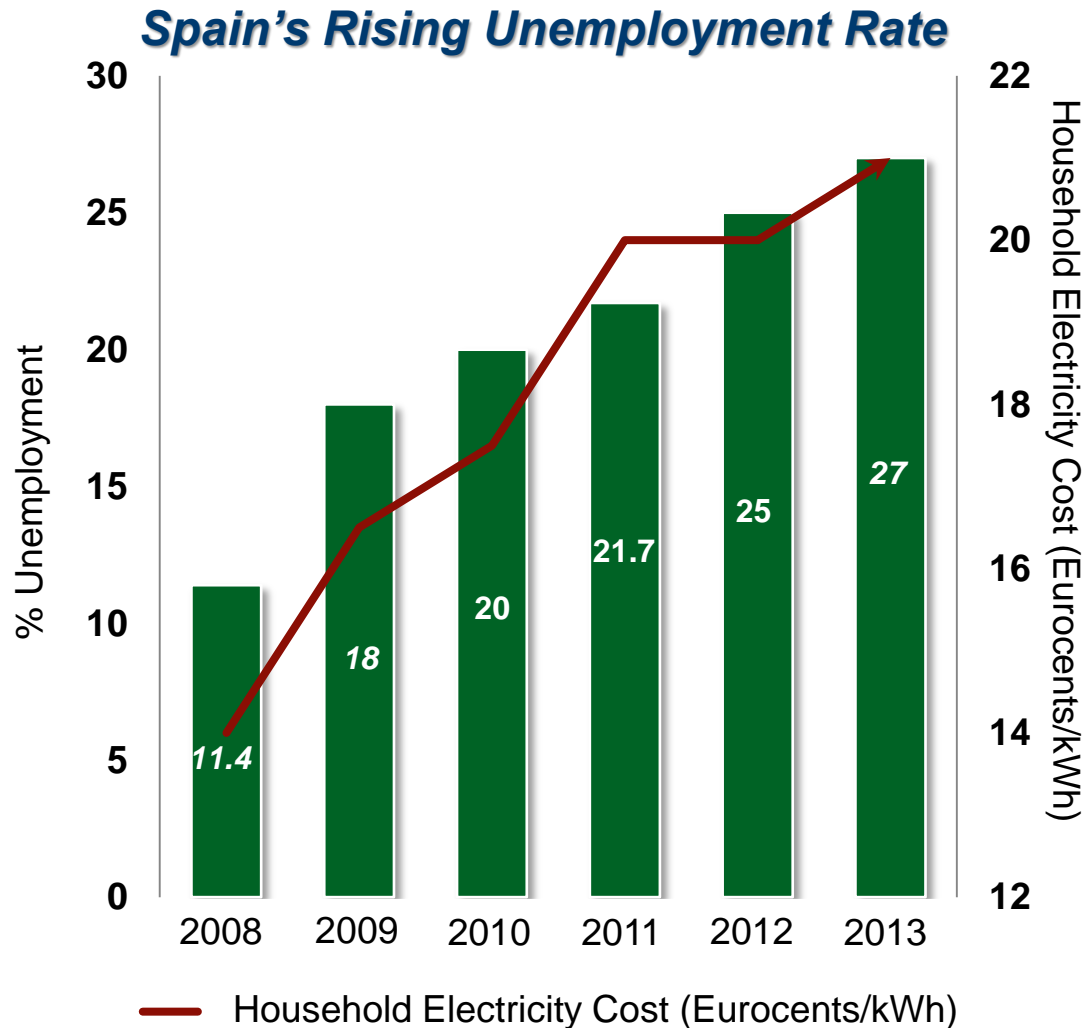


Sources: Europe's Energy Portal; EIA, 2011 and 2012.



The Lesson of Spain: Still Waiting for “Green” Jobs

Study: For Every Green Job, Subsidies Cost 2.2 Jobs Elsewhere



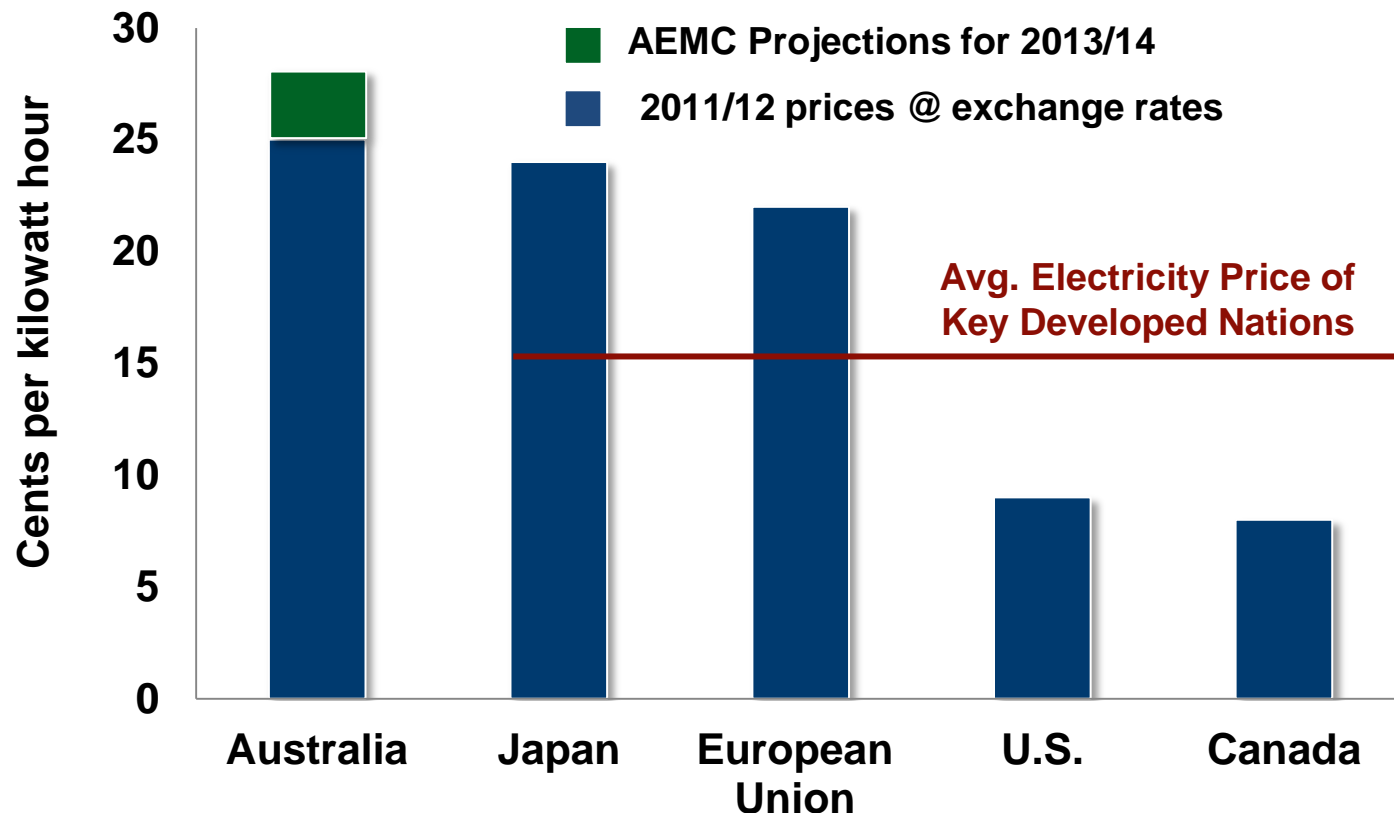
“Spain has already attempted to lead the world in a clean energy transformation. But our research shows that Spain's policies were economically destructive... and a source of social harm and net job destruction.”

- Professor Gabriel Calzada, King Juan Carlos University, “Study of the effects on employment of public aid to renewable energy sources”

Australia Has Highest Electricity Prices in the Developed World

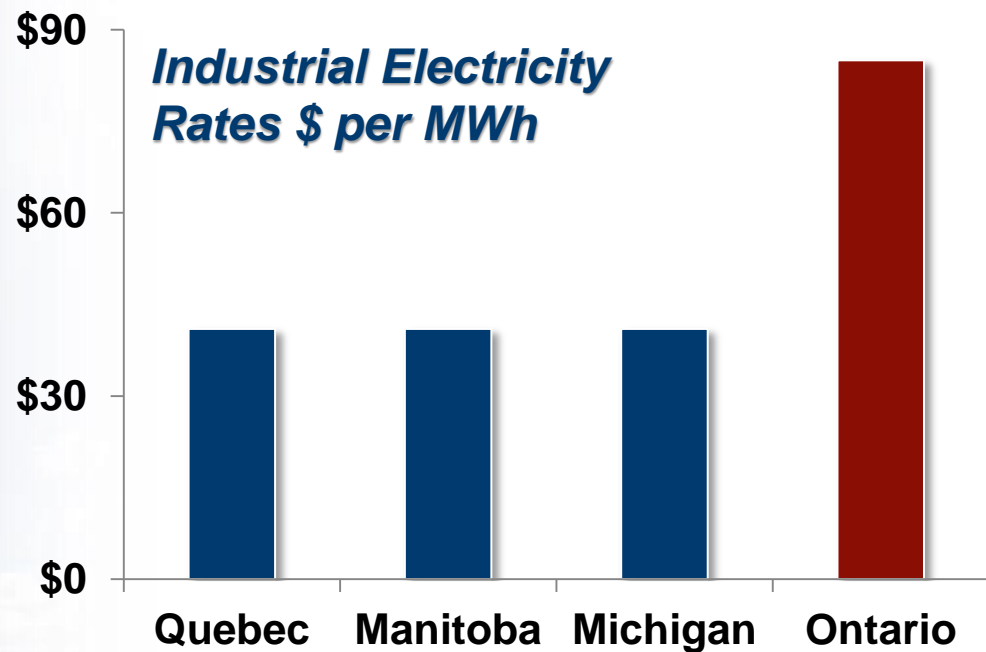
Nearly Double the Average of Other Developed Nations

***Average Household Electricity Prices in 2011/12
and Australia Projections to 2013/14
(2011 Exchange Rates)***



Ontario: Anti-Coal Policies Increased Rates, Reduced Competitiveness

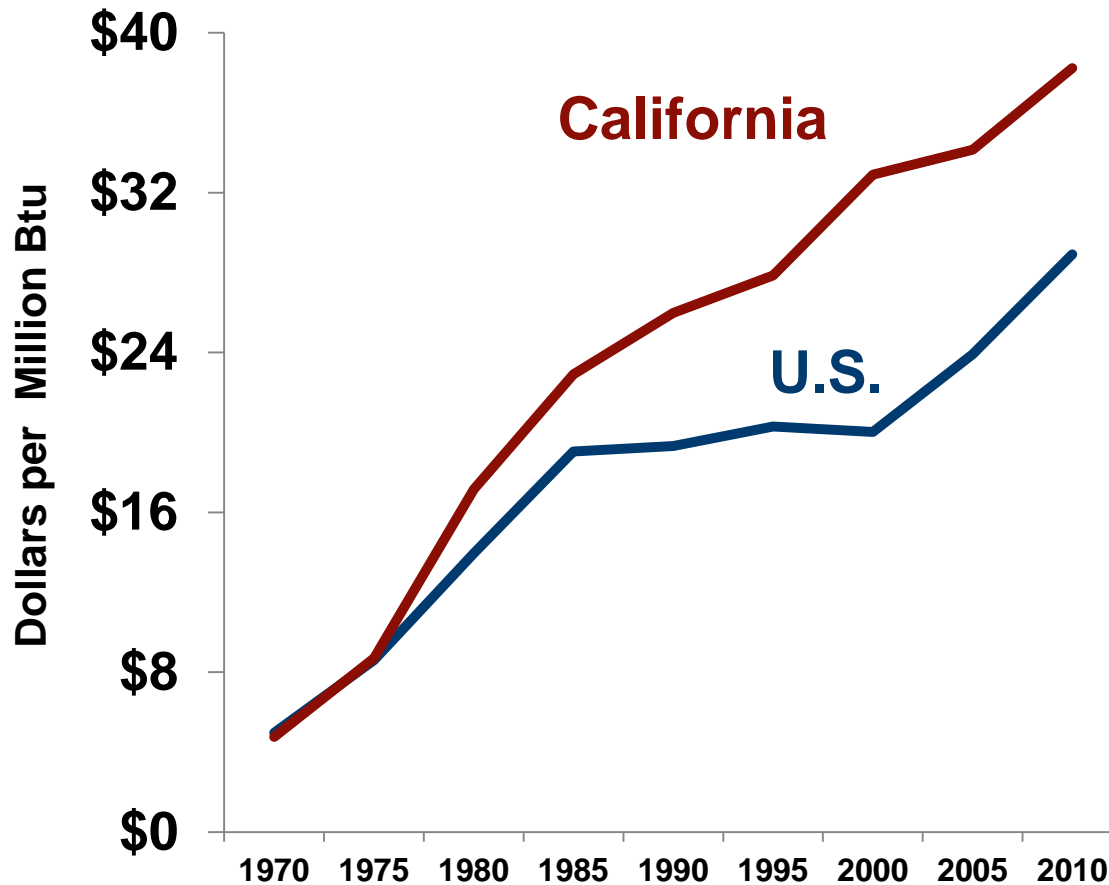
Ontario Now Has Highest Delivered Industrial Prices in North America



California's Anti-Coal Policies Massively Increase Prices for Ordinary Consumers

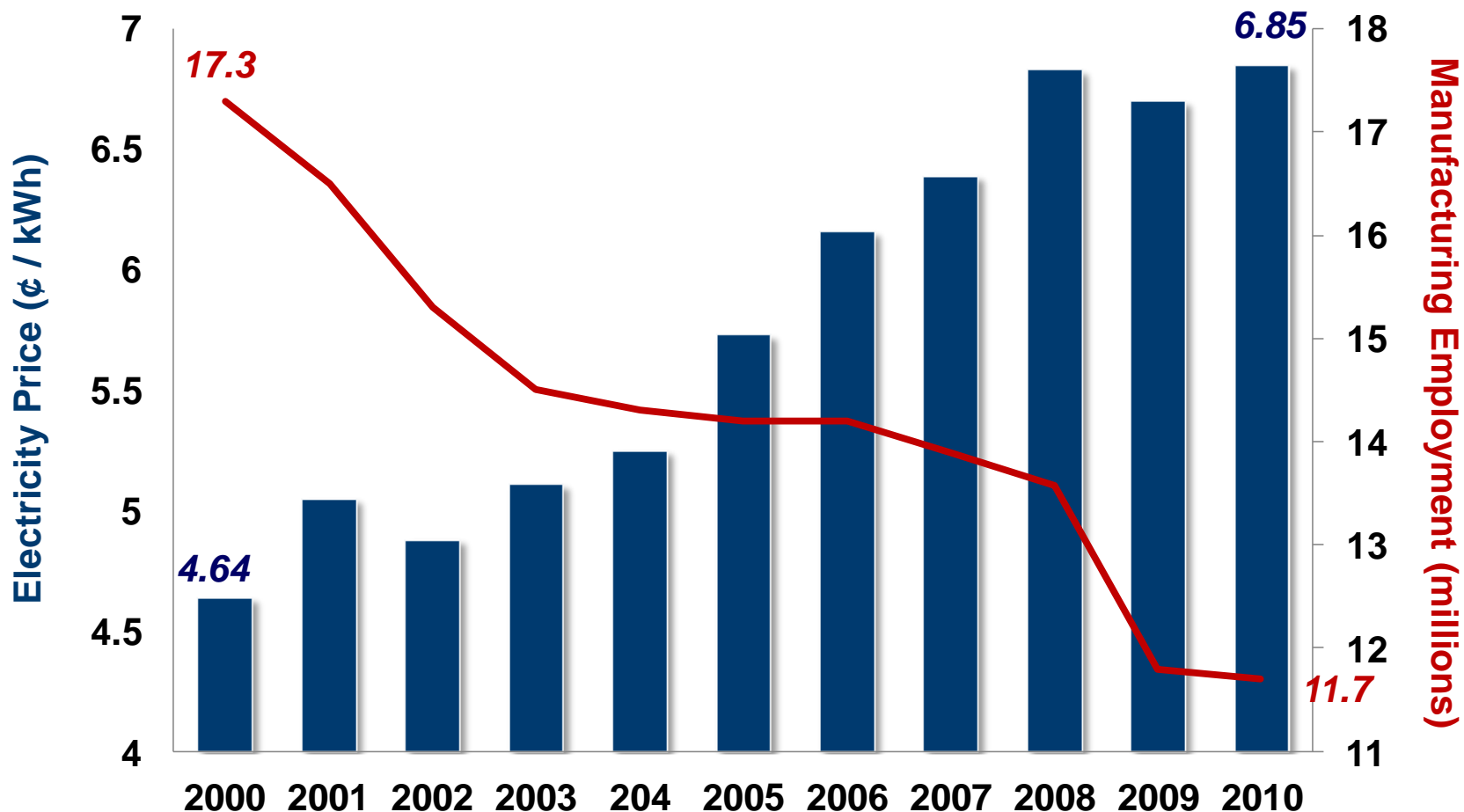


“Excessive energy costs have helped obliterate the state’s manufacturing base.” – Wall Street Journal, March 29, 2013



- Electric rates 40% > national average
- 12 million people eligible for low income energy assistance
- 700,000 manufacturing jobs lost since 2000
- Negative net worth of \$127 billion in 2013

Lesson Learned: Price Matters and High Power Costs Hurt People, Industry



In past decade, U.S. has lost nearly 6 million manufacturing jobs as electricity prices increase by 50 percent

How Coal? Through 21st Century Technology



Why Coal?

- The World Needs Energy
- Other Energy Forms Have Inherent Limitations
- Energy from Coal Creates Health and Longevity

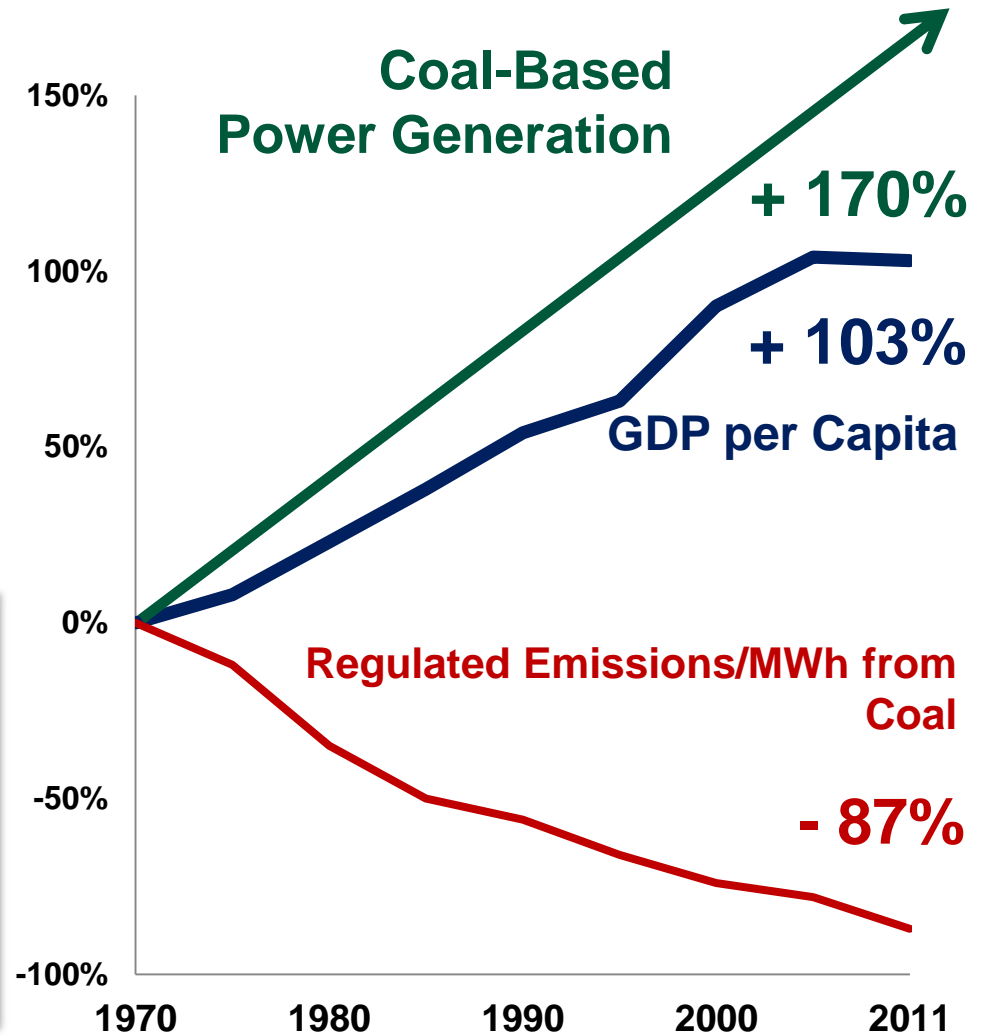
How Coal?

- Advanced Technologies Deliver Ultra Low Emissions
- Long Record of Progress
- Ultimate Goal: Near-Zero Emissions

GreenGen Power Plant and
Carbon Research Center; Tianjin, China

Clean Coal is the Answer to Environmental Problems, Not the Cause

U.S. Emissions Decline 87% Since 1970 as Coal Use Nearly Triples



The Better Way: 21st Century Coal and the Peabody Plan



Fuel the Future in 5 Steps

- Ensure at least half of new generation is from coal
- Replace older coal fleet with supercritical plants
- Develop 100 CCUS/CCS projects in a decade
- Deploy coal-to-gas, coal-to-chemicals, coal-to-liquids
- Commercialize near-zero emissions technology



Clean Coal...Green Coal...

Green Coal Provides Path to Near-Zero Emissions

Supercritical Plants

Carbon Capture and Storage (CCS) Demonstrations

Commercial Coal-to-Gas with CCS

Commercial Coal-to-Liquids with CCS

Commercial integrated
gasification with combined
cycle plants with CCS

Oxyfuel, carbon-consuming algae and other
low-carbon technologies

Retrofit Pulverized Coal
Plants with CCS

87%

2008

Path to Near-Zero Emissions

21st Century Coal Technology TODAY Achieves Near-Zero Criteria Emissions



Older Fleet

Advanced Coal

89%
↓ **Sulfur Dioxide**

93%
↓ **Nitrogen Oxide**

99.9%
↓ **Particulates**

-30%
CO₂

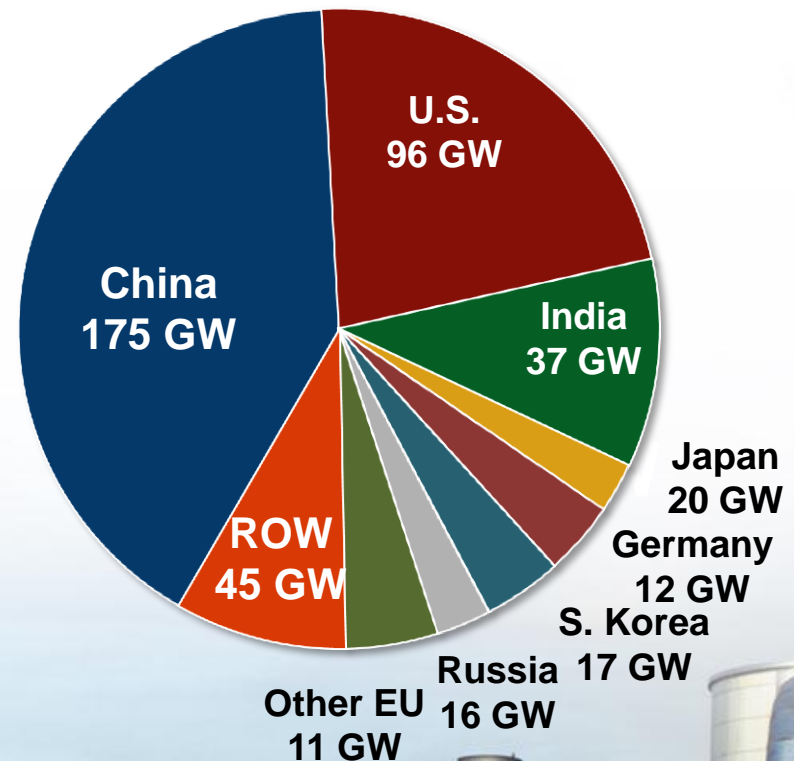
Every 21st Century Coal Plant Takes 'A Million Cars Off the Road'

**New 21st Century Coal Plants
= 265 Prairie State Facilities**

“A single, large coal plant, if built with the best-available technology, can reduce emissions by the annual equivalent of taking a million cars off the road...”

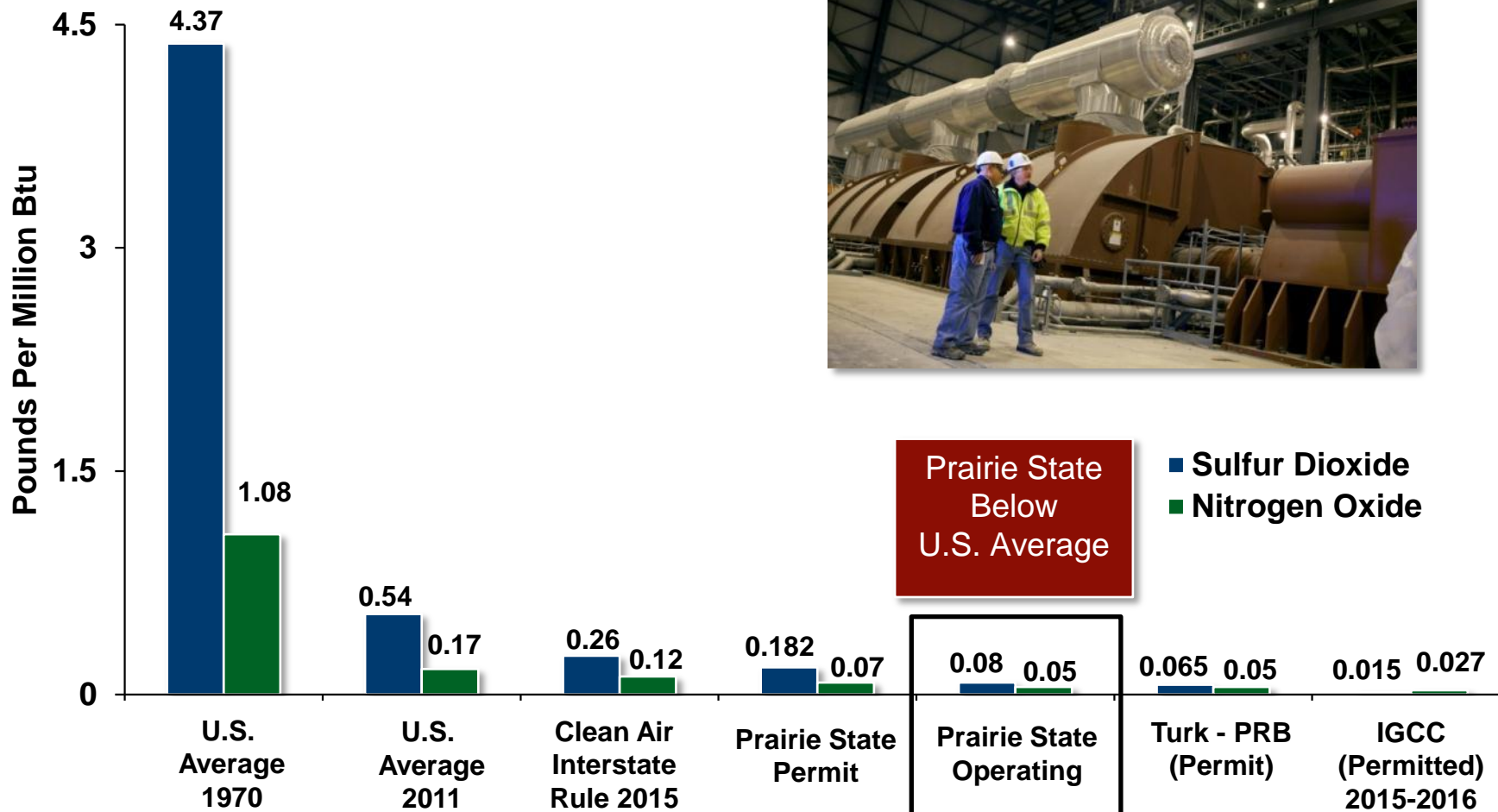
*– Maria van der Hoeven
Executive Director
International Energy Agency
December 2012*

429 GW of Supercritical On Line and Under Construction



Prairie State is 21st Century Coal

CO₂ Emissions Drop 25 % from Oldest Operating U.S. Coal Plants



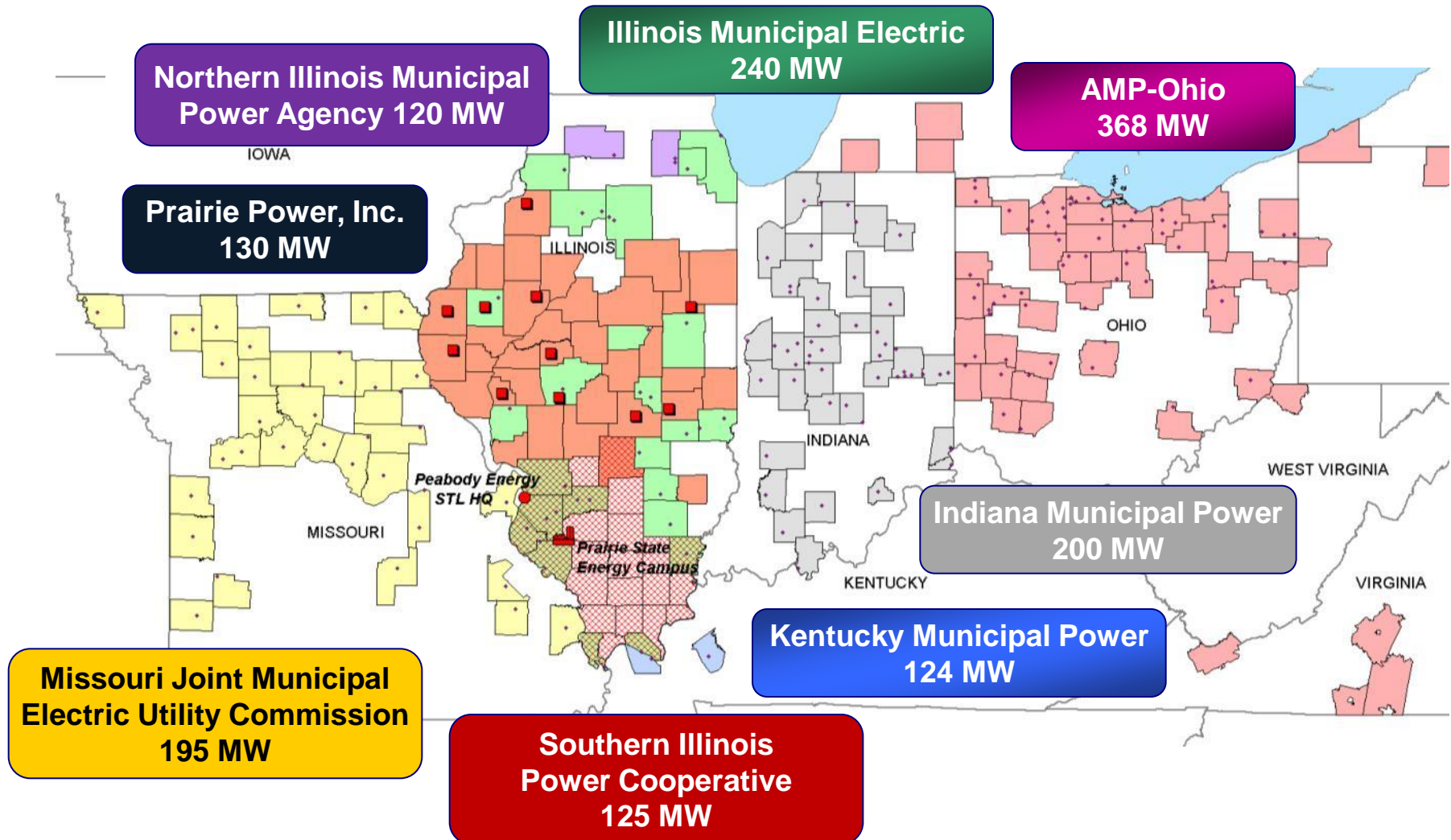
Prairie State Energy Campus 1,600 MW Mine Mouth Plant



Largest Coal Plant Built in U.S. in 30 Years

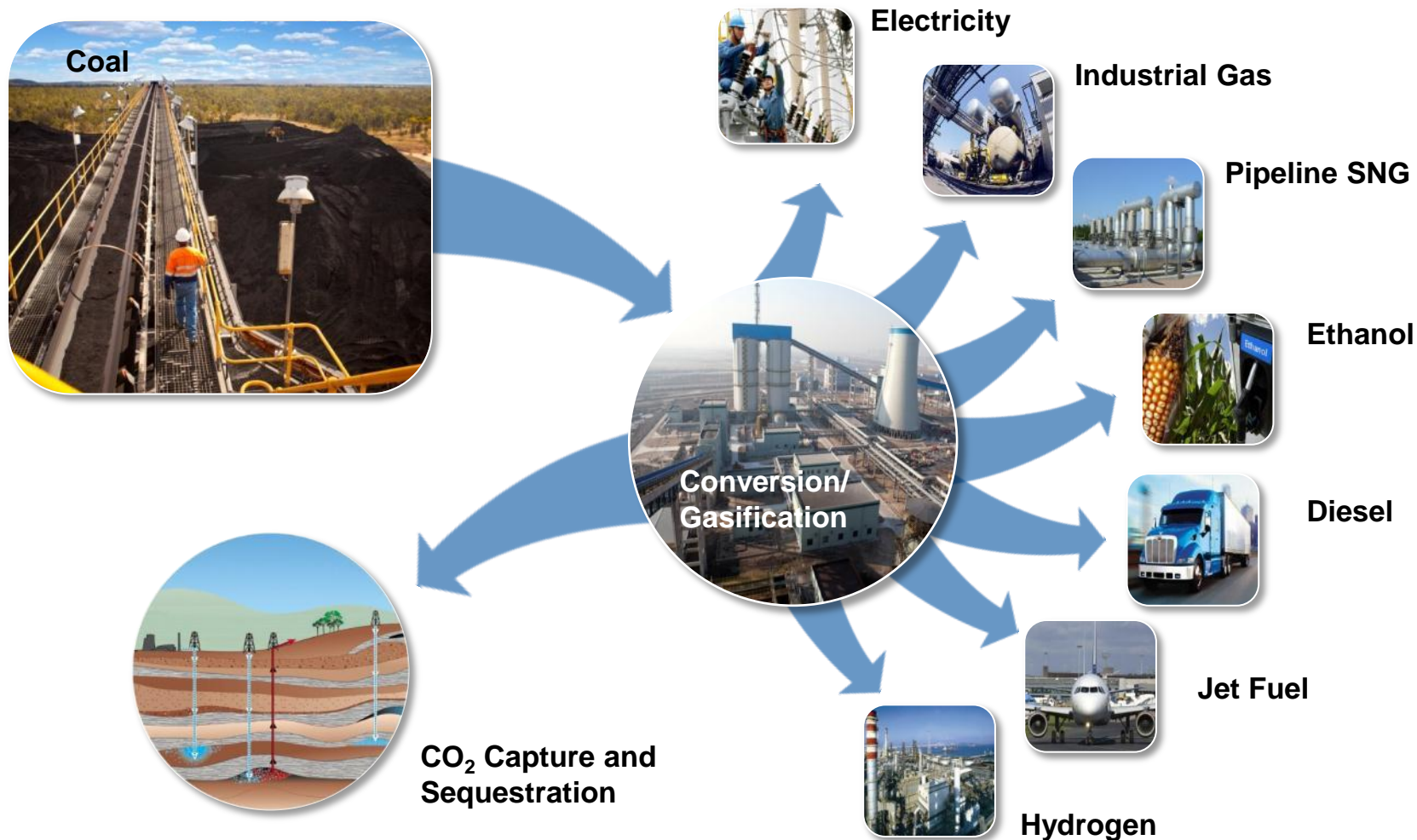


Prairie State Partners Serve More Than 2.5 Million People In Nine States



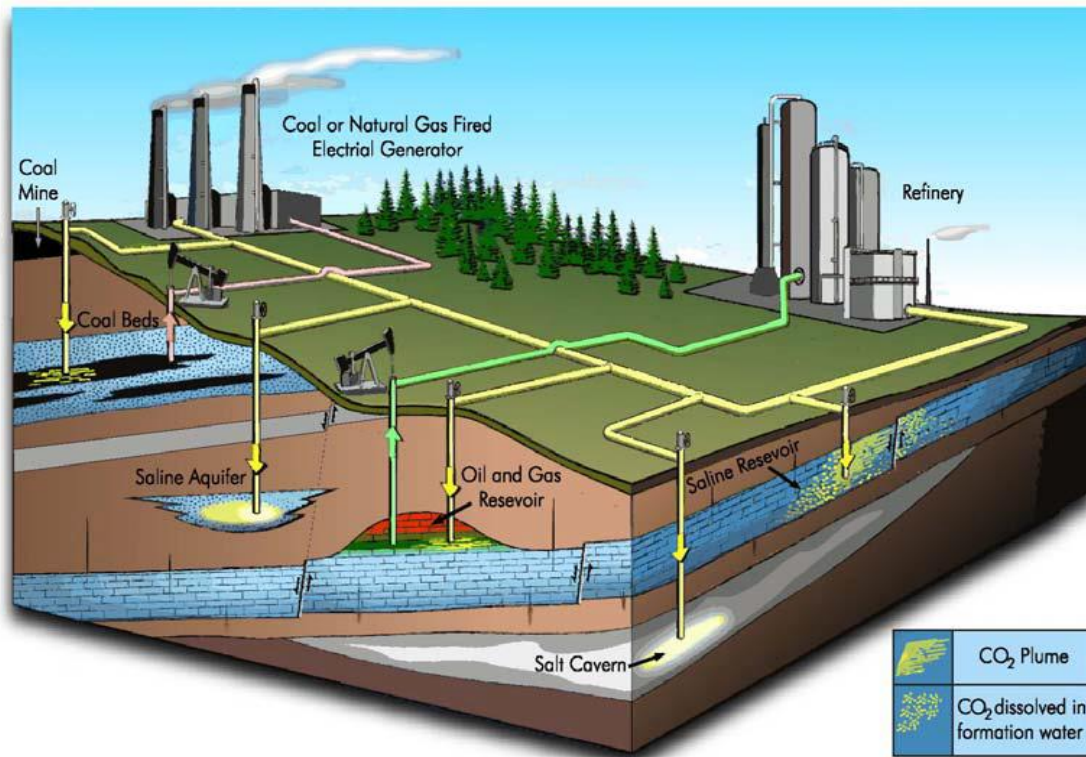
China is the Model, Using Coal Like World Uses Oil

Coal Fuels 80% of China's Economic Engine



CCUS-The EOR Option: Proven and Profitable at \$100/bbl Oil

Carbon is a Product and EOR Commercial Since Early 1970's



Over the next 30 years:

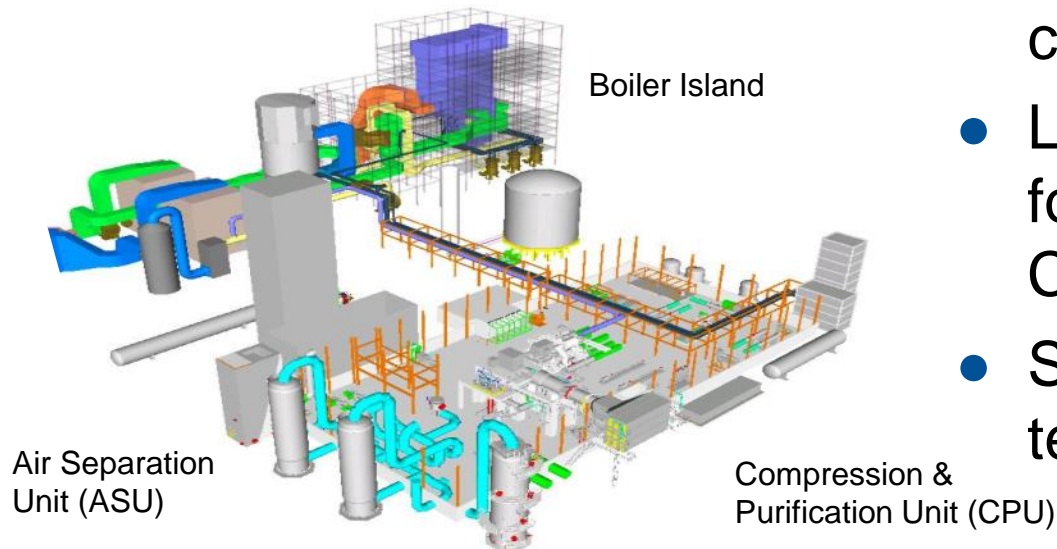
- 87 billion barrels in stranded oil could be recovered in the U.S. alone
- CO₂ is a necessary feedstock for EOR
- Maximum needed:
14 billion tons of CO₂
7 billion tons of coal
- Carbon is a product...
not a problem.

Source: National Energy Technology Laboratory, U.S. Department of Energy, "Storing CO₂ and Producing Domestic Crude Oil with Next Generation CO₂-EOR Technology," Jan. 9, 2009; International Energy Agency: "Coal-Fired Power Generation: Replacement/Retrofitting Older Plants," 2008; Management Information Services and Peabody analysis. Source: DOE/NETL_2012/1540-Figure 1.5.

Technology Path is Clear From DOE's FutureGen 2.0 from U.S...



- First-of-its-kind near-zero emissions plant
- Upgrading Meredosias in Illinois with oxy-combustion technology, capturing 90% of CO₂
- Cleaner than conventional natural gas combined cycle
- Lower cost than other forms of post-combustion CO₂ capture
- Safe, proven pipeline technology



... To China's GreenGen, a Global Model

GreenGen: Among World's Largest Near-Zero Emissions Coal Plants



**Control Room at the GreenGen Plant
Tianjin, China**

- Peabody only non-Chinese partner in GreenGen
- Multi-phase power project with carbon capture and carbon research center
- First 250 MW unit commissioned in 2012

Global Leader Advancing Clean Energy from Coal



Clean Coal Projects in the United States, Australia and Asia

GREENGEN 绿色煤电



- China's GreenGen, Australia's COAL21 Fund and U.S. FutureGen projects
- Australia's Global Carbon Capture and Storage Institute
- Consortium for Clean Coal Utilization
- U.S. Department of Energy National Carbon Capture Center
- GreatPoint Energy Hydromethanation Gasification Technology is China-Bound



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