



Electricity: 30 Years of Industry Change

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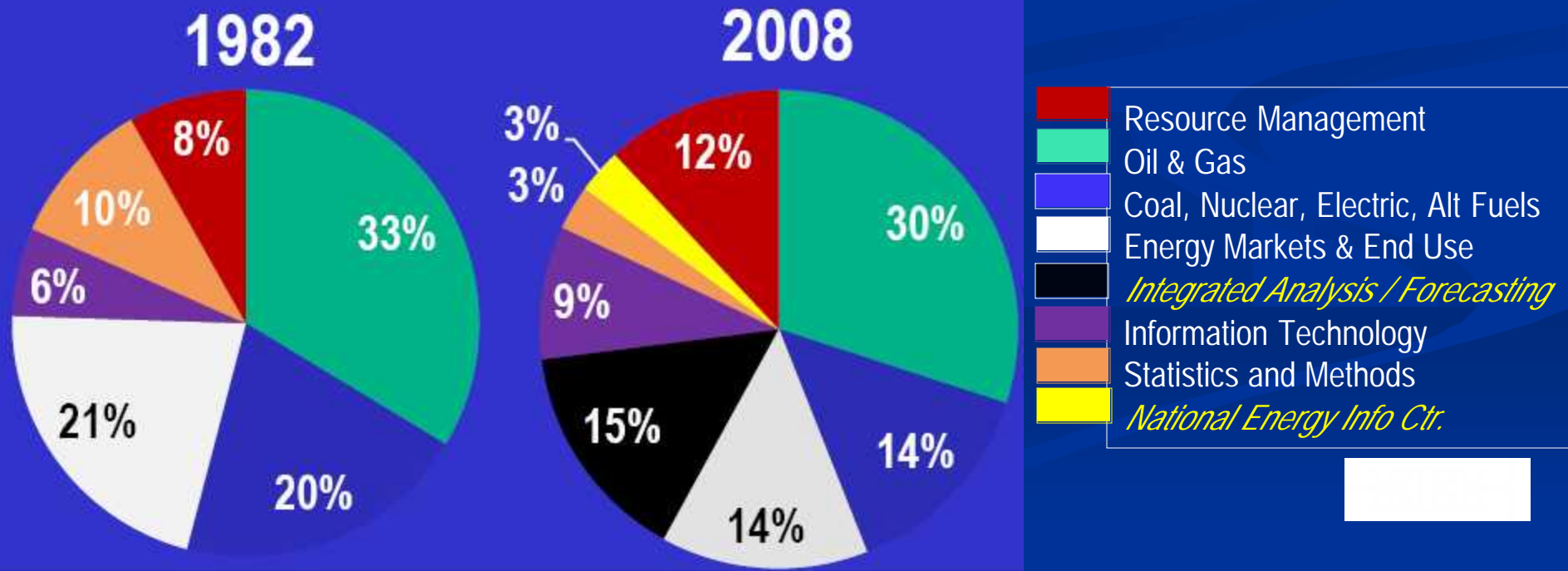
30 Years of Energy Information and Analysis
April 7, 2008

EIA Key to Policy Development and Advocacy Activities

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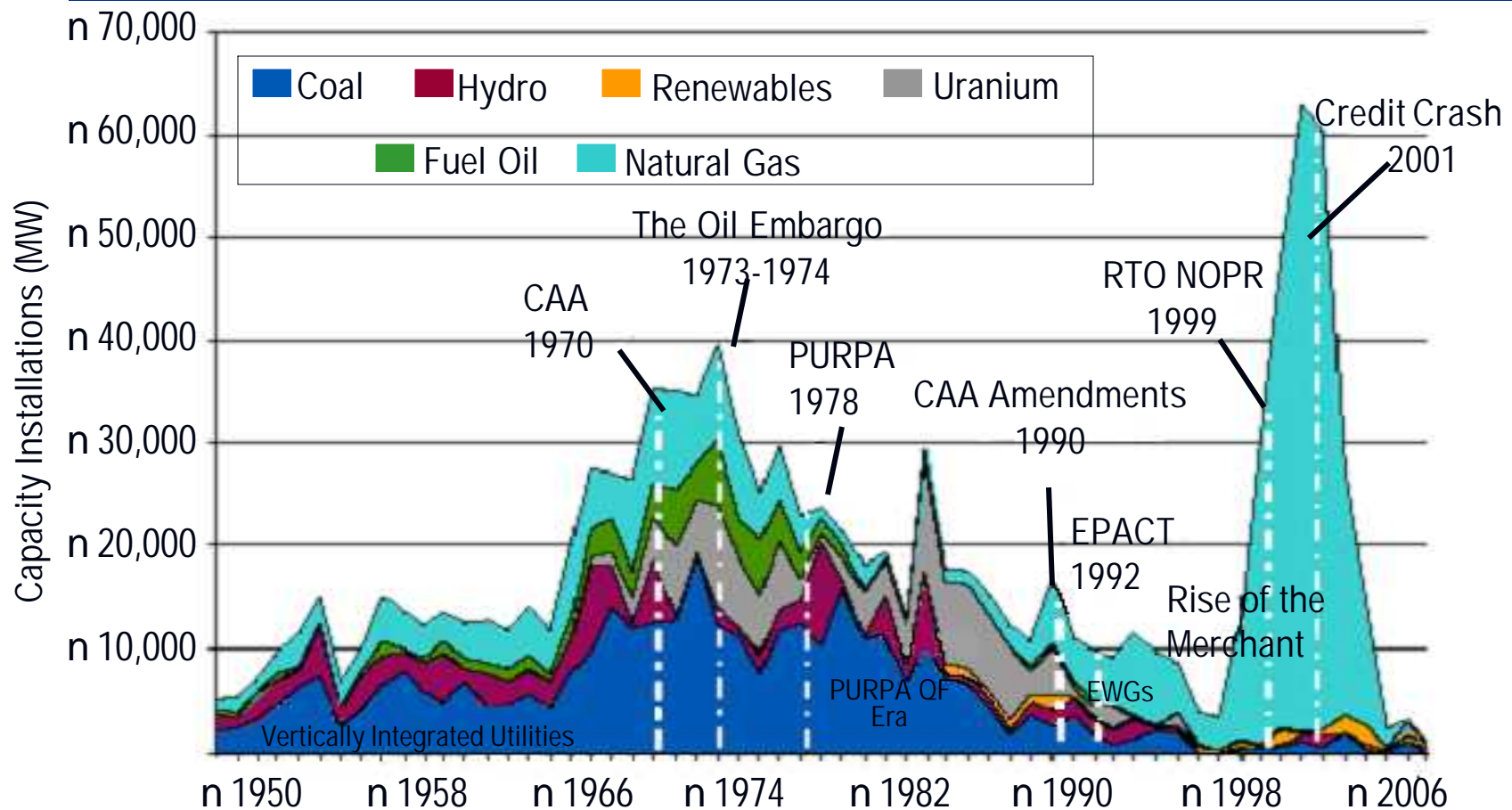
EIA Has Kept Pace With an Evolving Energy Industry

- EIA clearly provides more with less budgetary support
 - 1979: \$347 million
 - 2007: \$91 million (both in Real \$2007)
- EIA staff resource distribution has tracked changing energy markets and information needs



Generation Options – Public Policy Drives Resource Mix

New Generation Capacity By Fuel Since 1950



Source: Henwood Energy Consulting

Transformation or Chaos?

The New Public Policy Challenges

Enormous CapEx

\$750 -900 Billion
Exceeds current capitalization
Major new coal, nuclear and transmission

Rising Costs and Prices

No longer a declining cost industry
Fuel, infrastructure components,
global industrialization and competition

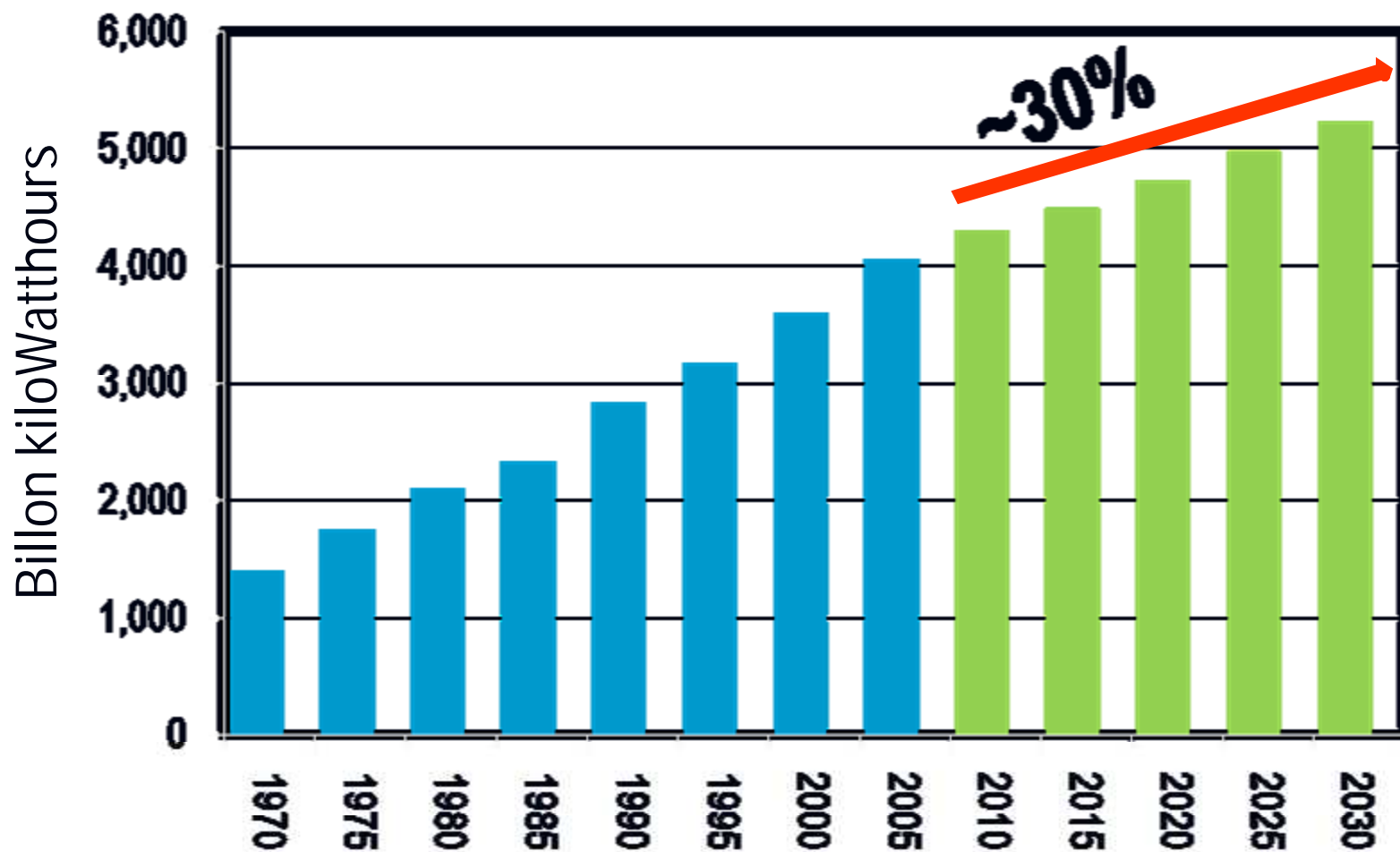
Climate Change

Dozen bills pending in Congress
States becoming aggressive
Role of Renewables
> \$1 Trillion ???

Energy Efficiency

Low hanging fruit for Climate Change
Need to make it a sustainable business
"Smart" appliances, buildings, grid

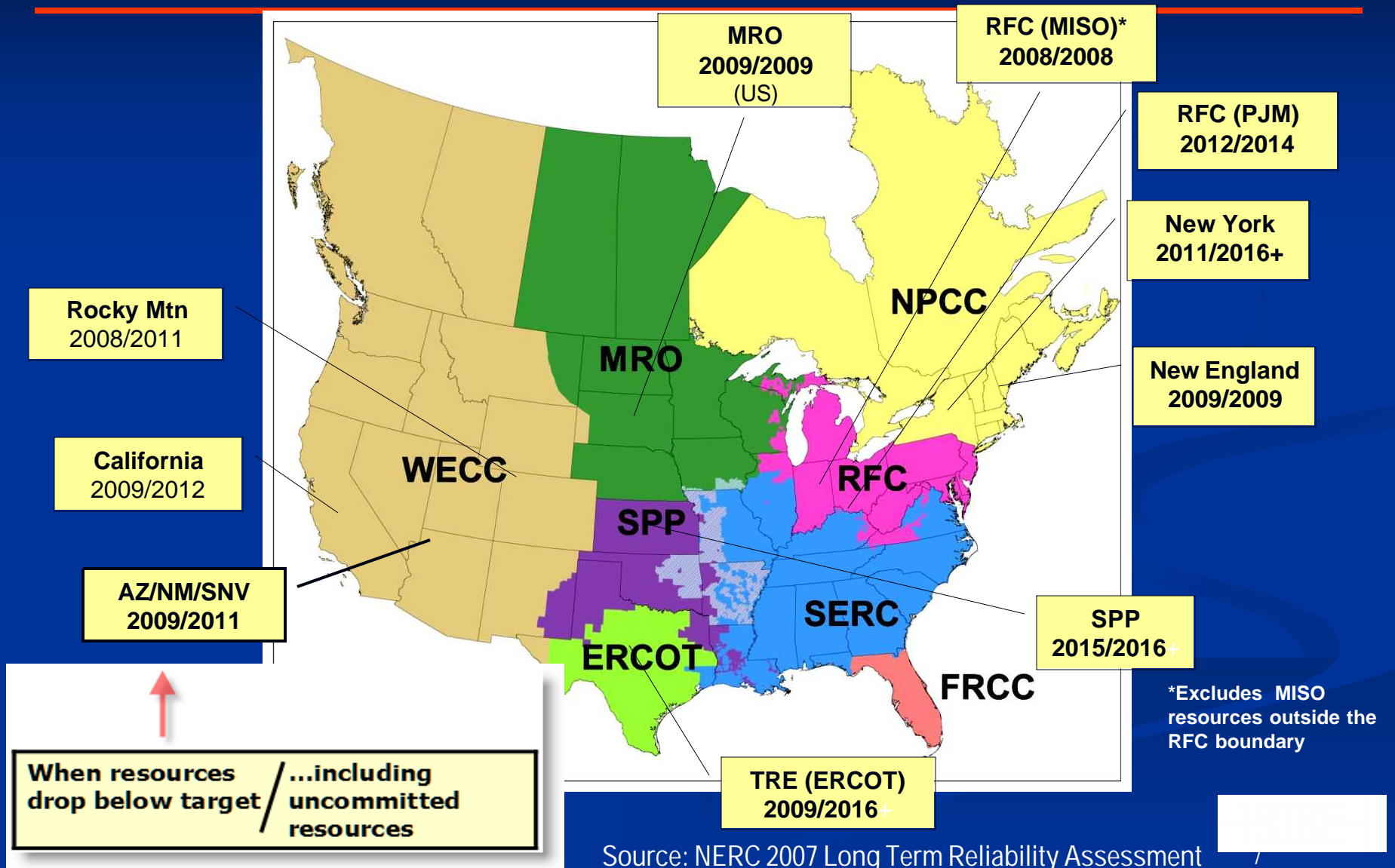
Demand Projected To Increase 30% by 2030



Sources: U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2006* and *Annual Energy Outlook 2008 Early Release*

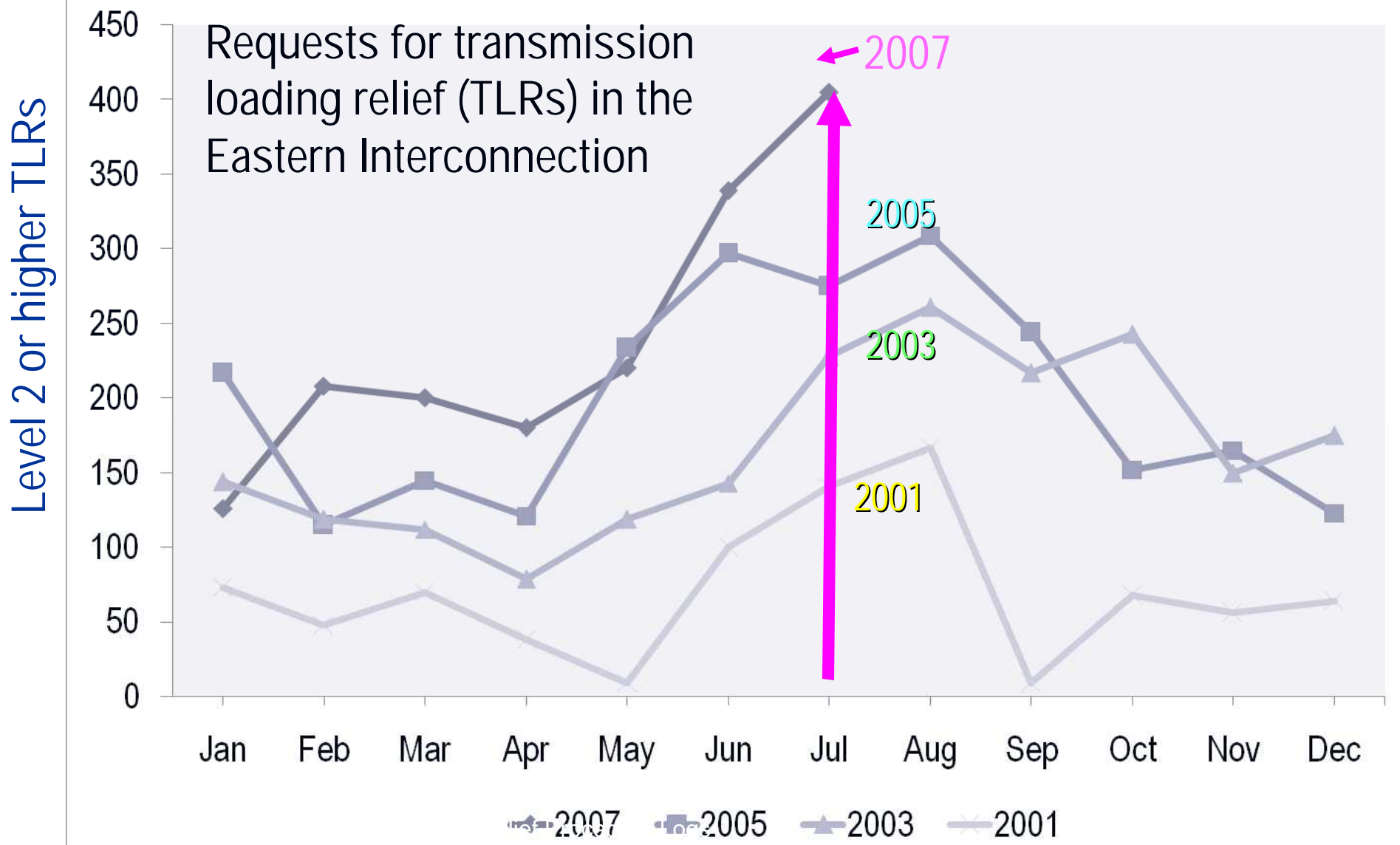
*Electricity demand projections based on expected growth between 2006-2030

Margins Projected to Fall Below Minimum Target Levels



Source: NERC 2007 Long Term Reliability Assessment

Transmission Congestion Dramatically Increasing



Aging Transmission Infrastructure

- “Rising Utility Construction Costs: Sources and Impacts”
 - Edison Foundation/Brattle Group Report
- *70 % of transmission lines are 25 years or older*
- *70 % of power transformers are 25 years or older*
- *60 % of circuit breakers are more than 30 years old*

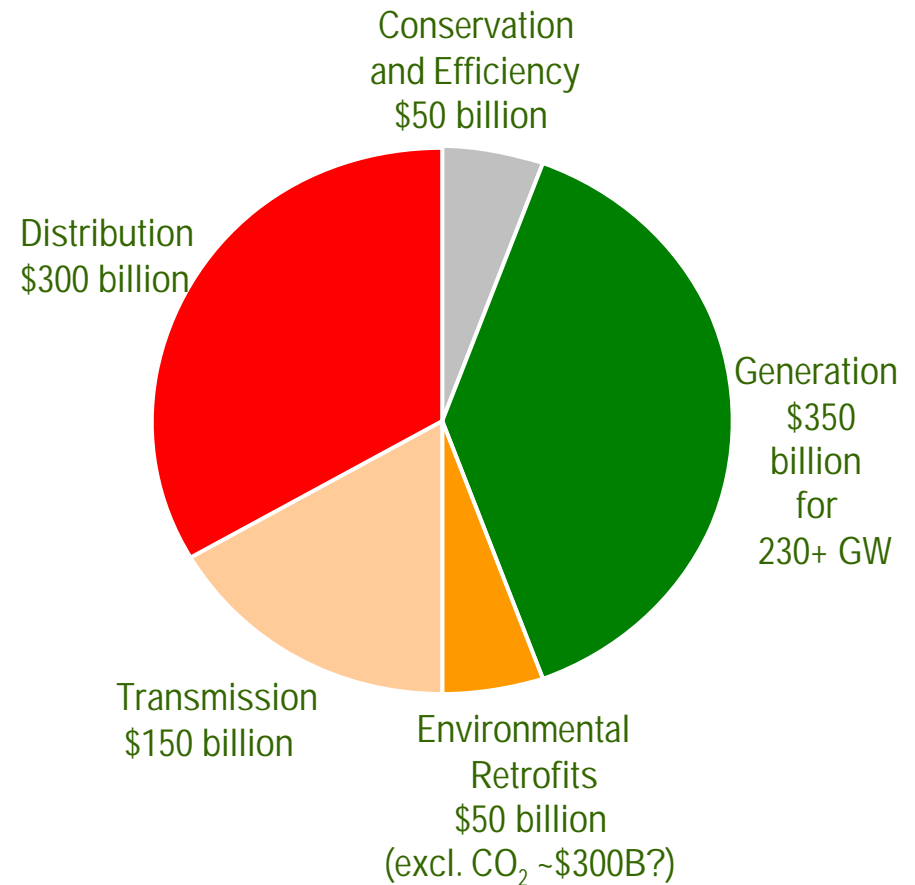
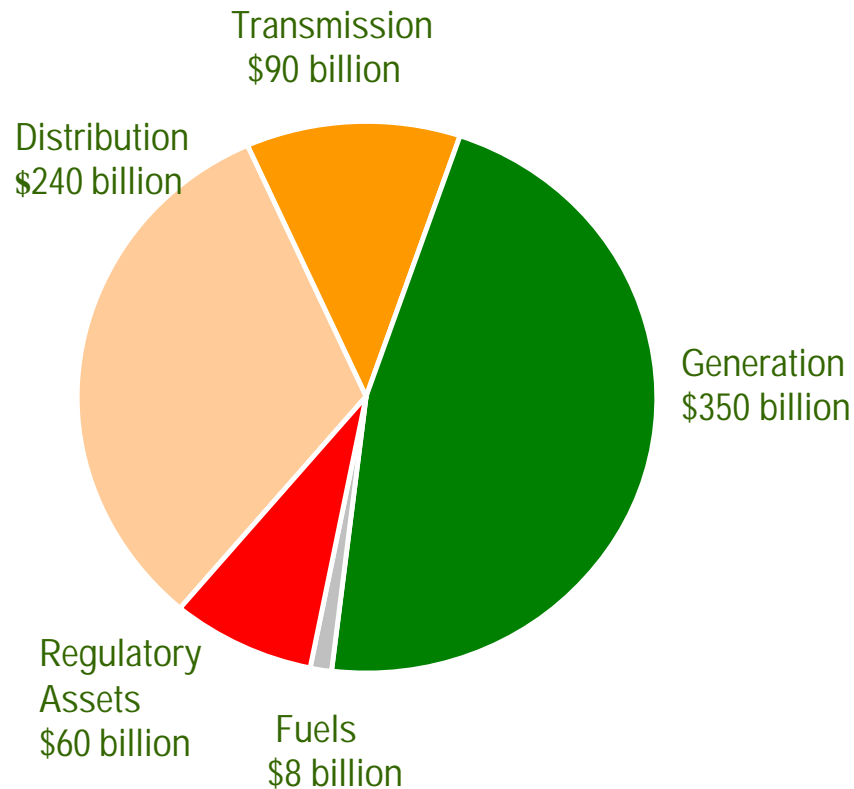
http://www.globalenvironmentfund.com/GEF%20white%20paper_Electric%20Power%20Grid.pdf



Significant Electric Capital Investment Required

Existing Net Plant in Service \$750 Billion⁽¹⁾

Investment Need for Next 15 Years: \$900 Billion⁽²⁾

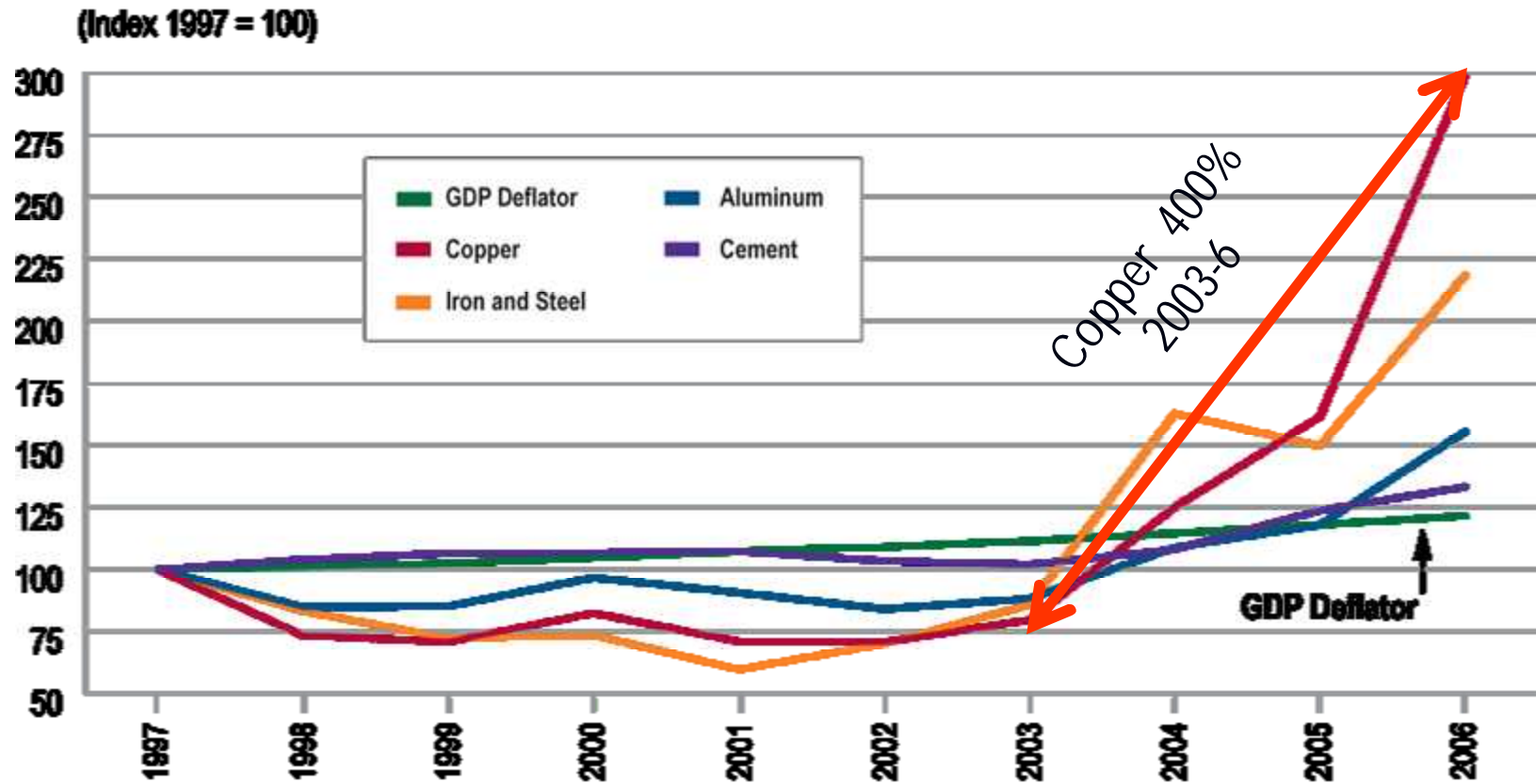


1. End of 2006.

2. 2006 dollars

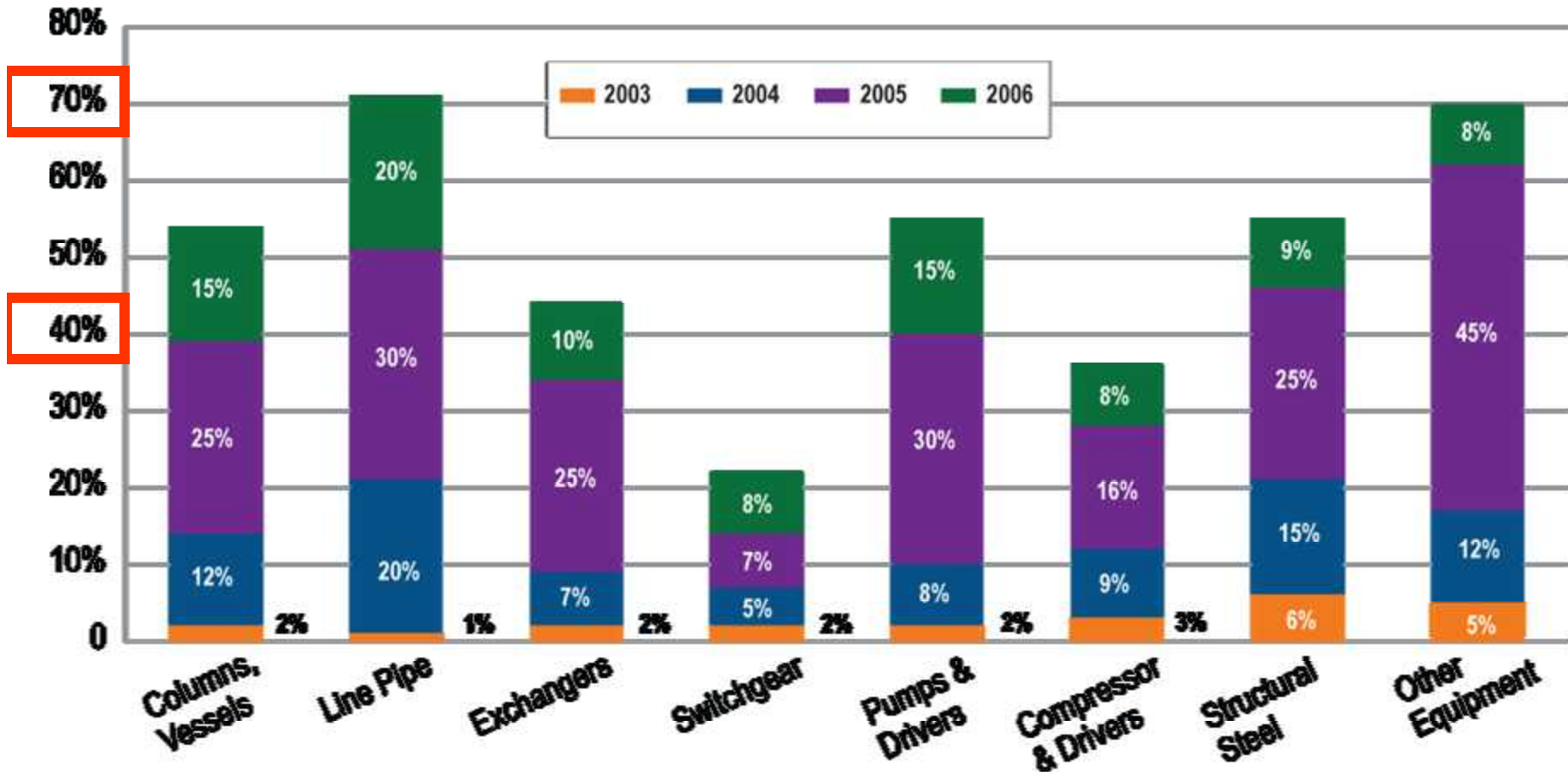
Source: Lehman Brothers. July 2007

Raw Materials Price Indexes



Sources: U.S. Geological Survey, Mineral Commodity Summaries, the Bureau of Economic Analysis, and a forthcoming report on rising utility construction costs prepared by *The Brattle Group* for the Edison Foundation.

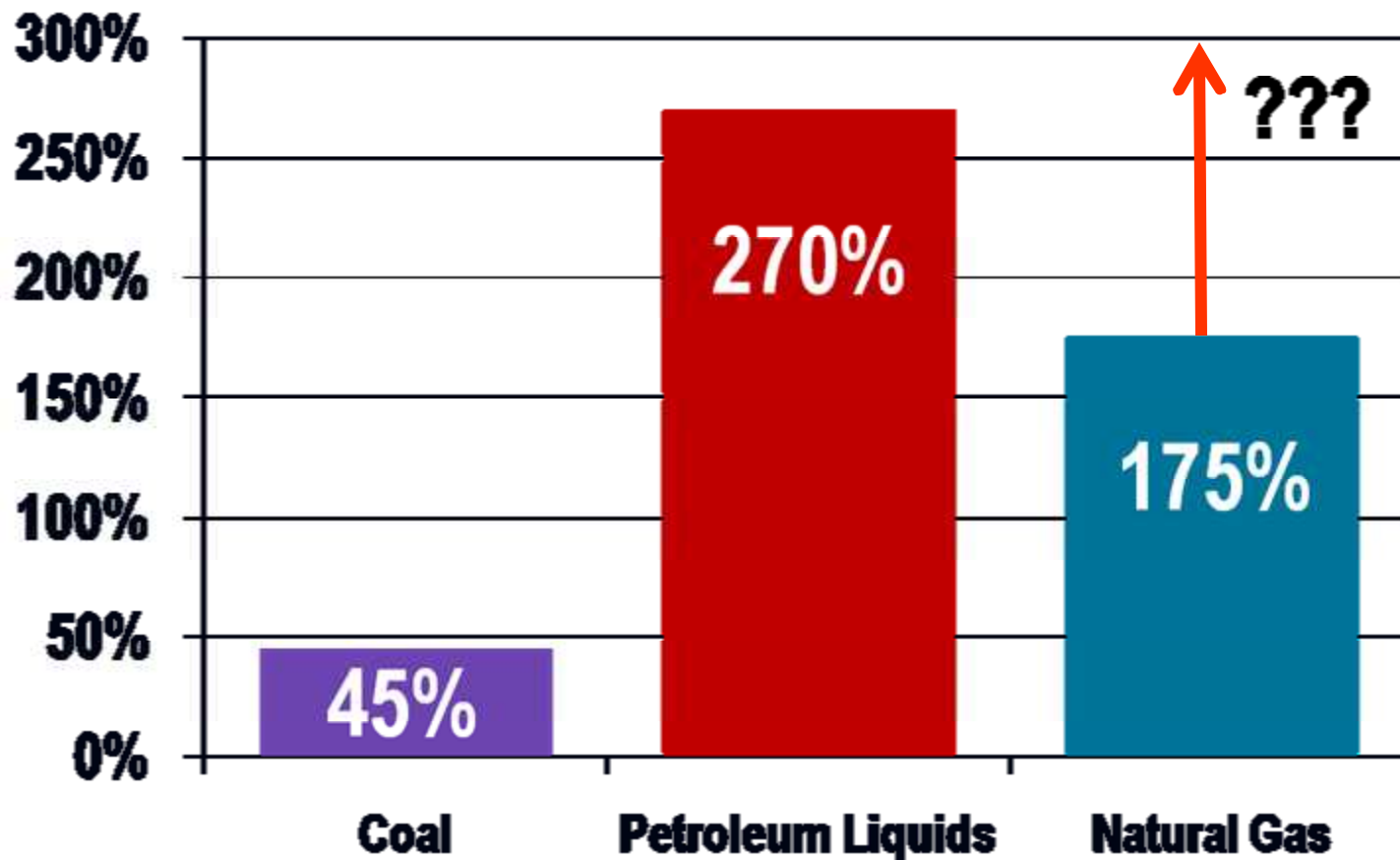
Equipment Price Increases 2002-2006



Sources: John Siegel, Bechtel Power Corp., "Who, What, Where, How" (presentation delivered at the Next Generation of Generation Conference [Dewey Ballantine LLP], May 4, 2006), and a forthcoming report on rising utility construction costs prepared by The Brattle Group for the Edison Foundation.

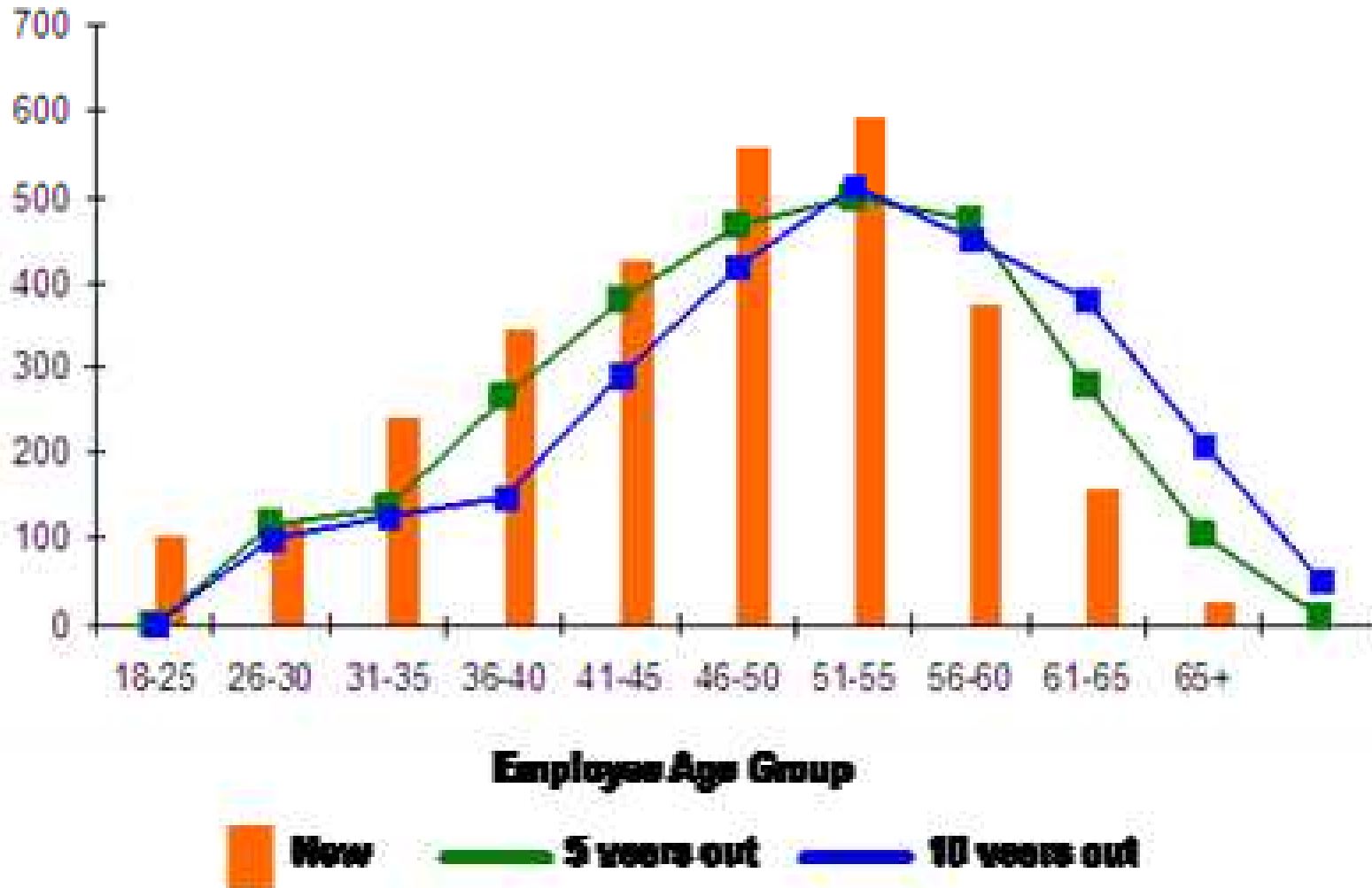
Fuel Costs Increasing Dramatically

1999 – November 2007



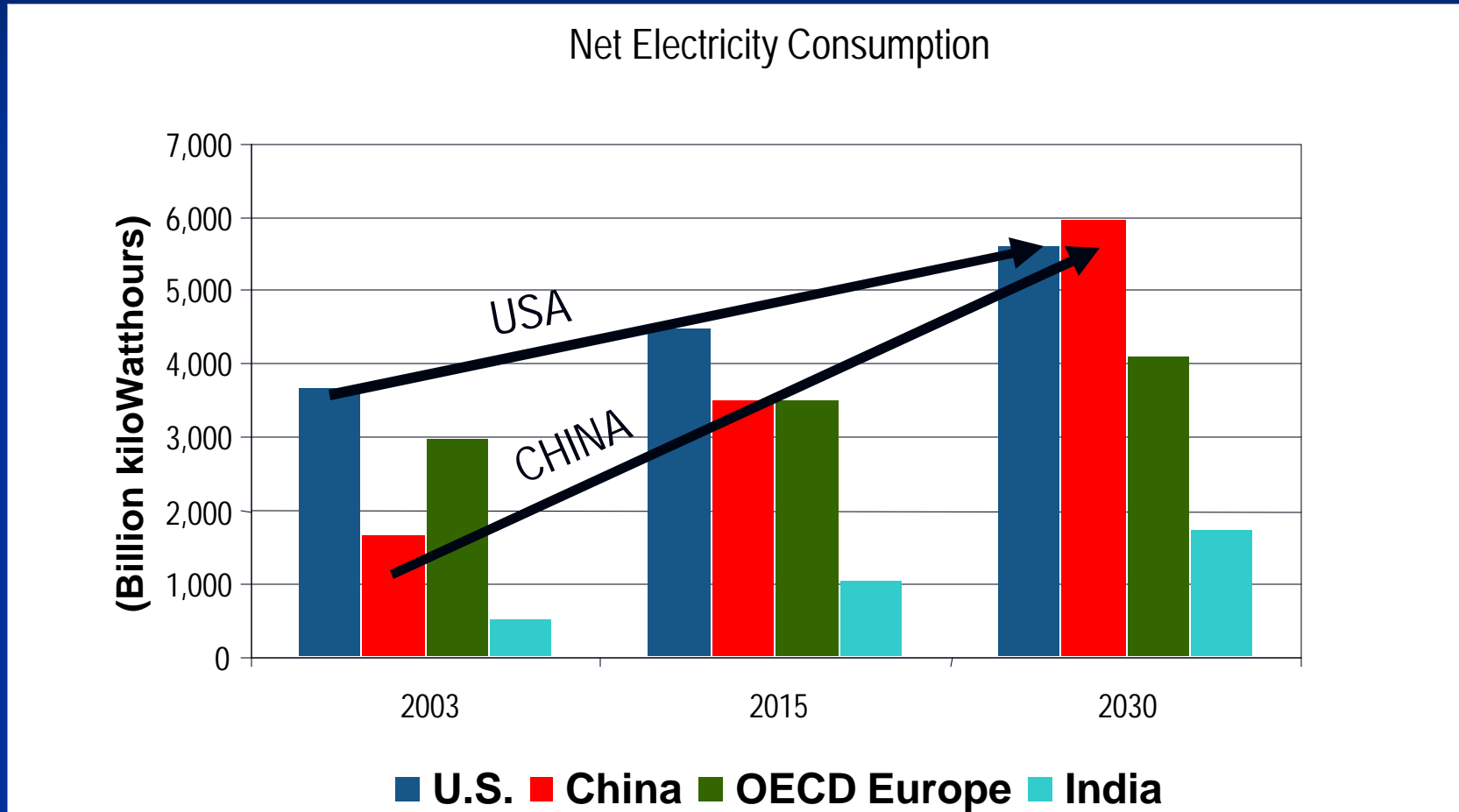
Source: U.S. DOE/EIA Electric Power Monthly, March 2008 Release
Table 4.1-based on \$/MMBtu Delivered Cost

Aging Workforce Trend (Typical Utility)



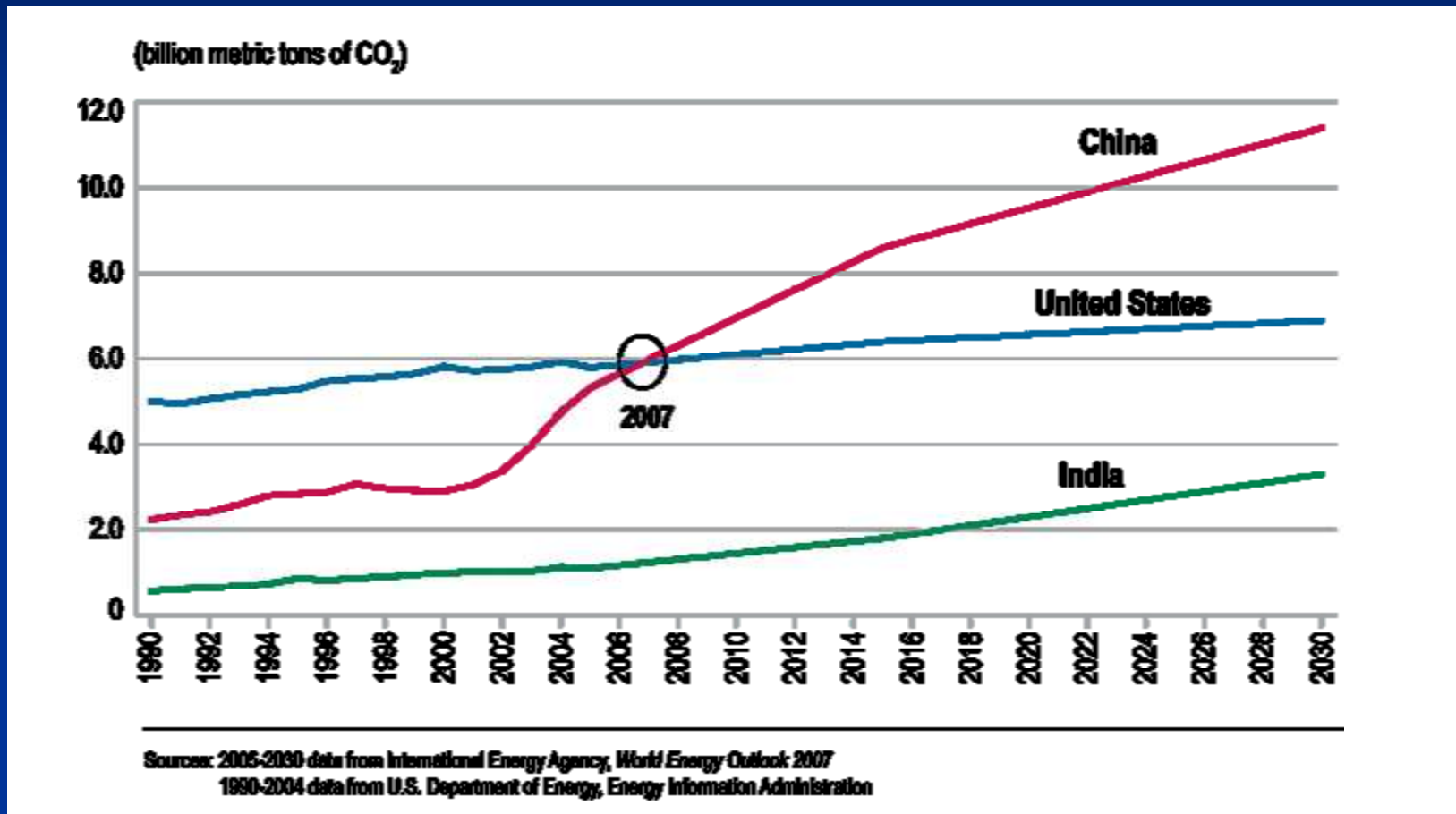
Source: KEMA

Worldwide Electricity Demand Growth



Source: Energy Information Administration, *International Energy Outlook 2006*

China's CO₂ Emissions Surpass U.S. in 2007*



* Based on projected data from the International Energy Agency, November 2007.

What Will It Take?

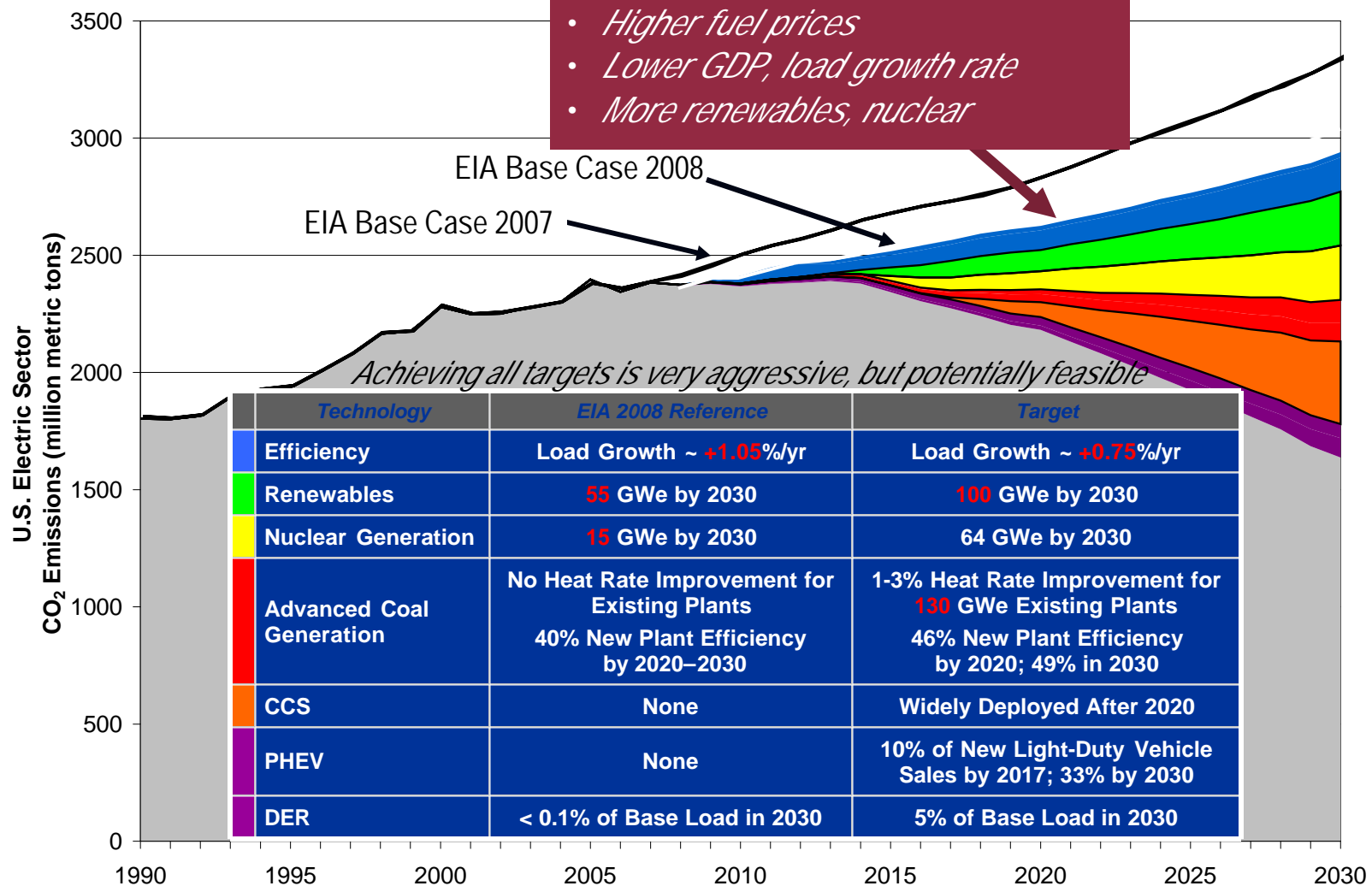
There Is No Silver Bullet!

- Energy Efficiency
- Renewables
- Clean Coal Technologies
- Carbon capture and storage
- Nuclear
- Plug-in hybrid electric vehicles

*We need it all ...
but it will be costly!*



CO₂ Reductions – What's Technically Feasible?



(EPRI Prism – With EIA Update)

An Intensified National Commitment To Energy Efficiency

- Aggressive campaign for technologies
 - Smart buildings
 - Smart appliances
 - Smart electric meters and grid
 - Smart rates

- Use of “smart technologies” and new rate designs can
 - Allow consumers to control their energy usage to save money
 - Avoid wasting energy
 - Control how and when appliances do their jobs
 - Help utilities efficiently operate their systems and maintain reliability
 - Help keep supply and demand in balance
 - Support more efficient use of generating resources

- Commercializing plug-in hybrid electric vehicles



Challenge:




Technologies and Timeframes

- Advanced coal technologies integrated with Carbon Capture and Storage (CCS)
 - Not commercially available until 2020-2025
- Deployment of nuclear plants
 - Not possible until 2015 at earliest

*During the transition there will be a "dash to gas"
Driving up both electricity and gas prices*



Range of Potential Impacts From Climate Legislation?

- Cost per household  \$446 - \$2927 in 2020 / year
- Electricity prices  21% - 35% in 2020
- Natural gas prices  20% - 39% in 2020
- GDP  0.7% - 1.74% (~ \$336B out of \$~19.2T GDP)
- Employment  1.1 - 2.78 million in 2020
- Coal consumption  42% - 66% in 2020
- Permit prices (\$ / ton CO₂ equivalent)  \$18 - \$48 / ton in 2020
- Total US GHG emission (mmtCO₂-equivalent)  4887 – 6654 in 2030 ("Business As Usual" 9672 in 2030)

It's All About The Assumptions!

Who's Assumptions Are Right? Wide Ranges

- New Renewables
 - 16 GW <--> 176 GW by 2030
- Coal w/ Carbon Capture and Storage
 - 25 GW <--> 250 GW by 2030
- New Nuclear
 - 3.5 GW <--> 117 GW by 2030
- Energy Efficiency
 - *Major impact – How much?*
- Offsets
 - 15% domestic only <--> 30% domestic and international

Industry Challenges / Public Policy Context

- Climate change and the need to enhance the nation's electric infrastructure are historic
- Identify and understand assumptions
 - Future with nuclear, coal, energy efficiency
 - Potential rate impacts of various scenarios
- EIA's modeling and analysis role is critical to the debate and ultimate resolution of these issues
- A modeling forum?
 - Enhance understanding and appreciation of the assumptions and models used for the analysis of critical public policy initiatives



One Last Point ... EIA Survey Forms

- Concern :
 - Massive overhaul of EIA survey forms (eff.1/1/08)
- Result:
 - EIA and Industry too little time to adjust (EIA still developing software for form filing)
- Recommendations
 - (1) Need to start process earlier - explain forms, understand industry issues
 - (2) Improve consideration of industry concerns during ongoing industry transformation
 - (3) At least 6 months after final approval before forms effective



Summary:

Challenges Are Plentiful

- Supply margins are declining and demand is increasing
 - Need significant infrastructure investment but costs increasing rapidly
- Transmission is aging and becoming more congested
- All costs increasing – fuel, construction, equipment
- Workforce getting older
 - Need to support programs for science and engineering
- Significant concerns about the environment
 - Need to accelerate development and deployment of new technologies
- Energy efficiency is becoming increasingly important



The Path Forward

An Apollo Like Vision!

- Secure a national (worldwide) commitment to reducing GHG emissions
 - Involve all sectors of the economy
 - Aggressive education campaign - costs and benefits
 - Change attitudes about energy efficiency – all sectors
- Accelerate the development of needed technologies
 - Substantially increase funding and related incentives to stimulate research, development and deployment
- Create excitement around engineering, mathematics and science
 - Public / private partnership to replace the aging workforce and encourage the next round of technical and strategic leaders

*Not because it is easy,
but because it is the right thing to do!*

