



EPRI

ELECTRIC POWER
RESEARCH INSTITUTE

Electricity Technologies in a Carbon-Constrained World

Bryan Hannegan, Ph.D.

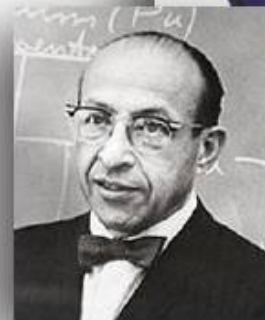
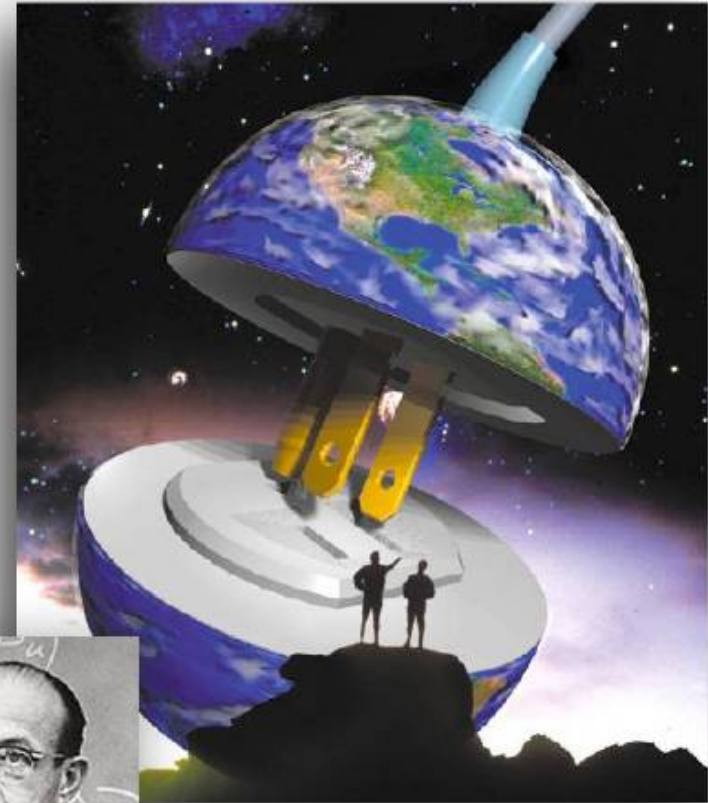
Vice President, Environment & Renewables

4th International Integration Conference

December 7, 2010

Our History...

- Founded by and for the electricity industry in 1973
- Independent, nonprofit center for public interest energy and environmental research
- **Collaborative** resource for the electricity sector
- Over 450 participants in 40 countries
 - Major offices in Palo Alto, CA; Charlotte, NC; Knoxville, TN



Chauncey Starr
EPRI Founder

Our Role...

Help Move Technologies to the Commercialization Stage...

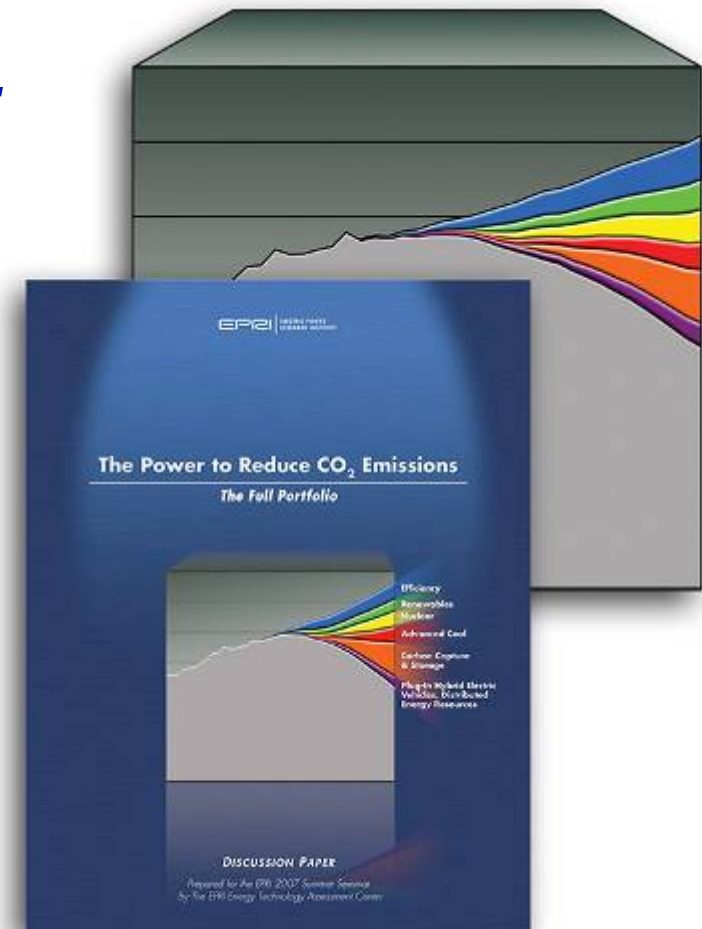


Technology Accelerator!

EPRI's Prism / MERGE Analysis...

Roadmap for a low-carbon future...

- Detailed analysis of the pathway to reducing CO₂ emissions across the electricity sector
- Provides guidance on the needed generation mix to slow, start and reverse global CO₂ emissions
- Cited in numerous national and international publications



Context

The EPRI Prism **IS** ...

- A bottom-up estimate of GHG reduction potential (if we accomplish X , we can reduce emissions by Y)

The EPRI Prism is **NOT** ...

- A rigorous unit-by-unit assessment
- A detailed economic analysis
- A climate policy recommendation

Intended to start conversations about technology, not end them!

Components of the 2009 Prism

- Efficiency
 - End-Use Efficiency
 - T&D Loss Reduction

EPRI Analysis and Initiatives
- Renewables
 - Central Station (Wind, Solar CSP, Biomass, Geothermal)
 - Distributed (Solar PV)

EPRI RPS Analysis
- Nuclear
 - Existing Plant Life Extension
 - New Advanced Reactors

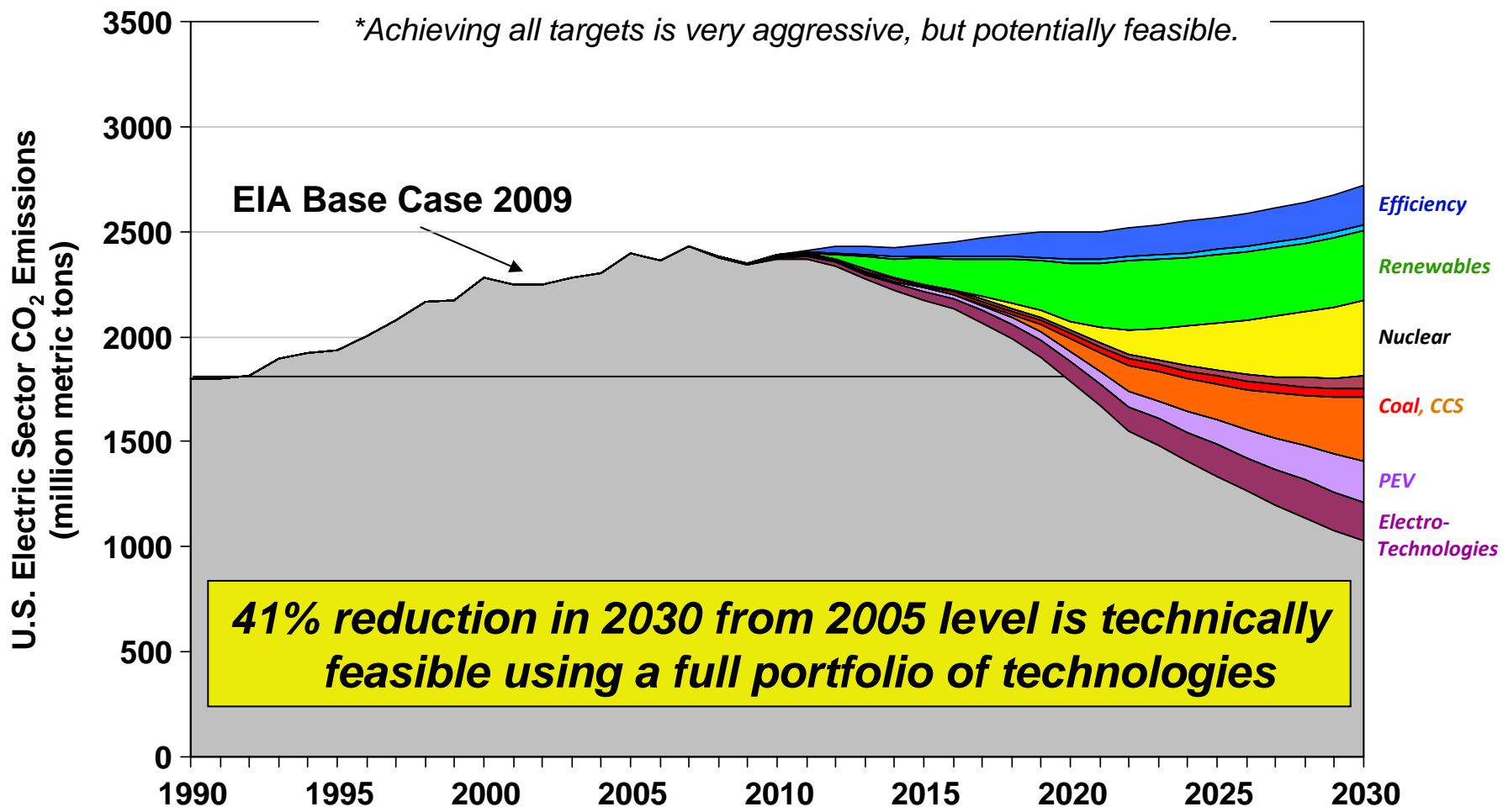
EPRI – INL Roadmap
- Fossil Plant Efficiency
 - Heat Rate Improvements for Existing Coal
 - High Efficiency New Coal and New Gas

EPRI – CURC Roadmap
- Carbon Capture and Storage
 - Existing Coal Retrofits
 - All New Coal + NGCC Post-2020

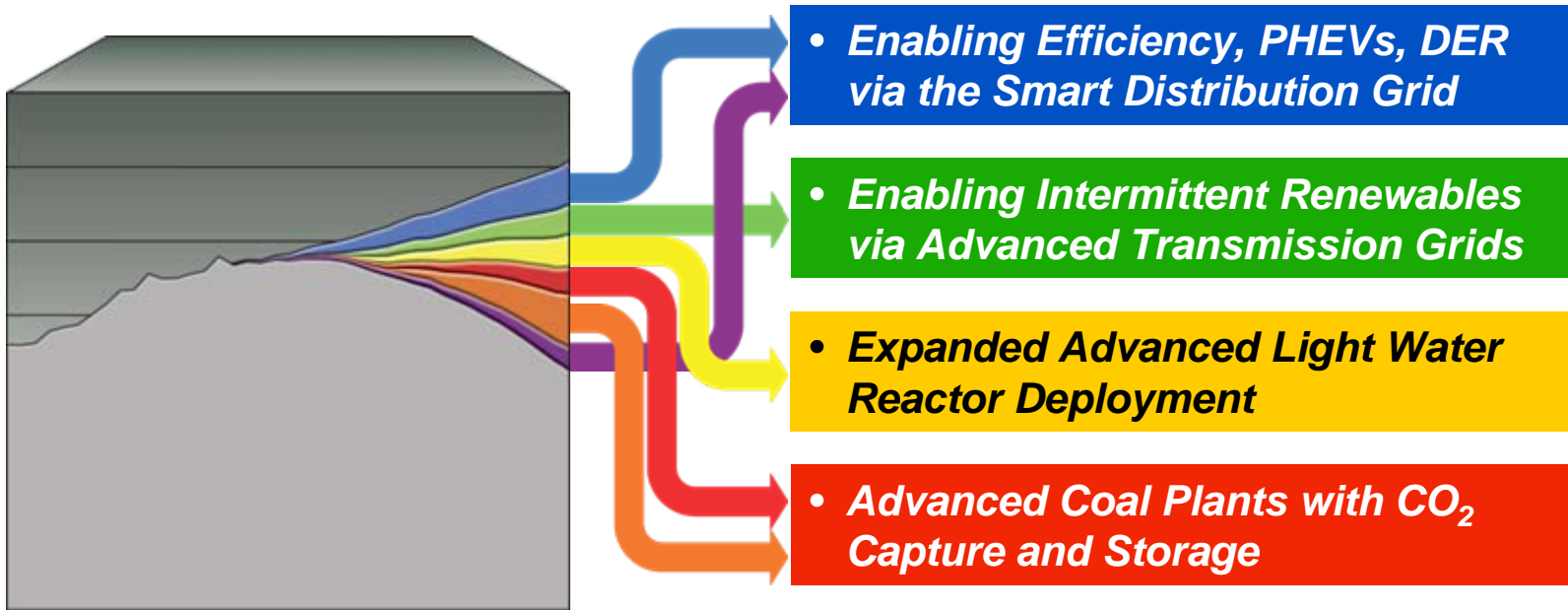
EPRI CoalFleet; CCS Demos
- Expanded Use
 - PHEVs
 - Electrotechnologies

EPRI Analysis

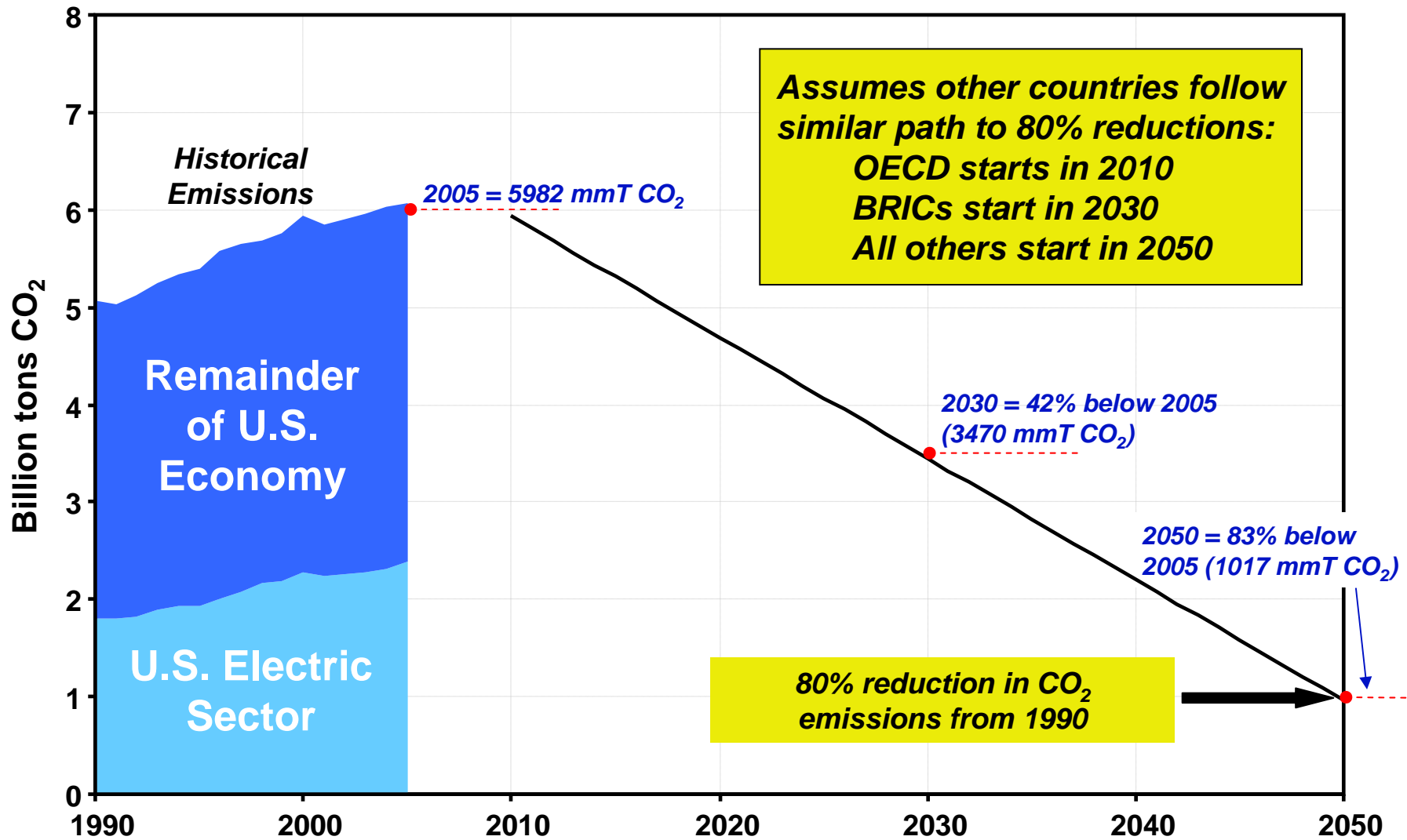
CO₂ Reductions ... Technical Potential*



Key Technology Challenges



MERGE CO₂ Reduction Scenario



MERGE Technology Scenarios

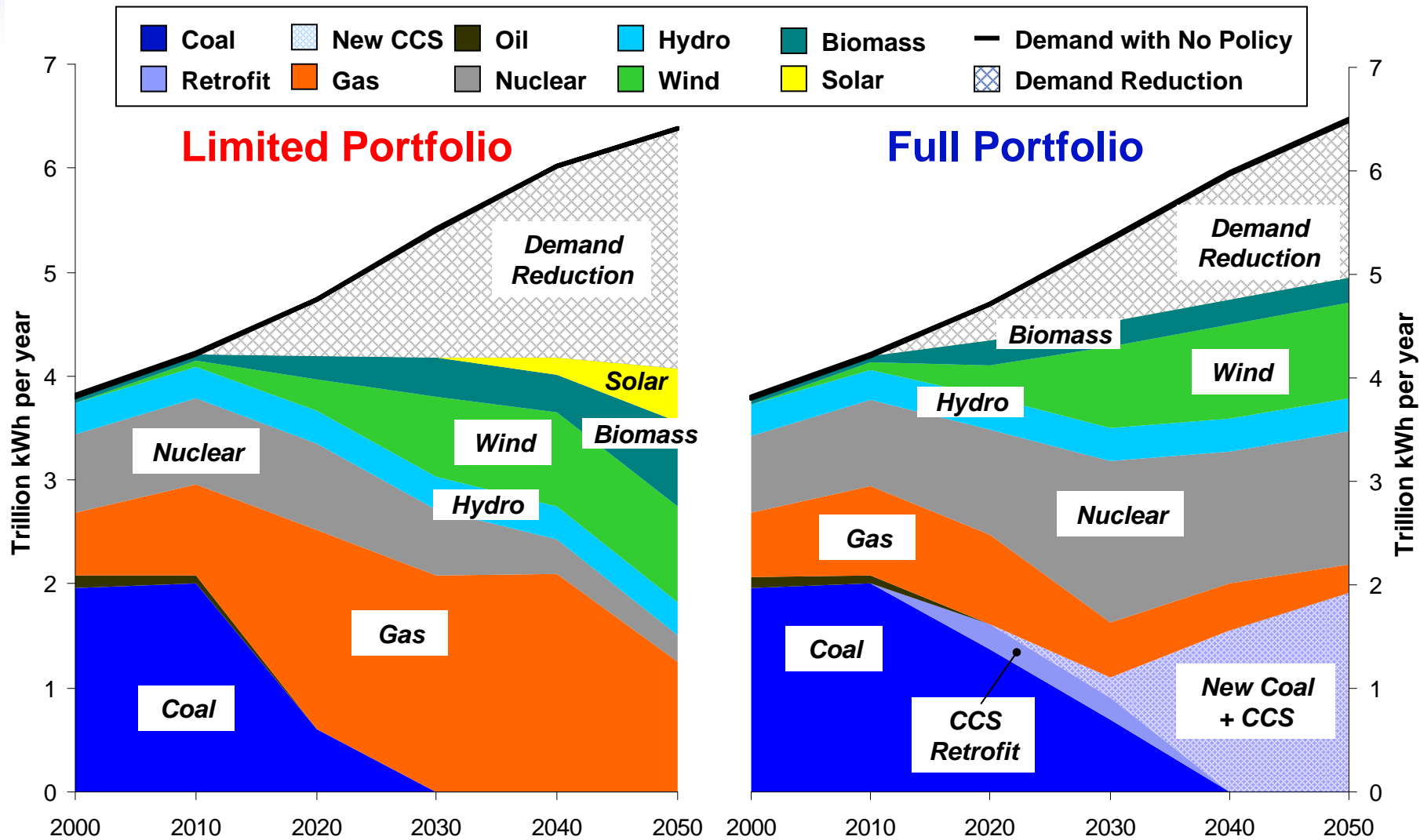
Supply-Side

	Limited Portfolio	Full Portfolio
Carbon Capture and Storage (CCS)	Unavailable	Available
New Nuclear	Existing Production Levels ~100 GW	Production Can Expand
Renewables	Costs Decline	Costs Decline Faster
New Coal and Gas Generation	Improvements	Improvements

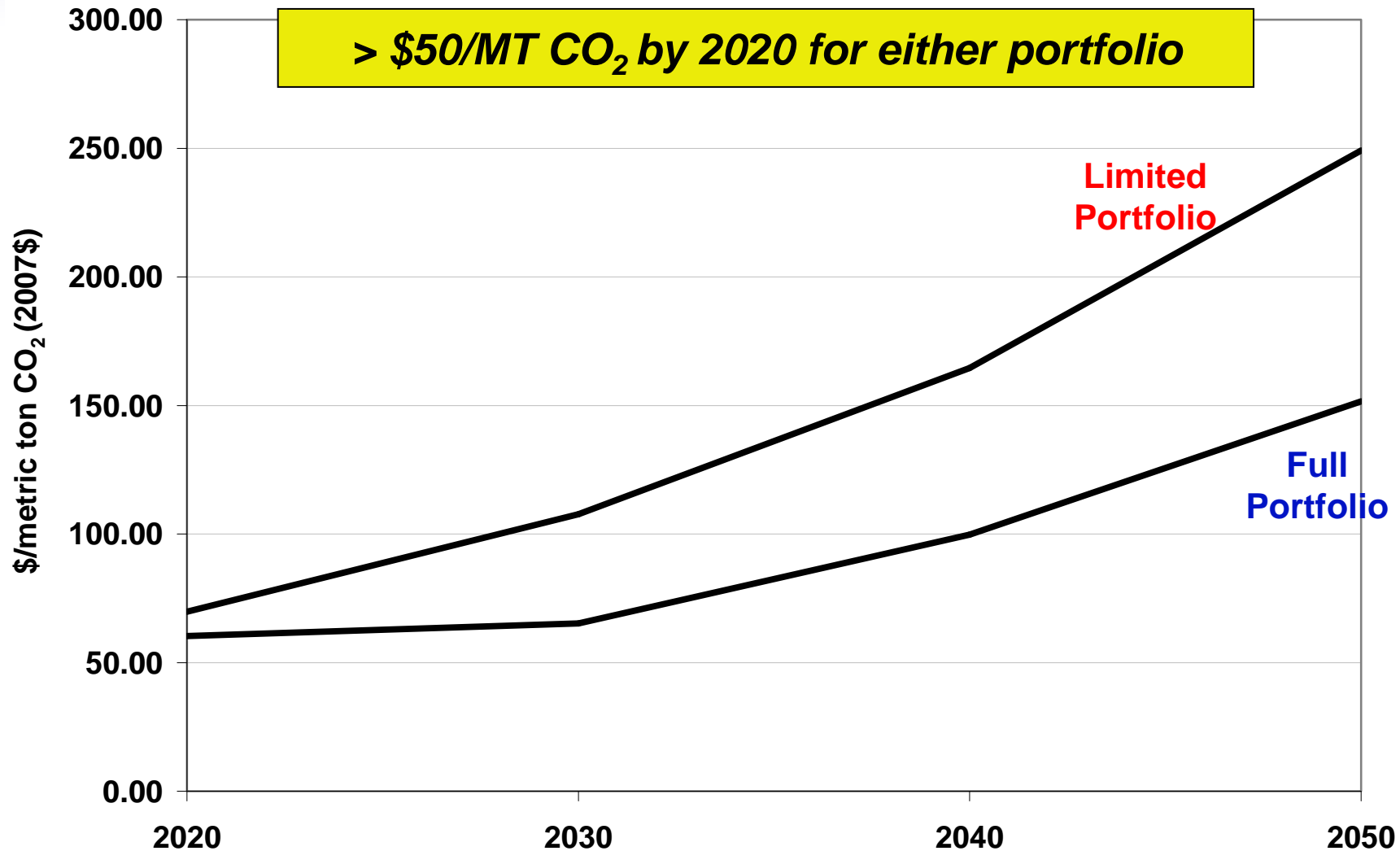
Demand-Side

Plug-in Electric Vehicles (PEVs)	Unavailable	Available
End-Use Efficiency	Improvements	Accelerated Improvements

MERGE U.S. Electric Generation Mix

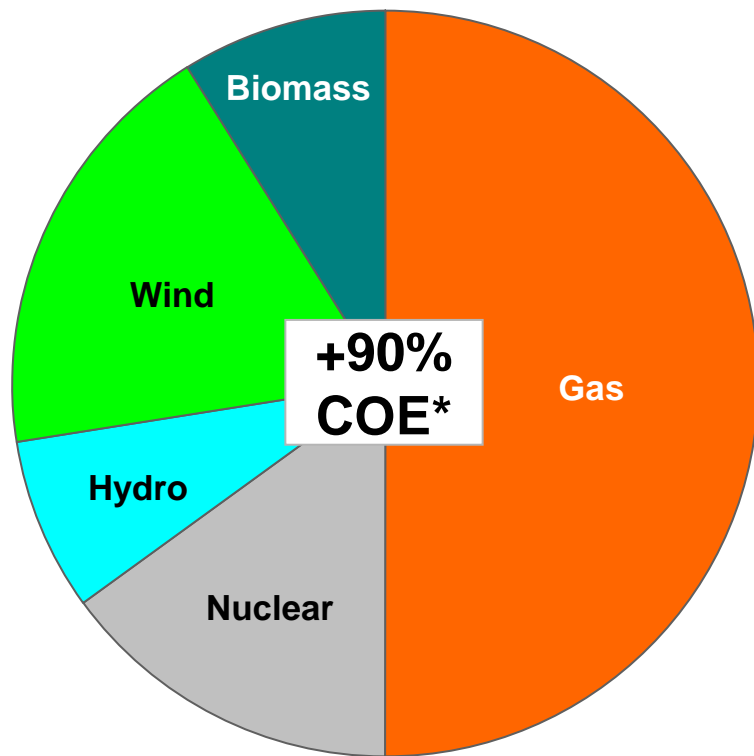


MERGE CO₂ Price Results

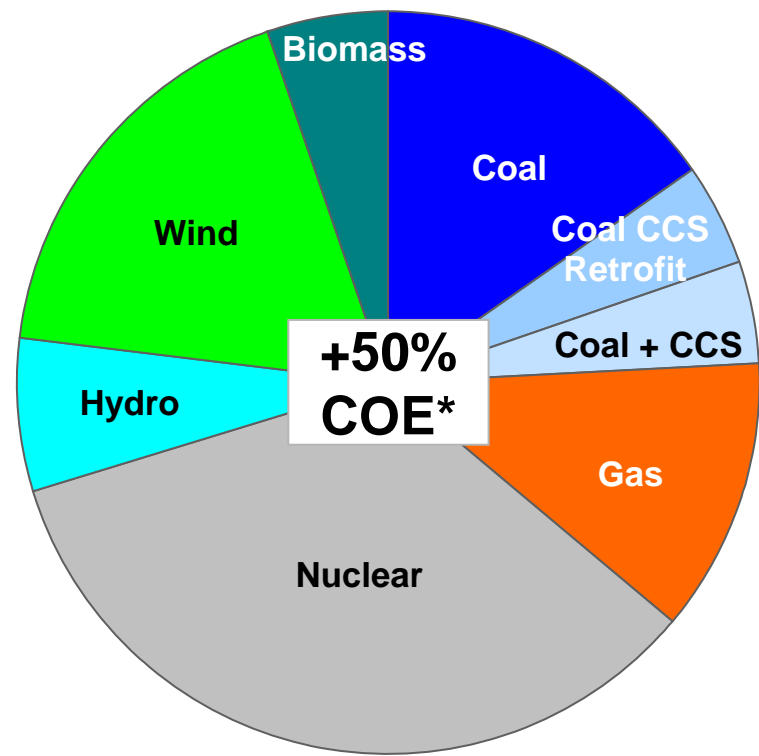


Generation Mix and Electricity Cost* in 2030

Remarkably different futures...and only 20 years away!



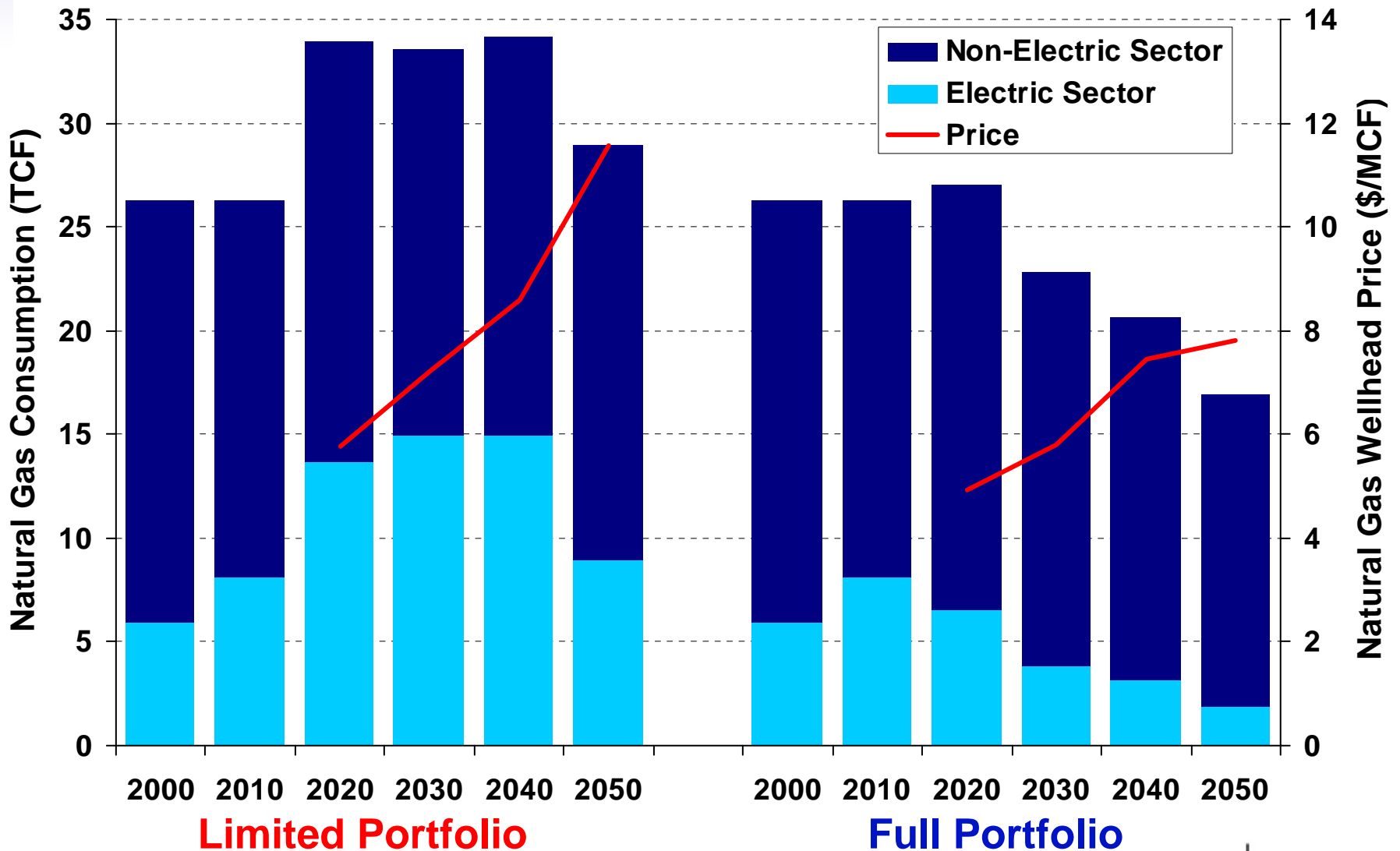
Limited Portfolio



Full Portfolio

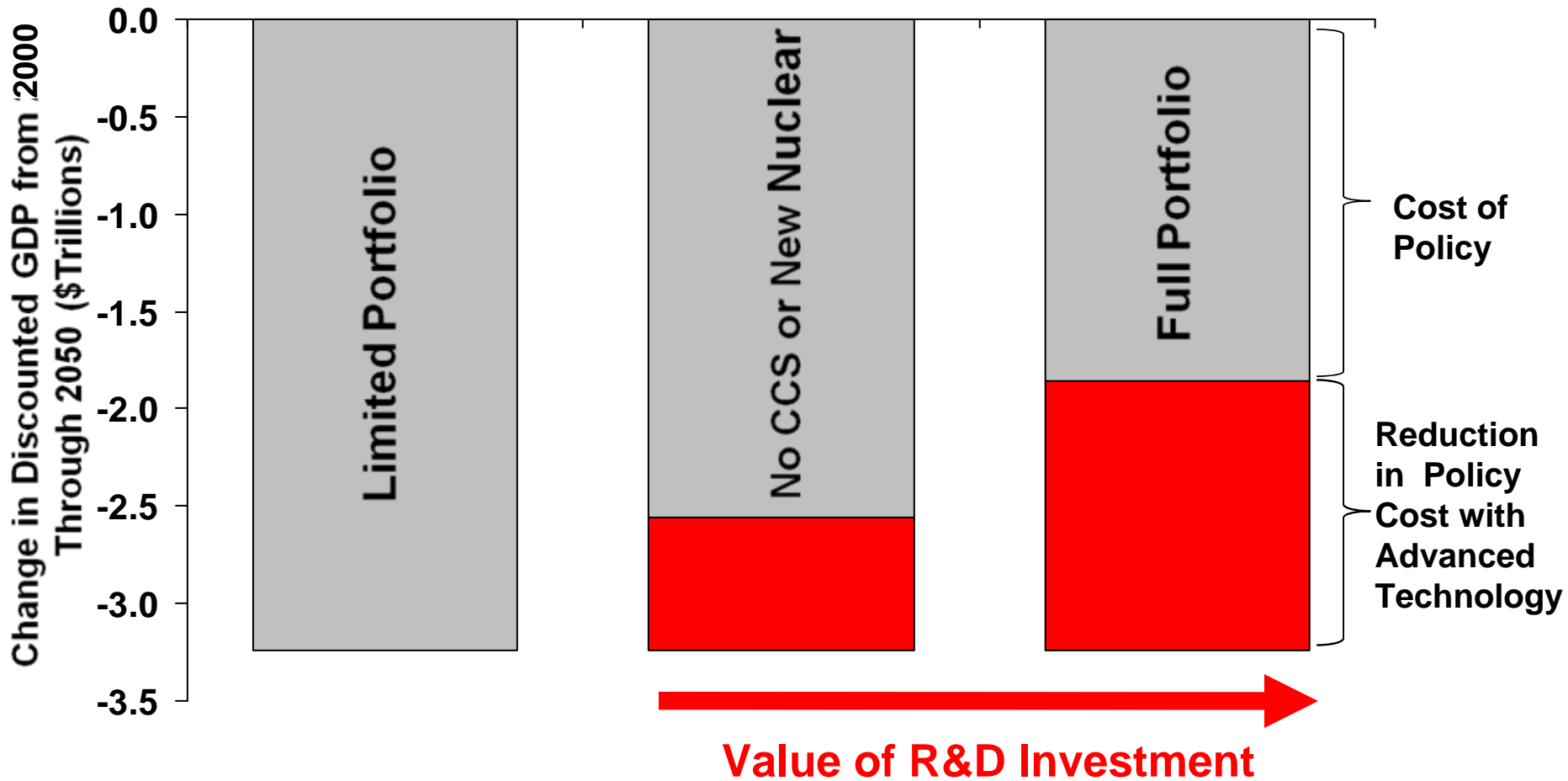
* Cost of electricity increase relative to 2007

Impact on Natural Gas Markets

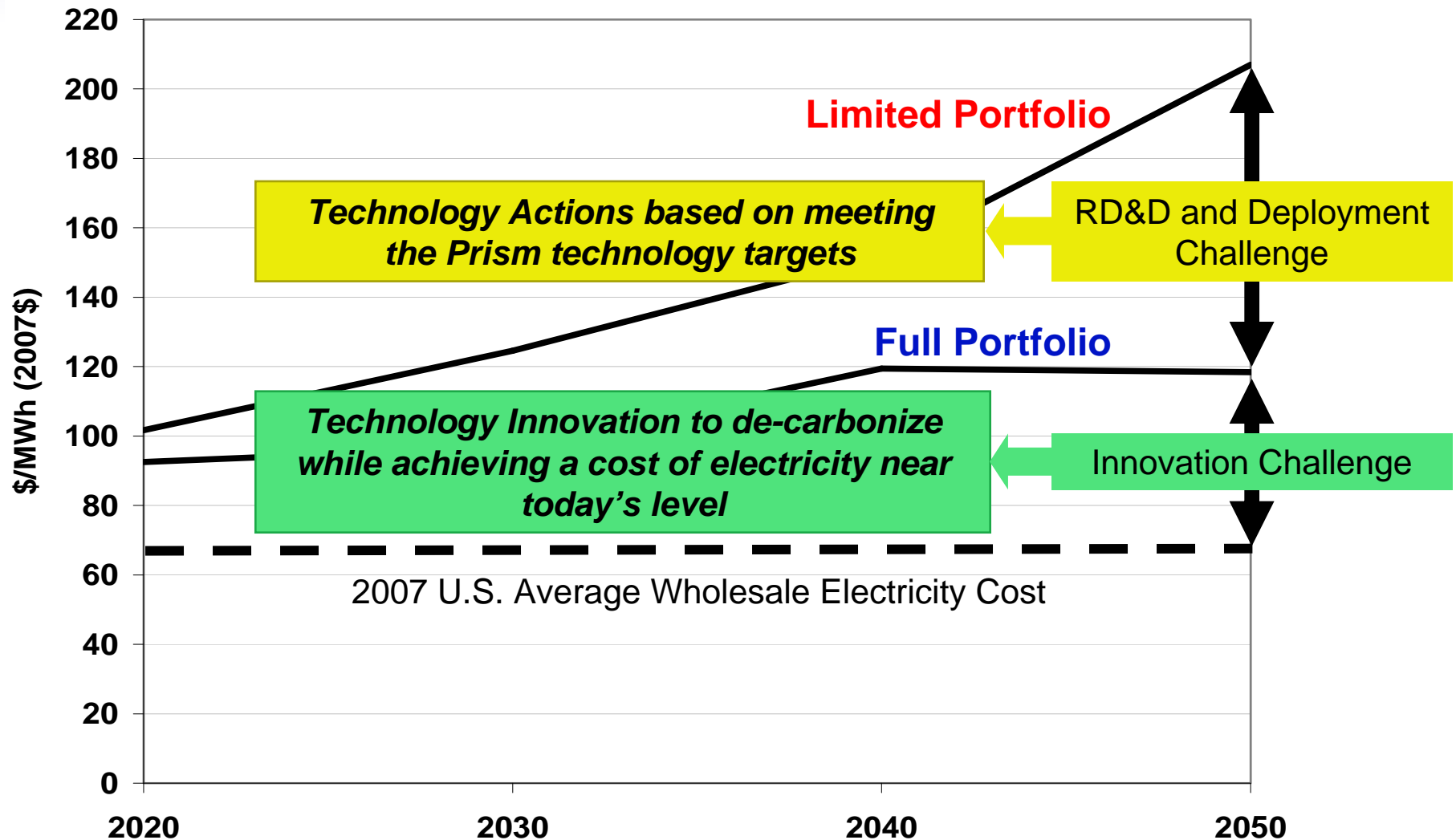


Impact on the U.S. Economy

Technology can reduce policy cost by ~45%



Meeting the Challenge



Key Insights from Prism/MERGE

- The technical potential exists for the U.S. electricity sector to significantly reduce its CO₂ emissions over the next several decades.
- Low-carbon electricity technologies can drive growth in electricity demand even as CO₂ emissions are reduced.
- A low-cost, low-carbon portfolio of electricity technologies can significantly reduce the costs of climate policy.
- No one technology will be a silver bullet – a portfolio of technologies will be needed.
- Much of the needed technology isn't available yet – substantial R&D, demonstration is required.

EPRI's Prism 2.0: The Next Generation

Featured in August 19th New York Times...

- Debuted at EPRI Summer Seminar
- Great interest across the industry
- Completion by end of year

“The one size fits all ... from a technical perspective, doesn't make a lot of sense... the model is illustrative, not predictive.”

***– Bryan Hannegan
EPRI Vice President – Environment &
Renewables***

The New York Times

Business Day

Energy & Environment

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OI

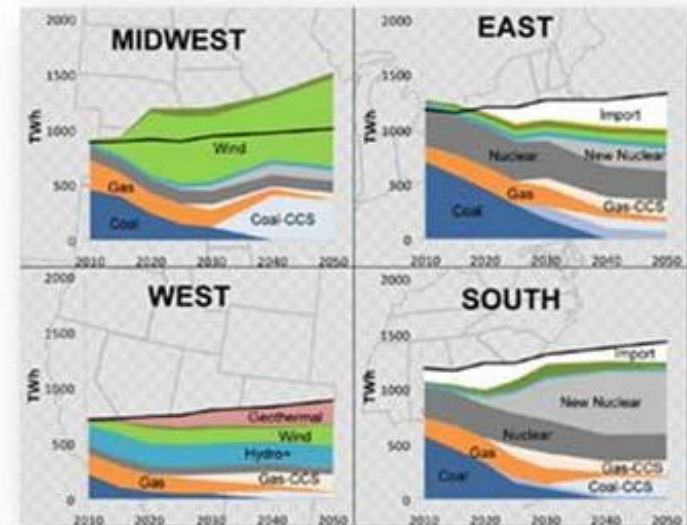
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A New EPRI Computer Model Makes the Case for Regional Climate Solutions

By PETER BEHR of [ClimateWire](#)

Published: August 19, 2010

The utility industry's top research group is making the case that regional solutions to the nation's climate policy challenges offer the best deal for consumers.



For More Information

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Together...Shaping the Future of Electricity