



EPRI

ELECTRIC POWER
RESEARCH INSTITUTE

Creating a ^{Secure} Low-Carbon Future

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The Electric Power Research Institute

RD&D for the Electricity Industry

- Independent, unbiased, tax-exempt collaborative research organization
- Full spectrum industry coverage
 - *Nuclear*
 - *Generation*
 - *Environment*
 - *Power Delivery & Utilization*
- 460 participants in over 40 countries
- Major offices in Palo Alto, CA; Charlotte, NC and Knoxville, TN



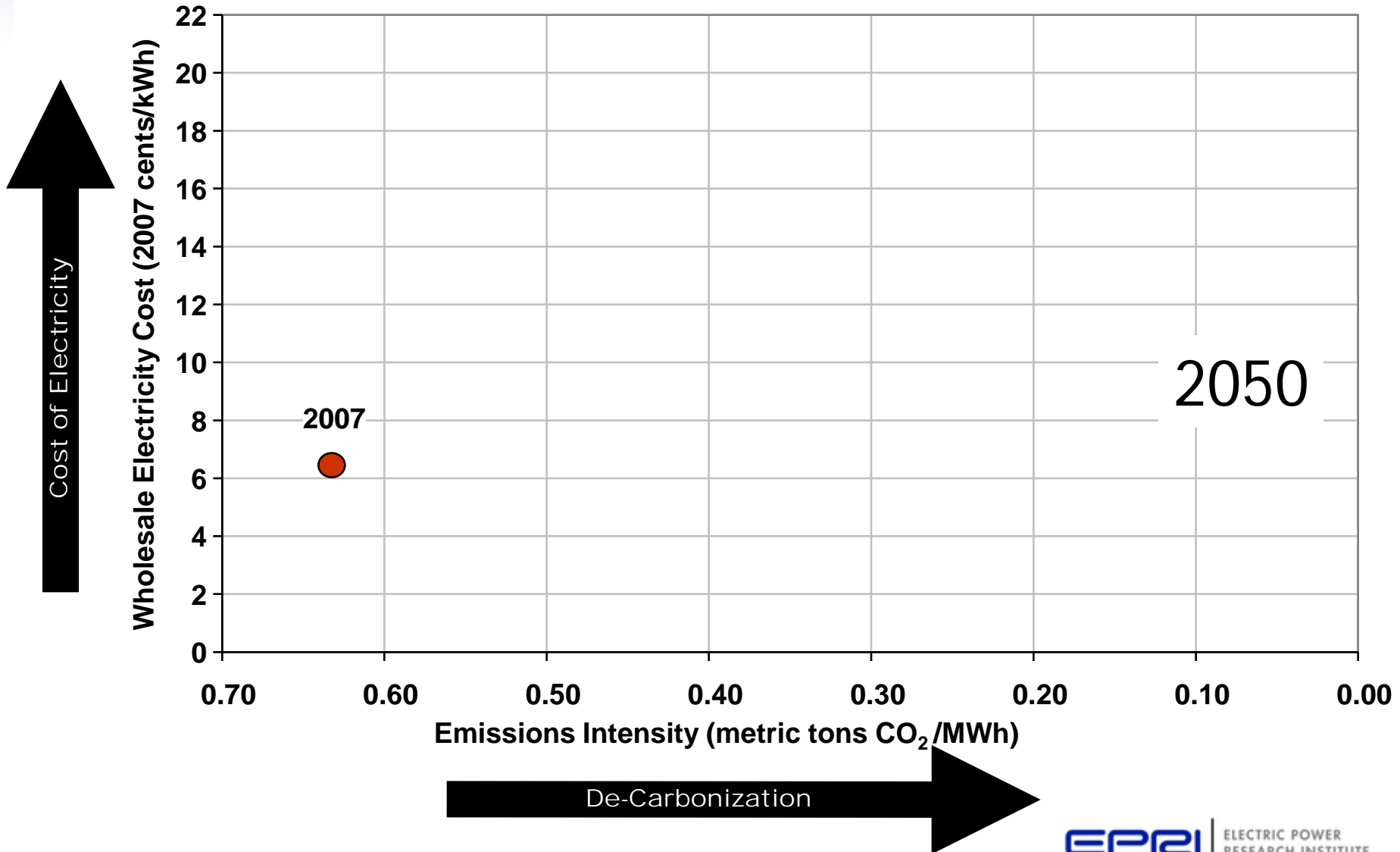
Presentation Overview

- **The Technology Challenge**

De-carbonize the electricity infrastructure and meet binding economy-wide CO₂ reduction targets

Provide reliable, affordable, and environmentally responsible electricity

The Technology Challenge



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- **The Technology Challenge**

De-carbonize the electricity infrastructure and meet binding economy-wide CO₂ reduction targets

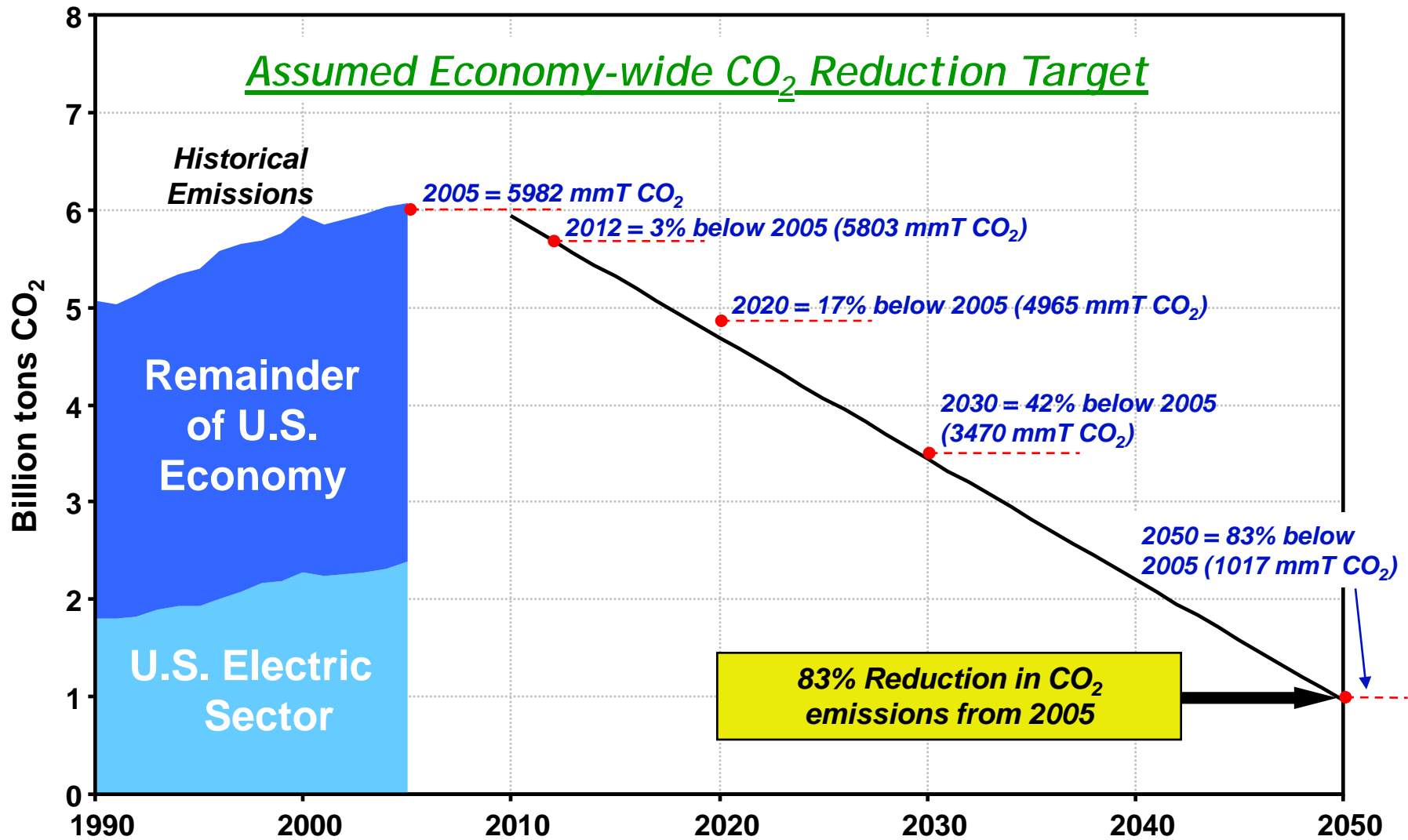
Provide reliable, affordable, and environmentally responsible electricity

- **Meeting The Challenge**

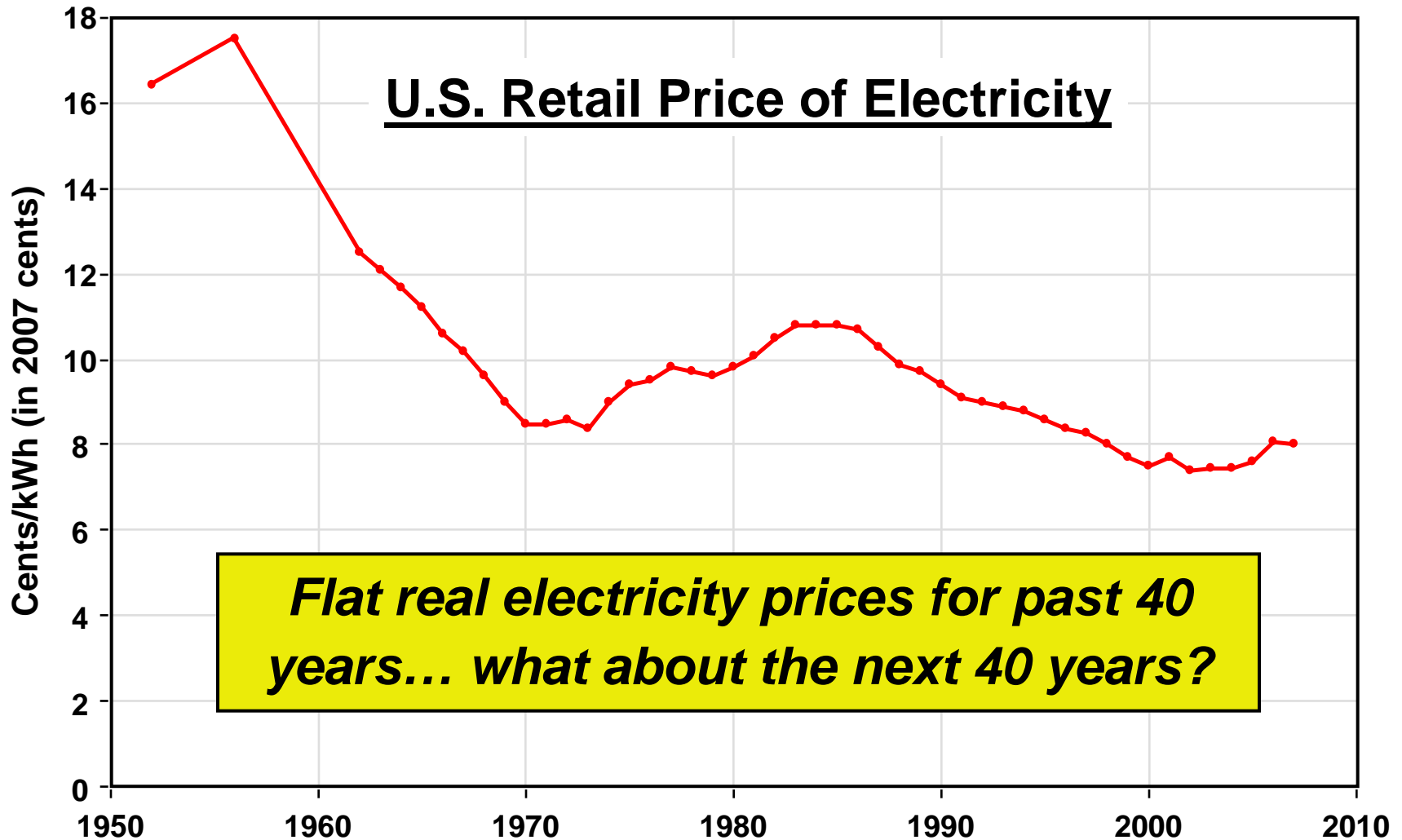
Technically feasible with a full portfolio of generation options

***Decisions Over the Next Decade will
Shape the Electricity Future of 2050***

The CO₂ Challenge



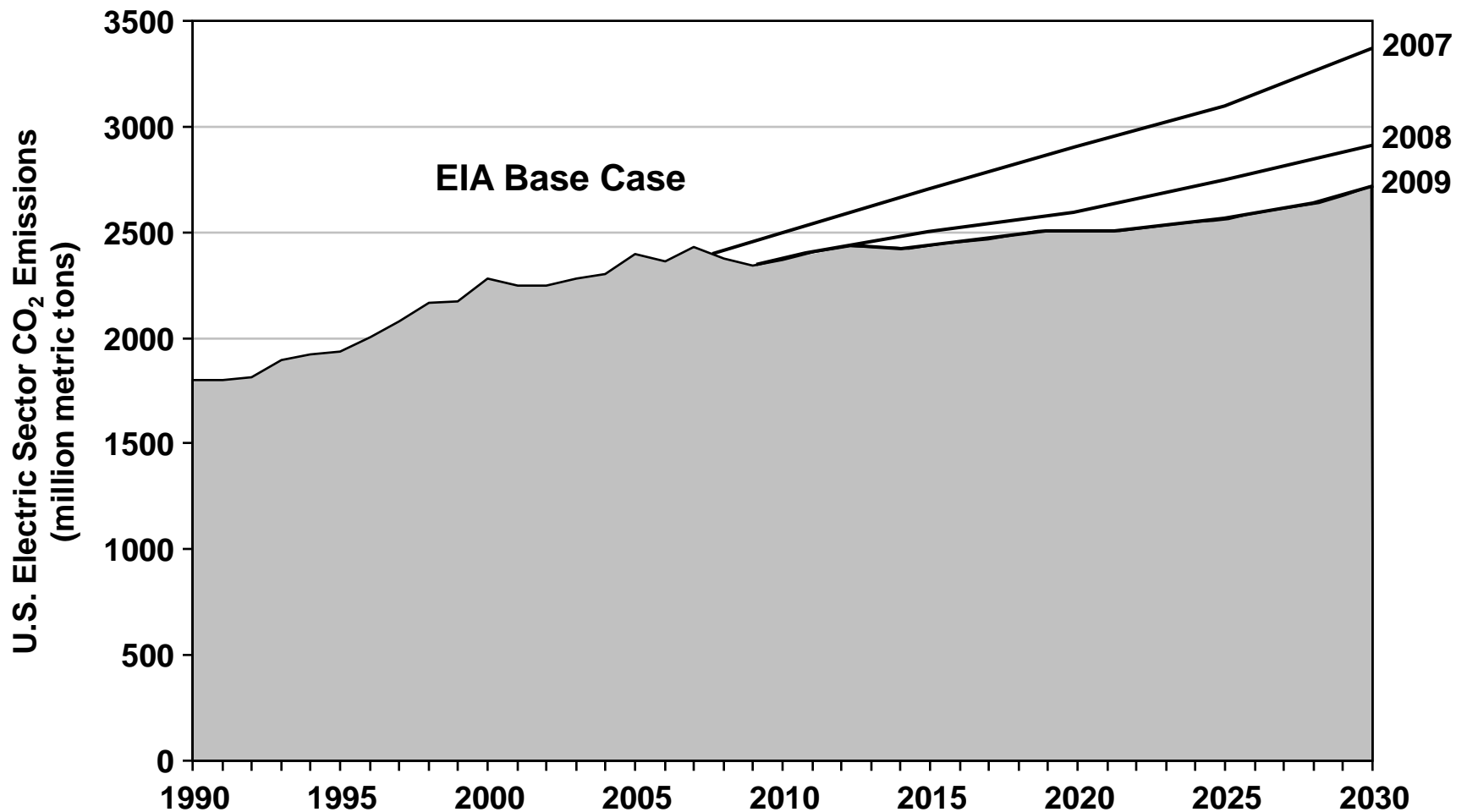
The Cost Challenge



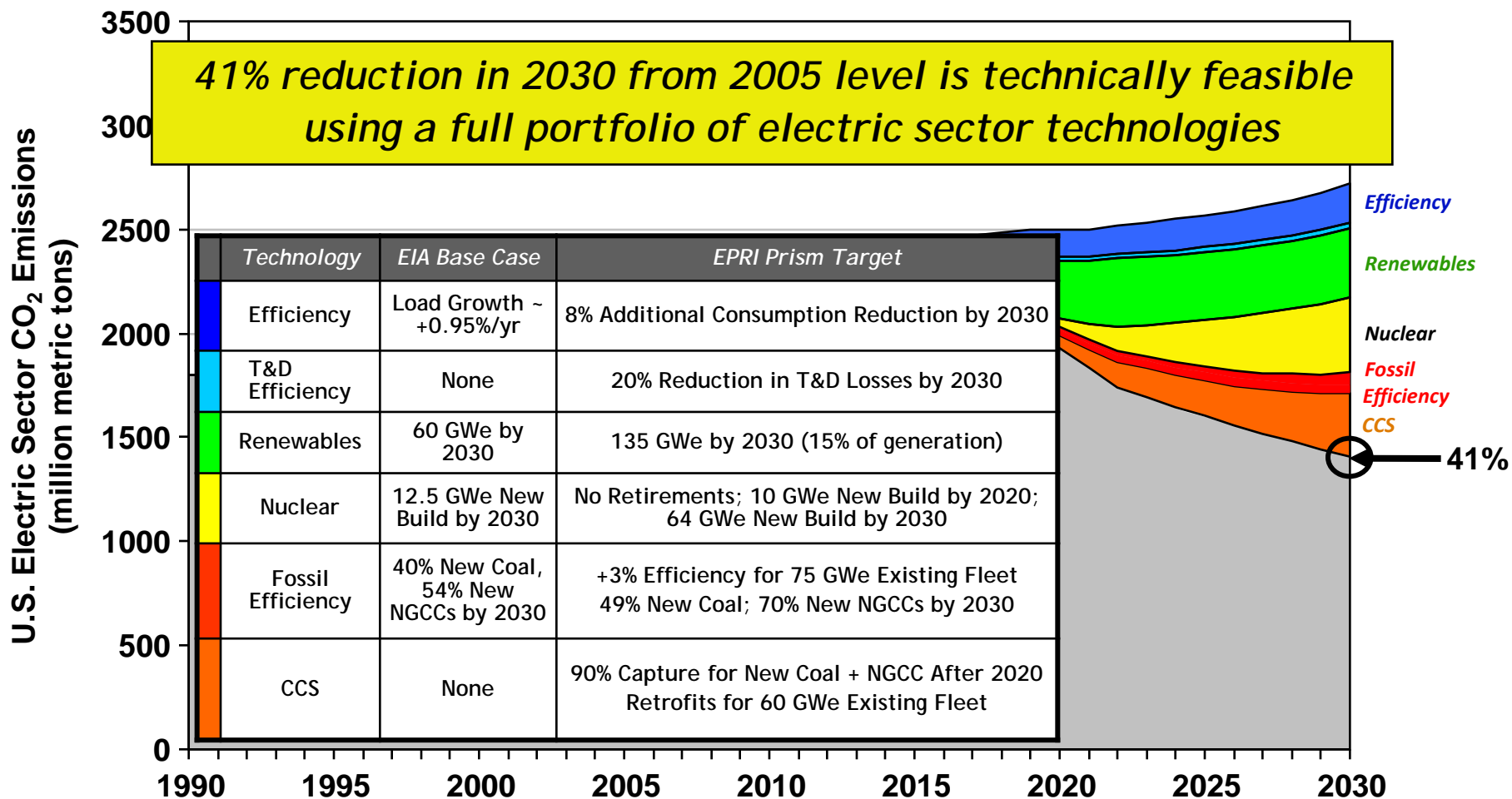
The Electricity Technology Challenge

- The Technology Challenge
- Meeting the Challenge

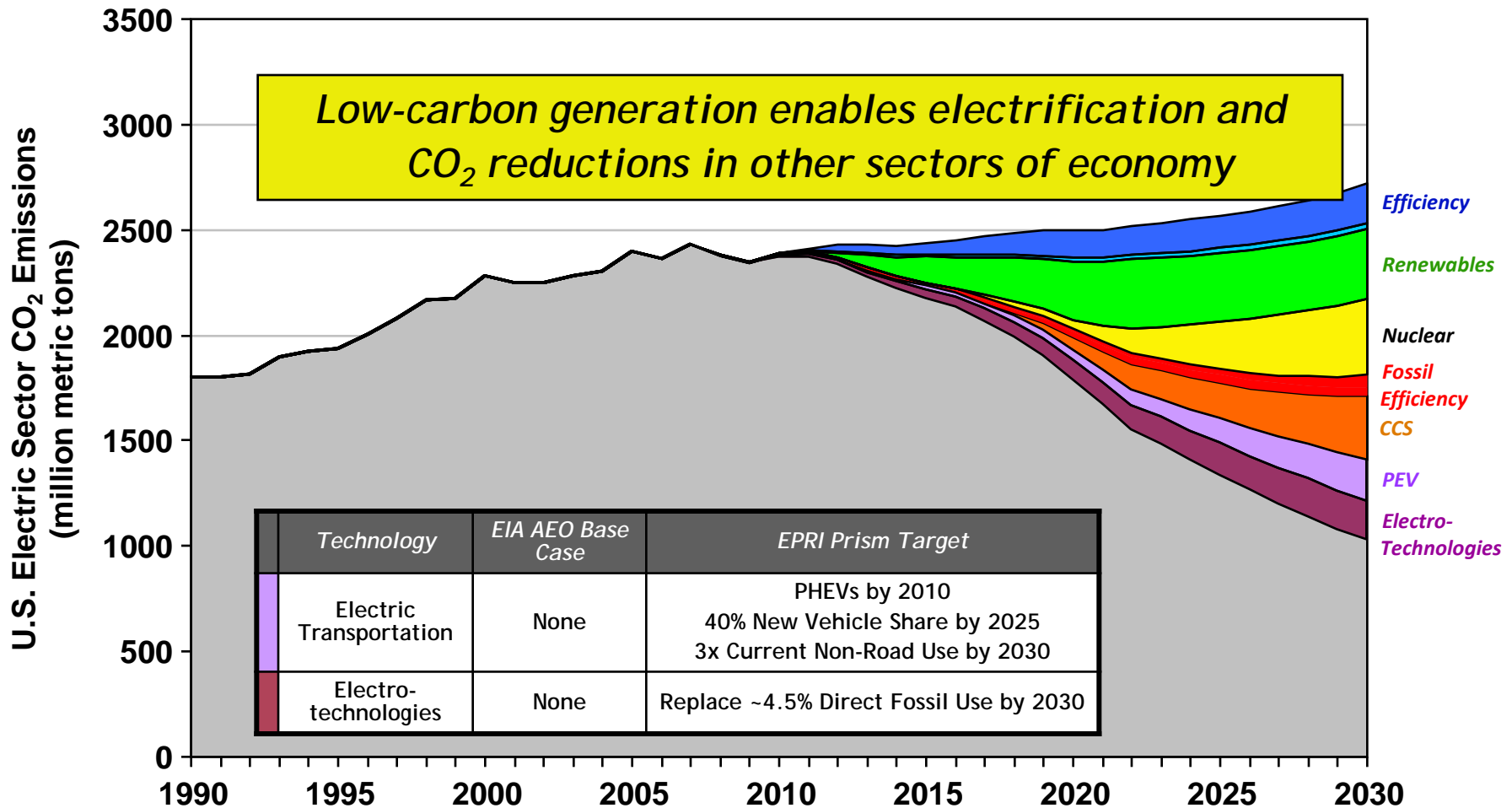
U. S. Electric Sector CO₂ Emissions



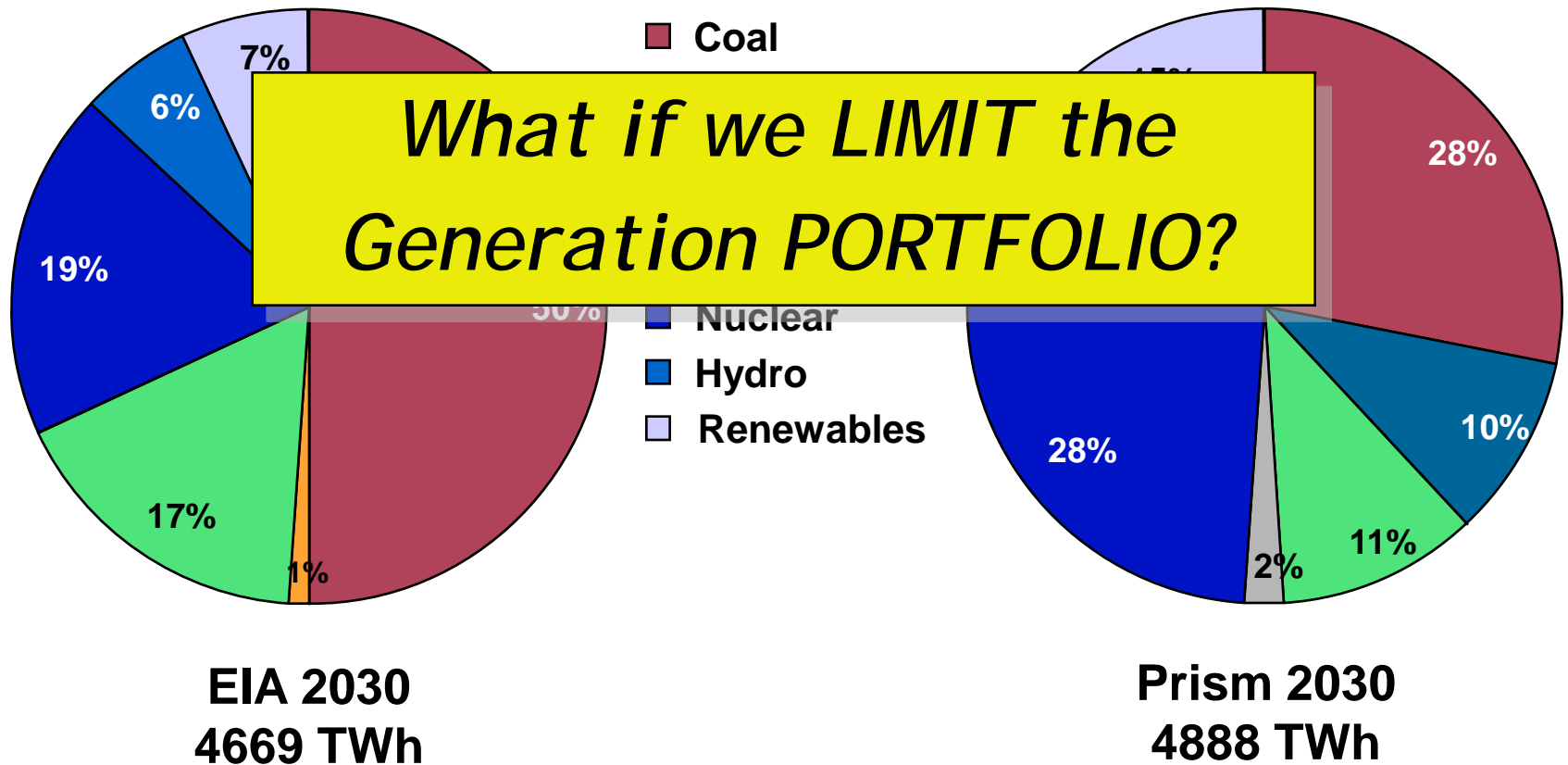
2009 Prism



2009 Prism - PEV and Electro-Technologies



Generation by Fuel Source in 2030



Prism → 60% no- or low-carbon electricity by 2030

Technology Portfolios

■ Full Portfolio

Coal and Gas CCS available

Accelerated end-use efficiency

PEV's can expand

Nuclear production can expand

■ Limited Portfolio

No CO₂ capture and storage (CCS)

No plug-in electric vehicles (PEV's)

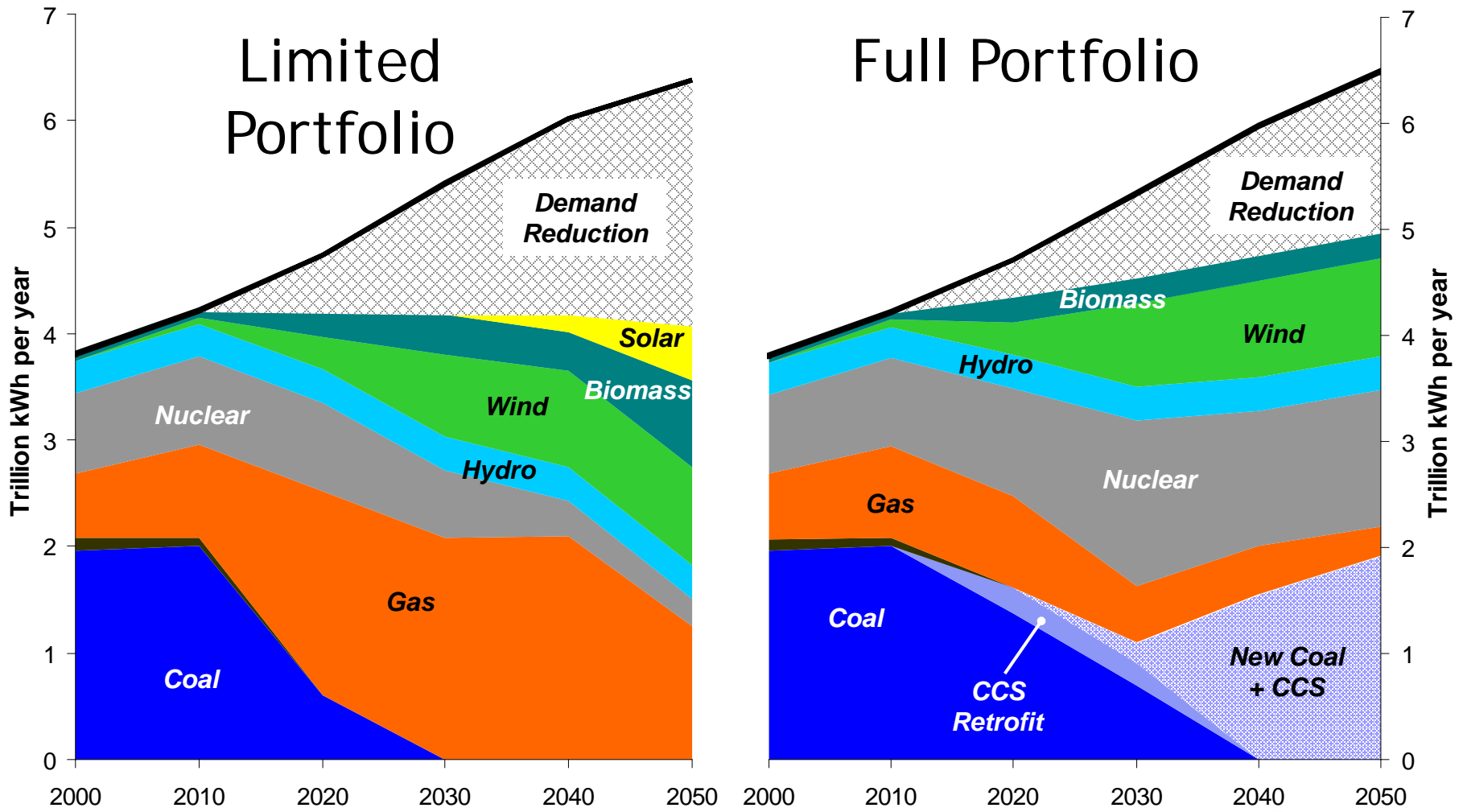
Nuclear generation remains at existing levels

MERGE Economic Model

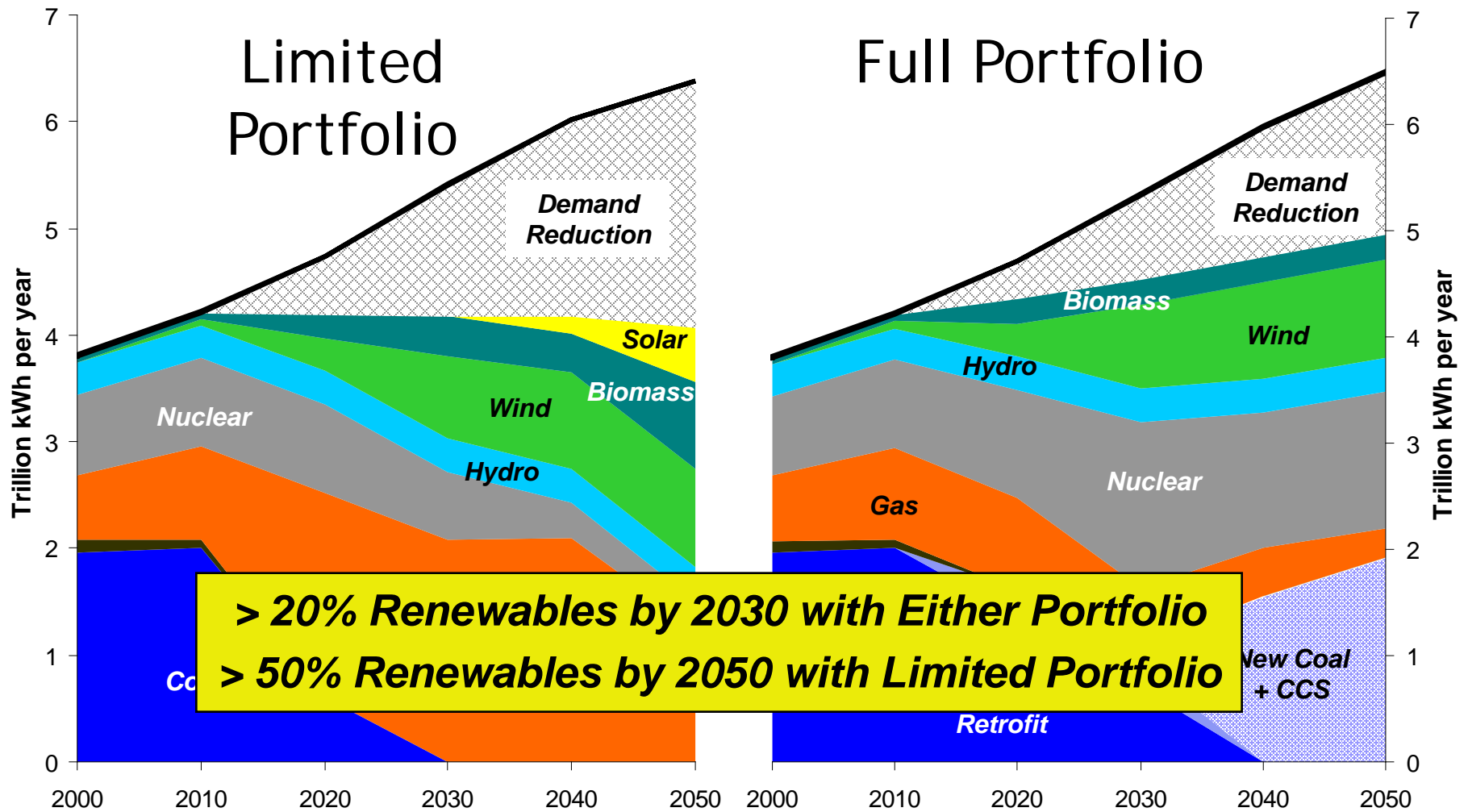
- Optimization Model of Economic Activity and Energy Use through 2050
 - Maximize Economic Wealth
- Inputs
 - Energy Supply Technologies and Costs for Electric Generation and Non-Electric Energy
- Constraints
 - Greenhouse Gas Control Scenarios
 - Energy Resources
- Outputs
 - Economy-wide Impact of Carbon Policy



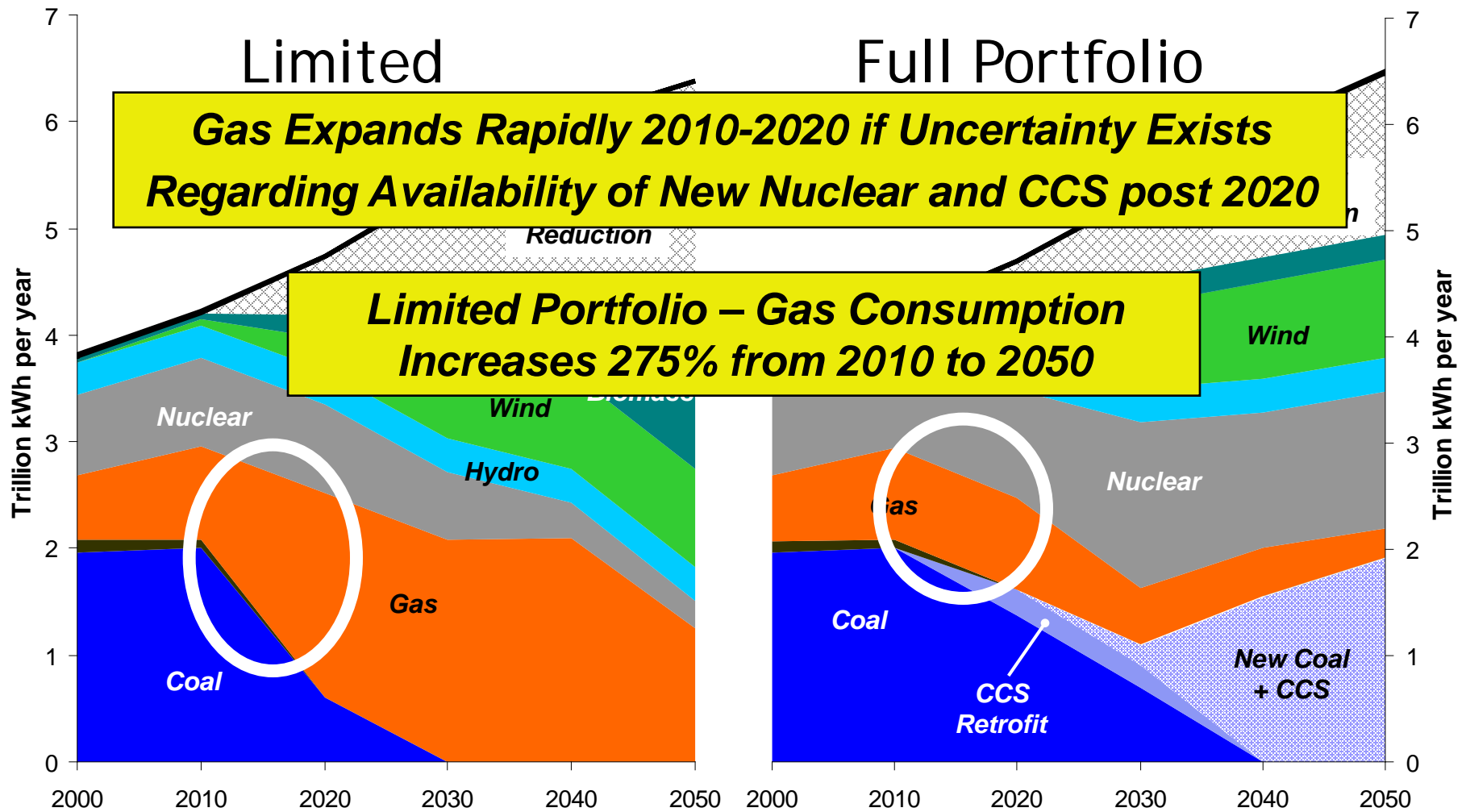
MERGE U.S. Electric Generation Mix



Insights - Renewables

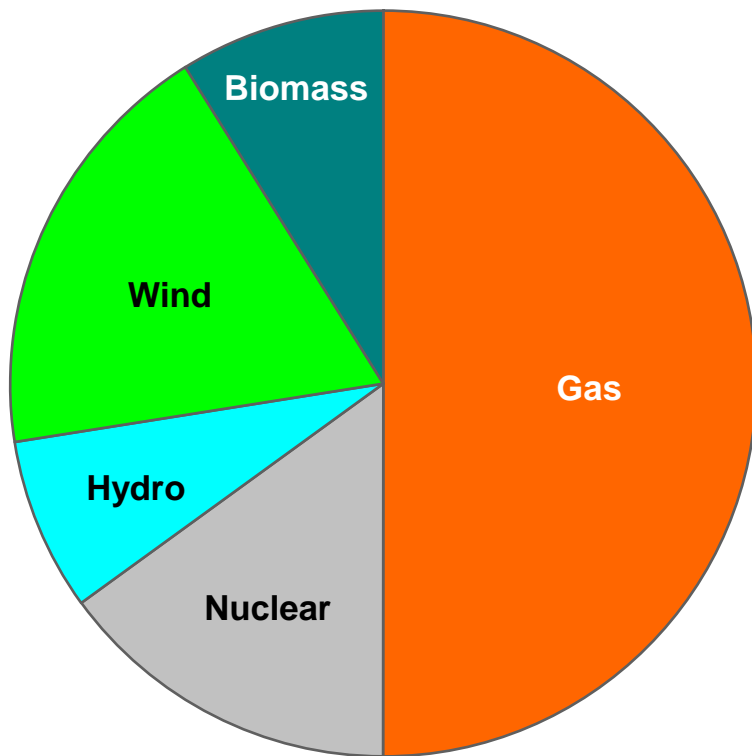


Insights - Nuclear and CCS

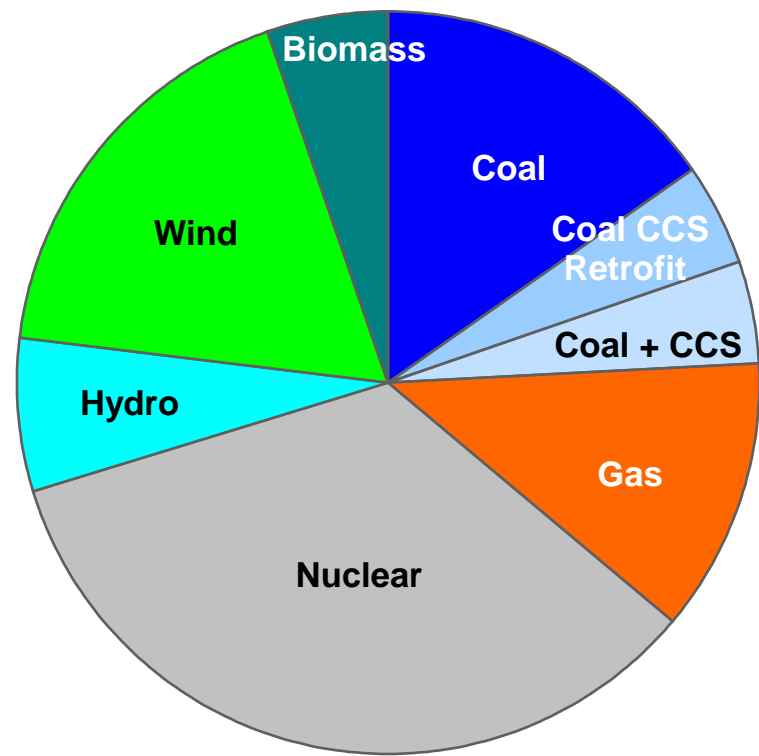


2030 Generation Mix

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



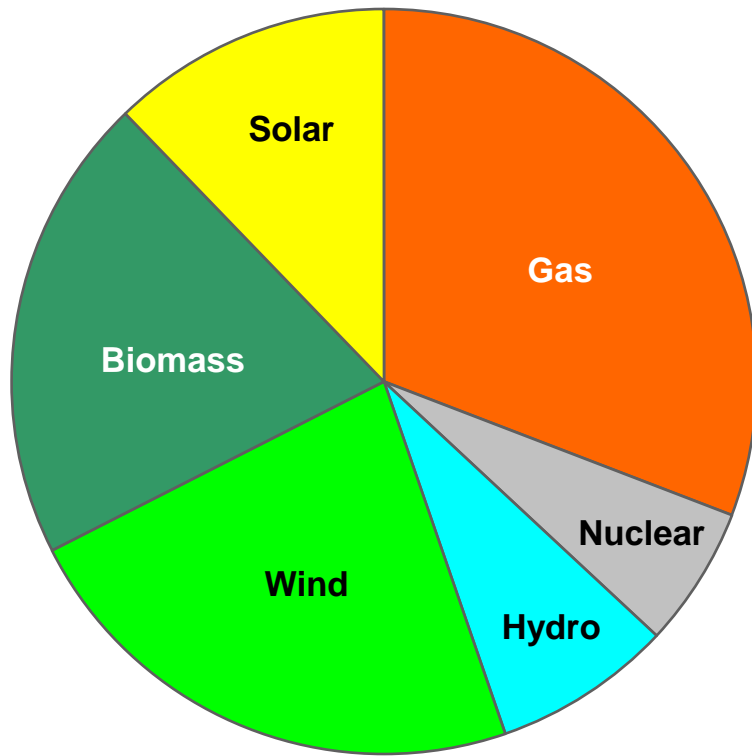
Limited Portfolio



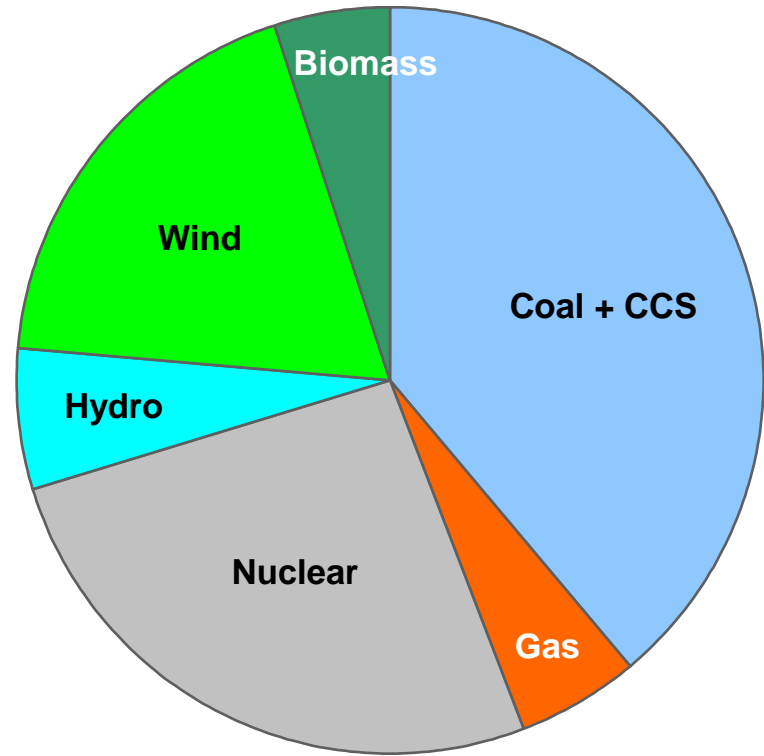
Full Portfolio

2050 Generation Mix

Totally different futures in 2050

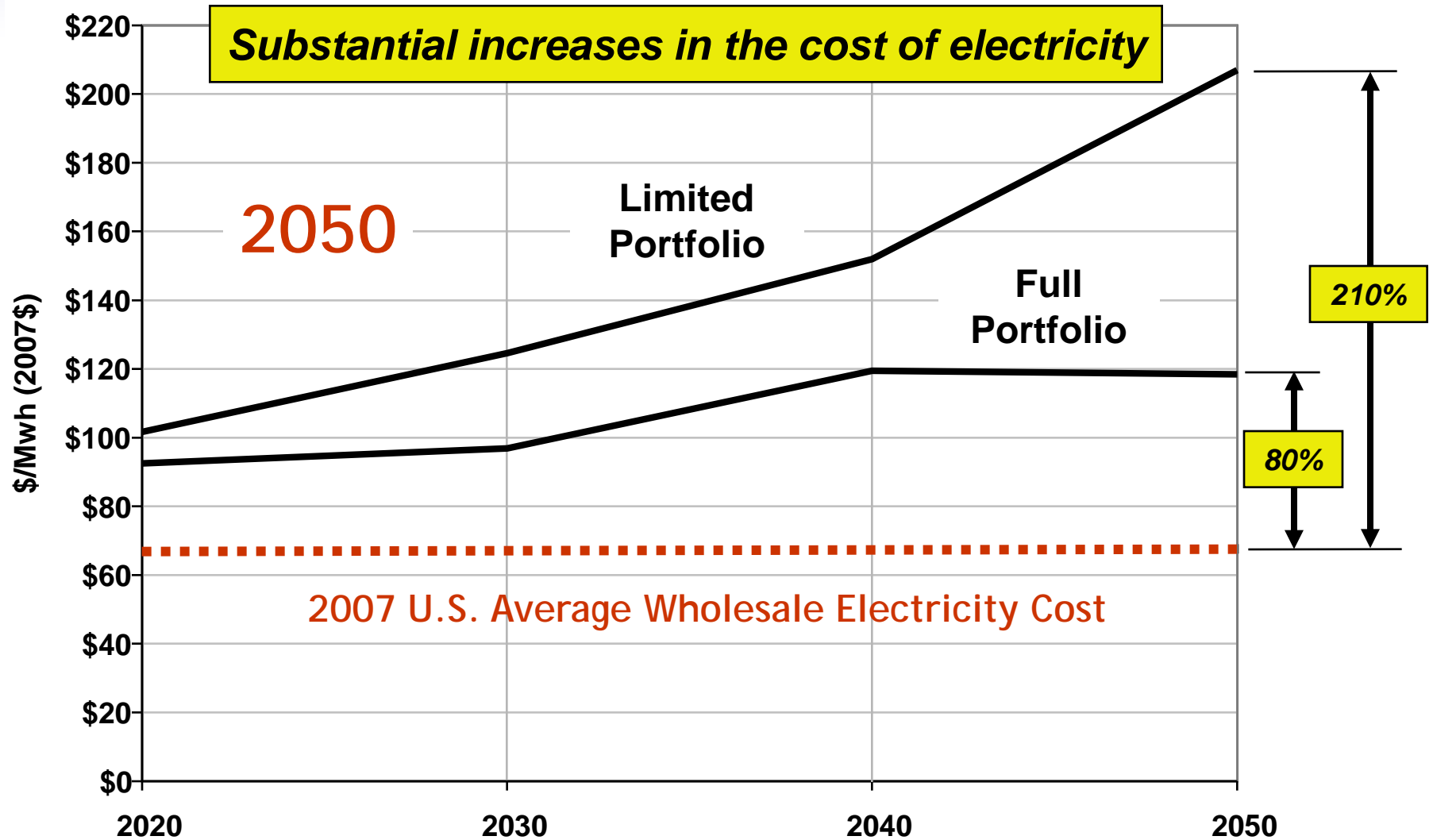


Limited Portfolio

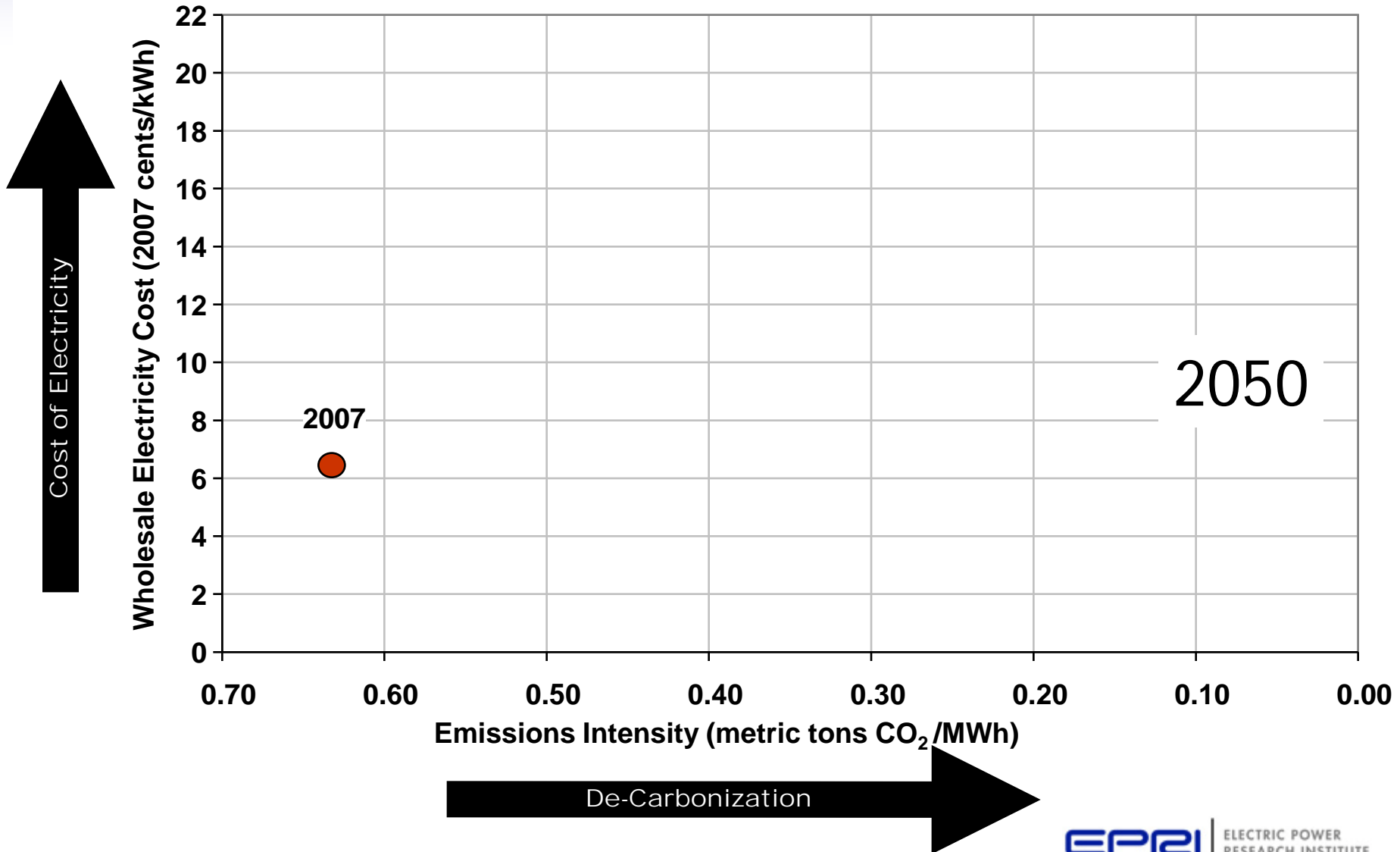


Full Portfolio

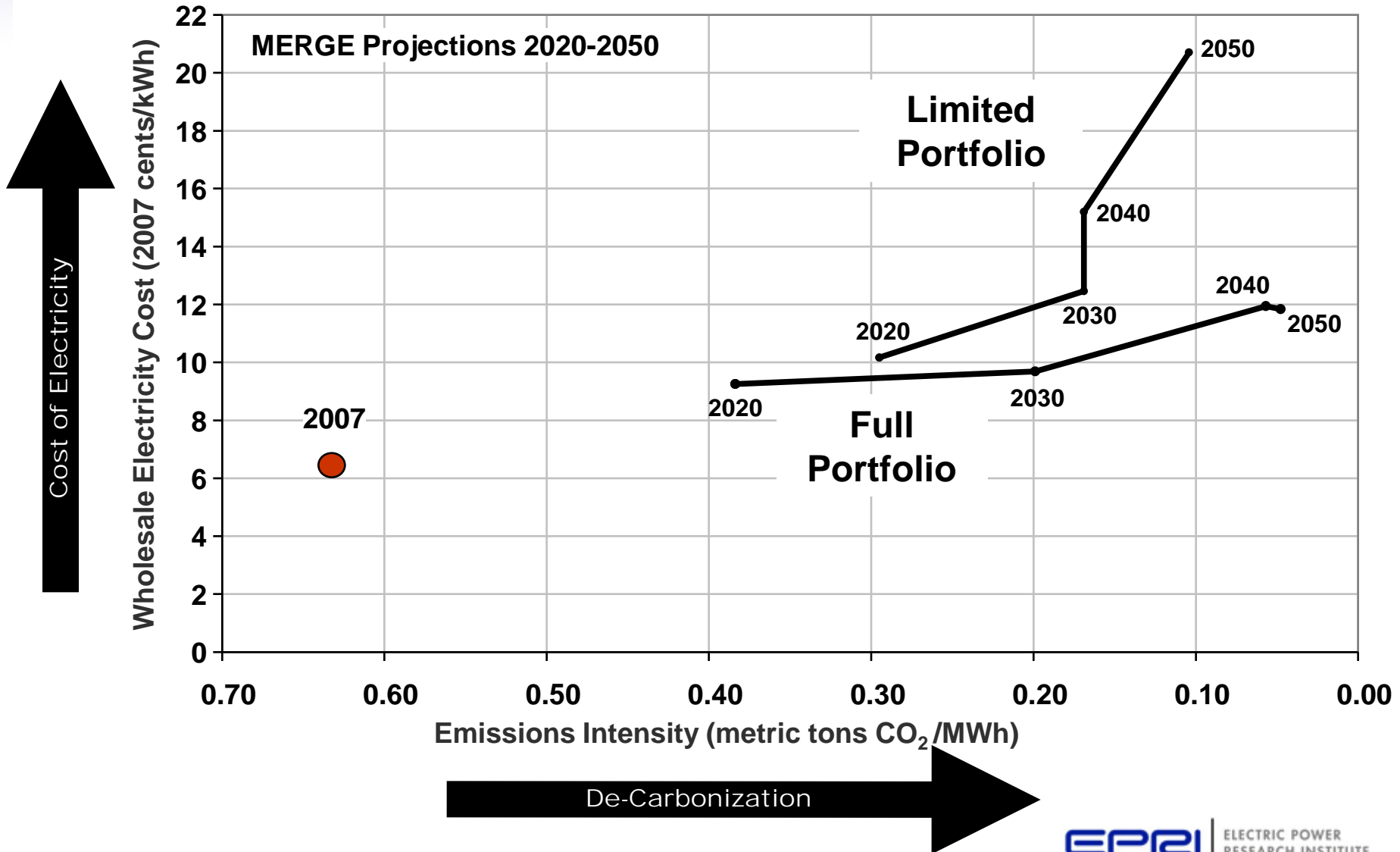
MERGE Wholesale Electricity Cost Results



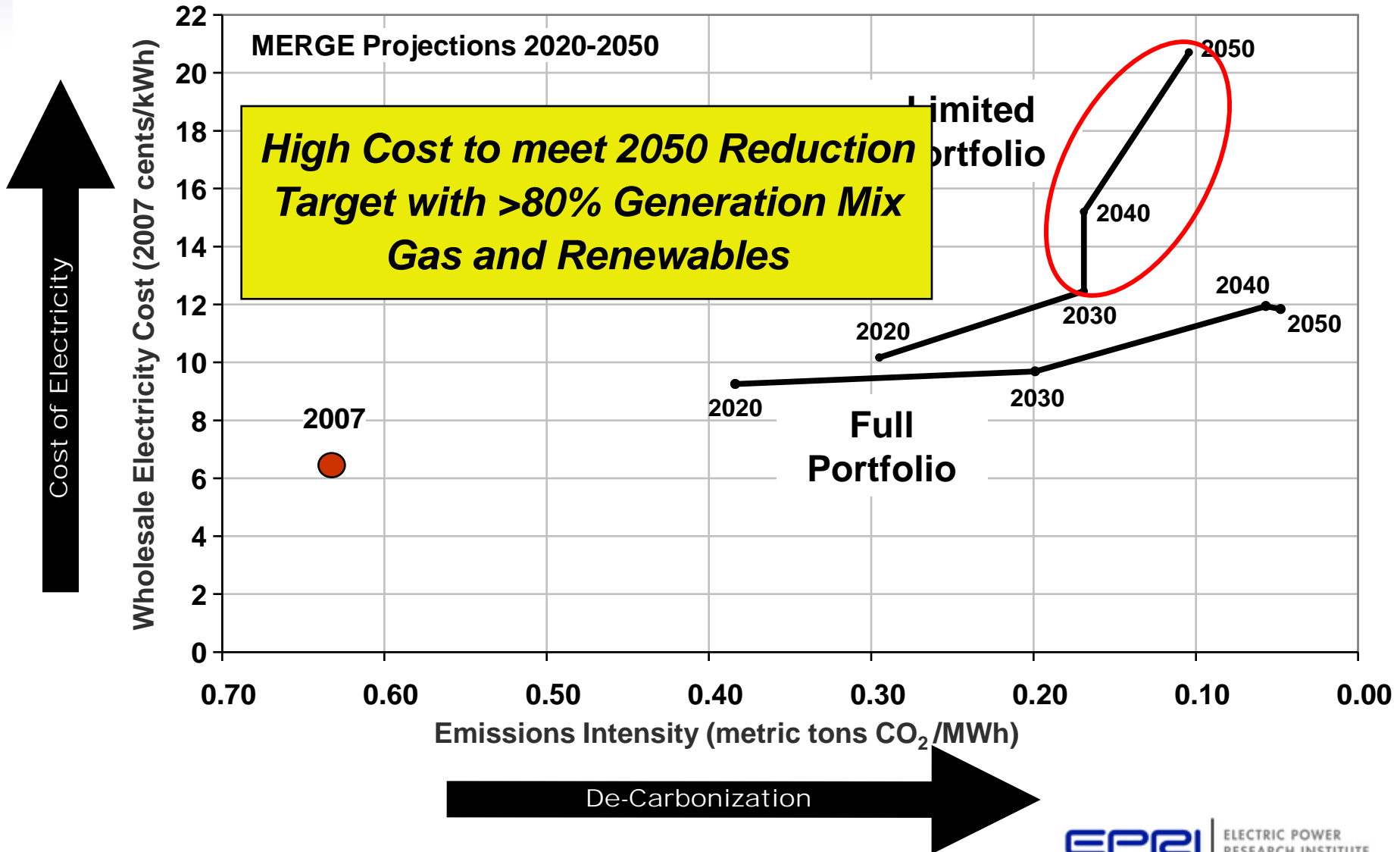
MERGE De-carbonization Results



MERGE De-carbonization Results



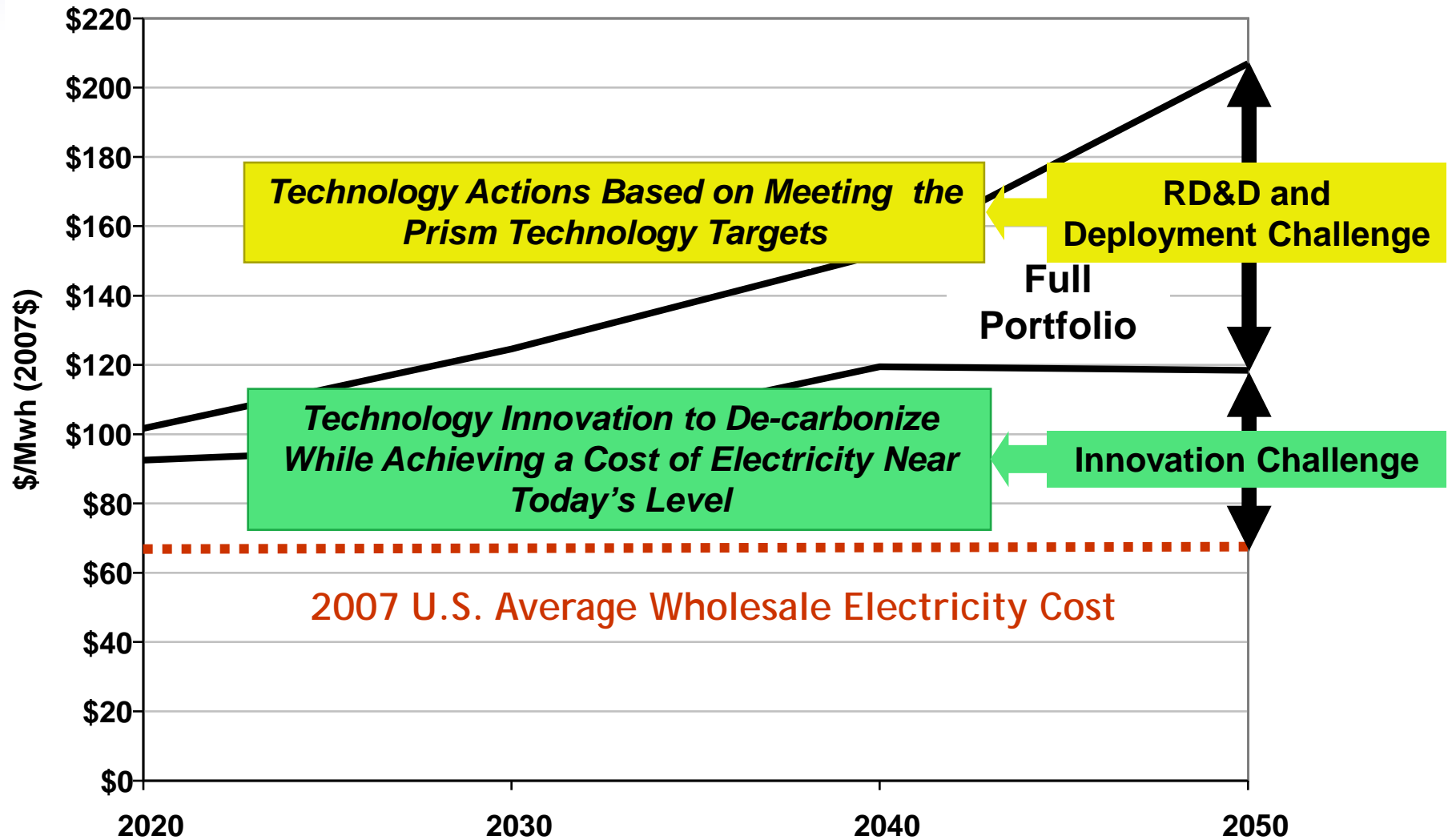
MERGE De-carbonization Results



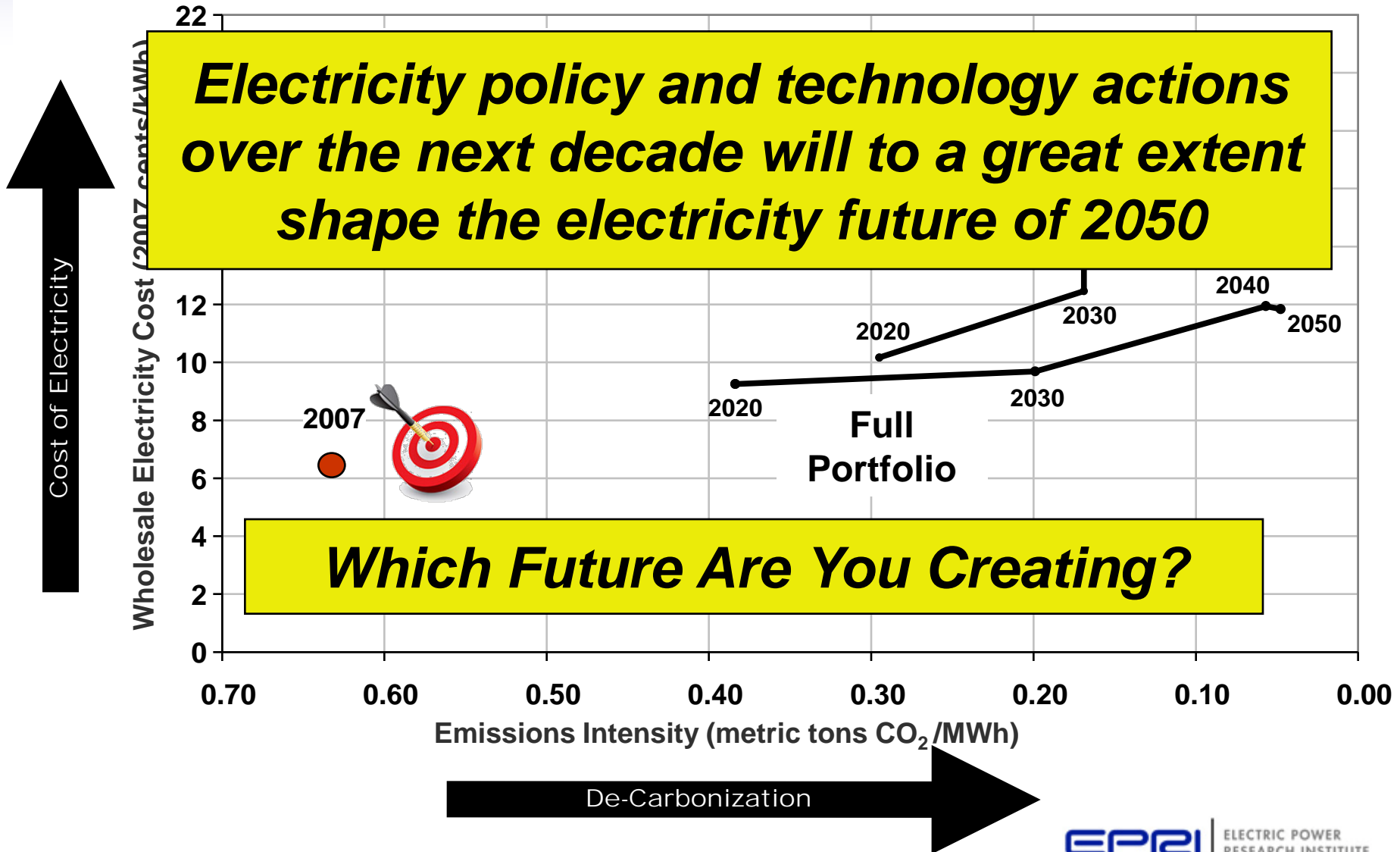
The Electricity Technology Challenge

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Meeting the Challenge



Conclusion



Together...Shaping the Future of Electricity



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