



EPRI

ELECTRIC POWER
RESEARCH INSTITUTE

Creating a Low-Carbon Future

NARUC – Joint Meeting of:

- **Committee on Electricity**
- **Committee on Energy Resources and the Environment**

February 16, 2010

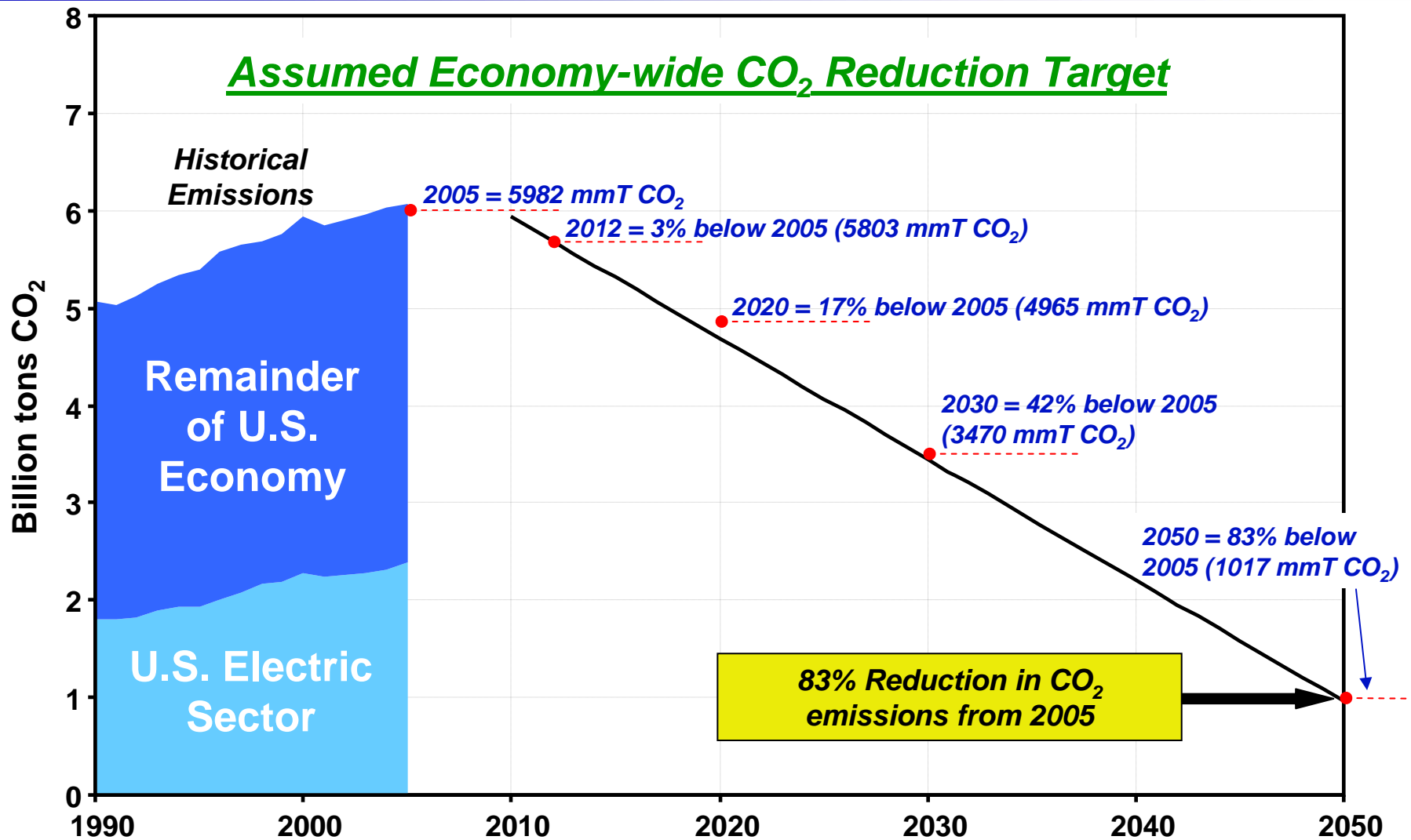
Hank Courtright
Senior Vice President

Defining the Electricity Technology Challenge

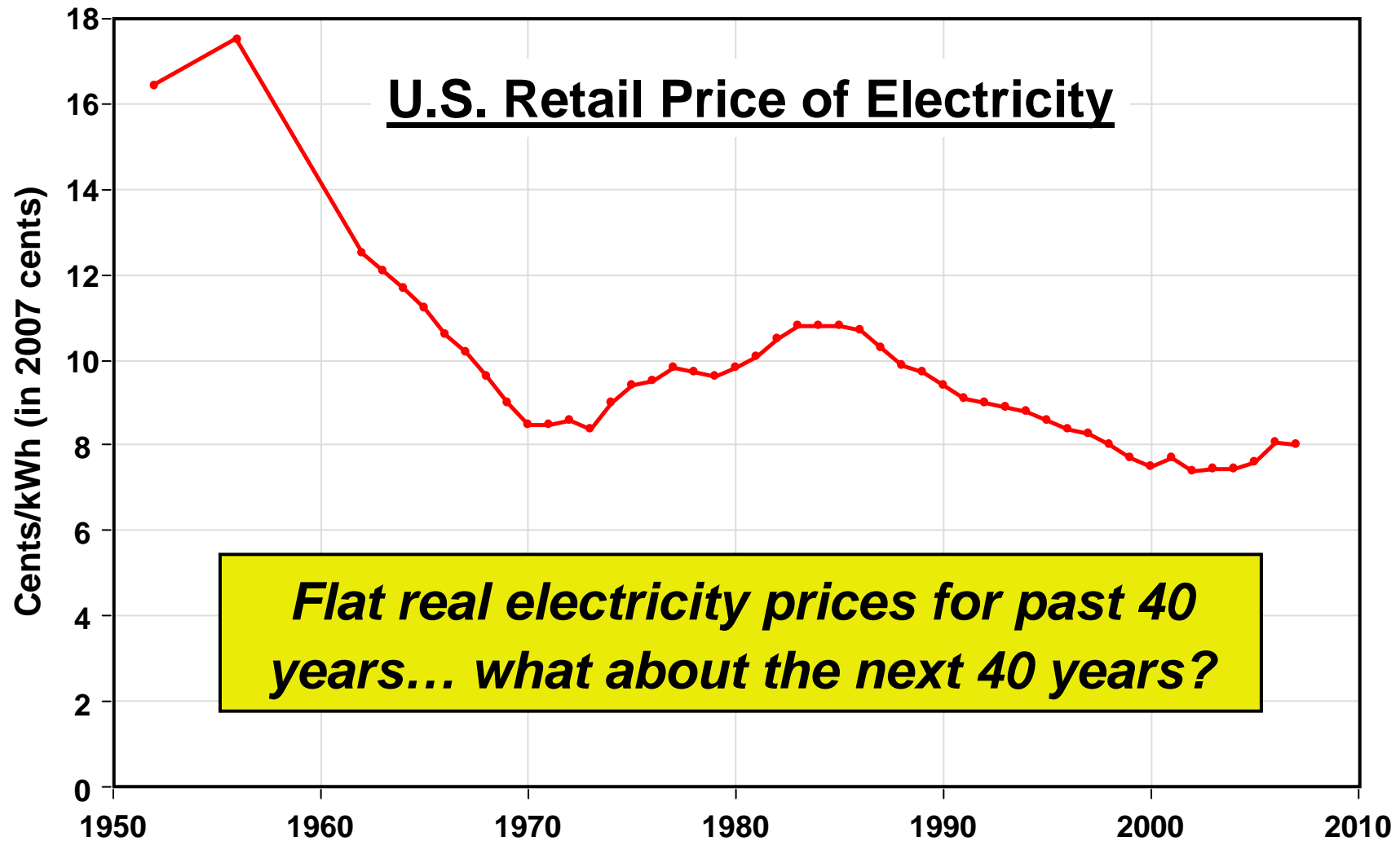
- *De-carbonize the electricity infrastructure*
- *Provide reliable, affordable, and environmentally responsible electricity to consumers*

Two Key Metrics: CO₂ Emissions and Cost of Electricity

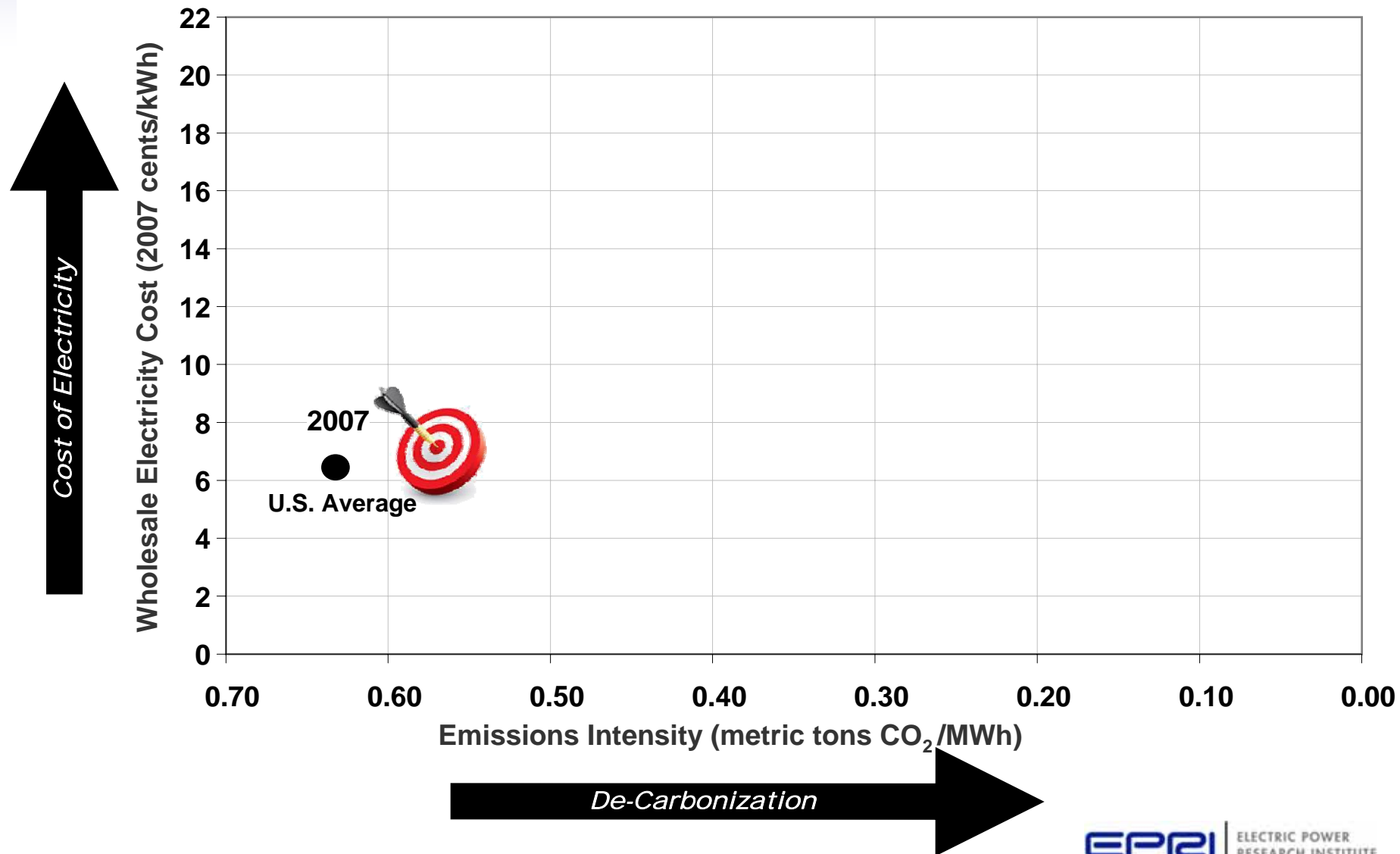
The CO₂ Challenge



The Cost Challenge



The Technology Challenge

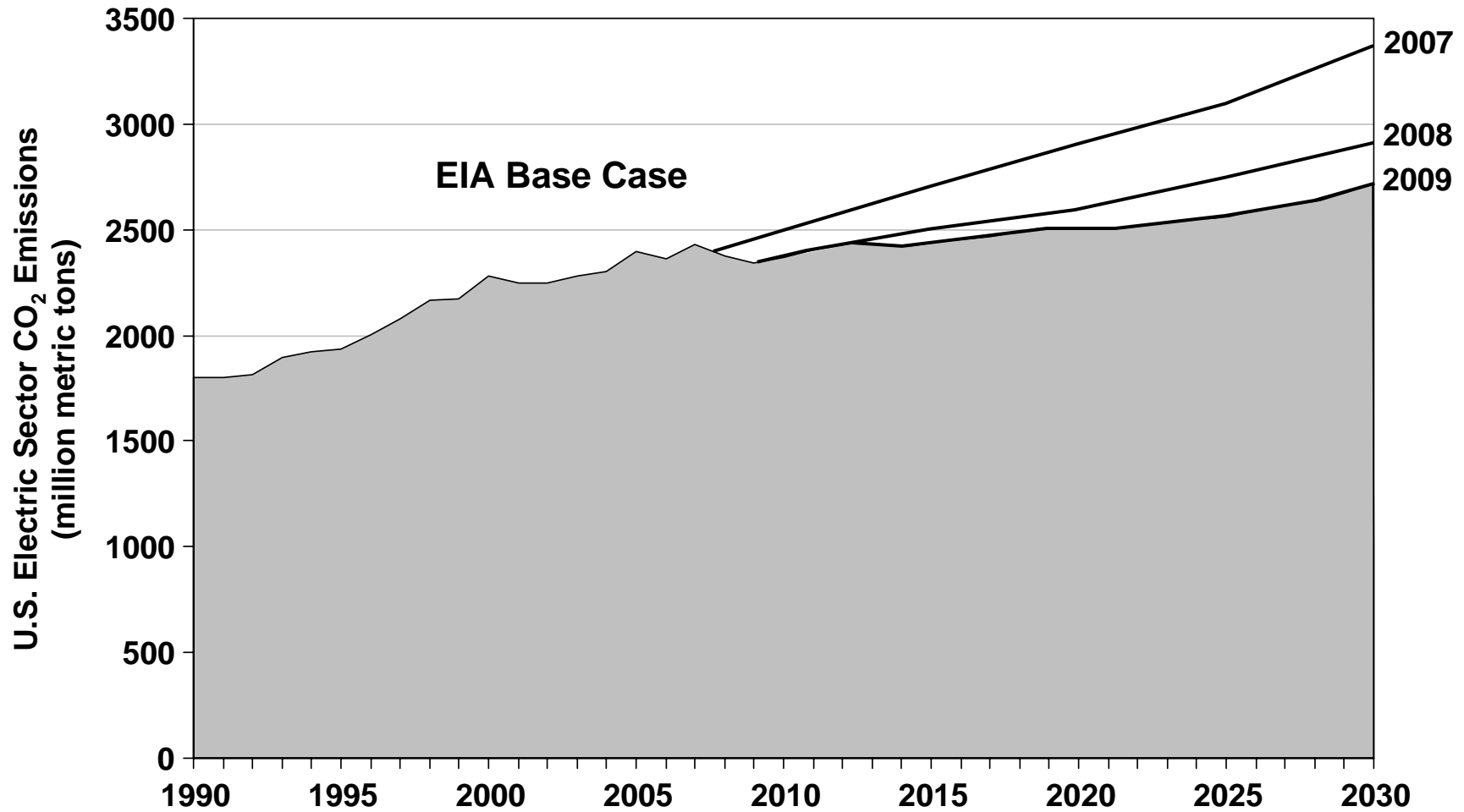


Understanding the Technology Challenge

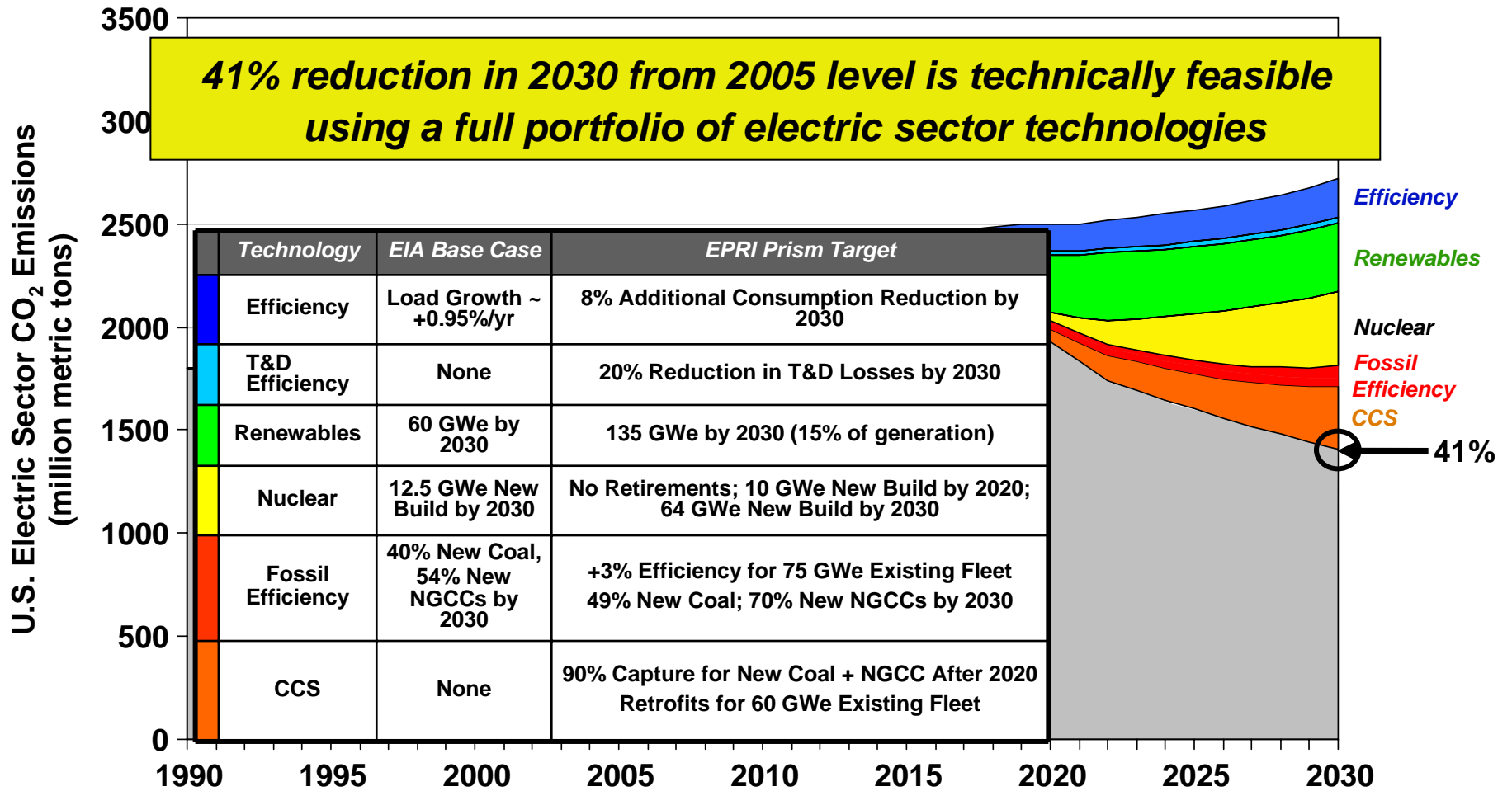
Insights Provided by Two Different Analytical Models

- **Bottoms-up “Prism” Technology Analysis**
 - *Uses Energy Information Administration’s (EIA) Annual Energy Outlook as the base case*
 - *Estimates CO₂ reduction impacts relative to the base case if more aggressive technology targets could be met*
- **Tops-down “MERGE” Economic Analysis**
 - *Optimization model of economic activity and energy use*
 - *Inputs: Energy supply technologies and costs for electric generation and non-electric energy*
 - *Constraints: Carbon policy and energy resource availability*
 - *Output: Economy-wide impacts of carbon policy*

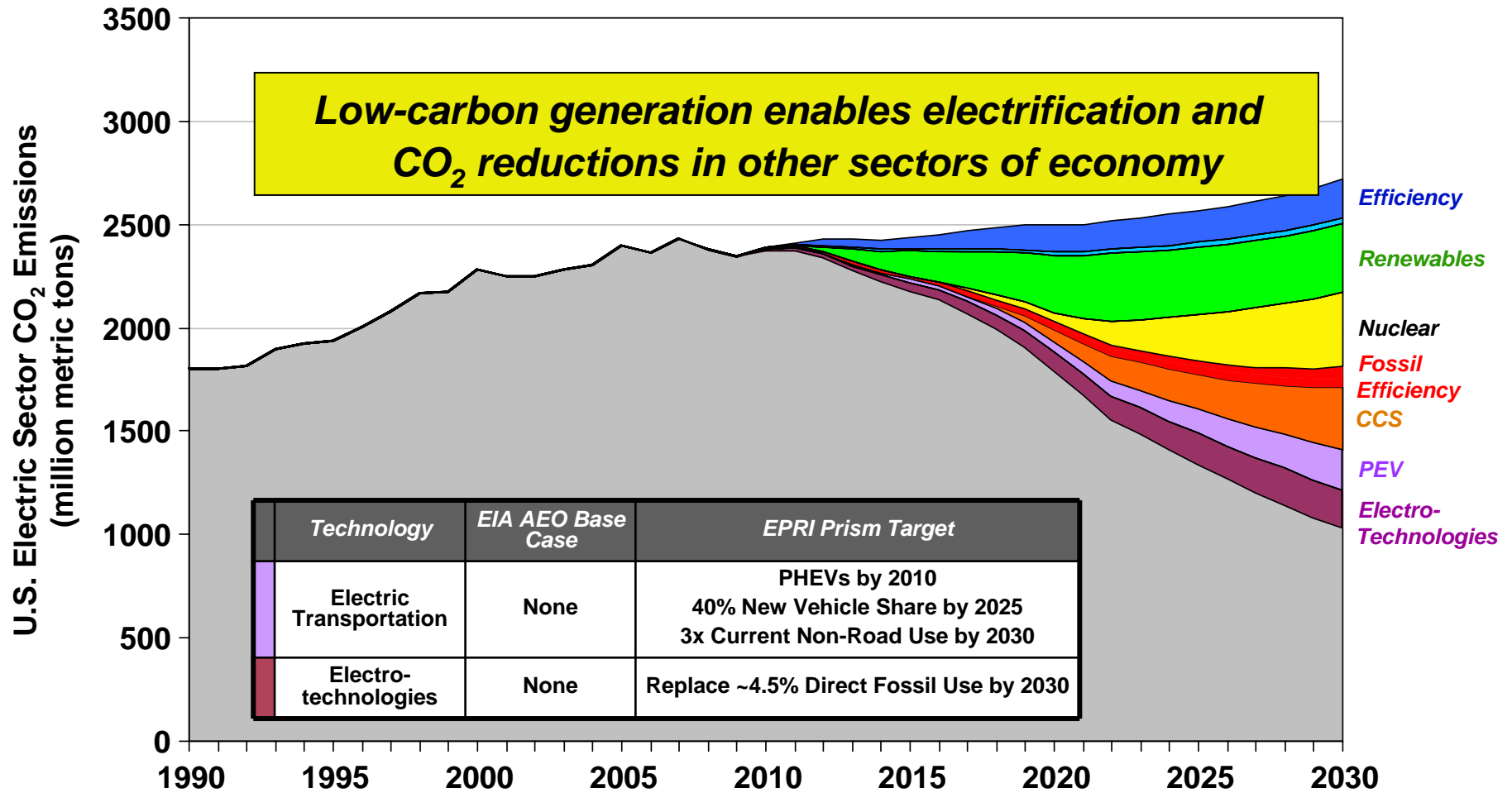
U. S. Electric Sector CO₂ Emissions



EPRI Prism

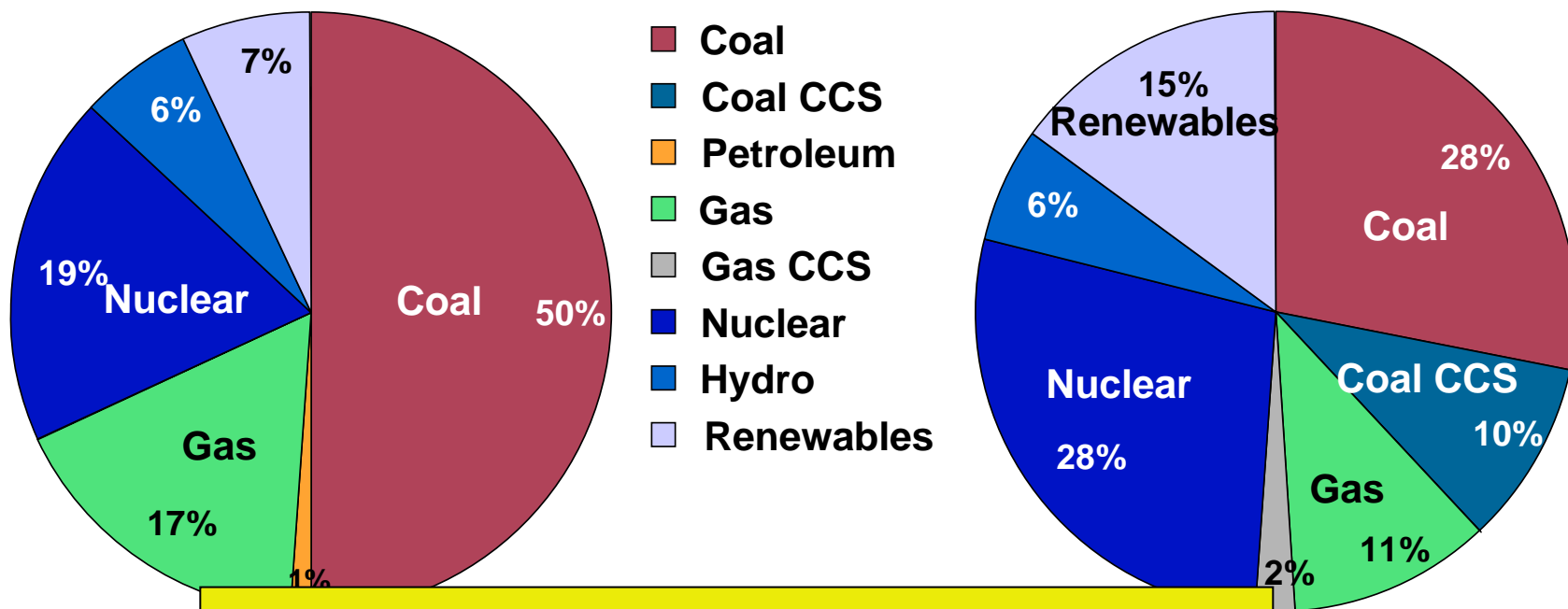


EPRI Prism – PEV and Electro-Technologies



2009 Prism

Generation by Fuel Source in 2030



What if we LIMIT the Generation PORTFOLIO?

2030 TWh

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

Technology Portfolios – MERGE Economic Model

• Limited Portfolio

No CO₂ capture and storage (CCS)

Nuclear generation does not expand

No plug-in electric vehicles (PEV's)

• Full Portfolio

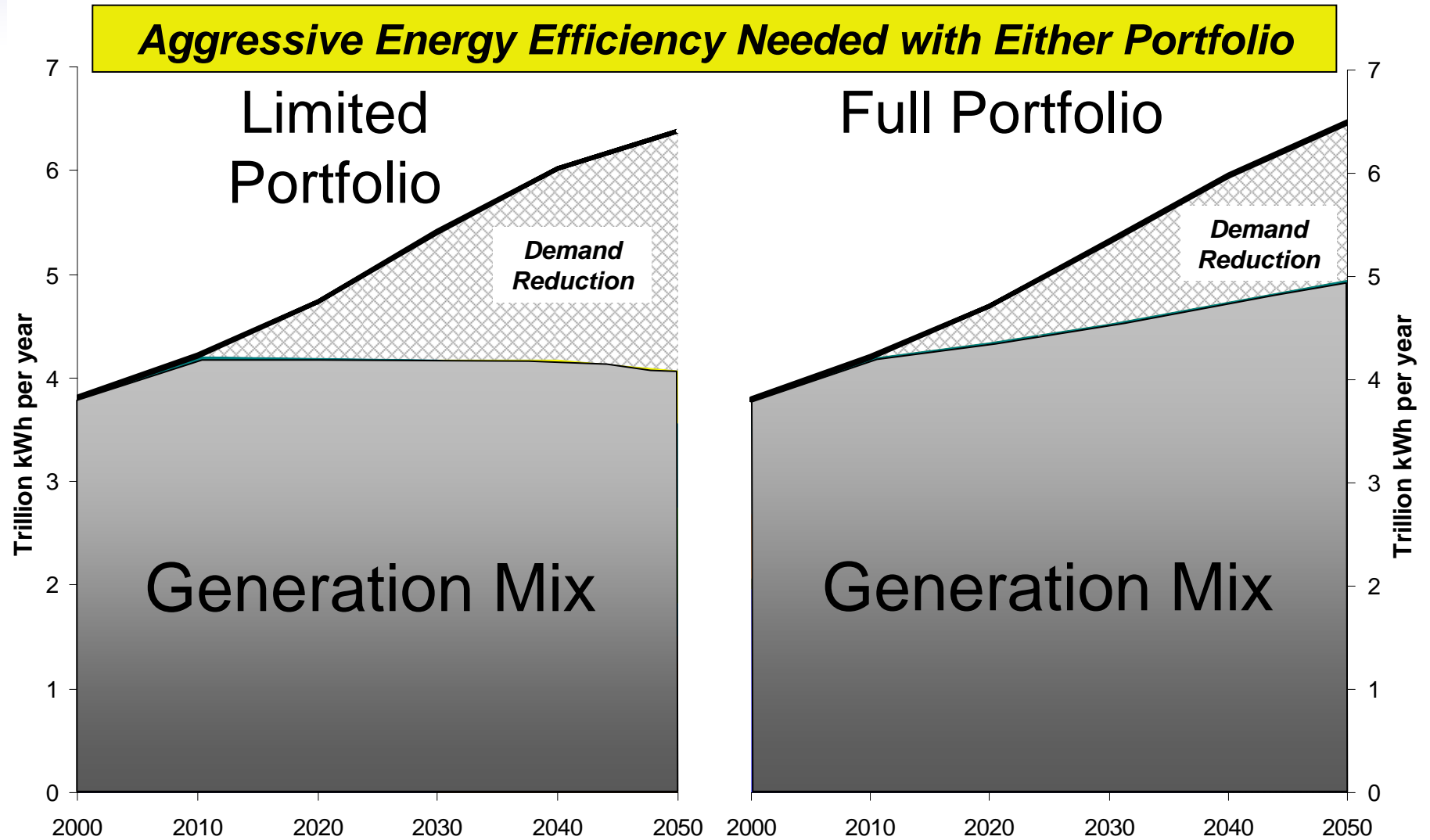
Coal and Gas CCS available

Accelerated end-use efficiency

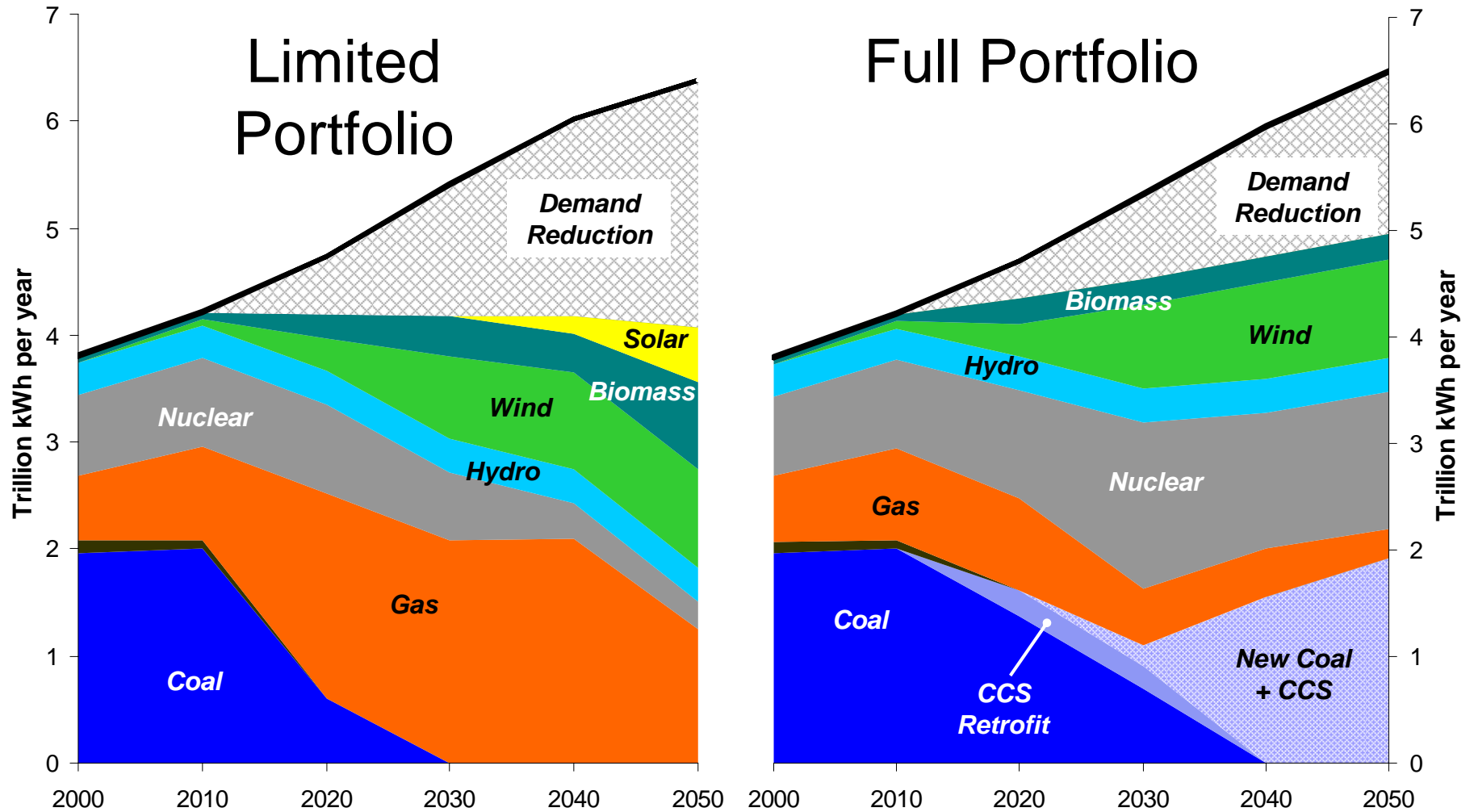
PEV's can expand

Nuclear production can expand

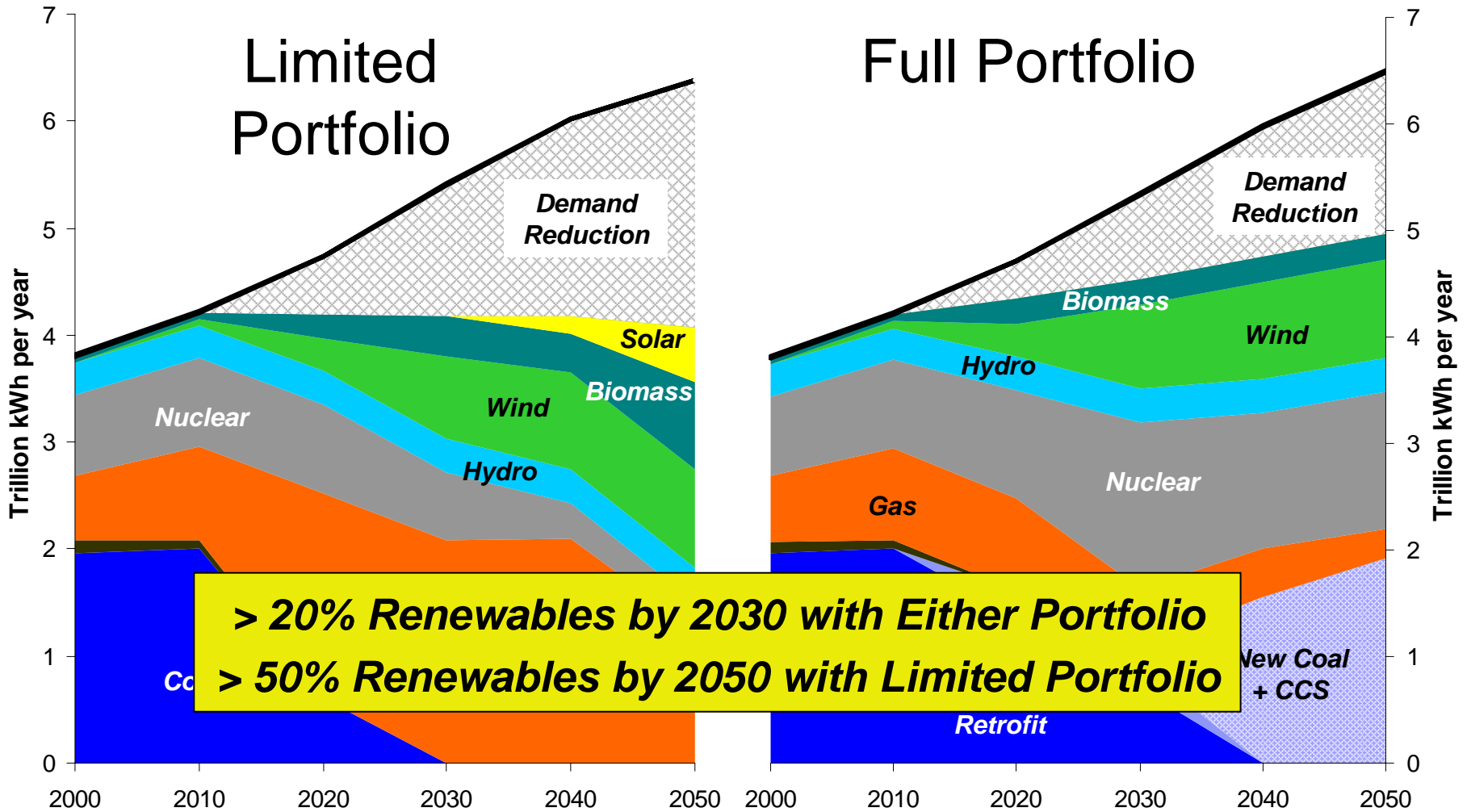
MERGE U.S. Electric Generation Mix



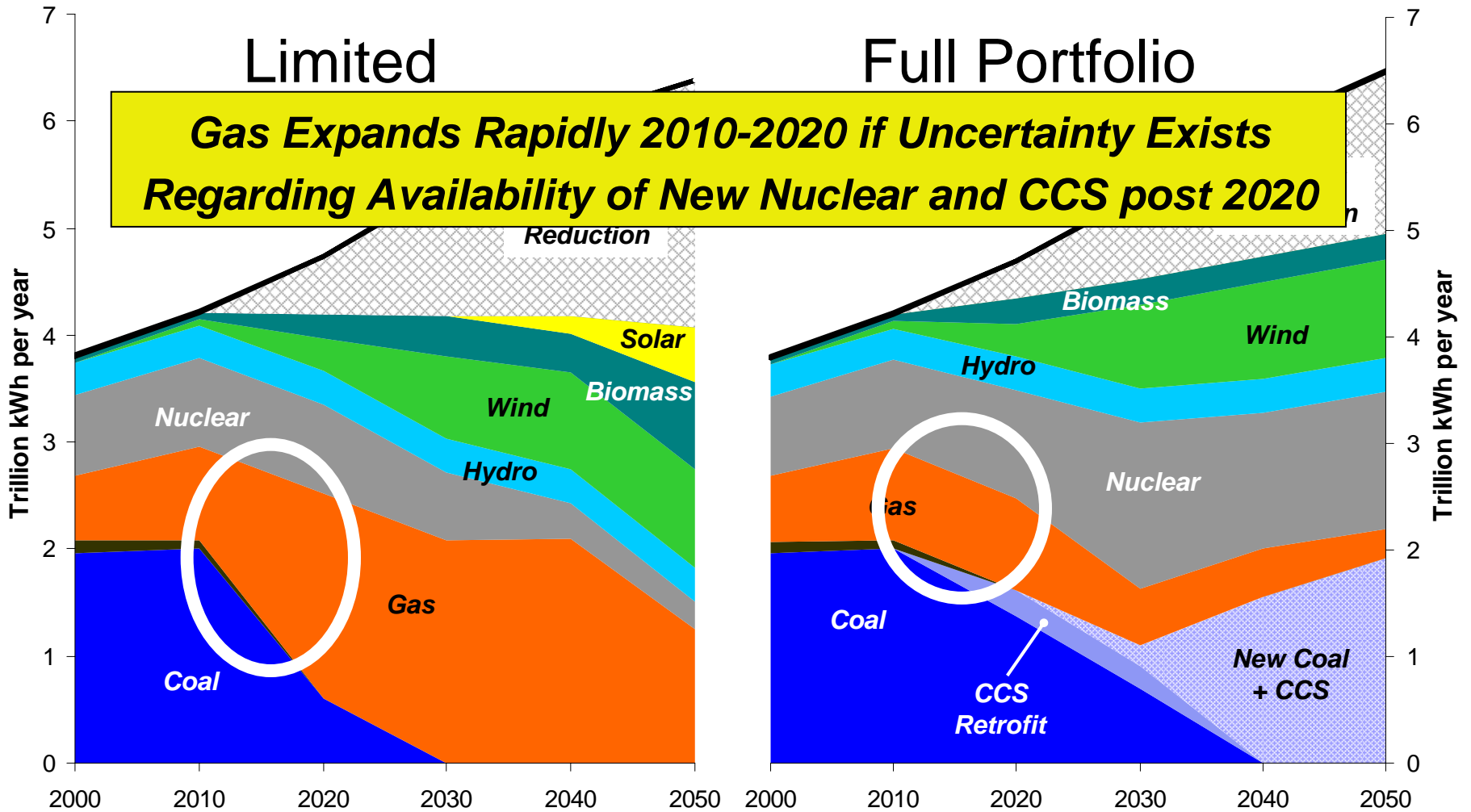
MERGE U.S. Electric Generation Mix



Insights – Renewables

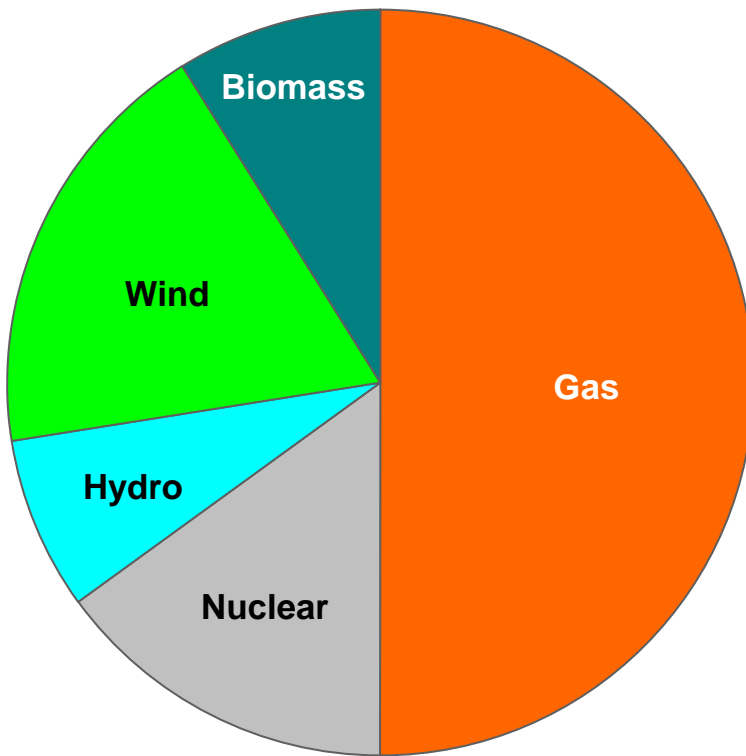


Insights – Nuclear and CCS

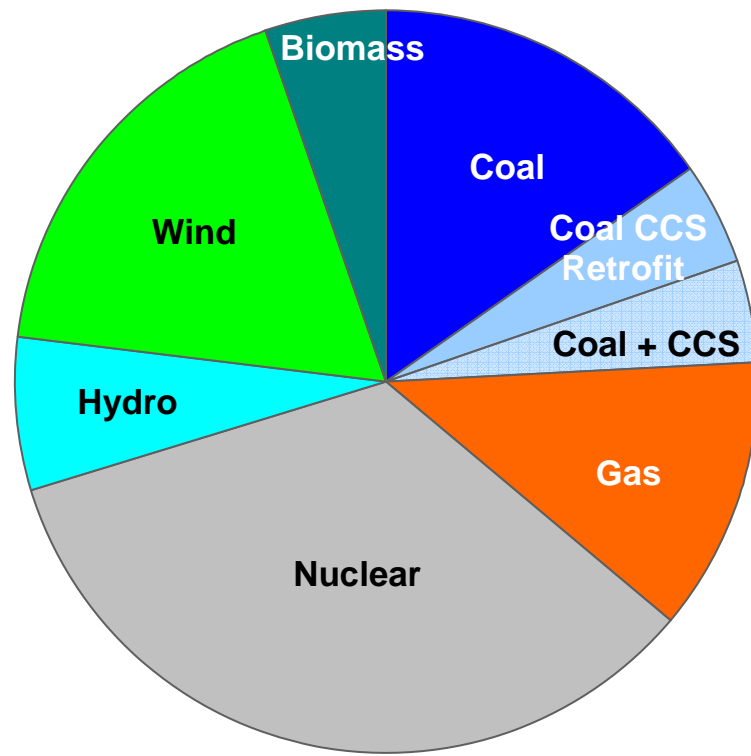


2030 Generation Mix

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



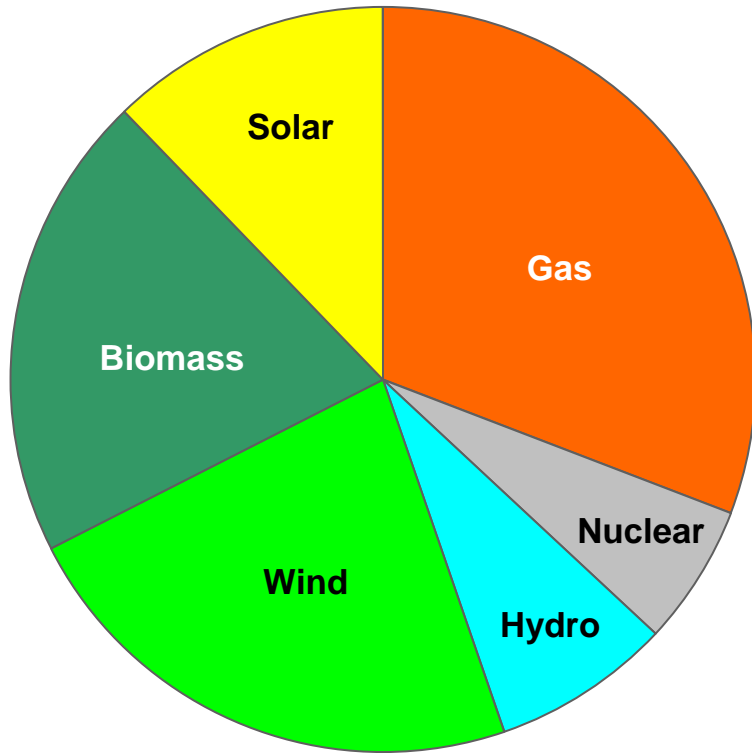
Limited Portfolio



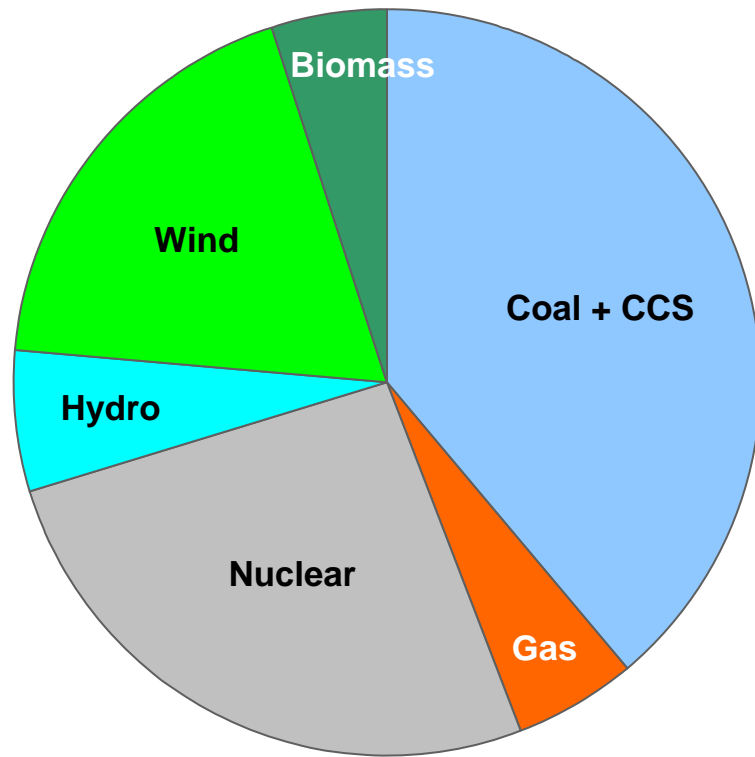
Full Portfolio

2050 Generation Mix

Totally different futures in 2050

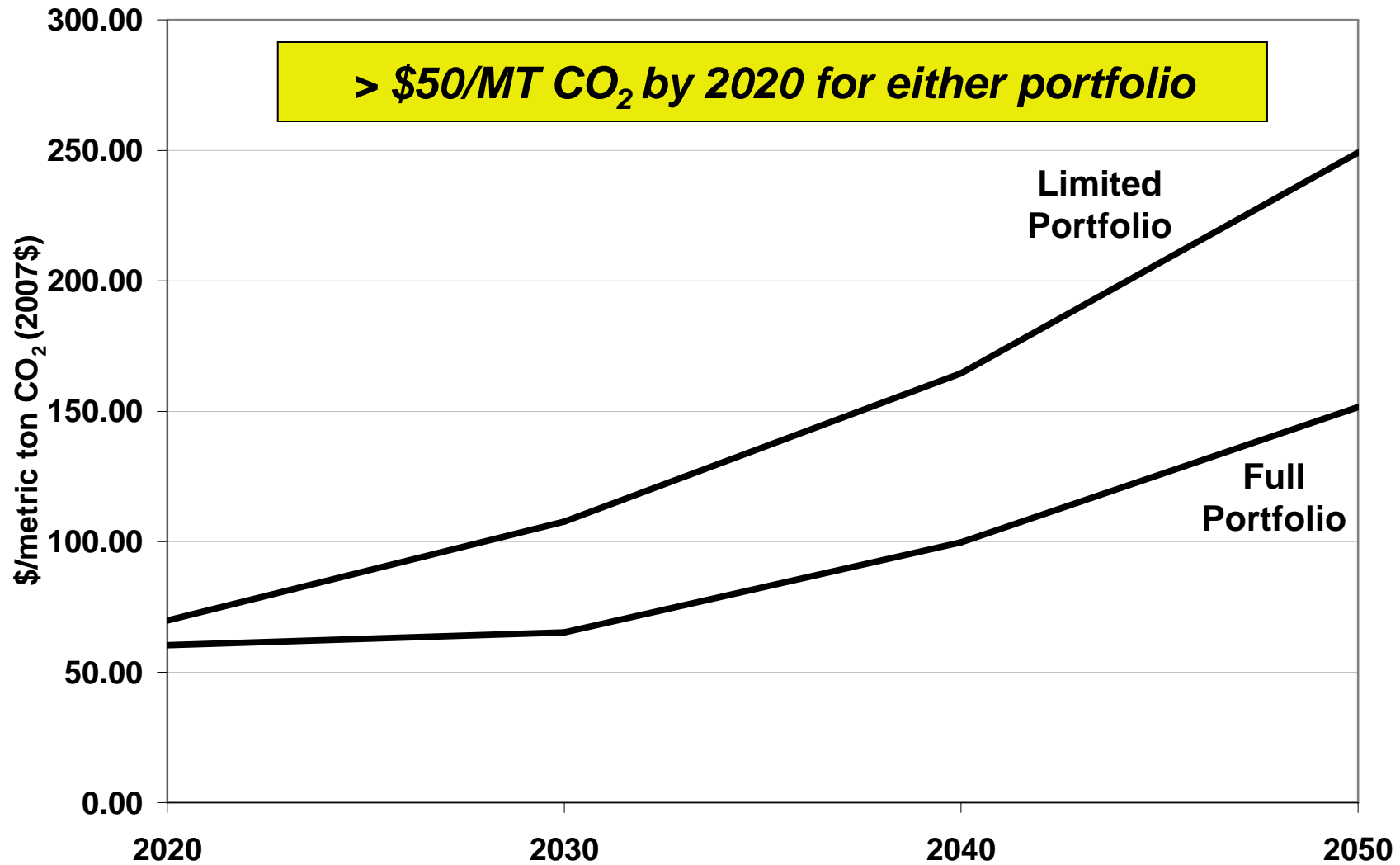


Limited Portfolio

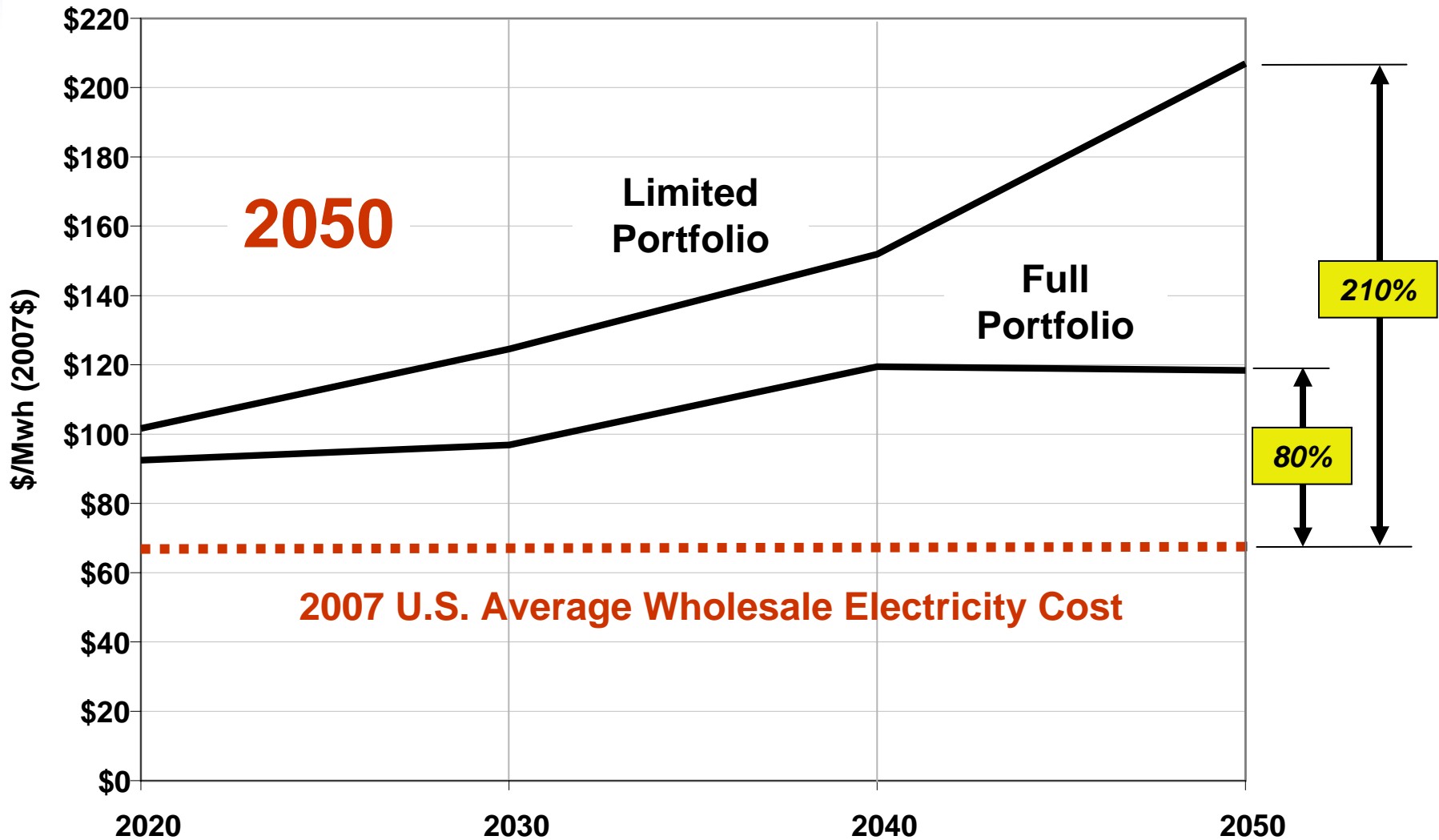


Full Portfolio

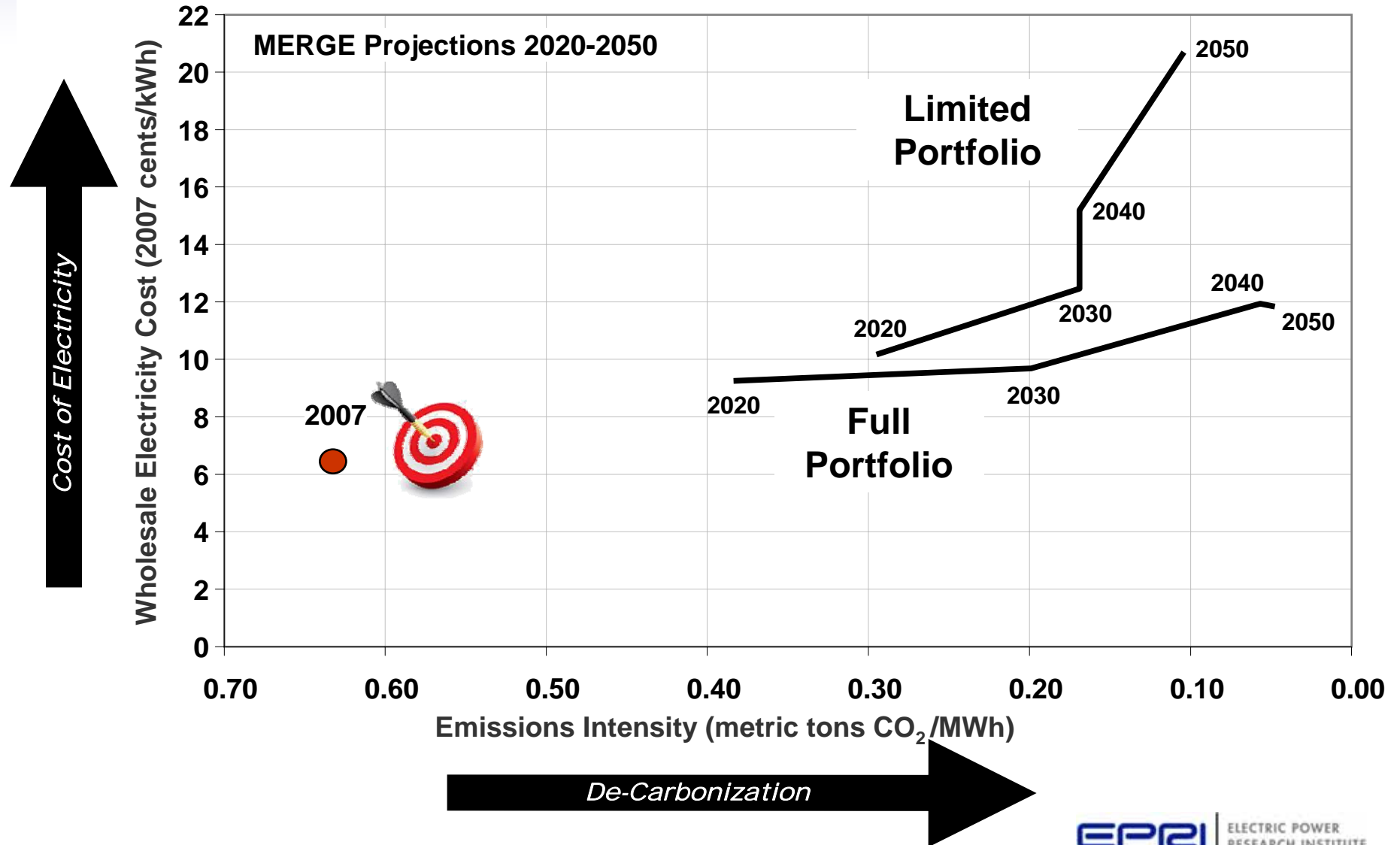
MERGE CO₂ Price Results



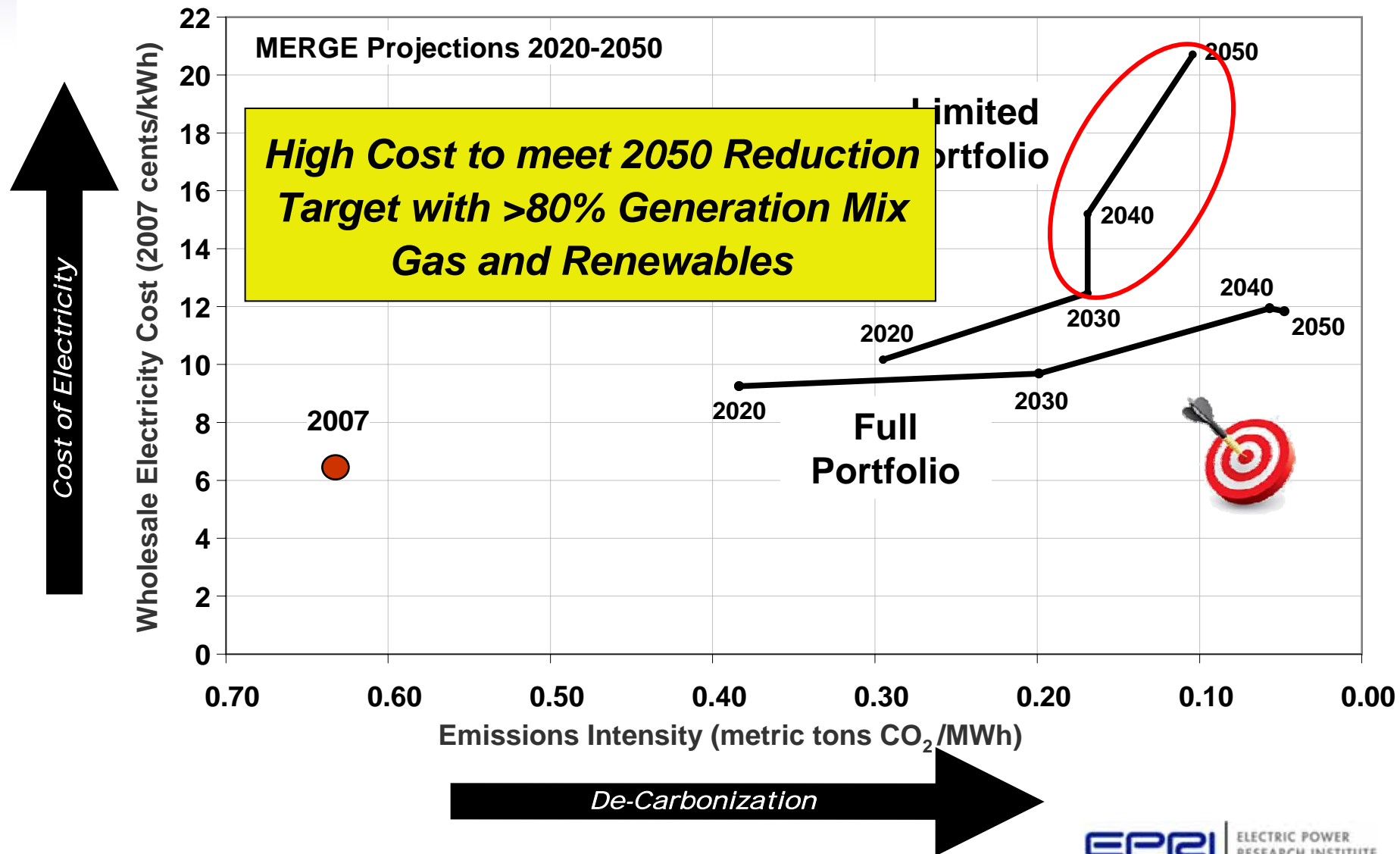
MERGE Wholesale Electricity Cost Results



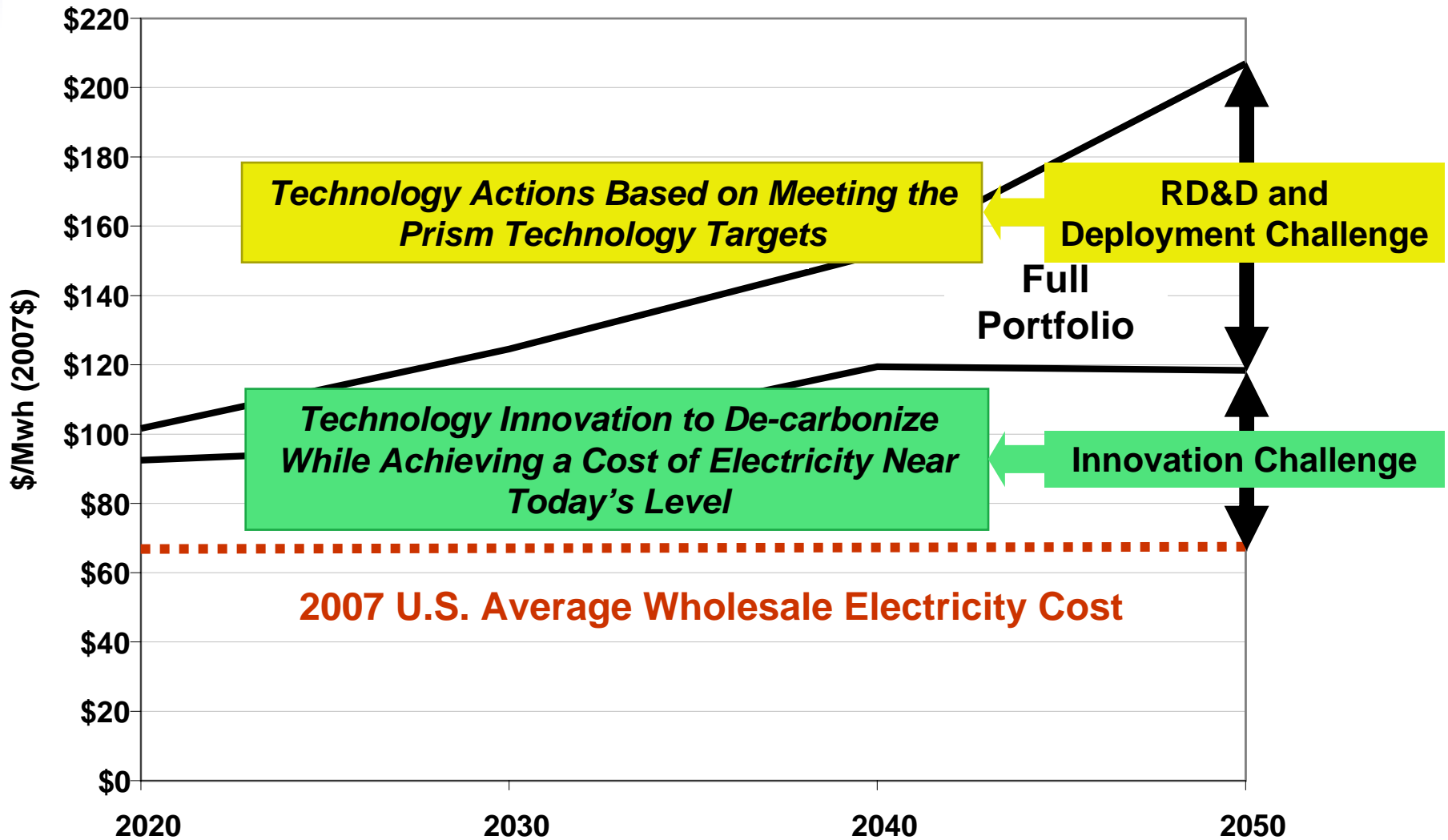
MERGE De-carbonization Results



MERGE De-carbonization Results



Meeting the Challenge



Meeting The Challenges



Energy Efficiency



Power Delivery



Renewable Energy



Nuclear Energy

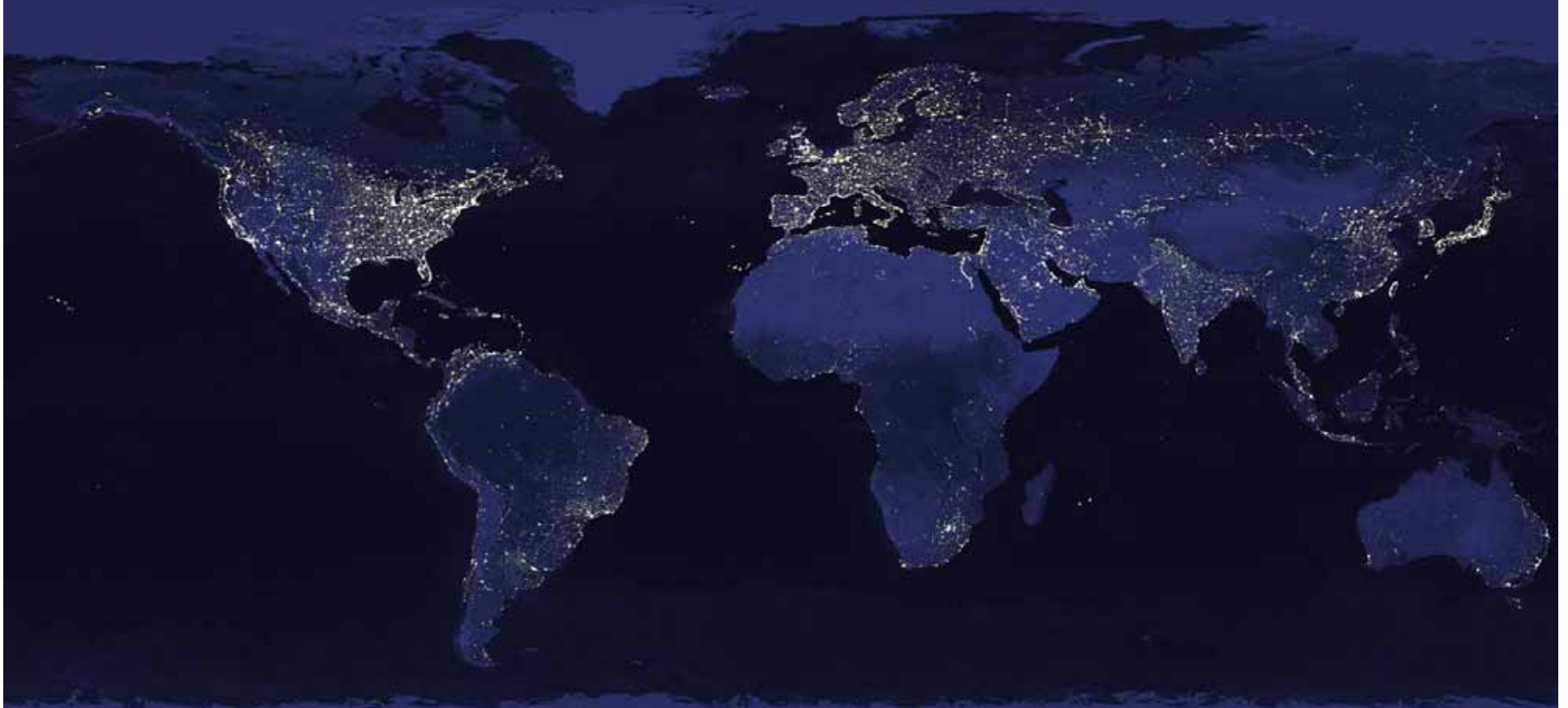


Fossil Generation

Electricity policy and technology actions during THIS DECADE . . .

. . . WILL shape our electricity future of 2050

Together...Shaping the Future of Electricity



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