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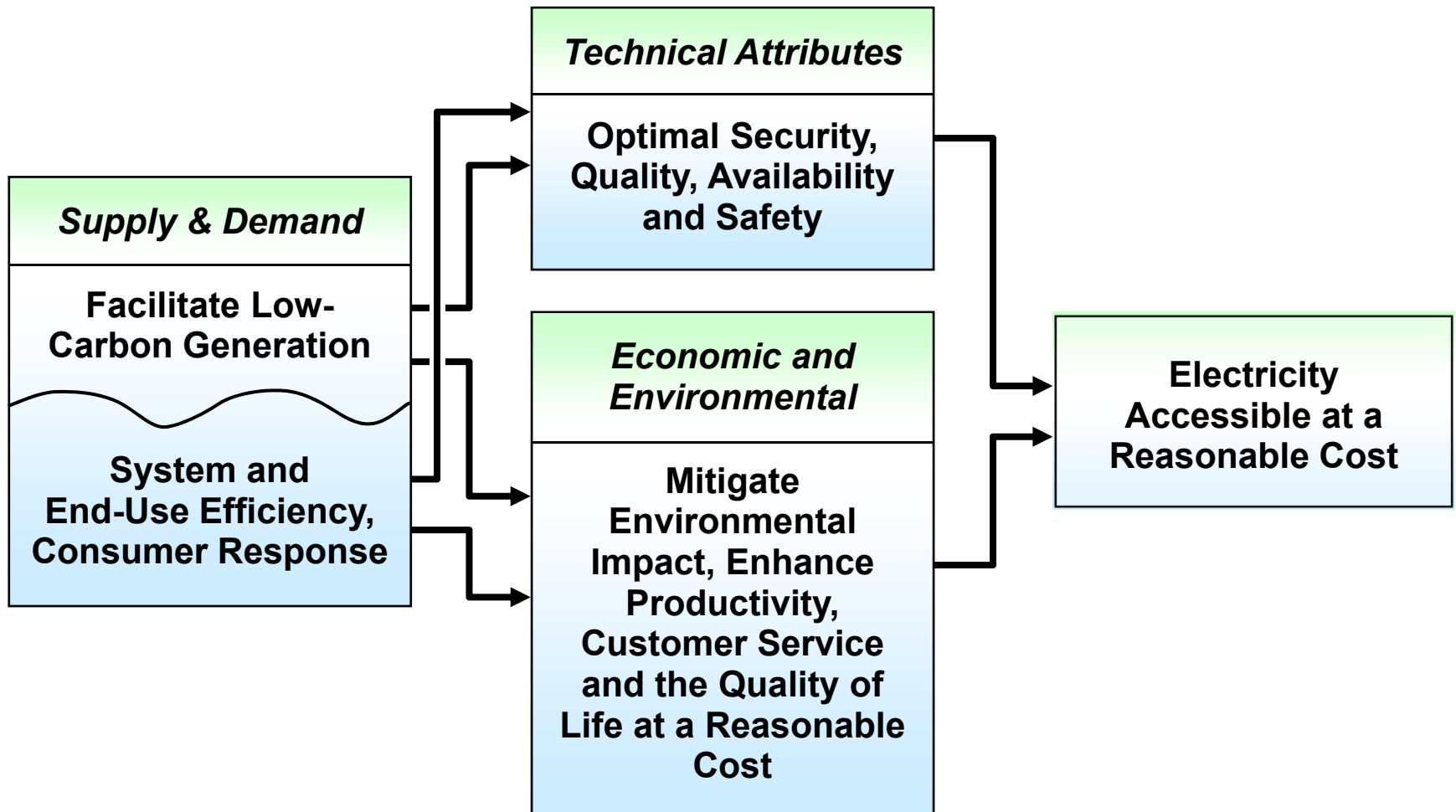
Observations on Investments in Smart Grid Technologies

**PSERC Executive Forum: Smart Grid
Deployment Strategies & Business
Opportunities**

Clark W. Gellings
Vice President – Technology

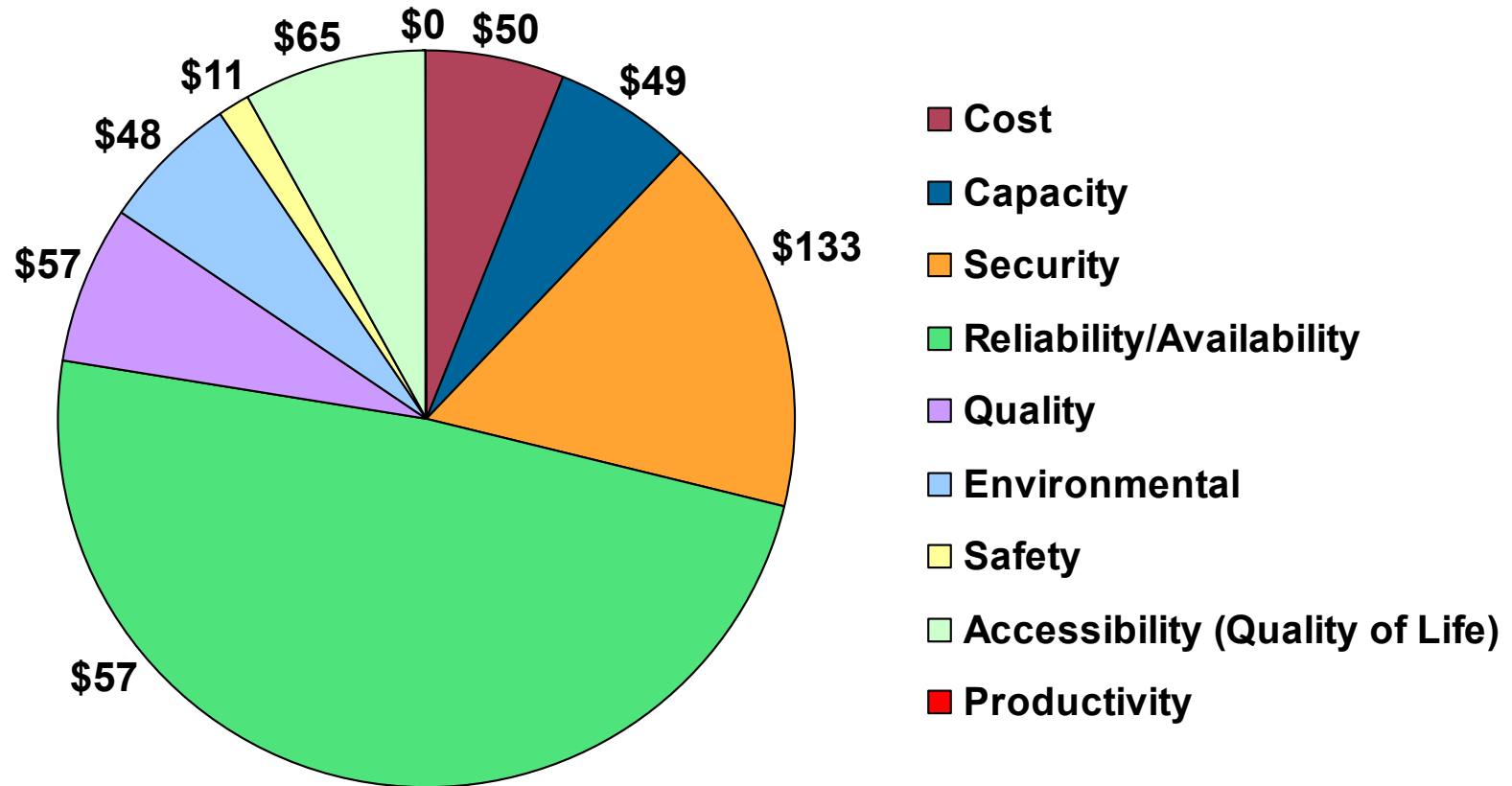
March 6, 2009
Austin, Texas

Smart Grid Benefits



Present Worth of All Attributes – Without AMI

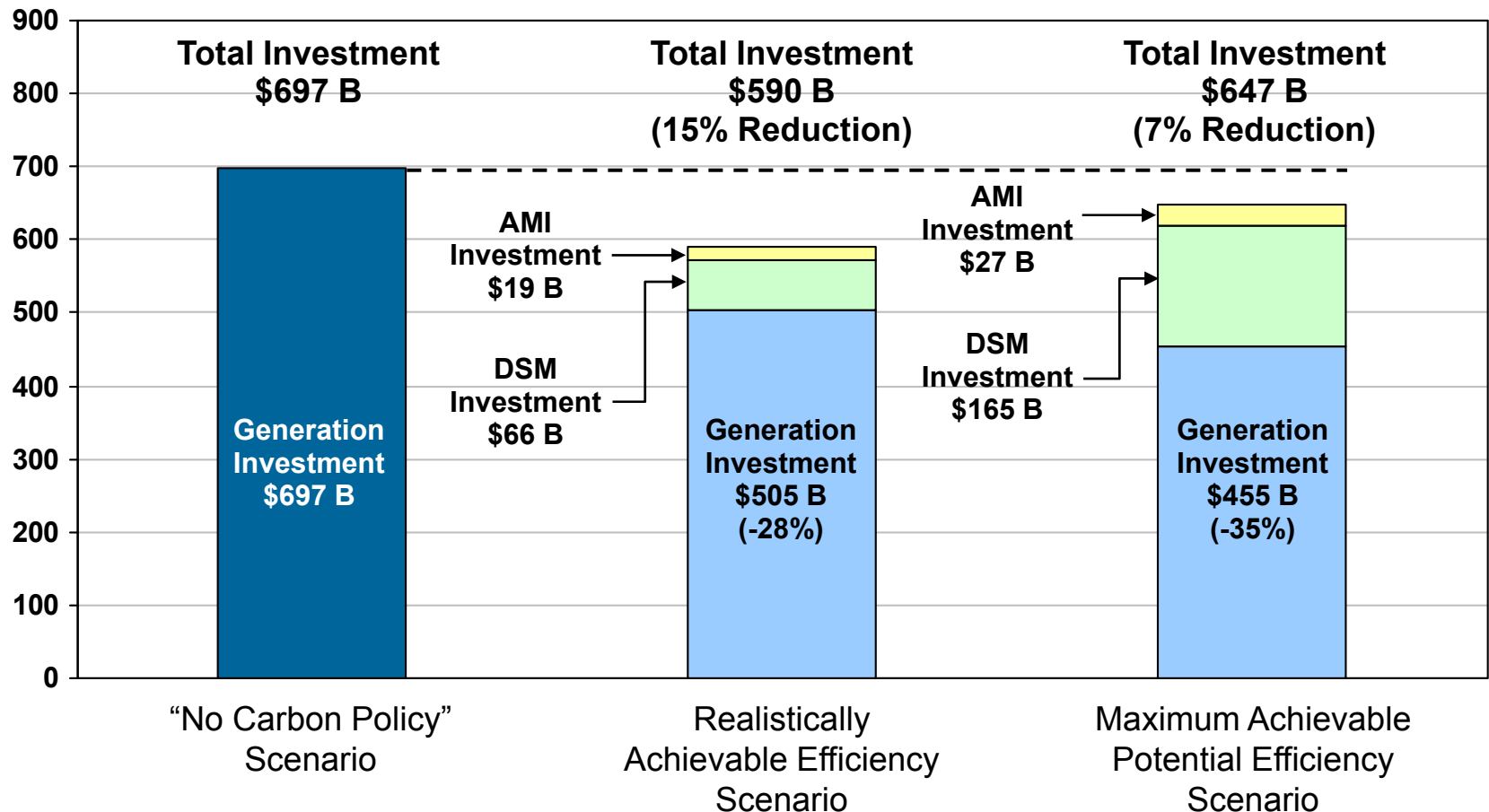
Aggregate Net Present Value All Attributes



- Present worth (5% discount rate) = \$802.32 billion
- Annualized value (5% discount rate) = \$64.38 billion/year

End-Use Efficiency and Demand Response Cuts Generation Capital Investment by 28% to 35%

Summary of Avoided Capital Investment Due to Enhanced Efficiency Illustrated Using “No Carbon Policy” Scenario

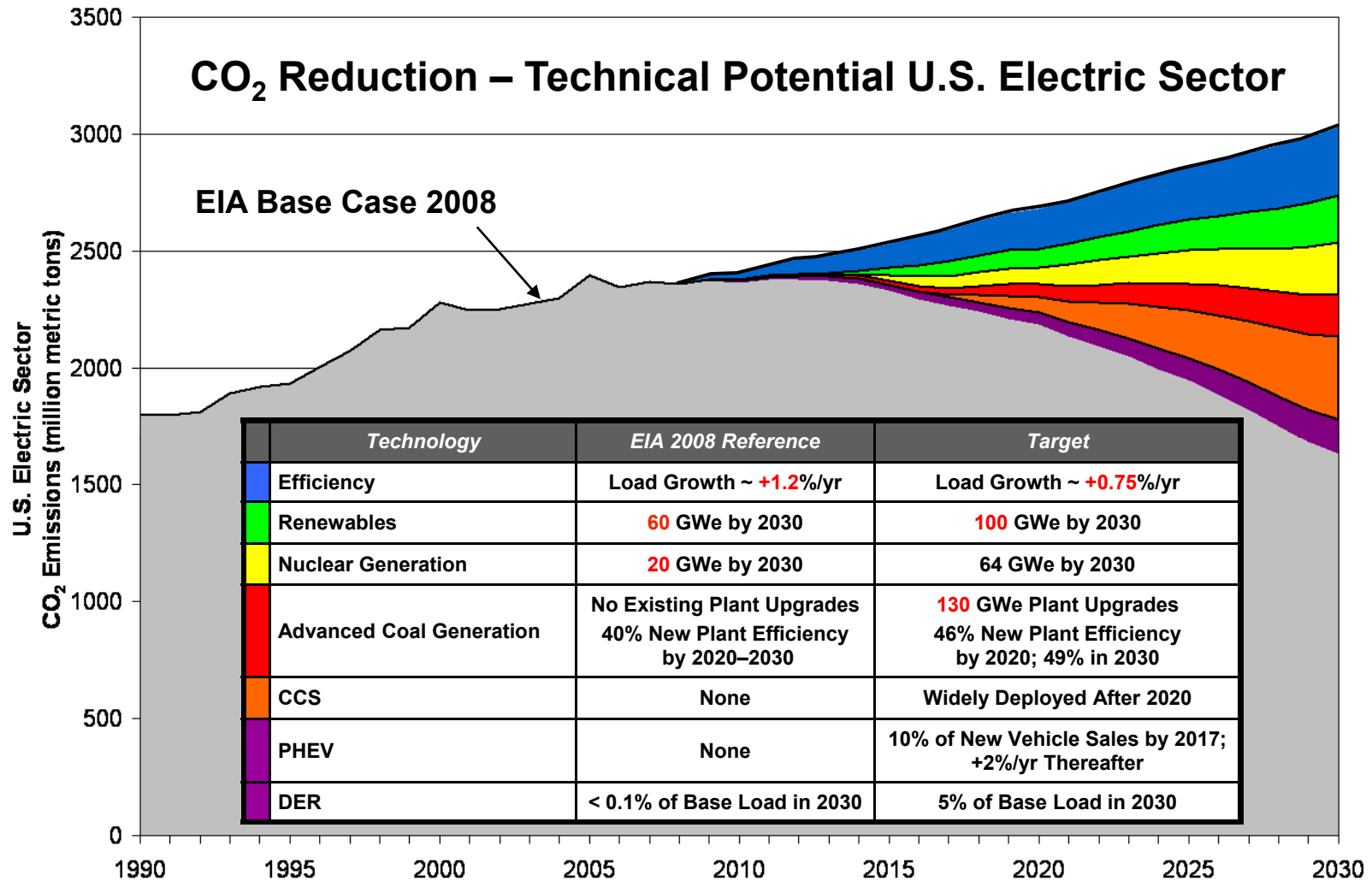


Source: The Edison Foundation

CWG/9596P

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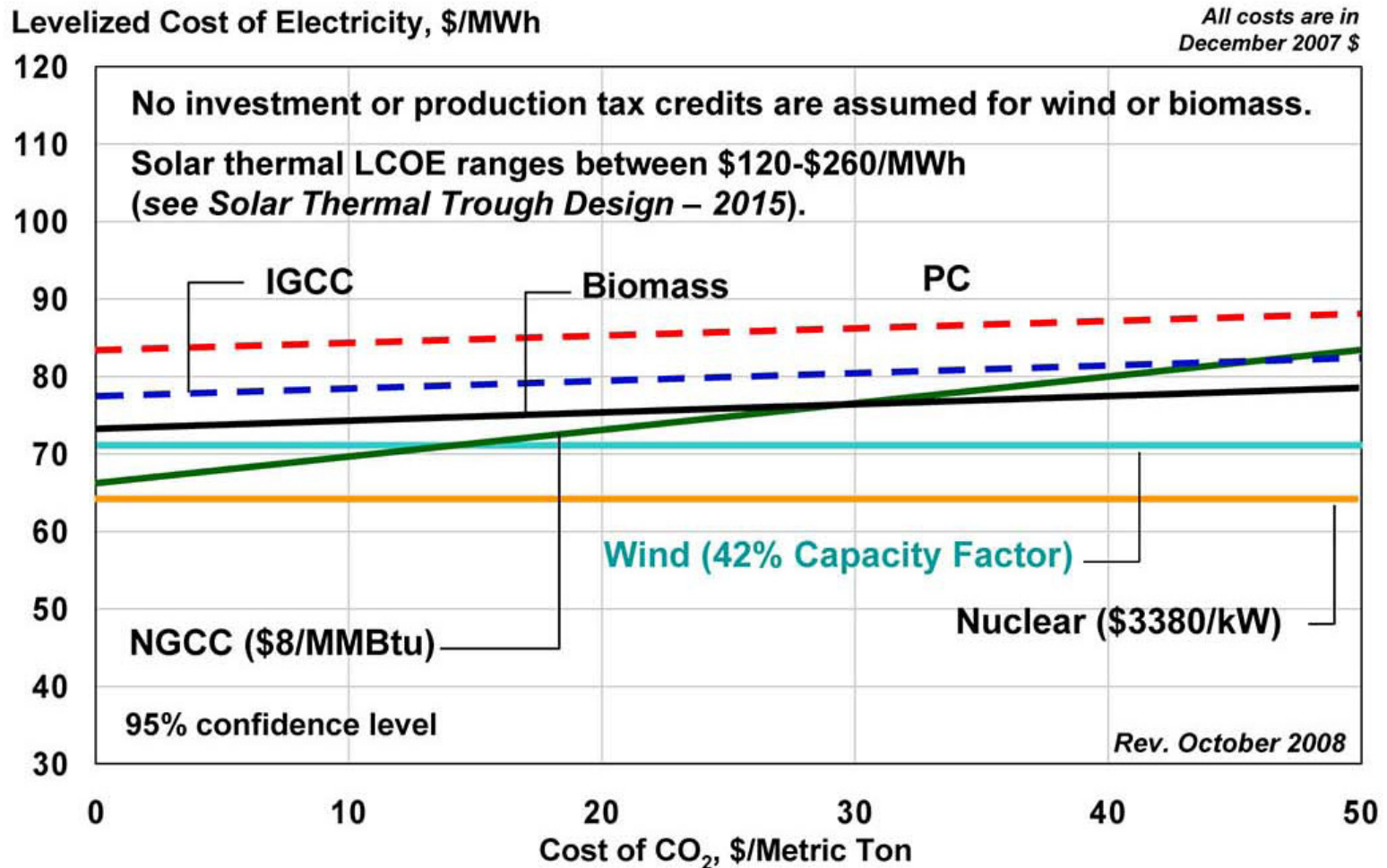
Supply and Demand



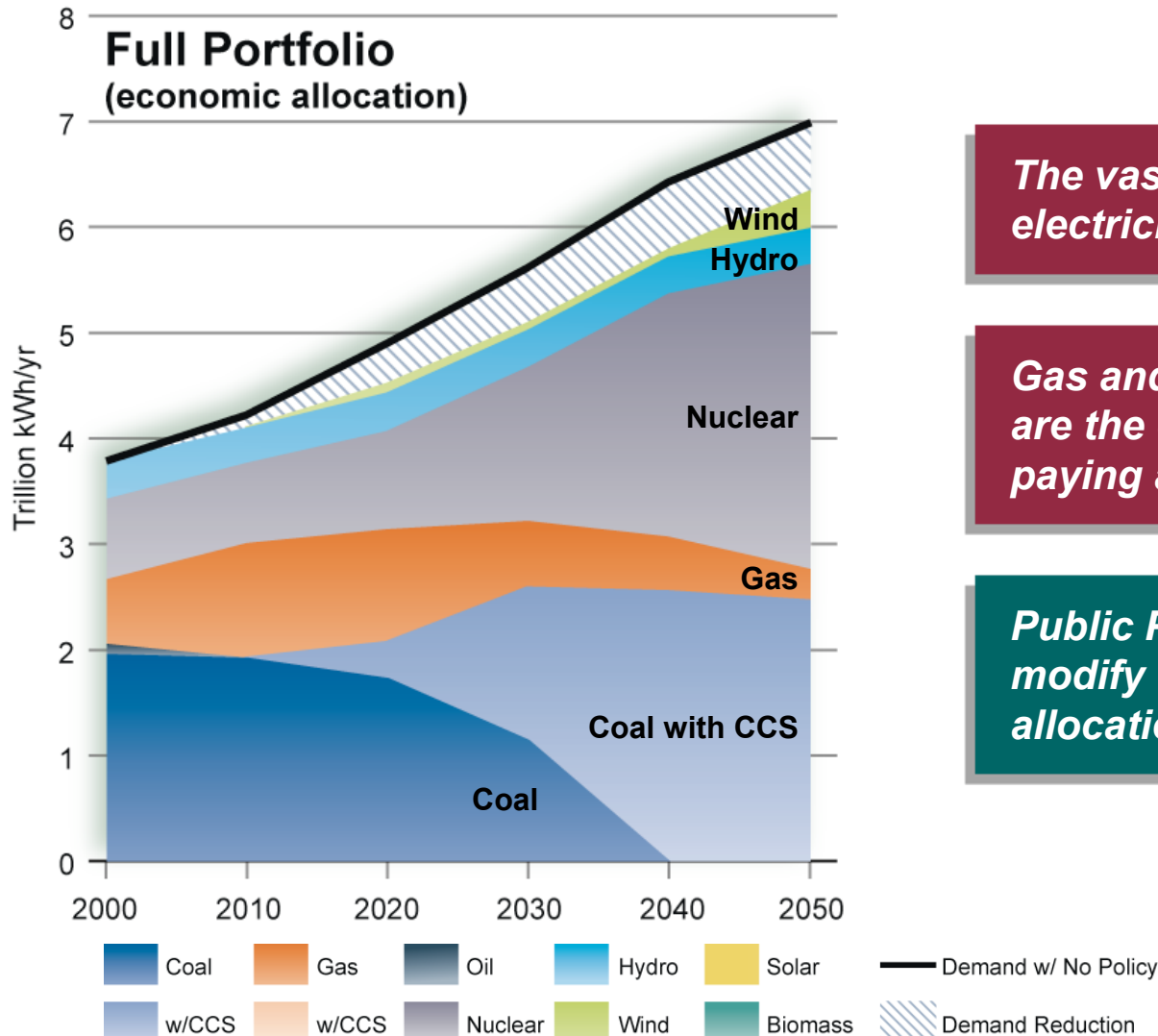
Electricity Technology Scenarios

	Full Portfolio	Limited Portfolio
Supply-Side		
Carbon Capture and Storage (CCS)	Available	Unavailable
New Nuclear	Production Can Expand	Existing Production Levels ~100 GW
Renewables	Need Smart Grid	Costs Decline Slower
New Coal and Gas	Improvements	Improvements
Demand-Side		
Plug-in Hybrid Electric Vehicles (PHEV)	Need Smart Grid	Unavailable
End-Use Efficiency	Need Smart Grid	Improvements

Value of Smart Grid: Enable Low-Carbon Generation



U.S. Electric Generation – Full Portfolio

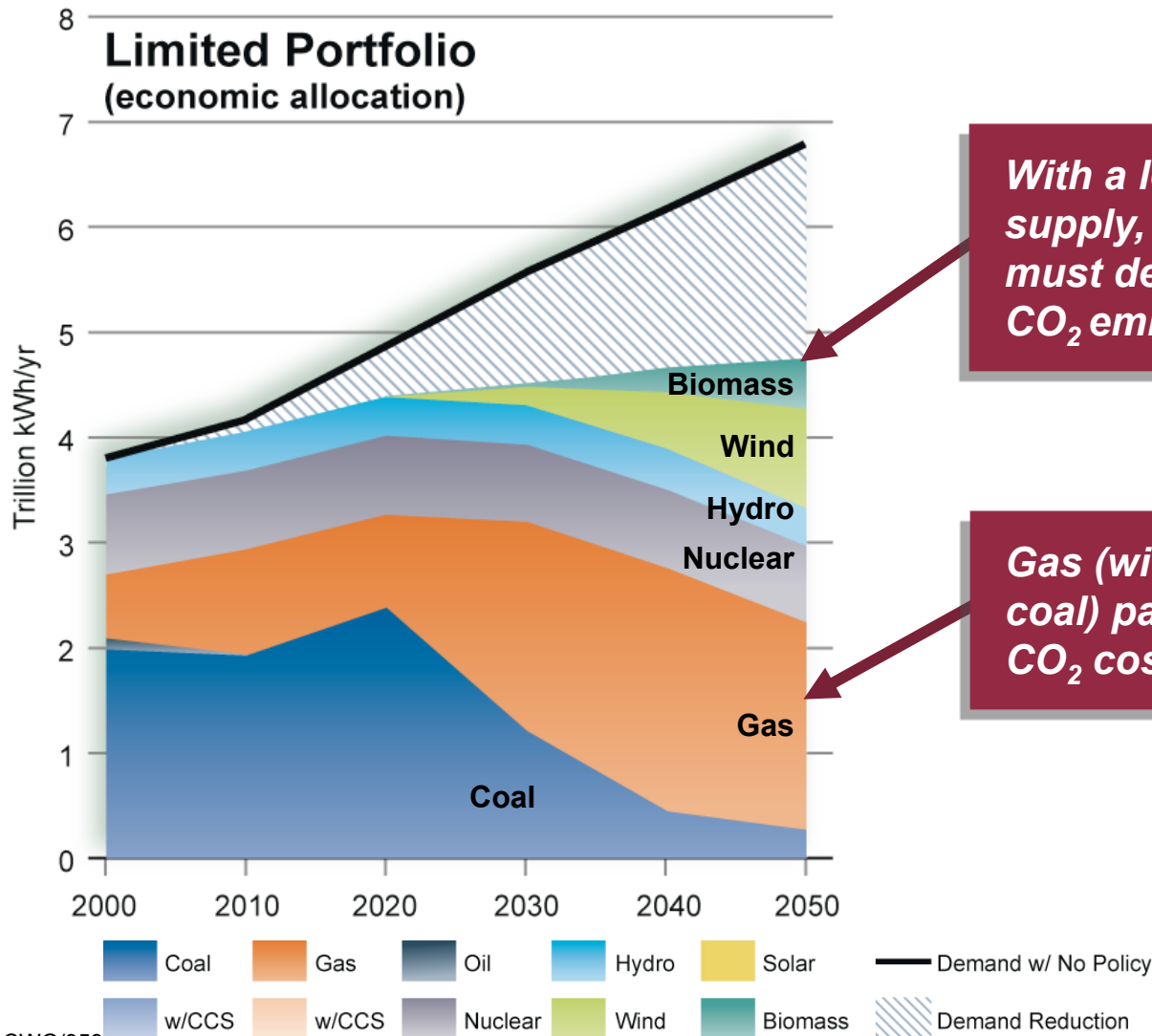


The vast majority of electricity supply is CO₂-free

Gas and non-captured coal are the only supply options paying a CO₂ cost

Public Policy (RPS) can modify this economic allocation

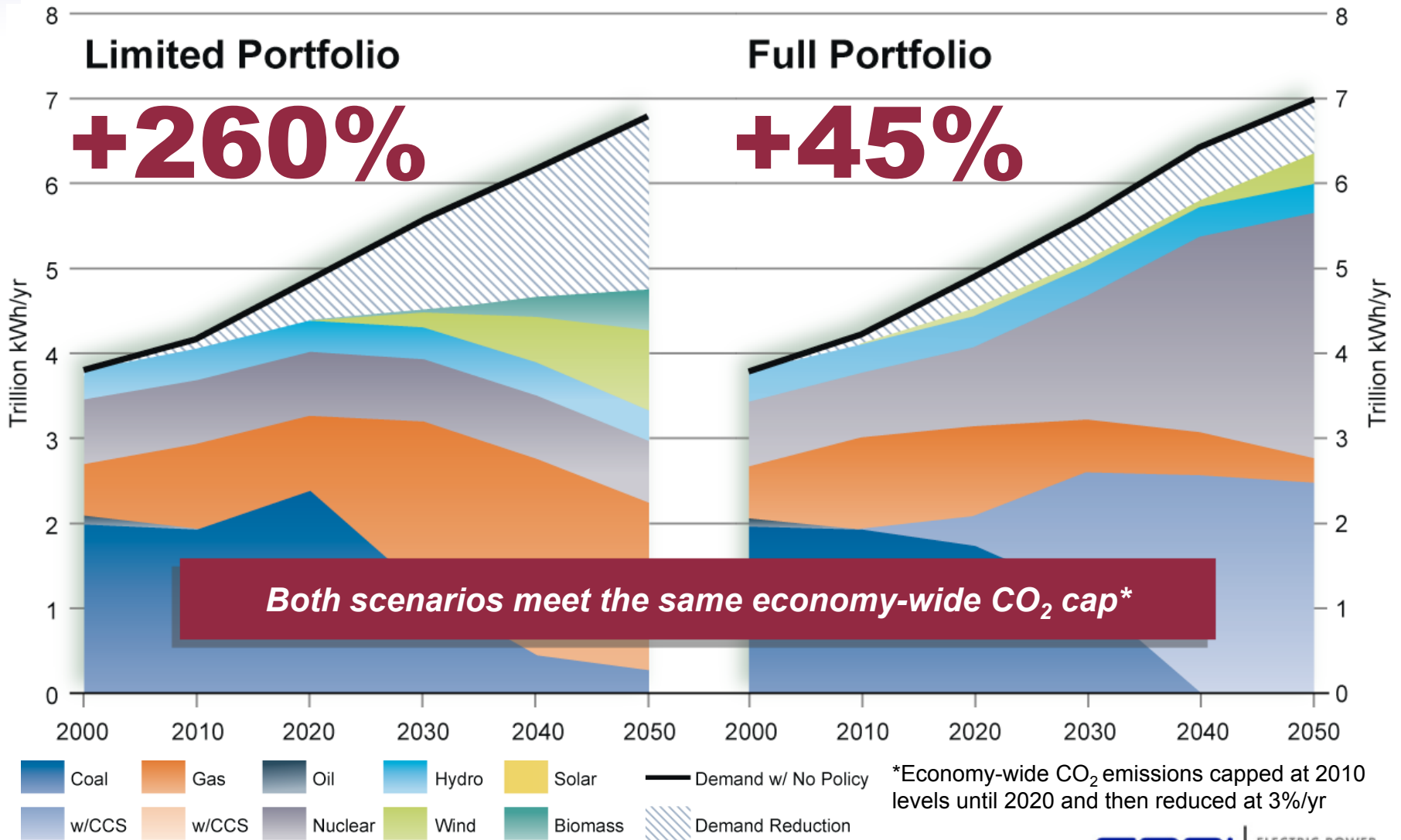
U.S. Electric Generation – Limited Portfolio



With a less de-carbonized supply, electricity load must decline to meet the CO₂ emissions target

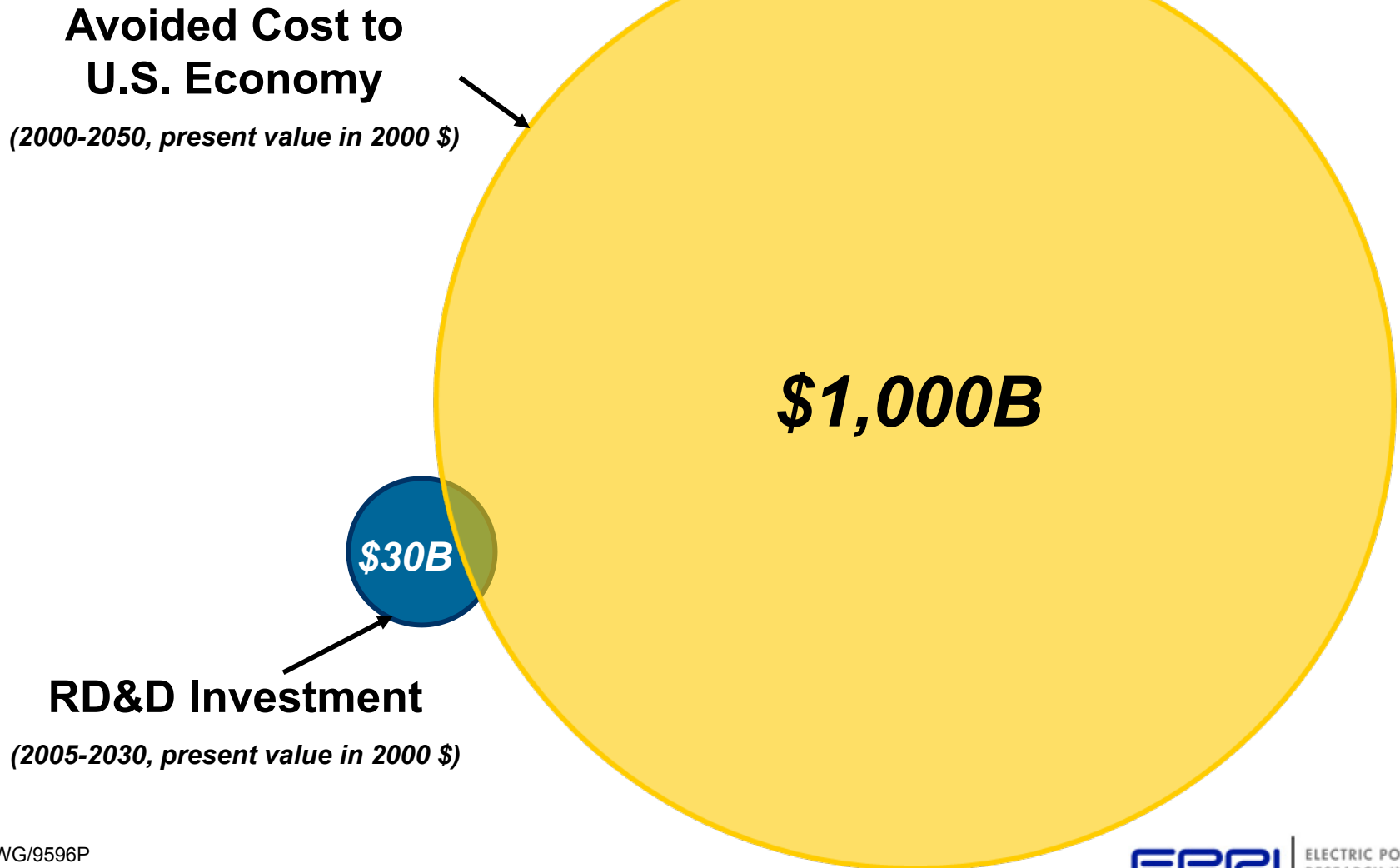
Gas (with half the CO₂ of coal) pays a significant CO₂ cost

Increase in Real Electricity Prices... 2000 to 2050

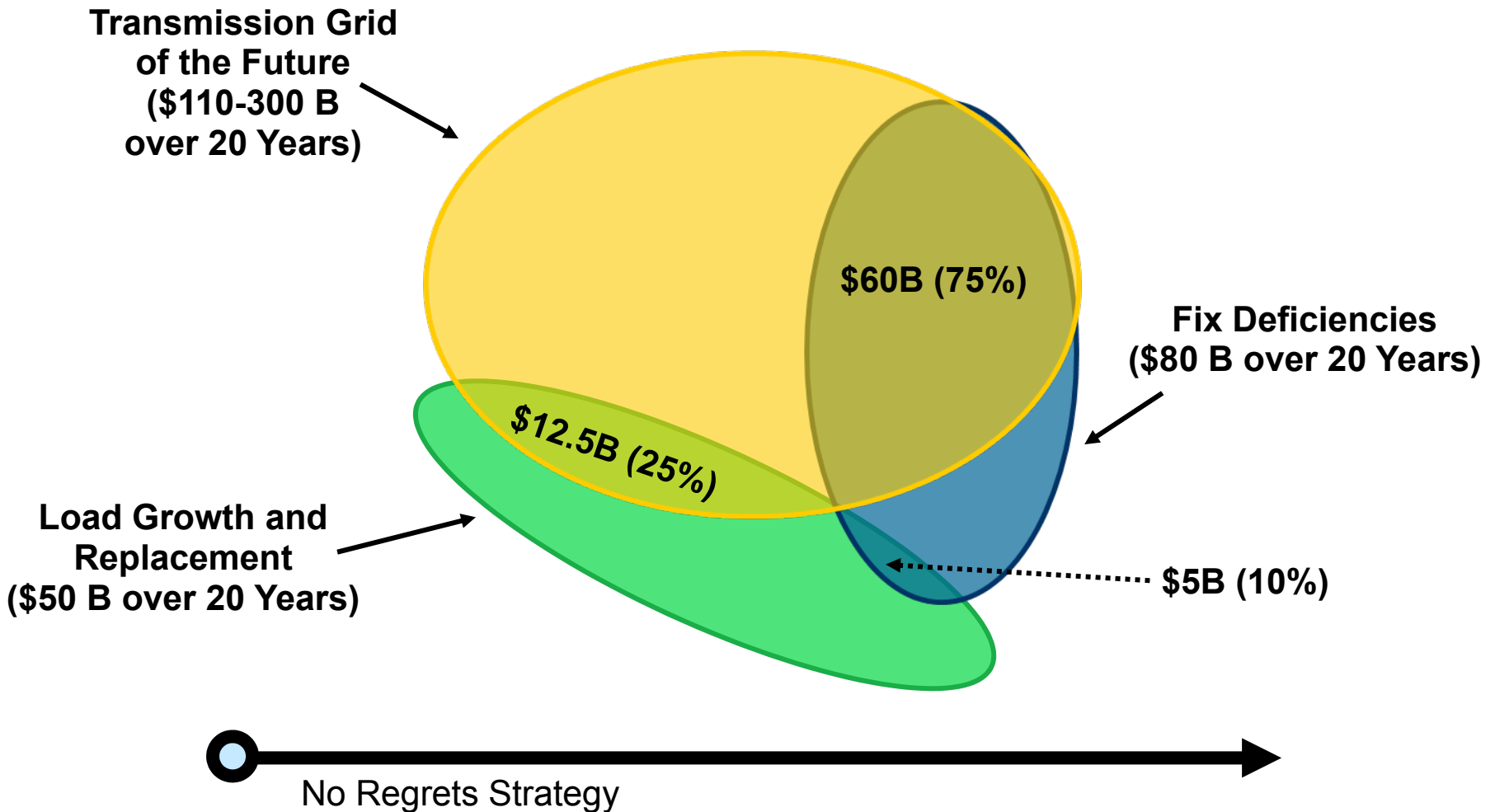


*Economy-wide CO₂ emissions capped at 2010 levels until 2020 and then reduced at 3%/yr

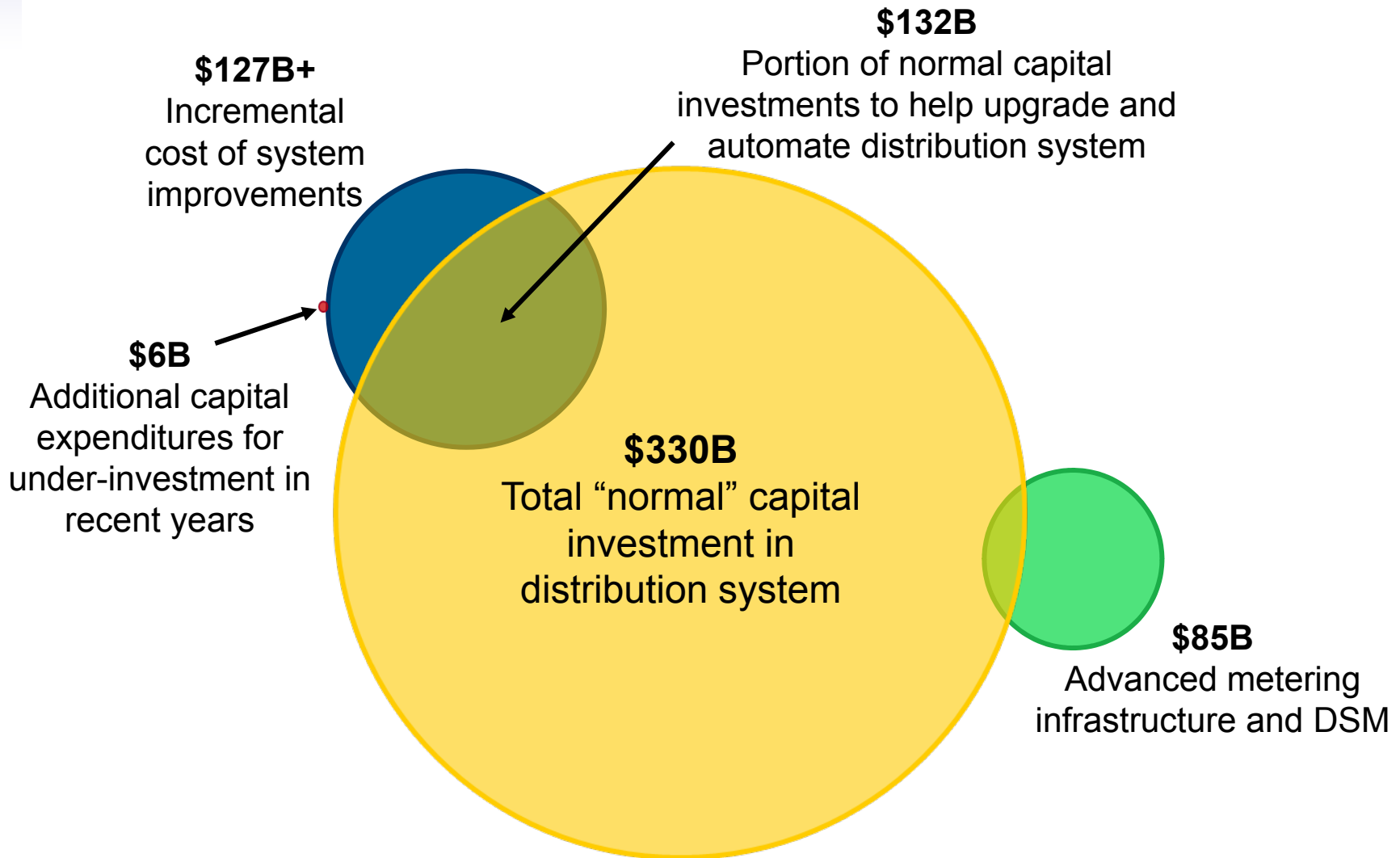
RD&D is a Good Investment



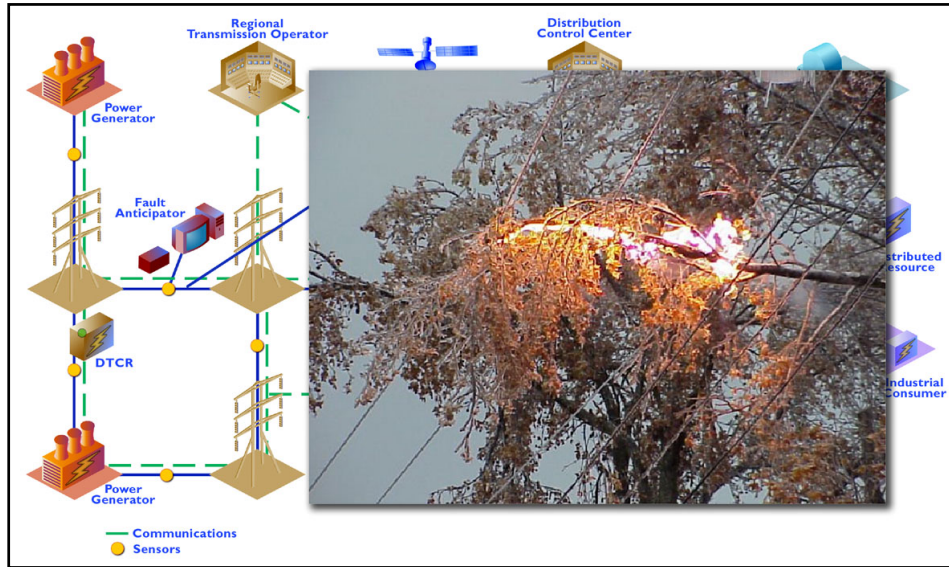
Transmission Costs for Fully Functional Power Delivery System of the Future



What is Required to Achieve the Fully Functional Distribution System of the Future?



Which Technologies?



Apply Fault Anticipation

Distribution DFA

Intelligent Transformer

For Further Information

- *“The Power to Reduce CO₂ Emissions: The Full Portfolio,”* August 2007, EPRI Report 1015461.
- *“The Green Grid: Energy Savings and Carbon Emissions Reductions Enabled by a Smart Grid,”* 2008, EPRI Report 1016905.
- *“Power Delivery System of the Future: A Preliminary Estimate of Costs and Benefits,”* 2004, EPRI Report 1011001.
- *“Analysis of Business Customers’ Willingness to Pay for Power System Enhancements,”* 2004, EPRI Report 1011363.
- *“Transforming America’s Power Industry: The Investment Challenge 2010-2030,”* November 2008, The Brattle Group.