



Program Goal and Baseline Plant

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DOE/NETL CCS Program Goals

By 2020, have **available for commercial deployment, technologies and best practices for achieving:**

90% CO₂ capture

99%+ storage permanence

Pre-combustion Capture (IGCC)

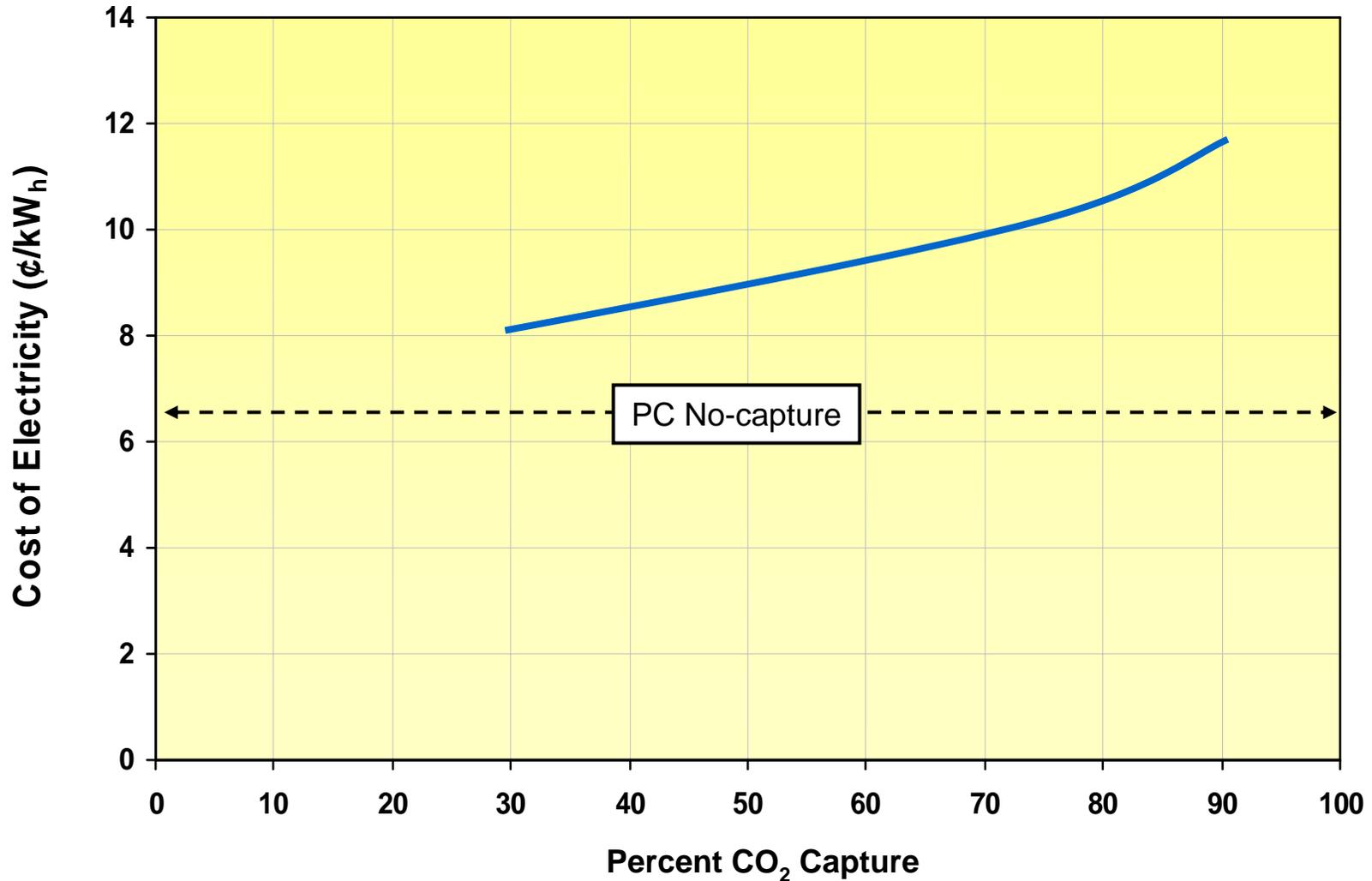
< 10% increase in cost of electricity (COE)*

Post- and Oxy-combustion Capture

< 35% increase in COE*

Includes 50 mile pipeline transport and saline formation storage, 100 years of monitoring

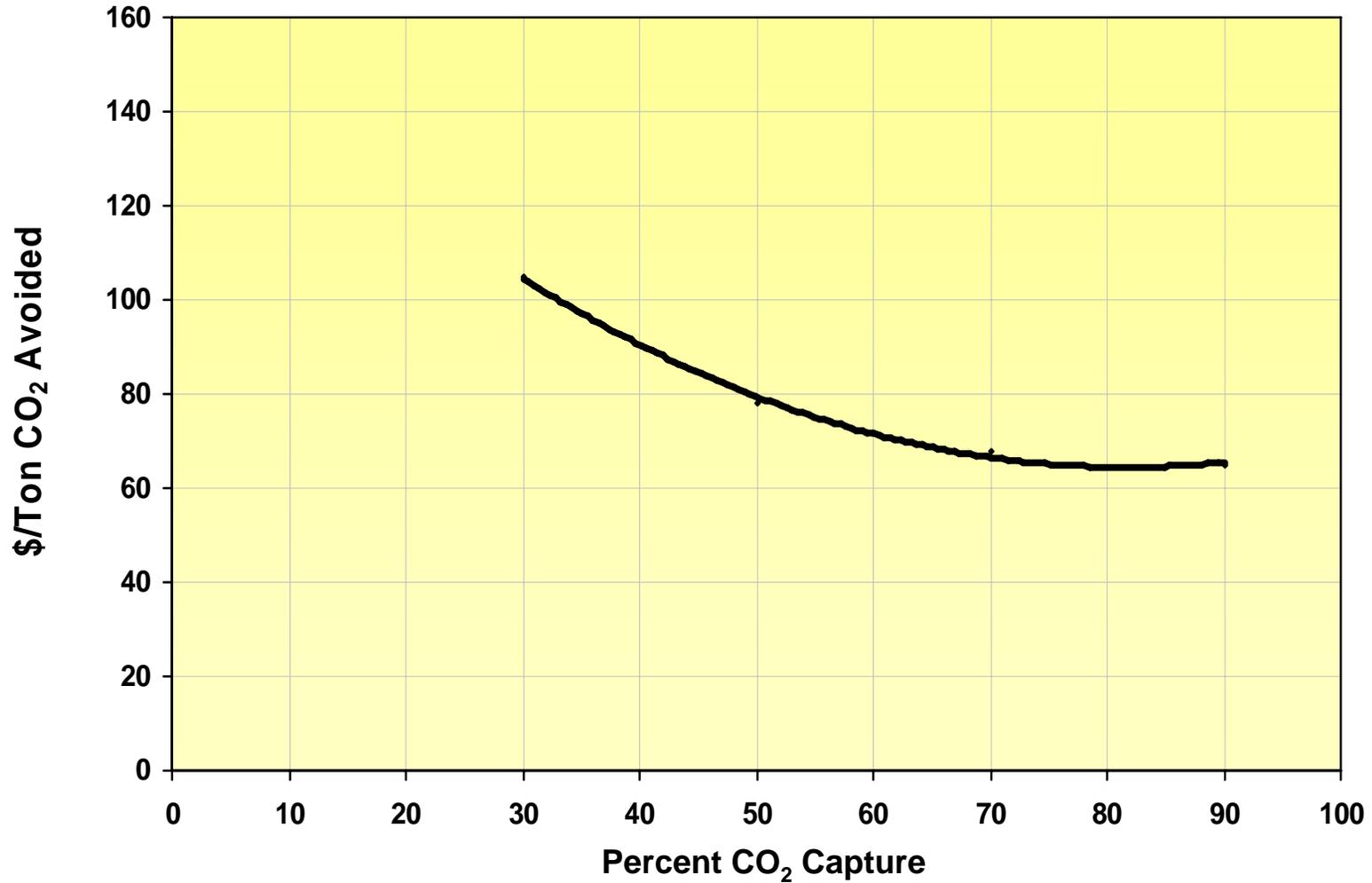
CO₂ Capture COE Impact



Source: *Cost and Performance Baseline for Fossil Energy Power Plants study, Volume 1: Bituminous Coal and Natural Gas to Electricity*; NETL, May 2007.

CO₂ Capture Cost

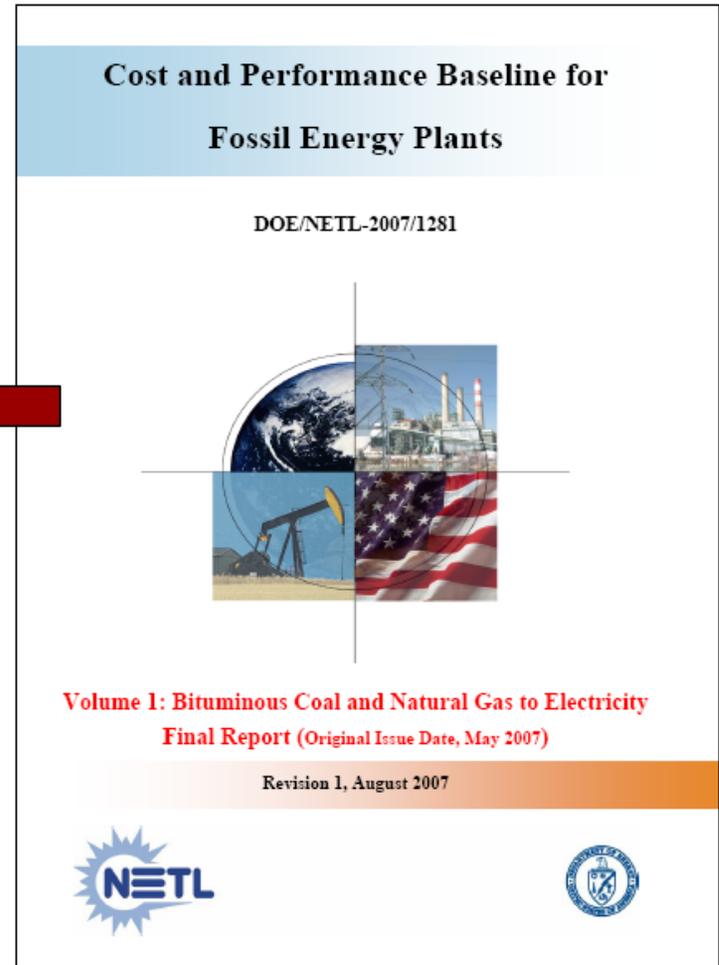
\$/Ton CO₂ Avoided



Establishing the Post-Combustion Power Plant Baseline

“Cost and Performance Comparison of Fossil Energy Power Plants”

- Report Contains -
- Subcritical Pulverized Coal
- Supercritical Pulverized Coal
- Integrated Gasification Combined Cycle (3 types)
- Natural Gas Combined Cycle



Existing Plants CO₂ Capture Program Goal

Why 35%?

Setting the Metric:

- % COE, \$/Ton Captured, \$/Ton Avoided

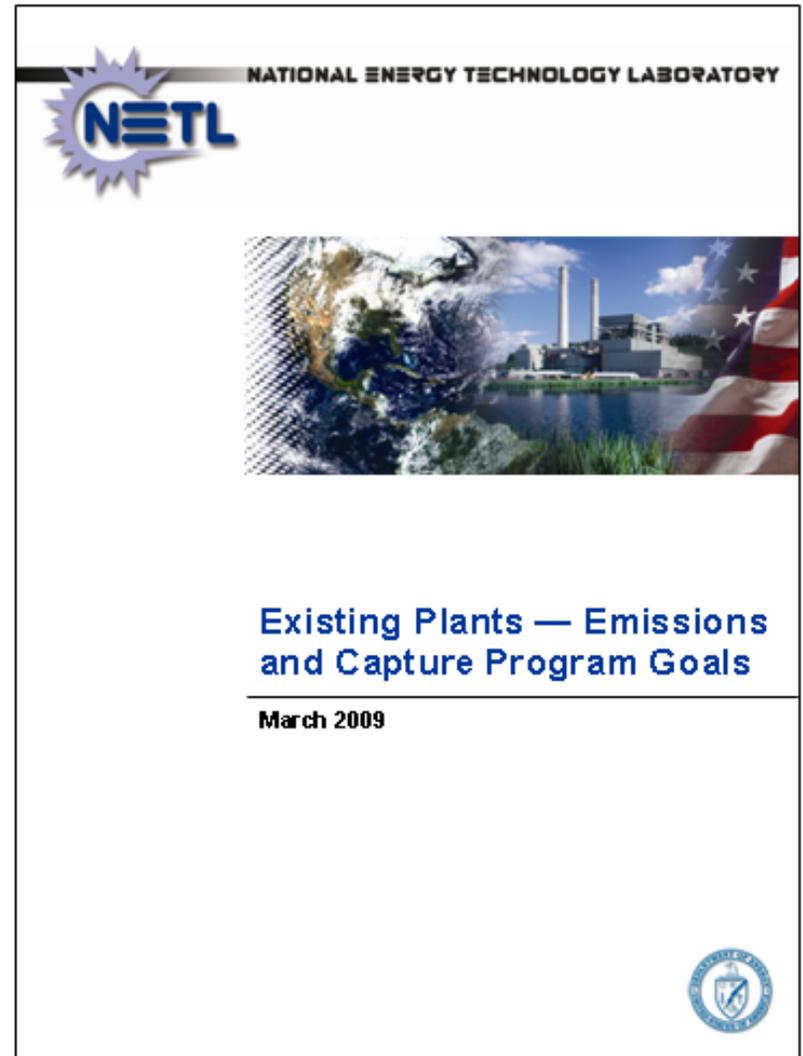
Re-distribute CCS cost components

- Capital
- Operating
- Capture
- Compression
- Transport, Storage, Monitoring

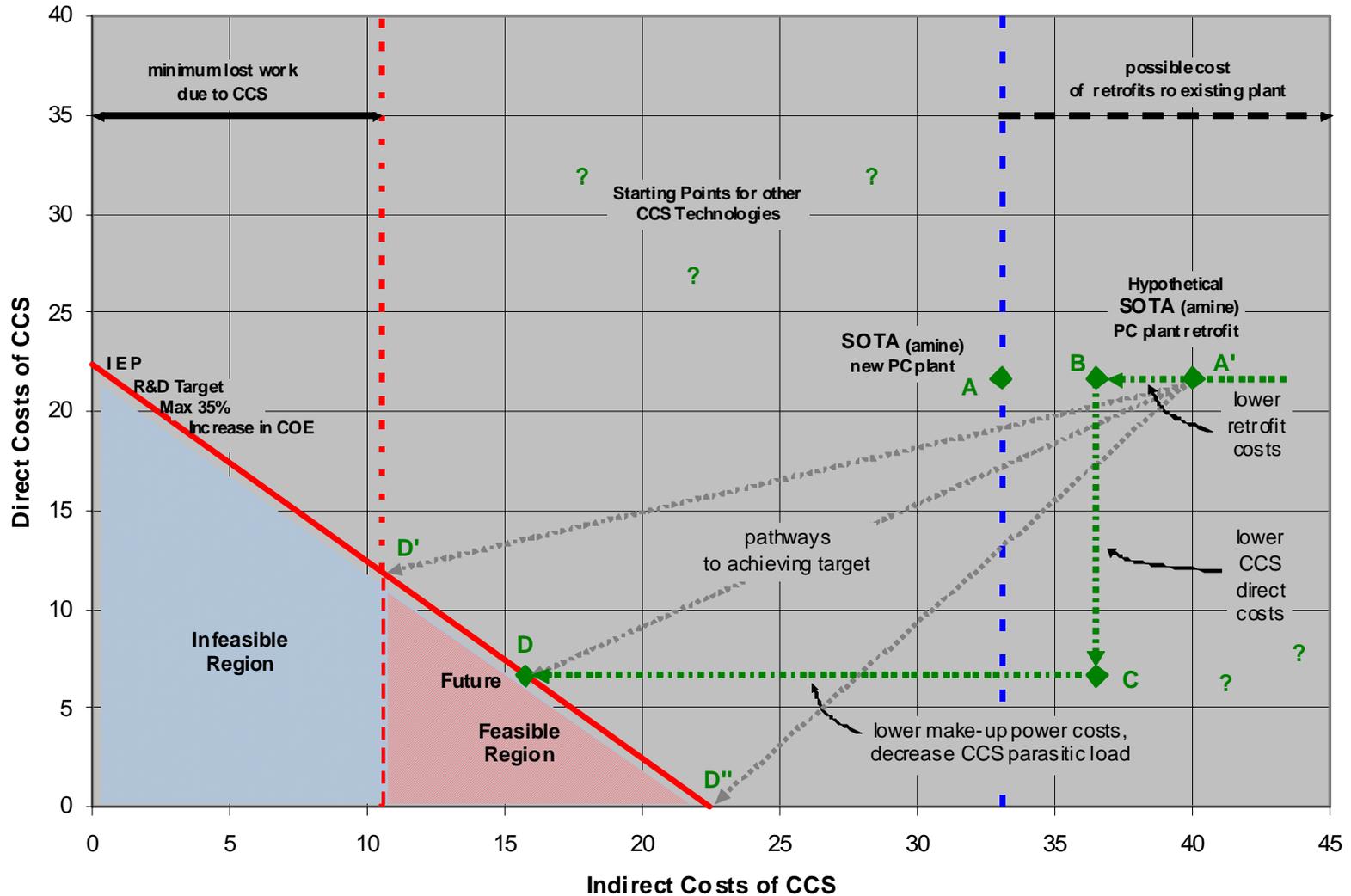
Technical feasibility

- Minimum Work

Estimate potential cost reductions across key cost components



Existing Plants CO₂ Capture Program Goal



Program Cost Reduction Strategies

OBJECTIVE 1 – Lower Specific Capital Costs of CCS					
Strategy	In-plant Capex	In-plant Opex	TSM	Retro-fit	Make-Up
Improve CCS Process Technologies	↓				
Develop Alternative Materials of Construction	↓				
Process Intensification	↓				
Reduce Equipment Volumes	↓				
OBJECTIVE 2 – Lower Specific Operating Costs of CCS					
New or improved Solvents, Sorbents, Membranes		↓			
Improve CDR Operability & Reliability		↓			
OBJECTIVE 3 – Improve Energy Efficiency of CCS					
Reduce Sorbent/Solvent Regeneration Energy				↓	↓
Reduce CO ₂ Capture Requirement	↓	↓	↓	↑	↓
Process Intensification & System Integration				↓	↓
Raise System Mechanical/Electrical Efficiencies				↑	↓
OBJECTIVE 4 – Lower Specific Retrofit Costs					
Process Synthesis				↓	
Reduce Engineering, Design, Installation Costs				↓	
OBJECTIVE 5 – Increase On-Site Steam & Power Generation					
Supply CDR Parasitic Load with Waste Heat				↑	↓
Increase Boiler Capacity	↑↓	↑↓	↑↓	↑	↓
Add Supplemental Boiler for Steam Generation	↑↓	↑↓	↑↓	↑	↓
Total CO ₂ TSM Capital & Operating Costs – Outside of Purview of EPEC Program					

Existing Plants—Emissions and Capture Program

2009 Program Activities

1. Preparation of *roadmap* for carbon capture & sequestration R&D efforts
2. Preparation of *annual technology update* that summarizes the current status of carbon capture R&D efforts
3. Preparation of new *Funding Opportunity Announcement* for additional carbon capture R&D projects