

Exhibit to Agenda Item #1

EPRI Presentation.

Board Strategic Development Committee and Special SMUD Board of Directors Meeting

Tuesday, August 11, 2026, scheduled to begin at 6:00 p.m.

SMUD Headquarters Building, Auditorium

Carbon Capture and Storage

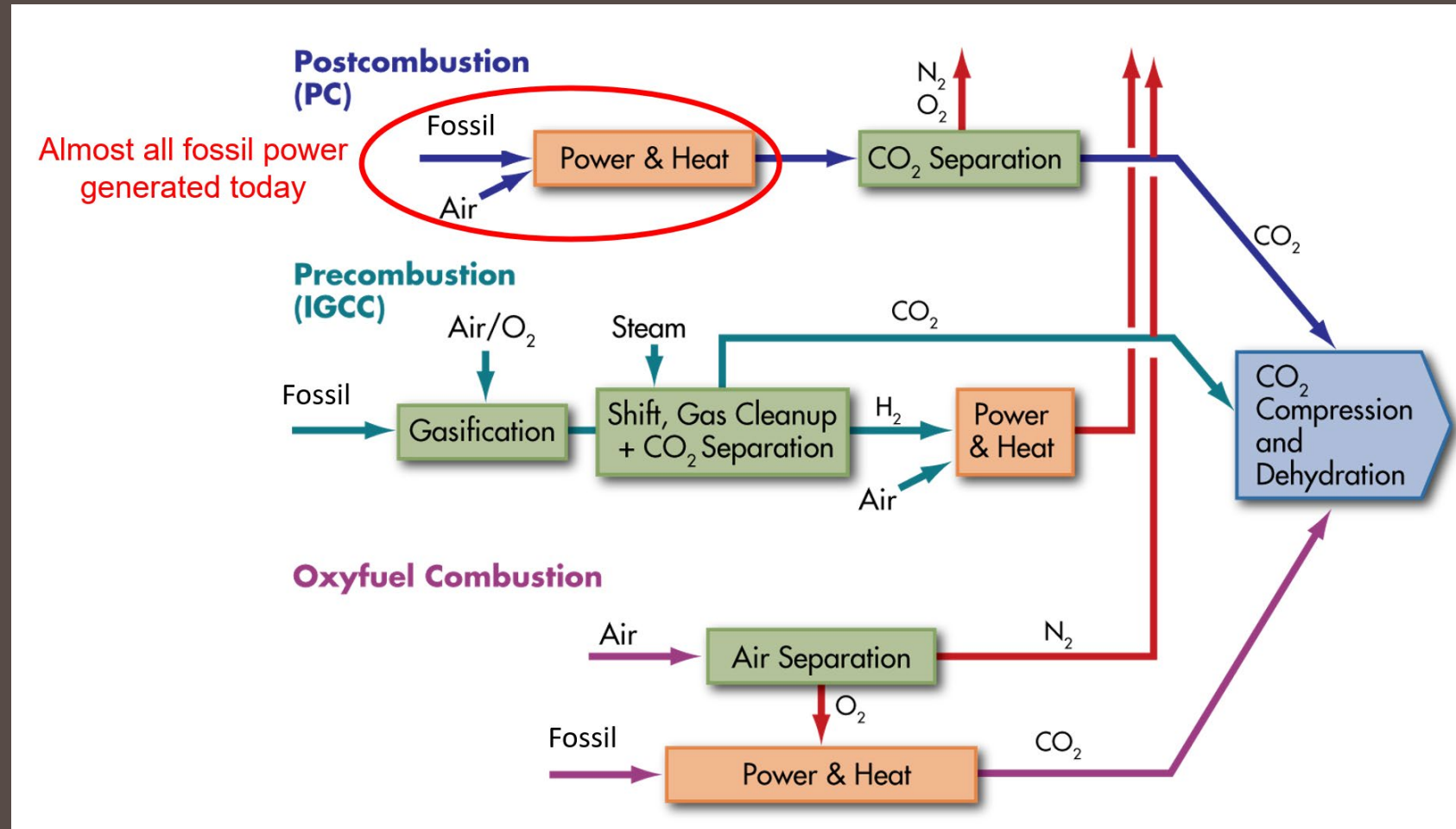
Abhoyjit S. Bhowan, Ph.D.

Sr. Program Manager

EPRI

August 11, 2026

Options for CO₂ Capture in Fossil Power Systems



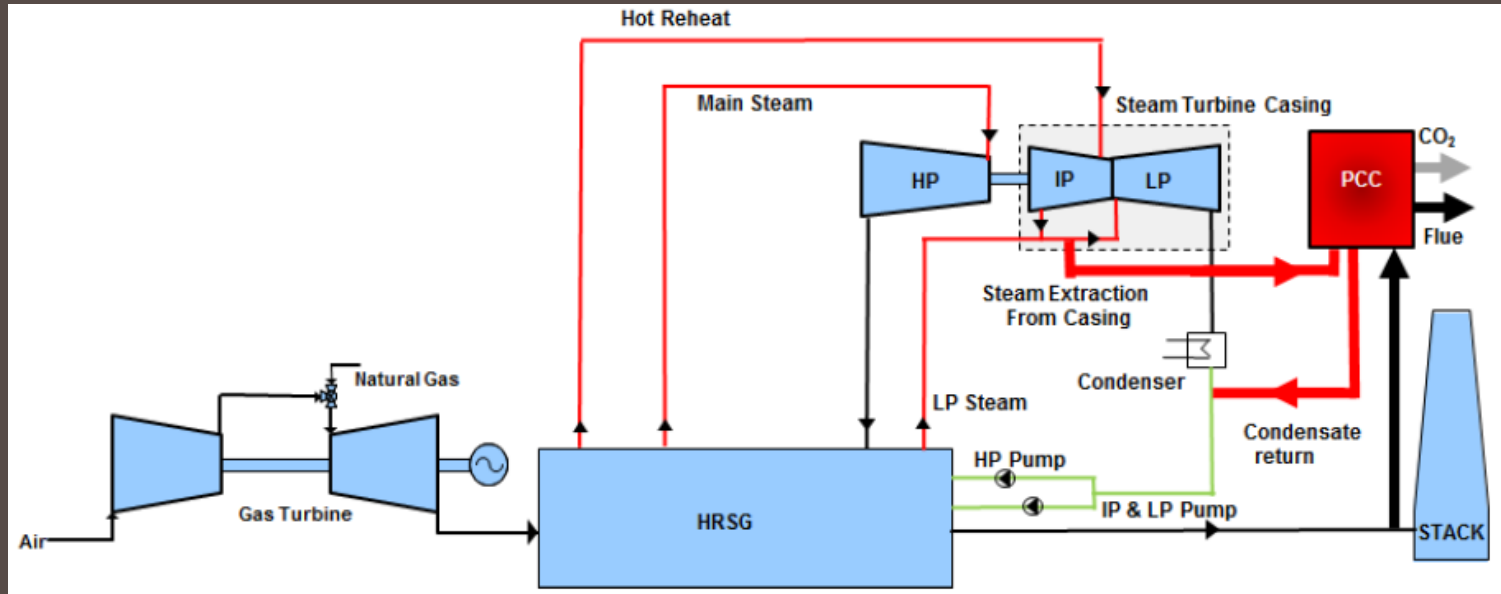
Post-Combustion

- Calpine Sutter

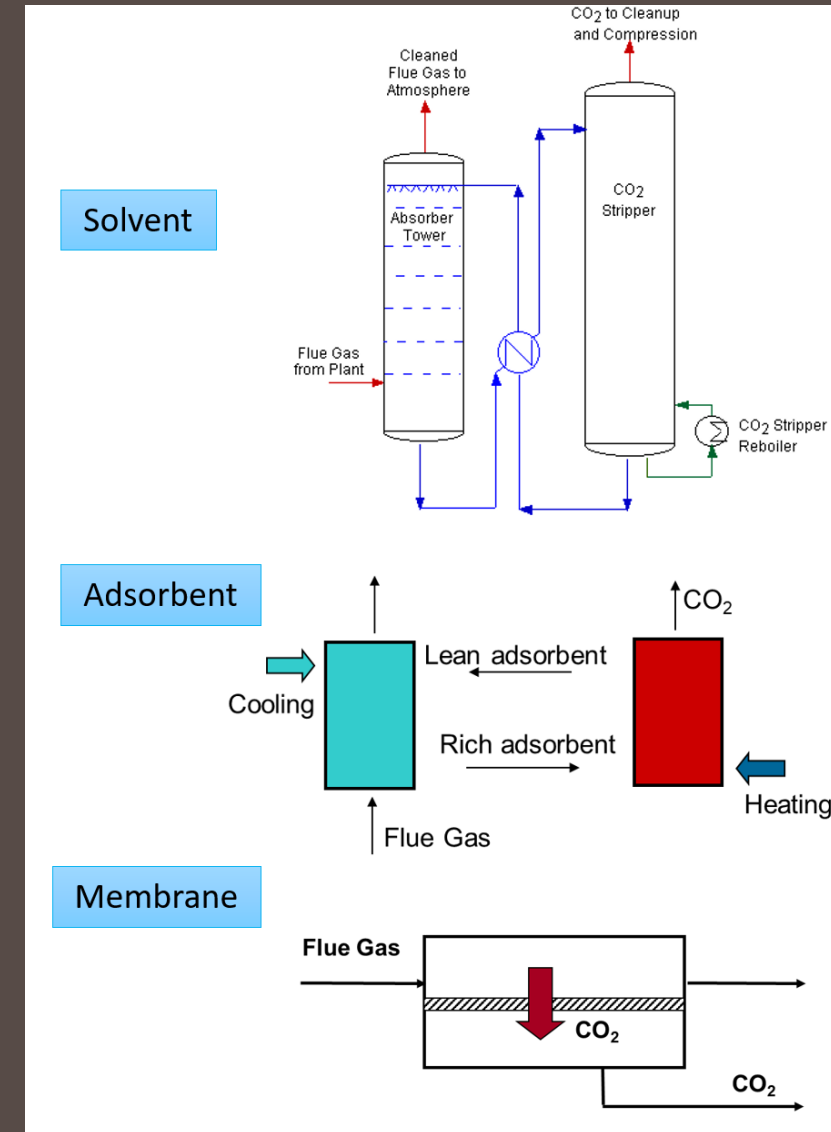
Fuel Cells:

- Proton Exchange Membrane (PEM): Similar to oxyfuel combustion, i.e., need energy for air separation
- Solid Oxide: Transports CO₂ across membrane as a carbonate

CO₂ Capture from Natural Gas Power



Natural Gas Combined Cycle (NGCC) Flue Gas ~3-4% CO₂
(Higher concentrations with CO₂ recycle)



Initial Factors to Consider for CCS

Capture

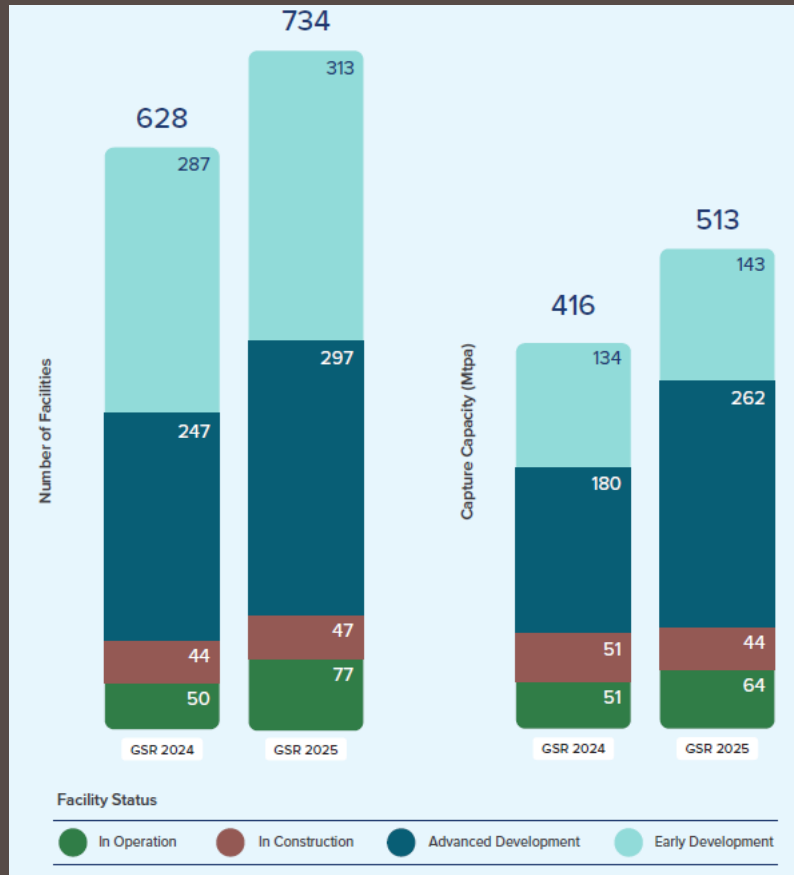
- Flue gas flowrate
- CO₂ concentration
- Impurities in flue gas
- Land area available
- Cooling
- Capture technology
- Maturity of technology

Transport and Storage

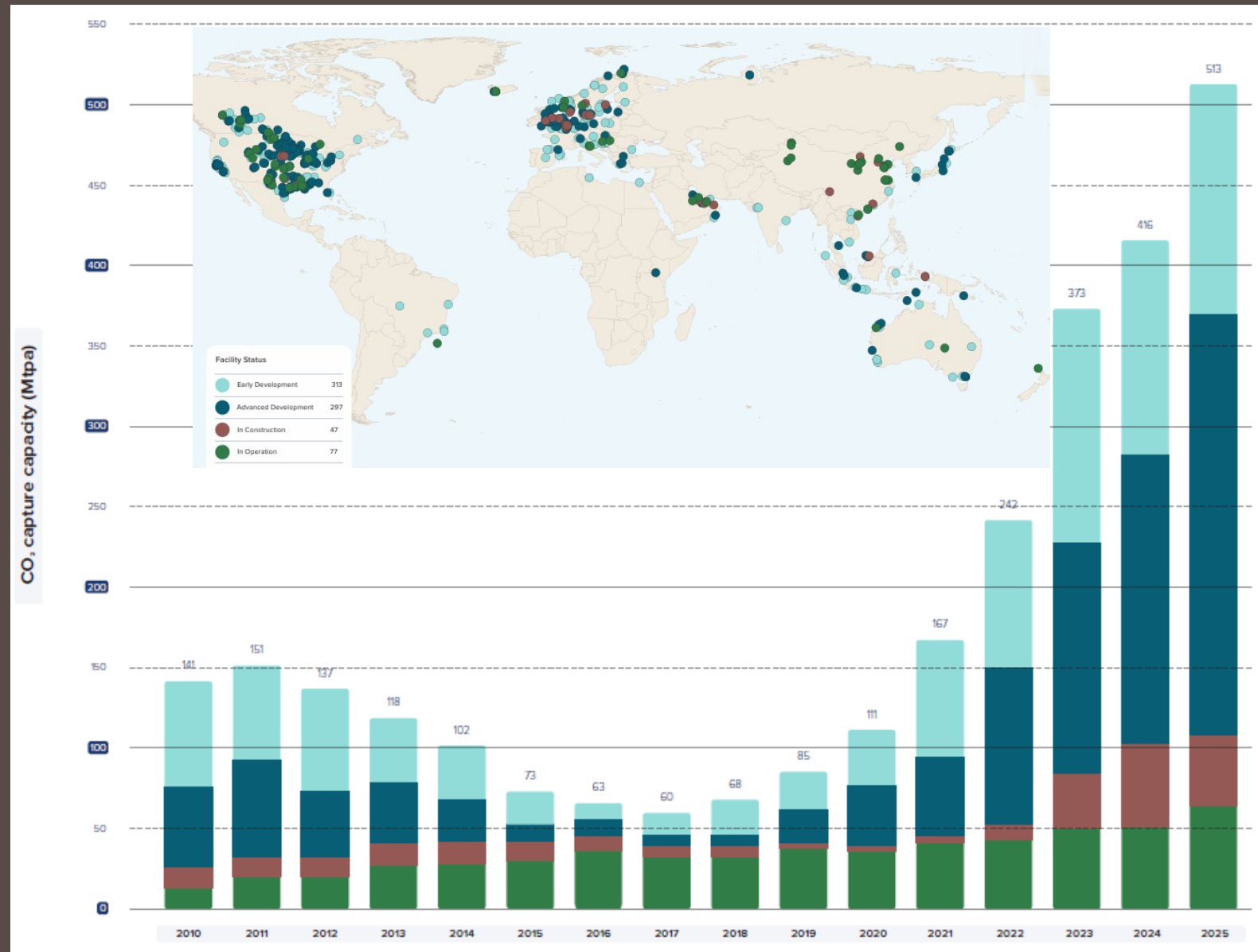
- Distance between plant and site
- Transport mode (pipeline, other)
- Right of ways
- Reservoir capacity, permeability, porosity
- Long-term liability
- Community acceptance

Capture tends to dominate cost of CCS

Global Status



Includes all types of CCS –
Industrial, Natural gas processing, power



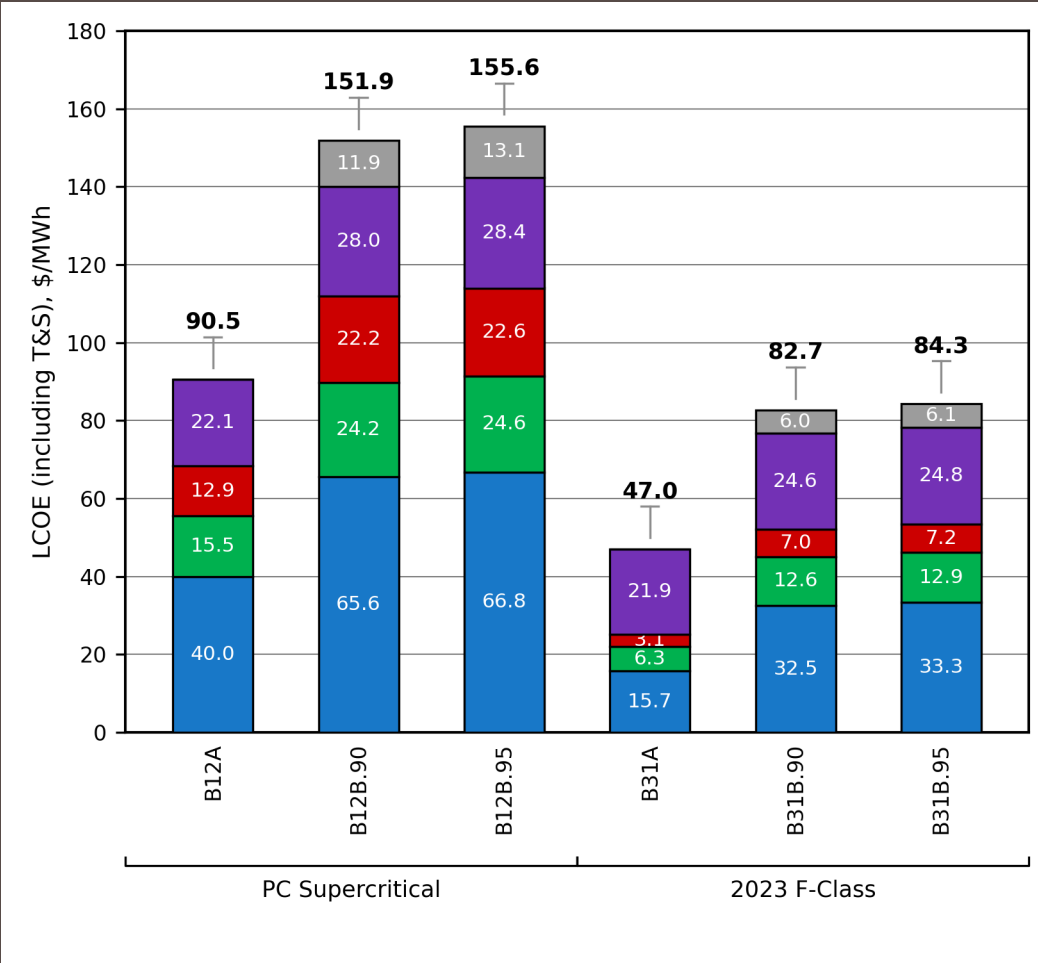
Figures from Global Status of CCS, Global CCS Institute, 2025

Commercial Scale Post-Combustion Capture on Power Plants

Fuel	CCS Site	Location	Capture Size (MWe)	Startup	Fate of CO ₂
Coal	Boundary Dam, Sask Power	Saskatchewan, Canada	115	2014	EOR* (mostly)
Coal	Petro Nova, Eneos Xplora	Thompsons, TX	240	2017	EOR
Coal	Long Dong, Hunaneng Group	Gansu Province, China	Scaling up to 1000 MWe	2025	EOR, other usage
Gas	Teeside, NZT Power (BP, Equinor)	Redcar, United Kingdom	742	2028	Offshore geologic storage

*EOR = Enhanced Oil Recovery

Post-Combustion on New Build (Dept of Energy)



	Supercritical Coal	NGCC F-Class
CO ₂ Concentration	12-15%	3-4%
t CO ₂ /MWh (w/o CCS)	~ 0.80	~ 0.34
Efficiency Reduction with CCS	~22%	~11%
Cost of CO ₂ Captured, \$/t CO ₂ (2023\$)	~\$55	~\$85
Capture Capital/Base Plant Capital, (2023\$)	~65%	~110%
Levelized Cost of Energy (LCOE) increase	~70%	~80%

Source: DOE/NETL-2025/5313, May 21, 2025

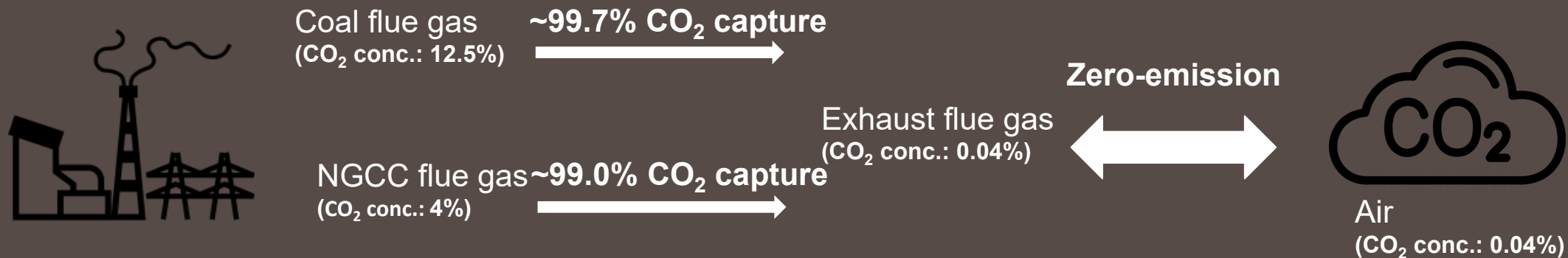
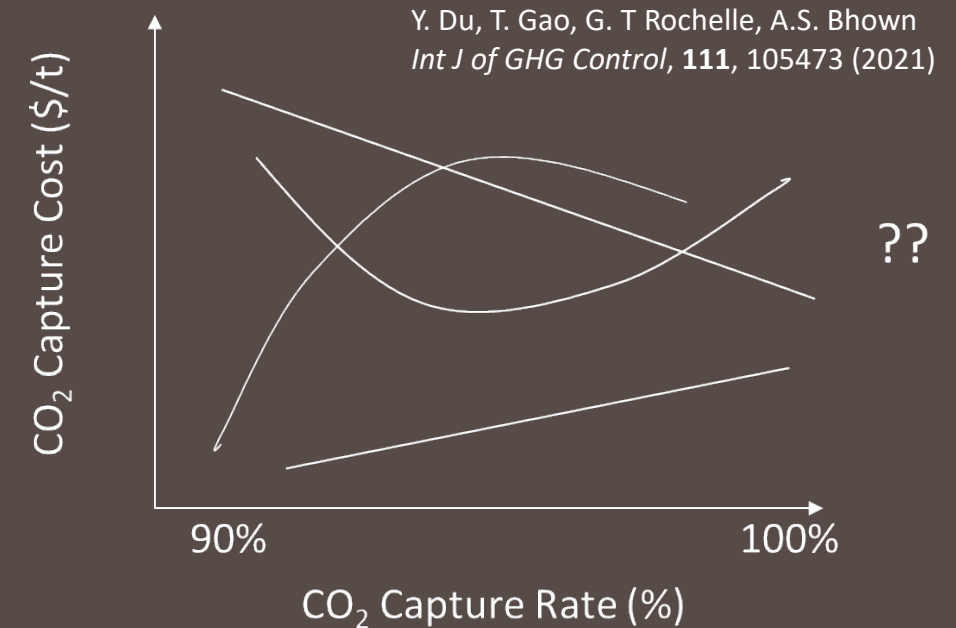
Post-Combustion CCS on Retrofits (DOE FEED Studies)

Parameter	Coal Retrofit		NGCC Retrofit			
	UIUC	Enchant	Southern Co.	UT	EPRI	Bechtel
Design basis flue gas, m ³ /s	1,800	1,860	1,050	1,050	725	740
Turndown	50%	43%	61%	58%	40%	50%
Absorber vessel	Not reported (MHIA)	Not reported (MHIA)	Cylindrical	Rectangular 40x47x117 ft	Not reported	Cylindrical 39x145 ft
Capture trains	4	2	4*	2	1	2*
Reasoning provided for number of trains	Absorber and quencher modularized for shipping	Accessible for delivery of large modules; maximum equipment sizing	--	--	--	Limited data from internal suppliers supporting operation for >49 ft diameter cylindrical vessels
Capital cost, million \$	2021\$ 2,044	2022\$ 1,554	*Two absorbers share one regenerator			
			\$752	\$727	\$751	\$477

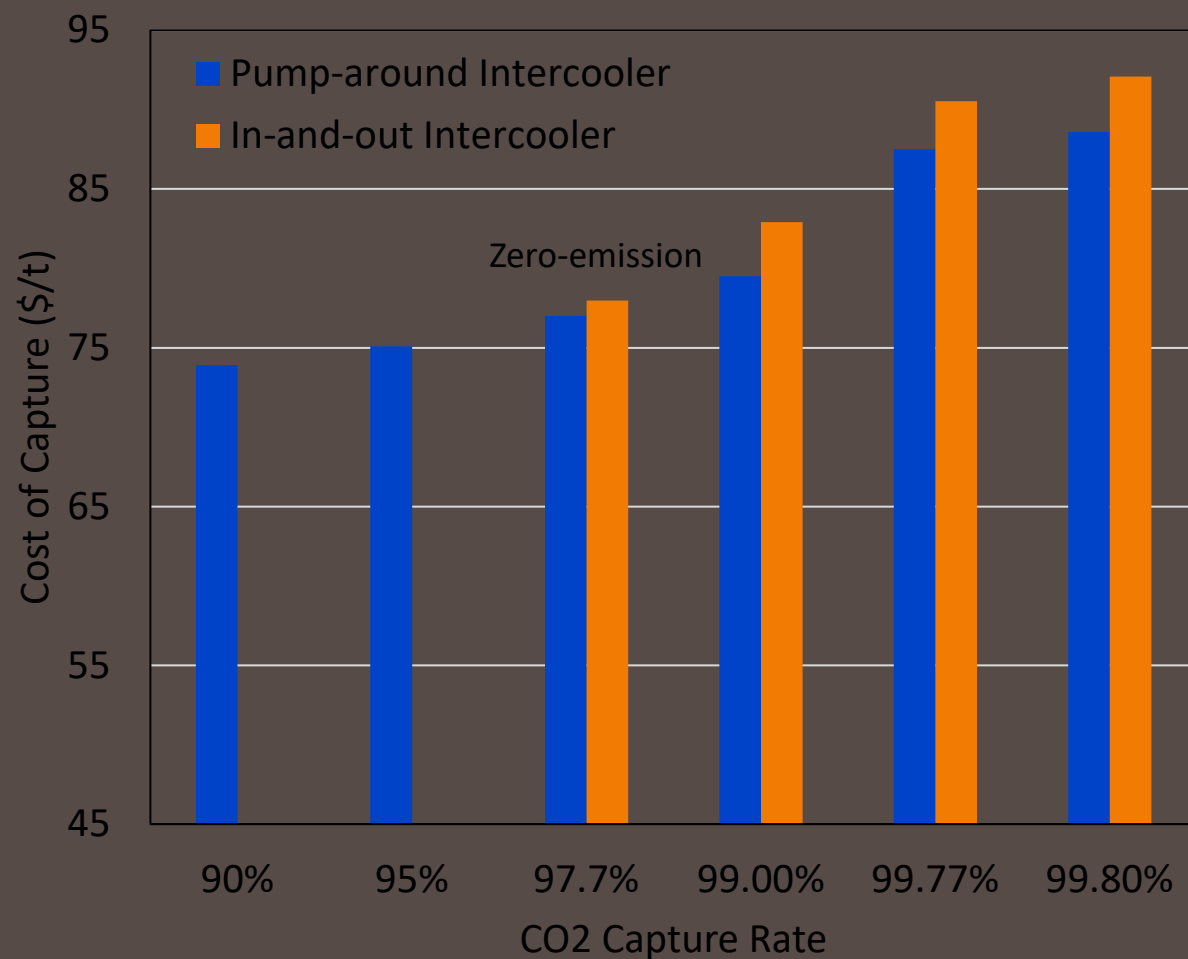
Source: S. Homsy et al., IEAGHG Seventh Post-Combustion Capture Conference, Pittsburgh, PA. Sept 26, 2023.

Zero- and Negative-Emissions with CCS

- No technical limitation of 90% or 95% capture
- Can obtain nearly 100% CO₂ capture
- Modeling and Technoeconomic analysis
- Pilot plant testing



Zero and Negative Emissions with CCS on NGCC



Pilot Plant	Flue Gas Source	CO ₂ Capture Rate	Solvent	Year
National Carbon Capture Center, Alabama	Coal	99.9%	MEA	2018
	Coal	99.1%	PZ	2019
	NGCC	95.8%	PZ	2020
Test Center Mongstad, Norway	NGCC	~99%	MEA	2021
	NGCC	~98%	PZ/AMP	2021
	Coal	97.7%	NAS	2022
	NGCC	99.8%	NAS	2022

- High capture rates technically possible
- Achieving net zero emissions is cheaper by increasing capture rates to 99+% compared to lower capture rates (90-95%) followed by Direct Air Capture

Federal Tax Credits and Community Engagement

Federal Tax Credits (45Q)

- \$85/t from point sources, \$180/t from air
- Projects must begin construction before Jan 1, 2033
- 12-year tax credits after start-up
- Credits can be direct pay or be transferred

Community Engagement

- Interest in CCS is community-dependent with wide-ranging views
- Early, transparent, and continuous engagement
- Discuss capture, transport, and storage
- Issues include benefits, risks, uncertainty, environmental impact