

SSEB Committee on Clean Coal Energy Policies & Technologies

Panel on Technological Solutions to a Robust Coal Future

**May 20, 2015
Kingsport, Tennessee**

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& General Counsel,**



Clean Carbon Technology
FOUNDATION OF TEXAS





Presentation Outline



Overview of CCUS Technologies

Incentives, Certainty, & Cooperation

Risk of Lost Opportunities





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Petra Nova CCUS Project - Overview

Power Generation:

250 MW of flue gas slip stream

Commitment to maintain full capacity to the grid

Carbon Capture:

Post-combustion amine solvent-based system

90% carbon capture of slip stream

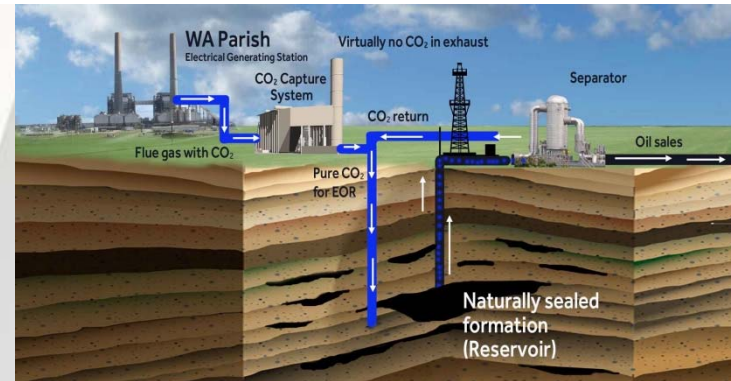
1.5 million tonnes (1.65 short tons) annually

Product Delivery and Utilization:

CO₂ will be safely moved from plant in 80-mile, 12-16" pipeline

EOR operations will be conducted by Hilcorp Energy Company

Location will be 4 000 of 11 400 acres of West Ranch Oil



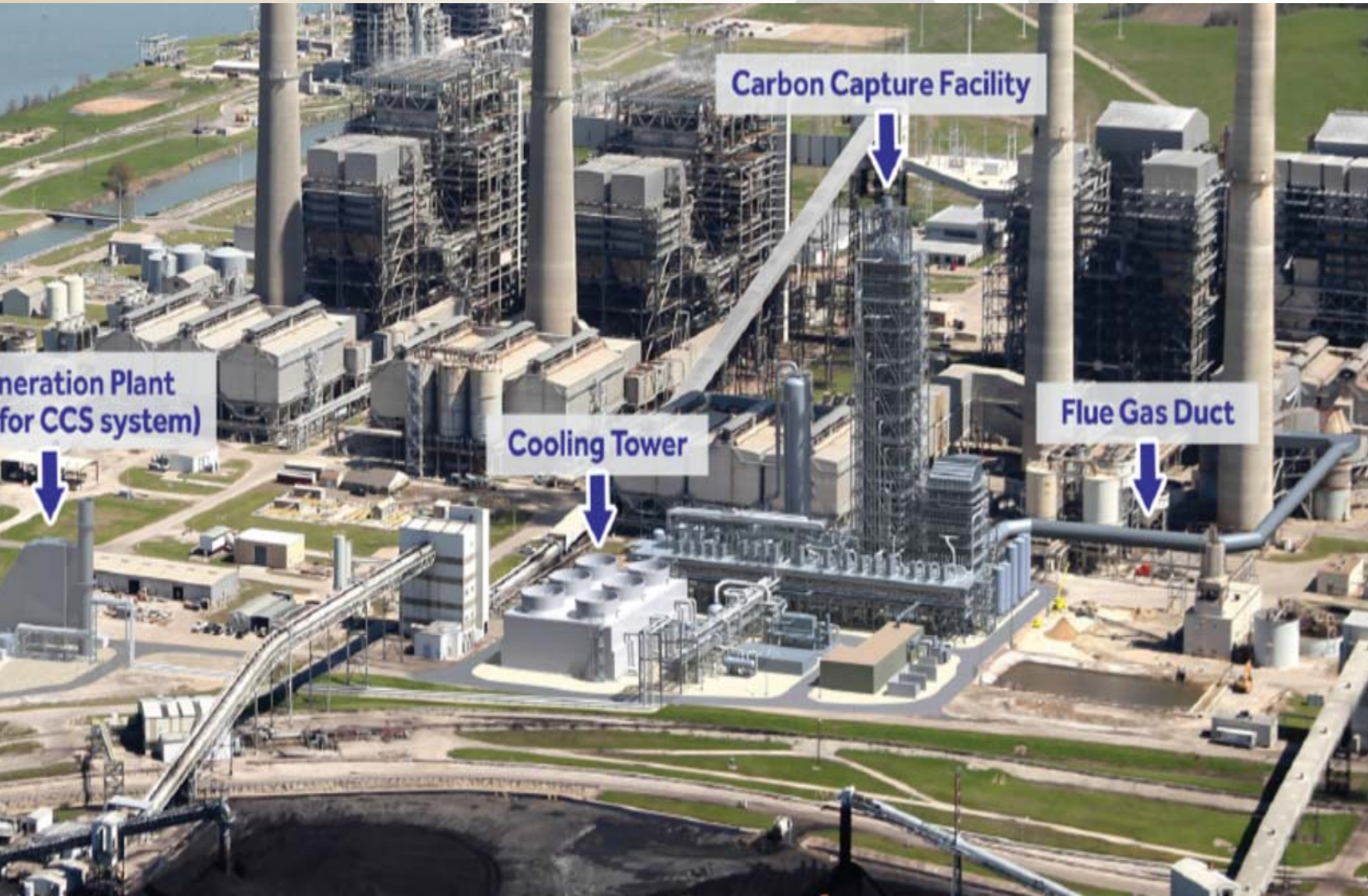


OP

Utility Rack

CCS

DUCT



Carbon Capture Facility

**Generation Plant
(for CCS system)**

Cooling Tower

Flue Gas Duct



Engineering (80% complete)

Design is mature with few changes.
(<1% of contract value)

Keeping pace with accelerated construction progress.

Procurement (56% complete)

All major POs issued.

Delivery of Critical Path items pulled forward 1 month (Compressor & Regenerator); COD held firm

Focus is shifted to fabrication, delivery, & quality

Construction (13% Complete)

3% ahead of Baseline Plan (on early curve).

Excavation work complete with few obstructions.

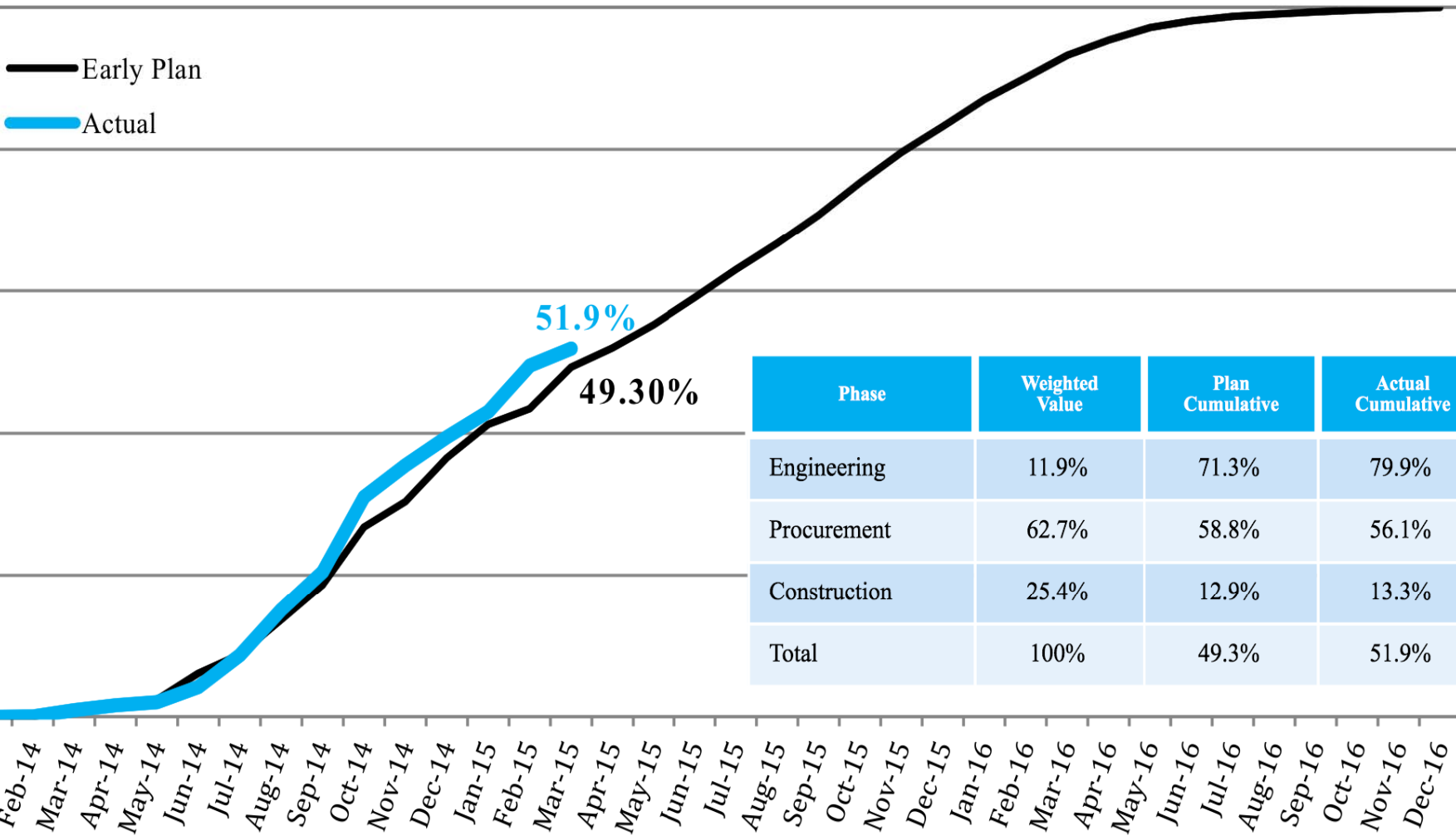
Most of the major foundations are poured.
(HRSG, Cooling Tower, Quencher/Absorber).

Ductbanks, U/G piping, and backfilling ongoing with goal of being "out of the ground" by July.

First anchor bolts up work begins this month
(Cooling Tower, Absorber erection, process piperack).



CCS/BOP Progress





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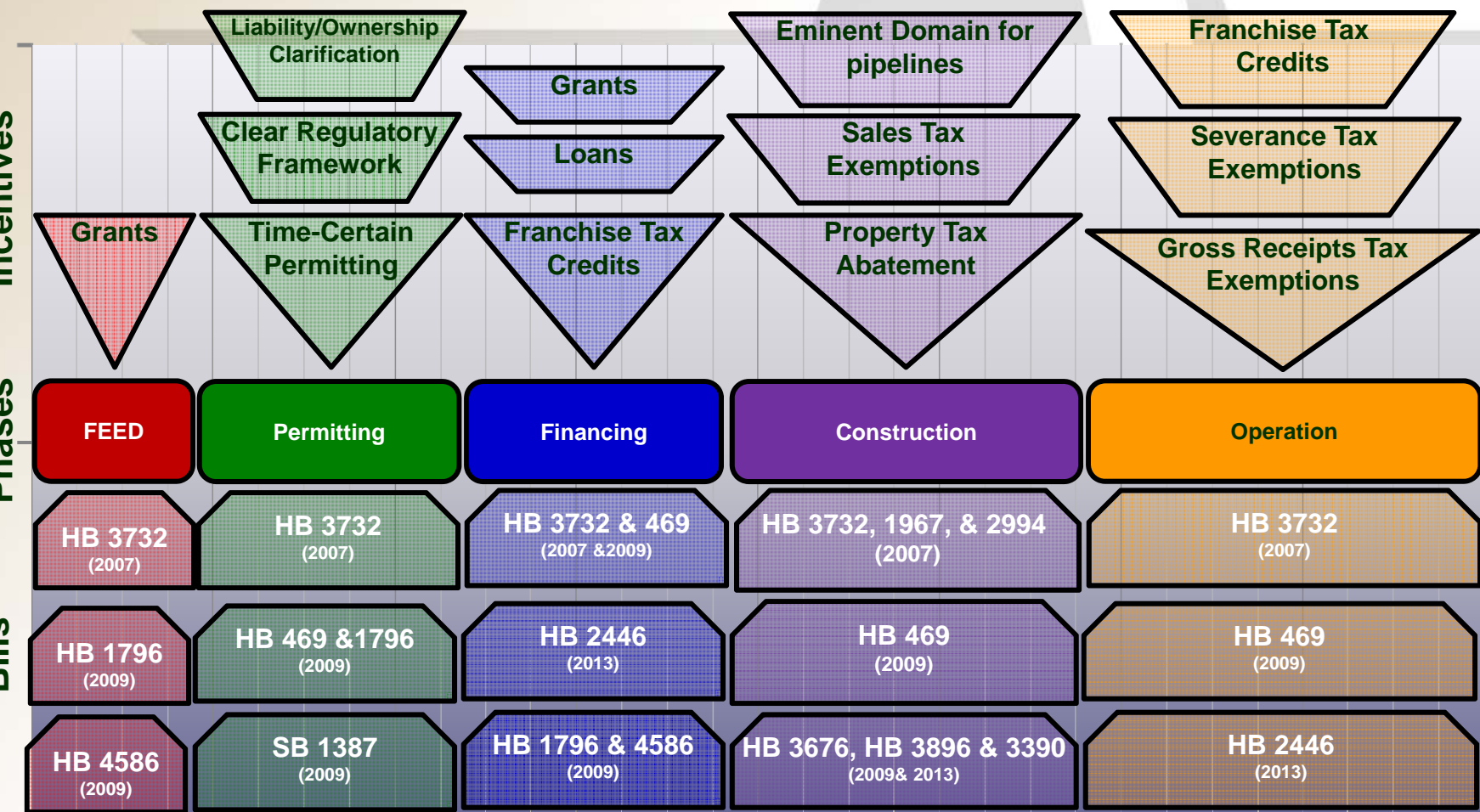
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Roadmap for Regional CCUS Incentives

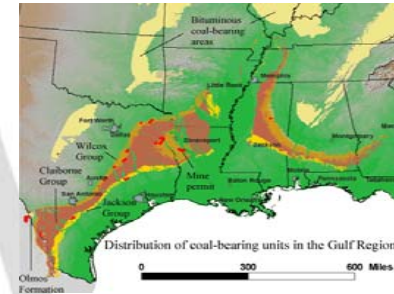
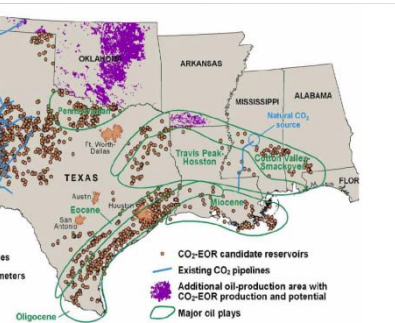
- . Local Tax Exemptions/Abatements
- . State Tax Exemptions and Credits
- . Environmental Regulatory Certainty
- . Oil & Gas Regulatory Certainty



State Incentives Play Key Role at in CCUS Project Development



Business Case for Gulf Coast CCUS



Coal Fleet (especially Texas) is Large, Clean, Young (useful life longer than national avg)

Gulf economy is healthy & demand for power, oil, and chemicals continues to grow

Gulf Coast EOR Opportunities are Significant

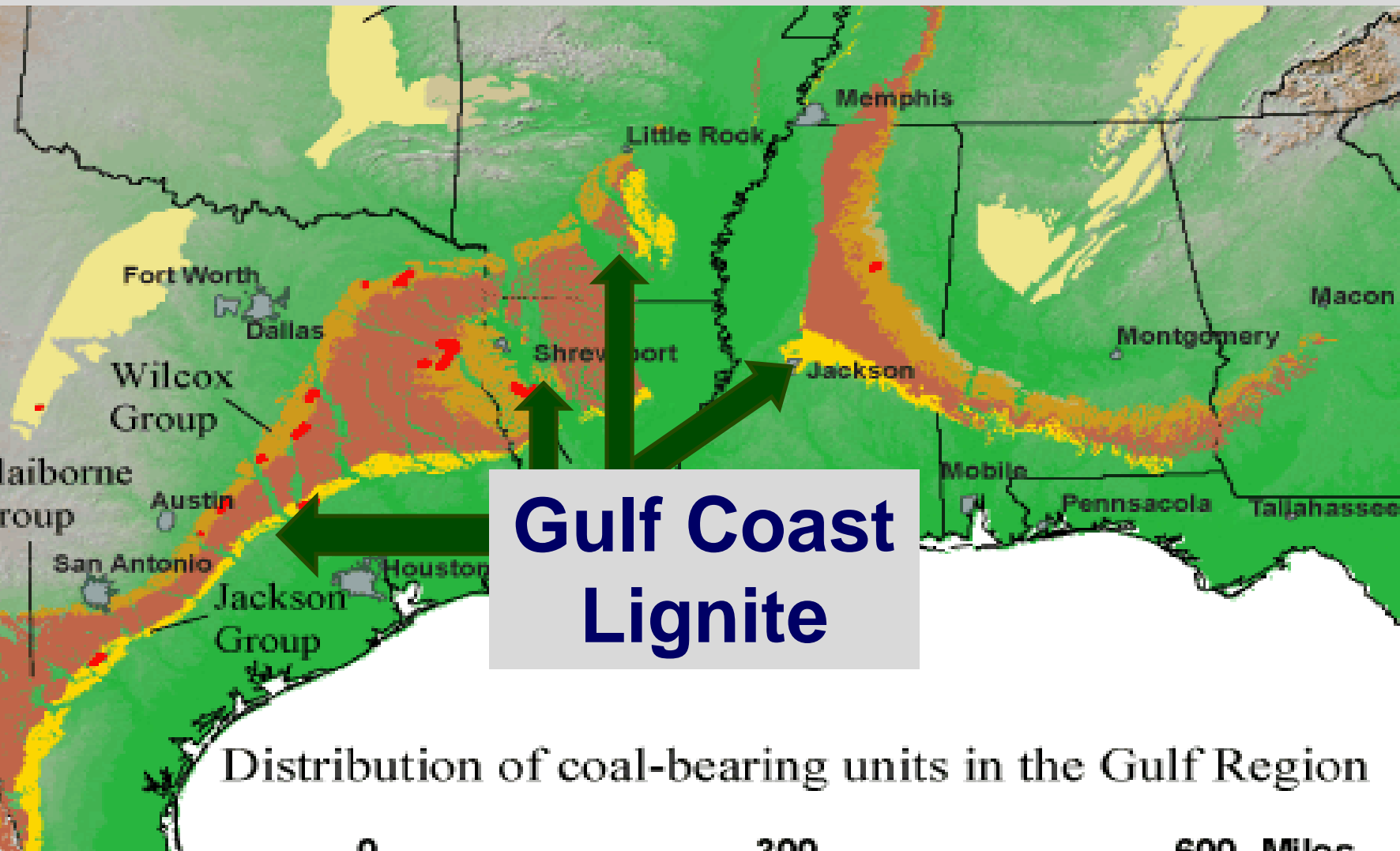
300-year Reserve of Gulf Coast Lignite

Good Rail Access to Powder River Basin Coal

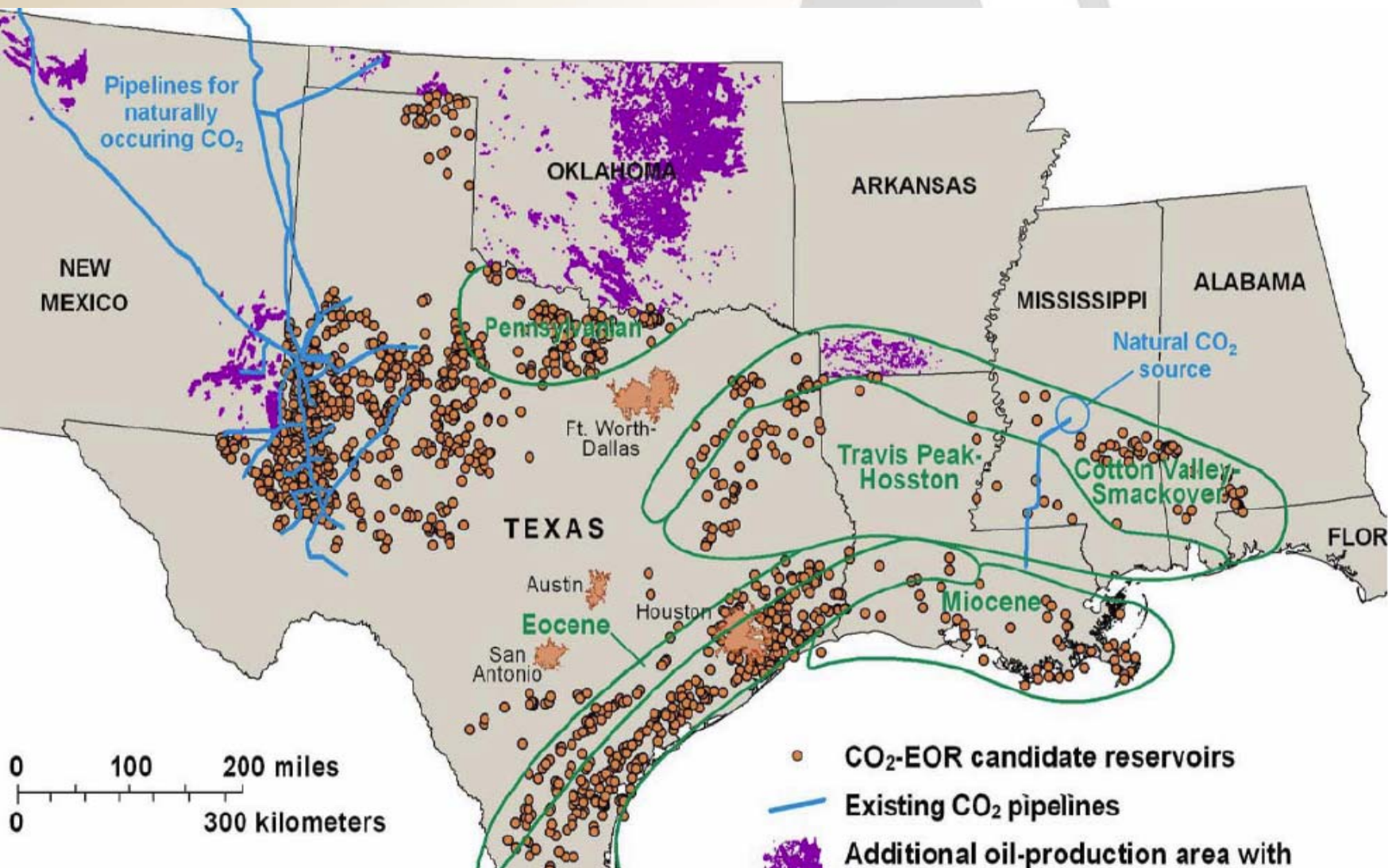
Portfolio of state-based incentives is a road



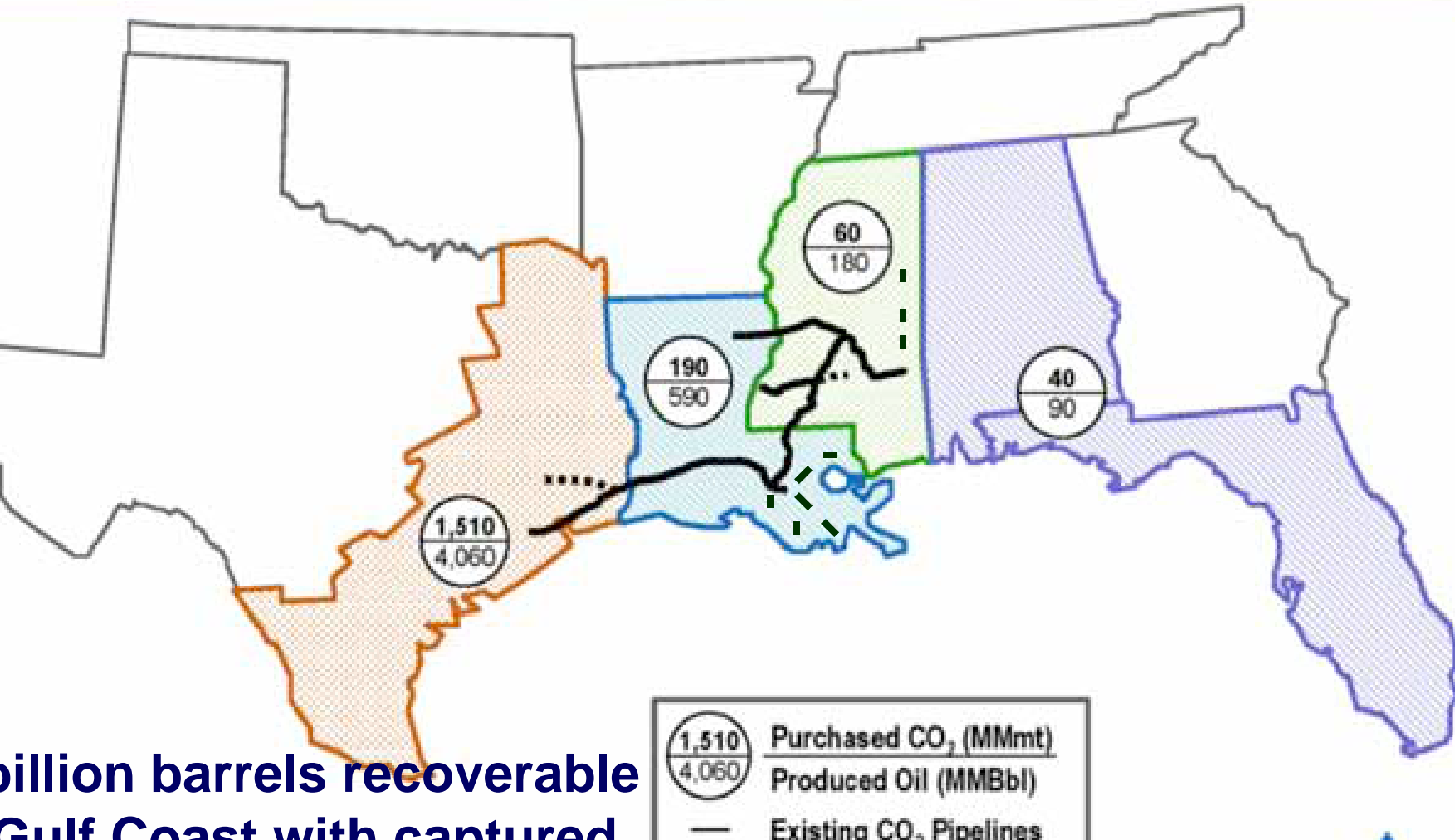
**~50 Million Tons Produced Per Year
(300 years of recoverable reserves)**



Gulf Coast Carbon Sinks



Growth Potential for Sale of Captured CO₂ for EOR





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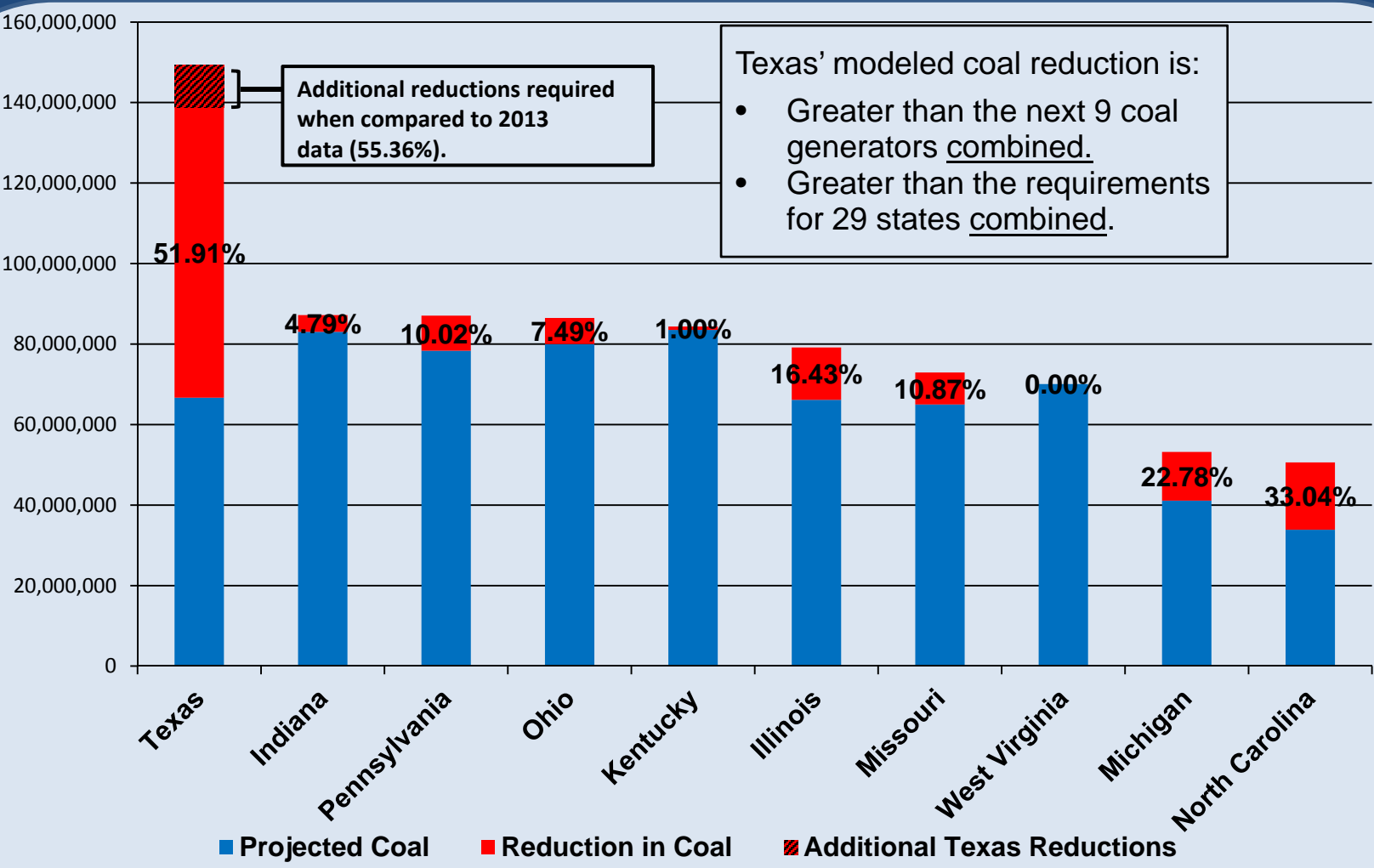
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EPA's Modeled CPP-Forced Retirements

Top 10 Generators of Coal Electricity – Final 2030 Target – BLOCK 2



Texas Projected Retirements By 2020*

Plant	# of Units	Proj. Year of Retire.	Coal (MW)	Plant	# of Units	Proj. Year of Retire.	CT (MW)	O/G (MW)
Brown	2	2016	1195	AES Deepwater	1	**		138
eto Creek	1	2018-2020	592	Lake Creek	2	**	4	
ette	3	2018-2020	1641	Lewis Creek	2	**		460
oons Creek	1	2018-2020	466	Nichols	3	**		457
rington	3	2016 (Unit 1); 2018-2020 (Units 2 & 3)	1018	Plant X 114B	1	**		200
Deely	2	2016 Base	871	Sabine	5	**		1814
nticello	2	2016	1130	Thomas Ferguson	1	**		420
union	1	2020-2025	670					
A Parish	4	2016-2018 (Units 5 & 6) 2018-2020 (Units 7 & 8)	2509					
ey	1	2018-2020	723					
Miguel	1	2016 Base	391					
sh	3	2016 (Units 1 & 3); 2016 Base (Unit 2)	1584					
TOTAL	24		12,790		15		4	3,489

COMBINED RETIREMENTS TOTAL: 16,283 MW; 39 Generation Units

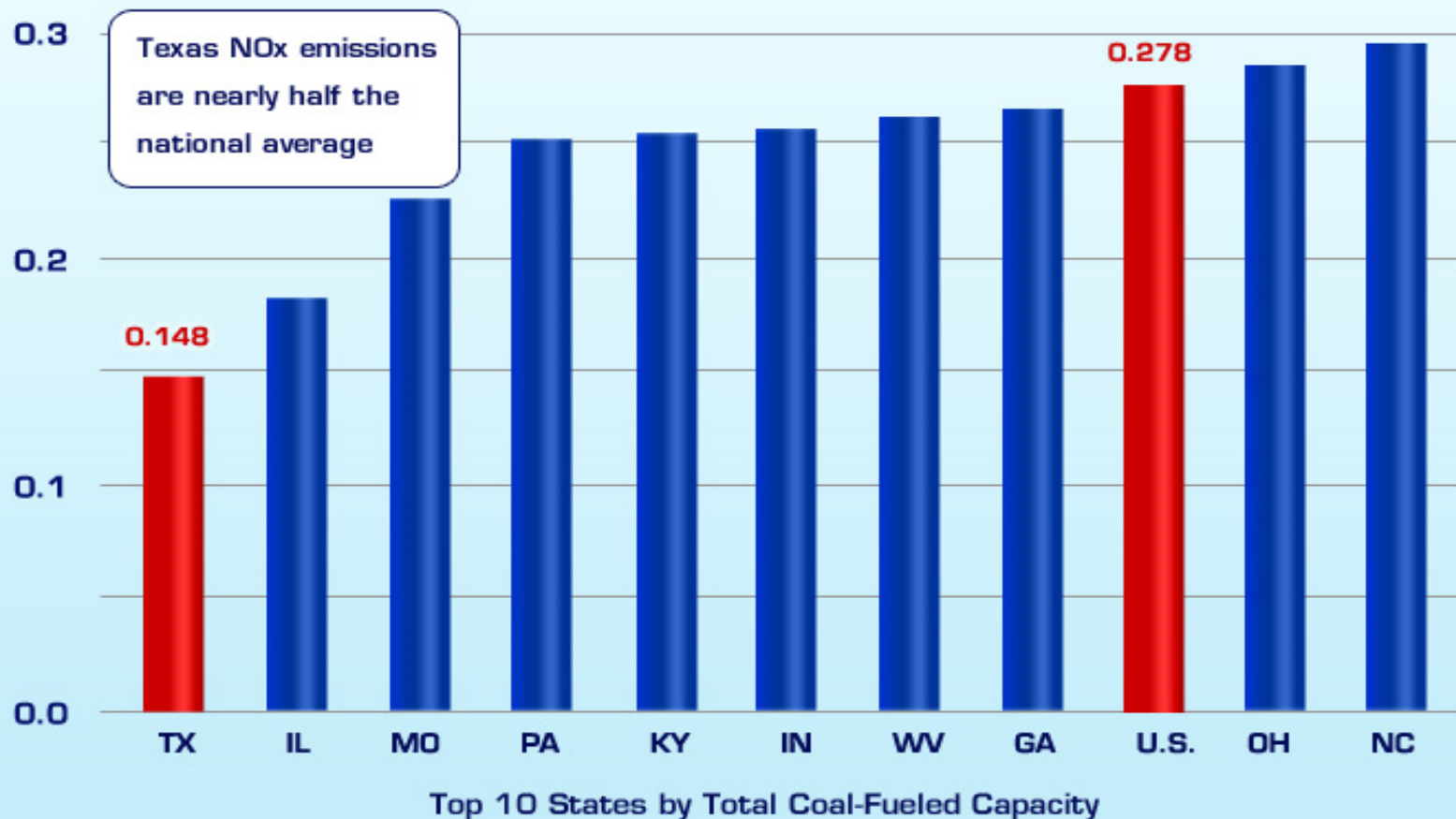
Lost: 1/2 of the Youngest Coal Fleet

Comparing the Age of Coal Fleets Top 10 States by Total Coal-Fueled Capacity



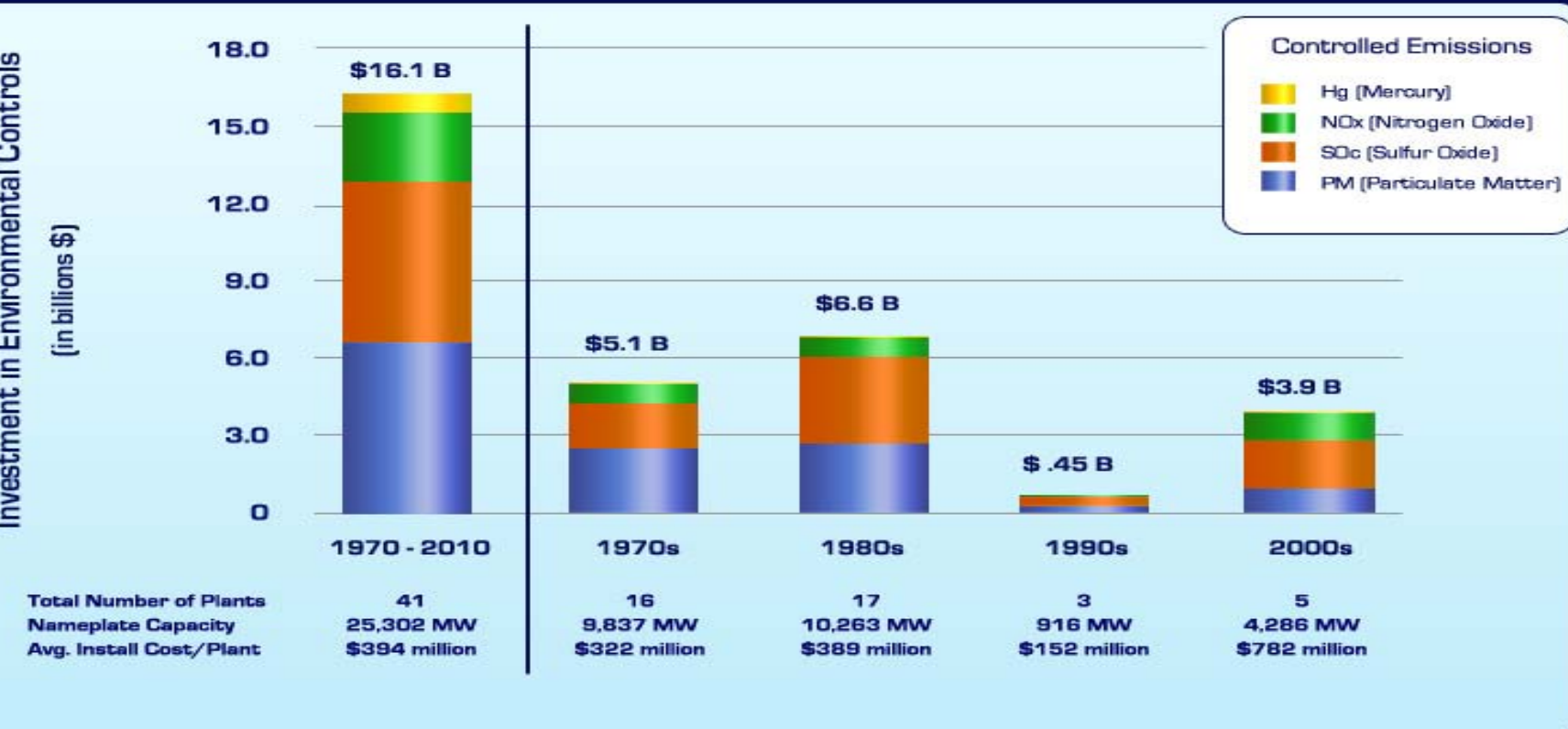
Lost: 1/2 of the Cleanest Coal Fleet

Average NOx Emissions Top 10 States by Total Coal-Fueled Capacity



Cost: 1/2 of the Most Retrofitted Coal Fleet

Investments in Clean Coal Technology 1970 - 2010



Investment control online date, cost and type information based on data from the U.S. Environmental Protection Agency, EPA IPM v4.10 Documentation and EPA's National Electric Energy Data System (NEEDS) v4.10. Particulate control cost data from Argonne National Laboratories. Environmental consequences of, and control processes for, energy technologies. Park Ridge: Noyes Data Corporation, 1990; reagent injection cost data from Jon Norman, United Conveyor Corporation, "UCC Dry Sorbent Injection: Dry Sorbent Injection as an Alternative to Scrubbers"; additional data compiled from other public sources, including press releases, company websites, etc. Unit characteristic sources based on data from U.S. Energy Information Administration (EIA), Existing Electric Generating Units Energy Source, 2008, and EIA Form EIA-860 Annual Electric Generator Report, 2008 Data.



QUESTIONS?

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