Texas Clean Energy Project
A 400MW Power/Polygen Project
With 90 percent carbon capture

Gulf Coast Power Association
Spring Conference 2015
Houston, Texas

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Jason Crew, CEO, Summit Power Group

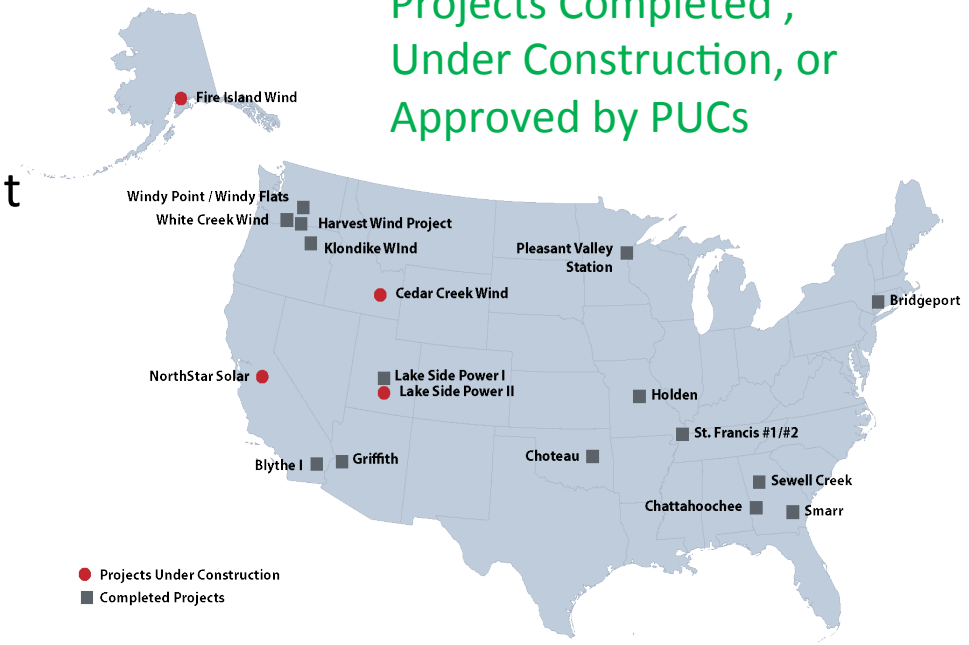
Summit Power

- Summit Power Group is a Seattle-based developer of clean energy projects
- Founded 23 years ago by former U.S. Secretary of Energy Don Hodel & COO of Department of Energy Earl Gjelde

- Summit's projects:
  - Over 7,000 MW completed
  - Over 2,500 MW in development

- Summit's principal project types:
  - Wind power
  - Solar power
  - Natural gas-fired power plants
  - Carbon capture projects

Projects Completed , Under Construction, or Approved by PUCs



Texas Clean Energy Project (TCEP): A 400 MW "polygen" IGCC plant

High Hydrogen Power Turbine

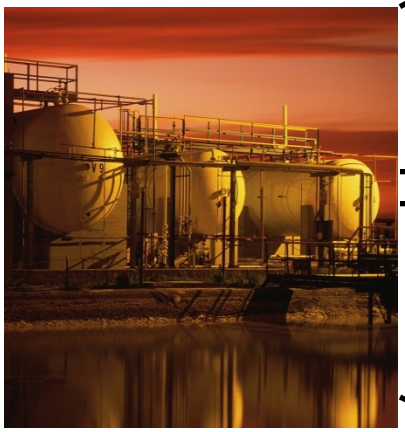
190 MW low carbon power delivered to City of San Antonio

Syngas

Wyoming Coal via Railroad

Coal 1.6mm tpy

Coal Gasification and Gas Cleanup



Ammonia/Urea Complex

Syngas

760,000 tons/yr delivered to Fertilizer Company

CO2

Non-drinkable Water

Steam

Coal and Steam Input, Main Outputs are Syngas (Hydrogen and Carbon Monoxide) and Pure CO2

CO2 Delivered to Oil Fields via Pipeline

CO2

1.9mm tons per year delivered to Oil Companies

Five Siemens gasifiers of TCEP-type on line in China

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The Siemens gasifier

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TCEP financing readiness & shovel-readiness

- All key permitting is now complete:
  - Record of Decision from US DOE on 9/29/11 (completes NEPA/EIS process)
  - Air permit issued 12/28/10 (no opposition/request for hearing)
- Off-take agreements completed & signed:
  - 100% of power sold to CPS Energy for 25 years (contract renewed 10/14)
  - 100% of CO2 sold for 30 years (Whiting Oil Company plus two other buyers)
  - 100% of urea sold for 15 years (CHS, Inc. based in Minnesota)
- EPC Team Updating FEED (front end engineering + design) 1stQ 2015
  - EPC Team Members: China Huanqui Contracting & Engineering Corp. (HQC), Technip and Siemens
  - Anticipated 2015 financial closing and groundbreaking
  - All of debt to be provided by the Export-Import Bank of China (Chexim); equity investors to be publicly disclosed in 3rdQ 2015

Where is the Project?

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Site Location and Infrastructure

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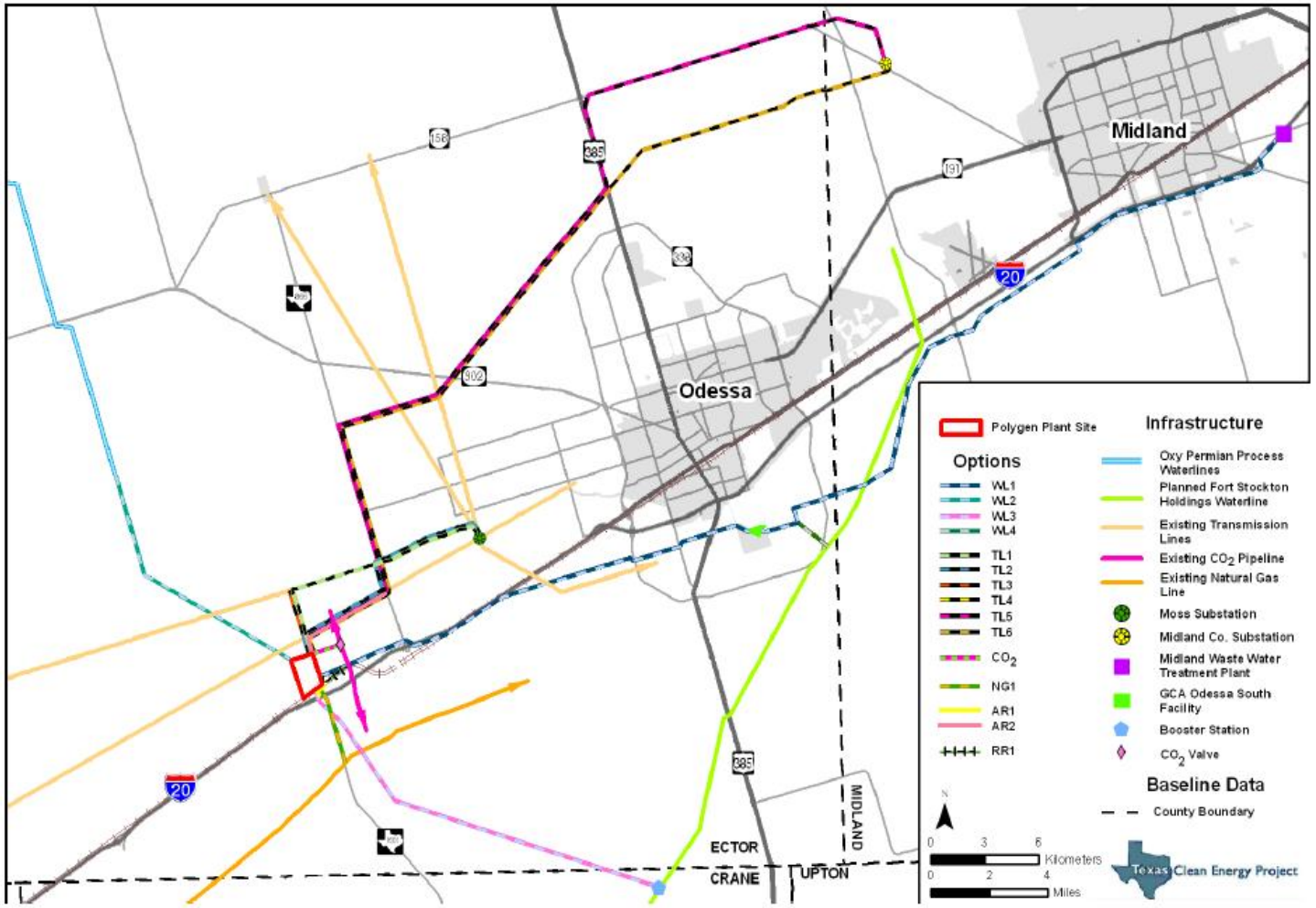

Figure 2.1. Polygen plant site and associated linear facilities.

The 600-acre site (after a rain)

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Four necessary acknowledgments

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TCEP could not be built without US DOE financial support

– Although designed to be project financed, TCEP is still a first-of-a-kind plant

DOE's $450 million significantly reduces the *net* cost to be project financed

Yet TCEP is also a "reference plant" we believe can be replicated elsewhere

Support from the people of Odessa, Texas, has been unwavering

– No project of this size can succeed without strong local support

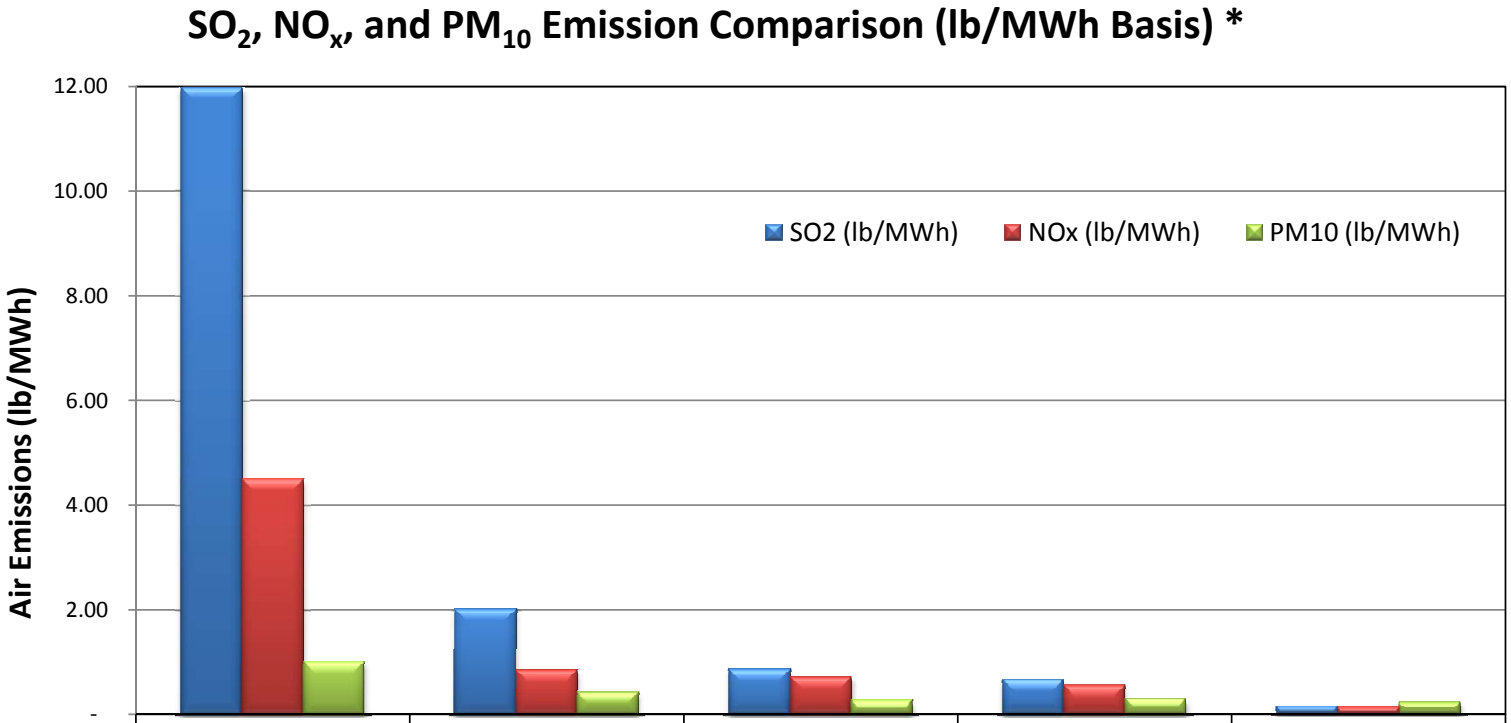
Support from national environmental groups has been essential

– EDF and CATF have supported from the outset; also strong relationship with NRDC. This has been immensely valuable in terms of process, not just politics

Good fortune, not genius, accounts for some key TCEP advantages

– Example: size "mismatch" between Siemens gasifiers & high-H_2 combustion turbine created extra syngas; this compelled polygen & led to urea production

Benefits (TCEP) from not burning coal: negligible SOx, NOx, PM



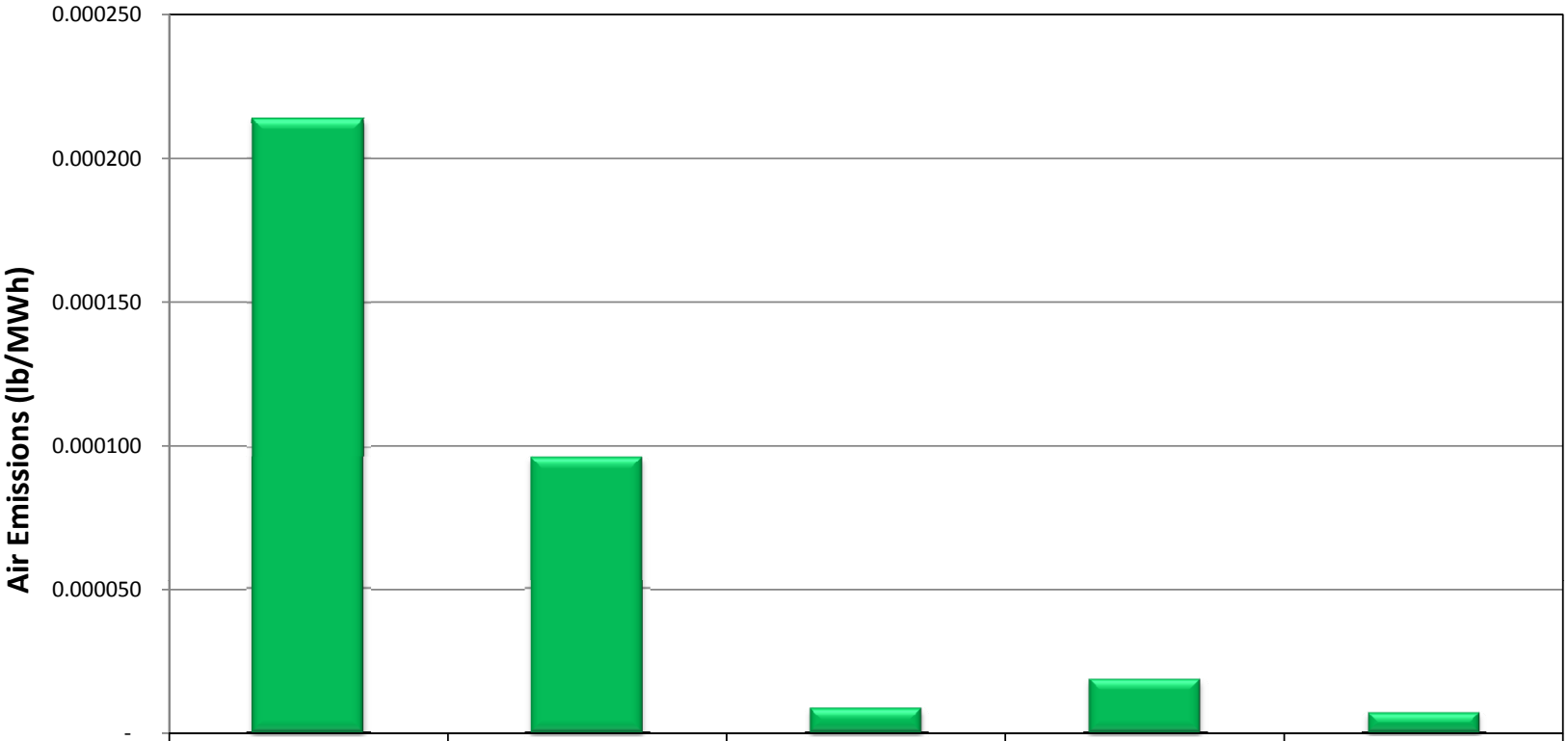
	Martin Lake Pulverized Coal (PC) (2,565 MW)	Oak Grove PC (1,720 MW)	White Stallion Circulating Fluidized Bed (CFB) (1,320 MW)	Tenaska Trailblazer PC w/Carbon Capture (765 MW)	TCEP (400 MW)
SO2 (lb/MWh)	11.97	2.01	0.86	0.65	0.14
NOx (lb/MWh)	4.49	0.84	0.70	0.55	0.13
PM10 (lb/MWh)	1.00	0.42	0.26	0.29	0.22

Plant Type

* Based on total annual emissions from all sources at site.

Benefits (TCEP) from not burning coal: negligible Mercury (Hg)

Mercury Emission Comparison (lb/MWh Basis) *



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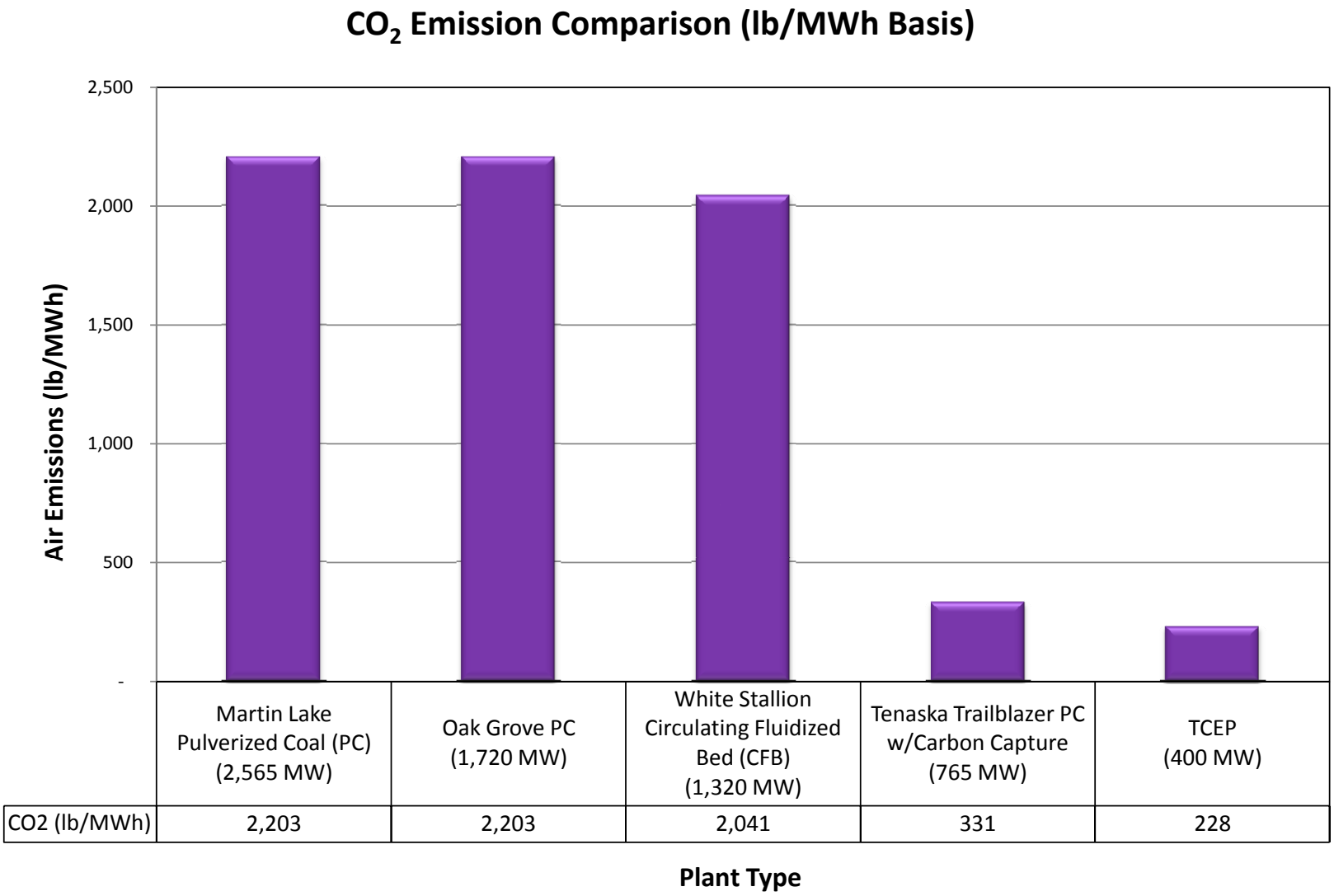
Hg (lb/MWh)	0.000214	0.000096	0.000008	0.000019	0.000007

Plant Type

* Based on total annual emissions from all sources at site.

Benefits (TCEP) from not burning coal: world's lowest CO_2



Context for forming Summit Carbon Capture

- It is important to commercialize CO_2 capture at large scale
- Capturing large volumes of CO_2 at a power plant is feasible
- Problem is where to put the CO_2 – and how to pay for its capture
- Today, U.S. (basically) doesn't pay for CO_2 capture & sequestration
- So today, EOR is the sole source for substantial CCS revenues (algae farms need CO_2 but consume relatively little)
- Moreover, building long new CO_2 pipelines eats up the revenue
- So "Stage 1" of large-scale CCS involves (1) locating capture plants where EOR infrastructure exists, and (2) dealing with oil producers
- Oil producers prefer natural (geological) CO_2 for several reasons
- TCEP provides lessons in how to compete with natural CO_2
- Major national environmental organizations support CO_2 /EOR

CO_2/EOR = CCS + a bridge

- **CO_2/EOR has safe, reliable, high-volume history since 1972**
  - Especially in Permian Basin, this is <u>not</u> an experiment with more than 3,000 miles of dedicated pipelines
- **CO_2/EOR with MVA can be highly reliable form of CCS**
  - CO_2 can remain sequestered for more than 1,000 yrs (the TX standard)

Job Creation

- TCEP will create:
  - **1,500 to 2,000** construction jobs (groundbreaking 2015)
  - **150** full-time plant jobs (management, administration, operators, maintenance est.) when plant opens 2018
  - **200** additional skilled personnel during major maintenance periods every 3 years
  - **8,000** ancillary jobs created by TCEP vendors (manufacturing, engineering, permitting, administrative, shipping, purchasing, R&D positions)

Local Financial Support

- Local financial incentives include:
  - $5 million jobs grant from Odessa Development Corporation (approved 1/25/10)
  - Donation of 600-acre site in Penwell by ODC (3/31/10)
  - 100 percent tax abatement for 10 years beginning 2013
    - Ector County (approved 5/23/11)
    - Odessa Junior College District (approved 6/23/11)
    - Ector County Hospital District (approved 7/12/11)
    - Ector County ISD (per Texas Tax Code, Chapter 313.025; approved 12-13-11)

Contact information

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