

Brown, Don

From: Tipsord, Marie
Sent: Tuesday, August 05, 2014 11:41 AM
To: Brown, Don
Cc: PCB.Board.Members; PCB.Attorneys
Subject: FW: Letter to Illinois Pollution Control Board
Attachments: 17JosephGioveIII_DEPARTMENTOFENERGY.pdf

Please print this out and enter as a public comment in PCB 14-134. Not sure it is right on point, but we need to get it in the record.

From: Betty Niemann [mailto:paint007@hotmail.com]
Sent: Tuesday, August 05, 2014 11:35 AM
To: Tipsord, Marie; Robertson, Daniel; Kruse, Chad; Fox, Tim
Subject: Letter to Illinois Pollution Control Board

Open letter to the Illinois Pollution Control Board: Chairman Deanna Glosser; Members: Carrie Zalewski, Jennifer Burke, Jerome O'Leary

I spoke out during the IEPA Public Comments on the two FutureGen permit applications last October.

Even though the public comment period is over and the decision has been made, I believe that the IEPA and the Illinois Pollution Control Board should be aware of new information.

This new piece of information began with this article in the Wall Street Journal. Below in the footnotes is permission from the author for me to pass this information on to several parties.

Wall Street Journal Article - EPA CCS Flip-Flop

<http://online.wsj.com/news/articles/SB10001424052702303480304579575993716327878>

With great fanfare, the Environmental Protection Agency proposed a rule last fall that would require all newly built coal-fired power plants in the U.S. to install an expensive new technology called carbon capture and storage, or CCS. Although the technology has never been installed on a large-scale power plant anywhere in the world, it theoretically will separate the primary greenhouse gas—carbon dioxide—from the plant's exhaust and pump it to underground reservoirs for storage.

The proposal instantly set off controversy. Many technical experts (including Burton Richter, a Nobel Prize-winning physicist at Stanford) believe that CCS isn't ready for prime time. EPA's proposal claims it is adequately demonstrated and can be installed at a reasonable cost. The Clean Air Act requires the agency to establish both of these factors before forcing plants to install a particular technology.

That's when things got weird.

Shortly after the proposal was released in September, EPA administrator Gina McCarthy defended carbon capture and storage in a highly publicized interview on PBS, describing it as a "technology that we believe is available today." Then, on Nov. 25, the EPA regional office in Texas did an about-face when it decided that [Exxon](#)

Mobil XOM -0.18% would not have to install the technology in its planned chemical plant (such plants emit carbon dioxide) in Harris County, because it would be prohibitively expensive.

Enter the Sierra Club, which challenged the EPA's Exxon Mobil decision on Dec. 26. Last week, three administrative law judges on the agency's Environmental Appeals Board upheld the Texas office's decision not to require CCS. Why? Because the EPA regional office found, and the judges agreed, that the "addition of CCS would increase the total capital project costs by more than 25%."

Enlarge Image – Image did not paste from article showing:

Southern Co.'s Kemper County power plant stands under construction near Meridian, Mississippi, U.S., on Feb. 25, 2014. *Bloomberg*

Talk about inconsistency: In its coal-plant proposal, the EPA admitted that CCS would increase the capital cost of every new coal plant built in this country by about 35%. Even with this staggering price tag, the agency still found the technology economically viable (and since then, the agency has given no indication that its position has changed). Meanwhile, an EPA regional office and its administrative judges decide that a 25% capital cost increase is prohibitively expensive. The agency is either incredibly sloppy or simply incompetent.

Either way, if—like me—you want this country to reduce its greenhouse-gas emissions, you should be worried. When industry lawyers challenge the EPA's new power-plant CCS requirement in court, Exhibit A will be the Exxon Mobil decision, which three independent EPA judges have now blessed. Challengers can claim that requiring the technology for new power plants is unlawful under the Clean Air Act because it's too costly—and point to the agency's own findings in the Exxon Mobil case as proof.

Then there is the ongoing saga of Southern Company's planned power plant in Kemper County, Miss. The Washington Post noted May 17 that the coal-fired Kemper plant—hailed for its plan to use CCS technology—is a year behind schedule and expected to cost \$5.5 billion, or more than double the original estimate, partly due to miscalculations designing and building the carbon-capture system.

Regardless of what happens with the Kemper plant, the EPA's internal inconsistencies on CCS could have much broader implications. Section 111 of the Clean Air Act says that the agency can't regulate greenhouse-gas emissions from existing power plants, unless and until it has regulations in place for new power plants. So if a court overturns the agency's carbon capture and sequester requirement for new plants, the EPA won't be able to implement its climate rules for existing power plants (which the agency plans to propose on June 2). The rules for existing plants are the ones that really matter from an emissions standpoint: Current power plants emit about a third of this country's greenhouse gases.

Fortunately for the EPA, it's not too late to right this wrong. Unfortunately there's probably only one way to do it: The agency has to scrap the CCS requirement for new coal plants and instead adopt something more legally defensible, such as requiring that all new coal plants be built using the most efficient plant design.

This would require Ms. McCarthy and the EPA to eat some crow. But it's the right decision for many reasons, including protecting the climate.

Mr. Potts is a partner at the law firm Foley & Lardner LLP. Contact bpotts@foley.com

Below is his permission for me to send this to you! [i] See footnote below

Actual USEPA documents for this ruling can be found at <http://yosemite.epa.gov/r6/Apermit.nsf/AirP#A> Scroll down to ExxonMobil Baytown...

Attached documents are from this webpage link...

Order Denying Review ...14 (1)

exxonmobil-baytown-olefins-letter0514 (Final Decision on Permit)

exxonmobil-baytown-olefins-resp2epa02082013 (Communications on CCS Cost of Project)

For more on IEPA, PSD, CCS, BACT and USEPA Region 5 read this summary of Taylorville, Christian County PSD CCS and BACT with IEPA <http://www.bgdlegal.com/news/2012/07/20/air-quality-letter/uncertainties-persist-in-greenhouse-gas-permitting-a-quartet-of-power-projects/>

And these:

30 SEP 2013 <http://www.forbes.com/sites/kensilverstein/2013/09/20/coal-could-be-resurrected-if-carbon-could-be-buried/>

Folks, if you click on the Michel link, another great article pops up <http://energybiz.com/article/13/07/carbon-capture-and-storage-and-climate-change> Comments below it are very interesting to read. The last 'Comment'- CCS is not a viable option. No one talks about or considers the Long Term consequences of underground storage, never mind the absurd costs.

Judi Greenwald testimony - Interesting that FutureGen is not listed in this presentation on 25 JUL 2013 <http://neori.org/greenwald-testimony/>

There are other CCS projects in trouble with cost overruns.

One is the Edwardsport Project/Duke Energy <http://www.indianadg.net/isnt-duke-energy-indianas-edwardsport-igcc-plant-such-a-great-deal-for-consumers-not/>

and the USEPA Region 5 told me about the Wabash CCS project http://en.wikipedia.org/wiki/Integrated_gasification_combined_cycle

IGCC [http://www.sourcewatch.org/index.php/Integrated_Gasification_Combined_Cycle_\(IGCC\)](http://www.sourcewatch.org/index.php/Integrated_Gasification_Combined_Cycle_(IGCC))

Also: Check this Morgantown April 2013 presentation by Ken Humphreys.

<http://uschinacleanenergy.wvu.edu/wp-content/uploads/2013/03/Session-4-0820-FutureGen-II-Update-Ken-Humphreys.pdf>

Page 13 is interesting. I did not know that landowners were partners and given the date of April 2013, 8000 acres were supposedly secured. Our acreage was only committed at that date. I think most of the landowners would be upset knowing they were portrayed as partners. This has legal ramifications on liability.

By virtue of FutureGen's inclusion in a power purchase agreement by the Illinois Power Agency, FutureGen became a utility and as a result is eligible for rights granted to utilities including the right of eminent domain. When FutureGen first started, it consisted of several venture capitalist companies forming an alliance supposedly to mitigate climate change with the removal of CO2 from the atmosphere and receiving financial backing from the Department of Energy, the State of Illinois, and Morgan County and as alliance members backed out, the financial burden was passed on to Illinois rate and taxpayers.

Electronic Filing - Received, Clerk's Office : 08/05/2014 **PC #1**

From FutureGen's journey on permit application and approval, FutureGen has been arguing that "by definition" it feels that "because of the oxy-combustion technology" it should not be required to obtain a Prevention of Significant Deterioration (PSD) permit. I became aware of this during my investigation and public comments with the Illinois Commerce Commission (ICC)/Illinois Power Agency (IPA) when FutureGen argued to be included in the ICC's Power Purchase Agreement. In 2011 the IPA worked on the Power Purchase Agreement, for 2012 during which time FutureGen tried to circumvent governmental authorizations with the IPA and ICC with regard to Prevention of Significant Deterioration Permit (From page 12: PSD request for variance on PSD (Air) Permit to IPA). Reference on ICC website: -0660&docId=172128 on 3 October 2011 or http://www.illinoiscompetitiveenergy.com/Commission_Final_Order_Procurement_Plan_December_21_2011.pdf Page 49 on eDocket 11-0660. The Illinois Power Agency and the Illinois Commerce Commission do not have the authority to waive permits, yet I believe FutureGen has negotiated with these entities as though these entities can grant permit waivers.

Given that the FutureGen 2.0 project is obtaining many of its permits from many governmental agencies, local, state, and federal, in my opinion, FutureGen has been using one permit from one agency to justify another agency to issue its permit. This, also, in my opinion is not a valid permitting of the entire project as a whole. I believe that the citizens of Illinois and Illinois ratepayers are offered no final protections against this project.

One of the US states competing with Illinois for the FutureGen project was Texas. Texas, as of December of 2013, USEPA in Texas was still passing rules and regulations for a FutureGen type project, meaning FutureGen, if it selected Texas for its project location, would have been delayed by virtue of the fact that Texas was still writing the rules and thereby would not have been able to meet all the DOE deadlines for a successful project. In addition, given that the USEPA in Texas requires that the project would need a PSD permit, which during the permitting process would reveal that the FutureGen's cost overruns would then prevent the CCS aspect of the FutureGen 2.0 project under the current USEPA Texas rulings.

Hence, FutureGen has spent considerable legal time, costs, and effort (as witnessed above) to discredit the PSD process in Illinois because the Illinois PSD permitting might jeopardize the CCS aspect of the FutureGen project. To me, in FutureGen's Illinois permitting strategy, the whole is not the total sum of the parts.

Also, I have attached a PDF file which I believe is the most up-to-date and indicates on 8 February 2014 that the construction costs are now 1.78 billion. Just who is to pay for this for this extra 13 million? Also, under the Illinois Department of Natural Resources request for incidental take on endangered and threatened species, FutureGen indicates that the output of the oxy-combustion power plant will be only 99MWe, down considerably from the initial 200 MWe of the original power plant and then down from 168 MWe of the proposed power plant. This is not energy efficient in my estimation. Furthermore, it seems that FutureGen can not seem to consolidate all project facts in one document which, to me, makes it hard for any entity - government or not- to make a valid decision.

Note: to sequester 1 million metric tons of supercritical CO₂ (385 million gallons of liquefied CO₂) will only reduce the atmospheric CO₂ by 0.00046 parts per million of CO₂. To me this is not enough to mitigate CO₂ in the name of climate change. To reduce atmospheric CO₂ by just 1 ppm, will take over 2000 like kind FutureGen type projects and there are not even that many coal fired plants in operation in the US.

Patrick Yeagle of the Illinois Times has written a couple of very good articles about FutureGen.

<http://illinoistimes.com/article-13897-gambling-on-a-black-rock.html>

and

<http://illinoistimes.com/article-13776-does-futuregen-have-a-future-.html>

In addition, a law student at Washington University in St. Louis, by the name of Daniel Coultas, wrote a letter to the editor of the Illinois Times concerning the use of the Jacksonville, Illinois, Community Park which FutureGen demanded for its Visitor, Training and Research Center - The FutureGen Center.

The link to the article is <http://illinoistimes.com/mobile/articles/articleView/id:13825> FutureGen's strategy is that the location of this Visitor, Training and Research Center announcement came during the NEPA process such that there was no official Environmental Impact Study conducted its location. In my opinion, the study would have been detrimental to FutureGen in that local people would have been asked about FutureGen's use of the Community Park for the VRT Center, local people would have not be favorable towards FutureGen. I will not discuss all these aspects at this time.

Thank your very much for listening,

Betty Niemann

[i] Sent: Thu 6/26/14 8:28 AM

To: 'Betty Niemann' (paint007@hotmail.com)

Hi Betty,

Feel free to pass my article on to EPA, if you think it will help your cause.

Best of luck,

Brian

From: Betty Niemann [mailto:paint007@hotmail.com]

Sent: Thursday, June 26, 2014 7:33 AM

To: Potts, Brian H.

Subject: EPA and CCS

Mr. Potts,

I read your 22 May 2014 article in the WSJ on EPA CCS Flip Flop.

I would like to send a copy of this article to the USEPA Region 5 who are currently reviewing at permit requests for at least UIC Class VI Injection Wells. <http://www.epa.gov/r5water/uic/futuregen/>

Four (4) permit requests are made by the FutureGen Industrial Alliance for 4 injection wells from one well site in

Morgan County, Illinois.

The characterization well for this project was drilled on trust property (399.35 acres) before my husband, his 2 nephews, and three cousins inherited the land when our part of the trust ended on 22 Feb 2014. The trustee committed this land plus 400+ acres additional family trust in 2011 to make a good portion of the 1000 acres FutureGen said it needed for the project. We read about the commitment of the land in the local newspapers a week before we received a letter from the trustee and were not specifically asked whether or not the heirs were for this happening to the land. Six days after the date in the letter, the trustee committed the land before the heirs (and beneficiaries) could secure legal counsel.

We have been fighting the FutureGen project at every public hearing, writing to members of congress and even the White House to no avail.

Our Public comments are found in the Final DOE/EIS-0460 -

Since USEPA Region 5 is still reviewing the FutureGen permit applications, I feel your article would be good input for Region 5.

If you have any other information that will help.



Update on US Clean Coal/CCS Major Demonstration Projects

Platts 8th Annual European CCS

Joseph Giove III

Director, Division of CCS Demonstrations

February 19, 2014



U.S. DEPARTMENT OF
ENERGY

Fossil
Energy

FE's Coal RD&D Investment Strategy

Approaches

Programs

Technology Development

RESEARCH & DEVELOPMENT

Core Coal and
Power Systems R&D

DOE – FE – NETL

Commercial Readiness

TECHNOLOGY DEMONSTRATION

FutureGen 2.0
Clean Coal Power Initiative
Industrial CCS

DOE – FE – NETL

Market Penetration

FINANCIAL INCENTIVES

Tax Credits
Loan Guarantees

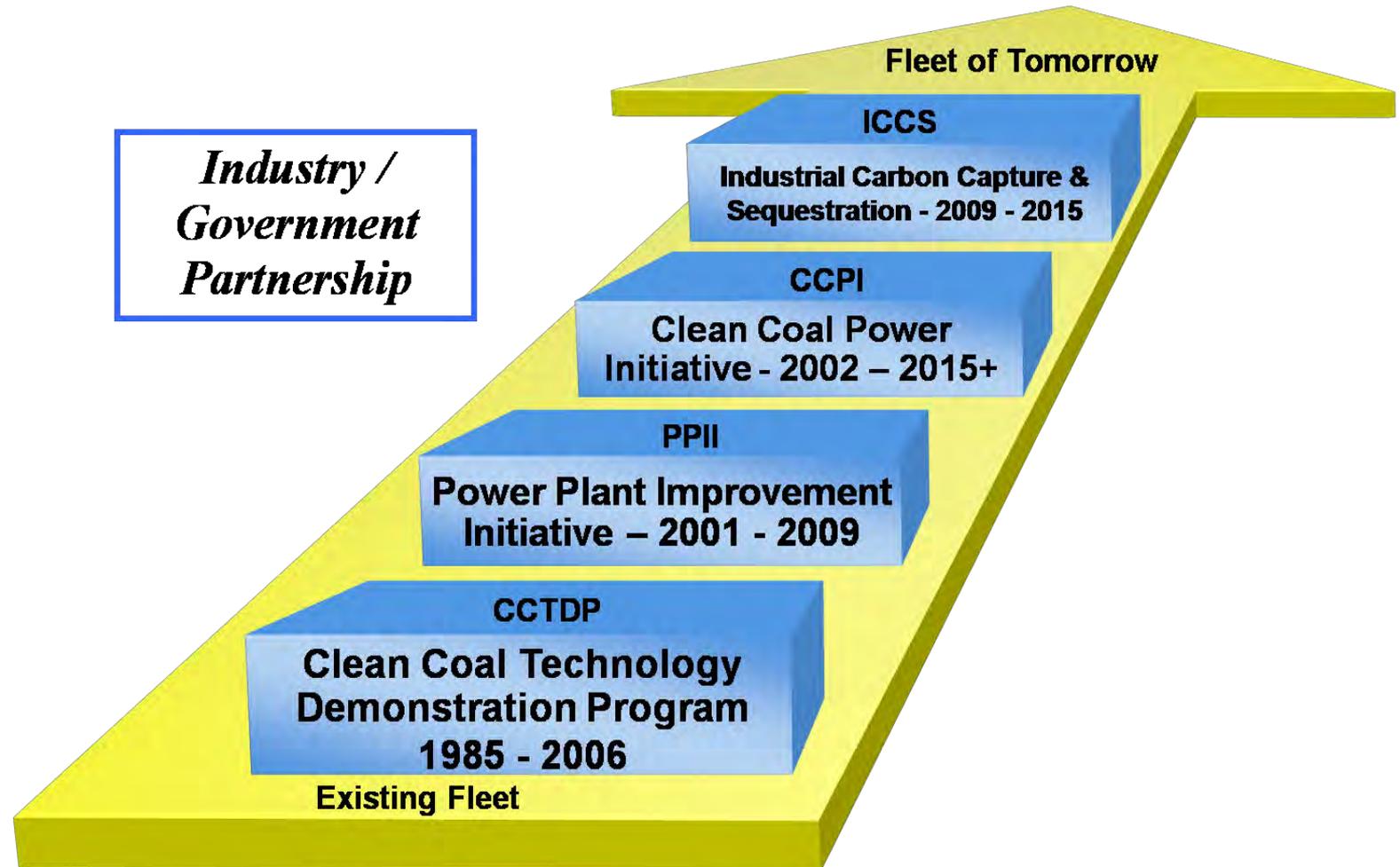
DOE – LGO – IRS



Electronic Filing - Received - Clerk's Office - 08/05/2014 **PC #1**

DOE's Major Demonstrations Program

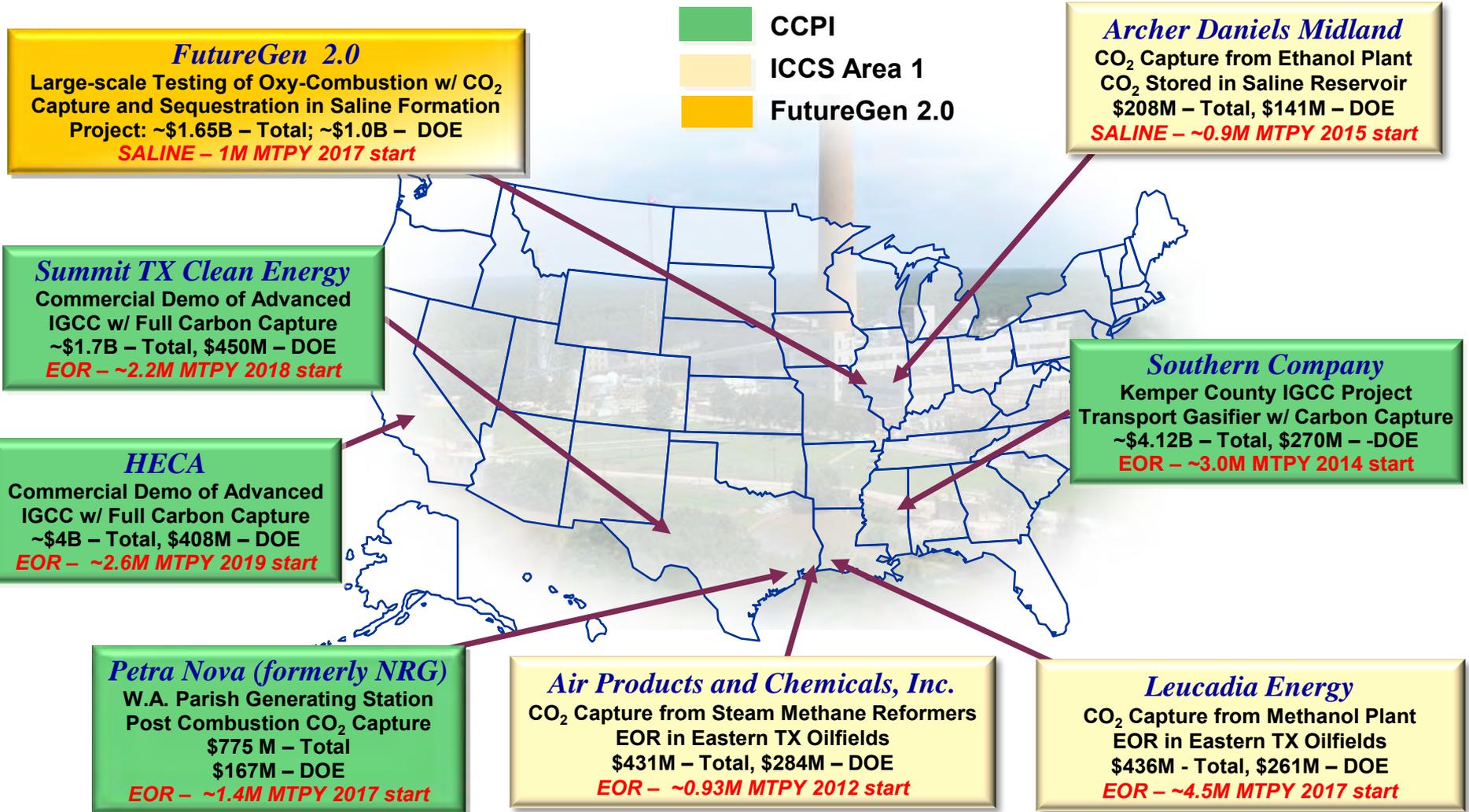
A History of Innovative Projects



Major CCS Demonstration Projects

Electronic Filing - Received Clerk's Office - 08/05/2014 **PC #1**

Project Locations & Cost Share



Portfolio of Capture and Storage Approaches

	Plant Type		Sequestration			Feedstock
	Power	Industrial	Saline	EOR	Rate*	
Pre-combustion						
HECA (IGCC-Polygen)	X	X		X	2.55	NM Sub-bituminous Coal/Petcoke Blend
Southern-Kemper Co. (IGCC)	X			X	3.0	MS Lignite
Summit Texas (IGCC-Polygen)	X	X		X	2.2	WY Sub-bituminous Coal
Leucadia, Lake Charles (Methanol & Hydrogen)		X		X	4.5	Petroleum Coke
Air Products and Chemicals, Inc. (SMR)		X		X	0.925	Natural Gas
ADM (Ethanol Production)		X	X		0.900	Corn Fermentation
Post-combustion						
NRG Energy	X			X	1.4	WY Sub-bituminous Coal
Oxy-combustion						
FutureGen 2.0	X		X		1.0	IL Bituminous /PRB Coal Blend

 CCPI

 ICCS

 FutureGen 2.0

*Rate in million metric tons per year



Southern Company Services

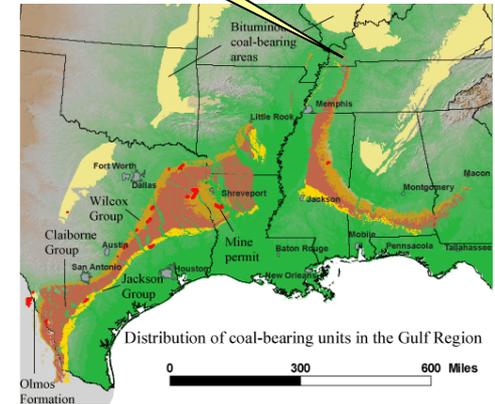
Advanced IGCC with CO₂ Capture



- Kemper County, MS
- 582 MWe (net) IGCC: 2 Gasifiers, 2 Siemens Combustion Turbines, 1 Toshiba Steam Turbine
- Mississippi Lignite Fuel
- ~67% CO₂ capture (Selexol® process)
3,000,000 tons CO₂/year
- EOR Denbury Onshore LLC, Treetop Midstream Services LLC
- Total Project: \$4.3 Billion
DOE Share: \$270 Million (7%)



Plant Site



Key Dates

- Project Awarded: January 2006
- Project moved to MS: December 2008
- Construction: July 2010
- NEPA ROD: August 2010
- Operations: 4th Quarter 2014

Status

- Plant construction >75% complete; >5,400 construction workers on site
- CO₂ off-take agreements signed
- Lignite mine under development
- Subsystem in pre-commissioning
- Combustion turbine startup: Aug 2013
- Roll Steam Turbine: Oct 2013
- Gasifier heat-up: June 2014







Electronic Filing - Received, Clerk's Office : 08/05/2014 **PC #1**

Treated Effluent Reservoir

Liberty Mine

Lignite Storage Dome

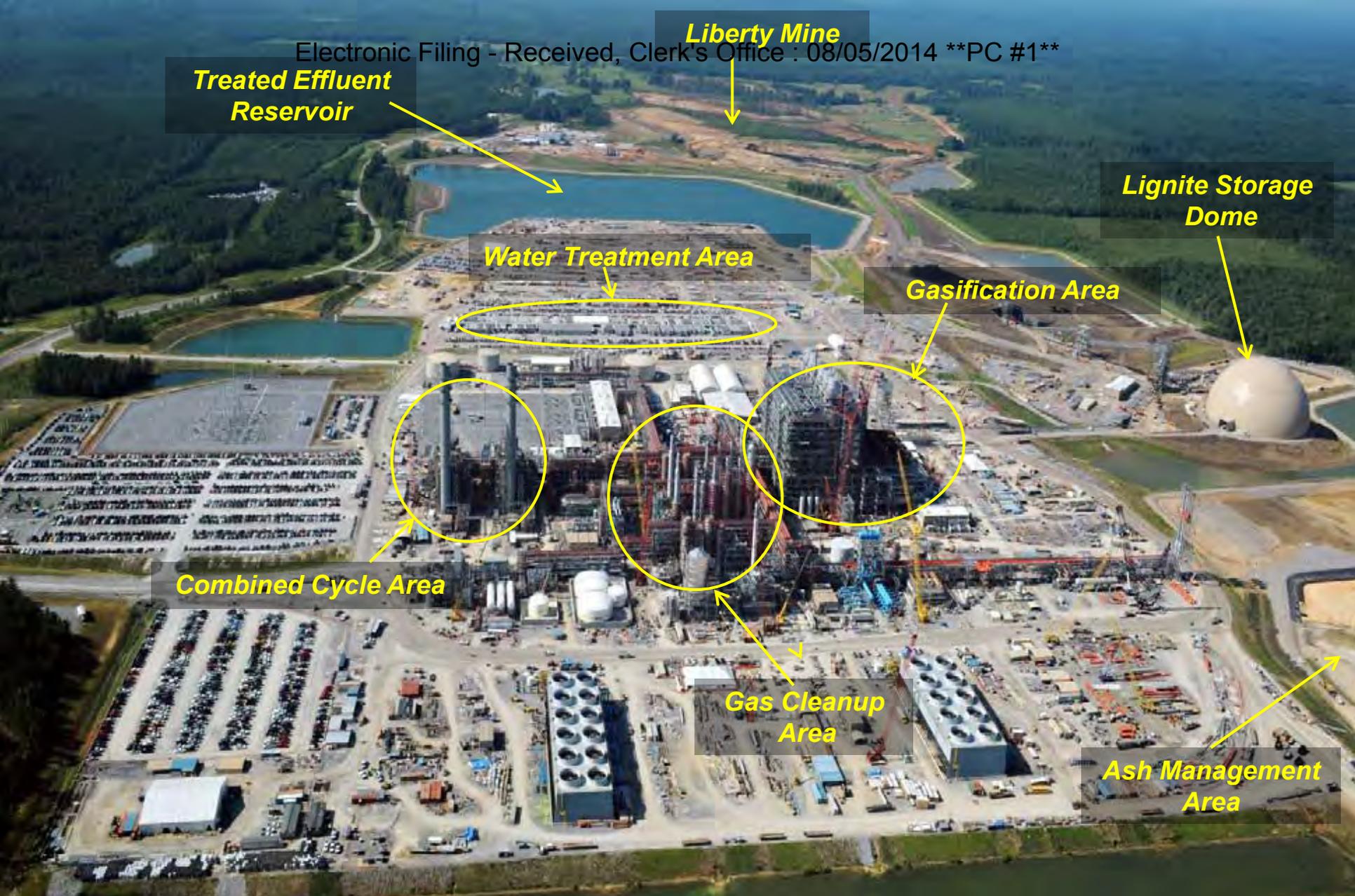
Water Treatment Area

Gasification Area

Combined Cycle Area

Gas Cleanup Area

Ash Management Area



U.S. DEPARTMENT OF
ENERGY

Fossil
Energy

Electronic Filing - Received, Clerk's Office : 08/05/2014 **PC #1**





Preparing for Lift of First Gasifier Sections

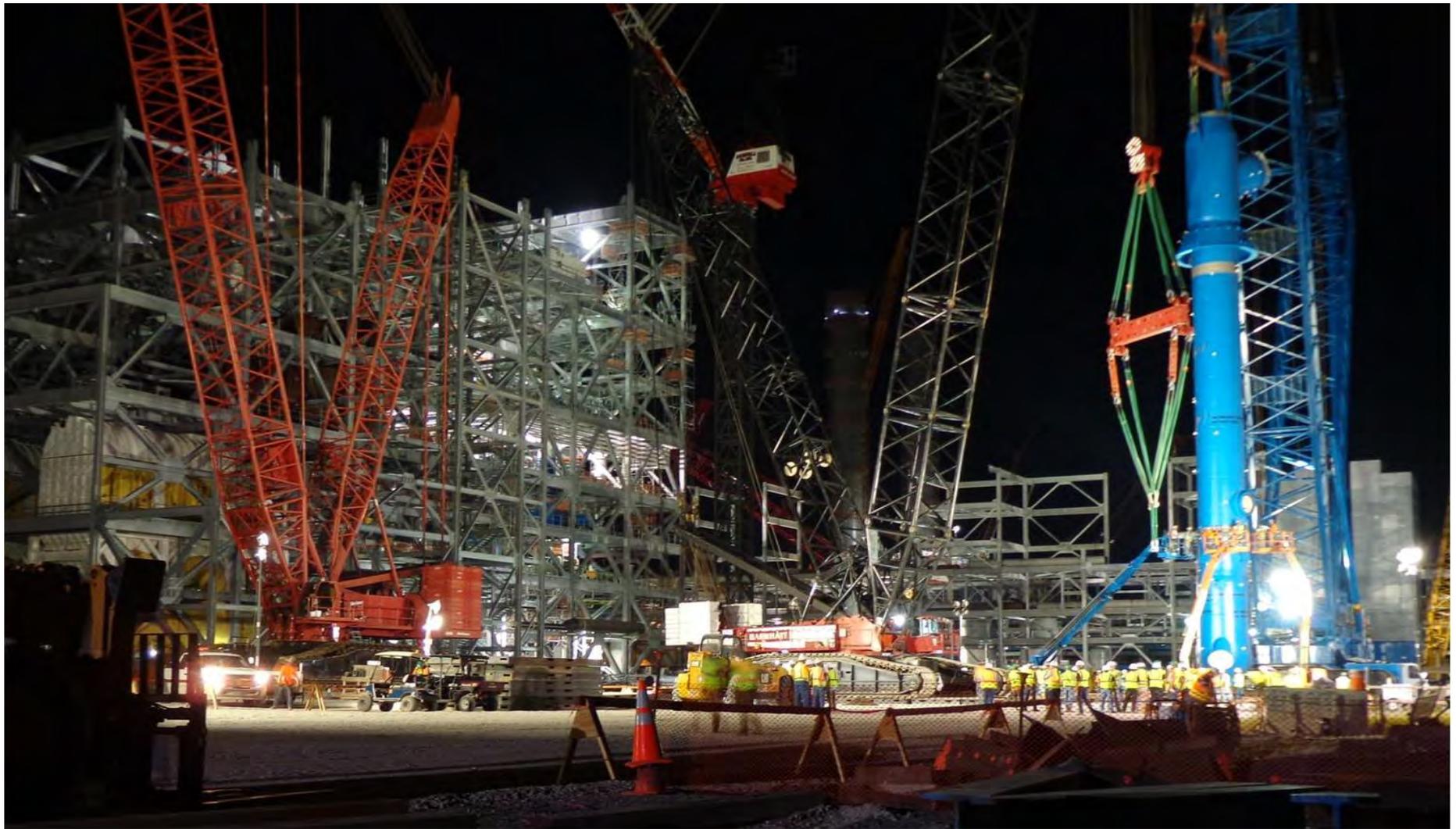
September 2012



U.S. DEPARTMENT OF
ENERGY

Fossil
Energy

Lift of First Gasifier Sections into Structure



Electronic Filing - Received, Clerk's Office : 08/05/2014 **PC #1**

Control Room



Steam Blow





Hydrogen Energy California (HECA)

Advanced IGCC-Polygen w/CCUS



- Kern County, CA, EOR: Elk Hills oilfield
- Up to 300 MWe (net) with load following; greenfield IGCC; Urea/UAN production
 - MHI oxygen-blown gasifier (1 x 100%)
 - MHI G-class air cooled combustion turbine (1)
- Fuel: Sub-bituminous coal/petcoke
- 90% CO₂ capture – 3,020,000 tonnes CO₂/year
 - 2.57M tonnes/y EOR; 0.45M tonnes/y Urea production
 - 2-stage Water Gas Shift, Linde Rectisol[®] AGR
- Use of brackish water for power production; ZLD
- Total DOE Project: \$4 Billion DOE - \$408 Million



Key Dates

- **Project Awarded: Sep 2009**
- **New Owner, SCS Energy: Sep 2011**
- **Financial Close: Mid-2015**
- **Start of Construction: Late 2015**
- **Start of Operation: 2019**

Status

- **NEPA public scoping meeting: Jul 2012**
- **Power/Fertilizer/CO₂/EPC discussions in progress**
- **FEED completed: Jun 2013**
- **Draft EIS published: July 19, 2013**



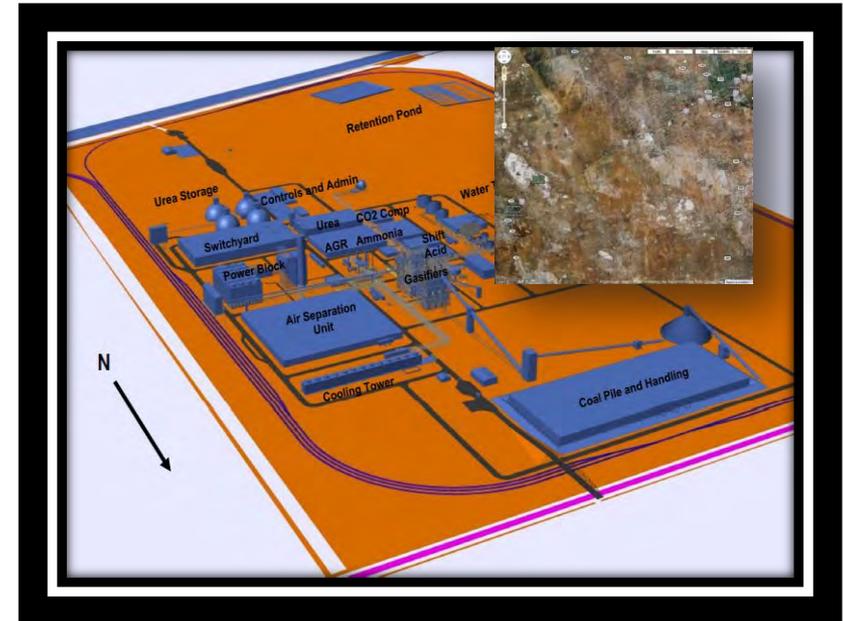
Summit Texas Clean Energy

Advanced IGCC-Polygen w/CCUS

- Penwell, Ector County, TX
- 200 MW (net), 0.7M tonnes/yr Urea; greenfield IGCC with Siemens gasification & power Block
 - SFG-500 gasifiers (2 x 50%)
 - High H₂ SGCC6-5000F combined cycle (1 x 1)
- Fuel: PRB sub bituminous coal
- 90% CO₂ capture – ~2,700,000 tonnes CO₂/year
 - 2.2M tonnes/y EOR; 0.5M tonnes/y to Urea production
 - 2-stage Water Gas Shift, Linde Rectisol[®] AGR
- EOR: Permian Basin Oilfields
- Total DOE Project: \$1.727 Billion
DOE Share: \$450 Million (26%)
- Total Plant Cost ~\$2.6 Billion

Key Dates

- Air Permit; Dec 2010
- NEPA Record of Decision: Sep 2011
- Financial Close: Mid-2014
- Construction: Late 2014
- Operation: Dec 2017



Status

- Urea contract: Jan 2011
- CO₂ contract(s): Nov 2011
- Power off-take contract: Dec 2011
- Chexim signed for debt financing MOU: Sep 2012
- Sinopec signed EPC agreement: Dec 2012



Petra Nova Parish Holdings (Formerly NRG)

Advanced Post Combustion CO₂ Capture

- Thompsons, TX (near Houston)
- 240 MWe slipstream at NRG Energy's W.A. Parish power plant (project scale up from original 60 MWe to improve economic)
- Fuel: PRB sub-bituminous coal
- 90% CO₂ capture (KM CDR Process[®])
1,400,000 tonnes CO₂/year
- EOR: Hilcorp West Ranch Oilfield
- Total DOE Project: \$775 Million (est.)
DOE Share: \$167 Million (21.5%)



Key Dates

- **Project Awarded: May 2010**
- **Air Permit: Dec 2012**
- **NEPA Record of Decision: Apr 2013**
- **Financial Close: Mar 2014**
- **Construction: Apr 2014**
- **Operation: Nov 2016**

Status

- **EOR Host Site acquired: Oct 2011**
- **240 MWe FEED completed: Feb 21, 2012**
- **MHI initiated detailed design: Dec 2012**
- **NRG-Petra Nova signed engagement letter with a debt financing provider: Dec 2012**
- **Notice of Final EIS: Mar 8, 2013**

FutureGen 2.0

Oxy-Combustion w/ CO₂ Sequestration



- Morgan County, IL (western IL)
- 168 MWe repowering of an existing steam turbine generator at Ameren's Meredosia Energy Center
- Fuel: Illinois bituminous/PRB blend
- 90+% CO₂ capture (cryogenic separation)
1,000,000 tonnes CO₂/year
- Geologic Storage, Mt. Simon Sandstone saline formation - ~ 30 miles east of power plant
- Total DOE Project: \$1.78 Billion
DOE Share: \$1.05 Billion (59%)



Key Dates

- **Project Awarded: October 2010**
- **NEPA Complete: Jan 13, 2014**
- **Financial Close: Summer 2014**
- **Construction: Summer 2014**
- **Operation: Winter 2017**

Status

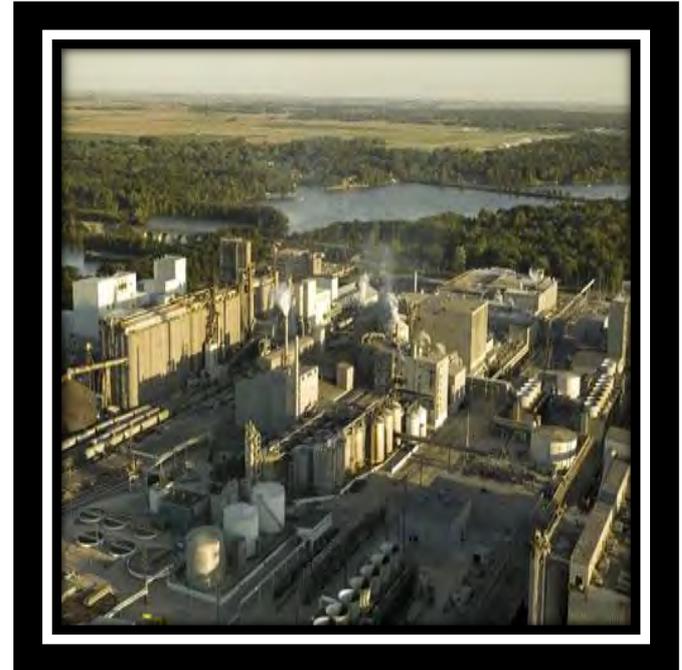
- **Storage site selected: Oct 2011**
- **Preliminary PPA approved by ICC: 12/19/12**
- **Power plant project novated to FGA: 1/30/13**
- **Phase II (NEPA, Permitting, Design) authorized: 2/1/13**
- **PPA signed: Aug 2013**
- **FEED completed: December 2013**

Archer Daniels Midland

CO₂ Capture from Biofuel Plant



- Decatur, IL
- CO₂ is a by-product (>99% purity) from production of fuel grade ethanol via anaerobic fermentation
- Up to 90% CO₂ capture; dehydration (via triethylene glycol) and compression – ~900,000 tonnes CO₂ /year
- Sequestration in Mt. Simon Sandstone saline reservoir
- Total Project: \$208 Million
DOE Share: \$141 Million (68%)



Key Dates

- Phase 2 Awarded: Jun 15, 2010
- FEED Complete: Apr 2011
- NEPA FONSI: Apr 2011
- Construction start: May 2011
- UIC Class VI Injection Well Permit: Aug 2014
- Sequestration start: Feb 2015

Status

- Construction ~55% complete
- UIC Class VI permit submitted: Jul 2011
- Two monitoring wells drilled: Nov 2012
- Commissioning compression and dehydration: began in July 2013



Four Compressor Train



Compressor & Auxiliaries



Dehydration System



8" High Pressure transmission Line



Electronic Filing Received, Clerk's Office: 08/05/2014 **PC #1**

ADM - Project Monitoring Photos (June 2013)



Shallow Groundwater Sampling



Soil Gas and CO₂ Flux Networks

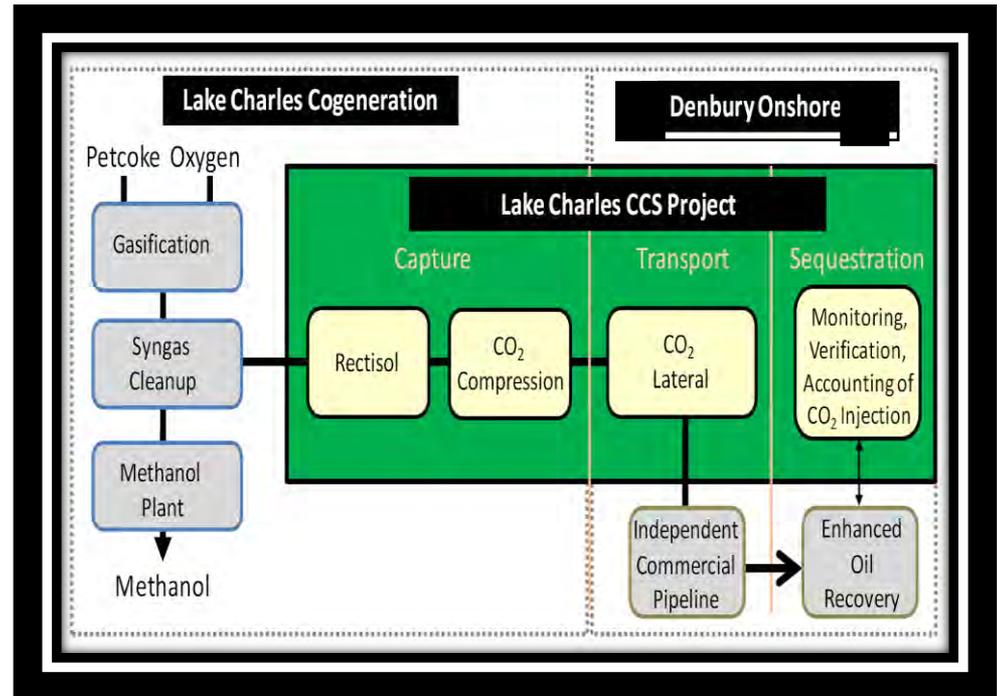


Leucadia Energy

Petcoke Gasification to Methanol



- Lake Charles, LA
- GE Energy Gasification
(4 gasifiers: 3 hot/1 spare)
- 700 million gallons/year methanol; 110 mmscfd hydrogen
- Fuel; Petcoke
- 89% CO₂ capture (Rectisol® process); 4,500,000 tonnes CO₂/year
- CO₂ to Denbury pipeline for EOR in Texas at West Hastings oil field
- Total Project: \$436 Million



Key Dates

- Phase 2 awarded: Jun 17, 2010
- Complete CCUS FEED: Jul 2011
- NEPA ROD: Nov 2013
- Financial close: March 2014 (est.)
- Construction: April 2014 (est.)
- Operation: Late 2017 (est.)

Status

- Product off-take contracts finalized (BP, APCI)
- NEPA ROD published: Dec 28, 2013
- FEED in progress for gasification plant

Leucadia Site



Panoramic View of Current Site Cleared Looking South



Site preparation and drainage - Completed



Site to be raised to 10 Ft above Sea Level (Post Rita Flood Level)



Air Products & Chemicals

Steam Methane Reforming with CO₂ Capture



- Port Arthur, TX (Hydrogen plant at Valero Refinery)
- 90%+ CO₂ capture (Vacuum Swing Adsorption) from 2 steam-methane reformers (SMRs) yielding ~925,000 tonnes CO₂/year
- ~30 MWe cogeneration unit to supply makeup steam to SMRs and operate VSA and compression equipment
- CO₂ to Denbury for EOR - West Hastings oilfield
- Total Project: \$431 Million
DOE Share: \$284 Million (66%)

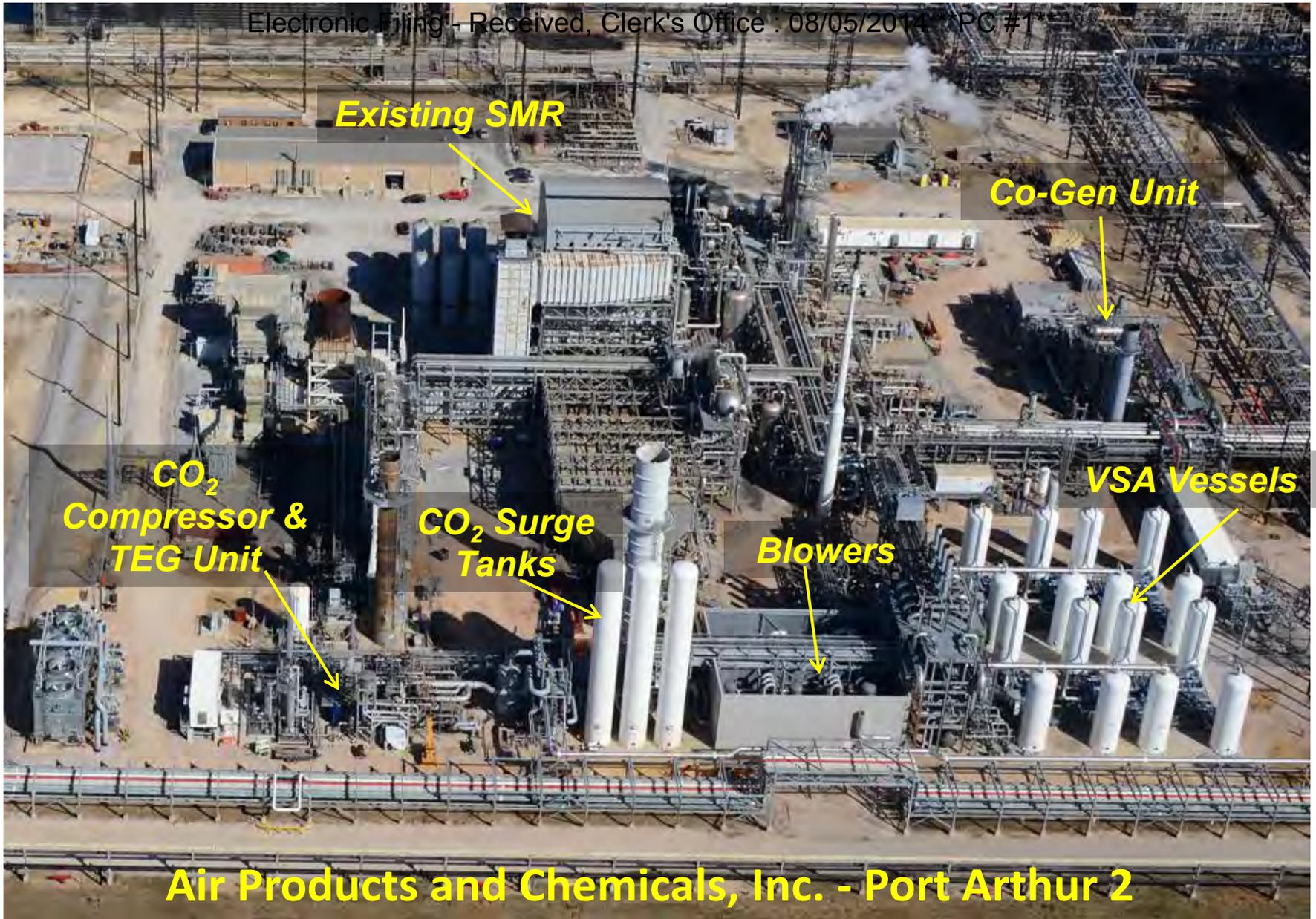


Key Dates

- Phase 2 Awarded: Jun 15, 2010
- FEED complete: Nov 2010
- Permit By Rule (PBR) and Standard Air Permits issued: May 2011
- NEPA FONSI: Jul 2011
- Construction start: Aug 2011
- Operation start: Dec 2012

Status

- PA-1 initiated operation: Mar 3, 2013
- PA-2 initiated operation: Dec 16, 2012
 - Operating continuously since Dec 31, 2012
 - Total CO₂ delivered: 680K tons (Dec 2013)
 - Full capacity achieved: April 2013
- Final MVA report submitted: Feb 2013



Air Products and Chemicals, Inc. - Port Arthur 2



U.S. DEPARTMENT OF
ENERGY

Fossil
Energy

RCSP Phase III: Large-Scale Geologic Tests

	RCSP	Geologic Province	Project Description	Injection Started & Volume to date (metric tons)
1	BIG SKY	Kevin Dome-Duperow Formation	Saline storage of naturally occurring CO ₂	Injection to begin 2015; Volume TBD
2	MGSC	Illinois Basin-Mt. Simon Sandstone	Saline storage of CO ₂ from ADM biofuel production	Injection began Nov. 2011; Volume >600K tonnes
3	MRCSP	Michigan Basin-Niagaran Reef	EOR using CO ₂ from gas processing plant	Injection began Feb. 2013; Volume > 260K tonnes
4	PCOR	Powder River Basin- Muddy Sandstone	EOR using CO ₂ from ConocoPhillips Gas Plant	Injection began June 2013; Volume TBD
5		Horn River Basin-Carbonates	Saline storage of CO ₂ from Spectra Energy gas processing plant	Injection to begin 2015; Volume TBD
6	SECARB	Gulf Coast – Tuscaloosa Formation	Saline leg of EOR; storage natural CO ₂	Injection began 2009; Volume >3,000,000
7		Gulf Coast – Paluxy Formation	Saline storage of amine capture CO ₂ from coal-fired generation	Injection began Aug. 2012; Volume >100,000
8	SWP	Anadarko Basin-Morrow Sandstone	EOR storage of CO ₂ from fertilizer and ethanol plants	Injection to begin 2014; Volume TBD
9	WESTCARB	Regional Characterization		No large-scale injection

- Injection Ongoing
- 2013 Injection
- Injection Scheduled 2014-2015



LPO Provides Project Finance Debt Capital

- \$8 Billion in Loan Guarantee Authority for Fossil Energy
- Long-Term Financing Available



What is an Advanced Fossil Energy Project?

- Projects Must Be Innovative, Utilize Fossil Energy
- Reduce Greenhouse Gas Emissions
- Located in U.S. with Reasonable Prospect of Repayment



Application Process and Dates

- Long-term, Two-part Application Process: Open Until 2016
- First Part 1 Deadline: February 28, 2014
- Online Application Portal and Streamlined Review Process





Advanced Resource Development

- Coal-bed methane recovery
- Novel oil and gas drilling



Low Carbon Power Systems

- Chemical looping or process that isolate fuel from air during combustion
- Fuel cells which convert chemical energy into electricity without combustion



Carbon Capture

- CO₂ capture from traditional coal or natural gas electricity generation
- Permanent geologic storage or utilization in enhanced oil recovery (EOR)



Efficiency Improvements

- Combined heat and power (CHP) and waste recovery
- High-efficiency distributed fossil power systems, and microgrids

**Qualifying projects may include but are not limited to the technologies within.*



The Advanced Fossil Solicitation Has Broad Applicability

- **Projects May Utilize any Fossil Fuel**
 - Including, but not limited to, coal, oil, natural gas, shale gas, coal bed methane, and methane hydrates
- **Covers the Full Fossil Fuel Value Chain**
 - Projects can include, but are not limited to, extraction, generation, greenhouse gas removal, and efficiency improvements
- **Solicitation is Open to a Wide Variety of Applicants**
 - Power plants, mines, refineries, utilities, project developers, and factories
 - Public and Private Sector infrastructure, such as universities, airports, and hospitals
 - Others



For Additional Information



Office of Fossil Energy
www.fe.doe.gov

NETL
www.netl.doe.gov

LGO solicitation homepage: <http://lpo.energy.gov/resource-library/solicitations/advanced-fossil-energy-projects-solicitation/>

LGO Questions: LPO.FossilSolicitation.Questions@hq.doe.gov



U.S. DEPARTMENT OF ENERGY
Fossil Energy