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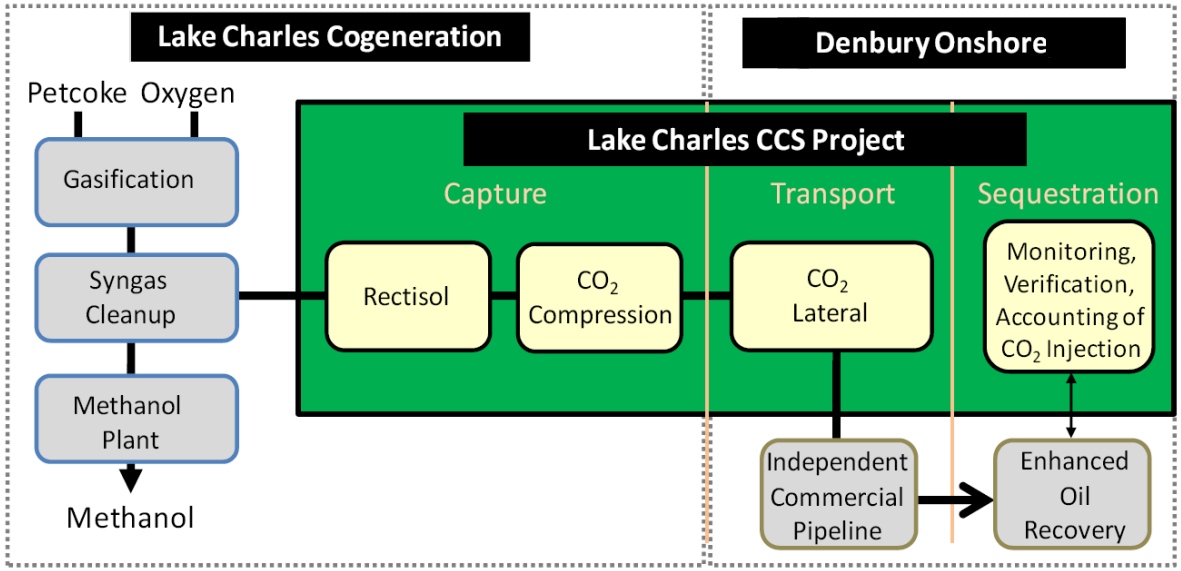
Lake Charles CCS Project



2010 NETL CO_2 Capture Technology Meeting

September 16, 2010

Lake Charles Gasification Project

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- **Owner:** Leucadia Energy LLC, an indirect subsidiary of Leucadia National Corporation
- **Project company:** Lake Charles Cogeneration LCC
- **Location:** Lake Charles Harbor & Terminal District, Lake Charles, Louisiana adjacent to existing petcoke terminal.
- **Fuel:** Petroleum coke delivered under long-term feedstock supply with Koch Carbon, LLC
- **Production:** Methanol to be used as feedstock for chemical production
- **Other products:** Sulfuric acid, argon, supercritical CO2
- **Financing:** $1 billion of Gulf Opportunity Zone Bonds closed April 2, 2008 with additional 2010 allocation of $310 MM, $128 MM 48(B) ITC, $260 MM FOA15 ICCS Grant.
- **Technology:** GE Quench gasification
- **Construction Services:** Turner Industries Group

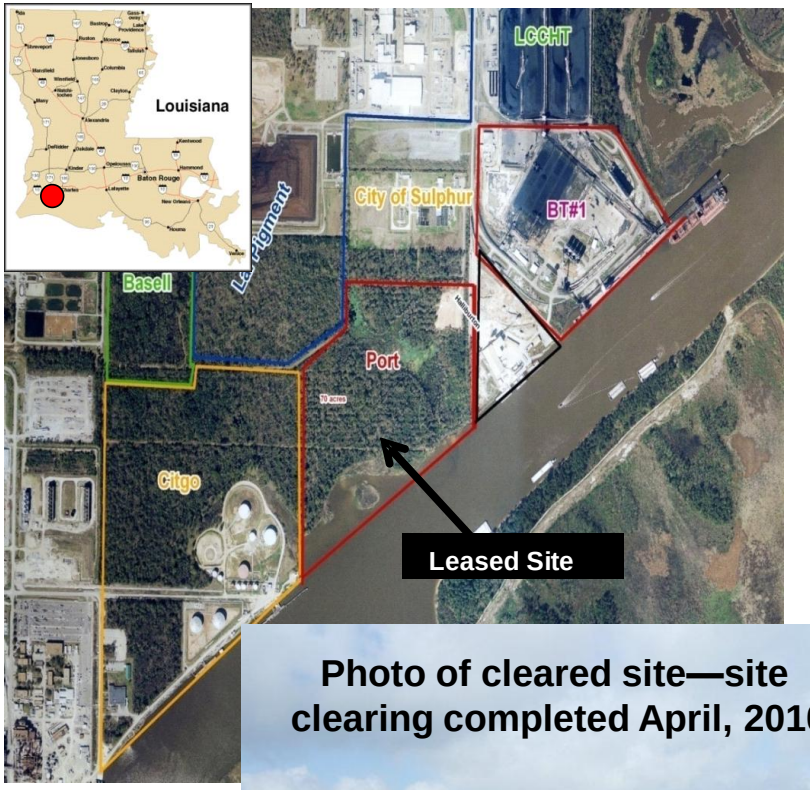

Photo of cleared site—site clearing completed April, 2010

Gasification/CCS Project Attributes

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- The Lake Charles project represents a major infrastructure investment that will provide jobs and significant economic benefits in the Gulf Coast region using state of the art clean energy technology.

- Petroleum coke is a high sulfur refinery waste product.
  - Gasification enables the remaining energy in petcoke to be extracted to produce valuable products, including methanol
  - About 80% of Gulf Coast petcoke is currently exported and subsequently burned with little or no environmental control and no carbon capture.

- Gasification of petcoke produces significant environmental benefits compared to current uses:
  - Very low air emissions;
  - Low or no discharge of process water;
  - Production of a saleable solid byproduct; and
  - Capture of about 85% of the CO_2 emissions.

- The Lake Charles CCS Project will result in the capture, transport and sequestration of 4.5 million tons per year of CO_2 and help demonstrate the viability of large-scale capture and sequestration in an EOR field from an industrial source using proven technology.

- The CCS Project will include implementation of a research MVA program at a site within the West Hasting oil field, establishing important precedent for CO_2 MVA at EOR projects.

CCS Project Phase I Overview

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Objectives

- Develop the engineering design basis for the capture, compression and transportation of CO_2 from the LCC Gasification Project.
- Establish the criteria and specifications for a research monitoring, verification and accounting (MVA) plan at a site within the West Hastings oil field in Texas.
- Complete an EIV describing the environmental impacts of the capture and compression facilities, connector pipeline and research MVA activities.
- Develop and provide Phase 2 financial and budget information.

CCS Project Team

- Leucadia Energy – Award recipient
- Denbury – Subcontractor (transportation, injection and MVA activities)
  - UT Bureau of Economic Geology
- Black & Veatch (B&V) – Subcontractor (facility engineering)

Preliminary Engineering: Capture & Compression

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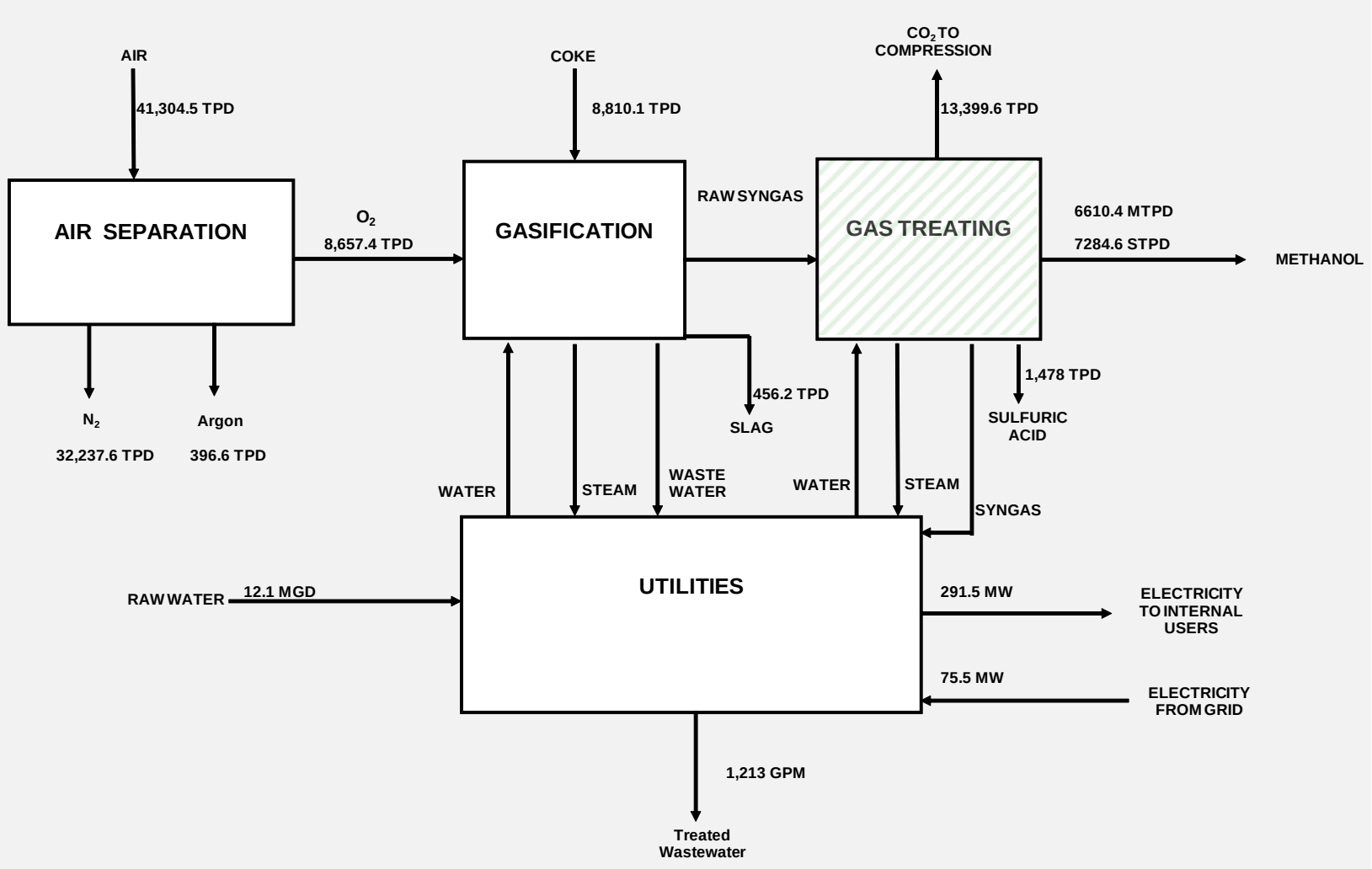

CO2 Capture Optimization Study

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Parameter	Units	Denbury CO_2 Spec.	One CO_2 Stream	Two CO_2 Streams	Three CO_2 Streams
CO_2 Pressure(s)	psia	-	29	17.4 48.6	23 40 60.7
CO_2 Purity	%v CO_2	97.0	99.2	98.0	99.1
	ppmv H_2S	-	20	7	1
	ppmv H_2S + COS	-	33	42	3
Specific Energy Use	MBtu/ton recovered CO_2	-	0.783	0.818	0.759
Operating Cost @ 90% Capacity Factor	$ Millions / year (2010)	-	+ 0.77	- 1.35	Base
Product Credit @ 90% Capacity Factor	$ Millions / year (2010)	-	- 0.44	- 4.48	Base
Capital Cost	$ Millions (2010)	-	+ 0.8	+ 6.3	Base

CO2 Compression Configuration

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- Evaluation 1x100%, 2x50%, and 3x33% compressor trains to serve two Rectisol trains.
- 1x100% configuration not considered since such a configuration would require CO_2 recirculation in the event of a Rectisol train shutdown (e.g. for maintenance); hence will waste compression energy and associated compression costs. Availability concerns with only one compressor train.
- 3x33% configuration in the order of 25 percent more capital intensive than a 2x50% configuration.
- 2x50% configuration selected because of lower capital cost and configuration will allow one Rectisol and compressor train to be shut down for maintenance while other Rectisol and compressor train can remain in operation.

CO2 Compression Technology

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- Pressure requirements too demanding for screw compressors.
- Reciprocating compressor capacity limitations will require multiple reciprocating compressors; and hence, reciprocating compressors were not considered.
- Centrifugal compressors most practical compressor type for large scale CO2 compression.
- Evaluation of two types of centrifugal compressors which included between-bearings and integrally geared multistage compressors.
- Based on polytropic stage efficiencies and capital costs received from budgetary quotes, integrally geared multistage compressors selected with eight stages of compression and six stages of intercooling.

Denbury – Commercial Operation

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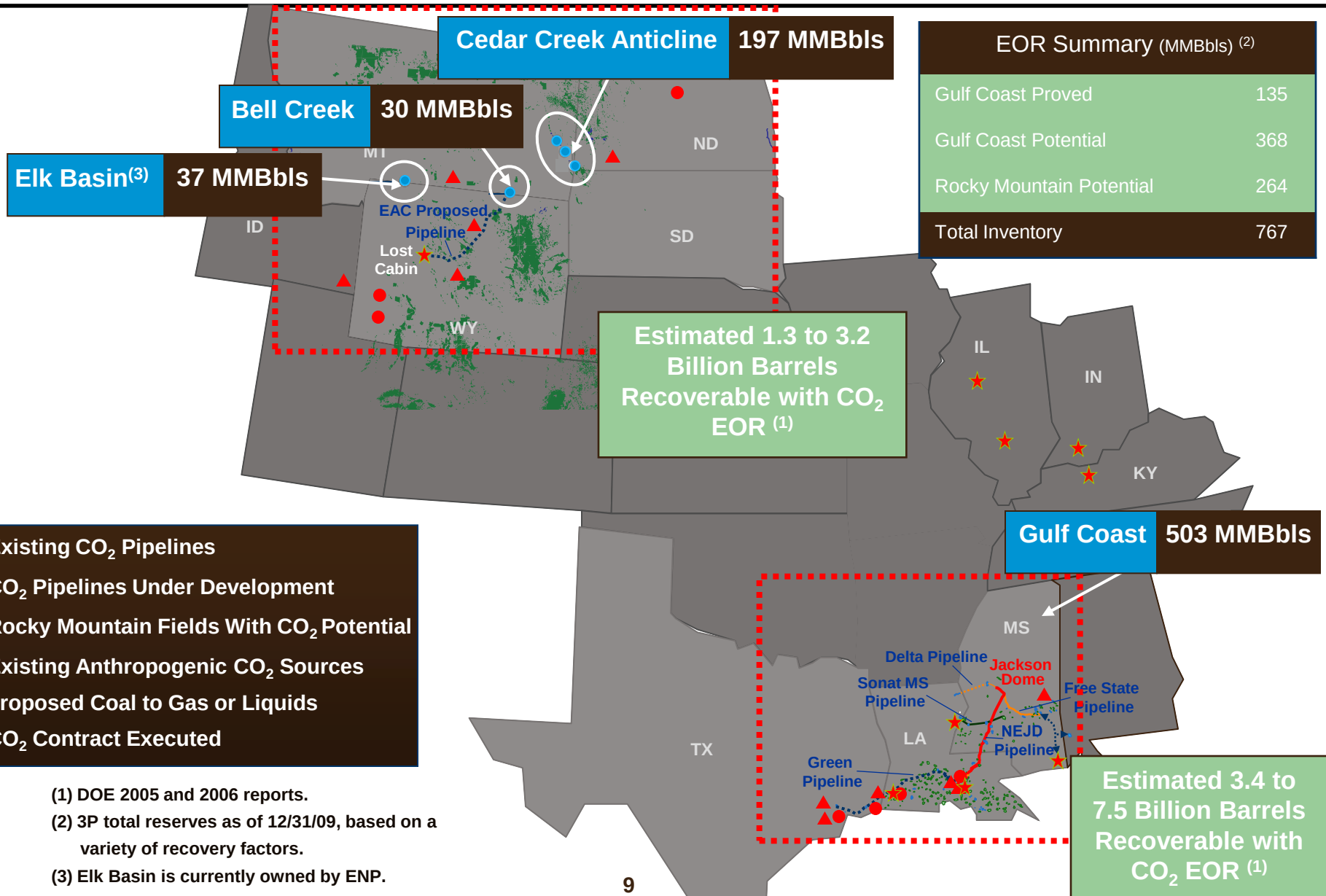

EOR Summary (MMBbls) (2)	
Gulf Coast Proved	135
Gulf Coast Potential	368
Rocky Mountain Potential	264
Total Inventory	767

(1) DOE 2005 and 2006 reports.

(2) 3P total reserves as of 12/31/09, based on a variety of recovery factors.

(3) Elk Basin is currently owned by ENP.

Green Pipeline

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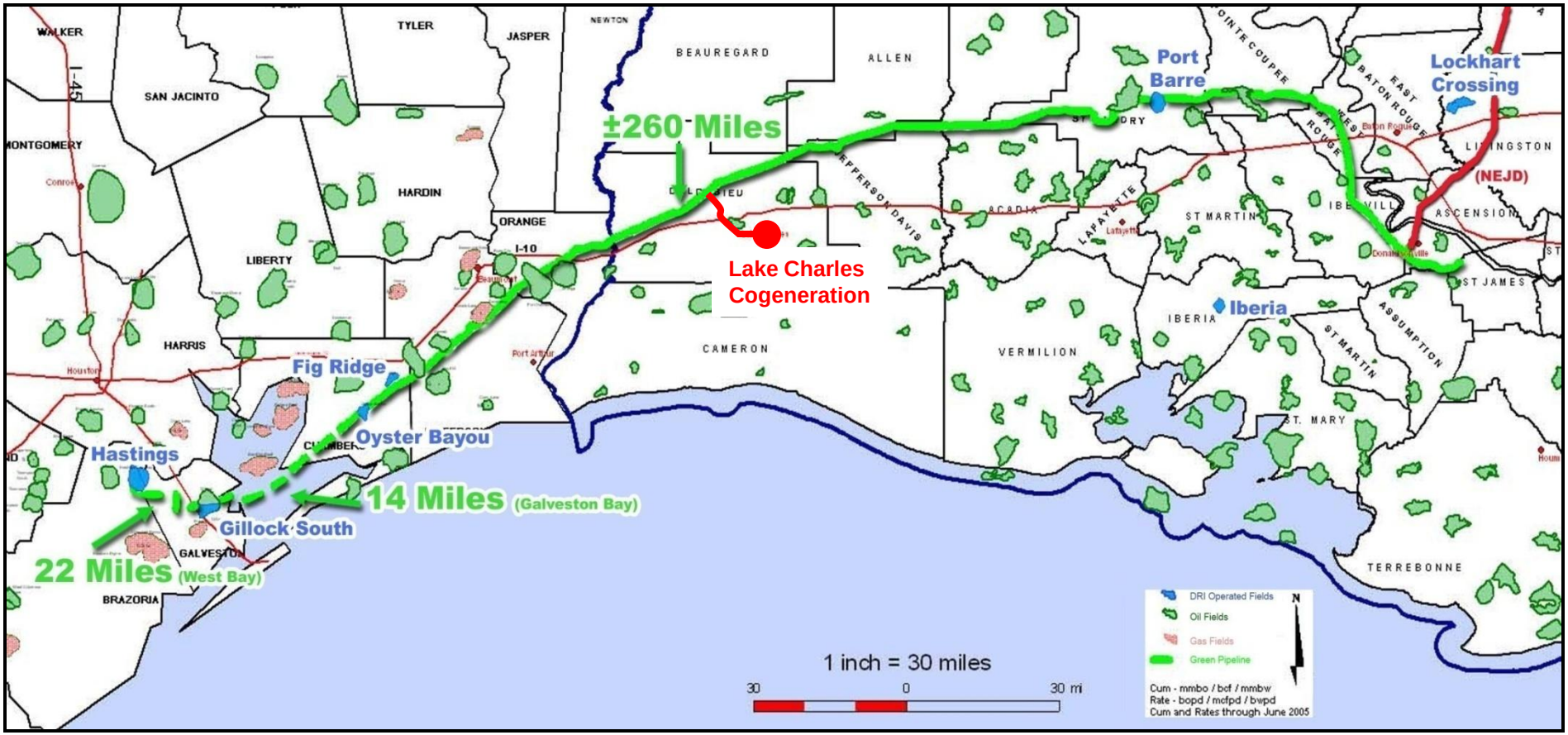

MVA—EOR/Geologic Sequestration & Injection

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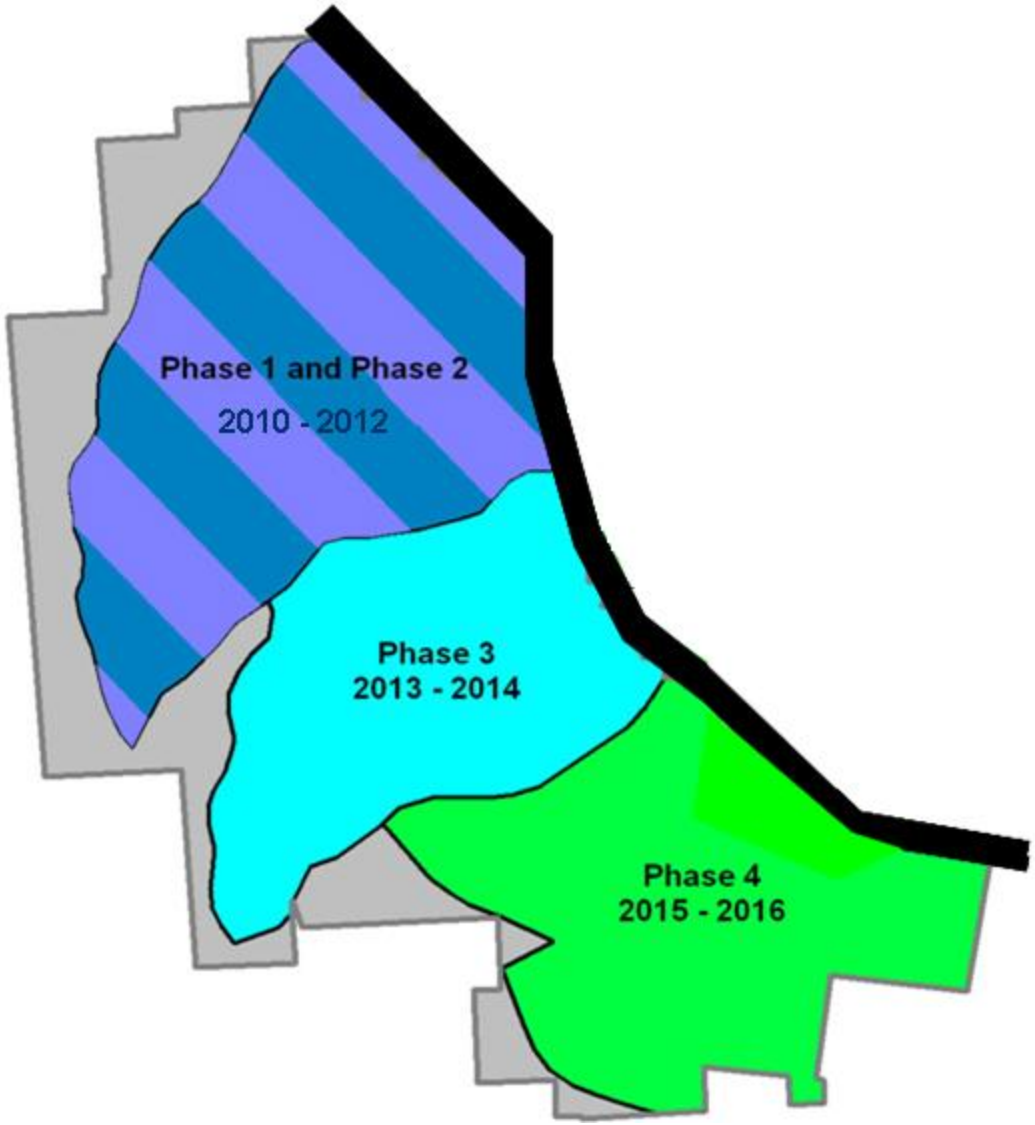
- West Hastings Field *
- Fault Block B and C
- Phase 3 of Field Development
- Frio Formation
  - Well characterized as an injection zone by prior water flood
  - Sufficient data available to confirm confinement, injectivity and storage capacity.
  - Anahuac Formation provides containment at the top of the Frio
- Faults
  - A major fault serves as the updip limit of the reservoir
  - Compartmentalized reservoir by additional cross faults
- The research goals of the MVA project:
  - Test the extent that current commercial practices can meet future MVA expectations
  - Test novel MVA approaches to determine if they increase confidence in a sequestration project.



*Preliminary plans for the expansion of the CO_2 EOR project

Preliminary Injection Pattern for Fault Block B and C in the Hastings Field

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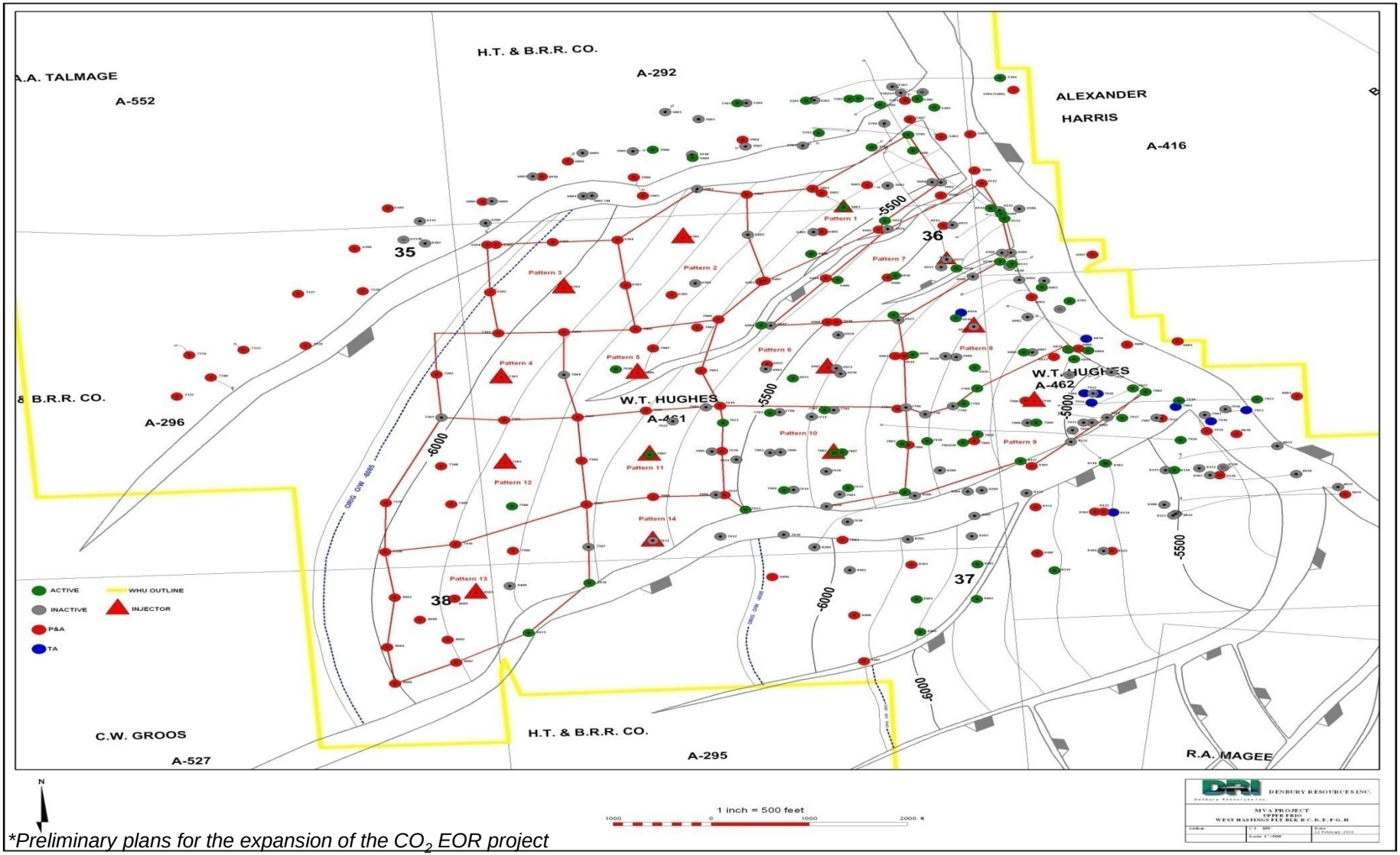

*Preliminary plans for the expansion of the CO_2 EOR project

MVA Components

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- Well Integrity Testing – The research MVA program will extend the commercial well integrity program by utilizing experimental logging tools to search for CO_2 migration out of the targeted Frio reservoirs being flooded. Groundwater and surface monitoring techniques will be utilized to monitor idle and plugged and abandoned wells.

- Fault Monitoring – “Proving the container” created by the fault systems in this field will be done through the collection of temperature and or pressure data from wells that penetrate the faults to determine if CO_2 flow can be identified up the fault.

- Above-Zone Monitoring – Plans include the drilling of three wells to measure the pressure in the deepest miocene reservoir to determine the extent of the pressure seal that exists. AZMI research will include the use of high temperature devices and pressure gauges to monitor the possible migration of CO_2.

- Flood Conformance Testing – A combination of geophysics, seismic arrays and gravity will be used to model the movement and the location of the CO_2 plume.

EIV Overview

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- **Part I** of the EIV describes the environmental impacts of the CO2 capture and compression facilities at the Lake Charles Gasification Facility. The proposed gasification facility is located on an approximately 70-acre parcel of land on the Calcasieu River in a heavy industrial area of Calcasieu Parish. The Parish is designated as attainment for all PSD pollutants. The CO2 capture facilities consist of the two Lurgi Rectisol Selective Acid Gas Removal (AGR) units where CO2 is separated from the process syngas. The compression facilities include two CO2 compressors, the building in which the compressors are housed (approximately 80 x 140 ft), and a meter station to monitor the volume of CO2 exported.

- **Part II** of the EIV describes the environmental impacts of the construction and operation of the 11.6-mile CO2 pipeline from the fence line of the gasification facility to Denbury's Green Pipeline in Louisiana. The connector pipeline will include a 50-foot-wide permanent ROW, which will parallel existing ROW to the greatest extent possible. A temporary construction ROW of up to 45 feet will also be required for pipeline installation. Temporary access roads will be constructed as necessary, although Denbury will seek to utilize existing roads to the extent possible.

- **Part III** of the EIV describes the environmental impacts of the research MVA activities at a site within the Hastings Field. The research MVA activities will supplement privately-funded, ongoing monitoring activities conducted in conjunction with Denbury's commercial EOR operations. Only the research MVA activities are considered in the EIV. The research MVA activities will generally be conducted in or around existing idle or plugged and abandoned wells. Any new wells drilled for MVA will be shallow and require only temporary placement and use of drilling equipment. As a result of this and other measures, potential impacts of the MVA activity will be minimal.

Project Funding & Schedule

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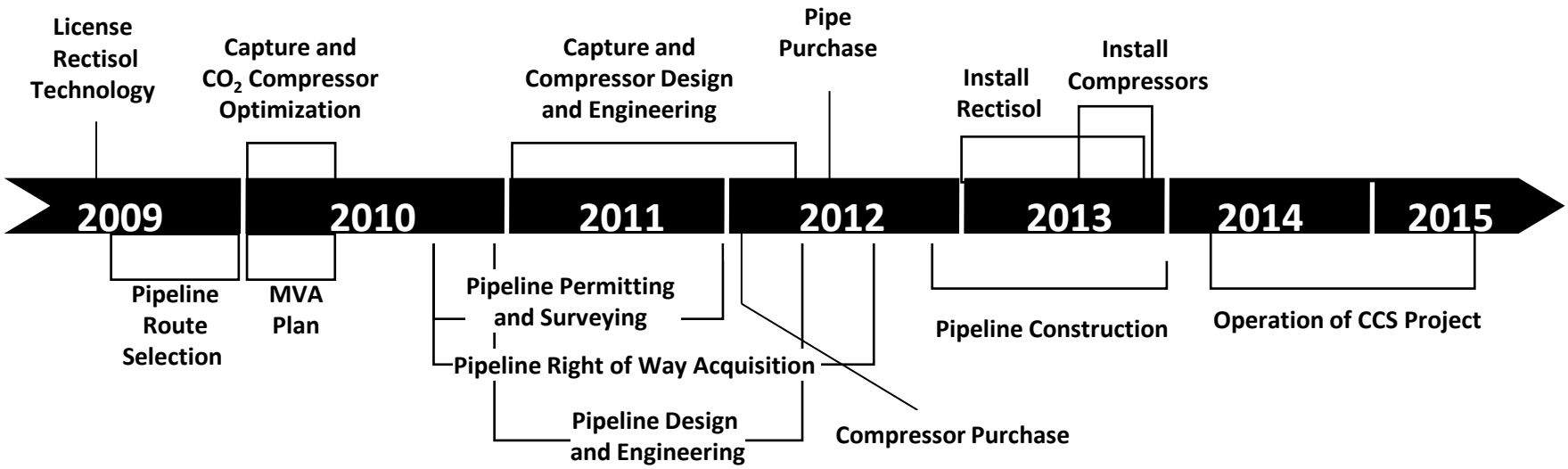
Grant Program Function or Activity	Federal	Non – Federal	Total
Phase 1	$390,103	$210,077	$600,180
Program Mgt./NEPA	$4,676,931	$3,117,954	$7,794,885
Capture	$177,652,602	$118,435,068	$296,087,670
Compression	$54,211,867	$36,141,245	$90,353,112
Transport	$15,702,595	$10,468,396	$26,170,991
MVA	$8,748,212	$5,832,142	$14,580,354
TOTALS	**$261,382,310**	**$174,204,882**	**$435,587,192**



Questions/Discussion