Petra Nova Carbon Capture and Enhanced Oil Recovery Project

December 8, 2014

David Greeson and Kenji Hagiwara
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NRG is a different kind of energy company. We’re at the forefront of delivering safe, reliable energy in new and innovative ways. We not only care about how energy is made, we also care about how it’s used, how it’s managed and how it’s changing life.
# Our Strength in Numbers

## Generation Capacity

- **1** Largest competitive electricity company in the U.S.
- **250** Fortune 250 and S&P 500 Index company
- **3M** Serving almost 3 million customers with NRG retail brands
- **53K** Generating more than 53,000 MW of global, diverse energy

## Job Creation

- **42M** Providing enough generation capacity to power 42 million homes
- **8K** Created or supported more than 8,000 clean economy jobs from 2007 - 2013
- **3B** Invested more than $3 billion on environmental improvements
Diversity of fuel-type, dispatch level, and geographic region help mitigate risk and moderate market demand cycles.
Why Did NRG Invest In This Project?
And what’s the Value Proposition

Commodity Diversification Through Oil / Natural Gas Price Arbitrage

Carbon Price Hedge

Enhance Value and Useful Life of Coal Fleet

Fight Climate Change While Preserving Critical System Fuel Diversity

<table>
<thead>
<tr>
<th>Illustrative Oil Price for Target Return ($/bbl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petra Nova Parish Project</td>
</tr>
<tr>
<td>$90</td>
</tr>
</tbody>
</table>

Historical WTI Crude Oil Prices ($/bbl)$^{1,3}$

1 Represents after-tax 10% unlevered return; Oil prices represent today’s dollars adjusted for annual inflation; Quality of oil produced at West Ranch field trades at a premium to WTI
2 Illustrative $20 Carbon Price Scenario assumes $20/ton carbon price beginning in 2020, oil field expansion post-West Ranch, 90% CO₂ removal rate on 240 MW, 1 ton/MWh baseline carbon emissions, 80% capacity factor, and $0.53/MWh uplift in power prices for every $1/ton carbon price; Illustrative 10 Year Life Extension assumes a $20/MWh dark spread
3 Source: EIA Historical Spot Prices; Market data as of 7/30/2014
Our Partners and the Transaction Structure

### Project Ownership Structure

- **nr**g
- **JX**

<table>
<thead>
<tr>
<th>Source</th>
<th>$MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRG Equity(^2)</td>
<td>$300</td>
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<tr>
<td>JX Nippon Equity</td>
<td>300</td>
</tr>
<tr>
<td>Project Financing</td>
<td>250</td>
</tr>
<tr>
<td>DoE Grant</td>
<td>167</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$1,017</strong></td>
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<table>
<thead>
<tr>
<th>Uses</th>
<th>$MM</th>
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<tbody>
<tr>
<td>Parish Site Capital(^3)</td>
<td>$637</td>
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<tr>
<td>Oilfield and Pipeline Capital</td>
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<td>Initial O&amp;M, G&amp;A, Fees, Other</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$1,017</strong></td>
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1. Petra Nova will be deconsolidated from NRG’s financial statements
2. Includes investments already incurred during development of the project
3. Includes costs associated with CCS system and contribution of Parish peaker

### Partner Summary

- One of the largest privately-held oil and natural gas E&P companies in the US
- Strong track record of implementing new production techniques into mature reservoirs
- Specialized team that has extensive experience implementing CO₂ floods
- Currently conducting oil and natural gas business in 14 countries
- Parent company, JX Holdings, is a leading integrated energy, resources, and materials company
- Policy-based financial institution
- Wholly-owned by the Japanese government
- Over 25,000 loan and equity commitments valued at over $479 billion
- Awarded $167 MM grant
- Funded through Clean Coal Power Initiative

Well-Structured Project with Strong and Experienced Partners
JX Nippon Oil & Gas Exploration

Energy Business
Market Share of domestic sales of petroleum products
36% *1
(No.1 in Japan)
Paraxylene production capacity
2,620 thousand *2 tons/year
(No.1 supplier in Asia)

Oil & Natural Gas Exploration and Production Business
Crude oil and natural gas production
(approximately 120 thousand barrels/day (B/D))
Worldwide business activities
Malaysia, Vietnam, UK, Middle East and others

Metals Business
Equity entitled copper mine production
(approximately 100 thousand tons/year)
Refined copper production capacity
1,170 thousand tons/year
Electronic Materials;
Products with world No.1 market shares

*1 FY 2011 actual
*2 As of Mar. 2013
*3 Crude Oil Equivalent (Estimated average daily production from Jan. to Dec. 2012)
*4 Equity entitled copper production contained in copper concentrate (Estimated production from Jan. to Dec. 2012)
*5 Pan Pacific Copper (86.0% equity stake) ; 610 thousand tons/year + LS-Nikko Copper (39.9% equity stake) ; 560 thousand tons/year (As of Mar. 2013)
$167M Grant (not a loan) awarded on May 6, 2010

Environmental Impact Statement (EIS) required per NEPA – Record of Decision (ROD) was received on May 8, 2013.

Includes a comprehensive site specific CO$_2$ Monitoring Plan over-and-above traditional CO$_2$-EOR accounting

There are numerous DOE requirements that the project must comply with:
- Prevailing Wages (Davis-Bacon Act)
- Procurement regulations (SSJ, AFV)
- Reporting Obligations (Monthly, Weekly)
- Technical Reports (w/ IP classifications of data)
- E.O. 11246 (Affirmative Action)
Project Facilities Overview

W.A. Parish Plant Site and CCS Configuration

Parish 8

Absorber

Flue Gas
11% CO₂

Cogen

99.9% Pure CO₂

Compressor

Striper

Solvent

w/o CO₂

Solvent

with CO₂

Steam

Electricity

82-mile CO₂ Pipeline

Oil Sales

West Ranch Oilfield

Pipeline Route

WA Parish Plant
Artist’s Rendering

- Compressor
- Absorber
- Regenerator
- DCC
- Flue Duct
- CHP and Cooling Tower
MHIA KM CDR Process™

- Kansai Mitsubishi Carbon Dioxide Recovery Process (KM CDR Process™) comes from one of the world’s most advanced industrial R&D programs (commenced in 1990 and ongoing).
- Commercially applied since 1999: 10 plants under operation and 1 under construction.
- The ‘Complete Solution’ - hindered amine solvent “KS-1™” with accompanying proprietary equipment.

- 2.0 tpd Nanko Osaka pilot plant from 1991
- 1.0 tpd Hiroshima pilot plant (MHI’s R&D Centre)
- 0.2 tpd mobile test unit
- 10 tpd Matsushima coal flue gas pilot since July 2006
- 25MW or 500 tpd Plant Barry since June 2011
Environmental aspects

1.6 million tons per year of existing CO₂ emissions captured and sequestered

University of Texas Bureau of Economic Geology providing world-class CO₂ monitoring program

No undisturbed land impacted since we’re using existing sites: power plant, right of way, and oilfield

Leading edge energy efficiency from CHP power and steam supply and CO₂ capture system is cutting edge efficiency

Full Environmental Impact Statement concluded with a finding of no significant impacts
Progress Photos (Nov 2014)
Progress Photos (Nov 2014)
Petra Nova Opportunities for CO$_2$-EOR

Over 15 billion barrels of oil recoverable with CO$_2$-EOR in US
West Ranch oil field

Field Discovery: 1938

Main Producing Sand: Frio sand (Oligocene)

EOR Target Sands: 98-A, 41-A, Ward, Glasscock, Greta

Source: AAPG V28, No.2 (Feb 1944)
West Ranch oil production

- Field development and production began at discovery (1938).
- Production peaked at 50,000-60,000 bopd in 1970’s.
- Field has produced more than 388MMbbl of oil as of the end of 2013.

Current production (TCV leases only):

Oil: 500bopd - Gas 400Mscf/d - Water: 55,000bwpd
Five target sands have similar characteristic.

<table>
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<th>98-A</th>
<th>41-A</th>
<th>WARD</th>
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Development will start with the 98-A (deepest sand) then move up sequentially into the shallower sands.
WEST RANCH FIELD
JACKSON COUNTY TEXAS
STRUCTURE TOP 41A SAND
CONTOUR INTERVAL 10 FEET

LEGEND
• PRODUCING WELL
• GAS WELL
• DRY HOLE

Source: AAPG V28, No.2 (Feb 1944)
Structure map (Glasscock)
Development will start from center area then expand to flank side.
Thank you.