Hydrogen Energy California

Commercial Demonstration of Advanced IGCC With Full Carbon Capture

July 2012
Solutions for a Low Carbon World

- Hydrogen Energy California will transform yesterday’s power plant into tomorrow’s polygeneration complex that will provide solutions to the world’s future needs for:
  - low carbon power
  - clean hydrogen gas
  - new transportation fuels
  - low carbon manufacturing of agricultural and industrial products
  - groundwater treatment
  - beneficial use of CO2
  - increased domestic oil production
• HECA combines commercially demonstrated technologies into an integrated facility that will convert coal and petroleum coke to hydrogen to **generate electricity, manufacture fertilizer** and **capture carbon dioxide** to expand the recovery of crude oil that remains in California’s oil basins.

• Features
  – A large commercial scale IGCC power plant with polygeneration and Carbon Capture Utilization and Sequestration (CCUS).
  – A nominal 300MW Combined Cycle Power Plant with Flexible Generation
  – A fertilizer manufacturing plant with multiple products
  – A CO₂ pipeline and EOR sequestration of 90% of project’s CO₂
  – Approximately 3 million tons of CO₂ will be sequestered through EOR annually
California 2050 GHG Policy Goals

Implications for California:

- By 2050, need to nearly eliminate all emissions from electricity sector
- Need to retire coal plants w/o CCS, and nearly all natural gas plants unless CCS included
- Need to transform all transportation fuels to low to zero carbon
- Need to dramatically reduce or eliminate carbon footprint of all manufacturing and product imports, including fertilizers

Low carbon base-load power and low carbon manufacturing is essential to achieve State’s 2050 GHG Policy Goals
Unchanged Features since SCS acquisition

- Hydrogen generation from fossil fuels, 90% carbon capture and sequestration
- Preservation of fresh water for agriculture
- Beneficial socio-economic effects
- Site, process water supply, electrical interconnection location
- Zero liquid discharge

Enhancements brought by SCS

- Utilization of hydrogen to create additional revenue streams for cost effective carbon removal and cost competitive clean power
- Dispatchability provision for Power Purchase Agreement
- Low carbon fertilizer manufacturing
- Rail spur for feedstock/equipment delivery and fertilizer/product off-take
Process Diagram with New Features

[Diagram of a process flow with labels for ASU, O₂, N₂, UREA/UAN PRODUCTION, H₂ RICH GAS, CO₂, STACK, HEAT RECOVERY STEAM GENERATOR, EXHAUST, STEAM TURBINE, HYDROGEN TURBINE, GASIFIER, SYNGAS COOLER, STEAM, ACID GAS REMOVAL, SULFUR RECOVERY & STORAGE, SULFUR PRODUCT, CO₂ INJECTION WELLS, CO₂ STORAGE, CO2 PRODUCT, TRANSPORT PIPELINE, COMPRESSION, STEAM, Generator, FEEDSTOCK DRYING/GRINDING, SOLIDS, DISPOSAL, COARSE SOLIDS HANDLING.]
HECA is an Ideal Site Location

Site close to:
- CO2 injection point and geologic storage formation
- Adequate non-potable water supply
- Electric transmission system
- Natural gas supply
- Existing Rail Line

Elk Hills Field is an Ideal location for EOR and Geologic Sequestration

Elk Hills Field is well characterized
- Part of Strategic Petroleum Reserve 1912-1998
- 7 potential storage horizons, each with shale seals

EOR & Sequestration is well understood
- 40 years of industry experience with CO2 EOR
- Oxy is acknowledged leader in CO2 EOR operations
- Sequestration demonstration projects ongoing throughout the nation and globally
- CO2 transportation and injection regulations are well-established
Helping To Ensure Adequate Supplies of Electricity
• Providing a nominal 300 MW of new, flexible, dispatchable, clean and reliable baseload electricity-generating capacity to supplement renewable supplies enabling California to meet its GHG emission goals

Helping to Protect the Environment
• Capturing more than 3 million tons per year of CO2 (equal to the carbon dioxide output of 650,000 automobiles) and sequestering it underground.
• Utilizing state-of-the-art emission-control technology to achieve minimal air emissions
• Conserving freshwater sources by using brackish groundwater for its process water

Protecting Domestic Energy Supplies
• Enabling the production of more Domestic Oil via Enhanced Oil Recovery (EOR) with Sequestration

Promoting Hydrogen Infrastructure
• Increasing the supply of hydrogen available to support the state’s goal of energy independence and the production of alternative fuels

Stimulating the Local and California Economy
• Employing 2,500 new jobs at peak construction and 200 permanent skilled operational. Bringing over $2 billion of direct local economic activity and $millions in new tax revenue
• Producing 1 million tons per year of domestic low-carbon fertilizers for regional markets
HECA Continues Extensive Outreach to All Stakeholders

- Governor’s Office
- CA Public Utilities Commission
- California Energy Commission
- CA Dept Of Conservation/DOGGR
- EPA Region IX
- US Fish & Wildlife
- Cal EPA & Air Resources Board
- SJV Air Pollution Control District
- Regional Water Quality Control board
- Department of Fish and Game
- State Legislative Representatives
- CA Congressional Delegation
- National Environmental Organizations
- Kern County Board Of Supervisors
- Local Labor, Trade Organizations
- Local Community Leaders
- Local Environmental Organizations
- Area Business Associations
- Area Homeowners’ Associations
- Local Schools & Community Organizations
Project Status & Milestones

- Site control of 1,100 acre site outside Bakersfield, California
- $408mm DOE CCPI-3 grant
- Japanese corporate and government project capital support via MHI, Mitsubishi, Mitsui, and JBIC
- Pre-FEED study completed, final FEED study initiated in Sept. 2011
- Permit modifications begun with a joint CEC/DOE process
- Buena Vista process water supply agreement signed
- Signed term sheet for CO₂ sales and enhanced oil recovery in place
- Negotiations underway for long term fertilizer product off-take agreement
- Negotiations restarted with key California Utilities for a long term PPA

• Permitting and Engineering: Through 1st Quarter 2013
• Construction & Startup: Summer 2013 to Fall 2017
HECA is Open to Visitors

Hydrogen Energy California
30 Monument Square, Suite 215
Concord, MA 01742
(978) 287-9529

Hydrogen Energy California Information Center
189 East Front Street
Buttonwillow, CA 93206
(661) 764-6442

http://www.heca.com
Future Site of Hydrogen Energy California:
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