Hydrogen Energy California

Commercial Demonstration of Advanced IGCC With Full Carbon Capture

July 2012

Solutions for a Low Carbon World

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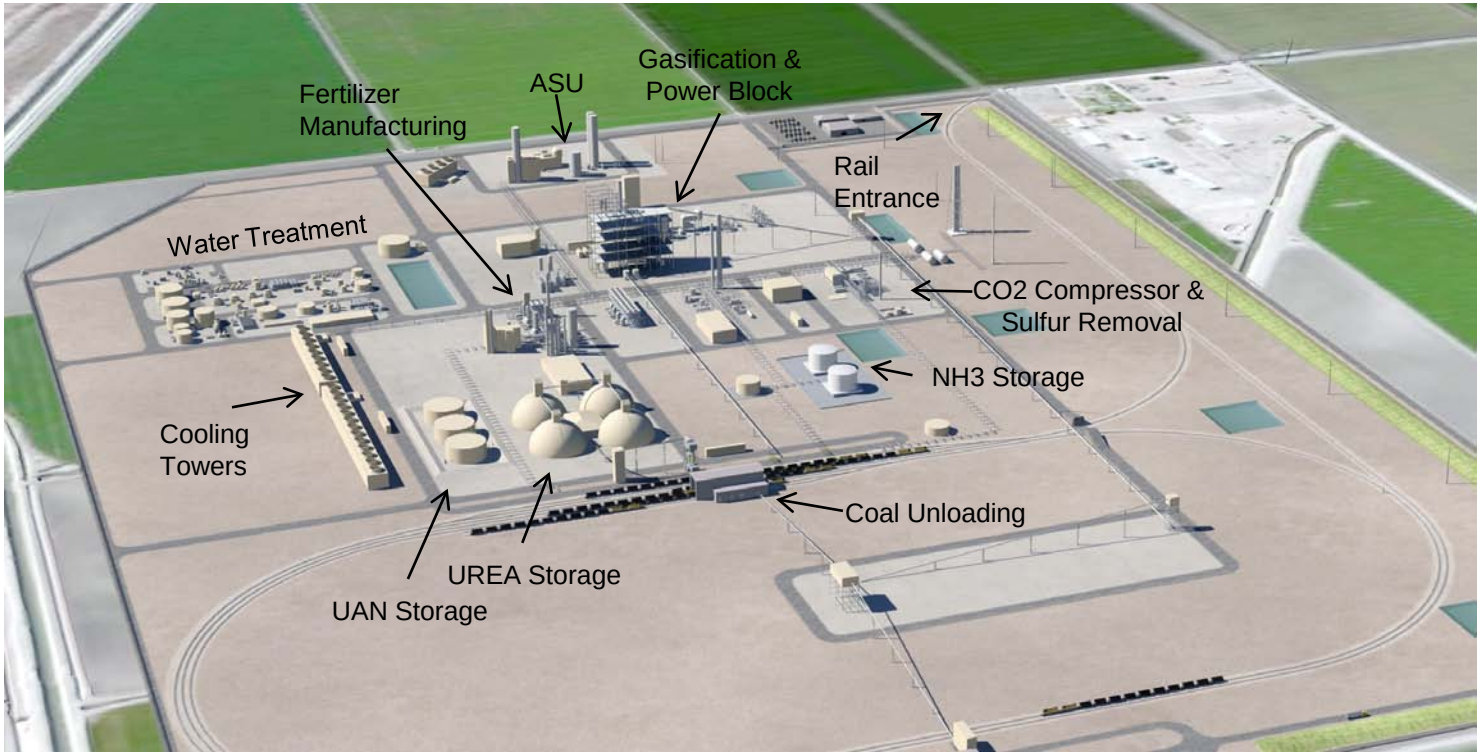
- Hydrogen Energy California will transform yesterday's power plant into tomorrow's polygeneration complex that will provide solutions to the world's future needs for:
  - low carbon power
  - clean hydrogen gas
  - new transportation fuels
  - low carbon manufacturing of agricultural and industrial products
  - groundwater treatment
  - beneficial use of CO2
  - increased domestic oil production



A Flagship Project

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- 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 CO_2 pipeline and EOR sequestration of 90% of project's CO_2
  - Approximately 3 million tons of CO_2 will be sequestered through EOR annually

Need for HECA in California

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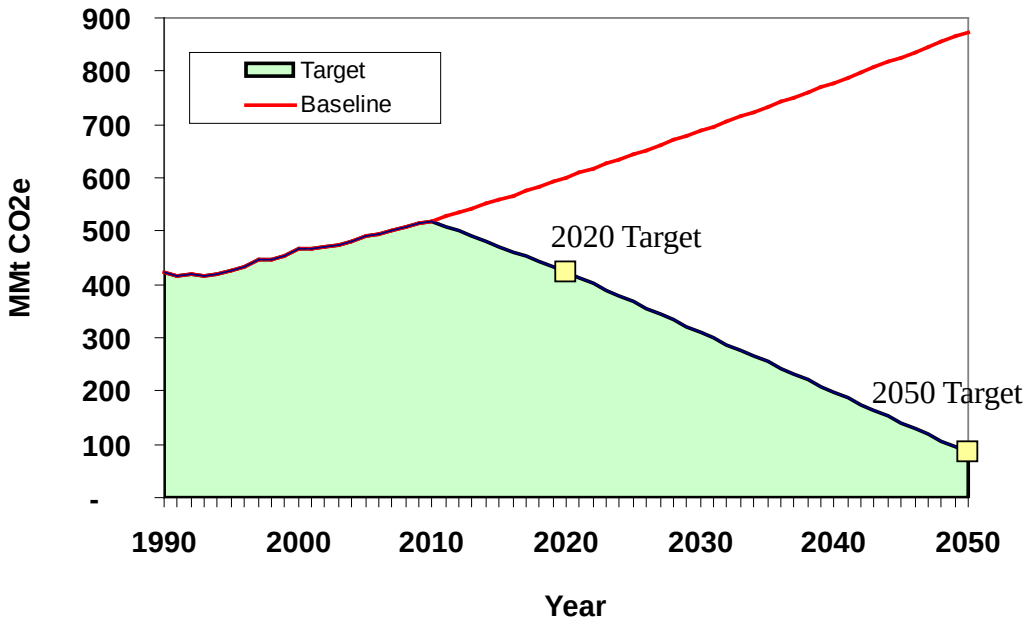
California 2050 GHG Policy Goals



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

Project Improvements

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- 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

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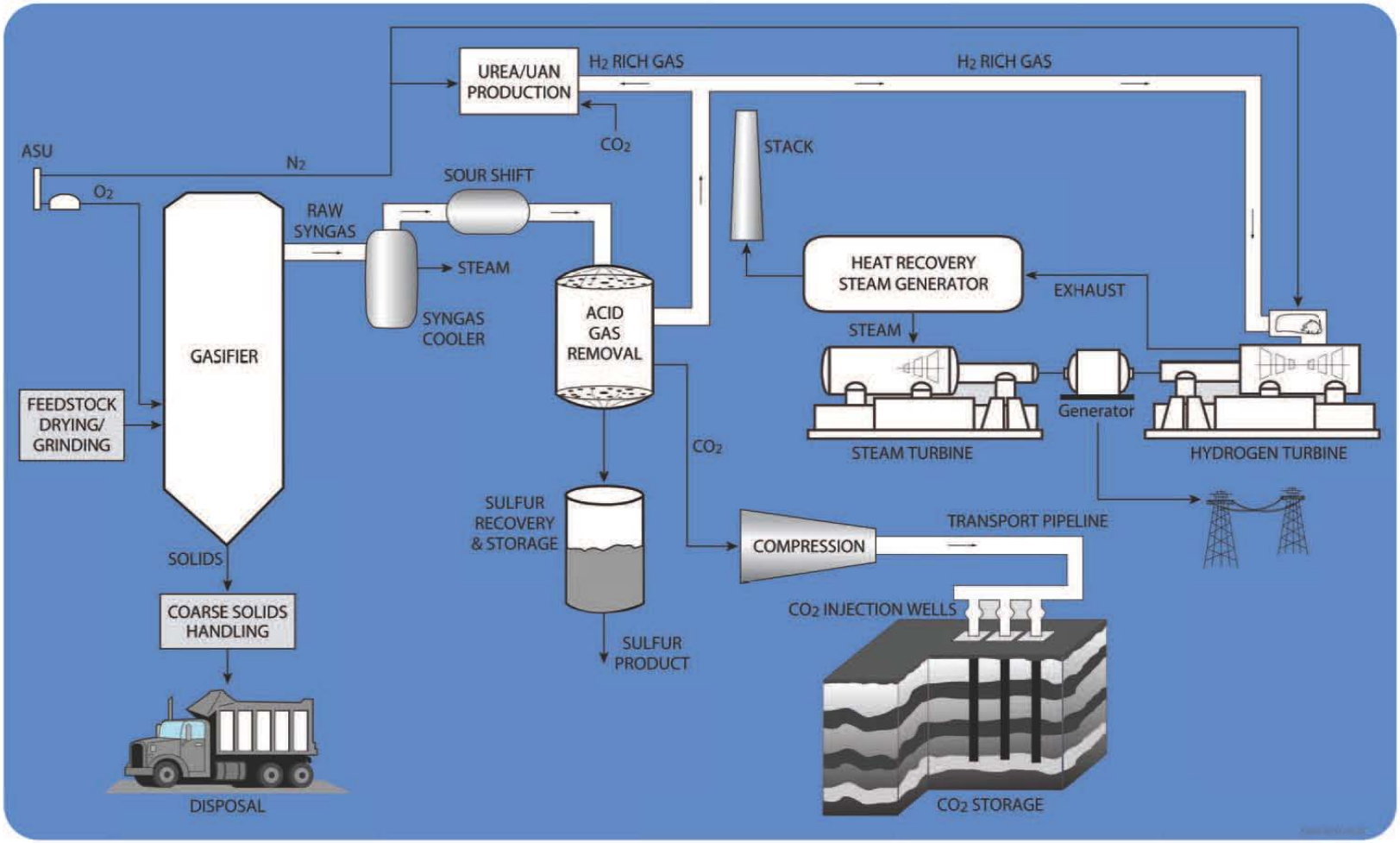

HECA is an Ideal Site Location

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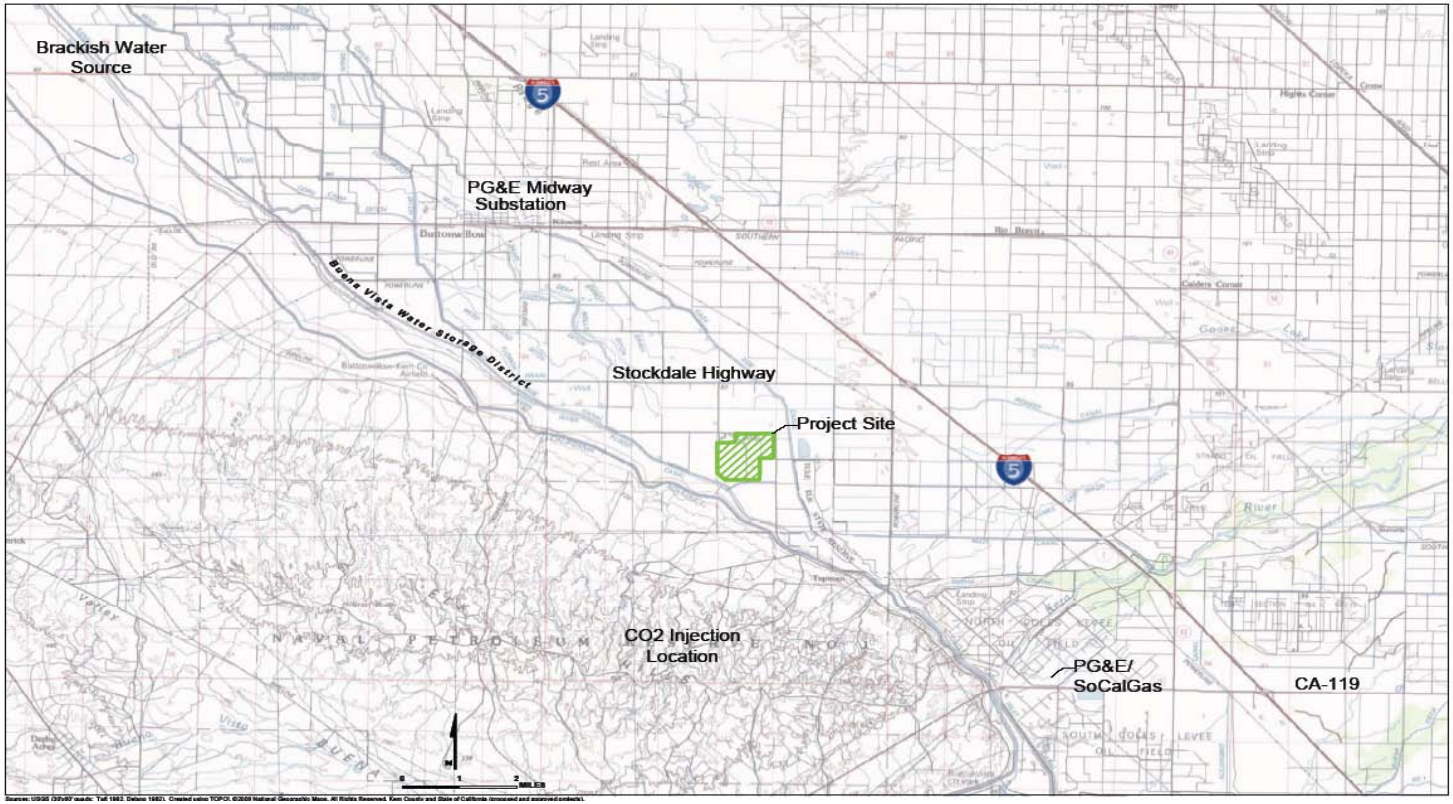

Site close to:

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

Sources: USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!. ©2006 National Geographic Maps, All Rights Reserved. Kern County and State of California (proposed and approved projects).

Elk Hills is an Ideal location for EOR and Geologic Sequestration

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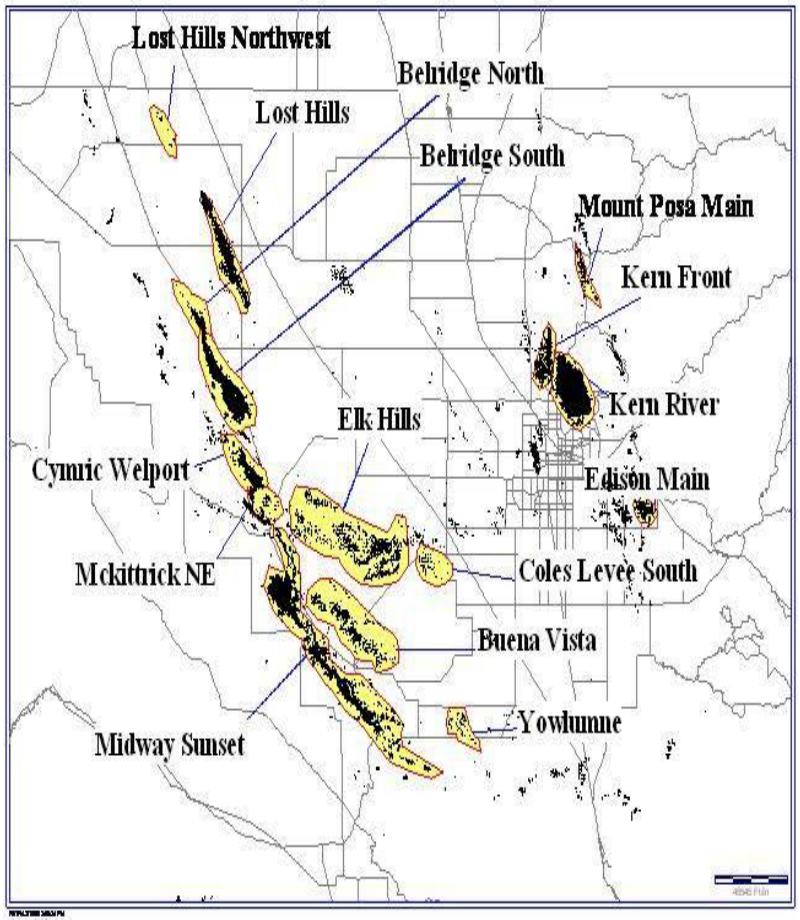

Elk Hills Field is well characterized

- 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

Project Benefits are Global and Local

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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

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- 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

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- 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 CO_2 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:
Solutions for a Low Carbon World

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