Carson Hydrogen Power

Seventh annual MIT Carbon Sequestration Forum
Cambridge, MA

31st Oct & 4th Nov, 2006
Carson Hydrogen Power
Outline of Presentation

- Project Participants
- Project Goals and Strategy
- Project Description
- Project Site
- CO2 EOR Plans
- Project Status
  - CPP Capital Value Process
  - Permitting and Licensing
  - Project Schedule
Carson Hydrogen Power
Sponsors and Key Participants

BP Alternative Energy
• Global leader in decarbonized fuels projects, including gasification projects and GHG sequestration

Edison Mission Energy
• Pioneer in first-of-kind IGCC (120 MW Cool Water and 528 MW ISAB in Italy)
• Leading developer of independent power (coal, gas, renewables)

Fluor
• One of the world’s largest publicly-held EPC contractors
• Leader in the design of clean coal, carbon capture, power generation facilities

GE Energy
• Leading Provider of IGCC Technology and Equipment and Supporting Services

Occidental Petroleum
• World's largest CO2 EOR operator

URS
• Renowned leader in the permitting of IGCC power plants; Respected technical expertise and successful relationships with CEC, EPA and SCAQMD.

West Basin Water District
• Nationally recognized industrial water recycler
Project Goals and Strategy

Project Goals
- Convert low grade refinery residues (coke) to “Carbon Free” fuels
- Produce “Decarbonized” Power near Load Centers in LA Basin
- Capture and Sell Carbon Dioxide for enhanced oil recovery and long-term storage in nearby oil fields
- Design, Construct and Operate to the highest environmental, safety and health standards that meet or exceed stringent California rules

Global Strategy
- Demonstrate commercial application of technologies for production of clean energy that reduces emissions of greenhouse gases, such as CO2
- Establish platform for future hydrogen based economy
- Deploy cutting edge technologies for gasification, hydrogen fuel turbines and other carbon capture and sequestration methodologies consistent with California and Federal DOE goals
- **Establish Technical, Environmental, and Commercial Basis to Replicate CH$_2$P in US and Abroad**
Carson Hydrogen Power Project
ISBL Block Flow Diagram

Water Treatment

3 * GE Quench Gasifiers

Shift Conversion

Acid Gas Recovery

CO2 to EOR
90% C-capture

5 – 6 MM Tons/Yr

6-7000 gpm reclaimed water

5000-6000 TPD Petcoke

Syngas

Oxygen

Nitrogen

Air Separation

250-300 tpd S

2 GE 7FB + STG

500 kpph

0-500 kpph HP steam

Refrinery Hydrogen

50-60 MMSCFD

500 MW

Note: CH2P Appraise Phase Design
CH₂P produces useful energy far in excess of the energy value of the feedstock.
Why Carson California?

- Site of Existing BP Carson Refinery and Watson Cogeneration
  - (JV BP and EME)
- Need for clean power near major load centers
- Need for Refinery Hydrogen and Steam for Clean Transport Fuels
- Need for Carbon dioxide for Enhanced Oil Recovery in depleted oil fields, where it can ultimately be permanently stored
- Significant local supply of fuel grade coke now being exported
- Supply of Recycled Industrial Water
- Located near Industrial Gas Plants (oxygen, nitrogen, hydrogen)
- State and local support (CEC one stop permitting)
- Consistent with National Energy Policy Act of 2005 and CA GHG Legislation

“This is the right project, in the right place, at the right time” Governor Arnold Schwarzenegger, February, 2006
CH₂P – an advantaged location

- Industrial zoning
- Coke disposition
- H₂ infrastructure
- Local CO₂ sequestration options
- Major Load Center
Captured CO$_2$ will enable enhanced oil recovery from California's mature oil fields

- Over 1 billion tonnes of CO$_2$ storage capacity available in local Californian oilfields and approx 57 billion barrels of ‘stranded oil resource’ (DOE 2005)
- 5-10% is technically recoverable via CO$_2$ enhanced oil recovery
- Technical studies are underway to determine which of Occidental’s California oil fields are most attractive for CO$_2$ flooding technology
- Our studies include:
  - Feasibility of pipeline routes,
  - Tertiary recovery potential
  - Site characterization for sequestration
  - Evaluating monitoring techniques
CH₂P - Roadmap to Project Excellence

Capital Value Process

‘Creating Distinctive Projects’

Appraise → Select

‘Delivering with World Class Execution’

Define → Execute → Operate

People

Build capability in solids gasification and in Alternative Energy project management

Major Projects Common Process

Pilot for Alt. Energy, establish Standards

Standardisation

Innovate only where needed to meet technology or business challenge

Projects Procurement & Supply Chain Management

Secure quality people and resources, and target competitive performance

Engineering & Technology

Deliver the right technology and integrity
### Carson Hydrogen Power Project Phases and CVP Gates

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- Permit application 2H07
- Anticipated investment decision 2008
- Project start-up 2011
Environmental Permitting

- California Energy Commission has over-riding jurisdiction for permitting CH₂P – “one stop shop” and 14 month statutory schedule
- Permit will encompass South Coast Air Quality Management District – Most Stringent Air Standards in the US
- CH₂P will meet strict standards through a design that will encompass:
  - Start-up of plant to avoid sour syngas flare
  - AGR to achieve deep Sulfur compound removal
  - Deep NOx removal to achieve natural gas BACT emissions
  - Recycling SRU tail-gas to eliminate venting
  - Enclosed petcoke handling & storage
  - ZLD on process wastewater
- CH₂P will create options for acquiring emission offsets, such as those offered by:
  - Avoided diesel emissions from petcoke trucking & export shipping
  - Ultra-Low GHG emissions
Carson Hydrogen Power
Long Term Benefits of CH₂P

- Adds to National Energy Security by demonstrating use of under-utilized pet coke from domestic heavy crude to generate clean power and fuels.
  - Enabling 70,000 TPD of now-exported low cost pet coke to generate 7 GW of power and mitigate offshore GHG emissions.
  - Reducing use of natural gas being imported to the US
- Capture of CO₂ could support recovery of up to 5 Billion bbls of domestic oil now classified as uneconomic “stranded reserves”
- CHPP’s success will stimulate investment in comparable facilities, domestically and globally, utilizing coal and pet coke
- Industrial competitiveness of US companies to export low carbon energy technology to developing countries
- Producing hydrogen & other byproducts for current & future use
- Eliminating 4-5 million tons/yr of GHG from the atmosphere