hydrogen energy

Hydrogen Energy Project for California
Michael Cox
Hydrogen Energy

The Opportunity – Hydrogen Energy California (HECA)

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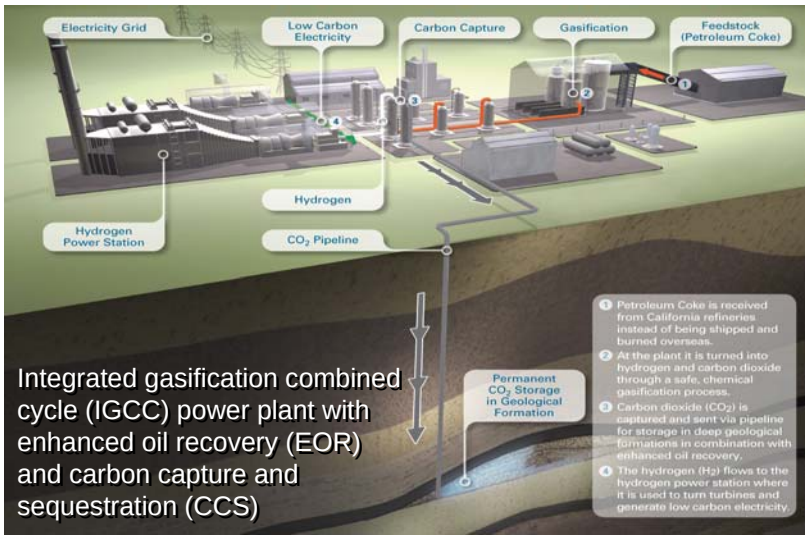

Integrated gasification combined cycle (IGCC) power plant with enhanced oil recovery (EOR) and carbon capture and sequestration (CCS)

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HECA will be located in the Bakersfield area, close to the Elk Hills production field (CO_2 EOR and sequestration site)

- 250 MW net power production
- Utilizes local area petcoke supply for primary feedstock (petcoke/ bituminous coal/potentially biomass capable)
- Production field characterized for CO_2 EOR and permanent sequestration
- CO_2 storage permitted by DOGGR/CEC
- Application for Certification (AFC) filed with CEC July 31, 2008

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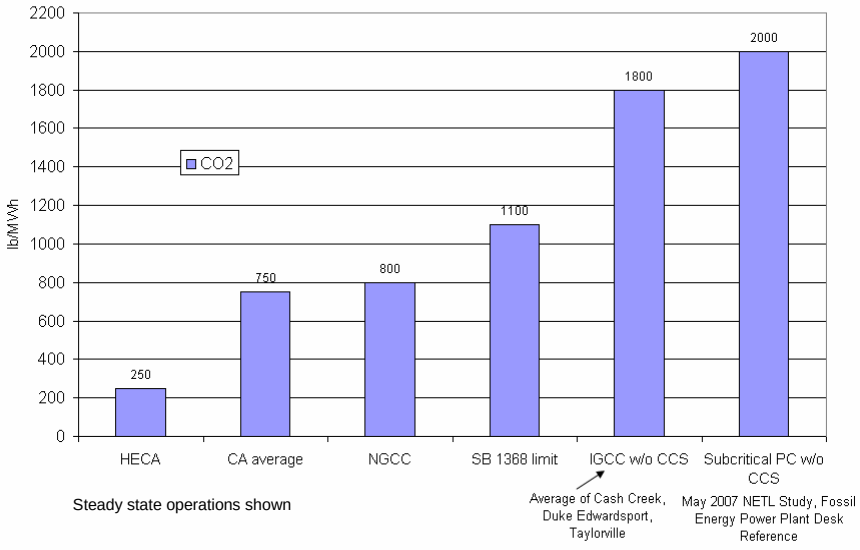
HECA achieves very low CO_2 emissions



HECA provides 250 MW of low-carbon, baseload power for California

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- Increases California energy security through CO_2 EOR (reducing foreign oil imports) and use of abundant local energy sources (petroleum coke, potentially biomass)
- Prevents generation of CO_2 and criteria pollutants in Asia from California energy byproduct source
- Saves fuel and pollution from shipping petcoke to Asia and crude oil to California
- Creates low carbon energy center in San Joaquin Valley with substantial growth opportunities
- Provides fuel diversity and reduced exposure to high natural gas prices
- Boosts local economy by creating up to 1500 construction jobs and 100 permanent operational positions in Bakersfield area
- Generates new tax revenues for local communities and the state

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HECA provides a timely opportunity for California clean energy leadership

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- Several years ahead of other projects that have not performed CO_2 site characterization and AFC preparation and submittal
- Project participation by industry-leading CO_2 EOR and subsurface experts BP (through HEI) and Oxy
- Essential technical and large complex project integration expertise required to deliver this first-of-a-kind project
- Helps create the technical, cost, regulatory, financial, and commercial framework to accelerate wide-scale deployment of CCS
- Lays foundation for wide-scale and critically needed international CCS deployment

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Capturing and Sequestering CO_2

- Over 1 billion tons of CO_2 storage capacity available in local californian oilfields (over 200 years)
- Initial studies are complete designating the most attractive depleted oil fields for co_2 sequestration
- Studies include:
  - pipeline routing studies to transport CO_2
  - site characterization for effective sequestration and enhanced oil recovery
  - evaluating appropriate long term monitoring techniques
- Initial study suggests several reservoirs in the San Joaquin Valley meet all of the screening criteria.
- CO_2 to remain permanently stored
- Additional oil recovery generates new revenues for the state

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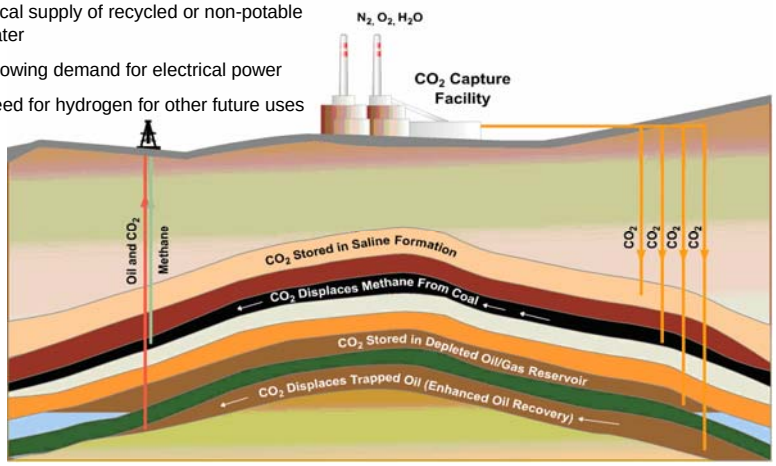
Why Kern County, California?

- Near existing depleted oil reservoirs and infrastructure to store carbon dioxide
- Local supply of recycled or non-potable water
- Growing demand for electrical power
- Need for hydrogen for other future uses



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Why will HECA be commercially successful?

Necessary components for a commercially viable project	HECA
Demand for base load low-carbon power	✓
Demand for CO_2 (dry, high volume, high purity, but less than food grade)	✓
Minimization of technical risks by using existing technology	✓
Well characterized EOR & storage site (EOR plus)	✓
Readily available feed stocks (petcoke, water, etc)	✓
State leadership pushing for "Green Energy" deployment	✓
Strong commercial partners	✓
Costs competitive with renewables, yet provide base load power	✓
Paves the way for a low-carbon energy center and future projects	✓

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Hydrogen Energy California
Key Participants

BP Alternative Energy -- global leader in clean fuels projects, including gasification projects and CO_2 sequestration

Rio Tinto -- internationally recognized global resources company

GE Energy -- leading provider of IGCC technology and equipment and supporting services

Fluor -- among world's largest publicly held engineering and construction contractors, and leader in the design of CCS and power facilities

URS -- renowned leader in the permitting of power plants; respected technical expertise and work relationships with CEC, EPA, and SCAQMD

Occidental Petroleum -- world leader in oil and gas production and CO_2 EOR

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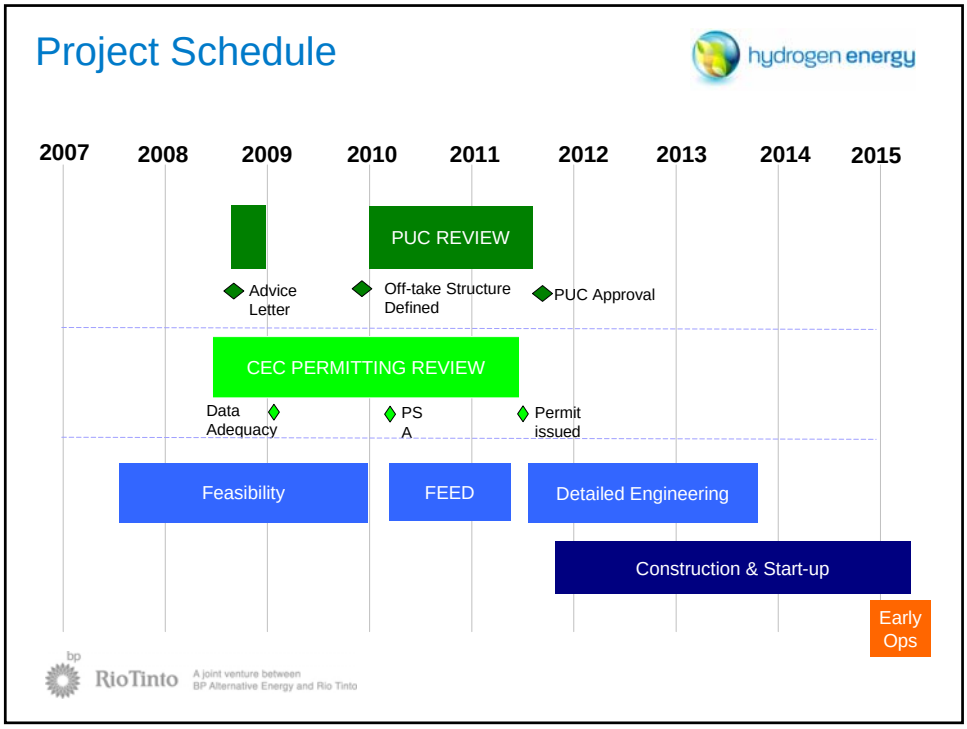
Project Schedule
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2007
2008
2009
2010
2011
2012
2013
2014
2015
PUC REVIEW
Advice Letter
Off-take Structure Defined
PUC Approval
CEC PERMITTING REVIEW
Data Adequacy
PS A
Permit issued
Feasibility
FEED
Detailed Engineering
Construction & Start-up
Early Ops
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