



## **Hydrogen Energy – IGCC with CCS**

presentation to Biomass Collaborative  
Sacramento, May 2009

# who are we?



## a company jointly owned by BP and Rio Tinto

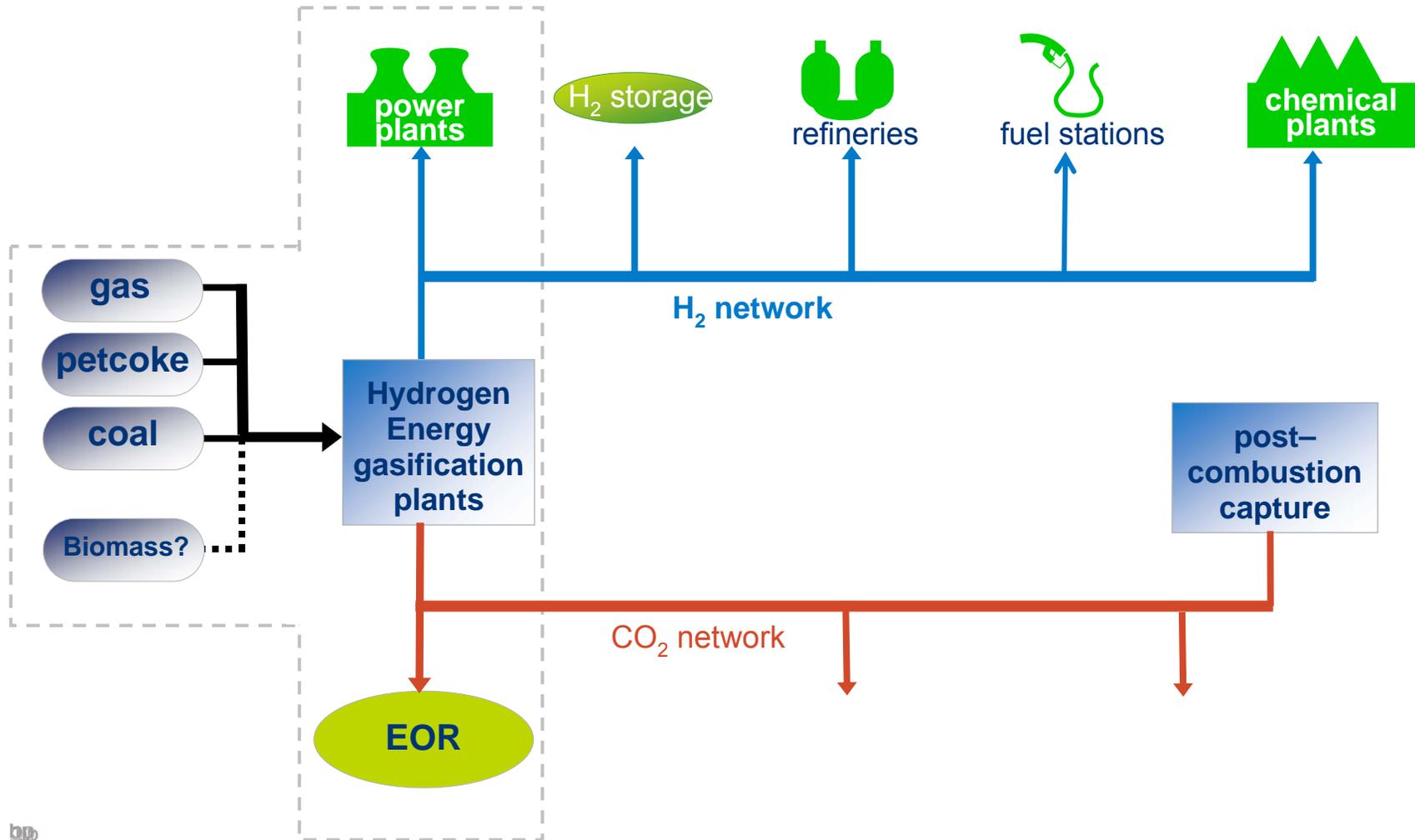
- established to focus on industrial scale, base-load, hydrogen fuelled power generation using fossil fuels and carbon capture and storage
- complementary skills
  - BP's leading position and expertise in chemical processing and low-carbon power generation and carbon capture and storage
  - Rio Tinto's expertise and world-class assets in minerals extraction and supply



RioTinto

A joint venture between  
BP Alternative Energy and Rio Tinto

# Hydrogen Energy - a fuel supplier



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# technology



## pre-combustion carbon capture technology is proven

pre-combustion carbon capture is the removal of the carbon content of a fossil fuel before burning it - this is done through:

1. conversion of fossil fuels into hydrogen + carbon monoxide in a gasifier, followed by a shift reaction
  - *BP is currently operating 4 gasifiers in Germany, Australia, UK, and Korea. 2 in acetic acid production (CO) and one in hydro-cracking (H<sub>2</sub>). feed stocks are: NG and Naphtha.*
2. burning hydrogen as a clean fuel
  - *many gas turbines around the world are already burning hydrogen in a syngas mix.*



22 gasifiers for power (Integrated Gasifier Combined Cycle – IGCC – plants) are already producing about 7700MWe in total, without capturing their CO<sub>2</sub>.



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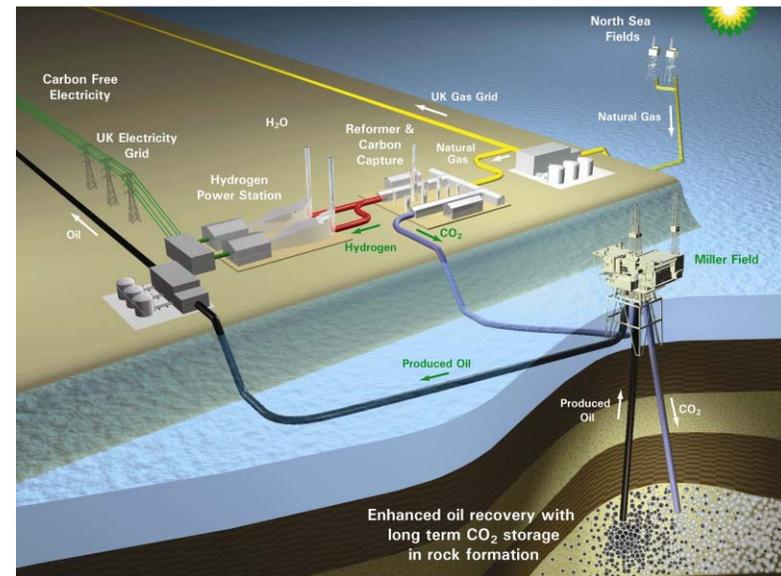
# technology



## geologic carbon storage technology is proven

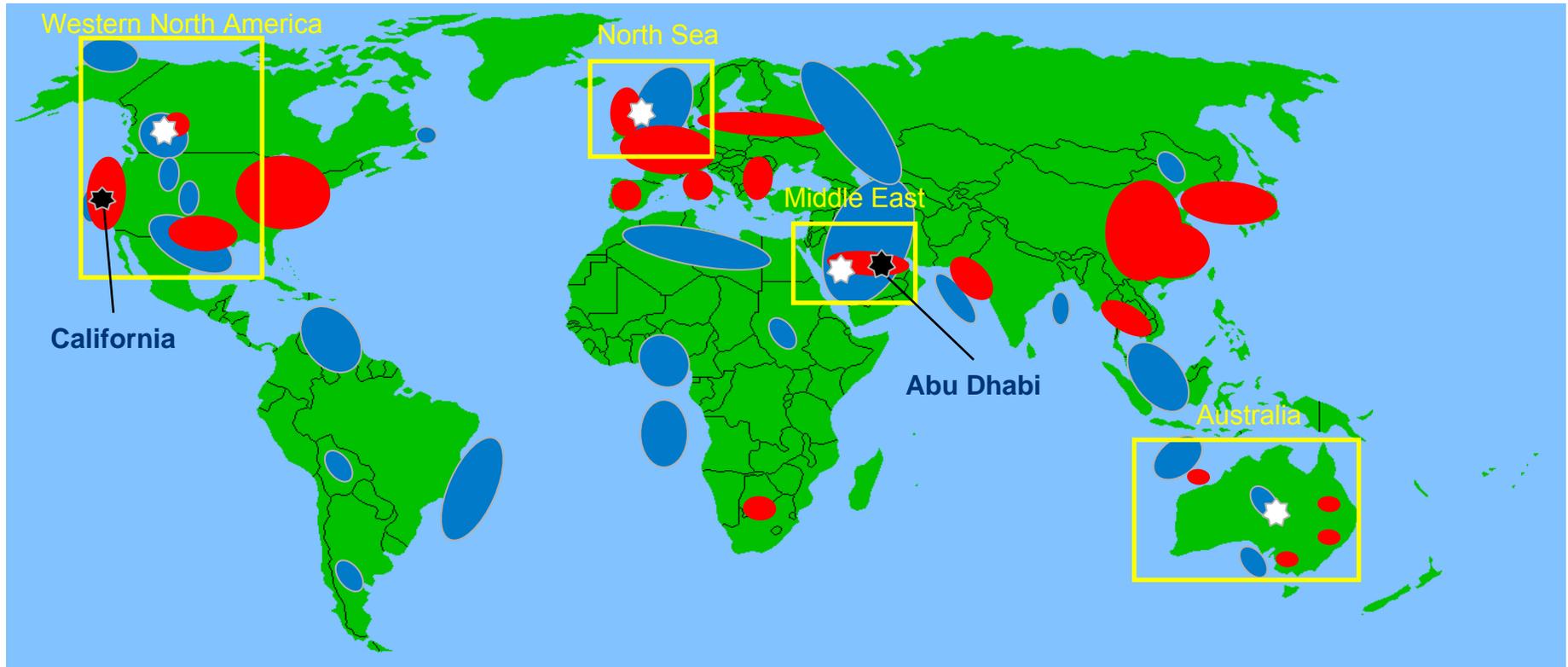
The Carbon Dioxide captured from the plant is compressed, then transported and stored securely in underground formations

- More than 30 million tonnes of CO<sub>2</sub> is currently injected for Enhanced Oil Recovery (EOR) into oil fields in the United States alone annually, and has been since the early 1970s.
- BP has been injecting and storing some one million tonnes of CO<sub>2</sub> each year at In Salah in Algeria since 2002.



Oil and gas fields are the obvious initial CO<sub>2</sub> storage sites. Their geology is thoroughly understood, and the effectiveness has been proven through the containment of oil and gas over millions of years.

# geographic focus



## key criteria:

- oil and gas sinks
- large CO<sub>2</sub> sources

## projects:

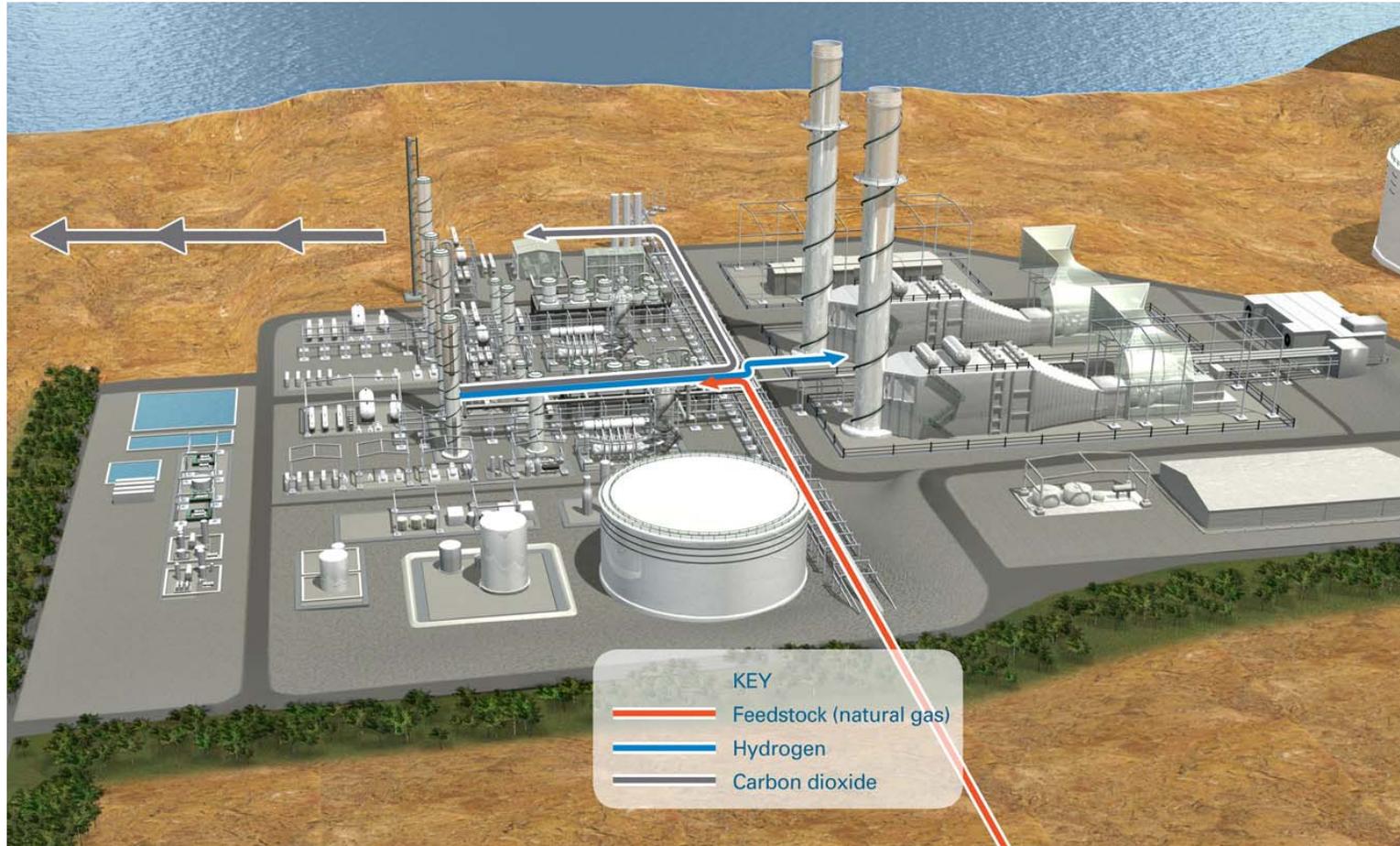
- ★ current developing opportunities
- ☆ developing opportunities



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# Abu Dhabi, UAE



...the most advanced project



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# Kern County, California



...permit filed and PUC supported



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# HECA Project Features and Environmental Performance



## Key Goals for Hydrogen Energy California

Generate low carbon “hydrogen power” to meet California’s increasing power demand

- Capture carbon dioxide (CO<sub>2</sub>) for long-term storage in nearby oil fields to address California regulations and climate change concerns: 250 MW net to grid at steady state CO<sub>2</sub> emissions equal to less than one-third of a natural gas combined cycle gas turbine
- Utilize CO<sub>2</sub> for enhanced oil recovery with storage and generate new revenues: over 2 millions tons of year of CO<sub>2</sub> captured
- Enhanced energy security and reduced emissions through domestic production and processing of light crude

## Feedstock flexible

- HECA can operate on a range of feedstocks from western bituminous coal to petcoke generated from California refineries
- Feedstock range has virtually no impact on plant performance
- Biomass as a feedstock?



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# Community & Environmental Benefits



## Eliminates 2 million tons/year of greenhouse gases

- *by sequestering them underground in depleted oil reservoirs*

## Provides over 150,000+ homes with new, clean *base-load* electric generation (250 MW )

- When state agencies are predicting possible power shortages in coming years,
- HECA creates a low carbon energy center in San Joaquin Valley with substantial growth opportunities

## Boosts the local economy

- Create up to 1,500+ construction jobs and 150 permanent operational positions in the Bakersfield area
- Generate new tax revenues for local communities and the state
- Generates new income for local commercial partners



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## Community & Environmental Benefits



### Uses abundant local energy sources (petroleum coke, potentially biomass)

- *Utilizes a by-product from the oil refining process*
- *Provides fuel diversity and reduced exposure to high natural gas prices*
- *Reducing stress on natural gas demand for power generation*
- *Reducing dependence on foreign oil imports (from domestic EOR)*

### Preserves limited fresh water sources

- *by utilizing brackish non-potable groundwater for process consumption*
- *Helps local water authorities better manage spread of brackish water table*

Builds a hydrogen source for electrical power generation and possible other important uses, including clean transportation



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hydrogen energy

further information:  
[www.hydrogenenergy.com](http://www.hydrogenenergy.com)