

# In Salah Gas

## Carbon Dioxide Storage

### The In Salah Gas Project

#### Central Algeria

Clive Bishop

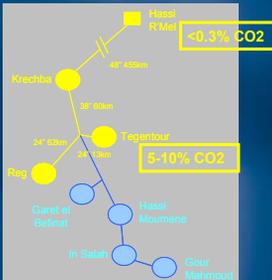


## Talk Outline

- **Outline of In Salah Gas Project – Scene Setting**
  - Sonatrach / BP / Statoil Joint Venture
  - Multi-field Gas Development
- **Outline of CO<sub>2</sub> Storage Concept**
  - Project Emissions
  - CO<sub>2</sub> Storage in the Carboniferous Reservoir
- **Project Status**
  - Wells
  - Reservoir Performance Prediction
  - Surveillance & Monitoring
  - Operations Strategy

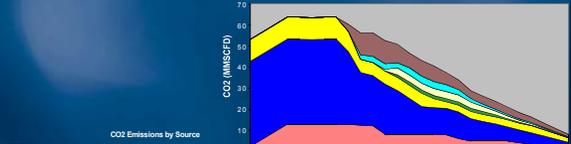
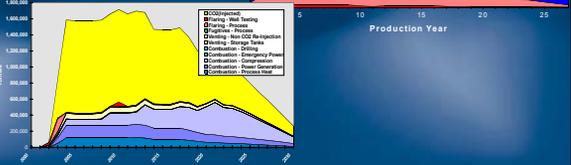


## In Salah Gas Project Location, Algeria

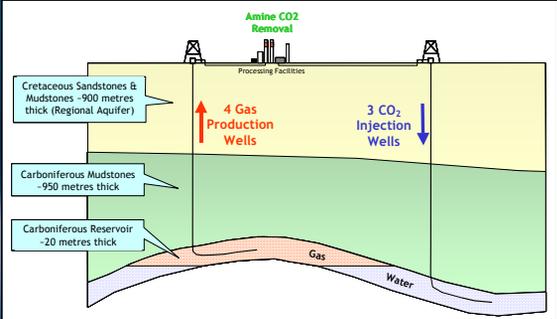




## Carbon Dioxide Production Profile

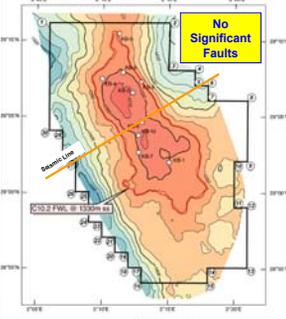
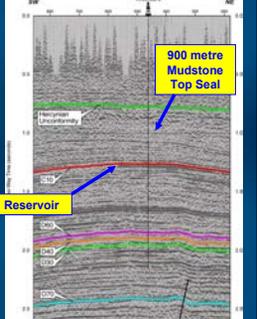
- Maximum CO<sub>2</sub> Production Rate ~65 mmcsf/d
- Total CO<sub>2</sub> Production ~450 bcf


## CO<sub>2</sub> Storage at Krechba




## Krechba Geology


## Project Status

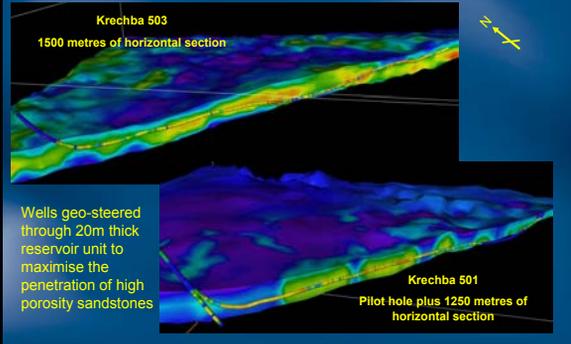


Krechba CO<sub>2</sub> removal and gas dehydration plant



- 2 CO<sub>2</sub> injection wells complete
- Krechba facilities nearing completion
- Gas sales and CO<sub>2</sub> injection to commence Summer 2004

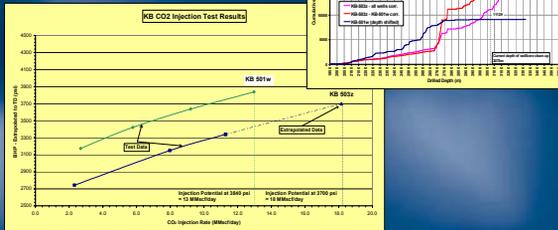
## Drilling of the Two CO<sub>2</sub> Injection Wells



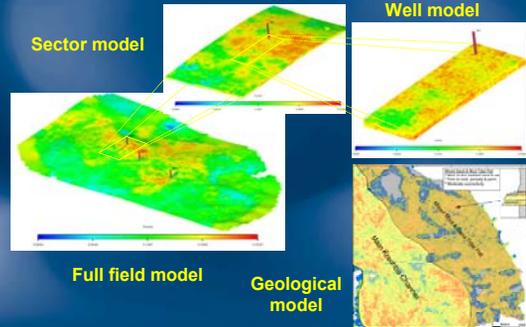
## Prediction of CO<sub>2</sub> Injection Rates



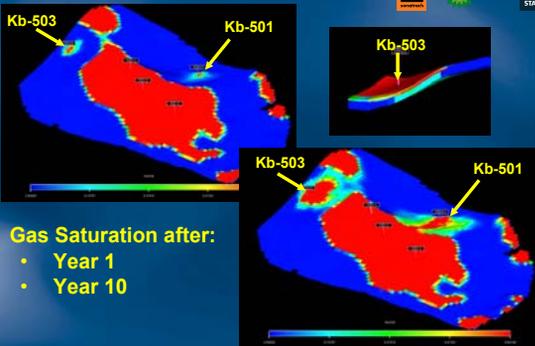
- Permeability \* height from well logs
- Water injectivity tests



## Simulation Models



## Simulation Results



## Surveillance & Monitoring Objectives



- Management of the Krechba production and injection operations
- Provide assurance that secure geological storage of CO<sub>2</sub> can be cost-effectively verified and that long-term assurance can be provided by short-term monitoring.
- Demonstrate that industrial-scale geological storage of CO<sub>2</sub> is a viable GHG mitigation option.
- Set precedents for the regulation and verification of the geological storage of CO<sub>2</sub>, allowing eligibility for GHG credits

## Surveillance & Monitoring



- Sample analysis of water, gas and solids.
- Noble gas tracers will be injected with the CO<sub>2</sub>
- Pressure surveys, surface and down-hole (static and interference)
- Electric logs (production, SP and tomography)
- Gravity baseline, soil-gas survey, micro-seismic and tilt-meters
- Meteorology and microbiology
- 4D Seismic
- Aquifer monitoring well with oriented cap-rock core and cuttings analysis
- Down-hole gravity and geo-mechanical monitoring
- Surface eddy flux co-variance data

## Operations Strategy



Establish a performance target & management process that maximises the business value of In Salah's investment in CO<sub>2</sub> storage

- Optimise commercial value
- Drive environmental performance within operations
- Enhance In Salah's reputation

### Target

Maximum total volume of CO<sub>2</sub> vented per annum  
Set annually based on historic performance (+ stretch)

### Through

- Managing well allocation
- Operational efficiency of Power
- Operational efficiency of CO<sub>2</sub> compressors
- Operational efficiency of CO<sub>2</sub> re-injection wells

## Conclusions



- CO<sub>2</sub> storage at In Salah will commence in Summer 2004
- Two injection wells have been drilled, facilities and flow-lines are being commissioned
- An operating strategy has been developed with targets of capturing net savings of 1.2 million tonnes per annum of equivalent green house gas emissions ( >60% of total project emissions )
- A monitoring / surveillance programme has been established, with opportunity for wide learning from this industrial scale storage project.



Foreign Legion Fort

Kb-501 CO<sub>2</sub> Injection Well

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