Phase 1:

Drilling of 25 wells
- 22 producers
- 3 injectors

Construction of 3 CPF
Compression Station at Hassi R’Mel
A 48” Pipeline, 460 km long
CNDG

Hassi R'Mel

Krechba

Reserves: 24 BCM
CO2: 1%
173 bars / 102°C

Reserves: 21.4 BCM
CO2: 9.1%
325 bars / 144°C

Reserves: 76.5 BCM
CO2: 8.6%
290 bars / 149°C

Teguentour

Reg

Reserves: 45.4 BCM
CO2: 3.8%
178 bars / 108°C

Phase 1

Carb.

Dev.
### Key elements

**A multi-phase Project, of multiples fields**

- **Reserves in place**: 340 BCM
- **Recoverable Reserves**: 232 BCM
- **Start of the Project, phase 1**: November 2001
- **First gas**: July 2004
- **Plateau**: 9 BCM / year
- **Duration of the plateau**: 14 years
- **Duration of the Contract**: 30 years
- **Investment phase 1**: 1.7 billion dollars
- **Compression start up**: As from 2010
- **Investment for Compression**: 0.8 Billion dollars
- **Southern Fields Production**: As from 2012
- **Estimated investment for Southern Fields**: 1.5 billion dollars
- **Total number of wells for the two phases**: 73
CO2 produced by source

CO2 extracted from gas sequestered
Some Figures

- 0.7 billion of m3 per year of CO₂ re-injected
- 60% reduction of greenhouse effect gas
- 20 Million tons of CO₂ re-injected throughout the life of the project

Analogies
- Equivalent of 200,000 cars running 30,000 km/year
  - 200 km² forest equivalent

- Re-injection Capex: 100 Million
- Estimated Re-injection Opex: 10 Million/year
SEQUESTRATION OPTIONS

• **Site choice criteria**
  - Integrity and tightness of the reservoirs
  - Sufficient storage capacity
  - Good porosity
  - Moderate Pressure

• **Carboniferous Reservoir at Krechba**
  - Tight reservoir and high storage capacity
  - Availability of seismic data.
  - Existence of exploration and evaluation wells
  - A unique facility of CO2 extraction
Wells location
CO2 injection pattern

Carboniferous reservoir ~20 metres thick

Cretaceous Sandstones & Mudstones ~900 metres thick (Regional Aquifer)

Gas Production Wells

4 Gas Production Wells

CO2 Injection Wells

3 CO2 Injection Wells

Processing Facilities

Amine CO2 Removal

Carboniferous reservoir ~20 meters
CO2 compression system parameters

- CO2 Extraction from produced gas (average content 7%) using Amine
- Extracted CO2 is sent to the re-injection system
- 2 compressors disposed in parallel are used for the compression of the whole extracted CO2
  - Suction Pressure: 0.15 to 0.30 bars
  - Discharge Pressure: 150 to 200 bars
  - 4 stages of compression
  - All the casings and impellers are made of stainless steel
Reservoir challenges

- Injection pressure limited to 160 bars in order to avoid any risk of fracturing the reservoir
- Low absorption at the start of the project. Stimulation required
The experience of CO2 sequestration introduced by In Salah Gas Project showed that:

- The solution is technically feasible
- Is Economically acceptable
- The monitoring and satellite pictures show that the CO2 evolves in accordance with predictions and simulations
- Geologically, the solution is viable
- Could be generalized, provided that there be a receiving reservoir