Porthos

CO$_2$ transport and offshore storage from Rotterdam, the Netherlands

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Technical Aspects of Depleted Gas Fields

- Reuse of Facilities
- Re-use of wells
- Gasfield Containment & Seismicity
- Thermodynamics
- Permits & Lookahead
Porthos

- Re-use of depleted gas fields
- Onshore & Offshore pipelines
- New compressor station
Reuse of Facilities

- Life time extension assessment
- Maintenance philosophy: from break-down to preventive
- Concurrent operations: gas production & CO2 injection
- Change operations & logistics to daylight only and boat access
- Gas price development impacts cease of production dates
Re-use of gas wells

Well integrity
• Cement bond logs reliable?
• Status of casing, liners and conductors
• Annulus pressures

Well Design
• New completions
• Thermal loads and tubing of Cr25
• DTS / DAS monitoring
• Developed SSSV’s for arctic conditions

Well Containment
• Thermal loading: debonding of casing-cement-rock face
• Hydrostatic head/pressure as containment barrier
Closure of gas production wells

Well Abandonment:

• Re-entry of suspended wells

• Complex wells, not designed for re-use or re-entry

• Full bore formation plugs become the standard?

Successful well campaign pre-FID to de-risk the project
Risk Management Storage

1. Containment Risk
   - Migration
   - Leakage
   PERMIT REQUIRED

2. Seismic Risk
   - Earthquake
   - Leakage
   PERMIT REQUIRED

3. Operational Risk
   - Flow Assurance and control

4. Commercial Risk
   - Injectivity
   - Storage Capacity
Key Technical Aspects

A. Containment
1. from the reservoir laterally
2. from the reservoir vertically
3. from injection wells, during injection
4. from wells after plugging and abandoning

B. Seismicity
5. Fault slippage -> “earthquake”
Storage in depleted fields is new

- Gas fields have a proven geological containment
- Reservoir pressure is low (20 bar, was >350 bar)
- CO2 transport is high pressure, dense mode
- Challenge is pressure drop
- Temperature drops with pressure drop
- Low temperatures in wells and reservoir
- Reservoir pressure will remain lower than (CO2) virgin pressure
- CO2 specification affects phase behaviour
Reservoir modeling from under-pressure to equalized pressure
Reservoir modeling
Thermal effects and seismicity
Status of Permitting

• Porthos received the concept storage permits from the regulator (MEA).

• Now awaiting European committee advise and definitive permits

• Porthos permit was first of its kind.
  • How will other projects approach this?
  • How will authorities deal with differences?
Look ahead

Current
- Permit procedures
- Decommissioning of well
- FID deliverables
- European tenders construction compressor station and offshore pipeline

Second half of 2022
- Final Investment Decision (FID)

2023
- Start construction

2024/2025
- System operational
Thank you