
CO2Europipe
Project results
Brussels, September 13
Technical challenges

CO_2 transport experience

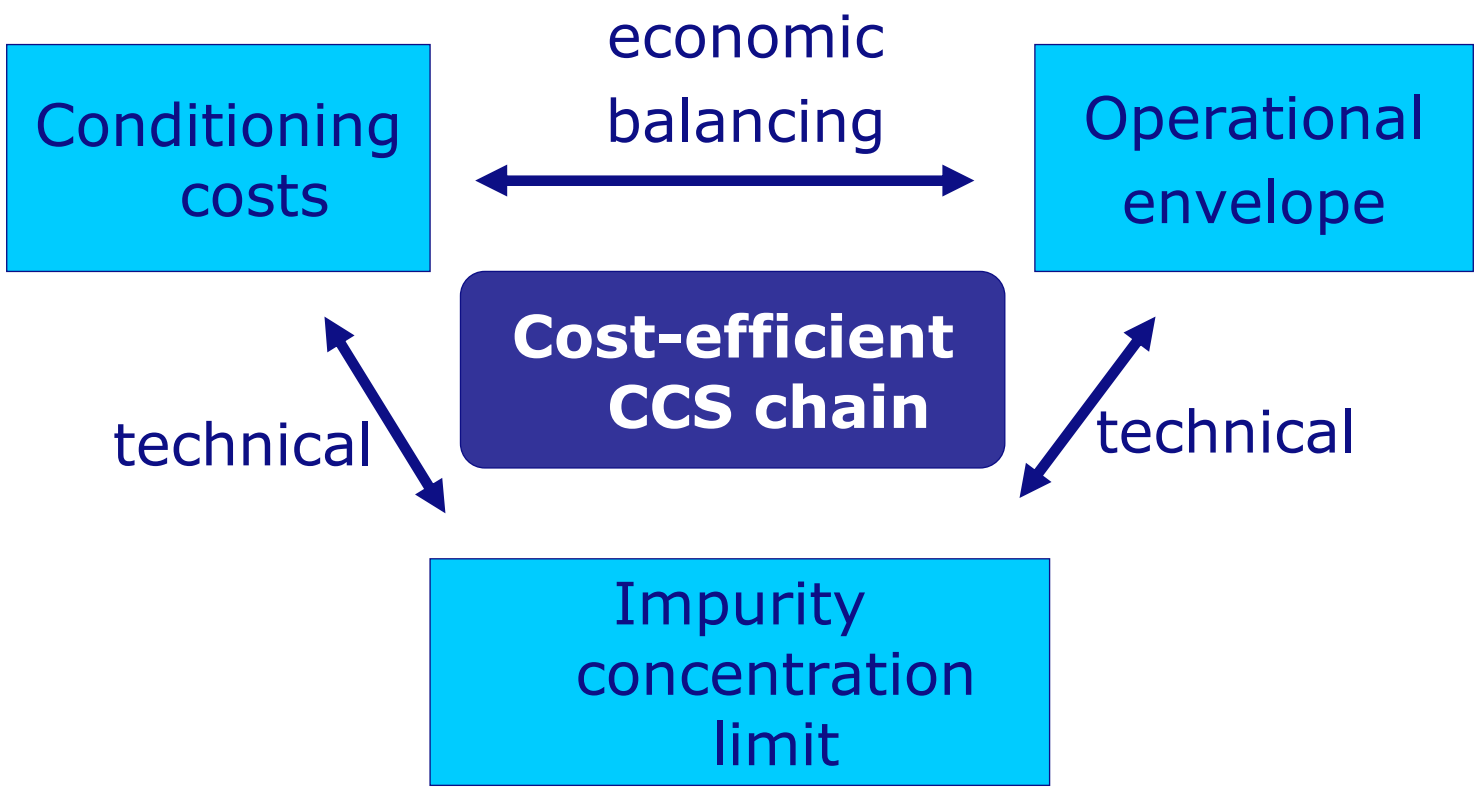
- Experience in CO_2 transport:
  - In the United States, > 6000 km of pipelines transporting 40 Mt/yr CO_2 for enhanced oil recovery
  - Onshore CO_2 transport for more than 30 years
  - Offshore CO_2 transport since 2007 (Snøhvit Snøhvit CO_2 removal in LNG plant, Norway)
  - Extensive pipeline network required for transportation of captured CO_2, but manageable

CO_2 composition

- Important: water concentration limit to prevent corrosion
  - Pipeline integrity issues (corrosion)
  - Cost (stainless steel not an option)
- Understand impact of impurities, but maintain flexible specification:
  - Thermodynamics (increase in compression requirements, impact on fracture toughness)
  - External safety (HSE exposure for some contaminants, e.g. H_2S)
  - Cost for additional treatment of CO_2 stream are significant
  - Minimize effect on storage injectivity
- (Cross) effects of impurities to be studied

Impurity concentrations

→ Technical **and** economic considerations



CO_2 release from pipeline

- Models for CO_2 releases require refinement
  - Validation of existing models required
  - Experiments ongpoing, more are being planned

- Validated CO_2 release models **essential** for planning of major CO_2 transmission network, as required for CCS in Europe!

Other issues

- Leak detection
  - Sensitivity of leak detection should be increased (challenging)
- Many elastomers and other soft materials deteriorate in contact with high-pressure CO_2
  - Standards for CO_2-resistant materials should be developed
- Excessive noise generation during blow-down requires mitigation
  - Extensive safety zone, slow blow-down or silencer
- Offshore transmission lines do not have block valves , therefore the Blow down of an offshore pipeline could take weeks
- Mechanisms and risk related to propagating fractures need to be better understood
- Internal pipeline inspection tool to be confirmed suitable for long-distance CO_2 pipelines

Reuse of existing infrastructure?

- In principle, reuse of existing pipelines and installations is possible, but:
  - Most (natural gas) pipelines will remain in use and unavailable for CO_2 transport for decades to come
  - Onshore pipelines (and some offshore pipelines) not designed for pressure regime used in large-scale CO_2 transport
- Conclusion: in general, new pipelines have to be built

Shipping

- CO_2 shipping is an existing business
- Transported volumes are typically small
  - Example: 3 Mton/yr for 200 km transport distance, cost of shipping is equal to pipeline transport.
- Injection of CO_2 from a vessel into the reservoir: promising option, robust solutions to be developed
- Reuse of (LPG or ethylene) tankers for shipping CO_2 possible
  - Number of suitable CO_2 vessels (± 30 tankers currently) insufficient
- Dedicated CO_2 vessels will have to be built

Conclusion

- CO_2 transport technically feasible
- Reuse of existing pipelines or ships probably limited
- Research needed on specific topics (especially CO_2 release), but no real barriers to large-scale CO_2 transport
- Demo projects and R&D will help solve remaining operational issues:
  - Safety zones for CO_2 transport operations
  - Injection from ships into reservoir
  - Injection in depleted gas fields
  - Management of multi-user networks
  - Mixing rules and quality guidelines (new FP7 project planned)