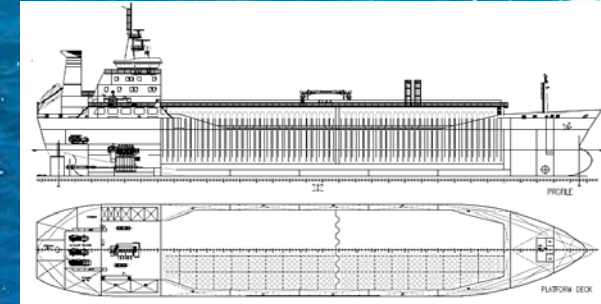
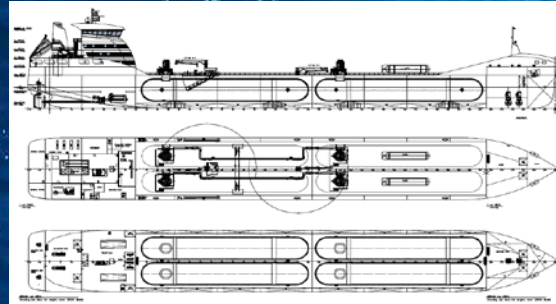
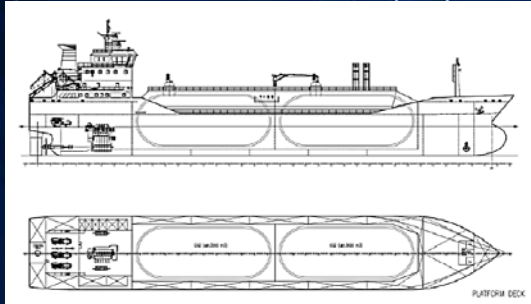


Beyond pipelines: The case for shipping CO₂

CCSA – CSLF Joint Workshop
London, June 29th 2016
John Kristian Økland

Gassco is studying alternative ship designs for CO₂



«Low» pressure

- 7 barg / -50°C
- 6 000 – 7 000 m³
- Little margin to the triple point (dry ice)
- Highest density - CO₂ (1150 kg/m³)
- Less steel in containment system
- Most insulated containment system
- Most energy consuming process
- Comparable to shipping of LPG

«Medium» pressure

- 15 barg / -25°C
- 7 400 – 7 770 m³
- More margin to triple point
- High density - CO₂ (1050 kg/m³)
- Large wall thickness (~45mm)
- Insulated containment system
- Less energy consuming process
- Established concept

«High» pressure

- 45 barg / +10°C
- 7 000 – 12 000 m³
- Large margin to triple point
- Low density - CO₂ (870 kg/m³)
- Most steel in containment system
- No/little insulation required
- Least energy consuming process
- Benefits if offshore direct injection

The selection of transport condition should be performed in a value chain assessment

Gasscos experince from CO₂ transportation studies

Transportation of CO₂ is proven feasible both by pipeline and ship
Standards and specifications to be "good enough"

Ship transportation of CO₂ could be an enabler for realising big scale CCS

CCS is on the Norwegian government's agenda, based on cooperation with the industry

Beyond pipelines: The case for shipping CO₂



Thank you for your attention