

Catching our future
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European CO₂ Technology Centre Mongstad TCM

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By

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TCM Ambitions

- Develop CO₂-capture technologies capable of wide national and international deployment
- Reduce cost and technical, environmental and financial risks related to large scale CO₂-capture
- Test, verify and demonstrate CO₂-capture technology owned and marketed by Vendors
- Encourage the development of a market for such technology



TCM on track – Start-up in 4Q 2011

- Planning is completed except negotiation of EPC contract with Alstom for chilled ammonia
- Site preparation and other civil work is ongoing
- Aker Clean Carbon has been awarded contract to supply the amine plant
- Agreements with Mongstad Refinery concluded
- The State and StatoilHydro decided in December to commence further preparations
- TCM DA will be established before sanction
- Parliament expected to pass bill on 7 May to sanction investment
- Formal project sanction in May 2009 by TCM DA owners
- Start-up of TCM plant planned for 4rd quarter 2011

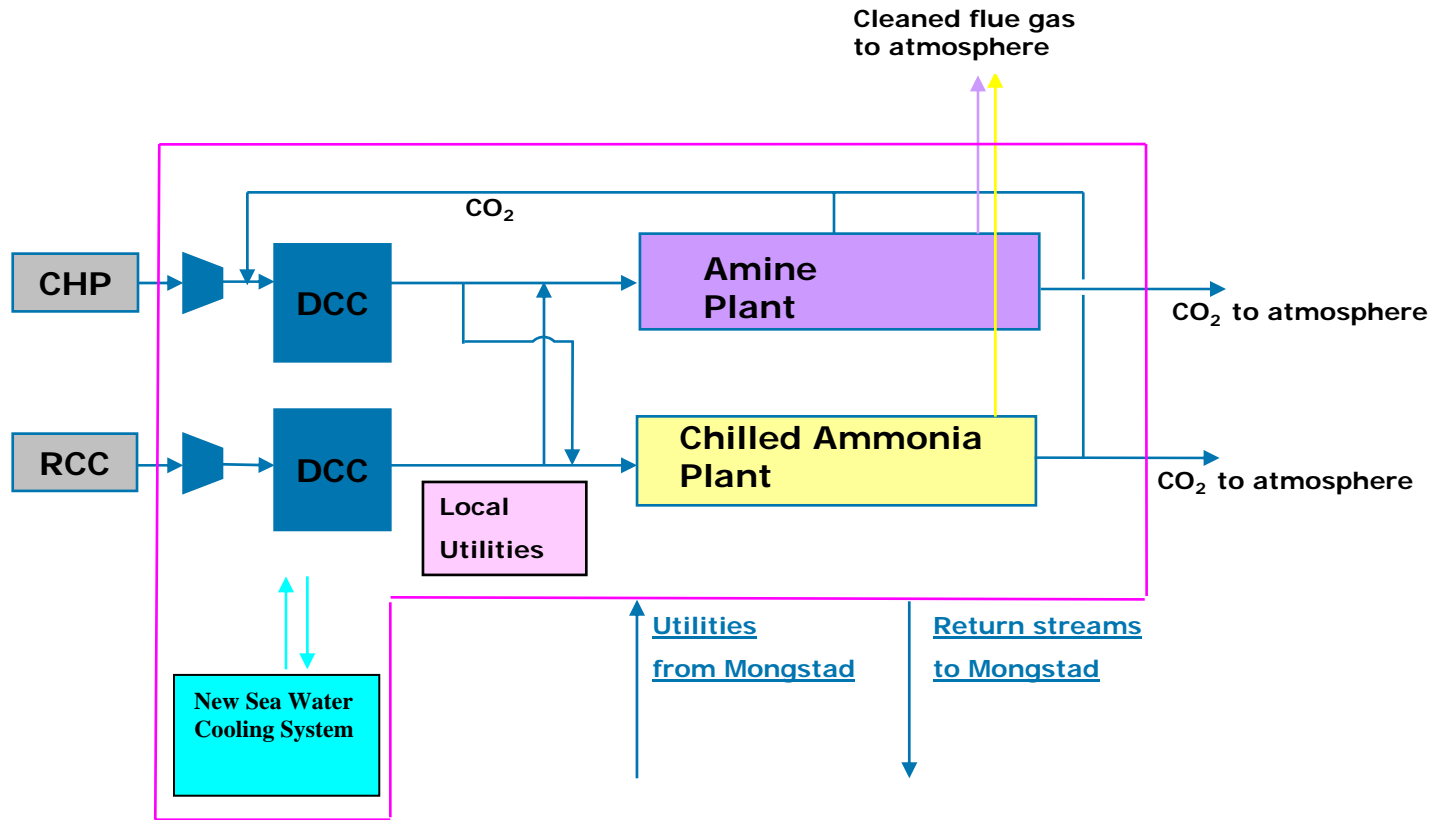


TCM on track – Start-up in 4Q 2011 (Cont.)

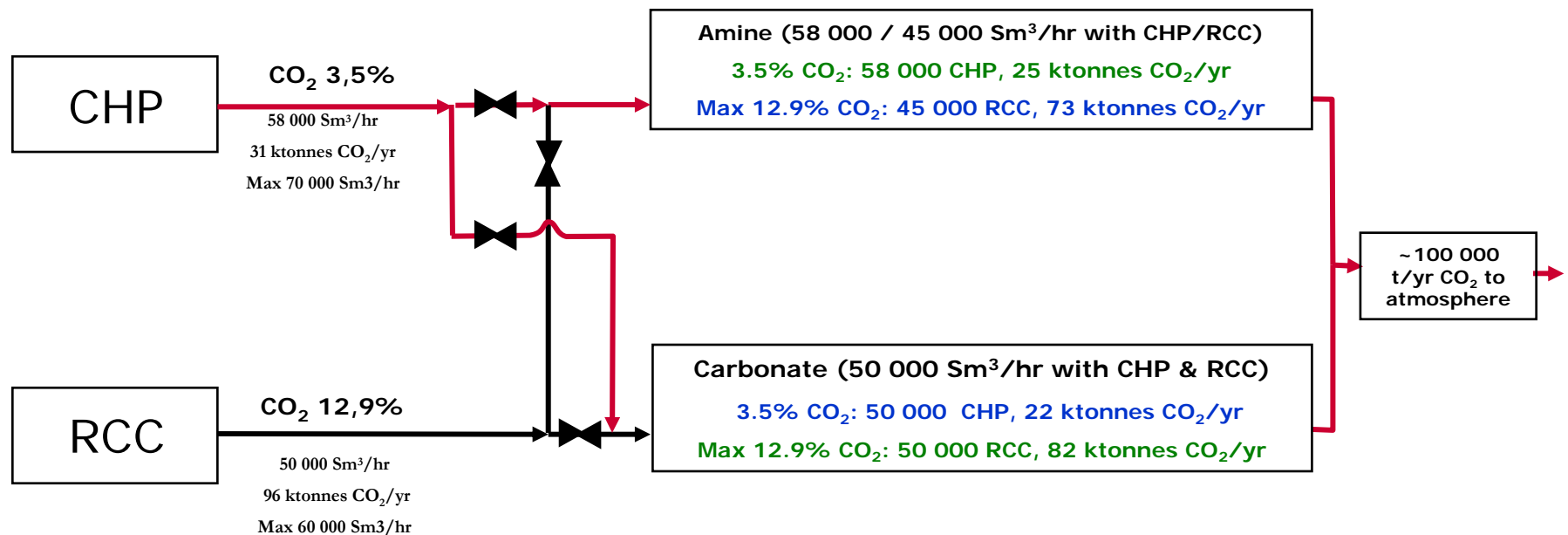
- Work in the intermediate period financed by the State and StatoilHydro
- Capital expenditure estimate per 31.3.09 at NOK 4,2 billion excl VAT
- StatoilHydro's share of the investment will be 20 % and the State's 80%
- The State will dilute its share by inviting industrial partners
- Present partners have right of first refusal – then others will be approached
- The state offer's industrial partners to invest approximately 2,4 % each of capital expenditure budget and operating costs



TCM Overall Concept



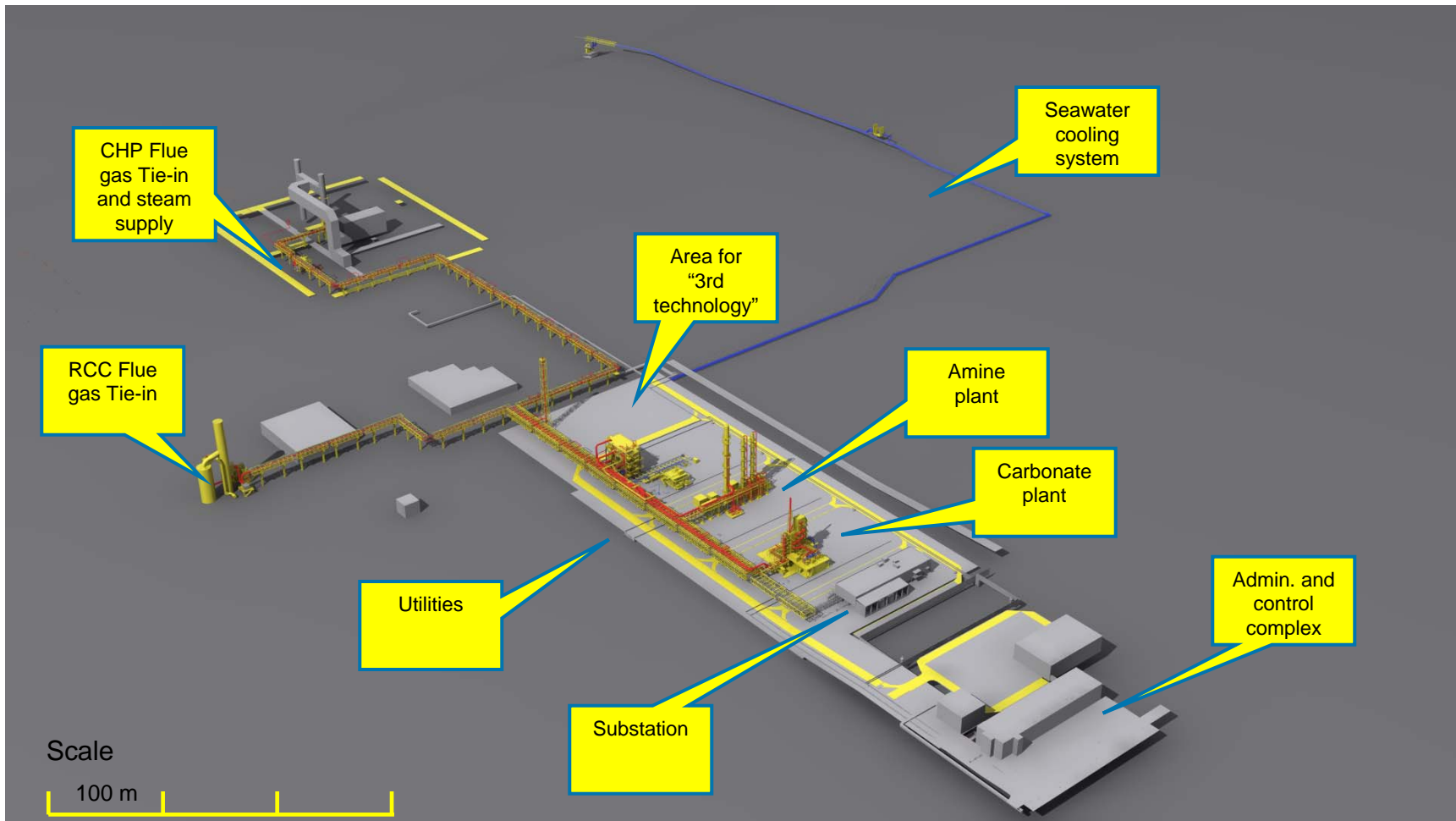
Design Capacities



- Simultaneous operation is possible
- Feed gas flexibility
- Smallest duct sizes
- Meets 100 000 t/yr production
- Exhaust Gas Recycling with CO₂ recycle (5% - 9% CO₂)

Blue case: 22 + 73 = 95 ktCO₂/yr
 Green case: 82 + 25 = 107 KtCO₂/yr

European CO2 Test Centre Mongstad layout



Mongstad site



Amine Technology

Advantages:

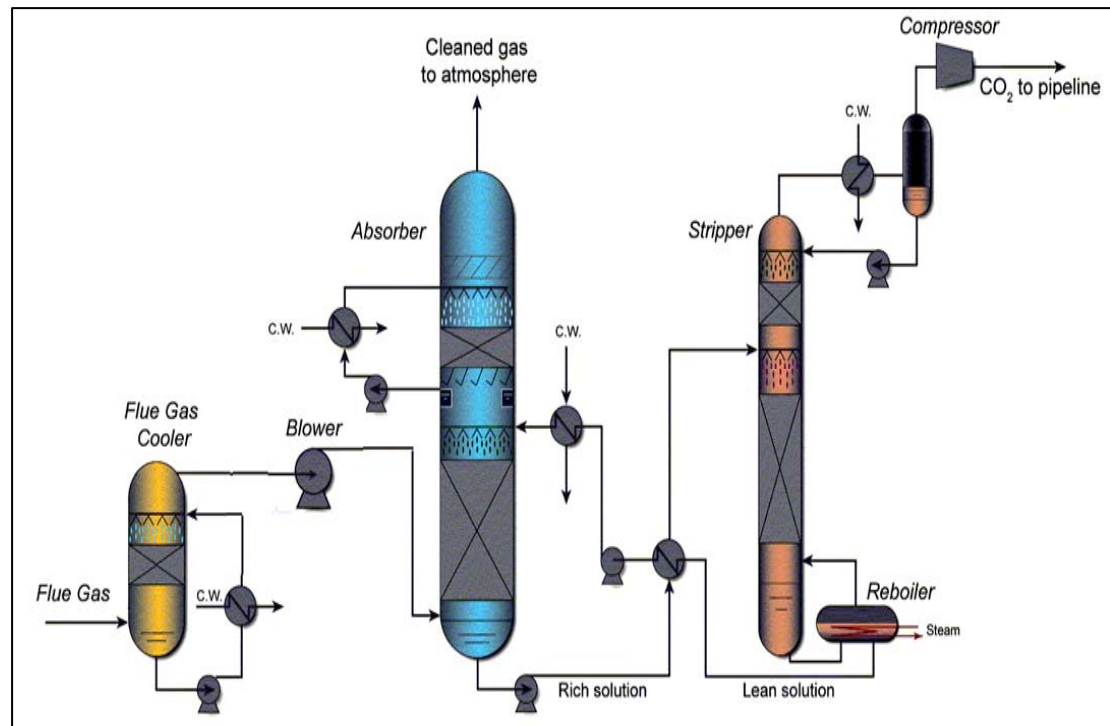
- Known technology
- Pilot units and references
- Simple, flexible, independent
- Improvement potential

Disadvantages:

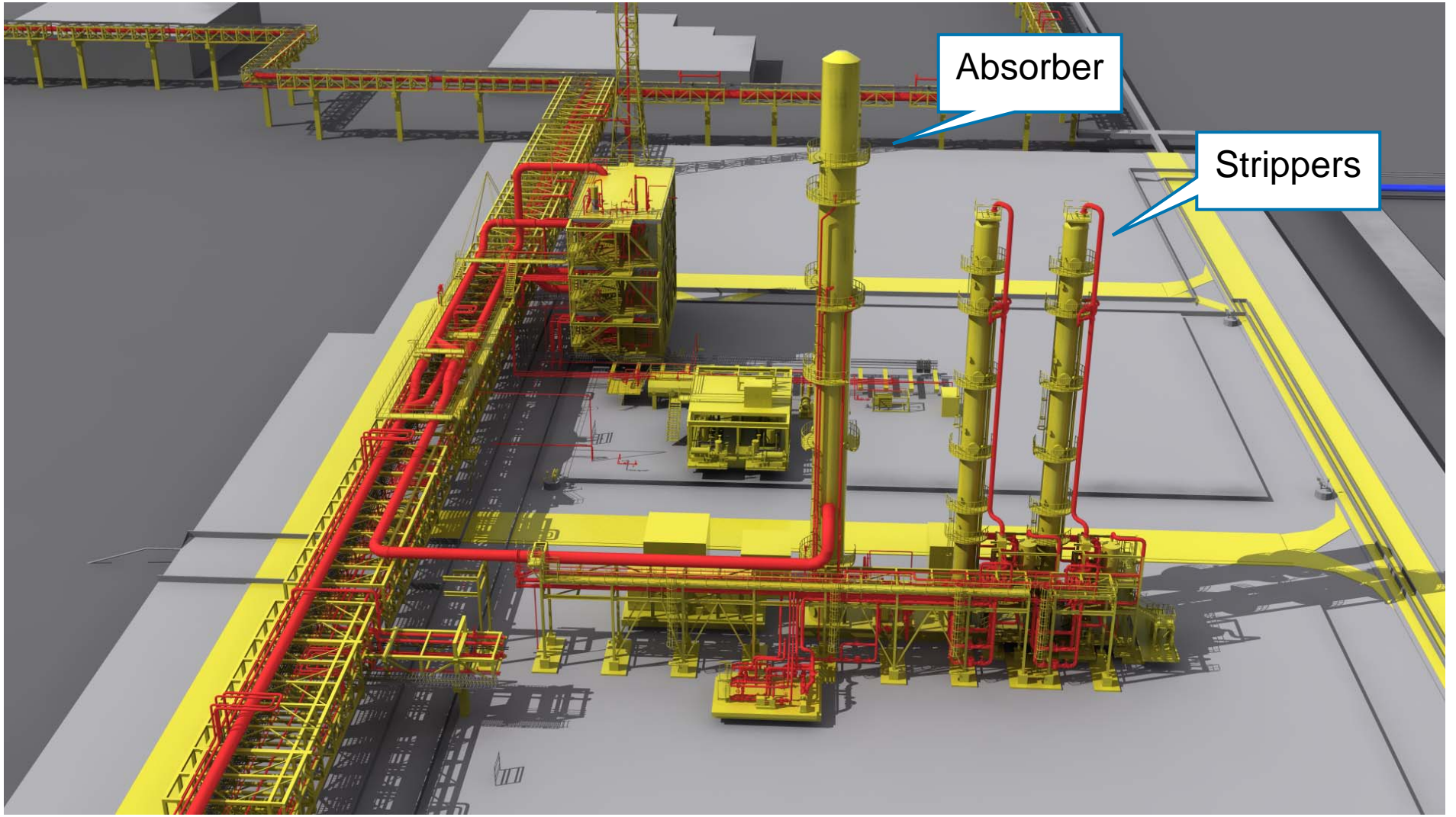
- High energy demand
- Waste and corrosion
- Large and costly equipment
- Uncertain HSE effects

TCM Objective:

Test and qualify improvements of existing technology



TCM Amine Plant Illustration



Chilled Ammonia Technology

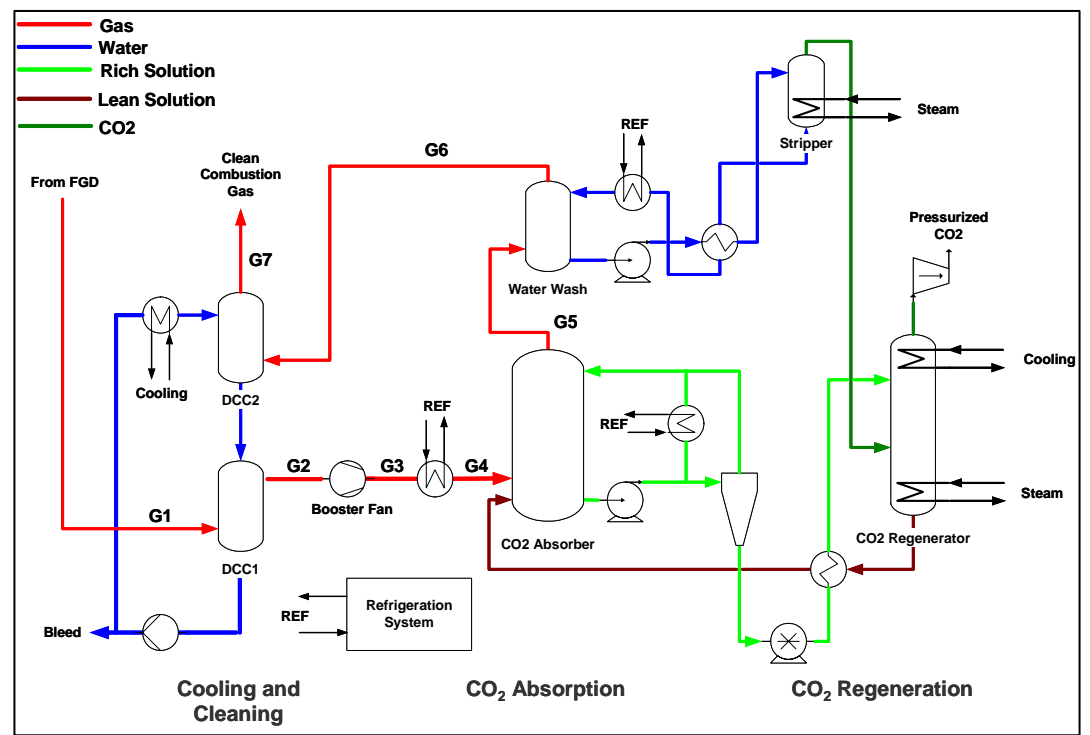
Advantages:

- Decreased steam load compared to MEA
- Exceeds CO2 capacity of MEA
- High pressure regeneration
- Low cost reagent
- Expected good HSE performance (little waste and harmful emissions)

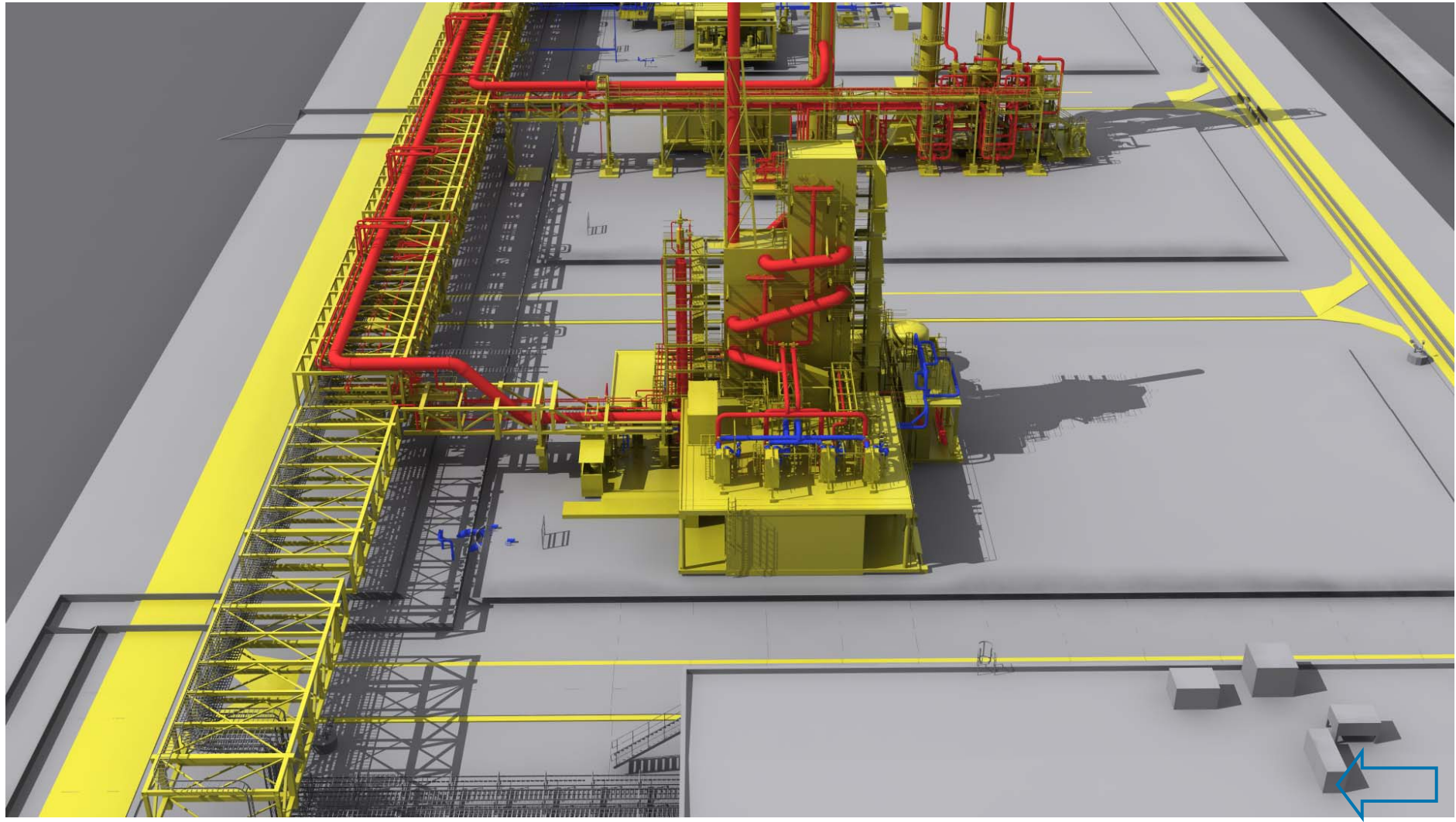
Disadvantages

- Immature (high risks)
- NH3 emissions - must be avoided
- Equipment must handle solids
- High refrigeration load
- Slow kinetics

TCM objective:
 Qualify new CO2 capture technology



Chilled ammonia plant



DONG
energy



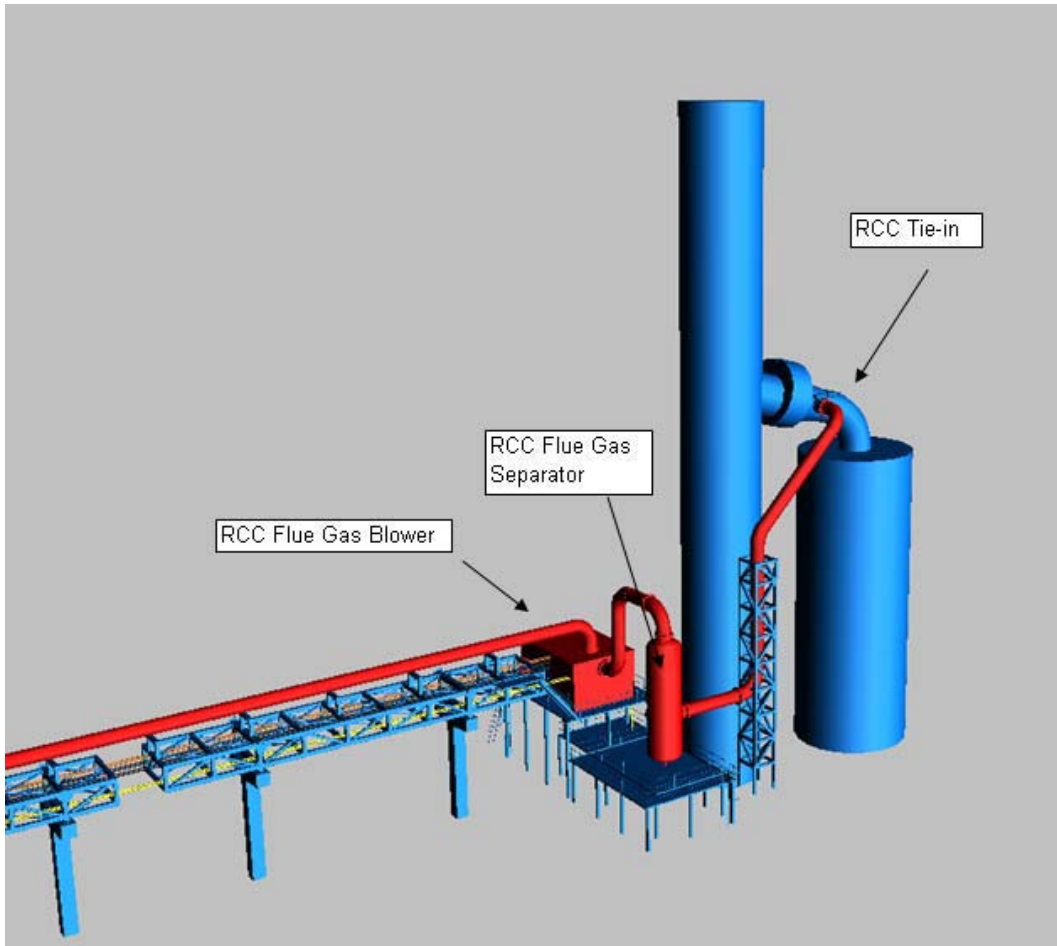

GASSNOVA

StatoilHydro

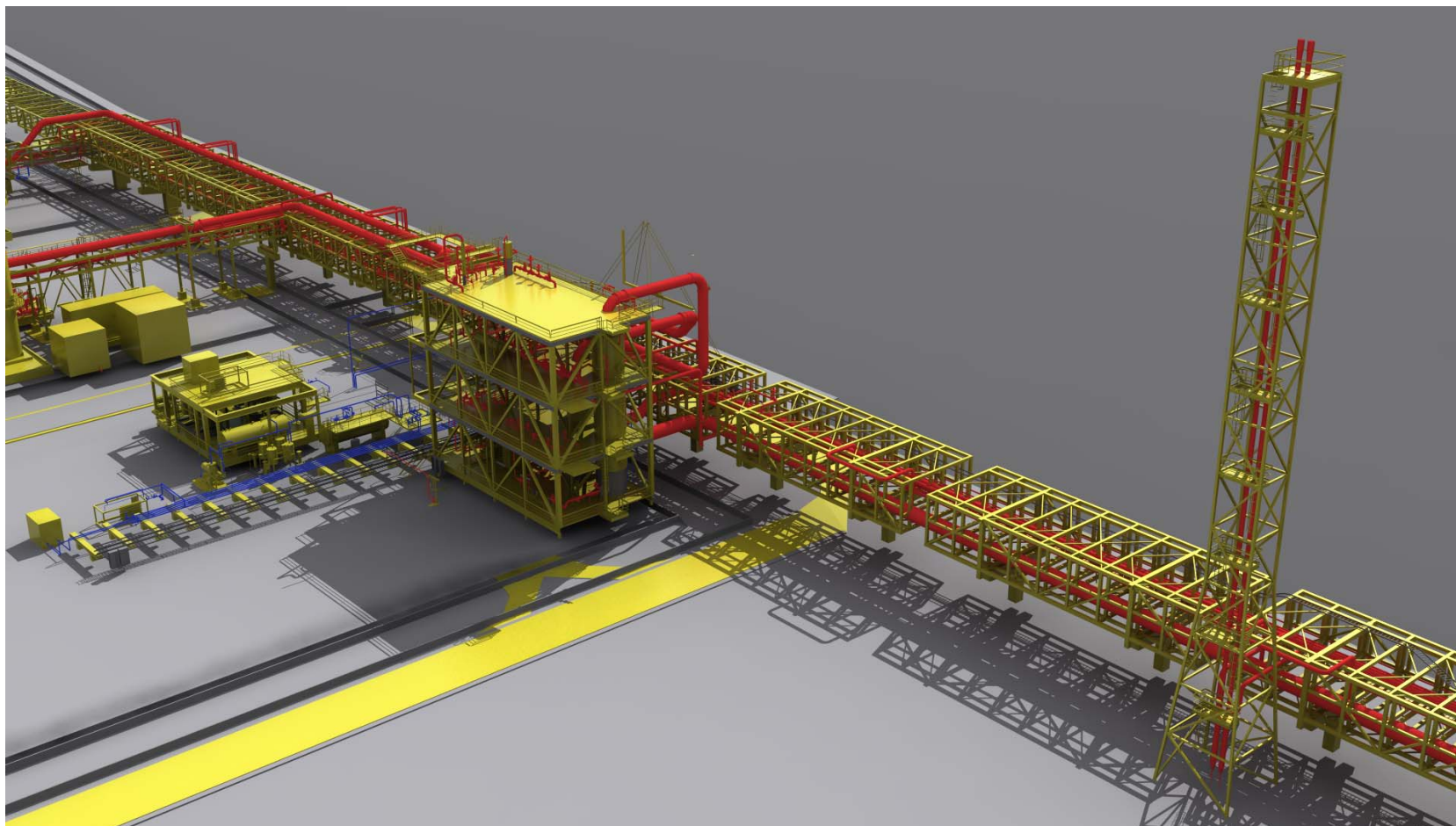
CAPEX and OPEX

- Total CAPEX estimated at BNOK 4.2 per 31.3.09 (Ex VAT)
Infrastructure and interfaces to refinery and power plant represents nearly 2/3 of capex
- OPEX estimated to be MNOK 150 – 250 annually
Major opex items are steam, electricity and personnel costs

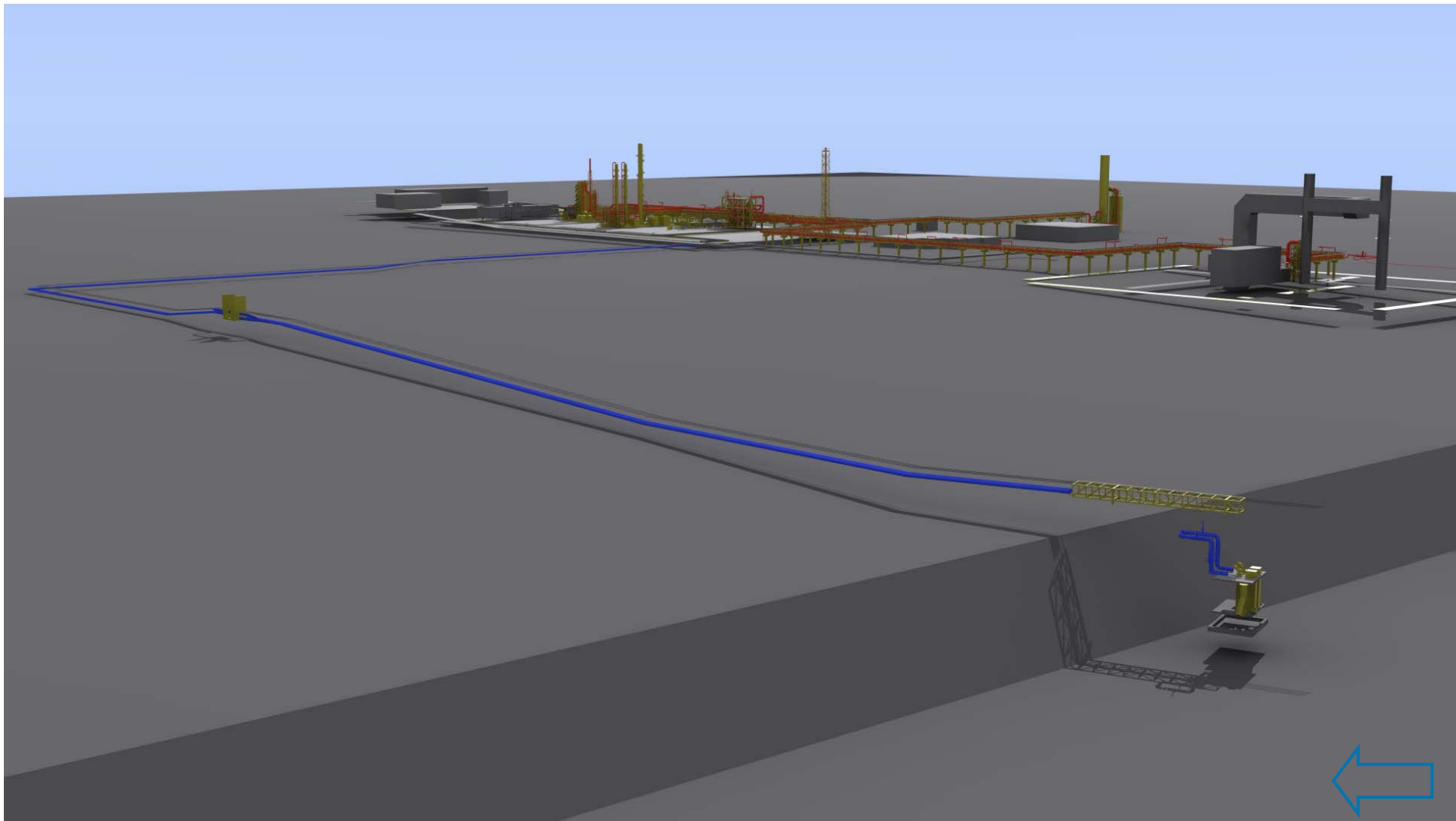
RCC Tie-in



Pipe racks



Seawater Cooling System



TCM – Organisation

