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«CCS midt Norge»

- status, utfordringer og muligheter

BJØRN HØLAAS, LEDER AV STYRINGSGRUPPEN

Finalized a pre-feasibility study on CCS at Heimdal Incineration plant

Carbon neutral delivery of heat in **2040**

~220 000
tonnes waste per year

25%
of fossil CO_2 emissions in Trondheim

FOSSIL CO_2
80 000
tonnes per year

BIOGENIC CO_2
160 000
tonnes per year

- Technical, economic and environmental analysis and development of CO_2 handling covering the complete value chain
- Commercial analysis of possible exploitation of captured CO_2
- Evaluation of commercial and financial viability
- Analyse alternatives to carbon capture – fossil fractions in residual waste

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Two important enablers

KAN – Klimakur for Avfallsforbrenning i Norge

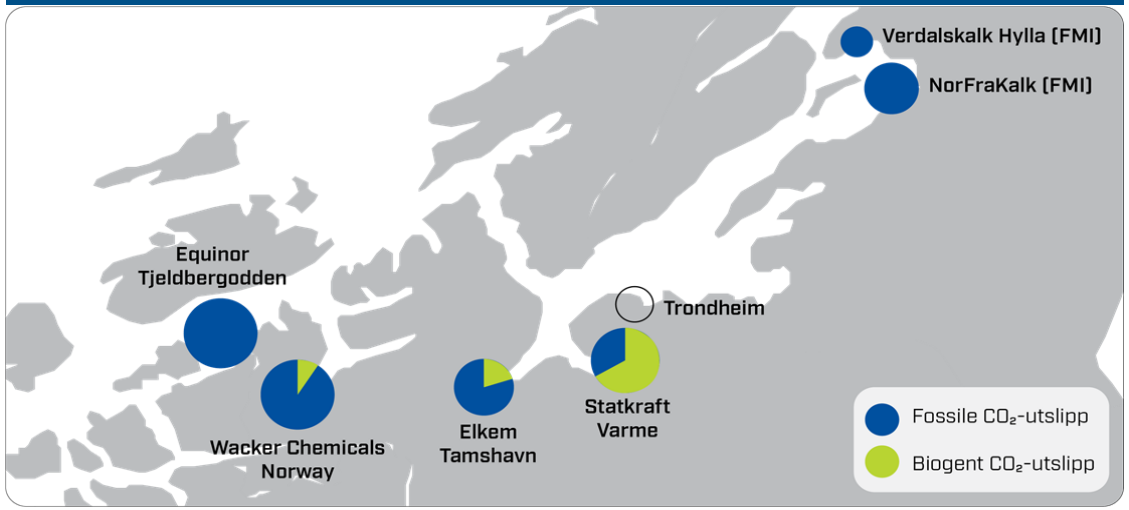
- Common development of CCUS for WtE plants

- **Capture technology**
- **Integration**
- **Financing and business opportunities**
- **Transport, logistics and intermediate storage**
- **Permanent storage**

Statkraft Returkraft Hafslund Oslo Celsio BIR Forus Energigjenvinning

Cluster cooperation "CCS mid-Norway"

- Concept(s) for transport and intermediate storage
- Possible regional business models



FRANZEFOSS MINERALS Elkem equinor WACKER Statkraft

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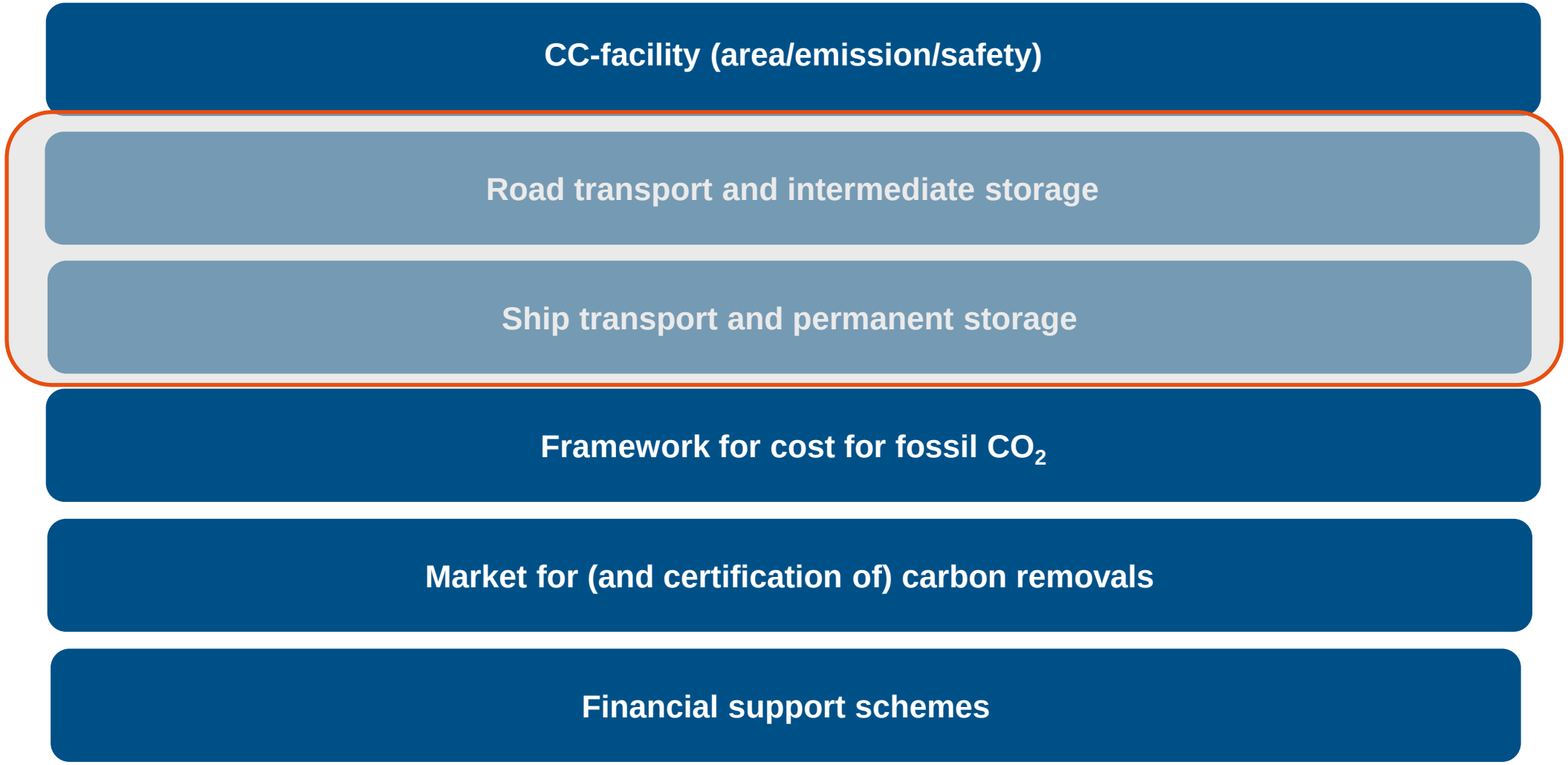
Main challenges to solve going forward



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Oppsummering av logistikkstudie, med CO_2-transport til Northern Lights

Vurdert ulike løsninger

- Bil, rørledning
- Alle leverer alene, felles skip, felles mellomlager nr.2, et skip pr. hub, etc.

Foreløpige resultater

- Beste alternativ; 30-40% kostnadsreduksjon
  - Felles skip og mellomlager 1 og 2 og 3 og 4
  - Felles skip 5 og 6
- Viktige verdidrivere: Volum i klyngen, størrelse mellomlager, antall skip og størrelse, seilingsdistanse

Videre arbeide;

- Analysere effektene av å gå ned til 7 bars trykk
- Diskutere eventuell videreføring av klyngen

Avstand til Northern Lights…

… og til mer kortreist CO_2-lagring

Limit for HC generation and migration
West: petroleum province – depleted field storage potential/EOR: 1,1 Gt
East: No proven HC, all aquifers assessed: 4,4 Gt

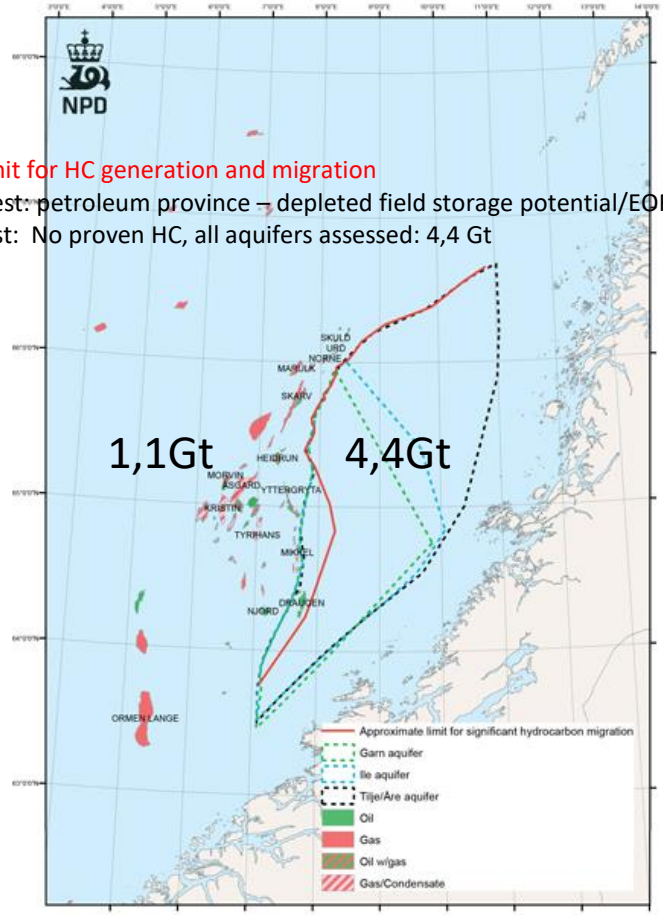


Fig-5-057

Distribution of aquifers in the Trøndelag Platform.

Red line shows the approximate limit for hydrocarbon migration

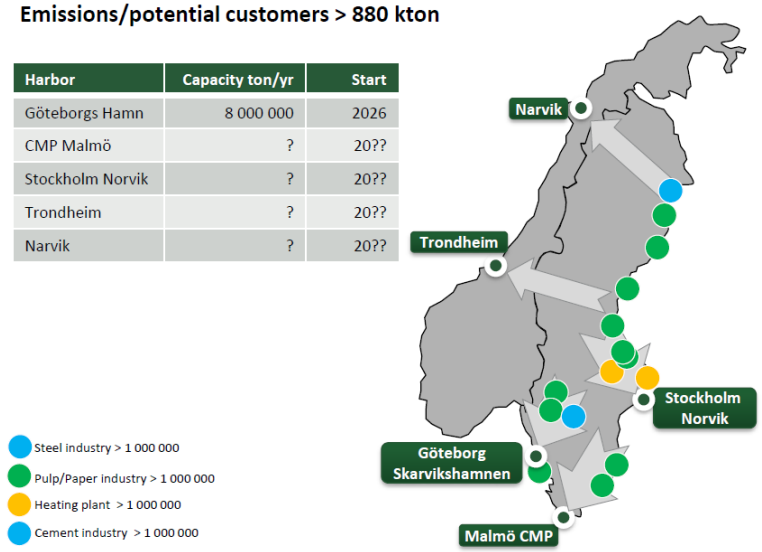
CO_2 fra Sverige til Midt-Norge?

- Svenske Green Cargo kan ha kommet lengst i Europa med å forberede for CO_2-transport med tog i stor skala
- Jobber mot energiintensiv industri over hele Sverige – inkludert lokasjoner som kan nå Trøndelag med tog etter elektrifisering av Meråkerbanen i 2024

Emissions and proposed flows – Rail (1)

Emissions/potential customers > 880 kton

Harbor	Capacity ton/yr	Start
Göteborgs Hamn	8 000 000	2026
CMP Malmö	?	20??
Stockholm Norvik	?	20??
Trondheim	?	20??
Narvik	?	20??



Industries or Plants where train is a possibility > 800 000 ton

Customer	Location	Industry	Emission (ton)
SCA Graphic	Timrå	Pulp/Paper	1 978 480
Lulekraft	Luleå	Heating	1 872 753
Södra Cell	Mönsterås	Pulp/Paper	1 773 512
Södra Cell	Värö	Pulp/Paper	1 757 410
Metsä Board	Örnsköldsvik	Pulp/Paper	1 388 618
Gruvön	Grums	Pulp/Paper	1 358 874
SSAB	Luleå	Steel	1 292 244
Skutskärs bruk	Älvkarleby	Pulp/Paper	1 235 358
Smurfit Kappa	Piteå	Pulp/Paper	1 197 448
Södra Cell	Mörrum	Pulp/Paper	1 190 764
Korsnäs	Gävle	Pulp/Paper	1 030 375
Sthlm Exergi	Stockholm	Heating	1 003 663
Mälarenergi	Västerås	Heating	1 003 309
Stora Enso	Skoghall	Pulp/Paper	980 615
Iggesund	Iggesund	Pulp/Paper	886 889

green cargo

Green Cargo - Wagons

ERMEWA - Wagons (type Zacns)	
Weight (ton)	28
Loa per ax (ton)	22,5
Payload (m3)	62
Payload (ton)	64
Length	15,5
Pressure	15 bar
Temparature	-25

VTG - Wagons (type Zacns)	
Weight (ton)	28
Loa per ax (ton)	22,5
Payload (m3)	56
Payload (ton)	62
Length	15,5
Pressure	15 bar
Temparature	-25

Floating gas

- Official term of transport: Carbon dioxide
- UN-number 1013
- ADR/RID Class 2
- Code 2A

20
1013

Carbon dioxide holds for 6-8 days within the railway tank.

green cargo

Bilder fra Björn Nordh, Green Cargo

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