

OG21. Gassverdikjeden



HYDRO

S. Kvisle. Industrifagdag Univ. i Oslo 3.12.2004

Innhold

- OG21 generelt
- Gassverdikjeden
 - Verdiskapningsmål
 - Satsningsområder
 - Status, utfordringer, mål og forslag
- Status og veien videre for Gassverdikjeden i OG21



OG21

Bakgrunn og hensikt

- Initiert av OED
- Utvikle en *nasjonal strategi* knyttet til den samlede teknologi- og forskningsinnsatsen innen petroleumssektoren
- Strategien dekker *hele FoU-verdikjeden* fra grunnforskning og utvikling til demonstrasjon og kommersialisering av teknologi
- Utgangspunktet er de 2 scenariene i Stortingsmelding 38:
 - *Forvitringsbanen* med sterkt fall i produksjonen fra besluttede prosjekter frem mot 2020
 - *Den langsiktige utviklingsbanen* med produksjon fra norsk sokkel i et 100 års perspektiv
- Den langsiktige utviklingsbanen krever at olje- og gassnæringen og myndighetene satser sammen på å utvikle petroleumsressursene på en kostnadseffektiv måte

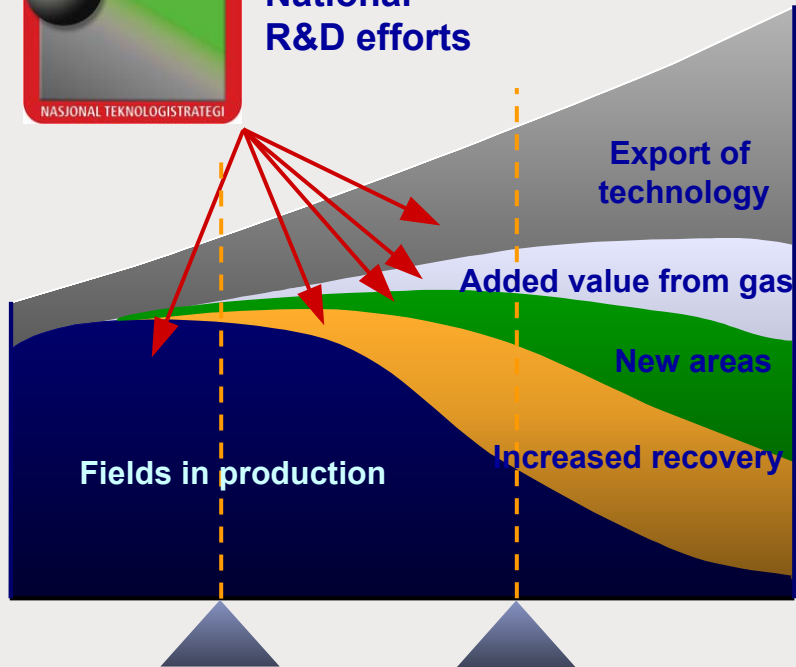


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Hovedmål



Coordinated
National
R&D efforts



- Legge til rette for størst mulig verdiskapning på *norsk kontinental-sokkel*, som samtidig skal føre til økt eksport fra norske teknologibedrifter
- 5 prioriterte innsatsområder
 - Økt utvinning
 - Miljø
 - Dypt vann
 - Små felt
 - Gassutnyttelse
- ...som definerer 9 teknologiområder.....

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9 teknologiområder (TTA)

- Zero harmful discharge to sea
- 30% reduced emissions to air
- Stimulated recovery
- Cost effective drilling
- Real time reservoir management
- Deep water platform technology
- Long range wellstream transport
- Seabed/Downhole processing

- **Competitive gas production and offtake**

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For hvert teknologiområde skal det:

- utarbeides *helhetlige teknologistrategier* med oversikt over pågående teknologiutviklingsprogrammer
- identifiseres *teknologigap*
- etableres en *handlingsplan* for lukking av teknologigap
- etableres "*e-nettverk*" og *møteplass*

Competitive Gas Production and Off-take

Group members

Vollsæter, Geir	Chair, Norske Shell
Frivik, Per-Erling	SINTEF
Graff, Oscar	AkerKværner
Hestenes, Rolf	TBL
Kvisle, Steinar	Hydro
Olsvik, Ola	Statoil (Kirsti Tangvik)
Thaule, Svein Birger	Gassco
Thomassen, Dag	Institutt for Energiteknikk

Competitive gas production and off-take

Develop technology that leads to 50% increased value creation in the Gas Value Chain through:

- ✓ More cost effective production and transport
- ✓ Increased market flexibility
- ✓ Strengthening Norwegian industry's competitiveness in a global market

Optimising transport infrastructure

CO₂ for EOR

Stranded gas

Domestic use and petrochemicals

Status

- Well developed infrastructure for production, transport and NGL recovery
- Gas will be landed at five locations in Norway
 - Kårstø, Kollsnes, Tjeldbergodden, Nyhamna, Melkøya
- LNG terminal in place at Snøhvit
- Small scale LNG plants at Kollsnes, Tjeldbergodden, Karmøy

Challenges

- Insufficient capacity; bottlenecks
- High cost NGL extraction
- Pipeline intervention and maintenance
- Tie-in of small gas resources
- Ageing, wet and dry gas systems

Goal

- 10 % increased transport capacity in existing pipelines
- 10 % increased NGL extraction
- Cost effective development of small and marginal fields
- Increased infrastructure utilization

Proposal

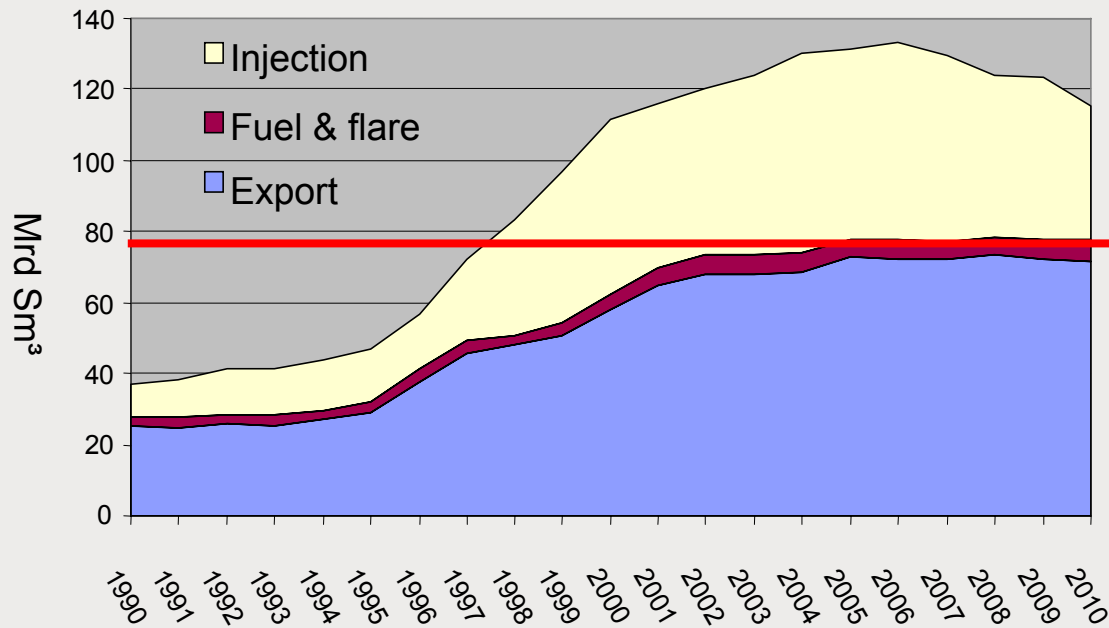
- Increase capacity by
 - New gas management tools
 - New technologies for pressure loss reduction
- Improved NGL extraction efficiency
- New or improved technologies for intervention and integrity inspection
- New technical solutions for tie-in of small fields (unprocessed gas) to existing infrastructure

Key: Gassco R&D strategy



Increased gas export CO₂ as substitute for gas injection

Gas balance on NCS



Gas injection on the rise

Gas for fuel and flare increase

Increasing production but plateau is getting closer

Increased gas export CO₂ as substitute for gas injection

● Status

- Year 2000 – 2005:
 - 40-50 Bcm injected p.a
 - 20 % not recoverable
 - 34% of total gas production reinjected (2002)
 -
- Sleipner CO₂ deposition, a pioneer project
-
- Increased focus and attention for CO₂ EOR
 - 70 CO₂ EOR fields in op.
 - Ongoing studies for NCS
 - 1 ton CO₂ may yield 3 bbl oil

Challenges

- Cost and availability
 - CO₂ capture technologies
 - Infrastructure - pipeline, shipping, storage (flexibility)
- Operation
 - Injection and reproduction
 - CO₂ removal from produced gas
 - Permanent storage of CO₂
- The potential for CO₂ for EOR is larger than Norwegian CO₂ emissions
- Kyoto commitment and regulatory uncertainty



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Increased gas export – CO₂ as substitute for gas injection

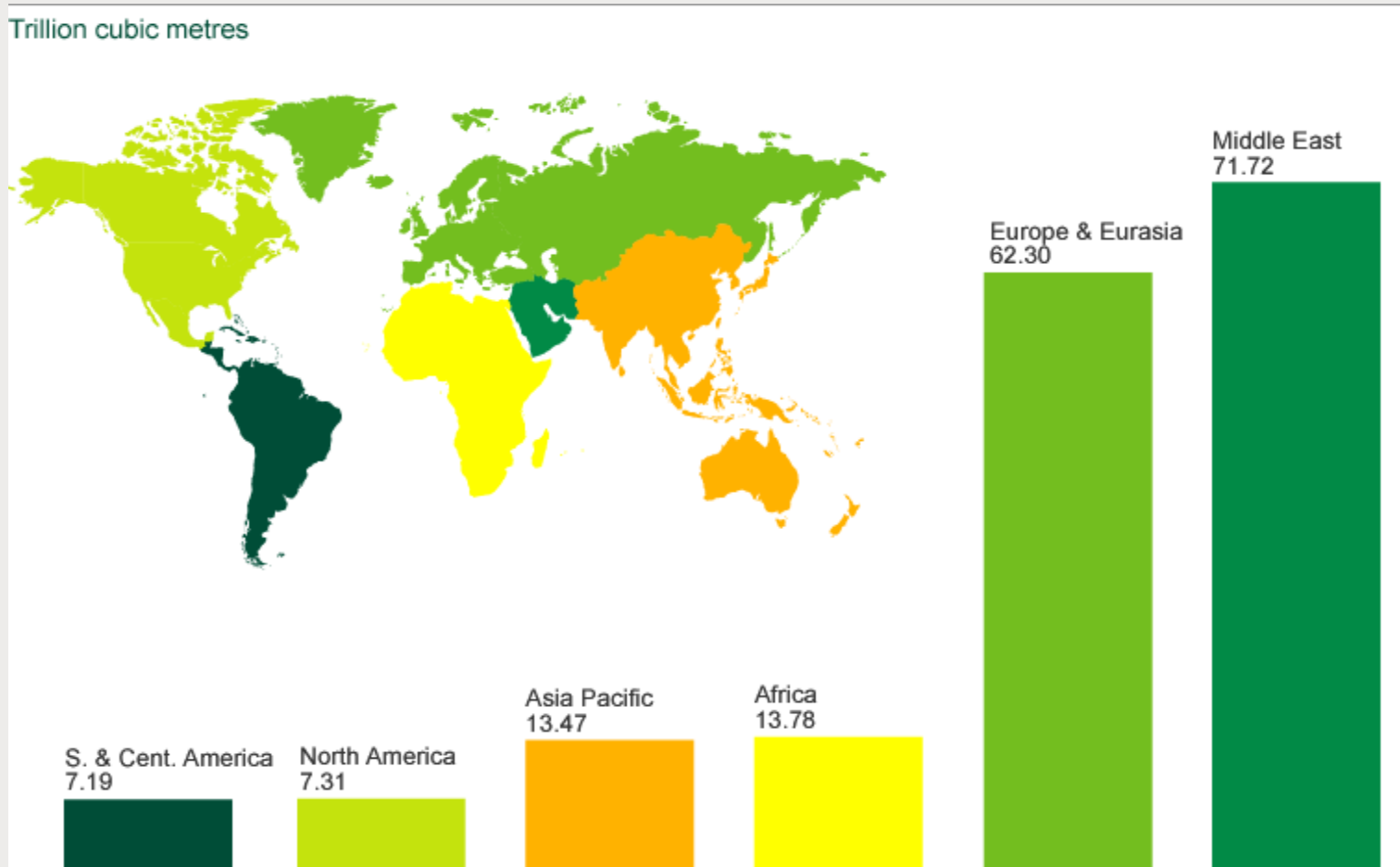
- Goal

- 50 % reduction in gas injection by substitution
- CO₂ for EOR field demonstration

- Proposal

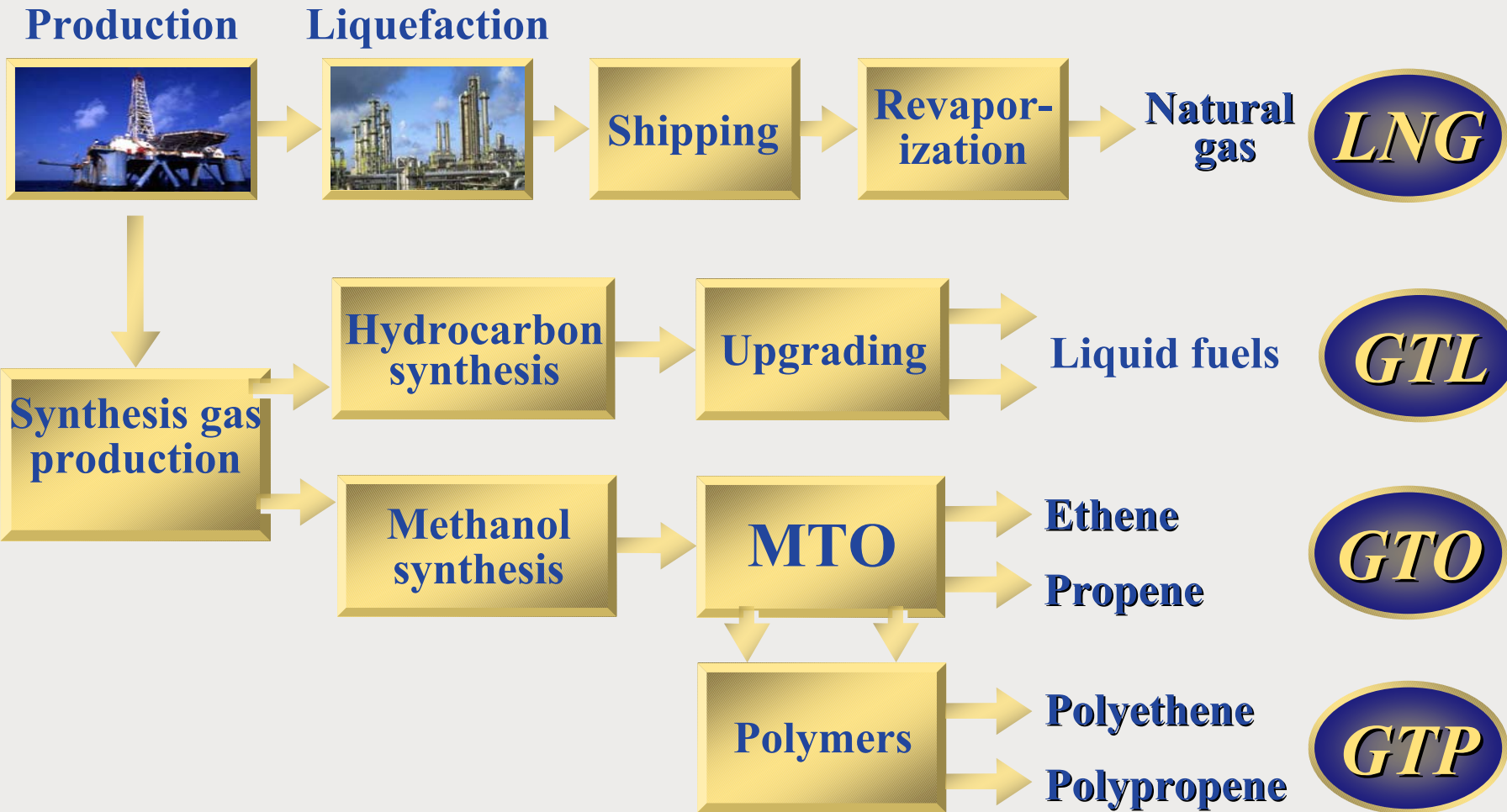
- Commission national CO₂ capture program
 - 30 % reduction in CO₂ capture and transportation costs
 - CO₂ selective agents and membrane development
- CO₂ – EOR field test by 2006

Proved natural gas reserves at the end of 2003



source: BP
with permission

Stranded gas monetization processes



• Status

- Future Norwegian gas discoveries in Northern areas will probably be stranded
- Large share of world's gas is stranded
- Non-flaring policy for assoc. gas in many regions, but non-flaring still a challenge

- LNG a mature technology; GTL, GTO, CNG and NGH emerging technologies
- Strong Norwegian technology position within stranded gas technologies, developed in alliance with international players

- Norwegian industry a worldwide supplier of subsea and floating production systems

• Challenges

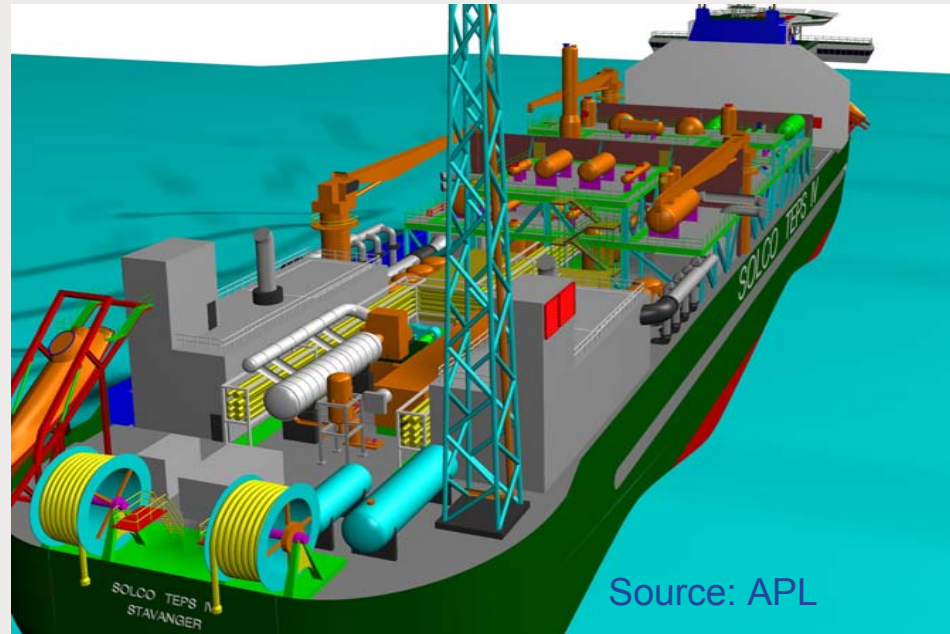
- Reduced CAPEX and OPEX by more compact process design and other process improvement

- Marinization of technologies, e.g. floating LNG, GTL and Methanol

- Financing of demo plants for emerging technologies

- “Direct conversion” of methane to liquid fuels and chemicals remains one of the world's major scientific challenges

A major challenge: Put it on a vessel!



Steam methane reformer plant (SMR)

Methanol highly mature onshore

And offshore methanol concepts are fairly well advanced

Goals

- LNG, CNG and NGH: Further develop technology position and alliances
 - Target: gas delivered at \$3/mmbtu
- GTL & GTO: Maintain leader position in Fischer-Tropsch (GTL) and GTO technology
 - Target: Competitive with crude based production at \$15/bbl Brent
- Safe, efficient and cost-effective offshore LNG, GTL or Methanol plants
- Be in the forefront of R&D on “direct” conversion of methane to liquid fuels and chemicals

Proposals

- R&D program covering
 - LNG
 - Chemical conversion (GTL, GTO, direct routes, etc)
 - Other technologies for gas transport and storage, NGH and CNG
- Marinisation of technologies
 - Qualification of solutions
 - Compact design
 - Loading/ unloading offshore
- Governmental financial support to pilot and demonstration plants
- Further develop international technology alliances

● Status

- Current domestic use is ca 1 % of total production, mainly:
 - Methanol production at Tjeldbergodden
 - Petrochemical plants in Grenland
- Significant supply potential for onshore use at five landing sites
- Local distribution:
 - LNG – Haugesund – Tjeldbergodden, Kollsnes
 - Pipeline – Haugesund and Stavanger
- 16 Twh-e used for offshore power production

● Challenges

- Secure *competitive* feedstock supply for the Norwegian petrochemical industry
- Use Natural Gas in the transportation sector, in particular LNG in ferries
- Substitute coal and fuel oil by Natural Gas for heating and generation purposes
- Use Natural Gas for power production in Norway



Goal

- Further develop domestic infrastructure through
 - pipelines
 - small scale distribution LNG, CNG and others
- Replace electricity and oil with gas for heating and industrial installations
- Reduce costs and emissions in NGL extraction
- Improve the competitiveness of Norwegian petrochemical activities on a global basis

Proposal

- Develop CNG transport and storage solutions, and small scale coastal floating LNG receiving facilities
- Implement public support and incentives facilitating demo of small scale applications
- Include petrochemical R&D as part of Gas Value Chain



...og hva skjedde så?

- Både Demo 2000 og Petromaks bruker OG21-strategiene, inkludert Gassverdikjeden
 - Utlysingsbeskrivelser i tråd med OG21-strategiene
 - Prosjekter finansieres
 - Petromaks' budsjetter økes
- OG21 arrangerer seminarer
- En utfordring å få mer gass inn i programmene
- Den store utfordringen er å få inkludert petrokjemi som en del av for eksempel Petromaks, alternativt et annet program
- OG21-strategiene skal revideres i 2005