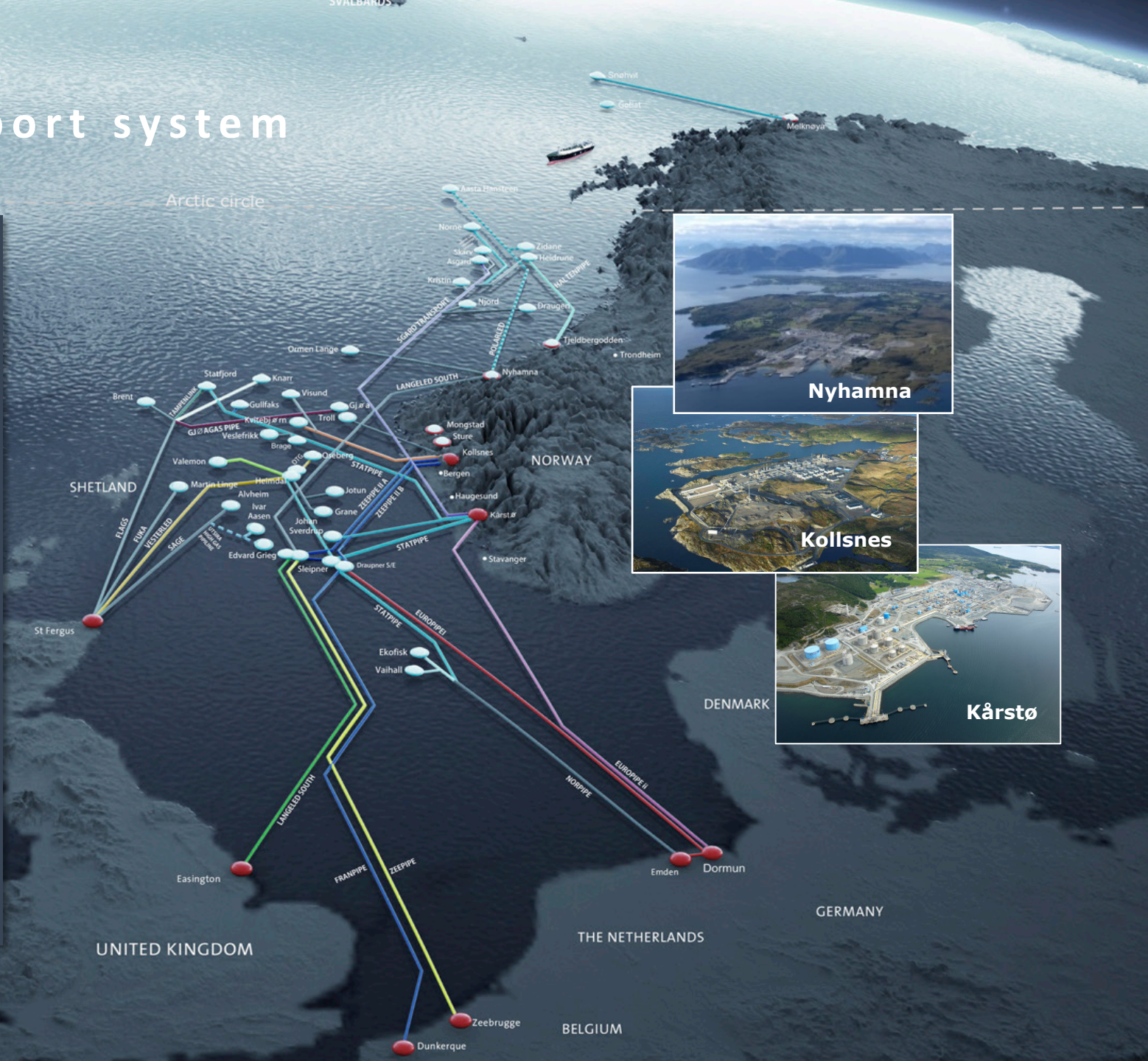
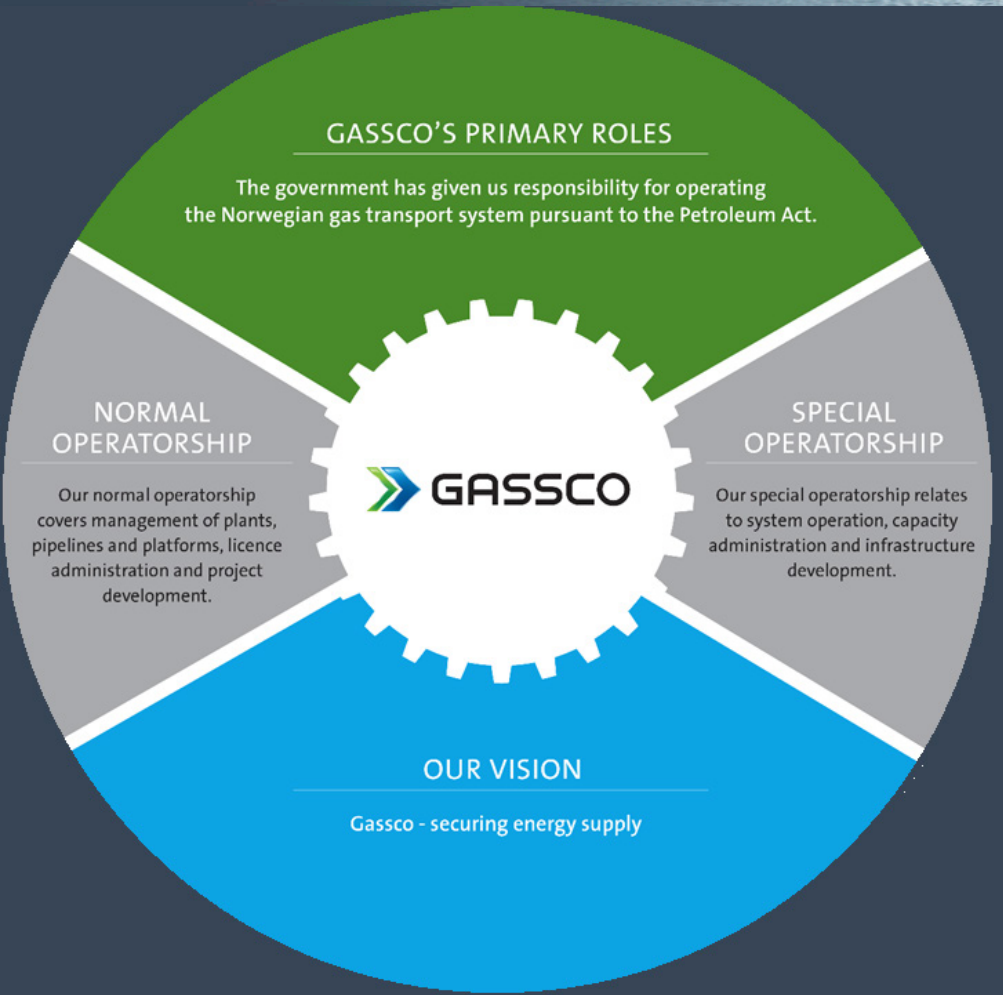




Green H2 Webinar

Hydrogen transport

The Norwegian gas transport system



R&D

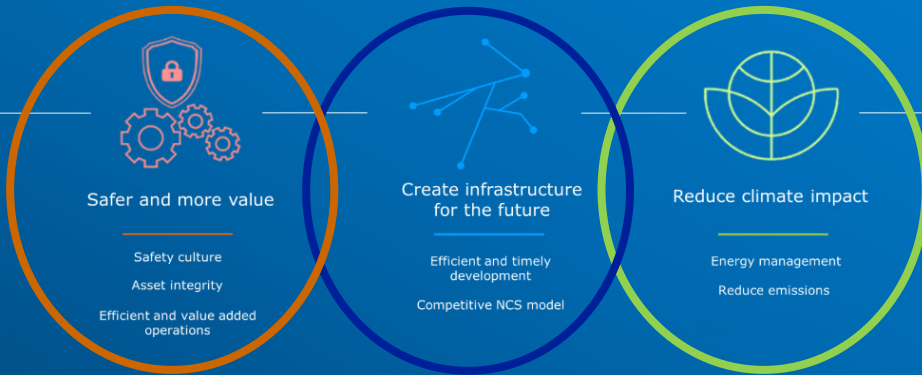
& PROGRAMS
PRIORITIES

FUTURE
VALUE CREATION

EFFICIENT
OPERATION

SUSTAINABLE
DEVELOPMENT

Gassco Strategy 2021



 **Organisational capabilities**

Company values – Competence development – Excellent leadership – Digital transformation

TECHNOLOGIES AND SOLUTIONS FOR LOW EMISSION VALUE CREATION



**SUSTAINABLE
DEVELOPMENT**

MAIN PRIORITIES 2021

DEVELOP SOLUTIONS AND TECHNOLOGIES TO REDUCE EMISSIONS FROM NCS, AND TO BUILD KNOWLEDGE TO PREPARE NCS GAS INFRASTRUCTURE FOR LOW CARBON SOLUTIONS

- REDUCE EMISSIONS – SCOPE 1
- LOW CARBON SOLUTIONS - CCS VALUE CHAIN
- LOW CARBON SOLUTIONS - HYDROGEN VALUE CHAIN
- LOW CARBON SOLUTIONS - FUTURE ENERGY SYSTEMS

Hydrogen transport in existing pipelines

DNV-GL

FEASIBILITY OF HYDROGEN TRANSPORT IN EXISTING PIPELINES

Pre-study: Hydrogen transport in existing subsea natural gas pipelines

Gassco AS

Report No.: 2016-1136, Rev. 01
Document No.: 1138FNWX-1
Date: 2017-01-16

Pipeline details	Hydrogen volume %					
	1%	5%	10%	20%	40%	100%
General steel strength (ksi)	Green	Green	Green	Green	Green	Green
General steel strength (MPa)	Green	Green	Green	Green	Green	Green
Design velocity	Green	Green	Green	Green	Green	Green

2016



DNV-GL

Proposal for Pilot: Re-qualification of Europipe for hydrogen transport

Gassco AS

Customer Reference:
DNV GL doc No: 1-1493CKH-ONN0718-1
Date of first issue: 2017-04-06
Date of this revision: 2017-06-12

2017



New Hydrogen Pipeline from Norway to Netherlands

Concept Only - To Be Evaluated

Project Objectives / Strategic Drivers

- Response to EU H2 strategy (Blue H2 import)
- Access to H2 backbone originating at Groningen
- Engagement directly with off-takers possible
- Offer optionality and scale of H2 (blue and green)
- Seat at the table in solving for EU energy transition
- Decarbonisation of O&G installations
- Consider H2 link between Kollsnes and Kårstø

Key Challenges

- Large commitment required (take-or-pay)
- EU subsidies required via price, not via CAPEX
- Long term gas supply outlook, consider LNG Imp?
- Better to export gas and import CO2?
- Will NOR be competitive producing green H2?

Key Numbers (estimates)

- Start Up: 2030
- CAPEX: xx bill NOK (for pipeline only)
- CO2 reduction: 20 Mill Tons CO2/yr
(90 TWh H2 replacing Natural Gas)

Industrial Partnership



The Value Chain

Norway

- 12.000 MW Blue Hydrogen
- 1.000 MW Green Hydrogen
- Local use for industry and maritime fuel

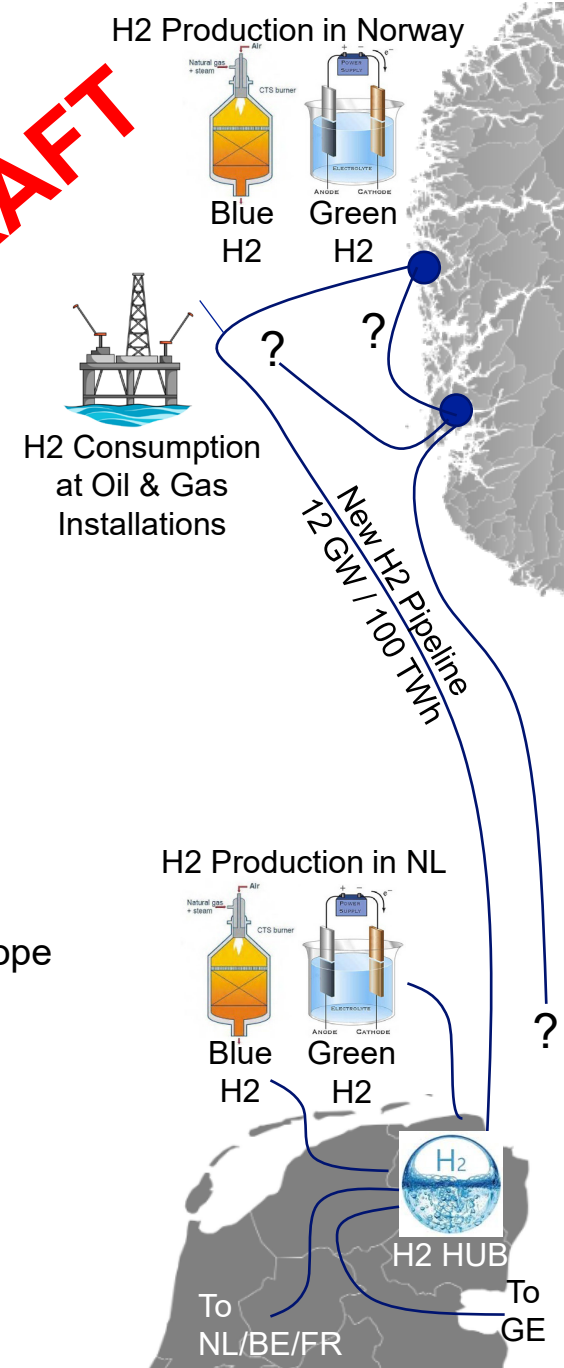
Offshore

- H2 offer full decarb of O&G installations
- New pipeline via some O&G installations
- Repurpose of gas pipeline to H2 also in scope (one of the three existing to Germany)

The Netherlands

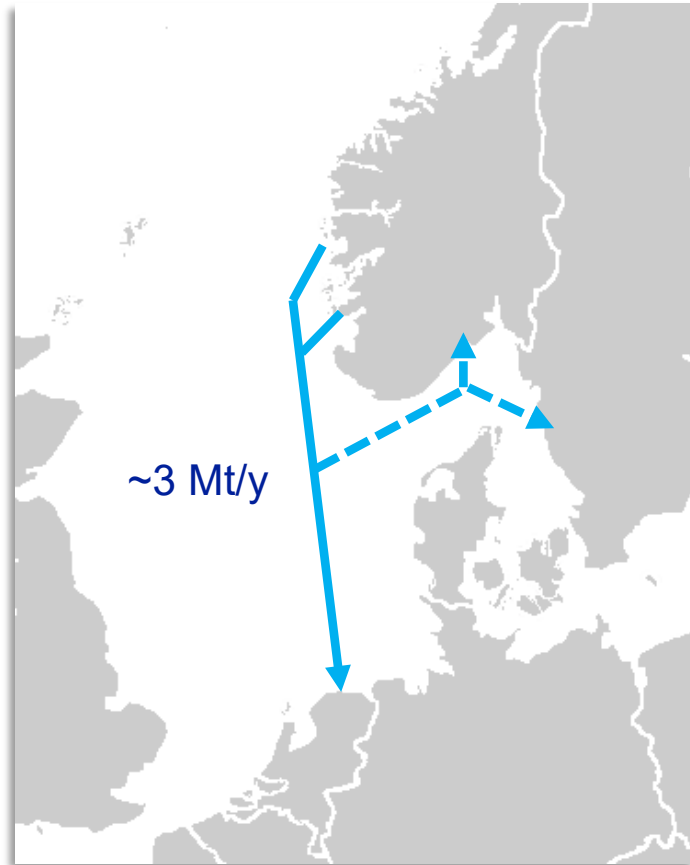
- Connect to H2 mega-hub in Groningen
- Access to H2 markets in NL, GE, BE, FR
- Sign up offtake-commitments
- Different price for Green vs Blue H2

DRAFT

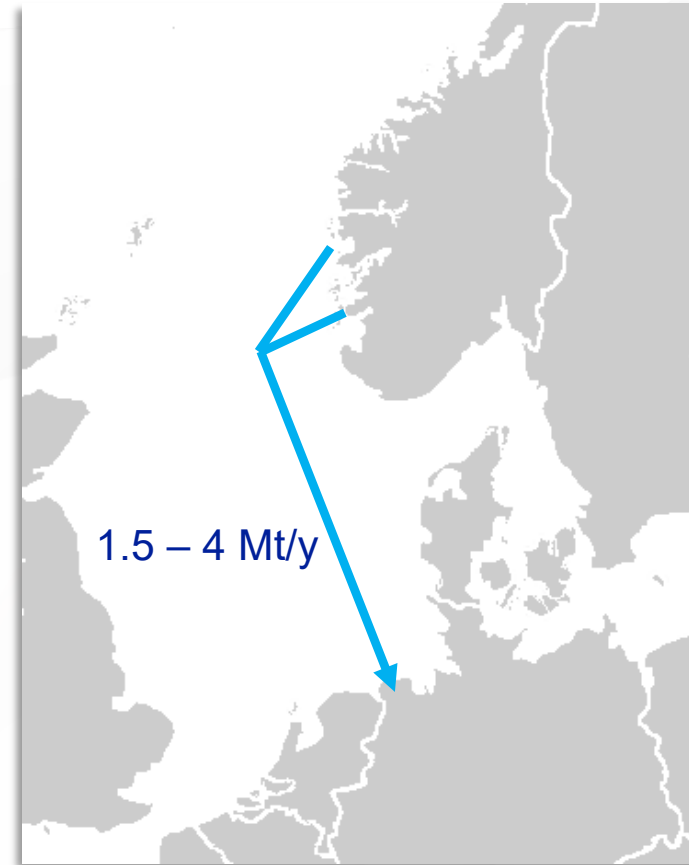


Pipeline options from Norway to the Netherlands

New pipeline



ZPIIB + Statpipe + Europipe

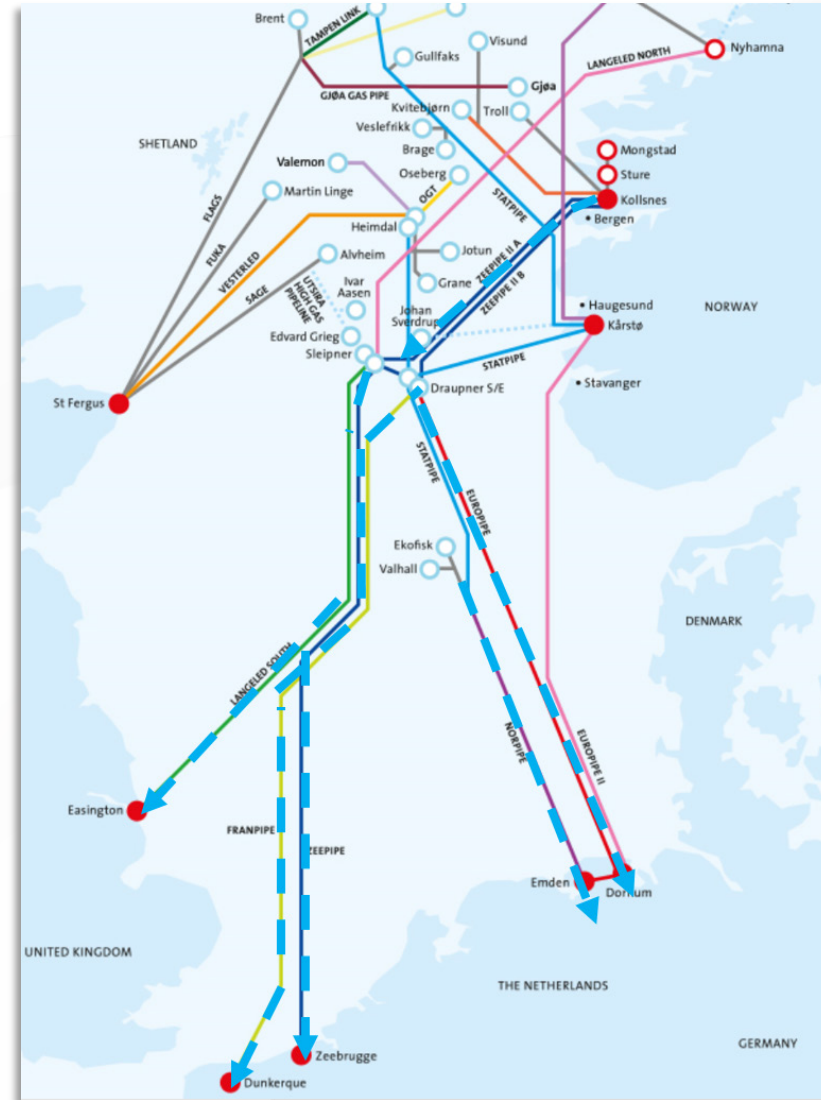


Blending hydrogen into natural gas

Dedicated routes



Free flow





Thank you for your attention