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Production of Low Carbon Hydrogen & CC(U)S

Prepared by: Hege Rognø (Snr Advisor CCS&LCS)

Presented by: Olaf Brekke (Advisor Rotating Equipment)

IGTC, Brussels
October 11th, 2023



WE ARE EQUINOR

A broad energy company, searching for better solutions

We are a Norwegian energy company, determined to use our competence, skills and innovation, continuously searching for the solutions that will drive the energy transition.

22,000

EMPLOYEES

Across the world

30

COUNTRIES

Presence and business operations

8,000

SUPPLIERS

Working together with us

170

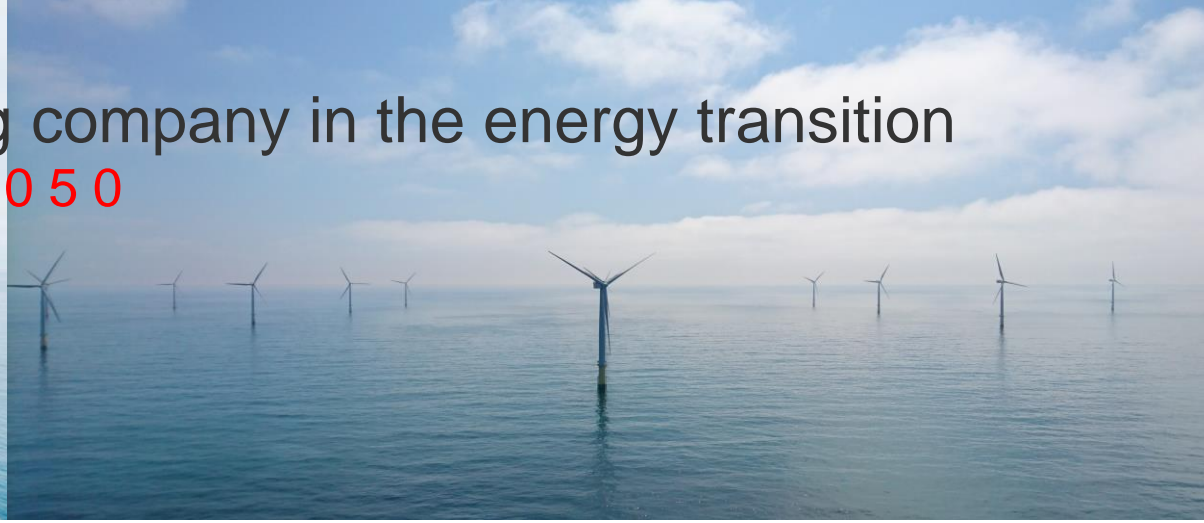
MILLION PEOPLE

Get access to our energy – everyday



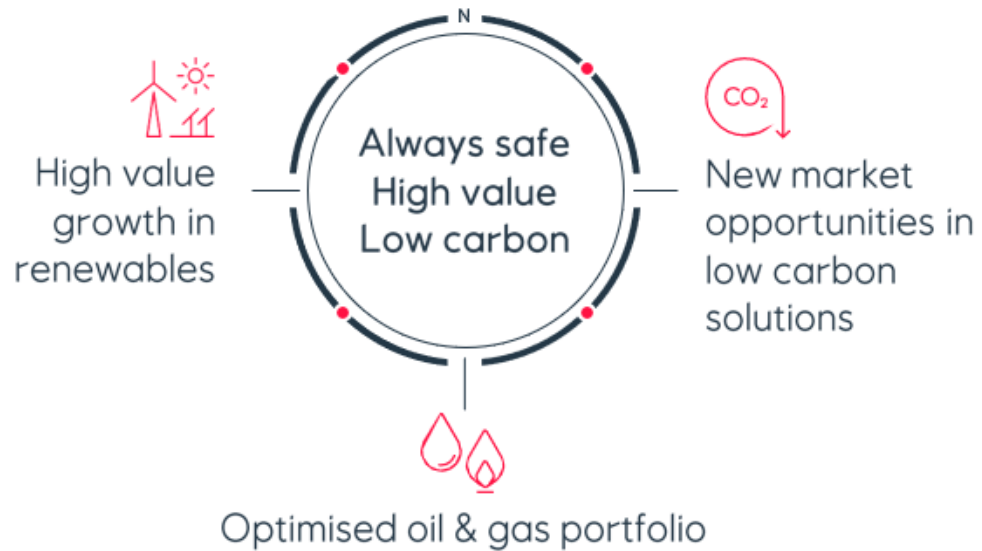
Equinor – A leading company in the energy transition

NET ZERO BY 2050



STRATEGY

LOW CARBON AMBITIONS



15-30 MILLION TONNES PER ANNUM
CO₂ transport and storage capacity by 2035
Equinor share

3-5 MAJOR INDUSTRIAL CLUSTERS
Clean hydrogen projects by 2035

50 % OF GROSS INVESTMENTS
Renewables and low carbon solutions by 2030

Equinor's low carbon portfolio | 2023

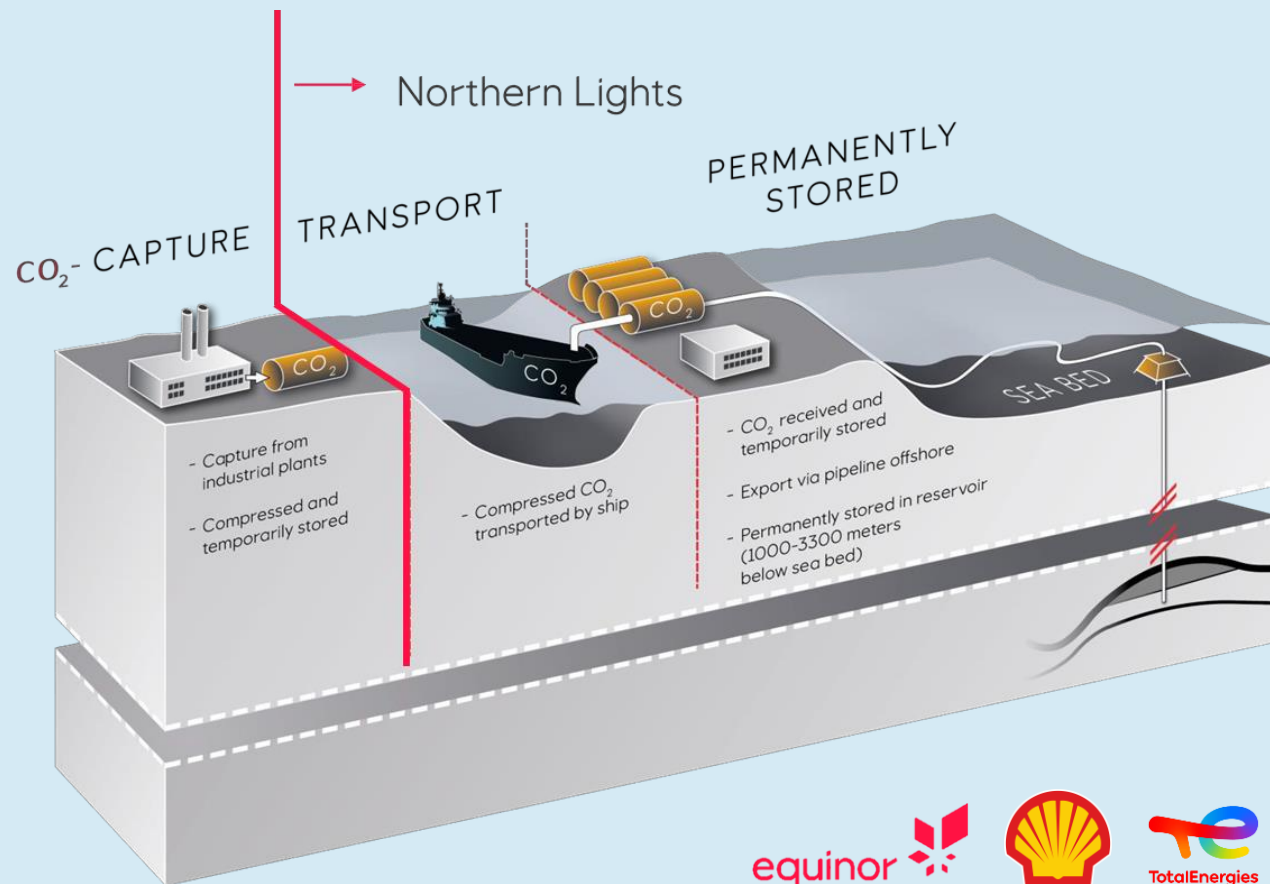


Project name	Project type	Country
Northern Lights	CO ₂ transport & storage	NO
Northern Endurance	CO ₂ transport & storage	UK
Smeaheia	CO ₂ transport & storage	NO
Bayou Bend CCS	CO ₂ transport & storage	USA
Keadby 3	Power with CCS	UK
Net Zero Teesside	Power with CCS	UK
Peterhead	Power with CCS	UK
H2H Saltend	Blue hydrogen	UK
H2H Production 2	Blue hydrogen	UK
Keadby H ₂ power station	Hydrogen fuel switch	UK
Aldbrough H ₂ storage	Hydrogen storage	UK
Clean Hydrogen to Europe	Blue hydrogen	NO
H2M Eemshaven	Blue hydrogen	NL, DE
H2BE	Blue hydrogen	BE
H2GE Rostock	Blue hydrogen/ammonia	DE
NorthH2	Green hydrogen	NL, BE, DE
AquaSector	Green hydrogen	DE
Tallgrass cooperation	Blue ammonia	USA



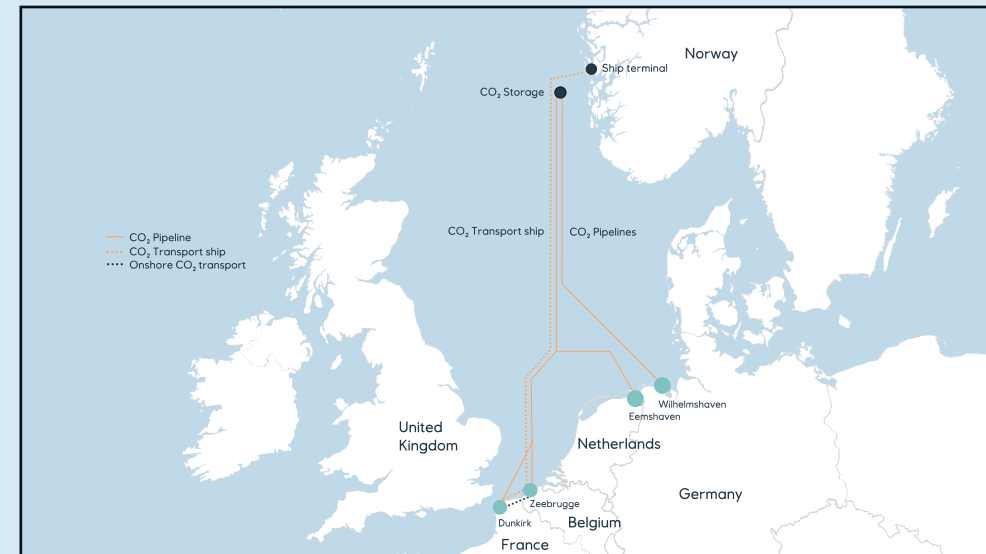
The low carbon future – roles & partnerships

- **Provider of CO₂ transport and storage solutions**



Smeaheia CO₂ transport & storage (NCS)

- Storage licence awarded Equinor 2022
- 20 mtpa storage capacity
- CO₂ pipeline can reduce transport cost significantly
- European collaboration required





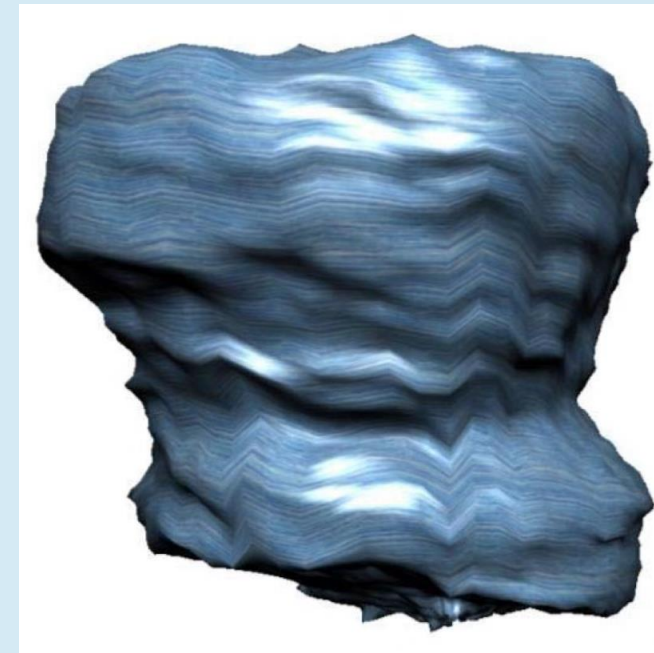
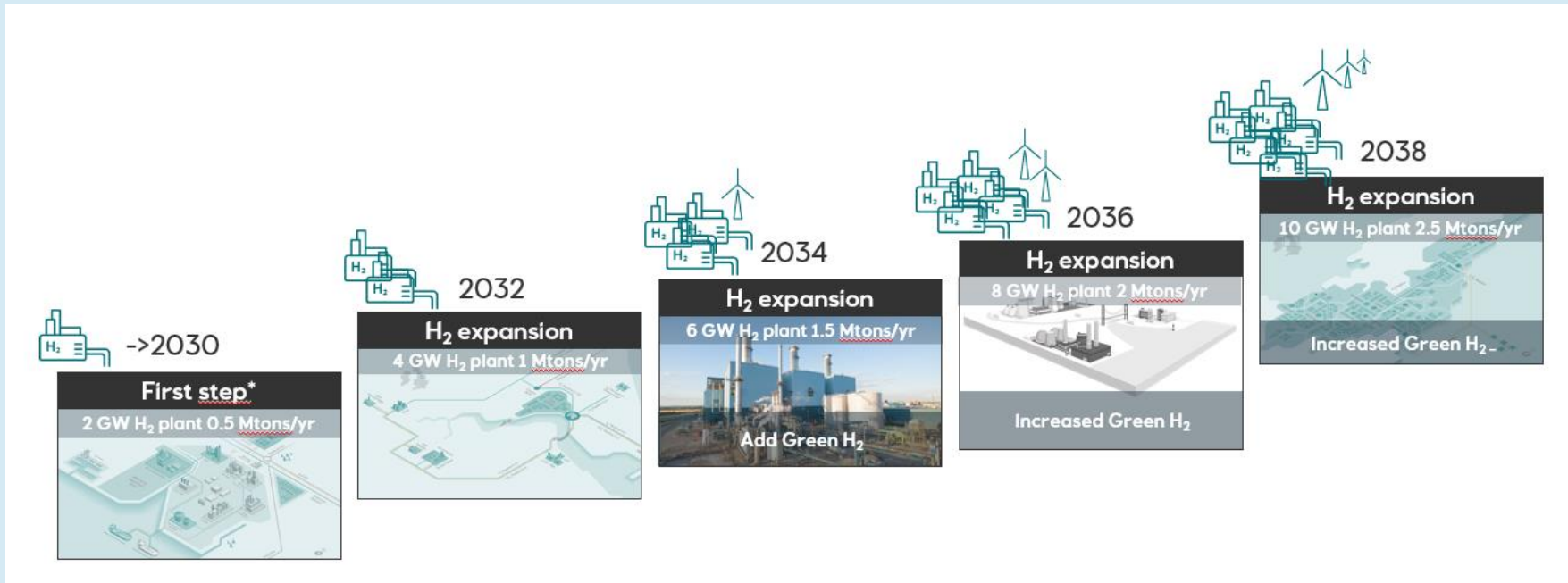
Northern Lights | First open access CO₂ T&S

The low carbon future – roles & partnerships

- Provider of CO₂ transport and storage solutions
- **Future provider of renewable & low carbon hydrogen and H₂ storage solutions**

Clean Hydrogen to Europe (CHE)
 Low carbon hydrogen production west coast Norway

Aldbrough Hydrogen Storage
 Partner: SSE Thermal (UK)



The low carbon future – roles & partnerships

- Provider of CO₂ transport and storage solutions
- Future provider of renewable and low carbon hydrogen and H₂ storage solutions
- **Part-owner in CCGT power plants that will be decarbonized**

SSE Thermal and Equinor join forces on plans for first-of-a-kind and carbon capture projects in the Humber

April 8, 2021 08:00 CEST | Last modified April 8, 2021 08:40 CEST



The Keadby 1 power station. (Photo: Stuart Nicol / SSE Thermal)

RWE AG

RWE and Equinor agree on strategic partnership for security of supply and decarbonisation



- Blue* and green** hydrogen to be transported from Norway to Germany via hydrogen pipeline, based on Equinor's ambition to produce hydrogen in Norway
- Partners to develop dedicated offshore hydrogen projects along the pipeline to gradually ramp-up the renewable hydrogen share of German imports
- Joint investment in 3 GW of hydrogen-ready CCGT capacity in Germany planned

Oslo/Essex, 5 January 2023

Anders Opedal (Equinor) and Dr Markus Krebber (RWE) agreed today on a strategic energy partnership between their companies. The agreement includes large scale projects that will contribute to the

Cooperating with ENGIE on decarbonisation of power generation

By Sverre Olden Mala - 23 May 2023 15:26



Stepha Schuncl

Director Group Communicat Affairs
T +49 (0) 201

Send e-mail



Equinor CEO Anders Opedal and ENGIE CEO Catherine MacGregor at the signing of the MoU.

Equinor and ENGIE have agreed to cooperate and explore co-investments in decarbonized thermal power production in France, Belgium and the Netherlands.

What about Ammonia in Power Generation?

The world's first carbon-free ammonia-fuelled supply vessel on the drawing board

By Vidar Hardeland - 23 jan. 2020 10:05



[Equinor]

BIGH2/Fase III – “Enabling safe, clean and efficient utilization of hydrogen and ammonia as the carbon-free fuels of the future”

Climit

HOME - NEWS - MHI AND INSTITUT TEKNOLOGI BANDUNG LAUNCH JOINT R&D FOR AMMONIA-FIRED POWER GENERATION USING GAS TURBINES IN INDONESIA

PRESS INFORMATION

MHI and Institut Teknologi Bandung Launch Joint R&D for Ammonia-Fired Power Generation Using Gas Turbines in Indonesia

2022-09-28



- Project will apply ITB's specialized expertise in chemical reaction engineering to probe
- Target set on achieving ammonia-fueled power generation testing with H-25 gas

PRESS RELEASE

GE and IHI Sign Memorandum of Understanding to Develop Gas Turbines that Can Operate on 100% Ammonia

January 18, 2023

[Mitsubishi Power](#)

The low carbon future – roles & partnerships

- Provider of CO₂ transport and storage solutions
- Future provider of renewable and low carbon hydrogen and H₂ storage solutions
- Part-owner in CCGT power plants that will be decarbonized
- **Facilitating technology qualification**
 - **Partnering to qualify fit-for-purpose technologies**
 - **Supporter of end-user technology development**
 - **Provider of test facilities => testing essential to build trust**



>40

PERCENT

R&D expenditure
to transition

Renewables and low carbon
solutions share by 2025

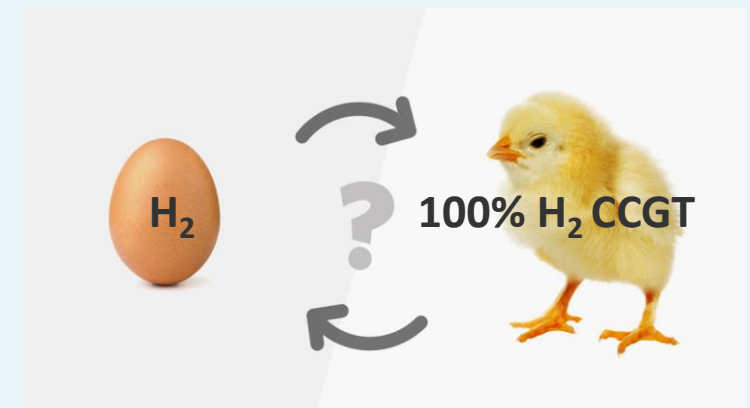


TCM – Test Center Mongstad



Key takeaways

- No single solution for decarbonization of power – several low carbon fuel options emerging
- Technology optionality required
 - Variable market needs and regulatory regimes globally
 - Both hydrogen and post-combustion CCS relevant
- Hydrogen Gas Turbines key end-user technology in enabling the hydrogen society
 - ~100% hydrogen firing is required for deep CO₂ emission reductions
- Direct NH₃ combustion being matured by some OEMs – we welcome the initiative
 - Ammonia a cost-efficient and well known H₂ carrier
- Medium/large scale testing required – collaboration key to break the chicken-and-egg dilemma





Production of Low Carbon Hydrogen & CC(U)S

Presented by:

Olaf Brekke

Advisor Rotating Equipment

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