CCS landscape in Norway

Norwegian solutions and opportunities for cooperation

Polish-Norwegian CCS Network

Eirik Melaaen

Krakow

1st February 2024

Iceland Liechtenstein Norway grants

Norway grants

Norwegian Energy Partners

This is Norwegian Energy Partners

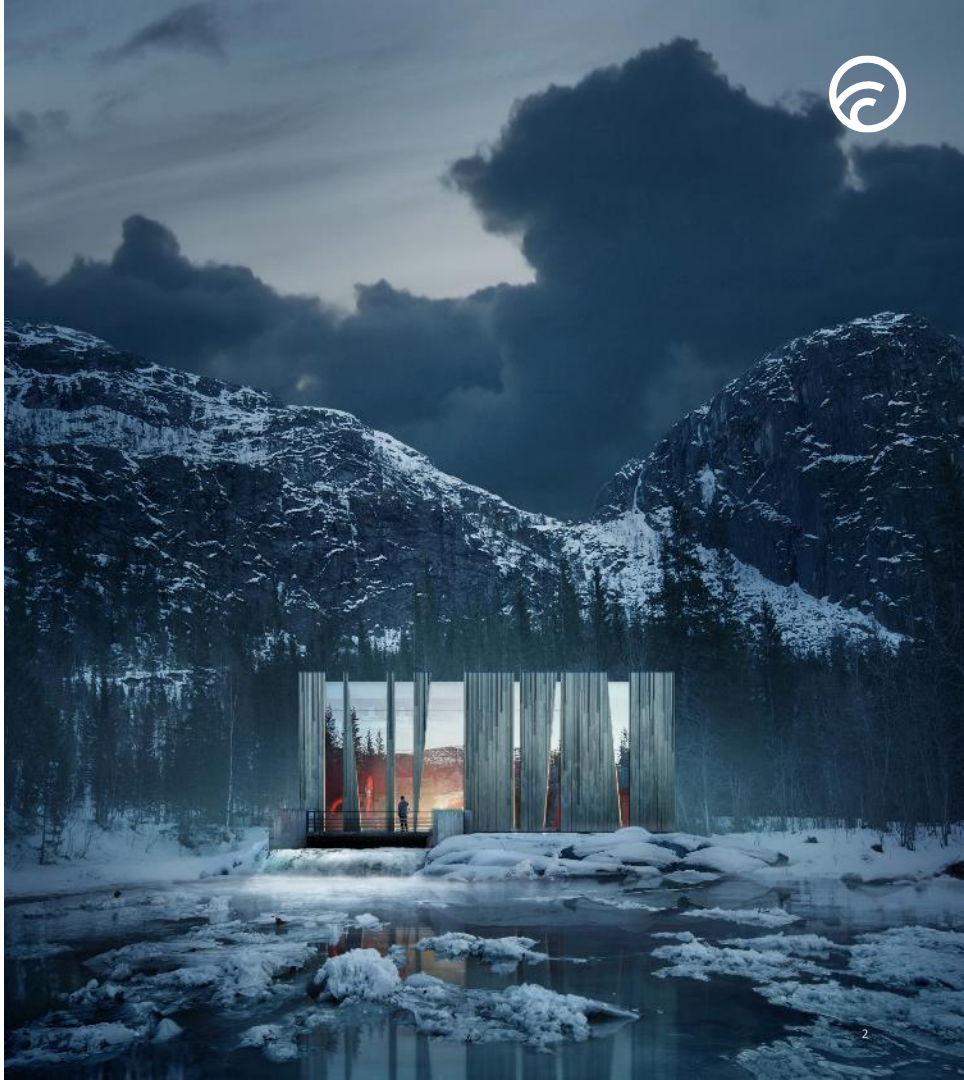
Norway is a country with fantastic energy resources.

For more than a century we have built our country on developing energy solutions in a sustainable way within a wide range of areas, from upstream and midstream oil & gas to energy systems, offshore wind, hydropower and solar energy.

Now we are promoting Norwegian energy capabilities in international markets.
Norwegian Energy Partners is providing solutions for global energy needs.

Agenda:

- Norwegian Energy Partners (NORWEP)
- Norwegian CCS history
- The Norwegian policy instruments
- Competence from oil & gas activities
- CCS concepts and projects
- CCS suppler industry



Who are we?

- Independent non-profit foundation
- 25 FTE and 24 local country advisors
- Established to strengthen Norwegian international business activities and exports
- We have more than 340 partners/company members from the Norwegian offshore, energy and maritime industries.

What do we do?

Market Intelligence - Provide market and project information to NORWEP partners and Norwegian industry at large

Technologies & Solutions - Map Norwegian competence and technology to fit needs of the energy industry

Create relevant **dialogue** between Norwegian industry and international partners and clients.

Founders

Organisations
- Energy Norway
- Federation of Norwegian Industries
- Norwegian Oil and Gas Association
- Norwegian Shipowners' Association
- The Norwegian Confederation of Trade Unions

Norwegian Government
- Ministry of Petroleum and Energy
- Ministry of Trade and Industry
- Ministry of Foreign Affairs

Industry
- Equinor
- Statkraft

Norway's sustainability legacy

- Early mover; CO2 tax introduced in 1991
- Strong political consensus towards sustainability

Norwegian Prime Minister Gro Harlem Brundtland – UN commission 1987

"…realise a cost-effective solution for full-scale CCS in Norway, provided that this incite technology development in an international perspective."

UN sustainable development goals

Norway has committed to cutting greenhouse gas emissions by 50-55 percent by 2030.

Norwegian Shipowners' Association – cut climate emissions by 50% per unit by 2030, new ships zero-emission technology from 2030, climate-neutral fleet from 2050, international ban on non-climate-neutral fuels from 2050

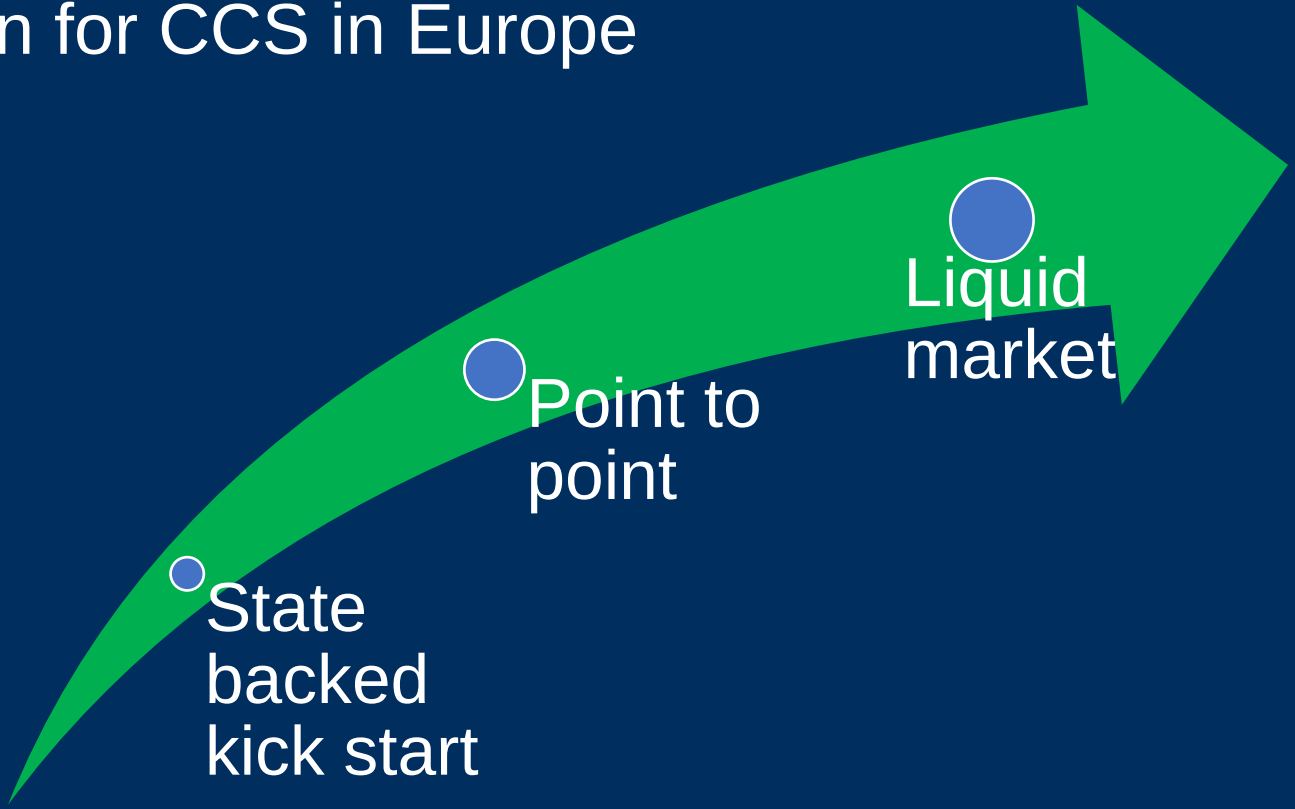
Equinor – The goal is to achieve carbon-neutral global operations by 2030, and be a net-zero energy company by 2050

LowEmission - Research Center for low-emission technology for petroleum activities on the Norwegian continental shelf (NCS)

The government's main objectives for CCS

- Speed up deployment of CCS globally
- New green industry
- Facilitate commercial CO_2 storage and CO_2 capture in Norway

Vision for CCS in Europe



Gassnovas mission:

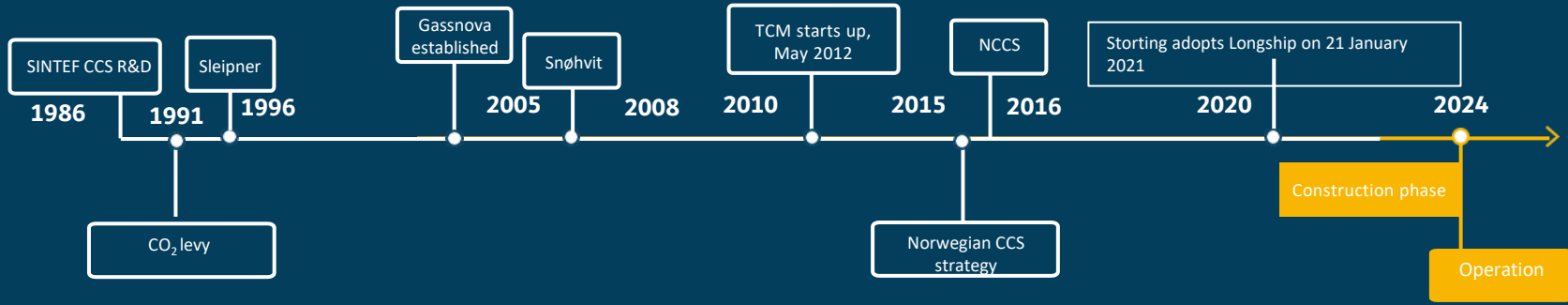
Facilitate development of technology and competence to ensure cost efficient CCS solutions.

Advise the Ministry of Petroleum and Energy related to Industrial Carbon Management.

GASSNOVA

Norway has > 25 years of successful CO_2 storage

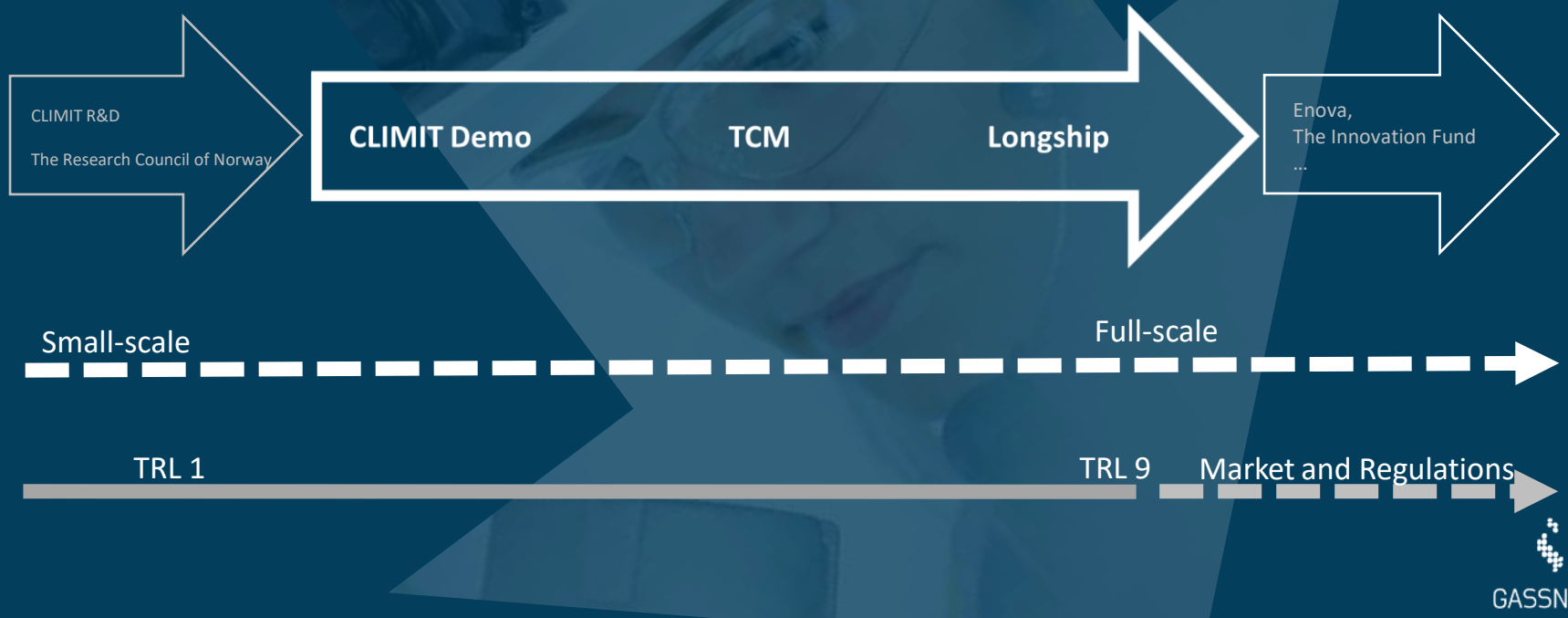
Government recognizes CCS as a key instrument to combat climate change



And nearly 40yrs of CCS experience

GASSNOVA

The uniqueness about Gassnova´s setup



GASSNOVA

TECHNOLOGY CENTRE MONGSTAD

- catching our future

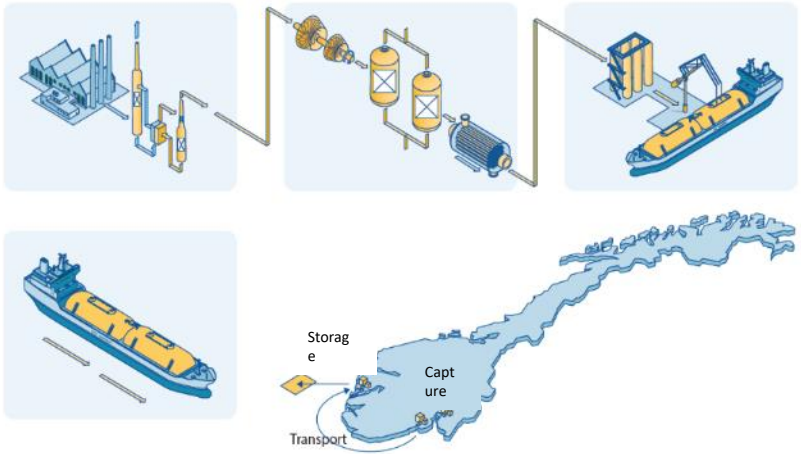
TCM helps players in various industries to adopt technologies that will enable them to achieve their goals for reducing carbon emissions.

- **The world's largest and most flexible test facility for CO2 capture**
- Sharing expertise, knowledge and experience
- Owners: Gassnova, Equinor, Shell, TotalEnergies

GASSNOVA

Gassnova-expertise at every stage of the CCS value chain

Capture
- Technology types
- Integration with sources
- Project maturation
- Cost estimates
- Industrial application
- Building and operating of facilities



CCS
- Project maturation
- Cost estimates
- Technological risk
- HSE related to CCS
- Government processes
- Regulatory matters
- Overview of operators: R&D, suppliers and end users
- National and global CCS networks

Transport
- Logistics
- Transportation of ships and piping
- Material requirements/corrosion
- Design tools
- Flow modelling
- CO_2 specification requirements

Storage
- Storage options
- Monitoring technologies
- Leak risk
- Injection wells
- Reservoir modelling for CO_2 movement

Gassnova's expertise represent Norwegian supplier capabilities

Gassnova - established by the Norwegian authorities to development of technologies and knowledge related to carbon capture and storage (CCS)

CLIMIT: The national programme for research, development and demonstration of technology for CCS

CLIMIT's primary goal is to contribute to the development of CCS technology and solutions, and to reduce the costs and risks for those adopting this technology.

Powered by Gassnova and the Research Council of Norway.

The Research Council of Norway

GASSNOVA

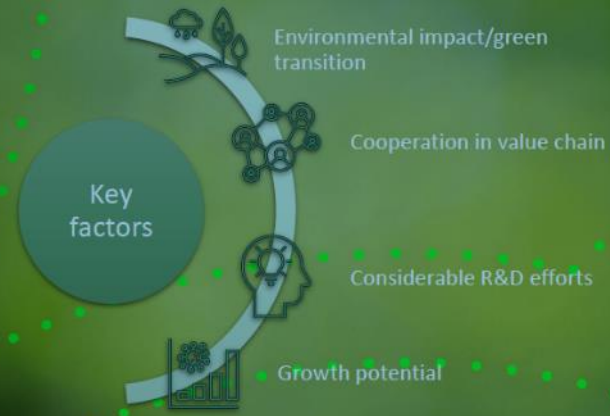
ENOVA Forskningsrådet Innovasjon Norge Siva

Green platform Initiative

The objective is to trigger opportunities for green value creation through major projects. They should comprise the whole value chain from research and knowledge production to testing, commercialisation and industrialisation of sustainable, green products and services.

What we want to achieve

- ✓ Long term value creation and export
- ✓ Significant improvements to climate and environment
- ✓ Development of new business and green value chains
- ✓ Cooperation between business and research
- ✓ Increased know-how and employment



Useful info on 2022 call

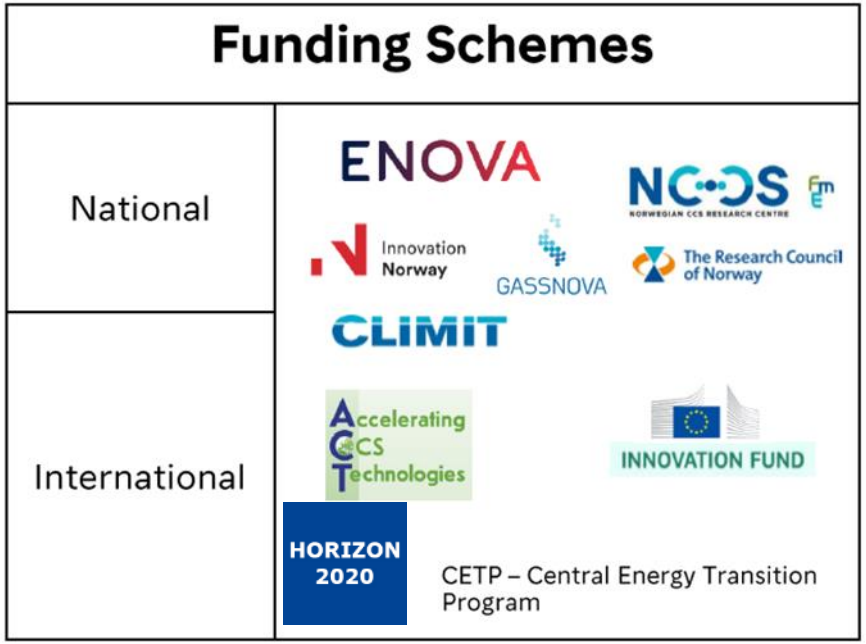
- Total allocation of MNOK 775
- Project grant of MNOK 30-80
- Project outline to be sent by May 4th
- Main application deadline in September
- Min 3 Norwegian entities in consortium
- Foreign businesses may participate in consortium, but will not receive funding

Projects awarded grant in 2021 call

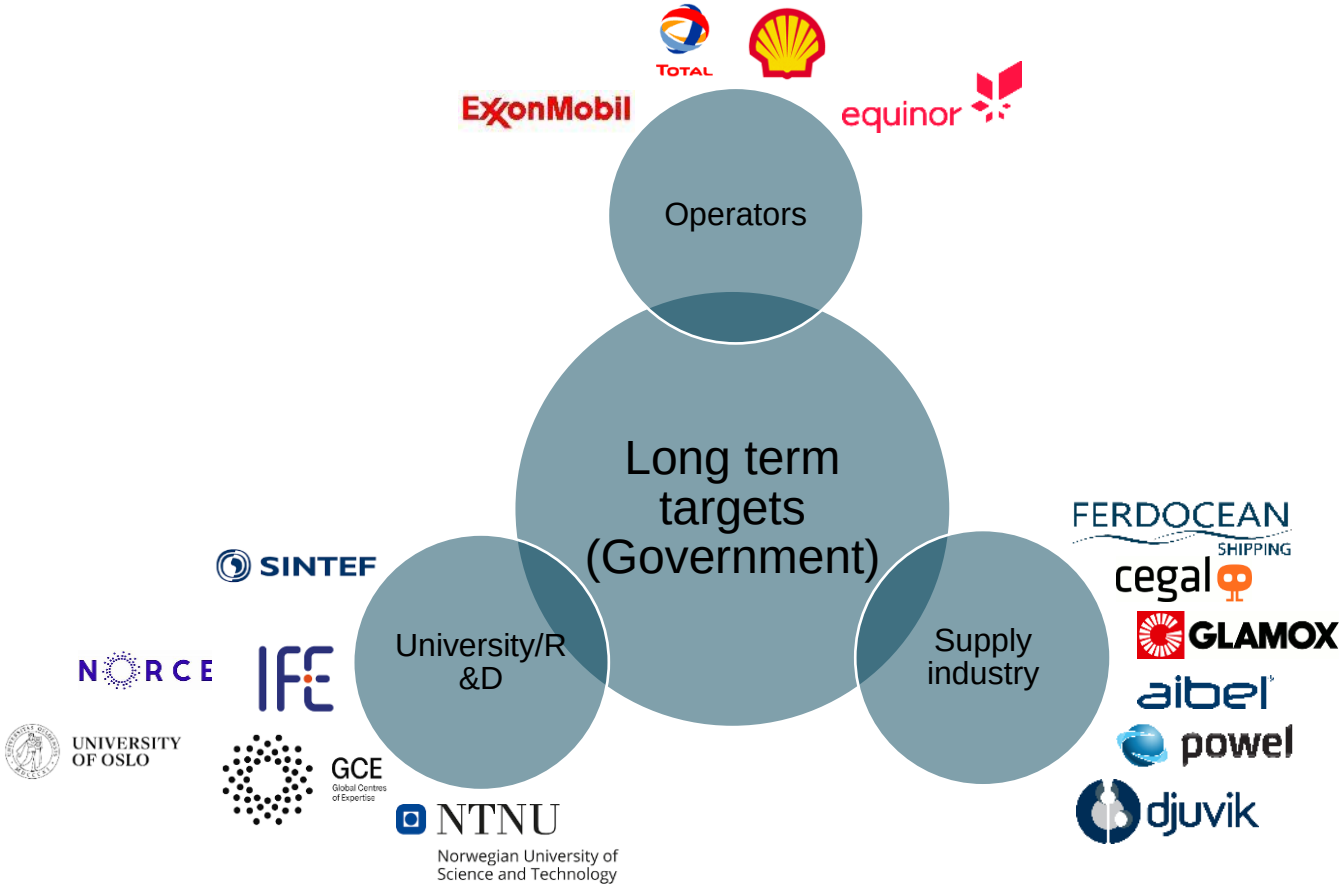
Project	Project responsible	Grant [MNOK]
Low-emission value chain for offshore aquaculture	BLUE PLANET AS	93,0
Green Platform Ocean Grid: Grid solutions for offshore wind	EQUINOR ENERGY AS	82,7
ZeroKyst: Zero emission fishing vessels and infrastructure	SELFA ARCTIC AS	120,0
Developing a new sustainable salmon food chain	FINNFJORD AS	93,3
Carbon Links (LINCCS): Permanent carbon storage on continental shelf	AKER SOLUTIONS AS	111,0
Norwegian Battery Packing Network	KONGSBERG KLYNGEN AS	51,7
sirkTRE: Establish fully circular value chain for lumber industry	OMTRE AS	105,7
AluGreen: Recycling of scrap aluminium	Norsk Hydro ASA	76,9
Hybrid solar and hydro power	SCATEC ASA	78,9
Ammonia fuel bunkering network: Solutions for maritime sector	ECONNECT ENERGY AS	89,1
Fra wood to biobased polymer production	NORSKE SKOG SAUGBRUGS AS	59,4
Sustainable Materials for the Battery Value Chain (SUMBAT)	Elkem ASA	105,8
Total		**1 067,7**

Funding and support in Norway

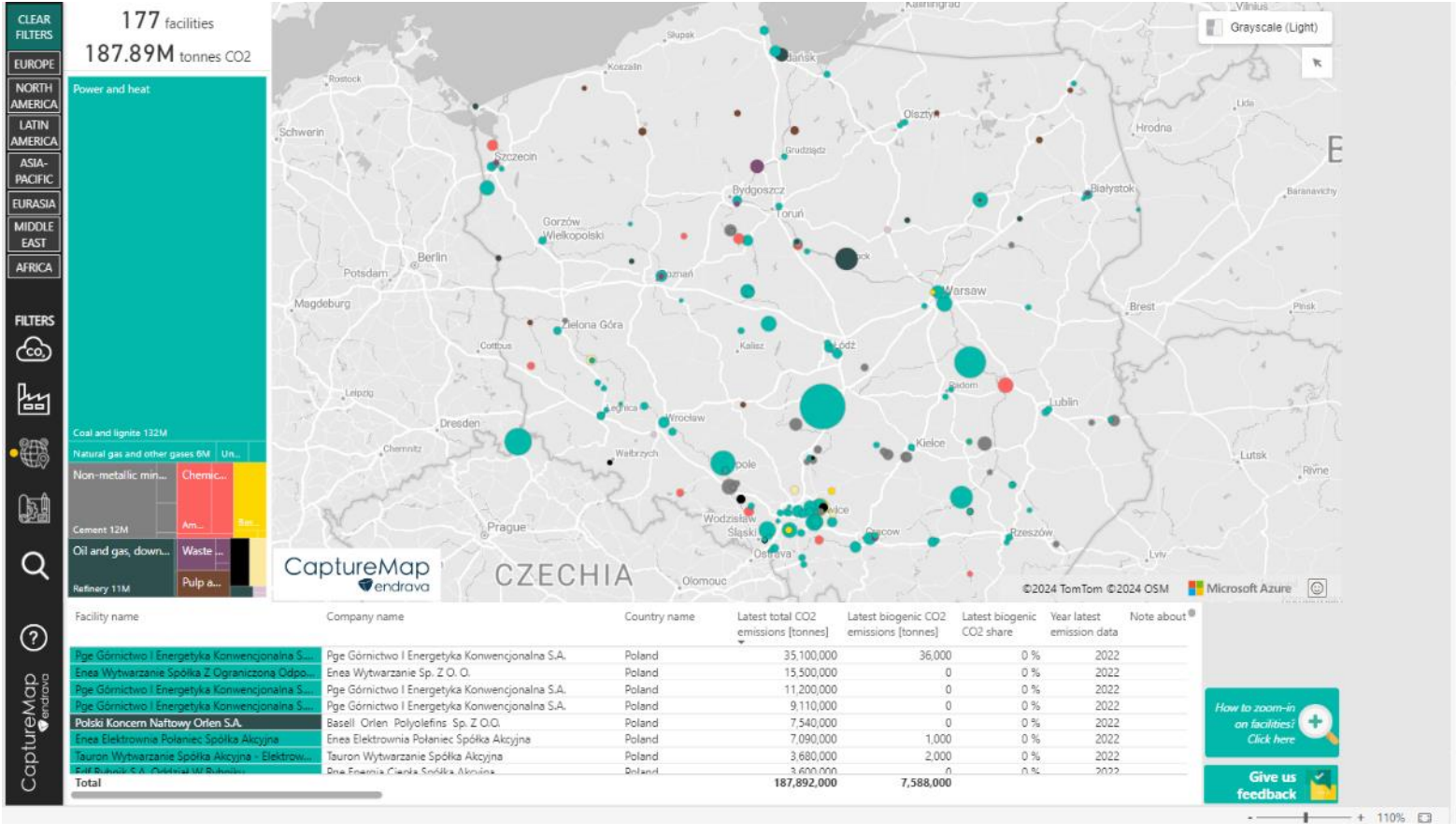
- Enova
- The Research Council of Norway (forskningsradet.no)
  - E.g The Green Platform Initiative (forskningsradet.no)
- CLIMIT - a national research program for CCS technologies
- Gassnova - Norwegian state enterprise for CCS industrial
- Home (innovasjonnorge.no)
- ACT (act-ccs.eu)
- Innovation Fund - European Commission (europa.eu)
- About us | CETPartnership
- etc



The Norwegian model



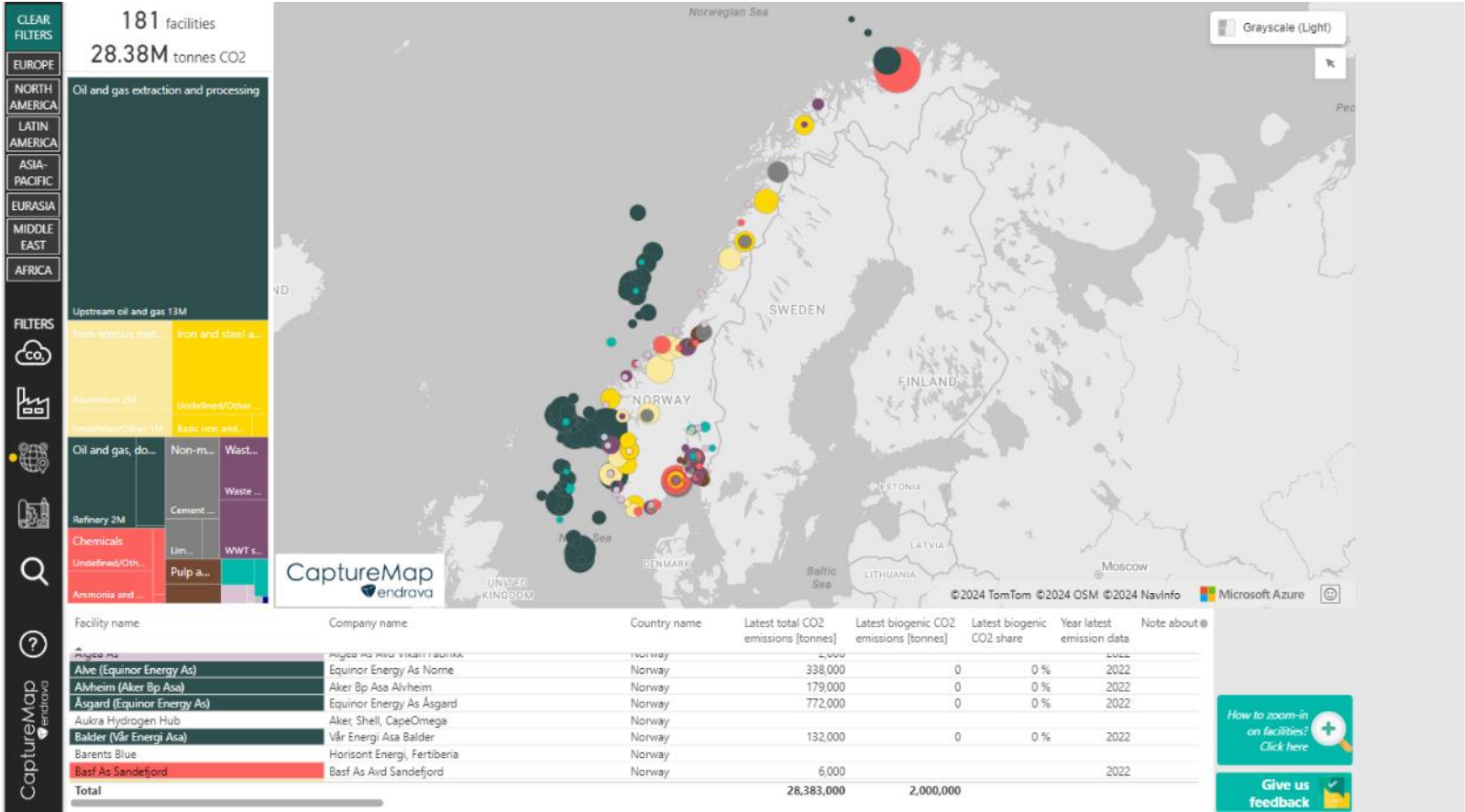
Emission Poland – Capture Map



Facility name	Company name	Country name	Latest total CO2 emissions [tonnes]	Latest biogenic CO2 emissions [tonnes]	Latest biogenic CO2 share	Year latest emission data	Note about
Pge Górnictwo I Energetyka Konwencjonalna S....	Pge Górnictwo I Energetyka Konwencjonalna S.A.	Poland	35,100,000	36,000	0 %	2022	
Enea Wytwarzanie Spółka Z Ograniczoną Odpo...	Enea Wytwarzanie Sp. Z O. O.	Poland	15,500,000	0	0 %	2022	
Pge Górnictwo I Energetyka Konwencjonalna S....	Pge Górnictwo I Energetyka Konwencjonalna S.A.	Poland	11,200,000	0	0 %	2022	
Pge Górnictwo I Energetyka Konwencjonalna S....	Pge Górnictwo I Energetyka Konwencjonalna S.A.	Poland	9,110,000	0	0 %	2022	
Polski Koncern Naftowy Orlen S.A.	Basell Orlen Polyolefins Sp. Z O.O.	Poland	7,540,000	0	0 %	2022	
Enea Elektrownia Połaniec Spółka Akcyjna	Enea Elektrownia Połaniec Spółka Akcyjna	Poland	7,090,000	1,000	0 %	2022	
Tauron Wytwarzanie Spółka Akcyjna - Elektrow...	Tauron Wytwarzanie Spółka Akcyjna	Poland	3,680,000	2,000	0 %	2022	
Total			187,892,000	7,588,000			

- Power & heat
- Non-metalics minerals
- Oil & gas, downstreams
- Chemicals
- Iron, steel ferro-alloys

Emission Norway – Capture Map



Facility name	Company name	Country name	Latest total CO2 emissions [tonnes]	Latest biogenic CO2 emissions [tonnes]	Latest biogenic CO2 share	Year latest emission data	Note about
Alve (Equinor Energy As)	Equinor Energy As Norne	Norway	338,000	0	0 %	2022	
Alvheim (Aker Bp Asa)	Aker Bp Asa Alvheim	Norway	179,000	0	0 %	2022	
Åsgard (Equinor Energy As)	Equinor Energy As Åsgard	Norway	772,000	0	0 %	2022	
Aukra Hydrogen Hub	Aker, Shell, CapeOmega	Norway					
Balder (Vår Energi Asa)	Vår Energi Asa Balder	Norway	132,000	0	0 %	2022	
Barents Blue	Horisont Energi, Fertiberia	Norway					
Basf As Sandefjord	Basf As Avd Sandefjord	Norway	6,000			2022	
Total			28,383,000	2,000,000			

- Oil & gas extraction and processing
- Non-ferrous metals
- Iron, steel ferro-alloys
- Oil & gas, downstreams
- Non-metalics minerals
- etc

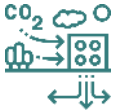
The CCS business model is being developed now – no market pricing standard yet

The EU ETS price - US IRA-tax - CfD - or regulations - need to be large enough to cover the cost in the value chain

~ 30 -250+
USD/t of CO_2 captured

Hard-to-abate industries

Carbon capture



5-20 USD/t of CO_2 captured
Blue H_2 and NH_3

40-100 USD/t of CO_2 captured
BECSS

? USD/t of CO_2 captured
Natural gas power plants with CCS

~ 15 – 30
USD/t of CO_2 transported

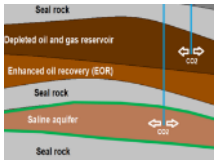
Carbon transport

Temporary Carbon storage & liquefication

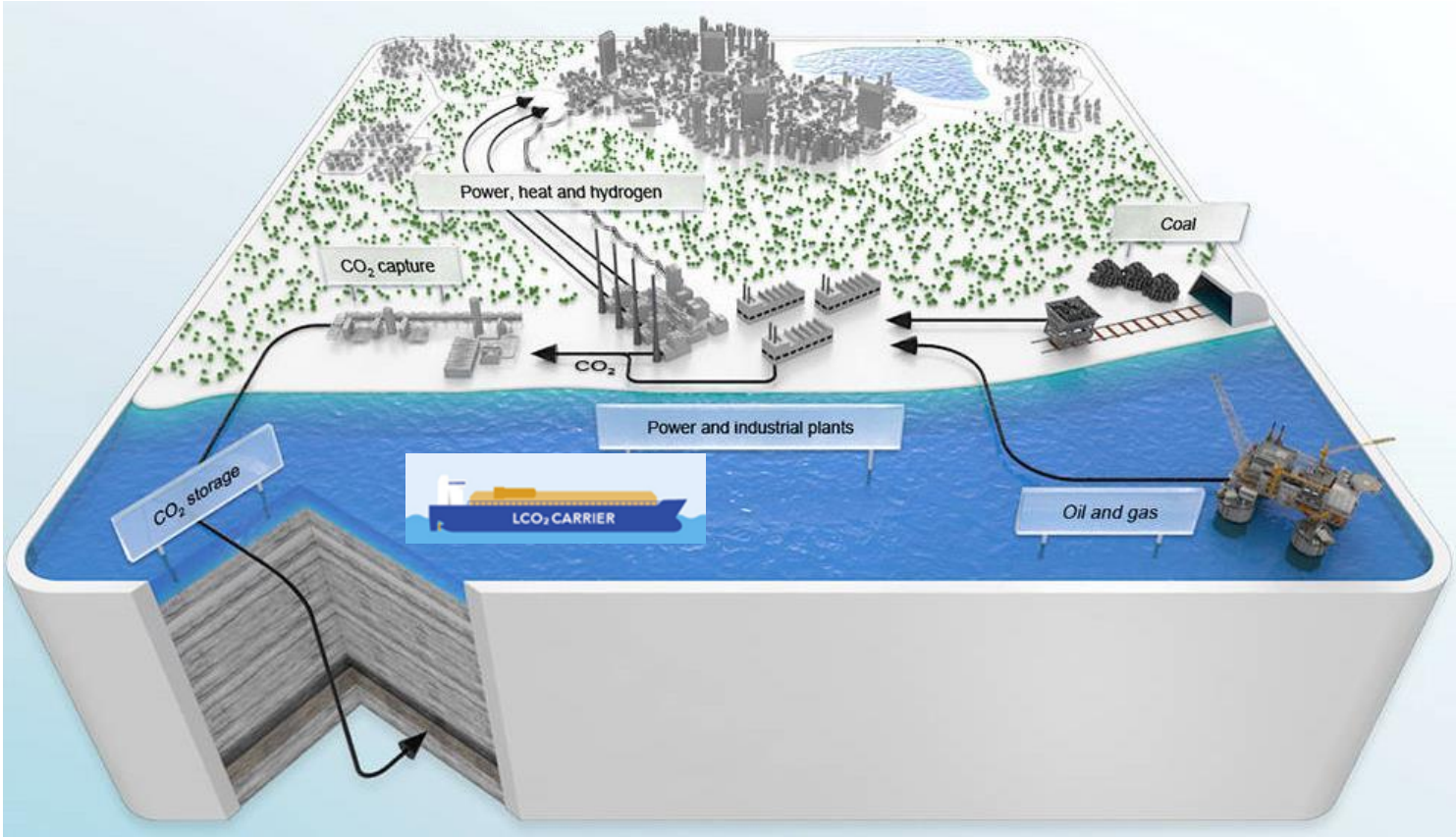
Carbon transport to long term storage

~ 25 – 40
USD/t of CO_2 stored

Long term storage



Norwegian carbon capture & storage (CCS) competence



CO2 Value chain

- Carbon capture
- Carbon transportation
- Carbon storage
- Carbon utilization

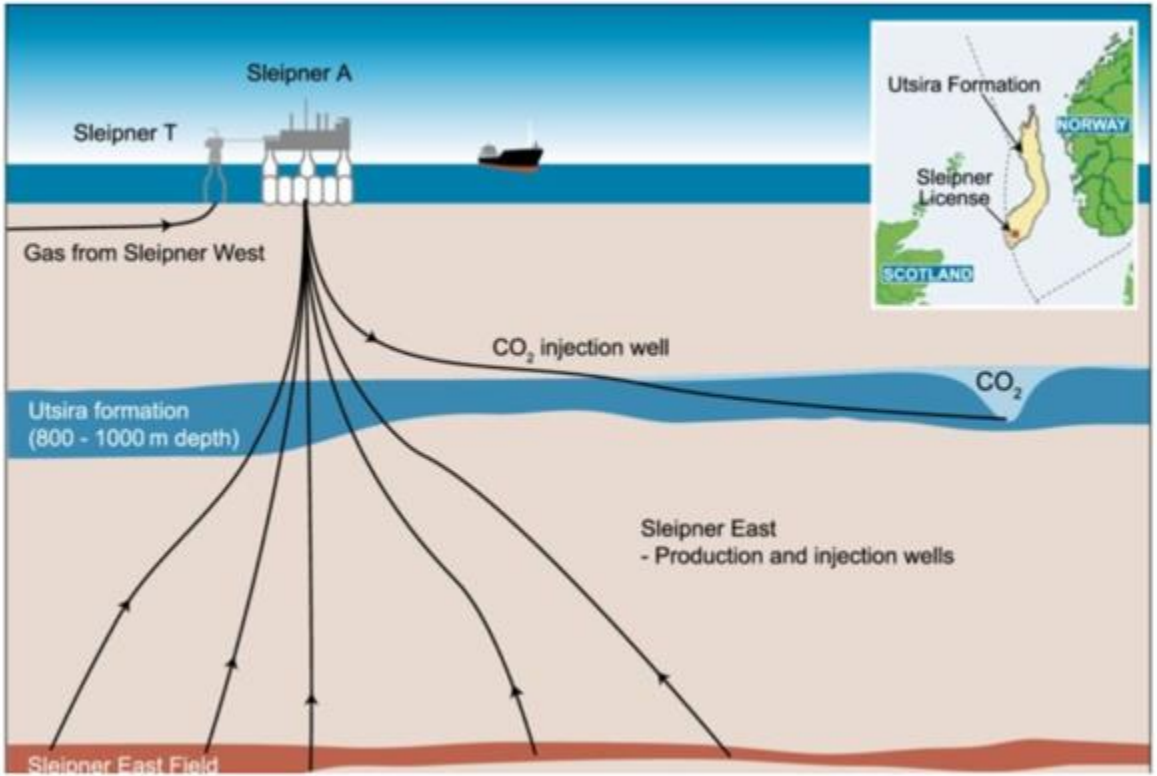
Offshore competence

- Geoscience & reservoir
- Well construction & operations
- Subsea systems & marine operations
- Platform, floating production systems & onshore plants

Source: Norwegian Petroleum
https://www.norskpetroleum.no/en/environment-and-technology/carbon-capture-and-storage/

Carbon Capture & Storage

- Known technology since 1920's in US for EOR
- Discussed permanent storage since 1977
- Norway: First industry scale & commercial project: Sleipner Project
  - By Equinor (Statoil) in 1996
  - Cost of Norway – North Sea
  - Capture from natural gas processing; injection into saline aquifer
  - 0.9 MTPA since 1996 – total > 20 MT
  - Driven by the national CO2 tax imposed in 1991 (~50 US$/ton)

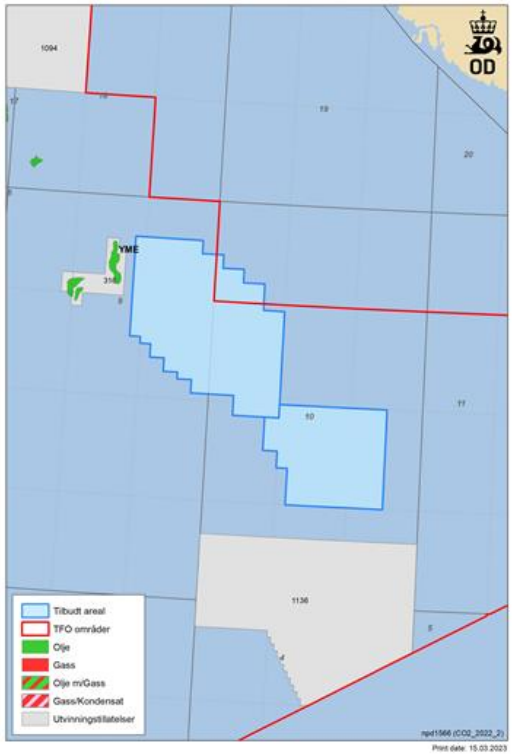


New licences for CO_2 storage

3 new exploration licences in 2023

3 new exploration licences in 2022

If the companies reach their targets, there is potential for storing 40 MT CO_2 annually from 2030



Some projects:

- Northern Lights
- Barents Blue/Polaris
- Smeheia
- Cape Omega & Wintershall DEA
- *Stella Maris CCS (Havstjerne)*
- *Errai*

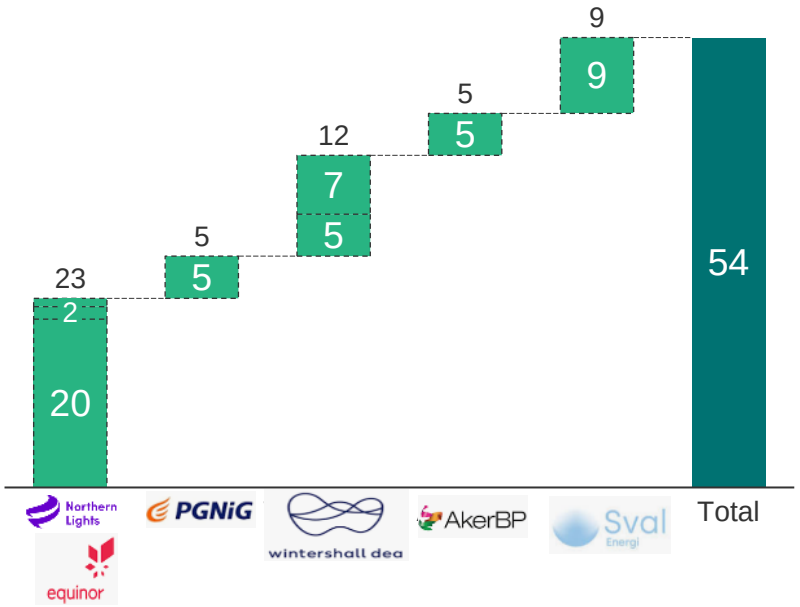
Storage licenses to the Sleipner East-field in the North Sea (august 2023):

- Neptune Energy Norge
- Storegga Norge
- Sval Energi

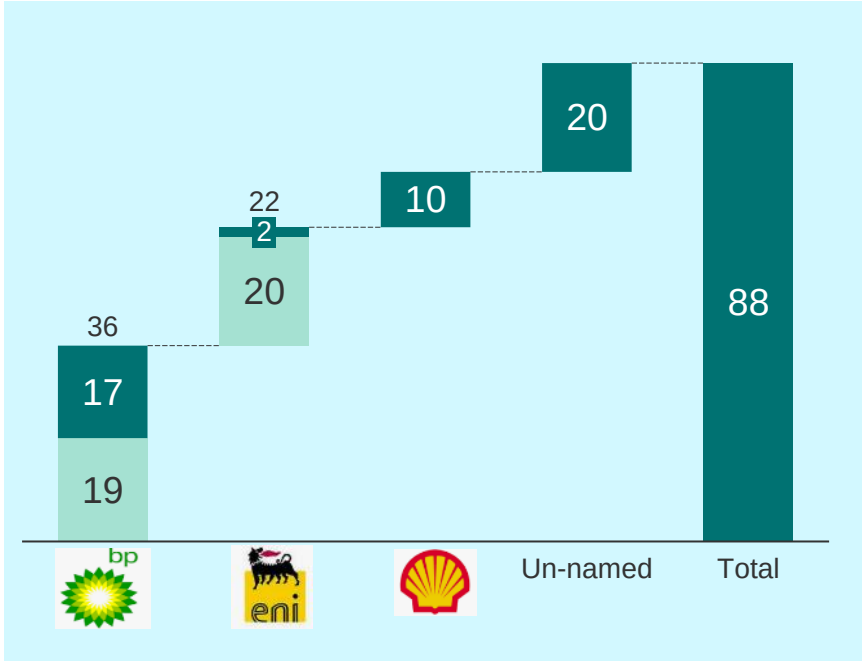
CO_2 Geological Storage projects per operator in Norway and UK

Plans for almost 50% of minimum required CO_2 storage for Europe

NCS storage capacity growth by operator, Mtpa



UKCS storage capacity growth by operator, Mtpa



The concession system on the NCS (on demand) is different from the UKCS (rounds)

How Equinor develops CCS

Equinor ambition

15-30

MILLION TONNES / ANNUM

CO_2 transport and storage capacity by 2035

Equinor share

Building on Northern Lights and over 27 years of CO_2 storage in the North Sea

Cost down by bringing scale

Market opener

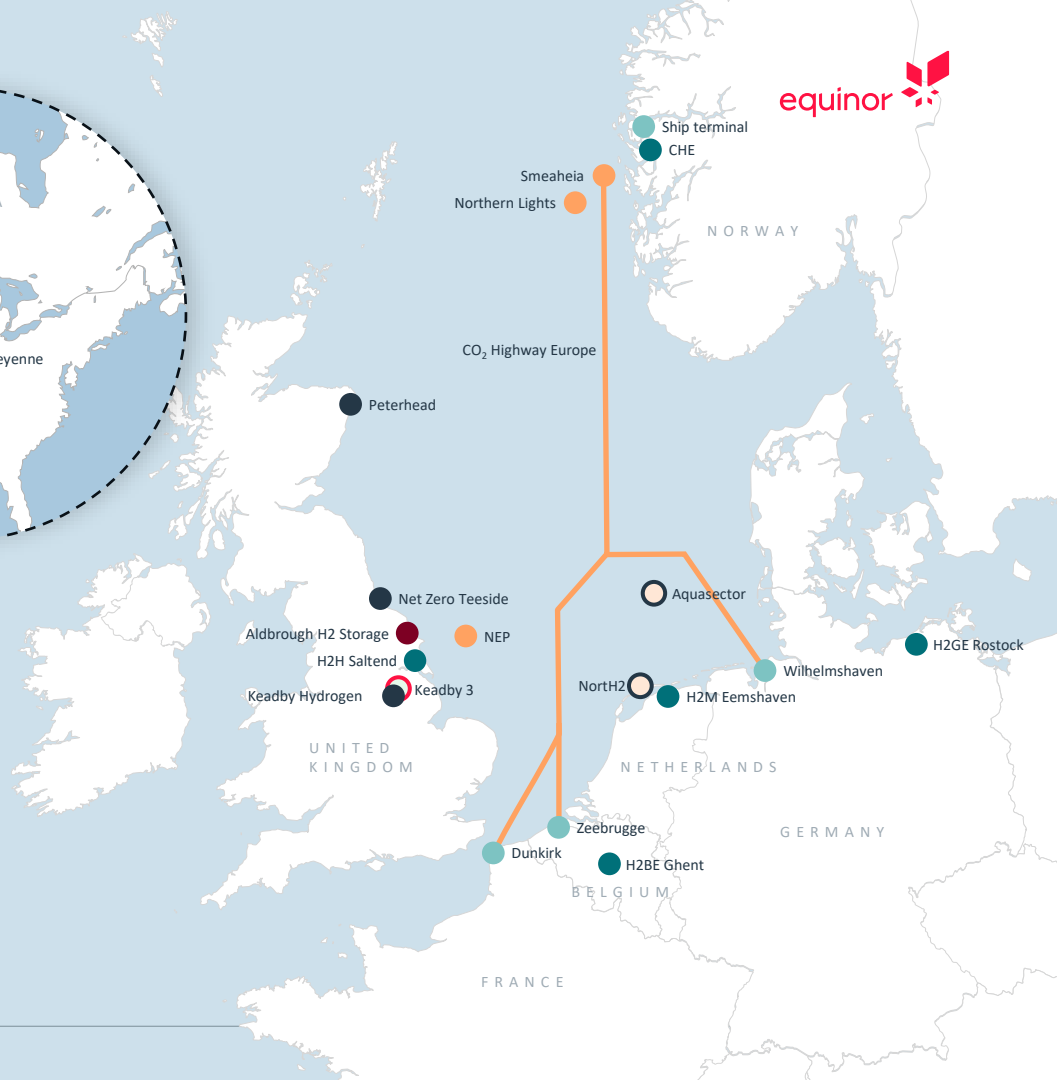
Operation experience – technology works!

1996	2008	2024	2026	2028-2030
Sleipner	Snøhvit	Northern Lights	Northern Endurance Partnership	Smeaheia

PORTFOLIO

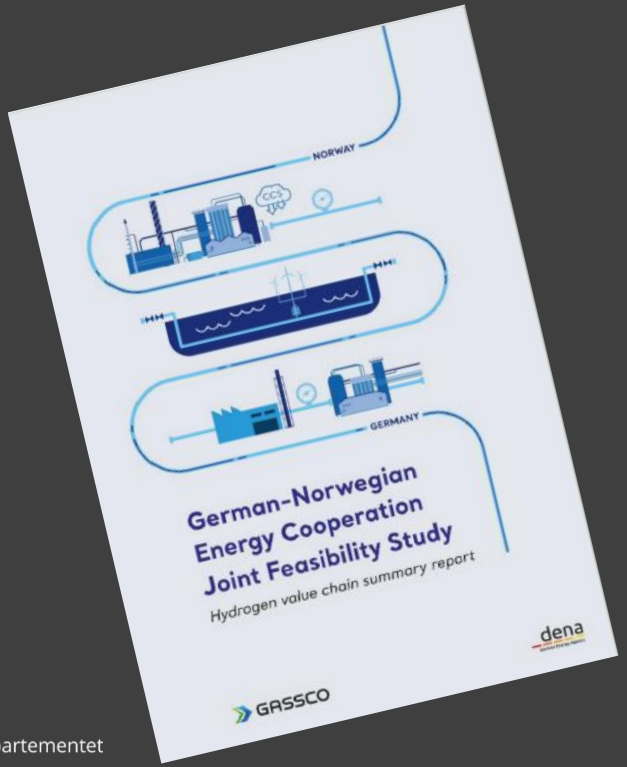
Global CCS & hydrogen portfolio

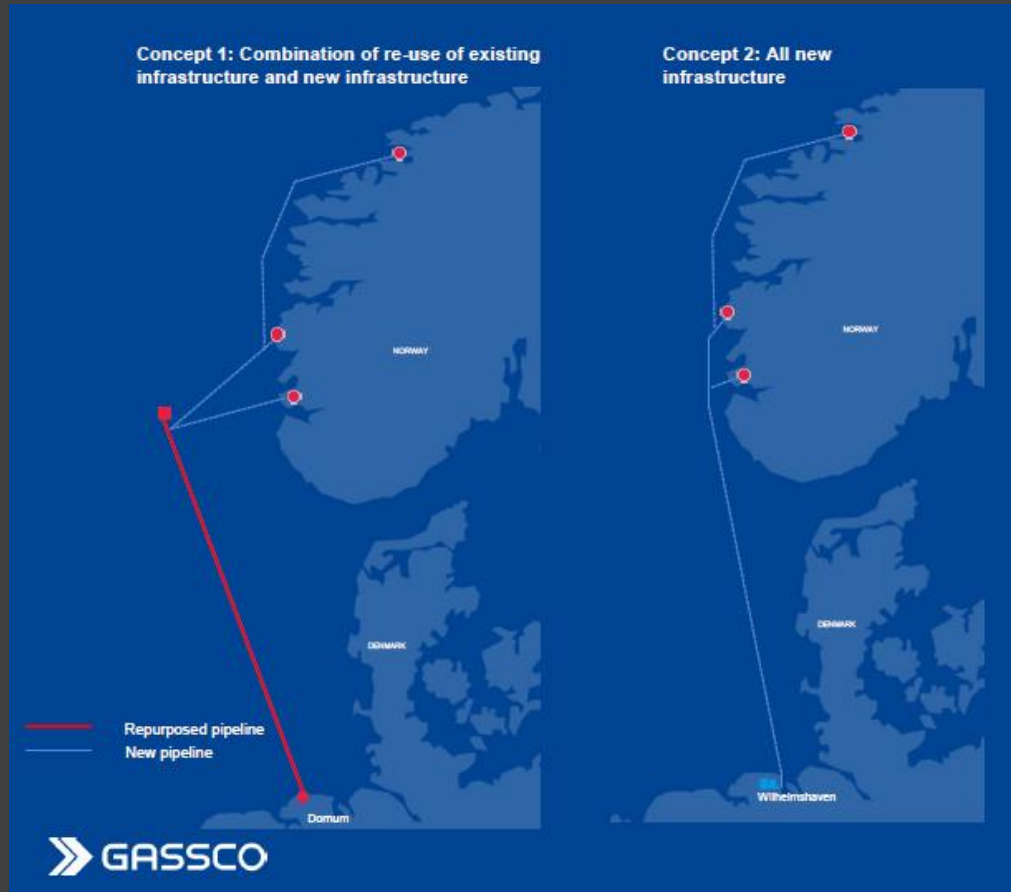
- Northern Lights
- Northern Endurance Partnership (NEP)
- Smeaheia
- CO_2 Highway Europe
- H2H Saltend
- Aldbrough H2 storage
- Net Zero Teesside
- Keadby 3
- Peterhead
- Keadby Hydrogen Power Station
- AquaSector
- H2GE Rostock
- NorthH2
- H2M Eemshaven
- H2BE Ghent
- Clean Hydrogen to Europe (CHE)
- Cheyenne
- Bayou Bend



- Landing point
- CO_2 transport & storage
- Blue hydrogen
- Green hydrogen
- Power + CCS
- Hydrogen storage
- Hydrogen to power
- Blue ammonia

Norwegian-German hydrogen cooperation
Feasibility study





Olje- og energidepartementet

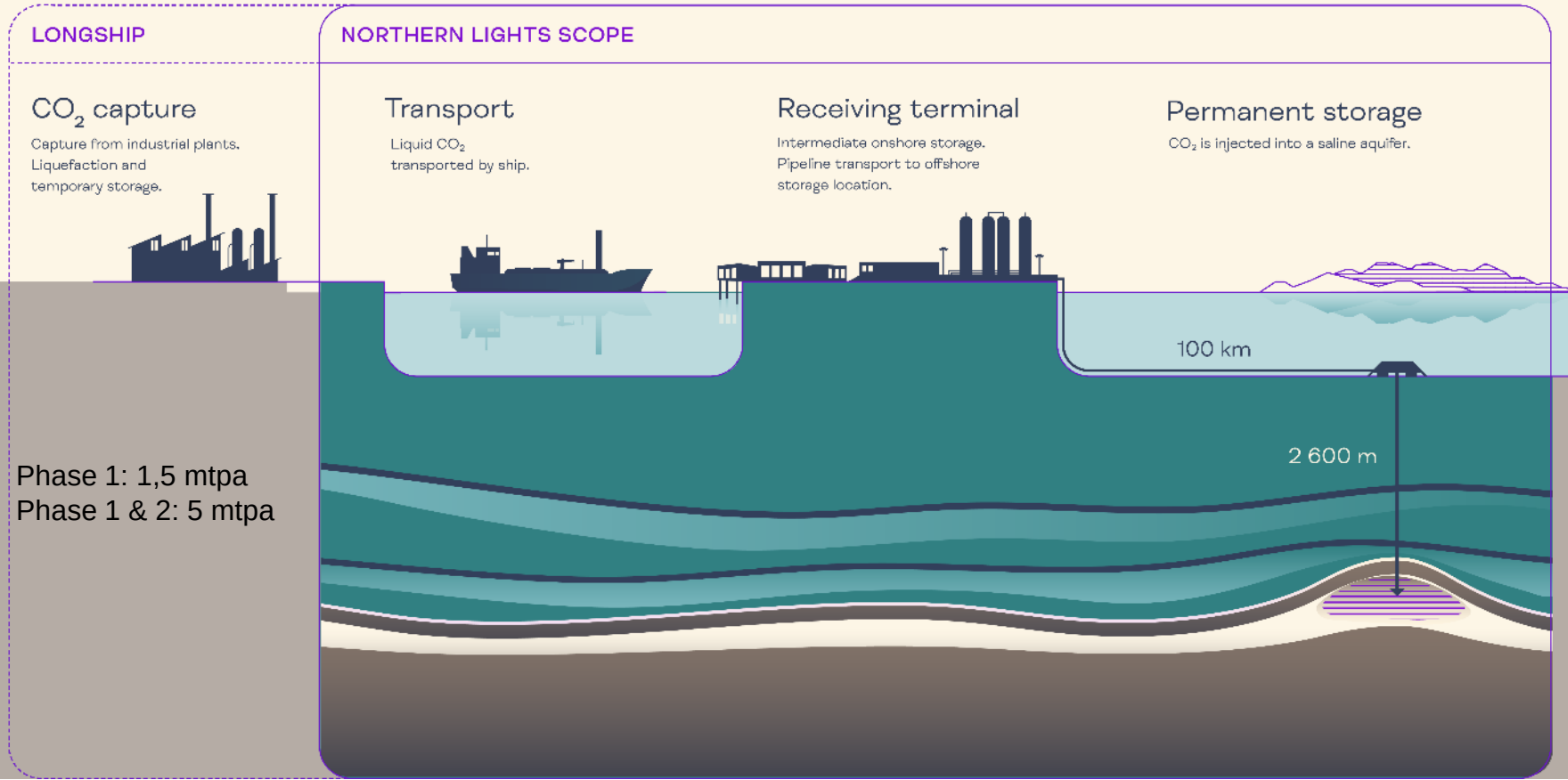
Northern Lights
CO_2 transport and storage at scale

LONGSHIP

Is a first-of-a-kind CCS project.
Construction started in 2021

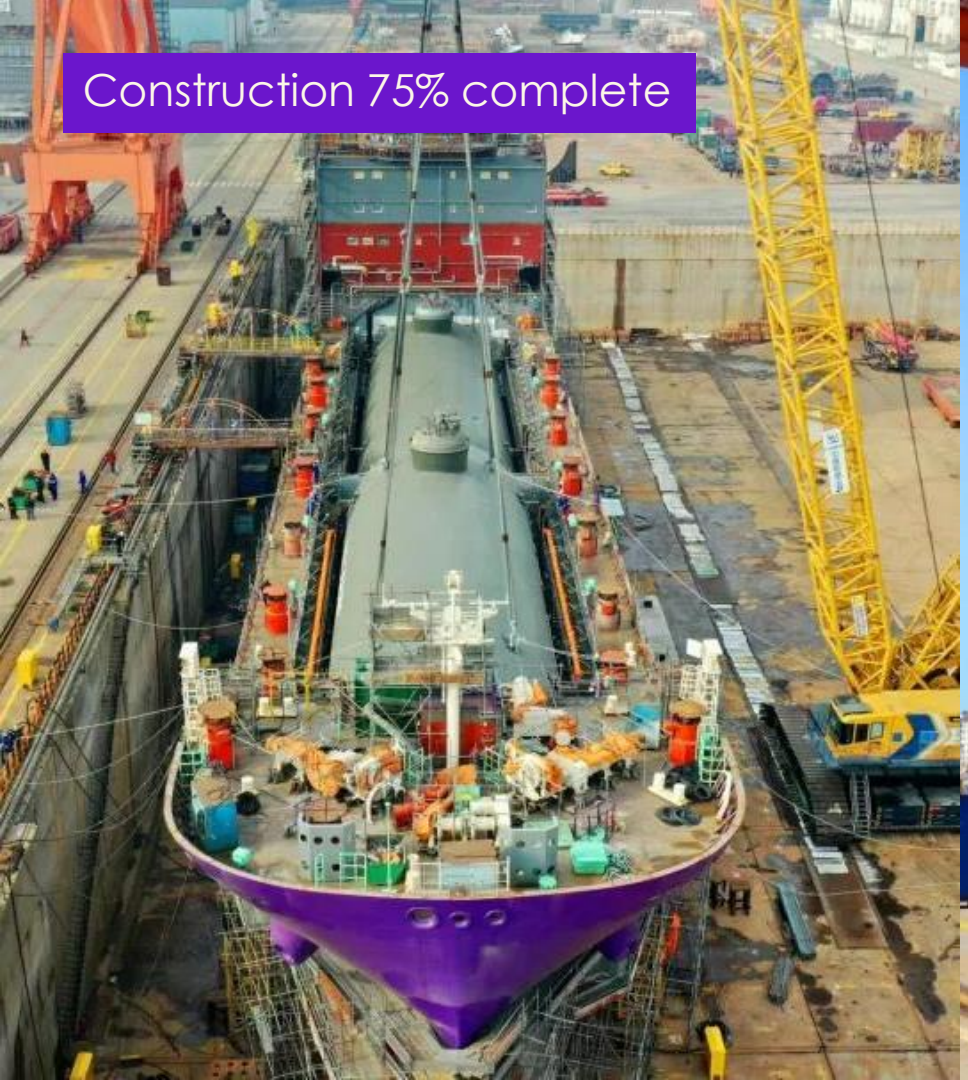
- Demonstration of a full-scale CCS chain, based on hard-to-abate industries
- Application of EU - and Norwegian regulations on industrial scale CCS projects
- Including both biogenic– and fossil-based CO_2
- Establishing flexible transport (ship based) and an open-source infrastructure
- Aimed at catalyzing CCS market development in Europe, including cross-border CCS chains
- Ship – enabling access to industrial emmiters all over Europe (scaled to marked demand)

Longship versus Northen Lights



Phase 1: 1,5 mtpa
Phase 1 & 2: 5 mtpa

Construction 75% complete



Dalian shipyard, January 2024

Onshore facilities

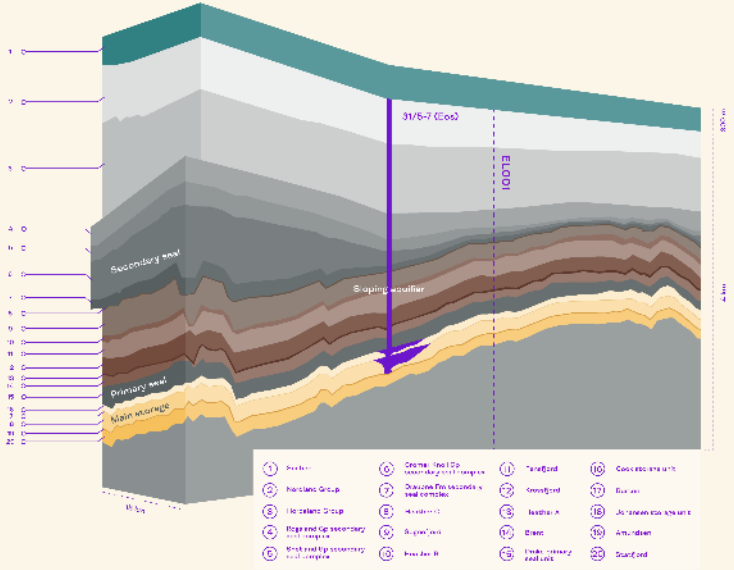
A vision turning into reality – ready to receive CO_2 from Europe in 2024

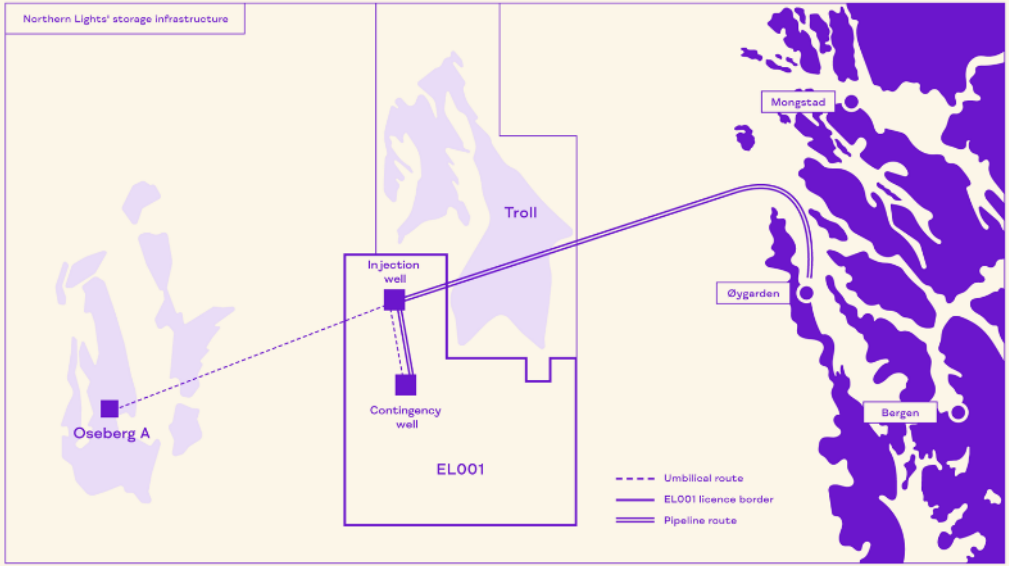
Construction on schedule and cost – 95% complete

Onshore facilities Øygarden, October 2023

Safe storage

Drawing on experience from over 25 years of CO_2 storage on the Norwegian Continental Shelf, Northern Lights delivers safe and permanent CO_2 storage as a service





Brevik Cement Plant - Overview of project

Demonstration plant

400.000 tons per year

55 tons per hour

50 % capture rate – limited by available waste heat

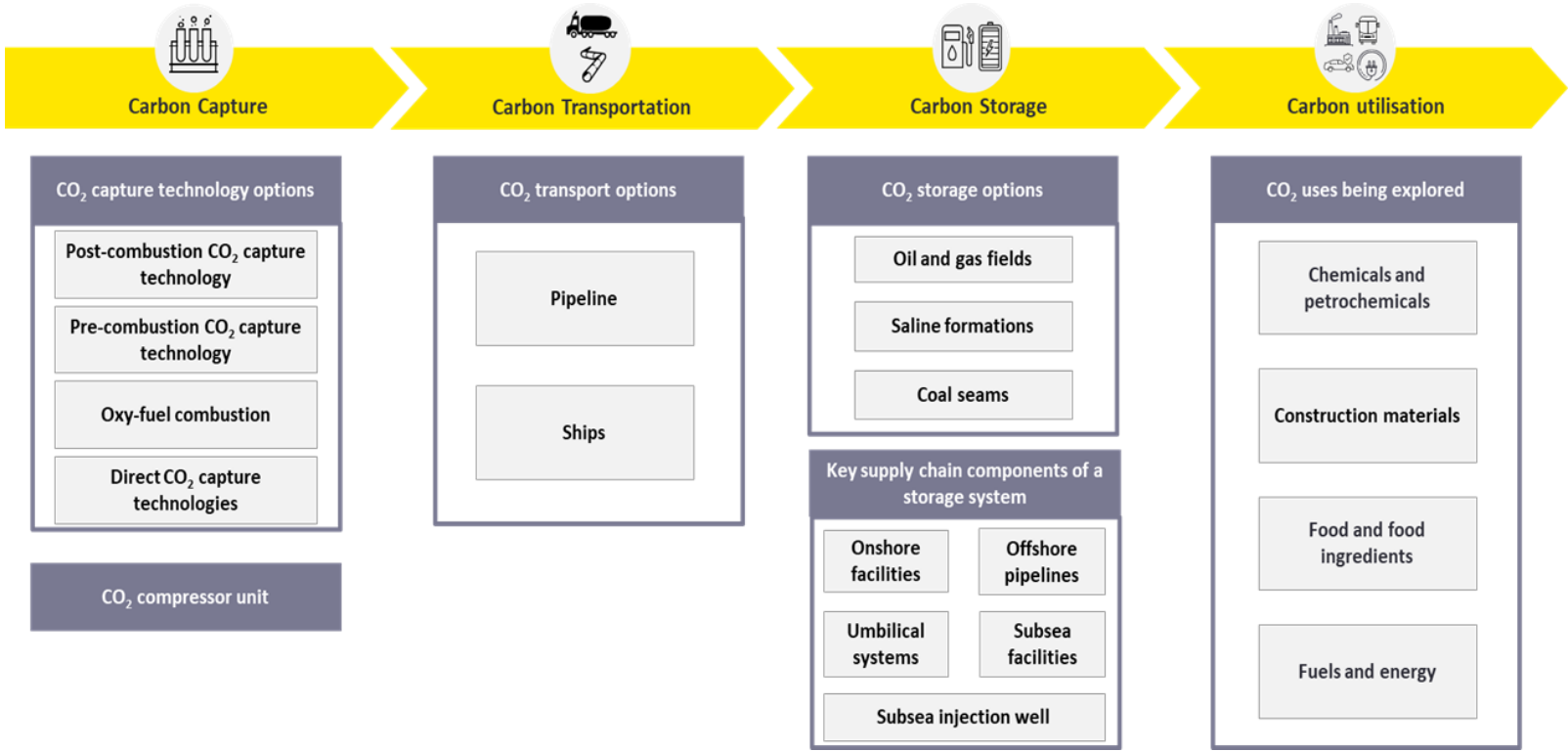
46 MW waste heat recovery

Foto: Heidelberg Materials

Carbon capture – Hafslund Oslo Celsio

- Hafslund Oslo Celsio (earlier Fortum Oslo Varme) plans to capture up to 400 000 tonnes of CO2 from their waste-to-energy in Oslo
- Altogether approximately 60% of the emission is based on biogentic sources
- About 200 000 tonnes of CO2 removed from the carbon cycle every year
- Bioenergy with carbon capture and storage (BECCS) - negative emissions techniques.
- Project on hold 2023

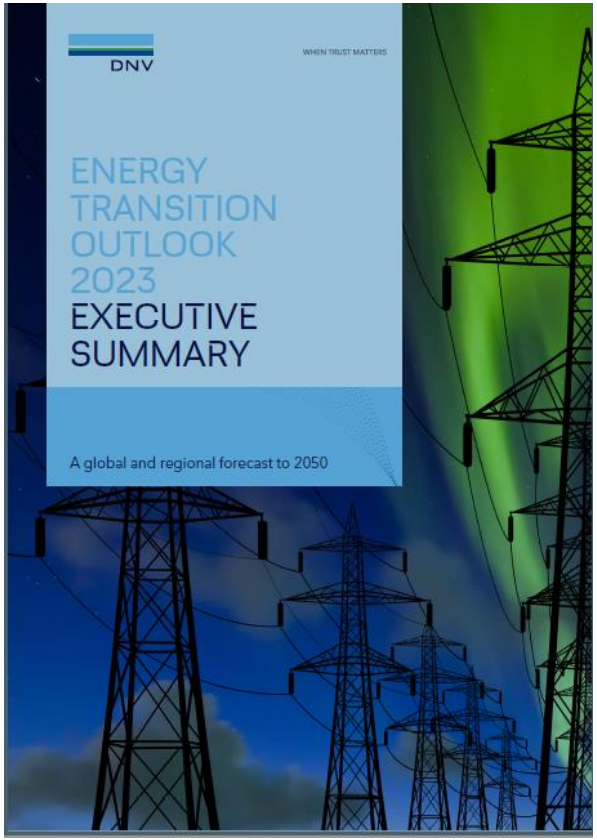
Value Chain – CCS/CCUS



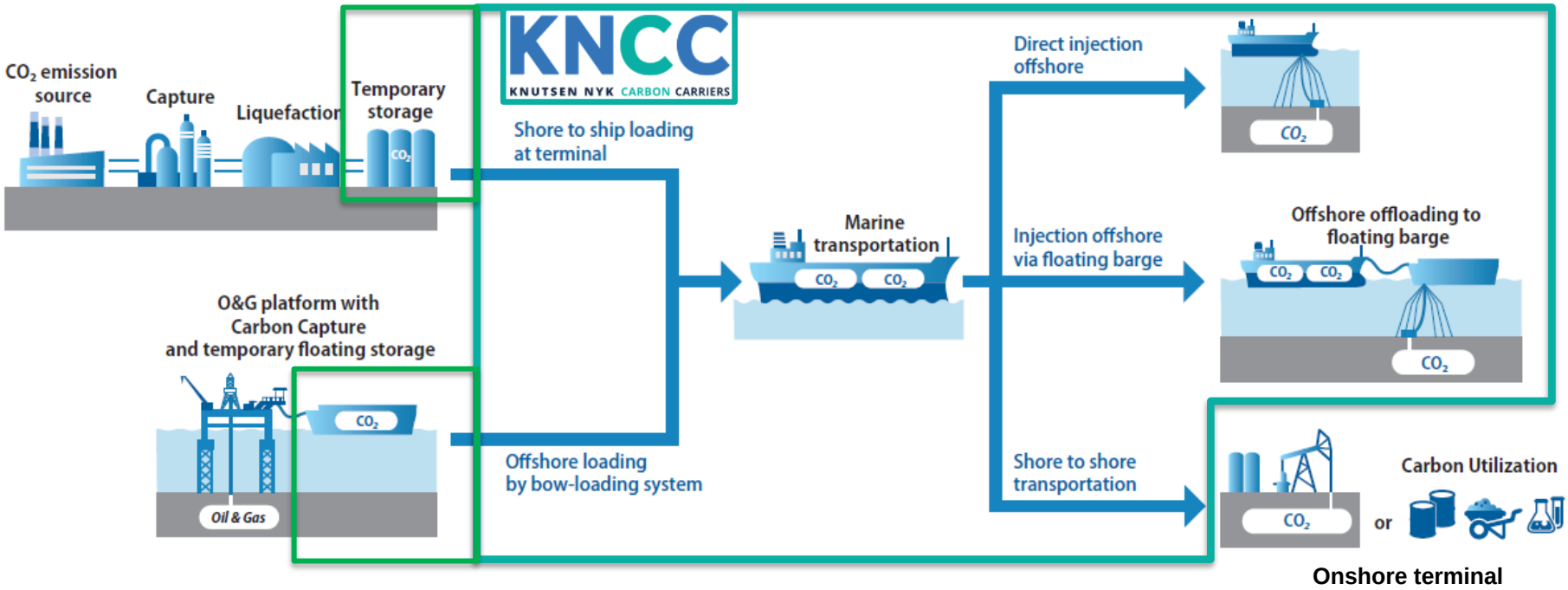
Note: *The above-mentioned technologies/components/building blocks are only representative and are not exhaustive*
Source: *Global Status of CCS 2020, Global CCS Institute; IEA, EY Research*

DNV - Cover the complete value chain

- Certification of conformance with regulations and standards (ship, Offshore, technology etc.)
- Leading role in international standards development
- Knowledge development through Joint Industry Projects

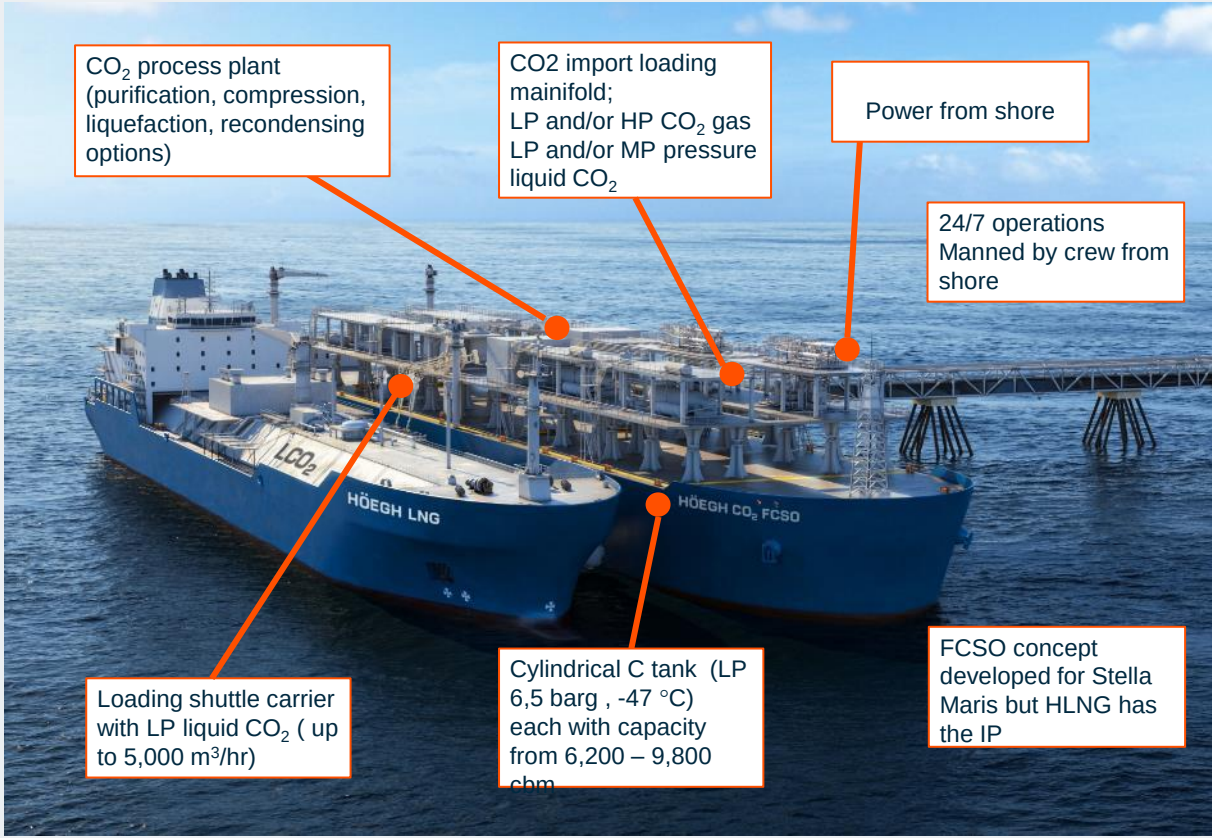


KNCC scope of business



CO2 Floating, Collection, Storage and Offloading Unit (FCSO)

- CO_2 Floating Collection, (Processing), Storage & Offloading (FCSO) hub moored at jetty/ quay or at sea in protected area
- Aggregate CO_2 from several emitters that will benefit from cost sharing and export possibilities
- ***Flexible design - receive and process:***
  - High- & low-pressure gas from pipelines
  - Medium & low-pressure liquid from trucks, rail, ships, barges
  - Various qualities with different levels of impurity
- Storage capacity from 40k - 80k cbm (size adaptable to need/site)
- Annual capacity from 2,5-8 mtpa/unit



Floating Energy Production with CCS

Post-combustion carbon capture can eliminate >85% of CO_2e emissions on FPSOs

Offshore-applications:

- Low-emission oil and gas production
- Gas to Power with CCS
- Blue hydrogen/ammonia

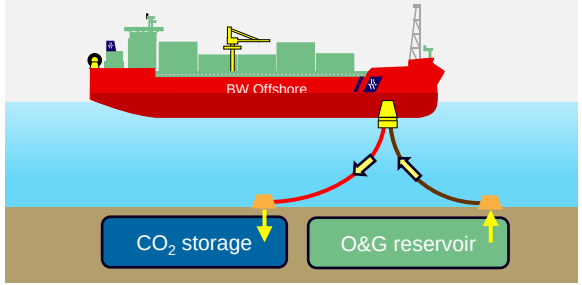
CO_2 injection to a suitable CO_2-reservoir or export via LCO_2 tankers

Cost reduction of transport and storage of CO_2 can be achieved through:

- EOR / injection to producing fields
- Scale through CO_2 storage hubs
- Floating/marine solutions in the CO_2 value chain

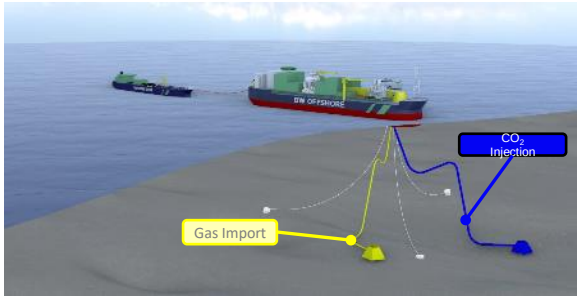
FPSO with CCS

- CO_2 injection
- LCO_2 export to tanker



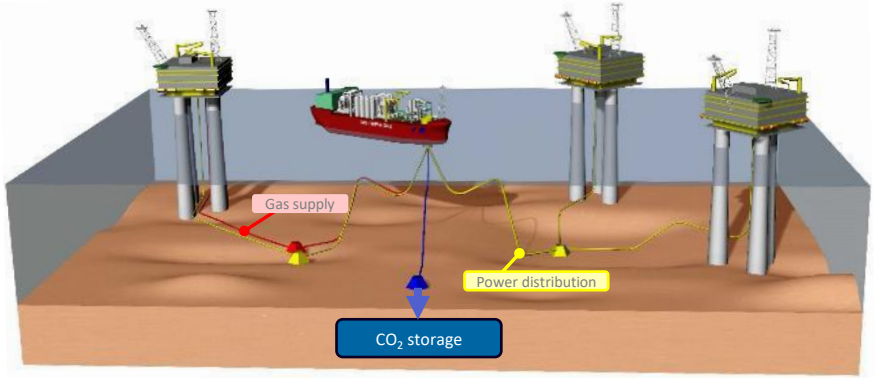
Blue Ammonia FPSO

Proximity to gas and CO_2 storage



Floating Gas to Power with CCS

Low-carbon baseload power to the grid or 'Power Hub' to electrify offshore installations



altera

- Altera/Wintershall Dea (licence operator)
- Storage licence for Havstjerne reservoir
- South of North Sea-close to Europe
- Expected capacity: 7Mt CO2/year
- Total capacity 200Mt CO2
- Start injection 2027
- Two alternatives:
- Direct injection from LCO2
- Injecten facility on a offshore solution

Storage, subsea, drill, well, seismic, monitoring & digital solutions

Capture technology

CO_2 from flue gas, WtE, gas and coal fired power plants, refineries and cement industries

Aker Carbon Capture

- Just Catch 40, 100, 400ktpa
- Footprint 13x23 m to 30x55m
- Units in parallell
- 95% capture rate
- Prove & efficient technology
- Modular design

Capsol Technologies

- License technlogy
- Stockholm Exergi
- 40-50% less energy
- 9 projects (0,7-1,6 mtpa)
- Proven solvent
- Capture rate >90

Wärtsilä Exhaust Treatment

- First maritime CCS pilot
- Captured, liquefied, stored
- Amine based solvent
- Capture rate >90
- To market 2025
- IMO’s CO2 emission target is capture rate of 70%
- CO2 retrofit of ethylene carrier

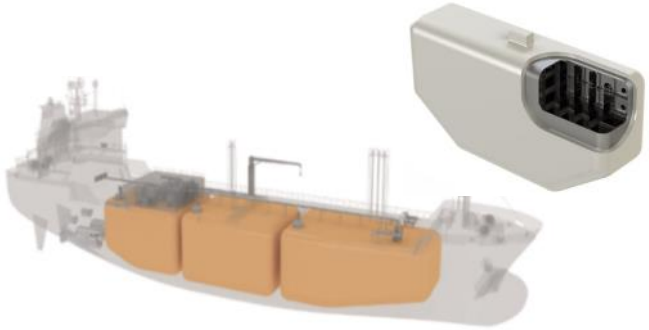
Transportation of CO2

KNCC-Knutsen NYK Carbon Carriers

- LCO2 – EP Carrier with Bow Offloading arrangement
- Temperatures above freezing (34 bar)
- offshore intermittent storage, onshore storage, inshore barges & containers

Larvik Shipping

- Mitsui O.S.K. Lines, Ltd. (MOL) and Larvik Shipping (LS)
- Transported CO2 since 1988
- Feasibility study, Klaipeda, Lithuania LCO2 & H2



Lattice Technology (LPV)

- Free-shape, free-size pressure vessels adaptable to any space
- Approved byASME, classification societies and US Coast Guard
- LNG in operation
- Available:LPG, LNH3, LCO2LH2

mossmaritime

CO2 ship transport – Northern Lights project

- Moss LNG experience → Moss LCO_2 design
- 2019: Moss engaged by Equinor, Total & Shell for design of cargo system for the Northern Light CO2 ships
- Ship transport by 7500 m3 ships for CO2 captured & liquefied from various sources – storage in Norwegian continental shelf
- Moss work scope: Basic design of the ship CO2 handling systems
  - Process definitions of cargo system including operational procedures
  - Layout & piping basic design
  - Equipment definitions & budgetary pricing

Power solutions

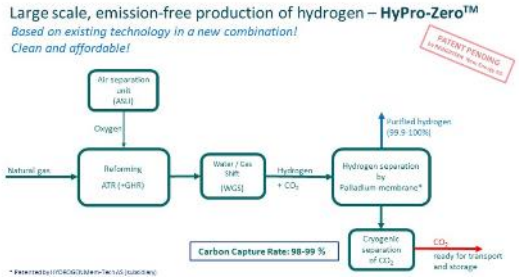
- Stena Floating Power Infrastructure
- SPP w Jettyless LNG receiving terminal
- Carbon Capture and Storage Platform
- CO2 transportation, off-loading and injection via CCS platform

- Sevan SSP
- Offshore CCS
- Floating unit with 100 - 900MW power generation plant
- Electricity production based on combined cycle configuration
- CO2 capture for the flue gas
- CO2 storage and injection

Blue Hydrogen

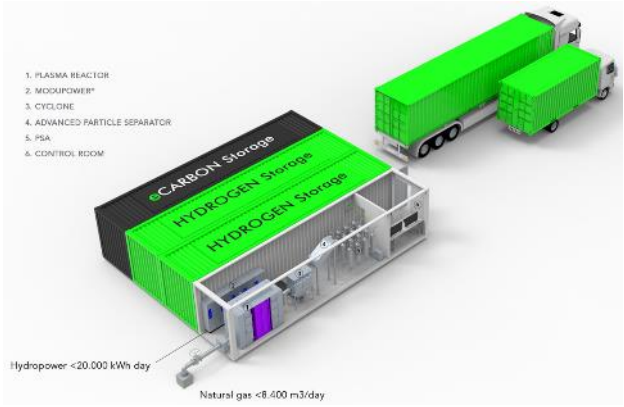
ZEG Power

- Clean hydrogen production with integrated carbon capture
- Capacity: 1-5 TPD, 10-50 TPD, >100 TPD
- Emission intensity well below the EU taxonomy threshold of 3 kg CO2e / kg.



Reinertsen New Energy

- High carbon capture rate (98-99%)
- High energy efficiency (~80%)
- Reduced H2 production cost (25% lower)
- Membran – Hydrogen Mem-Tech



Seid

- Methane pyrolysis
- Decomposition of CH4 into H2 and C
- Non-thermal Plasma systems
- 25% of Methane is H2
- Production of CO2-free H2 with solid carbon as the only by-product

Sustainable fuel/e-fuel

- **Hydrogen fuel** - LH2, PH2, LOHC + Ammonia
- **Synthetic fuels** - E-diesel, E-LNG, E-Methanol, Dimethylether (DME)

Nordic Electrofuel

- E-fuel pilot, 10 mill. liter (~8 kt)
- Herøya Industrial Park
- FID 2024
- Awarded EUR 40m Grant from EU to build e-SAF plant in Norway

Removr

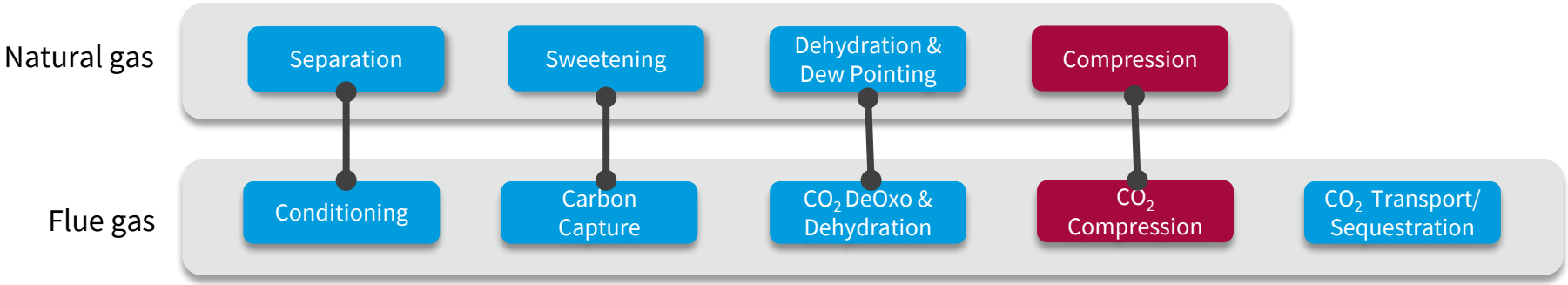
- Direct Air Capture (DAC)
- Zeolite- based technology
- CO2 removal at industrial-scale
- 50 ton/year pilot near Stavanger

Econnect Energy

- Clean projects needs clean infrastructure
- Worlds first JETTYLESS LNG system
- Capex reduction of about 50% compared to traditional jetties and quays
- IQuay solution for Wilhelmshaven
- Azane Fuel Solution - NH3 fuel bunkering

Carbon Capture Utilization and Storage (CCUS) Offering

Synergies between existing natural gas processing technologies and carbon capture utilization & storage



Relevant Knowledge Transfer and Technology Improvements / New Technology Developments for CCUS

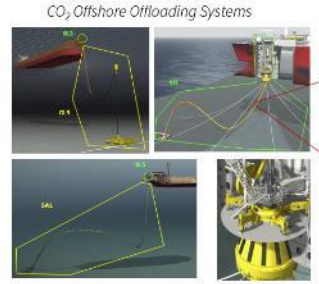
NOV has critical technology / equipment portfolio and relevant know-how in-house

NOV has part of the offering in-house and is establishing partnerships to offer the complete solution

Capture unit

TEG units

CO_2 conditioning & temporary storage



Tizir Titanium & Iron (TTI Tyssedal)

- H2 as reducing agent for ilmenite ($FeTiO_3$)
- Replace 85% of coal with H2
- Reduced emission by 82% (235 000 ton/year)
- Funded by Enova through IPCEI (about 30 mill $)

A Norwegian company developing clean energy and CO_2 transport and storage

ABOUT US:

- Committed to accelerating the energy transition
- Head office in Stavanger
- Experienced and dedicated team of 50 people
- Pure play carbon storage & clean ammonia company leading industrial partners
- Industrial ownership - E.ON as largest shareholder with 25% stake

CO_2 TRANSPORT AND STORAGE

CLEAN AMMONIA

Establishing large scale industrial projects in Norway

To accelerate the energy transition and to meet the high European demand

Polaris carbon storage facts

License number	EXL 003
Award	10.06.22
Area	Barents Sea
Size	1025 km^2
Water depth	250 m
Injection capacity range	3-6 MTPA (>1.5/well)
Total storage capacity	100-200 MT
Planned start up	By 2030

PGNiG Upstream Norway approved as operator and partner with Horisont Energi in the CO_2 storage exploration licence Polaris

"Med PGNiG Upstream Norway på plass som operatør og partner i Polaris, så har vi et sterkt fundament for realisere det potensialet Polaris har til å redusere utslipp i industriell skala»

Bjørgulf Haukelidsæter Eidesen
Administrerende direktør i Horisont Energi

torsdag | Arctic Energy Partners - Forside

Kristiane Mauno Krystad

Gode nyheter for C02-lager i Barentshavet

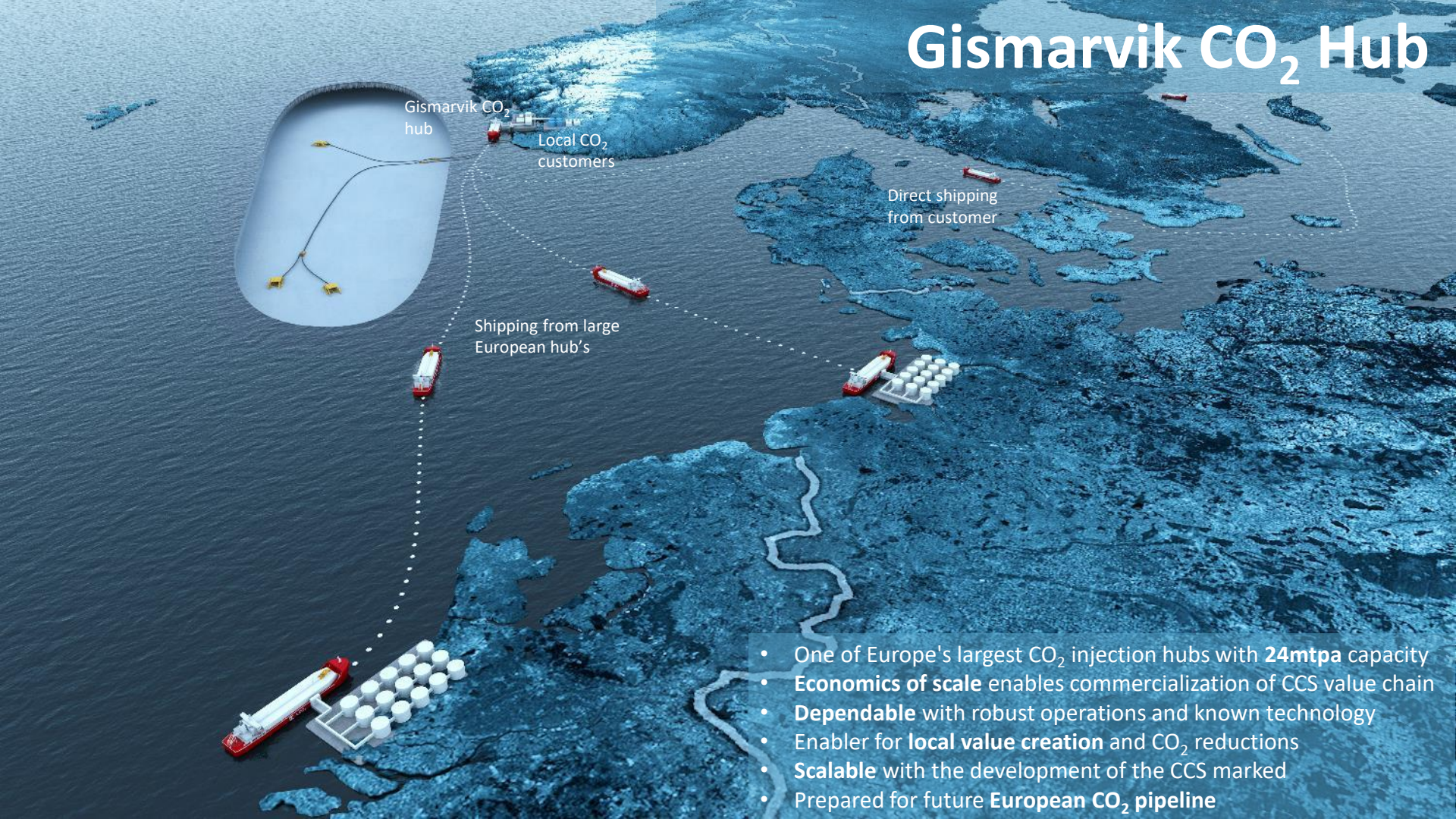
2024 starter med en god nyhet for Horisont Energi. Energidepartementet har godkjent PGNiG Upstream Norway som operatør og partner med Horisont Energi i Polaris, det eneste CO2-lageret i Barentshavet.

torsdag | EnergiWatch

PGNiG Upstream Norway godkjent som operatør i Polaris-lisensen

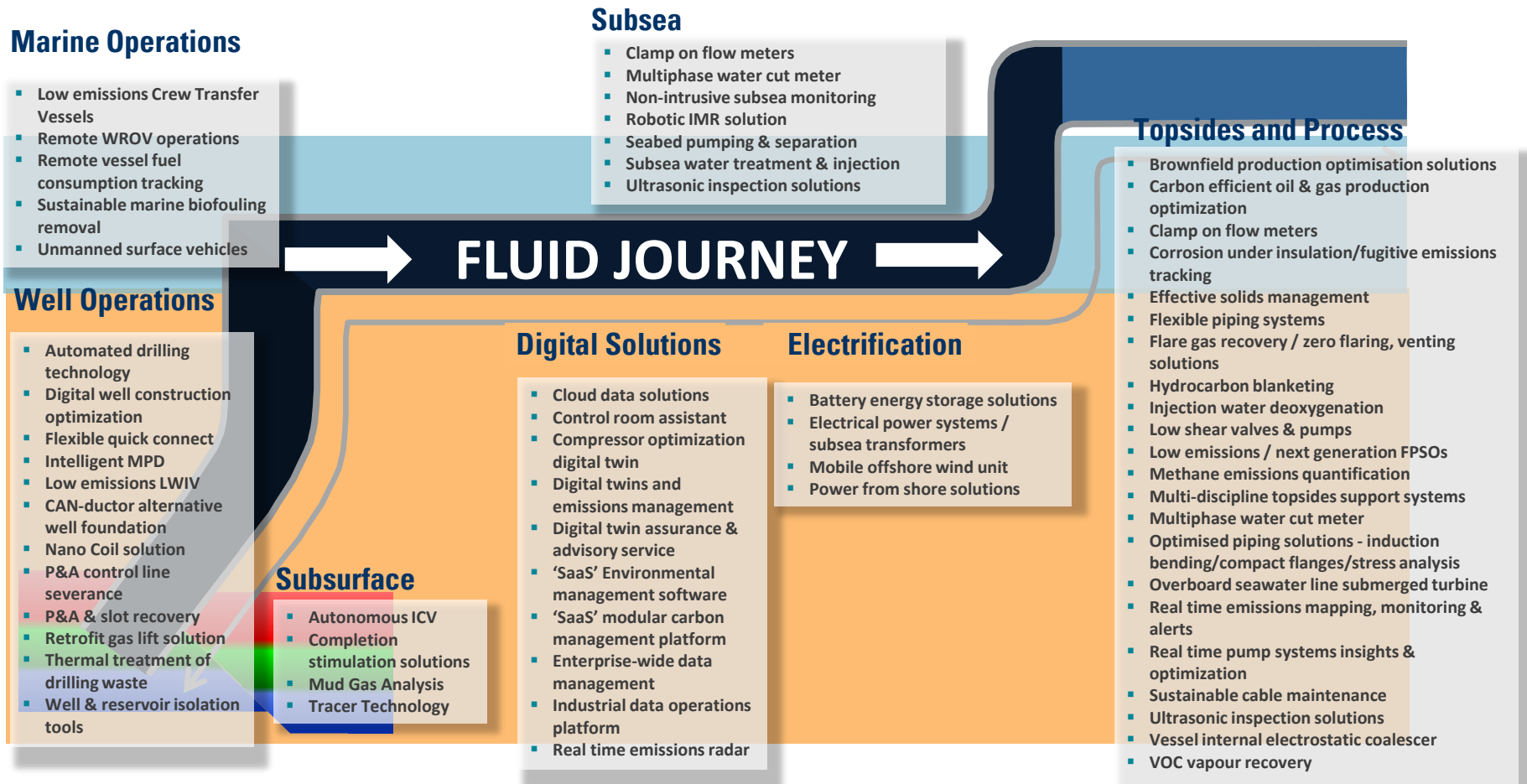
Har 50 prosent eierandel i Barentshavets eneste CO2-lagringsprosjekt. Horisont Energi, som eier den andre halvparten, meldte om godkjenningen fra Energidepartementet onsdag ettermiddag.

Gismarvik CO_2 Hub



- One of Europe's largest CO_2 injection hubs with **24mtpa** capacity
- **Economics of scale** enables commercialization of CCS value chain
- **Dependable** with robust operations and known technology
- Enabler for **local value creation** and CO_2 reductions
- **Scalable** with the development of the CCS marked
- Prepared for future **European CO_2 pipeline**

Lower Emissions Initiative (solutions) - NORWEP



CCUS – The big picture

- CCUS is part of the solution for reduced emissions
- Desirable to develop local competence
  - Skepticism to blue hydrogen and CO2 storage
  - International knowledge in capture and storage (EOR / IOR)
  - Legal and regulatory frameworks and standards must be harmonized
  - The "longship project" gives Norway advantages and international references
- Costs must go down
  - Create market – make business cases
  - Framework conditions must be in place
  - Global competition versus one-sided tax regime in Europe?
  - Uncertainty about schedules and realism
  - London Protocol – Cross-border transport and storage of CO2

Technologies & Solutions

Making Norwegian competence, experience and technology available. Search and find world class innovative Norwegian technology and solutions for our future energy needs. Find your perfect energy match from more than 1000 unique value propositions.

[Technologies & Solutions - Norwep]

Energy systems | Hydropower | Hydrogen | Oil & gas | Solar power | Windpower | CCS

Summary

Norwegian supply chain could offer:

- Advanced solutions, technologies, competences and cutting-edge expertise within oil & gas, offshore, maritime, process industry, energy transition and the green shift
- Advanced problem solvers with state-of-the-art digital solutions
- Innovative technical solutions developed together with industries, research centers, universities and governments
- High quality solutions with low emission, at a cost-efficient level and at competitive prices

For further information about
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Energy Partners

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N-5179 Godvik

Iceland Liechtenstein Norway grants

Norway grants