

# Norwegian Competence for the Development of LNG Infrastructure



## 11th International Conference Arctic Logistics Murmanshelf

14th April 2021

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# Agenda

- **Introduction of Norwegian Energy Partners (NORWEP)**
- **Norwegian service and supply industry**
- **LNG value chain**
- **Some references of Norwegian companies**
- **Arctic and cold climate solution projects**
- **Sustainable solutions in Norway – Hydrogen and carbon capture utilization and storage (CCUS)**
- **Summary**

# Norwegian Energy Partners

Norwegian Energy Partners is an independent non-profit foundation established to **strengthen** the long-term basis for **value creation** and employment in the Norwegian energy industry through **expanding** the industry's **international** business activities.

At the beginning of 2019, Norwegian Energy Partners has **300 independent**, operating companies as partners.

## Founders



# We Work with the Energy Industry



Oil & gas upstream



Wind energy



Solar energy



Hydrogen and CCUS



Oil & gas midstream



Hydropower



Energy systems

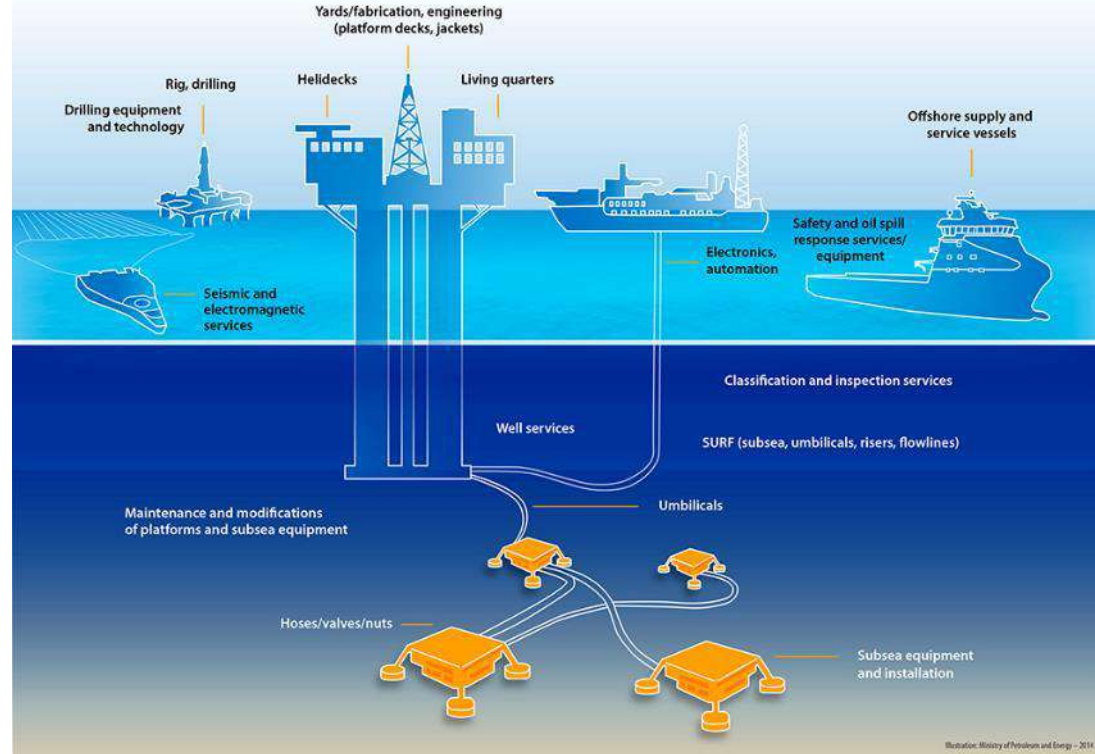
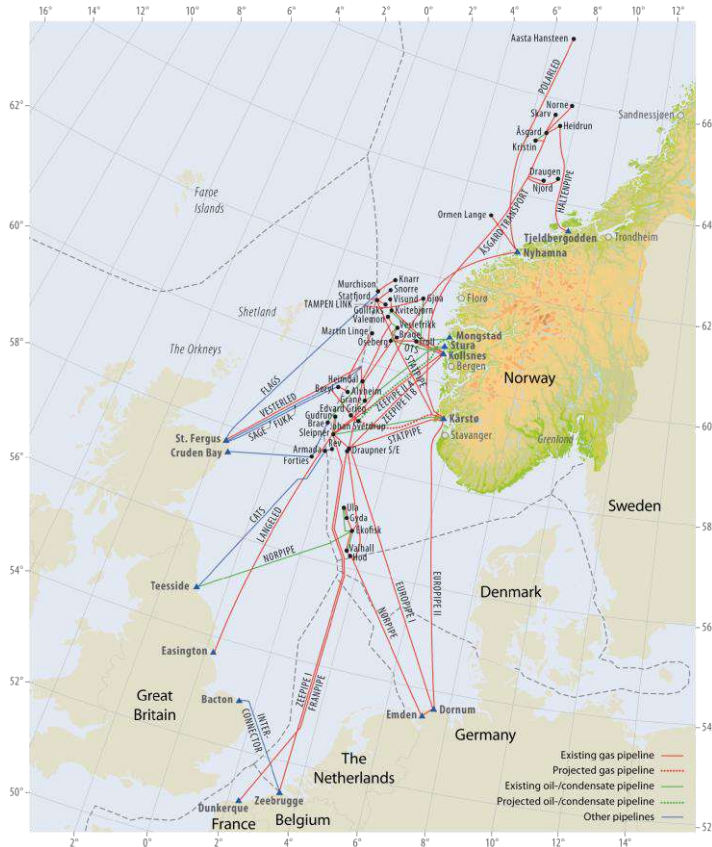
# The way we work:

- Mapping the competence, technology and comparative advantages of Norwegian companies - and matching it with customer demands internationally
- Priority markets defined by the industry
- Norwegian and international energy advisors with in-depth knowledge of their markets
- Improving competitiveness and reduce the risks related to international activities
- A network organization bringing customer and suppliers together



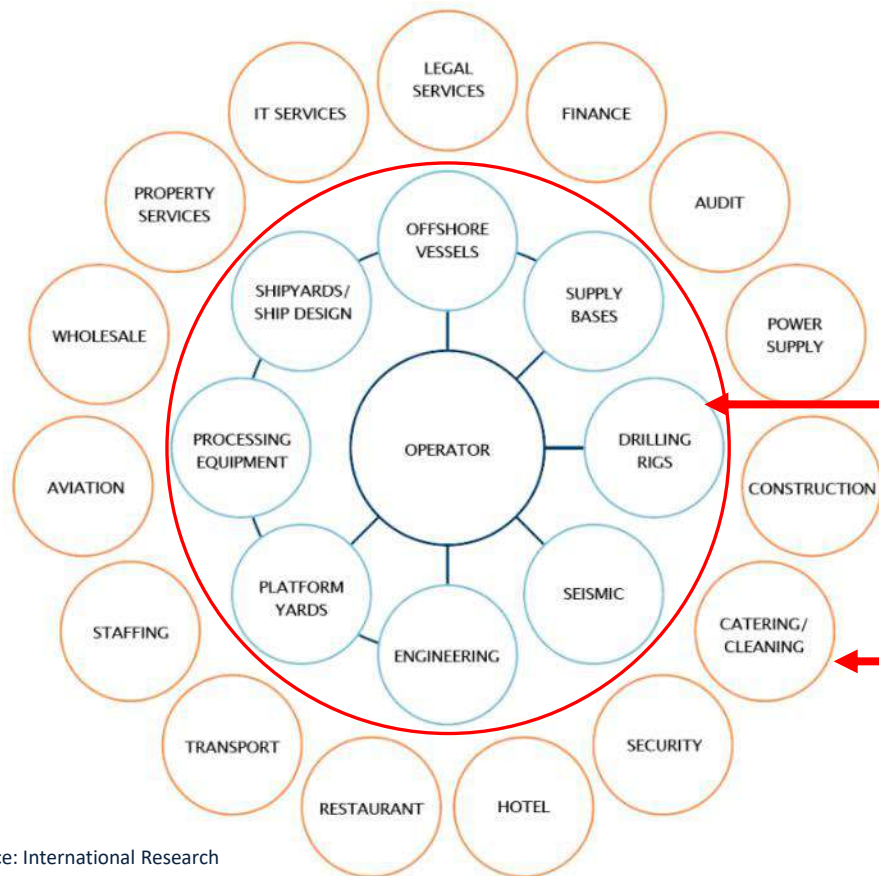


# Norwegian Service and Supply Industry



[www.norskpetroleum.no](http://www.norskpetroleum.no)

# Direct and indirect petroleum-related activities



## Service and supply in Norway (2017):

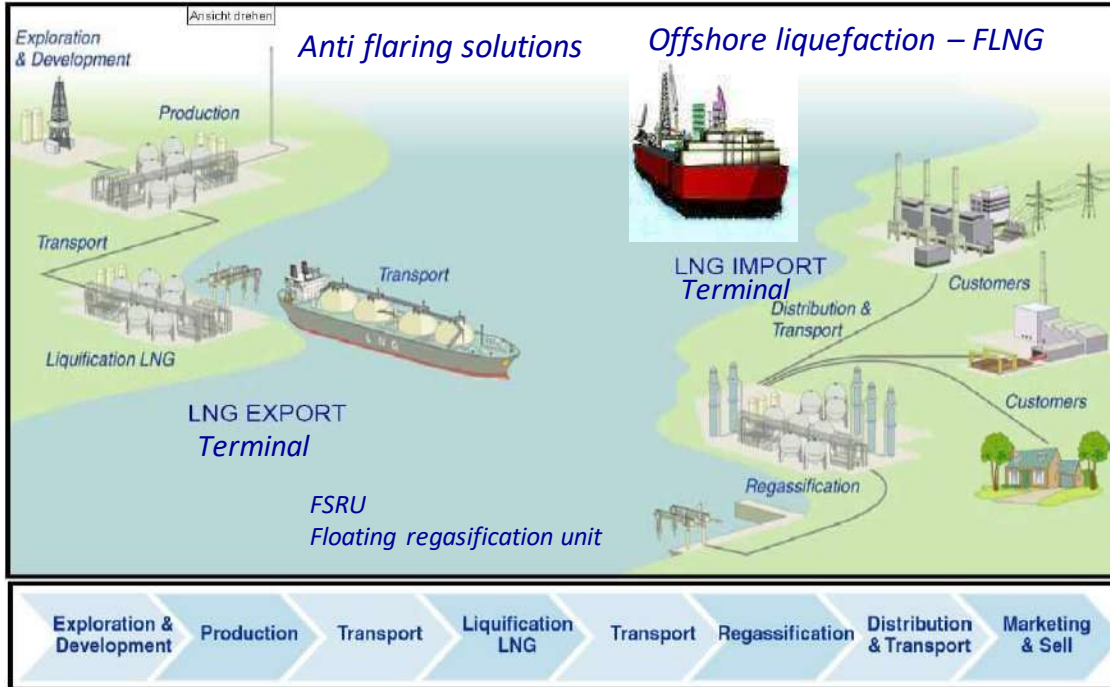
- **Second-largest industry in terms of turnover**
- **More than 1100 companies**
- **Total turnover of NOK 340 billion (USD 40 billion)**
- **29% in international market**
- **50 years of offshore petroleum activities**

Relationship between oil companies or operators (dark blue) and the different service and supply segments (light blue).

Other services (orange) not considered as part of the service and supply industry.



# Midstream and LNG Value Chain



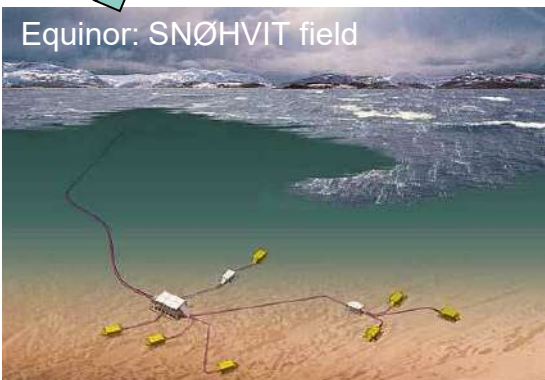
## Possibilities

- Production
- Liquefaction
- LNG terminals
- Gas carriers
- FSRU
- Small scale distribution of LNG
- LNG to power plant
- LNG as fuel
- Processing of NG to Hydrogen
- Value chain Hydrogen
- CCS
- Value chain for other gases



## Midstream and LNG

Processing including gas purification, storage and transportation of natural gas and LNG to end users/customers.



## Midstream and LNG

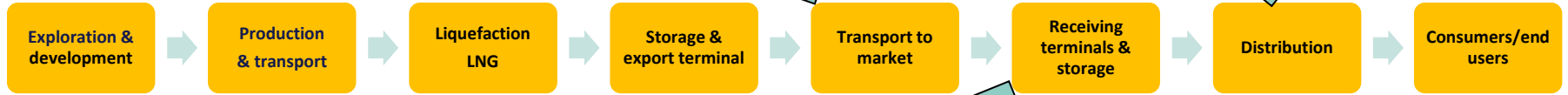
Processing including gas purification, storage and transportation of natural gas and LNG to end users customers.



BW LNG



Höegh FSRU and Höegh LNGC



Tornio Manga LNG receiving terminal



Sevane: natural gas-fired power plant on a cylindrical platform

# Norwegian Suppliers

Concept and  
feasibility studies

FEED study

Detail  
engineering

Digitalization



Equipment  
supply

EPC (Building and  
commissioning)

Operation &  
maintenance

Logistics &  
transport

# Arctic technology

## Handling the arctic environment

NORWEP  
Partner

Moss Maritime is world leading in design and engineering of floating units located in remote, harsh and Arctic environments including:

- drilling semisubmersibles for Arctic operation in light ice conditions
- octagonal shaped drilling vessel for Arctic operation in light to medium ice conditions
- drillship for severe ice conditions and year around drilling
- icebreaking production floaters

### Products:

- Arctic drilling vessels
- Icebreaking FPU/FPSE
- Icebreaking LNG carriers
- Icebreakers





# Arctic technology

## Handling the arctic environment

NORWEP  
Partner



# Höegh LNG – Transforming energy around the world!



NORWEP  
Partner



# Golar LNG – LNG infrastructure from gas to power

NORWEP Partner



1) GMLP currently has 50% interest in Hilli T1 and T2, which represents the current contracted capacity of the Hilli Episeyo, which has a total of 4 trains  
 2) Golar Power is a 50/50 JV between Golar LNG Limited and Stonepeak Infrastructure  
 3) Sergipe is a 50/50 JV between Golar Power and EBRASIL Energia Ltda, one of the largest independent power producers in Brazil



# COLD CLIMATE AND METOCEAN SERVICES

NORWEP  
Partner

## METOCEAN

### Waves, wind and ice

Complete range: from data acquisition to engineering design basis



## COLD CLIMATE ENGINEERING

### Onshore and offshore

Advanced simulations of snow drift, sea spray icing, winterisation solutions



## ARCTIC ENGINEERING

### Research, model and scale testing

Field and ice basin investigations  
Ice loads on structures





# OFFSHORE GEOTECHNICAL ENGINEERING

## SUBSEA TEMPLATES

Suction anchors, mud mats



## STEEL STRUCTURES

Offshore piling



## CONCRETE STRUCTURES

Evaluation of GBS installation  
on unlevelled sea bottom



# LNG Solutions

NORWEP  
Partner

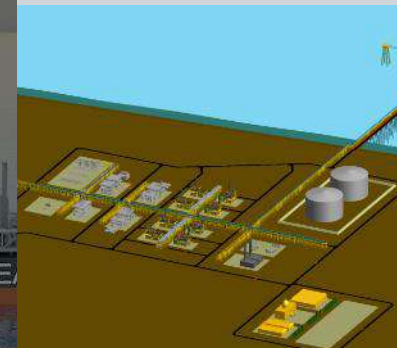
*Floating LNG (Offshore)*



*Barge LNG*



*Modularised Onshore LNG*



*GBS LNG*



*Platform LNG*

Tortue Ph2&3  
Concept Design for  
BP

(graphics confid.)

*Regasification*



*Broad range and  
experience of most  
concepts from floaters  
and fixed structures to  
onshore*

# Aker Solution (Kvaerner) –

Leader in marine concrete structures for oil and gas field development (EPCI)

NORWEP  
Partner



Aker Solution/Kvaerner deliver the following concrete substructures:

- Platforms with a concrete substructure sitting on the seabed (GBS)
- Concrete gravity base structures (GBS) for liquefied natural gas (LNG) production and receiving terminals
- Floating production platforms with a concrete hull (semi-submersible, TLP, SPAR)
- Terminals and facilities with process equipment installed on a concrete foundation



The Sakhalin-1  
GBS.

Kvaerner EPC  
responsible of  
the GBS.

**KVERNER**



The Adriatic  
LNG Terminal -  
GBS delivered  
by Kvaerner in  
2009



# Arctic & Cold Climate Solutions

**A project to strengthen Norwegian Arctic offshore and petroleum related technology and competence**

***A joint national industry project***

- *The database identifies technologies and solutions from Norwegian industry related to both oil & gas and renewable energy developments and operations!*



- *The database is a knowledge based portal to world-class competence, experience and technology/solutions!*
- *The database will be updated continuously by individual partners*



# Arctic and Cold Climate Solutions project

## Sponsors/Steering Committee



## Observers



# Project goal: To facilitate Norwegian petroleum industry, delivering world class technology/solutions for arctic and cold climate capital development projects



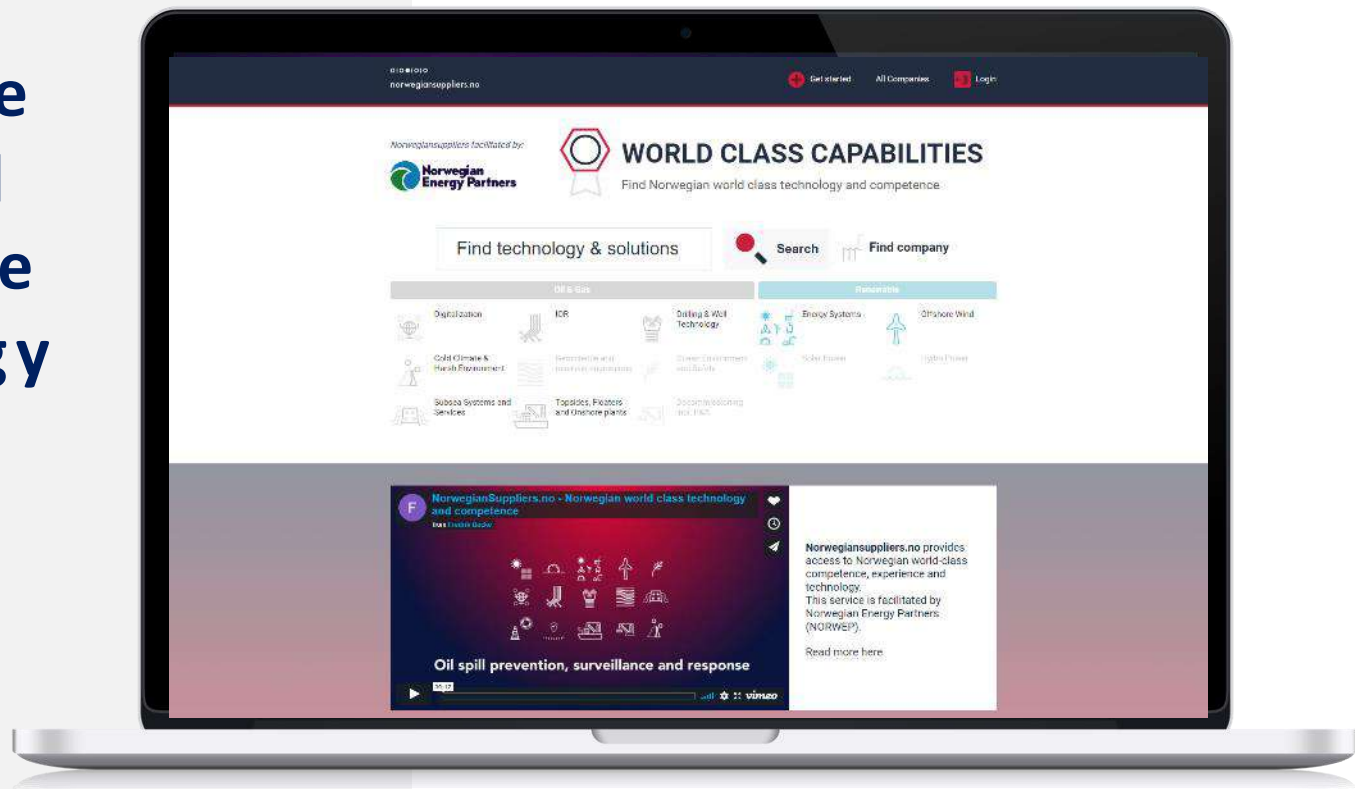
***Polar circle defines the Arctic with some exceptions:***

- *Sea of Okhotsk (Russia)*
- *Caspian Sea (Russia, Kazakhstan)*
- *Bering Sea (Alaska)*
- *Newfoundland and Labrador (Canada)*



**norwegiansuppliers.no**

**An effective  
tool to find  
your service  
/ technology  
needs**





# UN sustainable development goals



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

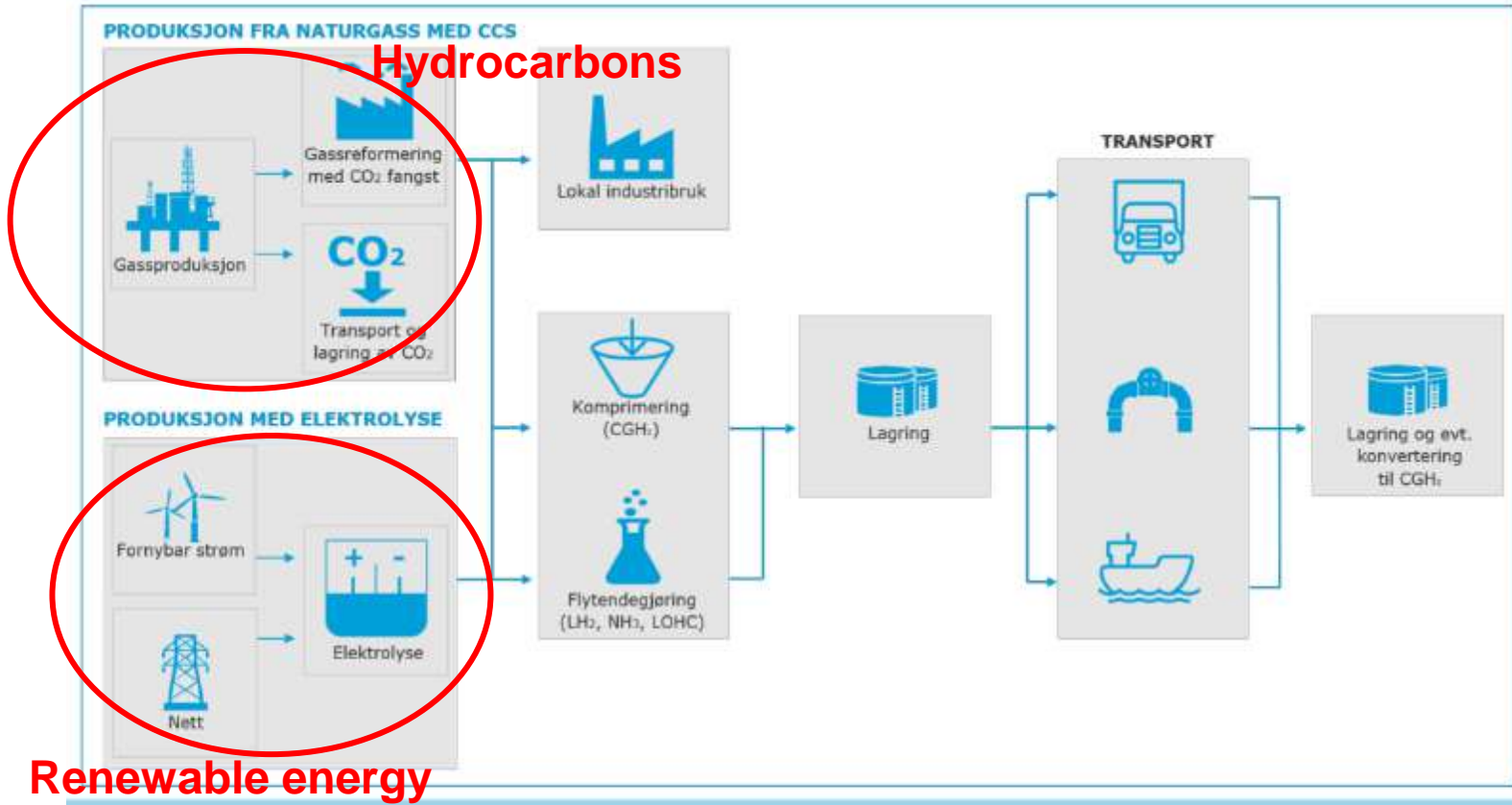
**Norwegian Shipowners' Association** – cut climate emissions by 50% per unit by 2030, new ships zero-emission technology from 2030, climate-neutral fleet from 2050, international ban on non-climate-neutral fuels from 2050

**Equinor** – The goal is to achieve carbon-neutral global operations by 2030, and reduce net carbon intensity in produced energy by at least 50% by 2050. **November 2020 - Net zero emission by 2050.**





# Hydrogen value chain





# Timeline for development



Viking Energy  
first LNG-  
powered  
supply vessel.  
2003

MF Hydra. First  
hydrogen ferry.  
Fuel cells, battery and  
LH2  
2021

First hybrid tug  
(battery/LNG)  
under construction

Viking Energy  
first supply vessel  
with ammonia and  
SOFC fuel cells  
2023

**LNG**

**Hybrid**

**Electricity**

**Hydrogen**

**Ammonia**

2000  
Glutra –  
First LNG ferry

2015  
Ampere/Norled  
World's first electric car  
and passenger ferry

Ferry Norled/Finnøy  
100% hydrogen and fuel  
cells, CGH2  
2021

2023  
Havila Kystruten. First  
LH2/fuel cell cruise  
ship planned



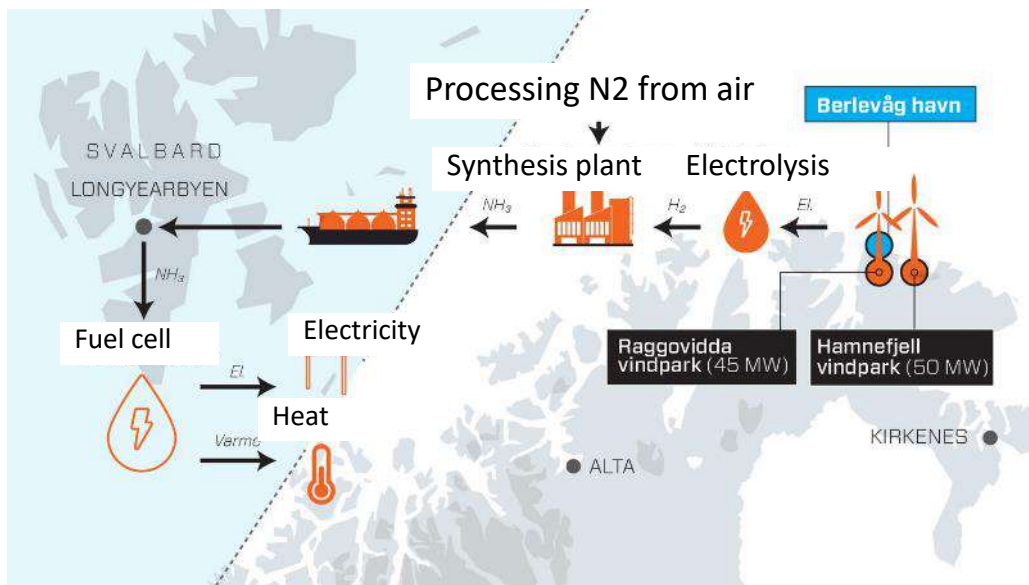


# Ammonia as energy carrier

Viking Energy is owned and operated by Eidesvik and on contract with Equinor. First supply vessel with ammonia propulsion and 2 MW SOFC fuel cells system .

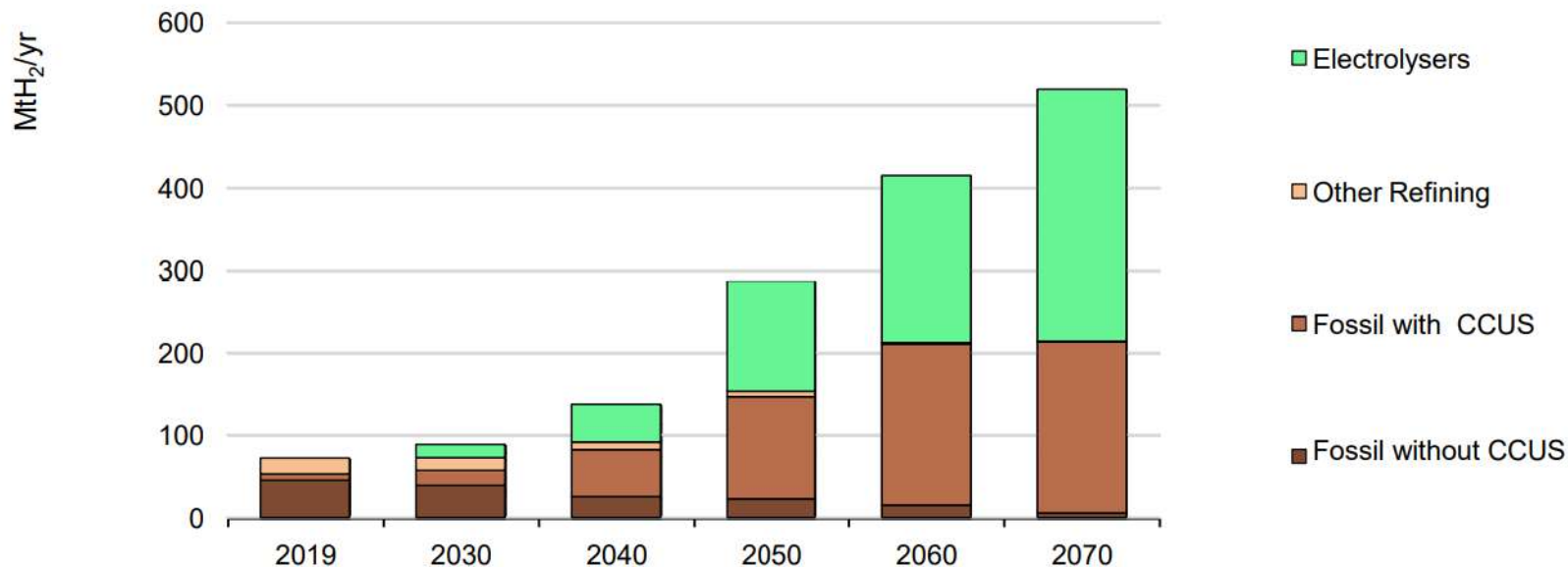
Retrofit from LNG

In operation from 2023



# Hydrogen – a key pillar for reaching energy & climate goals

Global hydrogen production and use by sector in the Sustainable Development Scenario, 2019-2070



**Global hydrogen production and use grows sevenfold by 2070 compared to today in the Sustainable Development Scenario, with demand growth almost completely met by lowcarbon hydrogen.**

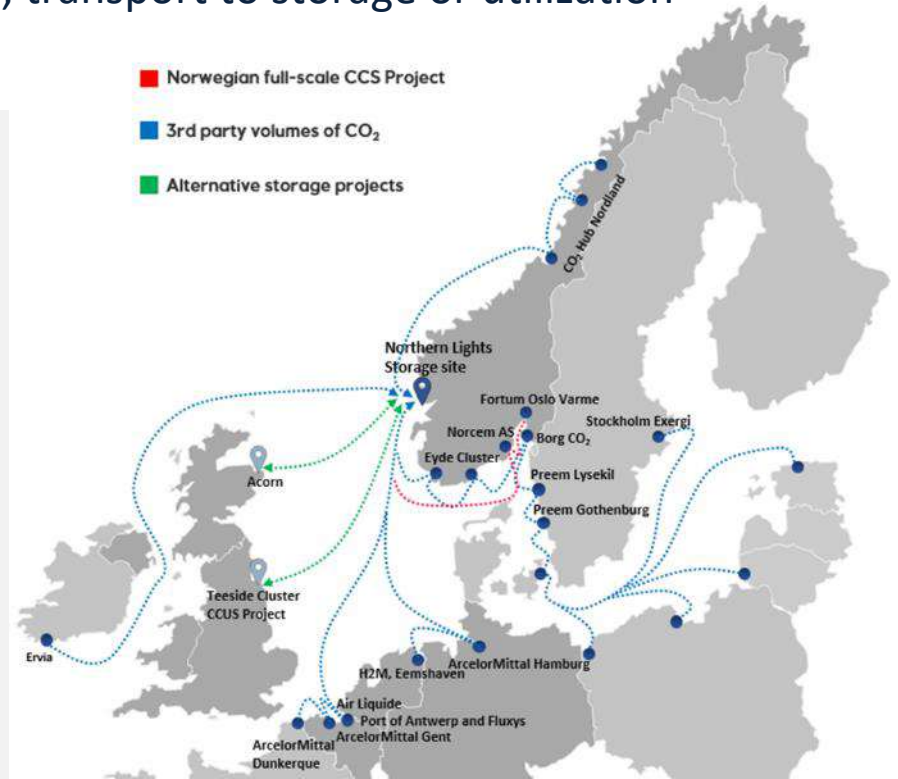
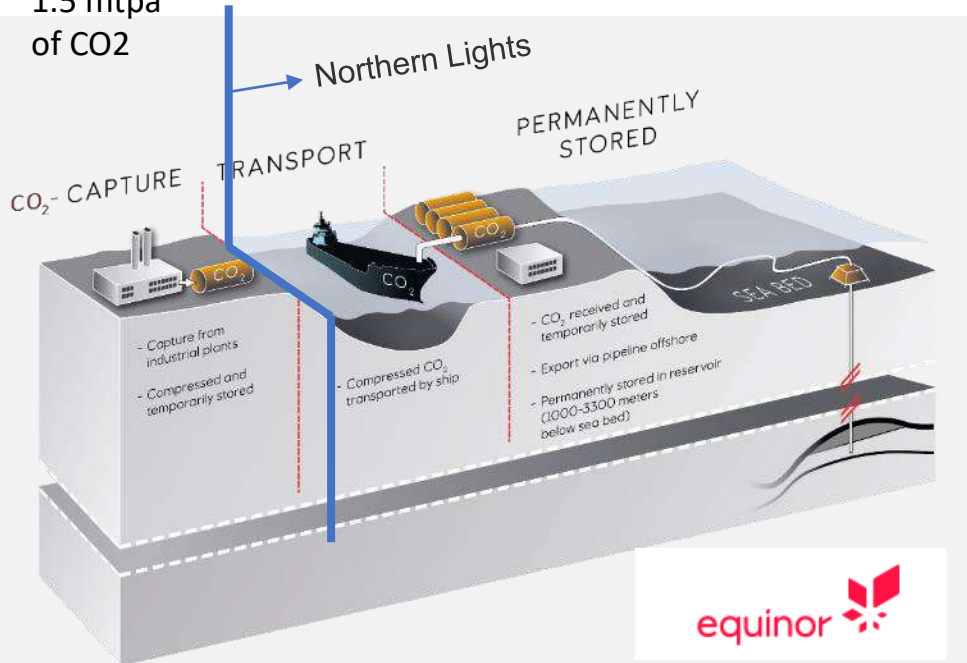


# Northern LightS project/Longship - CCUS



## The carbon dioxide value chain from capture, transport to storage or utilization

Phase 1:  
1.5 mtpa  
of CO<sub>2</sub>



**Cooperation between Equinor, Shell and Total and the Norwegian Government**

A large, complex offshore oil rig structure is shown in the background, featuring multiple levels of steel scaffolding, yellow and red accents, and a white multi-story building on the right. The rig is situated in a body of water with white-capped waves.

**SUMMARY**

**PROMOTING NORWEGIAN  
ENERGY CAPABILITIES  
IN INTERNATIONAL MARKETS**

[norwep.com](http://norwep.com)



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