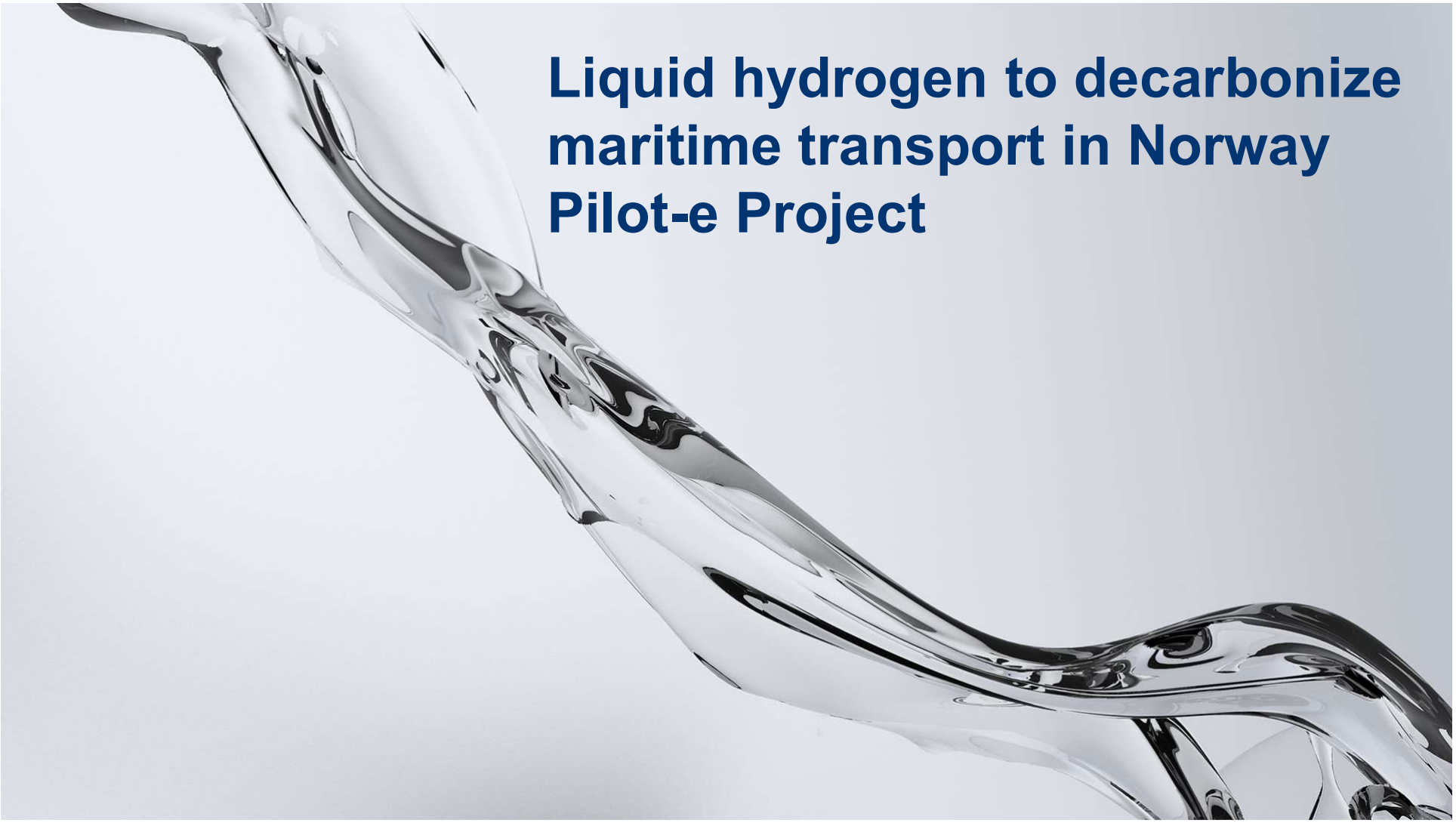
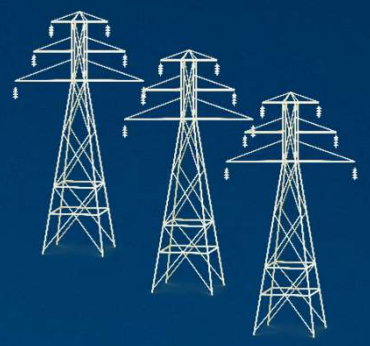


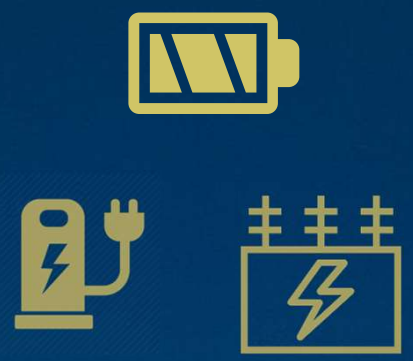
Liquid hydrogen to decarbonize maritime transport in Norway Pilot-e Project

BKK's role in electrification is to develop, build, own and operate infrastructure between grid companies and customers

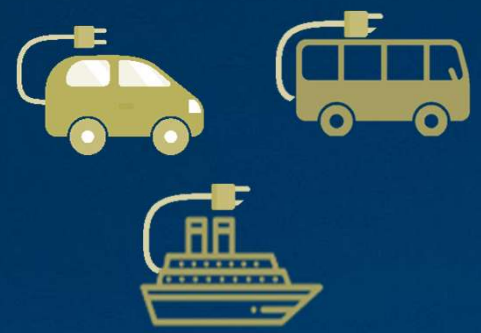
GRID COMPANY



BKK

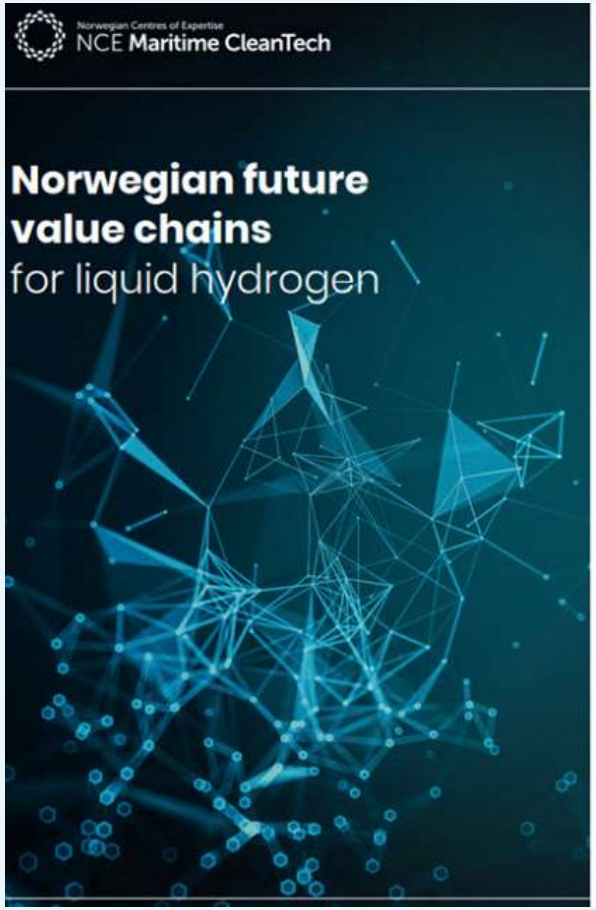


CUSTOMER



BKK

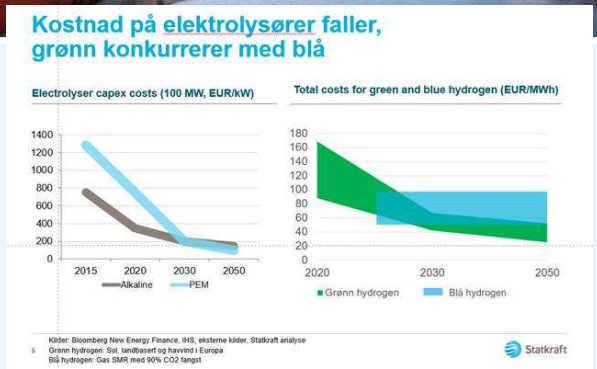
MAERSK LINE
MAERSK
MAERSK SEALAND
DAL


Norwegian Centres of Expertise
NCE Maritime CleanTech
Norwegian future value chains
for liquid hydrogen

NORLED
LH2

FLYING FOIL

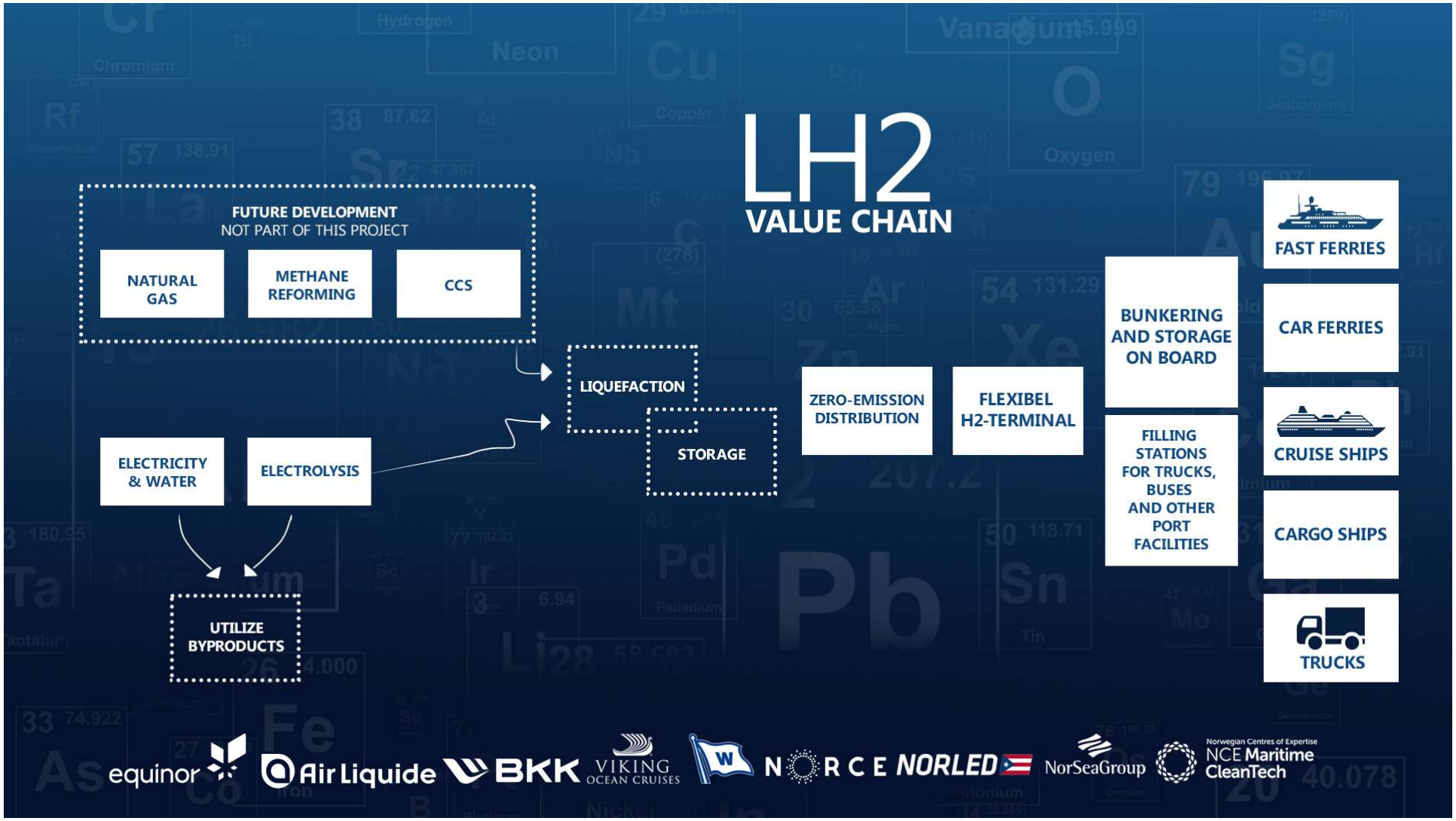
TU Maritim
INNHOLD
LEDIGE JOBBER
KONFERANSER
BLI EKSTRA-ABONNENT
SØK
LOGG INN
AMMONIAKK
Eidesvik skal få verdens første utslippsfrie offshorefartøy: Bruker ammoniakk
Kan bli «game changer» for nullutslipp på skipsfart verden over.
VIKING ENERGY


Kostnad på elektrolysører faller, grønn konkurrerer med blå
Electrolyser capex costs (100 MW, EUR/kW)
1400
1200
1000
800
600
400
200
0
2015
2020
2030
2050
Alkaline
PEM
Total costs for green and blue hydrogen (EUR/MWh)
180
160
140
120
100
80
60
40
20
0
2020
2030
2050
Grønn hydrogen
Blå hydrogen
Kilder: Bloomberg New Energy Finance, IHS, eksterne kilder, Statkraft analyse
Grønn hydrogen: Sol, landbasert og havvind i Europa
Blå hydrogen: Gas SMR med 90% CO2 fangst
Statkraft

Pilot-e partners

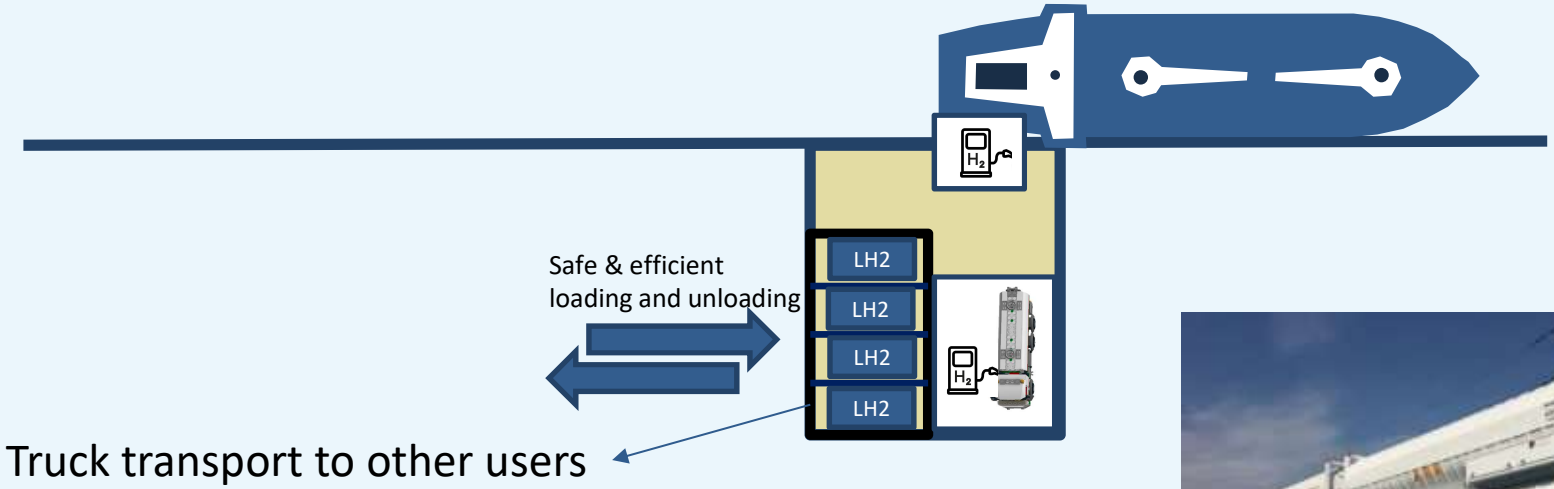
BKK	Energy	Project Management / Part of electrification strategy - possible investor
equinor	Energy	Develop hydrogen marked for production from CH4 w/CCS – possible investor
Air Liquide	Energy	Develop marked for liquid hydrogen in Norway – possible investor and operator
NORLED	End user	End user of LH2 for ferries and fast ferries
VIKING CRUISES	End user	End user of LH2 for new cruise vessels for Norwegian marked
WILH. WILHELMSEN	End user	End user of LH2 for new base-to-base cargo vessel
NorSeaGroup	Port oper.	Interest in distribution of LH2 and developing bunkering for LH2 in own ports
NORCE	R&D	R&D partner with GEXCON and Prototec as subcontracted partners with H2 comp.
NCE Maritime CleanTech	Cluster	MCT role in developing the marked for LH2 and resp. for communication

Liquide hydrogen advantage


LH2
VALUE CHAIN
FUTURE DEVELOPMENT
NOT PART OF THIS PROJECT
NATURAL GAS
METHANE REFORMING
CCS
ELECTRICITY & WATER
ELECTROLYSIS
UTILIZE BYPRODUCTS
LIQUEFACTION
STORAGE
ZERO-EMISSION DISTRIBUTION
FLEXIBEL H2-TERMINAL
BUNKERING AND STORAGE ON BOARD
FILLING STATIONS FOR TRUCKS, BUSES AND OTHER PORT FACILITIES
FAST FERRIES
CAR FERRIES
CRUISE SHIPS
CARGO SHIPS
TRUCKS
equinor
Air Liquide
BKK
VIKING OCEAN CRUISES
NORCE
NORLED
NorSeaGroup
Norwegian Centres of Expertise
NCE Maritime CleanTech

Flexible H2 terminal

Object: Develop a flexible hydrogen terminal located on ISPS sites for LH2 storage, vessel bunkering and filling of commercial vehicles.

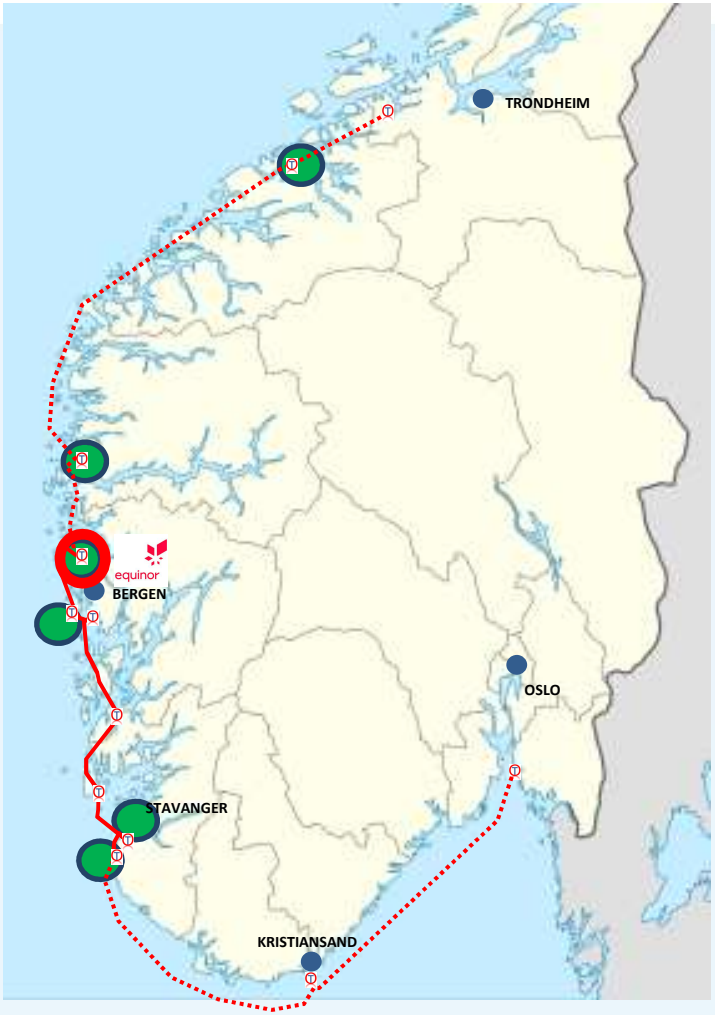


Opeka

SHIP NAME
WESTCON
NORLED
LMG 80 - DEH2
BALLARD
FUEL CELL
LH2
LH2
SHIP NAME

H_2 POWERED
Selfa
NORLED
SERVOGEAR
HYON
LMG

NORLED


TRONDHEIM
equinor
BERGEN
OSLO
STAVANGER
KRISTIANSAND

PROJECT PLAN

PILOT-E	PILOT-E FUNDING	CONSEPT SELECTION	JV & FINANCING	FID	START-UP
Consortium in place Application delivered	Project to start in case of positive outcome of the application	Evaluate different location for hydrogen production Select concept and start front-end-engineering FEED	Establish JV Financing of LH2 value chain BKK Equinor Air Liquide Others ++	Investment decision by JV	Start production and distribution of Liquide hydrogen

Site assesment | FEED | Execution 3/year

Q3 2019 | **12.12.2019** | **Q1 2020** | **Q4 2020** | **Q1 2021** | **Q1 2024**

Main Milestones | Activities between milestones