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The greatest travel experiences



MF Hydra – world's first LH₂ driven ship + Operating hydrogen-driven fast ferries in Port of Bergen

May 2021



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A major transport player in Norway

#2 Ferry company



57 ro-ro ferries

29 routes

#1 Express boat company



28 fast ferries

18 routes



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The green ferry revolution in Norway

2015: The first el-ferry
"Ampere" is launched



2022: About 80 el-
ferries in Norway



2022: World-first LH2-driven ship in
operation with others to come





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World's first LH2-driven ship "MF Hydra"



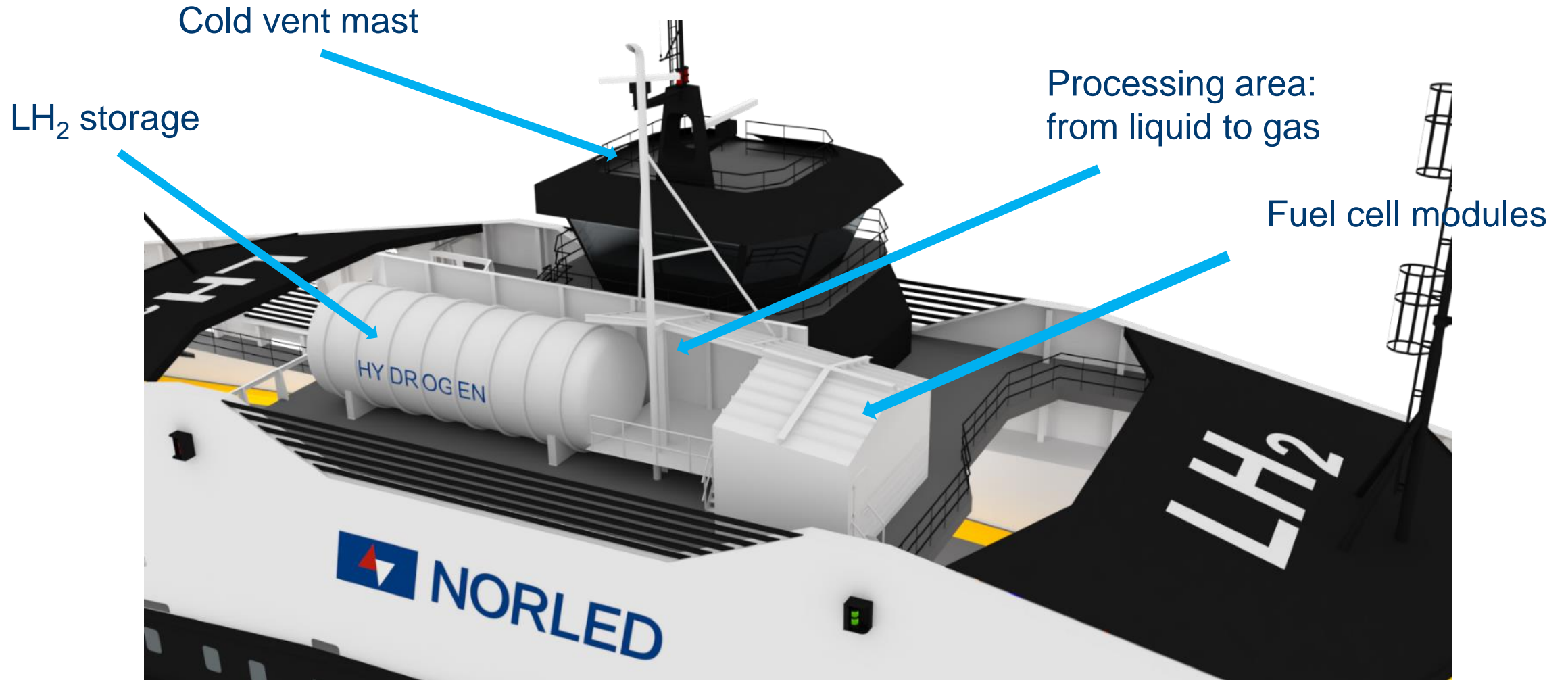
| | | | | | |
|---------|---------|--------------------|-----|---------|-----------------|
| Length | 82.40 m | Car capacity | 80 | FC | 400 kW |
| Beam | 16.75 m | Truck capacity | 10 | LH2 | 4 tons capacity |
| Draught | 2.8 m | Passenger capacity | 299 | Battery | 1,5 MWh |





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The LH₂ arrangement





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Operational route for MF Hydra

A typical “battery-ferry” route, east of Stavanger, Norway

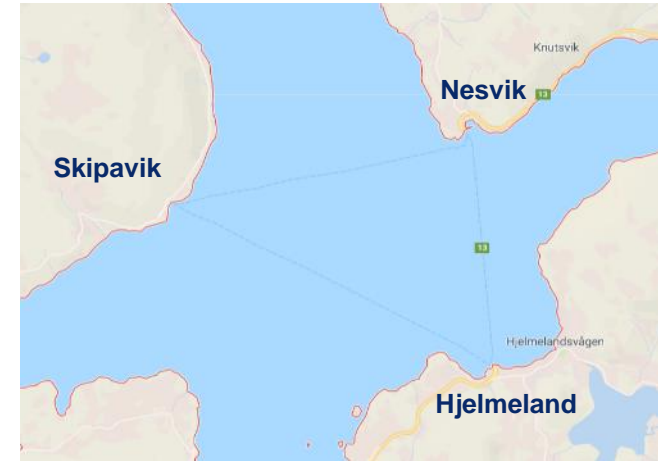
- Hjelmeland-Nesvik 3 km
- Hjelmeland-Skipavik 4,5 km
- Nesvik-Skipavik 4 km

Route utilised to demonstrate/develop hydrogen ship technology:

- Hydra can sail on a full fuel-cell mode with only peak loads required to be supplied from batteries – FCs providing 85-90% of required power

The energy stored onboard:

- Battery storage - lasts for 3 hrs before empty (without charging)
 - Onboard capacity could be increased up to 8-10 hrs
- LH2 storage tank - lasts for 12 days
 - Based on 100% FC operation with batteries handling peak-loads

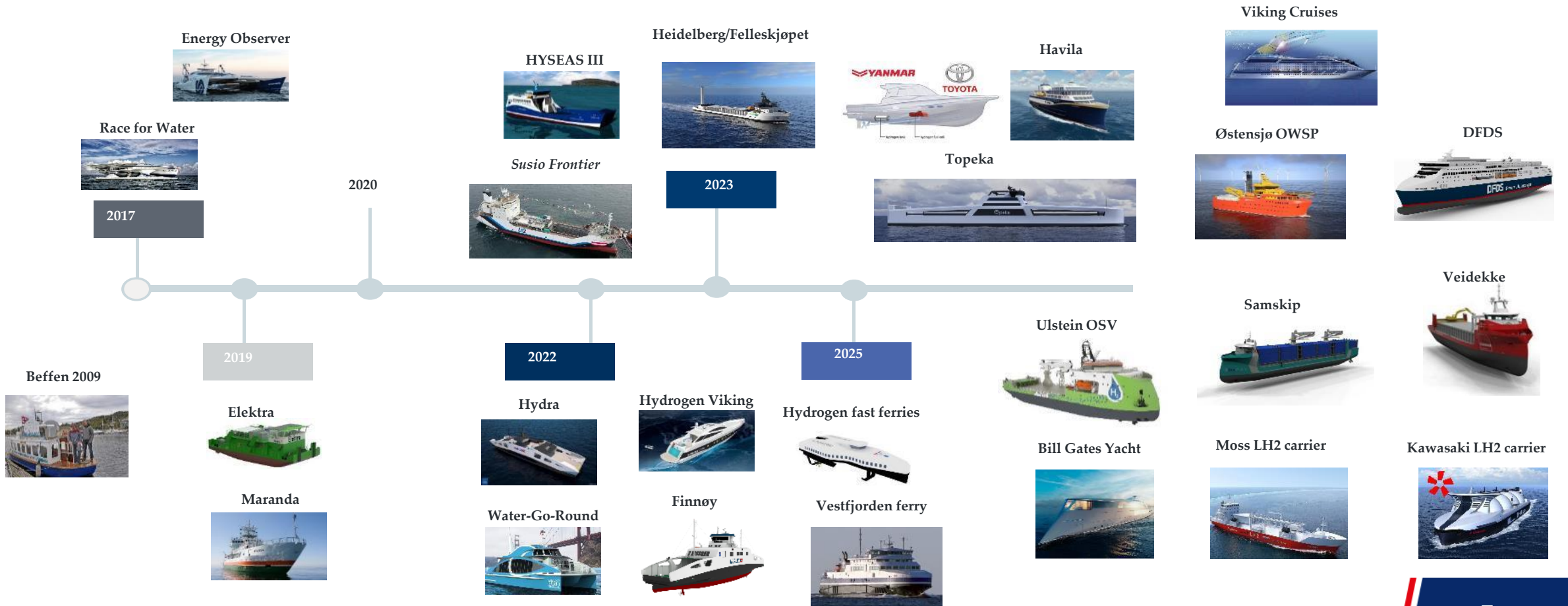


Orca Energy battery module (Corvus)



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Hydrogen-driven ship projects





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Future fast ferries in Port of Bergen



| | |
|---------------|----------------|
| Length | 29 m |
| Beam | 15 m |
| Pax capacity | 290 pax |
| Transit speed | up to 40 knots |

Hydrogen consumption per ship is 1-1,5 ton/day
GH2 vs. LH2 vs. NH3 vs. LOHC? Several issues to consider



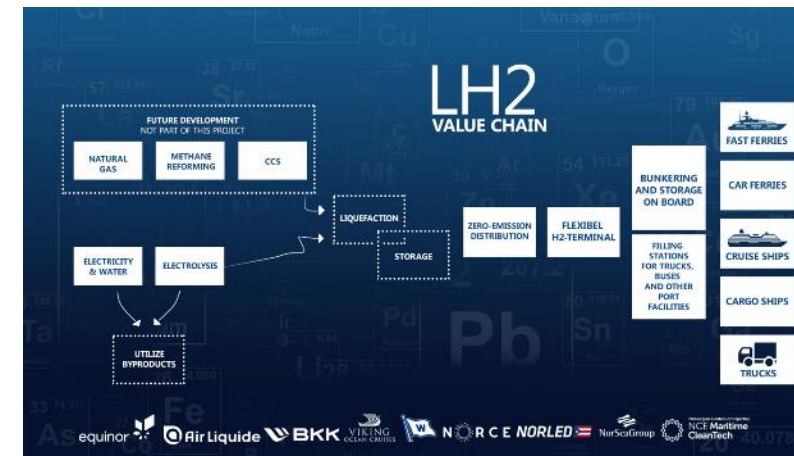


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LH₂ supply from Mongstad in 2024



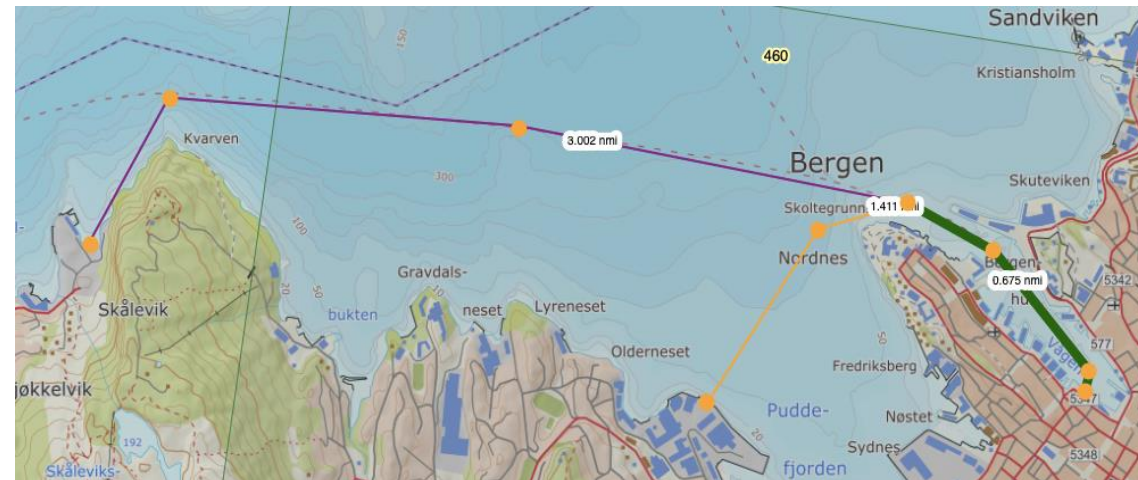
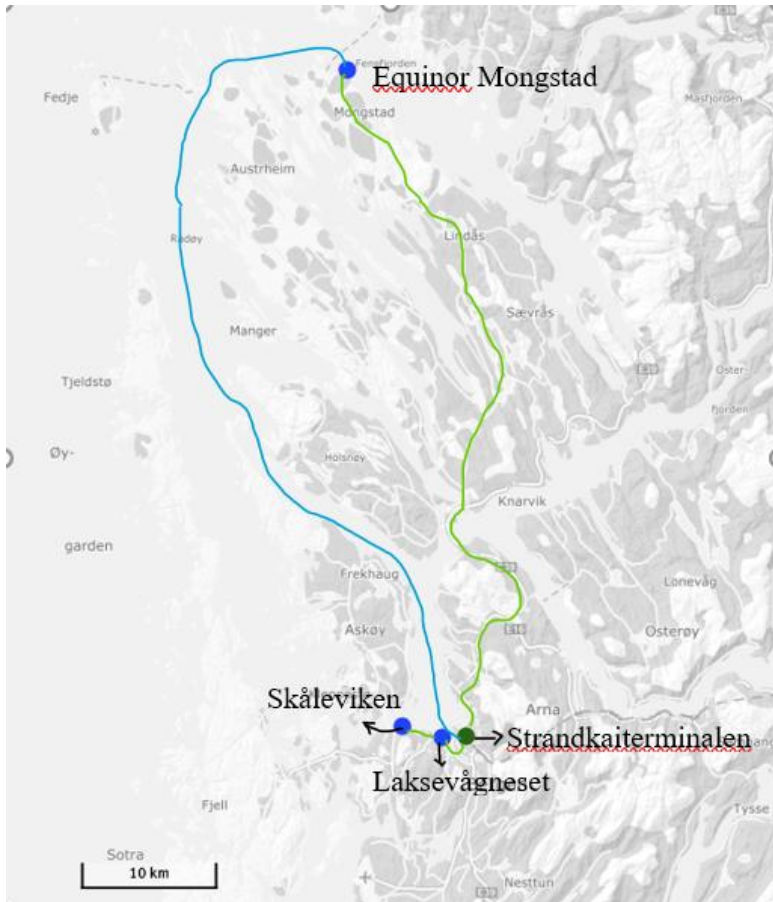
- BKK, Equinor and Air Liquide
- LH₂ production
- Planned to be in operation in 2024
- 6 tons/day growing to 30 tons/day
- Green hydrogen initially, blue hydrogen potential towards 2030





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LH₂ bunkering options in Port of Bergen





Ivan Østvik, ivan.ostvik@norled.no, Norled, May 2021