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**Norwegian Road Ferries – first movers
on LNG and battery propulsion.
–what will the future energy mix be?**

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The Norwegian LNG ferry history

- 1995, the Norwegian parliament funded a test project for ferries fuelled with natural gas
- 2000, Glutra the first ferry in the world powered by LNG
- Status by 31.1.2016 – 21 LNG powered car ferries (total 81)





All electric car ferry

- 2010 decision made to procure a environmental friendly car ferry
- The procurement was carried out as a competitive dialogue
- 2015, Ampere the first 100% battery powered car ferry in the world started operating:
 - 120 cars
 - 5 km connection





New requirements

The Government is requested by the Parliament, to ensure that zero-emission technology (and low-emission technology) are included in all future tenders for public ferries, when the technology allows for it.”



Zero an low emissions

- **Diesel engines w/scrubbers/SCR/EGR**
- LNG/gas engines single/dual fuel
- LNG/gas electrical propulsion with fuel cells and battery
- Biofuels
- Biodiesel or LBG “plug inn” hybrids
- **Electrical propulsion – battery only**
- **Hydrogen/ Hydrogen battery hybrids**



The green shift in domestic ferry services

- 4 New buildings «all electric» car ferries are contracted
 - Additional 15–25 will come within 2021
- 2 New buildings “plug inn” Hybrid car ferries are contracted
 - Additional 5–20 will come within 2021
- Several retrofit “plug inn” will come within 2021



The role of biogas, biodiesel and Hydrogen in the future

- Two-thirds of all energy consumption to domestic ferries will be possible to shift to electricity from shore
- Due to energy demand in the connections, one-third of the energy to ferry operations will come from energy carriers, such as:
 - Biogas
 - Biodiesel
 - Hydrogen
- We believe Hydrogen will represent an important supplement to available zero- and low emission technologies in the Norwegian ferry market
- Challenging but possible future zero emission fuel



Thank you for the attention!



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