



E-ferry: why going electric ‘pays off’ in the end

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 636027"

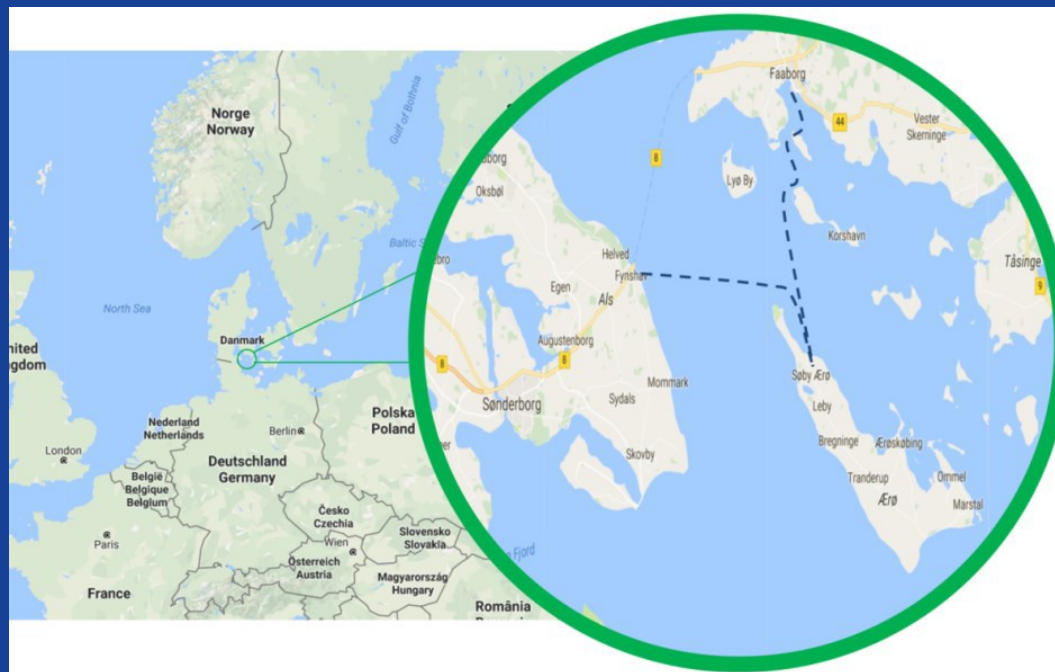
Making Marine Applications Greener, Reykjavik,
October 11, 2018



<https://www.youtube.com/watch?v=UOdkd9zEfb8>

Basics

- E-ferry is a standard car and passenger ferry
 - 60 meters long and 13 meters wide
 - 31 cars, 155-200 passengers
 - Speed of 13-14 knots



Highlights

- 4.3 MWH Battery capacity
 - (x4 of current vessels)
- DC charging with up to 4.4 MW
 - (x4 of current vessels)
- 22 nautical miles between charging
 - (x7 of current vessels)
- Energy consumption around 1600-1800 kW per trip
 - Energy efficient hull and superstructure
- Fully electric
 - (no genset for emergency power)

Project

- Horizon 2020 Innovation and research project to build a prototype of the "next generation electric ferry"
 - EU-funding of 15 mill. EURO
 - Swiss research funding of 1 mill. EURO
 - Municipality of ÆRØ funding of 12 mill. EURO

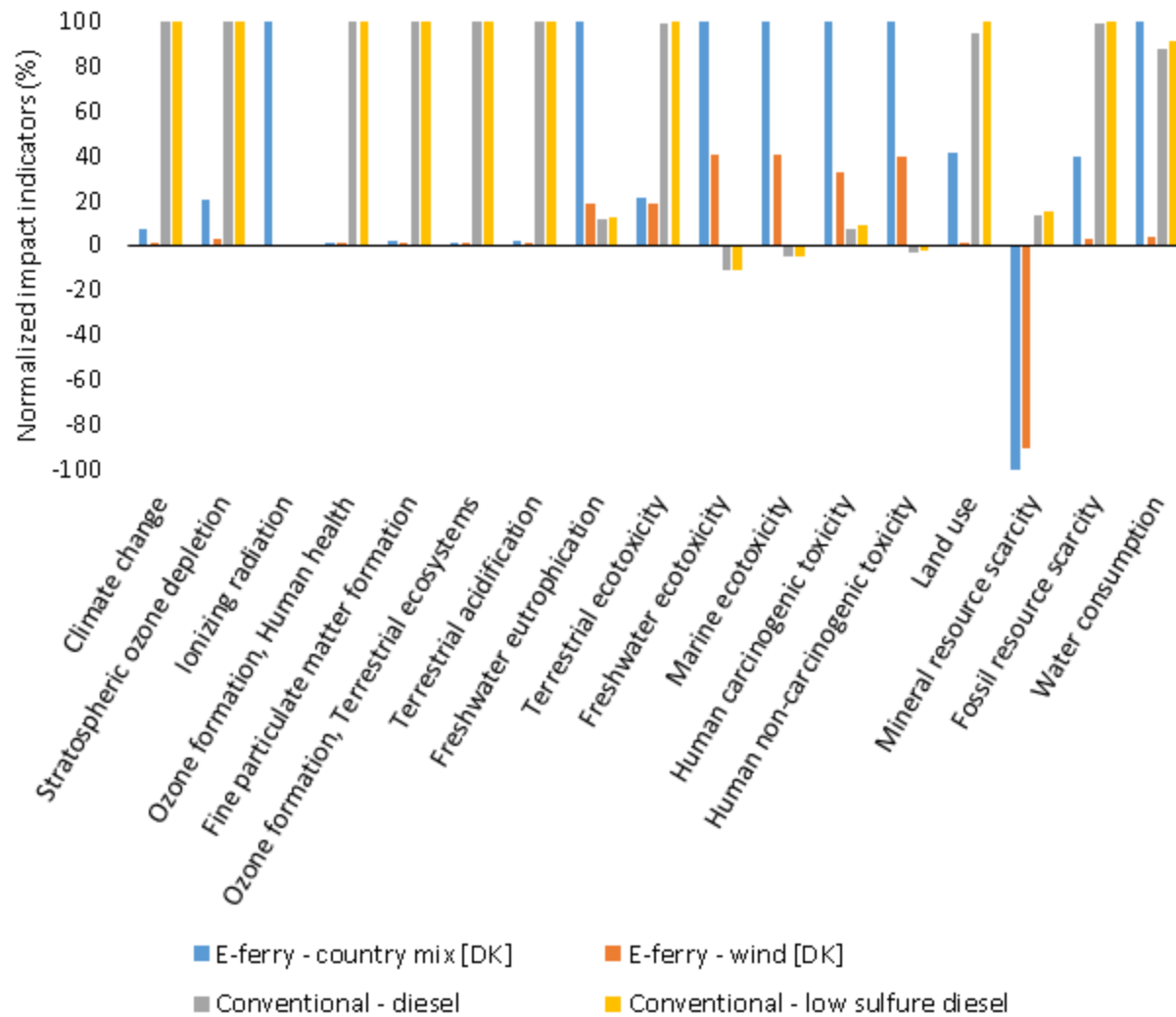


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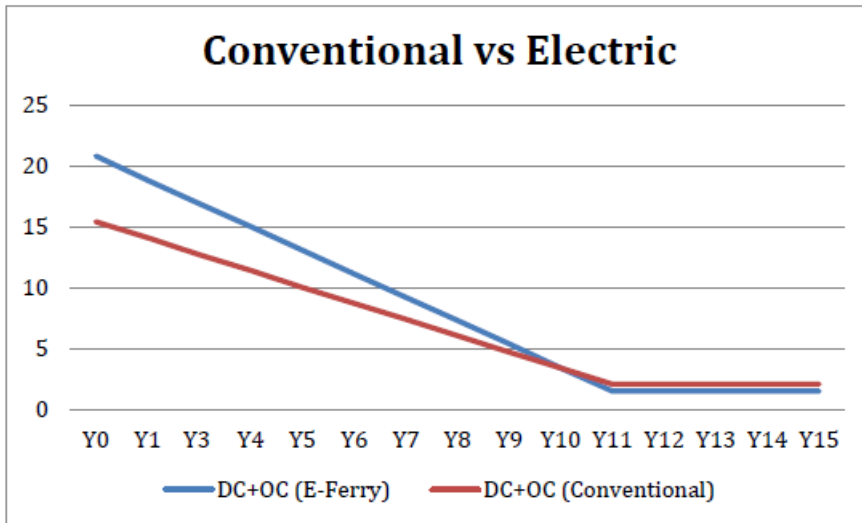
Why it pays off: Environmental benefits

- 0-emission operation:
 - savings compared to conventional ferry in operation:
 - 2.000 tonnes Co2
 - 41.500 kg NOx
 - 1.350 kg SO2
 - *Other technology that e.g. decreases NOx and SO2 increases GHG emissions*
- “Well-to-propel” analysis:
 - Electric systems are more efficient (80-90%) than diesel and diesel-electric systems (50-60%) = less energy needed to begin with
 - Impact of battery production is less significant than type of fuel used for vessel
 - Diesel > low sulphur diesel > general electricity mix > green/wind electricity



Why it pays off: Economical benefits

- Construction costs are higher for electric ferries than for conventional ferries
 - E-ferry prototype up to 50%, subsequent versions around 40% (in particular costs for batteries and charging infrastructure)
- Operation and maintenance costs are lower for electric ferries than for conventional ferries
 - Fuel around 60% (current prizes on low sulphur diesel, green electricity)
 - Crew/manning 25% (lower manning on electric ferry)
 - Maintenance/repair 50% (less docking and daily maintenance, fewer repairs)



*Siemens (2016) estimate break even at 5.5 years

Figure 41: Break even point for conventional vs electric ferry

Construction costs of E-ferry based on prototype costs

Operation and maintenance costs of E-ferry are conservative due to lack of empirical data

Fuel costs are based on Danish electricity and taxation prices

Decrease in battery prices not considered

Increase in diesel prices (particularly for low-sulphur Marine Gas Oil) not considered

Impact of IMO's greenhouse gas reduction strategy (2018) not considered



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