

The little big journey



Operating the region that never sleeps

Sailing every 15 minutes, 24 hours a
day, all year around in all weather

142 crossings per day

Efficient, punctual & safe

The most environmentally friendly
alternative to cross the strait

Business & Pleasure



One of the most important crossings over Öresund

- 7,1 million passengers
- 1,3 million cars
- 452 000 trucks
- 16 500 buses

The background of the slide is an underwater scene. The top portion shows the water's surface with numerous small, bright bubbles rising. Below the surface, the water is a deep teal color, and there are some faint, larger bubbles or light reflections scattered throughout. The overall effect is a clean, fresh, and serene aquatic environment.

**“The most sustainable, customer focused
company, striving for zero emission”**

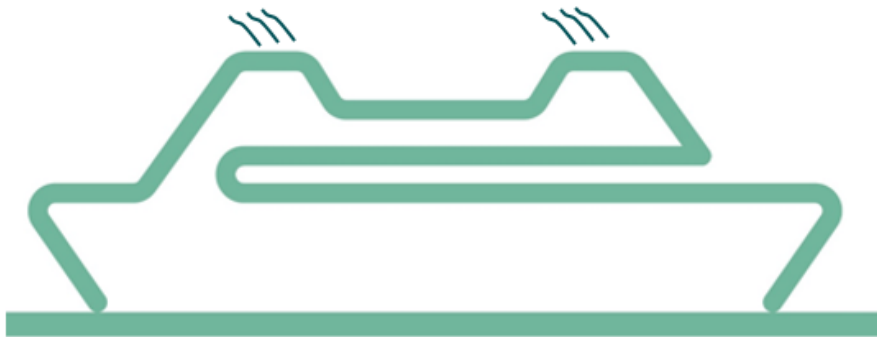
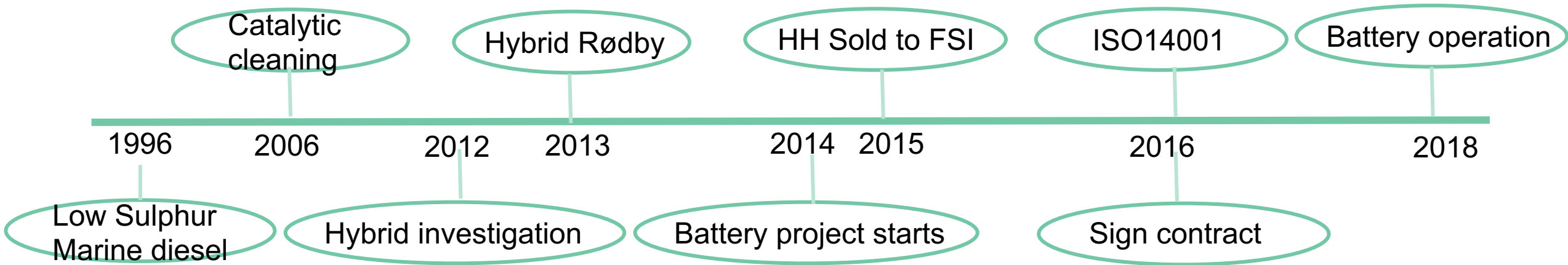
FORSEA

Battery ferries



Co-financed by the European Union
Connecting Europe Facility

The way to battery operation



- Two main consideration - high oil prices and environmental footprint
- Return of investment - unpredictable oil prices
- Power infrastructure in the port
- Battery lifetime – fast development
- Grant from INEA 13,15 MEUR
- Taxations on electricity
- Maintain high-frequency sailing schedule - 60 minutes turnaround
- How to achieve maximum environmental benefits



Authorities and approval



- No Rules for batteries
- 1455 Guidelines for approval of alternative design.
- Pre risk assessment before signing the contract. Design team consists of many different specialists
- Lloyds role for approval
- Flag state Authorities (DMA and STA) roles for approval





M/F Tycho Brahe

Battery driven



- FoodXpress
- Ristretto
- ShopXpress
- Conference & event
- Bar - open in certain periods

<u>Built</u>	1991
<u>Total Length</u>	111 m
<u>Width</u>	28 m
<u>Draught</u>	5.3 m
<u>Car capacity</u>	238
<u>Passenger capacity</u>	1100
<u>Lane meters</u>	539 m



M/S Aurora

Battery driven



- FoodXpress
- Ristretto
- Lounge
- ShopXpress
- Restaurant: Waves
- Bar with live music
- VIP-room/meetings

<u>Built</u>	1992
<u>Total Length</u>	111 m
<u>Width</u>	28 m
<u>Draught</u>	5.3 m
<u>Car capacity</u>	238
<u>Passenger capacity</u>	1250
<u>Lane meters</u>	539 m
<u>Gross tonnage</u>	11 046

Pioneering technology

- 640 batteries per ferry, with a weight of 90 kg per battery. A total capacity of 4,160 kWh/vessel
- The batteries are placed in four containers between the funnels
- Watercooled batteries for highest safety
- Possibility to hybrid mode or full diesel mode
- No emissions from in battery operation
- Higher degree of efficiency – reduced heat loss
- Less noise and vibrations





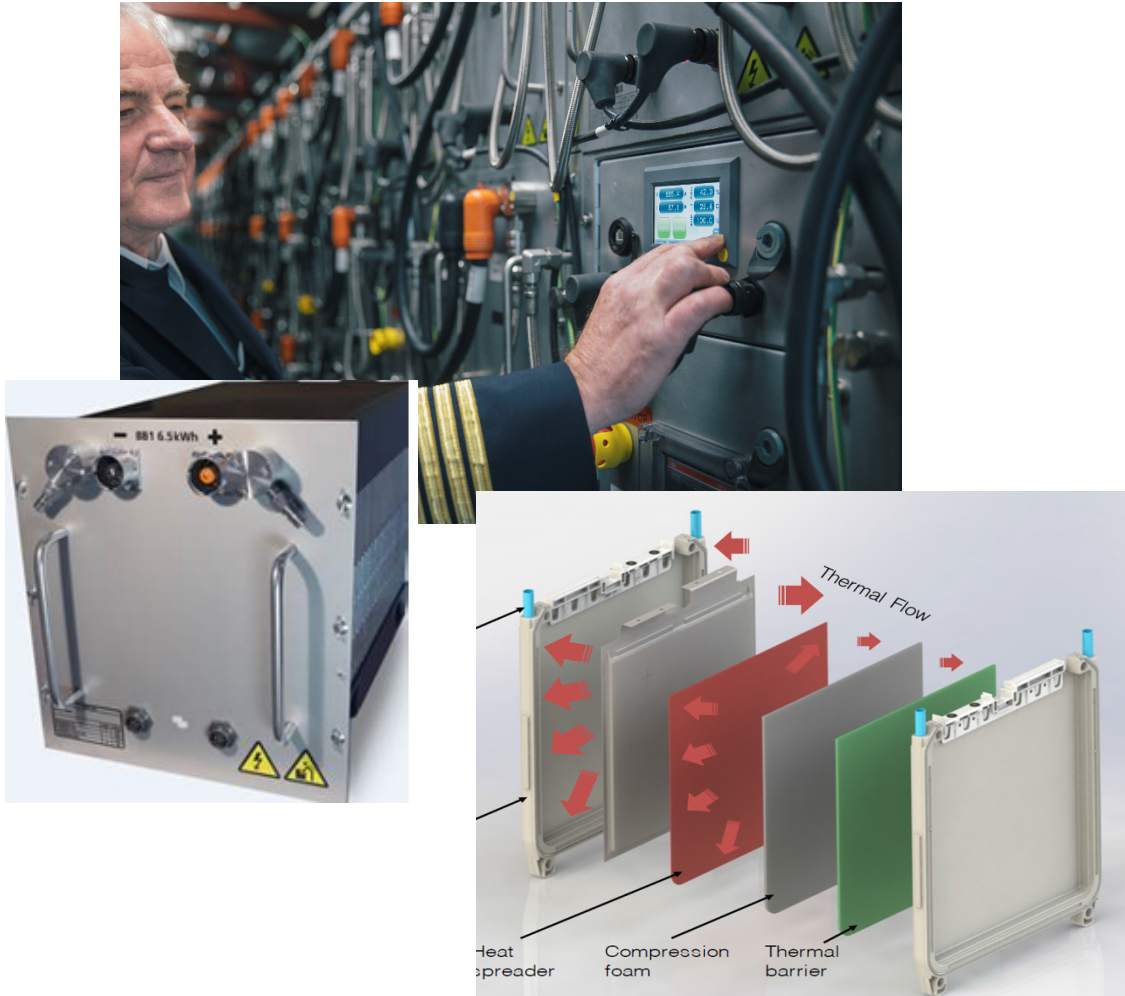
Charging fast and green

- A fully automatic laser-controlled robot arm
- 6-9 minutes of efficient charging for a 20-minute crossing
- Charging with 10 500 kW, 10 500 V and 600 Amp
- Green electricity – wind & water



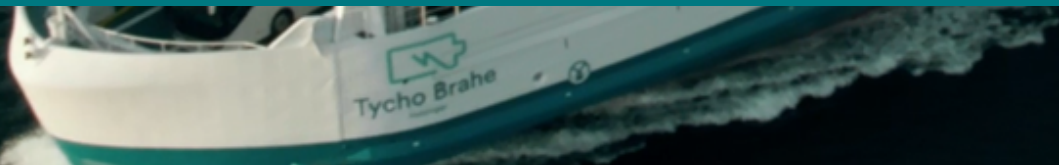
Batteries

- **Litium Ion batteries**
- **‘Production costs’ approx. 1200-1700 tonnes CO2**
- **Lifespan approx 5 years**
- **Minerals from controlled suppliers**
- **Batteries to be reused in other areas**
- **Casing to be reused after end of life of cells**
- **Fast development within the area**

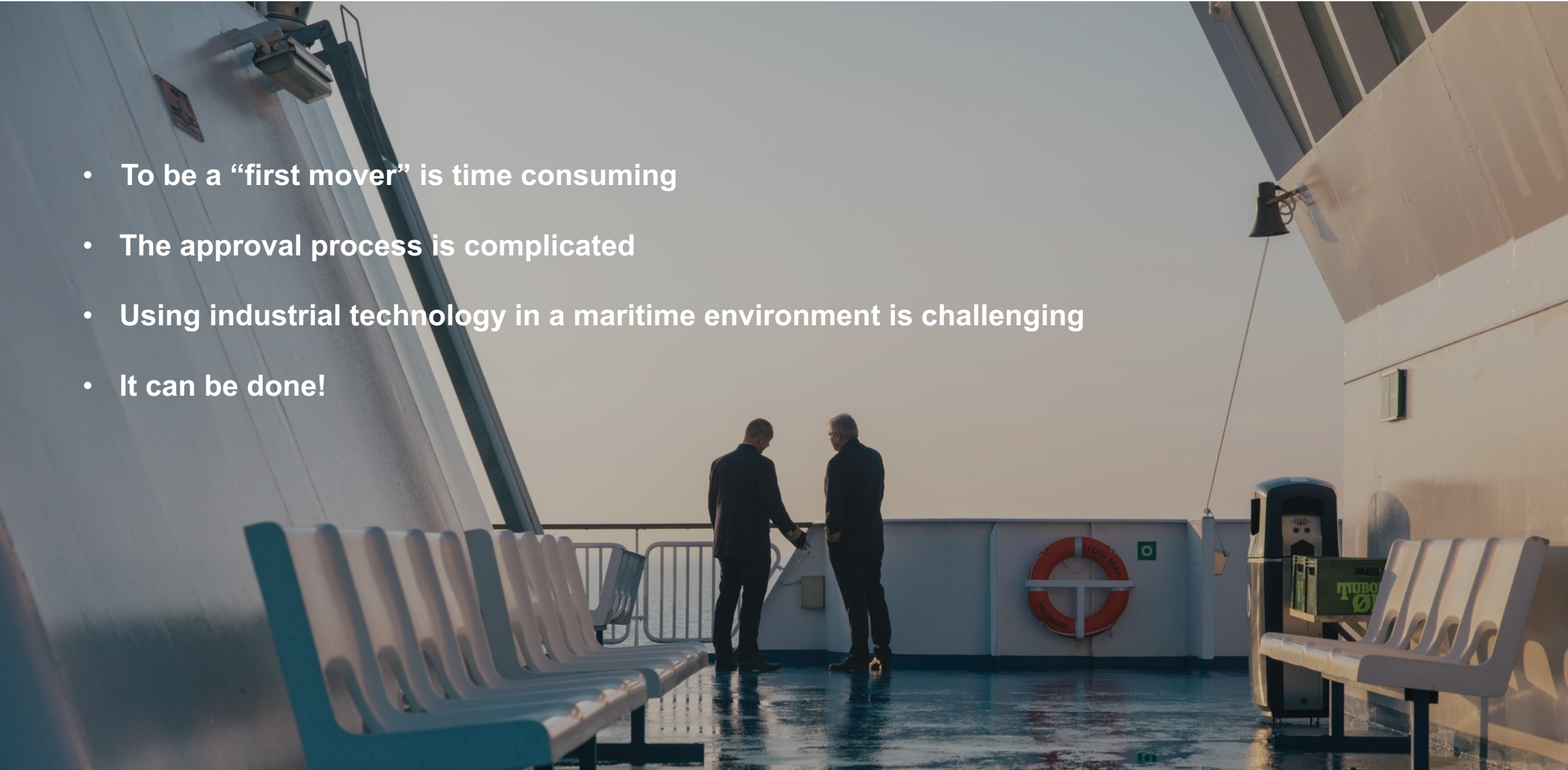


Results

- Reduced bunker and emissions by 40% in 2019 -14 000 tons CO₂
- Reduced energy consumption with approx. 24%
- Reduced amount of PM and SO_x
- Less noise and vibrations
- NPS – customer satisfaction increased from 50 to +62 on battery vessels
- In full batteryoperation (97%), reduction in bunker and emissions are expected to reach 65% in total – equals approx. 23 000 tonnes CO₂, 13 tonnes NO_x and 5 tonnes SO_x

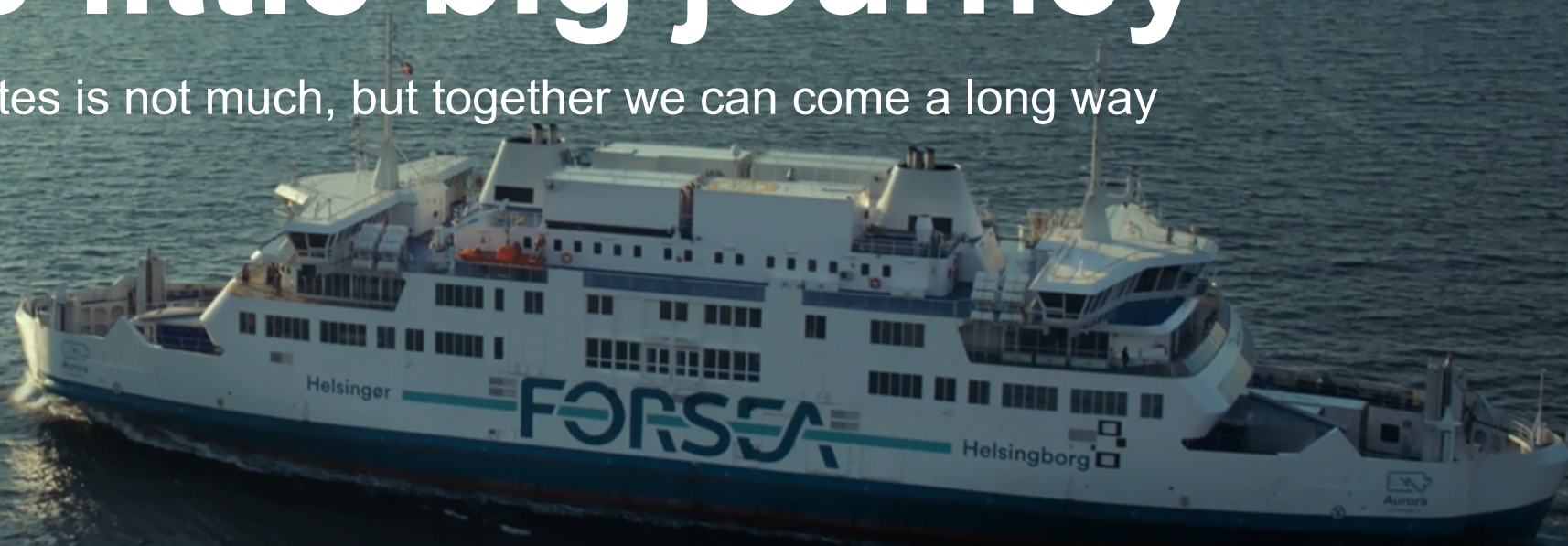


- To be a “first mover” is time consuming
- The approval process is complicated
- Using industrial technology in a maritime environment is challenging
- It can be done!



The little big journey

20 minutes is not much, but together we can come a long way



The logo for FORSEA features the word in a white, bold, sans-serif typeface. A horizontal light green line passes through the middle of the letters, with the line being slightly thicker as it passes through the circular 'O' and the 'A'.

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