The little big journey
Operating the region that never sleeps

Sailing every 15 minutes, 24 hours a day, all year round 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 most sustainable, customer focused company, striving for zero emission”
Battery ferries
The way to battery operation

- 1996: Low Sulphur Marine diesel
- 2006: Catalytic cleaning
- 2012: Hybrid investigation
- 2013: Hybrid Rødby
- 2014: Battery project starts
- 2015: HH Sold to FSI
- 2016: Sign contract
- 2018: Battery operation

- 23,000 ton CO2 / year
Two main considerations - 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

Built: 1991
Total Length: 111 m
Width: 28 m
Draught: 5.3 m
Car capacity: 238
Passenger capacity: 1100
Lane meters: 539 m

World's largest battery-powered ferry
M/S Aurora
Battery driven

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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
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<tbody>
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<td>Gross tonnage</td>
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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 battery operation.
- Higher degree of efficiency – reduced heatloss.
- 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
• Reduced bunker and emissions by 40% in 2019 - 14 000 tons CO2
• Reduced energy consumption with approx. 24%
• Reduced amount of PM and SOx
• Less noise and vibrations
• NPS – customer satisfaction increased from 50 to +62 on battery vessels

• In full battery operation (97%), reduction in bunker and emissions are expected to reach 65% in total – equals approx. 23 000 tonnes CO2, 13 tonnes NOx and 5 tonnes SOx
• 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