



**2018**

ForSea – same route, new name, even greener.

# The little big journey

- 7,1 million passengers
- 1,3 million cars
- 452 000 trucks
- 16 500 buses
- 50.000 departures / 142 per day
- 24/7 operation
- 99.8 % reliability
- Efficient, punctual & safe



# FORSEA

## Battery ferries



Co-financed by the European Union  
Connecting Europe Facility

# Business considerations

- Two main consideration - high oil prices **environmental footprint.**
- 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
- How to achieve maximum environmental benefits



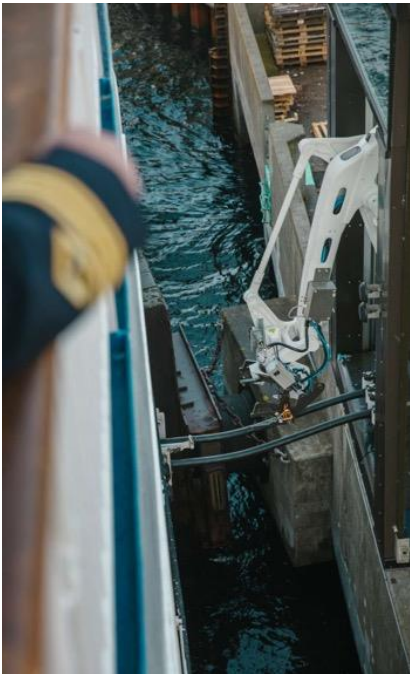
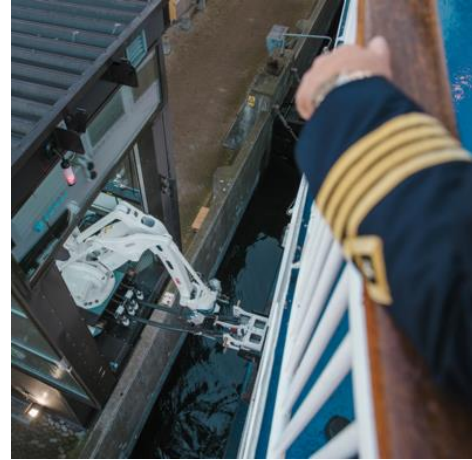


# Pioneering technology

- 640 batteries per ferry, with a weight of 90 kg per battery. A total capacity of 4,160 kWh
- Battery charged by “green electricity” from non-fossil fuel; wind, water, solar energy
- No emissions from the battery-operated vessels
- Watercooled batteries for highest safety
- The batteries are placed in four containers between the chimneys
- Less noise
- Possibility to hybrid mode or full diesel mode







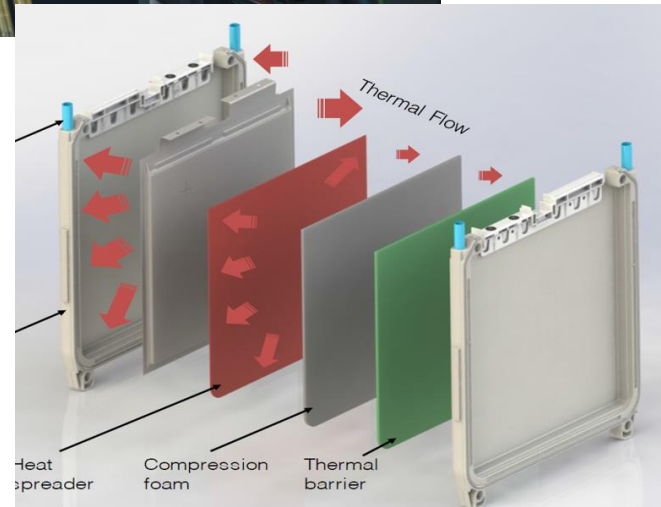
## Charging fast and green

- A fully automatic laser-controlled robot arm
- 6-9 minutes of efficient charging for a 20-minute crossing
- Charging with 10 500 kW, 10500 V and 600 Amp
- The energy combustion when using battery operation, is much lower compared to diesel, due to the efficiency of the power



# Batteries

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



# Authorities and approval



- No Rules for batteries, IMO Alternative design
- 1455 Guidelines for approval of alternative design.
- Pre risk assessment - HAZID
- Design team - all specialists
- Lloyds role for approval
- Flag state Authorities (DMA and STA) roles for approval





# Results

- So far reduced bunker and emissions by 50% in 2019 - 11 000 tons CO2
- Reduced energy consumption with approx. 30%
- Reduced amount of particles (PM) – reduced NoX and SoX
- Less noise and vibrations
- In full batteryoperation (97%), reduction in emissions are expected to reach 65% in total – this equals approx. 23 000 tonnes CO2, 13 tonnes NOx and 5 tonnes Sox
- NPS – customer satisfaction increased from 50 to +62 on battery vessels



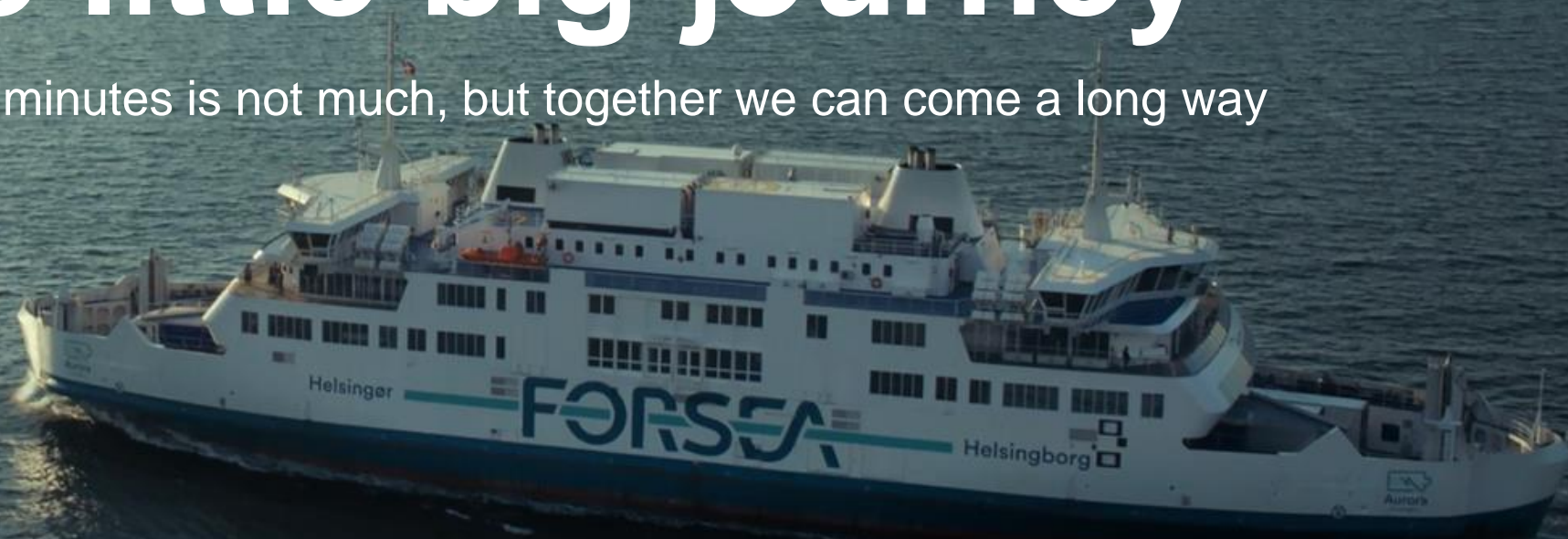
- To be a “first mover” is time consuming
- The approval process is too complicated.
- Using industrial technology in a maritime environment is challenging.
- It can be done!





# The little big journey

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





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, clear blue-green color, with some light rays and smaller, fainter bubbles visible throughout the depth.

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

# FORSEA

## History



Operating since  
the vikings

## Vision



"The most sustainable,  
customer focused company,  
striving for zero emission"

## Operations



- Every 15 minutes, all year around in all weather
- 142 crossings/day
- 7,1 million passengers
- 1,3 million cars
- 428 000 trucks
- 16 500 buses

## Offering



- Food & Beverages
- Retail
- Passenger traffic
- Freight

## Sustainability



- Charged by green electricity.
- 6-9 min of efficient charging
- 4160 kwh energy capacity

The logo for FORSEA features the word "FORSEA" in a white, bold, sans-serif typeface. A horizontal light green line passes through the middle of the letters, with the line appearing to be interrupted or cut by the letterforms. The entire logo is centered on a solid teal background.

FORSEA





## 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



## 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
<u>Gross tonnage</u>	11 434