Green Agenda:

Scandlines Hybrid Ferries and Zero Emission Project

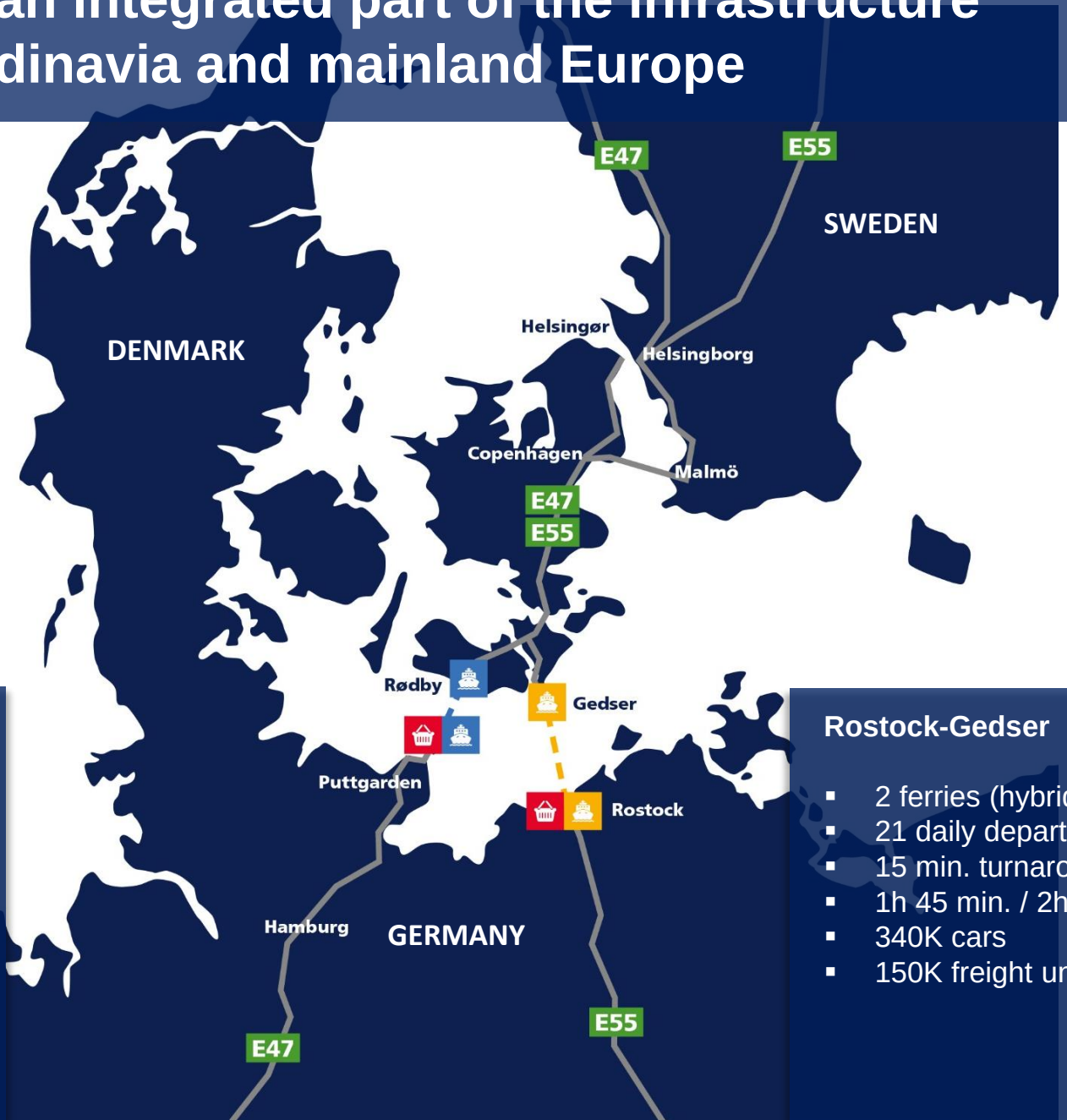
November 2019

Introduction

Present – Hybrid ferry operation

Future – Zero emission ferry operation

Scandlines is an integrated part of the infrastructure between Scandinavia and mainland Europe



Puttgarden-Rødby

- 6 ferries (4 hybrid in 30 min schedule)
- 110 daily departures
- 15 min. turnaround
- 45 min. crossing
- 1.4 M cars
- 550K freight units
- 13K train wagons

Rostock-Gedser

- 2 ferries (hybrid)
- 21 daily departures
- 15 min. turnaround
- 1h 45 min. / 2h crossing
- 340K cars
- 150K freight units

Introduction

Present – Hybrid ferry operation

Future – Zero emission ferry operation

Present

Prinsesse Benedikte – The world's largest hybrid ferry (2013-2015)

- Built in 1997, hybrid since August 2013

>25 million Euro investments in green technologies 2013-15 on Puttgarden-Rødby

- The world's largest hybrid ferry – 1.9 MWh battery bank
- The system equals approx. 180 hybrid cars and can propel the vessels for 20 minutes
- Reduce CO_2 emissions by 15 % (approx. 15,000 tons CO_2 yearly)
- Large international recognition for this industry leading concept

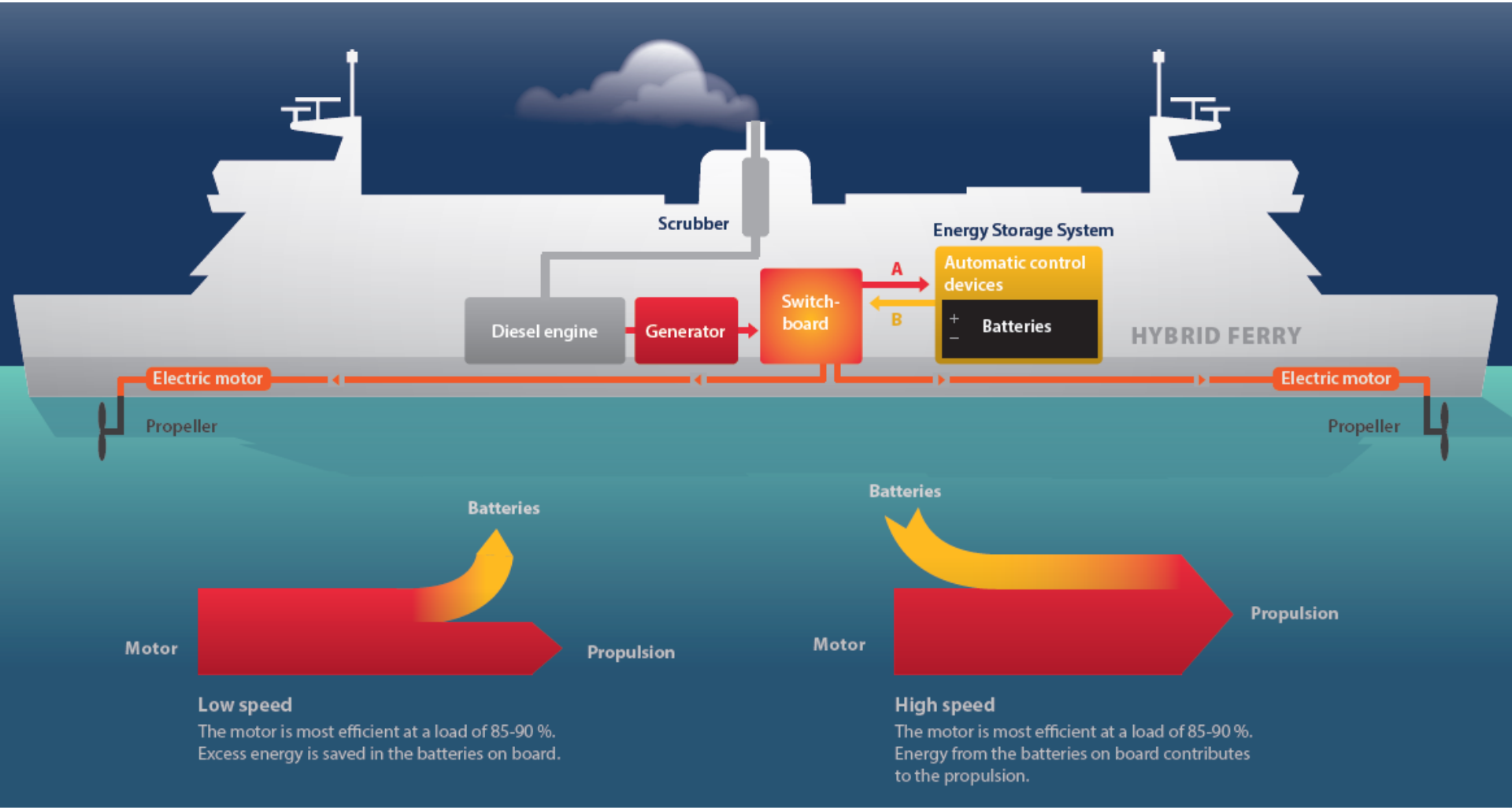
Co-financed by the European Union
Trans-European Transport Network (TEN-T)

THERE IS SOMETHING ABOUT SAILING

Scandlines

Technical backup – how it works

Scandlines HYBRID FERRY



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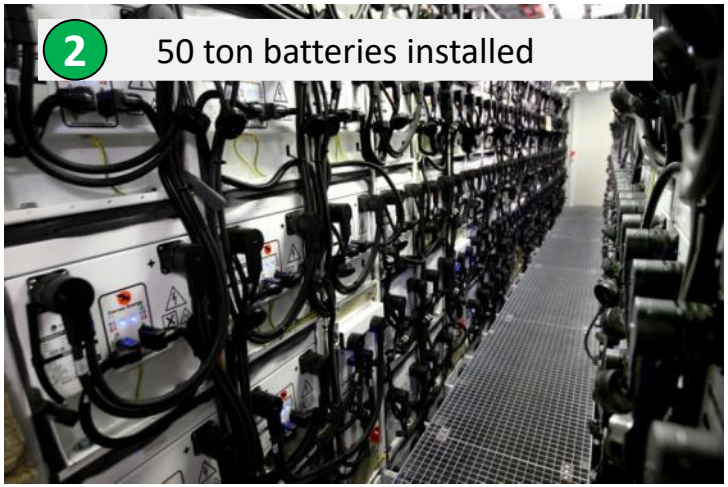
Present

How you convert a ferry to hybrid

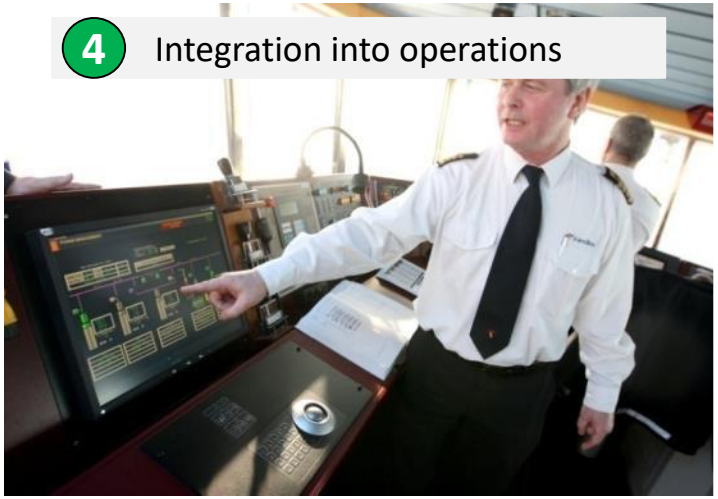
1 85 ton motor taken out

3 ESS control system installed

2 50 ton batteries installed



4 Integration into operations



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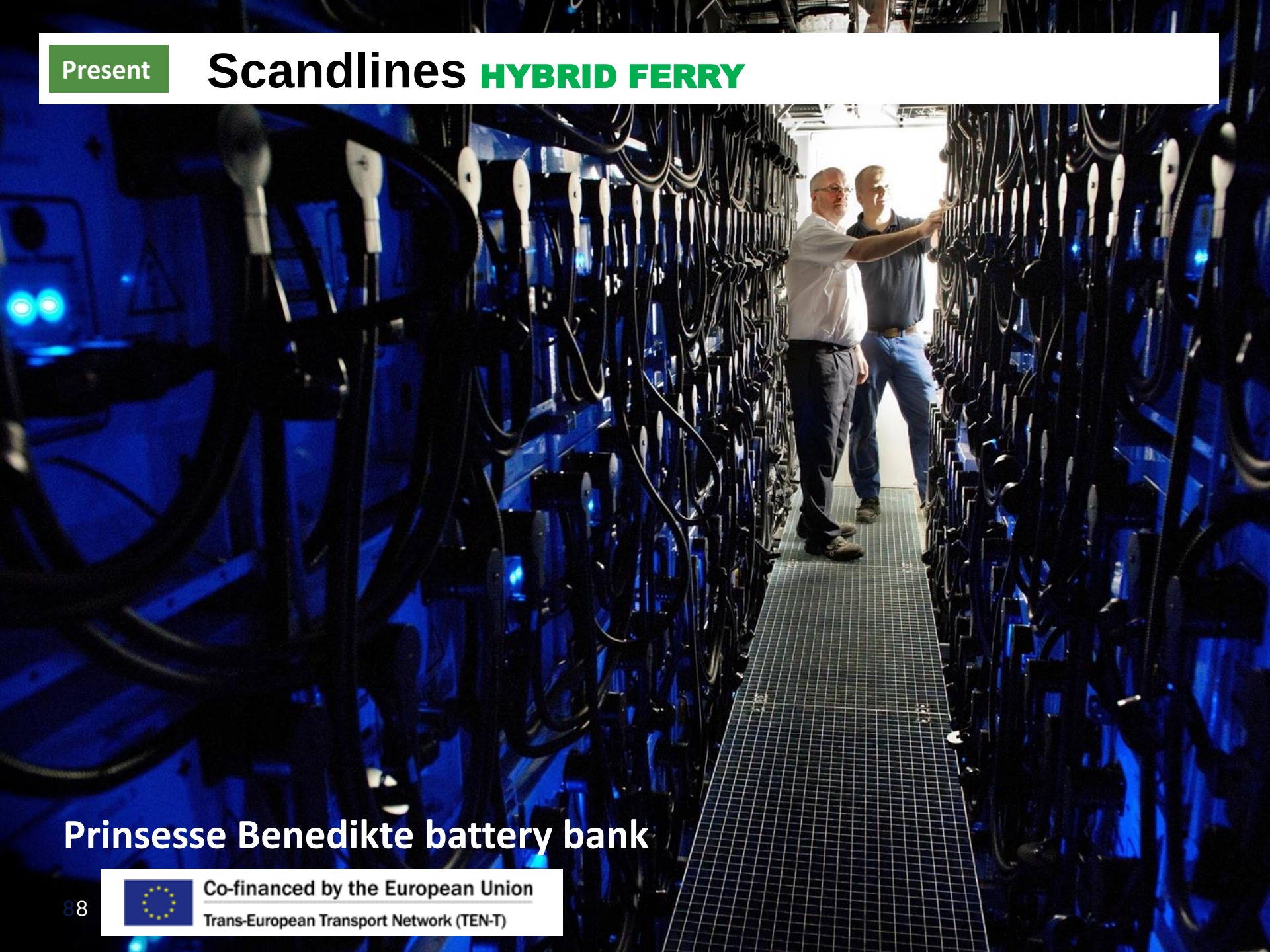
Present

Scandlines HYBRID FERRY



Prinsesse Benedikte battery bank

Co-financed by the European Union
Trans-European Transport Network (TEN-T)

Present

Worlds largest Hybrid Ferry Fleet in operation

Puttgarden-Rødby

Prinsesse Benedikte
Hybrid since 2013

Deutschland
Hybrid since 2014

Prins Richard
Hybrid since 2014

Schleswig-Holstein
Hybrid since 2014

- **Capacity per ship:**
  - 364 cars or 124/30 cars and trucks

Rostock-Gedser

Berlin
In operation since 2016

Copenhagen
In operation end 2016

- **Capacity per ship:**
  - 460 cars or 96 trucks

SHIPPAXAWARD electric & hybrid marine AWARDS 2014

Co-financed by the European Union
Trans-European Transport Network (TEN-T)

THERE IS SOMETHING ABOUT SAILING

Scandlines

Introduction

Present – Hybrid ferry operation

Future – Zero emission ferry operation

2015

2017

Future

Zero Emission ferries scope is increasing rapidly

Zero emission ferry project examples:

2015

- 6 km / 20 min crossing
- 34 crossings /day
- 120 vehicles capacity

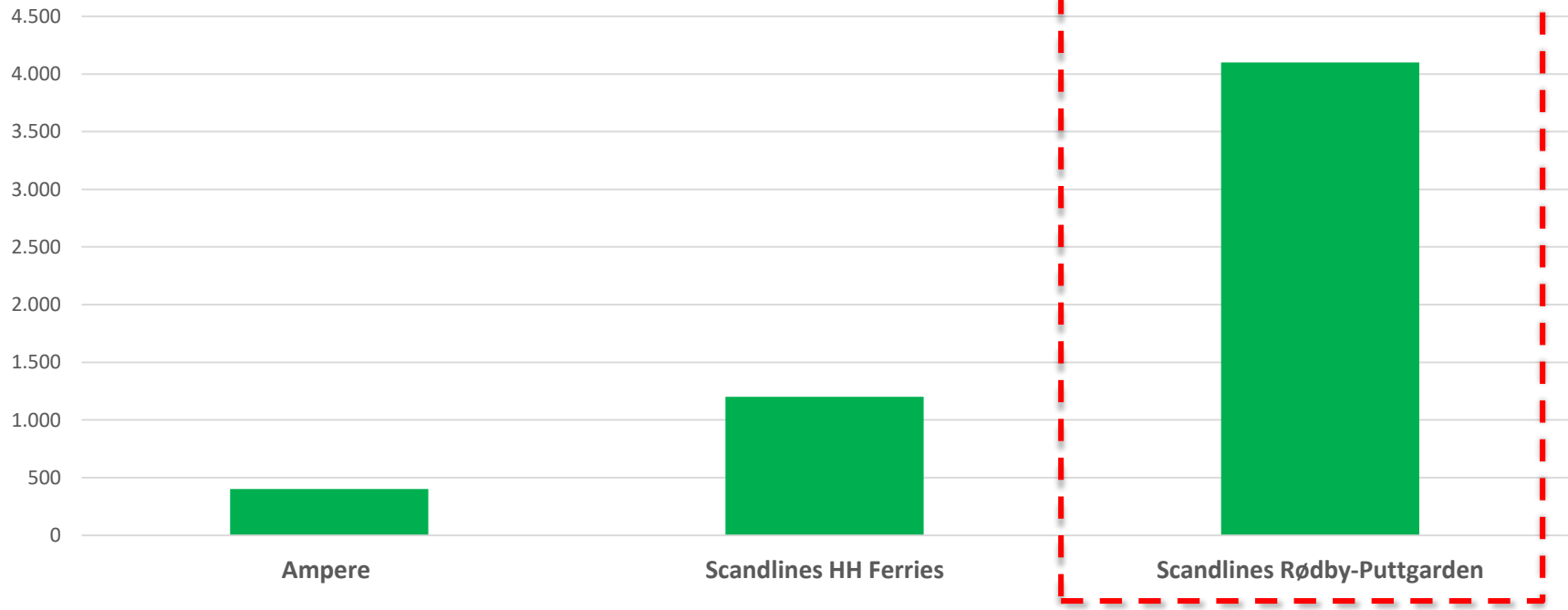
2017

- 6 km / 20 min crossing
- Up to 48 crossings /day
- 240 vehicles capacity

Near future

- 18 km / 45 min crossing
- 24 crossing /day
- 364 vehicles capacity

KWh per crossing



Source: Lit search

Future

Our goal is Zero Emission ferries in the near future

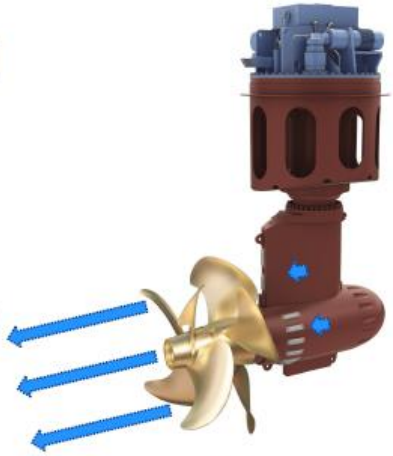
Present → **Hybrid Ferries**

Current focus → **Lower electrical consumption per trip**

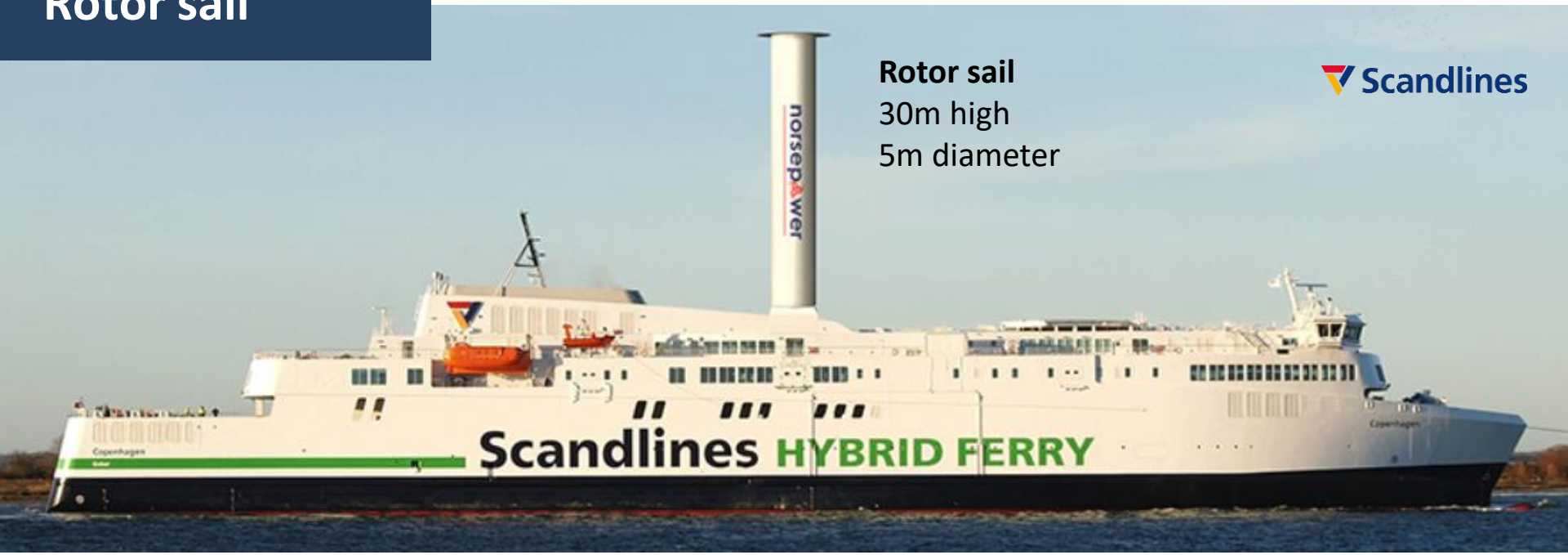
Near future → **Zero Emission Ferries**

- Investment in efficiency to lower electrical demand per crossing
- Develop Zero Emission technical solution
- Political dialogue - secure business case for Zero Emission implementation
  - Secure sufficient power grid to harbours – access to green electricity
  - Secure reasonable pricing of electricity
  - Access to funding and green loans

Thruster upgrade

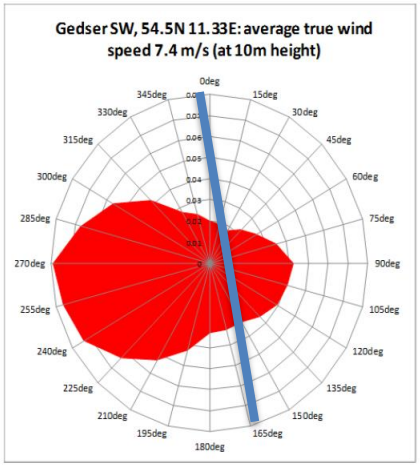


Rotor sail



Preliminary investigation with study of sailing pattern and wind conditions

- Simulation study with current sailing pattern and wind conditions suggests efficiency savings of 4-5 percent (Rostock-Gedser)
- The wind conditions of the route area are good and
  the prevailing wind direction is favourable for rotor sails



Project status

- Initial rotor to be installed on Copenhagen on Gedser-Rostock
- Rotor foundation installed November 2019 in connection with planned yard stay
- Rotor to be installed Q2 2020

www.scandlines.com/about-scandlines/greenagenda

Thank you for your attention

Scandlines Green Agenda

Our ambition is **emission free ferries** – we take **one nautical mile at a time**.
We invest responsively in tomorrows technology **leading towards a greener future**.

Past **1997-2013**

Diesel/electric

Present **2013-**

Diesel/battery
electric hybrid

Future **Near future**

Zero emission
- 100% electrical
- Hydrogen/battery hybrid