

Scandlines owns the **world's largest hybrid ferry fleet**

Our new hybrid ferries M/V Berlin and M/V Copenhagen are the **largest hybrid ferries in the world**

Our ambition:
From **HYBRID** to **ZERO EMISSION**



PUTTGARDEN – RØDBY



ROSTOCK – GEDSER



How the hybrid system works

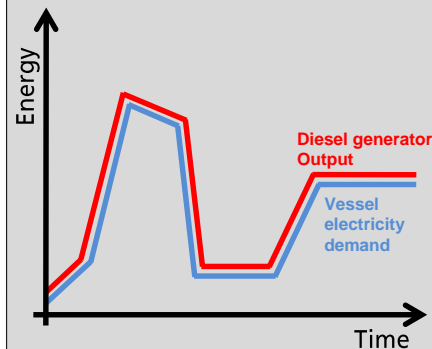


"The hybrid propulsion system is the key to our green agenda. We are the proud owners of the world's largest hybrid ferry fleet. With our knowledge and expertise we are on target to reach our goal – zero emission."

Søren Poulsen Jensen,
CEO Scandlines

Conventional diesel electric ferries

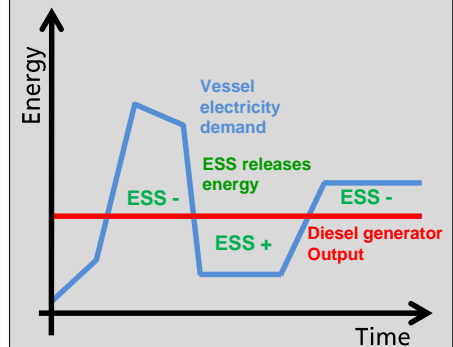
Electricity supply and demand varies



Vessels run with 1-3 diesel generators* at 40-55 percent load at sea on average and 8-9 percent load in ports.

Scandlines' hybrid ferry

Constant electricity supply at varying demand through ESS (Energy Storage System) ** buffer

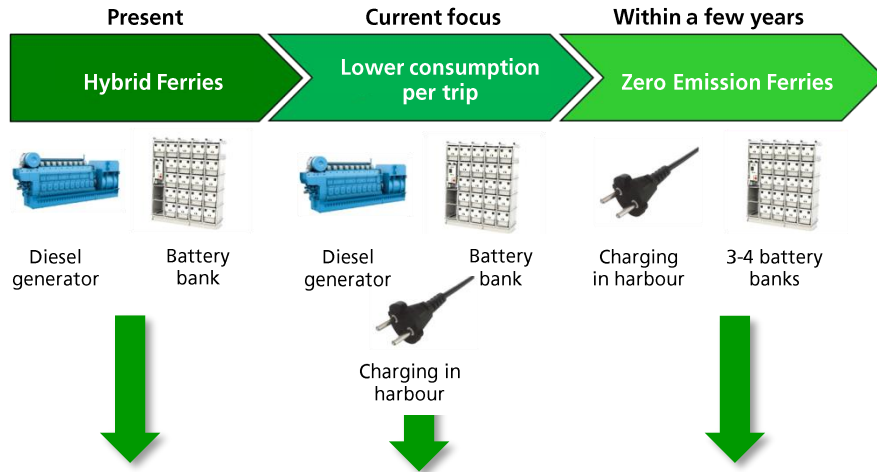


Scandlines' hybrid ferries run with 1 diesel generator at 85-90 percent load at sea and in ports. Optimal engine efficiency at load factor >85 percent.

* A diesel generator is a so called **GenSet**, a combination of a diesel engine and a power generator

** An **ESS** consists of a battery bank and a control system

Our ambition is emission-free ferries – we take one nautical mile at a time. We invest responsibly in tomorrow's technology leading towards a greener future.



- 1 ESS on board
- Traditional diesel power combined with electric battery power
- Constant electricity supply at varying demand through ESS buffer
- Protection of the environment by avoiding partial load and idling

- Investment in efficiency to lower electrical demand per crossing
- Minor adjustments leading to large energy savings
- Hybrid ferries to be prepared step by step to exclusively run on battery power
- Secure sufficient power grid to harbours

- 3-4 ESS on board
 - Yet another diesel generator will be removed
 - The ESS are recharged by charging stations that are situated ashore
- Puttgarden-Rødby:**
The whole route is covered by 100 percent battery power
- Rostock-Gedser:**
Compared to the Puttgarden-Rødby route, the journey on Rostock-Gedser is longer and therefore results in an increased energy consumption. Hence, in order to sail entirely emission free between Rostock and Gedser, new technology is required. A possible solution could be a hybrid ferry that combines hydrogen and battery power.

The first milestone

In 2013, Scandlines introduced a groundbreaking hybrid propulsion system on M/V PrinsesseBenedikte operating the route Puttgarden-Rødby. The hybrid system combines traditional diesel power with electric battery power. As the first ferry operator in the world, Scandlines is able to make large-scale use of an on-board hybrid propulsion system, which stores energy in batteries. During 2014 the remaining three passenger ferries on the route were converted to hybrid ferries.

The route Puttgarden-Rødby

- Length: 18.5 km
- Crossing time: 45 min.
- 34,000 departures every year
- Four double-ended ferries
- Departures every 30 minutes in each direction, 24/365
- The hybrid system is operated by a 1.9 MWh battery (approx. 400 hybrid cars)
- Hereby the ferry is expected to reduce CO₂ emissions by up to 15 percent

Commissioning of M/V Berlin and M/V Copenhagen

In 2016, Scandlines achieved yet another milestone on it's way to zero emission, by putting the world's largest hybrid ferries, the M/V Berlin and M/V Copenhagen, into service on the route Rostock-Gedser.

The route Rostock-Gedser

- Length: 49 km
- Crossing time: 1 h 45 min.
- Two ferries

The hybrid system on Rostock-Gedser is conceptually identical with the one on the four ferries on Puttgarden-Rødby. However, the usage is different, as the distance is longer, thus more energy is required.

On this route, the fuel consumption per car per crossing can be reduced to a third compared to the previous ferries.

Scrubber

All hybrid ferries are fitted with a so-called closed-loop scrubber system. The scrubber cleans the engine exhaust streams of pollutants such as sulphur and particulate matter by at least 90 percent.

Investments of several MEUR

Scandlines has invested several MEUR in the construction of M/V Berlin and the sister vessel M/V Copenhagen. Additional investments in the development of an environmental friendly ferry operation are already planned.

The EU has endorsed the conversion of the four ferries on Puttgarden-Rødby and the construction of the two new hybrid ferries for Rostock-Gedser with several million Euro.

A nautical mile in the right direction

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