



2019 JÖRGEN KARLSSON ABB MARINE

Electric. Digital. Connected.

ABB @ FORSEA 2019-09-18

ABB Group

Domestic Sales & Service



Power Grids



Industrial Automation



Electrification



Robotics & Discrete Automation



Motion



Core Business in Marine - electric systems, Azipod® propulsion and automation

Core solutions and Innovations



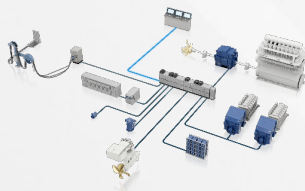
Bridge solutions



Digital Solutions



Azipod® propulsion



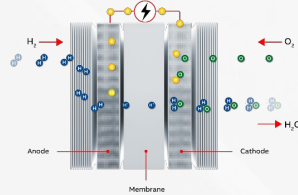
MV AC and Onboard
DC Grid electric systems



Automation



Marine Services



Fuel cell solutions



Battery Solutions

Vessel segments



Cruise



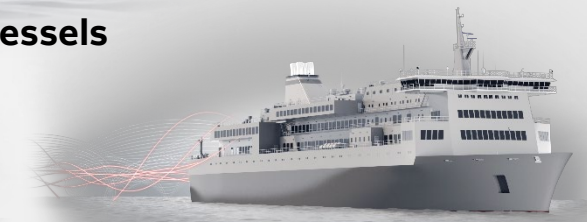
Drilling



Ice breaking vessels



LNG tankers



Passenger Ferries

Zero emission operation - solutions

Short distance shipping driving local environmental goals

Charging technology

Electric charging solution

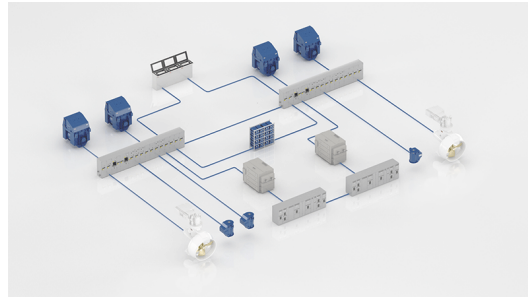
- Solutions
 - Robot charging
 - Semi Auto charging
 - Crane assisted charging
 - Manual operated charging



Onboard DC Grid™

Electric power solution

- Modular system
 - Increase flexibility
 - Increase efficiency
 - Future energy sources



Batteries

Clean, flexible and safe

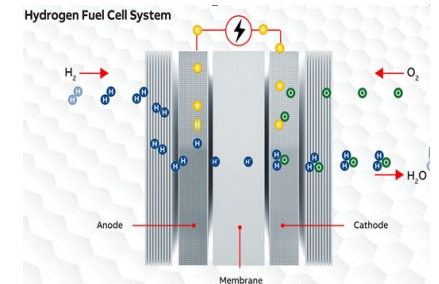
- Energy storage functions
 - Spinning reserve
 - Peak shaving
 - Back-up reserve



Fuel Cells

Clean and flexible

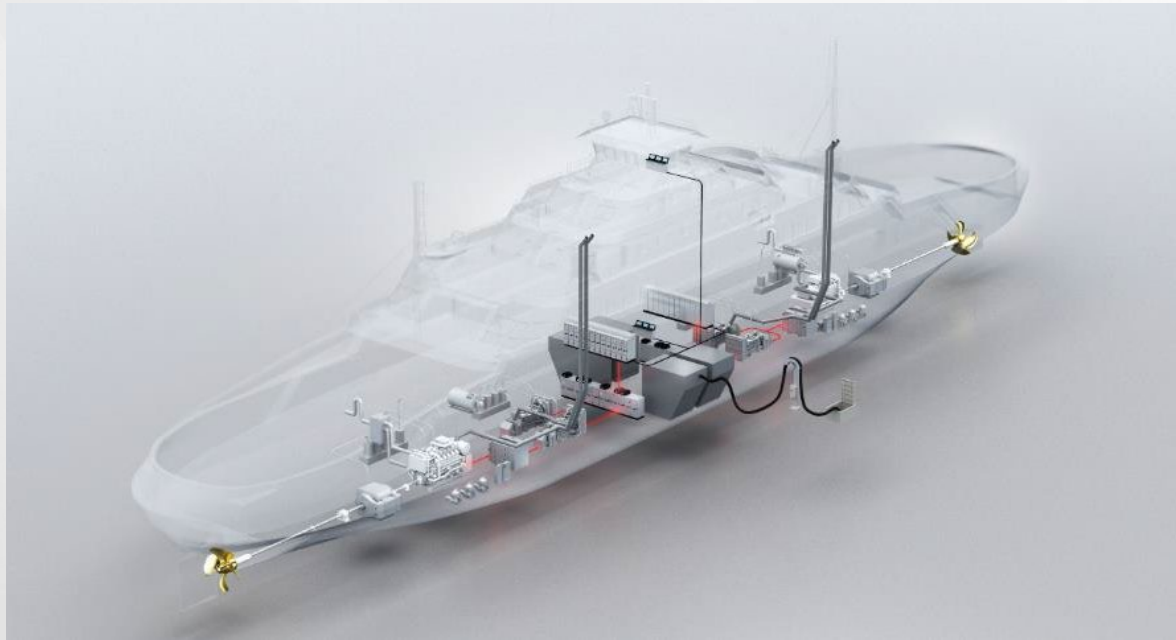
- Energy production function
 - Modular System
 - Increase range
 - Combined with batteries



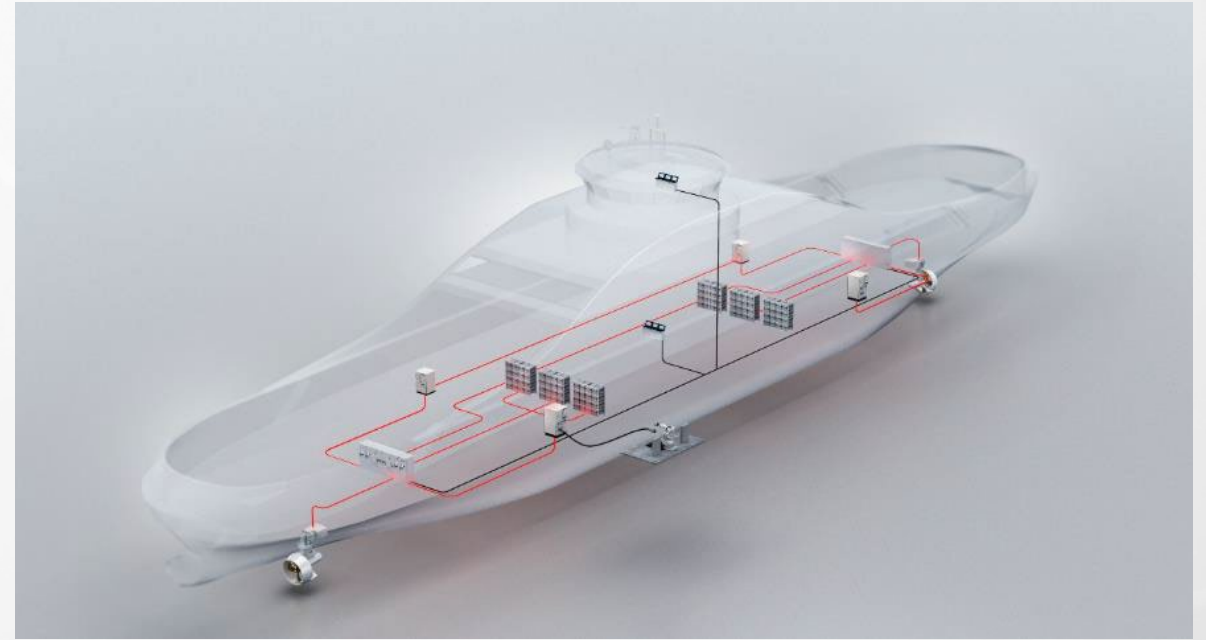
Electric. Digital. Connected.

Simplicity

Mechanical power train



Electric power train



Electric is more efficient, simpler, flexible, more digital and better integrated

Ship Design

Traditional Thinking

Services

Expert Support



Field Services



On call service offering for spares and support

Isolated Systems – Lot of Interfaces – No benefits to connect system - No possibility for pre-delivery testing

Control Systems

Power Management Systems



Propulsion & Remote Control



Device Monitoring



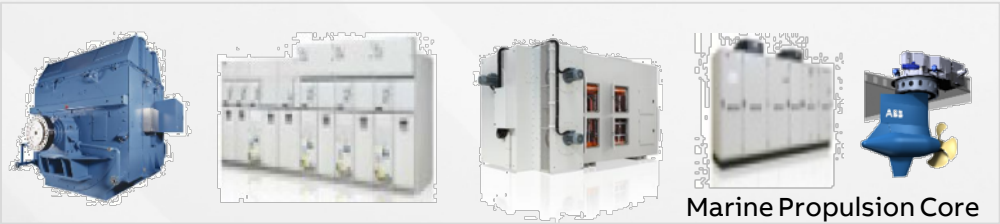
Ship Automation



Navigation Electronics



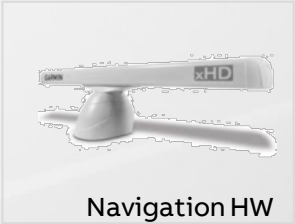
Functional Products



Marine Propulsion Core



Products & Non-ABB Systems



Navigation HW

Ship Design – Bridge to Propeller Integration

Digital Thinking

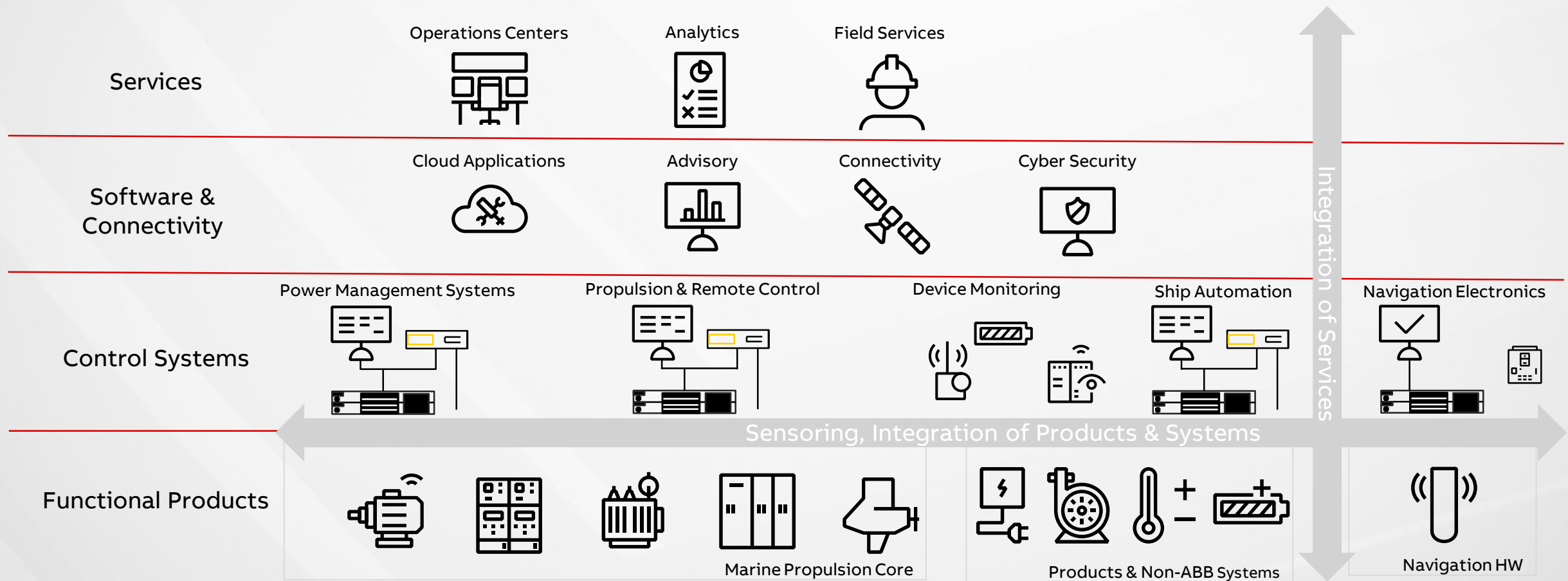
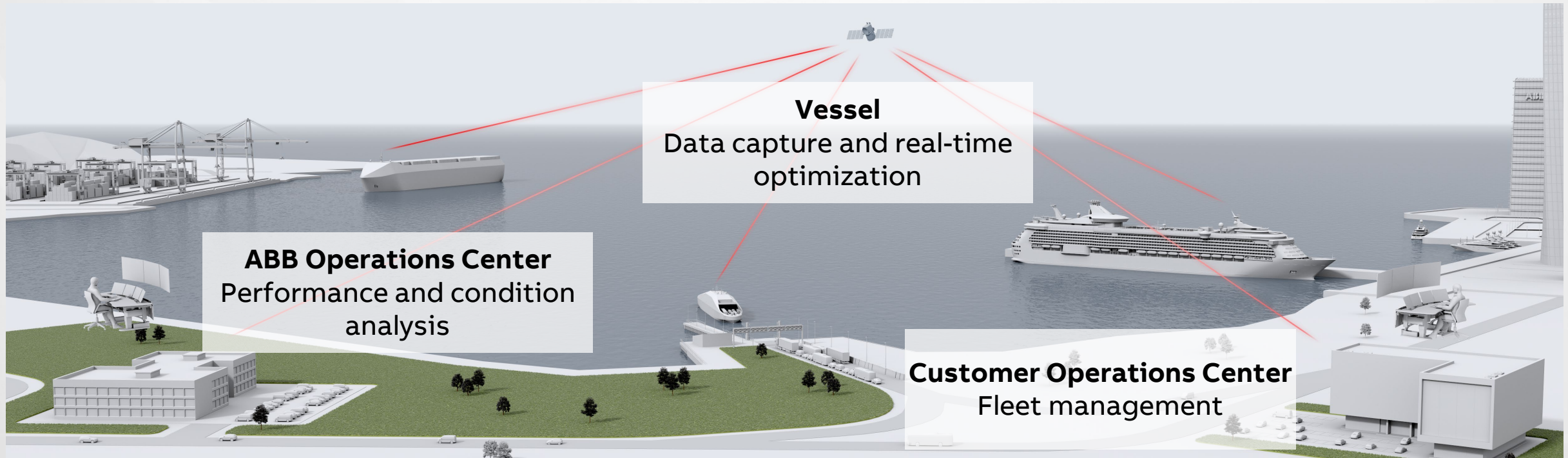


ABB Ability™ Collaborative Operations - Digitalization

1000 vessels connected

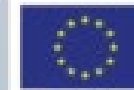
ABB is able to diagnose more than 90% of the service cases remotely, solving over 60%-70% of these cases without any on-site intervention.



Connecting vessels and shore operations with our experts

ABB Ability™ Collaborative Operations



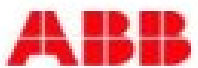


Co-financed by the European Union
Trans-European Transport Network (TEN-T)



ForSea M/F Tycho Brahe and M/F Aurora Vessel Introduction / Scope of Supply from ABB

Power and productivity
for a better world™



Onboard DC Grid & Energy Storage

Tycho Brahe & Aurora Energy Storage



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



Vessel information

- Vessel name: Tycho Brahe & Aurora
- Vessel Type: Car Ferry
- Design: -
- Yard: Landskrona
- Year of delivery: 2017-2018
- Class/Notation: Lloyds Register/DMA/STA
- Owner: ForSea

ABB's Solution and scope of integration

- Generators: 4x2480kW (remain as back-up)
- Energy Storage: 4x1040kWh (~5400 car batteries)
- Propulsion: 4 x 1,5MW Azimuth thruster / Drives
- Automation: PEMS with integrated VMS
- Advisory: Remote Diagnostic, Energy Story Control System
- Shipyard package: Under ABB Scope

Other Information

- Retrofit of existing system and install energy storage to enable full battery based operation with Diesel backup
- Ferries operating between Helsingor (DK) - Helsingborg (SWE)
- Shore side infrastructure for Battery charging, with automatic shore connection.
- Energy Storage onboard including transformers, rectifiers, DC/DC converters for battery connections, Power management upgrade and Energy Storage control

This project has received funding from the Innovation and Networks Executive Agency (INEA), Connecting Europe Facility, under grant agreement No. INEA/CEF/TRAN/M2014/1040935."



ForSea Design Criterias



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

1. Keep the existing operating time schedule
2. Modify the pier with the minimum distractions
3. To provide the system onboard and onshore which can be fully integrated with the existing vessel specification
4. Have a turnkey contract with single supplier over the project and life cycle
5. Allowed maximum added weight
6. Tidal changes and ballast changes
7. Number of trips: 46 trips/day each vessel M/F Tycho Brahe and M/F Aurora

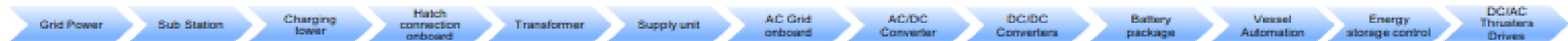
Description	Units	Helsingør	Helsingborg
Crossing	Min.	20	20
Harbour total	Min.	8	12
Mooring arrival + charging connection	Min.	1,25	1,5
Mooring departure + charging disconnection connection	Min.	1,25	1,5
Charging time each Harbor	Min.	5,5	9
Shore connection particulars	KV	10	10,7
	Amp.	660	600

ABB's Solution and scope on-board

- **Generators:** Remains as back-up
- **Energy Storage:** 4160kWh (comparable 5400 car batteries)
- **Propulsion:** 4x1,5MW Azimuth thruster drives
- **Automation:** Energy Storage Control System
- **Advisory:** RDS
- **Class/Notation:** Lloyds Register
- **Ship yard:** Ship yard package in ABB scope
- **Energy Storage Control System ESCS**

ABB's Solution and scope on-shore

- **Sub Station:** Medium Voltage shore connection Switchboard. One in each harbor.
- **Energy Transfer:** Fully automatic ABB Robotic system, two in each harbor
- **Charging time:** Helsingør: 5 min 30s (minimum)
Helsingborg: 9 min
- **Charging power:** Helsingør: 11,2 MW
Helsingborg: 10,35 MW
- **Charging voltage:** Helsingør: 10,4kV +/- 10%
Helsingborg: 10,7kV +/- 5%



Energy Storage System integration

- The ESCS will be integrated with the shore system infrastructure through a combination of distribution SWB, transformers, Automation, diode rectifier units and DC/DC converters, thus transforming the system into an **ABB Onboard DC Grid and Battery Management System**

Onboard DC Grid and Energy Storage

Vision of The Fjords – hybrid ferry



Vessel information

Vessel name: Vision of The Fjords
Vessel type: Sightseeing hybrid ferry
Design: Brødrene Aa
Yard: Brødrene Aa
Owner: The Fjords
Delivery: 2016
Class: DNV Light Craft

Solution and scope: Onboard DC Grid

PTO/PTI Gen.: 2 x 200kWe (G) / 150kW (M) HES880
Energy Storage: 2 x 285kWh 1C
Automation: PEMS
Shore charging: 2 x 450kWe HES880

Other information

Length: 40 m
Width: 15 m
Materials: Carbonfiber sandwich
Seats: 450
Speed: 20 knots (30 min) and 10 knots (1hrs)
Location: Between Flåm and Gudvangen

Emission free – Two fully electric sightseeing ferries

Maid of the Mist



Vessel information

Vessel name:	TBI
Vessel type:	Sightseeing ferry
Design:	Propulsion Data Services Inc.
Yard:	Schoellkopf Power Station site
Owner:	Maid of the Mist Corp
Delivery:	2019

Solution and scope:

Main Propulsion:	2 x 200kW motor with HES880 drive
Tunnel Thruster:	2 x 50kW motor with HES880 drive
Energy Storage:	2 x 158,2 kWh Battery package (2C)
Automation:	PEMS and VMS
Shore to Ship Connection	
RDS - Remote Diagnostics System	

Other information

Fully electric Sightseeing ferry	operating on the Niagara Falls
Length:	90.5 ft (27.58 m)
Width:	33.233 ft (10.16 m)
Hull Depth:	10 ft (3.05 m)
Seats:	530
Operation:	20 min cruise and 10min charging, 22 trips a day

Emission free – Iceland first electric ferry



Vessel information

Vessel type:	Passenger ferry
Design:	Polarkonsult, and StoGda Ship Design & Engineering.
Yard:	Crist SA
Owner:	Road and Coastal Administration's
Delivery:	2019/2020

Solution and scope:

Electrical:	OnBoard DC, drives, generators, transformers etc
Energy Storage:	3000 kWh Battery package
Automation:	PEMS and Energy Storage Control System
Shore to Ship Connection	
RDS - Remote Diagnostics System	
Octopus	

Other information

Electric ferry	operating route Landeyjahöfn on the mainland and the Westman Island,
Length:	70 m
Seats:	550 passenger, 75 cars (330 lane meters)
Operation:	13 km in about 45 minutes, 30 min charging, 3600 annual trips Able to enter the destination harbor in challenging weather

First remotely controlled passenger ship in the world

In a groundbreaking trial, the ice-class passenger ferry Suomenlinna II has been remotely piloted through a test area near Helsinki harbor



ABB Ability™ Marine Pilot

Eckerö line M/S Finlandia

Increased operational safety during Maneuvering & Docking

Real-time visualizations of a vessel's surroundings presenting the ship and its environment in ways beyond the capabilities of the human eye

“Our goal is to improve environmental performance and safety, and we worked with ABB to achieve greater efficiency in docking and high traffic situations. Our customers demand high levels of safety in all conditions and this solution enables our crew to provide a reliable service that doesn’t comprise their expectations,” said Daniel Olsén, Technical Manager, Eckerö Group.

Modernization of M/S Finlandia



Marine Pilot Vision to support the crew to maximize the value from the systems and integrate the additional tool with their current bridge team operations

ABB