



DECEMBER 7, 2021

# Process Automation in Sustainable Transport

## Capital Markets Day 2021

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# Important notices

This presentation includes forward-looking information and statements including statements concerning the outlook for our businesses.

These statements are based on current expectations, estimates and projections about the factors that may affect our future performance, including global economic conditions, and the economic conditions of the regions and industries that are major markets for ABB Ltd.

These expectations, estimates and projections are generally identifiable by statements containing words such as “expects,” “believes,” “estimates,” “targets,” “plans,” “outlook,” “on track,” “framework” or similar expressions.

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#### **The important factors that could cause such differences include, among others:**

- business risks associated with the volatile global economic environment and political conditions
- costs associated with compliance activities
- market acceptance of new products and services
- changes in governmental regulations and currency exchange rates
- general market conditions, and
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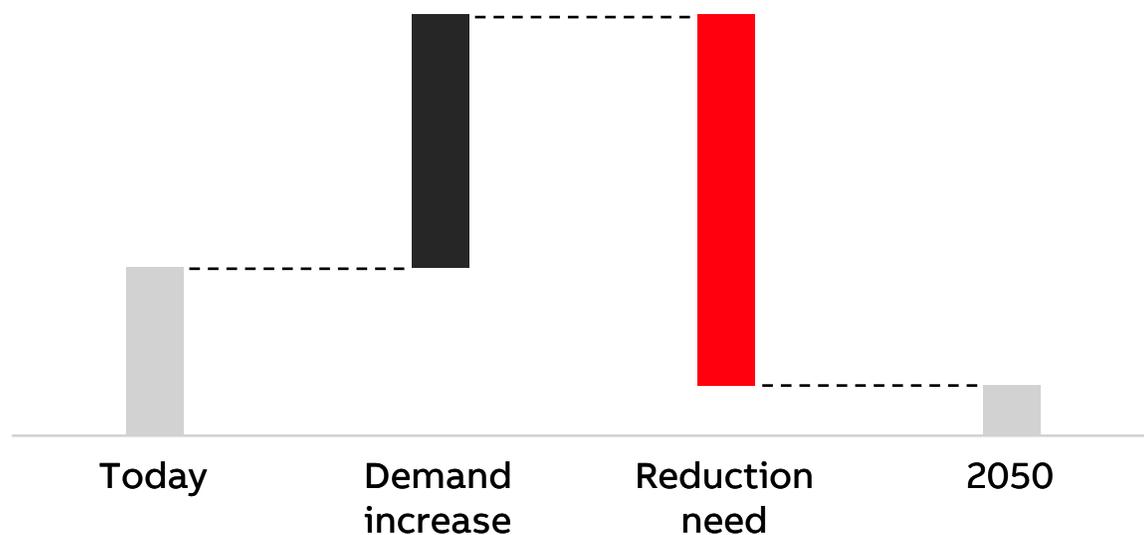
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This presentation contains non-GAAP measures of performance. Definitions of these measures and reconciliations between these measures and their US GAAP counterparts can be found in the “Supplemental Reconciliations and Definitions” section of “Financial Information” under “Quarterly results and annual reports” on our website at [www.abb.com/investorrelations](http://www.abb.com/investorrelations). Reconciliations can be found on our website under “Capital Markets Day 2021”.

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# The challenge: Helping customers in hard-to-abate industries reduce emissions

## EXAMPLE MARINE EMISSIONS



**2-3x**

freight and passenger transport increase



**>50%**

reduction of GHG emissions in shipping vs. 2008



# Key levers to make transport (more) sustainable



## Electrification of transport

Replace combustion engines with electric drive train, while increasing portion of renewable energy at the source



## Alternative fuels

Substitute fossil fuels with alternative fuels or fuel mixes, produced with low to no carbon footprint

## Increase efficiency

Transport more with less



# Our offering to decarbonize transport in hard-to-abate industries – examples

## AUTOMATION & DIGITAL

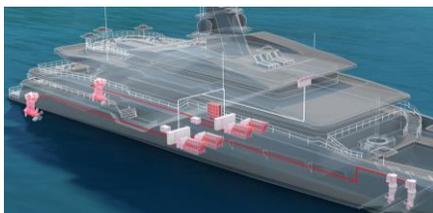


Fleet optimization software



Integrated Operations mgmt.

## INTEGRATED ELECTRICAL & MOTION SYSTEMS



Electric propulsion system



Electrified mine transport

## INDUSTRY-SPECIFIC “ANCHOR” PRODUCTS



Azipod® units



Power rectifiers

Towards net zero...



Voyage



Haulage



Automotive



Aviation

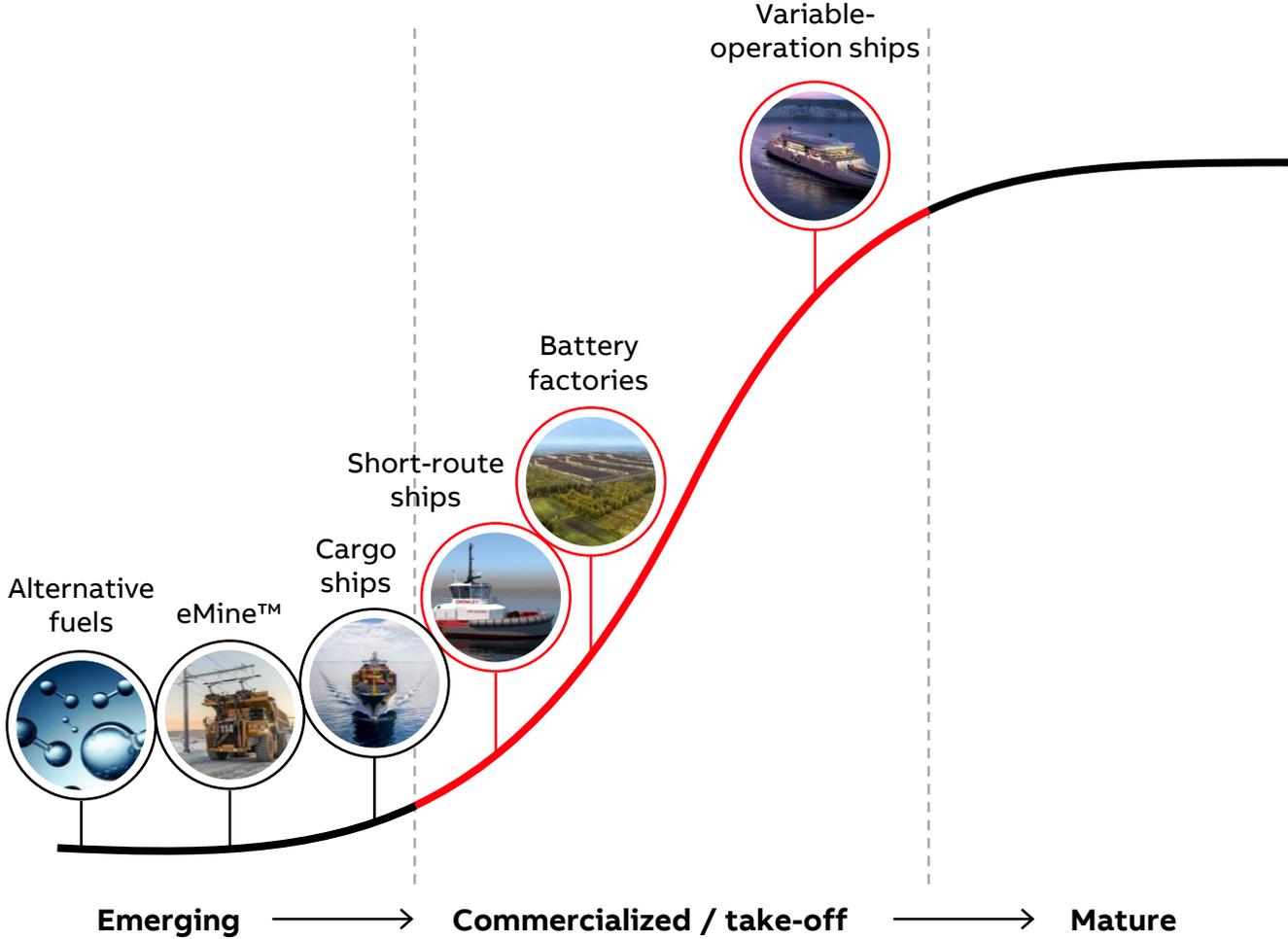
# Process Automation offering for sustainable transport

Segments | 2021 segment size<sup>1</sup>

-  **Variable-operation ships**  
~\$ 3 bn
-  **Short-route ships**  
~\$ 0.5 bn
-  **Cargo ships**  
<\$ 0.5 bn
-  **Battery factories**  
~\$ 1 bn
-  **eMine™**  
~\$ 0.1 bn
-  **Alternative fuels**  
~\$ 0.1 bn

Market position

#1  
#1-2  
Early-stage



Sustainable transport market has varying levels of maturity

Note: shipping segments also include ship-to-port connection business  
S-curve visual is illustrative



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# Marine



[https://www.youtube.com/watch?v=E7o\\_Sn5T-uw](https://www.youtube.com/watch?v=E7o_Sn5T-uw)

# Ships' operating requirements determine paths to decarbonization



## Variable-operation ships

**Different operation profiles**  
cruise, large ferries, ice-going vessels



## Short-route ships

**Coastal and inland waterways**  
road ferries, tugs



## Cargo ships

**Ocean-going**  
container ships, bulk carriers



Decarbonization accelerates electrification in shipping – a significant business opportunity for ABB

# Electric propulsion is default solution for variable-operation ships



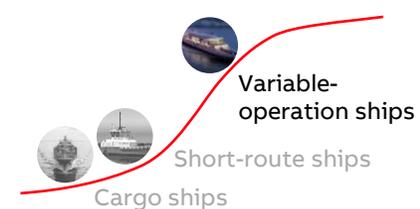
Market leading **ABB Azipod® propulsion** increases efficiency and safety in >300 ships



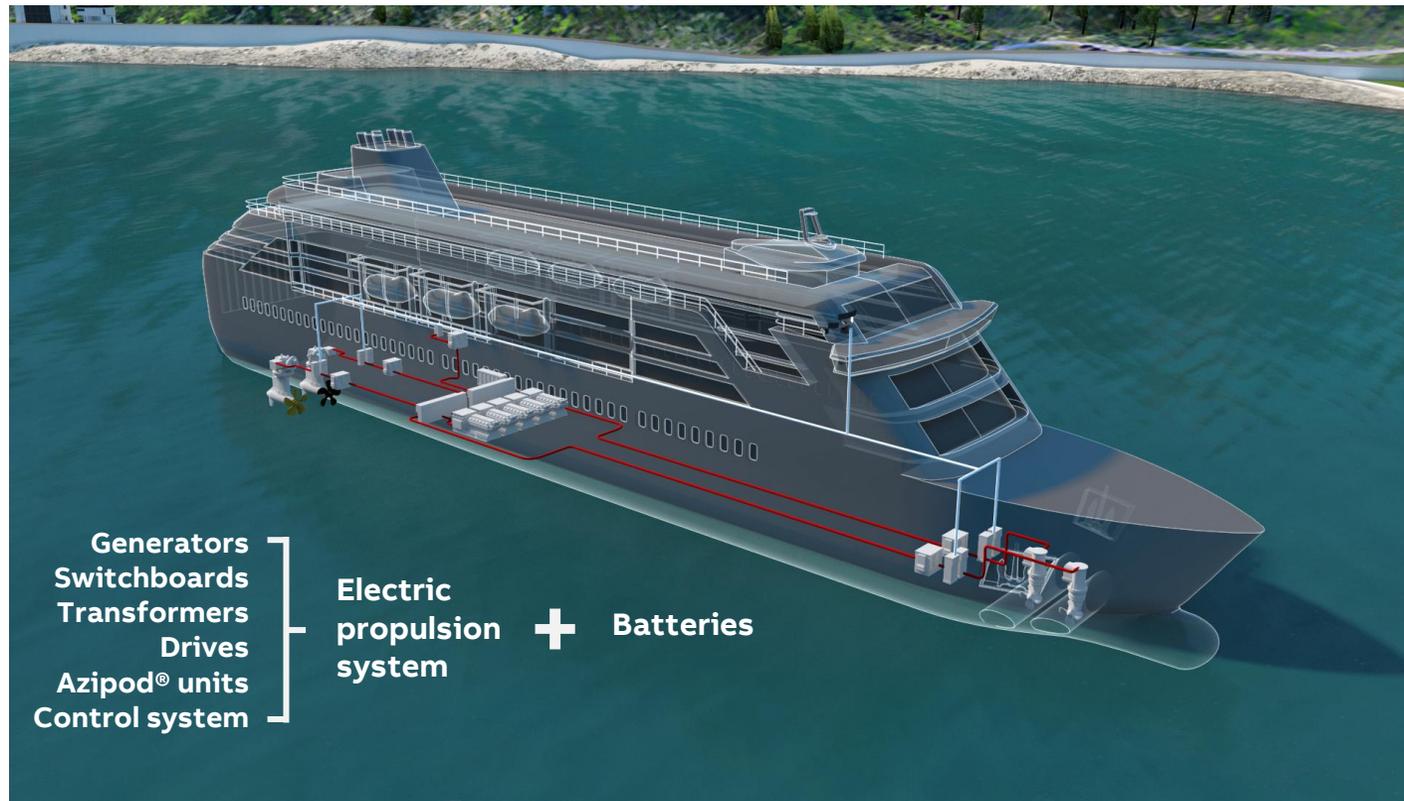
... enables **reliable and safe cargo transportation** in arctic seas



...while **optimizing** operations of **growing offshore wind turbine installation fleet**



**ABB SCOPE \$ 20-50 MN PER VESSEL PROJECT**



**Up to 20%<sup>1</sup>**

fuel and emission savings

**~\$ 2 bn**

addressable new vessel market

**~\$ 1 bn**

service market

**90%**

ABB product content in electric propulsion system scope creates high value for ABB

1. Compared to direct diesel driven propulsion

# Short route ships are becoming hybrid and full-electric



ABB's **propulsion solution** provides **fuel and emission savings** in hybrid vessels

**CASE: SEMBCORP MARINE**

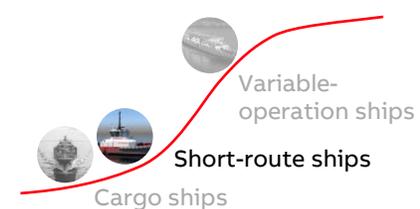
- First LNG hybrid tug in South Asia
- ABB Onboard DC Grid™ system
- 1 MWh batteries



...and enables **zero emission operations** in full-electric vessels

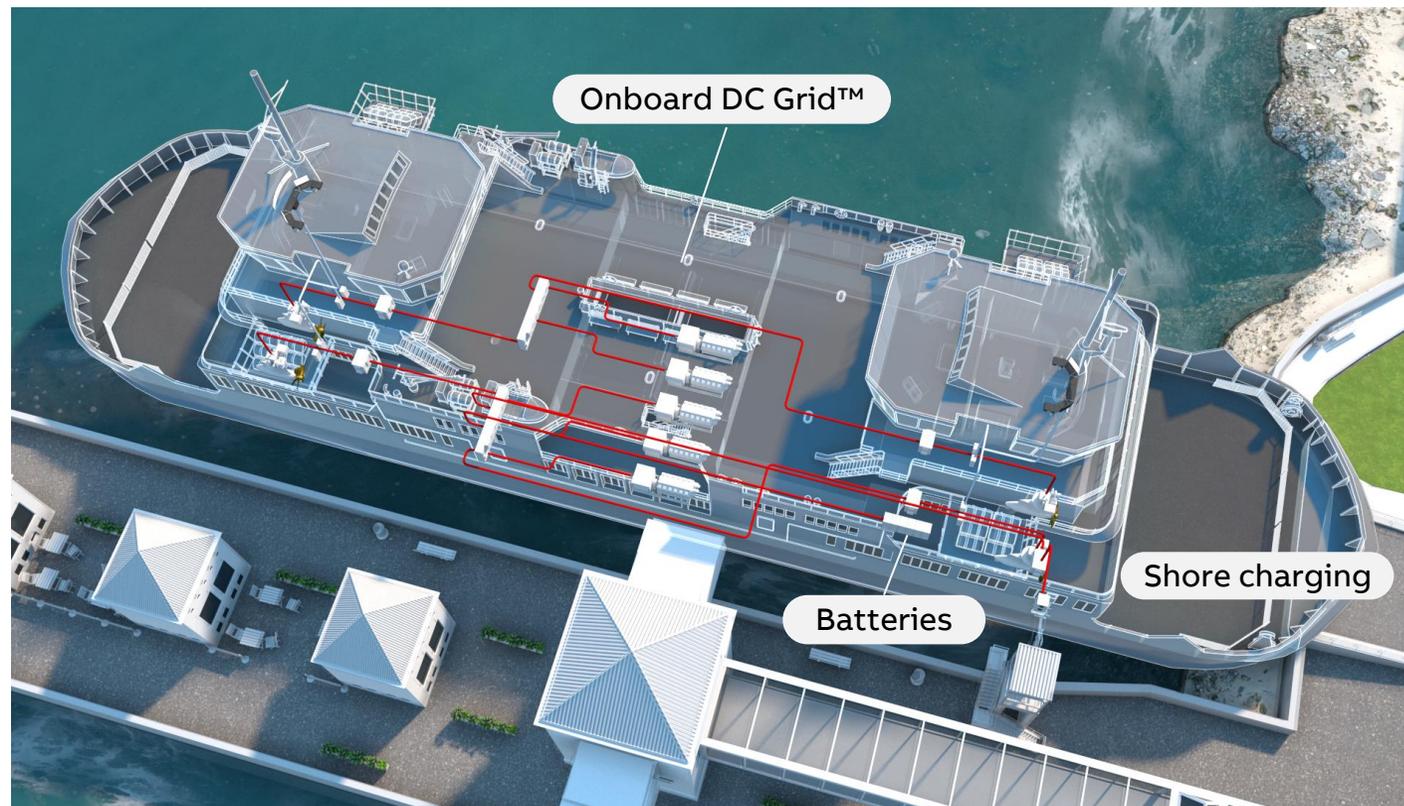
**CASE: FORSEA FERRY**

- Ferries operating between Sweden and Denmark
- ABB Onboard DC Grid™ system
- 4,5 MWh batteries
- ABB Automatic Robot charging



**ABB SCOPE \$ 3-10 MN PER VESSEL PROJECT**

**Electric drivetrain comparable to electric cars**



**Up to 30%**  
emission reduction in hybrid vessels

**Zero**  
emissions operations in full-electric vessels

**~\$ 500 mn**  
addressable market

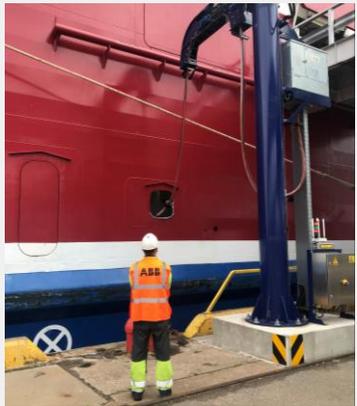
**>30% p.a.<sup>1</sup>**  
future growth

<sup>1</sup> Management estimate

# Electrification increases energy efficiency in Cargo ships



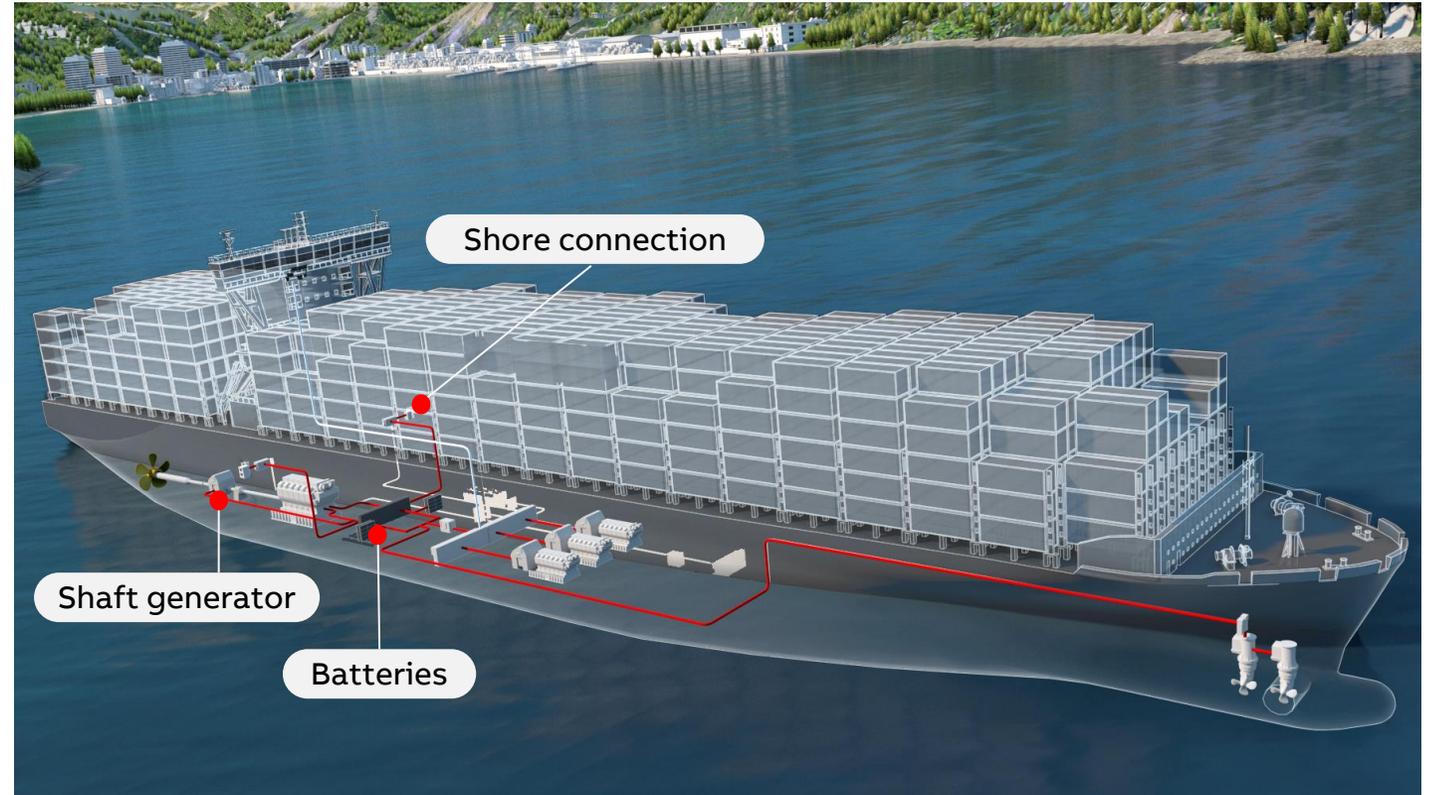
**ABB's electrification solutions** used in parallel with combustion engines **increase efficiency and cut emissions**



**ABB's shore power solution allows** ships to shut down engines and operate in **zero emission while in ports**



**ABB SCOPE \$ 10-20 MN PER CONTRACT (SEVERAL SHIPS)**



**Up to 5%**  
fuel and emission  
reduction with electric  
solutions during  
voyage

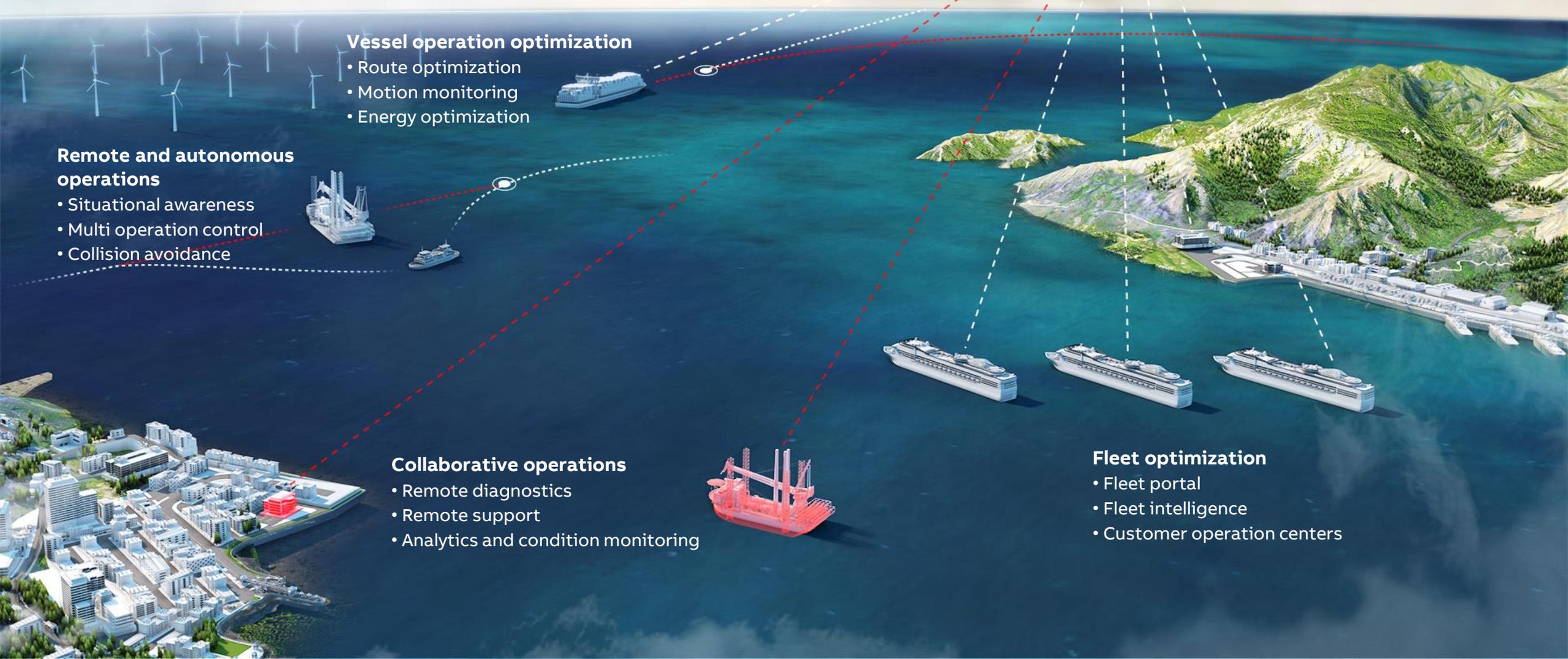
**Zero**  
emissions in ports  
with shore to ship  
connection

**~\$ 500 mn**  
addressable market

**>10% p.a.<sup>1</sup>**  
growth in shore  
connection market

<sup>1</sup> Management estimate

# Digital solutions improve efficiency and safety of all ship types - 1500 vessel subscriptions to date



## Vessel operation optimization

- Route optimization
- Motion monitoring
- Energy optimization

## Remote and autonomous operations

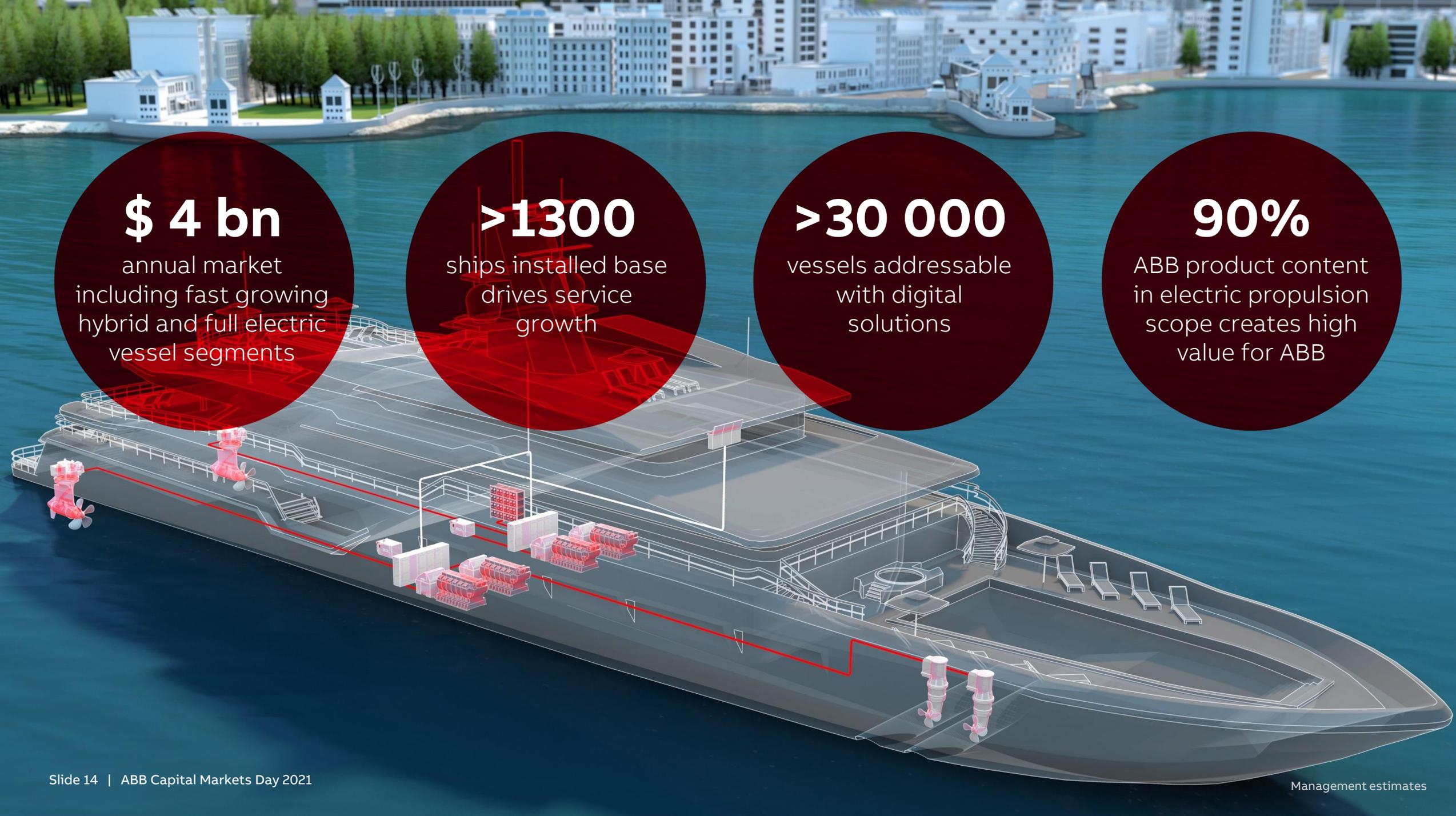
- Situational awareness
- Multi operation control
- Collision avoidance

## Collaborative operations

- Remote diagnostics
- Remote support
- Analytics and condition monitoring

## Fleet optimization

- Fleet portal
- Fleet intelligence
- Customer operation centers



**\$ 4 bn**

annual market including fast growing hybrid and full electric vessel segments

**>1300**

ships installed base drives service growth

**>30 000**

vessels addressable with digital solutions

**90%**

ABB product content in electric propulsion scope creates high value for ABB

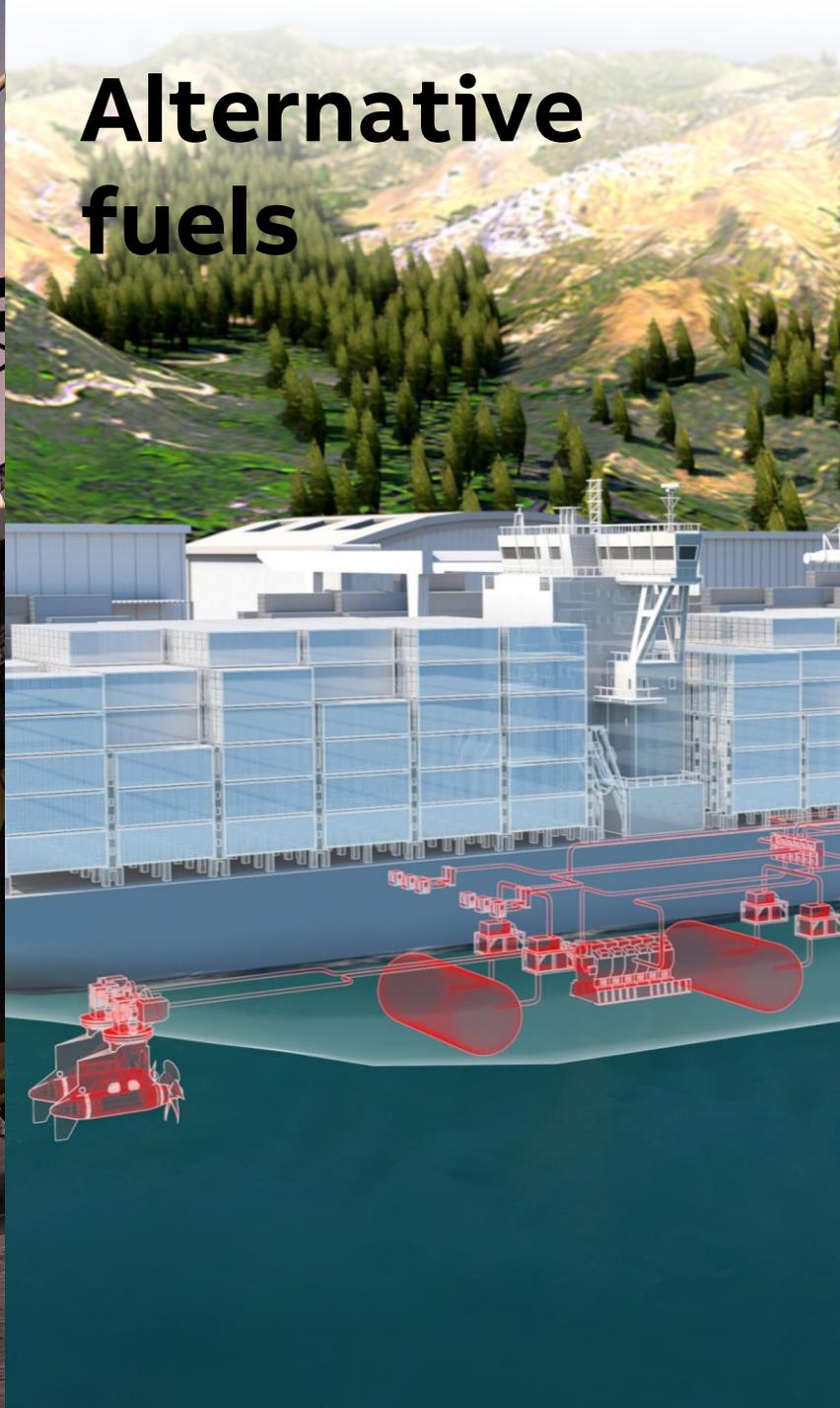
# Battery gigafactories



# eMine™



# Alternative fuels



# Battery gigafactories

ABB SCOPE | \$ 50-100 mn order volume per factory



Automation & digital



Electrical systems



Instrumentation



Robotics (from RA)



CASE: **NORTHVOLT ETT FACTORY, SWEDEN**



Battery factories

## Impact

Reduce cost for sustainably manufactured batteries

Enable faster production start-up

## Market outlook

~\$ 1 bn

Addressable today

>20% p.a.<sup>1</sup>

Future growth



# ABB eMine™ – transitioning to all-electric mine

ABB SCOPE (e-trolley line) | \$ 2-5 mn order

eMine™ transport solution



Electric trolley line



Vehicle charging



Optimized scheduling & energy usage

## CASE: COPPER MOUNTAIN, CANADA

- Off-truck infrastructure and system integration
  - Overhead catenary system
  - Rectifier substation >12 MW DC
- Ready for distributed control system (DCS) integration



eMine™

## Impact

Copper Mountain trolley system:  
7% lower CO<sub>2</sub> vs. diesel solution

eMine™ electrification and automation  
foundational to reach net-zero mining

## Market outlook

~\$ 100 mn Addressable today

>30% p.a.<sup>1</sup> Future growth



# Green hydrogen value chain

ABB SCOPE | ~30% of capex; \$ 1-10 mn orders today, increasing



Automation, safety & digital



Electrical systems



Power rectifiers



Analyzers & instrumentation

## CASE: GREEN HYDROGEN ECOSYSTEM, SG H2, USA

- Modular electrical design incl. engineering and digital twin
- Integrated automation, electrification and digital solution
- Collaborative Operations to further improve OPEX and overall safety

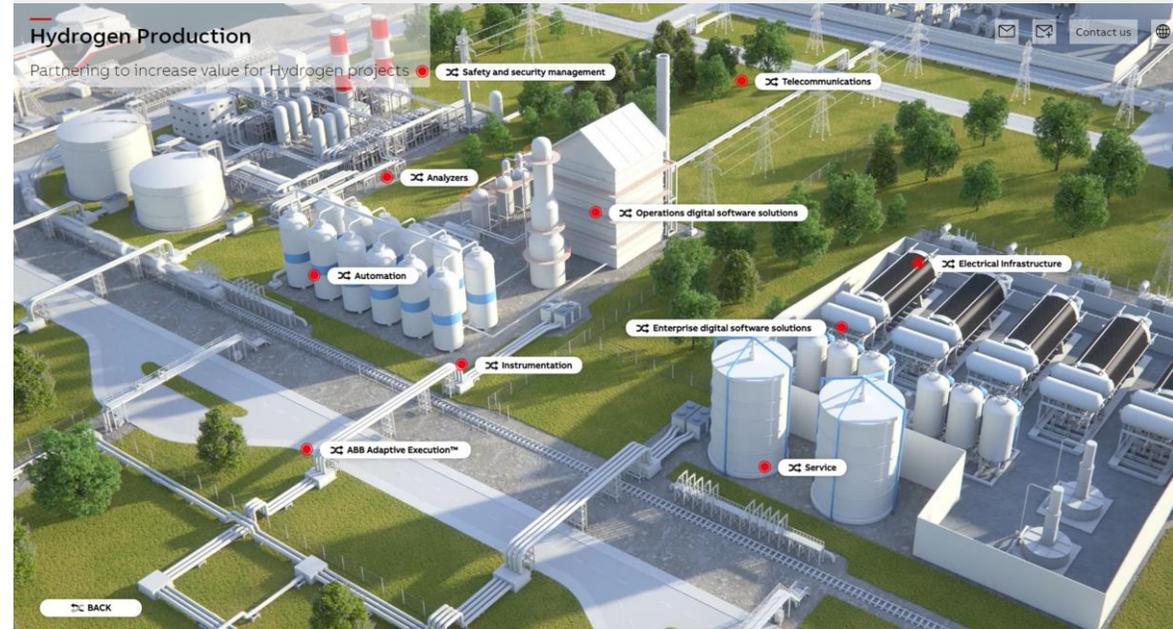


## Impact

Improving green H<sub>2</sub> competitiveness  
Green H<sub>2</sub> enables >20% GHG abatement, for net-zero by 2050

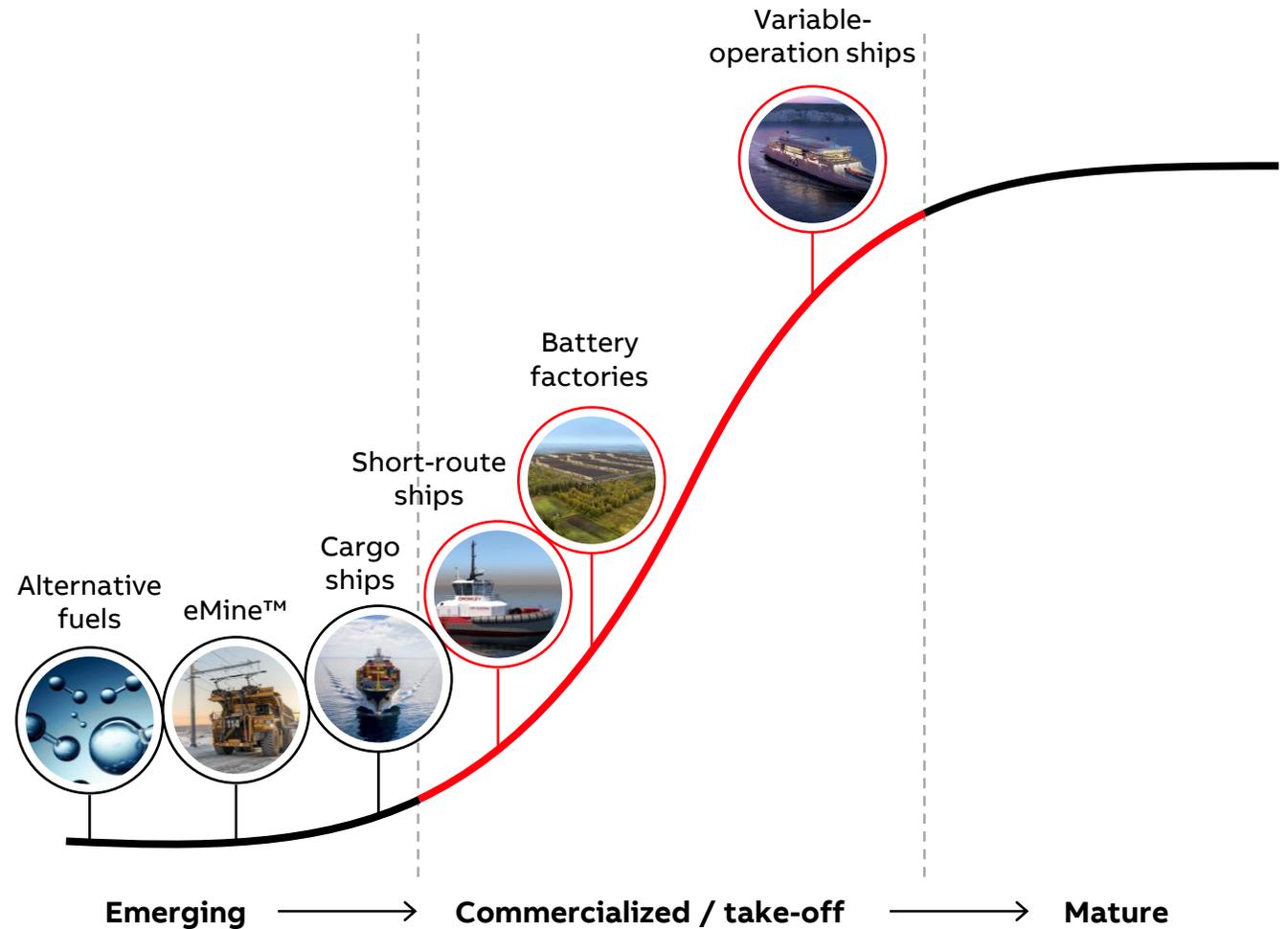
## Market outlook

~\$ 100 mn Addressable today  
>100% p.a.<sup>1</sup> Future growth



# Summary and outlook

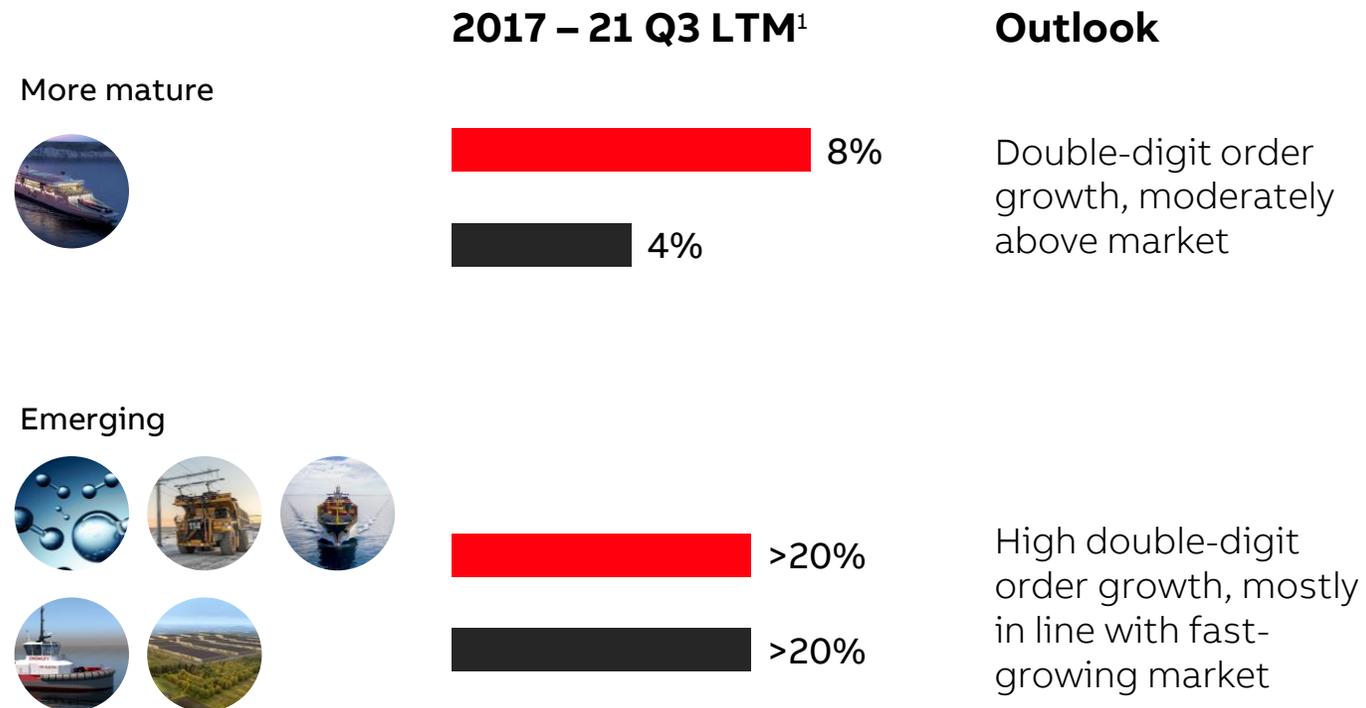
- Sizeable sustainable transport business of ~\$ 1 bn today
- Market-leading positions
- Double-digit growth outlook



Sustainable transport market has varying levels of maturity

# Sustainable transport in Process Automation

Orders of \$ 900-1'000 mn today, ~15% of PA order intake



## Sustainable transport market growth drivers

- 1 Greenhouse gas reduction in hard-to-abate-industries
- 2 Stricter regulations on emissions beyond greenhouse gases
- 3 Transport demand growth
- 4 Recovery in cyclical marine industry; pattern of large orders

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# Enabling sustainable transport is deeply embedded in our Purpose

**Creating Success**



**Addressing world's energy challenges**



**Transforming industries**



**Embedding sustainability**



**Leading with technology**



**ABB**