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Process Automation in Sustainable Transport
Capital Markets Day 2021

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- market acceptance of new products and services
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The challenge: Helping customers in hard-to-abate industries reduce emissions

EXAMPLE MARINE EMISSIONS

<table>
<thead>
<tr>
<th></th>
<th>Today</th>
<th>Demand increase</th>
<th>Reduction need</th>
<th>2050</th>
</tr>
</thead>
</table>

↑ 2-3x freight and passenger transport increase

↓ >50% reduction of GHG emissions in shipping vs. 2008

Source: IMO, OECD
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

<table>
<thead>
<tr>
<th>Segments</th>
<th>2021 segment size</th>
<th>Market position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable-operation ships</td>
<td>~$ 3 bn</td>
<td>#1</td>
</tr>
<tr>
<td>Short-route ships</td>
<td>~$ 0.5 bn</td>
<td>#1-2</td>
</tr>
<tr>
<td>Cargo ships</td>
<td>&lt; $ 0.5 bn</td>
<td>Early-stage</td>
</tr>
<tr>
<td>Battery factories</td>
<td>~$ 1 bn</td>
<td></td>
</tr>
<tr>
<td>eMine™</td>
<td>~$ 0.1 bn</td>
<td></td>
</tr>
<tr>
<td>Alternative fuels</td>
<td>~$ 0.1 bn</td>
<td></td>
</tr>
</tbody>
</table>

Sustainable transport market has varying levels of maturity

Note: shipping segments also include ship-to-port connection business
S-curve visual is Illustrative
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%¹ 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

Up to 30% emission reduction in hybrid vessels
Zero emissions operations in full-electric vessels
~$ 500 mn addressable market
>30% p.a.¹ future growth

1 Management estimate

Electric drivetrain comparable to electric cars
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.** growth in shore connection market

1 Management estimate
Digital solutions improve efficiency and safety of all ship types - 1500 vessel subscriptions to date
$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

**Impact**
Reduce cost for sustainably manufactured batteries
Enable faster production start-up

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

Automation & digital  Electrical systems  Instrumentation  Robotics (from RA)

**CASE:** NORTHVOLT ETT FACTORY, SWEDEN

**Market outlook**
~$1 bn  Addressable today
>20% p.a.: Future growth
ABB eMine™ – transitioning to all-electric mine

**Impact**
Copper Mountain trolley system: 7% lower CO₂ vs. diesel solution

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

**Market outlook**
~$100 mn Addressable today
>30% p.a.: Future growth

**ABB SCOPE (e-trolley line) | $2-5 mn order**
eMine™ transport solution

**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

Slide 17 | ABB Capital Markets Day 2021
Green hydrogen value chain

Impact
Improving green H₂ competitiveness
Green H₂ enables >20% GHG abatement, for net-zero by 2050

Market outlook
~$100 mn  Addressable today
>100% p.a.¹  Future growth

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

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

Automation, safety & digital  Electrical systems  Power rectifiers  Analyzers & instrumentation

Sources: Hydrogen for Net-Zero, Hydrogen Council, McKinsey
1. Management estimate
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

Note: shipping segments also include ship-to-port connection business
S-curve visual is illustrative
Sustainable transport in Process Automation
Orders of $900-1’000 mn today, ~15% of PA order intake

2017 – 21 Q3 LTM\(^1\)

<table>
<thead>
<tr>
<th>Category</th>
<th>ABB orders</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>More mature</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>Emerging</td>
<td>&gt;20%</td>
<td>&gt;20%</td>
</tr>
</tbody>
</table>

Outlook

- Double-digit order growth, moderately above market
- High double-digit order growth, mostly in line with fast-growing market
- Recovery in cyclical marine industry; pattern of large orders
- Transport demand growth
- Stricter regulations on emissions beyond greenhouse gases
- Greenhouse gas reduction in hard-to-abate-industries

1. Management estimate
Enabling sustainable transport is deeply embedded in our Purpose

Creating Success  |  Addressing world's energy challenges  |  Transforming industries  |  Embedding sustainability  |  Leading with technology

Slide 21  |  ABB Capital Markets Day 2021