Expanding e-mobility to small and medium vessels

Designed to meet your targets and your customers’ demands
With over 130 years of experience building electric motors and controls for hundreds of applications, including ships, trains, busses, and vehicles used in harsh environments like mining, ABB is perfectly placed to support your expanding electric vessel offering.

As your partner, we can supply the tough motors and drives you need. In addition, we can work closely with you and share our deep knowledge about motor dimensioning and cyclical loads, inverters and batteries, charging and connectors, and other system-related topics.
Your concerns are both important and solvable

E-mobility brings many advantages in a wide range of areas, like environmental impact, working environment, operating cost, vessel productivity and maintenance.

We would like to share the most common issues that we have learned about e-mobility from ship builders and operators, and then present our ideas and solutions that can support you in making e-mobility successful.

Identifying the winning strategy for moving forward can be tricky, since there are many challenges to be evaluated and solved as you transition further from traditional fossil fuels to clean electric propulsion.

Like many ship builders, you are probably thinking about e-mobility and assessing the best ways to expand your electric vessel range. You may also be considering sustainability issues and the increasing demands operators have for zero-emission shipping.
Where are we today?

- Fossil fuels, CO₂ emissions, increasing governmental regulations
- Diesel- or LNG combustion engines limit responsiveness of vessel maneuvering
- Noisy work environment, with noxious fumes
- Low energy efficiency, much wasted heat
- Mechanical wear and tear, many moving parts
Cleaner electric propulsion, free of CO₂ emissions, green solution

Electric propulsion with improved torque response

Cleaner air and quieter in operator’s work zone

Higher efficiency, reduced heat waste

Few moving parts, reduced mechanical stresses

Where are we going?
What it brings?

- Improved marketability of your vessel to zero emission requirements
- Reduced “fuel” costs, lower maintenance need and increased productivity
- Improved crew and passenger comfort
- Future-proof, clean operations in ports and cities
- Responsive controls bring safety and efficiency for maneuvering
**Where are you on your e-journey?**

<table>
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<tr>
<th>Total cost of ownership</th>
<th>Charging</th>
<th>Powertrain</th>
<th>Performance</th>
<th>Correct dimensioning</th>
<th>Reliability</th>
<th>Safety and maintainability</th>
<th>Support</th>
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<tr>
<td>- Can I be price competitive with an electric-powered vehicle?</td>
<td>- How is charging handled?</td>
<td>- What voltage level should I select?</td>
<td>- Will my customers buy the electric solution I develop?</td>
<td>- How do I correctly size the right products to get the targeted performance, and not be oversized or overpriced?</td>
<td>- How reliable and robust is electric compared to diesel?</td>
<td>- Is electrical safety complicated?</td>
<td>- If I need support, is there someone nearby who both speaks my language and understands the technology?</td>
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<tr>
<td>- Can it offer a lower TCO, total cost of ownership, than diesel?</td>
<td>- If there is limited available electrical capacity, can we charge all units at the same time, like during a lunch break?</td>
<td>- Will the solution fit in the vehicle?</td>
<td>- Will it perform as well as the equivalent diesel version?</td>
<td>- Needed motor size to meet the vehicle performance?</td>
<td>- Our operators regularly push the construction machines to, and sometimes beyond, their limits.</td>
<td>- Do I need a trained electrician to connect the motor during assembly and service?</td>
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<tr>
<td>- Will it help meet both existing and future emissions rules?</td>
<td>- What is the best electric powertrain layout for my vehicle?</td>
<td>- Performance is very important, and no operator or fleet manager wants a vehicle that feels slow compared to what they are used to</td>
<td>- What drive is best for the motor?</td>
<td>- What type of battery and capacity is needed?</td>
<td>- Can electric powertrains handle the wet, dusty, corrosive environments as well as diesel does?</td>
<td>- Will overheating at low speeds be a problem?</td>
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With ABB motors and drives at the heart of your e-powertrains, your electric propulsion vessels can give your customers everything they are asking for. Explore these benefits and features, which are designed to help you successfully deliver all the necessary requirements.

By working with ABB you will gain a trusted partner that offers proven e-powertrain products. This allows you to efficiently meet all the most important market demands, such as improved productivity, reduced TCO, increased uptime and operator environment.

ABB electric powertrains for marine

Our insight and products can make e-mobility much easier for you.
ABB’s product offering and technical specifications for E-mobility motors and drives

Common features in all our E-mobility motors and drives:

- High enclosure protection class, IP67
- Withstand heavy vibration and shocks
- Wide ambient temperature range, -40 to +85 °C (-40 to +185 °F)
- Liquid cooling with high liquid input temperature, up to +70 °C (+158 °F)
AMXE motors

Compact, permanent magnet synchronous motors for high efficiency propulsion and auxiliary usage. Configure your motor with specific lengths, windings and voltages to get your needed performance.

- Lower levels from 20 to 250 kW continuous power
- Speed range up to 5000 rpm
- Four different frame sizes
  - AMXE132 – up to 240 Nm
  - AMXE160 – up to 500 Nm
  - AMXE200 – up to 900 Nm
  - AMXE250 – up to 1500 Nm

Don’t find the motor you are looking for? We have long experience with unique customer projects and solutions and are happy to help you.

For more detailed information, click here.
Compact and rugged, the HES880 drive has been designed specifically to work in electric powertrains in applications.

Features and benefits include:

- Inverter for traction motor and generator up to 510 kW continuous and up to 760 kW peak electrical power
- Three different frame sizes with voltage from 320 to 750 VDC – 350, 600 and 900 A as maximum currents
- Bi-directional line converter for grid connectivity
- DC/DC converter for battery, super capacitor or fuel cell, up to 620 kW
- The same module can be used as a line converter, motor inverter or DC/DC converter
- Easy to install, only plug connectors
- Safe torque off (STO) as standard, integrated braking chopper as option
- Drive modules can be installed without any cabinets or enclosures, even on the deck

For more detailed information, click here.
The key features and benefits you want, to satisfy your customers
Due low weight and inertia, ABB’s e-powertrains respond better than the diesel engines you are used to. The innovative design in the water cooling means the motor gets high torque density, giving the operator a powerful vehicle while maintaining a quieter working environment all day long. Fast and accurate torque control provides excellent response to the operator commands.

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Fast acceleration and response time, for top-level performance

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- Fast and accurate torque control provides excellent response to the operator commands.
Total Cost of Ownership

Purchase cost
Initial cost can vary widely, since it mainly depends on the battery capacity. Best cost efficiency is achieved by correctly configuring the motor and drive to meet boat needs, and not oversizing the battery.

Cost of installation
Easy to install and commission.

Cost of running
Much more efficient than diesel with substantially reduced maintenance costs.

Cost of not running
Higher reliability and uptime, and reduced maintenance breaks, for big cost advantages.

Low Total Cost of Ownership
- Highly reliable powertrain performance, based on proven building blocks from similar e-mobility applications
- Maintenance-free mobile drive and robust motor bearings made to last for years
- Easy installation reduces integration costs

For more detailed information, click here.
Tolerates high shock loads and vibration levels, and wide ambient temperature ranges, for long running times.

Supervision to control motor and drive temperatures and protect if too high.

Enclosure Protection (IP) ratings to meet all application needs regarding moisture and dirt.

Designed for rough and tough work environments.

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Fit for your purposes and performance, with perfect sizing

- We help you precisely evaluate performance and dimensioning needs, to meet your applications and drive cycles.
- Our wide E-mobility portfolio lets you choose and mix the equipment that’s just right for you.
- Wide and flexible operational range for any application, over broad speed and torque ranges.
Additional advantages to help make your E-journey smooth and profitable

- Propulsion and auxiliary usage from same supplier
- Training for your personnel, e.g. in development, service, and assembly
- Global footprint and reach, combined with local presence and support wherever you are
- Low power consumption/energy losses
- Compatible with your battery via different voltage levels
- Compact motor and drive module are easy to fit in any vehicle
- Safe and easy to install, with quick plug connectors and high voltage interlock
- Additional advantages to help make your E-journey smooth and profitable
Besides the advantages of reduced emissions, electric powertrains can also offer better overall cost efficiency compared with diesel versions. Although initial purchase cost may be somewhat higher, this is often compensated by gains in the other three parts of the TCO equation.

Go electric. It makes good environmental and financial sense.
Electric propulsion in small and medium size vessels makes perfect environmental sense – already now and of course for the future. Operators avoid noxious fumes, CO₂ emissions are cut drastically and the transport and handling of fossil fuels/diesel is eliminated.

In addition, topics such as sustainable corporate initiatives or regional diesel bans also come into the calculation. For example, it is foreseen that certain cities and ports will request emission free shipping as a qualifier for operating on their proximity.
Complicated?

We are here to help. At ABB, we are pleased to share our knowledge – to help you solve challenges.
We’re here to help

If you have any questions or thoughts about E-mobility solutions for vessels, we would be pleased to discuss them with you.