Shore-to-ship power and smart port solutions.
Reliable power infrastructure for greener and more efficient ports.
Comprehensive connectivity and sustainable operations with shore-to-ship power and smart port solutions

To minimize the environmental impact of ports in the light of increasing goods and passenger traffic as well as ever more stringent emissions regulations, ship and port owners and operators are seeking ways to improve energy efficiency, productivity and sustainability of port operations. Fresh thinking leads to the advent of smart port concepts, expanding on the successful shore-to-ship power supply solutions.

Shipping industry trends
Growing global trade and passenger traffic are leading to an increase in the size of vessels as well as the number of port calls. To keep pace with this development, ports must invest in bigger docks, stronger quays and larger cranes. Deployment of smart port infrastructure and shore-to-ship power systems will help to make ports and shipping companies even more competitive, ecologically viable and profitable.

Acknowledging their significant role for national and regional economies, ports are turning to innovative technologies to:
- Become efficient providers of goods and passenger traffic capacity
- Improve environmental sustainability and upgrade waterfronts by optimizing traffic flow and reducing energy consumption and emissions
- Secure market leadership and maximize return on investment.

To achieve these goals, shipping companies and ports need to focus on increasing energy efficiency, productivity and sustainability, while mitigating limitations posed by weak power grid connections and often inadequate or obsolete electrical infrastructures.
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**Smart port solutions**
Integrating and strengthening of port grids

**Introducing smart ports**
Smart ports is a concept entailing highly integrated power and automation systems for ports and vessels. The concept embraces the complete port operations as well as power infrastructure of ports and vessels, ensuring their seamless integration to minimize energy consumption while increasing productivity.

**Smart port electrification and integration**
ABB is well-positioned to implement the smart port concept by offering a single interface for the design, supply, installation and commissioning of complete port electrification and integration solutions.

Comprehensive domain knowledge and experience enables ABB to offer optimized solutions, including high-, medium-low-voltage substations with switchgear, power transformers and frequency converters, as well as renewables integration, microgrid control systems, distribution grid automation and communication networks.

ABB supports the planning of greenfield and brownfield smart port projects with a comprehensive service offering, including consultancy on aspects such as:
- Network layout, including short-circuit, arc flash, protection coordination, grounding, lighting and seismic impact studies
- Grid code compliance covering short-circuit, voltage stability, harmonics and protection and control
- Electrical interfaces
- Safety
- System planning and advice
- Dynamic studies
- Reliability analysis
- Layout optimization to overcome space constraints
- Interactions with civil works
- After-sales service and support

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**Plugging into shore-side power**
Reducing emissions from ships berthed in ports

Shore-to-shore power is a leading technology within the smart port concept and the most effective way to make ports more efficient and sustainable.

**Shore-side power for berthed vessels**
Shore-to-shore power systems allow vessels to plug into an onshore power supply and shut down their auxiliary engines while berthed. The ship’s power load is seamlessly transferred to the shore-side power supply without disruption to onboard services. This substantially reduces greenhouse gas emissions, noise and vibrations.

**Complete solutions – onshore and onboard**
As a full-scope supplier, ABB offers turnkey Shore-to-shore services for a complete shore-to-ship solution. The portfolio includes the entire electrical infrastructure needed onshore and onboard – from the receipt of power from the local grid and its adaptation to the vessel’s requirements to the connection of shore power including the onboard system.

The array of ABB solutions is suitable for container terminals and city ports. It covers single and multiple frequency applications as well as single and multiple berth arrangements with power ratings to serve even the largest ports. Spatial limitations can be overcome by compact indoor concepts accommodating all major components in buildings. These have a small footprint, are located to ensure smooth dockside operations and match the surrounding environment. The modular solutions also support staged implementation and investments.

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Overview of shore-to-shore power connection for cruise vessels.

Overview of shore-to-shore power connection for container vessels.
From the local grid onto the vessel

The onshore solution comprises the entire chain from the main incoming substation receiving power from the local grid to the power outlet at the berth. The system includes transformers and frequency converters to match the grid power voltage and frequency to the ship’s onboard power system. It also comprises the shore connection boxes and cable management systems.

The solutions allow several vessels to be connected simultaneously, and the inclusion of a frequency converter enables the supply of 50 and 60 hertz (Hz) power regardless of the local grid frequency. Onboard, the ABB shore connection equipment is fully integrated with the ship’s electrical and automation system enabling seamless power transfer from onboard generation to shore power.

ABB provides turnkey onshore and onboard solutions and offers a state-of-the-art portfolio of key components for shore connections such as switchgear, frequency converters and power transformers, IEC 61850-compliant control and protection systems, etc. Apart from adapting the grid power frequency to that of the vessel, ABB’s highly efficient, low-maintenance frequency converters offer reactive power compensation and voltage control. These features help to reduce energy cost, while stabilizing the grid. Shore-to-ship power is the foremost solution for reducing emissions, noise and vibrations of vessels berthed in ports.

A full range of services

ABB’s shore connections portfolio is complemented by a comprehensive scope of services to ensure that the overall shore-to-ship electrical system is optimized both technically and economically. ABB also offers system studies to assess the impacts of the shore connection on the local grid and recommend optimized solutions to upgrade and strengthen the local grid and port network. By bringing ABB into the project from an early phase, design and implementation risks are minimized. As the project matures, ABB provides proficient project management as well as training courses at ABB’s or customer’s premises to optimize the utilization of all assets and investments.

Benefits all around

Reduced emissions are the ultimate goal of ABB shore-to-ship power solutions, yet another important benefit is less noise and vibrations, which creates a better environment for passengers, crew, dockworkers and local residents. The shutdown of onboard auxiliary generators also saves fuel and maintenance required, while providing service opportunities. For ship owners, operators and harbor authorities, a one-stop ABB solution provides enhanced safety and availability through comprehensive experience, in-depth application knowledge and, last but not least, competent support from ABB’s global service network.

The push for change and interoperable systems

With global (IMO/MARPOL), regional (European Union and North America emission control areas) and local (Canada, China and California) governing bodies issuing and enforcing regulations to limit sulfur oxide (SOx), nitrogen oxide (NOx) and carbon dioxide (CO2) emissions by the shipping industry, shore-to-ship power infrastructure proves to be a significant innovation.

International standards for shore-side electricity supply for seagoing vessels cover the design, installation and testing of the integrated systems, and ensure compliance with technical specifications accepted worldwide. ABB’s solutions comply with the standards for utility connections in ports IEC/ISO/IEEE 80005*, ensuring full interoperability of onshore and onboard systems and allowing their implementation on a global scale.