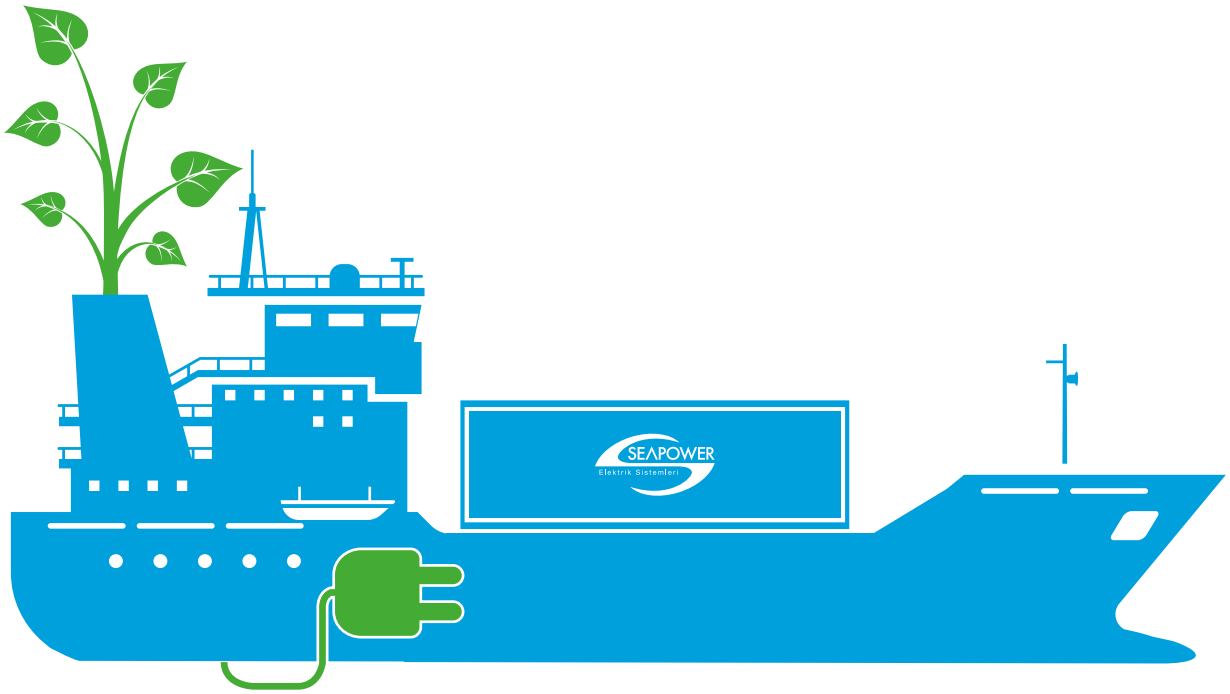
SEAPOWER

Electrical Systems

POWER OF THE SEA

GREEN PORT

www.seapower.com.tr



SEAPOWER provides shore connection solutions due to the international standards and environmental regulations at ports and vessels.

SEAPOWER ELECTRICAL SYSTEMS CO. Inc.

Seapower R&D and Innovation Center, providing critical solutions in the field of power electronics, operates in the shipyard area of Altınova/Yalova on a 10000m2 site.

The company offers turnkey systems that reduce fossil fuel consumption of ships due to new regulations and improve EEXI and CII Rating values. SEAPOWER is also involved in green port transformation projects for ports.

SEAPOWER, a producer of static frequency converters, static ups, transformer for the ship and yacht building industries, manufactures shore power converters for yachts and grid frequency converters for ships with Marine class products. With its innovative and solution-oriented approach, SEAPOWER is a pioneer of quality both domestically and internationally. Known for its reliable products in the maritime sector, SEAPOWER is also an approved supplier preferred in the defense industry thanks to its innovative R&D capabilities.

SEAPOWER, being among the leading organizations in the energy sector with its customer-focused approach and contemporary management understanding, continues its work with a 100% customer satisfaction focus. With a top-quality service approach provided by our expert team, SEAPOWER aims to offer future-oriented technologies to its customers and to provide solutions for their evolving new technology needs through long-term business partnerships.

We provide a fast, simple and flexible connection to the ship via a shore connection system. Shore connection system fulfills the different power requirements of port operators, ship-owners, shipyards and power supply companies. It can be installed at any port and adapted to any berth topology and power need. It can also supply all type of vessels, such as cruise liners or container ships and ferries.

Shore connection system offers the entire spectrum of reliable, safe and efficient power supply for future-oriented harbors. The extensive selection of software solutions for power supply and automation offers key advantages for integrated digital monitoring and operations management processes. The hardware portfolio ranges from low-voltage circuit breakers to entire microgrids and land connection systems.

In SEAPOWER Green Port conversion projects, we provide efficient and reliable power system solutions using both LV (Low Voltage) and MV (Medium Voltage) equipment.

The Sustainable Port

Turnkey Solutions for Smart Grid

What we do;

- Elimination of ship engine emissions in port areas (SOx, NOx, PM, CO2)
- Elimination of noise and vibration caused by ships at berth
- Improvement of working conditions and safety in ports
- Compliance of vessels at berth with International Maritime Organization (IMO)

How we do;

Innovative and Efficient reducing energy consumption

- Best in class energy quality and Efficiency with SEAPOWER GRID FREQUENCY CONVERSION technology. It's disposition within the SEAPOWER CONVERTER SYSTEM consume just the energy needed at any given moment and no more.

Safer and more reliable

- Proven components and systems
- Tested, Validated, Documented architectures
- Compliant with international standards

Scalable and movable

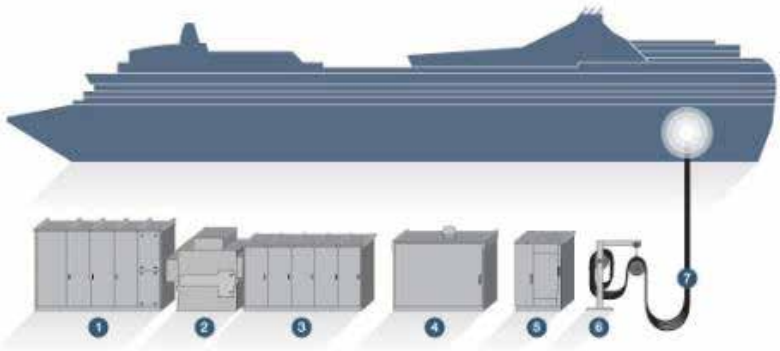
- Can be relocated when there's a change in berth configuration
- Different Compact SEAPOWER CONVERTER SYSTEM units can be installed in parallel for further power extension

Simple plug-and-play solutions

- Packaged solutions
- Easy to install
- Easy to maintain

Cost effective

- Standard components
- Optimised footprint
- Minimal commissioning



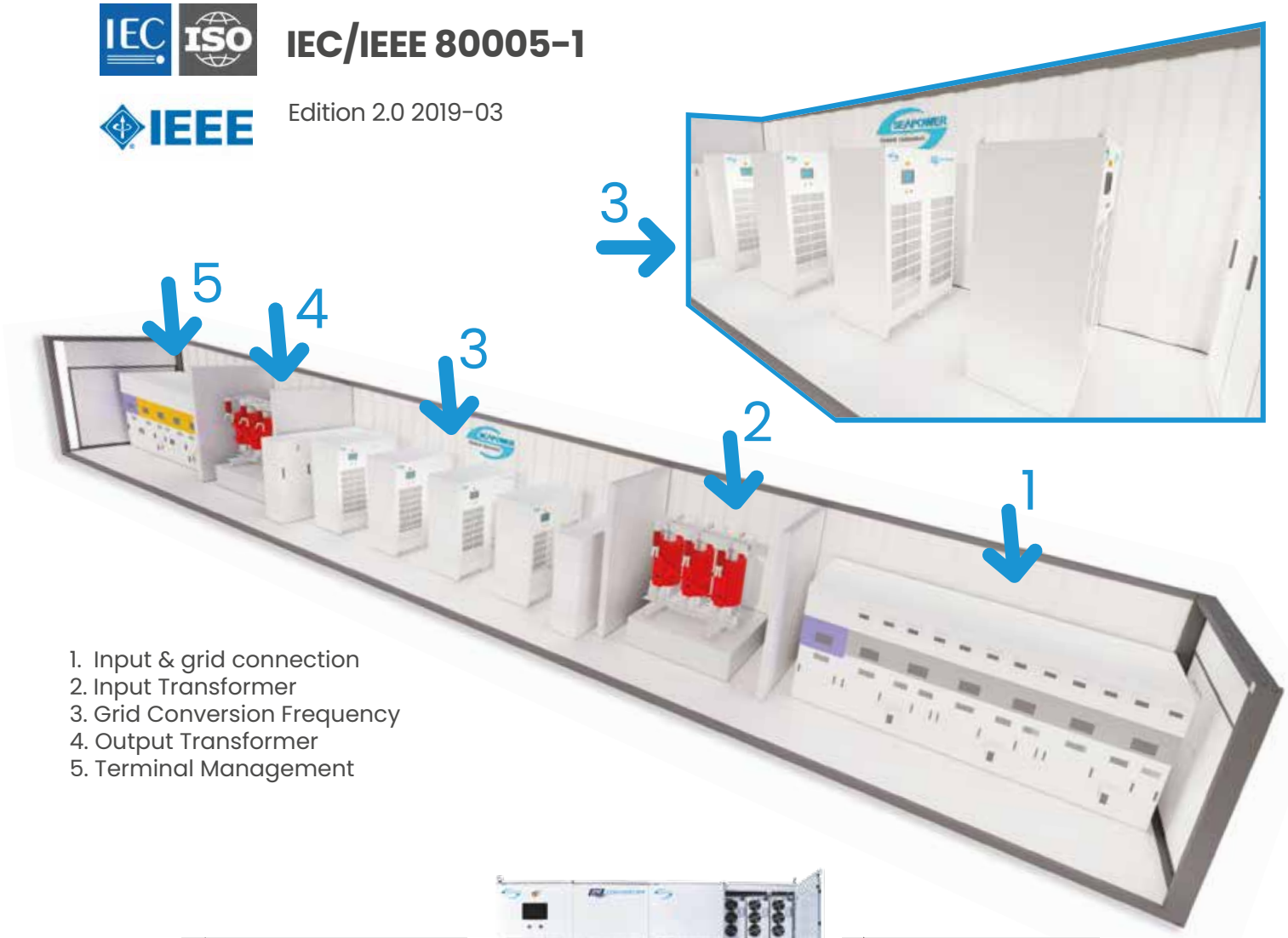
Shore Connection System:

1. Primary Metering Equipment
2. Transformer
3. Secondary Breakers
4. Capacitor
5. Ground Switch
6. Jib/Cable Management
7. Cable

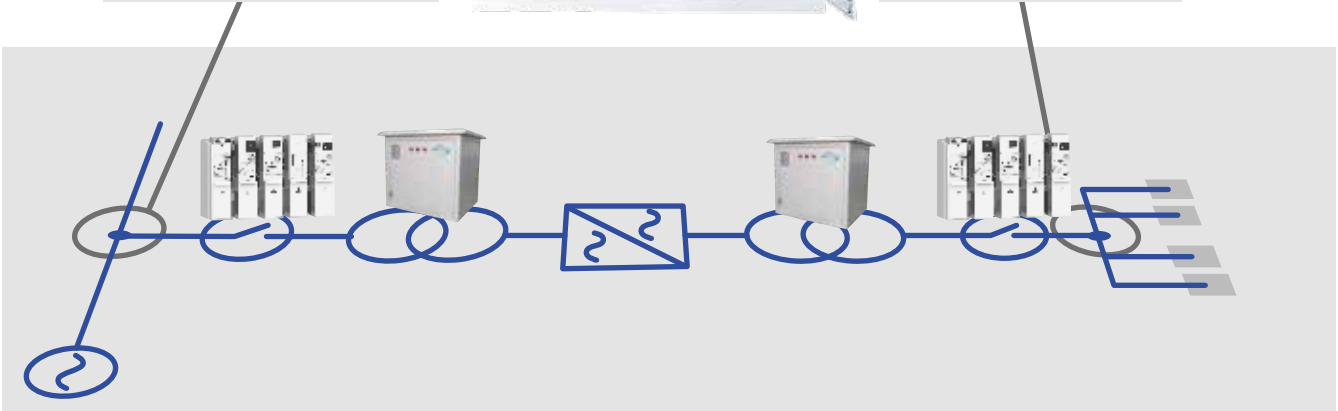
SEAPOWER Functional Architecture

IEC/IEEE 80005-1

Edition 2.0 2019-03



1. Input & grid connection
2. Input Transformer
3. Grid Conversion Frequency
4. Output Transformer
5. Terminal Management



On Shore Power Supply (OPS) Applications and Principles are described by IEC/ISO/IEEE 80005 Standard

Vessel Type	Ship Shore Energy Voltage Requirement	Ship Shore Energy Power Requirement	Ship Shore Energy Frequency Requirement	Number of MV Cables to Feed Vessel	Cable Management System Location
RO/RO and RO/Pax	11 kV, 6,6 kV	6,5 MVA	50 Hz or 60 Hz	1	Port
Container	6,6 kV	7,5 MVA	50 Hz or 60 Hz	2	Ship
Cruise	11 kV, 6,6 kV	20 MVA	50 Hz or 60 Hz	4	Port

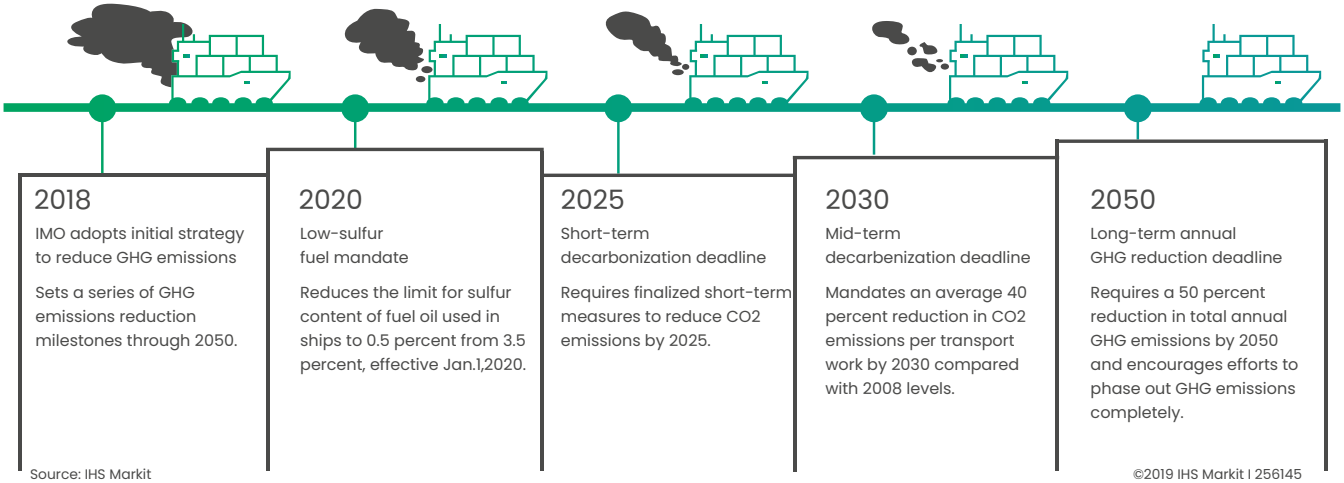
Auxiliary Components for Ship Shore Energy

Applications

Environmental Benefit

Sailing toward zero-emission container shipping

The International Maritime Organization(IMO) has introduced rules aimed at reducing harmful sulfur oxide (SO2), carbon dioxide (CO2), and other green house gas (GHG) emissions from ships.



2018
IMO adopts initial strategy to reduce GHG emissions

Sets a series of GHG emissions reduction milestones through 2050.

2020
Low-sulfur fuel mandate

Reduces the limit for sulfur content of fuel oil used in ships to 0.5 percent from 3.5 percent, effective Jan.1,2020.

2025
Short-term decarbonization deadline

Requires finalized short-term measures to reduce CO2 emissions by 2025.

2030
Mid-term decarbenization deadline

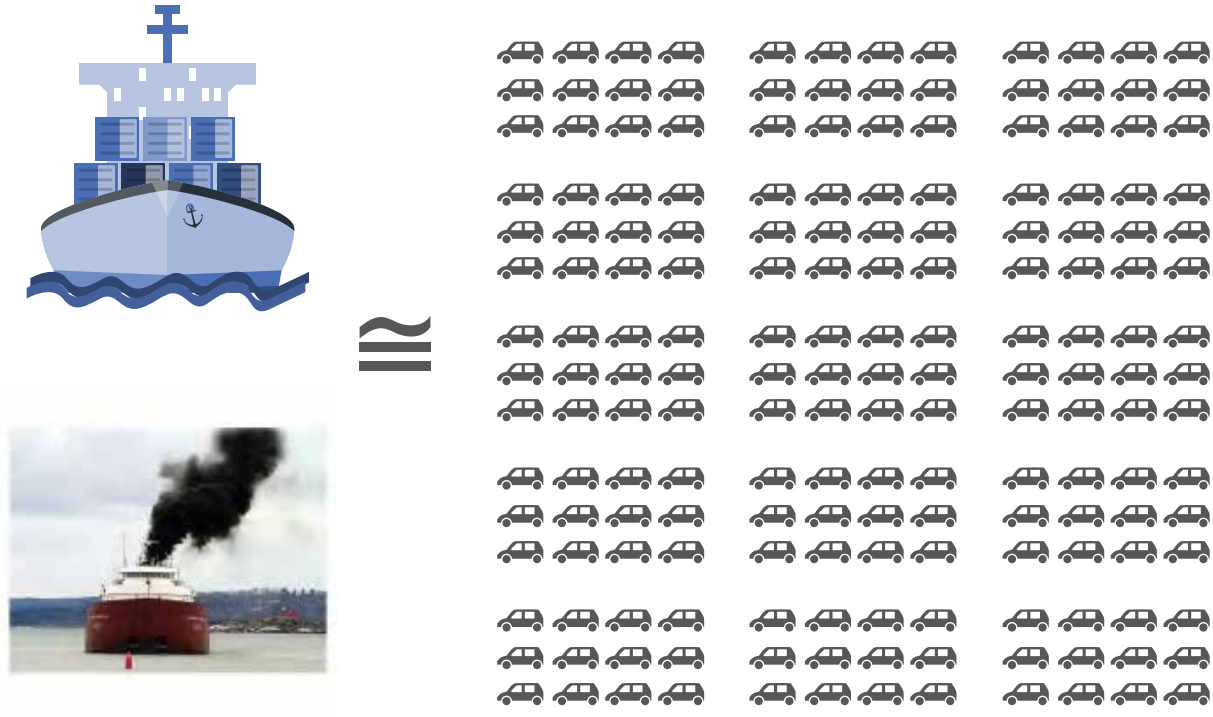
Mandates an average 40 percent reduction in CO2 emissions per transport work by 2030 compared with 2008 levels.

2050
Long-term annual GHG reduction deadline

Requires a 50 percent reduction in total annual GHG emissions by 2050 and encourages efforts to phase out GHG emissions completely.

Source: IHS Markit

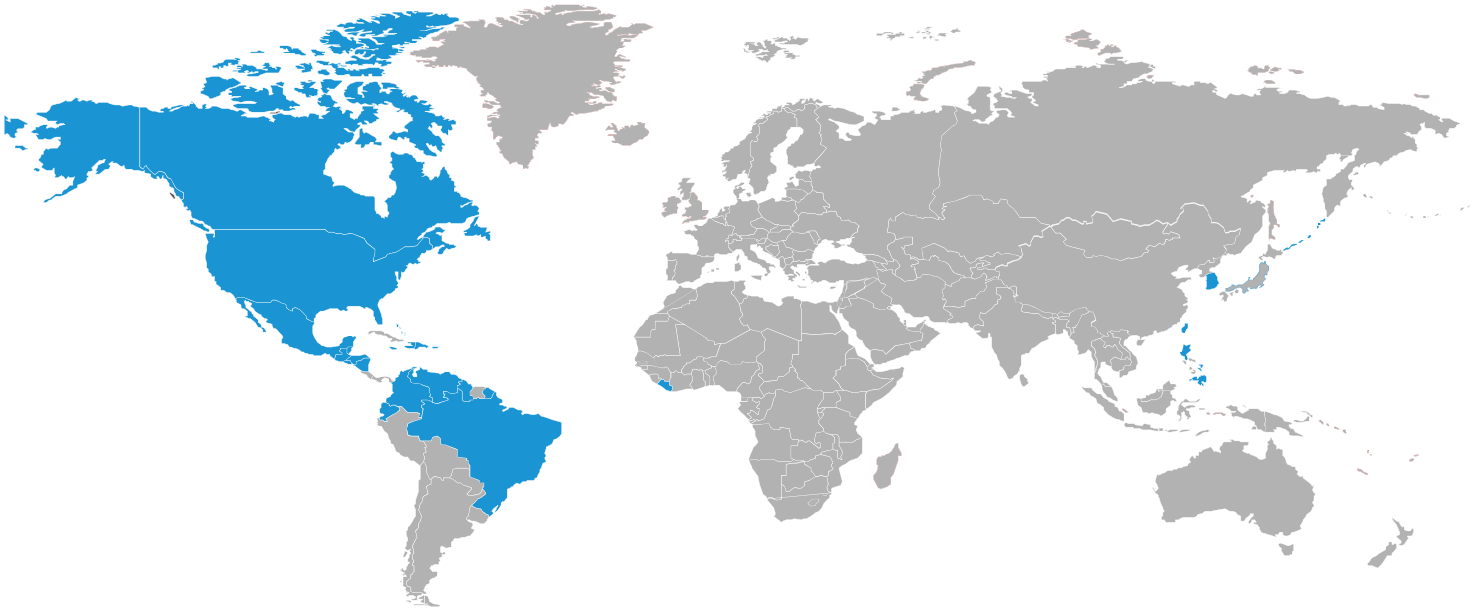
1 vessel emits NOX during 16 Hours port operation equals to 5,000 cars NOX emissions.



Worldwide Shore to Ship Power Detail

RORO and Military Ships operate with 50&60Hz, Cruise, Container and Chemical Ships with 60Hz electrical infrastructure.

In the picture below, the infrastructure of the ports is indicated Worldwide.



50 Hertz
60 Hertz
50 / 60 Hertz

Frequency on board	50 Hz	60 Hz
Container (<140m)	63 %	37 %
Container (>140m)	6 %	94 %
Container Total	26 %	74 %
Ferry / RORO	30 %	70 %
Tanker	20 %	80 %
Cruise (<200m)	36 %	64 %
Cruise (>200m)	-	100 %
Cruise Total	17 %	83 %

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