



# Shore Power Connection

Helping reduce ports' environmental footprint

Port Solutions

**Port Electrification** - Regulation on pollution, greenhouse gas emissions and noise in ports is becoming more stringent. Add to this increased demand for electrical power, there is more pressure on operators to optimize and update energy infrastructures. We work with customers across their ports' electrification needs, whether helping to improve existing assets or to increase energy efficiency through energy management systems and microgrids, shore-to-ship connections and alternative clean energy supplies.

## Helping to Reduce Port Emissions

**Onshore electrical power connections reduce or eliminate fuel and noise pollutants that might otherwise be produced by engines to power vessels docked in port.**

**Around 80% of a port's emissions can be associated with berthed vessels**

GE's Shore Power solution enables a vessel to switch off auxiliary engines when at berth and plug into electric power from the port itself. This enables port owners and operators to improve the environmental footprint of the facility in an energy-efficient way.

In addition to accommodating the needs of increasing traffic at ports and preparing for a new generation of ships and cleaner shipping networks, a smart investment in a shore-side power connection will take you a step closer to achieving a zero-emissions berth standard.

- Shore-to-ship electric power connectivity
- Enabling ships to have engines off during port visits
- Enabling ship battery charging
- Business opportunities with ability to accommodate new ship technology and meet stakeholder needs
- Opportunity for earlier payback of investment by selling electricity to vessel operator

MICROGRID

[gemicrogridsolutions.com](http://gemicrogridsolutions.com)

## GE Power Conversion's Solution

**Scalable, flexible, adaptable, bringing together GE microgrid, energy management and ship systems know-how**

GE offers medium voltage (MV) 6.6kV, 11kV and low voltage (LV) 400V, 690V converter solutions.

Providing power from a few hundred kilowatts to tens of megawatts, tailored to port traffic needs.

50Hz to 60Hz conversion for differing port and ship frequencies.

Focus on power quality and operator safety.

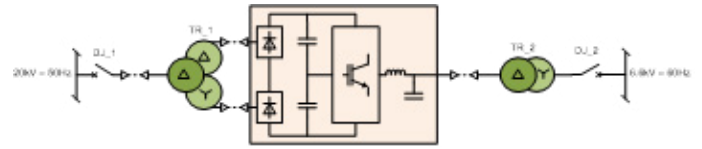
Compliance with shoreside electricity requirements.

**Decentralized Shore Power** architectures provide an island type layout and an inherent redundancy within the overall power system.

Compatibility with GE's **SeaGreen**

**Ship-to-Shore** connections.

## MV Solution



**Input transformer**

DFE (Diode Front End)  
*High efficiency*

**MV7000 series DFE converter**

Water cooled  
*Compact*

**Output transformer**

Sinus filter  
*Very low current and voltage harmonics*

Shipyards may require AFE configuration in order to run power tests on diesel engines and release energy into the grid.

## LV Solution

**Input rectifier 50Hz**

1 to 6 parallel MV3000  
Delta modules

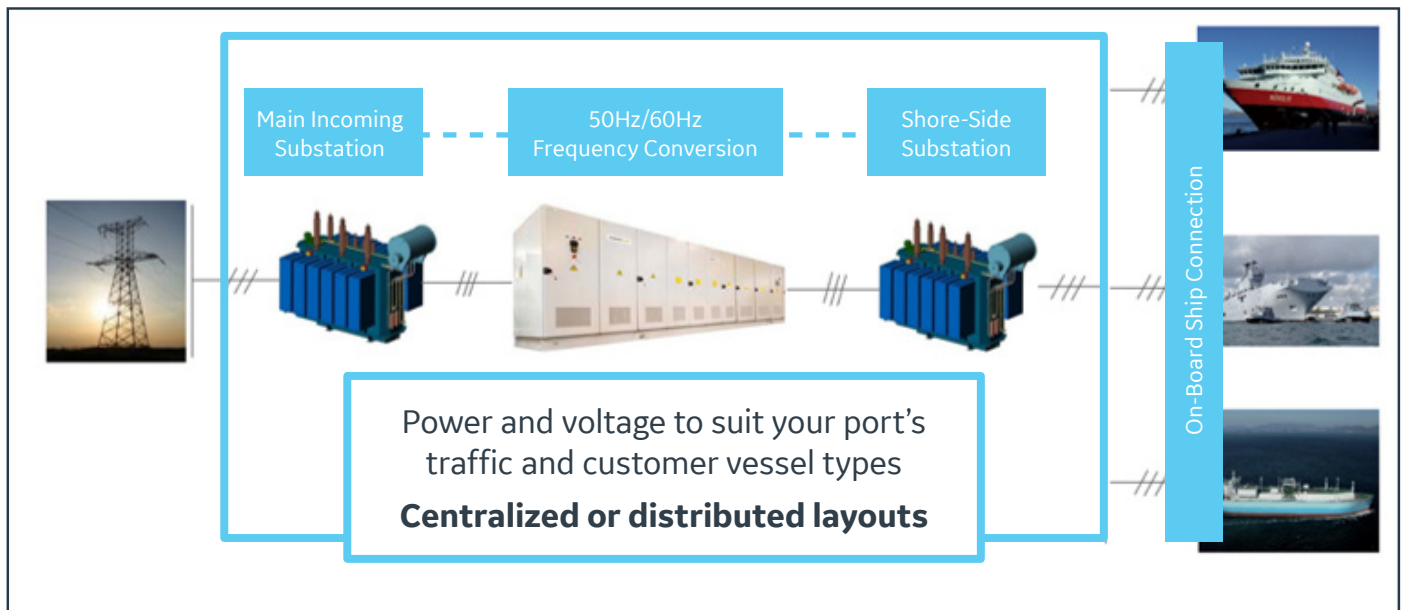
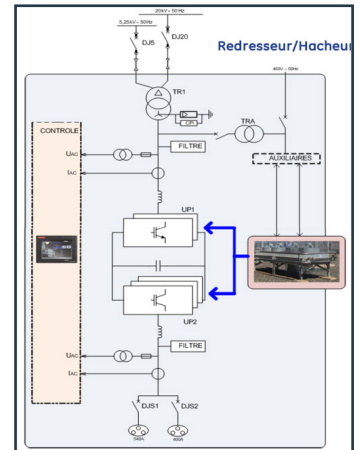
Sets DC voltage & power factor between 0.9 leading to 0.9 lagging

**Output inverter 60Hz**

1 to 6 parallel MV3000  
Delta modules

**Sinus filters** on  
50Hz & 60Hz sides

Pulse Width Modulation 2.5kHz





## Application Experience

**Containerized installations** – The power equipment can be installed in an existing equipment room or containerized in a modular and scalable container. Containers come prewired, fully tested and easy to install.

**MV/LV switchgear** – High quality products with customized solution to support medium and low voltage power distribution.

**Protection & control devices** – Powerful SCADA and HMI systems in our Shore Power Solution help monitor and control the system.

**Visor Connect** – Remote monitoring and diagnostic solution helps to provide real-time support and advice 24/7 - 365 days of the year.

**Active Front End (AFE) option** - Ports which need to release energy into the grid from power tests on diesel engines can be accommodated by replacing diode front end (DFE) with AFE converter configurations.

**Emergency energy storage** – Solutions with smart control and storage device are also available, to provide reliable energy supply during micro power outage.

### Portsmouth Naval Base, United Kingdom

GE's Queen Elizabeth Class (QEC) **High Voltage Shore Supply (HVSS) Long Term Service agreement (LTSA)** is a five year contract to supply enduring maintenance and technical support to Shore Power Connections for the Queen Elizabeth Class of Aircraft Carriers. The system is supported by specialists providing integrated logistic support, maintaining availability and access to shore power for the customer, helping to reduce carbon and noise emissions from the QE Class of vessels.

Delivered on site at Portsmouth Naval Base, the LTSA provides turnkey responsive and scheduled maintenance for all GE equipment. The team provides configuration management of the system, spares availability and supply, annual maintenance and engineering governance, and identifies opportunities for continuous improvement of equipment and service.

#### 2 x 13.5MVA – 11kV, 50Hz → 11kV, 60Hz

- Two shore supplies at berth
- Dedicated to HMS Queen Elizabeth and HMS Prince of Wales aircraft carriers
- Supporting GE's 110MW ship's electric grid when docked

## Shore Power Project Examples

### Marine Nationale, Brest, France



**6 x 4MVA – 20kV-50Hz → 6.6kV-60Hz**

- Each supply includes capacitive energy storage 4MVA - 1s to secure the loads
- Complies with IEC standards, NATO Stanag 1008



### Chantiers de-l'Atlantique, Saint-Nazaire, France



**2 x bi-directional 12MVA – 15kV,  
50Hz ← → 11/6.6kV, 60Hz**

4.8MVA<sub>r</sub> – 3.2kV – 60Hz for shipyard

Two bi-directional shore supplies with synchronous condenser. Meeting demanding electrical power requirements for cruise ships at berth. Helping to reduce:

- Emissions from fuel burn
  - Particulate matter (PM)
  - Nitrogen oxides (NO<sub>x</sub>)
  - Sulphur oxides (SO<sub>x</sub>)
  - CO<sub>2</sub>
- Noise pollution
- Vibration

To find out more:  
[contactus.powerconversion@ge.com](mailto:contactus.powerconversion@ge.com)

©2022 General Electric Company – All rights reserved. GE Power Conversion reserves the right to make changes in specifications shown herein, or discontinue the product described at any time without notice or obligation. Please contact your GE Power Conversion representative for the most current information. GE and the GE Monogram, are trademarks of General Electric Company.

MICROGRID