German Shipowners' Association Information Paper | Onshore power

Plugging ships into sockets: how this works in ports

German Shipowners' Association

ONSHORE POWER: AN ALTERNATE WAY OF REDUCING EMISSIONS

Ocean-going vessels also need energy in port, for operation of onboard systems or to keep refrigerated containers cold. The supply of external power during mooring is referred to as onshore power – usually via cable from a land based external power source on the quay to a socket on board.

Up until now, ships have mostly used their auxiliary diesel engines whilst in port. The main engine is switched off as soon as the ship is moored at the pier. The use of conventional Heavy Fuel Oil has already been banned as a fuel in European ports for years.

Energy demand in the port

~ 1 MW – Container feeder

~ 2 MW – RoPax ferry

~ 7.5 MW – Large container ship

~ 7 – 11 MW – Cruise ship

ONLY ABOUT 20 PORTS WORLDWIDE WITH FACILITIES

There are several thousand ports worldwide. While the number of ports with onshore power is growing, currently (as of 2020) only seven ports in California, one port in China and a total of a dozen ports in Europe (Sweden, Finland and Germany) offer onshore power. Only a very small portion of the world's fleet is capable of using onshore power yet.

GERMAN PORTS AIM TO BE PIONEERS

In German seaports, onshore power supply for ocean-going vessels is still the exception – but there are ambitious plans. Pioneer Lübeck, on the other hand, is cutting down on onshore power.

KIEL
A facility for the Oslo ferries has been in place since 2019. A second facility for cruise ships and the Gothenburg ferries is scheduled to go onstream by the end of 2020.

ROSTOCK-WARNEMÜNDE
An onshore power facility for cruise ships is under construction.

HAMBURG
An onshore power facility for cruise liners was commissioned in 2016. Ten facilities are to be built by 2022: eight for container ships, two for cruise ships.

BREMERHAVEN
Plans for eight facilities for merchant ships.

JADE-WESER-PORT
no facility to date

LÜBECK
One facility already in operation since 2008 is soon to be taken off the grid because it is only used by one ferry company, which will be relying on liquefied natural gas (LNG) in future.

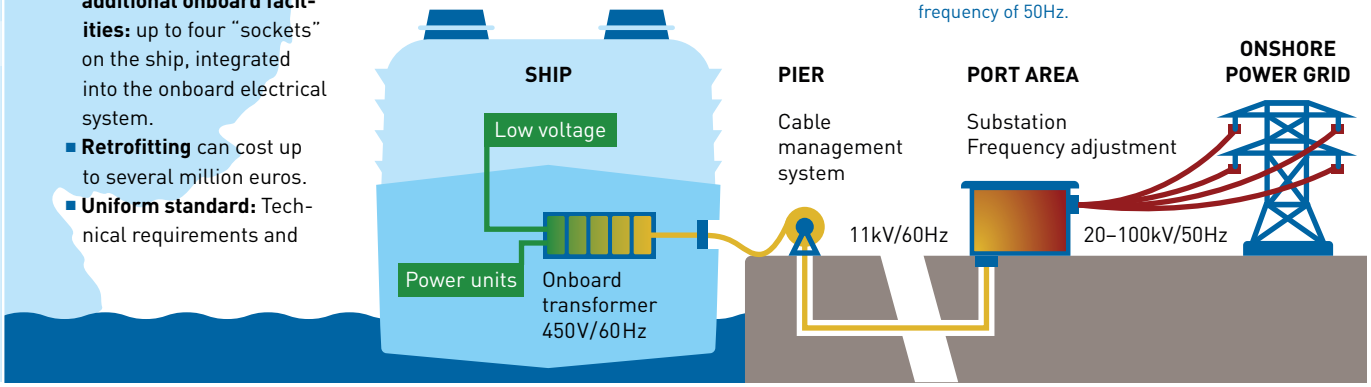
TRANSFORMERS REQUIRED

Different currents and frequencies are being used ashore and onboard. As a result, the voltage supplied from shore must be converted to match onboard voltage by using a transformer.

- **Ocean-going vessels require additional onboard facilities:** up to four "sockets" on the ship, integrated into the onboard electrical system.
- **Retrofitting** can cost up to several million euros.
- **Uniform standard:** Technical requirements and system descriptions, especially for voltages and connectors, are defined in the triple standard of ISO, IEC and IEEE since 2012 and are now uniform worldwide.

Electrical systems of large and modern ships

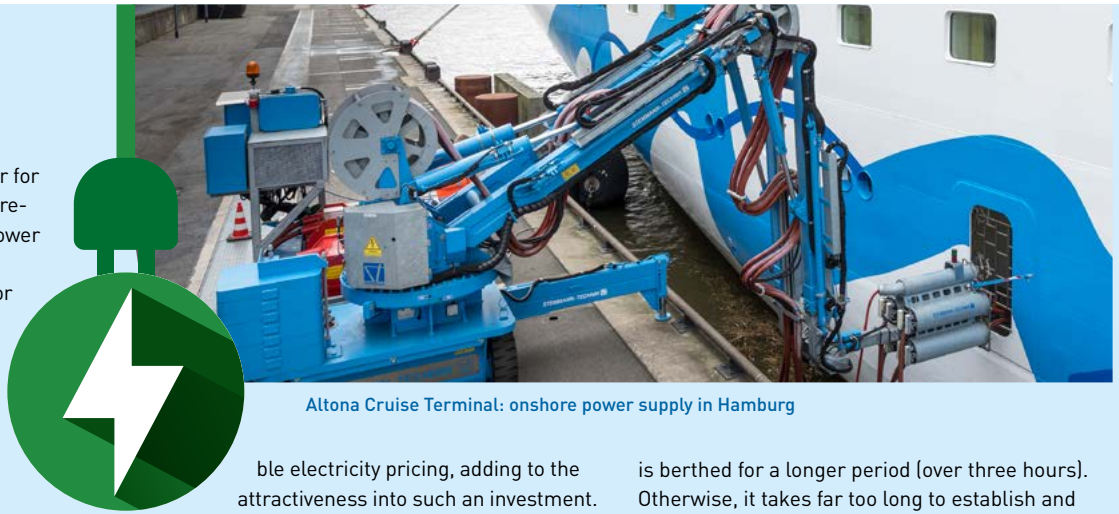
- the main voltage is usually 11KV/50 or 60Hz, and/or 6.6KV/50 or 60Hz.
- Older or smaller ships often have low-voltage electrical systems with 440V/60Hz or 400V/50Hz.
- The onshore supply grid in port cities is usually a medium-voltage network with 10KV at a network frequency of 50Hz.



HOW ONSHORE POWER WILL PROVE TO BE A SUCCESS STORY

WHAT TO BEAR IN MIND

Sustainable concept
Nothing is gained in the sense of climate protection, if the onshore power for ocean-going ships in ports is supplied by shore-based coal-fired power plants. An onshore power connection therefore only makes sense for a reduction of CO_2 emissions if the electricity for the ships stems from renewable energies. In addition, the onshore power facility also competes with alternative fuels increasingly used in maritime shipping – which might have an even better pollutant balance.



Altona Cruise Terminal: onshore power supply in Hamburg

Economic conditions
If you want to increase the use of onshore power, you have to make the conditions more attractive. Under the current regulative, the consumption of electricity on ships is tax-exempt in almost every country under EU-regulation. But only if the electricity is generated on the ship – not for onshore power. The German EEG levy excludes onshore power and should thus be waived to assist the use of green onshore power for vessels.

In addition, the large investments required for the vessel should be co-financed through favourable electricity pricing, adding to the attractiveness into such an investment.

Regular shipping services
Shore-side electricity is particularly suitable for an operation, where a vessel returns regularly to same berth, as is the case with ferries. If, in contrast, berths are changed frequently and the size and type of vessels vary, then this raises numerous practical questions.

Longer laytime
In order to be effective, the use of shore-side electricity only makes sense if the ship is berthed for a longer period (over three hours). Otherwise, it takes far too long to establish and terminate the connection.

Flexible connections
At the terminal, the onshore power connection must be spatially flexible in order to serve different ship types and sizes. Due to tide or current, it is often not known in advance how and where a ship will moor at the quay.

Transparent liability rules
The high energy demand of cruise ships or container vessels with reefers can have repercussions on the entire power grid of a port city. It must be clearly defined by regulation who is liable in the event of possible power failures. Over-voltages or short circuits can also cause damage to the ship or to the onshore power lines - again, this is giving rise to liability issues.

AN ALTERNATIVE, NO MAGIC SOLUTION

The construction of onshore power facilities is costly and time-consuming. At the same time, the use of fuels that emit far fewer pollutants is becoming increasingly widespread in maritime shipping. The emissions discharged by ships will continue to be reduced considerably – also during the berthing period.

It is foreseeable that in the near future a situation may arise in which energy generated on board will be more advantageous in the overall life cycle assessment than onshore power.

For certain types of traffic, shore-side electricity represents a sensible alternative to other forms of emission reduction in the port. It seems questionable, however, whether it should become the standard solution for power supply in the port.

Connection to a special container: onshore power solution in California

MANDATORY ONSHORE POWER: WHAT OBLIGATORY CONNECTION WOULD CAUSE

- High investments and elaborate remodeling are needed during ongoing terminal operations in order to be able to offer the connection across all seaports.
- A co-ordinated approach with other ports in the region is necessary. Otherwise, a shift in shipping traffic may occur. This would help neither the port nor the environment.
- The German government's initiative to advocate further measures at European level for the use of shore-side electricity in ports therefore can be supported.
- California has mandatory onshore power already in place since 2014. After initial difficulties, the use of the system now functions without any major problems – but it remains a challenge in technical terms. The experience gained in operational implementation should also be used and deployed elsewhere.

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Status as of: September 2020, Photos: ©HPA/Christian Bruch, Hapag-Lloyd AG (2)