Jeco Energies

WHITEPAPER FOR
MARITIME PROFESSIONALS

Shore Power: The future of sustainable ports

This e-book is intended for port authorities, terminal owners, shipping lines, maritime professionals, and anyone seeking practical ways to adopt shore power technology.

It also serves as a resource for policymakers, environmental advocates, and technology providers aiming to reduce emissions and drive innovation in the maritime sector.

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1. Introduction

Ports are evolving to meet the demands of a cleaner, quieter, and more sustainable future. One of the most effective advancements in this transition is shore power.

This technology allows docked vessels to connect to an onshore electricity supply, enabling them to turn off (diesel) auxiliary engines while in port.

The benefits of shore power are numerous. As many ports lay close to big cities, reducing emissions provides cleaner air for citizens. It's also a significant step towards achieving the port's sustainability goals, especially in light of new regulations. Yet, for maritime professionals, a lot of questions or concerns remain.

- How will we manage the increased electrical load from shore power?
- Which legal requirements apply to our port, and how do we meet them all?
- How will shore power affect our return on investment (ROI)?
- How do we determine the best solution for our port's traffic and operations?

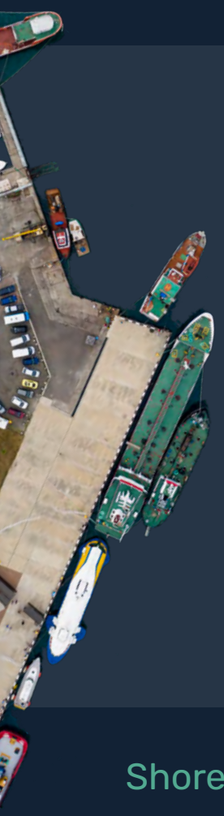
In this whitepaper, we answer all of these questions and provide expert advice to guide you through this transition. Here's to a deep understanding of shore power and a clear path forward for you as a maritime professional!

2. Understanding shore power

Harboring greener ports

Whether it's to refrigerate reefer containers or simply to activate ballast pumps: ships at berth require significant power. Currently, much of this power still comes from fossil fuel engines, which is not exactly sustainable.

As the global demand for greener maritime operations grows, more regulations are being implemented to reduce emissions from docked vessels. Shore power plays a crucial role in this sustainable shift.



What is shore power?

Shore power provides electrical power to a ship while it is docked in port. This way, vessels can turn off onboard generators and use electricity supplied from the shore instead.

A reliable physical connection between the ship and the dock delivers high- or low-voltage power at the correct specifications for any type of ship – regardless of size, country or manufacture. In other words: where there's a ship, there can be a plug.

"Shore power helps ports and shipping lines transition towards cleaner, quieter, and more sustainable operations."

Jan Van Nuffel, CEO Jeco Energies

Shore power in action

- 7.5 MW shore power
- Powering 100 stationed container ships / year
- Reducing 10,309 tons of CO2 / year
- Equals yearly emissions of 625 common households in Europe

Calculation based on ships per year with shore power, average power per ship along quay (MW), time along quay, total energy consumption along quay per ship (MWh), total energy consumption along quay per year (MWh) and total CO2 emissions along quay per year.

3. Why shore power matters

Why should you get started with shore power? Let's go over some key reasons, ranging from benefits and opportunities to upcoming legal requirements.

HARBORING GREENER PORTS

- Shutting down a ship's diesel or heavy fuel engines drastically cuts CO2 emissions as well as nitrogen and sulfate oxides.
- This improves air quality for everyone living and working in and around the port.

COMPETITIVE ADVANTAGE

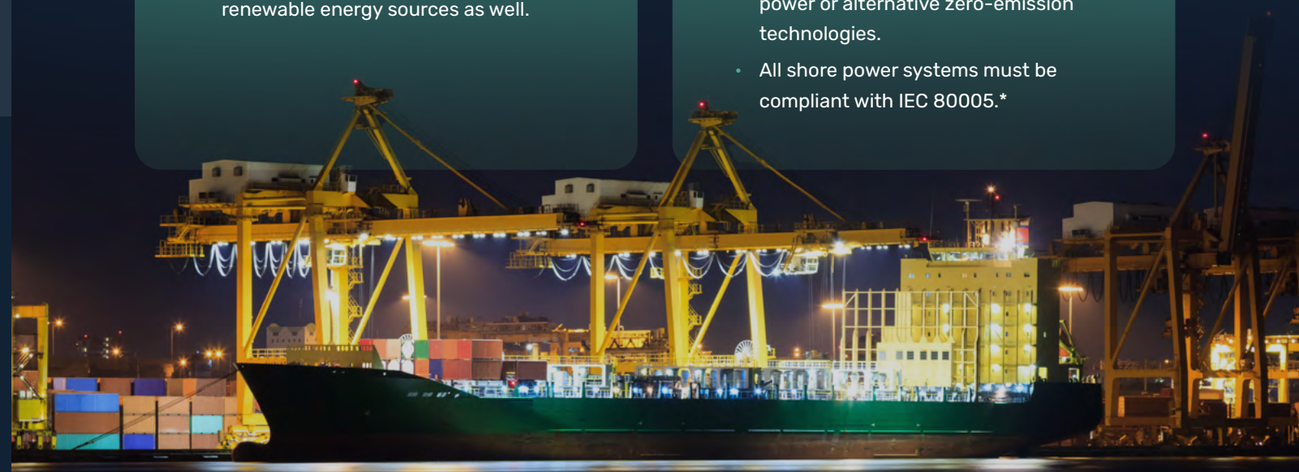
- A port or shipping line that invests in shore power infrastructure showcases its early adoption of greener operations.
- This makes you an attractive partner for clients who are prioritizing sustainable supply chain solutions.

SUPPORTING NET ZERO GOALS

- Many ports are steering towards Net Zero in 2030 or 2050 at the latest.
- Shore power is a critical step in this process, especially if you can integrate renewable energy sources as well.

COMPLIANT WITH REGULATIONS

- From 2030 onwards, 90% of all passenger and container ships at berth in EU ports covered under Art. 9 of AFIR must use shore power or alternative zero-emission technologies.
- All shore power systems must be compliant with IEC 80005.*



* A series of international standards defining requirements for high-voltage and low-voltage shore connection systems (HVSC/LVSC) for ships.

4. Shore power: challenges

The transition towards shore power is inevitable and rightfully so. Yet, it does present new challenges for ports. We talk through the two most common ones and advise a course of action for each one of them.

Grid capacity

Electrification is key in the global push towards sustainability. However, it requires a reliable and sufficient energy supply. Ports already operate near capacity without shore power, yet the IEC 80005 standard requires certain MV levels in order to be compliant. How do you increase the voltage load while making sure the lights won't go out along the way?

At Jeco Energies, we like to apply common sense. That's why we ensure IEC compliance while still preventing energy overload through dynamic load balancing. If one ship is plugged in, they get the full load. With multiple vessels, the energy is shared. This maintains stability in a cost-efficient way while still adhering to standards.

Financing

Achieving broader climate goals is important and has its own business merit. Yet, the cost of the infrastructure can be quite daunting. At the same time, a positive impact on the ROI remains unsure. How can you adhere to tightening regulations while still maximizing your investment?

With shore power as a service, you can categorize the investment under OPEX rather than CAPEX. This allows you to spread the cost over time, which makes the investment more manageable. Jeco Energies offers this service to eligible parties.

5. Shore power technology: how does it work?

Behind every seamless shore power connection lies a complex network of high-voltage cables, transformers, and frequency converters – all designed to deliver stable electricity to vessels of all types. Here's how Jeco Energies does it.

Our technical components of a reliable power transfer from grid to vessel:

Your MV grid
High-voltage cables coming in from the main grid of your location

Substation
A branch of the main grid that can step down to a lower voltage suitable for distribution

The heart of your shore power solution
POWERHOUSE

Converter*
Converts frequency: works on low voltage

Step-down Transformer
Changes incoming high voltage into low voltage

Step-up Transformer
Changes converted low voltage back into high voltage

Switchgear gridside
Safety switch towards the converter

Switchgear shipside
Safety switch towards the ship

Cable management system
Plug-in cables to connect power to the vessel

Ship

(*) Why a converter?

1. To ensure compatibility between the power supply and onboard systems. Many ships use a 60 Hz electrical frequency, while European grids operate at 50 Hz.

2. To help mitigate voltage drops over long cable lengths.

3. To preserve the quality of power provided to the ship.

Different vessels, different approach

Each vessel type has unique energy and even synchronization demands. A few examples:

- **Inland shipping and ferries** often operate with lower voltage power
- Cargo ships have varying power needs, depending on type and requirements. Unlike cruise ships and smaller vessels, they typically connect to shore using their own set of HV cables.
- Cruise liners demand significant power to maintain onboard services while docked

Even within the same category, vessels can have varying energy requirements. IEC 80005 serves as an extensive guide to navigate the specific regulations for each type of vessel.

Feeling overwhelmed by all the research required for your ideal shore power solution? **Focus on what you do best, and let us handle the rest**. After a site visit, we match your needs with the applicable regulations for your location or ships.

Safety first

ELECTRICAL SAFETY

Shore power involves high-voltage systems. That's why it's crucial to take proper measures for short circuit protection, grounding, environmental challenges (corrosion) and connection integrity. Avoiding a mismatch when connecting the on-shore power supply (OPS) to the ship is essential.

Ships use either the A1 or A3 synchronization method for shore power connections. In the A1 method, the vessel synchronizes with the OPS, adjusting its own power system to match the shore power. In the A3 method, the Onshore Power Supply (OPS) synchronizes with the vessel's power system by adjusting its frequency and phase before connection. A1 is the most common approach, which is why most shore power suppliers primarily support this method - **our method supports both.**

OPERATIONAL SAFETY

On the one hand, you need the right people on the job: certified technicians who are cleared to work with high-voltage.

On the other, the cable management system (CMS) plays a crucial role in securing operational safety. The right CMS depends on the type of vessel. Container ships, Roll-on/Roll-off (RoRo) ships, Lift-on/Lift-off (LoLo) ships, cruise ships, and shipyard applications all require tailored solutions.

Within these categories, factors such as footprint, manageability and budget must also be considered. In other words, finding the best-suited CMS favors a custom approach.

JECO ENERGIES' DEDICATION TO SAFETY

- IEC compliant in-house professionals
- In-house software engineering (TÜV certified)
- Regular recertification and specialized trainings
- Failsafe controller
- Hermetically sealed PowerHouse
- CE marked PowerHouse
- 30+ years experience with working in and around ports
- Service level agreements for maintenance and interventions

5. Case Study: Jeco Energies & PSA Antwerp

A cutting-edge shore power installation: that's what Jeco Energies together with Stadsbader has in store for PSA Antwerp. Up to 100 ships a year will be able to plug in for green electricity while docked. The contract was signed early 2025, with completion set for April 2026.

"With the planned shore power installation for Europa Terminal, PSA Antwerp will become the first container terminal in the Port of Antwerp to offer this revolutionary service. This once again underlines, our unwavering commitment to prioritizing sustainability in our operations."

— Jurgen De Wachter, General Manager PSA Antwerp Container Business

PSA STADSBADER

Funded by the European Union NextGenerationEU

PROJECT EMERALD

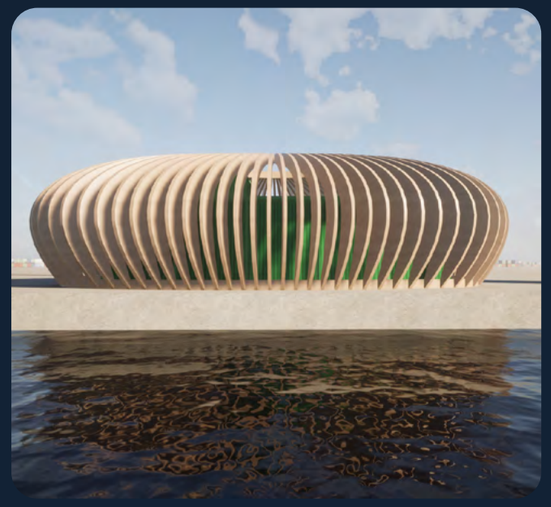
The shore power installation is part of Project Emerald, the large-scale renovation of the Europa Terminal. Jeco Energies has been appointed as the turnkey partner for fully-automatic electrical infrastructure across the entire terminal.

"Our team is proud to help realize this prestigious project. It's a clear example of how our innovative solutions contribute to the sustainability of the maritime sector."

— Jan Van Nuffel, CEO Jeco Energies

The PowerHouse as a true eyecatcher

You can place a large electrical installation and just be done with it... Or you can make it stand out. We're currently designing a façade around the powerHouse. An unexpected art piece in the middle of the port? That's bound to make some waves!



6. Jeco Energies: shore power solutions

As a full turnkey EPC **(Engineering, Procurement, and Construction)** contractor, Jeco Energies delivers end-to-end solutions for shore power projects around the globe.

With over 30 years of experience in industrial energy solutions, we cover every stage of shore power implementation:

TECHNICAL DESIGN

- Cable calculations
- Electrical short circuit power & grounding calculations
- Containerized BIM modeling
- Integration with existing MV/HV substations
- Guidance with grid companies

CIVIL WORKS

- Digging of trenches
- Directional drilling (including foundations)

SOFTWARE ENGINEERING

- PLC and SCALA interfacing: visualization of
  - PowerHouse
  - CMS
  - Terminal system
- Safety programming & configuration of relays on switchgear:
  - Interlocking
  - Blocking
  - Tripping

INSTALLATION & COMMISSIONING

- Mechanical team
- Electrical team
- Measurement team
- Project management team

PREVENTIVE & CORRECTIVE MAINTENANCE (SLA)

- Relay testing of switchgear
- Transformer inspections
- Circulation tests & firmware update of converter
- Cable diagnostics
- Critical spare parts
- Remote monitoring
- 24/7 hotline

OPERATIONAL SUPPORT

- Training
- Certification of HV ship cables (compatibility for shore power IEC 80005 with measurement van)

SUPPORT STRUCTURES

- PowerHouse façade (aesthetic)

7. Conclusion and outlook

Shore power is an essential technology in the transition towards greener ports. By plugging in docked vessels, you significantly reduce air pollution, offering cleaner air to both crew and citizens. A single 7.5 megawatt installation can cut CO2 emissions by over 10,000 tons annually.

As **shore power regulations** for the EU are imminent, **now's the time** for maritime professionals to explore the possibilities.

Why rely on Jeco Energies?

- Client-first approach: honest advice, transparent collaboration and personal service
- Maritime experience: over 30+ years of industrial energy projects in and around ports
- Digitalisation of high-voltage installations: we make power smart with software engineering
- Full turnkey EPC contractor: we coordinate the project from start to finish, and then our SLA kicks in
- Strong partnerships: with reliable partners such as PowerCon we offer a high-quality solution
- Flexible business models: we're happy to explore custom solutions such as shore power as a service or a split investment

Jeco Energies

Whatever you need, wherever you are.

Jeco Energies offers **tailored solutions worldwide** for ports of any size and vessels of any type. Our shore power installations know no bounds. Present us with your specific needs, and we'll deliver the best possible solution, fully compliant with your IEC 80005 standard.

Want to know more?

Our business developer **Stef Canters** is happy to answer all of your questions. Get in touch via e-mail at stef.canters@jeco-energies.com.

Or **scan the QR-code** and we'll write the email for you.
All you have to do is press send!

*WHEN **POWER** BECOMES **SMART***

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