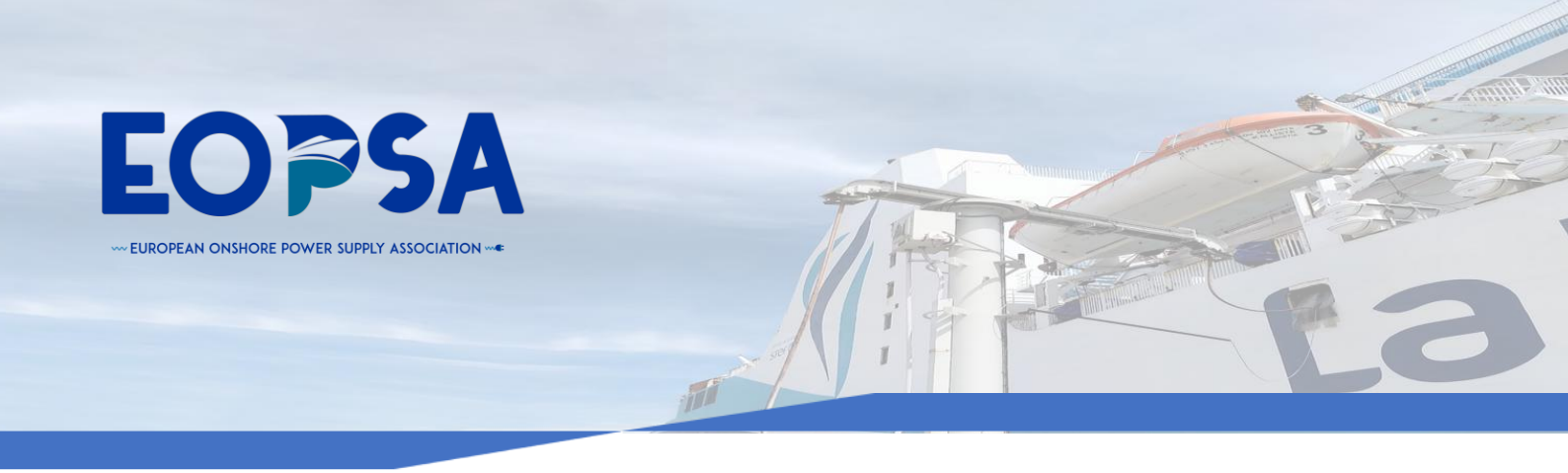

#Onshore Power Supply - #OPS

AGE OF OPS

Why we can!

April 2026

#ENERGIZING PORT ELECTRIFICATION
#LETSGETCONNECTED
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EUROPEAN ONSHORE POWER SUPPLY ASSOCIATION

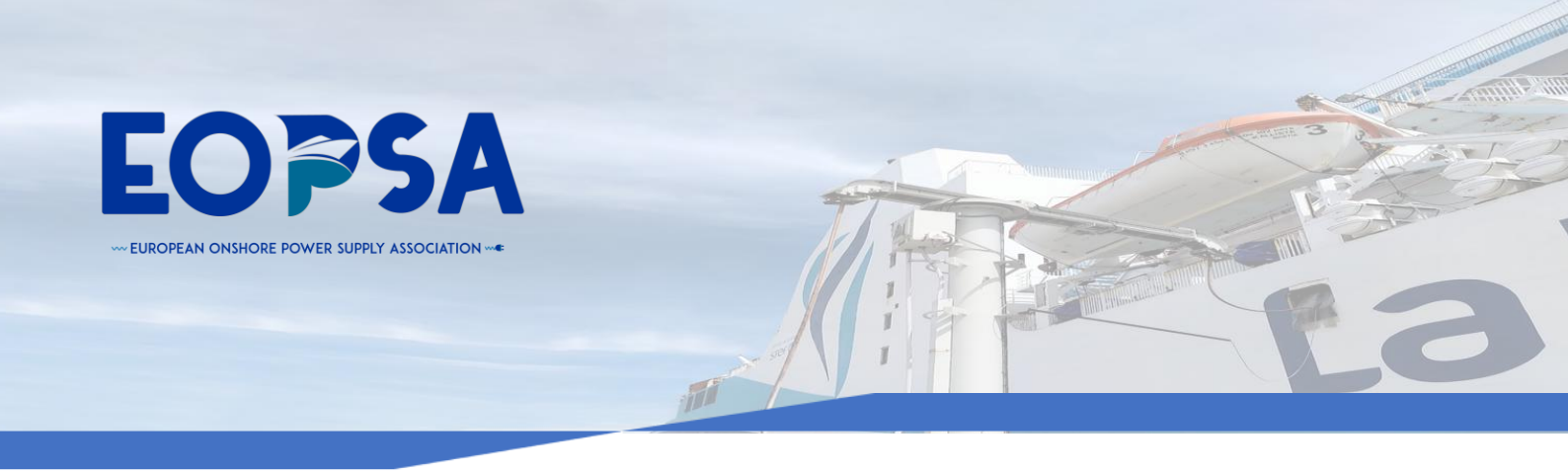
Executive Summary

The International Energy Agency has coined the “Age of Electricity,” where electricity is increasingly the backbone of global energy systems.

In parallel, the Electrification Alliance speaks of the “Age of Electrification,” emphasizing that electrification is the key enabler of decarbonizing major sectors.

Both concepts describe a pivotal shift: electricity is no longer one energy option among many, it is becoming the central pathway to a low-carbon future.

This paper argues that in maritime and port operations, onshore power supply (OPS) is the maritime embodiment of this age, merging OPS, battery integration, and terminal electrification into a fully decarbonized future.



Age of Electrification:

In recent years, leading global energy institutions have increasingly framed the ongoing energy transition as the emergence of a new era: the “Age of Electricity” or the “Age of Electrification.” This terminology is not merely rhetorical, it reflects a profound structural transformation of the global energy system.

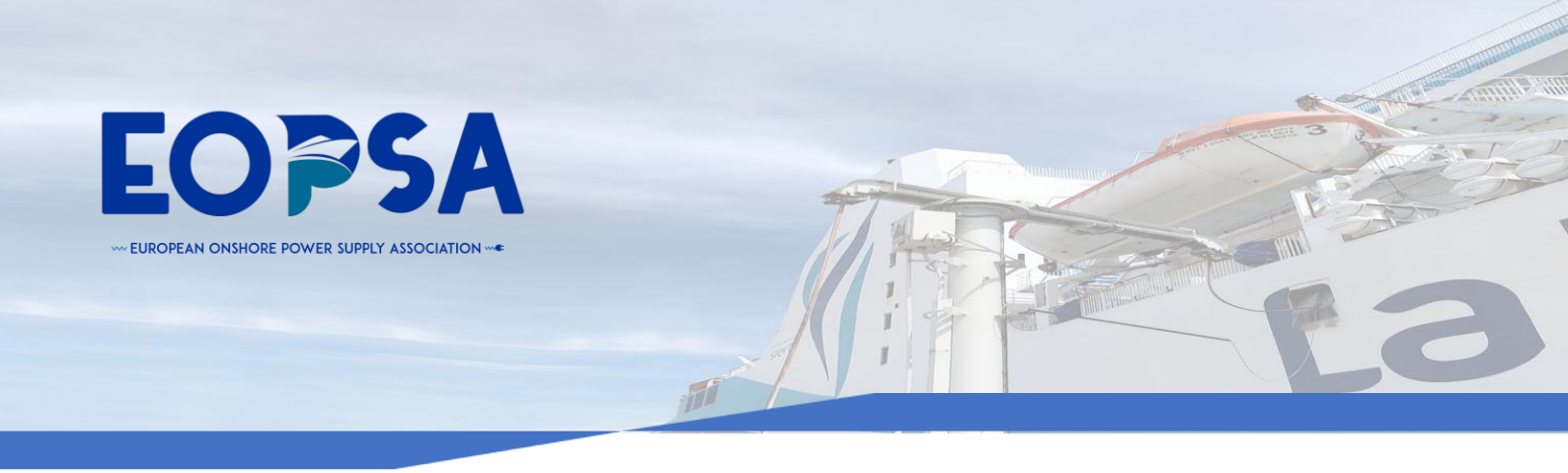
The International Energy Agency (IEA), in its flagship analyses and recent communications (17/11/2025), explicitly states that “the age of electricity is here.” This assertion is grounded in a series of converging trends. Most notably, electricity demand is now growing significantly faster than overall energy consumption, marking a historic shift in the way energy is produced, distributed, and consumed.

The IEA’s World Energy Outlook 2025 further highlights that electricity is rapidly becoming the backbone of the global energy system, driven by the electrification of transport, industry, heating, and the rapid expansion of digital infrastructure such as data centres. Electricity demand is projected to increase by 40–50% by 2035, underlining the scale and speed of this transformation.

This shift is not only quantitative but structural. Electricity is no longer a secondary energy carrier, it is becoming the central vector of decarbonisation, replacing fossil fuels across multiple sectors simultaneously. Investment patterns already reflect this reality, with spending on electricity supply and electrification now accounting for a substantial share of global energy investment.

In parallel, European industrial and policy actors, such as the Electrification Alliance, frame this transformation as the “Age of Electrification,” emphasizing that direct electrification represents the most efficient and scalable pathway to decarbonise end-use sectors. In this view, electricity acts as the unifying backbone linking renewable generation to consumption across transport, buildings, and industry.

The International Renewable Energy Agency (IRENA) reinforces this perspective by highlighting electrification as a central pillar of the global energy transition. In its analysis of “smart electrification,” IRENA argues that electricity will become the dominant energy carrier, potentially accounting for more than half of global energy consumption in a 1.5°C scenario, driven by the electrification of transport, heating, and industry.



At the same time, IRENA emphasizes that this transformation is not limited to power generation alone, but requires a system-wide shift combining renewable energy, electrification of end-use sectors, and innovation across infrastructure, markets, and technologies. Electrification is therefore not just a trend, but a structural pathway to decarbonisation, enabling the integration of renewables and providing the most cost-effective solution for reducing emissions across the economy.

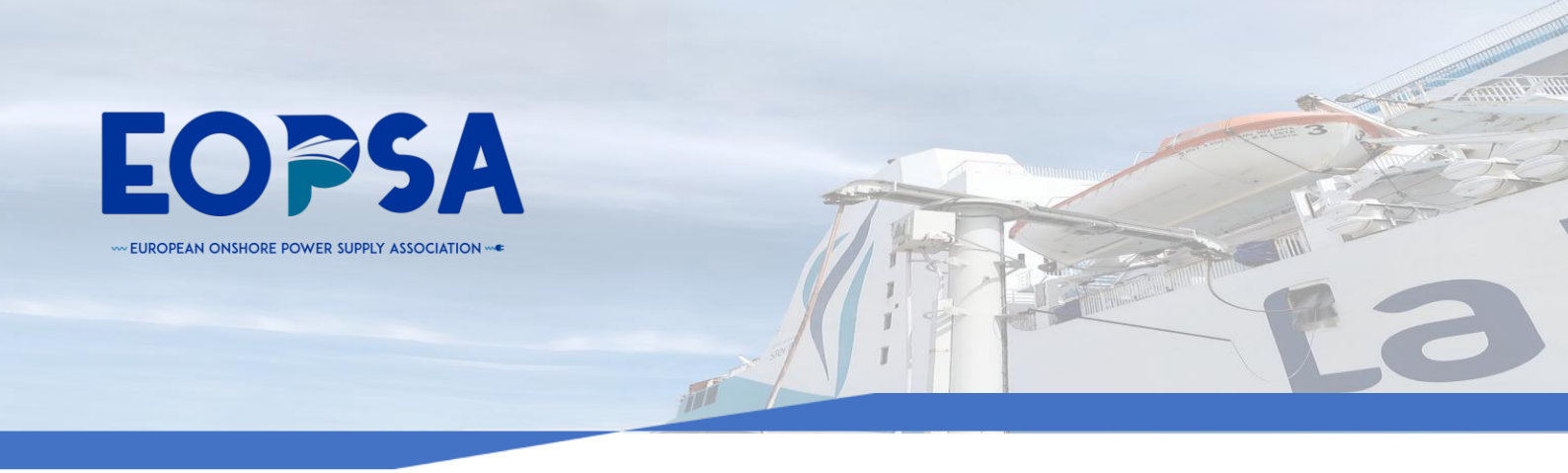
Furthermore, recent geopolitical developments, in particular the war in Ukraine, have further reinforced the strategic importance of electrification. The crisis has exposed the vulnerabilities associated with dependence on imported fossil fuels, highlighting the need for greater energy resilience, security, and autonomy. In this context, electricity, especially when generated from domestic renewable sources, offers a structurally more resilient pathway. Electrification enables countries to reduce exposure to volatile fuel markets, diversify energy supply, and strengthen control over critical infrastructure. As underlined by both the IEA and IRENA, the transition toward a more electrified energy system is therefore not only a climate imperative, but also a strategic response to geopolitical instability, positioning electricity as a cornerstone of energy security and system resilience in an increasingly uncertain world.

Taken together, these perspectives converge on a common conclusion:
we are witnessing a systemic transition in which electricity becomes the dominant energy carrier of modern economies, much as coal and oil defined previous eras.

Crucially, this transformation is not driven by a single factor. Rather, multiple forces are aligning:

- rapid technological progress in renewable energy and electrification solutions,
- strong policy frameworks and climate legislation,
- shifting investment flows toward clean energy infrastructure,
- and growing societal and industrial demand for decarbonisation.

It is within this broader context that the maritime and port sectors must be understood. Just as electrification is reshaping entire economies, a similar convergence is now taking place within ports and shipping.



Age of OPS

Building on this global shift toward electrification, Onshore Power Supply (OPS) emerges as a defining solution. Far from being a marginal or purely technical intervention, OPS represents the point at which the broader “Age of Electrification” materialises within port and maritime operations.

Today, multiple forces are aligning, regulation and EU strategy, infrastructure investments, the growing importance of resilience and security, and decarbonisation strategies, converging to position OPS at the centre of a new paradigm: the “Age of OPS.”

OPS: From local benefit to structural necessity

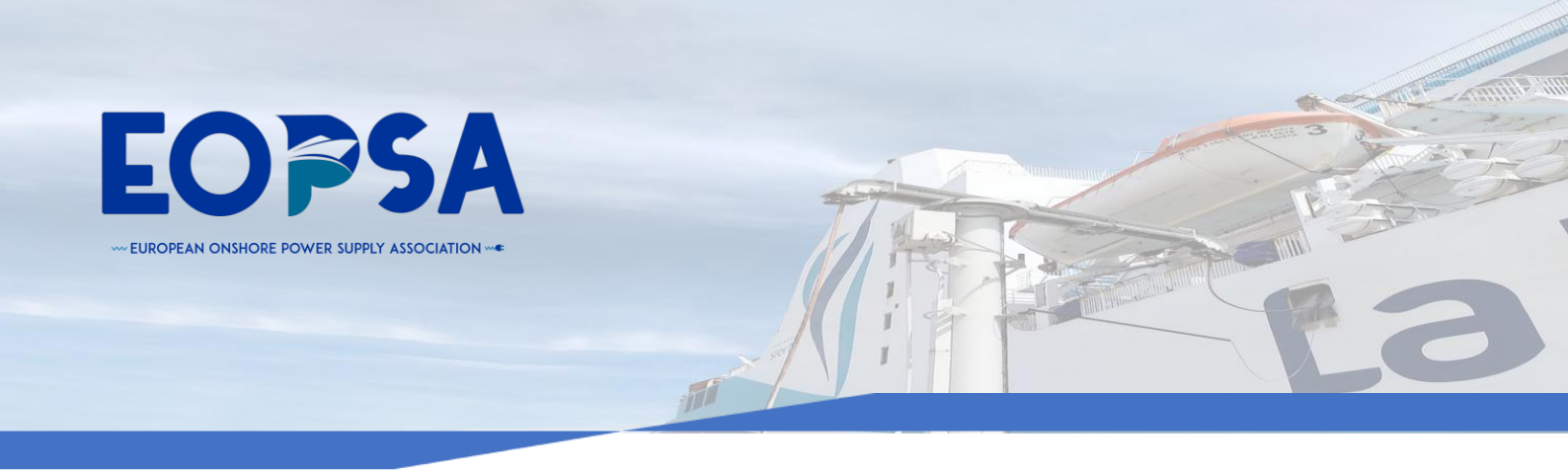
At its core, Onshore Power Supply enables vessels at berth to switch off their auxiliary engines and connect directly to shore-based electricity. By eliminating the need for onboard fuel combustion while docked, OPS significantly reduces emissions of CO_2, Nox, Sox, and particulate matter, directly improving air quality in and around port areas.

Beyond emissions, OPS also addresses critical local externalities. The reduction of noise and vibration contributes to improved living conditions for communities located near ports, while enhancing working environments for port personnel. In densely populated port cities, these benefits are not marginal; they are essential to maintaining the social licence to operate.

However, to view OPS solely through the lens of environmental compliance or local impact would be to underestimate its significance. Increasingly, OPS must be understood not as an isolated solution, but as a foundational building block in the broader transformation of port and maritime energy systems, contributing to competitiveness, resilience, job creation, education, and innovation.

Multiple forces are aligning

The rise of OPS as a central element of port strategy is being driven by a clear alignment of forces. On the regulatory side, the EU has created a powerful push-and-pull dynamic: AFIR requires the deployment of shore-side electricity in key TEN-T ports, while FuelEU Maritime requires certain ships to use OPS, or an equivalent zero-emission solution, at berth from 2030.



At the same time, the European Commission has launched work on a new EU Ports Strategy and EU Industrial Maritime Strategy, recognising ports as strategic assets in Europe's industrial, transport, and energy future.

This policy momentum converges with the needs of the offshore wind industry, where WindEurope and the Commission's own maritime forum both underline that ports must be upgraded and modernised to support the scale-up of renewable energy.

Finally, the war in Ukraine has given this transition an additional strategic meaning: attacks on large-scale electricity infrastructure have shown the vulnerability of centralised energy systems and reinforced the value of more decentralised, resilient energy models.

In that context, OPS is no longer just an emissions-reduction tool; it is becoming part of a broader vision of ports as clean, electrified, and resilient energy nodes.

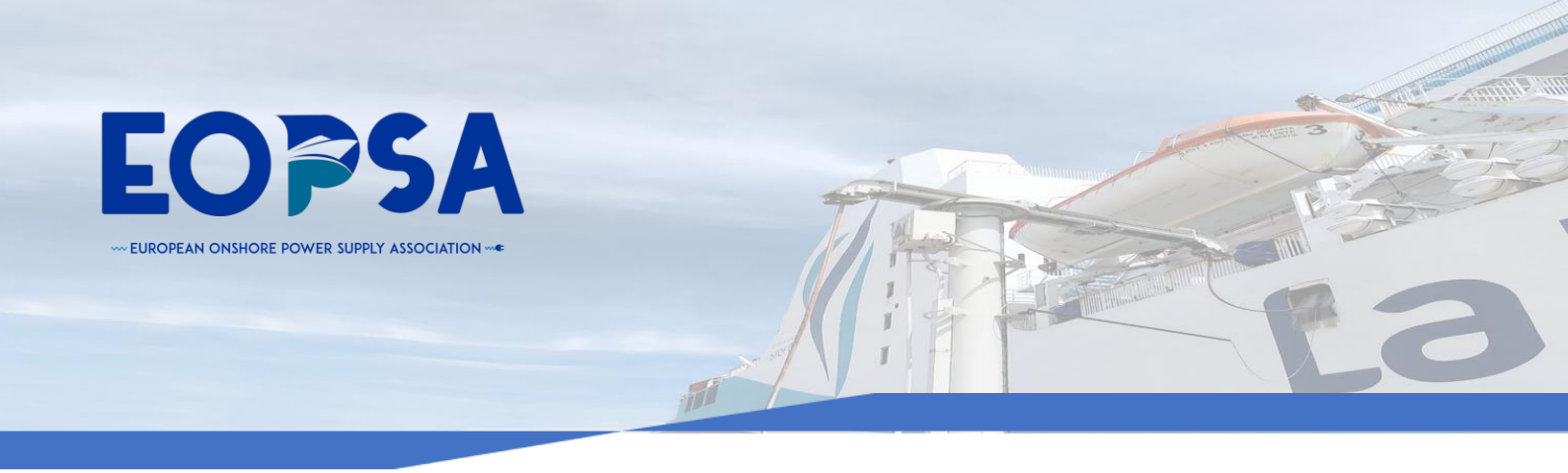
Beyond OPS: the electrification of port ecosystems

While OPS is a critical entry point, its true significance lies in what it enables. It represents the first step toward the full electrification of port ecosystems.

On the vessel side, the integration of onboard battery systems is rapidly gaining traction. While OPS provides power at berth, batteries extend this capability beyond the quay, enabling zero-emission operations during manoeuvring, port entry, and short-distance navigation. The combination of OPS and battery systems creates a continuity of electrification, bridging the gap between port infrastructure and vessel operations.

On the port side, electrification is expanding across a wide range of activities. Cranes, Rubber-Tyred Gantries (RTGs), terminal vehicles, and auxiliary systems are increasingly being electrified, reducing reliance on diesel-based equipment. This transformation not only lowers emissions but also improves operational efficiency and energy integration within ports.

As these elements converge, ports evolve from being passive infrastructure into active energy systems, capable of managing electricity demand, integrating renewable generation, and supporting storage solutions.



In this context, OPS becomes one component of a broader architecture, often referred to as port microgrids and energy hubs, where energy flows are optimised across multiple uses.

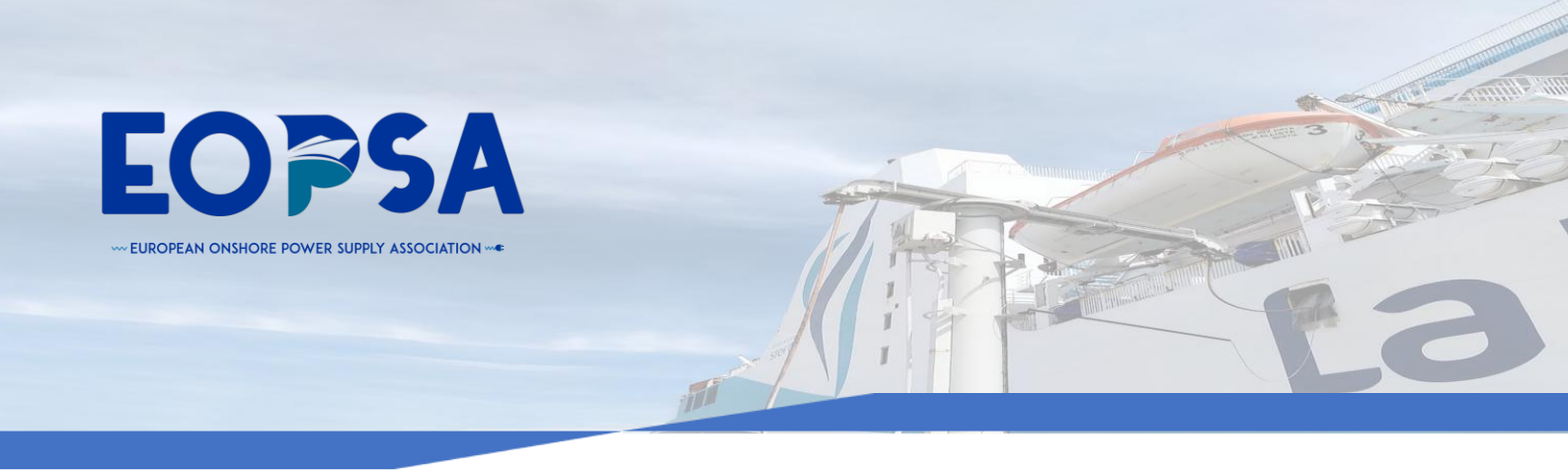
OPS as a strategic enabler

This evolution fundamentally changes the role of OPS. It is no longer simply a tool for reducing emissions at berth, it becomes a strategic enabler of systemic electrification.

By connecting vessels to the electrical grid, OPS establishes the physical and operational interface between maritime transport and the broader energy system. This interface is critical for enabling future developments, including:

- integration of renewable energy into port operations,
- deployment of large-scale battery storage,
- optimisation of energy demand across port and vessel activities,
- and increased resilience through diversified and locally controlled energy sources.
- development of advanced software and energy management systems will further enable concepts such as “boat-to-grid” electricity exchange and the emergence of port-based energy communities.

In this sense, OPS aligns directly with the broader dynamics identified by the IEA and IRENA. It translates the “Age of Electrification” into a concrete, operational reality within ports, linking maritime transport to the same systemic transformation affecting industry, buildings, and mobility.



Conclusion

The concept of the “Age of OPS” is therefore not a rhetorical extension, it is the logical consequence of the global energy transition.

When combined with onboard battery systems and the electrification of terminal operations, OPS becomes the foundation of a fully electrified port ecosystem. In such a system, emissions are drastically reduced, energy flows are optimised, and ports evolve into critical nodes within a decarbonised, resilient, and integrated energy network.

This transformation goes far beyond environmental performance. It drives industrial competitiveness, unlocks investment, supports high-quality job creation, and accelerates innovation across energy, transport, and infrastructure systems. It also repositions ports as strategic assets at the heart of Europe’s energy transition and its security architecture.

We are in the AGE OF OPS.