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IS COLD IRONING (ONSHORE POWER SUPPLY, OR ALTERNATIVE MARITIME POWER, OR SHORE-TO-SHIP POWER) A VIABLE SOLUTION FOR REDUCING GREENHOUSE GAS EMISSIONS IN PORTS? EU / GREEK PORTS PERSPECTIVE

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ABSTRACT:

Adaptation to climate change has led Institutional bodies to work relentlessly to find solutions to this progressing problem. European Union has been diligently formulating a comprehensive institutional framework aimed at addressing maritime transport's environmental impact and fostering sustainable practices. Maritime transport, responsible for approximately 75% of the Union's external trade and 31% of its internal trade by volume, plays a pivotal role in the economy of the Union. However, it also accounts for a significant portion of carbon dioxide (CO2) emissions within the EU, contributing around 11% of all EU CO2 emissions from transport and 3 to 4% of total CO2 emissions in the EU.

In response to the pressing need to curb emissions, Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') set a clear objective for the net reduction of greenhouse gas (GHG) emissions by at least 55% compared to 1990 levels by 2030. Moreover, this regulation places the Union on a trajectory towards achieving net zero GHG emissions by 2050. As part of this commitment, complementary policies have been introduced to expedite the adoption of sustainably produced renewable and low-carbon fuels in the maritime transport sector, all while respecting technological neutrality.

Regulation (EU) 2023/1804 requires the port to be able to provide shore-side electricity supply for at least 90% of container vessels over 5,000 GT, ro-ro passenger ships and high-speed passenger craft over 5,000 gt, and passenger ships over 5,000 gt, provided the annual average number of ships in each of these categories exceeds 100, 40 and 25 respectively. However, the lack of a common methodology for setting targets and adopting measures in national policies led to significant differences in the levels of ambition between Member States which was perceived as a hindrance to the establishment of a comprehensive network of alternative fuel infrastructure.

The paper examines the most important obstacles and towards EU legislative framework implementation and techno-economic challenges.

KEY-WORDS: Maritime Decarbonization, Cold Ironing, Onshore Power Supply, Climate Adaptation in Shipping and Ports, Sustainable Development.

1. INTRODUCTION

European environmental legislation has clearly committed the EU to becoming climate-neutral, achieving net-zero greenhouse gas emissions by 2050. The European Green Deal of 2019 is based on four pillars covering issues related to the implementation of the appropriate regulatory framework, financing specialized measures and policies, necessary skills adaptation for the implementation of innovative environmental actions, and the liberalization of global trade to enhance the EU's bilateral trade relations with its partners and avoid unfair competition practices.

In 2021, the European Parliament adopted the European Climate Law, which sets the achievable target of reducing greenhouse gas emissions by 55% by 2030 (compared to 1990 levels) and designates 2050 as the milestone date by which the EU will become entirely climate neutral. The implementation of these targets is institutionally reinforced by the adoption of the policy package known as "Fit for 55."

All productive sectors are included in the measures specified in the "Fit for 55" package, including shipping, which is most directly impacted by the EU Emission Trading System (ETS) as it came into effect on May 16, 2023. Additionally, the shipping sector is affected by the FuelEU Maritime Regulation, which is awaiting finalization and approval by the European Parliament and the European Council, the Energy Taxation Directive, the Alternative Fuels Infrastructure Regulation effective from July 13, 2023, and the Renewable Energy Directive.

As can be understood, the regulatory work at the EU level is continuous, and the institutional bodies of each member state, as well as representatives of sectoral interests within the EU, are working tirelessly to have their views, which reflect their specific interests, adopted institutionally and become EU legislation.

At the same time, the strict timelines set with the milestone years 2030 and 2050 intensify the efforts of entities (both private and public) to comply within these limits, even without waiting for the details and final adaptation requirements.

The shipping industry is in constant pursuit of the prevailing trends in the energy and maritime fuels sector, while the port industry is preparing the zero-emission ports of tomorrow, which now seem very close.

2. THE INSTITUTIONAL FRAMEWORK

The prevailing view for reducing greenhouse gas emissions is reported to be the creation of infrastructure for providing electric power to approaching ships, which, according to the most recent legislation (AFIR, 2023), must be supplied at least at ports belonging to the Trans-European Transport Network (TEN-T), with priority given to seagoing container ships and seagoing passenger ships, as these categories are recognized as the most energy-demanding and the most polluting.

The same legislation mentions that ports should be cautious about the underperformance of attempted capital investments. Special attention is also given to island areas that are not connected to the central power grid and rely exclusively on non-renewable sources, specifically conventional fossil hydrocarbons, for electricity production.

The finalization of technical requirements for installing power supply systems on commercial ships is expected in the coming months. Many ports, mainly in mainland Europe, have already installed such systems alongside networks for providing alternative maritime fuels, such as natural gas and hydrogen.

3. CONSTRAINTS AND CHALLENGES FOR THE GREEK PORT SYSTEM

In Greece, the ports within the core network of the Trans-European Transport Network with the highest traffic of container ships and cruise ships have initiated studies for the installation of Onshore Power Supply (OPS) systems. Piraeus, Heraklion in Crete, and Igoumenitsa have completed the study phase and are now in the development stage of the related infrastructure.

So, what are the biggest obstacles to developing such systems, and how economically feasible is this transition for port authorities and shipowners?

Obstacles such as infrastructure financing, delays in finalizing technological guidelines, and the issue of continuous power supply are some of the most significant challenges in the effort to decarbonize the port and maritime industry. Specifically:

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- **Port Infrastructure Cost:** The infrastructure cost, including studies and permits, is in the tens of millions, depending on the installed capacity and the prospect of serving primarily cruise ships, which are the most demanding in electrical energy during berthing. Assuming the minimum power requirement per ship is approximately 5-7 MW, then planning to serve two or three ships simultaneously raises the installed power requirement to at least 15 MW, with capital expenditure exceeding 25 million euros, depending on the complexity and technical work requirements within the port area and the cost of creating a substation. Such an investment cannot be supported based on the financial statements of most Greek ports.

- **Cost of Ancillary Works:** This cost pertains to the necessary infrastructure for transmitting electrical energy to the port installation and is considered significant.

- **Capital Investment in Ships:** The requirement for ports to comply with EU environmental legislation makes the corresponding adaptation of ships mandatory, with the cost per installation amounting to hundreds of thousands of euros.

- **Operational Cost – Charge per kWh:** This concerns the cost that each electrically powered ship will have to pay to the electricity provider. It is clear that this cost must be comparable to the opportunity cost created by forgoing the use of the ship's generators, which in turn is influenced by the international prices of MGO (marine gas oil).

4. CONCLUSION

Based on realistic figures regarding the cost of infrastructure and current electricity selling prices, and considering the marine gasoil prices in August 2023, we conclude that:

- The EU (as a whole) still lacks practical results compared to its rapidly evolving environmental regulatory framework.

- Issues of internal competition between countries and infrastructures that may, for various reasons, fulfill their environmental commitments at different times have not been sufficiently studied.

- The cost of studies and infrastructure cannot be undertaken by all ports, many of which serve specific and seasonal needs, without substantial subsidies approaching 80%.

- Ports are evolving into hubs for providing electricity, either by investing in energy production themselves or by entering into agreements with existing energy providers.

- The selling price of electricity is a key factor in the project's success, without compromising the quality of service in terms of frequency and regularity.

- The equivalent selling price of electricity compared to marine gasoil (MGO equivalent) is currently around €0.19/kWh, significantly lower than the selling price of electricity (€0.55/kWh), thus creating a significant "financial gap" for the shipowner **(Figure 1)**. With an electricity selling price of €0.55/kWh, the equivalent price of MGO is €2,558.1/tonne **(Figure 1)**.

- The annual benefit from the reduction of greenhouse gas emissions, especially CO2, must be considered, given that CO2 is now a traded commodity (the current price of 1 tonne of CO2 on 11/08/2023 was $92.77) **(Figure 2)**.

- Quantifying the environmental benefit and distributing it among all stakeholders should serve as an incentive and help mitigate the impact of the capital costs of environmental investments.

To sum up, decarbonizing the maritime industry is a complex issue with multiple components and consequences that can affect competition and the viability of critical activities. Therefore, the environmental approach requires a thorough consideration of cost-benefit elements with the ultimate goal of maintaining competitiveness and ensuring that environmental adaptation does not become a destabilizing factor.

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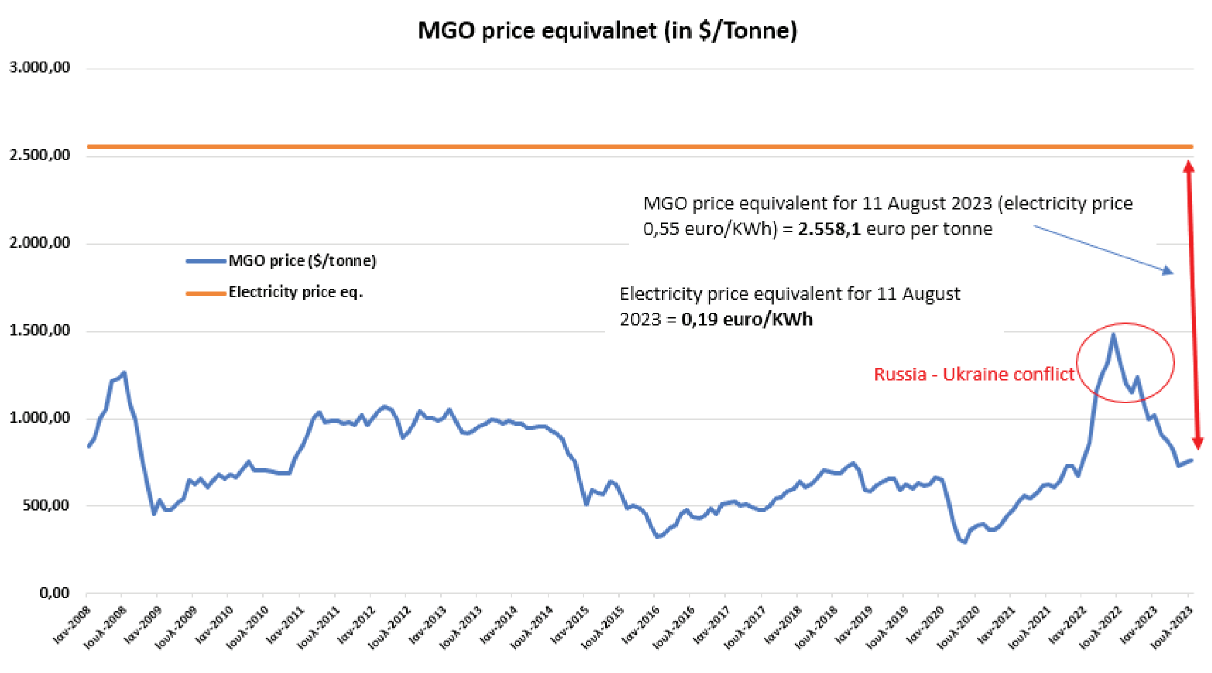

Fig. (1): Calculation of Equivalent MGO Price for the Same Period of Electricity Consumption in the Port
Source: data elaborated by Authors (database Clarksons, August 2023)

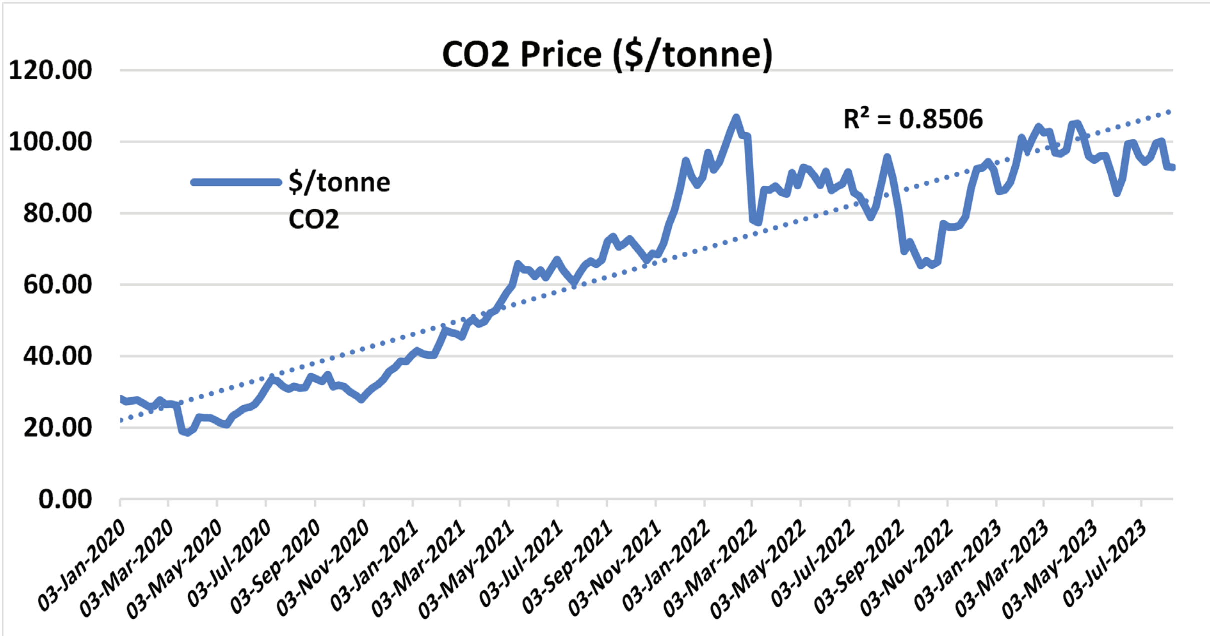

Fig. (2): CO2 Price per ton (August 2023) and Long-term Trend
Source: data elaborated by Authors (database Clarksons, August 2023)

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