PROJECT ACRONYM AND TITLE: **Computer modeling of waste heat utilization on cruise ships (CoMWaHUCS), UIP-2025-02-3327**

FUNDING PROGRAMME: Installation Research Projects, UIP-2025-02, **(Croatian Science Foundation)**

PERSON RESPONSIBLE: **Fran Torbarina**

Project total cost	**127.648,85 EUR**

SUMMARY AND OBJECTIVE: In line with global climate frameworks, including the Paris Agreement, the European Green Deal, and recent International Maritime Organization (IMO) directives, there is increasing pressure on the maritime sector to reduce greenhouse gas emissions and improve energy efficiency. Large-capacity vessels account for only 18% of the global fleet yet produce approximately 60% of maritime greenhouse gas emissions, with cruise ships representing a disproportionately high share due to their extensive hotel and auxiliary loads. Although propulsion remains the primary energy consumer on cruise ships, heating, ventilation, and air-conditioning (HVAC) systems and other auxiliary services contribute substantially to overall demand. Recent research highlights a wide range of strategies for improving cruise-ship energy efficiency, among which enhanced waste heat recovery (WHR) shows significant potential, offering annual savings of up to 15 GWh and CO_2 reductions exceeding 8,000 tons.

Waste heat is released across multiple temperature levels within the ship's energy system, enabling its use in diverse applications such as steam generation, absorption refrigeration, desalination, and domestic hot-water production. However, suboptimal system design, component performance, and management strategies frequently lead to underutilization of available heat. This project investigates the relationship between generator-engine load, waste heat availability, and resulting emissions through experimental analysis, complemented by computational modeling of alternative WHR system configurations. By comparing the energy performance of different designs and operating strategies, the study aims to identify solutions that maximize waste heat utilization on cruise ships. Given that a single large cruise ship can consume up to 180 GWh annually, improving WHR efficiency represents a significant opportunity to reduce fuel consumption, cut emissions, and support global climate objectives.

Start date	End date
1 December 2025.	30 November 2030.

PROJECT TEAM

Br.	Member	Affiliation	Role
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