HITACHI

Valenciaport Hackathon

# Advanced Energy Management System for Ports & Terminals

## About the Challenger – Hitachi Energy

Hitachi Energy is a global technology leader advancing the energy transition through the integration of power systems, digital solutions and automation. As part of the Hitachi Group, the company operates at the intersection of energy and digitalisation, addressing complex challenges in infrastructure-intensive environments such as ports and terminals.

Through this challenge, Hitachi Energy aims to collaborate with startups to explore innovative and scalable solutions for multi-vector energy management in port terminals, with a strong focus on real operational use cases and a clear pathway towards a deployable Proof of Concept (PoC) in a live port environment.

## Challenge Brief

Ports and maritime terminals are undergoing a profound energy transformation. The progressive electrification of operations, the integration of new renewable energy sources, and the emergence of new energy vectors—such as Onshore Power Supply (OPS), electric vehicle charging, photovoltaic self-consumption, energy storage, production and consumption of hydrogen and E-fuels—are significantly increasing the complexity of terminal energy management.

In parallel, the decarbonisation objectives of maritime and port transport require terminals to adopt advanced tools capable of quantifying, comparing and anticipating the environmental impact of operational decisions. The gradual replacement of diesel-based solutions with electrified alternatives—such as OPS, electric vehicles or renewable generation—demands reliable models to estimate $CO_2$ emissions reductions and support data driven decision making.

This challenge focuses on the design of a **next generation, multivector Energy Management System (EMS)** tailored to port terminals, capable of acting as a digital control layer between energy and operations.

The proposed EMS should enable terminal operators to:

- **Provide a unified, integrated view** combining terminal information, asset level energy consumption, demand forecasts and predictive intelligence.

- **Optimize the use of multiple energy sources**, including local renewable generation (e.g. photovoltaic), battery energy storage systems (BESS), hydrogen generation and storage, and backup systems.
- **Support scenario modelling for operational planning**, considering vessel berthing schedules, reefer stacking strategies and peak demand periods.
- **Manage increasing and highly variable loads**, such as OPS connections, reefer containers, EV and truck charging, cranes and yard equipment.

The EMS is expected to function as an **energy and operations control tower**, providing capabilities such as:

- Monitoring and forecasting energy needs across OPS, reefers, cranes and EV fleets.
- The comparison of $CO_2$ emissions between diesel-based operations and electrified alternatives (OPS, EVs and renewable generation), providing **clear estimates of avoided emissions**.
- Orchestrating multiple energy supply sources (grid, PV, BESS, hydrogen, containership fuel and OPS) and costs.
- Running scenario simulations to support both operational and energy planning.
- Demonstrating how storage assets contribute to peak demand management and grid constraint mitigation.

**Expected Outcomes**

Each participating startup is expected to deliver:

- A **conceptual design and architecture of a multi-vector EMS** relevant for port and terminal operators.
- A **clear pathway towards a deployable Proof of Concept (PoC)** that could be tested in a real terminal environment.