autoMated vessels and supply chain Optimisation for sustainable short SEa Shipping

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Syros

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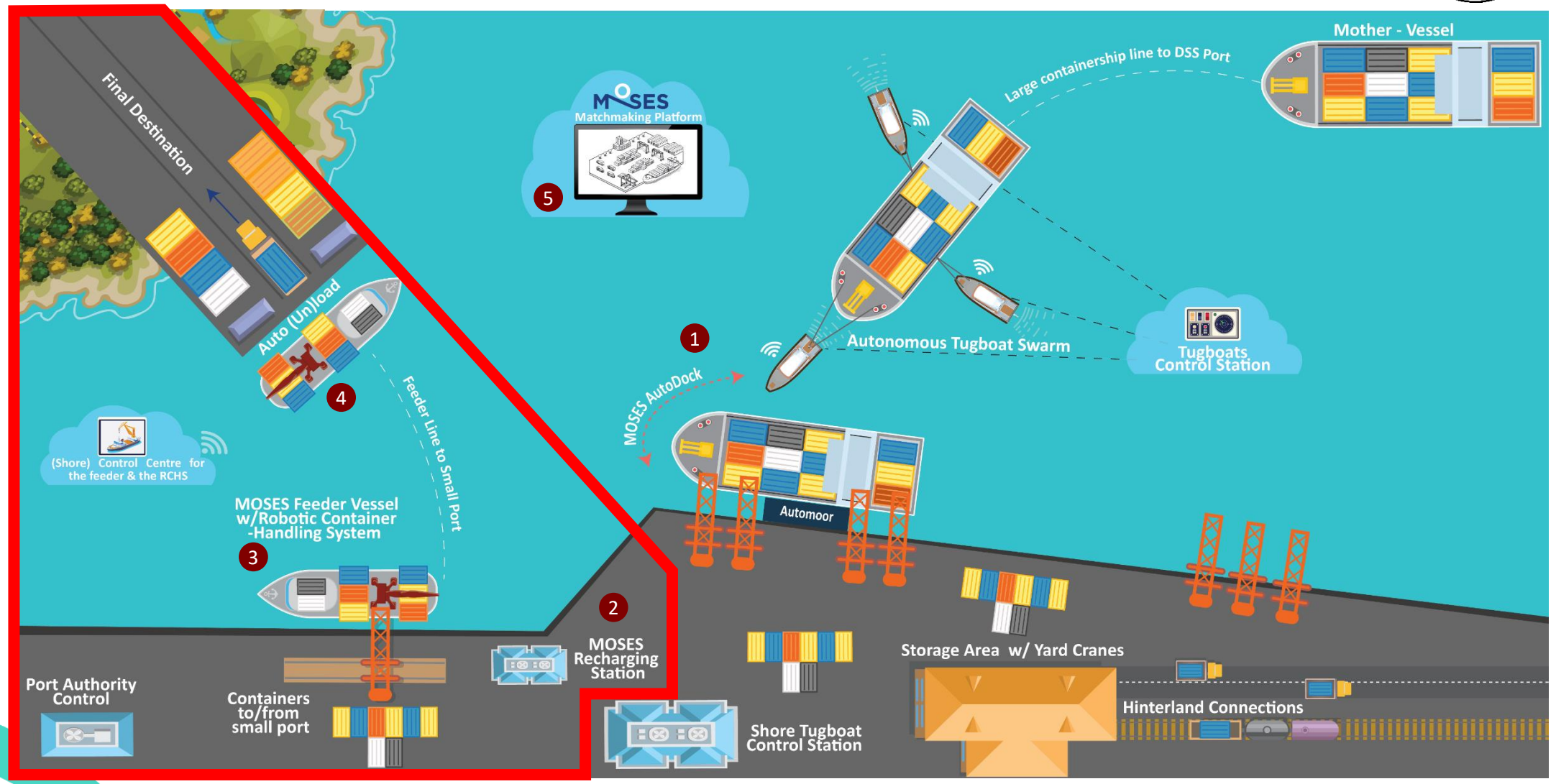
The MOSES concept



MOSES Innovations:

1. MOSES AutoDock (MOSES Autonomous tugboats + AutoMoor)
2. MOSES Recharging Station
3. Innovative Feeder Vessel
4. Robotic container-handling system
5. MOSES matchmaking platform

MOSES aims to…

Significantly **enhance the SSS component** of the European container supply chain!

Sustainable feeder services

Minimum decrease of end-to-end costs for container transport with feeder services

Increase of feeder traffic between large terminals and small ports

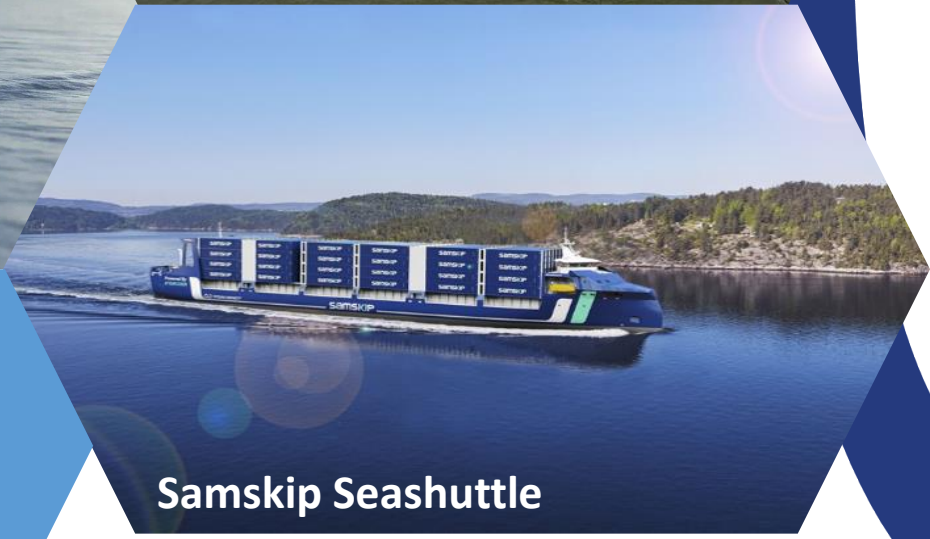
Modal shift to Short Sea Shipping in designated areas

Create sustainable feeder services from large container terminals to **small ports with no infrastructure**

MOSES aims to…

Feeder vessels are required that are:

- Environmentally friendly
- Cost-effective for carrying relatively small amounts of cargo
- Able to approach relatively small ports



Vessels that carry up to 300 containers and are operating with zero emissions (batteries, hydrogen fuel cells) are already being developed!

The MOSES Use Cases

Northern Case

MOSES Open Call

Submit by 31-Aug-2023 (05:00:00 PM CEST)

SUBMIT HERE

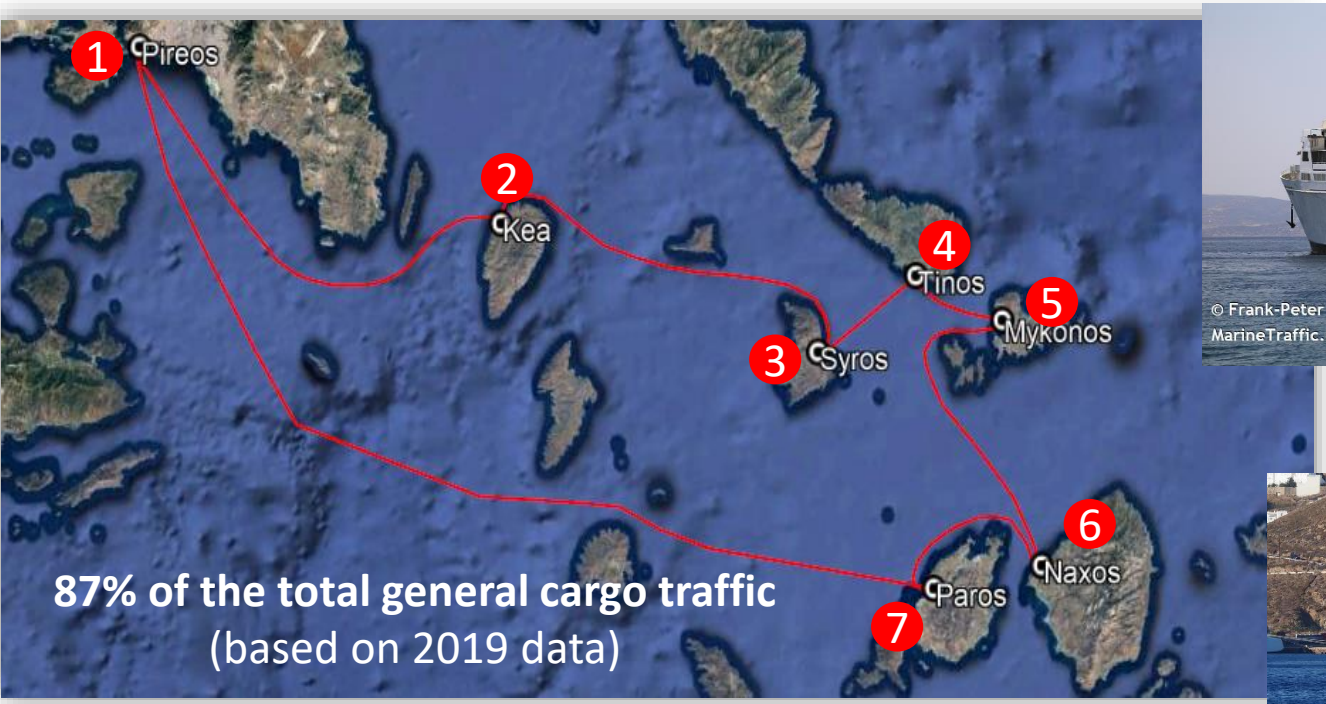
Western MED-Spain

Decongest truck transport traffic in Valencia port and connect it to Sagunto and Gandia satellite ports

Eastern MED-Greece

Decongest Piraeus container terminal and integrate small Greek ports into the container supply chain

“Eastern MED-Greece” use case



The feeder would be competitive (i.e. **-3.5% cost / cargo unit**) IF:

- **80% of the maximum estimated demand** is captured and the feeder **carries approx. 100 TEUs**.
- At least **two weekly services** in each port.

40% captured demand and approx. 180 TEUs cargo carrying capacity may also be viable.

The feeder's technical characteristics

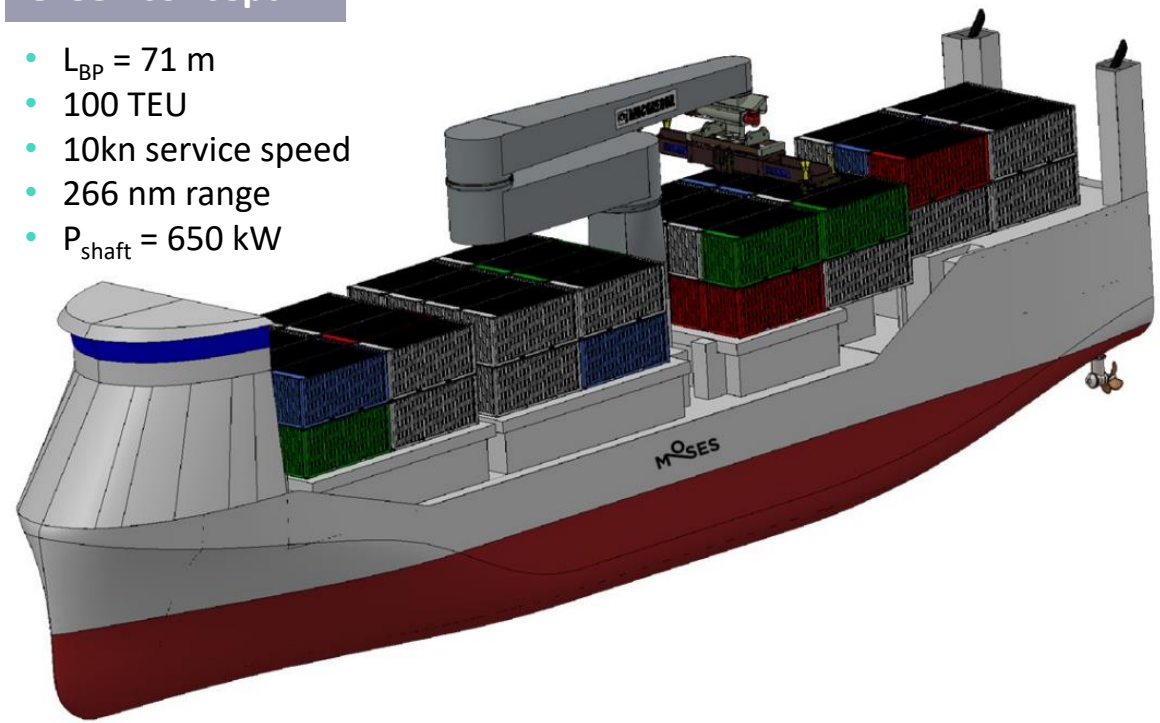
Greek concept I

- L_{BP} = 80 m
- 180 TEU
- 10 kn service speed
- 266 nm range
- P_{shaft} = 800 kW

Available power for safe navigation in adverse weather conditions was **verified through simulations** (based on 2011 – 2016 weather data)

Greek concept II

- L_{BP} = 71 m
- 100 TEU
- 10kn service speed
- 266 nm range
- P_{shaft} = 650 kW



Innovations:

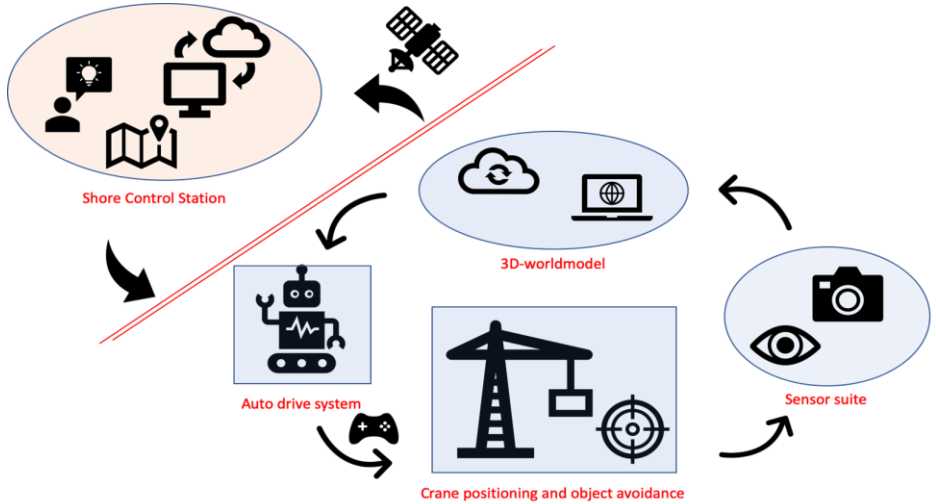
- Sustainable propulsion (Hybrid – methanol ICE + batteries, Full electric)
- Azimuth thrusters for enhanced manoeuvrability
- Automated cargo-handling, *as first step towards higher autonomy*

MOSES Robotic Cargo Handling System

Automated Crane

- Compensation of pendulation (ship motions, weather conditions)
- Identification of container to load

Intelligent Operator Support System (IOSS)

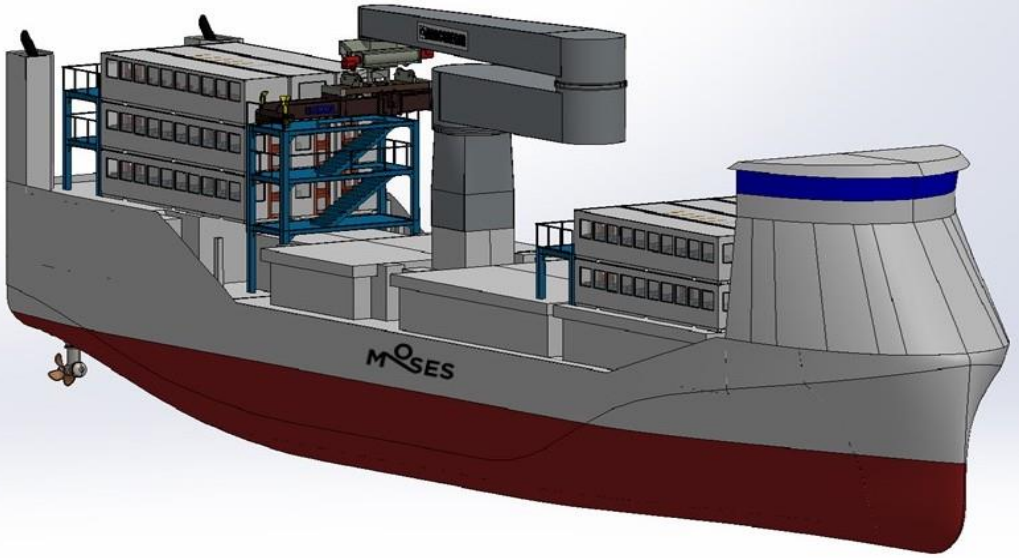


- Enabling local situation awareness – anomaly detection
- Robot self awareness in problem detection
- Control Intelligence
- Dynamic task allocation (One-to-many)
- Risk assessment for problem solving

The innovative feeder's additional functionality

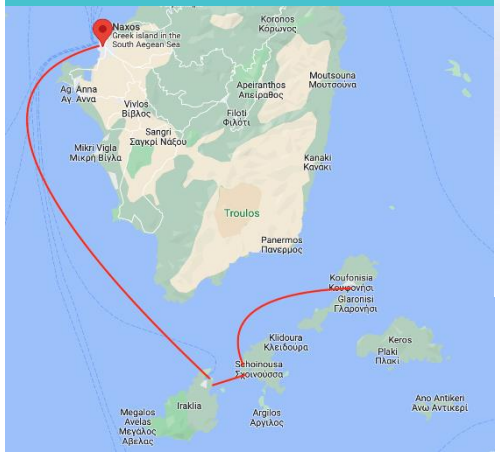
- A ***feasibility study*** was conducted to identify if waiting time could be exploited for other uses.
- ***10 waiting hours*** *(based on trip simulations) for* pax transportation to nearby islands.

***Modular* concept design** for the accommodation of passengers



Mykonos-Delos

Naxos-Iraklia-Schoinousa-Koufonisia

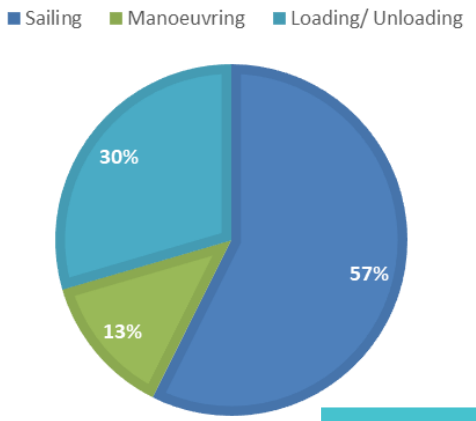


MOSES Recharging Station – Feasibility study

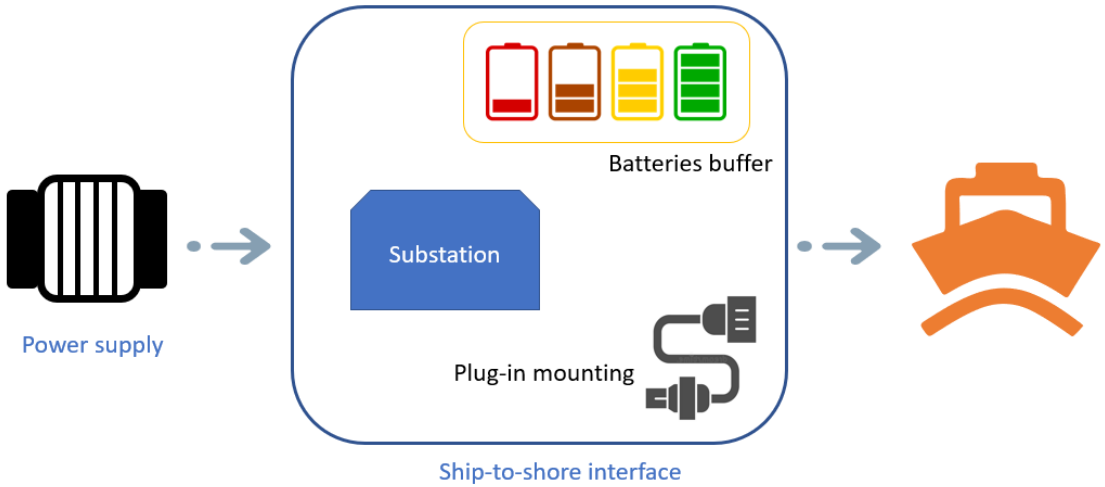
Criteria:

- Recharging should not disrupt the ship's or the port's operation
- The required power needs to be available from the grid
- Port real-estate needs to be available for the station

Feeder operational profile:



Port	Time for charging (h)
Piraeus	2,72
Mykonos	7,09



Preliminary Scenario:
Feeder recharges at Piraeus and Mykonos to avoid draining the batteries below 20%

- Need to install batteries buffer at Mykonos port to allow constant supply without the risk of port black-out
- Recharging at Mykonos does not seem promising given the current state of the grid and the recharging technology

Final scenario:
Feeder recharges only at Piraeus

Model-scale demo for autonomous operation

September 14, 2023

Demonstrate **port-to-port autonomous operation** of the MOSES Innovative Feeder vessel

Free sailing, 1:17 scale ship model of Greek II concept design in MARIN's Seakeeping and Manoeuvring Basin (SMB)

Netherlands

Full-scale demo for automated cargo-handling

September 28, 2023

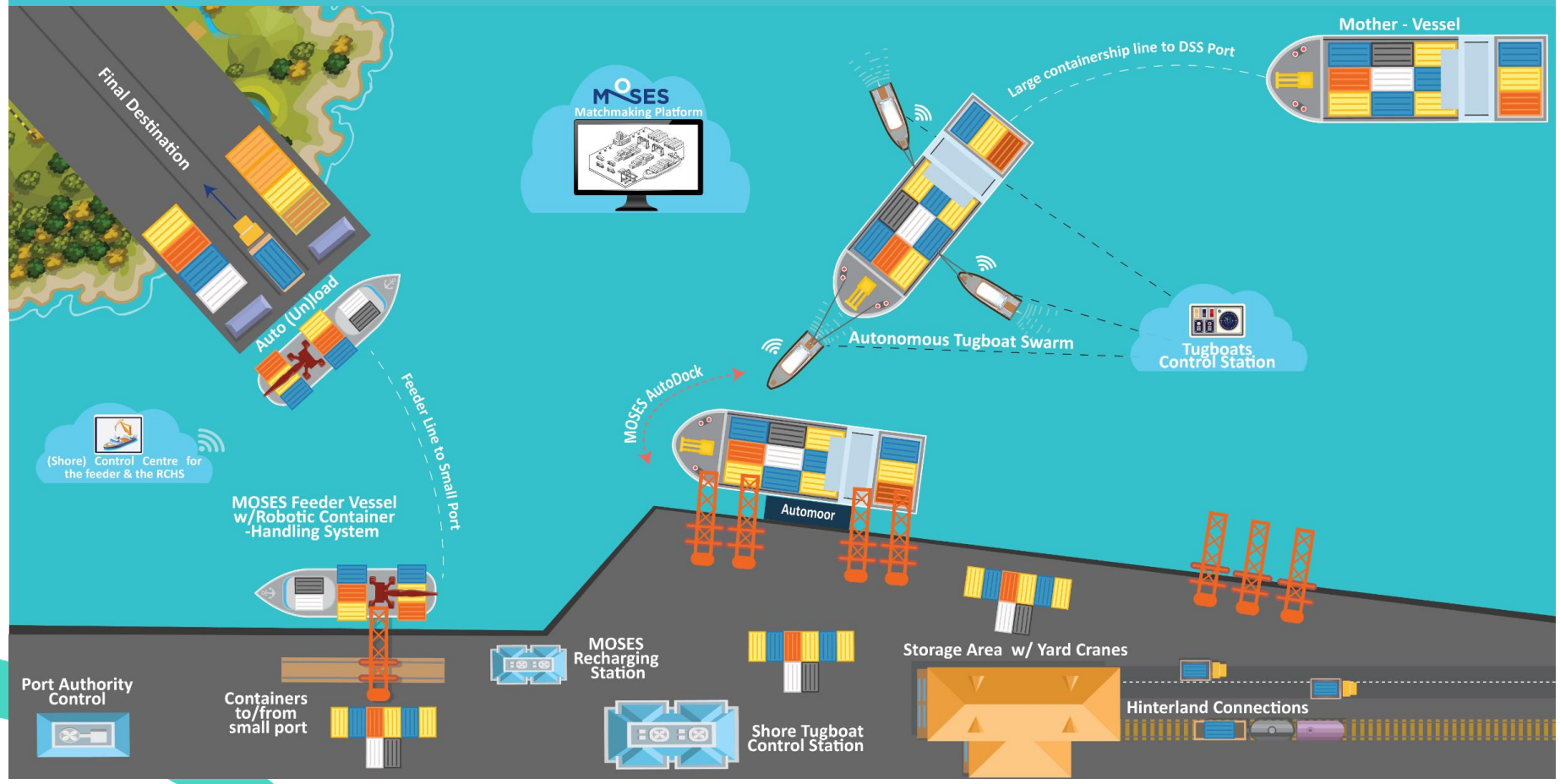
Demonstrate the **automated operation for (un)loading containers** from the MOSES Innovative Feeder with the Robotic Container-Handling System

- A **full-scale crane** (*located at MacGregor's test site*) will be outfitted with a sensor package and control systems to enable remotely controlled and autonomous operation
- A remote operator (*located at TNO's facilities*) will monitor the operation through the **Intelligent Operator Support System (IOSS)**

Sweden and the Netherlands

MOSES experience and key take-aways

- Competitiveness depends on the **container transport demand captured** by the feeder.
- The hybrid power solution is estimated to have **10% lower operating costs** compared to fully electric.
- Charging a fully electric feeder at Piraeus is **technically and economically feasible**.

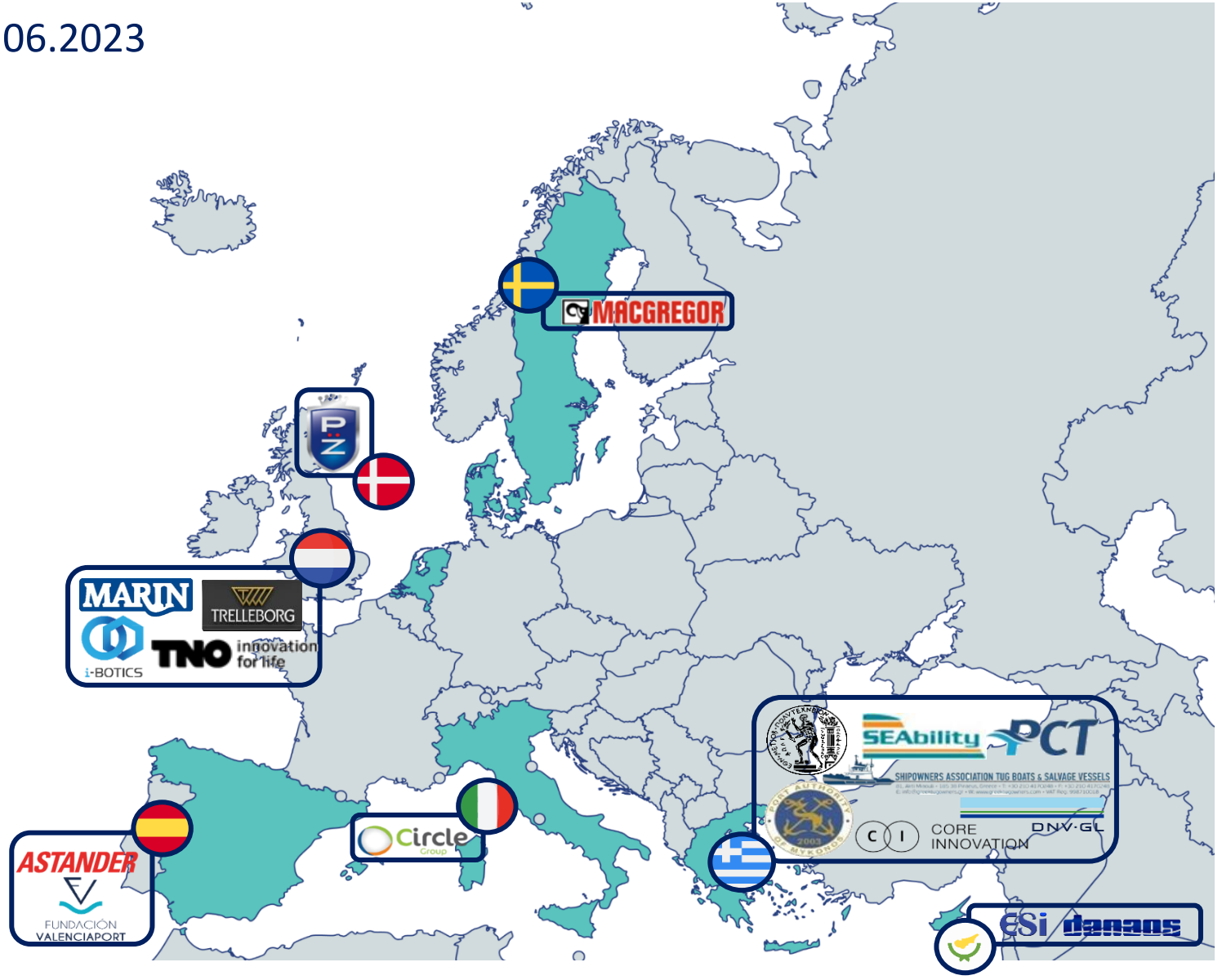


For the MOSES use cases to be successful we need:

- **Shipowners willing** to build and operate the innovative feeder vessel.
- **Cargo owners willing** to use the feeder instead of trucks on Ro-Ro.
- A way to achieve cost-effective **last mile transportation** at the islands.

Facts about the MOSES project

- **Duration:** 01.07.2020 - 30.06.2023 (36 months) – *extension 31.12.2023 (42 months)*
- **Budget:** 8 million €
- **Consortium:** 17 Partners
- **Coordinator:** NTUA



One more thing…an interesting event

AUTOSHIP
Autonomous Shipping Initiative for European Waters

MOSES

Aegis

Brussels

November 7, 2023

www. moses-h2020.eu

MOSES project2020

@mosesproject20

MOSES Project

Thank you for your attention!

If you have any questions or require further information, please contact me:

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