



Multifuel SOFC system
with Maritime Energy
vectors

Efficient use of fuels in the maritime sector

JOHANNES LACKNER

AMOM FUELSOME WEBINAR

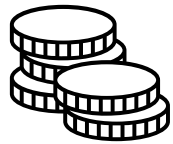
28TH OCTOBER 2025



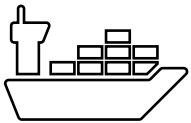
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The FuelSOME Consortium

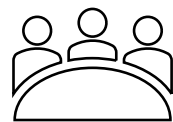
FuelSOME = Multifuel SOFC system with maritime energy vectors



Total project budget €2.5 Million under CINEA funding



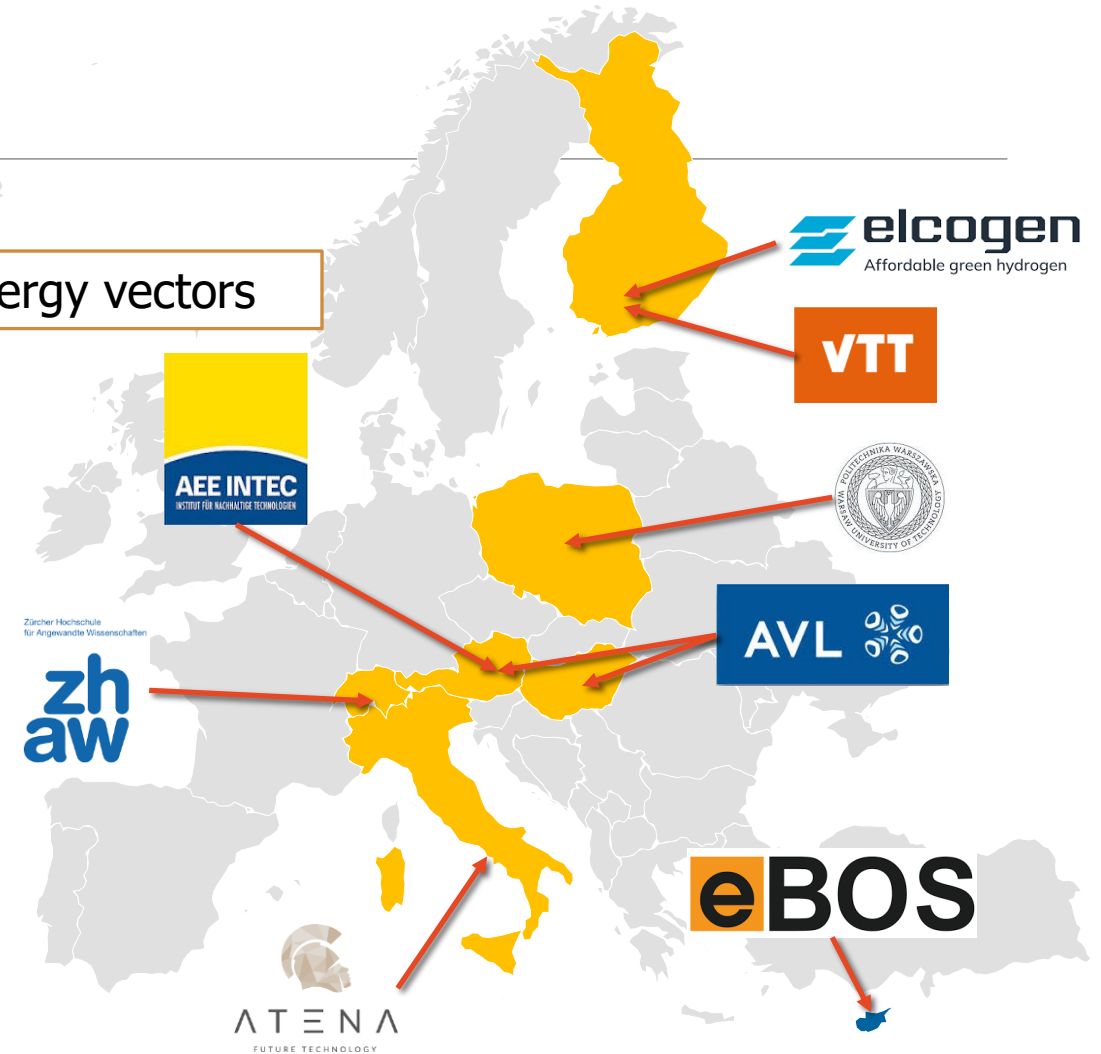
4-year project, Sept 2022 to Aug 2026



8 project partners in 7 countries



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Motivation

1. Shipping is responsible for around 1 billion tons of carbon dioxide emissions, making up about **2.5% of total global greenhouse gas emissions**.
2. Within the transportation sector, shipping claims the third position in terms of carbon dioxide emissions, **comprising 11% of the total**.
3. Shipping is reported to produce **16.14 grams of CO₂ per kilometer** for each metric ton of cargo they carry.



Project Vision

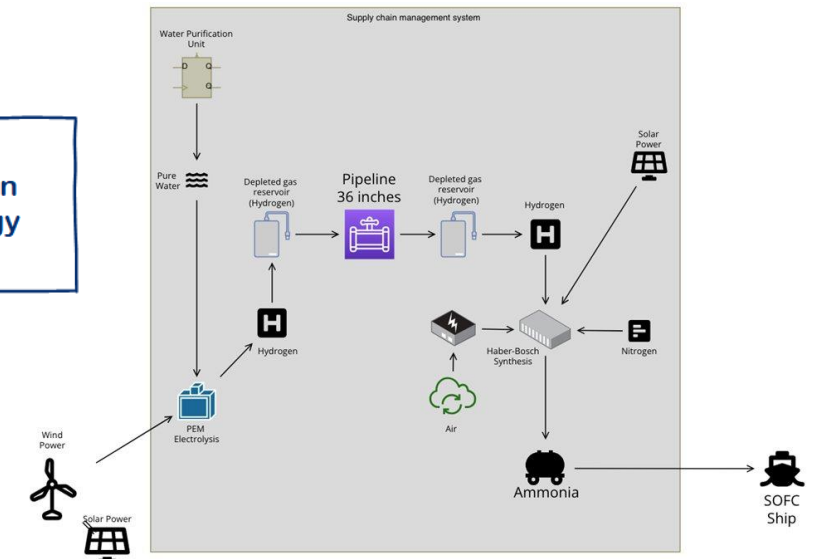
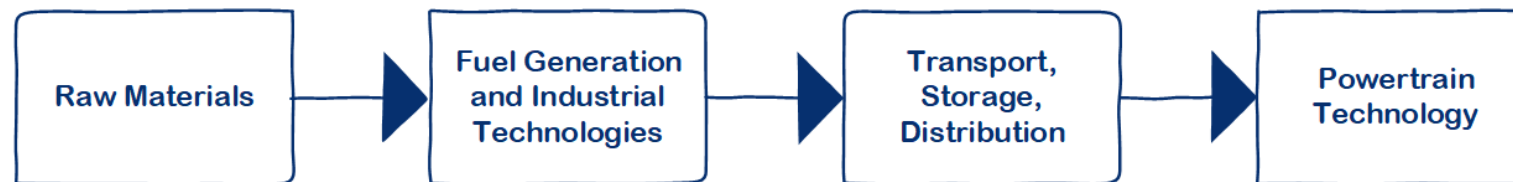
*The **vision of the project** is to find a scalable and flexible path for supply of various fuels such as ammonia and methanol besides hydrogen, to act as key contenders in replacing marine diesel as fuel on ocean going vessels, coupled with their use in a **multi-fuel generation system** using **Solid Oxide Fuel Cell** technology.*

FuelSOME Objectives

Objective 1	"End-to-End Technology Concept & Modelling"	WP1
Objective 2	"Advance Stack Performance & Development"	WP2
Objective 3	"Design & Test Multi-Fuel SOFC Prototype"	WP3
Objective 4	"Techno-Economic & Life Cycle Assessment"	WP4
Objective 5	"Maximize Impact via Dissemination & Standards"	WP5

Fuels specifications, Technology concept design, Modelling

Definition **“fuel pathway”** includes **all steps and processes involved from transforming a raw material** (any type) by any technology to a state where the resulting product (i.e., fuel) fulfils the required specification and the quantity which is required **for powering the propulsion system within the propulsion systems limit** at a specific utilization efficiency.



Multifuel SOFC Development at Stack Level



Development of **stacks** and **stack modules** suitable for multi-fuel applications.

Investigation of **new degradation mechanisms** from multi-fuel operation and creation of mitigation strategies.

Provision of data on the **impact of fuel reforming** degrees, **operating conditions**, and **fuel type on stack performance** for WP3 modelling.

Construction and commissioning of **reforming/cracking units** for operating two 3 kW stack modules on ammonia and methanol.

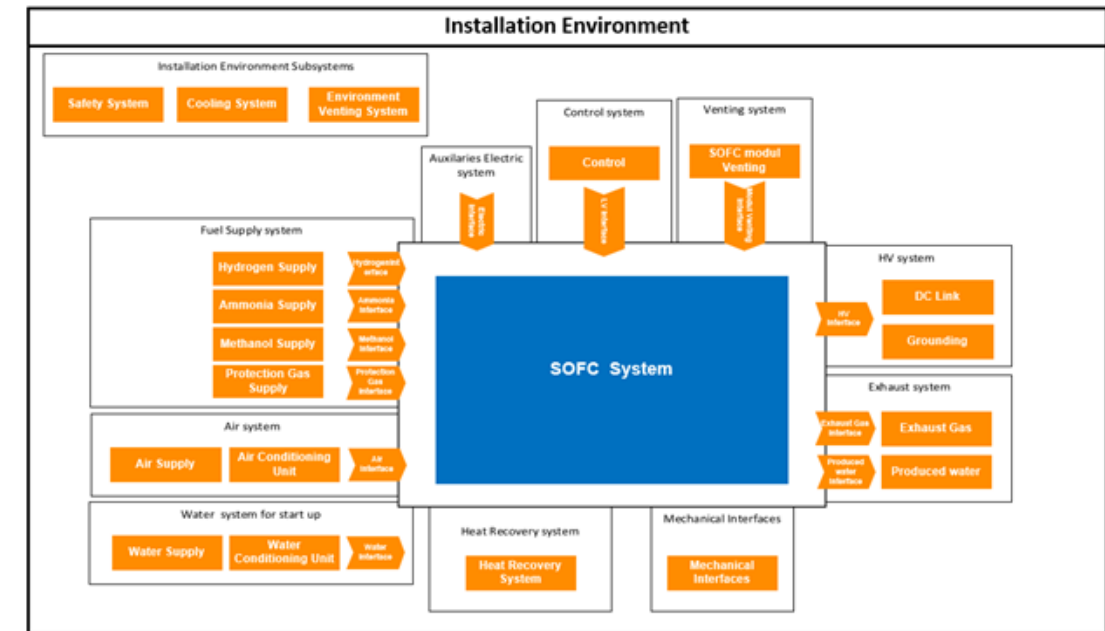
Testing and **characterization of a 6 kW stack module** under multi-fuel conditions to evaluate performance and long-term degradation.

Lab scale validation of multi-fuel SOFC system

Definition of **system requirements** for a lab-scale prototype of a multi-fuel energy generator.

Development of a system with a standardized stack module–system interface that can integrate the SOFC stack, operate at different temperatures, and **use various fuels** (ammonia, methanol, hydrogen).

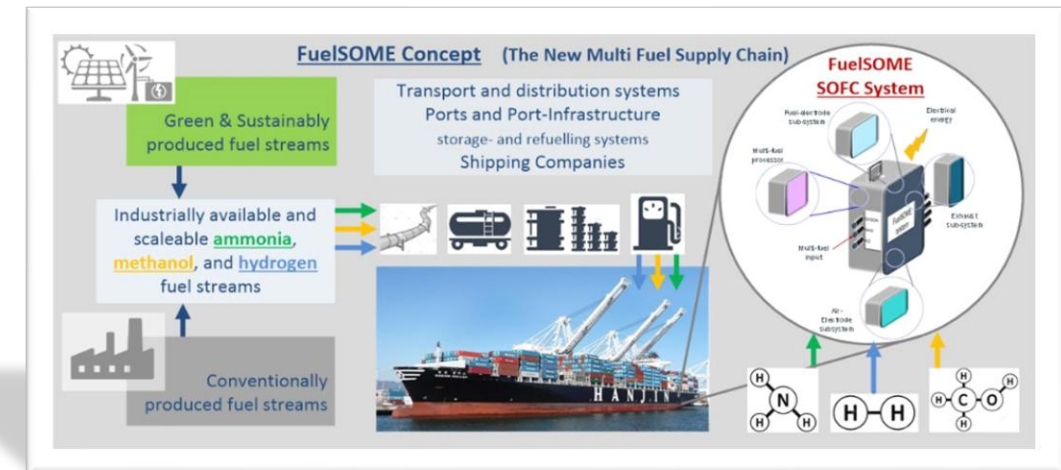
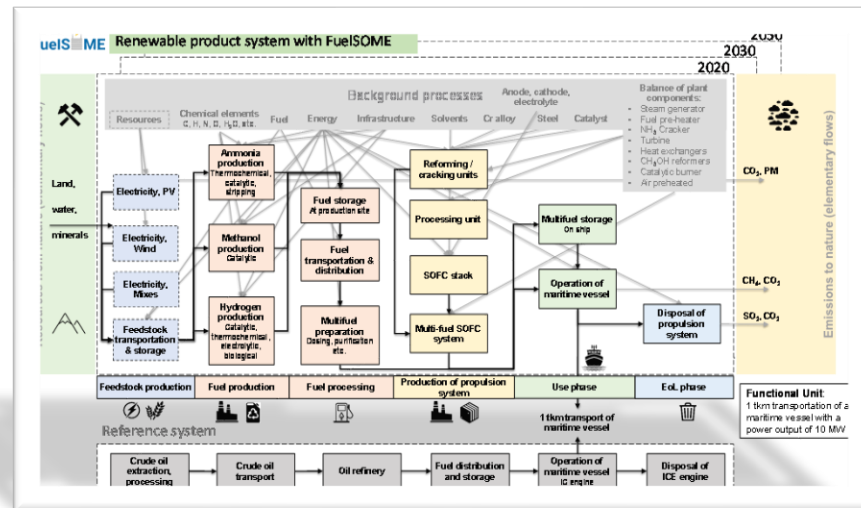
Procurement, **build-up, testing, calibration,** and **characterization of the system.**



Techno-economic analysis and prospective Life Cycle Sustainability Assessment

Comparing **environmental, social, and economic sustainability performance** of FuelSOME against conventional alternatives using a prospective Life Cycle Sustainability (LCSA) approach.

Carrying out and evaluating the **technical and economic feasibility** of the FuelSOME multi-fuel **SOFC system**, including identification of environmental benefits for ocean-going vessels. → TCA





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Thank you!



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