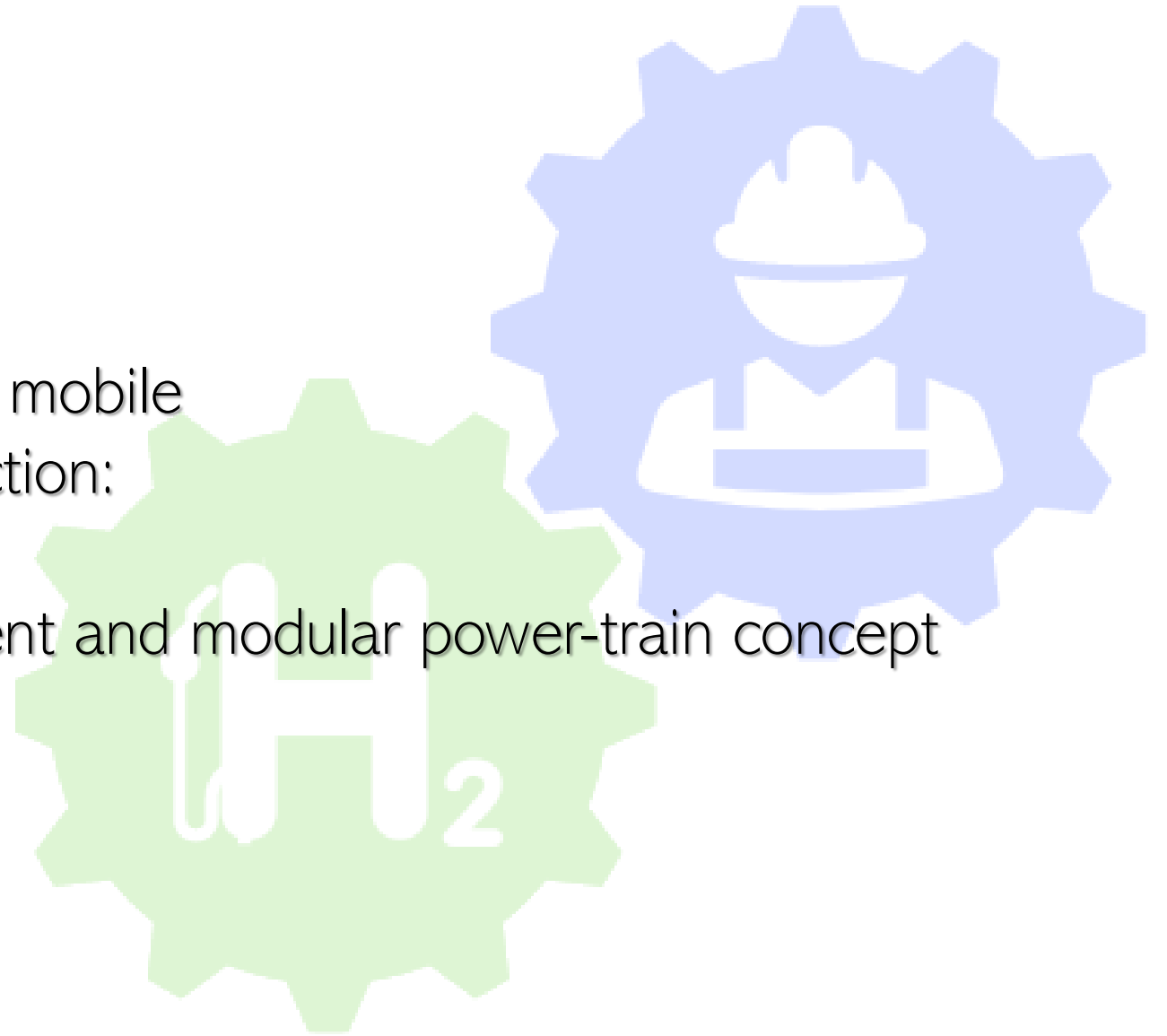


H₂MAC

Hydrogen fuel cell electric non-road mobile
MACHinery for Mining And Construction:

An innovative, efficient, scalable, silent and modular power-train concept

ENAGAS HYDROGEN TECHNICAL DAY, 10 June 2026.



Strategic objective

Simultaneous **demonstration** during at least **1000 hours** in a real environment of **two** newly designed **NRMM** (excavator and shredder for the mining and construction sector) **hydrogen FC powered**.

HIDROMEK



Excavator ≈ 120kW (Current design for ICE)

ZB

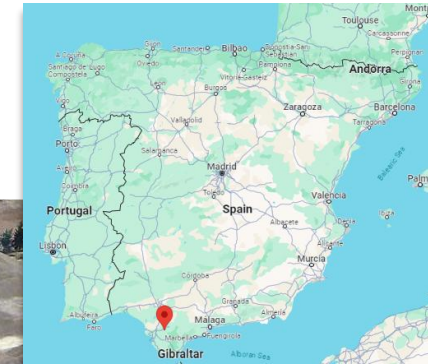


Shredder ≈ 240kW (Current design for ICE)

ZB



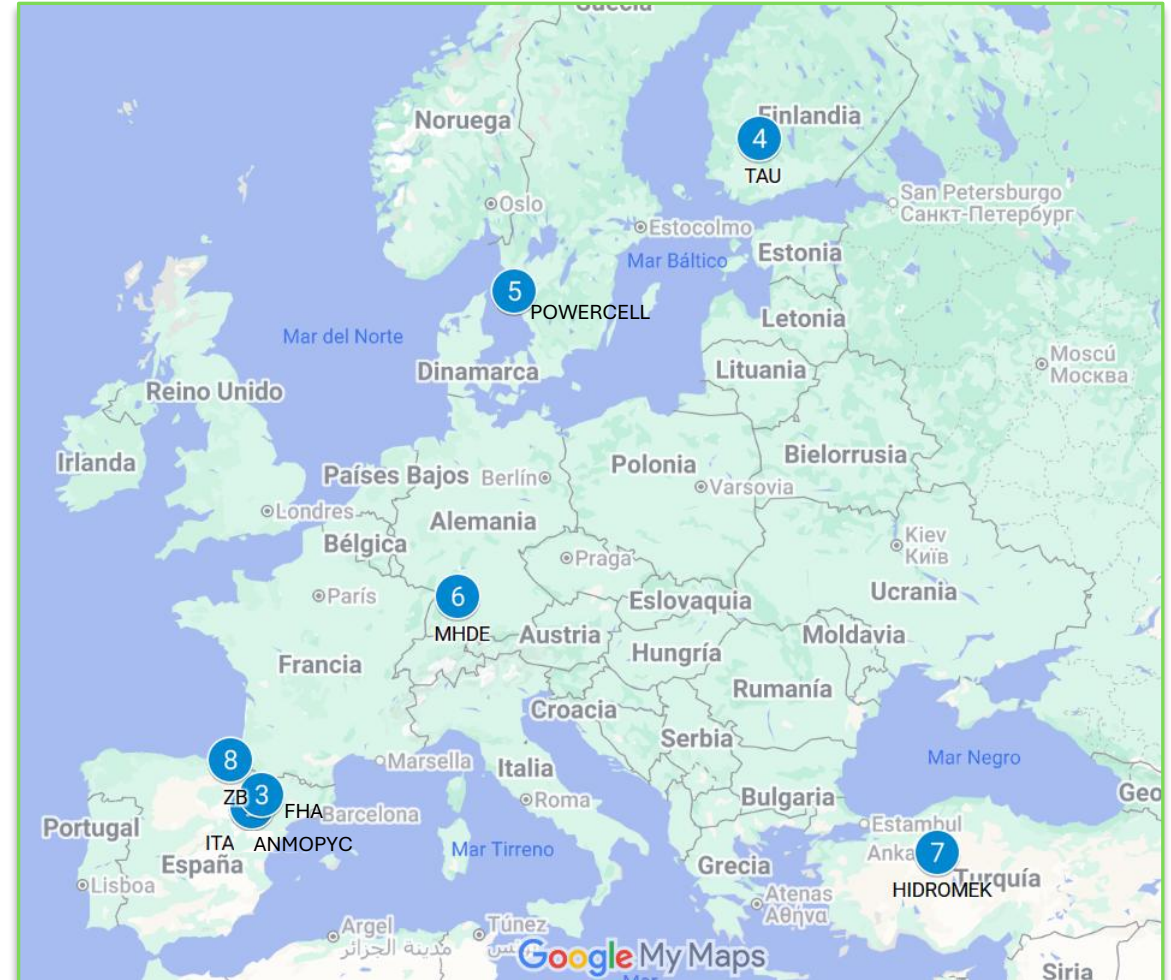
Demo site (Arcos de la Frontera, Spain)



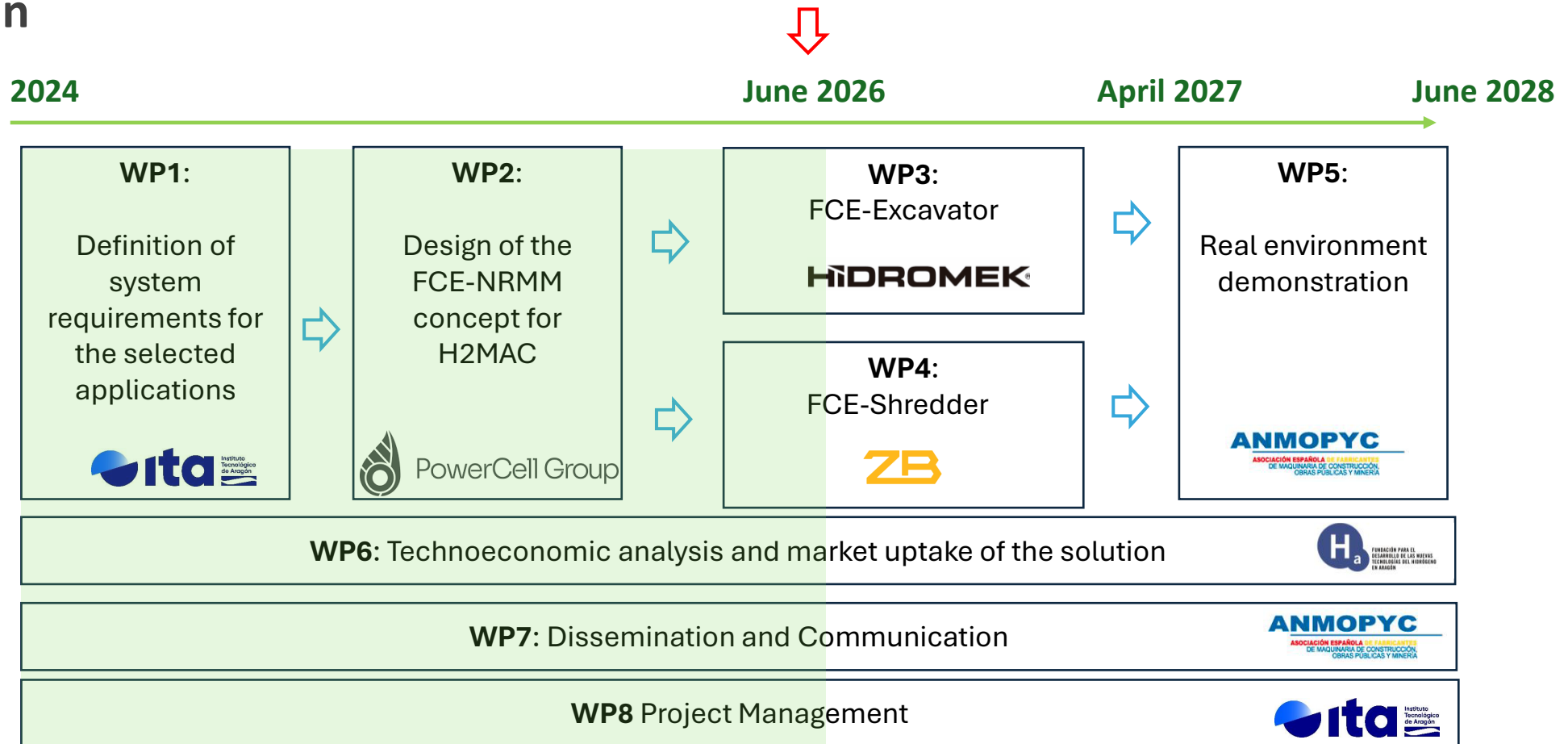
Specific Objectives

- O1.** Enhanced system operation for the developed machinery in terms of **emissions reduction** and external **sound power level reduction**.
- O2.** **Improved Fuel Cell System** characteristics, targeting 80% system lifetime of conventional power sources, a CAPEX <800 €/kW and 80% of NRMM availability.
- O3.** Improved **component and system reliability under the specific working conditions**.
- O4.** Compliance with regulations, codes and standards (RCS) in place and development of **new standards** for industrial development.
- O5.** **Communication and dissemination** of project results for a swifter adoption of the project innovations.
- O6.** Preparation of exploitation and business **pathway to reach technology maturity**.

8 Partners (5 Countries)

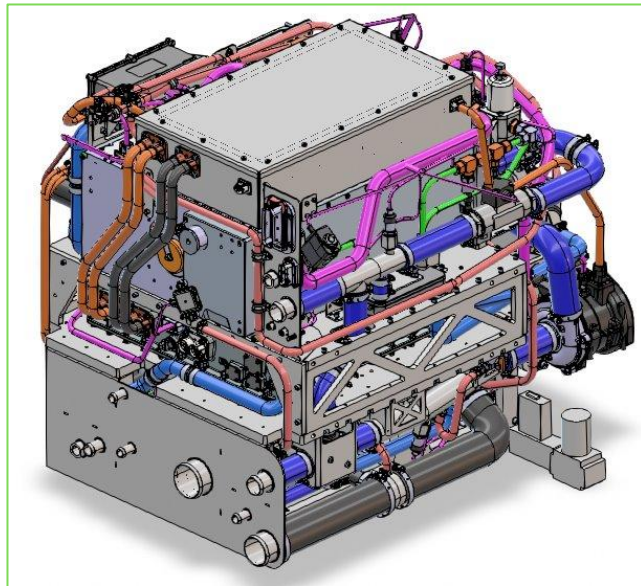


Work Plan



Development of EU-made components for H₂-FC Non-Road Mobile Machinery

Fuel Cell module for NRMM

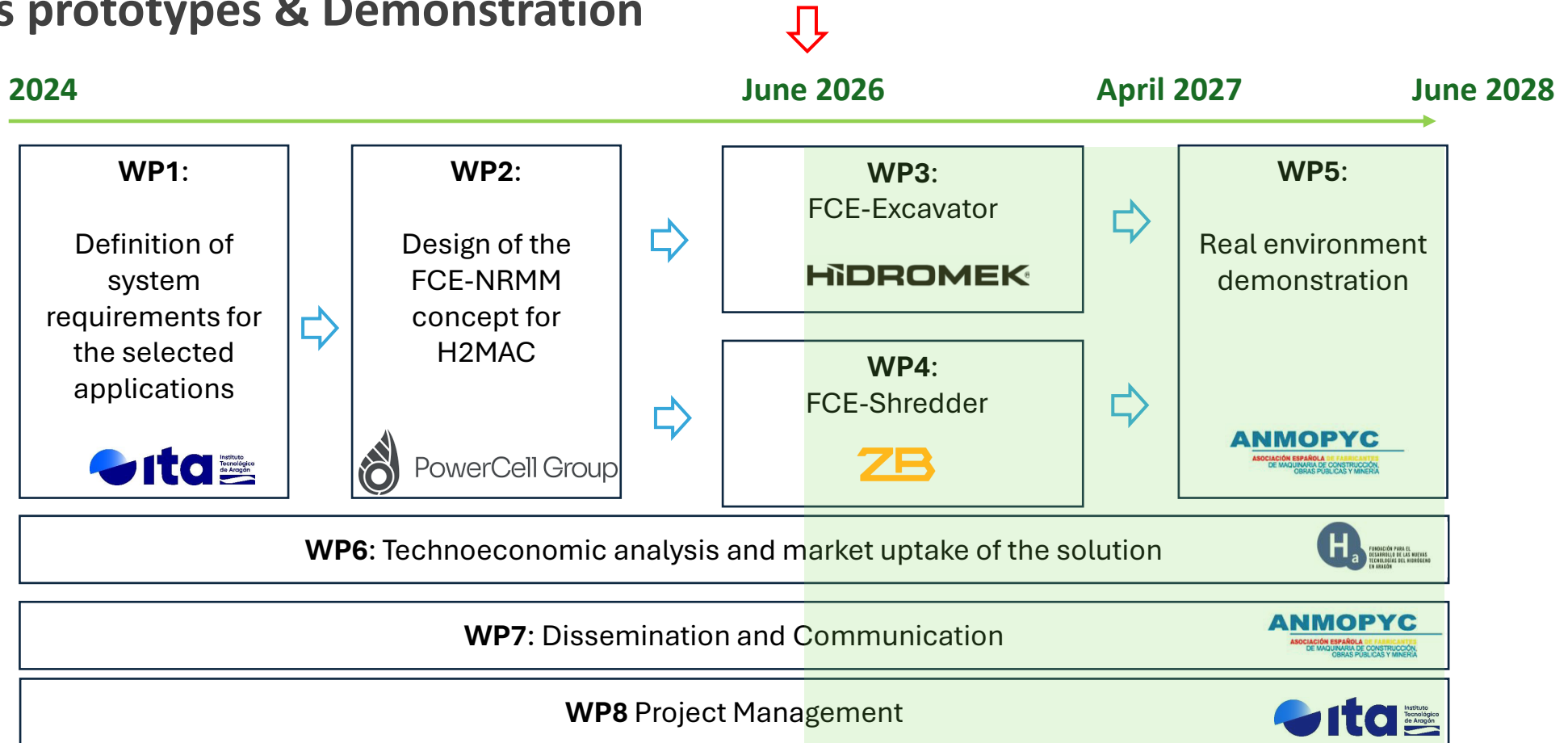


Filtering system for NRMM dusty environment



*For confidential reasons, the picture illustrates a prototype not the final product.

Machines prototypes & Demonstration



The role of ITA

- Project Coordinator
- Main R&D support to machinery manufacturers and Tier-1 suppliers:
 - Energy management system
 - Cooling system
 - H₂ supply system
 - Noise and vibration

Power electronics
Mecatronics
Fluid-dynamics
Acoustics and dynamics



...support based on our H₂ mobility lab

H₂MAC

Thank you for your attention.

Dr. María García-Camprubí
mmgarcia@ita.es

H2MAC Project Coordinator
Leader of the Fluid-driven systems group at ITA



Co-funded by
the European Union

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