



Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir
This project is co-funded by the European Union and the Republic of Türkiye



International Brokerage Event on Clean Hydrogen Partnership 2024 Call

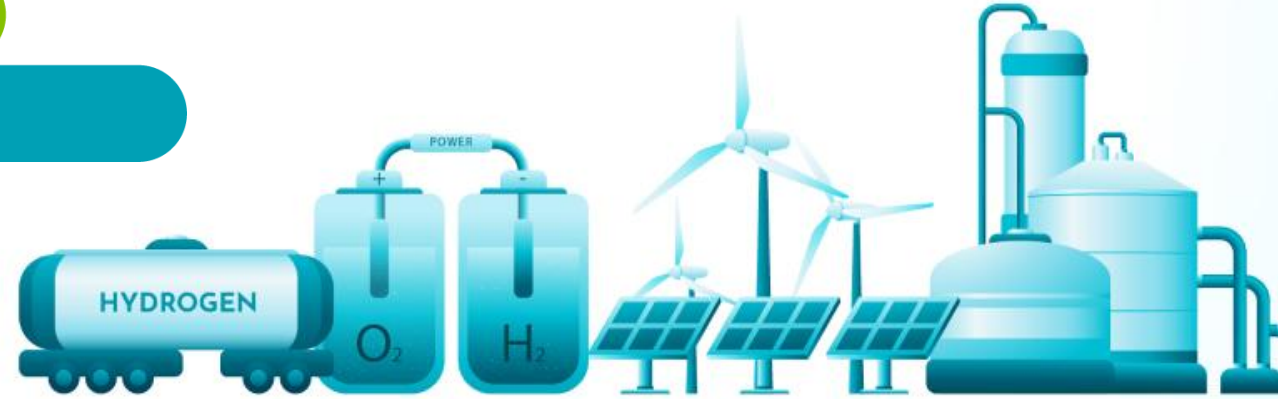


Online

Presenter Full Name: Şiringül Ay, PhD

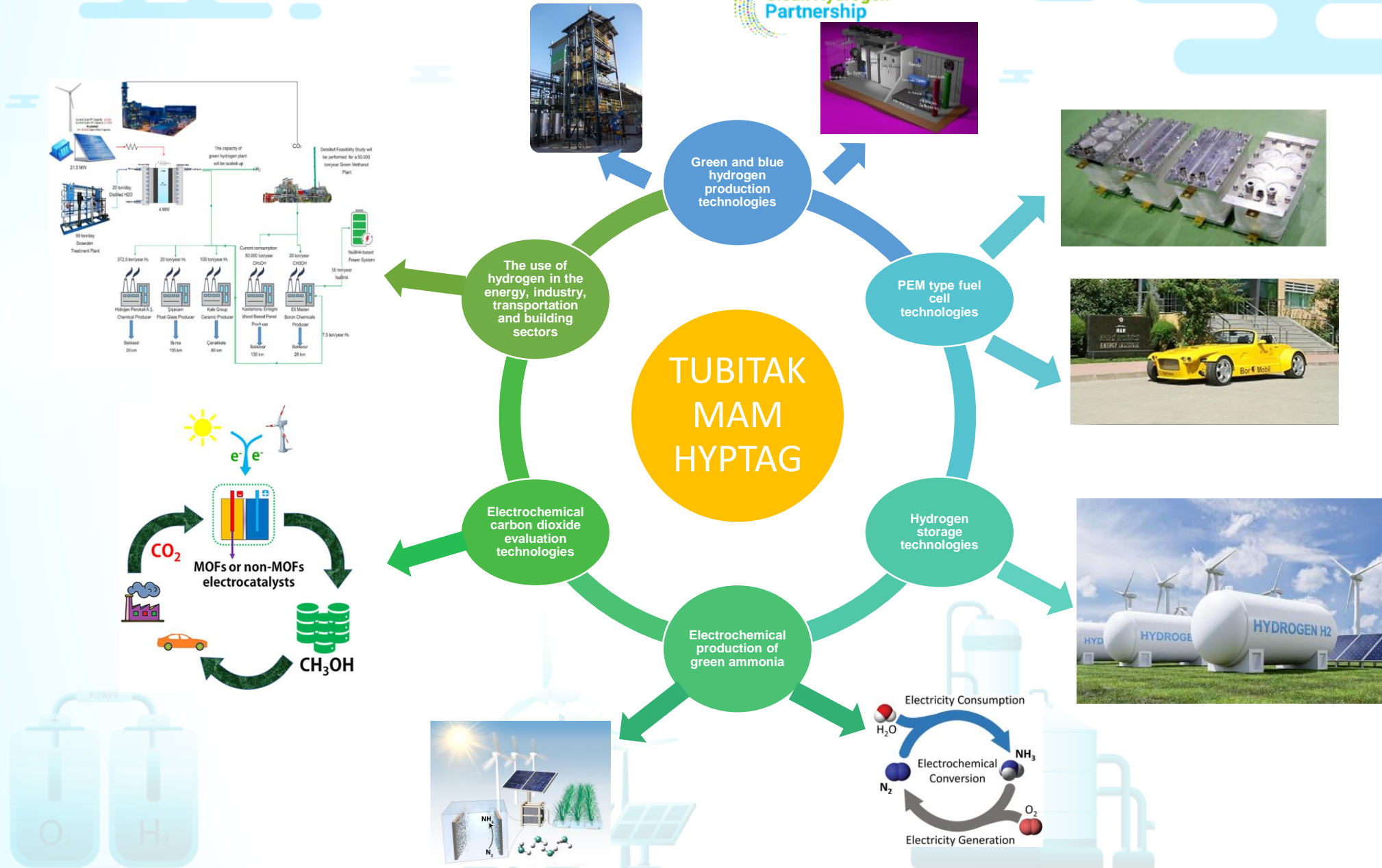
Organization: TÜBİTAK MAM

E-mail: siringul.ay@tubitak.gov.tr



Description of the Organization

Short Description Research Activities of Organization



Description of the Organization

Research Activities at TÜBİTAK MAM:
Hydrogen and FuelCell Technologies Research Group
Research Interest Areas



Natural Gas, Metanol, Diesel Reforming

NaBH_4 Based Hydrogen Generation

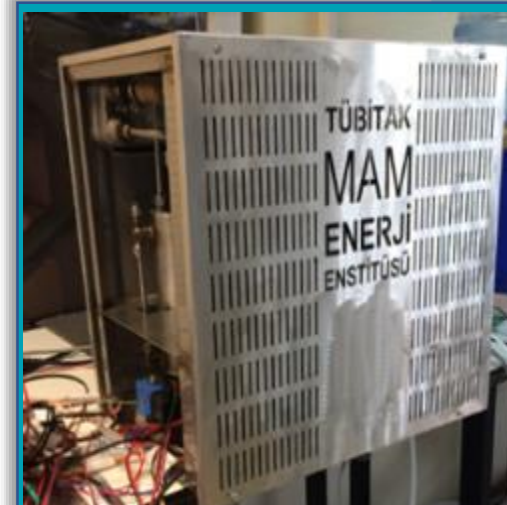
**Hydrogen Production with PEM, AEM etc.
Electrolysis**

Catalytic Burners

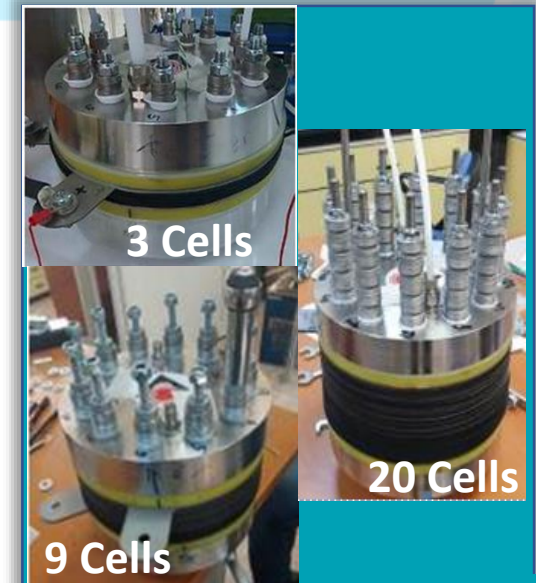
Hydrogen Production from Coal and Biomass

Hydrogen Purification Systems (PSA&DEOX)

Catalyst Development and Production



Sodium Borohydride Based H_2
Production System



PEM Electrolyzer



Reformer System



REPUBLIC OF TURKEY
MINISTRY OF INDUSTRY
AND TECHNOLOGY



COMPETITIVE
AND INNOVATIVE
PROGRAMS

Description of the Organization

TÜBİTAK MAM – Hydrogen and Fuel Cell Technologies Research Group – Completed Projects



MAMBORGEN-e



Boron Based Fuel Cell Range Extender Project for Electric Vehicles



Fuel Cell Unmanned Air Vehicle Project



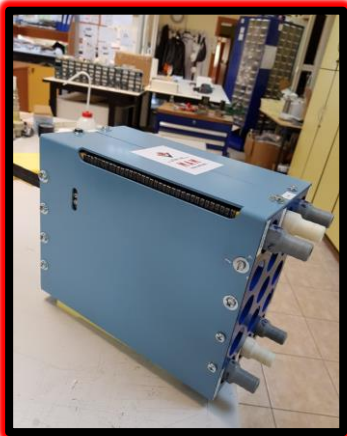
Sodium Borhydride Fuel Cell Powered Electric Vehicle Project



MAM Fuel Cell Power Supply



2 kWe PEMFC



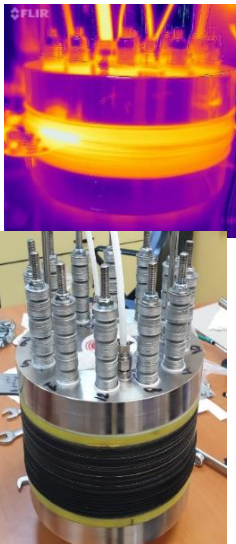
5 kWe PEM mCHP



1 kW DBHFC



PEM Type Electrolyser Development Project



Description of the Organization

Research Activities at TÜBİTAK MAM:

Hydrogen Production With Electrolysis Technologies



- ✓ Polymer Electrolyte Membrane Water Electrolysers (PEMWE)
- ✓ Anion Exchange Membrane Water Electrolysers (AEMWE)
- ✓ Alkaline Water Electrolysers (AWE)



Electrocatalyst



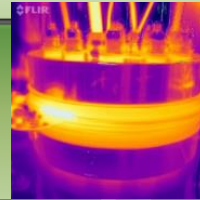
Bipolar plate



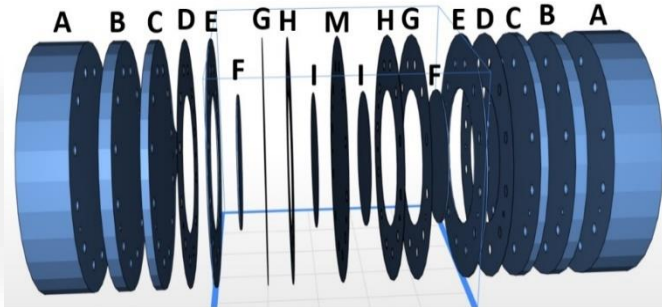
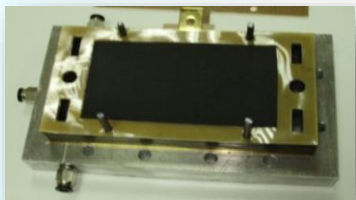
MEA



Electrolyser Stack



System Integration and Tests



- Development of electrolyzer components (**electrocatalysts, bipolar plates and MEA**)
- Development and production of electrolyzer system subcomponents (**data acquisition, control, power conditioning units**)
- System integration and prototyping of electrolyzer based hydrogen production systems
- Real time data acquisition and control of electrolyzer systems (**both in lab. demonstration and embedded system scales**).

Expected outcomes of the TC-01-02

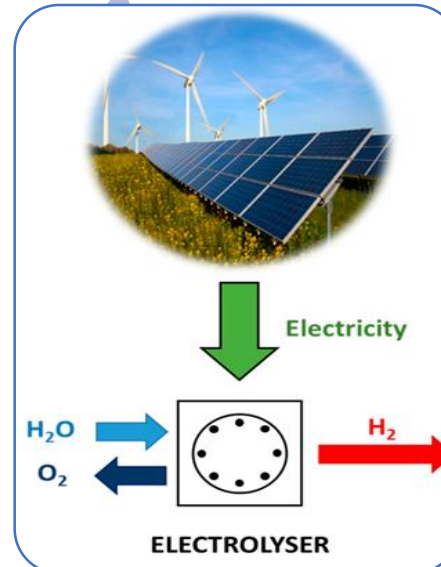
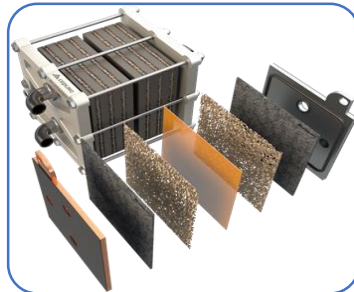


HORIZON-JTI-CLEANH2-2024-01-02 - Advanced anion exchange membrane electrolyzers for low-cost hydrogen production for high power range applications



No critical raw material containing catalysts
(0 mg/W)

Development of higher stability and efficiency stack and sub components
(1,5 A/cm²)



- Increasing performance and durability (<0.5%/1000h)
- Proof of technology with long tests (3000 h)

- Reduction of CAPEX and OPEX (48 kWh/kg)
- Determination of business model for the scale up and industrialisation



TRL 3

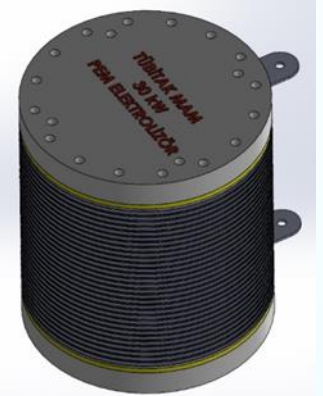
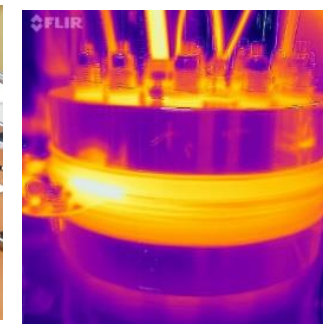
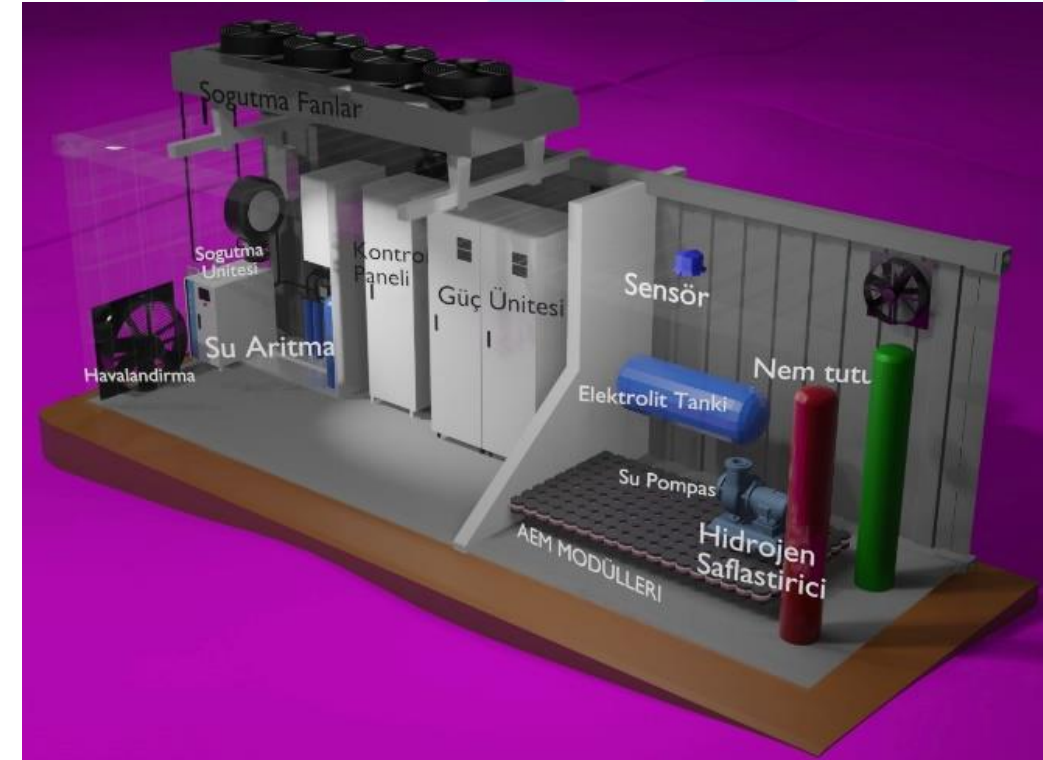
TRL 5

Description of the proposed project



Development of modular AEMWE system for low-cost hydrogen production

- We are planning to start a new project about AEMWE system development.
- Within the scope of the project electrolyser module components (Critical Raw Materials free catalyst, membrane, bipolar plates, PTL etc.) will be developed
- The module & system design and integration of the subcomponents will be carried out.
- Performance, lifetime tests according to EU harmonised test protocols and the lifetime extension studies will be performed
- Build up test protocols and procedures for the performance and durability assessment of AEMWE systems



Description of the proposed project

Development of modular AEMWE system for low-cost hydrogen production



WP1

• System concept design

WP2

• Development of Non Critical Material Containing Catalysts

WP3

• Development of Non Flourinated & Durable Membranes

WP4

• Development of MEA Formulations and System Subcomponenets (bipolar plates, PTL etc.)

WP5

• System Integration and Lab Scale Tests at High Pressure Values (single cell / multiple cell)

WP6

• System Durability & Performance Tests According to EU Harmonised Test Protocols and Optimization Studies (3000 h tests)

WP7

• Determination of Business & Commercialisation Model For The Scale Up and Industrialisation

WP8

• Project Management



REPUBLIC OF TURKEY
MINISTRY OF INDUSTRY
AND TECHNOLOGY



Consortium - profile of known partners

No	Partner Name	Type	Country	Role in the Project
01	A	University	Turkiye	Project partner for development of novel catalyst and membrane formulations
02	B	Industry	Turkiye	Pilot scale experiments and onsite tests
03	C	Public R&D Institution	Turkiye	Laboratuary scale performance and lifetime tests
04				
05				
06				



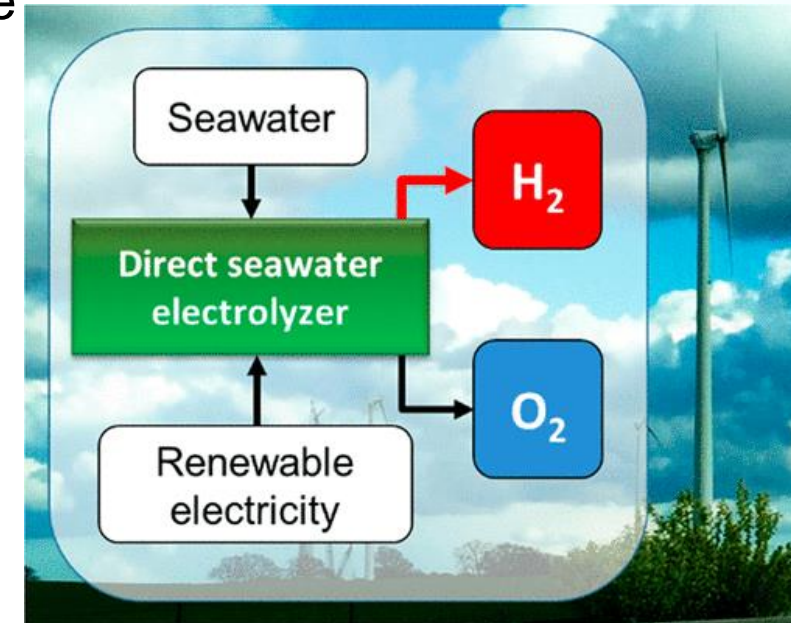
Consortium – required partners

No	Expertise	Type	Country	Role in the project
01	Catalyst development and characterization	Any	Any	Project Partner or WP leader etc.
02	Membrane development and test	Any	Any	Project Partner or WP leader etc.
03	Module and subcomponent design	Any	Any	Project Partner or WP leader etc.
04	System integration and design	Any	Any	Project Partner or WP leader etc.
05	Computer aided design and simulation of the system	Any	Any	Project Partner or WP leader etc.
06	Pilot scale onsite demonstration of the final system	Any	Any	Project Partner or WP leader etc.
07	Developing test protocols and procedures for AEMWE lifetime tests	Any	Any	Project Partner or WP leader etc.

We are also interested in HORIZON-JTI-CLEANH2-2024-01-03

(Development of innovative technologies for direct seawater electrolysis - Expected outcomes)

- Energy consumption @ nominal load: 53 kWh_e/kg for low temperature EL and <40 kWh_e/kg + <10 kWh_{th}/kg for high temperature EL.
- Current density $\geq 0,5$ A/cm².
- Degradation: ≤ 5 %/500h.
- Operational flexibility: 20 to 100 % of nominal load.
- Minimal capacity : 20 gH₂/h.
- PGM electrode load: < 0.4 mg/W.
- Purity of hydrogen > 99%.
- Techno-Economic, Environmental and Social Analysis of the system (LCA, LCCA, LCSA etc.)



TRL 2  **TRL 4**



Contact Details:

Full Name: Şiringül Ay, PhD / Özlem Karahan, PhD

Organization and Department: TÜBİTAK MAM Hydrogen and Fuel Cell Technologies Research Group

Country: Türkiye

Tel/E-mail/Web: 0262 677 2000 – 3866 - 2730

Siringul.ay@tubitak.gov.tr / ozlem.karahan_d@tubitak.gov.tr

