



## RESILIENCE Project Kick-Off Newsletter

### **Process Intensification of Carbon Dioxide and Methane Valorization by Microwave Heating**

We are pleased to announce the official start of RESILIENCE, a three-year research project funded by the Hellenic Foundation for Research and Innovation (HFRI) under the 3<sup>rd</sup> Call for Research Projects to Support Faculty Members and Researchers.

The project started on 3<sup>rd</sup> November 2025, has a duration of 36 months, and a total approved budget of €280,857.

### **What is RESILIENCE about?**

RESILIENCE aims to develop electrified catalytic processes for the sustainable conversion of the two most abundant greenhouse gases, carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>), into valuable chemicals and fuels.

The core idea is to replace conventional fossil-based heating with microwave-powered reactors, enabling:

- Direct, selective heating of catalysts
- Faster and more efficient energy transfer
- Lower overall energy consumption
- Improved selectivity and yield

The project focuses on two highly endothermic reactions:

- Dry Reforming of Methane (e-DRM)
- Non-Oxidative Conversion of Methane (e-NOCM)

### **Scientific Objectives**

RESILIENCE will:

1. Develop advanced catalytic materials.
2. Design and construct innovative microwave reactors.



3. Intensify the studied processes for improved performance.
4. Reduce energy consumption by up to 40%.
5. Assess sustainability using LCA and LCC.

## Consortium & Roles:

RESILIENCE brings together complementary expertise in **nanomaterials, catalysis, reaction engineering and process intensification**:

- NCSR “Demokritos” – Institute of Nanoscience and Nanotechnology (INN)  
Host Institution & Coordination  
Principal Investigator: Dr. Fotios Katsaros
- National Technical University of Athens (NTUA) - Collaborating Organisation  
Led by Prof. George Stefanidis

## Work Plan Overview:

- WP1 – Synthesis of novel catalysts
- WP2 – Design and implementation of electrified reactors
- WP3 – Efficiency assessment (reactive testing, optimisation, LCA/LCC)
- WP4 – Project management and dissemination

## Expected Impact:

RESILIENCE supports decarbonisation, greenhouse gas mitigation, energy efficiency, and advancement of electrified reactor technologies, contributing to sustainable chemical manufacturing.

## Stay Connected:

**LinkedIn Page:** RESILIENCE – HFRI Research Project