A Turkish university is developing a waste heat-powered marine antifouling system with flexible energy harvesting and laser-induced graphene surfaces and seeks partners for EIC Pathfinder 2026

Summary

Profile type	Company's country	POD reference
Research & Development Request	**Türkiye**	**RDRTR20261004001**
Profile status	**Type of partnership**	**Targeted countries**
PUBLISHED	**Research and development cooperation agreement**	**• All countries**
Contact Person	**Term of validity**	**Last update**
Enrico FRANZIN	**4 Oct 2026** **4 Oct 2027**	**4 Oct 2026**

General Information

Short summary

A Turkish university is developing an integrated marine surface protection system for the EIC Pathfinder Challenge 2026 on Advanced Materials for Miniaturised Energy Harvesting Systems. The concept combines a flexible expanded graphite micro thermoelectric generator, an expanded graphite-based low-resistance supercapacitor, and a laser-induced graphene antifouling surface. Partners are sought in power management, marine biofouling validation, and marine systems integration.

Full description

Marine biofouling starts soon after a surface is immersed and can impair the performance of critical wetted components. Current approaches often depend on biocidal coatings, periodic cleaning, or an external power supply. The proposed project addresses this problem through an energetically autonomous surface protection concept for selected marine components.
The project will develop an integrated materials and energy architecture. Low-grade waste heat available on a marine vehicle will be converted into electricity by a flexible expanded graphite micro thermoelectric generator. The harvested energy will be accumulated in a low-resistance supercapacitor. It will then be released when required as controlled low-voltage pulse AC excitation to a multifunctional laser-induced graphene surface.
The system is intended for critical and spatially limited wetted areas such as sea chests, seawater intakes and sensor housings. It is not intended to energise the complete hull or remove established macrofouling. The aim is to suppress conditioning films and early biofilm formation before severe fouling develops. The surface will combine passive water repellence with active electrical stimulation.
The project will study the complete energy pathway as one coupled system. Energy generation will be assessed against temperature difference and mechanical cycling. The storage unit will be evaluated for capacitance, internal resistance, pulse delivery, and cycling stability. The LIG surface will be tested for electrical impedance, wettability, marine durability and biofilm formation. Voltage, frequency, duty cycle and exposure time will be optimised against biological response and electrical energy use.
A key performance measure will be the electrical energy required to protect a defined surface area at a specified level of biofilm control. This will link the energy that can be harvested on board with the area that can be protected in practice.
The Turkish university will contribute expertise in advanced carbon materials, expanded graphite systems, thermoelectric materials, laser-induced graphene, surface engineering and materials characterisation. Complementary partners are sought for power management and electronics, marine biofouling validation, and marine system integration. The project is being prepared for the EIC Pathfinder Challenge on Advanced Materials for Miniaturised Energy Harvesting Systems and aims to reach an integrated laboratory demonstrator at TRL 4.

Advantages and innovations

The main innovation is the integrated design of energy harvesting, energy storage and active marine surface protection around one quantitative energy balance.
The project will use a flexible expanded graphite thermoelectric architecture instead of treating the energy harvester as a separate rigid component. The supercapacitor will buffer slowly accumulated energy and provide short controlled power pulses when the surface requires active protection.
The LIG surface will combine passive water repellence and active electrical functionality. The concept therefore avoids relying on only one antifouling mechanism. The electrical function will target early biofilm formation on critical surfaces rather than continuous treatment of the complete vessel.
Another distinctive feature is the performance metric. The project will determine how much electrical energy is required to protect a defined surface area at a specified biological performance. This creates a direct link between harvested energy and useful antifouling function.
The project also addresses the full pathway from advanced material to miniaturised energy harvesting module and then to an energy-autonomous marine system. The integrated demonstrator will be benchmarked in a representative laboratory environment targeting TRL 4.

Technical specification or expertise sought

The team is looking for complementary partners in three areas.
1. Power management and electronics. Expertise is sought in low-power conversion, energy harvesting interfaces, supercapacitor management, pulse drivers, ultra-low-power control electronics, power conditioning, pulse AC control, and laboratory benchmarking.
2. Marine biofouling and biological validation. Partners should have access to controlled seawater or tank facilities and experience in biofilm assays, surface coverage analysis, biomass or cell viability measurements, and marine surface testing.
3. Marine systems and robotics. Expertise is sought in unmanned or autonomous marine vehicles, marine sensors, submerged equipment and system integration. The partner should help define realistic integration constraints and representative validation conditions.
Experience in EIC Pathfinder or Horizon Europe projects is welcome. Partners should be able to join as full beneficiaries and lead clearly defined research tasks.

Stage of development

Concept stage

Sustainable Development goals

- **Goal 12: Responsible Consumption and Production**
- **Goal 13: Climate Action**
- **Goal 7: Affordable and Clean Energy**
- **Goal 17: Partnerships to achieve the Goal**
- **Goal 9: Industry, Innovation and Infrastructure**
- **Goal 14: Life Below Water**

IPR Status

No IPR applied

IPR Notes

IPR Notes

Partner Sought

Expected role of the partner

Selected partners are expected to join the project as full beneficiaries and lead the activities linked to their expertise.
The power management partner will integrate the energy harvester, supercapacitor and pulse AC driver. It will support energy conditioning, control logic and system level benchmarking.
The marine biofouling partner will design and conduct biological validation. It will establish suitable test organisms, protocols and performance indicators for early biofilm control.
The marine systems or robotics partner will define the application case and integration constraints. It will support laboratory or controlled tank validation under conditions relevant to marine vehicles and submerged equipment.
All partners will contribute to the scientific methodology, data interpretation, proposal preparation, dissemination and future exploitation of the results.

Type of partnership

Research and development cooperation agreement

Type and size of the partner

- **SME <=10**
- **SME 50 - 249**
- **University**
- **SME 11-49**
- **Big company**
- **R&D Institution**

Call Details

Framework program

Horizon Europe

Call title and identifier

HORIZON-EIC-2026-PATHFINDERCHALLENGES-01-01 Advanced Materials for Miniaturised Energy Harvesting Systems

Submission and evaluation scheme

Single-stage evaluation. Horizon lump-sum grant under EIC Pathfinder Challenges

Anticipated project budget

Approx. EUR 4 million

Coordinator required

No

Deadline for EoI

20 Oct 2026

Deadline of the call

28 Oct 2026

Project duration in weeks

156

Web link to the call

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/HORIZON-EIC-2026-PATHFINDERCHALLENGES-01-01

Project title and acronym

THERMALIG: Thermoelectric Energy Harvesting and Laser Induced Graphene Surfaces for Autonomous Marine Antifouling

Dissemination

Technology keywords

- **02007022 - Conductive materials**
- **07003004 - Micro- and Nanotechnology related to marine resources**
- **02007005 - Composite materials**
- **02007024 - Nanomaterials**
- **02007020 - Biobased materials**

Market keywords

- **06008 - Energy Storage**

Targeted countries

- **All countries**

Sector groups involved

- **Energy-Intensive Industries - Materials**
- **Energy-Intensive Industries - BioChemTech**