Photon-Based Energy Conversion Reactor

Non-confidential opportunity for KETs2026 Reloaded - seeking industrial and R&D; co-development partners

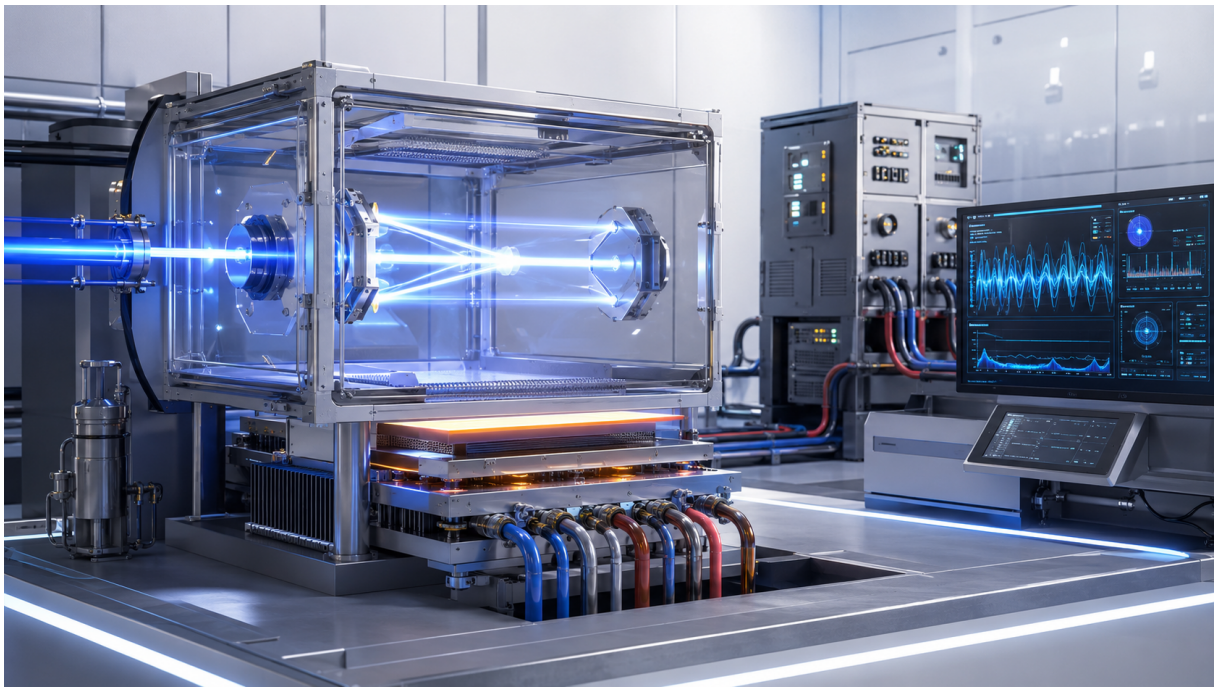

Illustration: non-confidential conceptual laboratory demonstrator for a photon-based conversion architecture.

Opportunity summary

The project explores a theoretical photonic energy-conversion architecture coupling an external pumping source, a photon-confinement/amplification cavity, controlled opto-thermal conversion and a thermo-electric or equivalent power-conversion stage. The goal is not to claim a demonstrated energy generator, but to initiate a rigorous feasibility pathway through modelling, materials testing, laser/optical bench experiments, thermal management studies and prototype validation.

The concept is positioned as an early-stage research and proof-of-concept opportunity in photonics, advanced materials, thermal engineering, power electronics and control systems.

Suggested KETs2026 opportunity fields

Field	Recommended content
Opportunity title	Photon-Based Energy Conversion Reactor - Seeking Photonics and Energy R&D; Partners
Type	Project cooperation / R&D; cooperation / Feasibility study
Project stage	Early-stage concept; theoretical model and feasibility study
Topics	Photonics, Advanced Materials, Energy Efficiency, Energy-Intensive Industries, ICT/Control, Power Electronics
What is sought	Industrial partners, photonics laboratories, laser-system experts, thermo-electric specialists, thermal-management suppliers, simulation partners, power-electronics integrators, EU consortium coordinators
Non-confidential positioning	A controlled photon-to-heat-to-electricity conversion architecture requiring multiphysics validation and prototype experiments.

Why this can interest KETs2026 participants

• Photonics and quantum technologies: optical cavities, lasers, photonic confinement and advanced integrated photonic devices.

• Advanced materials: selective absorbers, graphene/multilayer coatings, thermal interfaces, cryogenic-compatible materials and heat sinks.

• Industrial energy efficiency: possible long-term use cases in energy-intensive sites, scientific instrumentation, thermal recovery and controlled conversion modules.

• Digital/control: dynamic feedback, nonlinear operating regimes, stability analysis, sensor-driven optimization and power electronics.

• EU project fit: early research can be shaped as a modelling, proof-of-concept, prototype and validation consortium.

Priority organisations to approach on KETs2026 Reloaded

Organisation	Why relevant
Poro Technologies Ltd	MicroLED and photonic platforms; device physics and silicon photonics.
Gradiant	Digital technologies and advanced integrated photonic-device topic alignment.
RECENDT	Research centre with photonic-device topic alignment; relevant for optical measurement and testing.
Ikergune	Applied R&D; with laser processing, advanced manufacturing and industrial optimization.
Etxetar	Large enterprise with turnkey laser powder directed-energy deposition capabilities; useful laser/process engineering dialogue.
CEA	Research and technology organisation aligned with energy-efficient industrial processes, materials and digital technologies.
EHU / University of the Basque Country	Relevant for efficient energy input, process industries and advanced materials research.
ETRI	R&D; institute; potential partner for electronics, ICT, control and photonic/communication-related technologies.
TVP Solar SA	Industrial thermal systems up to high temperature ranges; relevant for thermal conversion and heat-management discussion.
Nexuswelt Group / EU-Support / FundtoInnovate	EU funding, consortium positioning, exploitation and market-access support.

Non-confidential technical scope

Proposed architecture

External pumping source; photon-confinement/amplification cavity; active medium; opto-thermal absorber or conversion layer; thermo-electric/equivalent power conversion; sensors, feedback control and power conditioning.

Validation roadmap

1. Literature and IP positioning; 2. Multiphysics model; 3. Optical/thermal bench test; 4. Materials ageing study; 5. Low-power laboratory prototype; 6. Independent performance review; 7. Industrial use-case definition.

Main feasibility questions

Energy balance and net efficiency; heat rejection and thermal cycling; laser/pump input requirements; conversion-stage efficiency; durability of absorbers/coatings; safety and shielding; scalability; cost-per-watt or cost-per-kWh-equivalent.

Potential partner roles

Photonics/laser partner; absorber/materials partner; thermal-management partner; thermo-electric/power-electronics partner; modelling partner; test laboratory; industrial end-user; EU project coordinator.

Confidentiality approach

The marketplace profile should disclose only the high-level architecture and intended validation pathway. Detailed equations, material stack, dimensions, control laws and drawings should be shared only under NDA or structured consortium agreements.

Suggested short description under 255 characters

Early-stage photon-based energy conversion concept combining optical pumping, photonic confinement, opto-thermal conversion and controlled power electronics; seeking partners for modelling, feasibility tests and prototype validation.

Suggested full description

This opportunity presents an early-stage photonic energy-conversion concept intended for scientific and industrial feasibility assessment. The architecture combines an external pumping source, a photonic confinement or amplification stage, a controlled opto-thermal conversion layer and a thermo-electric or equivalent electrical conversion subsystem. A feedback-control unit would monitor optical, thermal and electrical variables in order to evaluate stable operating regimes and optimize conversion efficiency.

The project is currently theoretical and requires independent validation. Partners are sought for multiphysics modelling, optical bench design, absorber and coating selection, thermal management, cryogenic or high-gradient testing, power electronics, safety engineering and prototype experimentation. The objective is to determine whether the concept can progress from theoretical architecture to a measurable proof-of-concept suitable for further R&D; or European collaborative funding.