Energy Technology LCA and Sustainability

Institut de Recerca en Energia de Catalunya (IREC)

Dr. Victor José Ferreira research centre

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1. Your organization and capacities

IREC

Shaping Energy for a Sustainable Future

Institució CERCA Centres de Recerca de Catalunya

tecnio catalonia | ACCIÓ Generalitat de Catalunya

HR EXCELLENCE IN RESEARCH

AREAS OF EXPERTISE

Energy & Environment

- Renewable energy sources and integration to the grid
- Sustainable mobility
- Fusion energy
- Environmental impact

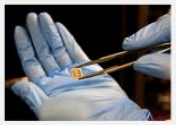
Energy Storage

- Batteries
- Chemical storage
- Energy conversion
- Harvesting and other autonomous systems

Smart Energy Management

- Smart cities & districts
- Smart grids
- Distributed energy management and aggregators
- Energy efficiency in buildings

Research and technological units



ADVANCED MATERIALS FOR ENERGY (M2E)

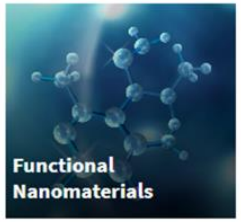
- Functional nanomaterials
- Catalysis
- Materials for solar systems
- Nanoionics and fuel cells
- Hydrogen technologies
- CO_2 conversion
- Energy storage and harvesting
- Thermochemical conversion

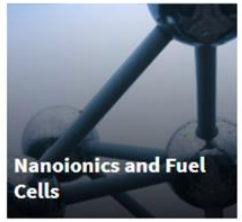
ENERGY EFFICIENCY: SYSTEMS, BUILDINGS & COMMUNITIES (ECOS)

- NZEB (Net Zero Energy Buildings and Communities)
- Integration of renewables
- Smart Grids and microgrids
- Electric mobility
- Economic analysis and regulation
- Energy systems analytics
- Wind energy (control/integration)

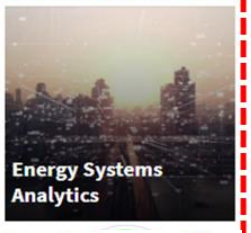
Research groups

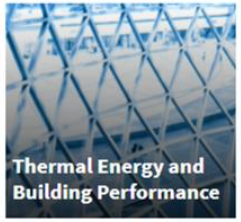
Advanced Materials and Systems for Energy Area





Energy Efficiency in Systems, Buildings and Communities Area





ESA ENERGY SYSTEMS ANALYTICS

1. Your organization and capacities

ENERGY SYSTEMS ANALYTICS

Energy System Integration

Dr. Josh Eichman

Energy System Analysis:

Smart Grid Analysis

EV Battery Technology

Vehicle-to-Grid Systems

Modeling and Optimization:

Energy Economics, Social and Regulatory Impact Assessment

Dra. Gabriela Benveniste

Policy and Regulation Research:

Techno-economic analysis

Socio-Economic Evaluation:

Market Dynamics:

Consumer Behavior Analysis

Energy Poverty and Equity

Risk Assessment

Energy Technologies LCA and Sustainability

Dr. Victor Ferreira

Life Cycle Assessment (LCA)

Life Cycle Costing (LCC)

Social Life Cycle Assessment (S-LCA):

Carbon Footprint:

Eco-design

Circular Economy

4 TRL 8

1. Your organization and capacities

Energy Technologies LCA and Sustainability Group

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Life Cycle Assessment (LCA): Assessing environmental impacts throughout the full life cycle of products and systems.

Life Cycle Costing (LCC): Analysing the total cost of technologies over its life cycle.

Social Life Cycle Assessment (S-LCA): Assessing social aspects and their impact on stakeholders, value chains and communities.

Carbon Footprint: Quantifying greenhouse gas emissions of energy systems and technologies.

Eco-design : Designing approaches to minimize environmental impact of energy technologies focused on resources, water, energy and waste reduction.

Circular Economy : Applying and measuring circular economy strategies in the development of energy products and new business models.

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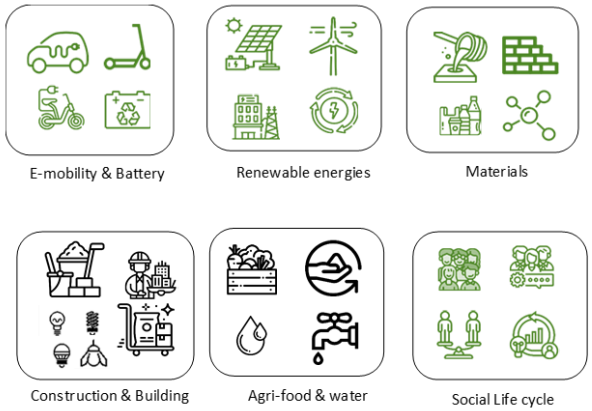
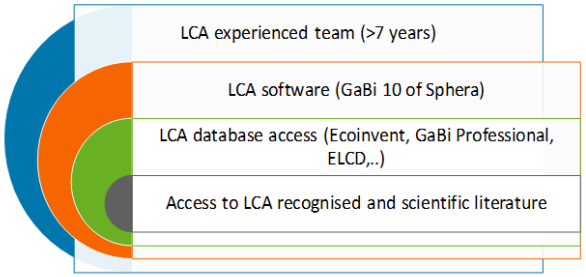
APPLICATION AREAS



OUR RESOURCES



"Companies, organizations, industrial plants, services and public administrations wishing to know the environmental impact associated with their activities, as well as aiming to optimize their material and energy resources and production processes"

https://www.irec.cat/

Dr.Victor Ferreira
(vjferreira@irec.cat)

2. Topics of interest in calls 2025

Topic	Experience and Contribution
HORIZON-JU-CLEANH2-2025-01-06: Innovative hydrogen and solid carbon production from renewable gases/biogenic waste processes	**Experience:** ColdSpark Project participation leading a Work Package **Contribution:** • Performing the **Sustainability Assessment** in line with the current methods and regulations (RED II) • Analyze **carbon-negative or carbon-neutral** pathways if bio-based processes capture more CO_2 than they emit. • Compare the sustainability performance of the new processes against existing **hydrogen production technologies** (e.g., green, blue, and grey hydrogen). • Life Cycle Techno-economic analysis for economic feasibility.
HORIZON-JU-CLEANH2-2025-03-02: Scalable innovative processes for the production of PEMFC MEA	**Experience:** Cell3Ditor Project participation **Contribution:** • **LCA of MEA Production:** Analyzing the environmental footprint of new MEA manufacturing processes, including material sourcing, energy use, and emissions. • **Eco-Design for MEAs:** Proposing sustainable material choices (e.g., alternative catalysts, lower-impact membranes) to improve durability and recyclability. • **Carbon Footprint & Circular Economy Strategies:** Assessing the potential for closed-loop recycling of MEAs and recovery of valuable materials. • **Benchmarking with Conventional MEAs:** Comparing the environmental impact of the new scalable MEA production process with existing state-of-the-art processes.

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Please send to cristina.garrido@cdti.es before 31st January

If necessary, presentations will be selected by the maturity of the project idea and its adequacy to the proposed topic

1. Power System's

COMMUNICATIONS

- IoT-based comms
- LORA-technologies
- Standards
- CyberSecurity
- Gateway development
- SCADA & HMI

POWER ELECTRONICS & RENEWABLE ENERGY

- Power Electronics Design development and control
- Power Quality, Stability and Coordination
- RES Integration
- Floating Wind and Solar
- DigitalTwin for RES

ELECTRICAL NETWORK

- Islanded operation
- State Estimation & Fault-Location
- Grid operation & Grid Edge
- Efficient and distributed operation
- Resilience
- Grid Concepts: AC, DC

ENERGY STORAGE

- Advanced BMS (model and electronics)
- EV applications
- Hybrid concepts
- SOC & SOH tools
- Grid Support

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2. Topics of interest in calls 2025

Topic
HORIZON-JU-CLEANH2-2025-03-03 Reliable, efficient, scalable and lower cost 1 MW-scale PEMFC system for maritime applications.
Role (partner / coordinator): *Coordinator* **Description of the contribution:** Balance of plant optimization, digital twin development for fuel cells, sensing and monitoring system development **Technical Specification or Expertise Sought:** Development of high-power/multi-stack/modular fuel cells, development of high-power DC/DC converters, development of BoP, Communication, IoT, software development

Topic
HORIZON-JU-CLEANH2-2025-01-01 Improvements in lifetime and cost of low temperature electrolysers by introducing advanced materials and components in stacks and balance of plant
Role (partner / coordinator): *Coordinator* **Description of the contribution:** *Contribution in balance of plant (BoP) optimization, software development, IoT* **Technical Specification or Expertise Sought:** *Communication, IoT, IT*

2. Topics of interest in calls 2025

Topic
HORIZON-JU-CLEANH2-2025-01-06 Innovative hydrogen and solid carbon production from renewable gases/biogenic waste processes
Role (partner / coordinator): *Coordinator* **Description of the contribution:** *Contribution in balance of plant (BoP) optimization, software development, IoT* **Technical Specification or Expertise Sought:** *Communication, IoT, IT*

Profiles we are looking for:

partner#1 – manufacturer of DC/DC with high net power output for fuel cells integration
partner#2 – manufacturer of fuel cells and balance of plant
partner#3 – end user / ship owner company
partner#4 – system integrator / company with expertise in system integration services to ship owners and equipment suppliers
partner#5 – software development company with expertise in control software/simulation tools for fuel cell systems

2. Topics of interest in calls 2025

Topic
HORIZON-JU-CLEANH2-2025-04-01 Demonstration of stationary fuel cells in renewable energy communities
Role (partner / coordinator): *Partner* **Research activities:** Decentralised control of microgrids supported by real-time optimisation, which increases grid reliability and resilience, and allows for autonomous operation during disturbances; Contribute to demand-side strategies, which can reduce energy bills and provide overall benefits to the energy system such as stability and less emissions; Provide ancillary services to the overall energy system such as frequency control and power reliability; **Our technical expertise:** Experience in power grid detailed modelling and analysis (different tools: Pandapower, Matpower, PowerFactory, proprietary models, OpenDSS, Simulink) Power Hardware in the loop testing and experimentation Multi-energy networks analysis Fuel cells operation and control for ancillary services provision Virtualization and digital twinning of fuel cell stacks Power system resilience analysis Participation to a wide range of EU research projects on grid integration topics