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Current Progress of Activities at EU-SOLARIS ERIC: The European Research Infrastructure Consortium for CSP Technologies

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Abstract. An ERIC, established by a decision of the European Commission, is a legal entity possessing legal personality and full legal capacity acknowledged across all EU Member States. Its primary role is to establish and operate a research infrastructure on a non-economic basis.

Under the initiative of Spain, France, Germany, and Cyprus as Members, with Portugal as an Observer, a European Research Infrastructure Consortium (ERIC) has been formed. This consortium, named "European Solar Research Infrastructure for Concentrated Solar Power" **(EU-SOLARIS ERIC)** is established in accordance with Council Regulation (EC) No. 723/2009 of 25 June 2009.

The establishment of an ERIC was sanctioned by the European Commission, as evidenced in Commission Implementing Decision (EU) 2022/2297 of 19 October 2022 [1]. The inaugural assembly of the EU-SOLARIS ERIC took place at the CIEMAT Headquarters in Madrid on 12th January 2023. During this gathering, the General Assembly was officially convened, and the Statutes along with other governing documents were formally endorsed. At the time of composing this document, negotiations for the accession of three additional countries—Greece, Turkey, and Italy—are underway.

This paper summarizes the R&D activities carried out during this first year of the ERIC, particularly, we describe the new projects achieved.

Keywords: Research Infrastructure, Concentrating Solar Power, Solar Thermal Energy, EU-SOLARIS, European Research Infrastructure Consortium

1. An update on the first research activities of EU-SOLARIS ERIC

EU-SOLARIS has been highly active in participating in proposals for acquiring externally funded projects throughout 2023. Three of the four proposals we participated in under Horizon Europe [2] have been successful, providing us with an initial set of projects to support our activities.

The authors would like to emphasize that EU-SOLARIS always strive to involve the R&D institutes associated with it in these projects, whether as partners, affiliated entities, or even later during the project's execution as collaborators in its tasks.

1.1 Internal projects

With full support from the General Assembly, it was decided to fund a RI-focused project for the first time in 2023 with EU-SOLARIS' own resources.

The aim of this call for project proposals was to fund one project able to deliver innovative scientific instrumentation, tools, methods or solutions contributing to advance the state-of-art of CST-related Research Infrastructures (RIs). The project outcomes, which underpin the provision of improved and advanced services, should enable research infrastructures to support new areas of research and/or a wider community of users, including industrial users. The project was expected to improve the interoperability of RIs and the quality of the services offered to users of CST RIs.

Finally, a proposal led by the Spanish IMDEA-Energy and with the participation of the German Fraunhofer ISE and the Cyprus Institute was selected for funding after a thorough evaluation process carried out by the ERIC' Scientific & Technical Committee.

The name of the winning project is FLARES - Fast Laser Assessment for near Real-time Evaluation of Soiling and it has been awarded with 45 000 € for a 18-month execution time.

The goal of the project is the development of new techniques needed to automatize and generalize soiling assessment for all CST technologies, while simultaneously making it faster and able to measure a greater number of units.

In this project, a novel technique using a 3D laser scanner will be developed and tested at real solar fields, such as the one at IMDEA Energy and at the Cyprus Institute.

Measurements will be compared with reflectometer data aiming to establish a model with an absolute reflectance error lower than 2%. Some preliminary tests have been already performed at IMDEA showing promising results.

A call to fund a new project under similar boundary conditions in year 2024 has been already published.

2.2 Projects under 'HE Research Infrastructures Programme 2023-2024'

In the year 2023, EU-SOLARIS ERIC achieved success in four out of five proposals submitted to various calls.

2.2.1 Project CACTUS

Under the theme **'Strengthening bilateral cooperation on research infrastructures with Latin America'**, two projects were realized. The first project, **CACTUS**, titled 'Enhanced Solar PV Performance through Improved Research Infrastructure for Adapted Climate Conditions',

is a 24-month initiative led by CEA-LITEN (FR) and involves partners from six countries, including Chile and Colombia from the Latin American and Caribbean (LAC) region.

CACTUS started on 1 December, 2023 and it proposes to improve the research infrastructure (RI) and its portfolio of services for an enhanced solar PV performance, particularly adapted for various climate conditions (such as tropical, desert, temperate), considering the whole lifetime of PV projects, from design, installation, operations, decommissioning and End of Life. This will be achieved by linking outdoor and indoor measurements with physical parameters based on material analysis, improving algorithms for O&M, developing common data treatment procedures, assessing sustainability related aspects, while enhancing bi-regional scientific cooperation (EU-LATAM) in the renewable energy sector.

Finally, yet importantly, and for the whole solar technologies, an increasing focus will be needed on sustainability, circular economy aspects, and to socio-economic effects associated with the massive and the terawatt-scale deployment.

The main role of EU-SOLARIS ERIC at CACTUS is the leadership of the work package entitled ‘Enhancing Research Infrastructures’, with a specific deliverable on ‘Best practice guidelines for climate-specific data quality collection for operation and maintenance of PV plants’.

More information can be found at the project web site [3].

2.2.2 Project EULAC ENERGYTRAN

The second project under the EULAC cooperation umbrella is **'EULAC ENERGYTRAN** - Research Infrastructures Cooperation for Energy Transition between European and Latin American and the Caribbean Countries'. ENERGYTRAN is coordinated by the ‘Organización de Estados Iberoamericanos’ (OEI) and it is a 24-month project, with official starting date on 1 January, 2024.

The general objective of ENERGYTRAN is to address the energy transition, as a common challenge, through the exchange, generation, and transfer of knowledge among EU and LAC research infrastructures from a multidisciplinary approach (technological, environmental, social) and to support the development of public policies and regulatory frameworks promoting a clean, sustainable and just transition of the energy sector to advance to a resilient society.

More specifically, this can be split into the following goals:

- The modernization of the technologies developed by the energy research infrastructures to supply solutions for a progressive electrification, integrating decarbonized and low emission energy carriers such as renewable hydrogen and lithium technologies.

- Fostering the scientific cooperation between the EU and LAC energy research infrastructures transferring the results to make energy transition a key perspective for the main stakeholders involved on the sector while ensuring it effectively takes place with an ethical and quality approach.

- Standing out the environmental dimension on the energy transition to make it compatible, to assure new energy sources are sustainable and environmentally friendly. making research and promotion of social methods and public policies to make the energy transition highly beneficial for societies – considering both territorial and international economic justice – by approaching it from an integral perspective.

EU-SOLARIS ERIC plays a very relevant role in this project, leading the two work packages related to energy technology:

- Work Package 1: Mobilities for Technology
- Work Package 2: Research and innovation actions for technology

More information can be found at the project web site [4].

2.2.3 Project RISEnergy

Another initiative within the Research Infrastructures Work Program 2023-2024 focuses on **'Research Infrastructure Services to Enable R&I Addressing Main Challenges and EU Priorities',** where EU-SOLARIS ERIC participates as a partner representing the Concentrated Solar Thermal (CST) community in the **'RISEnergy** - Research Infrastructure Services for Renewable Energy' project.

RISEnergy is a 54 month-long project, with official starting date on 1 March, 2024. It is coordinated by the German Karlsruher Institut fuer Technologie (KIT).

The main objectives of RISEnergy are:

- To enable research and innovation to increase energy efficiency and reduce the cost of energy technologies, to foster wider use of renewables into energy systems through proactive innovation management. Provision of a single entry point with tailor-made access roads for academics, industry, and SMEs, and advising RI providers, all access Users, and policy makers on LCA, ICT development and networking issues.
- To provide efficient transnational access (TNA) to facilities to support renewable energy technologies and systems and to provide more than 2,500 days of access to major 87 European and international world-leading analytical facilities.
- To reach out to all stakeholders performing research along the value chain, from materials and technology development to applications in the eight most relevant fields of PV, CSP/STE, hydrogen, biofuels, offshore wind, ocean energy, integrated grids, and energy storage, research infrastructure providers and policy makers;
- To provide comprehensive services of unprecedented quality, like new cross-RI services, a single entry point, tailor-made access roads for academia, industry, and SMEs with a particular focus on scientists from research fields in which the use of research infrastructures is not yet established.

EU-SOLARIS ERIC is a full partner in RISEnergy, with a strong implication in the delivery of trans-national access to CST-related research infrastructures. The access is to be provided by several of the R&D institutes involved in the EU-SOLARIS partnership namely: CNRS, DLR, CyI, UEVORA, LNEG, IMDEA and CENER participate as affiliated entities in this project.

More information can be found at the web site [5].

2.2.4 Project SOLARIZE

Lastly, EU-SOLARIS ERIC oversees the '**SOLARIZE - Bringing EU-SOLARIS to its Zenith'** project, a 42-month initiative valued at €4.7 million, falling under the 'Consolidation of the RI Landscape - Individual Support for Evolution and Long-term Sustainability of Pan-European Research Infrastructures' destination.

SOLARIZE is a 42-month project, involving 12 partners from 8 countries (see map), coordinated by EU-SOLARIS ERIC, with starting date on 1 July 2024.

This project involves the participation of all countries within the ERIC since its inception, aiming to advance the long-term sustainability and evolution of EU-SOLARIS to its fullest potential.

Figure 1. *The SOLARIZE project partnership*

These are the three general objectives the consortium is pursuing through SOLARIZE:

- Strengthening of EU-SOLARIS ERIC (Internal): Providing the ERIC with internal resources to achieve a stronger position based on a wider base of members, a clear scientific agenda and a realistic business strategy

- Positioning of EU-SOLARIS ERIC (External): Position the ERIC in the World, providing it with a presence in the media but also reinforcing its interaction with the various stakeholders: industry, research community worldwide, funding entities and potential new members

- Provision of Enhanced Services: Offering improved access services and a new e-infrastructure to meet the new open access policy requirements and enhance interoperability among the partners

3. THE STRATEGIC PLAN 2023-2026

As specified at the statutes (Art. 28.3-e) of EU-SOLARIS ERIC, the Managing Director is charged with the preparation of a Strategic Plan for the ERIC. The current version of it was approved by the General Assembly on November 2023.

Taking into account that EU-SOLARIS ERIC was formally approved by the European Commission on October 2022 and that its governing bodies were established just on January 2023, the list of strategic objectives should begin with a modest approach in this very first issue

of the Strategic Plan, focusing on the consolidation of the institutional framework and on the acquisition of further resources to expand the portfolio of activities in a consistent and sustained manner.

This is the list of strategic objectives for the first half term, covering years 2023-2024:

1. Achieve full development of the ERIC institutional framework, which includes all governance and advisory bodies and the National Nodes. Develop all necessary policies and related operational procedures.

2. Establish and consolidate an annual call for internally funded projects focused on topics of common interest for the partnering research infrastructures, according to the list of topics described in the section 'Tasks and Activities'.

3. Adopt the celebration of the annual 'Doctoral Colloquium' and 'Summer School' events, established at the former SFERA projects, to keep going with them in year 2024 and beyond.

4. Review and update the catalogue of solar facilities available at the Member & Observer countries plus the portfolio of technical services related which are offered by all R&D institutes affiliated to the National Nodes.

5. As an e-infrastructure has been already designed under the umbrella of the SFERA-III project [6], the goal is to get the necessary external funding to set up its central node at the ERIC's Central Hub and, at least, one of its secondary nodes in one of the partners' leading research centers.

6. Establish and consolidate a regular participation of the ERIC in EU-funded calls in order to achieve external funding necessary to expand the range of activities and services offered to the users, in particular, free access to the test facilities according to scientific merit criteria.

7. Strengthen the interaction with industrial stakeholders with the aim to steer the progress on the RI level to the requirements of the industry, thus enabling a sustainable innovation ecosystem and a closer collaboration to assist European industry to lead the CST sector.

8. Promote the enlargement of the membership. Some European countries have participated in former stages of the EU-SOLARIS creation process, though they have not joined at last for different reasons.

This reference document will be discussed by the General Assembly and duly updated by the end of year 2024, according to the results achieved in the 2023-2024 period. A new version setting the goals for the period 2025-2026 will be then released.

Data availability statement

This submission is not based on research data.

Author contributions

All co-authors: Writing - Review & Editing.

Competing interests

The authors declare that they have no competing interests.

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