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EU-SOLARIS: The European Research Infrastructure Consortium for CSP Technologies

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Abstract. After many years of fruitful collaboration in the field of research infrastructures (RIs) for concentrated solar power/solar thermal energy applications, several European countries decided to apply to the European Commission to go a step forward and create a European Research Infrastructure Consortium (ERIC), a new legal form of association which poses a number of advantages in the endeavour for a further development of this technology in Europe at all levels.

This new consortium, EU-SOLARIS ERIC, is likely to be legally implemented in October 2022, after a long negotiation and evaluation process, where the support of the respective Governmental research agencies of the countries involved has been crucial.

EU-SOLARIS ERIC will be a legal entity and its main goal will be the improvement of the interoperability, accessibility and quality of services provided by the existing European research infrastructures to the CSP/STE research communities and industrial stakeholders.

Although the current Members of the EU-SOLARIS consortium are Germany, France, Cyprus and Spain (Statutory Seat at Plataforma Solar de Almería, Spain), plus Portugal as an Observer, it is open to any other country willing to participate as Member or Observer.

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

1. The establishment of the European Research Infrastructure for Concentrating Solar Power

Starting from a long tradition of collaboration, in 2010 a set of European research centres that develop and operate research facilities dedicated to concentrating solar technologies began the development of the European Research Infrastructure for Concentrating Solar Power (EU-

SOLARIS), a distributed research infrastructure using a common legal form, a joint management board and one access point for users, targeting the integration and coordination of research and development activities in concentrating solar technologies and related applications. As a result, EU-SOLARIS was included in the 2010 Roadmap of the European Strategy Forum on Research Infrastructures (ESFRI) [1].

A preparatory phase, partially funded by the European Commission between the years 2012 and 2016 (ref. FP7-CP-CSA-Infra, Grant agreement 312833) [2], carried out a relevant share of the work required to establish the framework of this joint infrastructure. After being included as "Landmark" in the 2021 ESFRI Roadmap [3], the process of establishing EU-SOLARIS is about to conclude in the coming weeks with the establishment of an European Research Infrastructure Consortium (ERIC) [4]. In the following subsections the concept of ESFRI and the ERIC legal figure are going to be introduced. Later, the main features of the EU-SOLARIS ERIC will be presented.

The 'ESFRI' initiative and the Research Infrastructure Roadmap

The European Strategy Forum on Research Infrastructures plays a key role in policy-making on Research Infrastructures in Europe. It was established in 2002, with a mandate from the EU Council to support a coherent and strategy-led approach to policy-making on research infrastructures (RI) in Europe, and to facilitate multilateral initiatives leading to the better use and development of RIs, at EU and international level.

The ESFRI's mandate can be summarized in the following bulleted list:

- establish a European Roadmap for Research Infrastructures for the next 10-20 years, stimulate the implementation of these facilities, and update the roadmap as needed;
- support a coherent and strategy-led approach to policy making on RIs in Europe;
- facilitate multilateral initiatives leading to a better use and development of RIs, with the ESFRI acting as an incubator for new initiatives;
- ensure the follow-up of implementation of already on-going ESFRI projects after a comprehensive assessment, as well as the prioritisation of the infrastructure projects listed in the ESFRI roadmap;
- implement the European Research Area (ERA).

ESFRI is composed of national delegates nominated by research ministers of EU countries and countries associated with Horizon Europe. It also includes a European Commission representative.

In 2006, ESFRI published its first roadmap for the construction and development of the next generation of pan-European RIs. The roadmap was updated in 2008, 2010, 2016, 2018 and 2021, to include projects and landmarks that intend to foster European leadership across a broad range of scientific fields.

2. The 'European Research Infrastructure Consortium' (ERIC) legal figure

The European Research Infrastructure Consortium (ERIC) is a specific legal form that facilitates the establishment and operation of Research Infrastructures with European interest (European regulation EC 723-2009). It allows the establishment and operation of new or existing RIs on a non-economic basis, though an ERIC can carry out some limited economic activities related to this task.

An ERIC becomes a legal entity from the date the European Commission decision setting up the ERIC takes effect.

a. Advantages of an ERIC

The main advantages of an ERIC over other legal figures for joint RIs management are:

- a legal capacity recognized in all EU countries;
- flexibility to adapt to specific requirements of each research infrastructure;
- a faster implementation process than creating an international organization;
- exemptions from VAT and excise duty;
- the possibility to adopt its own procurement procedures, respecting the principles of transparency, non-discrimination and competition.

b. Requirements for an ERIC

The ERIC status is granted by the European Commission (EC) against a request that must be submitted by a consortium of countries, led by one of them where the statutory seat is established. The request follows a two-step process and include:

- a formal request to the EC to set up the new ERIC;
- the definition of the new ERIC statutes, which must contain the provisions governing the ERIC, notably its tasks and activities, the rights and obligations of its members, the bodies of the ERIC and the principles covering the different policies to be implemented by the consortium.
- the technical and scientific description of the research infrastructure to be established and operated by the ERIC.
- the declaration by the host state recognising the ERIC as an international body and international organisation within the meaning of the directives on VAT and excise duties.

Beyond the aforementioned formalities, the proposed ERIC must meet the following requirements:

- it must be a European joint-venture (also allows the participation of countries from outside Europe);
- the infrastructure is necessary to carry out research programmes and projects;
- it represents added-value in the development of the European Research Area (ERA) and significant improvement in the relevant scientific and technological fields
- effective access is granted to the European research community in accordance with the rules established in the statutes;
- it contributes to the mobility of knowledge and/or researchers within the European Research Area (ERA);
- it contributes to the dissemination and optimisation of the results.

An ERIC can be used for establishing new research infrastructures or for operating existing research infrastructures which consider it useful to change their legal structure to become an ERIC. RIs may be single-sited or distributed.

3. The EU-SOLARIS ERIC

The following subsection describe the main characteristics of EU-SOLARIS ERIC, namely its current members, its purpose and strategic objectives, the main activities to be developed in the near future and its organization scheme.

a. Current membership

The current Members of the EU-SOLARIS consortium are Germany, France, Cyprus and Spain (Statutory Seat at Plataforma Solar de Almería, Spain), plus Portugal as an Observer (temporarily, aiming at becoming a full Member).

It is envisaged the establishment of National Nodes (see Figure 2) where all RI-related research institutes of a country will be invited to take part in EU-SOLARIS activities. Meanwhile, the institutes leading this initiative are DLR (Germany), PROMES-CNRS (France), CYI (Cyprus), LNEG & UEVORA (Portugal) and PSA-CIEMAT (Spain).

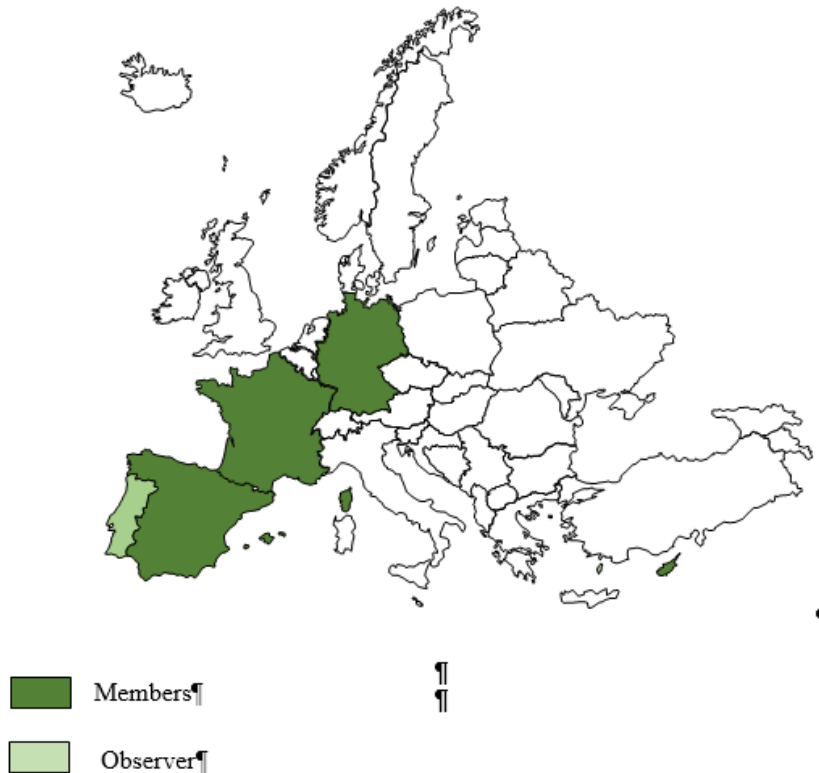


Figure 1. Current membership of EU-SOLARIS.

b. The vision

To become the European reference research infrastructure in the technological development of Concentrating Solar Power/Solar Thermal Electricity (CSP/STE) and related applications: production of electricity, solar chemistry and thermochemistry, materials, desalination and brine management, water treatment, energy storage, process heat, etc..

c. The mission

To offer the most favourable conditions for the development of CSP/STE technologies and the deployment of advanced pilot projects for the scientific and industrial communities.

d. Strategic objectives

EU-SOLARIS ERIC has established a set of strategic objectives to be pursuit during its activity:

1. To coordinate, as a unique infrastructure of distributed character, main existing R&D installations in Europe, providing the most complete and high quality scientific infrastructure portfolio at international level to the CSP/STE sector;
2. To offer, to research communities and industrial stakeholders, a single User Entry Point where highly specialized facilities, resources and research services are effectively and optimally offered to users demanding CSP/STE related services;
3. To reinforce the collaboration between the scientific institutions, academia and industry, also fostering the collaborative research among main European research centres of the sector;
4. To identify new requirements for the improvement of the research facilities, and for the construction of new ones (when needed), also optimizing and promoting the specialization of existing ones, avoiding unnecessary technological duplication and repetition;
5. To identify and establish the best research and experimental practices, leading and coordinating the open dissemination of results and experimental data, contributing to the reinforcement of the European leadership position at an international level;
6. To maintain Europe at the forefront and leadership of CSP/STE technologies development.

4. EU-SOLARIS ERIC model

The following features define the model and operating characteristics of EU-SOLARIS ERIC organization:

1. Main EU-SOLARIS ERIC activity will be the improvement of the interoperability, accessibility and quality of services provided by the existing RIs to the CSP/STE research communities and industrial stakeholders.
2. EU-SOLARIS ERIC will operate on the basis of a non-profit entity.
3. The organization shall coordinate the use of the research facilities in the distributed infrastructure and coordinate plans for their upgrade and new investments.
4. The organization shall assure that access to the RIs is granted to European researchers on a scientific merit basis.
5. The organization shall, furthermore and within its means and competence, support the owners of the research facilities in their endeavours to enhance the operations of their facilities, their upgrading and the creation of new facilities.
6. The Central Hub will be sited in Spain, with National Nodes established in all of the member countries

a. Main activities

EU-SOLARIS will have two layers of activities. The first include core activities, to be carried out with the basal funding provided by the Members through an annual fee:

- Promotion and coordination of access to the members' R&D infrastructures to address specific high quality research.
- Joint definition and standardization of common testing protocols, procedures and methodologies with regard to the qualification of components and subsystems, improvement of measurement devices and other services.
- To promote and coordinate mobility and staff exchange actions/activities to deeper advance in the partners' integration process.
- Optimization of similar existing research facilities by promoting the differentiation among them and fostering the specialization of involved laboratories.
- Coordinating the provision of sectorial inputs to reference European stakeholders, i.e. EC, SET-Plan, EERA (European Energy Research Alliance), Member States and Industry Associations, with regard to research agenda, prospective assessments, etc.

The second layer of activities include topics to be addressed with external funds, when available:

- Development and implementation of an e-infrastructure interconnecting the already existing research facilities.
- Identification and promotion of joint development of new facilities, when needed.
- Continuous monitoring of the industry & research needs for R&D infrastructure and research agenda in general.
- Annual Summer School / Training Network for Pre-Doc students.

b. Functional organization

The overarching legal structure of EU-SOLARIS ERIC is outlined in the ERIC Statutes, whilst the functional organization structure is shown in the chart below.

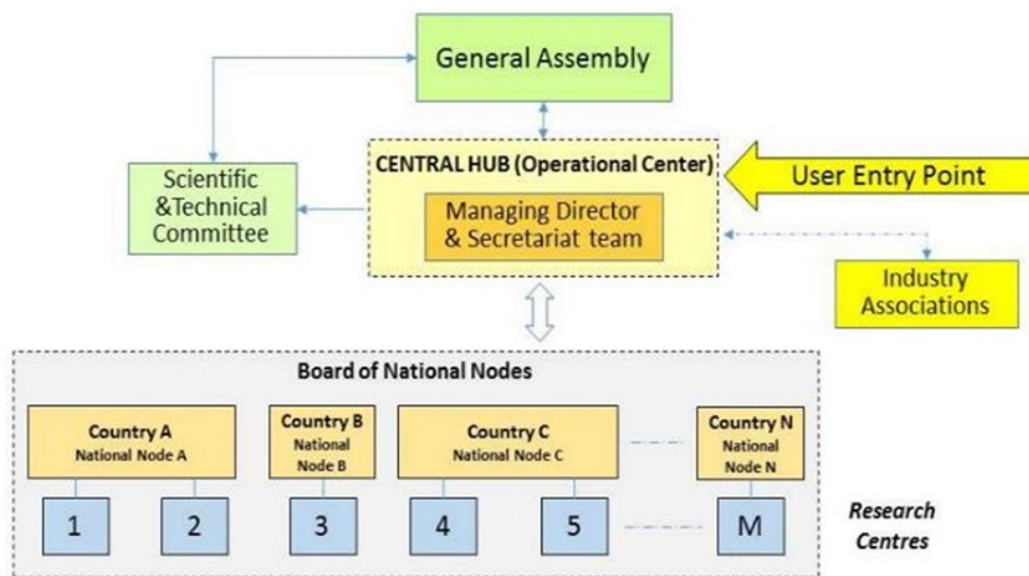


Figure 2. EU-SOLARIS ERIC functional organization structure.

There will be a single **User Entry Point** for EU-SOLARIS ERIC's users/applicants through a Central Hub (the operational centre located in Plataforma Solar de Almeria, Spain), with centralized and common proposal evaluation and access procedures.

i. EU-SOLARIS ERIC' governing bodies

The ERIC shall be governed and administered by the General Assembly, which shall be composed of representatives of the Members and Observers of the EU-SOLARIS ERIC. The General Assembly is the EU-SOLARIS ERIC' supreme governing body, deciding on the matters required to accomplish EU-SOLARIS ERIC' purposes and objectives and also on any matters specifically reserved for the General Assembly in these Statutes.

The day-to-day activity will be coordinated by the Managing Director whom shall be the chief executive officer and legal representative of EU-SOLARIS ERIC under appointment by the General Assembly.

ii. EU-SOLARIS ERIC' advisory bodies and support committees

EU-SOLARIS ERIC' governing bodies shall be assisted by, at least, two advisory bodies as follows.

The Scientific & Technical Committee shall assist the General Assembly and shall have the following duties:

1. Supervise any report prepared by the Managing Director and his/her office on technical and scientific matters of interest for EU-SOLARIS ERIC, for the scientific community, for the industry and for society in general, in the framework of CSP/STE technologies
2. Carry out a scientific evaluation of EU-SOLARIS ERIC' activities on a regular basis
3. Periodically inform on EU-SOLARIS ERIC' evolution from a technical and scientific perspective, reporting directly to the General Assembly
4. Make proposals for repairs, refurbishment or improvements that it deems appropriate, to the Managing Director, to be analyzed by the General Assembly

The Board of National Nodes shall support the Managing Director in coordinating the application of the strategies approved by the General Assembly on a technical and scientific level, supervising the national scientific activities related to EU-SOLARIS ERIC and, in coordination with the Managing Director, should maintain coherence in EU-SOLARIS activities and collaboration amongst all of the involved CSP/STE research centres.

5. Current Status and Next Steps

The consortium expects a formal declaration by the European Commission very soon, likely next October 2022, then, a Constitutive Meeting will take place in Almería on 26-27 October. At that meeting the governing bodies will be formally established and the ERIC will begin operations, likely by beginning of year 2023.

6. Conclusions

- After long preparatory steps EU-SOLARIS ERIC will be legally implemented in October 2022.
- EU-SOLARIS will become the European reference research infrastructure in the technological development of CSP/STE (Concentrating Solar Power/Solar Thermal Electricity) and related applications.
- Main EU-SOLARIS ERIC activity will be the improvement of the interoperability, accessibility and quality of services provided by the existing European Research Infrastructures to the CSP/STE Research Communities and Industrial stakeholders.
- Although the current Members of the EU-SOLARIS consortium are Germany, France, Cyprus and Spain (Statutory Seat at Plataforma Solar de Almería, Spain), plus Portugal as an Observer, it is open to any other country willing to participate as Member or Observer.

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All co-authors: Writing - Review & Editing.

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