

The EERA Joint Programme on Concentrating Solar Energy

Position Paper March 2017

1. Objectives of CSP/STE research community

Concentrated Solar Power (CSP), also called Solar Thermal Electricity (STE), is expected to play a relevant role in any future energy scenario because of its capability of base load behaviour and in general its dispatchability due to the possibility of integrating thermal energy storage. As it is done in other EU-based frameworks, the collaboration between research and industry is an essential condition to maintain at the same time the impact of EU-industries in the market and the potential to develop the next generation technologies. In this context, the most important objectives for the CSP/STE research community, well and efficiently organized within the EERA Joint Programme on CSP, fully aligned with SET-Plan policy targets, and in particular with SET-PLAN targets on CSP, are:

1. **Supporting the STE industry**, in the short term, to achieve significant cost reductions, to increase commercial deployment worldwide and, in the medium term, through the integration of national and European road-maps.
2. **Clustering of European R&D activities on CSP/STE** to develop exploitable breakthrough technologies, novel concepts and innovative configurations enabling improvements in system efficiency and final cost. Significant effort will be devoted to Thermal Energy Storage (TES) as a means to provide low carbon base-load and backup power.
3. **Defining a limited and clear priority of scientific and technological targets/challenges** in each current CSP/STE technology (JP-CSP Sub-Programmes) for the effective cost reduction and increase benefits in social and environmental impact.
4. **Increasing the integration of CSP into the energy system** through cost-effective solutions supporting the decarbonisation of all main energy sectors, including residential/industrial process heat applications and transport through thermal and chemical storage (thermochemical production of solar fuels, power-to-gas, power-to-liquids).
5. **Addressing all previous challenges in the context of aligned European and Member States Research and Innovation objectives** to leverage the research potential and optimise integrated resources in the CSP/STE field at European level.

Coordination of action at the EU level is necessary because none of the EU research centres gathers all the skills necessary to properly address all indicated challenges. At the same time, this coordination of action forces and engenders the synergetic cooperation, the open exchange of ideas and the share of human, material and R&D infrastructure resources, which are the key to foster the innovation process to accelerate the desirable decarbonisation of the energy sector and sustainable economic development. So far, Europe is still a technological leader in this sector, but this situation could quickly change due to the ambitious initiatives recently launched in other world regions (China being the most remarkable one).

In this context, the contribution of the EU R&D sector is essential to achieve the necessary cost reduction as well as the generation of new and breakthrough concepts and configurations enabling improvements in system efficiency. CSP/STE research requires, on one side, high-level

material and human resources covering a wide range of competences and, on the other, complex and large research infrastructures, both aspects being essentially not available to most industries. CSP/STE has still large room for improvement from on-site quality control and monitoring systems in commercial power plants to the development of new promising concepts (i.e. new cycles and innovative storage systems). Both technological developments have to be driven mainly by R&D centres with the advice of industry to avoid misalignment of key targets. To reach the most effective cost reduction it is necessary to foster and promote joint efforts and resources from all perspectives (R&D centres and Industry)

2. The current role of EU CSP/STE research community

Since the formal launching of the EERA JP-CSP in 2011 and the posterior achievement of STAGE-STE Integrated Research Programme (IRP) in 2014, the cooperation and integration of EU R&D community has achieved a remarkable progress up to levels never seen before. In this 5-years period the main achievements and contributions were the following:

1. **Greater cohesion in the CSP/STE sector**, with stronger links and fruitful communication channels between R&D centres and industry as well as fluent interaction with all sector stakeholders when taking decisions and analysing options, as demonstrated by the quick and effective input provided with regard to the Implementation Plan to SET-Plan CSP/STE defined targets achievement.
2. **Identification of a very large number of relevant R&D organizations** in Europe that have actively contributed to the progress of CSP/STE technology, increasing the number of active countries and partners involved in the field beyond the traditional ones.
3. **Identification of core capabilities and competences** of all previous organizations making possible the starting of a natural process of clustering and specialization around specific technological topics and reinforcing collaboration opportunities between R&D centres and industry.
4. **Creation of an efficient collaborative group at the European level** in the field of CSP/STE research, with a broad vision and visibility actively supporting and favouring the integration of National and European research efforts and objectives.
5. **Creation of a wide network with strong links with industries and international actors** to promote synergetic international cooperation and create market opportunities for EU industry.
6. **Achievement and successful launching of both IRP and ECRIA** initiatives.

All these successful achievements can be translated into the corresponding strengths of the JP-CSP and added to the ones associated to the exchange of knowledge, personnel and sharing of resources and infrastructures to define the current profile of the community, which has become the reference and representative forum of the whole EU R&D sector on CSP/STE, providing a common voice to the different stakeholders (industry, Commission, Member States, etc.).

However, relevant bottlenecks and drawbacks are also present and urgent actions are necessary to address them. Among them, the most important is the complete absence of commercial CSP/STE projects in Europe, which is severely threatening the viability of the whole industrial sector; with regard to this, the execution of the previously indicated “Implementation Plan” would be an important help. In addition, the collaboration within the CSP/STE community is far from being consolidated and additional progress should be made to:

- a) reinforce collaborative networks and knowledge sharing;
- b) consolidate the achieved collective intelligence;
- c) strengthen the alignment of European funds;
- d) intensify research activities to achieve the cost reduction needed in a short-term.

In this context the finalization of IRP STAGE-STE activities are seen with great concern due to the important risk of a partial or complete return to the situation of 2011 (before the launching of JP-CSP) with a significant risk of regression within the previously mentioned topics. The support of EU funding was of paramount importance to boost integration and progress of research activities and the discontinuity of such a support can jeopardize those achievements, in particular in a moment of difficulty for the CSP/STE industry at domestic level, and promising opportunities in foreign markets. The recent programme launched in China is starting to promote a clear transfer of engineering background and design capacities from European to Chinese companies that may produce a situation equivalent to that experienced by PV in the past. Therefore, the EU support to R&D is particularly necessary in this moment in order to keep the sector alive and progress on research to exploit these opportunities.

3. Future vision and challenges

Any future vision (next 10 years) for the CSP/STE sector can only be associated with an effective and strong European leadership at both R&D and industrial levels. To achieve this vision continuous cooperation, collaboration and coordination of all involved stakeholders at both national and European levels is necessary, moving alongside common targets and objectives. The major challenges to the achievement of this vision are:

- ✓ **Secure and long lasting European energy policy** (including at both the national and regional levels), supporting the promotion of global initiatives in the area: RTD actions, demonstration and implementation of large scale systems. This should attract industry and investment to the sector.
- ✓ **Political commitment to open EU frontiers and support a flexible energy transmission** and distribution, opening energy (i.e. electricity) flow and consumption networks. To allow for wider RES penetration in the energy sector there is a need of an overall and integrated EU grid management. Moreover, penetration margins over 30 to 40 percent would get the most from dispatchable renewable energy (like CSP/STE).
- ✓ **To foster and consolidate European industrial players with worldwide competitiveness in the field** while developing in Europe advanced and novel solutions for STE plants, matching costs and efficiency targets.



- ✓ **Providing opportunities for disruptive technologies** and new systems adapted for suitable integration into the European energy domestic sector and within the strategy of accelerating clean energy innovation.
- ✓ **Providing opportunities for flexible technologies** with higher capacity for fast implementation in global markets.

Overcoming such challenges first depends on a suitable policy environment across the EU. Then on an agreement among the RTD sector, regarding medium and long term visions, to present coherent proposals for policy makers at European and National levels. This agreement can be reached, also including industry. Useful tools to address the previous challenges are a mix of focused collaborative projects allowing components and systems development, and integrated projects that enable to define common strategies. With regard to this, the usefulness of current existing instruments for alignment of national programmes and resources (mainly ECRIAs and ERA-NETs) is limited, as they cannot adequately support the integration and long-term cooperation of research communities due to the usual limitation of available funds and the administrative complexity (in the case of ERA-NETs).

Therefore, in addition to the above mentioned instruments, a similar tool such as the highly successful IRP STAGE-STE (2014-2018) is proposed to keep up with its important role to support the success of the CSP/STE sector.