



▶ SET Plan Concentrated Solar Thermal Technologies Implementation Plan

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CSP-Implementation Working Group

BACKGROUND

- The EU's Strategic Energy Technology Plan (SET) Plan is a key instrument to boost the transition towards a climate-neutral energy system through the development of efficient low-carbon technologies in a cost-competitive way.
- Established in 2007, since the creation of the ENERGY UNION in 2015, it has played a central role in implementing its research, innovation and competitiveness dimension.
- The SET Plan activities are clustered into 10 actions for R&I that address the whole innovation chain, from research to market uptake, and are implemented by 14 Implementation Working Groups (IWGs).

Nº 1 in Renewables

Key Actions 1&2:

1. Reduce cost
2. Improve performance

CSP-IWG

- Declaration of Intent (DoI) endorsed end 2016
- **Implementation Plan (IP) endorsed in Nov 2017**

COMPOSITION

- **SET Plan countries:** Spain (chair), Germany, Italy, Portugal, Turkey, Belgium, Cyprus, France, Greece
- **European Commission**
- **ESTELA** - European Solar Thermal Electricity Association
- **EERA JP-CSP**
- Other entities: SOLAR HEAT EUROPE; EU-TURBINES,...



2023 Updated IP-CST

WHY?

- to align targets and related R&I activities with the new energy policy context: EU Green Deal, REPowerEU, and other relevant policies,
- to adapt initial targets to a new timeframe (2030), and to redefine R&I activities,
- to include two new CST-related targets not considered appropriately in other IWGs, i.e. solar heat for industrial processes and solar fuels.

February 2023 Updated Implementation Plan in Concentrated Solar Thermal Technologies

CONTRIBUTION FROM CST TO THREE SECTORS:

Electricity

- ✓ Main asset of CST plants for **electricity systems** is achieved by integrating large high-temperature thermal storage systems (standard storage capacity between 7 and 12 h/day), offering **flexibility to the electricity system** by being capable of supplying large amounts of **synchronous power** at any time (day and night) and **dispatchable renewable electricity**.

Industry-H&C

- ✓ CST technologies can provide and store medium and high temperature **heat for industrial processes** (any temp level up to 600 °C) and high-capacity factor using TES.

Transport

- ✓ CST has also great potential in harder-to-decarbonise areas, in the mid/long term, by developing **new “solar” fuels** (“Green” hydrogen derivatives), allowing an efficient carbon-free operation at constant load and at high-capacity factor.





2023 Updated IP- targets

1. **Cost reduction** of electricity provided during periods with low wind, PV or hydropower infeed, **to values below 15 c€/kWh in Southern Europe locations by 2025**, targeting below **10 c€/kWh by 2030**, considering 2050 kWh/m²/year as reference conditions and no constraints regarding the size/type of the plant and Power Purchase Agreements (PPA) with a duration of at least 25 years.
2. Development of the next generation of CSP/STE technology (NEXTGEN) to achieve **at least 3 points of increase in the overall power plant efficiency** from the reference value 39.4 percent to 42.4 percent by 2025.
3. **At least one First of a Kind (FOAK)** integrated in the energy system **by 2025**, demonstrating either the cost reduction or the efficiency increase.
4. **Thermal energy cost** for industrial process heat applications **below 3 c€/kWh by 2030** for the same Southern Europe locations as the target 1, with process temperatures higher than 200 °C and 25 years' lifetime.
5. Demonstration of 24/7 economically viable **solar thermal baseload production of green hydrogen** and other solar fuels **by 2030**.



2023 Updated IP-R&I activities

Areas of activity	Defined R&I activities of current IP
1. Line-focus solar power plants technology	Activity 1.1: Process innovation and cost optimization for molten salts systems Activity 1.2: Solar collector fields with silicone oil as HTF
2. Central Receiver power plants technology	Activity 2.1: Improvement and optimization of current central receiver molten-salt technology Activity 2.2: Innovative concepts for central receiver molten-salt technology Activity 2.3: Solar tower with particle receiver technology
3. Reliable and cost-effective heat transfer medium and high-temp. thermal storage systems	Activity 3.1: Single molten salt thermocline Activity 3.2: Next generation of Thermal Energy Storage technologies
4. Turbomachinery developed for specific conditions of solar thermal power plants	Activity 4.1: Development of expansion turbine technologies for advanced CSP power blocks Activity 4.2: Development of turbomachinery for supercritical CO ₂ cycles
5. Medium-and high temp. systems for industrial solar heat applications	Activity 5.1: Medium temperature systems for industrial solar heat applications Activity 5.2: High temperature solar treatment of minerals and metals
6. Thermochemical production of solar fuels and hydrogen	Activity 6.1: Liquid synthetic fuels from solar redox cycles Activity 6.2: Solar fuels from carbon neutral feedstock Activity 6.3: Solar particle receivers/reactors for solar fuels production
7. Cross-cutting issues	Activity 7.1: Digitalization of CSP plants for a more efficient monitoring, operation and maintenance Activity 7.2: Innovative coatings for CSP mirrors Activity 7.3: Reliable CSP, PV and other renewables integration Activity 7.4: CSP with thermal storage to facilitate variable RE penetration in the electrical system





2023 Other actions

- To expand the scope of the CST IWG, to address also non-concentrated solar thermal technologies. Starting March.
- Net-Zero Industry Act (NZIA) and the Critical Raw Material Act (CRM), proposals. March.
- The preparation of a Solar Energy Joint Research Agenda, an action included in the EU Solar Energy Strategy of 18 May 2022. The agenda will promote the R&I priorities defined by the PV and CST IWGs and develop crosscutting issues that are relevant for the whole solar energy sector. Workshop held in July.
- The revision of the SET Plan, being its Communication adopted on 20th October 2023. the revised SET Plan will help harmonise the original SET Plan strategic objectives with the European Green Deal, REPowerEU and the Green Deal Industrial Plan, notably the Net-Zero Industry Act.





Thank you!

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