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## D6.2 Complete Dataset of Experimental Data

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**POLYPHEM**  
THE FUTURE OF SMALL-SCALE CSP PLANTS

# POLYPHEM

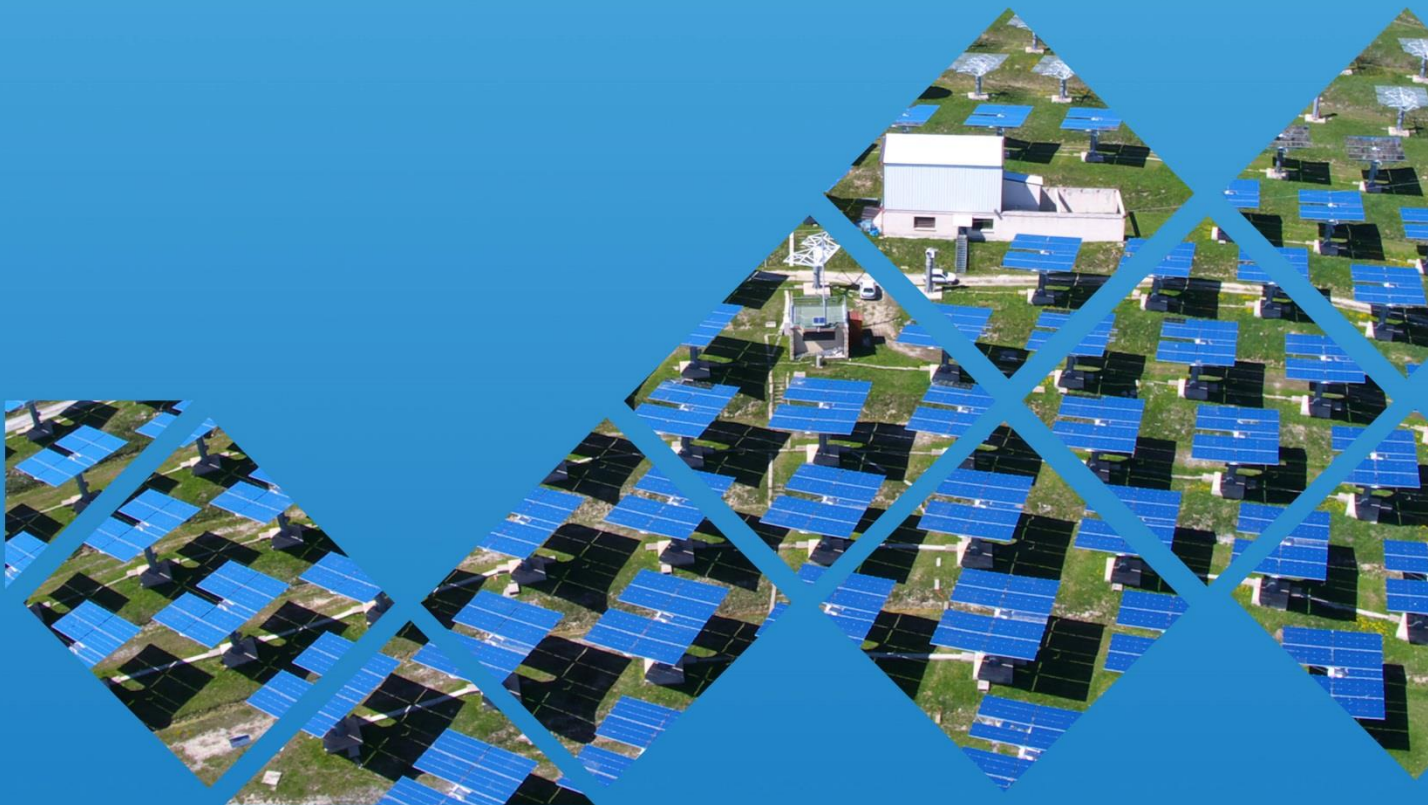
Small-Scale Solar Thermal Combined Cycle

## D6.2 Complete dataset of experimental data

Date of delivery 01/09/2022

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<b>SUMMARY</b>	<p>This document is the deliverable D6.2 of the project POLYPHEM. It reports on the results of the experimental part of the program of work, in the form of a complete dataset of experimental data.</p> <p>At the end of the period of validity of the Grant Agreement, the experimental part of the program could not be started, because the installation of the plant was not completed. Consequently, no experimental data could be obtained.</p> <p>The experiment of the plant is scheduled to be started from 17 October 2022, when the construction is finished and the TES and ORC are commissioned.</p>
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*Background: about the POLYPHEM project*

<b>FULL TITLE</b>	<b>SMALL-SCALE SOLAR THERMAL COMBINED-CYCLE</b>
<b>Acronym</b>	<b>POLYPHEM</b>
<b>Call identifier</b>	H2020 LCE-07-2017-RES-RIA-TwoStage
<b>Instrument</b>	Research and Innovation Action (RIA)
<b>Grant Agreement N°</b>	764048
<b>Starting Date</b>	01/04/2018
<b>Duration</b>	48 months
<b>Website</b>	<a href="https://www.POLYPHEM-project.eu">https://www.POLYPHEM-project.eu</a>
<b>Keywords</b>	Renewable electricity; Energy collection, conversion and storage; Renewable energy
<b>Additional keywords</b>	Concentrated solar power; Solar tower system; Combined cycle; Gas-turbine; Thermal energy storage; Organic Rankine cycle; Process control
<b>Beneficiaries</b>	CNRS, CEA, CIEMAT, Arraela S.L., Fraunhofer ISE, Kaefer SE, Orcan Energy, Euronovia, Aalborg CSP

The POLYPHEM project is a research and innovation action funded by the European Union's H2020 program. It is implemented by a European consortium of 4 research centres and 5 industrial partners. The aim is to increase the flexibility and improve the performance of small solar tower power plants. The concept of POLYPHEM consists in implementing a combined cycle formed by a solarized micro gas-turbine and a Rankine organic cycle machine, with an integrated thermal storage device between the two cycles. The need for cooling is minimal.

Developed from a patented technology by CNRS and CEA, the pressurized air solar receiver is integrated in the micro-turbine cycle. The thermal efficiency targeted for the receiver is 80% with a cost of 400 €/kW. The innovative thermal storage uses a thermal oil and a single thermozone tank with a technical concrete filler material.

The main expected impact of this project is to enhance the competitiveness of low-carbon energy production systems through the technology developed. The expected progress is a better fitting of electricity generation to variable local needs, an overall conversion efficiency of solar energy into electricity of 18% for an investment cost of less than 5 €/W and a low environmental impact. By 2030, the cost of electricity production targeted by the POLYPHEM technology is 165 €/MWh for an annual direct normal irradiation of 2600 kWh/m<sup>2</sup>/year (North Africa and Middle East) and 209 €/MWh under 2050 kWh/m<sup>2</sup>/year (Southern Europe). In addition to decentralized power generation, other applications are considered for the deployment of this technology used in poly-generation: industrial heat production, solar heating and cooling, desalination of seawater or brackish water.

A prototype plant of 60 kW<sub>el</sub> with a thermal storage of 1300 kWh is designed, built and installed on the site of the experimental solar tower of Themis in Targassonne (France). The objective of the project is to validate the technical choices under test conditions representative of actual operating conditions.

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### List of Acronyms and Abbreviations

Acronym/abbreviation	Meaning/full text
<b>ORC</b>	Organic Rankine Cycle
<b>TC</b>	Thermocouple
<b>TES</b>	Thermal Energy Storage
<b>URL</b>	Uniform Resource Locator

## 1. SUMMARY

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