CSP Data: a data discovery web application of commercial CSP plants

Javier Bonilla[1,2,a], Richard Thonig[3], José A. Carballo[4,2], Johan Lilliestam[3], Diego C. Alarcón-Padilla[5,2], Eduardo Zarza[5]

[1] CIEMAT-PSA. Solar Thermal Applications Unit. P.O. Box 22, E-04200 Tabernas, Almería (SPAIN)

[2] CIESOL, Solar Energy Research Center, Joint Institute University of Almería – CIEMAT. E-04200 Almería (SPAIN)

[3] RIFS – Helmholtz Centre Potsdam, Energy Transitions & Public Policy group, D-14469 Potsdam (GERMANY)

[4] CIEMAT-PSA. Point-Focus Concentrating Solar Thermal Technologies. P.O. Box 22, E-04200 Tabernas, Almería (SPAIN)

[5] CIEMAT-PSA. Linear Focusing Technologies Unit. P.O. Box 22, E-04200 Tabernas, Almería (SPAIN)

[a] Corresponding author: javier.bonilla@psa.es

1. Introduction

CSP Data (https://cspdata.com) is a free web application for data discovery of all commercial Concentrating Solar Power (CSP) plants. Researchers can use this application to study trends, identify patterns and highlight areas for improvement. Policymakers can use this application to monitor the growth of the CSP industry and make informed decisions about incentives and regulations. Investors can also use this application to get a general view of the field and identify promising projects. The goal of this paper is to explain the tools and information provided by *CSP Data* to potential users so they can use it efficiently.

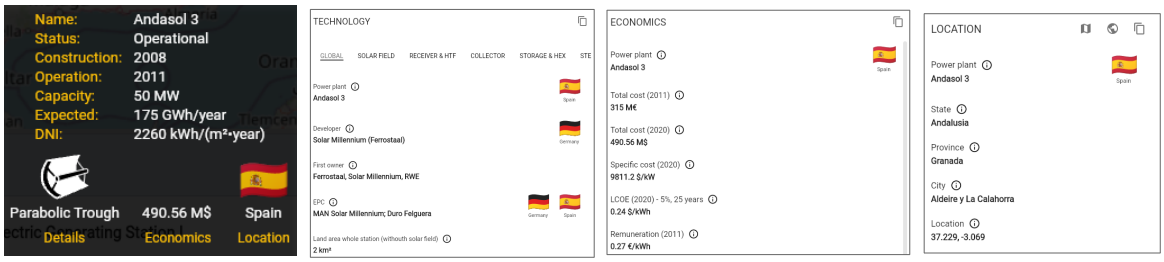
2. CSP.guru

CSP.guru [1] (https://csp.guru) is an open dataset of CSP plants of the world for energy modelers and analysts. This dataset holds technical, economic, financial, and industrial data on all commercial CSP plants. *CSP.guru* is periodically updated, the latest update dates to January 2023 [2]. For detailed description of the data collection procedure, please check [3]. Data is provided in different standard formats: Comma Separated Value (CSV) and Microsoft Excel extensible markup language format (XLSX). The dataset also includes a JavaScript Object Notation (JSON) file holding the metadata information. The license of this dataset allows to share and adapt it giving appropriate credit, under the Creative Commons Attribution 4.0 International (CC BY 4.0) license. *CSP data* web application is fed with *CSP.guru* data, and presents an easy, fast and convenient way of visualizing, filtering and exporting all information of CSP plants directly in the browser.

3. CSP Data

CSP Data (https://cspdata.com) shows all commercial CSP power plants in a map and a table. The map can be moved, reset, zoomed in and out (see Fig. 1). Map pinpoints are interactive, clicking on them will show a card with the summary of the selected power plant (see Fig. 2.a) and links to detailed information about the technology, economics and location of the power plant (see Fig 2.b - 2.d). The map pinpoint colors depend on the CSP technology as stated in the map legend.

Fig. 1: *CSP Data* map

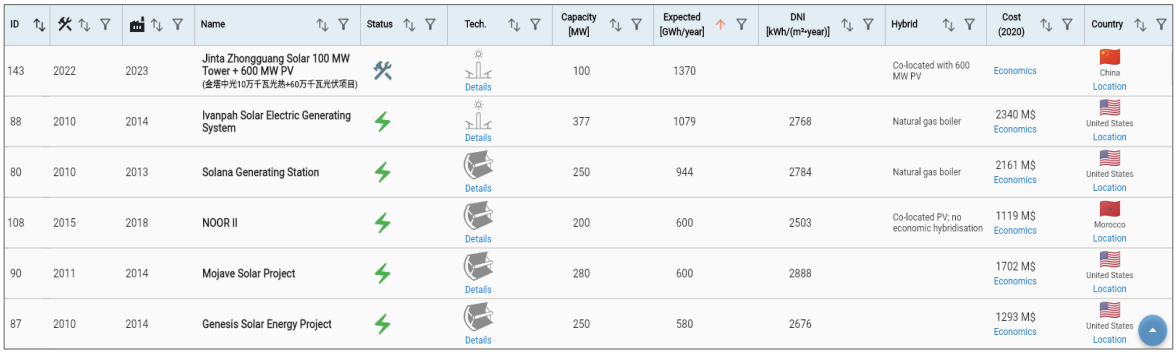


a. Summary card b. Technology c. Economics d. Location

Fig. 2: Power plant summary and details about technology, economics and location

The table is also interactive and contains links to the detailed information about each power plant previously mentioned (see Fig 2.b - 2.d). The columns displayed in the table are year of construction, year of operation, name, status, technology, capacity, expected production, kind of hybridization, total cost (deflated to 2020 dollars) and country of location.

When a row is selected, the map is zoomed in to the location of the power plant. The table can be sorted by any column, clicking on the arrows icon in the column header. It has also filtering capabilities. The data can be filtered by one or several columns with Excel-like filters: search, text and number filters. Filtered data in the table can be downloaded as a Microsoft Excel XLSX file.



ID			Name	Status	Tech.	Capacity [MW]	Expected [GWh/year]	DNI [kWh/(m²·year)]	Hybrid	Cost (2020)	Country
143	2022	2023	Jinta Zhongguang Solar 100 MW Tower + 600 MW PV (金塔中光10万千瓦光热+60万千瓦光伏项目)		Details	100	1370		Co-located with 600 MW PV	Economics	China Location
88	2010	2014	Ivanpah Solar Electric Generating System		Details	377	1079	2768	Natural gas boiler	2340 M$ Economics	United States Location
80	2010	2013	Solana Generating Station		Details	250	944	2784	Natural gas boiler	2161 M$ Economics	United States Location
108	2015	2018	NOOR II		Details	200	600	2503	Co-located PV; no economic hybridisation	1119 M$ Economics	Morocco Location
90	2011	2014	Mojave Solar Project		Details	280	600	2888		1702 M$ Economics	United States Location
87	2010	2014	Genesis Solar Energy Project		Details	250	580	2676		1293 M$ Economics	United States Location

Fig. 3: *CSP data* table

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References

[1] J. Lilliestam, L. Ollier, M. Labordena, S. Pfenninger, and R. Thonig (2021) The near- to mid-term outlook for concentrating solar power: mostly cloudy, chance of sun, Energy Sources, Part B: Economics, Planning, and Policy, 16:1, 23-41. https://doi.org/10.1080/15567249.2020.1773580

[2] R. Thonig, A. Gilmanova, & J. Lilliestam. (2023). CSP.guru 2023-01-01 (2023-01-01) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7798946

[3] J. Lilliestam, M. Labordena, A. Patt, and S. Pfenninger (2017). Empirically observed learning rates for concentrating solar power and their responses to regime change. Nature Energy 2, 17094. https://doi.org/10.1038/nenergy.2017.94