ORUGA® by sener

ORUGA® PERFORMANCE MODEL

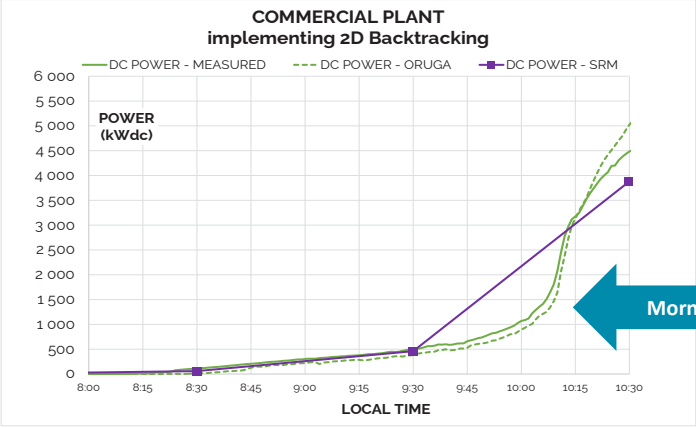
The state of the art in software for performance calculation of PV plants

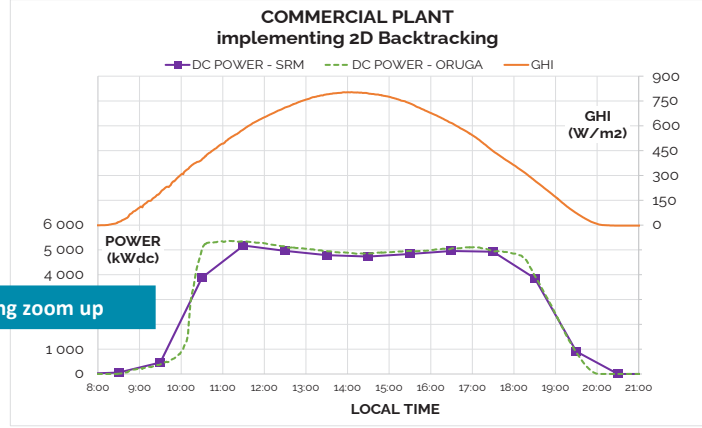
Certified by a Technical Advisor – Extremely accurate in 3D terrains

ORUGA® Performance Model is a commercial software that accurately predicts any PV plant performance overcoming the limitations of the Software considered as the Reference in the Market (SRM), especially on complex terrains:

FEATURE	Comments
Calculation of plants > 5 MWp considering actual 3D terrain	The SRM cannot consider I-V curves in a precise way when plants are larger than 5 MWp
Modelization of any tracker in the market on any 3D terrain	ORUGA® can simulate terrain-following trackers like IDEEMATEC, Nextracker XTR, ARRAY OmniTrack, PVH Infinity... in addition to "standard" tracker designs. Fixed structures as well
Proprietary 3D Backtracking algorithm	ORUGA® can predict plant performance applying Sener proprietary 3D Backtracking algorithm[1]
Up to 1 minute time-step	The SRM can only calculate in 1 hour time-steps
Complex wind stow strategies	ORUGA® can represent complex wind stow strategies and determine the corresponding loss in performance
Easy calculation of terrain influence on plant performance	Reduce uncertainty in the Business Model
Fast, precise calculations on 3D terrains	It takes just a few minutes to calculate a 100 MWp plant on a 3D terrain in ORUGA® considering I-V curves

ORUGA® Performance Model is certified by a technical Advisor[2,3] and cross-checked against thousands of hours of operation at commercial plants:





Morning zoom up



EXTREMELY ACCURATE IN 3D TERRAINS

ORUGA® Performance Model accurately simulates the electrical behaviour of the strings every minute.

The image shows a commercial plant in operation with 2D or flat Backtracking. The undulations of the terrain generate a lot of shadowing between rows, producing electrical losses.

These losses evolve throughout the morning depending on the operating conditions at each time step.

It can be seen how ORUGA® simulation accurately matches reality while the SRM deviates significantly from it.

[1] In addition, ORUGA® internal version at Sener can calculate plant production for any Backtracking algorithm on the market using as input data to the software the tilt angle of each tracker of the plant at each time step

[2] The Certificate is available for all potential Sener Clients interested in the use of ORUGA®

[3] For further information, read article *ORUGA® software PERFORMANCE MODULE - Comparison to the SRM*, June 23, 2023, available here: https://bit.ly/45h75CH

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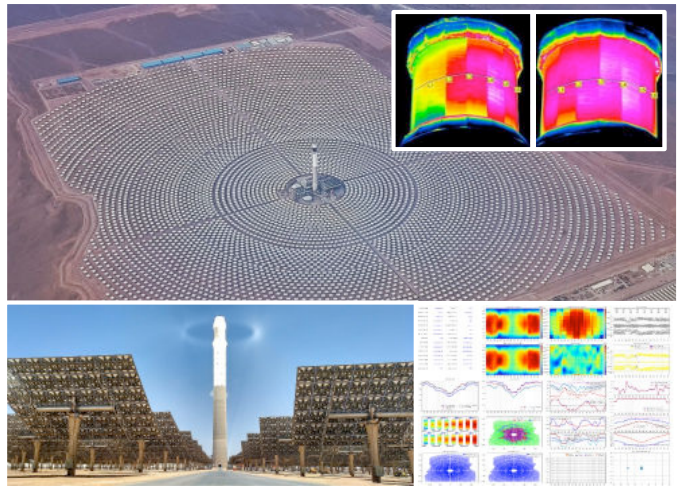
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ORUGA® Technology

ORUGA® Performance Model is based on the lessons learned in the solar concentration tower projects Gemasolar (Spain, 19.9 MW) and Noor III (Morocco, 150 MW), where Sener proprietary advanced control techniques are implemented.

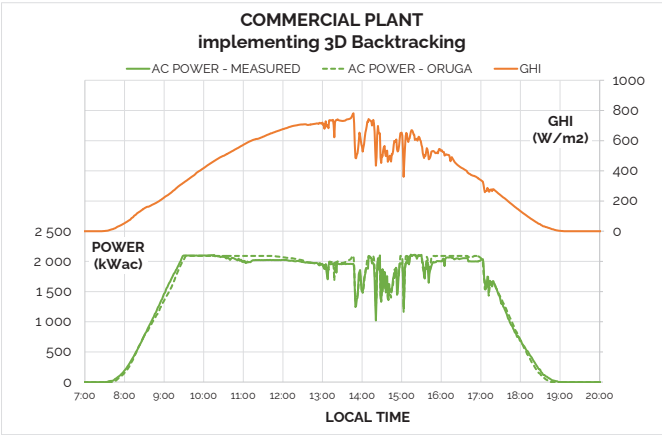
Specifically, a team from the Aerospace division has been the responsible for the development of the software required to simulate the behaviour of this type of plants, as well as for the testing and implementation of the control logic for the solar field of the tower plants, a major technical challenge in a technology that is an order of magnitude more complex than any photovoltaic plant.

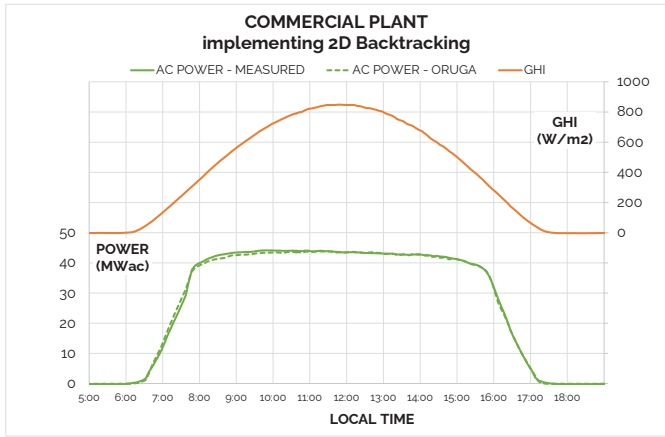
In both projects, Sener has met the expected values of annual production. This has been possible thanks to the extreme accuracy of its simulation software for solar concentration tower projects: SENSOL®, the precursor of ORUGA®.



Accurate simulations

The following graphs show a 1-minute-time-step comparison between real life and the corresponding simulation by ORUGA® Performance Model for a whole day in two different commercial plants (left: Spain, right: Brazil). It is clear that, even during cloudy periods, the difference between the measured data and the simulation is very small.





References

Developers, EPC contractors, O&M providers, Engineering firms and Technical Advisors are already using ORUGA® Performance Model to precisely simulate PV plants on complex terrains, thus reducing performance related uncertainties in the Business Model and benefiting from the implementation of ORUGA® 3D Backtracking algorithm in their projects.

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Want to know more? **orugaPV@sener.es**

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