ORUGA® software
CIVIL WORKS MODULE
3D DESIGN OPTIMIZATION

January 23, 2023

0. EXECUTIVE SUMMARY

ORUGA® software calculates precisely, automatically and realistically both Earthworks and Pylon Design for any given terrain and tracker (or fixed structure) in the market, at the same time optimizing the volumes to be moved at the plant.

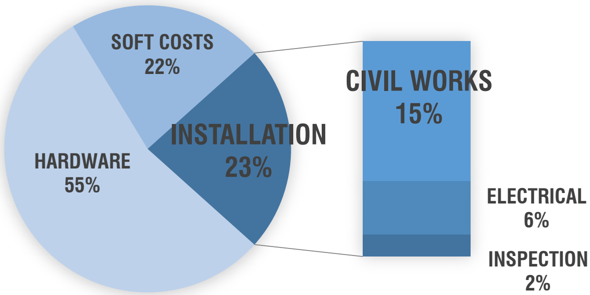
The software has been fully developed by the Digital Solutions team at Sener and pursues the reduction of uncertainties during design and investment phases of PV projects on complex orography terrains.

Furthermore, ORUGA® implements an iterative calculation mode in which it can manage thousands of design alternatives, evaluating accurately the CAPEX, OPEX and Electricity Production, hence determining the LCOE (Levelized Cost of Electricity) of each option. This way, ORUGA® can find the optimum design, which maximizes project profitability.

These new features represent a giant step forward with respect to the state-of-the-art software for Earthworks calculation. Some of them provide estimates far from reality while others require a considerable amount of time and experience, with no guarantee of volume optimization.

1. THE PROBLEM

The Civil Works of a PV plant on a complex terrain may drive project profitability due to its great influence on total CAPEX and, collaterally, on Plant Performance. The Civil Works encompass, amongst other things, the Earthworks (EW hereafter) and the installation of the pylons of the trackers or the fixed structures where PV modules are mounted.



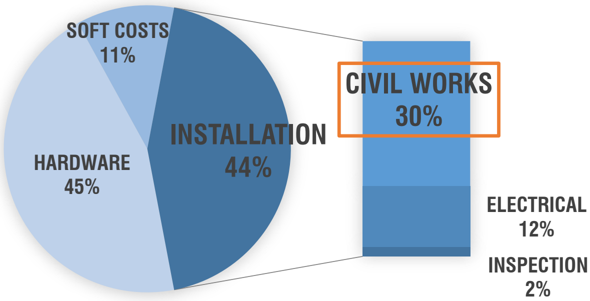


Fig. 1: Influence of Civil Works on project CAPEX. Flat terrain (left) and complex terrain (right). Source: IRENA[1]

Among these parameters, typically EW have a greater influence on the Civil Works of plants on complex orography terrains. EW volumes to be moved for terrain preparation in order to fulfil trackers (or fixed structures) design requirements in a 50 MWp plant may be as high as hundreds of thousands of m^3, rating 10 000 m^3 per installed MWp or higher.

In this case, assuming a cost of 4 EUR/m^3, only the EW of a 50 MWp plant on a complex terrain would be 2 MEUR, the 7% approx. of total CAPEX (30 MEUR).

[1] IRENA (2020), Renewable Power Generation Costs in 2019, International Renewable Energy Agency, Abu Dhabi. Comparison between USA and Japan

State of the Art

EW design for complex terrains, furthermore, **is not an easy task.** Better said, it is not easy to optimize or reduce to the maximum extent while fulfilling the tolerances for trackers (or fixed structures) installation and for final terrain preparation.

There are several software solutions in the market that assist the user in designing the EW of PV plants on complex terrains. These could be divided into 2 large groups:

1. Software dedicated to the global design of the PV plant, which include a module to estimate the EW of the project
2. Specialized software for terrain modelling

The first group have the disadvantage of giving estimates which greatly differ from reality or from the design that would be produced during detailed engineering phase[2].

The second, while precise and widely used not only in the PV Industry, do not optimize *per se* the amount of EW (this will depend on user's skills and experience) and require a considerable amount of time for their execution: typically, it would take 2 to 3 weeks to perform the complete EW calculation of a 50 MWp plant on a complex terrain, with no guarantee to achieve the minimum volumes.

To be noted also, final terrain configuration has a paramount influence on plant electricity production: **a complex terrain produces shadows between trackers, reducing plant performance** (see Fig. 2)[3].

Uncertainty in EW leads to uncertainty in plant performance calculation.

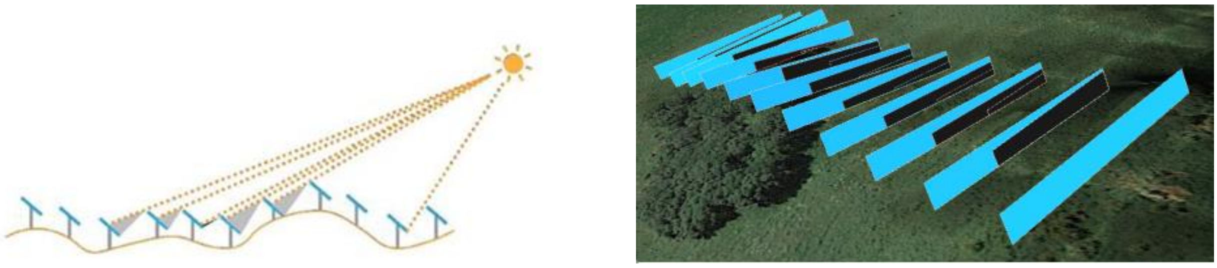


Fig. 2: Shadows between trackers due to terrain undulations

2. THE CONSEQUENCES

The lack of a reliable and fast EW calculation for a PV plant on a complex orography terrain **increases considerably the uncertainty and risks during Development and Construction phases of the project**. The following questions arise to our Clients (see ANNEX 2):

- As ***Project Developer***…
  - Can I offer a reliable energy price (USD/MWh), assuring long term profitability of my project?
  - Is the Business Model realistic?
  - Will the Technical Advisor for the Lenders accept the EW estimate I considered, together with the associated CAPEX?
  - Is plant performance estimate accurate for this terrain?
  - Am I fulfilling the requirements of the Environmental Impact Assessment?
- As ***EPC Contractor***…
  - Can I guarantee the CAPEX required by the Developer or is it unachievable?
  - Is the layout provided by the Developer constructible?
  - Can I offer an alternative layout to the Developer minimizing the CAPEX?
  - Which is the best tracker for this terrain?
  - What production level can I guarantee in this project, with such an undulated terrain?

[2] This is dealt in detail in section **¡Error! No se encuentra el origen de la referencia.**
[3] For further information, read article *ORUGA® software – PERFORMANCE MODULE*, November 25, 2022, available here

3. THE SOLUTION

ORUGA® calculates precisely, automatically and realistically both Earthworks and Pylon Design for any given terrain and tracker (or fixed structure) in the market.

ORUGA® was born in 2017 and has been developed in parallel to other tools for automatization and digitization of Engineering at Sener. It implements advanced algorithms for the **generation of continuous surfaces** (without embankments or steep slopes) within the plant site, meeting **2 essential targets**:

1. **Fulfilling trackers design tolerances:**
   a. North-South absolute slope
   b. North-South relative slope, between rows of the same tracker (dual row or multirow)
   c. East-West absolute slope
   d. East-West relative slope, between rows of the same tracker (dual row or multirow)
   e. Minimum pylon height
   f. Maximum pylon height

2. **Minimizing Earthworks**
   There are 2 options:
   a. Produce a specific Cut/Fill ratio (usually 50/50 or 55/45), or…
   b. Perform the EW that lead to the minimum cost of Civil Works based on the following parameters:
      - Cost of cut
      - Cost of fill
      - Cost of import (bring volume from outside the plant)
      - Cost of export (bring volume outside the plant)
      - Cost of foundation
      - Maximum volumes of import/export

To give an idea of the surfaces generated by ORUGA®, hereafter there is a **comparison of results to a Commercial Software** – ***which has a module to estimate Civil Works***, *see group 1 in section 1-State of the Art* – **for a 70 MWp plant**:

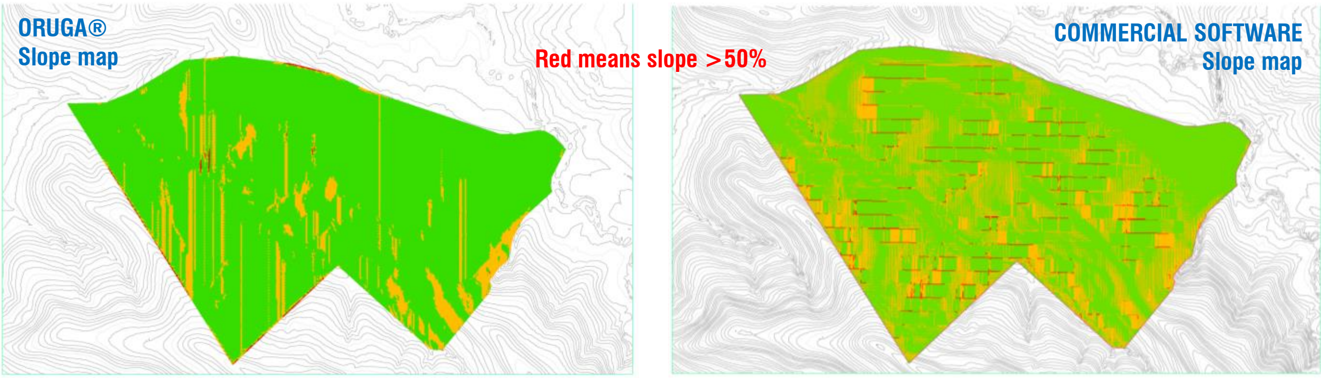


Fig. 3: Comparison of results between ORUGA® (left) and a Commercial Software (right) for a given layout (top right)

It can be clearly observed that **the Commercial Software generates a terraced surface, with numerous steep embankments.** The following figure shows this on a North-South cross-section of the terrain:

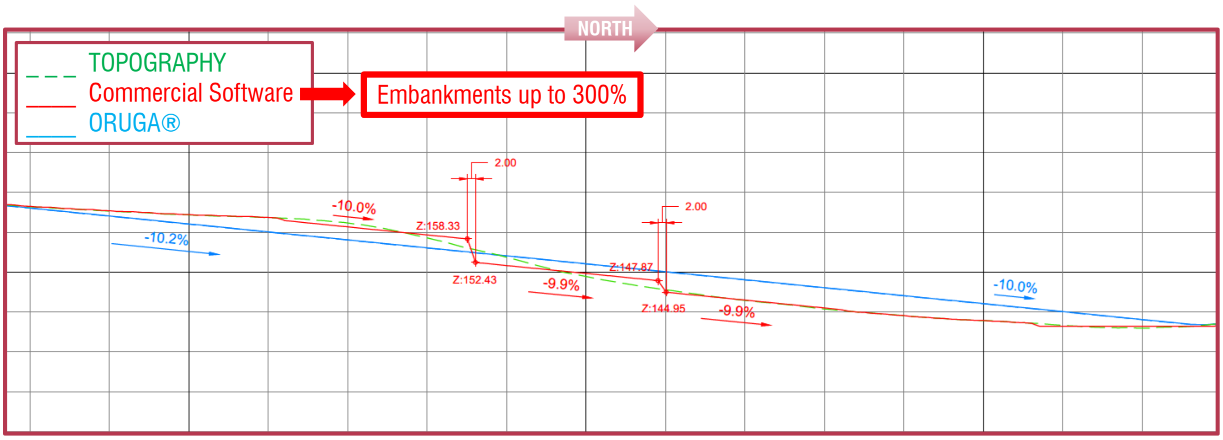


Fig. 4: ORUGA® vs Commercial Software. N-S cross-section of the terrain

These terraces make very difficult, if not impossible, plant construction and, at the same time, lead to a critical underestimate of Earthworks: in this particular case, <u>the Commercial Software produced a volume of EW 5 times smaller than ORUGA® calculation</u>.

The difference in height is so pronounced in certain areas (embankments of 6 m height and 300% slope, see Fig. 4), that **some tracker groups cast shadows on the trackers to the North even at solar noon**. This significantly affects plant performance and modules durability:

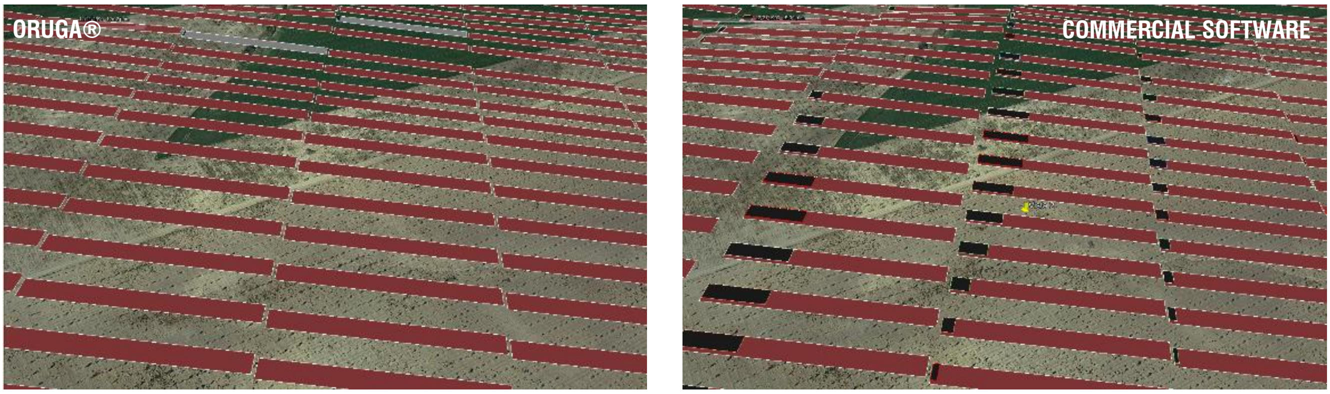


Fig. 5: Shadowing calculation via ray-tracing methods for ORUGA® (left) and the Commercial Software (right) in the case study

The Calculation Process

The **Civil Works Optimization process in ORUGA®** for a given layout starts with the definition of the <u>original topography</u> of the terrain (blue area in Fig. 6 below) and the <u>forbidden areas</u> within site limits (those where trackers cannot be installed and/or EW cannot be performed). Later, <u>design conditions</u> are defined, such as trackers construction tolerances and the requirements for the EW (Cut/Fill ratio, maximum volumes allowed…). The result of the process would be the target surface (green area in Fig. 6 below), which fulfils 2 main targets: positioning the trackers within design tolerances and minimizing EW volumes (or, better, the total cost of EW).

Once the target surface and the 3D model of the trackers (see Fig. 8) have been created, <u>the production of drawings and BOQs for the Engineering team is automatic</u>.

Case 1 in section 5 is an actual example of Civil Works Optimization

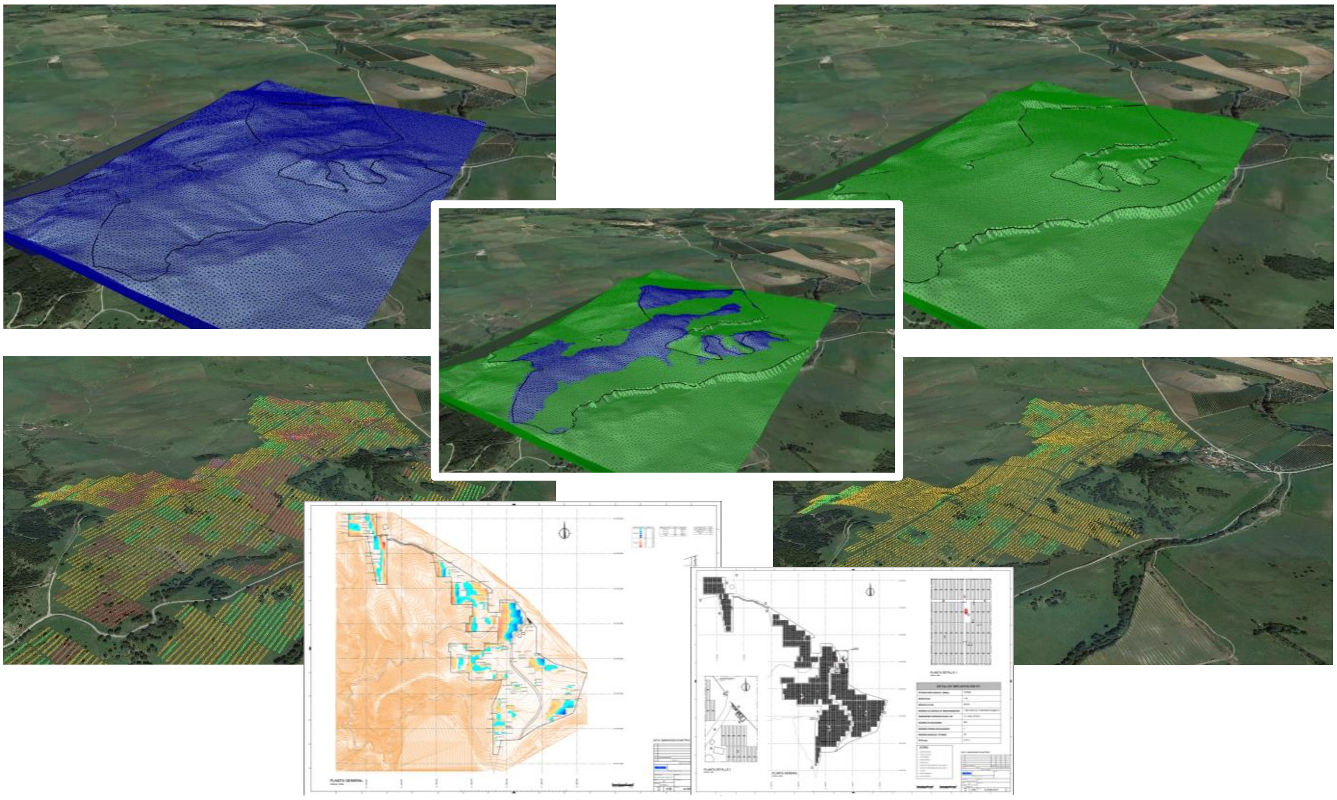


Fig. 6: Civil Works optimization process. Left: original topography (blue) and initial layout (trackers out of tolerance are shown in red). Right: target topography (green) and final layout (there are no trackers out of tolerance). Bottom: EW drawings with contour lines and layout

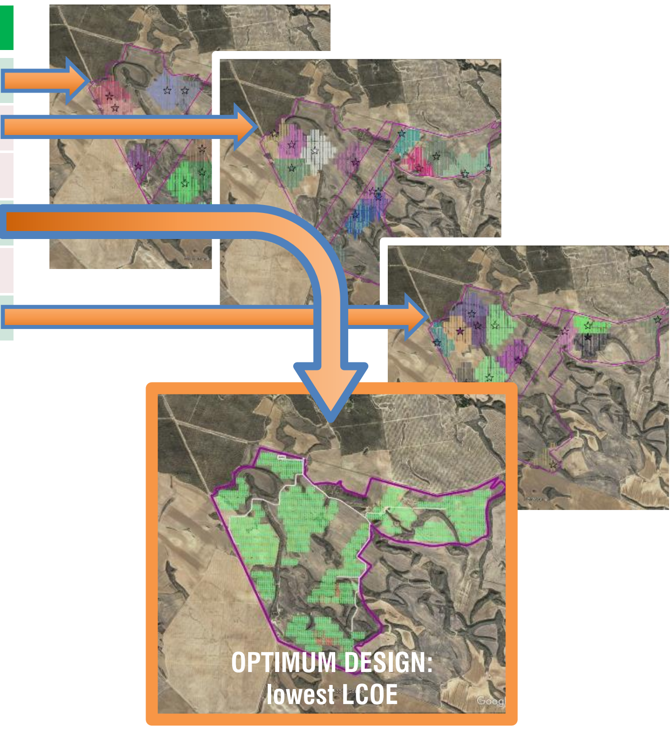
4. ONE STEP FURTHER: 3D OPTIMIZATION OF PLANT DESIGN

ORUGA® features **iterative calculation**, i.e. can manage thousands of alternatives, evaluating their…

- CAPEX, which includes a precise calculation of EW and pylon heights,
- OPEX and
- Performance, which will be computed considering in detail the 3D configuration of the trackers,

and, therefore, the LCOE (Levelized Cost Of Electricity) in each case. This way, **ORUGA® can find the optimum design, which maximizes project profitability.** This is of the most advantage when there is room for improvement in plant design (usually in early stages of the project):

#	CAPEX	OPEX	PRODUCTION	LCOE
1	$CAPEX_1$	$OPEX_1$	$PROD_1$	$LCOE_1$
2	$CAPEX_2$	$OPEX_2$	$PROD_2$	$LCOE_2$
…	…	…	…	…
N	$CAPEX_N$	$OPEX_N$	$PROD_N$	$LCOE_N$
…	…	…	…	…
1000	$CAPEX_{1000}$	$OPEX_{1000}$	$PROD_{1000}$	$LCOE_{1000}$



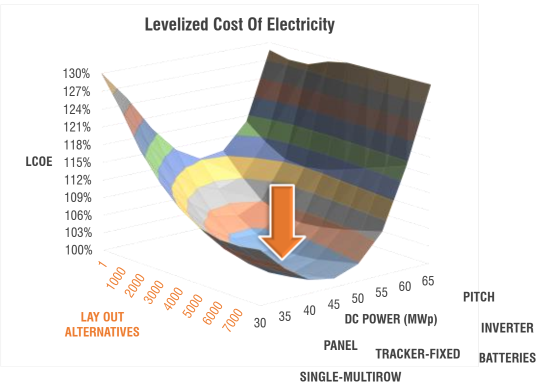


Fig. 7: Design optimization process (iterative)

<u>The design alternatives managed by ORUGA® in an optimization process</u> like the one shown above <u>come from combining all possible design parameters under consideration</u>. E.g., if a Developer does not know which tracker model is the most adequate for a specific terrain nor the best DC power and GCR (Ground Coverage Ratio), the analysis could consider…

- A tracker models
- B DC powers
- C GCR values

Case 2 in section 6 is an actual example of 3D Design Optimization

ORUGA® would then calculate the LCOE of A x B x C design alternatives. To this end, the software would determine the optimum layout for each design alternative after testing the thousands of layout possibilities for the site (see previous figure). **This is the <u>added value of ORUGA®</u>: it introduces the LAYOUT variable into the design optimization process of a PV plant, calculating accurately, furthermore, the Earthworks volumes, the Total Length of Pylons and the Electricity Production of the plant in a 3D scenario.** ***These variables are the key to determine project LCOE without uncertainties.***

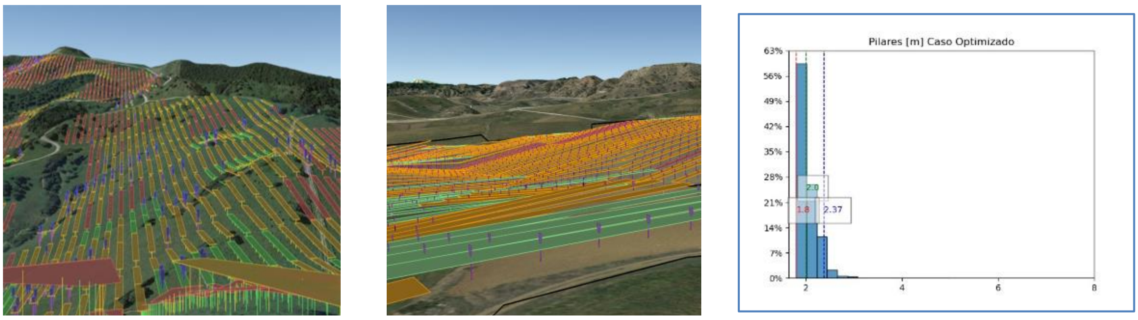


Fig. 8: 3D plant modelling and pylon height histogram

5. REAL CASE STUDY #1

Recently, **a Developer ordered a Civil Works Optimization Study to Sener for a <u>PV plant under development</u> on an extremely complex orography**. The plant has 400 MWp approx., 1P dual-row trackers and half-cell, bifacial modules. It is located in the American continent.

The initial EW estimate by the Client was 14 Mm^3, which meant 56 MEUR, a 18% approx. of total project CAPEX.

The Client wanted to 1) calculate precisely plant EW, 2) reduce this volume as much as possible and 3) evaluate the impact of the terrain on plant performance, all of which could not be done with commercial software tools.

Using ORUGA®, an <u>optimization study</u> was performed first to minimize plant EW. Later, a <u>sensitivity analysis</u> was carried out for a plant zone in order to find ways of reducing EW by modifying different design parameters and, finally, a <u>performance calculation</u> was produced.

The **<u>results</u>** of the analysis are shown below:

EARTHWORKS, thousands of m^3				
CASE	**CUT**	**FILL**	**TOTAL**	**m^3 per m^2**
Client's initial estimate	8 000	6 000	**14 000**	**1.6**
ORUGA®	6 709	5 489	**12 197**	**1.4**
ZONE				
NORTH-1	1 137	930	**2 067**	**1.2**
NORTH-2	660	540	**1 200**	**0.6**
NORTH-3	821	672	**1 494**	**0.9**
NORTH-4	1 368	1 120	**2 488**	**1.4**
SOUTH-1	734	601	**1 335**	**1.9**
SOUTH-2	738	603	**1 341**	**3.0**
SOUTH-3	1 250	1 023	**2 273**	**3.0**

Table 1: Results. Civil Works Optimization

It can be clearly seen that plant terrain is extremely complex, with an average EW volume of 1.4 m^3 per m^2 of area, or 14 000 m^3 per Ha. The zones in the south are particularly hilly.

Furthermore, it is also clear that **ORUGA® has reduced EW volume in a 13% w.r.t. Client's initial estimate.** This means a **<u>saving of 7.2 MEUR</u>** approximately.

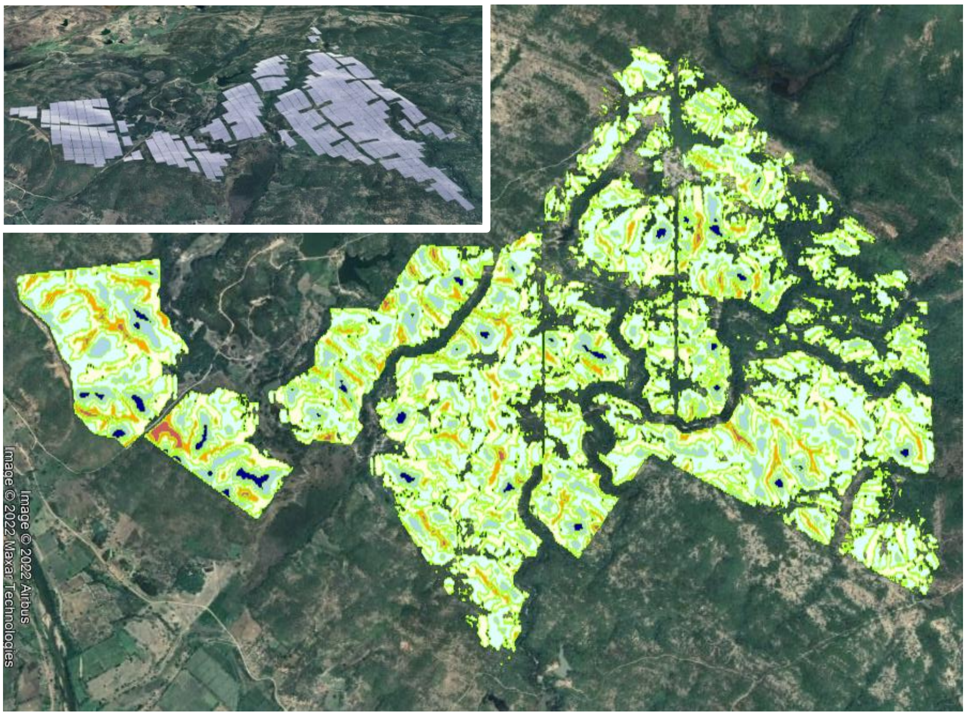


Fig. 9: Civil Works Optimization. Original layout (top left) and Cut/Fill areas determined by ORUGA® (blue: Cut, red: Fill)

EARTHWORKS, thousands of m^3				
ZONE	CUT	FILL	TOTAL	TOTAL
NORTH-2	660	540	1 200	100%
SENSITIVITY				
Remove restriction of relative N-S slope between the rows of the same tracker [before: 2%]	443	362	805	67%
Increase of maximum N-S slope from 15% to 20%	637	522	1 159	97%
Increase of difference between maximum and minimum pylon height from 0.6 to 1.0 m	543	444	987	82%

Table 2: Results. Sensitivities

It can be perfectly seen that **current tracker design (1P dual-row) is NOT adequate for plant terrain: when removing the restriction of relative N-S slope** between the rows of the same tracker (i.e. "turning" dual-row trackers into single-row trackers, see Fig. 10), **EW volume decreases a 33%** in the zone under study.

On the other hand, **increasing pylon height tolerance 40 cm** (from 60 cm to 1 m), **decreases EW volume in a 18%**.

Increasing maximum N-S slope of the trackers from 15% to 20% does not impact significantly EW volume.

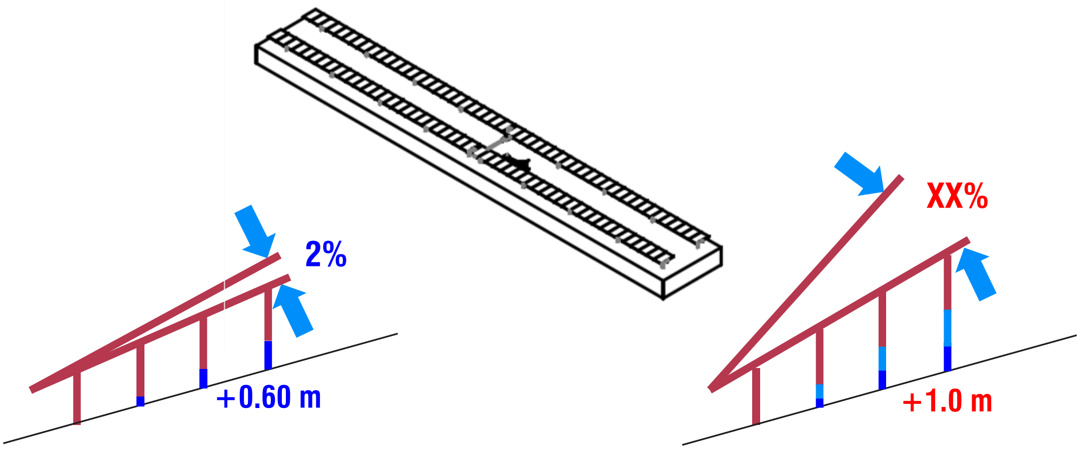


Fig. 10: Sensitivity analysis of relative N-S slope and pylon height. Left: original design. Right: new design

Regarding the **economical impact** resulting from these design changes, these have not been evaluated. However, the approximate **savings** that they produce are shown below:

- **Remove relative N-S slope:** 16.1 MEUR = 0.030 EUR/Wp = 5.1% of total CAPEX
- **Increase maximum N-S slope:** 1.5 MEUR = 0.003 EUR/Wp = 0.5% of total CAPEX
- **Increase pylon height tolerance:** 8.8 MEUR = 0.017 EUR/Wp = 2.8% of total CAPEX

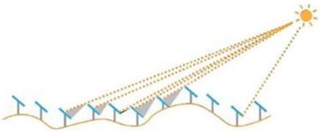
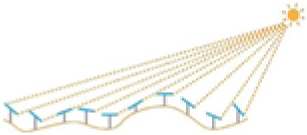
ANNUAL ELECTRICITY PROUCTION				
CASE		TERRAIN	*BACKTRACKING*	ANNUAL PRODUCTION
A		Flat	2D	100.0%
B		3D	2D	96.7%
C		3D	3D	98.7%

Table 3: Results. Annual electricity production

Regarding annual electricity production (see Table 3 above), **the 3D configuration of the trackers** on the terrain after performing the Earthworks **decreases production in a 3.3%** w.r.t. a calculation on an ideal flat terrain (Case B vs Case A).

The implementation of **ORUGA® 3D *Backtracking*[4]** would recover part of this loss, leaving the **decay in production due to terrain undulations in a 1.3%** (Case C vs Case A). This improvement is due to the elimination of shadows between trackers:

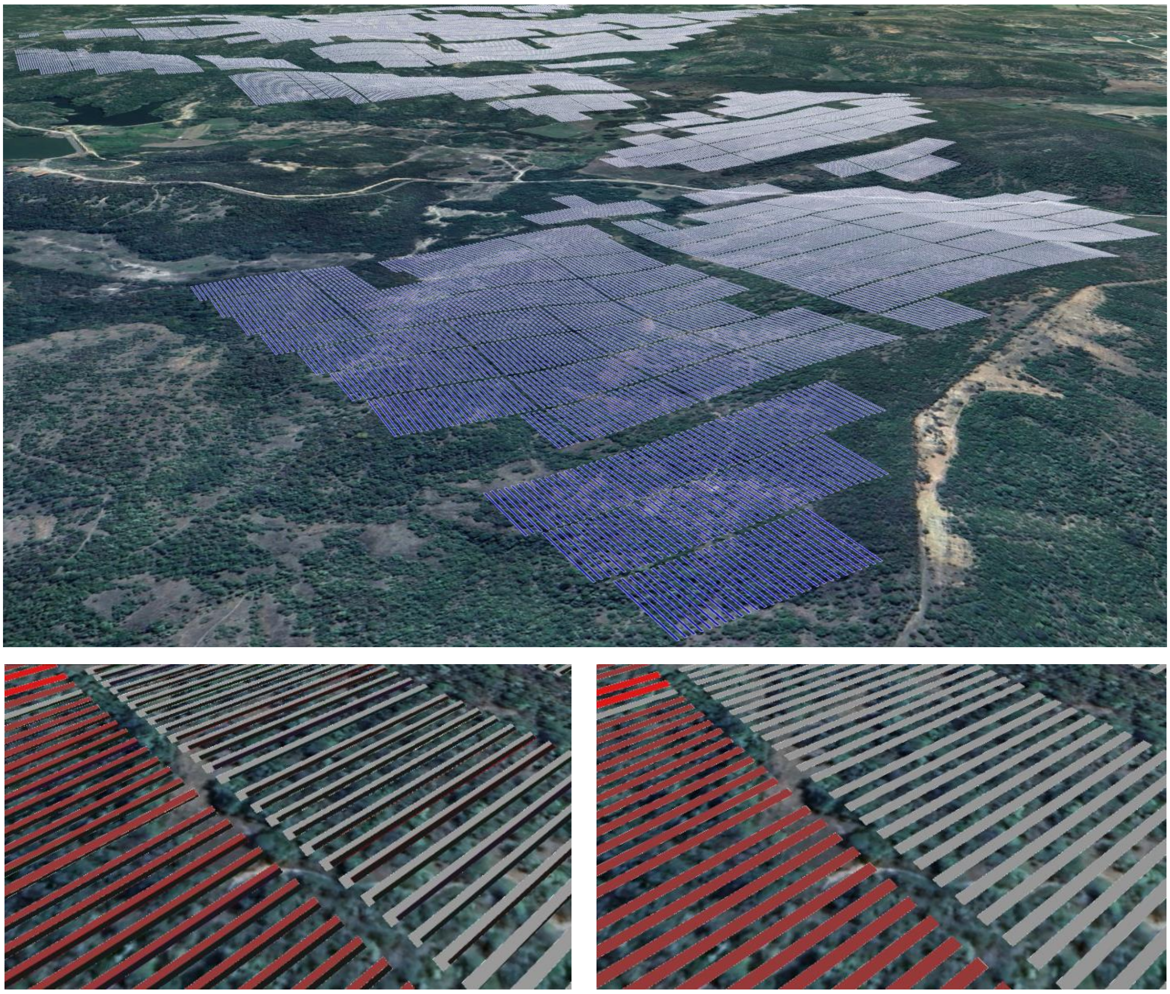


Fig. 11: 3D plant model (top) and calculation of shadowing between trackers (bottom; left: 2D *Backtracking*, right: 3D *Backtracking*)

[4] ORUGA® 3D *Backtracking* utilizes a Sun tracking strategy adapted to the 3D topography of the terrain which minimizes shadowing between trackers, maximizing at the same time plant production. 2D *Backtracking* or Flat *Backtracking* is a conventional strategy in the PV Industry, which considers that the terrain is perfectly flat. In complex orography terrains, 2D *Backtracking* produces shadowing between trackers

What ORUGA® does NOT do

ORUGA® is a software that modifies the original topography of a terrain producing a target surface in which trackers/structures fulfil design tolerances while Civil Works are minimized, at the same time. This target surface is accurate, automatically generated and realistic, meaning that it is a **smooth surface**, where there are embankments only at plant boundaries (unless another criterion is defined). See graphs below for further information.

Notwithstanding with the above, the software is not currently prepared to calculate the following:

- Hydrology and Drainage studies
- Detailed design of roads, trenches, equipment platforms, buried networks, etc…
- Structural calculation of embankments, walls, foundations and similar components

Regarding ORUGA® accuracy, the reader is referred to the graphs in the following page, as an illustrative example.

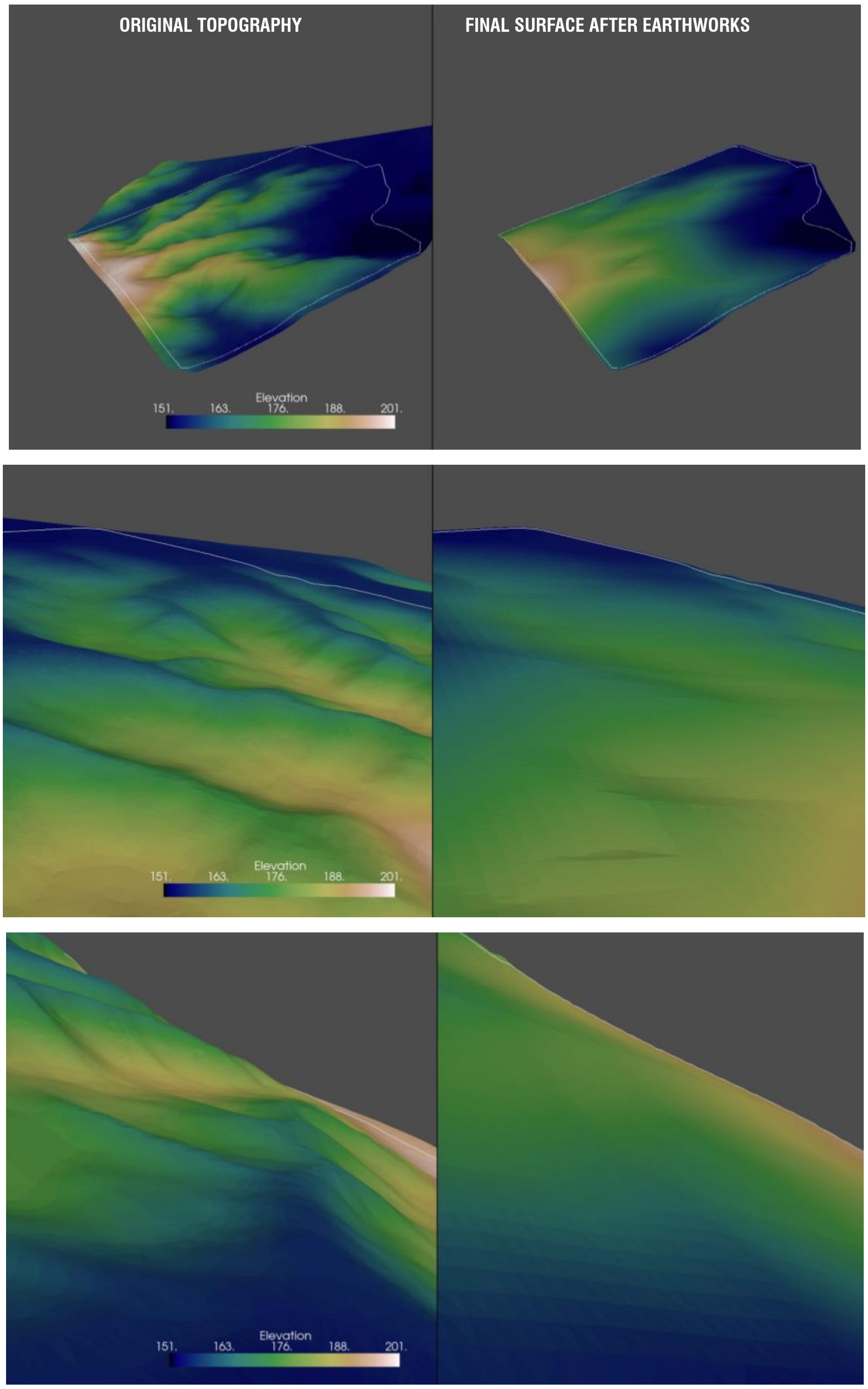


Fig. 12: Results. Original topography (left) and Target surface (right)

ACCURACY OF RESULTS

In the EW calculation of this project, the convergence of the solution by ORUGA® is as follows:

- **99.5% of pylons within design tolerance** (±5 cm additionally due to construction tolerance)
  <u>NOTE</u>: the pylons out of tolerance are located basically in the boundary areas, where trackers are very close to the embankment that surrounds the plant. These embankments are particularly high in some areas due to the complexity of the terrain in this specific case
- **100% of the trackers within limits of maximum N-S slope**
- **99.9% of the trackers within limits of maximum E-W slope**

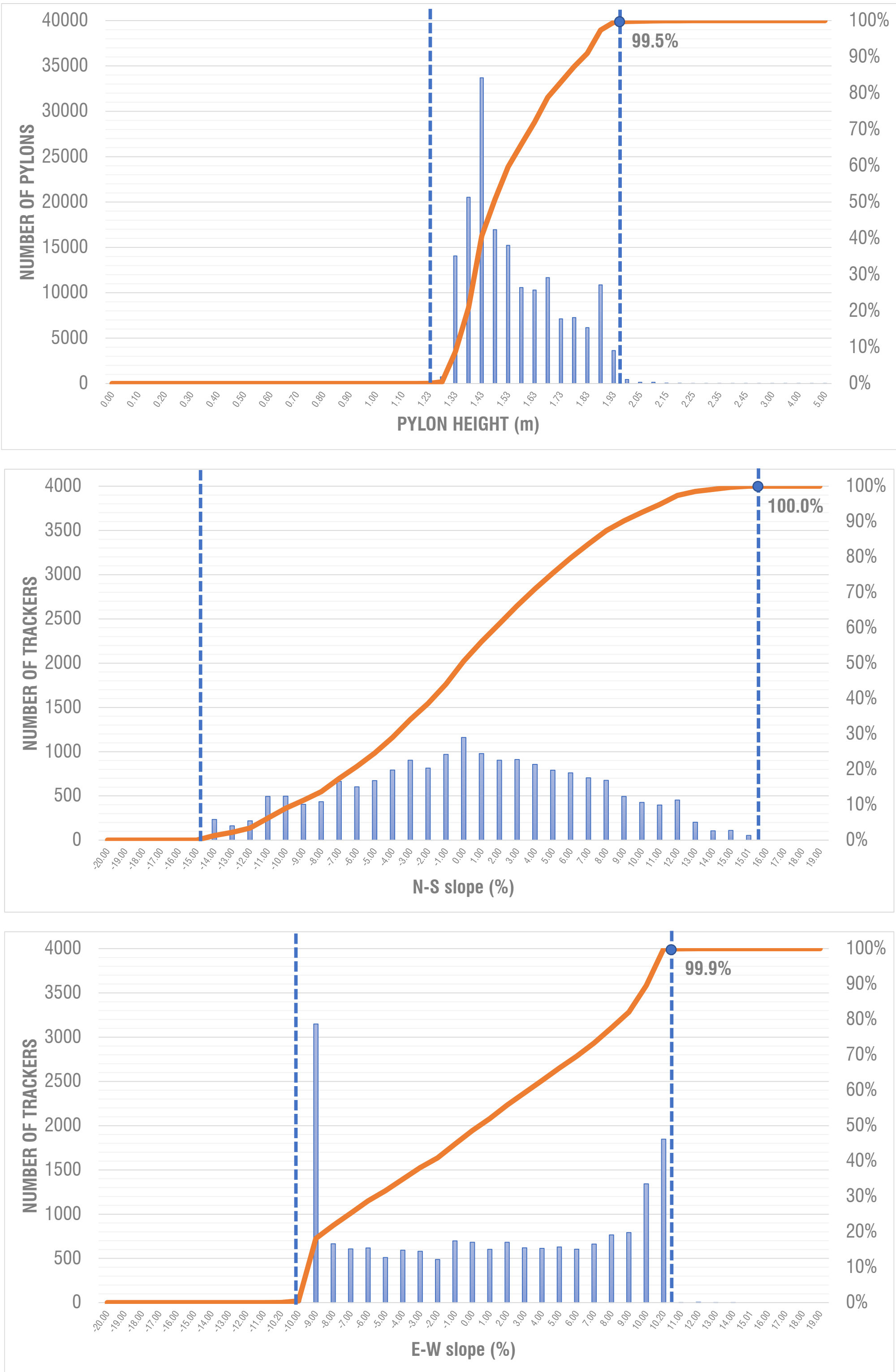


Fig. 13: Accuracy of results

6. REAL CASE STUDY #2

In 2022, **a Developer order a Design Optimization Study to Sener for** **2 PV projects under development** **on a complex orography terrain.** The DC power of each plant was 100 MWp approx. with half-cell, bifacial modules.

The Client wanted to 1) define the optimum DC power and GCR, 2) find the most adequate tracker for each project and 3) evaluate the impact of the terrain on plant performance, which could not be done with commercial software tools.

There were firm Technical and Economical Proposals from 4 tracker suppliers, which differ significantly in terms of design, construction tolerances and price per Wp.

The key to calculate the LCOE without uncertainty in this study was the capacity of ORUGA® to…

- ***Calculate precisely the volume of EW for all the tracker models***
- ***Calculate accurately the Annual Production on a 3D terrain for all the tracker models***
- ***The possibility of iterative calculation to define the optimum layout (lowest LCOE)***

Using ORUGA®, a design optimization study was performed first in order to find the optimum DC power and GCR. The **results** of the analysis are shown below:

DC Power				
PROJECT 1				
TRACKER	GCR	DC POWER	LCOE[5]	
Tracker 1	GCR 2	Base – 4 MWp	**102.3%**	
		Base	**101.8%**	
		Base + 4 MWp	**102.2%**	
Tracker 2		Base – 4 MWp	**100.2%**	
		Base	**100.0%**	*optimum*
		Base + 4 MWp	**100.4%**	
PROJECT 2				
TRACKER	GCR	DC POWER	LCOE	
Tracker 1	GCR 2	Base – 4 MWp	**101.4%**	
		Base	**100.9%**	
		Base + 4 MWp	**101.5%**	
Tracker 2		Base – 4 MWp	**100.2%**	
		Base	**100.0%**	*optimum*
		Base + 4 MWp	**100.5%**	

Table 4: Results. DC Power

GCR				
PROJECT 1				
TRACKER	GCR	DC POWER	LCOE	
Tracker 1	GCR 1	Base	**100.0%**	*optimum*
	GCR 2		**100.5%**	
	GCR 3		**100.9%**	
PROJECT 2				
TRACKER	GCR	DC POWER	LCOE	
Tracker 1	GCR 1	Base	**100.2%**	
	GCR 2		**100.0%**	*optimum*
	GCR 3		**100.3%**	

Table 5: Results. GCR

As a conclusion of this 1st phase of the study, **optimum DC Power and GCR** for both projects were…

- Project 1: DC Power Base + GCR 1
- Project 2: DC Power Base + GCR 2

[5] The LCOE is referenced to the minimum value of each Project and within each table

Later, the **other 2 tracker models** were analysed for the optimum DC power and GCR. **Results** are shown in the following table:

Tracker						
PROJECT 1						
TRACKER	**GCR**	**DC POWER**	**LCOE**[6]		**EW, thousands of m³**	**EW**[7]
***Tracker* 1**	GCR 1	Base	**104.7%**		267	**100%**
***Tracker* 2**			**102.6%**		375	**140%**
***Tracker* 3**			**102.6%**		483	**181%**
***Tracker* 4**			**100.0%**	***optimum***	68	**26%**
PROJECT 2						
TRACKER	**GCR**	**DC POWER**	**LCOE**		**EW, thousands of m³**	**EW**
***Tracker* 1**	GCR 2	Base	**106.0%**		373	**100%**
***Tracker* 2**			**104.9%**		352	**94%**
***Tracker* 3**			**103.8%**		635	**170%**
***Tracker* 4**			**100.0%**	***optimum***	221	**59%**

Table 6: Results. Trackers

It can be seen that **Tracker 4 leads to the lowest LCOE and, at the same time, to the lowest** EW in both projects.

In each case of Table 6, to calculate annual electricity production, it was considered 3D terrain (real) and 2D *Backtracking*. It was also computed the impact of the implementation of ORUGA® 3D *Backtracking*. The results are shown hereafter for Trackers 3 and 4:

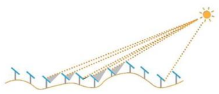
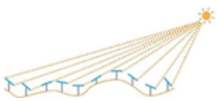
ANNUAL ELECTRICITY PRODUCTION							
				ANNUAL PRODUCTION[8]			
CASE		**TERRAIN**	***BACKTRACKING***	**PROJECT 1**		**PROJECT 2**	
				***Tracker* 3**	***Tracker* 4**	***Tracker* 3**	***Tracker* 4**
A		**Flat**	**2D**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
B		**3D**	**2D**	**96.9%**	**97.1%**	**96.6%**	**96.5%**
C		**3D**	**3D**	**98.3%**	**97.4%**	**98.2%**	**96.9%**

Table 7: Results. Annual Electricity Production

Table 7 shows how **the influence of the terrain is similar in both projects and for both trackers** (Case B vs Case A), while **the implementation of ORUGA® 3D *Backtracking* does not lead to the same yield increase in both trackers** (Case C vs Case B).

This is an usual fact: **tracker design has a critical influence on the yield increase produced by ORUGA® 3D *Backtracking***. The more degrees of freedom in the tracker, the higher the yield increase. It is not the same thing: single-row, dual-row, N-S tables configuration or multi-row; each of them has a highly different capacity to regulate the shadowing between rows via tracking strategy.

6 The LCOE is referenced to the minimum value of each Project and within each table
7 The EW is referenced to the 1st case (Tracker 1) of each Project
8 The Production is referenced to Case A (Flat Terrain + Flat *Backtracking*) within each Project

ANNEX 1 – INFORMATION ON ORUGA® SOFTWARE

ORUGA® software is a Sener proprietary tool conceived for the **3D Optimization of PV projects**, adding the best value in ***terrains with complex orography***.

ORUGA® provides the **most profitable plant design for any given plot**, thanks to its differentiating features:

1. Accurate calculation of **Civil Works**, including Earthworks and Metallic Structure optimization
2. Precise determination of annual **Plant Performance – *certified by a Technical Advisor*** –, considering…
   a. Actual shadowing between trackers, via ray-tracing methods
   b. I-V curves behaviour of cells+modules+strings+inverters
   c. 3D *Backtracking* Algorithm that minimizes shadowing between trackers at all times
3. **Iterative mode** in order to manage thousands of design alternatives, evaluating CAPEX, OPEX, Production and, hence, LCOE of each one

Sener provides advanced engineering services supported by ORUGA®. Basically, there are 3 options:

A. Civil Works optimization, when PV plant lay out (XY) is defined
B. Plant performance calculation, when PV plant lay out (XYZ) is defined
C. Techno-Economical optimization, when there is room for design improvement

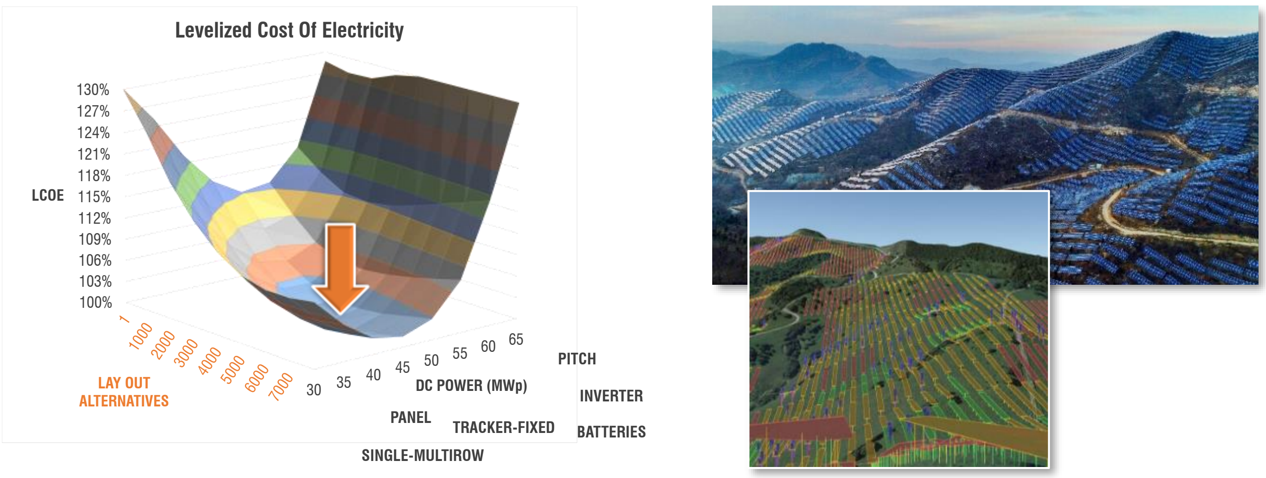


Fig. 14: 3D Design Optimization for the lowest LCOE in complex orography terrains

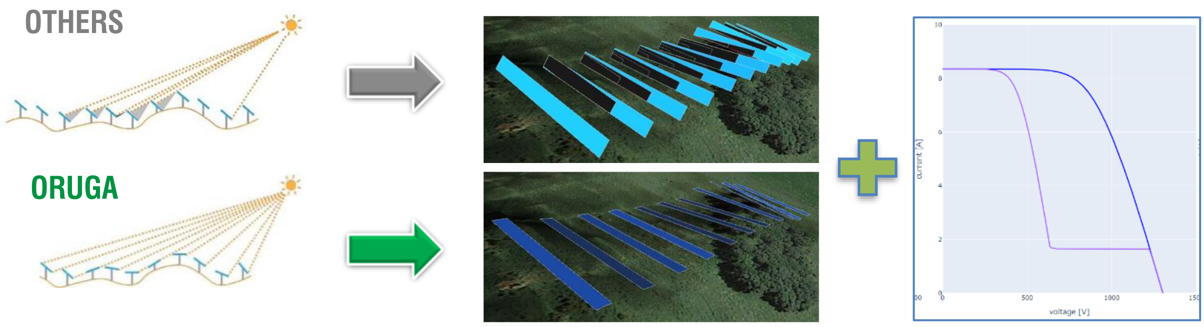


Fig. 15: 3D Backtracking Algorithm to enhance plant production and modules durability + I-V curves precise consideration

Fig. 16: Civil Works Optimization process

ANNEX 2 – REFERENCES

The table below shows the projects in which ORUGA® has been applied so far:

#	DATE	COMPANY (*)	POWER [MWp]	OPTION ORDERED			
				Design Optimization BEST LCOE	Civil Works Optimization	Performance Calculation	Check of Civil Works & Performance
1	feb-20	ACCIONA	190	■			
2	mar-20	A&G RENOVABLES	200	■			
3	may-20	ATA RENEWABLES	100/63/63	■			
4	dec-20	ENFINITY	116		■		
5	apr-21	ESPARITY SOLAR	120	■			
6	may-21	FCC INDUSTRIAL	50		■		
7	jun-21	GALP	15	■			
8	jul-21	IGNIS	70	■			
9	aug-21	IMASA	30	■			
10	aug-21	NEOEN	55	■			
11	sep-21	NEOEN	100	■			
12	oct-21	NEOEN	50		■	■	
13	jan-22	NEOEN ECUADOR	40	■			
14	feb-22	NEXTERA	72	■			■
15	feb-22	OHL INDUSTRIAL	72	■			■
16	feb-22	QAIR	270	■		■	■
17	mar-22	Q-ENERGY	40			■	
18	jul-22	VINCI ENERGIES	400	■		■	
19	sep-22	X-ELIO	166		■		
20	sep-22	X-ELIO	16			■	
21	oct-22	X-ELIO	528		■		
			2825				

Table 8: ORUGA® references

NOTES:

1. Companies above are listed in alphabetical order – not chronologically as the rest of the columns – due to confidentiality issues
2. Performance calculation is also carried out in option *Design Optimization – BEST LCOE*

Do you want further information on ORUGA® software?

Do you have a project on a complex terrain, and you think that it needs to be optimized?

e-mail us at orugaPV@sener.es