SolarPACES Task III Project: Analyze Heliostat Field: Results of Methodologies Comparison, Gaps to Be Filled and Next Steps to Further Improve the Solar Central Receiver Technology

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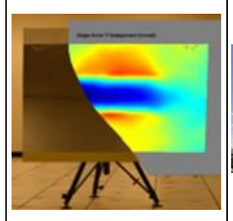
This project addresses to review, compare, and discuss the advantages and disadvantages of heliostat evaluation methodologies, which are either currently developed or being developed, to be used in already operating heliostat fields to maximize their performance.

Comparison Methodology

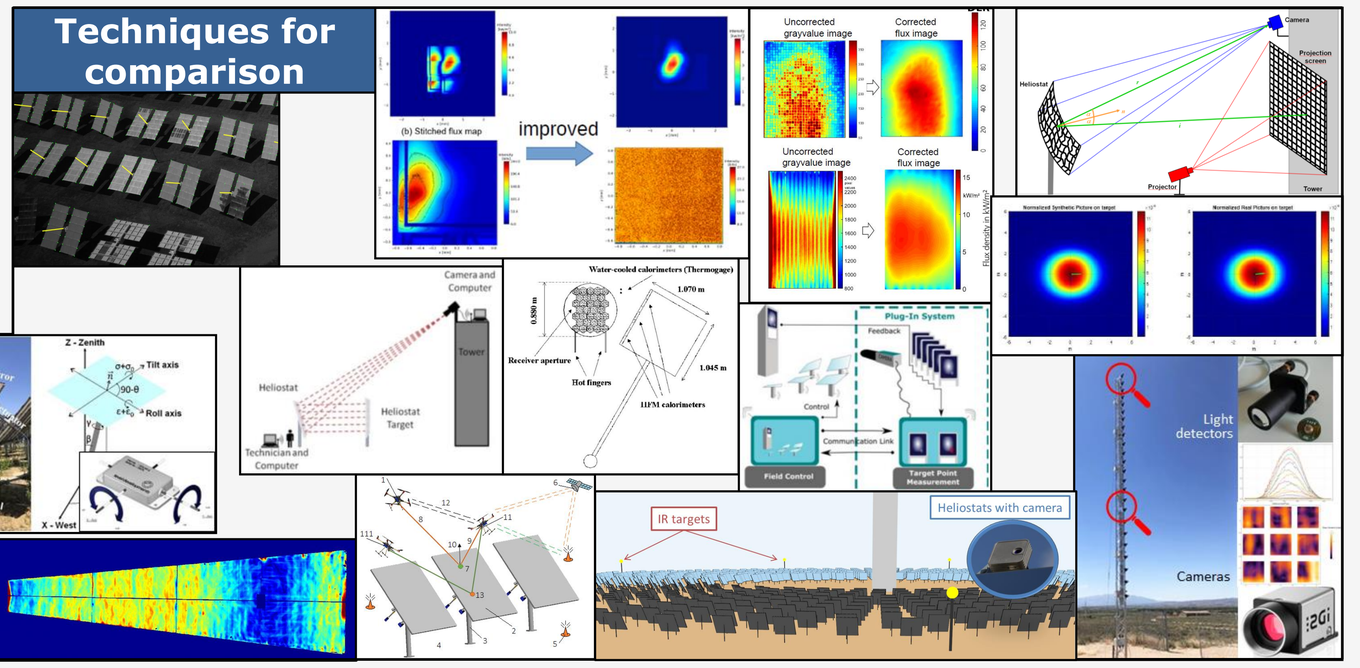
Tracking Accuracy		Concentrator Characterization	Flux Mapping
Format of the measurement	Degree of intrusiveness	Format of the measurement	Format of the measurement
Required instrumentation	Application to a complete heliostat field	Required instrumentation	Required instrumentation
Accuracy/uncertainty of the measurement	Measurable heliostat orientations and further restrictions	Accuracy/uncertainty of the measurement	Accuracy/uncertainty of the measurement
Purpose of the measurement	Operational requirements and limits	Direct or indirect measurement	Direct or indirect measurement
Scope	Number of normal vectors per heliostat	Scope	Scope
Time per measurement process per heliostat	Basis for the measurement	Time per measurement process per heliostat	Time per measurement process
		Degree of intrusiveness	Degree of intrusiveness
		Application to a complete heliostat field	
		Distinguish between contour and canting errors	

Heliostat Analysis Development Cycle	A1. Heliostat R&D: Components	A2. Heliostat R&D: Integrated Heliostat & On-Site Assembly	B. Mass Manfacturing & Qualification	C1. Solar Field: Deployment & Commissioning	C2. Solar Field: Full Operations & Monitoring
					

A qualitative comparison of the systems has been performed after defining a series of attributes that would be desired to put in a common context for all the techniques. This raised the difficulties that encompassing such variety of techniques bring to the comparison.

A future collaboration between the project participants is being discussed to produce an exhaustive technical comparison of the techniques.

Some aspects of the comparison taxonomy have been discussed, as a classification of heliostat development stages.



Main Outcomes & Results

This methodology aims to establish the basis for maintaining, after the project end, a close collaboration between the centers involved in the form of a technical in-depth comparison of their developed systems. This comparison should open the possibility of, in some way, making the quality measurement obtained with each system comparable between them, and fund the basis for a technical recommendation about solar field performance analysis, applicable at industrial level.

This project is a coordinated work carried out by 11 research centers from 5 different and distant countries, with the collaboration and support of 8 companies from 4 different countries, showing that the CSP community can work together to bring our energy generation technology to higher levels of reliability.

Ongoing Work and Future Collaboration

The team continues working on the development of a methodology to perform an in-depth technical comparison of the techniques devoted to solar field testing, desirably a round robin at a certain research facility and applying the techniques to the same heliostat/group of heliostats to make them as comparable as possible.

In addition, as the effort to be committed to such task is not residual, funding is needed and being searched to open research facilities (Sandia PSA, IMDEA, CSIRO, CyI, Jülich…) and fund the activities, travels to and stays in the selected facilities during the round-robin.

Partners and Collaborators

CENER · DLR · acciona · Fraunhofer ISE · Heliogen · CIEMAT-PSA · tewer · IMDEA Energy · Australian National University · CSIRO · cspservices · The Cyprus Institute · NREL · Sandia National Laboratories · Tekniker

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