SIMULATION OF YEARLY ENERGY FOR SOLAR HEATING SYSTEM

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The preliminary design step is one of the most important stages of the project process of a solar concentrating facility. In order to improve performances of the central receiver system (CRS), we developed a simulation tool based on Monte Carlo methods taking into account sun positions over the year to evaluate yearly energy at receiver in one simulation. With the efficient Monte Carlo Sun Tracking (MCST) algorithm, we obtain a fast and accurate code that permits to achieve optimization step in a reasonable time.

We compare MCST results with Tonatiuh [3] to compute a testing case: a tower and 146 heliostats (9 squared mirrors of 1.6 meter sided) in a heliostats field designed with the MUEEN [5] method, following a radial staggered layout. We make some general assumptions:

- Reflections are specular;
- CRS is located at the junction of the Greenwich meridian and the equator;
- The target is a square with 10m.

Firstly, we compute only one date at a time (4 dates tested at noon) to obtain a power value. Then, we randomly choose 50 dates and compute each date with Tonatiuh to approximate the average instantaneous energy received by the receiver over one year (Number of rays = 3650). We only need to do one simulation with 50 rays to integrate over time and obtain an average instantaneous energy value. We see that EDStaR gives an estimation in accordance with Tonatiuh results for a yearly simulation done date by date even if error bars are significantly large due to the small number of dates computed. By increasing the number of dates we obtain a more precise value of the yearly energy.

We plan to use it with typical year DNI data to design a solar field optimized on a yearly production basis.

**CONCLUSION AND OUTLOOK**

We present a new approach:
- To evaluate yearly energy at CRS receiver;
- Fast and accurate;
- Which can easily be integrated in an optimization process;
- We plan to use it with typical year DNI data to design a solar field optimized on a yearly production basis.

**REFERENCES**