

Requirements of representative acceptance measurements for the identification of the yield of solar thermal power plants

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Parabolic trough power plants are the first proven solar technology for large-scale solar electricity generation. Over the last 30 years technical enhancements and component improvement along with an increasing awareness of the anthropogenic contributions to the greenhouse effect paved the way from first installed plants to a technology on the verge of breaking through.

As a consequence of regenerative electricity production incentives especially in Spain and the South Western states of the USA numerous solar thermal power plants have now entered the planning or even construction stage. At their final acceptance tests performance and operation specifications are to be verified. At present, these tests are completed according to an individual and arbitrary schedule agreed on by contract for every individual case. In the medium term however, it would be desirable to establish standard measurement and acceptance procedures on the basis of which the annual thermal yield of the solar field as well as the significance of the latter could be determined. This would simplify and harmonise solar thermal power plant projects as well as minimise their financial risk.

In a first step the applicability of the quasi-dynamic testing procedure as proposed by the European Standard for solar thermal collector testing EN 12975-2 to concentrating collectors is to be investigated. To this end performance testing itself, performance modeling, data analysis, parameter identification, uncertainty and test statistics evaluation are to be carried out. Subsequently, the method is to be transferred and expanded to loop/field testing. In doing so the identification of suitable measurement methods in search of adequate uncertainty and representative measurements as well as the enhancement of the performance model are focused on. Later a strategy for predicting the annual thermal yield of the solar field on the basis of acceptance measurements and determining the confidence interval of predictions is to be developed.