

# Dynamic modelling of a parabolic trough solar power plant

Robert Österholm<sup>a</sup>, Jens Pålsson<sup>b</sup>

<sup>a</sup>Lund University, LTH, Department of Energy Sciences, Lund, Sweden

<sup>b</sup>Modelon AB, Ideon Science Park, Lund, Sweden

[osterholm.r@gmail.com](mailto:osterholm.r@gmail.com), [jens.palsson@modelon.com](mailto:jens.palsson@modelon.com)

## Abstract

Models for dynamic simulation of a parabolic trough concentrating solar power (CSP) plant were developed in Modelica for the simulation software tool Dymola. The parabolic trough power plant has a two-tank indirect thermal storage with solar salt for the ability to dispatch electric power during hours when little or no solar irradiation is present. The complete system consists of models for incoming solar irradiation, a parabolic trough collector field, thermal storage and a simplified Rankine cycle. In this work, a parabolic trough power plant named Andasol located in Aldeire y La Calahorra, Spain is chosen as a reference system. The system model is later compared against performance data from this reference system in order to verify model implementation. Test cases with variation in solar insolation reflecting different seasons is set up and simulated. The tests show that the system model works as expected but lack some of the dynamics present in a real thermal power plant. This is due to the use of a simplified Rankine cycle. The collector and solar models are also verified against literature regarding performance and show good agreement.

*Keywords: concentrating solar power; parabolic trough; solar salt thermal storage; dynamic modeling; Dymola; Modelica.*