Transient Simulation of the Power Block in a Parabolic Trough Power Plant

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Abstract

In the field of concentrated solar power (CSP) plants, parabolic trough systems with thermal oil as heat transfer fluid represent the technically and economically most mature technology. Due to storage systems these plants produce electricity on demand. However, a considerable portion of the annually collected thermal energy is consumed for the start-up procedure. In fact, after shut-down periods thermal masses must be reheated and additionally further energy losses due to imperfect start-up procedures occur. The present work has been carried out within the TURIKON project. The main goal is to evaluate and to optimize the transient behavior, namely the start-up of parabolic trough plants with thermal oil. For this purpose, a dynamic model was developed. An internal DLR solar library was used for the modelling of the solar field while the power block is modelled with the publically available ThermoPower library where some components had to be adapted for the needs of CSP plants. In the present publication first results are shown in order to demonstrate the capabilities of the plant model. The dynamic behavior of the power plant during normal operating mode and during a warm and a hot start-up procedure is evaluated and the warm start-up procedure energetically optimized.

Keywords: transient power block simulation, parabolic trough, concentrated solar power