

# Robust Aiming Strategies in Solar Tower Power Plants

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February 14, 2019

**Abstract:** Electricity production via solar tower power plants is an important new technology in the renewable energy sector. A solar tower power plant consists of a receiver mounted atop of a central tower and a field of movable mirrors called heliostats. The heliostats reflect and concentrate the solar radiation onto the receiver where a fluid is heated to produce electricity in a conventional thermodynamic cycle.

In this talk, we consider aiming strategies for the heliostats. These strategies dictate the way in which the heliostats aim on different locations of the receiver surface. The objective is to maximize the heat transfer inside the tubes of the receiver. However, it has to be taken into account that the receiver can be permanently damaged from thermal overloading due to high heat flux densities. Consequently, the aiming strategy affects the energy production of the entire power plant as well as the lifespan of the receiver materials.

We present a mixed integer linear programming (MIP) formulation for the optimization of heliostat aiming strategies. Furthermore, we extend this formulation to a robust one to get protection against receiver damage caused by uncertainties. Finally, we present some preliminary computational results of our formulations on the PS10 Solar Power Plant. This plant features 624 heliostats and is currently being operated in Spain.

**Joint work with Christina Büsing, Jeff Cumpston, Fynn Kepp, and Pascal Richter.**

**Talk will take place from 4:00PM - 5:00PM, Watt Family Innovation Center, Room 203.**

**Bio:** Sascha Kuhnke is a scientific employee and Ph.D. student at RWTH Aachen University, Germany, supervised by Prof. Dr. Arie Koster. He received his master's degree in mathematics in 2016 from University of Cologne, Germany. His current research interests are in mixed integer nonlinear programming (MINLP), particularly with applications in water allocation problems. Furthermore, he is currently working on the optimization of aiming strategies in Solar Tower Power Plants where he investigates robust optimization approaches.