



Demonstration of the Once-Through Concept in Parabolic Trough Power Plants

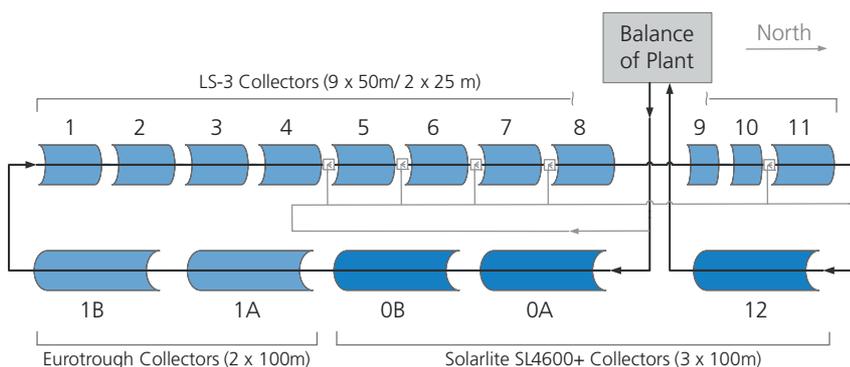
The **goal** of the research project DUKE (Durchlaufkonzept – Entwicklung und Erprobung) is the development and demonstration of the once-through concept for parabolic trough plants with direct steam generation (DSG). Solar fields with DSG generate the steam for a steam turbine directly in the solar field's receivers, whereas other solar field concepts need an additional heat transfer fluid, like synthetic oil. By that, DSG is more efficient and higher temperatures are possible.

The **concept** for a 'once-through' solar field is rather simple: Water enters the receivers, gets heated, evaporated, and is finally superheated to the desired temperature, all in the same collector loop. Compared to the current commercial DSG concepts, the once-through approach can avoid a lot of piping and tanks, such that the investment is significantly lower and the efficiency can be further increased.

The main **challenge** is in the control of the process: How can the main steam temperature be stabilized during passing clouds? How can the lifetime of the piping be further increased? Corresponding concepts, e.g. advanced control strategies, will be developed, implemented and demonstrated during the project. The objective is to get power plants that are easily scalable, non-hazardous to the environment as well as more cost- and energy-efficient.

The new demonstration **plant** is an extension of the DISS test facility at the Plataforma Solar de Almería (PSA), which has been used for fundamental research paving the way for the first commercial DSG plants. The new collector loop will have a length of 1000 meters and will be able to generate steam of 500 degrees Celsius and 112 bar.

The solar research project DUKE is sponsored by the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Another great part of the investment is financed by DLR itself. The plant will offer worldwide unique opportunities to analyze and develop this technology. The project is implemented together with industrial **partners** and the test facility will be operated together with the long standing partner CIEMAT (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas).



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