A Sunny **Future**

A family barbecue in a garden near Badajoz in Central Spain: lamb chops are sizzling on the electric barbecue grill, music sounds from the stereo carried outside and patio lights create the right atmosphere. The electricity required for this family get-together is provided by the sun, more precisely by the SAMCASOL 1 solar thermal plant. Thanks to its sophisticated storage facilities, it can provide electricity well into the evening hours. In sunny Spain, solar power generation has become quite popular. Major investment is being made in utility-scale solar thermal power plants with capacities between 20 and 50 MW. SAMSON prepared itself early on for this promising green market. Control valves were supplied for SAMCASOL 1 and several other Spanish plants, where they ensure optimum functioning and the smooth running of processes.

Thanks to their storage facilities, solar thermal power plants can also supply electricity at night.

Enormous potential

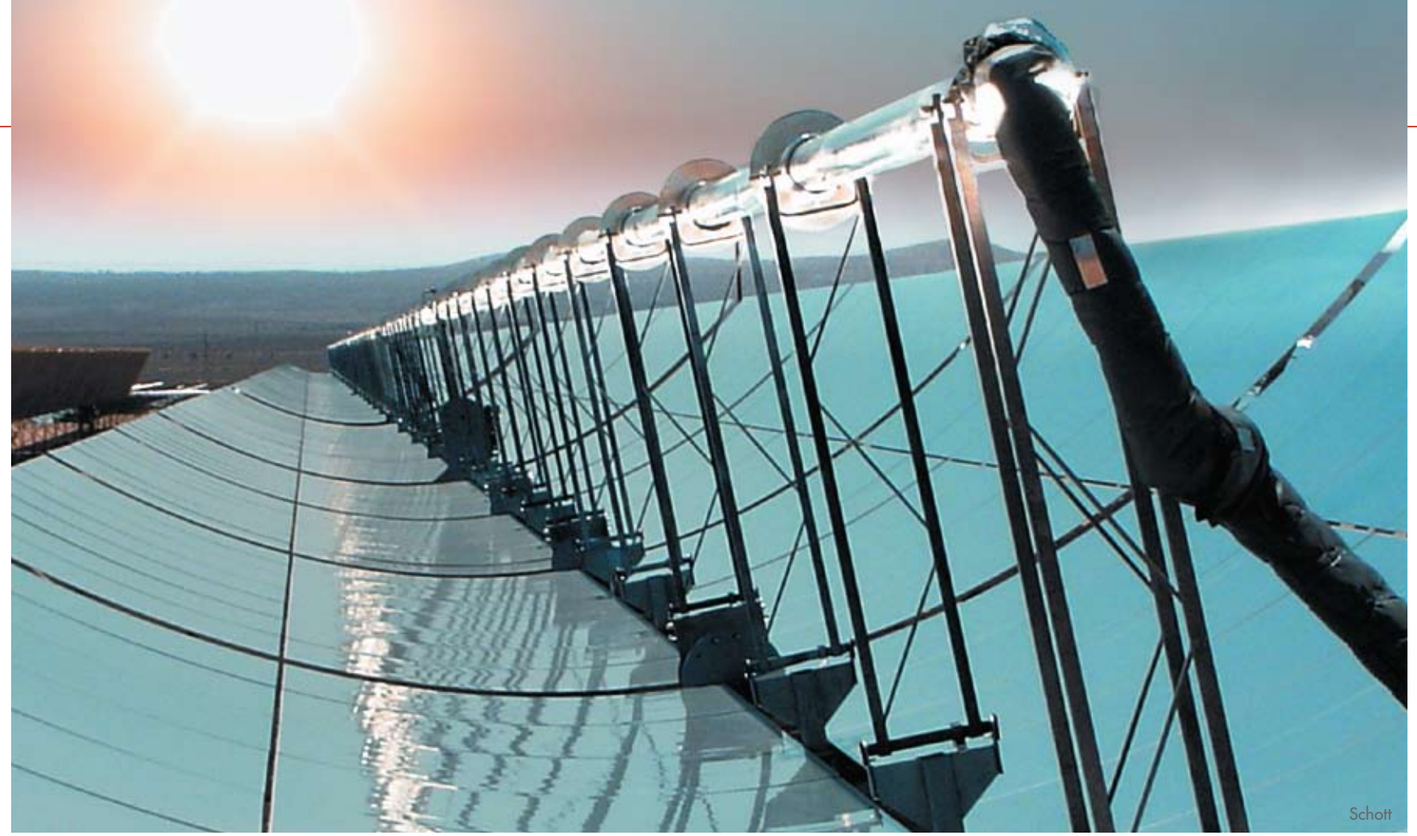
In the past five years, solar thermal energy production has experienced a rapid growth. At the end of 2008, solar thermal power had a worldwide capacity of 0.4 GW, with the U.S. representing 80 % of that production. Meanwhile, Spain is competing with the U.S. for world leadership in this sector. By 2011, the plants currently being constructed will supply at least an additional 1.7 GW, of which 0.96 GW will be produced in Spain alone. In the U.S., plans are being made to build plants with a total capacity of 7 GW, while Spain plans to add a further production capacity of 10 GW until 2017. Apart from tourism, solar power and research in the associated technologies could be set to become an essential economic factor for Spain.

Based on an ambitious development outlook and high energy efficiency, experts estimate that solar thermal plants could cover up to 7 % of the global electricity demands by 2030, and up to 25 % by 2050. Solar thermal plants use the unlimited supply of the sun as an energy source and combine it with the proven technology used in conventional fossil fuel power generation. Yet, they are less damaging to the environment, produce very low levels of greenhouse-gas emissions and reduce fossil fuels consumption, making them a key technology with huge growth potential.

Within merely six hours, the world's deserts receive the amount of solar energy that corresponds to the global annual fossil fuel consumption. No wonder that there is general agreement in the EU and the Union for the Mediterranean about the need to use renewable energy sources. As a result, large corporations including Siemens, RWE, E.ON, Deutsche Bank and Munich Re, have joined forces to create a detailed technical plan for the implementation of the multi-billion-euro Desertec project to turn desert sun into electricity. Based on a concept by the Club of Rome, a global think tank for international political issues, Desertec was drawn up as part of the Club's agenda to propel the use of solar energy to unprecedented levels. Desertec will make extensive use of solar and wind energy in the deserts of North Africa and the Middle East to produce electricity, which will be supplied, at first to the neighboring countries, and from the year 2020 also to Europe, via a super grid of high-voltage DC cables.

Well focused

To produce electricity, solar thermal power plants use CSP (Concentrating Solar Power) systems: these systems use hundreds of mirrors to focus the sun's rays on a liquid that, when heated, drives a steam turbine to produce heat or electricity. A benefit of CSP systems is that they can integrate thermal storage and are suitable for hybrid operation, e.g. in combination with natural gas combustion as a backup. As a result, CSP



Schott

The parabolic trough collectors are up to 400 m long and track the sun's radiation. The thermal oil in the central receiver pipe transports the received energy to the power station unit.

Sunny outlook for renewable energy: the sun shines longer in Spain than in any other European country.

In the SAMCASOL plant, the flow rate and temperature of the heat transfer oil, which is routed through the entire solar field to the power plant, are regulated by a LEUSCH LTR 43 Butterfly Valve and a SAMSON Type 3241 Valve in split-range operation.

plants can supply the base-load power as well as function as a reserve for times of peak demand. Even though CSP power plants are always based on the same functional principle, the technological specifics may differ from plant to plant: how the collectors are shaped, whether the receivers are fixed or mobile, how the collectors track the sun's radiation throughout the day, whether irradiance is focused on a linear receiver or at a single-point receiver, and how the solar energy is converted into electricity.

The bulk of commercial solar power plants now in operation or the planning stages uses parabolic troughs with linear receivers. At the moment, this technology is the most mature and provides the highest efficiency. The sun's rays are focused on linear absorber tubes filled with a circulating synthetic oil that acts as the heat transfer fluid. This fluid transfers the heat to heat exchangers where water is superheated. The resulting superheated steam drives a turbine, which in turn drives a generator that produces the desired electricity. Excessive heat not needed during the daytime is stored in molten salt tanks.

Technology and service

With its tailor-made valve solutions for the specific process requirements in these solar power plants, SAMSON has already acquired considerable experience and expertise in this evolving market and is heading towards a sunny future. Credit for this has to be given mainly to the staff at SAMSON Spain, whose high commitment opened the doors for SAMSON's involvement. They recognized the enormous market potential early on, made important contacts and promoted the technological exchange between manufacturers and operators.

SAMSON's product portfolio provides the entire control valve technology for solar thermal plants: proven control valves suitable for use in the thermal oil applications, the solar collectors and the steam circuit as well as special valves able to handle the molten salt heat storage system. The latter are equipped with graphite-free packings to withstand the extremely corrosive molten salt atmosphere. Nevertheless, SAMSON supplies more than the "naked" equipment and technology. Valuable expert services are provided as well. Plant constructors are given any support necessary, from valve selection during the planning stages, valve configuration, on-time production and delivery, installation and start-up to servicing and maintenance.

Sunny outlook

Solar technology has come a long way. Yet, there is still huge potential for improvement in terms of efficiency, capacity utilization and production cost. As a result, science and industry are working on collectors with better performance, more efficient storage methods and alternative heat transfer media. For example, thermal oil can only be heated up to 380 °C, which limits the yield from this medium. Possible alternatives under investigation are molten salt and air.

Solar thermal plants are also being considered for use in fields other than energy production, for example further using the generated process heat or coupling solar thermal power plants with desalination units. Naturally, regions with relentless sunshine also suffer from water supply shortages. SAMSON, as a one-stop shop for instrumentation and controls, already possesses the control technology and expertise required for such applications in the proven SAMSON quality.

The trough collectors heat the transfer oil up to reach temperatures of 400 °C. 168 Type 3251 Control Valves in NPS 3, Class 600 with bellows and electric actuators ensure optimum flow.