

New era of solar energy: Solar Millennium makes possible the plannable operation of solar-thermal power plants by using heat storage tanks

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The thermal energy storage system of Europe's first parabolic trough power plant, Andasol 1, has been successfully put into operation. With the use of storage technology, a new era has begun in solar energy: The use of the world's biggest molten salt thermal energy storage in any industrial plant to date, enables a plannable plant operation even when the sun isn't shining. The commissioning of the storage system and the turbine, along with the feeding of electricity into Spain's grid (on a test basis) will follow within the coming days. In a few weeks, Andasol 1 will then go into regular operation.

The Andasol 1 storage system absorbs part of the heat produced in the solar field during the day. The turbine produces electricity using this heat during the night, or when the sky is overcast. In this way, the ability to plan the production of electricity is significantly improved. Additionally, it almost doubles the number of operational hours per annum of the solar thermal power plant.

Dr. Henner Gladen, CTO of Solar Millennium AG: "With parabolic trough power plants Solar Millennium is applying a proven technology to solar power generation, leveraging it into a completely new dimension by using energy storage systems. The storage technology of the first European (and the world's largest) parabolic trough power plant, Andasol 1, represents an outstanding technical innovation, and is a very important step on the way to solar thermal power plants attaining base load capacity."

At Andasol 1, the heat generated in the solar field is to be stored in a molten mixture of 60% sodium nitrate and 40% potassium nitrate. Both substances are used in food production as preservatives and are also used as fertilizer. The storage tank consists of two, 14-meter high tanks with a diameter of 36 meters and a capacity of 28,500 tons of molten salt. During the pumping process from the 'cold' to the 'hot' tank, the molten salt absorbs additional heat at an outlet temperature of approx. 280° C, thereby reaching a temperature of 380°C. A fully loaded storage system can keep the turbine in operation for 7.5 hours, which means almost 24-hour operation of the power plant in summertime. Molten salt has been used in different industrial applications for about 60 years to date, e.g. in galvanizing.

About the Andasol projects:

The Solar Millennium Group initiated the Spanish parabolic trough power plants Andasol 1 to 3 up to a successful completion of the project development activities. Andasol 1 is under construction since 2006 and will go into operation this year. The sister projects will be completed in 2009 and 2011. With the Andasol projects, solar thermal energy generation is being realized on power plant level for the first time in Europe. By using thermal storage, the power plants can produce electricity in a plannable way – even at night. Furthermore, the Andasol power plants are the largest solar power plants in the world. Each of the 50-Megawatt plants has a solar field with a collector area of 510,000 square meters - which is more than 70 soccer fields – and provides solar power for up to 200,000 people. In summer,

the Andasol power plants also contribute to covering the peak demand periods in the Spanish power grid, which are largely caused by high energy usage associated with air conditioning.

About Solar Millennium AG:

Solar Millennium AG, Erlangen, is a globally active company in the renewable energy sector, with a main focus on solar thermal power plants. Together with its subsidiaries, Solar Millennium specialises in parabolic trough power plants - a reliable, proven technology in which the company has a worldwide leading position covering all major business sectors along the value chain for solar thermal power plants from project development over technology and turn-key construction to the operation and ownership of power plants. In Spain, Solar Millennium developed Europe's first ever parabolic trough power plants, which are already under construction. Further projects are planned worldwide with an overall capacity of over 2,000 Megawatts. The current regional focus is on Spain, the USA, China and North Africa. In addition, the company develops solar chimney power plants aiming to make this technology ready for the market.

About solar thermal power plant technology:

Solar thermal power plants generate electricity using thermal energy converted from solar radiation. In a parabolic trough power plant, the solar radiation is concentrated by trough-shaped mirrors onto a pipe in the focal line of the collector and absorbed by a heat transfer fluid which, thus, heats up to about 400°C. The heat is transported by the fluid to the power block where it generates steam by means of a heat exchanger. As with conventional power plants, the steam powers a turbine to generate electricity. And by integrating a thermal storage, electricity can be supplied on demand, even after sunset.

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