German Aerospace Center

Press releases 2009

Andasol 1: The largest solar power station officially inaugurated

1 July 2009

Andasol 1: 500 000 square metres of mirror surface catch sunlight

On 1 July 2009 the solar-thermal power station Andasol 1, located in the Spanish province of Granada in Andalusia, was officially inaugurated. At the present time, Andasol 1 is the largest solar power station in the world. Researchers at the German Aerospace Centre (Deutsches Zentrum für Luft- und Raumfahrt; DLR) were heavily involved in the development of key technologies and identified the most suitable location with the help of various tools, including satellite data. They did this on behalf of Solar Millennium AG, the project development company. In addition, their measuring methods contributed towards the precision design of the parabolic trough collectors.

Climate-compatible power for 200 000 people

Andasol 1 delivers climate-compatible power for 200 000 people. This makes it possible to cut annual emissions of carbon dioxide by 150 000 tons. There are more than 600 parabolic trough collectors distributed over a total surface area of about two square kilometres, each of which measures 150 metres in length and 5.7 metres in width. These mirrors have a total surface area in excess of 500 000 square metres.

There is also a heat accumulator located in the centre of this gigantic solar field. Here, two giant tanks, measuring 14 metres in height and 36 metres in diameter, are used to store surplus energy during the midday period using liquid salt. This salt is heated by solar power to temperatures of up to 390 degrees Celsius and this stored heat enables the power station to operate at full power (50 megawatts) for up 7.5 hours after the Sun has set – a key requirement for the future use of solar power stations.

Other solar power stations already at the planning stage

As well as Andasol 1, the first commercially operated power station of its kind, plans are well underway for a further two solar power station at the same location. In the course of this year, Andasol 2 is scheduled to come on stream, also rated for a capacity of 50 megawatts. Andasol 3, also with a 50 MW rating, is expected to follow in the course of 2011.

DLR researchers tasked with finding the ideal location

On behalf of Solar Millennium AG, the project development company, employees in the Solar Research department of the DLR Institute for Technical Thermodynamics (Institut für Technische Thermodynamik; ITT) at the Plataforma Solar de Almería research station located about 50 kilometres from the Andasol site were tasked with identifying a suitable location for the new solar power station. One key decision-making indicator took the form of the statistical mean values calculated from many years of sunlight readings taken by the DLR from meteorological measurements at ground stations, and sequential satellite data.

Precision boosts energy yield levels

Parabolic troughs are constantly directed to face the sun

When setting up this system, it is also possible to use high-speed optical measuring processes developed by the DLR for precision production control of the parabolic collectors. Precise and well-aligned parabolic mirrors are able to boost the energy yield by up to 10%, and this makes a key contribution to the cost-effectiveness of a plant of this kind.

Development of the actual collector technology was aided by the DLR taking a leading role in several projects sponsored by the German Environment Ministry. This meant that the industrial partners were supported during the design and testing of collector prototypes and absorber tubes by DLR employees working at the Spanish test centre of Plataforma Solar de Almería, located in Almeria.

The total cost of this power station is somewhere in the region of € 300 million. A key form of early assistance for the Andasol 1 power station was also forthcoming from the European Union, which contributed € 5 million of funding aid for the preparation and accompanying scientific research.

Precision mirrors boost cost-effectiveness

Power from concentrated solar energy

Andasol 1 is a solar-thermal power station and what is known as a parabolic trough power station. In this configuration, the concentrating mirrors take the form of a very long trough with parabolic cross section. The individual elements of this trough, the collectors, are rotated to track the Sun as it moves from east to west. Sunlight falling on the collector is reflected onto a focal line, where the light energy is concentrated by a factor of up to 80. Absorber tubes run down this focal line. These steel tubes, surrounded by an evacuated, insulating glass tube, have a special surface coating which is highly effective at absorbing solar radiation and converting it into heat. In this process, temperatures substantially in excess of 400 degrees Celsius are developed on their surface. An oil known as 'thermo-oil' flows through the centre of each steel absorber tube. This oil is heated to almost 400 degrees, and the collected heat is then directed to a thermal transfer unit in which steam is generated at high temperature and pressure. As in conventional power stations, this steam is then used to drive a turbine that – linked to a generator – then generates electrical power.

Related Contacts

Dorothee Bürkle
German Aerospace Center
Corporate Communications, Editor, Energy
Tel: +49 2203 601-3492
Fax: +49 2203 601-3249
E-Mail: Dorothee.Buerkle@dlr.de

Contact details for image and video enquiries as well as information regarding DLR's terms of use can be found on the DLR portal imprint.