Press releases 2009

Jülich solar tower power plant – research facility officially handed over to the operator

20 August 2009

Jülich solar tower power plant

Key technology from DLR is on its way to the market

On 20 August 2009, the solar thermal experimental and demonstration power plant in Jülich (Solarthermisches Versuchs- und Demonstrationskraftwerk Jülich; STJ) was officially handed over to its future operator, the Jülich Department of Works, by the general contractor, Kraftanlagen München. The technology for the core of the facility, the receiver, was developed and patented by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR). DLR, together with the Jülich Solar Institute, provided scientific guidance and support for the planning, design and operation of the power plant. This collaboration will continue throughout the on-going operation, for the purpose of joint development of the technology.

Handover with Federal Minister for the Environment Gabriel and signing of a follow-on project

The solar tower power plant was handed over to the Jülich Department of Works in the presence of the German Federal Minister for the Environment, Sigmar Gabriel, North Rhine-Westphalia's Minister for Economic Affairs, Christa Thoben, and the Parliamentary State Secretary to the Federal Ministry of Education and Research, Thomas Rachel.

2,153 movable mirrors (heliostats) with a total area of almost 18,000 square metres are arranged over an area of around eight hectares. They follow the path of the Sun and concentrate the solar radiation on a receiver that is around 22 square metres in size, installed at the top of a 60-metre tower. The receiver is made of porous ceramic elements through which incoming ambient air flows. In passing through the receiver, the air is heated to around 700 degrees Celsius and this heat is delivered to the water-steam cycle in a heat recovery boiler. The steam generated there drives a turbine, which produces power via a generator. The power plant will supply 1.5 megawatts when operated at its rated capacity. A heat storage module that extends across two stories of the tower is integrated into the plant. This heat storage module contains ceramic filling material through which hot air flows and which can thus be heated. When discharging, the process works in reverse: the heat storage module releases its energy so that power can also be produced when clouds pass overhead.

Tower at the solar thermal power plant Jülich (STJ)

Now, the Jülich solar power plant can be used to demonstrate for the first time the technology for a solar tower power plant that was developed in Germany as a complete system. "The new facility provides a unique opportunity to further develop the technology in order to make it ready for a market launch through practical experience, and to further cement DLR's role as a leading international developer of solar thermal power plant technologies," said Professor Hans Müller-Steinhagen, head of DLR's Institute for Technical Thermodynamics, at the celebratory handover. Professor Müller-Steinhagen added: "Of course, the Sun does not shine as often in Jülich as in North Africa, but for an experimental power plant in which the technology is to be further developed, having good connections to the research institutes is more important than continuous operation." The solar thermal power plant in Jülich thus serves as a reference for future commercial power plants in southern Europe and North Africa, which will play a major role in the desert power project DESERTEC. The technology and the knowledge obtained by the researchers in Jülich will be used in sunny regions of the world, where solar thermal power plants have the greatest potential.

Heliostat field: over 2,000 movable mirrors

In addition to its role as licensor for the receiver technology, DLR was also involved in the design of the heliostat field and the receiver and in qualifying individual components within the system. Furthermore, DLR computer simulations led to the development of operating concepts and to the calculation of the annual yield of the overall facility that are important for assessing efficiency. In this regard, DLR can rely on the many years of experience gained from its development work and the test operation of solar thermal facilities at the Plataforma Solar de Almería in southern Spain.

One storey of the tower to be used for experiments

Inside the tower of the solar power plant, DLR and its partners will set up a research platform on one storey that is at around half the height of the tower. The researchers will be able to place experiments behind a three-by-seven metre opening onto which the power plant's heliostats can be focussed. Included among the planned activities are tests for new receivers and experiments on the thermochemical manufacture of hydrogen using solar energy.

Reference for future commercial power plants

The project will be supported by a research programme spanning several years which, as well as providing scientific support for the operation of the power plant, will in particular develop methods for optimising operation, assuring quality and developing the technology in order to further improve the competitiveness of the facilities. For example, a fully dynamic computer model of the facility will be developed which is later expected to enable the real-time optimisation of operations supported by the model. The project was sponsored by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit; BMU), the Ministry of Economic Affairs and Energy of the State of North Rhine-Westphalia (Ministerium für Wirtschaft, Mittelstand und Energie des Landes Nordrhein-Westfalen; MWME NRW) and the Bavarian State Ministry for Economic Affairs, Infrastructure, Traffic and Technology (Bayerischen Staatsministerium für Wirtschaft, Infrastruktur, Verkehr und Technologie; STMWIVT).

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