THE ECHO

Ferrostaal

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DECEMBER 2009

Regenerative
Worldwide boom in solar technologies

Sustainable
How to successfully avoid accidents

Established
30 years of business in Libya

The sun – power for the 21st century

The solar market is booming: the USA, the most important energy market on earth, is pumping subsidies worth billions into generating renewable energy. With Desertec, standing for electricity from the desert, the largest solar investment in human history is being discussed. At the same time, Ferrostaal is constructing its first commercial parabolic trough power plant in Spain, while Fresnel technology is about to be introduced onto the market. The climate for solar power could not be better.

Solar boom in the land of unlimited opportunity

In the USA the indicators for solar thermal power point to growth. Subsidies in the triple-digit billion range will produce greater dynamism in the largest energy market on earth than has ever been known before. As a leading company for the construction and development of solar thermal power plants, Ferrostaal will also profit from the favourable economic climate for solar power.

In the US market Ferrostaal focuses on three segments through its 100 percent subsidiary Ferrostaal Incorporated: the construction of solar thermal power plants that use parabolic trough technology, the production of process steam using Fresnel technology, and solar heating and cooling of buildings. All three segments hold enormous growth potential: since the government changed hands, the pursuit of energy independence and the efforts to reduce CO_2 emissions have combined with increasing energy requirements to drive the market in the USA at an unprecedented speed.

To enable the greatly increased demand for solar thermal power to be met, in the middle of the year Ferrostaal Incorporated concentrated its activities in the solar power plant sector in a joint venture with Solar Millennium AG. Ferrostaal Incorporated owns 30 percent of this company, which is named Solar Trust of America (STA), while Solar Millennium owns 70 percent. STA covers the entire value added chain for the construction of solar thermal power plants with its Project Development, Supply Chain Management, Financing, Engineering, Procurement, Construction, Operation and Maintenance departments. Uwe T. Schmidt, member of the Management Board of Ferrostaal

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"We are the only company in the USA which offers the development and construction of solar power plants from a single source. This is how we stand out decisively from our competitors."

Uwe T. Schmidt, member of the Management Board of Ferrostaal and also Chairman and Chief Executive Officer of Solar Trust of America

and also Chairman and Chief Executive Officer of STA has the following to say about this: "We are the only company in the USA which offers the development and construction of solar power plants from a single source. This is how we stand out decisively from our competitors. With Solar Trust of America we will promote project development in the southwest states of Nevada, Arizona, California, Colorado and New Mexico. The solar radiation and availability of land are ideal in these states. It is possible there to generate six times as much energy as the entire US market can consume in a year."

Gigantic proportions

The special feature of the solar thermal power plants in the USA is their size. With an output of 240 megawatts they are considerably larger than solar power plants in Spain or other parts of world. However, although the size reduces the relative power generation costs, the absolute investment costs for construction are appreciably higher. Innovative financing strategies and power purchase agreements (PPAs) with local energy providers are therefore the linchpin for successful project development for companies from the solar power sector.

Solar Trust of America already has PPAs for constructing up to three parabolic trough power plants in California, each with an output of 242 megawatts. The EPC contracts are currently being drawn up. The power plants are scheduled to be commissioned in 2013 and 2014. The PPAs regulate the usage of the electricity produced in the solar power plants for a period of 20 years. Each of these power plants will supply 80,000 households per year with electricity. Furthermore, the company has signed a declaration of intent with NV Energy, the largest power provider in the state of Nevada. The prospects for intensifying the solar power business in the USA are therefore bright.

Government subsidies in the triple-digit billion range

The general political conditions for financing are also favourable, because the Renewable Energy Portfolio Standards which already exist in some states in the southwest oblige the energy providers to obtain a proportion of their power from renewable energy sources. This provides additional impetus for the solar power market. By 2020, solar power plants generating 20,000 megawatts are scheduled to be installed in the southwest states of the USA. Mr Schmidt comments: "Now is a particularly good time to implement solar power projects on a large scale. Tax depreciation allowances – what are known as Investment Tax Credits – make investments in solar thermal power plants more attractive. In addition, the Obama government's programme to stimulate the economy has created further incentives. Government subsidies amounting to 30 percent of the investment amount and government guarantees for credits set a clear sign for

environmentally-friendly electricity. However, since we're dealing here with something that is in a different league from Spain, it is essential to guarantee the financing. We're currently checking out various options for accessing the capital market ourselves to permit us to develop and implement several large projects in parallel."

In the Fresnel segment, Ferrostaal Incorporated focuses on plants with capacities ranging from 30 to 75 megawatts which are to be developed in conjunction with the technology affiliate Solar Power Group. The potential applications for Fresnel plants are very varied. They are envisaged primarily for extending conventional power plants and for use in enhanced oil recovery. Here the plant's process heat helps to flush the crude oil from the wellheads. The hot steam is pumped into the wellhead and releases the encrusted oil reserves which can then be opened up.

The market for solar cooling and heating in the USA is also particularly promising. Currently, 3.5 million public buildings are cooled using electrical cooling systems. At the same time President Obama's government is attempting to double the capacity of environmentally-friendly power in the next three years. Replacing electrical cooling systems is therefore merely a logical step in doing this.

"Finally the right economic climate exists to permit above-average growth of the solar power industry in the USA. The coming years will give the industry an unbelievable boost. Ferrostaal Incorporated will play its part in generating the power of the 21st century," concludes Mr Schmidt.

The power requirements in the rapidly growing and most densely populated cities in the USA are increasing. Solar power offers a future-oriented alternative to power from fossil sources.

Construction of the solar power plant Andasol 3 has begun

Ferrostaal, together with Solar Millennium and the Spanish company Duro Felguera, was awarded the contract to construct the parabolic trough power plant Andasol 3. It is scheduled to be completed in 2011. 210,000 mirrors will then collect the sun's rays in the Spanish province of Granada each day and supply around 200,000 people with environmentally-friendly electricity.

The parabolic trough power plant Andasol 3 is currently being built on an area of approx. 2,000,000 square metres.

The power plant will begin operating with an output of 50 megawatts. This makes it one of the largest solar thermal power plants in Europe. The Essen-based industrial service provider has taken on a leading role in constructing Andasol 3. As the general contractor, the company will perform the EPC services amounting to an order volume of over 300 million euros and is responsible for the turnkey construction. In addition, Ferrostaal is also co-owner.

Ferrostaal plays a key role in the interim financing of the solar power plant. The reason for this is the Real Decreto 6/2009 which was passed in May in which Spanish legislators re-regulated the prerequisites for obtaining the legally guaranteed feed-in tariff of around 30 euro cents per kilowatt hour. This demands, for example, proof of major authorisations, ordering key components and proof that at least 50 percent of the investment sum can be financed in order to ensure pre-registration of the project and consequently ensure the feed-in tariff. In order to permit pre-registration, the Essen-based plant constructor and industrial service provider committed itself financially and, through a holding company, took over the majority share in a project company which is the owner of the power plant. A consortium consisting of German power companies plans to take over a majority share in the project company at a later date, as soon as Andasol 3 has been registered (status as at the editorial deadline in October). The receipt of the feed-in tariff would then be ensured if the power plant is placed in service within 36 months of its being registered. Dr. Rainer Kistner who, together with Tom Koopmann, is responsible for the Solar Energy business unit at Ferrostaal, says of this: "Without Ferrostaal, Andasol 3 would not have been built. Through our commitment with regard to the interim financing, we have established a clear position on the market and proved that we believe in sustainable power generation. The upcoming registration and the increased tariff security that this will entail will make Andasol 3 significantly more attractive for additional investors to become involved in."

Tried and tested business model

Thus Ferrostaal's well-tried business model will be employed for Andasol 3: developing a plant together with partners and investing in it with the company's own capital. The company is consequently project developer, constructor and co-owner. The advantage is that not only the profits but also the risks are distributed fairly to all partners, and there is a greater focus on the plant's overall lifecycle: whereas other plant constructors withdraw from a project after the handover, the Essen-based industrial service provider remains involved.

Andasol 3 will be constructed in the immediate vicinity of its two partner projects Andasol 1 and 2 – the first parabolic trough power plants in Europe. In technical terms Andasol 3 will differ slightly from its predecessors. "We're trying to integrate the lessons we've learned and to implement the potential for improvement," explains Mr Kistner. "The differences are to be found first and foremost in the detail engineering, in the storage strategy and in the solar field itself. We will also use a different turbine for the power plant."

Reliable and predictable

The main special feature of a parabolic trough power plant is that it will continue to drive the turbines for around seven and a half hours at night: the large salt storage system which the sun heats up to a maximum of 390 degrees Celsius will also enable the power plant to generate electricity reliably after sunset. This means that the plant will generate considerably more power than a solar power plant without a storage system – a criterion which gives solar thermal power plants enormous potential for the future. "They are

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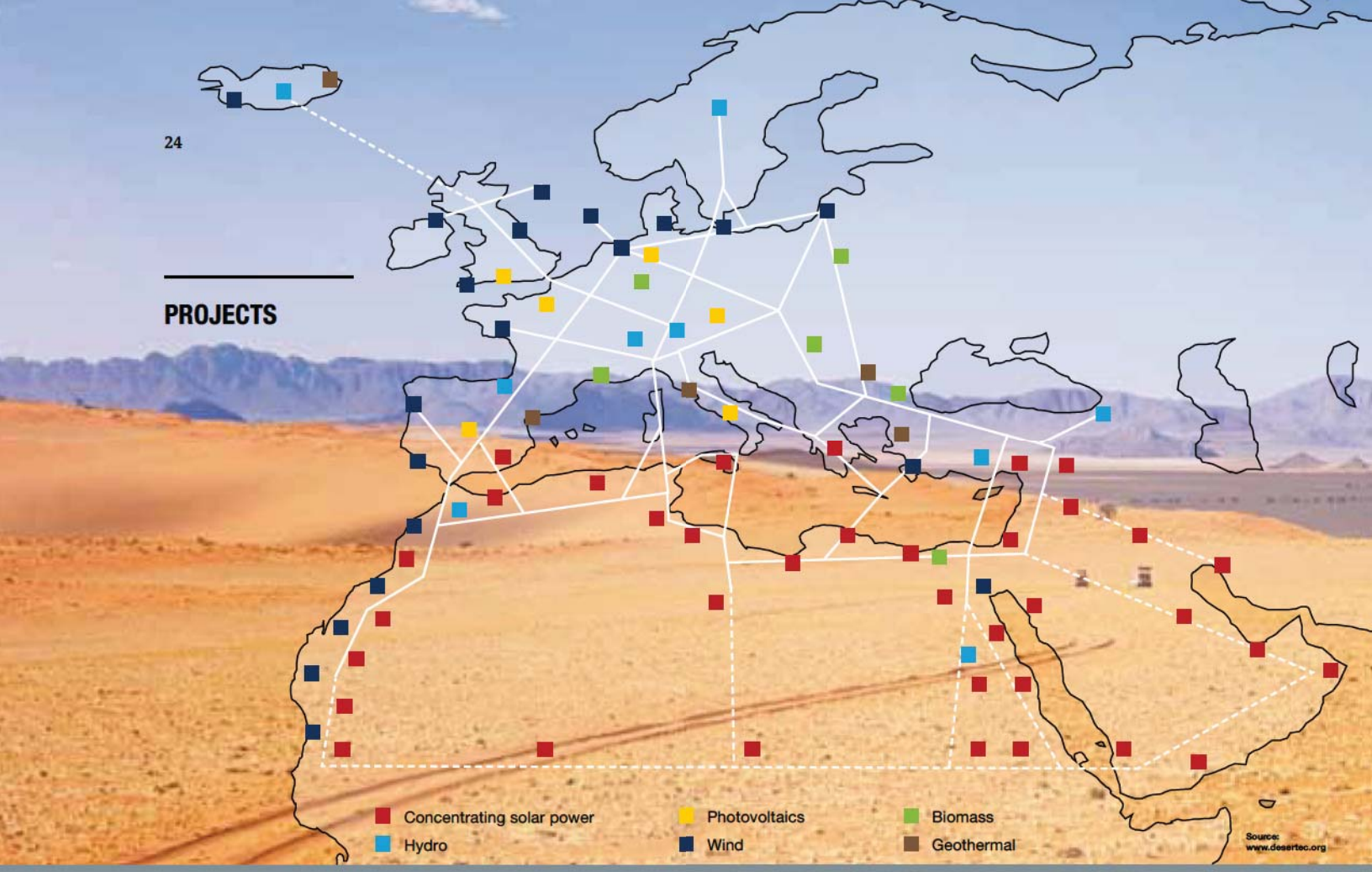
environmentally friendly, reliable and predictable because they are independent of the fluctuating oil and gas prices," says Mr Kistner.

The construction of Andasol 3 is already at an advanced stage. The excavation work has been completed, the foundations for the collector supports have been cast, and the positions of the fixing screws have been measured and marked in the foundations. The hall in which the collectors are constructed has also been built. The first collectors are currently coming off the assembly line there. One after the other, these will be attached to the foundations. The solar field will be gradually built up in this manner by the summer of next year. The start of commercial operation is scheduled for the summer 2011 – a sea of cambered mirrors, installed with millimetre precision, will then generate green electricity on an area covering around 2,000,000 square metres.

The construction of Andasol 3 is progressing in leaps and bounds. It is planned that 200,000 people will be supplied with solar power by spring 2011.



The vision: This is what the infrastructure for sustainable power generation from renewable power sources such as sun, water, wind, biomass and geothermal energy could look like in 2050.

Desertec – the power strategy of the future?

What sounds utopian today could become reality in just a couple of decades: utilising the solar power in the Sahara to cover the energy requirements of nearby Europe. This project is undoubtedly visionary, but not impossible. A group of companies now wants to work together with the Desertec Foundation, the ambassador and promoter of the concept, to check feasibility – including Ferrostaal through its joint venture MAN Solar Millennium.

The project bears the name of "Desertec", a combination of the words "desert" and "technology". The objective of Desertec is to construct giant solar thermal power plants in the Sahara. These will utilise the enormous energy of the sun, which in the summer produces maximum temperatures of 50 to 60 degrees Celsius, to generate electricity. The concept behind the power plant parks is that they will supply the countries in North Africa and the Middle East with power as well as covering 15 percent of Europe's electricity requirements. Desertec will have an estimated investment volume of 400 billion euros and is planned to already begin supplying power in ten years.

It is planned that giant solar thermal power plants should supply the MENA region with electricity and at the same time cover 15 percent of Europe's power requirements.

According to expert opinion the project is technically feasible; the solar radiation in the Sahara is also ideal to generate power on a large scale. According to a study of the German Aerospace Centre (Deutsches Zentrum für Luft- und Raumfahrt – DLR), three thousandths of the world's 40 million square kilometres of desert are sufficient to satisfy the global hunger for energy. However, it is essential to create the basic conditions for implementing this project. For example, Desertec requires a gigantic electricity grid to be constructed. For this reason Ferrostaal, through its joint venture, the Desertec Foundation and eleven other leading enterprises such as Münchener Rück, Siemens, Deutsche Bank and RWE, have signed a Memorandum of Understanding to establish the Desertec Industrial Initiative in order to examine the technical, economic, political and ecological feasibility of the project. In regard to this, Tom Koopmann, Head of the Solar Energy business unit at Ferrostaal, says: "With Desertec we see a way of re-inventing our entire power strategy. The project is in its early stages. It is a vision which must be checked for its feasibility over the coming years. We think it makes sense to be involved in defining how the general conditions are to be implemented."

Thousands of kilometres through the Mediterranean

The solar power could be transported via high-voltage DC power networks. In contrast to alternating current power networks, these are extremely efficient: Only three percent of the electricity which is fed in would be lost when it is transported across the Mediterranean. The opportunities which Desertec offers are enormous: in view of global warming and the fact that fossil resources are finite, the project provides an alternative to power generated in conventional power plants – without producing CO_2 and in a way that is harmless to the environment. Solar thermal power plants also promise stability for countries in Africa. Energy is regarded as a basic requirement for economic growth and competitiveness on the global markets. The production costs for industrial and consumer goods, for example, are directly dependent on access to energy. Desertec could prepare the ground for a sustainable basis for living.

"The project offers enormous potential for the whole world," confirms Mr Koopmann. "We very much welcome the Desertec initiative. Ferrostaal is one of the few companies which offers all the services for constructing solar power plants from a single source. We will play an active part in order to translate the Desertec vision into reality."