

**"Be careful what you wish for .... you just might get it."**

That's an old adage we often use in referring to something we have worked hard to make happen, but once it does, all the old rules we have played by will change. We will have to get out of our comfort zone and do something new, something perhaps less comfortable at first.

We have been in the business of developing Concentrating Solar Power (CSP) technology for many years, and we have made major strides. The reliability and performance of trough technology has not only been proven at the commercial plants in the California desert, but we have, for both troughs and power towers, developed and demonstrated advanced, higher-performing collectors, receivers, and operating strategies. We have improved hybridization and added storage as an option. We have made major strides on improving reliability of dish systems.

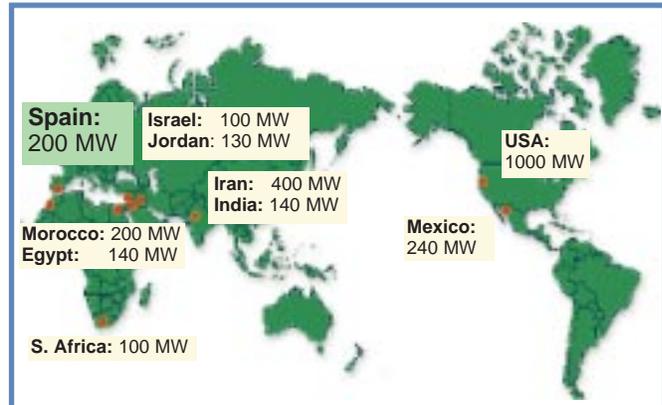
But we have also realized that developing technology is not enough. Several years ago, we crafted a new strategic plan for SolarPACES that added a specific focus on market development and an emphasis on expanding awareness of the potential of CSP. And so we stepped out of our comfort zone and refocused some of our effort to, as our former Chairman Gary Burch often said, "make something happen". We sent out START Missions, supported World Bank/GEF analyses, and pushed our respective governments to support early projects. We tightened ties with our industry partners (as witnessed by industry now providing Executive Committee representation from three member countries) who will make these projects a reality, and these industries have been out there, working hard to sell their wares.

These efforts have now brought us what we wished for. A range of trough and tower projects will now be built in Spain, thanks to government approval of a substantial solar premium. Meanwhile, two of the GEF activities, Mexico and India, have projects out for bid. The U. S. has requested proposals to build a megawatt of dish/engine systems in Nevada. Israel has announced intent to build 100 to 500 MW of parabolic troughs.

So where does that leave us? Of course, we still need R&D to reduce costs, and we still need to look for market opportunities and spread the word on CSP. But what we really must do now is again step out of our comfort zone and deliver on these hard-earned opportunities, to respond with competitive bids to the requests already out there, to flex our industrial muscle, and to start the assembly lines rolling. To quote another old adage, **"It's time to put up or shut up."** Let's build some solar plants!

**Craig Tyner**  
Chairman, SolarPACES

## Green light for CSP in Spain: the incentive premium for solar thermal electricity is published



**In place and in the pipeline:** 2.7 GW, 10 million m<sup>2</sup> CSP fields, 4.5 billion euro investment, 200 M US\$ GEF grant, 15 M euro EU grants - and the Spanish plants are moving at last !

After a two-year wait, the Spanish Government has finally approved the inclusion of incentive premiums for solar thermal electricity generation in the current tariff regulation for promotion of renewable electricity within the Royal Decree 2818. The new incentive premium of this Royal Decree grants a premium of 0.12 Euros above the market price for electricity generated from solar thermal energy in facilities with a maximum unit power of 50 MW.

The approval was made by the Council of Ministers on August 2, 2002 by proposal of the Ministry of Economy, after a long process of consultation with industry, producer associations and public offices such as the Spanish Agency for Energy Diversification and Saving (IDAE) and the Center for Energy, Environment and Technological Research (CIEMAT). It marks the culmination of a process to create a legal framework to support electricity generation with renewable energies within a liberalized power market. Before this modification, Royal Decree 2818 of 1998 provided attractive premiums for promoting power generation with all other renewable energy technologies but contained an important gap with regard to regulation of solar thermal electricity. This has now been corrected.

Dr. Manuel Romero, Director of the Plataforma Solar de Almeria (PSA) - and Operating Agent for Task I in the SolarPACES Program - warmly welcomes the Spanish government's action.

*"The Spanish Plan for Promotion of Renewable Energies has already set a market objective of 200 MW of solar thermal power plants by the year 2010. Thanks to the mobilization of industry, social agencies, politicians and R&D institutions to support this technology in Spain, with the authorization of this premium price we now have the conditions in place to allow us to meet our objective."*

Dr. Romero also highlights the international significance of the new legislation:

*"The course of action adopted in Spain is in perfect harmony with the new European Directive 2001/77/EC of September 27, 2001, on the promotion of electricity generated with renewable energy sources, and may also be an example for other countries in Southern Europe such as Italy, Greece and Portugal. Beyond this, I know that this measure has been long awaited by the entire international SolarPACES community"*

Meanwhile he confirms that extensive plans for project development are already in place in expectation of the incentive premium. Its publication is the starting shot for the construction of the first four commercial plants. These projects, tracked in earlier issues of SolarPACES News, are::

**PS10:** This 10-MWe solar-only power tower plant project Planta Solar 10 at Sanlúcar near Sevilla is promoted by Solucar S.A., part of the Spanish Abengoa Group, with partners. It features application of a volumetric air receiver with high temperature storage developed at the Plataforma Solar de Almeria.

**Solar Tres:** The 15-MWe solar-only power tower plant project at Cordoba is promoted by the Spanish Ghera and Boeing with application of US molten-salt technologies for receiver and energy storage. Ghera and Boeing have formed a company in Spain called Solar Tres to finance and build a fully commercial 15 MWe solar power tower plant that can deliver this power around the clock thanks to 16-hour thermal storage.

**EuroSEGS:** The 15-MWe solar trough power plant at Montes de Cierzo near Pamplona is promoted by the Spanish EHN group and DukeSolar, making use of improved LS-2 technology and Duke parabolic troughs.

**AndaSol:** This 50-MWe solar trough power plant in the region of Andalusia will have a 549'360m<sup>2</sup> EUROtrough solar collector field and a 9-hour thermal storage. It is promoted by Milenio Solar S.A. and the Spanish Abengoa group. (see also back page).

With the activity that will be stimulated by these projects in the next two years, Spain is set to become a worldwide reference point and center of attention in the development of solar thermal power. The Plataforma Solar de Almería has of course a strong track record in international co-operation projects and also plays a key role as the link between European research activities (many financed by the EC) and the development of commercial projects in industry. Components and prototypes developed at PSA will now be employed by a new generation of commercial plants which will have the continued support of the Plataforma in product development, commissioning and performance evaluation.

For the PSA, for solar Spain - and perhaps for the whole SolarPACES community - it is probably not an exaggeration to say that a new era has begun.

*For further information on the Spanish projects see <http://www.solarpaces.org/projects.htm> and/or contact: [manuel.romero@psa.es](mailto:manuel.romero@psa.es)*

## INDUSTRY *focus*

### Solar Millennium AG

Within International Energy Agency programmes, Germany has a record of some 25 years of commitment to the development of Concentrating Solar Power (CSP) technologies. With state-of-the-art technology now available, it is fitting that the major players in the country are now focusing on state-of-the-art "corporate architecture". Solar Millennium AG, established in Erlangen, Germany, in 1998, brings CSP to the marketplace, giving shareholders the chance to invest in this joint-stock company.

Solar Millennium AG was designed to overcome one of the big hurdles for CSP during the 1990's: the lack of a qualified organization to take turn-key responsibility for the implementation of a CSP plant. Recognising the problem, a few individuals from industry took matters into their own hands, raised over 13 million Euro venture capital solely for solar thermal project development and forged a group of competent cooperation partners who are jointly able to realize turn-key CSP facilities based on parabolic trough technology. The group includes:

- Flabeg Solar International GmbH: for solar field lay-out, design and engineering - also the only manufacturer of highly precise solar reflectors
- Kramer Junction Operating Company: the world leader in commercial operation of utility-scale solar thermal power plants and host of Solar Millennium AG's and the German Federal Ministry of the Environment's (BMU) co-funded EuroTrough full-sized 800 m demonstration test loop
- Schlaich Bergermann und Partner GmbH (SBP): the

construction specialists with high-level expertise in structural steel design and, specifically, designer of the EuroTrough collector structure

- Solucar S.A., the solar company within the Spanish Abengoa Group with lengthy experience in the fabrication and assembly of solar field equipment at the Plataforma Solar in Spain and envisaged partner of Solar Millennium's AndaSol 50 MWe parabolic trough projects in southern Spain

These partners, together with Schott Rohrglas GmbH and the German Aerospace Center (DLR), have initiated the qualification and scale-up program PARASOL-SKALET, co-funded and supported by BMU. Starting December 2002, a 4'360m<sup>2</sup> EuroTrough demonstration loop will be implemented within this program at Kramer Junction, California. The next step is the implementation of a 549'360m<sup>2</sup> EuroTrough solar field in the 49.9MWe AndaSol plant in Southern Spain. This project has received a grant offer worth 5 Million Euro from the European Commission, and the project will commence as soon as the expected Spanish premium for solar thermal electricity is published. Meanwhile, to be prepared for the management of a turnkey solar field supply and the entire solar field engineering, Solar Millennium AG and Flabeg Solar International have joined forces, creating a new solar field company FLAGSOL GmbH in June 2002.

*For further information see: [www.solarmillennium.de](http://www.solarmillennium.de) and [www.solarmillennium.com](http://www.solarmillennium.com) or contact: [aringhoff@solarmillennium.de](mailto:aringhoff@solarmillennium.de)*

## Solar storage: a 21st century quest

As concentration and conversion technologies mature, the concentrating solar power (CSP) industry is moving a further critical CSP component to the top of the development agenda. Storage technology, it appears, is now seen as critical to the success of the new generation of CSP plants in the pipeline around the world. So after a period of relative neglect, why is it that interest in solar storage is escalating right now? Rainer Tamme from the German Aerospace Center DLR explains:

*"It was appropriate that attention was first given to the solar concentration and conversion technologies, as these could be integrated relatively easily with conventional power technologies to deliver real benefits in the short term. But now there is a need to increase the solar contribution of hybrid plants, in order to further reduce emissions. And in addition we are also seeing plans come on stream for solar-only plants, driven by legislative regulations and specific credits for green energy. Efficient storage technology is critical within both these scenarios."*

Looking further into the strategic significance of solar storage technology, major benefits on offer include improved plant efficiency and the reduction of levelized electricity costs. The bottom line is simple - If the incremental cost for storage is lower than for an additional power block, then efficient solar storage makes sound economic sense.

### Europe addresses the storage challenge

Recognising the emerging global demand, a new European R&D initiative is underway to underpin the commercialization of efficient, economic storage technology. The proposed STORTECH consortium is designed to overcome a fragmented approach to storage R&D in Europe. Still open to new members, it already combines the industrial competence of leading European CSP industries with the scientific excellence of European research centres and universities. The team is embarking on an ambitious four year development program budgeted at some 22 million euros, with the expectation of securing financial support from the forthcoming EU 6th Framework Programme.

### STORTECH targets

The aim of the STORTECH initiative is to develop storage technologies which will significantly upgrade the operation of CSP plants - by increasing the solar annual contribution, by improving plant efficiency and by reducing levelized energy costs (LEC). This will be achieved by developing stable, low-cost storage materials, by developing economically optimized heat exchanger configurations and by developing optimized integration and operation strategies. The consortium partners have set themselves the following specific targets for energy storage technology:

- efficiency of more than 90%
- specific costs of less than 20 euros/ kWh thermal capacity and less than 0.01 euros/kWhel
- modular design and flexible scale of storage capacity
- 30 year life time

The aim is to achieve these targets for parabolic plants by 2005, and for solar tower plants by 2006.

### Advanced storage materials: project WESPE

The project WESPE, funded by the German Government, focuses on the development of efficient and cheap sensible storage material and on the optimization of the geometric arrangement of the heat exchanger tubes in the storage volume. Previously concrete has been investigated as a storage material. Within WESPE, materials with a higher storage capacity are being developed. These castable ceramics are composed of a binder and aggregates, with materials selected on the basis of appropriate properties, low cost and easy availability.

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TOP: a test block of castable ceramics

RIGHT: an advanced composite storage material consisting of expanded graphite with encapsulated PCM



In order to achieve the ambitious targets the work program of STORTECH is structured in horizontal and vertical tasks. Horizontal tasks deal with storage development for the specific CSP technologies. The vertical tasks are independent of specific CSP technology and are relevant for all technical approaches. These include:

- standardisation of storage material testing
- characterisation and evaluation
- economic aspects such as specific costs of sub-components, influence of site and location, tariff structures and demand profiles
- aspects of plant integration and operation strategies

### The SolarPACES context

While STORTECH is a European initiative, results of the project will have a spin-off internationally, thanks to the collaborative R&D framework provided by the International Energy Agency's SolarPACES program. Task III within the SolarPACES program focuses on the development of specific CSP components. Information sharing arrangements between the fourteen participating countries (see page 4) means that innovative solar storage techniques can be rapidly shared, contributing to global action on emission reduction.

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For information on SolarPACES Program's Task III: [www.solarpaces.org/task\\_iii.htm](http://www.solarpaces.org/task_iii.htm)

## Berlin conference confronts market issues

On 19-20 June, an international conference "Expanding the Market for Concentrating Solar Power" brought some 60 senior executives from 16 countries to Berlin. Organized by the German Development Bank, KfW, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the UNEP-GEF Technology Transfer Networks, the conference addressed the current obstacles faced by developers of CSP plants. The program included a review of current projects worldwide, an investigation of the policies needed to level the playing field and a discussion of financing requirements.

The meeting resulted in a decision to take a cohesive, structured approach to expanding the global CSP market. While expressing their resolution in the "Declaration of Berlin", participants agreed to form three working groups "Financing community", "Government" and "CSP industry/project developers". These groups will contribute to the formulation of an integrated long-term market introduction strategy to remove investment obstacles and to achieve required cost reductions. The first concrete solutions for a CSP Global Market Initiative will be presented at a follow-up conference at the beginning of 2003.

See: [www.solarpaces.org/berlin\\_conference.htm](http://www.solarpaces.org/berlin_conference.htm) and [www.en-consulting.com/csp/](http://www.en-consulting.com/csp/)

## Hybrid CSP plant for Israel

In April 2002 the Israeli government approved a decision to introduce CSP as an ingredient in the Israeli electricity market. The initial commitment is to a minimal power unit of 100 MWe with an option to increase the CSP contribution up to 500 MWe at a later stage, after the successful operation of the first unit. The investment in the first unit is expected to be 200 million US\$, with an estimated cost of 9 ¢/kWh for the electricity of the first unit and an expected reduction to 7 ¢/kWh when the 500 MWe unit is completed. The plant will operate in hybrid mode, 4400 hours/year, 50% of which is solar and the balance is gas.

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## AndaSol receives European Commission support

The 50 MWe "AndaSol" plant in Southern Spain has been offered financial support of up to 5 million euros from the European Commission. The funding, offered within the 5th Framework Programme for Research and Development, is to support the first implementation of EuroTrough technology at utility scale.

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## Solar Dish project for Nevada

The U.S. Department of Energy, Albuquerque Operations Office is seeking applications for research and development for a new project to deploy solar dish-engine systems at a site in southern Nevada. The two project objectives are to fabricate and field one megawatt or more of solar dish-engine systems in a power plant environment, and to develop a project development, installation, and O&M database for dish-engine systems

## RFP published for Indian plant

The long-awaited CSP plant in Mathania, Rajasthan has moved a step closer to reality with the publication of the "Request for Proposals" on June 8th, 2002. The Global Environment Facility (GEF) will support the addition of a 200'000 m<sup>2</sup> parabolic trough field to a 135 MW natural gas fired combined cycle power plant to be implemented by Rajasthan State Power Corporation Limited (RSPCL), Jaipur. The project will receive a Rs.50 core grant from the Indian Ministry for New Energy Sources (MNES), a USD49 million grant from GEF and a 126 million Euro soft loan from the German KfW. The KfW is the implementation agent for the GEF grant and the entire financing.

## New prospects for CSP in Algeria

Algeria is set to join Egypt and Morocco in the drive to develop concentrating solar power in North Africa and envisages the development of a 120MW integrated solar combined cycle. With a new concentrating solar power program in the planning process, Algeria has become the latest country to apply for SolarPACES membership.

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## ExCo update

Following the 63rd ExCo meeting on September 2nd and 3rd in Zurich, Switzerland, the 64th SolarPACES ExCo Meeting is scheduled for March 18th and 19th, 2003 in Rio de Janeiro (Brazil). The meeting will be followed on March 20th by "Host Country Day".

Craig Tyner, the new ExCo chair, continues as the US alternate ExCo member, while four members of the US concentrating solar power industry have been nominated as US ExCo members on a rotational basis: William Gould, (Nexant), Dale Rogers, (Boeing Company), Robert Liden, (Stirling Energy Systems) and Gilbert Cohen, (Duke Solar).

The latest SolarPACES annual report, reviewing the status of current R&D activities, may be downloaded from [www.solarpaces.org/annualreports.htm](http://www.solarpaces.org/annualreports.htm).



## SolarPACES NEWS

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SolarPACES is a program of the **International Energy Agency** focusing on concentrating solar power and solar chemical energy systems. As of August 2002 the participating members are:

**Australia, Brazil, Egypt, European Commission, France, Germany, Israel, Mexico, Russia, South Africa, Spain, Switzerland, United Kingdom, United States.**

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