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Solar Power

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Editorial



By Marcel Bial,
*Managing Director, European Solar
 Thermal Electricity Association (ESTELA)*

The total amount of electricity generated by Solar Thermal Electricity (STE) plants around the world is growing steadily. More than 2 GW have been connected to the grid in Southern Europe in the past few years. Operating experience has led to reductions in costs and risk. Plants with installed capacity of a further 1 GW are currently under construction in North America, Africa and Asia.

The European industry has a large stake in many of those projects, and the Renewable Energy Sources (RES) Directive together with the Infrastructure Regulation open the way for even more opportunities in Southern Europe and in the Middle East and North Africa (MENA) region.

In addition to providing significant local economic benefits, a key asset of solar thermal electricity is its dispatchability, as this makes it possible for a utility to accommodate an even larger number of other technologies with variable generation output: the cost per unit of dispatchable generation in STE plants (i.e. generation and storage) is becoming competitive compared with existing renewable energy technologies.

STE technologies have therefore a huge potential and R&D is essential to improve the competitiveness of the current designs. An important push must be given to specific technology development activities and to support innovative demonstration plants of commercial size in order to contribute to lower generation costs and to enhance the bankability of the projects.

Due to the expected cost reductions through technological advancement and mass production, the technology will probably no longer depend on the same feed-in-tariffs as the ones needed at the very beginning of STE deployment.

This is why ESTELA is keen on facilitating the alignment of R&D efforts with the support of the public administrations, including the European Union and the SET-Plan.

The ESTELA Strategic Research Agenda covers the four broad categories that up to now have been proposed for the thermal conversion of solar energy by the scientists. To varying degrees, they have been the subject of considerable interest. That is why STE is already making a promising contribution to satisfying electricity needs in many regions of the world. It is expected that advances in other fields such as materials and monitoring will create the conditions to conceive other innovative thermal conversion systems. The kind of R&D supported by ESTELA remains the best way to foster innovation and opens possibilities as the clock ticks for the inhabitants of our planet to find a sustainable path.

Link to ESTELA Strategic Research Agenda:

http://www.estelasolar.eu/fileadmin/ESTELAdocs/documents/Publications/ESTELA-Strategic_Research_Agenda_2020-2025_Jan2013_Full_HD.pdf

AUGUST 2013

SET-Plan update

Solar Power Focus

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The aim of the European Strategic Energy Technology Plan (SET-Plan) is to transform the way energy is produced and used in the European Union and to foster the development of cutting-edge renewable energy technologies, in order to provide Europe with the technical solutions required to meet its 2020 and 2050 energy and climate goals.

Since the SET-Plan was launched, many activities have been undertaken to advance these goals and to bring Europe closer to its renewable energy targets and to increase public awareness of the benefits of low-carbon energy. This update aims to provide a chronological overview of actions taken to promote the widespread uptake of solar energy technology throughout the EU in support of SET-Plan objectives.

- Solar Days was launched in 2002 in Austria, Germany and Switzerland and later expanded to become an official annual **European Solar Days** event held throughout Europe, aimed at increasing public awareness of solar energy and encouraging more people in the European Union to use it. The 6th edition of the European Solar Days, held in 2013, has shown massive public support across Europe for solar energy, with more than half a million European citizens attending 6,000 events in 20 countries.
- The European Union finances the **SOLFACE** project in 2004, which aims to open up a high-flux solar facility to scientists from Europe and allow them to tackle some as yet unexplored areas of research. SOLFACE offered high-quality research in two of the seven FP6 priority thematic areas, namely: "Nano-technologies and nano-sciences, knowledge-based functional materials, new production process and devices" and "Sustainable development, global change and ecosystems".
- The European Commission publishes **Concentrating Solar Power: from Research to Implementation** in 2007. This policy document outlines the Commission's policy aims and objectives to encourage the increased uptake of CSP technologies across Europe.
- In July 2008, the heads of states and governments of the European and Mediterranean countries launched the **Union for the Mediterranean** to provide a new impetus for regional cooperation. A key goal of the Union is to create a more integrated Mediterranean energy market in order to cope with fast growing energy demand in Southern Mediterranean countries.
- The flagship project of the Union, which favours low-carbon and renewable energy sources and energy efficiency, is the **Mediterranean Solar Plan**.
- The European Council and the European Parliament adopt the Commission's proposal for a **European Energy Programme for Recovery** (EPR) in July 2009. This €4bn programme includes several electricity interconnection projects in Spain, Portugal and Italy that contribute to the development of the local renewable energy markets and facilitate the grid connection of renewable energy sources, particularly solar sources, in the region.
- In 2009 the first four **EERA Joint Programmes** (JPs) were prepared, after their approval by the EERA Executive Committee, and are launched at a SET-Plan event in Madrid in June 2010, one of these JPs is dedicated to the photovoltaic sector. The objective of the Joint Programme is to accelerate the development of photovoltaic solar energy to an energy technology that can be implemented at a very large scale through Joint Programming activities by key research institutes in Europe.
- In October 2009 the European Commission issued a Communication on **Investing in the Development of Low-carbon Technologies**, which grouped the technology objectives for concentrated solar power (CSP) into four categories: Reduction of generation, operation and maintenance costs; improvement of operational flexibility and energy dispatchability; improvement in the environmental and water-use footprint; and advanced concepts and designs.
- The **Solar Europe Industry Initiative (SEII)** was launched in 2010 as a joint initiative between the **European Photovoltaic**

Industry Association (EPIA) and the **European Photovoltaic Technology Platform (EU PVTP)**, in collaboration with the EC and the Member States. The SEII Team gathers the relevant stakeholders involved in the development of PV, drawn from industry, EU institutions, research centres and Member States to draft detailed roadmaps of RD&D priorities on which public and private resources should focus. The first SEII Implementation Plan covered the period 2010-2012, and the second, which covers the period 2013-2015, has recently been launched.

- In May, 2010, the **European Solar Thermal Electricity Association (ESTELA)** issued an implementing plan for 2010-2012 for the Solar Thermal Electricity European Industrial Initiative (STE-EII) based on the four policy objectives identified in the EC Communication on Investing in the Development of Low-carbon Technologies, published in 2009.
- In September 2010, the EC launched a comprehensive technical assistance project “**Paving the Way for the Mediterranean Solar Plan**” as a support tool for the implementation of the Mediterranean Solar Plan. The Mediterranean Solar Plan aims to achieve two complementary goals: developing 20 GW of new renewable energy production capacities and achieving significant energy savings around the Mediterranean by 2020, thus addressing both supply and demand.
- The **EERA Concentrated Solar Power JP** is officially launched during the SET-Plan Conference in Warsaw in November, 2011. The main targets of the JP on CSP are: to perform a general review of the state of the art on Heat Transfer Fluids (HTFs) and Heat Storage Media (HSMs) to identify potential improvements, to develop tools to perform analysis, modelling and simulation of new solutions, and to realise small-scale test apparatuses under real solar irradiation conditions.
- In November 2011, the EC welcomed the signing of a Memorandum of Understanding (MoU) between the **Desertec Industry Initiative (Dii)** and **Medgrid**. The MoU establishes closer cooperation between the two private industry initiatives, which are key to the promotion of a renewable energy partnership between the EU and countries in the Southern Mediterranean.
- In May 2012, the association of **Mediterranean Transmission System Operators (TSO)** was presented to the international community. Med-TSO is based on the EU's ENTSO-E model and aims at the long-term integration of the regional electricity market. Med-TSO will facilitate electricity systems integration by coordinating development plans and grid access in MED-TSO countries.
- In June 2012, the European Commission and the Secretariat of the Union for the Mediterranean jointly organized a **Mediterranean Energy Forum** and a meeting of the Joint Committee of Experts for the Mediterranean Solar Plan, which focused on regulatory aspects of the Plan and on electricity transmission infrastructure.



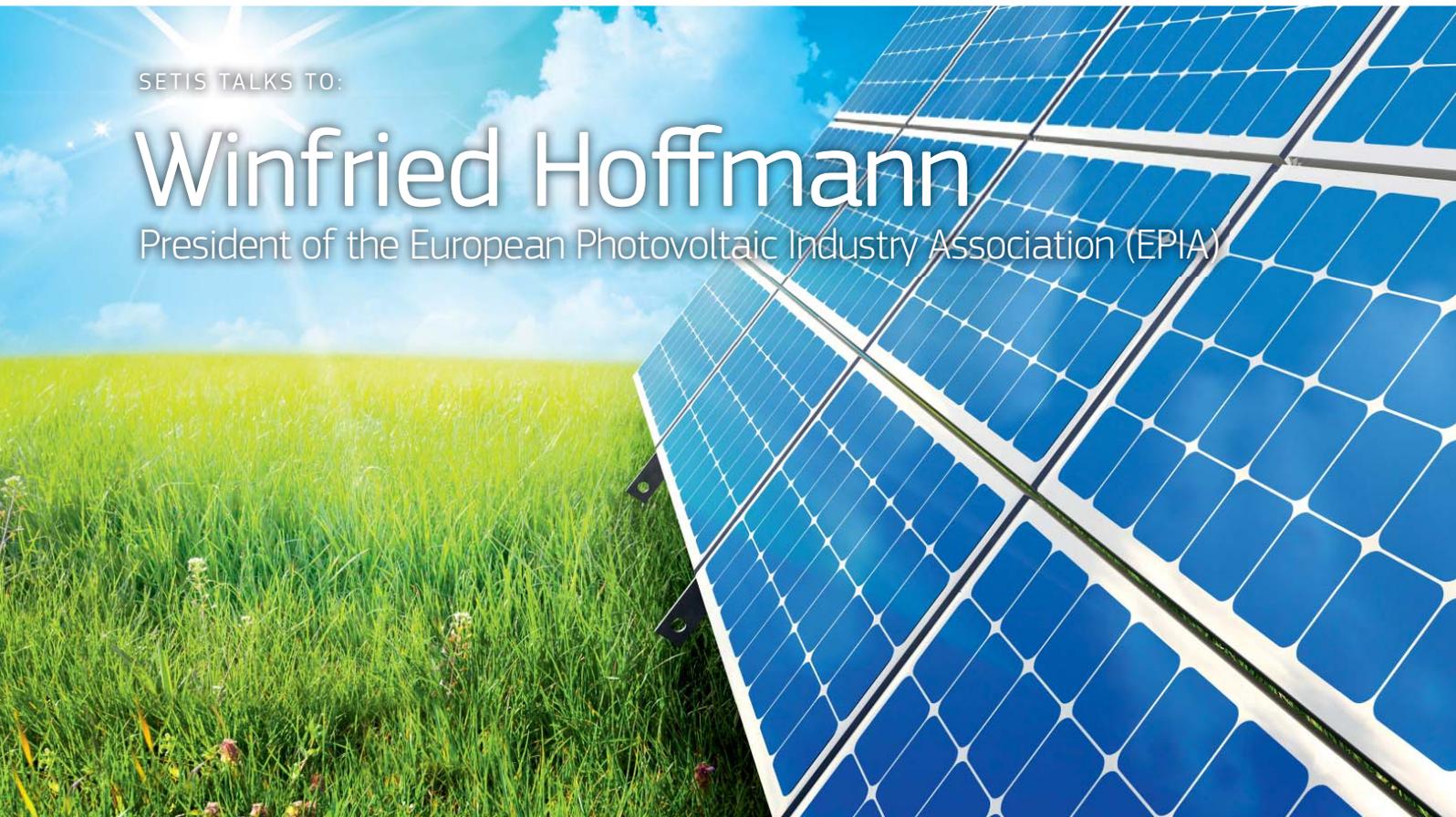
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- The European Commission published its **Energy Roadmap 2050** in 2012, in which it states that the EU needs to expand and diversify links between the European network and neighbouring countries with a particular focus on North Africa, with a view to harnessing the solar energy potential of the Sahara. This Roadmap also identified concentrated solar power as a renewable technology in need of increased investment.
- In an award decision issued on 18 December 2012, the European Commission awards funding to 23 renewable energy projects under the **NER300** first call for proposals. These include four CSP projects: Helios Power in Cyprus, the Minos and Maximum projects - both in Greece, and Spain's PTC50-Alvarado. These four projects were awarded a total of over €203 million in funding.
- In May, 2013, an ad hoc **Union for the Mediterranean Senior Officials Meeting on Energy** was held in Jordan to advance preparations of the Mediterranean Solar Plan and prepare for the upcoming Union for the Mediterranean's Ministerial Meeting on Energy, set to take place in December 2013 in Brussels.
- The European Commission's in-house science service, the **Joint Research Centre (JRC)**, produces an annual PV status report highlighting developments on the PV market and their implications for the meeting of SET-Plan objectives. The **PV Status Report 2012**, which is the eleventh edition of the report, gives an overview of current activities concerning research, solar cell production and market implementation of photovoltaics internationally.
- The 28th European **PV Solar Energy Conference and Exhibition (EU PVSEC)** is set to take place in Paris on 30 September – 4 October, 2013, bringing together scientists, researchers and policy makers to discuss the current challenges facing the PV sector in Europe and globally.

SETIS TALKS TO:

Winfried Hoffmann

President of the European Photovoltaic Industry Association (EPIA)



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According to the EPIA Global Market Outlook for PV for 2013-2017, we are at a 'turning point in the global PV market', with 'profound implications in the coming years.' Why is it a turning point and what are some of these implications?

W. H.: “On a positive note, we’ve proven that renewables have already been able to demonstrate their cost and price development. If you’d asked anyone, only a few years ago, whether it was possible for a decentralised, photovoltaic (PV) system on a roof in Germany to produce electricity at below EUR 0.15 per kilowatt-hour (kWh), without any subsidy, where you normally pay EUR 0.28/kWh, like I do, they would have said, ‘maybe in 50+ years, but definitely not in this decade’. And most northern countries like the UK, at least south of Manchester, have similar sunshine conditions to Germany. But today, at EUR 0.15/kWh for rooftop decentralised PV in most northern countries and well below EUR 0.10/kWh in Spain, Italy and Southern Europe, you’re already able to produce electricity from rooftop PV at well below the retail price of electricity in these countries.

Also, looking back at how things have changed, in the 1990s all the major utilities and municipalities in Germany were saying that it would never be possible to have more than

4% of renewables in the electricity production mix – even including hydroelectric. Today, we have 25% in Germany, and 5% of this is for PV alone. That shows how things have developed through the technology advances. That is the big game changer. Meanwhile, the large nuclear or fossil-fuelled power stations will only become more expensive. Each power station is a project in its own right and materials are getting more expensive, even if you are increasing efficiency. In addition, fuel will be more expensive in coming years.”

So why is it a turning point now?

W. H.: “In a positive way it is a turning point because, up until two years ago 80% of the solar PV modules produced in the world were installed in Europe. Obviously, this is not a very healthy situation for a global industry. Now the European market is slowing down but other regions in Asia, Africa and America outweigh this. Last year only 50% of the modules produced globally were installed in Europe. So, we are no longer so dependent on a few countries supporting PV and are increasingly competing openly in the energy sector. This is shown clearly in EPIA’s flagship publication, ‘Connecting the Sun’.¹

¹ To download the EPIA report, ‘Connecting the Sun’, see: <http://www.epia.org/news/publications/connecting-the-sun/>

Take India for example. Here they are adding PV to existing diesel systems, which might be in a mining factory in the desert. By adding PV and the necessary control equipment, they end up with lower energy costs. With several gigawatts of newly installed diesel systems in India, there is a good market volume for PV. That is the turning point. We are truly developing a global PV market. ”

Does that mean that PV can compete without the subsidies and feed-in tariffs?

W. H.: “ In the future PV will be competitive without subsidies – but not in countries where other fuels are heavily subsidised. For fossil and nuclear power, the generation cost will be around EUR 0.10/kWh and PV will definitely be below EUR 0.10/kWh, as will onshore wind. And for fossil-fuelled power, they’re still working hard to develop carbon capture and storage. So far, the results aren’t very encouraging. And even when it is done, technically, the question is how expensive it will be and how safe it will be forever. If CO₂ leaks out in the future, that’s not really what we need. ”

Is the new abundance of oil and shale gas, especially in the USA, going to undermine chances of renewables like PV becoming competitive with fossil fuels?

W. H.: “ Some people are talking of fracking and having cheap gas. That may be possible for some places in the USA – but not without some environmental concerns - but not for Europe. In Germany, if we could use all our available shale gas, it would just deliver enough for 17 years, based on annual gas consumption today. Is that a solution for the future? Definitely not. ”

So is PV now a good investment for the homeowner in Europe?

W. H.: “ As a private homeowner you can now ask yourself whether to make an investment that gives you at least 25 years’ use (the warranty period for the major components, like the modules, which probably means the real lifetime of the products is above 30 years).

But the real advantage comes if legislation allows you to utilise the electricity produced in your own home, which I think should be possible. After all, if you’re growing vegetables in your own garden you should be able to eat them and not be forced to shop at the local market store! If that is the case, you can then optimise your PV system. That is what is happening now in Germany. Self-consumption should be increased from present levels of 20-25%. You can also do a lot to increase that

self-consumption, like demand side management. Some things you can do yourself, like switching on the dishwasher when the sun is shining. And there are some more sophisticated methods for demand side management, like home managers – such as those sold by SMA, the company I represent at EPIA. These can switch appliances in a house on and off. ”

Germany has recently offered federal support to encourage local storage for PV. What is the advantage?

W. H.: “ If you add a few kWh from batteries it will increase your self-consumption possibilities to 70% or more. You then get even cheaper electricity for the next 25 years. The difficulty here is that, with investment in the batteries of today, the costs are still about EUR 0.20/ kWh. If you then add the generation costs from the PV system plus the storage, you are, in some countries, just about on a level with the cost of electricity from the grid. But that’s why support at this stage is useful – and I emphasise support, not subsidy. A support scheme has a goal. For PV in Germany, 12 years ago we started with a feed-in tariff where the goal was to have lower costs and price with increased volume, which indeed was the case. When we started, we had, in Germany, a levelised cost of about EUR 0.60/kWh; today we are at EUR 0.15/kWh and below

The same will be true for storage. The battery industry has still not identified the technology for decentralised storage of electricity in homes in the kWh range and in municipalities in the MW/h range. Like for PV, it needs some push and support schemes to get people interested in investing. When the market shows up I am pretty sure we will be at storage costs well below EUR 0.10/kWh in the medium term and even EUR 0.05 – 0.06/kWh. With 10 euro cents for production of PV plus 5-8 euro cents per kWh for storage, you’re still below 20 cents. If you pay 28-30 euro cents, because electricity prices will increase, then by including storage you will be able, in a few years, to be below what you pay normally. ”

What are some of the technological challenges for solar PV now?

W. H.: “ For the next few years we have a lot to do to bring costs down further. Today’s prices are mainly determined by overcapacity. The next steps should lead to good efficiency improvements and lower material costs. That means that future production costs will be below today’s prices. Then we’ll see the prices continue to decrease, according to the price/experience curve. ”

In 2012 the European market declined for the first time, compared to the previous year. Meanwhile, China plans to quadruple its solar power generating capacity to 35 GW by 2015. Is this good news or bad for European manufacturers?

W. H.: “It’s great that they have increased their goal for the next few years to install at least 10 GW a year of new solar PV in China. This is good for China, it’s good for the planet, and it’s good for industry in China. It’s positive.”

How about its impacts on the European solar industry? Will there be a market for European manufacturers?

W. H.: “I would say, knowing what the competition within China will be like, there will be some challenges for companies outside China. There might be joint ventures for example. SMA has taken a majority share in a Chinese inverter company in order to be able to participate in this increasing market. I think that is the way to go, as in many other industries, like the car industry.”

So the potential markets for European manufacturers are elsewhere, like India and South America?

W. H.: “In many places it depends on the size. There aren’t many countries where you can identify a multiple gigawatt/year market. India will be one. It depends on the size of the installation and the products being made in that country. In the future it will be more important to compare the cost of low volumes of [domestic] production versus importing the

technology and then having to add transport costs. Components are going down, but transport costs will go up.”

Given the changing market for renewables, is the EU SET-Plan still an effective tool for achieving low-carbon goals in Europe?

W. H.: “First, within the SET-Plan, it was possible – together with our umbrella organisation, the European Renewable Energy Council (EREC) – to have an agreement on a number of renewable targets for 2020. Now we would still like to see a clear political commitment from the EC and Parliament for 2030. We would like to have a clear goal – where we would like to be in 2030. And of course it should not be too broken up into too many details. But, as we did for the last 10 years, to give support to those technologies that have proven that they are able to develop and get cheaper and cheaper with volume. PV is perhaps the best example of that. There is no other technology within the energy sector that has been able to demonstrate, over a 20-year period, a decrease by more than a factor of ten. That is outstanding.

So whenever you decide to create a market support system, you should also take a close look, together with industry, to make sure that you are not supporting a technology that stays the same with increased volume or, in the worst case, even goes up. This will involve close monitoring to make sure that the promises are always kept. If this is done, then I’m pretty sure you can very soon arrive at the goal of green electricity at affordable prices that are below those of fossil and nuclear and without further support schemes.”



Winfried Hoffmann

President of the European Photovoltaic Industry Association (EPIA)

Dr. Winfried Hoffmann is a solar industry veteran with nearly 30 years of experience. He is currently President of the European Photovoltaic Association (EPIA) and is a member of the Supervisory Board of SMA Solar Technology AG. He has a Doctorate in Physics from the University of Freiburg, Germany.



EU, China reach amicable settlement in PV trade dispute

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The European Union and China reach an amicable agreement on PV imports, but not everybody is happy.

The European Union has reached an amicable agreement in its trade spat with China over the dumping of Chinese-made solar panels on the European market. But this does not mean an end to the ongoing saga, as European manufacturers see the agreement as more capitulation than compromise and plan to challenge the deal in the EU General Court in Luxembourg.

In a statement issued by the European Commission on July 26, EU Trade Commissioner Karel De Gucht said that he was satisfied with the offer of a price undertaking submitted by China's solar panel exporters, as foreseen by the EU's trade defence legislation, and that this was the amicable solution that both the EU and China were looking for.

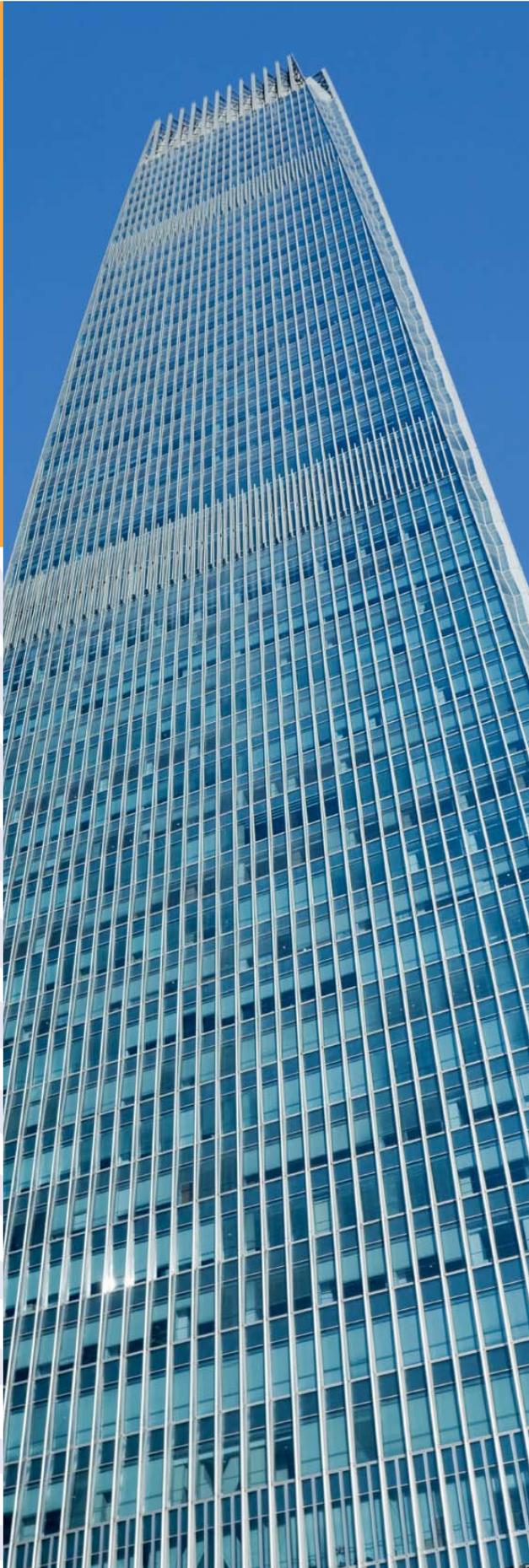
"We are confident that this price undertaking will stabilise the European solar panel market and will remove the injury that the dumping practices have caused to the European industry. We have found an amicable solution that will result in a new equilibrium on the European solar panel market at a sustainable price level," the Commissioner said, adding that he intended to table this offer for approval by the European Commission.

EU ProSun, the EU solar industrial initiative that filed the original complaint against Chinese dumping practices, said in a statement that it would challenge the latest agreement in the EU General Court in Luxembourg. EU ProSun President Milan Nitzschke said that

the agreement between the European Commission and China was contrary to European law and that it would threaten the very existence of the European solar industry, which has already lost 15,000 jobs.

In an attempt to explain the EU position, the Trade Commissioner said that the European Commission was faced with a situation where it was unable to accept injury to the European market caused by Chinese dumping, but at the same time it was not interested in a solution that would result in a shortage of supply in Europe, with consequent negative effects on the downstream industry and on consumers.

According to a statement from the Commissioner, the deployment of solar panels in the EU is an important element of European policy aimed at achieving 2020 renewable energy and CO2 reduction targets. As a result, demand for solar panels in Europe has been buoyant and exceeds Europe's capacity to supply the technology, so the EU will continue to be reliant on solar panel imports, even after the injurious effects of the dumping are eliminated and the industry has recovered. The Commissioner believes that when the undertaking enters into force, European suppliers will see the shield against Chinese dumping go up from the 11.8% currently in place to 47.6% for those exporters who are not participating in the undertaking. The industry counterargument is that, with an expected solar market of 10 gigawatts in 2013, the EU has effectively awarded 70% of the market to products subsidized by the Chinese government, while the remaining 30% will be shared between European and other manufacturers from around the world, who will have to compete under market conditions.



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In its original anti-dumping investigation, the European Commission found that Chinese dumping practices were life-threatening to the European solar industry and that a tariff of 47.6% should be introduced to protect European manufacturers. In order to cause the least possible disruption to the market, the tariff was phased in with an interim tariff of 11.8% which was set to jump to 47.6% on August 6, but this has now been avoided by the new agreement. The Chinese responded to the original decision to introduce the tariff by opening an anti-dumping investigation into imports of polysilicon and wine from the EU. This move, seen as a tactical ploy by the Chinese aimed at heightening disagreements on the issue between individual EU Member States, would mainly affect France and Southern European nations, who had supported the tariff, with minimal effect on Germany and the UK, who opposed it. It is hoped that these related cases will be dropped as part of the settlement. Meanwhile, the EU will also continue a separate investigation into the possible illegal subsidies granted to Chinese solar manufacturers - so it seems likely that there will be further developments in this case.

Some independent observers have supported the position of the European manufacturers¹, believing that the best that can be said of the compromise is that it has averted an all-out trade war, but that in reality the new price commitment deal is possibly even worse than the unilateral tariff initially proposed by Mr De Gucht, as it will inflict the same harm as an outright tariff (the higher purchase price will mean a fall in the number of installations and will penalize not only consumers but also installers and European polysilicon manufacturers) without generating the revenue that the tariff would have brought.

As regards the other sectors dragged into the PV dispute - specifically the wine and polysilicon industries, it can only be hoped that this deal will indeed preclude any further action from the Chinese side. Whatever the eventual outcome in this affair, it is generally felt that the Chinese have strengthened their hand and will be able to enter into future trade disputes on a firmer footing with more experience of exploiting European divisions to their own advantage, which can only be bad news for Europe.

For more information:

http://europa.eu/rapid/press-release_MEMO-13-729_en.htm

<http://prosun.org/en/media.html>

¹ Financial Times, Editorial, 30.07.2013

MSP aims to confront energy challenges in EU and larger Mediterranean region

CSP Egypt. © Dii

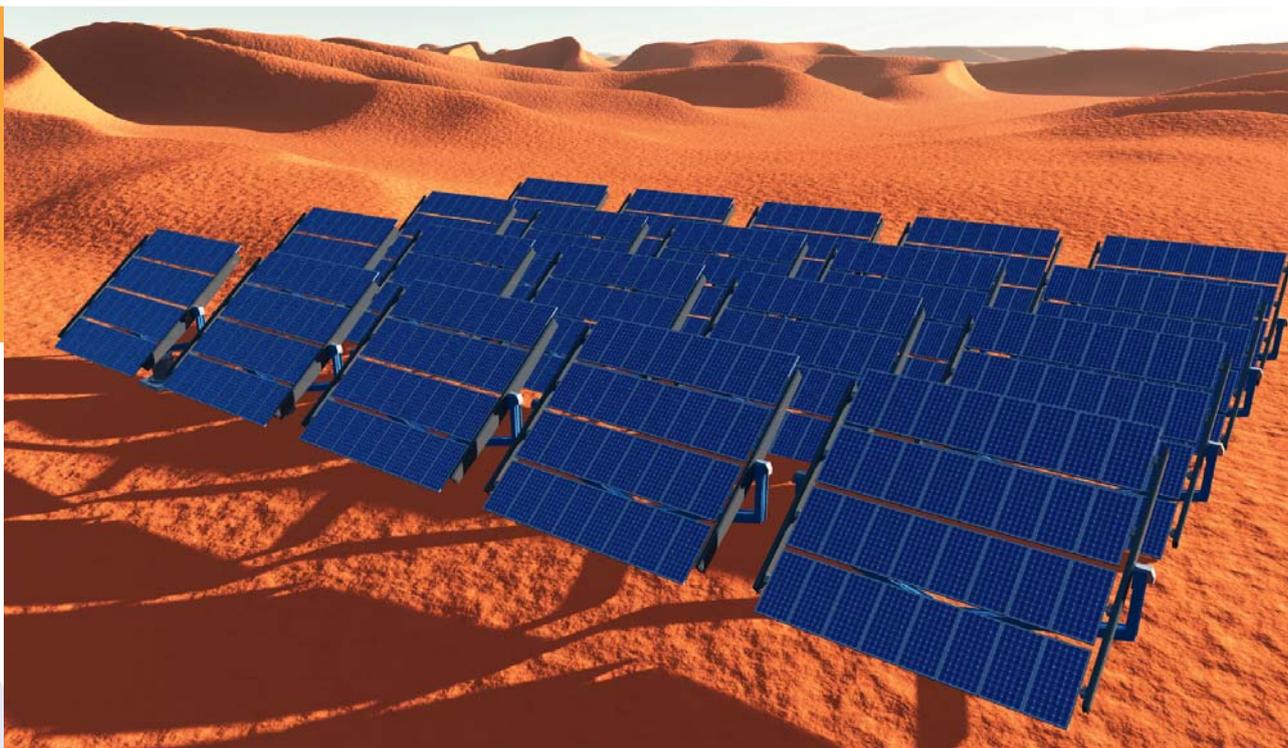
The Mediterranean Solar Plan (MSP) is one of six key initiatives of the Union for the Mediterranean that aims to meet the major energy and climate challenges confronting the European Union and the larger Mediterranean region in the coming decades. In order to achieve these objectives, the MSP has set itself two complementary targets: developing 20 GW of new renewable energy production capacities, and achieving significant energy savings around the Mediterranean by 2020, thereby addressing both supply and demand.

The MSP aims to complement existing Euro-Mediterranean activities and to work within existing renewable energy structures and associated grid infrastructure development projects, and will focus on creating an adequate regulatory, economic and organizational environment to enable the development and large-scale deployment of solar energy and other renewable energy technologies in the Mediterranean region, with the ultimate goal of helping the European Union meet its energy and climate goals for 2020 and beyond.

The MSP will help improve the balance in north-south trade by promoting sustainable energy projects, facilitating cooperation and promoting the development of electricity interconnections between the EU and the Middle East and North Africa (MENA) region to establish a viable framework for the import and export of clean electricity. The plan complements work being done under a number of Mediterranean energy interconnection projects being funded by the European Neighbourhood and Partnership Instrument (ENPI), such as the MED-REG II, which aims to support

the development of an efficient energy regulatory framework in the Mediterranean Partner Countries; MED-EMIP - a platform for energy policy dialogue aimed at integrating energy markets and improving security and sustainability; MED-ENEC II - a project aimed at promoting energy efficiency and the use of solar energy in the construction sector; and an electricity market integration project, supporting the development of an integrated electricity market between Algeria, Morocco and Tunisia and between these three countries and the EU.

One of the most visible projects to supply clean electricity from the MENA region to the European Union, in part made possible by the MSP's work to create the necessary organisational and regulatory environment, and specifically mentioned in the Identification Mission for the Mediterranean Solar Plan, has been the DESERTEC project. The DESERTEC Foundation was set up in January 2009 as a non-profit global civil society initiative that grew out of a network of scientists, politicians and economists from around the Mediterranean, who together developed the DESERTEC concept, the basic premise of which was that the almost inexhaustible supply of energy, in the form of direct sunlight and wind, offered by the deserts of the world could, with the appropriate technology, be converted into electricity and could potentially supply about 90% of the world's population with additional electricity to supplement their locally available sources of power. The DESERTEC Industrial Initiative (Dii) was founded in Munich in October 2009 as a private industrial consortium working towards enabling the DESERTEC vision. The project has seen some successes, such as the launch of a solar plant in Ouarzazate, Morocco, by Dii shareholder ACWA



Power, but it has also encountered a number of problems, such as the withdrawal of major investors and the Spanish government's failure to turn up at the signing of an agreement to launch the project. In further developments, the DESERTEC Foundation and Dii parted ways somewhat acrimoniously last month following a disagreement over strategy and managerial style, among other things. Both sides have said that this decision will not influence their plans to tap the clean energy potential of the world's deserts. Dii Head of Communications Klaus Schmidtke was quoted recently¹ as saying that the decision would not affect Dii's work or the realisation of desert power in the Middle East or North Africa.

This remains to be seen, but whatever the fate of the DESERTEC project, the vision on which it is based of creating an integrated electricity market in the Mediterranean region to supply clean energy to the European Union is one that will continue to be the focus of the Mediterranean Solar Plan. According to the MSP Project Preparation Initiative (MSP-PPI) of the European Investment Bank, "despite Mediterranean partner countries' (MPCs) awareness of the region's huge potential for renewable energy and energy efficiency, and some encouraging steps towards their deployment under the MSP, their overall contribution to meeting the growing energy demand in the region has remained limited. There is a need to accelerate the development of renewable energy and energy efficiency projects in the MPCs, in order to fulfil their national targets and to achieve regional MSP objectives."²

The EIB's Facility for Euro-Mediterranean Investment and Partnership

(FEMIP) has been a key instrument in financing strategic projects in the region. Between its launch in 2002 and 2012, FEMIP had provided EUR 14.2 billion of financing through 192 projects in the 9 Mediterranean partner countries, and mobilised nearly EUR 43 billion of additional capital, with 31 000 jobs created through support for SMEs in the region and 42 000 jobs supported via direct growth capital investments. During 2011, FEMIP prioritized the private sector, which accounted for 64% of the lending volume for the year, including EUR 50 million for energy projects.

The Priority Action Plan for Euro-Mediterranean Energy Cooperation for 2008-2013 identified three priority areas for Euro-Mediterranean energy cooperation: ensuring the improved harmonization of energy markets and legislation and pursuing the integration of energy markets in the Euro-Mediterranean region; promoting sustainable development in the energy sector; and developing initiatives of common interest in key areas, such as infrastructure extension, investment financing and research and development. Given the size of the renewable energy resource in the MENA region, it is clear that renewables will continue to play a key role in relations between this region and the EU in years to come.

For more information:

http://www.enpi-info.eu/mainmed.php?id=96&id_type=3&lang_id=450

<http://ufmsecretariat.org/>

¹ <http://www.theguardian.com/environment/2013/jul/05/renewable-energy-desertec-foundation-dii?INTCMP=SRCH>
² European Investment Bank, Mediterranean Solar Plan - Project Preparation Initiative, 14 June, 2012.

SETIS TALKS TO:

Paul van Son

Dii Managing Director

Despite the recent controversy between the DESERTEC Foundation and Dii, Dii Managing Director Paul van Son remains upbeat about the project's future.

Has the withdrawal of the DESERTEC Foundation from Dii resulted in a revision of the Desert Power project's time frame, and when can solar power from the MENA region be realistically expected to be supplied into the European grid?

P.v.S.: “The DESERTEC Foundation is an NGO, which wishes to act neutrally. The Foundation gave its share back to Dii. Dii respects that decision. This development will have no impact on Dii's goals, strategy or activities, as these have never been determined by the Foundation. We will continue to work with all engaged NGOs towards the creation of a market for desert power in Europe, North Africa and the Middle East.”

How important has the Union for the Mediterranean been in creating the necessary regulatory and organizational environment for the Desert Power project to be implemented?

P.v.S.: “The Union for the Mediterranean is currently preparing the Master Plan of the Mediterranean Solar Plan to be adopted by the Energy Ministers of Europe and MENA at the UfM Ministerial Meeting in December 2013.

The Master Plan analyses the necessary steps to facilitate the deployment of an additional 20 GW of renewable energy capacities by 2020. It thus serves as a basis for developing further the regulatory framework for renewable energies in the EU and the Southern Mediterranean.

Dii's strategy report “Desert Power: Getting Started” represents the industry perspective on the MSP Master Plan and complements it with actionable recommendations regarding grid expansion, renewables cooperation between the EU and the MENA region (EUMENA) and financing of renewables.”

Solar energy is expected to play a significant role in meeting the EU's renewable energy targets. How much of a contribution will the Dii Desert Power project make to this common effort?

P.v.S.: “First of all our analyses show that wind energy, also from the deserts, will constitute the main renewable energy source in Europe, North Africa and the Middle East in the coming decades. Renewable energy generated in the desert will of course primarily serve the region itself as fossil fuels should be replaced by renewable energy locally. The MENA countries that have no fossil fuel resources can save the money that they currently have to spend on the global market. Oil and gas producing countries will use their petro revenues to invest in renewable energy, thus increasing their oil and gas export revenues. Over time, and in particular from 2020 onwards, more and more desert electrical power is expected to be offered competitively to the European market. Dii has calculated that by 2030, 120TWh of electricity could be exchanged between Europe and MENA. This is three times the volume imported annually by Italy, Europe's largest energy importer. According to our prognosis, desert power can supply 10-20% of the European Energy mix by 2050.”

What are the main challenges facing the project, and what actions are required to deal with these challenges?

P.v.S.: “The main challenge is to develop an open and transparent interconnected market environment in EUMENA in which the conditions for renewables are fair. The extension of (intercontinental) transmission capacity is a real challenge due to different regulatory hurdles. To guarantee the free cross-border trade of electricity and establish an economically viable business case which is attractive to investors in the medium term, politicians and governments of the respective countries have got to work towards a reliable framework. Dii has presented the relevant restraints and outlined potential solutions in its latest report “Getting Started”.”

Is the current level of R&D in the sector sufficient for the project to be implemented on a technical level, or is further work required? What are the main technical difficulties to be overcome?

P.v.S.: “During the last few years most wind, solar and

transmission technologies have shown considerable learning curves in terms of cost and efficiency. Already today solar and wind power plants at many sites in the MENA region can generate power on a competitive basis compared to simple oil- and gas-fired power plants. Dii would welcome additional R&D work to further improve real market integration and competitiveness of the plants in the MENA region. This includes advanced system designs for solar thermal power plants and reliability of solar and wind technologies under harsh MENA desert conditions. Dii is convinced that the drive of the industry to deliver competitive technology to a fair market will eventually lead to sustained success. However this implies that subsidies for fossil and nuclear based generation, for example, shall be terminated. Existing renewable power plants in the MENA region demonstrate that technological challenges are not a real obstacle for desert power. First and foremost investors need political investment security in a healthy market environment. ”

Is the legal, economic, regulatory and institutional framework for the project already in place, or is further work required in this area?

P.v.S.: “ In the last four years we have observed considerable progress in MENA countries in the area of strategy and conditions for renewable energy. Prominent examples are the 110 billion dollar investment plan of the Saudi Government and ambitious solar and wind plans in Algeria, Tunisia and Morocco. Dii has identified the most important short-term steps for supplying the entire EUMENA region with renewable energies which would lay the foundation for a supergrid throughout EUMENA, comprising production facilities in the best locations that can deliver power where it is needed. ”

Is the desire for renewables in the European Union matched by political will in the MENA region to implement the project?

P.v.S.: “ MENA countries have adopted renewable energy targets for 2020 totalling approx. 50 GW. This is ambitious, but it is the wish of the region itself! There are plenty of suitable locations, and in fact there is a potential for more than 800 GW of wind and solar installations across an area of 40 000 square kilometres.

Many countries in North Africa and the Middle East find themselves in a phase of political transition which is currently dominating their daily lives. The total population is growing dramatically; meanwhile, the demand for power in these countries is rising at an annual rate of 5 - 9 %. This is a problem that requires rapid solutions, since an energy deficit would only further complicate the situation unnecessarily. Renewables will offer effective solutions to the pressing economic problems. This has long been recognised by the nations in question, who are already taking action to this end. A good example is the desert power project, Ouarzazate I, where a solar thermal power plant is being constructed as part of Morocco’s solar energy plan. Morocco chose to pursue this path with Dii as a partner, who provided the Moroccan Agency for Solar Energy (MASEN) with solid support. Similarly the 2000 MW wind plans of Morocco are advancing very well.

Model calculations by Dii also reveal that complete reliance on renewable energies will be less costly to the entire EUMENA region if countries work together instead of switching to renewable energy sources individually. The sooner countries start working together and the more countries that do so, the more stable and more affordable the transition to sustainable energy supplies will become. Analysis has also shown that the exchange of substantial quantities of power between countries is also economically advantageous.

Furthermore Desert Power has the potential not only to create local jobs in the MENA region and support economic growth, but also to stabilise the Eurozone. Closer cooperation with MENA can therefore be beneficial, especially to nations in Southern Europe. ”



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Paul van Son

Dii Managing Director

Paul van Son has been active in various management and executive positions in the international electricity and gas business for over 30 years at Siemens AG, SEP, KEMA Consulting/ECC and Essent N.V. He was appointed CEO of Dii GmbH in 2009.

LOCAL STORAGE:

The way forward for solar PV?

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Fifteen years ago solar photovoltaic (PV) energy was mostly used to power small off-grid installations such as roadside signage systems. Today, it provides a significant share of Europe's electricity mix, covering 2% of demand and roughly 4% of peak demand. In 15 regions in the EU 27, PV covers nearly 10% of the electricity demand on a yearly basis – and as much as 18% in Spain. However, as solar PV becomes competitive with conventional sources of electricity generation, the time is coming to re-think the way its contribution to the energy mix is managed. And a key element in this transition will be local, decentralised storage, recently given a kick-start by the German Federal government, with a new scheme to subsidise the purchase of storage systems for small domestic rooftop PV installations, up to 30 kilowatts (kW).

According to a recent report by the European Photovoltaic Industry Association (EPIA),¹ over the past century or so electricity generation has moved from small, decentralised generation systems to large, centralised power plants and is now moving back again to more local, decentralised generation, particularly through the use of smart grids. "In this transition," says the report, "a new figure will emerge: the 'prosumer', producing and consuming his or her own electricity. By covering on-site part of the final user's electricity needs, PV systems will generate new opportunities." Decentralised local storage is set to play an important part in this process, for a number of reasons.

As a recent report from the EC Energy Directorate² explains, "locally, storage can improve the management of distribution networks, reducing costs and improving efficiency. In this way, it can ease the market introduction of renewables, accelerate the decarbonisation of the electricity grid, improve the security and efficiency of electricity transmission and distribution (reduce unplanned loop flows, grid congestion, voltage and frequency variations), stabilise market prices for electricity, while also ensuring a higher security of energy supply."

Solar PV is already moving towards grid parity in some EU countries, so that new incentives, beyond state-subsidised feed-in tariffs, will be needed to maintain the impetus in take-up that these subsidies have so successfully facilitated over the past 10-15 years. For example, in Bavaria, in southern Germany, there are already about three solar panels per household, equivalent to about 600 watts per person. One driver of future developments will continue to be economics. Particularly where the price of electricity from the grid is high, as in Germany (at about EUR 0.28 per kilowatt-hour, or kWh), the domestic 'prosumer' can potentially save money by consuming his or her own electricity, which currently costs around EUR 0.15 per kWh to produce from PV in Germany, almost half the grid price.

There may, however, be an obligation to feed a certain percentage of the electricity produced into the grid, in order to qualify for feed-in tariffs. And it may mean that the consumer is not free to choose the optimal time for self-consumption. This is further complicated by the fact that the output from a solar PV installation is variable, producing its maximum power around noon – but this is not necessarily when the demand is greatest. Also, a few times a year, if the peak energy output from PV is fed directly into the grid, it can produce a potentially damaging spike. Grid operators protect themselves from this by limiting the proportion of the maximum power output of a PV unit that can be fed into the grid, known as peak shaving. Without local storage at these peak times, if the 'prosumer' can't use this excess electricity, or feed it into the grid because of peak shaving, it would have to be dumped. But, with storage, the electricity can be saved for use later, for example in the evening, when the output of the PV panels is lowest. It can then be fed into the grid if required, or used to power household lighting and appliances, or even to charge the batteries of an electric car.

Local storage systems also give 'prosumers' the option potentially to control their electricity use in increasingly sophisticated – and financially beneficial – ways, through demand-side management.

¹ Connecting the Sun, <http://www.connectingthesun.eu>

² http://ec.europa.eu/energy/infrastructure/doc/energy-storage/2013/energy_storage.pdf

"You need energy management systems to coordinate production and demand," explains Felix Keuer of SMA Solar Technology, "but you can also optimize the storage. It's good if the storage is part of an energy management system with a consumption forecast and planning of energy flows." And, he adds, "it's a much better use of the grid infrastructure if you don't build the grid to meet these power peaks, which occur only for a few minutes or hours in a year. In the year you lose only 2% - 5% of the energy produced [through peak shaving] but you have a lot more reserve in the grid and can put more PV systems on the same grid, without having to spend money to expand or strengthen the grid." If owners of PV installations consume at least some of the electricity they produce, especially with local storage and some form of demand-side management, there is less need to expand the grid as more PV units are connected.

Despite the increasing advantages of local, decentralized storage for PV, the units are still too expensive for take-up on a scale that would attract investment in the technology and bring prices down, as has happened for both wind and solar power installations themselves. This is why the German Federal government has recently introduced an attractive system of grants for domestic PV owners. "From May 1, the purchase of new battery storage for photovoltaic systems will be subsidized up to EUR 660/kW of solar power," explains Germany's solar industry association, BSW-Solar. "Plant operators can apply for financial support for photovoltaic projects that are installed in 2013 and have a maximum capacity of 30 kW." The grants will come from a EUR 50 million fund set aside by the government – EUR 25 million in 2013 and a further EUR 25 million for 2014. A lower rate subsidy of EUR 600 per kW is available for the storage component of combined PV plants installed in or after 2013.

According to BSW-Solar, the incentives can cover about 30% of the battery costs, with a couple of provisos: the PV power plant that the battery system supports must feed in up to 60% of its installed capacity into the grid over its lifetime, or at least for 20 years. And the battery systems must have a guaranteed life of at least seven years. BSW gives some examples of the savings. For fitting a 3.3 kW lithium-ion battery costing EUR 8000 as part of a 5 kW combined PV system costing EUR 19 500, the PV plant owner would get EUR 3000 (the maximum grant of EUR 600 per kW x the 5 kW output of the system) back from the State. And for retrofitting an existing 4 kW PV system with a 3.3 kW lead-acid battery costing EUR 6000, the owner would receive EUR 1800, at a rate of 30% of the cost per kW (or EUR 450 per kW in this example).

At present, lead-acid batteries are still the main technology for decentralized local storage. But they have an efficiency of only around 80%, compared to the latest lithium iron phosphate and

lithium titanate batteries, which have a charge-discharge efficiency of over 90%. These batteries are also smaller and lighter than lead-acid and have a lifetime of 10, perhaps even 20 years. But they are expensive and, until a new market emerges, there is little incentive to attract investors in developing new technology. Indeed, the German Federal subsidy was introduced precisely to help create a market and attract investment in research and development.

"Today, developments are coming from the automotive industry", explains Winfried Hoffmann, of SMA Solar Technology and President of EPIA [see interview]. "But the main challenge for automotive batteries is to optimise both weight and volume. You have to transport the battery in the car, so you need a high energy density and less weight per kWh. At the same time it shouldn't take up too much space. In a decentralised PV system at home you don't care about the volume and weight. You only care about decreasing cost and price. In time and with the right incentives for investment, there will be specific batteries for PV storage that are built for the least cost and price." This being said, electric vehicles can also be used as a form of storage for domestic PV systems, so both may stimulate the drive for more efficient batteries.

Felix Keuer is more circumspect when it comes to the immediate effects of the German support programme for local storage. "It probably won't cause any immediate take off," he says. "It still just 'relieves the pain', as these systems border on being economically viable. But this will change sooner or later. The main driver is the price difference between self-generated PV electricity and electricity drawn from the grid. As soon as this difference is great enough to pay for the storage costs (consisting of investment costs + energy losses + battery wear), people will increasingly use local storage systems."

In Germany the price difference is already large enough to motivate homeowners to take up the offer of help to buy storage. But in several countries, such as Spain, even if grid parity exists, electricity is still too cheap and/or feed-in tariffs too high – for self-consumption to be an incentive at present. But according to a report by Sun Edison,³ "as from 2013 PV will progressively reach competitiveness for a range of electricity consumer segments in key EU countries. Investment in a PV system for self consumption will then be financially attractive for self consumers." And, once the cost to the consumer comes down, probably with state subsidies in the first instance, decentralised local storage will play a significant role in ensuring the place of PV in the smart grids of the future.

³ Enabling the European Consumer to Generate Power for Self Consumption. [http://www.sunedison.es/docs/SunEdison_PV_Self-consumption_Study_high_resolution_\(13_Mb\).pdf](http://www.sunedison.es/docs/SunEdison_PV_Self-consumption_Study_high_resolution_(13_Mb).pdf)

Solar heating and cooling provides local economic opportunities

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As the European Union strives to achieve its 2020 renewable energy targets, solar heating and cooling technologies could potentially play an important role, not least because of their adaptability - solar heating technologies are compatible with almost all conventional heat back-up sources and have the potential to be widely applied. But, solar heating and cooling technologies have another string to their bow, in that there is a strong local economic argument in their favour. Since a significant portion of the value chain cannot be delocalised, and some of the technologies - specifically flat-plate or vacuum tube collectors - are relatively simple to produce, these technologies have significant potential for local manufacture, with the associated benefits for local economic development both in Europe and in the developing world. Meanwhile, research has shown that this technology will be most efficient, benefitting from economies of scale, when combined into larger district heating systems.

A recent JRC report on district heating and cooling potentials¹ notes that building heat load in Europe is not likely to shrink significantly due to the difficulty and cost of retro-insulating buildings. The report also notes that there are practical difficulties with the supply of renewable electricity to the current building stock in cities due to the cost of upgrading distribution networks. In these conditions, local heating and cooling technologies may provide an opportunity to increase the share of renewables in the energy mix in communities across the EU. The report underlines that the integration of district heating based on combined heat and power (CHP) could pave the way for the development of a robust infrastructure supporting the integration of wind power and solar energy, helping to deal with the

issue of intermittency and the need to meet peak heat demands. With respect to solar heating and cooling technology, there are two distinct types available: active and passive. Passive technologies aim to maximise the absorption of heat by buildings in cold weather, while minimizing heat intake in the summer. Active systems, on the other hand, allow for more efficient use of the captured solar heat. Temperature levels in these systems can vary from as low as 25 °C to as high as 1,000 °C in concentrating solar technology, with a corresponding range in possible applications - from swimming pool heating to power production from which waste heat can be used for other thermal applications.

The level of development of solar heating and cooling technology varies depending on the application. Some technologies used in areas such as domestic water heating are relatively mature and can be competitive, and solar-assisted district heating and low-temperature industrial applications are close to commercialisation in some European countries, while other applications, such as solar space cooling and heating require further targeted R&D to ensure cost effectiveness and widespread uptake.

In common with other renewable technologies, solar heating and cooling technologies reduce exposure and sensitivity to energy price fluctuations, as most costs occur at the initial investment stage and operating costs are minimal. Solar cooling also benefits from the correlation between supply and demand - demand for cooling is highest when the solar resource is at its strongest. Moreover, systems are local and therefore more efficient, with reduced need for transmission. Solar heating and cooling systems can also be

¹ JRC Scientific and Policy Reports, Background report on EU-27 District Heating and Cooling Potentials, Barriers, Best Practice and Measures of Promotion, EUR 25289, 2012.



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used to complement other RES technologies and energy efficiency measures, with possible synergies with CHP and biomass systems for the provision of hot water and process heat; and with photovoltaic systems and CHP for power generation. The JRC report explores these synergies, specifically the use of large-scale solar water heating as a source to supply district heating systems. In its Solar Heating and Cooling Technology Roadmap², the International Energy Agency (IEA) also notes that, in economic terms, larger systems are generally more effective due to economies of scale, but there has nevertheless been a significant increase in demand for smaller residential systems recently, especially in Spain.

A Danish study quoted in the JRC report reaches the same conclusion - finding that the cost of solar energy rapidly decreases with size, indicating that solar-based district heat is much more economic than individual systems. Moreover, the cost of storing heat becomes considerably cheaper as the size of the store increases, which indicates that using solar heat distributed by district heating systems will be more economic than individual roof mounted units. In the study, district heating is seen as fundamental to energy saving in Europe, as it is perceived as being the ultimately flexible tool for integrating power station waste heat, industrial waste heat, large-scale solar heat in summer, and surplus wind energy via electrode boilers and heat pumps. Moreover, the use of multi-tasking units that provide space heating, cooling and hot

water from one appliance maximises the solar fraction and results in improved environmental outcomes and added end-user benefits. In addition, the latest technological developments mean that solar heating can be stored from summer to winter in underground pit storage facilities, which basically use landfill technology combined with a floating insulated cover.

The International Energy Agency (IEA) forecasts the development and deployment of solar heating and cooling by 2050 to produce 16.5 exajoules³ (EJ) of solar heating and 1.5 EJ of solar cooling, or over 16% of energy use for low-temperature heat and nearly 17% of total energy use for cooling by that time. The annual collector yield of all water-based solar thermal systems in operation by the end of 2010 in 55 countries surveyed for an IEA report was 162,125 GWh. This corresponds to energy savings equivalent to 17.3 million tons of oil and 53.1 million tons of CO₂⁴. To foster a wider uptake of solar heating and cooling technologies, the IEA recommends the setting of medium-term targets for mature technologies and long-term targets for advanced technologies, accompanied by differentiated economic incentives such as feed-in-tariffs for commercial heat and subsidies or tax incentives for end-user technologies. From the demand side, barriers hindering uptake include a general lack of information about solar heating and cooling technology, which can be dealt with by organizing awareness campaigns.

At a time when NIMBY opposition is stalling many renewable energy projects, such as onshore wind farm projects in various countries in the EU, the fact that solar heating and cooling technology has the potential to make a significant contribution to local economies, combined with the relatively unobtrusive nature of the technology - it has low visual impact and no other controversial side effects, such as noise, odour or landscape pollution - may provide a significant boost to its wider adoption, and the integration of this technology into large district heating and cooling systems will allow these systems to benefit from economies of scale and become competitive as a result.

For more information:

<http://archive.iea-shc.org/publications/>

<http://setis.ec.europa.eu/technologies/Solar-heating-and-cooling/info>

<http://setis.ec.europa.eu/publications/jrc-setis-reports/background-report-eu-27-district-heating-and-cooling-potentials>

² Technology Roadmap, Solar Heating and Cooling ©OECD/IEA, 2012.

³ 1 exajoule = 10¹⁸ joules.

⁴ Solar Heat Worldwide, **Markets and Contribution to the Energy Supply 2010** (2012 Edition) Weiss, Werner and Mauthner, Franz IEA Solar Heating & Cooling Programme, May 2012.



ESTI research facilities to help develop international PV standards

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New facilities launched at the European Solar Test Installation (ESTI) will allow it to assess the performance of new and improved photovoltaic (PV) devices, to perform pre-normative research and to help develop international standards for the industry.

The new EUR 3-million facilities were officially inaugurated on June 24 by JRC Director General Dominique Ristori in the presence of dignitaries from the scientific, technical, industrial and political communities. The new lab, which is located at the Joint Research Centre's site in Ispra, Italy, offers a unique range of precision measurement capabilities that can be used to conduct research into factors influencing the cost effectiveness of photovoltaic installations. In addition, it will enable ESTI to maintain and extend its role as a European reference laboratory, particularly for next generation PV technologies.

The new capabilities cover, for example, power calibration for high performance silicon, thin film, and concentrated PV or organic PV, which will in turn contribute to the promotion of innovation in PV technologies in the EU. ESTI's role is to build confidence in the comparability of measurements of PV devices through the production and dissemination of validated methods, reference measurements, inter-laboratory comparisons and training.

The lab's measurement capability covers cells of a few mm² up to modules of several m². Prices for photovoltaic devices are commonly quoted per Wp (Watt peak), i.e. the electrical performance under standard test conditions. To have legal value, these measurements need to demonstrate an unbroken traceability chain to

international primary standards. ESTI has been at the forefront of developing calibrated measurement methods for over 20 years, supporting EU policy to promote renewable energy technologies in fair and transparent market conditions.

Underlining the importance of the new facilities to the European effort to retain a leading position in renewable energy, European Research and Innovation Commissioner Máire Geoghegan-Quinn said: "Renewable energy technologies are key to growth, jobs and better quality of life in Europe. In the global race for clean and competitive energy, photovoltaics in particular have huge potential to increase efficiency and reduce costs. A strong and vibrant European research infrastructure is essential to this, with the support of reference laboratories such as the JRC's European Solar Test Installation".

ESTI is fully accredited under ISO 17025 to calibrate PV devices. The laboratory has experience with a large variety of PV technologies: mono- and multi-crystalline silicon, thin film (amorphous silicon, cadmium telluride, copper indium-(gallium)-di selenide) and multi-junction concentrator systems. ESTI's experimental resources and capabilities include lifetime testing of PV modules. The lifetime of a photovoltaic module is one of three key factors determining the generation costs of solar electricity. Although long-term performance data (>20 years) is now available for crystalline silicon modules, there is a lack of understanding of the physical mechanisms which may degrade performance. The development of reliable methodologies in this area for both existing and advanced PV technologies is therefore of high potential interest to PV module manufacturers,

Key ESTI milestones

- 1977** ESTI is equipped with simulators to extend measurements to photovoltaic devices.
- 1984** Performs acceptance tests for the first 15 photovoltaic pilot plants in 10 European Member States. Develops specialised equipment to measure large photovoltaic arrays.
- 1986** Definition of monitoring guidelines, which are still in use worldwide today.
- 1987** Construction of a large test field for long-term outdoor testing of all PV modules manufactured in Europe at that time.
- 1992** ESTI staff takes on responsibility for the scientific programme of the European Photovoltaic Solar Energy Conference (EU PVSEC), a role it continues to play.
- 1995** In a world first for PV, ESTI is accredited as a calibration and test laboratory to the requirements of ISO 17025, audited by the prestigious French accreditation body COFRAC.
- 1998** ESTI publishes a practical method for calculating the total electricity delivered by PV modules during their lifetime.
- 2002** ESTI develops PV-GIS, a satellite based atmospheric and geographic model to determine PV electricity yield for any location in Europe on a 100 m resolution, for any hour of the year.
- 2003** Based on its measurement results and knowledge, ESTI estimates a lifetime for PV products above 30 years.
- 2009** ESTI announces intention to become reference lab for monitoring the implementation of European Solar Energy Industrial Initiative under the SET-Plan and of the new Renewable Energy and Climate Change Directive targets.
- 2013** ESTI launches new facilities to allow it to assess the performance of new and improved photovoltaic (PV) devices, to perform pre-normative research and to help develop international standards.

standards organisations, installation companies, electric utilities, and investment companies. The ESTI approach includes indoor accelerated aging of modules through damp heat testing of a series of thin-film based module technologies, and the installation and long-term monitoring of small PV systems (<1kWp).

One of the new facilities (the Apollo large-area steady-state simulator) opens the door to new measurements on advanced products as it provides full sunlight conditions over a 2m x 2m test area for up to 8 hours, and is the first of its kind installed in Europe. Improved methods to determine long-term performance (more than 20 years) are also a priority, as this makes it possible to calculate the cost of solar electricity after investment costs have been recovered.

ESTI's research is fed into European and international standards, supporting a transparent market and maximising the benefits of innovation. ESTI pioneered tests on the reliability of early PV products in the 1980s, when the European Commission financed the first pilot phase of terrestrial PV systems, and helped to provide the basis for international standards, supporting a market worth EUR 20-25 billion in Europe last year. The enormous potential of photovoltaic solar energy conversion technologies remains largely unexplored, while solar electric generation has the highest power density among renewable energies. These factors underline the importance of continuing research on PV, and in the medium term ESTI's strategy targets very high efficiency multi-junction cells, luminescent concentrators and organic PV systems.

PV research at the JRC's Ispra site started in the 1970s as part of the then department of physics. In 1977 the solar testing lab was formally opened and ESTI's activities began. The facility is part of the Renewable Energy Unit of the Institute for Energy and Transport. ESTI's work supports the EU's renewable energy goals and the implementation of the SET-Plan.

For more information:

http://ec.europa.eu/dgs/jrc/index.cfm?id=1410&obj_id=4560&dt_code=EVN

Four CSP projects receive NER300 funding



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Highlighting the key role Concentrated Solar Power (CSP) is expected to play in the European renewable energy mix, four CSP projects received a combined award of over €203 million from the €1.2 billion earmarked for 23 renewable energy demonstration projects by the European Commission in December 2012, under the first call for proposals for the NER300 funding programme.

Helios Power, a 50.76 MW CSP project to be implemented in Cyprus, was awarded €46.6 million. This project will use Stirling dishes to harness Cyprus's abundant solar energy and generate electricity to be supplied into the national grid, easing pressure on the grid in the summer, when demand is at its peak. This dish generates more electricity for less installed capital and within a smaller footprint than competing technologies, and the innovative nature of the technology made the project eligible for consideration for NER300 funding. The project, which will consist of 16,920 power dish units supplying a total of 115,936,000 kWh per annum, will be implemented on a plot of over 2 million square metres near Larnaca in the south of Cyprus.

The second CSP project to receive NER300 funding is the Maximus project located in the Florina region of north-west Greece. This project will also be supplied with Stirling dishes and will use 25,150 dishes with 3 kW of rated power capacity each. The plant is composed of 37 small modular plants located on different land plots, which will be connected to the grid via a single connection point. This project has been awarded €44.6 million and will have a total installed capacity of 75 MW.

Also in Greece, this time on the island of Crete, the Minos CSP project has been awarded €42 million. The project, which will be located on a site of approximately 143 hectares near the existing Atherinolakos power plant, will use a central tower system based on innovative superheated steam technology to produce 50 MW of electricity. No storage system is envisaged for the project, which will use a conventional diesel boiler to supply back-up energy. Finally, Spain's PTC50-Alvarado project was awarded €70 million. Like the Minos project in Greece, this project also involves a central tower plant using superheated steam. The plant, which will



be located 15 km south east of the Spanish city of Badajoz, will have a capacity of 50 MW and will produce electricity by means of a large field of heliostats that reflect solar radiation onto a solar thermal receiver mounted on the central tower. The plant includes a high capacity molten nitrate salt thermal energy storage system and integrates hybridization with biomass and natural gas, in order to improve manageability and overall efficiency.

Like other NER300 projects, these CSP projects will be co-financed with revenues obtained from the sale of emission allowances from the new entrants' reserve (NER) of the EU Emissions Trading System. NER300 projects cover a wide range of renewable technologies from bioenergy (including advanced biofuels) and geothermal power to wind power, ocean energy and distributed renewable management (smart grids). These projects will have a collective impact on renewable energy production in Europe amounting to about 10 TWh. Another aspect of these projects,

and one that is potentially more important for the long-term development of renewable energy in Europe, is the fact that they aim to successfully demonstrate cutting-edge technologies that will push the technological level of the renewable energy sector in Europe forward and substantially increase renewable energy production across the EU.

NER300 is implemented by the European Commission with the collaboration of the European Investment Bank (EIB) in the project selection, the sale of 300 million carbon allowances from the EU Emissions Trading System and the management of revenues.

For more information:

<http://www.ner300.com/>

<http://helioscy.com/index.html>

<http://www.csp-world.com/news/20121219/00675/four-csp-projects-awarded-eu-2033-m-under-ner300-programme>



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