

Innovation structures in Germany for technological leadership – Solar Valley Central Germany

Summary

The federal states of Saxony-Anhalt, Thuringia and Saxony have developed into a region with the highest photovoltaic industry density in Europe. In the regional cluster “Solar Valley Central Germany”, a comprehensive innovation concept was launched, made possible by a co-operation between the industry, research, education and politics, allowing for the implementation of the latest solar technologies in the industry and which aims to create additional jobs in the region, beyond today’s 11,000 up to 40,000 by 2020. This concept allows solar power to reach competitiveness with electricity from conventional fuels.

1. Introduction

In the cluster “Solar Valley Central Germany”, winner of the Cluster of Excellence innovation competition held by the German Federal Ministry of Research in 2008, this international leadership is further expanded upon with an alliance of industry, silicon photovoltaics research and educational institutions. With appropriate co-operation and topical coordination, solar power is to reach competitiveness with electricity from conventional fuels. With the planned investments by industry partners and with public funding, “grid parity” can be achieved within a few years. This would mean that solar power would cost less than “electricity from the socket”. This is the crucial milestone.

2. The world’s leading photovoltaic region

The region – consisting of the three federal states of Saxony, Saxony-Anhalt and Thuringia – has Europe’s highest density of photovoltaics companies (Figure 1). In 2009, 11,000 workers were already employed in this area. The industry-specific growth rate in recent years was over 35 percent; a similar average growth rate is expected for the coming years.

The leading manufacturers in the region – representing 43% of the German PV industry turnover – are the motor of the innovation concept “Solar Valley Central Germany”.

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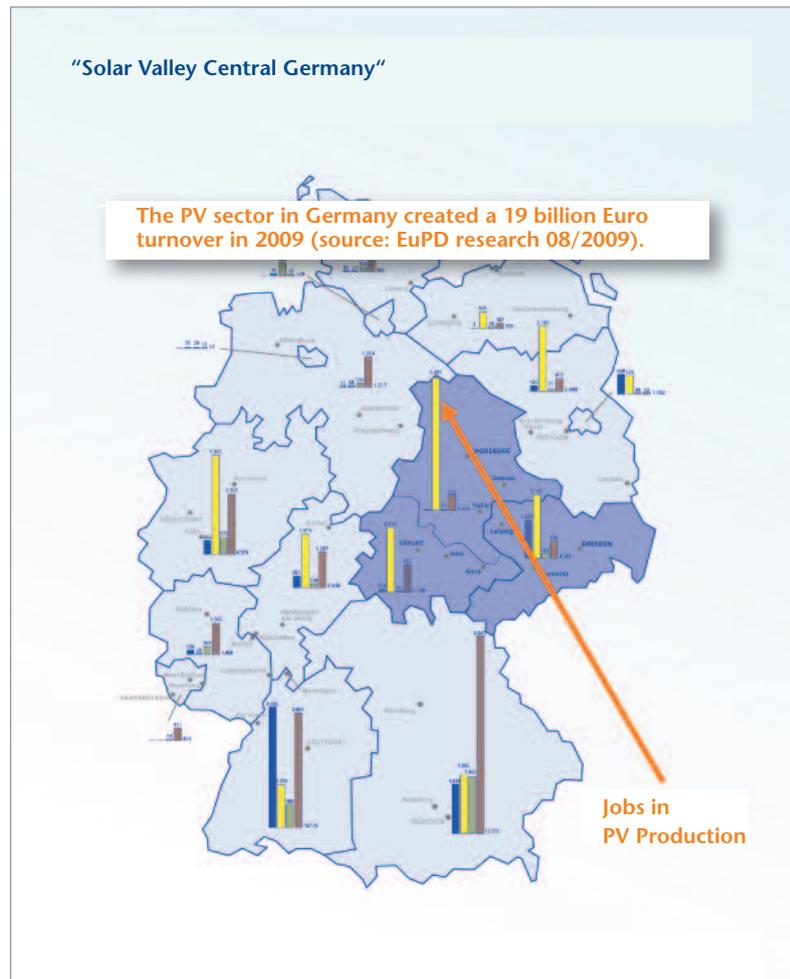
3. The innovation strategy in the “Solar Valley Central Germany”

Currently, 29 global companies, 9 research institutes and 4 universities are cooperating to pursue three interrelated goals in a jointly adopted strategy:

- Technology development
- Education and
- Cluster management

The strategy is being implemented in 98 individual projects with a total budget of €150 million over a period of five years. The public sector – the Federal Ministry of Research and the state ministries – are funding 50% of the expenditure. The cluster is managed by the industry, which is responsible for work themes, partner selection and financing the equity ratio.

Figure 1
The federal states of
Thuringia, Saxony and
Saxony-Anhalt – the
world's leading solar
region



This tightly coupled approach to development is effectively supported by the regional network of stakeholders. Technological development is forced within the framework of a long-term innovation strategy incorporating all steps of the value chain in order to promote solar power system efficiency, product reliability, service life and reduction of production costs. All innovations share the ultimate goal of reducing the costs per kilowatt-hour of energy. The development concept extends from basic research to applications in innovative production technologies.

Of particular importance to achieving the ambitious goals is the adaptability of the respective development results to the interface of the following value-added step.

The cost targets for these innovation goals are based on past experiences: When the installed PV capacity doubled, the price dropped by 20%. The Solar Valley concept will ensure that this price-learning curve (*Figure 2*) will be carried forward into the future – while maintaining margins for the manufacturers. It will thus make a major contribution towards achieving the grid parity milestone.

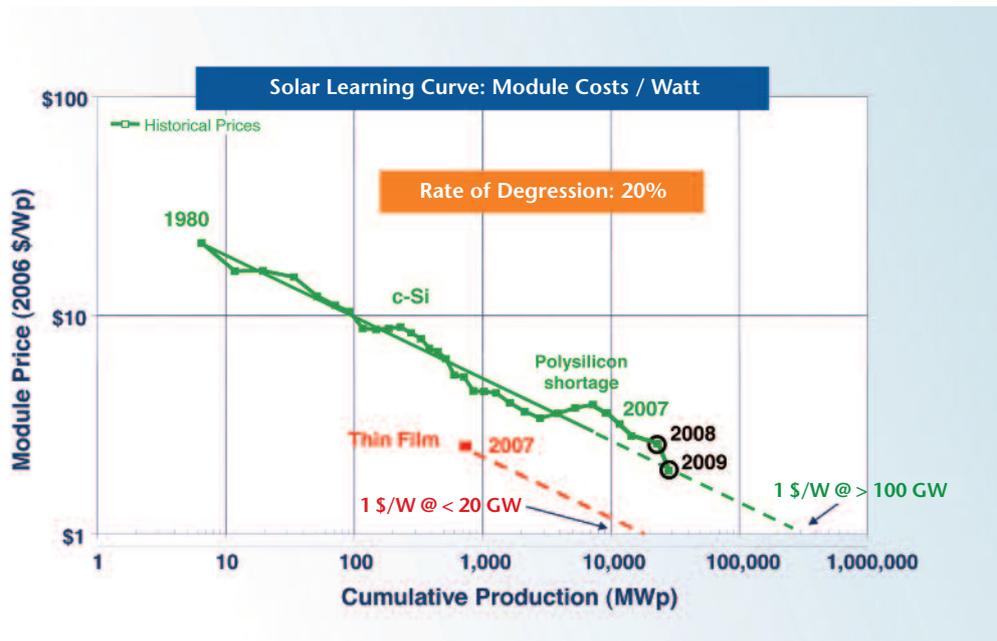


Figure 2
Solar power on its way to becoming a competitive energy source: Thin-film modules (red curve) already reach a price of 1 \$/W at less than 20 GW of installed capacity, silicon modules (green curve) at 100 GW.

Source: NREL

With the prevailing solar irradiation in this region, this will already be achieved well before the year 2015.

The field of education includes the specific measures to meet the needs of this rapidly growing industry with regard to professionals and managers on all levels of qualification. An integrated education system for all steps of the value-added chain and for comprehensive strategic tasks is to be established in a coordinated effort of the federal states.

Cluster management supports the professionalisation and expansion of the network as well as the coordination along the value-added chain of the regional PV industry.

Of particular importance are measures for increasing the attractiveness of the region for national and international investors, supporting the foundation of spin-offs and the coordination of joint appearances for international industry representatives, expert panels and political authorities. For the operational implementation, a management platform with regional offices

has been established in the three participating federal states, cooperating as an umbrella organisation with the industry representatives on site.

4. Technologies and products for grid parity

The research and development programme for grid parity is being realised in a system of 12 joint projects that are coordinated in terms of content and schedules.

In the key activity area of the crystalline silicon (c-Si) technology line, the objective is to produce a maximum of electricity with a minimum of silicon. This means decreasing the thickness of silicon wafers from today's 180 micrometres to about 100 micrometres and increasing the efficiency rates of solar cells and solar modules. To reach the ultimate goal of reducing the cost per generated kWh of energy, we need new solutions both at the level of the product and of the manufacturing technology.

In addition, product reliability and a service life of over 30 years have to be guaranteed to the end user.

The milestones on the way to grid parity are agreed upon, what now counts for the year 2011 is:

- More than 30% material savings
- Increasing efficiency to 20% module efficiency for c-Si and 10% for thin-film solar modules
- Increasing reliability and service life of the module to over 30 years

5. Education and research for a future technology

The high-tech photovoltaics industry has an extraordinary demand for highly qualified specialists and managers. In addition to the purely quantitative number of required staff for the rapidly growing industry, the challenge lies in meeting the quality demands of an industry that wants to remain competitive especially in the international high-end segment.

The achievement of cost targets is closely linked to the growth scenarios of the industry. By the year 2020, 40,000 jobs have to be filled, corresponding to 50% of all jobs in the PV industry and its suppliers in Germany.

An integral, cross-state education system is to meet this demand. As an immediate measure, four new bachelor and master degree programmes were launched, six endowed chairs were established and a competence centre for vocational education and training was built.

For the 2011 milestone, the following targets are to be realised:

- Qualification of 5,000 skilled workers in the region
- Recruitment of 2,000 professionals from the region
- Academic education network with 400 bachelor/master degrees per year
- Expansion of PhD positions for 40 graduations per year

6. High-tech region highly attractive to economy and society

With the innovation concept of the Solar Valley Central Germany, structures for technological leadership in international competition are created. This results in new opportunities:

- Environmental policy – CO₂ reduction with solar power
- Economic policy – solar power as a driver for clean energy
- Regional policy – Central Germany is developing into a leading high-tech region highly attractive to investors
- Corporate policy – accelerating the innovation process to consolidate the technological lead

An interdisciplinary cooperation of manufacturers and users, planners and architects allows for innovative solar power system solutions that meet technological and economical demands as well as those of architectural designing, landscaping and urban landscaping. These model solutions can affect the manufacturer's product range and secure unique selling points in the booming buyers' market. An example is the newly established international conference series BauhausSolar in Erfurt. Bauhaus tradition – with its roots in Weimar and Dessau – and the regional industry see the development of new system solutions and the future paths for an "energy culture".

In the "Solar Valley Central Germany" cluster, the stage is being set for a change in the energy strategy – in addition to excellence of product and technology suppliers, the announced 40,000 jobs and the qualitative development of the region all being on the agenda.