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## Large photovoltaic power plants: average growth by almost 100 % since 2005



by Denis Lenardic and Rolf Hug  
24/01/2008

In the past three years the annual growth of large photovoltaic plants with an average peak power of 200 kWp or more accounts for almost 100 %. It is expected that this trend will continue even in 2008, further growth is expected for 2009. In cooperation with the independent portal site pvresources.com the German and international solar portal site solarserver.com outlines the world wide development of commercial PV power plants and presents national and international trends.

Solar-Report as [PDF-Document](#)



Left: 20 MW solar PV plant at Beneixama (Spain). Right: PV plant Brandis/Waldpolenz in Eastern German; scheduled capacity 40 MW. Courtesy: City Solar AG (left); juwi-Gruppe

The solar report 1/2008 first gives an overview on the development of photovoltaic markets in general and showcases the biggest commercial solar plants around the world, the installed and cumulative solar power in 2007 as well as the important markets all around the world. The statistical data are focussed on photovoltaic power plants larger than 200 kWp and therefore exemplify the global development of solar electric power on a grand scale. Data are carefully collected and checked by pvresources.com, but due to the rapid development of some PV markets and their intricacy the figures inevitably give a snap-shot: even more facilities (yet in MW range) may have been put into service in the past few months - and new PV

panels are mounted day by day. The solar photovoltaic boom – especially in Spain -continues: for example the Meinel International Power Ltd. (MIP; Jersey) in January 2008 announced the construction of a 15,4 MW PV plant in the province of Almeria.

## Global Solar Photovoltaic market estimated 2.3 GWp in 2007

The European Photovoltaic Industry Association (EPIA) reported that the photovoltaic world market (all types of PV systems, i.e. big power plants, private net connected systems and off grid PV) in 2007 grew by over 40 %, with approximately 2.3 gigawatt (GW) of newly installed capacity. Four countries mainly contributed to the global photovoltaic market growth: established countries such as Germany, Japan and the US; but also Spain, which made a large contribution by tripling its annual installations. Germany remains clearly in first position with a 50 % global market share.

Japan's market is estimated to have stagnated 2007, while Spain's market approached 300 MW. The US may have registered a 260 MW market by the end of 2007. Other new European markets have confirmed the effectiveness of their feed-in tariff schemes: Italy registered about 50 MW of installed capacity, while France is following with an estimated 40 MW. South Korea is also becoming a significant market player with 50 MW of newly installed systems in 2007.

Due to first data collected by the German Solar Industry Federation (BSW-Solar) PV systems with a nominal capacity of approximate 1.100 MW have been installed in Germany 2007 - as many as never before. The total installed capacity due to BSW-Solar reached roughly 3,8 gigawatt and the solar electricity produced by this systems is sufficient to supply the households of a metropolis like Hamburg. After additional installations of 850 MWp in 2005 as well as in 2006 last year for the first time 1.1 GW were connected to the German grid, BSW-Solar emphasizes.



Left: North America's largest solar photovoltaic power system with 70,000 solar panels on 140 acres of unused land at Nellis Air Force Base (Nevada). Right: Solar power plant by SunTechnics in South Korea with an output of one megawatt. At SinAn, southwest of the Korean capital Seoul, a new sun-tracking photovoltaic system with a total maximum output of 19.6 megawatts is under construction. Pictures: US Air Force; SunTechnics.

## Almost one half of global installed large photovoltaic power connected to the German grid

80 % of all large photovoltaic plants (power related) are installed in Europe (700 MWp). The share of the USA accounts about 16 % (142 MWp) and in Asia 4 % (34 MWp) are installed. At present Germany hosts nearly 50 % of the world's installed photovoltaic power, but its market share was decreasing slowly within the last months.

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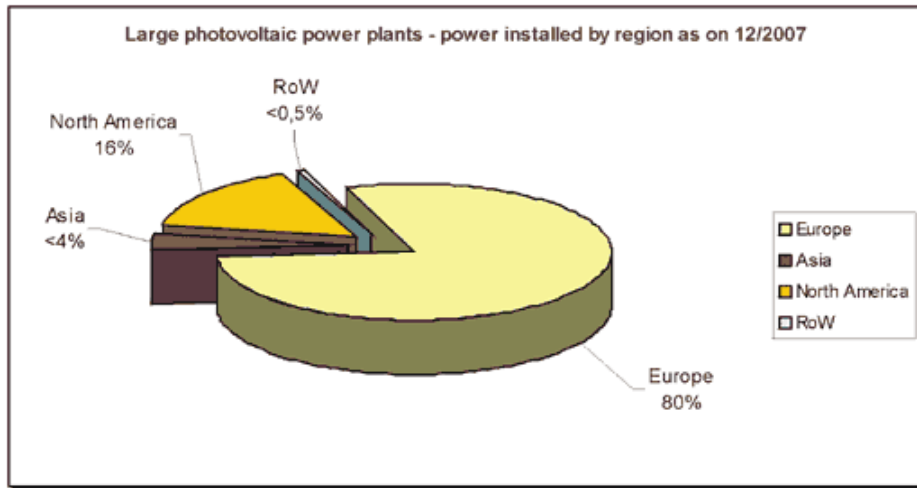
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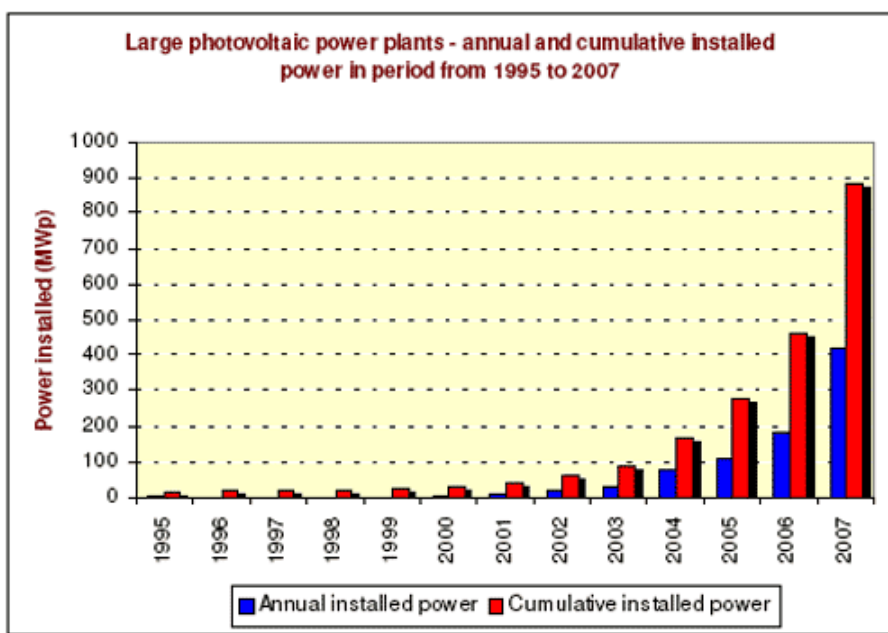
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80 % of the world's large PV plants are situated in Europe, 16 % in the USA and 4 % in Asia.

The most dynamic market is Spain - where an extreme increase of installed power has been observed in 2007. In the last decade only the USA and Germany created a steady growth of their photovoltaic market. The fast growth in Spain started about three years ago and led to an extreme increase in 2007. Further progress is visible in Europe and in South Korea. Italy, particulate France, and Greece turn out to be auspicious markets. The rest of the world (i.e. Africa, South America and Australia) represents less than 1 % of global installed PV power but shows significant potentials for future solar energy use in these regions.

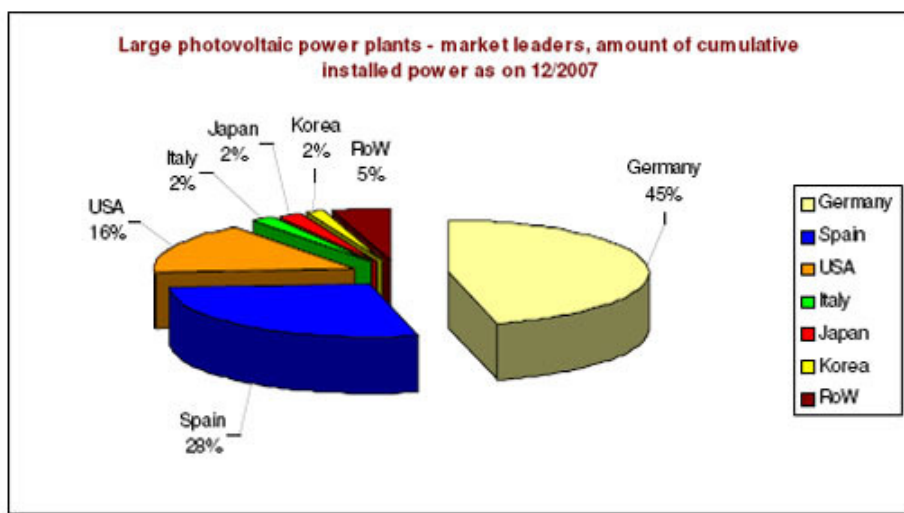


Annual installed power grew significantly from 2004; the cumulative power quadrupled.

### Seven Countries hosting the majority of large photovoltaic power plants

Countries with cumulative installed power more than 1 MW of large photovoltaic power plants (> 200 kWp each considered plant) are listed in Table 2 at the end of this report. Germany leads with more than 400 MW, followed by Spain (almost 250 MW) that displaced the USA (140 MW) at the second position. Italy and Japan (each about 17 MW) Korea (13 MW) and Portugal (12 MW) anyhow reached two digit figures. Countries with less than 1 MWp installed are Thailand, France (without overseas territories), United Kingdom, Malaysia, Saudi Arabia, Luxembourg, Rwanda, India and Mexico.

Primary PV world markets are still Germany with about 45 % of the installed power, followed by Spain (28 %) and the USA with 16 % market share. Spain proved as the most dynamic PV market with an impressive growth that might be probably lower this year. The average installed capacity of a single large commercial power plant has increased from 400 kWp in 1997 to 1,64 MWp in 2007. The average capacity of sole commercial PV plants accounts for 1,14 MWp.



Germany remains market leader but Spain and the USA catch up.

### Germany, Spain and Italy leading the market of big scale photovoltaic power plants in Europe

Almost 60 % of all European large photovoltaic plants (power related) are located in Germany (403 MW), followed by Spain (245 MW; 35 %) and Italy (17 MW; 2,4 %). More than one percent of power installed on European territory contribute countries like Netherlands and Portugal. Other European countries represent less than one percent of installed large photovoltaic plants power in Europe. These countries are Switzerland, Belgium, Czech Republic, France (without overseas territories), Austria, Luxembourg and United Kingdom etc



Würth Solergy realizes a solar PV electric plant in Spain with 41.600 CIS modules by Würth Solar which after completion in May 2008 will have a total installed capacity of 3,26 MW.

This will be a world record – nowhere else a solar park with CIS technology is realized yet.

The first construction stage with 14.400 CIS panels is already finished and will be connected to the grid by early 2008.

Source: Würth Solar

Das 15 MW-Solkraftwerk der US-Luftwaffe auf der Nellis Air Force Base (Nevada) ging im November 2007 in Betrieb und stieg sofort auf Platz drei in der Liste des Multi-Megawatt-Clubs ein. Drei weitere der Top 10 Ten-Großanlagen befinden sich in Spanien: Salamanca (13,8 MW), Lobosillo/Murcia (12,7 MW) und der Huerta Solar Monte Alte/Milagro (9,55 MW). Germany belegt drei Spitzenplätze mit den Solarparks Erlasee (12 MW), Waldpolenz (10 von 40 geplanten MW sind an das Netz angeschlossen) und Pocking (10 MW). Der Solarpark Serpa in Portugal (11 MW) komplettiert die PV Top 10.



Another solar power plant on Solar-about 130,000 square meters is being constructed by TAUBER SOLAR near Abuzaderas (Spain). When finished 18.000 panels in roughly 100 rows with a peak power of 3 MW will produce 5,1 million kWh each year.

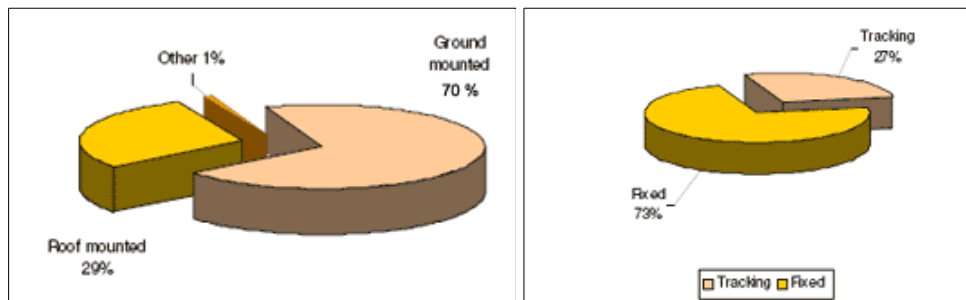
Source: TAUBER-SOLAR.

## Top 10 photovoltaic power plants dominated by Spain

Amongst the Top 10 largest photovoltaic power plants 50 % are operating in Spain. The so-called Huertos Solares are headed by the facility at Beneixama and the "Parque Solar Hoya de Los Vincentes", each with an installed peak power of 20 MW and thus the world's actual highest capacity PV plants. The plants were both completed in 2007. The US Air Force's 14 MW power plant at Nellis Air Force Base (Nevada) finished in November 2007 entered the "multi megawatt club" at rank three. Another three plants are located in Spain: Salamanca (13,8 MW), Lobosill/Murcia (12,7 MW) and Huerta Solar Monte Alto/Milagro (9,55 MW). Germany occupies three of the top positions with Erlasee (12 MW), Brandis (10 of 40 scheduled MW connected to the grid) and Pocking (10 MW). The Serpa PV plant in Portugal (11 MW) completes the PV Top 10.

PVresources.com is listing almost 800 photovoltaic power plants, each with a peak power of 200 kWp or more. Cumulative power of all these photovoltaic power plants is about 880 MWp and average plant power is slightly more than 1,14 MWp. More than 330 large photovoltaic plants are located in Germany, 210 in USA and more than 120 in Spain. These are also the most important markets worldwide.

## Ground mounted fixed arrays still prevailing; scarcely on third uses solar trackers



Ground mounted systems still are prevailing; trackers are used in roughly on third of the solar power plants

At the end of 2007 almost 70 % of all large photovoltaic power plants (power related) were ground mounted. 29 % were installed on roofs. Other types of plants (about 1 %) include photovoltaic power plants integrated into building envelopes (BIPV), noise barriers and similar applications. 27 % of the large power plants (power related) have tracking arrays (single or double axis trackers), 73 % have fixed arrays.



Left: Solar power plant Darro (5,8 MW) in Granada (Spain). Right: Solar trackers in the plant at La Junquera (Murcia). Both systems use double axis tracking systems. Source:

EPURON GmbH.

## Final Remarks

The pvresources annual Report 2007 is presented "as it is", without warranty of any kind. If you find mistakes, errata or if some plants are missing in the list of large photovoltaic power plants published at <http://www.pvresources.com/en/top50pv.php> please report them to [contact@pvresources.com](mailto:contact@pvresources.com).

## About the author / Special thanks

Denis Lenardic holds a degree of electrical engineering from the University of Ljubljana, Slovenia. He is member of the International Solar Energy Society (ISES) and EUROSOLAR and also supporting member of WWF and Greenpeace. At present Lenardic is as well chairman of the slovene national section of IEC "TC82" Technical Committee („PV modules“)

Solarserver.com thanks Denis Lenardic and pvresources.com for cooperation as well as all individuals and companies who have contributed to the pvresources.com list of large photovoltaic power plants filed in the "special thanks" section on [pvresources.com](http://www.pvresources.com) web pages:  
<http://www.pvresources.com/en/top50pv.php>.

## Addendum 1: World's largest photovoltaic power plants

This table presents data of the 25 largest photovoltaic power plants put into service until 31.12.2007. Several plants with a total power above 10 MW are under construction but no official press releases or announcements concerning completion were available until December 31st 2007. These plants will be added to the pvresources list as soon as they will be on line and officially put into service.

Peak Power DC (MWp)	Country	Region	City
20	Spain	eu	Jumilla (Murcia)
20	Spain	eu	Beneixama (Alicante)
14	USA	na	Nellis, NV
13,8	Spain	eu	Salamanca
12,7	Spain	eu	Lobosillo (Murcia)
12	Germany	eu	Erlasee (Arnstein)
11	Portugal	eu	Serpa (Alentejo)
10,35	Germany	eu	Brandis
10	Germany	eu	Pocking
9,55	Spain	eu	Milagro
8,76	Spain	eu	Viana (Navarra)
8,4	Germany	eu	Göttelborn
8,22	USA	na	San Luis Valley, Alamosa, CO
6,3	Germany	eu	Mühlhausen
6,277	Spain	eu	Aldea del Conde (Extremadura)
6	Spain	eu	Olmedilla (Castilla la Mancha)
6	Germany	eu	Doberschütz
5,8	Spain	eu	Darro (Granada)
5,568	Germany	eu	Oberottmarshausen
5,27	Germany	eu	Miegersbach
5,21	Japan	asia	Kameyama
5,076	Germany	eu	Kleinaitingen
5,04	Spain	eu	Alvarado (Badajoz)

## Addendum 2: Large photovoltaic power plants - countries with more than 1 MWp of cumulative photovoltaic power installed

Country	Power (MWp)	Market share
Germany*	400	45
Spain*	245	28
USA*	142	16
Italy*	17	2
Japan	17	2
Korea*	13	<2
Portugal	12	<1,5
Netherlands	9	1
Switzerland	5	<1
Belgium	3	<0,5
Australia	2	<0,5
China	2	0,2
Austria	1,5	0,2
Czech Republic	1,4	0,2
Philippines	1,1	<0,1
Réunion	1,0	<0,1

\*Countries where large projects are under construction and an increase or at least a similar market share is expected even in 2008. France should also be considered as a promising expanding market.

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