



**SolarSuperState**

**Prize 2013**

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17.00 hours

Zurich Volkshaus





## **1. SolarSuperState Prize 2013 category WIND for Denmark**

In the year 1891, 122 years ago, the Danish government funded the first Danish wind mill for electricity production in Askov. The project was initiated by scientist Poul la Cour. In the year of his death in 1908, some 30 wind turbines for electricity operation existed in Denmark. Already at that time, electricity from oil was cheaper than from wind. This situation continued during most of the twentieth century, except in war times, when Danish oil supply for electricity production was curtailed.

The first wind energy boom occurred during the first World War 1914 to 1918: the total number of wind mills for electricity production exceeded 120. The second wind energy boom took place during the second World War 1939 to 1945 with a total number of wind turbines exceeding 1400. The third wind energy boom started after the first oil shock in 1973 and culminated in the year 2000 with more than 6000 operating wind turbines.

The wind energy boom during the world wars was enabled by the existence of an industry which was capable of manufacturing wind mills for the production of electricity, as well as for mechanical work such as grinding, cutting straw or water pumping. In 1973, however, the Danish industry was not ready to replace oil-fired electricity by wind power despite the innovations of Johannes Juul in 1957 with his 200 Kilowatt Gedser wind turbine. In 1973, the Danish industrial production capacity for wind turbines was zero and Johannes Juul had passed away for 4 years earlier. Denmark had to reinvent its wind energy industry.

The first public research and development program for Wind Power after the oil crisis 1973 was launched in 1976. The very first task was to repair and restart Johannes Juul's historic wind turbine in Gedser . Another important milestone was the establishment of a test station for wind turbines at Risø National Laboratory in 1978. The mainstream activities of the emerging Danish wind energy industry after 1973 were focused on smaller wind turbine below 60 Kilowatt because of a lack of manufacturing experience.

The Second Energy Plan 1981 (Energiplan 81) of the government supported wind energy with subsidies. In 1985, the government restricted certain ownership models for wind turbines. Local wind energy cooperatives became the mainstream for investment in wind energy as from 1986. The subsidies for new wind turbines ended in 1986. The annual additions peaked temporarily in 1988. Between 1989 and 1995, the annual additions fell below the level of 1988. In 1996, the main Danish wind energy boom started. . In summary, the cumulative installed capacity grew from some 0.5 Watt per capita in 1980 to some 60 Watt per capita in 1990.

In 1992, the Danish feed-in-tariff for wind energy guaranteed grid access and a "fair price" for wind power at 85 % of the retail electricity rate. Furthermore, the Danish government obliged the Danish municipalities to identify suitable sites for wind turbines and to organize public hearings before officially fixing wind turbine sites. The environment minister (later also energy minister) Svend Auken was the key person in the Danish government promoting wind energy between 1992 and

2000. In 1993, the feed-in-tariff was reduced and new subsidies were introduced in the form of tax incentives and direct payments from the revenue of a Danish carbon tax. In the year 2000, the annual additions of wind turbines reached a preliminary peak with some 120 Watt per capita. At the end of the year 2000, the cumulative installed wind power was some 440 Watt per capita. By 2001, wind turbine cooperatives, including more than 100 000 families, had installed 86 % of all turbines in Denmark.

In the year 2012, Denmark still ranks number one in the world with a cumulative installed wind power of some 730 Watt per capita. In 2012, some 5000 wind turbines produced some 34 % of the Danish gross electricity production.

## **2. SolarSuperState Prize 2013 category WIND for Spain**

In 1980, the Law of Energy Conservation (Ley 82 / 80 de Conservación de la Energía) gave the right to grid access for wind power and other renewable electricity.

In the 1980s, the Spanish government subsidized the development and deployment of several wind turbines and wind farms. In 1983, two prototypes of an 24 Kilowatt wind turbine were tested at Alfabia (Mallorca). In 1984, the first 15 Kilowatt wind turbine of the cooperative Ecotènia was installed in Vilopriu, province of Girona, in Catalonia.

The Royal Decree 2366 of 1994 introduced feed-in tariffs for wind energy and other renewable energies. The feed-in compensaton was some 80 - 90 % of the mean retail price of electricity.

In 1997, the Electric Power Act (Ley 54 / 1997 del Sector Eléctrico Español ) granted priority access to the grid and a feed-in-tariff for electricity from wind power. Further amendments and modifications to the law and degrees were made in the years 1998, 1999, 2001, 2004 and 2007. The regional governments were primarily responsible for the administrative and permitting processes. The autonomous regions of Spain especially Navarra provided additional support to both foreign and domestic investors in the 1990s to set up manufacturing units in Spain. The main motivation was the increase of local employment.

In the year 2007, the annual additions of wind turbines reached the preliminary peak with some 80 Watt per capita. At the end of the year 2007, the cumulative installed wind power was some 330 Watt per capita.

In 2012, some 22 Gigawatt wind turbines produced some 17 % of the Spanish gross electricity production and 18 % of the net electricity consumption. In the year 2012, Spain ranks second in the world with a cumulative installed wind power of some 480 Watt per capita.

### **3. SolarSuperState Prize 2013 category WIND for Portugal**

In the year 1986, a wind park was built on the island Porto Santo in the Madeira island group. The wind park "Figueiral" on the island Santa Maria of the Azores followed in 1988. The first wind park on the mainland of Portugal opened in the municipality Sines in the year 1992.

In 1995, the Decree-Law number 313 / 95 guaranteed the first time grid access for wind power. In 1999, the Decree-Law 168 / 99 specified a feed-in tariff system. In 2001, the Decree-Law 312 / 2001 supported the wind energy sector by clarifying the licence-granting process for grid access and simplifying the administrative procedures. In the same year, the Decree-Law 339-C / 2001 improved the feed-in tariff for investors. Between 2001 and 2005, a major source of investment support was the "Incentive Scheme for Rational Use of Energy - Renewable Energies" which provided capital grants for different types of renewable installations. The scheme was run by the Ministry for Industry and Energy and supported by the European Union.

In the year 2008, the annual additions of wind turbines reached the preliminary peak with some 90 Watt per capita. At the end of the year 2008, the cumulative installed wind power stood at some 300 Watt per capita. In the same year, Enercon launched its rotor blade and tower production which was at that time the biggest wind energy manufacturing site in the country.

In 2012, some 5 Gigawatt wind turbines produced some 21 % of the Portuguese gross electricity production. At the end of the year 2012, Portugal ranks third in the world with a cumulative installed wind power of some 430 Watt per capita.

### **1. SolarSuperState Prize 2013 category SOLAR for Germany**

In 1989, the Aachen based non-profit non-governmental organization Solarenergie Foerdereverein Deutschland e. V. suggested a "Cost Covering Feed-in Tariff" for solar electricity ("kostendeckende Einspeiseverguetung fuer Solarstrom") at the level of the federal state. The basic outline included:

- 1) priority access to the grid
- 2) feed-in compensation level based on a technically optimized installation of the same year of manufacture and on economic operation of this installation including an appropriate profit
- 3) compensation period 20 years
- 4) coverage of the additional costs by the electricity customers

For the reason 4, such a Cost Covering Feed-in Tariff is no subsidy.

In 1990, a feed-in tariff law for renewable electricity (Stromeinspeisungsgesetz) was passed by the federal parliament. It came into force in 1991. This feed-in tariff law guaranteed for solar electricity grid access and a feed-in tariff of 90 % of

the average electricity retail price (some 8 Euro cents per Kilowatthour at that time). This was not sufficient for photovoltaics but another support for feed-in tariffs at city level.

In 1993, the Bavarian cities Hammelburg and Freising were the first German cities with a cost-covering feed-in tariff for photovoltaics. Then some 40 other German cities followed.

In 2000, the members of the German parliament Hans-Josef Fell, Michele Hustedt, Hermann Scheer and Dietmar Schuetz initiated a national cost-covering feed-in-tariff law - Renewable Energy Act (Erneuerbare-Energien-Gesetz, EEG). The tariff for solar electricity was limited to 99 Pfennig (some 50 Euro cents) per Kilowatthour. Additionally, the bank Kreditanstalt fuer Wiederaufbau KfW granted low interest rates for the first new 300 Megawatt photovoltaics on roofs of buildings. In 2011, the feed-in-tariffs were between 20 and 30 Euro cents per kilowatthour.

In 2012, the annual additions of photovoltaics peaked preliminarily at some 94 Watt per capita. Germany ranks number one in the world with a cumulative installed photovoltaic power of some 400 Watt per capita. Some 32 Gigawatt photovoltaics produced approximately 5 % of the German electricity production and consumption.

## **2. SolarSuperState Prize 2013 cateogry SOLAR for Liechtenstein**

In 2007, the first feed-in law of the country was initiated. In 2008, this feed-in tariff law for renewable electricity (Energieeffizienzgesetz, EEG) was passed by the parliament and then came into force. The law guaranteed for photovoltaic electricity producers

- 1) priority access to the grid
- 2) feed-in compensation for 10 years
- 3) subsidies for a photovoltaic installation

Often, the municipalities added more subsidies for photovoltaic installations. The additional costs for the feed-in compensation were paid by the electricity customers.

In total, this legal framework boosted the annual additions from some 3 Watt per capita per year in 2008 to some 95 Watt per capita per year in 2012. This is an average annual growth rate of some +137 % over a period of 4 years.

At the end of the year 2012, Liechtenstein ranks number two in the world with a cumulative installed photovoltaic power of some 290 Watt per capita. Some 11 Megawatt photovoltaics produced approximately 2 % of the electricity consumption and some 10 % of the domestic electricity production.