

Feed-in systems in Germany and Spain, and a comparison

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Feed-in compensation in Spain and Germany

Similar instruments for promoting expansion of renewable electricity; reasons for success

Germany and Spain are leaders in the area of renewable energies. Germany, for example, is number one world-wide in installed wind-power systems, while Spain is number two. In addition, both countries have the world's highest rates of addition of new renewable electricity production.

Germany and Spain have the same basic model

In both Spain and Germany, this success has been achieved via renewable energies acts that guarantee grid access for electricity from renewable energy generation systems and that provide a long-term compensation framework. The two countries' renewable energies acts thus provide the economic security that investors and wind-power-system manufacturers require. Another important aspect is that for some time both countries have been pursuing renewable energies policies and have applied suitable co-ordinated mixes of instruments in the process.

Both the German Renewable Energy Sources Act (*Erneuerbare-Energien-Gesetz – EEG*), the amended version of which came into force on 1 August 2004, and the *Real Decreto 436/2004* (which is a half-year older than the German act) support a broad portfolio of renewable electricity technologies and orient compensation to the costs of generating electricity with the various relevant technologies. Additional expenditures for additional compensation are distributed among electricity consumers in accordance with consumers' consumption.

Clearly, the two countries are emphasising different specific technologies. In Spain, solar-thermal power plants play an especially important role as a result of that country's abundance of sunshine. Energy from the sea is also of special importance and receives special rates. Germany, on the other hand, has differentiated more strongly in the areas of offshore wind, structurally integrated photovoltaic systems and various biomass applications.

Table 1: Comparison of the German and Spanish feed-in frameworks for renewable energies

	Spain	Germany
Guaranteed duration of compensation levels	1 year ¹	20 years (except for hydro-electric power) ²
Duration of increased compensation	Depends on technology (10 to 25 years)	Normally 20 years
Graduated rates	No	Yes
Degression in rates	Is continually adapted	Pre-defined (2-6.5% per year) ³
Distribution of burdens	Even distribution among electricity customers	Even distribution among electricity customers ⁴
Premium model possible?	Yes	No

Access to electricity exchange (bourse) in connection with feed-in	Yes	No
Access to grid	Legally guaranteed	Legally guaranteed
Costs of energy to compensate for fluctuation in feed-in	Do not have to be paid by operators of renewable energies systems	Do not have to be paid by operators of renewable energies systems
Special feed-in regulations for		
Biogas	Yes	Yes
Offshore wind	Yes ⁵	Yes
Photovoltaic systems	Yes	Yes
Structurally integrated photovoltaic systems	No (only differentiation by plant size)	Yes
Geothermal electricity generation	Yes	Yes
Solar-thermal power plants	Yes	No
Sea energy (wave and tidal energy)	Yes	No
Modernisation of large hydro-electric systems	No	Yes
Co-generation (CHP) systems fired with biomass ⁶	No	Yes
Renewable raw materials	Yes	Yes
Bonus for innovative technologies such as fuel cells, micro-turbines, etc.	No	Yes

¹ The compensation level is based on average regulated electricity rates and is annually redefined in accordance with such rates. Since regulated electricity rates are set annually and fluctuate very little, security for investments is comparable to that provided by the German EEG.

² 15 years (modernisation of large hydro-electric plants) or 30 years (modernisation of small hydro-electric plants)

³ The compensation level per kWh normally remains constant for 20 years for plants in service, but it depends on the calendar year in which the plant goes into service. The later a plant is commissioned, the lower the compensation.

⁴ With the exception of reductions for electricity-intensive industry and railways as provided by Art. 16 Renewable Energy Sources Act (EEG).

⁵ In principle, yes, but with same compensation level as for onshore

⁶ Separate compensation for electricity from heat-power co-generation

(Source: Ragwitz, Fraunhofer ISI)

How the models differ

Both systems apply the principle of legal regulation in support of renewable energies – for increased, cost-oriented compensation and guaranteed grid access. Nonetheless, the Spanish and German laws differ in a number of ways. Compensation under Spain's *Real Decreto* is oriented to the development of average electricity prices, while in Germany fixed compensation levels, defined for each year in question, are guaranteed. Furthermore, plant operators in Spain may choose between a) supplying their electricity to the network operator at a constant price that is calculated on the basis of the valid electricity rates established by the regulatory authority and b) receiving the market price, which varies over time, along with a specific additional bonus price. For example, an operator of wind-power systems in 2004 may choose between a) fixed compensation of about 6.5 cents/kWh_{el} and b) a bonus of about 3.6 cents/kWh_{el} in addition to the agreed electricity price on the open market. Renewable electricity producers who expose themselves to short-term fluctuations in electricity

requirements and prices, thereby incurring the risk of not being able to sell any electricity during low-demand periods, receive an additional incentive bonus. This arrangement is aimed at speeding integration of renewable energies within the overall energy system.

Under the Spanish model, compensation depends on regulated electricity rates. Theoretically, this should reduce investment security. But since annually defined rates have not changed, decisively and suddenly, in the past years, and since such changes are not expected in the future, this arrangement – clearly enough – has not had any negative impact on the development of the Spanish market.

In Germany, in comparison to the situation in Spain, feed-in rates for renewable electricity are oriented more strongly to actual generation costs. For example, in compensation for feed-in of wind power, sites with less wind receive better rates than sites with much wind. Such graduated compensation systems provide better adaptation of compensation to actual generation situations – and over-subsidisation is avoided. The German Renewable Energy Sources Act (EEG) also features greater differentiation with regard to plant sizes, technologies used and raw materials used.

Flexibility in compensation rates is based not only on location. Germany also applies a chronological degression. In each case, the compensation rate depends on the calendar year in which a plant is commissioned. For nearly all renewable energies, compensation drops by 2 to 6.5% when plants are commissioned a year later. While small photovoltaic systems installed on buildings in 2005 receive compensation, for a 20-year period, of 57.4 cents per produced kilowatt-hour, plants built a year later receive 5% less compensation over 20 years, i.e. 54.53 cents/kWh. This degression in compensation was derived from so-called "learning curves". It is in keeping with the fact that technologies become cheaper, for various reasons, with increasing market penetration: learning effects in production occur, higher discounts can be negotiated in purchase of supplied components and materials and sales and marketing become more efficient. Such "technology learning" is anticipated – and promoted – by the compensation degression.

The policy applied in Spain, on the other hand, calls for reductions or increases in compensation to be determined anew each year – in keeping with the market's development. Such variation in compensation affects both new and old plants. For example, if a wind-power plant is purchased at a particularly favourable time, and if compensations are then increased in the framework of adaptation, the plant will be over-subsidised.

In January 2005, the International Feed-in Cooperation was founded. This organisation, in which both Germany and Spain are currently active, has the aims of further improving feed-in-compensation regulations and of integrating feed-in within an international context.