German Renewable Energy Law and its Innovative Tariff Principles.

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The successful elements of the 1991, Act on Feeding in Electricity, resulting in a breakthrough for wind power with 50% of the total European capacity, form the essential principles of the new law. However, the tariff structures are differentiated allowing specific renewable energy technologies a compensation determined by the stimulus which is required to maximize the implementation of a variety of energy solutions of the future. The paper presents the principles and concrete compensation rates of the new law.

New Industrial Development and Job Creation

Increased use of renewable energy will create jobs, especially in the sector of small and medium-sized enterprises, which play a crucial role in the economic structure of most European countries. Small and medium-sized enterprises are not only an important factor in crafts and trades; they also provide an impetus for a variety of industries, including the metal industry, electrical engineering, mechanical engineering, engine and equipment engineering, as well as the building materials industry. The stimulation of the use of biomass for electricity generation associated with the adoption of the new law will also provide a major impetus for an economic recovery of the agricultural sector. Furthermore, the production and use of renewable energy sources will promote sustainable regional development, which will help to improve the social and economic cohesion and to harmonise living conditions.

In three European countries – Germany, Denmark and Spain – (Denmark till 1st January 2000) national legislation has been adopted to introduce minimum prices for feeding into the grid electricity generated from renewable energy sources. It is owing exclusively to the national legislation of these three countries that the European Union witnessed the emergence of a wind turbine manufacturing industry which offers the leading technology in the world market today. This also proved that it was wrong to assume that the introduction of minimum price systems would hamper productivity, because in all the three countries mentioned above the introduction of wind energy was based on minimum prices guaranteed by law. A market development was stimulated – initially in the wind energy sector – which led to an efficient industry with considerable export opportunities, which has created jobs for over 20,000 people in Germany and 15,000 in Denmark.

As a result of the associated economies of scale and the global competition initiated among manufacturers of windmills, production costs as well as the compensation paid in real terms have been successfully reduced by 50 per cent since 1991. Owing to technological progress, there is growing demand in the world market. In the next ten years, demand for wind turbines alone may amount to over 100,000 megawatts.

Against this background, the market introduction of renewable energy sources should not be underestimated in terms of its importance for industrial policy, not least

because it can be assumed in view of global climate problems that there will be a rapidly growing demand world-wide. It can be expected that the impact which a new German law will have on other sectors in which renewable energy sources are used will be similar to the effects which it will have on the wind energy sector.

Innovative German Renewable Energy Law.

With the purpose of protecting the environment, managing global warming and securing a reliable energy supply, the German Government and the German Bundestag – in agreement with the European Union – have committed themselves to at least doubling the percentage share of renewable energy in total energy supply by the year 2010. This objective is related to the envisaged commitment on the part of Germany to reduce greenhouse gas emissions by 21 per cent by the year 2010 in the framework of the European Union's commitment as laid down in the Kyoto Protocol to the Framework Climate Convention of the United Nations; this objective is linked to the German Government's objective to reduce carbon dioxide emissions by 25 per cent by the year 2005, relative to 1990.

In order to attain this objective, it is necessary to mobilise the renewable energy sources. Traditional hydro power from large dams today accounts for a significant share of the renewable energy sources. However, the utilisation potential of hydro power is almost exhausted. For this reason, it is necessary additionally to generate electricity from wind energy, solar energy, biomass, and small scale hydro in order to attain the objective set for Europe as a whole by the year 2010. To this end, the currently used potential of these energy sources will have to grow fivefold.

In order to transform this objective into reality, the European Commission has proposed a number of energy policy measures entitled "The Energy Policy Dimension of Climate Change", in which renewable energy plays a key role. The purpose of the Act on Granting Priority to Renewable Energy Sources (Renewable Energy Sources Act) is intended to help attain these objectives and to implement the European Union's "Campaign for a Breakthrough of Renewable Energy Sources". In view of growing meteorological evidence of global warming and the increase of natural disasters world-wide, prompt action by the legislators is considered indispensable in the interest of protecting the environment and managing global warming.

Currently, renewables are unevenly and insufficiently used, although many renewable energy sources are available in large quantities. Despite their considerable economic potential, they account for an extremely low share of the total energy consumption in Germany like in most other countries. If a much larger share of the energy requirements is not being covered by means of renewable energy sources, there will be two consequences: not only will it become more and more difficult to meet the obligations in the fields of environmental protection and global warming management, at both European and international level. Germany like any other country will also loose major economic development opportunities. Renewables are domestic energy sources which can help to reduce the dependence on energy imports, thereby making the energy supply more reliable. Currently, the EU depends on energy imports to cover approximately 50 per cent of its energy consumption; and there is a risk that this figure will increase to 60 per cent by the year 2010 and 70 per cent by 2020 unless the potential of renewable energy is being tapped.

Consequences of Various Legislation Models

Three countries with price regulations, Germany, Spain, and Denmark represent over 75% of wind energy generation in Europe. Great Britain in comparison has high wind power resources, however, with quantity regulations by tendering like a number of other European countries. These countries represent a modest share of wind power in Europe.

Wind Energy in Europe. Comparison of price regulations with quantity regulations

	Country	Cumulated end of Sept. 2000 (MW)	Installed in 1999	Installed capacity per area (kw/km^2)	Installed capacity per capita (Watt/capita)
Countries with price regulations (Feed-in law)	Germany	4,443	1,568	15.2	66
	Denmark	1,761	313	16.8	382
	Spain	1.225	391	4.2	53
	Sum	**7,429**	**2,272**		
Countries with quantity regulations (Call for tenders)	UK	353	20	1.6	7
	Ireland	73	0	1.3	25
	France	22	3	0.08	0.7
	Sum	**448**	**23**		

Source: New Energy 1/2000 and 6/2000.

In the past, the *Stromeinspeisungsgesetz für Erneuerbare Energien* (Act on Feeding into the Grid Electricity Generated from Renewable Energy Sources), which entered into force on 1 January 1991, has mainly provided an impetus for the wind energy sector because the compensation rates of the law made this possible. By the end of 1999, i.e. nine years after the implementation of the law, as much as 4,400 megawatts had been installed within the territorial scope of the law, accounting for about one-third of the wind power capacity installed world-wide and half of the capacity in Europe.

For hydro-electric power plants below the capacity limit of five megawatts, the 1991 law has not brought about a level of utilisation of the existing potential that would be comparable to the use of wind energy. And the compensation rates have not been sufficient to stimulate a large-scale market introduction of electricity generated from other sources, especially photovoltaic cells and biomass. For this reason, the compensation rates have been modified in the new Renewable Energy Sources Act, which replaces the Electricity Feed Act, in order to promote large-scale generation of electricity from all kinds of renewable energy sources.

The new law was decided in the German Bundestag 26th February 2000 and implemented by 1st April 2000.

Sufficient data are now available so that comparison can be made between minimum price regions and where quantity regulations are being implemented. The tendering procedure used in countries with quantity regulations seems to lead to bureaucratic and costly process, both for the operators and for the authorities. However, the main problem is that each tendering round introduces maximum limits, i.e. quotas for the various technologies.

As a result, only a fraction of the technical and economic potentials is exploited. This impedes natural market developments. Also, the enormous pressure on costs due to competition between tenderers means that only large-scale projects are carried out and in areas with very favourable wind conditions, but often with a sensitive landscape as well.

Small private operators or operator communities, as in Germany or Denmark, are practically non-existent, because they cannot keep up financially with the big planning and developing companies, who are often backed by banks and energy suppliers. In Britain, this has led to significant acceptance problems for wind power which go well beyond the occasional local frictions familiar in Germany or Denmark, since the local population in Britain is not included in the project planning and implementation. Finally, tenderers often submit unrealistically low tenders owing to the enormous competitive pressures.

The crucial argument against this quantity-rated tendering model, however, is the official stipulation of a specific upper limit for renewable energies and due to uncertainty whether it will be extended by political decision. A market whose further development depends on government decisions, while at the same time no defined limits are set to the inputs of nuclear or fossil energy sources, adds up to discrimination against the new, clean energy solutions. The tendering procedure means that if the quota were met, further capital spending would have to be suspended for the time being. The consequence would be state constraints on investors going beyond the stipulated quantity in the electricity market.

Furthermore it is not realistic to expect a government to increase the quota in order to encourage the penetration dynamics. Each redefinition of the quota collides with conventional power producers' interest in maintaining status quo. Traditionally, these producers exert great influence in all countries on the political process. They also complain of losses if utilization of existing conventional capacities is jeopardized by the operations of new competitors. Basically, their interest is in protecting the status quo, as in a planned economy, in order to avoid stranded investments.

Global Wind Energy Statistics. Status per September 2000

table

Source: New Energy. 6/2000.

Limitations of the New Legislation

The new law shall not apply to electricity:

1. Produced by hydro-electric power plants and installations fuelled by gas from landfills or sewage treatment plants with an installed electrical capacity of over 5 megawatts, or by installations in which electricity is generated from biomass, with an electrical capacity of over 20 megawatts.

2. Produced by installations of which over 25 per cent is owned by the Federal Republic of Germany or one of Germany's federal states.
3. Produced by installations for the generation of electricity from solar energy, with an installed electrical capacity of over five megawatts. In the case of installations for electricity from solar energy which are not part of structures for purposes other than the generation of electricity, the upper capacity limit shall be 100 kilowatts.

Reactivated or modernised installations shall be considered as new installations if major components of the installations were replaced. Modernisation work shall be deemed to be major if the modernisation costs amount to at least 50 per cent of the investment cost required to build a completely new installation

Obligation to Purchase and Pay Compensation

Grid operators shall be obliged to connect to their grids installations to purchase electricity from these installations as a priority, and to compensate the suppliers of this electricity. This obligation shall apply to the grid operator whose grid is closest to the location of the electricity generation installation, providing that the grid is technically suitable to feed in this electricity.

The upstream transmission grid operator shall be obliged to purchase, and pay compensation for, the amount of energy purchased by the grid operator. If there is no domestic transmission grid in the area serviced by the grid operator entitled to sell electricity, the next closest domestic transmission grid operator shall be obliged to purchase and pay compensation for this electricity.

The minimum compensation amounts shall be payable for newly commissioned installations for a period of 20 years after the year of commissioning, except for installations which generate electricity from hydro power.

Compensation for Electricity from Hydro Power, Landfills, Mines, and Sewage Plants

The compensation to be paid for electricity from hydro power and gas from landfills, mines and sewage treatment plants shall be at least 15 pfennigs[1] per kilowatt-hour. In the case of electricity generation installations of over 500 kilowatts, this shall apply only to that part which corresponds to the ratio of 500 kilowatts of installed capacity. The price to be paid for other electricity shall be at least 13 pfennigs per kilowatt-hour.

[1] 1DEM = 100 pfennigs = appx. 0.46 USD (11/2000)

Compensation for Electricity from Biomass

The following compensation shall be paid for electricity generated from biomass:

1. At least 20 pfennigs per kilowatt-hour in the case of installations with an installed electrical capacity of up to 500 kilowatts.
2. At least 18 pfennigs per kilowatt-hour in the case of installations with an installed electrical capacity of up to 5 megawatts.
3. At least 17 pfennigs per kilowatt-hour in the case of installations with an installed effective electrical capacity of over 5 megawatts.

As of 1 January 2002, the minimum compensation amounts specified in above shall be reduced by one per cent annually for new installations commissioned as of this date.

The use of biomass, including biogas, for electricity generation represents an insufficiently used potential. At the same time, biomass provides additional perspectives for the domestic agriculture and forestry. The compensation rates have been increased substantially above the rates laid down in the 1991 law in order to enable operators of biomass installations to operate their installations cost-effectively, thereby initiating a dynamic development. Compensation rates differ in accordance with the electrical capacity of installations in order to give due account to the fact that power production costs of smaller decentralised installations are higher.

Compensation for Electricity from Geothermal Energy

The following compensation shall be paid for electricity generated from geothermal energy:

1. At least 17.5 pfennigs per kilowatt-hour for an installed electrical capacity up to 20 megawatts, and
2. At least 14 pfennigs per kilowatt-hour for an installed electrical capacity over 20 megawatts.

Compensation for Electricity from Wind Energy

The new law introduces a differentiated set of tariffs for wind power.

According to the plans of the law, wind power in Germany will in 2007 deliver 22 TWH, which is 5% of the total national power consumption.

1. The compensation to be paid for electricity generated from wind energy shall be at least 17.8 pfennigs per kilowatt-hour for a period of five years starting from the date of commissioning. Hence, the compensation during this period, achieve150 per cent calculated for a reference installation shall be paid at least 12.1 pfennigs per kilowatt-hour

2. For off-shore wind farms commissioned before 2007, the period with the high compensation of 17.8 pfennings per kilowatt-hour is increased to nine years.
3. As of 1 January 2002, the minimum compensation amounts shall be reduced by 1.5 per cent annually for new installations commissioned after this date.

Scenario for wind energy development in Germany (1997-2007)

Table …..

Source: ISET, 1998

The previous provisions applying to wind energy did not give due account to the differences between various sites. Irrespective of the type of technology used, the rates in future will vary as a function of site profitability. Compared to the previous, the new provisions – when applied to electricity generating installations over a service life of twenty years – lead to the following results: at very good sites, compensation rates will be reduced to 13.5 pfennigs per kilowatt-hour for a 20 years period; at sites with reference average wind conditions, the rates will be at 16.4 pfennigs per kilowatt-hour, and at inland sites, the rates will be moderately changed to 17.3 pfennigs per kilowatt-hour during the 20 years of operation.

The purpose of these new provisions is to avoid payment of compensation rates that are higher than what is required for a cost-effective operation of such installations, and to create an incentive for installing wind mills at inland sites. The higher initial compensation rate will facilitate the financing of wind energy converters which was previously being questioned by credit.

The electricity production costs of offshore wind energy converters are expected to decrease substantially in the future. At present, however, the investment cost is higher than the cost of onshore installations due to the lack of experience, higher expenses for new technology, complicated foundation work and the lack of economies of scale. The purpose of the special provisions for offshore installations, which will be in effect for a limited period, is to make up for the shortcomings and to create incentives for investments. The relevant provisions apply to wind turbines located at least three miles seawards from the baselines.

Compensation for Electricity from Solar Power

In the long term, the use of solar electricity holds the greatest potential for providing energy supply which does not have an adverse impact on the climate. This energy source both requires sophisticated technology and will attain considerable economic importance in the future. The relatively high compensation rate is due to the fact that, because of insufficient demand, these electricity generating installations are currently not yet produced in sufficient quantities.

1. The compensation to be paid for electricity generated from solar radiation energy shall be at least 99 pfennigs per kilowatt-hour. As of 1 January 2002, the

minimum compensation paid shall be reduced by 5 per cent annually for new electricity generation installations commissioned after this date; the amounts payable shall be rounded to one decimal.

2. The obligation to pay compensation as specified in 1) above shall not apply to photovoltaic installations which are commissioned after 31 December of the year following the year in which photovoltaic installations under this Act reach an installed capacity of 350 megawatts.
3. The compensation to be paid applies only to installations integrated in buildings and only up till 100 kW peak capacity taking into consideration that this will have optimal consequences for industrial development, job creation and a new building culture.

As soon as the new law has created sufficient demand, the larger production volumes can be expected to lead to a substantial reduction in manufacturing cost, and hence, in electricity production cost, so that the compensation rates can be allowed to decrease accordingly. In addition to the real reduction of compensation payments due to inflation, the development is anticipated the new law by stipulating degressive compensation rates. For electricity generating installations which will become operational after 1 January 2003 and in subsequent years, the compensation rates – for newly commissioned installations only – will once again be reduced degressively by five percent.

German 100,000 roofs programme

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Source: ……

In combination with the "100,000 Roofs Programme", the compensation payments for the first time will make electricity generation from solar energy an attractive option for private investors; however, in many cases, the compensation specified does not permit a profitable operation of such installations at all times. The level of compensation has also been influenced by the compensation rates currently paid in Spain. In this context, it should be borne in mind that solar radiation intensity is much greater in Spain than in Germany.

The Innovative Aspects of the Law

The compensation defined in the new Renewable Energy Sources Act is based on the systematic approach introduced in the Electricity Feed Act and following the recommendations presented by the European Commission in its White Paper, "Energy for the Future: Renewable Sources of Energy" as well as the relevant resolutions adopted by the European Parliament. The compensation rates specified in the Renewable Energy Sources Act have been determined by means of scientific studies, so that the rates identified should make it possible for an installation to be operated cost-effectively, based on the use of state-of-the-art technology and depending on the renewable energy sources naturally available in a given geographical environment.

In some cases, the cost of the production of renewable energy sources is still much higher than the production cost of conventional energy sources. This is largely due to the fact that the overwhelming share of the external costs associated with the generation of electricity from conventional energy sources is not reflected in the price; instead, these costs are borne by the general public and by future generations. In addition, conventional energy sources still benefit from substantial governmental subsidies which keep their price artificially low. Another reason for the higher costs is the structural discrimination of new technologies. Their lower market share does not allow economies of scale to become effective.

For this reason, the purpose of the new law is not only to protect the operation of existing installations but also to stimulate a dynamic development in all fields of electricity generation from renewable energy sources. In combination with measures aimed at internalising external costs, the purpose of the pricing regime is to bring renewable energy sources closer to conventional energy sources in terms of their competitiveness. In order to continue to facilitate major improvements in technological efficiency, the compensation rates specified in the Renewable Energy Sources Act vary, depending on the energy sources, the sites and the installation sizes involved; furthermore, they will decline over time and will remain in effect for a limited period of time. The fact that the rates will be reviewed every two years guarantees that they will be updated continuously and at short intervals to reflect market and cost trends.

Compensation paid under this law cannot be state aid from a terminological perspective because operators of installations for the generation of electricity from renewable energy sources are not granted special benefits; the law compensates disadvantages which such operators have in comparison with conventional electricity producers. After all, most of the social and ecological follow-up costs associated with conventional electricity generation are currently not borne by the operators of such installations but by the general public, the taxpayers and future generations. The Renewable Energy Sources Act merely reduces this competitive advantage which conventional electricity generators have vis-à-vis operators generating electricity from renewable energy sources which cause only limited external costs.

Compliance with EU-regulations

In no other field is the introduction of a pricing regime at the expense of polluters more legitimate and more justifiable than in the field of energy supply because of the ecological damage associated with conventional electricity generation. The Renewable Energy Sources Act, which is designed to promote the market introduction of emission-free and sustainable energy sources to substitute for conventional energy sources, provides for consistent and equal burden sharing among all power suppliers. This is in keeping with the ‘polluter pays’ principle established in environmental protection. This principle is part and parcel of the primary law laid down in the EC Treaty, which in its Article 6 stipulates compliance with ecological interests.

The Renewable Energy Sources for which the new law provides compensation payments cannot otherwise be obtained at lower prices in the needed scale. For this reason, the pricing scheme specified in the law is not an instrument for artificially supporting the “commodity” kilowatt-hour of electricity generated from renewable

energy sources; instead, the prices specified in the law will permit operators to manage their installations cost-effectively in the first place.

The EU Commission's White Paper has not only adopted the recommendation for an EU feed-in directive, but gone even further and given it concrete shape. In the process, explicit reference is made to the terms of the directive for the internal electricity market, which provide for an entrepreneurial and transparent separation of electricity generation, transmission and distribution, and are of vital importance for the creation of a competitive market in the EU's electricity sector. Reference is also made to preventing grid operators from discriminating against other grid users in favour of their own subsidiaries or shareholders.

The key regulatory element contained in the Renewable Energy Sources Act is the obligation to purchase electricity generated from renewable energy sources. Such obligations are usually imposed when the trade of goods poses serious risks to external interests and when those who are responsible for such risks are not expected to take any voluntary action or sufficient action to prevent such risks. The consumption of electricity in the free market poses such risks to the climate and to the environment. Therefore, the Renewable Energy Sources Act can be characterised as a protective standard. Such standards are quite commonly used without this constituting state aid: The fact that it is prohibited to sell alcoholic beverages to adolescents, for instance, does not constitute state aid for non-alcoholic beverages. And systematically reducing the price of lead-free petrol despite higher production costs does not constitute state aid; instead, it is a buying and investing incentive based on the 'polluter pays' principle.

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