

Note: The following paper was written by Andreas Wagner, Fördergesellschaft Windenergie (German Wind Turbine Manufacturer's Association) for the 1999 European Wind Energy Conference in Nice, France. Wagner's paper examines the advantages of German Renewable Energy Feed-In Tariffs (REFITs) to that of other systems such as renewable quotas. My thanks to Herr Wagner for his articulate explanation of how REFITs have worked in Europe. --Paul Gipe

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## **Wind power on “Liberalised Markets”: Maximum Market Penetration with Minimum Regulation**

### **Introduction**

Wind energy has the potential of becoming one of the major electricity sources of the 21<sup>st</sup> century. It's average growth rates during the 1990s are close to those of the booming telecommunications sector. Technology is available, and is continuously improving, costs have substantially fallen, and public opinion for wind and other renewables is overwhelmingly positive, much more than for fossil or nuclear energy sources.

A recent study<sup>1</sup>, presented at the UN Climate Change conference in Buenos Aires last November, concludes that within the next 20 to 25 years, wind power can easily provide up to 10 per cent of global electricity consumption.

The ***crucial question is a political one***, however: Will renewable energies receive the institutional backing required for a young and emerging, but vulnerable industry to grow and develop in a favourable framework?

### **1. Evaluation of Existing Support Schemes for Wind Energy**

In principle, there are two basic support schemes currently applied in the European Union, price-oriented and capacity-oriented models.<sup>2</sup>

#### **1.1 Guaranteed Feed-in Price Regulation Systems**

During the past ten years, various countries have introduced REFITs, Renewable Energy Feed in Tariffs which oblige electricity companies to purchase renewable electricity at a minimum price defined by law. To name just the most important examples: Denmark's wind mill law, Germany's *Stromeinspeisungsgesetz* (Electricity Feed Law) of 1990, and the Spanish Royal Decree of December 1994, granting independent power producers minimum prices for electricity from renewable energies fed into the grid.

These REFIT laws have paved the way for an impressive success story, unexpected by most of the renewable energy experts. Due to the sudden growth of wind energy, the European Wind Energy Association (EWEA) had to revise its own target of 4,000

MW installed by the year 2000. Although this was considered by many observers quite optimistic in 1991, it had been already surpassed in 1997 (see table 1). Therefore, EWEA doubled its own objective to 8,000 MW in the same year. For 2010, the Association now calculates with 40,000 MW installed in Europe.<sup>3</sup>

It is not a coincidence that three quarters of total wind energy capacity in the EU are installed in Germany, Denmark and Spain.<sup>4</sup> Germany alone accounts for almost 50 per cent of the European wind capacity (see table 1). Within ten years, from 1988 to 1997, total installed wind energy capacity grew from 5 to 2079 MW in Germany. At the end of 1998, the densely populated country in the centre of Europe has surpassed the United States with its vast wind energy potential by some 1,000 MW. Table 1 shows the share and development of the German and the total European wind energy market during the past six years.

**Table 1**

**Wind Power Development in the Germany and the European Union (1993-1998)**

Year	Installed Capacity (MW)			Cumulated Capacity (MW)			Average Annual Market Growth	
	Germany	Europe	D-EU	Germany	Europe	D-EU	Germany	EU
1993	143	332	43 %	337	1,245	27 %	74 %	36 %
1994	295	448	65 %	632	1,693	37 %	88 %	36 %
1995	500	836	60 %	1,132	2,529	44 %	80 %	49 %
1996	420	967	43 %	1,552	3,496	44 %	37 %	38 %
1997	533	1,199	44 %	2,081	4,695	44 %	34 %	34 %
1998*	770	1,500	51 %	2,851	6,195	46 %	37 %	32 %
<b>Average annual market growth (1993-1998)</b>							58 %	38 %

\* estimated

Sources: BTM Consult, ISET, DEWI, own calculations

The German market continuously accounted for almost half of the total European market in the years after 1995, even though it was comparatively small in the years before.

**The German Secret of Success**

The *Stromeinspeisungsgesetz*, combined with preferential planning guidelines, lower interest rates (DtA loans), and other support programmes (e.g. investment grants for wind energy, most of these are terminated now) from various German states (Länder), has brought Germany into the pole position of wind energy use world wide. The prestigious WorldWatch institute observes:

*„One of the most effective new policies ... is the so-called electricity ‘feed law’, which sets a fixed price at which small renewable energy generators are provided access to the electricity grid ... The law has also reportedly created at least 10,000 new jobs in the wind power industry. “<sup>5</sup>*

### **Cost reduction through fierce competition**

The German market is not only the largest one, it is also the most competitive. This has allowed domestic and foreign turbine manufacturers to improve technology rapidly, and to develop new and innovative concepts. Wind energy in Germany has seen an impressive progress ratio of 0.86, during 1992 and 1997, according to calculations from ISET. This means, that every doubling of installed capacity has led to ex-works cost reductions of 14 per cent.<sup>6</sup>

Today, more than one per cent of total German electricity consumption comes from wind. In some regions the share is considerably higher, e.g. 16 % in Schleswig-Holstein, the most northern state. Most of the development takes place in regions which are economically less developed, thereby attracting new jobs and income for rural areas.<sup>7</sup>

According to a realistic scenario presented recently, some additional 10,000 MW could be installed within another 10 years. This would be equal 5 per cent of total German electricity consumption at an additional cost of 0,35 Pfennig per kWh at the most. However, the assumption for the scenario was a continuation of the successful *Stromeinspeisungsgesetz*.<sup>8</sup>

## **1.2 Capacity-Oriented Systems**

In the UK, Ireland and most recently in France, governments have introduced an alternative support scheme based on public tenders for a certain wind (renewables) capacity. The underlying assumption was that maximum competition among potential developers would bring costs down substantially, thereby exploiting an ever increasing market volume. The results are disappointing, however. Although generation costs have fallen considerably, this has more to do with reduced turbine costs - mainly caused by mass production - due to a large market volume in the few countries with REFIT systems. In addition, wind speeds are higher in the UK and Ireland, causing lower generation costs compared to Germany, or even Denmark.

### **More Concentration, Less Competition**

Finally, exaggerated competitive pressure sometimes causes unrealistically low bids; a virtual reality with virtual prices that are never being realised. Concentration, rather than competition is another major side effect; with regard to sites, turbines, and developers. This is the major reason for the planning and acceptance problems of wind power in these countries. All of this has resulted in a negligible domestic industry, leaving the potential of thousands of new and sustainable jobs untapped, let alone exports.<sup>9</sup>

Another form of a quantity based system is the quota model with tradable green certificates, practically applied on a voluntary basis only in the Netherlands since early 1998, with little success so far.

### 1.3 Comparison and Evaluation

In table 2, the two categories of countries are compared. Both are representative and comparable, in terms of size and population. It should be noted however, that average wind speeds are substantially better on the British islands than in any other European country.

Table 2

#### Guaranteed Minimum Prices versus Quota Systems Installed Wind Power in selected EU Member States

Category	Country	Cumulated 1997 (MW)	Installed in 1997 (MW)	Watt/capita	kW/km <sup>2</sup>
<i>price-oriented</i>  ( <i>feed-in laws</i> )	Germany	2,082	537	25.6	5.8
	Denmark	1,116	259	214.6	26.0
	Spain	512	263	13.1	1.0
	<b>Total</b>	<b>3,710</b>	<b>1,059</b>	<b>29.5</b>	<b>4.1</b>
=====					
<i>capacity-oriented</i>  ( <i>„competitive“</i> )	UK	320	50	5.5	1.3
	Ireland	51	40	14.2	0.7
	France	10	0	0.2	0.02
	<b>Total</b>	<b>381</b>	<b>90</b>	<b>3.0</b>	<b>0.4</b>
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Source: Windstats. Wind Power Monthly 1998

When comparing these basic support schemes in terms of effectiveness, the REFIT model has obvious advantages. Minimum price models are not only 10 times more effective in terms of installation rates, they have also a very positive effect for the national economy because they allow for the development of a strong manufacturing industry. The picture for 1998 looks quite similar, even though the final figures are not available yet (mid-January 1999).

## 2. Renewable Energies, Liberalisation and Competition in the European Union

It is obvious that a free European Electricity Market with free trade and production of electricity does not exist. Distortion of European electricity markets, caused by protected national markets and lack of competition, was one of the main reasons for the European Commission to propose a Directive for a European Electricity Market.<sup>10</sup> Due to extremely diverging national interests, this was not an easy task. It took eight years to agree on a final proposal.

### 2.1 EU Electricity Directive

The main objective of the Directive is an increasing share of competition. The crucial provision is Article 14 (3), separating electricity generation, transmission and distribution, at least financially. Article 7 (5) - preventing a grid operator from discriminating against other grid users - is closely linked to this. These two articles are a prerequisite to arrive at a „real“ electricity market without distortion.

## 2.2 Incomplete European Electricity Market

Two structural problems of the electricity sector, however, are not tackled by the Directive:

- Most of the environmental and social costs associated with energy use are borne by society as such (the state and its taxpayers), and not by the polluter (the electricity industry and its customers). It is still a long way to arrive at internalisation of externalities via taxation of energy.
- Energy subsidies have serious distortionary effects, to the disadvantage of renewables. According to the UN, *total* subsidies for renewable energies between 1974 and 1997 amounted to 20 billion US-Dollar, compared with a total of 300 billion US-Dollar subsidies *given each year!!* for conventional energies, not taking into account expenditures for infrastructure, safeguards, and military actions.<sup>11</sup>

## 2.3 Protection for Renewable Energies

Even though European electricity markets are to be liberalised, i.e. some degree of competition will be introduced to closed monopolistic „markets“, wind energy and other renewables certainly will need some kind of protection in the future. As described above, renewable energies need a favourable framework to compensate for the massive distortion in current electricity „markets“, in terms of non-internalisation of external costs and the massive subsidies granted to conventional energies.

Furthermore, many renewable energy systems are still in an infancy phase of their development (comparable to children), even though their production costs have already dropped substantially. And they can be expected to drop further in the long perspective.

*„The problem is however, that the market does not have a long-term perspective, and that large economic interests are supporting systems based on fossil (and nuclear) fuels.“<sup>12</sup>*

Nevertheless, there are several provisions in the Electricity Directive which can and should be used to the benefit of renewables:

- Article 3(2) allows for the introduction of public service obligations.
- Article 8 (3) and 11 (3) are related with Article 14 (3), giving Member States the right to grant priority access for electricity from renewables at the transmission and distribution level.
- It is also allowed to introduce priority measures to protect domestic energy sources, e.g. renewables, up to a market volume of 15 per cent. In Eastern Germany, this clause is used to protect environmentally damaging lignite.

### 3. White Paper for Renewables

One year after the Electricity Directive was adopted, the European Commission released its White Paper 'Energy for the Future: Renewable Energy Sources'.<sup>13</sup> It is the first strategy paper for renewables at the EU level, listing all their economic and environmental benefits in a very convincing way. Within the next 12 years, the Commission intends to double the share of renewables from 6 to 12 per cent. The European Parliament even called for 15 per cent.<sup>14</sup>

#### 3.1 Targets for Wind Energy

The White Paper contains indicative targets for the various renewable energy sectors until 2010. For wind energy it is 40,000 MW (80 TWh). This is almost 12 times of installed capacity in 1995. Only three years later, this is only 6 times of present wind power capacity in Europe. Based on average growth rates during the 1990s (see table 3), the Commission's target seems to be rather realistic, even when assuming a slow down (in relative terms) of these impressive growth during the next decade.

**Table 3**

**Market growth scenario for wind energy in Europe (1998-2010)**

Period	Installed Capacity (MW)	Cumulated Capacity (MW)	Average Annual Market Growth (%)
1993-1997	3,792	4,705	38
1998-2000	5,632	10,337	30
2001-2005	15,384	25,721	20
2006-2010	15,704	41,425	10

Source: own projections

Undoubtedly, wind energy has rapidly grown during the past few years. This is no coincidence, but the result of a favourable framework in a few Member States. The White Paper confirms that

*„... a significant contribution from wind energy for 2010 can only be achieved if conditions of access to the European grids are fair for the wind generators.“<sup>15</sup>*

#### 3.2 Commission Proposal for a Renewables Directive

Even more importantly, the White Paper has presented a proposal for a minimum price mechanism that might be applied all over the EU. According to this, the Commission proposal for a Directive should contain a regulation on

*„... the price to be paid to a generator from renewables sources which should at least be equal to the avoided cost of electricity on a low voltage grid of a distributor plus a premium reflecting the renewable's social and environmental benefits ...“<sup>16</sup>*

In a footnote the Commission refers to the environmental premium and the avoided costs. The latter refers to the cost at the 'city-gate', „i.e. the wholesale price at which the grid operator of a municipal low voltage grid buys electricity from the transmission network ...“. The premium could be „above 20 % of that avoided cost“ which is about equivalent to the average tax on electricity in the European Union.

In the White Paper, the EU Commission had obviously realised the advantages of a REFIT model. Internal discussion papers, that circulated in Brussels in 1998, seemed to neglect this recognition, promoting a market radicalism instead which has nothing to do with practical experience of the renewable energy sector, nor with the basic requirements of the Electricity Directive. The same holds true for drafts of a proposal for a Directive that are being discussed right now inside the Commission.<sup>17</sup>

#### **4. Conclusion**

If liberalisation is to be used for maximum market penetration of renewable energies, it should be accompanied by minimum, though effective regulation. In a REFIT model this is quite simple to achieve. There is only one variable, the price which can be even combined with indicative targets.

##### ***Simple and Effective***

The experience of Denmark and of Schleswig-Holstein has shown that ambitious targets are not only achieved timely. These are even realised earlier than originally expected, provided they are based on a stable institutional framework with legally guaranteed prices. In the early 1990s, the Danish government set a goal of at least 10 per cent wind power by 2005 (1,500 MW), probably reached by the turn of the century. At the same time, Schleswig-Holstein set a target of 25 per cent by 2010 (1,200-1,400 MW), probably achieving it within the next five years,

Compared with any quota model, the REFIT can be monitored, controlled and eventually adapted quite easily, without much bureaucracy, according to the price development of wind power. Contrary to this, the rather superficial debate about the quota model seems to be based more on wishful thinking than on reality. A quota model has many variables which all require a lot of regulation. Uncertainty would increase substantially for all players involved, most importantly for potential investors.<sup>18</sup> Unless it's proponents can prove in reality that the quota system can be implemented with less regulation, and at the same time ensuring better results in terms of market penetration, the whole debate about a quota system is irresponsible.

##### ***A Sensitive Debate***

The discussion about green labels and a quota model in Denmark is the most dangerous one because it is not only undermining the domestic market, but the largest foreign markets for the Danish industry, too. The outcome of the political debate in Denmark is yet open. Most of the renewable energy experts and the wind energy associations in Denmark seem to be quite reserved to the government's ideas. They clearly favour minor adaptations of the existing REFIT scheme, rather than starting an experiment with a very uncertain outcome.<sup>19</sup>

### **Facts and Fiction**

Therefore, any future support scheme for renewables should be based on hard empirical facts, rather than fiction or wishful thinking! The EU White Paper confirms this view by observing:<sup>20</sup>

*„A major factor in the recent market success of wind energy in the Member States such as Denmark, Spain, and in particular Germany, which now has the world's largest electricity generating capacity from wind, has been the price to be paid by the utilities to wind generators for sale onto the grid.“*

And it concludes:

*„Any major changes that might be made in this regulatory structure should encourage and not jeopardise the appropriate development of wind energy.“*

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