Feed-in tariff for wind energy in Portugal

1. SUMMARY

Despite the deployment of wind energy in some European countries in the mid eighties, the production of wind electricity in Portugal remained small and nearly unchanged until the mid 1990’s. Several factors contributed to that situation: the state of the art didn’t allow a wider application of wind technology to most of the wind resources in Portugal; the legal and financial frameworks were not yet tailored to the specifics of wind energy; and there were no driving forces in place to actually set the market in motion.

With the technology coming to a mature stage and with national and international policies pushing towards an increased use of renewable energy, a more suited legal and financial framework for wind energy was put in place. Besides regulating and facilitating the access to power production by independent power producers, the price paid for renewable electricity was primed, thus creating a more attractive framework for market to grow on. The revision of the feed-in tariff that was first established in 1988, played a key role in this market growth.

This instrument is part of the Portuguese energy policy, for an increased use of national indigenous resources, thus improving security of supply and reducing GHG emissions. Current target for wind energy is 3.750 MWe by 2010, as part of an overall objective to reach 9.680 MWe of installed capacity from renewables.

The results of this and other instruments will ultimately contribute to the overall objective of addressing Portugal’s international commitment under the UNFCCC (Kyoto Protocol) and to reach the national indicative target of 39% electricity consumption from renewables by the year 2010, as assumed under Directive 2001/77/EC.

2. DESCRIPTION OF THE CASE

This instrument takes the form of a feed-in tariff. It was first established by Decree-Law 189/88, which setup the rules applicable to the production of electricity from RES. Tariffs where then undifferentiated to all renewables. In 1995, D.L. 186/95 and D.L. 313/95 introduced an autonomous regime for renewable electricity production, as part of the National Electrical System. Later, D.L. 168/99 introduced a complete change in the feed-in tariffs (increasing the price paid for renewable electricity), reorganised the regulatory process and changed the access mechanisms to grid connection. An environmental parcel associated to the avoided CO₂ emissions was then included in the new formula to determine the price to be paid to producers. There was a general increase in the tariff, common to all RE technologies. In 2001, D.L. 339-C/2001 performed a further adjustment in the formulation that determines the feed-in tariff by introducing a coefficient Z that affects the environmental
parcel differently according to the renewable energy technology. The sequence of changes introduced in the feed-in tariff are depicted in Figure 1.

**Figure 1 – Evolution in the feed-in tariff in Portugal**

The current formulation is detailed in Figure 2.

**Figure 2 – Current form of formula used to determine monthly payments to renewable electricity producers (feed-in tariff).**
In the case of wind energy, the coefficient Z introduced by D.L. 339-C/2001 varies from €1.70 for the first 2,000 hours per year of electricity production to €0.65 for production above 2,600 hours per year. This option is intended to reward sites with limited wind resources, broadening the number of economically feasible projects.

<table>
<thead>
<tr>
<th>RES</th>
<th>Specification</th>
<th>Coef. Z</th>
<th>Feed-in tariff (EUR/MWh)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>Wind</td>
<td>Below 2000 h</td>
<td>1.70</td>
<td>52</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>2000 to 2200 h</td>
<td>1.30</td>
<td>44</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>2200 to 2400 h</td>
<td>0.95</td>
<td>38</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>2400 to 2600 h</td>
<td>0.65</td>
<td>32</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Above 2600 h</td>
<td>0.40</td>
<td>26</td>
<td>52</td>
</tr>
<tr>
<td>Solar PV</td>
<td>&gt; 5 kWp</td>
<td>6.35</td>
<td>150</td>
<td>285</td>
</tr>
<tr>
<td></td>
<td>&lt; 5 kWp</td>
<td>12.00</td>
<td>255</td>
<td>465</td>
</tr>
<tr>
<td>Small hydro</td>
<td></td>
<td>1.20</td>
<td>42</td>
<td>82</td>
</tr>
<tr>
<td>Wave energy</td>
<td></td>
<td>6.35</td>
<td>145</td>
<td>280</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>1.00</td>
<td>40</td>
<td>75</td>
</tr>
</tbody>
</table>

This instrument has been complemented by D.L. 312/2001, which established a clearer regime for the reception, by the public electric system, of the electricity supplied by independent power producers (including renewables).

3. RESULTS

Wind energy (on land) has been the market segment of most interest during the last four years in Portugal (see Figure 4). A significant number of wind farms were erected and several projects are now at different planning stages. From 20 MW in 1997, the installed capacity was increased to nearly 200 MW by the end of 2002. In that year, the production of wind electricity amounted to 0.24 TWh. More than 60 MW was expected to be installed in 2003. Furthermore, by the end of 2001, nearly 116 projects have been awarded with a grid connection point and this could mean more 1.140 MW to be installed in the following years.

Figure 3 – Installed capacity for wind energy in Portugal from 1990 to 2003 (estimate)

The feed-in tariff was the main cause for the current interest in wind energy. This new market dynamic had several positive consequences like the creation of new jobs (not yet quantified) and the idea of enabling the national industry to take part in the actual manufacturing of the wind generators, thus avoiding dependence on foreign manufactures and suppliers.
The total costs for enforcing the feed-in tariff as a policy instrument may be estimated in 3,800 million EUR as capital cost to install 3,750 MW of wind power by 2010, plus around 185,000 EUR.year^{-1}.MW^{-1} in payments for the feed-in tariff. The total primary energy savings can be estimated 31,1 PJ per year, considering a generation of 2,3 GWh.year^{-1}.MW^{-1} (from “Forum - Renewable Energy in Portugal”, ADENE/INETI, 2002, and 1 GWh = 0,0036 PJ). Also, the energy generated may represent a displacement of 2,600 kton CO_{2}/year (considering 83,6 kton CO_{2}/PJ).

4. EVALUATION: MAIN ELEMENTS OF SUCCESS AND PROBLEMS

Several actors played important roles in the success of wind energy in Portugal. First, there are the actual promoters of the projects, which are a vital driving force for the sector and now comprise a small but active group of private investors with ambitious plans for further developing wind energy. Second, the financial institutions who see wind projects as very attractive and are keen on making available the necessary funds for promoters to put their projects to practice. And, third, the municipalities, that because D.L. 339-C-2001 defined that 2.5% of the price paid to wind farms for the electricity supplied to the grid must revert to the Municipality where the farm is located, were strongly stimulated to bring wind energy into their territory and also to be an active partner in a increasing number of wind projects.

Other success factors to be pointed out are:1) the positive discrimination of wind energy in the formula that determines the feed-in tariff, particularly in those sites where the resource is available to a less extent; 2) the tariff being guaranteed for 12 years and, after that, there is only a reduction in the environmental premium; 3) wind energy emerging as a mature and reliable technology; 4) the availability of the largely unexploited resource.

The main bottleneck so far has been the limited capacity of the public grid, particularly in those regions were wind resources are available, which caused requests for further connection points to be halted for the past months. Market will continue to develop as the capacity of the grid is improved and technical restrictions are removed.

Another important barrier to the deployment of wind energy in Portugal has been the Environmental Impact Assessment (EIA) process that most wind projects must be submitted to. Despite being clearly regulated according to European directives, the EIA was, in practice, imposing severe restrictions to the fast development of wind projects. To overcome this situation, the Ministry of Environment issued additional legislation in 2001 (Despachos 11091/2001 and 12006/2001) and more recently in 2004 (Despacho conjunto 51/2004) to facilitate and speed up the permitting process. These diploma recognised the national interest of wind energy projects and introduced special but careful considerations to the specific case of wind farms to be sited in environmentally protected sensitive areas.

Objectives for further development
The feed-in tariff is an on-going policy instrument and can be complemented by other instruments that further aid the development of wind energy in Portugal. That is already the case of the PRIME programme (former POE), that can provide direct capital incentives to investment in wind projects, and the NovEnergia 2010 fund, that can be used by national promoters of RE projects to help financing its projects.

Targets for wind energy have already been set at 3.750 MW by the Council of Ministers Resolution 93/2003, providing an important contribution to reach the national indicative target of 39% electricity consumption from renewables by the year 2010, as assumed under Directive 2001/77/EC.

5. CONCLUSIONS

The revised feed-in tariff had a strong and noticeable impact in the wind energy market in Portugal. Installed wind capacity is growing exponentially since 1999. Within the RE electricity production technologies and despite most being covered by the feed-in tariff legislation, wind has been the one that clearly deployed. Some details in the formula for the tariff and in the associated legislation were very important for the success of this instrument for wind energy and, as the existing barriers are being lifted, the market is expected to continue to growth at a very high rate.

The main attractions of the feed-in tariff are the positive discrimination of less windy sites and the price guarantee for 12 years. These bring wind energy to the category of financially safe projects, thus raising the interest of many investors. Also the fact that municipalities now benefit directly from the income generated by those projects developed in the region turn out to be a major incentive to further projects.

However, it’s crucial to have an adequate framework for the practical development of wind projects and there the planning and permitting procedures need to be carefully established. Aspects like the capacity of the grid, the bureaucracy of the environmental process and the involvement of local actors (like the municipality) are important factors for success.