Installation of Wind Turbines through the Use of Fixed Ten Years PPA and Feed-in Tariffs

Case study #9 (21 October 2004)
Country: Greece
Market: electricity

1. Summary

The systematic study of wind potential in the Greek islands was started by the Greek Public Power Corporation (PPC) in the mid-1970s. It has continued, aided by the European Union (Thermie Programme) and the Centre for Renewable Energy Sources (CRES). However, the market for wind turbines in Greece was almost non-existent before 1990. The only installations that existed were demonstration projects of the relatively new technology of wind turbines. It was the implementation of Law 2244/94 that gave the first push forward for the market, introducing ten year PPAs and feed-in tariffs. This favourable approach has continued with law 2773/99 which is currently the main regulating tool for the liberalized electricity market. The feed-in tariff is expressed as a percentage of the selling price of electricity for the whole period of ten years that is the duration of the PPA.

2. Description of the case

Law 2244/94 has set the rules for fixed ten years Power Purchase Agreements between the Public Power Corporation and the RES electricity producers and also set the fixed feed-in tariffs for RES electricity, defined as a percentage of the consumer tariff. This was the first attempt to create a secure investment environment in RES. The results show that it has helped considerably the increase in installed capacity of wind turbines in combination with an investment subsidy scheme under the Operational Programme for Energy (1996-2000) and the favourable wind conditions in Greece.

The legislation changed in 1999 due to the liberalisation of the electricity market. Law 2773/99 has set the rules for the liberalised market and kept all the favourable conditions for RES electricity (PPAs and feed in tariffs). Although in the new law the feed-in tariffs that were set by L.2244/94 are considered as a ceiling and could be lowered by a ministerial decision, this has not happened so far, and it is most unlikely that it will happen.
The law makes a basic distinction between Autoproducers, who are producing electricity to cover their own needs and are selling the surplus to the network and Independent Power Producer, who sell all their electricity production to the network.

Following this distinction:

- For Autoproducers (producers of electricity for own consumption who sell the surplus), the buy-back rate is set at 70% of the utility's low-voltage (domestic) consumer tariff, for RES electricity produced and sold in the non-interconnected Greek islands, and at 70% of the utility's consumer tariff corresponding to the actual grid

connection voltage of the RES installation (be it low,mid, or high-voltage), for RES electricity produced and sold in the Greek mainland.

- For Independent Power Producers, the buy-back rate for RES electricity is set at 90% of the utility's low voltage (domestic) consumer tariff (in the non-interconnected Greek islands), and at 90% of the utility's mid-voltage (commercial) consumer tariff (in the Greek mainland).

The values that correspond to this system in 2001 is shown in the following table.
A few other key provisions of Law 2773/99 concerning renewables are:

- the Transmission System Operator (TSO) is obligated to grant priority access (priority in load dispatching) to RES electricity-producing installations up to 50 MWe in power capacity (up to 10 MWe in the case of small hydroelectric units),
- the TSO is obligated to enter into a 10-year contract (PPA) with the RES-electricity producer, for the purchase of his electricity. The contract always includes a renewal option;
- every RES-electricity producer is subject to a special reciprocity charge (annual fee), specified by a joint decision of the Ministers of Finance and Development, and equal to two-percent (2%) of the producer's electricity sales to the grid. This charge is collected by the TSO and is given to the local authority, within the area of which the RES generation unit operate, for the purpose of realising local development projects.

Table: Feed-in tariffs in Greece in 2001

Interconnected system		Autoproducers (energy: 70% of kWh selling price)	Independent Power Producers (energy: 90% of kWh selling price)
Low voltage (220/230 V)	Energy [€/kWh]	0.05826	-
Medium voltage (6.6, 15, 20, 22 kV)	Energy [€/kWh]	0.04712	0.06059
	Capacity [€/kW]	-	1.55540
High voltage	Peak zone [€/kWh] Oct-April: 10-14, 18-21 h May-September: 10-14 h	0.03077	
	Med. Zone [€/kWh] Remaining hours	0.02132	0.06059
	Low zone [€/kWh] Oct-April: 01-08 h May-September: 00-08 h	0.01582	
	Capacity [€/kWh] (peak zone)	-	1.55540
Non-interconnected islands [€/kWh]		0.05826	0.07491

3. Results

The increase of the installed capacity of wind turbines from 26MW in 1995 to 337MW at the end of 2003 (figure 1) which is expected to about 550MW by the end of 2004, shows that the market has received a significant boost, part of which is due to the PPAs and feed-in tariffs applied. The other important factor that contributed to the increase of installed capacity was the existence of the investment subsidy schemes under the Operational Programme for Energy (1999-2000) and the Operational Programme for Development (2000-2006). These programmes offered investment subsidies up to 35% of the initial installation cost and therefore have increased the profitability of the investments considerably.
The increase in the installed capacity, resulted in the production of 4.5TWh from wind turbines in the period 1989-2003. The market of RES electricity is well developed and an association of electricity producers from RES has been created, which acts as a forum for the promotion of the investors objectives (www.hellasres.gr).

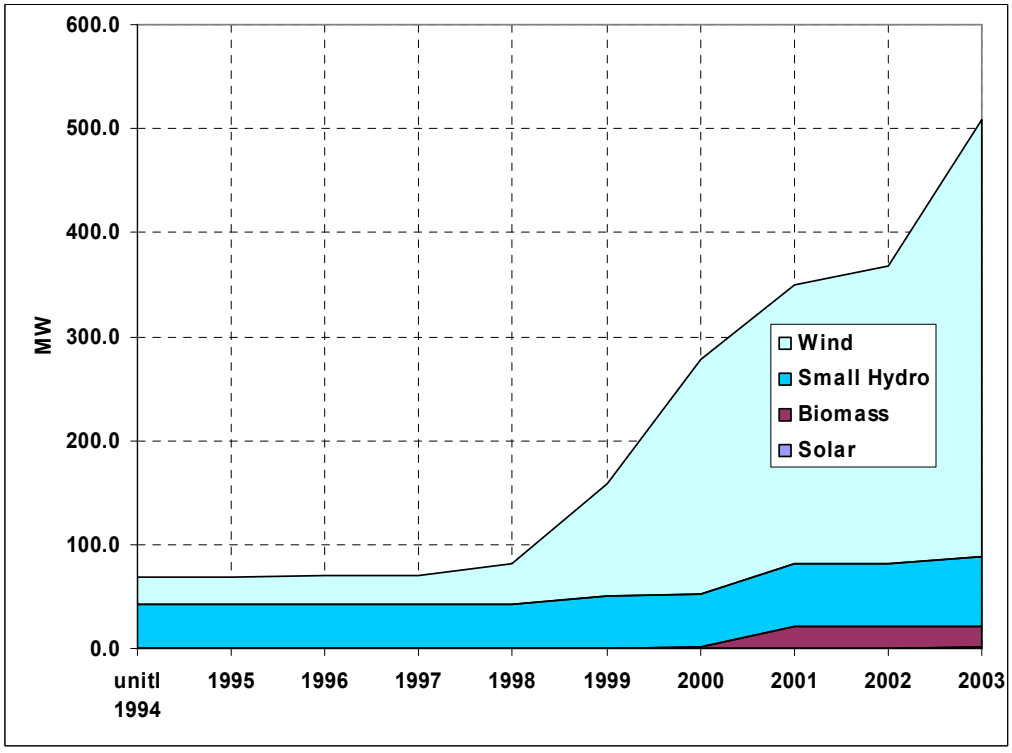

Figure 1: Development of the installed capacity of RES

4. Evaluation: Main elements of success and problems

The main success element of the combination of PPAs and feed in tariffs was the establishment of a stable investment environment. This has led a lot of Greek companies to move into the wind energy technology and proceed to the installation of wind parks. Some of the installations are owned by local development companies, which are established by local

municipalities. A reaction against the installation of wind parks in high potential areas has occurred with the local population, especially in cases where there were a lot of installations. In order to overcome this, law 2773/99 established a local tax of 2% over the annual electricity sales, that was paid by the investors to the local communities. This was a way of ensuring that the local people participated directly in the financial benefits of the wind parks and has improved the acceptability of the installations. In the direction of increased acceptability, the developers provide access to the sites and organise local promotion events, in collaboration with the local energy agencies and the Centre for Renewable Energy Sources.

In 2001, when the liberalisation of the electricity market began, the Regulatory Authority for Energy (which is responsible for the licensing of all electricity producing installations) received applications for a total of 10GW installed capacity of wind turbines. Out of these applications 555MW have obtained a license of installation or operation, which means that they are in operation or under construction and 3120MW have a production license, which means that they have a green light to proceed to the construction phase.

The first wind parks that were constructed were rather small, but the tendency with new wind parks is to have more and larger machines. For instance one of the park that have enter operation last year has 24 turbines of 1.3MW each. An approximate breakdown of the existing wind parks as a function of their installed capacity is shown in the following table. So 152.8MW of wind turbines are installed in wind parks that have a size of 10-15MW which seems to be the most "popular" size at the moment.

	Installed capacity of each wind park					
	<1 MW	1– 3MW	3– 5MW	5-10 MW	10-15 MW	>15 MW
Total Installed capacity (MW)	14.8	29.9	34.5	74.3	152.8	31.2

5. Objectives for further development

The market for wind-generated electricity will be regulated by the same rules in the future, since it was proved that these create the proper environment for the increase in the installed capacity. The main problem in the market is the delay in the deployment of new projects due to the very slow procedures for licensing of RES projects. Some attempts have been made to simplify the bureaucracy involved and the results are to be seen. The target that is set by the Greek state in the second communication to the European Commission in view of the directive for RES electricity is 1300MW installed capacity of wind turbines by 2010. In order to achieve this target the state is proceeding to designate specific zones for wind energy development, especially in the high potential areas and at the same time reinforce the electricity transmission network in these regions. The weak grid in the remote windy areas is an important obstacle for the development of wind parks.

6. Conclusions

The main lesson learned from the use of PPAs and feed in tariffs in combination is the fact that it is important to establish a long-term stable environment for investment in RES projects.

7. Contact Information

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