**NEW ISSUES CONCERNING DISPERSED GENERATION IN PORTUGAL**

António Espírito Santo BRITO, Luis Neves da COSTA
EDP – Energias de Portugal, S.A.
antonioespirtosanto.brito@edis.edp.pt
luis.neves@edis.edp.pt

**INTRODUCTION**

This paper discusses the improvements in the grid connection and in the economic instruments contained in the remuneration of dispersed generation within the context of the Portuguese legislation. The management of the capacity available in the grid is explained, focusing on the transparency of the process. The economic models that support the value of environmental protection are explained in the context of the energy remuneration.

**EVOLUTION OF DISPERSED GENERATION IN PORTUGAL**

The 1973 oil crisis lead to a global change of the European energy politics in an attempt to reduce external dependence.

Thus, in striving to reach this objective, some priorities were defined: diversity of the oil supply, promote the saving and the rational use of energy and develop the internal sources of energy.

In this context, renewable energy sources achieved greater importance, as a main contribution to the global security in terms of energy supply. A special focus has also been given to the research and development of new technology.

The technological evolution that occurred in the eighties permitted small dispersed generations to become profitable and therefore much more interesting to investors. Moreover, automation and remote control allowed a substantial reduction in the costs of exploitation of these small units, increasing significantly their profitability.

Portugal, having also suffered the consequences of the fossil fuels price increase, found it essential to follow the European Union politics in the use of internal sources of energy. In this context, the dispersed generation has been promoted in our country under a special regime. The technical conditions of grid access have been defined and the acquisition of energy has been assured to the producers within a legally fixed remuneration process.

Taking renewable energies into account, without forgetting the importance and the weight of the hydroelectric energy in the satisfaction of our country’s needs, it is also necessary to enhance the wind driven production of energy, that will constitute a key future energy source within the Portuguese energy sector. It is important to remember that, in accordance with the community directive (28.09.2001), by 2010 renewable energies will have to satisfy 39% of the total energy consumption in Portugal.

**MANAGEMENT OF THE CAPACITY AVAILABLE IN THE GRID**

The management of the capacity available in the grid of the Public Electric System was established by means of Decree-Law nº 312/2001, which was published on the 10th of December. This management takes into consideration the Investment Plans in the transport and distribution grid, and the characterization of that grid.

The capacity of the grid power reception, either existent or predictable, is available in the General Direction of Geology and Energy (Ministry of Economy) Internet site, which is www.dge.pt.

**GRID POWER RECEPTION POINT ATTRIBUTION**

To obtain a grid power reception point, the promoters ask to the General Direction of Geology and Energy a request of a previous information (which is known by the abbreviation PIP-Pedido de Informação Prévia) about the possibility of the power plant connection to the grid. These requests must be presented in the first fortnight of each four-month period. Due to the high number of requests, usually that Direction publishes some dispatches before the four-month period.

That previous information enables the promoters to know the conditions to the development of their projects. This information is very useful to the promoters, because it indicates the predictable grid point of reception, the tension and neutral regime of the grid, as well as the electric infrastructures, which are necessary to build for the connection of the power plant to the grid. The date after which there is capacity of grid reception is also pointed out.

After having the above information, the promoters may request to the General Direction of Geology and Energy the attribution of the grid reception point, in the time limit of 70 days (for small hydro power plants) or 12 months (for eolic plants to be built in sensible environmental places).
After analysing the power plant project, and if there are no reasons to reject the request, the mentioned Direction confers the reception point in the grid. The promoters must also apply for a establishment license of their power plant. The construction of the plants must be completed in the time limit of 24 months after the date of the mentioned licence. In the case of hydro plants, which power must be under 10 MVA, that time limit is delayed for 36 months.

If the capacity of reception is not enough to satisfy all the requests, the General Direction of Geology and Energy makes a selection of those requests, under certain criteria.

**CONNECTION OF THE POWER PLANTS TO THE GRID**

After obtaining the previous information and the establishment license from the General Direction of Geology and Energy, the promoter must contract with the utility the execution of the electrical infrastructures to connect the plant to the grid. For this purpose, the promoter must send to the utility a plan containing the placement of the installation, as well as the reception point.

The promoters may build the electrical infrastructures, if these circuits don’t interfere with those belonging to the utility, in certain conditions to be agreed with the utility.

The power plants must be equipped with protections that assure the quick and automatic disconnection of the grid in case of faults or lack of tension in the grid.

The protection system must be projected according to the specifications presented in the guide, which is published under the supervision of the General Direction of Geology and Energy (Guia Técnico das Instalações de Produção Independente de Energia Eléctrica).

**Measurement equipment**

The equipments for measuring the energy emitted to the grid, as well as the means of data transmission, belong to the producer and are sealed by the utility.

There is a guide for telemetering, which was approved by the regulatory authority. This guide can be found in Internet site [www.edp.pt](http://www.edp.pt), using the paths **Clientes > Serviços para empresas > Guia de Telecontagem**. The download of this guide can be done.

Telemetering allows the producer to manage the energy emitted, assuring great reliability of obtaining data. The producer obtains the information in the beginning of each month, which is essential to calculate the remuneration of the energy.

**Elements of project of the power plants**

The promoter must present, to the utility manager, some elements related to the project of the power plant. These elements are necessary to analyse the connection of the plant to the public grid and are the following:

- Scheme of the connection of the power plant to the grid;
- Constitution of the generators, mentioning their main characteristics;
- Schemes of electrification of the interconnection block, containing the connections of protections and measurement equipment and also the characteristics of measurement transformers.

**Connection of the power plants**

Before the connection of the power plants to the grid there are some technical and administrative procedures to be executed by the promoter and by the grid manager. The main procedures are the following:

**From the promoter initiative**

- Obtaining of the exploitation licence of the plant after being inspected by the official authorities;
- Delivery to the utility of possible infrastructures, which were built by the promoter, and that, must be integrated in the public grid. In this case there must be signed a protocol of delivery;
- Asking the grid manager to make an inspection of the interconnection block of the power plant to the grid. This block contains the measurement and telemetering equipment, as well as the interconnection protections.

**From the grid manager**

- Celebration of the contract of energy acquisition, as well as the exploitation protocol, where the main conditions of relationship between the producers and the grid managers are pointed out.

The text of the contract was established by regulation nº 416, published on the 6 June of 1990. The contract is considered after the date in which the first interconnection of the plant to the grid was established. This date is fixed in a document signed by both the producer and the grid manager.

The relevant information is published in the site [www.edp.pt](http://www.edp.pt) and can be obtained through the path **Fornecedores > Produtores em Regime Especial**.
PRODUCTION UNDER SPECIAL REGIME ECONOMIC REMUNERATION MODELS

The production under a special regime has benefited from several incentives, since its environmental impact is less than the “classic” generation modes. This production also contributes to the diversification of the energy sources, providing a reduction of the national dependence upon external sources of energy.

These incentives are expressed in investment and the obligation of purchasing the electric energy produced, within a previously defined remuneration process.

Remuneration process for renewable energies

Decree-Law number 168/99 established that the energy purchasing process for renewable energies is based upon three additive remunerations:

- **Fixed Remuneration** (PF) – which represents the avoided investment costs;
- **Variable Remuneration** (PV) – which represents the avoided operation costs;
- **Environment Remuneration** (PA) – that valorises the avoided emissions of CO$_2$.

In the remuneration process, the losses prevented in the nets are still considered (coefficient LEV). There is also a correction that depends on the diagram of energy production (coefficient KMHO) and another correction according to the inflation, which is measured by means of the Prices to the Consumers Coefficient.

The above graph shows the distribution of the energy remuneration for a significant sample of producers.

The greatest percentages of the remuneration components are related to variable remuneration (PV) and environment remuneration (PA). These components are proportional to the energy emitted to the grid. The mentioned Decree-Law number 168/99 didn’t differentiate the several types of renewable energy sources.

So, in 29 December 2001 Decree-Law 339-C/2001 was published which differentiates the types of renewable energy sources by means of a new parameter that multiplies the environment remuneration. This parameter, designated by the letter Z, assumes the following values, considering the use of declared power, in hours:

**Wind Energy**

- For the energy produced in the first 2,000 hours... $Z=1.70$
- For the energy produced between 2,000 and 2,200 hours... $Z=1.30$
- For the energy produced between 2,200 and 2,400 hours... $Z=0.95$
- For the energy produced between 2,400 and 2,600 hours... $Z=0.65$
- For the energy produced above 2, 600 hours... $Z=0.40$

If the use of the declared power is greater then 2,200 hours, the remuneration will begin to decrease. The purpose of this procedure is to stimulate the construction of wind plants near the loads, preventing the installation of these plants on top of the hills. Most hilltops are still environmentally preserved because they are inaccessible.

**Small Hydro**

The Z parameter assumes always the value 1.20.

**Wave Energy**

For wave energy, up to the installed capacity in Portugal of 20 MW, the Z parameter is 6.35.

**Photovoltaic Energy**

For photovoltaic plants, up to the installed capacity in Portugal of 50 MW, the Z parameter takes the following values:

- Plants with installed power greater than 5 kW... $Z=6.55$
- Plants with installed capacity less than 5 kW... $Z=12$

**Production modulation**

There is also a coefficient, called KMHO that multiplies the remuneration, which is optional. This coefficient is related with the shape of the diagram of energy production.
If the producer does not want to take the coefficient into consideration, it takes the value 1.

If the producer can modulate the production (for instance if the hydro plant has a small dam) he may choose the use of KMHO coefficient. The formula of KMHO depends upon the energy emitted on flood and low load hours.

The following graphs show the variation of that coefficient according to the percentage of energy emitted on low load hours.

If the percentage of energy production in a hydro plant during low load hours is greater than 42% it is advisable for the producer not to consider the coefficient (it takes then the value 1).

If the percentage of energy produced in low load hours is small than 42% it is advisable to choose the coefficient, because it takes a value greater than 1. This usually happens when the plant has a dam, so that the production can be modulated.

For the other plants (excluding Hydro) the corresponding graph is also presented:

The variable remuneration is the most significant component. It represents the avoided costs in the grid and prevented costs related to the production of energy in conventional thermal plants.

The environmental remuneration is much small than in the case of renewable energies.

The cogeneration plant must also have an electrical efficiency level above a certain degree. According to the type of plant, this level may be:
0.55 for plants using natural gas;
0.50 for plants using fuel oil;
0.45 for plants using biomass or residual fuels.

Those plants that have a greater efficiency level can also achieve an increase in the remuneration.

FUTURE PERSPECTIVES

Presently, all consumers, through the UGS tariff (Global Use of the System) pay for the costs related to the acquisition of energy produced under a special regime.

This procedure will probably evolve in the coming years. It may be replaced by the “green certificates” mechanism.

In European Union discussion has continued concerning the contribution of renewable energies by the year 2010. The Green Book considers a doubling of the present percentage, that is 6 or 7 %, to a value that can be between 12 and 15 %.

The project seeks to implement a common set of rules in all member States, so that the use of renewable energies can be increased.

For the year 2010, it is desirable and likely that the contribution of renewable energies may reach 12% of the European Union’s energy consumption.

In conclusion, these are the guidelines of the European Perspectives:

- Reduction of the obstacles that can prevent the increase of electricity by means of renewable sources of energy;
- Simplification of administrative procedures;
- Establishment of objective rules;
- Easy access to the grid, maintaining the reliability and safety of the electric system.

INTERNET SITE

In the site of EDP – Energias de Portugal, SA, the relevant information concerning dispersed generation has been available in order to make easier the relationship between the producers (or promoters) and the utility.

Using Internet, the time in the interactions is reduced, and the most common questions and difficulties are answered in the site. The site as also a hiperconnection with that of General Direction of Geology and Energy.

The next picture shows one example of a page of that site, which can be accessed as following:

www.edp.pt

Fornecedores > Produtos em Regime Especial

The site has also some contents in English, for the understanding of foreigner investors. The information in Portuguese can be translated into other European languages by means of Internet Services Providers.

ACKNOWLEDGMENTS

The authors thank Carlos Fernandes Farinha and Mark Carpenter for their collaboration in this paper.

REFERENCES


