Public-Private Partnerships for Wind Power Generation:

The Portuguese Case

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ABSTRACT

Today's portfolio of energy production, based mostly on fossil fuels, and the increasing energy consumption go against the sustainable vision for the world's development. Governments are shifting their energy policies towards renewable, non pollutant sources of energy, developing large investment plans to ensure an adequate response the energy consumption while keeping the environmental impact within reasonable boundaries. Like in many other infrastructure related sectors, new models for the provision of these facilities, and services, are being developed. Over the past 20 years, highways, hospitals, social housing, airports and dams have been developed in close collaboration with the private sector, not only in a contractor-supplier relation but also in deeper partnerships where the private sector assumes a substantial responsibility in managing and running the business. These models are known as Public-Private Partnerships (PPPs). This research will look at the Portuguese experience in the application of PPP arrangements in the energy sector, particularly as far as the wind power plants development is concerned. The evaluation procedures for selecting the private partner, the contract structure and the risk-sharing agreement are some of the issues deserving special attention.

Keywords: Access to the market; Contract management; Public-Private Partnerships (PPPs); Risk-sharing; Wind Power Plant.

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1. INTRODUCTION

The growing need for energy at a worldwide scale, and a deeper environmental awareness, has led to a new level of commitment by governments to develop renewable energy sources (Yue et al., 2001). *Kyoto protocol*, the alarming increase in greenhouse gas emissions (global warming), and disasters associated with traditional energy sources, like the recent oil spill in BP off-shore platform over the Golf of Mexico, pressured political decision makers to implement more environmentally friendly energy policies, leading to a significant increase in renewable energies in general, and wind power in particular (Jacob, 2005). The European Commission (2005) developed several support schemes to foster the market penetration of electricity produced from renewable energy sources (RES-E). These schemes include *feed-in* tariffs (a price paid by electricity companies to domestic "green electricity" producers), *green certificate system* (all consumers are forced to buy *green certificates* to producers), *tendering systems* (tenders for supply of RES-E, sold at market price) and *tax incentives*.

Several countries have been planning packages of investment to shift the portfolio of energy production towards more sustainable solutions (Webber, 2010; Saidur et al., 2010; Sahedi et al., 2010; Zahedi, 2010; Mabel and Fernandez, 2008), but under a macro-economic scenario of worldwide crisis, it will be difficult for public budgets to face this new and demanding investment priority. These are not "cheap" solutions[1]. Renewable energy still has a higher cost than traditional sources, and financing mechanisms need to be found to overcome this gap, and foster the development of these technologies (Liu and Liou, 2001). On top of this, the recent economic crisis has shown that a country's ability to finance itself is no more unlimited. Portugal, Greece and Spain are some examples on how credit availability

is restricted and may lead to a dramatic increase in interest rates. In face of these challenges, alternative ways of service delivery are required in this field.

Firstly developed in the 1990s in the UK, Public-Private Partnerships (PPPs) arrangements have been developed all over the world in different sectors, such as water supply, health care infrastructures, transportation, and also energy. They appeared as a panacea for public budgetary constraints, but their implications are wider than just a financing mechanism. In the late 90's, Portugal started developing this procurement model to address the development of highways, moving afterwards for the railway sector, light railway projects, and healthcare infrastructures and more recently has engaged in the application of this models to the provision of wind power plants.

This paper will present the Portuguese experience in this field. First, the authors will clarify the concept and rationale for PPPs usage, their benefits and pitfalls, pointing out the risks of an inadequate use. The economics behind wind power plants is also addressed, identifying the critical success factors and making a deeper analysis on the risk sharing scheme adopted for the specific case study, that is, the development of wind farms. The Portuguese experience is outlined afterwards. A general overview of the electricity sector and its organizational structure will be presented, splitting the value-chain into its primary components and identifying the key stakeholders in each sub-system, as well as the respective industrial organization model (monopoly *versus* competition). A public tender procedure for an 800MW unit is discussed next, focusing on the process of selection of the private partner, on the risk sharing scheme adopted and on the management of contracts.

2. PPPs IN RENEWABLE ENERGY SECTOR

2.1. PPPs definition

Often referred to as financing mechanisms, PPP arrangements are far broader and their implications are not restricted to the financing domain. PPPs are a procurement model where private and public sectors join up to provide a certain service or facility. The Portuguese legislation defines a PPP as *"contracts or union of contracts, by which private entity is bound before a public partner to ensure the development of an activity aimed at satisfying a collective need, and where the funding and responsibility for investment and operating obligations belong in the whole or in part, to the private partner"*. The public partner can take different forms, it may be the central government, or even independent legal bodies incorporated in the State or Regional and Local Administrations (Koch and Buser, 2006). The European Commission's Green Paper on PPP projects established two distinct partnership types, purely contractual and institutionalized PPPs[2]. The first type refers to partnerships where the relationship public-private exists only through contracts. These contracts establish a *level playing field* so that private and public agents can work together, and they should be as complete as possible. The problem of contract incompleteness has been one the most interesting subjects in the area, occupying academics since the 70's (Williamson, 1976). When the relationship is established through a distinct entity, held jointly by both parties, or when a public body is controlled by a private entity, then a institutionalized PPP is formed. In this case, the relationship between private and public sectors is centered not only on a contract, but also on a governance model of the new entity.

2.2. Models for private involvement

Traditional procurement models take the form of *public work contracts*, where the private sector delivers a pre-designed service, ordered by the contracting agency (public entity), and its sole responsibility is related to the quality standards (established for the service itself). The relationship between the two agents is a transaction agency-contractor. The complexity of these traditional models may increase when there are technical assistance contracts or sub-contracting, in which the private partner is responsible for the provision of a certain service, which is part of a larger system, for example, cleaning services in a healthcare facility. At this point, a deeper involvement of private agents goes into the PPPs domain. Management contracts, leasing or concessions (PPPs), are more complex than the traditional procurement models (Gómez-Ibanez, 2006). In the first, the private party receives a *management fee*, generally indexed to a performance target, for running a service on the public's agent behalf. In the second, *leasing*, the business risk is assumed by the private agent, who manages and runs the service, using public infrastructures according to a *lease fee*. Finally, there are concessions that can take different forms (Build-Operate-Transfer, Build-Own-Operate, etc.). In this case, the private agent not only assumes the total (or partial) business risk, but also engages in investments to upgrade or increase capacity of the infrastructure. Although it should not be considered a PPP project, divestitures are the ultimate level for private engagement in service provision, since in this case the Government step out of the service provision process, keeping, in most situations, only a regulatory role (Koch and Buser, 2006; Devapriya, 2006).

2.3. Benefits of using PPP projects

With this procurement process, advantages for both parties can be joined. In fact, they have two different concerns. The private one is essentially the profit-driven return on investment for risk-taking and fulfillment of business purposes. The public concern is more complex, driven by legislation, regulation and authorities, political opinion, democratic decision-making, minimizing the risk and maximizing the social value (Jones, 1994). As a result of this alliance, there can be a mutual added value, since the private partner gets a profit and the public partner can reduce its costs. With the aim of increasing fiscal restraint and without jeopardizing the quality of services provided, there was the need to appeal for the private sector expertise and financing ability. Especially in projects that require large up-front sunk investments, like roads, dams, railways or seaports, to name some examples, PPP option allow to pay the "bill" over time. When user's revenues are enough to cover investments and operation costs, no additional expenditure is required from the Government. Renewable energy production might be one of these examples. In other cases, for example *"shadow tolls"* highways, the Government pays a fee to the concessionaire during the contract. There are other advantages is using this procurement model. Despite the lack of irrefutable evidence on the benefits of private over public management, regarding *construction costs*, there is consensus that the probability of cost overruns under a private management is significantly lower than when directly managed by a public body (Grimsey and Lewis, 2002). In large-scale investments this could be enough to justify the adoption of PPP arrangement, though the decision on whether to use a PPP project or not is far more complex. This issue will be further developed in detail.

2.4. Pitfalls in PPPs usage

The development of PPP arrangements has been far from perfect. In fact, the need of Governments to develop projects without public expenditure has lead to contracts poorly designed and eventually to the delivery of projects without a positive *Net Present Value (NPV)*, even when considering social and larger economic benefits. *Ad hoc* renegotiations become inevitable, and are a direct result for lack of preparation by the public authorities (Engel et al., 2009). These renegotiations take place during the contract period, meaning that there will be only one price, the one presented by the private partner, without any competition and with profit margins well above the ones observed in a competing market. This abusive behavior is sometimes expected by the companies competing for the contract. Engel et al. (2009) found evidence of firms lowballing their offers to levels of predatory prices, expecting to reach their desired levels of profitability during renegotiations. For example, in the construction of the Portuguese highway network there are examples of renegotiations even before the highway is open to use.

2.5. PPPs *vs.* traditional procurement models: public sector comparator

PPP arrangement as a procurement model should be compared with the traditional procurement methods to ensure that *value-for-money (VfM)* is delivered. This means comparing the cost of developing the project under a PPP, with the hypothetical risk-adjusted cost of the project if developed by the Government (Devapriya, 2006). It is then necessary to estimate the cost of building and maintaining the infrastructure (investment and operational expenses - OPEX) along with the risk entirely assumed by the public sector, contrasting to PPP projects where risks are allocated to the private sector. If the VfM delivered by the PPP solution is higher, then this should be

the procurement model adopted. In the case of wind power generation this question does not exist because energy production left the public sphere, and is now carried out by independent companies. In some cases, like EDP (Portuguese Electricity Company) in Portugal, the Government remains as a shareholder having special rights (golden share). The alternative of developing this project under a traditional model of public works contract is not a real possibility, so calculating the public sector comparator could not make sense (Partnerships Victoria, 2001)[3].

3. THE PORTUGUESE ENERGY SECTOR

3.1. General framework

The Energy Policy is a responsibility of the Government through the Ministry of Economy, which has in its direct dependency the Directorate-General of Energy and Geology (DGEG) for conceiving, designing and assessing energy related policies. The sector-specific regulation is handled by the Energy Services Regulatory Authority (ERSE). Its main functions include the protection of consumer interests regarding price, service quality, access to information and security of supply and also fostering competition and efficient energy use. The National Electricity System (SEN) is organized in two different systems: a public electricity system (SEP) and an independent electricity system (SEI). The first comprises all required activities for ensuring the electricity supply in Portugal, taking into account the public service obligations of universal energy delivery, under adequate levels of quality of service, determined by the regulator. The SEI encompasses the non-binding electricity system

(SENV) and the special regime generators, making deliveries to the SEP networks under specific legislation. Figure 1 provides a general overview on the SEN.

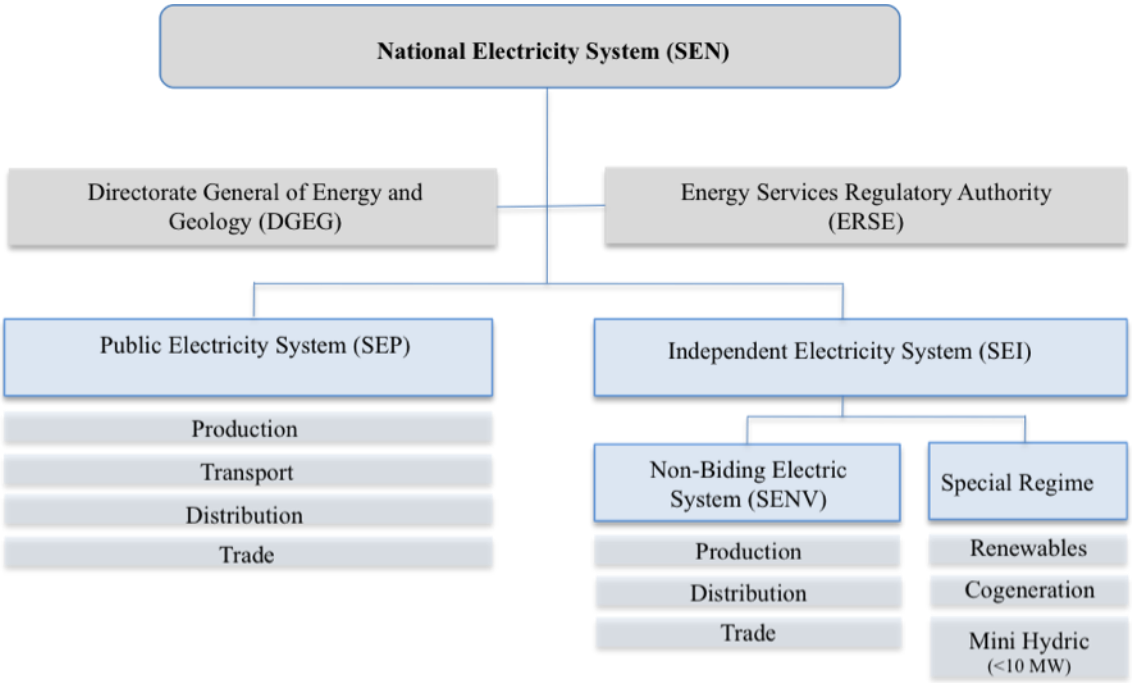


Figure 1 – Organization of the SEN

The energy production and commercialization to users is a market-based activity, while transportation and distribution can only be performed under a public service concession. In Portugal, transportation/transmission is performed by the National Electricity Network (REN), under a concession established in 2007 for a 50 year period, with the main goals of planning, constructing, operating and maintaining the National Electricity Transmission Grid (RNT)[4].

The Government controls, directly or indirectly, 51.1% of the shareholders votes, and the remaining belongs to several energy related industries, investment groups and 20% is *free float*. The distribution activity is also an exclusive concession operated by EDP Distribution, from EDP Group. EDP Group is a company listed in Lisbon Stock Exchange where the Portuguese Government controls, directly or indirectly, 24.49% of the votes.

In trade, which is the last activity of the value-chain, there are basically two distinct markets, one regulated, with regulated prices (by ERSE), where EDP Universal Services is the main provider, though small consumers associations also deliver electricity, and the other deregulated, where several enterprises compete with each other, EDP Commercial, Endesa, Iberdrola, just to name a few. Thus, final users may choose to establish contractual relationships with suppliers from the regulated trade, also called *suppliers of last resort*, under conditions approved by the regulator, or negotiate other conditions directly with the traders working in the open market (liberalized trade). Figure 2 presents a general framework based on the sector's value-chain structure.

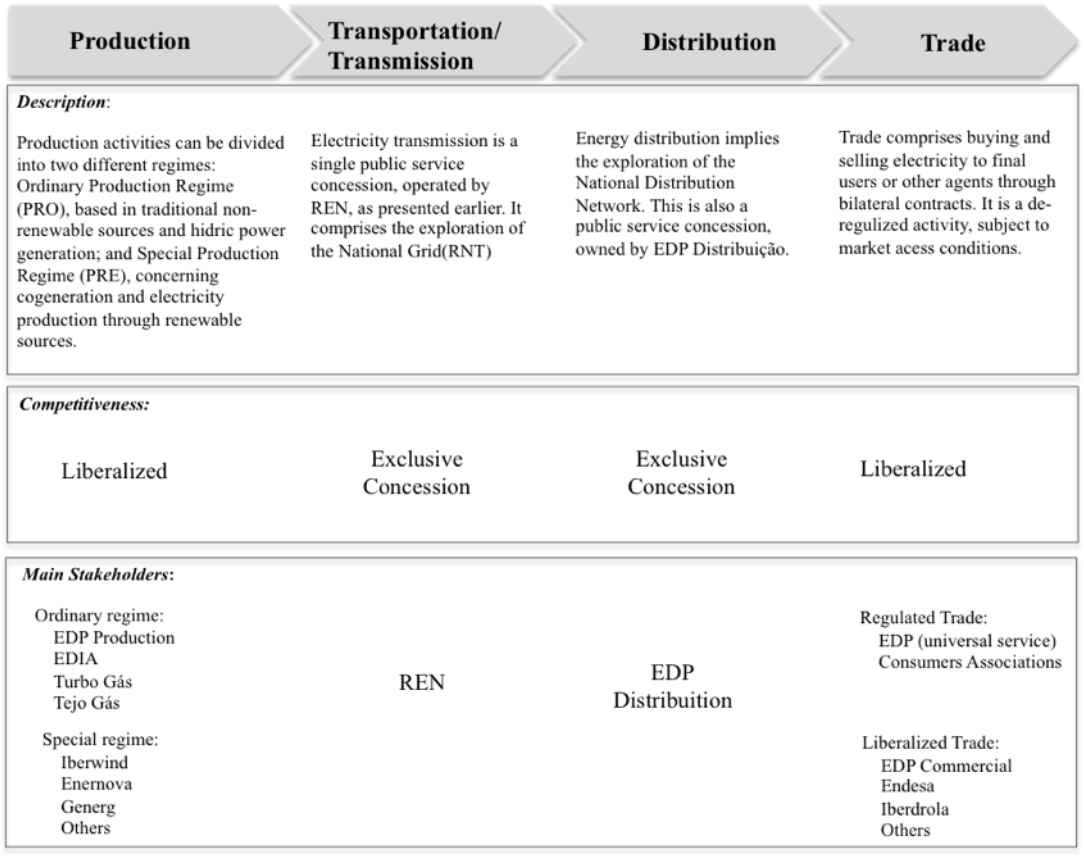


Figure 2 – Electricity sector value-chain

3.2. Renewable Energy

Portugal is currently undertaking a major investment program in renewable energies. This political priority arises from the need of reducing greenhouse gases and increasing the national energy production while decreasing the external "energy bill". The creation of specific regulations[5] and the signing of the *Kyoto Protocol* were decisive to release a wave of projects based on renewable energies. According to DGEG, by the end of March 2010, Continental Portugal reached 9229 MW for electricity energy production capacity through renewable energies, as shown in Table 1. The main factor responsible for this increase is the wind power generation, moving from 175 MW in 2002 to 3725 MW in 2010, (more than twenty times more).

Table 1 – Evolution on installed capacity of renewable sources (MW) (DGEG, 2010)

	2002	2003	2004	2005	2006	2007	2008	2009	2010 (Mar)	AAGR[a]
Hydroelectric Total	4288	4292	4561	4752	4784	4787	4792	4821	4821	1.8%
Large Hydroelectric(>39MW)	3783	3783	4043	4234	4234	4234	4234	4234	4234	1.7%
PCH (>10 e <= 30 MW)	251	251	251	232	263	263	263	263	263	0.7%
PCH (<=10MW)	254	258	267	286	287	290	295	324	324	3.9%
Wind	175	253	537	1047	1681	2446	3012	3566	3725	276.8%
Biomass (with cogeneration)	372	352	357	357	357	357	357	359	359	-0.5%
Biomass (Without cogeneration)	8	8	12	12	24	24	24	101	103	166.1%
Urban Solid Waste	88	88	88	88	88	88	88	88	88	0.0%
Biogas	1	1	7	8.2	8.2	12.4	12.4	20	21	271.4%
Photovoltaic	1.5	2.1	2.7	2.9	3.4	14.5	58.5	103.7	108.7	973.3%
Tides Energy							4.2	4.2	4.2	
Total	4934	4996	5565	6267	6946	7729	8344	9059	9226	11.9%

[a]AAGR – Annual Average Growth Rate.

Portugal currently still imports about a quarter of the electricity consumed. However, aiming at making this country more independent, the Portuguese government has heavily bet on renewable energy, both in terms of wind energy and biomass, by promoting tenders for the allocation of power within the network. In addition, mini-hydroelectric (increasing the capacity by approximately 50%) and geothermal energy

have also gained importance. Great emphasis has been given, as well, to the pilot project on the wave energy and photovoltaic installations, where the expectations in terms of solar energy are quite ambitious. Due to its geography and geomorphology, Portugal presents interesting conditions for wind power development. The first projects begun in the early 90's, and in 2001 the Government set as a priority to increase the number of plants from 24 to 204 by March 2010 (see Table 2).

Table 2 – Evolution on wind power generation capacity in Continental Portugal (DGEG, 2010)

	2002	2003	2004	2005	2006	2007	2008	2009	2010 (Mar)	AAGR
Installed Power	175	253	537	1047	1681	2446	3012	3566	3725	277%
No. of sites	24	42	71	103	139	152	174	195	204	102%
No. of wind turbines	213	276	441	702	1003	1137	1609	1879	1956	112%
Average Power Capacity (MW)										
Farms	7.3	6	7.6	10.2	12.1	16.1	17.3	18.3	18.3	22%
Aerogenerators	0.8	0.9	1.2	1.5	1.7	2.2	1.9	1.9	1.9	20%

4. THE ECONOMICS BEHIND A WIND FARM

4.1. The wind business

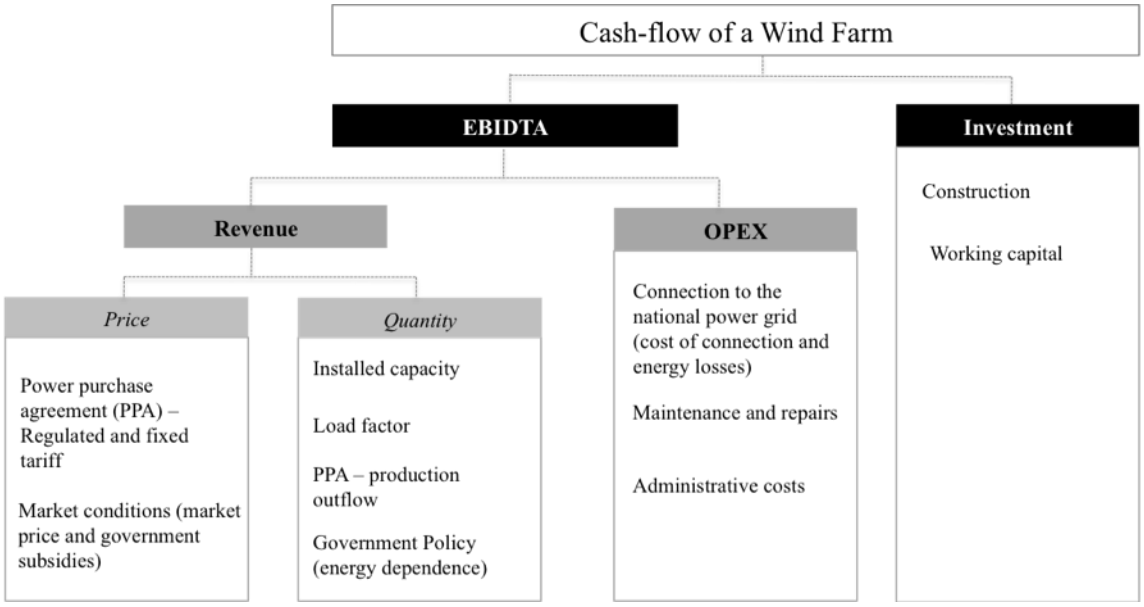
The development of a wind power plant requires a great technical expertise and know-how, in addition to a large capital availability. Therefore, Project Promoters are the main drivers of such projects, and usually are industries specialized on the energy sector, with financial partners that provide the necessary funds for developing these projects. Since they have a large visual and environmental impact in the areas where they are placed, a favorable opinion of the municipalities is required. To facilitate this public support, Decree-Law 339-C/2001 of 29 December established that the municipalities that accept theses project will receive a 2.5% of monthly fee

paid by the recipient of the electricity produced in wind farms. Whenever wind farms are located in more than one municipality, the payment is shared in proportion to the installed power in each. For instance, in the UK the wind farm projects were highly contested by public opinion, and the development of "trust" and "fairness" among projects promoters and local communities, according to Aitken (2010), can make the process of compensation easier. For example, in Portugal part of the monthly fee paid by the promoter to the municipality was used through small local committers (named Improvement Committees) to support small projects in the villages[6].

Nevertheless, several barriers to entry in this market can be found, such as the licensing procedures to acquire mandatory permits for participating in tender procedures. These procedures are quite complex, bureaucratic and time and money consuming, involving various administrative bodies. In Portugal, there are at least 11 permits to be acquired in an estimated period of 290 days. The environmental impact, mainly concerning visual impact, noise and influence in bird fauna, can generate public contestation to the project, especially from environmental agencies. The connection to the national grid could also be a critical factor. The places where these projects are developed are often remote, without connection to the national electricity grid. Depending on the difficulty and distance to implement this connection, this can add complexity (resulting in delays) and increase the cost of the project. Another important barrier to take into account is the know-how and expertise required. For example, the quality of the turbine is an extremely relevant factor, because it is directly related to the productivity and reliability of the service, affecting greatly the costs of maintenance, and therefore, the cost for each unit of output produced.

The investment required and the expertise necessary to develop and manage a wind farm makes it a complex and, sometimes, a risky investment. The input required for

producing wind energy is a highly uncertain variable, more than any other type of (renewable) source. But the wind is not the only factor with impact on the project profitability. In order to discuss the economics behind a wind farm, it is first necessary to identify the critical variables to ensure that the planned *cash-flow* is achieved, and an adequate return on equity is provided to investors as shown in Figure 3.



EBIDTA - Earnings Before Interest, Taxes, Depreciation and Amortization; OPEX – Operational Expenses.

Figure 3 – Cash-flow critical variables

4.2. Remuneration System (Price)

The remuneration system for wind energy in Portugal follows the "feed-in" tariffs system that has emerged as an incentive to projects based on renewable energy. The basic principle of this remuneration system is intended primarily to establish a stable tariff imposed by the regulator (ERSE) and / or a bonus in addition to the market price received per MWh of electricity generated, in order to ensure a reasonable rate of return of the producer. These rates were established in 1999 and subsequently revised by ERSE, and amended in 2001, 2005 and 2008. Decree-Law 33-A/2005, in 2005, introduced a constraint on the yield for feed-in tariffs for a maximum of 15

years, starting from the date of supply of electricity to the grid. The warranty period of new tariffs, for over 15 years, can also be booked up to the first 33 GWh supplied to the grid for each MW of capacity, and it will be used whichever comes first. During this period, the regulator assures the producer the purchase of all its energy production by REN, with no demand risk for the producer. However, although the tariff schemes ensure their implementation during these 15 years, the regulator may decide to increase or decrease the rate or the fixed component of tariff for electricity produced from renewable sources (EDP Renováveis, 2007). In addition, at the end of the 15 year period, the price will tend to get closer to the market price of electricity (40 €/MWh) plus a premium for the sale of green certificates. The green certificate system can be considered as a system of incentives for renewable energy sources of electricity generation, entitling the producers to a green certificate for each MWh of energy they produce.

4.3. Quantity

The number of sales depends directly on the installed capacity, load factor, power purchase agreement (PPA) and the Government policy, being the wind power resource availability a decisive factor for the amount of energy produced. No wind, no money. The PPA is an essential element to consider, because with the licensing process completed and in possession of the right to operate the wind farm, the developer has the sale of production energy ensured.

4.4. OPEX

All the operating expenses that the developer of the wind farm has are recorded in OPEX. This means all ongoing costs and necessary to manage the project. According to EWEA (2009), the services and spare parts represent the largest share of the total cost of O&M, with about 26%, followed by administration (21%), land rent (18%), insurance (13%), power from the grid (5%) and others (17%).

4.5. Investment

The investment in a wind farm is specific, because the turbines represent the cornerstone of the whole process, regarding the choice of the model and its power, the definition of the groups to ensure a good efficiency, maintenance and even the replacement of components. This investment justifies the higher costs either in the initial phase or the operation one, especially in the phases of transport and installation. In a typical structure of an investment in a wind farm, the capital cost is dominated by turbines with 75% of the total investment, representing the electrical system (10%), civil work (10%) and engineering project management (5%).

5. WIND POWER PLANT TENDER – CASE STUDY

5.1. Introduction

A public tender for the attribution of capacity to inject power in the electrical system of public service and associated reception points for electricity generated from wind farms was launched in July 2005, by DGEG. It was divided into three distinct phases (A, B and C). This paper only looks at phase A of the competition, which refers to

the allocation of a share of power between 800 and 1000 MW. The subsequent phase B and C, were planned to allocate extra 400 to 500 MW, and 200 MW, respectively, and those public tenders were similar.

In phase A, four consortiums presented bids: "Novas Energias Ibérias" (NEI): Iberdrola, Gamesa, Alberto Martins Mesquita & Filhos, Meci and Viatel; "Ventinveste": Galp Power, Martifer, Enersis, Efacec and Repower; "Eólicas de Portugal" (ENEOP): Enernova (EDP), Generg, Finerge and TP; and finally, "Ventonorte": Enel, Union Fenosa, WPD GmbH & CO.KG and Suzlon Energy A/S. Ventinveste and ENEOP, were qualified to the negotiation phase, but the best and final offer (BAFO) of ENEOP was the most advantageous, allowing them to win the 17 year contract. The evaluation of such proposals had to account for several factors, each with a determined impact (weight) on the final score. A more detailed analysis on the multicriteria analysis model used is presented next.

5.2. Selecting the private partner

5.2.1. Bids evaluation model

For the evaluation of bids to phase A, the following 4 criteria were used: (A) Economic Impact; (B) Creation of an Industrial Cluster; (C) Technical Management and (D) Support for Innovation. To each criteria was attributed a weight of 20%, 45%, 25% and 10%, respectively.

Table 3 – Criteria and weights in the bid evaluation model

Criteria	Weight	Sub-criteria	Weight
A. Economic Impact	20%	**A1.** Discount to the remuneration of the energy delivered to the grid of wind farms	20%
B. Creation of an Industrial Cluster	45%	**B1.** Direct Investment Volume of Industrial Project	11%
		B2. Indirect Investment Volume generated by the Industrial Project	8%
		B3. Direct Employment generated by the Industrial Project	11%
		B4. Indirect Employment generated in the Industrial Cluster	8%
		B5. Gross added value of Industrial Cluster	7%
		B6. Coherence and consistency of the Industrial Project	-
C. Technical Management	25%	**C1.** Capacity management technique of wind farms	10%
		C2. Management of energy production	2.5%
		C3. Energy storage solutions	7.5%
		C4. Additional reactive power control	2.5%
		C5. Participation of primary frequency regulation	2.5%
D. Support for Innovation	10%	**D1.** Support for Innovation	10%

Given the weights of the criteria of this public tender, economic and financial factors were valued 65%, while the management of the system had a relative weight of (25%), means that the Portuguese government, through the DGEG, strongly favored the creation of a cluster of support for the wind sector, trying to attract investment to the country (a weight of 45% given to the direct or indirect creation of a cluster). There is evidence in the literature about the positive effects of the energy policy on expansion of the industry (Lund, 2009). Criteria A concerns the economic impact, meaning the discount required to the remuneration of the energy delivered to the grid. Theoretically, this should be the most important factor, since the financial sustainability at the stage of operation of the wind project depends largely on this item. Nevertheless, the political strategy to address these projects is to ensure a long lasting support to the sector, and so the creation of an Industrial Cluster was the most valuable factor. The new industry aimed essentially to create investment and jobs in non-supported areas as well as technology transfer to the country so as to perform exports rather than imports.

For each of the criteria B and C above sub-criteria were also used, on which assigned weights were also related. The B sub-criterion values the investment to the establishment of factories for the assembly of wind turbines and the creation of components production units in the less favored areas and surrounding ones, the creation of direct and indirect employment generated respectively at and in the Industrial Cluster, the ratio between VAB and direct sales (VAB/Sales) which exceed 20%. It also values the degree of coherence and consistency of commitments, sustainability investment, building on criteria related to the time frame for investments, as well as the Portfolio Firm Orders and the ratio of exports to sales ratios and degrees of consistency and reliance of contractual relationships.

Criterion C, holding a 25% weight, is divided into five sub-criteria which value the creation of a central system for managing the wind generation with a capacity of electronic communication with the network operators, covering all wind farms that will be licensed in order to create storage solutions for energy (wind energy, unlike, for example, the hydroelectric energy which cannot be stored, and so it is essential that synergies are established with other technologies). The quality of energy produced is another criterion.

Criterion D refers to the creation of a Support Fund for Innovation for the funding of the national scientific research projects and technological development and it grants masters and doctoral programs, with particular emphasis on renewable energies (including wind energy) and energy efficiency.

5.2.2. Bids analysis

In phase A of the wind power tender, four bids were in competition, as described earlier: ENEOP, Ventinveste, NEI and Ventonorte.

The Consortia Ventinveste and Energias de Portugal in their initial offers reached the highest scores for the appreciation of criteria A, C and D, showing a great advantage before the other two bidders. So the jury deliberated that these two competitors were considered fit to continue the negotiation.

Subsequently, the jury proceeded with the negotiations stage with the two bidders, admitted to this stage, where each presented its BAFO. As for the surrounding areas, only ENEOP showed interest in investing. Another factor that put the ENEOP in advantage is the fact that all the industrial units were to be built on the same area (Viana do Castelo), while the Ventinveste proposal pointed to its construction in different locations. As for the business plan of wind farms, only ENEOP submitted a proposal which was considered quite detailed. The consortium ENEOP also took advantage of the investment sustainability and of the contractual arrangements. So, as the winner of the first phase (A), ENEOP signed a contract with DGEG on 27 October 2006, for a minimum of 17 years (minimum life expectancy of the Industrial Project). Since the proposal by a consortium led by EDP showed quality and contract soundness, it was worth "exceptional merit" and the power awarded was not 800 MW, as it was supposed to be if the winner had a regular proposal, but 1000 MW. From the total amount of the overall power awarded the consortium was entitled to more 200 MW, which was the result of 20% over-equipment for each wind farm to be built, giving a total of about 1220 MW of wind capacity to be installed.

It is important to remember that the purpose of this tender procedure was to select the “partner” for establishing a PPP with the Government, represented by DGEG. This particular case is a contractual PPP, meaning that there is a contract between the two sides, stating each other’s responsibilities. In other words, the contract formalizes a

risk sharing matrix, where all risks (internal or external) of the projects, are allocated to one or both partners.

5.3. Contract structure

The bids evaluation process ends with the selection of the private partner that will set out the PPP with the Government, or the contracting agency representing the State. The next step is the establishment of the PPP contract. Basically, contracts in any PPP regardless the sector, need to address common issues, like the responsibilities, rights and obligations of both agents concerning the development and management of the project, the risk sharing agreement stating each other's specific obligation, and setting the events or situation that can justify an earlier contract termination (Talus, 2009). Table 4 presents the usual contract structure. This structure is based on the Portuguese case study and it is quite similar to the other tenders in the energy sector.

Table 4 – Contract structure for a Wind Power Plant PPP

Contract structure for a Wind Power Generation PPP
1. Definitions and notes 2. Purpose of the Contract 3. Description of the project promoter (legal and financial) 4. Specific obligations of the promoter a. Discount on the energy delivered to the network b. Characteristics of the industrial project i. Characterization of the wind farms ii. Planned investments iii. Milestones for the construction of industrial units iv. Project duration c. Characteristics of secondary industrial units d. Technical management system of the project e. Timeline for the obligations established in the contract f. Penalties for delays 5. General obligations of the promoter 6. Licenses a. Financing scheme b. Risks c. Insurances 7. Monitoring of the contract and information management 8. Non compliance with contract and contract termination 9. Arbitrage and conflict resolution

Following the tender, the wind promoter chosen will be the one that best suits the requirements and then a PPP arrangement will take place. The private company then proceeds to the recruitment of suppliers either of services or equipment. At a first level, a Public (DGEG) – Private (Winner of the tender) partnership will be established, through a contract, or more precisely, a series of contracts. In a second stage, several contracts will be established between the winner and the suppliers.

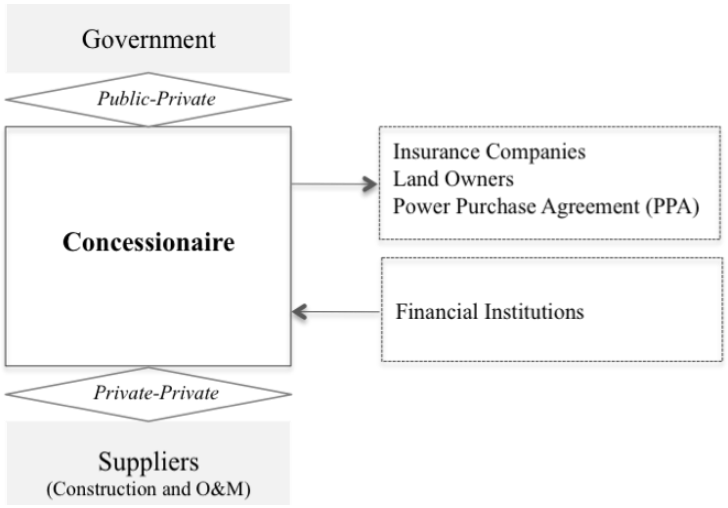


Figure 4 - Contractual structure of a wind power plant

5.4. Risk sharing

Risk in PPP projects is a critical issue for the success of this procurement model, and its correct allocation is essential to ensure a better VfM than traditional procurement models. The private partner is entrusted with the responsibility of building, financing and managing the infrastructure, but this does not mean, however, that it bears all the associated risks. With this type of procurement, it is intended that each partner does what it is best fitted and prepared to, ensuring that services and infrastructure are provided as efficiently as possible. Many authors have focused on the issue of risk allocation (Grimsey and Lewis, 2002,2005; Meda, 2007). Although complex, a generally accepted principle for risk sharing is that each agent should carry the risk

that is best capable of dealing with[7]. Of all the renewable, we only considered the risks associated with wind, because it is the feature that involves more hazards and is the main topic of this paper. The wind contract does not have a risk matrix or a study discriminating all the risks that can happen in a wind project, but this is the best methodology to identify, evaluate and allocate them, as mentioned in the Table 5.

Table 5 – Main Risks at an Energy PPP

Risk Type	Risk Description	Risk		Probability	Impact Level
		Public	Private		
Planning and Design	• Definition of projects *outputs*; • Adequacy of construction projects as defined in specific design.	X		Low	Medium
Construction	• Delays in the commissioning of the wind farm; • Risk of failure of wind resource; • Uncertainty about geological and environmental conditions; • Equipment damages during operation or during the installation; • Difficulty in providing material.		X	Low	Medium
Security	• Accidents during the construction and operation stages.		X	Medium	Medium
Grid Connection	• Risk of non-generation of power pre-agreed; • Loss of entitlement to power not available.		X	Low	High
Accessibility	• Risk of damage of existing roads; • Risk of occupation of private property.		X	Medium	Medium
Licenses and Expropriations	• Acceptance of expropriation; • Obtaining licenses for construction and operation.		X	Low	Medium
Environmental	• Obtaining the environmental impact statement; • Location of wind farms on migratory routes (barriers to certain species of birds and risk of death).	X	X	Low	Medium
Operation and Maintenance	• Uncertainty of the availability of wind (losses caused by wind intermittency, failures of income); • Facilities state; • System reliability; • Availability of equipment; • Uncertainty about the quality of maintenance services; • Risk of availability of infrastructures.		X	Medium	High
Technological	• Uncertainty about technological changes.		X	Medium	Medium
Performance	• Uncertainty about the quality of service for maintenance; • Growing demand in service quality.		X	Medium	Medium
Demand and competition	• Location and displacement of enterprises; • Threat about the coming of new competitors into the business.		X	Low	High
Financial	• Risk of insolvency of lenders; • Uncertainty about rising inflation; • Evolution of the financial burden; • Amendment of conditions of tariff by the regulatory authorities.		X	Medium	High
Legal	• Likelihood of new legislation with an impact on the structure cost; • Stricter regulations.	X		Low	High
Force Majeure	• Natural disasters, vandalism, war, epidemics.	X	X	Low	High

As one might expect, in a PPP contract the risks are mainly transferred to the private sector, except for the risk of planning and design and the environmental risks, legal, force majeure, demand and competition. The risks most likely to occur are those related to the safety factor (workers), the accessibility to wind farms, operation and maintenance, technology, the performance of the private partner, and behind all those risks, the ones related to the financial factor.

A PPP project engages two entities in a long-term commitment. Because it is extended over time, is important to clarify the mechanisms by which adjustments can be made and that performance measurement is correctly ensured. In accordance with Partnerships Victoria (2007) a PPP contract management encompasses three steps which are: development of strategic plan, development and implementation of the monitoring process and a systematic review. The first step corresponds to the development of a careful plan in order to define the strategy for monitoring the contract, able to answer questions about tools and processes that should be required for the project, as well as the knowledge about the human, financial and technological resources available and the deadline for the development of the contract. The second step should address aspects such as the contract management, performance monitoring, the relationship management, contract flexibility, and contingency planning. Finally, a systematic review able to cope with changes (internal and external) impacting the performance of the project itself, and even the adequacy of the monitoring plan, should be guaranteed. This review process allows for the incorporation of positive externalities arising from knowledge development.

5.5. Contract management

The contract management is a fundamental issue in the monitoring of projects, since it establishes several procedures, either in terms of ensuring strong relations between the partners in all phases of the project, including conflict situations, or in terms of ensuring compliance in all stages of monitoring. It requires a thorough knowledge of legal documentation of the project, as well as the commercial interest of the parties, operating issues related to services and legislative and regulatory context associated with the project. However, it is defined not only for ensuring compliance with the obligations and responsibilities under the contract, but also for enforcing the effective monitoring of issues related to performance, risk, payments, reporting and change. The private partner's performance should be regularly reviewed by comparison with the values of the key indicators (KPI's) defined previously for each specification output. However, it should be noted, that once there is the possibility of changing the circumstances throughout the project lifetime, the KPI's must be subject to revision. The reports of performance evaluation are intended to assess whether the services are delivered in accordance with the required parameters, and to evaluate the corrective measures taken by the private partner, whenever the performance standards are not met. The contract behind the case study presented, does not address this issue properly. It only refers the obligation of a report that should be delivered to the public authority responsible (DGEG) every three months, containing a summary on the investments taking place, as well as the annual report. The purpose of this report is to ensure that any deviations in the schedule initially planned, are foreseen in advance.

Irrespective of the importance of this control, the contract clearly lacks indicators in other to assess, in more detail, the effective performance of the private partner. For

instance, considering that other two tenders were planned to be launched, it would be important, for the regulator, to compare the performance of each winner bid of the three concessions. The publication of those results could function as a "stick and carrot" approach, indirectly forcing concessionaire to improve their efficiency. There are some aspects referring to the monitoring and management of contracts (Partnerships Victoria, 2001; Australian Government, 2006), which had no echo in the Portuguese model for wind power tender procedures, for example, that there are no step-in or contingency plans. Even termination clauses are unclear, making contract termination more difficult. Although, as argued by Talus (2009), few examples can be found of contract termination.

6. CASE STUDY ANALYSIS

It is clear the political priority given to wind power generation in Portugal. In fact, the investments in this field are being used by the Government, as a symbol of the country's ability to innovate and deal with the future challenges for energy provision. The commitment of the Portuguese government to develop renewable energies will allow for decreasing the foreign energy dependence by 25% until 2020 (representing 2.000 million Euros annually). This means producing 31% of energy using endogenous resources, and having 60% of electricity production based on renewable sources. It will also allow the annual exportation of 400 million Euros by a sector that will have created 21.000 jobs by 2020. This explains the importance given by the Government to the creation of an industrial cluster. For example, EDP owns directly or indirectly 77.5% of EDP Renewables shares. Today it is the world's third-largest wind energy producer with an annual production of 10.907 GWh (2009), 54%

coming from the US market, 30% from Spain and 14% from Portugal, although is operating, or investing, in 10 markets : Portugal, Spain, France, Belgium, Poland, Romania, UK, Italy, Brazil and US. However a question remains, whether or not the model defined to implement the strategy is the most adequate.

Portugal is following a *feed-in* remuneration scheme. There are advantages in this policy, especially in the *kick-off* period for developing this project. Revenues are guaranteed at a pre-determined price and all the energy produced will be bought, as long as the concessionaire is able to deliver. One of the main sources of uncertainty disappears and investors are more prone to engage in large investments. Notwithstanding this positive effect, it may have some negative implications on the long term. There are no direct incentives to efficiency gains, and if they are achieved, there will only be gains for the private partner. There is no sharing mechanism for these hidden revenues that would allow the public sector to also benefit.

This leads to the discussion on the risk-sharing assumptions of the contract. The risk-sharing matrix shows a large majority of risks being entirely (or mostly) assumed by the private partner, which is a desirable principle for a successful PPP, but, unfortunately, not always achieved in large infrastructures. Nevertheless, for the reasons presented above, a substantial uncertainty is eliminated by the public sector. At least in the first 17 years the demand risk is removed (and supported by the public partner) and the commercial (revenues) risk is almost eliminated (depending on the intensity of wind). After the initial period this situation may turn around and if the prices of wind power are not competitive compared with the traditional energies, there will be no demand for the wind power. Note, however, that if the price of

traditional energies includes the negative externalities this circumstance will be diverse. So, at the long-term there is a lot of uncertainty about the wind business. However, at the short term, the help of the government (guaranteeing the purchase of wind power) will allow a faster development of the projects, but may lead to a "quiet life" for the producer and will not encourage it to be more efficient and innovative. Indeed, the contracts in the Portuguese wind PPP projects have no incentives. It will also be difficult to monitor the performance of operators, since no detailed and effective monitoring plan exists. The definition of a list of key performance indicators, periodically reported and examined by the regulator regarding efficiency, might prevent some of the pitfalls identified. The contract lacks this monitoring/reporting plan.

Concerning the bids evaluation process, the priority set by decision makers was to select the bid with greater economic and financial impact in the country, namely as regards the cluster development, jobs created, construction of industrial units, among other items. The relatively lower weight given to maintenance procedures can affect negatively the performance of the system, although one might argue that indirectly there is an incentive to keep the system running at an optimal level because the remuneration system is based on energy delivery to the grid. Nevertheless, considering the long period of the project, this can lead to underinvestment and prevent the improvement in its efficiency.

7. CONCLUDING REMARKS

Engaging in PPP arrangements, Governments found a way of developing large, massive investments without public expenditure, bringing the expertise and profit-

oriented approach of the private sector, to projects of public service delivery. Although several pitfalls might be pointed out, more than weaknesses in the model itself, problems have arisen from its application, on specific cases.

This paper presents a contractual PPP applied to a wind power plant, in Portugal. This was the first PPP carried out in this sector, and it is clear the political commitment in fostering the development of this sector in Portugal using private leverage to induce growth. Evidence can be found in the evaluation factors under the tender procedure. 65% of weight given to the creation of a cluster in national territory, and most of the risks allocated to the private sector. There are still some barriers regarding the development of this sector, related to the price per unit of power. In fact, from an economic perspective, there is an extra cost associated with this energy type, when compared to more conventional energy sources. This is reflected in the remuneration scheme adopted.

The rising of wind power generation, and the growing interest of private sector in embracing these projects, shows a promising research area, though there is a gap in academic literature regarding other international experiences and models of PPPs adopted.

This work aimed to achieve two main objectives: the first referred to the analysis of a PPP contract relating to a wind energy project, focusing on understanding the factors of access and competition aspects related to a business of this nature, and the second regarded the analysis of the risks associated with this sector.

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[1]It can be argued that the energy prices on conventional production systems (fossil fuels), do not reflect the true cost, because they do not internalize the externalities cost (mostly environmental).
[2] Several other definitions can be found, The World Bank for example, categorizes private participation into: concessions, greenfield, divestures and, finally, management and lease contract. For more detail on PPPs classification, see Loosemore (2007).
[3] For more information on PSCs calculation see Grimsey and Lewis (2005) and Partnerships Victoria (2001).
[4] It also holds a 40 year concession for natural gas distribution and storage.
[5] European Directive 2001/77/CE, 27 September 2001, is related to electricity production through renewable sources of energy, for the internal electricity market, also known as Renewables Directive.
[6] For more details on public perception and attitudes towards wind farm projects, see Ek (2005).
[7] Notwithstanding the first aim should be the risk minimization and the risk premium.