

Electricity Restructuring in Iberian Peninsula

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Abstract: Spain and Portugal, based on their geographical location in the Iberian Peninsula, have limited interconnections with their European neighbors in terms of energy exchanges. This paper draws a brief overview of the present status of the Iberian Peninsula's electricity market. The topics that are presented in this paper include, Who are the players in the Iberian electricity market? What are their positions? How is the market affected by the economic situations in Europe and South America? What is the expected energy mix for the coming years? Also, the paper focuses on the possible merger between the Portuguese and the Spanish markets. The creation of that common market in this case may be difficult to settle but it will reinforce the position of the two countries for electricity trading in Europe.

Keywords: Electricity restructuring, Spain, Portugal, restructuring models, unbundling, open power market.

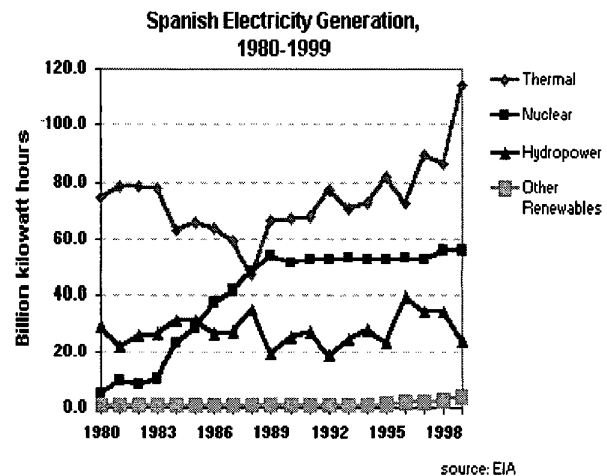
I. SPANISH ELECTRICITY MARKET

SPAIN is currently the fifth largest electricity market in Europe behind Germany, France, the United Kingdom, and Italy. The country has a fast growing economy and is expected to become a large energy importer in the near future. The estimated electricity demand in Spain for the year 2001 rounded around 205 billion kWh, an increase of 5.4% compared to the year 2000. In terms of generated MW power, the Spanish system is led by coal plants, representing 38% of its production, 35% by nuclear, 21% by hydro plants and renewable energy, and the remaining 6% is produced by fossil plants. As of the end of 2000, the total installed capacity in Spain amounted to 55.2 GW (excluding self-generators). The country is expecting a 5,000 MW increase in its generation capacity in the year 2003. Combined-cycle plants are currently under construction to meet the estimated rise in the domestic electricity demand. The oil sector has been privatized and the coal industry has been restructured.

Since 1986, Spain has undertaken a large expansion of its energy market, orienting it to be more competitive. Currently, the Spanish market is being opened faster than what is mandated by the European Union. In 1994, Spanish Parliament adopted an electricity law aimed at improving efficiency, open access, and competition in the electricity sector. The current developments have resulted in an

overall increase in Spanish electricity prices while creating additional opportunities for increasing the electricity production. These developments include special tariffs for IPPs to increase their production, which should take into account the balance in electricity supply/demand in order to give the right price signal to operators.

In 1999, the Spanish energy production was around 198 TWh. At this time, the country almost fulfills its demand, while exporting 6.5TWh and importing 12 TWh. The following figure depicts the Spanish electricity generation mix.



Nuclear power is generated by nine nuclear reactors with a total installed capacity of 7.5GW that produced 63.6 TWh in 2001, a 2.3% increase compared to the 2000 production. In the past, 40% of the installed Spanish generating capacity was hydro, while hydro production in recent years has exhibited a decline as a percentage of the total energy production. Spain's current plan for renewables is to reach 15% of the total energy production by the year 2005. Today's Spanish "green" power comes mainly from hydro and biomass. However, the fastest growing type of renewable in Spain is wind power plants. About 1800 wind turbines are expected to be installed in the coming years and about 10 MW of solar PV have already been commissioned, which are mostly stand-alone units in remote areas for supplying pumping, lighting and communication systems. In principle, the Spanish legislation allows small

(solar) energy producers to supply electricity to the grid, while the price of solar energy has been fixed at 0.4 Euro/kWh for systems smaller than 5 kW and 0.22 Euro/kWh for larger units.

II. POWER COMPANIES IN THE SPANISH MARKET

Table 1 shows the shares of companies for generation and distribution of electricity in Spain.

Table 1 Electricity generation and distribution in Spain

	Generation	Distribution
Endesa Group	50%	41%
Iberdrola	27%	40%
Union Fenosa	13%	15%
Hidro Cantabricosa	5%	4%
Viesgo (ENEL; Italy)	5%	

Endesa, the European 4th largest company, controls 50% of the Spanish electricity market. The company has businesses in Spain, Chile, Argentina, Peru, and Colombia, with a total installed generating capacity of 43,000 MW. In 2000, it generated 165,000 GWh and distributed 153,000 GWh throughout the world. Its activities include generation, transmission, distribution, commercialization, and trading of electricity. The company is involved in other energy related businesses including the co-generation, development of renewable energy, and natural gas distribution. On the co-generation side, Endesa Cogeneración y Renovables is the owner of 90 cogeneration plants with a total capacity of 711 MW (in operation), and other plants are under construction. Endesa has planned the construction of a 400 MW natural-gas-fired plant, while three other 400 MW gas-fired are under construction near Cadiz, Barcelona, and Tarragona. Iberdrola is the second electricity provider with about 30% of the market shares. Union Fenosa plans to add 5,000 MW of new capacity by 2005.

The Spanish transmission network operator is Red Electrica de España (REE). In 1996, Spanish grid was represented by 14,004 km of 400 kV lines, 15,525 km of 220 kV lines, and 19,798 km of lines ranging from 100 kV to 132 kV, as well as 131 substations with more than 19,500 MVA of transformer capacity. REE is a state-owned company, which is responsible for the central dispatch of the system. Because of its long-term operation history, REE is regarded as one of the leaders in the transmission and dispatch of electricity in Europe.

As the system operator, REE is responsible for the balance between generation and consumption of electric energy, and guarantees the quality of supply at any place and at any time. A third party access is guaranteed by the nature of the company, which ensures non-discriminatory access criteria. REE is the Spanish member of UCTE

(Union for the Coordination of the Transmission of Electricity). Currently, transmission upgrades are mainly implemented to improve the inter-ties with other countries, especially those with France, Portugal, Morocco, and Algeria.

Union Fenosa and Endesa have signed agreements with Moroccan Power Company (ONE). With the status of "external operator" since 1998, ONE can directly deal with Spanish power companies. Those signed agreements have impacted the grid interconnection between the two countries. Other agreements are now underway to increase interconnections with a new transmission line between Spain and Algeria. Interconnections with France are about to increase on a short-term basis.

Hidro Cantabricosa was acquired in October 2001 by EDF and Eletricidade de Portugal (EDP), after the Spanish government decided to lift the sanction on such deals. Some 60% of Hidro Cantabricosa will actually be owned by Energie Baden-Wurtemberg (EnBW) of Germany, which is controlled by EDF. The agreement with Spanish government is subject to commitments by the French and Portuguese governments to open up their electricity markets to Spain and subject to commitments by France to increase its interconnection with Spain from 1,000 MW to 4,000 MW between 2006 and 2011. This includes a new 1,200 MW line to run along the planned high-speed rail line between Perpignan and Figueras in Catalonia.

Viesgo's acquisition by ENEL of Italy from Endesa was completed in January 2002. Viesgo has a 5% market share. This is part of ENEL's strategy of regaining market share abroad after selling its Elettrogen utility at home to Endesa in 2001.

III. IMPLICATIONS FOR DESIGNING THE SPANISH MARKET

In 1997, the Spanish legislation constituted the establishment of a Spanish wholesale market for electricity. The market is implied to be an efficiently managed transmission system, which can effectively link generation and distribution of electricity. The Spanish market also is perceived to guaranty the third party access to the system.

Spain has made a significant amount of investment in Latin American countries. For instance, it has invested 45 billion Euros in Argentina during the last decade and recent economical and political turmoil experienced by Argentina has adversely affected Spanish companies. These issues may have large implications not only on Spanish companies but on the entire country's ability to compete in Europe where market shares are currently opened. In essence, if the country's financial losses in Latin America would remain excessively high, it is expected that the Spanish companies would hike up their prices within Spain in order to compensate for their losses.

A 1% increase in electricity prices has already been

approved in Spain for industrial consumers. The primary reasons for that increase is cited as 17% drop in electricity prices during the past five years, while the inflation level has been about 14% for the same period. However, Spanish companies would be concerned with the infiltration of foreign countries into their markets. EDF in France, Electrabel from Belgium, ENEL in Italy or Energie Baden-Wurttemberg (EnBW) of Germany may have benefited from of the price increase by enforcing their position in Spain. The Spanish government may no longer be able to prevent those companies from buying assets or selling energy in Spain.

During the last years, electricity demand grew impressively at the rate of 6% per year. However, high summer temperatures and the lack of hydro resources during the same period reflected a desire for adding new generating plants in Spain. As it is the case in the US, Spanish electricity is mainly produced from fossil fuel plants. This point added to the small Spanish resources of oil and natural gas pushes Spain to be highly dependent on its oil and natural gas imports, leaving the country economically vulnerable to world oil price fluctuations. Furthermore, the increase in energy demand is expected to be met largely by combined cycle and gas units which mandate further natural gas imports. The increase in using natural gas has added to the country's dependence on Algeria, from which Spain obtains 60% of its natural gas imports. With an extensive gas network now in place between the two countries, Spain's demand for natural gas is expected to increase dramatically during the next few years. However, Spain would need to diversify its demand for oil and natural gas supplies to reduce its energy risks.

Like in any other country, Spanish's population is divided on its opinion about nuclear energy. In Spain, the Popular Party supports nuclear power whereas the Socialist Worker's Party (PSOE) has indicated that it supports a gradual shut-down of Spain's nuclear plants. As of the end of 1994, the Spain's total Recognized Moratorium Debt on nuclear plants was 729 billion pesetas (about \$5.8 billion, at an exchange rate of 125 Ptas/\$). If we try to foresee the future of the existing Spanish nuclear plants, it is again uncertain at this time. The existing nuclear plants have been designed with a prospected life time of 30 to 40 years. Actually, the future of nuclear power industry is of concern not only in Spain but in the entire Europe. Spain will first have to figure out how it will safely decommission its existing nuclear plants and then consider whether or not to built new nuclear generating plants in the future. However, because of the ongoing political debates on this issue, it is envisioned that no new nuclear power plant construction will be under deliberation for the upcoming years. Although, the construction of new nuclear plants is not

illegal in Spain, but domestic and international companies are unlikely to invest in such plants because of high costs and little government incentive available for such initiatives.

In the past ten years, there has been a major increase (around 15% per year) of electricity generation from renewables. This rate represents new opportunities for new generating facilities such as wind, solar, small hydro plants, fuel cells, and tidal energy. These types of generation represent "green plants" with a minute level of emission as compared with classical generating plants. Since one of the main concerns in Europe is the pollution level and the creation of a clean environment, it is expected that the rate of increase of green plants to remain considerably high in upcoming years. Currently, electricity prices from renewables except for large hydro plants are relatively high and consequently the demand is low; however, it is expected that the interest in utilizing renewables will increase as green energy prices drop in a foreseeable future.

IV. PORTUGUESE ELECTRICITY MARKET

Electricity restructuring started in 1994 in Portugal. At that time, Portugal's electricity group, Electricidade de Portugal (EDP), was reorganized into generation Portuguesa de Producao de Electricidade (CPPE), transmission Rede Electrica Nacional (REN), and four distribution companies. These four companies represented Lisbon as well as north, south, and central parts of the country, respectively. The Portuguese electricity grid is integrated with the Spanish grid and consists of 44,127 miles of high/medium voltage transmission lines and 69,640 miles of low voltage transmission lines.

The Portuguese power system represents a combination of private and public sectors. The National Electricity System (SEN) encompasses the Public Service Electricity System (SEP) and an Independent Electricity System (SEI). Both sectors are represented in the National Transmission Grid (RNT), which is operated by Rede Eléctrica Nacional (REN). The state, largely involved in the company shares, guaranties the independence and autonomy of the system. The power system is centrally planned, under the tariffs and conditions established by ERSE – the Electricity Sector Regulator.

EDP was originally created through the merger of the principal electricity sectors and incorporated in 1976. At that time, 48% of EDP was privatized. EDP has been progressively privatized in recent years, with an additional 18% privatized in October 2000. This has reduced the government's stake to just 32.6%, although the state retains "golden share" rights that gives it the veto power. In essence, the company is following a privatization path, while the government plays a critical role in its destiny. As a holder of 30% of REN's shares, EDP generates 72% of the electricity, and is the principal in transmission and distribution of electricity in Portugal.

V. PORTUGUESE ELECTRICITY GENERATION

In 1997, the total installed generating capacity in Portugal was 23,790 GWh, including 52% for hydro power for a total capacity of 12,256 GWh, and the rest was mainly represented by thermal power plants which accounted for 11,513 GWh. Co-generation has offered major opportunities for enhancing the Portuguese generation capacity. In 1997, co-generation units produced 3,605 GWh, of which 826 GWh was consumed in the national grid. In addition, the country is using natural gas for energy through a 500 mile natural gas pipeline which extends from south to north which feeds natural gas plants. Since 1993, IPPs have been established in Portugal, which accounted for 28% of the country's power production in 1998. In 1999, electricity production in Portugal was 41.696 billion kWh with a total consumption of 37.915 billion kWh. Imports averaged 3.628 billion kWh.

In 2000, there was a 6.2% increase in the Portuguese electricity demand. The consequence was an increase in the amount of electricity purchased by REN from IPPs. In 2000, the corresponding energy purchases totaled 37,008 GWh, a 5.5% increase compared to 1999. The amount of electricity that was sold to customers was about 34,091 GWh, with retail low voltage customers accounting for 55% of the total in 2000.

EDP owns 82% of the Portugal's generating company, Companhia Portuguesa de Produção de Electricidade, S.A., (CPPE). Today, the CPPE's installed capacity is 7,588 MW in Portugal which is divided into 3,954 MW of hydropower, 3,505 MW for conventional thermal power, and 29 MW of generation capacity from other renewables including co-generation, solar, biomass and wind farms. In 2000, those plants produced 24,000 GWh of electricity. Finally, the company owns 14% shares in GALP Energia, S.A., for natural gas. EDP's foreign acquisitions are quite diversified. It has a stake in five Brazilian companies, as well as companies in Chile, Guatemala, Macao, Morocco, Mozambique and Cape Verde.

The consequence of the market restructuring is a decrease in electricity prices in Portugal. During the last five years, residential prices have dropped by 4%, and a 7% decline in prices was applied to the industrial sector. The former rates are below those of average European rates while the latter prices are higher than those in Europe. However, the national agency that establishes Portuguese's electricity tariffs has planned a 1.2% increase for 2001 electricity prices attributable to the rise in fuel prices.

VI. MERGER OF TWO IBERIAN MARKETS

Spain and Portugal have fast growing economies, but like many other European countries, they suffer from the

lack of major energy resources. Portugal and Spain have planned to merge their energy markets at the 2003 horizon. The goal is to create a single Iberian market, as it is the case for the Nordic countries, Norway, Sweden, Finland and Denmark, which constitute the Nord Pool.

From the electricity generation perspective, Spain will benefit from offering its nuclear generating capability, while Portugal is regarded as being far more developed than Spain in terms of renewable energies.

Spain and Portugal are two countries which are relatively isolated from the European geographical point of view. The two countries constitute the Iberian Peninsula at the extreme southwest side of Europe. The only connection that these countries have with the rest of Europe is the France-Spain frontier through the Pyrenean mountains. As a consequence, it is difficult to increase the links with the rest of the European Union for trading electricity. France is an important partner with these two countries for supplying electricity during shortage periods as it can provide excess power from its nuclear plants. The three countries remain close and additional high voltage transmission lines are under construction to supply potential electricity to the Iberian Peninsula.

Most liaisons between the Iberian Peninsula, Italy and other countries, with an exception of France, are through the sea. It is also viewed that Spain and Portugal have more energy links with North African countries than European ones. Algeria and Morocco are large energy exporters to Spain and Portugal. Even though the African-European pipeline is still under construction, the undersea link connecting Morocco, Algeria, Spain, and Portugal for natural gas usage is already completed.

It is interesting to learn that the Spain and Portugal already share the dispatch of their electrical loads and that the electricity markets in the two countries seem to be already interconnected. The Portuguese electricity company owns 40% of the Spanish electricity company, Hidro Cantabricosa, and the remaining shares are owned by Energie Baden-Wurtemberg (EnBW) of Germany. Electricidade de Portugal has also agreements with Endesa and Iderdrola (see Table 1). The interconnection between Spanish and Portuguese electricity grids is able to meet 10 per cent of Portugal's current electricity demand. In general, the two countries will benefit from the merger as both countries will be efficient enough to supply their electricity demands while possibly exporting energy to other countries.

It is perceived, however, that neither country is strong enough to compete for electricity trading at the European level. By reviewing the list of companies that play a major role in the European electricity market, we learn that the Spanish companies Endesa and Iberdrola are ranked six and eight, respectively. Furthermore, EDP is not among the first fifteen companies on the list.

Another important point is the relative size of electricity markets in the two countries. Portugal market accounts for one fourth of the Spanish market. The consequence of the merger would be an increase in market potentials for power companies in both Spain and Portugal. The increase in market size will theoretically increase their competitiveness, may potentially slow down the infiltration of European major players in either countries, and could increase their overall generating capacity in acquiring electricity markets in other countries.

VII. CONCERNS WITH THE MERGER

There are problems that are going to be encountered in order to fulfill the merger of the two markets. The first concern is the effective rate of implementing the electricity restructuring in the two countries. It is viewed that Spain is currently restructured at 60% and plan a complete restructuring of its electricity for 2003, whereas Portugal has just fulfilled the 2003 European Union requirements, with 33% of its electricity market restructured.

Portugal will definitely need to adhere to most of the Spanish laws and expedite its restructuring. The establishment of the Portuguese electricity market under its current hierarchy may be more difficult as the country tries to meet its goal for a fully restructured market at the 2005 horizon. It is envisioned that the current hierarchy in both countries may have to be revitalized further in order to establish a competitive private sector for electricity. It is possible that transmission and distribution sectors remain as monopolies in each country. The multitude of distribution companies will be responsible for different geographical regions and will not be intended for competition. It is also possible that there will be notable ties between the activities of generation and distribution companies.

The merger will result in a uniform price setting for the Iberian Peninsula. Furthermore, compensation and subsidies may be eliminated for the existing power companies. For instance, Spanish companies are currently facing a financial deficit due to their massive investments in the construction of nuclear plants. The lack of subsidies may render these companies more vulnerable and less competitive in the international arena. In order to compensate the restructured companies for their stranded costs, the Spanish government has offered CTCs "costs of transition to competition" to generating companies for a maximum of ten years. CTCs are about 30 \$/MWh. This payment would compensate the power companies' loss for the drop of the electricity price in the spot market. However, similar opportunities may not exist in Portugal.

It is advisable to eliminate the subsidies in steps and progressively. At this time, Spain is the fifth largest European electricity market. The merger with the

Portuguese market will definitely enhance the Spanish place in the international energy arena. It is important to recognize that the major European electricity generating companies, EDF of France and ENEL of Italy, are Spain's neighbors. If the Iberian market loses its competitive edge, foreign companies' infiltration into Spain can be further expanded. At this time, the process in Spain and Portugal has only been limited by the respective government's close monitoring of foreign investments. However, in a fully restructured market, protective legislations may not work in favor of national companies.

Both countries would need to be very cautious of their progress in the restructuring process in order to retain their IPPs that are very much needed for the country's electricity generation. In essence, both states would need to agree on the electricity price of IPP generation. Today, Portuguese IPP generation, which represents 30% of the total generated energy, is bought directly by the state at a fixed rate. The restructured spot market would enhance IPPs' chance of marketing their products while could reduce their income. The risk of creating too much competition would be the closure of some of those plants in the case of an insufficient rate of return. Without those independent producers both countries will endure a shortage of electricity that could be supplied by foreign imports for a short period, and will ultimately increase the price of the electricity in the Iberian market.

Finally, the market for electricity trading could be a concern. At this time Spanish trading market is brand new, and Portugal has not yet opened one of its own. With the merger it looks like that Portugal would directly start trading electricity on the Spanish exchange. The Spanish market is a new entity with a day-ahead market that deals with hourly spot market contracts. The Spanish market would develop a number of contracts like weather derivatives for managing the risk of its energy resources. Moreover, Spanish market would create futures contracts for electricity trading.

VIII. CONCLUSIONS

The Iberian energy market is on the road to expand its electricity sector. This is mainly due to an increase in electricity consumption and the growth in the transportation industry. The expansion is expected to continue at least for the next decade while the two main objectives are set for the next few years as the increase in the rate of electricity restructuring and identifying solutions for environmental issues and gas emissions to fulfill Kyoto requirements.

The merger between the Spanish and the Portuguese electricity markets seems to be conceivable for a 2005 horizon. However, several political, social, and economical problems are to be resolved in both countries before the implementation of the proposed merger and the restructuring of the electricity market in the Iberian Peninsula. Additional reorganizations may also be forthcoming in order to increase

the competitiveness of the new Iberian market in Europe and elsewhere. Both countries will need to be wary in their restructuring process of their IPP prospects that are much needed for the expansion of the country's electricity generation. Furthermore, subsidies for generating companies may have to be reduced progressively in order to maintain the continuity in the restructuring process. The lack of savviness and competition in the Iberian market could encourage other markets to penetrate further in the Iberian market which could cause major losses for local companies in their potential market.

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X. BIOGRAPHIES

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