ANNEX II

Liberalising the Portuguese Energy Markets

Introduction

The Portuguese electricity sector after being nationalized in the seventies became a vertical integrated monopoly (EDP). Privatization of EDP started in June 1997. Legal unbundling of the electric transmission network started in 1996, but at the end of 2000 the high voltage network was ownership unbundled, under a state owned firm, REN. Presently, the State still has about 25% of EDP share capital. REN launched an IPO in 2007, after acquiring the high pressure gas network and some additional assets from the gas infrastructure company (Transgas). According to present regulation no single supplier can have more than 10 percent of the capital of REN. There are six regional distribution networks of electricity almost all owned by EDP.

Notwithstanding, independent power producers did enter the Portuguese market, but under the SEP (see below) and under the protection of long term PPAs. This happened in 1993 with a coal power plant (Tejo Energia, owned by Endesa, International Power and EDP) and in 1998 with a 3X330 MW CCGT (Turbogás, owned by International Power and EDP).

Natural gas was introduced in Portugal only in the 1990s, and is still under a derogation from liberalisation until 2010. Up to 2006 it was a fully integrated firm owned by the petroleum company (Galp) and ENI. Most of the gas supplied comes from a pipeline linked to Algeria, under a long-term take-or-pay contract. In 2004 the first LNG terminal in Sines initiated operations and it has been supplied since then mainly with gas from Nigeria. The development of the gas network was made feasible by the contracts with
the new combined cycle electric generators that have been consuming about half of the imported.

There are six regional distribution networks for gas, almost all controlled by Gas de Portugal (GdP).

**The first steps of liberalization**

Liberalization of the Portuguese electricity market started in 1995, through a series of decree laws that anticipated the main principles of the EU electricity internal market directive of 1996. The legislation prescribed the legal separation of the TSO and free entry in generation activities. However, it created a dual system for electricity trade at the wholesale and retail level. In fact, the Portuguese electricity market comprised a Public Service System (SEP) and a liberalized system, called the Non-Binding System (LM). A special regime system (PRE) was also created for renewables and co-generation, under which producers benefited from feed-in-tariffs with buy-back obligation by the network operators.

At the time the SEP was created, almost all existing generation capacity was included under a PPA (Power Purchase Agreements) framework, where the TSO acted as the single buyer for all power plants. Tariffs to SEP end customers and for the transmission and distribution parts (the monopoly segment) were regulated by ERSE, the Portuguese Electricity Regulatory Agency created in 1997. Until 1999 no customer was free to choose its supplier. The liberalized system allowed for free entry in generation, under a market driven framework, requiring a Third Party Access regime to be put in place by ERSE.

With the creation of the Spanish electricity pool in 1998, discussions between the Portuguese and Spanish authorities led, in 2001, to a protocol for the creation of an

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1 Perhaps due to the pre-euro phase and the high interest rates prevailing at the time, these PPAs ensured an implicit real return of 8 percent per annum.
Iberian pool for electricity wholesale trade, that was due to start by the beginning of 2003. Under this agreement, interconnection capacity was supposed to be expanded in order to reduce constrains in electricity wholesale trade between the two countries. The MIBEL included a day ahead market, located in Spain and managed by OMIE, and a forward and derivatives market, located in Portugal and managed by OMIP. Notwithstanding, the launch of the Iberian pool faced several delays for political, technical and operational reasons. The forward and derivative market OMIP was launched in July 2006, with very limited liquidity. In July 2007, the day-ahead market was created, using market splitting as the main mechanism for congestion management in the interconnection between Portugal and Spain.

Although the regulatory framework allowed for free entry, until 2004 no new generation capacity entered the liberalized system. Only at the end of 2003 a 3X392MW CCGT was commissioned in the liberalized market, an investment made by the incumbent.

**Installed generation capacity in SEP, Liberalized Market and PRE**

![ Installed generation capacity in SEP, Liberalized Market and PRE ](image)

Source: ERSE

Several factors account for the relative ineffectiveness of the market framework created by the legislation in 1995 to allow independent entry in generation and promotion of
competition. On the one hand, customers’ ability to choose their supplier was only introduced in 1999, and until 2002 when all Medium Voltage Customers were allowed to choose their supplier, the retail market opening only produced negligible effects. That meant that new power plants would face limited market opportunities to sell their electricity.

On the other hand, regulatory uncertainty, related with several delays in launching MIBEL, diminished the incentives for new entry in electricity generation. By 2003, with MIBEL in perspective, new legislation was published foreseeing the extinction of SEP. In fact, the PPAs, as exclusionary agreements, and the role of the TSO in electricity trade under the single buyer model, created a clear conflict of interest and were incompatible with the integration of the wholesale electricity market with Spain. Between 2003 and 2006, due to several delays in agreeing the terms for MIBEL creation, the electricity sector faced an unstable legislative framework. Eventually, several requests for new investment in generation were made by potential new entrants, but they faced delays in the authorisation procedures by the Portuguese government, in part due to the inadequacy of the legislative framework that existed during this period.

In 2006, with the new legislation published and after a two-year delay, authorizations for building new CCGT, amounting to 3200 MW, were granted. Still, the incumbent was awarded licenses to build two 400 MW groups. By 2009, the earliest, non-incumbent new generation capacities will enter the market.

Since 1999, independent investment in power production came mainly from renewable power producers, a consequence of the favourable feed-in tariff levels that were fixed by government acts in 1999 and in 2001.

Transmission Unbundling and its impact on the market
The most successful area of the still undergoing liberalization process of the Portuguese electricity market has been the unbundling of generation and transmission. Ownership separation of the TSO in 2000, following a dramatic blackout\(^2\) that affected the most populated regions in Portugal,\(^3\) has provided incentives for greater efficiency, successful entry (mainly for generation using renewables) and for regional integration with the Spanish market.

Available data covering the period 1994-2006, where the TSO has changed from vertical integration to legal unbundling and to full (ownership) unbundling, since 2000, clearly suggests improvements in investment and efficiency. Total investment in the transmission network declined gradually during the vertical integration and legal unbundling stages (the incumbent was at the time financially constrained). However, it increased substantially under ownership unbundling. Investments related to interconnection investment (a requirement from the MIBEL protocols signed between the Portuguese and Spanish governments) and the incorporation of renewable energy sources explain part of this increase. More importantly, the delays in launching MIBEL have not diminished the willingness of the Portuguese TSO to invest in interconnection.

In the next five years REN will have to invest 1.4 billion euros in the electricity network and 330 million in the gas network, in line with the high levels reached in 2006. Sometimes it is argued that an unbundled TSO will face up a higher cost of capital. This

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\(^2\) The press hid the real factors behind the blackout, and attributed it to a dead stork.

\(^3\) The blackout showed a dramatic deficit in investment by the incumbent EDP that owned REN. There was an additional factor for the underinvestment. Since 1996 the government was pushing major enterprises to invest abroad, mainly in Brazil, and EDP followed the instructions.
is not the Portuguese case, where REN has been able to finance its debt at a spread even more favourably than EDP and its IPO revealed a high demand for its capital.\(^4\)

Transmission network total investment (at constant 2006 prices)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>International interconnections</th>
<th>Special Regime Generation connections</th>
<th>Other investments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>57,113</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1995</td>
<td>63,942</td>
<td>0.00</td>
<td>0.00</td>
<td>53,014</td>
</tr>
<tr>
<td>1996</td>
<td>76,358</td>
<td>0.00</td>
<td>0.00</td>
<td>81,543</td>
</tr>
<tr>
<td>1997</td>
<td>90,637</td>
<td>0.00</td>
<td>0.00</td>
<td>110,191</td>
</tr>
<tr>
<td>1998</td>
<td>93,741</td>
<td>0.00</td>
<td>0.00</td>
<td>118,431</td>
</tr>
<tr>
<td>1999</td>
<td>90,092</td>
<td>0.00</td>
<td>0.00</td>
<td>123,013</td>
</tr>
<tr>
<td>2000</td>
<td>91,398</td>
<td>0.00</td>
<td>0.00</td>
<td>173,652</td>
</tr>
<tr>
<td>2001</td>
<td>93,000</td>
<td>0.00</td>
<td>0.00</td>
<td>189,963</td>
</tr>
</tbody>
</table>

Source: ERSE (with REN data)

It is doubtful that the Portuguese TSO would have invested as much as it did in interconnection capacity if it remained under the ownership of the Portuguese incumbent. In fact, the previous figure shows that such type of investment occurred from the point in time when ownership unbundling occurred.

Overall efficiency was also raised, as quality of service indicators suggest. Network losses decline gradually over the full period, as does the average interruption time indicator, showing that quality improvements were not adversely affected by the transition to full unbundling.

\(^4\) The larger spread of EDP is partly due to the risk associated with large investments in Brazil.
Transmission network losses

![Graph showing transmission network losses]

Source: ERSE

The estimated interconnection capacities that will become available for trade following the interconnection reinforcement are showed in the next table.

### Interconnection between Portugal and Spain

<table>
<thead>
<tr>
<th>Season</th>
<th>Interconnection (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portugal</td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>600 – 850</td>
</tr>
<tr>
<td>Summer</td>
<td>550 – 750</td>
</tr>
<tr>
<td>Spain</td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>750 – 1.050</td>
</tr>
<tr>
<td>Summer</td>
<td>600 – 850</td>
</tr>
</tbody>
</table>

Source: REN/REE

The estimated values for 2007/2008 double the existing capacity in 2002 and will represent up to 20% of peak demand. These values show that the openness to foreign trade will rise substantially, and, while new generation capacities do not enter the market, imports, within an Iberian pool, will become the main source of competitive pressure.
over the Portuguese incumbent. Although these import capacities do not allow for full integration of the two Iberian markets, they will diminish the level of congestion, therefore, diminishing the market power of the Portuguese electricity incumbent.

ERSE regulates transmission and distribution tariffs according to an additive model that captures all the different components of costs for different types of consumers. The model used for regulation is a rate of return on capital. The rate used is 7 percent for electricity and 8 percent for gas, on a nominal basis, and before taxes. It is similar to the UK model. ERSE has also required annual targets for increased network efficiency. Overall, tariffs on transmission and distribution have decreased by about 30 percent in the last six years, mainly due to the x factor in the price cap imposed on the TSO. With ERSE regulation, which effectively started in 1999, significant declines in the general transmission tariff and for the Very High Voltage transmission tariff were observed.

General Transmission Tariff

Source: ERSE.

Source: ERSE.

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5 One of the complaints of the TSO is that the model does not have enough incentives for OPEX.
However, margins in the production sector have not changed significantly, since prices paid to producers depend on PPAs (CMECs) that assure a real rate of return of 8 percent to capital and allow the full pass-through to consumers of variable costs. These also take into account the level of rain in hydroelectric production. Overall, this amounts to a model of monopoly combined with a generously guaranteed rate of return paid for by consumers.

How was the problem of coordination solved?

The full opening of the Portuguese electricity market is still a challenge for the electricity Portuguese transmission system. Locations chosen for the licenses can be considered as optimal for the location of new power plants, since in the TSO long term investment plan, that is made public, the best sites for location of new generation are indicated. This transparency is important, since new power plants have to pay for the connection to the grid and for the transmission grid reinforcement required to dispatch the new generation capacities. In these sites, grid reinforcement costs are lower than in other available locations. As a matter of fact, both the incumbent, which previously owned the TSO, and new entrants have chosen the same locations for installing new generation capacities.

Up to 2007, the model for managing the network was a central planning system based on the merit of the supplier, with a daily computation of the marginal cost. With the end of the PPAs a market mechanism has been introduced, with an auction system.\(^6\)

Another topic that suggests the benefits of an ownership unbundling model is related to the way in which the TSO, under the single buyer model, improved the short run optimization of the generation capacities under PPAs. An incentive scheme put in place

\(^6\) There is still a limitation. REN continues to handle the PPA of Turbogas and Tejo Energia that refused to move to the CMEC system because of complications arising from investments based on project financing.
by ERSE allowed the TSO to appropriate 50% of the savings or gains from its exporting and importing activities. As the single buyer it could profit from exporting when it had spare generation capacities at competitive costs to be sold at the Spanish pool. On the contrary, it could save if Spanish pool prices were lower than the variable costs of the marginal plant that the TSO controlled. This incentive improved efficiency, and REN increased its profits. More importantly, efficient behaviour was also beneficial for competition at the retail level.

Congestion rents are important to signal investment needs in the network, but they are a small share of REN total profits.\(^7\)

Coordination is ensured by a system of planning with regulator and government involvement. According to Decree-Law 29/2006 of February 15, it is the responsibility of the TSO, e.g. REN, “to ensure planning, construction and operation of the electricity network in order to allow third party access and to manage efficiently equipment and structures (article 24 2-d)” and “to supply to all operators of SEN the required information for the coordinated development of the network and other information required for their expansion 2-f)”.

To the above extent, REN produces, every two years, two documents: (i) Forecast for the Electricity Sector (PESEP), with a 20 year horizon, that contains projections for demand of electricity based on GDP and population growth, supply by type of fuel and type of demand (peak and off-peak hours). The plan contains a scenario “business as usual” and other policy scenarios according to government policies. It contains also information about the need for interconnector capacity and emissions. Furthermore, it provides economic information for a social welfare optimization. The current plan is shying away

\(^7\) According to a recent ETSO report REN is one of the most efficient TSOs in Europe and its interrupt rate is among the smallest.
from a central plan perspective and adopts a market based approach. (ii) Plan for the Transmission Network (PIR) with a 5-year horizon, with detailed planning of expansion and maintenance of the network, based on eight study areas, and details for each substation, loss estimates and capacity of interconnection with Spain.

The Plan is submitted for approval to the Ministry of Economy and Innovation, through its Energy Directorate-General. The Ministry, in turn, forwards the Plan to the sector regulator, ERSE. It then becomes mandatory for TSO operations, and it is also a base for the government licensing program.

There is also a need for downstream investment coordination between the TSO and the Regional Distribution systems. In the case of Portugal that coordination is ensured by a joint committee for each region meeting on a monthly basis.

**Building an Integrated Iberian Market**

Until 2004, the available generation capacity to supply non regulated/defranchised customers was very low, so all retailers needed to import from Spain. With historically low prices in the Spanish pools, part of the demand was transferred from the public sector to the liberalized sectors. Demand for interconnection capacity increased and congestion levels rose, constraining the existing trade opportunities that resulted from the Spanish competitive prices.

A major challenge to the generation system and the TSO that is responsible for overall reliability is the new wind generation that is entering, and is planned to enter, the system from now until 2010. According to estimates by REN, in 2010 there should be 4 500 MW installed capacity that will represent 44 percent of peak demand. The intermittent

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8 In some occasions government officials have even referred the possibility to build up to 7 000 MW.
character of this type of supply will generate an increase in the level of uncertainty, requiring quick response mechanisms from an excess supply capacity of other sources that could substitute for the wind power, in case there is no wind. The problem is being already felt by Denmark\textsuperscript{10} that has a much lower percentage of wind generation in exploration\textsuperscript{11} than the one planned for Portugal.\textsuperscript{12} There is also a large cost of investment in building the transport network up to each windmill, due to the disperse nature of its installation. There are only early estimates of the impact of the cost of adding such high level of wind power, but the price guaranteed by the government to this type of energy is about 30 to 40 percent above the marginal cost of the base-load plant.\textsuperscript{13,14} ERSE estimated that the impact of reaching the 22 percent of renewables in total energy

\textsuperscript{9} While hydroelectric plants take only 90 seconds to start injecting electrons into the system, fuel or coal fired plants take up to 2 hours. There is a high urgency in building four more dams in Portugal in order to fully exploit the hydro power of the country. But only 2 dams can be used for reverse pumping in order to balance the system when wind energy is above the safe limit for balancing the energy network.

\textsuperscript{10} Denmark relies heavily on the Nordpool market and now in the connection with Germany to fill up unbalances. Note that Denmark has already the highest wholesale prices of electricity in Europe.

\textsuperscript{11} Spain is planning an installed capacity of wind generators equivalent to 12 percent of peak demand.

\textsuperscript{12} There is still need to apply widely more advanced methods for project evaluation of power generation using the method of real options.

\textsuperscript{13} According to estimates of the Department of Energy the levelized cost of wind is 6.8 cents per kWh (2005 prices), just for plant generation cost, while the advanced combined cycle costs in the US 5.53 cents per kWh. (Annual Energy Outlook, 2007).

\textsuperscript{14} The paper by F. Münsgens and K. Neuoff. Modelling Dynamic Constraints in Electricity Markets and the Costs of Uncertain Wind Output. February 2006 present a sophisticated dynamic stochastic optimization model for computing the costs of introducing wind power, but their estimates do not include the costs of adding a substantial amount of wind power that requires excess capacity. In fact, they claim that costs will rise significantly in this situation.
will increase consumer prices by 14 percent. By extrapolation, when all wind power capacity is added the additional cost will be 25 percent.\textsuperscript{15}

However, interconnection rules allowed for netting flows (independence or ownership unbundling of both the Spanish and Portuguese TSO favours more efficient interconnection rules), meaning that each time the TSO exported to Spain, it was freeing capacity for others that were importing. As the next graph shows, there were several periods in 2004 where retailers were importing at the same time the TSO was exporting. This sort of conduct allowed for the rise of the share of supplies in the Portuguese liberalized / non regulated market. If the TSO remained under the ownership of the incumbent generator this sort of behaviour would be highly unlikely. On the contrary, its incentives would be to congest more the interconnection capacity in order to reduce the entry opportunities of its rivals at the retail level.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{GWh.png}
\caption{Public and Private transactions at the Interconnection - Year 2004}
\end{figure}

Source: REN

\textsuperscript{15} This estimate assumes that the average market price of nonrenewables stays at the same level as nowadays of 50 euros MWh.
With the creation of MIBEL, by July 2007, the pre-existing Power Purchase Agreements that prevailed in SEP were extinct\(^{16}\) and replaced by a compensation scheme called CMEC\(^{17}\). The aim of CMEC payments is to equalize revenues under market conditions with the previously guaranteed by the PPAs. CMECs payments are therefore variable and dependent on market prices. Its aim is to secure the revenues of the power plants that early terminated their PPAs. One of the effects of these CMEC payments is that the incumbent generator will be immune to market prices for most of its generation capacity, while it still retains the ability to influence market prices. In Spain, where a similar stranded cost scheme was implemented until 2006 - called CTC - massive distortion of market prices has been detected. In fact, since Spanish incumbents revenues were protected by CTCs, they could keep prices low in order to prevent entry by independent producers.

Within MIBEL, market splitting has been adopted as the congestion mechanism to deal with limited interconnection capacity. Under this framework, the market power of the Portuguese incumbent in what concerns price fixing is confined to hours where congestion occurs. Historically, the annual highest level of congestion in the Portuguese-Spanish interconnection has been about 30% of the hours, but dominated by peak-hours. Without congestion, the price will be Iberian in scope, while the Portuguese incumbent Iberian market share is below 20%. Daily spot prices in the Iberian Exchange have been on average about 30 percent above Spanish prices, as the following graph shows.

\(^{16}\) Except for the two independent producers, Tejo Energia and Turbogas, who did not accept the terms for early termination of their respective PPA’s.

\(^{17}\) Custos de Manutenção do Equilíbrio Contratual
Due to the regional integration with Spain, the effect of the Portuguese stranded cost payments (CMEC) in price fixing might be less significant than the one that arose in the Spanish pool from CTCs. As a matter of fact, the phasing out by the Spanish Authorities of the CTC mechanism may reduce the effects of CMECs in the Portuguese area of MIBEL. Notwithstanding, with the MIBEL just kicking off, it is a subject that needs careful attention.

Defranchising consumers

The process of defranchising consumers started in 1999, with large consumers. However, since generation capacities in the liberalized sector were limited (mainly small hydro generation facilities), retailers in the liberalized sector had to import electricity from Spain in order to supply end customers. The price level of the Spanish pool has since then been key to understand the performance of the Portuguese electricity retail market.
By 2000, ERSE simulations demonstrated that under existing Spanish wholesale prices, regulated tariffs still provided the best price for large end customers. In fact, since large customers tariffs were in part subsidised by small and domestic customers – a situation inherited from the pre-regulation tariffs – market prices could not beat regulated tariffs. In 2002 all medium-voltage customers were defranchised. By 2003, and more evidently in 2004, with Spanish pool prices at historically low levels liberalized sales boosted, but mainly for Medium Voltage customers. With the incumbent new generation capacities entering the liberalized market and the competitive pressure from imports, liberalized sales reached a maximum of 25% of overall consumption in Portugal mainland by October 2005.

With the significant rise of Spanish pool prices in 2005 and 2006, prices offered by retailers were significantly less competitive. Customers eventually started to return to regulated tariffs (which are supplied by the supplier of last resort, e.g. the incumbent). At the end of 2006, less then 10% of demand was supplied by liberalized retailers. A lag could be observed between the moment in time when Spanish pool prices rose and customers started to return to regulated tariffs, since most of the contracts with end customers were of fixed price with one year duration.

Domestic customers were defranchised in 2004, but the ability to change supplier was effective only in September 2006, upon implementation of the incumbent software to manage supplier switching. Yet, in end-2006 the government rejected a 15% rise in regulated tariffs for domestic customers proposed by ERSE, imposing a limit of 6%

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18 There is a significant deficit built up by generation firms due to regulated prices that do not cover plant costs, amounting to about 2 billion euros in Spain and 650 million in Portugal in the accounts of REN plus the deficit of EDP due to the capping of consumer prices for medium and low voltage consumers at 6 percent in 2006.
maximum rise. A tariff deficit was created, meaning that tariff revenues could not cover costs. This tariff deficit is due to be recovered in the next 10 years. However, more importantly, the limit in regulated tariffs rise meant that no liberalized retailer could beat regulated tariffs. Actually, under this framework some retailers already supplying the industrial market decided not to present price offers to domestic customers while the ones who did it (the incumbent included) presented prices that are higher than the regulated tariffs.

In June 2007, this competition scenario was to be made worse with the anticipated phasing-out of PPAs and its replacement by CMECs. Indeed, CMEC introduction led to a financial transfer between tariff components. Stranded costs are now recovered by network access tariffs, while in the past all the PPAs costs were recovered by the energy tariff component. At the same time, regulated tariffs to end customers, due to CMECs introduction, are supposed to decrease. With regulated tariffs to end customers climbing and access tariffs rising (which are paid for by retailers), the perspectives for retail competition at the domestic level are then made worse. Under this scenario it is likely that the return of consumers to the regulated tariffs system will rise. Contradictorily, the creation of better conditions for wholesale competition with the early termination of PPAs is worsening competition at the retail level.

Share of liberalized market in Overall Consumption and differences between the Spanish pool price and SEP Energy Acquisition Cost
Conclusions

The Portuguese experience suggests that ownership unbundling of the Transmission System Operator, while strategic to allow independent entry and to provide incentives to invest in overall interest of the market and electricity system is not enough to create the conditions for competition. It also shows that regulatory uncertainty and government intervention with the aim of creating national champions might have a detrimental effect on competition in the long-run.

Finally, the Portuguese experience also suggests that, as a small market, the best path for overall efficiency is to participate in regional integration with its neighbors. But in this regard, it matters a lot if the large neighboring country is in itself a competitive market, preferably with a lower cost.