

# 9. The challenge of competition in the electricity sector

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SUMMARY: 1. INTRODUCTION.—2. THE STRUCTURE OF THE SECTOR.—3. COMPETITION IN THE WHOLESALE MARKET.—4. VERTICAL RELATIONS AND THE RETAIL MARKET.—5. MARKET STRUCTURE AND COMPETITION IN THE SPANISH WHOLESALE MARKET.—6. REGULATION AND COMPETITION POLICY.—7. CONCLUSIONS.

## 1. Introduction\*

The process of liberalisation in the electricity sector, as well as in other energy industries, is based on the idea that competition is a source of efficiency. Competitive markets provide the appropriate signals regarding production and investment for firms and consumers. The creation of the integrated European energy market is also based on this concept and was spurred by the pioneering experiences of liberalisation in the United Kingdom and Scandinavian countries. The increase of efficiency in the energy sector is fundamental in order to face the challenges presented by supply and economic growth.

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The liberalisation process is linked with the privatising tendency within the sector. The international experience, in the United Kingdom particularly, shows that the introduction of competition is fundamental in order for privatisation to bear fruit in terms of economic efficiency. Little — or nothing — can be gained by going from a public monopoly to a private one.

The concept of a natural monopoly, where the ‘bottle-neck’ — the transmission and distribution of electricity — dictated the nature of the whole sector, from generation to commercialisation, changed to a narrower vision in which competition is introduced in the phases of generation and commercialisation. At the same time, regulation is maintained and limitations to vertical integration are established, and important changes take place with respect to tariff regulation and the nature of the regulatory authority.

Spain is not an exception in the liberalisation (and privatisation) process. The Law of the Electricity Sector of 1997 introduced partial competition in generation, a transition to competition in commercialisation, and maintained tariff regulation in transmission and distribution. The 1998 Hydrocarbon Law created the Comisión Nacional de Energía (CNE, National Energy Commission), to regulate gas, electricity and oil, and incorporated the electricity regulatory authority Comisión del Sistema Eléctrico Nacional (CNSE), created in 1994. In contrast to the deregulation process in the United Kingdom and California that imposed vertical separation between generation and commercialisation, under the assumption that it would favour entry, vertical integration was maintained in Spain. Also, the sector was concentrated before privatisation and, consequently, had a high level of concentration at the time of liberalisation.

In this chapter, the difficulties faced when introducing competition in the electricity sector and its interaction with regulation will be addressed<sup>1</sup>. The specificity of the sector will be considered, as well as its consequences on the competitive mechanism in wholesale and retail markets. Among the underlying questions, one can emphasize the following: To what extent is the traditional analysis of competition valid for the electricity sector? What is the impact on efficiency of the degree of concentration in the wholesale market? How does the

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<sup>1</sup> A general vision of the main issues in the sector can be found in the White Paper, *Libro Blanco sobre la reforma del marco regulatorio de la generación eléctrica en España*, directed by Ignacio PÉREZ ARRIAGA (June 2005).

degree of vertical integration influence the level of competition? Under which conditions is it efficient to introduce competition in commercialisation? What is the role of competition policy and how does it relate with the regulator? Which are the factors that mitigate market power? How can we analyze whether mergers are going to be in detriment to or in favour of productive efficiency and the consumer? Is a regulated retail tariff compatible with competition in the wholesale market?

Section 2 briefly reviews the structure of the electricity sector. Section 3 analyses competition in the wholesale market and the conditions under which the companies can make use of unilateral and co-ordinated market power. Section 4 deals with the vertical relations in the sector and analyzes the retail market. Section 5 studies the market structure and competition in the Spanish wholesale market, with special attention to concentration, regulation and prices. Section 6 deals with regulation and competition policy in the sector, with particular attention to merger policy and tariffs in the retail market. Section 7 presents the conclusions.

## **2. The structure of the sector**

The analysis of competition in the electricity sector is complex due to the physical characteristics of electricity and the different vertical phases which exist from production to consumption. Electricity is not storable and must be generated at the moment at which it is consumed. In order to avoid interruptions to the service, the system must have a reserve capacity margin at each point of the grid to ensure supply in the event of a power failure in the station or any problem in the transmission network. The operations of a generating plant must be coordinated with the rest of suppliers, taking into account transmission costs and the possibility of network congestion. The result is that the marginal cost of producing electricity depends on the location of the power plant in the network. In addition, the level of capacity available in the system is a random variable, since it depends on how many power stations are unavailable and it also depends on demand, which in turn depends on the climate (temperature).

In the electricity sector one must distinguish between the following phases: that of generation, with multiple technologies, such as

hydroelectric, thermal — nuclear, coal or fuel — or renewable energies such as wind energy; the phase of transmission of the electricity produced with high-tension power lines; the distribution phase; and the commercialisation or retail supply phase. In a thermal system, fuel costs determine the variable costs and the power plants face a capacity limit; in a hydroelectric system, the marginal cost of the energy is the opportunity cost of water and the limit is the water reserve.

The generation and commercialisation phases are potentially competitive, whereas those of transmission and distribution are a natural monopoly that must be regulated. From being vertically integrated and regulated, the sector opened up to competition in the competitive phases. At the present time in Spain, the large companies continue to be vertically integrated, except in the transmission segment, which is controlled by *Red Eléctrica de España, S.A. (REE)*, and with the requirement of accounting separation in the distribution activity.

### 3. Competition in the wholesale market

The wholesale market in Spain is organised as a *pool* with different hourly markets (daily, intraday and other complementary ones). The central market in Spain is the daily one (*day-ahead*) that combines aspects of the previously established markets in the UK and Nordic countries (*NordPool*). In this market, the generating, distributing and commercialising companies, as well as the eligible consumers, participate. Participation in the market is obligatory, excluding physical bilateral contracts, which have occurred very seldom in practice due to disincentive regulation. The generators can send, for every hour of the day, simple production proposals in terms of volume and price, or more complex ones that recognise production restrictions. In every period, the market operator constructs a supply curve and a demand curve with bids received, and determines the market clearing price along with the units produced and consumed. This price is uniform for all the transactions in the market<sup>2</sup>. The intraday market and the complementary markets ensure a constant balance between production and consumption in the network. The

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<sup>2</sup> The advantages and objections of uniform price auctions in relation to discriminatory ones are the object of a recent debate, which we will not explain due to space restrictions.

Spanish market also includes capacity payments for the generators that declare their available capacity, although these payments are not linked to the capacity's effective operation in periods of high demand. Big consumers pay according to capacity depending on the time of day. Others pay a flat tariff (even those who could have real-time meters.)<sup>3</sup>

The characteristics of the sector make it prone to the exercise of market power, either unilaterally or coordinated by the companies.

#### UNILATERAL MARKET POWER

The unilateral market power (or monopoly) of a producing company is its capacity to raise prices above the marginal cost (or competitive price). For a consuming company (monopsony power) the market power resides in the company's capacity to reduce prices below the marginal value. The two most important factors that make the electricity sector susceptible to market power are the following:

- The supply is relatively inelastic, since electricity is not storable (except in hydraulic dams) and restrictions exist regarding supply capacity in the short term.
- The short term demand is inelastic since the consumers, particularly the domestic ones, are confronted with a regulated price independent of their consumption.

These two conditions imply high market power when the demand and the total supply are similar to each other. This normally happens in periods of high demand. This exercise of market power does not only take place on the aggregate system level, but also locally when the transmission restrictions create isolated geographic markets. In addition to these basic conditions, there is the uncertainty about the available production units and the interaction between multiple generation technologies with the capacity to set the price in the spot market.

Several *market power indicators* of the companies in the electricity generation market have been proposed. The market share and the

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<sup>3</sup> For a more detailed description of the wholesale market, see the chapter by N. FABRA in this same volume.

Herfindahl index of concentration are typically used. In order to define the market share it is necessary to start by defining the relevant market in terms of product, geography, and time. The market can be the production, including reserves or not, the short term capacity or the capacity in the long term. In addition, electricity in different periods represents different markets (for example, a day of high demand and peak phase or off-peak) and the transmission restrictions can define the relevant geographic market. Once the relevant market has been defined, one must determine what level of market share leads to problematic market power. In the United States, the Federal Energy Regulatory Commission (FERC) has established 20 percent as the critical threshold. Nevertheless, the Californian experience indicates that there are circumstances in which companies with a smaller market share can exert substantial market power. The reason behind this is that when supply and demand are very inelastic, a producer, that is necessary to serve the demand (that is to say, a 'pivot'), can have a great capacity to influence prices (the generator is a pivot if its capacity is greater than the difference between the total capacity and the demand). The percentage of time in which a company is a pivot can then be calculated. A refined indicator is the index of residual supply (developed by the system operator in California, CASIO). This index measures a company's capacity in the market once the capacity considered in relation to the total demand of the company has been subtracted. If the result is less than one, the company is a pivot. The use of thresholds of this index has been proposed in the United States, along with the market share, to warn about the market power of a company.

The analysis of market power should be done by postulating an appropriate oligopoly model for electricity generation and estimating its parameters. The ratios of market share or concentration only make sense in an oligopoly model. So, which is the appropriate model to understand the *pool*?

The first possibility is a model in which the companies compete in supply functions<sup>4</sup>. In effect, each generating company submits to the

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<sup>4</sup> See X. VIVES (1999), 'Oligopoly pricing', *MIT Press*, chap. 7.2, and P. KLEMPERER and M. MEYER (1989), 'Supply function equilibria in oligopoly under uncertainty', *Econometrica*, vol. 57, pages 1243-77. The English *pool* has thus been modelled by R. GREEN and D. NEWBERY (1992), 'Competition in the British electricity spot market', *Journal of Political Economy*, vol. 100, pages 929-953, and R. GREEN (1996),

*spot* market the amount of energy they are willing to sell at different prices, that is to say, a supply curve. (Buyers also have the possibility to send acquisition offers sensitive to the price)<sup>5</sup>.

The Cournot model assumes that companies compete in the quantity of product supplied to the market, and presents various advantages in the analysis of market power, in addition to its relative simplicity:<sup>6</sup>

- The Cournot equilibrium provides the least competitive of all the possible equilibria in supply functions or multi-unit auctions, offering an upper bound to the market power in the industry.
- Capacity restrictions are important in the generation industry, both in the medium-term (construction of new power stations) and short term (due to the availability or strategic withdrawal of power stations in certain periods), and they are easily incorporated into the model<sup>7</sup>.
- Non-strategic competitors can be incorporated as a competitive fringe (with its aggregate supply curve) which modifies the residual demand faced by the oligopolists.

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'Increasing competition in the British electricity spot market', *Journal of Industrial Economics*, vol. XLIV, pages 205-216.

<sup>5</sup> Technical problems in the modelling exist since the supply functions of the companies are actually discrete (or step-shaped), whereas in the model of supply functions they are supposedly continuous and without kinks. Also, many different equilibria are possible in the market. An alternative model is an auction. See the recent developments on the model of supply functions by R. BALDICK, R. GRANT and E. KAHN (2004), 'Theory and application of linear supply function equilibrium in electricity markets', *Journal of Regulatory Economics*, vol. 25 (2), pages 143-167, and A. RUDKEVICH (2005), 'On the supply function equilibrium and its applications in electricity markets', *Decision Support Systems*, vol. 40, pages 409-425, and N. H. VON DER FHER and D. HARBORD (1993), 'Spot market competition in the U.K. electricity industry'. *Economic Journal*, vol. 103, pages 531-546, for the auction models.

<sup>6</sup> See X. VIVES (1999), 'Oligopoly pricing', *MIT Press*, chap. 4, X. VIVES (1998), 'Concentración y competencia', *Anuario de la Competencia 1996. Fundación ICO*, pages 71-85, S. BORENSTEIN and J. BUSHNELL (1999), 'An empirical analysis of the potential for market power in California's electricity industry', *Journal of Industrial Economics*, vol. 47, pages 285-323, and C. OCAÑA and A. ROMERO (1998), 'Una simulación del funcionamiento del *pool* de energía eléctrica en España', *CNSE*, DT 002/98.

<sup>7</sup> This last possibility has been manifested in the United Kingdom according to F. WOLAK and R. PATRICK (1996), 'The impact of market rules and market structure on the price determination process in the England and Wales Electricity Market', *CEPR Discussion Paper 463*.

The Herfindahl index is closely related to the Cournot model. It is defined as the sum of squares of the market shares of the companies in the industry. By giving more importance to larger companies, it incorporates a measure of the inequality in market distribution and has a direct relation with the margins of a homogenous product industry competing in quantity *à la Cournot*. Indeed, in this case the Lerner index for a company (the relative margin of price on marginal cost) is equal to its market share divided by the elasticity of demand in the market. So, it is easy to see that the Herfindahl index divided by the demand elasticity of the market is equal to the sum (weighted by the market shares) of the Lerner indexes of the companies. Given the elasticity of demand, the degree of aggregate monopoly of the industry is directly proportional to the concentration. This does not mean that there always exists a uniform relation between welfare (total market surplus) and market concentration<sup>8</sup>. In fact, if companies maintain different productive efficiencies or if there are economies of scale, a rise in concentration can increase welfare. Even without synergies, but with companies with different efficiencies, a price increase together with more concentration can increase welfare (total surplus of the industry) if the symmetry in terms of capacity of generation and balance between the company's technologies is increased, thus productive efficiency is sufficiently increased.

The results in the literature suggest that in concentrated markets companies have substantial capacity to raise prices above marginal cost and the problem becomes worse when the competitors are asymmetric. In this case, inefficiencies in production are created, since industry costs are not minimised because the allocation of the use of the companies' productive capacity is distorted. This happens because the largest company has a greater incentive to maintain high prices and, therefore, restricts its supply<sup>9</sup>. Additionally, if in a concentrated market with high profits the door is opened to new competitors, an 'excess entry' phenomenon could take place,

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<sup>8</sup> The total welfare in the industry is the sum of consumers' surplus and producers' profits.

<sup>9</sup> See R. GREEN and D. NEWBERY (1992), 'Competition in the British electricity spot market', *Journal of Political Economy*, vol. 100, pages 929-953. A. GARCÍA-DÍAZ and P. L. MARÍN (2003), 'Strategic bidding in electricity pools with short-lived bids: an application to the Spanish market', *International Journal of Industrial Organization*, vol. 21, pages 201-22, reach to the same conclusion with an auction model and apply the result to the Spanish case.

which would simultaneously reduce prices and create an excess of capacity.

#### COORDINATED MARKET POWER

The exercise of market power in a collective way is established through the tacit or explicit coordination of companies' strategies in order to maximise joint profits. This collusion takes place when the companies increase prices above what is considered to be consistent with a short term profit maximisation strategy. Companies can maintain this strategy, resisting the temptation of taking advantage of their competitors in the short-term, if they anticipate that such an action could turn out to be expensive in the long term. In order for collusion to be possible, it is necessary that:

- the companies in the collusive group agree (implicitly or explicitly) on the distribution of the market;
- the incentives to deviate from high prices in the short term — in order to gain market share and increase the profits — are controlled;
- any observed deviation from the agreement is credibly penalised.

The capacity to detect deviations, i.e. to control price reductions or variations in the supply, is critical to implement any punishment strategy. In fact, a secret price cut is a threat to the stability of a collusive agreement. The transparency in prices from the companies' point of view constitutes a practice that facilitates collusion.

The electricity spot generation market is a market of a homogenous product with repeated interaction, concentrated, and transparent for the producers. One of the arguments for the transition from a *pool* system of repeated interaction to the current NETA bilateral contract system in the UK was to eliminate collusion possibilities. These conditions, along with inelastic demand and entry barriers, are considered as circumstances that facilitate collusive behaviour. These characteristics are aggravated if the companies have similar capacities and cost structures. Indeed, in homogenous product markets with capacity constraints — such as the electricity market — it has been shown that asymmetries in the asset structures reduce

the predisposition to collusion when the aggregated capacity of the sector is moderate in relation to the demand. The reason for this is that companies with different sizes have different (and sometimes opposed) incentives for maintaining a collusive agreement<sup>10</sup>.

Thus, there is a tension between moderating market power and stimulating static efficiency, encouraging companies to have similar capacities and production technologies while controlling possible collusion by means of dynamic strategies.

#### INVESTMENT INCENTIVES

The analysis of unilateral and coordinated effects fundamentally refers to economic efficiency given certain production capacities. A fundamental question is how to guarantee sufficient capacity investment in a sector where the investment gestation period is long and the existence of a reserve margin to ensure the supply is crucial. For example, in a wholesale market in which an operative *price cap* exists, the incentives to invest in capacity for periods of high demand will be insufficient since the profits or scarcity rents are reduced in these periods. The introduction of capacity obligations and associated payment can restore the correct incentives to invest<sup>11</sup>. On the other hand, there is an open debate on how to better remunerate investment in available capacity for reserve margin. For example, the reliability of the supply can be considered a public good, and the question is how to provide it. In Spain, the mechanism currently in force has been criticised for its lack of transparency and for not having a direct relation with the effectiveness and reliability of the capacity installed.

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<sup>10</sup> See *Horizontal Merger Guidelines* of the European Commission, X. VIVES (1999), '*Oligopoly pricing*', MIT Press, chap. 9, O. COMPTE, F. JENNY and P. REY (2002), 'Capacity constraints, mergers and collusion', *European Economic Review*, vol. 46, pages 1-29.

<sup>11</sup> See P. JOSKOW and J. TIROLE (2004), 'Retail electricity competition', *NBER Working Paper 10473*.

#### 4. Vertical relations and the retail market

##### VERTICAL RELATIONS AND COMPETITION

Vertical relations and forward contracts must be added to the market's horizontal structure. Forward contracts tend to induce a higher level of competition in the cash market since only one part of the production of the company is left free for the market. Thus, the company has fewer incentives to reduce the quantity supplied to raise the price, since this price rise does not affect the inframarginal amounts committed to under the contract. A company that has committed its entire production to a certain price has no incentive to raise the price in the wholesale market. Even so, it is necessary to carefully examine the incentives of the generators with market power for forward contracting. When these forward contracts are observable — and the wholesale market is characterised by competition *à la Cournot* with perfect arbitrage between contracting and the spot wholesale market — then each generating company has an incentive to contract to commit itself to being more aggressive in the spot market. Then, the companies are in a 'prisoner's dilemma' situation<sup>12</sup>.

Likewise, if the companies are integrated in the generation and distribution/commercialisation phases, they are on both sides of the wholesale market, both suppliers and demanders. In this case, the incentive to increase prices above costs only exists if the company is a net supplier; if the company has a balanced position it will be price taker; and if the company is a net demander it has an incentive for the price to be below the marginal cost. Nevertheless, since the degree of market power of the net suppliers and net demanders is similar, even when prices are close to the competitive level, this does not mean that there is no productive inefficiency, since the net demanders are going to produce too much and the net suppliers too little<sup>13</sup>. Estimations using oligopoly models that do not take these vertical relations into consideration do not assess market power

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<sup>12</sup> See B. ALLAZ and J. L. VILA (1993), 'Cournot competition, forward markets, and efficiency', *Journal of Economic Theory*, vol. 59, pages 1-16; R. GREEN (1999), 'The electricity contract market in England and Wales', *Journal of Industrial Economics*, vol. 47 (1), pages 107-124; and D. Newbery (1998), 'Competition, contracts and entry in the electricity spot market', *Rand Journal of Economics*, vol. 29, pages 726-749.

<sup>13</sup> See K.-U. KÜHN. and M. P. MACHADO (2004), 'Bilateral market power and ver-

correctly. Recent studies in the United States demonstrate that ignoring vertical relations greatly overestimates market power<sup>14</sup>.

Vertical relations potentially have an anticompetitive side when a company uses a bottle-neck in some segment of the vertical chain to exclude competitors. In the electricity sector this situation can occur when a company that is vertically integrated in the competitive segments (generation and commercialisation) and natural monopoly segments (transmission and distribution) uses its control over the natural monopoly sector to exclude or degrade its rivals' interconnection. Having control of the transmission phase could be especially problematic, but in Spain this is in the hands of the independent company Red Eléctrica de España, S.A. (REE).

Another possibility is that a company which is vertically integrated in gas and electricity uses its control of gas either to increase the costs of rival companies in the electricity sector or to prevent the entry of new competitors, given that gas is the fuel for the combined cycle technology. The integrated company will tend to internalise the effect of the gas price in the *pool* price and will have an incentive to raise it to increase the final price and thus increase profits. Nevertheless, the conditions for achieving a rise in price are restrictive. In the first place, electricity companies should not have other options apart from the integrated provider of gas at reasonable cost and quality, and the integrated company should be an important provider for the electricity companies. Secondly, the costs of gas for the rival companies must increase. However, if the *upstream* company sets gas prices above marginal cost (and therefore a double margin exists) before the integration, the post-integration gas costs will be smaller for the *downstream* division of the integrated company and the costs for the rival companies can be greater or smaller, since these can contract their gas derived demand given that they are less competitive in the electricity wholesale market. Finally, the rise in price in the gas market for the rivals, should it occur, must lead to higher prices in the electricity wholesale market. This means that the direct effect of the elimination of the double margin for the integrated company

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tical integration in the Spanish electricity spot market', *CEMFI Working Paper 0414*, for its application to the Spanish case.

<sup>14</sup> See J. BUSHNELL, E. MANSUR and C. SARAVIA (2005), 'Vertical arrangements, market structure, and competition: An analysis of restructured U.S. electricity markets', *CESEM Working Paper 126*.

must be more than compensated for by the indirect effect of the rise in gas costs of its non-integrated rivals. Nevertheless, on many occasions, the direct effect of the elimination of the double margin predominates over the possible indirect strategic effect of the rivals' increase in costs<sup>15</sup>.

### THE RETAIL MARKET

Competition in commercialisation must in principle contribute to the efficiency of the system, by confronting consumers with the real costs of producing, transmitting and distributing electricity. At the same time, the commercialising companies can offer more stable prices and assurance mechanisms for those consumers who are more unwilling to take a risk in the short term. These commercialising companies will have incentives to get insured and contract forward supply of electricity. The countries that are more advanced in the liberalisation process, like the Scandinavian countries, United Kingdom or Holland, have abolished tariffs, and competition in the market offers to the consumers a menu of supply contracts with different insurance levels and, therefore, risk levels (fundamentally in terms of the transfer from wholesale price to retail price). The situation is similar to that of a consumer who can request a loan at variable or fixed interest rates.

Consideration of competition in commercialisation must begin by ascertaining that there are impediments — independently of risk aversion — for the consumers confronting wholesale market prices in real time: the consumer may have a meter counter that only considers the total consumption within a period; even if the consumer had a real-time meter counter, he would face adjustment and transaction costs to adapt to changes in the electricity price; and

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<sup>15</sup> This case is when the *downstream* competition is with a homogeneous product and in quantities *à la Cournot* (plausible characteristics in the electric sector). See J. CHURCH (2004), 'The impact of vertical and conglomerate mergers on competition', *Report for DG Competition, European Commission*; G. GAUDET and N. V. LONG (1996), 'Vertical integration, foreclosure, and profits in the presence of double marginalization', *Journal of Economics and Management Strategy*, vol. 5, pages 405-32; R. S. HIGGINS (1999), 'Competitive vertical foreclosure', *Managerial and Decision Economics*, vol. 20, pages 229-37; M. A. SALINGER (1988), 'Vertical mergers and market foreclosure', *Quarterly Journal of Economics*, vol. 103, pages 345-56.

there may be technical restrictions in the distribution network, which prevent the adjustment of the consumer's consumption.

When there are consumers who are not sensitive to prices, efficiency in investment and consumption of the competition mechanism in wholesale and retail markets is only guaranteed under a set of restrictive conditions: the wholesale market must be competitive (thus, the price must reflect the social opportunity cost of generation); there should be efficient rationing if it exists (among other conditions, implying that consumers facing the wholesale price in real time are not rationed); the commercialising companies have to confront the wholesale price in real time for the aggregated consumption of their customers; and the consumers have to have the same tariff profile (modulo a scale factor)<sup>16</sup>.

When the consumers' meter counters only measure their consumption over long periods, the consumers and the commercialising companies that supply them do not confront the real-time price of their consumption, and competition in commercialisation does not provide an efficient result. Competition among commercialising companies does give an efficient result (at least when the consumers have the same charge profile) if consumption can be measured in real time; thus, the commercialising companies themselves have the correct incentives to install the appropriate meter counters.

If the tariff paid by the consumers is regulated and in line with the energy costs, these tariffs can reflect the company's costs and market prices or reference costs of other companies. This referential element of competition incentivizes the commercialising company to save costs. In New Jersey, consumers who don't go to the free market to contract their supply are served by the electricity contracted by their distributor through the *Basic Generation Service*. The electricity supply at regulated tariffs is then auctioned to generating companies for determined periods (for example, one year), and the price that consumers pay depends on the winning bid in the auction. With this method the price paid by consumers reflects the production costs and the necessity of price stability for a period. The risk is assumed by

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<sup>16</sup> See P. JOSKOW and J. TIROLE (2004), 'Reliability and competitive electricity markets', *NBER, Working Paper 10472*, and 'Retail electricity competition', *NBER, Working Paper 10473*.

the supplying companies. The industrial consumers can contract the service at a price that is indicated for the wholesale market (PJM).

In summary, the characteristics that point to vigorous competition are: a market structure that is not very concentrated, companies with similar capacities and generation technology portfolios, developed long term and forward contracts, and vertically integrated companies in the phases of generation and commercialisation which balance supply and demand in the spot market. This way, entry will also be facilitated, and potential exclusionary behaviour will be avoided when the transmission phase is vertically separated and sufficient competition in the gas market exists. The demand in the wholesale market will become more elastic when consumers' demand responds more to price. In order for this to happen, competition in commercialisation must exist and meter counters must measure consumption in real time.

## **5. Market structure and competition in the spanish wholesale market**

### CONCENTRATION

The generation market has had an elevated degree of concentration since the beginning of the 1980s and the following decade, when the public company Endesa took over other companies like ENHER, ERZ or Viesgo, and Iberdrola was formed by the merger of Iberduero and Hidroeléctrica Española. This process received an important boost when ENDESA — before its privatization — took control in 1996 of Sevillana and FECSA, which controlled, respectively, 10 percent and 9 percent of the total capacity. The Herfindahl concentration index for the installed capacity under the ordinary regime in the Iberian peninsular system in 1996 was around 3460, and it remained stable with a slight tendency to rise (in 1999 it was in the 3569-3596 range)<sup>17</sup> until the sale of Viesgo to the Italian ENEL in 2001 and the entry of Gas Natural as a generator in 2002. The index fell below 3000 in 2002 and decreased again in 2004 to

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<sup>17</sup> Own elaboration based on the data of the Competition Court and the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) reflected in the files on Endesa-Iberdrola and Unión Fenosa-Hidrocarbónico.

2837-2847 due to the market share increase of Gas Natural<sup>18</sup>. In addition, Portuguese EDP bought Hidrocantábrico in 2004.

The forecasts of investments in new power stations anticipate new falls in the concentration index down to the 2200 level on the 2008-2009 horizon<sup>19</sup>. The regulatory uncertainty, with changes in rewards for generators in the ordinary regime, could have influenced the lack of investment from the launch of the market in 1998 to 2002. The new (and anticipated) investments are mostly focused on combined cycles and the special regime (wind energy in particular) which benefits from financial rewards. The evolution of the reserve margin will depend on the evolution of peak demand.

In order to check the consequences of a certain degree of competition it is necessary to refine criteria, since the technological mix of the different companies does matter. Indeed, the installed capacity is not transferred automatically into market share since it depends on the availability of the power stations and the hydraulic power of each company. Thus, for example, whereas in 2004 the installed capacity (ordinary regime in the Iberian peninsular system) of Endesa and Iberdrola was around 36 percent<sup>20</sup>, the market shares of production in the ordinary regime in the wholesale market of Endesa and Iberdrola were more asymmetric: 42 percent for Endesa, whereas for Iberdrola it did not reach 30 percent due to its relative predominance in hydraulic power stations<sup>21</sup>.

In the electricity sector, the high degree of concentration, both in generation and in distribution, along with little opening abroad, forms a sector that is less inclined to be competitive in spite of the liberalisation of the generation and commercialisation segments. This problem has been aggravated by the failure to restructure the sector in a competitive sense prior to the privatisation. The error

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<sup>18</sup> Own elaboration, from data of the Competition Court and the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) reflected in the file on Gas Natural-Endesa.

<sup>19</sup> Own elaboration based on the Report on the Spanish Electric System of 2004, by the REE, and 'Framework Report on the demand of electric energy and natural gas, and their coverage' (2005), by the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) .

<sup>20</sup> Own elaboration based on the data of the Competition Court reflected in the file on Gas Natural-Endesa: 35 percent for Endesa and 37 percent for Iberdrola.

<sup>21</sup> According to data in the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) report of the Gas Natural-Endesa case.

made in Britain when privatizing a concentrated sector has been repeated, since Endesa increased in size before its privatisation. At the time of privatising, the income the State would earn had greater relevance than economic efficiency. The problem is that this creates a distortion in the market in the long run.

Endesa's taking control of Sevillana and FECSA, in 1996, seems to have increased the market power of the competitors Endesa, Iberdrola, Unión Fenosa and Hidrocantábrico, measured in terms of price-cost margins<sup>22</sup>. Also, the evidence of the behaviour in the *pool* in 1998 would be consistent with tacit collusive behaviour disciplined by means of price war episodes, although it can also be attributed to companies' learning about the new market<sup>23</sup>. Another indication is that in 2001 the Spanish Competition Court (TDC, Tribunal de Defensa de la Competencia) imposed a fine on Endesa, Iberdrola and Unión Fenosa for abuse of dominant position by using the companies' local market power when the transmission routes were congested. Nevertheless, in spite of these indicators and structural factors, there have been compensatory factors in the exercise of market power, which are examined below.

#### REGULATION, VERTICAL RELATIONS AND PRICES

The implementation of the 'competition transition costs' (CTC) in 1997 has had a fundamental impact on the evolution of prices in the *pool*. The CTC were introduced to compensate for the possible loss of income of producers in a competitive regime in relation to the regulation in force up to date (*Stable Legal Framework*). The companies had compromised some investments under the *Stable Legal Framework* and the rules of the game were changed. The CTC are the compensation for the stranded costs under the new conditions. Another controversial subject is their calculation, since mechanisms that allowed the market to value the stranded assets were not used.

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<sup>22</sup> A. GARCÍA-DÍAZ and P. L. MARÍN (2003), 'Strategic bidding in electricity pools with short-lived bids: An application to the Spanish market', *International Journal of Industrial Organization*, vol. 21, pages 201-22.

<sup>23</sup> N. FABRA and J. TORO (2005), 'Price wars and collusion in the Spanish electricity market', *International Journal of Industrial Organization*, vol. 23, pages 155-181.

Every year's CTC are the difference between the income of the distributors from sales at regulated rate and the costs (which include the purchase of the energy in the wholesale market). Therefore, CTC act, essentially, as contracts by means of differences in relation to the tariff paid by consumers with quotas that are pre-assigned by the companies. They have an asymmetric impact on the companies, stimulating a rise in prices for those companies which, like Iberdrola, have a generation quota greater than those of CTC, and stimulating a fall in prices for those companies which, like Endesa, have a generation quota lower than those of CTC. In addition, as long as the payment is taken for granted, they in fact imply a *price cap* on the *pool* prices, since if the average price received by a company is greater than 3.6 cEuro/kWh then the extra income must be subtracted from the company's allocation of CTC<sup>24</sup>. This occurred during 1998 and 1999, when the price oscillated around this value. Later, the average price was increased and became more volatile due to a combination of a threat to the collection of CTC (since the European Commission could have possibly considered them as State aid), an increase in demand and lack of investment, as well as climatic conditions and impacts on the supply side. From 2002 onwards, new investments in combined cycles contributed to lower prices. In 2004 there were mutual accusations of price manipulation among companies that can be explained by the incentives that the CTC mechanism generates.

After 2004, demand's pressure and the increase in fuel prices caused a noticeable increase in *pool* prices. In fact, from the year 2000 the income of the distributors from sales at the regulated tariff did not cover costs for several years, even considering the income from CTC. The result has been a 'tariff deficit.' It was predicted that this deficit would be paid through the electricity tariff in future periods. The deficit explosion in 2005 and 2006 made the Government (in February, 2006) provisionally fix the price of the energy matched from the supply and demand of the vertically integrated companies (physical bilateral contracts) at 42.36 Euros per MW/h. Since the approval of the Decree prices have fallen, risen dramatically and then collapsed in June 2006 due to Iberdrola-distribution's order not to buy energy at a price higher than 33.65 Euros per MW/h. The consequence is that 40 percent of the energy remained unmatched,

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<sup>24</sup> See C. CRAMPES and N. FABRA (2005), 'The Spanish electricity industry: plus ça change...', *The Energy Journal*, vol. 26, pages 127-154.

the price fell to almost 31 Euros per MW/h, and the market of technical restrictions and diversions had to be activated in order to ensure supply<sup>25</sup>.

Another implicit *price cap* in the *pool* prices is the fact that consumers could also avail themselves to the regulated tariff. Nevertheless, this last element is weakened when the tariff deficit of the distributing companies is recognised. In this case price rises in the wholesale market would be compensated later on.

Finally, as stated before, vertical integration between generation and distribution/commercialisation implies that the incentives to fix prices different from the marginal costs depend on the magnitude of the company's position as net seller or buyer. In contrast to the deregulation process in the United Kingdom and California — which imposed vertical separation between generation and commercialisation —, in Spain the six largest companies in the electricity market are vertically integrated from generation to commercialisation (except Gas Natural, which does not have distribution) and, therefore, incentives not to fix prices in line with costs diminish considerably<sup>26</sup>. Thus, for example, Endesa has a market share in generation higher than that of supply (distribution and commercialisation), whereas the opposite is true for Iberdrola. The incentive for Endesa is to raise the prices in the *pool* and the opposite works for Iberdrola. This incentive does not account for the effect of the CTC that goes in the opposite direction, but it will be the prevailing one once the CTC disappear (as the Government announced in June, 2006).

The tariff deficit and the instability in the wholesale market are symptoms of the tensions between a regulated tariff for the consumers independently of costs and competition in the wholesale market.

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<sup>25</sup> For a more detailed description of the price evolution in the wholesale market, see the chapter by N. FABRA in this same volume.

<sup>26</sup> K.-U. KÜHN and M. P. MACHADO (2004), 'Bilateral market power and vertical integration in the Spanish electricity spot market', *CEMFI Working Paper 0414*, conclude, with data for 2001, that the market power of the companies had a small impact on prices, but was significant in the degree of productive inefficiency.

## 6. Regulation and Competition Policy

Given that market power is a crucial issue in the electricity markets, a variety of structural or regulatory methods have been considered to mitigate it. The typical structural methods are the sales of assets, which are possible in the transition from a public company into a private one or as conditions for merger procedures; the reduction of entry barriers, like facilitating the locations for power plants or the non-discriminatory access to the transmission network; the increase in interconnection capacity with other markets; and the increase in elasticity of the consumers' demand. The regulatory methods include virtual capacity auctions in which the production capacity of certain power stations is auctioned (like in France, Canada or Holland), the requirement for dominant operators to contract capacity at the regulated price (this has happened in the privatisations in the United Kingdom and has been proposed in California) and the general promotion of forward contracts. The introduction of *price caps*, mainly for specific units of production, is a more interventionist measure. In any case, the regulatory remedies to mitigate market power must have expiry dates. Naturally, the threat of regulatory or competition policy intervention can be very effective. For example, in the United Kingdom, the moderation of prices in the *pool* has been attributed to regulatory threats<sup>27</sup>.

The complexity of the electricity sector, its convergence with other energy sectors — like gas — and its transition to a competitive market with natural monopoly segments (transmission and distribution) makes it necessary to have a specialised regulatory authority for the energy sector. What is the role of competition policy and how should it be related to the regulator? Competition authorities face an information problem if they need to intervene in complex network sectors like electricity. In addition, competition policy procedures tend to be slow. For sectors with bottle-necks it is necessary to regulate access so that all the companies can compete in the competitive segments of the market. Regulators are an indispensable complement to competition authorities, particularly because they have a specialised knowledge of the sector that the competition authorities lack.

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<sup>27</sup> See C. WOLFRAM (1999), 'Measuring duopoly power in the British electricity spot market', *American Economic Review*, vol. 89, pages 805-26.

According to the Law of the electricity sector, the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) must watch over competition in the energy markets. The Servicio de Defensa de la Competencia (SDC, Service for Competition Defence) must be made aware of any detection of anticompetitive behaviour, and in merger cases the CNE must issue a binding report on the effects on regulated activities and a non-binding report on the effects on competition. Nevertheless, the CNE has not had a very active attitude towards the SDC regarding potential anticompetitive behaviour. In fact, the monitoring report on the electricity market, published in the first year of operation (1998), was discontinued. With respect to the setting of tariffs, the CNE has consultative and informative capacities for the Government.

Two crucial regulatory matters are: merger policy and the determination of consumers' tariffs.

#### MERGERS AND COMPETITION POLICY

Since 2000, several merger attempts have been blocked by the Government or the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission). In 2000, Unión Fenosa tried to take over Hidrocantábrico, but the Government followed the recommendation of the Tribunal de la Competencia (Competition Court) and disapproved the merger. Unión Fenosa and Hidrocantábrico were then, and still are, the third and fourth companies by share in the generation market, respectively, but much smaller than the two leaders Endesa and Iberdrola. Whilst the CNE did not establish fundamental barriers to the operation, the Competition Court did not approve the elimination of an independent aggressive competitor from the market like Hidrocantábrico because it increased the collusion opportunities in the sector (among other factors, going from four to three competitors) without creating a producer that could genuinely compete with Endesa and Iberdrola. Nevertheless, an analysis of the unilateral effects using a simulation with a Cournot model indicates that the increase of symmetry among companies due to the merger (by increasing the capacity of the merged company towards that of the two leading companies) would increase the total surplus (welfare) in relation to the *statu quo*, in spite of the decrease

from four to only three competitors. The analysis of coordinated effects only indicates a potential increase of the collusion possibilities in off-peak periods due to the greater symmetry among companies, in addition to the loss of an aggressive competitor. In summary, the competition analysis only gives weak support to the recommendation of the Competition Court, followed by the Government, since the reliability of the simulation of the unilateral effects is greater than that of the coordinated effects, and in these last ones only under certain circumstances conditions that ease collusion occur.

In the same year 2000, the merger of Endesa and Iberdrola was attempted with an ambitious disinvestment plan that liberated a capacity equivalent to that of Iberdrola and allowed the creation of two new companies. Nevertheless, the disinvestment conditions imposed by the Government (in mix of generation, distribution, asset sales management and CTC) were too strict for the parties to be willing to go on with the merger. It must be emphasized that in generation it would have been possible to disinvest the equivalent capacity of Iberdrola and create three or four approximately symmetrical companies (in addition to Unión Fenosa) with the result of an improvement in the total surplus (unilateral effects) due to the increase of symmetry among the companies, except for the larger one. Also, a decrease in collusion possibilities would have been obtained due to the increased asymmetry between the largest company and the other companies.

In 2003, Gas Natural tried to take over Iberdrola, but the operation was blocked by a veto from the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) after observing the risk of rent transfers from the regulated activity to the free market, distorted incentives for the merged company to invest in gas expansion, and financial stability in the investments in the regulated sector. The economic rationality of the operation was based on the convergence gas-electricity, since, as already mentioned, gas is the fuel of cutting-edge technology, the combined cycle power stations. The competition authority and the Government did not make any statement on the forecasted disinvestment plan due to the withdrawal of the project.

In 2005, Gas Natural initiated an unsolicited takeover bid for Endesa and the Government approved the operation after considering the favourable recommendation of the Comisión

Nacional de Energía (CNE, National Energy Regulatory Commission) and the unfavourable opinion of the Tribunal de la Competencia (Competition Court). In these decisions, the boards of the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) and the Tribunal de la Competencia (Competition Court) had divided votes. Endesa argued before the European Commission so that the operation would be considered at the EU level and examined in Brussels, but the decision of the Commission, extraordinarily delayed for over two months, was negative. The approval of the Government was subject to the conditions of maintaining investment plans, disinvestments in the electricity and gas sectors (the merger project already contemplated assets sales to Iberdrola), as well as other measures to encourage competition in the commercialisation phase in gas and electricity, given the overlapping of Gas Natural and Endesa's distribution networks. At the beginning of 2006, E.ON initiated a takeover bid, competing with that of Gas Natural, which was authorised by Brussels. However, at the moment the takeover is paralyzed by court rulings in response to Endesa's claims.

To sum up, the major attempts to restructure the sector and the functioning of the market for corporate control have been blocked. This has prevented — up to now — to follow the general trend of convergence between the electricity and gas, and also Spanish companies from being suitably prepared for an integration phase of the European electricity market and the energy market in general. In particular, it has been impossible to take advantage of merger proposals to establish a market structure more conducive to competition.

#### TARIFF AND RETAIL MARKET

In Spain, all consumers can choose their supplier and can keep the regulated tariff that corresponds to them (at least until the beginning of 2007; and until 2010 for those with high-voltage). The tariff — established by a Government administrative procedure, independently of the expected evolution of costs — has regulated how much the consumers pay and how much the companies receive. The influence of the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) in the setting of the tariff has been

insignificant. It has been an economic policy instrument to control inflation, possible in conditions of moderate energy prices, low interest rates, and the existence of excess capacity. When separating the consumers' payment from the production cost a tariff deficit can be incurred, as has happened, when the above conditions change. At the same time, neither the appropriate price signals are sent to the consumers, nor are the incentives to manage the demand provided. In spite of the possibility of changing to another supplier, 80 percent of consumers have the commercialising company as distributing company as well. Inertia, informative asymmetry in favour of the distributor, and the interference of the regulated tariff are the factors that explain this situation.

## 7. Conclusions

The introduction of competition in generation and commercialisation in the electricity sector poses great challenges. This is due to the combination of the attributes of electricity and electric networks, as well as to the characteristics of the supply and demand of electricity.

The balance of the liberalisation process in Spain is mixed. On the one hand, the results in terms of prices and the assurance of supply are in an intermediate position among the developed nations. Spain has a sophisticated wholesale market, the transmission phase has been vertically separated with the reduction of the large electricity companies' participation in Red Eléctrica de España, S.A. (REE), and a competent regulator of the energy sector has been established. Nevertheless, the concentrated market structure — inherited from the privatisation process —, an insufficient capacity of interconnection with France and the failure to take advantage of merger proposals to generate a competition-prone market structure, have created a potential market power problem. Also, the systematic blockade of all restructuring initiatives in the sector, preventing the development of the convergence between gas and electricity, for example, raises concerns on the capability of the Spanish companies to compete in the future integrated European energy market. On the other hand, the Comisión Nacional de Energía (CNE, National Energy Regulatory Commission) has not had its role as independent

regulator sufficiently reinforced: it has not had sufficient power to influence or determine the criteria for tariffs and has not been very active in the supervision of the development of competition in the market. The liberalisation has remained half-finished because the maintenance of a 'political' regulated tariff — insensitive to costs — as well as the compensation for the transition to a competitive system have distorted the operation of the wholesale market. A consequence of this has been that the retail competition and forward markets have not developed, and the consumers have not received the appropriate price signals.

Regulation must be stable and consistent in order not to add uncertainty and to ensure long-term investments, as well as to reinforce the role of the market — instead of trying to supplant it — and avoid possible collateral distortion effects on competition. The challenge is, simultaneously, to allow effective competition in retail and wholesale markets for the consumers' welfare, and allow the restructuring of the sector to guarantee the companies' productive efficiency and international competitiveness.