Structure, Functioning and Regulation of the Spanish Electricity Sector. The Legal Framework and the New Proposals for Reform

Francisco Javier Ramos-Real
Eduardo Martínez-Budría
Universidad de La Laguna

and

Sergio Jara-Díaz
Universidad de Chile

10.1 Introduction

An electrical system consists of a series of distinct stages: generation, transmission, distribution and supply (merchandising) of electricity services to the end-users. The traditional organisational model assumes, implicitly or explicitly, the extension of a natural monopoly condition from some of these stages to others. This is a consequence of the presumptive existence of strong, vertically-integrated economies. On the other hand, an increasing number of studies have proposed the vertical disintegration of the sector, suggesting that the common ownership of the different stages of the electric sector should be replaced by the introduction of competition wherever possible. These ideas have been developed within the context of a critique of the traditional control structure, characteristic of natural monopolies, which has been emerging in the industrialised world since the 1980's. The emphasis has now shifted towards the internal efficiency of the companies involved, and to uncovering those faults in the regulatory system which do not allow the product to be obtained at minimum cost.

In this paper, we study the structure, operation and regulation of the Spanish electricity system from 1983 to 2000. This system reflected that the general trend of reform was operating in Spain in 1983. The basic aim of the regulation was to ensure both the recovery and adequate financial return on investments made in the sector at a time of economic crisis. Furthermore, the regulatory system was particularly concerned with introducing incentives as a means for efficiency. The sector began a period of transition from a traditional system of control towards competition in generation and merchandising in 1997.

This paper is organised as follows: in section 2, the structure, functioning and regulation of the sector from 1983 to 1996 is analysed. The modification and improvement process, the basic principles of regulation, the companies financial returns systems, and their influence on the behaviour of companies, are described. In section 3, we summarise the main improvements proposed in 1997. Finally, in section 4, we present the most important conclusions which can be drawn from the study.

10.2 Structure, Functioning and Regulation of the Spanish Electricity Sector between 1983-1996

The structure and operation of the electric sector after the implementation of modifications to the system in 1984, along with the financial returns system operating in the companies until 1996, meant a great change, which had important economic consequences for the Spanish electricity industry[1]. We shall now describe the operation of the Spanish electricity board during that period.

1. This regulatory framework was in effect, in fact, until 1997 when the Electricity Act of 27 November 1997 came into effect, as the directions needed to apply the Ordering of the National Electricity System Act passed in December 1994 were never developed.

The Spanish electricity sector[2], until 1996, operated as an integrated system. The transmission of electrical power and the short term management of the capacity for generation were in the hands of an independent entity operating under the name of Red Eléctrica de España (REE) or Spanish Electricity Network. The power generation needs for the entire network were defined by the National Power Plans (Plan Energetico Nacional, PEN). Distribution, for the most part, was the responsibility of large companies vertically integrated with generation; these companies were responsible for the supply within certain geographic regions and had the exclusive right to do so. These companies were integrated into the sector's managerial group UNESA[3].

Figure 10.1, is a simplified flowchart showing how the system works. The UNESA companies transfer their production to the transmission network. This power plus the balance arising from international transfers, form a pool where the distributors obtain electrical power to distribute to the consumer. The operational features that are peculiar to the Spanish network are in the transmission stage, which operates and is managed independently of generation and distribution.

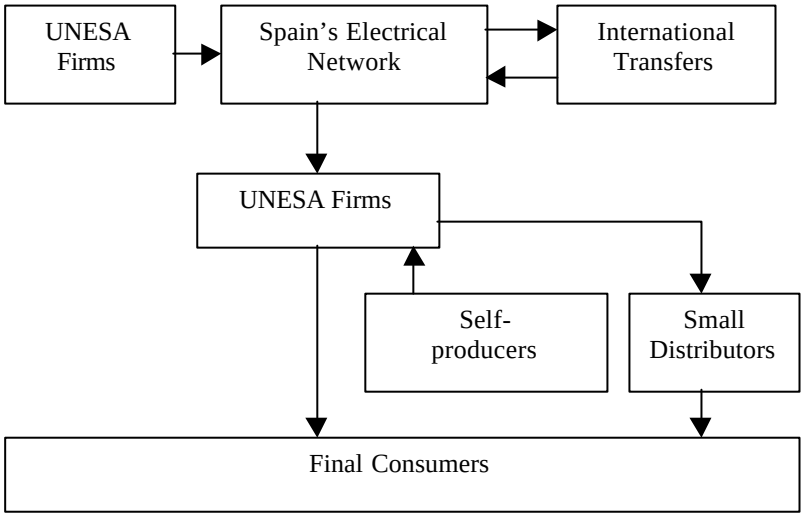

Figure 10.1. Simplified Operations of the Electricity System in Peninsular Spain

2. We shall be looking only at the mainland's electricity system as the non-peninsular companies such as GESA in the Balearics and UNELCO in the Canaries operate as complete cycle systems independent of the electricity network on the mainland.

3. Furthermore, there are some small distribution companies that acquire power generated by UNESA companies and resell it to the consumer at the end of the chain. Likewise, there also exists a series of so-called "self-producers" who produce electricity for their own industrial

In 1996, the companies that constituted UNESA accounted for 88,9% of the gross production of energy and more than 90% of the distribution. UNESA was made up of ten vertically integrated companies, operating as regional distribution companies. Furthermore, a great proportion of generation was consolidated in the parent-company ENDESA , which acted only at the supply stage and which has been a public owned company for some time now. The production structure of the companies forming UNESA in 1996 is showed in Table 10.1.

Table 10.1. Production by UNESA Firms in 1996

Generation.	Mill.Kwh.	%
Hydroelectric	37.694	24,1
Fossil-fueled	62.640	40
Nuclear	56.329	35,9

Source: UNESA Annual Reports

Regarding the installed capacity, the UNESA companies account for 92.65% of the total. The structure is shown in Table 10.2.

Table 10.2. Power installed in UNESA firms in 1996.

Generation.	**Power installed MW**	**% of total**
Hydroelectric	16.547	36,4
Coal	10.925	24,1
Oil	8.065	17,8
Oil-Gas	2.355	5,2
Total fossils-fueled	21.345	47,1
Nuclear	7.498	16,5

Source: UNESA Annual Reports.

The generation field shows great diversification in the source of the energy. Compared with other countries, the Spanish electricity industry is characterised by a high proportion of hydroelectricity. However, there are important differences between the structure of installed capacity and the production structure. The role of coal and nuclear power in production is much higher than in capacity.

In the 1990's a rapid process of concentration took place thanks to various mergers which gave the ENDESA group (allowing for the absorption in 1996 of FECSA and SEVILLANA) 52% of the generation and 40% of the distribution

processes and who sell the excess to the electricity companies who, in turn, are obliged to acquire this power at prices set by the legislation. They are also obliged, under the same terms, to buy up the power from independently produced renewable energy sources.

market. The second group, IBERDROLA, holds a generation quota of 29% and 38% for distribution. The third and fourth producers, Union Fenosa and Hidrocantábrico, have 13% and 6% in generation and 15% and 5% in distribution, respectively.

10.2.1. The Reform Process and the Basic Principles Regulating the System's Operation (1983-1996)

The regulation until the end of 1996, which had been in effect since the early 1980's, had arisen in response to the sector's financial crisis. This crisis was the result of large investment programmes that started after the oil crisis in the 1970s. In an attempt to regulate the situation, government intervention increased during this period, setting a pattern based on negotiations between the companies and the government. In May 1983, an agreement was signed between the main companies in this sector and the Administration. The regulation and legal ordering of the Spanish electricity sector was set by law 49/84 of December 26th, which dealt with the unified administration of the sector. The Stable Legal Framework (Marco Legal y Estable, MLE) set by Royal Decree 1538/1987 regulated the economic environment in which companies should operate. The general outlines defining the Spanish regulatory framework during the period studied were three: centralised planning of the electricity systems by means of National Energy Plans, the unified control of generation and transport, and the setting of standard rates for the entire country.

The agreement made the National Network and the company, public-owned for the most part, responsible for running the Spanish electricity system. The aim of this move was to ensure optimum efficiency, to maintain the National Network, and to promote international transfers of energy. The basic running practices were regulated by law 49/1984 of December 26th. On the 28th of January 1985, Red Electrica de España S.A. (the Spanish Electricity Board) came officially into existence, and assumed the controlling role.

The second additional clause of law 49/1984 established the need for approval of a general plan for the sector regarding the transfer of assets by the Ministry of Industry and Energy, aimed at achieving greater financial-economic equilibrium as well as power equilibrium. The previous unbalance was a consequence of dissimilar investments made by the different companies in response to the oil crisis. In 1985, the negotiations regarding the transfer of assets between the main electricity companies developed and came to an end. These negotiations lasted throughout the period of 1983-1996.

10.2.2. Unified Management and Central Planning

The National Energy Plan (PEN) 1983-1992 considered, for various reasons, paralysing the construction work on five nuclear power stations being built at that time. An order from the Ministry applied an extra charge to the price of electricity in order to finance this moratorium. Simultaneously, a plan was set up, whereby the construction of coal power plants was sped up and the work on oil-gas power plants was also paralysed. The existing Oil-Gas power plants should be used to cover the peak hours demand. REE decided on the extensions to be made to the

distribution network, allowing no newcomers and keeping up the local monopolies. In accordance with the aims of the PEN this network extension was carried out by these monopolies. When growth overlapping the cahtment areas of two local monopolies occurred, the Government assigned it to one of the distributors.

The centralised running of the Spanish electricity sector is in the hands of REE. REE decides which power plants should operate, according to the so-called order of merit, which means the increasing order of variable costs. The system of operation aimed to reduce to an absolute minimum the supply costs while maintaining them within limits set by general criteria regarding safety and energy policy[4]. The policy of unified running is carried out within a structure whereby companies involved in the generation and distribution stages, and the one parent-company ENDESA (specialised in power generation) work hand in hand. Therefore, power transfers during each timetable block become necessary so that the production planned in each company's power plants, plus the balance of exchanged power, coincides with the demand.

The assignment of energy transfers, as well as its cost, took place through a pool formed by energy surplus from firms with excess capacity, since the REE programme assigned them a production that exceeded their market necessities. To the surplus of each firm, a marginal cost was assigned equal to that of the energy delivered at the highest marginal cost. From these reference values, a weighted average price was calculated with the marginal costs of all the firms' surplus. This is the price that is taken into account to calculate the standard cost[5] of transfers. In the case of firms whose variable cost was larger than that of the pool, it was supposed that they deliver energy at this price and buy again at the new average price of the resultant pool.

In Table 10.3 we summarise the reform process in the period 1983-1997.

Table 10.3. Summary of the Reform Process

Year	Event	Development
1983	Agreement convention signed between firms	Revision of the PEN
1984	Law 49/1984 for integrated operations of the sector	Compensation system begins.
1985	_____	Development of assets exchange. January: creation of REE
1987	Legal and Stable Framework, Royal Decree 1538/1987.	
1988	_____	Development of the new compensation system of firms and MLE compensations.

4. In this respect it is worth mentioning the restrictions resulting from quotas and limitations on the use of national coal.

5. In this way no firm covers its demand with energy whose variable cost is more expensive than that of the pool. This mechanism allows afterwards the compensation system that needs to identify standard costs of trade for each firm.

1994	Approval of Law Ordering the National Electricity Sector (LOSEN)	Proposal of creation of independent system.
1997	Approval of New Electricity Law	End of traditional regulation system of the MLE.

10.2.3. The rates and Financial Return Policy of the Legal and Stable Framework (MLE)

The guidelines regulating the economic and financial returns in the sector was finalised at the end of 1987 with the promulgation of the Stable Legal Framework, which came into effect in January 1988.

Although the mechanism of the MLE is rather complicated, it basically implied that a company involved in the generation and/or distribution stages received payments equal to its standard cost. The standard costs are a value set across all the companies involved in generation and distribution, based on both the fixed and variable costs, and including sufficient return for invested capital. Income from sales, according to the methodology of the MLE, should cover the cost of the service of the entire system. This cost is calculated by finding the aggregate of all the recognised standard costs. Furthermore, a series of extra charges is added to the rates.

The Ministry of Industry and Energy, by means of the General Board of Energy, determines the standard values following particular economic and energy parameters which define each concept involved in the cost. The costs that make up the total expenses to be included in the final prices are:

1. Fixed costs of generation. These cover the investments in the infrastructure and include the depreciation charges and returns on the assets.
2. Operation and maintenance costs. One part is considered fixed and another part variable according to the power installed or energy generated.
3. Variable costs arising from fuel used and transfers. This includes the costs of fuel and other fungible materials used in generation, the net cost of transfers with the pool and other transfers such as that with self-producers and international contracts.
4. Fixed and running cost in distribution. Levels of tension above or below 36KV are distinguished. In lower levels of tension this is calculated by means of the quantity of energy circulated. For higher levels, the type of investment is used for fixed cost and physical entities are used for running costs.
5. Merchandising costs. This comprises activities related to the upkeep and development of the market. This is standardised through the number of contracts and by the power turnover in tensions larger than 1 KV.
6. Cost of distribution and generation structure. This embraces costs that are not linked to productive activity and financial expenditures of clients' accounts.
7. Miscellaneous costs. This includes the quota of the Spanis h Electricity Network and other surcharges in the invoice like the nuclear moratorium, the quota of the Office of Compensation (OFICO), basic stock of uranium and research funds. These surcharges together represented 14.38% of the electrical tariff in 1989 and 13% in 1996.

The Compensation System.

There is just one rate for the whole country, but the different companies have both different generation equipment and different market structures, which lead to different distribution costs and different revenue per kwh sold. The acknowledged income of the companies is not the actual sum paid by clients, but the total of the acknowledged standard costs instead. Therefore a compensation system between companies becomes necessary in order to balance out the final income received by each firm with the sum of its recognised costs.

A more detailed description of the calculation of inter-firm compensation is provided by Rodríguez and Castro (1994). The compensation system aims to even out each company's unit cost regarding generation (generation compensation) and, on the market side, the idea is to even out each company's average income as compared with the average income of the system (market compensation). The algebraic sum of the compensations equals zero.

Generation compensation is calculated as follows:

$$Z^i_g = (CF^i_g + \frac{CV^i_g}{1+\pi}) - \sum (CF^i_g + CV^i_g) \frac{D^i_g}{\sum D^i_g} + \beta_i \frac{\pi}{1+\pi} \sum CV^i_g \qquad (10.1)$$

where:

Z^i_g: generation compensation of the firm i.

CF^i_g: standard fixed cost of generation of the firm i.

CV^i_g: standard variable cost of the generation of firm i.

D^i_g: demand of the firm i in Plant[6]

π: percentage which is taken from the variable costs to reward firms with the lowest variable costs.

β_i: coefficient of efficiency in variable costs of the firm i.

The first two terms of equation (10.1) reflect the difference between the company's average generation cost and the system average, multiplied by the company's market share. The parameter π represents the percentage of the variable costs not considered in the compensation. This creates a fund (generation margin) to be redistributed among the companies, according to the coefficient β_i[7]. The third term in equation (10.1) may be interpreted as the share of the generation margin due to each company's subsystem, based on technical efficiency. Thus those companies who contribute to the reduction of the cost of the service are rewarded.

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6. This is the sum of the energy generated in Plant from all the installations of each firm. This is standardized by a coefficient of their own consumption so that any saving in real consumption means an additional profit for the firm in question.

7. This coefficient is calculated as being inversely proportional to variable costs.

Market compensation includes compensations for distribution costs, income from sales, and other revenue.

$$Z_m^i = \left(\frac{D_d^i}{\sum D_d^i}\sum I^i - I^i\right) - \left(\frac{D_d^i}{\sum D_d^i}\sum C_d^i - C_d^i\right) \qquad (10.2)$$

where:

Z^i_m: market compensation of the firm i.

C^i_d: fixed and variable costs of distribution and commercial management of the firm i.

D^i_d: demand in Plant, obtained in each tariff from the consumption of the subscribers for the firm i.[8]

I^i: collects the net sales turnover and other incomes from each firm.[9]

The first component in equation (10.2), if positive, means that the company receives less revenue than is due them, according to the average for the sector[10]. The second component has a similar meaning to the generation compensation in that the company is compensated for the difference between its acknowledged cost and the average for the distribution sector.

We can sum up the basic principles that make up the MLE as follows (Rodríguez and Castro, 1994):

a) The administration determines for each firm a standard cost CS, according to its generation equipment and distribution structure.
b) Each firm conducts its production activity according to the directives from the managing firm from the integrated operations, incurring a cost C, and receives from sales in its market an income R thus obtaining a gross profit:

   GB=R-C.

c) Each firm receives a compensation (T) equal to the difference between the standard costs and their income (or payment if negative):

   T=CS-R.

d) The net profit received (GN) by each firm will be:

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8. The invoiced energy declared in each tariff is multiplied by a standard coefficient of losses to convert it in demand in Plant. In this way each kwh not invoiced suppose a loss for the firm. The standard coefficient is the average value of the system for which will coincide with that of generation for all the system but not for each individual firm.

9. Gross income is converted into net income by detracting the charge for invoicing valid in each period and adding amounts received from the Office of Compensation (OFICO) for special tariffs such as off-peak electricity provision.

10. To give more detail, payment made by way of compensation is calculated , tariff by tariff, by comparing the average income of the company with the average income of the whole system. If the result is positive, the company keeps half, and if it is negative, it loses half. Thus the standardisation of revenue could encourage companies to increase their sale prices.

GN = GB+T = (R-C) + (CS-R) = CS-C

The regulating method supposes that the aim of each company is to maximise the difference between standard and real costs. Regarding the productive efficiency of the system, it may be stated that the reduction of production costs is favoured, as any reduction in real costs benefits the company.

Effects of the MLE on Firms' Behaviour

On many occasions, the MLE has been classified as a case of yardstick competition, where the fixing of the price in any company is decided according to the average cost across the other companies. As Schleifer (1985) suggests, any improvement in efficiency in the sector becomes a modification of the 'yardstick'.

Rodríguez and Castro (1994), consider that calculation of the individual standard cost figures should be carried out in an *ad hoc* manner, arising from a specific price index (the Consumer Price Index, the Industrial Price Index or an average of the two). For this reason, the standard cost should be taken as a maximum price and updated periodically, independent of the average efficiency of the sector[11].

Kühn and Regibeau (1998) consider that the regulation system of the MLE has brought about incentives to reduce costs, but they point out a series of aspects which could have a negative effect on the behaviour of the companies during this period, against the intentions of the regulator. On one hand, the incentives for cost reduction were not applied equally to all types of costs. In the case of REE, such incentives did not even exist as the standard cost established was to be the same as its income. On the other hand, the aim of maximising the difference between real and standard costs can be achieved by increasing the standard costs after complicated negotiation between the government and the companies.

Crampes & Laffont (1995) studied, within the framework of the theory of incentives, how the MLE's financial return system created incentives for efficient behaviour. The standard costs CS and real costs CR for each company i are separated into fixed F and variable V:

$$CS^{i}_{average} \equiv \frac{CS^{i}}{q^{i}} = cvs^{i} + \frac{FS^{i}}{q^{i}}$$

$$CR^{i}_{average} \equiv \frac{CR^{i}}{q^{i}} = cvr^{i} + \frac{FR^{i}}{q^{i}}$$

The standard values depend, above all, on the company's decisions regarding investments, but they also depend on the regulator's assessment of the company's fixed and operative costs. A variable e_1 will be used to refer to the effort made by the management regarding equipment or technical issues ex ante, e. g. the choice of power plant size, which is beyond the control of the regulator. The variables of

11. The classic *price cap* formula allows for price increases equal to the rate of inflation minus a factor X which reflects the average growth of productivity of the companies.

the real costs depend on e_1 and on the appropriate use of the equipment, thus we will call e_2 the variable associated with the appropriate use of equipment or technical effort ex post. Although the management does not decide on the price, they do have a say in the decision of supplying to each area of the market. As each company sells different products[12], we can consider e_1, e_2 and e_3 as vectors. The optimising model that explains the behaviour of the company may be expressed as follows:

$$\max_{e1,e2,e3} \sum_r \left(CS_r^i - CR_r^i\right) - \psi^i(e_1, e_2, e_3))$$

$$= \sum_r \left[(cvs_r^i(e_{1r}) - cvr_r^i(e_{1r}, e_{2r}))q_r^i(e_{3r}) + FS_r^i(e_{1r}) - FR(e_{1r})\right] - \psi^i(e_1, e_2, e_3))$$

where r represents each type of tariff and ψ the disutility or cost of the effort.

The technical decisions depend on e_1 and e_2, such that the first order conditions of the problem are:

$$q_r^i\left(\frac{dcvs_r^i}{de_{1r}} - \frac{\partial\, cvr_r^i}{\partial\, e_{1r}}\right) + \frac{d(FS_r^i - FR_r^i)}{de_{1r}} = \frac{\partial\, \psi^i}{\partial\, e_{1r}} \tag{10.3}$$

$$-q_r^i \frac{\partial\, cvr_r^i}{\partial\, e_{2r}} = \frac{\partial\, \psi^i}{\partial\, e_{2r}} \tag{10.4}$$

The condition (10.4) shows that the marginal disutility of effort in variable costs coincides with the marginal profits derived from the reduction in variable costs. So, technical effort *ex post* leads to minimise costs through the compensation mechanism. From condition (10.3) it cannot be deduced that the technical effort *ex ante* is adequate, that is, the marginal disutility of effort in fixed costs does not coincide with the marginal profits derived in fixed cost reductions, for this it must be that:

$$-\frac{\partial\, CR_r^i}{\partial\, e_{1r}} = \frac{\partial\, \psi^i}{\partial\, e_{1r}} \tag{10.5}$$

We can deduce that the incentives derived from the regulatory framework can produce bias in investment decisions. As regards market effort the first order condition is:

$$(cvs_r^i - cvr_r^i)\frac{dq_r^i}{de_{3r}} = \frac{\partial\, \psi^i}{\partial\, e_{3r}} \tag{10.6}$$

12 Considering the quantity sold in each tariff as a separate product.

This shows that the company is interested in concentrating its sales at those rates where the cost is the lowest in relation to the standard value defined by the regulator. The company does not study social welfare, measured in terms of the individual surplus of each type of consumer; nor does it find a solution to the secondary problem presented by a competitive balance whose solution would be:

$$(pr_r^i - cvr_r^i)\frac{dq_r^i}{de_{3r}} = \frac{\partial \psi^i}{\partial e_{3r}} \qquad (10.7)$$

Crampes & Laffont highlight a further series of facts derived from the regulation and financial returns system, which we detail below:

1. Firms are remunerated on the basis of the equipment available encouraging the management to declare in total avoiding selective declarations.
2. The MLE determines two complementary mechanisms to correct inefficiencies. The first was a share of the margin on variable costs (generation margin) to redistribute it between the firms according to the coefficient β. This produces an incentive that approximates efficient behaviour *ex ante* although limited by the lack of weight that this margin has since it does not influence fixed costs.
   The second mechanism is to try to create incentives for the adequate behaviour of the market effort. For this the company only recognised half of the difference in each tariff between the average sector income and that of each firm. The advantage of this mechanism allows consideration of the prices as a decision variable so that firms internalise the market structure.
3. The system resembles yardstick-competition but taking as a reference standard costs instead of the sector average. These standard costs take into account the sector's heterogeneity and avoid the production of huge profits or losses that would result from the pure application of a pure reference system.
4. From the dynamic point of view efficiency can be affected in different ways. The revision of standard costs is achieved in a discretional way[13] so that firms fear that real reductions of costs mean reductions in standard values and consequently a possible decrease in future income. This can discourage firms from investing appropriately.
5. A difficult element for the regulator to control is product quality. This is not easy to distinguish in the case of network investment if the aim is to expand or to improve the service. In the regulatory framework in force, if firms tend to minimise cost against quality, other firms will not be remunerated appropriately so that this is a problem of overall regulation. In the MLE this is a personalised problem in the context of the revision of the standard costs.
6. Another problem emerges because the system does not provide incentives to save energy since a co-ordination mechanism does not exist to reduce production. The compensation system in fixed costs means that firms have equipment ready to produce, and the mechanism of variable standard cost ensures a safe profit for any quantity that is produced.

13 . Apart from the factor depending on the Consumer Price Index or the Industrial Price Index, it is not known exactly what other adjustments are involved in the calculation of standard costs.

The Evolution of Productivity

There may be certain reservations regarding incentives for efficiency present in the terms of the MLE, but the majority opinion is that considerable improvements have been made in the technical efficiency and profitability of the sector.

Kuhn and Regibeau (1998) point out certain indications that would support this opinion. For them, the prices of electricity in Spain are below the average of the surrounding countries in the majority of consumer categories. This fact, along with the high profit level in Spanish generation companies would suggest that the price of generation in Spain is somewhat lower than in many other industrialised countries.

The report produced by UNESA (1997) also tells us that, during the period that the SLF was in effect, –and more specifically from 1988-1995– utilities achieved increased efficiency which was transferred to the consumer in part through the drop in electricity rates in real terms (10.6% during that period). Equally, the report points out that the rates in Spain, both for domestic and industrial use, have been kept below the average of the main European countries.

Arocena and Rodríguez (1998) assess the consequences of the regulation on productivity in coal-based electricity generation during the period 1988-1995, using the Malmquist productivity index. The unit of analysis is the generating group and capital; work and fuel are factors considered. The main conclusions of the paper are the following:

- Productivity increases are observed for all groups during these years apart from 1989 to 1990. The annual average rate of productive growth between 1988 and 1994 is 3.2%. This productivity index can be broken down into the rate of technical efficiency and technical progress.
- The rate of technical efficiency shows its greatest increase the first year (4.7%) and the last year (2%). The first case can be explained by the immediate effects of the MLE coming into effect. In the second case, the explanation is to be found in the improvements brought into the running of the system thanks to the competitive environment created by the new Law Ordering the National Electricity System (LOSEN) in 1994.
- The rate of technical progress shows a moderate increase, except between 1991 and 1992, when it was 5.6% as a consequence of the environmental measures which required large investments and improvements in the thermal efficiency of the plants.
- This index should be modified, bearing in mind the effect of the rate of installed energy used, given that the greater use of fixed factors could explain, in part, the improvements in productivity. The new index shows improvements each year, with an average of 2.8% between 1988 and 1994.

Ramos (2000) has carried out a study of the evolution of productivity in the Spanish electricity sector, by means of the estimation of a multiproduct long run cost function, where the unit studied is the company. The results suggest that productivity has improved almost 20% during the period of 1989-1996, with an annual rate of 2.62%. The most significant improvements occurred between 1989 and 1993, during the first years of the MLE.

The improvements in productivity have, for the most part, been expressed as increased profit for the companies, as the adjustment of price rates did not take into account the possible gain in productivity.

10.3. Regulation Reform in the Spanish Electricity Sector from 1997

In this section we will deal with the most significant aspects of the renewal process undertaken in the Spanish energy sector, starting in 1997. Fundamentally, it has been a case of developing the system from a traditional control model to a market model based on the generators and on the final demand for energy. We shall detail the views and opinions of different writers about the process underway, specifically the analyses by Kühn and Regibeau (1998), Marín (1999), and Rodríguez (1999).

The reform of the regulation directed towards the market was discussed initially in 1993, and was started by the promulgation of the Law Ordering the National Electricity Sector (LOSEN) in 1994. This legislation permitted the gradual introduction of competition in the sector without totally dismantling the system established by the MLE. The idea was to create a competitive energy market parallel to the existing system. The National Commission for the Electricity System (CNSE), which was a regulatory institution independent of the Ministry of Industry and Energy, was created although the latter retained the power of final decision. The problems arising from the system designed by the LOSEN, in combination with the change of government in 1996 accelerated the reform process. The companies reached an agreement with the government at the end of 1996, called the Electricity Protocol, which provided the basis for the new Electricity Law of November 27th, 1997.

The Electricity Law of 1997 (LSE)

The 1997 Electricity Law (LSE) extended the liberalisation brought about by the LOSEN and created the electricity wholesale market, with an initial transition period to deregulate prices and re-structure the market. This liberalising process has to meet the standards laid out in European Guidelines 96/92 EC on the community rules governing the internal energy market. The liberalising process suggested in the EU guidelines has been, however, slower than that followed in Spain.

The final aim is to completely deregulate generation and merchandising. Transmission and distribution, networks by definition, will continue to be regulated, as will be the tolls applied for their use. The law only specifies, within the areas of these regulated activities, that the tolls should be related in some way to the costs and should be uniform across the State. Third party access to the network will be guaranteed, assuming available capacity.

The agents who will take part in the electricity market are the generators who produce the electricity, the companies whose high-voltage wires carry the

electricity, the distributors who serve the non-eligible customers, the customers eligible because of the volume of energy they consume, and the new marketing companies. The market will be overseen by two operating companies: the system operator who physically manages both the network and the delivery of power, and the market operator who directs the energy transfer system to determine the market price. The CNSE will inspect the system.

A company with sufficient financial and technological means will be allowed to enter the generation segment; any agent with sufficient financial resources will be able to sell energy to any type of consumer. The income of these marketing agents will depend solely on the contracts signed with their customers. The prices obtained by the generating companies will be decided by the market or bilateral contracts.

The spot market functions as a double auction where there are sales and purchase offers on the demand side. A regulatory surcharge, known as the power guarantee, is added to the spot market price, to avoid insufficient supply. The initial amount was fixed at 1.3 pesetas/kwh and corresponds to all the capacity available during the 4,500 peak demand hours of a year. At the end of 1998, the average charge was around 1.26ptas/kwh.

The merchandising segment will be liberalised gradually, so that, in year 2001, all high voltage customers will be able to choose their supplier, (which represents 50% of the power consumed). The customers who cannot choose freely will still be within the influence area of particular distributors; the rate will be set by the government, and will be standard across the country. This rate will be based on the permanent costs of the system (operators and CNSE), the purchase price of the electricity, distribution and transmission costs, and two types of financial returns from transition costs: the nuclear moratorium and the expenses incurred by transition to competition.

The regulating regime imposes some type of vertical separation of activities in relation to property and accounting regulations. The operators will be private companies. Companies and consumers operating on the spot market will be allowed to participate, though with a maximum limit to the number of shares. The companies taking part in any of the regulated activities will not be allowed to participate directly in the non-regulated areas. Although there may be a legal separation, the presence of holding companies operating in both fields will be permitted. The accounting regulations require keeping separate accounts in the case of firms with shares in more than one regulated area; this is required from those companies that only participate in the areas subject to competition.

The Nuclear Moratorium and the Costs of Transition to Competition (CTC)

The payments to the firms affected by the nuclear moratorium have been extended indefinitely. The companies receive compensation by means of a surcharge on the price of electricity, which cannot exceed 3.54% of the income obtained. The Transition to Competition Costs (CTC) are aimed at compensating the loss of capital of the companies constituting the MLE on December 31st 1997, due to the introduction of competition. This payment will be expressed in pts/kwh and will reflect the difference between the average revenue obtained by these companies

under the previous system and that obtained in the spot market. If the average price on the market exceeds 6 ptas/kwh, the difference will be deducted from the discounted value of the compensation. These payments will be made during a period of ten years and will increase the utility rates.

The discounted value of the compensation will not exceed 1,988,561 million pesetas (including the incentives related to coal). These coal-related incentives have been a load on the sector, since the national coal cost is twice as much as coal on the international market. These incentives will last throughout the transition period, as the law explicitly permits the authority's interference in the rules so that the use of national sources of primary energy may reach 15%.

Controversies

The CTC has been very controversial since the start of the liberalisation process. The calculations noted in the Protocol were widely criticised by the CNSE and consumer associations. For some existing assets, the price obtained on the market may suppose a loss in value (the remuneration through market price being lower than the costs acknowledged under the previous remuneration system); however, the opposite may also occur[14]. The controversy has reappeared with the claim on part of the CTC (worth 1.3 billion pesetas) by the power firms, a claim backed by the government. There is a debate regarding the exact final quantity of money to be paid. Moreover, the European Commission's intervention considering the CTC as a disguised grant system to favour national companies, places the whole process in question.

The opinion that the sector is highly concentrated on a few firms seems fairly unanimous, as is the opinion that these companies operate following the vertical integration structure in the area of generation and distribution. The privatisation of ENDESA could have been carried out segregating the assets beforehand, but the opposite route was chosen. The government allowed ENDESA to acquire other companies and create a larger group. Rodríguez (1999) has pointed out that this can be analysed from two different angles. In the national context, and bearing in mind the scarce capacity for international connection, the level of concentration could be considered excessively high for the market to function efficiently. If, on the other hand, we consider the international market and adopt a mid-term and long-term perspective, any policy of de-concentration could have an influence on the future competitive ability of the Spanish companies. Ramos (2000) noted the existence of moderate economies of vertical integration between generation and distribution and, to a greater extent, the presence of economies of horizontal integration between the different types of generation and distribution. The

14. One illustrative example is that of the Austrian regulator. In Austria, as in Spain, hydroelectric energy is remunerated according to costs, independent of when it was generated. However, liberalisation allows it to be remunerated at the price of the pool, which at peak times is much higher, providing extra revenue for the companies. The Austrian regulator considered that this improvement in the remuneration system more than compensated for the CTCs and so did not award any further compensation. Each European country has followed different criteria in their liberalisation process, regarding this type of compensation for transition costs. In England and Wales, for example, it has been incorporated into the company sale price.

existence of savings obtained from undertaking different activities together should be kept in mind when restructuring the sector, but it is not incompatible with the vertical disintegration of the sector as long as the markets allow effective competition in each area.

Another problem is the distortion that the CTC can bring about in the spot market. The control of the spot market price by the same companies that receive the CTCs generates unethical incentives. The established companies could try to keep the prices in this market down, in order to claim maximum compensation and, at the same time, make it difficult for other companies to enter the field of generation. Rodríguez (1999) notes that the average price of the market in 1998 has settled to around 6 pts/kwh, thus maximising the income derived from the market without affecting the maximum quantity recoverable through the CTC.

The regulatory effort is insufficient to introduce competition into the sector in Spain, according to Kühn and Regibeau (1998). We now detail the opinion offered by these authors, who compare the Spanish situation with that of the United Kingdom. Basically, they analyse three issues: the concentration of the generation field, the slow liberalisation of merchandising and the high level of vertical integration.

1. In the United Kingdom, the high level of concentration on the supply side allowed only a few companies the control of marginal supplies on the spot market; the gains obtained in productivity were not felt by the consumer. In Spain, only two companies (ENDESA & IBERDROLA) control the majority of the assets that determine the marginal price of the market: the coal power plants and the hydroelectric plants. The problems of market structure are worsened by other characteristics of the Spanish sector. In Great Britain, the larger companies' share began to deteriorate with the introduction of combined-cycle technology. In Spain, there was a greater capacity surplus in the sector and the primary energy source, natural gas, is practically a monopoly. These companies make agreements with the existing generators to keep new firms from entering the field.
2. The extended period of transition for the liberalisation of the merchandising allows the distribution monopolies already in existence to set up barriers protecting themselves from competition in distribution. The manipulation of the final price for consumers is possible given that it is set by an implicit agreement between the government and the companies. Although the government and the firms have committed themselves to annual price reductions of 3%, the high margins in generation allow greater price reductions.
3. The high level of vertical concentration does not seem appropriate, nor does the delay in the freedom to choose the supplier by final consumers. These two circumstances could make the price hardly vulnerable to competition pressure, given that the same companies will bid on demand as distributors and/or merchandising agents.

Finally, the regulating institutions have been designed to give MIE greater control over the CNSE. Moreover, the government has certain prerogatives for the fixing of tolls and for other important decisions.

10.4. Conclusions

The organisation structure of the electricity sector between 1983 and 1996 drew together the features of a vertically integrated and a non-integrated structure. The transmission stage operated separately from the generation and distribution stages, and its management was also separated from those two stages. The regulation system assumed that the aim of the company was to maximise the difference between standard and real costs, in order to favour the reduction of production costs, given that any decrease in real costs supposed an increase in gains for the company. The studies carried out by different analysts suggest that, while the Stable Legal Framework was in effect, the electricity companies achieved increased productivity mainly thanks to management improvements, which had positive repercussions on the efficiency of the companies.

The reform of the sector that got underway in 1997 had as its goal the complete deregulation of the areas of generation and merchandising. The new scheme for operating and regulating will be developed gradually. Some experts express specific doubts about the future of the liberalisation, basing their opinion on the point of departure of this process. The factors that encourage this opinion are largely focussed on four issues: the low capacity for international connection, the excessive concentration in the area of generation, the slow liberalisation of the marketing area, and a high degree of vertical integration.

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