Electricity and the Single European Market

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A description of the principal features of the electricity industries in the 12 EEC countries is followed by an examination of their likely development within the framework of the Single European Act. An analysis of their structure, organization and institutional framework reveals profound differences among the 12 systems. Given the distortions created by the influence of public authorities on industry decisions, one can understand the difficulties involved in opening up to competition an industry accustomed to working on a national basis. The possible consequences of the introduction of a single energy market, envisioned for the beginning of 1993, are illustrated using four scenarios. It is proposed that the most likely scenario is a progressive convergence of national industries with a limited increase in competition, the latter operating by way of improved information flows and price comparisons.

Cet article a deux objectifs: illustrer les principales caractéristiques de l'industrie électrique des 12 pays de la CEE et discuter l'évolution possible de cette industrie dans le cadre de l'Acte Unique. L'analyse de la structure, de l'organisation et du cadre institutionnel montre qu'il existe des différences profondes entre les systèmes électriques des 12 pays. Si à cela s'ajoute la distorsion introduite par l'influence des pouvoirs publics sur les décisions de l'industrie, on comprend qu'il ne sera pas facile d'ouvrir à la concurrence une industrie habituée à fonctionner sur des bases nationales. Les conséquences possibles de l'introduction d'un marché unique de l'énergie, prévu pour le début 1993, sont esquissées à l'aide de quatre scenarios. Toutefois la préférence est donnée à une progressive convergence des industries nationales et à des formes limitées d'ouverture à la concurrence, surtout par la comparaison et la transparence.

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The electricity industry has developed throughout Europe behind the shelter of national barriers. As elsewhere in the world, electricity supply attracted the attention of public authorities in European countries because it is a natural monopoly and plays such an important role in the economy. This involvement of national governments has helped to assure that the particular institutional, economic and geographic characteristics of each country are evident in the structures created to supply electricity.

These structures have never been completely stable, but their change has been more or less rapid at different times. At present the electricity industries of the EEC countries have to cope with change on two fronts: the transformation of the conditions under which they operate within each country and the creation of the single European market.

Changes in the nature of electricity supply and demand and changing relations between the electricity industry and the public authorities form the backdrop to present trends and influence the scope for developing a more European electric power industry. This paper presents some scenarios within which the single market might be accommodated or resisted. To provide background for these scenarios, Parts 1-3 contain

a survey of current change and a description of the main features of each national situation. The scenarios are then described in Part 4.

1. From Public Service to Industry

Electricity supply in all countries has always involved strong public intervention. Three forms have predominated: regulation, nationalization and concession. These have shaped the evolution of the industry in specific ways in each country, in terms of the objectives pursued and the sharing of power between the centre and the periphery.

The perceived reasons for intervention by public authorities have been numerous and diverse:

- the rational use of public land and highways;
- protection of consumers against a "natural" monopoly;
- the collection of revenues to fund other activities;
- the need to guarantee a reliable service;
- increased efficiency through coordinated management;
- control over a powerful, private economic lobby; and
- the socialization of rents from natural resources (e.g., from hydroelectric power).

Some of these aims are compatible with each other, others call for some sort of compromise; some are common to all countries, others are quite country-specific; and objectives have changed with time. Until recently, one could argue that there existed a common denominator in the attitude of the state in all industrialized countries: the electricity industry has been viewed more as a public agency rather than as a regulated supplier in the private sector.

This attitude can be explained by various factors. Electricity has been viewed as unique: a natural monopoly that seldom enters into competition with other goods and services[1] and one of the most homogeneous and stable products in existence. There may be differences in its quality, in regard to voltage, modulation, frequency and continuity, but this cannot be compared with product differentiation in other industries. Above all, quality differences in electricity are difficult to sell.

An examination of innovation in electrical plants and equipment over the long term indicates that the electricity industry itself has not played a key role. This was less the case in France, the United Kingdom and Italy, which all had a major electric utility with research centres and capability in engineering. But even in these countries the main objective consisted in guaranteeing supply, an attitude nurtured, if not imposed, by the context in which they operated. Demand for electricity was increasing spontaneously at such a rate (one recalls the widely-believed rule-of-thumb — "10-year doubling") that producers had, above all, to develop their supply capacity in order to cope with it. In many countries, innovation came only from the national and international electromechanical engineering industry and from public research laboratories.

This situation began to change in the 1970s. After the stability of the previous period, these changes were initially thought to be temporary adjustments; today, they are generally believed to be permanent.

The first structural change was the slowdown in the growth rate of demand. Despite some exceptions (notably in the UK), there had indeed been a doubling of electricity consumption every 10 years in the 12 present member countries of the EEC over the period 1950-1973 (see Figure 1). However, from then on there was to be a break in the growth rate. Substantial temporal and spatial differences make the elaboration of any new "10-year rule" impossible. In order to support growth in demand, the solution was increasingly to be found in the promotion of an aggressive marketing strategy: the aim was to win a share

1/ Of course, this refers to attitudes that prevailed as the industry grew. The use of electricity for competitive, essentially thermal purposes, developed well after its captive uses. Moreover, there has been uneven development of its competitive uses in the various countries under study. In some, like France, electricity supply has entered the competitive era; in others, like Italy, it remains almost exclusively oriented towards captive uses.

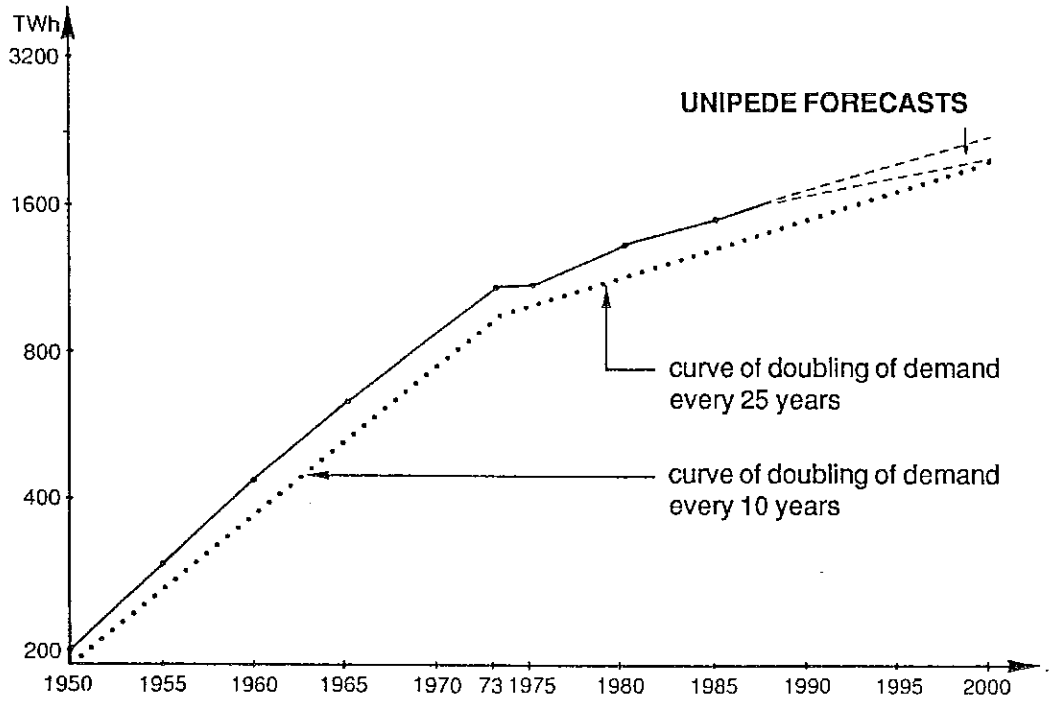

Figure 1: Gross electricity consumption in the 12 member countries of the EEC (TWh)

in the competitive market and encourage innovations related to electricity use. This called for an ability to control costs, as well as to develop marketing and industrial partnerships, all of which had been unheard of in the past.

However, just as the slowdown in the growth of demand was reducing the gains arising from the economies of higher-density consumption, changes also took place on the supply side. These changes made the job of the electrical utilities more difficult:

- the unit cost of power plants stopped falling, and in fact began to rise, despite the increase in the size of the installations;
- more interaction with governments and citizens began to develop (planning began to be called into question in numerous countries and substantial disparities emerged);
- the share of construction and contracting costs in the overall cost of power plants began to rise in relation to that of industrial equipment; and
- in many countries the choice of the type of plant ceased to be a straightforward one-answer affair.

These conditions had varying effects on electric utilities. Nuclear power provides an interesting example. In France, the standardization policy of Electricité de France and continuing support from successive governments have made it possible, to a certain extent, to stick to the initial timetable and the planned costs of the nuclear program. In West Germany the much more lukewarm support from the political parties, and the more decentralized process for obtaining planning permission, have prevented the timetabled construction of nuclear power plants. In the UK the difficulties of the nuclear program, which date back to the 1960s, were due to the organization of the system for constructing the plants, rather than to technological choices. In Spain, there were financial difficulties, related to planning mistakes and costing errors arising from changes in regulations. In Italy, inability to re-

spect the timetable and initial cost estimates for the construction of nuclear power plants has been due to the use of the strictest American standards and the way these standards have evolved. This and the recent halting of the nuclear program have come about because of the inability of the political mechanism to make nuclear power and its risks acceptable to the public and, as a result, to provide stable prospects for a nuclear commitment.

In the past, electric utilities were expected to give the highest priority to guaranteeing continuous service. Efficiency mattered, but the issue was obscured by productivity gains that spontaneously accompanied growth in electricity consumption. In the last 15-20 years the operating environment has changed and the industry has become riskier. Within this context, however, managers of the various European utilities have had differing degrees of control over the environment within which they worked due to cross-national differences in policies, institutional arrangements and political support. This variation in external conditions, along with differing managerial decisions, explains the growing differences in economic performance across European electric utilities. While differing performance does not raise any particular difficulty so long as domestic electricity markets remain more or less closed, problems can arise if markets are opened to outside competition. The single market is thus likely to reduce the scope for manoeuvre. A common challenge will be faced, under the particular conditions within each country: to achieve the shift from a forward-looking but quiet public administration to an efficient industry striving to deal with the uncertainty of a larger, more open environment.

2. Electricity Demand and Supply in the EEC: The Present Situation

The 12 member countries of the Community differ greatly in terms of industry size; level and density of population; degree of economic development; and climate. There are also differences in political systems and in the organization of electricity industries. Although it would be difficult to provide a complete survey of these differences, several physical indicators can summarize the essential character of the separate markets. Certain organizational and institutional factors, important in determining performance and the scope for change, will also be noted.[2]

2.1 Size

The size of the electricity industries in the EEC countries varies greatly. There is a 100:1 relation between the leading electricity producer and consumer (Federal Germany) and the country at the bottom (Luxembourg) (see Table 1). Measuring size in terms of domestic consumption (which corresponds fairly well to output, except in the case of Luxembourg), the 12 countries can be divided into three groups:[3] the five biggest, from West Germany to Spain, which consume at least 100 terawatt-hours (TWh) per year; an intermediate group of five, from the Netherlands to Portugal, whose members consume between 20 and 100 TWh/yr; and finally, Ireland and Luxembourg, which both consume less than 20 TWh.

The size of an electricity system is important because it affects the economies of scale and coordination that can be achieved. Minimal size for achieving efficiency is smaller for electricity distribution than for electricity generation. The latter varies with the type of generating facility involved. There is no convincing empirical study that estimates the exact minimal size for the electricity industry; however, if we accept the findings of a study by Christensen and Greene (1976) for the US, we may consider that the minimal size for an efficient system is 4000 MW. From this

2/ In addition to the data sources and the specific studies cited below, some useful sources of information on the European electricity sector are Lucas (1985), Ninni and Rullani (1985), Ngheim and Bechet (1988), Helm and McGowan (1987), Holmes (various years), and yearly reports from UNIPEDE and UCPTE.

3/ Using the Herfindhal index and its inverse to measure the existing degree of concentration (see Scherer, 1980, pp.58-59), the 12 countries correspond to only six protagonists of an equivalent weight (H=0.17; n=5.97).

Table 1: Size of Electric Power Systems in the EEC in 1987

	Net production (TWh)	Net consumption (TWh)	Installed power (GW)	Peak Load (GW)
Federal Germany	392.7	380.5	95.5	65.1
France	360.7	303.4	97.6	62.3
United Kingdom	282.5	268.3	67.6	55.3
Italy	190.9	192.6	56.6	35.5
Spain	126.8	112.0	41.2	21.4
Netherlands	66.0	66.6	17.4	11.3
Belgium	60.0	53.3	14.1	9.6
Denmark	27.5	27.9	8.5	6.0
Greece	27.9	25.9	8.1	4.4
Portugal	19.4	19.8	6.8	4.1
Ireland	12.2	10.7	3.9	2.4
Luxembourg	1.0	3.9	1.2	0.6
EEC	1567.6	1464.9	418.5	278.0

Sources:
United Nations/EEC, *Bulletin annuel de statistiques de l'énergie électrique pour l'Europe* (various years).
Unipede — Programmes et perspectives électriques, 16th ed.
UCPTE, *Annual Reports* (various years), for the peak load.

Note: The peak load of the EEC is the sum total of the maximum loads and not the instantaneous maximum load.

standpoint, all the EEC countries, apart from Luxembourg, are large enough to have at least one electric utility that achieves scale economies. We will return to this assumption when we discuss the structure of the electricity industry.

2.2 *Demand*

The second source of difference among EEC countries concerns the level and structure of demand. Given the economies that can be obtained from demand density and from sales of high and extra-high voltage power, electricity systems in countries where demand is greatly concentrated, or where industry has the largest share in overall consumption have an advantage.

With a density of demand (see Table 2) of 0.2-0.3 GWh/km^2, four countries (Ireland, Greece, Portugal and Spain) appear to have a relative disadvantage. Three countries (France, Denmark and Italy) are in an intermediate position with a density of 0.6-0.7 GWh/km^2. And five countries (the UK, Luxembourg, Germany, Belgium and the Netherlands) have an advantage in terms of density of consumption, at 1.2-1.8 GWh/km^2.

Data on the shares of the various voltage levels in overall demand (the relative weights of which influence transport and distribution costs) are unfortunately not available for all the EEC countries. However, the structure of consumption by type of consumer provides some indication of this: industry is supplied with high and extra-high voltage, while households and the tertiary sector almost always use low voltage. In five countries industrial consumption accounts for between 42% and 51% of the overall total, which is close to the average of 46.6% (see Table 2). Italy, Belgium, Spain and especially Luxembourg are above that average. On the other hand, in the UK, Ireland and Denmark, industrial electricity consumption is relatively lower than in the rest of the Community. Their systems must, other things equal, put up with higher distribution costs.

Two user-industries are generally of prime importance in industrial consumption: steel and chemicals. In this respect, Luxembourg is an ex-

Table 2: Electricity Demand in the EEC in 1987

	Unit demand			Structure of demand (%)			
	Consumption per head (kWh/inhab.)	Household consumption per head (kWh/inhab.)	Consumption per km^2 (TWh/km^2)	Industry	Chemicals & Steel Industries*	Households	Other uses
Federal Germany	6220	1650	1.59	49.0	19.3	26.5	24.5
France	5447	1710	0.60	44.8	14.2	31.3	23.9
United Kingdom	4716	1650	1.19	37.1	10.4	34.8	28.1
Italy	3344	840	0.70	55.3	23.0	25.0	29.7
Spain	2884	665	0.25	54.5	17.3	22.8	22.7
Netherlands	4532	1170	1.70	47.2	19.2	25.5	27.3
Belgium	5376	1785	1.82	53.4	25.6	33.0	13.6
Denmark	5438	1795	0.70	29.9	8.0	32.9	37.2
Greece	2599	855	0.21	44.7	8.8	33.0	32.3
Portugal	1910	470	0.24	57.2	11.9	24.2	18.6
Ireland	3020	1170	0.17	37.5	10.5	39.6	22.9
Luxembourg	10605	1620	1.51	62.5	45.0	15.3	22.2
EEC	4540	1315	0.69	46.9	17.1	29.0	24.1

*The amounts shown in this column are included in the amounts shown under "Industry."

Source: Data elaborated from the *Bulletin annuel des statistiques de l'énergie électrique pour l'Europe*, United Nations.

treme case; these two industries account for more than three-quarters of its industrial electricity consumption. In most of the other countries steel and chemicals comprise from one-third to one-half of industrial consumption. This percentage is correlated with the share of industry in overall electricity consumption. Electrical systems in countries with large steel and chemical industries are materially affected by their performance.

2.3 *The Structure of Generating Facilities*

Table 3 shows how generating facilities in the EEC differ according to the type of primary source or fuel used. After the first oil shock some efforts were made in Europe to increase the capacity for generating electric power from renewable sources. The results have not been substantial. The contribution of solar energy at present and in the foreseeable future is almost non-existent; wind energy, although much more promising, has only just begun to be developed; and Italy is the only country involving itself with the growing use of geothermal energy. That leaves only the most traditional of renewable energies: hydraulic power.

With the exception of pump storage plants, hydraulic power installations were built long ago in most countries. Thus initial investments have now been written off and those countries well endowed with hydraulic resources now benefit from substantial rents. There is, however, little scope for further development, since large unexploited hydraulic resources are to be found only in Spain and Portugal. The share of hydraulic power is highest in Portugal, where electricity consumption remains low. France, Spain and Italy have made the most of their hydraulic power, where it accounts for 18-25% of output. Greece and Ireland come next, followed by countries in which the share of hydraulic power is low (West Germany) or very low.

With the exception of Portugal, thermoelectric generation is largely predominant. Thus the choice of fuel and the type of plant constitutes one of the most important factors determining system performance.

Table 3: Electricity Generation in the EEC in 1987

	Generating capacity (GW)			Output (%)				
	Hydraulic	Nuclear	Thermal	Hydraulic	Nuclear	Conventional thermal		
						Solid	Liquid	Gaseous
Federal Germany	6.7	18.9	69.9	5.2	31.5	51.5	2.9	8.8
France	24.3	49.4	23.9	20.0	69.7	7.4	1.4	1.5
United Kingdom	4.2	7.2	56.2	2.2	17.1	69.1	8.5	3.1
Italy	17.9	1.3	36.9	23.5	0.0	15.3	46.8	14.4
Spain	15.1	6.5	19.6	21.8	31.2	40.3	4.6	2.1
Netherlands	-	0.5	16.9	-	5.1	26.5	4.7	63.7
Belgium	1.3	5.5	7.2	2.4	66.3	20.7	3.3	7.2
Denmark	0.1	-	8.4	0.8	-	94.2	3.9	1.1
Greece	2.1	-	5.9	10.6	-	67.5	21.7	0.2
Portugal	3.2	-	3.6	46.8	-	27.7	25.3	0.2
Ireland	0.5	-	3.4	9.0	-	52.4	20.5	18.1
Luxembourg	1.1	-	0.1	54.7	-	2.6	0.9	41.7
EEC	76.5	89.3	252.0	11.7	32.3	37.7	9.9	8.2

Sources: United Nations/EEC (1988) *The electric power situation in the ECE region in 1987.*

Note: The heading "Hydraulic" includes geothermal and wind energy.

France and Belgium have opted exclusively for nuclear power development; Federal Germany, Spain and the UK also have a nuclear commitment, but a more moderate one. The rest of the EEC has not followed suit. Italy, which had announced an ambitious nuclear program, gradually abandoned its initial plans and decided to close down its three existing nuclear plants after a referendum late in 1987. Almost everywhere nuclear programs have had to take into account varying degrees of social opposition.

Thus the choice facing electric utilities is not entirely free. Their ability to limit costs depends very much on the social and institutional context. Even the choice between different sorts of fossil fuels for conventional thermoelectric generation, or between domestic and imported fuels, is not left entirely to those who generate electricity. Four countries generate a substantial share of their electric power from domestic solid fuels (coal or brown coal): the UK, Federal Germany, Spain and Greece. In each of these, for reasons which have more to do with social considerations than narrowly defined energy planning, the political authorities intervene directly or indirectly to encourage the use of domestic coal.

In the UK, as a result of pressure from the miners' union, the government used its jurisdiction over the nationalized industries (Robinson, 1988, pp.99-100) for at least 30 years to impose restrictions on the coal imports of the Central Electricity Generating Board (CEGB) and British Steel. Prime Minister Thatcher's attitude on this issue has been radically different. Nonetheless, the CEGB is still restricted in regard to coal imports.

In Federal Germany, state intervention has been much greater. A "contract of the century" was agreed upon between the electric utilities and the coal companies in 1980 as a result of pressure from the public authorities. This agreement, formalized in law, stipulates that the electricity companies must take a certain quantity of coal each year. To avoid infringing EEC rules, this quota is applied to coal coming from anywhere in the Community, though in reality only German coal (essentially that produced by Ruhrkohle) benefits from the arrangement. Since the latter is more expensive than imported coal,

the corollary to the agreement has been the so-called *Kohlenpfennig* tax. This tax accounted for 7.5% of the price/kWh in 1987, following the fall in international coal prices.

A similar situation is to be found in Spain, although there are no statutory arrangements and the impact is more limited. Their approach to offsetting higher relative costs is more complex and less transparent than in Germany. The electricity consumer bears most of the burden, either explicitly in the form of a compensation fund to which the electricity companies contribute, or in a less obvious way because the price of domestic coal is fixed above the real import price. Taxpayers pay the difference by covering the losses of the coal industry.

The Greek situation is less clear. The incentive for the national electric utility to make any real choice between domestic brown coal and other imported fuels is compromised because it is also responsible for mining lignite.

In the Netherlands, despite diversification plans concerning coal and nuclear power, natural gas is by far the most commonly used fuel. This has been made possible by the existence of abundant reserves of natural gas, sold to the electricity companies by Gasunie at below market prices as a result of pressure from the public authorities.

In fact in all countries with relevant domestic resources there is a tendency to use them in electricity generation whatever their real production costs may be. The only electricity producers that can choose their fuels freely are those operating in countries which either have no relevant resources, or where resources are far too uncompetitive with other fuels to be considered. Even in these cases, there may be substantial political or environmental constraints that reduce the scope for choice, especially in regard to the use of nuclear power or coal.

Those countries that have opted for conventional thermoelectric production have one feature in common: they are all increasingly building multi-fuel plants. This is a response to substantial fluctuations in fuel prices in the past and, to a lesser extent, to fears that environmental problems may make it difficult to rely on one or another fuel.

2.4 *Trade*

Finally, EEC electricity industries can also be distinguished in terms of their trade with neighbouring countries. For both technical and political reasons, the balance between supply and demand for electricity is achieved first at the local level and then at the national level. International trade in most cases only provides marginal adjustments in balancing supply and demand. The limited extent of such trade can be seen by using three indicators for each EEC country: the degrees of openness, specialization and dependence in electricity trade.

Taking the total of imports and exports over home consumption as an indicator of the degree of openness, in no country (with the exception of Luxembourg) did this exceed 25% in 1987 (see Table 4). For the EEC as a whole the rate is about 11%, of which 70% is accounted for by trade within the Community, 18% by trade with Switzerland and the rest by trade with neighbouring non-member countries. However, the degree of openness has steadily grown; it was 5.2% in 1970 and 7.6% in 1980. The smallest countries (Belgium, the Netherlands and Denmark), so long as they are connected to other developed electric systems, are the most open.

Regarding specialization in electricity trade, France is the only country to be strongly oriented towards exports. On the other hand, Italy, Portugal, the UK, Greece and Denmark are highly import-oriented, with a trade deficit of at least 50% (see Table 4).

The most important trade indicator is the degree of dependence on outside sources. This is measured by the trade balance in electricity over total domestic consumption. Among the countries that are overall importers, only two exceeded the 10% mark in 1987 (Portugal and Italy), and two others exceeded 5% (Denmark and the Netherlands). Among surplus countries, only France has a substantial export figure — in 1988 it was more than 10% of home consumption.

This overview of the European situation confirms that, in general, trade in electricity remains limited. For some countries however, it is no

Table 4: Trade in Electricity in the EEC in 1987

	Foreign trade (TWh)			Indicators[1] (%)		
	Exports	Imports	Balance	Openness	Dependence	Specialization
Federal Germany	18.3	22.0	-3.7	10.2	1.0	-9.3
France	38.4	8.7	29.7	14.3	-9.0	63.1
United Kingdom	0.0	11.7	-11.7	4.0	4.0	-99.4
Italy	1.7	24.8	-23.1	12.6	11.0	-87.4
Spain	4.7	3.2	1.5	6.4	-1.2	19.5
Netherlands	4.4	8.0	-3.6	17.8	5.2	-29.3
Belgium	7.8	5.7	2.1	23.9	-3.7	15.8
Denmark	1.8	4.2	-2.4	20.1	8.0	-40.9
Greece	0.4	1.0	-0.6	5.0	2.1	-45.9
Portugal	0.7	3.7	-3.0	19.7	13.4	-69.1
Luxembourg	0.5	4.0	-3.5	112.1	92.7	-80.2
Inside EEC	62.2	61.0	1.2 [2]	7.8	-	-
Outside EEC	16.5	36.0	-19.5	3.3	1.2	-37.3

Source: United Nations/EEC, op.cit.
Notes:
1/ The indicators are defined as follows: openness = (X+M)/C; dependence = (M-X)/C; and specialization is defined according to the Balassa index = (X-M)/(X+M), where X represents exports (+), M represents imports (-) and C domestic gross consumption, including network losses.
2/ While this overall balance should equal zero, it does not because of a lack of consistency in the trade data provided by France and Germany.

Table 5: Utilization Times of Public Thermal Generating Plants, excluding Luxembourg (hours/year)

	1970	1975	1980	1985	1987
Federal Germany	4968	4122	4046	3403	3364
France	4012	4033	4141	1400	765
United Kingdom	3596	3317	3578	3862	4046
Italy	3894	4281	4521	3601	4197
Spain	3796	3559	4634	3168	2831
Netherlands	3774	3203	3285	2980	3029
Belgium	4621	4218	4734	2626	2488
Denmark	4262	2949	3638	3191	3293
Greece	4653	4045	4714	4553	3080
Portugal	2318	4645	3700	2598	3380
Ireland	4329	4432	3596	3897	3325

Source: Data based on the *Bulletin annuel des statistiques de l'énergie électrique pour l'Europe*, United Nations (various years).

longer marginal. Will trade become even more important as the electricity industry develops? It is useful to consider four categories of electricity trade before answering this question.

(1) *Trade resulting from shareholdings in power plants abroad*: This currently represents a substantial part of the overall total. Cross-border cooperation between electricity generation companies is now a reality. This could develop in the future if the political and institutional context is conducive to it.

(2) *Trade resulting from complementarity between peak time hydroelectric power and thermal energy (mainly nuclear)*: This category has a role to play, in particular with the help of non-EEC member countries — Switzerland and Austria in central

Europe and Norway in the north. There is, however, little technical scope for developing such complementarities any further.

(3) *Trade aimed at compensating deficits in generating capacity*: There is a more secure future for this type of trade. In theory such deficits should not exist, since the electricity companies are charged with providing adequate generating capacity. At present the only notable and deliberate exception to this rule is Luxembourg. In general, it is difficult to determine from available data exactly when an electricity company begins to have a surplus or a deficit in its supply capacity. In simple terms, however, observing that the average utilization rate of thermal plants in the EEC has not exceeded 5000 hours/year, we assume that a global load factor of 60% corresponds to a need for imports. Based on this hypothesis, no EEC country in 1987 entered the "pre-emergency zone" (defined as a utilization rate between 50 and 60% of thermal power generating facilities). If, however, the UK, Portugal and Italy were to eliminate all their electricity imports, the first two would enter the zone and Italy would be using the thermal power generating facilities of ENEL (Ente Nazionale per l'Energia Elettrica) at more than a 60% rate, based on data for 1988.[4] Italy has thus become structurally dependent on imports. It can only escape from this dependence if the rate of growth of electricity demand slows and the power plants now under construction are completed without too much delay.

(4) *Trade based on surplus capacity and a variable cost advantage*: Countries in this situation may be willing to export at any price above their variable cost. Bargaining establishes a price between the buyer's and the seller's marginal cost. At the present time in the EEC only nuclear energy can provide such an export base for electricity. Assuming a running time of at least 6000 hours/year for nuclear plants, the potential for such exports exists only in France, which has an as yet unexploited reserve estimated at around 50 TWh/yr (see Table 6).

Table 6: Utilization Times of Nuclear Generating Plants (hours/year)

	1970	1975	1980	1985	1987
Federal Germany	6369	3476	4786	7821	6535
France	3124	6032	4026	5864	5090
United Kingdom	6655	5820	4526	7035	6710
Italy	5437	6557	1452	5277	38
Spain	5588	6331	4498	4823	6105
Netherlands	7082	6046	7547	7234	6616
Belgium	4455	3556	7148	6025	7230

Source: Data based on *Bulletin annuel de statistiques de l'énergie pour l'Europe*, United Nations.

Note: Denmark, Greece, Portugal, Ireland and Luxembourg have no nuclear plants.

3. Industry Organization and Its Institutional Environment

Electricity supply is generally divided into three segments: generation, transport and distribution. These may be carried out either by the same operator or by different companies. Because it is impossible to stock electric power, close linkages are necessary and complete vertical integration is a quite common form of organization. This does not, however, prevent interaction with other companies through networks that connect centres of production and consumption in different countries.

There is almost complete vertical integration in France, Italy, Greece, Portugal and Ireland. In each of these countries a state-owned utility is in charge of generating, transporting and distributing electricity. In the UK the electricity industry is also state-owned; however, different approaches have been developed in Scotland and Ireland, on the one hand, and England and Wales on the other. In Scotland and Ireland the three state-owned electric utilities are integrated, whereas in England and Wales the Central Electricity Generating Board generates and trans-

4/ These calculations are based on 1987 statistics because the national data are incomplete after that point. For Italy the import balance rose from 23 TWh in 1987 to 32 TWh in 1988, without the available electricity capacity having changed.

Table 7: Weight of Self-Producers in Electricity Production in the EEC (%)

	1970	1975	1980	1985	1987
Federal Germany	33.0	20.8	19.2	15.3	15.2
France	20.0	15.8	13.6	8.8	8.2
United Kingdom	8.7	7.5	6.5	5.8	6.3
Italy	24.3	20.7	17.3	12.9	12.6
Spain	6.8	4.4	2.9	2.7	2.9
Netherlands	15.8	11.2	10.1	12.5	12.3
Belgium	31.2	22.8	6.9	5.0	4.6
Denmark	2.1	2.4	1.4	0.9	1.3
Greece	4.3	3.5	1.1	1.5	1.9
Portugal	6.8	5.9	6.0	6.2	6.3
Ireland	2.8	2.3	1.4	1.4	1.5
Luxembourg	57.8	65.7	71.4	41.9	41.5
EEC	19.7	14.4	12.0	9.6	9.5

Source: Data based on *Bulletin annuel de statistiques de l'énergie pour l'Europe*, United Nations.

ports electricity which is then distributed by 12 Area Boards.

There is less vertical integration in the other countries, but it is nonetheless the dominant mode of organization, even when there is substantial private participation in the industry (Spain and Belgium) or when public intervention is locally or regionally based (the Netherlands, Germany and Denmark).

3.1 *Concentration and Coordination in Generation and Transport*

Generation accounts for approximately 50% of capital investment and 75% of annual operating costs. Transport is of only limited importance in terms of costs. However, when it is also taken to include dispatching (i.e., the management of generating facilities), it plays a considerable role in supplying electricity at the lowest possible cost. Thus transport and dispatching interact closely with generation.

As might be expected, there is a very strong correlation between the degree of vertical integration and industrial concentration in the EEC electric industries. But, even in the countries where vertical integration is not highly developed, there is a very high degree of concentration at the generation level. Only in Germany, Spain, the Netherlands and Denmark are there more than five companies producing 90% of the electricity (see Table 8). On the other hand, the number of producers who account for the rest of the total output may amount to several hundred.

For a long time electricity generation was considered to be a textbook case of economies of scale (plant size, number of production units per site, dimension of construction programmes, etc.). While this has been modified by the experience of the last 20 years, the existence of a size efficiency threshold for a producer has not been called into question, although its level has not been precisely defined. Neither does the degree of industrial concentration tell us whether the companies involved have achieved a minimum efficient scale. If we look at the past trends towards industrial concentration (in particular in Germany and the Netherlands), it can be seen that certain electricity companies have managed to survive for historical reasons only (Helm and McGowan, 1987). On the other hand, it is difficult to ascertain whether certain larger companies have reached the minimum size or not.

Indeed in some countries, electricity companies — because they are not large enough to employ certain production techniques — have resorted to creating joint subsidiaries in order to build power plants and this makes the above problem even more difficult to resolve. If we also take into account the joint shareholdings of private capital in several different companies, industrial concentration is even greater than it appears, even in the five countries that have no state-owned enterprise.

Rational management of the network and of existing generating facilities is a problem in all of these countries. Three groups can be distinguished according to the solutions they have found to this problem:

(1) countries in which an economic dispatching system has been set up by the electricity companies;

(2) countries in which such a system has been or is being introduced by the state; and

(3) countries in which there is no economic dispatching — the coordination that exists is left up to the companies themselves.

Belgium belongs to the first category. Under

Table 8: Companies Involved in Electricity Generation and Transport in 1987[1]

	Production[2]	Share of foremost producer	Transport[3]
Federal Germany	35	35	DVG
France	1	94	EDF
United Kingdom	2	88	CEGB, SSEB, NSHEB, NIES
Italy	1	95	ENEL
Spain	8	20	RED, Electrica
Netherlands	12	15	WEP
Belgium	3	41	CPTE
Denmark	12	n.a.	Elsam, Elkraft
Greece	1	94	PPC
Portugal	1	98	EDP
Ireland	1	90	ESP
Luxembourg	n.a.	n.a.	CEGE DEL, SOTEL

Source: Data based on company reports and various other sources.
Notes:
1/ Companies excluding self-producers; 2/ number of producers who account for at least 90% of the production of the public services; 3/ institution or company in charge of coordinating and administering the high voltage transmission network.

the latent threat of nationalization, the electric power industry has had to develop close coordination and an economic dispatching system that reduces variable costs to a minimum, as if there were only one producer.

Spain and the Netherlands are in the second group. Since industry performance in both these countries was considered unsatisfactory, the public authorities have attempted to intervene by increasing the power of the transporter. In 1985, the Red Electrica de Espana (Redesa) was created, with a majority state shareholding of 51%. It was given responsibility for central dispatching and the development of the network. In 1987-88 a system of standard or reference prices (the so-called *Marco estable* system) was introduced; it serves as a basis for remuneration in the exchange of supplies.

In the Netherlands, the government and parliament are preparing a reform package intended to reinforce the role of the Samenwerkende Elektriciteits Produktiebedrijven (SEP) — a producer cooperative, set up in 1947. This company, which already owned the transport network, was also in charge of planning the use of generating facilities. However, it had no way of imposing its point of view about the construction of new power plants or about the way existing plants were used. When the reform is introduced, the SEP will become the sole buyer of electricity — paid according to standard costs — and will deal with long-term planning of generation and transport. In the UK the privatization program has similar aims: a single transport utility, which will also own the distribution network, will attempt to preserve the present merit order system (i.e., the systematic use of the cheapest power plants at each point in time). This system will operate alongside that of direct contracts between regional producers and distributors.

Finally, we have Denmark, and especially Germany, where there is no unique dispatching centre and no legal means of obliging companies to coordinate the development of their generating capacities. This is due not only to the structure of the industry, but also to traditions concerning state intervention in the economy. The distribution of powers between the central government and the local authorities is the main explanatory factor here. Management of the interconnected transport network is nonetheless coordinated by the Deutsche Verbundgesellschaft (DVG), in which the nine major electricity producing companies participate. However, it is by no means clear that the German electricity market is big enough to accommodate such fragmentation.

Generally speaking, the more numerous are the producers, the more coordination problems arise. This leads the public authorities to intervene so as not to lose economies of coordination, which are substantial in the electricity sector.[5]

5/ The attempt by the American political authorities to facilitate "pools" — which are inconsistent with anti-trust legislation — can be explained by the efficiency gains obtained through greater coordination. Nonetheless these pools have had great difficulty in operating properly and in remaining stable. See Joskow and Schmalensee (1983).

Inset: Self-Production in Europe

Self-producers now generate and consume slightly less than 10% of the electricity of the 12 EEC members, compared with 20% in 1970 (see Table 7). Thus their role in the European electricity industry is limited, though not completely negligible, especially in certain countries.

Self-production may be hydraulic or thermal. In the inter-war period thermal self-production became most important, since constraints on primary energy sources were not a problem. It also had an extra economic advantage, as it could be used to produce or recover heat. After World War II, the share of electricity generated by self-producers began to fall for two reasons: the decline of certain basic industries that had been major consumers of both heat and electricity (steel, chemicals, etc.) and the decline of share of industry in overall electricity consumption.

However, internal economic reasons alone are insufficient to completely explain the decline in self-production. Through substantial nuclear programs that promised cheap electricity, and relatively discriminatory electricity tariff and trade policies, the self-producers were dissuaded from renewing, and sometimes even from using their installations.* Resource prospects having now changed substantially, the decline in industrial cogeneration may be expected to slow down. And there may even be a certain revival, if national programmes based on the American PURPA model** are launched in Europe.

In this case, the self-producers could step up their sales to public distributors or even sell directly to other major electricity consumers, thus somewhat diversifying production, as in the US. All this is still at an embryonic stage, but could develop shortly, especially in those countries that have had difficulty with their nuclear program (Italy, for instance) or that already have strong industrial self-production traditions (Germany, for example, or even the UK after the privatization of the electric power industry). However, even if such trends do develop, the electric power sector will remain dominated by public utilities.

*The paradoxes of the Italian situation, which have to do with the tariff system, are highlighted by Balduzzi (1988).

**See, for example, Jaccard (1988). It should, however, also be recalled that PURPA led to some distortions and that its application has raised a certain number of problems. Moreover, the fall in fuel prices has led to a great many projects being abandoned.

However, when the intervention is not binding on the companies it may be difficult to obtain the desired results. This is why Spain and the Netherlands, and most likely the UK, believe it necessary to give a key role to the transporter, through which the public authorities might be able to bring about the desired level of coordination and competition.

3.2 *Concentration and Regulation of Distribution*

Electricity distribution is much less concentrated than its production. In most countries separate municipal distribution agencies were established or local authorities became part owners of private distribution companies. But there are also economic reasons for this difference—economies of scale are exhausted at lower output levels in distribution than in production.

At the same time, the distributors are so heterogeneous in terms of size that a very limited number of them can control the major share of distribution in each country (see Table 9). This is especially true of the countries that have a large state-owned electricity producer (France, Italy, Greece, Portugal and Ireland). The UK is an exception in this respect, in that the nationalization process resulted in the creation of 12 distributors, operating on a regional basis in England and Wales.

In the other countries (Germany, Spain, the Netherlands, Belgium, Denmark and Luxembourg), the situation is between that of the UK and countries with a single national production

utility. While it is difficult to get a clear picture of the actual degree of concentration, given the amount of direct, indirect and joint shareholding, the number of distributors appears to be higher and their respective shares of the market more balanced where production is less concentrated. Although economies of scale in this segment are small, they are far from insignificant and this explains why there has been a tendency for concentration to increase almost everywhere, and especially where private distribution companies operate. For instance, the number of distributors in Federal Germany fell from 3000-4000 in 1957 (Proefrock-Vagneron, 1979, p.111 ff.; Vdew, 1987) to around 1000 in 1987, and in Belgium from 235 in 1949 to 44 in 1987.

The monopoly power enjoyed by distributors has called for a certain measure of public control, particularly in regard to pricing. There are differing views in the 12 EEC countries about controlling rates for major industrial consumers. The latter are almost always directly supplied by the producers. They have sufficient bargaining power for them to be allowed, in some countries, to negotiate prices directly. On the other hand, the tariffs applied to small-scale consumers are monitored or fixed by the public authorities.

In practical terms, when a state-owned producer dominates the industry, it is natural that tariffs should be controlled and that they should be uniform throughout the country. Indeed, despite theoretical criticisms concerning territorial equalization of prices (Colombier and Hourcade, forthcoming), the above solution has been adopted by all the countries with a nationalized production utility. In countries with several production-distribution companies the public authorities have opted for different solutions. In Belgium and Spain there is a single national tariff and even industrial tariffs are controlled. In Denmark, the Netherlands and Germany, there is no single-tariff system. Tariff differences, which are quite small in Germany (plus or minus 10% around the average), are more substantial in the Netherlands. Moreover, in both these countries, industrial tariffs are confidential and this has been criticized by the Community Commission.

Table 9: Companies Involved in Public Electricity Distribution in 1987

	Number of distributors	Share of foremost distributor (%)
Federal Germany	627	18-20
France	215	94
United Kingdom	15	12
Italy	150	95
Spain	560	15-20
Netherlands	80 (approx.)	n.a.
Belgium	44	n.a.
Denmark	120 (approx.)	n.a.
Greece	1	n.a.
Portugal	70 (approx.)	n.a.
Ireland	1	n.a.
Luxembourg	15	n.a.

Source: Data based on company reports and various other sources.

Note: n.a. — not available.

4. What European Electric Power Market?

At present, efficiency seems to be the key word in the electric power industry. The easy productivity gains due to growth in demand are now a thing of the past and the opening of economic systems to international competition calls for an efficient electricity service.

There will, however, be no spontaneous change in the behaviour of the national electric power industries. For reasons already mentioned, the attitudes of public authorities concerning the opening of markets and the promotion of efficiency will play a major role. But it is by no means self-evident that the member countries of the EEC will arrive at a common position on the priority to be given to the market, as opposed to other objectives.

4.1 Between Nationalism and Competitiveness

A closer examination of the way the public authorities have intervened in the electricity sector would suggest that the drive for efficiency has not always been their primary objective. Many examples can be provided to back this up: the

policy of support for domestic coal production in Germany, Spain and the UK; cross-subsidization due to the pursuit of social objectives or to the need to control inflationary mechanisms in Italy and elsewhere; and support for the national electromechanical engineering industry in nuclear investment decisions in France.

Ulterior motives even play a role in the drive to remove national barriers — national interests lie behind every move. The traditional principle of self-sufficiency in electricity and the conception of electricity companies as being, above all, national enterprises have not really even begun to change. This tendency towards autarchy often includes equipment suppliers, whatever extra costs may be involved.

What could be done to maintain the trend of the European electricity market towards integration and to make the electric power industries more responsive to market constraints? Two groups would benefit most from such action: those countries with exportable surplus capacity and industrial consumers. The Commission of the European Communities (CEC) is also affected because of its interest in the success of the Single European Act. Let us consider briefly what these interested parties can do.

An interest in developing exports is not widespread, since at present it essentially concerns only France. So, in this respect, it is difficult to imagine the development of alliances that would increase opportunities for opening up the market. All the more so since the French government seems more interested in improving the market for French electricity exports than in creating the conditions for improved competition as such (through freedom of entry and movement and the dismantling of vertical integration). The problem of the French nuclear power surplus could in any case be resolved "spontaneously" if the deficit in Italy and other countries continues.

On the other hand, greater competition between electricity producers is in the interests of major industrial consumers throughout the EEC: they themselves will have to cope with stiffer competition as markets become more open. They have a great deal to gain, even in countries where the average cost of electric power is low. However, the power companies could respond to the pressure for more competitive industrial rates by resorting to cross-subsidization — i.e., by transferring expenses onto other national electricity users — thus reversing the trend that has emerged in certain countries (Wenders, 1986).

Finally, the Commission can play a role in opening up the electricity market by defining the rules that should apply to this sector. It is clear that greater integration would lead to cheaper supplies and enhanced security. In the Commission's document on the internal electricity market, the general objectives are set out as follows (CCE, 1988, pp.5-6):

> A better integrated European energy market is intended to lower the costs of access to energy. There will be a direct benefit for both the individual consumer and industry....The single market should also have beneficial effects on the structure of the community energy industry: it will lead to better use of complementarities, improvements in the cost structure and rationalization of energy production, transport and distribution activities....
>
> Moreover, a better integrated energy market represents significantly greater security of supply for all the member states. Greater interconnection of equipment will increase both solidarity between the member states and industrial flexibility. It will also increase the potential for assistance in the event of a crisis and make extra trade a possibility. The growth in trade between member states is, indeed, one of the likely results of the setting up of an internal energy market. This will tend to lower costs even more so than in the present set-up....This intra-community trade has accounted for less than 5% of the Community's electricity consumption, and, in any case, much of this has come in the form of exchanges of electricity. In this sector, despite the characteristics of electricity itself, an increase in trade based on comparative situational advantages could well have a significant impact on the average cost per kWh.

For the CEC then, there is no doubt that a single, open market must be developed in the electricity sector and that efficiency should be the criterion used to determine the rules to be introduced. This is stated quite clearly in the

Commission's defined conditions for putting all electric power consumers and producers on the same footing: tax arrangements, equal conditions of access to the financial market, technical and administrative procedures (in particular those which limit the use of transport networks), tariff-setting criteria and price transparency. But will this revival of the Community spirit in the energy field be any more successful than past attempts of the same nature? Will the Community continue to lack the necessary clout to affect the course of events?[6]

In the final analysis, there are some forces working in favour of breaking down national barriers and others that are endeavouring to hold back the movement in the various countries. In each country, these interact with the tension between those who seek efficiency and those who give priority to other social objectives.

4.2 Four Possible Scenarios

Both at home and in their dealings with the outside world, public authorities are confronted with a fundamental choice: should they favour competitive solutions or solutions based on co-operation among utilities? In the first case, it is necessary to define new Community rules that will guarantee the free play of market forces. The public authorities will have to play an active part in this process. In the second case, it is a matter of encouraging integration through the types of exchange and cooperation that the electricity companies consider to be in their interests.

Between free competition and cooperation that is planned and administered by the electricity companies, several scenarios are possible. No attempt is made here to evaluate the relative advantages of each solution for the citizens of the EEC; rather this analysis is limited to outlining the main possible or proposable scenarios and their probable evolution.

(1) An "extreme-case" scenario, involving maximal integration, could be the creation of a major European electricity monopoly. Such a solution could be justified by the economies of scale, and above all of coordination, it would achieve. It could concern both production and transport, or be limited to transport.

A single transport and production monopoly could be described as a "technocratic dream." Similarly, the separate management of the European transport network — which could have a common carriage function as well as a role in the coordination of production and in investment decision-making — is also a dream, this time a utopian liberal one. Such a solution could be conceived so as to allow greater competition between producers. Economies of coordination, especially in the short term, would be a second advantage; and economies of scale, in transport, would be a third.

Although the second proposal, the transport network monopoly, is mentioned in the EEC document, it would seem that neither of these solutions is seriously envisaged. We will therefore not examine them here.

(2) Perhaps less extreme, but nonetheless still very unlikely, would be the complete removal of national barriers, the withdrawal of measures aimed at defending national industries and the systematic encouragement of competition. In this case, one could expect a steep increase in trade within the Community, and a significant restructuring of the industry, especially in production. Of course, it would remain to be seen what conditions would have to be created, taking into account both national particularities and commonly agreed rules, in order to facilitate the operation of such a single market.

(3) Contrasting sharply with the two previous scenarios, this one could be called the "defence of the status quo." In such a scenario the principal EEC countries would aim at maintaining their electric power industries under national control, while minimizing change through the administration of concessions.

It is not particularly difficult to argue for such a solution. On the one hand, one could use the technical arguments put forward by the electric power industry itself to resist such troublesome measures as the introduction of the common

6/ This judgement about the ineffectiveness of the commission in the energy field calls for some closer examination. See Finon (1989).

carriage system or the dismantling of vertical integration. It is worth noting that, despite a possible conflict of interest, there has been some agreement in this respect between the most efficient companies (which could export if they wished) and their least efficient counterparts. This agreement has affected the debate, for the Guibal Report (CCE, 1988) endorses the validity of the arguments developed by the electric power industry without critical examination.

Moreover, from a more political standpoint, the various governments may try to hold up the process by pointing out that, for competition to operate properly, everyone should be on an equal footing. This would entail standardizing the administrative procedures concerning the implantation of power plants, safety standards, environmental standards, conditions of access to the financial markets, tax arrangements, and tariff structure and control, as well as obligations in terms of security and quality of service, etc. This list illustrates how easy it could be to resist actual change, while at the same time calling for change under some set of ideal conditions.

Is this the scenario the electricity companies prefer? If it is, then they should take into account its consequences for other interested parties, especially the major electricity consuming industries. The demands of the latter could be met if the electricity companies set their prices for industrial customers at competitive levels consistent with an open European market. However, this would mean penalizing their other customers. Nevertheless this seems a likely solution if we take into account the confidentiality that already surrounds the large industrial supply contracts in many countries, as well as government pressure in favour of special treatment for certain industries.

(4) A last scenario seems still more likely in the context of present trends. It is halfway between the two preceding scenarios: a slow evolution towards more open national electricity markets and the convergence of certain operating conditions.

There are many reasons for this being the most likely outcome. The likelihood of a single model for European electricity should be ruled out: there is too much difference in horizontal and vertical integration across the various countries for convergence to be possible through a common act of will. Moreover, pressure is at present neither strong enough nor homogeneous enough, in the absence of any political initiatives, to provoke such a convergence. Similarly, it is difficult to imagine how the electricity rate structures could be harmonized: a general Community rule would not leave enough room for the very sort of national adjustments that everybody is seeking. Even the standardization of the planning procedures for power plants would seem problematic for the time being. The administrative systems of each country are too dissimilar, and, above all, the dichotomy between written rules and actual procedures cannot be written off with a stroke of the pen.

On the other hand, convergence and integration may be easier to achieve in other fields. Standards of environmental protection would be a good example here, though even in this area national particularities cannot be completely ignored.

Similarly, interconnections between the EEC countries have already made great headway and should continue to develop. The present electricity networks were designed within a framework of purely national preoccupations, but this is gradually changing (Stoffaes, 1988). Consequently, trade should increase, not only to obtain economies of coordination, but also in order to make the most of differentials in variable production costs. The construction of new transmission lines is a necessary but not yet sufficient condition for increasing trade within the Community. It is of interest, in this respect, that the European Community intends to fund some major additions to the transmission infrastructure and that it has suggested better adaptation of existing networks to the existence of the EEC (CCE, 1988, p.28): "As far as electricity is concerned..., the aim should be an optimal use of infrastructures. This could be obtained, for example, by completing the network interconnection (Greece and Ireland), or by developing the Community dimension of existing networks, and, when appropriate, increasing their capac-

ity. This would make it easier to handle the growing trade in electricity, by facilitating transportation and transmission operations." Even if some of the Community's proposals are too far ahead of what national governments are willing to accept, there is enough interest in greater integration for it now to be likely.

Another example of possible convergence could be the setting up of national "mini-PURPAs" on the same model as the American Public Utility Regulatory Policies Act. Cogeneration and self-production could be particularly important, because they would not only have intrinsic advantages but would also stimulate efficiency on the part of existing electricity producers. There could also be beneficial technological side-effects. Energy conservation, protection of the environment and diversification of production and producers all constitute good grounds for developing decentralized production sources, as well as those designed to use urban waste or to supply district heat networks at the same time.

Finally, the most important change which would lead to greater convergence would be a higher degree of competition by comparison ("yardstick competition").[7] This requires a political determination to promote the efficiency of the national electricity system. To this end, the improvement of information flows in regard to price and cost is one of the fundamental objectives called for by the EEC document on the internal energy market (CCE, 1988, p.75): "It is self-contradictory to praise the beneficial effects of a free market in electricity based on greater competition and profitability, while continuing to underestimate the importance of transparency." In those countries with major public enterprises, the efficiency gap could be closed by comparisons with the outside world, something quite natural even if national markets were being opened up only in a limited fashion.

Without arriving at a complete — and traumatic — removal of national barriers, or carrying out the sort of institutional engineering operations that are to accompany the privatization program in the UK, all national electricity systems are capable of introducing a certain degree of competition and incentive by appropriate measures. The introduction of fixed-term concessions in Federal Germany is a good example here.

Even if the market is not perfectly "contestable," it is important to get closer to a situation of potential competition. To do so, inopportune protection of the home market — going as far as guaranteeing that the electricity companies will never lose the exclusive right of supply — should be avoided. It has been argued here that, in most countries, the political authorities would not seem to be particularly interested in the economic efficiency of electric utilities. This does not mean that they ignore the matter entirely, as can be seen in the Spanish and Dutch reforms. Moreover, there are good grounds for believing that the removal of some national barriers and the resulting possibility of comparing the relative performances of national companies would bring out more clearly the cost and efficiency differences, thus leading to corrective action.

Subjecting national electricity systems to international competition and comparison with their European rivals could lead to more substantial changes than the initial increases in electricity trade. While it is difficult to forecast the rate and direction of change, these trends could lead to a European electricity industry that might be quite unlike the present arrangement in terms of its organization and especially its behaviour. This does not mean that a single optimal solution would be imposed, though some rules would be applied in common. The creation of a single regulatory body, on the model of the American Federal Energy Regulatory Commission, that would take over certain national powers could, as has already been suggested, be the high point of such a process of integration.

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