

The liberalisation of the European Electricity Market(s): An *Unstructured Restructuring* Process?

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Abstract

This paper discusses the process by which the countries of the European Union have restructured their electricity markets. It shows that the restructuring process has focused on legal and organisational issues, but did not contain specific prescriptions for economic design of the market. Harmonised approaches are missing for short-term market arrangements like organised markets and balancing markets, for management of congestion at the international links and for long-term investments issues for generation and transmission. Additionally, apparently the problem of market power has been overlooked, which may nevertheless appear to be the Achilles-heel of liberalisation. Therefore, the restructuring of the electricity system into an electricity market can be labelled as 'unstructured' with respect to the heart of the matter: it does not provide guidance on the question how the internal electricity market is supposed to function integrally.

Introduction

During decades, the electricity industry around the world was organised predominantly as in the form of vertically integrated and mostly public monopolies. Recently, the liberalisation process aiming to introduce competition in the generating and supply segment of the industry has incurred dramatic changes. In Europe, the clear objective to create a competitive electricity market, formulated in Directive 96/92, has led to an unexpected outcome. Where the Directive focuses on the formation of a pan-European single electricity market, the restructuring process has given way to 15 more or less fragmented markets, each liberalised to a different degree and shaped following a wide range of different principles.

In this paper, the authors argue that this outcome is partly due to the approach followed, which may be labelled as the '*Unstructured Restructuring Approach*'. In contrast to e.g. the U.S. liberalisation process, where the Federal Energy Regulatory Commission (FERC) has issued a proposal for standard market design and market power mitigation (the 'Notice of Proposed Rulemaking', abbreviated as NOPR), in Europe, there is apparently a clear lack of what the European market design should look like. Additionally, the major issue of market power has been widely overlooked. In practice, the liberalisation process has focused extensively on the legal aspects describing the organisational network structuring but the European authorities forgot to pay due attention to the economic aspects of market design and the need for market monitoring.

This paper will indicate several critical areas where the European Union has failed to provide a proper and coherent market view. Positively, the paper will discuss why these issues are crucial for any electricity market. These relate to different aspects of market design, like market dynamics, congestion management and long-term investment aspects, and to the Achilles-heel of liberalisation: the threat of market power. This paper is organised as follows: Section 1 of this paper presents the policy focus of the liberalisation process. Section 2 emphasises the importance of market design. Finally Section 3 addresses the need for market monitoring and the fundamental issue of market power.

1. The European liberalisation process: Focus on legal aspects

1.1 Introduction

The EU directive 96/92/EC¹ defines common rules for the generation, transmission and distribution of electricity. The directive considers a gradual establishment of a single internal electricity market in distinction to 15 liberalised national electricity markets. For this, member States are obliged to open their national electricity supply market which means that eligible customer must be able to choose their supplier. Moreover, the generation activity is totally free, allowing competitive electricity prices. Finally the operation of the transmission network has to be independent from generation and distribution at least in managerial terms in order to avoid discrimination.

¹ "Directive on Common Rules for the Internal Market in Electricity", 96/92/EC OJ L27 of 30.01.1997. For recent amendments, see "Amended proposal for a Directive amending the Electricity and Gas Directives and Amended proposal for a Regulation on cross-border exchanges in electricity (COM(2002)304final of 07/06/2002" available at <http://europa.eu.int/comm/energy/en/internal-market/int-market.html>).

1.2 Competition in generation

The directive aims at full competition in the generation sector by removing the monopoly incumbent players had on the construction of new power plants. For this purpose, the directive provides two alternatives to member states: an *authorisation* or a *tendering* procedure (articles 4–6). Under the first option, member states have to define public criteria and procedures, followed by an open and impartial procedure deciding which companies willing to build new power plants are allowed to do so. Under the second option, a specific authority designated by the Member State defines the needs for new investments and solicits tenders. The tenders are then accessed by an impartial procedure.

1.3 Unbundling

Concerning transmission, each member state must directly establish a transmission operator (articles 7–9). The role of the system operator is defined concerning its main tasks, i.e. generation dispatch and determination of the use of the interconnections. This part of the directive implies that the system operator must dispatch power plant on a non-discriminatory basis between incumbents and new entrants. The goal of separation between generation and transport is to insure transparent and fair access to the network in order to avoid discrimination and cross-subsidisation between consumers (eligible and captive).

Electricity distribution must follow the same principles as electricity transmission concerning non-discrimination and independence from generation and supply (articles 10–12). Furthermore, it specifies that supply to final customers may be regulated as long as they are not eligible. An important distinction between distribution and transmission is that member states may impose requirements on distribution companies to meet specific public service obligation. Although this notion is not clearly defined it must relate to one of three categories: security of supply, price-quality of supply, or environmental protection.

Following the need for separation of activities, the directive also requests unbundling and transparency of accounts (articles 13–15). Hence, companies with generation, transmission and distribution activities must present separate balance sheets for each activity. The objective of this accounting unbundling is to avoid any cross-subsidisation between different types of activity.

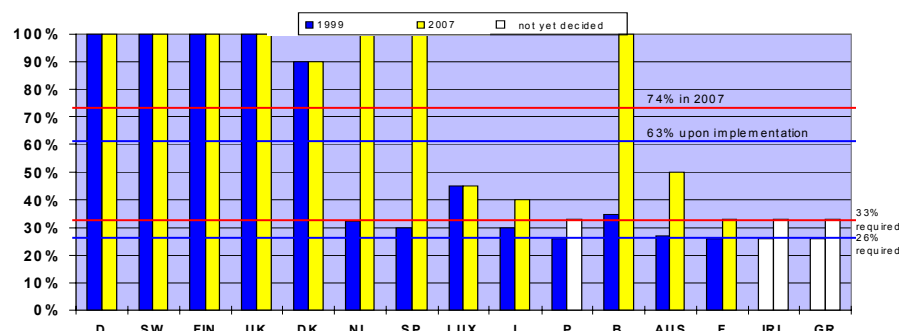
1.4 Third Party Access (TPA)

The heart of the directive is the model of third party access (articles 16–18). The idea is that owners of a network are obliged to allow generators, traders and consumers to have access to their network in order to trade in accordance with the objectives of transparency and non-discrimination. The directive included three models for this: negotiated third party access (nTPA), regulated third party access (rTPA), and the now obsolete single buyer model. In the nTPA model, consumers and producers must be able to negotiate access to the network with the system operator. For this purpose, the system operator must publish an indication of the access price as a guide to potential new players. In the rTPA model, the tariff for network access is regulated and not subject to negotiation. The tariff must be publicly available. The system operator may refuse access to the network for technical reasons but such refusal must be motivated by a legitimate reason. Finally, the single buyer model, in which a nominated entity acts as the sole purchaser of electricity, was included to appease France. Each member state was free to choose a different model.

1.5 Market opening

Finally, the directive specifies the extent of the market opening (article 19), which was defined as the percentage share of the electricity market that should be opened to competition. The directive defined thresholds for market opening, 40 GWh by 1999, 20 GWh by 2000 and 9 GWh by 2003. These thresholds represent minimum requirement of market opening of 26% in 1999, 28% in 2000 and 33% in 2003. In the November 25, 2002 meeting of the European Council on Transport, Telecommunications and Energy has reached political agreement on further market opening up to full retail competition in 2007.

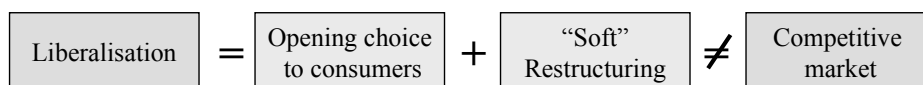
Figure 1: Market opening (1999)



1.6 The creation of a competitive market

The EU directive 96/92/EC liberalising the electricity sectors within EU members States which was agreed upon in 1997 has been debated for nearly ten years. Now, it represents the cornerstone of the European liberalisation process. However, it provides “*a framework in the loosest sense of the word: its objectives are laid down in general terminology and moreover, member states are given a substantial degree of choice in how they are about introducing more competition into their electricity markets. Indeed the margin is so substantial that it would seem possible for the determined anti-market countries to avoid introducing any meaningful degree of competition at all*” (Hancher, 1997). The directive provides only guidelines while leaving actual implementation to the national governments. Such an approach leaves a large freedom to member states (which is condoned by appealing to the principle of subsidiarity). The directive focuses on administrative and legal unbundling and on the creation of a non-discriminatory and level playing field. With respect to liberalisation of end consumers it requires only ‘soft’ restructuring² (figure 2). However the directive is silent on trading arrangements and market institutions that are necessary to support such restructuring for the creation of an integrated European market (Bergman et al, 1999). The focus on institutional arrangements is not balanced by a view on the economic aspects: what a market in electricity should look like and how it is supposed to work.

Figure 2: Liberalisation alone does not ensure the creation of a competitive market.



Indeed, creating an integrated market not only requires network access regulation and proper unbundling, it also needs designing market institutions and trading arrangements that are the heart of the market. One of the reasons why such arrangements are necessary for a market in electricity is that electricity is a network-related that cannot be stored in a commercially viable way. Therefore, the technical electricity system should be balanced minute by minute, which puts severe constraints on the flexibility and nature of electricity trade. Additionally, electricity is a product that cannot be transported over too long a distance as losses will increase. The mentioned institutions and trading arrangements should therefore describe the nature and conditions of electricity trading under these specific network and system related constraints. The creation of such arrangements is generally referred to as *market design*.

Creating an electricity market does not eliminate the physical characteristics of electricity. Hence, some characteristics of electricity make market design a difficult task due to three fundamental features of electricity are:

- Electricity, unlike most other commodities, cannot be stored,
- Electricity flows follow the laws of physics (‘Kirchhoff’s laws’), not contractual paths,
- The existence of transmission constraints (which are ubiquitous in the European grid) put severe limitations on the type of commercial transactions that are ‘acceptable’ to the network.

In order to create a real competitive market, one needs to recognise these aspects and integrate them through careful market design.

Ideally, the design of the market (including both structure and rules) should create a ‘level playing field’ for competing parties. However, international experiences (notably from California and the UK) have shown that once market mechanisms are introduced, market power, which is the ability to unilaterally manipulate prices, is a major concern in recently liberalised electricity markets. The introduction of competition in the electricity industry has produced the creation of multiple interdependent markets described as “*an extremely complicated non-co-operative game with a very high-dimensional strategy space*” (Wolak, 1999). Especially due to the high level of concentration of these markets its proper functioning must be ensured. For this purpose, it seems to be ineluctable to also install effective market monitoring.

Figure 3: A competitive market requires market design and market monitoring



In conclusion, we have argued that ‘liberalisation’ is clearly different from the ‘creation of a competitive electricity market’. The creation of a really competitive electricity market requires not only ‘liberalisation’ but also needs to address both the issue of market design and market monitoring, which have been widely neglected (or even overlooked) in the European liberalisation process (see figure 3). Section 2 analyses some fundamental issues in market design, while section 3 focuses on the issue of market monitoring.

² ‘Soft’ restructuring (unbundling, TPA) stands in opposition to ‘hard’ restructuring (divestiture, splitting of generation companies).

2. The need for market design

2.1 Introduction

While in the US, FERC has issued a master plan to lay out principles and policy decision on a standard market design (see box 1), in Europe, paradoxically, the design of the 'European' market has been left to each national country. It is not surprising that this process has led to the creation of very different market designs. In order to illustrate the diversity of market design within Europe this section will describe the characteristics of the different European markets with respect to some key aspects of market design: short-term market mechanisms, congestion management and long-term aspects.

From the point of view of European market design, the energy commodity market (including short-term organised markets and the bilateral market) is separated from transmission. Short-term organised arrangements exist for both spot trade and balancing services. For the first one, numerous power exchanges have emerged providing organised marketplaces for day-ahead trading. For the second one, different arrangements are being applied as market-based ('balancing markets') and non-market-based ('balancing mechanisms') mechanisms to cope with system imbalances. The institutional setting of these two types of markets is totally different, as power exchanges are private entities independent from the Transmission System Operator (TSO) while imbalance mechanisms are directly managed by the TSO.

Box 1: FERC's standard market design proposal

In 2002, the Federal Energy Regulatory Commission's (FERC) Order No. 2000 set in motion the voluntary formation of regional transmission organisations (RTOs). Unhappy with the progress to date on RTO formation and in an effort to foster seamless transmission and wholesale energy markets, FERC issued its proposed rule on Standard Market Design (SMD) in the Notice of proposed Rulemaking, NOPR. The proposed SMD rule would require the mandatory formation of Independent Transmission Providers (ITPs) that will implement and administer the new SMD. The aim of this proposal is to create: genuine wholesale competition, efficient transmission system, proper pricing signals for investment in transmission, generation facilities and demand reductions, and more customer options. Moreover market monitoring and market power mitigation are also key features.

Some key elements of the SMD proposal are presented below:

- **Transmission constraints → Locational Marginal Pricing (LMP)**

In order to manage transmission congestion LMP (nodal pricing) should be used

- **Volatility → Bilateral contracts**

The SMD includes reliance on financial bilateral contracts that limit the effect of potential volatility

- **Short term trading → An independent Transmission Provider (ITP)**

The ITP will establish short-term and ancillary services markets.

- **Security of supply → A resource adequacy requirement**

Requirement on load-serving entities to insure that they have adequate capacity to serve their load plus a minimum reserve margin

- **Market power → Monitoring and mitigation procedures**

Special attention should be given to market power through monitoring of bids (when relevant), possible withholding of capacity, and implementation of a safety-net cap.

The SMD proposal represents a significant step forward to enhance competition in American's electricity markets. While some details are missing and need to be further discussed (see Hogan, 2002), this proposal provides a consistent starting-point-framework that can support a competitive electricity market. The open question now is about how long it will take to implement the SMP.

With respect to national and international congestion the European markets combine different mechanisms. In general, at a national level congestion is not priced. The costs are socialised *ex post* (after physical delivery) among the users of the system. Hence at this level, congestion is managed by the national TSO according to national rules and not by market-mechanisms. At the international level, cross-border exchanges use a system of physical transmission rights (PTRs). This approach allows market participants to conduct their trades insulated from the details of system operation. Such a system allows *ex ante* (before physical delivery) pricing. The major difference between a physical transmission rights approach and a financial transmission rights approach as being applied in some areas in the U.S. is in the final settlement and its impact on the value of a transmission right (Green, 1998; Joskow & Tirole 2000). In a PTR system, the price of transmission is set in advance by market participants, while in a FTR system the prices are determined *ex-post* by the TSO. In practice, although the Association of European Transmission System Operators is working on harmonised international congestion management methods across Europe, the resemblance between the cross-border allocation mechanisms is superficial and many fundamental differences can be shown to exist.

As indicated above, the actual production and consumption of electricity in the power system should be balanced each minute. Consumption patterns change by the time of the day and the time of the year, so that electricity contracting is a highly complex and dynamic process. In order to safeguard system operation at the one hand and facilitate long-distance trade at the other hand, ‘energy programme responsibility’ arrangements should be in place that prescribe how traders should balance their portfolio and notify their transactions to the national TSOs. At this moment, each country in Europe has its own energy programme responsibility system, with different procedures and different requirements. Absence of a minimum level of harmonisation appears to hamper international trade.

Furthermore, for market design not only short-term market dynamics are important, but also long-term market development. Due to the fact that electricity storage is not yet commercially viable, the power system should develop in such a way that adequate supply remains available to meet demand. It is still an open question whether liberalised markets will provide sufficient investment signals to guarantee an adequate amount of generation in order to supply future load (Stoft, 2002). Additionally, since a tight margin between available supply and demand may increase market power, some level of overcapacity appears to be warranted. Nevertheless, the issue of investment in generation has not yet been addressed at a European policy level.

2.2 Short-term arrangements

Following liberalisation, market participants have expressed the need for organised marketplaces which could facilitate short-term trading and reduce transaction cost for this type of trading. Since electricity is a homogeneous product, standardised contracts can be traded on organised marketplaces. Hence, market participants have promoted the creation of power exchanges.

A power exchange is a competitive wholesale trading facility for electricity. The role of a power exchange is to facilitate the trade of short-term products by assisting market participants to balancing their purchase and sale portfolio more easily. In this respect, a power exchange forms a neutral marketplace where market participants trade day-ahead contracts at equal terms. Although many European countries already have a power exchange, it appears that most of them are shaped according to the national market model. In this way each power exchange solely provides a marketplace for its own country and mechanisms to connect one power exchange with another in a neighbouring country are mainly absent. Such a feature does not facilitate international trading.

Table 1: Creation of organised day-ahead markets in Europe

Country	Date	Name
England and Wales	1990-1999	Electricity pool
	2001	UK Power Exchange (UKPX)
	2001	Automated Power Exchange (AUPX)
	2001	International Petroleum Exchange (IPE)
Norway	1993	Nord pool
Scandinavia	1996	Nord pool
Spain	1998	Omel
Netherlands	1999	Amsterdam Power Exchange (APX)
Germany	1999-2000	Amsterdam Power Exchange (APXDE)
	2000	Leipzig Power Exchange (LPX)
	2000	European Power Exchange (EEX)
Poland	2000	Polish Power Exchange (PPX)
France	2001	Powernext
Austria	2002	Austria's Alpen Adria Power Exchange (AAPEX)
Italy	2003?	Gestore Mercato Elettrico (GME)

Similar to power exchanges, balancing arrangements have been designed at national levels. However, while power exchanges still have some common features, balancing arrangements widely diverge. In some member states, balancing electricity is priced according to market principles, where market participants bid into a monopsony ‘pool’ owned by the TSO (e.g. Denmark, Finland, Spain, Netherlands). In other member states, the price of balancing is regulated (Italy, France, Portugal). Second, the details differ, for instance with respect to the balancing periods varying from 15 to 60 minutes (EC, 2002). Hence, from the point of view of the balancing market the national electricity markets work independently from each other. Moreover, regulated balancing mechanisms are shown to distort the price in the other markets because it construes price expectations on administratively defined penalties (Boucher & Smeers, 2001). In conclusion, both types of short-term arrangements have been designed separately at national levels regardless of the systems adopted in neighbouring countries.

For a market to become competitive, it is important that changes in the energy portfolio can easily be adjusted without evoking system penalties. Normally, this can be done by contracting at shorter-term markets. For this reason, a liquid and competitive intra-day market is required in order to avoid significant trading risk due to programme imbalances. Alternatively, a cost-based balancing market run by the system operator may also decrease

trading risk. For this reason, the design and harmonisation of national intra-day and balancing markets forms a prerequisite for European-wide trade. At the moment, the national systems are much too diverse for the European electricity market to be considered 'harmonised'.

2.3 Congestion management

Electricity networks have been built to optimise national supply and not European supply. In Europe, only about 8–10 % of national consumption originates from cross-border trading (EC, 2001). The existing price differences between national markets have encouraged international trade and thus increase the demand for interconnection capacity. European competition law does not prescribe any particular method for the system to charge transmission prices (Albers, 2001). Hence, in the event of cross-border disputes, the competition rules of the European Treaty apply.

Moreover, the directive does not contain any specific rules for the allocation of interconnection capacity, which are essential for the development of an internal European electricity market. The directive only establishes general principles for open access of cross-border transmission capacity. Following these principles each member state was free to implement a system for national transmission pricing as well as access arrangements to cross-border capacity. Paradoxically, this implies that in practice, the design of the internal European power market has been decided at the respective national levels. Due to this freedom granted by the directive it is not surprising to encounter a range of bilateral arrangements for allocation of cross-border capacity. Subsequently, the actual European electricity market is characterised by a patchwork of national and bilateral arrangements (Glachant and Finon, 2000).

Table 2: Example of the diverse methods applied for the allocation of cross-border capacity: the case of France.

Location:	Allocation frequency*	Method 1	Method 2
France to UK	d, m, q, y,	call for tender	auction
UK to France	d, m, q, y,	call for tender	auction
France to Italy	d, m, y,	long term contracts	prorata
Italy to France	d, m, y,	long term contracts	prorata
France to Germany	d	list of priority	prorata
Germany to France	d	prorata	-
France to Belgium	d,m	first come first serve	prorata
Belgium to France	d	prorata	-
France to Spain	d	first come first serve	prorata
Spain to France	d	prorata	-

*daily, weekly, monthly, quarterly, yearly

Source: RTE

In practice, at the international level cross-border exchanges use a physical transmission rights (PTRs) system, also coined a system of 'explicit auctions'. This implies that interconnection capacities are defined in advance by the involved TSOs and that market participants should acquire capacity before contracting the energy. From a theoretical point of view such an approach is questionable since the separation of energy flows (resulting from trade) and transmission capacity (resulting from network capacity calculations) easily result in inefficient allocation of the available capacity because the real capacity available can only be determined once physical flows are known (Ruff, 2001). Moreover, even on the assumption that a transmission system operator can accurately estimate the actual network use, the methods applied to allocate cross-border capacity lack harmonisation and co-ordination. Although the member states have decided at the sixth Electricity Regulatory Forum in Florence³ meeting that their allocation procedures should comply with an agreed set of rules on congestion management, in practice different methods are still being used. Table 2 may serve as an example.

Apparently, not all European cross-border capacity is yet allocated according to a market-based mechanism. Additionally, many long term contracts signed before the reform initiated by the directive are still in place, allowing incumbent generators to control a large part of the interconnection capacity and limit the possibilities for new entrants to the national markets. In conclusion, despite the goodwill of the parties attending the Florence forum, the fact that the directive lacks a design how to handle cross-border congestion has led to the creation of a non-harmonised patchwork of (mainly) non-market-based methods.

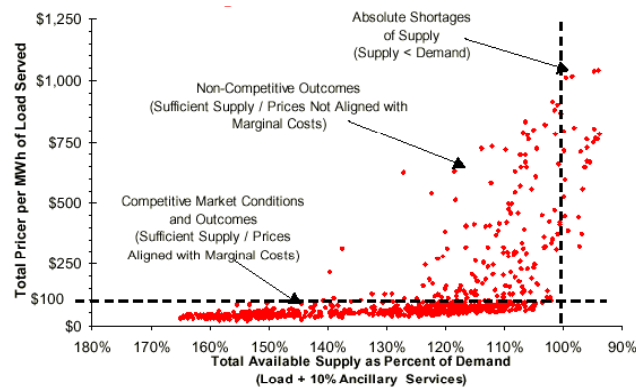
³ This bi-annual forum is being attended by national regulatory authorities, member states, the European Commission and organisations representing the transmission system operators, generators, electricity traders, consumers and power exchanges. The forum was set up to discuss issues regarding the creation of a true internal electricity market that are not addressed in the Electricity Directive. See http://europa.eu.int/comm/energy/en/elec_single_market/florence/index_en.html.

2.4 Long-term aspects

Market design relates to both short-term and long-term market functioning. As has been shown above, there has not been devoted much European policy attention to the question how the short-term market for electricity should be organised. Similarly, the question of long-term investment signals for installing new generation has not been addressed either. This issue is not only important for securing energy supply for the next decades, but also for the functioning of short-term markets as a tight reserve margin may increase the potential to exert market power leaving ample possibilities for individual companies to influence the price (see figure 4).

There is no scientific consensus whether liberalised electricity markets can be expected to produce adequate capacity levels continuously (De Vries & Hakvoort, 2003). While there are some cases (most notably California) in which a liberalised market appears to produce insufficient investment in generation capacity, practical experience with liberalised markets is rather limited, and the available cases are too much convoluted by factors such as flawed market design or regulatory restrictions, to provide convincing empirical evidence. As the social cost of capacity shortages is so high, at least the question whether additional investment incentives should be in place should have been discussed. At this moment, many European markets rely on energy only markets, which may expose the market to significant price risks on the long term.

Figure 4. Relation between the energy price (vertical axis) and the system reserve margin (horizontal axis) in California during the period of the supply shortages in May-June 2000.



Source: California ISO

Another long-term issue concerns electricity network development. In order to facilitate European trade, the network should be able to transport at least the flows resulting from European trade. Although market-based congestion management systems are economically efficient 'patches' to cope with the current lack of interconnection capacity, many tie lines need to be reinforced. At least on this issue, the European Commission has expressed a view. In a recent document on Trans-European energy networks the European Commission has stated that "it would appear to be a reasonable, initial target that all Member States should achieve a level of electricity interconnection equivalent to at least 10% of their installed generation capacity" (EC, 2001). Notwithstanding it is unclear which assumptions and models underlie this number. Since it is a general number, it may be too low for some countries, or too high for others. Nevertheless, at least on this issue, the European Commission has expressed a clear view. The mentioned Trans-European energy network programme also provides incentives to study specific network reinforcements, although recent experience shows that most subsidies in this programme go to links at the outer areas of the European Union instead of network reinforcements at the heart of (continental) Europe where trade will benefit most.

A question related to network expansion is the increased dependence of some countries on European trade. Although this may enhance competition and lower the average price for electricity, there is also a strong relation with the topic of security of supply. In the absence of any harmonised regulation on mutual assistance in situations of prolonged supply shortages (except for system stability which is being agreed on in the existing UCTE regulations), those countries who are heavily dependent on imports do not have much certainty that the imported electricity will still be available in periods of supply shortages. Due to existing EU regulation it is possible for countries to cancel exports in case of severe system problems, thereby 'exporting' their supply shortage to neighbouring countries (Article 23 of the EU Directive). Depending on the national security of supply policies, this may still form a strong incentive for each country to have sufficient (national) backup generation capacity to compensate for lost imports, the cost of which will probably offset the efficiency gains by the European trade.

3. The need for market monitoring

3.1 The issue of market power

The ability to unilaterally manipulate prices, defined as market power, is a major concern in recently liberalised markets. Abuse of market power is easily possible given the high level of concentration of these markets and the nature of electricity markets (highly variable price-inelastic demand, significant short-run capacity, costly storage). Two main categories of market power can be distinguished: vertical market power (the possibility to influence the network access price) and horizontal market power (the possibility to influence the commodity price). The liberalisation process has strongly diminished the source of vertical market power by providing open access and forcing unbundling of generation/supply and transmission/distribution. Thus, the creation of the independent transmission system operator, which has been achieved in most European countries, has reduced the possibility to exercise vertical market power. However, with the exception of the UK, the liberalisation process did not change market structures in terms of concentration and ownership.

Table 3: Market concentration in some European countries measured by the Hirschman-Herfindahl Index (HHI).

Country	Largest generator	Market share*	HHI
UK	<i>British Energy</i>	15%	529
Netherlands	<i>EPZ</i>	20%	1299
Germany	<i>RWE</i>	28%	1509
Austria	<i>Vorbund</i>	48%	2417
Spain	<i>Endesa</i>	44%	3082
Italy	<i>Enel</i>	65%	4290
Belgium	<i>Electrabel</i>	86%	7396
France	<i>EDF</i>	88%	7757

* based on installed capacity

Source: Companies annual reports (2001)

For some countries in Europe, due to the dominant position of incumbent generators, the Hirschman-Herfindahl index (HHI)⁴ of the production side of the market is well above 3600 (see table 3). The high level of market concentration is an important concern since it creates a high potential for the exercise of market power. This is for instance the case in France, Belgium and Italy where the dominant players own more than 60% of the installed capacity in their national market. The objective of the liberalisation process to integrate the different national markets into a single pan-European market can be seen as a good way to dilute such national market power. However, as discussed above, the lack of sufficient interconnection capacity and the large differences in market design hamper the integration process and do not very effectively reduce market power on the national markets.

Concentration measures are not sufficient to identify potential market power. Electricity markets are highly dynamic: the market can change dramatically in the course of just a few hours. For this reason, abuse of market power can take several forms in electricity markets. Market power can be exercised by withholding production on some units in order to increase market prices and profit more from production by other units (Hogan & Harvey, 2001) or by strategic bidding at excessively high prices compared to marginal costs (Wolfram, 1998). These type of abuse are possible due to inter-temporal variations of electricity demand and transmission constraints (Borenstein & Bushnell, 2000). Hence, even in apparently unconcentrated markets, market power can be exercised. International experiences and especially the California crisis have shown the scope and disastrous effects of such behaviour (Joskow & Kahn, 2002).

3.2 Market monitoring: essential to an electricity market

The threat of market power shows the necessity of effective penalising abuse of market power. For this accurate market monitoring is required since the electricity market is very complex and highly dynamic. Legally electricity is considered a 'good', similar to others market products, and is therefore subject to article 81 and 82 of the Treaty prohibiting anti-competitive behaviour. However, European competition law is designed for normal product and service markets but appears inadequate for the electricity market given the special property of electricity (Newbery, 2002). First, under European Union competition law, a market share above 40% is usually considered dominant. This threshold is ill suited for electricity because in many European countries some players exceed such market share (see above). Moreover in a period of high demand and in the presence of transmission constraints, a player with a

⁴ The HHI is defined as the sum of the square of the market shares of individual participants and gives then a first approximation of the distribution of the shares in the market.

small market share in absolute term can exercise significant market power by withholding a bit of its supply. Such type of abuse is extremely difficult to prove and even more difficult to stop in the absence of effective monitoring. In the European restructuring process, the regulatory institutions have failed to recognise such possible behaviour. Neither did they address the question how to mitigate market power.

Second, additional measures need to be taken with regard to the market structure. The European Commission has shown powerless to block large mergers and acquisitions. While across Europe electricity markets are already very concentrated, there is a growing trend of further concentrations. For instance, despite the fact that EDF was already the largest player in Europe, the European commission was unable to forbid this company to participate in Austrian, Italian, British and German companies. Even worse, EDF has been able to increase its market share in France by buying a French co-generation company (Dalkia). Similarly, the impotence of national competition authorities has been recently illustrated with the German merger between E.on and Rurhrgas. The EU Commission has been relatively silent on this 'mega-fusion' simply because this merger does not fall under the current EU competition law (Turmes, 2001). At a national level, competition authorities are often reluctant to challenge such mergers because the concept of a 'national champion' able to compete at the European market appears appealing – regardless of the threat it represents for the well functioning of (national) market. Competition needs players and therefore further concentrations should be carefully evaluated.

Market monitoring appears to be a very complex task in practice. First, the surveillance committee should have access to all relevant information. Until now, the focus on the regulation of the natural monopoly (the transmission and distribution network) implied that not many regulatory committees have the powers to collect information about the market, e.g., wholesale prices, demand, reserve margin and outages. Such information is crucial for effective market monitoring. Second, in Europe there is not yet much experience in monitoring electricity markets. Due to their complexity concentration measures do not suffice for electricity markets. For this purpose, a framework needs to be defined to distinguish acceptable market behaviour and non-competitive market behaviour (like abuse of market power). Finally, the relevant authorities need sufficient powers, not only to penalise potential abuse, but also to improve market design. Since it is difficult to get everything right at the outset, there should be a procedure to fix electricity market performance problems. Unfortunately, the EU directive and traditional competition law are currently inadequate in Europe to facilitate these requirements.

Conclusion

Market design and market monitoring are two essential elements for the well functioning of electricity markets. In Europe these two issues have been widely overlooked by the liberalisation process where the focus was on the legal and organisational restructuring. For this reason, the actual design of the European electricity market can best be described as a patchwork of national markets. Additionally, the threat of market power, while high, did not receive due attention. The directive represents a significant step toward the creation of competitive markets – it has involved dramatic changes in the electricity industry – but did not provide guidance on the question what the market should look like. Liberalisation is only one step in the process that alone cannot deliver the expected benefits of a single integrated European-wide market. Hence, the peculiarities of electricity markets need to be recognised which involves designing the market at a European level rather than at the national levels, and installing committees that are well equipped to perform effective monitoring of market functioning.

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