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Abstract

The purpose of this Essay is threefold. First, to describe the Italian reform in electricity markets, comparing the models of liberalization and privatization followed by the Italian legislator with the British and French experiences. Second, to analyze the structure of the Italian electricity industry, which arose from the reform, and to study its effects in terms of increased competition from the vertical separation of the former monopolist. For this reason the traditional definition of market power will be revised. New indicators of the existence of a dominant position will be described. Studying the peculiarities of this industry, it will be proven that market power depends on the firm capacity to modify the short-run marginal costs and to withhold some of its generation capacity. Third, to analyze how this notion of market power is subject to continuous change and to take into account the evolution of the electricity industry towards a multi-utility structure in a multinational context.

MARKET POWER IN ELECTRICITY MARKETS: REGULATION, DEREGULATION AND COMPETITION—LESSONS FROM THE ITALIAN EXPERIENCE AND OTHER EUROPEAN AND U.S. CASE STUDIES

*Giuseppe Tesauro**

INTRODUCTION

The purpose of this Essay is threefold:

- To describe the Italian reform in electricity markets, comparing the models of liberalization and privatization followed by the Italian legislator with the British and French experiences.
- To analyze the structure of the Italian electricity industry, which arose from the reform, and to study its effects in terms of increased competition from the vertical separation of the former monopolist. For this reason the traditional definition of market power will be revised. New indicators of the existence of a dominant position will be described. Studying the peculiarities of this industry, it will be proven that market power depends on the firm capacity to modify the short-run marginal costs and to withhold some of its generation capacity.
- To analyze how this notion of market power is subject to continuous change and to take into account the evolution of the electricity industry towards a multi-utility structure in a multinational context.

Italian and European Commission merger cases will be analyzed to understand the importance of this "new" definition of market power. Moreover, since the degree of competition depends on the ability to limit market power, this definition will also be relevant to assess the effect of the electricity reform. Solutions to enhance competition in the industry will also be explored.

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I. THE ITALIAN ELECTRICITY INDUSTRY

A. Description of the Italian Reform

Italy is radically changing the role of the public sector in all network utilities—public utilities that require a fixed network to deliver their services, such as electricity, gas, water, rail, and fixed link telephony.[1]

Until the 1990s, the State was directly involved in production and distribution of all public utilities. Public utilities were organized in a monopolistic way and the State granted concessions and subventions. Price regulation was not based on a rational policy: some prices were very low for social objectives (e.g., water and transport), while others were high, especially for electricity and telecommunications. The monopolistic structure, soft budget constraints, and absence of actual and potential competition, generated a low level of efficiency and problems for the public deficit.

The organizational structure of many public utilities has been changing over the past decade, following the principles of liberalization, de-integration, and market contestability dictated by the European Commission in many Directives. Many State

1. David M. Newbery, *Privatization, Restructuring, and Regulation of Network Utilities*, MIT PRESS (2000). Network utilities are economically of high importance since the networks of these utilities are classic natural monopolies; they create rents that are fought over. The networks are durable and fixed, so the rents persist. The capital of the network is large and sunk, so, once created, the balance of bargaining advantage shifts from investor to consumer. Finally the networks of electricity, gas, water, and telecoms are directly linked to the consumer, giving their owner potentially large exploitative power. The problem facing investors and consumers is to devise an institution that will balance these interests and this power. The tension between the investor and consumer can be side-stepped by State-ownership, which has the coercive power to finance the sunk capital, without requiring the assurance of a future return from the utility. Alternatively, it can attempt to reconcile private ownership with consumers' political power through regulation.

Economists since Adam Smith have argued that competition provides incentives for firms to minimize production costs and to restrain prices. This theory fails for natural monopolies. They either face no effective competition and hence are under little pressure to cut costs or keep prices low or, if competitors enter, wastefully duplicate facilities, raising costs and prices. Either way, the market will fail to satisfy consumer needs at a low cost. The conventional analysis of network utilities starts from this market failure, which justifies regulation or public ownership to restrain prices and restriction on entry to avoid costly duplication. The task is to devise rules for setting prices and meeting demand that encourage efficiency and to favour the development of competition through a vertical separation between markets in natural monopoly (i.e., the transmission grid in the electricity industry) and markets potentially contestable (i.e., generation and supply of electricity).

bodies have separated from government and have transformed into companies partially or fully privatized.

The Italian electricity sector is one of the most important "productive and distributive spheres" experiencing a profound transformation. Italy began to reform from a position of very little competition. Until 1991, the electricity sector was a public legal monopoly, with a vertically integrated structure, meaning all electricity activities were reserved to Ente Nazionale Energia Elettrica ("ENEL") through a sole concession. In that year, generation was opened to cogeneration and generators using renewable energy, which had to sell their output to ENEL at regulated premium prices. In addition, auto generators were allowed to sell electricity directly to ENEL. ENEL's considerable influence in approving entrants served as a limit to this market structure. In fact, until Legislative Decree n.79 of March 16, 1999,[2] implementing EC Directive 96/92,[3] was enacted, only a marginal number of generators (in terms of power capacity) were allowed to enter the market and sell electricity.

Legislative Decree 79/99 represents a milestone of reform in the Italian electricity sector. It introduces competition in: (i) generation, (ii) supply to liberalized customers and a new regulatory mechanism for non-contestable markets, (iii) supply to captive customers (small customers who are not eligible to participate in the free market), and (iv) transmission (i.e., the natural monopoly market characterized by the essential facility nature of the grid).

More precisely, the main points of the Decree 79/99 are:

1. It gradually opens the supply market to competition for liberalized customers (i.e., mainly industrial customers, either singly or grouped in consortia,[4] who are now free to choose their own supplier and to participate in the future wholesale market).

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2. Legislative Decree n.79 of March 16, 1999 (Italy).

3. Council Directive 96/92/EC, O.J. L 027, 0020-0029 (1997).

4. Legislative Decree Concerning the Implementation of Directive 96/92/EC, art. 14 (Italy). At present, all final customers and consortia with a minimum annual consumption of 20 GWh/per year are eligible. This corresponds to about 35% of total Italian demand. From January 1, 2002 the new threshold is fixed at 9 GWh/per year, liberalizing about 40% of the electricity demand in Italy. Moreover, according to the budget law for 2001, 90 days after the disposal of the first generating company by ENEL, the threshold for final customers will be lowered to 0.1 GWh/per year, corresponding to a market opening of about 70%.

2. It creates a new company, ENEL Distribuzione Spa, with the goal to manage the local transmission grid and to supply electricity to captive customers.
3. It grants concessions for local distribution to the incumbents[5] by the Minister of Industry until December 31, 2030, allowing for only one concession on the territory of each municipality and providing that distribution access tariffs are regulated by the Energy Authority ("*Autorità per l'energia elettrica e il gas*").
4. It establishes a public company, the Single Buyer, to ensure electricity supply to all captive customers. This Single Buyer will express the captive demand in the future wholesale market.
5. It charges a public company established in 1999, Gestore della Rete di Trasmissione Nazionale, an independent system operator ("ISO"), with the management and dispatch of the national transmission system. Moreover, it establishes that network access can be refused only on the basis of lack of capacity and, for imports, where reciprocity conditions are not met.
6. It requires the Transmission System Operator to establish a company, Gestore del mercato elettrico, responsible for organizing and managing the electricity wholesale market. The market is expected to become active in 2002.
7. It introduces a limit on generation and import by any single company to fifty percent of the total electricity powered and imported in Italy, from January 1, 2003 (this is the deadline for the divestiture of 15.000 MW by ENEL through three companies called Gencos).

In summary, the aim of the Italian reform is to favor the development of competition through a vertical separation of the historical operator, ENEL, to remove barriers to entry into production and distribution, and to establish a new market to keep in balance supply and demand between independent generators and eligible customers. It creates new independent institutions of regulation to control the access to the transmission grid (Gestore della rete and the Energy Authority), to guarantee the supply to captive customers (the Single Buyer), and to organize the future wholesale market (Gestore del mercato).

The object to separate generation, transmission, and distri-

5. ENEL Distribuzione is the most important local distributor and supplier of electricity to captive customers. In fact, it covered 92% of the captive demand in 2000.

bution is to offer guarantees of transparent and fair access to the grid and to avoid discrimination and cross-subsidization between consumers with different demands (eligible and captive customers). The vertical separation has been realized with the establishment of different subsidiaries. At present, the ex-monopolist is active in generation, through ENEL Produzione and ERGA, in transmission, through TERNA, in distribution to captive customers, through ENEL Distribuzione, and in supply to liberalized customers, through ENEL Trade. Since the national grid is an essential facility, the management of the network has been transferred to a new independent company, in such a way as to avoid the risk of abuse of a dominant position by the historical operator.

The choice to realize only a structural and budgetary separation in the vertical integrated activities of the historical monopolist is not the best solution and presents many limits, which could be eliminated with a much more radical reform: ownership separation. Actually, the existence of a unique integrated group, although separated in different companies, does not assure the necessary transparency for the development of a real contestable industry.

The idea to create a totally unbundled industry, in which every single activity is under different owners and in which no company in any one segment owns assets in any other, is the most efficient but not the most common. The critical element of vertical separation is to ensure that the link between generation and transmission is severed so that generators do not own transmission and the transmission company does not own generation.

Regulation and antitrust activities are simplified if generation and distribution are also separated, because then the boundary between the natural monopoly and potentially competitive parts is clearly defined.

Between European countries it is possible to identify two extreme modalities to reform the electricity industry: the British model and the French model. Italy followed an intermediate solution. Although the European Directive 96/92 dictates some basic principles, it leaves each country the power to decide modalities and timing to transform the electricity industry in a group of contestable markets. For this reason the European

electricity industry is characterized by a heterogeneous market structure. The need to harmonize the organization and regulation of all national electricity industries is one of the main aims in the context of European integration. To understand the importance of these objectives it is useful to point out the peculiarities of the electricity reforms in Britain and France—the two extreme models of liberalization and privatization in the electricity industry.

B. *A Comparison with the British and French Experiences*

The English model of vertical separation represents a model for reform in developed countries.[6] In summary, the British reform restructured the State-owned electricity industry separating generation from transmission, allocating generation capacity between different companies, and creating a spot market for wholesale electricity to make generation competitive. The limit of this radical reform was the existence of only two companies with plants whose output could be varied and who could therefore set the price. Each one could, by raising the prices of the marginal plant, increase the revenue earned by all of its inframarginal plants and hence have an incentive to distort its bids.

The consequences became clear a few years later. In the first three years, the two fossil generators set the pool price ninety percent of the time and raised pool prices even though fuel costs were falling. The final straw came with the sharp increase in pool prices in April 1993. Faced with the alternative of a reference to the Monopolies and Mergers Commission for abuse of market power, the generators agreed to a price-cap on pool prices for the two financial years 1994-95 and 1995-96 and to divest 6,000 MW of plants. In this way, the regulator increased competition from entrants and significant decreases in genera-

6. The United Kingdom started with an industry which was under public ownership from 1948 to 1990, and for most of this period the Central Electricity Generating Board operated all generation and transmission as a vertically integrated statutory monopoly, with 12 area boards acting as regional distribution monopolies. The Electricity Act 1989 divided the Central Electricity Generating Board of England and Wales into four companies. These companies were created as public limited companies and sold, together with the National Grid Company to the public in December 1990. Moreover, the aim of the British reform was the development of a single market where supply meets demand, and that operates as a daily, day-ahead, sealed bid auction.

tion prices are now observed. The British experience is of great importance both to understand what "market power" means in the electricity industry and to analyze the role of regulatory and antitrust authorities in this reformed market.

Unlike the aims of the European promoters of Directive 96/92 and of the British reformers, the objectives of the French authorities were not to favor the development of the competition *per se*, but to respect the directive *a minima*.[7] The starting situation in France is the public service model in the form of the national utility, an integrated public enterprise Electricité de France ("EDF"), which is supposed to supply electricity on the basis of the egalitarian principles of public service and to be the instrument of the industrial and energy policies.

In summary, the French reform did not destabilize the inte-

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7. The aim of the French legislator in the directive transcription was to find a difficult equilibrium between opposing principles:

(i) to accept the regulations relating to competition but also to maintain the capacity for State action in matters of energy policy;

(ii) to preserve the legitimacy of the sectorial integration inside the public electricity enterprise but also to guarantee fairness in competition, by the transparent rules of access and the presence of an autonomous regulator. The implicit aim of this reform is to make contestable the French power market and to place the incumbent under the threat of entries without dispersion of production assets or the creation of regional or major local distributors.

In order to meet these different and opposite objectives, the French reform is characterized by the following principal traits:

(i) it removes the legal barriers to entry into production with a simple procedure of authorisation and sales to eligible consumers, without imposing divestitures of plant to the incumbent;

(ii) it aims to separate transmission, operation, and dispatching from the historical operator's other activities in order to offer guarantees of transparent and fair access to the grid, but without organic separation through the creation of a subsidiary;

(iii) it creates an independent institution of regulation, with powers of control aimed at limiting abuse of the dominant position; and

(iv) it grants liberalized customers the power to choose the supplier (but the threshold for eligibility is very high).

Therefore, contrary to several other European power reforms (for example, the British and Italian reforms), the law allows restricted access to the network for French consumers by defining the threshold of their eligibility at the lowest level laid down by the Directive without the possibility of sites aggregation or consumers grouping. Unlike other European countries, the 190 local distributors are only partly eligible, their freedom of purchase of electricity being limited to the quantities taken by eligible consumers in their zone. Moreover, the historical incumbent is already vertically integrated and no divestiture in generation plants has been imposed to induce entry into the market.

grated electricity market structure. This preservation of vertical and horizontal integration confers upon the historical operator a number of advantages in competition, which also constitute endogenous barriers for potential entrants. First of all, EDF held about ninety percent of production capacity in 1999, most of it at low variable cost (hydro and nuclear), which means that it had a considerable capacity to respond to the threat of competition and to keep its market share. The decision not to impose a divestment in generation, in such a way to induce entry by other national and foreign producers, has preserved the dominant position of the historical monopolist.

In addition, the vertical integration structure allows the incumbent to influence the price for connection, in other words, to submit the competitors to the discretionary valuations made by the historical operator. Moreover, the Electricity Law contains significant restrictions, which further limit the margin of maneuver of the independent electricity generators for the supply of eligible customers.[8]

The French experience and the large number of merger cases, which involve the historical monopolist, prove that, for a market to be contestable, one must not only remove the legal barriers to entry, but define its structure in such a way that the incumbent and the entrants all compete under terms that are symmetric. Regulatory and antitrust authorities must ensure that the incumbent does not abuse and benefit from advantages that allow it to dissuade entry and to reduce potential competition.

The asymmetry in structures and regulations between European countries, which is evident in comparing the British reform with the French reform, has created a significant level of inconsistency between Member States, with the risk that anticompetitive behaviors in one State generate legal, political, and economic disputes referring to the reciprocity principle at the European level.

The necessity of harmonizing the organization of all na-

8. *See e.g.*, Electricity Law, ch. IV, art. 22 (Fr.); *see also* Decree No. 2000-1069 of October 30, 2000 (Fr.) (providing that authorized electricity generators can only purchase electricity for resale to eligible customers for an amount of 20% of their respective installed generation capacity). This significantly restricts the ability of the independent electricity generators to play a more active role in the market for supply of liberalized consumers.

tional electricity industries is becoming more and more evident given the large number of mega-mergers which involve States with different regulatory and market structures.

In this heterogeneous environment, Italy has made great strides in redesigning the regulatory regime and the structure of its electricity sector following the principles of competition and de-integration. The Italian legislators followed the model of the British reform and, contrary to the French experience, the reform in Italy went well beyond the minimum specified in the European Union Electricity Directive. Actually, within the European Union only the United Kingdom has acted more positively to create a structure of generation with the intent of promoting competition.

However, even after the realization of the major objectives of the reform, precisely after the divestitures imposed on the historical operator ENEL, the electricity industry in Italy retains various restrictions on competition.

More precisely, the analysis of the Italian electricity industry indicates that further divestiture is needed for effective competition to be likely and that the limit for generation and import by any single company (fixed to fifty percent) is potentially dissuasive and insufficient to induce efficiency choices by the incumbent and to stimulate new entry. In addition, ownership of transmission assets and the bulk of generation have not been separated out in Italy; separate owners would be necessary to ensure efficient maintenance, development, or operation of the grid. Moreover, the long-term fix for local distribution concessions (December 31, 2030) implies a "stable" natural monopoly structure with the consequence of assuring to each local incumbent (ENEL in the large part of the territory) a non-contestable dominant position. Reducing the duration for these concessions would be useful to introduce competition for the market and to harmonize the local electricity distribution market with the duration for other public utilities, such as gas.

To understand the effects of the Italian reform and the further steps in the regulatory regime to open the electricity industry to competition, it is necessary to analyze:

1. The four markets in which it is possible to decompose the vertically related stages of production and distribution of the electricity industry;

2. The notion of market power taking into account the key differences between electricity and other primary commodities;
3. The evolution of this notion as a consequence of the establishment of multiutility and multinational firms; and
4. The role of regulatory and antitrust authorities in this reformed industry.

II. *THE FOUR ELECTRICITY MARKETS THAT COMPOSE THE ELECTRICITY INDUSTRY: THE ITALIAN SCENARIO*

The activities of the electricity industry can be divided into four different markets or physical stages: generation, transmission, distribution, and supply. Generation is the production of electricity in power stations. The geographical dimension of this market can be defined nationally since the existence of import barriers, particularly the low capacity in the interconnection between national and foreign grids, do not allow a constant flow of electricity.

In this market, ENEL is already the dominant operator in Italy, with a market share of about fifty to fifty-five percent and a gross capacity of about 40.000 MW.[9] This data takes into account the divestment of 15.000 MW of capacity that ENEL must realize before 2002 to comply with Article 8 of the Legislative Decree n.79/99. After this divestiture, three new companies will compete in the market: Eurogen, Elettrogen (Gencos), and Interpower, with a market share of nine to ten percent, eight to nine percent, and three to four percent, respectively, in terms of production. Other competitors are Italenergia (Edison—Sondel), with a market share of about seven to eight percent, and municipalities with a total share of four percent.

Even if the market share is not the most important and correct indicator of market power, it is a first proxy of the capacity to operate independently from the other generators. In fact, under European Union competition law, a company with a market share above forty percent would usually be considered dominant and its actions subject to special scrutiny to ensure its dominance is not abused. Despite the reform, ENEL remains the leader in generation since its high capacity (five times higher

9. Italian Competition Authority Bulletin, n.8/2001 (case C4438—ENEL-France Telecom/New Wind) (containing all data reported).

than the second operator) prevents contestability and allows fixing prices without competitive pressure.

Transmission means the transport of electricity over high-tension cables. Since the transmission grid is unique and since there is no competition with other foreign networks, the geographical dimension is national.

ENEL already has the ownership of this network even if the management has been transferred to an independent company, the Gestore della rete. This last operator should guarantee access with no discriminatory tariff, so that all generators can use the essential facility grid and compete with ENEL to supply electricity to final consumers. Of course, the existence of an independent operator that manages the grid is a necessary but not sufficient condition to open the supply market. It is necessary because without an independent company, ENEL could control access into the market. It is not sufficient because ENEL already has the ownership of the grid, which means it has the power to acquire relevant information about electricity flow and to determine investment plans.

Distribution means the transport of electricity over the low-tension local cables. ENEL operates in this market through ENEL Distribuzione, a subsidiary that has the ownership of the local cables and manages the supply to captive consumers. Even if there are numerous companies in this market, in particular municipalities, ENEL is the dominant firm with a share of about ninety percent in terms of supply to captive customers; the second operator's market share is not above two percent. This is a relevant market since the supply to captive consumers represents seventy-four percent of the total demand of electricity in Italy in 2000. Taking into account that companies in this market operate until 2030 on the basis of concessions by the Ministry of Industry, the dominant position of ENEL is stable and incontestable in the short term.

Delivery to liberalized customers is the market of all consumers that are declared eligible, so they are free to choose their own suppliers of electricity. This market was created by EC Directive 96/92 and, in Italy, by the Legislative Decree n.79/99. In fact, this decree allows private customers and consortia, with consumption above a specified threshold, to sign bilateral contracts with generators. Following the same arguments used for

generation, this geographic market is national. Although some electricity can be exchanged between Italy and other neighboring countries, the equipment permitting these exchanges is of limited capacity.

At present, the supply of energy to liberalized customers is a highly concentrated and asymmetric market. ENEL is the first operator, in terms of electricity supplied. In fact, in 2000 ENEL covered about forty to fifty percent[10] of the liberalized energy demand (it supplies about 20-25 Twh), while the second most important operator was Edison, with a market share of about twenty to twenty-five percent.[11]

For the future, the aim of the reform is to increase the degree of competition in the supply to eligible customers through the organization of a wholesale market. According to Article 5 of the Legislative Decree n.79/99, a wholesale market should be active starting from 2002. In this market, generation owners send bids to the system administrator (Gestore del Mercato) for each unit they own. These bids represent the prices at which owners are willing to sell power from specific units for a specified time period, usually the next twenty-four hours. The system administrator dispatches units in order of the lowest to highest bid as needed to meet demand for all participants (liberalized customers) on a continuous basis. The bid price of the last unit dispatched during any given hour sets the market clearing price for that hour. All units dispatched during that hour receive the same market-clearing price regardless of the unit bid price.

The aim of the reform is to establish a perfectly competitive market in which generation owners bid their production costs (or short-run marginal costs); however, this implies the existence of numerous suppliers, that is the absence of one or few operators with the power to fix the clearing price. This means that generation must have a competitive structure with a low concentration degree and symmetric, not vertically integrated operators.

In other words, creating a competitive supply market requires that nobody has the capacity to exercise market power in

10. *See* SECURITY EXCHANGE COMMISSION, ANNUAL REPORT (Italy) (specifying that that ENEL trade accounted for approximately 47% of the sales to free market).

11. *Id.* (specifying that this data takes into account the effect of the acquisition of Montedison by Italenergia).

generation, otherwise the dominant position in production implies a dominant position in fixing prices in the liberalized supply market. The result is the neutralization of efficiency and social benefits that are expected from competition.

In summary, since the effect of competition in the supply market to eligible customers is strictly linked with the degree of competition in generation, and since competition in generation depends on the peculiarities that characterize electricity, the analysis requires a move from a simple static index (e.g., the Hirschman-Herfindahl Index) to a new dynamic market power indicator. Studying this indicator of market power in the electricity markets is relevant both from a competitive point of view (e.g., an antitrust authority which has to decide to oppose or not to oppose a notified merger) and from a regulatory point of view (e.g., a regulatory agency which has to fix access tariffs or to impose a price cap mechanism).

III. *THE ELECTRICITY MARKETS AND MARKET POWER*

A. *Market Power Indicators: The Limit of Market Share Analysis and the Necessity to Estimate the Capacity to Fix the Marginal Price*

In order to understand how and when regulatory and antitrust authorities have to intervene in the electricity industry, the first step is to revise the traditional definition of market power in such a way to take into account the peculiarities of electricity.

The starting point in analyzing the market power in the electricity industry is to take into account the key feature of the electricity: producers and consumers must be physically linked, with changes in supply and demand propagated through the entire network at the speed of light. In fact, since electricity cannot be stored, supply and demand must be kept in balance second by second. Gas is similar in that pipelines must link producers and consumers, but its physical flow is relatively slow—it can be stored within the pipe or at storage sites, and its flow through each link separately controlled. Electricity, in contrast, chooses a path through the network following a specific physical law, whereby any change in demand or supply at any node immediately affects the pattern of flows through all links in the network. This means that changes in supply by any producer or demand by any consumer create external effects on all others connected

to the network, and these externalities threaten the efficiency of decentralized markets.

In addition, each link in the network has a maximum rated capacity for carrying current, so the flows into each node have to be controlled and may have to be constrained to prevent these transmission limits being exceeded. Moreover, the quality of electricity (frequency, voltage, phase angle) must all be maintained within tight limits. It is therefore important to balance supply and demand and to match them as closely as possible at the standard voltage and frequency to avoid power fluctuations in consumers' appliances.

These characteristics of electricity imply the necessity to pass from a static traditional market power indicator to a dynamic one. In fact, although the degree of market concentration (e.g., market shares or the Hirschman-Herfindahl Index) gives an estimation of the firm capacity to follow independent behaviors, the ability to exercise market power in electricity markets (generation and delivery) depends on much more than market concentration. More precisely, market power depends on the firm's capacity to modify the short-run marginal costs of generation in almost every hour of the day and to withhold some of its capacity. In other words, to define the market power, it is necessary to analyze the firm's ability to fix the market-clearing price of electricity significantly higher than "perfectly competitive" prices. Actually, the important points to note about the future wholesale markets are the bid-based dispatch of generating units, and the payment rule whereby all units dispatched in each time interval receive the market clearing price, which is set by the bid price of the marginal unit required to meet demand in each time interval.

Thus, to valuate the market power in generation (consequently in delivery) it is of primary importance to analyze the structure of plants in terms of production costs and the capacity to meet demand during peak hours. Plants can be classified on the base of the marginal production cost in three different groups: base load (low marginal production costs and high fixed costs), mid-merit, and pick load (high marginal production costs and low fixed costs). Since it is the last unit supplied which fixes the price for all infra-marginal units, the share of pick load plants owned, that is, the capacity to meet demand in each hour without necessitating a continuous flow of generation,

is a relevant indicator of the existence of a dominant position. On the contrary, using traditional indicators, such as market shares, creates the risk of underestimating the real market power. A firm can dispose of all plants necessary to meet demand in peak hours, thus the power to fix the clearing price, and nevertheless the system can be within the range considered only moderately concentrated. In other words, in an industry with fluctuating demand, with a potentially constrained transmission link, and with a product that cannot be stored, the market power depends on the ability to generate electricity in such a way to satisfy peak demand and to control the price strategy for the last units supplied. To measure this market power, a proxy is the reserve capacity that is the excess production with respect to peak demand.[12] Of course, this capacity must be analyzed taking into account the quality of the plant, for example, the percentage of mid-merit and peak load plants owned by each operator.

The Italian Competition Authority followed this approach in the merger case *ENEL/Infostrada.*[13] The Authority's investigation showed that the acquisition of a telecommunication company, Infostrada, would have increased the ex-monopolist's dominant position in delivery to liberalized customers. In fact, ENEL would have increased the number of its eligible customers for electricity through the supply of a bundle of goods (telecommunication services and electricity), that is, through its change into a multi-utility enterprise. Moreover, competitors would have had no chance to follow the same strategy given ENEL's dominant position in generation.

To prove the existence of a dominant position in generation, the Authority pointed out that the ex-monopolist, ENEL, owned the sixty percent (42.000 MW[14]) of the total gross genera-

12. A more complex indicator is the Supply Function Equilibrium, that is the average difference between the instantaneous market clearing price and the production cost. Economists, such as R. Gree & D. Newbery [1992], A. Rudkevich, M. Duckworth & R. Rosen [1998], define the "market clearing price" as the Nash Equilibrium solution. The formula for the market clearing price of electricity resulting from Nash Equilibrium based bidding strategies is a function of the particular electric system's production cost *curva*, the instantaneous demand of electricity, the maximum anticipated demand in the overall period for which bids are submitted and the number of generating firms bidding into the wholesale market.

13. Italian Competition Authority Bulletin, n.8/2001.

14. This data takes into account the divestiture of 15.000 MW through the three Genco.

tion capacity in Italy, with a reserve capacity, that is an excess generation capacity with respect to peak demand, of 15.000 MW. Given this gross capacity in generation, ENEL was the only firm able to meet the demand during peak hours, i.e., for forty-eight percent of the time.

Moreover, ENEL gained ownership of a big share of peak load and mid-merit plants. As a result, ENEL had control of those plants that supply the marginal unit of electricity, which means the power to fix price in generation. More precisely, ENEL had a generation capacity composed of sixty-five to eighty-five percent pick load and mid-merit plants.

In summary, the Authority utilized not only the static data represented by the market share (i.e., the fact that ENEL provided electricity for about fifty percent of the total liberalized demand in 2000), but also dynamic indicators (i.e., the gross capacity, the excess capacity with respect to total demand and the power to control the marginal unit price through the ownership of a large number of pick load and mid-merit plants). The use of simple static data would underestimate the real market power since even a lower market share would be compatible with the dominant position in generation. In fact, the ex-monopolist could have a market share lower than fifty percent but its excess capacity in generation and the structure of its plants would always guarantee the power to fix prices higher than marginal costs, independently from consumers and potential competitors.

For these reasons it is possible to argue that the existence of a limit for generation and import by any single company (the Legislative Decree 79/99 fixed a threshold of fifty percent) is useless since it is not a real indicator of market power. On the contrary, this static threshold can reduce the incentive for improvement and can produce inefficiency in generation.

Of course, the market power in generation has a relevant effect in terms of market power in delivery, more precisely in delivery to liberalized customers. In fact, if a company can fix the wholesale price, that is the price in generation, it has the power to control the basic variable in the computation of the retail price. In other words, without competition in generation it is impossible to have a competitive market in delivery.

As clearly pointed out in the merger case, ENEL/Infostrada as the dominant operator in generation, was also considered the

company with market power in delivery to the liberalized market. More precisely, ENEL had a share of about fifty percent in delivery to eligible customers in 2000, while its most aggressive competitor, Edison, had less than the half of this percentage. On the basis of these figures the Authority concluded that ENEL was in a dominant position both in generation and in delivery. This link between generation and delivery has become one of the more controversial points in the analysis of regulatory reforms and in evaluation of mergers in the electricity industry.

From a regulatory point of view, this link implies that opening the supply market without removing restraints in generation is a useless reform with no effects in terms of efficiency and consumers' benefits (lower prices and higher quality). From the point of view of a competition authority, the link between generation and delivery implies the need to analyze the effect of an acquisition or to evaluate potential anticompetitive behaviors that take into account the market power in both markets.

B. *The Evolution of the Market Power Definition in a Multi-Utility and Multinational Electricity Industry*

The above definition of market power in the electricity industry—the capacity to control prices while keeping in balance supply and demand second by second, forcing up the market clearing price, and withholding some of the capacity—is a notion which must be improved with regard to the evolution of the electricity industry. The Italian Competition Authority improved this notion taking into account the effect of the establishment of a multiutility firm, namely a firm that supplies a range of public services such as electricity, gas, telecommunications, water, etc. In the merger case *ENEL/Infostrada*, the Authority analyzed the effect of the acquisition of a telecommunication company, Infostrada, by ENEL, the dominant operator in both generation and delivery to eligible customers. The Authority pointed out that this merger would have increased the market power of ENEL in delivery to liberalized customers through the supply of bundle of goods/services.

With the acquisition of Infostrada, ENEL would have increased the number of its potential clients for electricity. In fact, a share of about twenty-five to forty-five percent of customers, who are not liberalized customers at the moment, will be sup-

plied by ENEL for both electricity and telecommunications in the near future when the reduction in the threshold will transform them into liberalized customers. The Authority maintained that the existence of supply contracts for telecommunication services between Infostrada and these shares of captive customers (that is, not liberalized consumers) would have facilitated the establishment of long-term contracts between ENEL and these future eligible customers for the supply of electricity. ENEL would have internalized the economies coming from this increase of potential customers for electricity; consequently it would have reinforced its dominant position in delivery.

Actually, the supply of bundle of goods/services to a large number of eligible customers would have produced economies of scale (i.e., lower cost in measuring consumption, in issuing unique bills, etc.) and economy of scope (i.e., the trade-mark effect in terms of customer satisfaction) with the effect of increasing the ex-monopolist's ability to use an aggressive price strategy with respect to competitors and potential entrants. Moreover, its dominant position in generation would have guaranteed the power to fix prices in the future wholesale market. So, competitors in delivery would have been subject to the price strategy of ENEL in generation.

To sum up, given the ex-monopolist's dominant position both in generation and delivery to liberalized customers, and the capacity to "transform" eligible consumers to captive clients through the supply of bundles of goods/services, ENEL would have had the power: (i) to act with aggressive strategies in delivery to eligible clients, fixing the retail price above the wholesale price but below the competitors' level (thanks to the economies generated by the multiutility strategy); and (ii) to oblige competitors to fix prices below generation price (that is the cost to buy electricity in the wholesale market) in order to induce their exit from delivery to liberalized consumers.

In order to solve the competition problems raised by this acquisition, the Italian Competition Authority approved the operation subject to full compliance with the commitment to divest at least 5.500 MW of generation capacity owned by ENEL. Moreover, given the importance of the cost structure in generation, the Authority specified that sixty percent of the divested capacity should be composed of mid-merit and peak load plants, that is plants with the power to meet the fluctuating demand second by

second and to fix the clearing price. This decision made clear the need to take advantage of the reform opportunity and go further with respect to creating a structure that promotes competition, especially in generation. In fact, although the Legislative Decree 79/99 imposed a threshold of fifty percent on total capacity, this was not sufficient to develop competition in generation and, consequently in supplying to eligible customers. As explained above, the real indicator of market power is not only the market share but the capacity to control the clearing price, which implies the capacity to keep in balance supply and demand second by second through peak load and mid-merit plants. So, a lower market share can guarantee the market power in generation, and consequently the capacity to influence the price strategy of competitors in delivery to liberalized consumers.

Together with divestitures in generation, another measure to increase competition is the divestiture of transmission from generation. Actually, even if the reform de-verticalized the electricity industry, ENEL has the ownership of the transmission grid. This structure does not provide strong economic incentives for the ex-monopolist to act in a way to increase competition. For example, the incumbent has no incentives to realize investments in the transmission capacity so as to open the "geographic market" to large import flows from foreign firms.

The definition of the relevant geographic market is the second dimension, together with the relevant product market, which must be analyzed taking into account the evolution of the electricity industry and the effects due to national reforms. The necessity of giving a correct definition of the geographic market in the electricity industry has become more and more relevant in the last few years, given the great number of concentrations involving national and foreign companies. Currently, both the Commission of the European Communities and the Italian Competition Authority, consider generation and supply as national markets due to the regulatory restrictions and the technical constraints that characterize the electricity industry. In fact, in all European Countries no significant imports of electricity can take place. Imports are constrained by the limited character of interconnector capacity. For example, the interconnector capacity between France and its neighboring countries amounts to approximately 20 to 25 GW. Compared with the installed genera-

tion capacity in France of about 110 GW, the import capacity is less than ten percent. In Italy, the interconnector capacity is not higher than in France and imports amounted to approximately fifteen percent of total production in 2000.

Regulatory restrictions are another reason for this geographic definition. In particular, the existence of relevant asymmetry in implementing EC Directive 96/92 determines a heterogeneous context with some States characterized by a fully liberalized electricity market, for example UK, and others with an integrated and dominant incumbent, for example France. This asymmetry can become a critical point when the Commission or a Competition Authority has to evaluate mergers that can reduce competition, that is, increase the incumbent's market power, in a national geographic market involving neighboring foreign companies.

The Commission merger case *EDF/EnBW*[15] gives a clear representation of the need to define the market power taking into account the geographic peculiarities of the parties involved. As a result of this concentration, EnBW (a vertically integrated electricity utility which is active in all fields of supply and transport of electricity in the Southwest of Germany) would have become a joint venture controlled by EDF (the dominant incumbent in France) and OEW (an association of nine public districts in Germany).

The Commission pointed out that the proposed concentration would have strengthened EDF's dominant position on the market for eligible customers in France since it would have eliminated EnBW as a potential competitor on the French market and it would have increased EDF's retaliation potential in Germany.

More precisely, the Commission observed that, although the French reform tried to open the electricity markets, EDF could significantly influence the price for electricity supply to eligible consumers. Moreover, as an integrated monopoly company, it was able to respond to competition challenges in the market for liberalized customers by moving margins from these consumers to the sector of captive customers (those which cannot freely choose their supplier). On the other hand, EnBW was one of the major electricity suppliers at an interconnected level in Ger-

15. Commission Decision, Case No. M.1853 (Feb. 7, 2001).

many with a long common border with France, and with EDF's supply area. Consequently, EnBW could have supplied a significant share of consumption by French liberalized customers and the merger would have eliminated one of the more aggressive competitors.

Moreover, given the asymmetry in regulation and in the reform process, the Commission argued that the concentration would have increased EDF's potential for retaliation in Germany. In fact, given the asymmetry in the electricity reforms between France and Germany, EDF enjoys a very strong position in the market for supply to eligible customers in France, but it is "protected" from foreign competition. The acquisition of EnBW would have granted EDF the possibility of being active on the fully liberalized German market via an existing highly aggressive competitor, whilst EDF's position in its home market was still well protected due to its very strong position in the French market in terms of capacity and secured non-eligible customers. Given these competition concerns, the concentration was declared compatible with the common market subject to full compliance with some commitments. In particular, EDF undertook to make available to competitors access to in total 6,000 MW generation capacities located in France.

This merger case highlights the importance of considering the asymmetry in regulation between geographic markets to give a correct definition of market power. Actually, this asymmetry can not only guarantee the incumbent's dominant position in its own market but also influence the potential restrictions in competition due to the acquisition of companies operating on foreign markets. This is the case with *EDF/EnBW* merger case: the acquisition of a German company by the dominant firm in France would have reinforced the market power of this last company in its home-France market given the asymmetric regulations and the transmission constraints between these two countries.

Of course, the reverse is not always true. Actually, the dominant position in a geographic market does not guarantee the capacity to exercise market power in another geographic area dominated by a national incumbent. This is the case of the acquisition by the Fiat Group, through Italenergia, of sole control of Italy's energy company Montedison and subsidiaries Edison

and Sondel.[16] The Commission's investigation has shown that the takeover will not adversely affect competition in the Italian electricity market since Montedison will be controlled by Fiat and the latter has only a small activity in the electricity sector. However, in the event that EDF, at the moment a minority shareholder, will acquire joint control in Montedison, the Commission will have to examine the case again, given the risk that its market power in the French home market could restrict competition in the Italian market.

Without any intention to anticipate the future, in the event of a hypothetical merger evaluation of two considerations are possible:

1) The need to take into account the existence of geographic constraints, in terms of limited transmission capacity, to define the market power, and to make forecasts about the extension of this market power from the domestic to foreign markets; and
2) The necessity of harmonizing the regulation and the organization of all national electricity industries given the above restraint in the evaluation of mergers involving national and foreign operators.

In fact, only removing the barriers to exchanges of electricity between countries, both from a regulator and a technical point of view, for example reducing the incumbent privileges and increasing transmission capacity, will make it possible to integrate the national electricity markets and analyze the market power in a new perspective. Without this harmonization and without investment to improve the transmission grids there will always be the risk of confusion between the consequence of the political disputes referring to the reciprocity principle at the European level and the economic restrictions connected with those concentrations involving national and foreign companies, which affected only the national relevant markets given the geographic dimension of the electricity industry.

IV. *REGULATION AND DEREGULATION IN THE ELECTRICITY INDUSTRY: THE MOST IMPORTANT THINGS TO LEARN FROM THE RECENT EXPERIENCE IN CALIFORNIA*

The recent electricity crisis in California provides some use-

16. Fiat/Italenergia/Montedison, Case No. COMP/M.2532 (Aug. 28, 2001).

ful hints to complete the analysis of the electricity regulatory reforms in European countries. The collapse of California's electricity restructuring and competition program has attracted attention around the world. Prices in California's competitive wholesale electricity market increased by 500% between the second half of 1999 and the second half of 2000. For the first four months of 2001, wholesale prices were ten times what they were in 1998 and 1999.

While wholesale prices rose dramatically, retail prices were fixed until early in 2001. As a result, California's two largest utilities, Pacific Gas & Electric and Southern California Edison, were paying far more for wholesale power than they were able to resell it for at retail. The bankruptcy was inevitable and the State of California had: (i) to use state funds to buy power from unregulated wholesale suppliers; and (ii) to modify the electricity reform in such a way to avoid widespread blackouts.

A discussion of lessons about electricity market liberalization gained from California's experience is useful in order to avoid similar problems in other countries, such as Italy, where the electricity reform is taking its first steps. To understand the reason for this electricity crisis it is necessary to summarize California's restructuring program. For nearly a century, California's electricity industry was organized around three regulated private vertically integrated monopolies. The California Public Utilities Commission, an independent state regulatory agency, heavily regulated their prices, costs, and service obligations. This industry was reformed in 1996.

The reform was built around a new industry structure in which the production of wholesale electricity from existing generating plants and the entry of new plants would be deregulated, and their power sold in a new competitive wholesale market. Retail consumers would have the power to choose a competitive electricity service provider, using the transmission and distribution wires of their local utility to obtain "direct access" to these new competitive wholesale markets or to continue to receive power from their local utility at prices determined by the regulatory agency. This means that the utilities were forced to sell their generating plants, in order to facilitate the creation of a truly competitive wholesale market with several additional independent suppliers, but they also retained the obligation to buy power in the new wholesale market for retail consumers who did

not choose a competitive retail supplier and to resell it to them at a fixed price regardless of its cost for up to four years.

This reform did not to take into account the definition of "market power" in the electricity market and this was the big mistake. The reform did not consider that while during low demand periods the energy markets appear to be quite competitive, when demand gets very high the clearing price is far above the marginal cost. In fact, since there is virtually no real demand elasticity in these markets, it is evident that as demand grows and supply gets tight, generators realize that a small amount of capacity withholding, even with moderate levels of concentration, can lead to large wholesale price increases. The combination of inelastic demand and tight supplies creates opportunities for individual suppliers to exercise market power. In this context, maintaining fixed retail price with deregulated and increasing wholesale price implies: (i) the utilities bankruptcy; or (ii) widespread blackouts.[17]

CONCLUSION

This recent experience in California's electricity industry highlights the risk of following a reform model that liberalizes some markets (generation) but regulates others with fixed prices (supply to eligible customers). This kind of reform creates a distorted mechanism during high demand periods since independent service providers cannot compete with the fixed utility retail price and have incentives to return the customers with whom they have contracts to the utility default service so that they can increase profits by selling their power in the wholesale market. In other words, given the rigidity in demand for electricity, gen-

17. During May 2000 these market power problems and associated strategic behavior by suppliers became more and more severe as the wholesale electricity prices began to rise above historical peak levels and above the fixed price that utilities were permitted to charge for retail service.

Since retail consumers did not pay prices that responded to movements in wholesale market prices, they had no incentive to reduce demand and independent service providers (independent generators) could increase profits by selling their power to utilities in the wholesale market at increasing prices. For these reasons, by September 2000, utilities were paying nearly three times as much for power in the wholesale market than they could charge at retail and began to confront serious cash flow problems.

California government officials responded to the emerging crises only in early 2001, increasing the retail fixed price by about 40%, speeding up the permitting of new power plants, and negotiating long-term contracts with generators.

erators can sell in the wholesale market at increasing price and transfer to the utilities the cost of these behaviors. Of course, the result is the bankruptcy of these utilities and the necessity of State intervention with high social costs.

To avoid similar problems it is clear that the liberalization and regulation process in the electricity industry must have the following characteristics:

1) Generation has to be a real competitive market, which requires (i) a reduction in the incumbent's market power through divestitures in plants and (ii) easy procedures to enter into the market;
2) All markets have to be free from regulatory restrictions in terms of price caps or price fixing, since a liberalized wholesale market with a regulated retail market implies dissuasive behaviors during high demand periods and risks of bankruptcy for utilities;
3) The number of eligible customers has to be increased (reducing the threshold of consumption necessary to become eligible customers until a complete liberalization of the supply market);
4) Eligible customers have to be induced to buy electricity from the market, limiting the possibility of staying captive and buying at fixed price; and
5) Fixed prices for captive customers must be regulated taking into account the evolution of the wholesale market and the important signals about reduction in reserve margins coming from this market.

The lesson from the recent crisis in California gives important insight into how to avoid the occurrence of similar problems in the Italian electricity reform. First of all, the need to create a competitive and open generation market is evident. This implies that the power plants should not be concentrated in the hands of few generators, in particular the historical incumbent. Secondly, the threshold to become eligible customers has to be reduced in such a way to increase the demand and the wholesale market dimension.

Finally, investments in the transmission grid have to be realized so as to increase imports from foreign countries and the number of competitive suppliers in the wholesale market. For the same reason, the ownership of the grid should be transferred to a public company not controlled by the ex-monopolist.

In summary, regulatory reforms in Italy as in all other countries must guarantee a market structure in the electricity industry that does not encourage market power. This structure would also reduce the risk of abuse by incumbent operators and would guarantee a clear scenario for Competition Authority's investigations.