T.C.
MARMARA ÜNİVERSİTESİ
AVRUPA BİRLİĞİ ENSTİTÜSÜ

AVRUPA BİRLİĞİ İKTİSADI ANA BİLİM DALI

# CONVERGENCE MERGERS IN EUROPEAN GAS AND ELECTRICITY MARKETS: HOW TO ASSESS?

YÜKSEK LİSANS TEZİ

SERDAR ALPER

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**Supervisor:** Asst. Prof. Bülent Nomer

**Examining Committee Members:** Prof. Dr. Abdülkadir Mercül<br>Assoc. Prof. Murat Çokgezen

The thesis was approved by unanimity.

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| | |
|---|---|
| CCGT | Combined Cycle Gas Turbine |
| CPPE | Companhia Portguesa de Producção de Electricidade |
| EDIS | EDP Distribução de Energia |
| EDP | Energias de Portugal |
| ERSE | Entidade Reguladora do Sector Energético |
| EU | European Union |
| GdF | Gaz de France |
| GDP | Gaz de Portugal |
| GW | Gigawatt |
| HHI | Herfindahl-Hirschman Index |
| M&As | Mergers and Acquisitions |
| MTOE | Million Tonnes of Oil Equivalent |
| MWh | Megawatt-hour |
| RRC | Raising Rivals` Costs |
| SEI | Sistema Eléctrico Independente |
| SEP | Sistema Eléctrico Independente |
| TPS | Transactions per Second |
| TWh | Terra Watt per Hour |

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## ABSTRACT

The European gas and electricity markets have been experiencing a trend towards consolidation. The ongoing mergers between natural gas suppliers and power generation companies are one of the most striking aspects of this consolidation process. These vertical mergers can be also regarded as convergence mergers since they imply the harmonization of the integration of two formerly separate infrastructure industries.

In this study, the question of how convergence mergers should be assessed is addressed. First, the classical vertical merger theory is discussed, and then two different methods specially developed by Brennan (2001) and Hunger (2003) for assessing convergence mergers are explained. These two methods are later applied on the EDP/GDP/ENI merger case which was prohibited by the European Commission after an in-depth investigation in 2004. Since some information and data necessary to implement these methods are not available, several assumptions and interpretations are made. The summary of the Commission`s assessment is also included to provide a full illustration of the anticompetitive effects arising from a convergence merger and to make a comparison between the Commission`s and our assessments based on Brennan (2001) and Hunger (2003).

Our analyzes come to the same conclusion with the Commission`s assessment. However, it is found that neither the Brennan method nor the Hunger method takes into account the horizontal effects of the convergence mergers, which constitute a large part of the Commission`s assessment. In addition, based on the different points of interest of the two methods, it can be argued that a practitioner assessing convergence mergers by using Brennan and Hunger methods might reach to different outcomes. Moreover, in our opinion, the classical vertical merger theory is still useful in some respects.



**Key Words**: Convergence Mergers, Vertical Mergers, Electricity Industry, Gas Industry, Brennan Method, Hunger Method

# ÖZET

Avrupa gaz ve elektrik piyasasında uzun zamandır bir konsolidasyon yaşanmaktadır. Doğal gaz tedarikçisi firmalarla elektrik üretim firmaları arasındaki birleşmeler söz konusu konsolidasyon sürecinin en çarpıcı yönü olarak öne çıkmaktadır. Bu dikey birleşmeler, iki farklı altyapı sanayisinin entegrasyonunu öngörmesi dolayısıyla “yakınsama” (*convergence*) birleşmeleri olarak da adlandırılabilir.

Bu çalışmada, yakınsama birleşmelerinin ne şekilde değerlendirilmesi gerektiği ele alınmıştır. Öncelikle, klasik dikey birleşme teorisine ilişkin kısa bir literatür taraması yapılmış ve yakınsama birleşmelerini değerlendirmek için Brennan (2001) ve Hunger (2003) tarafından bilhassa geliştirilmiş olan iki farklı değerlendirme yöntemi incelenmiştir. Daha sonra ayrıca, elektrik ve gaz piyasalarının genel yapısı ve işleyişi hakkında bilgi verilmiştir. Bir sonraki bölümde ise Brennan ve Hunger yöntemleri Avrupa Komisyonu tarafından 2004 senesinde izin verilmeyen EDP/GDP/ENI arasındaki birleşme vakasına uygulanmıştır. Söz konusu iki yöntemin uygulanmasını teminen gerekli olan bazı bilgi ve veriler mevcut olmadığından dolayı, çok sayıda varsayım ve yorumda bulunulmuştur. Yakınsama birleşmelerinin rekabet bozucu etkilerini tam olarak göstermek ve Brennan ile Hunger yöntemleri baz alınarak çalışmamızda yapılan incelemeyle Komisyon incelemesini karşılaştırmak için Komisyonun vakayla ilgili resmi incelemesi de kısaca ilgili bölümde özetlenmiştir.

Yaptığımız analiz, Komisyonun incelemesiyle aynı sonuca varmıştır. Ancak, Komisyonun incelemesinde hacimli bir yer kaplayan, yakınsama birleşmelerinin yatay etkilerinin ne Brennan ne de Hunger yönteminde yer almadığı tespit edilmiştir. Ayrıca, yakınsama birleşmelerini inceleyen uygulayıcıların bahse konu iki yöntemin farklı noktaları dikkate alması nedeniyle farklı sonuçlara varabileceği düşünülmektedir. Dolayısıyla, klasik dikey birleşme teorilerine yakınsama birleşmeleri incelenirken de başvurulmalıdır.

**Anahtar Kelimeler:** Yakınsama Birleşmeleri, Dikey Birleşmeler, Elektrik Sektörü, Gaz Sektörü, Brennan Yöntemi, Hunger Yöntemi

# CHAPTER I

# INTRODUCTION

The European energy sector has been witnessing a wave of merger and acquisition activity, especially between electricity producers and natural gas suppliers, before the full liberalisation of the sector which has began in July 2007. Some believes[1] that European energy industry will become more and more like an oligopoly dominated by a number of giant surviving energy companies, as a result of these mergers and acquisitions. This trend expresses considerable concern about the future of well-functioning and competitive integrated European energy market.

Among the merger cases in the European energy market, mergers between natural gas distributors and power generators constitute a large part. Such mergers have also been called convergence mergers. Convergence here implies the integration of two formerly separate infrastructure industries which have a vertical relation like electricity and gas (Hunger 1999). Since natural gas provides input for electricity generation with the introduction of new combined cycle gas turbines (CCGTs), these mergers can be designated as vertical mergers, with gas suppliers occupying upstream of the market and electricity generation companies competing downstream market.

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[1] For such an argument, see (Barquin et al. 2005) “Brief academic opinion of academic professors and scholars on the project of acquisition of Endesa by Gas Natural”, October 28th, 2005.

An example would be helpful here to explain the convergence mergers (Henriksson, 2005). First, suppose that the Gas Supplier (1) and Gas Supplier (2) which are showed below in Figure 1.1 merge. This merger will be taken as horizontal merger since the two merging companies are operating at the same level of the supply chain. A merger between Gas Supplier (1) and Electricity Producer A, on the other hand, is a vertical merger. Given the fact that the merging companies are from formerly separate infrastructure industries, this kind of mergers might also be taken as convergence mergers.

The increasing use of natural gas in electricity generation is the main driver of the convergence mergers. Today gas-fired power plants account for one fifth of the electricity in the EU-27 (IEA 2007)[2]. In Europe, about two-thirds of new electricity generation plant under construction is gas-fired. There are several factors behind the increasing popularity of natural gas in power generation vis-à-vis other inputs like coal. These factors include environmental qualities of gas, the shorter plant construction times and highly efficient technology.

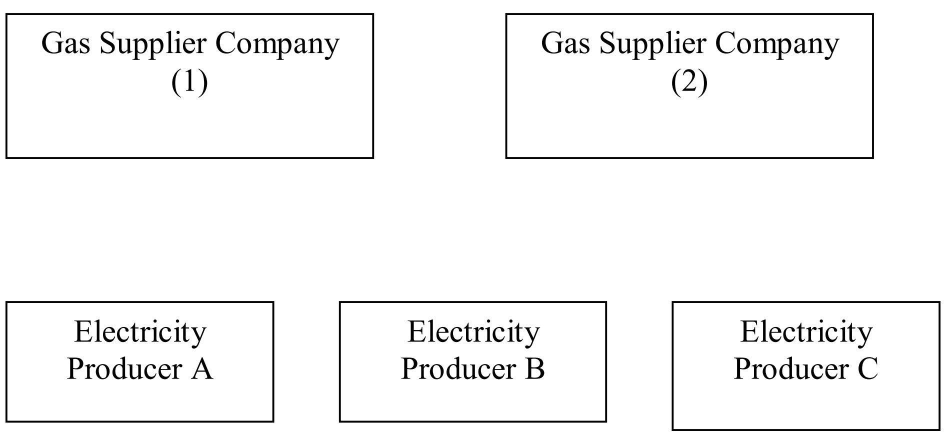


Figure 1.1: The structure of an electricity market
Source: Henriksson (2005)

[2] The same ratio was 7.5% in 1990.

The question of how to treat vertical mergers has always been subject to controversy. A consensus has not yet been reached on the potential anticompetitive effects of the vertical mergers. In the first vertical merger cases like Brown Shoe and Ford-Autolite, the antitrust treatment was highly restrictive. This rather restrictive approach attracted harsh criticism from Chicago School economists claiming that the main motivation for firms to vertically merge is only to reduce costs. This criticism had its effect on competition authorities which later adopted a more lenient approach towards vertical mergers. However, starting from the first half of the 1980s, a number of industrial economists including Jean Tirole developed models based on more realistic assumptions, and showed that vertical mergers might have anticompetitive effects under certain conditions. Foreclosure, exchange of information and evasion of regulation are the main anticompetitive conducts that vertically integrated companies might engage in.

The infrastructure industries in Europe have traditionally been protected from competition since they provided crucial services for the economy as a whole[3]. They often operated as vertically-integrated national monopolies. However, from 1980s onwards these industries have gone under a process of restructuring and privatization (Newberry, 2002). Facing with increased competition as a result of this process, utilities are now tend to merge with other firms from the same industry to maintain their market power and promote their competitiveness.

The European energy sector is one of the infrastructure industries in which there is extensive merger and acquisition activity, especially between power generators and natural gas suppliers. Table 1.1 illustrates a number of European deals in gas-electricity sector which occurred between the years 2000 and 2002. Among the merger cases listed in the table, the mergers between Italenergia-Edison, E.ON-Hein Gas and Fortnum-NYA Birka were examined by the European Commission, and received unconditional clearance.

[3] In addition to this, the infrastructure industries are also characterized by extensive economies of scale and scope as well as large sunk costs.

As is seen on the table below, the merger between National Grid Group PLC and Lattice Group PLC is the largest vertical merger case in terms of the deal value in Europe. However, since the merging companies are grid operating companies, the merged entity does not pose any danger like RRC[4] if the third part access is guaranteed by the regulator, which is the case in the UK.

Table 1.1: Top European gas-electricity mergers

| **Buyer-Seller** | **Date Effective** | **Deal Value** | **(Buyer-Seller)** |
|---|---|---|---|
| National Grid Group PLC (UK)<br>Lattice Group PLC (UK) | 2002 | 18,440 | Electric-Gas |
| E.O.N. AG (Germany)<br>Ruhrgas AG (Germany) | 2002 | 3,824 | Electric-Gas |
| RWE AG (Germany)<br>VEW AG (Germany) | 2000 | 3,432 | Electric-Gas |
| Fortum Corp. (Finland)<br>NYA Birka Energi (Sweden) | 2002 | 3,052 | Gas-Electric |
| Italenergia (Italy)<br>Edison SpA (Italy) | 2001 | 2,139 | Electric-Gas |
| Fortum Corp (Finland)<br>Stora Enso Oyj (Finland) | 2000 | 1,861 | Gas-Electric |
| Enel SpA (Italy)<br>Camuzzi Gazometri SpA (Italy) | 2002 | 907 | Electric-Gas |
| E.ON Energie AG (Germany)<br>Hein Gas GmbH (Germany) | 2001 | 750 | Gas-Electric |

Source: Toh (2004)

There are also some other major convergence merger cases which are not listed on the above table but are worth to mention.

[4] RRC (raising rivals` cost) is an anticompetitive strategy which is discussed in detail in chapter 2.

In 2004, the European Commission prohibited the proposed acquisition of joint control over Gás de Portugal (GDP), the incumbent natural gas utility in Portugal, by Energias de Portugal (EDP), the incumbent electricity utility in Portugal, and ENI, an Italian energy utility. This case, which will be discussed later in detail, is quite illustrative of anticompetitive effects arising from a convergence merger.

On 10 May 2006, the European Commission received a notification of a proposed merger between Gaz de France (GdF) and Suez group, both of which are giant French energy companies. The Commission approved the merger after the parties offered extensive remedies including the divestiture of some of their major facilities (EC 2006). While the new president Nicolas Sarkozy was opposed to the Villepin government's plans for a merger of the two companies, he eventually accepted the government proposal. The parties have planned to finalize the merger during the course of 2008. If this merger is allowed to go ahead, it will become the fifth-largest electricity producer and the operator of the largest gas transport and distribution network in Europe (Gaz de France, 2006).

In 2005, Gas Natural, Spain`s largest natural gas supplier, made a bid for the country's leading electricity company, Endesa. Despite the opposition of the Spanish competition authority, the Spanish government gave its full support to the proposed merger. For some, the aim of the government was to create a national champion which is able to compete successfully in European energy market. However, the German utility company E.ON launched another bid. As of October 2006, the case is still pending.

This vertical merger activity between energy companies in Europe have added a new dimension to the ongoing discussion on the anticompetitive outcomes of vertical mergers, given the fact that these industries are regulated infrastructure industries with special characteristics distinguishing them from other industries of the economy. There is no doubt that every merger case triggers another merger, since companies tend to protect themselves from takeovers and increased competitive pressures by merging with another company. This trend might result in greater market power and reduced consumer welfare. Given the fact that the merger activities in energy markets have increased both in number and size, the challenge for the competition authorities is to accurately assess the potential anti-competitive outcomes of these mergers to protect European consumers. This fact provides another motivation to study the anticompetitive outcomes of vertical mergers in electricity and gas industries.

Some scholars argue that competition authorities dealing with convergence mergers in energy industry should adopt a tougher policy[5]. For them, there might be some additional anticompetitive effects of such mergers. While a dominant energy company might charge excessive prices due to extremely weak demand elasticity and hence lead to a huge reduction in consumer surplus, the cost of prohibiting mergers with efficiency gains will do relatively little harm to consumers (Barquin et al. 2005).

As merger cases between power generation companies and gas suppliers are new phenomena, there is inadequate literature explaining the causes and consequences of the convergence mergers as well as their differences from typical vertical mergers as regards to their possible anticompetitive outcomes.

Although there is extensive literature on vertical mergers, this is clearly not the case with the amount of studies on convergence mergers. Nevertheless, a number of recent studies have substantially contributed to the existing literature.

Studies like Brennan (2001) and Hunger (2003) propose new approaches about how to deal with convergence mergers. In their view, typical theories on vertical mergers are insufficient to understand the impacts of convergence mergers. Brennan (2001) reviews two convergence mergers in the US energy market and applies the three-stage method developed in the same study on

[5] See Barquin et al. “Brief academic opinion of academic professors and scholars on the project of acquisition of Endesa by Gas Natural”, October 28th, 2005.

these cases. Brennan compares the assessment made by the Federal Energy Regulatory Commission (FERC) and his review. He finds a number of differences, which is discussed further in next chapter. The main difference is arising from the fact that Brennan model focuses on the dominance of the gas supplier over only its customers in the downstream electricity market. Brennan (2001)`s assumption that a convergence merger is likely to be more dangerous if the merging firms had no prior buyer-seller relationship is another difference.

In addition to Brennan (2001), Hunger (2003) also developed a method to assess convergence mergers. He argues that the standard concentration measures are inadequate for a thorough analysis of convergence mergers and proposes to use supply curves.

These two studies rely more or less on the well-known theory of raising rivals` costs (RRC), since both studies, at the end of the day, seek to find out whether the merging entity have the ability and/or incentive to raise rivals` cost. Apart from these, there are also a number of studies based on agent-based models to explain convergence mergers. For instance, Estañol et al. (2005) investigates the possibility that there are other factors except foreclosure for vertically integrated energy firms to benefit, by taking into account the strategic interactions of the market participants.

This dissertation aims at finding out the potential anticompetitive impacts of convergence mergers between gas and electricity companies and evaluating theories that can be used in assessing anticompetitive effects of convergence mergers. The recent merger case between EDP, GDP and ENI which was prohibited by the European Commission is investigated to illustrate the potential anticompetitive effects of the convergence mergers. The methods proposed by Brennan (2001) and Hunger (2003) are used on this case to the extent that available data permit. A brief comparison of the assessment of the European Commission and our assessment based on these two methods is also provided.

The remainder of this study is organized as follows.

In the second chapter, a review on existing literature of vertical integration theory which provides a methodology for this dissertation is given. An emphasis is placed on the ability of the standard vertical merger theory to assess convergence mergers in electricity industry. The methods specially developed for convergence mergers by Brennan (2001) and Hunger (2003), which provide the basic methodology in the assessment of our case, EDP/GDP/ENI merger, are also explained.

Since electricity and gas industries bear significant differences from other industries, the third chapter is devoted to a discussion of these two industries which are also the prime examples of natural monopolies. The issue of security of supply is also briefly addressed. It is hoped that this chapter will facilitate the understanding of the reason why convergence mergers should be treated differently than any other vertical mergers.

In the fourth chapter, a convergence merger case is analysed. The EU Commission`s recent decision on the GDP/EDP/ENI merger case, which is one of the most detailed review of potential anticompetitive effects arising from a convergence merger is discussed. This case is investigated in detail to understand potential anticompetitive effects of convergence mergers. To this end, the methodologies proposed by Brennan (2001) and Hunger (2003) are employed on this case.

In chapter five, final remarks and conclusion are given.

The methodology used in this dissertation is based on microeconomic theory and industrial economics. In industrial economics literature, three potential anticompetitive effects of vertical mergers are discussed extensively: raising rivals` costs, regulatory evasion and anticompetitive exchange of information. However, the RRC has attracted more scholarly attention. These studies so far have focused on whether the vertically-integrated company would have the ability and incentive to raise its rivals` costs. The methods specially developed by Brennan (2001) and Hunger (2003) for convergence mergers, which basically focus on the same question, are also used in this dissertation.

# CHAPTER II

## VERTICAL MERGER THEORY and the METHODS for ASSESSING CONVERGENCE MERGERS

Firms in a market are related to each other either horizontally or vertically. Horizontally related firms are in competition with each other by producing or selling substitute goods[6]. Vertically related firms, on the other hand, operate at different stages of the supply chain. In a vertical relationship, the market is divided into two groups: upstream market and downstream market. Firms in the upstream market produce or sell intermediate goods for the use of downstream goods. Retailers are also deemed downstream firms in a sense that they are marketing upstream goods. The upstream product can be viewed complementary to the downstream product, since an increase in the price of one will decrease the demand for the other.

Mergers and acquisitions (M&As) between firms are also classified in accordance with how firms are related with each other. In that regard, while horizontal mergers take place between competitors, vertical mergers occur between firms operating at different levels of the market. M&As have two effects on market: competitive effects and efficiency effects. After almost a century-long experience of merger enforcement, a general consensus has emerged among antitrust economists on the possible anticompetitive effects arising from horizontal mergers. However, this is not the case with vertical mergers. Unlike horizontal mergers, vertical mergers do not lead to a removal of a competitive constraint. One can not observe a clear trend in the evolution of the treatment of vertical mergers.

[6] Two goods are deemed substitutes, if an increase in price of one good induces an increase in demand for the other good.

## 2.1 The Evolution of the Vertical Merger Theory: Changing Approaches

The first cases of vertical mergers like *Brown Shoe*[7] and *Ford-Autolite*[8] were subject to very restrictive antitrust treatment, reflecting the then view on the anticompetitive effects of the vertical integration. In these cases, the ability of the integrated firm to prevent its downstream rivals` access to inputs by refusing to supply or charging excessive prices was the major concern. This harsh antitrust treatment received severe criticism from the so-called Chicago School economists[9]. Their critique focuses on two main concerns of the vertical merger policy (Riordan and Salop, 1995).

First, in their view, the vertical merger does not necessarily lead to reduction in input supplies to downstream rivals. Since the unintegrated upstream firm(s) that previously supplied the merging downstream firm will no longer provide inputs to the integrated firm, the rivals ensure their access to inputs. So, the foreclosure can only lead to a realignment of the purchase patterns among the downstream firms.

Secondly, according to the Chicago School, vertical mergers do not strengthen the monopoly power of the merging parties. By using a simplified model, these economists show that only a single monopoly profit can be extracted by the vertically integrated monopolist. So, firms merge just to achieve efficiency gains. In this context, Chicago School`s economist Richard Bork questioned the profitability of foreclosure for the upstream monopolist:

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[7] The Courts` decision in Brown Shoe Co. v. United States (1962) had remained the key decision in this area for more than a decade.

[8] In Ford Motor Co. v. United States (1972), the Supreme Court prohibited Ford`s proposed acquisition of Autolite, a spark plug manufacturer on the ground that the proposed merger would prevent other companies to enter the spark plug market.

[9] See Robert H. B., (1978) The Antitrust Paradox, p. 225-245 and Posner R. A., (1978) Antitrust Law.

> "Antitrust concern with vertical mergers is mistaken. Vertical mergers are means of creating efficiency, not of injuring competition" (Borke, 1978 p. 226)

> "…vertically related monopolies can take only one monopoly profit. If each level tries to maximize by restricting output, the result will be a price higher than the monopoly price and an output smaller, the result being less than a full monopoly return. …The monopolist must allow the retailers a competitive return, and he will not want to allow them more than that. If he allowed them less, the level of investment and operation in retailing would decline to the manufacturer`s detriment." (Borke, 1978 p. 229)

This single monopoly profit theory is based on four restrictive assumptions:

1. Inputs are used in fixed proportions, which means downstream firms are unable to substitute inputs
2. The input supplier is a monopoly
3. The downstream market is perfectly competitive
4. The upstream market is not regulated, which allows input supplier to enjoy monopoly rents

Starting from late 1980s, a number of antitrust economists developed new models on vertical mergers[10]. Although these new post-Chicago theories did not reject the Chicago School`s contribution on vertical merger theory, they analyzed the conducts of the firms in more realistic market settings after the above-mentioned assumptions are relaxed (Riordan and Salop, 1995). The distinguishing feature of the post-Chicago approach is the recognition of the fact that the post-merger incentives of the merging parties are likely to alter. These

[10] Among many studies focusing on the anticompetitive effects of vertical mergers, the leading ones are the following: Salop and Scheffman (1987) "Cost Raising Strategies"; Salinger (1988) "Vertical Mergers and Market Foreclosure"; Hart and Tirole (1990) "Vertical Integration and Market Foreclosure"; Ordover *et al*., (1990) "Equilibrium Vertical Foreclosure."

models demonstrate that the single monopoly profit does no longer hold in the absence of these assumptions, and vertical mergers might have anticompetitive effects under certain circumstances[11]. For instance, suppose the fourth assumption is relaxed, that is, the upstream market is subject to regulation. The regulator is authorized to set the prices based on costs incurred by the upstream firm. The regulated firm might evade regulation by merging with an unregulated downstream firm.

## 2.2 Efficiency Gains from Vertical Mergers

It is a common view that vertical mergers have greater efficiency potential than horizontal mergers (Riordan and Salop, 1995). However, in most cases, mergers have both anticompetitive and efficiency effects. So, the crucial point is to analyze whether merger-specific efficiencies might offset the potential anticompetitive effects. Some efficiency can not be achieved in horizontal mergers. However, according to the RBB (2005), the two-step approach used in horizontal merger assessments (first, review the potential anti-competitive effects and then find out whether resulting efficiencies offset these concerns) is not practical for the treatment of vertical mergers, due to the fact that efficiency and anticompetitive effects stem from the same source.

Williamson (1979) discusses vertical integration within the context of transaction cost economics. Transaction cost economics provides the bases for the all theories regarding efficiency benefits arising from vertical mergers. This is because a vertical merger can be seen as an alternative to contractual exchanges, and it may eliminate all the inefficiencies associated with them. There are costs related to writing up a contract, enforcing it and monitoring compliance when economic environment is uncertain and where parties have

[11] The assumption that downstream market is perfectly competitive seldom reflects the real downstream market structure. In real life, most of the markets are oligopoly dominated by restricted number of firms. In this respect, the majority of the post-Chicago models are developed to study the strategic behaviours of the firms competing in oligopolistic markets.

bounded rationality. Therefore, the decision of a firm on vertical merger depends on the cost difference between external market transactions and internal exchanges. A firm probably prefers to merge when the cost of market transaction is higher than the cost of internal exchanges (RBB Economics, 2005 p. 77).

In addition to eliminating transaction costs, a vertical merger might also allow better coordination in design and production, which in turn translates into lower costs, higher quality and shorter launch time for new products. As the merged entity wants to achieve a common goal of joint profit maximization, the parties of the merger can better trust each other, and this further facilitate coordination (Riordan and Salop, 1995).

Avoiding double marginalisation is another source of efficiency. A firm holding a monopoly power tends to deviate from marginal-cost pricing to add a mark-up over the marginal cost. In case of both an upstream firm and a downstream firm charge monopoly prices, then there appears a danger of double mark-up (a mark-up first by the input supplier and second by the output producer). A vertical merger between the two monopolists might reduce the final price by eliminating one of the mark-ups. This is due to the assumption that the upstream division of the merged firm is to transfer the input to the downstream division at marginal cost without adding a mark-up.

Apart from the ones mentioned above, there are many potential efficiency gains derived from a vertical merger such as economies of scope, supply assurance, rationalization of input usage and elimination of free-riding[12].

[12] For a detailed discussion of potential efficiency gains of vertical mergers, see RBB Economics (2005), "Efficiency-Enhancing Effects of Non-Horizontal Mergers."

## 2.3 Anticompetitive Effects of Vertical Mergers

The question of whether the merger will lead to an increase in final price and will create a dominance which might affect competition is at the core of the merger enforcement. There are four major competitive concerns associated with vertical mergers: vertical foreclosure, information exchange, evasion of regulation and elimination of a potential competitor.

### 2.3.1 Vertical Foreclosure

Vertical foreclosure occurs when an integrated firm refuses to enter into transaction with other firms and/or imposes conditions to a transaction disadvantageous to these firms. According to Riordan and Salop (1995), vertical integration might change the incentives of the parties to get involved exclusionary conduct. A vertically integrated firm might use two ways to foreclose the market.

A. *Input Foreclosure*: According to the theory, the upstream part of the vertically integrated firm might refuses to supply or increases the prices of inputs used by unintegrated downstream firms. Facing with higher input prices, the unintegrated firms will have to raise their downstream products or reduce their output level. That allows the integrated firm to expand its downstream market share if it maintains premerger downstream prices which would remain lower than those of its rivals, or to enjoy excessive profits if it prefers set downstream prices equal to those charged by the unintegrated downstream firms.

B. *Customer Foreclosure*: It occurs when the downstream part of the merged firm refuses to buy from an unintegrated input supplier. In the presence of substantial economies of scale in input production, a sophisticated downstream buyer might have the ability to force the rival upstream firms produce below minimum viable scale, and eventually exit the market.

Riordan and Salop (1995) suggest a four-step analysis to evaluate the anticompetitive effects of the vertical mergers. This analysis basically investigates the ability and incentive of the integrated firm to use foreclosure as a profitable strategy. It concludes with the following points:

- There will be no harm from input foreclosure, provided that the unintegrated rivals have the chance to substitute to alternative equally cost-effective inputs and there is an effective competition in the input market.

- If the foreclosed input constitutes a small share of total cost of downstream production, which means the input demand is less elastic, then there is a greater scope for the input supplier to increase prices.

- Vertical mergers in concentrated markets are more likely to impede competition.

- The success of foreclosure strategies depends on the ability of rival input suppliers to increase sufficiently their supply capacities. If that is the case, then the Chicago School argument will hold: vertical merger just leads to a rearrangement in supply structure.

- Vertical mergers are more likely to have welfare-reducing effects when pre-merger competition is imperfect.

Salop and Scheffman (1987) develop a model with a predator dominant firm controlling a parameter $\alpha$ which reflects the input price, and a competitor fringe. They find out that a dominant firm might find it profitable to buy the input on the market at a price above the marginal cost incurred internally in producing the input. For them, raising rivals` costs strategies can be more advantageous comparing to predatory pricing strategies, and be successfully used even if the predator firm is price-taker in the downstream market. In their paper, Salop and

Scheffman mentioned the need for assessing the counterstrategies of the other firms against the predator`s anticompetitive conduct. They further argue that cost-raising strategy is more likely to be successful when:

I. The supply curve of the fringe is less elastic
II. The market demand curve is less elastic
III. The fringe uses greater amount of input per unit of output than the predator does

In a different market setting, Ordover et al. (1990) explain foreclosure with a game theoretical model, by taking into account the counter strategies of the rival firms. In their model, there are two upstream firms engaging in Bertrand competition and two downstream firms with equal market share. They find different results depending on different strategies and counter strategies formulated by the market players. One interesting conclusion is the finding that it may not always the vertically integrated upstream firm`s interest to stop supplying rival downstream firms. The upstream division of the merged firm might continue supplying input to other firm by setting a price which is slightly lower than the one charged by the other upstream firm.

Altering some of the assumptions of the Ordover et al. (1990), Salinger (1988) argues that a vertical merger does not necessarily lead to higher input prices for the downstream firms, and for this reason, the competition authority dealing with vertical mergers should adopt a “rule of reason” approach.

It can be argued that RRC is a profitable strategy when the excess profit arising from increased downstream sales and/or prices exceeds the foregone profits from loss input sales.

### 2.3.2 Information Exchange and Collusion

A vertical merger allows the downstream firm to access important information on its rival`s input consumption patterns and variable costs. As it will be seen while discussing our case in the third chapter, this might raise considerable anticompetitive concerns in some industries where the cost of input supplied by the upstream firm of the merger constitute a large part of the variable costs of production in the downstream market.

However, there are a number of conditions required in order this kind of information sharing to pose an anticompetitive danger. First, the upstream input market must be highly concentrated, which does not give the downstream competitors the chance to change their supplier. Second, as in the electricity generation sector, there must be intense transactions between the supplier and the customer (Riordan and Salop, 1995).

### 2.3.3 Regulatory Evasion

Vertical mergers might allow a firm to evade cost-based price regulation. To evade regulation, an integrated firm might set artificially high prices on inputs sold by its unregulated supplier to its regulated downstream affiliate. The artificially increased input costs will easily be passed on to consumers. It would be difficult for the regulator to prevent this when there is no sufficient number of firms in unregulated market to allow regulator to make comparison. Vertical mergers for regulator evasion might result in foreclosure of downstream markets to unintegrated upstream firms which would likely to supply cheaper and better quality products (Riordan and Salop, 1995).

### 2.3.4 Elimination of a Potential Competitor

In some sectors, an upstream (downstream) firm is able to enter into downstream (upstream) market more easily than the other firms outside the market. A vertical merger between firms having an incentive and ability to enter into markets of each other might result in elimination of a potential competitor. Thus, the merger might lead to a removal of a potential competitive restraint.

It is widely accepted that there is a greater potential for efficiency gains from vertical mergers. On the other hand, as it is briefly explained above, vertical mergers might also lead to a number of anticompetitive results when certain conditions are met. Therefore, the competition authority needs to weigh the anticompetitive effects of a vertical merger against the possible benefits. However, this balancing method is not a straightforward process. Among the anticompetitive concerns of vertical mergers, the foreclosure is the most controversial one.

From the early 1980s, the competition authorities, under the influence of Chicago School, adopted a more lenient approach towards vertical mergers. Reiffen and Vita (1995) argue that there are no empirical studies, but many theoretical models showing vertical mergers are really welfare-reducing. Opposing "a faulty analogy between vertical and horizontal mergers" drawn by Riordan and Salop (1995), they proposed *per-se* legality to vertical mergers, since the efficiency gains of vertical mergers are more likely to exceed consumer harms.

## 2.4 Theories for Convergence Mergers in Electricity-Gas Industries

Electricity markets have some of the necessary features for a successful vertical anticompetitive strategy. As is explained in detail in the third chapter, electricity markets are characterized with highly inelastic short-run input demand, inelastic output supply and short-run capacity constraints. There is also a certain degree of potential for efficiency gains from convergence mergers. For instance, there are substantial transaction costs of arranging a long-term contract between a natural gas supplier and an electricity generator. Vertical merger might eliminate these costs.

A number of methods have recently been laid down by some scholars for competition authorities to assess the potential anticompetitive effects of convergence mergers. Although these methods do not discuss the potential efficiency effects arising from convergence mergers, they take into account the special characteristics of the electricity and gas markets.

### 2.4.1 Brennan Method

Brennan (2001) offers a three-stage method "based on a more sound horizontal approach." He argues that the essence of the problem is not vertical but horizontal market power. This is because RRC strategy necessitates an upstream market power, which is more fundamentally a horizontal problem. In his example, an electricity generator acquires a natural gas supplier.

> "One would then have to ask how owing this gas supplier enables the acquiring generator to control the price or output of the gas suppliers` customers, as if there in fact had been the hypothesized direct horizontal merger of the acquiring generator and those customers" Brennan (2001, p.14).

This vertical merger might produce a result as if the acquiring generator merges with the acquired gas supplier`s customers, which are also the acquiring generator`s rivals in the downstream electricity generation market. The fact that the market power of the merging gas supplier is transferred to the acquiring generator will create an effect like the acquiring generator merged with the competing generators. For that reason, this vertical merger should be treated as if it is a horizontal merger. As is known, post-merger concentration is the main concern in the treatment of horizontal mergers. And here the question is whether the combined market shares of the acquiring gas supplier and its rival(s) constitute a substantial share of the relevant electricity market.

In the figure below, the other generators which do not buy their inputs from the acquired gas company is represented by the box “Other generators”. HHI might be used to assess post-merger concentration as in the horizontal merger assessment. Special attention should be given to the fact that firms in electricity markets even with a small market share might enjoy market power in peak demand periods. If the assumed merger between the acquiring generator and the acquired gas supplier`s customers would pose a competitive problem, then we move to the second step.

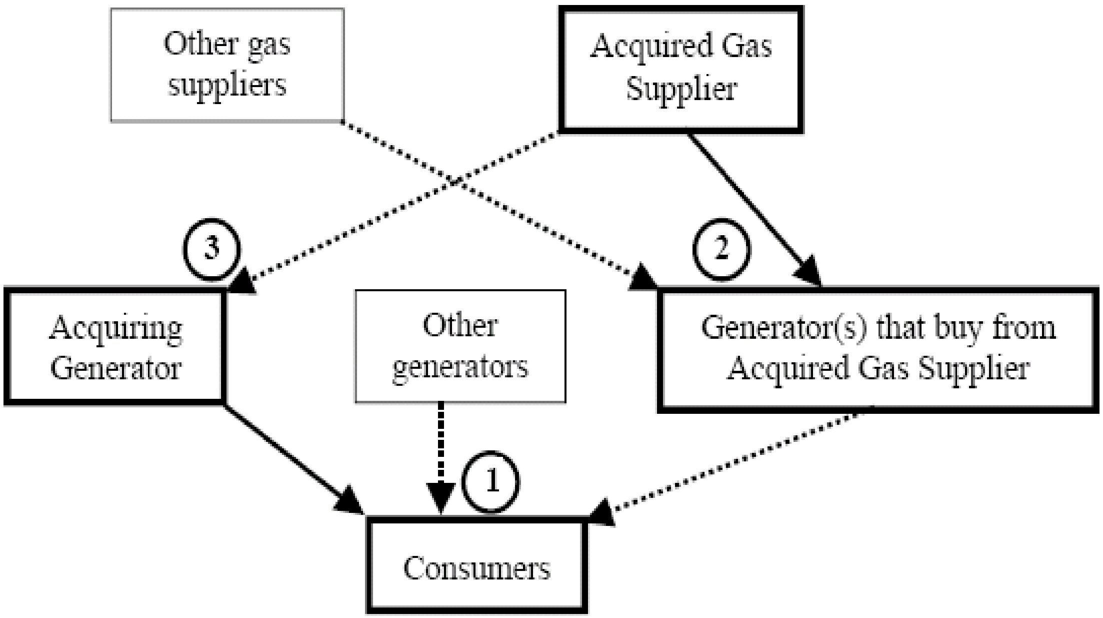


Figure 2.1: Three steps of Convergence Merger Analysis
Source: Brennan (2001)

In the second step, we are trying to find an answer to the question whether the acquired gas company has the market power[13] over its customer generators other than the acquiring electricity firm, which are represented by the circle 2 in the figure. The availability of alternative gas suppliers which would sell gas to the acquired firm`s customers directly affects the degree of the acquired gas firm`s market power. In the case of the acquired company drives up gas prices, its clients would switch their natural gas supplier. However, electricity generators may not always switch their supplier due to the binding long-term contracts with their existing natural gas suppliers. There is also a possibility that the other gas suppliers are already locked in to other generators by these sorts of long-term contracts, which prevent them to sign an agreement with the other generators in the short term.

In the third step, we are focusing on whether or not the acquired gas company, prior to the merger, is the dominant supplier for the acquiring

[13] Market power refers to the ability of a firm to raise and maintain prices above the competitive level.

company. The fact that the acquired gas company is the sole supplier of the acquiring generator means that it already can exercise market power over the acquiring company. So, the merger would not make the situation much worse. For Brennan (2001), there is an inverse relation between “the incremental anticompetitive effect of the merger” and “the dealings between acquiring and acquired firms.” If there is no premerger market power, the merger is more likely anticompetitive.

To sum up, according to Brennan (2001), the following questions must be answered by the practitioners dealing with a convergence merger:

1. Would a merger between the acquiring utility and the acquired gas company`s customer generators constitute an anticompetitive share of the electricity market? If no, stop. If yes, continue.

2. Does the acquired gas company already have a market power over its clients except the acquiring generator? If no, stop. If yes, continue.

3. Is the acquired gas supplier the dominant gas supplier for the acquiring generator company, prior to the merger? If yes, there is a small possibility that the convergence merger will have an anticompetitive outcome.

### 2.4.2 Hunger Method

The procedure suggested by Hunger (2003) consists of two sections, with each one asking three questions. In the first section, the ability of the merged firm to raise prices is investigated. The second section focuses the incentive of the merged firm to increase prices.

Prior to the merger, the natural gas supplier has the ability but no incentive to increase the electricity prices by using its power in input market. The power generator, on the other hand, has the incentive but no ability to raise the downstream electricity prices. Therefore, the merged energy firm is more likely to have both ability and incentive to increase electricity prices, depending on some other factors. The input demand elasticity, supply and demand elasticities in the downstream market as well as the upstream market power of the gas supplier are some of the leading factors affecting the ability of the merged firm to raise the downstream prices.

The cost-raising strategy of the vertically integrated firm will be less successful if the rival electricity firms have a diverse power generation portfolio, which allows them to substitute between inputs and also reduces their dependence on natural gas supplies of the merged firm. It is again less successful if the other gas suppliers take up the slack and expanding their production correspondingly.

Each section consists of three questions. As is mentioned above, the three questions of the first section investigate the ability of the merged firm to raise downstream prices.

Section 1:

1. Does the merger connect upstream and downstream markets?
2. Does the merger create a highly concentrated upstream market?
3. Do the marginal gas-fired electric generators have the ability to substitute to a different fuel input in response to a gas price increase?

For Hunger (2003), the necessary condition for a successful RRC strategy is the existence of concentrated upstream market, which is the subject of the second question. If the upstream market is highly concentrated, then the downstream generators can not switch their suppliers. Calculating HHIs is useful to measure the market concentration. Unlike Brennan (2001), Hunger does not specifically focus on the upstream market power of the merging company over its customer electricity generators. The third question addresses the possibility of input demand elasticity. The merged firm would not be able to keep the input prices high, if the other generators have the ability to switch fuels. If our answers to all three questions are “yes”, then we progress to the second section.

Section 2:

1. Does the merged firm have an upstream market power and considerable inframarginal electricity capacity?
2. Is the supply curve inelastic for a significant number of hours?
3. Does the merger affect the answers to second and third questions? If it does, how?

In the second section, the question is whether the merged firm have the incentive to raise prices, in other words, whether it is the merged firm`s interest to pursue such a policy. The first question is about the merged firm`s generation capacity which it might want to sell when the other generators reduce their capacity in response to an input price increase. It is also important to know what kind of capacity the merged firm holds. To answer that question, we need to draw a supply curve showing the available capacities of the generators and the merit order. In the second question, we are trying to understand the effect of reducing a certain amount of gas in the upstream market on the downstream electricity prices. The merged firm`s incentive to raise input prices would largely depend on the downstream supply elasticities.

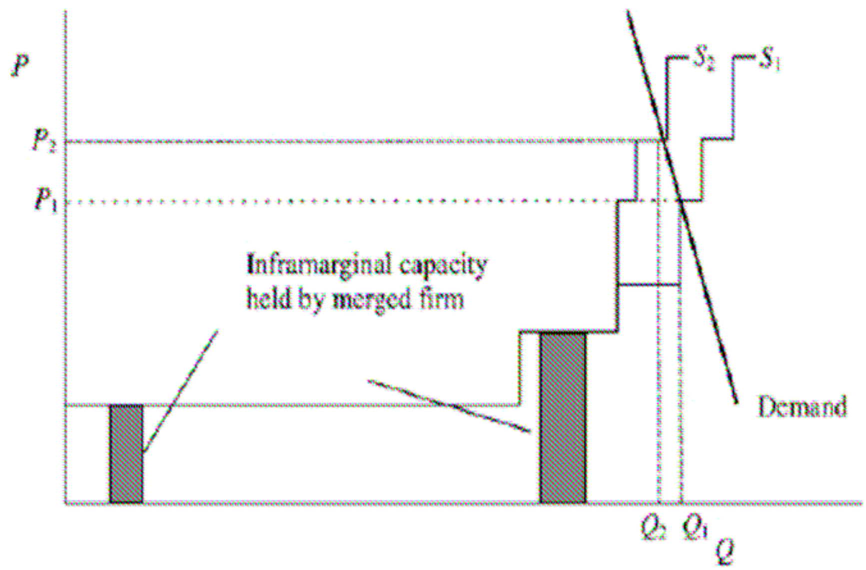


Figure 2.2: Raising Price by Raising Rivals` Costs
Source: Hunger (2003)

The profitability of an RRC strategy largely depends on the difference between the foregone profits from lost sales in the upstream market and the excess profit in the downstream market. This excess profit equals to the per unit price increase multiplied by the amount of inframarginal capacity. In the figure above, a firm adopting an RRC strategy might increase the downstream electricity market price from $P_1$ to $P_2$ by shifting its supply curve. The degree of supply elasticity determines the difference between $P_2$ and $P_1$. When the downstream supply curve is inelastic, the merged firm can affect the downstream price of electricity by raising the price of its natural gas in the upstream market. However, its ability to benefit from this downstream price increase depends on its inframarginal capacity[14].

To sum up, the methods developed by Brennan (2001) and Hunger (2003) include questions for competition authorities while assessing convergence mergers. The distinguishing feature of the Brennan method lies on its particular emphasis on the dominance of the merged firm over other downstream firms.

[14] Inframarginal capacity refers to the capacity which satisfies the base load demand.

According to Brennan (2001), market dominance is a prerequisite for a successful RRC strategy. Hunger (2003), on the other hand, investigates the merged firm`s ability and incentive to conduct a successful RRC strategy.

As is seen, most of the studies, including the ones on vertical mergers, focus on only the possible anticompetitive effects of the mergers without discussing the efficiency effects. Given the widely accepted idea that vertical mergers have more potential for efficiency gains, the competition policy practitioners should assess the potential efficiency gains arising from a vertical merger and weigh these gains against the anticompetitive outcomes. If the former exceeds the latter, then the proposed merger should be allowed to go forward. This basic intuition is also valid for convergence mergers.

# CHAPTER III

# THE STRUCTURE of THE ELECTRICITY and GAS INDUSTRY

## 3.1 Electricity: a different commodity

There are a number of fundamental differences between electricity and other primary commodities. Firstly, producers and consumers of electricity must be physically linked through a network where changes in supply and demand may emerge at the speed of light. Also, given the fact that electricity can not be stored, supply and demand must be always maintained in balance. It is the same for gas, in a sense that consumers and producers must be linked by pipelines. However, the physical flow of gas is relatively slow, and its flow via links can be separately controlled. In contrast to gas, electricity runs a path through the network in accordance with Kirchhoff's circuit laws,[15] that is, a change either in supply or demand at any node instantaneously affects the pattern of flows via all the links in the network. Therefore, changes in supply made by any producer or in demand by any consumer produce external consequences on all connected to the network.

It should also be kept in mind that each link of the network has a maximum capacity limit for carrying current. Therefore, the electricity flows into each node should be controlled and/or restricted to maintain the flows within the transmission limits. Moreover, the factors determining the quality of electricity such as frequency, voltage and phase angle have also to be kept within strict physical limits (Newberry, 2002). Hence, the refined power can only be produced by meeting these standards. A number of ancillary services are also required in

[15] Kirchhoff's circuit laws deal with the conservation of charge and energy in electrical circuits, and were first described in 1845 by Gustav Kirchhoff.

the process of delivering refined power to the consumers. For instance, voltage may suddenly drop as a result of a rise in demand or fall in supply. And the voltage, electric potential energy, will drop, which in turn reduces the load on the network. System operators need to call generators for the system to be able to respond to changes in demand or supply. Generators have to maintain a minimum level of reserve capacity to keep the probability of system failure below an acceptable threshold. Failure at one point in the network (failure of a generation plant) can have serious implications on the whole network if not managed properly (Newberry, 2002). To sum up, it is very significant to always keep the supply of electricity in line with the demand to prevent changes in voltage which harms the consumer electric appliances.

The technology for centralized generation and distribution of electric power first entered into operation in September 1882 by a company owned by Thomas Edison in Pearl Street of New York City. So, the technology has been in use for more than a century. The idea of dispatching electricity from a centre comes from the crucial need for coordination over operations of network via meeting all these standards. A system operator (dispatcher) has to take into account all the factors giving rise to externalities while operating the system. The system operator`s first duty is to forecast demand at each node as well as at each moment in accordance with past experiences, temperature[16], time of year[17], business days and special events[18].

The electricity industry consists of four major interrelated segments: generation, transmission, distribution and supply. Electricity can be produced by using the flow of water, the burning of fossil fuels (thermal), the power of wind, sun or earth (geothermal), or nuclear fission. Transmission is the bulk transfer of electric power between generation plants and distribution facilities via high

[16] For instance, increasing use of air conditioning in hot summers leads to considerable increases in electricity generations.
[17] Time of the year is significant since it affects the lighting demands.
[18] For instance, a surge in electricity demand can be witnessed, while millions of people switches on their TV sets to watch popular TV programs like World Cup.

voltage network. Distribution, on the other hand, refers to the supply of electricity to residences or industry through lower voltage wires. Supply of electricity to the final consumers involves metering, computing and billing. In fact, electricity services historically have been supplied through vertically integrated firms encompassing generation, transmission and distribution activities. In the following, the first two fundamental segments, generation and transmission, are briefly explained to better understand the structure of the electricity market.

### 3.1.1 Generation

Electric power generators use a variety of technologies and energy sources to generate electric energy. Technologies are the engine, turbine, water wheel, or similar machines that drive an electric generator. Energy sources can be listed as combustion of fossil fuels, nuclear fission, kinetic energy in water or wind, chemical energy in a fuel cell, and sunlight. Water, wind, sunlight, geothermal energy, biomass, and waste products are renewable energy sources that are regarded inexhaustible.

Generating units also vary in size. Nuclear and fossil-fuel steam-electric units normally have large capacities with many over 1,000 megawatts (MW), while hydroelectric units range from less than 1MW to thousands of MW. Combined-cycle gas turbine units typically generate less than 200 MW, but some are larger. Wind and solar plants, on the other hand, are relatively small.

Electricity generation is planned in a "merit order" by using the plant that is available to supply power at the least cost first (Baldick, 1999). The generating units operated by an electric utility vary by planned usage, that is, by three major types of load (generally categorized as base, intermediate, and peak) requirements the utility must meet.

A baseload generating unit is generally used to meet all or part of the minimum or base load of the system and, as a consequence, produces electricity at a mostly fixed rate and runs continuously. Baseload units generally consist of the newest, largest, and most efficient of the generation plants.

A peakload generating unit, normally the least efficient of the three types of unit, is used to satisfy the requirements during the periods of greatest or peak load on the system.

Intermediate-load generating units are for meeting system requirements that are greater than base load but less than peak load. Intermediate-load units are generally employed during the transition between baseload and peak load requirements.

From the perspective of a system operator, generating plant is distinguished by how much it costs to start up, keep unworked under no load and produce power at different levels of utilization. After forecasting a pattern of demand and all the transmission constraints, the system operator is able to calculate the least-cost solution for meeting the electricity demand.

There are mainly four types of generation.

***Steam Units***: Steam-electric (thermal) generating units are typically used as the large baseload plants. Steam generated in a boiler turns a turbine to drive an electric generator.

Fossil fuels such as coal, petroleum and petroleum products, natural gas or other gaseous fuels as well as other combustible fuels like biomass and waste products can be burned in a boiler to produce the steam. In nuclear plants, nuclear fission is used as the source of heat to make steam. Geothermal or solar thermal energy can also be used to produce steam.

***Gas Units***: In gas turbines and combustion engines, instead of steam, the hot gas produced by burning fossil fuels is used to turn a turbine that runs the generator. Since these kind of plants can be brought up quickly, they are used as peaking plants. Recent technological advances in gas turbine design has led an increase in the number of gas turbines.

***Combined-Cycle Units***: In combined cycle plants, gas turbines are firstly used to generate power. The key difference from the other units is that the waste heat in a steam-electric generator is also used to produce more electricity. Therefore, combined-cycle plants use the heat energy in fossil fuels more efficiently.

***Renewables***: Renewable energy is derived from natural processes that are replenished constantly. In other words, renewable generating units use energy sources that are judged to be inexhaustible natural resources such as sunlight, wind, tides and geothermal heat, which are naturally replenished. Many wind and solar plants are intermittent in nature, depending on the availability of their energy source.

### 3.1.2 Security of Supply in Generation

Today, it is a significant policy objective to ensure a secure and uninterrupted electricity supply in almost all economies. Some uses of electricity are essential components of modern life. There is a limited possibility to replace electricity by other forms of energy. Therefore, underinvestment in the electricity industry is potentially very costly and disruptive.

According to the (IEA, 2002), the security of electricity supply depends on the sufficient amount of investment in terms of providing:

- Enough generating capacity to meet the demand,
- A sufficient portfolio of technologies to deal with changes in the availability of input fuels, and
- Adequate transmission and distribution networks to deliver electricity.

The policy of introducing competition into electricity market has far-reaching implications for investment decisions. In the traditional method of regulation, governmental institutions have a direct role in investment. And the priority is given to ensuring enough capacity to cover demand for electricity at all times. Costs are also taken into account, but only to the extent that the ability to meet demand is not compromised. In this regard, over the last 20 or 30 years, the electricity systems of most developed countries have maintained plenty of generation units to meet demand. Therefore, it can be argued that the security of electricity supply has been consistently high. However, apart from its virtues, this policy comes with a number of side effects such as overinvestment and additional costs to the consumers. In a competitive liberalised market, investment decisions are made by market actors who will bear the costs and risks of their decisions. This tremendous change generally eliminates the incentives causing overinvestment that exist in the traditional approach, aiming at producing a leaner, but still reliable, electricity system.

As is mentioned earlier, electricity markets have some externalities and distortions that could have a negative impact on security of supply (Borenstein, Bushnell and Wolak, 2002). Firstly, there is a limited demand side sensitivity to market circumstances, which in turn leads to capacity shortages during peak-demand periods. Price distortions caused by a number of factors may hinder some investments, such as those on peaking and reserve capacity. Policy barriers to the use and development of certain technologies[19] and to the use of

[19] For instance, some countries including Sweden and Germany have banned building new nuclear facilities due to increasing environmental concerns after the reactor accident at the Chernobyl nuclear power plant in 1986.

certain fuels[20] may discourage investment, hence disrupting the security of supply. In some particular cases, strict regulations and onerous licensing requirements may deter investors. Since liberalised electricity market is somewhat a new concept, relatively little is known about how to deal with these potential problems.

The electricity crisis in California in 2000-2001[21] sparked a huge discussion regarding the potential impacts of reform on generation since the crisis resulted largely from inadequate new capacity investment in the years preceding it. Although the main subject of this dissertation is not the potential benefits and harms of electricity market reform, nevertheless it may be worth mentioning here some arguments which form the conventional wisdom.

Firstly, adequate and timely investment in the energy infrastructure is needed to ensure energy security. Markets are believed to be a powerful tool to this end. Electricity markets are generally able to attract investment in generation capacity and to sustain reliability. Electricity prices are the driving forces behind the investment decisions. While high prices attract investment, low prices discourage it. However, the debate regarding whether market price signals are strong enough to stimulate adequate and timely investment is still ongoing continues.

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[20] In some countries, certain fuels such as coal are not used as input in producing electricity, since they increase the carbon gases released to air.

[21] The California electricity crisis of 2000 and 2001 is believed to be resulted from the gaming of a partially deregulated California energy system by energy companies such as Enron and Reliant Energy. The energy crisis was characterized by a combination of extremely high prices and rolling blackouts. Due to regulated prices, utility companies were paying more for electricity than they were allowed to charge consumers, which led to the insolvency of Pacific Gas and Electric and the public bail out of Southern California Edison, and eventually a shortage in energy and therefore blackouts. Rolling blackouts began in June 2000 and recurred several times in the following 12 months.

The debate is still ongoing regarding the real causes of the crises. Some argues that the crisis was the result of factors associated with regulatory decisions and actions. Others blame the liberalization itself for the disruptions of electricity supply, since the market had undergone a reform immediately before the crisis.

Secondly, a number of political choices such as the need for a diversified energy sources and environmental concerns still affect the approach adopted for ensuring the security of supply. For instance, according to the (IEA, 2002), changes in the use of natural gas in electricity markets vary by country and gas use primarily depends on comparative generating costs and, occasionally, on policies preventing the use of particular fuels. Gas use greatly increased during the 1990's in the UK and California where alternative fuels such as coal were not competitive. The share of gas in the capacity mix remained low in Australia where cheap coal supplies are available. In Norway, on the other hand, the share of gas remained small because of the existence of policies against the use of gas in power generation.

Ensuring adequate investment in generation is a challenge for regulators and policy-makers. So, it is appropriate here to discuss briefly the role of regulation. Economic regulation refers to the state imposed restrictions on the decisions and conducts of individuals and/or organizations. Because of their special characteristics, infrastructure industries are most likely to be regulated. Infrastructure industries bear natural monopoly features in a sense that industry cost of producing a product is minimized when this product is produced only by a single firm. In addition to that, fixed cost component of production costs is large in these industries. In more technical sense, network industries are characterized by the trade off between allocative efficiency and productive efficiency. While productive efficiency requires single-firm production, the single firm may reduce the allocative efficiency by setting price above marginal costs. Thus, we need governmental regulation to minimize the effects of externalities. Regulation affects costs, prices, innovation, the distribution of wealth between the consumers and producers in the industry. However, regulation is not a straightforward process. While trying to solve the problems arising from externalities, the regulators affect the welfare of consumers and hence the industrial outcomes (Brown, Stern and Tenanbaum 2006). Whereas the effect of the “good” regulation is positive on the industry, bad regulation may produce worse industrial outcomes. It is not easy to review the effect of the regulatory decisions on industry, since every industry is under the influence of various factors and conditions. Even the best regulatory decisions can not always achieve positive industrial outcomes when the external factors would play crucial role in the direction of industry.

Therefore, a key task for governments is to ensure that policies and regulations provide an adequate framework for investment. Policies should minimize distortions on price signals, provide a predictable and stable investment framework, reduce regulatory risk[22] and produce consistency among the growing number of policies and regulations (Ergas and Hornby 2001 et al.).

### 3.1.3 Transmission

Electricity markets are dependent on the network to connect buyers and sellers. Transmission can be regarded as the natural monopoly component, a bottleneck, for the electricity supply industry. In practice, electricity is transported at very high voltage levels, generally 220 kV and above. The share of transmission in total electricity costs is relatively small, ranging from 5% to 10%, depending on geographical factors and utilization rates (IEA, 2002). As in other infrastructure industries, the transportation or “transmission” network is essential for the electricity industry, since inadequate transmission capacity hinder the development of other electricity segments such as generation.

Transmission includes many activities like construction and maintenance of lines and system operation. System operation refers to the coordination of transportation services to keep the system constantly in a state of electrical equilibrium. As is mentioned above, equilibrium means that power supplied equals power demanded at each node of the network. To this end, system

[22] Regulatory risk arises when the interaction of uncertainty and regulation changes the cost of financing the operations of a firm. It may be aggravated by the absence of clearly-defined objectives and future direction of regulation and energy policy. Increasing regulatory discretion and increasing regulatory involvement will increase on-going regulatory risk.

operator controls inflows and outflows of energy over the entire network and providing the ancillary services essential to maintain the technical reliability of the network. In contrast with generation, the business of system operation is always a monopoly.

The transmission network is characterized by economies of scale both at the nodes and the whole network. Also, it should be kept in mind that the value of investments in transmission lines is the function of investments made in other transmission and generation assets. A rapid growth in generation may increase the potential value and rate of returns of a potential investment in transmission. So, the so-called network externalities[23] are in operation.

The transmission system can also be viewed as the enabling infrastructure of the power industry. Tight control is required to ensure service reliability and to avoid failures of grid elements and generation units (Chao, Oren and Wilson, 2005). It is also significant to set and maintain uniform standards and procedures within interconnecting segments of the network. The development of efficient electricity transmission requires adequate incentives to solve congestion problems, recoup long-term fixed costs and short-term maintenance costs, and investment to expand the network.

Transmission lines are increasingly congested in many countries, since the networks are not well adapted to the emerging structure of electricity transmission (IEA, 2002). The increased competition and the gradual regionalisation of markets have led to a sharp rise in cross border and inter-system electricity trade. Existing links cannot cope with these new trade patterns.

In areas of buoyant economic growth, transmission within systems is also increasingly congested. Congested transmission lines have negative implications

[23] Network externalities are the effects on a user of a product or service of others using the same or compatible products or services. Positive network externalities exist if the benefits are an increasing function of the number of other users. Negative network externalities exist if the benefits are a decreasing function of the number of other users.

on potentially effective electricity markets, pushing the final electricity prices up and making them much more volatile within constrained zones. This is because electricity from more cost-effective generation units may not be available where it is needed. In other words, the cheap but distant generation may have to be replaced with more expensive local generation, in order to reduce power flows. Moreover, a congested network can affect the development of new generation capacity in the long run, since it encourages the development of distributed generation.

As is mentioned earlier, the main component of the electricity market liberalization is vertical unbundling which implies separating generation from transmission. Prior to the ongoing global reform trend, the main argument behind the policy of single firm active both in generation and transmission is the coordination benefits of vertical integration.

A policy-maker seeking to unbundle generation from transmission has to decide how to price transmission services, and how to decentralize decisions on the location of generation and investment in new transmission (Newberry, 2002). According to the (Newberry, 2002), regulators in countries with sparse network or distant hydro resources or those with increasing electricity demand growth need to think more carefully how to preserve these coordination benefits. Theoretically the best way is to price electricity at each point on a network (node) reflecting the marginal cost of providing electricity at that node, the so-called nodal pricing. Nodal pricing is chosen in Scandinavia and Latin America. The English solution, on the other hand, is to ignore differences of costs in nodes and take the single integrated market as benchmark. In the event that transmission constraints prevent the dispatch of units in merit order, they are compensated with their lost profit. The important point here is that the extra cost is then recovered from all consumers, not just those whose demands created the extra cost. The choice between these two methods is fundamental.

As in the generation, adequate transmission investment is needed to ensure the security of supply. Policy-makers have some tools to promote investment in transmission (IEA 2002):

- In the licensing of new installations, unnecessary delays and regulatory processes should be avoided.
- An emphasis should be placed on building of cross-border and interconnecting links. As the European case shows, it is especially a challenging policy objective since it involves different jurisdictions and governments as well as regulators, and requires a certain degree of harmonization of rules regulating the use and pricing of the different networks.
- Apart from developing new lines, improving or expanding existing networks may also be taken into account when it is extremely expensive to build a new one.

## 3.2 The Structure of Gas Market

According to a view, gas and electricity markets should be discussed together due to several similarities they share. Before all else, they are both forms of energy, requiring a high-pressure pipeline system (gas) and/or high-voltage lines (electricity) to be transported to local distribution networks. In addition, similar to electrons, gas molecules can not be distinguished. Most importantly, large investments are needed to establish the necessary networks (pipelines or grid). Once these excessively costly networks are built, there is always a danger that consumers avoid paying the cost-reflective prices.

Despite the existing similarities between gas and electricity, there are also remarkable differences (Newberry 2002). While almost all the EU countries are self-sufficient in electricity generation and there is relatively small-volume electricity trade among them; several European countries, except for Norway and

Netherlands, are dependent on imports for their gas needs[24]. It seems that Russia will remain as the sole supplier of gas to Europe in the near future. The EU gas market is due to be completely open by the end of 2008 but Russia could prove to be a barrier due to the monopolisation of its gas market by Gazprom and its heavy subsidies (ABS Energy Research, 2006).

It should also be kept in mind that the countries importing gas via pipelines are locked into sensitive supply relationships. Another interesting contrast of the gas industry with the other infrastructure industries like electricity and telecoms is that gas, as a final commodity, faces competition from other fuels like oil. In oil, on the other hand, most countries can quickly react by switching between several suppliers. In this point, one might argue that gas has the quality of being liquefied and transported, like oil, by giant ships. However, this method requires the stages of liquefying, transporting and regasifying, any of which are undertaken by different facilities. Naturally, there appears a need for long term contracts as inflexible as in the case of conventional gas trade via pipelines between these facilities.

In electricity, despite the fact that access to cheap fuel is significant, generating units, except for hydro power facilities, have freedom in choosing a location for operation. Given the fact that electricity fuel prices are likely to be similar in neighbouring countries and it is still not cost-efficient to transmit electricity over long distances, electricity trade is not common. On the other hand, gas production is bounded to gas fields which are unevenly distributed across countries. A pipeline provides access to a limited market. To eliminate the problem of ex post opportunism, long term contracts are concluded between the parties before building fields and pipelines.

Moreover, costs and technology are much more transparent and relatively stable in electricity generation (Newberry 2002). Therefore, it is easier to set

[24] Gas import dependence is significantly higher in ten new Member States of the enlargement 2004, than in the old ones.

efficient prices. Although national transmission networks offer a more complex cost structure, its share in total electricity cost is relatively small in densely populated countries. In contrast, gas production has opaque costs. It also tends to include a site-specific resource rent, and as is stated earlier, heavily dependent on the market into which it is planned to be sold. The sites where gas is produced are determined by geological conditions and unevenly distributed across countries.

According to (Newberry, 2002), the above-mentioned characteristics of gas form a new set of pricing and regulatory inefficiencies. His detailed study well summarizes the issue:

> "If gas is to be exploited and delivered to customers, large investments in exploration, production and gas pipeline systems are needed before any gas can flow. These production and delivery systems are inflexible and durable, and at least in the early stages of development, they lock the producer and consumer into a bilateral relationship. The cost of producing gas includes a resource rent whose size depends on the value placed upon the gas by the consumer. … Gas not produced today can be sold tomorrow, and its future value is therefore important in determining its present opportunity cost." (Newberry, 2002)

As a result of these above-mentioned factors, gas producers are reluctant to invest in the absence of a secure long-term contract with a pipeline company. Similarly, it is very common that the pipeline company is also unwilling to invest without a long-term secure contract to sell to final consumer. Therefore, the potential resource rents of the producers or consumers depend on the price and volume sold in the market.

Therefore, the high costs of building pipelines and other extreme costs required to deliver gas into pipelines justify the high regulated prices to charge in the market. As is known from the theory of regulation, the regulators should set cost-reflective final prices in order to attract sufficient investments. Likewise, in order to ensure allocative efficiency, the regulatory body should prevent excessive pricing. However, the regulators are seldom to solve this problem due to the opacity of the cost structure and the endogeneity of the rent element of those costs. Hence, liberalization has become an alternative solution to this ongoing regulatory problem.

### 3.2.1 The Functioning of the Gas Market

In the traditional structure of gas industry, the company owning the pipeline buys gas from producers and transports the gas via its high-pressure pipeline system. The pipeline company which operates and maintains the network also delivers the gas to large customers and local distribution companies. In a number of countries like Portugal, these local distribution companies are owned by the monopoly pipeline company, which in turn makes the monopoly question more acute. On the other hand, the pipelines may also be owned and operated by the producer company. In addition, the pipeline may be viewed as a contract carrier. In this case, the pipeline company may contract with the producer companies to deliver their gases to the market providing that it is free to accept contracts.

The pipeline company may be obliged to act as a common carrier which offers transport services on a nondiscriminatory basis. Common carriage is different from the regulatory concept of third party access (TPA). TPA is defined by the European Commission as follows:

> “a regime providing for an obligation, to the extent that there is capacity available, on companies operating transmission and distribution networks for … gas to offer terms for the use of their grid, in particular to individual consumers or to distribution companies” (EC, 1992).

As is understood from the above quoted passage, while common carriage refers to an obligation for the pipeline owner, the third party access imposes no obligation on the pipeline owner providing that the capacity has already allocated.

To sum up, the investment required to build the infrastructure needed to transport gas from gas fields is characterised by significant costs, large economies of scale and irreversibility. This can lead to a trade-off between the efficient use of resources and the wish for greater competition. In order to ensure the efficient use of resources, the unnecessary duplication of infrastructure should be prevented. On the other hand, alternative offtake routes should be kept available to producers for increased competition. Also, effective regulatory action may be necessary to eliminate the exploitation of local monopoly rents where competition does not exist and to ensure third part access.

### 3.2.2 Gas Consumption for Electricity Generation

According to the several forecasts made by the leading institutions like the International Energy Agency, natural gas is the fastest growing primary energy source at a global level. The principal engine of growth in global natural gas consumption is the increasing demand for fuel for CCGT plants. The favourable economics of combined cycle gas turbine power plants, especially their relatively low fixed capital requirement and high conversion efficiencies, make natural gas the preferred fuel for power generation. There are several other advantages of CCGT plants such as shorter construction time, modularity of capacity additions due to smaller economies of scale and higher conversion efficiencies. Also, the emission properties of natural gas provide an insurance against possible future costs associated with CO2-emissions. The International Energy Agency's (IEA, 2004) "reference scenario" points out that power generation will account for about 130 of the 200 bcm/a projected increase in the consumption of natural gas for the European Union (25) during the period of 2002-2020. However, there are a number of factors shadowing that bright prospect.

Firstly, as is mentioned earlier, increasing import dependency expresses huge concerns for the security of supply. Secondly, the constantly raising gas prices have started to diminish the attraction of gas as an effective input for electricity generation. Since the increasing gas prices have its effect on the final electricity prices, it adversely affects the decision of investment for building new gas-fired electricity generation plants. A further issue is how future nuclear policies will develop. Much of the projected medium-term growth in gas consumption stems from the planned retirement of nuclear power plants in Europe. It should be kept in mind that the kind of generation plant built to meet ever-increasing demand and to replace retiring equipment in liberalised electricity markets should be the function of the economics of the different plant types.

There are mainly two facts affecting the choice of gas as an input of generating electricity (IEA 2004):

- Given the expected gas prices, CCGTs in every assessment are the most economic option for mid-load and peak units

- There is no remarkable difference between the costs of coal-fired power plants and CCGTs for baseload generation. However, this assumes a high utilization rate for baseload production. For the lower utilization rates, CCGTs have certain economic advantages.

As is seen from the below table, natural gas shows very different patterns in the total energy supply as well as in electricity generation across the European countries.

Table 3.1: Natural Gas in Selected European Markets

| | Total Primary Energy Supply 2003 (mtoe) | Share of Natural Gas in TPS | Electricity Generation 2001 (TWh) | Share of Natural Gas in Electricity Generation | Largest Electricity Source |
|---|---|---|---|---|---|
| Czech Republic | 43.4 | 19% | 75 | 4% | Brown Coal |
| France | 260.6 | 15% | 550 | 3% | Nuclear |
| Germany | 332.2 | 23% | 583 | 10% | Nuclear/Coal |
| Hungary | 23.7 | 49% | 36 | 24% | Nuclear |
| Italy | 181.9 | 35% | 279 | 37% | Natural Gas |
| Poland | 91.3 | 12% | 146 | 1% | Hard Coal |
| Spain | 141.5 | 15% | 238 | 10% | Nuclear |
| Sweden | 46.4 | 2% | 162 | 0% | Hydro |
| The Netherlands | 90.0 | 39% | 94 | 59% | Natural Gas |
| Turkey | 74.3 | 25% | 123 | 40% | Natural Gas |
| United Kingdom | 223.2 | 38% | 386 | 37% | Natural Gas |
| EU-15 | 1,498.0 | 24% | 2673 | 18% | Nuclear |
| EU-25 | 1,690.0 | 23% | 2986 | 17% | Nuclear/Coal |

Resource: IEA 2004

The state of play in natural gas consumption is determined largely by two interrelated factors: the availability of domestic energy resources and past policy choices. The strong position of natural gas in the United Kingdom and the Netherlands is obviously affected by the large domestic resources available, while the limited presence of gas in French power generation can be seen as a direct result of the country's policy to promote nuclear energy. Italy and Turkey, on the other hand, are the two European countries where power is generated mainly from imported gas. Spain shows strong growth rates in electricity demand and newly-built power plants are largely gas-fired, making Spain, for the future, another country strongly reliant on imported gas for power generation.

The increasing interdependence between gas and electricity has a number of adverse implications for security, reliability and competition. As is known, gas-fired plants are mostly needed at peak times, especially in summer. Due to inadequate investments in baseload generation capacity in so many countries, gas-fired plants set the price of electricity for a significant amount of time (IEA 2007). Therefore, ever-raising gas prices translate into ever-increasing electricity prices. Against this background, the strong interdependence between gas and electricity should be taken into account when designing markets and reforming the regulatory compact in these two infrastructure industries.

# CHAPTER IV

## ANALYSIS of the ENI/EDP/GDP MERGER CASE

In July 2004, the European Commission received a notification of a proposed acquisition of Gas de Portugal (GDP) by Energias de Portugal and the Italian energy company ENI. This merger can be classified as convergence merger since EDP is mainly active in electricity generation and GDP`s main activities is in natural gas. In its decision on this case, the Commission made one of the most detailed assessments regarding a convergence merger. It prohibited the proposed merger, shortly, on the ground that it would “lead to the strengthening of EDP`s and GDP`s respective dominant positions on the electricity and gas markets in Portugal, as a result of which effective competition would be significantly impeded in a substantial part of the common market” within the meaning of Article 2(3) of the Merger Regulation (European Commission, 2004). In September 2005, the European Court of First Instance upheld the Commission`s decision.

In this chapter, this merger case will be analyzed. The analysis will be based on Brennan and Hunger methods. Since some information and data necessary to implement these methods are not available, several assumptions and interpretations will be made. Classical vertical merger theory will also be used while discussing the assessment of the European Commission. But first of all, it will be useful to give general information on Portuguese gas and electricity markets.

## 4.1 The Portuguese Energy Market

Similar to its other assessments on convergence mergers, the Commission`s investigation views gas and electricity markets as separate markets since there are considerable switching costs between the two types of energy. Although the parties of the merger proposed a different opinion, the Commission defined the relevant geographic market as Portugal for both electricity and gas. As to electricity, the current insufficient level of interconnections between Portugal and Spain is the main reason behind the Commission`s geographic market definition.

Since the relevant geographic electricity and gas markets are taken national in scope, first electricity market and then natural gas market in Portugal will be reviewed briefly.

### 4.1.1 The Electricity Market

The main legislation governing the national electric system was passed in 1995 through a set of decree laws. The Portuguese electricity sector is organized in two co-existing systems: the public electricity system (*Sistema Eléctrico de Serviço Público*, "SEP") and the independent electricity system (*Sistema Eléctrico Independente, "*SEI"). Both systems use national transmission grid, under a concession regime, operated by Rede Eléctrica National ("REN"). In the public system, power generators sell electricity to REN which sells the energy to the regulated distributor EDP. EDP then sells this electricity to customers at regulated tariffs set by the Portuguese energy regulator, ERSE (*Entidade Reguladora do Sector Energético*). In the independent system, customers are eligible to choose from whom to buy.

Whereas electricity demand in Portugal is expected to grow steadily at around 4% per annum, Portugal can still be regarded as a small electricity market in Europe, with a peak demand of around 7GW (CEPA, 2004). The basic sources of electricity generation are hydro, coal, gas and fuel oil. Natural gas accounts for approximately 11% of the installed generation capacity and around 20% of production in Portugal. As it is seen in the figure below, hydro-generation remains as the main generation type, with accounting for 45% of the total installed generation capacity. Therefore, rainfall is the key factor determining the availability of hydro and hence the electricity price.

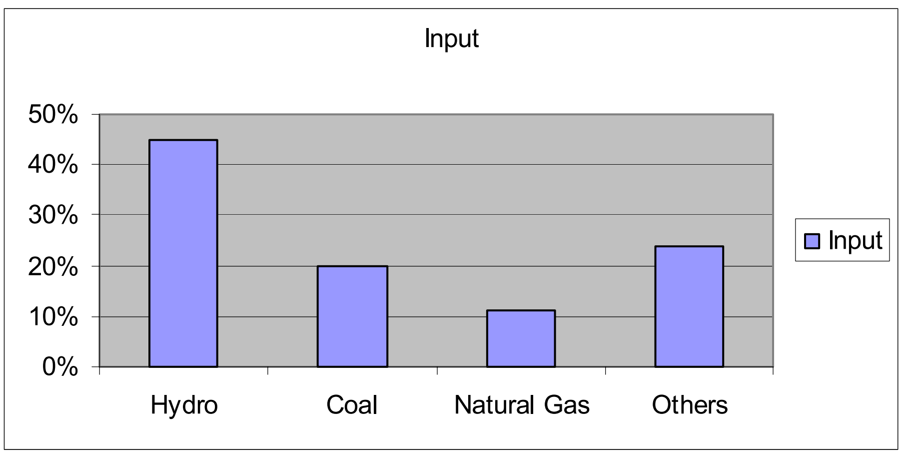


Figure 4.1: Mix of Installed Generation Capacity in Portugal

Source: Own construction based on CEPA (2004)

As in France, Italy and Belgium, the Portuguese electricity sector is also dominated by a single company, EDP, which is active in generation, distribution and supply of electricity (CEPA, 2004). EDP`s subsidiary CPPE (Companhia Portguesa de Producção de Electricidade) generates 7.4GW out of a total capacity of 9.0GW. EDP also enjoys a diverse power generation portfolio including oil, coal, gas and hydro plants.

Table 4.1: The breakdown of the generation capacity and net generation

| 2003 | Capacity | | Net Generation | |
|---|---|---|---|---|
| SEP | **8625 MW** | | **36152 GWh** | |
| EDP | 7051 MW | 81.7% | 26582 GWh | 73.5% |
| Turbogas | 990 MW | 11.5% | 5403 GWh | 15% |
| Tejo Energia | 584 MW | 6.8% | 4167 GWh | 11.5% |
| SENV | **647 MW** | | 908 GWh | |
| EDP | 647 MW | 100% | 908 GWh | 100% |
| PRE | **2129 MW** | | **3697 GWh** | |
| EDP | 241 MW | 11.5% | 1041 GWh | 28% |
| Others | 1888 MW | 88.5% | 2656 GWh | 71% |
| Total | **11401 MW** | | **40757 GWh** | |
| EDP | 7939 MW | 69.6% | 28531 GWh | 70% |

Source: European Commission (2004)

There are two other companies active in electricity generation: Tejo Energia and Turbogás. As seen from the table above, the combined share of Tejo Energia and Turbogás accounts for only 26.5% of the electricity generated in the public electricity system.

As is mentioned above, the transmission is operated by REN. Distribution, on the other hand, is undertaken by EDP`s subsidiary EDIS (EDP Distribução de Energia). EDP also has a dominant position on the retail electricity markets: market for large industrial customers and residential customers[25].

[25] The dominance might be more powerful on the market for residential customers. These customers are less likely to switch to another supplier since electricity costs constitute relatively a small share of the household expenses.

### 4.1.2 The Gas Market

Natural gas was introduced very recently, in 1997, with the construction of the Maghreb-Europe pipeline which transports Algerian gas via Morocco and Spain. The use of natural gas for electricity generation was the main factor behind the introduction of natural gas (European Commission, 2004). In 2001, 2.7bcm natural gas was consumed in Portugal. Gas-fired electricity generation accounted for 47% of the natural gas consumption (CEPA, 2004). Natural gas demand for generation is expected to grow, mainly due to the ongoing power station projects which will be operational in the next couple of years.

The natural gas market in Portugal is dominated by GDP through its subsidiary Transgás. Transgás holds the concession for importation[26], transmission[27], storage[28] and supply of natural gas at high pressure networks (CEPA, 2004). The distribution and supply of gas for most end-users is achieved via medium and low pressure networks by six local distribution companies. GDP has the largest stake in five of these local distribution companies. Portgas is the only local distribution company which is not controlled by GDP.

Pursuant to Portugal`s compliance with the so-called First Gas Directive,[29] gas-fired generators and large industrial customers will be liberalized by 2009. The liberalization process is likely to encourage new entries and lead to creation of new supply companies, most probably stemming from the existing local distribution companies.

[26] Transgás has a long term agreement with the Algerian supplier company Sonatrach.
[27] Natural gas is transported via a high pressure network owned by Transgás.
[28] An underground storage facility has been built in Carriço by Transgás.
[29] Directive 98/30/EC of the European Parliament and of the Council of 22 June 1998.

## 4.2 EDP/GDP/ENI Merger

In pursuant to the Commission`s market definition, a market structure is presented in the figure below. The Commission makes a distinction between natural gas markets for local distribution companies, large industrial customers and power generation. Therefore, local distribution companies and large industrial customers are not included into the upstream gas market presented below. As part of the liberalization process, new entries to the gas market for power generation are expected.

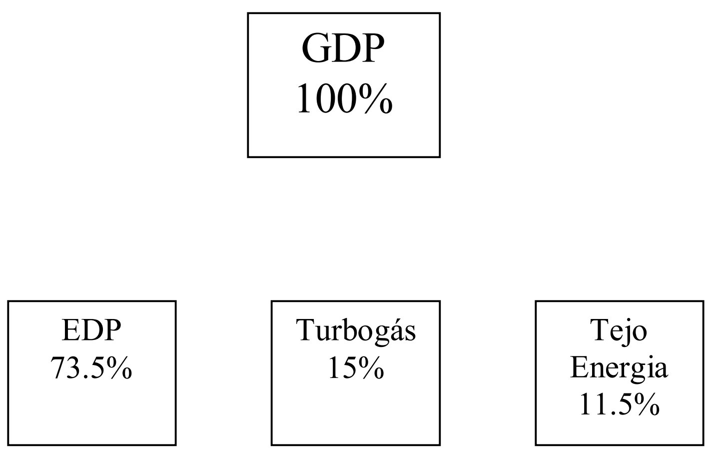


Figure 4 2: Market structure in the Portuguese gas-electricity market
Source: Own construction based on European Commission (2004)

It should be kept in mind that the shares in the downstream market illustrates the total electricity generation as to 2003, since the market shares of gas-fired electricity generation is not available. Therefore, we are assuming that the same fractions are produced by gas-fired generators.

### 4.2.1 The Application of the Brennan Method

We might start to analyze the merger by applying the Brennan method. The first question of the Brennan method is whether or not EDP and GDP`s power generator customers constitute an anticompetitive share of the downstream market. Currently, there are two customers buying gas from GDP. One is EDP which operates a CCGT (TER) and a dual fuel plant in Carregado. The other company is Turbogás which owns a CCGT in Tapada Do Outeiro (European Commission, 2004). The combined market share of these two companies is 88.5%, which undoubtedly indicates an anticompetitive share[30].

Following the steps proposed by Brennan (2001), we now try to find out whether GDP has a pre-merger market power over its clients except EDP. In the current situation, electricity generation companies do not have any alternative supplier other than GDP. But we know that, with the ongoing liberalization process, the natural gas supply market will be open to competition. And there is a strong possibility that energy companies, including the local distributors, will enter to the natural gas market. Therefore, for the sake of a complete review, it is better to look at switching possibilities for the generator companies currently buying their gas from GDP. Turbogás signed an agreement with Transgás in 1994, which started in 1999 when the first gas-fired generation facility became operational. EDP also has an agreement with Transgás for its new CCGT, TER. These agreements include take-or-pay obligation. Given these long term supply contracts already in place for the existing generation plants, the scope of competition after completion of the liberalization will probably be limited (European Commission, 2004). Nevertheless, the future gas suppliers will be able to compete for the supply of the short term requirements of the existing power plants, which is equal to the difference between take-or-pay quantity and

[30] Normally, the Herfindahl-Hirschman Index ("HHI") is used to understand whether the market is highly concentrated or not. But in this case, since the high concentration is obvious from the extremely high combined market share, there is no need to calculate the HHI.

the effective yearly consumption. In dry seasons, the amount of the short term requirements might reach considerable levels, since the available hydro generation plants will not be able to be used. However, there is no certainty. In the light of these facts, considering the current situation in the upstream market, one might conclude that the possibility for the power generator firms to switch supplier is limited and GDP has a pre-merger market power over its customers.

In the last step, we focus on whether GDP is the dominant gas supplier for the acquiring generator company, EDP, prior to the merger. Considering the existing agreements of GDP with EDP, it can be argued that GDP is the dominant supplier of EDP well before the merger. Since GDP is the only company active in natural gas market for electricity generation, we can assume that GDP might exploit its dominance by charging an excessive price. However, there are some factors restricting GDP`s pre-merger dominance over EDP. First, EDP has a diverse power generation portfolio including oil, coal, natural gas and hydro plants, which allows it to switch between inputs. On the other hand, more importantly, EDP operates a dual-fuel generator which enables it to switch to oil when gas prices jump up.

This step constitute the most crucial and distinctive part of the Brennan method. If GDP has a pre-merger dominance over EDP, the proposed merger will not worsen the situation, and hence the merger should be allowed to go ahead. However, it will be quite difficult to give an accurate answer to this question. In our opinion, GDP has a certain degree of pre-merger dominance in the long term even though it is limited in some respects.

To sum up, according to the step-by-step application of the Brennan method, the proposed EDP/GDP/ENI merger can be regarded as anticompetitive, and in the absence of efficiency benefits and possible remedies, this merger should be prohibited.

### 4.2.2 The application of the Hunger Method

As it is explained in the second chapter, Hunger method is divided into two sections. In the first section, we seek to find out whether the merged firm has the ability to increase the gas prices. The first question of the Hunger method is easy to answer. It is very clear that the proposed merger links upstream and downstream markets. As regards to the second question, there is no doubt that the upstream market is highly concentrated, with only one supplier, GDP.

The third question is on whether the marginal gas-fired electric generators have the ability to substitute to a different fuel input in response to an increase in gas prices. The ability of the power producers to substitute to a different fuel largely depends on the existing technologies that they have. As it is mentioned before while discussing the second step of the Brennan method, EDP has a diverse power generation portfolio. In addition, it has a dual-fuel plant in Carregado (European Commission, 2004). On the other hand, according to Söderholm (2001), inter-fuel substitution induced by price increases is limited between base load fuels (coal and hydro) and peak load fuels (oil and gas). Turbogás, which operates a CCGT with 990MW capacity, purchases natural gas from Transgás under a 25-year gas supply contract ending in 2024 (Turbogás Annual Report, 2005). So, Turbogás has no chance to substitute to another supplier due to its existing contract with Transgás and its generation technology. In conclusion, we might think that GDP has the ability to increase gas prices without loosing significant amount of its gas supply.

In the second section of the Hunger method, the analyst`s duty is to find out whether the merged firm has the incentive to increase downstream electricity prices by raising gas prices. Like the first section, this section also involves three questions.

In the first question, we focus on whether the merged firm has an upstream market power and considerable inframarginal electricity capacity. First, since GDP is currently the only gas supplier to power generators, there is no doubt that the merged company will have a significant presence in the upstream market. Secondly, inframarginal capacity implies to the capacities whose place is at the beginning of the merit order. In other words, base load capacities can be regarded as inframarginal capacities. In Portugal electricity market, coal plants tend to set prices facing base load demand (European Commission, 2004). Hydro plants come after coal plants in Portuguese merit order. EDP`s diverse generation portfolio including coal, hydro, oil and natural gas plants allows EDP to enjoy both marginal and inframarginal price-setting capabilities (European Commission, 2004). In addition, EDP`s new CCGT plant, TER, is located in the middle zone of the merit order[31] due to its high efficiency as compared to other gas-fired plants.

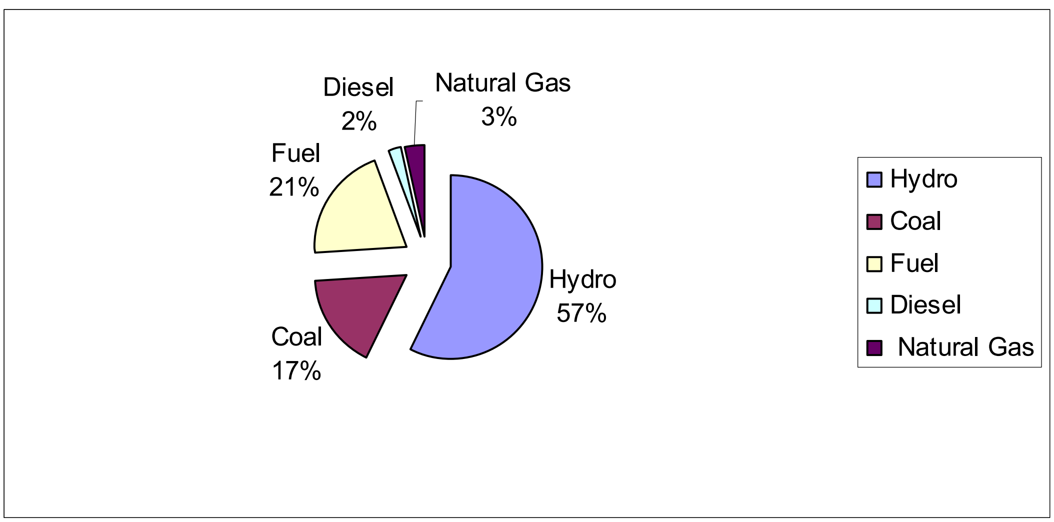


Figure 4.3: EDPs Electricity Generation Capacity Mix in 2005

Source: Own calculation based on EDP Annual Report (2005).

[31] Electricity demand quite often stops in the middle-zone of the merit order. See European Commission Decision, Case No COMP/M.3440 – EDP/ENI/GDP Official Journal of the European Communities, 2004.

As it is seen in the figure above, hydro plants constitute 57% of the generation capacity owned by EDP. Given the fact that EDP accounts for approximately 70% of the total generation in Portugal, its diverse generation mix and the share of base load plants in that mix, we can draw a conclusion that EDP has a considerable inframarginal capacity.

The second question is on whether the supply curves are inelastic for a significant number of hours. The answering of this question requires the estimation of supply curves for various time periods. In the presence of inelastic supply curves, the merged firm is more likely to increase downstream price by withholding a certain amount of gas in the upstream market. By estimating supply curves, we can find an answer to this question: "Does a 1% decrease in output at the margin raise the market price by 1/2% or 2%?" Hunger (2003)

Supply curves in Portuguese electricity market are not estimated in this study. Nevertheless, we might draw some conclusions regarding the merged firm`s ability to increase downstream prices from the information available from the Commission`s assessment.

First of all, it should be kept in mind that EDP`s only rival in gas-fired power generation, Turbogás has a less efficient CCGT plant comparing to TER. That is to say, Turbogás`s situation is between TER and EDP`s gas-fired dual fuel power plant in Carregoda (European Commission, 2004). EDP`s power plants set the marginal price of electricity supplied to REN between 60-80%[32] of the time between 2001 and 2003. TER has an annual capacity of producing 8000GWh, which accounts for nearly 20% of the total national electricity consumption in 2004. Due to its location in merit order, TER is likely to be the marginal plant setting the price of the market during a considerable portion of the time (European Commission, 2004). Given the relatively limited capacities of the rival firms (approximately 25% of the total generation capacity) and EDP`s

[32] The exact figure is not given in the Commission`s assessment.

marginal plants setting the price most of the time, it can be argued that supply curve is relatively inelastic in peak demand. This allows the merged firm to increase downstream prices by withdrawing gas in the upstream market, which makes RRC a profitable strategy. Therefore, during the period of peak demand, the merged firm might enjoy some extra profits from an RRC strategy.

In the light of the above analysis, we might conclude that the merged firm has both the ability and incentive to pursue an anticompetitive strategy. Before the merger, GDP, as the single dominant player in the natural gas market, has ability but no incentive to raise the downstream prices. It has no incentive because it is not active in electricity generation, which means it can not realize the extra profit it might gain from high downstream prices. Similarly, EDP has the incentive without ability to increase downstream prices. Applying the Hunger method, our conclusion is that the proposed merger would provide the parties with both ability and incentive to increase prices. This reasoning also gives an answer to the last question of the second section: how does the merger affect the ability and incentive to conduct a successful RRC strategy.

### 4.2.3 The assessment of the European Commission

The European Commission assessment includes vertical and horizontal concerns. It also discusses the effects of the proposed merger on retail supply of electricity and gas supply to both large industrial customers and local distribution companies. According to the Commission, the proposed merger would strengthen the dominant position of the parties, GDP and EDP. EDP maintains its dominant position even without the merger due to a number of factors. First, imports expected from Spain will not reach to a sufficient level due to inadequate interconnection capacity between two countries. Secondly, the new generation facilities built by the rival companies are unlikely to become operational by the scheduled date, 2007[33]. Even if these facilities become operational by 2007, EDP`s dominant position remains unaltered due to its diverse generation portfolio and large generation capacity.

It can be argued that the large part of the Commission`s assessment focuses on the horizontal effects. The horizontal effects of the merger on both electricity and gas markets are discussed in detail. First, the Commission believes that the proposed merger will remove GDP as a major potential competitor in the electricity generation market[34], and hence strengthen EDP`s dominant position. GDP has strong incentives and ability to enter the electricity generation industry, mainly due to its direct access to its large quantities of gas which allows GDP to operate a gas-fired plant with low variable costs compared to TER or Turbogás. The fact that gas suppliers become effective competitors in generation industry has been proved in some member states like Spain and UK. For instance, in Spain, the incumbent gas supplier company, Gas Natural has entered the power generation sector by building a number of gas-fired generation plants. Similarly, EDP is also regarded as a major potential competitor of GDP in the gas retail market. Since EDP buys gas on a larger scale, it has a strong incentive to resell the gas which is above the level it needs. Moreover, EDP is capable of exploiting arbitrage opportunities between selling the gas or using it in power generation depending on the respective prices (European Commission, 2004). Again, there is an example from Spanish experience of how a power generation company (Iberdola) successfully enters to gas markets. The elimination of EDP as a major potential competitor would reinforce GDP`s dominant position in the retail gas market. Consequently, both merging parties are the most effective potential competitors with each other, and their removal as

[33] There would be three gas-fired plants in Portugal: the first to be operated by Tejo Energia, the second to be operated by Iberdola and the third to be operated by Gas Natural. These CCGT`s are scheduled to become operational by 2007, but the Commission has considerable concerns regarding whether these generation facilities will be able to become effectively operational by the scheduled time.

[34] According to the European Commission (2004), the merger would also eliminate a significant potential competitor, GDP, on electricity retailing market.

a result of the merger would strengthen the respective dominant positions of the merging parties.

As regards to non-horizontal effects, the Commission is of the view that the proposed merger will change the competitive structure of the wholesale electricity market and reinforce EDP`s dominant position. By merging with GDP, EDP will be able secure the gas supply for electricity generation, and hence will place itself in an advantageous position against other actual and potential electricity producers in Portugal (European Commission, 2004). GDP`s dominant position is likely to remain unaltered in the short term. This is because in Portugal gas market, GDP has the control of all available entry capacity via the international pipeline[35]. For the Commission, third party access rules might not work properly in Portuguese natural gas market due to GDP`s ownership status in some key facilities.

Furthermore, the Commission believes that the merged firm will be able to "optimize the management of the gas supply to EDP and to its competitors in a way which benefits the former" (European Commission, 2004). First, EDP will be the first gas-fired power generator to know a possible incident interrupting the gas supply. Anticipating a possible incident, EDP might avoid paying penalties arising from its commitments. In addition, the merged entity would be more likely to give priority to EDP`s needs in times of technical restrictions in the supply system to the detriment of rival generators.

The European Commission (2004) further argues that the proposed merger will allow EDP to access information on gas costs[36] and gas nominations[37] of current rivals. As a result, EDP will know, in advance, the production patterns planned and the kind of bids made by rival power generators for the following

[35] GDP controls the pipeline which transports gas from Algeria, and owns and operates the only LNG (liquidated natural gas) terminal and the only underground storage in Portugal.
[36] Gas accounts for approximately 70% of the variable costs of producing electricity with CCGT`s (European Commission, 2004).
[37] This is the information, which is given one day in advance, on the volume of gas that the gas-fired plant will need on an hourly basis.

day. This information confers an unfair advantage to EDP over its competitors. For instance, if EDP knows one of its rival`s decision on not to generate power at a certain time for the following day, EDP might increase its prices above the variable cost of its rival.

In conclusion, the Commission assessment has established that the proposed merger will have both the ability and incentive to foreclose its rivals. Even though EDP`s current competitors covers most of their gas requirement at a defined price formulae by signing a long term agreement with GDP, the merged firm might still foreclose the downstream market by charging excessive prices for the short-term requirements of the EDP`s competitors. The merged firm might compensate any loss arising from decreases upstream gas sales by the excess profit it can get from high downstream electricity prices.

To sum up, elimination of potential competitors, access to important information and foreclosure are the main concerns seen in the assessment of the European Commission.

# CHAPTER V

# CONCLUSIONS and DISCUSSIONS

In this study, the question of how convergence mergers should be assessed was addressed. First, the vertical merger theory was discussed, and then the special methods specially developed for assessing convergence mergers were explained. Before moving into the merger case analyzed in this dissertation, the structure of electricity and gas industries were addressed. A special emphasis was placed on the externalities and distortions of these sector as well as the fundamental differences between them. The special methods for assessing convergence mergers were later applied on the EDP/GDP/ENI merger case which was prohibited by the European Commission after an in-depth investigation. The summary of the Commission`s assessment was also included to provide a full illustration of the anticompetitive effects arising from a convergence merger and to make a comparison between that and our assessments based on Brennan (2001) and Hunger (2003).

The Commission`s judgement regarding the merger and the result of our assessments are the same: the proposed merger will have anticompetitive effects since it creates the ability and incentive to increase downstream prices by foreclosing the rival firms. Even tough there is almost a strong consensus on the economic literature that vertical mergers have larger potential for efficiency gains, this conclusion demonstrates that practitioners should be more cautious while assessing convergence mergers. Nevertheless, the practitioners dealing with convergence mergers should also assess the potential efficiency gains, and should weigh these gains against the anticompetitive effects. If the former exceeds the latter, the merger should be allowed to go forward. The potential gains are discussed very briefly in the second chapter of this study. Yet, the efficiency gains specific to convergence mergers were not covered, since they were not the focus of this study.

Furthermore, it should be kept in mind that, even though both methods which were employed in this study have reached to the same conclusion, it might not be always the case. For instance, a change in pre-merger market power might be the determining factor on the conclusion of the assessment based on Brennan method. However, this point is not a matter of interest in Hunger method. The possible post-merger changes in the market structure and their effects on supply patterns are not covered in Hunger method. In addition, Hunger method does not especially focus on the market power over a specific group of power generator companies, but considers the market power over the downstream market as a whole. Therefore, the methods might lead to different conclusions.

Due to the lack of necessary data and information for the proper application of the two methods, we had to make a number of assumptions and interpretations while assessing the merger. For instance, even though the estimation of supply curves was not performed while applying the Hunger method, an idea about the supply elasticity was extracted from the information on inframarginal capacities of the merging power generator firm.

One thing which is worth to be mentioned here is that it can not be argued that one method is superior to the other in terms of accuracy of the results obtained with each of these methods. The two methods focus on different aspects of the markets where merger take place. In relation to their different points of focus, their application also requires different types of data. While the information on patterns of supply between the gas firms and power generators is necessary for the application of Brennan method, Hunger method requires the estimation of the supply curves which correspond to different time periods. In Brennan method, the merging gas supplier`s dominance over the merging generator and the other customer generators allows the gas supplier to conduct a RRC strategy. In Hunger method, on the other hand, the merged firm`s incentive to raise input prices to a great extent depends on the downstream supply elasticities.

When we go back to the four-step analysis developed by Riordan and Salop (1995) to evaluate the anticompetitive effects of a classical vertical merger, it would not be difficult to see some similarities with the Hunger method in some respects. For instance, similar to Hunger model, Riordan and Salop (1995)`s guideline also establish that the success of foreclosure strategies depends to a great extent on the ability of rival input suppliers to make an adequate increase in their supply capacity. As is remembered, supply elasticity is a matter of concern for the Salop and Scheffman (1987) as well.

The Commission`s assessment focuses largely on horizontal effects of the merger. Since both the electricity and gas markets in Portugal are already highly concentrated, the elimination of the "most effective" potential competitors was regarded as unacceptable by the Commission. On the other hand, neither the Brennan method nor the Hunger method takes into account the horizontal effects of the convergence mergers, which might be regarded as a deficiency of these methods. The methods also do not include any guideline to detect collusive outcomes of convergence mergers. As it is evident from the Commission`s assessment, there are some anticompetitive concerns associated with access to important information of the rival firms through convergence mergers. In addition, customer foreclosure stemming from EDP`s elimination as a major input buyer is viewed as one of the potential anticompetitive outcomes of the merger in the Commission`s assessment. However, again neither the Brennan nor the Hunger method covers these concerns.

Due to the above mentioned points, it is our opinion that the practitioners assessing convergence mergers still need to use some aspects of the classical vertical merger theory along with the theories developed for convergence mergers for the sake of the completeness of their assessment.

Another point which is worth mentioned here is that, as is clear from the fourth chapter on the structure of electricity and gas industries, these industries show fundamentally different qualities from the other industries. So, a practitioner should also take into account the special features of these industries. Also, a strong communication and exchange of information between regulators dealing with these industries and competition experts reviewing convergence merger cases are needed for a better assessment.

Lastly, in the merger case chosen for this study, both electricity and gas markets are dominated by single players with large market shares in their respective markets. This fact has affected the outcome of both our assessments and the Commission`s investigation. The application of Brennan and Hunger methods on convergence mergers which occur in markets where several firms with similar sizes operate, might lead to more interesting and perhaps contradicting outcomes. It is hoped that the attempt to apply these methods in this study will encourage scholars and researchers who are interested with convergence mergers to analyze other real-life cases.

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