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THE INTERNAL ELECTRICITY MARKET

INTEGRATING A NETWORK INDUSTRY

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ABSTRACT

The EC Internal Market is aiming at integrating all markets, securing competition and allowing for free movements of goods, services, persons and capital. Measures have been taken to also include the so-called network industries in the internal market, but because of their special features this is not as straight forward as with regular goods. The electricity sector is one of these network industries characterised by vertical integration, network infrastructure, natural monopoly and obligations to provide a public utility. These industries, including the electricity sector, have traditionally been subject to public intervention which is contradictory to the goal of the Internal Market of liberalised markets and competition.

The purpose of this paper is to investigate the Internal Market for electricity and what the effects of the integration and liberalisation of the network industry have been and it attempts to give a general picture of the internal electricity market and the industry itself as well as surveying the current situation and the impacts of the integration. The theoretical framework used is that of economic integration and therefore the focus is largely on competition. The electricity industry is investigated by looking at different factors such as degree of market opening, cross-border trade, market structure and prices in order to see if there is any correlation between these and liberalisation and integration. Conclusions to be drawn are that although the electricity markets have been formally integrated, they are not fully integrated and liberalised in practice. The results are fairly ambiguous and this could be because integration of the electricity markets is still a recent occurrence.

Keywords: electricity, internal market, network industry, economic integration, liberalisation

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LIST OF ABBREVIATIONS

EC	European Community
EU	European Union
FED	Final energy demand
GDP	Gross domestic product
GWh	Gigawatt hours
kWh	Kilowatt hours
RCA	Revealed comparative advantage
TEN	Trans-European Networks
TEN-E	Trans-European Networks for Energy
TPA	Third Party Access
TSO	Transmission System Operator

1. INTRODUCTION

The industrialisation, economic growth and development taking place during the 1900's resulted in great increases in the consumption of energy and today this energy in its different forms is indispensable for most people and industries. It is a topic of interest, from many different angles, often giving rise to both political and economic discussions in the European Union and the rest of the world. Increasing dependency on oil is one such controversial issue as it generally results in dependency on other countries, not to mention the instable oil producing Middle East. Nuclear power is another sensitive issue in many member states where the question of safety and radioactive waste sits in opposition to the efficiency and economic motives for the nuclear power stations. Currently the deteriorating environment and climate change has high priority. It is an issue present on most political agendas resulting in more emphasis on the impact of energy usage.

Perhaps not as controversial as the above mentioned examples, but just as important in the current energy debate is electricity markets. Electricity is a network industry, sometimes referred to as 'public utilities' as they provide goods and services considered to meet people's basic needs. Because of their specific structure, these industries are often subject to public intervention. Network industries in general and the electricity sector in particular have a tradition of public ownership, monopolies and vertical integration. With the increasing integration of the European Union this situation causes problems. One of the main objectives of the EC Treaty, and the crucial part in the Internal Market, is to secure competition. The Internal Market was created to establish free movement of goods, services, persons and capital and the goal was to integrate all segments of the market, including the network industries and therefore also the electricity markets. Furthermore, the electricity markets are included in the common energy policy that has been developed to establish a competitive energy sector, to secure energy supply and to improve the environment. Thus there are conflicting forces with the special treatment of the network industries and state monopolies on one side and then integration, liberalisation and competition on the other.

Liberalisation of the markets is a sensitive issue raising concerns that security of supply at reasonable prices will be jeopardized when markets are not subject to public intervention. But since the 1980's initiatives have been taken to liberalise the domestic markets and to create a single European electricity market, and the markets are still undergoing many changes. The 2000 Lisbon Agenda stated that securing energy supply at reasonable prices is important to the future growth and competitiveness of the union and this would be achieved by speeding up the progress of integrating the energy markets, including the electricity markets. Yet the electricity markets are far from fully integrated. There is common understanding that there still are several obstacles to completing the internal electricity market and that international competition still is limited.

The purpose of this paper is to investigate the Internal Market for electricity and what the effects of the integration and liberalisation of the network industry have been. Considering the specific features of electricity, the structure of the industry and the legacy of large public monopolies, the electricity market is different from that of other goods and therefore it is interesting to see what impact the integration has had. There is a vast amount of research on the electricity markets, much of it related to Industrial or Financial Economics, or energy in general. This thesis however, attempts to look upon the electricity industry from an Economic Integration perspective, focusing on liberalisation and integration and its effect on competition, prices and international trade. Furthermore, the energy sector includes many important primary resources such as oil, natural gas, coal and renewables on which there is plenty of research and reports, especially now with the emphasis on its impact on the environment. The scope of this thesis will however be limited to electricity, leaving the other energy resources and environmental aspects aside and instead focus on integration.

The impact of integration and liberalisation on the electricity markets will be studied by looking at market opening, market structure, cross-border trade and prices. The main source from which the data has been collected is the European Commission and Eurostat. Information about market structure and market shares has in many cases been limited which has influenced the decisions of what material to present and how to present it. Considering that the integration of the electricity markets still is developing and the recent enlargement of the EU, this paper will be delimited to EU15 since these member states have been involved in the process for some time making the effects of the integration more noticeable. In order to study changes over time, the time span studied for this paper is 1990 until 2004 (in some

cases 2006). This is because the actual liberalisation did not take place until the 1990's, and data from before 1990 is insufficient.

In Chapter 2, the thesis will initially present the Internal Market of electricity, why this integration is important and what measures have been taken in order to achieve integration and liberalisation. Chapter 3 presents a survey of the special features and the structure of the electricity industry, which has similarities to many other network industries. In Chapter 4, a brief overview of the applicable economic theory is presented pointing at the expected effects of economic integration, with focus on situations when markets are characterised by imperfect competition and increasing returns to scale. The main part to the chapter is however dedicated to the empirical study and thus the observed effects of the integration of electricity markets. Finally a summarising discussion and the conclusions are presented in Chapter 5.

2. THE INTERNAL MARKET FOR ELECTRICITY

2.1 Why an internal market for electricity?

In the 1980's the European Community (EC) decided to deepen integration by pushing for a completion of the Internal Market, something that had been long neglected. This slow progress had impeded the potential benefits of the integration. Measures were taken by the Community to eliminate all barriers between the member states and to secure the four freedoms – free movement of good, services, persons and capital. The White Paper on “Completing the Internal Market” from 1985 formally initiated the Single Market Program which aimed at taking further efforts to fulfil the EC Treaty and to complete the Internal Market. This could only be achieved if all segments of the market were integrated and the White Paper covered most sectors including some of the network industries.

The electricity sector was not explicitly mentioned in the White Paper and it was not until later that Community-initiatives in the sector were introduced. In this sector, liberalisation of the domestic markets was a necessary step to eventually forming a single European electricity market. In some member states, reforms had already been made in the electricity industry before any measures were taken by the EC, following a trend of deregulation across Europe. The UK started to open up their market as early as 1989 and major reforms were made in the Swedish electricity market in 1996 that resulted in opening up the industry for competition.¹ Nevertheless, compared to other sectors included in the Single Market Program, the energy and electricity sector were subject to market opening much later and it was not until the 1990's that legislation on electricity was issued.

Because of the importance of the energy sector – the dependency on different energy sources, the necessity to provide energy to all consumers, etc. – efforts have long been made at Community level to agree on a common energy policy. This has resulted in an agreement on three objectives with the policy: (i) to have an efficient, competitive integrated sector i.e. higher growth rates and increased competitiveness, (ii) to ensure secure supply of energy and

¹ Bergman (2000), pp. 8-9

(iii) to increase the effectiveness of environmental protection.² The EC emphasises the importance of energy supply at reasonable prices for both domestic and industrial consumers, and it is a prerequisite to fully integrate the Internal Market. Well functioning energy markets are necessary to achieve the objectives of the energy policy and the EC Treaty and thus to increase growth and welfare within the EU, something that was also stressed in the 2000 Lisbon Agenda.³ The EC is pursuing this end by liberalising and integrating the markets, which among other measures requires legislation and regulation.

In many countries government intervention, in the form of state aid, legal monopolies and other forms of regulations, has been a common feature in energy policy as well as a feature in most network industries. Because of their specific characteristics (see Chapter 3) the European electricity markets have a long tradition of public ownership and vertical integration with legal monopolies and limited competition, contradicting the goals of the Internal Market. The dominating public company was often used as an instrument for government industry, regional, employment, energy and environmental policies. But as the technology in the area has evolved and the consumption of electricity has increased, the conditions of the traditional electricity sector have changed weakening the motives for monopolies and vertical integration.⁴

European integration and the creation of an internal market require liberalisation and the opening up of markets to competition. In a report from the Commission⁵ different driving and resistance forces towards liberalisation and competition in network industries are identified, here presented in figure 2.1. The central driving force to liberalisation is European integration, since competition across the borders within the Internal Market, which is one of the goals with integration, requires efficient competition within in the member states' domestic markets. Another reason why liberalisation and competition is preferred to government intervention is technological change and the development of alternative services which reduces the motive for, and eventually undermines, a public monopoly. More innovation and business sectors' and consumers' demand for lower prices and higher quality, are other driving forces as well as pressure from potential market entrants. Furthermore, to achieve macroeconomic stability governments sometimes have to cut expenditures and therefore

² European Commission (2007), p. 114

³ European Commission (2005), p. 2

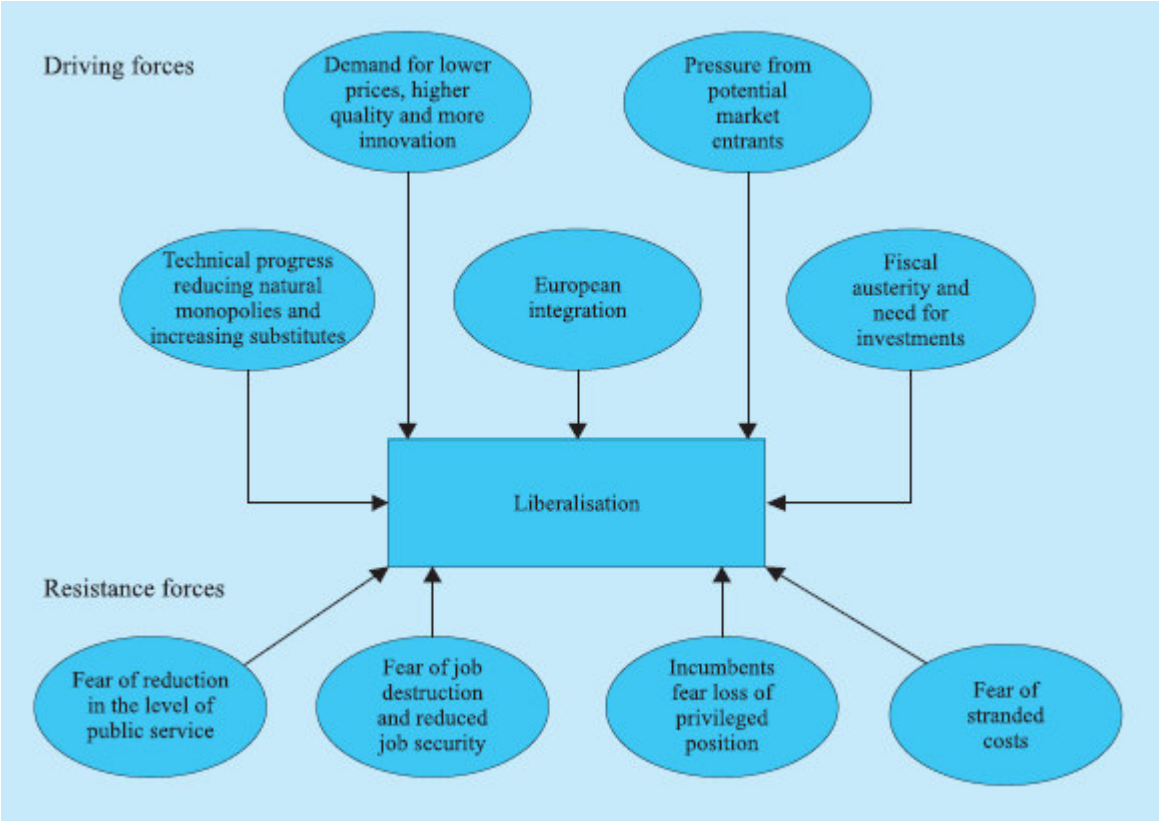
⁴ Bergman (2000), p. 13

⁵ European Commission (1999)

cannot finance the large investments necessary in the network industry, primarily related to the network infrastructure. Budget restraints threaten to affect the quality of the networks and the governments then have incentives to sell off public utilities and open up to private capital in the industries, rather than cut down expenditure on other sectors, i.e. health care.

The resistance forces often stem from conservative attitudes and ideology opposing privatisation and free enterprise but certain players also have an interest for example the trade unions fearing job losses, and the industry itself that was previously protected and now loses its privileged position. Another fear is that of reduced levels of public services when the industry is opened up for private interests. Governments have reasons for resisting liberalisation as legal monopolies have been a way to protect their large investments in the network infrastructures, and opening up for competition could result in these investment costs being stranded.⁶

Figure 2.1 – Driving and resistance forces towards liberalisation and competition



Source: European Commission (1999), p. 27

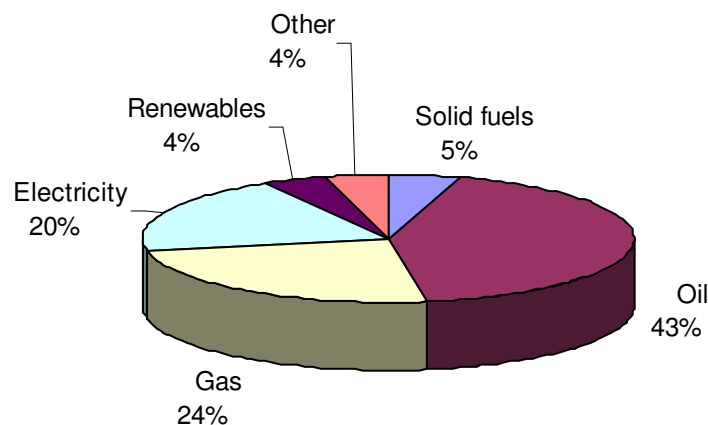
⁶ European Commission (1999), p. 28

2.2 The importance of the sector

Electricity is indispensable as an input in production of most goods and services. Not only is it an essential energy source for industrial users, but also an energy source on which a great number of households depend. Considering the importance of the sector it is not surprising that it has central role in European integration.

With a share of 20 % of the final energy demand (FED), electricity is the third largest source of energy after oil and natural gas in EU25 (Figure 2.2), although the demand of the different energy sources differs greatly between the member states. In Sweden, Finland and Malta the share of electricity of the FED is greater than 25 % whereas in Latvia, Luxemburg, Poland and the Netherlands it is less than 15 % and the differences are even greater in oil and natural gas.⁷

Figure 2.2 – Final energy demand (2004)



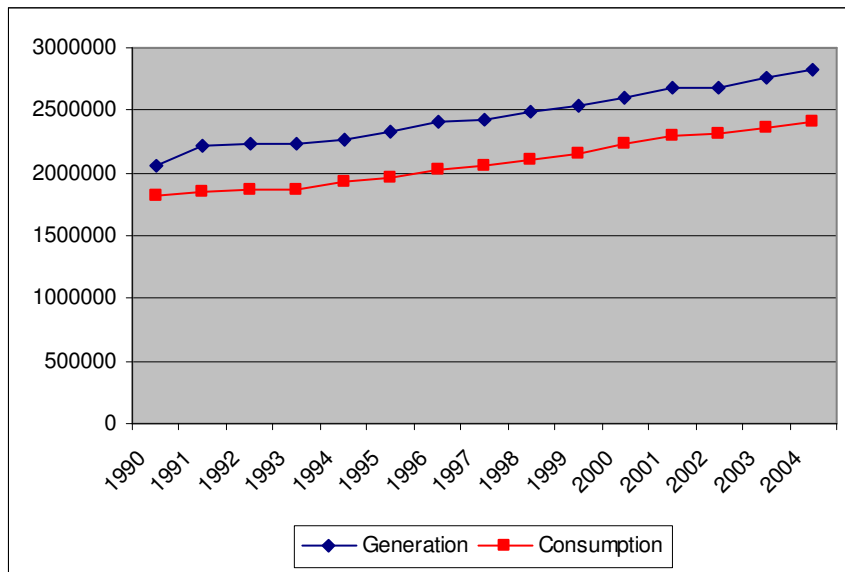
Source: European Commission (2006b)

The value of the total FED as a percentage of EU15's GDP has been growing as a result of the economy being more service oriented, motorization and increased fuel and electricity prices. In 2003, FED amounted to more than €323 billion for EU25 and electricity represents as much as 50,5 % while the remaining part was divided between motor fuels and natural gas.⁸ There has been a noticeable increase in both consumption and the production of electricity, generation, as shown in figure 2.3. Between 1990 and 2004 consumption and generation increased with nearly 33 % and 37% respectively for EU15.

⁷ European Commission (2006a), p. 65

⁸ Ibid, p. 68

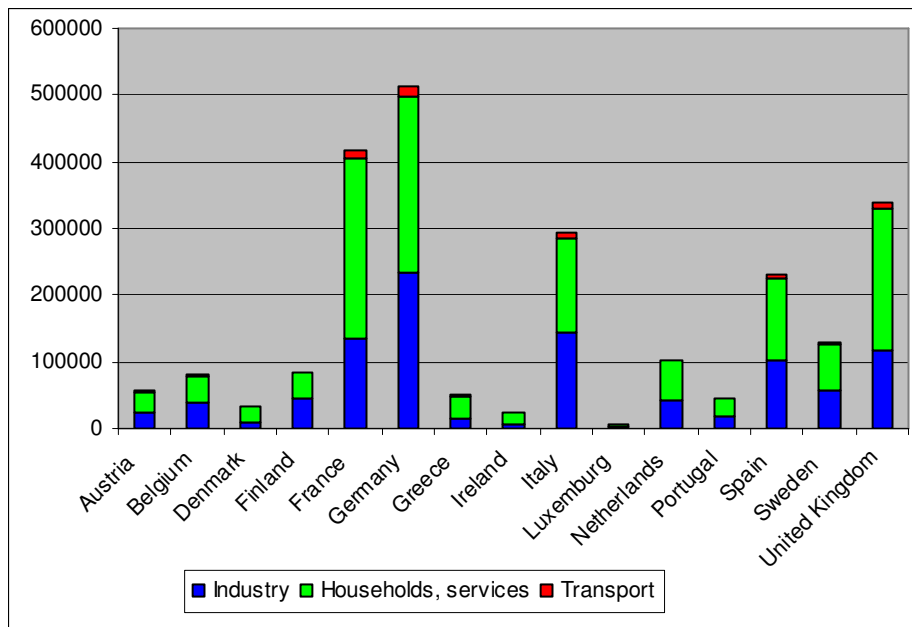
Figure 2.3 – Electricity generation and consumption in EU15, GWh



Source: Eurostat, compiled by author

Also pointing to the importance of the electricity sector is the fact that electricity constitutes the largest part of energy costs to households and industries and is 3-6 times the cost of other sources, largely because of its high quality and its large area of use.⁹

Figure 2.4 – Consumption of electricity according to sector, GWh (2004)



Source: Eurostat, compiled by author

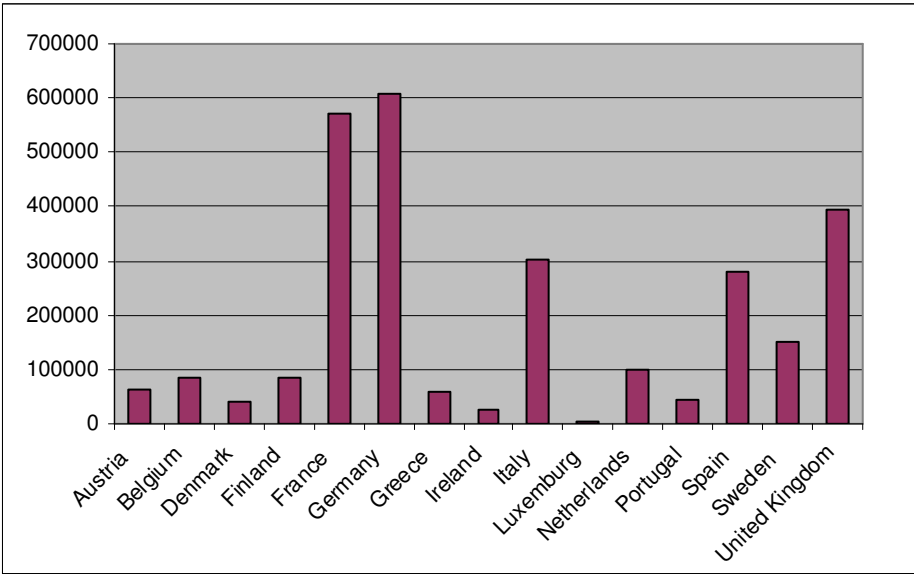
Figure 2.4 shows the level of final consumption of electricity in EU15 and how the consumption is divided between industry, transport and households/services. Consumption in

⁹ European Commission (2006a), pp. 17-18

industry covers all industrial sectors excluding the energy sector (i.e. power stations and oil refineries) and transport covers mainly railways and electrified urban transport systems, since oil and diesel usually are the dominant energy sources for the transport sector. Finally households and services cover consumption by for example private households, small-scale industry and services with the exception of transport, agriculture and fishing. As shown in the figure, the largest markets are Germany, France, Italy, UK and Spain and in general households is the sector using most electricity.

Figure 2.5 finally, compares the generation of electricity in EU15 and is very similar to the previous figure. The member states consuming the most are also the ones generating the largest amounts of electricity. At a first glance, it looks as if the countries are self-sufficient in electricity considering most of them generate enough electricity to cover the demand from consumers, but as will be shown later in the thesis cross-border trade in electricity is taking place.

Figure 2.5 – Generation of electricity, GWh (2004)



Source: Eurostat, compiled by author

2.3 Legislation

2.3.1 Competition Policy

EC competition policy is a crucial part of the integration process aiming at preventing distortions in competition and integrating markets. The EC Treaty consists of general principles forming the goals of the Community and the competition policy is based on Article 3(g) in the EC Treaty which calls for a ‘system ensuring that competition in the common market is not distorted’. In addition the competition policy is covered in Articles 81-99, where

Articles 81-82 deal with the behaviour of firms and cover restrictions on competition and undertakings with a dominant position. These articles are aimed at ‘undertakings’ and do not differentiate between public and private undertakings in the competition policy.

Articles 86-89 are aimed at preventing competition from being undermined by government intervention and these can be applied to network industries and electricity. The central article here is Article 86 which explicitly mentions public undertakings and undertakings that have been granted ‘exclusive rights’ stating that these undertakings must not pursue measures that are contrary to the Treaty. But it also states that undertakings that have been granted the rights to provide ‘services of general economic interest’ are exempted from the treaty rules and Article 86 therefore balances the Community interest, i.e. market integration and competition, and the member states interest, to ensure the provision of the ‘services of general economic interest’¹⁰. This derogation has for long been used by many member states to motivate a legal monopoly in network industries and until the 1980’s these were protected from competition and exempted from Articles 81 and 82.¹¹

Eventually more emphasis was put on the promotion of competition within the Internal Market. The last paragraph of Article 86, gives the European Commission a special surveillance duty. This right allows the Commission to ensure the application of the regulation in the treaty, for example by issuing Directives, and has recently been used frequently. Several directives have been enacted to promote liberalisation and harmonisation in network industries. Furthermore, as the Commission has introduced measures to liberalize the network industries, the scope for the exemptions in Article 86 has been reduced.¹²

Another issue related to the Internal Market of network industries is state aid. State aid has been a common feature in the network industries because many of these companies are run at a loss, especially in the railway industry. Articles 87-89 in the EC Treaty cover state aid and survey under what conditions it is consistent with the internal market. When the markets were still closed to competition and the network companies were granted ‘exclusive rights’, state aid was a domestic issue. But as markets have opened for cross-border competition, it has become a question with increasing importance, especially when public and privately owned

¹⁰ Pelkmans (2001b), pp. 433-434

¹¹ Bergman (1999), p. 69

¹² Steiner & Woods (2003), p. 401

companies are competing in the same industry. Public financing of infrastructure, within transport, energy or water distribution, is seen as a discriminatory measure if the infrastructures are not open to all companies.¹³

2.3.2 The Directives

The first legislation with the aim to liberalise the electricity market, the *First Electricity Directive* (96/22/EC), was agreed upon in 1997 and implemented into member states' legislation in 1999. The purpose was to create an integrated European market for electricity with free price formation and competition in both production and distribution. The Directive gradually opened up the markets by allowing large customers to choose their suppliers. In this way legal monopolies could be removed and the competitiveness and efficiency in the markets improved.

Market opening was a necessary but not sufficient measure to improve competition. Up until the issuing of the Directive, public companies dominated both the upstream and downstream segments of the electricity sector as well as the network infrastructure. An important component of the Directive was to grant 'Third Party Access', i.e. to make vertical integrated companies allowing for other market players to access the transmission and distribution networks.¹⁴ Securing the network access was essential because of the situation of natural monopoly characterising the electricity markets. A natural monopoly in the infrastructure is difficult to eliminate considering the high costs of duplicating the network and instead efficient competition requires that market players are granted fair access to the networks.

Furthermore, the Directive called for vertically integrated companies to separate their network business from other activities. The so-called 'unbundling' implied that the Commission made a distinction between a regulated part of the market, the networks, and a competitive part, generation and supply.¹⁵ An independent 'Transmission System Operator' (TSO) was to be issued in every member state with the responsibility for ensuring non-discrimination between the incumbent and new market entrants.

¹³ Bergman (1999), p. 71

¹⁴ There were three alternatives of how this could be done; negotiated (nTPA), regulated (rTPA) or "Single Buyer Model" where the latter involve one company's right to procure all electricity produced and provide it to the customers. With nTPA the conditions of market entry is set by the owner of the network and the users while with rTPA prices and conditions of market entry must be published and are not negotiable. Bergman (2000), p. 24.

¹⁵ European Commission (2007), p. 114; Bergman (2000), p. 23

Even though the first directive was a step towards liberalisation and integration it did not fully reach the expected results. The process of gradually liberalising the markets resulted in differing degrees of market opening among member states which prevented a levelled playing field within the Internal Market. The regulation of TPA and unbundling issued in the first Directive were important parts but there was still room for improvement.¹⁶

Further measures were taken to liberalise and integrate the markets when the Commission adopted the *Second Electricity Directive* (2003/54/EC) in 2001, which came into force in 2003. Several changes were made from the previous directive in order to promote competition, remove discrimination and to secure network access. Contrary to the previous, the second directive aimed at a complete market opening by 1st of July 2007, when the markets will be open for both industrial and domestic customers. The Third Party Access would now be 'regulated' i.e. securing access to the networks in a non-discriminatory fashion, based on published tariffs applicable to all customers, a measure to improve the transparency. Furthermore, the Directive called for national regulatory authorities, independent of the electricity industry, to be appointed in order to ensure non-discrimination, effective competition and the efficient functioning of the market. In addition to the unbundling of 'accounting' and 'management' in the first directive, the second directive also called for 'legal' unbundling, i.e. the transmission and distribution system operators must be independent in their legal form, organisation and decision making.¹⁷

The Second Electricity Directive was a further initiative in the progress towards integrated electricity markets, but its effects depend on the degree of implementation in the member states. Given that the Directive only contains minimum requirements it still allows for differences in the market designs between member states.¹⁸

In addition to the Second Directive, a *Regulation on Cross-border trade with electricity* was adopted by the Commission in 2003, as a measure to set fair rules for cross-border trade in electricity and to improve competition within the internal electricity market. The regulation states that

¹⁶ European Commission (2007), p. 114

¹⁷ Directive 2003/54/EC

¹⁸ European Commission (2007), p. 116

'the creation of a real internal electricity market should be promoted through an intensification of trade in electricity, which is currently underdeveloped compared with other sectors of the economy' ¹⁹.

The regulation introduced harmonised principles and especially important were regulations on congestion management. These regulations relate to situations where an interconnection (linking national transmission networks) cannot handle the increased flow of electricity, resulting from international trade, because of limited capacity of the interconnections and/or the national transmission systems concerned.²⁰ According to the regulation, congestion problems on interconnections are to be dealt with through non-discriminatory and market based solutions.

2.4 Trans-European Networks – positive measure for integration

Apart from the Commissions' liberalisation initiatives by issuing legislation on the electricity markets, another positive measure for integration have been taken to complete an Internal Market for electricity. An extended and efficient electricity network infrastructure is fundamental to achieve a well functioning internal market since the provision of the service depends on the network. In 1992 the Maastricht Treaty called for the creation of Trans-European Networks (TEN) in energy-, transport- and telecommunication-infrastructure. Three articles, 154-156, were now included in the EC Treaty giving the Community the responsibility to contribute to the establishment and the developments of the networks. The TEN-program for energy (TEN-E) included electricity and gas networks and was introduced to deal with bottlenecks and missing links in between the national transmission grids. Interconnection and interoperability between, as well as access to, national electricity networks were central in the TEN-E. Prioritised measures were connecting isolated networks and developing interconnections between member states and third countries.²¹ In accordance with the overall energy policy, the TEN-E also aimed at improving environment by connecting renewable energy sources to the transmission grid, and to secure supply by developing links with third countries to avoid being dependent on only one or a few suppliers.²² Recent progress in the TEN-E program include the improved guidelines from 2003, which better defined the priority interconnections and projects and identified 12 priority projects, seven for electricity networks and five for natural gas network. New financial rules were issued in 2004 implying that priority projects and projects of European interest would

¹⁹ Regulation No 1228/2003, p.3

²⁰ Regulation No 1228/2003, Article 2.1.c

²¹ Senior Nello (2005), p. 267

²² European Commission (2004)

receive support from the EU of up to 20 % of the total cost of investment, and on average €48 million per year was budgeted for the TEN-E projects 2007-2013, compared with €25 million per year in the period 1995-2003.²³

2.5 Competition policy vs. Regulation

There are differing views on how to approach the process of liberalisation in relation to network industries – competition policy (presented in 2.3.1) or regulation (i.e. legal monopolies, subsidies etc.). With well functioning competition policy, sector-specific regulation of network industries should be unnecessary. Some argue however that regulation in these industries is important during a transitional phase of liberalisation. Because of the remaining market power of the former monopolies special regulations may be necessary initially since the enforcement of competition policy, and especially that of abuse of dominant position, often is very complex and time-consuming. Unless technological developments can remove the feature of natural monopoly and overcome the need for coordination of operators using the network infrastructure, control and regulation on for example access to the networks is required. Finally, some form of government regulation may be needed when the obligations to provide services of general interests are imposed on private operators. Taking these arguments into consideration, some degree of regulation will probably be necessary for some time to come.²⁴

This is one of the conclusions of a study of the liberalisation of network industries²⁵ that introduced three phases in the liberalisation process. The first phase is characterised by monopoly where there is only one supplier and the prevailing regulation is aimed at preventing the misuse of the dominant position towards consumers. Competition is introduced in all or some parts of the markets in the second phase where the regulation has the same purpose as in the first phase, but where regulation also cover prices, issues of competition when new companies are established, and the public service obligations. Thus during the second phase the level of regulation has increased and an independent regulatory body is usually introduced. In the final phase, however, competition is established in most markets and only a low level of regulation remains.²⁶ The predominant approach has been that of

²³ European Commission (2006a), pp. 26, 36

²⁴ European Commission (1999), pp. 36-38

²⁵ Presented in Bergman (1999)

²⁶ Bergman (1999), p. 27

regulation but over time this has given way to competition policy, pointing at a development in competition and possibility to use competition policy to deal with market failures.²⁷

Table 2.1 summarizes the differences between the two approaches.²⁸ Regulation is sector-specific and aims at for example protecting consumers and promoting innovations in addition to safeguarding competition, something that is done by continuous supervising by regulatory authorities. Competition policy in contrast has an economy-wide responsibility and intervenes primarily after getting the knowledge of activities restricting competition, instead of issuing regulations in advance.²⁹

Table 2.1 – Differences between regulation and competition policy

	<i>Regulation</i>	<i>Competition Policy</i>
<i>The sectoral scope of control</i>	Sector-specific	All parts of the economy
<i>Objectives</i>	Consumer protection, promote innovation, sometimes protecting an incumbent firm's legal monopoly	Safeguarding conditions of competition
<i>Continuity</i>	Continuous oversight	Sporadically in response to complaints or specific circumstances
<i>Control over detailed management decisions</i>	Detailed control over pricing and quality	Preventing limited set of anti-competitive behaviour, ensuring healthy market structure
<i>Information requirements</i>	Detailed info	Less detailed info
<i>Danger of industry influence over authorities</i>	More likely to be influenced by firms they are supposed to control or by politicians	Less likely due to economy-wide responsibilities, not in continuous contact with any industry
<i>Timing of interventions</i>	At all stages, but primarily prior authorisation	After the activity with restricted competition

Source: European Commission (1999), p 36-37, compiled by author

²⁷ Pelkmans (2001b), p. 447

²⁸ In the case of Sweden, the regulatory body would correspond to 'Energimyndigheten' while the competition policy would be dealt with by 'Konkurrensverket'.

²⁹ European Commission (1999), pp. 36-37

3. THE ELECTRICITY INDUSTRY

As mentioned previously, public intervention in the electricity sector has been motivated by the industry's specific characteristics, with the result of limited competition, and the sector has been exempted from the goals of the Internal Market. There are different ways to approach electricity; by looking at electricity as a good similar to others with changes in supply or demand or by looking at the supply of electricity as a service. In either case, the sectors' special features, the structure of the sector and the characteristics of a network industry makes the analysis somewhat complicated compared to regular goods.

3.1 Features of the 'good'

Electricity is referred to as a 'secondary energy source' given that it is transformed into its current shape from one of the primary sources; nuclear power, coal, oil, natural gas or renewable resources. It has common features of other goods with market price and quantity reacting to changes in supply and demand. It does however have very low price elasticity and changes in price will not lead to large changes in consumption – consumers normally demand (or depend on) a certain amount no matter the price.³⁰ Furthermore, demand fluctuates both during the day and according to seasonal change, but because consumers are reliant on the secure provision of electricity at any time supply must be constant. To achieve this suppliers of electricity must have capacity to provide electricity instantly and is forced to maintain excess capacity. The crucial feature relating to this and that gives the entire industry its specific structure is that electricity cannot be stored. This implies that the electricity must be produced and consumed instantaneously and it is fundamental for the whole market that supply and demand are balanced, since consumers and producers are interconnected with a transmission/distribution network.³¹

3.2 Vertical structure

The structure of the electricity industry has implications for the integration and liberalisation of the markets. Similar to many other network industries, i.e. telecommunications, the electricity industry has a vertical structure, with the network infrastructure linking upstream

³⁰ European Commission (2007), p. 113

³¹ Steiner (2000), p. 8

production with downstream supply. Traditionally, the electricity industry has been largely vertically integrated with large publicly owned companies dominating all segments of the market.

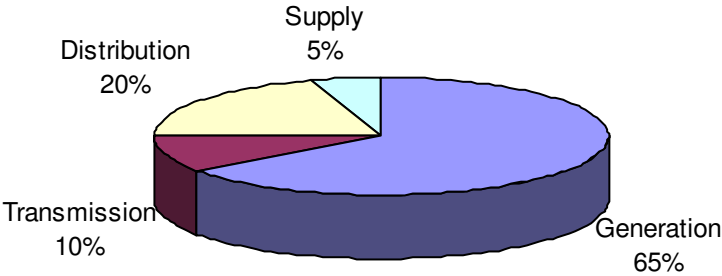
(i) *Generation* is the upstream production of electricity where a primary energy source i.e. oil, natural gas, coal, nuclear power or renewable resources is transformed into electricity in a power station.

(ii) *Transmission* is the transport of electricity along high voltage wires in the network infrastructure, from the power stations or generators to the local and regional networks. The transmission also involves the function of managing the different generators connected by the network.³² By maintaining the suitable voltage and frequency, unbalances in the grid and possible breakdowns of the system can be avoided. The coordination is catered for by a Transmission System Operator, who often is the owner of the network. The transmission is the part of the structure where natural monopoly still exists.

(iii) *Distribution* is the transport of low voltage electricity from the transmission network over the regional and local distribution networks. The distribution is also considered to be a natural monopoly.

(iv) *Supply*, finally, is the provision of electricity to end-users, and involves both wholesale and retail to household and industry consumers. To illustrate the impact of each of the levels in electricity supply industry, figure 3.2 shows the shares of the different functions in the cost of providing electricity to the final user.

Figure 3.1 – Electricity supply costs according to function



Source: Steiner (2000), p. 36

³² Steiner (2000), p. 9

3.3 Network industry

Network industries, or public utilities, are industries such as telecommunication, railway, air transport, water and electricity that are essential to most consumers, both domestic and industrial and that has to be provided through a network infrastructure. The above mentioned features of electricity have resulted in a structure of the electricity industry that differs from industry structures of regular goods. It does, however, have many of the common features of the other network industries; natural monopoly, externalities and public service obligations.

3.3.1 Natural monopoly

Similar to other network industries, the electricity industry requires a network infrastructure, in order to provide the electricity. The infrastructure in the case of electricity consists of the transmission and distribution networks along which the electricity is transported from the power stations to the end-users. The network infrastructure requires large initial investments that usually are sunk and average costs are falling with increased production implying economies of scale. It is more efficient for one firm to dominate the market and provide the service of transmission and distribution, instead of a more competitive market and this result in a situation with a natural monopoly. The large fixed cost is a barrier to entry and duplicating the infrastructure in order to enter the market is far too costly, and not an option for new entrants. The element of natural monopoly was for long the primary motive for regulation in the electricity sector. Legal public monopolies were exempted from the EC-legislation and could exist to secure the investments and maintenance of the network.³³

With new technology and increased emphasis on competition in all sectors within the EU, the case for legal monopolies due to the existence of natural monopolies, has been reduced. The entire electricity industry has been assumed to be a natural monopoly when in fact such a monopoly can only be observed in the network infrastructure. The ‘unbundling’ that was called for in the Electricity Directives has opened up for the possibility to separate the transmission and distribution networks, characterised by natural monopoly, from other parts of the industry and allowing for competition in the up and downstream sections of the industry.³⁴ The access to the networks is a prerequisite for this up and downstream competition, because of the impossibility to duplicate the networks and the regulation on Third Party Access is relevant in order to secure competition on the network.

³³ Pelkmans (2001a), p. 142

³⁴ Ibid

3.3.2 Externalities

Another feature of the network industries are network effects or externalities. Consumers and producers are interconnected through the network infrastructure and the activity of one user can affect all other users of the network. The effects could be positive when the value of being connected to the network increases with the number of consumers or producers connected. On the contrary, negative network effects could be network failure, low quality of the network or congestion in the network.³⁵ Applied to the electricity sector, examples of network effects are the generators connected to the network whose operation, function and malfunction would affect the whole network.³⁶ Power failure or congestion in the network would be a negative externality of the electricity sector. Adding another generator to the network could on the other hand create positive network effects spreading the risk of power failure to more power stations.

3.3.3 Public Service Obligations

The third common element for the network industries relates to the responsibility of the public sector to provide utilities to everyone. Certain goods and services are considered to be especially important responding to the basic needs of the population and should be available to all consumers at reasonable prices, even in remote and isolated locations. Goods and services provided by network industries are often assessed with the concept of ‘services on general economic interest’.³⁷ There is a balancing act between the goals of the internal market – free movement, competition and efficiency – on one hand and the obligation to provide these services on the other and the support for the public sector to provide these services have been strong. The concept of ‘services of general interest’ can be interpreted in different ways in the member states. In the absence of EU regulation, public service obligations can be problematic as differences between the member states in their provision of the service can constitute an entry barrier and not leading to proper functioning of the Internal Market.³⁸

Cross-subsidisation, when profitable services in areas with dense population compensate for the loss-making services in remote areas, is a way to deal with the public service obligations. This tool has been protected under the ‘exclusive rights’ clause in Article 86 in the EC Treaty because allowing for competition would imply new firms concentrating their activity in the

³⁵ Pelkmans (2001a), pp. 143-144

³⁶ Steiner (2000), p. 8

³⁷ European Commission (1999), p. 42

³⁸ European Commission (1999), p. 42

densely populated areas resulting in selective competition or ‘cream-skimming’, and not securing the provision of the services to vulnerable consumers.³⁹

³⁹ Pelkmans (2001a), p. 143

4. THE IMPACT OF INTEGRATION ON THE ELECTRICITY MARKETS

4.1 *Expected effects from integration*

The orthodox theories of Economic Integration analysed the welfare effects of integration by making a distinction between *trade creation* and *trade diversion*. To investigate these ‘static effects’, assumptions were made that markets were perfectly competitive. With integration, internal trade barriers would be removed leading to increased trade and countries would gain from this trade if they specialised according to comparative advantages. In economic integration theory, more emphasis was eventually put on trade in markets with increasing returns to scale and imperfect competition. The new theories of market integration introduced ‘dynamic effects’ which have played an increasing role and which can serve as a starting point for an analysis of the integration of electricity markets.

The electricity markets are characterized by increasing returns to scale and imperfect competition, primarily an oligopoly structure. As mentioned earlier, the costs of production decline with increased output and the falling average costs results in economies of scale. The high initial fixed cost is a result of the network infrastructure required to provide the electricity and therefore the market is characterized by natural monopoly implying limited or no competition. The new theories of market integration take this into consideration and are therefore applicable to the electricity markets.

The *dynamic effects* of integration are central in the analysis of the integrated electricity market and were important features in studies performed both prior to and after the creation of the Internal Market.⁴⁰ These studies pointed to the positive effects integration would have on costs and prices, setting aside the static effects. By eliminating internal trade barriers, increased competition lead to lower prices and countries would respond to this by initially reducing excess profits and wages and improve efficiency within the firms. Eventually, the lower prices would lead to increased demand and thus restructuring through mergers and

⁴⁰ For example the Cecchini-report, ‘The cost-of Non-Europe’ from 1988.

investments in order to exploit economies of scale. This in turn would lead to improved productivity and reduced prices and costs.⁴¹ Hence, the crucial point in the new framework of market integration theories is the emphasis on gains from regional market integration that stem from *increased competition*. By eliminating trade barriers within the regional integrated area, the markets are opened up for more competition resulting in decreased oligopoly mark-ups and reduced market segmentation.⁴² These dynamic effects appear in addition to the traditional gains from increased trade and are often referred to as *pro-competitive effects*.

Thus, to complete a single electricity market, barriers have to be eliminated which in this case could be more complex as they consist of so-called non-tariff barriers (i.e. public monopolies) and physical barriers (limited capacity in the network infrastructure). Harmonizing and issuing common legislation is one way to overcome the non-tariff barriers where liberalising all the national electricity markets and therefore reducing market power of the incumbents, implies more competition in the domestic markets as well as between member states. Regulation on Third Party Access is another measure that ensures fair access to the networks both for national and international market players, something that is also necessary to improve competition. When it comes to the physical barriers, the TEN-E program is aiming at improving the network infrastructure so that the capacity to trade electricity across the borders is facilitated.

Apart from the positive effects from increased competition, regional integration gives rise to benefits from larger market size. Firms that operate in larger markets can exploit economies of scale by developing longer production runs and therefore lower production costs. Also, larger market size implies that more products are available and there are welfare gains from increased product diversity.⁴³

Another aspect from the economic literature is the hypothesis of *contestable markets*. A contestable market is a market with competitive pricing even though there are one or two firms dominating the market in a monopoly or oligopoly setting. A key feature is that there are no initial sunk costs and an entrant therefore has the same costs as the incumbent firm and will have the same opportunities as the incumbent to generate profits at any prices. The only way for the dominant firm to block the entry of other firms is to set price at marginal cost,

⁴¹ Senior Nello (2005), pp. 113-114

⁴² Robson (1998), p. 84

⁴³ Senior Nello (2005), p. 103; Robson (1998), p. 84

implying zero profits for both the incumbent and the potential entrants. With this hypothesis, the ‘threat’ of potential competition results in competitive behaviour even in markets with monopolies or oligopolies.⁴⁴ International trade can be an anti-monopoly policy in a contestable market. In an industry with economies of scale and fixed costs, the market can only support one or two producers. But if the market is opened up for international trade, the potential competition from the international firms will lead to the incumbent firm avoiding to raise the price because price increases – and thus making profits – will attract more entrants into the market.⁴⁵

In reality there are very few examples of contestable markets since no or low barriers to entry are very rare. The hypothesis is interesting in relation to electricity markets however. One of the main features of network industries is the initial sunk cost of the network infrastructure but assuming firms can access the networks through for example legislation on Third Party Access (see 2.3.2), the electricity market can be thought of as contestable. The legacy of the public monopolies implies there are one or a few dominant firms in the market, but with integration and liberalisation the markets are opened up to both domestic and international competition. The hypothesis of contestable markets would then imply the potential competition from integrated electricity markets and cross-border trade would lead to the firms not being able to charge monopoly prices and competitive electricity prices would be observed.

4.2 Observed effects of integration

As mentioned earlier, the special features of electricity markets makes the analysis of electricity somewhat different than that of other goods. With the latter, it is possible to use conventional measures to calculate the static effects of economic integration such as trade creation, trade diversion and comparative advantages. With the electricity industry however, other tools will be used to analyse the impact of integration. The degree of market opening in the member states is relevant to investigate to see if there are any links between the market opening and market structure, cross-border trade and prices, and thus for the analysis of effects of liberalisation and integration. The effects of integration will be approached by looking at the market structure; the number of companies within the industry and their market shares in order to survey the dynamic effects stemming from more competition. Cross-border

⁴⁴ Martin (1994), pp. 75-76

⁴⁵ Markusen et al. (1995), p. 276

trade of electricity will be examined to see if there are any patterns that can be related to the degree of liberalisation and integration, in terms of more traditional static effects. Looking at net trade flows, i.e. the difference between imports and exports is one way to find patterns of specialisation, but in addition to this the countries' revealed comparative advantages will also be examined briefly. The focus will then shift to the effects on prices, since lower prices is an expected effect of economic integration.

4.2.1 Market opening

In the last 15 years electricity markets have gradually been liberalised as a part of the process towards integration. Throughout this period member states have been allowed to determine the degree of market opening on a national level, but the introduction of the electricity directives implied that certain minimum levels were required and that these were to be raised gradually over time in order to eventually reach a complete market opening. Some countries have gone beyond the directives and opened their markets early on, resulting in differing structures of the electricity markets in the EC. Differing degrees of market opening can in itself constitute an internal barrier since companies then have difficulties to establish abroad, and because prices are not market based and can differ between the member states.

Table 4.1 – Market opening

<i>Full market opening in 1999</i>	Finland Germany Sweden United Kingdom
<i>Full market opening in 2002</i>	Austria
<i>Full market opening in 2005</i>	Denmark Ireland Netherlands Portugal Spain
<i>Not fully opened in 2005</i>	Belgium France Greece Italy Luxemburg

Source: Bergman (2000), European Commission (2006b)

Table 4.1 illustrates the development of market opening in the EU15 countries, defined as the share of consumers, both industrial and domestic, that are free to choose the supplier of electricity as a proportion of total electricity consumption. As presented, four of the countries, the UK, Sweden, Finland and Germany, had already fully opened their markets for

competition when the First Directive was implemented in 1999 but at that time most of the other member states had only a quarter of the market open corresponding to the lowest level required in the Directive. In 2005 however, 10 of the 15 member states had a fully opened markets but five countries had yet to liberalise theirs, something they are obligated to do by 1st of July 2007 following the Second Electricity Directive. Hence, by this time all consumers, both domestic and industrial, are free to choose their supplier and full market opening will in theory be achieved.

4.2.2 Cross-border trade

A crucial part in creating an Internal Market for electricity is the possibility of cross-border trade. In trade theory, many models state that in most cases increased international trade lead to welfare and growth. Despite the importance of the sector, the cross-border trade in electricity has remained limited and is lower than in other sectors that have been subject to integration, such as telecommunication and financial services, only amounting to 11 % of the total consumption in 2004.⁴⁶ This is due to limited possibilities to trade both in domestic markets because of the limited competition, and across the borders because of low capacity in the interconnections between the national networks.⁴⁷ Facilitating cross-border trade within the EC Internal Market must therefore include legislation, in order to eliminate the restrictions on competition, as well as improved capacity by developing the networks.

The fact that cross-border trade is limited by the capacity of the networks, in addition to that electricity cannot be stored to cover possible future domestic needs, implies that the volumes traded are dependent on physical matters rather than the traditional driving forces to trade – the gains from trade by further specialisation according to comparative advantages. Trade in electricity is more of an economical choice than trade due to shortages of generation possibilities.⁴⁸ But the level of electricity traded can also depend on production capacity and regular changes in demand. One example is the Nordic countries where a large part of the electricity is generated by hydropower and during a dry year the production is limited, increasing the demand for imported electricity. Nonetheless, there is a significant level of cross-border trade, which took place in some regions even before the integration of the electricity markets and several of the national networks have long been interconnected as a

⁴⁶ Eurostat (2007), p. 24

⁴⁷ Bergman (2000), p. 18

⁴⁸ Eurostat, *Statistics in focus* (6/2006), p. 4

way to secure the supply. Regional markets such as the Iberian, Nordic and West European market have developed showing that neighbouring countries tend to trade with each other. This is barely surprising considering the closeness of the networks and the fact that the farther electricity is transported, the more efficiency is lost.⁴⁹

Figure 4.1 – Total imports of electricity, GWh

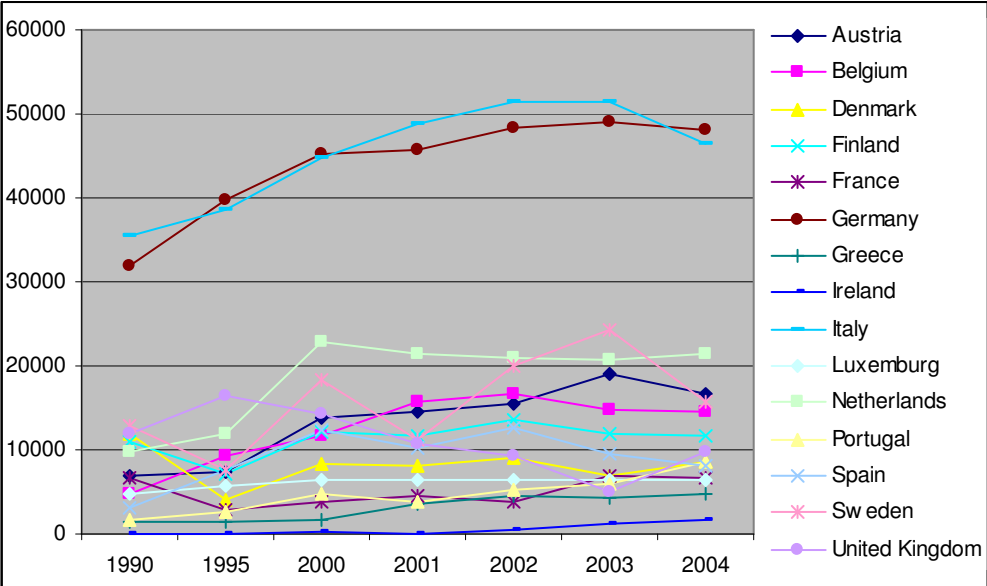
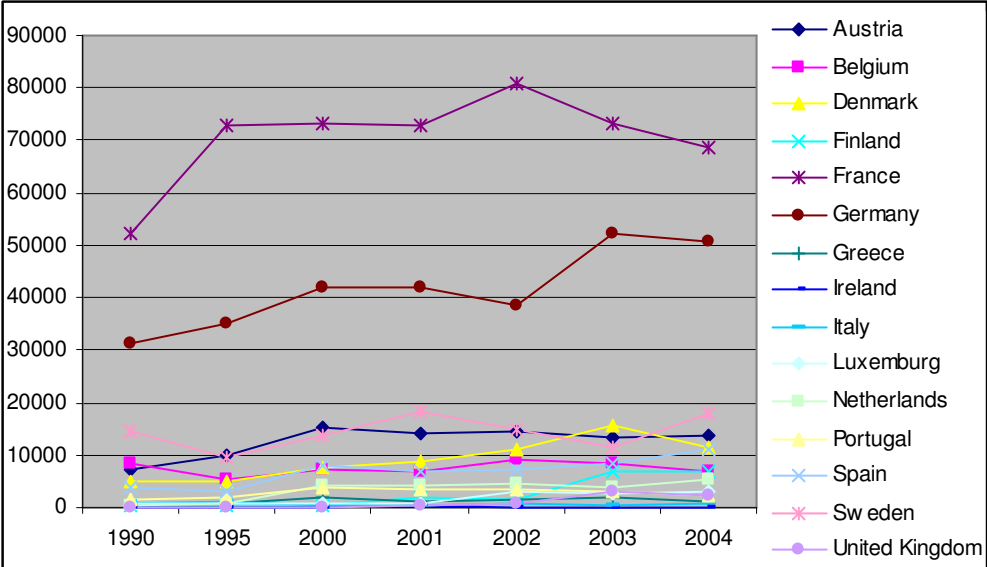


Figure 4.2 – Total exports of electricity, GWh



Source: Eurostat, compiled by author

Looking at total imports and exports of electricity in the period 1990-2004, as in figure 4.1 and 4.2, the pattern shows a slight increase in cross-border trade, although the trend is not obvious. This development is expected considering the increase in the overall generation and

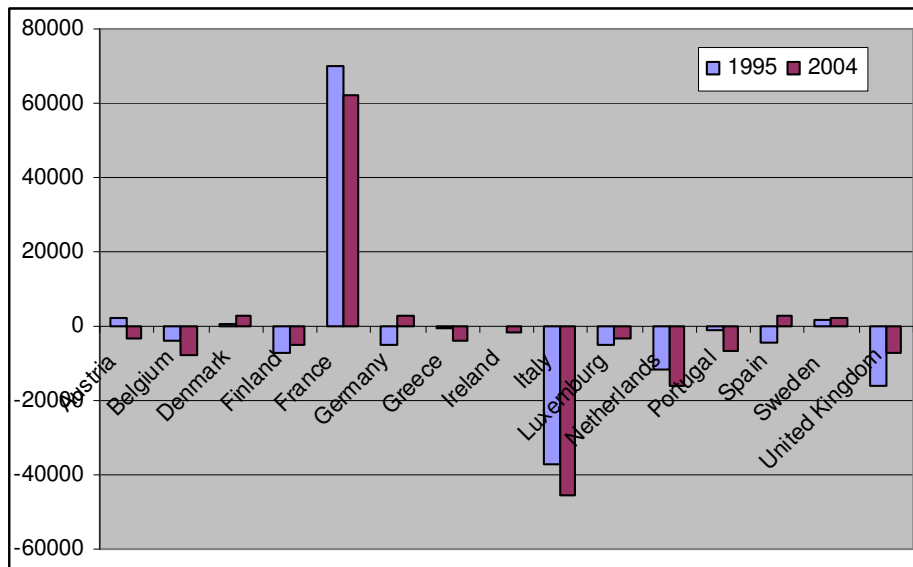
⁴⁹ Eurostat (2006), p. 48

consumption in Europe (see figure 2.3) and is not necessarily a result of the integrated markets. The imports and exports of the countries fluctuate each year showing that trade in electricity, as mentioned above, is generally an economic decision and not a result of deficits or surpluses in their own production. France is dominating the export market while Italy and Germany are the top importing countries when it comes to total volumes, which is interesting considering they also are among those countries that also produce the most electricity (shown in figure 2.5). Furthermore, Germany is one of the member states exporting the largest amounts and one explanation of Germany's leading position in exports, imports and generation could be the large population and the many industries that require large amounts of electricity, at the same time as it has large production capacity. Germany also borders to several other member states which could be another explanation of the trade.

In addition to Germany, many member states are in fact both importers and exporters of electricity and therefore it is relevant to look at the net trade to get a better idea of the trade flows within the EC and to see if there are any patterns of specialisation, as net trade flows can be used as an indicator of this. Hence, figure 4.3 shows the net trade of electricity for EU15, comparing 1995 and 2004. Positive numbers imply the countries being net-exporters i.e. exports are larger than imports, while countries with negative numbers are net-importers.

As can be seen, most countries are net-importers in both years with Italy being the dominant net-importer. France is the dominant net-exporter but both Denmark and Sweden were also net-exporters during these two years. For most of the member states, the net trade is fluctuating greatly over the period and a country could be a net-importer one year but net-exporter of large amounts of electricity the next. To make the figure more readable only two years were chosen for comparison, but looking at a 15 year period net trade differs greatly both between the countries and over time. The fluctuations can be explained by the fact that it is the countries economic decisions that determine trade, not primarily a continuous shortage or surplus in the domestic supply. But of course it could also be regular changes in demand and supply due to climatic changes (primarily when discussing hydro and renewable energy sources) or sudden changes in fuel prices. France is the only continuous net-exporter which might be an indication of the country's specialisation in electricity generation as compared to other member states. Finland, Italy, Luxemburg, Netherlands, Portugal and United Kingdom on the other hand have been net-importers during the last 15 years indicating shortages in production capacity.

Figure 4.3 – Net trade, GWh



Source: Eurostat, compiled by author

When comparing the level of market opening in table 4.1 with the cross-border trade in electricity, there is no clear pattern showing that market opening would imply more trade or in which direction trade flows are headed. One example is France being a large net-exporter of electricity and Italy which is a net-importer, despite the fact that these countries have had a slow progress in the liberalisation of the electricity markets. This can be compared to the four countries that were the first to liberalise, namely Finland, Germany, Sweden and the UK, that show no real patterns in common when it comes to trade flows. The cross-border flows of electricity are thus more related to the capacity, the interconnections and size of the network infrastructure than the level of liberalisation of the market. In time, with more integrated networks by developing interconnections and create a larger network infrastructure, electricity could perhaps gain more of the features of regular goods, where regular driving forces determines the trade, rather than facing limits imposed by the network infrastructure.

When dealing with economic integration and cross-border trade, it is interesting to examine whether a country has a comparative advantage in a certain sector. Trade theory states that it is beneficial for a country to specialise in that sector and to export the good in exchange of other goods. The Balassa index helps establish if a country has a revealed comparative advantage (RCA), i.e. if a country has a comparative advantage in a specific sector.⁵⁰ One version of calculating this is, when adapted to this thesis' topic of electricity:

⁵⁰ Van Marrewijk (2002), pp. 36-40

$$\text{Balassa index of RCA} = (X_e^i / X_e^{EU}) / (X_t^i / X_t^{EU})$$

where X_e is export of electricity, X_t is total exports, i is the country investigated and EU corresponds to EU15. The index compares a country's relative share of EU15:s electricity export with the country's relative share of EU15:s total trade and indicates that a country has a revealed comparative advantage if $RCA > 1$ and a comparative disadvantage if $RCA < 1$.

Table 4.2 – RCA-index of EU15 in 2004⁵¹

	<i>RCA index</i>
Luxemburg	3,31
France	2,61
Denmark	2,57
Sweden	2,47
Austria	1,97
Finland	1,90
Greece	1,16
Spain	1,05
Portugal	1,02
Germany	0,96
Belgium	0,38
Netherlands	0,25
United Kingdom	0,11
Italy	0,04
Ireland	0,00

When applying the RCA-index to electricity it is important to keep in mind that electricity is different from other goods because it is non-storable and depends on the network infrastructure, as mentioned previously. Because of limited capacity of the interconnections, trade cannot flow freely in response to supply or demand. The results are presented in table 4.2 where the countries are ranked in descending order according to their RCA-index. The countries above the bold line have a revealed comparative advantage in electricity and the others have not. The results from the RCA-index are in several cases in line with the results from the net trade flows in figure 4.3. France, Denmark and Sweden have a strong comparative advantage in electricity and are at the same time net-exporters and this can indicate specialisation in the industry. This is also the case for Italy, the UK and the Netherlands who have a low RCA-index and are great net-importers. The result for the other member states is more ambiguous. Luxemburg shows a very strong comparative advantage but is still a net-importer and also the member state producing the smallest amounts of

⁵¹ Due to lack of data and the complexity of price formation in electricity markets, the results should be taken with a pinch of salt. To compare exports in electricity with other goods, the export value had to be calculated. This was done by multiplying the volumes of electricity exported, with a highly estimated electricity price based on information from the Commission on prices on wholesale electricity markets in 2004.

electricity. However, this version of the Balassa index does not take imports into account and does therefore not give the whole picture of the trade, which could be one explanation of Luxemburg's strong position.

4.2.3 Market structure

The structure of the electricity markets is one way to investigate what impact the integration and liberalisation have had on the electricity markets, with regard to competition. Looking at market structure in the upstream generation and the downstream supply of electricity to final consumers is a way to determine the degree and the development of competition as well as how this is related to integration and liberalisation.

(i) Generation

The generation section of the electricity industry is in general the first part to be liberalised in order to remedy imperfect competition in the sector. Another incentive of market opening is the possibility of introducing new and alternative ways of producing electricity, for example from renewable sources. But because of the growing demand of electricity, the generation is also subject to government policy of security of supply which works in the opposite direction.⁵²

The number of companies active within generation in EU15 is presented in table 4.3 and can provide information about the situation in the EC market. The left hand column refers to the number of companies representing 95 % of the net electricity generation.⁵³ Comparing the number of companies with the level of market opening in the right hand column (figures are from 1st January 2005, in the absence of figures from 2004), shows that the member states with fully liberalised markets tend to have a higher number of generating companies, with the exception of Spain. This is especially noticeable for the countries that have been fully liberalised since 1999, marked with an asterisk in the table. The number of generating companies is of course also related to the size of the member states.

⁵² Eurostat (2003), p. 12

⁵³ Due to the rapidly increasing number of smaller companies in the market, complicating the collection of data, the figures are presented by Eurostat in this manner. Eurostat, *Statistics in Focus* (6/2006), p. 2

Table 4.3 – Number of generating companies

	<i>No. of companies representing at least 95 % of the net electricity generation</i>	<i>No. of companies producing at least 5 % of the national net electricity generation</i>	<i>Degree of market opening</i>
	2004	2004	2005
Austria	39	5	100
Belgium	3	2	90
Denmark	42	2	100
Finland*	29	5	100
France	4	1	70
Germany*	–	5	100
Greece	1	1	62
Ireland	3	2	56
Italy	83	4	79
Luxemburg	9	1	57
Netherlands	53	4	100
Portugal	46	3	100
Spain	5	4	100
Sweden*	14	3	100
United Kingdom*	20	7	100

Source: Eurostat, edited by author

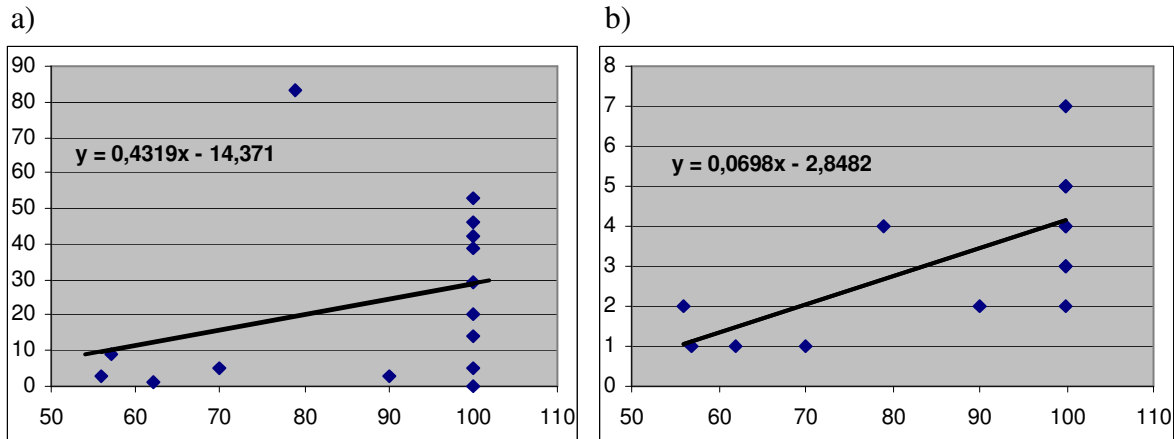
* Countries with full market opening in 1999

The centre column in turn, shows the number of companies which have a significant share of the market, i.e. each responsible for at least 5 % of the total national net electricity generation.⁵⁴ Several countries still retain some of the former monopoly and oligopoly market structures considering the limited numbers of companies in the markets – six of the countries only have one or two companies with a significant share of the market. On the contrary, Austria, Finland, Germany and the UK show a larger number of companies with importance where all except Austria have been liberalised for a longer period of time.

In figure 4.4 the information from table 4.3 is plotted in a diagram to show if there is a correlation between the number of companies and the level of market opening. Panel a) shows the number of companies representing 95 % of the market and panel b) the number of companies with a significant market share. After using the simple tool in Excel and inserting a trendline, one can draw the conclusion that there is a clear positive relationship between market opening and number of companies, i.e. there are more companies and more competition where the level of market opening is higher. Although this is a very simple analysis and does not take into account the size of the different countries, which also affect the number of companies in a market.

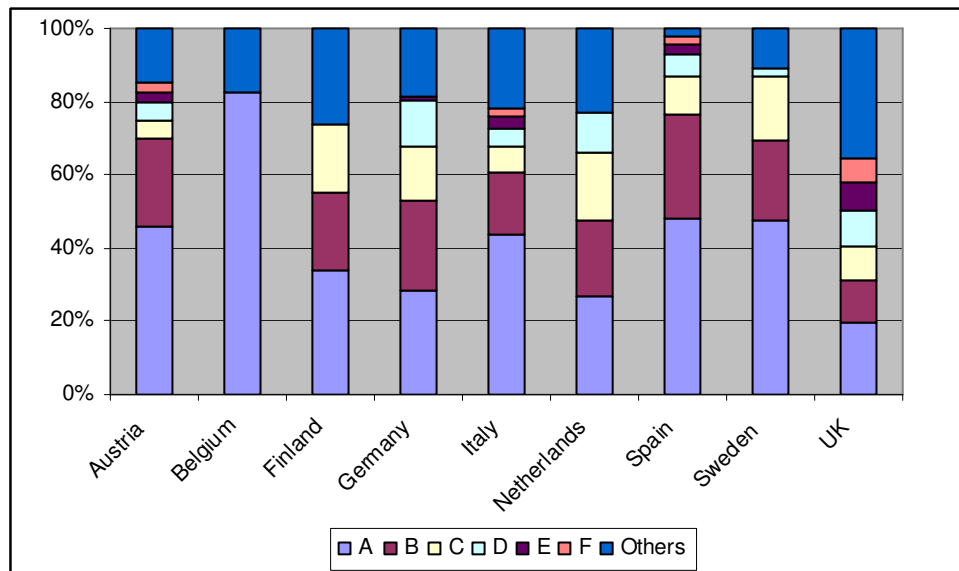
⁵⁴ Eurostat, *Statistics in Focus* (6/2006), p. 2

Figure 4.4 – Correlation between no. of generating companies and market opening



The market structure of the electricity generation in 2004 can finally be illustrated as in figure 4.5. As mentioned, there are generally one or two large operators dominating the markets. Belgium is the least competitive with the incumbent having a market share of more than 82 %, followed by Spain where the two dominant operators have 48 and 28 % of the market respectively. Turning to the competitive markets instead, the UK stands out with a market share of the incumbent of less than 20 % and several other companies having a significant market share.

Figure 4.5 – Market shares of generating companies, selected countries (2004)



Source: European Commission (2006c), edited by author and own calculations

(ii) Supply

It is now important to consider the market structure in the downstream section of the electricity markets, i.e. the supply and sales of electricity to final consumers. The integration and liberalisation process in this part of the electricity sector is more obvious than in the

generation sector largely because it directly affects consumers through the increased possibility to choose supplier and in the changes in prices to consumers.

The pace of the liberalisation process has differed between member states resulting in different structures in the supply sector. In some countries, where liberalisation has been slow, companies are both distributors (transporting electricity over the medium or low voltage networks) and retailers (selling the electricity to the final consumers), i.e. there is still a degree of vertical integration, while in other countries companies specialising in selling the electricity are separated from those running the distribution.⁵⁵ The market opening has clearly resulted in the creation of new retailers implying even more opportunities for final consumers to choose their supplier.⁵⁶ Table 4.4 shows the number of suppliers of electricity in EU15, where the left hand column shows the total number of suppliers in the different member states.

Table 4.4 – Number of supplying companies

	<i>Total no. of suppliers</i>	<i>No. of suppliers having a share of at least 5 % of the total</i>	<i>Degree of market opening</i>
	2004	2004	2005
Austria	125	5	100
Belgium	48	3	90
Denmark	75	–	100
Finland*	>100	3	100
France	166	1	70
Germany*	940	4	100
Greece	4	1	62
Ireland	8	4	56
Italy	400	1	79
Luxemburg	11	3	57
Netherlands	34	3	100
Portugal	9	1	100
Spain	315	3	100
Sweden*	130	3	100
United Kingdom*	32	7	100

Source: Eurostat, edited by author

* Countries with full market opening in 1999

Similar to the situation with generation, the countries with the largest numbers of suppliers tend to be those where the markets have been completely liberalised. There are several exceptions to this, for example Italy and France, but these countries are two of the largest

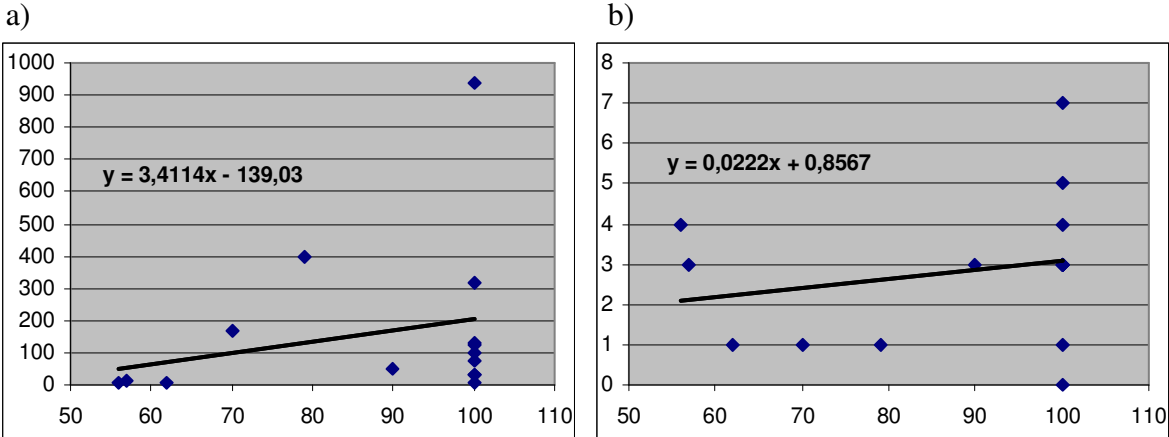
⁵⁵ Eurostat (2003), p. 20

⁵⁶ Eurostat, *Statistics in focus* (6/2006), p. 5

markets and so it is not surprising that they can support more electricity companies. In all countries there are few suppliers with a larger market share, as shown in the centre column, pointing at the legacy of monopolies.

Once again, plotting the information from table 4.4 in a diagram and inserting a trendline shows a positive relation between the degree of market opening and the number of suppliers in the downstream part of the electricity industry, just as in the electricity generation.

Figure 4.6 – Correlation between no. of supplying companies and market opening.



European energy companies are expanding across the borders; there is a trend whereby national players enter other markets, often strategic and neighbouring areas, and this is usually done through mergers and acquisitions. A rapid change occurred in 2001-2002 when several companies landed trans-national deals, above all German RWE and E.ON, French EdF and GdF, the French-Belgian Suez and Italian ENI and Enel. E.ON is the largest supplying energy company in Europe and one of the largest in the world. It has gained influence in the market when acquiring large companies in the UK, Scandinavia and Eastern Europe and also took over the leading gas company in Germany. The publicly owned EdF and GdF in France have lost market shares but simultaneously gained foreign assets primarily in Germany, the UK, Italy, Spain and in most of the Eastern European countries. Suez is active in many energy sectors and has grown larger both within the EU and outside. Companies in Italy and Spain have ‘exchanged’ assets when Italian Enel took over shares in Spanish generation while Spanish Endesa did the same in Italy.⁵⁷

⁵⁷ European Commission (2006a), p. 32

4.2.4 Prices

The last variable to investigate, and perhaps one of the most interesting, is electricity prices and how these have been affected by the integration of the electricity markets. How the electricity prices are set in detail is beyond the scope of this thesis but it can be said that the vertical structure of the network industries implies different levels of competition and therefore different price mechanisms in the different layers of the industry. As mentioned earlier, the network infrastructure and the system operation are still largely monopolies, due to the element of natural monopoly. Price formation in this part of the industry has to take security of supply into account as well as the need to ensure incentives for long run investments. They are therefore set by public regulations and are not very flexible. In the downstream markets however, the supply part of the industry is very competitive and have come a long way in the liberalisation process, thus prices set to the consumers are more market based and flexible.⁵⁸

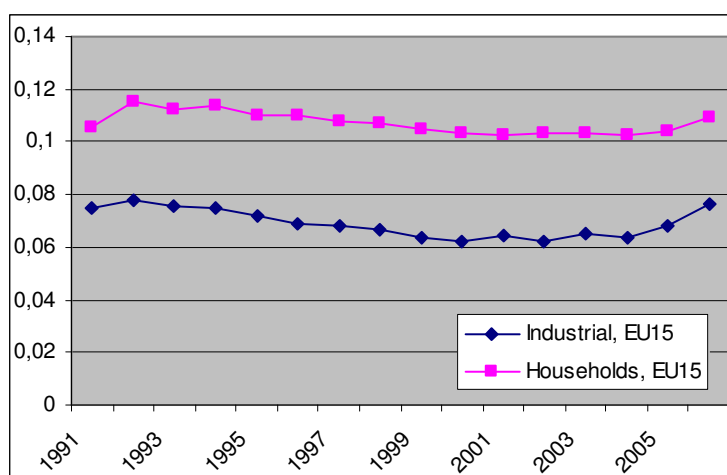
As markets are liberalised, prices are expected to decline because of increased competition, which leads to more companies entering the market so that existing mark-ups are eliminated. The price of electricity is a sensitive issue since many people and industries are dependent on the energy source, and probably do not have other options. The price elasticity is low and a change in price does not change the consumption much, but it still has an impact on households' expenditure and the industries' costs.

As shown in figure 4.7, the trend in average electricity retail prices for EU15 was declining following the initiation of the integration process of the markets, both for industrial and household consumers. Contrary to what is expected, the trend later changed and since 2000 the electricity prices have risen, reaching a price level equal to or even above the initial situation. The recent increase in prices can be explained partly by rising fuel prices, primarily oil and gas, which affects cost of power generation and thus the electricity prices. But it can also be because of a rise in the overall demand of electricity. The increase in the electricity price may however have been buffered by the pro-competitive effects and may have been even larger without the integration. Furthermore, the falling value of the dollar in which oil is traded against the euro, may also have limited the effects of the increased world oil price.⁵⁹

⁵⁸ European Commission (2006a), p.14

⁵⁹ European Commission (2006a), pp. 18, 47-48

Figure 4.7 – Electricity retail prices, euros per kWh



Source: Eurostat

Electricity retail prices are also illustrated in table 4.5, this time showing the differences both between the countries and between the level of the industrial and household prices. Once again recalling the different degrees of the market opening, member states with early liberalisation – Finland, Sweden and the UK – are the countries with lower prices while Italy, Belgium, Luxemburg and Ireland all have a higher price level. On the other hand, Germany and Portugal both have high prices even though they have a fully opened market so there is no clear pattern appearing.

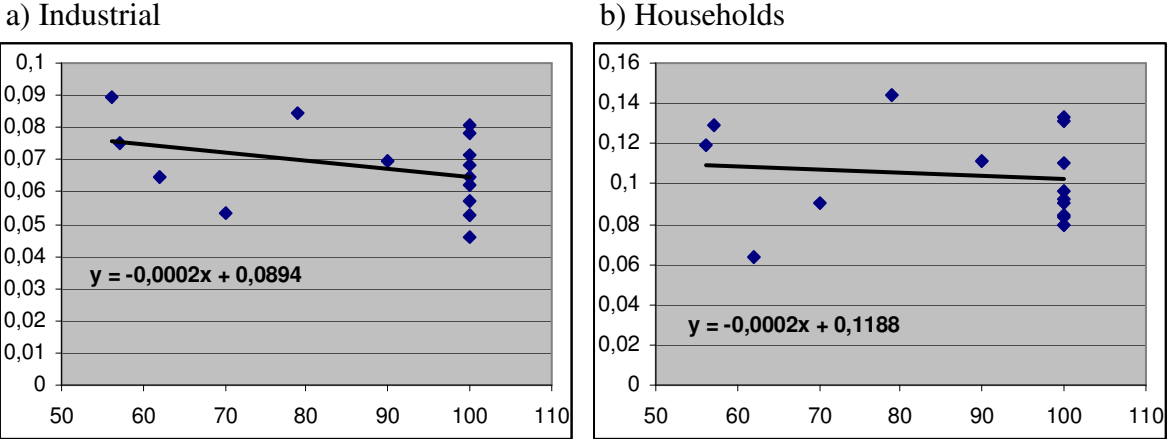
Table 4.5 – Retail prices for industrial and household consumers, euro per kWh (2005)

	<i>Industrial</i>	<i>Households</i>	<i>Degree of market opening</i>
	2005	2005	2005
Austria	0,0621	0,0964	100
Belgium	0,0695	0,1116	90
Denmark	0,0646	0,0927	100
Finland*	0,0527	0,0792	100
France	0,0533	0,0905	70
Germany*	0,078	0,1334	100
Greece	0,0645	0,0637	62
Ireland	0,0896	0,1197	56
Italy	0,0843	0,144	79
Luxemburg	0,0752	0,1288	57
Netherlands	0,0806	0,1102	100
Portugal	0,0713	0,1313	100
Spain	0,0686	0,09	100
Sweden*	0,0462	0,0846	100
United Kingdom*	0,057	0,0836	100

Source: Eurostat, compiled by author

Using the same procedure as previously, figure 4.8 shows the correlation between the retail price and the degree of market opening as presented in table 4.5. In this case the correlation is negative indicating lower prices (both for industrial and households) where markets are more liberalised. This relationship is expected and in line with economic theory.

Figure 4.8 – Correlation between retail price and market opening (2005)



However, as can be seen in the figure, the prices are differing greatly between the member states. In a regional integrated area with increased trade, prices on goods and services are expected to be levelled out. This is not the case with the electricity market but there are several possible explanations to this. When it comes to retail prices, there are many different factors involved in determining the price. The prices used here are without taxes, but otherwise taxes on generation and on the energy sources are contributing factors to price differences between member states. The prices to end users are also determined by electricity stock markets, both on a spot market but also on more long term forward markets, where supply and demand are the driving forces, and since the markets are not fully integrated the prices set on these stock markets can differ. The integration and liberalisation of the electricity markets has yet to reach its full effects and within a few years time the prices may be more harmonised and perhaps also decreasing following further improved competition.

5. SUMMARY AND CONCLUSIONS

The features of electricity and the structure of the industry differ from regular goods but have characteristics in common with other network industries such as telecommunications and railways. Because of these characteristics, it is interesting to study the electricity industry in a context of European economic integration considering there has been a contradiction between the Community goals of competition and liberalisation on one hand, and the regulated industry with limited competition on the other. The purpose of this paper was to examine the Internal Market for electricity and the effects of the integration and liberalisation on the electricity markets. It attempts to give a general picture of the internal electricity market and the industry itself as well as surveying the current situation and the impacts of the integration.

Initially the thesis presented measures that have been taken to create the internal electricity market. The energy sector including electricity is a precondition for further growth and development in the EU. Because of this and the fact that there is a great amount of people and industries depending on electricity, the markets have to be well-functioning. The measures of integration includes liberalisation of the national markets which is required if different markets in the EU are to be integrated, and this is done primarily by legislation but also by improving the network infrastructure through Trans-European Networks. In addition to this, the electricity industry was studied and presented in chapter three. As mentioned, it has special features that make it different from other regular goods primarily that it is non-storable, but at the same time it is a network industry with much in common with other similar industries. Hence, the liberalisation of other networks industries is comparable to the electricity industry.

A brief theoretical framework was introduced in chapter four where the new theories of market integration were introduced and applied to the electricity sector. Because of the industry's features, emphasis is put on dynamic effects of economic integration rather than static effects and includes pro-competitive effects. In a setting of imperfect competition and increasing returns to scale, as in the electricity industry, integration leads to improved competition and thus lower prices and a more efficient market. Also, relevant in the analysis

of network industries in general and the electricity markets in particular, is the hypothesis of contestable markets. With integration, potential competition can result in markets having competitive pricing even though there are only one or two dominant firms. This could be the case in electricity industry where incumbents may have to reduce prices now that the markets have been opened.

The remaining part of the thesis consists of the empirical analysis. The focus is on the effects of integration and liberalisation on competition, cross-border trade and prices, and the electricity sector is looked upon from several perspectives. The degree of market opening involves the percentage of the consumers that are free to choose their suppliers. This is regulated in the Electricity Directives but some countries liberalised their markets before the directives were issued. The next step was to look at cross-border trade as this is one of the key issues in the theory of economic integration. The trade between the member states is limited largely due to the capacity restrictions in the network infrastructure. But trade is not so much driven by regular forces as it is an economic choice of the country. Trade often takes place between neighbouring countries since the transport of electricity is dependent on the network infrastructure. Many countries are both importers and exporters and only France is a net-exporter of electricity, indicating its specialisation in electricity generation. With the Balassa index, the revealed comparative advantages were calculated and compared between the member states and this showed that France also was one of the countries with the strongest comparative advantage in electricity. Italy had a strong comparative disadvantage in electricity and is also a net-importer but for most of the other countries in the analysis the results are ambiguous. However, there is little evidence of any correlation between the level of market opening and the cross-border trade. This is probably due to the restrictions of trade due to the feature of network industry.

Another aspect analysed was the market structure of the industry. In sum, the electricity industry is characterised by one or two dominating companies in the member states which points to the legacy of the monopoly and oligopoly structure that was previously predominant. The downstream supply part of the industry is more competitive than the upstream generation of electricity, possibly because it is easier to set up supplying companies than to start generating electricity. In both the upstream and downstream part of the industry there is a positive correlation between the degree of market opening and the number of companies in

the market, indicating that liberalisation can be successful and lead to improved competition, even though there is still plenty to be done in the case of electricity markets.

The final step was to look at prices as they are expected to decrease following regional integration and liberalisation. In line with the theory, electricity prices in EU15 decreased after the initial integration and liberalisation and continued to do so during 10 years until the beginning of 2000's when the trend changed. The increase in prices could be due to markets that do not function properly but it could also be an effect of increasing fuel prices as well as increasing demand. Comparing the member states in the EU15, there is correlation between prices and the level of integration, however. Countries with full market opening tend to have lower prices than countries with slow liberalisation process. Some countries with early market opening have lower prices than for example Italy, which has been slow in the integration process but there are also examples of member states where the opposite is true so also in this case are the results somewhat ambiguous.

Looking at the results presented, a conclusion to be drawn is that progress still needs to be made before the Internal Market for electricity is completed. Even though the markets are more or less liberalised, the competition is still limited and in many of the member states the incumbent electricity company still has a great share of market power. As mentioned, the cross-border trade is limited and prices still differ between countries and have not decreased as was expected from integration. There are patterns of a positive relation between integration and the level of competition in electricity markets and therefore it is desirable that the markets are fully integrated. In addition to competitive markets, security of electricity supply is essential and can be realised with a developed network infrastructure. Competition has been addressed in legislation and from the 1st of July 2007 the member states are obliged to fully open their markets and work is in progress on the TEN:s so in a few years time the current situation might have improved.

The completion of electricity markets is a fairly recent occurrence and its effects may yet be difficult to discover. Nevertheless, many still argue that obstacles exist which prevent the markets from fully integrating and that further efforts must be made. In the Commission, the Directorate-General of Energy and Transport states that barriers to a single electricity market includes differing tax levels and differing access charges for TPA in addition to different

degrees of market opening, even though measures to harmonise these have been taken.⁶⁰ Some of this may be improved with further implementation of the Directives but it is also necessary that the regulatory agencies in the respective member states supervise the markets so that no anti-discriminating behaviour is pursued by the incumbents. This is in their interest because efficient domestic competition is important to secure the competition in the European internal market. In the recently published Energy Sector Inquiry of the gas and electricity sectors from the Directorate-General of Competition, it was shown several problematic areas in the electricity sector that hampers the completion of the internal market. These include for example companies with market power, remaining vertical integration and insufficient unbundling of network and supply, lack of market integration and cross-border competition and lack of transparency and information.⁶¹ Other reasons that the markets are not fully integrated are capacity restraints and lack of incentives of investments – would an incumbent want to invest in the network infrastructure just to see more competition as a result, with nothing but sunk costs for the incumbent? In addition to this, many national governments are reluctant to liberalise as fierce competition in the market might jeopardize the security of supply to all nationals.⁶² A deep analysis of these problems and why the electricity markets have not been fully integrated is a task that needs plenty of research and resources, and this was carried out recently by the Commission in the Sector Enquiry. It is beyond the scope of this thesis that instead focuses on the internal electricity market and its effects so far, in a context of Economic Integration theory.

As with many of the reforms in the European Union, they imply large changes for the member states and with the enlargement of the union the reforms are rather slow and the full impacts are not evident until further into the future. The electricity markets are to be fully opened in 2007 so the effects have to be investigated and evaluated again in a few years. The development is especially interesting considering the recent enlargement of the union, 12 new members within a couple of years. How will they adapt to the internal electricity market? It is possible that regional, intermediate markets are created initially and that these markets' integration with the rest of Europe are very dependent on the development of the network infrastructure and the TEN:s.

⁶⁰ European Commission (2006a), p. 49

⁶¹ European Commission (2007), pp. 7-10

⁶² Pelkmans (2001b), pp. 453-454

The development of the internal electricity market after the enlargement is one interesting topic that could be investigated further. The same goes for the other network industries, what is the situation in for example the area of transports? The railway sector is characterized by very little competition and great public monopolies still exist, largely due to the enormous sunk costs and there are little or no profits for companies to be made if they enter the market.

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