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Paul J.J. Welfens
Albrecht Kauffmann
Martin Keim

Liberalization of Electricity Markets in Selected European Countries

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Paul J.J. Welfens
Albrecht Kauffmann
Martin Keim

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EUROPÄISCHES INSTITUT FÜR INTERNATIONALE WIRTSCHAFTSBEZIEHUNGEN (EIIW)/
EUROPEAN INSTITUTE FOR INTERNATIONAL ECONOMIC RELATIONS
Bergische Universität Wuppertal, Campus Freudenberg, Rainer-Gruenter-Straße 21,
D-42119 Wuppertal, Germany
Tel.: (0)202 – 439 13 71
Fax: (0)202 – 439 13 77
E-mail: welfens@uni-wuppertal.de
www.euroeiiw.de

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Summary: We look into liberalization issues in the context of the EU Electricity Liberalization. Taking a look at principal issues reveals that the Community Directive 96/92/EC does not really take into account the interdependencies of energy markets. Moreover, third party access is not effectively enforced, particularly not in Germany, where mergers between a major electricity company and the dominant gas company have raised particular issues. Electricity liberalization in Scandinavia is working relatively well. EU accession countries are considered potential electricity exporters in the long run as full restructuring will drive down both energy intensities and electricity intensities. Russia would be wise to quickly become a member country of WTO, not in the least to gain access to Western Europe's electricity market; the role of Russia so far has been neglected in the discussion of electricity liberalization. Excess capacities in EU-27 can be expected in the medium term. There is considerable doubt that politicians – often with ambitious goals in the field of environmental policy – will allow for a pan-European liberalization of electricity. We also take a closer look at regulatory policy issues.

Zusammenfassung: Der Beitrag beschäftigt sich mit Fragen der Liberalisierung der Elektrizitätsmärkte in der EU. Man kann feststellen, dass die Gemeinschaftsdirektive 96/92/EC die Wechselbeziehungen der Elektrizitätsmärkte nicht ausreichend behandelt. Außerdem wird vor allem in Deutschland der Zugang für Dritte nicht effektiv gefördert, wobei der Zusammenschluss eines großen Elektrizitätsunternehmens und einem dominanten Gasunternehmen neue spezielle Fragen aufgeworfen hat. Hingegen verläuft der Liberalisierungsprozess in Skandinavien konsequenter. Osteuropäische EU-Beitrittsländer sind langfristig potenzielle Elektrizitätsexporteure sobald Modernisierungen zu niedrigeren Energie- und Elektrizitätsverbrauch führen. Russland sollte rasch WTO-Mitglied werden, um Zugang zu den westeuropäischen Elektrizitätsmärkten zu bekommen, wobei Russland in den gesamten Liberalisierungsdiskussionen noch keine Rolle gespielt hat. Mittelfristig können Überschusskapazitäten in einer EU-27 erwartet werden. Zweifelhaft jedoch ist, ob Politiker, die ansonsten so ehrgeizige Ambitionen in der Umweltpolitik zeigen, einer gesamteuropäischen Liberalisierung der Elektrizitätsmärkte zustimmen werden. Außerdem werden regulierungspolitische Aspekte behandelt.

Prof. Dr. Paul J.J. Welfens, Jean Monnet Chair for European Economic Integration and European Institute for International Economic Relations (EIIW) at the University of Wuppertal, Gaußstr. 20, D-42119 Wuppertal, welfens@uni-wuppertal.de, www.euroeiiw.de

Albrecht Kauffmann, EIIW Center at the University of Potsdam

Martin Keim, University of Wuppertal

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1. Introduction

Given sustained output growth in OECD countries and high growth rates in Asia and some Latin American newly industrializing countries at the turn of the century, one must anticipate long term growth of energy demand. The supply side of the energy sector is complex and politically sensitive in the case of oil and gas. As regards oil reserves, the Middle East will continue to represent the world's largest reserves; as for natural gas, Russia and Kazakhstan represent the dominant share of global reserves. Oil will remain the prime energy source for mobility for many decades while gas together with coal and nuclear fuel plus renewables will be most crucial inputs for the generation of electricity. Electricity is a vital input factor for all industries and is used by almost all households, which therefore makes generation, transmission and distribution a sensitive field. While reducing costs and prices of electricity is desirable from the user point of view it also is important that continuous power supply be guaranteed with close to 100% probability. In advanced industrialized countries, even short-term black outs can have disastrous effects as was shown by black-outs in North America in 2003 and in Italy in early 2004.

Liberalization of electricity markets has been considered in many OECD countries and in some other countries as well. In the case of the EU, liberalization and economic integration – the creation of a single electricity market – go hand in hand so that both pricing issues and safety of supply naturally have an international dimension. Since the electricity sector is very capital intensive, firms emphasize the need for long run planning. At the same time, liberalization often goes along with privatisation which means that formerly state-owned electricity firms become subject to short term pressure from stock markets. In some cases, this leads to fraudulent management behaviour as in the case of Enron in the US in the late 1990s.

Taking a more long term view seems to have become a wide-spread concern among politicians who often emphasize sustainability. However, while this development sounds like the beginning of a new political culture there are some indications suggesting that sustainability is largely a buzz word, that is the decision horizon of politicians has not become more long term in the late 20th century, rather it is getting biased more towards the short term. We will pick this issue up in the final section of our analysis when we look at policy implications.

The EU progressively liberalized electricity markets after 1999; indeed, at face value by the end of 2003, a single electricity market had been established. This represents remarkable progress, since electricity is not only an input into nearly all products and services but is also a politically sensitive area:

- First, it was a monopoly market in many EU countries for decades.
- Secondly, there are universal service obligations which require the electricity sector to provide access to the network and sell power to any user in the respective country wishing access as well as power.
- Thirdly, electricity is an important element of the energy sector which is largely responsible – together with manufacturing industry and transportation – for both CO_2 emissions and the global warming problem.

Electricity generation, transmission and distribution are capital intensive so that investment decisions are facilitated by a stable long term policy framework. Due to the pending Kyoto Protocol, there is no clear long term framework at a global scale. The EU, however, has decided that CO_2 emission trading will be adopted which will concern all industries and the energy sector. Since the price range of CO_2 emissions traded will not be clear before trading starts in 2005 there is some uncertainty from the side of emission trading. Such uncertainty is, however, to some extent a normal part of entrepreneurial life; facing risky environments in decision-making is a natural element of electricity markets after phasing-in liberalization in the EU. As regards renewable energy sources, the Community wants to increase the percentage of renewable energy in the total energy supply to 12% by 2010 which amounts to a doubling in one decade.

In a technical sense, liberalization means on the one hand freedom of investment and free market entry, while on the other it signifies freedom of choice on the side of electricity users.

The electricity market consists of three layers:

- Electricity generation
- Electricity transmission (high voltage grid)
- Electricity distribution to firms and households

In some countries, there are vertically integrated markets with EDF in France serving as an extreme example; moreover, it is a state-owned company which – assuming that good political connections are helpful for the company – is even less exposed to potential and actual competition. The UK and Poland are counter-examples since both countries have separate grid companies. Germany is in an interim position since it has several major regional electricity companies which are both electricity producers and owners of the regional transmission network. The grid serves as an essential facility since it stands between power generation and the use of electricity. Hence access to this grid is crucial for competition; if there is competitive pricing of the grid, electricity prices will be relatively high while profits for firms owning the grid will be supernormal, which in turn encourages X-inefficiency (employment of more labor and capital than is really necessary) and distorts foreign markets. Firms with high profits will have an advantage in acquiring foreign firms, yet it is not clear that the relatively most efficient and innovative firms will expand internationally. Weak competition in the electricity sector could also undermine static and dynamic competition in the generator equipment industry which might contribute to a lower rate of technological progress and hence lower growth. Hence lack of competition in one EU country implies:

- price distortions in the home market
- distorted structural change as sectors using electricity strongly will gradually be relocated to foreign countries with lower electricity prices
- distort competition abroad since foreign direct investment is distorted.
- weaken Schumpeterian competition in the generator equipment industry.

Weak competition in energy markets implies relatively high prices and a low rate of innovation, including service innovations associated with the provision of electricity (e.g. benchmarking of electricity efficiency in the case of a multi-plant firm). Lack of innovation in turn undermines the goal of improving energy efficiency in the EU. From this perspective, more competition in the EU is crucial where particular emphasis must be put on vertical integration and discrimination of firms seeking access to transmission networks. The following analysis looks at key developments in electricity liberalization in selected EU countries – including the upstream gas market (section 2). In section 3, we draw some conclusions for further consideration.

2. EU Single Electricity Market

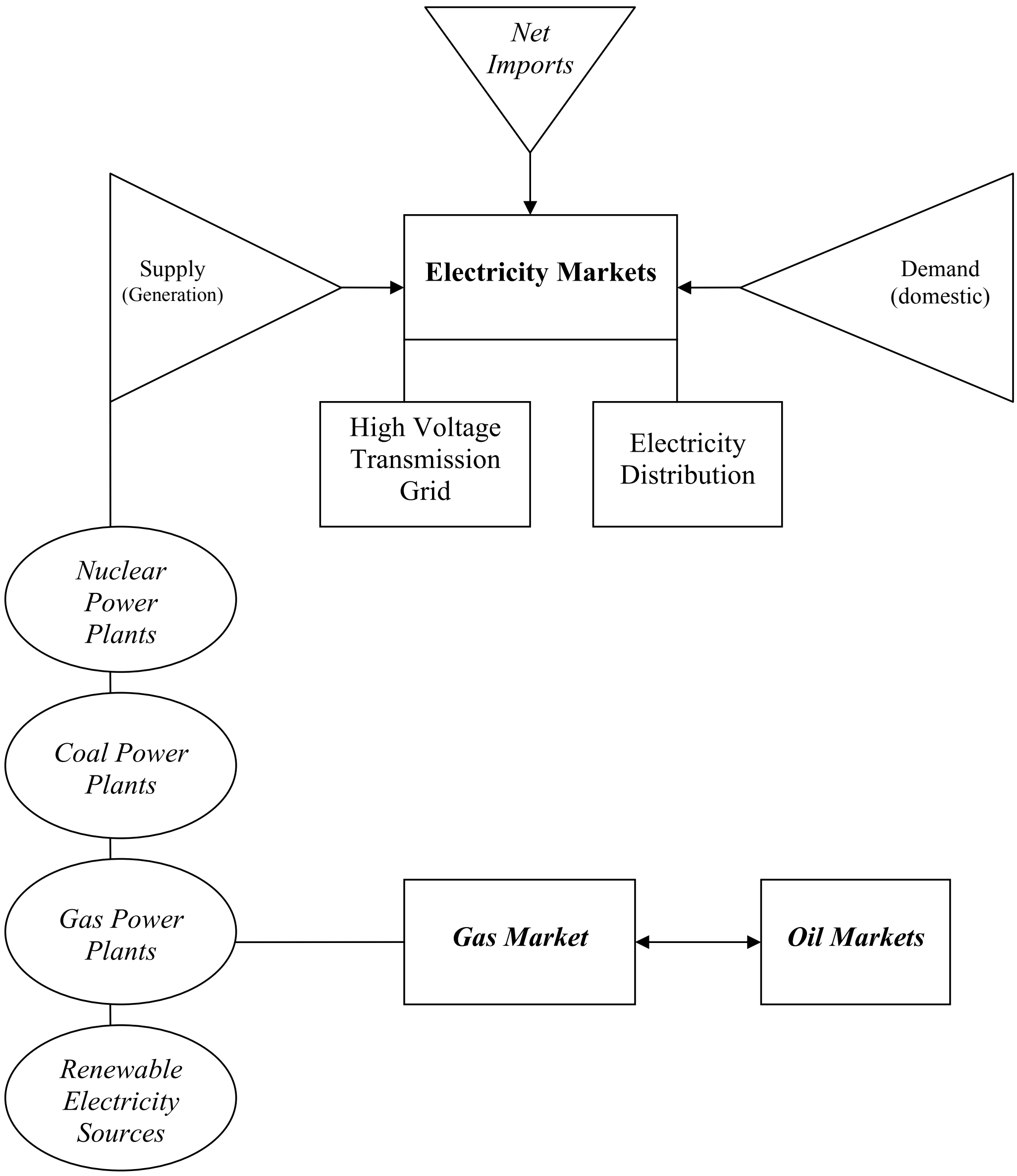
The EU monitors competition in the single market (EUROPEAN COMMISSION, 2001) and has developed a broad set of indicators. As a basic approach for the indicator framework developed, the electricity market is divided into two sub-areas:

- competitive market areas where focus is on competition in power generation, the role of wholesale markets and competition in customer supply;
- non-competitive market areas where the focus is on network access conditions, interconnection of national network and regulatory influence.

This methodology is somewhat doubtful as it does not consider key aspects of upstream links (e.g., mergers of electricity and gas companies or mergers between coal and electricity companies) and downstream links. Moreover, EU monitoring so far does not consider whether large electricity firms are quoted on the stock market and thus subject to the discipline of the stock market. One also might consider to which extent there is state ownership in the electricity sector. State ownership certainly will undermine non-discriminatory regulatory policies as close ties between the ministry of finance – responsible for state-owned firms – and the ministry responsible for organizing regulatory policies raise doubts about any promise of non-discriminatory regulation.

Energy markets are interdependent. The oil market, shaped by the OPEC cartel with its market power, dominates the gas market which in turn strongly influences electricity prices, not in the least in spot markets as gas powered electricity generation is relatively flexible in its response to changes in demand. In a more general sense, liberalization of the electricity market should not be analysed in an isolated way since upstream markets – e.g., the gas market (with gas being an input factor in gas-powered generators) and the renewables market – are not fully liberalized or are distorted by external effects. Figure 1 shows some interdependencies which play a role for competition as well as for merger control.

Fig. 1: Interdependencies in the Electricity and Energy Markets

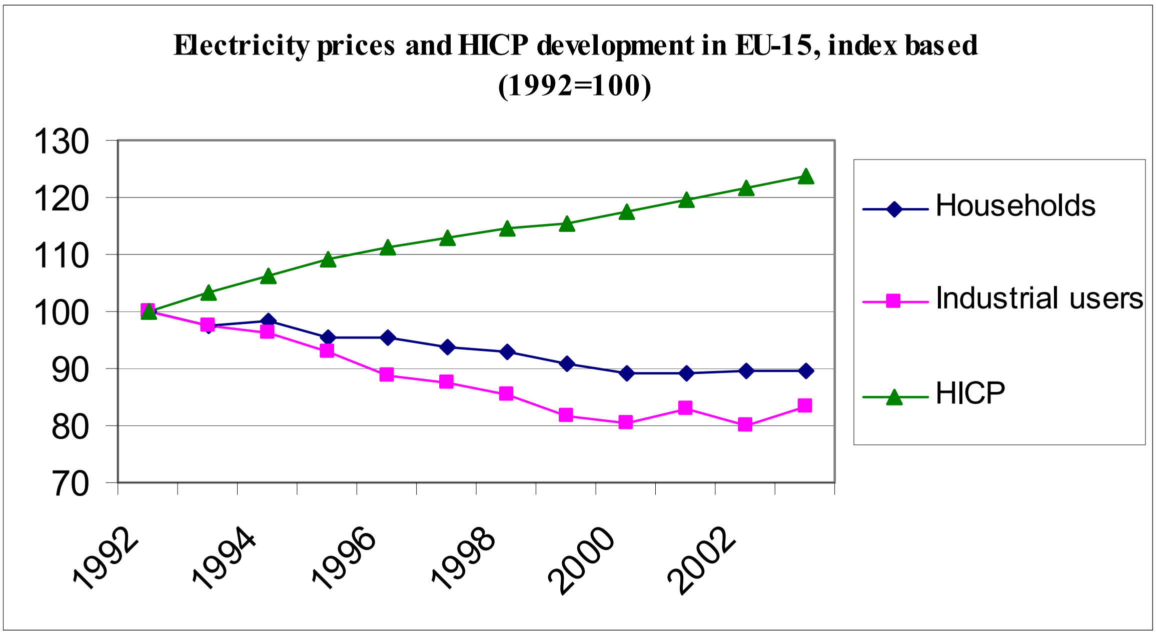


2.1. The Dynamics of Liberalization

As of 1999, the EU has phased in competition in electricity. Generation has been liberalized in a phasing-in approach. Starting in February 1999, any producer will be able to build new power generation capacities anywhere in the Community. Member countries are allowed to apply a tendering approach or an authorisation system, through which new plants can be built and operated under the widely applied latter system if they comply with the planning and energy supply criteria for authorisation defined by the respective member country.

The lack of competition in electricity is clearly visible in large price differentials across the 25 EU countries. Under competition, prices across countries would reflect transportation costs and potentially user preferences with respect to the energy mix underlying the generation of electricity. Private households (consumers of 3300 kWh) faced net prices prior to liberalization of between roughly 6 cents per kWh in Greece, Denmark and Sweden versus 12.31 in Germany, 12.45 in Portugal and 16.54 in Italy in 1997. Industrial consumers – with consumption of 50 GWh – faced prices in the range of roughly 3 cent in Finland and Sweden and 4 cents in Denmark, Greece and France, while the highest prices were in the UK, Austria and Germany at about 6 cents (EUROPEAN COMMISSION, 2004). Taking 1996 as the starting point in our price analysis, we can see that the relative price of electricity for both industrial users and private households fell in the period from 1996 to 2003 in EU-15. Relative to 1996, the price index for industrial users fell more strongly in certain time periods than for households.

Fig. 2: Electricity Price Index for Industrial Users, Private Households and the Harmonized Index of Consumer Prices for EU-15[1]



EUROSTAT, own calculations

EU accession countries will become active members of the EU single energy market in 2004. On December 19, 1996, the EU countries adopted Community Directive 96/92/EC which, will – within a phasing-in approach – allow for large and (also later) medium sized purchasers of electricity to choose freely among suppliers in the EU. The directive sets a framework of minimum electricity market regulation and allows member countries to have some degree of manoeuvrability. Under the directive there is a gradual liberalization scheme, namely 26% of national electricity demand must be liberalized by 19 February 1999. Moreover, consumers of more than 100 GWh p.a. must be permitted to choose from among suppliers. 28% of national electricity demand must be liberalized by February 19,

[1] "Electricity prices: households: This indicator presents electricity prices charged to final domestic consumers, which are defined as follows: annual consumption of 3500 kWh among which 1300 kWh overnight (standard dwelling of 90m²).
Electricity prices: industrial users: This indicator presents electricity prices charged to final industrial consumers, which are defined as follows: annual consumption of 2000 MWh, maximum demand of 500kW and annual load of 4000 hours.
Prices are given in Euro (without taxes) per kWh corresponding to prices applicable on 1st January each year."

2000, and 33% of demand by February 19, 2003. Ireland, Greece and Belgium obtained some extra transition time.

Most critical is the access to the electricity networks since a firm from city/region A which wants to buy electricity – and the respective services (e.g., a half-hour monitoring of all electricity user sites of a multi-plant firm) – from a generator in region or country C can get the electricity only if it can be transported over the grid. Access to the grid network by any other than the owner of the grid – so-called third party access (TPA) – is crucial for the effectiveness of the liberalization network. At the same time, it is absolutely clear that integrated producers which produce electricity in a region and own the respective grid have no interest in facilitating competition. The higher the grid user price is set, the weaker the competition.

EU liberalization should formerly put an end to national and regional monopolies which could help in recovering all kinds of costs under the heading of state-regulated electricity tariffs. One therefore should ideally expect three effects:

- one-off fall of prices as a consequence of the regime switch from monopoly prices to competitive prices;
- elimination of X-inefficiencies (i.e., static efficiency criteria will be met);
- stimulation of process and product innovations in the electricity sector; product innovations could particularly refer to providing an individually desired energy input mix for electricity generation and all kinds of services with a focus on optimal electricity management.

Norway and Switzerland also have access to the EU electricity market – namely under WTO membership. If Russia should join the WTO, it would also obtain full access to the electricity market in EU-25. Post-socialist transition countries which even a decade after transition energy showed intensities five to seven times higher than the average for the Euro zone countries can to some extent be considered natural electricity exporters in the medium term. Once further restructuring and modernization has brought energy intensity close to the figure of Western Europe, there should also be excess capacity in electricity generation in eastern Europe and Russia as well as in the Ukraine and Belarus. There is, however, a crucial distinction between EU accession countries from Eastern Europe and Russia. Electricity generators from accession countries will gain access to Western Europe's power grid under the single market framework while Russia (and other CIS countries) will not. In the context of EU eastern enlargement, not only could occur a trade diversion in goods and (traditional) services occur, but also with respect to Russia's electricity exports to eastern Europe as well.

Fig. 3: Energy Intensities in Selected Countries, 2001[2]

EU-15	**194**	**Accession Countries**	**766**
Finland	263	Estonia	1361
Greece	261	Lithuania	1321
Portugal	238	Slovakia	1017
Sweden	229	Czech Republic	940
Belgium	228	Latvia	901
Spain	227*	Poland	643
United Kingdom	225	Hungary	584
Netherlands	201*	Slovenia	341
Luxembourg	191	Cyprus	282
France	189	Malta	269
Italy	188*		
Germany	168*	**Other countries**	
Ireland	161	Bulgaria	1885
Austria	146	Romania	1164
Belgium	125	Turkey	503
		Iceland	478
		USA	330
		Norway	197
		Japan	119

* estimations

EUROSTAT, own calculations

With respect to EU-25, the respective market share of the largest electricity generator was below 40% only in Denmark, Germany, Austria, Finland, UK, Hungary and Poland in 2001. However, in Germany the existence of powerful regional firms – namely vertically integrated companies – implies that competition in Germany is also not very strong.

[2] "This indicator is the ratio between the gross inland consumption of energy and the gross domestic product (GDP) for a given calendar year. It measures the energy consumption of an economy and its overall energy efficiency. The gross inland consumption of energy is calculated as the sum of the gross inland consumption of five energy types : coal, electricity, oil, natural gas and renewable energy sources. The GDP figures are taken at constant prices to avoid the impact of the inflation, base year 1995 (ESA95). The energy intensity ratio is determined by dividing the gross inland consumption by the GDP. Since gross inland consumption is measured in kgoe (kilogram of oil equivalent) and GDP in 1000 EUR, this ratio is measured in kgoe per 1000 EUR."

Tab. 1: Market Share of the Largest Generators in the Electricity Market, 2001

	Company	Capacity (in MW)	Market share	Generation (in TWh)	Market share
1	EDF (FRA,UK,GER)	115.460	24,77	536	25,32
2	ENEL (ITA)	56.348	12,09	182	8,60
3	Vattenfall (SWE,GER)	33.963	7,29	180	8,50
4	RWE (GER,UK)	40.339	8,65	179	8,46
5	E.ON (GER,UK)	42.231	9,06	171	8,08
6	Endesa (ITA,SPA)	26.089	5,60	129	6,09
7	Electrabel (BEL,NL)	23.945	5,14	106	5,01
8	British Energy (UK)	11.528	2,47	68	3,21
9	Iberdrola (SPA)	16.088	3,45	58	2,74
10	Statkraft (NOR)	8.700	1,87	58	2,74
11	TXU Europe (UK)	7.746	1,66	50	2,36
12	DEI (GRE)	11.121	2,39	48	2,27
13	Scottish & Southern (UK)	7.036	1,51	45	2,13
14	Fortum (FIN)	5.800	1,24	41	1,94
15	Edison Mission (UK)	6.363	1,37	40	1,89
	TOTAL 15	412.757	88,56	1.891	89,32
	TOTAL 25	466.091		2.117	

PWC (2002), own calculations

Access to the Electricity Grid and Unbundling

There are three ways for access to the grid within EU context:

- regulated third party access
- negotiated third party access (access is based on tariffs fixed by authorities; tariffs are published and known to companies interested in investment in generation)
- single buyer model

Most countries apply regulated third party access. Only Greece and Germany use negotiated third party access.

As transmission networks are typically part of vertically integrated companies, the Directive requires that EU Member States adopt three measures:

- Management unbundling of the transmission system operator
- Accounting separation of transmission and distribution activities
- Prevention that confidential information is leaked to other parts of the firm.

The alternative to such unbundling is to establish an independent transmission company as is the case in the UK and Poland. At the bottom line, three aspects define the nature of efficient access to a transmission network be it electricity or gas:

- non-discriminatory access;
- price of access – very high access prices can amount to an implicit discrimination;
- freedom to build new private network elements

Non-discriminatory access is rather unlikely as long as there is a fully integrated competitor. The price of access ideally should reflect long run marginal costs, but high fixed costs in the energy sector always make assignment of fixed costs a field of manipulations.

2.2. Electricity Market Liberalization in Scandinavia

After the first European electricity markets began their liberalization processes in the end of the 1980s/early 1990s (namely England and Wales), Norway started as the first Scandinavian country to open its electricity market to competition, also in 1990. Year by year the other Scandinavian countries started to set market power elements in this market with the exception of Iceland. This section gives a brief overview of the most important steps in the liberalization processes of each country and shows which 'Nordic' elements are working nowadays to help unify the single markets to a common single market with strengthening market elements. By means of a quite up-to-date look at the Scandinavian countries (Iceland will be neglected), progress of the processes and their impacts on the market participants will be examined, and in the end it will be shown that some differences in the development of each market can be observed.

Norway

Norway was the first Scandinavian country to begin liberalization of the electricity market through the establishment of the Norwegian Energy Act in 1990, which came into force in January 1991. The main objectives of the energy act were economic efficiency, security of supply and national equalisation of electricity prices.

In 2001, about 178 companies have been engaged in grid management and operations. Each grid company may own a local, regional or central grid. 42 of them are solely grid operators, while the other 136 companies are generating and/or trading electricity. The state owns 87 % of the central transmission grid, through Statnett SF, which is also the operator of the entire central grid. The regional and local grids are owned by municipalities and the counties. Statnett is also the Norwegian transmission system operator and therefore co-ordinates the operation of the entire Norwegian power supply system. It is also responsible for the Norwegian balance system since the relations between electricity production and consumption rates differ from region to region quite enormously.

Norwegian electricity generation is largely hydropower (99%) while a small remainder is generated by wind power plants. The state-owned Statkraft is the largest producer with a market share of about 40% of all hydro power plants in 2001. Although ten large companies dominate the nuclear power plant market, Statkraft is also the dominant player in this market as well with a share of nearly 66% through its indirect ownership in several companies – in 7 of these 10 companies, Statkraft has the controlling position and is the operator (NCA 2002, 25-28). In 2001, Statkraft's market share totalled approximately 37. (NCA 2002, 48)

Sweden

Sweden started the liberalization reform in 1996 with electricity prices being fully liberalized in November 1999. Only the national grid is still a regulated monopoly. The Swedish Energy Agency is responsible for efficiency, reasonable prices and for a non-stifling sales behaviour of grid companies. These grids are owned by approximately 200 network companies. Svenska Kraftnät applies a spot tariff on the national grid which means that all customers who are connected to the grid have access to the entire electricity market and hence can choose the supplier. Svenska Kraftnät is also responsible for the state-owned central transmission network as well as for maintaining the balance between production and consumption in all parts of the country.

The Swedish electricity market is dominated by six companies[3] (Vattenfall, Sydkraft, Birka Energi, Fortum Kraft, Skellefteå Kraft and Graninge) which together have a market share of approximately 93 % (in 2001). The 11 nuclear power plants are owned by Vattenfall, Sydkraft (these two companies are again dominating the market), Mellansvensk Kraftgrupp and Fortum. During the whole liberalization process lots of mergers could be observed, mainly due to purchases of smaller companies by larger ones.

Concerning the electricity production, Vattenfall was the biggest producer in 2001 with a market share of 47 %, followed by Sydkraft (20 %) and Fortum (17 %). (NCA 2002, 51)

Finland

A comparable Finnish Electricity Market Act came into force in 1995, but a full opening to all Finnish electricity users first took place in November 1998. Electricity generation is based on hydropower, nuclear power and mainly on conventional thermal power (mainly bio fuels, coal, natural gas and peak as well as fuel oil). Finland is dependent on imports from its neighbouring countries since consumption is higher than production.

In Finland about 120 companies and about 4000 power stations are competing, but the major players are Fortum and PVO/TVO with a joint market share of about 65%. Fingrid owns the national grid and is responsible for the whole national system and for international relations. There are more than 30 balance provider companies. Finland has two nuclear power stations and four (in the near future five) nuclear power reactors. (NCA 2002, 29, 45)

The five major producing companies and their market shares (altogether about 80 %) are:

1. Fortum (33 %)
2. Teollisuuden Voima (TVO) (21 %)
3. Pohjolan Voima (PVO) (11 %)
4. Helsingin Energia (8 %)
5. Kemijoki (6 %)

Denmark

In 1999, Denmark started its liberalization process gradually as the last of the four relevant Scandinavian countries, but since January 2003 consumers are able to choose their electricity suppliers freely. The Danish Energy Regulatory Authority (DERA) has supported these processes since January 2000.

The Danish electricity market is divided into two separate markets – Denmark West and Denmark East – which are not interconnected; interconnections exist merely between them and Germany, Norway and Sweden. There are only two, non-interconnected

[3] Meanwhile Fortum has bought Birka Energi.

transmission system operators[4] (Eltra and Elkraft) and about 100 grid companies – which are owned by the customers or the municipalities – that have small shares in one of the two TSOs. None of them has a big influence in any TSO. The Danish market consists of three generators, but only two of them (Elsam A/S in Denmark West and Energi E2 A/S in Denmark East) have emerged as the dominant forces in the market now and in the future through mergers of lots of existing companies before the Danish Competition Act in 2000 (total installed capacity of Elsam is 7000 MW and of Energi E2 is 5500 MW).

The Danish thermal production, which comprised 87% of the total Danish electricity generation in 2002, is mainly based on coal and gas. The rest of the whole electricity generation is based on other renewable power. As Denmark produces more electricity than it consumes and there is a lack of production capacity in Norway and Sweden, the necessity of Danish export becomes more and more important. (NCA 2002, 20-22)

Common Nordic institutions

The Nordic Working group is a common working group consisting of the competition authorities of the five Scandinavian countries (Norway, Sweden, Finland, Denmark and Iceland) which came into force in the beginning of the 1990s. The first European electricity markets started to introduce market power (competition) elements which implicated the integration of national markets. As the Icelandic electricity market is currently a non-liberalized market, this market will not be considered in this section. Since the national markets are regulated by national competition authorities and the four Scandinavian countries have access to a common wholesale power market, a common working group was established in September 2002 with the following tasks and competencies:

- "to identify common Nordic competition issues in the market for electricity power,
- to consider actions to handle obstacles to competition,
- to consider suggestions to amend regulations in order to improve competition,
- to suggest co-operation solutions to improve the effectiveness of competition law enforcement",
- to consider obstacles to competition as a consequence of the integration of actors between different levels of the power market. (NCA 2002, 4)

Nord Pool, the Nordic Power Exchange, was established in 1996 when the Norwegian company, Statnett Marked AS, started a cooperation with the Swedish electricity market and became the first multinational power exchange in the world (Nord Pool ASA). Finland joined the spot market area in 1998, Denmark West in 1999 and Denmark East in 2000.

The spot market for physical contracts and next-day-deliveries (day-ahead-auction) are traded on the Elspot market; the largest players are Norway and Sweden (NORD POOL, 2002, 5 and NORDIC COMPETITION AUTHORITIES, 2003, 7): "Elspot is a market place where electricity and capacity is combined into one simultaneous auction and in cases of bottlenecks different area prices are established". Nord Pool also has a financial derivatives market where futures and option contracts are traded, and as it additionally offers clearing services for contracts traded in OTC bilateral contracts. Besides Elspot being traded on the Elbas (power adjustment) market, physical contracts are also traded but

[4] This situation may change in 2004 with an interconnection between Eltra and Elkraft System planned. The stations are Storebælt and The Great Belt. The transmission capacity will be 300 MW. (NORDEL 2001, 51).

exclusively between Swedish and Finnish market participants. "Due to the lengthy time span of up to 36 hours between Elspot price-fixing and delivery, participants need market access in the intervening hours to improve their balance of physical contracts."

The significance of Elspot has been increasing continuously since turnovers have been rising steadily. The following graph underlines that. In 2002, physical contracts with a volume of 123.6 TWh have been traded on Elspot, which is about one-third of the whole electricity generation/consumption in the Nordic countries. The country shares are: Norway 44.7%, Sweden 30.1%, Finland 12.0% and Denmark 13.2%. The trading volume on the Elbas market was only 0.8 TWh in 2002.

On the financial market, the volume of the traded financial contracts in 2002 was 1019 TWh (which represents 33.8% of the total volume of all financial power contracts). The value was NOK 180 million (≈ EUR 23 mill.). 54.1% of the contracts were futures contracts, 40.1% forward contracts and 0.7% options contracts (NORD POOL 2002, 27).

Fig. 4: Elspot Turnover 1993-2002, weekly traded volumes

NORD POOL (2002, 27)

Nordel is an organization of the transmission system operators (TSOs) of the Nordic countries (Denmark, Finland, Norway and Sweden) and is responsible for the development of an efficiently working Nordic electricity market. For that purpose, the cooperation between those TSOs and the most important market players is a key point which must be better understood. The five TSOs are: Statnett (Norway), Svenska Kraftnät (Sweden), Fingrid (Finland), Eltra and Elkraft System (Denmark). Nordel shall:

- act as one Nordic TSO and be the basis for a harmonised Nordic electricity market
- be in the front rank in the development of the Nordic electricity market
- be a strong force in the development of the European electricity market
- have the ability to react quickly to challenges, make decisions and have a shared commitment to implementing them." (NORDEL 2002, 3)

Now some figures about the Scandinavian electricity market should give some impression of which countries are producing what kind of power and which countries are dependent on imports or exports of electricity power.

Tab. 2: Key figures of the Scandinavian electricity market, 2002

		Nordel	Norway	Sweden	Finland	Denmark	Iceland
Population	mill	24,3	4,5	8,9	5,2	5,4	0,3
Total consumption	TWh	397,1	120,9	148,7	83,9	35,2	8,4
Maximum load	GW	59,2	17,3	23,3	11,6	6,1	1,0
Electricity generation	TWh	391,6	130,6	143,4	71,9	37,3	8,4
Generation surplus	TWh	-5,5	9,7	-5,3	-12,0	1,9	0,0
Generation surplus	%	-1,4	7,4	-3,7	-16,7	5,1	0,0
Structural Breakdown of Electricity Generation:							
Hydropower	%	55	99	46	15	0	83
Nuclear Power	%	22	0	46	30	0	0
Other thermal power	%	21	1	8	55	87	0
Other renewable power	%	2	0	0	0	13	17

NORDEL (2002, 3), own calculations

This statistics show that Norway and Denmark are interested in boosting electricity exports while Finland and Sweden are dependent on imports of electricity. It is also remarkable that Norway's electricity generation is totally based on hydropower (the same for Iceland) while Denmark's is mainly based on gas and coal. The electricity generation in Sweden and Finland is distributed in more types of power.

Market concentration

Fig. 5: The 15 largest electricity producers of the Nordic market (2001)

1. Vattenfall	(19 %)
2. Fortum	(16 %)
3. Statkraft	(12 %)
4. Sydkraft	(8 %)
5. Teollisuuden Voima (TVO)	(4 %)
6. Elsam	(4 %)
7. Energi E2	(3 %)
8. E-CO	(3 %)
9. Norsk Hydro	(3 %)
10. Pohjolan Voima (PVO)	(2 %)
11. BKK	(2 %)
12. Agder Energi	(2 %)
13. Lyse Energi	(2 %)
14. Helsingin Energi	(1 %)
15. Vannkraft Øst	(1 %)

These 15 companies produce about 81% of the total produced electricity in Scandinavia. (NCA 2002, 42) It is interesting to see that only three companies have a market share higher than 10 % but lower than 20 %. (Vattenfall, has a market share of 19 %). The market share of Fortum is very high since there is a high activity both on the Swedish and the Finnish market. All in all, the Swedish companies have the leading position of all electricity companies.

The NCA uses the Herfindahl-Hirschman-Index (HHI) to measure the concentration of the Nordic electricity market. The results are:

Tab. 3: The electricity markets concentration (2002)

	HHI	HHI*
Norway	1634	2735
Sweden	2893	2988
Finland	1766	3005
Denmark	4844	4844
The Nordic Market	892	1138

NCA (2002, 36 ff.)

HHI* includes the full effects of cross-ownerships. The scope is from 0 (an atomistic market) to 10000 (monopoly). “The US merger guidelines[5] stipulates an a priori assumption that markets with a HHI below 1000 is unconcentrated, a HHI between 1000 and 1800 is moderately concentrated, and a HHI above 1800 highly concentrated” (NCA 2002, 36). Together with the above shown tables and figures it can be stated that under the real conditions, each of the four markets is highly concentrated[6], while the whole Nordic market can be regarded as moderately concentrated.

International electricity trade

Tab. 4: Exchange of electricity 2002 – GWh

From\To	Norway	Sweden	Finland	Denmark	Other countries*	Σ From
Norway	-	11974 (79,8%)	146 (1,0%)	2883 (19,2%)	0	15003
Sweden	2769 (18,8%)	-	6492 (44,0%)	3510 (23,8%)	1979 (13,4%)	14750
Finland	162 (6,1%)	2492 (93,9%)	-	0	0	2654
Denmark	2176 (19,6%)	4094 (36,9%)	0	-	4832 (43,5%)	11102
Other countries*	223 (1,8%)	1548 (12,5%)	7939 (64,2%)	2654 (21,5%)	-	12364
Σ To	5330	20108	14577	9047	6811	55873
Total to	5330	20108	14577	9047		49062
Total from	15003	14750	2654	11102		43509
Net imports	-9673	5358	11923	-2055		5553
Net imports/total consumption	-8,0 %	3,6 %	14,2 %	- 5,8 %		1,4 %

* Russia, Germany and Poland

NORDEL (2002, 40), own calculations

Although multinational companies have become the electricity market participants more and more during the last ten years, the trade of the physical products has reached its international dimension much earlier. The following table shows the import/export

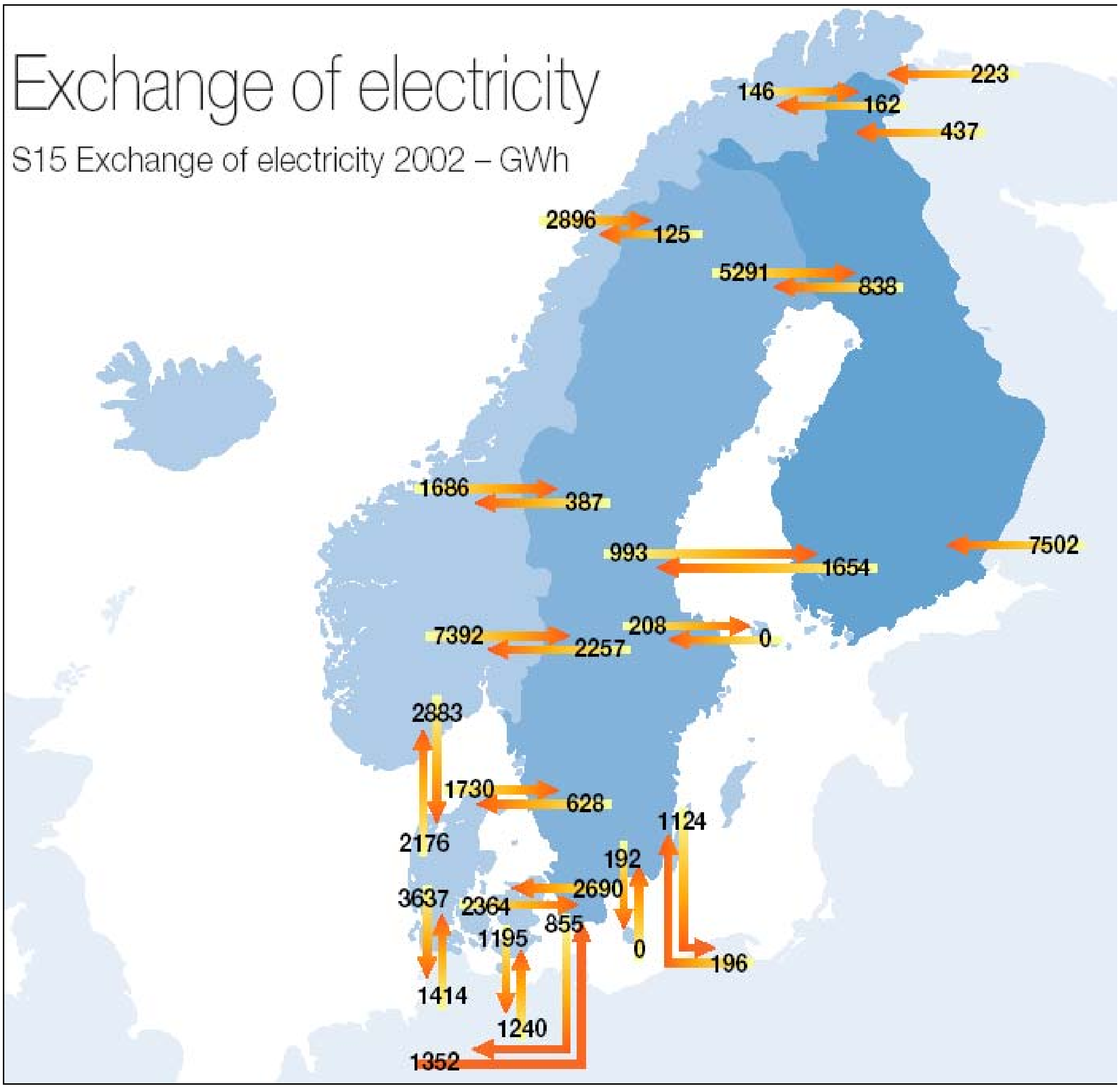
[5] The US Department of Justice and Federal Trade Commission (1992).

[6] Also in the NCA (2002) report, in each case in section 3 the fifteen largest electricity companies and their common market share totals at least 88%.

relations of electricity products among the Nordic countries and it gives a first impression of the European trading relationships. It is obvious that Sweden has a high total turnover since it is located in the middle of all Nordic countries. Finland is highly dependent on imports from Russia which is also reflected in the table.

The following figure gives a visual impression of those international trade relationships.

Fig. 6: Exchange of electricity in 2002



NORDEL (2002, 40)

A look at the international grid systems and at the interconnections must not be neglected.

Fig. 7: Existing Interconnections among the Nordel countries and others

	Norway	Sweden	Finland	Denmark	Germany	Russia	Poland
Norway	-	9	1	1	0	1	0
Sweden		-	5	6	1	0	1
Finland			-	0	0	4	0
Denmark				(1)*	5	0	0

(NORDEL 2002, 34), own calculation
* see footnote 4

The transit problem

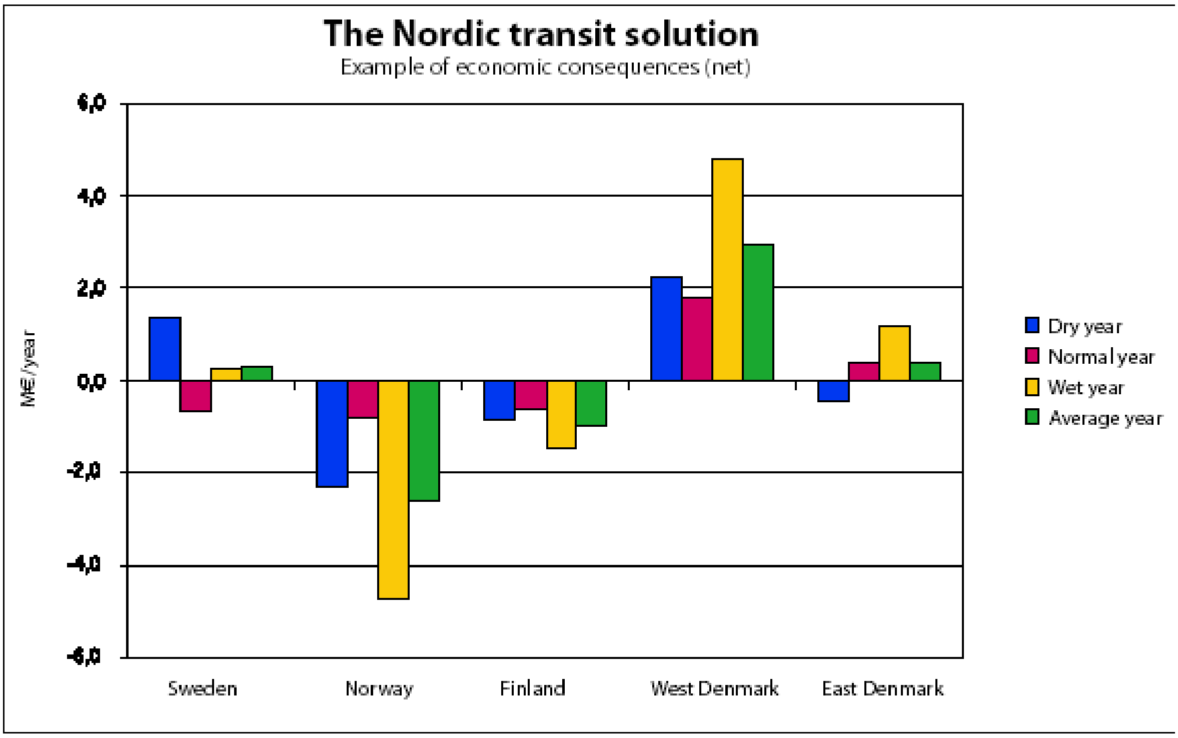
Since March 2002, all cross-border tariffs among all Nordic electricity market participants have been removed (the last agreement which was dissolved was that between Sweden and Denmark).[7] "With the removal of cross-border tariffs, the TSOs are faced with the important challenge of establishing a system for transit compensation which will help make the market more efficient than with a system of cross-border tariffs." In that sense, the transit problem has to be solved.

Transit means that electric power is transferred through an area where it is neither produced nor consumed there. For instance, if Norway – which also has agreements with Germany but no direct interconnection between those countries – transmits power to Germany, it passes through Danish lines. This transit problem causes costs for the transmission system operators. Cross-border and special transit tariffs are now, due to EU Directives and regulations, no longer allowed.

Each TSO has to pay into a transit fund. The differences between compensation (receipts) and payment (based on the TSO's gross exports and their net exchanges per hour), the net compensation will be redistributed among all TSO's which means that the sum of all net compensations has to be zero. The next figure shows to which extent the Nordic members are influenced in order to get or pay compensations due to transit.

[7] All three Scandinavian EU countries are declared fully opened by the EU Commission (Finland since 1997, Sweden since 1998 and Denmark since 2003). (IEA 2003b, 71)

Fig. 8: Compensation for grid losses (2002), negative values mean payment



NORDEL (2001, 40)

Price Developments

Generally, prices for electricity vary between customer categories and between urban and rural areas. The final price of electricity consists of the price for the energy, of a network tariff and of taxes (VAT and energy taxes). In the first year of the liberalization (1996), the spot price rose by the end of the year. The impacts of the increasing competition lowered the prices by the year 2000, but in 2001 the prices rose again. Although they fell again slightly in 2002, the price level remained higher compared to previous years. (NEA 2002, 12)

Since the system price[8] for electricity is highly dependent on variations in hydro power generation, it is reasonable to assume that a high availability of hydro power in the years from 1997 to 2001 led to lower prices than were seen during years of shortage problems in 2002 and 2003. The high price level in December 2002 reflected pessimistic expectations of further possible scarcities. The price level for network charges remained almost unchanged between 1997 and 2002, but tax levels were been increased continuously. This led to higher total costs for end consumers as will be shown in the following tables and graphs. (SEA, 4,5).

[8] The energy price is about 40%, the price for network charges 20% and the taxes 40% of the whole final price for energy.

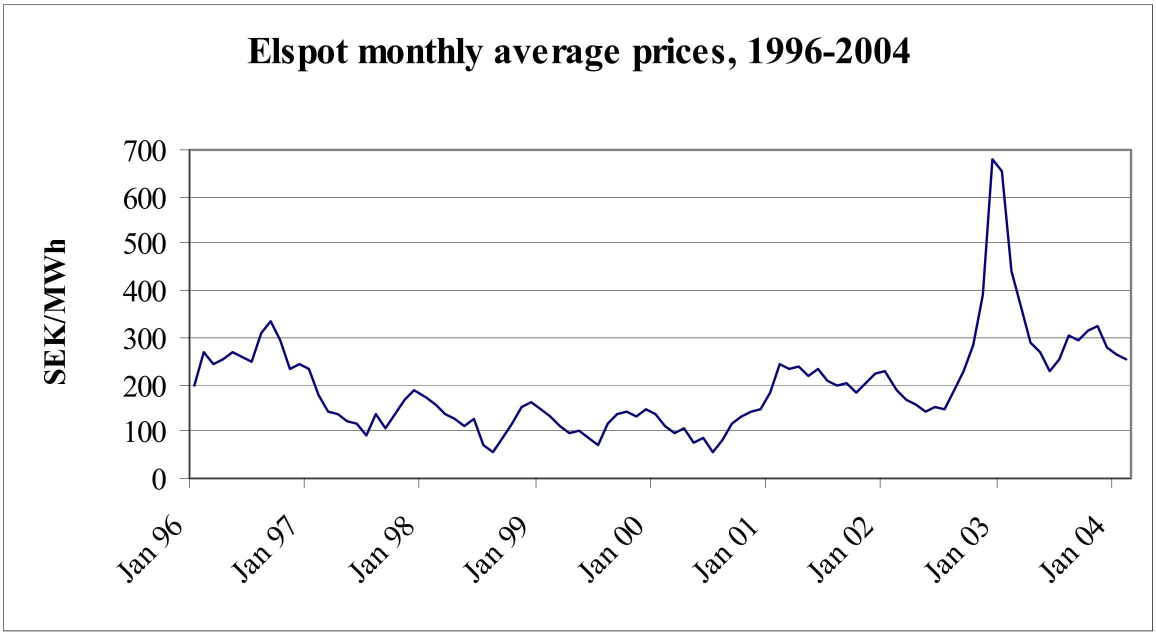
Tab. 5: Developments in prices of electrical energy*, between 1997 and 2003, medium values, Swedish öre/kWh

	Jan 97	Jan 98	Jan 99	Jan 00	Jan 01	Jan 02	Jan 03
Apartment	29,2	29,0	27,1	25,8	27,0	35,6	51,9
Commercial operations	25,8	24,5	23,3	21,0	22,1	28,8	43,6
Small industrial plant	25,6	24,1	22,8	20,4	22,0	28,5	44,3
Medium-sized industrial plant	24,4	23,1	21,6	19,6	21,7	28,3	44,8
Electricity-intensive industrial plant	23,7	22,7	22,5	19,7	22,6	28,3	48,0
Average	25,7	24,7	23,5	21,3	23,1	29,9	46,5

SEA (2003, 9), own calculations
* excluding taxes and network tariffs, to different customer categories

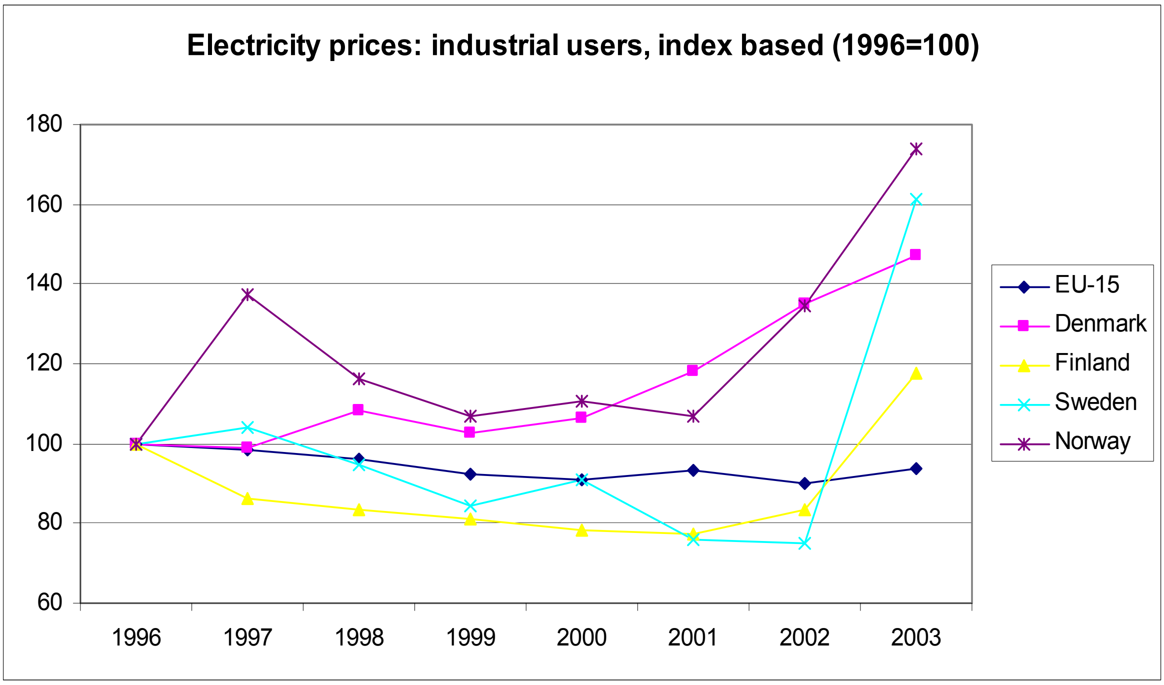
This development of Swedish prices is quite comparable to the price level on Nord Pool (Elspot) in the same period.

Fig. 9: Elspot monthly average prices, 1996-2004



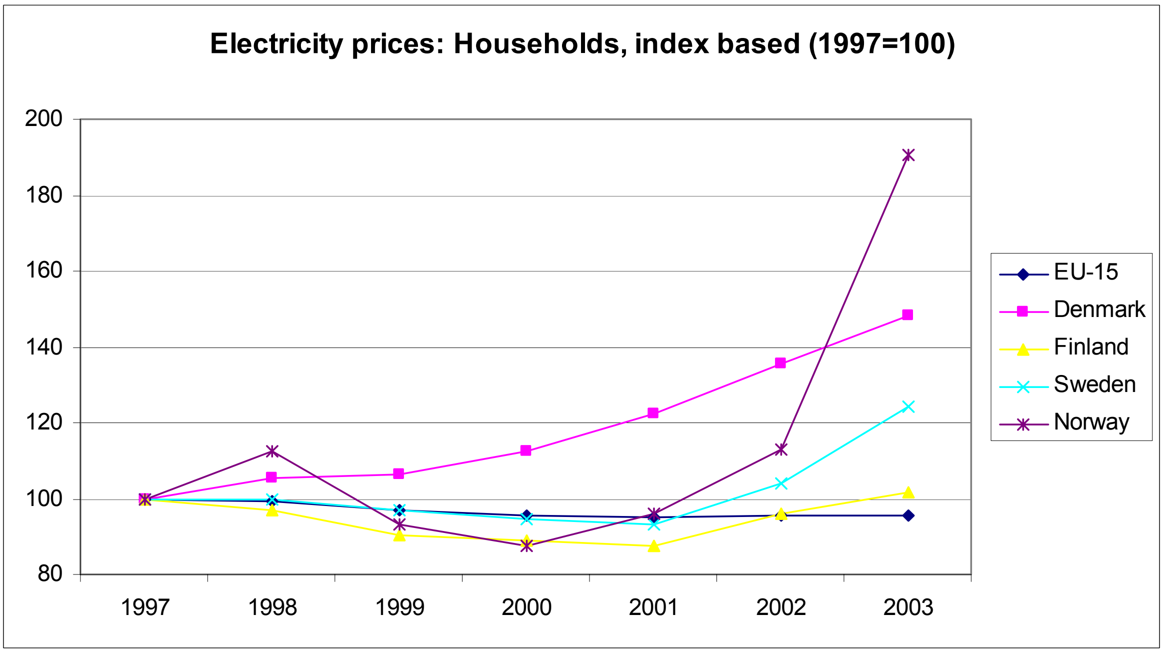
NORD POOL (2004)

Fig. 10: Electricity Price Dynamics: Industrial Users



EUROSTAT, own calculations, see footnote 1

Fig. 11: Electricity Price Dynamics: Households



EUROSTAT, own calculations, see footnote 1

2.3. Problems and Prospects of Liberalization in Germany and Austria

Austria fully liberalized its electricity market in 2001. Disregarding taxes (as well as tax changes), electricity prices fell by roughly one-fifth in the period from 1996 to 2003 (E-

CONTROL, 2004). If tax increases are included, the conclusion is more modest. In nominal terms, overall prices have increased slightly, but in real terms fell by 2.4%. Austria's electricity prices for households were much lower than in Germany in 2003. At 9.2 cents per kWh, the price of electricity in Austria was nearly 1/3 below that of Germany. Interestingly, the willingness to change the electricity company is apparently rather low in Austria as only 2.6% of households changed the electricity company between 2001 and 2003. For Austrian industry, the electricity price was somewhat higher than the EU average in 2003 which points to some further room for manoeuvring in price reductions.

Germany fully liberalized the electricity market in 1998. However, there are clearly distortions in this market as the use of hard coal is heavily subsidized. By contrast, lignite is competitive to a large extent.

Government and industry have decided to phase out nuclear reactors. At the same time, the government implicitly subsidizes renewable energy, although OECD statistics do not cover the type of subsidy granted. Those firms using, for example, windmills to generate electricity obtain a guaranteed price – much above the market price level. Hence electricity users are explicitly subsidizing the production of wind energy.

Access to the electricity grid is a major problem in Germany, as the country traditionally has been characterized by a half-dozen integrated electricity companies. Negotiated third party access was the approach adopted by the German government (i.e., generators and integrated electricity companies had to negotiate access prices). A similar approach was adopted in the gas market which yielded unsatisfactory results as access to the pipeline system seems to be rather restricted. After two agreements on access in the gas market, there will be a third agreement for 2003/04. As regards regulation of the electricity sector (and the gas sector) it would be adequate to impose principles which guarantee non-discriminatory access to the grid, as regards price regulation the price cap could be useful as could be reference to the cost of efficient provision of services – these principles have been quite useful in the telecommunications sector (as regards the option of rate of return regulation this would be encouraging inefficiencies – in particular capital intensity would be excessive – as is well known from literature: AVERCH/JOHNSON, 1962)

The Federal Cartel Office is supposed to combat abuse of a dominant market power, but it is doubtful that the Office has had much of a sustained impact. This rather sceptical perception holds despite the fact that the Federal Antimonopoly Office noted (BÖGE, 2002a) it was conducting inquiries into alleged cases of abuse of market power in a dozen cases while State Antimonopoly Offices were looking into some 200 cases.

Regional distribution in Germany is often in the hands of local government (local companies which are owned by the respective municipality – it often uses profits from electricity distribution to cross-subsidize public transportation which makes selling the regional distribution network a conflict-prone issue). Germany's major electricity companies have invested in access to customers, and local government eager to cope with high local budget deficits in many cities have accepted to sell out regional distribution companies. The Federal Antimonopoly Office has emphasized that it considers this strategy a problem with respect to workable competition, since Germany's two leading integrated electricity firms – E.ON and RWE – effectively stand for a duopoly with respect to the market for large electricity customers and distribution companies (BÖGE, 2002b, p.14).

A very delicate case in the German energy market concerned the envisaged merger of E.ON and Ruhrgas where the latter is Germany's leading gas company which even has a minority stake in Russia's giant Gazprom. Germany's gas pipeline system is mainly owned by Ruhrgas/VNG, which leads together with long term contracts for use of pipeline companies of up to two decades to weak access of outsiders to the pipeline network. Adding new compressors can, however, increase the amount of gas that can be pumped through a given pipeline system. The Federal Antimonopoly Office has decided against the merger of E.ON and Ruhrgas, however, while the Ministry of Economic Affairs supported the merger through application of an exceptional escape clause. The merger of E.ON and Ruhrgas was allowed mainly with the argument that the relevant market is the wider European market in which a merged company, E.ON/Ruhrgas, would be only one of several major players. However, the problem of reduced access to the Ruhrgas pipeline system was not strictly considered. The merger creates a vertically integrated mega energy producer in Germany. Whether it will give adequate access to its gas pipeline system and the electricity transmission grid is an open question.

At the bottom line, Germany has adopted a broad liberalization policy in both the field of electricity and gas liberalization. However, the initial plan of government to solve the problem of TPA on the basis of a cooperative contract framework within the industry has not worked. Rather almost prohibitive transmission pricing has implied that competition remains rather weak in the electricity sector. The situation in the gas sector is not much better, as there is a duopoly situation which includes pipeline networks. Expansion of gas-powered electricity generation has been anticipated in Germany and some EU countries following earlier examples in the UK and the Netherlands, not in the least because Germany has promised to cut greenhouse emissions (in accordance with EU goals and the Kyoto protocol) strongly.

As of 2007 there will be legal unbundling in the sense that distribution companies will no longer be able to effectively practice price-discrimination in the field of transmission and the access to customers, respectively. Setting up a legally separated transmission company - with uniform transmission prices for a certain amount of power – will largely eliminate discriminatory pricing and cross-subsidization, respectively. Integrated suppliers no longer should enjoy a cost advantage. This in turn should lead to more electricity trade as transmission prices will have a tendency to fall: Newcomers will have more opportunities to buy cheap power abroad – via various digital electricity markets – and to sell this power to firms or private households.

However, it will still be difficult to remove all X-inefficiencies at the local distribution level. As long as distribution companies are owned by local government and the cities, respectively, there will be weak pressure for consolidation and the diffusion of best practice. Local distribution companies in Germany are considered in the political sphere as an interesting opportunity for retired politicians to start a second career – jobs offered are paid well and indeed are not open to full competition. Therefore there will be tremendous resistance against privatisation of local distribution companies and mergers and acquisition in the field of distribution companies. Moreover, as long as many retired politicians govern electricity distribution companies there will be only weak pressure for efficient provision of services. From this perspective regulation of the electricity sector is necessary. An adequate approach in terms of efficiency would be not to allow distribution companies to charge for actual transmission costs – rather the costs of efficient provision of services should be the benchmark. If a company is able to provide secure power at even lower costs it should be allowed to keep most of the extra profit for a certain time period.

A strange issue is metering which is always done by local distribution companies and indeed could be easily installed as remote metering. Newcomers in the electricity markets should be allowed to rent access to users, and this would include the metering device which, of course, is necessary since physical control and stability of the network otherwise is uncertain.

2.4. Problems of Liberalization in Accession Countries and in Russia

EU Eastern enlargement raises many issues with respect to the larger single market for electricity. There are certain issues of transition – e.g., ownership, restructuring and foreign direct investment (EBRD, 2001; WELFENS/YARROW, 1996) – which were partly solved during the first transition decade. Valuation of assets of electricity generators was a thorny problem in the early transition stage since management had a tendency to push for overvaluation of assets in this capital intensive sector: The effect would be excessive depreciation and hence effective hiding of profits. It is not known to which extent this plays a role in EU accession countries. By implication the electricity firms might be underpriced in the stock market. Taking a closer look at the state of liberalization in the energy market and comparing it to the overall transition indicator, we see that the energy sector was still lagging in the transformation process (EBRD, 2003). Even in the Baltic countries, which are known to be relatively liberal in their transformation strategy, there are still problems to be solved. However, it is also true that liberalization in large or medium-sized countries – such as Poland, Romania or Hungary – is easier to achieve than in smaller countries where only a small number of suppliers co-exist.

According to EBRD, the Transition Index for electric power infrastructure – with a range of 1 to 4+ – was better than the overall infrastructure reform index in Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Russia and – very clearly – in the Slovak Republic in 2003. No country in the subsequent table shows a score of less than 3, which indicates that the restructuring and modernization process in the field of electric power infrastructure is rather advanced.

Tab. 6: Energy Sector Transformation and Overall Infrastructure Reform Index for Selected Transition Countries (EU Accession Countries plus Russia)

	Electric power infrastructure	Overall infrastructure reform index
Bulgaria	3+	3-
Czech Republic	3+	3
Estonia	3	3+
Hungary	4	4-
Latvia	3	3-
Lithuania	3	3-
Poland	3	3+
Romania	3	3
Russia	3	2+
Slovak Republic	4	2+
Slovenia	3	3

The scale ranges from 1 (worst grade) to 4 (best grade); EBRD (2003, 32)

With EU eastern enlargement, there are new prospects for higher growth and structural change in the Community as postsocialist accession countries face the competitive pressure of the single EU market including intensified trade and structural adjustment as well as ecological modernization. For growth, trade and ecological modernization, the energy sector plays a major role. As regards the energy sector, the Baltic Sea Region plays a crucial role for the EU, not least of which because there is a natural political and economic link with Russia. Moreover, the influences from Scandinavian countries could accelerate liberalization in this region. Moreover, one may anticipate a revival of historical trade links across the Baltic Sea which would include some EU-15 countries as well as some of the accession countries (Poland, Lithuania, Latvia and Estonia) plus Russia/Kaliningrad area. In quantitative economic terms, Poland, Hungary, the Czech Republic and the Slovak Republic as well as Slovenia will naturally be more important for energy market integration than the Baltics.

The transition countries in the Baltic Sea Region are expected to grow steadily in the next decade with rising demand for energy. This demand fell only transitorily in the early transition recession, restructuring and economic expansion and have seen higher levels of energy consumption in some countries in recent years. As market economies are characterized by broad outsourcing – including international imports – there is particular growth of energy demand in the field of transportation. In accordance with the logic of the gravity equation (for trade) regional links in the field and foreign investment can be expected to growth. However, only Estonia and Poland have been relatively successful in attracting FDI inflows. As regards FDI inflows into the energy sector, rather limited success was seen with the exception of Russia. Since the energy sector is relatively capital intensive, it is obvious that functional capital markets as well as FDI and capital inflows are a requirement to finance the modernization of the energy sector. In the past, EU accession countries in the BSR were heavily dependent upon energy imports from Russia. For political reasons, some of the accession countries are hesitant to accept a high degree of dependency from the new Russia; this stimulates political and economic efforts for diversification and modernization.

Governments in Europe – including those in the BSR – have declared their interest in implementing energy efficiency policies (e.g., Aarhus Declaration with Policy Statement on Energy Efficiency and the Energy Charter Treaty with its Protocol on Energy Efficiency and Related Environmental Aspects). There is also a working group entitled "Baltic Energy Efficiency Group" which includes the European Commission and government representatives from the BSR. Governments have committed themselves to achieving lower energy intensity so that growth and energy consumption can be partly uncoupled; cost of energy should be reduced, partly through energy market liberalization; emissions of CO_2, SO_2 and NO_x should be cut by some 30%, and modern technologies should be promoted (e.g., district heating, efficient power stations/CHP, etc.). Moreover, energy efficiency investments have been envisaged and several co-operative initiatives and networks related to energy efficiency have been launched (bilateral and multilateral approaches).

The EU has adopted a Northern Dimension of European energy policy (COM(99)548). In this context, some BSR countries naturally play a role. Poland is, of course, particularly important because of the geographical location and size. In addition, its reliance on coal as a major source of energy for many years has caused considerable problems with emissions. The Baltic States and Denmark have, however, only very limited indigenous energy resources and thus naturally must emphasize energy efficiency. Denmark and also Germany have put strong emphasis on long term expansion of renewable energies. EU programmes with a focus on the environmental dimensions (e.g., SAVE, ALTENER) are open to new member countries. To some extent, however, Germany seems to be in a situation similar to that of Poland, namely that an influential lobby in the coal mining industry – more in hard coal than in the more competitive lignite – is pushing for subsidized production. While modern clean coal technologies can reduce the ecological problems associated with electricity generation based on coal, it is doubtful that considerable coal mining activities will be competitive in Germany and Poland.

While integration into the EU single market and establishing links among themselves in the energy sector is important for the accession countries, a wider perspective implies a particular relevance for relations between EU-25 and Russia, and as such the Kaliningrad area is of special importance in a strategic perspective. As regards the energy sector, Kaliningrad is interesting in terms of oil, lignite and peat.

The Community imports about 1/5 of its natural gas consumption and roughly 16% of the EU consumption of oil. This strategic relevance of Russia in the field of energy trade is embedded into the dynamics of global energy markets which are to an extent highly volatile, not in the least due to the fact that major producer countries of oil and gas are politically unstable. Hence economic volatility and political instability are overlapping phenomena in the energy market which in turn reinforces EU interest in long term energy security. Add to this the fact that the oil market is strongly shaped by the international OPEC cartel and the fact that nuclear power stations are associated with sensitive security issues, it is clear that global energy markets have special needs. As regards national gas, there are regional energy markets unless one includes LNG which then makes the market more global.

EU interest in affordable energy prices and energy security are not the only aspects relevant for the energy sector and energy trade, rather ecological modernization is also important. The demand for ecological modernization is partly endogenous, namely to the extent that growth and higher per capita income raises the demand for a clear environment. To the extent that EU eastern enlargement stimulates growth, such an endogenous increase in the demand for a clean environment can be anticipated, and since growth in accession countries particularly is expected to remain high for more than a decade, ecological modernization and raising energy efficiency will be on the agenda in all accession countries. As regards the energy sector, the Scandinavian EU countries and Germany have made considerable progress in this field, partly due to the pressures of the Kyoto protocol. Against this background, the BSR represents a region offering dynamic opportunities for trade, growth and ecological modernization. Moreover, since BSR allows for the partial integration of Russia in certain energy activities, one of the leading global energy producers can also be involved. Russia, however, can export oil, gas and electricity only if it is able to sufficiently invest in exploration, generation and transportation. This must be sufficient to cope both with rising domestic demand and rising international demand where investment depends strongly on volatile prices.

The IEA has calculated that Russia has enormous long term investment needs if production and exports of coal, oil and gas are to increase (at least $ 200 bill. in the gas sector). The EUROPEAN COMMISSION has published a report on energy security in which long term scenarios for the energy sector are discussed, including a scenario based on “EU-30” including Norway. The latter scenario, however, is quite uncertain, as political sentiment in Norway is not very pro-EU and since favourable prospects for raising gas exploration and exports bolster the country’s economic expansion. In the period from 2000 to 2020, Norway intends on investing some 200 bill. Euro within the gas sector. Taking into account Norway's large proven gas reserves and the fact that Sweden and Finland were pioneers in liberalizing energy markets in the 1980s and 1990s, Scandinavia will play an important role for European energy security and energy efficiency.

Raising energy efficiency in Russia and Introducing Innovations

Given rising internal demand for coal in Russia, there is only a narrow potential for rising coal exports. Rising use of coal will in any case bring additional environmental pollution unless government imposes the use of costly clean coal technology. The situation is different in oil and gas where in a global perspective the oil market still dominates the gas markets. As regards the CIS gas market, Gazprom is clearly dominant; the company not only is a giant firm active in gas exploration but also increasingly active in international gas trading. For example, Gazprom made a deal with Turkmenistan that the company will import 3 bill. cbm natural gas over the next 25 years, and Gazprom is also in negotiations with Kazakhstan and Iran about similar contracts which would allow the company to raise gas exports from 130 bill. cbm in 2002 to some 200 bill. in 2008. New gas sites could be used in Russia, but investment costs are relatively high so that the profitability of new exploration will clearly depend on world oil and gas price developments. If Iraq should become a major oil producer and exporter between 2005 and 2010, world oil prices are likely to fall below 20 dollars, which in turn would undermine the viability prospective new gas exploration. As domestic oil and gas prices in Russia are still much below the world market prices, domestic price liberalization could stimulate exports more strongly than growth of production.

The basis for Gazprom's ability to increase investment in exploration, production and trade has been reinforced by a minority investment of Ruhrgas which has declared its intent to gradually raise the share in the Russian company from 6.5% to 8-10% in the medium term. Both more upstream and downstream investment could thus become possible. As regards the expansion of the pipeline network, Gazprom has access to the capital market. As for building new pipelines in some Asian countries, there are also multilateral funds available for organizations such as the Asian Development Bank. As regards oil and gas, however, it is obvious that some countries in the CIS are politically rather unstable. One should not overlook the fact that the expansion of modern ecologically efficient gas powered electricity plants – this holds for EU-25 as well as Russia – establishes a market-based link between electricity prices and gas market developments.

To the extent that Russia increases energy efficiency and that its government realizes the envisaged relative prices increases of energy in Russia – reducing domestic demand despite considerable growth –, there are considerable medium term opportunities for raising Russian energy exports. Given the high marginal costs of new exploration and site development in eastern regions of Russia, the improvement of domestic energy efficiency could become a major driving force for higher Russian energy exports. However, such improvement in domestic energy efficiency requires considerable investment on the side of households, firms and municipalities, and it is unclear whether sufficient funds are available. Moreover, there is a need to organize diffusion of best-practice technologies in energy efficiency where the EU has already financed some regional pilot projects.

With respect to modernization of the energy sector in transition countries, EBRD also plays a crucial role. The Kaliningrad area is relatively depressed compared to the Baltic States so that modernization of the Kaliningrad area – this might include investment in the energy sector, port facilities and pipeline networks – could help to achieve regional economic convergence and to promote the idea of ecological modernization. Moreover, successful regional cooperation in the energy sector EU-Kaliningrad area could serve as a role model for more comprehensive cooperation between EU-25 and Russia.

As regards nuclear energy, there are many difficult questions to be resolved in Russia and the former CIS. It must be studied carefully to which extent the expansion of nuclear power generation in Russia – associated with gradually rising electricity exports to EU-25 – could become a problem. Dumping issues as well as security aspects are involved here.

As regards EU-15 countries, there has been early liberalization of the energy sector in Scandinavia and the UK, more recently also in Germany. Liberalization and privatisation in several EU countries plus the phasing in of a EU single energy market – with industrial segments opened up first with two different modes of electricity liberalization (single buyer versus third party access) – M&As have intensified in the energy sector with part of the consolidation process including international M&As. For example, German, French, Dutch and British investors have become active foreign investors in eastern Europe.

Russia has the world's largest proven gas reserves and thus could easily switch towards innovations in the field of gas-powered transportation. Gas can be used in hybrid cars, but even more easily in bus transportation. It would make sense for Russia to promote hybrid cars, as the sale of cars is growing rapidly. Using gas for transportation would considerably help Russia to easily live with the Kyoto protocol while the country still recorded high growth for decades. Relying at least partly on gas in transportation could allow Russia to export more oil than otherwise. Moreover, Russia could stimulate the export of cars with hybrid motors which use alternatively natural gas or gas.

Russia's Role in Energy Liberalization

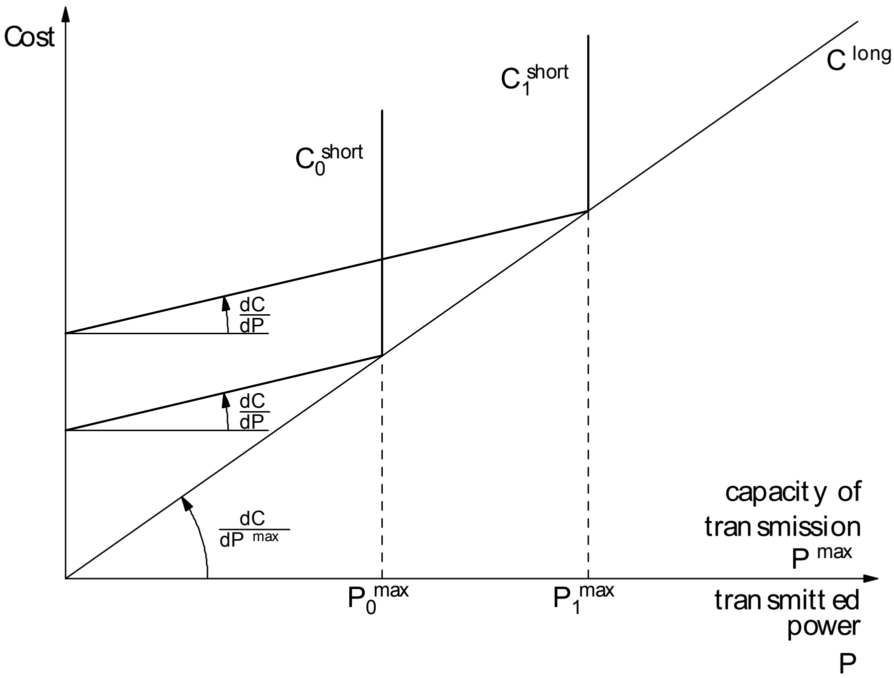
The role of Russia in energy supplies is related to its ambitions for increasing oil and gas exports to western Europe and the desire of UES – the dominant Russia electricity company – to export electricity. The gas business with its exports to Western Europe is politically quite sensitive, since it involves pipeline systems which go through the Ukraine on the one hand and through Belarus on the other. Both countries have tried to effectively raise transit fees, sometimes by stealing gas as Russian authorities claim. Transit pipelines create a typical hold-up problem which amounts to saying that the transit country effectively wants to renegotiate the transit fees when the pipeline – representing sunk costs for the integrated gas producer company – has been built. Privatisation of gas transportation in transit countries can solve part of the conflict potential between neighboring countries when one country is a gas exporter and the other is a transit country. With private pipeline companies, conflicts end before the court and will not become a politically hot issue with its associated risks, including in the very extreme case warfare.

Russia has some potential for exporting electricity, in particular to the Baltic countries, Poland, Hungary, Bulgaria and Romania. However, few of these countries want much dependency on imports of Russian electricity, nor would domestic electricity generators be interested in letting Russian electricity in. Some critics of Russia electricity would also point o the fact that part of the power imported is from rather unsafe nuclear reactors in Russia. This issue deserves closer inspection but cannot be discussed here.

2.5. Regulatory Aspects in the Electricity Sector

The extent and quality of electricity transport service can be determined by means of adequate parameters of quality and quantity. The transmitted electric power is a pure quantitative dimension, while quality parameters are the risk and the expected duration of disconnection, the constancy of frequency and the stability of voltage. These qualitative features can be summarized in the notion of quality of supply (see SCHWEPPE et al., 1987, p. 157 and 161). These attributes of quantity and quality can only be fulfilled if the requirement of an adequate capacity of the grid is met; this particularly means the ability of each and every single circuit to transmit its share of desired electricity power at every moment. While instantly transmitted power varies considerably over time, the transmission capacity is fixed in the short run. The short term cost burden of the grid operator arising from system operation and maintenance services rises by leaps and bounds if the border of transmission capacity is reached (see fig. 12). In the long run expenditures for securing the quality of supply have to be added to the costs of energy losses and maintenance of the grid. These expenditures are caused by the expansion of the grid. In case of no occurrence of transmission shortages, long run marginal costs are equal to the short term ones.

Fig. 12: Short and Long Term Costs of the Electricity Grid

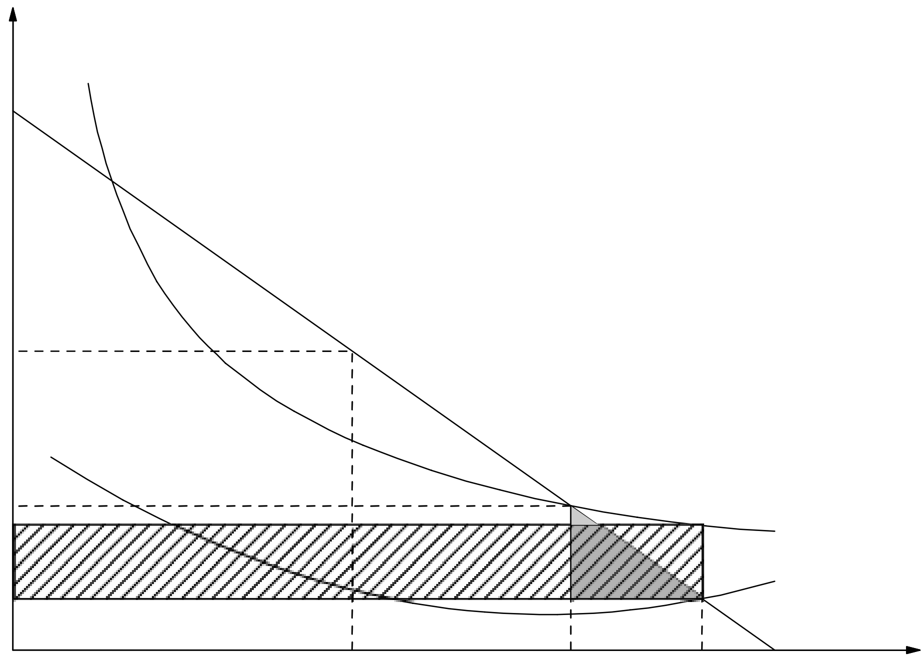


Source: Kauffmann (2001); see also Laffont/Tirole (1993) p. 21.

In case of instantly insufficient transmission capacity, rationing procedures (e.g. disconnection or both the refusal of connection or transmission) must be applied if no market mechanism equalizes the differences between supply of and demand for electricity transport services. A mechanism like this has to secure that the grid is first available to users with the highest readiness of payment. The more expensive the use of grid, the more the users of the grid will try to reserve and look for alternatives (e.g. bypass). Optimal transmission capacity is reached since marginal readiness of payment of the users meets marginal cost of alternative action in case of congestion, and since marginal cost of grid scarcity equal marginal costs of its elimination. In the short run, grid owners can increase their profits by keeping grid capacity limited due to increasing readiness of payment.

Announcement effects to the users of a grid take for granted that shares of short term and long run marginal costs at total marginal costs are known. For this reason, a subdivision of power transmission services in partial services like physical connection, reserve of transmission capacity and power transmission, scaled for different time zones and individually priced (e.g. for reserve of capacity and transmission, for use of the grid during peak or low load periods, …), is recommended. Every distinguishable partial service of power grids is limited in terms of quantity and quality, its production requires the employment of limited factors. Efficient allocation of these goods and factors cannot be described simply on the basis of the price level of these bundles of services and factors but implies an optimal price structure. Let us assume first that the grid company is a one-product-firm operating the power transmission grid natural monopoly. Due to high fixed costs, the grid company has an U-shaped marginal cost function with average cost C/Q exceeding marginal cost dC/dQ (see fig. 13).

Fig. 13: Non-coverage of Costs due to Marginal Cost Pricing and Welfare Loss Second Best Outcome



Source: Kauffmann (2001).

If the grid company priced tariff t for power transmission Q(t) at the welfare optimizing first best level t^{fb} at marginal costs dC/dQ, the company would record losses to the extent of the hatched area in fig. 15. Since a state subsidy to the grid company is not optimal for several reasons (see e.g. SHERMAN, 1989, p. 39; COASE, 1945 and 1946), a feasible solution to this problem could be price discrimination of a second degree (different prices for different services). For the one-product-firm considered now, the best feasible solution is the so-called second best outcome by pricing of the tariff at average cost level C/Q. To reach second best outcome, the grid company must be allowed to mark-up the difference between average costs and marginal costs, resulting in the lowering of power transmission Q and the public welfare loss to the extent of the shaded triangle in fig. 15. This kind of regulatory regime by monitoring the rate of return (or rate of output, sales, or costs, respectively) of the grid company was applied in practice all over the world for many decades with the strange side effect of overinvestment in grid capacities or/and other facilities of the companies owning the transmission grids. This effect, formalized by AVERCH and JOHNSON (1962), is caused by information asymmetries between the grid company and regulatory authorities. To reach more efficient regulatory outcomes, both diversification of services and strategic behavior of the grid company connected with asymmetric information have to be considered.

If we consider the grid company as a multi product firm, the question of the “right” tariff ratios for different services of the company arises. This question is strongly related to the question for the “right” taxation rates of a value added tax to be raised on a bundle of goods facing different price elasticities of every single good. This task was solved by F. RAMSEY (1927). For the regulation of power transmission tariffs, the so-called RAMSEY-rule implies different treatment of tariffs for services considering their price elasticity of demand: Tariffs for services with unelastic price-demand-function should to be more varied than tariffs for services with high price-demand elasticities. This requirement can come into contradiction with our ideas of social justice, because price-inelastic services are often identical with basic human needs.

According to our findings thus far, the goals of regulation should be:

Static efficiency:

- to secure welfare maximizing tariffs for all kinds of power transmission services as near as possible to the first best outcome;
- to give incentives for cost-cutting by efficient employment of production factors;

Dynamic efficiency:

- to give incentives for the supply of transmission grids with optimal transmission capacities
- to give incentives for cost-cutting by means of innovation

Goals connected with public tasks of transmission grids:

- to secure the quality of supply of the grid
- to avoid undesired distributional effects
- to hold the costs of the regulatory authorities at low level

These goals raise some contradictions or restrictions, namely:

- the grid company costs must be covered;
- the regulatory authority needs information from the grid company about demand and cost functions of the company (deficit of information);
- transaction costs of regulation;
- regulatory staff persecutes its own interest (principal-agent problem, regulatory capture)

The most important regulatory instruments are different methods of price setting for transmission services,

1. based on reported internal enterprise data (e.g. Rate-on-Return regulation);
2. based on external data;
   a) of reported sales and costs of comparable companies (“Yardstick Competition”, see SHLEIFER 1985);
   b) of expected development of markets and of technology (“Price Cap”).

Further instruments like transfer payments (e.g. LAFFONT/TIROLE 1993, p. 37) and linear contracts (LAFFONT/TIROLE 1993, p. 6) are rather theoretical concepts.

Because of its great importance for regulatory practice, we will glance at the topic of price cap regulation (see e.g. HELM/YARROW 1988, BEESLEY/LITTLECHILD 1989, BRUNEKREEFT 2000). Based on a regulatory mechanism for multi-product firms developed by VOGELSANG/FINSINGER (1979), price cap regulation was suggested for the first time in 1983 as a method for regulation of British Telecom by LITTLECHILD, first as a modified Rate-on-Return regulation. The basic idea seems quiet simple: Starting from the assumption that consumer satisfaction in the face of certainty of his expenditures for a bundle of services (at the very least) will not increase, the only requirement to the regulated company is not to overrun the average of tariffs for his subservices $\vec{t}_\vartheta$ in the current period ϑ weighted with the quantity structure of previous period $\vec{q}_{\vartheta-1}$:

(1) $$\frac{\vec{q}_{\vartheta-1}\vec{t}_\vartheta}{\vec{q}_{\vartheta-1}\vec{t}_{\vartheta-1}} \leq 1.$$

Such price setting would be independent of company cost and would create exceptionally strong incentives for cost reduction by means of both the optimization of traditional processes and innovation. However, while average price remains constant, the gap between marginal cost and prices would increase after cost cutting. In the case of the ability of regulatory authorities to prescript a future development of average tariff of the bundle, it would be able to prevent too wide of an opening of the scissors between prices and costs. However, this requires the prediction of future development of power transmission markets and technology to find orientation to set average tariffs for some periods in advance – the regulatory period Θ. Assuming a certain amount of periodical cost reduction X, 0 < X < 1, the authority had to adjust the LASPEYRES index (1) for next Θ by X_Θ,

(2) $$\frac{\vec{q}_{\vartheta-1}\vec{t}_\vartheta}{\vec{q}_{\vartheta-1}\vec{t}_{\vartheta-1}} \leq 1 - X_\Theta.$$

In this manner, customers would share in cost reduction. The incentive for the grid company to reduce costs would exist despite X, provided that X is not set too high. X must not be constant but can be modified over time, provided that any modification be planned and announced ex ante, i.e. at the beginning of regulatory period. Self-commitment on the part of regulatory authorities is one crucial element of the mechanism: A regulatory roadmap, once announced, has to be kept up until the regulatory period ends. However, the grid company would face serious problems under the regulatory setup (2) in the event of increasing prices on its input factors. Therefore index (2) must get a mark up that has to be determined largely independent from the expected development of sector specific factor prices in order to prevent factor input overpricing. The retail price index RPI is regarded as a good approximated value close enough to the index of factor inputs of the power transmission sector but far enough from influence by strategic behavior of market players in this specific segment. Thus the regulatory authority restricts the level of tariffs for the next regulatory period Θ to

(3) $$\frac{\vec{q}_{\vartheta-1}\vec{t}_\vartheta}{\vec{q}_{\vartheta-1}\vec{t}_{\vartheta-1}} \leq 1 + RPI - X_\Theta.$$

Another crucial point of price cap regulation is the chosen length of regulatory period. The shorter Θ the more the similarity the price cap increases to Rate-of-Return regulation. Too long of a regulatory period could leads to extrapolation of misdirected development, perhaps caused by the badly chosen value of X. In practice, the regulatory period should have a duration of 3 to 5 years (BRUNEKREEFT 2000).

Price cap regulation clearly has its advantages in comparison with price setting based on reported rate on return or cost of the firm (see BEESLEY/LITTLECHILD 1989, p. 456, 460 f., VOGELSANG 1998, p. 16 f.):

- reference to future development;
- high powered incentives for increase of productivity;
- high flexibility of prices;
- possibility of convergence to RAMSEY prices;
- easy use by regulatory authority;
- equalization of short and long run marginal costs of the grid

Disadvantages could arise as the result of a badly chosen value for X, perhaps caused by misevaluation of future developments. Under distributional aspects, the introduction of price cap regulation could become problematic if it leads to huge profits reaped by grid companies on the one hand and deterioration of customer groups (e.g. in areas with small population density) on the other hand. It is one task of regulatory authority to set clear instructions regarding quality of supply of power transmission.

In Germany, electric power tariffs of household customers were traditionally subject to regulation by state authorities at the Ministry of Economic Affairs applying price setting based on Regulation-of-Cost methods. The disadvantages of methods like overinvestment and lack of incentives for cost reduction are well known and frequently discussed (for an overview see e.g. SHERMAN, 1989, and BORRMANN/FINSINGER, 1999). The future regulation of power transmission tariffs should be based on a broad set of internal and external information, leading into price caps for bundles of partial transmission services for partial customer groups.

3. Policy Conclusions

It is clear that a collapse of the OPEC cartel would have enormous implications. The oil price under global competition would hardly be much higher than 10-15 $, which is less than half of the price fetched by OPEC in the three decades after 1974, the year of the first oil price shock. A fall of oil prices would bring about a fall of gas prices which in turn would raise the demand for gas-powered electricity generation. However, given the fact that the Middle East is the source of most of the world's proven oil reserves and taking into account high long term growth in oil and gas demand in Asia, including China, one should expect that the relative market share of OPEC will not decline quickly, thereby ensuring its sustained market power for many decades to come.

Turning directly to the electricity market we find modest liberalization gains in Germany and other EU core countries and more dynamics in Scandinavian countries. The electricity liberalization results thus are relatively modest in the overall EU. Electricity prices still have not converged much, and there are considerable doubts that transmission fees reflect long run marginal costs. Indeed, there are two long term inefficiencies:

- grid operators and the distribution companies have a strong incentive to levy all fixed costs on the transmission fees which implies that distribution companies or grid companies that also are power generators will largely impair access of "outsiders", in particular foreign suppliers.
- there also is no incentive for firms to restructure existing networks in an efficiency-enhancing way – this in turn reinforces competition among generators as reduced network charges imply a larger market radius for every power generator which profitably can sell power over the grid.

In many countries, politicians are not eager to promote comprehensive liberalization since the electricity sector is a field in which part of the political elite finds a cosy future environment for retiring from political life. Structural separation will improve competition only after 2007 when distribution companies are no longer able to charge higher network charges to outsiders than to the own units producing electricity. An unsolved problem is the distortions emerging from CO_2-emissions is that in countries with a high share of CO_2-intensive energy inputs in electricity generation, there will be an incentive to import more nuclear electricity from abroad where producers often are not facing the full costs of production – e.g. due to artificial limits on liability and thus a bias towards low costs of insurance (France and Germany for example).

The German approach of negotiated third party access is strange, unique in the EU-15 and not efficiency-enhancing. Rather negotiated third party access might reinforce the risk of collusion in the electricity sector. With the introduction of a new regulator for the electricity sector in 2004, the German system might gradually move towards a more efficient system of resource allocation in electricity. It remains to be seen which approach to regulation the new authority (the existing body overlooking telecommunications and the post will be enlarged) will adopt.

The special German TPA approach – initially shared by Greece and Denmark – suggests that Germany's political culture has a preference for bargaining approaches and mistrusts market dynamics which often are perceived as containing a high degree of uncertainty. By contrast, most economists consider competitive markets efficiency enhancing and useful in particularly bringing about international efficiency gains through trade. At the same time, they mistrust the mechanisms of bargaining among select players, in particular in the area of political bargaining which often has a bias towards short-term orientation and national solution concepts.

As regards a wider Europe, it is clear that the EU enlargement will bring new opportunities for intra-EU-25 trade in the electricity sector. However, it is doubtful that all EU outsiders in Europe will enjoy non-discriminatory access to the EU-25 market. Russia is facing particular problems as long as it is not a member of WTO.

A rather paradoxical element of energy policy in many EU countries is that it lacks a solid long term orientation which would be useful for achieving sustainable development in Europe. Instead, changes in government typically bring major shifts in energy policies which makes the highly capital intensive energy sector – including the electricity sector – a highly politicised business. Foreign investors not well connected to political circles in the respective country and the Commission might face a crucial disadvantage in the industry. In this respect, US investors are only slightly better positioned than potential investors from Russia or Japan, and this effectively restricts investment from those countries.

In a period of major budget problems in Germany, France and Italy, government is likely to exploit efficiency gains and price cuts in the electricity sector by imposing new taxes as was done in Germany and some other EU countries after liberalization. Scandinavian countries are clearly advanced in terms of competition in electricity, and all firms using electricity intensively will particularly benefit from this.

In EU-15, the political drive towards comprehensive liberalization in the energy sector is undermined by high unemployment in Germany, France and Italy. Introducing competition is likely to lead to lay-offs in part of the industry, and in countries where unemployment already is high, there clearly is resistance to liberalization policies. The electricity sector is capital intensive and characterized by high concentration in most EU countries so that it is rather easy for well organized workers and a handful of firms to appropriate economic rents. Germany, France and Italy have a culture of resisting reforms and can hardly be expected to quickly move towards comprehensive liberalization. The industry facing pressures of CO_2-trading also broadly resists the idea of comprehensive liberalization.

As regards EU accession countries, Poland has the most competitive electricity sector as its reform in the 1990s largely followed the British model with its separation of power producers, grid companies – owned jointly by power producers – and local distribution. In most accession countries, however, one can hardly expect much competition in electricity. The Baltic states, the Slovak Republic and Slovenia are truly small countries in which very few domestic electricity firms compete. Benchmarking in such cases is also rather difficult.

In the early liberalization stage, the very low rate of households changing the electricity supply company in EU-15 indicates that establishing a competitive electricity market is a complex challenge. Attempts to create markets for heterogeneous electricity – reflecting the type of input used (so that users can have access for example to "green power" from renewables at a slightly higher cost) – have largely failed in the EU.

The slow growth of technological progress and the true state of weak competition in the electricity sector is finally revealed by failure of almost all companies in major EU countries to install metering with remote controls. Only in the UK could one explain annual visits by the meter man from the local distributor with a solid reason, that being emphasis on tradition which is a nice part of the British way of life.

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Annex 1. Eurostat Electricity Retail Prices
(Current Prices, Before Taxes)

	Jul 97	Jul 98	Jul 99	Jul 00	Jul 01	Jul 02	Jul 03	% change since 1/1999	% change since 7/2002
Germany	162	163	158	134	133	126	134	-17%	6%
Ireland	135	127	126	126	126	127	128	2%	1%
Luxemburg	136	137	137	131	121	122	127	-8%	4%
Belgium	146	149	148	146	128	130	122	-18%	-6%
Italy	119	114	115	128	78	101	104	-8%	3%
Portugal	118	115	105	104	105	100	101	-3%	1%
Spain	109	100	98	98	98	99	95	-3%	-4%
EU-15	105	104	102	98	92	92	93	-9%	2%
Greece	84	82	86	83	87	87	90	5%	4%
Austria	160	161	162	126	102	97	89	-45%	-8%
France	91	89	87	85	85	86	83	-7%	-4%
UK	105	105	108	101	93	84	78	-28%	-7%
Finland	59	59	55	54	54	57	68	21%	19%
Denmark	51	52	52	55	65	67	65	23%	-3%
Sweden	69	67	59	53	41	36	46	-26%	30%
Netherlands	91	92	94	101	106				

Eurostat category Ib: Consumption of 50MWh/year

Prices in the table exclude VAT and other energy taxes.

Source: EUROPEAN COMMISSION (2004)

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