International EnergySymposium Ossiach 2001

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Impacts of market liberalisation on the electricity supply sector: a comparison of the experience in Austria and Germany

Abstract

The impacts of market liberalisation on the electricity supply sector depend on many different factors and boundary conditions. Comparing these impacts in Austria and Germany, two countries which both participate in the European internal market and have a central geographical location in Western Europe, and which both have borders and important trade relationships with Central and Eastern European countries, provides some important insights with regard to the following aspects: (a) the differences in the primary energy supply mix for electricity genera-tion; (b) the substantial excess capacity, not only in the two countries analysed but also in the EU as a whole, and its uneven reduction due to different market opening speeds within the Community and differences in the plant stock composition; (c) the utility company structure, including ownership and traditional energy supply and customer relations; (d) the changing situation faced by co-generation and small power producers; and (e) the relevant regulation of third-party access to the grid, electricity transmission, and prices for small/captive consumers. Last but not least, the paper also covers the influence of the expected increase in the volumes of electricity traded in the two countries, also with their Central and Eastern European neighbours (where the level of the playing field may not yet be equalised in the near future), and the concerns that this may lead to conflicts in the achievement of the energy policies, environmental policies, and climate change policies aimed for at the national and European level.

1 Introduction

The liberalisation of the electricity sector, like in other network-based industries, induces substantial structural change, and the consequences for a particular country are often hard to predict, as experience has shown, e.g., in the UK and Norway. This change causes an urgent need to (often rapidly) adjust to a new market environment – by adapting the prices and quantities offered, the marketing strategy, and also the portfolio of products and services purchased and sold. However, the strategic and operational adjustments required may be quite different, depending on the particular boundary conditions (domestic energy resource base, CO2 reduction obligations, etc.) for the electricity industry in question and the actual impact of market liberalisation on the electricity supply sector.

In the course of the European electricity market liberalisation, as stipulated in the EU Directive 96/92/EC, the German Federal legislation decided for an instant full liberalisation by April 1998 (EnWG 1998), while the Austrian parliament opted for a stepwise market opening, starting in February 1999 (ElWOG 1998), in accordance with the minimum limits given in the EU Directive. Following the rapid restructuring of the industry in Europe, however, and in the light of the uneven exposure of Austrian power utilities to competitive pressures, it was decided in 2000 to completely open the Austrian power market by October 2001 as well (ElWOG 2000), as Germany, still way ahead of many other EU member states. Given the different market opening schedules, and other differences, such as in market size and in the pre-opening organisational and ownership structure of the utilities, it seems to be worthwhile to compare the impacts of liberalisation in the two countries – with an annual per capita electricity consumption beyond 6,500 kWh, comparatively high environmental standards, and traditionally strong electricity trade relationships with Central European countries. Besides, factual competition in the power sector in both countries has developed at an impressive pace. The findings can also provide some useful hints for utilities and public administration in those countries that are currently planning to open their electricity markets within the next couple of years (like Switzerland and most EU accession countries).

2 Primary energy supply mix for power generation – the starting point

The primary energy basis for electricity generation in the two countries is significantly different and can be expected to have some specific implications on the behaviour of the participants in the electricity markets in both countries. Whereas electricity generation of the German power sector has been traditionally heavily dependent on coal (hard coal: around 25 %; lignite: around 26 %) and nuclear energy (ca. 36 %), with almost negligible shares of hydro (1.5%) and wind power (0.4%), respectively, the Austrian power sector has its major basis in hydro power (44%) and fossil-fuel based thermal power generation (around 9% oil, 30% gas, 12% coal; mostly in co-generation plants), and – due to the 1978 people's referendum on the Zwentendorf plant – no nuclear generation (see Table 1).

Type of energy	Germany (2000) PJ	Germany (2000) %	Austria (1999) PJ	Austria (1999) %
Fossil-based				
- oil	38	0.7	29	8.7
- natural gas	504	9.7	100	30.0
- hard coal	1,272	24.6	39	11.7
- lignite	1,337	25.8		
Nuclear power	1,850	35.7	0	0.0
Bioenergy-based	79	1.5	19	5.7
Hydro power,	80	1.5	146	43.8
Wind power and PV	20	0.4		
Total	**5,180**	**100.0**	**333**	**100.0**
Electricity net exports	9	0.2	7	2.1

Table 1: Primary energy input of the German and Austrian electricity generation sector, by fuel (in PJ, %)
Data sources: ARGE Energiebilanzen (2001), ÖSTAT/E.V.A. (2001); own estimates

In Germany the current primary energy input share of natural gas of about 10% is expected to rise considerably in the future, mainly because of the anticipated continued boom of combined-cycle power plants (due to their relatively lower capital cost and hence lower financial risk, and relatively low CO2 emissions per kWh output), and most recently also due to the planned phasing out of nuclear power stations within the next two decades, as agreed upon between the German government and power industry. Altogether, the fossil-fuel share of the German primary energy supply mix for electricity generation is very likely to increase, because it is very unlikely that the phase-out of nuclear capacity can actually be compensated immediately by increases in energy efficiency and/or the use of renewables alone.

In Austria the situation is markedly different, at least in the short and medium term. Given the extraordinarily high dependency of Austria on (relatively inexpensive, clean and domestic) hydro power, the fossil-fuel plants are merely used as back-up systems in times of high power demand and low river flows and/or low pump storage levels. This dispatch priority, however, leads to a considerable amount of fossil-fuel based 'stand-by'/reserve capacity that is relatively expensive because of the capacity under-utilisation, but at the same time difficult to reduce. The reduction potential depends on the market situation (in terms of demand growth, fuel prices, electricity import options and transmission capacity constraints) and the required local physical reserve capacity which is especially important in times of low precipitation levels (cf. Schröfelbauer 2001, esp. Fig. 8). Verbund, for example, the largest power producer in Austria, is concentrating its generating capacity in its current cost-cutting restructuring activities into two distinct and essentially centrally managed blocks – for hydro and thermal power plants – enabling the exploitation of important synergy potentials in plant operation, maintenance, and administration.

3 Market opening – the window of opportunities

Despite some political will to liberalise, exemplified recently by the full opening of the Austrian power market by 1 October 2001, the electricity markets both in Germany and Austria are nonetheless still characterised by important market barriers and impediments to competition. In particular, three issues need to be sorted out urgently: (i) the transmission tariffs and capacities available; (ii) who pays for stranded assets; and (iii) the accepted impacts of liberalisation on national integrity.

The EU Directive 96/92/EC allows for different speeds of market opening, but at the same time demands a minimum speed for all member countries (19 Feb 1999: 26.48%; 19 Feb 2000: 30%; 19 Feb 2003: 35%). The German government and parliament decided to open the electricity market completely in a single step by 24 April 1998. This included:

- immediate free choice of electricity supply for all consumer categories;
- financial unbundling of vertically integrated utilities (minimum requirement);
- negotiated third-party access (nTPA) to the grid;
- allowance of power traders.

An immediate full opening of the market was chosen with the argument that smaller electricity consumers would either demand from the distributors, generators or traders similar conditions to those offered to the larger consumers (threat of changing the supplier), or they would merge their small electricity demand to larger quantities (e.g. by establishing joint purchase syndicates) in order to receive more favourable prices from the (now) competing electricity companies.

1) Note that thermal-based input fuels appear much more important here than hydro power in terms of primary energy contributions for a given electrical output, because the thermal conversion losses are also counted as contributing to primary energy production.
2) Percentages are approximate, calculated as the total electricity share consumed by final consumers with an annual consumption level exceeding 40 GWh, 20 GWh, and 9 GWh (according to the three liberalisation steps planned for in EU Directive 96/92/EC).

	Lowest	Average	Highest	Related company	
	(in EUR/kWh)			Lowest rate	Highest rate
High voltage transmission	0.86	1.27	2.04	Energie Dienst/KWL	AÜW, Kempten
Medium voltage transmission	0.62	1.45	2.78	RWE-Net, Dortmund	avacon aBL, Helmstedt
Low voltage distribution	0.66	1.85	3.50	Mainova, Frankfurt	Energie Dienst/KWR

Table 2: Individual electricity transmission and distribution rates, Germany (as of April 2001)
Source: BWK (2001b), p.27; own calculations
Note: Cumulative rates tend to be higher (lower) than the sum of the lowest (highest) rates.

	Annual hours of utilization					
	1,000 hrs		4,000 hrs		8,000 hrs	
(in EUR/kWh)	Lowest rate	Highest rate	Lowest rate	Highest rate	Lowest rate	Highest rate
110 kV (3)	1.51	3.42	0.86	1.46	0.66	1.28
10/30 kV (5)	2.62	7.63	1.59	3.68	1.42	3.21
Transformer station (6)	3.15	10.29	1.91	5.52	1.71	4.76
0.4 kV (7)	6.50	15.61	3.68	8.88	2.90	7.74

Table 3: Cumulative electricity transmission and distribution rates, Austria (as of January 2001)
Source: WKOÖ (2001); own calculations
Notes: Grid use charges in Austria vary by region (province); numbers in brackets denote the voltage layer.

In contrast, Austria has implemented the EU Directive 96/92/EC with an electricity act that was published on 18 August 1998 and entered into force on 19 February 1999 (Elektrizitätswirtschafts- und -organisationsgesetz – ElWOG 1998). The Federal law was concretised by complementary laws of the nine Länder, as well as two ministerial ordinances, one dealing with the principles of transmission pricing and the other with stranded cost compensation. Besides, the Länder laws focused on details of the promotion of renewable energy use, new power plant authorisation criteria, and public service obligations. In 2000 a new electricity act (ElWOG 2000) was published. Among other changes (e.g. installation of a clearing house, labelling obligation), an important aim was to reduce the existing imbalance in exposure to competition faced by the various Austrian regional electric utilities (ranging from some 5% to 80%). Figure 1 contrasts, in a stylised fashion, the regulatory and actual market opening in Germany and Austria.

An important instrument for avoiding market distortion among EU member countries is the so-called reciprocity clause, which contains possibilities of refusing access for customers from other EU member countries when the member country itself opens its market wider than the other countries. The main problem with the reciprocity clause in its current form is, however, that it can be circumvented by trading in a pool or at a power exchange, so that the country of origin cannot be figured out any more.

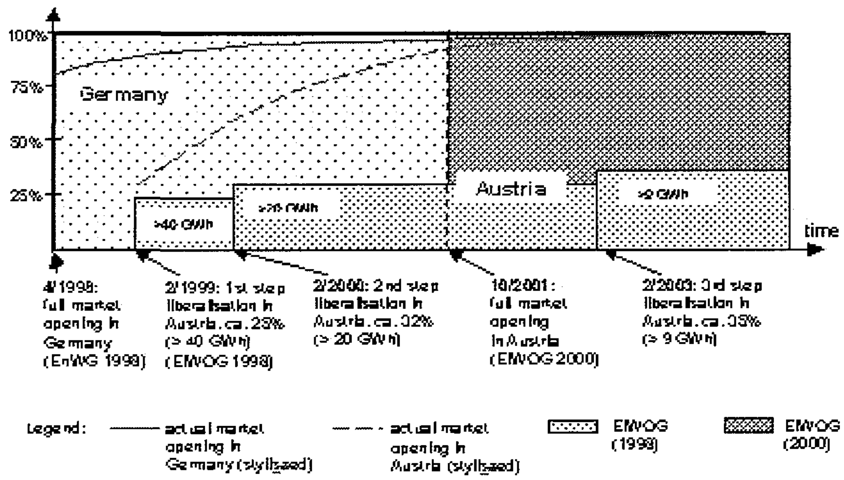

Figure 1: Development of regulatory and actual market opening in Germany and Austria (stylized)

4 Regulatory issues and renewables promotion – how to reach an equal level of the playing field

Germany, the largest electricity market in the European Union, is the only EU member country that still clings to a negotiated third-party access (nTPA) to the grid without a regulator. This offers, at least for a while, some leeway for the transmission and distribution grid operators to charge excessive transmission fees and hence to reduce competitive pressure, but at the same time also (at least temporarily) reduces the need for innovation and structural change. Three years after the market opening, rates for electricity transmission and distribution still vary quite substantially among the grid operators in Germany (see Table 2). Electricity traders have been complaining about the large difference of (partly still unpublished) transmission rates, delays of wheeling contracts, and high measurement charges at the point of final use (Oehler 2001). One of the six remaining large utilities, EnBW, has even called for a regulator (Wertel 2001). The German antitrust administration has stated that there is sufficient evidence that some of the observed wheeling and distribution rates are far above real cost and that unjustifiable charges for grid use are taken from traders and final consumers. Therefore, it is presently developing a concept for evaluating fair rates for using the grid (E&M 2001a).

In contrast to Germany, an independent regulatory authority for the Austrian electricity sector ('E-Control') has been established by 1 March 2001, which is obliged to monitor and regulate the 100% liberalised Austrian power market after 1 October 2001, when the new electricity act (ElWOG 2000) has fully entered into force. This approach seems to be much more in line with the current stance of the European Commission, which has recently clearly indicated a strong preference for a regulated TPA (e.g. European Commission 2001). There is also hope that the regulator will harmonize the currently regionally very heterogeneous grid-use charges (see Table 3) in the near future, thereby reducing the current level of market distortion.

5 Impact on excess capacity – the countdown of production monopolies

Surplus capacity of electricity generation before liberalisation was more than 17 GW in Germany (or around 20%; see Table 4), and the total surplus capacity within the EU was estimated to be in the order of 40 to 50 GW. In Austria, due to the high reliance of electricity generation on hydro power, as already indicated in section 2, surplus capacity of a particular year depends strongly on the annual amount and seasonal distribution of rainfall, which creates a need for higher reserve capacity and makes it harder to come up with a concrete number (see, e.g., Jansen and Musil 1995; Schröfelbauer 2001).

Because of the different speeds and points in time of the market opening in the EU member countries, and the open time schedule for the accession of the Central European countries, the impact of market liberalisation on excess capacity is somewhat difficult to evaluate. However, it is not only the timing of the opening and extension of the power market which influences the phasing out of excess capacity, but also the

- age structure and economic performance of existing power plants, which may induce investments in new and highly efficient generating capacity (e.g. ten state-of-the-art generating plants with a total capacity of 3,900 MW(!) were added to the German stock in 2000 alone);
- intensity of competition in particular regional or national markets;
- market structure and power, which also depend on the size of the companies (due to their financial flexibility), the type of the power plants (high financial back-ups of companies running nuclear power plants), and the ownership (e.g. EdF with no specific profitability obligations; municipal electric utilities, "Stadtwerke", that traditionally used profits for the co-financing other public services, such as city transportation and swimming-baths);
- price policies of the utilities differentiated by customer groups;
- development of new entrepreneurial activities by existing utilities (e.g. with the aim of customer binding), new foreign energy companies entering the domestic market, or specialised companies (such as contractors for co-generation plants);
- new recent technological developments, such as information and communication technology, remote control of electricity generating plants, micro-turbines, and in the future also fuel cells; and finally
- national or regional policy measures for developing renewables and/or co-generation, such as those aiming at climate change mitigation and/or technical innovation (e.g. the German buy-back rate law for renewables, and most recently for co-generation and fuel cells).

Given this complexity, it is not trivial to trace back the direct impacts of the electricity market opening at the national level. But the net phasing out of surplus capacity is substantial anyway: In Germany, for instance, two of the major remaining companies announced in summer 2000 to phase out around 10,000 MW of generating capacity, some of which is planned to be kept in a conservation status (see Table 4). Two nuclear power plants, a rather old plant in Stade and a new and practically never fully operational plant near Mülheim-Kärlich, with a total capacity of 2,000 MW (or almost 10 % of the nuclear capacity in Germany), will be phased out by 2003.

Company	Capacity (in MW)	Power plant		Year	Remarks
E.ON	4,800	**Dismantling:** Arzberg: 5,7 Aschaffenburg: 21,31 Franken II: 1,2 Offleben: C Schwandorf: D	**Conservation:** Arzberg: 6 Emden: 4 Pleinting: 2 Staudinger: 2	2001	Expected savings: approx. EUR 72 mio. p.a.
HEW / E.ON	672	Stade (nuclear)		2003	
RWE	5,000* 1,300	 Mülheim-Kärlich (nuclear)		until 2004 2001	
Total capacity in November 1999: Max. load in 1999:	 101,400 70,900				Capacity addition in 2000: 2,700 MW

Table 4: Planned phase-out of power generating capacity in Germany, 2000-04
Source: E.ON Energie Presse (2000), RWE (2000), VDEW (2001) * including supply contracts

The association of the German electricity sector (VDEW) comments on these changes by emphasising the optimisation process the sector has to undergo. Companies no longer plan their own maximum reserve capacity, but try to co-operate. In other cases, mergers contribute to reducing the reserve capacity. VDEW (2001) also emphasises that the planned and already realised reduced capacities of electricity generation will not reduce the traditionally high level of security of electricity supply.

In Austria the development has been less dramatic, given the dominance of hydro power stations whose investment cost with few exceptions (like the run-of-river plant Freudenau) have been recouped during the time of a regulated monopo-listic market structure, so that they are currently very cost-competitive. The planned shut-down of the (hard-)coal-fired thermal power plants at St. Andrä (124 MW), Korneuburg (285 MW), and Zeltweg (137 MW) in the short run and of Voitsberg (330 MW; lignite) in the medium term has not only been motivated by their relative cost-inefficiency, but also been driven by the marketing desire of the Verbundgesellschaft to be able to offer and sell still 'greener' electricity in the future.

6 Impact on electricity prices – the expected fruits

Due to the enormous market pressure and the induced rationalisation, average electricity prices have been substantially reduced since the beginning of the market opening in Germany (and even before 1998 in anticipating the liberalised market: 1991/97 industrial consumer prices: -20%; residential consumer prices: -5%; see Jochem/Tönsing 1998; BMWi 2000). The producer prices have almost halved within three years, reaching average prices in the order of 1.5 ¢EUR/kWh at the Leipzig Power Exchange (LPX). These prices did not even cover the variable costs of electricity generation in most cases and may have been possible only by the revenues gained from financial assets of the large utilities. The consumer prices charged depend on the producer prices, the rate for using the transmission and distribution grid, the taxes/levies imposed, and the sales margin. The rates for using the grid, which depend on the voltage and time of use over the year, vary substantially among the companies, with average values of, e.g., in Germany 1.3 ¢EUR/kWh at the high voltage and 4.6 ¢EUR/kWh at the low voltage level (including the upstream rates; see Table 2).

The Dow Jones VIK Price Index for industrial consumers shows an interesting development of the electricity prices between the opening of the German power market in April 1998 and June 2001 (see Figure 2):

- Average electricity prices in Germany declined by some 2 ¢EUR/kWh between 1998 and early 2000, stagnated during most of 2000, and seem to fluctuate since early 2001 with some tendency to increase again.
- At the opening of the market, industrial consumer prices among the large generators only differed around 1.2 ¢EUR/kWh, whereas they differ by more than 2 ¢EUR/kWh since January 2000. Theoretically, one would have expected a decrease of the difference under competitive conditions.

Hence there is some indication that the transition phase of liberalisation, as far as price adaptation is concerned, may last no longer than four to five years in a country with full market opening. Industrial customers have greatly benefited from the price decline since the market opening, whereas retail prices for private households have been reduced only slightly in Germany, if at all in nominal terms (partly as a result of the eco-tax, which was introduced in 1999 and raised to 1.5 ¢EUR/kWh by 1 Jan 2001). The same is true for Austria, where the savings of the captive consumers have been considerably reduced by the rise of the electricity levy from 0.73 to 1.5 ¢EUR/ kWh (ATS 0.1 to ATS 0.2/kWh) by 1 June 2000 as one of the fiscal measures taken to reduce the budget deficit.

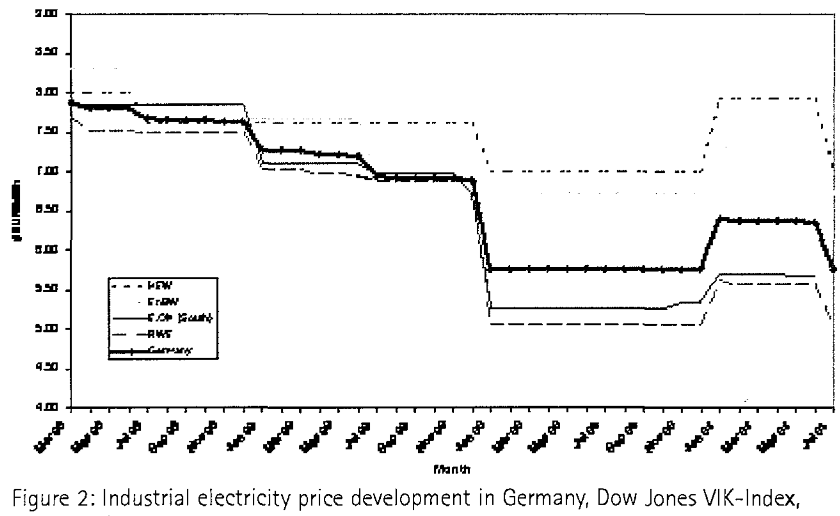

Figure 2: Industrial electricity price development in Germany, Dow Jones VIK-Index, 3/1998–6/2001
Source: BWK (2001a), p.13

7 Impact on utility company structures – the search for optimal utility size

The major objective of the liberalisation of infrastructures with natural local monopolies is to introduce competi-tive structures and to increase market transparency in order to avoid economic inefficiencies and extra profits of local or regional monopolies. Competitive behaviour in the deregulated electricity market was expected to lead to rationalisation of labour and capital, but of course it also leads to concentration (e.g. mergers & aquisitions, co-operation agreements) of the electricity generating and distributing companies in search for economies of scale and economies of scope. Sceptical energy economists have sometimes questioned whether the liberalisation of electricity supply with a monopolistic structure but some influence from local and regional governments (with their broader perspectives and objectives, especially with regard to the expected societal benefits related to it) would finally lead to an oligopolistic market structure with similar prices and de facto dependency of many electricity customers from electricity suppliers, but within the changed context of a much narrower set of business objectives. Presently, one can observe the following changes in market structure (see also Table 5):

- The number of large generating and transmission companies at high voltage in Germany (Verbundunternehmen) decreased from nine in the early 1990s to six in 2000 and is likely to diminish further to four by 2003 (two thirds of the German electricity generation capacity is owned by RWE and E.ON alone).
- The number of regional distributors decreased from 80 in 1997 to 34 in 2001, and is likely to go down to less than 25 within a few years; the merger & acquisition process is still going on (five regional companies in Bavaria will be merged to one company before the end of 2001).
- The number of municipal electric utilities is decreasing, though no official statistics exist and the recent numbers published in various journals differ strongly (ranging from no change to a decline by 230).

Year	1997	2001	2005 (estimate)
Type of company		Number of companies	
High voltage generation and transmission*	8	6	4
Regional distributors	80	34	< 25
Local distributors, municipal utilities	800	570 to 800?	< 400

Table 5: Structural change due to liberalisation in the German electricity industry, 1997–2005
Data sources: Schiffer (1999); ARE (2001); E&M (2000); estimates by CEPE; * Verbundunternehmen

Looking into the next few years it seems rather likely that the number of companies at all three levels of electricity supply in Germany will at least halve. But more importantly, the ownership of the formally independent regional and local distributing companies is changing from public to private owners, and often shifts to the big European players in the electricity and gas markets. Going Europe seems to be a must for the big and formerly national players, and the list of examples becomes longer every week: recently, for example, the German EnBW has contracted 600 GWh of electricity per annum with Austrian customers, and E.ON is a top favourite to become a new shareholder of EVN, the utility of lower Austria. Verbund seeks access to final consumers abroad by delivering electricity to German Stadtwerke, while RWE has set a foot in the south of Austria (by buying 49% of KELAG via the Carinthian energy hol-ding company). Meanwhile, the new joint venture EHP (European Hydro Power) between Verbund and E.ON will create a 'new' major European player in the provision of green power (NZZ 2001).

Most of the price reductions could be achieved by severe rationalisation of labour. Employment in the German electricity sector declined by 18,000 between 1993 and 1997, and between 1997 and 2000 by some additional 64,000 (i.e. 25%), whereas electricity production stagnated from 1997 until 1999. In Austria, the number decreased from some 30,400 by the end of 1990 to 24,000 by the end of 1999 (end of 1997: 26,500). This rationalisation may have its own social cost as, for example, most of the demonstration projects and free consulting services offered to small customers regarding a more efficient use of energy have been stopped. Other options for cost savings, such as diminished technical redundancy in the grid, reduced maintenance, and phasing out of power generation plants have also been taken up by the companies.

8 Impact on CHP and power from (new) renewables – importance of adequate boundary conditions

Co-generation of heat and power (CHP) has a long tradition in the two countries studied, both in industry as well as in district heating. The low electricity prices for large industrial customers during the last few years, however, led to a 20% decline of co-generated electricity in the German industry between 1995 and 1999 alone. According to a survey undertaken in mid-2000, the declining trend is continuing (Vierthaler 2000). The decline was most pronounced in the steam turbine technologies (-30% for back pressure turbines, -23% for extraction condensing turbines), whereas gas turbines (+10%) and engine-driven plants (+55%, though from a low level) experienced considerable growth (VIK 2001). The decline of co-generated electricity was also influenced by structural changes towards less energy-intensive industries. In contrast, the share of co-generated electricity in Austria increased by 22% to 14.3 TWh (equivalent to 24.8% of total electricity generation) during the same period (Eurostat 2001).

In Germany, on 11 May 2001 five associations agreed upon a compromise on a bonus system for electricity produced by co-generation and fed into the grid (voluntary agreement, approved of by the government). The bonus (1.5 to 1.25 ¢EUR/kWh) and its duration (4 to 8 years) depend on the construction year of the co-generation plant and the year of repowering. It is claimed in the declaration that the bonus will contribute to an additional electricity production of some 55 TWh p.a. in 2010, reducing Germany's CO2 emissions by some 11 million tonnes. The cost of the bonus is estimated to be about EUR 4 billion and to increase electricity prices for all customers by 0.1 ¢EUR/kWh (E&M 2001b). Electricity used within the co-generating companies will not be eligible for the bonus, an important drawback relative to a quota and a certificate system that the German government originally wanted to implement as a market-oriented instrument.

In order to maintain innovative developments in the use of renewable energies, which commonly exhibit substantially lower external cost, the German parliament decided upon a law on buy-back rates for electricity from renewables in 1999 (EEG 2000) that guarantees certain feed-in prices for electricity based on renewables, and that particularly helped to sustain the rapid development of wind power use in Germany in a liberalised market environment. And while the feed-in law for electricity from renewables was extremely successful in supporting wind energy diffusion in Germany, it nevertheless contributed an extra 0.2 ¢EUR/kWh to the bills of the electricity users. In Austria, feed-in tariffs have been used for quite some time by the provincial governments for the promotion of renewable energy technologies. The new electricity act (ElWOG 2000) contains an increasing quota target for non-hydro-based renewables (1% by Oct 2001; 2% by 1 Oct 2003; 3% by Oct 2005; 4% by Oct 2007, based on final electricity consumption) and, in combination with a tradable certificate system, another consumption-based fixed quota target of 8% for small-scale hydro power (≤10 MW).

9 Influence on cross-border electricity trade volumes – profits and troubles?

Concerns have been raised that the opening of the electricity market in Western and Central Europe may at least in some countries induce major changes in the electricity trade balances. Particularly, imports from France and Central European producers, or even cheap electricity from Russia, have been identified as a potential threat to German and Austrian electricity producers. The capacity of the ten accession countries Bulgaria, Czech Republic, Estland, Hungary, Latvia, Lettland, Poland, Romania, Slovak Republic, and Slovenia accounts for approximately 20% (112 GW) of the power generation capacity of the EU-15 in 1999 (561 GW). Most of the Eastern European countries have excess capacities, albeit most of the capacity is neither very efficient nor very reliable, and in most countries (except perhaps in the Czech Republic) rather polluting.

A very recent analysis on the future development of cross-border electricity trading patterns in Germany, however, concluded that net imports may actually increase up to only 8% in 2005 and can be expected to decrease thereafter (Bradke et al. 2001). In line with this and other studies (e.g. Prognos/EWI 1999, 2000) and our own assessment we do not expect the German or Austrian power trade balance to deteriorate significantly. There are several reasons: Transmission losses are significant. Over time, the age structure of the power plants in Europe will converge significantly, making foreign trade of base and medium load power less attractive. Moreover, due to the continued integration of the European power market and the environmental obligations to the accession countries, similar generation cost in the Central European countries can be expected. Due to a large potential in hydro-based (peak) power production, Austrian generators, just like the Swiss, are in a favourable position in this respect. The possible increase in net imports will only partially be influenced by increased imports, but also by reduced exports. Also, import levels in the coming decade will strongly depend on actual electricity demand; traditionally importing countries such as Italy (from France) are not likely to increase their generating capacity above the growth of their electricity demand. The changes in electricity trade are, to varying degrees, severely restricted by current cross-border transmission line capacities, which are unlikely to be substantially increased in the near future due to their high capital intensity (and the related high investment risk). Finally, the risk inherent in building long-distance transmission lines from Russia to Western Europe is further aggravated by the yet unknown diffusion rates of the fuel cell technology in Western and Central Europe over the next 20 years ("virtual power plants").

10 Conclusions

Although the introduction of competition and the establishing of a fair level playing field (non-discriminatory market access, transparency) are cornerstones of a successful liberalisation policy, the initial "endowments" of countries in terms of the traditional structure of the industry, the institutional framework, the political circumstances, the domestic power resources available, and the aptitude for swift adjustments of both industry and regulatory bodies seem to be all too often neglected in the analysis and discussion. The following important trends could be identified in the analysis:

- The surplus generating capacity of some 10 to 15% will disappear within a few years; capital-intensive, large-sized generating technologies (e.g. nuclear or hydro plants), although in a currently quite comfortable position, have less chances in the future due to the high investment risks in an at least partially saturated market, and subject to structural change by innovations such as fuel cells and micro-turbines, and to non-polluting and decentralised electricity generation from renewables (e.g. wind, geothermal, biomass) with relatively low external cost;
- Without political intervention, co-generation is likely to suffer in the adaptation period because of low industrial electricity prices based on short-term marginal cost calculations (which often may be less than the variable cost of co-generators), back-pressure steam turbines are specifically in danger; in the longer term, co-generation may have a brighter future, envisioning a widespread use of fuel cells (virtual power plants);
- The transition phase in an instantly opened electricity market with some overcapacities may be in the order of four to five years, before prices tend to be based again on long-term marginal cost, whereas the trend of mergers and acquisitions of companies and other concentration processes (and thus the need for consoli-dation of business units) will last much longer;

- Companies with large financial resources, particularly nuclear power operators, can develop substantially more market power and benefit more from the liberalised market than small utilities (economies of scale, purchase power); further, it is not clear whether national and international antitrust bodies will in the long run be able to effectively avoid market power abuse by new oligopolistic market structures;
- The substantial rationalisation of labour (by at least one third of the workforce under a monopolistic power generation and retail market structure) occurred at the expense of energy efficiency/energy saving consul-ting activities for small consumers and cross-financing of non-profitable public ser-vices, as well as to re-duced spending in RD&D projects;
- Offers for energy services, such as contracting for bigger customers, will continue to be drastically increased to bind large consumers for longer periods to electricity (and gas) deliveries.

After the breakthrough at COP-6bis in Bonn to salve and in 2002 to eventually ratify the Kyoto Protocol, present activities of CO2 mitigation are likely to be reinforced, and more energy-efficient and/or less carbon-intensive electricity generation and use may receive increased attention in the future. This in turn may have a substantial impact on the service portfolio of electric utilities, on the prospects for decentralised power generation options and efficient electricity use, and the export opportunities for highly efficient technologies to industrial and developing countries ("leapfrogging"), especially to those in the process of opening their electricity markets.

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