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Power Generation Market Concentration in Europe 1996-2005. An Empirical Analysis

Berlin, February 2007

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Summary

The liberalisation of the European power market has significantly changed the framework of the electricity industry. The process of market opening and securing fair, transparent and sustainable third party access is still underway. However, (incomplete) liberalisation can be thwarted by concentration trends in the electricity generation market.

This study analyses the market concentration trends in six regional markets in Europe from 1996 to 2005 based on different methodological approaches.

The analysis shows two very different development patterns. On the one hand, the market concentration in the United Kingdom has decreased significantly in recent years and has led to electricity generation markets which could be described as unconcentrated, similar to the Scandinavian power production market. On the other hand, market concentration and its trends are occurring in all other regions. In markets which are characterised by former centralised state monopolies, the concentration indicators remain very high. Furthermore, especially in the German market, which is historically characterised by a diversity of power generation, mergers have pushed the concentration indicators to levels which are increasingly critical.

Given this background, it is necessary to create stricter competition rules in the electricity markets as a necessary counterbalance to these developments. Key elements of this approach are a stricter unbundling, a premium for decentralised power generation taking into account long-term avoided network costs, the elimination of other market distortions (decommissioning funds, etc.) as well as disinvestment obligations for market-dominating generators.

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1 Methodological Framework

There are different approaches to measuring market concentration. In this study, two different methodologies were combined.

Firstly, an analysis was undertaken to identify the different market *concentration ratios* (CR) levels. The concept of concentration ratios is used extensively by the German Federal Cartel Office and other authorities.[1] The *concentration ratio* CR_n is defined as the market share of the n largest undertakings competing in the market.

$$CR_n = \sum_{i=1}^{n} x_i$$

CR_n *concentration ratio for n largest undertakings competing on a certain market*
x_i *market shares of the undertakings*

The concentration ratio is used by the German Federal Cartel Office following the guidelines provided by the Act against Restraints of Competition (Section 19, No. 3)[2]:

"*An undertaking is presumed to be dominant if it has a market share of at least one third. A number of undertakings is presumed to be dominant if it*

1. *consists of three or fewer undertakings reaching a combined market share of 50 percent, or*
2. *consists of five or fewer undertakings reaching a combined market share of two thirds,*

unless the undertakings demonstrate that the conditions of competition may be expected to maintain substantial competition between them, or that the number of undertakings has no paramount market position in relation to the remaining competitors."

Secondly, the *Herfindahl-Hirschman Index* (HHI) is another widely accepted indicator of market concentration which takes into account the relative size and distribution of the companies in a market. It is calculated by squaring the market share of each firm competing in the market and then adding together the resulting figures.

$$HHI = \sum_{i=1}^{m} x_i^{\,2}$$

HHI *Herfindahl-Hirschman Index*
x_i *market shares of the undertakings*
m *number of undertakings competing on a certain market*

[1] The concentration ratio indicator was also used in the USA until 1982, when the Herfindahl-Hirschman Index (HHI) was introduced instead of CR4 (market share of the four largest undertakings on a certain market).

[2] http://www.bundeskartellamt.de/GWB01-2002.pdf

The U.S. Department of Justice states that[3]

"Markets in which the HHI is between 1000 and 1800 points are considered to be moderately concentrated, and those in which the HHI is in excess of 1800 points are considered to be concentrated. Transactions that increase the HHI by more than 100 points in concentrated markets presumptively raise antitrust concerns under the Horizontal Merger Guidelines issued by the U.S. Department of Justice and the Federal Trade Commission."

In Table 1, the specific levels derived from these definitions and used in this study for the different concentrations indicators are presented.

Table 1 Critical levels for concentration indicators

Concentration Ratio CR	Herfindahl-Hirschman Index HHI
Market dominance is presumed if CR1 > 33,3 % CR3 > 50 % CR5 > 66,7 %	Unconcentrated: HHI < 1,000 Moderately concentrated: 1,000 < HHI < 1,800 Highly concentrated: HHI > 1,800

A key issue for the analysis of market concentration is the definition of the relevant markets. However, there is no consensus in the scientific debate on relevant markets, as some analysts insist on national markets as the relevant ones while others argue that a more regional view is appropriate.

In this study a mixed approach has been used. For some countries the analysis was carried out for the national market first and then combined with other countries in a second step. The grouping of national markets followed the physical flows of electricity related to the volume of the national electricity markets according to the most recent data published by the Union for the Co-ordination of Transmission of Electricity (UCTE). Based on this data, the following regional markets for electricity generation were identified:

- United Kingdom
- Denmark, Sweden, Norway and Finland (Scandinavia)
- Spain and Portugal
- France, Belgium, the Netherlands and Luxembourg[4]
- Germany (with a special focus on the national market), Austria and Switzerland
- Italy, Austria and Switzerland.

[3] http://www.usdoj.gov/atr/public/testimony/hhi.htm

[4] The Netherlands and Luxemburg could also be classified with the regional market of Germany, Austria and Switzerland. However, this different classification would not significantly change the results of the analysis.

Subsequently, an analysis was carried out for continental Europe which considered France, Belgium, the Netherlands, Luxembourg, Germany, Austria, Switzerland and Italy. It should be pointed out, however, that this approach is more of a theoretical one given the background of today's reality.

The calculation of market shares in power generation was carried out in a way that took direct control on power generation into account. If detailed data were available, the power generation of undertakings which are owned partly by other firms was counted separately and was *not* ascribed to the shareholders.[5] The power generation of single power plants owned by different utilities was, however, differentiated according to the ownership structure. As a result of these assumptions, the analysis can be characterised as a conservative one.

The data for power production of the different undertakings were derived from annual reports, sector statistics and other statistical materials, which were compiled in the Öko-Institut's power generation database. The quantification of the different national power generation markets is based on data from Eurostat, UCTE, Nordel and national statistical offices (see Table 2). All analysis is based on net power generation.

This study does not cover the accession countries. For an analysis of these countries, a more complex approach is needed which would take into account the liberalisation and privatisation process – still underway in some countries – as well as the more complex ownership structures.

Last but not least, the focus of this study is the power generation market. An analysis of the concentration trends in electricity distribution as well as the fast-growing integration of power and gas markets is increasingly important, but exceeded the resources available for this analysis.

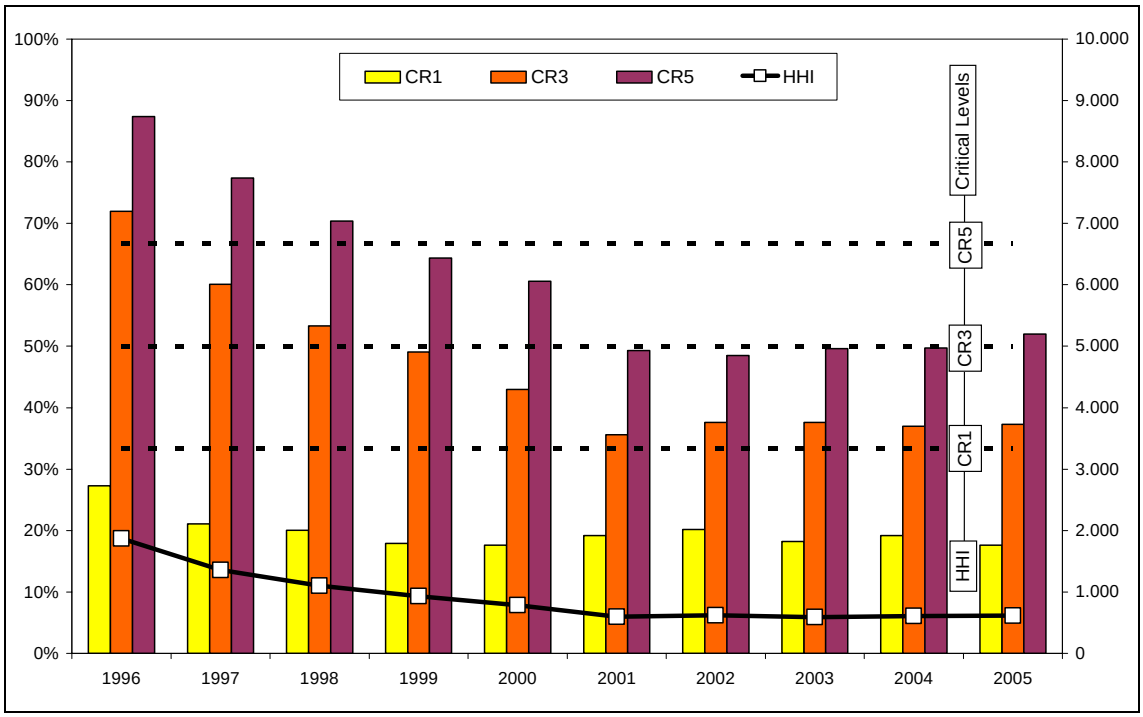
[5] See Table 4 for more details on the ownership structures of the main European power generators.

2 Market Concentration in Different Regions

2.1 United Kingdom

Electricity generation increased significantly in the UK between 1990 and 2005 as well as from 1996 to 2005. In 2004 about 382 TWh were generated, which is 27.7 percent more than in 1990 and 16.0 percent higher than in 1996. The electricity market in Great Britain was the first and most strictly liberalised market in Europe. Market liberalisation was linked to privatisation which covered most of the non-nuclear generators. According to the Department of Industry, the number of major electricity generators increased from 6 before privatisation to 11 in 1991 and 33 in mid 2001. The big generators were urged to disinvest and a number of new Combined-Cycle Gas-Turbine (CCGT-) based generators now operate more than one power plant. The dramatic changes in the electricity sector led to a drop in concentration indicators in recent years. Whereas CR3, CR5 and HHI exceeded the critical levels in 1996, the power generation market in the United Kingdom can be characterised as unconcentrated since the year 1999.

Figure 1 *Power generation market concentration in the United Kingdom, 1996-2005*



Source *Öko-Institut calculations*

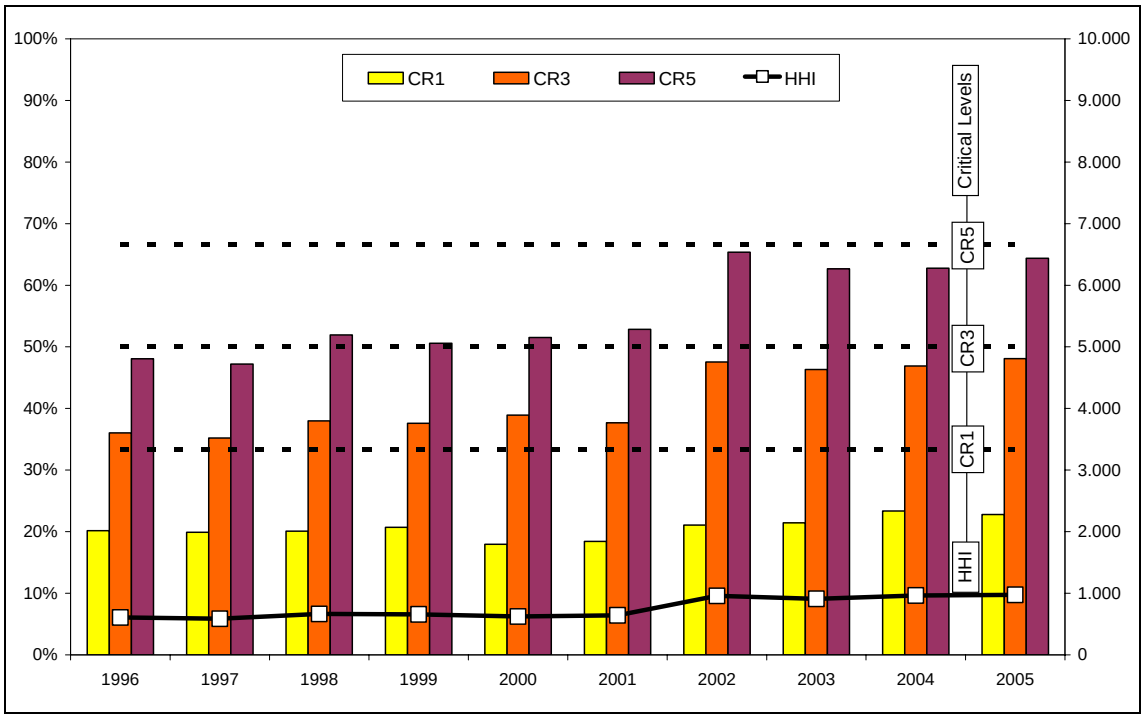
The major players in the power generation market of the UK in 2005 were British Energy (67 TWh), E.ON UK (37 TWh), RWE npower (33 TWh), EDF Energy (23 TWh), Scottish and Southern Energy (38 TWh), Scottish Power (18 TWh) and BNFL (14 TWh).

2.2 Scandinavia

Electricity generation in Scandinavia totalled about 394 TWh in 2005. Compared with 1990 this is an increase of about 16.1 percent. Since 1996, power generation has expanded by 10.2 percent there.

The Scandinavian power market is characterised by diversified structures and a high level of competition. Neither the CR indicators nor the HHI exceeded the critical levels. Nevertheless, the acquisitions of Fortum and Sydkraft/E.ON Nordic resulted in a slight increase of the market concentration indicators.

Figure 2 *Power generation market concentration in Scandinavia, 1996-2005*



Source *Öko-Institut calculations*

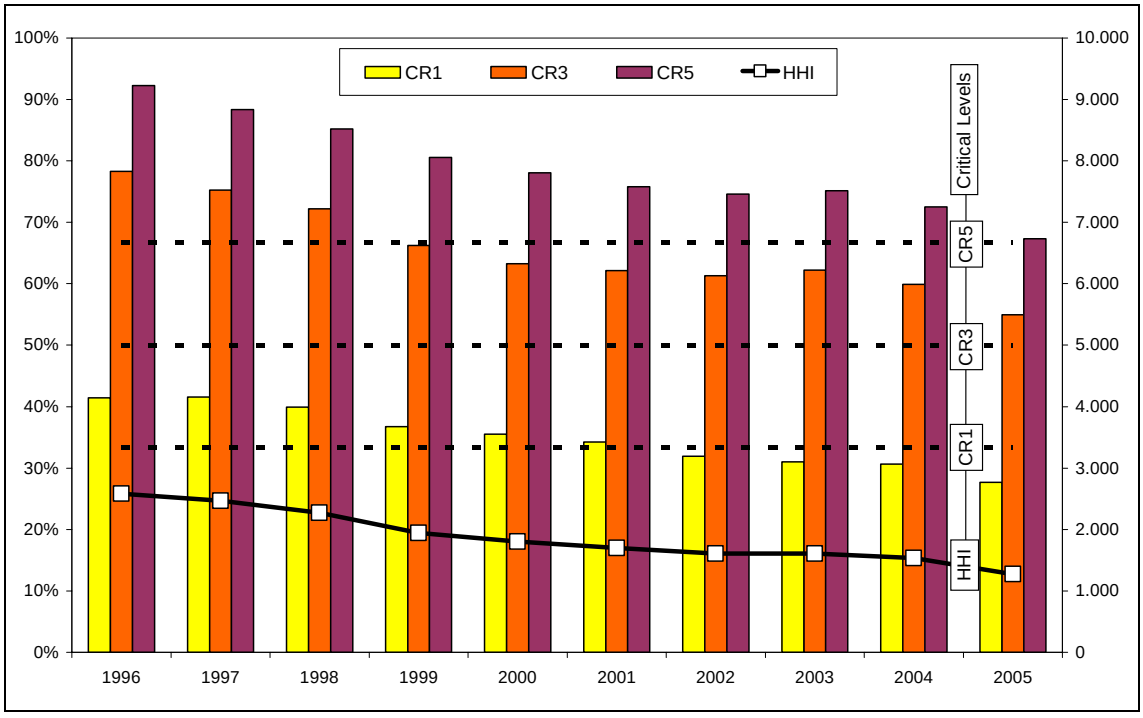
The major players in the Scandinavian power generation markets are the Swedish Vattenfall (90 TWh), Fortum of Finland (51 TWh), the Norwegian Statkraft (49 TWh) and E.ON Nordic (33 TWh).

2.3 Portugal and Spain

Power generation in the Iberian Peninsula is a rapidly growing market. The electricity generation in 2005 (about 338 TWh) was 96.8 percent higher than in 1990 and has increased by about 68.6 percent since 1996.

Although the concentration indicators show a slightly declining trend, all indicators remain above the critical levels. The sensitivity analysis clearly shows that this situation would not change even if increased electricity imports are assumed. Given the background of the large increase in power generation, the downward trend is a result of the overall growth of electricity production being somewhat higher than the generation growth of the major power producers.

Figure 3 *Power generation market concentration in Portugal and Spain, 1996-2005*



Source *Öko-Institut calculations*

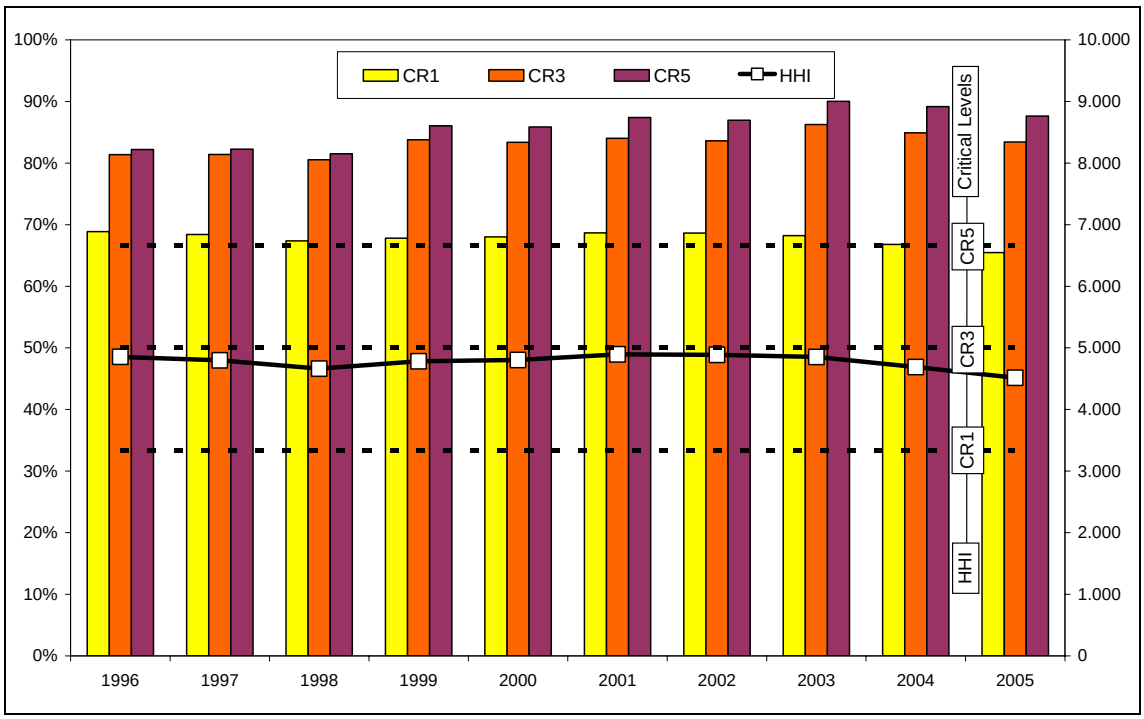
The power generation market in Spain and Portugal is dominated by Endesa and Iberdrola of Spain (94 TWh and 64 TWh), which generate about half of the total electricity. The other large generators are Union-Fenesa, Hidrocantábrico (29 and 17 TWh, both of Spain) and Electricidade de Portugal (25 TWh).

2.4 France, Belgium, the Netherlands and Luxembourg

The power generation market of France and the Benelux countries is largely dominated by developments in France. In 2005 the power production in the four countries amounted to 735 TWh – representing an increase of 36.4 percent compared to 1990 levels and 13.7 percent compared to 1996 levels. Three quarters of the power generation in 2005 came from France.

The French power generation market dominates the development of the concentration indicators. All indicators significantly exceed the critical levels and no trends of substantial changes can be observed.

Figure 4 *Power generation market concentration in France, Belgium, the Netherlands and Luxembourg, 1996-2005*



Source *Öko-Institut calculations*

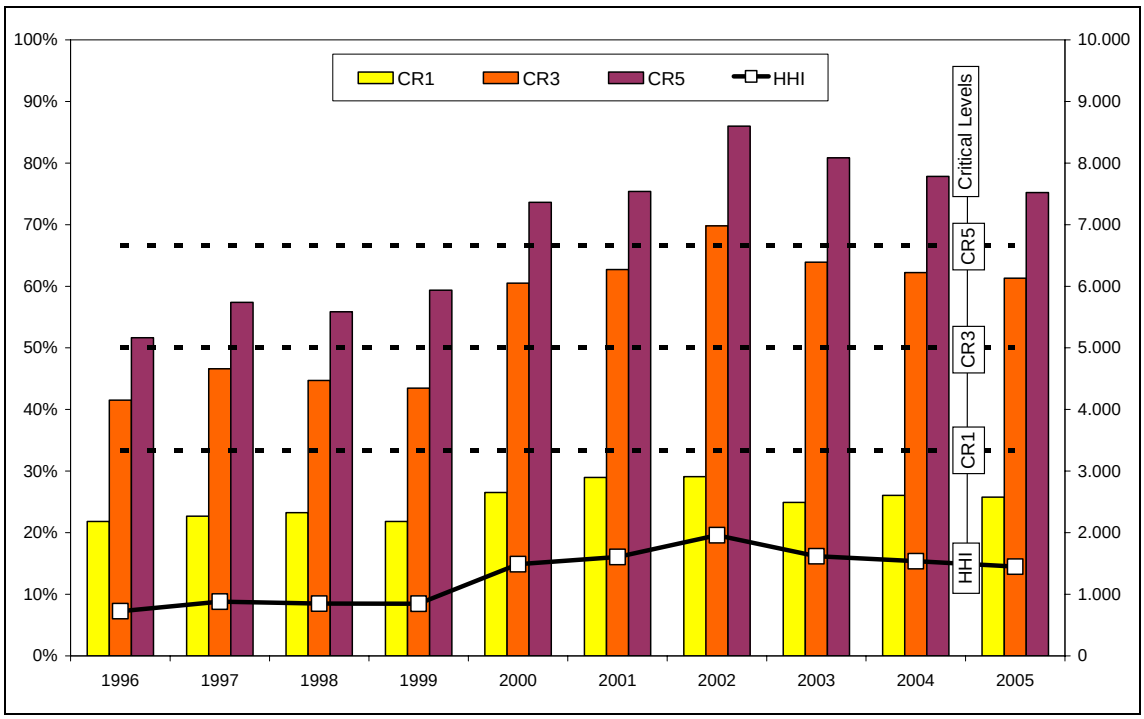
The main players in the power generation market in France and the Benelux countries are Electricité de France (481 TWh) and Electrabel (89 TWh). Although some other undertakings generate significant amounts of electricity (the French CNR - Compagnie Nationale du Rhône and Essent in the Netherlands), they only play a minor role in the overall market. This can be seen very clearly from the small differences between the indicators CR3 and CR5. Not surprisingly, generators from Luxembourg are less relevant in the regional market.

2.5 Germany, Austria and Switzerland

The 692 TWh power generation market in this region is clearly dominated by Germany. In 2005, the German 577 TWh electricity production was about 13.2 percent greater than in 1990. The increase from 1996 to 2005 amounted to 11.8 percent.

Whereas the concentration indicators were below the critical levels historically, CR3 and CR5 have exceeded the critical levels in the meantime as a result of the mega mergers of EnBW (EVS and Badenwerk), E.ON (VEBA and VIAG), RWE (RWE and VEW) and Vattenfall Europe (HEW, Bewag, VEAG and LAUBAG). Following this, the HHI accounted for more than 1,450 which is in the upper range of a moderately concentrated market.[6]

Figure 5 Power generation market concentration in Germany, 1996-2005



Source Öko-Institut calculations

The major German electricity generators are RWE and E.ON (149 to 119 TWh annually in Germany) and Vattenfall Europe (76 TWh). The power production of EnBW in Germany amounts to 55 TWh. However, it should be noted that RWE, E.ON and EnBW have contracted significant additional power plant capacities. If these contracts are taken into account, the power production controlled by RWE amounted to 181 TWh in 2005. The total production of E.ON in their own power plants and in the contracted

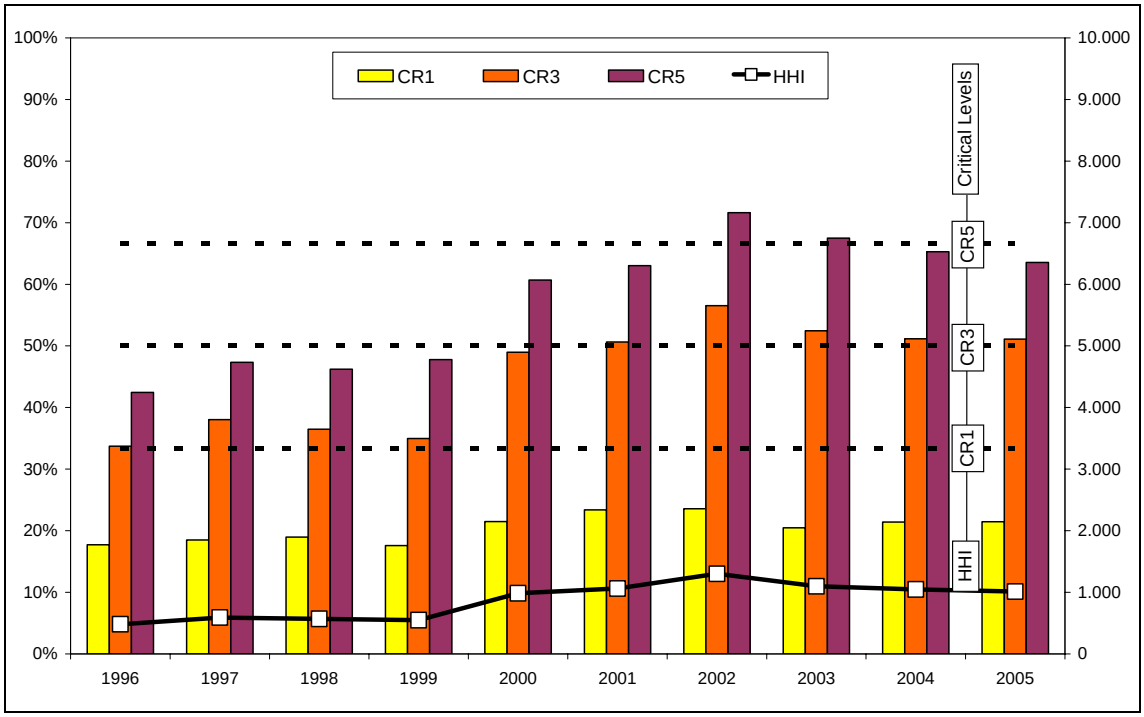
[6] The extreme level of all indicators in 2002 is caused by exceptionally high power production by E.ON in 2002.

ones was about 130 TWh and the total supply to EnBW from their own power plants and those of EdF amounted to 74 TWh in 2005.

As a result, the concentration indicators shown in Figure 5 represent a more conservative approach. If the total power plant capacity controlled by RWE, E.ON and EnBW is taken into account, the CR1 would increase from 0.26 to 0.31, the CR3 would grow from 0.60 to 0.67, the CR5 would amount to 0.84 instead of 0.74 and the HHI would indicate a highly concentrated market (1,840 points).

If a wider view on the relevant markets is taken, the concentration indicators do not reach the critical levels today on the one hand, but nevertheless show the same growth trend. From 2001 onwards, CR3 exceeded the critical level. Once again, if the additional power plants controlled by RWE, E.ON and EnBW are taken into account, all main indicators exceed the critical levels.

Figure 6 *Power generation market concentration in Germany, Austria and Switzerland, 1996-2005*



Source *Öko-Institut calculations*

Besides the large German generators, only the Austrian Verbundgesellschaft (29 TWh) and AXPO of Switzerland (31 TWh) play an important role among the major power producers in the region.

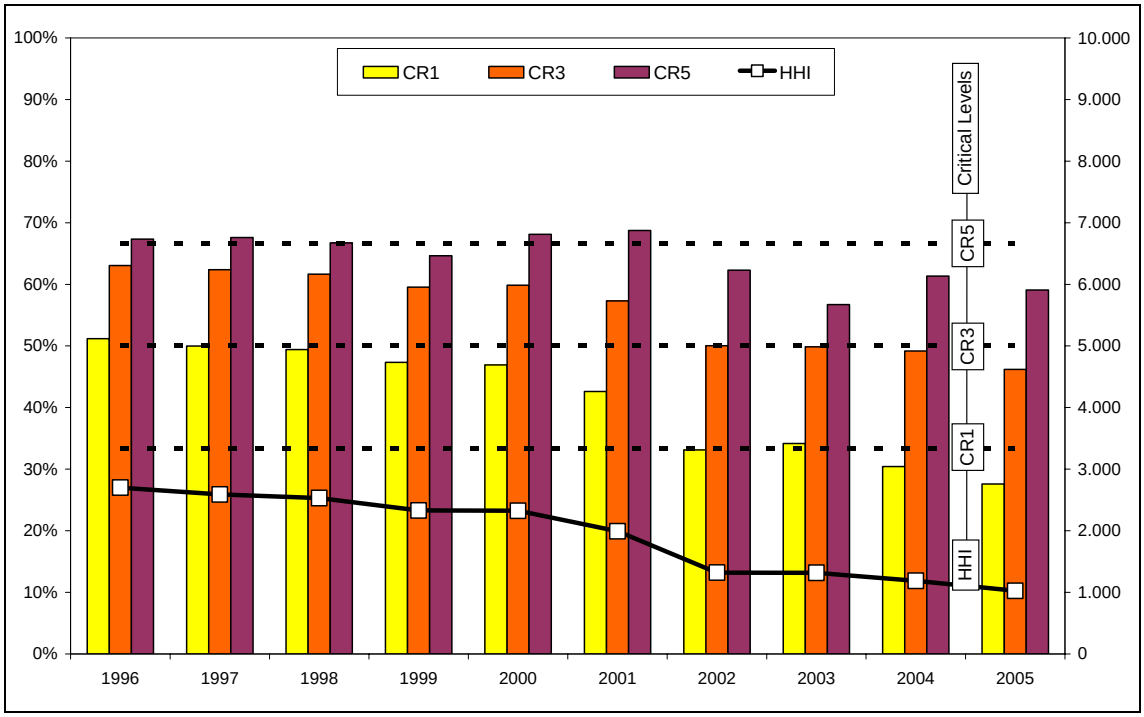
2.6 Italy, Switzerland and Austria

The total electricity generation in the regional market of Italy, Switzerland and Austria was 406 TWh in 2005, of which 291 TWh was produced in Italy. The regional market expanded from 1990 to 2005 by about 31.8 percent and from 1996 to 2000 by about 19.2 percent. Power production in Italy accounts for more than two thirds of the regional market. The increase in power generation in Italy between 1990 and 2005 as well as between 1996 and 2005 was significantly above the regional trend.

The concentration indicators only show small changes between 1996 and 2001. From 2002 onwards, all indicators show a significant decrease. In 2004 CR1, CR3 and CR5 dropped below the critical levels, whereas HHI indicates an almost unconcentrated power generation market. The main reason for this trend are major disinvestments of the former monopoly ENEL.

However, it should be noted that significant amounts of electricity are exported from France to Italy (see Table 3).

Figure 7 *Power generation market concentration in Italy, Switzerland and Austria, 1996-2005*



Source *Öko-Institut calculations*

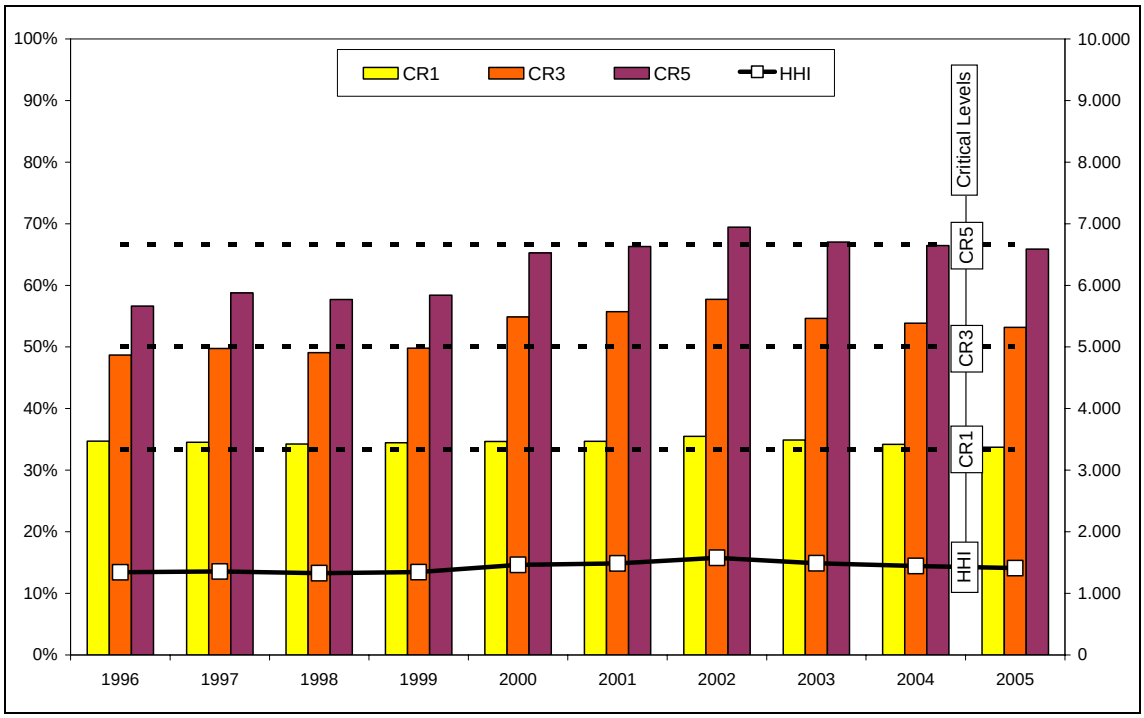
The regional market is dominated by Italy's ENEL, which generated 112 TWh in 2005. The other large generator in Italy that is undergoing considerable growth is Edison, which produced 45 TWh, followed by Endesa Italia (23 TWh) and Enipower (22 TWh). Last but not least, it should be noted that EdF of France directly and indirectly holds the majority of the shares in Edison.

2.7 A Theoretical Approach: France, Belgium, the Netherlands, Luxembourg, Germany, Switzerland, Austria and Italy

The continental power generation market of France, the Benelux countries, Germany, Austria, Switzerland and Italy is more of a theoretical approach than a market reality. The generated power in these eight countries amounted to 1,717 TWh in 2005, which is equivalent to a 26.6 percent increase from 1990 to 2005 and a 14.3 percent growth between 1996 and 2005. About two thirds of the total generated power came from France and Germany.

The concentration indicator CR1 illustrates the dominant role of EdF in the continental power market, which exceeds the critical level of 33 percent. In the real market, EdF's power should be even larger because German EnBW and Edison of Italy are partly owned by EdF, which will increase the concentration indicators. In particular, the additional power generation capacities controlled by RWE will increase the indicators CR3, CR5 and HHI.

Figure 8 *Power generation market concentration in France, Belgium, the Netherlands, Luxembourg, Germany, Switzerland, Austria and Italy, 1996-2005*



Source *Öko-Institut calculations*

The increase of CR3 and CR5 underlines the significant influence of the mergers in Germany. As a result, CR3 and CR5 exceeded the critical levels in 2000. HHI indicates a moderately concentrated market in the upper range of concentration (about 1,400

points) even in this more theoretical case of a large integrated market for power generation in continental Europe.

Again, if the links between the companies (EDF and Edison and EnBW, contracted power generation of E.ON and RWE, etc.) are considered, all concentration indicators are higher than indicated in Figure 8 and reach or exceed the critical levels.

3 Conclusions and Recommendations

The analysis leads to a clear picture of market concentration in the liberalised power generation markets in Europe.

Electricity production in the United Kingdom and in Scandinavia can be characterised as unconcentrated because of the developments in recent years; however, in all other regions market concentration and its trends are critical.

In the markets characterised by former centralised state monopolies, the concentration indicators remain very high. The situation in Spain, Portugal and Italy, where a decrease of market concentration can be observed, does not lead to a significantly different situation than in France and the Benelux countries where nearly no changes can be measured.

Furthermore, especially in the German market, which is historically characterised by a certain diversity of power generation, the mega mergers pushed the concentration indicators to levels which must be seen as critical.

Taking into account the challenge of developing fair, transparent and sustainable energy markets in Europe, several conclusions can be drawn:

- the remaining market concentration in the field of power generation has to be seen as endangering fair, competitive and sustainable energy markets;
- breaking old monopolies and avoiding new concentration trends in the generation sector must be a central issue for competition policy in the energy sector;
- the high levels of market concentration in the generation sector could partly be compensated by extremely transparent and coherent rules for third party access which favour independent power producers and newcomers in the market;
- additional measures to decrease market concentration in the power generation sector should attract more attention.

Regarding the last issue the following subjects should be addressed:

- Strict unbundling of generation, transmission and distribution is a key issue. Further activities on an EU level should tackle ownership unbundling for the transmission networks as the main priority.
- Decentral power generation should receive a premium for long-term avoided network costs, avoided network charges and avoided network losses.
- Additional market distortions (availability of decommissioning funds for activities in the market, fuel cycle cost obligations, liability issues, etc.) between electricity generators should be removed.
- The existing and more or less successful approaches to urge market-dominating companies towards disinvestments (e.g. in the UK and Italy) or equivalent measures (virtual power plant auctions in Belgium, France etc.) should be strengthened and extended.

After a period in which the regulatory scheme for third party access was the main focus of market liberalisation in the European Union and significant progress was made in this direction as a result of sustained pressure from the European Commission, breaking the market concentration in the power generation must be seen as a new and urgent challenge for the Internal Market. If the market concentration in power generation cannot be reduced to below the critical levels, even a perfect design and a perfect regulation of the third party access to the networks will not be sufficient to establish and maintain a competitive market for electricity.

Against the background of increasing cross-border mergers and acquisitions (EdF, E.ON, etc.), the extension of interconnectors for cross-border electricity supplies will also not necessarily lead to more competitive market structures in the EU electricity markets.

In addition, the linkages between the progress in gas market liberalisation, the availability of natural gas supplies for new entrant investments and the importance of new entrants for decreasing market concentration in power production should feature prominently in future policies.

In the light of the considerable importance of market-based price signals in attracting investments in power generation, the recent efforts to eliminate market-based pricing for energy-intensive electricity consumers in different Member States (France, Germany, etc.) must be seen as extremely problematic as regards the development of a competitive Internal Market for electricity.

Last but not least, further in-depth evaluation of market concentration in the electricity sector that takes place on a regular basis and is differentiated by relevant markets as well as load segments should be seen as a key issue in the future improvement of the internal market for energy.

Table 2 Net electricity production in European countries, 1990-2005

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	TWh															
United Kingdom	299,4	302,7	299,2	304,0	307,9	316,6	329,7	329,1	344,3	351,7	361,0	367,6	370,3	380,9	378,2	382,4
Denmark	24,1	34,3	29,1	31,9	37,8	34,5	50,7	41,9	39,2	37,0	34,4	36,1	37,3	43,7	38,4	34,4
Sweden	142,9	143,5	142,8	142,4	139,4	144,2	136,6	143,2	153,8	150,8	141,9	157,6	143,2	132,5	148,5	154,8
Norway	120,8	110,1	116,5	119,3	112,5	122,5	104,1	111,1	116,1	121,7	142,4	121,2	130,1	106,8	109,7	136,8
Finland	51,6	59,2	55,0	58,0	62,2	60,6	66,4	66,2	67,3	66,7	67,3	71,2	71,6	80,4	82,2	68,1
Spain	144,6	148,4	150,9	149,4	154,5	159,5	167,4	182,2	187,2	199,2	215,2	228,2	235,3	252,3	268,7	292,6
Portugal	27,3	28,7	28,7	29,9	30,2	31,9	33,2	32,9	37,5	41,7	42,2	44,8	44,4	45,4	43,5	45,7
France	400,8	434,7	442,7	451,2	455,2	472,1	490,5	481,6	487,7	500,3	516,7	526,8	535,0	542,3	547,6	550,2
Belgium	67,2	68,1	68,2	67,2	68,6	70,6	72,4	75,1	79,5	80,9	80,2	76,1	78,1	80,8	81,5	82,0
Netherlands	69,5	71,8	74,5	74,0	76,7	77,7	81,8	83,1	87,4	82,9	86,0	89,9	91,9	92,9	96,6	98,3
Luxembourg	1,3	1,3	1,2	1,0	1,2	1,2	1,3	1,2	1,3	1,0	1,1	1,2	3,6	3,6	4,1	4,1
Germany	509,5	500,5	498,7	488,2	489,3	497,8	515,9	512,8	517,9	518,7	533,6	549,0	536,1	564,7	571,8	576,6
Austria	48,9	50,2	50,1	51,5	52,1	55,3	53,4	55,3	56,0	59,0	60,0	60,8	61,1	58,0	60,4	57,3
Switzerland	54,0	55,8	57,1	59,7	64,8	61,6	55,0	60,6	60,9	66,7	65,4	70,1	64,9	65,3	63,5	57,9
Italy	205,2	210,5	214,4	211,4	219,9	228,9	232,0	238,6	246,3	252,1	263,6	266,0	270,8	280,2	290,0	290,7

Sources Eurostat, UCTE, NORDEL, Öko-Institut calculations

Table 3 Net electricity imports in European countries, 1990-2005

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
		TWh															
United Kingdom		11,9	16,4	16,7	16,7	16,9	16,3	16,7	16,6	12,5	14,2	14,2	10,4	8,4	2,2	7,5	8,3
Denmark		7,0	-2,0	3,7	1,2	-4,8	-0,8	-15,4	-7,3	-4,3	-2,3	0,7	-0,6	-2,1	-8,5	-2,9	1,4
Sweden		-1,8	-1,3	-2,2	-0,6	0,3	-1,7	6,1	-2,7	-10,7	-7,5	4,7	-7,3	5,4	12,8	-2,1	-7,6
Norway		-15,9	-2,8	-8,7	-7,8	-0,1	-6,7	9,0	3,8	3,6	-1,9	-19,1	3,6	-9,7	7,9	11,4	-12,0
Finland		10,6	7,3	8,4	7,6	6,5	7,0	3,7	7,7	9,3	11,1	11,9	10,0	11,9	4,9	4,9	16,7
Spain		-0,4	-0,7	0,6	1,3	1,9	4,5	1,1	-3,1	3,4	5,7	4,4	3,5	5,3	1,3	-3,0	-1,0
Portugal		0,0	0,1	1,3	0,2	0,9	0,9	1,1	2,9	0,3	-0,9	0,9	0,2	1,9	2,8	6,5	6,8
France		-45,4	-52,9	-53,8	-61,4	-63,2	-69,8	-68,8	-65,4	-57,6	-63,1	-69,5	-68,4	-77,0	-66,4	-62,0	-60,3
Belgium		-3,7	-1,8	0,1	2,2	4,0	4,1	4,2	3,3	1,4	0,9	4,3	9,1	7,6	6,4	7,8	6,1
Netherlands		9,2	9,2	8,7	10,3	10,6	11,4	10,6	12,6	11,8	18,4	18,9	17,3	16,4	17,0	16,2	18,3
Luxembourg		3,9	4,0	4,0	4,1	4,5	5,0	4,9	5,2	5,4	5,6	5,7	5,6	3,4	3,7	3,4	3,3
Germany		0,8	-0,6	-5,3	0,9	2,3	4,8	-5,3	-2,3	-0,6	1,0	3,1	3,7	0,7	-8,0	-7,3	-8,5
Austria		-0,5	0,8	0,6	-0,7	-0,8	-2,5	1,0	-0,8	-0,2	-1,9	-1,4	0,2	0,7	5,6	3,1	3,0
Switzerland		-2,1	-2,3	-3,7	-7,1	-11,6	-7,0	-0,3	-6,3	-5,4	-9,3	-5,7	-9,4	-3,2	-1,8	0,8	7,5
Italy		34,7	35,1	35,3	39,4	37,6	37,4	37,4	38,8	40,7	42,0	44,3	48,4	50,6	51,0	45,6	49,1

Sources Eurostat, UCTE, NORDEL, Öko-Institut calculations

Table 4 Ownership structure of main European power generators

Country	Company	Main shareholders as of 31 December 2005[a]
Austria	Verbund	51% Republic Austria, 12.5% EVN, 10.62% Wienstrom, 7.2% TIWAG
Belgium	Electrabel	98.62% SUEZ
Denmark	Elsam	35.3% Vattenfall, 17.9% Sydvest Energie Net, 13.3% EnergiGruppen Jylland, 12% EM El
Denmark	Energie E 2	36.04% NESA, 34.0% Kobenhavn Energi Holding, 15.92% SEAS Transmission, 8.15% NVE net
Finland	Fortum	51.52% Finnish State
Finland	PVO-Group	42.04% UPM-Kymmene, 15.6% Stora Enso, 8.72% Kymppivoima Tuotanto, 7.52% Etelä-Pohjanmaan Voima
Finland	TVO	57.72% PVO, 26.5% Fortum Power and Heat [100% Fortum], 8.1% Oy Mankala Ab, 6.6% Etelä-Pohjanmaan Voima
France	CNR	49.95% Electrabel, 29% Caisse de Dépôts de Consignations (CDC), 21% municipalities
France	EdF[b]	87% French State, 10% institutional investors and individuals
Germany	E.ON[c]	3.6% Allianz SE, 2.5% State of Bavaria, 89% free float
Germany	EnBW	45.01% OEW (Zweckverband Oberschwäbische Elektrizitätswerke), 45.01% EdF
Germany	RWE	53% institutional investors, 31% municipalities, 16% private and employee sharholders (total free float 89%)
Germany	STEAG	100% RAG [39.2% E.ON, 30.2% RWE]
Germany	Vattenfall Europe	97% Vattenfall
Greece	PPC/DEI	51.12% Hellenic Republic
Ireland	ESB	95% Government of Ireland
Italy	Edison	17% EdF, 69% Transalpina die Energia (71% votes) [50% EdF, 50% Delmi [51% AEM Milano]]
Italy	Endesa Italia	80% Endesa, 20% ASM Brescia
Italy	ENEL	21.36% Italian Ministry of the Economy and Finance, 10.18% Cassa Depositi e Prestiti (a joint-stock company controlled by the aforesaid Ministry)
Italy	Enipower	100% Eni [20.31% Ministry of Economy and Finance, 6.99% Cassa Depositi e Prestiti]
Netherlands	Delta[d]	50% Zeeland (Dutch province), provincial authorities
Netherlands	Electrabel Nederland	100% Electrabel
Netherlands	Essent	100% seven Dutch provinces and nearly 140 municipalities
Netherlands	Nuon	44% Province of Gelderland, 13% Province of Friesland, 10% Province of Noord-Holland, 10% Municipality of Amsterdam
Norway	Statkraft	100% Norwegian State
Portugal	EDP	21% Parpublica (Participacoes Publicas), 5% Caixa Geral de Depositos, 6% Iberdrola (5% votes)
Spain	Endesa	9% Caja de Madrid, 5.7% Chase Nominees, 5.4% AXA
Spain	Iberdrola	7.5% Bilbao Bizkaia Kutxa, 5.42% Banco Bilbao Vizcaya Argentaria
Spain	Union-Fenosa	24.51% ACS (Actividades de Construcción y Servicios), 9.99% Corporación Caixa Galicia
Sweden	E.ON Sverige	55.3% E.ON, 44.6% Statkraft
Sweden	Vattenfall	100% Swedish State (via Vattenfall AB)
Switzerland	Axpo	18.43% Kanton Zürich, 18.41% Elektrizitätswerke des Kantons Zürich, 14% Kanton Aargau, 14% AEW ENERGIE AG, 12.5% St, Gallisch-Appenzellische Kraftwerke AG, 12.25% Elektrizitätswerk des Kantons Thurgau AG, 7.9% Kanton Schaffhausen
United Kingdom	BNFL	100% Her Majesty's Government
United Kingdom	British Energy[e]	14% Deutsche Bank
United Kingdom	Centrica[f]	4.64% Legal & General Group, 4.03% Barclays, 4.01% Petronas
United Kingdom	E.ON UK	100% E.ON
United Kingdom	EDF Energy	100% EDF
United Kingdom	RWE npower	100% RWE
United Kingdom	Scottish & Southern Energy	3.84% Barclays, 3.5% Legal and General Group
United Kingdom	Scottish Power	7.82% Capital Research and Management Company, 3.52% Legal & General Investment Management, 3.36% Barclays

Notes: [a] if not indicated otherwise. - [b] as of January 2006. - [c] as of October 2006. - [d] as of January 2007. - [e] as of October 2005. - [f] as of February 2006

Sources Company information, Öko-Institut research