The Cambridge-MIT Institute Electricity Project

SESSA

Electricity Liberalisation In The European Union:

Progress, Status, and Prospects

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Outline

- Introduction
- Assessing liberalisation
- Evidence from EU
- Conclusions

Questions?

- How should performance of electricity market be measured?

- What do these measures show for the EU electricity market?

Assessing Liberalisation

How Should Performance Be Measured?

- Properties of indicators: (Jamasb et al. 2004)
  - measurement unit;
    - difficulties of comparison,
    - degree of independence,
    - monetary units,
    - accounting standards,
    - composite indicators (are these useful?)

How Should Performance Be Measured? Contd.

– Indicators as proxies e.g. generation capacity for investment

– Stock and flow effects e.g. cumulative vs annual switching

– accelerating rate of change may be important e.g. in investment, sophistication of regulation

Criteria for Selecting Indicators

- Measurability
- Comparability & consistency across time and countries
- Data & aggregation level - e.g. national vs whole EU?
- Essentiality - what is really important
- Complementarity - collective usefulness

Council of European Energy Regulators

TOWARDS THE EUROPEAN ELECTRICITY MARKET

		1996 DIRECTIVE	2003 DIRECTIVE
GENERATION	MONOPOLY →	AUTHORISATION TENDERING →	AUTHORISATION (TENDERING)
TRANSMISSION DISTRIBUTION	MONOPOLY →	REGULATED TPA NEGOTIATED TPA → SINGLE BUYER	REGULATED TPA
SUPPLY	MONOPOLY →	FREE →	FREE
CUSTOMERS	NO CHOICE →	CHOICE FOR ELIGIBLE (≈ 1/3) →	ALL NON-HOUSEHOLD (2004) ALL (2007)
UNBUNDLING T / D	NONE →	ACCOUNTS →	LEGAL
CROSS-BORDER TRADE	MONOPOLY →	NEGOTIATED →	REGULATED

Source: CEER (2004)

What is the Objective of the EU in December 2007 (Directive 03/54)?

- Role of regulator strengthened
- Unbundling of TSO & DSO
- Generation - free entry
- Monitoring of supply
- 100% Market opening
- Promotion of renewable sources
- Single market?

Lessons from IO Literature on how to reform markets?

- Number of firms (+) and market shares (-)
  - Competitive generation and retail markets
- Entry barriers (-)
  - Freer entry to generation and supply
- Market size (+)
  - Increased and local market rules harmonised
- Regulation of natural monopoly networks
  - incentive based and independent

Experience of Electricity Markets

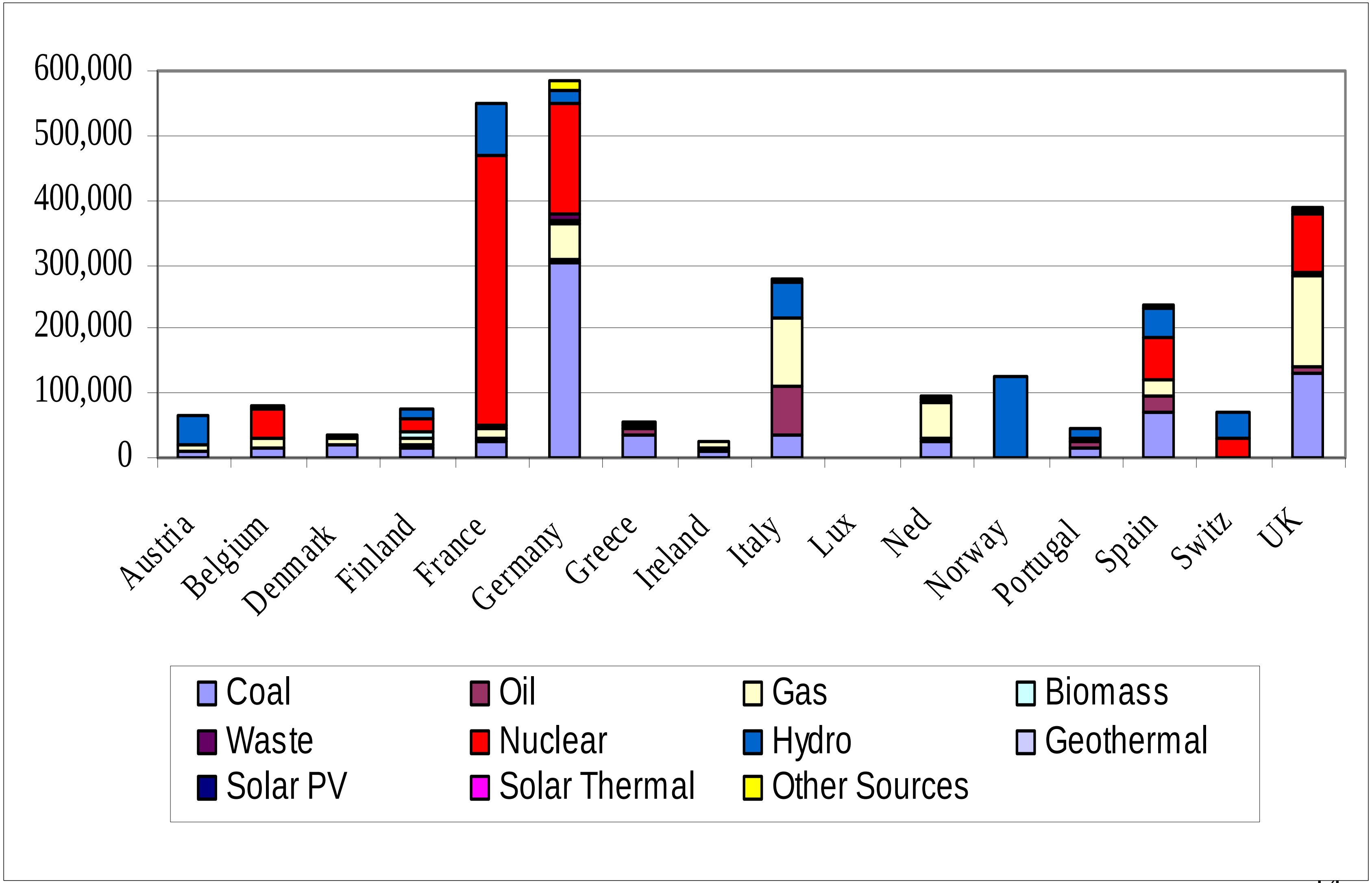
- Vertical integration a problem (e.g. Chile)
- Ineffective Regulation a problem (e.g. NZ)
- Collusion (or gaming) a problem (e.g. UK, California)
- Entry barriers a problem (e.g. France, Germany)
- Security of supply an issue (e.g. NY, Italy etc.)

Key Reform Indicators (Jamasb et al, 2004)

- Resource endowments
- Key reform steps
- Market structure
- Institutions & regulation
- Sector performance
- Firm performance
- Social impact
- Environmental impacts
- Economic impact

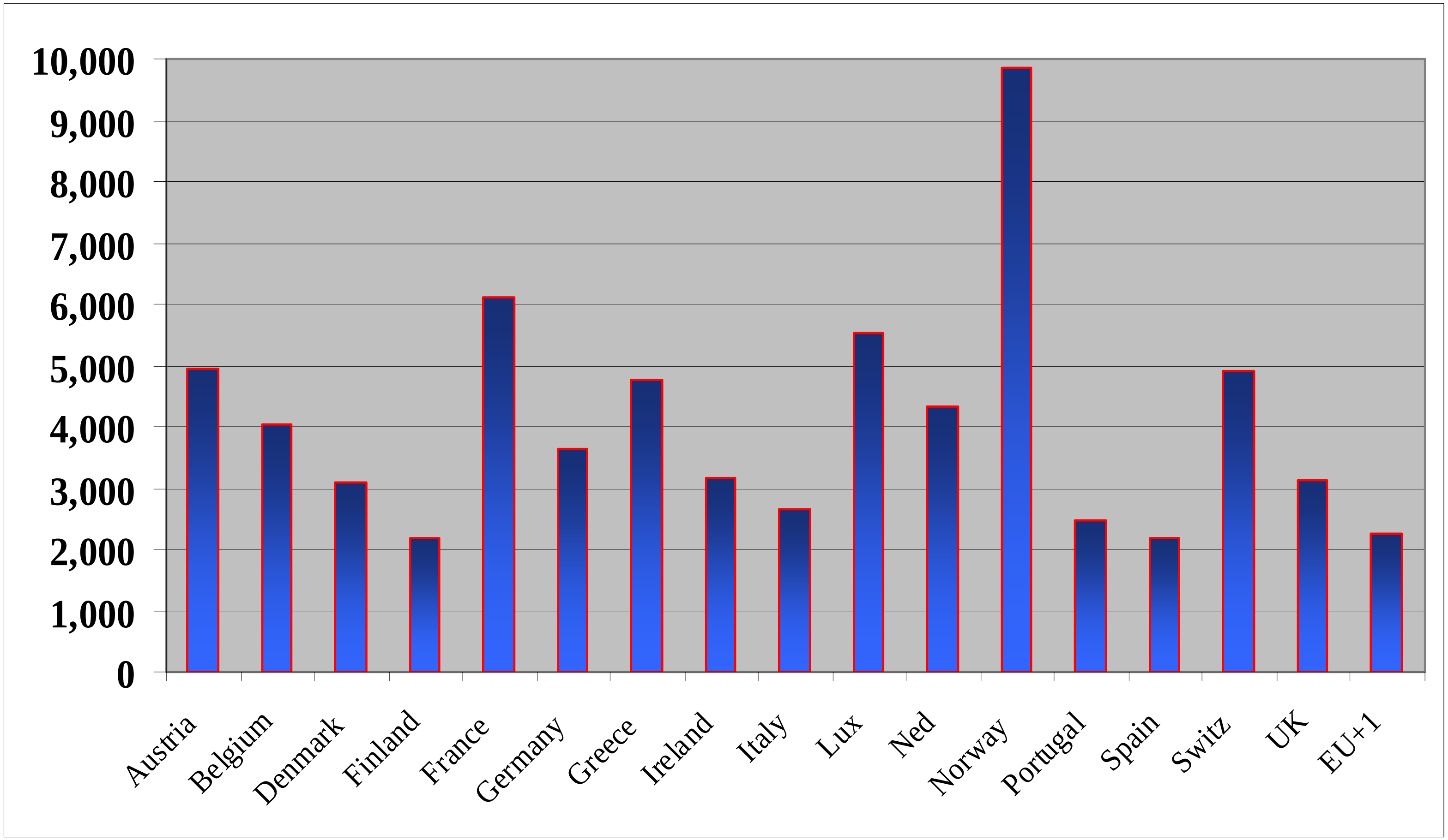
Resource Endowment

Electricity Supply by Source (GWh) 2002



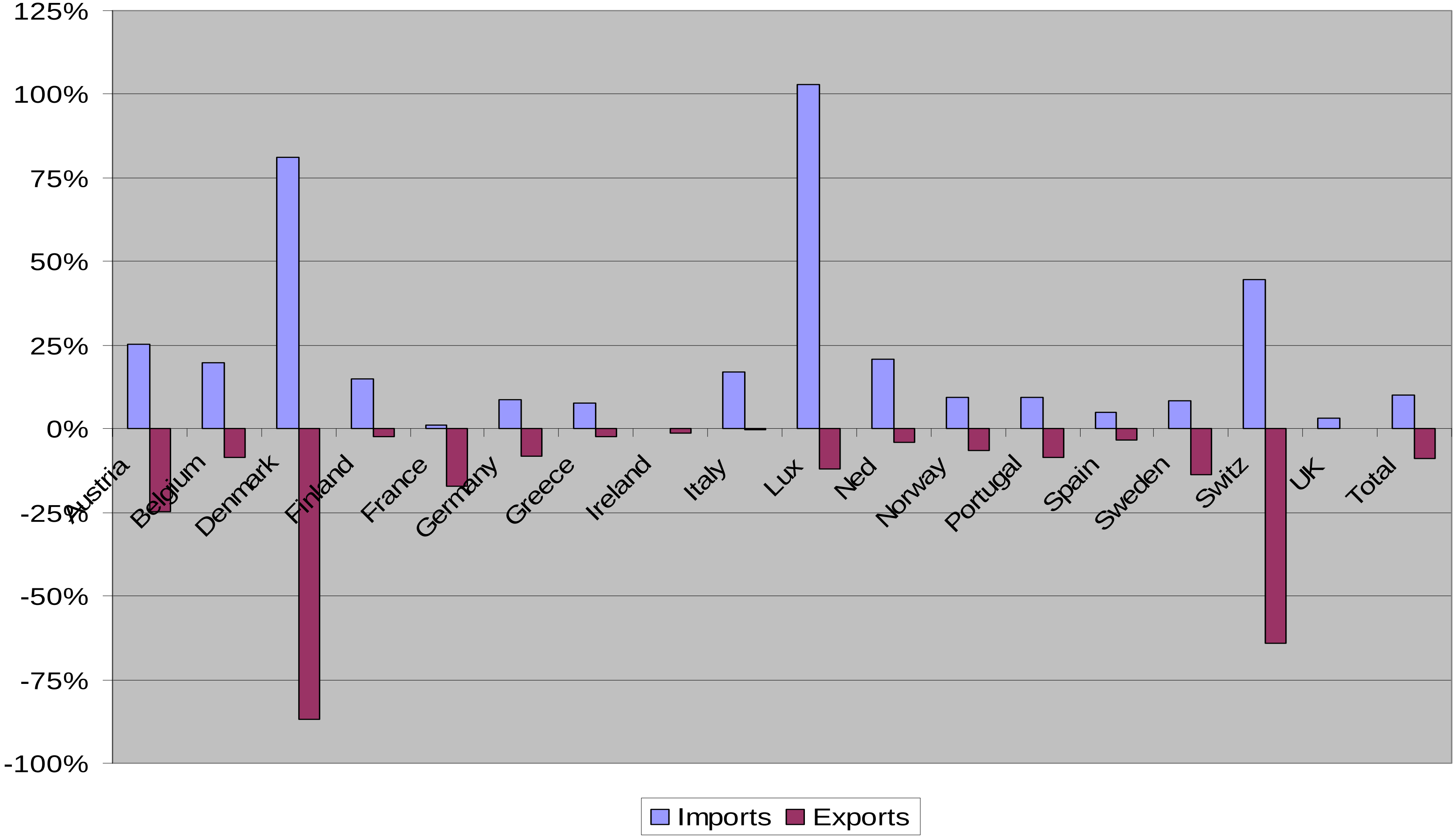
Source: IEA Online Database

Herfindahl Index - Generation Sources (2002)



Source: Based on IEA Online Database

Imports and Exports as % of National Consumption - 2001



Source: IEA Electricity Information 2003

Cross Border Exchanges in 2000 (TWh)

	Import flows	Export flows	Imports	Exports
	within EU15 + 2	thin EU15 + 2 TW	to EU15 + 2 TW	om EU15 + 2 TW
Austria	7.5	11.7	6.3	3.7
Belgium	11.5	7.3		
Germany	34.2	40.3	9.6	2.2
Denmark	8.4	7.8		
Spain	12.2	5.2	0	2.3
Finland	8.3	1	4.5	.
France	3.1	71.9		
Greece	0	0	1.7	1.5
Ireland	0.1	0		
Italy	40.4	0.4	4.5	0.1
Lux	6.4	0.7		
Neth	22.9	4		
Portugal	4.6	3.8		
Spain	18.2	13.2	0.1	0.4
UK	14.4	0.1		
Norway	1.2	20.5	0.2	0
Switz	23.6	29.4		

Source:EC 1st Benchmarking Report (2001)

Potential Regional Markets within EU

Source: Eurelectric (2004)

Organised Markets in EU

	Wholesale Market Structure		Opening of organised market
	Organised wholesale market	**Bilateral contracts allowed**	
Austria	EXAA	yes	2002
Denmark	Nord Pool	yes	Joined the Nord Pool in 1999 (Western Denmark) and 2000 (Eastern Denmark)
Finland	Nord Pool	yes	Joined the Nord Poll in 1998
France	Powemext	yes	2001
Germany	EEX	yes	LPX (Leipzig) and EEE (Frankfurt) up to 2002; EEX (merger of LPX and EEE) since 2003
Italy	Ipex	yes	Opening announced on 1 April 2004
Netherlands	APX	yes	1999
Portugal	Mibel	yes	Opening announced on20 April 2004
Spain	OMEL	yes	1998
Sweden	Nord Pool	yes	1996
UK	NETA	yes	England & Wales from 1990 to March 2001; NETA since March 2001

Source: Based on NERA (2003)

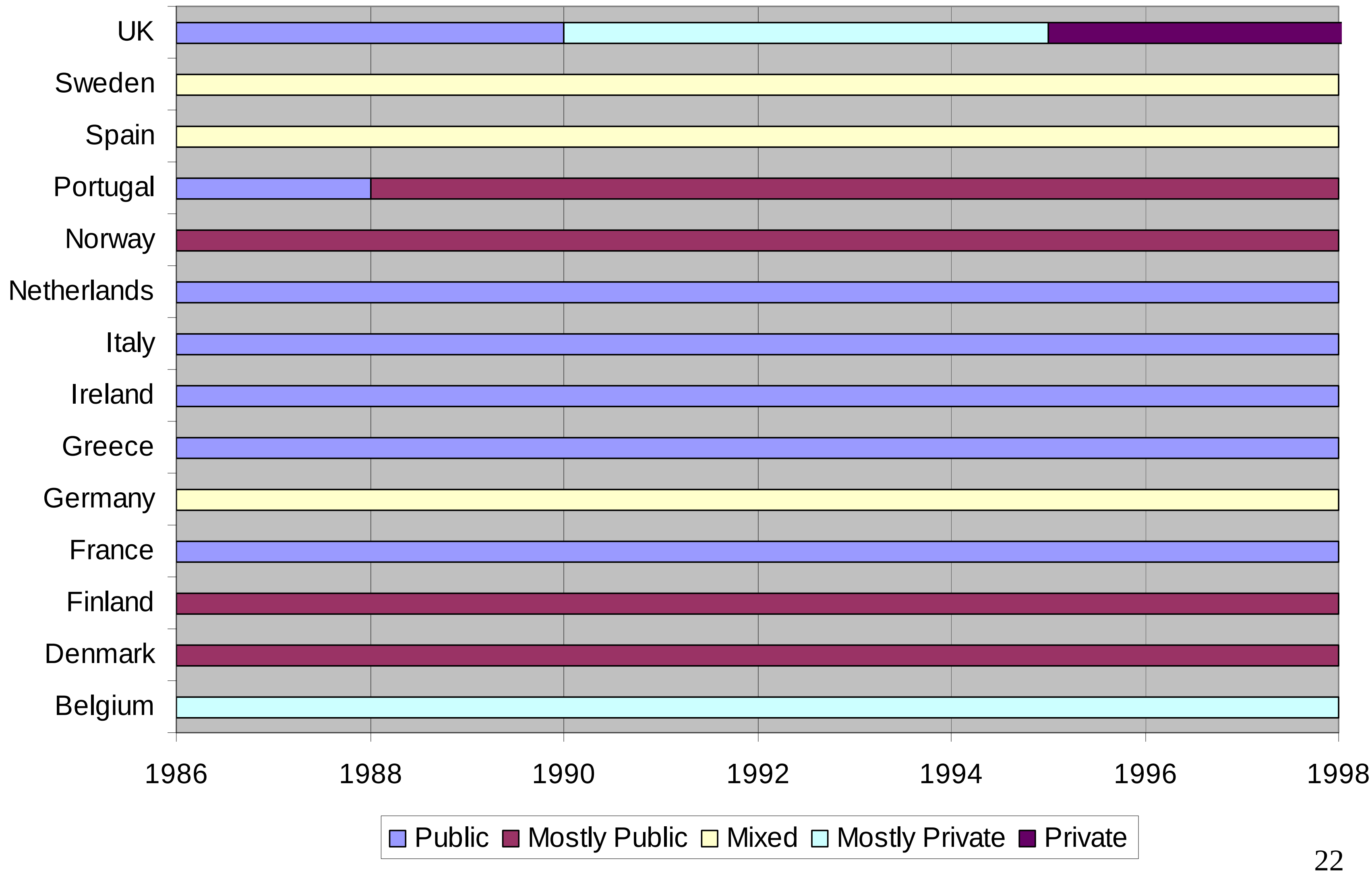
Liberalisation Timeline

Year	National Legislation	National Regulation	EU Directive etc.
1988			White Paper
1989	England & Wales	England & Wales	
1990	Norway		Transit + Price Transparency
1991	Portugal	Norway	
1992			
1993			
1994	Spain		
1995	Portugal, Finland	Finland, Spain	
1996		Portugal, Italy	
1997	Spain		1st Electricity Directive
1998	Germany, Netherl.	Netherl.	1st Gas Directive
1999	Ireland, Belgium, Italy, England & Wales	Ireland	
2000	Luxembourg, France	Greece, France, Belgium	
2001	Luxembourg		
2002			
2003			2nd Electricity Directive, 2nd. Gas Directive, Regulation Cross Border

Source: CEER (2004)

Key Reform Steps

Privatisation



Source: OECD International Regulation Database

Competition - Market Opening & Size

	Market Opening	Size of Open Market TWh
Austria	100%	55
Belgium	80%	60
Denmark	100%	33
Finland	100%	77
France	37%	140
Germany	100%	490
Greece	34%	15
Ireland	56%	12
Italy	66%	182
Lux	57%	3
Ned	63%	64
Portugal	45%	18
Spain	100%	205
Sweden	100%	135
UK	100%	335
Norway	100%	115

Source: EU 3rd Benchmarking Report (2004)

Competition - European Market - Approximate Opening

Year	Degree of Opening	Level Specified in 1996 Directive
1995	5%	
1996	11%	26%
1997	14%	
1998	34%	
1999	57%	28%
2000	63%	
2001	64%	
2002	64%	33%
2003	81%	

- The levels specified by the 1996 directive were calculated as the average market share of the 40GWh customers (1996), the 20GWh customers (1999) and the 9GWh customers (2002).
- The second directive requires that all non-household consumers have a choice by 1 July 2004, and all consumers by 1 July 2007.

Source: Own calculations

Restructuring - Network Unbundling

	TSO	DSO
Austria	Legal	Accounting
Belgium	Legal	Legal
Denmark	Legal	Legal
Finland	Ownership	Accounting
France	Legal/Management	Accounting
Germany	Legal	Accounting
Greece	Legal/Management	Accounting
Ireland	Legal/Management	Legal/Management
Italy	Legal	Legal
Lux	Accounting	Accounting
Neth	Ownership	Legal
Portugal	Ownership	Legal/Management
Spain	Ownership	Legal
Sweden	Ownership	Legal
UK	Ownership	Legal
Norway	Ownership	Accounting

Source: EC 3rd Benchmarking Report (2004)

Extent of Unbundling

	TSO Score/4	DSO score/4
Austria	4	0
Belgium	4	4
Denmark	3.5	1.5
Finland	4	1
France	4	1
Germany	4	1.5
Greece	2	0
Ireland	4	3
Italy	4	2
Lux	1	1
Neth	3	3
Portugal	3	2
Spain	4	3
Sweden	4	2
UK	4	3
Norway	4	1

- *Published accounts*, Yes=1, No=1
- *Compliance officer*, Yes=1, No=0
- *Separate corporate* identity, Yes=1, No=0, Often=0.5
- *Separate locations*, Yes=1, No=0, Partly=0.5

Source: EC 3rd Benchmarking Report (2004)

Regulation - Renewables Support

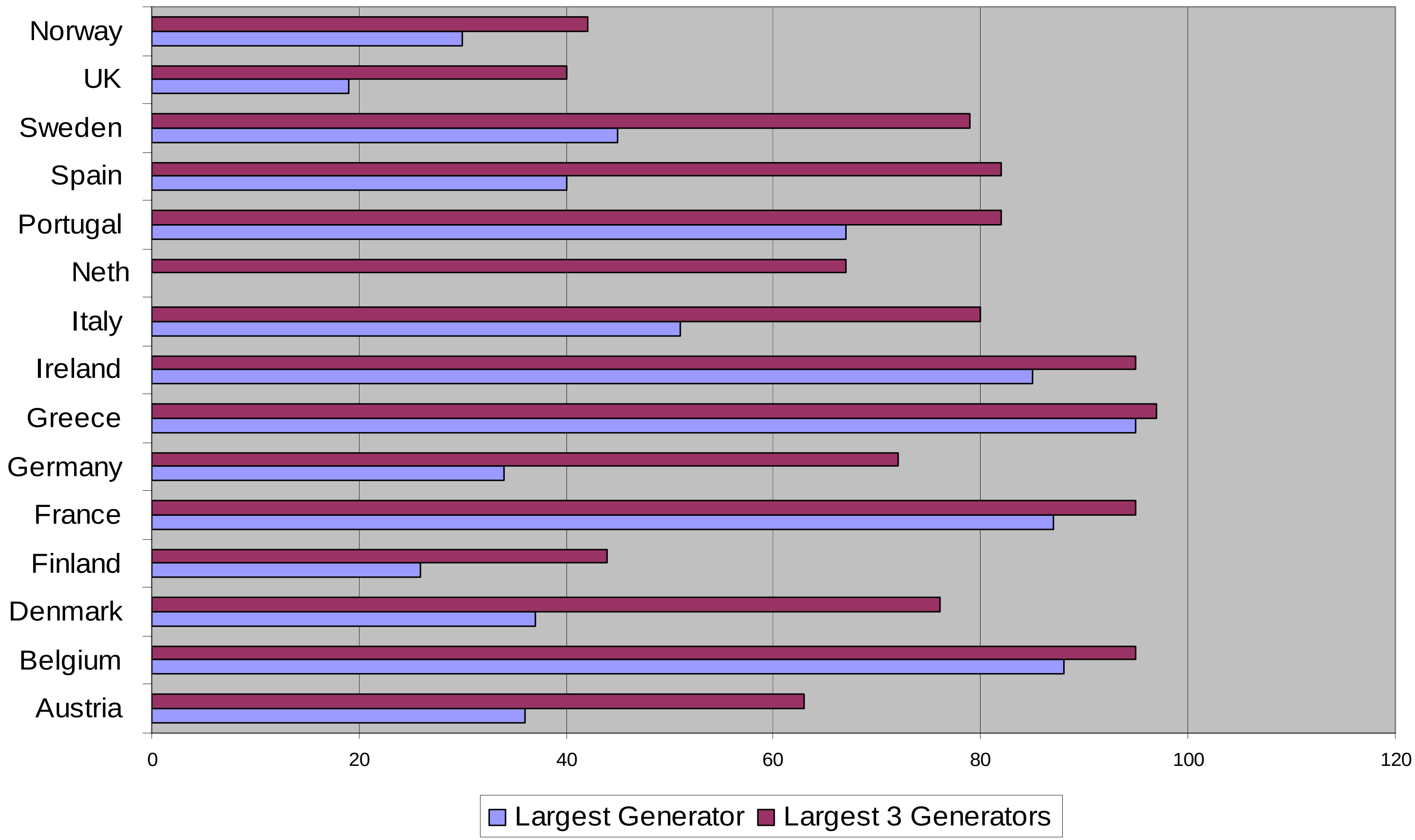
Country	Capital subsidies	Feed-in tariffs	Certificates/ obligations	Competitive tender	Fiscal mechanisms
Austria	X	X	H		X
Belgium	X	X	X		X
Denmark	H	X			X
Finland	X				X
France	X	X		X	X
Germany	X	X			X
Greece	X	X			X
Ireland	X			X	X
Italy	X	H	X		X
Luxembourg	X	X			
Netherlands	X	X	X		X
Portugal	X	X			X
Spain	X	X			X
Sweden	X		X		X
UK	X		X	H	X

X: Mechanism currently present
H: Historical policy, now changed

Source: Adapted from Stenzel, Foxon and Gross (2003).

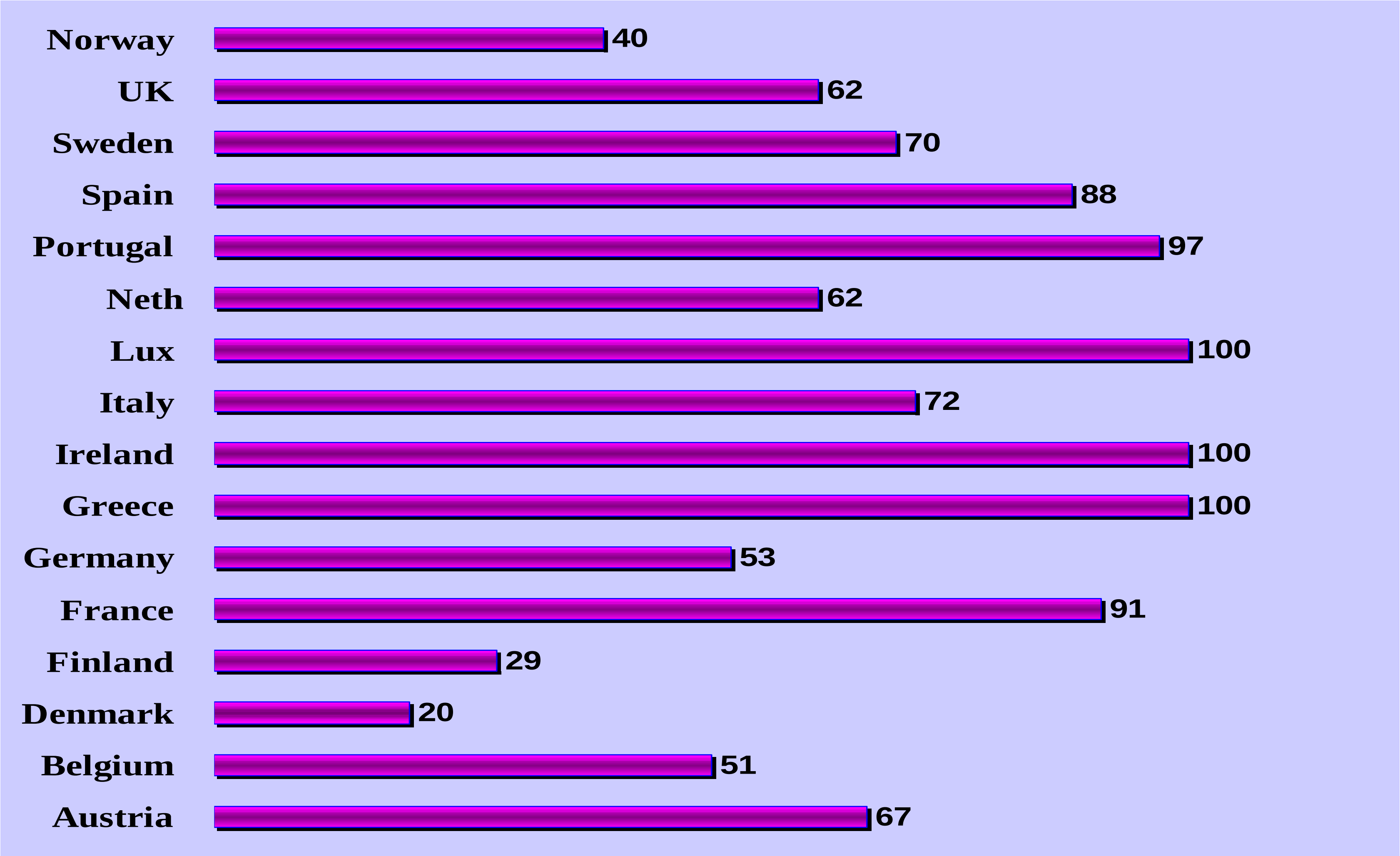
Market Structure

Market Share - Largest and 3 Largest Generators (%)



Source: EC 3rd Benchmarking Report (2004)

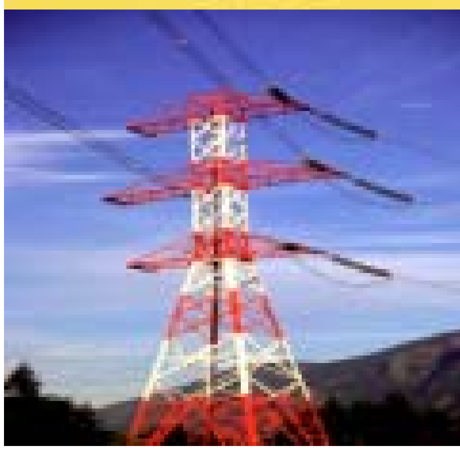
Market Share - 3 Largest Retailers



Lux = 2 Firms **Portugal = 1 Firm** **Denmark: <20% Market Share**

Source: EC 3rd Benchmarking Report (2004)

TOP 12 congested interconnectors



From	To	Capacity/ MW	Allocation method	Long term contracts	Congested	Market based system
CH	IT	2800	Retention/Pro rata	29%	always	
FR	IT	2600	Pro rata	69%	always	
AT	IT	220	First come-fs/Pro rata	50%	always	
FR	DE	2850	First come-first serve	13%	frequently	
DE	NL	2800	Auction	46%	frequently	nov-00
FR	BE	2200	First come-fs/Pro rata	72%	frequently	
FR	UK	2000*	Auction		frequently	mars-01
DK-W	DE	1200	Auction		frequently	sept-00
FR	ES	1100	First come-fs/Pro rata	45%	frequently	
DK-W	NO	950*	Market splitting		frequently	juil-99
DK-E	DE	550*	Auction	100%	frequently	janv-02
SE	DE	460*	Retention/Fixed price	100%	frequently	

* = DC link   = Problem

Source: EC DGTREN

Institutions and Regulation

Regulatory Competence

	Score /5
Germany	0
Denmark	3
Greece	3
Netherlands	3
Spain	3
Luxembourg	3.5
Finland	4
France	4
Sweden	4
Austria	4.5
Italy	4.5
Belgium	5
Ireland	5
Portugal	5
UK	5
Norway	5

- *Type of regulation*, Ex Ante=1, Ex Post=0
- *Network Access conditions* set by regulator =1, Other=0
- *Dispute Settlement* by regulator=1, Other=0
- *Ministry involvement*, No=1, general=0.5, Yes=1.
- *Information powers*, strong =1, Other=0.

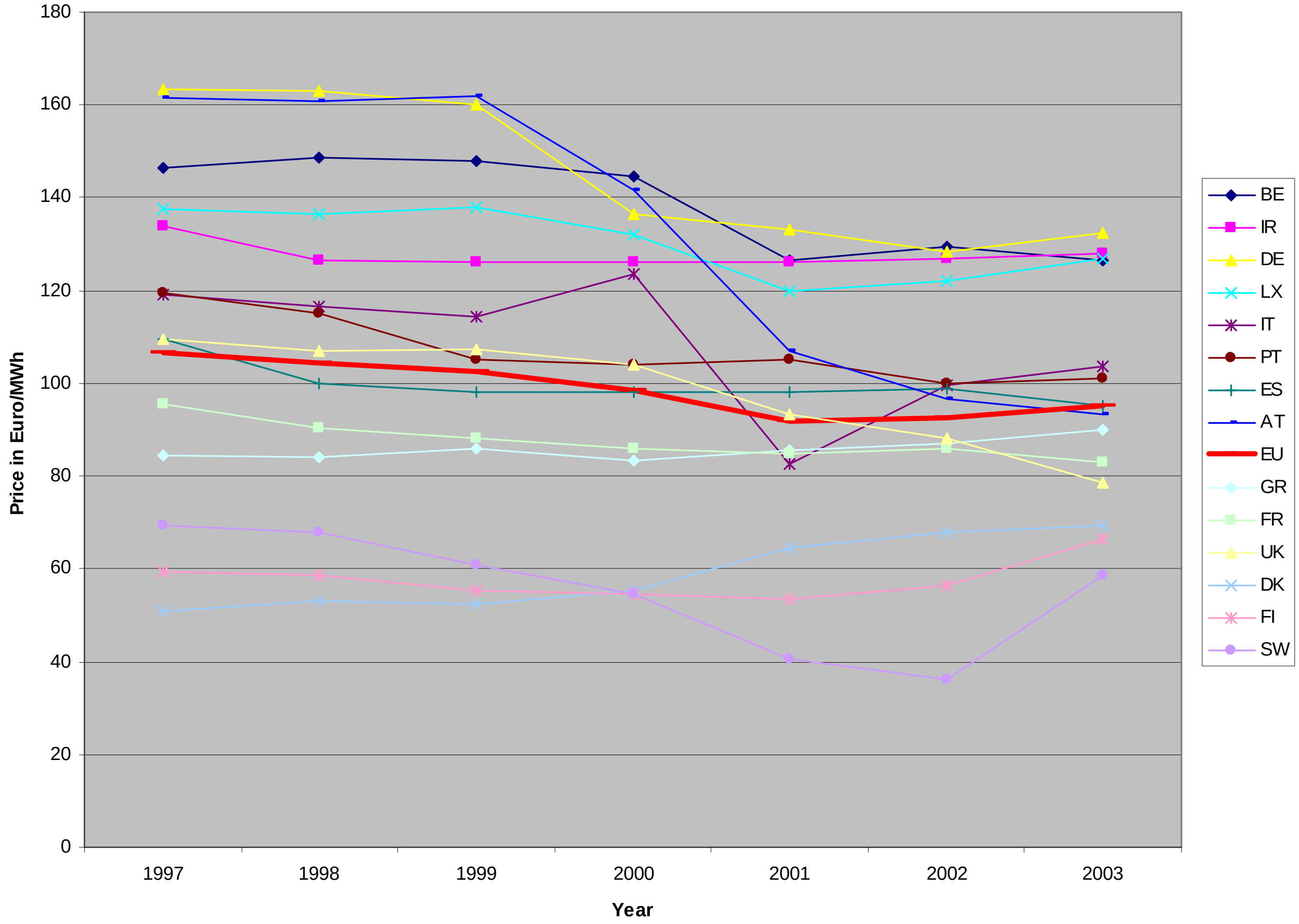
Source: Derived from EC 3rd Benchmarking Report (2004)

Sector Performance

Measuring Performance

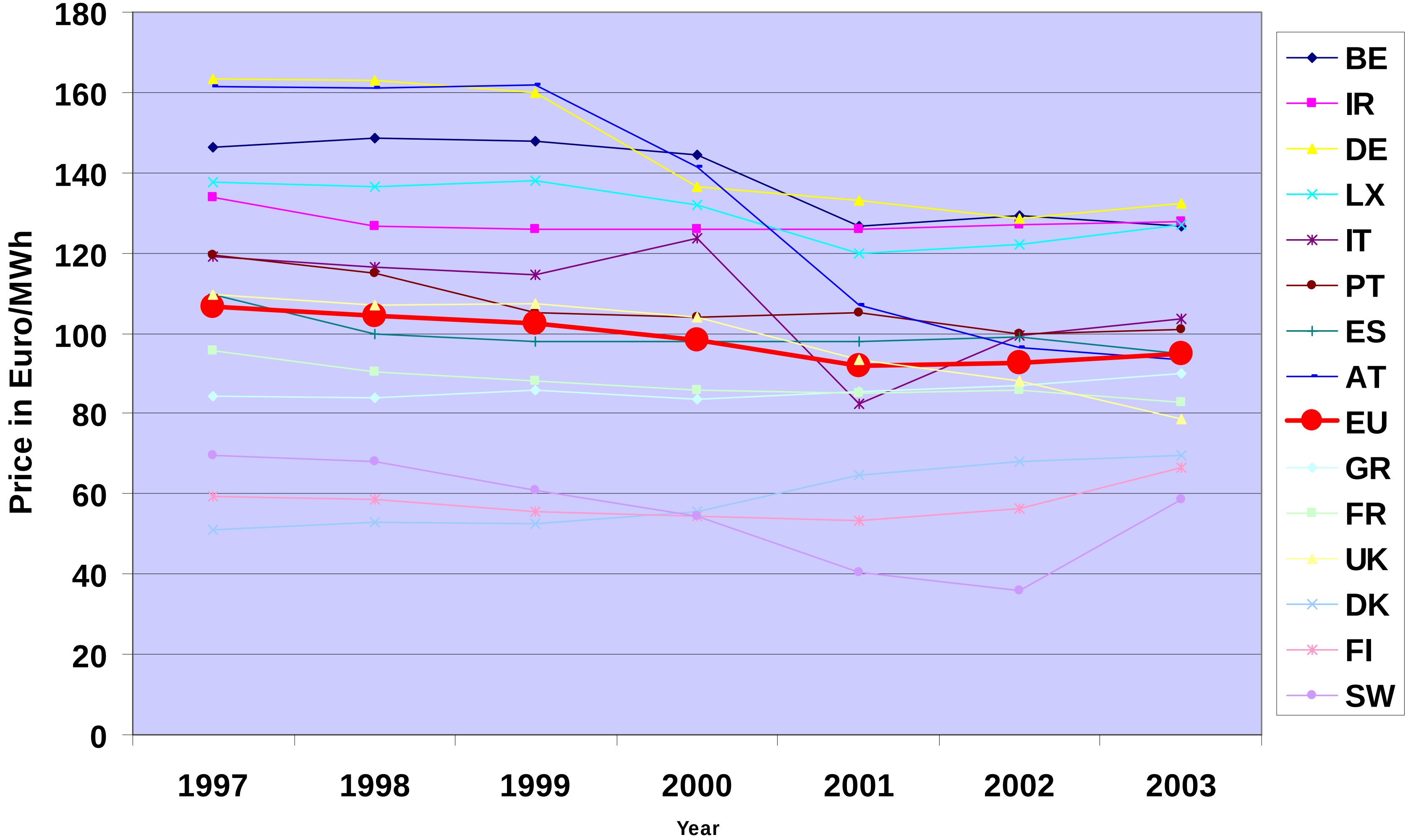
- At the sector level:
  - Good performance if prices fall on average and converge across Europe.
  - However may need to be some rebalancing of individual prices.
  - Tarrifs should be more reflective to market conditions.
  - Network tariffs should fall as regulation toughens and efficiency improves.
  - More efficient use should be made of reserve capacity.
- At the firm level:
  - Market structure in generation and retail should begin to look more competitive.
  - Productivity should rise.
  - Merger activity should increase to realise efficiency gains but these should be pro-competitive not anti-competitive.
  - Investment should be adequate and rates of return sufficient but not excessive.

Pre-Tax Prices for Households (current)



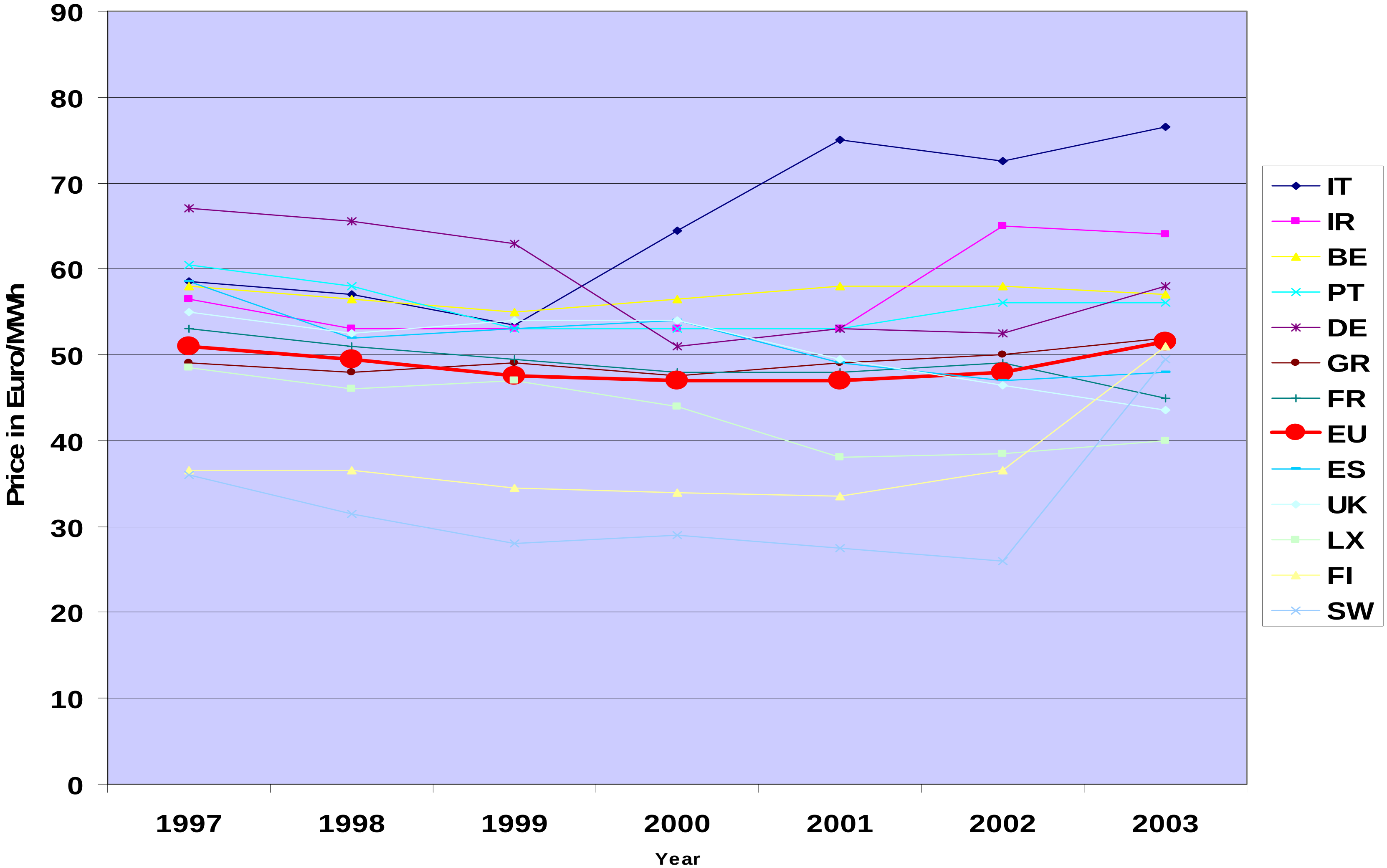
Source: EC 3rd Benchmarking Report (2004)

Pre-Tax Prices for Small Industry (current)



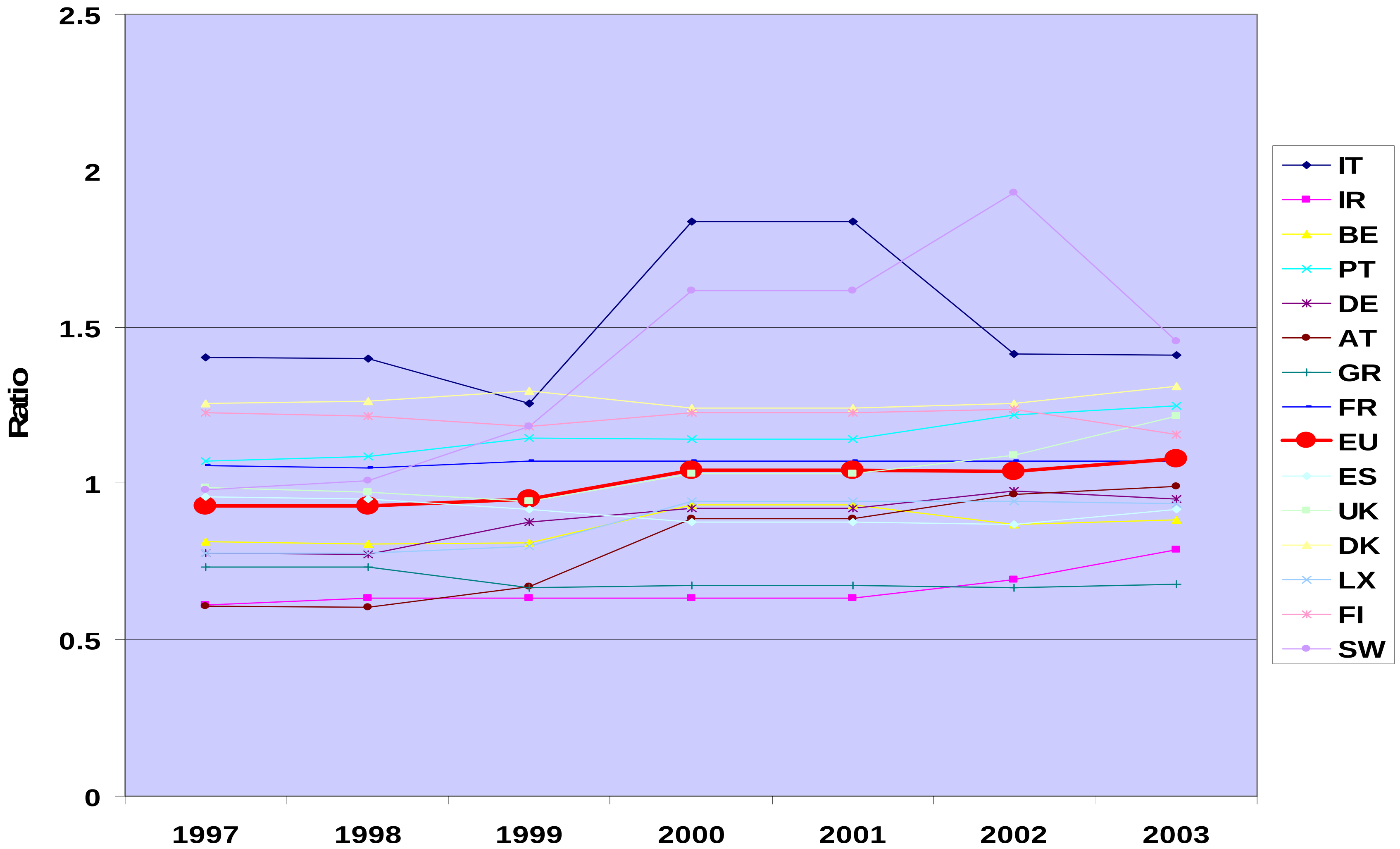
Source: EC 3rd Benchmarking Report (2004)

Pre-Tax Prices for Large Industry (current)



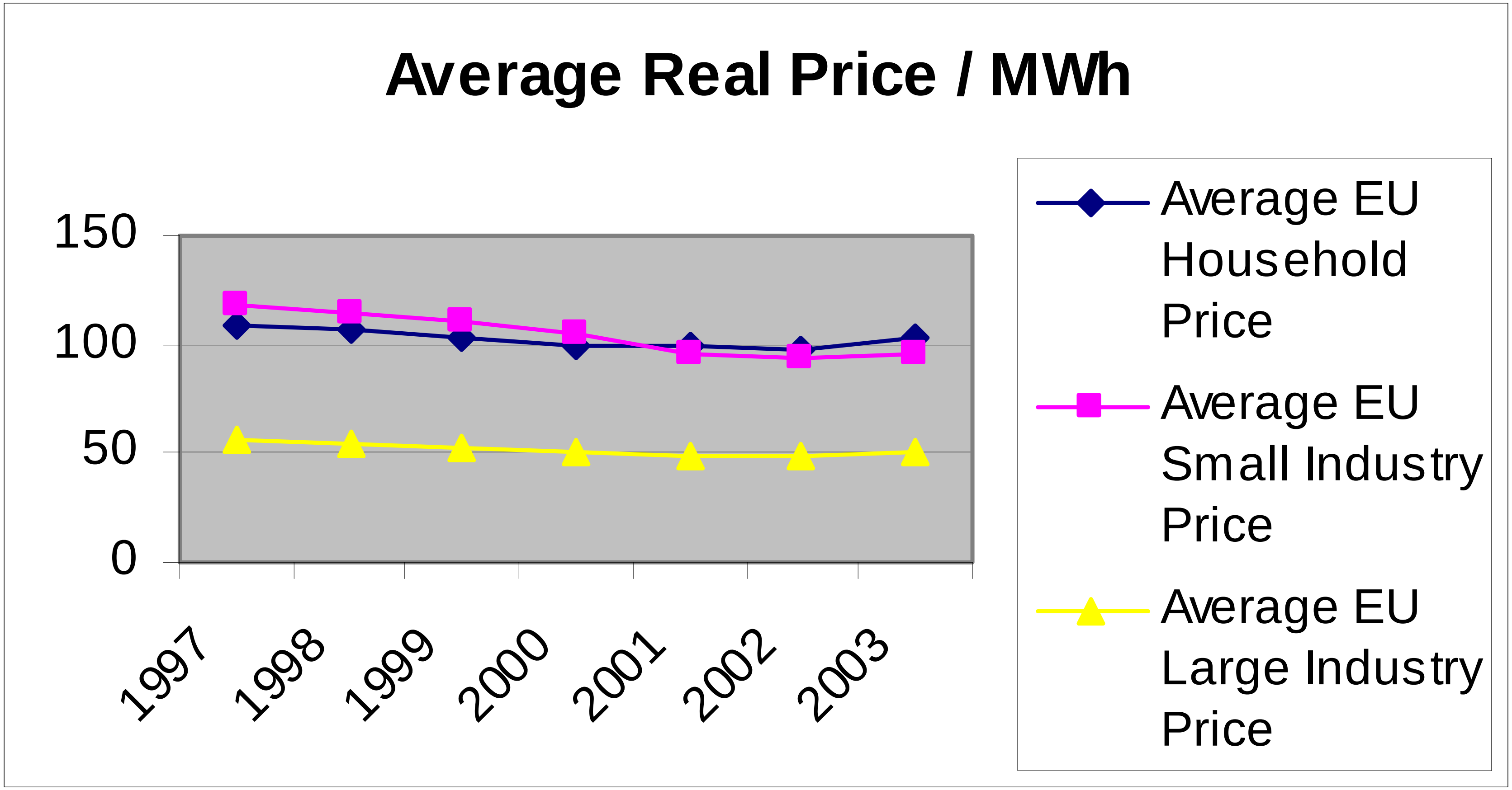
Source: EC 3rd Benchmarking Report (2004)

Household/Small Industry Price Ratio



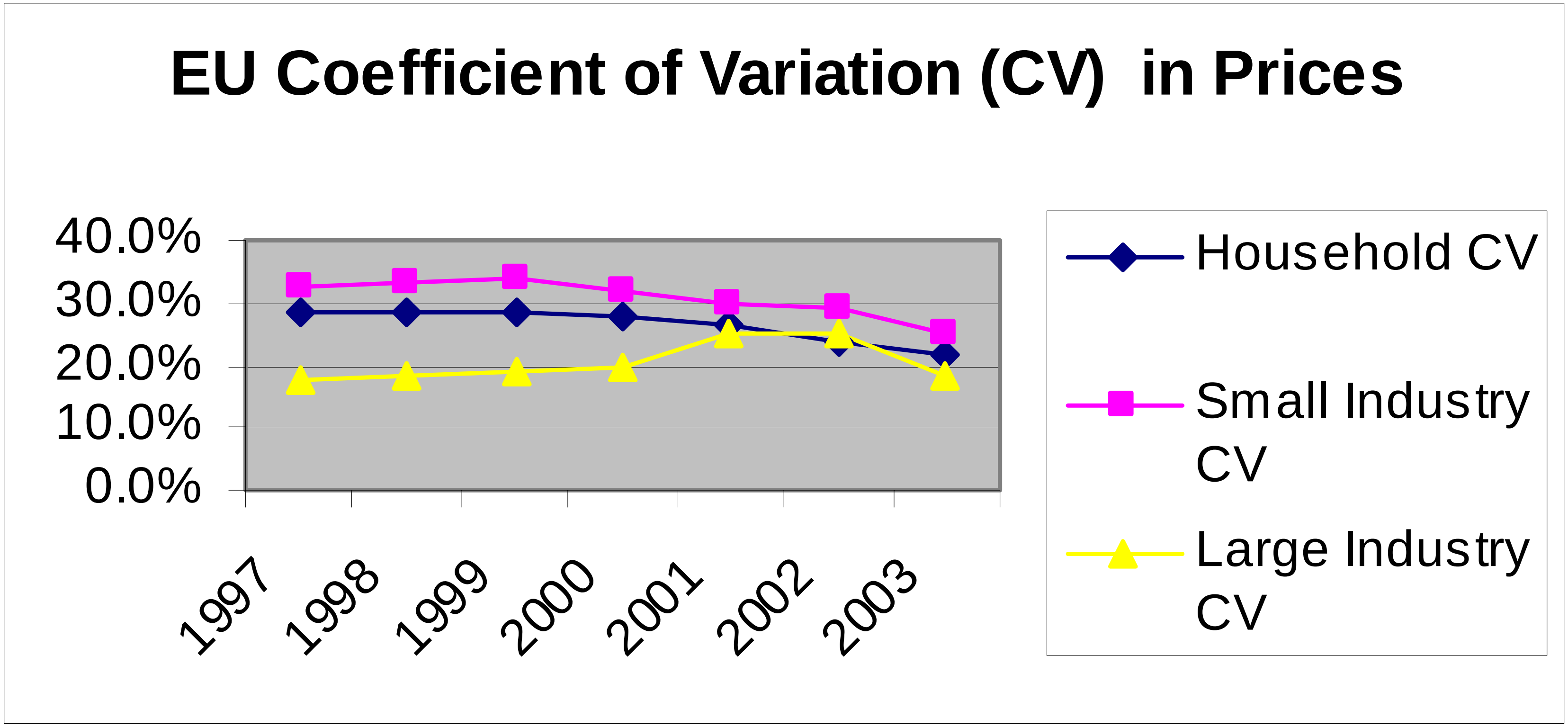
Source: Own Calculations

EU Average Prices



Source: Own calculations from EU data (using EU inflation rate)

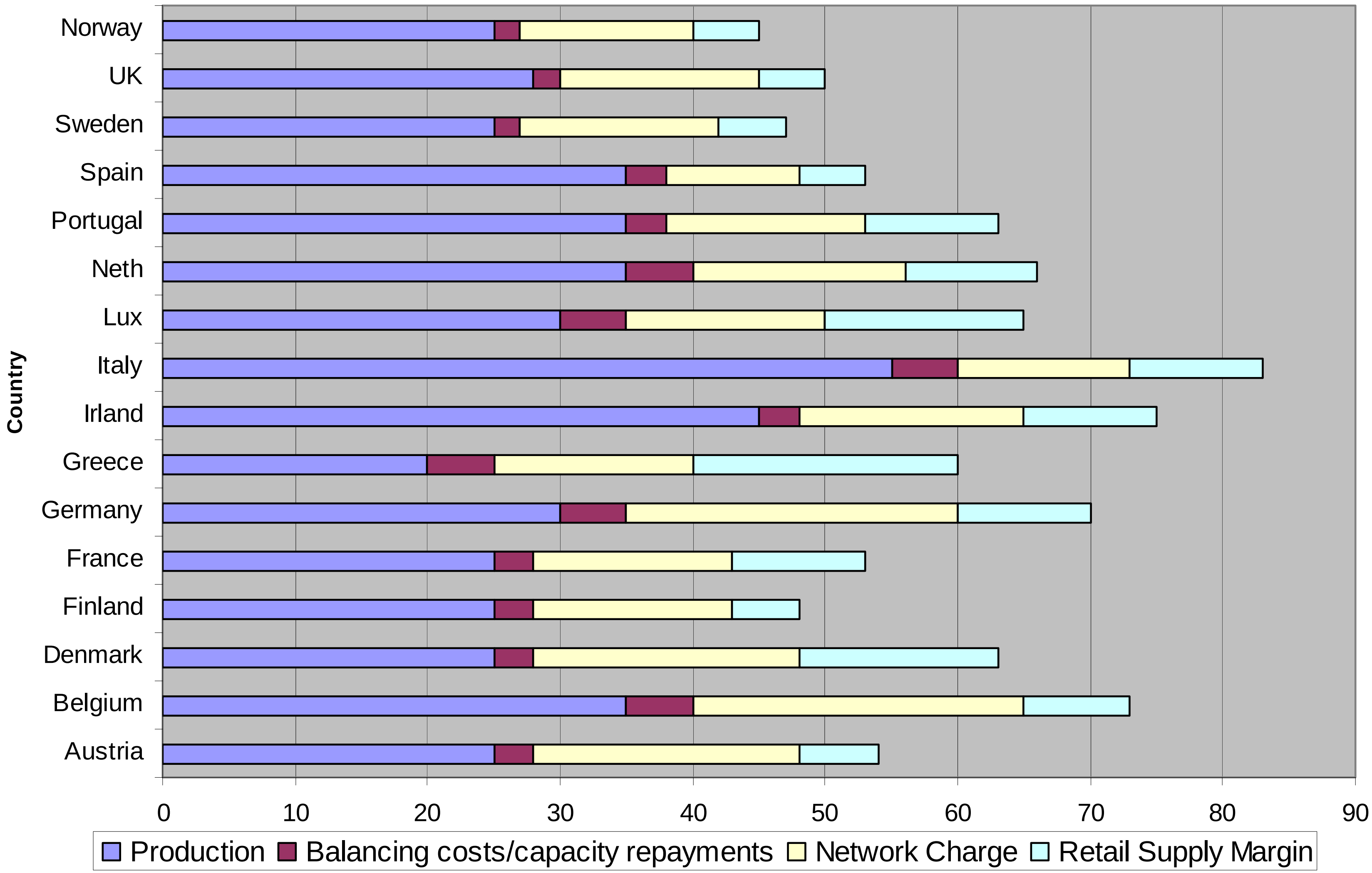
EU Price Convergence



CV= Standard Deviation / Mean

Source: Calculations from EC 3rd Benchmarking Report (2004)

Estimated Price Breakdown (2004) in Euro/MWh



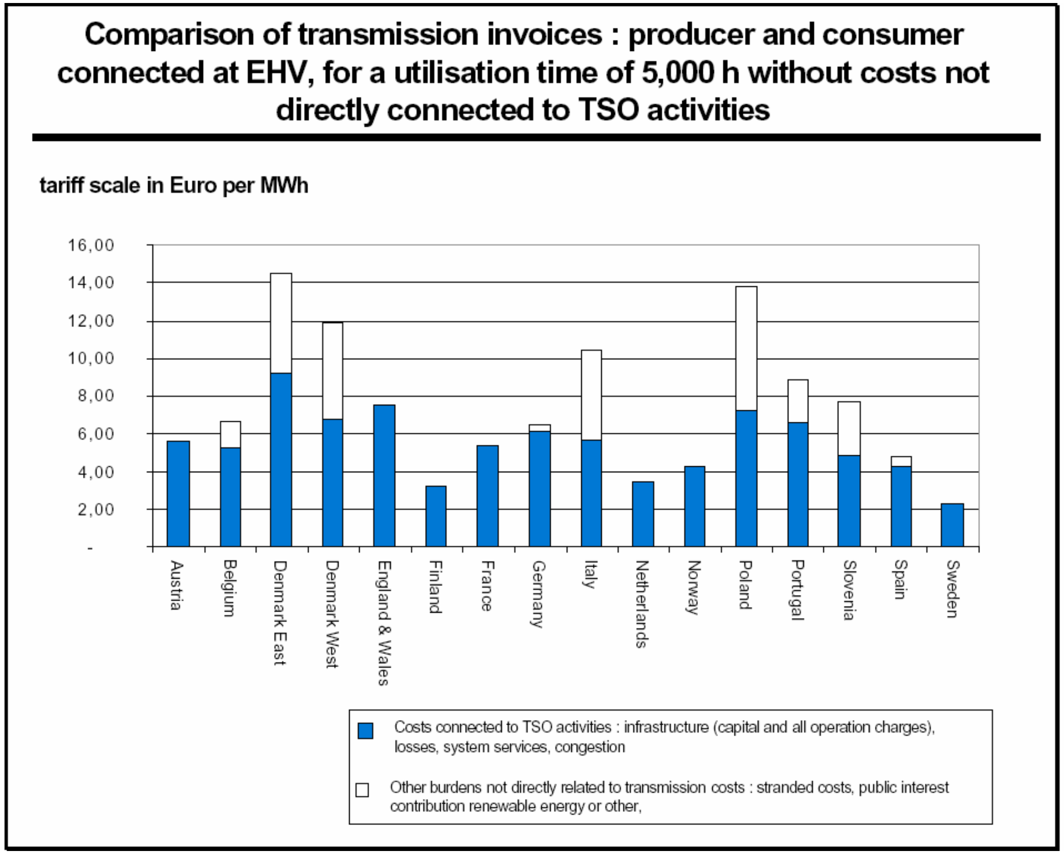
Source: EC 3rd. Benchmarking Report (2004)

Transmission Tariff Structure

% of total charges dependent on…	Generation			Load				
	Fixed Tariff (per connection)	Capacity (KW)	Flow (MWh)	Fixed Tariff (per connection)	Capacity (KW)	Flow (MWh)	Charges vary by location?	Charges vary by time of day?
Austria	-	-	9	-	27	64	N	N
Belgium	no generation charge			-	68	32	N	N
Denmark (E)	no generation charge			-	-	100	N	Y
Denmark (W)	-	-	21	-	-	79	N	Y
Finland	-	-	7	-	-	94	N	Y
France	no generation charge			-	54	46	N	Y
Germany	no generation charge			-	81	19	N	N
Greece	30			70			N	N
Ireland	-	17	2	-	34	47	Y	Y
Italy	-	-	13	1	25	61	Y	Y
Netherlands	2	-	21	2	31	44	N	(Y)
Portugal	no generation charge			-	59	41	N	Y
Spain	no generation charge			-	28	72	N	Y
Sweden	-	22	14	-	23	41	Y	Y
UK (E&W)	-	20	9	-	54	18	Y	Y
Norway	-	38	6	-	53	3	Y	Y

Source: EC 1st Benchmarking Report (2001)

Transmission Tariffs 2003



Average Transmission tariffs fell 9% in real terms between 2002 and 2003,though the spread scarcely changed (ETSO, 2003 and 2004).

Average Tariff=5.2 Euros
Max =8.0, Min=2.3, CV=33%.

Source: ETSO (2004)

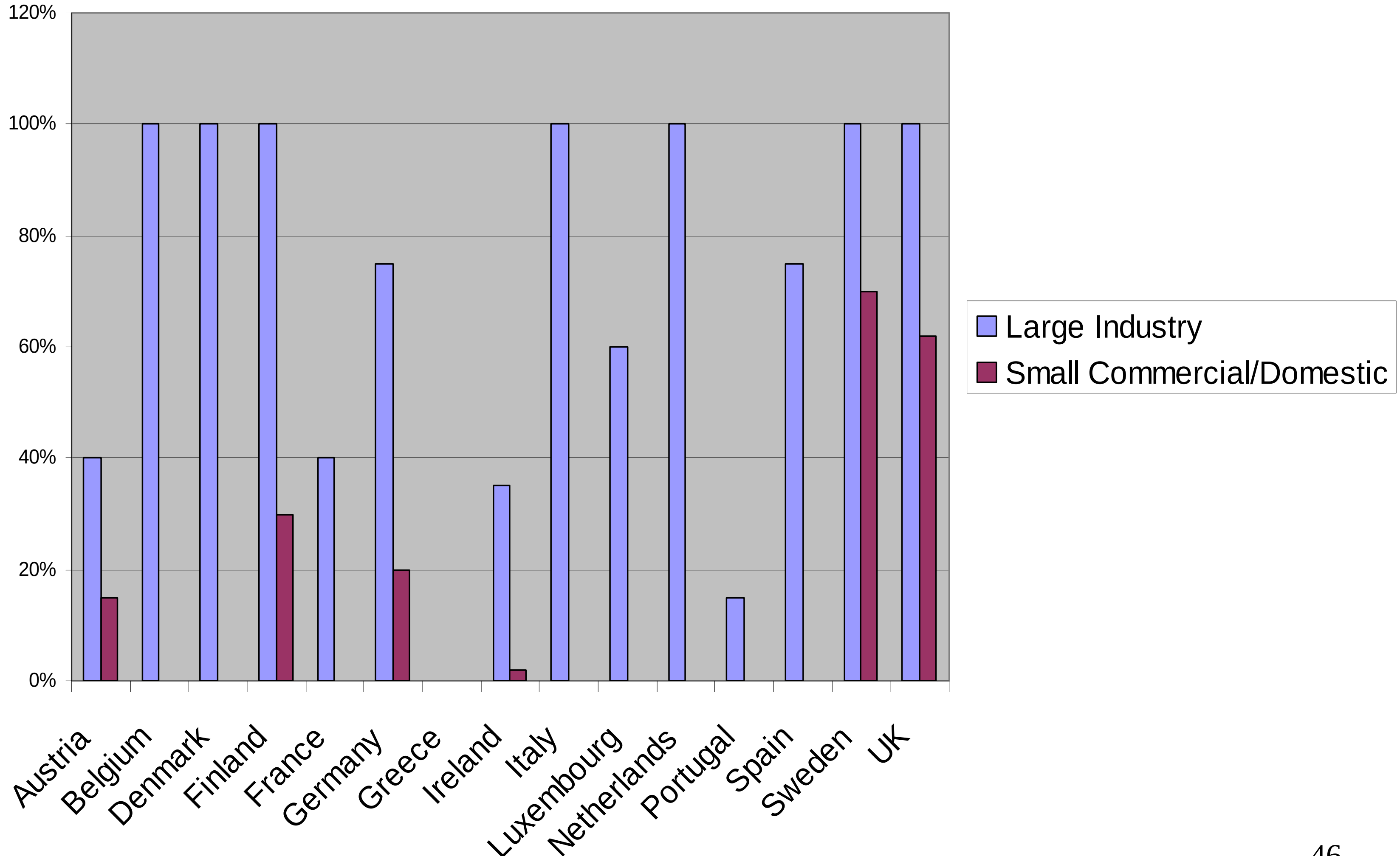
Distribution Tariffs 2001

		Euro / MWh
Austria	Vienna	54
Denmark	Copenhagen	52
Finland	Helsinki	28
Germany	Munich	58
	Hamburg	57
	Berlin	55
Ireland	National	33
Netherlands	ENECO	31
Spain	National	49
Sweden	Stockholm	37
UK	London	21
	Glasgow	34

- Country Average tariff =41 Euros / MWh
- Max= 56.7, Min=27.5, CV=29%.
- This is less variation than for transmission tariffs.
- However within country variations large.

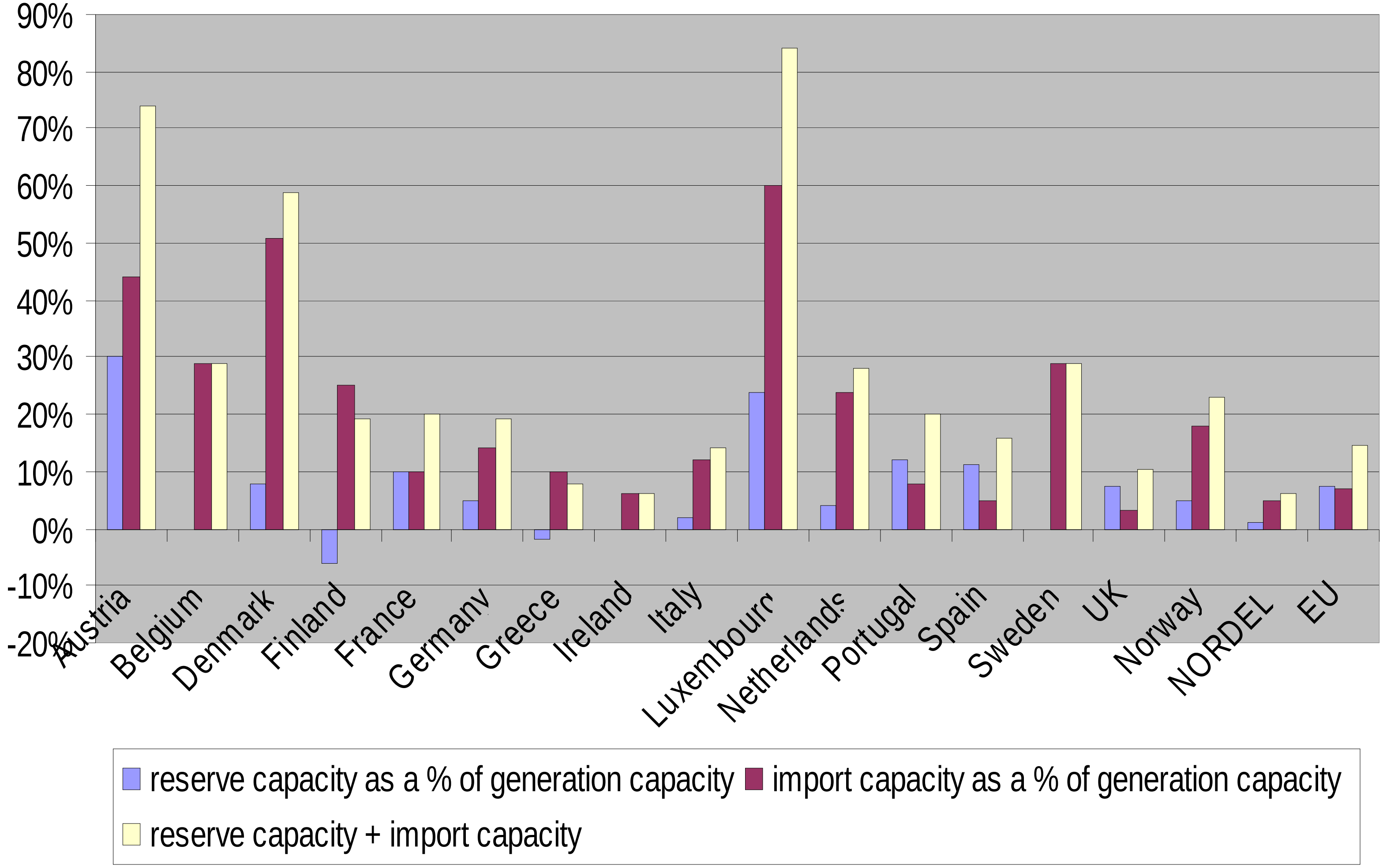
Source: EC 1st Benchmarking Report (2001)

Customer Switching:
% Switched or Renegotiated 1998-2002



Source: EC 2nd and 3rd Benchmarking Reports (2002, 2004)

Reserve Margins (2003)



Source: EC 3rd Benchmarking Report (2004)

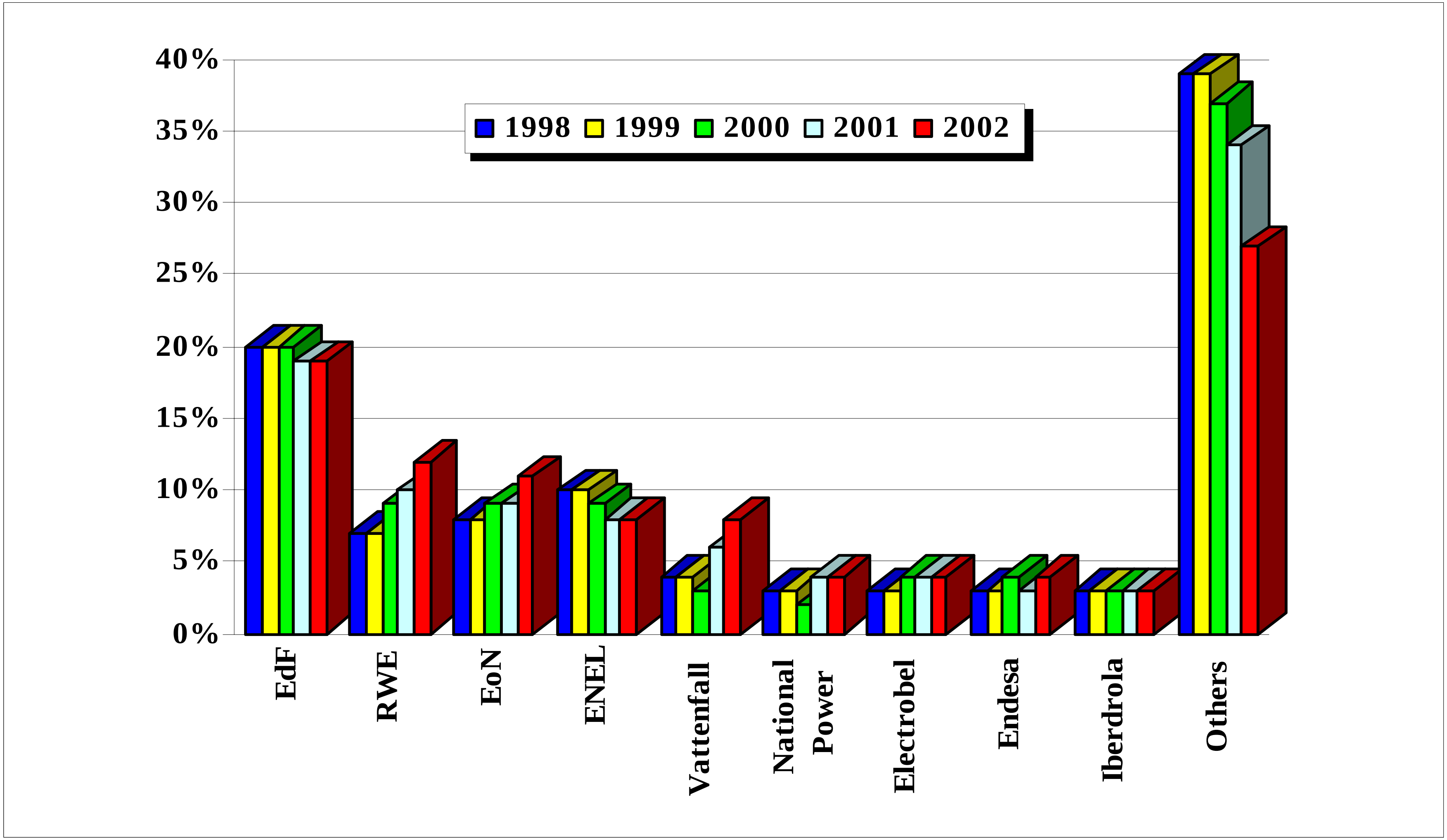
Herfindahl Index for the EU (inc Norway) Electricity Resources

		1990	1994	1998	2002
Coal		37.1%	32.0%	27.9%	26.2%
Oil		9.0%	8.4%	7.8%	5.6%
Gas		6.9%	9.5%	14.7%	17.3%
Biomass		0.3%	0.6%	0.8%	0.9%
Waste		0.4%	0.5%	0.8%	0.9%
Nuclear		33.4%	34.9%	34.2%	31.2%
Hydro		12.8%	13.8%	13.1%	16.6%
Geothermal		0.1%	0.2%	0.2%	0.2%
Solar PV		0.0%	0.0%	0.0%	0.0%
Solar Thermal		0.0%	0.0%	0.0%	0.0%
Other Sources		0.1%	0.2%	0.5%	1.0%
HHI		2781	2589	2399	2271

Source: IEA

Firm Performance

Generation Market Shares in Western Europe

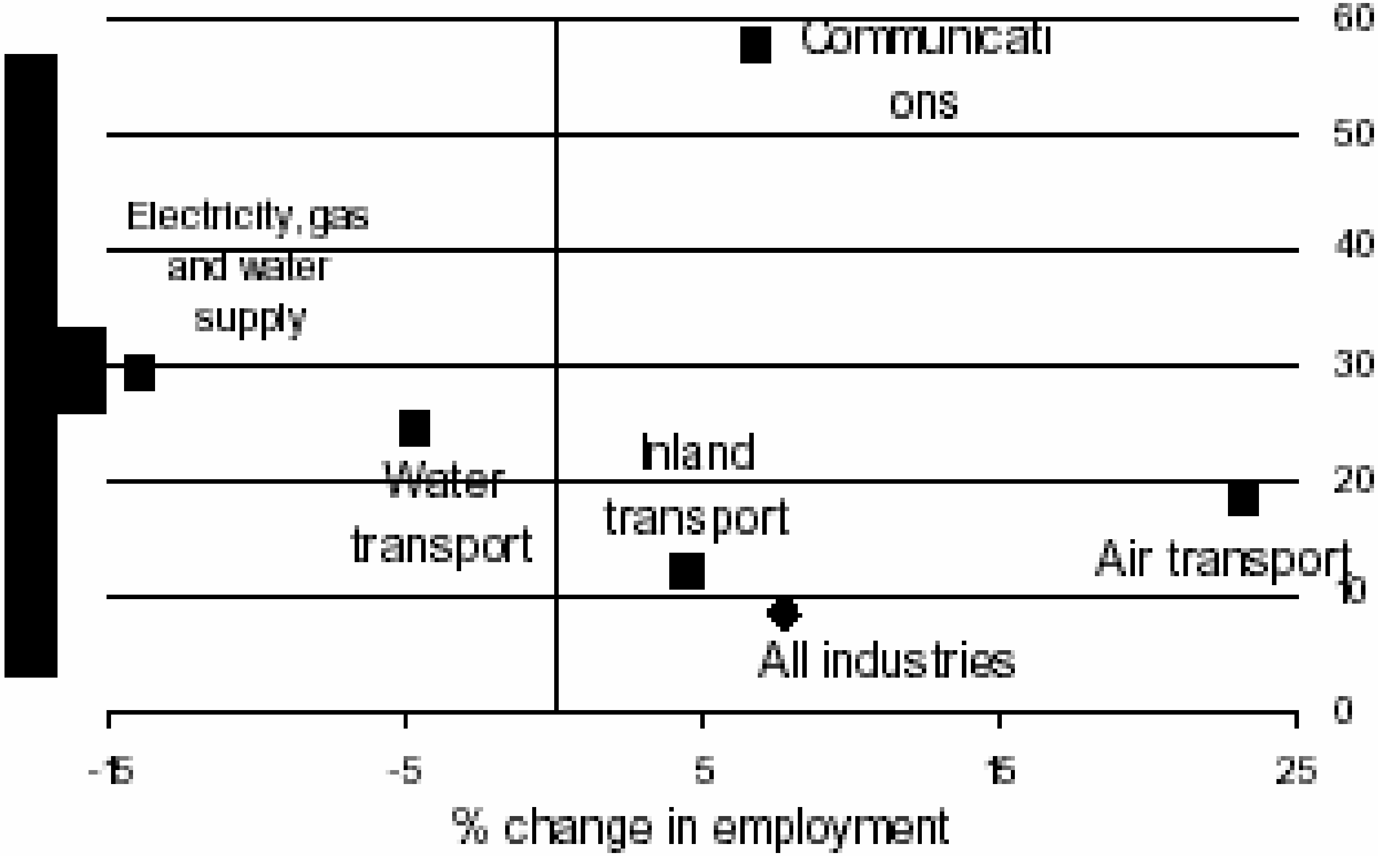


Source: Codognet et al. (2002) and Energiklub (2002)

Supplier Market Shares

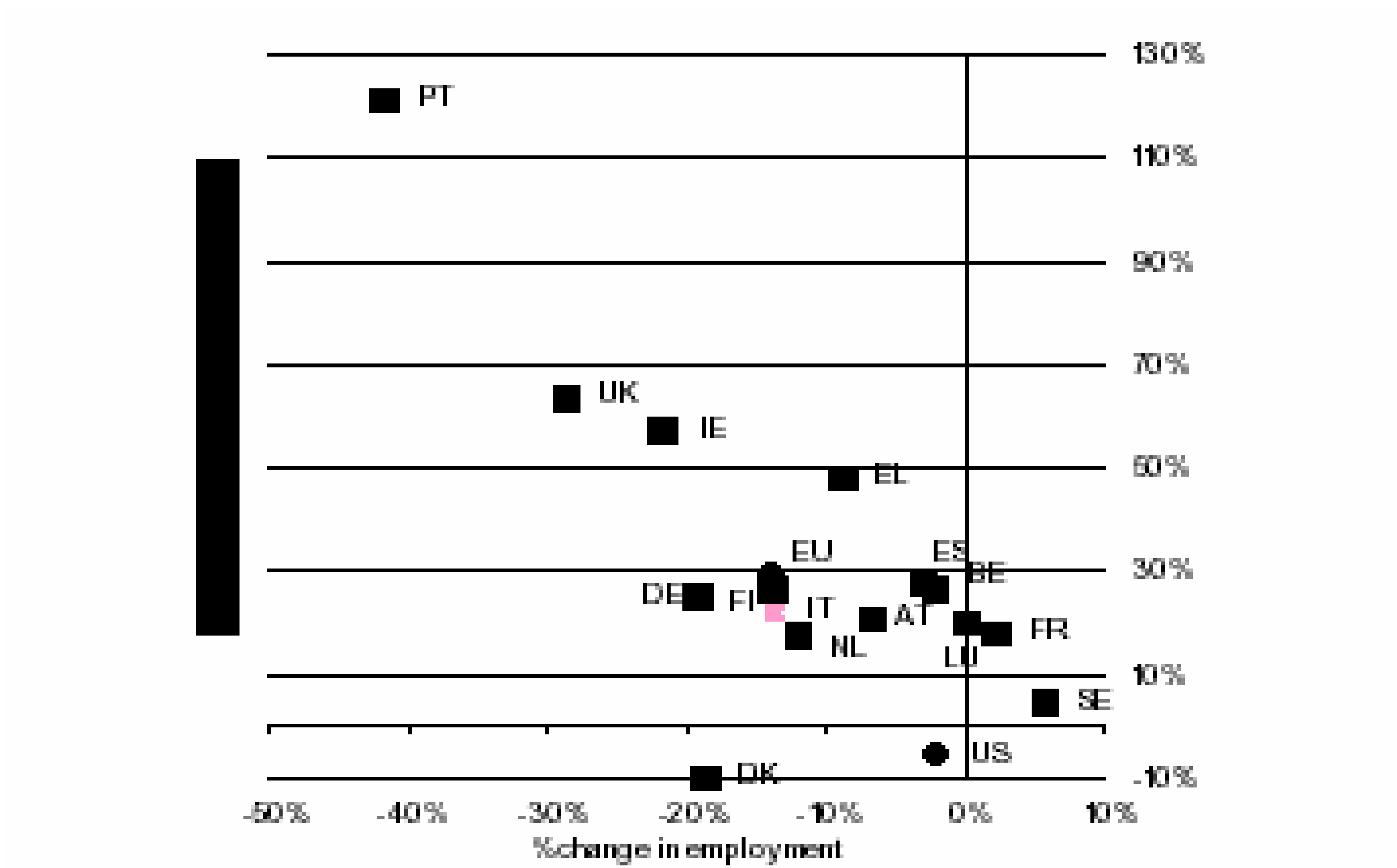
- These are very unclear at the EU level.
- Approximately 220m electricity consumers in EU.
- Number of energy (electricity+gas) customers 2003 (Hallas, 2003):
  - EdF 36m
  - ENEL 29m
  - E.ON 20m
  - Centrica 19m
  - RWE 17m
- This suggests top 5 firms have nearly 50% of EU electricity customer market.

Changes in Employment & Labour Productivity 1996-2001



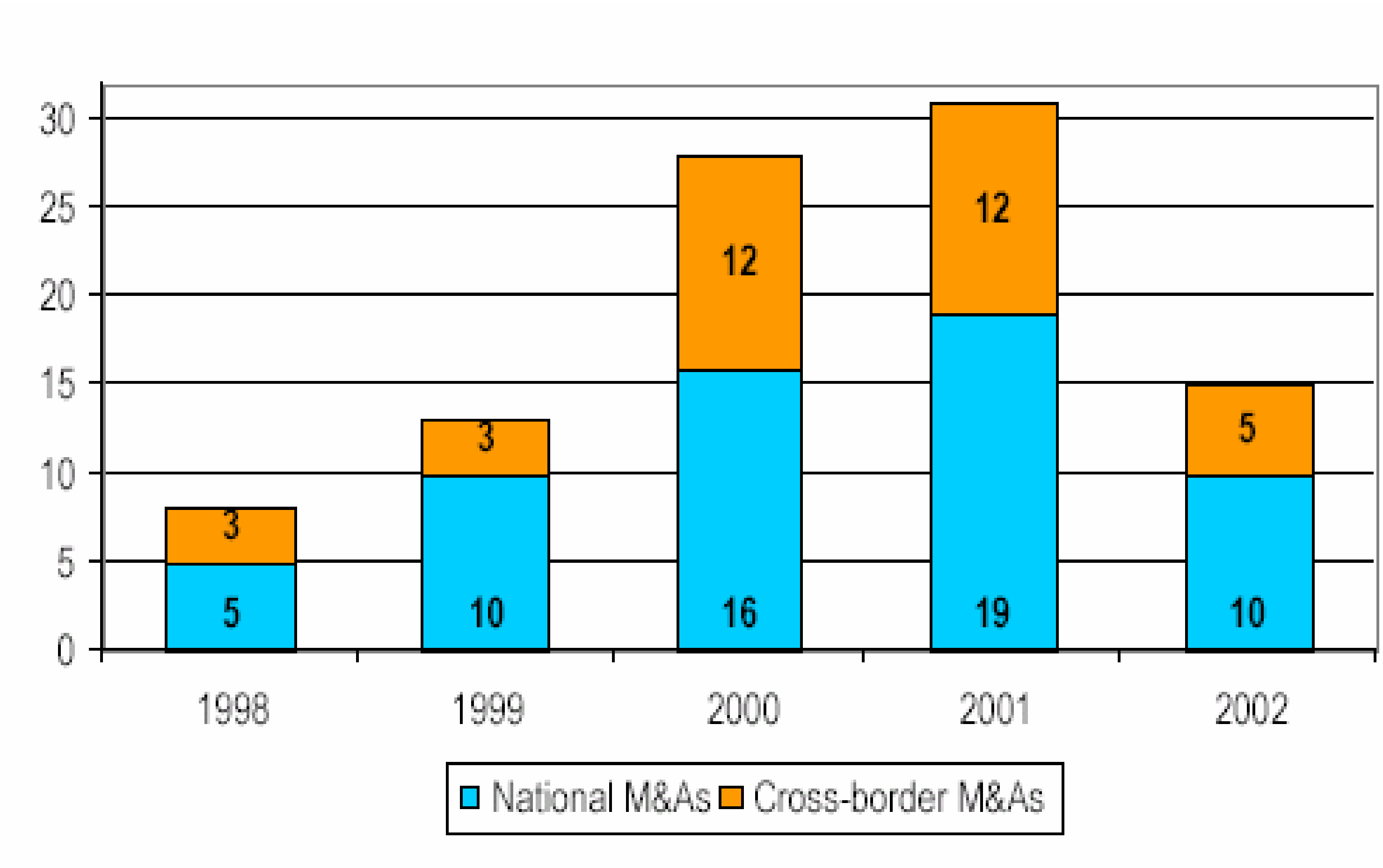
Source: University of Groningen in EC (2004)

Changes in Employment and Labour Productivity in Energy & Water 1996-2001



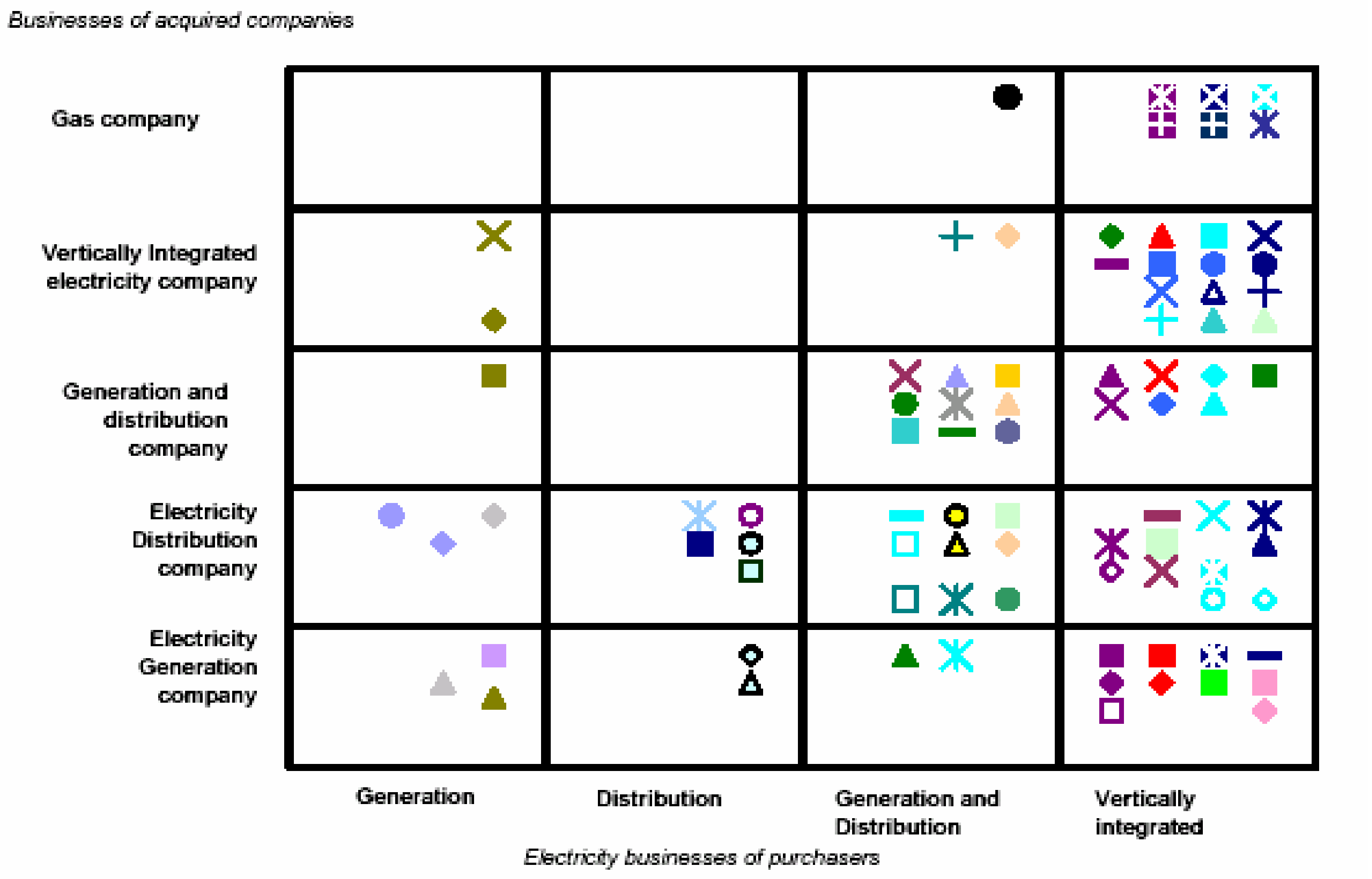
Source: University of Groningen in EC (2004)

National & Cross Border Utility M&As in Europe



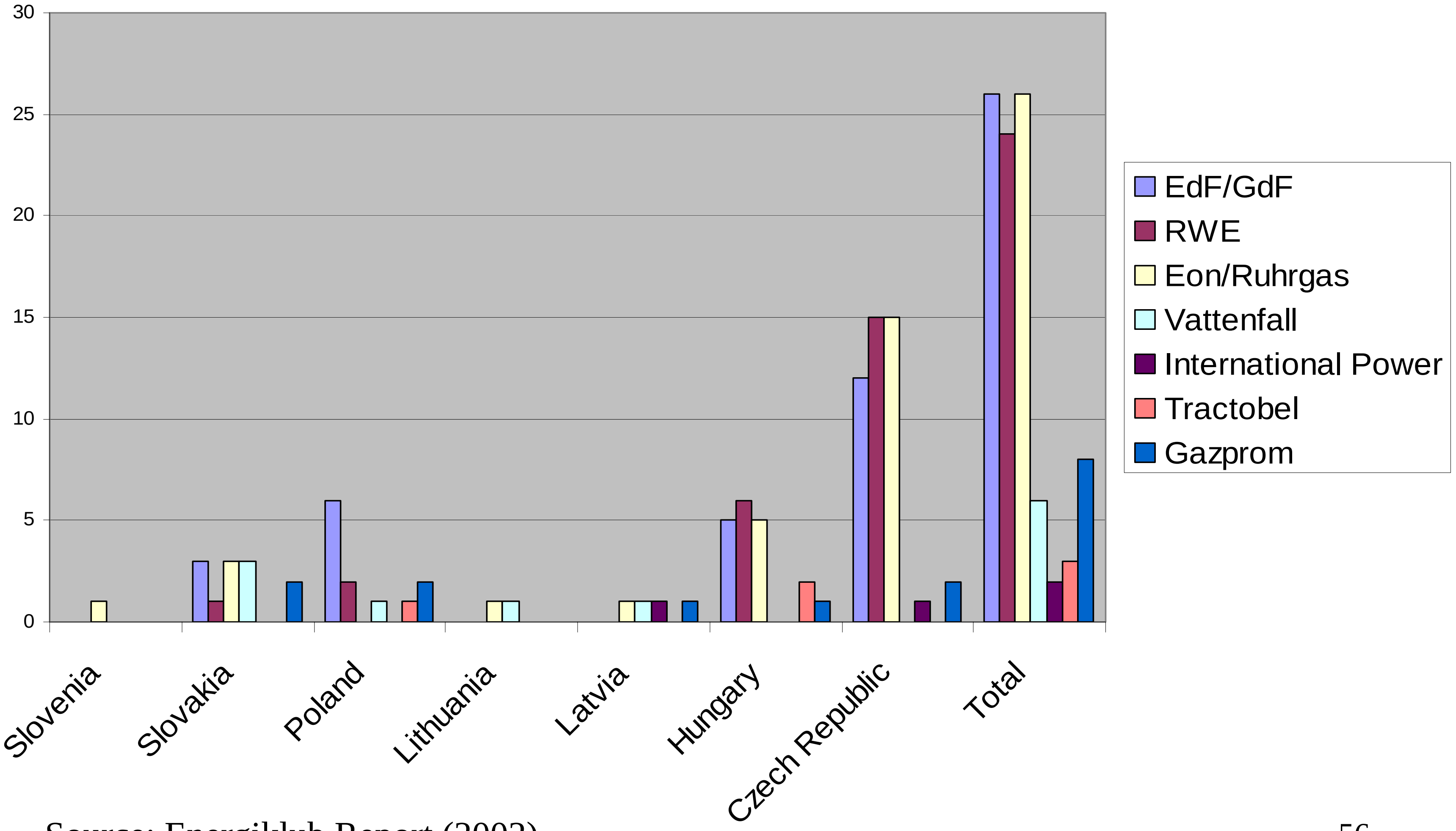
Source: Codognet et al. (2002)

Vertical Integration through M&As in Europe



Source: Codognet et al. (2002)

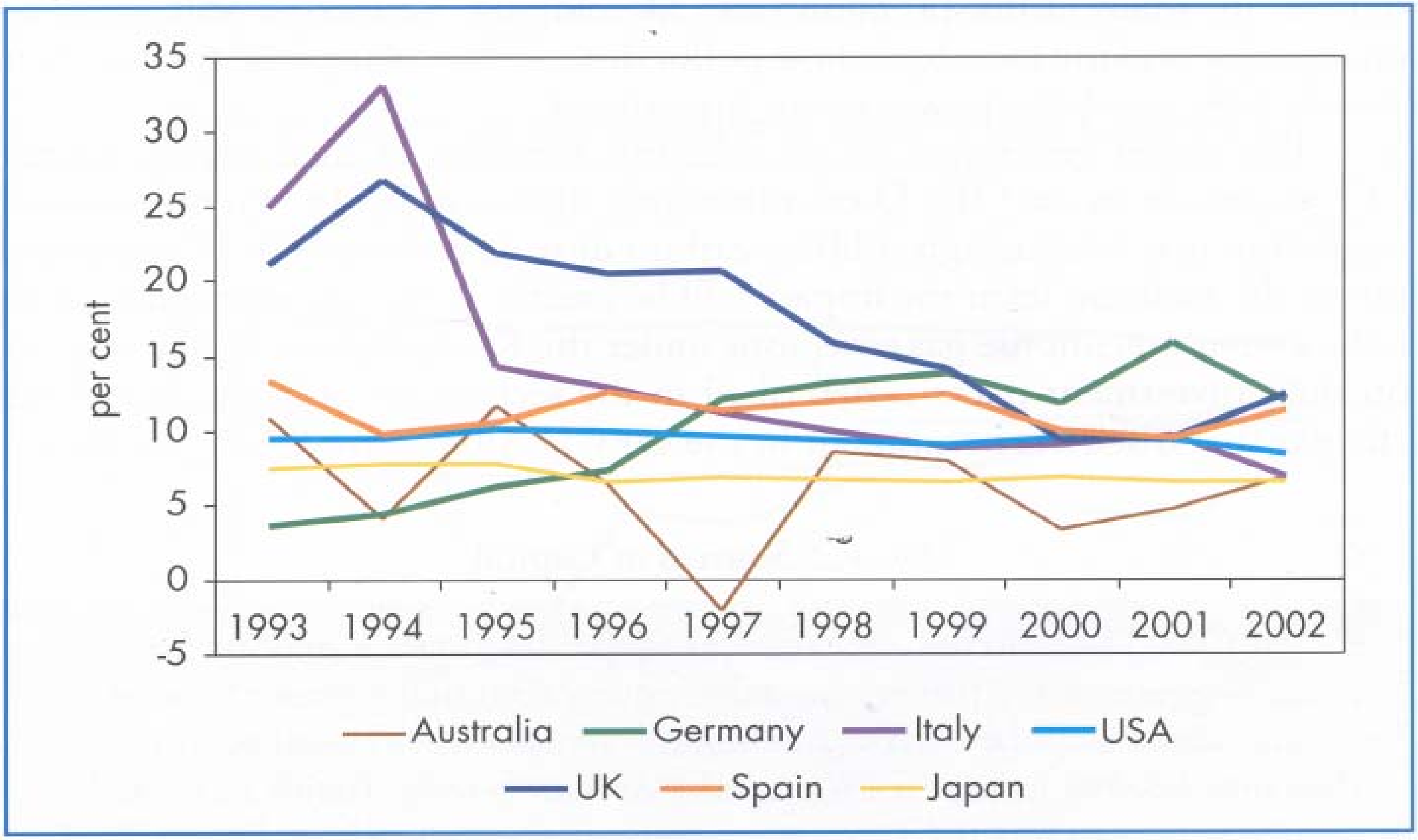
European Utilities Investments in Accession Countries (Number)



Source: Energiklub Report (2002)

Return on Assets

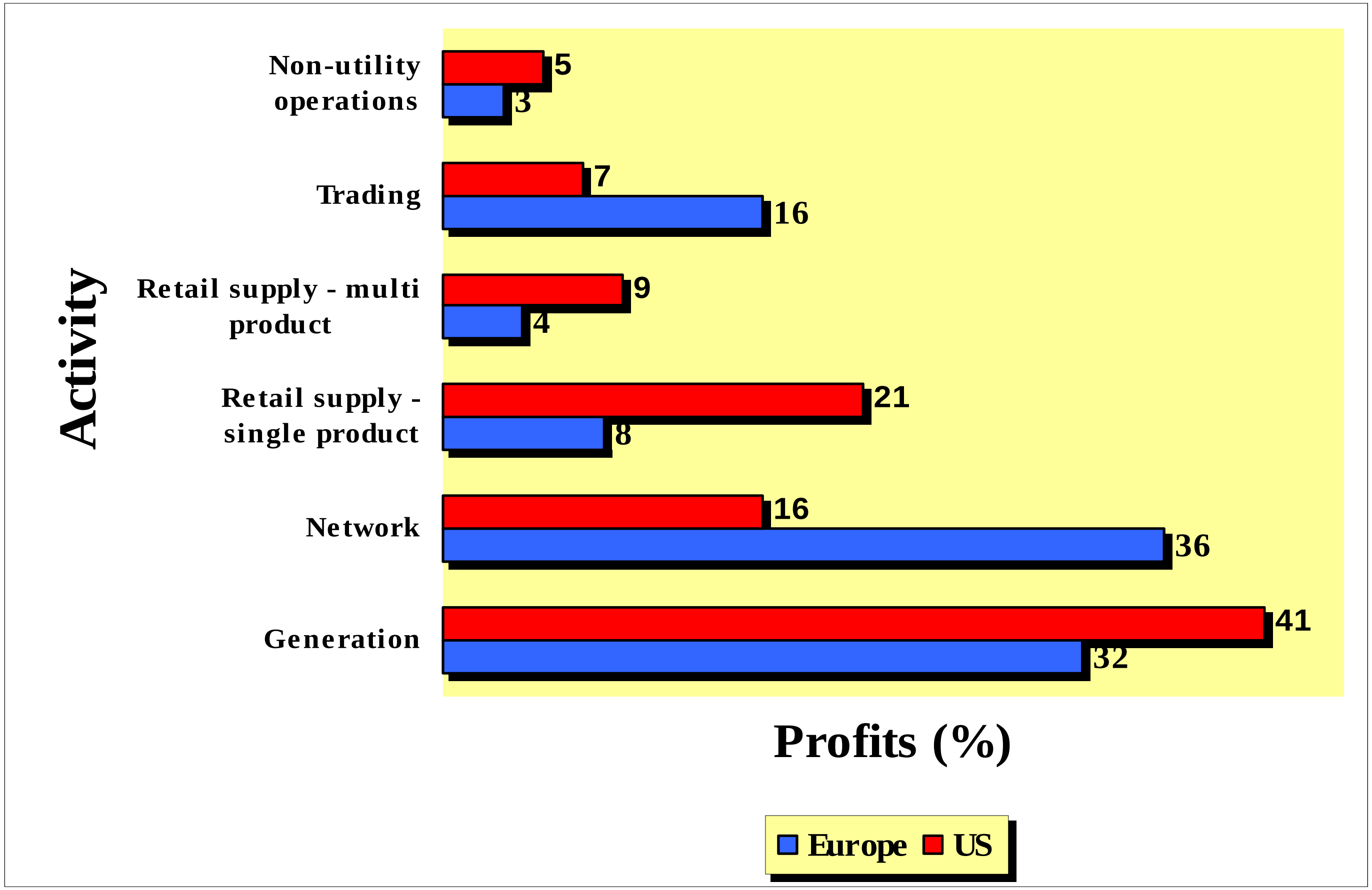
Figure 7.11: **Return on Investment of OECD Electricity Companies, 1993-2002**



Source: Standard and Poor's (2003).

Source: IEA Investment Outlook 2003

Electric Utilities Profits - Europe Vs. US



In 1996 US IOU assets were 55% generation, 40% network, 5% other (EIA, 1997).

Source: PriceWaterhouseCoopers (2003)

Social Impact

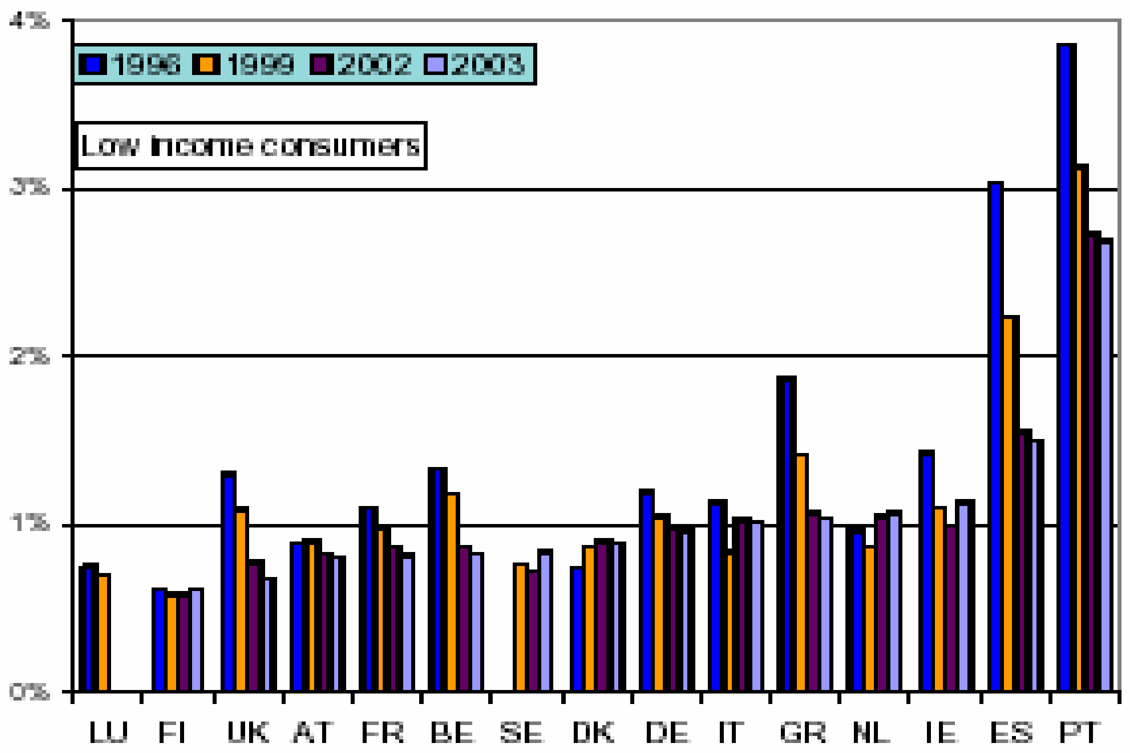
Universal Service & Vulnerable Customers

	Universal service			Vulnerable Customers				
	Default supplier	End user price controls	Perequation (uniform tariff)	Special tariffs	Pre-payment meters	Free supply amount	Restrictions on disconnection	Disconnections for non-payment
AT	P	No	No	No	Yes	No	No	n.k.
BE	P	All	Yes	Yes	Yes	Yes	Yes	0.15%*
DK	P	HH only	No	No	No	No	Yes	negligible
FI	P	HH only	No	No	No	No	Yes	negligible
FR	P	all customers	Yes	Yes	No	No	Yes	215,000
DE	P	No	No	No	Yes	No	Yes	0.02%
GR	P	all customers	Yes	No	No	No	No	n.k.
IE	P	all customers	Yes	Yes	Yes	Yes	Yes	7,000
IT	D	all customers	No	Planned	No	No	Yes	255,264
LU	No	all customers	No	No	No	No	Yes	n.k.
NL	P	households	No	No	No	Yes	No	n.k.
PT	P	all customers	No	Yes	No	No	Yes	n.k.
ES	P	all customers	Yes	Yes	Yes	No	No	n.k.
SE	P	No	No	No	Yes	No	Yes	n.k.
UK	P	No	No	No	Yes	-	Yes	995

I = financial incentives/penalties in price limit, C = direct compensation to customers; L = licence condition or other legal instrument; M = meter reading and billing standard; HH: Household; *: 2001 data; Default supplier: P – predetermined, D – designated by regulator if necessary; n.k.: not known

Source: EC 3rd. Benchmarking report (2004)

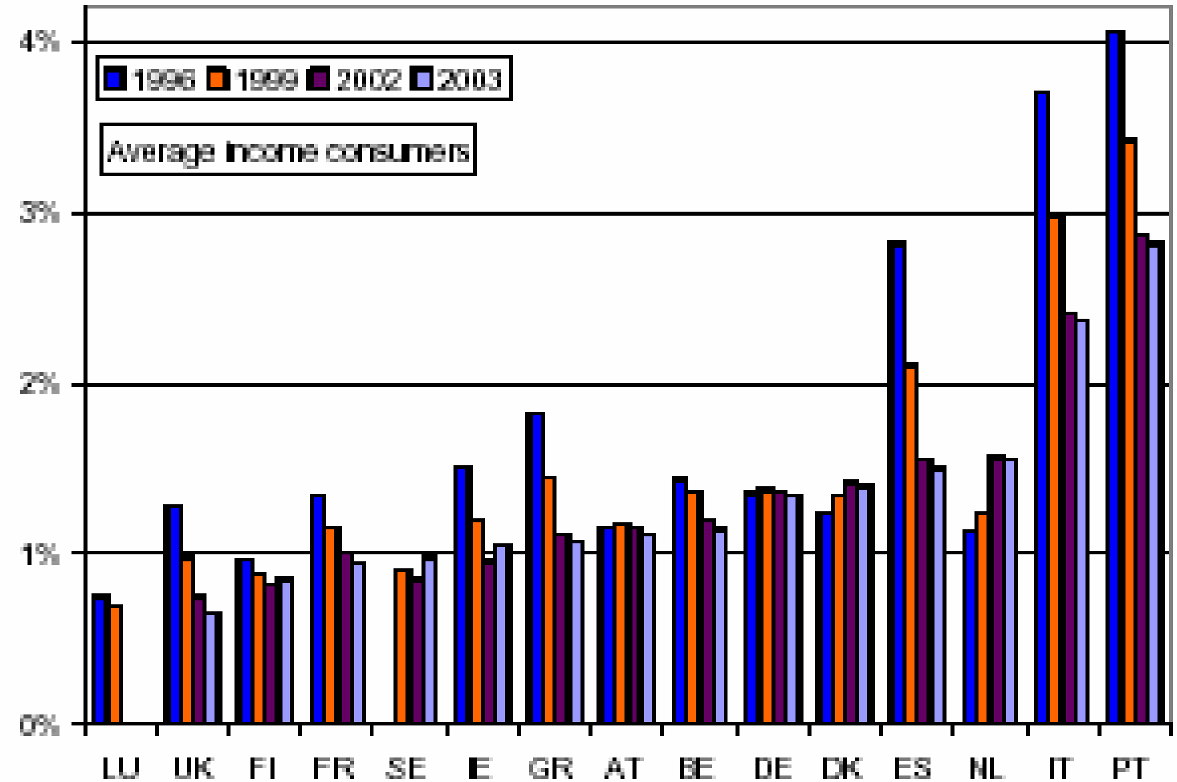
Electricity Affordability Index - I



Percentage of per capita income necessary to pay an annual consumption of 1,200 kWh; households in the lower income bracket

Source: EC (2004)

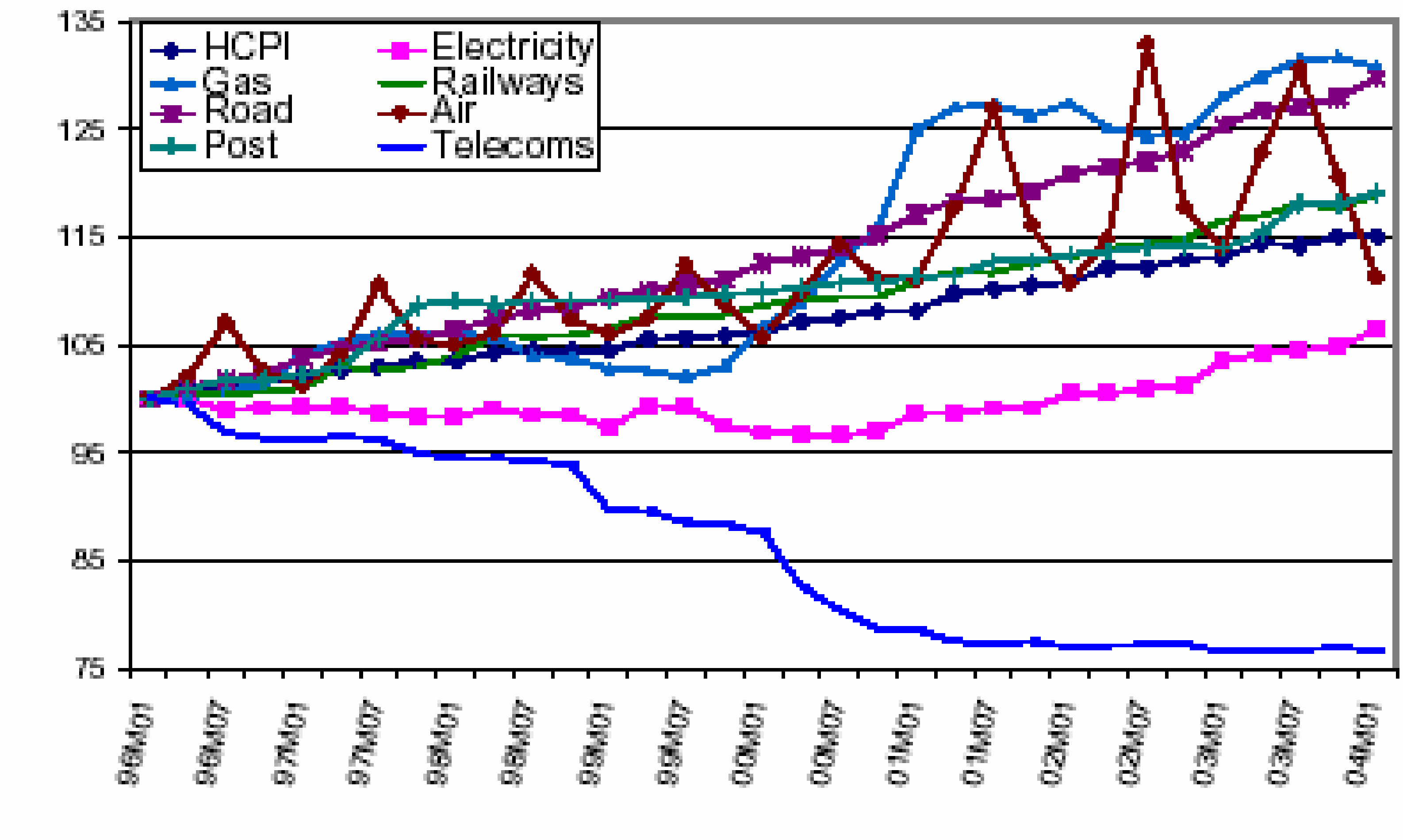
Electricity Affordability Index - II



Percentage of per capita income necessary to pay the annual consumption of 3,500 kWh. Households in the income bracket around the median (between 40 to 60%).

Source: EC (2004)

Evolution of Prices and CPI 01/1996-01/2004

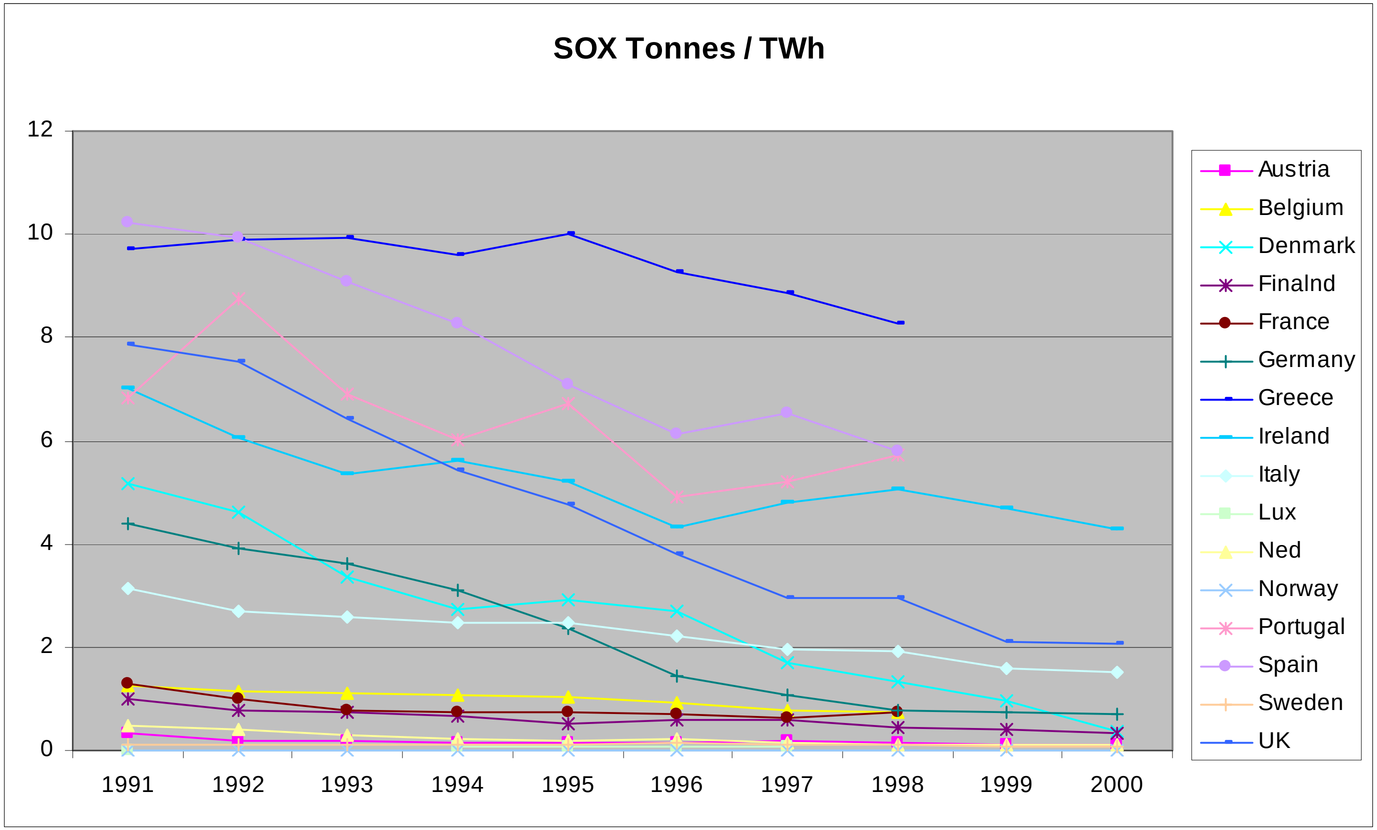


January 1996=100; *Source: Monthly data from Eurostat NewCronos database*

From: EC (2004)

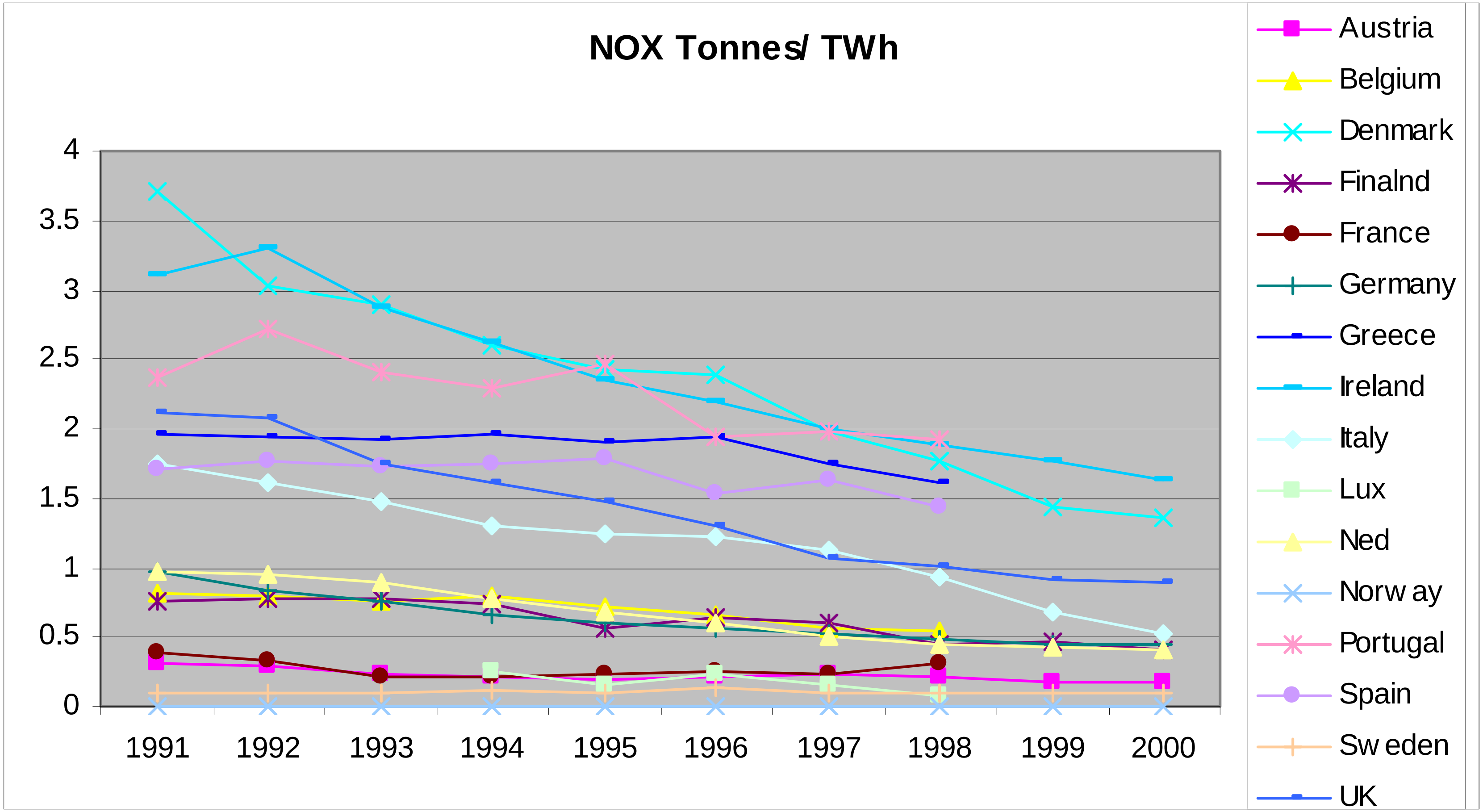
Environment

Power Sector SOx Emissions



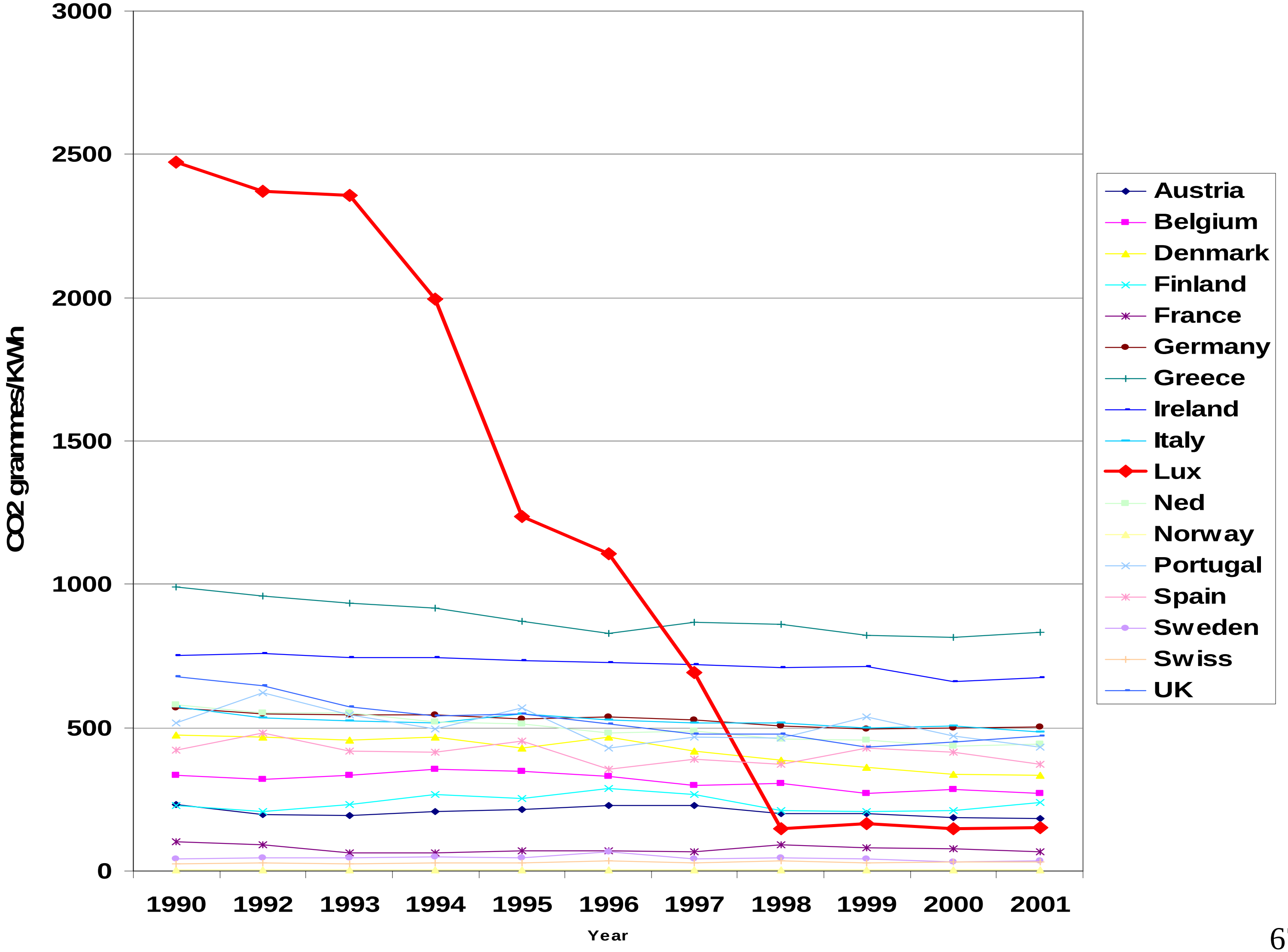
Source: OECD Environmental Data 2002

Power Sector NOx Emissions



Source: OECD Environmental Data 2002

Power Sector CO2 Emissions



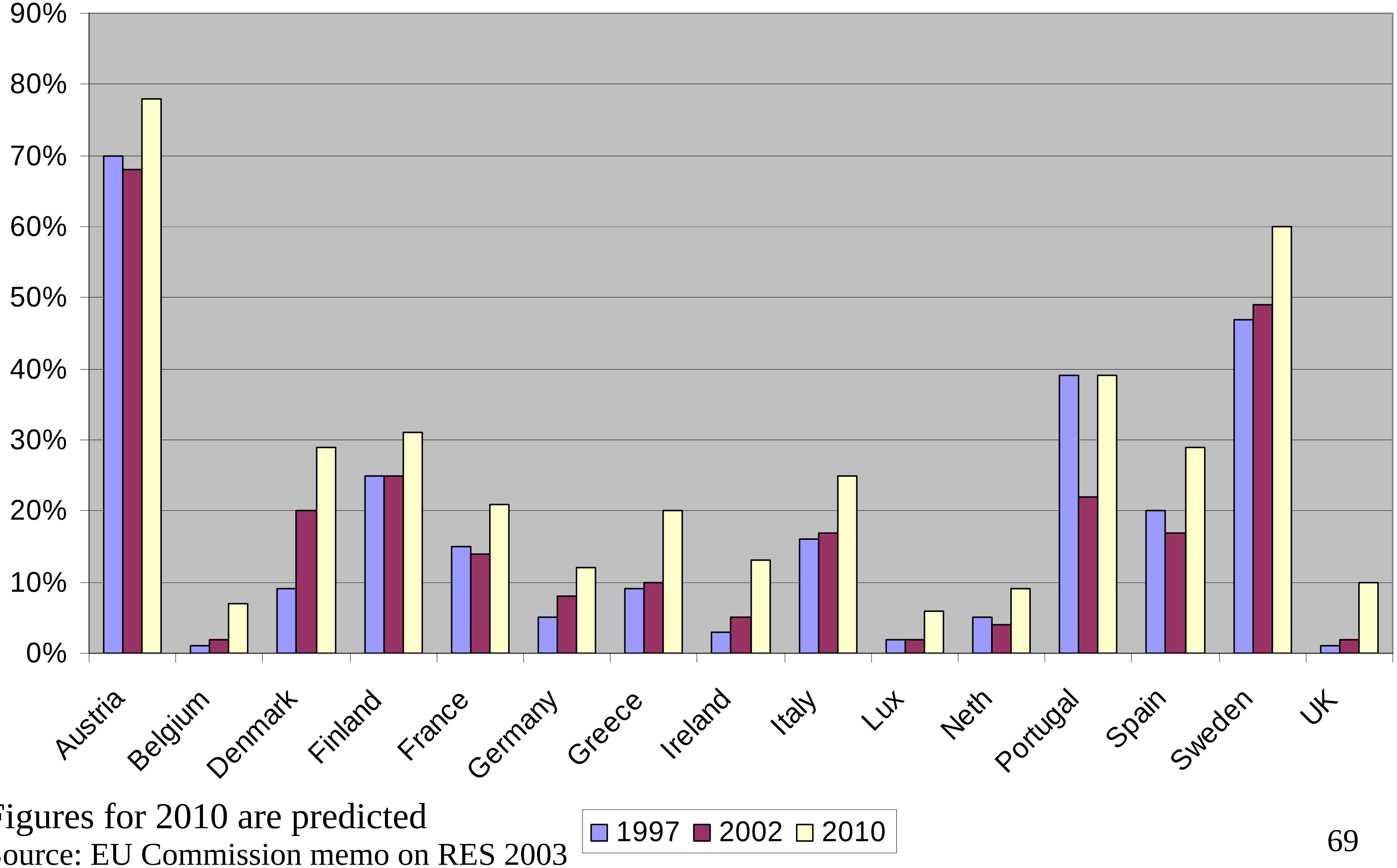
Source: IEA Coal Information 2003

RES Share of Generation Across EU15+2

	1974	1980	1990	1995	2000	2001	2002
RES Share	24.40%	22.31%	18.23%	18.91%	19.70%	19.71%	18.02%
Hydro Share	23.97%	21.84%	17.72%	17.97%	17.80%	17.61%	15.52%
Solar, Wind, Tide Share	0.04%	0.03%	0.06%	0.20%	0.86%	1.02%	1.35%
Geothermal Share	0.17%	0.15%	0.14%	0.14%	0.17%	0.16%	0.17%
Other Renewables	0.22%	0.30%	0.32%	0.60%	0.86%	0.92%	1.00%

Source: IEA Electricity Balances 2003

% of Electricity from RES Relative to 2010 Targets



Figures for 2010 are predicted
Source: EU Commission memo on RES 2003

Conclusions

Conclusions and Discussion

- Impressive forcing effect due to Directive
  - Opening proceeding rapidly
  - Standardisation of structures and rules
- Social Cost Benefit of Reforms still difficult
  - Consumers are seeing lower prices and convergence
  - Profits of EU electricity firms, not suffering unduly
  - Government impact unclear but not significantly –ve
- Missing Data
  - On EU market shares of individual companies
  - On costs, especially of network operators
  - Subsidies to electricity production and tax revenue
  - Trend in EU security of supply

Conclusions and Discussion

- Things to watch
  - Market shares of leading companies
  - Network tariff divergence
  - Network regulation and whether it is best practice
  - Security of supply at EU level
  - Role of Accession countries in EU security

- Issues
  - What additional data should the EU be collecting?