

Electricity Liberalisation In The European Union

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FEEM, 30 June 2009

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Outline

- Background
- Resource Endowments and Trading
- Key Reform Steps
- Market Structure
- The 2003 blackouts
- Institutions and Regulation
- Sector Performance
- Firm Performance
- Environment
- Recent market developments
- Conclusions and Lessons

Background

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 ($\approx 1/3$)	→ ALL NON-HOUSEHOLD (2004) ALL (2007)
UNBUNDLING T / D	NONE →	ACCOUNTS	→ LEGAL
CROSS-BORDER TRADE	MONOPOLY →	NEGOTIATED	→ REGULATED

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 economic theory on how to reform markets?

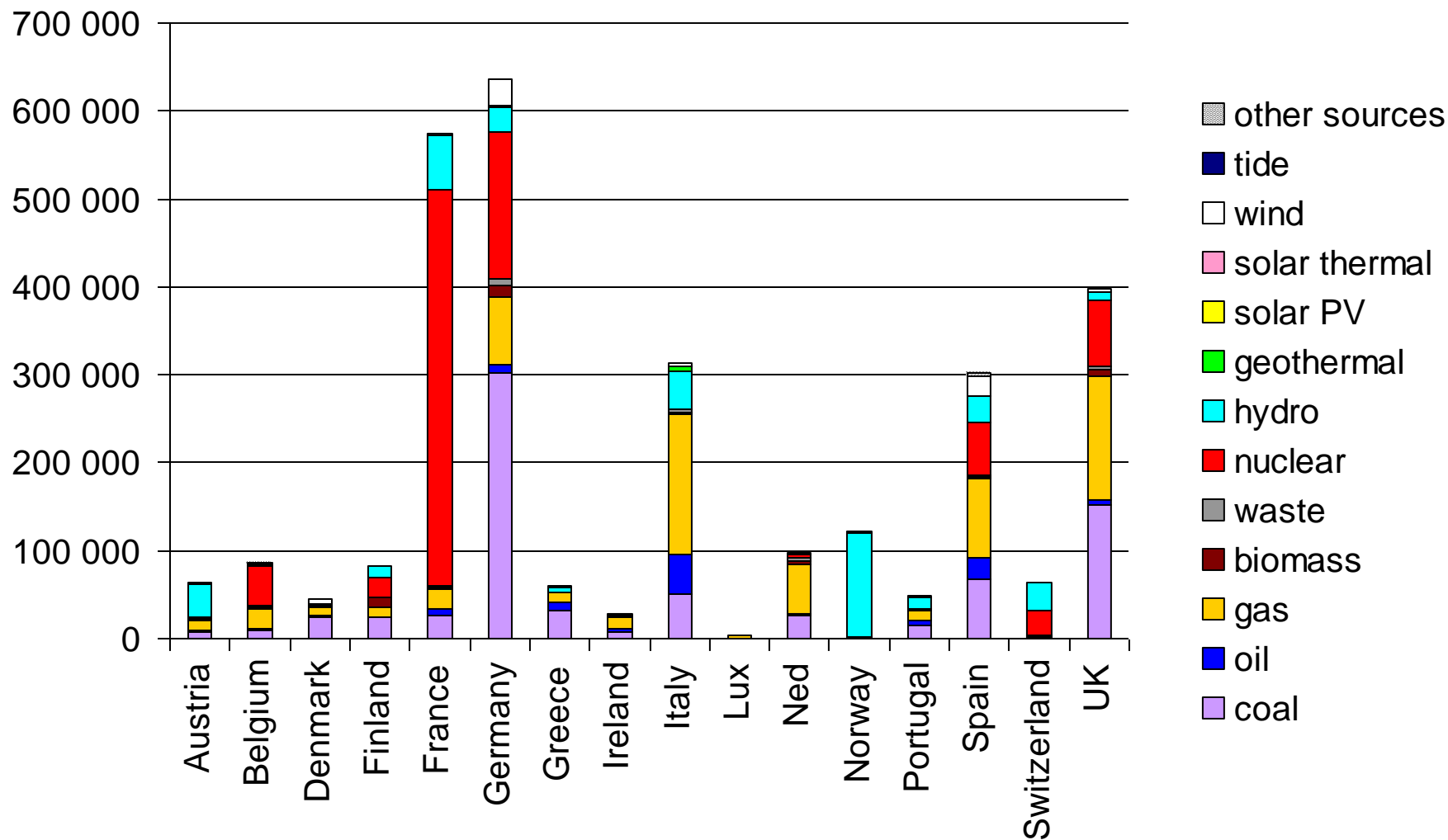
- Number of firms (+) and market shares (-)
 - Competitive generation and retail markets
- Entry barriers (-)
 - Freer entry to generation and supply
- Market size (+)
 - Increased and local market rules harmonised
- Regulation of natural monopoly networks
 - incentive based and independent

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.)

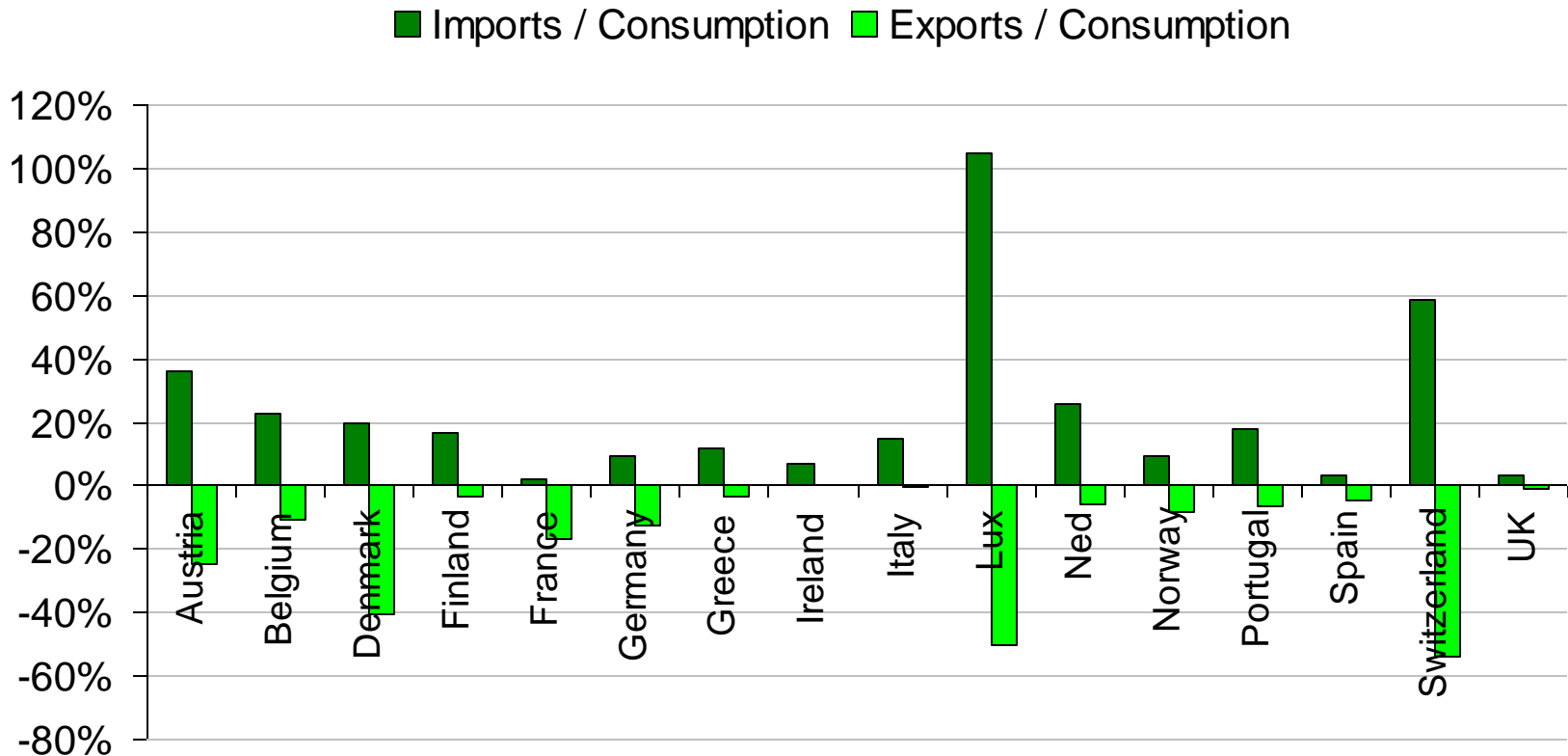
Resource Endowment and Trading

Electricity Supply by Source (GWh) 2006



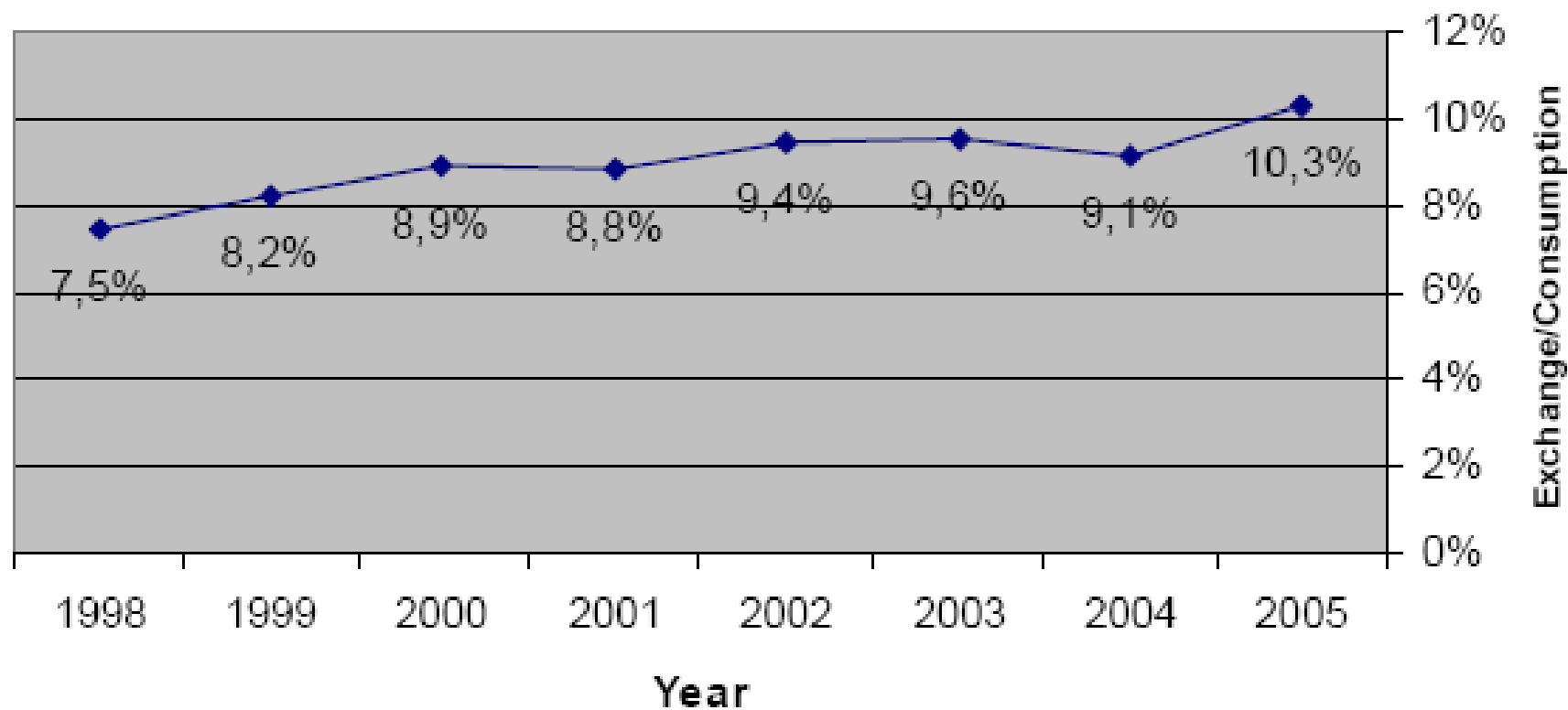
Source: IEA Energy Statistics 2008

Imports and Exports of Electricity as % of National Consumption - 2006



Source: IEA Energy Statistics 2008

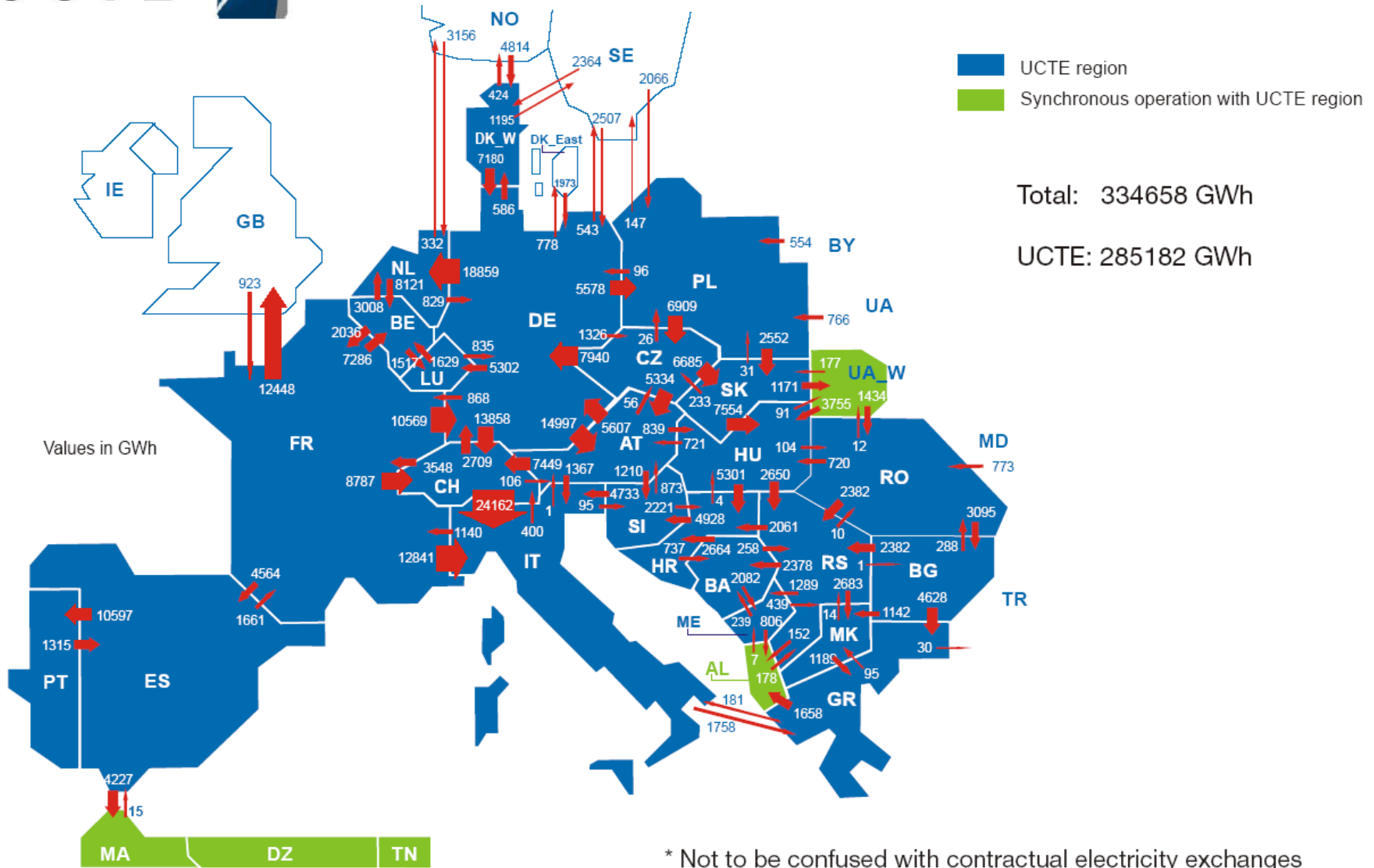
Cross-border Electricity Exchange in EU



Source: EC, 2007. Data for EU-27 + Switzerland + Norway



Physical energy flows 2008 *



Regional Markets within EU



Organised Markets in the EU

Wholesale market structure			
	Organised wholesale market	Bilateral contracts allowed	Opening of organised market
Austria	EXAA	yes	2002
	EEX	yes	2002
	Nord Pool		2002
Germany	EEX	yes	LPX (Leipzig) and EEX (Frankfurt) up to 2002, EEX (merger of LPX and EEX) since 2003
Denmark	Nord Pool	yes	Joined the Nord Pool in 1998
Finland	Nord Pool	yes	Joined the Nord Pool in 1999 (Western Denmark) and 2000 (Eastern Denmark)
Sweden	Nord Pool	yes	1996
Norway	Nord Pool	yes	n.d.
France	Powernext	yes	2001
Italy	Ipex	yes	2004
Netherlands	APX	yes	1999
	APX		n.d.
UK	NETA	yes	England & Wales from 1990 to March 2001, NETA since March 2001
Portugal	Omel	yes	n.d.
	Mibel	yes	In progress
Spain	Omel	yes	1998

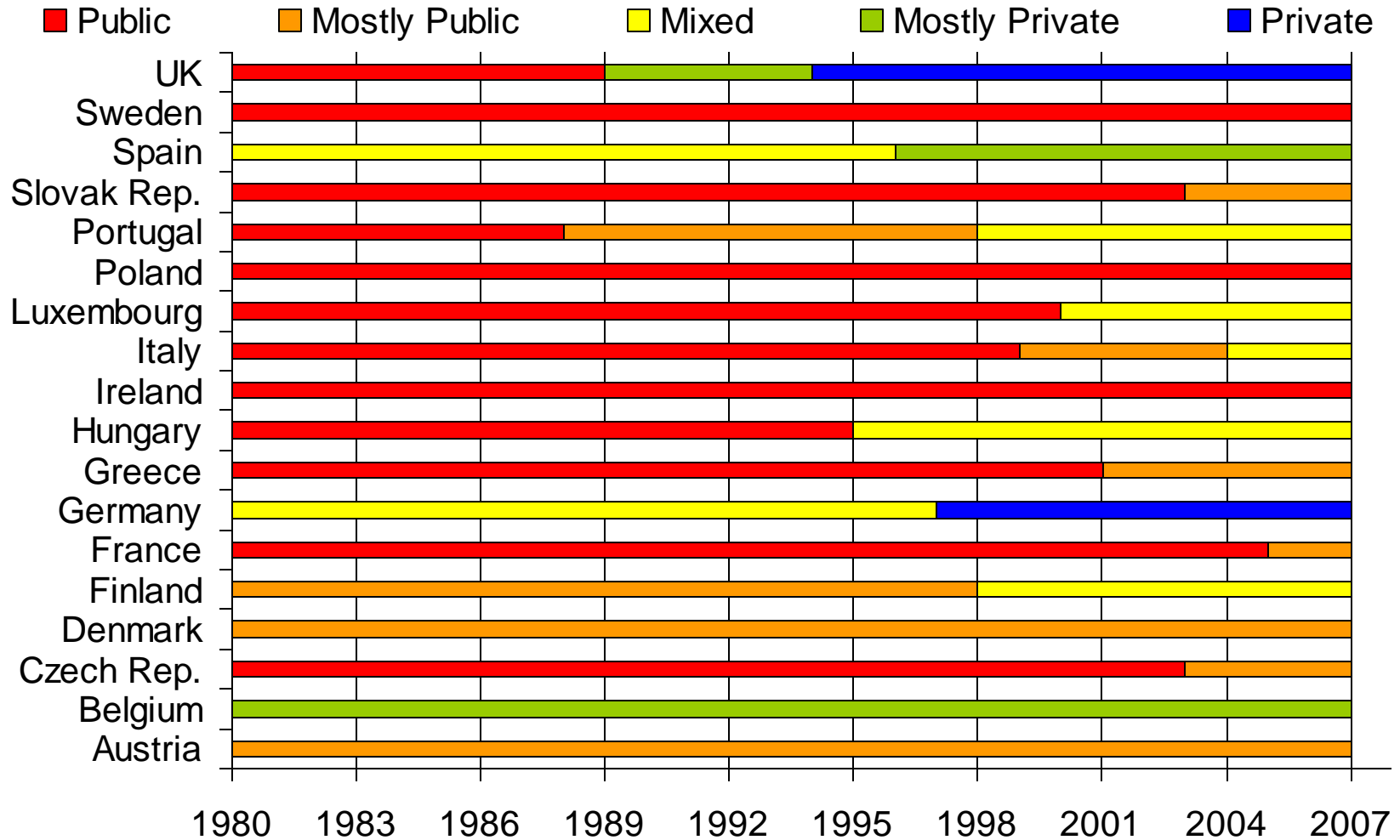
Source: market operators' websites

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	1st Electricity Directive
1997	Spain		
1998	Germany, Netherlands	Netherlands	1st Gas Directive
1999	Ireland, Belgium, Italy, England and Wales	Ireland	
2000	Luxembourg, France	France, Denmark	
2001	Luxembourg	Austria	
2002			
2003			2nd Electricity Directive, 2nd Gas Directive, Regulation Cross Border
2004	Latvia, Estonia, Lithuania, Poland, Czech Rep., Slovakia, Hungary, Slovenia, Malta, Cyprus.		
2005		Germany	
2006			
2007	Bulgaria, Romania		
2008			
2009			Discussion on the Third Energy Package (3rd Electricity and Gas Directives)

Key Reform Steps

Privatisation



Source: OECD international regulation database, 2009

Levels of market opening by country in 2008:

Proportion of the electricity market open to competition

	2006	2007
Austria	100	100
Belgium	87.4	100
Bulgaria	60	100
Cyprus	30.8	31.8
Czech Republic	100	100
Denmark	100	100
Estonia	13	12
Finland	100	100
France	69	100
Germany	100	100
Greece	70	90.1
Hungary	37.09	22.29
Ireland	100	100
Italy	73	100
Latvia	76	100
Lithuania	74	74
Luxembourg	84	100
Netherlands	100	100
Poland	80	100
Portugal	100	100
Slovakia	80	100
Slovenia	75	100
Spain	100	100
Sweden	100	100
United Kingdom	100	100

Source: EC Benchmarking Report (2009)

Extent of network unbundling across the EU

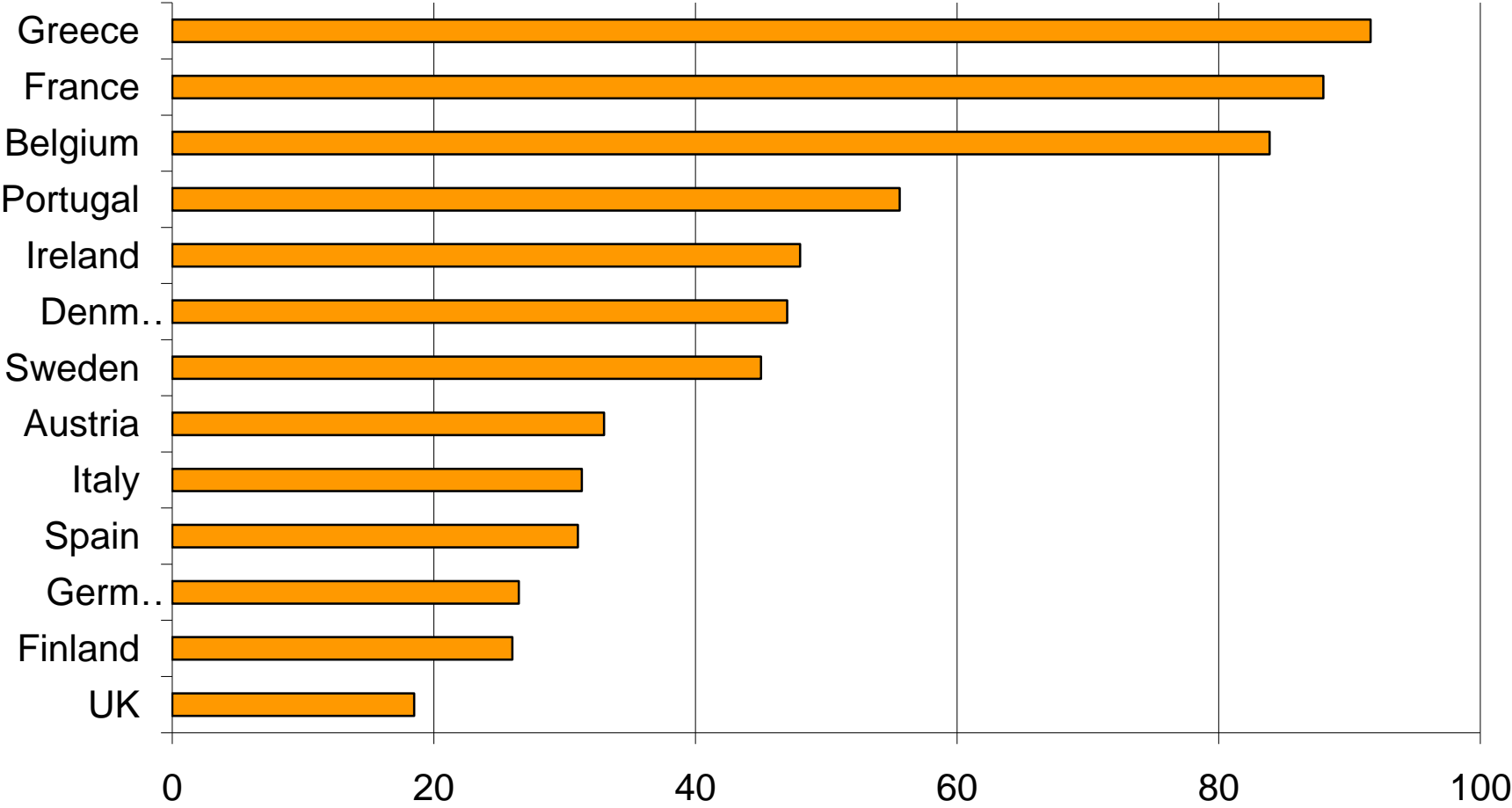
	Ownership unbundling of the TSO	Public ownership	Private ownership	Nr. DSOs	% DSOs legally unbundled	Application of 100,000 customers exemption	% DSOs with less than 100,000 customers
Austria	No	51	49	130	8%	Yes	92%
Belgium	No	35.55	64.45	26	100%	No	54%
Bulgaria	No	100	0	4	100%	No	25%
Cyprus	No	100	0	1	0%	Yes	0%
Czech Rep.	Yes	100	0	280	1%	Yes	81%
Denmark	Yes	100	0	101	100%	No	95%
Estonia	No	100	0	40	3%	Yes	98%
Finland	Yes	12	88	89	56%	No	93%
France	No	84.8	15.2	148	0%	Yes	97%
Germany	No	0	100	855	18%	Yes	91%
Greece	No	51	49	1	0%	No	0%
Hungary	Yes	0.1	99.9	6	100%	No	0%
Ireland	Yes	100	0	1	0%	No	0%
Italy	Yes	30	70	163	*	Yes	93%
Latvia	No	0	100	10	10%	Yes	90%
Lithuania	Yes	96.6	3.4	7	29%	Yes	71%
Lux.	No	32.8	67.2	9	22%	Yes	89%
NL	Yes	100	0	8	100%	No	63%
Poland	Yes	100	0	18	78%	Yes	22%
Portugal	Yes	51	49	13	85%	Yes	77%
Romania	Yes	100	0	30	23%	Yes	73%
Slovakia	Yes	100	0	154	2%	Yes	98%
Slovenia	Yes	100	0	1	100%	No	0%
Spain	Yes	20	80	329	100%	Yes	98%
Sweden	Yes	100	0	175	100%	No	90%
UK	Yes	0	100	18	100%	No	22%

Source: EC Benchmarking Report (2009)

*Obligation of legal unbundling for companies serving more than 100,000 clients in force since th 1st January 2008

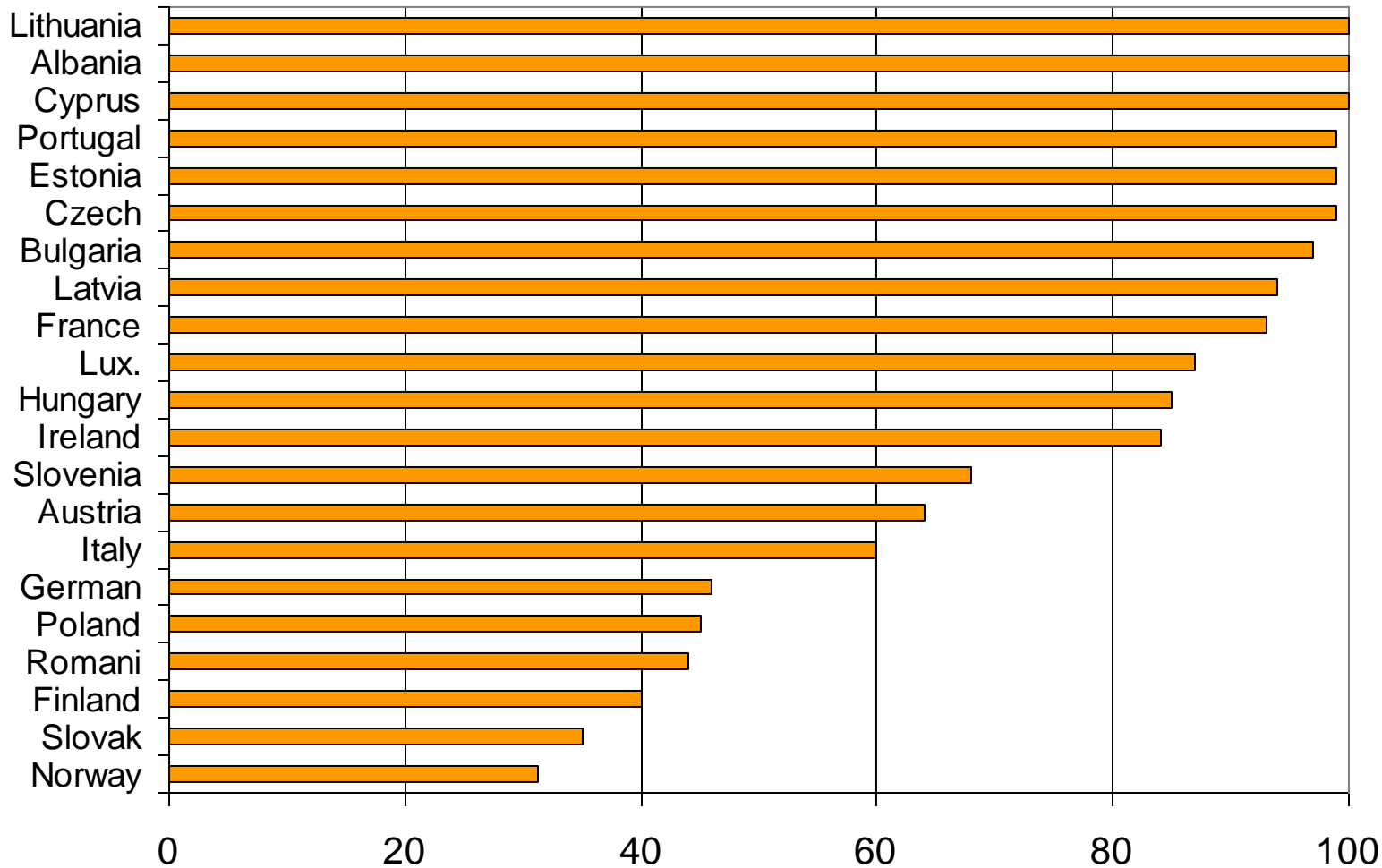
Market Structure

Market Share - Largest Generator (2008)



Source: Eurostat and own calculations

Market Share - 3 Largest Retailers (2008)



Source: ERGEG data



TOP 12 congested interconnectors



From	To	Capacity/MW	Allocation method	Long term contracts	Congested	Market based system
CH	IT	2800	Retention/Prorata	29%	always	
FR	IT	2600	Prorata	69%	always	
AT	IT	220	First come/first serve/Prorata	50%	always	
FR	DE	2850	First come/first serve	13%	frequently	
DE	NL	2800	Auction	46%	frequently	nov-00
FR	BE	2200	First come/first serve/Prorata	72%	frequently	
FR	UK	2000*	Auction		frequently	mars01
DKW	DE	1200	Auction		frequently	sept-00
FR	ES	1100	First come/first serve/Prorata	45%	frequently	
DKW	NO	950*	Market splitting		frequently	jul-99
DKE	DE	550*	Auction	100%	frequently	janv-02
SE	DE	460*	Retention/Fixed price	100%	frequently	

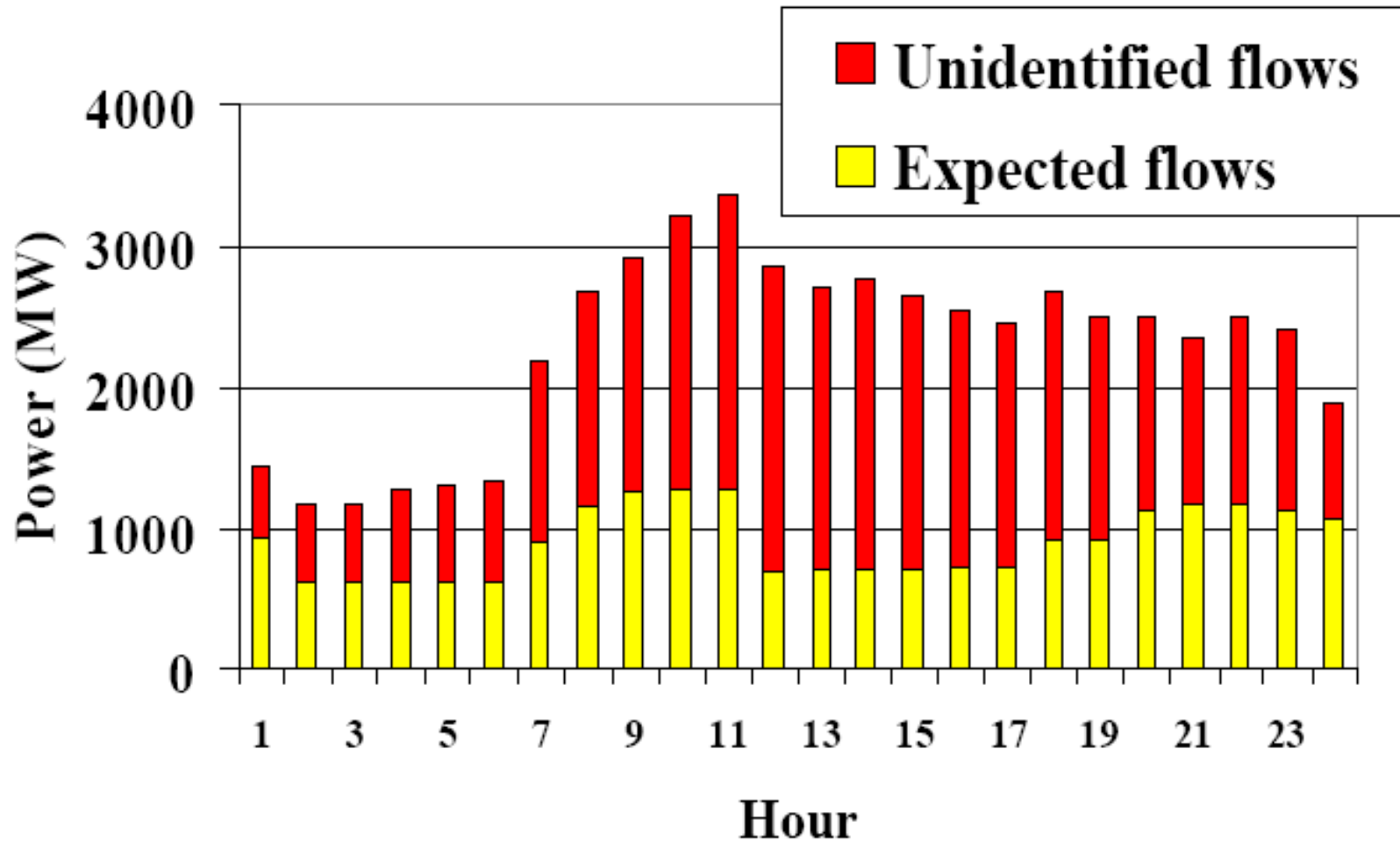


2003 blackouts and relation to trading

2003 blackouts (see Bialek, 2004)

- 6 blackouts within 6 weeks affecting 112 million people in 5 countries
- USA, UK, Denmark/Sweden, Italy
 - Denmark-Sweden: 5 million people
 - Italy: largest blackout in Europe since WW2

Flows through the Belgian Grid on July 14, 1999



Source: P. Bonnard, 2003 IEEE Trans. Distr. Conf

Conclusions on 2003 blackouts (Bialek, 2004)

- US and Continental Europe:
 - problems at interfaces between networks
 - old rules and mechanisms fail under liberalisation
 - new paradigm needed
- Need to re-examine (N-1) rule due to hidden modes of failure?
- Technical questions: protection, prevention of cascading
- UK: commissioning of new equipment
- Security of supply is *the* most important problem

Blackouts since Liberalisation

(Yu and Pollitt, 2009)

Table 5: Distribution percentage of blackout causes of two 5-year periods (Europe)

European Region	First 5-year Period (1998 – 2002)		Second 5-year Period (2003 – 1007)	
	No. of incidents	Percentage Distribution	No. of incidents	Percentage Distribution
Causes / Total	58	100%	120	100%
Technical	16	28%	24	20%
Weather	11	19%	25	21%
Accident	10	18%	14	12%
Unknown	6	10%	30	25%
Natural Disasters	4	7%	3	2%
Capacity	2	3%	7	6%
Human	2	3%	4	3%
Disruption	3	5%	2	2%
Tree	2	3%	1	1%
Maintenance	1	2%	4	3%
Animal	1	2%	6	5%

Rise in number of incidents is not significant for change in liberalisation. 28

Institutions and Regulation

Powers of Sector Regulator

	Score /5
Germany	3
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=0.*
- *Information powers, strong =1, Other=0.*

Sector Performance

Measuring Performance

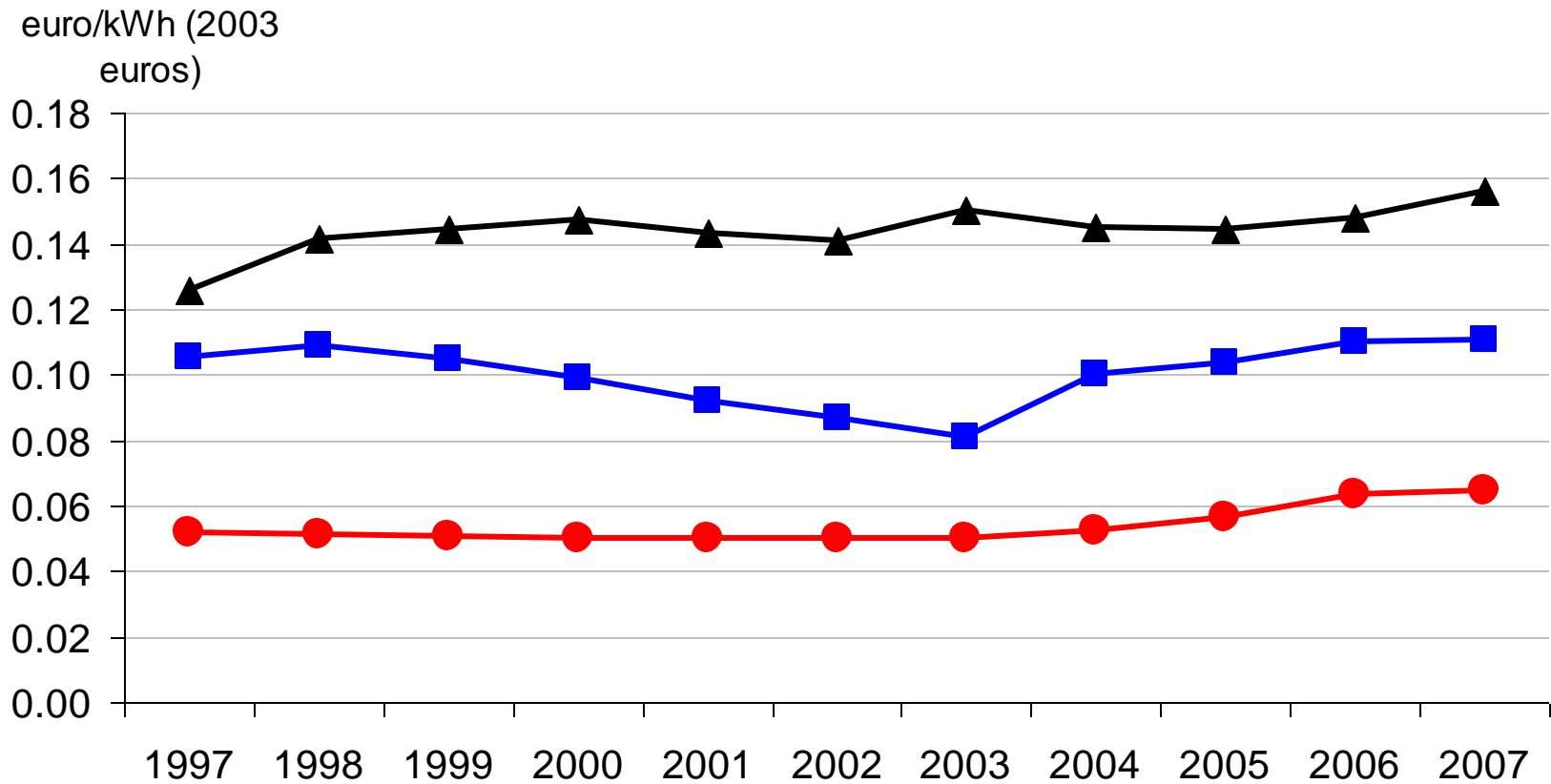
- At the sector level a good performance if:
 - Prices fall on average and converge across Europe.
 - However may need to be some rebalancing of individual prices.
 - Tariffs should be more reflective to market conditions.
 - Network tariffs should fall as regulation toughens and efficiency improves.
 - More efficient use should be made of reserve capacity.

Measuring Performance

- At the firm level good performance (*for society*) if:
 - 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.

EU Average Prices (2003 Euros)

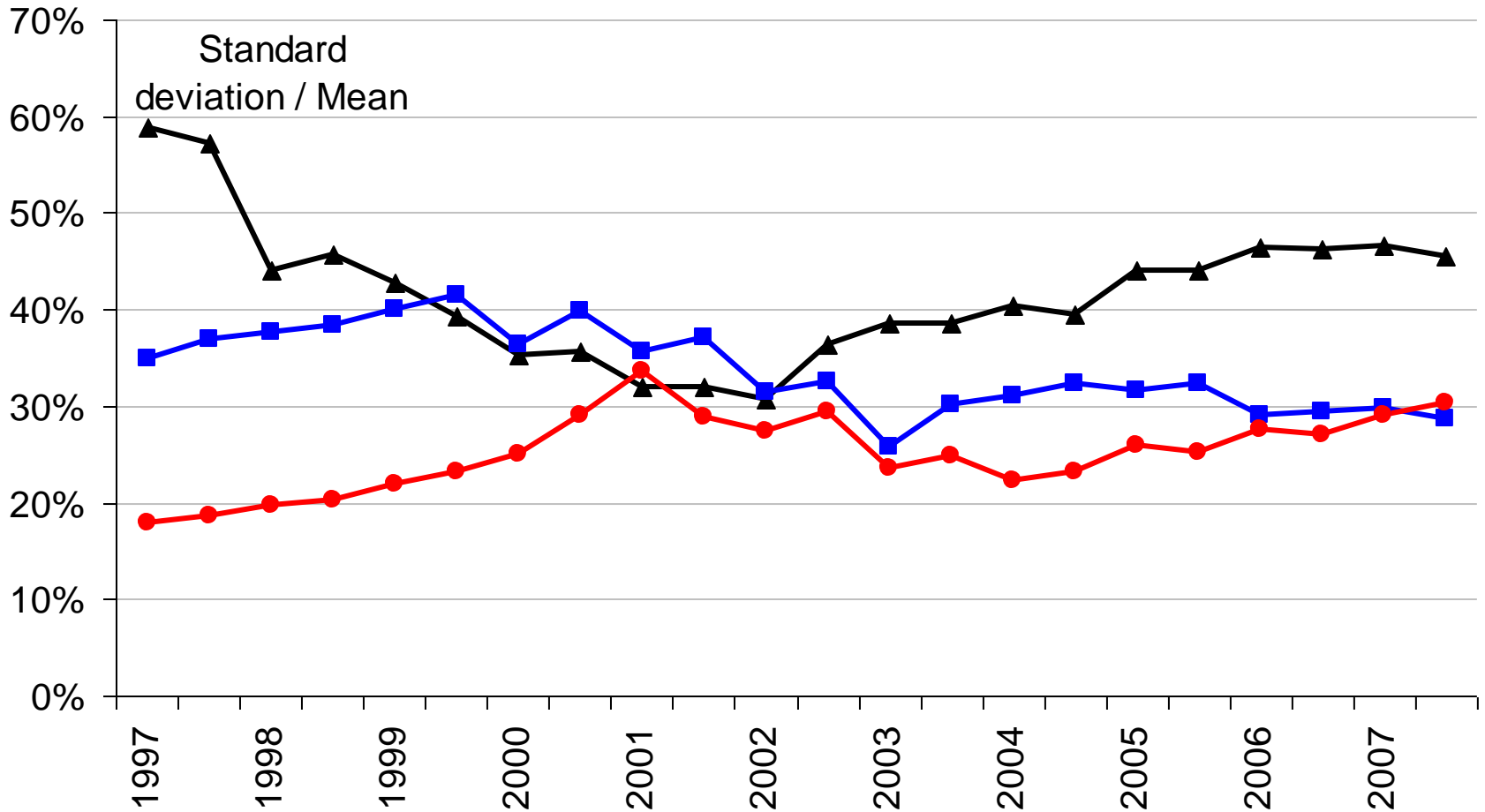
- ▲ EU-15 residential user
- EU-15 small industrial user
- EU-15 large industrial user



Source: Eurostat

EU Price Convergence

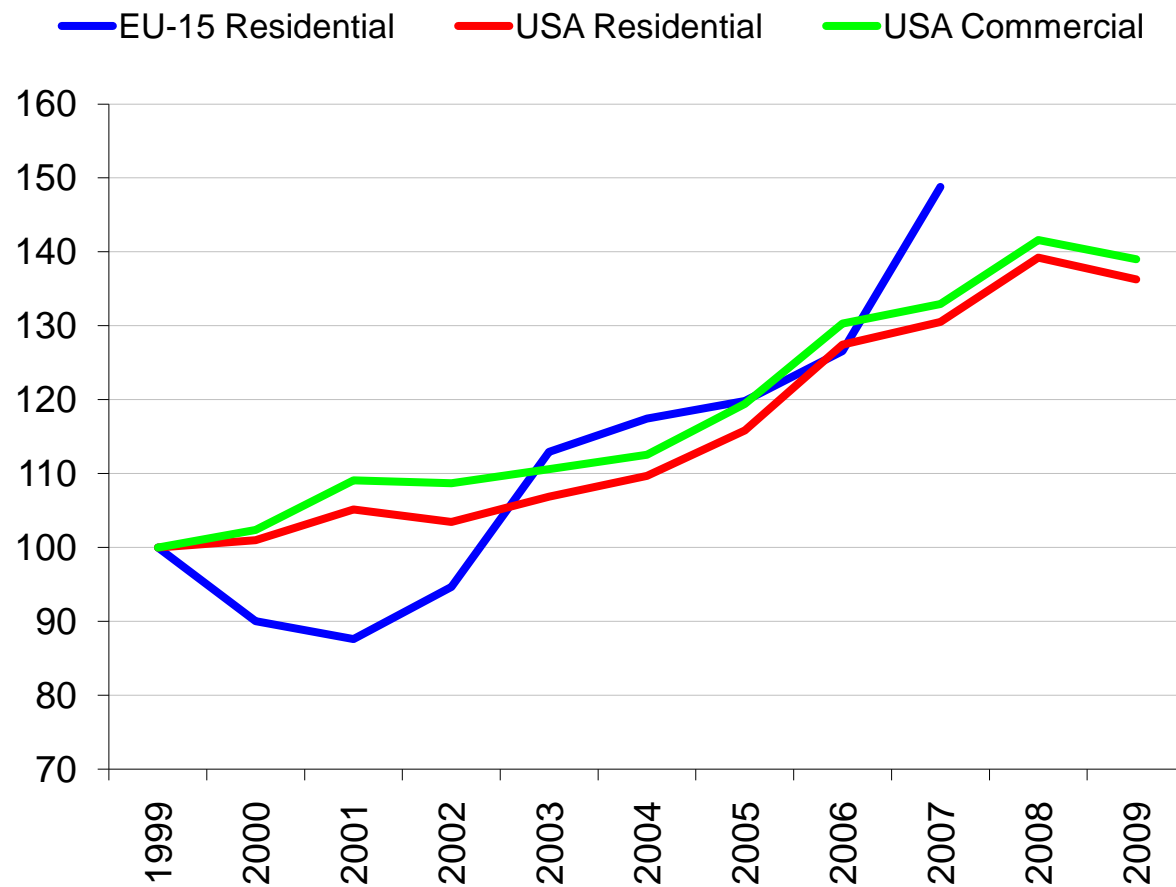
▲ Residential ■ Small industrial ● Large industrial



Source: Eurostat

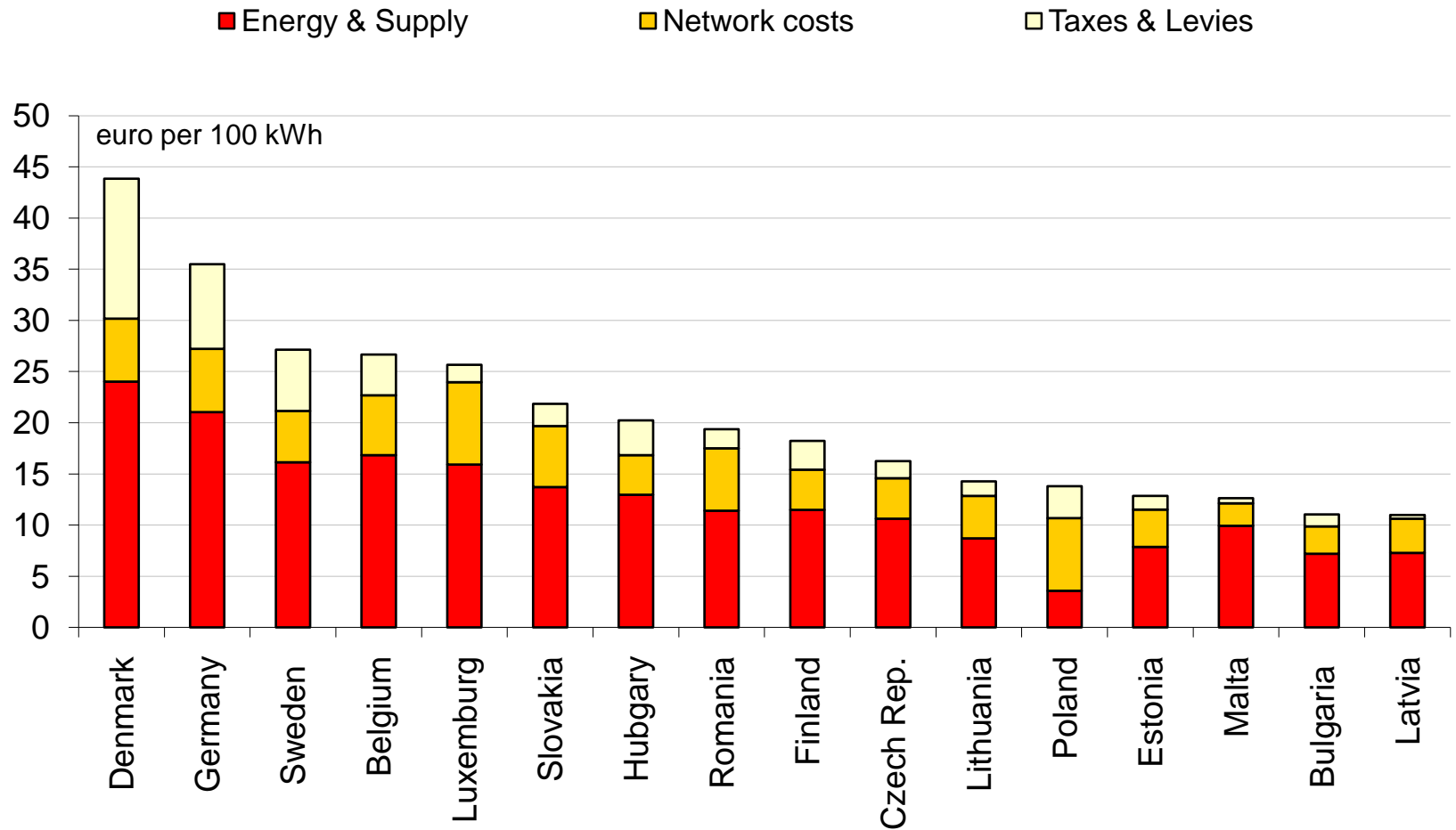
US vs EU Prices

(nominal e/rs)

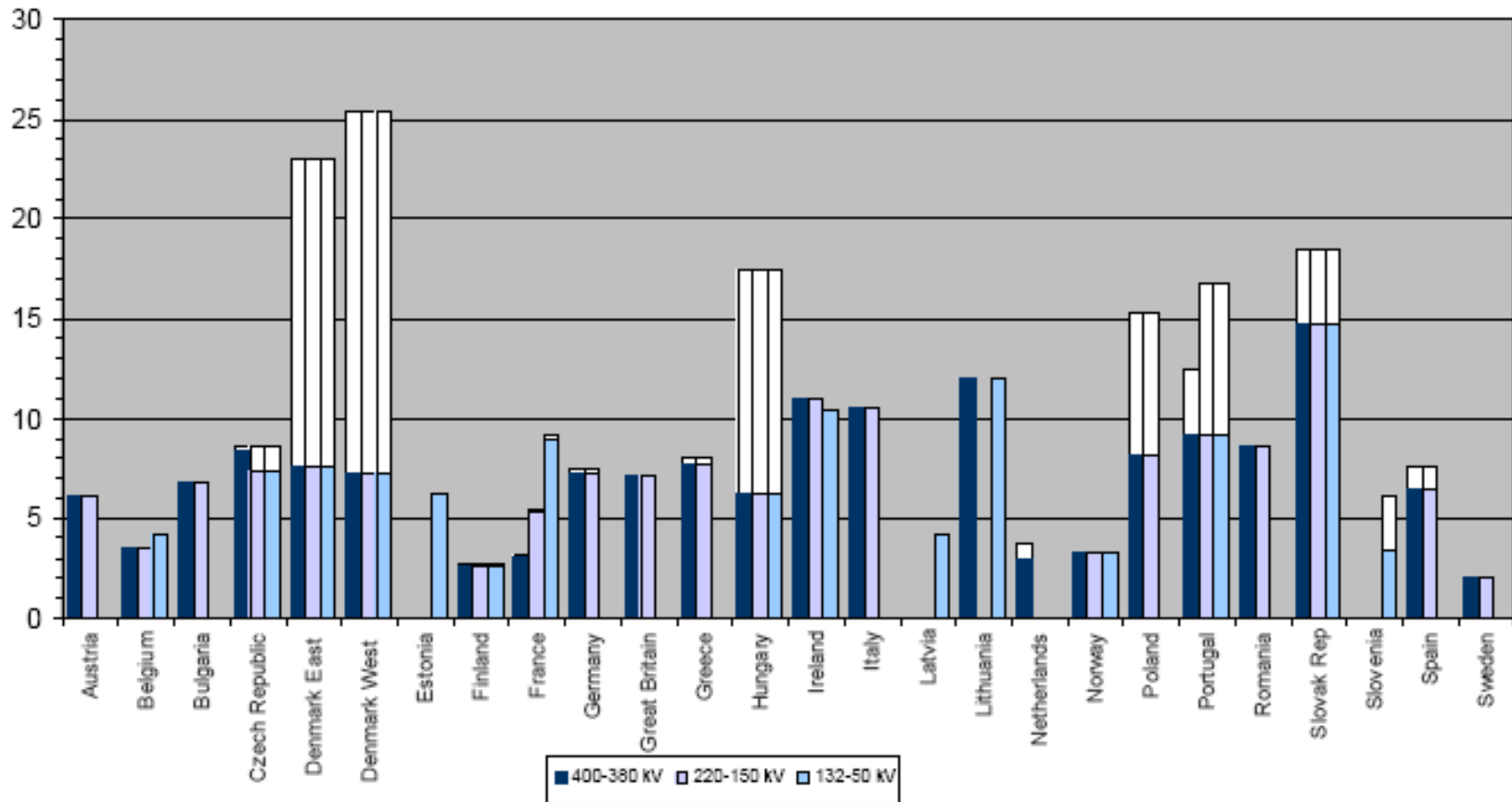


Source: IEA, Eurostat

Estimated electricity price breakdown (2008)



Transmission Tariffs 2007



Blue: costs connected to TSO activities: infrastructures (capital and all operational charges), losses, system services, congestion

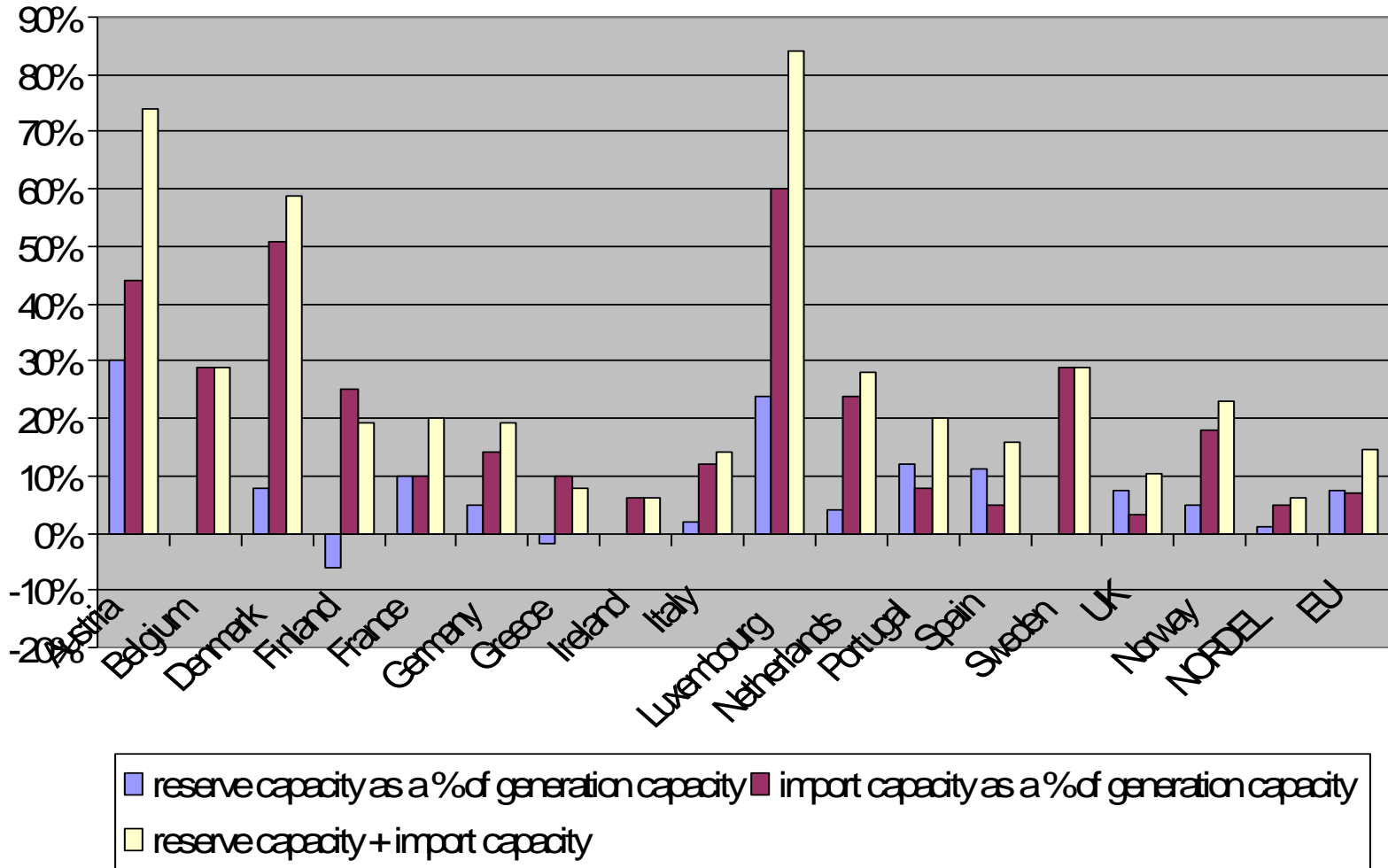
White: other regulatory charges not directly related to TSO activities: stranded costs, public interest contribution, renewable energy and other

Source: ETSO (2008)

2007 switching rates in different countries (%)

Country	In large industry	In medium-sized industry	In small industry and households	In the whole retail market
Austria	7.3	2.1	1.5	
Bulgaria	48.6	1.1	0	12.7
Cyprus	0	0	0	0
Czech Rep.	6	3	0.1	0.8
Denmark		20.8	6.4	13.7
Estonia	0	0	0	0
Germany	13.2	9.7	4.2	10
Greece	0	0	0	0
Italy	1.2	7	4	4.6
Latvia	0	2	0	1
Lithuania	0	0	0	0
Luxembourg	29.1	0.4	0.2	15
Poland	17	0.1	0	7.8
Portugal		14.1	5.2	7.2
Romania	6.2	7.1	0.9	
Slovakia		0	0	2
Slovenia	0	6.5	4.5	3.6
Spain	10	22	3	10
Sweden	8.7	8.7	10.4	9.1
<i>Source: ERGEG data, 2008</i>				

Reserve Margins (2003)



Herfindahl Index for the EU (incl. Norway) Electricity Resources

	1990	1994	1998	2002	2006*
Coal	37.1	32.0	27.9	26.2	28.6
Oil	9.0	8.4	7.8	5.6	3.9
Gas	6.9	9.5	14.7	17.3	21.1
Biomass	0.3	0.6	0.8	0.9	2.7
Waste	0.4	0.5	0.8	0.9	n.d.
Nuclear	33.4	34.9	34.2	31.2	29.5
Hydro	12.8	13.8	13.1	16.6	9.2
Geothermal	0.1	0.2	0.2	0.2	0.2
Solar PV	0.0	0.0	0.0	0.0	0.7**
Solar thermal	0.0	0.0	0.0	0.0	
Other sources	0.1	0.2	0.5	1.0	1.1
HHI	2781	2589	2339	2271	2242

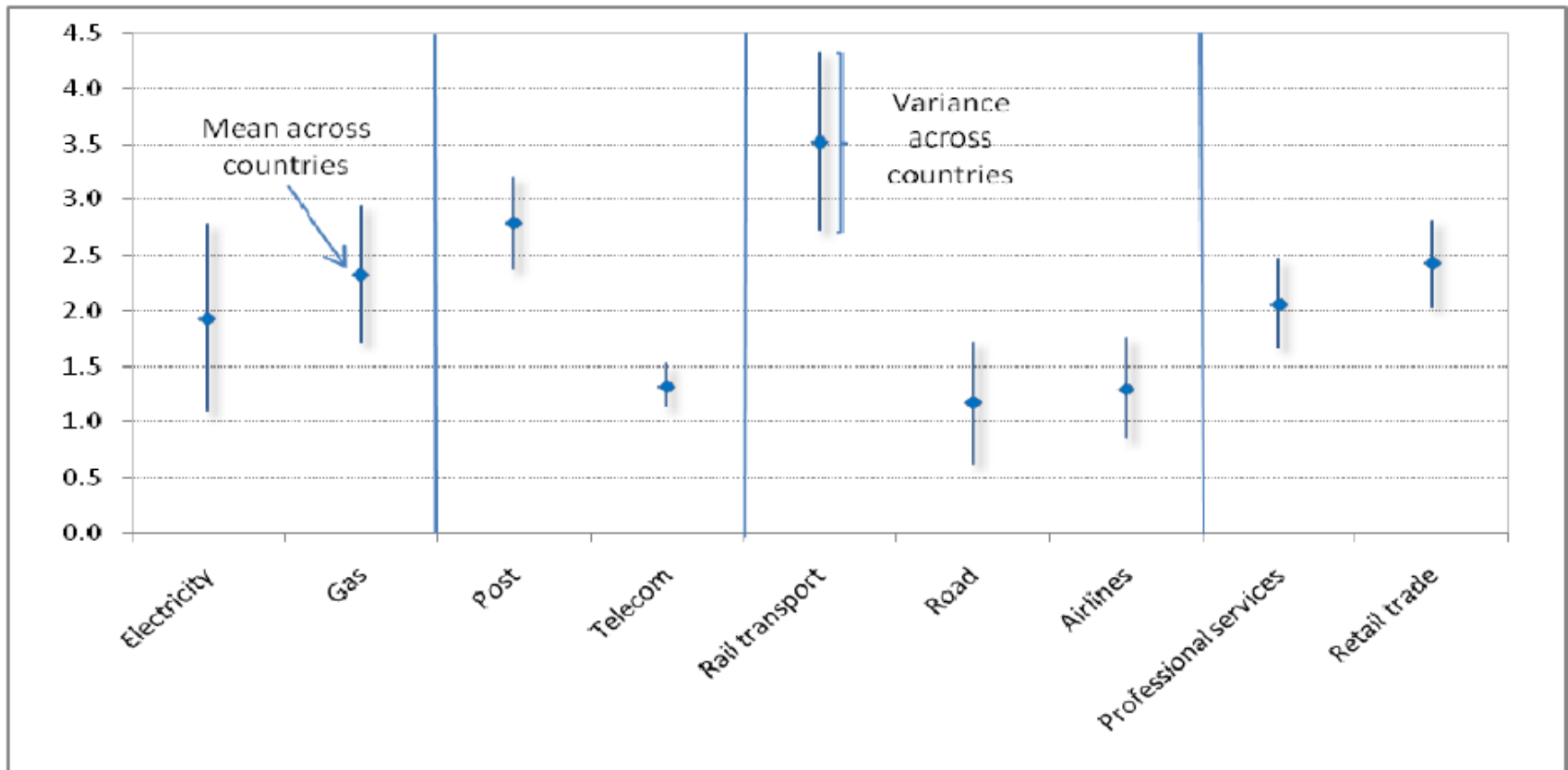
* EU-27 + Norway

** Includes solar thermal generation

Source: IEA and Eurostat data

Electricity Liberalisation in context 2008 (0-6, 0=least restrictive)

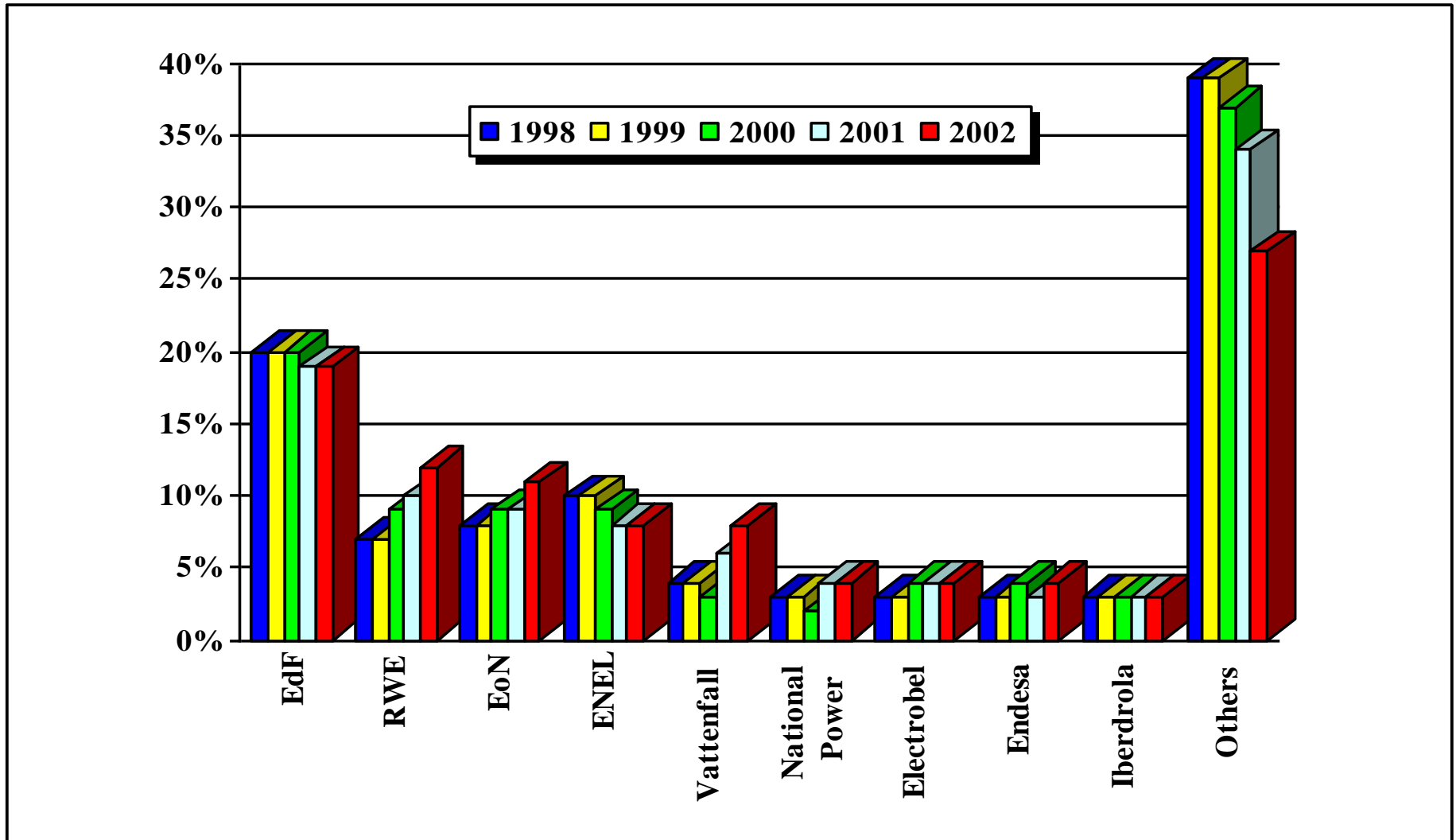
Panel B: by sector



Source: Wolf et al., 2009, p.26.

Firm Performance

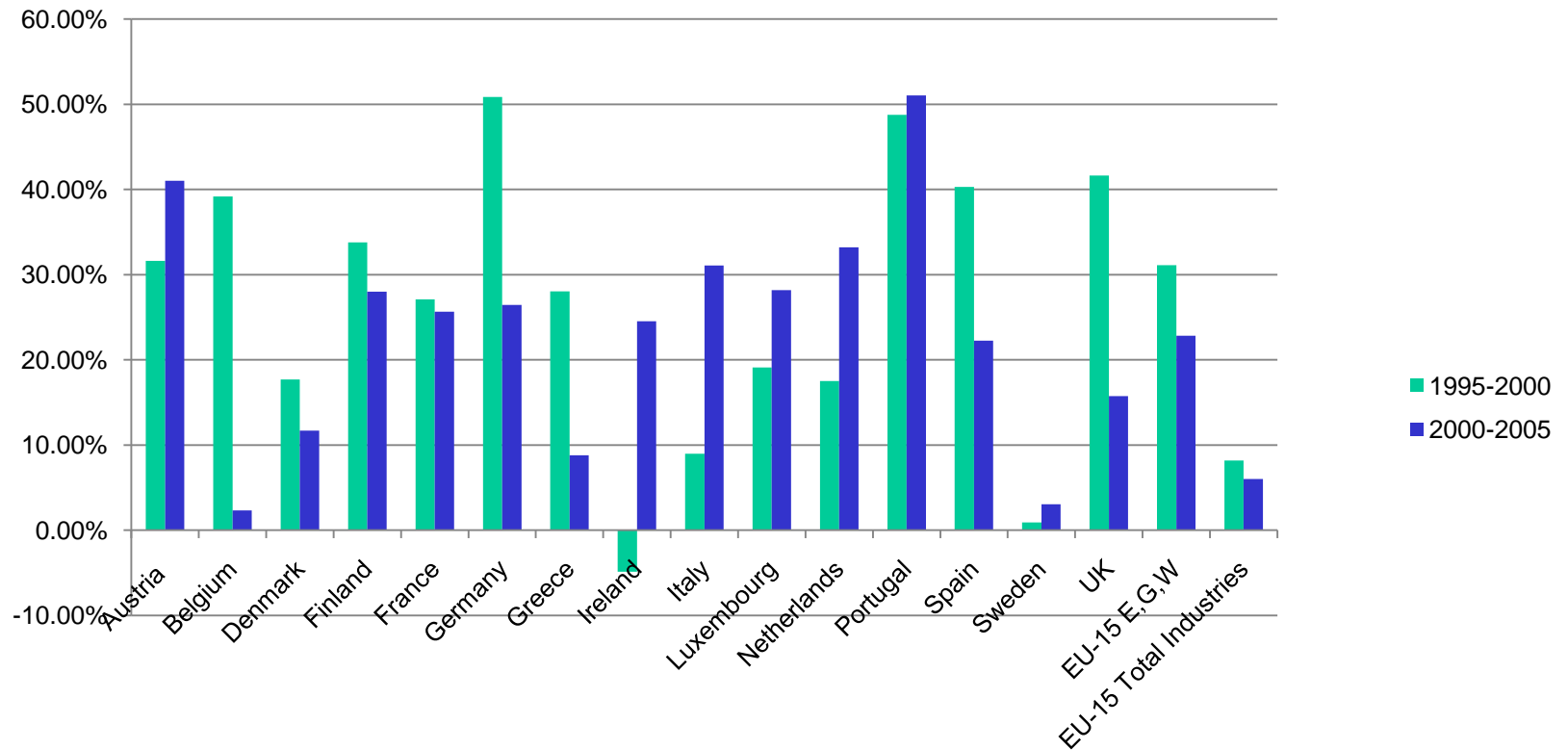
Generation Market Shares in Western Europe



Supplier Market Shares

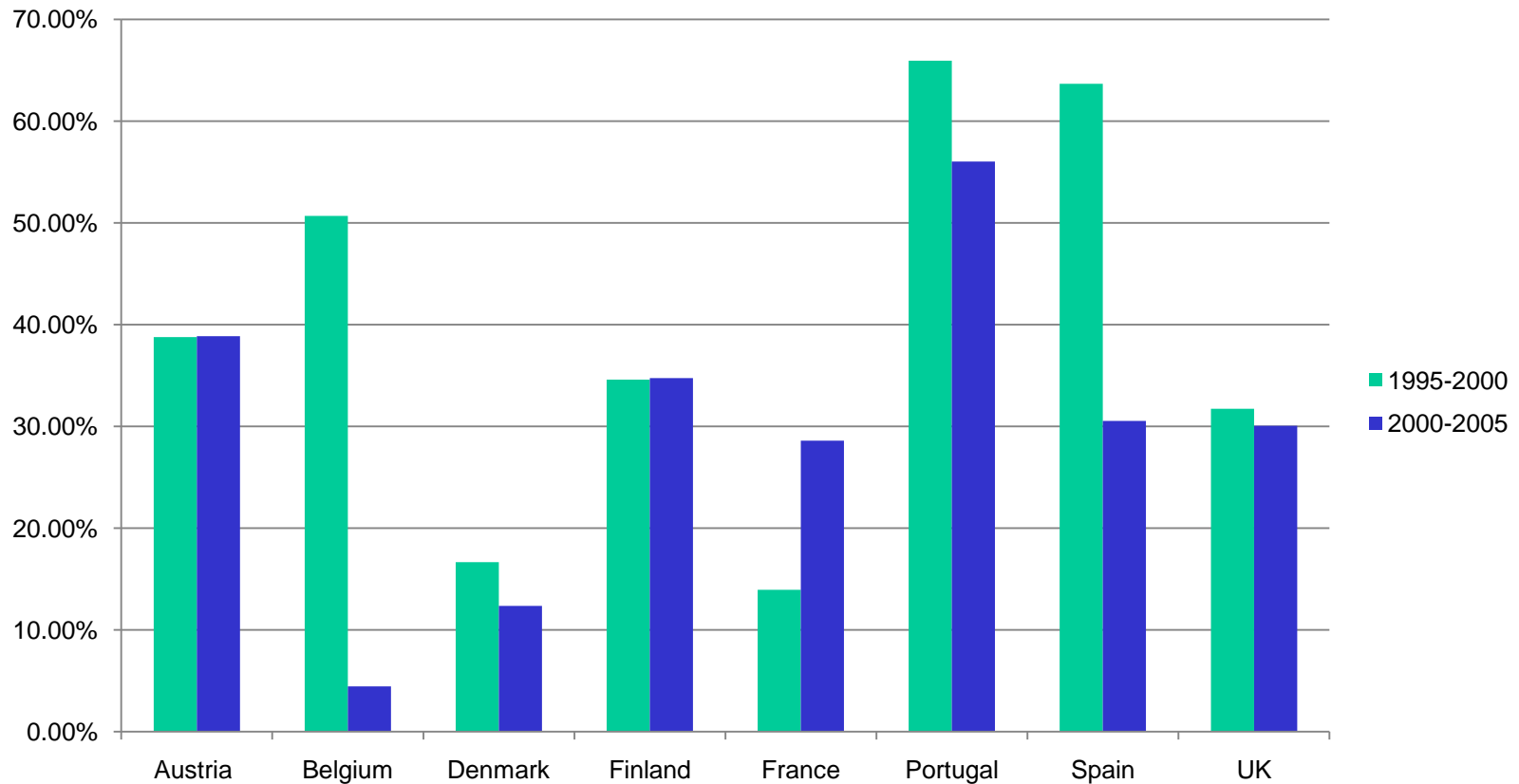
- These are very unclear at the EU level.
- Approximately 220m electricity consumers in EU.
- Number of electricity customers (latest):
 - EdF 38m
 - ENEL 32m
 - E.ON 22m
 - RWE 14m
- This suggests top 4 firms have almost a 50% of EU electricity customer market.

Labour Productivity in Electricity, Gas and Water 1995-2005



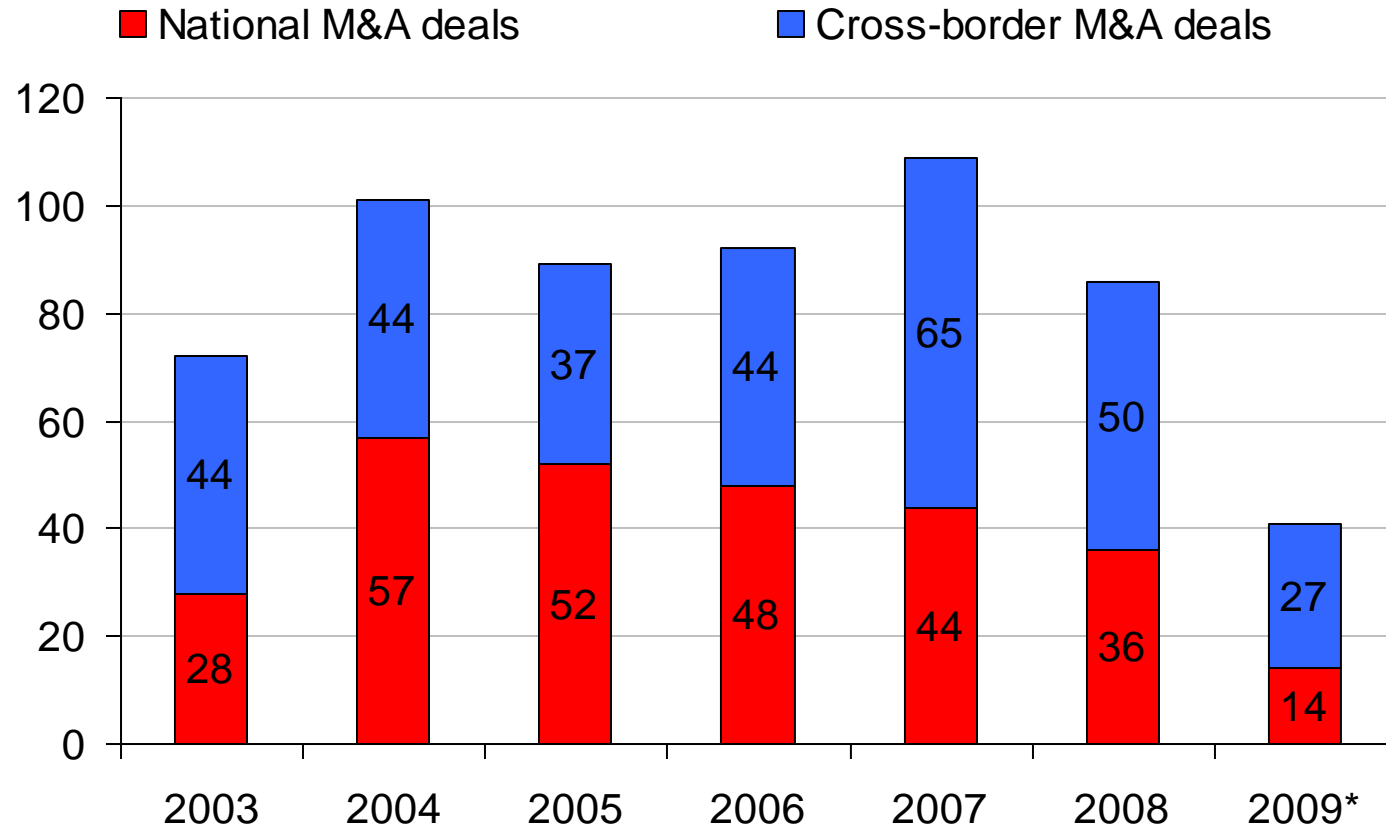
Source: EU KLEMS database: Output per hour worked (LP_I).

Labour Productivity in Electricity Supply 1995-2005



Source: EU KLEMS database: Output per hour worked (LP_I).

National & Cross Border Utility M&As in Europe



Source: M&A Database, REF Ricerche per l'Economia e la Finanza

* up to mid May, 2009

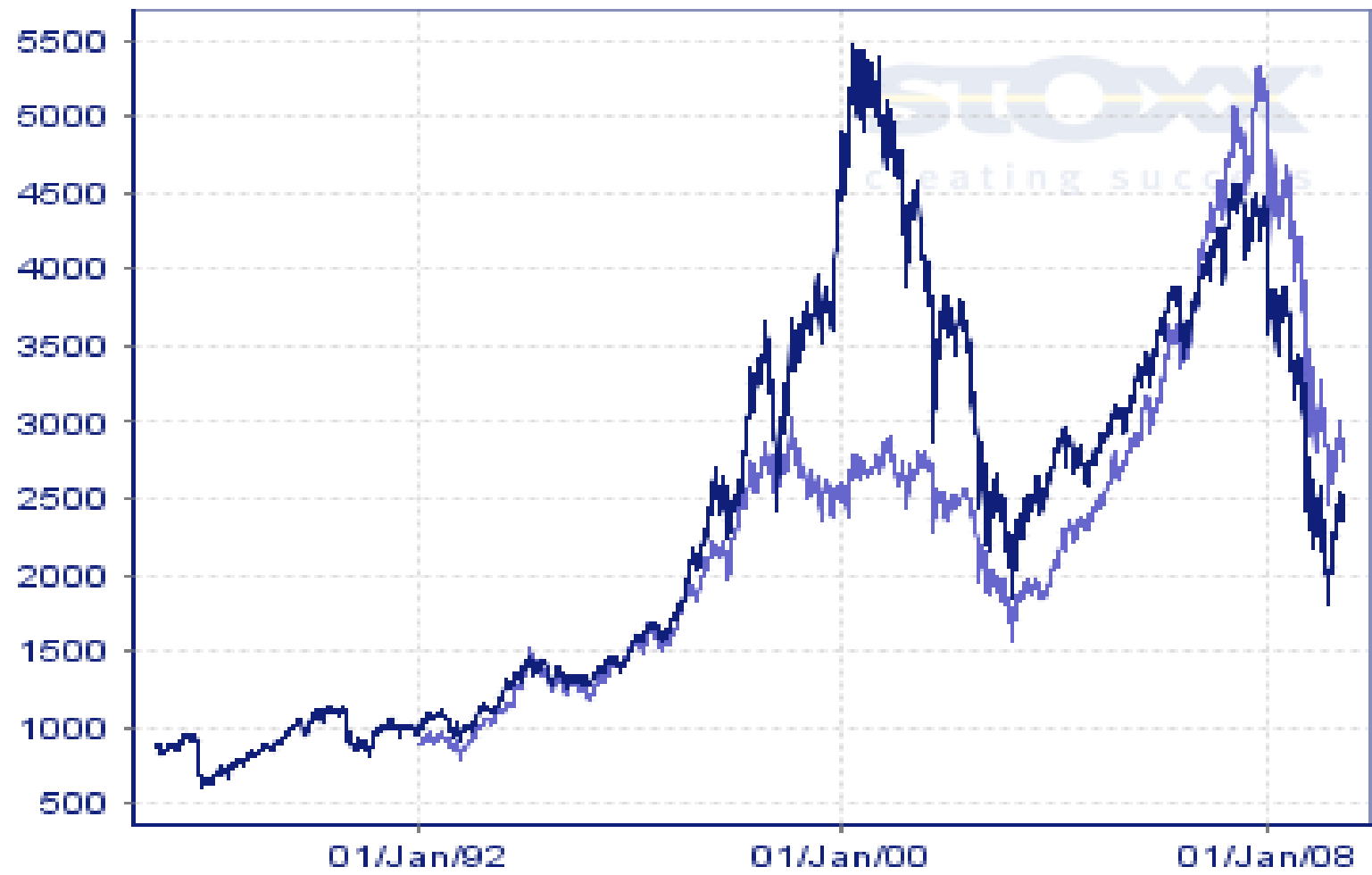
Electricity sector: M&A deals aiming at vertical integration in the EU (2000 to mid may 2009)

Acquired company	Company active (also) in the gas sector	19	11	10	116
	Integrated company or gen + distr + sales company	12	0	3	84
	Gen + distr or gen + sales company	0	0	1	2
	Distribution	0	20	2	31
	Generation	45	0	18	183
		Generation	Distribution	Gen + distr or gen + sales company	Integrated company or gen + distr + sales company
Purchaser					

Source: elaborations on M&A Database, REF Ricerche per l'Economia e la Finanza

Electricity stock (Light) vs General stocks (Dark)

Source: <http://www.stoxx.com/indices/benchmarking.html>



Conclusions on Performance Effects

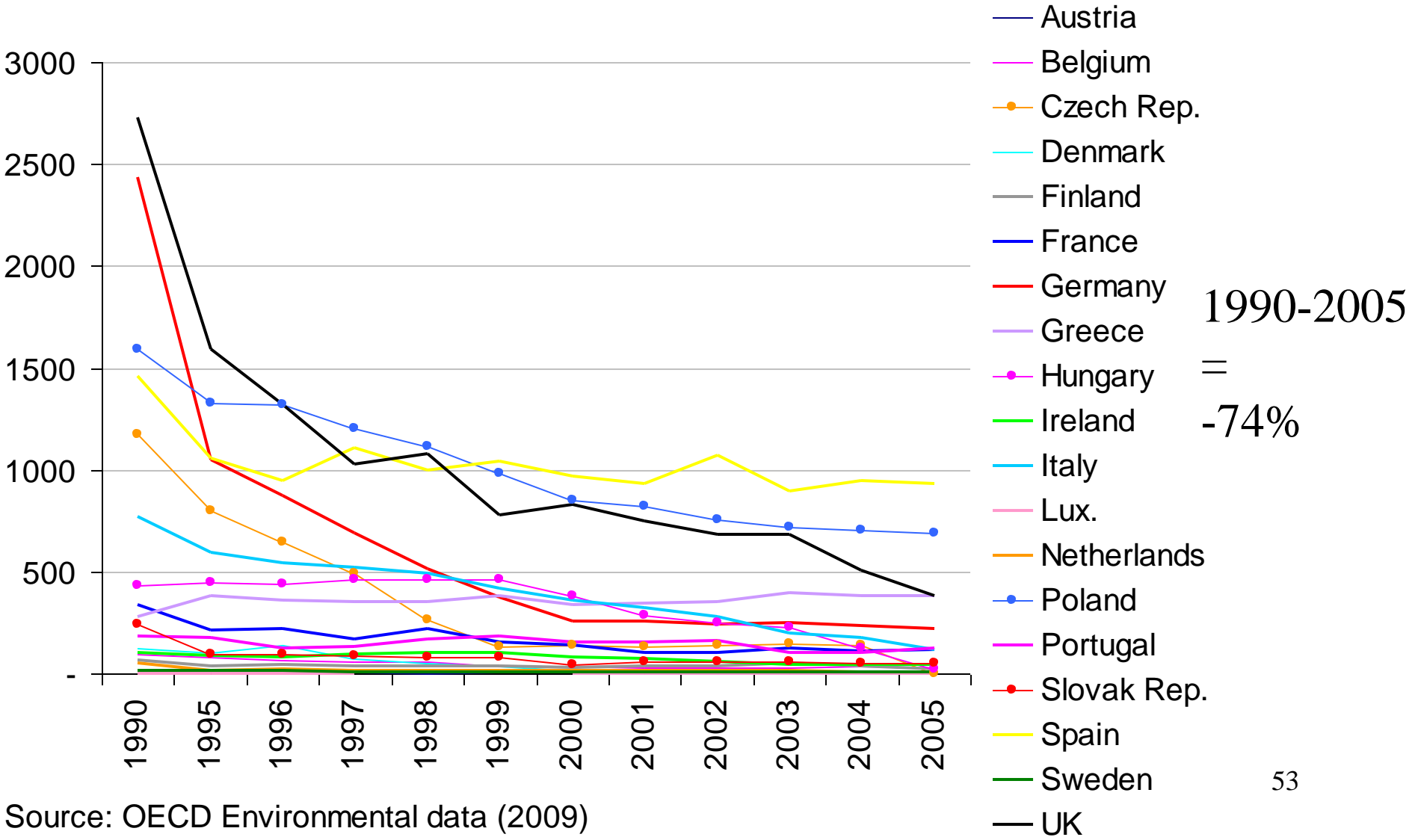
(see Pollitt, 2009)

- Academic evidence in Steiner (2001), Hattori and Tsutsui (2004), Fiorio et al. (2007) and da Silva and Soares (2008):
 - Strong evidence of productivity improvements
 - Weaker evidence of price benefits
 - Some evidence of price convergence
- These cross-country econometric studies suffer from inability to satisfactorily measure reform as a package.
- Other evidence (e.g. Copenhagen Economics, 2005) shows stronger improvements in leading reform countries at the micro and macro-economic level.
- Comparison to other sectors, esp. telecoms, implies some way to go (Wölfl et al., 2009).

Environment

Power Sector SOx Emissions

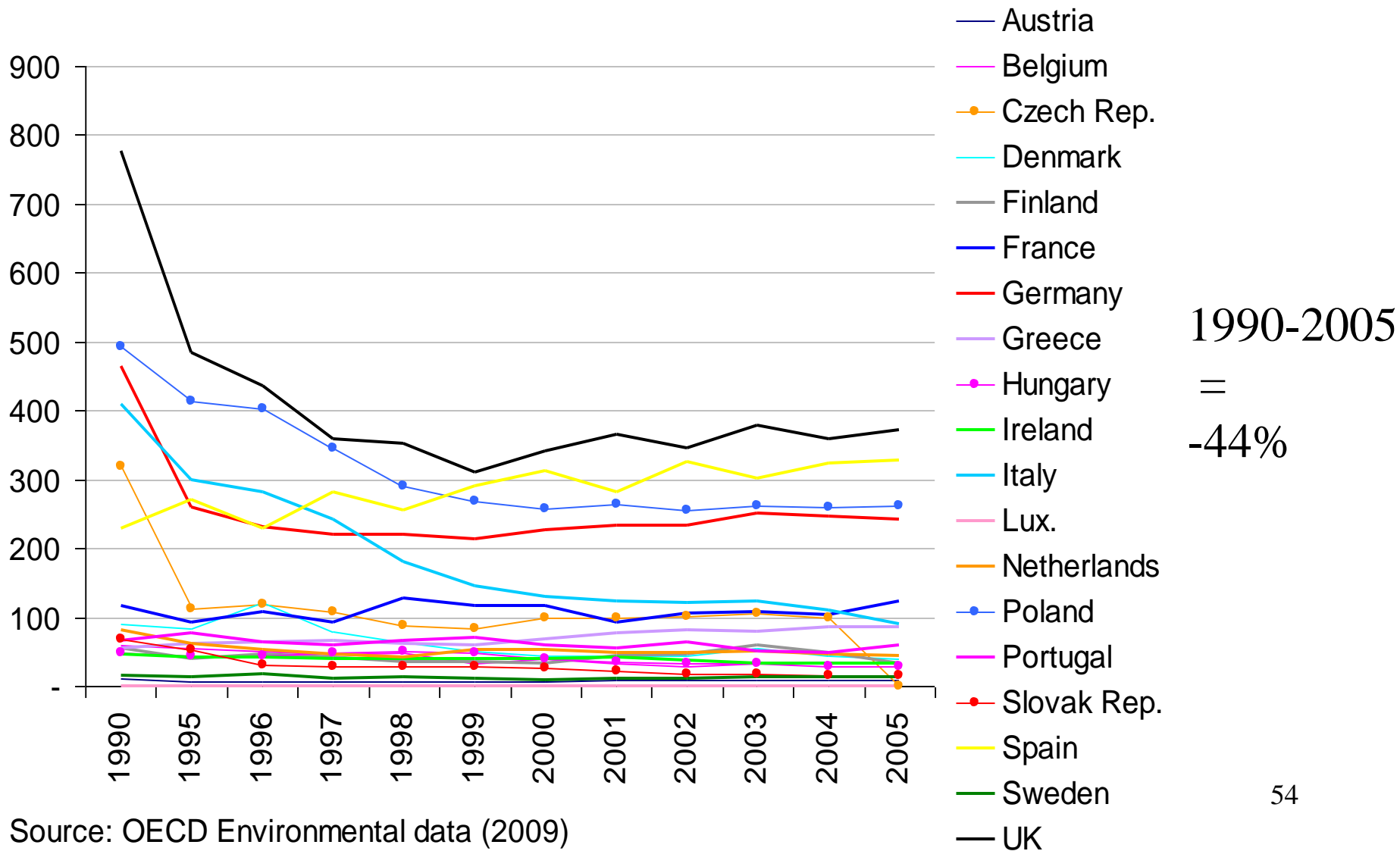
1000 tonnes



Source: OECD Environmental data (2009)

Power Sector NOx Emissions

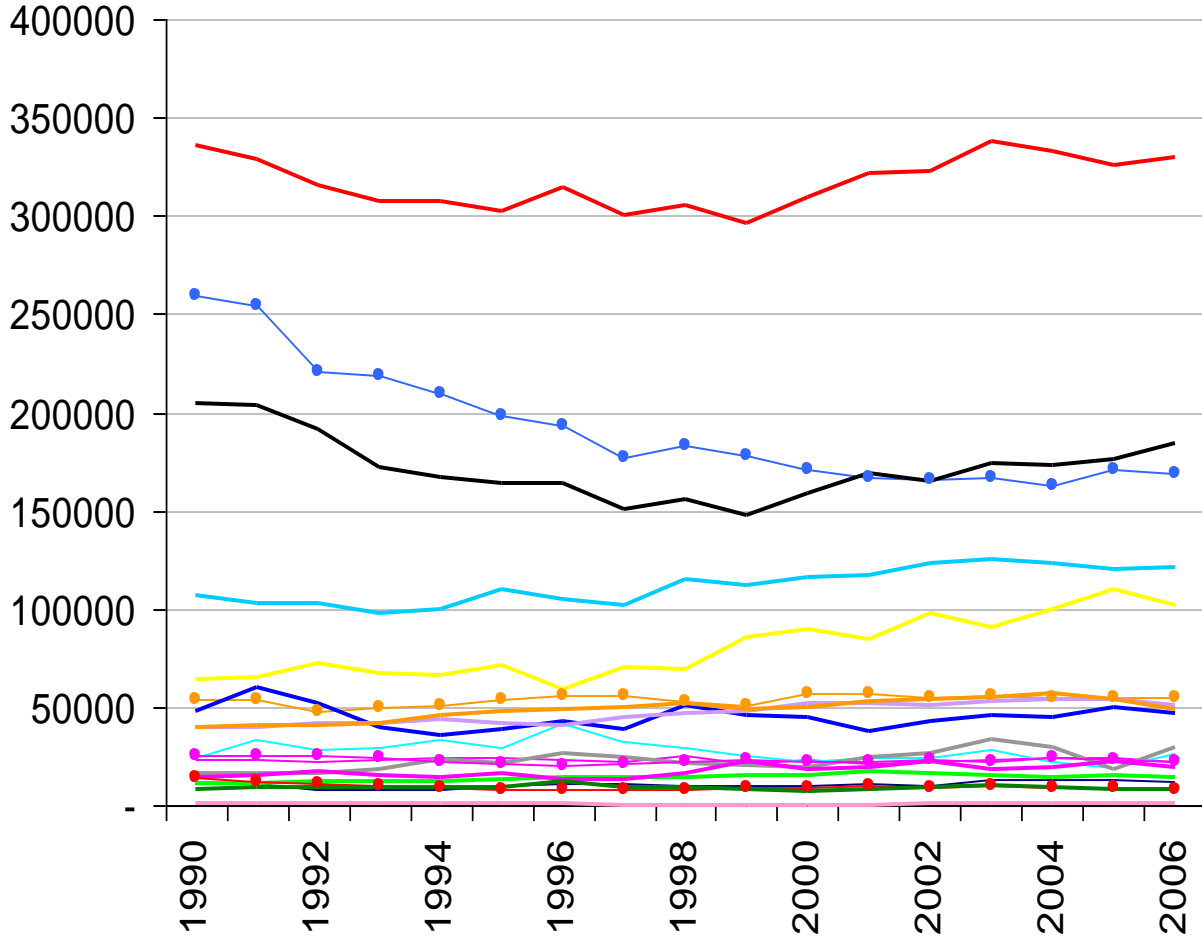
1000 tonnes



Source: OECD Environmental data (2009)

Power Sector CO2 Emissions

1000 tonnes



1990-2006
= - 3%

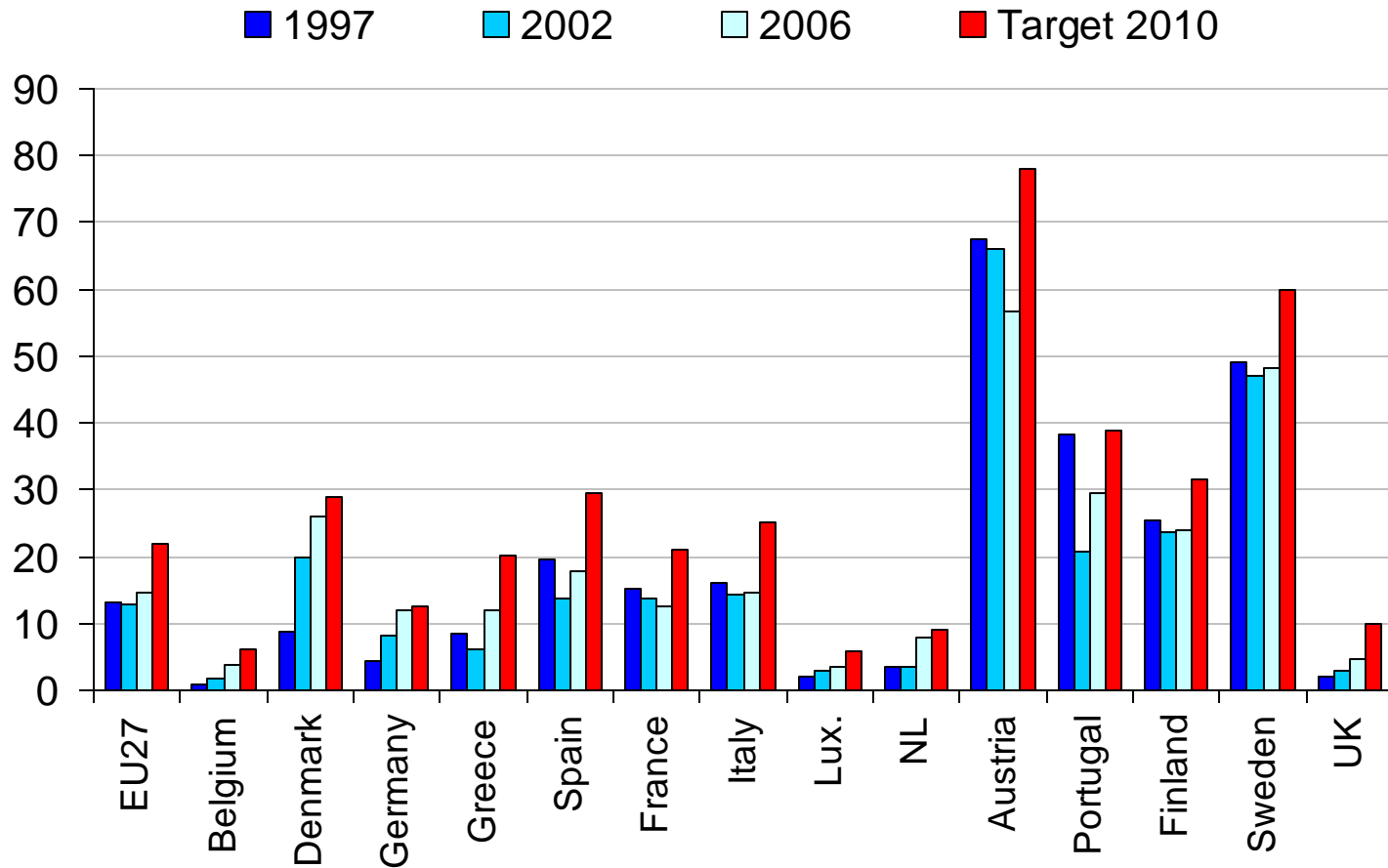
Source: European Environment Agency (2009)

RES Share of Generation Across EU15+2 (%)

	1974	1980	1990	1995	2000	2001	2002	2006
RES Share	24.40	22.31	18.23	18.91	19.70	19.71	18.02	19.91
Hydro Share	23.97	21.84	17.72	17.97	17.80	17.61	15.52	13.99
Solar, Wind, Tide Share	0.04	0.03	0.06	0.20	0.86	1.02	1.35	5.65
Geothermal Share	0.17	0.15	0.14	0.14	0.17	0.16	0.17	0.27
Other Renewables	0.22	0.30	0.32	0.60	0.86	0.92	1.00	n.d.

Source: DG TREN, 2009, and IEA Electricity Balances 2003

% of Electricity from RES Relative to 2010 Targets

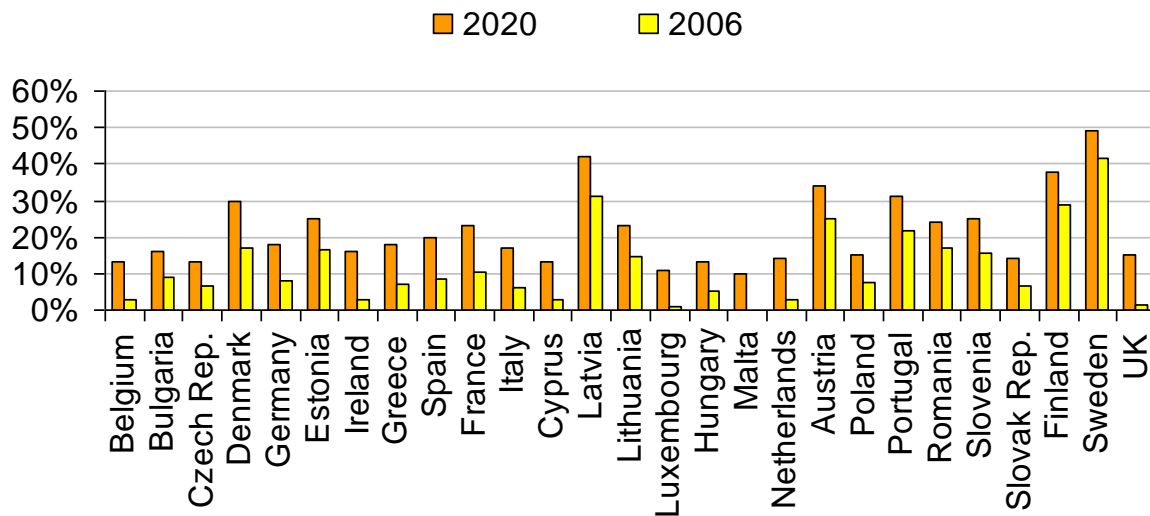


Source: DG TREN (2009)

Target for 2010: 2001/77/EC

2008 RES proposals

National overall targets for the share of RES to final energy consumption in 2020, in comparison with 2006 data



	2020	2006
Belgium	13%	3%
Bulgaria	16%	9%
Czech Rep.	13%	6%
Denmark	30%	17%
Germany	18%	8%
Estonia	25%	17%
Ireland	16%	3%
Greece	18%	7%
Spain	20%	9%
France	23%	10%
Italy	17%	6%
Cyprus	13%	3%
Latvia	42%	31%
Lithuania	23%	15%
Luxembourg	11%	1%
Hungary	13%	5%
Malta	10%	
Netherlands	14%	3%
Austria	34%	25%
Poland	15%	8%
Portugal	31%	22%
Romania	24%	17%
Slovenia	25%	16%
Slovak Rep.	14%	7%
Finland	38%	29%
Sweden	49%	41%
UK	15%	2%

Source: DG TREN, 2009

Recent Market Developments in the EU

EU Energy Sector Inquiry (Jan 07)

- Confirms 'serious competition problems'
- Basis for further action
- Intentions going forward:
 - To pay serious attention to future merger proposals particularly involving gas (gas-electricity mergers a problem)
 - To investigate structural remedies
 - To pay close attention to state aids
- Vigilance on possibility of collusion

- Vertical integration between supply and generation and infrastructure businesses a problem
- Lack of access to infrastructure a problem
- Particular issue with cross-border access

Third Energy Package (Sept 07)

- Ownership unbundling preferred model with ISO as alternative
- Assets sales outside EU to be restricted to countries with similar unbundling requirements.
- Agency for the cooperation of National Energy Regulators, with binding decision powers, to complement National Regulators
- Increased independence for national regulators
- New European Network for Transmission System Operators
- Greater transparency to improve market transparency on network operation and supply

Franco-German proposal

- Economically efficient unbundling (EEU)
- Legally separate TSO with integrated group
- Compliance officer
- Restrictions on movement of staff

- Now...
- EON have now offered to sell electricity TSO and some generation (4.8 GW).
- Vattenfall have offered to sell electricity TSO.
- RWE have offered to sell gas TSO (not electricity!).

Conclusions and Lessons

Conclusions

- Impressive forcing effect due to Directives
 - Opening proceeding rapidly
 - Standardisation of structures and rules
 - Strong support from European Commission
- Market benefits:
 - Increased trading
 - Improvements in quality of regulation
 - Impressive labour productivity gains
 - Some price falls and convergence to 2003
- Market challenges:
 - Price divergence since 2003
 - Continuing (and increasing) market power

Conclusions

- Social Cost Benefit of Reforms still difficult
 - Consumers were seeing lower prices and convergence
 - Profits of EU electricity firms, not suffering unduly
 - Impact on government unclear but not significantly –ve
- Significant issues remain
 - Retail competition per se
 - Competition in the market for gas
 - Security of supply agenda
 - Climate change policy impact: 20-20-20 targets=?
 - Vulnerable customers
- Consistency of belief in (energy) markets important

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