
European Electricity Markets Structure and Trading

Phase I: Retail Competition and Crossborder Mergers

Modelling and Managing Competitive Electricity Markets

30 September – 3 October 2003

John Bower

European electricity market overview

The Directive and retail supply competition

Unresolved regulatory issues

BREAK

Transmission economics

Measuring market integration

Transmission pricing solutions

Case Study

European electricity market overview

Four coordinated AC transmission grids linked by DC lines define market boundary....

TRANSMISSION SYSTEMS IN THE EUROPEAN ELECTRICITY MARKET



Source: UCTE

.... owned by 45 separate entities spread across 28 countries coordinated by ETSO

EUROPEAN TRANSMISSION SYSTEM OPERATORS (ETSO) MEMBERS

- TSOI, the association of TSOs in Ireland:
Irish Republic (ESB), **Northern Ireland**, (NIE)
- UKTSOA, the United Kingdom TSO association:
England & Wales (NGC), Scottish Power (**S. Scotland**), N. Scotland, (**Scottish Hydro**)
- NORDEL, the Nordic TSOs:
Norway (Statnett), **Sweden** (Svenska Kraftnat), **Finland** (Fingrid), **W. Denmark** (Eltra), **E. Denmark** (Elkraft)
- UCTE, the Union for the Co ordination of Transmission of Electricity, association of TSOs of the Continental countries of Western and Central Europe: **Belgium** (Elia SA/NV), **Germany** (Bewag AG, Energie Baden Württemberg AG, E.On Netz GmbH, Hamburgische Electricitäts-Werke AG, RWE Net AG, Vereinigte Energiewerke AG), **Spain** (Red Eléctrica de España S.A.), **France** (EdF Gestionnaire du Réseau de Transport d'Electricité), **Greece** (Hellenic Transmission System Operator), **Italy** (Gestore della Rete di Trasmissione Nazionale), **Slovenia** (Elektro Slovenija), **Croatia** (Hrvatska Elektroprivreda, FRJ, EP CG, Elektroprivreda Crne Gore, Elektroprivreda Srbije), **FYROM** (Elektrostopastvo na Makedonija), **Bosnia –Herzegovina** (Joint Power Coordination Center), **Luxembourg** (Compagnie Grand Ducale d'Electricité du Luxembourg), **Netherlands**, TenneT bv), **Austria** (Tiroler Wasserkraftwerke AG, Verbund - Austrian Power Grid, Vorarlberger Kraftwerke AG), **Portugal** (Rede Eléctrica Nacional, S.A.), **Switzerland** (Aare-Tessin Ltd. for Electricity, BKW FMB Energie AG / BKW FMB Energie S.A., Elektrizitäts-Gesellschaft Laufenburg Grid AG/ Electricité de, Laufenbourg Grid AG, S.A., Energie Ouest Suisse, Etrans Ltd., Nordostschweizerische Kraftwerke AG), **Czech Republic** (CEPS), **Hungary** (Magyar Villamos Művek Rt.), **Poland** (Polskie Sieci Elektroenergetyczne SA), **Slovak Republic** (Slovenské Elektrárne, a.s., Prenosova sústava)

European electricity market overview

Market serves 460 million people with peak load of 400 GW using 2784TWh per year

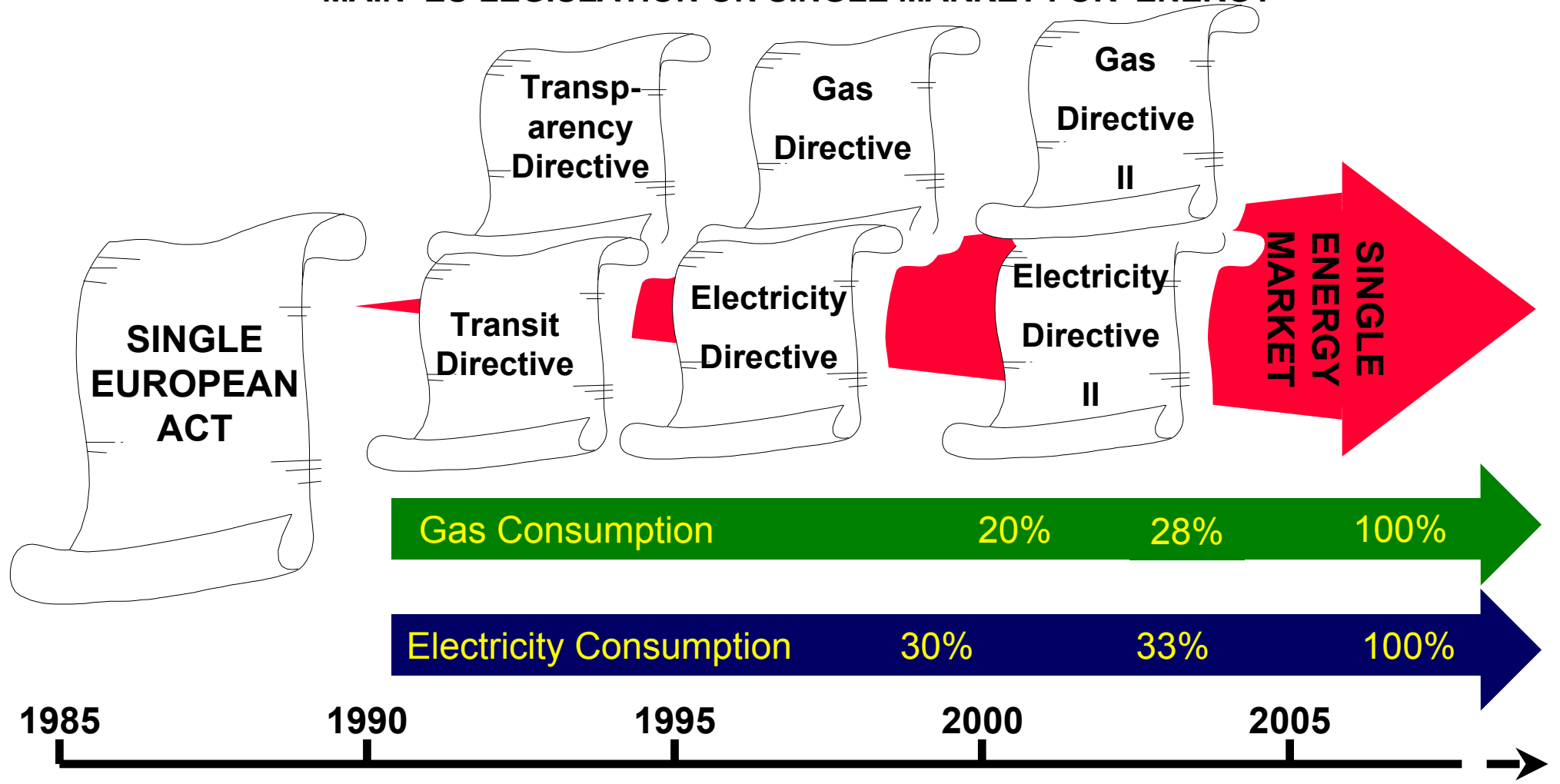
EUROPEAN ELECTRICITY MARKET STATISTICS

Country	Area km ²	Population million	Installed Generation Capacity MW	Maximum System Load MW	Total Net Generation GWh	Pump Storage Consumption GWh	Total Consumption GWh	Net Imports GWh
Austria	83900	8.10	13517	7728	54068	1986	50718	-1364
Belgium	30500	10.20	14088	12291	80162	1639	82851	4328
Czech Republic	78866	10.30	13746	8744	67741	749	56974	-10018
Denmark	43000	5.30	12544	6284	34230	2148	32748	666
Finland	338000	5.20	16143	12700	67113	2901	76093	11881
France	544000	58.60	108291	66863	503998	6604	427471	-69923
Germany	357000	82.00	107769	74300	496588	5789	493953	3154
Great Britain	243300	59.00	69866	51000	359637	3497	370312	14172
Hungary	93030	10.10	7847	5543	32420	0	35858	3438
Croatia	56538	4.70	3601	2430	9829	18	13763	3952
Greece	132000	10.50	9401	7699	45208	585	44617	-6
Ireland	70300	3.70	4165		21634	449	21283	98
Italy	301300	57.60	65513	49019	262426	9177	297706	44457
Luxembourg	2600	0.40	0	888	1145	1022	5834	5711
Netherlands	41500	15.60	14210	12255	52910	0	71824	18914
Norway	324000	4.50	27622	20420	137000	10256	107721	-19023
Poland	120728	38.60	30135	21836	144681	2790	135517	-6374
Portugal	92400	9.90	9784	6022	37573	560	37949	936
Slovakia	48845	5.40	7832	4149	28718	392	25653	-2673
Slovenia	20253	2.00	2400	1698	12529	0	11180	-1349
Spain	504800	39.70	44921	32430	195372	4908	194905	4441
Sweden	450000	8.90	32934	26000	139994	11707	132974	4687
Switzerland	50000	8.90	14606	9027	65392	1974	56401	-7017
Total	4026860	459.2	630935	439326	2850368	69151	2784305	3088

The Directive and retail supply competition

New EU Directives give all electric (gas) consumers right to choose supplier by 1 July 07

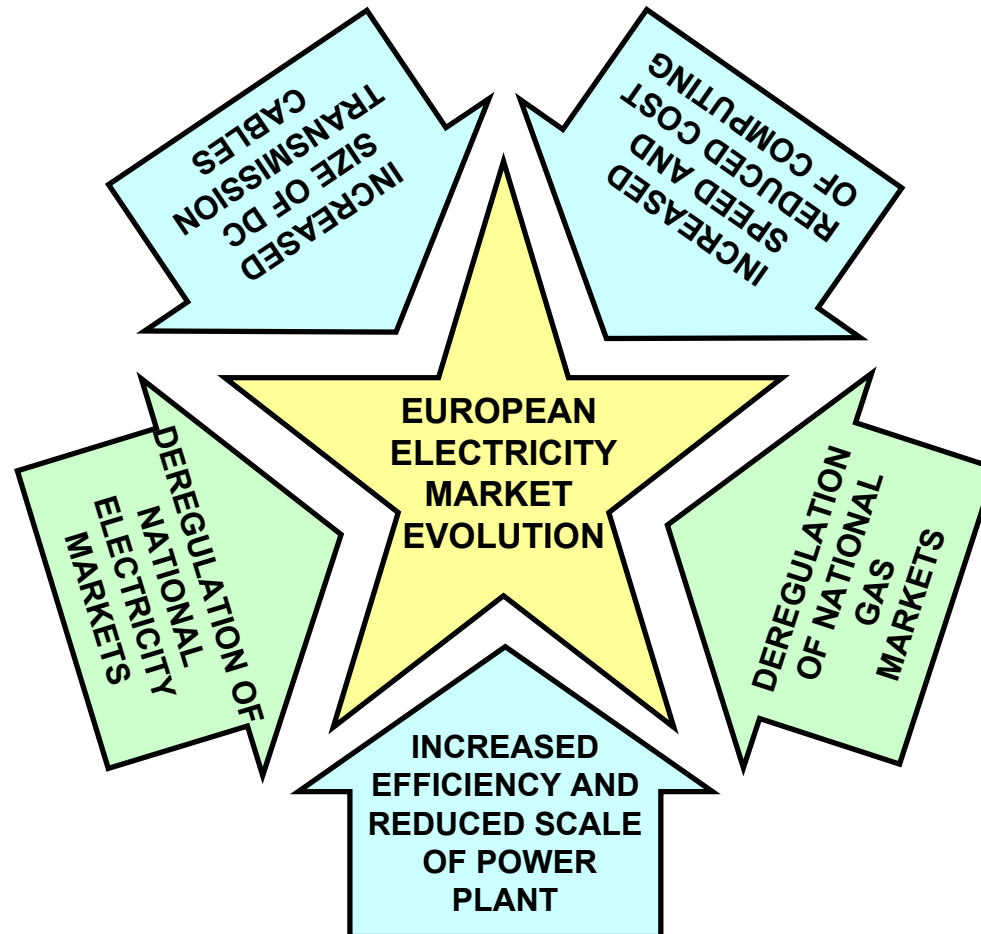
MAIN EU LEGISLATION ON SINGLE MARKET FOR ENERGY



The Directive and retail supply competition

.... with energy market liberalisation also being driven by economic / technical pressures

FORCES FOR CHANGE IN CROSS-BORDER ELECTRICITY TRADE



The Directive guarantees competition in supply with transmission / distribution access.

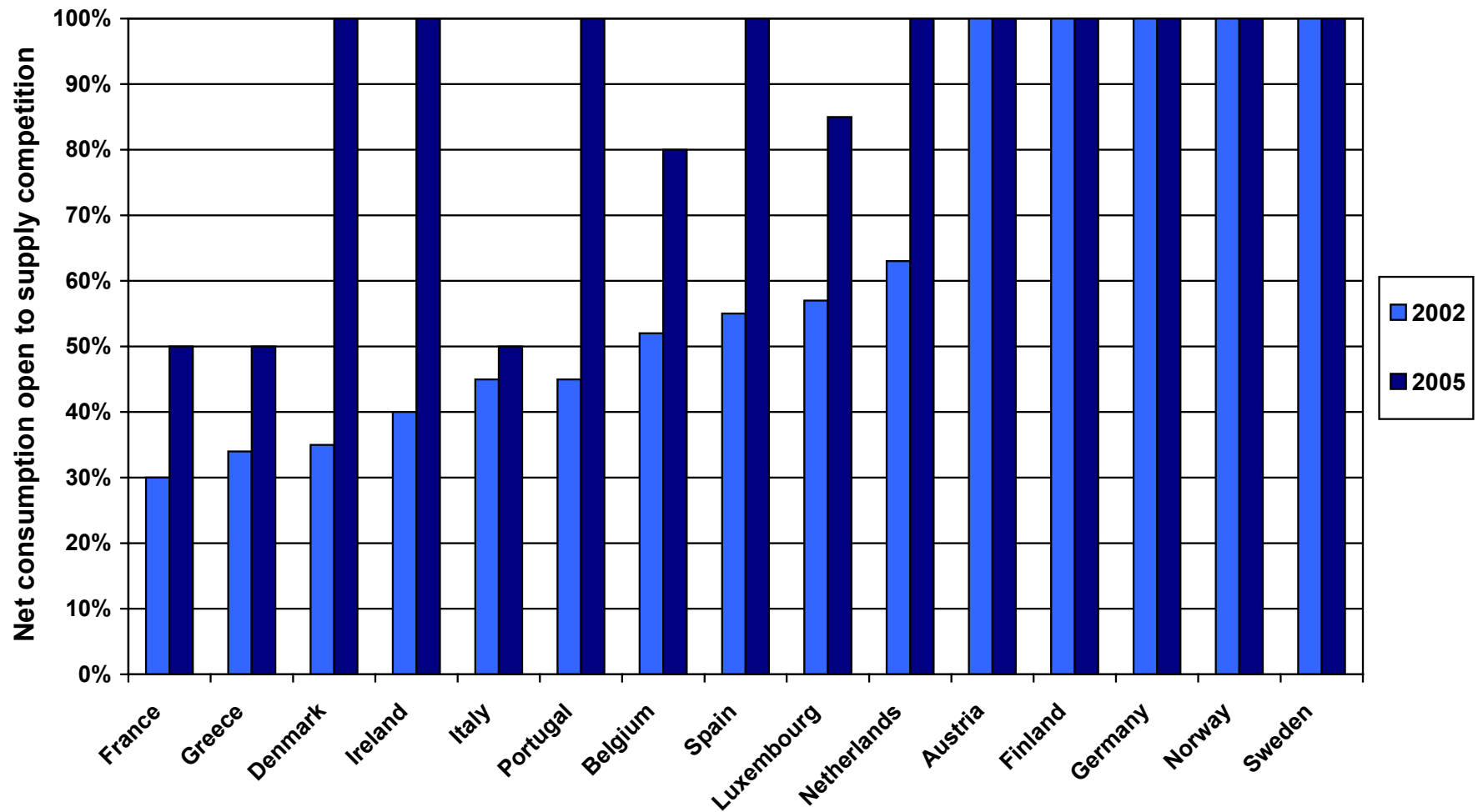
KEY PROVISIONS OF THE ELECTRICITY DIRECTIVE

- **Unbundling of accounts**
 - Prevents subsidisation and distortion of competition in vertically integrated firms
- **Competition in construction and operation of new plant**
 - Authorisation procedure allows market to determine investment criteria
 - Tendering procedure allows central planner to determine when/where to build capacity
- **Open access to transmission (and distribution) networks**
 - Independent Transmission System Operator (TSO) must be appointed
 - Tariffs for connection and carriage must be transparent and non-discriminatory
 - Reciprocity clause and system reliability issues allows countries to bar access
- **Right of consumers to choose their supplier**
 - Increasing number of consumers should be authorised to choose their suppliers

The Directive and retail supply competition

About 70% of **electricity** retail market volume is now eligible for supply competition and...

PERCENTAGE OF ELECTRICITY CONSUMPTION ELIGIBLE TO CHOOSE SUPPLIER

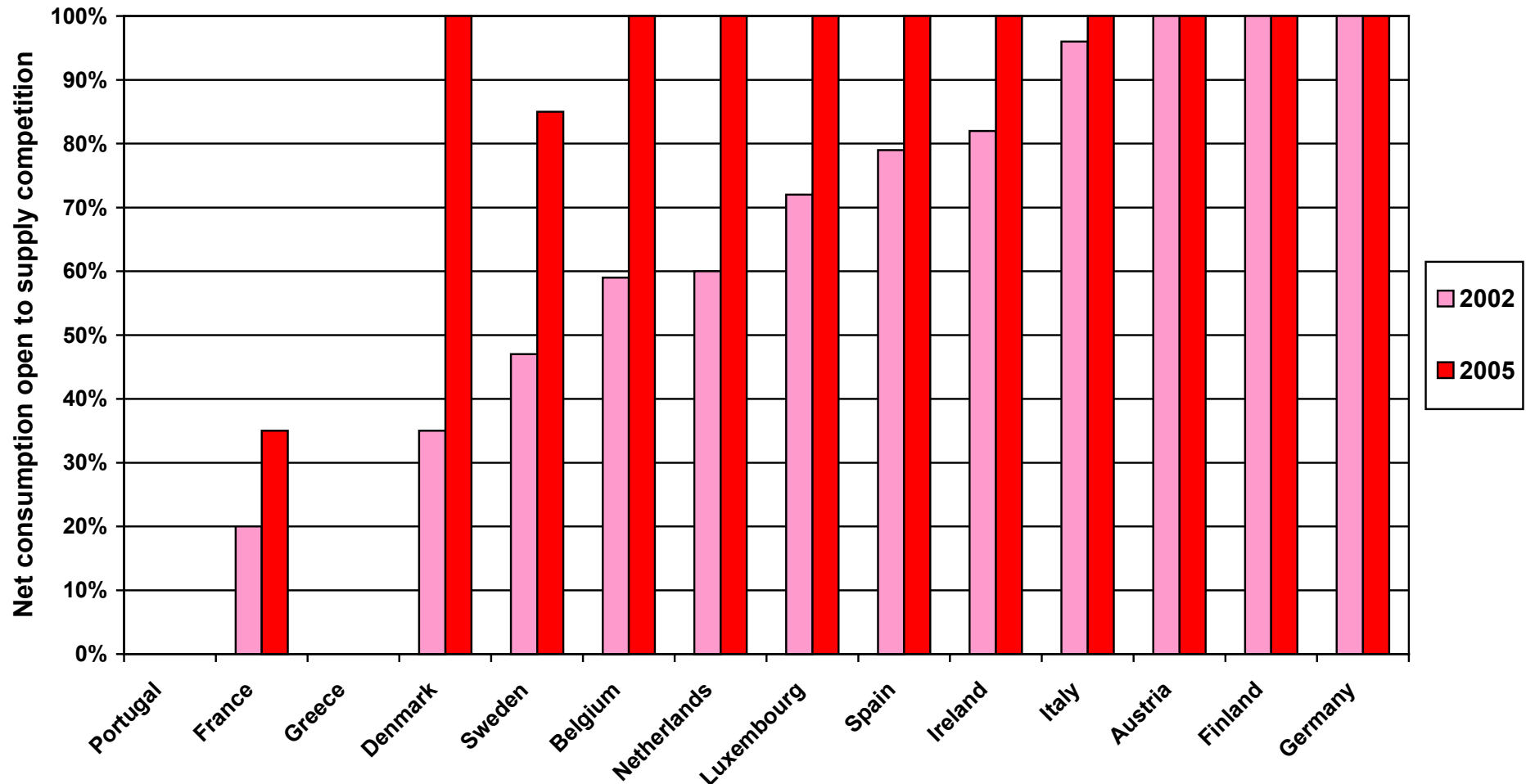


Source: European Commission DG Energy and Transport

The Directive and retail supply competition

.... about 80% of **gas** retail market volume.

PERCENTAGE OF GAS CONSUMPTION ELIGIBLE TO CHOOSE SUPPLIER



Source: European Commission DG Energy & Transport

In reality State and Federal policy objectives are interdependent and often in conflict

LIBERALISATION CONFLICTS

- **Security**

- Concern about dependence on other countries for generation capacity
- Concern about dependence on other countries for generation fuels
- Concern about dependence on other countries for gas / electricity transmission routes

- **Competition**

- Conflict between capital market and public service obligations
- Access rights to transmission/ distribution and pricing of transmission
- Increasing industry concentration through mergers and acquisitions

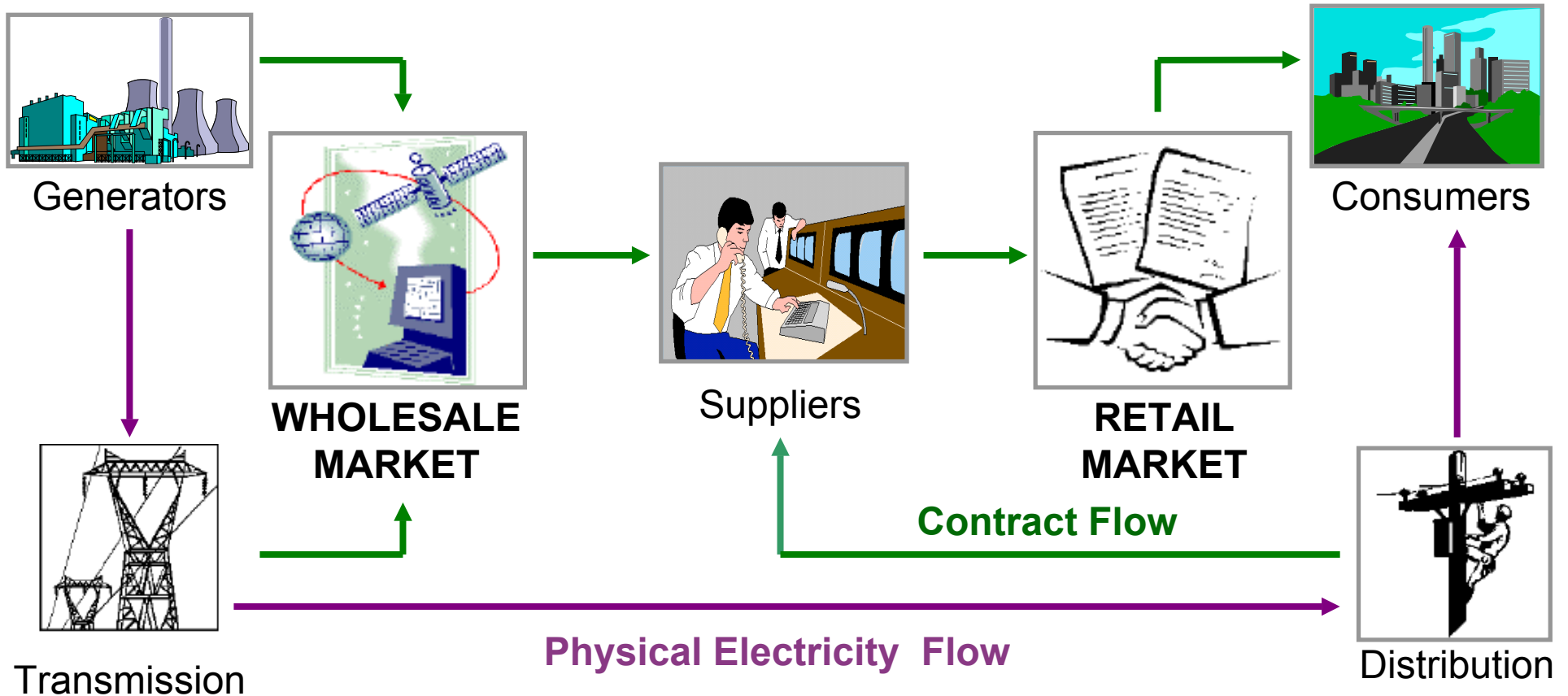
- **Environment**

- EUETS (CO₂) and LCPD (NO_x, SO_x, particulate) costs versus lower prices
- Renewables versus Combined Cycle Gas Turbines (CCGT)
- NIMBY delays on approval of transmission routes / generation site licences

Unresolved regulatory issues

Liberalisation means wholesale / retail markets replace government control and

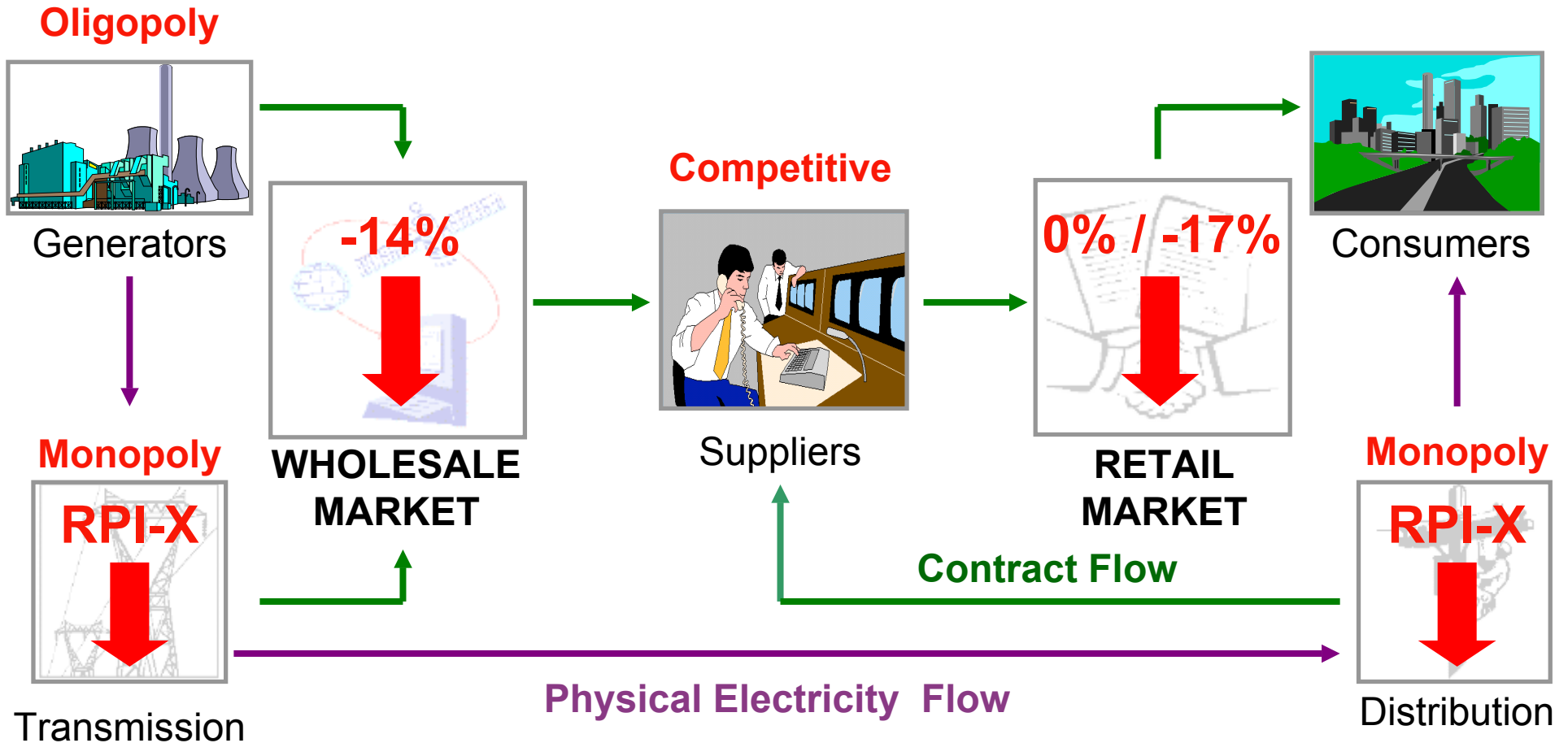
STRUCTURE OF A LIBERALISED ELECTRICITY MARKET



Unresolved regulatory issues

.... with new entrants and increased efficiency reducing prices....

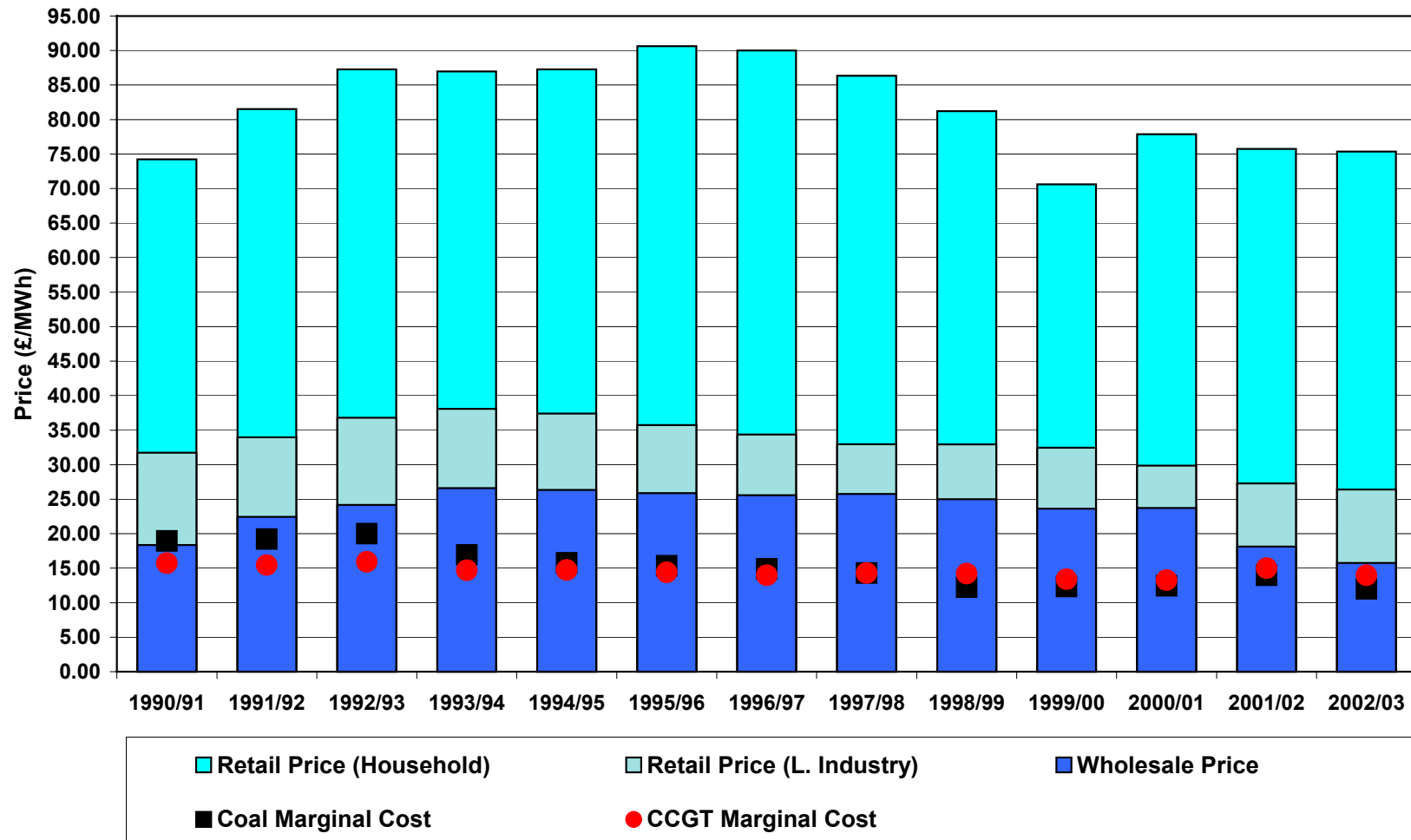
IMPACT OF LIBERALISATION IN ENGLAND & WALES 1990 - 2003



Unresolved regulatory issues

.... but this outcome is not guaranteed and prices may rise instead.

ENGLAND & WALES ANNUAL ELECTRICITY PRICE HISTORY 1990 - 2003

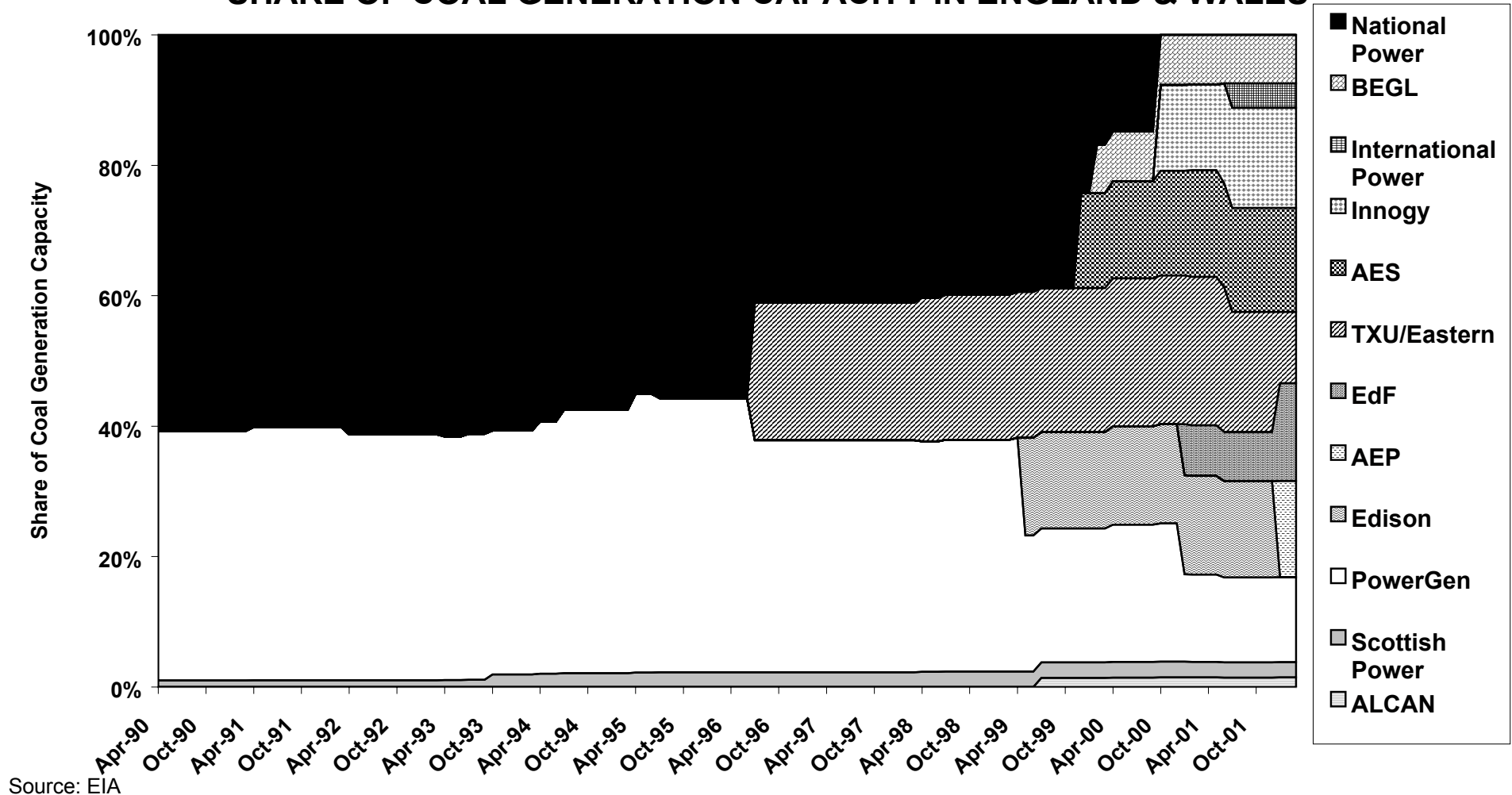


Source: EIA

Unresolved regulatory issues

National regulation is still required to create and maintain a competitive industry...

SHARE OF COAL GENERATION CAPACITY IN ENGLAND & WALES

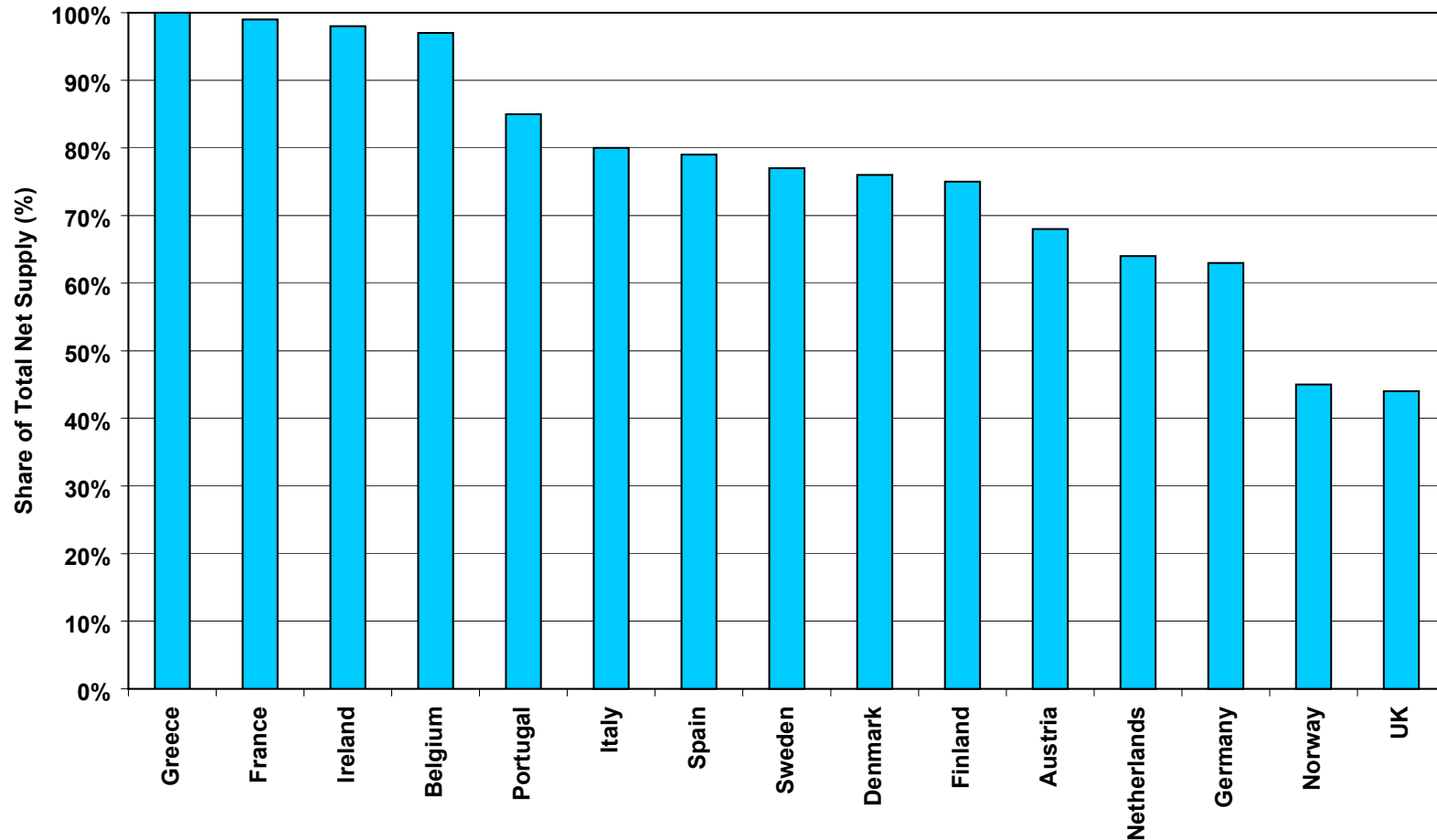


Source: EIA

Unresolved regulatory issues

.... but many countries still pursue the 'national champion' objective....

EU GENERATION CAPACITY CONCENTRATION RATIO (3 FIRM) 2001

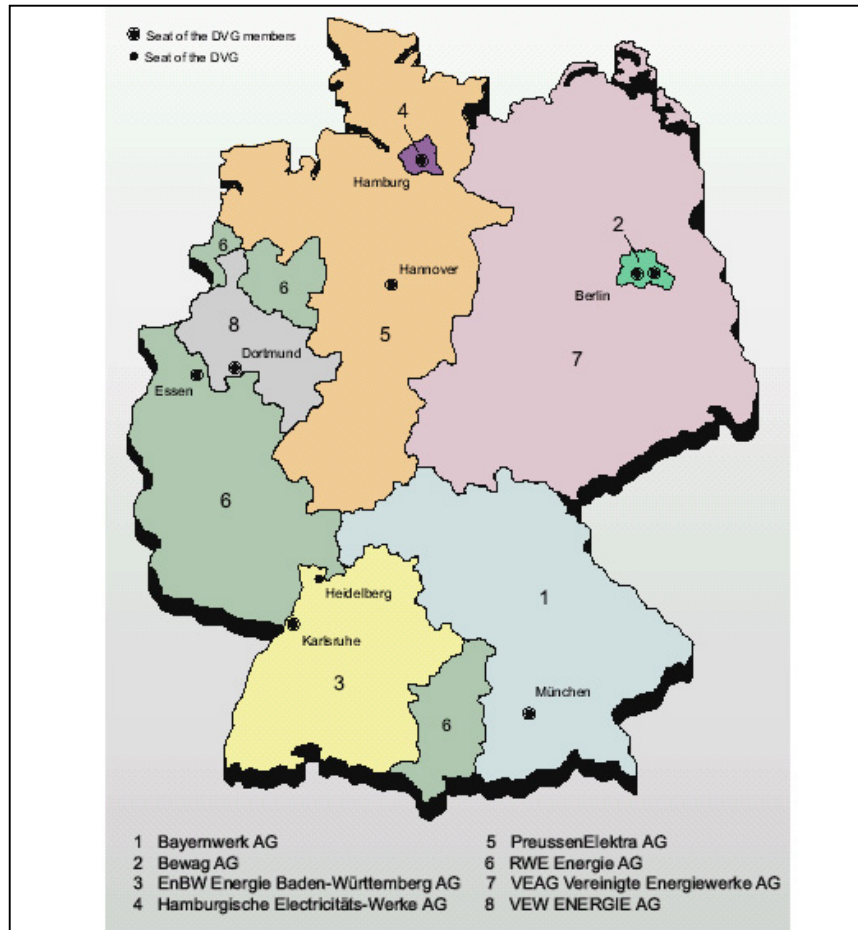


SOURCE: European Commission, Company Accounts, OIES estimates

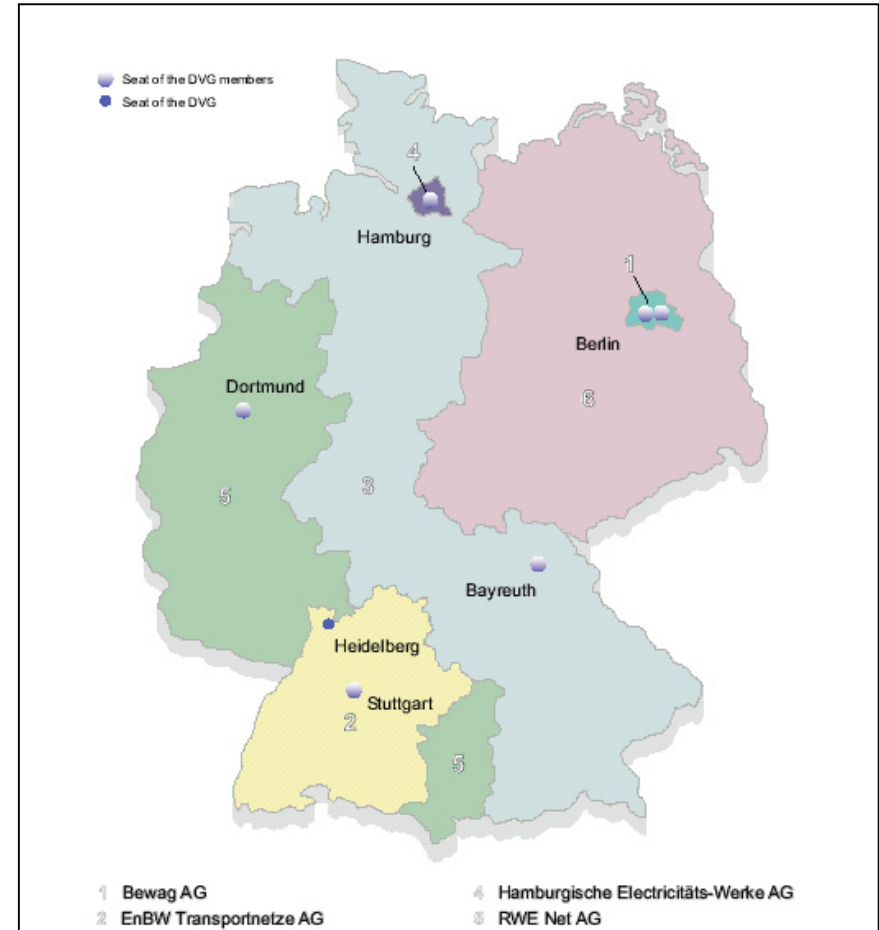
Unresolved regulatory issues

... and vertical integration between concentrated generation sector and monopoly 'wires'

Control Areas of the German Transmission System Operators as at 1 Jan 2000



Control Areas of the German Transmission System Operators as at 1 Jan 2001

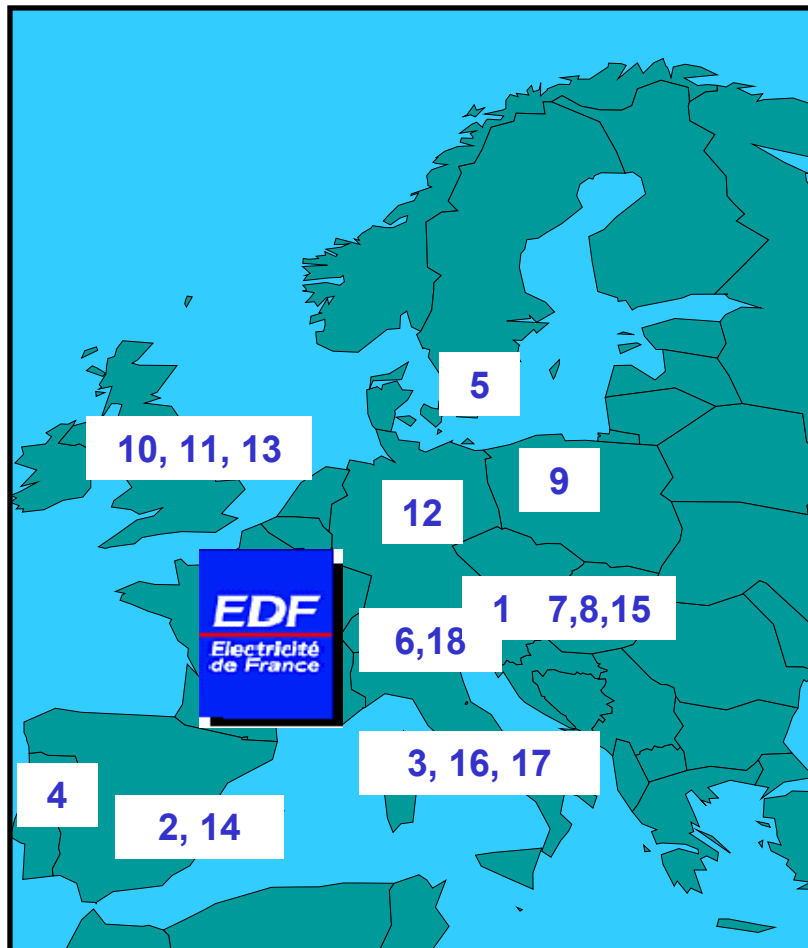


Source: Source: DVG (Deutsche Verbundgesellschaft) [http://www.dvg-heidelberg.de/extern/DVG/res.nsf/files/Regelzonen2001-GB.pdf/\\$file/Regelzonen2001-GB.pdf](http://www.dvg-heidelberg.de/extern/DVG/res.nsf/files/Regelzonen2001-GB.pdf/$file/Regelzonen2001-GB.pdf)

Unresolved regulatory issues

Cross-border mergers may now be preventing access to transmission / distribution

EUROPEAN INVESTMENTS OF EDF (APR 2002)

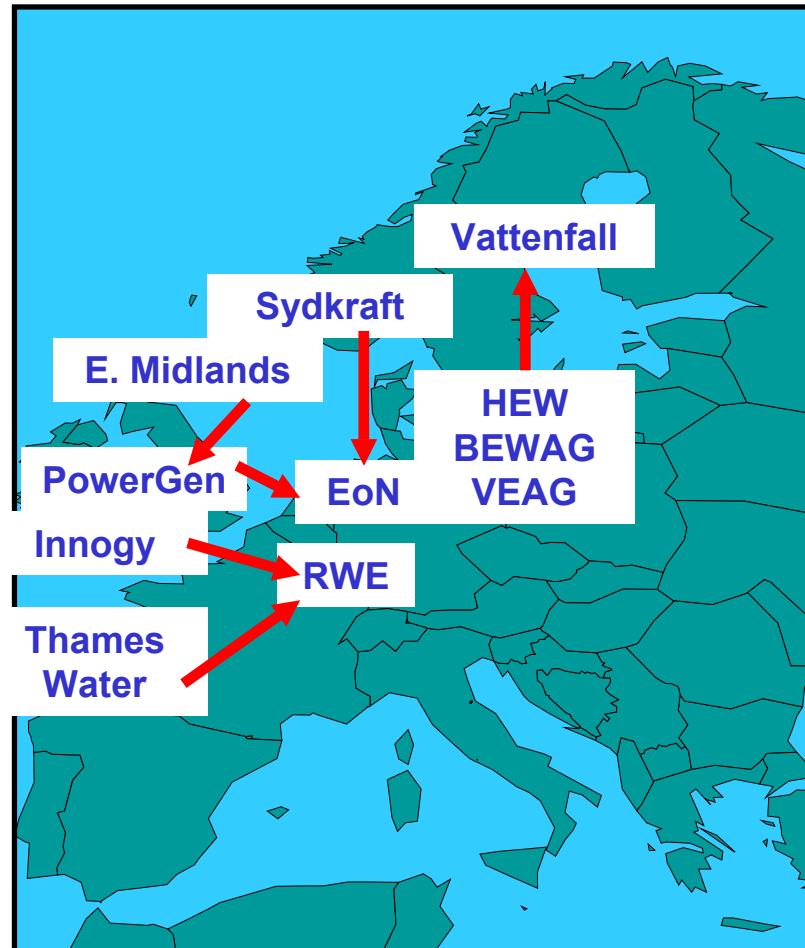


- | | |
|-------------------------|---------------------|
| 1. Estag 25% | 15. Bert 89% |
| 2. Elcogas 29.1% | 16. Itالenergia 18% |
| 3. ISE 30% | 17. Montedison 97% |
| 4. Pego 10% | 18. ATEL 13% |
| 5. Graningue 36% | |
| 6. Motor Columbus 20% | |
| 7. Edasz 29% | |
| 8. Demasz 50.0% | |
| 9. Ech 58% | |
| 10. London Elec. 100% | |
| 11. SWEB 100% | |
| 12. EnBW 34% | |
| 13. Seaboard 100% | |
| 14. Hidrocantabrico 59% | |

Unresolved regulatory issues

.... creating interlocking relationships make regulation of network effects very complex

CORPORATE LINKS BETWEEN SWEDISH, GERMAN, UK MARKETS (APR 2002)



All national governments want to intervene to set national energy policy....

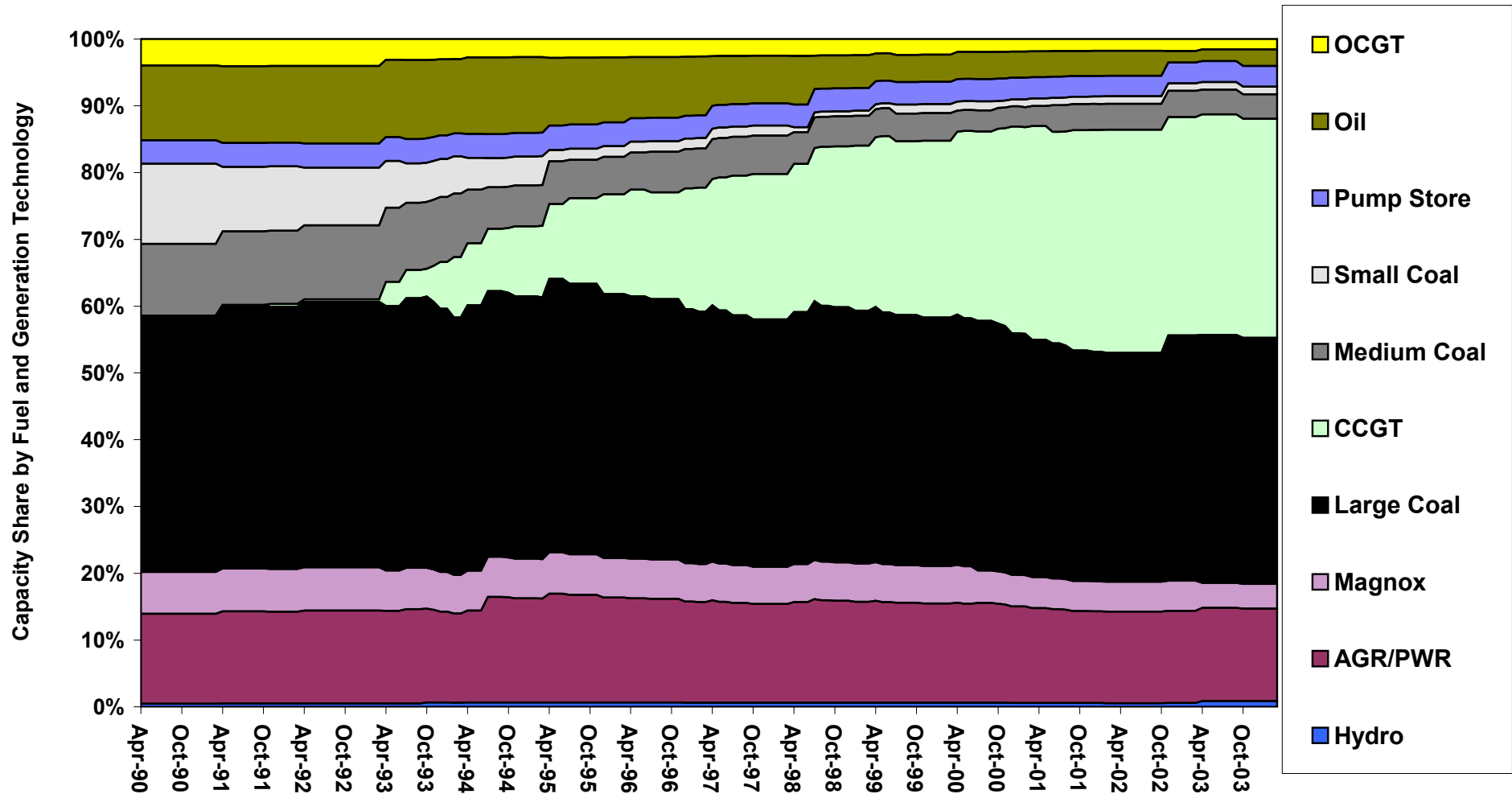
RECENT BRITISH ENERGY HEADLINES

- 28 Aug 02** **British Energy drained by low prices-minister**
- 01 Sep 02** **British Energy ponders US sale**
- 06 Sep 02** **Nuclear firm British Energy begs for bailout**
- 07 Sep 02** **British Energy shares suspended as company warns of insolvency**
- 08 Sep 02** **Ministers offers £410 million loan to British Energy**
- 09 Sep 02** **British Energy falls almost 80 pct after LSE lifts trading curbs**
- 26 Sep 02** **Ministers extend loan to British Energy and increase it to £500**
- 18 Sep 03** **Government sets deadline on British Energy restructuring**
- 22 Sep 03** **Nuclear plants may get new lease of life**
- 02 Oct 03** **???????**

Unresolved regulatory issues

... usually under the guise of energy security...

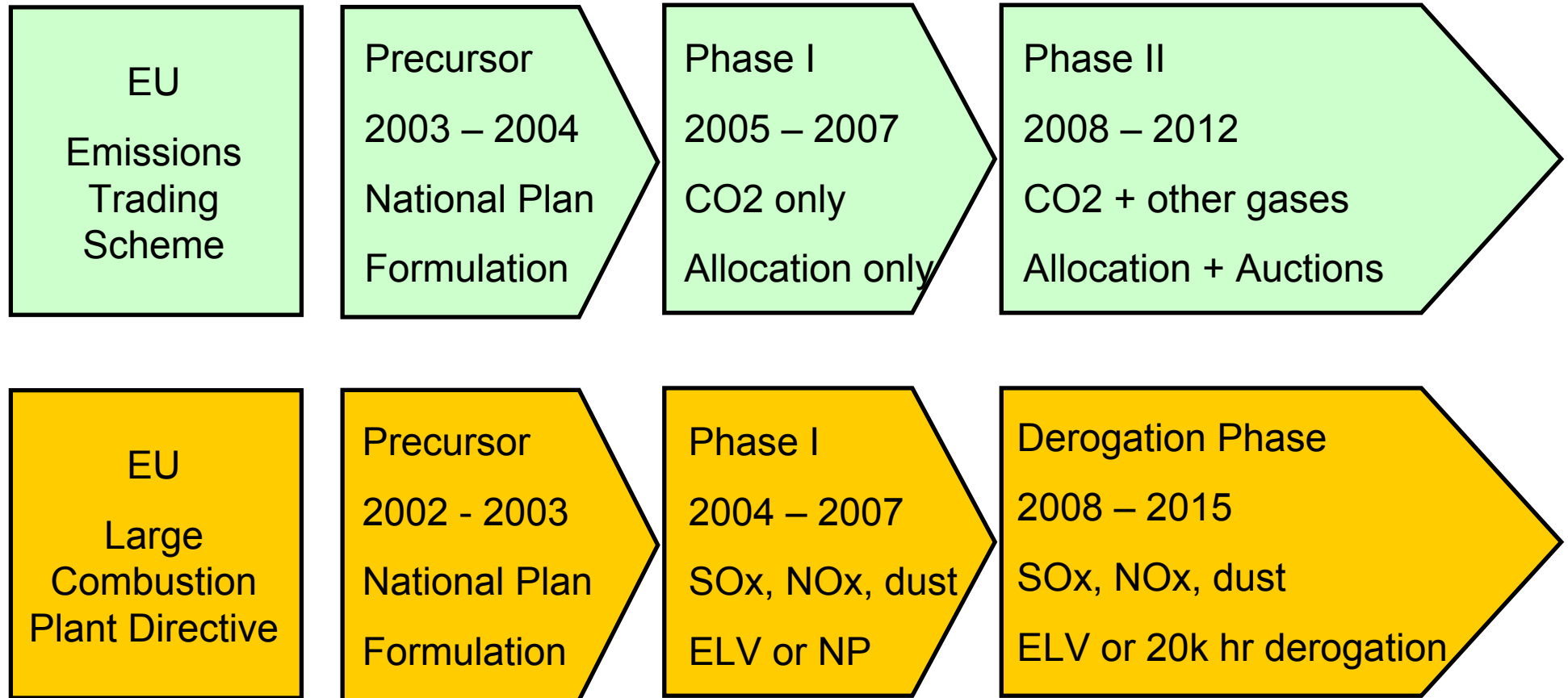
GENERATION TECHNOLOGY CAPACITY SHARE IN ENGLAND & WALES (Apr 1990 – Mar 2004)



Unresolved regulatory issues

...but is in conflict with the environmental objectives of EUETS and LCPD...

EU EMISSIONS TRADING SCHEME AND LARGE COMBUSTION PLANT DIRECTIVES

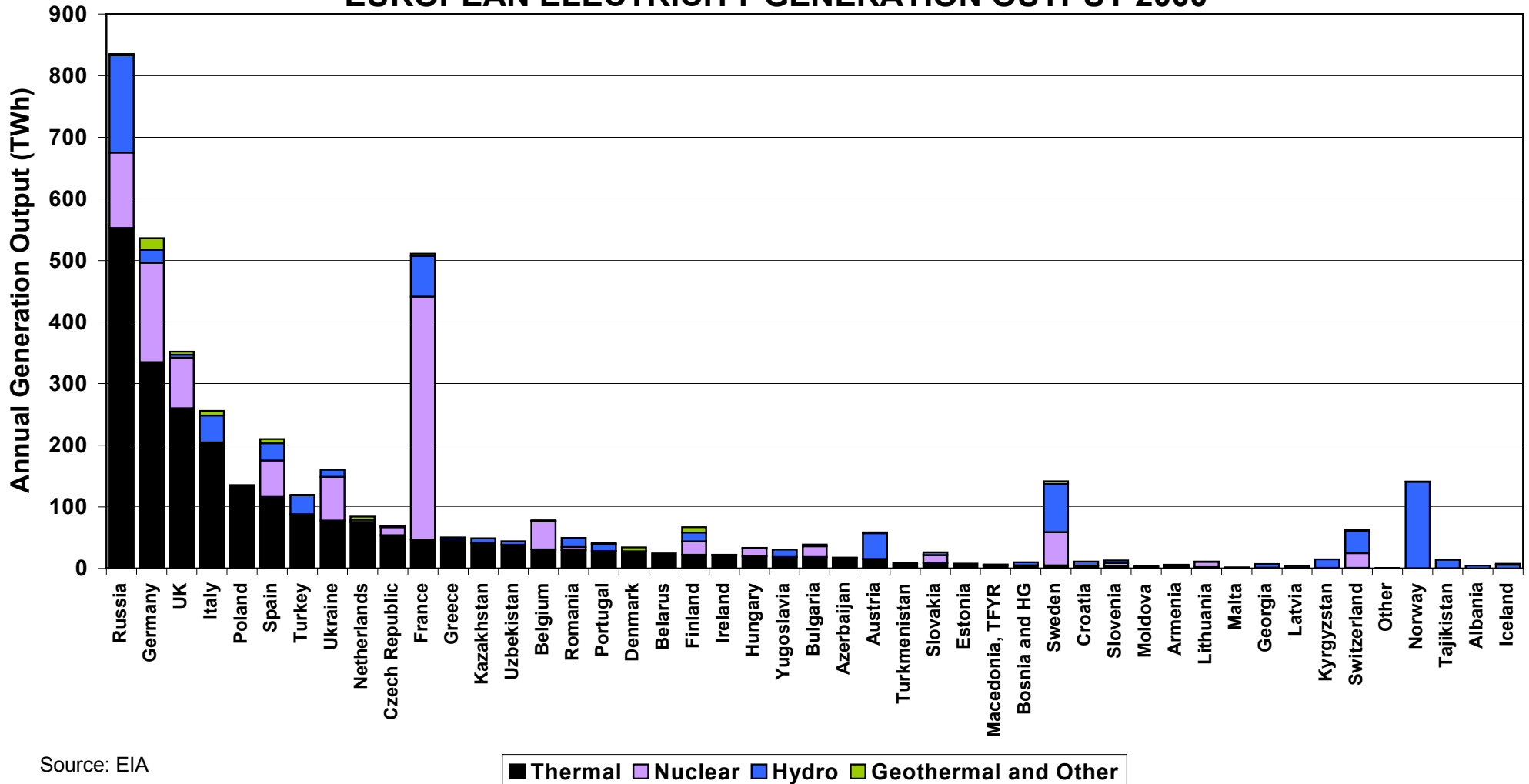


Source: EIA

Unresolved regulatory issues

...even the EU Renewables Directive 10% target by 2010 is really about energy security

EUROPEAN ELECTRICITY GENERATION OUTPUT 2000

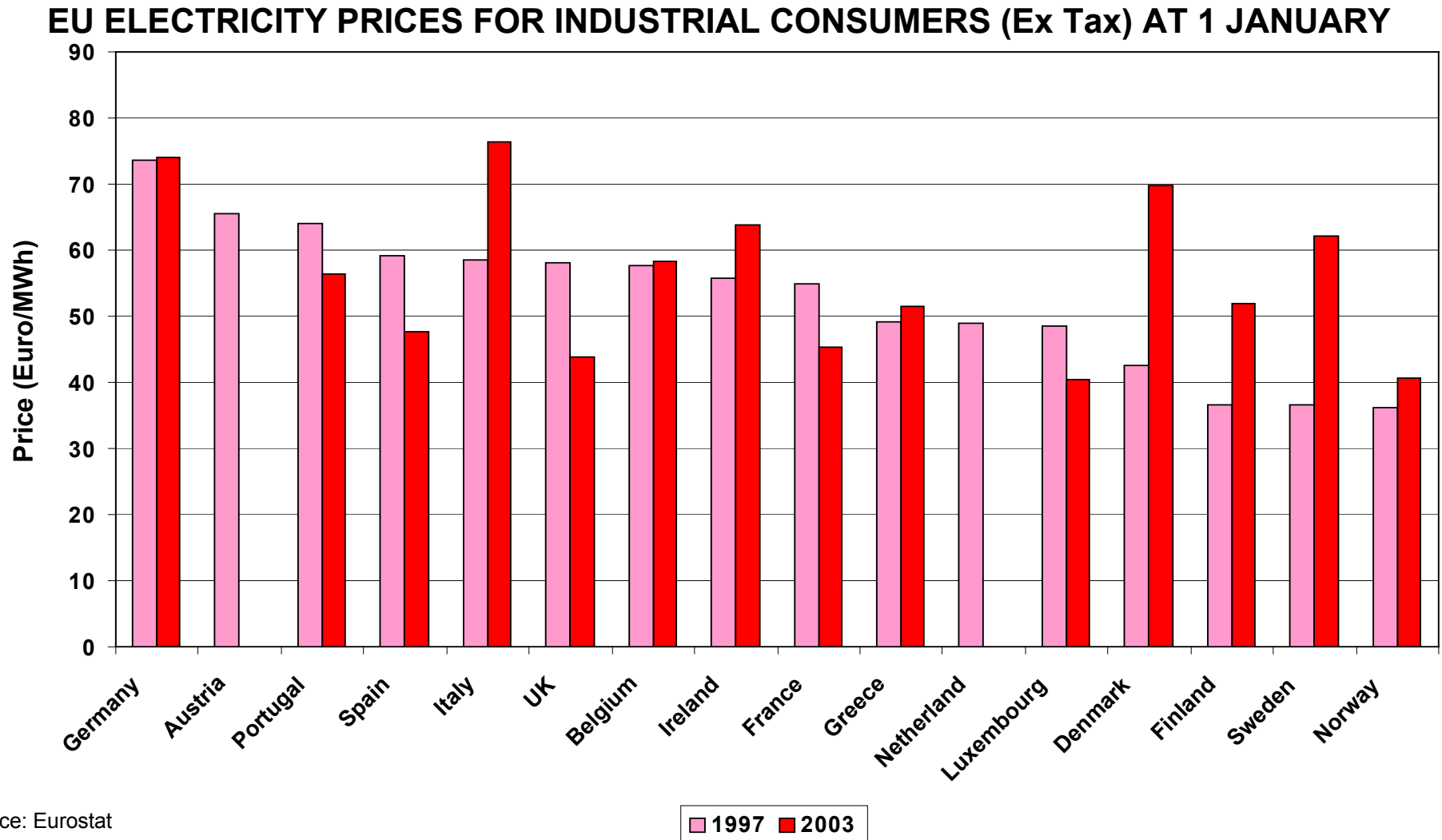


Source: EIA

■ Thermal ■ Nuclear ■ Hydro ■ Geothermal and Other

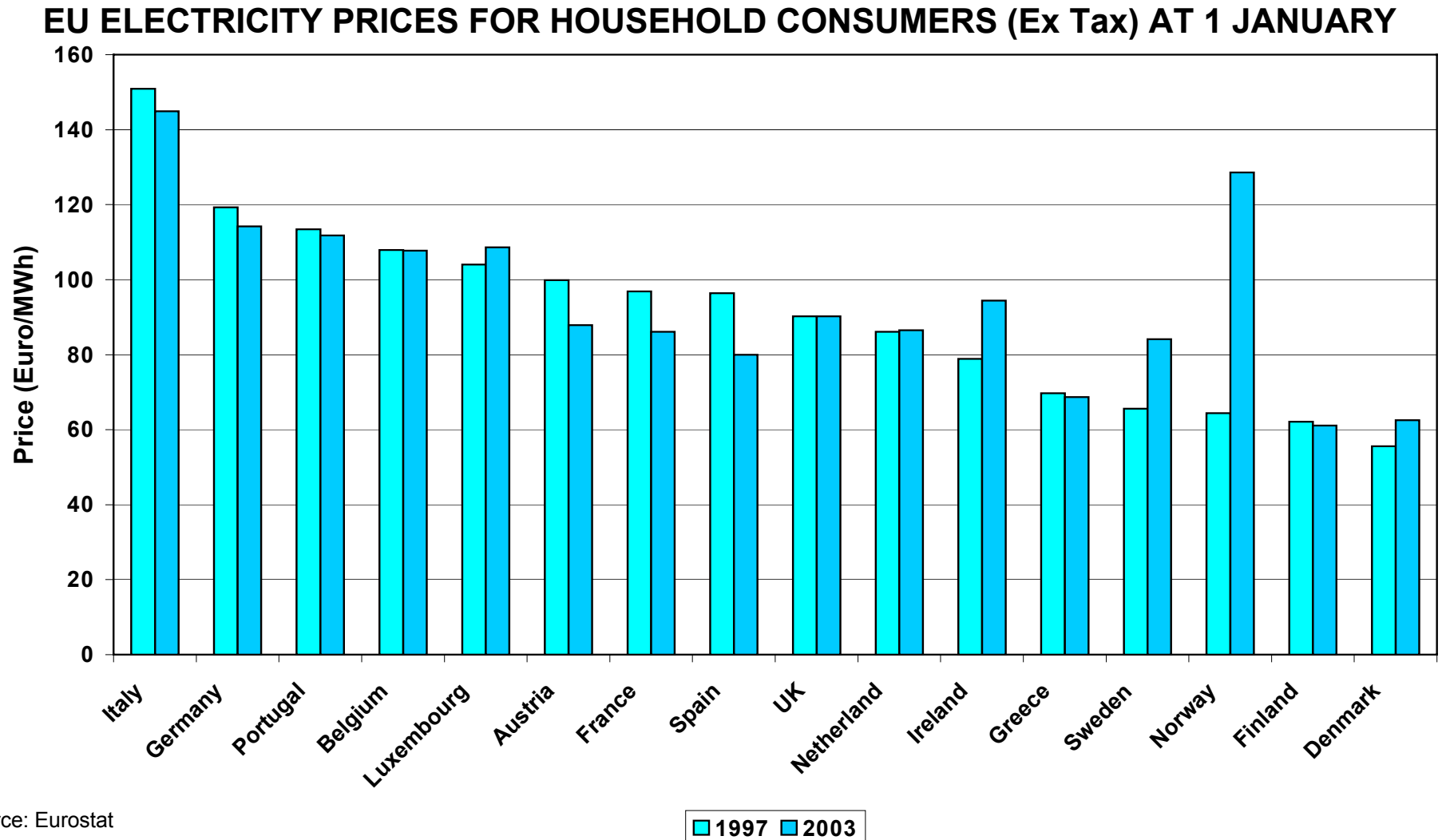
Unresolved regulatory issues

Some EU industrial price fell initially but beginning to rise now and a wide range persists....



Unresolved regulatory issues

.... while household prices only fell a little overall and went up a lot in Scandinavia



Source: Eurostat

John Bower is a Senior Research Fellow at the Oxford Institute for Energy Studies which is an independent research charity affiliated to Oxford University and dedicated to advanced research in the social science aspects of energy. John joined OIES in November 2001 and his research interest is in the emergence and evolution of integrated cross-border electricity and gas markets. Specifically; the development of efficient pricing and investment mechanisms for energy, transmission capacity, and emissions.

Before joining the OIES, John completed his PhD at London Business School and his previous career was in the commodity industry. His experience ranges from energy trading, at Marc Rich & Co, to risk management consultancy, with Coopers & Lybrand, advising commodity traders, producers and processors in base metal, precious metal, 'softs' and energy markets. Immediately prior to his PhD he was Global Controller Metals/Commodities at Deutsche Morgan Grenfell.



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