Restructuring of the European Power Industry:

Market Structure and Price Volatility

2nd SESSA Conference

Addressing Market Power and

Industry Restructuring for Consumer Benefits

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DE-REGULATION

Driven by Economic Policy

Remove or make cross-subsidies transparent

Efficiently allocate capital

Achieve lowest cost to end-user

Moving to

- Market-based investment and operation
- Economic cost recovery through competitively determined pricing
- Wholesale & retail customer choic

Moving away from

- Utility least-cost investment and operation
- Cost recovery through regulator approved tariffs

Electricity Level of Competition

⇓

Large Differences!

Not unctioning

⇓

- Greece
- Estonia
- Latvia

Just Starting (1st Steps)

⇓

- Brussels & Wallonie (Belgium)
- Luxemburg
- Portugal
- Poland
- Czech Rep.
- Slovenia
- Slovakia
- Lithuania

Some Progress

⇓

- Germany
- Spain
- Flanders (Belgium)
- Ireland
- Italy
- France (?)
- Hungary

Well Developed

⇓

- Austria
- Netherlands

Complete

⇓

- UK
- Sweden
- Finland
- Norway
- Denmar

	market opening (%)	transmission system operator\owner	Distribution system operator[4]		conditions favourable to entry	generators' share of capacity (%)[5]	generators' share of capacity (%)[6]
Austria	100	Legal	Accounts	ex-ante	favourable	6[7]	33
Belgium	80	Legal	Legal	ex-ante	unfavourable	59	66
Denmark	100	Legal	Legal	ex-ante	favourable	0	25
Finland	100	Ownership	Accounts	ex-post	favourable	11	29
France	37	Management	Accounts	ex-ante	moderate	78	86
Germany	100	Legal	Accounts	planned	unfavourable	23	61
Greece	34	Legal\Mgmt	Accounts	ex-ante	unfavourable	85	87
Ireland	56	Legal\Mgmt	Management	ex-ante	moderate	80	90
Italy	66	Own\Legal	Legal	ex-ante	moderate	43	72
Lux	57	Accounts	Accounts	ex-ante	unfavourable	0	0
Neth	63	Ownership	Legal	ex-ante	favourable	n.k	33
Portugal	45	Ownership	Management	ex-ante	moderate	59	74
Spain	100	Ownership	Legal	ex-ante	favourable	37	79
Sweden	100	Ownership	Legal	ex-post	favourable	16	50
UK	100	Ownership	Legal	ex-ante	favourable	16	37
Norway	100	Ownership	Accounts	ex-ante	favourable	12	24
Estonia	10	Accounts	Accounts	ex-ante	unfavourable	15	21
Latvia	11	Legal	Legal	ex-ante	n.k.	0	0
Lithuania	17	Legal	Legal	ex-ante	moderate	0	29
Poland	51	Management	Accounts	ex-ante	moderate	4	25
Czech R	30	Legal	Accounts	ex-ante	unfavourable	43	53
Slovakia	41	Legal	Legal	ex-ante	moderate	29	40
Hungary	30	Accounts	Accounts	n.k.	moderate	5	41
Slovenia	64	Legal	Accounts	ex-ante	unfavourable	16	43
Cyprus	0	Management	None	ex-ante	not decided	100	100
Malta	0	Derogation	None	n.k.	not decided	100	100

[3] Throughout the report, n.k. = not known, n.a. = not applicable
[4] i.e. unbundling from supply activities.
[5] After taking account of import capacity: red if > 40%, Green if < 20%
[6] After taking account of import capacity: red if > 70%, Green if < 40%

Table 1
Implementation of the Electricity Directiv

Source: DGTREN
Draft – WP (1/3/2004)

Electricity

	Market opening	size of open market TWh	eligibility threshold	unbundling TSO	unbundling DSOs
Austria	100%	55	-	leg.	acc.
Belgium	80%	60	10GWh[19]	leg.	leg.
Denmark	100%	33	-	leg.	leg.
Finland	100%	77	-	own.	acc.
France	37%	140	7 GWh	man.	acc.
Germany	100%	490	-	leg.	acc.
Greece	34%	15	1kV	leg.	acc.
Ireland	56%	12	0.1 GWh	leg.	man.
Italy	66%	182	0.1 GWh	leg.	leg.
Luxembourg	57%	3	20 GWh	acc.	acc.
Netherlands	63%	64	3*80 A	own.	leg.
Portugal	45%	18	1kV	own.	man.
Spain	100%	205	-	own.	leg.
Sweden	100%	135	-	own	leg.
UK	100%[20]	335	-	own.	leg.
Norway	100%	115	-	own.	acc.
Estonia	10%	<1	40GWh	acc.	acc.
Latvia	11%	<1	40GWh	leg.	leg.
Lithuania	17%	<1	9GWh	leg.	leg.
Poland[21]	51%	48	10GWh	man.	acc.
Czech R	30%	15	40GWh	leg.	leg.
Slovakia	41%	4	40GWh	leg.	leg.
Hungary	30-35%	9	6.5GWh	leg.	acc.
Slovenia	64%	6	41kW	leg.	acc.
Cyprus[23]	33%	1	0.5GWh	man.	none
Malta	-	-		-	-

Table 2
Electricity Market Opening Basic Data

18 For national transport only

19 Full market opening in the Flanders region

20 In Northern Ireland the electricity market is only 35% open and gas market only to very large users

21 Currently open for domestic production only

22 Negotiated for transit

23 from 2004

24 The Bulgarian gas market is only open fro domestic production

Source: DGTREN Draft WP (1/3/2004)

	market model	with at least 5% share of installed capacity	(% installed capacity) Top 1	Top3	generation capacity (GW)[29] a	capacity NTC[30] (GW) b	capacity as % of installed capacity b ÷ a	installed capacity) net of import capacity 2001 data Top 1	Top3
stria	Bilateral	5	36[31]	63	17	5.1	30%	6	33
lgium	Bilateral	2	88	95	16	4.6	29%	59	66
nmark	Hybrid	2	37	76	8	4.1	51%	0	25
nland	Hybrid	4	26	44	14	2.1	15%	11	29
ance	Bilateral	1	87	95	112	10.3	9%	78	86
rmany	Bilateral	4	34	72	109	12.2	11%	23	61
eece	Bilateral	1	95	97	10	1.0	10%	85	87
land	Bilateral[32]	2	85	95	5	0.3	6%	80	90
ly	Bilateral	5	51	80	80	6.0	8%	43	72
x	Bilateral	n.a.	n.a.	n.a.	1.2	1.0	90%	0	0
th	Bilateral	4	n.k.	67	20	4.7	24%	n.k	33
rtugal	Bilateral	3	67	82	11	0.9	8%	59	74
ain	Pool\CFD	4	40	82	56	1.8	3%	37	79
eden	Hybrid	3	45	79	27	7.8	29%	16	50
K	Bilateral	6	19	40	80	2.3	3%	16	37
rway	Hybrid	7	30	42	23	4.2	18%	12	24
tonia	Bilateral	2	90	96 (2)	3	2.0	75%	15	21
tvia	Bilateral	1	97	100	3	3.6	>100%	0	0
huania	Pool\CFD	3	46	79	6	3.1	50%	0	29
land	Bilateral	8	14	35	35	3.5	10%	4	25
ech R	Bilateral	1	66	76	16	3.6	23%	43	53
ovakia	Bilateral	1	75	84	8	3.5	44%	29	40
ngary	Bilateral	6	27	63	8	1.8	22%	5	41
ovenia	Bilateral	3	69	96	3	1.6	53%	16	43
prus	Bilateral	1	100	100	1	-	-	100	100
alta	Bilateral	1	100	100	1	-	-	100	100

Table 3
Market Development Indicators: Concentration and New Entry[27]

Source: DGTREN Draft – WP (1/3/2004

Most of this information on generation market structure relates to data recorded by Eurostat in 2001. Some updates have been made where available.
This data may understate concentration to the extent that cross ownership exists (e.g. Italy, Germany)
UCTE July 2003 forecast, Nordel winter 2003-4 forecast, NGC 7 year statement.
Based on ETSO Winter 2003-04 NTC data, includes capacity from Switzerland, Morocco, Russia not included
Data before merger of "Energie Austria"
Ireland plans to move to Pool\CFD market by 2005

	active licensed suppliers	suppliers independent of DSO	with market share > 5%	suppliers' share (all consumers)[36] 2001 data	of foreign owned suppliers
Austria	144	2	4	67%	2%
Belgium	17	17	4	51%	4%
Denmark	48	17	1	<20%	n.k.
Finland	100+	9	3	29%	21%
France	67	60	1	91%	8%
Germany	1050	50	3	53%	"substantial"???
Greece	11	10	1	100%	0%
Ireland	6	4	3	100%	<10%
Italy	212	183	4	72%	5%
Lux	12	1	2	100% (2)	0%
Neth	36	16	3	62%	n.k.
Portugal	8	7	1	97% (1)	n.k.
Spain	69	61	4	88%	5%
Sweden	127	120	3	70%	40%
UK	91	67	7	62%	64%
Norway	130	70	5	40%	n.k.
Estonia	87	0	2	96% (2)	0%
Latvia	1	0	1	100% (1)	0%
Lithuania	21	14	1	100% (1)	0%
Poland	475	446	4	20%	0%
Czech R	396	0	4	48%	n.k.
Slovakia	85	13	4	77%	n.k.
Hungary	15	5	5	66%	0%
Slovenia	68	63	6	53%	20%
Cyprus	1	0	1	100%(1)	0%
Malta	1	0	1	100%(1)	0%

36 includes both eligible and non-eligible markets

Table 4
Market Shares Retail Supply

Source: Eurostat: Competition Indicators in Electricity Market, Survey Responses

Robustness of Electricity Market

***Indicator*: degree of customer activity**

Switching

Supplier

Renegotiating

[benchmark: 15-20% of business changing suppliers every year and/or renegotiating tariffs); Households: switching of 10%...]

	Large eligible industrial users[10]	Small commercial/ Domestic
ustria	15%	5%
elgium	5%[12]	
enmark	45%	
inland	[13]	10%
rance	15%	
ermany	20%	5%
reece	0%	
eland	20%	2%
aly	15%	
uxembourg	10%[15]	
etherlands	20%	
ortugal	10%	
pain	20%	
weden	[10]	10%[16]
K	15%	12%
orway	12%	14%
stonia	0%	
atvia	0%	
ithuania	0%	
oland	2-5%	
zech R	8%	
ovakia	n.k.	
ungary	>50%	
ovenia	n.k.	6%
yprus	0%	
lalta	0%	

borderline!

Table 5
Switching Estimates for the Calendar Year 2002

10 in general this refers to clients consuming more than 1GWh/year

11 in general this refers to clients consuming more than 0.1million m3 per year

12 40% have renegotiated their contract

13 Most large users in Finland and Sweden tender every year for a new supplier

14 All large users (mostly power stations), self ship.

15 15% have renegotiated their contract

16 cumulative 40% since 1998

Industry → **Relatively good performance!**
(EU-15)

→ ***Bad Cases:*** **Belgium (5%)**
Greece (0%)

Households → **Only U.K. and Nordic States are above 10%!**

⇓

WHY?

- **End user price controls for households still exist.**

Is it bad?

Perhaps not completely…

- Such control allow for smooth transition from a regulated to a competitive sector
- “ “ “ give a safeguard to customers.

However… problems on the functioning of the market over the long term.

Table 6 *Electricity Security of Supply*

	amount of reserve generation capacity GW[37]	as % of generation capacity	import capacity (% generation capacity)[38]	% p.a. increase in peak load	Mainly market based	Incentives e.g. capacity payments	Obligation on TSO or suppliers	Tender by Regulator or TSO
ustria[39]	5.4	30%	44%	+1.2%	x			
elgium	0.0	0%	29%	+2.1%	x		(x)	
enmark	0.6	8%	51%	+1.5%	x			
nland	-0.9	-6%	25%	+3.0%	x			
ance	10.9	10%	>10%	-0.6%	x			
ermany	5.2	5%	14%	+1.9%	x			
reece	-0.3	-2%	10%	+3.8%				x
eland	0.0	0%	6%	+4.6%		x		x
aly	1.5	2%	12%	+1.2%		(x)		
uxembourg	0.4	24%	90%	+2.8%	n.a.			
etherlands	0.5	4%	24%	+5.6%	x		(x)	
ortugal	1.2	12%	8%	-5.3%	x			
pain	6.8	11%	5%	+6.5%		x		
weden	-0.1	0%	29%	-4.4%	x		(x)	
K	n.k.	5-10%	3%	+5.3%	x			
orway	1.1	5%	18%	n.k.	x			
B: NORDEL	0.8	1%	5%	+0.8%	x			
stonia	n.k.	100%	75%	+0.5%	not covered in this report			
atvia	n.k.	60%	>100%	+1.5%				
ithuania	n.k.	100%	50%	+3.0%				
oland	5.4	12%	10%	+1.3%				
zech R	2.4	16%	23%	+3.0%				
ovakia	0.4	5%	44%	+1.5%				
ungary	0.4	5%	22%	+1.5%				
ovenia	0.2	8%	53%	+3.0%				
yprus	n.k.	26%	-	+5.0%				
alta	n.k.	25%	-	+4.0%				

Source: UCTE, Nordel (x) indicates planned measures CEC (2004)

According to UCTE definition of "remaining capacity" = "guaranteed capacity" minus "load at 11 am" as a percentage of "total generation capacity". Power Balance of UCTE: Foreca 2004-10, published 19 January 2004. Forecast for 2004: lowest value from January or July. Nordel figure based on June 2003 report "Power and Energy Balances, 2006/7 forecast norm winter.

K based on NCG seven year statement, "plant margin" adjusted to approximately correspond to "remaining capacity" definition with outages\overhauls and system reserve =10% and non-usable capacity 0-5%.

land based on ESB NG Generation Adequacy Report 2004-10: 2005 results, median assumptions on availability and demand growth, interconnector deducted.

Based on ETSO NTC winter 2003-04 including Switzerland, Russia and Morocco

TOTAL NETWORK TARIFFS	Number of transmission companies	Number of distribution companies	Estimated average charge (€/MWh)	Approx. range high-low (€/MWh)	Estimated average charge (€/MWh)	Approx. range high-low (€/MWh)
Austria	3	139	24	18-36	60	44-75
Belgium	1	28	23	21-26	70	63-97
Denmark	2	130	21	n.k.	45	n.k.
Finland	1	95	15	9-22	34	22-52
France	1	166	16	n.a.	50	n.a.
Germany	4	930	26	20-39	55	40-75
Greece	1	1	15	n.a.		
Ireland	1	1	17	n.a.	52	n.a.
Italy	1	178	13	n.k	30	n.k
Luxembourg	2	11	15	10-20		
Neth	1	20	16	10-24	35	n.k.
Portugal	1	1	15	n.a.		
Spain	1	299	15	n.a.	45	n.a.
Sweden	1	180	10	8-11	38	33-45
UK	4	15	15	10-17	35	20-50
Norway	1	190	13	n.k.	28	24-34
Estonia	1	67				
Latvia	1	13				
Lithuania	1	7				
Poland	1	29				
Czech Rep	1	390		not covered in this report		
Slovakia	1	3				
Hungary	1	6				
Slovenia	1	5				
Cyprus	1	1				
Malta	1	1				
Candidate Countries						
Romania	1	8				
Bulgaria	1	8		not covered in this report		
Turkey	1	9				
Other Neighbouring Countries						
Croatia	1	1				
Bosnia	3	4		not covered in this report		
Serb\Mont.	1	27				
FYROM	1	1				
Albania	1	1				

Table 7
Network Access: Electricity (estimated tariffs)

Table 8 - Unbundling of Network Operators: Electricity

	Basic unbundling model TSO	Basic unbundling model DSO	Shareholders from vertically integrated company?	Published accounts TSO	Published accounts DSO	Compliance officer TSO	Compliance officer DSO	Separate corporate identity TSO	Separate corporate identity DSO	Separate locations TSO	Separate locations DSO	Total Yes
Austria	L	A	most DSOs	Y	Y	N	some	Y	N	Y(1)	N	4
Belgium	L	L	64% VI	Y	Y	Y	Y	Y	Y	Y	Y	8
Denmark	L	L	some DSOs	Y	Y	1 of 2	Y	Y	N	Y	N	5½
Finland	O	A	around 50%	Y	Y	Y	N	Y	N	Y	large	5½
France	M	A	100%	Y	Y	Y	N	Y	N	Y	N	5
Germany	L	A	100% VI	Y	Y	Y	N	Y	N	Y	partly	5½
Greece	L/M	A	49% VI	N	N	N	N	Y	N	Y	N	2
Ireland	L/M	M	100% VI	Y	Y	Y	Y	Y	N	Y	Y	7
Italy	L	L	state owned	Y	Y	N	N	Y	Y	Y	Y	6
Lux	A	A	n/a	Y	Y	N	N	N	N	N	N	2
Neth	O	L	state, no VI	Y	Y	N	N	Y	Y	Y	Y	6
Portugal	O	M	TSO 30% VI	Y	Y	N	N	Y	N	Y	Y	5
Spain	O	L	minimal	Y	Y	Y	Y	Y	Y	Y	N	7
Sweden	O	L	Most DSO	Y	Y	Y	N	Y	Y	Y	N	6
UK	O	L	[40]	Y	Y	Y	Y	Y	often	Y	often	7
Norway	O	A	DSOs munic	Y	Y	Y	N	Y	N	Y	N	5
Estonia	A	A	state VI	N	N	N	N	Y	N	N	N	1
Latvia	L	L	state owned	N	N	N	N	N	N	Y	Y	2
Lithuania	L	L	state mostly	Y	Y	Y	Y	Y	N	Y	Y	7
Poland	M	A	state VI	N	N	N	N	Y	N	N	N	1
Czech R	L	A	yes CEZ	Y	Y	N	N	Y	Y	Y	Y	6
Slovakia	L	L	yes DSOs	Y	Y	N	N	Y	N	Y	Y	5
Hungary	A	A	TSO state	Y	Y	Y	N	Y	N	Y	N	5
Slovenia	L	A	state owned	Y	Y	N	N	Y	Y	Y	Y	6
Cyprus	M	N	100% VI	Y	N	Y	N	N	N	N	N	2
Malta	N	N		N	N	N	N	N	N	N	N	0

40 Scottish TSOs are vertically integrated and some DSOs with suppliers

Obstacles to the Introduction of Competition in the Electricity Market

Legal/Policy (New Member States)

Generating companies with an excessive degree of market power at national or regional level

+

Lack of interconnection including vital transmission lines creating bottlenecks within the European space

+

use of uncoordinated & discriminatory methods to manage congestion impede new entrants.

A

Status of Key Priority Interconnection Projects

Past:
Siersdorf/Oberzier (DE)- Maasbracht (NL)
Greece- Italy submarine cable
Vigy (FR) – Uchtelfangen (DE)
Cartelle (ES) -Lindoso II (PT)

Waiting list:
Avelin (FR) – Avelgem (BE) line
Moulaine (FR) – Aubange (BE) line
Lienz (AT) – Cordignano (IT) line
New interconnection between Italy and Slovenia
Udine Ovest (IT) – Okroglo line (SI)
St. Peter (AT) – Tauern (AT) line
Südburgenland (AT) – Kainachtal (AT) line
S. Fiorano (IT) – Robbia (CH) line
Austria - Italy (Thaur-Brixen) interconnection through the Brenner railway tunnel
Sentmenat (ES) – Bescanó (ES) – Baixas (FR) line
Valdigem (PT) – Douro Internacional (PT) – Aldeadávila (ES) line and Douro Internacional facilities
Philippi (GR) – Hamidabad (TR) line
Submarine cable England (UK) and Netherlands
Submarine cable Ireland – Wales (UK)
Kasso (DK) – Hamburg/Dollern (DE) line
Submarine cable Skagerrak 4 (DK) – (NO)
Poland – Lithuania link, including necessary reinforcements of the Polish electricity network
Submarine cable Finland – Estonia (Estlink)
Subsea cable Fennoscan between Finland and Sweden

Competition ⇒ **change in the way investment decisions are made.**

Before → **"*predict and provide*" rule**
(regulated monopolies)

↓

Often: overcapacity!

Competitive Market → **investment decisions based on:**

Price signals from electricity markets	Expectations about the longer term

Electricity

Italy, various CCGT projects (8300MW)
Spain/Portugal, various CCGT projects (11 400MW)
Belgium / Netherlands
- Rijnmond (795MW)
- Zandvliet (385MW)
- Antwerp (120MW)

France
- Gonfreville (260MW)
- Dunkerke (788MW)

Germany
- Duisburg-Hamborn (255MW)
- Goldisthal (1065MW)
- Duisburg-Wannheim (240MW)
- Munich (417MW)
- Niehl (400MW)
- Sandreuth (180MW)
- Ludwigshaven (400MW)

Nordic market
- Horns rev wind (160MW)
- Nysted wind (165MW)
- Olkiluoto (1600MW)

UK/Ireland
- Huntstown (343)
- Ballylumford (600MW)
- Baglan Bay (525MW)
- Immingham (760MW)
- Spalding (860MW)
- Coolkeeragh (400MW)
- Various wind projects (up to 120MW)

Important projects recently completed or construction in progress

(Source: Power in Europe: new plant tracker)

Table 9 - ≠ Levels of Political Interference on Regulator Activity

	ex-ante/ ex-post	Network access conditions	Dispute settlement	Ministry involvement	Information powers	Staff number	Annual Budget 2003 (€m)	Increase in budget since 2002 (€m)
Austria	Ex-ante	R(elec)/R gas)	R(elec)/R(gas)	general guidelines	strong	60	8	-1.0
Belgium[25]	Ex-ante	R/R	R/R	no	strong	99	17	+2.0
Denmark	Ex-post	R/R	R/R	yes	strong	25	2.5	-0.5
Finland	Ex-post	R/R	R/R	no	strong	16	1.25	+0.25
France	Ex-ante	R/R	R/R	tariff approval	strong	96	12	+3.0
Germany	n.a.	N/N	C/C	n.a.	n.a.	n.a.	n.a.	n.a
Greece	Ex-ante	M/n.a.	R/n.a.	tariff approval	strong	40	4.4	+0.4
Ireland	Ex-ante	R/R	R/R	no	strong	39	10	+4.0
Italy	Ex-ante	R/R	R/R	general guidelines	strong	104	18.6	+0.6
Luxembour	Ex-ante	M and R	R/R	n.k.	strong	2	0.3	+0.0
Netherlands	Ex-ante	R/H	C/C	issues instructions	strong	55	7	+1.0
Portugal	Ex-ante	R/n.a.	R/n.a.	no	strong	53	6.4	-0.3
Spain	Ex-ante	M/M	R/R	yes	strong	187	21.0	+2.0
Sweden	Ex-post	R/R	R/R	no	strong	42	3	0.0
UK	Ex-ante	R/R	R/R	no	strong	302	57	-1.0
Norway	Ex-ante	R	R	no	strong	33	1.8	n.k.
Estonia	Ex-ante	R/R	R/R	n.k.	n.k.	11	0.3	+0.0
Latvia	Ex-ante	R/R	R/R	no	strong	68	1.7	+1.2
Lithuania	Ex-ante	R/R	R/R	instruction	strong	50	0.6	+0.0
Poland	Ex-ante	R/M	R/R	supervision	strong	258	6.7	-1.3
Czech R	Ex-ante	R/R	R/R	no	strong	88	3.8	+0.6
Slovakia	Ex-ante	R/R	R/R	no	limited	57	1.5	+0.0
Hungary	Ex-ante	M/M	R/R	tariff approval	strong	95	6.2	+1.8
Slovenia[26]	Ex-ante	R/M	R/R	non-eligible	strong	22	1.5	-0.4
Cyprus	Ex-ante	R	R	instructions	strong	7	0.5	+0.5
Malta		R	R	n.a.		15	0.3	

25 Distribution tariffs are controlled by the federal regulator: the CREG. Budget and staff numbers include the CREG as well as the regional regulators, VREG, CWAPE and IBGE-BIM.

26 For gas Regulation is ex-post with limited information powers for the regulator

R – regulator responsible, M – ministry responsible, C – competition authority, N – not regulated , H - hybrid

n.a. –no regulator

Source: Survey responses.

Industry Re-structuring
AND
CONSUMER BENEFITS

- Public Service Obligations
- Sustainable Economic Development
- Prices

Achievement of Competitive Electric Systems

⇓

3 Dimensions

Changes in the legislation
(laws & rules)
applied to tasks and markets

Organisation of
technical & trade
infrastructures of those
tasks and markets

Adjustment (of industrial
structures, activity portfolio and
companies ownership structure)
Strategic Dimension

Effective Dynamics of each country (or European region) competitive reforms = f (combination or the above 3 dimensions).

Efficiency of Public Utilities is much more than COSTS/PRICES dimension

also comprehends:

Services Renewal

New Services

Re-arrangement (new groups)

of different services in supply

Personalised options concerning the access tariffs or invoices

Public Service (Obligations)
&
Customer Protection

Universal Service

↓

the right to be connected to the network, to be supplied & to benefit from high quality services

Protection of Vulnerable Consumers

↓

guarantees proper protection against any unjustified disconnection for aged people, unemployed and disable people, giving them a real right to energy

Protection of Final Consumer

↓

transparency regarding contractual terms

- ***Regulators effective capacity to act***
- ***Arbitrage: flexibility to solve problems***

- **Public Service – problems!**

Security of Supply

Service Standards

	amount of reserve generation capacity GW[37]	as % of generation capacity	import capacity (% generation capacity)[38]	% p.a. increase in peak load	Mainly market based	Incentives e.g. capacity payments	Obligation on TSO or suppliers	Tender by Regulator or TSO
ustria[39]	5.4	30%	44%	+1.2%	x			
elgium	0.0	0%	29%	+2.1%	x		(x)	
enmark	0.6	8%	51%	+1.5%	x			
nland	-0.9	-6%	25%	+3.0%	x			
rance	10.9	10%	>10%	-0.6%	x			
ermany	5.2	5%	14%	+1.9%	x			
reece	-0.3	-2%	10%	+3.8%				x
eland	0.0	0%	6%	+4.6%		x		x
aly	1.5	2%	12%	+1.2%		(x)		
uxembourg	0.4	24%	90%	+2.8%			n.a.	
etherlands	0.5	4%	24%	+5.6%	x		(x)	
ortugal	1.2	12%	8%	-5.3%	x			
pain	6.8	11%	5%	+6.5%		x		
weden	-0.1	0%	29%	-4.4%	x		(x)	
K	n.k.	5-10%	3%	+5.3%	x			
orway	1.1	5%	18%	n.k.	x			
B: NORDEL	0.8	1%	5%	+0.8%	x			
stonia	n.k.	100%	75%	+0.5%				
atvia	n.k.	60%	>100%	+1.5%				
ithuania	n.k.	100%	50%	+3.0%				
oland	5.4	12%	10%	+1.3%				
zech R	2.4	16%	23%	+3.0%				
ovakia	0.4	5%	44%	+1.5%			not covered in this report	
ungary	0.4	5%	22%	+1.5%				
ovenia	0.2	8%	53%	+3.0%				
yprus	n.k.	26%	-	+5.0%				
alta	n.k.	25%	-	+4.0%				

Table 9
Security of Supply

(already presente

Source: UCTE, Nordel (x) indicates planned measures CEC (2004)

According to UCTE definition of "remaining capacity" = "guaranteed capacity" minus "load at 11 am" as a percentage of "total generation capacity". Power Balance of UCTE: Forecas 2004-10, published 19 January 2004. Forecast for 2004: lowest value from January or July. Nordel figure based on June 2003 report "Power and Energy Balances, 2006/7 forecast norm winter.

K based on NCG seven year statement, "plant margin" adjusted to approximately correspond to "remaining capacity" definition with outages\overhauls and system reserve =10% and non-usable capacity 0-5%.

land based on ESB NG Generation Adequacy Report 2004-10: 2005 results, median assumptions on availability and demand growth, interconnector deducted.

Based on ETSO NTC winter 2003-04 including Switzerland, Russia and Morocco

***Problems*:**

Delicate supply demand balance in certain regions

Greece **Ireland** **Italy**

Problems: network performance in terms of interruptions

Electricity	Standards of Service Distribution network performance minutes of interruptions per customer per year[43]	are there targets for performance	how are these enforced	Conditions are placed on retail suppliers	how are these enforced
Austria	43	no	n.a.	no	n.a.
Belgium	<60	yes	technical regulation	yes	regulator checks
Denmark	"high service level"	no	n.a.	general retail standards	L
Finland	230	no	n.a.	no	n.a.
France	65	yes	in contracts	M,R,A	C
Germany	15	no	n.a.	no	n.a.
Greece	n.k.	no	n.a.	yes	L
Ireland	385	yes	I	M,R,A	L,C
Italy	300	yes	I, C	M,R,A	C
Lux	n.k.	no	n.a	M	n.a.
Neth	35	yes	I	M,R,A	L
Portugal	>500	yes	reporting	M,R,A	C
Spain	215	yes	C	M,R,A	C
Sweden	192	planned	planned	yes	L
UK	85	yes	C,I	M,R,A	L, C
Norway	315	no	C	no	n.a.
Estonia	n.k.	n.k.	n.k.	n.k.	n.k.
Latvia	n.k.	yes	L	yes	L
Lithuania	n.a.	planned	n.a.	planned	n.a.
Poland	n.k.	yes	L	yes	L
Czech R	n.k.	yes	L	yes	L
Slovakia	n.k.	n.k.	n.k.	n.k.	n.k.
Hungary	6	yes	I	yes	I
Slovenia	n.k.	no	n.a.	yes	L
Cyprus	1.92KWh/year lost	yes		no	n.a.
Malta	no information				

I = financial incentives\ penalties in price limit, C = direct compensation to customers
L = licence condition or other legal instrument

A = appointments and works, M = connection, meter reading and billing standards, F – financial and technical status, R = response to complaints, queries

Table 10
Public Services an
Service Standards:
Electricity

Source:
Survey responses, CEER 2nd Benchmarking repo
on Quality of Suppl

Sustainability

Renewable energy | **CHP (Combined Heat & Power)** | **Demand Management**

Improving performance

⇓

But still far from…

⇓

Most new capacity coming on line: conventional gas fired generation:. Majority being constructed in Spain and Italy.

Table 11 – Environmental Policy Framework: Electricity generation

	VAT rate	energy tax	main RES support mechanism	Net addition to generation 2002 (MW)			
				net new coal/oil	net new gas	net new RES/CHP	other
Austria	20	**	fixed feed in tariff	-429	-273	+186	0
Belgium	21	*	obligation (green certs.)	0	0	+40	0
Denmark	25	***	obligation (green certs)	0	0	n.a.	n.a.
Finland	22	**	investment subsidies	0	0	+140	+15
France	19.6/5.5	*	obligation (tender)	0	0	+66	0
Germany	16	***	fixed feed in tariff	n.k.	n.k.	n.k.	n.k.
Greece	8	none	fixed feed in tariff plus subsidies	+75	+492	0	0
Ireland	13.5	none	obligation (tender)	0	+700	+23	0
Italy	10	**	feed in tariffs and certificates	0	+2400	+400	0
Lux	6	*	fixed feed in tariff	0	0	n/a	n/a
Neth	19	***	obligation (green certs)	n/a	n/a	n/a	n/a
Portugal	5	none	fixed feed in tariff	0	0	+++	0
Spain	16	*	fixed feed in tariff	0	+2600	+225	+1700
Sweden	25	***	obligation (green certs)	0	0	+222	0
UK	17.5/5	**	obligation (green certs)	0	0	+++	+++
Norway	no information available						
Estonia	n.k.	-	n.k.	-	-	-	-
Latvia	18	none	feed in tariffs	0	0	+35	0
Lithuania	18	*	fixed price purchase	0	0	0	0
Poland	22	*	obligation	+110	+231	+54	0
Czech R	22	none	feed in tariff	0	+64	+5	+1000
Slovakia	14	none	none	-	-	-	-
Hungary	12	none	feed in tariff	0	+110	+185	0
Slovenia	20	none	feed in tariff	0	0	-	0
Cyprus	0	*	direct grants	0	0		0
Malta	no information available						
Total				**-250**	**+6500**	**+1500**	**+2700**

* average energy tax less than €5/MWh

** average energy tax between €5-15/MWh

*** average energy tax above €15/MWh

Source: Eurostat, Survey response

PRICES

- → **Price increases – winter 2002-03 in the Nordic Market, hot summer months in Continental Europe…**
- → **Despite these trends, prices to end users appear, in generate, to remain lowest in Member States which present grater market opening.**

Table 12 Summary of Energy Price Levels: July 2003

	ELECTRICITY Large Users			ELECTRICITY Small Commercial		
	Price levels					
trend since 1/1999	Low	Med.	High	Low	Med.	High
Falling	UK,	FR, ES, LX	DE	UK, SE	FR, AT	IT, BE, DE, LX
Stable		EL	BE, PT		EL, ES	IR, PT
Rising		DK, FI, SE	IT, IR	DK, FI	NL	

AT, NL, no data

PRICE SETTING (FORMATION) heavily influenced by the set of distinctive features that characterise electricity wholesale markets:

- → **El. cannot be stored (at least in an efficient economic way);**
- → **Supply must be instantaneously matched to demand;**
- → **Transmission constraints require active systems balancing;**
- → **Demand is highly inelastic in the short run over which daily price variations occur.**

THEREFORE:

Electricity generation companies need to forecast electricity prices as accurately as possible

IN ORDER TO ESTIMATE

Short Term Market Behaviour

To make Budgets and Investments in the Medium/Long Term

Main electricity price characteristics

Volatility

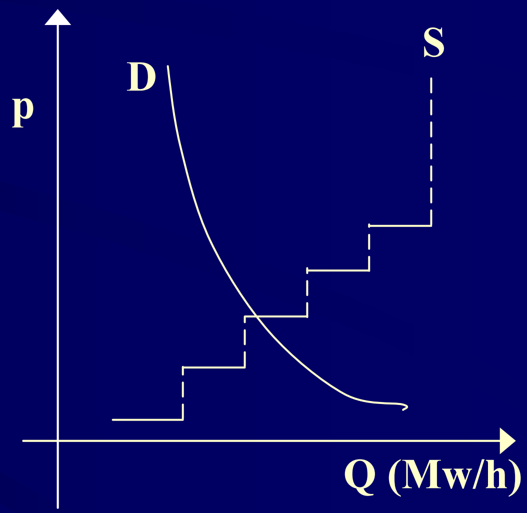
Electricity is non-storable

D is highly inelastic

Highly weather-dependent

S & D

- Supply stack



- **Main seasonal behaviour of Electricity Prices are explained by:**
  - **Economic & Business activities**
  - **Weather conditions**

- **Seasonality(*)**
  - **Intra-daily**
  - **Weekly**
  - **Monthly**

(*) We assume that seasonality is generated by deterministic factors.

(*) importance of deterministic regular patterns in the behaviour of electricity prices…

THEN:

- El. Markets are managed by system operators who need short-run direct control over, at least some plant, creating important differences with other commodity markets (even gas).
- considerable volatility over short time periods remain the most obvious evidence of el. market features.
- Electricity prices $\Leftrightarrow$ high volatility and volatility clustering.

Liberalised context:

Risk & uncertainty of Generators have considerably grown

Price Volatility:
the main source of uncertainty

Volatility of electricity prices

Introduces additional cost for supply

Presents many challenges for producers, consumers, companies and policymakers

- **Price volatility is exacerbated by the unresponsiveness (inelasticity) of consumer demand for electricity to high prices.**

- **The characteristics of the supply stack of each market can also contribute to the volatility of a particular demand.**

SINCE SHIFTS IN D will push prices up →

→ increasing the economic incentives of

more expensive generators to enter ⇔ SHIFT IN S.

- **POOL's prices**

  $\Downarrow$

- **D_{LOW}** - - - - - → **S_{el}.: base-load units with low mg costs.**

- **D↗** - - - - - → **S_{el}.: generators with higher mg costs enter the system**

- Relative insensivity of D to price fluctuations

AND

- S can face buiding constraints at peak time

↓

Make short-terms prices for Electricity

EXTREMELY VOLATILE

MOREOVER:

- Depending on the structure of the market
- The market power of generators

For high levels of D only few generators could satisfy the residual demand and therefore…

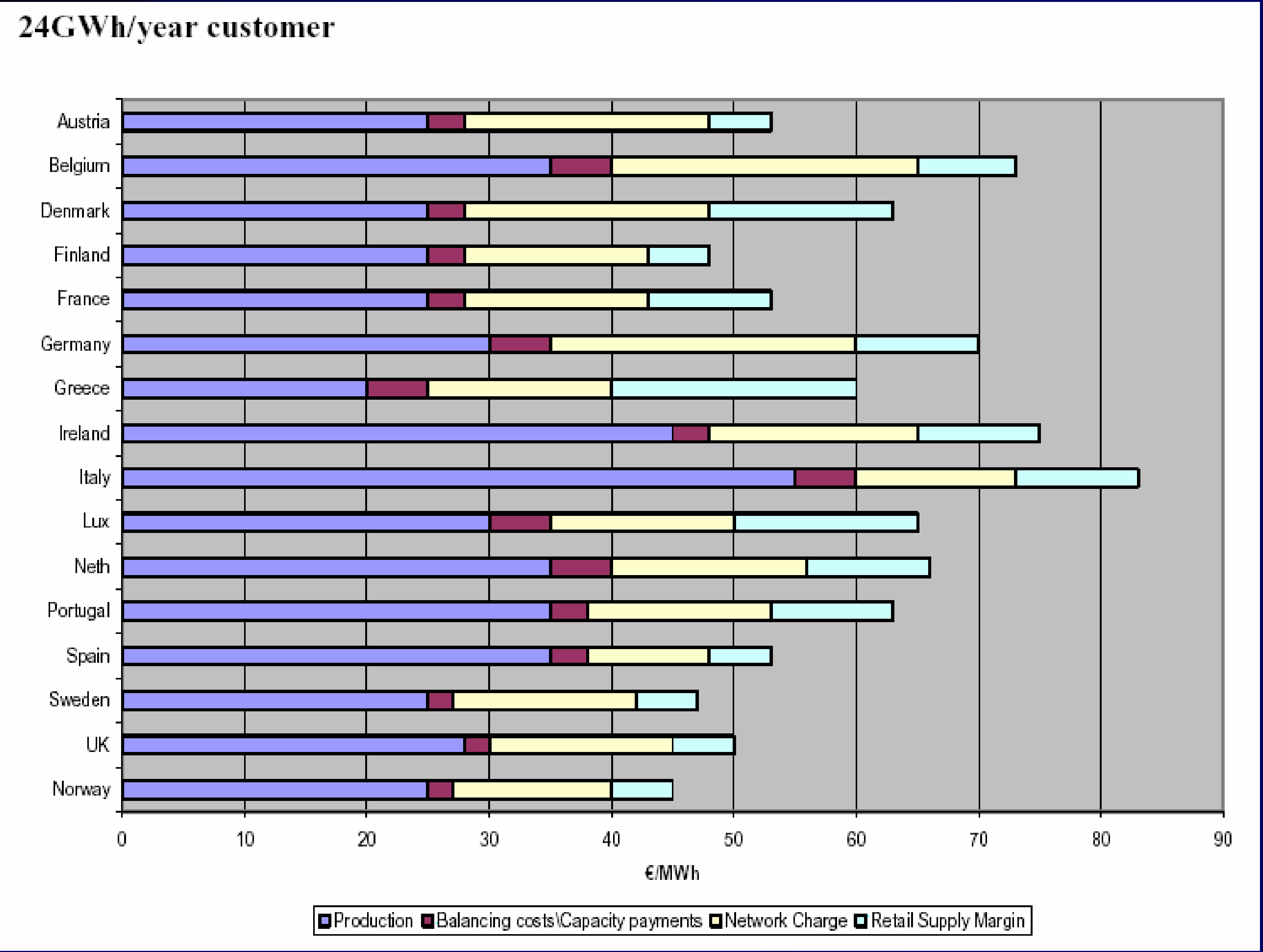
market power could come into play through monopolistic or oligopolistic behaviours of generators.

(Hogan, 1997)

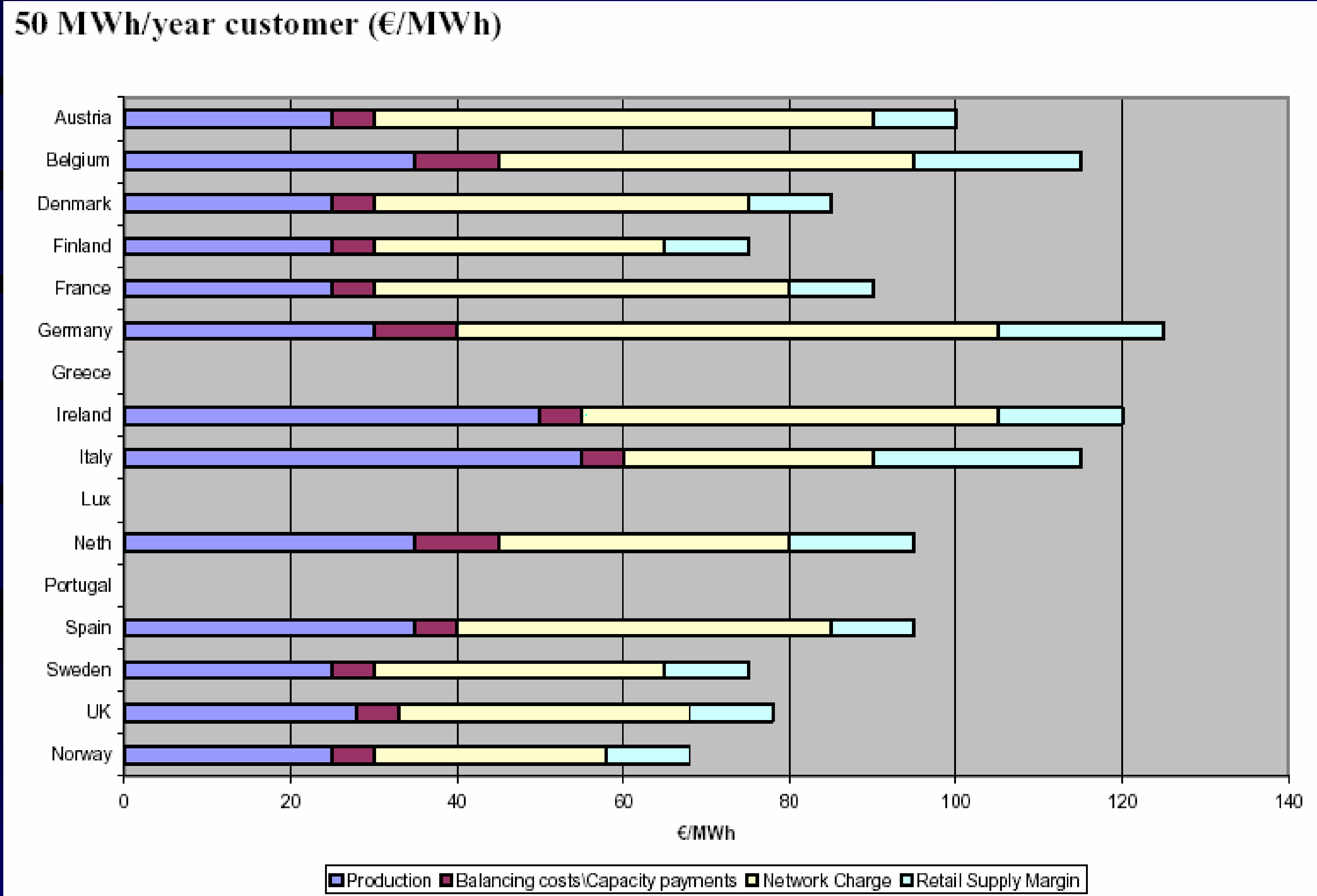
Main Electricity Price Characteristics

- **Mean-reversion process?**
  - Since increases in demand will push prices up and therefore increasing the econon incentives of more expensive generators to enter in the supply side of the system, it seems logical to expect some degree of mean reversion in electricity prices.
  - Weather is a mean-reverting process, some argue.
- **Mean-reverting models**
  - Lucia and Schwartz, 2001; Bhanot, 2000; Knittel and Roberts, 2001.
- **Non-mean reverting models**
  - De Vany and Walls, 1999; León and Rubia, 2001.
- **Mean-reverting models with Jumps**
  - Price does not stay in the level to which it jumps, but reverts to the previous level rapidly.
  - Johnson and Barz, 1999 → analysed the fit of mean-reverting and non-mean reverting models with and without jumps to a set of deregulated markets → → THE BEST FIT EAS OBTAINED BY A MEAN-REVERTING MODEL WITH JUMPS. HOWEVER: they didn't provide any formal test (unit roots, etc) nor considered the possibility of constraints volatility (GARCH, …)

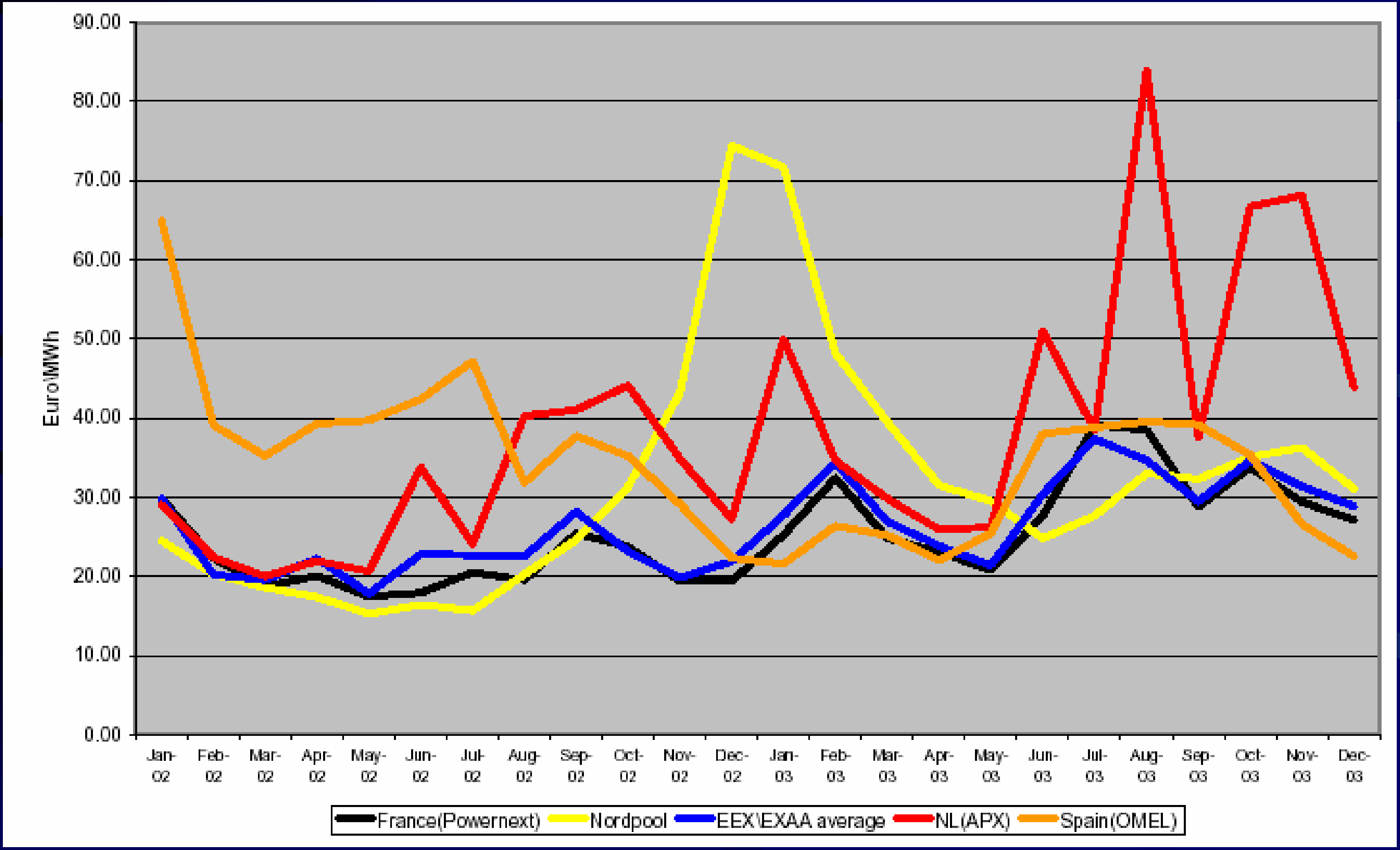
Graph 1 – Estimated Breakdown of expected Electricity Prices 2004



Graph 2 – Estimated Breakdown of expected Electricity Prices 2004



Graph 3 – Evolution of wholesale Electricity Prices January 2002 – December 2003



Source: relevant power exchange websites

The Iberian Electricity Supply Industry: Market Structure and Price Volatility[1]

– Postponed to June/July 2005

⇓

– Regulatory Differences ⇒ serious obstacle. Delay.

→ An integrated model based on a single market operator and 2 system operators.

→ Although concentration degree will APPARENTLY be lowered (both at generation and distribution levels), Iberian companies are vertically integrated into the distribution/retail ⇒ Market Power!

⇓

with MIBEL → Oligopoly

- Generation
  - 34% ENDESA
  - 21% IBERDROLA
  - 11% EDP
  - 36% ENDESA
- Distribution
  - 34% ENDESA
  - 21% IBERDROLA
  - 11% EDP
  - 36% ENDESA

(1) Soares, M.I.; P. Silva (2004): "*The Iberian Electricity Supply Industry in Transition: Market Structure and Price Volatility*", 6th IAEE European Conference "Modelling in Energy Economics and Policy", 1-3 September, Zurich.

Price Behaviour in OMEL (independent pool's operator)

- Full Competition in the Spanish Market – 01/01/2003.
- Most physical production is sold on the day-ahead market at a system mg price (SMP).
- All generators but the ones under physical bilateral contracts and electricity imports receive capacity payments.
- Mean-reverting models with Jumps

Daily observation of prices in OMEL

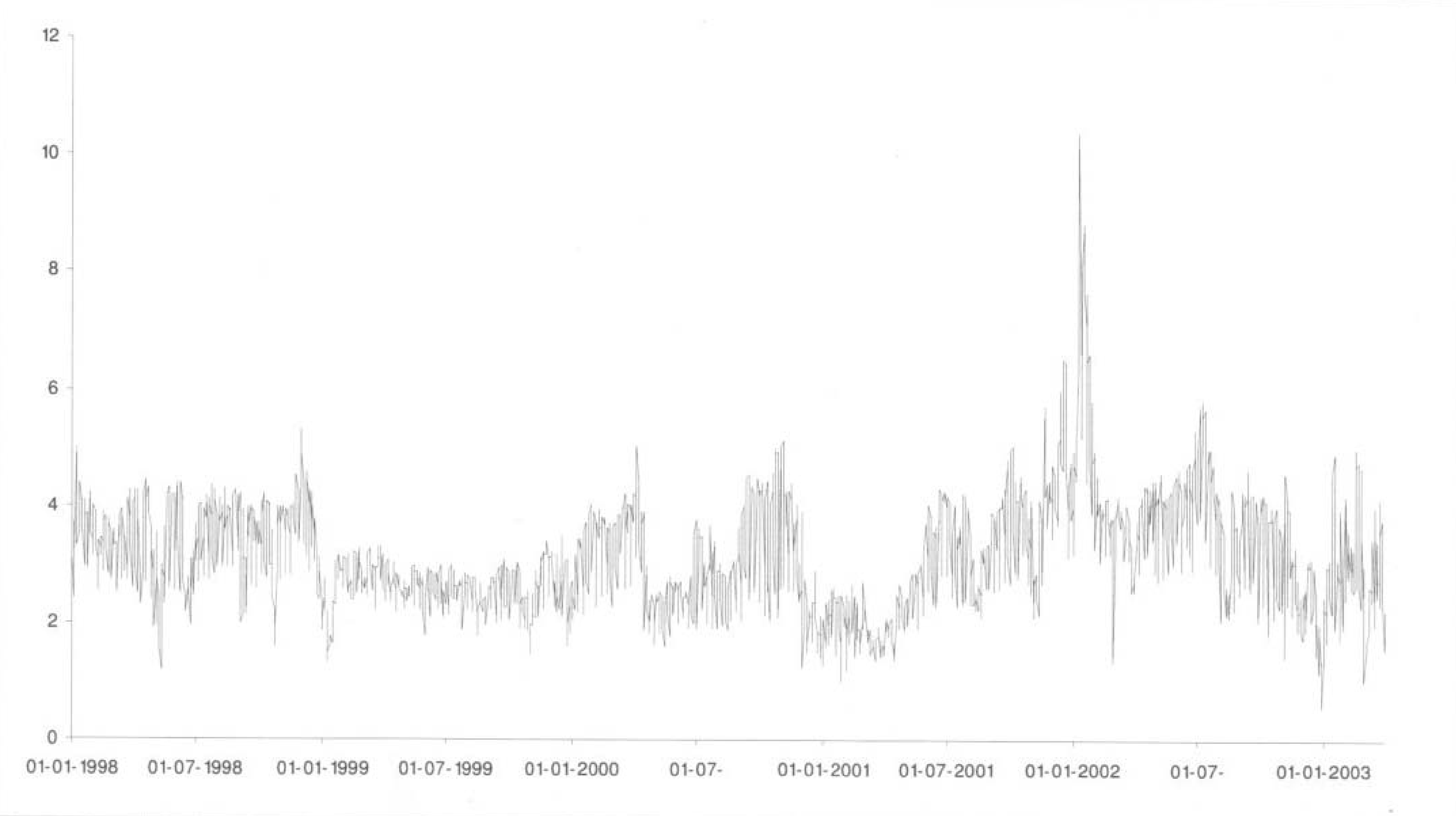
since the opening day (01/01/1998) until 31/03/2003)

→ 1916 observations.

– **The resulting series, St: average price of the daily market.**

Graph 4 – Spot Price Behaviour in OMEL[1]

- **January 1998 to March 2003**



Data from www.omel.es

We took the

Standard Deviation of the Logarithmic Price Changes

Rt = In (Pt/Pt – 1)

measured at regular intervals of time as an immediate and forward way to measure volatility.

Prices are extremely volatile: the annualised volatility in the OMEL Market reaches 378.28% for the period (01-01-1998/31-03-2003).

AND

It is evident the presence of volatile clustering (*)

(*) a very frequent feature of other financial series (GARCH effects)!

Volatility: many roots!

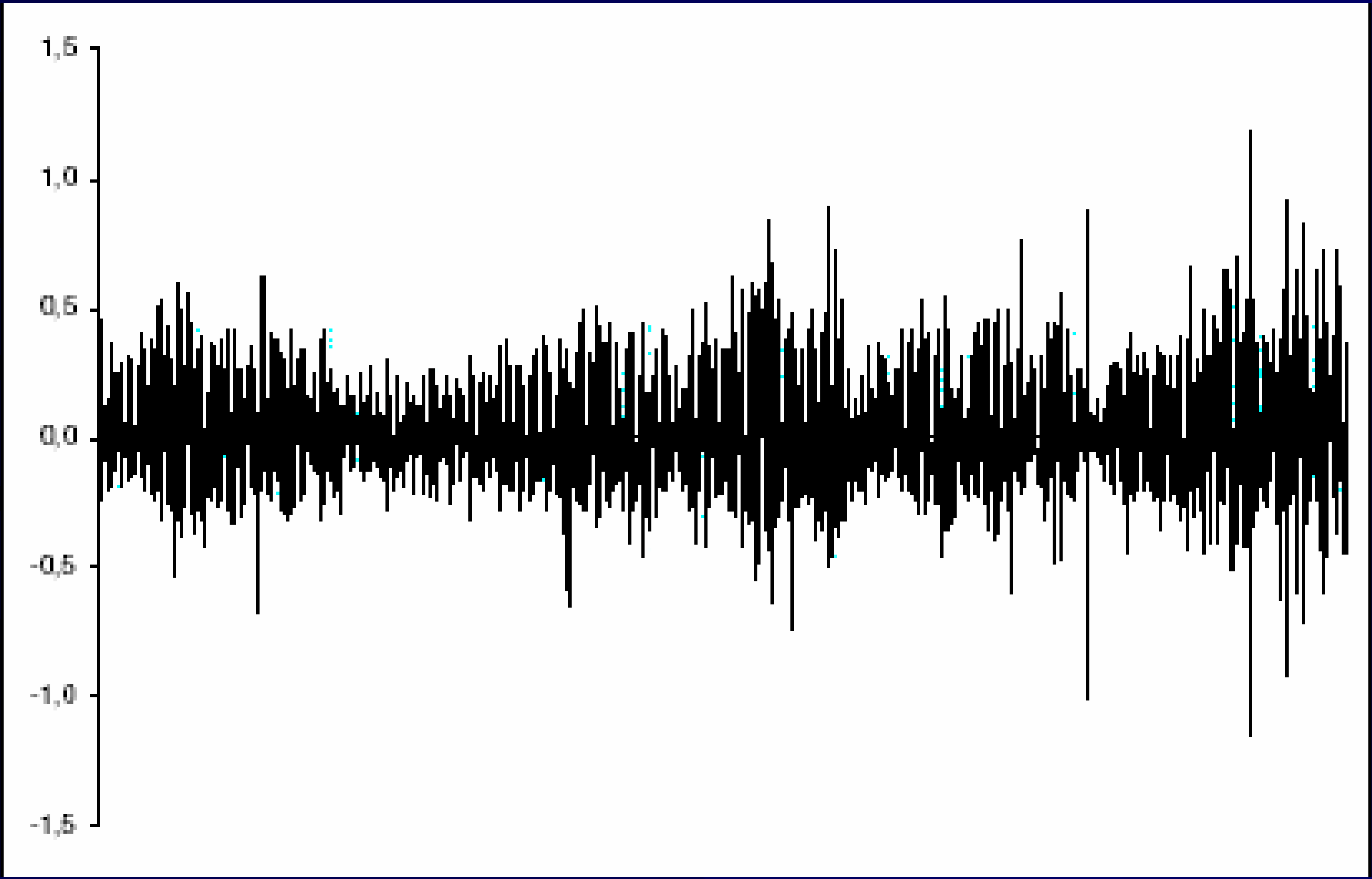
↓

The Iberian case seems to depend predominantly upon:

- **Economic Factors (production/consumption balance and transportation costs);**
- **Political Factors (market regulation & environmental regulation);**
- **Industry Structure**
- **Market rules**
- **Weather and Seasonality (Acrocena et al, 1999) [(2)]**

(2) "*Regulatory Reform in the Spanish Electricity Industry: a missed opportunity for competition*", Energy Policy, 27, 387-399

Graph 5 – Return Series



Spot Price Behaviour in OMEL (ii)

- Firms' pricing behaviour has been highly influenced by the recovery of stranded costs and the way in which these have been reimbursed.
- Spanish electricity producers might have been alternating between episodes of *collusion* and *price wars* (Fabra and Toro, 2004).

Immediate Conclusions (Sort of…):

For the Iberian Electricity liberalisation to deliver sustainable and competitive prices,
some important conditions must be met.

The first is that there is adequate and secure capacity relative to peak demand. Electricity cannot readily be stored (except as storage hydro), so reserves must be sufficient to meet generation outages, unexpected surges in demand, and, in a liberalised market, strategic bidding or capacity withholding as demand increases relative to available capacity.

Second, for the wholesale market to be competitive, potential suppliers must have access to the transmission system in order to reach customers. This also applies to import capacity, and requires that customers have access to foreign suppliers and that incumbent generators do not control the import capacity.

Third, there needs to be sufficiently many independent generators competing to supply each customer, and that in turn requires adequate transmission. Transmission constraints fragment the market, reducing the number of generators actively competing in sub-markets.

Finally, markets for contracts, spot energy and ancillary services need to be sufficiently well developed, liquid, and competitive to enable the increased risks created by vertical unbundling to be adequately managed. The higher the share of electricity sold under contracts, the lower is the incentive to manipulate the spot price. For the contract market to be competitive, the number of generators offering contracts (with appropriate profiles) should be adequate, and the threat of entry by new Independent Power Producers (IPPa) should be credible.

There are no generally accepted quality solutions for the electricity spot price forecasting. This is partly because the empirical properties of the price differ across markets, partly because ongoing market reform means there is continual fundamental change in the dynamics of prices, and partly because they exhibit complex volatility patterns. Unfortunately, building a statistical model for the electricity spot price is not straightforward.

Traditional financial-based models of asset prices ignore the nature of the good being priced. Electricity is a commodity that is predominantly instantaneous and must be consumed at the time of generation which affect the price formation dynamics. In addition to price forecasts, in this new competitive era market participants need to assess accurate information to manage risk. Actually, electricity markets are known for their high short-term volatility relative to that observed in the markets for more traditional commodities. Using a GARCH type time series model we provided some empirical evidence on the spot price volatility of the Spanish electricity market.

The method described in this paper could, properly fine tuned according to the actual application, be useful in risk management of risky electricity portfolios, as well as in the pricing and hedging of different types of derivatives in the electricity market.

→ BEYOND THE MIBEL – Conclusions

(not so intermediate!)

LEGISLATION AND MARKET DYNAMICS

Flexibility

Speed

High Degree of Vertical Integration →

→ payments (made and received) from the spot market are pure transfers from retail to generation activities of the same companies!

→ The Costs (*)? No public information!

→ Financial contracts? No public information! ("effective" decreases in mg costs)

(*) Even costs!

- Concentrations ↗
- Electricity trading between firms (owned By largest companies) ↗

⇓

- Market power of incumbents ↗
- Absence of effective competition between generators
- <u>Bias:</u> offers linked to the wholesale market ⇔ dominant players!
- Forward prices on the wholesale market based on balancing prices (short term)

Market Price Indicator

PROBLEM:

Regulation of Electricity Trading

Sectoral Regulator?

Financial Regulator?

PROBLEM:

Industrial Consumers → able to negotiate balancing & supply contracts (up to 85% of the el-bill) under competitive conditions?

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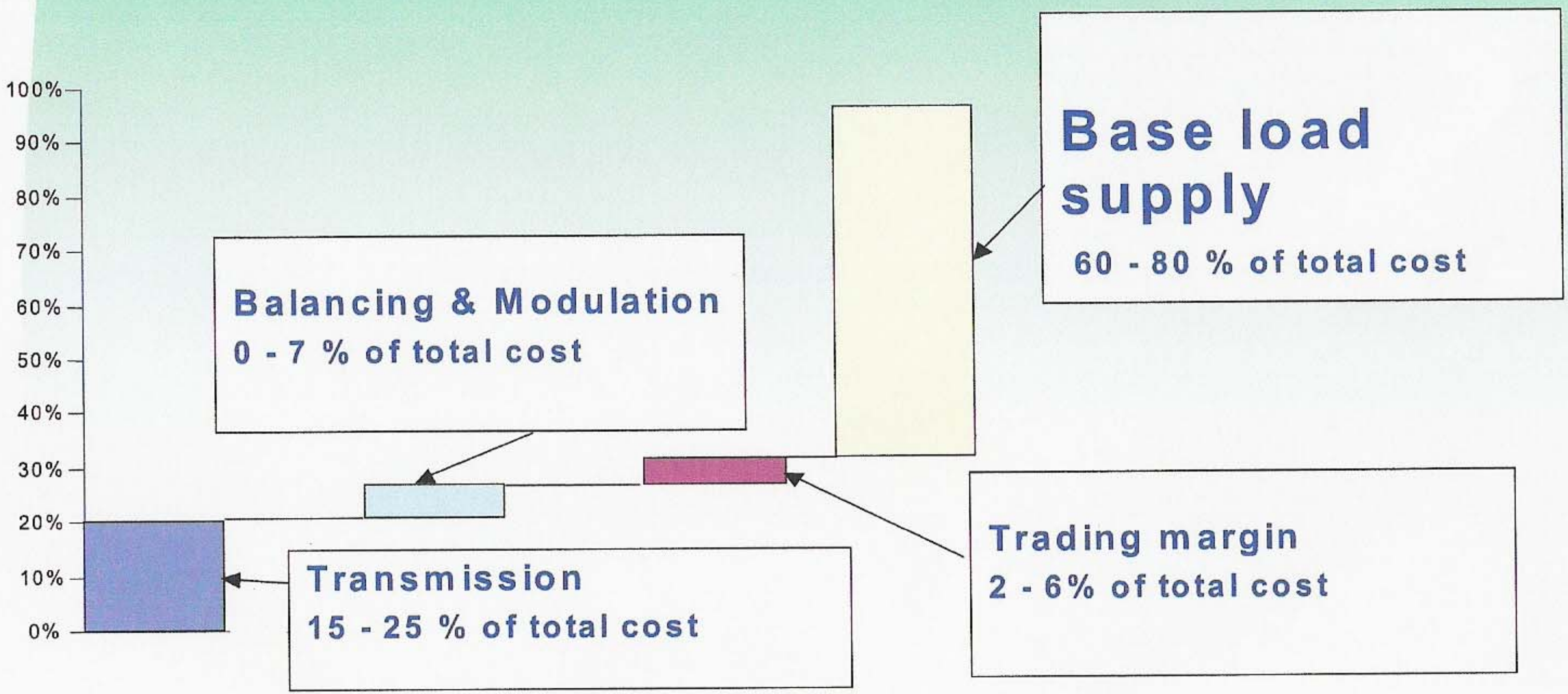
NOT YET!

↓

Only the trading margin is currently negotiable.

Break-down of the EU electricity bill in 2004
not including surcharges



Dominant Incumbents (Generators)

Competition based on
→ **Sales Prices**
→ **Not market share!**

Support Mechanism
→ **Wholesale trading**
↓
W.T. Market Price →
→ unique reference for physical supply contracts negotiations with industrial consumers!

Actually:

Electricity trading regime $\rightarrow$ price signals

$\Downarrow$

volatility

$\Downarrow$

unstable environment!

?

- Market Re-design
- Sectoral & Financial Regulation flows of information.