

The Spanish Electricity Industry Analysis and Prospects

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Outline

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 - 1.1. Market design
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 - 1.3. Evolution of the market structure
 - 1.4. Investment in generation capacity and resource adequacy
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 - 2.1. Competition from abroad
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Is liberalization a success or a failure?

- seems a success
 - between 1998 and 2003, the average price of the kWh has decreased by 7.42 %
 - the retail price index has increased by 17.27 %
- but the generation cost has increased by 7.98%

Cost and demand

Year	1998	1999	2000	2001	2002	2003
Production cost (millions €)	6 384	6 873	7 353	8 065	8 553	9 561
Total cost of the electricity service (millions €)	11 644	11 780	12 236	12 985	13 463	14 952
Demand (GWh)	158 831	169 917	181 289	189 676	196 334	220 300
Production cost/Total cost	54,82	58,34	60,1	62,11	63,53	63,95

main conclusion

- liberalization did not foster competition
 - uniform-price auction
 - tacit collusion
 - CTC
- decrease in price comes from
 - economies of scale in network activities
 - administrative decisions

1.1. Market design

- sequence of markets
 - day-ahead market
 - balancing markets ("real time")
 - ancillary services market.
- day-ahead market
 - 24 hourly markets
 - supply side: producers submit supply functions (up to 25 price-quantity pairs per production unit)
 - demand side: distributors submit flat demand functions, retailers and eligible consumers submit decreasing demand functions (up to 25 price-quantity pairs per production unit)

System Marginal Price

- OMEL constructs a merit order despatch
- despatch and equilibrium prices determined through market clearing
- conditionally on being despatched, the price to be received or paid is set according to a uniform-price auction.)
- Red Eléctrica de España studies the feasibility of the despatch and modifies it to network constraints
- market participants may adjust their positions in either direction in a sequence of six balancing markets.
- Last, REE runs several markets to provide ancillary services when needed.

Production Price

production price of electricity

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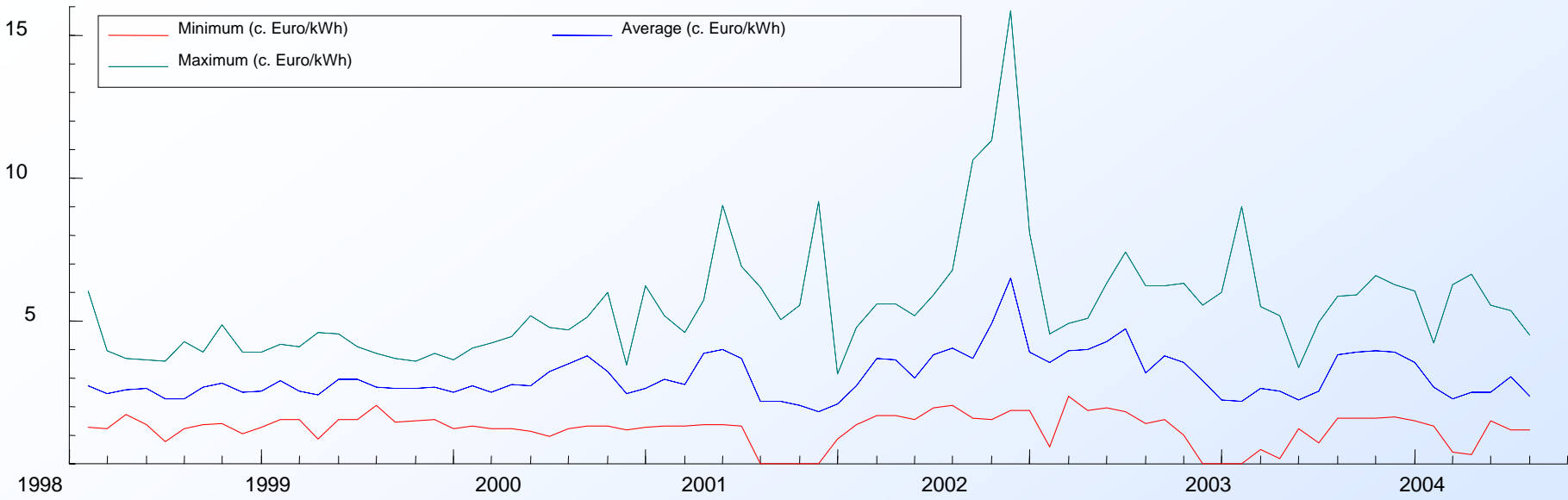
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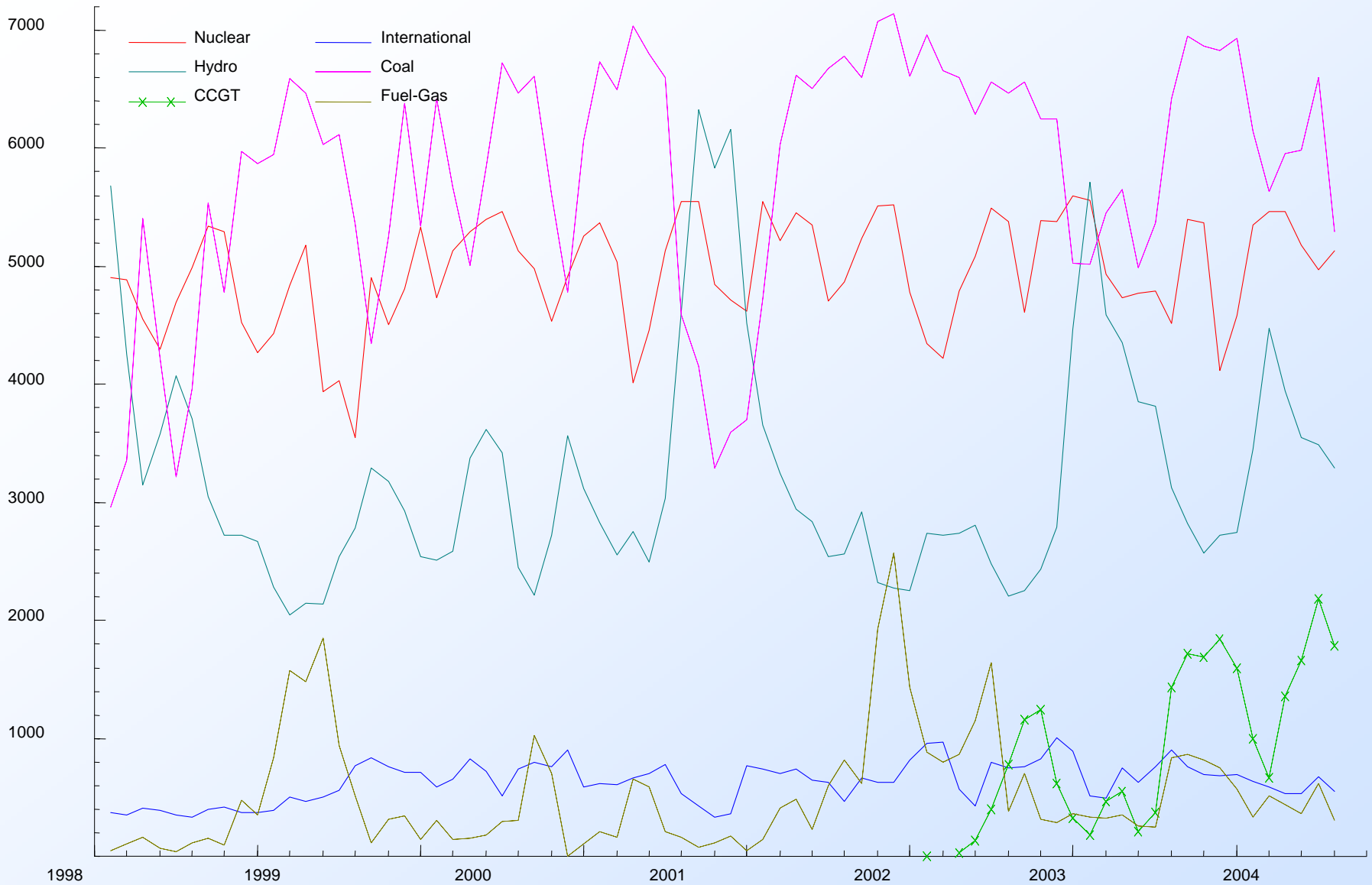
per-kWh costs to balance the system

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capacity payment (0.78 cents of Euro/kWh from 1998 to 2000 and 0.48 cents of Euro/kWh onwards)



Prices and Demand in the Spanish Day Ahead-Market
January 1998- April 2004

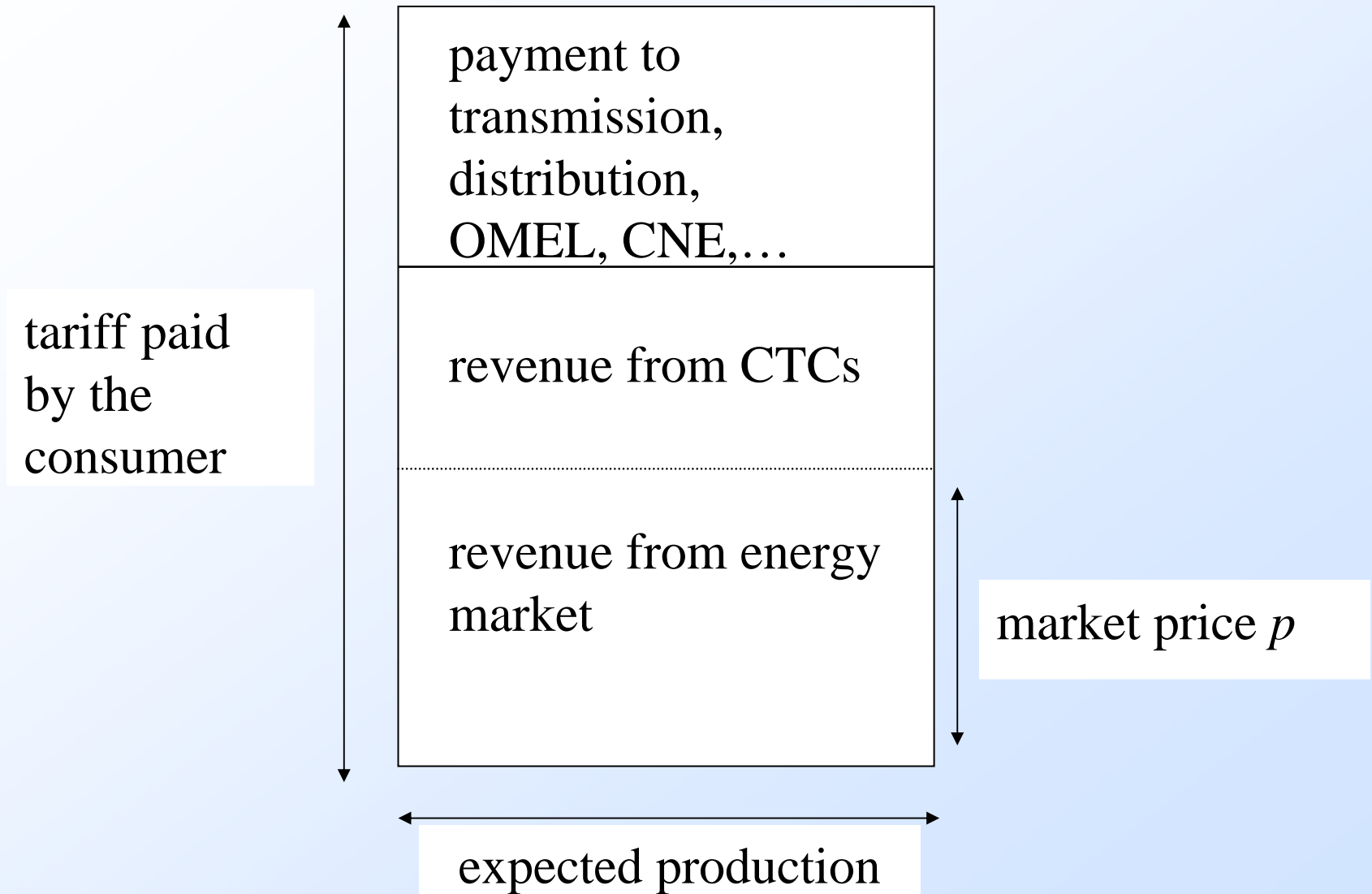


**Production by Technology Type in the Spanish Day Ahead Market
January 1998- April 2004**

1.2. Competition Transition Charges

- agreement on the recovery of stranded costs (1996)
- the electricity companies shall receive during a transition period a fixed payment, expressed in €/kWh, equal to the difference between the average revenues from tariff and the regulated costs
- the net present value will not exceed 11,951.49 millions €. If the generation cost exceeds 3.61 cents of €/kWh, the excess is deducted from the above-mentioned amount

computation of the CTCs



payment to generator i

- $CTC = \text{industry revenue} - \text{"fixed costs"} - \sum_j pq_j$
- generator i receives $pq_i + \alpha_i \times CTC$
as long as $p \leq 3.61 \text{ c€/kWh}$
- $pq_i + \alpha_i \times CTC - (p - 3.61)\alpha_i \sum_j q_j$ otherwise
- $\alpha_{EN} = 51.2\%$, $\alpha_{IB} = 27.1\%$, $\alpha_{UF} = 12.9\%$, $\alpha_{HC} = 5.7\%$

effects on bidding behavior

- $CTC = \tau \sum_j q_j - p \sum_j q_j = (\tau - p)Q$
- $\frac{\pi_i}{Q} = pm_i + (\tau - p)\alpha_i - \frac{C_i(m_i Q)}{Q}$

is increasing (decreasing) with p if the market share m_i is larger (smaller) than α_i

- IB advocates for the suppression of the CTCs, EN opposes the suppression

1.3. Evolution of the market structure

- EN and IB result from a strong movement of mergers supported by the government prior to 1998
- EN and IB control 80% of generation and distribution assets
- high degree of vertical integration
- convergence with gas
- recent merger failures
 - UF and HC, EN and IB, Gas Natural and IB

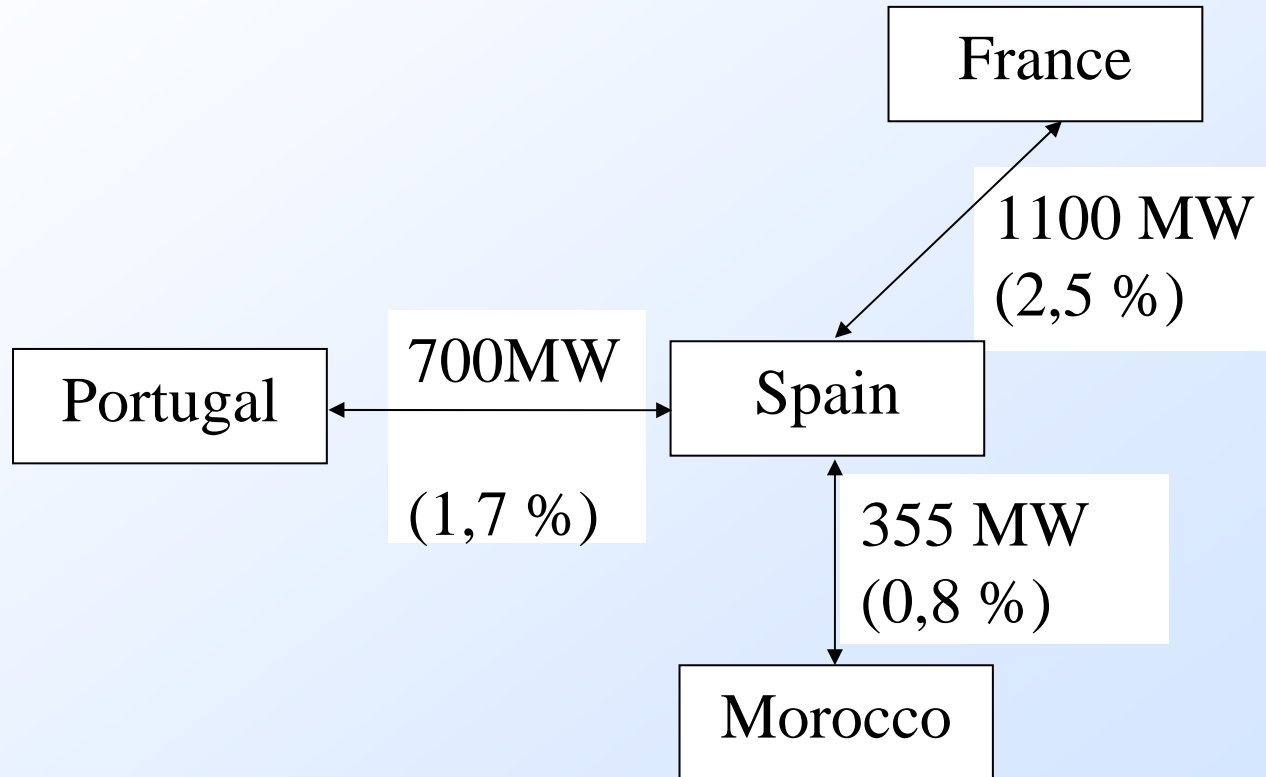
1.4. Investment in generation capacity and resource adequacy

- initial excess capacity absorbed by rapid growth in demand
- in December 2001, the SO forced rolling blackouts in central Spain
- regulatory authorities request firms to carry about all the investment plans that had previously been announced
- In 2002, 2.800 MW of new capacity entered into operation, 800 belonging to Iberdrola and 800 to Gas Natural

Installed capacity, load, and reserve margins in Spain and Portugal

	2004	2006	2008	2010
Power Data (GW)				
Hydro	22,5	22,8	22,9	23,2
Nuclear	7,6	7,6	7,5	7,6
Thermal	31,4	35,2	37,3	39,3
Renewable	6,6	10,1	12,9	15,9
Intalled Capacity	68,1	75,7	80,6	86,0
Guaranteed Capacity	51,5	55,7	58,2	60,1
Load	47,1	49,8	52,8	56,1
Reserve Margin	4,4	5,8	5,4	4,0
Interconnection capacity	1,8	2,4	3,0	4,1
R. Margin/ I. Capacity (%)	6,5%	7,7%	6,7%	4,6%
Inter. Cap./ I. Capacity (%)	2,6%	3,2%	3,7%	4,8%
R. Marg.+Inter. Cap./I. Cap. (%)	9,0%	10,8%	10,4%	9,4%

2. Network activities



interconnections in MW (% of installed capacity)

weak interconnections

- several projects delayed or abandoned unilaterally by the French government; penalties paid by EDF to REE
- momentum towards an Iberian market but yet ahead
- the relevant market is the Spanish electricity market

transmission and distribution

- network apparently poorly congested
- increase in demand results in decrease in average cost
- price cap provides incentive to higher efficiency (see Griffel-Tatjé and Knox Lovell, *Scand. J. of Economics* 2003)

3. Evaluation of recent performance and avenues for a regulatory change

- governmental interventionism and lack of transparency
- strategic announcement of new investment by incumbents to dissuade entry
- no new plant between 1998 and 2002 = lack of capacity = risk of collapse of the system
- obvious need for regulatory change