9. BUSINESS STRATEGIES IN ELECTRICITY MARKETS

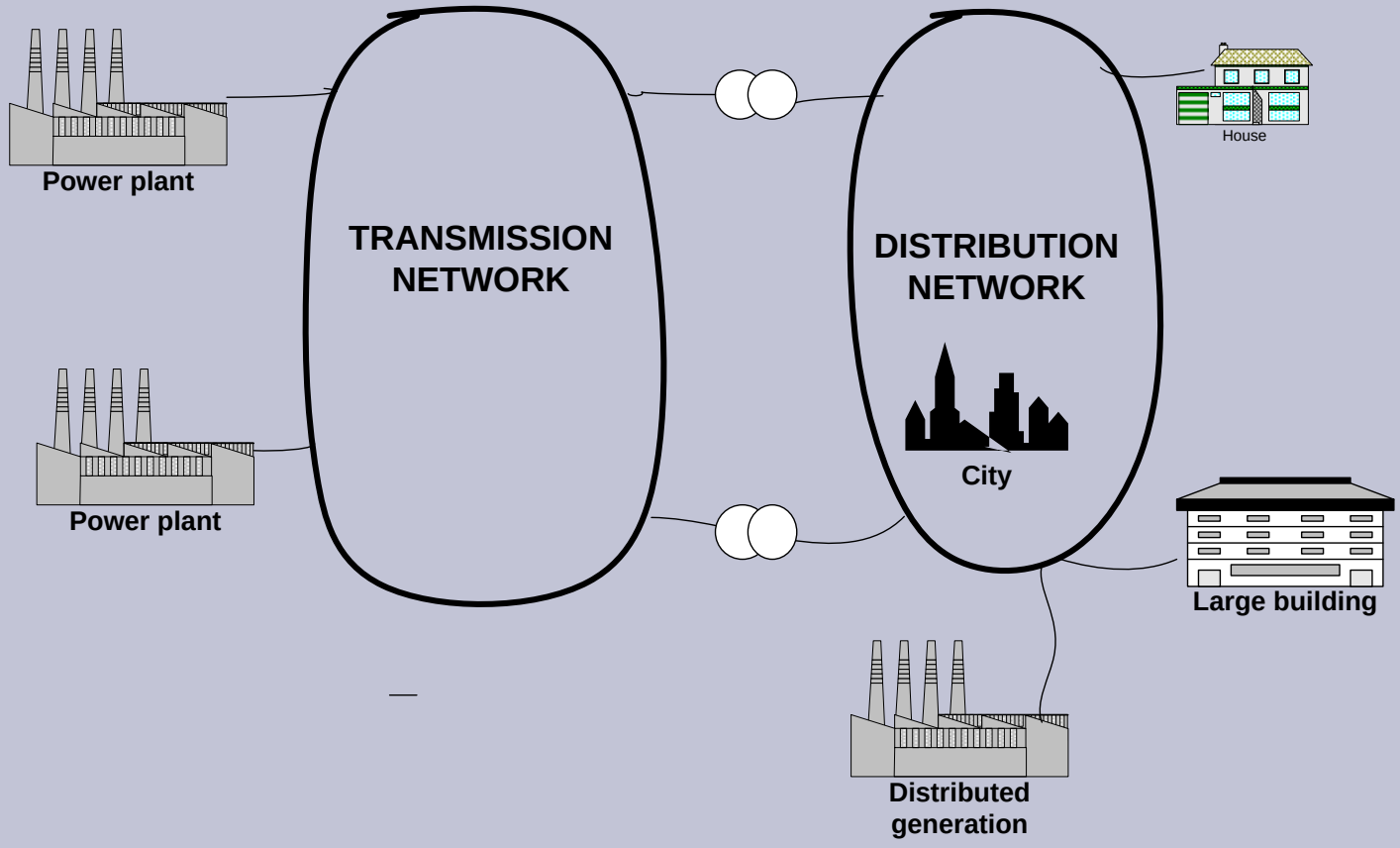
Asko Vuorinen

Electricity markets

- Traditional electricity markets
- Competitive electricity markets
- Capacity markets
- Benchmarking

Traditional electricity markets

Market structure



Traditional electricity markets

- May have monopoly on all levels (UK before liberalisation)
- May have monopolies on the distribution level only (Nordic countries before liberalisation)
- Industrial consumers might produce their own electricity

Traditional electricity markets National monopoly

- National monoplies tend to increase their resources (people and capacity) put the all costs to their tariff base
- The planning is easier and can be made to minimize costs in the long term
- They tend to build more high investment cost plants, which have low fuel costs (nuclear and hydro)

Traditional electricity markets Competition in transmission network level

Tends to keep the whole sale prices of electricity lower

Tariff = Fc x P + Vc x E

Where

Fc = fixed costs of power plant (€/kW/month)

P = capacity ordered by customer (kW)

Vc = variable costs of power plant (€/MWh)

E = electrical energy (MWh)

Traditional electricity markets competition in transmission network level

There can be separate tariffs* for base load, intermediate load and peak load

1)Base load tariff could correspond the costs of nuclear plant (23 €/kW/month and 17 €/MWh)

2)Intermediate load tariff could corresponds to the costs of coal fired plant (14 €/kW/m and 48 €/MWh)

3)Peak load tariff corresponds to the costs of gas engine (9 €/kW/m and 75 €/MWh) or diesel engine plant (5.7 €/kW/m and 109 €/MWh)

* See presentation ”Planning of national power systems”

Traditional electricity markets Strategies of utilities

- Utilities try to maintain the monopoly position as long as possible
- Network ownership is critical for control of customers
- Sell power at reasonable price or allowed maximum price

Traditional electricity markets Strategies of industrial companies

- Build own power plants to get lowcost electricity
  1) Combined and Heat Power (CHP) at factory sites
  2) Nuclear power or hydro plants at remote sites

Competitive electricity markets

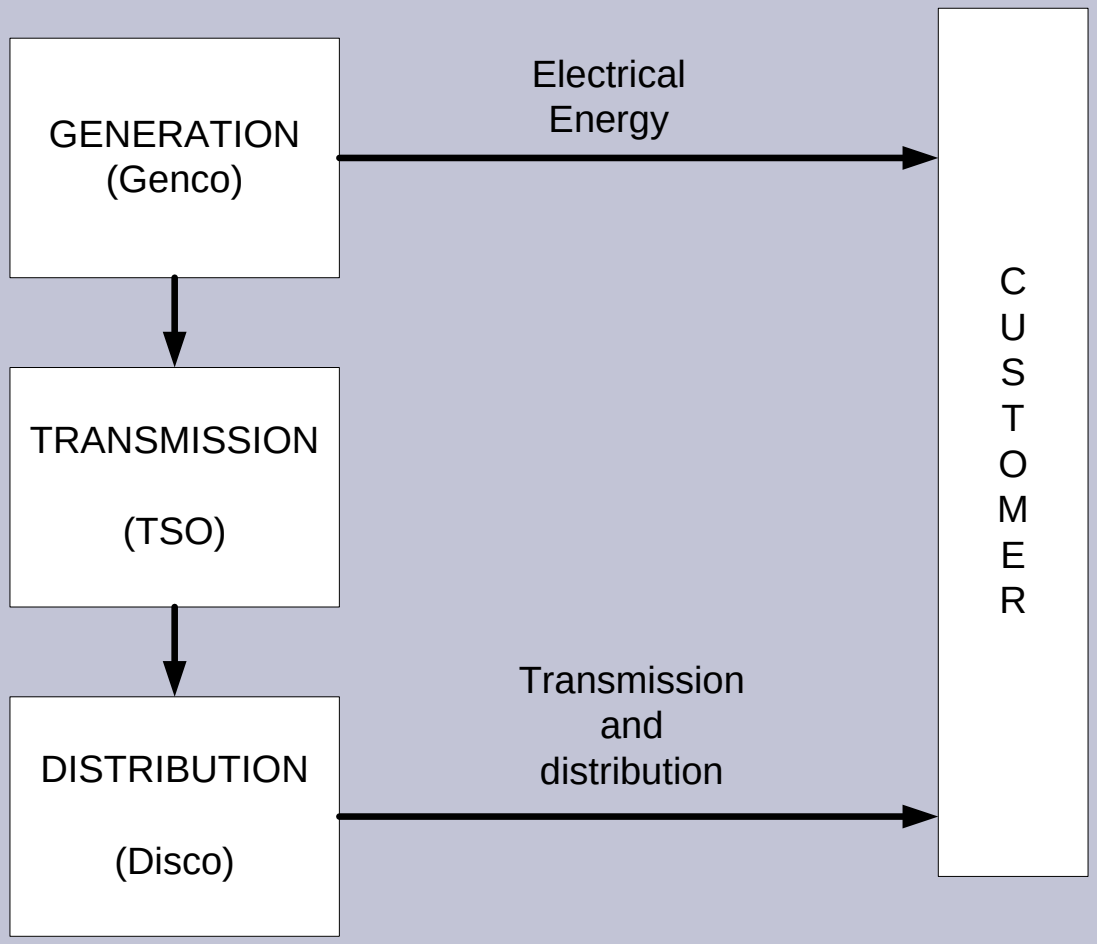
Competitive electricity markets Targets

- Competition should reduce prices of electricity
- Lower prices should increase the competitivness of industries
- Lower prices should increase living standard of people

Competitive electricity markets What should be done

- Separate energy, transmission and distribution to seprate companies (unbundle)
- Allow open competition of electrical energy (free customer choice)
- Use controlled monopoly only in transmission and distribution

Unbundling of electrical energy, transmission and distribution



Competitive electricity markets, History

- Margaret Tatcher in UK separated CEGB* to production, transmission and distribution companies and allowed open competition in the 80'ies
- Nordic countries opened electricity markets after UK in 1998
- EU directives say that electricity markets should be open by 2007

* Central Electricity Generating Board

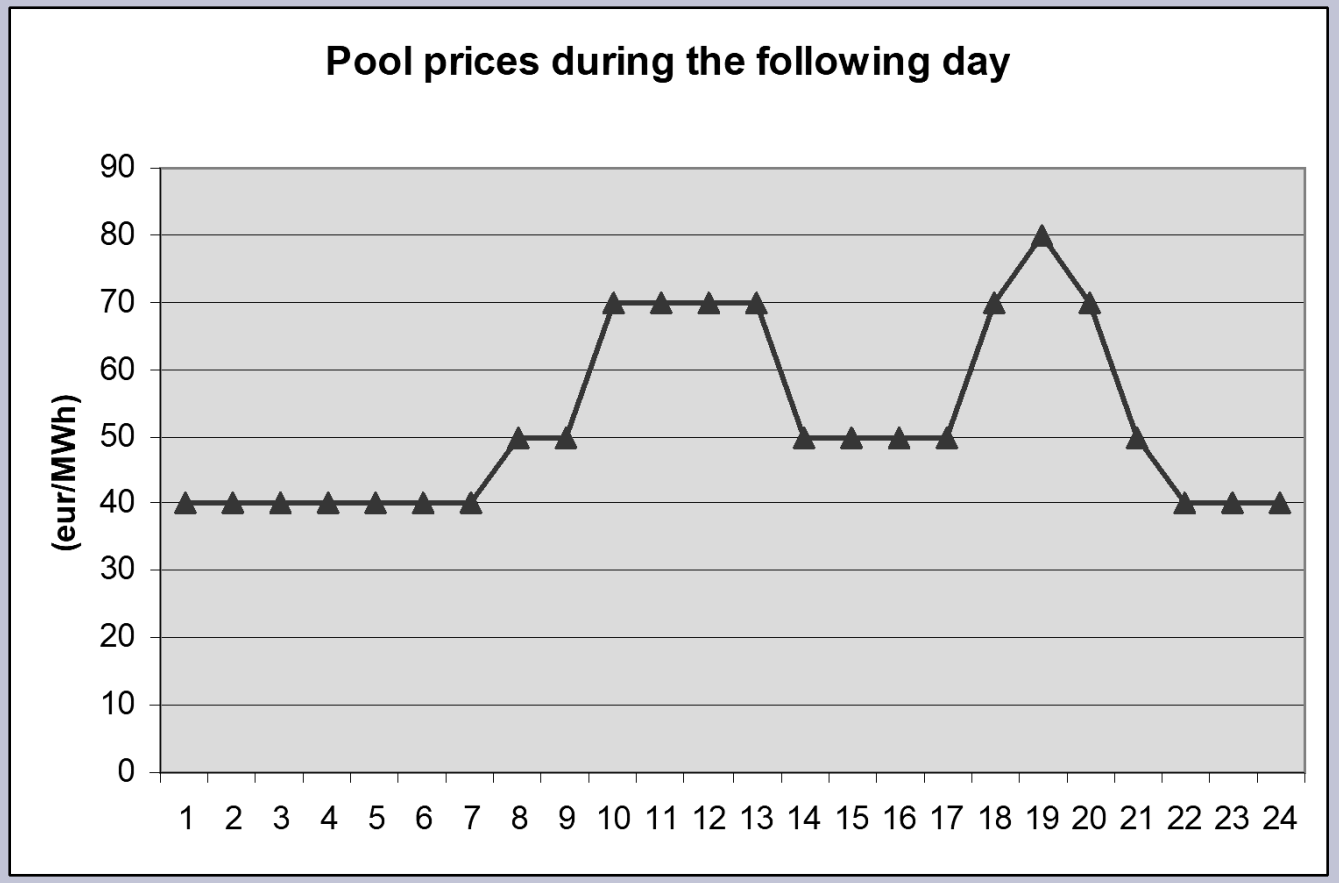
Competitive electricity markets
Competitive prices

- Electricity sellers and buyers give bids for electricity exchange for each hour of the following day
- Sellers bid at the price, which corresponds to the variable costs (Vc) of their power plants
- The electricity exchange people will select power plants starting from the lowest Vc plant
- The last plant selected by the exchange gives the competitive price (Pe) to all sellers and buyers for each hour or the next day

Competitive electricity markets
Competitive prices

- Electricity price (Pe) is low during the night time, when marginal plant might be a coal fired plant (40 €/MWh)
- Price is at intermediate level during the day, when the marginal plant might be a heavy fuel oil plant (60 €/MWh)
- Price is high during peak hours, when gas (70 €/MWh) or diesel plants (80 €/MWh) will be started

Competitive electricity prices for the following day



Competitive electricity markets Energy profits

Profit = ∑ (P(i) x (Price (i) – VC(i)))

In the night time Pe = 40 €/MWh

- Coal plant profit is 40 – 40 = 0 €/MWh
- CHP plant profit is 40 – 30 = 10 €/MWh
- Wind energy plant makes 40 – 10 = 30 €/MWh

During peak hours Pe = 70 €/MWh

- Coal plant makes 70 – 40 = 30 €/MWh
- CHP plant makes 70 – 30 = 40 €/MWh
- Gas plant makes 70 – 60 = 10 €/MWh

Competitive electricity markets Strategy of utilities

- To sell the highes cost plant to others or close them
  - This might lead to capacity problems, because peaking plants will disappear
- To keep the electricity prices up by stopping construction of new power plants
- To build transmission lines to high price areas and sell them electricity

Competitive electricity markets Strategy of industrial companies

- To keep all own plants in operation and switch fuels from high to low cost
- To built new lowcost (CHP and nuclear) capacity to keep the electricity oversupply situation
- To built transmission lines to areas, which have lower electricity prices

Competitive electricity markets Mistakes made in opening of the markets

- Some state owned utilities enlarged their market share
  - As a result there was less competiotion in the market place
- Some indutrial companies sold their generating assets
  - Their electricity prices went up
- Capacity shortage may appear

Capacity markets

Capacity markets Purpose

Ensure generating capacity in long term by given load serving entities (LSE) capacity obligations to maintain capacity

Capacity markets Criteria

Available capacity >∑ Pi x Ri

where

Pi = installed capacity of unit i

Ri = reliability of unit i = 1 – EFORdi*

* EFORdi figures should be based on historical evidence of the units

Capacity market Operation

- The load serving entity should show that it has enough capacity to cover peak load in three following years
- If capacity is less than needed, LSE can purchase capacity from the capacity market
- If LSE has excess capacity, it can sell the exess to the capacity market

Benchmarking

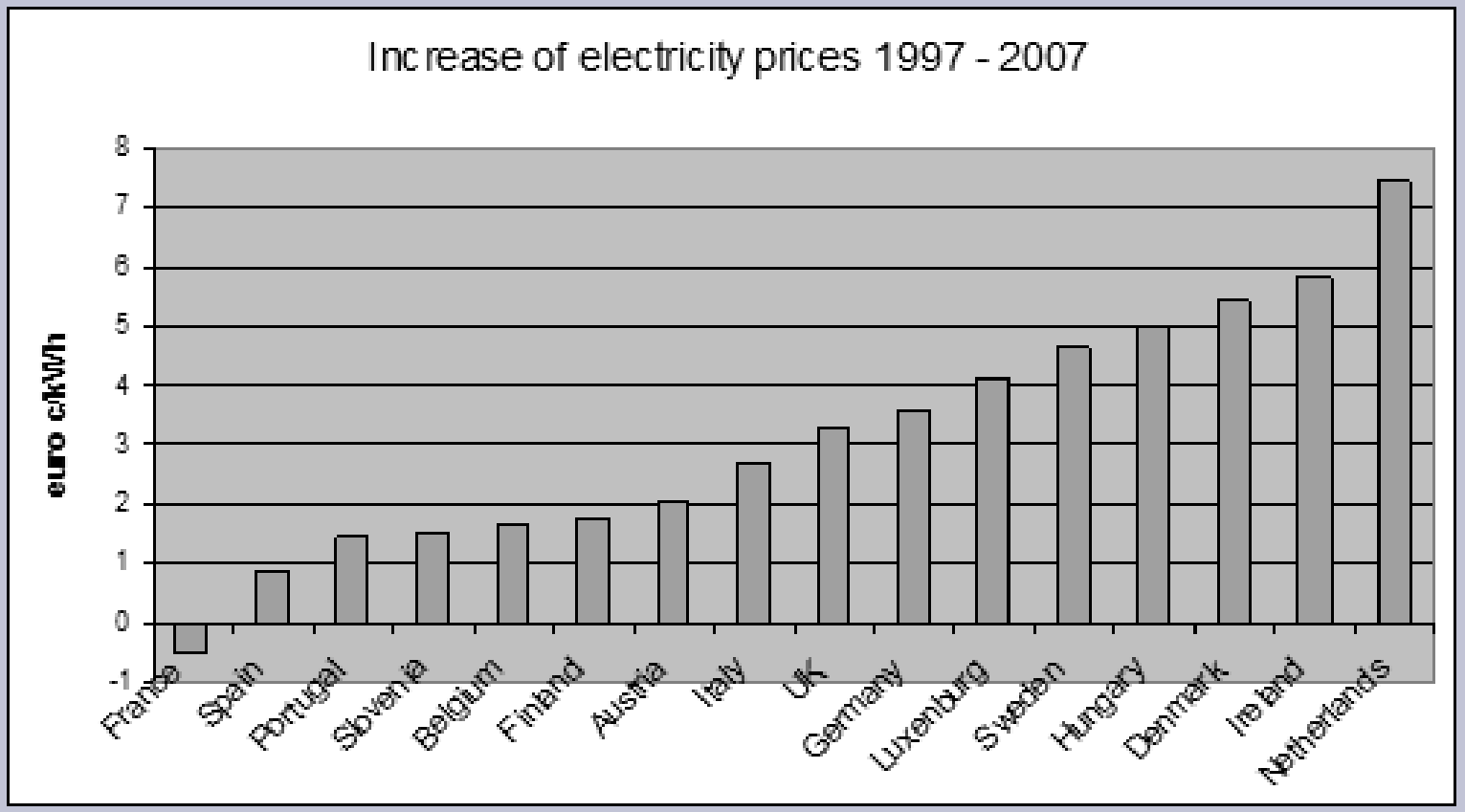
Benchmarking
Electricity prices in EU in 1997

	Households	Industry	Average
Hungary	5,7	4,7	5,2
Finland	9,4	4,4	6,9
Sweden	10,0	4,2	7,1
Slovenia	8,1	7,1	7,6
Ireland	9,2	7,1	8,1
UK	10,5	5,9	8,2
Netherland	11,5	5,7	8,6
Luxenburg	11,4	7,3	9,3
Spain	12,2	6,9	9,5
France	13,2	5,9	9,5
Portugal	13,4	7,3	10,4
Austria	12,7	8,3	10,5
Denmark	16,6	5,4	11,0
Belgium	14,6	7,5	11,0
Germany	14,7	8,3	11,5
Italy	22,4	9,5	15,9
Average	**12,2**	**6,6**	**9,4**

Benchmarking
Electricity prices in EU in 2007

	Households	Industry	Average
Finland	11,6	5,7	8,6
France	12,1	5,9	9,0
Slovenia	10,6	7,5	9,1
Hungary	12,2	8,2	10,2
Spain	12,3	8,5	10,4
UK	13,2	9,7	11,5
Sweden	17,1	6,3	11,7
Portugal	15,0	8,6	11,8
Austria	15,5	9,5	12,5
Belgium	15,8	9,5	12,6
Luxenburg	16,8	10,0	13,4
Ireland	16,6	11,3	13,9
Germany	19,5	10,7	15,1
Netherland	21,8	10,3	16,1
Denmark	25,8	7,1	16,4
Italy	23,3	13,9	18,6
Average	**16,2**	**8,9**	**12,6**

Benchmarking
Changes of average prices from 1997 to 2007



Conclusions

- The average electricity prices have been increasing quite moderately while the fuel prices have increased consideably in ten years time
- The countries with open markets have in average lower prices than others
- The liberalization is still in progress and we will see final results in next ten years
- The operation of power plants in liberaized market should also consider ancillary service*

*see presentation ”Strategies in Ancillary Service Markets

For details see reference text book ”Planning of Optimal Power Systems”

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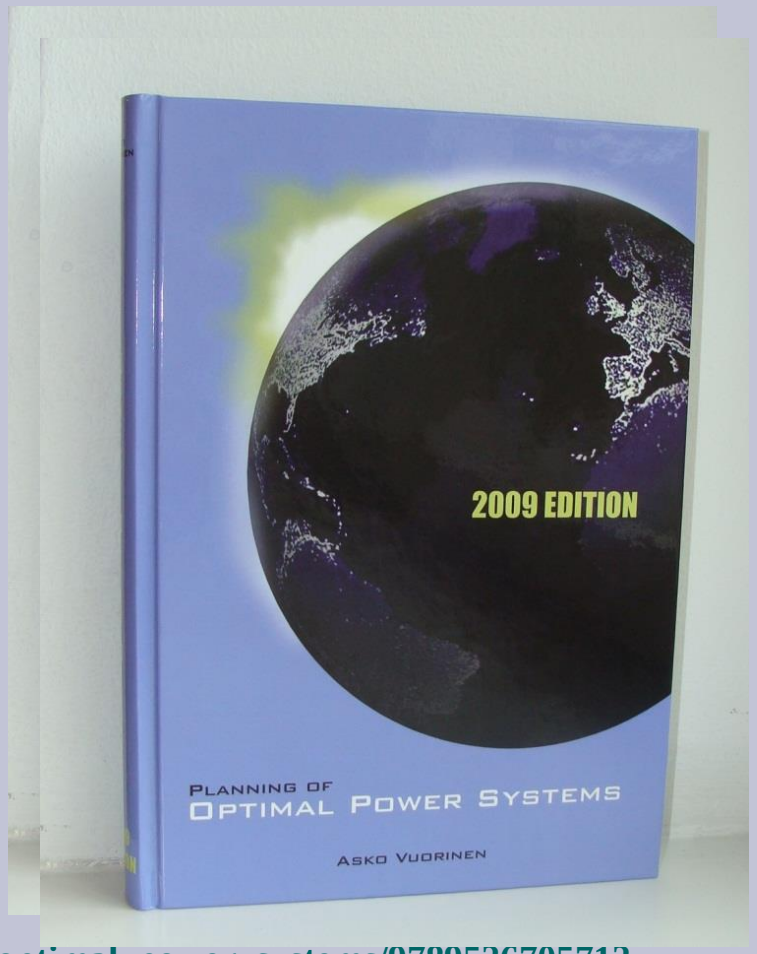

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