

International Electricity Trade Economic Considerations

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Workshop on International Electricity Grid Interconnection
in Northeast Asia
Beijing, May 14-16, 2001

INTERNATIONAL ELECTRICITY TRADE

Gains

Costs

Pricing

Congestion in Competitive Market

Congestion in Monopoly / asymmetric market

Financing options

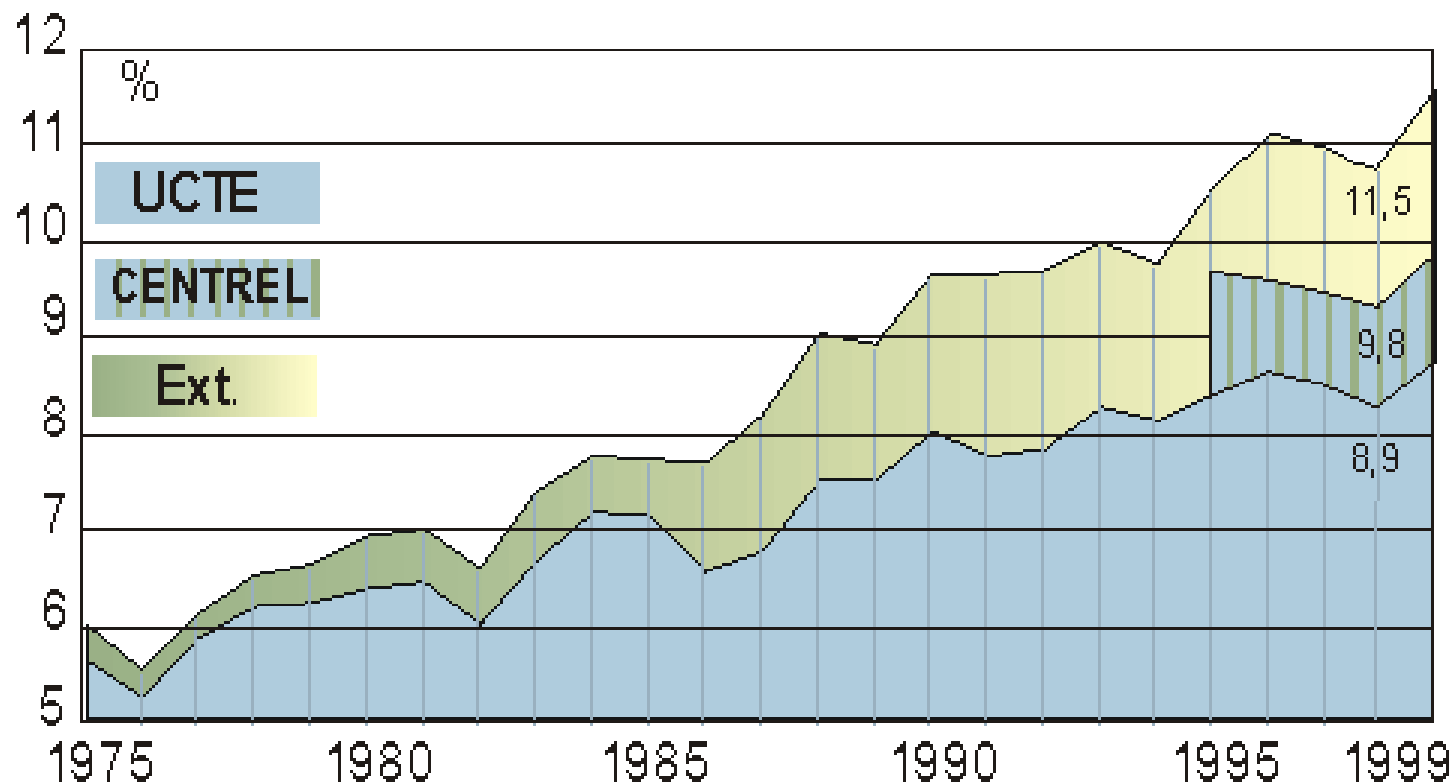
International cooperation

Conclusion

EUROPEAN COUNTRIES TRADE 11% OF ELECTRICITY

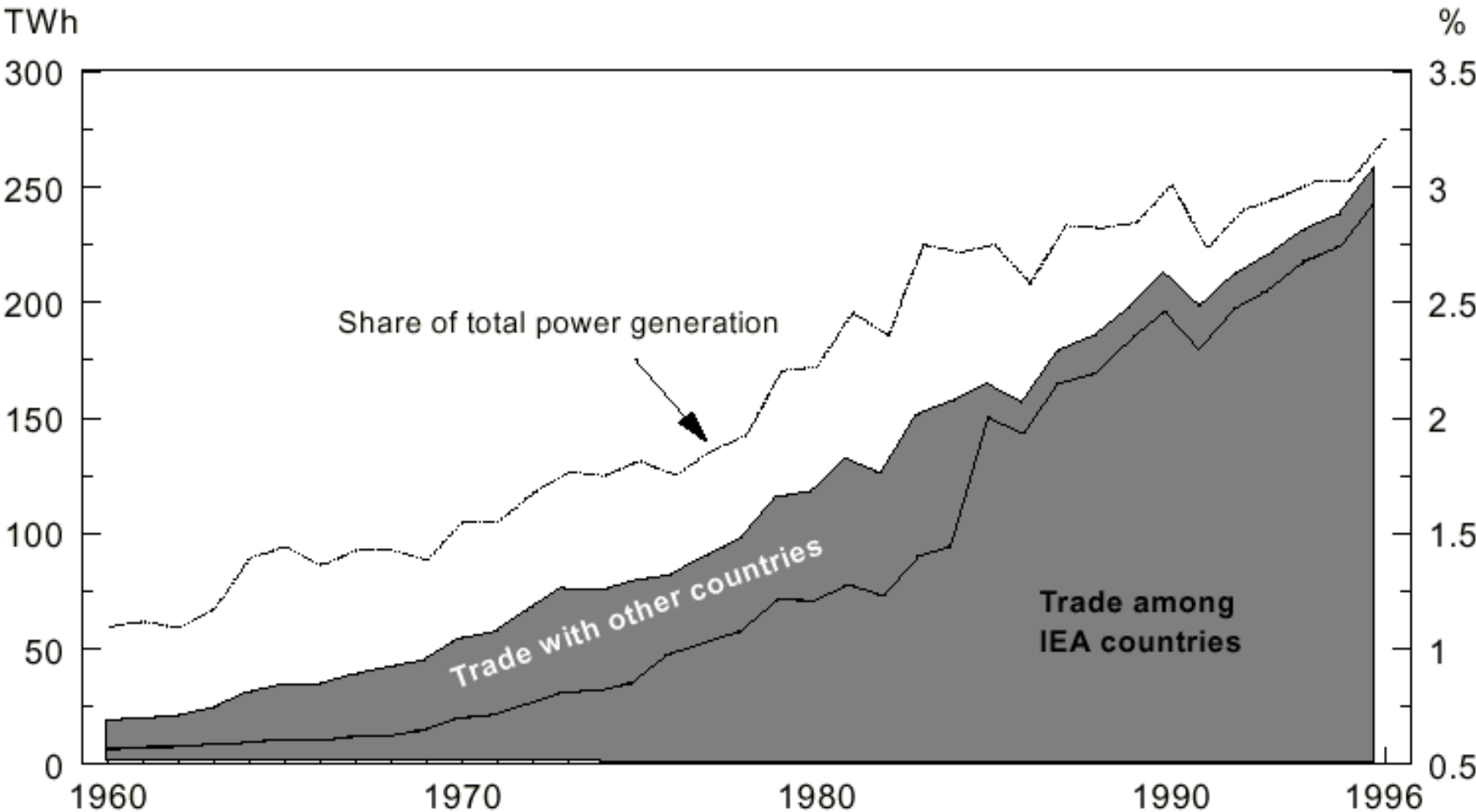


Part of exchanges in the consumption
1975 - 1999

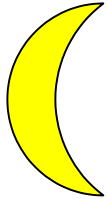


UCTE: Sum of exchanges between the UCTE countries
CENTREL: Sum of exchanges between the UCTE countries and CENTREL
Ext.: Exchanges with third countries

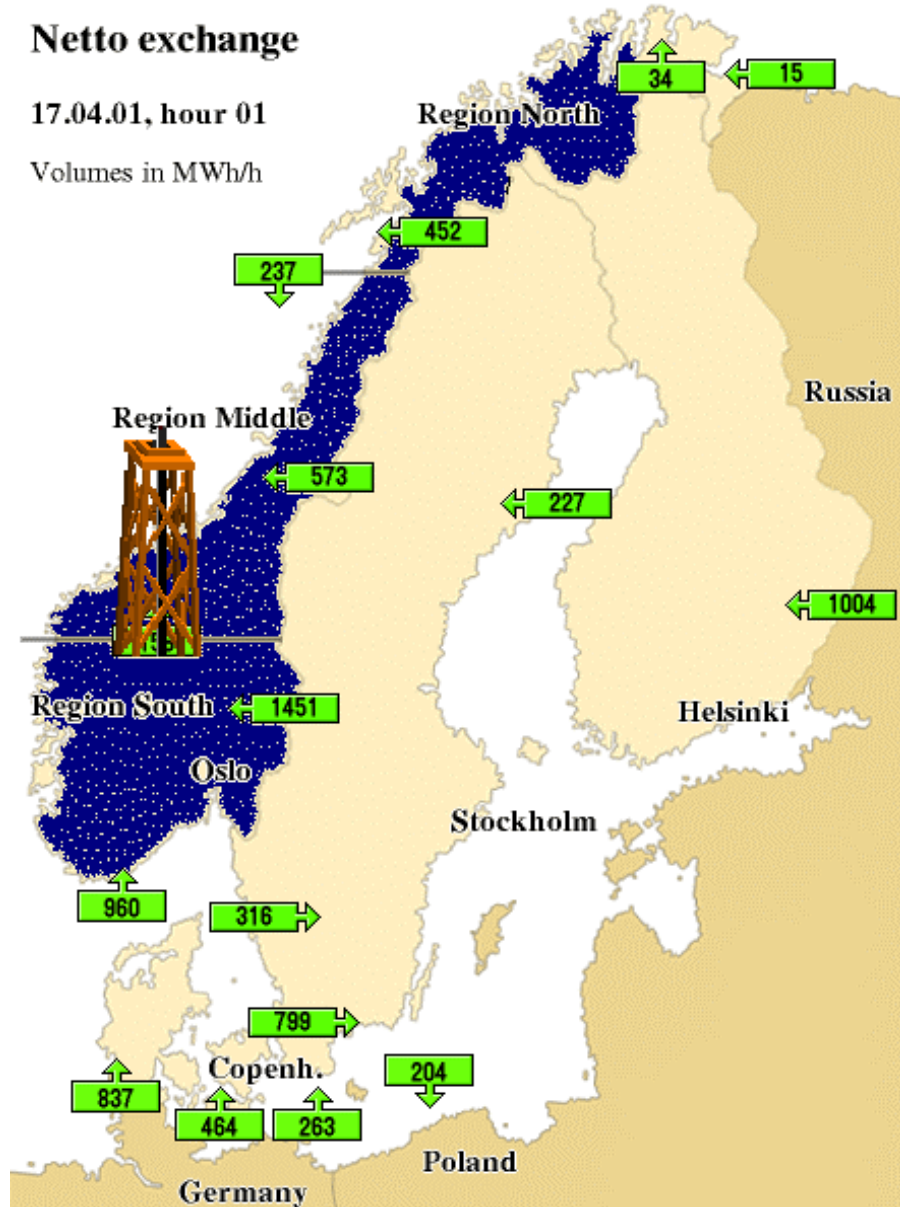
SIMILAR GROWTH RATES IN IEA COUNTRIES



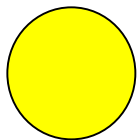
TRADING TO USE GEOGRAPHICAL ADVANTAGES



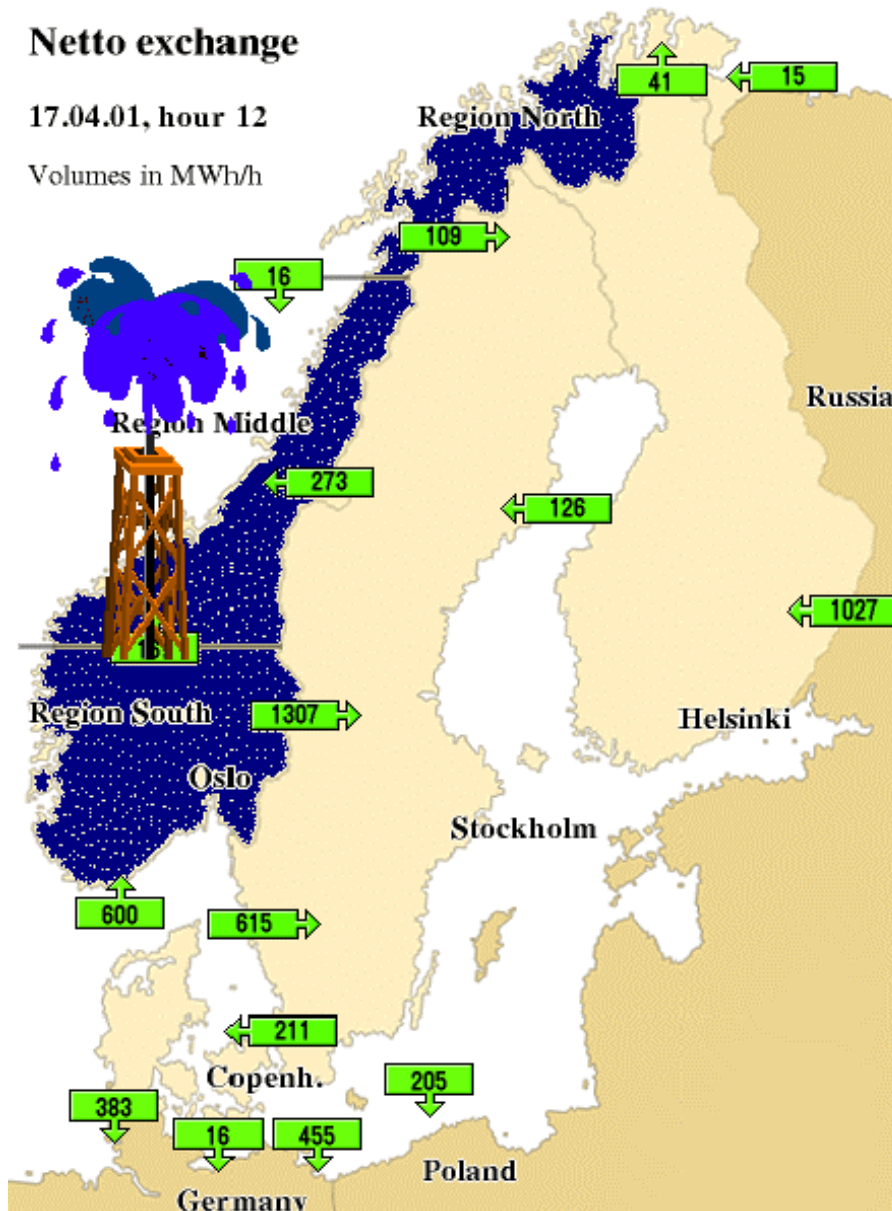
Night-time
import 3436 MW
cheap off peak
power



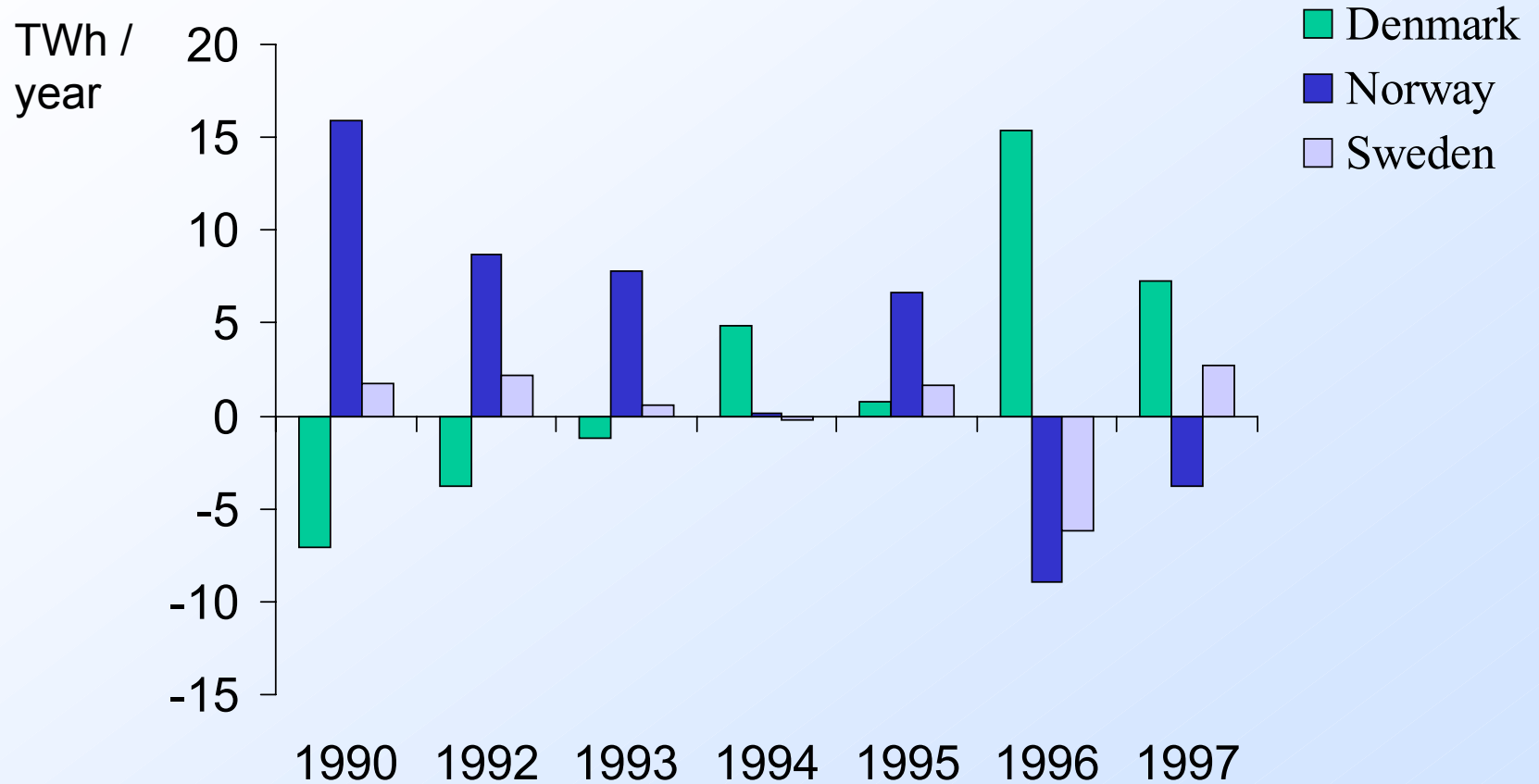
TRADING TO USE GEOGRAPHICAL ADVANTAGES



Daytime exports
543 MW of
peak power



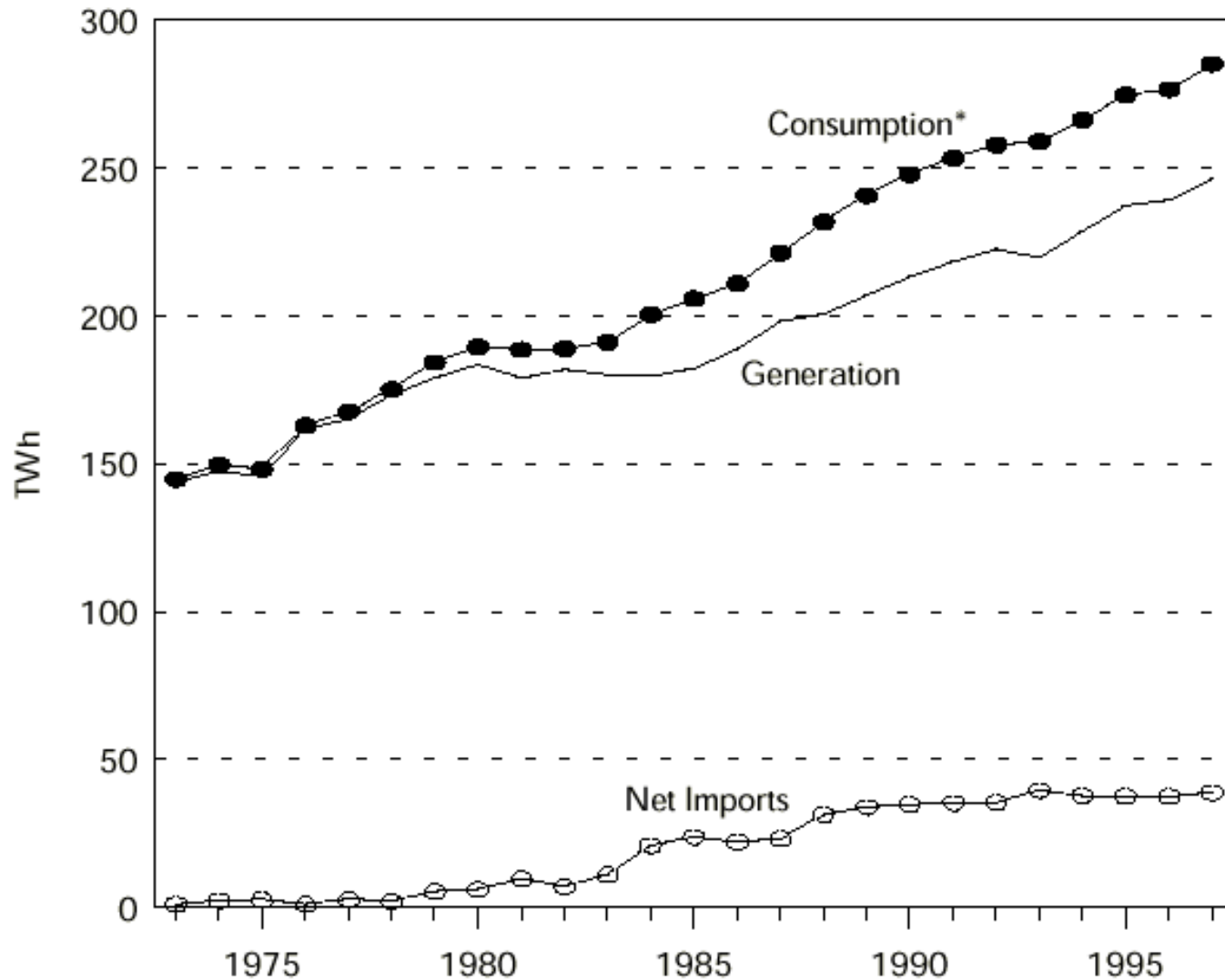
TRADING TO BALANCE PEAKS



Source: Electricity Information 1997, IEA, Energy Statistics Yearbook, UN 1997

Remark: High Norwegian exports in 1990 are partly due to lower overall demand level

TRADING TO BALANCE HISTORICAL DIFFERENCES

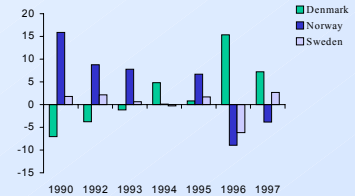


ADVANTAGES OF INTERNATIONAL ELECTRICITY TRADE

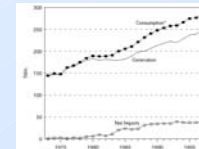
Using geographical differences



Balancing of peaks and seasonal differences



Balancing of historically development



Pooling of reserve power

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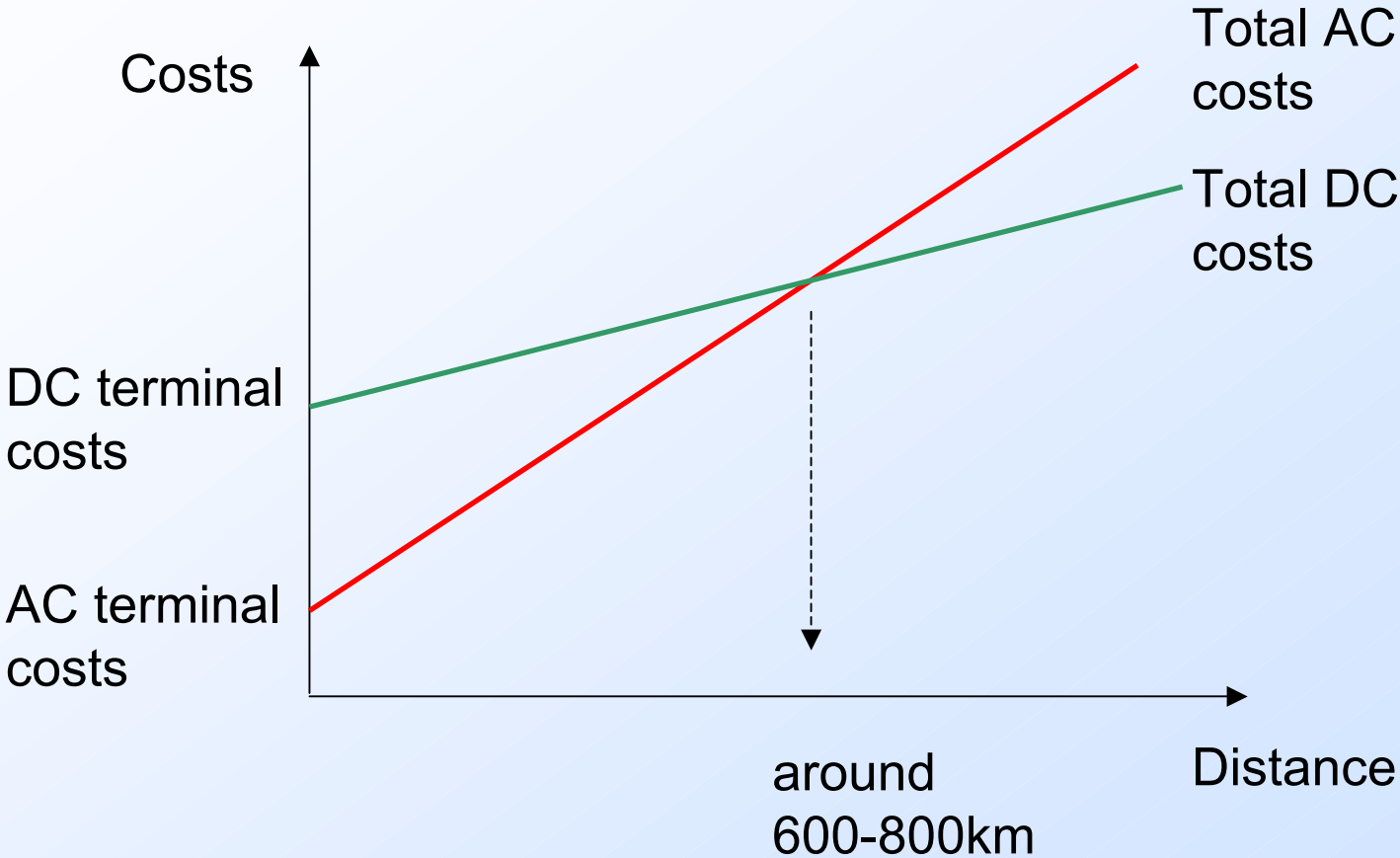
Congestion in Monopoly / asymmetric market

Financing options

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INVESTMENT COSTS FOR INTERCONNECTION

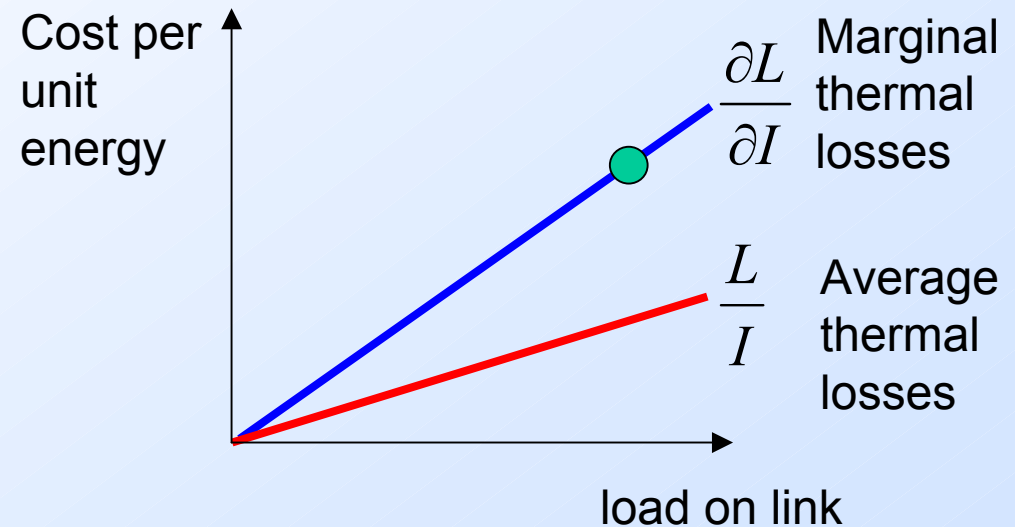
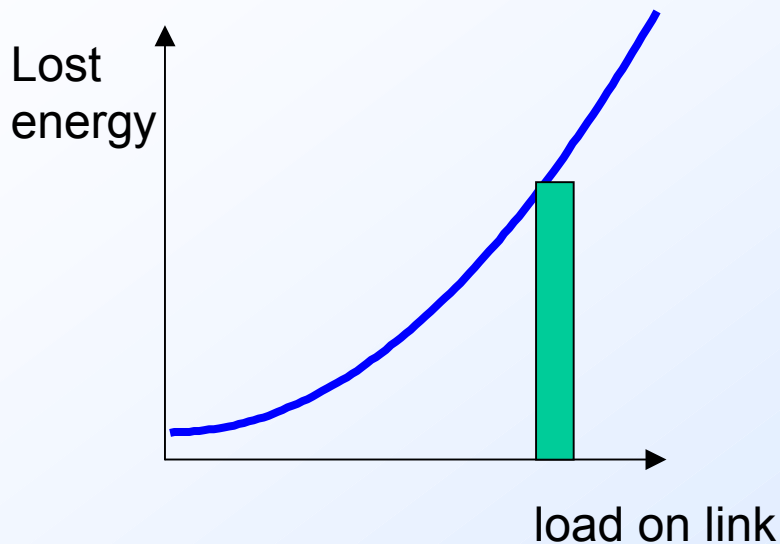


Source: ABB

VARIABLE COSTS FOR INTERCONNECTION CAPACITY

Energy losses grow quadratic

Variable costs grow linear



Marginal pricing results in economic efficiency

Use over-recovered costs to pay for fixed costs

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aggregate information in
complex systems

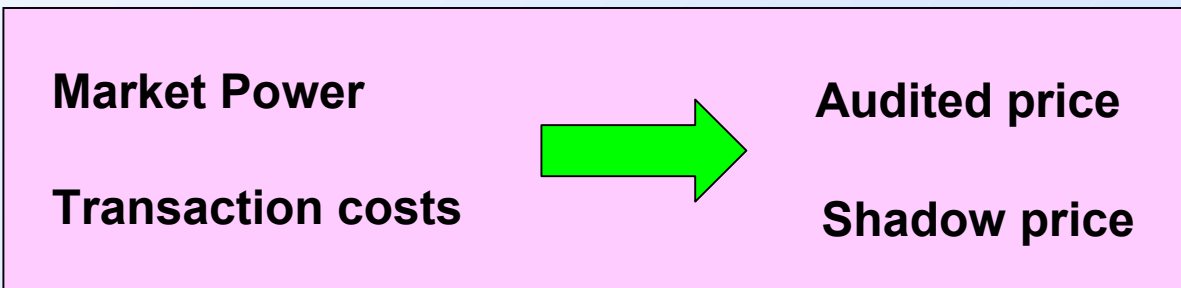
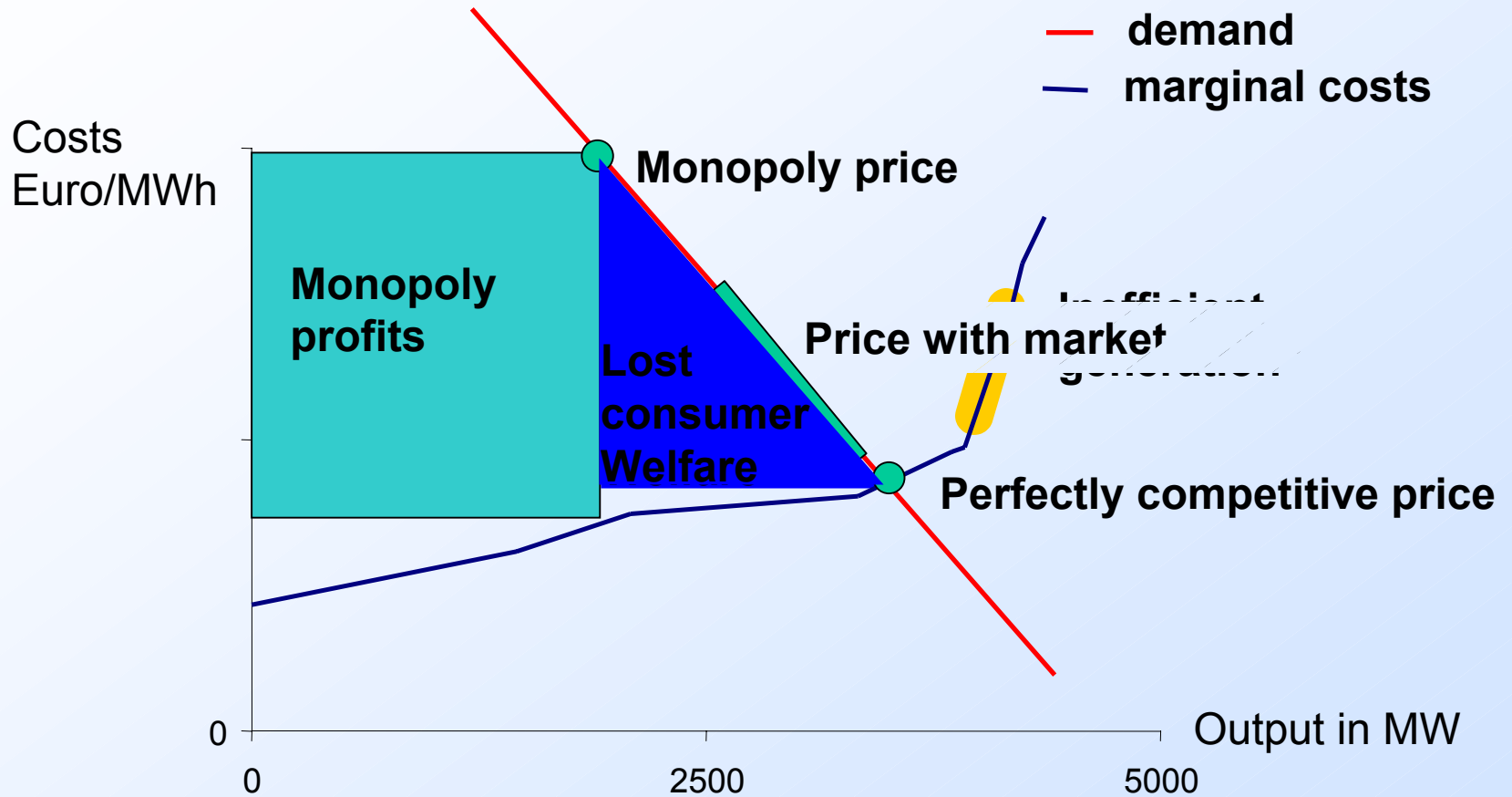
offer unifying framework for
communication

keep overall system
efficient when decisions
are decentralised/
automated

PRICES

But - do they exist ?

DO 'GOOD' PRICES FOR ELECTRICITY EXIST?



ELECTRICITY LIBERALISATION TO INTRODUCE COMPETITION

Advantages of competition in a liberalised market

- incentive management improve organisation/technology
- reveal costs (Nuclear Energy in UK)

The problems with liberalisation

- Market Power :
 - Foreclosure due to transmission constraints
 - Inelastic demand
- Missing regulatory commitment brings risk for investors

REGULATION IN A LIBERALISED ENVIRONMENT

Transmission and distribution are a natural monopolies and need regulation

- i) ensuring open access
- (ii) equitable distribution of welfare gains
- (iii) monitoring international contracts

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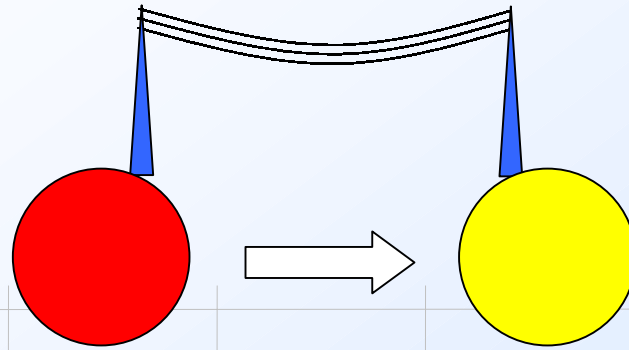
Financing options

International cooperation

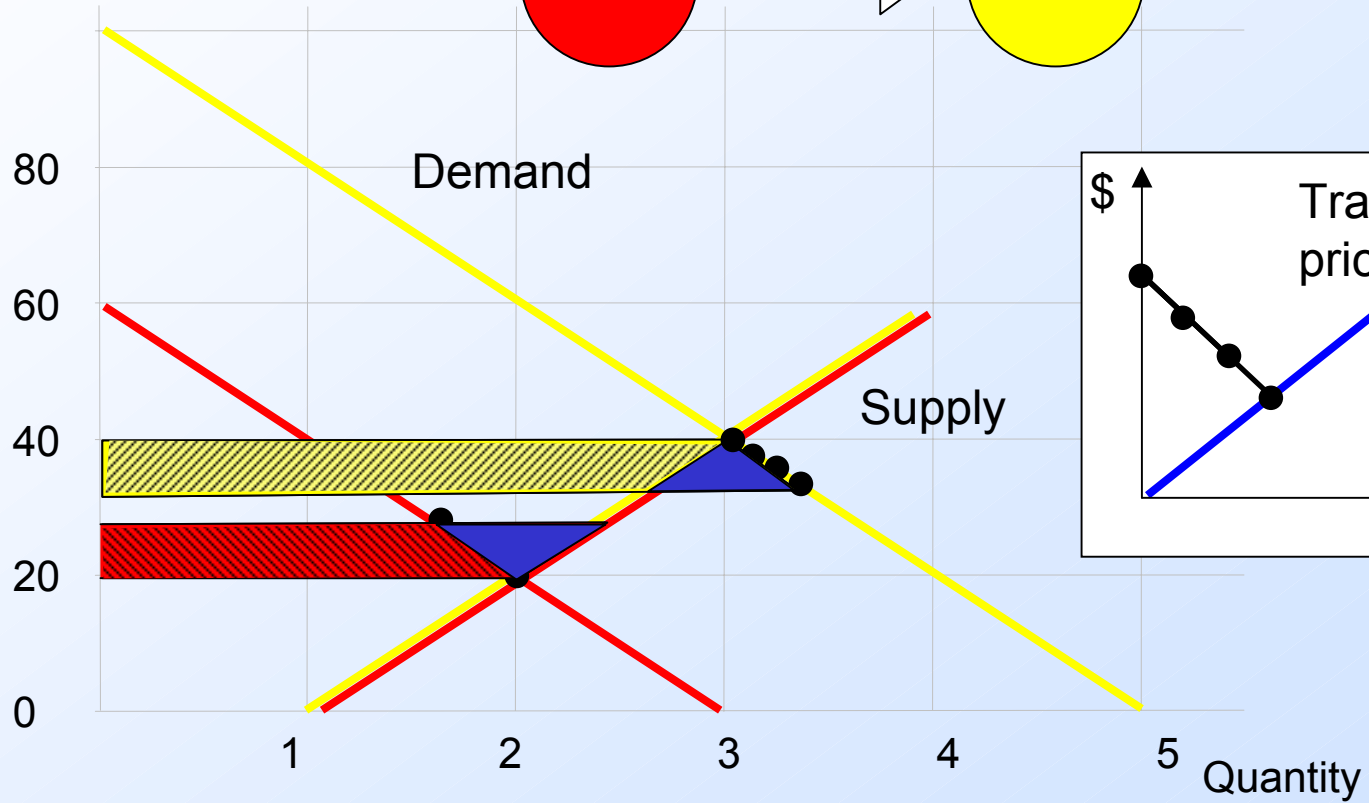
Conclusion

ILLUSTRATE TRADE

assuming perfect competition



Price

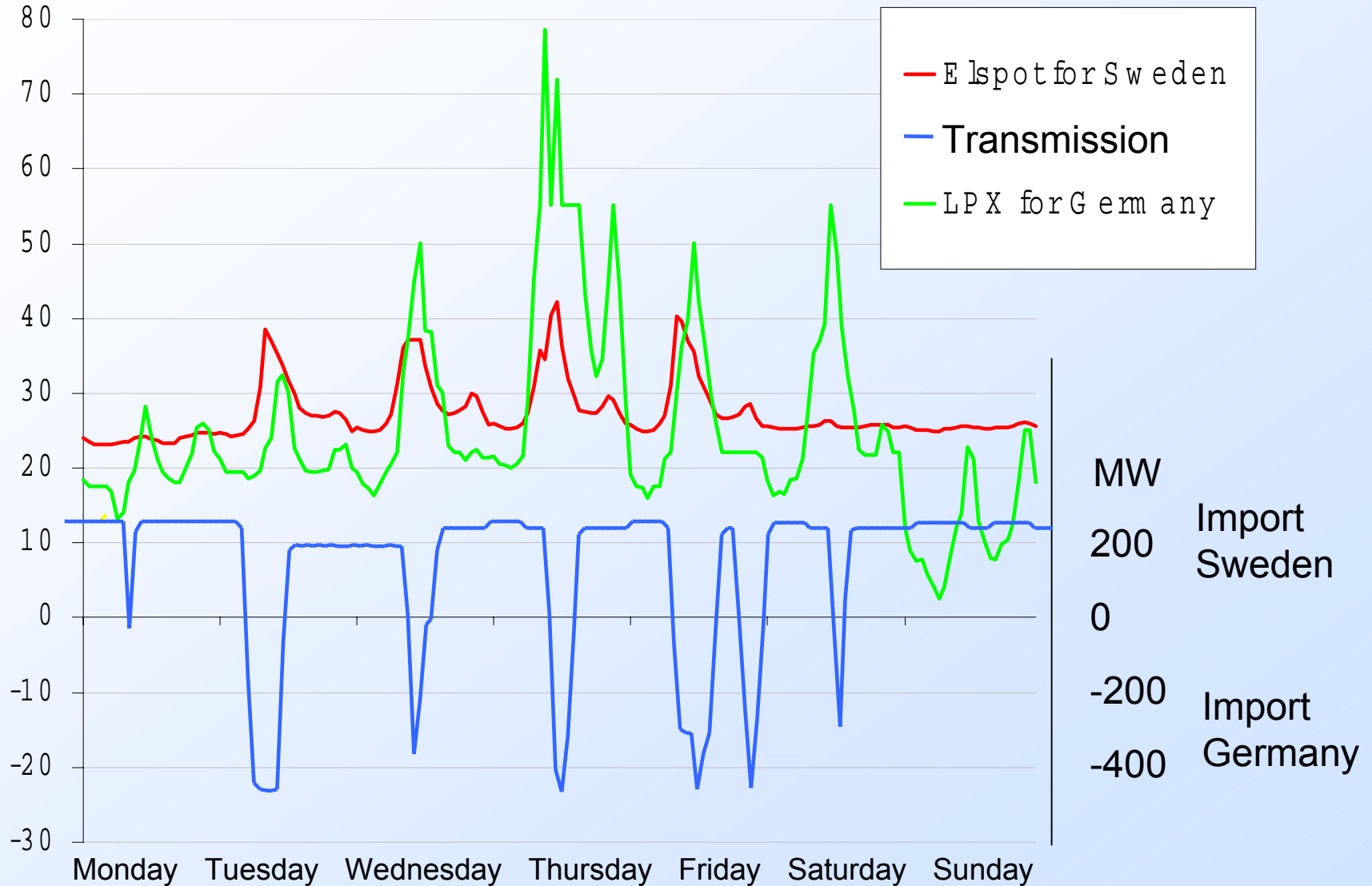


Welfare gain

ELECTRICITY TRADE

SWEDEN - GERMANY

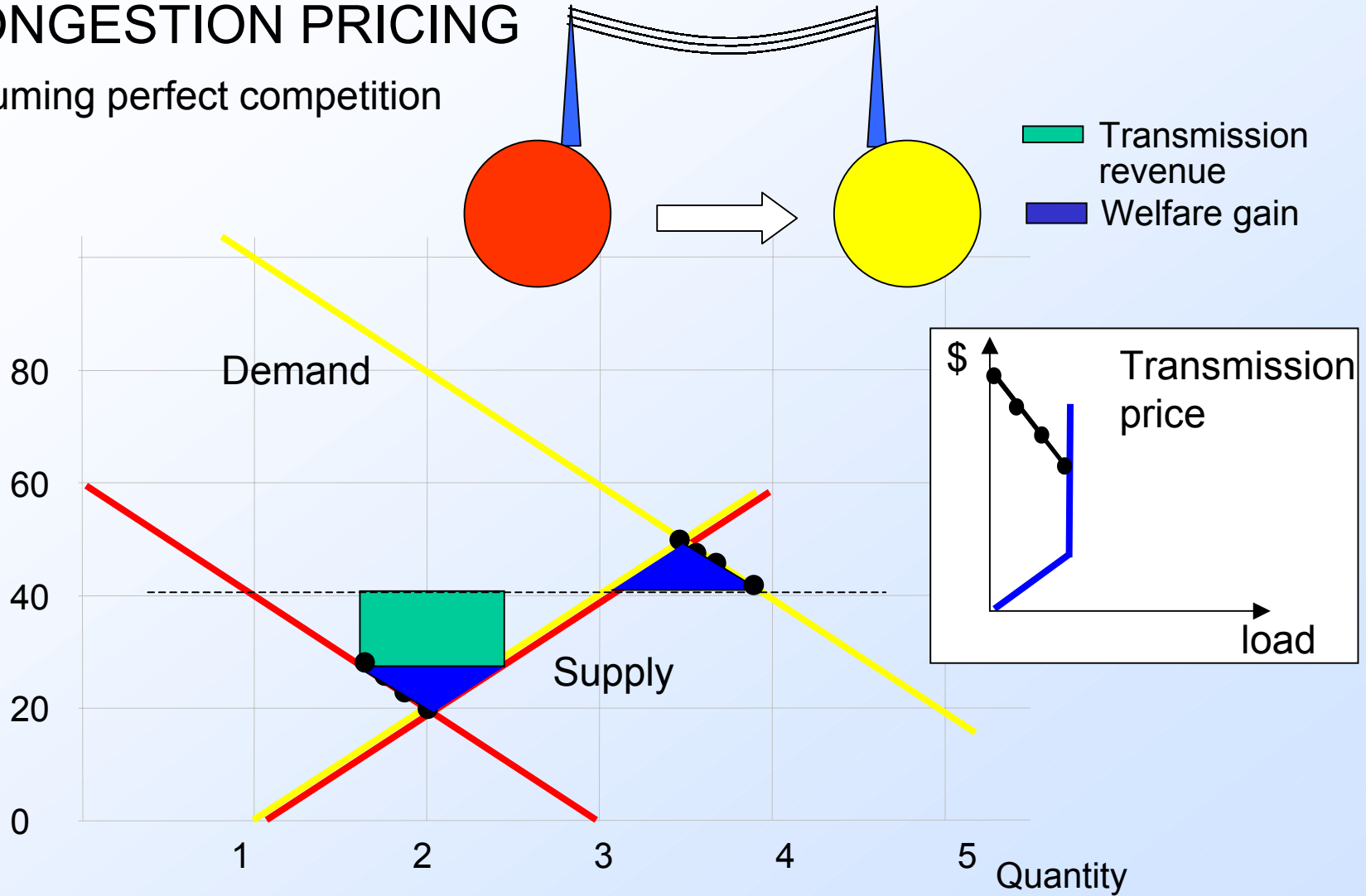
Euro/MWh



CONGESTION PRICING

assuming perfect competition

Price



Transmission requires regulation

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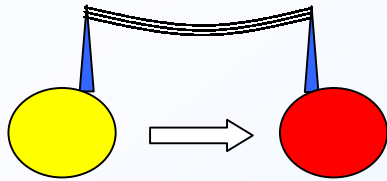
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WHO CAPTURES THE RENT

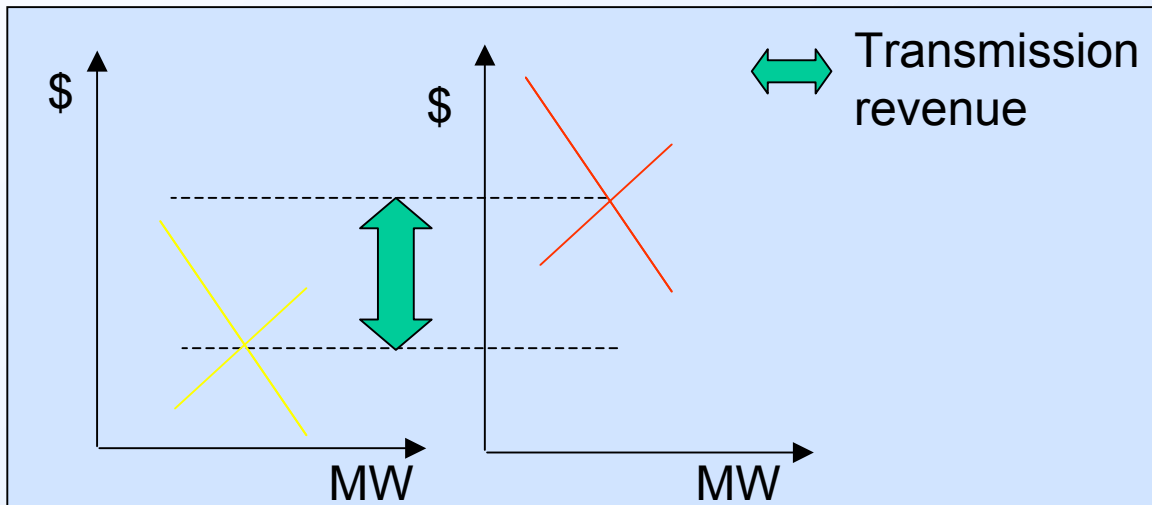
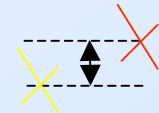


Competition

Competition

What happens with rent

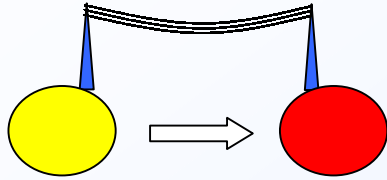
Collected in auction



Germany - Netherlands
May 2001

RWE 9.3 Euro/MWh
E.ON 11 Euro/MWh

WHO CAPTURES THE RENT

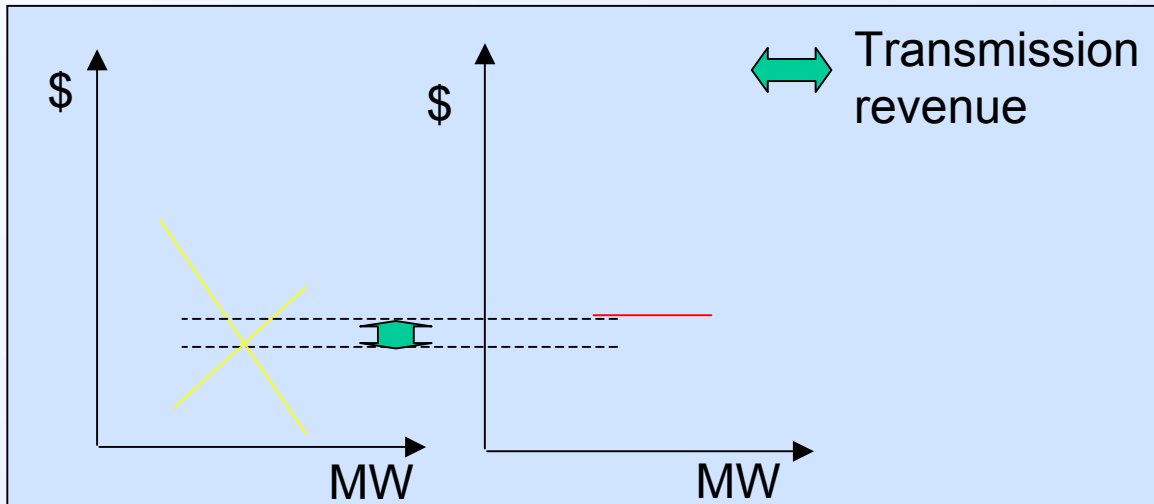
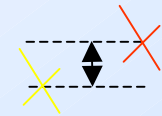


Competition
Competition

Competition
Monopoly

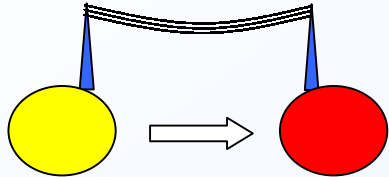
What happens with rent

Collected in auction
Kept by Monopolist



Example:
Italian Imports

WHO CAPTURES THE RENT

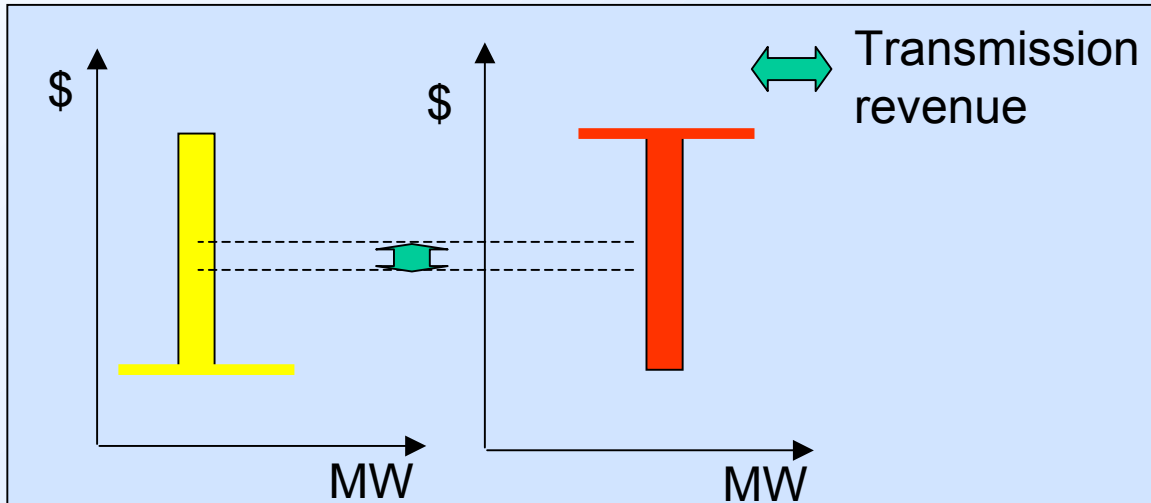
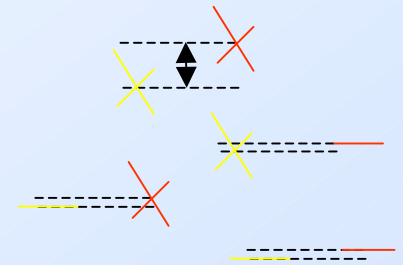


Competition
Competition
Monopoly
Monopoly

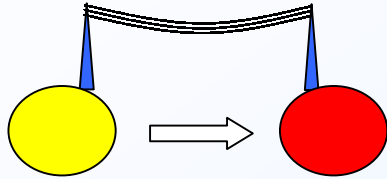
Competition
Monopoly
Competition
Monopoly

What happens with rent

Collected in auction
Kept by Monopolist
Kept by Monopolist
Kept by Monopolists



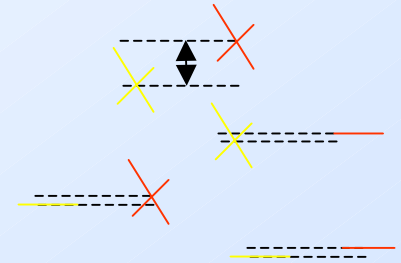
WHO CAPTURES THE RENT



↻	Competition	Competition
↻	Competition	Monopoly
↻	Monopoly	Competition
↻	Monopoly	Monopoly

What happens with rent

- Collected in auction
- Kept by Monopolist
- Kept by Monopolist
- Kept by Monopolists



Example: United Kingdom - France

Before 1992	France sold to England at price of calculated costs
Liberalisation in UK 1992	France sold to England at Pool price and kept profit
Competition in Europe	Transmission capacity is auctioned at 4.6 Euro/MWh

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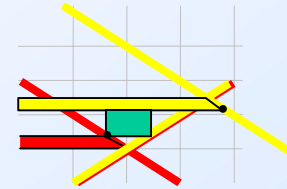
International cooperation

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FINANCING OPTIONS

Private ownership

- Might induce congestion



Private Public Partnership

- Private investor constructs and maintains line
- Payments based on available capacity

Public ownership

- Lowest interest rates but funding problem
- Option value for restructuring of industry

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ELECTRICITY TRADE BRINGS CLOSE COOPERATION

Transmission System Operators

[http:// www.etso-net.org](http://www.etso-net.org)

UCTE

<http://www.ucte.org/>

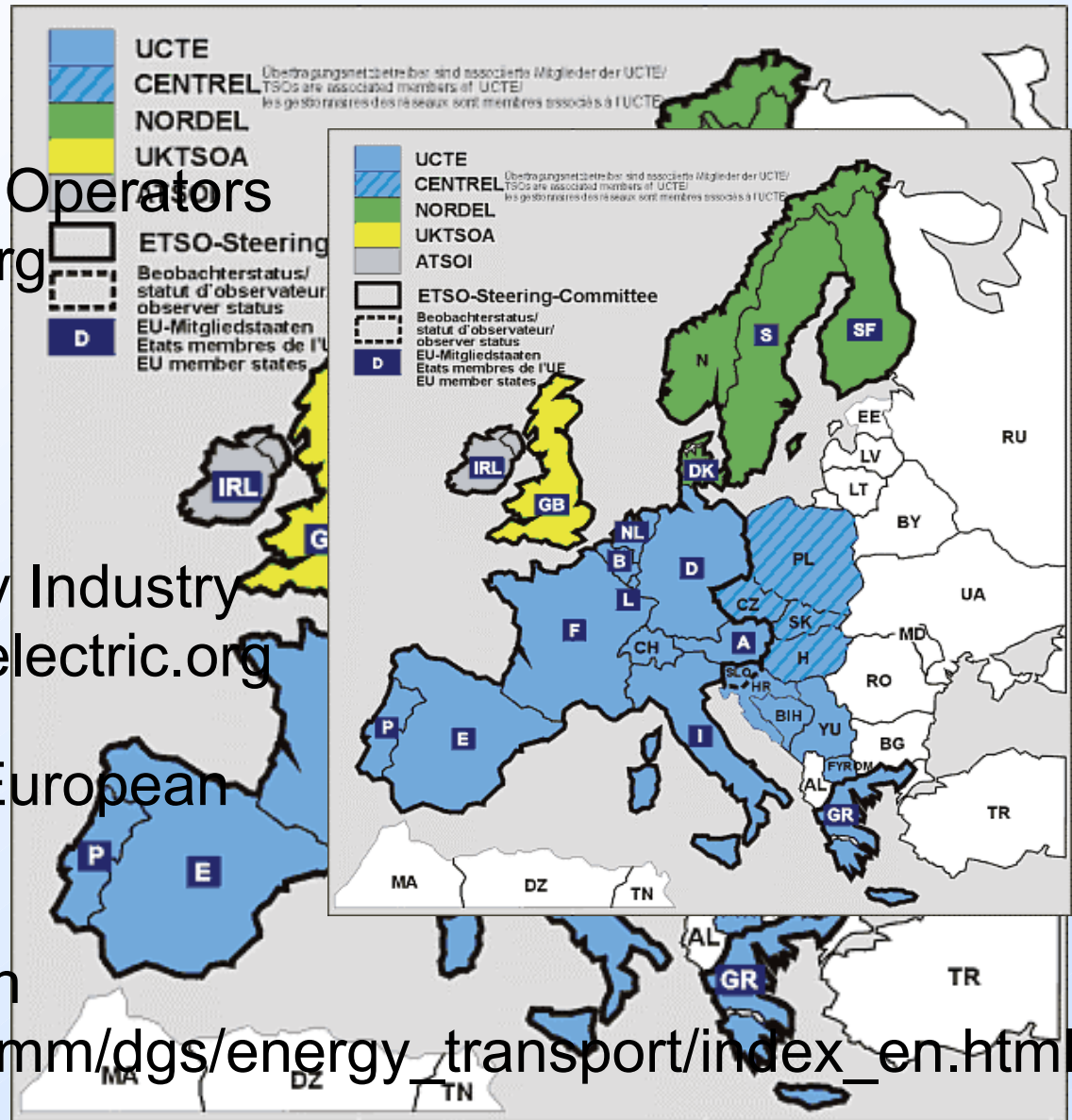
Union of the Electricity Industry

<http://www.eurelectric.org>

Regular Meetings of European
Regulators

European Commission

http://europa.eu.int/comm/dgs/energy_transport/index_en.html



INTERNATIONAL COOPERATION

Electricity Interconnections have to be designed as win-win games (Example France - Spain)

Short term bargaining power with exporting country

- competitive markets
- long term contract framework

Barter (i.e. electricity for steel) trades hedge price volatility

- Energy flows usually parallel
- Electricity price related to gas/oil price - potential conflicts if relative value of barter good changes

Electricity interconnections motivate co-operation on all levels (administrative, technical, political)

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CONCLUSION

International interconnections can bring significant welfare gains

Interconnection pricing

- Marginal costs for efficient decisions
- Auction possible if competition on both sides
- Long term contracting if monopolies involved

Welfare gain from interconnection has to be split!

International interconnections bring co-operation on all levels