

SNF-SESSA Conference: Harmonising Effective Regulation

Bergen, March 3-4, 2005

Network planning and operation, TSO role in integrated electricity markets

- **TSO roles**
- **Security of supply**
- **Promotion of competition**
- **Trading capacity and congestion management**
- **Conclusions**

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TSO role in integrated electricity markets

- **Security of supply**
 - Responsibility for the technical operation of complex system
 - ⇒ “Keep the lights on” (MW, kV, Hz etc.)
- **Promotion of competition**
 - Responsibility for the market framework (together with authorities!)
 - ⇒ “Make the competition work” (§, €/MWh)

Security of supply

- **Power System Adequacy**
 - Avoid load shedding due to limitations in the supply chain
 - Energy: Coal, gas, hydro, wind etc.
 - Capacity: Network and generation (incl. system services)
- **Operational Power System Security**
 - Avoid large interruptions in supply due to disturbances
 - Operational criteria's and restoration procedures

Security of supply – TSO roles

• Power System Adequacy

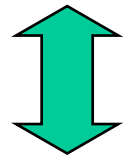
- **Energy:** Governments can delegate responsibilities to TSOs, e.g. monitoring fuel storage or hydro situation
- **Capacity:**
 - **Network:** TSOs are responsible for providing an appropriate network to ensure the chosen level of security of supply and service for the market
 - **Generation:** Market players are expected to provide the necessary generation capacity to meet the demand

• Operational Power System Security

- TSOs are responsible for the systems ability to withstand disturbances at any time (ensure operational reserves, system control etc.)

Adequacy of generation capacity

TSOs are responsible for ensuring the necessary
operational reserves
to uphold the chosen level of security of supply



Market players are expected to provide the necessary
peak load capability
to ensure market clearing

Requires unambiguous definitions and a clear distinction

Promotion of competition (1)

Some prerequisites for a well-functioning market:

- Non-discriminatory network access and balancing mechanisms
- Efficient congestion management
- No extra tariffs for import and export

- Public price quotation and liquid financial markets

AND

Simple, transparent and predictable framework for the market players

Promotion of competition (2)

Integration of national and regional markets is further accentuated by:

- Merging of generation companies
 - Increase of market dominance
- Differences in system characteristics
 - Wind, hydro, thermal and nuclear

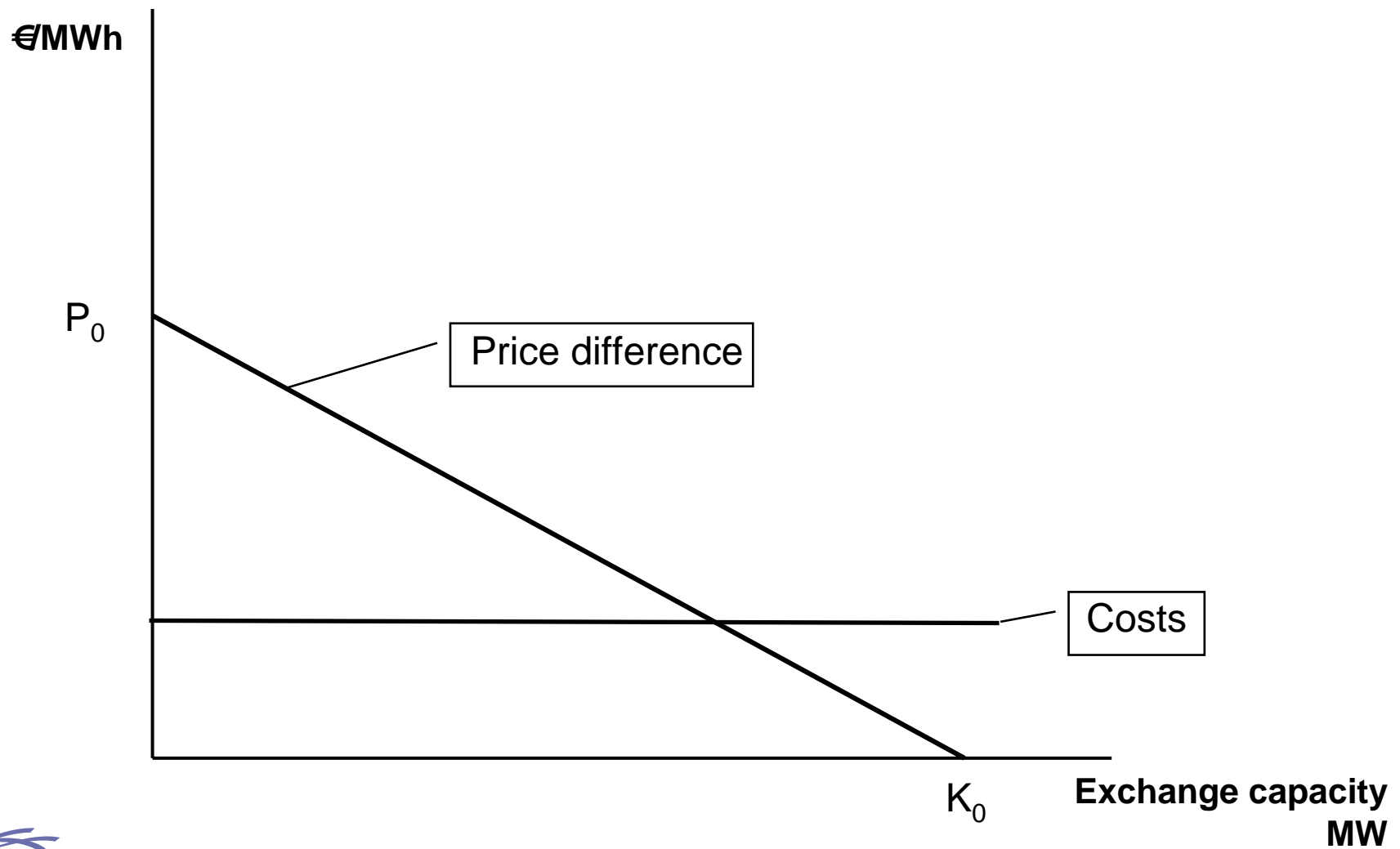
A tighter integration requires:

- Available trading capacity on inter-connectors
- Compatible market designs
- Efficient congestion management mechanism

Further promotion of competition requires international cooperation between TSOs, regulators and others!

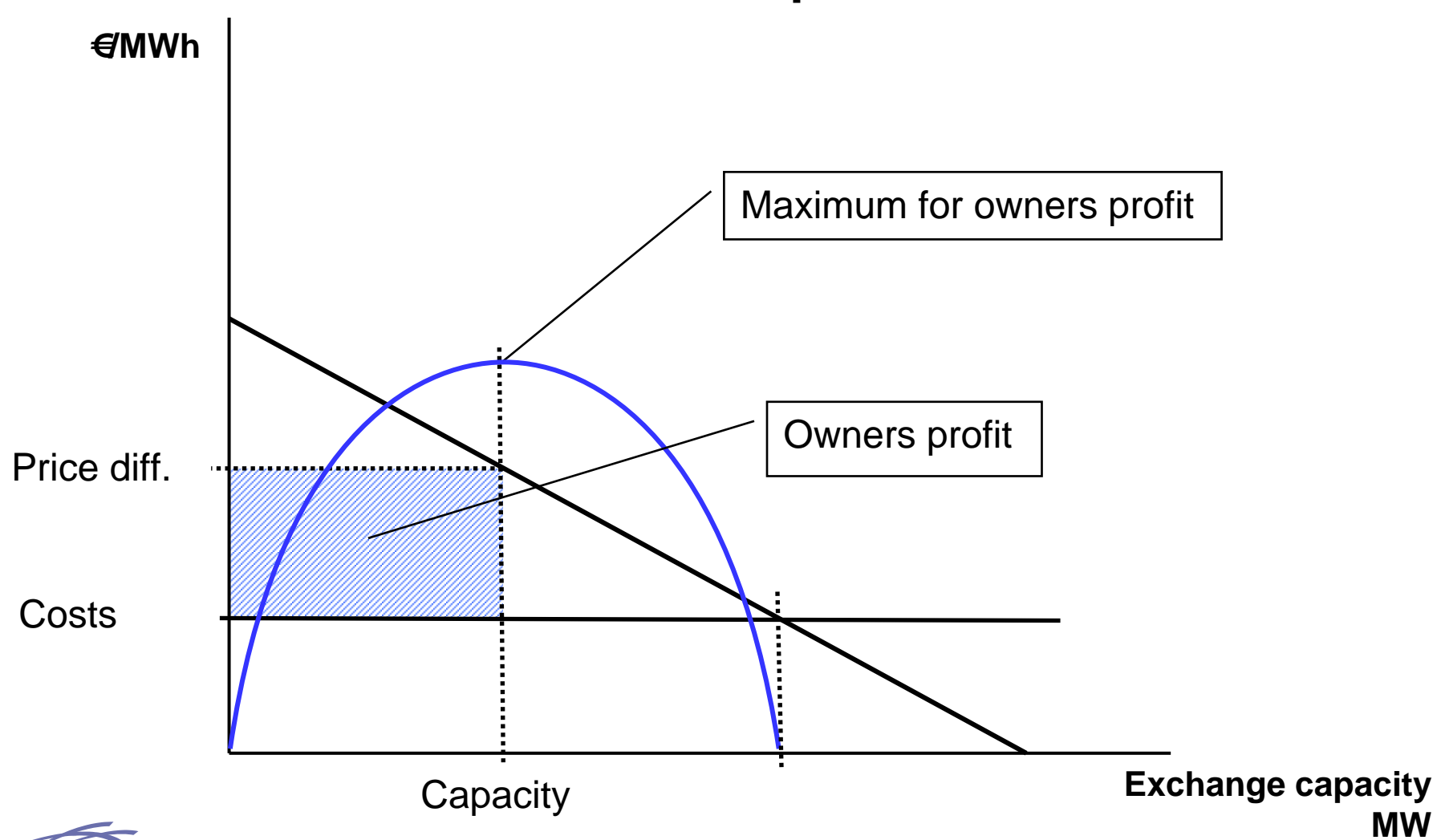
Trading capacity and congestion rents (1)

Simplification: Linear price difference and constant cost



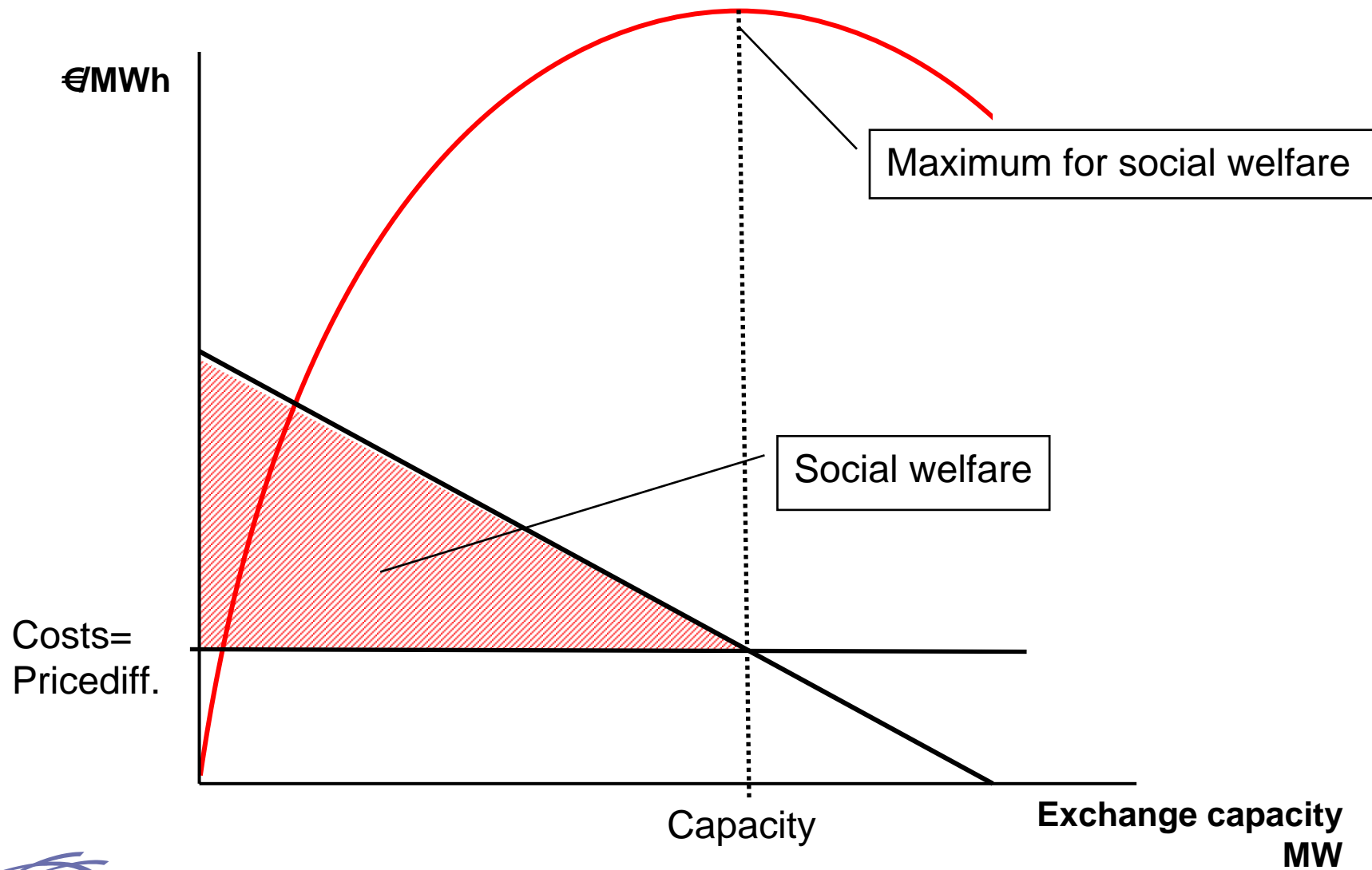
Trading capacity and congestion rents (2)

Owners profit



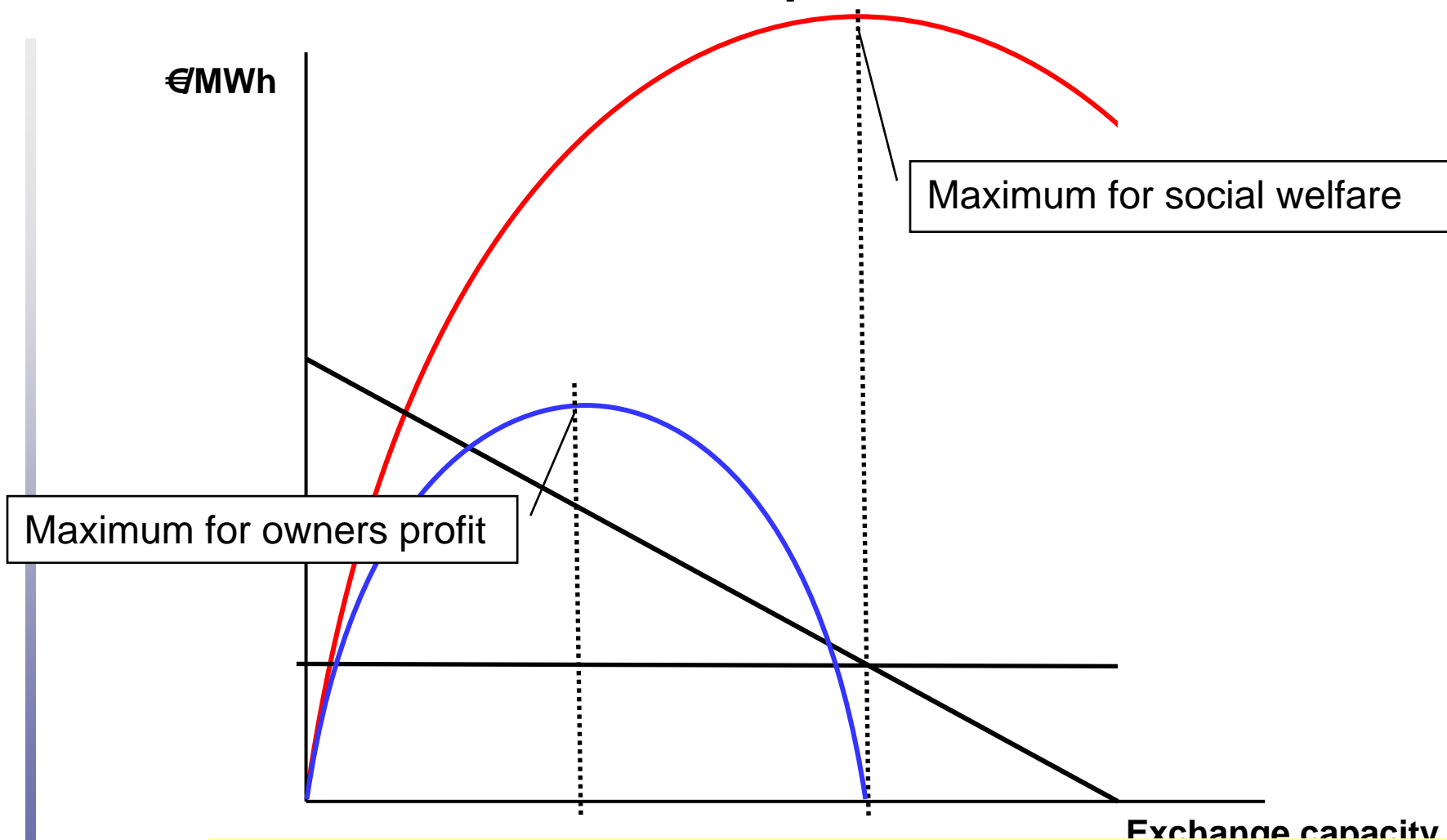
Trading capacity and congestion rents(3)

Social welfare



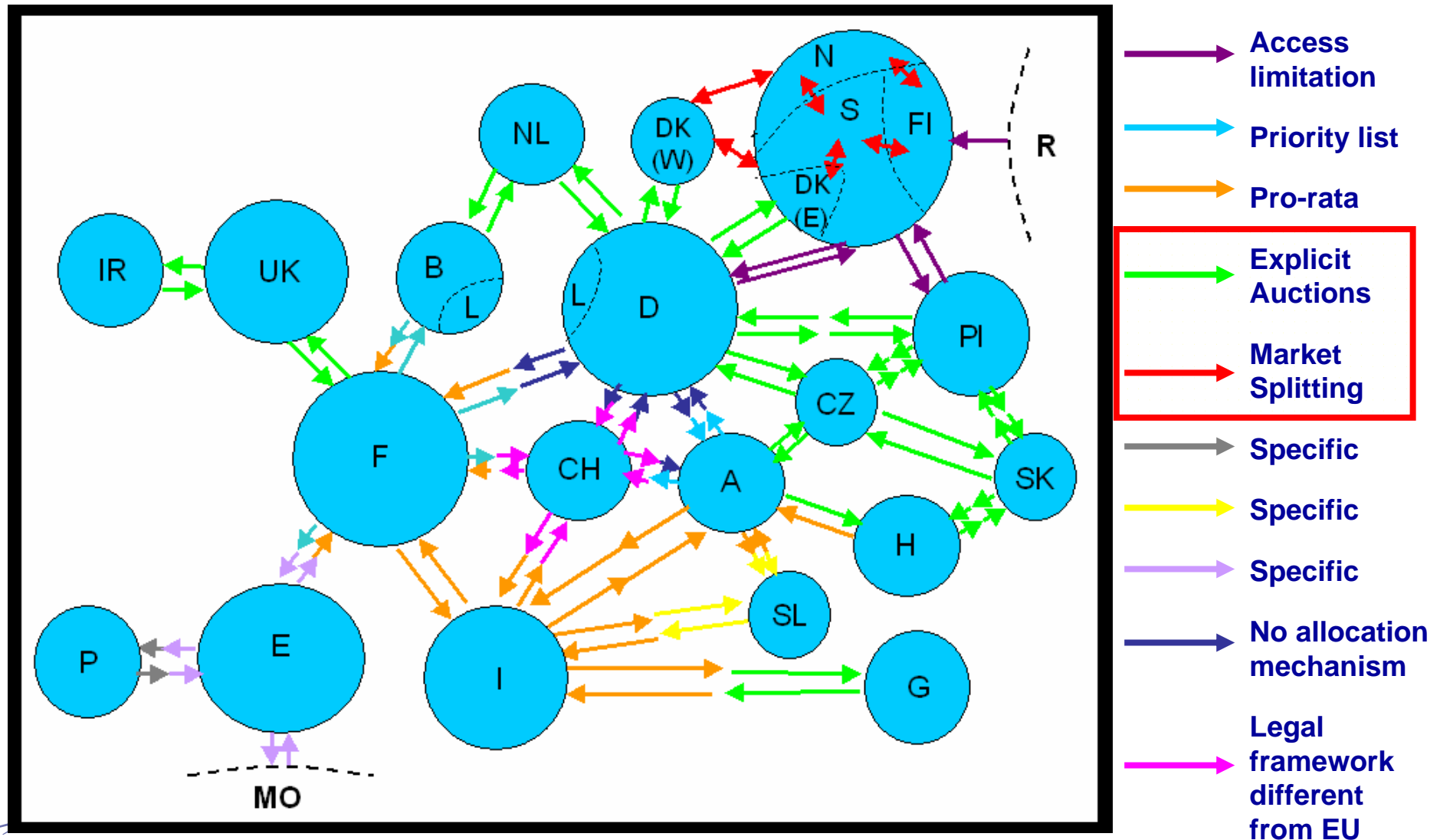
Trading capacity and congestion rents (4)

Maxima for owners profit and social welfare



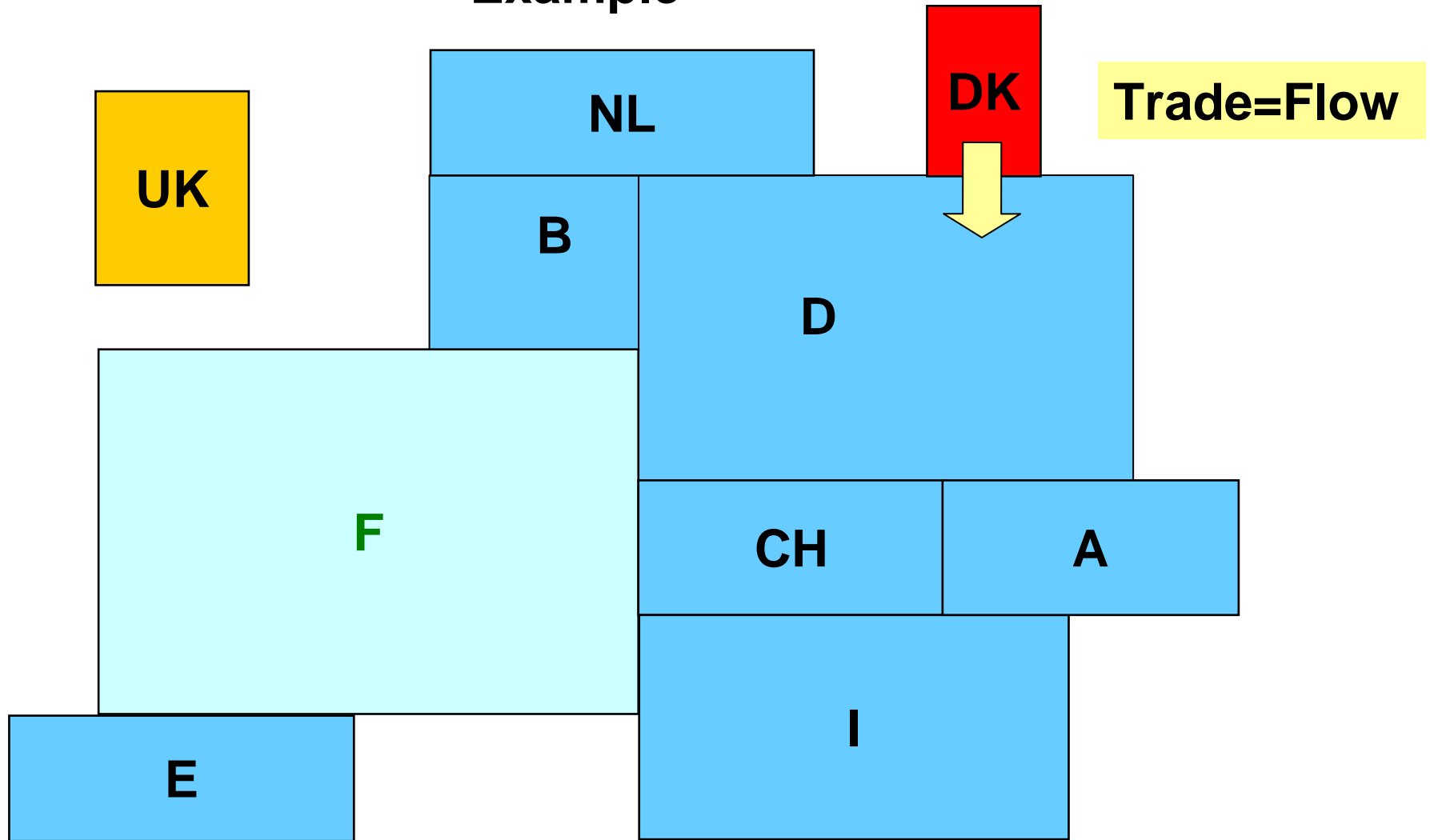
Corporate form and regulatory regime for TSOs must ensure social welfare in investment decisions!

Congestion management mechanisms 2004



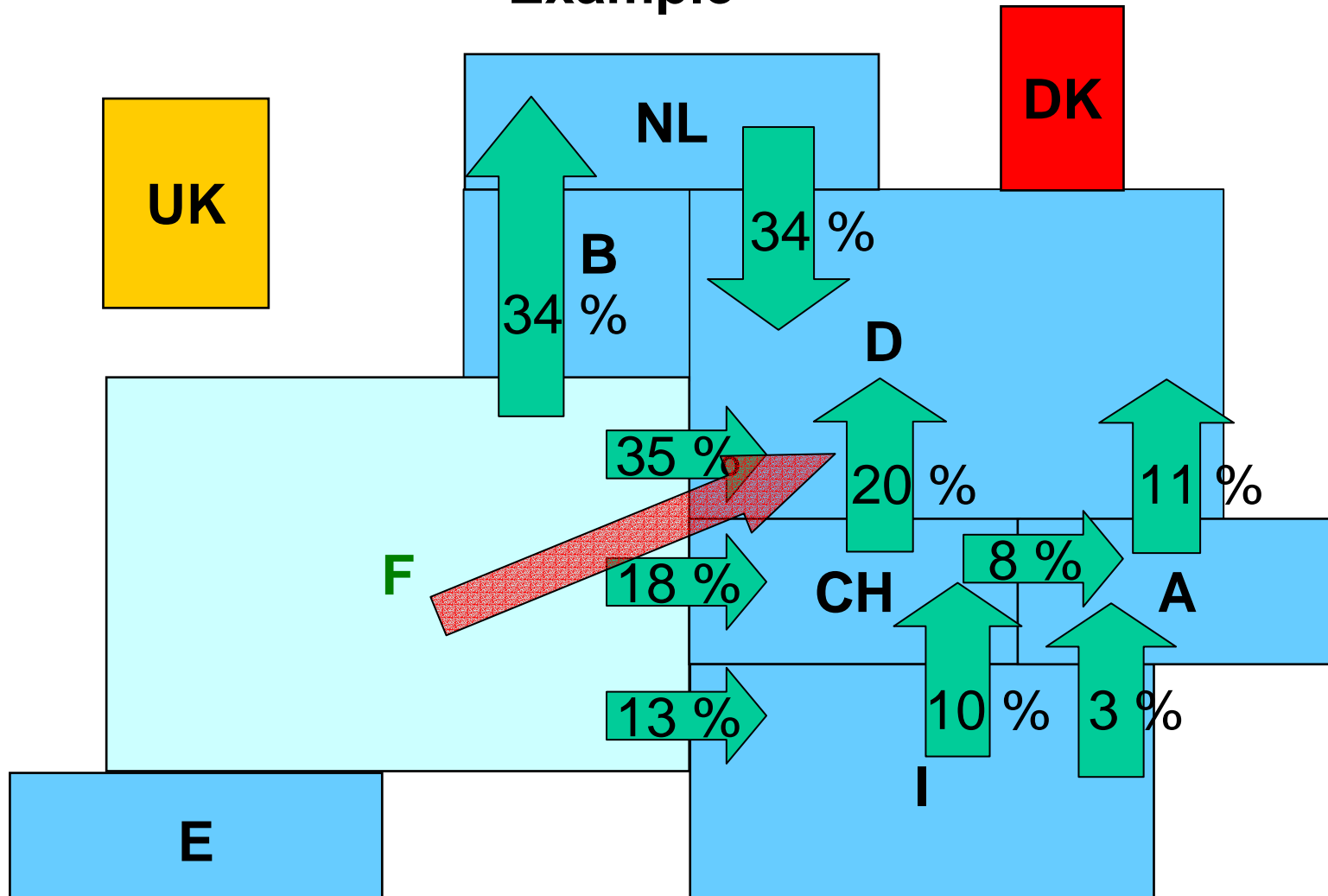
Flow pattern in radial grid

Example



Flow pattern in meshed grid

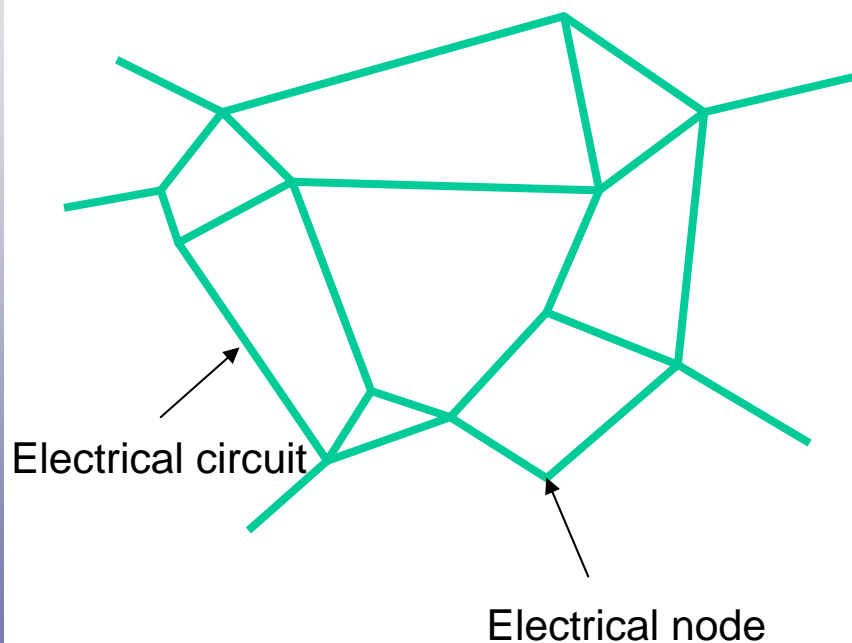
Example



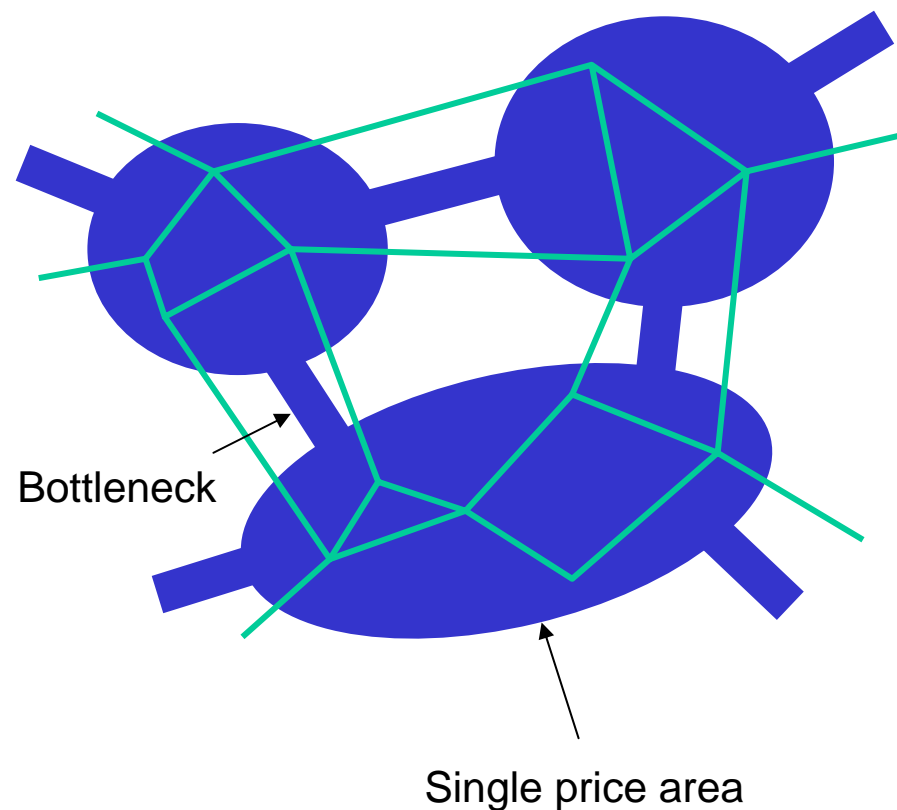
Physical complexity independent of allocation method !

Transmission model

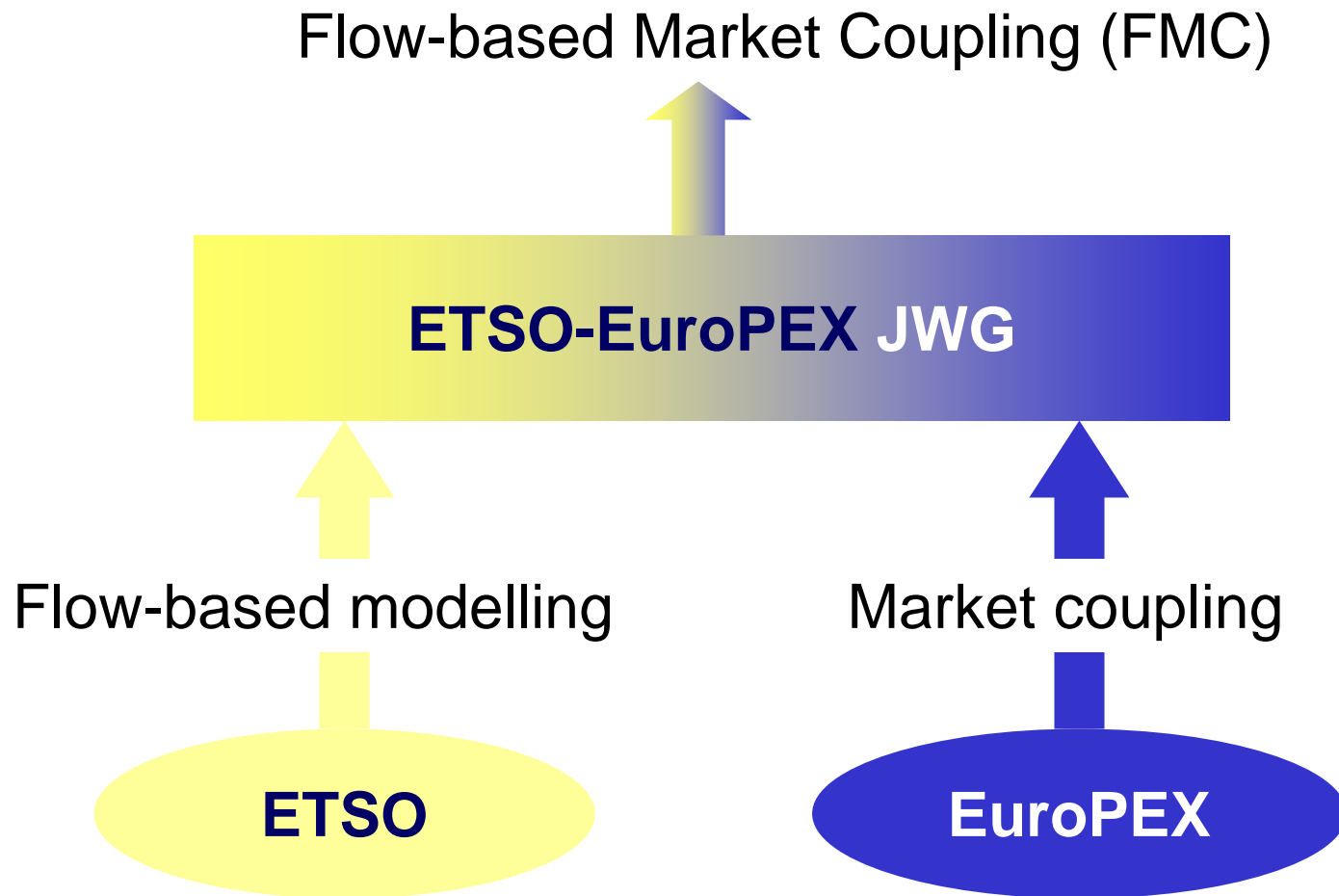
Operational transmission model



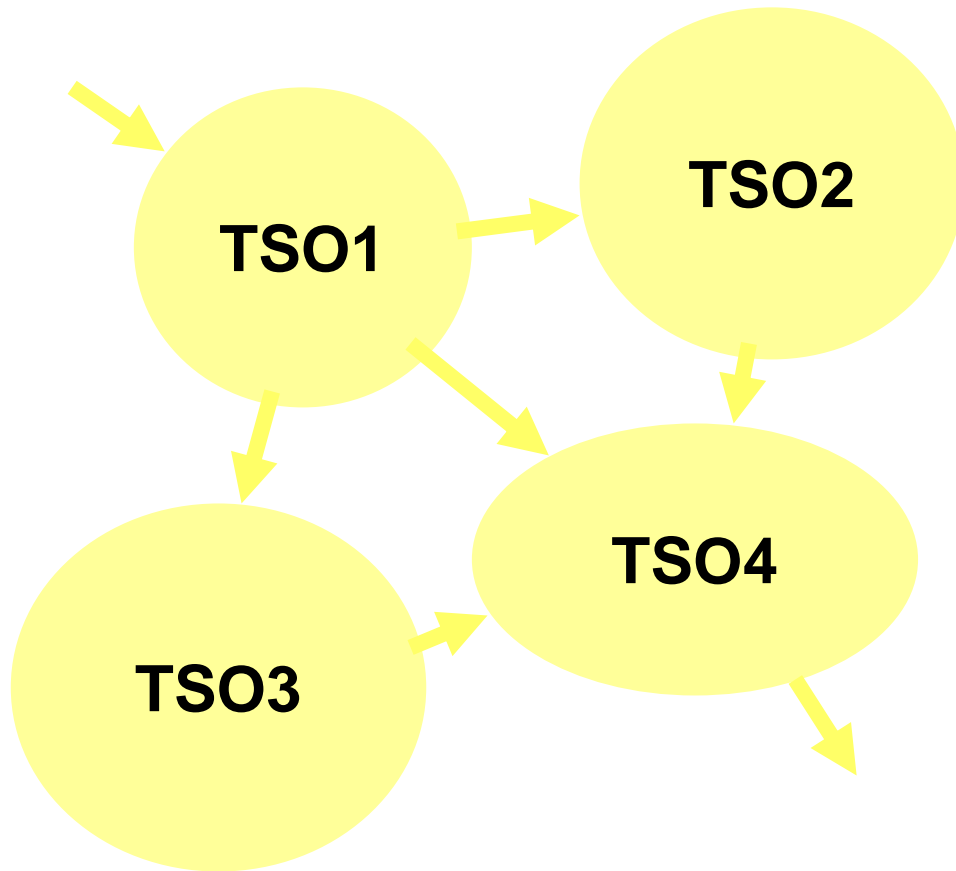
Simplified transmission model for FMC



Efficient market based congestion management in meshed grids

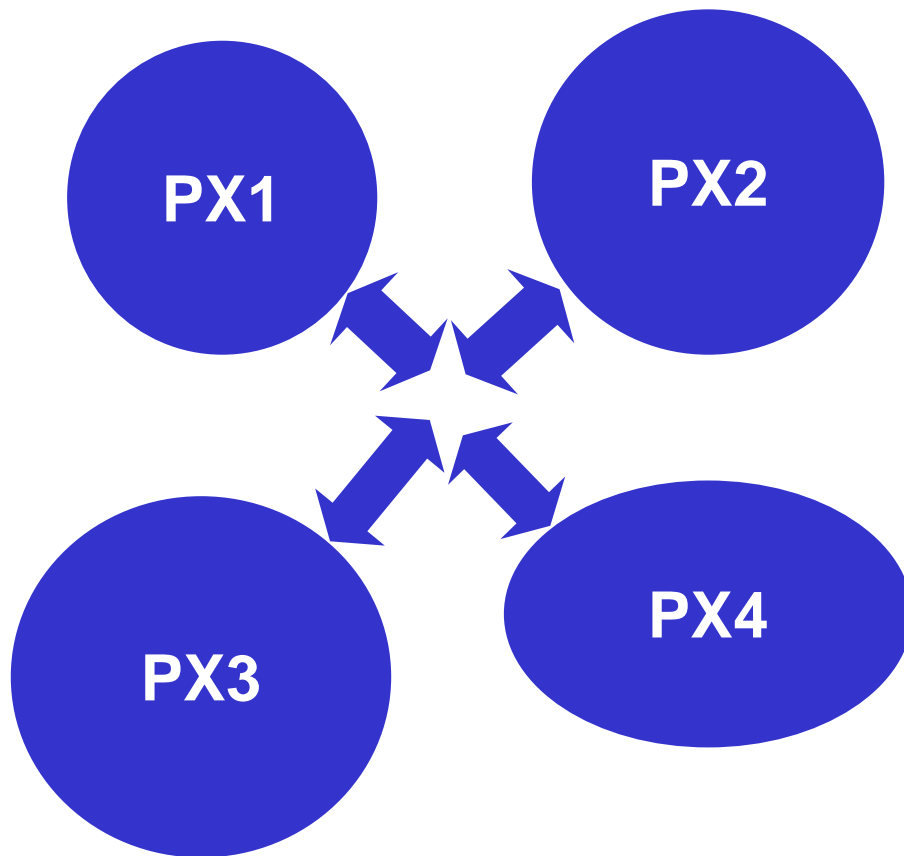


Flow-based Modelling



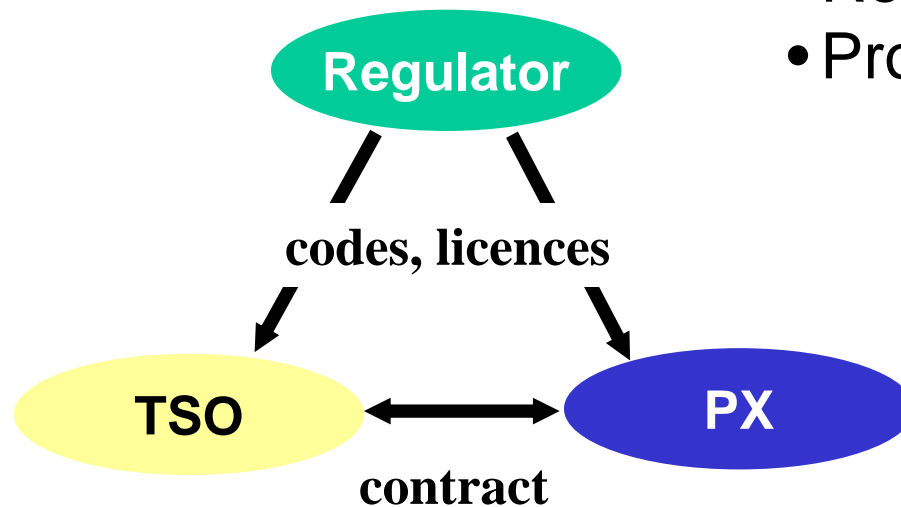
- All modelled electrical flow paths taken into account, not just 'contract path'
- Maximises use of inter-regional transmission capacity

Market Coupling (= Market Splitting)



- Efficient trading between regional markets via power exchanges
- Maximises inter-regional market efficiency

FMC builds on existing arrangements



- Regulate monopolies
- Promote competition

- Grid access
- Ancillary services
- System security and balancing
- Notification and imbalance settlement

- Trader screen/interface
- Matching
- Settlement and credit
- Information
- Audit, dispute resolution and market surveillance

Co-ordinated Counter-trade

A mean to stabilize and guarantee available trading capacity

Market players demand:

- maximum trading capacity
- firm trading capacity

TSOs ensure:

- operational security in system with unforeseen outages, fluctuating wind, changing flow patterns etc.

virtual
trading
world

real
physical
world

Reconcile with co-ordinated counter-trade performed by TSOs

- Level of guaranteed trading capacity ?
- Time horizon for guaranteed capacity ?

A complicated cost/benefit analysis to assess how much the TSOs shall “smoothen” the playing field!

Conclusions

TSOs to handle technical challenges and provide “smooth” playing field for market players requires:

- **Clear distinction between roles and responsibilities of TSOs/authorities and market players**
- **Stable and transparent framework for commercial investments in generation capacity**
- **Sound regulatory framework for TSOs’ transmission investments and other TSO tasks**
- **Tighter integration of regional markets with efficient coordinated congestion management**

⇒ Committed cooperation between authorities and TSOs on international basis