The more co-operation, the more competition?

Possible effects of Market Integration of the Belgian and Dutch power markets

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Overview of the presentation

- Introduction to COMPETES model
  - Questions addressed
  - Model structure
- Congestion management B ↔ NL
  - Current auction system
  - Proposed market integration
- Effects of Market Coupling
- Sensitivity analysis on physical capacity: Value under different policies

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Questions to be addressed

- Assessment of the liberalised Northwestern European electricity market
- *Questions*: What is the effect of *energy market design & structure,* considering *generator strategic behaviour,* upon:
  - ✓ Electricity market prices
  - ✓ Transmission prices
  - ✓ Income distribution (TSO revenues, profits, consumer surplus)

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Value added

Why has ECN developed *COMPETES*?

- Endogenous modelling of strategic behaviour
- Integrating exchanges with neighbouring countries
- Taking into account of (congestion in) the electricity network → Nodal Pricing

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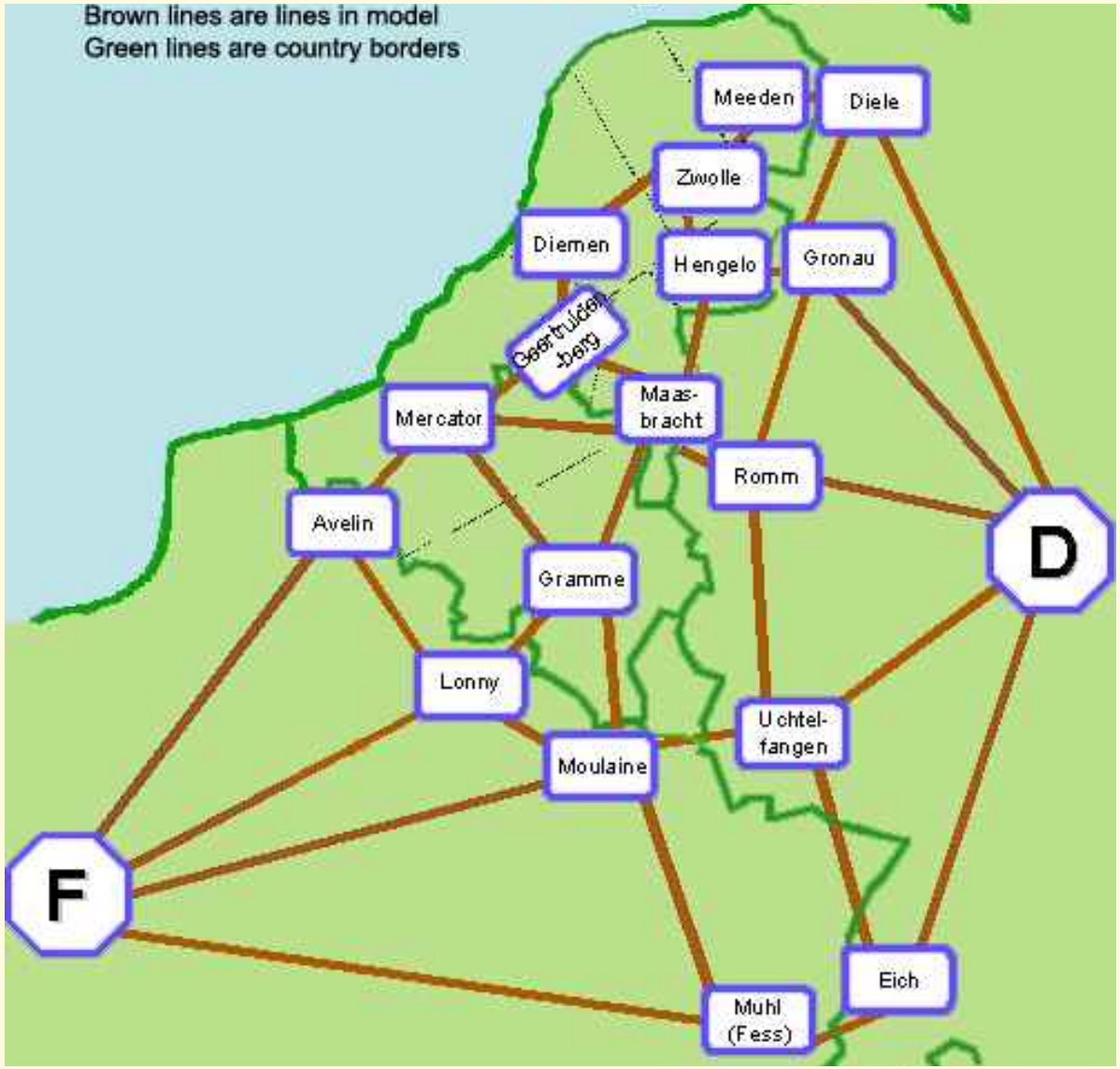
Geographic scope of the model



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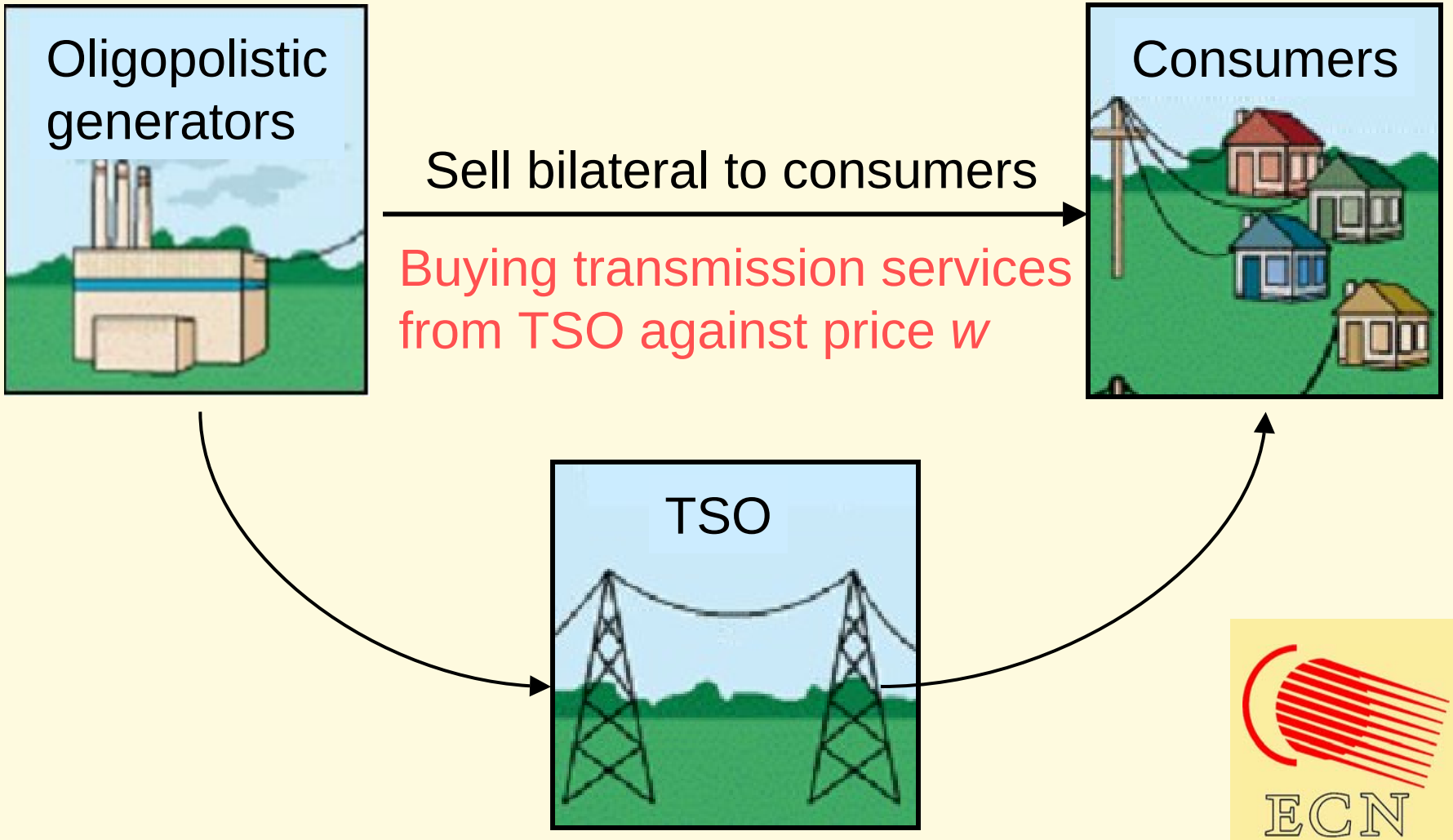
Market structure - Transmission operator



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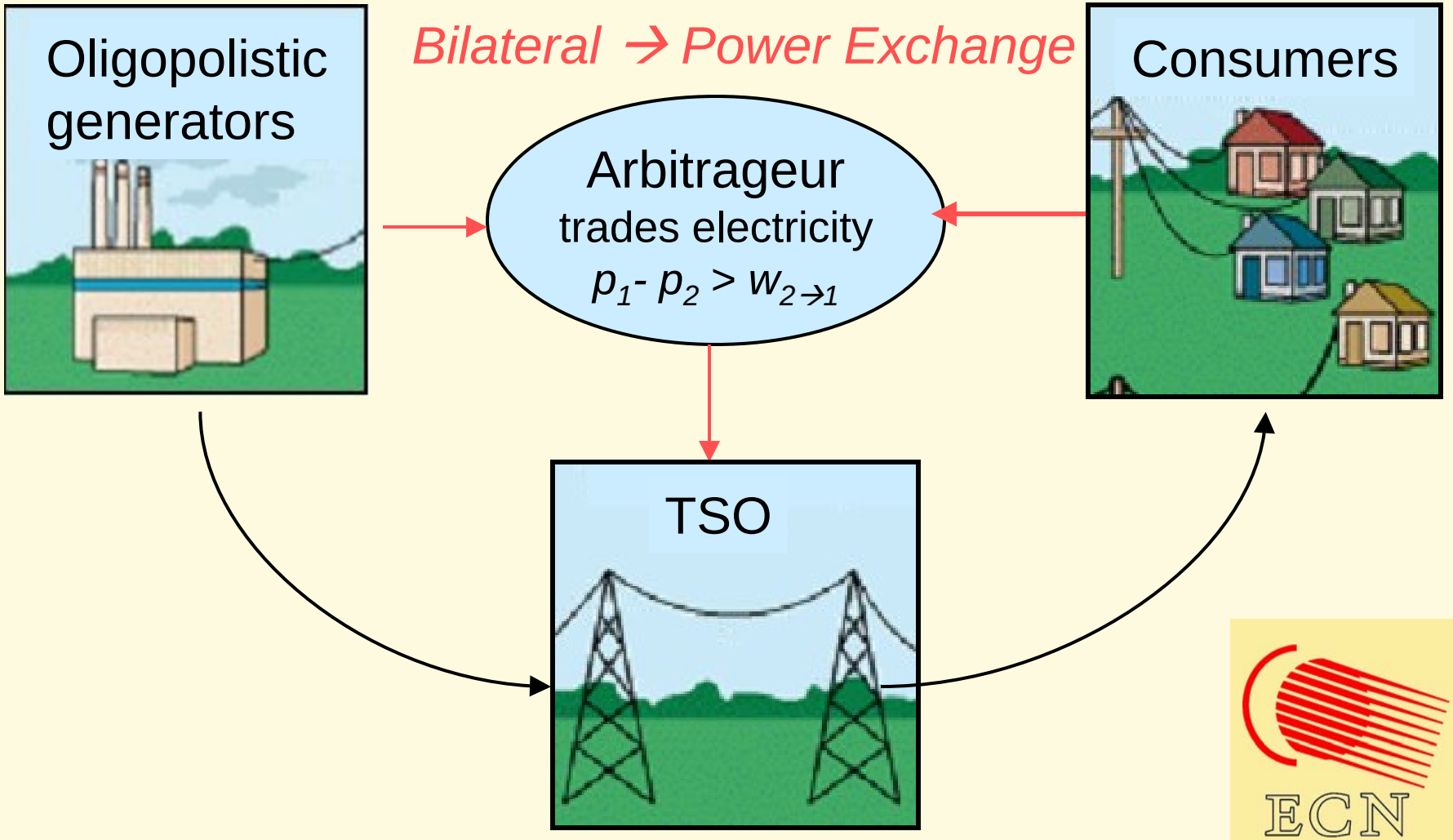
Market structure - Arbitrageur



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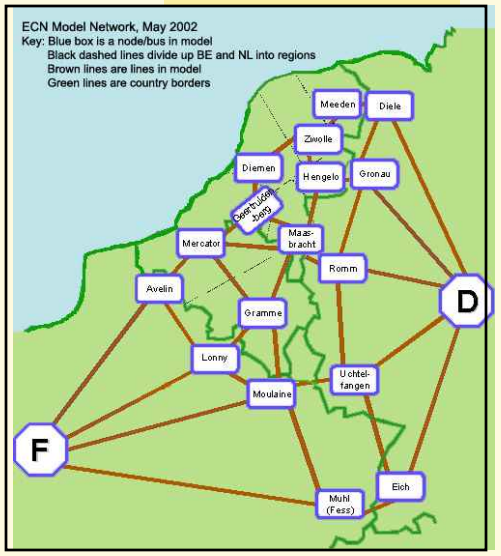
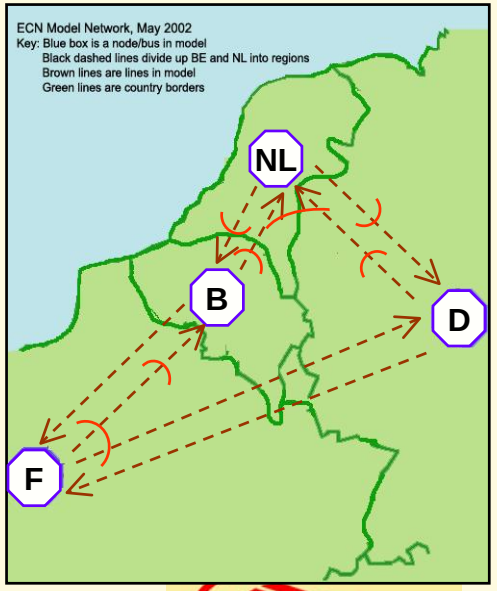
Transmission network

- Type of Game ≈ Cournot
- Physical representation network
  1. Linearized DC Load Flow
  2. Several nodes per country (6 NL, 2 Be)
- Path based representation
  - One node per country →
    one market price per country
  - Interfaces defined between countries
  - Crediting for counterflows (netting vs. no-netting)





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Solution properties

- Complementarity formulation
  - Direct solution of equilibrium conditions
  - Solves large models (1000s of variables)

- Methodology
  - Derive the first-order conditions for each player
  - Formulate market clearing conditions
  - Solve resulting system of conditions

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Inputs

- Demand
  - 12 periods → 3 seasons, 4 load periods
  - Allocated to the different nodes
  - *Source: TSOs and UCTE*
- Generation
  - 15 large power generators (4 NL, 1 B, 2 F, 8 G)
  - 5272 generating units in total
  - Marginal costs based on efficiency and fuel type

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What are the impacts of a reformed Congestion Management system for B ↔ NL ?

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Congestion management B ↔ NL

Current Auction System

- Yearly, monthly and daily auctions
- Available capacity for auction *[www.tso-auction.nl]*
  - Belgium - Netherlands: 1150 MW
  - Germany - Netherlands: 2200 MW
- Total import capacity to NL ≤ 400 MW per party
- Price set by lowest accepted bid
- Daily auction takes place before APX settles

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Congestion management B ↔ NL

Proposal for market integration

- Single market
  - One market price
  - TSO responsible for re-dispatch
  - Payments for constrained-off or -on
- Market Coupling (Splitting)
  - Similar to the NordPool
  - If Congestion: two separate market prices
- Brattle advice (February 2003):
  - Market Coupling with divestiture of generating capacity in Belgium

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What are the impacts of Market Coupling between B ↔ NL ?

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Effects of Market Coupling

Differences with the current situation

1) Increased market access into Belgium
   - For (foreign) Generators and
   - For Traders → Introduce arbitrage

2) Netting of transmission capacity

3) Efficient co-ordination of ‘Auction’ and APX

Effects of Market Coupling

Definition of scenarios

		Import cap on firms			Import cap on arbitrageurs			Netting
		B → NL	**NL → B**	**NL → B Electrabel**	**B → NL**	**NL → B**	**G ↔ NL**	
Competitive		No limit	No limit	No limit	No limit	No limit	No limit	Yes
COURNOT	**Current situation**	**400**	**0**	**950**	**0**	**200**	No limit	**No**
	Market splitting	None*	None*	None*	No limit	No limit	No limit	**B ↔ NL**

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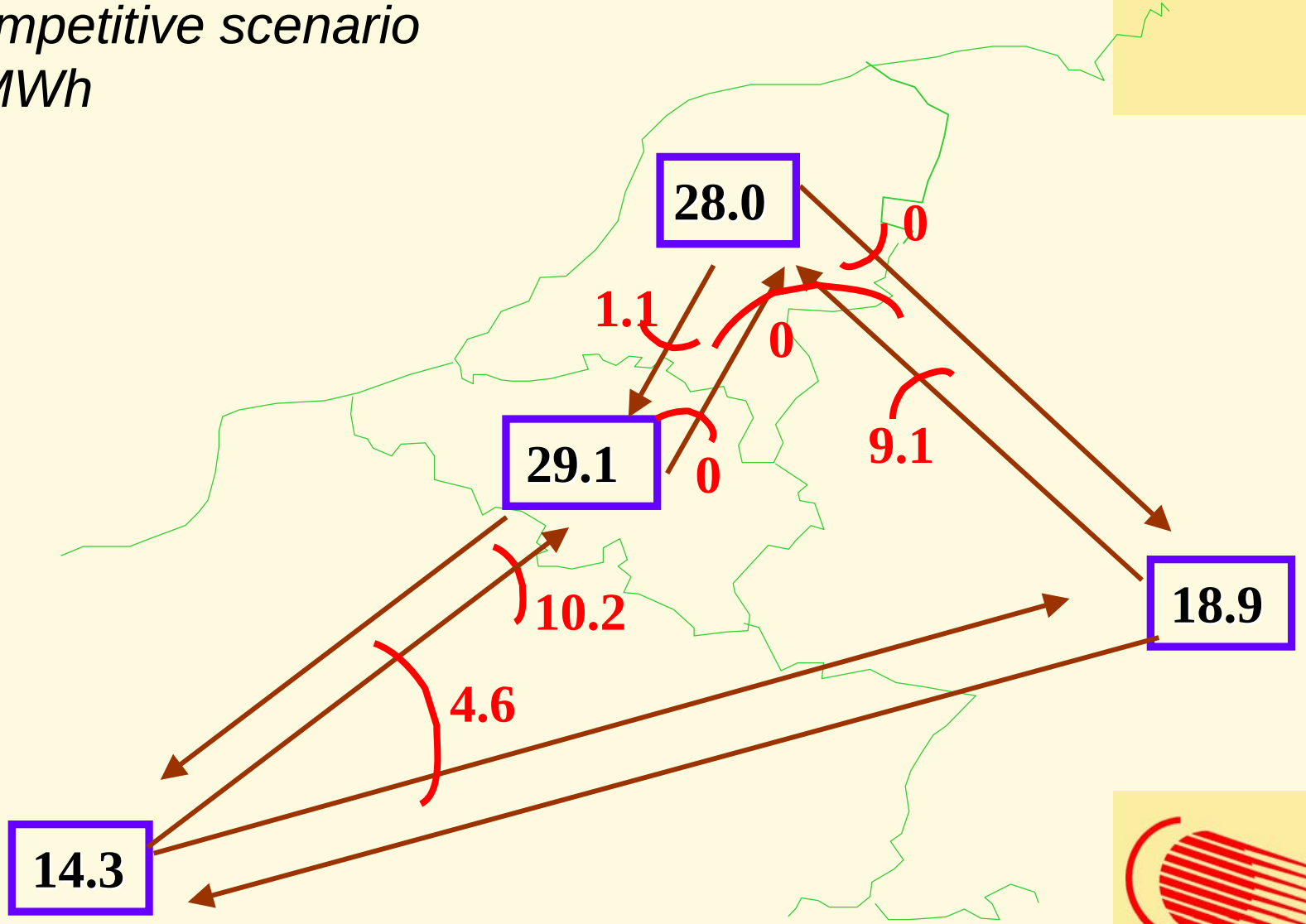
Model results

Competitive scenario

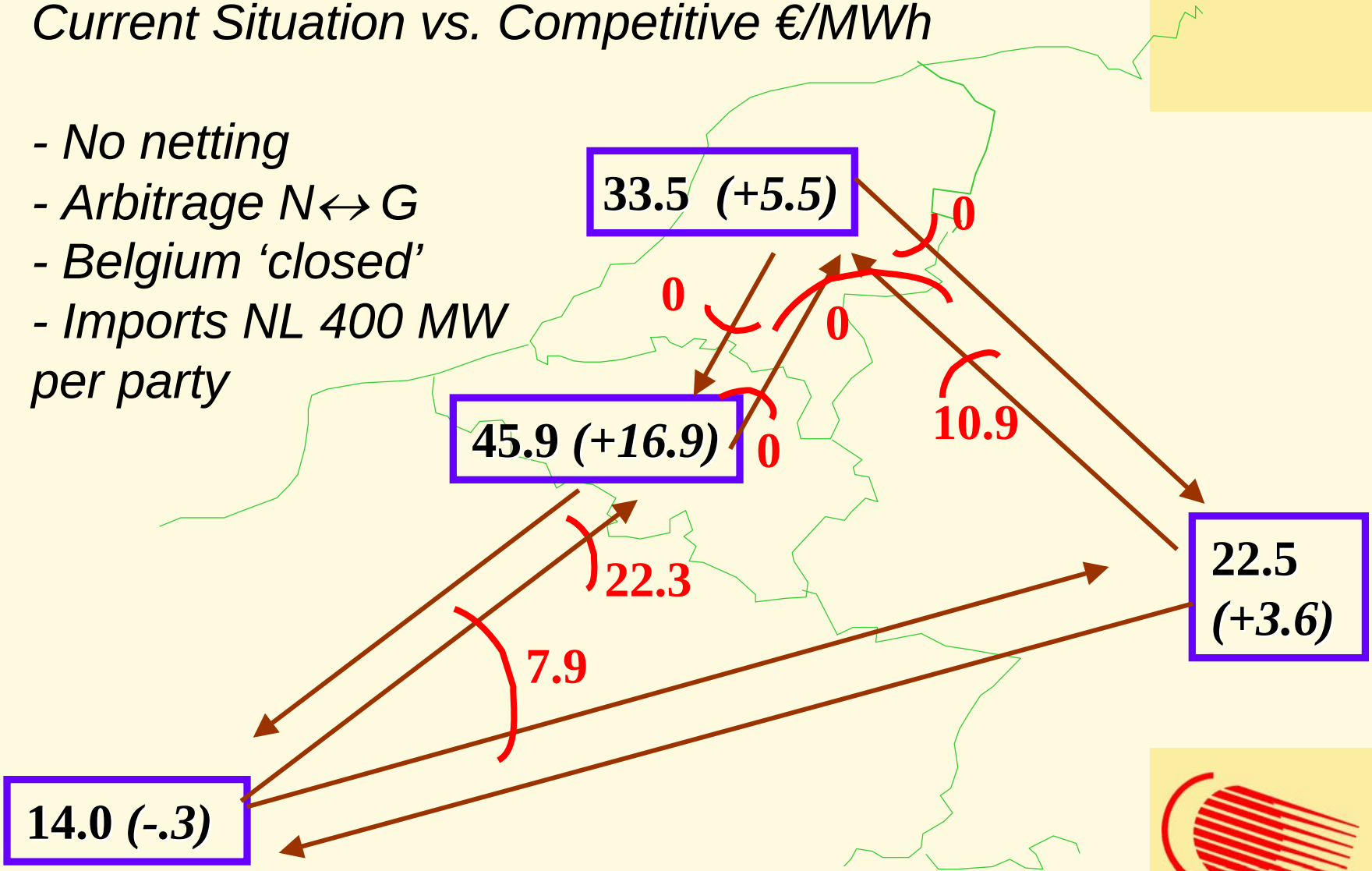
€/MWh



Model results

Current Situation vs. Competitive €/MWh

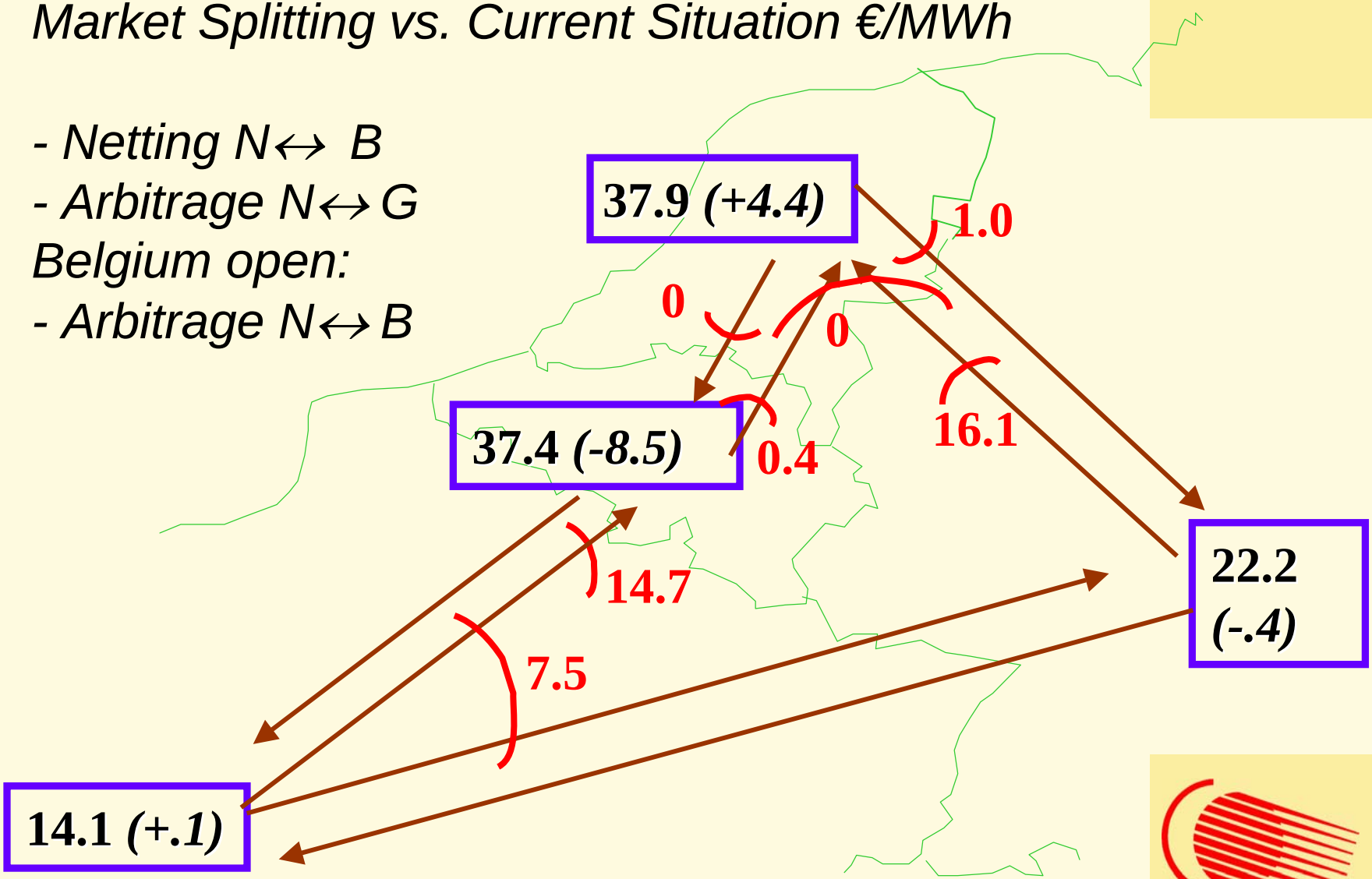
- *No netting*
- *Arbitrage N↔G*
- *Belgium 'closed'*
- *Imports NL 400 MW per party*



Model results

Market Splitting vs. Current Situation €/MWh

- Netting N↔ B
- Arbitrage N↔G
Belgium open:
- Arbitrage N↔B



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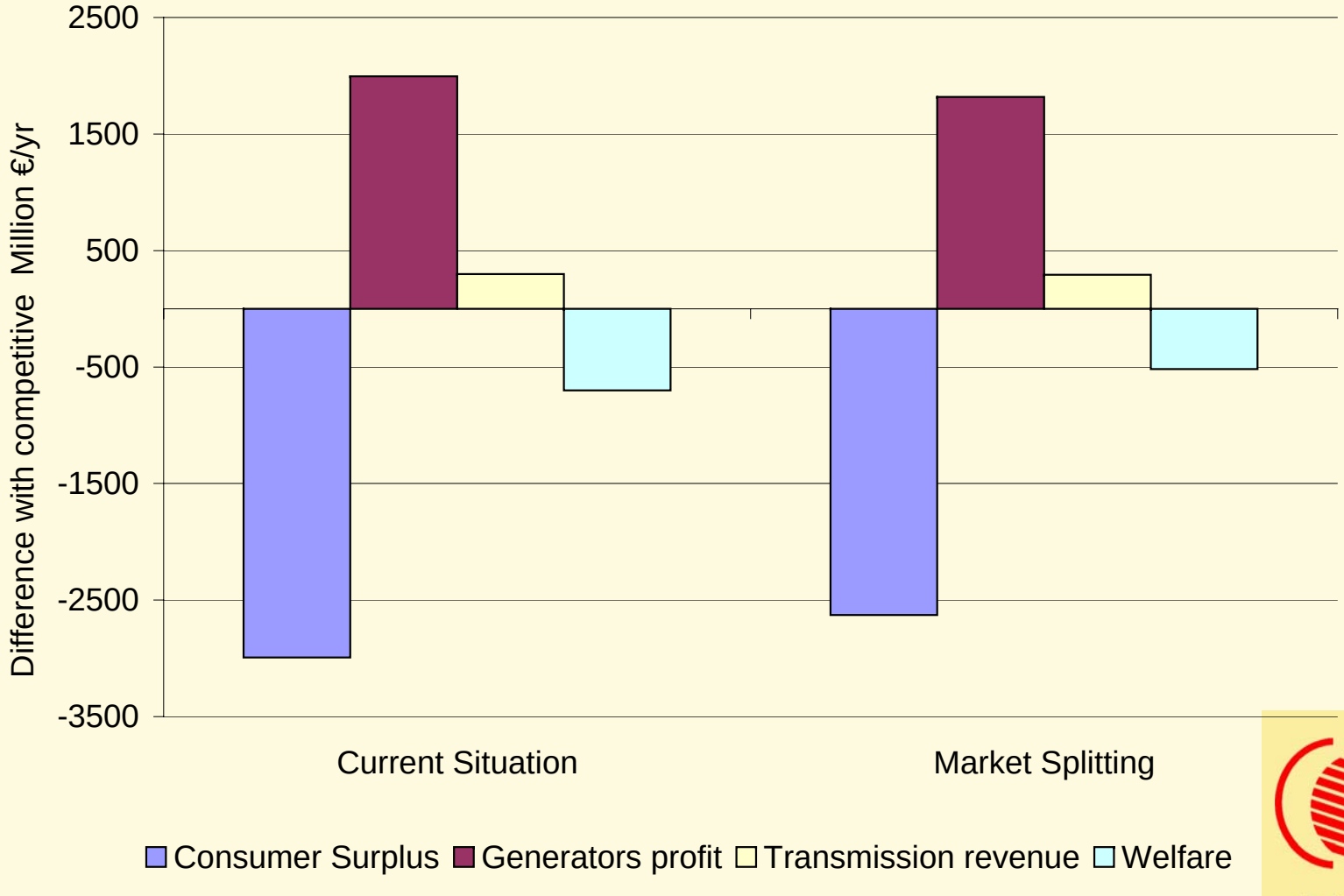
Effects of Market Coupling

Welfare comparison compared to Perfect Competition



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Effects of Market Coupling

Relevant conclusions

- Market Coupling affects prices and increases **overall** welfare (+ 182 mln €/yr more than current)
  - Induced by lower prices in Belgium
  - Increased welfare is mainly in Belgium

- What is “in it” for the Netherlands?
  - Profits Dutch generators increase
  - But consumer surplus decreases more
  - *Increase of spot market volume*

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What if marginal costs in Belgium are lower than assumed ?

Lower marginal cost in Belgium

All Belgian power plants decreased by 3 €/MWh

- Only marginal changes
- Belgian exports to France increase a little
- Conclusions on Market Splitting still apply:
  - Overall welfare increase
  - Decrease of welfare in NL
  - Prices in NL up, prices in BE down (to similar level)

What if large ‘Belgian incumbent’ is regulated <*acts competitively*> in Belgium but Cournot elsewhere?

Regulated prices Belgian incumbent

Electrabel modeled as a price-taker in Belgium

- Current Market Structure
  - Prices lower in both BE and NL (- 14.5 and - 1.3 €/MWh) compared to unregulated prices in BE
  - Belgian price now lower than in NL
- Market splitting
  - Increases welfare
  - Lowers prices both in BE *and* NL
- Reduced *market power* of Belgian incumbent results in overall price reduction

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Does the value of additional Transmission Capacity depend on the market design?

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Value of transmission

10% increase of capacity B ↔ NL

Euro/MW/yr	Competitive	Current Situation	Market Splitting
Valuation Transmission	12658	-8694	734

- *Competitive:* large increase of consumer surplus
- *Current market* structure: increase of arbitrage to BE, generators' profits decreases
- *Market Splitting*: decrease of consumer surplus is offset by increase of generators' profit

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General conclusions

Based on COMPETES model results

- The current market structure in Northwestern EU hampers competition → *prices above competitive*
- Market Coupling increases overall welfare → *Increases prices in Netherlands*
- Lowering MC in BE has marginal effect → *3 €/MWh decrease only lowers BE prices ~ 0.3 € /MWh*
- Price regulation in Belgium → *Market Coupling reduces prices in both Netherlands and Belgium*
- Valuation of transmission capacity depends significant on market design

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