



# Financial Transmission Rights

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- Obstacles to the Single Electricity Market
  - Lack of price convergence
  - Market power
  - Lack of interconnection
- Solutions
  - Market coupling
  - More investment and

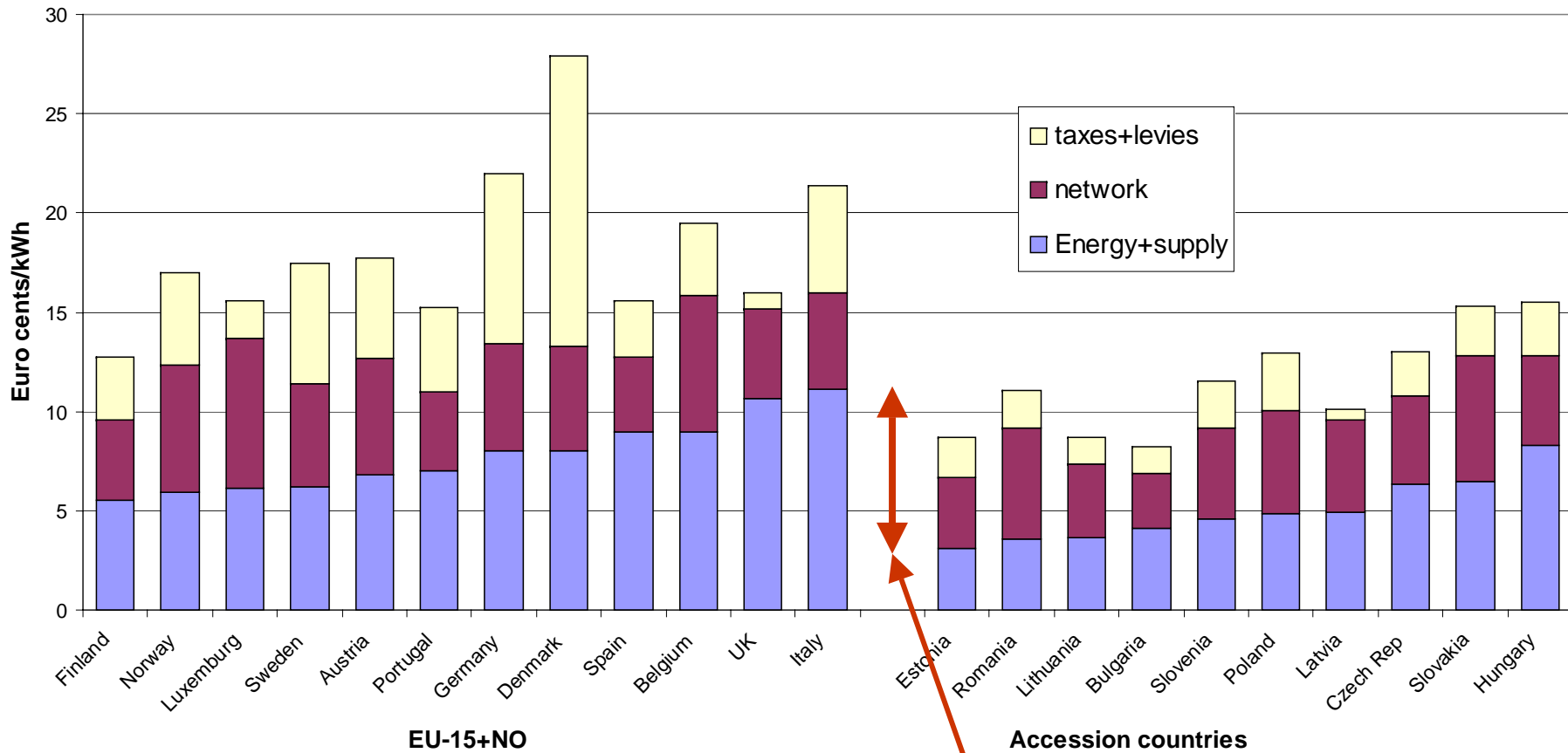
***Firm FTRs: our study for DG-ENER***

- Deliver **secure sustainable** electricity **efficiently**
  - ⇒ competitive markets, full use of ICs (inter-connectors), efficient & timely T & G investment
    - ⇒ But most markets becoming **more concentrated**
- => unbundle transmission **ownership**
- Target Electricity Model couples markets
  - Provides liquid reference price
- Competition aided by **long-term FTR obligations**
  - Can be netted to increase effective contestability
  - Price discovery guides transmission investment



# No single energy price in the SEM

Domestic electricity prices 2008



Source: ERGEG (2009) Status Review

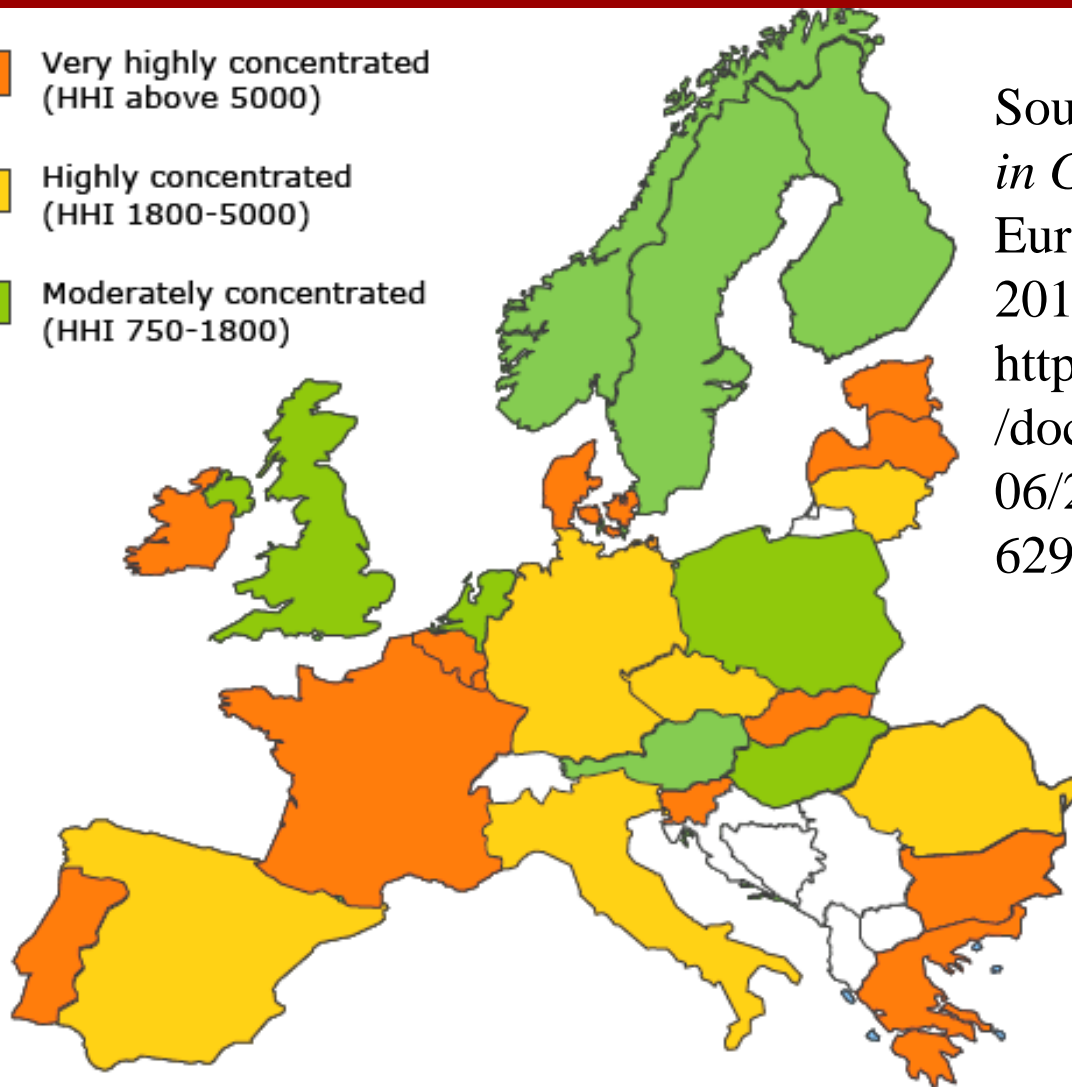
3:1 variation in energy price

- Most markets are concentrated
- Imports can increase competition
- But interconnections limit trade
  - were inefficiently used
  - expansion resisted by incumbents
- Market coupling improves efficiency
- FTR obligations makes markets contestable

***Together clarify where T investment needed***

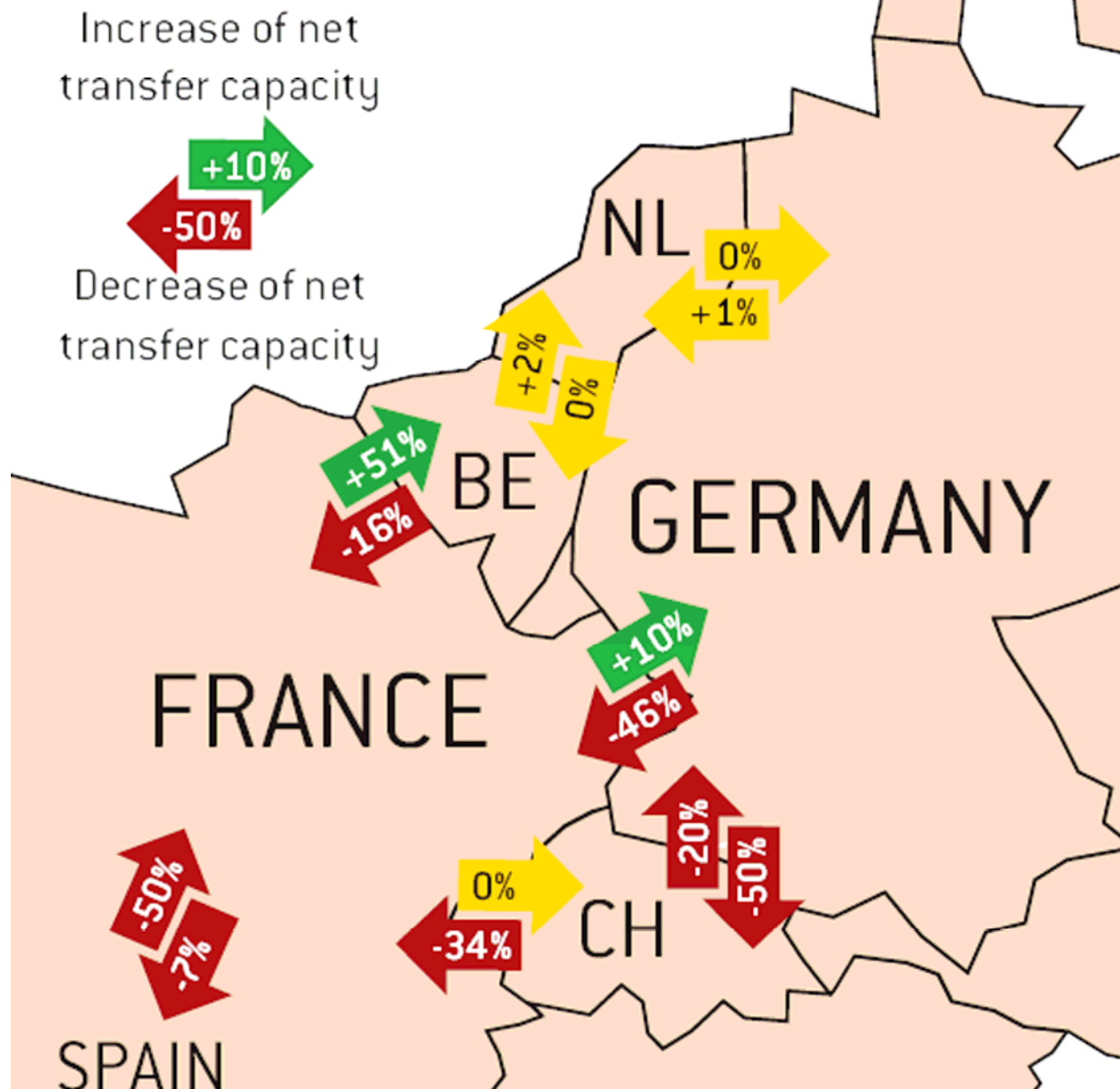
# 10 countries increased concentration in 2008

- Very highly concentrated (HHI above 5000)
- Highly concentrated (HHI 1800-5000)
- Moderately concentrated (HHI 750-1800)



Source: *EU Energy Markets in Gas and Electricity*, European Parliament 2010 at <http://www.europarl.europa.eu/document/activities/cont/201106/20110629ATT22899/20110629ATT22899EN.pdf>

## Decreasing transmission capacity jeopardises the single market

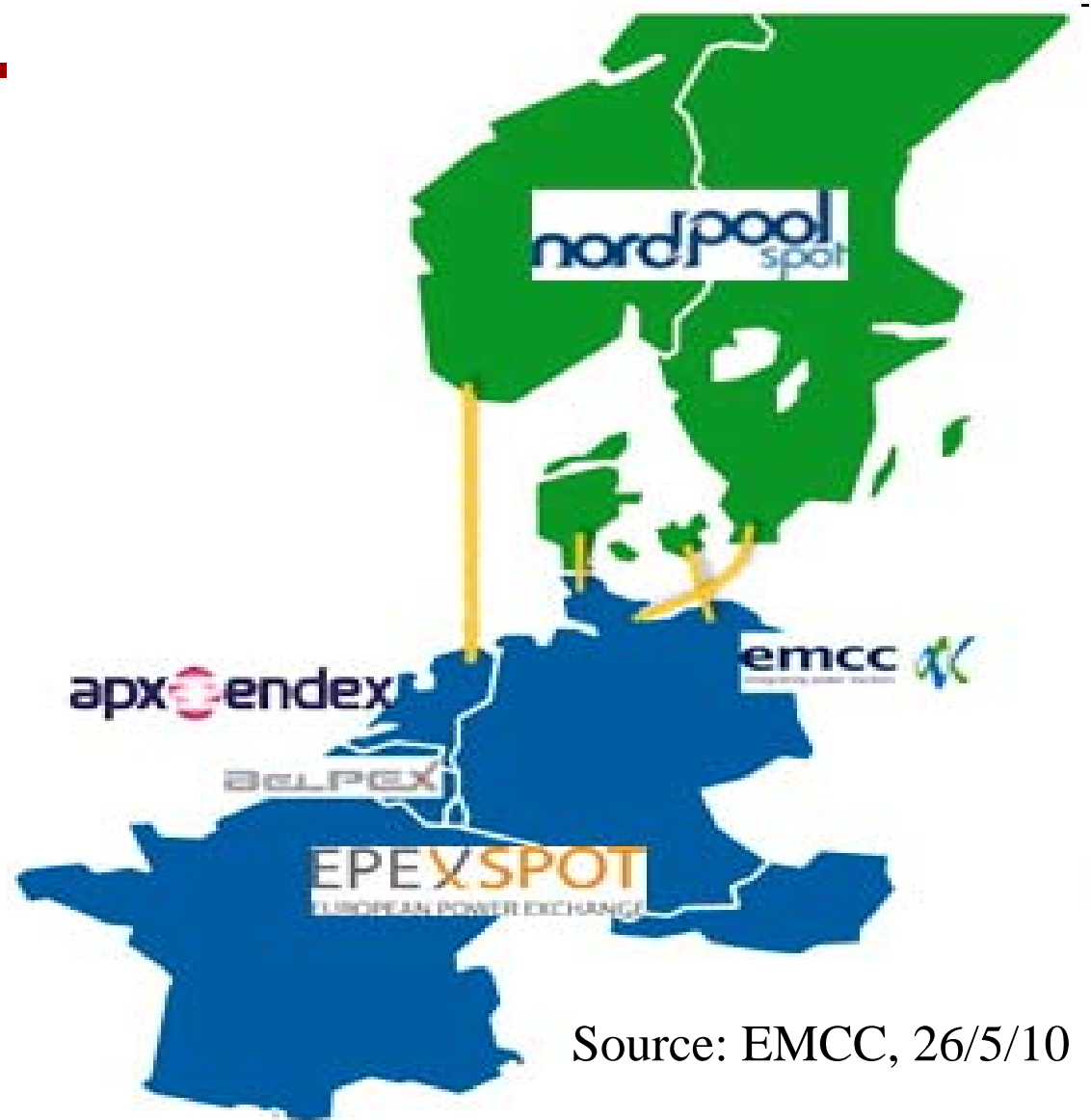


Change in net transfer capacities between winter 2004/05 and winter 2009/10  
- mostly decreases

Source: Zachman (2010) from ENTSO-E. Figure shows change in net transfer capacities between winter 2004/05 and winter 2009/10 in direction of arrow

# Market coupling

- Market coupling makes efficient use of interconnectors
- Markets are cleared at a single price over largest area
- Transmission constraints determine price zones
- 9 Nov 2010 Central West Europe moves to Interim Tight Volume Coupling



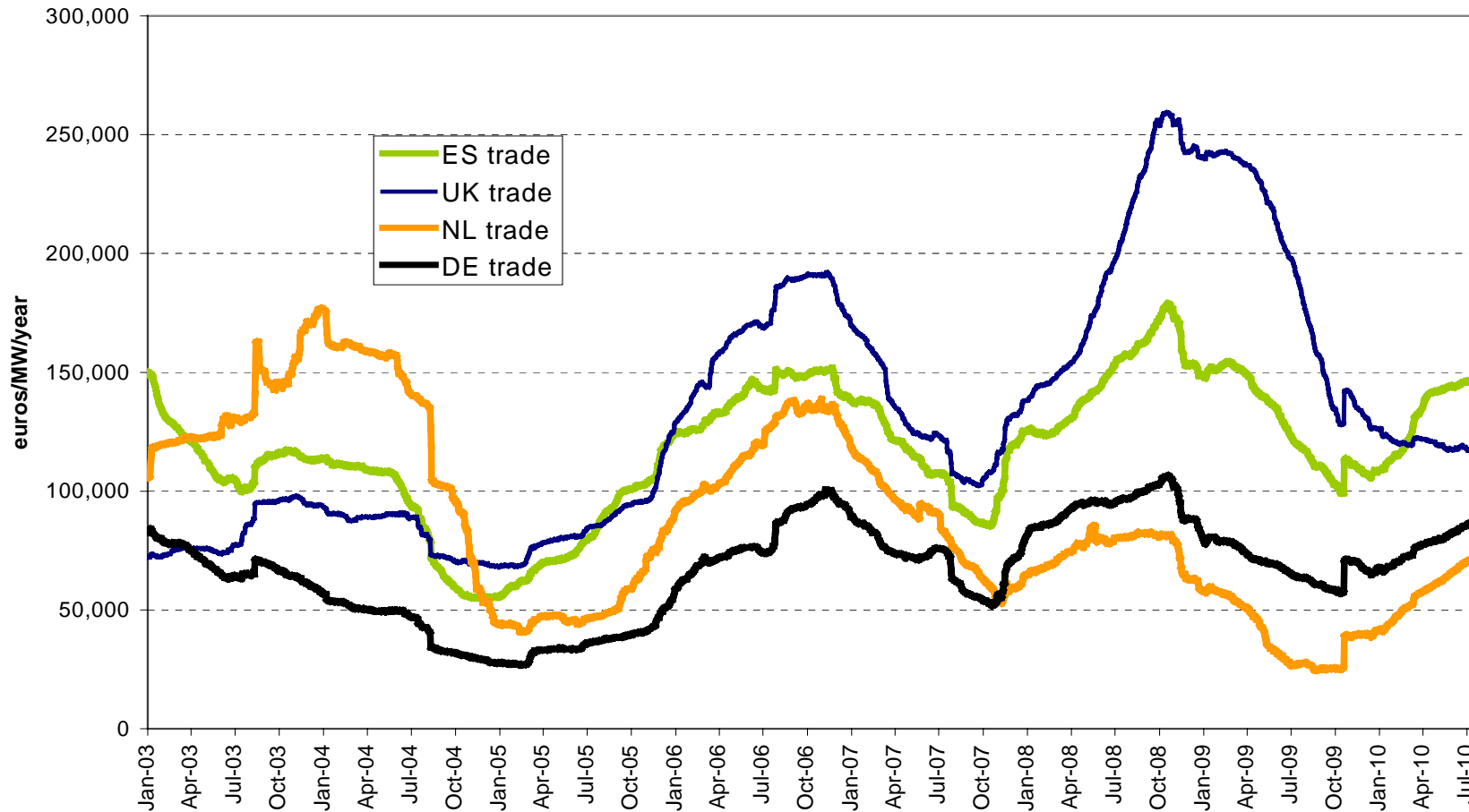
Source: EMCC, 26/5/10





# Absolute hourly difference relative to France 2005-10

Annual value of trade between France and other countries



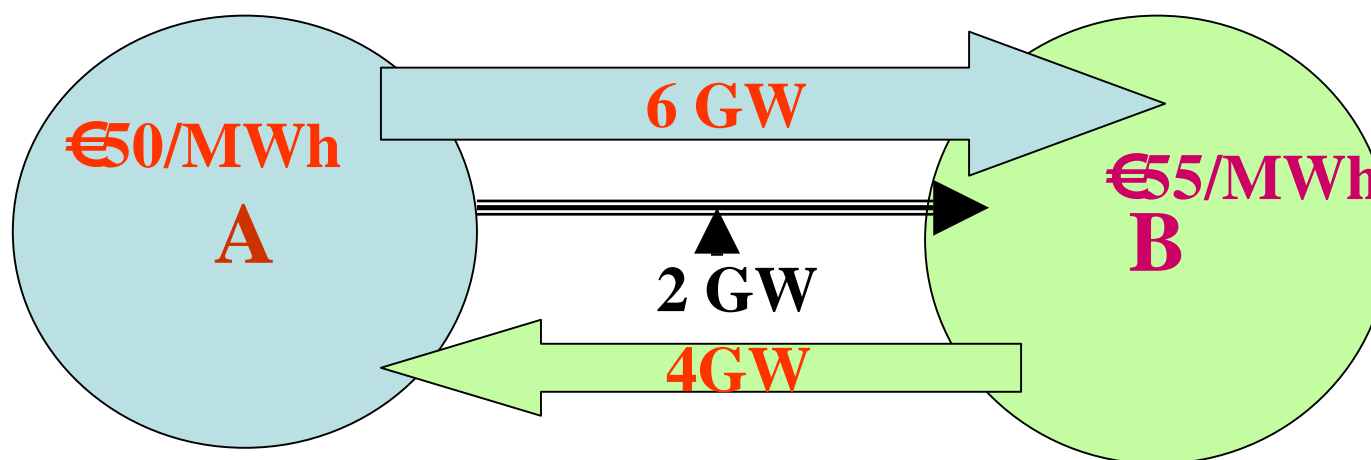
- DG-ENER commissioned Booz&Co for study
  - *Physical and Financial Capacity Rights for Cross-Border Trade* by David Newbery and Goran Strbac
  - Contributes to 3<sup>rd</sup> Package Target Electricity Model
- Consulted with ENTSO-E; CEER/ ERGEG/ ACER; CEFIC; Euroelectric; EFET; IFIEC
- Presented to Northern European Regional TSO meeting and Florence Forum (interim & final)

- Identify **advantages and disadvantages** of tradability of long-term Transmission Rights
- Should rights be **financial transmission rights** (FTRs) or **physical transmission rights** (PTRs), (or variants/hybrids);
- Propose **practical recommendations**, including the **preconditions necessary, for a facilitating a market in the rights**
  - which will meet the needs of participants, and deliver efficient and reliable long-term price signals

- TSOs offer 1 yr PTRs (one-sided options)
  - Use it (nominate) or sell it (UIOSI) day-ahead
  - Sale transforms PTR into financial instrument
  - Effectively becomes an FTR day-ahead
- TSOs and incumbents like PTRs - “reflects physical reality”
  - one-sided options restrict trade as cannot be netted
  - **protect incumbents, impedes competition**

- Promotes **efficiency** in the use of interconnectors (ICs)
- Promotes generation **competition** across borders
- Tends to **mitigate market power** in generation
- Price differences identify required IC **investment**
- Allocates **risk** efficiently to TSOs and rewards them appropriately
- Accommodates **intermittent** generation

- 2 GW interconnector between countries A & B
- FTRs obligations trade at €5



**Netting can dramatically increase imported competition**

# FTR obligations increase competition

- Consider an IC ATC = 2 GW connecting two concentrated markets, A, B (peak L = 20 GW)
- Large Industrial Consumers (LIC) demand = 8 GW
  - PTRs only release 1 GW in each direction
  - 87% of market dominated by incumbent G
- **Now SO issues 2 GW FTR *obligations* each way**
  - Initially LICs buy 2 GW A→B,  $G_B$  loses 2 GW custom, sells to A, FTR of 2 GW B→A nets to zero; SO continues to issue FTRs subject to net value of 2 GW
- Generators in each country vulnerable to competition from abroad *for any customer in their market*

- All US nodal markets offer long-term **FTR obligations**: market participants happy
  - PJM and CAISO offer FTR options (for Merchant Transmission projects)
  - **Market demand for FTR options < 1%**
  - Many ISOs have looked at issuing FTR options
    - Reluctant to issue/administer FTR options market because of challenge in designing a set of options while ensuring TSO revenue adequacy
    - Hard to price FTR options => concerns about liquidity of secondary markets
    - nothing stops traders issuing them
- => Offer FTR options and obligations if market demands



- Target Electricity Model has zonal not nodal prices
- FTRs are from zone-to-zone
- But flows depend on which **nodes** inject and withdraw  
=> ATC depends on which nodal flows, so **market condition dependent**  
=> TSOs provide nodal load flow data to maximize day-ahead ATCs
- **Simultaneous Feasibility Test: ATC does not depend on market conditions**



# Simultaneous Feasibility Test (SFT)

- SFT needed to maximise ATC
  - ⇒ Represent all FTRs in network model + all external loop flows
  - ⇒ Solve for network flows pre- and post-contingency states
- guarantees **if all FTRs exercised to support IC transfers then no constraint or ATC exceeded**
- Provided topology unchanged, TSO congestion ***revenues will be “adequate”***
  - to settle all FTRs

- Subsea links face higher and longer outage risks
  - => Firm contracts could rapidly bankrupt owner
  - => Should be permitted to offer interruptible service
    - guaranteeing firm service likely needs a large insurance premium provided by asset-adequate insurance firm
- If NRAs impose new conditions on merchants
  - Merchants should retain existing property rights
  - Can negotiate compensation for less favourable terms
- EC/ACER consider merchant regulation carefully
  - Currently discourages new merchant links when more ICs needed

- TSOs prefer 1 yr PTRs not 3+ yr FTRs
  - Defending incumbents from competition?
- ⇒ NRAs need to take tougher line
- ⇒ **no discrimination** - treat domestic and external access alike
- MiFID subjects TSOs to financial regulation?
  - But NRAs better regulators
  - SFT ensures revenue adequacy
    - but NRAs must assure compensation for *force majeure*

- **Firm** long-term TRs are desirable
  - TSOs need regulatory assurance to recoup losses
  - within country transmission is firm - **need EU non-discrimination**
  - Only undersea & merchant IC's should be **exempt** from firmness
- **Anything PTRs can do FTRs can do better**
- FTR obligations increase competition and efficiency
  - netting allows more competitors into each market
  - but zonal pricing is an impediment to full market integration
  - Inter-zonal ATC calculation is **market-condition dependent**
    - does not respect the physics (loop flows, internal congestion)
    - => under-declaration and inefficient use of capacity

# Financial Transmission Rights

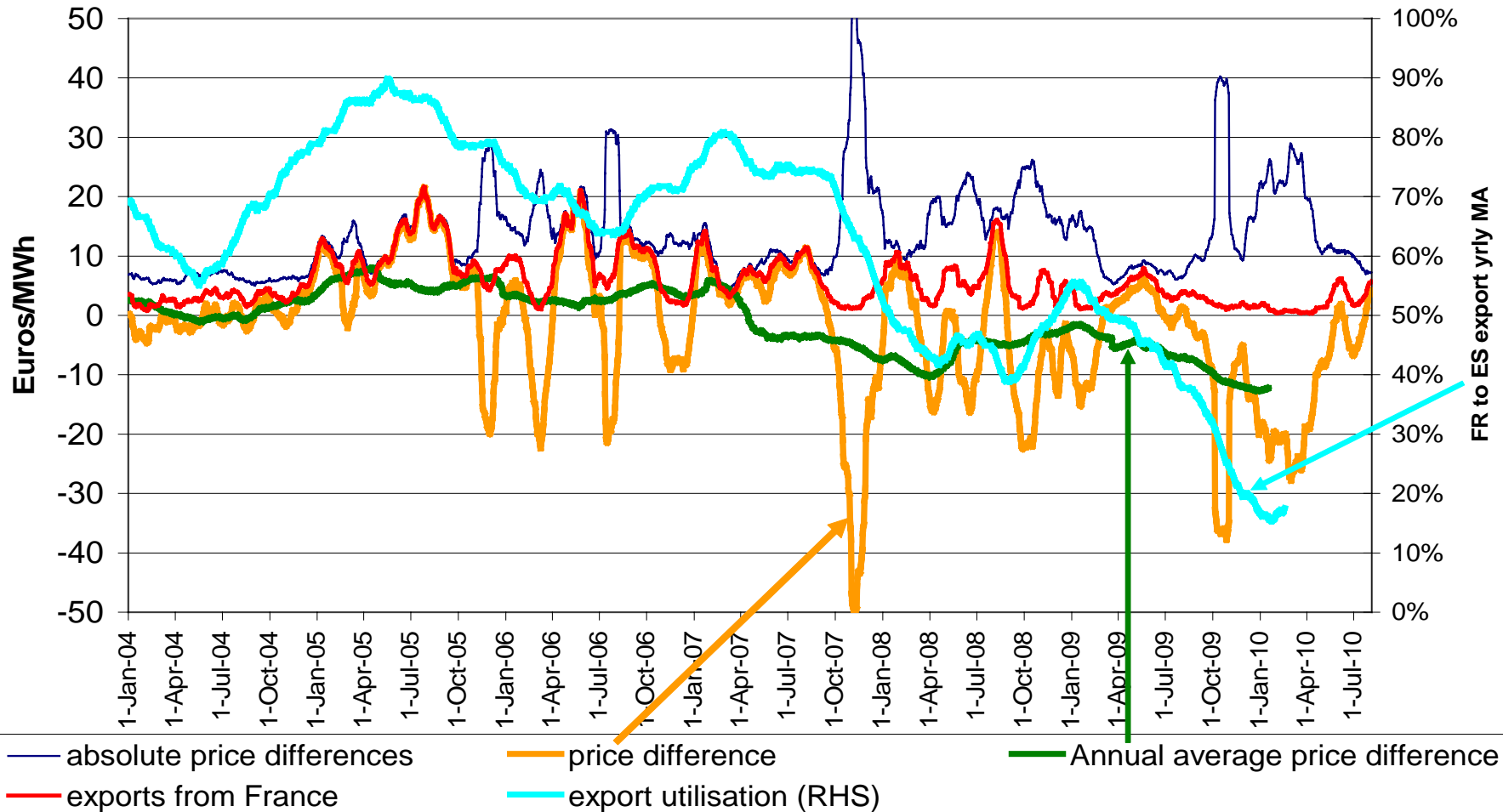
## Appendix

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## Price differences, Spain-France

monthly moving averages of hourly differences



## Trading example: Spain – France in 2006

- 1 yr base contract €50.65/MWh in Spain; €48.13 in France
- But PTR FR→ES worth €8.49/MWh (value of exports only)
  - does this mean  $L_S$  cannot bid for PTR when  $E p_F - E p_S = €2.52/\text{MWh}$ ?
- **No: not if LIC actively trades**
  - $G_F$  has MC €30/MWh, contract to sell to  $L_S$  who holds PTR at €48.13/MWh
  - 19 July 2006:  $p_F = €116.83/\text{MWh}$ ,  $p_S = €55.30/\text{MWh}$ ,  $p_F - p_S = €61.53/\text{MWh}$
  - $L_S$  sells into FR market, profit =  $€116.83 - 48.13/\text{MWh} = €67.87/\text{MWh}$ , releases PTR (value = 0), having paid €8.49/MWh, buys in ES at €55.30/MWh rather than at contract of €48.13/MWh, loss of (€7.17)/MWh,
  - net gain =  $€67.87 - €7.17 - €8.49 = €52.21/\text{MWh}$  on this day
- same as  $L_S$  holding Spanish CfD for €48.13/MWh and one-sided FTR FR→ES for €8.49/MWh



## Contracting *within* a price zone (all prices /MWh)

- Generator G has variable cost €30, sells to L at €40, issues L 2-sided CfD with strike price  $P = €40$
- G offers into PX at €30, L bids at limit price e.g. €9,999
- Spot  $P = €25$ , G does not generate, L buys at €25, L pays G  $€40 - 25 = €15$  on CfD, G makes profit of  $€15 >$  strike price less MC = €10
- Spot price = €50, G generates, sells at €50, L buys at €50, G pays L  $€50 - 40 = €10$  on CfD (can afford to), reducing G's sales revenue to €40 = strike price. Profit = €10
- **Credit risk: L defaults on CfD (contract stranded)**

## Contracting *across* price zones: FTRs (all prices /MWh)

- Generator G in A MC= €30, sells to L in B at €40, issues L 2-sided CfD with strike  $P = €40$ , buys FTR A=>B for €5
- G offers into PX at €30, L bids at limit price e.g. €9,999
- $P_A = €25$ , G does not generate,  $P_B = €35$ ; L buys at €35, L pays G €40-35= €5 on CfD, G collects €35- €25 = €10 on FTR, makes generating profit of €15 > strike price less MC = €10 (less FTR €5)
- $P_A = €50$ , G generates, sells at €50,  $P_B = €45$ , L buys at €45, G pays L €45-40= €5 on CfD, G pays €5 on FTR, G's revenue to €50—5-5=40 = strike price. Profit = €10 (less FTR €5)

**Credit risks: buyer defaults on CfD**

- ATC: available transfer capacity
- CfD Contract for Difference
- FTR financial transmission right
- HHI: Herfindahl–Hirschman Index (measure of concentration)
- IC: interconnector
- ISO Independent System Operator
- MC Marginal cost
- MiFID Markets in Financial Instruments Directive 2004/39/EC
- NRA: National Regulatory Agency/Authority
- PTR: physical transmission right
- PX Power exchange
- SEM Single (or integrated) electricity market
- SFT: Simultaneous Feasibility Test
- TEM: Target Electricity Model
- TSO Transmission System Operator