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Economics of Interconnectors

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E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Definitions

- Interconnection vs. transmission
  - Inter-market vs. intra-market
  - Under jurisdiction of 2+ TSOs

- Why make the distinction?
  - Allocation of costs is difficult
  - Coordination between TSOs (Brunekreeft, 2003)
  - Intra-market constraints often not priced

Merchant investments

- Market based investment
  - Evaluated on the basis of private benefits
  - Arbitrage revenues from trading
  - Capacity may be auctioned

- Features
  - Only feasible with directional flows
  - Transmission constraints priced explicitly

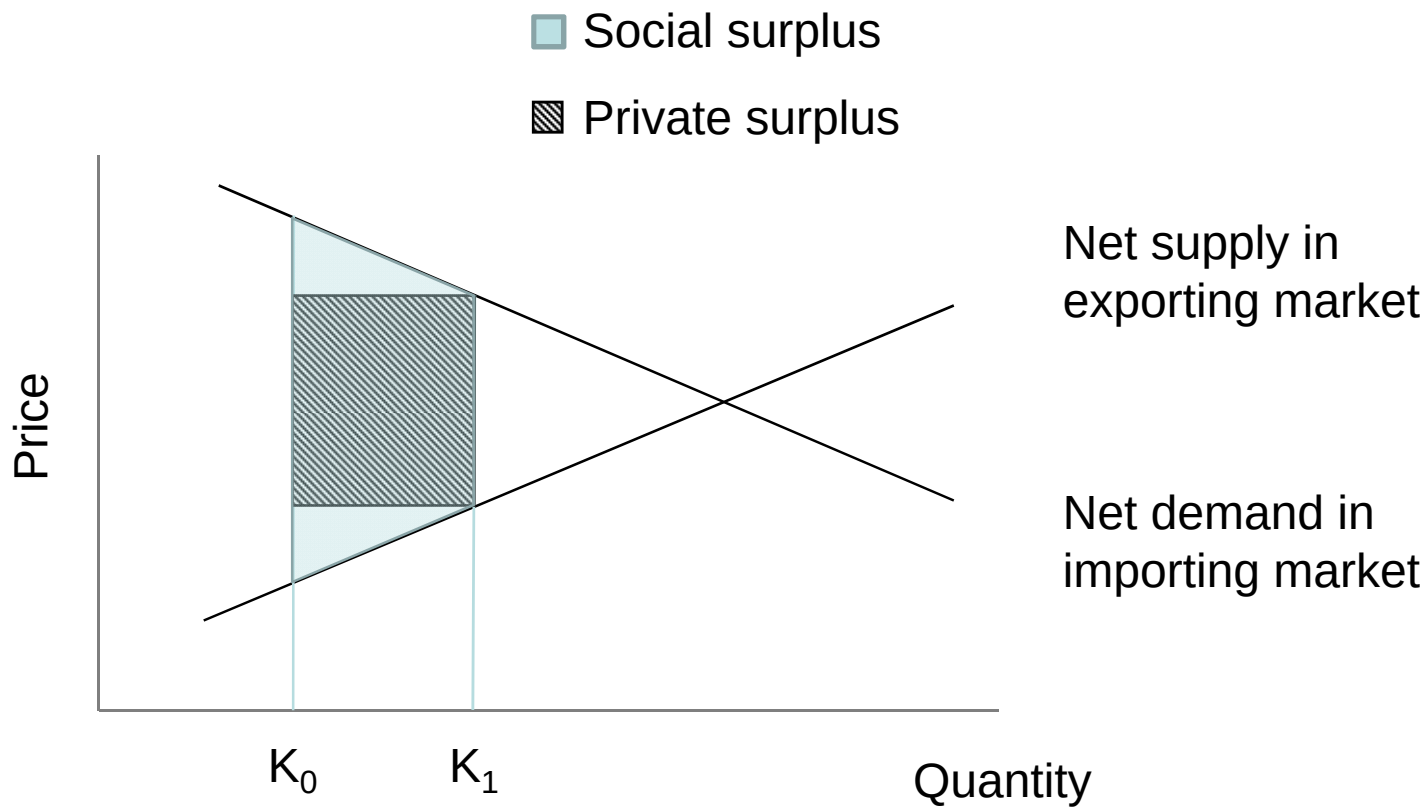
Background

- World wind generation doubling every 3 years
- Wind output is volatile and unpredictable
- Demand is inelastic and predictable
- Difference met with extra peaking gas generation?
- Cheaper to interconnect markets?

Underinvestment concerns

- ‘Lumpiness’ may make interconnection a natural monopoly
- Private incentives to invest in transmission capacity may be below social optimum
- Argument illustrated in Joskow & Tirole (2005)

Lumpiness of investment



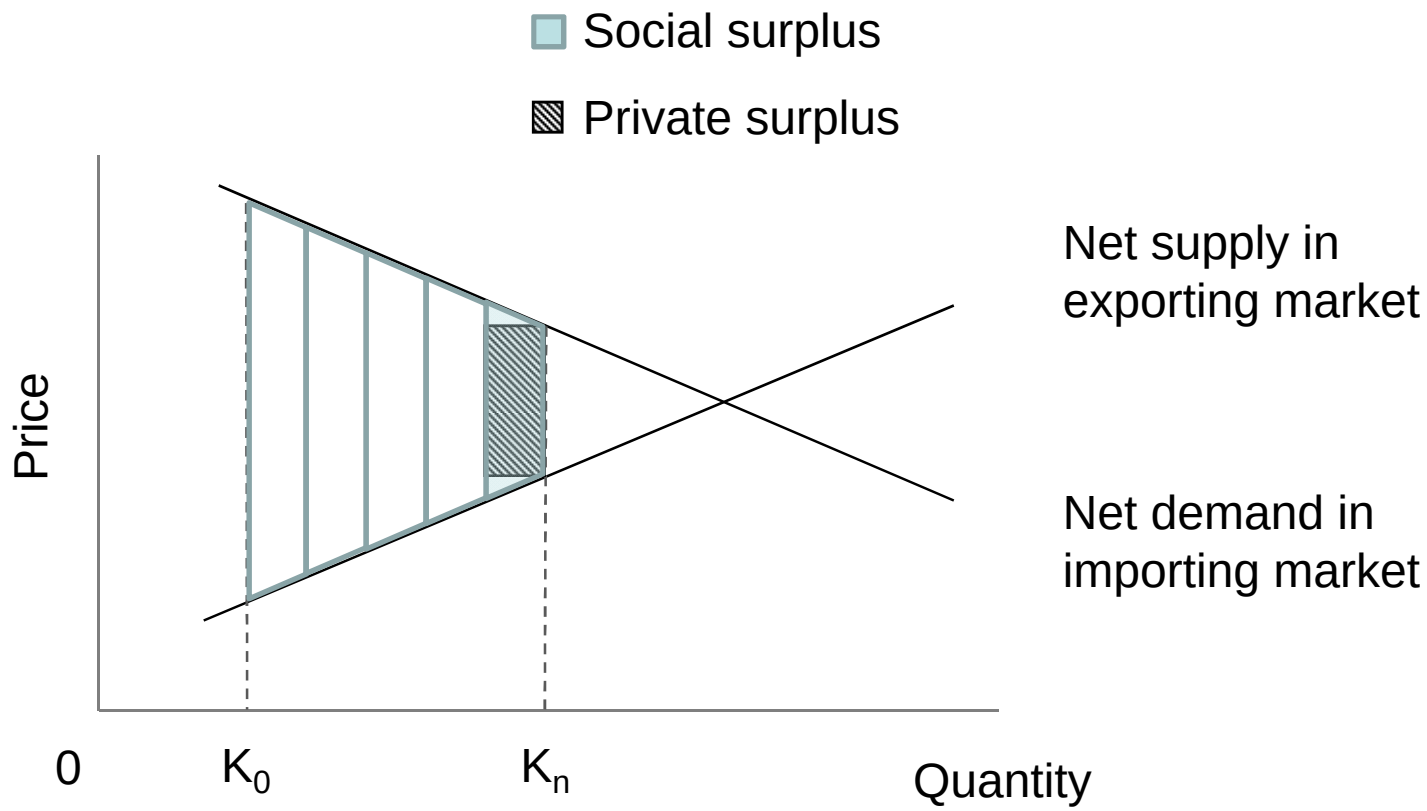
Are interconnectors contestable?

- Is interconnection a natural monopoly?
  - Does fear of moving prices too close lead to under-investment?
- Increment of investment may not be large
  - May have small impact on local prices

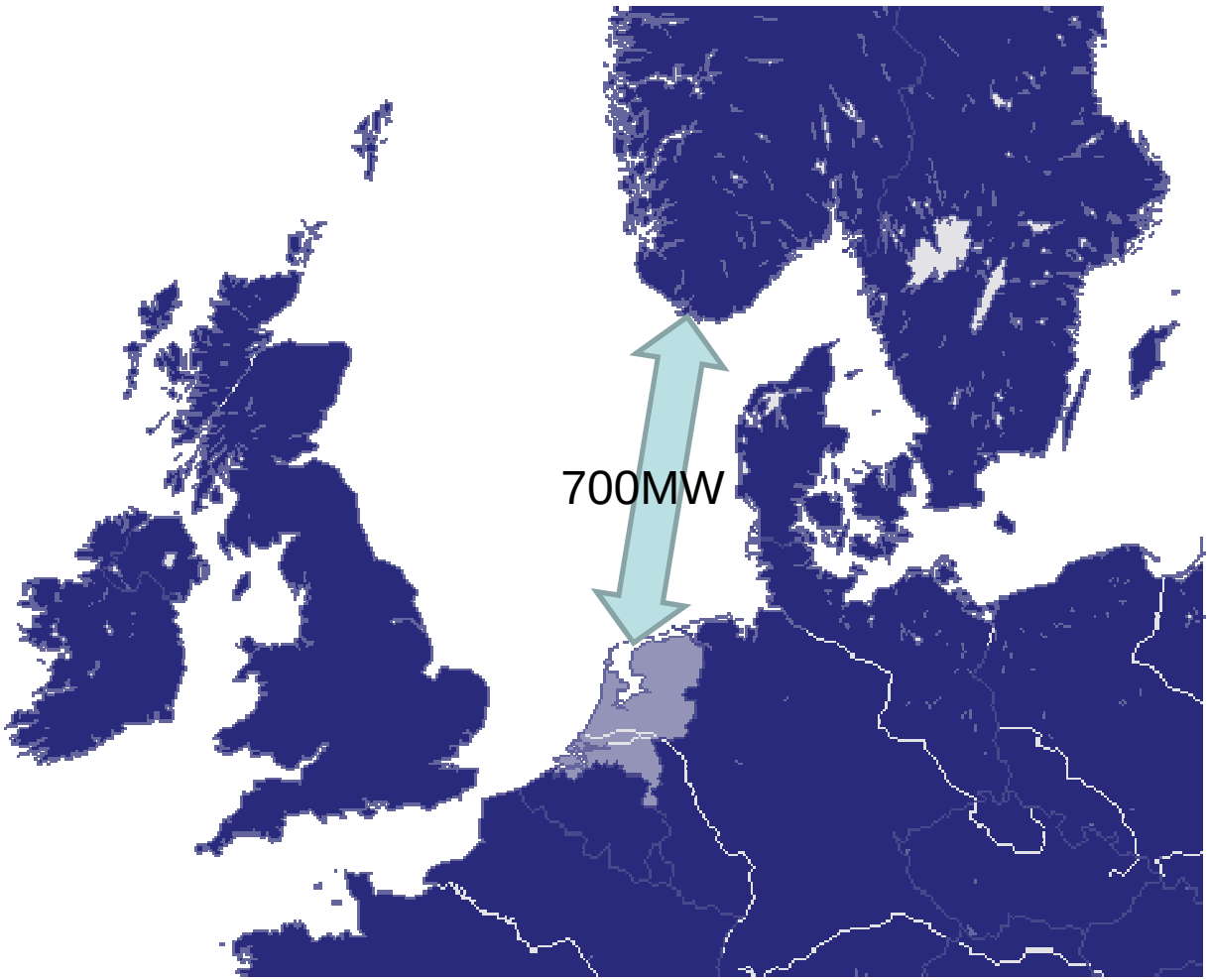
=> Competitive provision of interconnection capacity?

- Consider difference between social and private benefit only for the marginal investor

Competitive investment



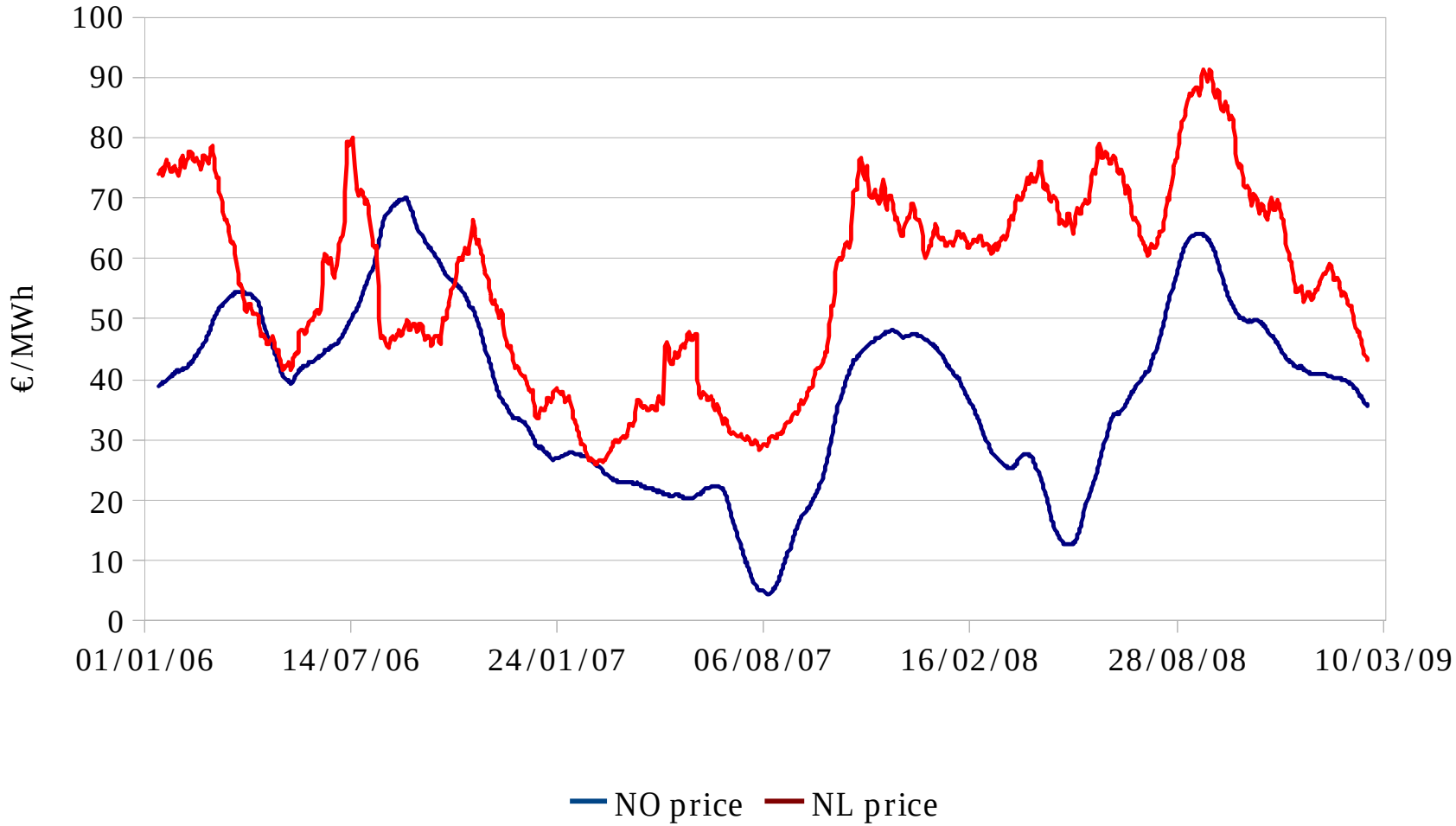
Case Study - NorNed



NorNed description

- DC link with 700MW capacity
- Consists of two 350MW cables
- Total project cost around €600m
- Funded jointly by Statnett and TenneT
- Capacity sold in uniform price auction
- Connected markets are not coupled
- Gate closure times differ by one hour
- Data from 1 Jan 2006 to 12 May 2009

NL and NO prices: moving average



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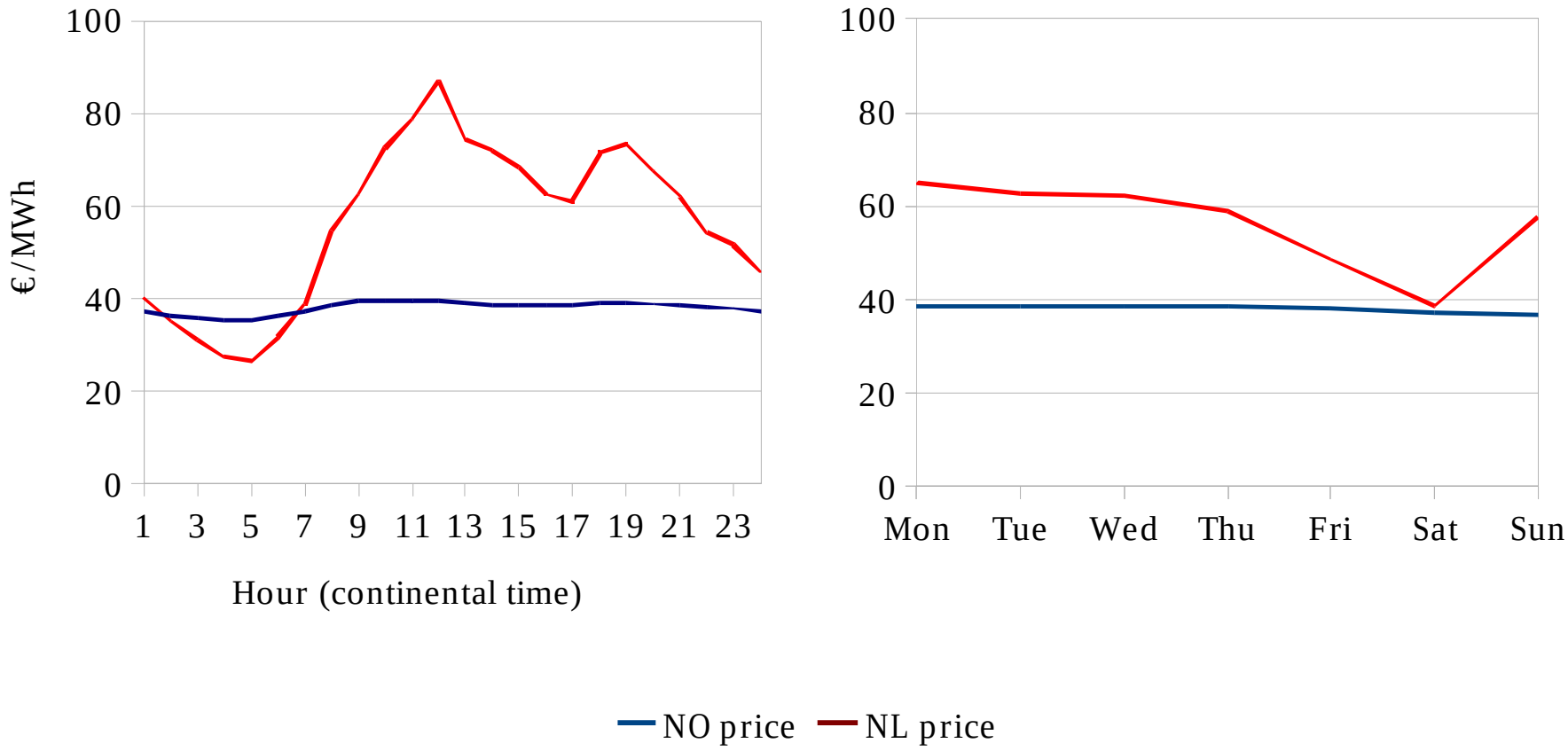
Hourly and daily price differences



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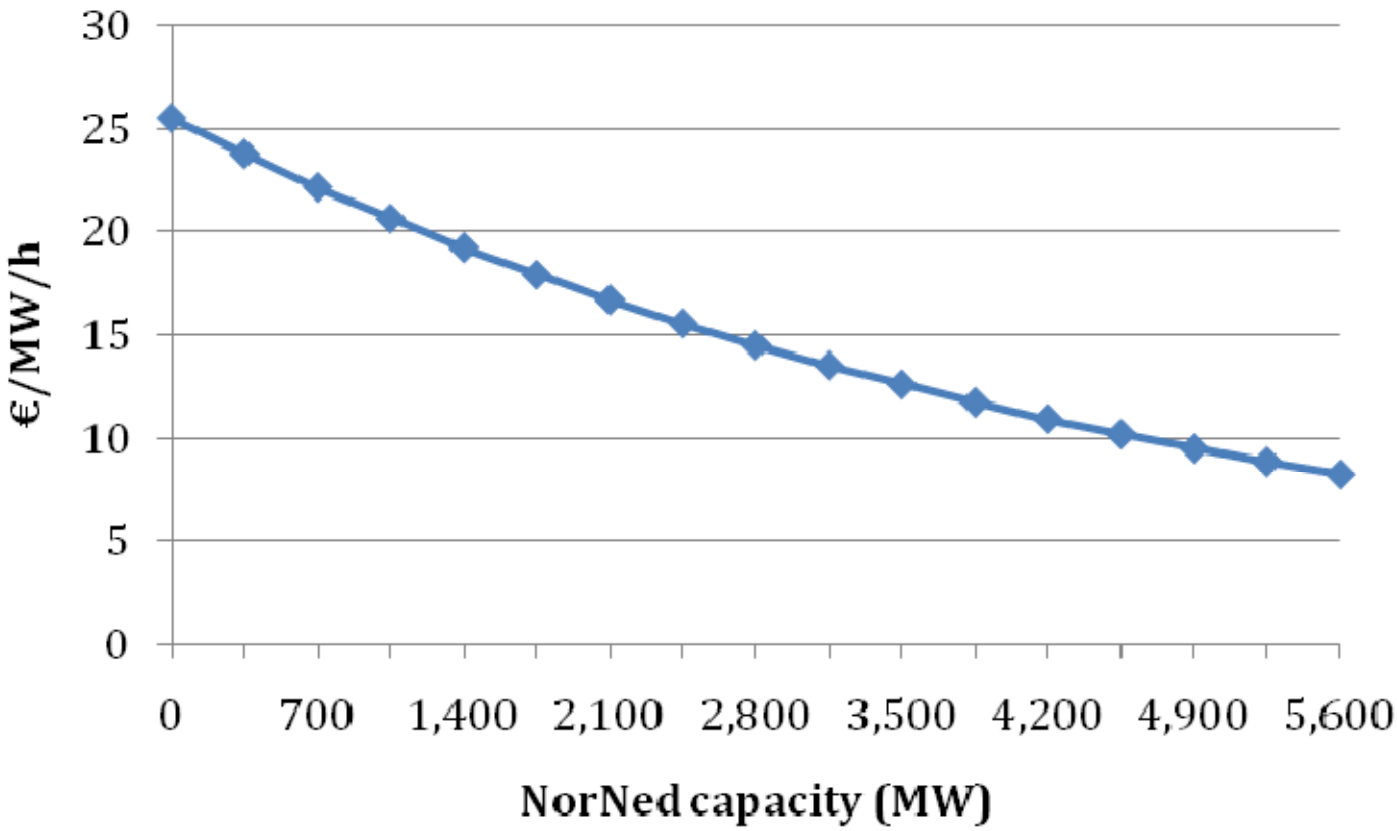
Arbitrage

- Arbitrage on price differences
  - Consistent differences (e.g. time of day)
  - Unexpected differences from stochastic shocks
- Arbitrage expected to reduce price differences
- Feedback into arbitrage profits
- Hydro system can act like a battery

Results

- Effect of 700MW of flows over NorNed
  - 2.6% change in Dutch electricity price
  - 4.2% change in South Norway electricity price
- Expected effect of reservoirs does not materialise
- Demand in both markets is comparable in size
- 700MW represents ~5% of each market

Arbitrage profits



Note: Assuming no transaction costs

Implications for investment

- Investment in increments of 350MW
- €11.5/MW/h gives IRR of 10% for NorNed investment with a 20 year life
- Estimated socially optimal capacity is 3,850MW
- Lumpiness may stop the last 350MW investment
- Difference between socially optimal and profit maximising interconnection capacity <10%

Implications for other interconnectors

- NorNed not a unique investment
- BritNed under construction (1,000MW)
- NL – GB prices Jan 2006 to Mar 2009
  - Difference in mean prices €4.9/MW/h
  - Mean price difference €19.3/MW/h
- Mean price difference ~20% less than NL – NO
- BritNed cable length ~55% less than NorNed
- Financial returns potentially much greater

Thank you