Market Power in the Capacity Market? The Case of Ireland

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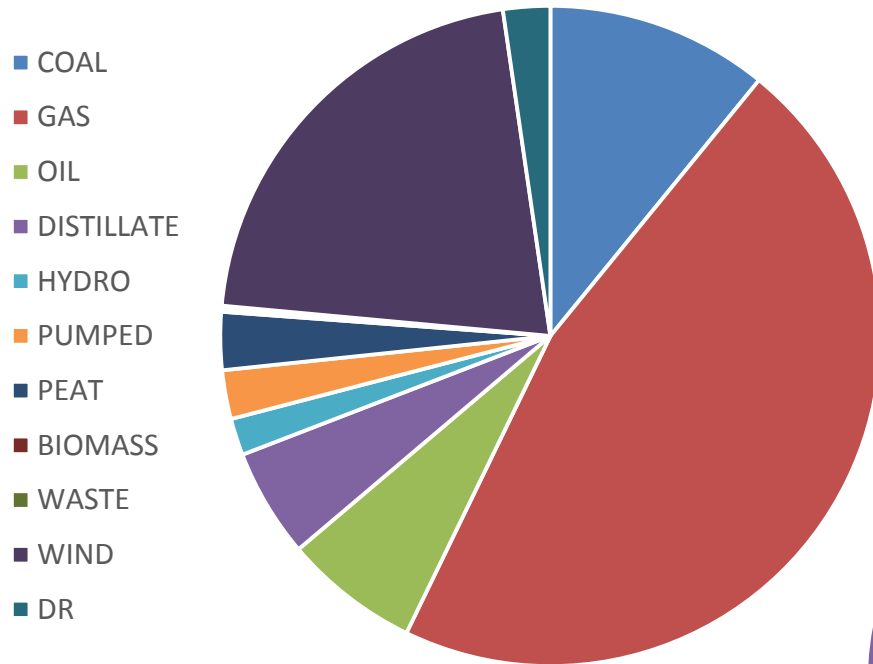
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Background

- The current electricity market in the island of Ireland (Single Electricity Market, SEM) is highly regulated

- There is a redesign process ongoing to make the SEM more competitive and compliant with the European legislation (the EU 3rd package and the Target model)

- A new capacity payment mechanism based on reliability options is to be introduced

- Currently, there is one dominant firm, ESB, in the Irish electricity market, that owns 44 % of the capacity

- There are concerns that the new capacity market will help ESB gain disproportionately by abusing market power in the two markets (electricity and capacity market)

Planned capacity market for Ireland

- An annual uniform price sealed bid multiunit auction
    1. The authority announces the amount of procured capacity based on the estimated demand in the future
    2. Firms bid a quantity-price pair (EUR/kW) for each of their power plant units
    3. Auction clears and the clearing price is paid for all units winning in the auction

- In response for the capacity payment generators commit to pay the difference if the price in the electricity market exceeds a pre-defined strike price (500 EUR/MWh used here) = effectively accept a price cap

- In short: electricity generators give up peak load pricing but get an upfront payment instead

SEM summary statistics

- COAL
- GAS
- OIL
- DISTILLATE
- HYDRO
- PUMPED
- PEAT
- BIOMASS
- WASTE
- WIND
- DR

Total generation capacity (wind excluded) by firm in 2015

- ESB
- SSE
- AES
- Viridian
- NIE PP
- Bord Gais
- Tynagh
- Aughinish Alumina
- Other

Total registered generation capacity in SEM (12225 MW) by fuel type in 2015
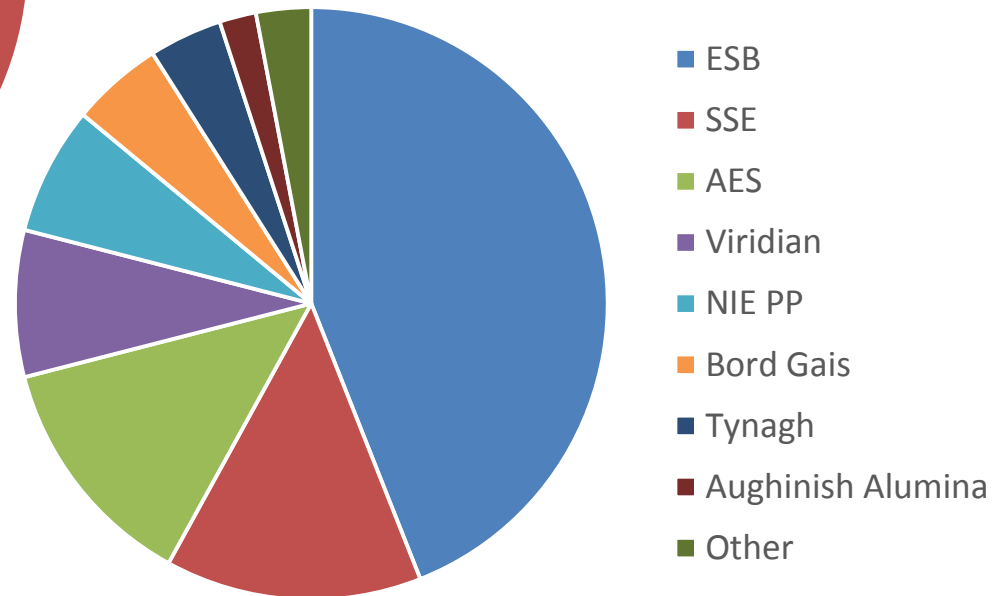
Note that the highest load in 2015 was less than 6500 MW!!

Main research questions

- Can ESB use its dominant position to abuse market power in the capacity market?

- What would be ESB's main strategy to execute market power?

- What is the end user cost of ESB's strategic behaviour?

- How to mitigate market power?

Model

- Electricity market
  - Cournot model, 7 firms with a competitive fringe
  - Hourly resolution
  - Electricity market competitiveness is varied adjusting the share of forward contracts in the electricity market
  - Costs based on observed bids in SEM
- Capacity market
  - Multiunit auction model, firms bid a bid curve
  - Electricity market is nested inside the capacity market, bids in the capacity market depend on long-run profits in the electricity market
- ESB maximizes total profits in the two markets

Competitive benchmark in the capacity market

- Competitive benchmark in the capacity market is defined here as a least-cost aggregate capacity supply curve so that all units in the market are profitable and the marginal unit just breaks even

- Market power is measured as a deviation from the competitive benchmark

- The two extremes w.r.t. the electricity market competitiveness are studied
  - competitive market with 100 % forward contracts
  - non-competitive market with 0 % forward contracts
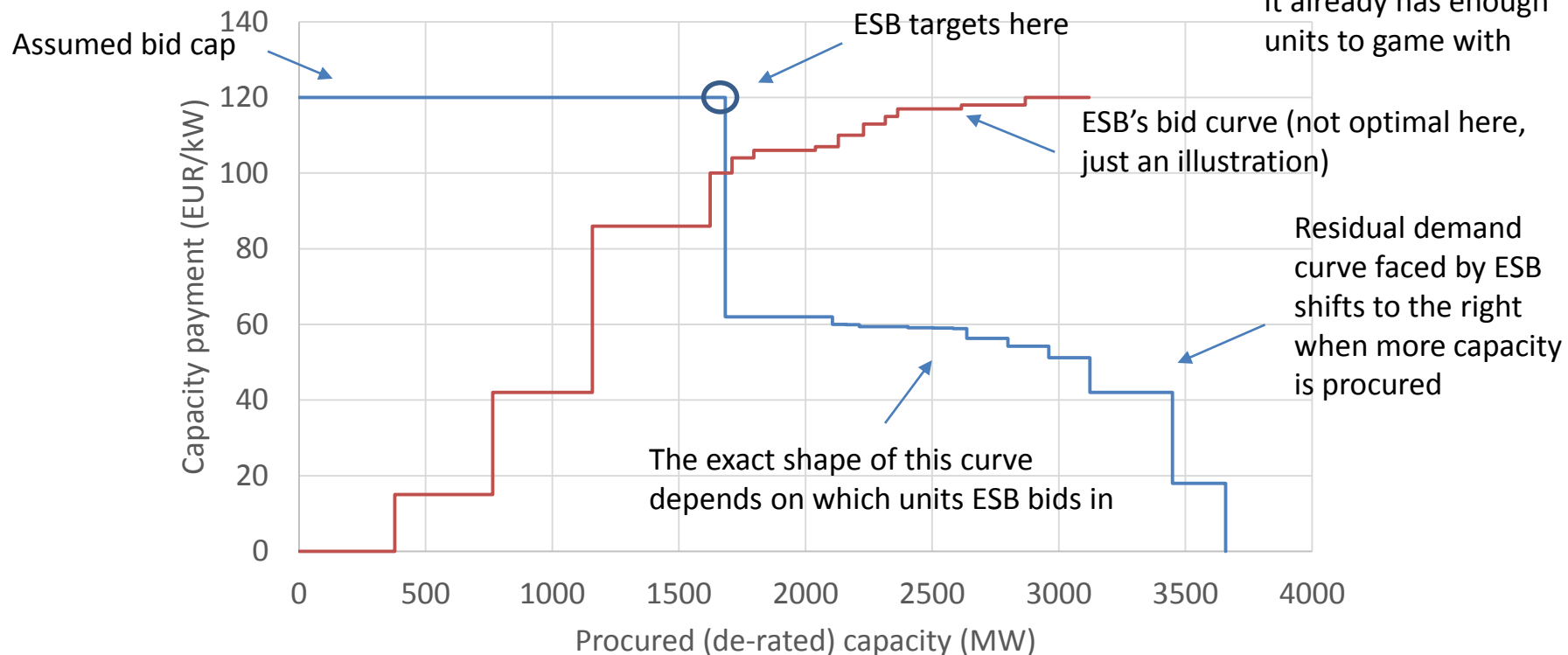 (a realistic value is about 60-80 %)

Competitive benchmark in the capacity market
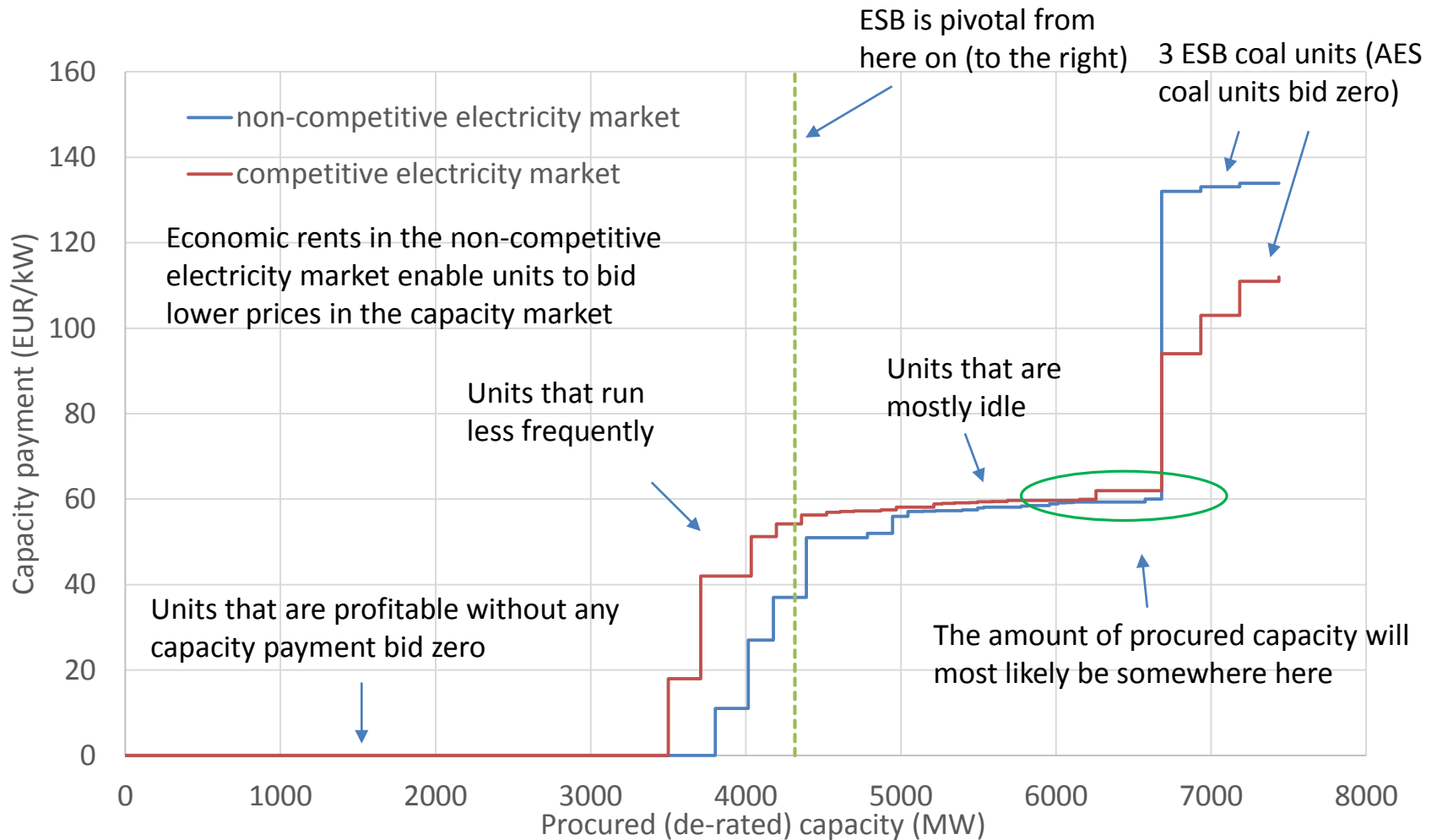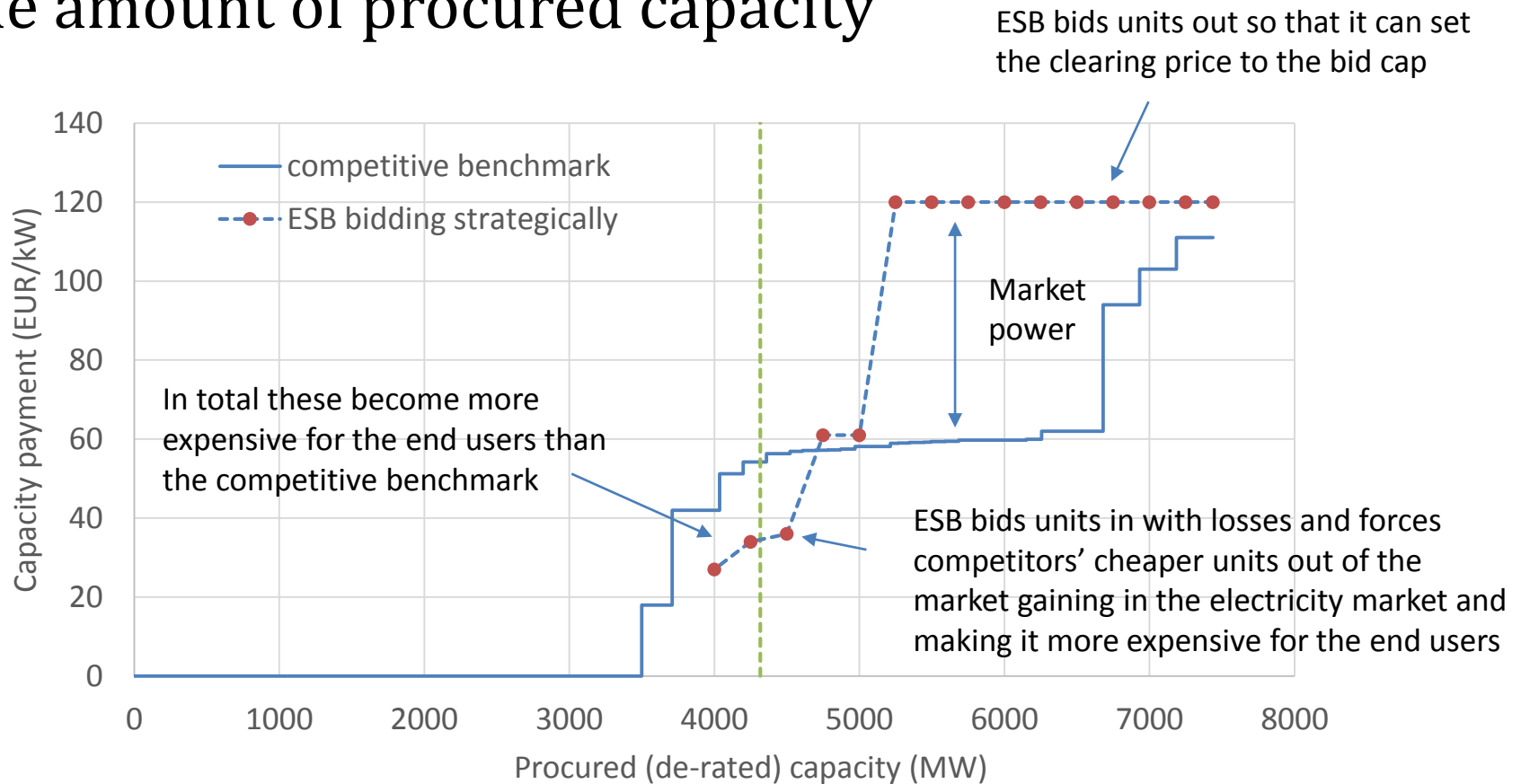
Residual demand curve for ESB

- If ESB is pivotal it faces very inelastic residual demand curve and wants to withhold capacity so that the auction clearing price equals the bid cap

ESB would not invest in new units to deter entry, it already has enough units to game with

Assumed bid cap

ESB targets here

ESB's bid curve (not optimal here, just an illustration)

Residual demand curve faced by ESB shifts to the right when more capacity is procured

The exact shape of this curve depends on which units ESB bids in

Capacity payment (EUR/kW)

Procured (de-rated) capacity (MW)

Strategic aggregate capacity supply curve

- If there is no entry and the electricity market is fully competitive ESB's strategy is two-fold depending on the amount of procured capacity

ESB bids units out so that it can set the clearing price to the bid cap

Market power

In total these become more expensive for the end users than the competitive benchmark

ESB bids units in with losses and forces competitors' cheaper units out of the market gaining in the electricity market and making it more expensive for the end users

Capacity payment (EUR/kW) — competitive benchmark — ESB bidding strategically
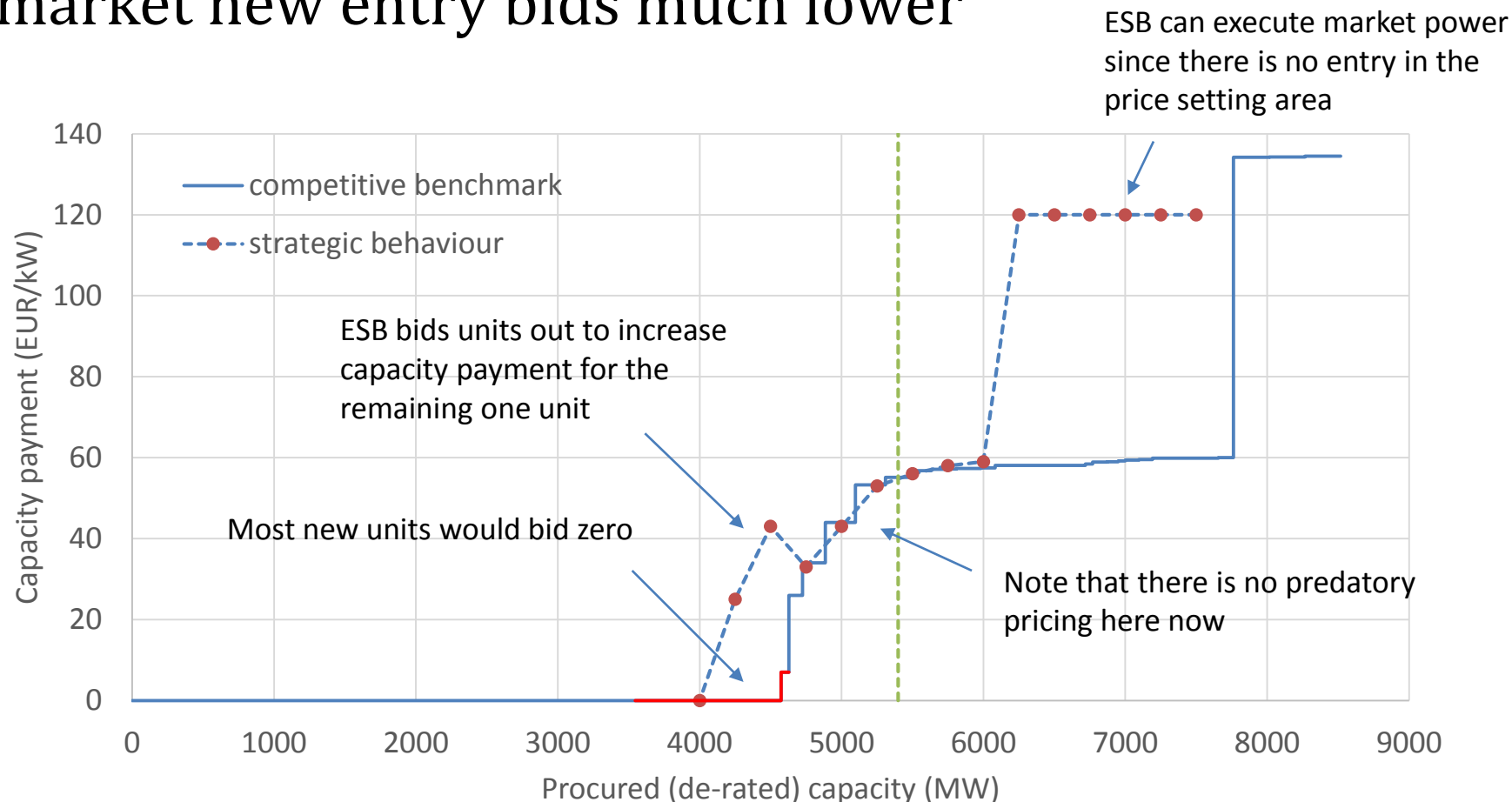
Procured (de-rated) capacity (MW)

1082 MW of new entry, competitive electr. market

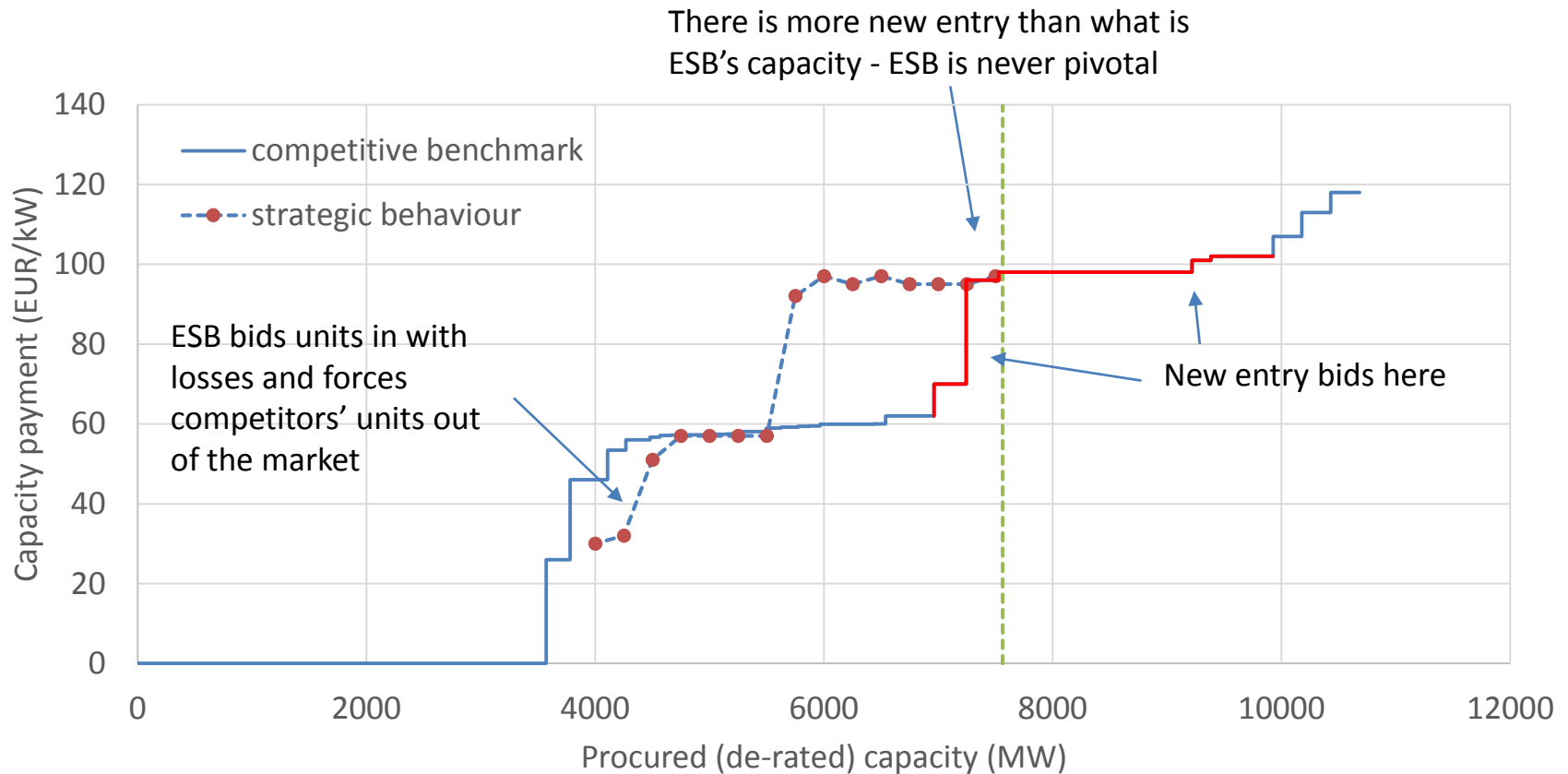- If there is new entry (5 units) in the capacity auction some market power is mitigated
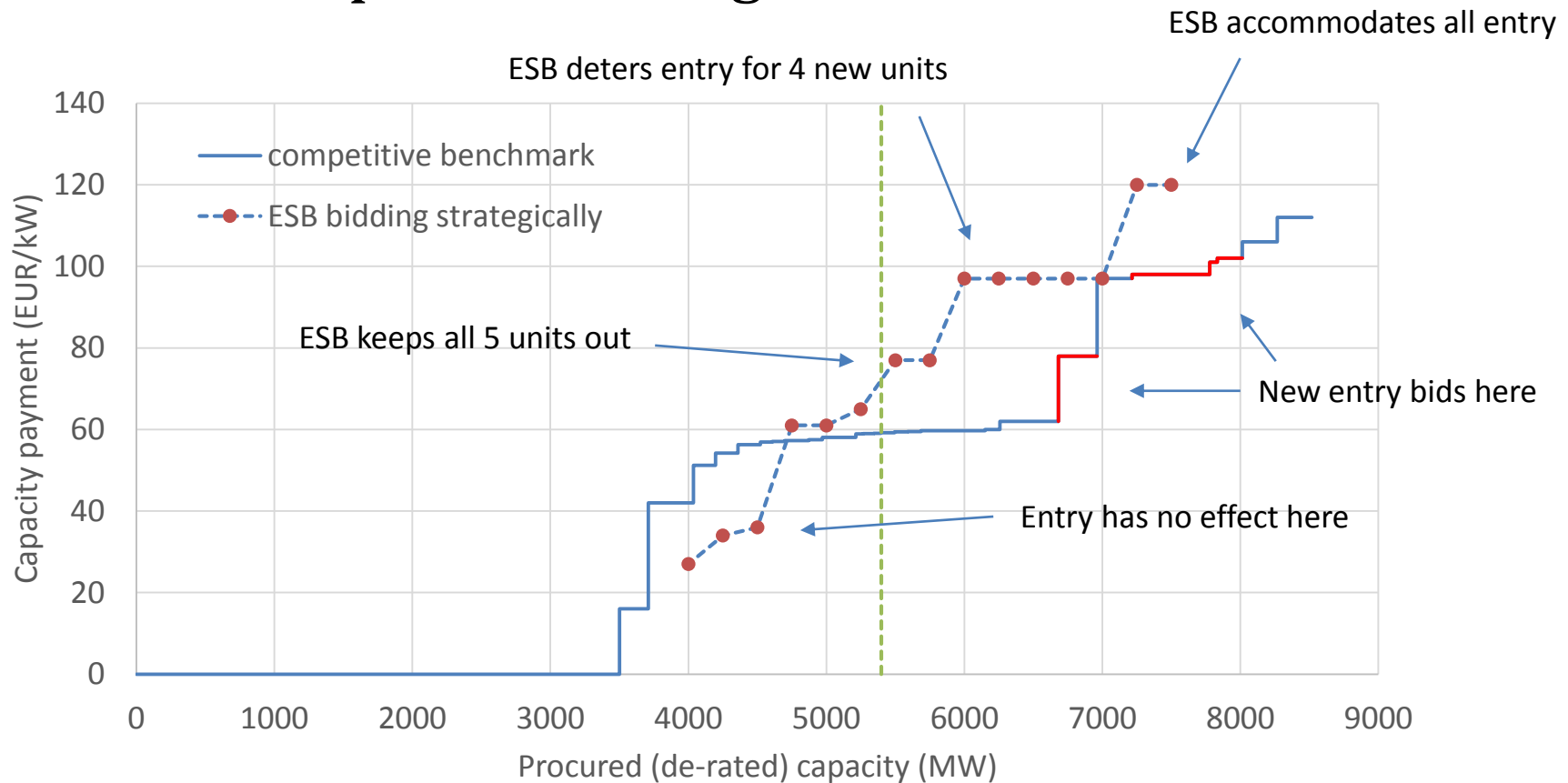
1082 MW of new entry, **non-competitive** el. market

- If there are high economic rents in the electricity market new entry bids much lower
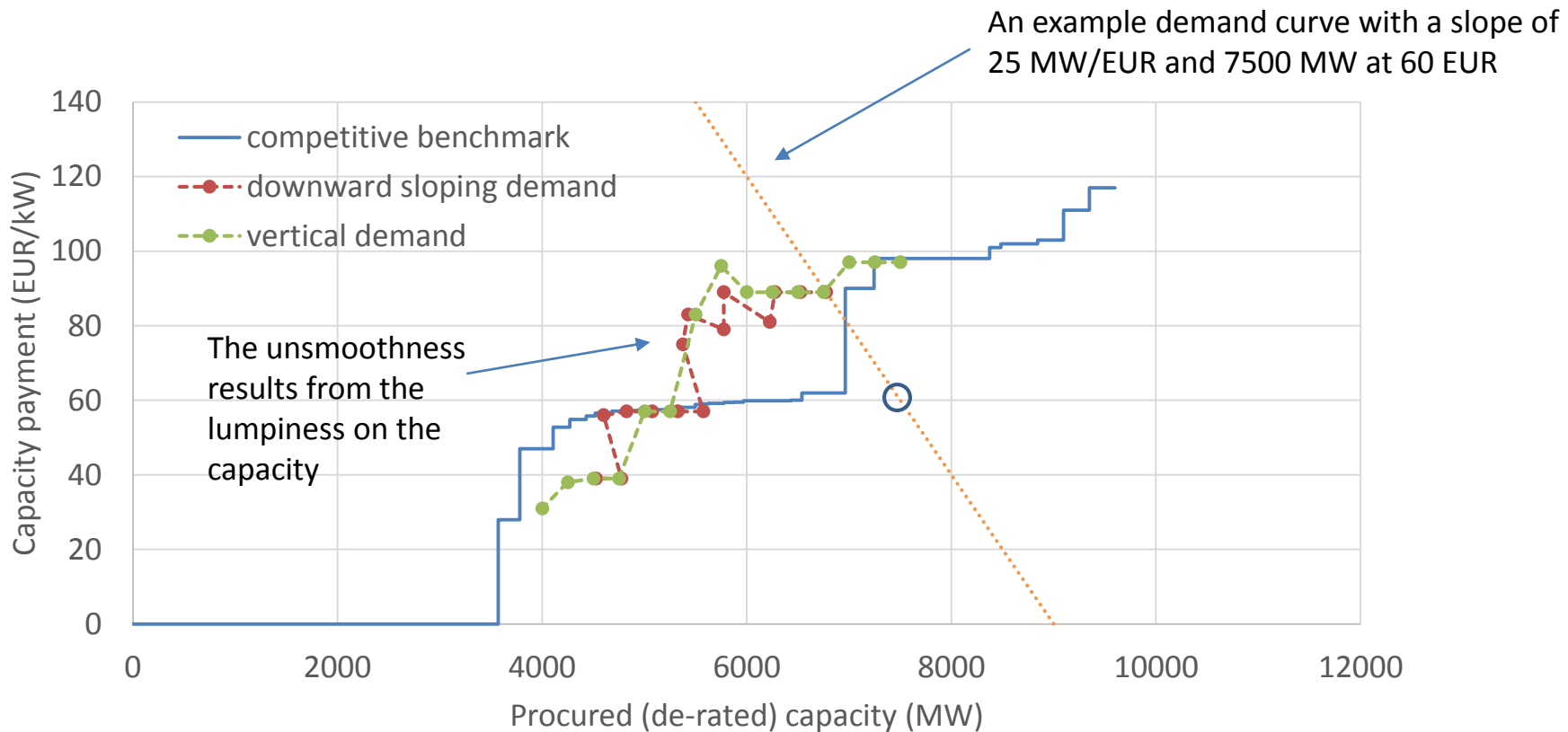

ESB can execute market power since there is no entry in the price setting area

ESB bids units out to increase capacity payment for the remaining one unit

Most new units would bid zero

Note that there is no predatory pricing here now

3246 MW of new entry, competitive electr. market

- Increasing the amount of entry does not necessarily mitigate market power more

There is more new entry than what is ESB's capacity - ESB is never pivotal

ESB bids units in with losses and forces competitors' units out of the market

New entry bids here

www.eprg.group.cam.ac.uk

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Downward sloping capacity demand curve

- A common way to make the residual demand curve more elastic is to use downward sloping capacity demand curve (instead of vertical)

An example demand curve with a slope of 25 MW/EUR and 7500 MW at 60 EUR

The unsmoothness results from the lumpiness on the capacity

Legend:
- competitive benchmark
- downward sloping demand
- vertical demand

X-axis: Procured (de-rated) capacity (MW)
Y-axis: Capacity payment (EUR/kW)

Total costs for the end users

- With 120 EUR bid cap the capacity market markup is at maximum about 14 – 18 % of total costs for end users (up to 450 million EUR)

- The amount of difference payment is negligible

Total cost in the electricity market

Total cost in the capacity market
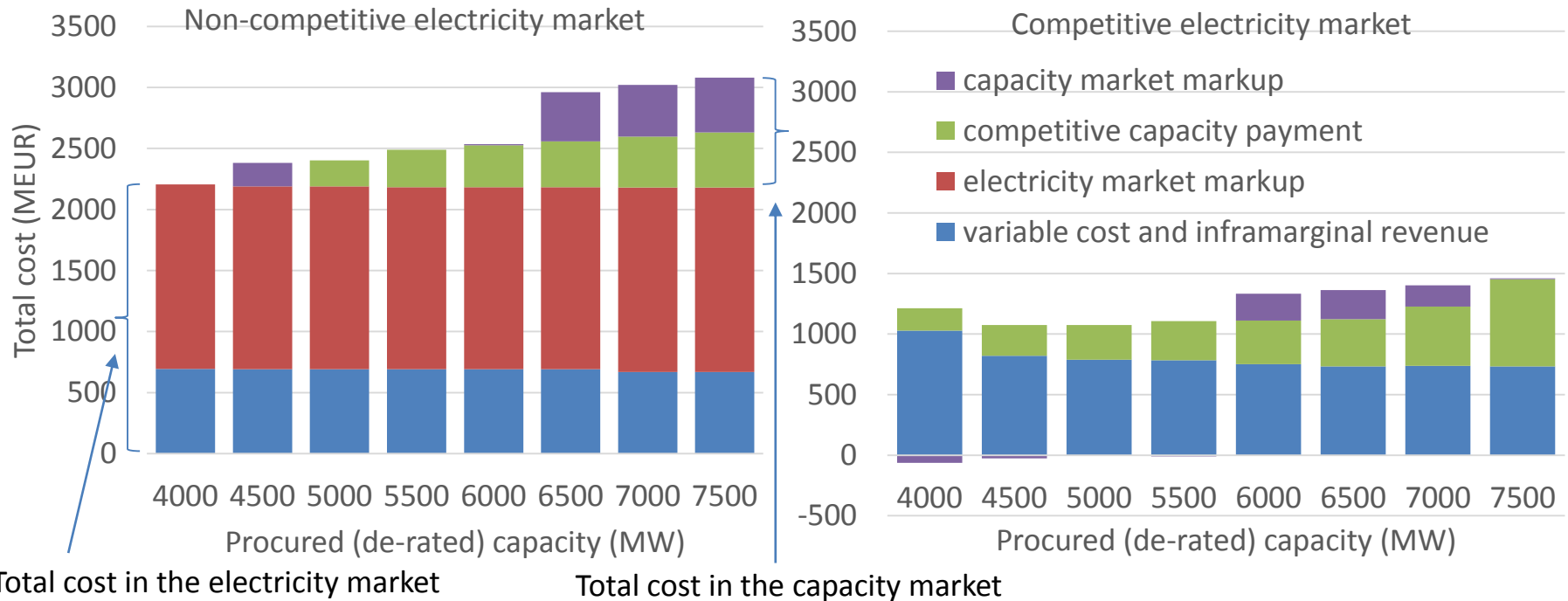
Conclusions

- The main strategy for ESB in the capacity market would be economic/physical withholding of capacity to make the clearing price equal the bid cap

- The amount of new entry does not mitigate market power much if the entry is not bidding in the price setting area

- The competitiveness of the electricity market affects significantly how the new entry bids

- Market power in the capacity market can be relatively costly for end users

- No simple solution how to mitigate market power

- On average, more competitive electricity market means more competitive capacity market

- Residual Supply Index (RSI) is not a perfect metrics for market power