EFET European Federation of Energy Traders

Co-optimisation

26 October 2023, EBSG, Stefan Janson

Key points

- Since the early stage of drafting of the Electricity Balancing network code, we have questioned the concept of reservation of cross-border transmission capacity by the TSOs for balancing purposes.

- By allocating transmission capacity specifically for use in the balancing timeframe, TSOs remove available capacity from the allocation in the other timeframes

- Application of the co-optimization process is voluntary according to the EBGL.

- The bidding complexity with co-optimization is drastically increased. This statement is to be illustrated in these slides.

- The increased complexity holds for all units with any sort of dependency between previous and future generation schedules (power output, energy level), most prominently with energy restrictions (hydro, battery, DSM, …).

- The exponential increase in bidding complexity can neither be tackled by the auction algorithm, nor can market participants handle the multitude of market outcomes to be considered when preparing their bids. Both aspects are negatively impacting the potential efficiency gain by co-optimization.

Co-optimisation project prioritisation

The need to refocus

1 Without any clear idea of what the actual bidding complexity would look like ("bidding guide"), any further implementation and preparation steps have little value.

2 Co-optimization might prevent several units that are crucial for balancing services to participate in both the DA and the Balancing Capacity Market (BCM).

3 Co-optimization should be part of the projects prioritisation discussion between market participants, NEMOs, TSOs and ACER

Co-optimisation for bidding

Co-Optimization Workshop in 2022:

- "BSPs take into account auction results of preceding market timeframes. Subsequent bids can be adapted to previous market results."

- "With a single gate closure time, we see severe restrictions for bidding Limited Energy Resources (e.g. hydro). Those are currently offering a significant fraction of the balancing services. In current sequential process, the LER's BSPs can adjust their DA bids in order to comply with the balancing capacity results. MW and MWh are not interchangeable for LERs, as reservoir restrictions need to be respected by the generation schedules."

- "The considerations that are currently done in a reactive manner would all need to be included into one super-strategy ('policy' in stochastic optimization terminology). In order to replicate the current multi-stage decision process, market participants would need to provide an infinite number of „if-then-clauses".
  -> the complexity involved in the sequential bidding process cannot be captured by the proposed linking options nor can it be tackled"

## Simultaneous bidding BCM and DAM with storage units

- Current energy level (reservoir level, state of charge) has an impact on bidding decisions for subsequent MTUs
  - Generation/consumption schedules have to comply with capacity restrictions
- Uncertainty of activation is causing additional limitations on available flexibility for trading
  - Activation uncertainty can partially be managed by energy price and (expensive) mitigation measures (set-point)

Sequential bidding as an example

- Reduced example for DAM/BCM bidding
  - 3 MTUs for DAM and BCM
  - Price expectations (DAM: €/MWh, BCM: €/MW)

MTU	DAM	BCM
1	1	2
2	3	2
3	5	1

  - Storage initially empty, capacity 1 energy unit
  - Assumption: activation probability can be restricted to 1/3 by selection of energy price and/or reaction
  - Illustration of DAM/BCM bidding and storage operation
    - BCM bids for negative regulation in all MTUs
    - Schedule: DAM bid (- consumption, + generation)
    - MIN: minimum energy level, with given activation uncertainty
    - MAX: minimum energy level, with given activation uncertainty
    - Different scenarios for every BCM outcome
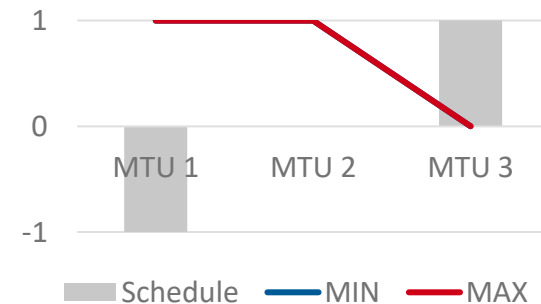
Sequential bidding example

- ## Accepted BCM bids in at most one MTU
  - With the assumption on restricting the activation probability per MTU below 1/3, DAM bidding is still feasible in MTUs without accepted BCM bids

BCM: -	BCM: MTU 1	BCM: MTU 2	BCM: MTU 3
Revenue: 4 DAM: -1 + 5 = 5 BCM: 0	Revenue: 3 DAM: -1.5 + 2.5 = 1 BCM: 2	Revenue: 4 DAM: -0.5 + 2.5 = 2 BCM: 2	Revenue: 3 DAM: -1 + 3 = 2 BCM: 1

Sequential bidding example

- Accepted BCM bids for 2 or 3 MTUs
  - No DAM activity is possible with accepted BCM bids for more than 2 MTUs. In scenario "MTU 2+3" a DAM bid of -0.33 could be considered.

BCM: MTU 1+2	BCM: MTU 1+3	BCM: MTU 2+3	BCM: MTU 1-3
Revenue: 4 DAM: 0 BCM: 4	Revenue: 3 DAM: 0 BCM: 3	Revenue: 3 DAM: 0 BCM: 3	Revenue: 5 DAM: 0 BCM: 5

Conclusion and consequences

The need to refocus

- Co-Optimization bidding for storage units
  - Example was highly simplified: 3 MTUs, no portfolio, at-market DAM bids
  - Every outcome of BCM for all MTUs requires a specific generation schedule, i.e. DAM bid

- Consequences for co-optimization bidding
  - Inter-MTU links required for all MTUs and all products
  - Highly complex conditional bids necessary to generate feasible auction results
  - Bidding complexity not manageable for BCM/DAM market participants
  - "**Market participants will need to reduce the offered volumes to account for the uncertainty involved**. The feature of iteratively offering all of the previously unused capacity is lost." (see EFET responses)