



# Co-optimisation

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20/10/2021

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# Co-optimisation

## Process organization

- **One step approach**
  - This approach truly optimises at the same time the economic surplus of both BCMs and DAM, including all products, requirements and constraints
  - Pros: First best in terms of optimality, welfare, pricing and consistency.
  - Cons: Highly challenging in terms of scalability, performance and time to implementation. Also risks on SDAC operations
  - *It represents the enduring solution, but hard to be delivered in the short term.*

# Co-optimisation

## Process organization

- **Two-step approaches**
  - To handle the complexity and achieve adequate performance, the process could be split in several steps (“divide-and-conquer” principle). In the first step, CZC (cross zonal capacity) is split between BCMs and DAM, with BCMs and DAM orders and requirements included in a simplified way, later these markets are solved separately with the information provided by CZC split. Several sub-options:
    - Which aspects are simplified: reqs, constr, products?
    - What does it come first: BCMs or DAM?
    - Which algorithm is used for CZC split: Simplified version of Euphemia or a different algorithm?
  - **Pros: less challenging for scalability, shorter time for implementation**
  - **Cons: second best in terms of optimality, risks of inconsistencies from the 2 steps (Once solved the first step, may the second step fall into infeasibilities?), potentially higher impact on operational timings**
  - **Suited for early implementation and also for MPs to gather experience**

# Co-optimisation

## Process organization

- **Flow based**
  - Whatever option is selected, one of the most challenging parts is solving the support of flow-based in combination of co-optimisation: for any usage of matched balancing orders in BCMs, it should be guaranteed that the solution provided in DAM will always respect all the requirements, specially for those that link several periods (e.g. ramping limits) or groups of topological elements (e.g. line sets).

# Co-optimisation

## Linking

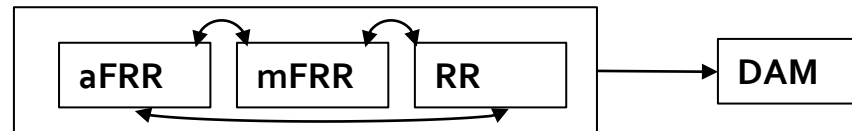
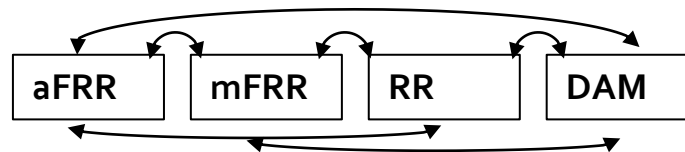
- **Unilateral vs Multilateral**

- **Unilateral:** Unilaterally linked bids can be transferred from one market to the next market in case the bid was not accepted due to a higher absolute bid price than the marginal price of the prior market. Hence this approach comes with a predefined prioritisation of the different market clearings.
- **Multilateral:** Multilateral cross-product linking of bids waives the prioritisation of a market and clears each market according to a maximisation of the total surplus of all markets combined. The allocation of a bid to a specific market is solely based on maximising the economic surplus of all markets including the seller surplus, the buyer surplus and congestion rents.

# Co-optimisation

## Linking

- **Linking and options**
  - One step approach
    - This is the only approach capable of supporting full multilateral linking between BCMs and DAM
  - Two-step approaches
    - Support multilateral linking only between BCMs
    - These approaches support only unilateral linking from BCMs towards DAM



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