Cross-Border Balancing Cooperation in the Alpine Region: Benefits and Challenges

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Agenda

1. Motivation

2. Setting

3. Model Structure

4. Results
Motivation

- Balancing capacity/energy is used by TSOs to balance the electricity system when positive or negative deviations from the scheduled production or consumption are occurring.

- Increasing share of fluctuating renewable energy sources could lead to an increasing amount of necessary balancing capacity.

- Continuous growth of intermittent share requires further actions as auction timing is limited.

- The new Network Code on Electricity Balancing by the ENTSO-E fosters cross-border exchange of balancing services with the objective to lower overall costs:
  - Harmonization of electricity balancing rules
  - Cooperation by imbalance netting, joint activation and joint reservation of reserves
  - IGCC allows for imbalance netting between German TSOs and different neighboring TSOs.

→ We want to quantify the benefits of cooperation on balancing markets.
Setting

- We want to quantify the benefits of cooperation on balancing markets
  - Regarding the influence of balancing services on total system cost
  - Distributional effects of increased international cooperation

- Our case: Cooperation between Austria, Germany, and Switzerland
  - Different generation portfolios (Hydro in AT & CH, fossil in DE)
  - Good interconnection

- Scenario dimensions:
  - Different levels of cooperation
    - No Cooperation
    - Cooperation: Joint procurement of secondary and tertiary reserves with a common merit order list, allowing interconnector reservation to exchange balancing services
  - Anticipation of reserve activation costs
Model Structure

- Cost minimization unit-commitment model with hourly resolution, 53 x 168 hours
- Block sharp representation of power plant portfolios
- NTC transmission constraints between AT, CH, DE
- Fixed import and exports for other neighboring countries’ cross border interaction
- Two-step model: 1) reservation and 2) reserve activation
- Optional: Anticipating the cost of activated reserve volumes

Input:
- Demand (spot/reserve)
- PP characteristics
- RES

Optional:
- Imbalance probability

RESERVATION

Spot market:
Cost minimal generation and reservation

Pre-solve:
- Storage boundaries

ACTIVATION

Real-time market:
Cost minimal activation of reserves

- Generation schedule
- Reserve Commitment

Output:
- Realized Imbalances

Input:
- Demand (spot/reserve)
- PP characteristics
- RES

Optional:
- Imbalance probability

Pre-solve:
- Storage boundaries
Results 1:

- Reserve provision cost for the Alpine Region can be reduced by 32% from 119 million € to 79 million € by a joint reserve procurement.

- These costs are much lower than current real balancing cost due to:
  - No strategic behavior included
  - Pessimistic assumptions on CHP must run constrains
  - Optimistic assumptions on CHP power plant flexibility
  - No block biddings and no portfolios
  - Hourly resolution

- Prices for SRL in Germany:
Results 2: Contracted Negative Secondary Reserves [MW*h]
Results 3: Cross-Border Balancing Exchanges with DE [MW]
Conclusion

- Cross-border exchanges of balancing capacity leads to significant cost reductions

- Cost reductions are dependent on the generation portfolios of the participating countries

- Austria and Switzerland seem to be able to provide relatively cheap balancing capacity

- Despite the currently very high prices in Austria

- Assumptions regarding future market design are crucial
  - Bidding periods / Interconnector reservation

- Hypothesis: Cross-border exchanges are only beneficial with flexible interconnector reservation

Thank You for Your Attention!

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Positive Secondary Control Calls in Germany 2013

![Graph showing call frequency vs MW](image-url)

- Observed
- Block Approximation