Dimensioning and procurement of reserves in the context of an evolving energy mix and European harmonisation

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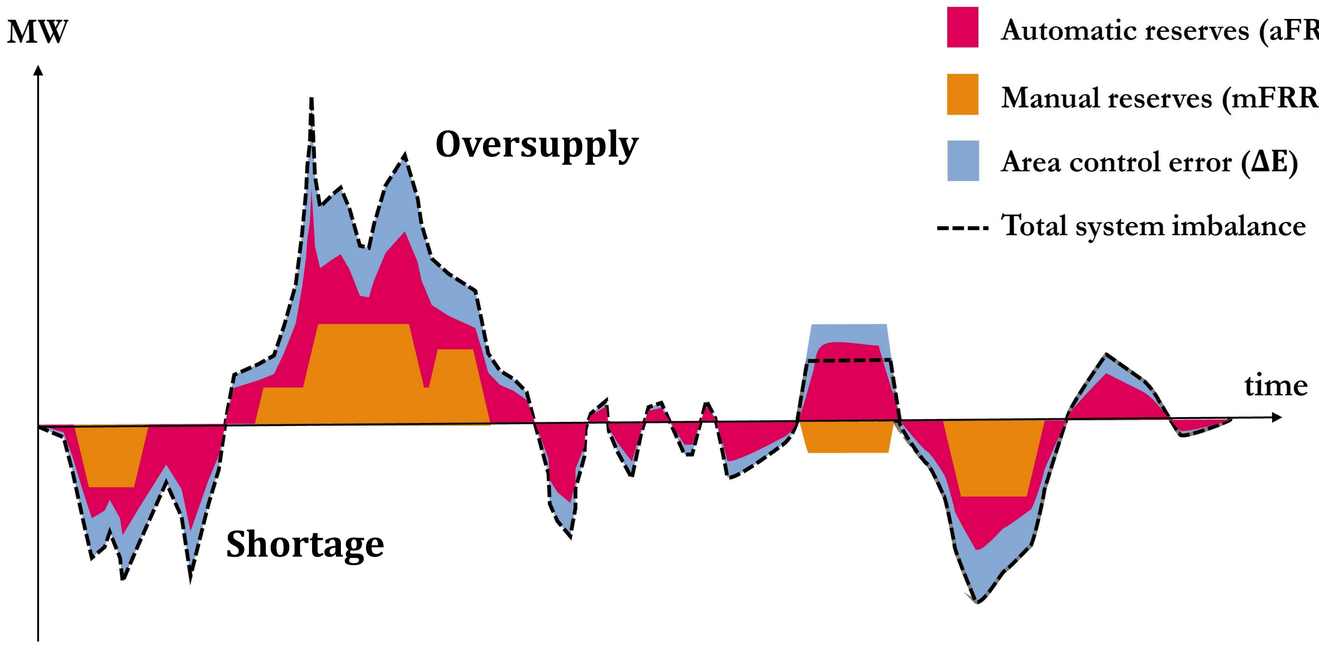
At any instant, maintaining a constant balance between injections and withdrawals from the electricity network is essential for security of supply and network stability. To mitigate the physical risk related to insufficient balancing capacities, Transmission System Operators (TSOs) must adequately size the need for reserves ahead of real-time and design an efficient procurement strategy.

Emerging challenges for short-term balancing



- RES introduce **additional variability** and **uncertainty** in generation, while the decommission of thermal units **decrease the system inertia**.
- **Ongoing European harmonisation** of **reserve products, activation platforms** and shorter operational windows question the procurement strategy of the TSO.
- **New market participants** (batteries, EVs, demand-side response, P2G…) are **highly flexible** but are **limited in energy provision due to technical or economic constraints [1].**

Literature review objectives

- Build a comprehensive assessment framework for day-ahead balancing processes, including dimensioning and procurement of reserves.
- Identify current and future drivers of short-term balancing costs.
- Evaluate social welfare maximisation given market design choices and bidding strategies.

Understanding the system imbalance

Balancing perspective

ACE	aFRR	mFRR	Other bids

Physical perspective

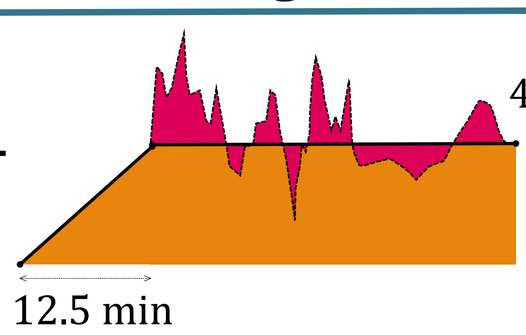
Solar	Wind	Thermal	Transmission	Load

Market perspective

BRP1 — BRP2 — BRP3 — … — BRPn

Managing imbalances through reserve activation

STANDARD PRODUCT CHARACTERISTICS

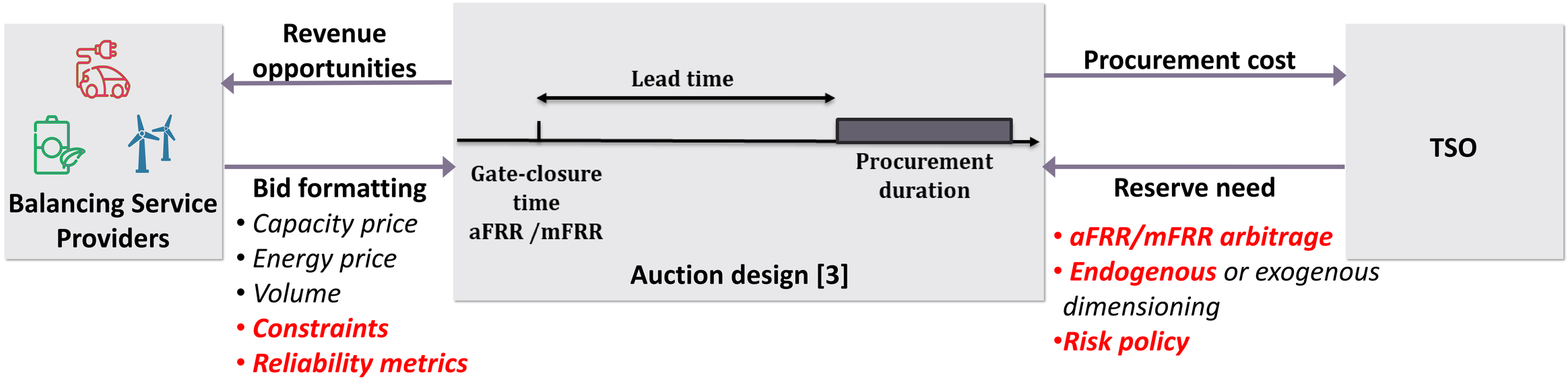


TSO-SPECIFIC BALANCING STRATEGY

Automatic and **continuous adjustment**
→ Reactive control of aFRR based on real-time measurements.

Manual and **block-based activation**
→ Reactive or **proactive** control of mFRR with **preventive** or **cost-minimization** objectives [2].

Designing an effective procurement strategy



References

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