



New market design options for future flexible energy systems

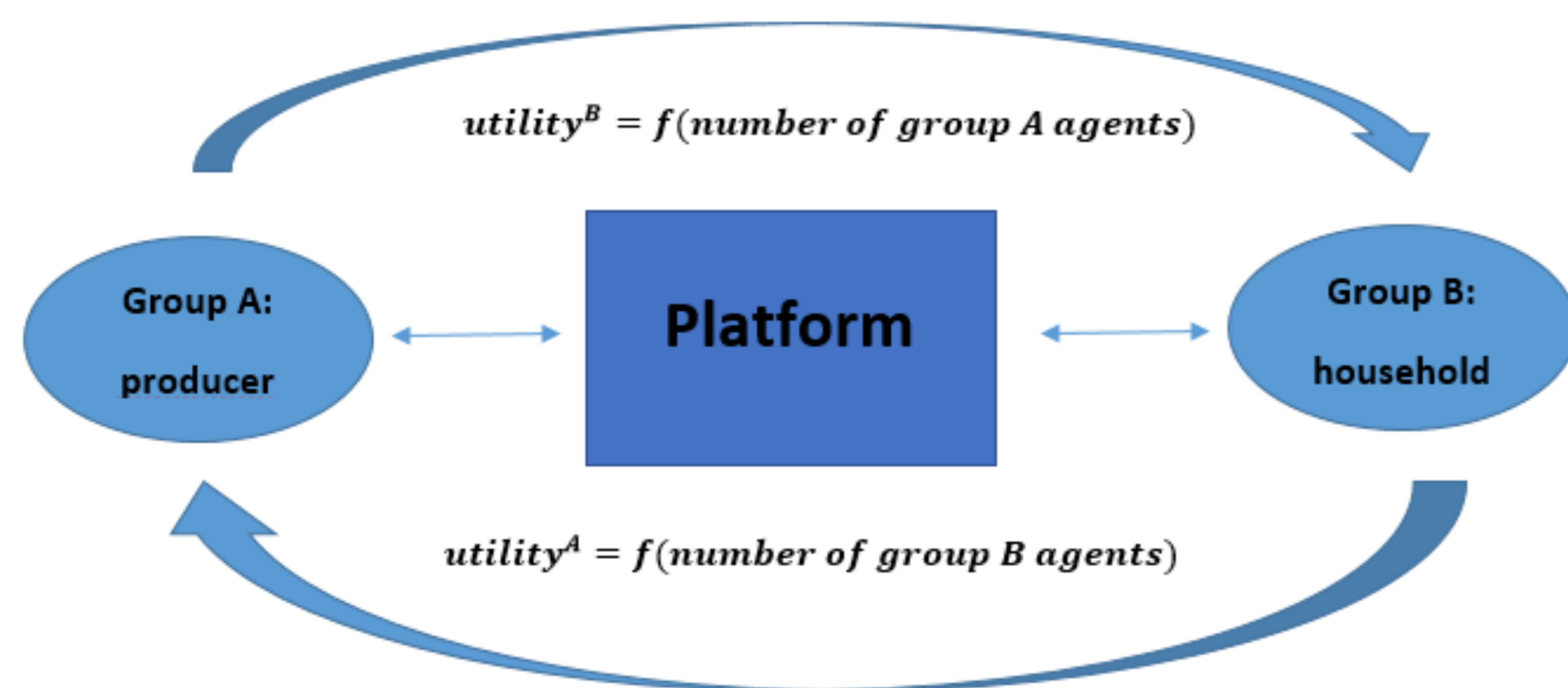
Platform market pricing

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Increasing share of variable renewable energy sources and a larger penetration rate of smart metering in households are possible drivers towards platform market, which combines producers in need of balancing services and households able to provide balancing.

Characteristic for the two-sided platform market is the network effect: utility of group i depends on the participation on side j :



Setting the price structure such that both sides get on board important but challenging, e.g., the profit maximizing platform mark-up decision for one side is affected by

- the own-side price elasticity,
- the mark-up set for the other side,
- the cross-side price elasticity and
- the fraction of group sizes.

Components and alternative designs of electricity market

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Elements of electricity market design

Generators

- All generators are treated the same
- Generators are classified
 - Firm / Flexible (several classes)
 - Inflexible / VRE (Wind, PV)

Markets for energy

- One market: Day-ahead –market plus additional short-term components
- Two markets for energy, two products, two price levels
 - Firm and flexible (only firm capacity, VRE with a firm back-up)
 - As available (obligatory for inflexible generators, voluntary for others)
 - Regulated price at first and market-based in the future (without economic support)
 - Zero-marginal-cost options should use only one-year-fixed-price contracts as they reflect the economies of the internet

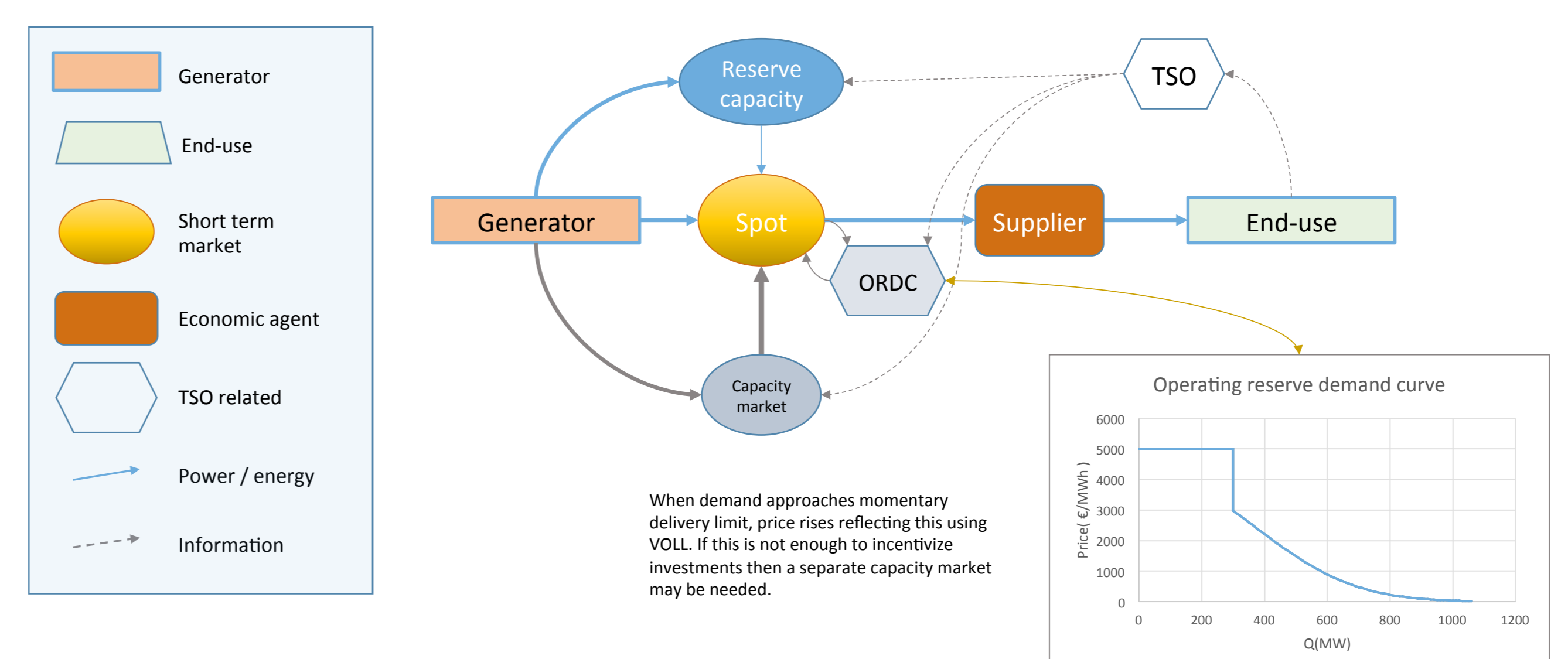
Securing capacity investments

- Reserve capacity market
- Capacity market (and secondary capacity market for upgrading VRE)
- Capacity certificate market
- Operating reserve demand curve and VOLL related-pricing element

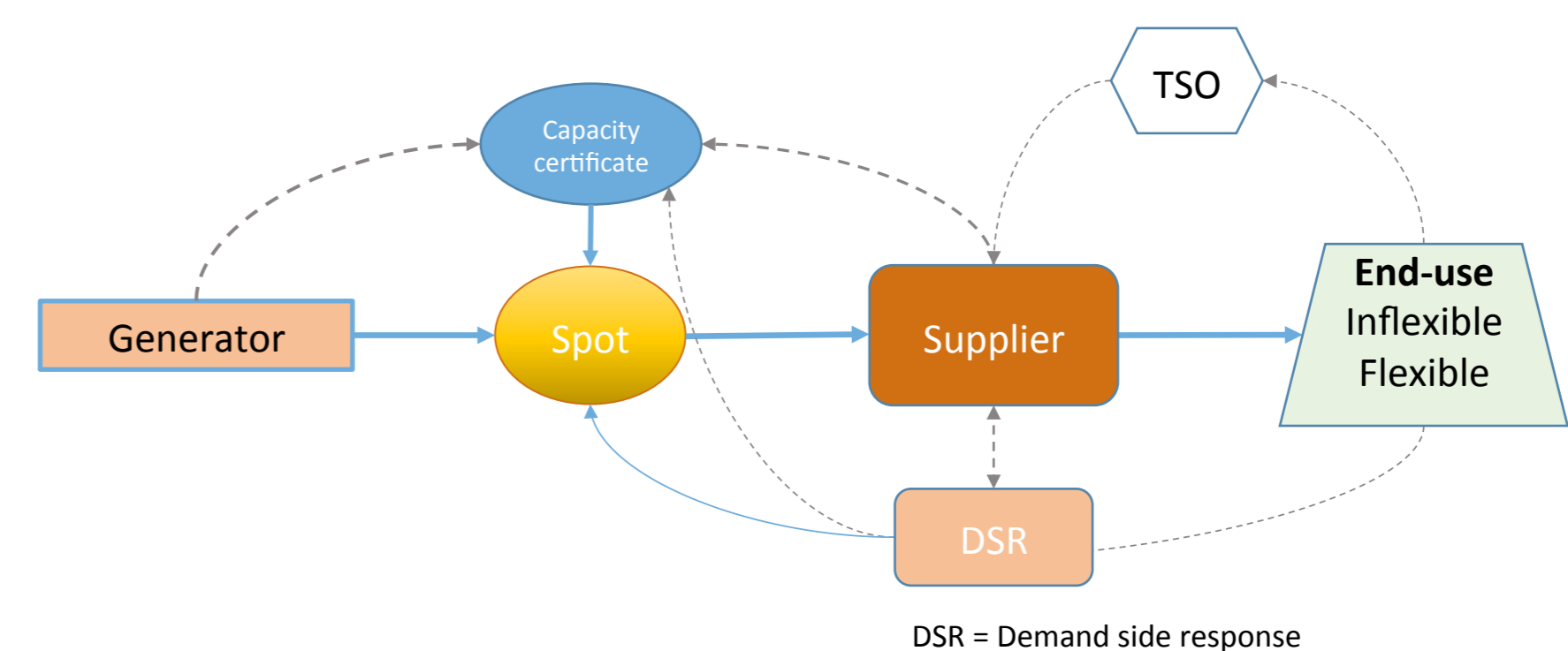
Demand

- No structures/incentives for utilizing potential demand flexibility
- End-users not exposed to real-time price: aggregators take care of load control
- Incentivizing end-users to be flexible; customer classes
 - Inflexible, met by flexible generation
 - Flexible, met by cheaper inflexible generation

Energy-only-market (EOM) - with supplementary features



EOM with a capacity certificate obligation for a supplier according to its customer base



Two-market structure with two capacity markets

