

Management of Distributed Energy Resources (DER)

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Shaping the future

Impacts of DER in System Operations

New breed of resources with diverse characteristics

- Technical performance and commercial arrangement
- Uncertainty, local intelligence, aggregation ...

Challenges for reliable grid operations

- Situation awareness: monitor, analyze, assess
- Physical performance: solar swing, voltage/var control, balancing, resiliency ..
- Regulatory/commercial constraints: contracts, services, transactions

Customer empowerment & Services

- Empower customer prosumer choices
- Sustainable DER business through value-based services

Operational Flexibility

DER impose greater operational flexibility requirements

- To maintain power balance (intermittency, ramping)
- To improve quality of energy service (voltage, resiliency..)

DER can be effective providers of flexibility services

- Aggregated DER offer in wholesale energy and ancillary services as economic and emergency resources
- Dynamic flexibility services for local distribution grid operation reliability, resiliency, and economics

Value-driven service transactions

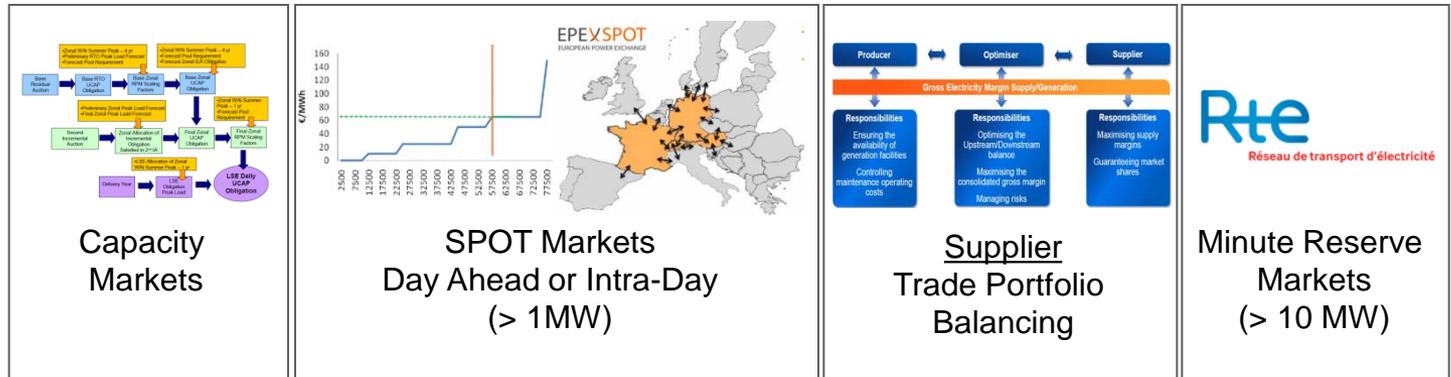
- Support grid operations (TSO and DSO)
- Sustains long term DER financial viability

DER Problems – examples illustrating diversity

- Integrated Voltage/VAR control
- Power balancing
- Microgrid operation (connected/islanded)
- TSO/DSO coordination of DERs
- ...

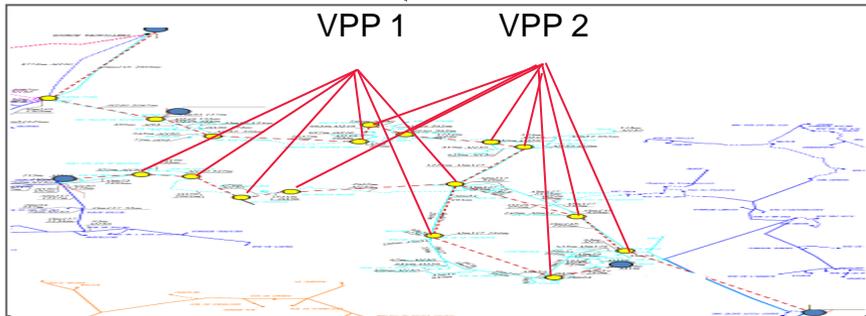
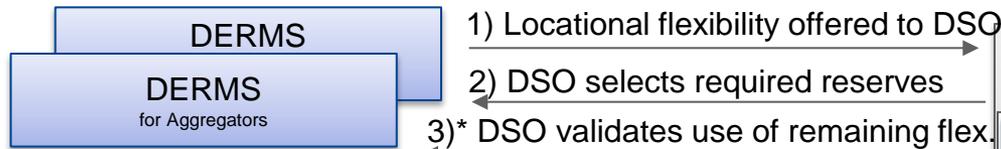
Enhanced T&D Grid Ops using DER Flexibility Services

Wholesale Market Operator

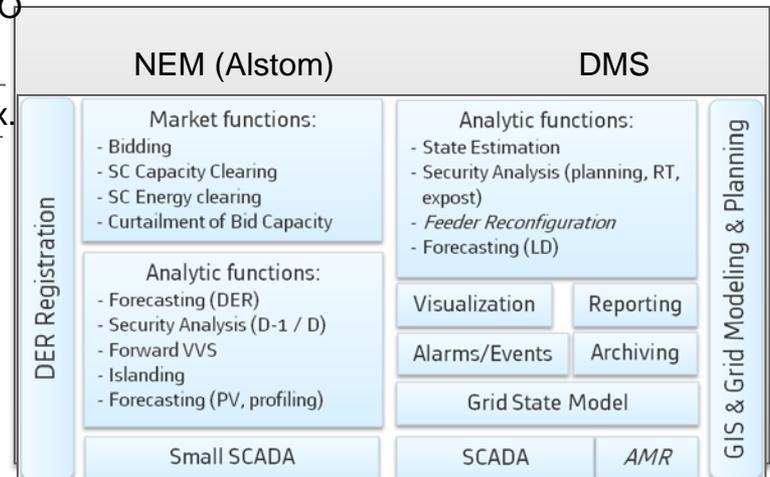


4)* Aggregation of DER capabilities

Aggregators



Distribution System Operator



DER Problem Framework



DER Problem Framework

