Management of Distributed Energy Resources (DER)

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ALSTOM
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

Capacity Markets

SPOT Markets
Day Ahead or Intra-Day (> 1 MW)

Supplier
Trade Portfolio
Balancing

Minute Reserve Markets (> 10 MW)

Aggregators

DERMS
for Aggregators

1) Locational flexibility offered to DSO
2) DSO selects required reserves
3)* DSO validates use of remaining flex.
4)* Aggregation of DER capabilities

Distribution System Operator

NEM (Alstom)

Market functions:
- Bidding
- SC Capacity Clearing
- SC Energy Clearing
- Curtailment of Bid Capacity

Analytic functions:
- State Estimation
- Security Analysis (planning, RT, exposure)
- Feeder Reconfiguration
- Forecasting (LD)

DER Registration

Analytic functions:
- Forecasting (DER)
- Security Analysis (D-1 / D)
- Forward VVs
- Islanding
- Forecasting (PV, profiling)

DMS

Small SCADA

SCADA

AMR

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DER Problem Framework

Model → Measure → Control → Coordinate → Optimize
DER Problem Framework

Model
- Technical
- Commercial
- Aggregation
- Uncertainty
- Data sets
...

Measure
- Non-homogeneous
- Correlation
- Usage
- ...

Control
- Modes
- Jurisdiction
- Verification
- ...

Coordinate
- Resources
- Constraints
- Timeframes
- ...

Optimize
- Formulation
- Data model
- UX/UI
Are we ready for change?