electra
Turn on the Grid of the Future

2nd ELECTRA / WG1 ETP Smart Grids Joint Technical WS
The Web of Cells and alternative Concepts
New Architectures for the Grid of the Future

The grid of 2035+: Why do we need new architectures?

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EERA
European Energy Research Alliance
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ELECTRA Assumptions

- Generation will shift from classical dispatchable units to **intermittent renewables**
- Generation will shift from few large units to **many smaller units**
- It will shift from central transmission system connected generation to **decentralized distribution system** connected generation
- **Electricity consumption will increase** significantly

ELECTRA Assumptions

- Large amounts of **fast reacting distributed resources** (can) offer reserves capacity

- **Electrical storage** will be a cost-effective solution for offering ancillary services

ELECTRA Assumptions

- **Ubiquitous sensors** will vastly increase the power system's observability

- Developments in Information and Communication Technologies will support the pathway towards **more decentralized managed power systems**

Why a new architecture?

Two feasible functional architectures

Centralized managment

- The TSO remains responsible for reserves activation in its CA/CB
- To dispatch reserves at distribution, increment of observability and bi-directional TSO/DSO communication is required
- Local problems may not be noticed at TSO level. Local imbalances produced at distribution levels may counterbalance each other and at system level it can result in insecure load flows

Decentralized managment

- Sub-division of the power system into **cells**, each one managed by a control cell operator
- Local problems are solved “locally”
- A cell operator is responsible for the balance within its own cell. The procurement of reserves can be done in coordination with neighbouring cells

- It allows a more flexible control
- Global reserves activation is not required

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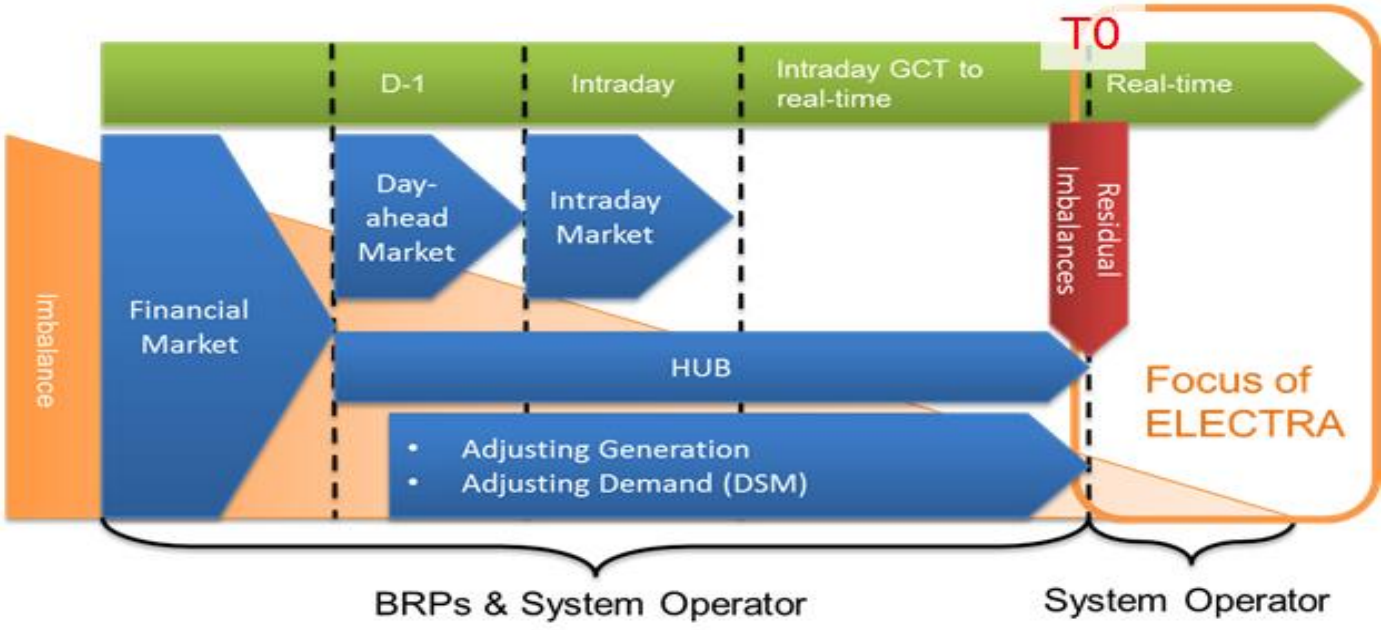
Technical Objectives

- The focus of ELECTRA is on providing **voltage and frequency control** services for power systems 2030+
- Develop and test **horizontally-distributed control schemes** to provide for a dynamic power balance that is closer to its equilibrium value than a conventional central control scheme



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