

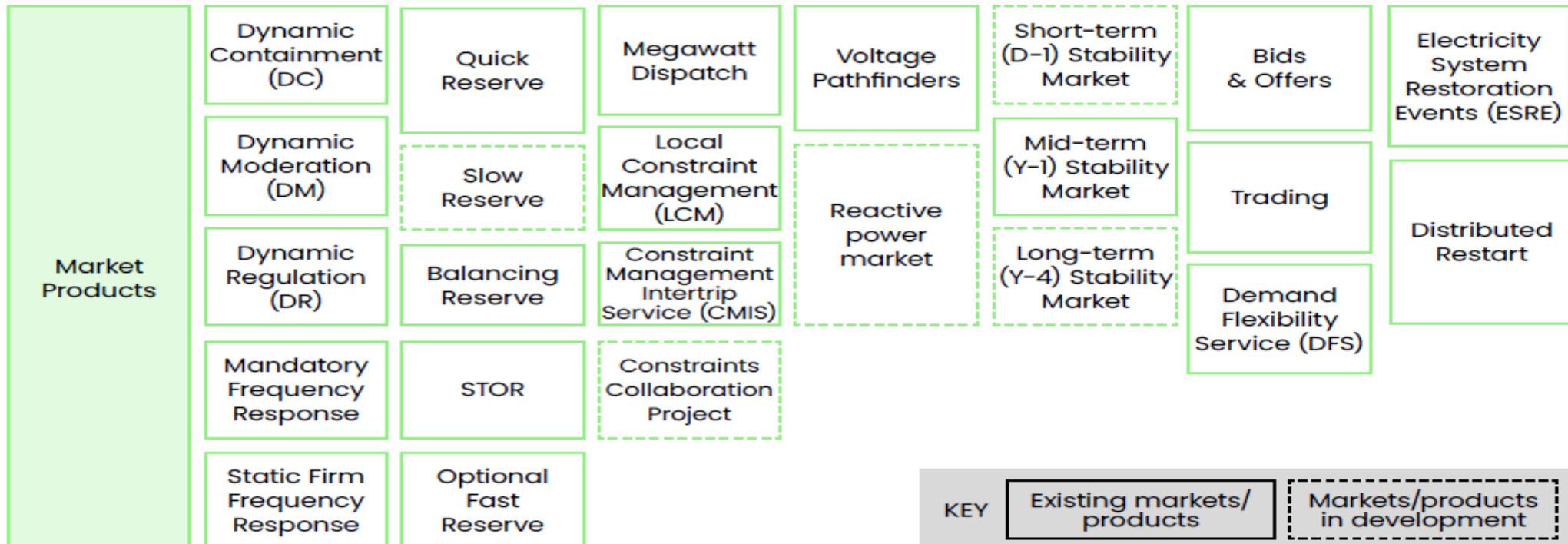
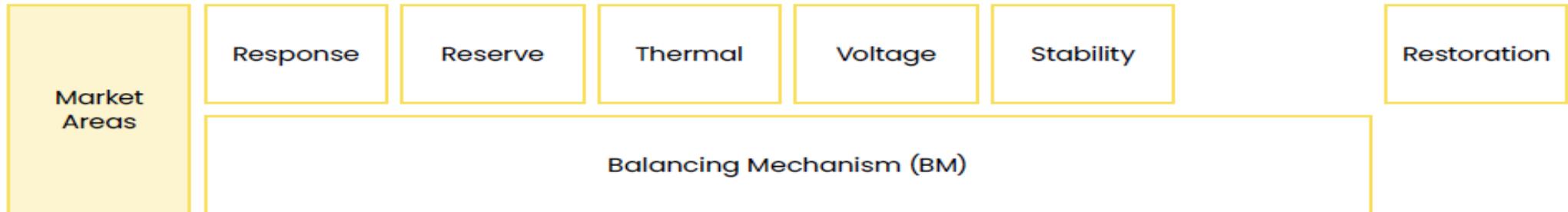
System service interactions

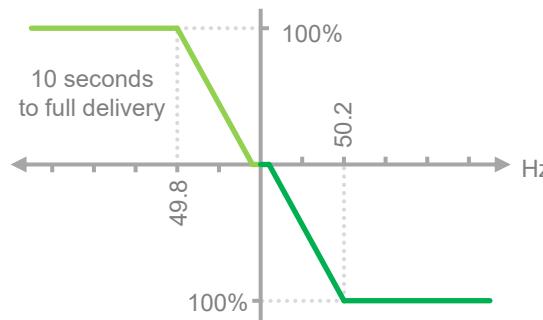
Dr Xiaoyao Zhou

Requirements and system needs are identified by the Operability Strategy Report
and by the Frequency Risk and Control Report

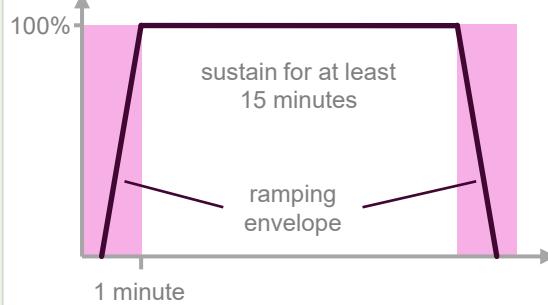


The Markets Roadmap outlines different markets and products to address these system needs

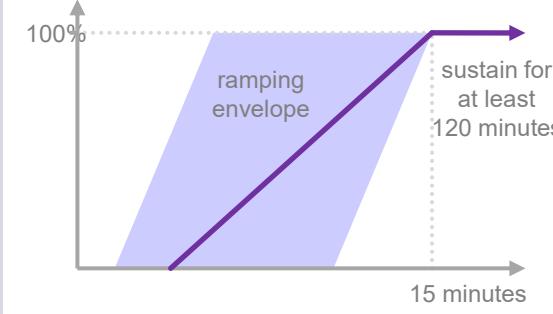


Dynamic Regulation

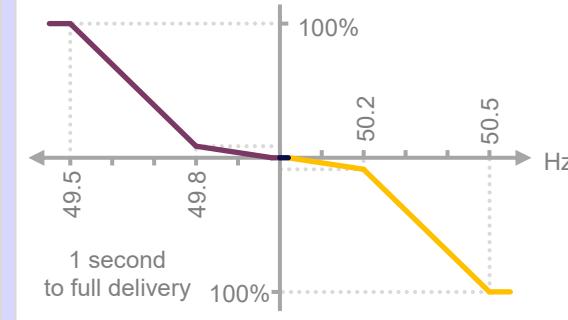
Assist in keeping frequency near to 50Hz during normal conditions

Quick Reserve

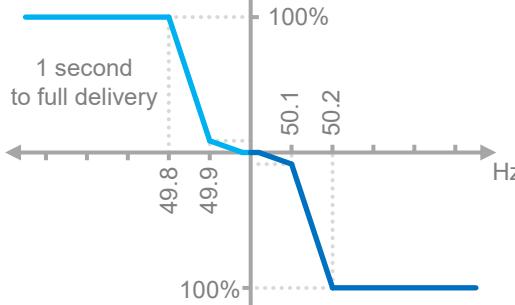
Recover frequency back towards 50Hz, mainly during normal conditions

Slow Reserve

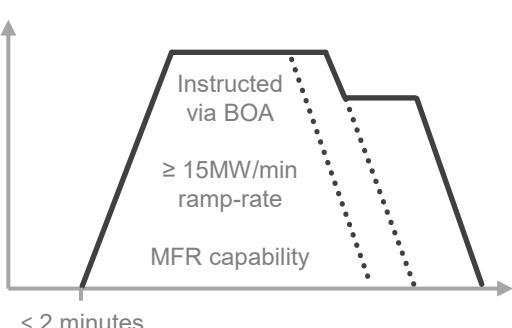
Recover frequency back to 0.2Hz within 15 minutes

Dynamic Containment

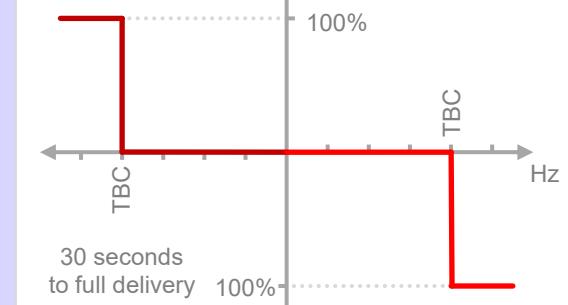
Prevent frequency deviations outside -0.8Hz / +0.5Hz following large losses

Dynamic Moderation

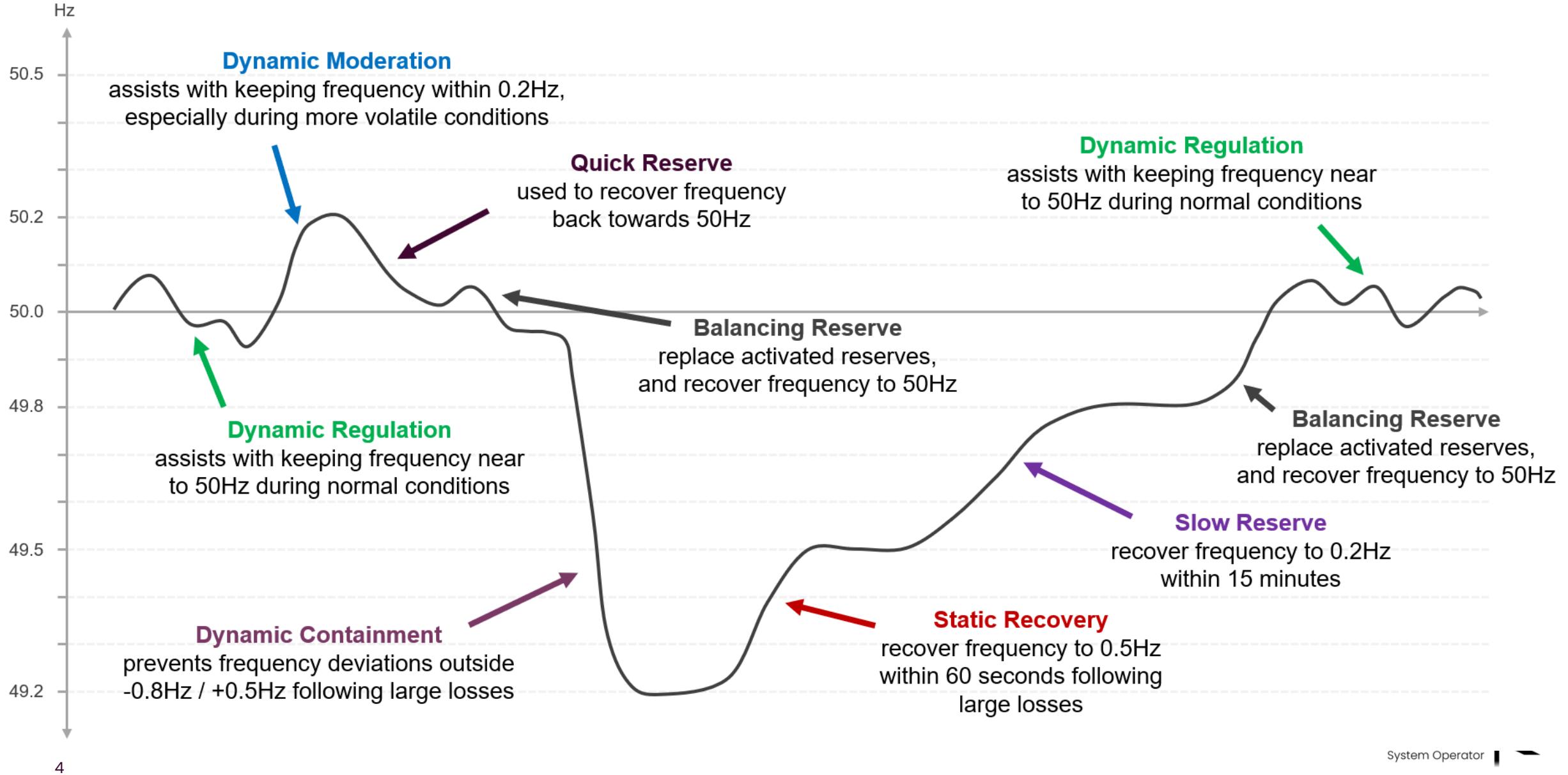
Assist in keeping frequency within 0.2Hz, especially during more volatile conditions

Balancing Reserve

Manage real-time imbalances, and replace activated reserves

Static Recovery

Recover frequency to 0.5Hz within 60 seconds following large losses



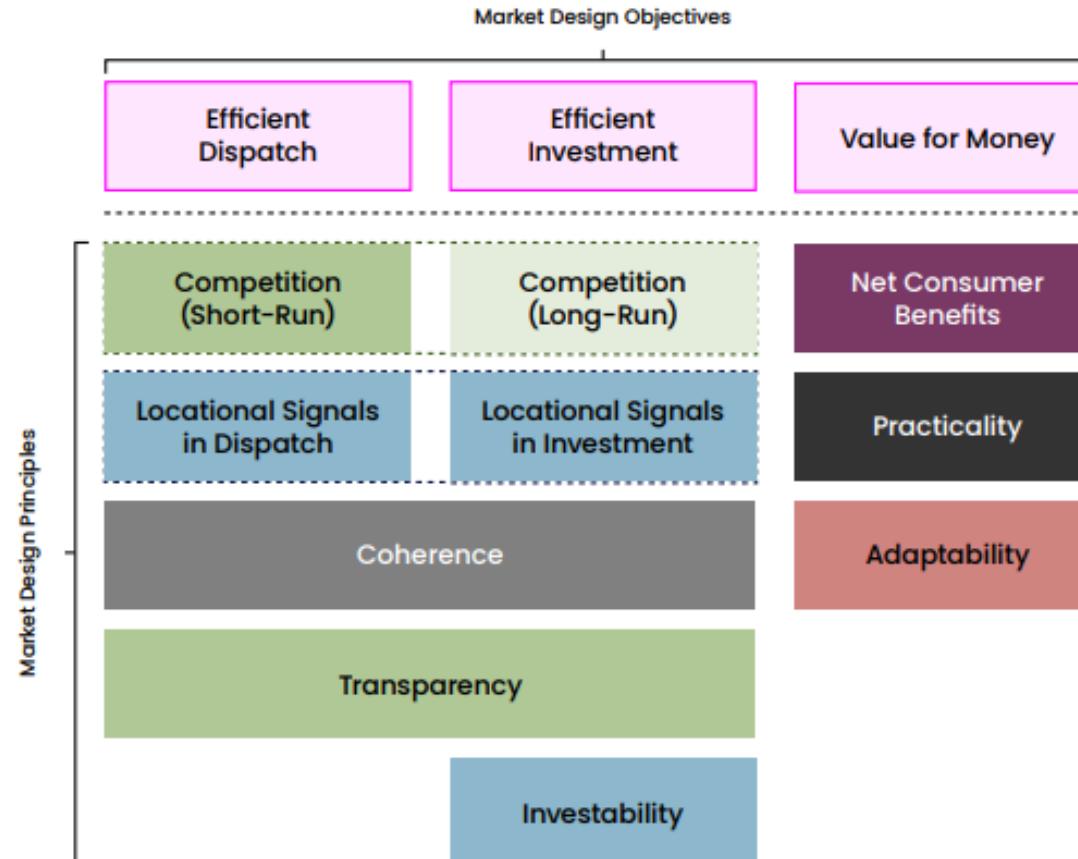
Service interactions (SO perspectives)

- Within the same operational area
 - Different frequency services, Quantity optimization
- Across different operational areas
 - Frequency Vs Stability : oscillations, inertia Vs response
 - Frequency Vs Thermal Constrains
 - Voltage Vs Thermal Constrains
- Overall system needs Vs local needs

Service interactions (User perspectives)

- Services and revenue stacking
 - What is the right process
 - How to validate the performance for each services

Overall challenges



- System needs
- Service specification and qualification
- Optimization

<https://www.neso.energy/publications/markets-roadmap>