



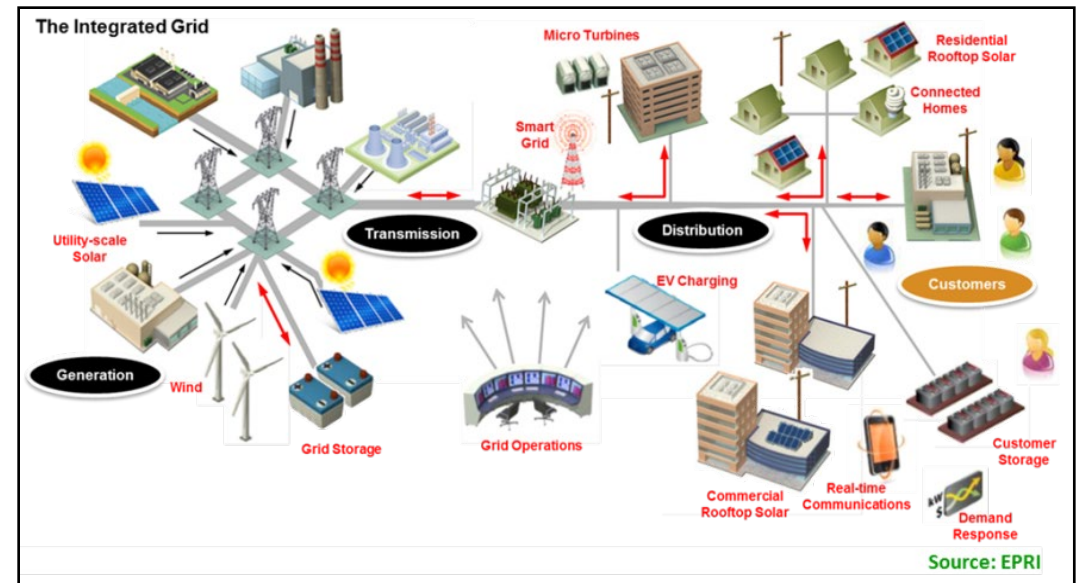
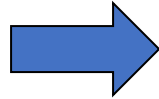
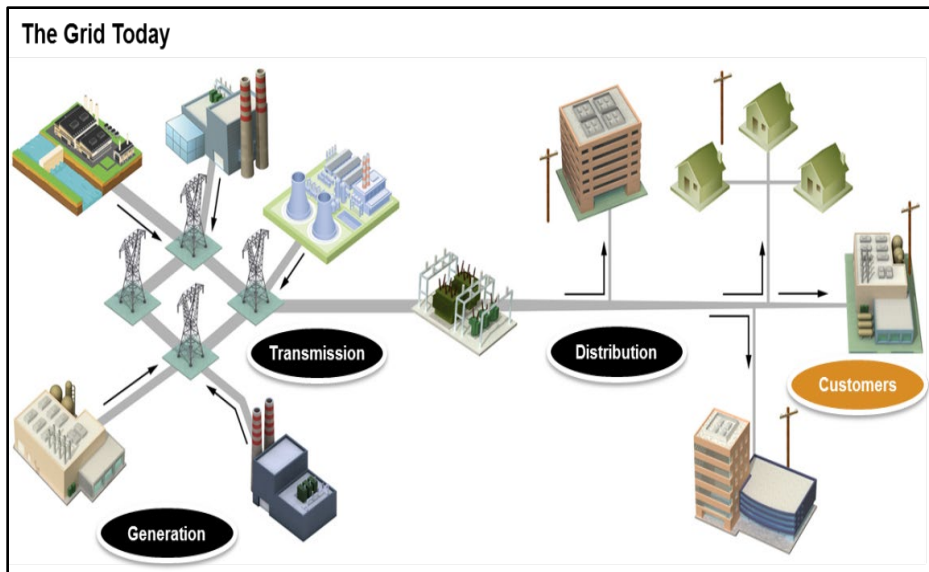
Electricity Advisory Committee Meeting

Sal Salet, VP of Distribution Operations, PPL EU

October 21, 2021

Grid is Evolving

- Increased **two-way power flow** will change dynamics and operation of T&D system
- Uncertainty on short-, mid-, and long-term electric **sales volumes**
- Pressure to have a **strong and resilient grid**
- Threats to business model - Establishment of **technology enabled markets**



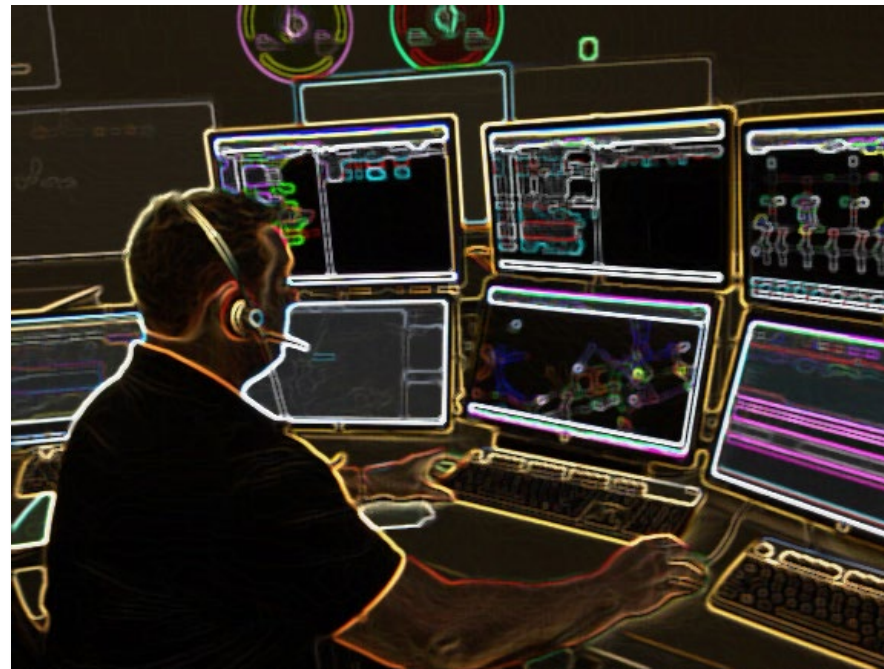
Source: EPRI

Position ourselves for the future

Maintain
Our Role

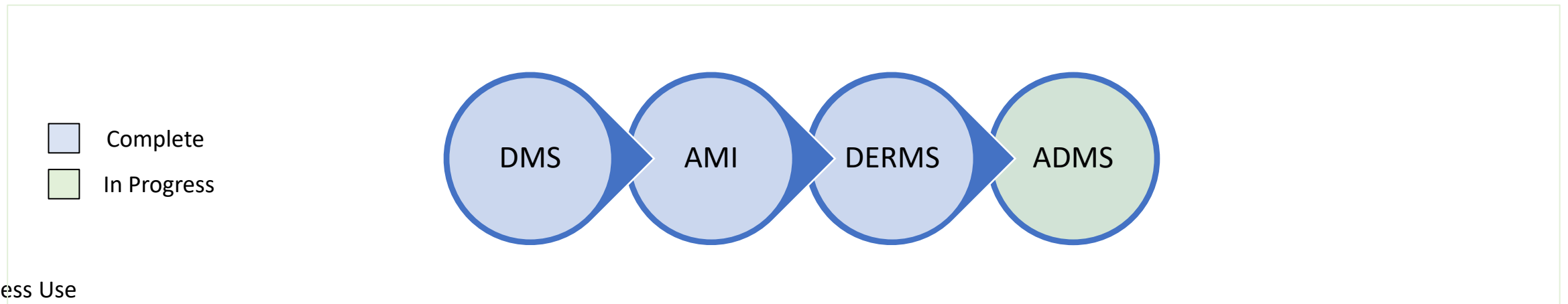
Operate a safe,
reliable, and
affordable grid

- Gain visibility and management of generation and load: sensors and communication – Grid Modernization
- Automated and integrated controls: ADMS, FISR, DERMS
- Leverage technology, standards and data analytics

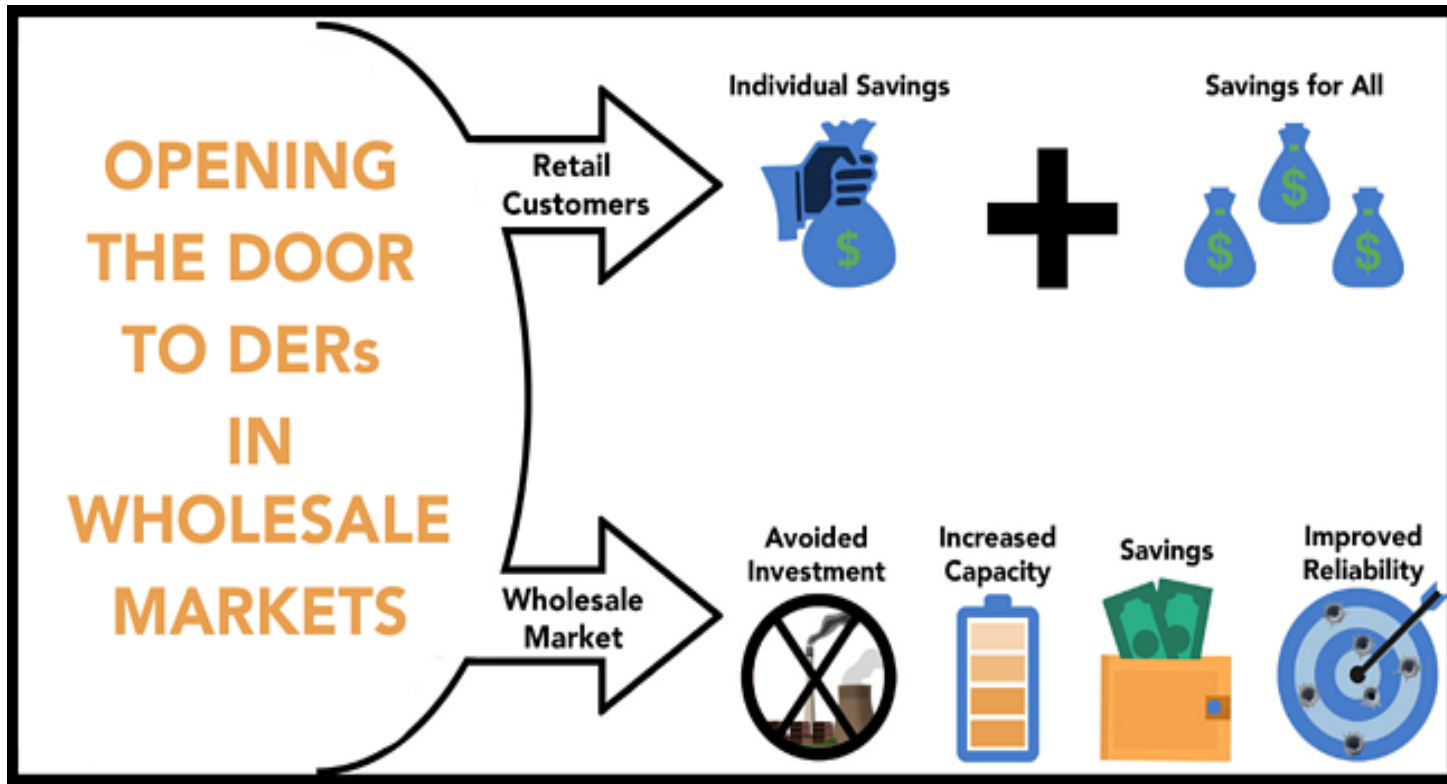


PPL's Grid Modernization Journey

- **DMS/FISR**
 - Using more than 7,000 Smart Grid devices to detect and locate faults and restore customers automatically
 - 1.2 Million customer outages prevented
 - Electronic switching
- **DERMS** - Distributed Energy Resources Management System
 - Visibility and management of distributed generation/Reduces investments — lowering costs to customers
 - Currently PPL is running a DER Management pilot that will run for ~4 Years
 - Monitor and manage behind the meter DERs using DERMS
 - 600 DERS (expect to have 10000 DERS part of the pilot)
 - Leverages Mesh Network for communication
- **ADMS** – Advanced Distributed Management System



FERC Order 2222 Overview View



- Grants DERs access to the whole sale market through aggregation
- Requires EDCs/RTOs to enable DER aggregation
- Increases the dynamic nature of the Distribution Grid
- PJM – Tariff is due February 2021
- Correct Implementing of FERC Order 2222 is Key to realize the value

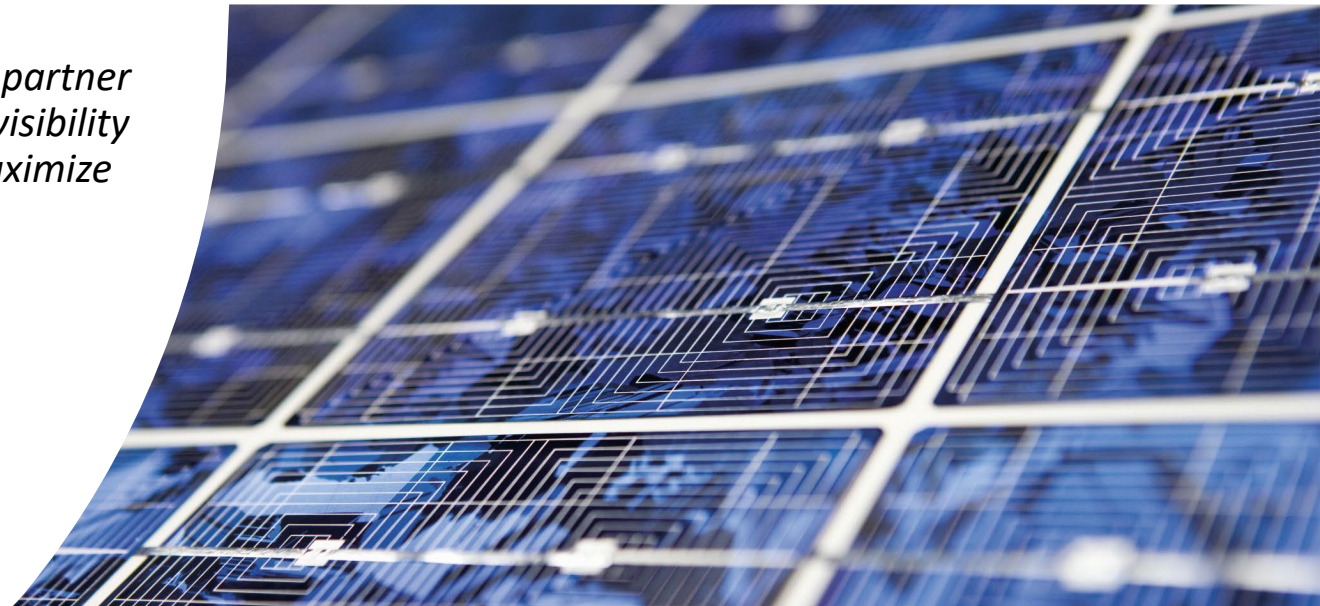
EDC Involvement in DER Management for Reliability and Safety

- *Without careful planning and operations, the growth of DER can significantly compromise grid safety, reliability and stability*
- *DER Visibility and controllability are prerequisites for fully integrating DER into the grid and can be achieved through grid modernization.*
- *Grid operators have real-time awareness of load profiles, grid configurations, locations of outages and line work, and customer conditions.*
- *While third-party companies such as DER aggregators may partner with grid operators, such companies have only partial grid visibility and may not be able to make operational decisions that maximize benefits for the grid and customers.*

Source: EPRI (2021) *DER Grid Modernization White Paper*

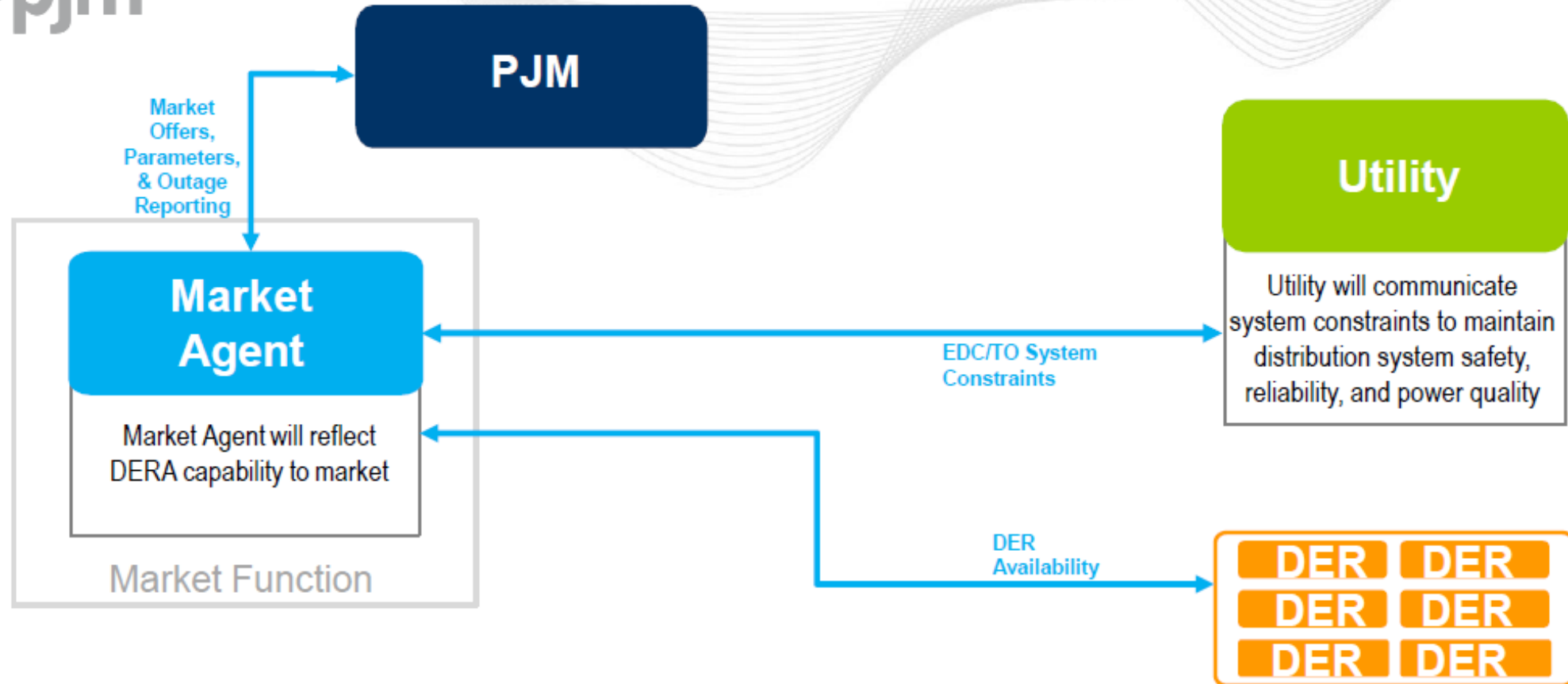
“Grid operators are ideally positioned to manage the increasingly complex DER ecosystem to optimize operation while maintaining the high degree of reliability that customers expect.”

Business Use





DERA Day-Ahead Wholesale Market - Communications Model

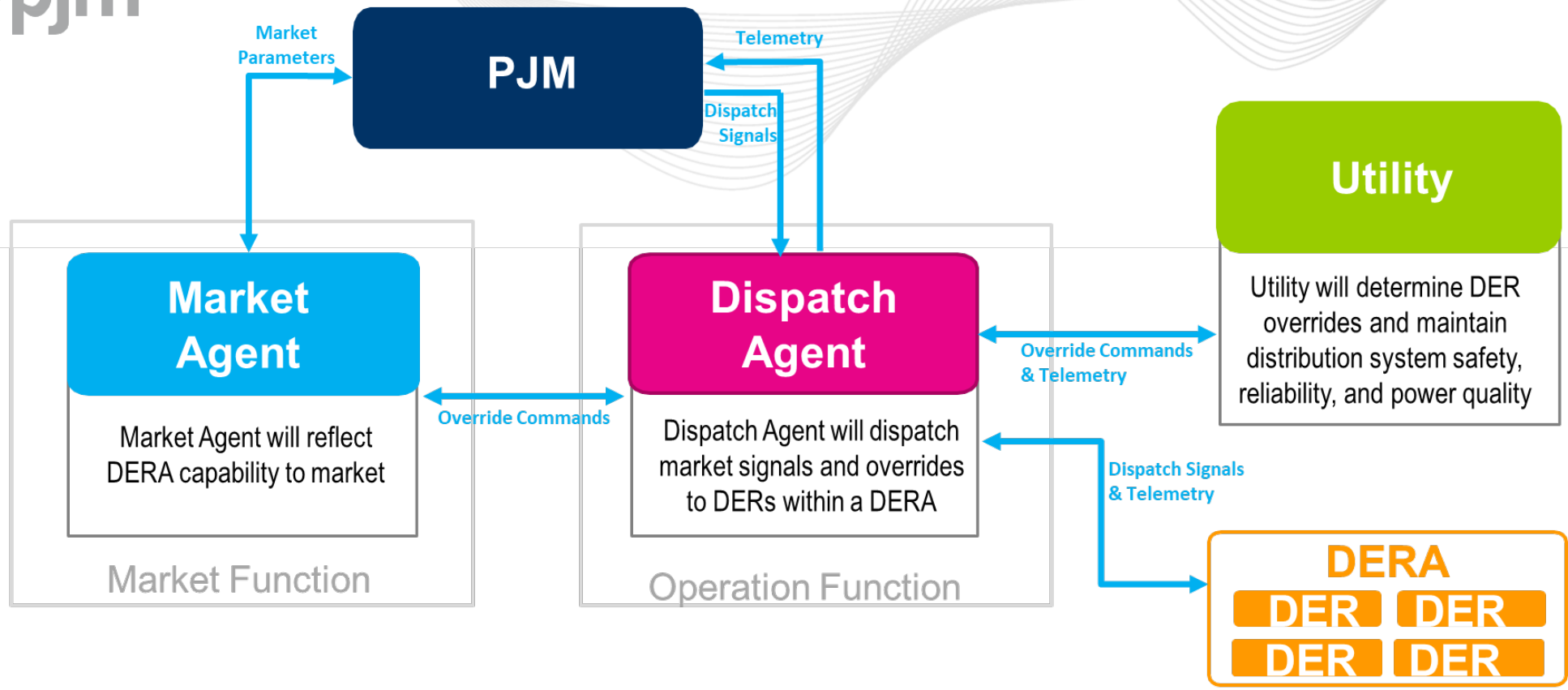


- **Market Agent** could be EDC, DER Aggregator, or a 3rd party as assigned during the DER Aggregation registration process in accordance with RERRA / PUC and Utility requirements.
- Existing PJM to Transmission Operator communications remain in place but are not shown in this model.
- This model represents necessary PJM communications but is not necessarily inclusive of all communications required by the utility

a flexible real-time model that provide the right for utilities to override/dispatch DERs



DERA Real-Time Wholesale Market - Operations Model



- **Market Agent** and **Dispatch Agent** could be EDC, DER Aggregator, or a 3rd party as assigned during the DERA registration process in accordance with RERRA / PUC and Utility requirements.
- Existing **PJM** to Transmission Operator communications remain in place but are not shown in this model.
- This model represents necessary **PJM** communications but is not necessarily inclusive of all communications required by the utility

a flexible real-time model that provide the right for utilities to override/dispatch DERs