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Enterprise Integration of Distributed Energy Resources

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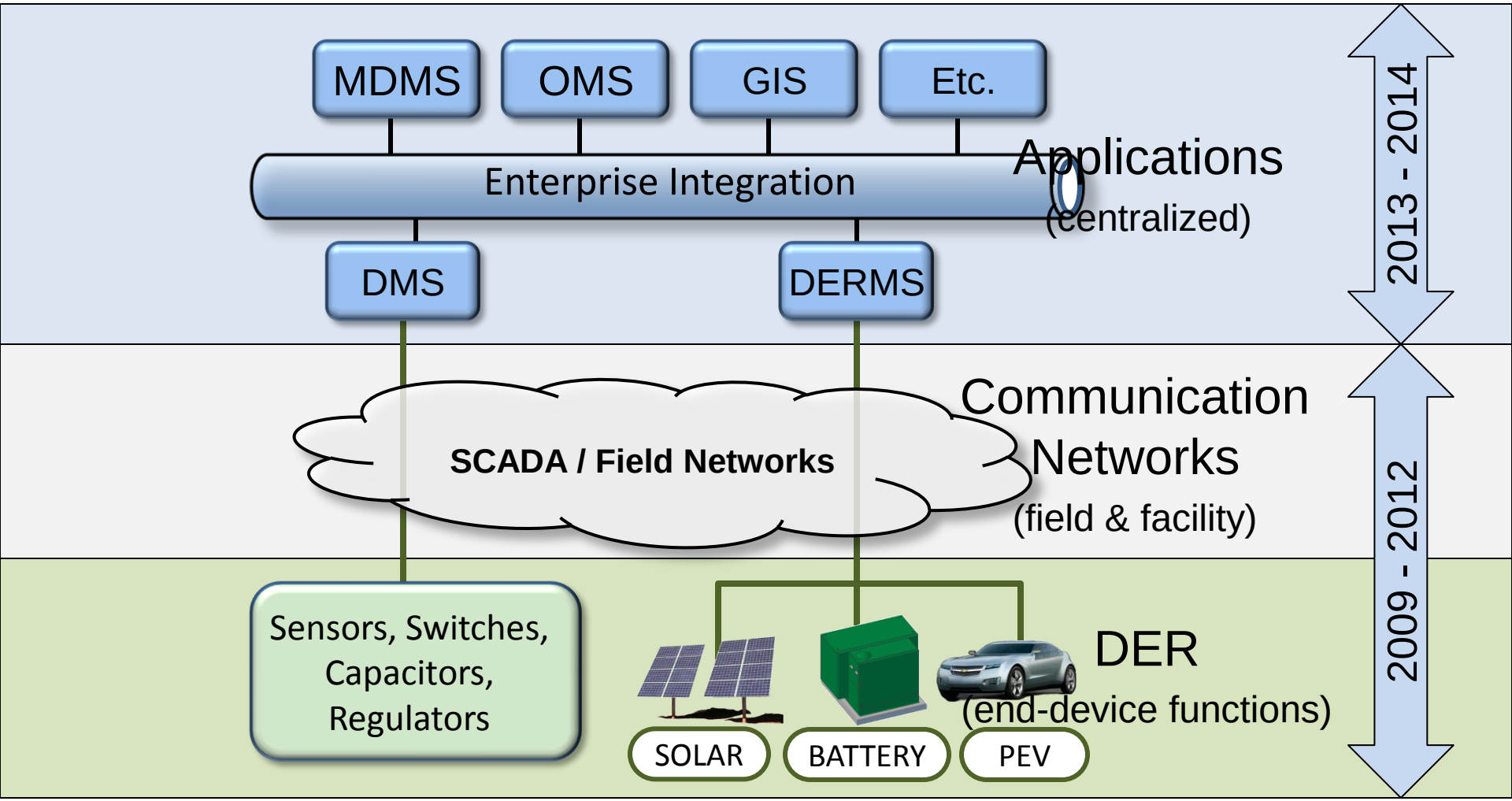
EPRI IntelliGrid Smart Grid Information Sharing Webcast

January 22rd, 2014

Coordination of Work in this Area

- US Department of Energy DOE SunShot SEGIS-AC (Solar Energy Grid Integration Systems – Advanced Concepts)
  - Field demonstration of smart inverters
- NIST / SGIP Domain Expert Working Group (DEWG) for Distributed Renewables, Generation and Storage (DRGS)
- International Electrotechnical Commission (IEC) TC57 WG14 and others
- MultiSpeak
- IEC TC57 WG17, DNP3, SunSpec Alliance, IEEE P2030.5 SEP2.0

DER Enterprise Integration



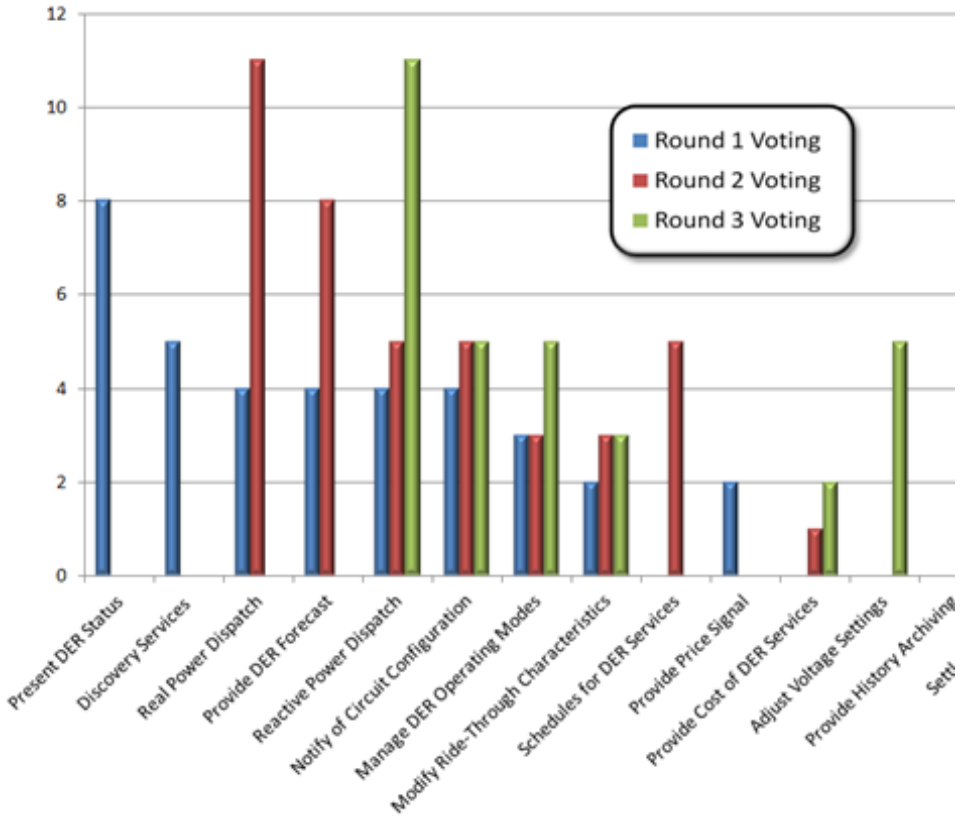
Sample of Related Documents

Document	Description
EPRI 1020435	Development of a Standard Language for PV and Storage Integration
EPRI 1020906	Standard Language Protocols Whitepaper
EPRI E237894	Common Functions for Smart Inverters, Update DNP3 Standard
IEC 61850-90-7	Information Model for DER + Standard Function Definitions
EPRI 1021674	Specification for Smart Inverter Interactions with the Electric Grid Using International Electrotechnical Commission 61850
EPRI 1026809	Common Functions for Smart Inverters, Version 2
EPRI 1017909	Advanced Metering Infrastructure (AMI) Considerations for Distributed Renewables Integration
DNP AN2011-001	DNP3 Profile for Basic Photovoltaic Generation and Storage
DNP AN2013-001	DNP3 Profile for Advanced Photovoltaic Generation and Storage
Multiple	DRGS DEWG Documentation (www.sgip.org/distributed-renewables-generation-storage-drgs-dewg)
SunSpec	Sunspec Alliance Specifications, Including Modbus mapping
IEEE P2030.5	Draft Standard for Smart Energy Profile 2.0
EPRI 1024360	Integrating Smart Distributed Energy Resources with DMS
EPRI 1026789	Collaborative Initiative to Advance Enterprise Integration of DER
MultiSpeak	Draft Version 5.0 Release (Q1, 2014)
EPRI 3002001249	Enterprise Integration Functions for Distributed Energy Resources

Enterprise Integration Needs

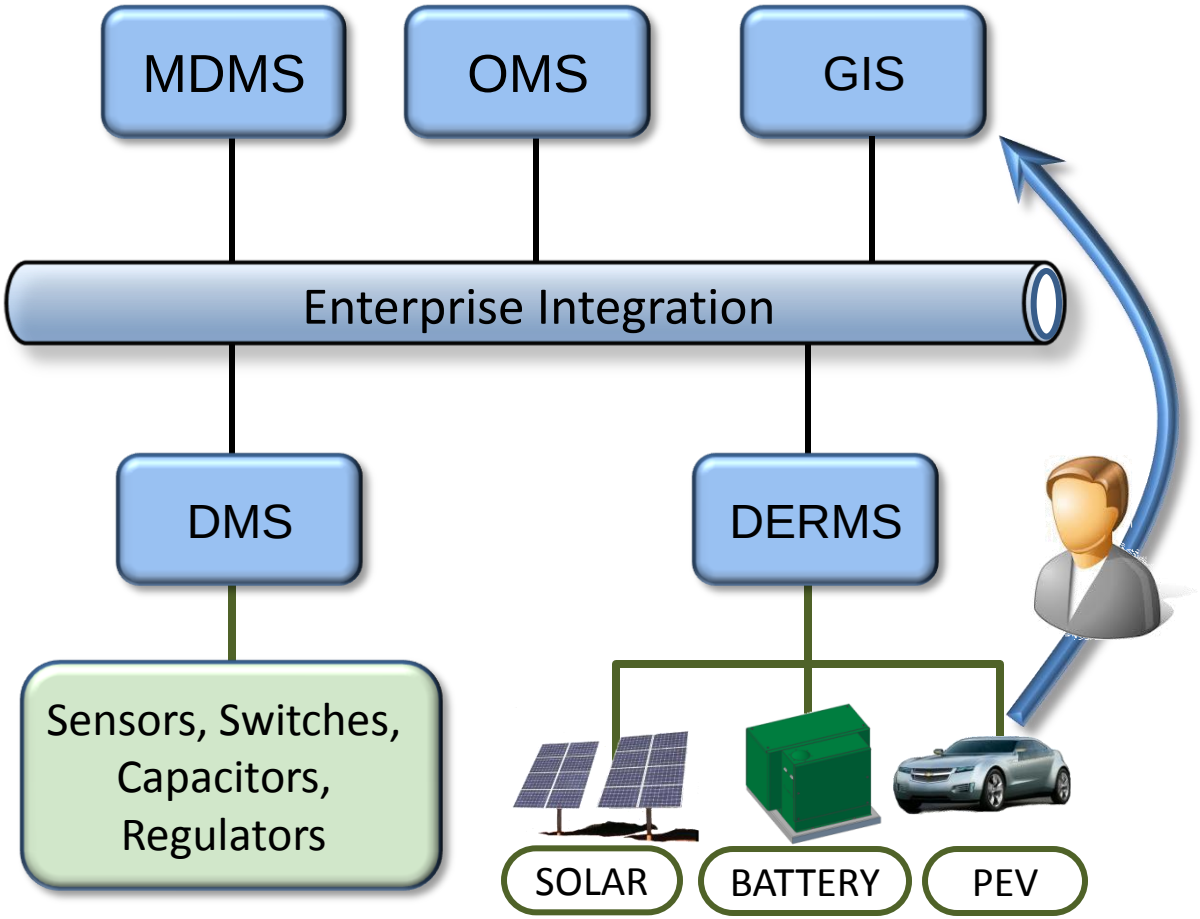
From the Fall 2012 Workshop in Washington, DC

- At the Enterprise (e.g. DMS), the needs for DER involve higher-level concepts
- Enterprise interactions (between software apps) need to be less granular and not dealing with all the configuration details of the field interfaces
- Need to think of DER in groups, aligned with the design and hierarchical-levels of the power system
- Don't need all the functions, many may be fixed out of the box. Start with the basics – real and reactive power



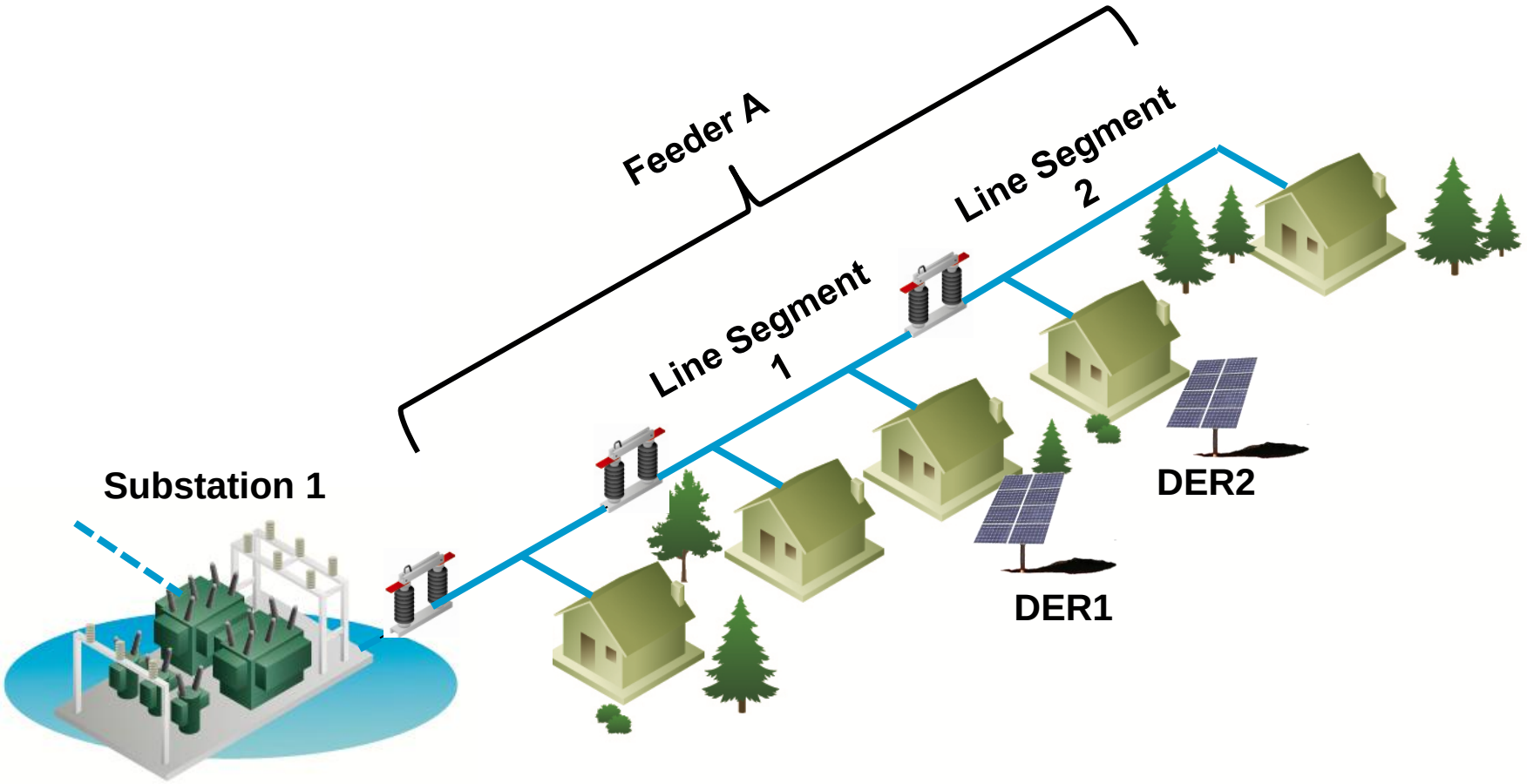
1. DER Representation in the System Model
2. Creation of Groups of DER
3. Status Monitoring by Group
4. Real and Reactive Power Dispatch by Group
5. Exchanging DER Group Capability Forecasts

DER Enterprise Integration

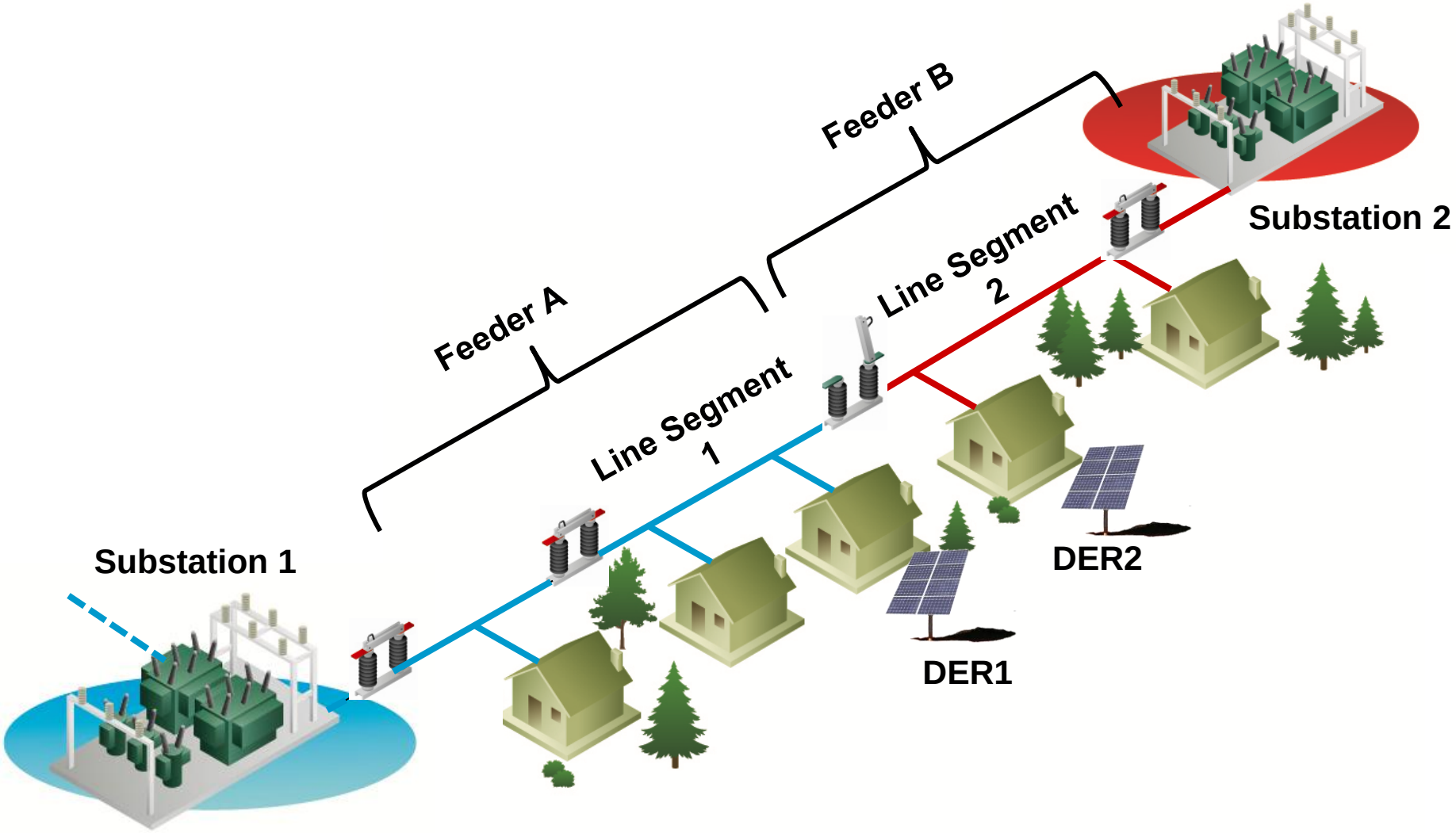


- Representation of individual DER in the system model
- Leveraged prior bodies of work, identified the set of DER attributes needed to support the remaining steps
- Including DER type, size, and basic capabilities

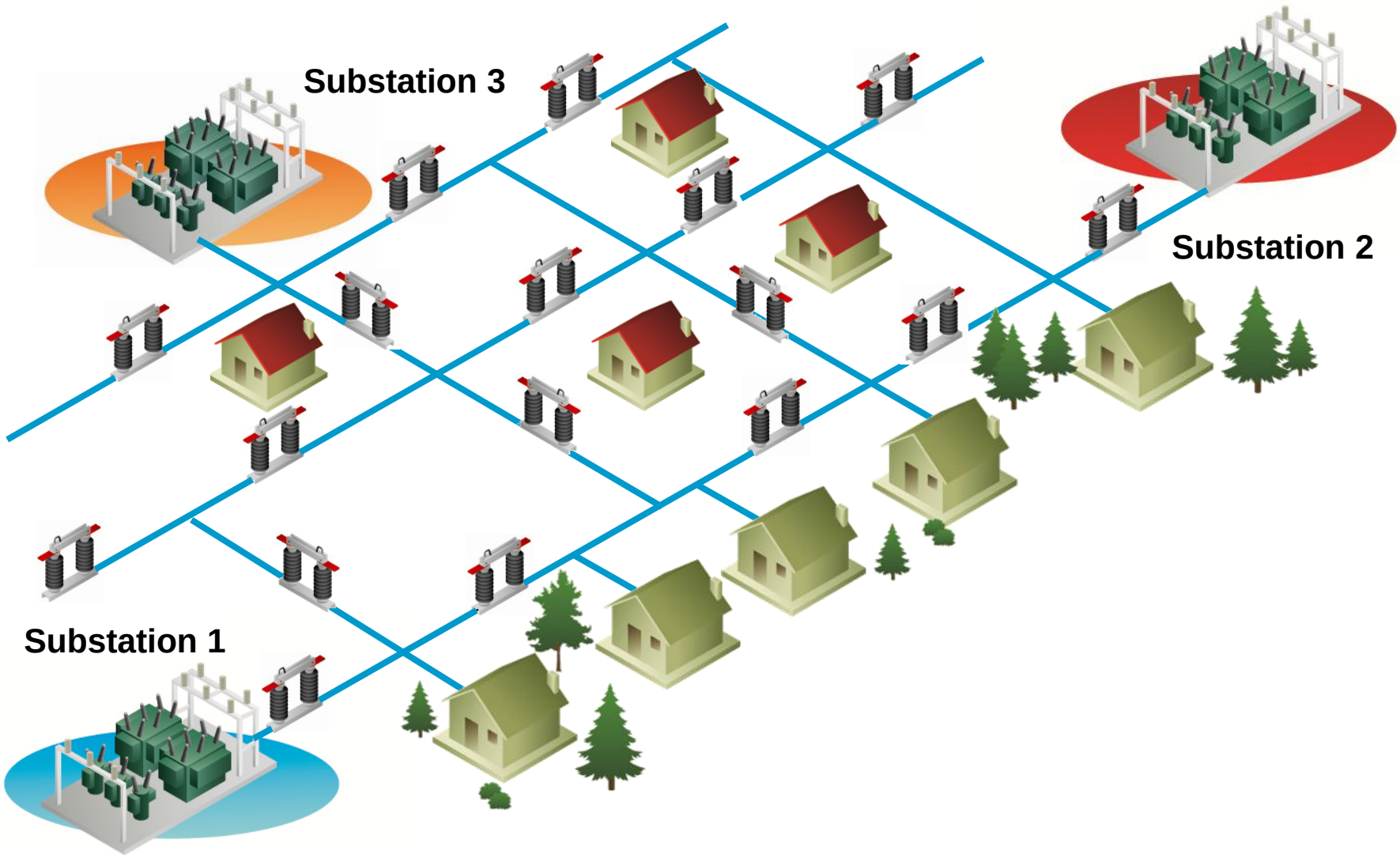
Simple Radial Feeder Example



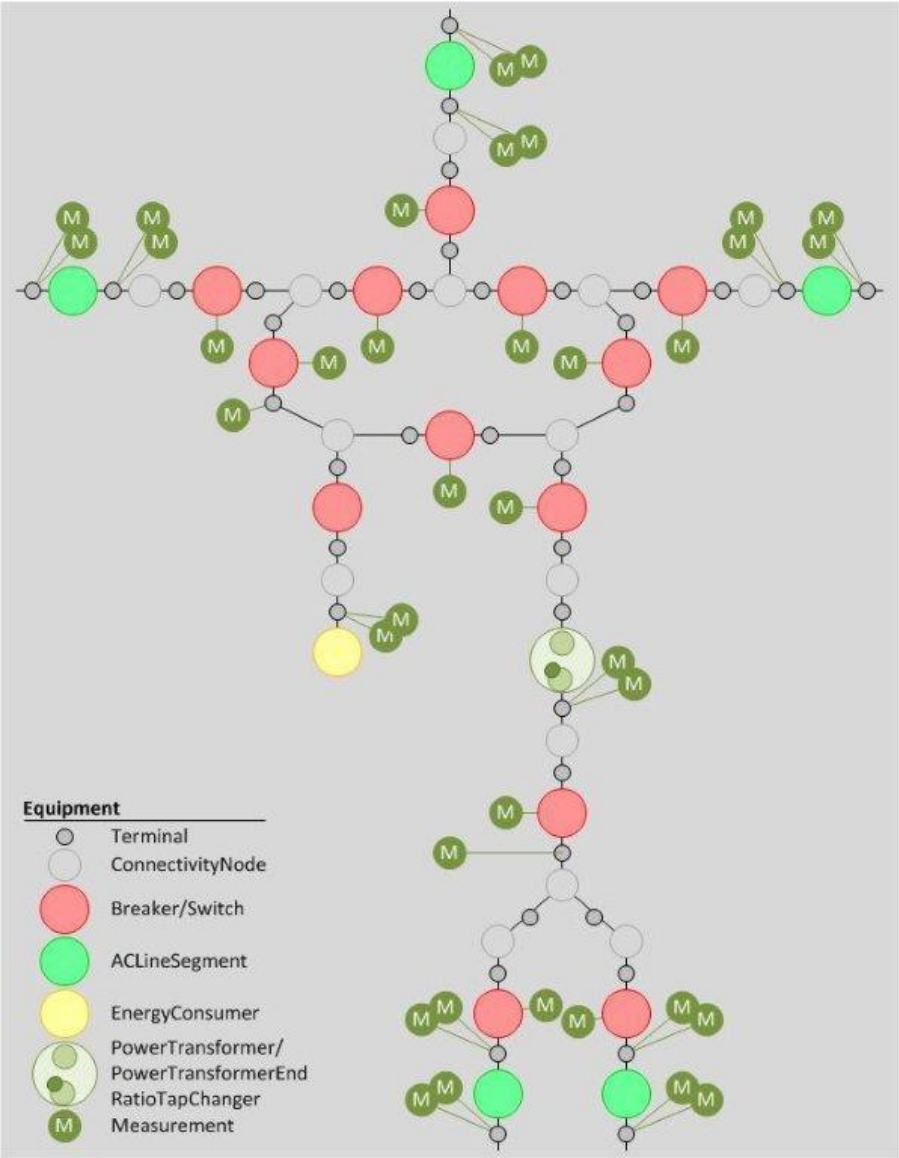
Alternate Sub Example



Network Example



Common Information Model



Arbitrary Group Creation

An application can create a DER_Group based on any criteria or combination of criteria:

- All DER on a certain circuit or circuit segment (dynamic entities)
- Those on the same phase
- Those of a certain type
- Those of a certain size
- Those of a certain asset owner
- Those enrolled in a particular program

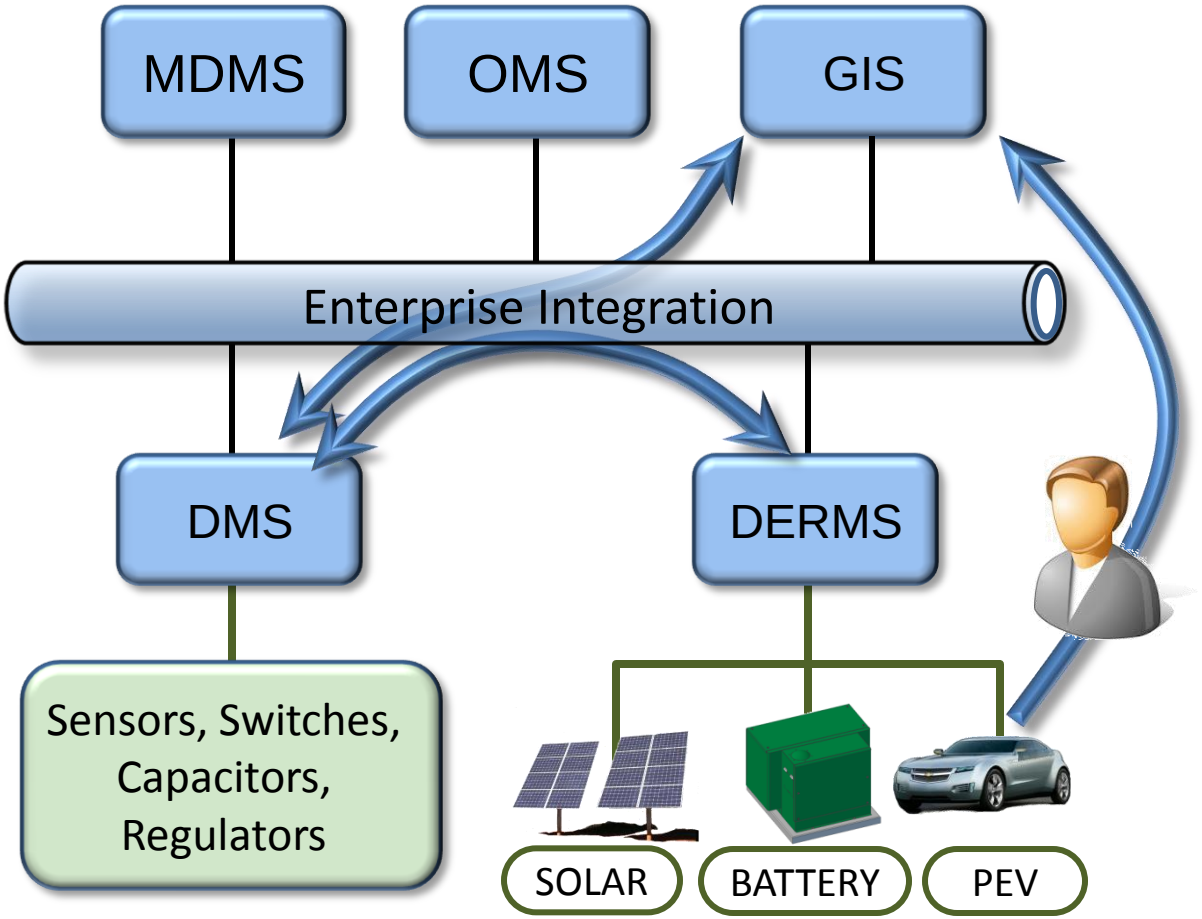
Can make “groups” of one or many DER

An individual DER can be a member of multiple groups. Useful for aligning monitoring and control actions with:

- Circuit reconfigurations
- Islanding

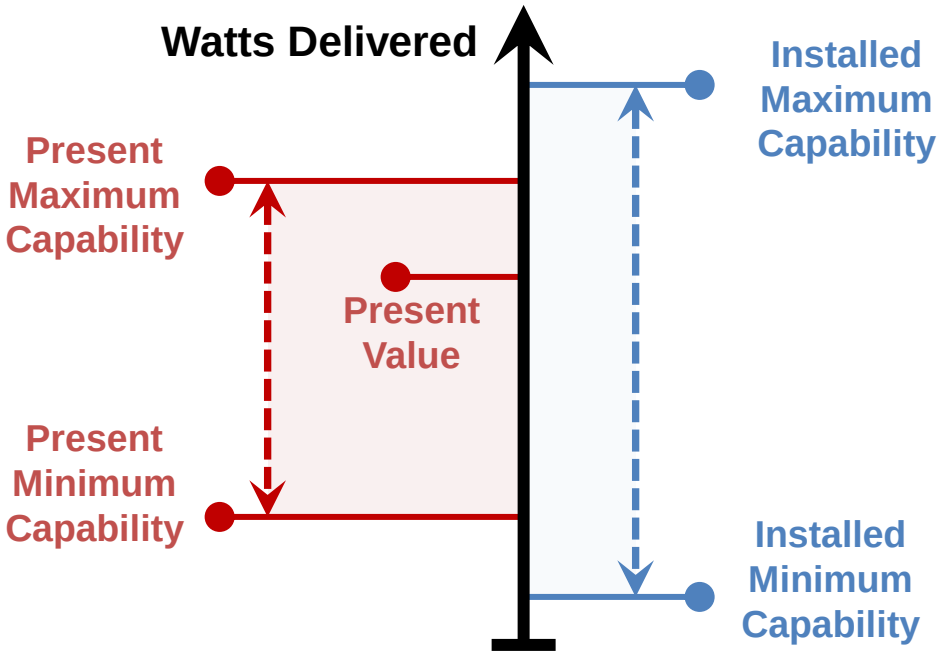
A standard method for sharing the group definitions with other applications

DER Enterprise Integration

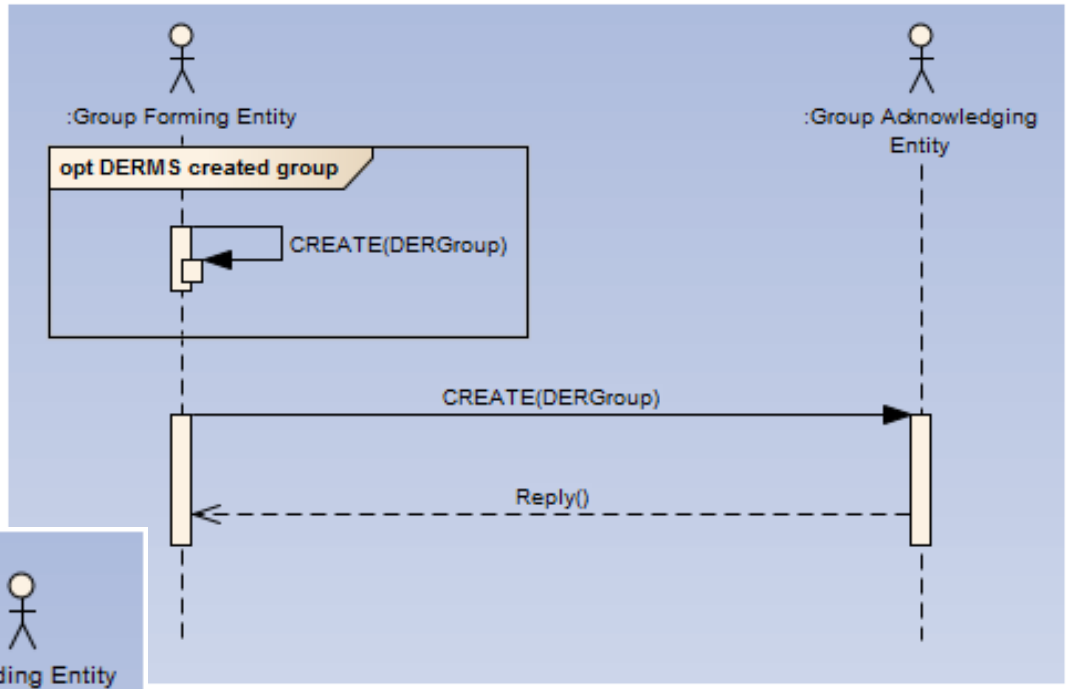


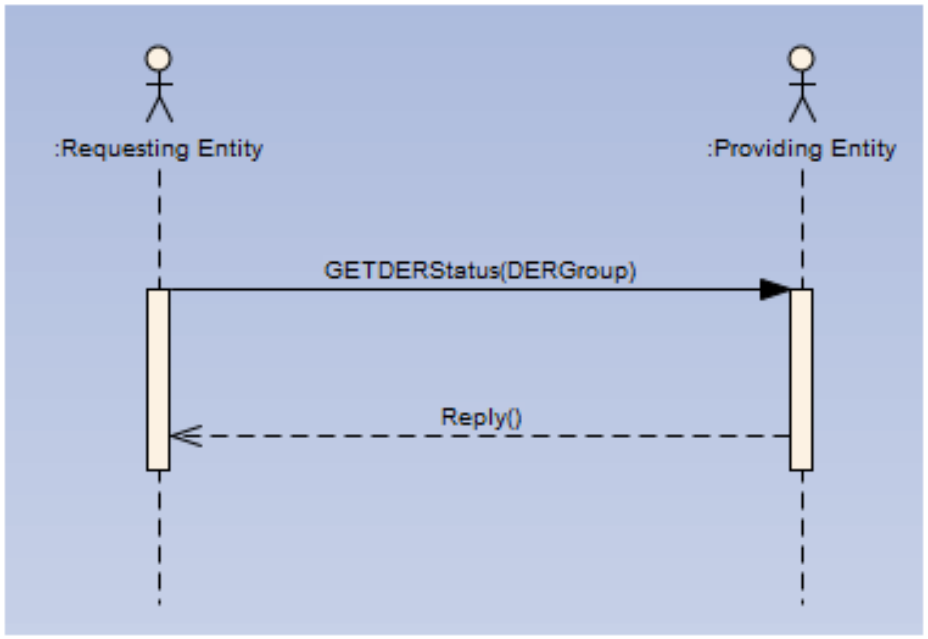
- DER representation in system model
- Creation of groups and sharing of group definitions

Monitoring DER Group Status and Capabilities



Supporting Sequence Diagrams





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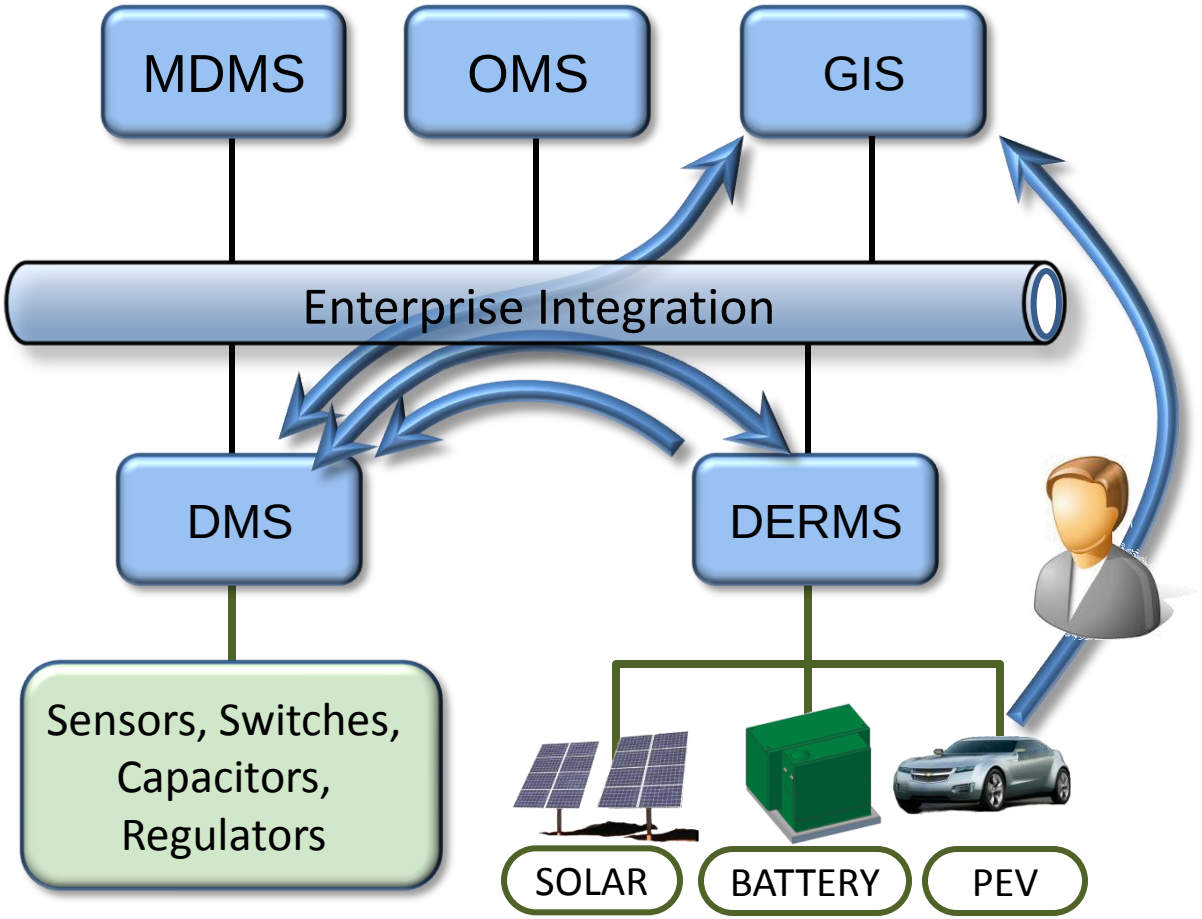
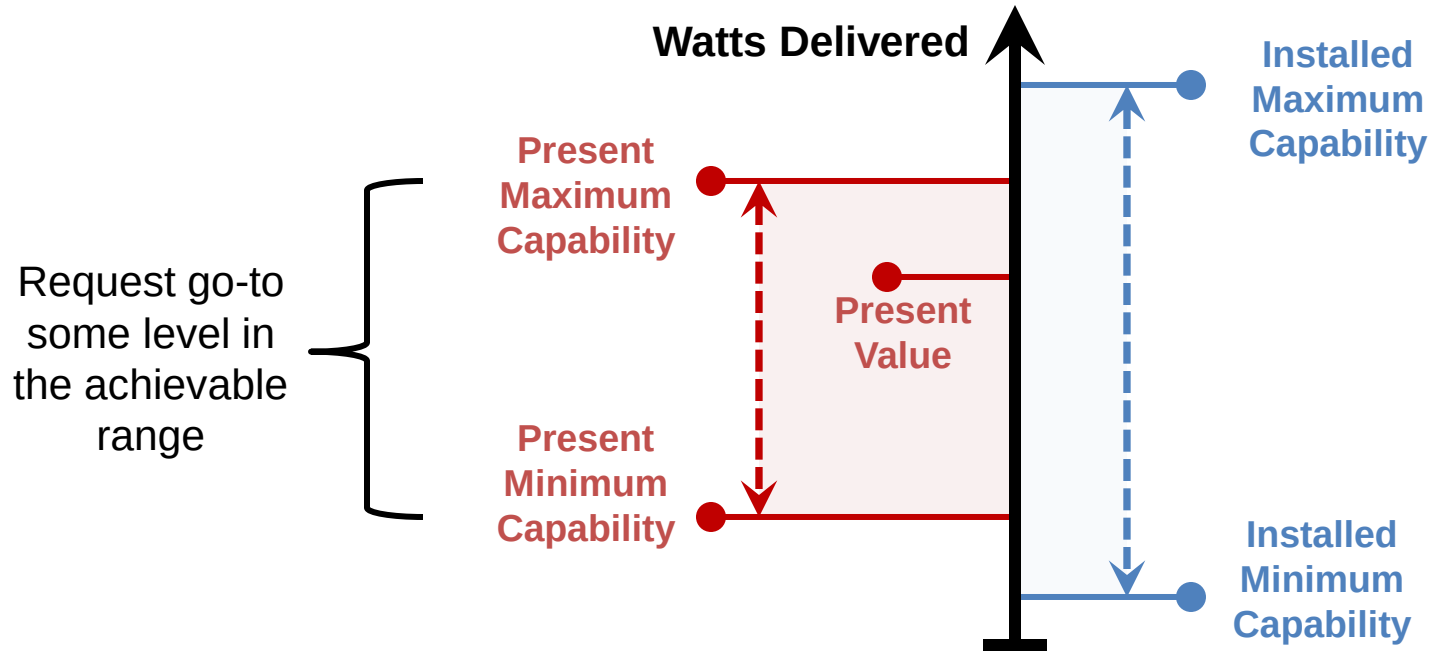


- DER representation in system model
- Creation of groups and sharing of group definitions
- Monitoring of group status

Requesting Action from a DER Group



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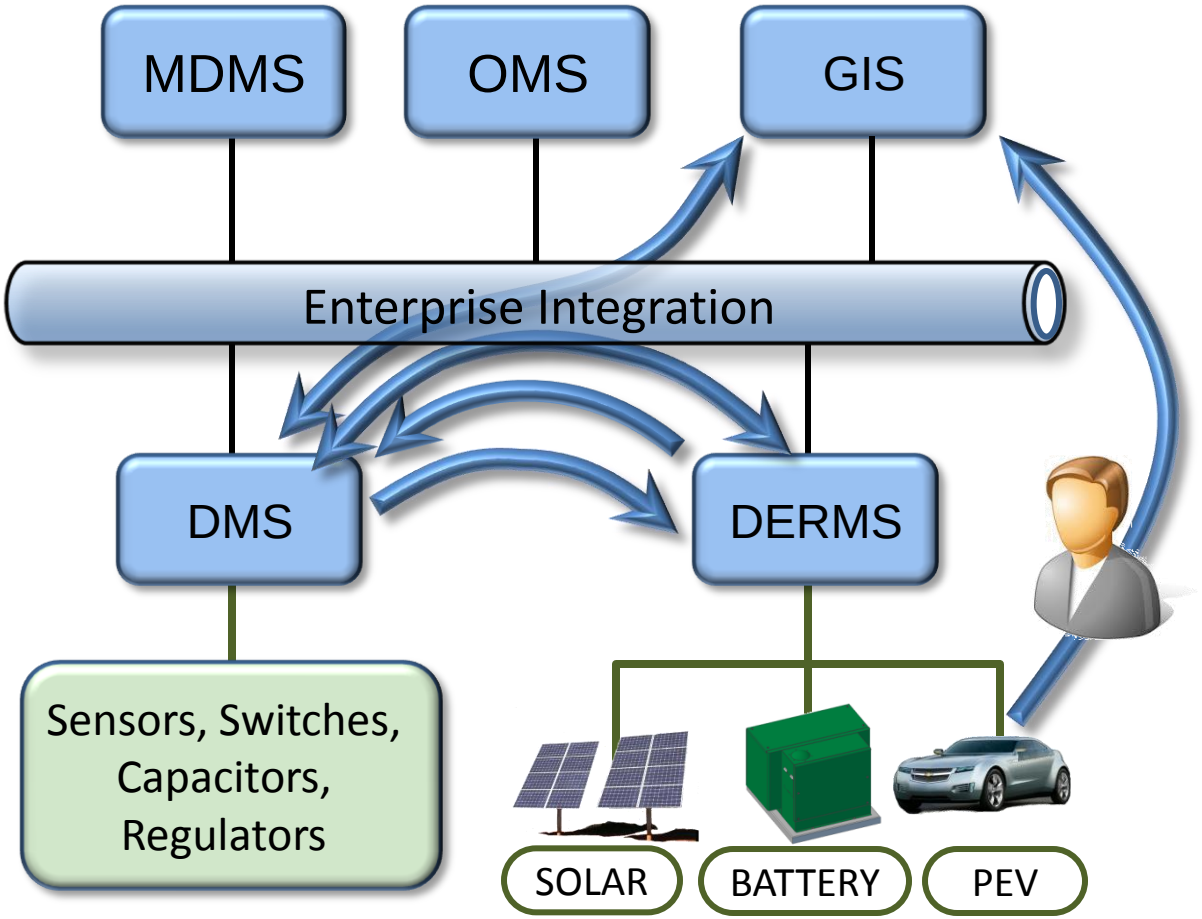
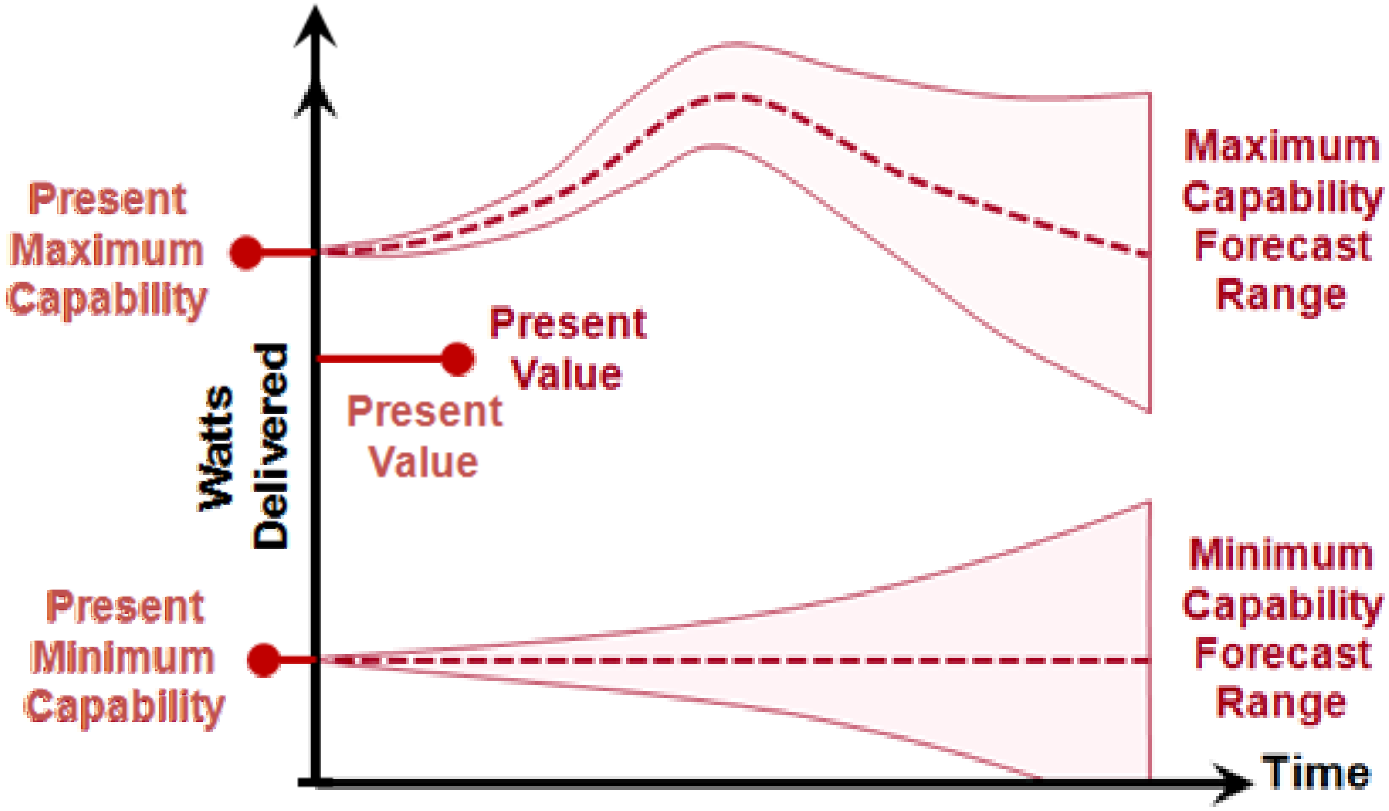


- DER representation in system model
- Creation of groups and sharing of group definitions
- Monitoring of group status
- Dispatch of real and reactive power

DER Group Capability Forecasts



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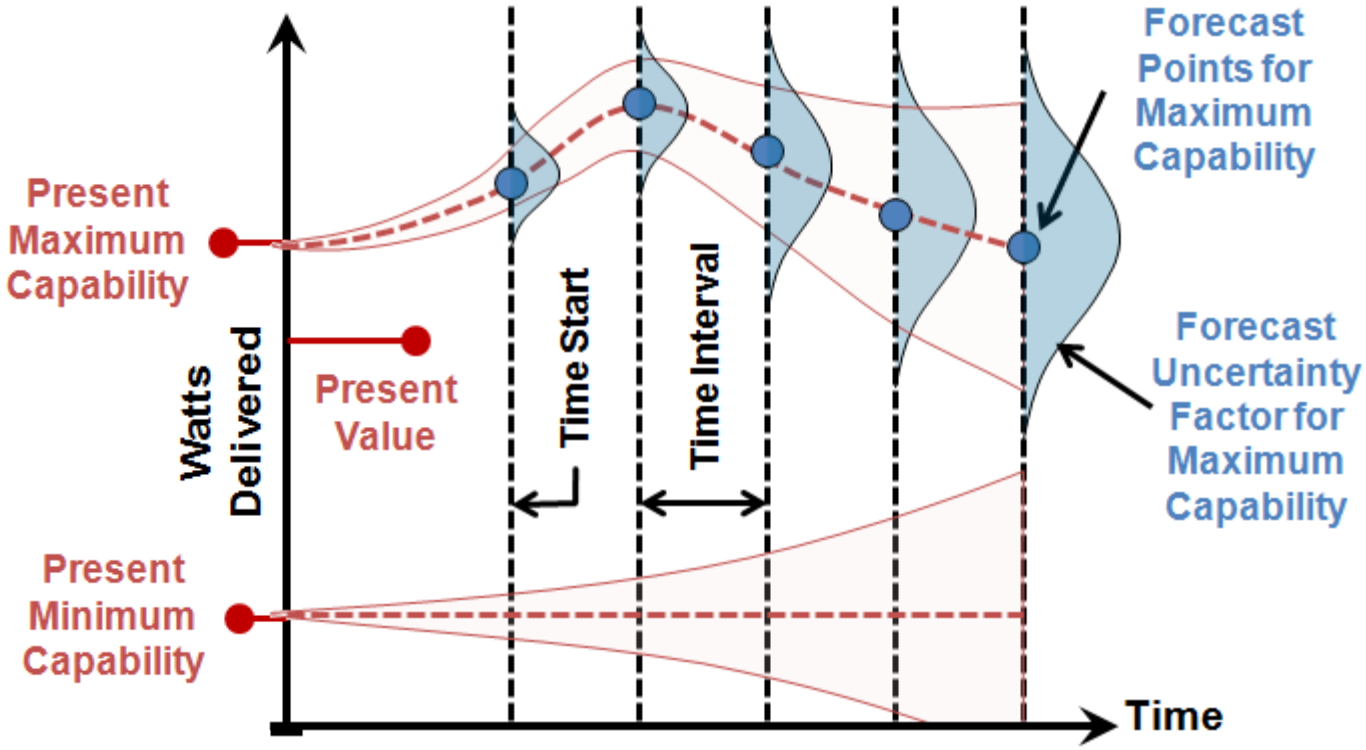
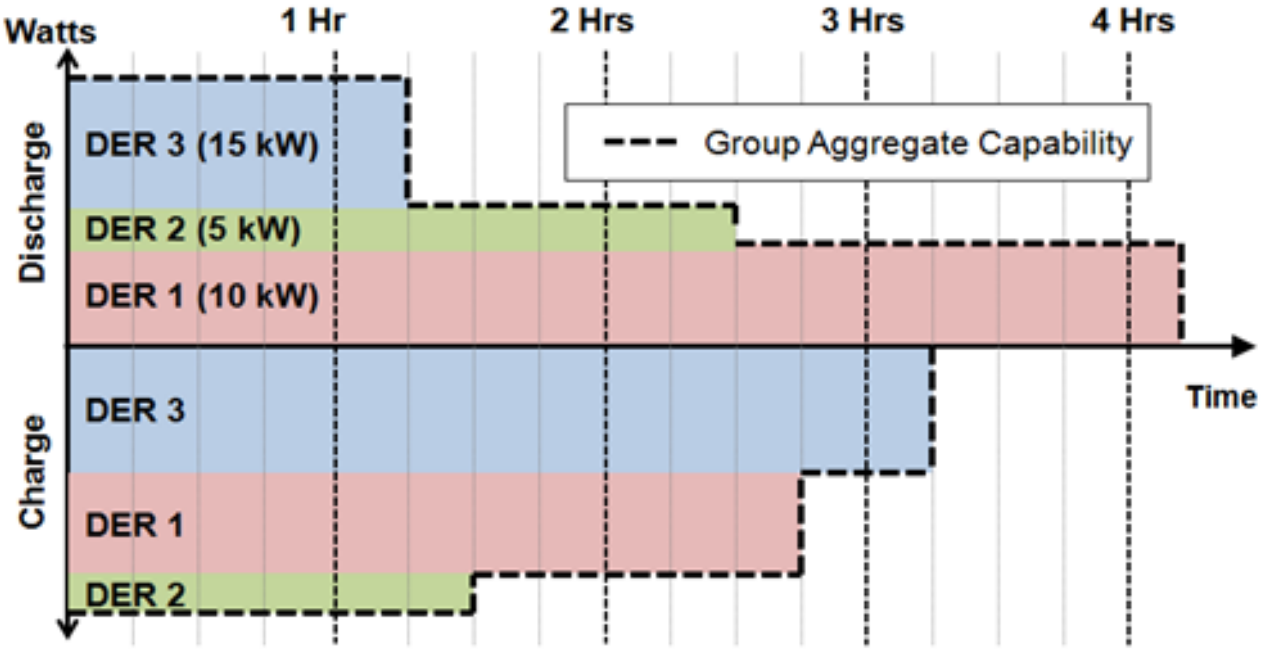
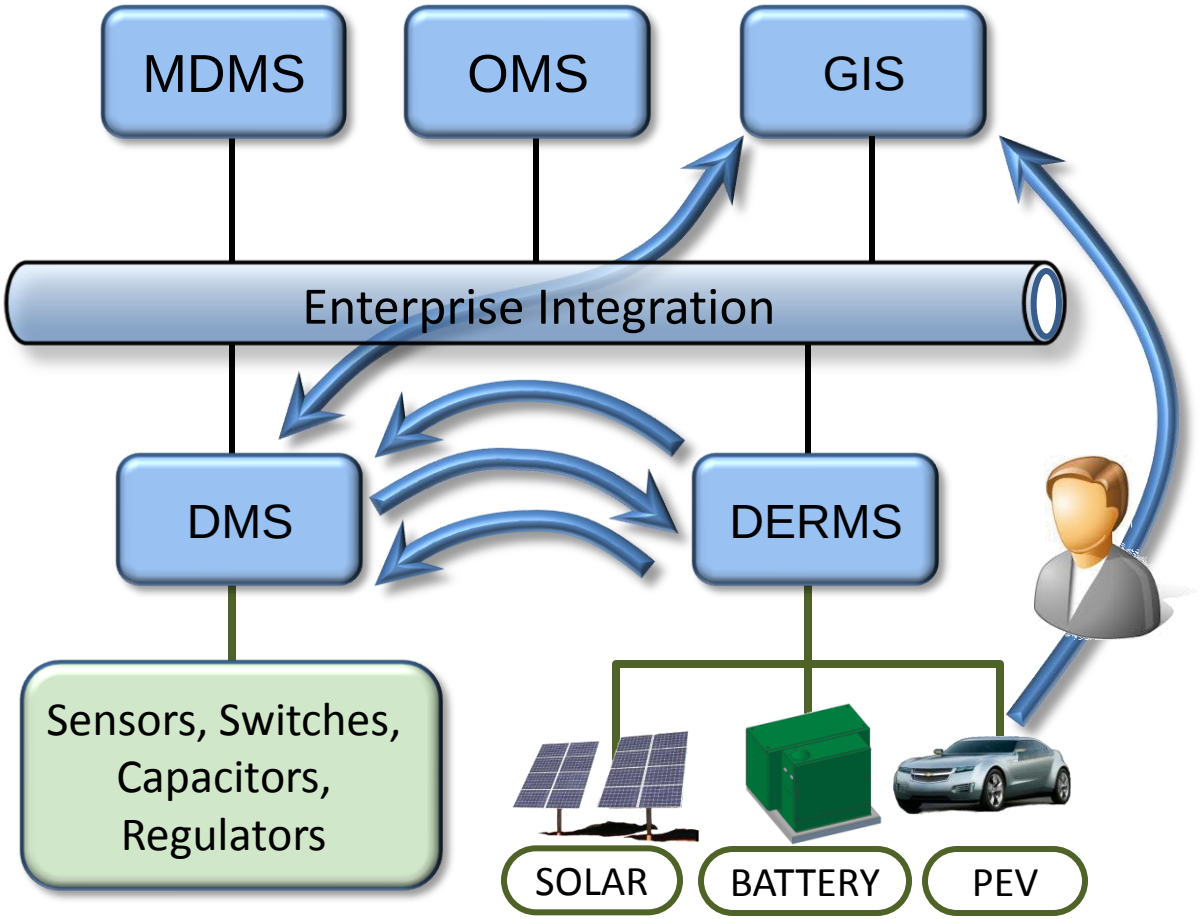


Storage Group Capability Forecasts



Power Available		
Duration	Discharge	Charge
1 Hour	30 kW	30 kW
2 Hours	15 kW	25 kW
3 Hours	10 kW	15 kW
4 Hours	10 kW	0 kW

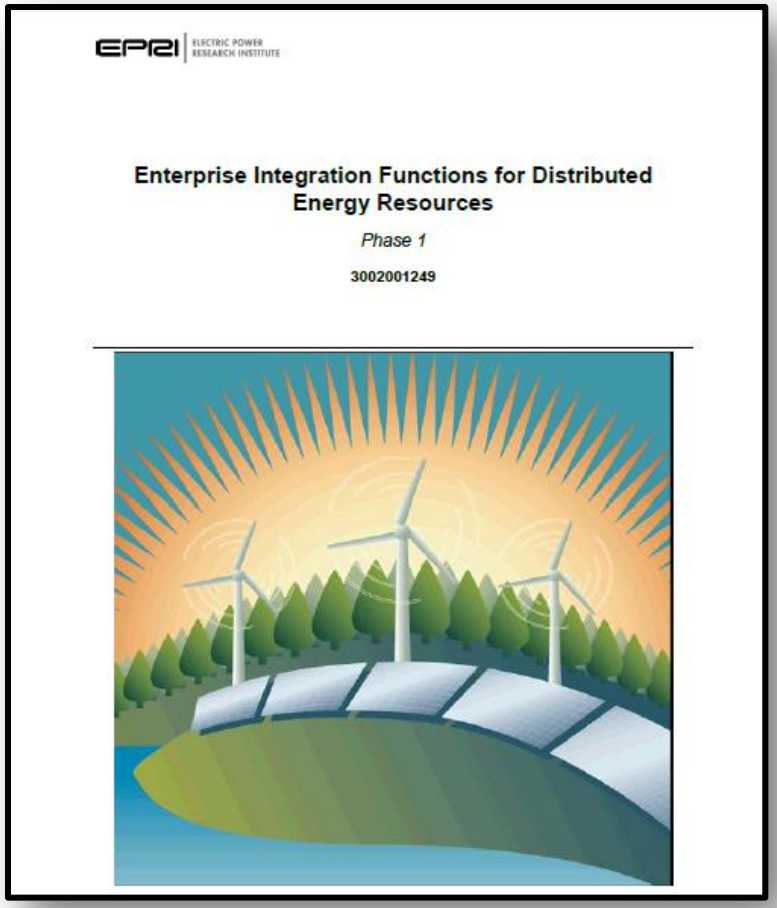
DER Enterprise Integration



- DER representation in system model
- Creation of groups and sharing of group definitions
- Monitoring of group status
- Dispatch of real and reactive power
- Forecasting of group capabilities

Summary of this Work: EPRI Report 3002001249

CONTENTS



Next Steps – Implement and Test

- Finalize support in CIM and MultiSpeak
- Interest Group
- Define and Document Test Cases
- Update Test Harness
- Conduct Workshop
- Feedback to Standards Organizations
- (future) Add Further Capabilities to Standards

Discussion

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