

Breakout Session 4: Steady State Control and Coordination

Report-out Presentation – Topic A Internal Services within a Microgrid

By:

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Framing of the Topic (15-20mins)

- **What is covered**

- Frequency and voltage control

- Energy management (storage , generator, load; thermal)

- Run time Optimization (heat, emissions, electrical losses, equipment efficiency, economics, fuel cost)

- Control degrading (if it loses a resource – first contingency, loss of equipment)

- Synchronization of microgrid and utility grid

Framing of the Topic (15-20mins)

- **What is not covered**

- Fault protection

- DC microgrids

- System planning (re configuration ; dynamic changing topology of system)

Current Technology Status (~15min)

- **State of the Practice**

- Centralized command and control

- Emergency power supply / UPS

- Single generator/ single load

- Building EMSs

- **State of the Art**

- Autonomous control (CERTS concepts, droop control)

- Distributed control

- Current R&D activities**

- Control schemes that support the full spectrum of DER

Current Technology Status (~15min)

- **State of the Art**
(Bulleted descriptions)
- **Current R&D activities**
(Bulleted descriptions)

Needs and Challenges (~15min)

- **What is needed and why**

DER interface with legacy systems (interfacing with dumb inverters)

– why: lower cost , greater flexibility

Protocol for all microgrid components (distributed equipment) to talk to one another (standardized)

Cyber Security

Enhancement of Energy management models – operational

Adaptable distributed controls to manage the inclusion and exclusion of equipment

Use of PMUs

3 phase state estimators

Coupling and decouples operations

Bump-less transfer

Interface hardware and protocol

R&D Scope

- **Description of the R&D scope responding to the challenges and needs**

Develop standard set of hardware and software that support the communication protocols and cybersecurity standards that have been developed that allow DER to plug and play

Develop three phase estimators based on PMUs and compatible instrumentation for developing run time control .

Develop a better understanding of methods of decoupling frequency and voltage.

Demonstrate a system that can synchronize and reconnect a microgrid under all edge conditions (high PV penetration) for all classes of microgrids.

R&D Scope

- **Description of the R&D scope responding to the challenges and needs**

1-2 slides