

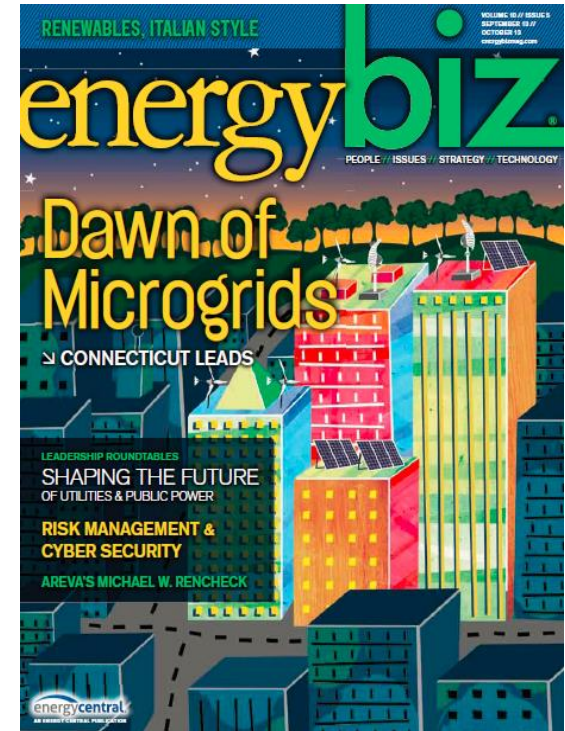
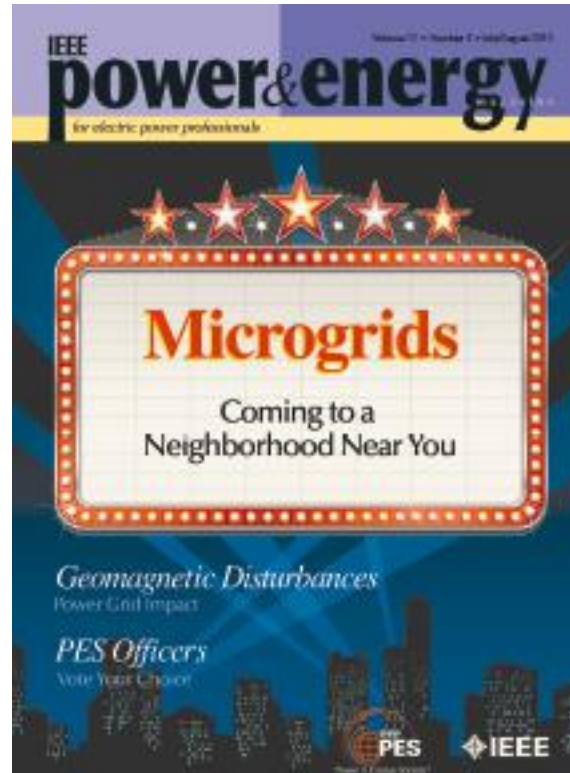
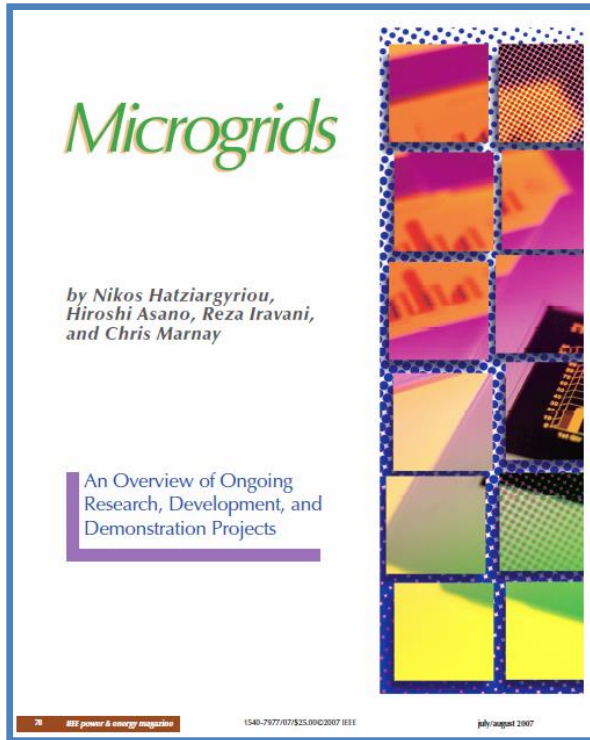
The Role of Microgrids in the Future Utility Network

Mark McGranaghan

Vice President, Power Delivery and Utilization

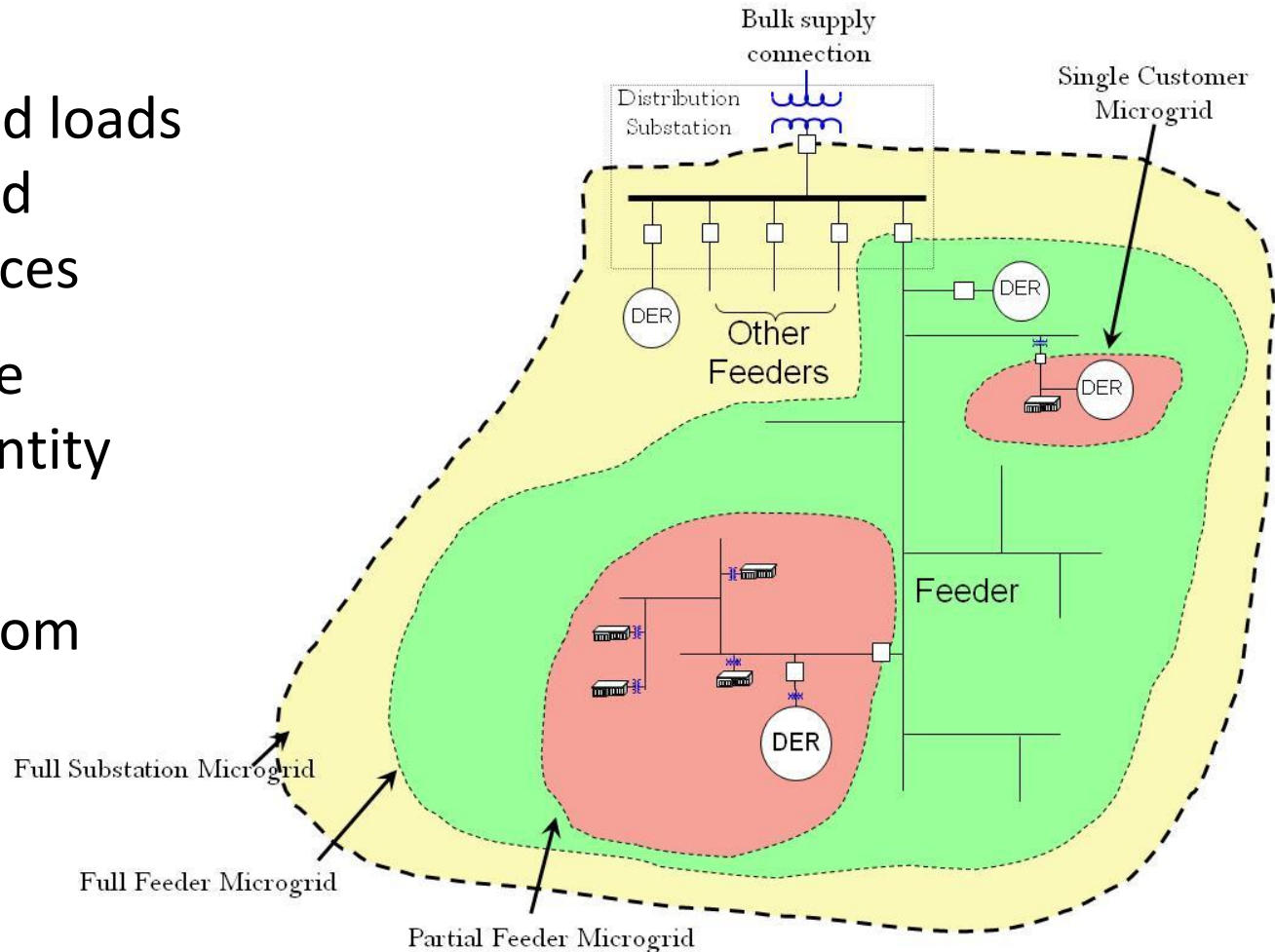
Electric Power Research Institute

Microgrids in the News



Examples of Microgrids

- Interconnected loads and distributed energy resources
- Acts as a single controllable entity
- Connects and disconnects from the grid



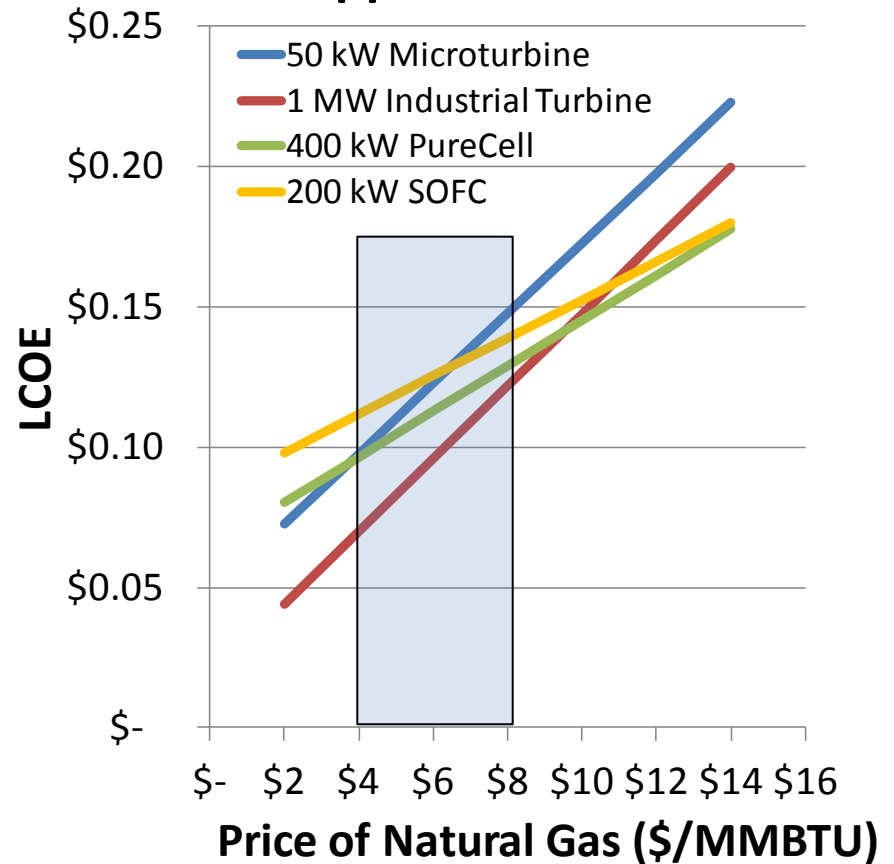
Commercial Distributed Generation

LCOE for DG in Commercial Applications



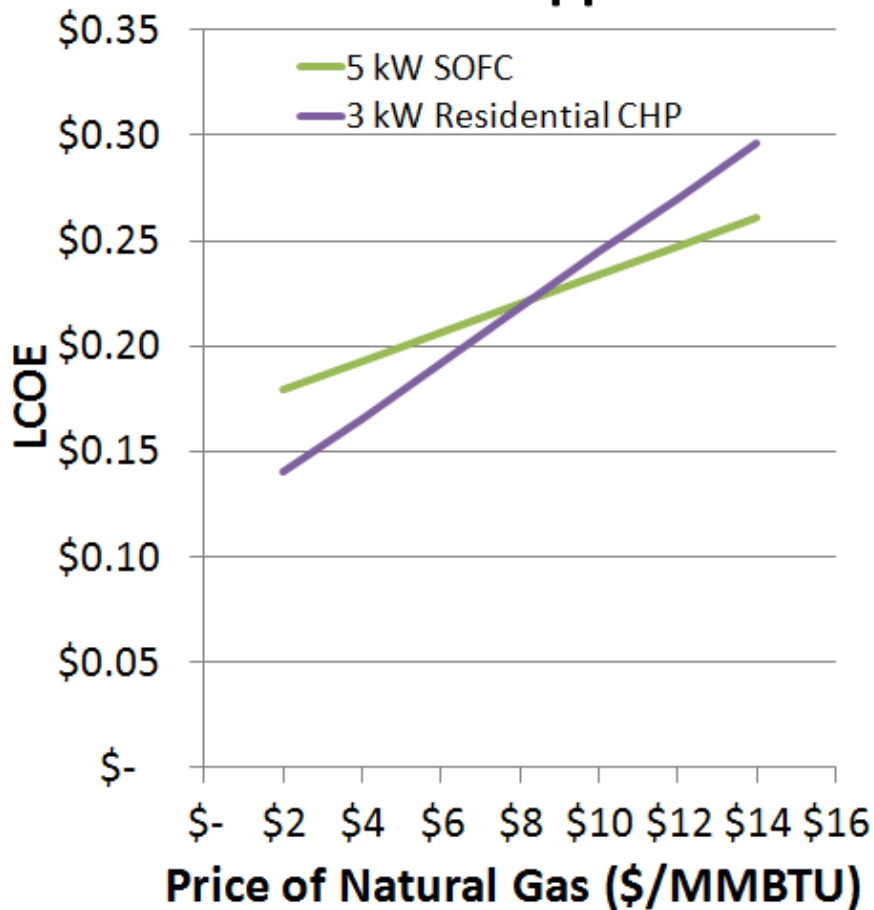
Fuel Cell installed at Whole Foods in Fairfield, CT

Source: Whole Foods



Residential Distributed Generation

LCOE for DG in Residential Applications



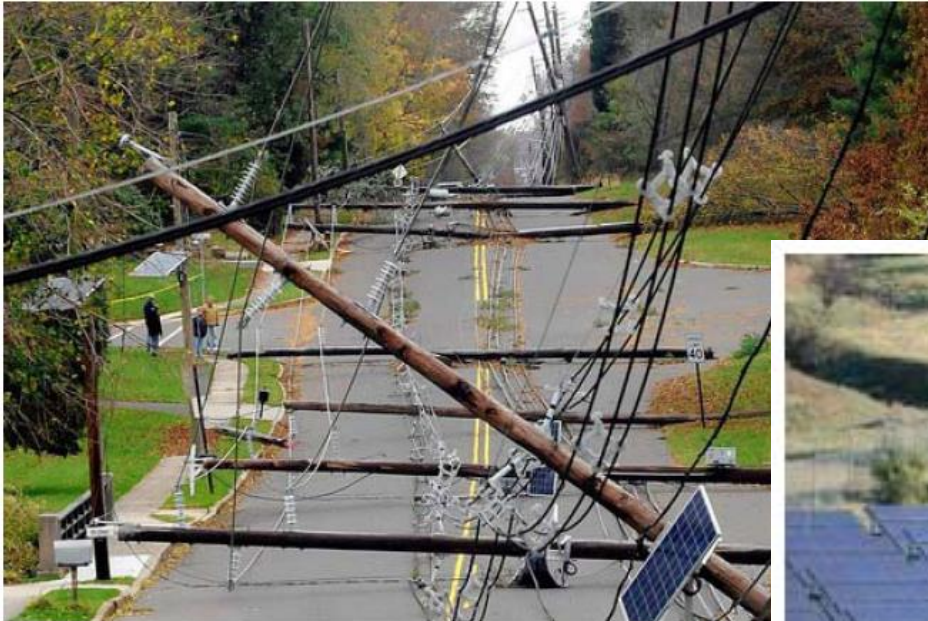
Source: ClearEdge Power

Japan Developments

- Subsidy for Building Energy Management Systems (BEMS) and Home Energy Management Systems (HEMS)
- Feed in Tariff for PV Applications
- Residential and commercial storage applications also subsidized
- Electric vehicle charging with two way capability



But Why Microgrids?



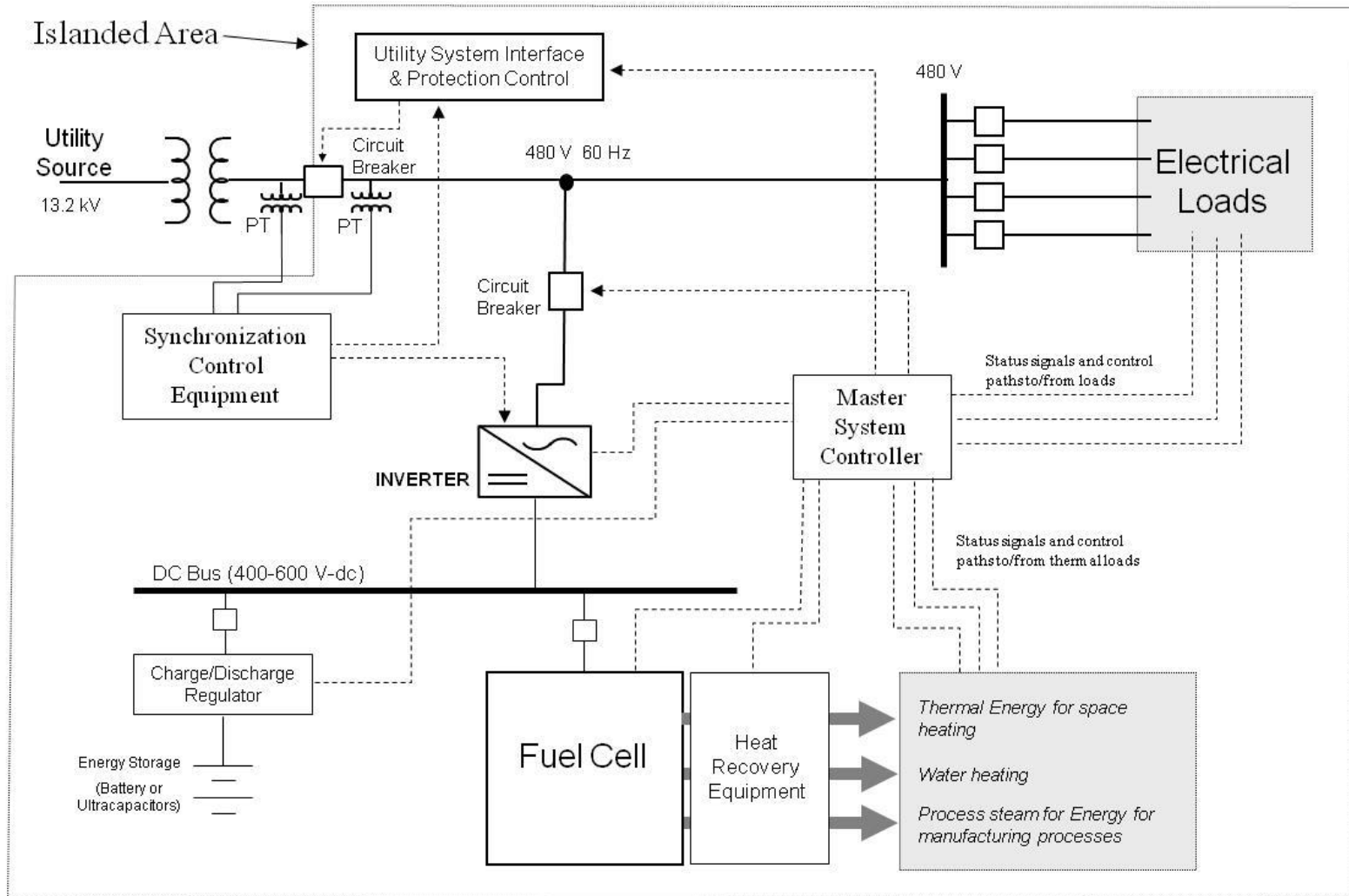
Remote Power Systems



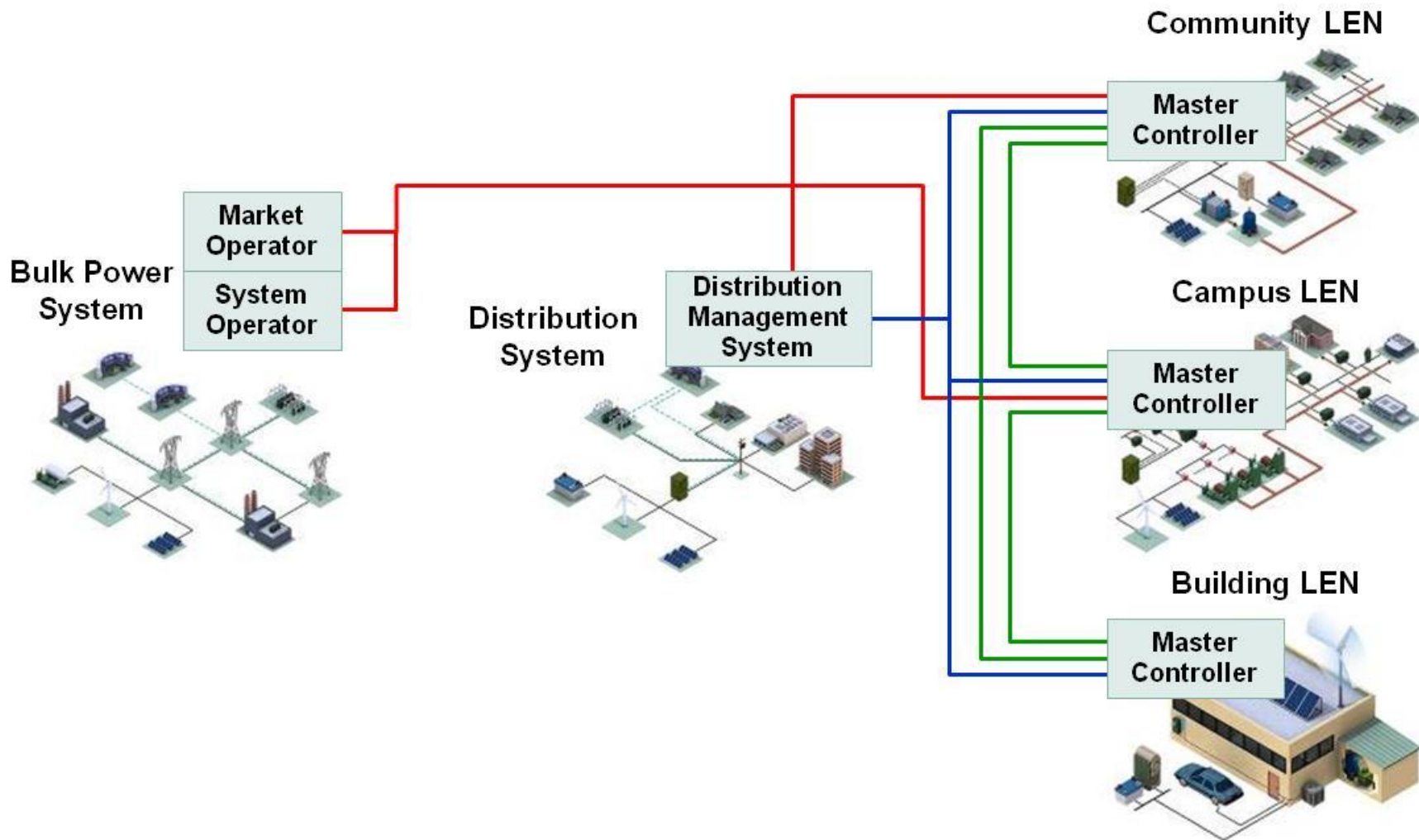
Resiliency

Marble Bar, Western Australia

Microgrid Technology Requirements



Utility Challenge – Integration



Still Many Questions

- Cost of generation?
 - PV and Wind
 - Gas Turbines
 - Fuel Cells
- CHP Opportunities
- Cost of Energy Storage?
- Value of reliability and resiliency?
- Policy and regulations?
- Grid integration requirements
- Safety, ownership, maintenance?

