Utilizing Advanced Microgrid Controls to Approach 100% Renewable Power

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Basic Microgrid versus Advanced Microgrid

Definition published by GTM Research in July 2018:

Microgrids vary in complexity ranging from a basic microgrid – a backup generator that is capable of running in parallel with the grid and has the ability to automatically island and resynchronize to the grid after an outage – to a multifunctional microgrid with increased capabilities providing more flexible generation and enhanced reliability to both the local community and the bulk power grid.
Illinois Institute of Technology (IIT) - 2009

- 1 generation source
  - Campus central plant
- Existing distribution system
- Controlled by SCADA system
What happens if generation source is lost?
Santa Rita Jail, California - 2012

- Multiple generation sources
  - 2MW ESS
  - 1MW Fuel Cell
  - 3MW PV
- One centrally located microgrid controller
What happens if the controller goes down?
Ameren TAC Microgrid Installation - 2016

- Multiple generation sources
  - 125kW PV array
  - 2 430kW NG generators
  - 100kW Wind turbine
  - 250kW Battery energy storage
Ameren Goal: Economics and Resiliency

DER Optimal Power Flow
Frequency Control
Demand Response
Peak Load Shaving
Grid Connected Transition
Islanded Transition
Storm Preparedness
Green Mode

Distributed ability for multiple use cases and contingencies
Ameren Powered by 100% Renewables
Advanced Microgrid Controls

Traditional
Single Point of Failure

Ameren
Distributed Intelligence
Advanced Controls Need Simple Visibility
Multi Layered Security Approach

- Firewall
- Encryption
- Hardware Hardening
- Software Hardening
- Intrusion Detection
- Whitelisting
- Authentication
What are advanced microgrids providing?

• Ability to optimize power flow

• Multi level contingency planning

• Increased resiliency