Dynamic Islanding

For Improving Electric Service Reliability with Energy Storage

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Outline

1. Existing AEP storage projects
   - performance data

2. New AEP storage projects
   - exploring new storage values

DOE/Sandia has been sponsoring the innovative components of energy storage projects in AEP
AEP NaS Application #1

1.2 MW, 7.2 MWh Distributed Energy Storage System in Chemical Station, North Charleston

Started Operation on June 26th, 2006

DOE/Sandia Report
SAND2007-3580
Operational Data Supports Benefits

- Capital Deferral - three years
- Less Stress on our Aging Infrastructure
- Quick Alternative to Conventional Mitigation
- Energy Value
Energy Storage - beyond Peak Shaving

- 2006: 1 MW, Peak Shaving  *(Being relocated to a new site)*
- 2008: 6 MW, Peak Shaving + Islanding
- 2009: 4 MW, Peak Shaving + UPS (City-Scale)
- ...
- + Renewables
- + Ancillary Services
- 2020: 1000 MW total + Multiple Values
Another Relaizable Benefit of Energy Storage

A *Quick* solution to *Reliability* and *Capital Deferral*:

1. Provide contingency power to single-source loads
2. Maintain service during system repairs
3. Defer Investment

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Improved Service Reliability
AEP NaS Application #2 - with DOE support

- 2MW, 14.4 MWh in Bluffton, Ohio
- Two other identical sites (2008)
- All will have dynamic islanding
- DOE/Sandia is sponsoring development of Dynamic Islanding
Using a NaS Battery to Mitigate Outages

A Fault Occurs Locking Out the Balls Gap Feeder

IT-II will “Island” the battery to serve feeder loads for permanent faults upstream of Sw#3.
Using a NaS Battery to Mitigate Outages

All IT-II Devices Open (on Loss Of Voltage)

Opening all devices allows IT-II to “qualify” that the load in each section does not overload the DESS.
Using a NaS Battery to Mitigate Outages

**IT-II Closes SW-1 to Energize Team 3**

IT-II verifies the pre-fault load in each section will not overload the DESS as each is energized.
Using a NaS Battery to Mitigate Outages

IT-II Closes SW-7 to Energize Team 2

IT-II verifies the pre-fault load in each section will not overload the DESS as each is energized.
Using a NaS Battery to Mitigate Outages

IT-II Closes SW-4 to Energize Team 1

IT-II verifies the pre-fault load in each section will not overload the DESS as each is energized.
Using a NaS Battery to Mitigate Outages

IT-II Closes SW-5 to Energize Team 4

IT-II verifies the pre-fault load in each section will not overload the DESS as each is energized
Future Work

• AEP’s 2009 project in Texas (4MW) will provide islanding without power interruption

• It is a City-Scale UPS with several hours of backup
Conclusions

• Utility-Scale batteries are a viable option
• Challenges:
  – High cost limits applications
  – Realizing multiple benefits of storage
  – Regulatory limitations on:
    • ownership (generation vs. T&D)
    • socializing storage cost

• Financial assistance is still needed to break the price cycle (cost vs. units sold)