Development of the Conceptual Basis for the Optimal Application of Electrical Storage in an Energy Surety Microgrid

Daniel A. Brown

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ESS Peer Review

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Outline

- Who is Thayer Gate?
- Definition of Energy Surety
- Motivation
- Project Background and Goals
- Schedule
- Next steps

Thayer Gate Energy

- Not-for-profit group of engineers, military officers, former West Point Professors and utility executives
- Hold a common vision of secure power for national military/first responder sites
- Vision is for Thayer Gate to serve as a vehicle to partner with the US government to solve impending problems in energy and national security.

Our Definition of Surety

Energy System is:	If it:
Safe	Safely supplies energy to end user
Secure	Uses diversified energy sources
Reliable	Maintains power when and where needed
Sustainable	It can be maintained indefinitely
Efficient	Produces energy at the lowest cost

Motivation

- Ft. Huachuca served by two feeders
- May 2002, fire takes out both feeders
- Base down for 16 hours
  - -Cost $3M
  - -Potential loss of mission capability

Lessons Learned

- Disperse the generation; reduce single points of failure
- Run generators full time
- Use proven technologies
- Secure the fuel supply
- Include on-site fuel/energy storage

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Project Background

- Optimize electricity storage on a Surety Microgrid
  - Determine appropriate type, size and location
- Conceived with military installations in mind
- Minimize single points of failure
  - Central fuel storage
  - Single line feeds

Project Background

- Maximize fuel source security
  - Incorporate generation in proximity to loads
  - Rely primarily on renewable resources
  - Use fossil fuel generation as backup
    - Local fuel storage/no central storage
- Energy storage is key to a well designed surety microgrid

Energy Storage is Key

- Storage helps bridge the gaps with
  - Voltage sags caused by motor starts
  - Transition to and from islanding mode
  - Renewable resource ramping

Goals

- Develop model that allows optimal storage selection
  - Type
    - Battery, Flywheel, Fuel, etc.
  - Size
  - Location
- Model output
  - Cost vs. number of “9’s” of reliability

Future Goals

- Apply model to actual military installation
- Validate model by building surety microgrid prototype on chosen military installation

Schedule

- CRADA officially began – Feb 05
  - Since Feb 05
    - Determining rolls of partnership
    - Defining necessary terms including Surety Microgrid
    - Preliminary model requirements outlined
- May 05 – It became clear that the Sandia team did not have the necessary expertise to build model
  - Work began to secure internal money to fund additional partner

Schedule

- Sandia/New Mexico State University partnership – Officially started Oct 05
  - NMSU has agreed to help develop model
- Data collection underway – as available
  - Power system details from military base layout (unclassified)
  - Reliability of renewable resources
  - Reliability of energy storage components
- Prioritize critical loads – Oct 05

Schedule

- Identify modeling and analysis approach – Dec 05
- Develop models for sources and storage – Feb 06
- Develop tool for optimum resource mix – June 06
  (reliability vs. cost)
- Identify verification strategies – June 06

Thank-you

Daniel Brown

Sandia National Laboratories

dabrown@sandia.gov

505-284-5858