Achieving Critical Power for Critical Loads

The Army’s Base of the Future
How to Achieve Resiliency Requirements for Critical Assets?

Do you need to buy an expensive battery?

What Do your Customers Want?

What does the Microgrid need to control?

How do I know what Cybersecurity requirements are required?

Will my existing infrastructure work with the Microgrid?

Where do I get started?
The 5 Critical Lessons for Critical Assets

• Coordination of Stakeholders
• Cybersecurity
• Challenges integrating with existing infrastructure
• Ensuring operational requirements are met
• Multi-level contingency handling
1: Coordination of Stakeholders

- **SATISFY NEEDS**
- **ENGAGE & INFLUENCE**
- **MONITOR**
- **INFORM**

### Interest of Stakeholder
- Low
- High

### Influence of Stakeholder
- Low
- High
Municipal Utility-Owned Microgrid

Minster, OH
Solar plus storage microgrid – Completed 2015

Megawatts
- 10

Storage
- 7 MW

Solar
- 3 MW

Interest of Stakeholder
- Low
- High

Influence of Stakeholder
- Low
- High

Satisfy Needs
- Industrial Customers
- Third party financing company

Engage & Influence
- City Leadership
- Utility

Monitor
- Local / state policy officials

Inform
- Equipment Providers
Utility Driven, Consumer Focused Microgrid

City of Field Microgrid
Utility project highlighting effectiveness of battery storage – Completed 2013

1 MW / 7 MWh

Megawatts
Storage

Interest of Stakeholder

Low

High

Satisfy Needs
Customer

Engage & Influence
Utility
EPC Contractor
Customer

Monitor
Local community
Local / state policy officials

Inform
Equipment Providers
First Nation bands
Parks department

Low
High

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Ameren Technical Application Center, IL
Utility prototype with 15 use cases – Completed 2017

- Megawatts: 1.5
- Generators: 1.0 MW
- Solar: 150 kW
- Storage: 250 kW
- Wind: 100 kW
- Electric Vehicle: Load Only

Interest of Stakeholder
- Low: Residential customers, Local university
- High: Utility leadership

Influence of Stakeholder
- Low: System operators, Regulators, Other utility providers
- High: Equipment providers

Satisfy Needs
- Residential customers
- Local university

Engage & Influence
- Utility leadership
The Complexity of a Military Microgrid

Fort Belvoir, VA
Critical base for military applications – Completed 2019

Megawatts: 3
Generators: 1.6 MW, 1.0 MW, 400 kW
Solar: RMF
Mobiles: 3
ATO: 1.0 MW

Influence of Stakeholder
- Low: Government contracting, DoD Leadership, IA Validators
- High: SATISFY NEEDS
  - Government project management
  - Base energy manager
  - System operators

Interest of Stakeholder
- Low: DoD policy officials
- High: MONITOR
  - Local utility
  - Non-local military base officials
  - Government tenant(s)

Inform: INFORM
- National labs
- Equipment providers

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Practical Tips to Consider

- Project Management
- Make Time
- Smarten Up
- Who’s Who
- Hidden Helper
2: Cybersecurity - System of Systems
Overly Complex Security Protocols Result in Fragile Systems

**COMPLEXITY ≠ RESILIENCY**

Augmentation of cybersecurity solutions adds devices and applications that can malfunction and cause system degradation or cascading failures.

**KNOW YOUR SYSTEM’S NEEDS**

Understand the components and interfaces of your system and assess the risks at hand before selecting security measures.
Not all security postures are created equal

Legacy Security Paradigm
- Firewall
- Intrusion Detection
- Whitelisting
- Authentication
- Encryption
- Soft/Hardware Hardening

Defense in Depth Security Paradigm
3: Existing Infrastructure Integration

• Sizing of transformers
• Imbalance on the system
• Existing PV & feeder
• Adaptive relay settings
Generation Assets

• Examining generator operational state
• Upgrading generator controls
• Considering associated equipment
Physical Location

• Considering sub-grids
• Identifying open space for installation
• Installing new equipment

Network

• Varying speeds of communications
• Coordinating network design
• Integrating network hardware
• Participating in existing network
4: Ensuring Operational Requirements are Met

- **Standard Use Cases**
  - Grid-Tied
  - Island
  - Transitions
    - Black start
    - Intentional Island
    - Island to Grid-Tied
  - DER Optimization
  - DER Monitoring and Control

- **Complex Use Cases**
  - Storm Preparedness
  - Islanding with renewables (Green Mode)
  - Peak shaving
  - Curtailment
  - Renewable smoothing
  - Frequency Regulation
  - Power Factor Correction
A microgrid must be able to withstand the loss of equipment or communications when supporting critical facilities.
What can we do?

• Coordination of All Stakeholders
• Deploying the latest Cybersecurity
• Review and develop Plan for Existing Infrastructure
• Ensure Operational Requirements are Met
• Deploying Multi-level contingency handling
Check List

• Engage Stakeholders

• Evaluate what is existing
  • Generators
  • Transformers
  • Distribution Circuit
  • Some areas maybe a better fit for a microgrid than others

• Develop of Resiliency Plan
  • If you have one, develop a feasibility study for your critical assets
Thank You!

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