Planning for the Future with Cyber-Secure Microgrids

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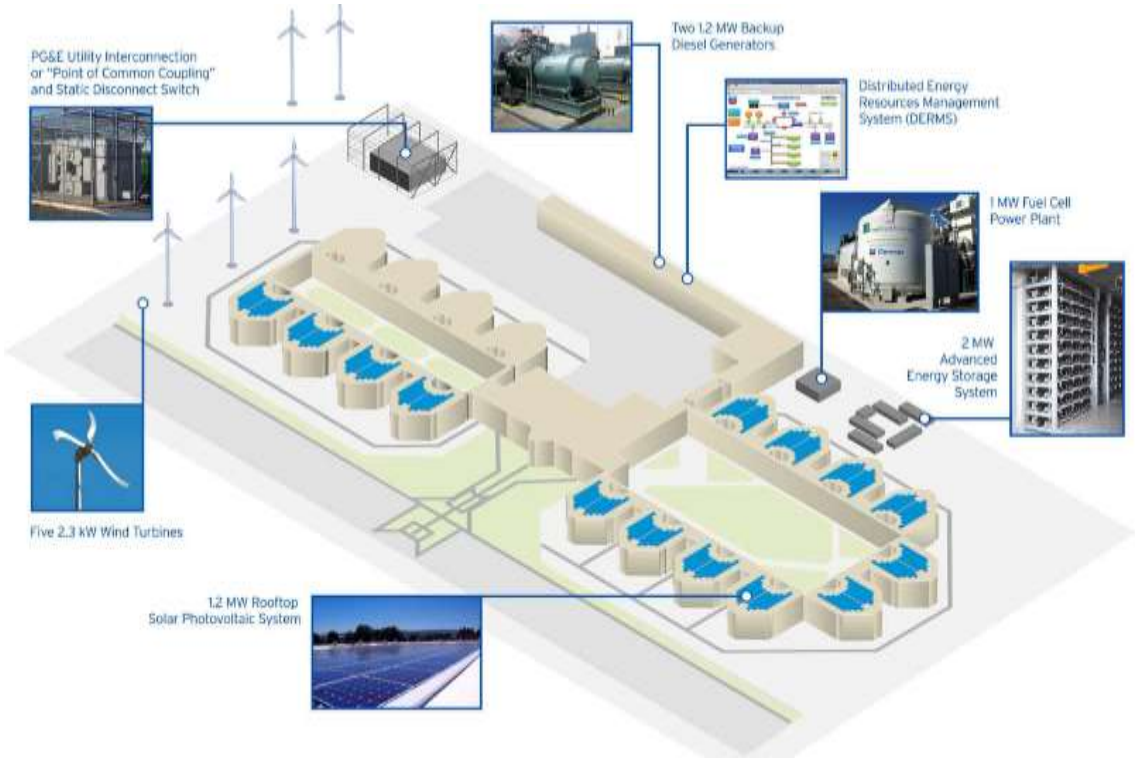
Hybrid Fueled Microgrid

Santa Rita Jail, California

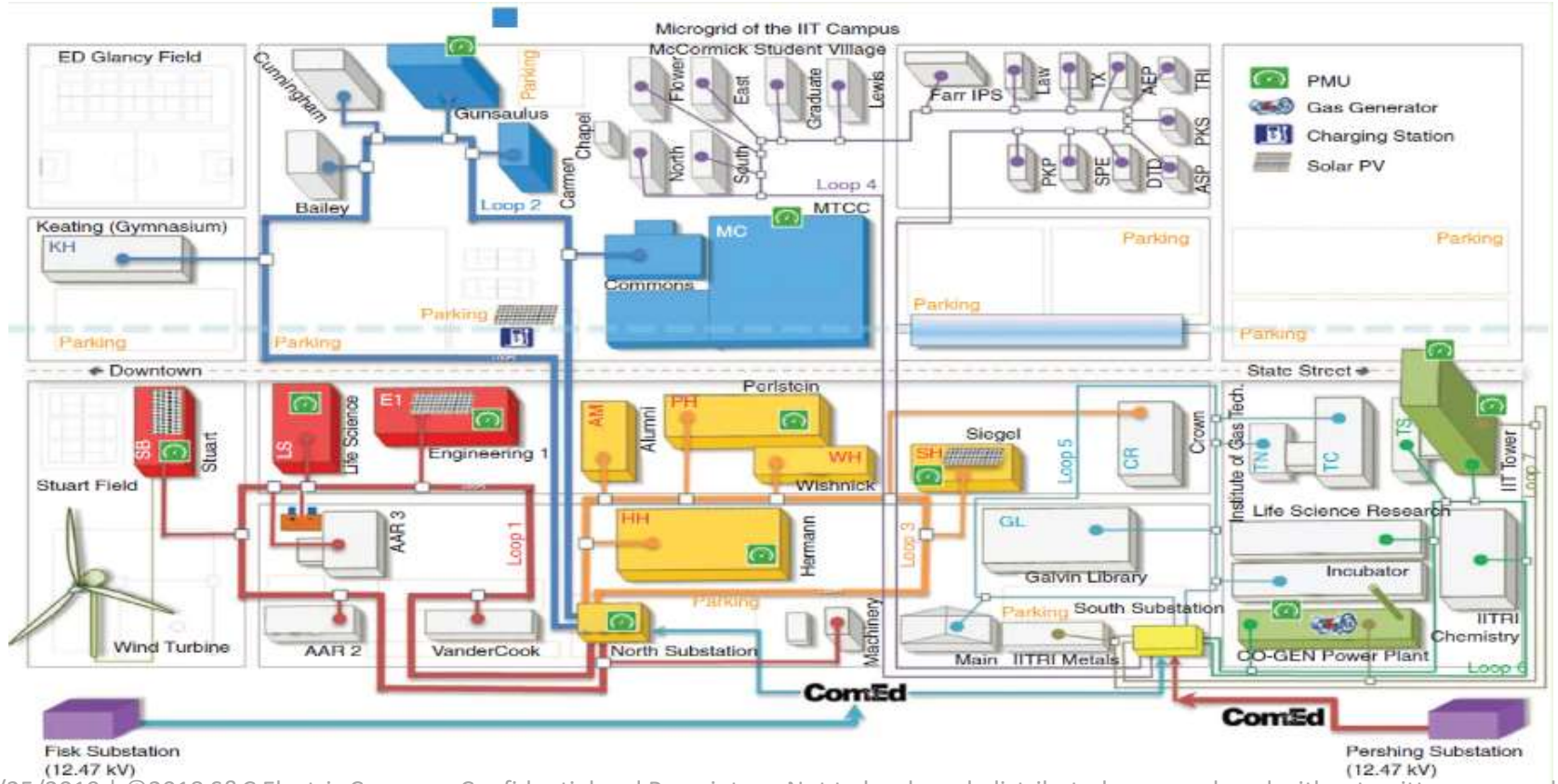
- Energy Arbitrage
- Islanding
- Peak Shaving
- Carbon Reduction



Increased Reliability

Illinois Institute of Technology – Chicago, IL

- Improved reliability, $1.3 million annually
- Reduced their peak demand charge
- T&D Deferral - $5 million substation



Community Resiliency Hub

North Bay Hydro, Ontario

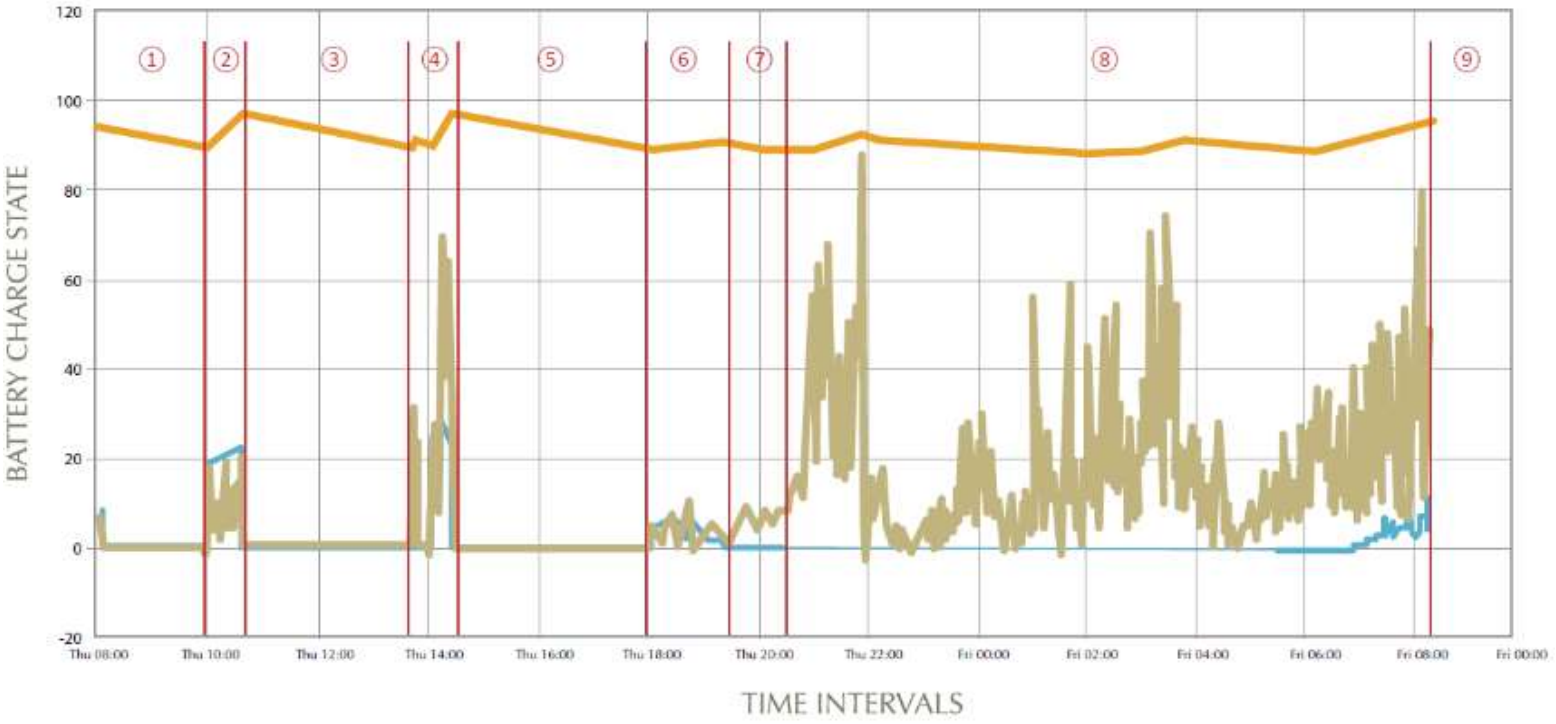
- Serves as place of refuge
- Lower energy cost
- Educational Tool
- Community Engagement

Advanced Microgrid

Ameren – Champaign, IL

- Economic Dispatch
- Self-Healing
- Islanding
- 16 Total Use Cases
- Seamless Transitions
- Latest Cyber-Security

100% Renewable Powered Microgrid



24-Hour PureWave® SMS-250 Storage Management System Island Test at Ameren microgrid.
Start of test 8/3/17 8:00AM CST, Completion of test 8/4/17 8:00AM CST

① Start of 24-hour SMS Island Test. State of Charge 97%. Solar & Wind off. SMS powers microgrid load.
② SMS State of Charge < 90%, system dispatches Solar & Wind. Solar & Wind power microgrid load and excess power charges SMS.
③ SMS fully charged to 97%, curtails Solar & Wind to zero output. SMS powers microgrid load.
④ Daytime cycle similar to interval #2. Higher wind output.
⑤ Daytime cycle similar to interval #3.
⑥ SMS SoC < 90%. Approaching Sunset, thus low solar output. Low wind output. Still enough Solar & Wind to power load and slowly charge SMS.
⑦ Dusk. Solar inverter shuts off. System relies on wind power to deliver microgrid load and SMS to provide voltage reference.
⑧ System successful through night-time with strong winds and SMS. Microgrid load powered the entire time.
⑨ 24-hour SMS Island Test complete. SMS never dropped below 88% SoC. Sunrise brings solar power back up.

Battery
Solar
Wind

S&C ELECTRIC COMPANY
Excellence Through Innovation

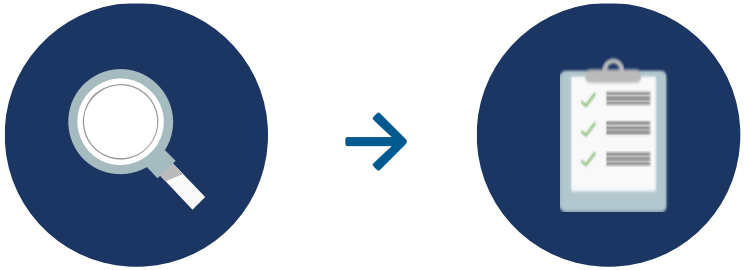
Overly Complex Security Protocols Result in Fragile Systems

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

Applying Lessons Learned

- Challenges integrating with existing infrastructure
- Ensuring operational requirements are met
- Multi-level contingency handling
- Cybersecurity approach

Key Points

- Hybrid Fuels Lower Cost
- Advanced Microgrids increase Resiliency
- Comprehensive Cybersecure system will provide layers of stability and Resiliency
- Non-Wire Alternative Solution for Reliability