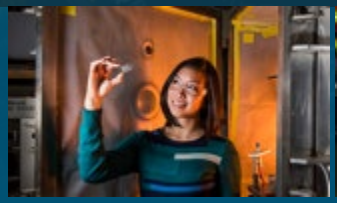
Multi-Objective Energy Storage Labs



PRESENTED BY

Ben Schenkman September 26, 2018

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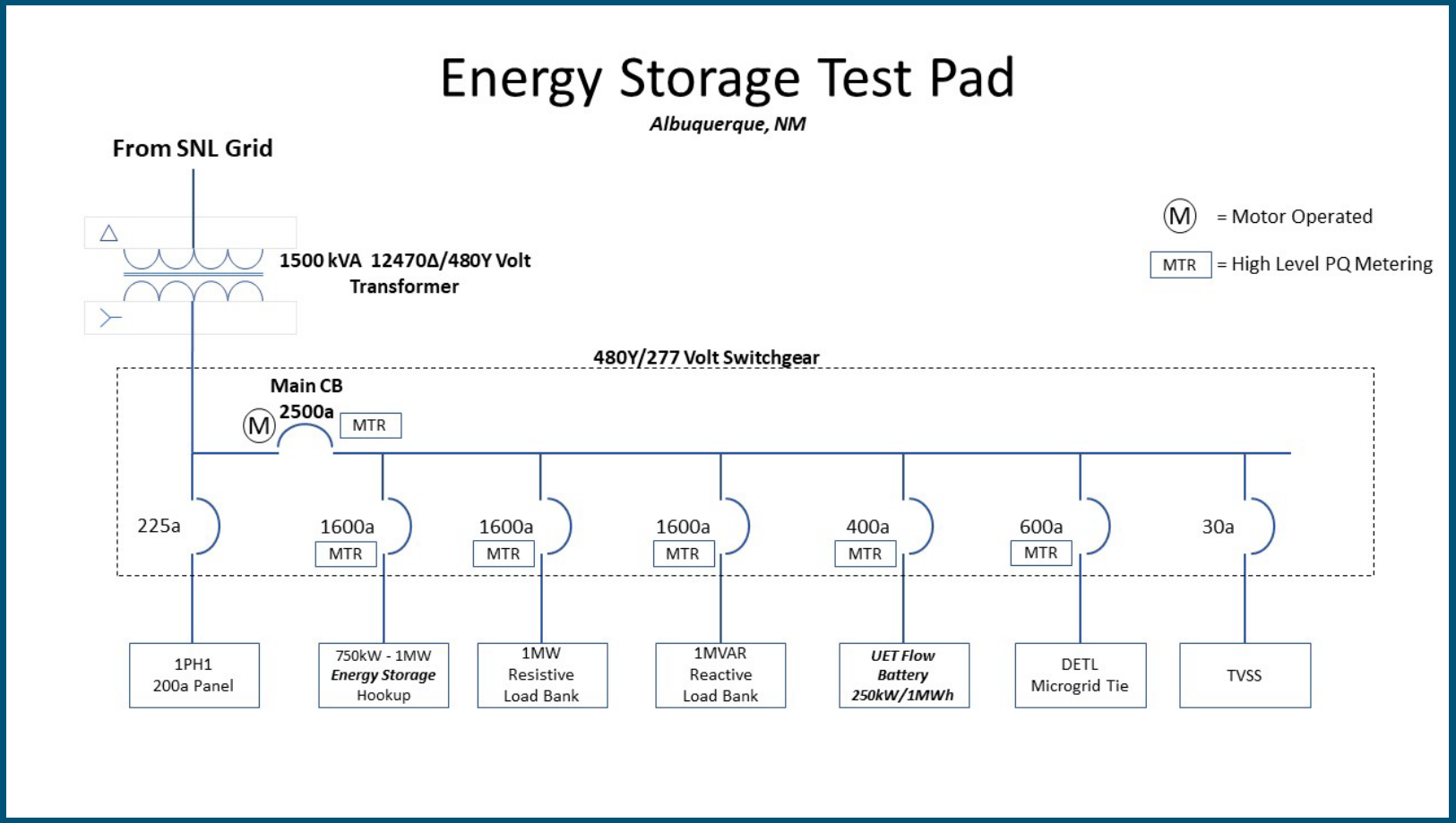
Sandia Energy Storage System Labs

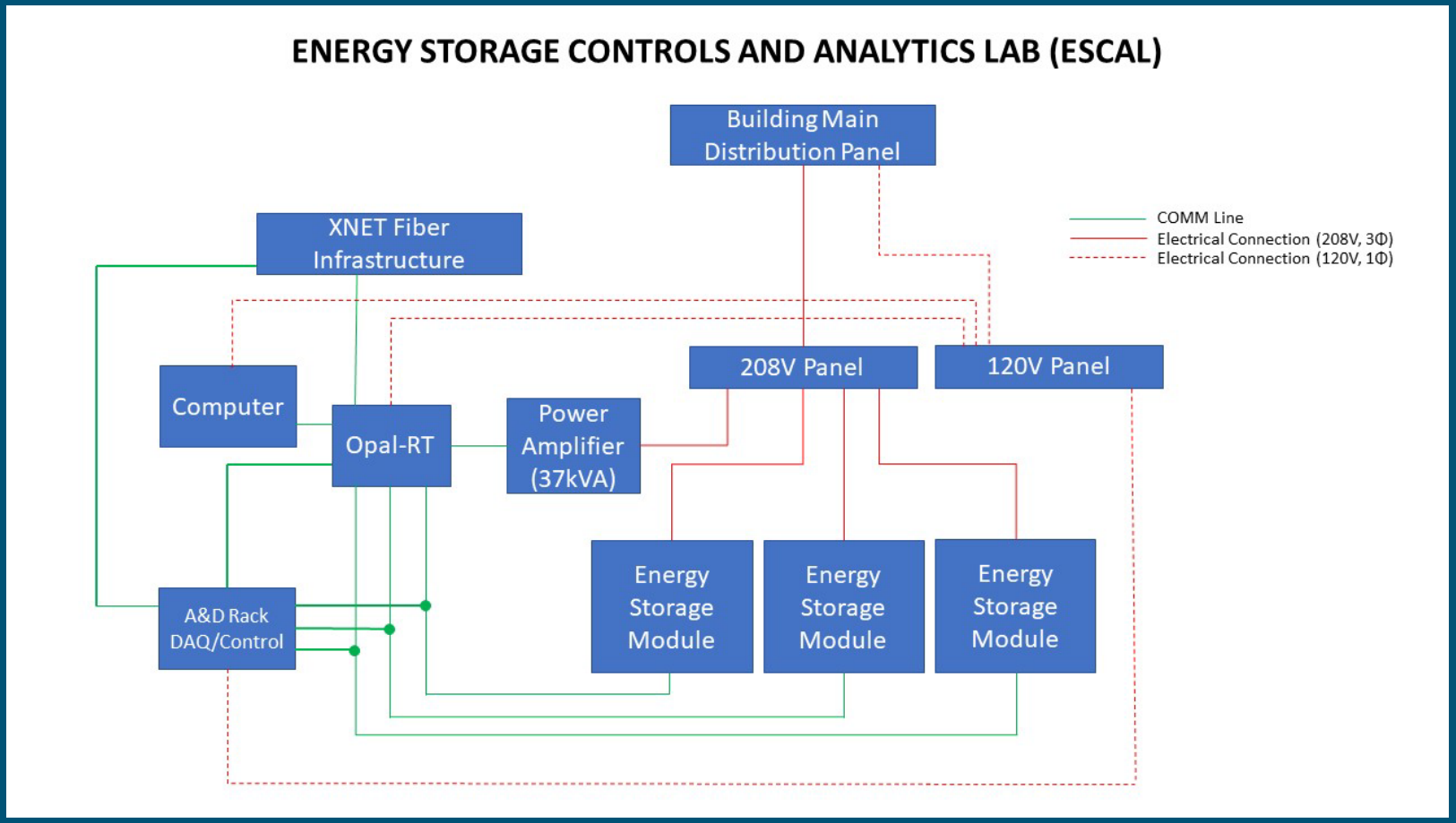
Energy Storage Test Pad (ESTP)

Energy Storage Controls and Analytics Lab (ESCAL)

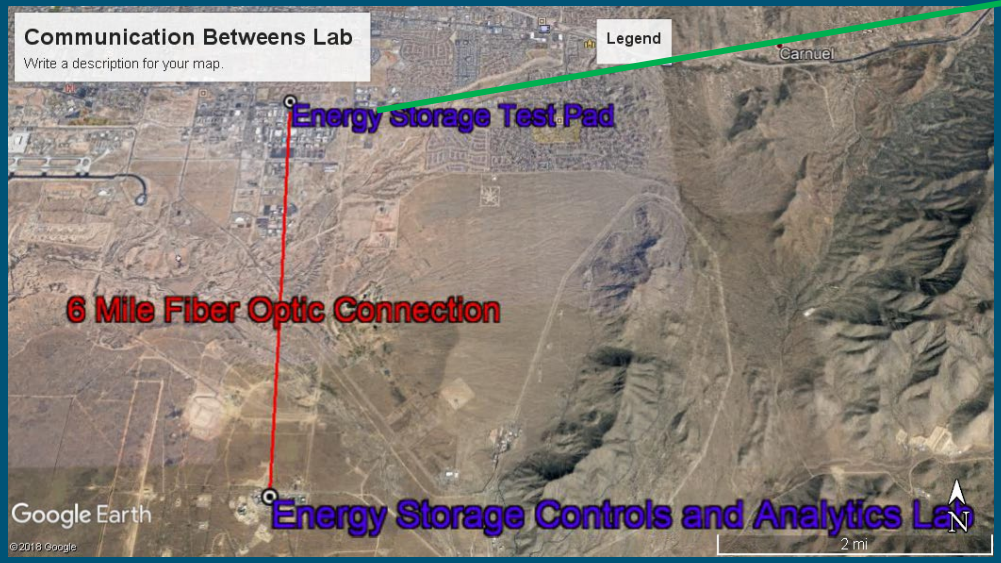
ESTP

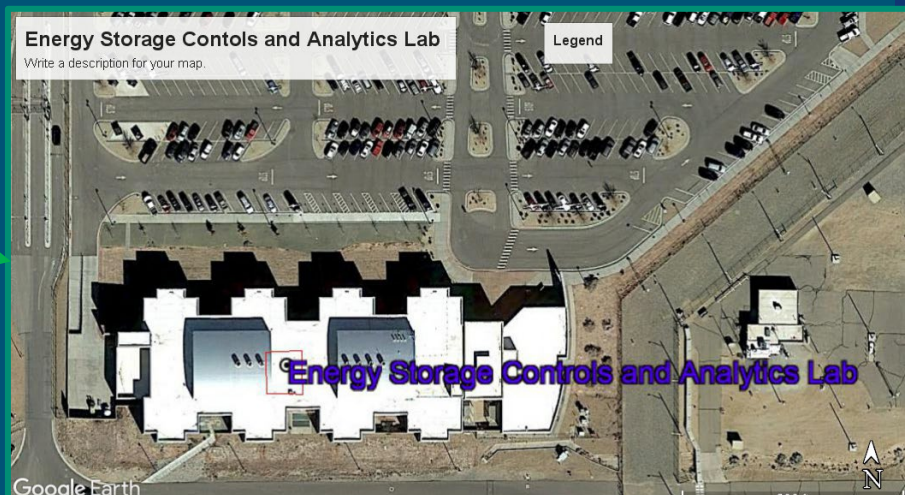

Energy Storage Test Pad
Albuquerque, NM
From SNL Grid
1500 kVA 12470Δ/480Y Volt
Transformer
M = Motor Operated
MTR = High Level PQ Metering
480Y/277 Volt Switchgear
Main CB
2500a
MTR
225a
1600a
MTR
1600a
MTR
1600a
MTR
400a
MTR
600a
MTR
30a
1PH1
200a Panel
750kW - 1MW
Energy Storage
Hookup
1MW
Resistive
Load Bank
1MVAR
Reactive
Load Bank
UET Flow
Battery
250kW/1MWh
DETL
Microgrid Tie
TVSS

ESCAL


ENERGY STORAGE CONTROLS AND ANALYTICS LAB (ESCAL)
Building Main Distribution Panel
XNET Fiber Infrastructure
COMM Line
Electrical Connection (208V, 3Φ)
Electrical Connection (120V, 1Φ)
208V Panel
120V Panel
Computer
Opal-RT
Power Amplifier (37kVA)
A&D Rack DAQ/Control
Energy Storage Module
Energy Storage Module
Energy Storage Module

ESTP and ESCAL Communication

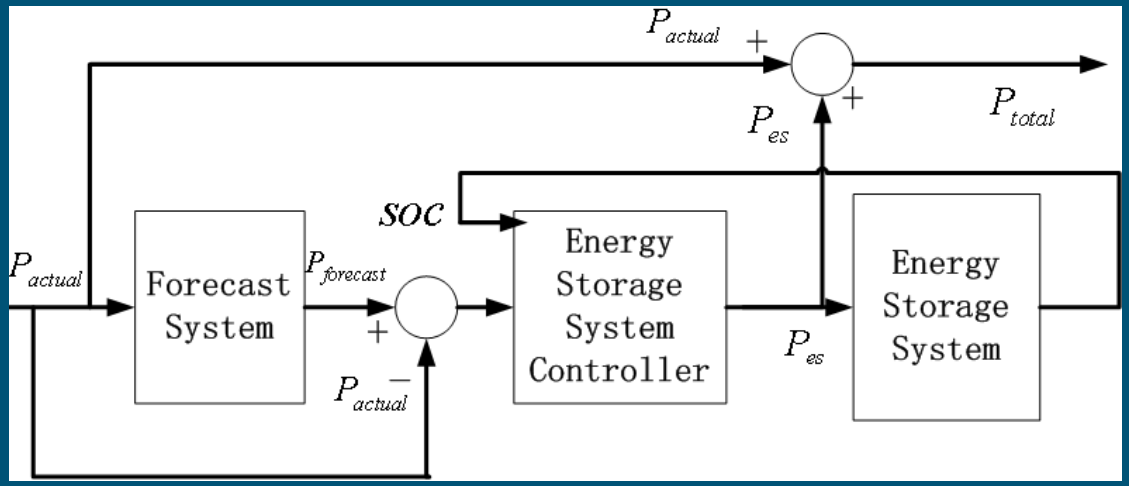


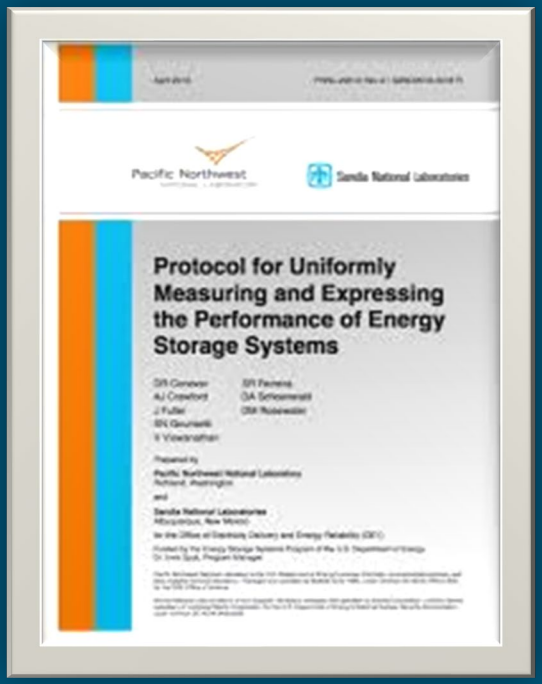


XNET is an isolated Sandia network connecting many labs

Energy Storage Technology Evaluation

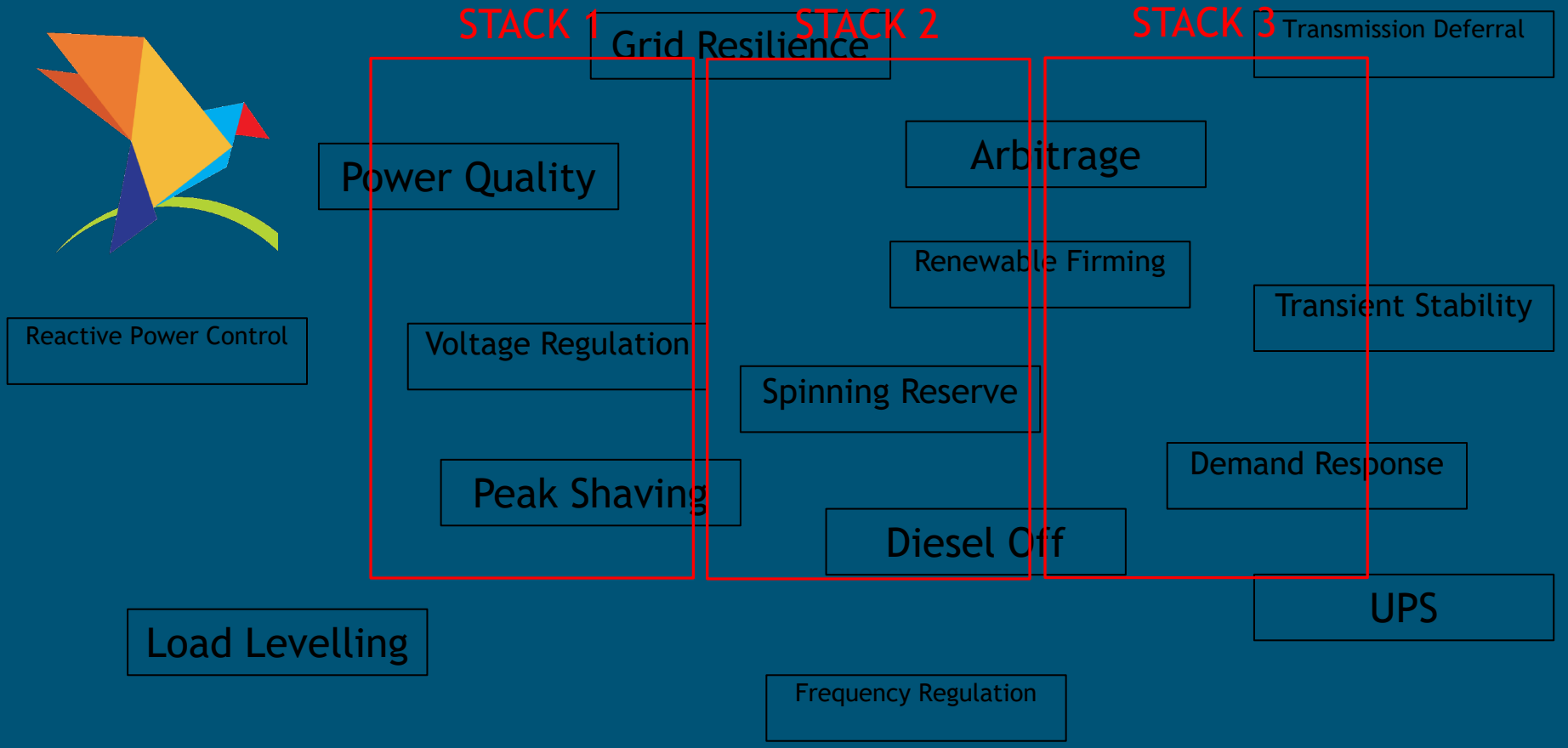
- Dynamic Model Development
- Technology Performance evaluation and comparison





Energy Management and Dispatch Controls

- Optimized economic dispatch algorithm development for grid tied and islanded systems
- Resilient and Stacked application development
- Validation through real time power hardware-in-the-loop and field validation

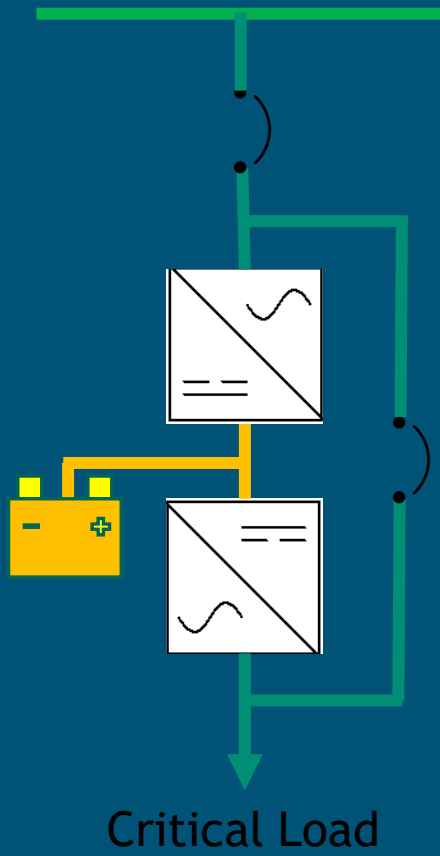


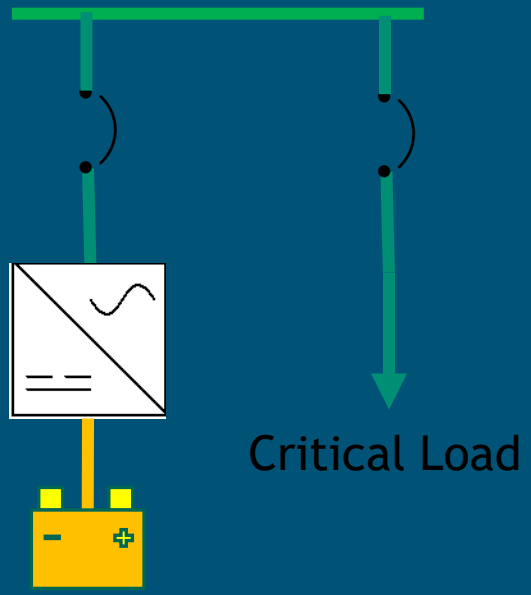
Topology Evaluation

- Central (Big) vs Distributed (Multi-Small)

Topology Evaluation

- Central (Big) vs Distributed (Multi-Small)
- Series vs Parallel UPS





Topology Evaluation

- Central (Big) vs Distributed (Multi-Small)
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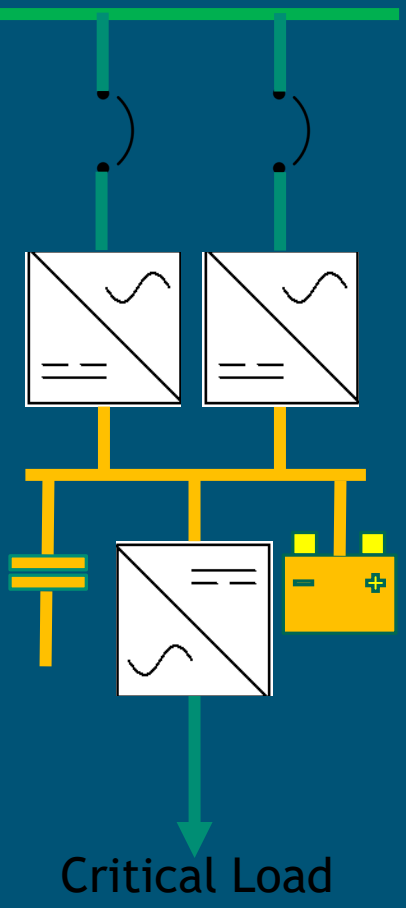
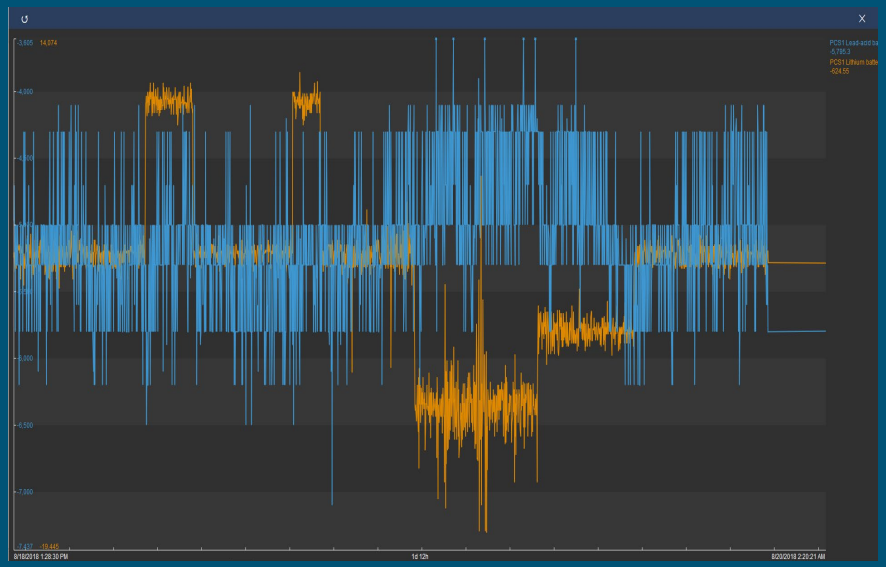
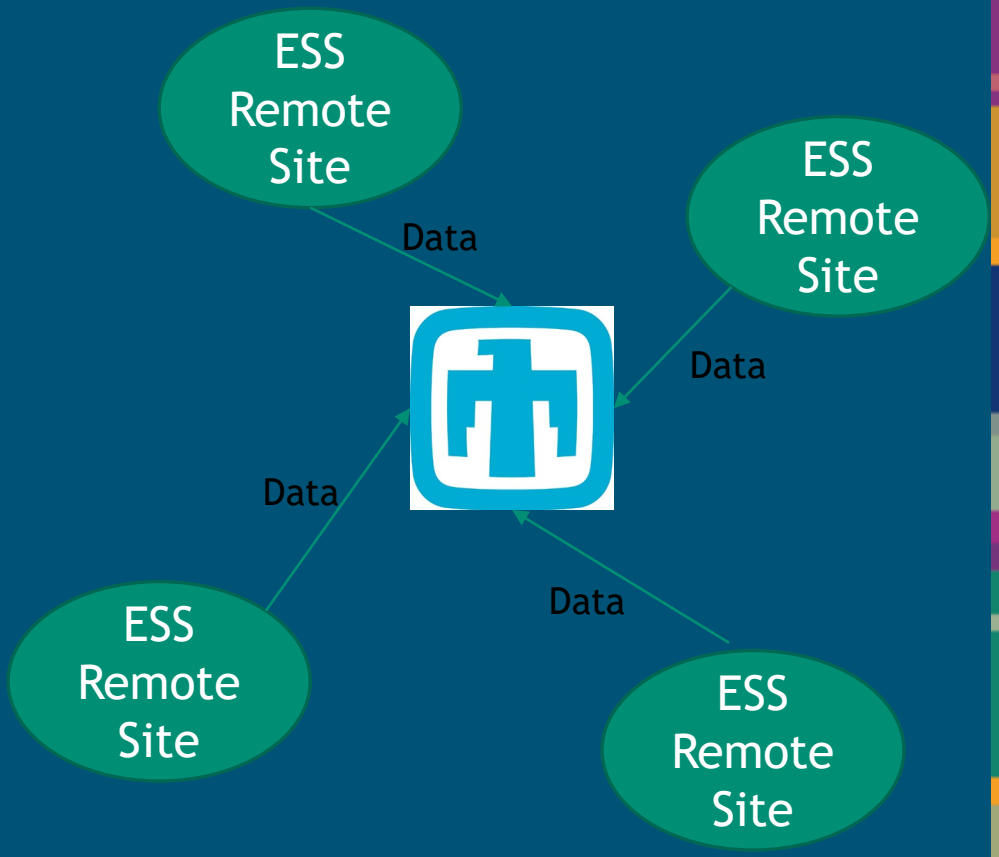


Remote Data Gathering

- Performance Evaluation such as degradation of technologies for various applications
- Optimize dispatch over time
- Future: Machine Learning algorithm





QUESTIONS

Thank you to DOE/OE Dr. Imre Gyuk for supporting this and other projects advancing the industrial and commercial acceptance of energy storage