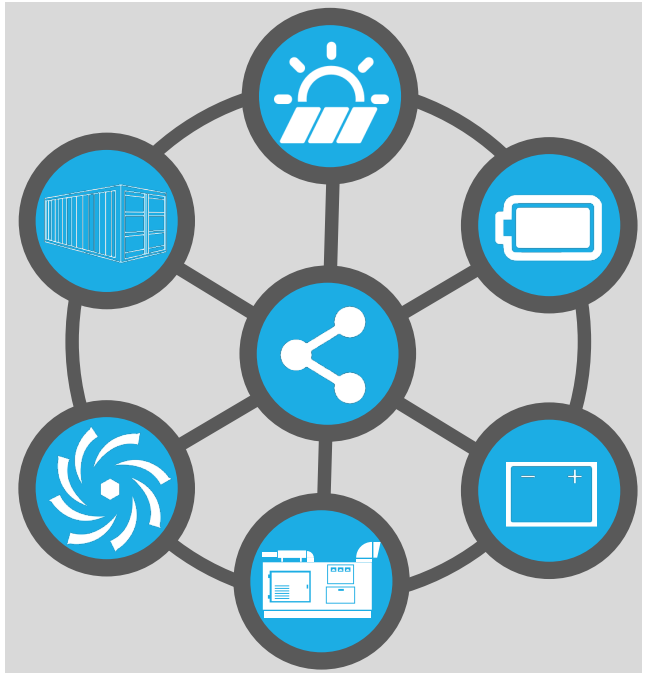
Finding the Balance Between Economics, Sustainability, and Energy Security With Microgrid Technology



Bryan Huber
Chief Innovation Officer

Our Start: MCB Camp Pendleton FractalGrid

Completed in 2014

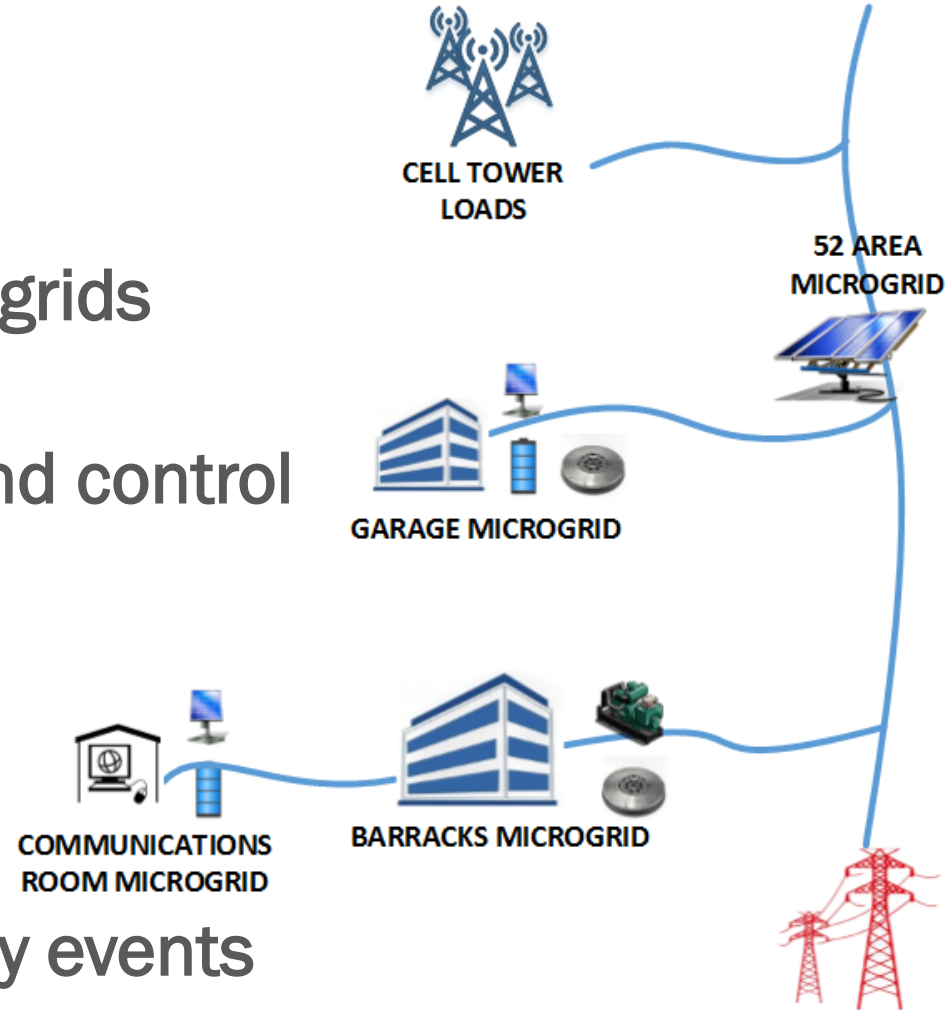
CEC-PIR-12-033

Illustrate the notion of interconnected microgrids

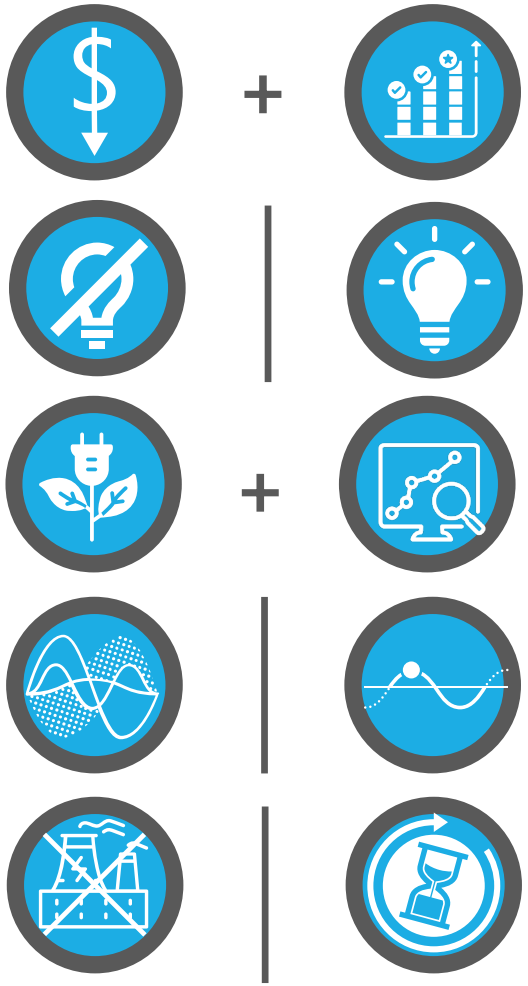
Each with renewable generation, storage, and control

That work together in concert
during normal operation

But island and harden during energy security events



What is Currently Driving Adoption of Microgrid Technology?



Reduce Expenses

Energy Security During Grid Outage to Maintain Ops

Sustainable and Flexible Energy Cost Certainty

Improve Poor Power Quality for Equipment

Overcome No or Significantly Delayed Utility Power

Our Partners Leverage us as their Vendor Agnostic SME

1 Software and Controls

mVSO (Analytics Software)
mPulse (Control Software)

2 Equipment Sales

LV & MV Switchgear
Integrated Power Centers

3 Support Services

Electrical Engineering and
Grid Development Services

Our Projects Deliver Value and Security

- Meaningful expense reduction
- On-site power generation from dedicated systems
- Outage ride through via BESS
- Standby generator failover with runtime optimization
- Power quality improvement
- \+ Flexibility for future expansion with operation scaling

- Better power service
- Reduced expense increasing NOI and NAV

Traditional Use Cases

Always On

U.S. DEPT OF DEFENSE

Defense

Remote Community

Disaster Prone Areas

Higher Education

Traditional Use Cases

Standby Available

CHP/Distributed Generation/
Peak Shaving Projects

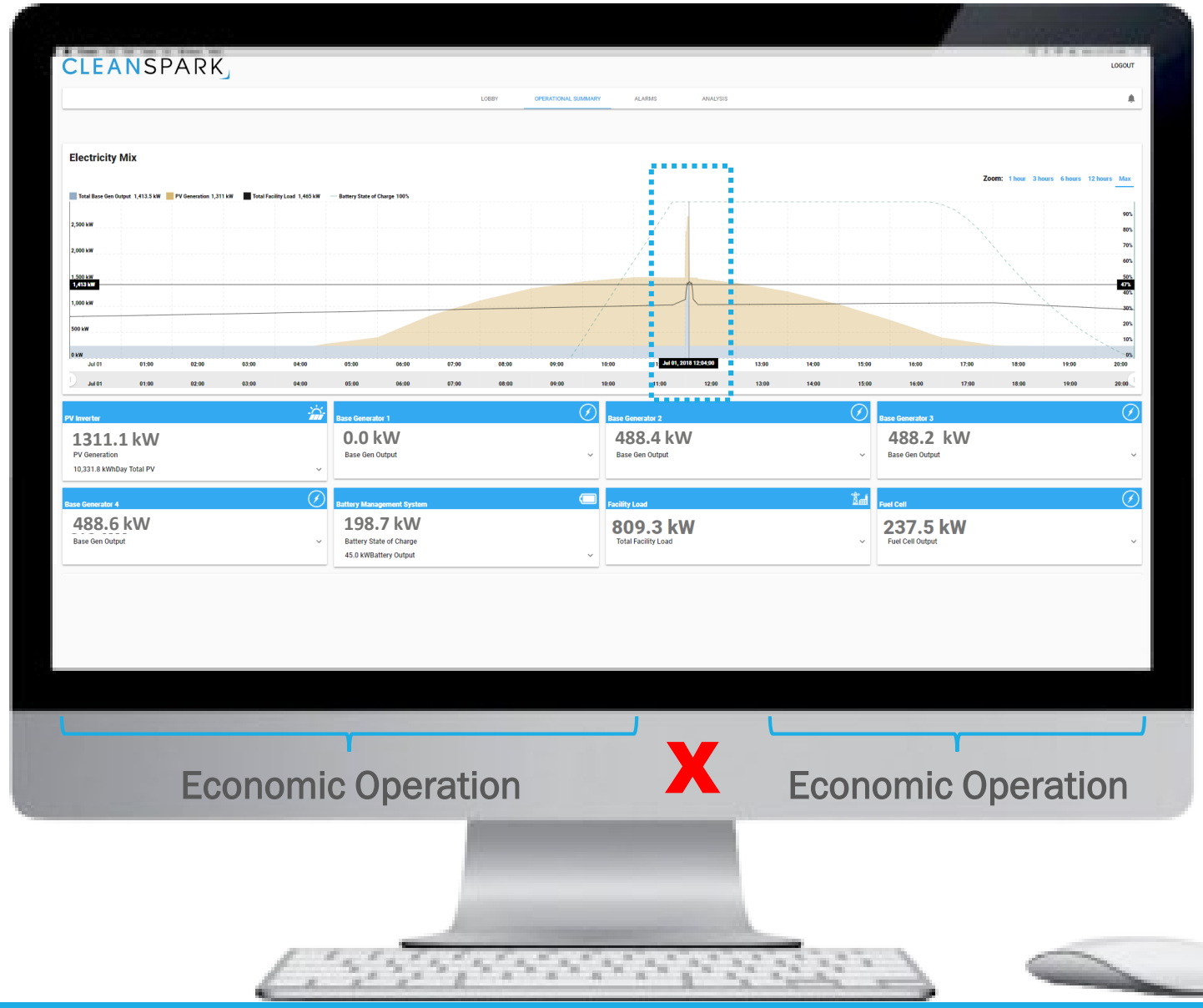
Data Centers

Water/Waste Treatment Plants

Other Commercial Projects

Optimization

- Starts with a baseline
  - Energy & Cost
- Knowing your load profile
  - And how it changes
- New costs and savings
  - After system installation
- Start with “Why?” Value.

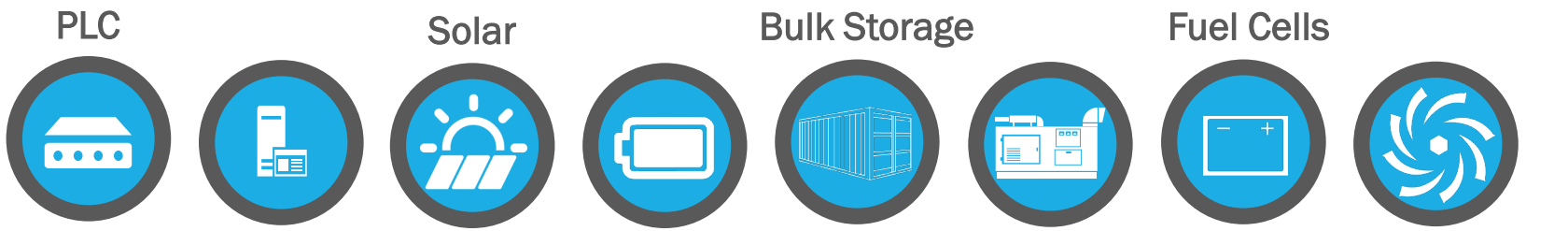


When Economics and Energy Security are Important

- Economic Operation
- Until Critical Power Requirement
- Correct and Reconfigure
- Resume Normal Operation

Real World Considerations for Optimum System Operation

Diverse Device Connections



Protocol Interoperability

Modbus®

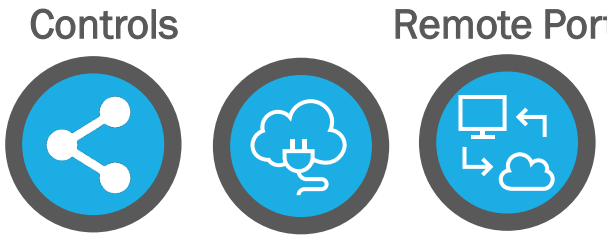
SUNSPEC ALLIANCE

IEEE

dnp Distributed Network Protocol

Proprietary Vendors

Compute, Access, & Action



And don't forget about

SPEED and SAFETY

Site

- Raw Observations Streamed for Further Analyses
- Resilient Disconnected Operation
- Data Encrypted Over the Wire
- Vendor and Configuration Agnostic
- Token Based Limited Scope Communication
- Optimization Logic On-Site
- Site Network Security with Limited External Footprint

Connected DER

- Intermittent Renewable
- Energy Storage
- Baseload Natural Gas

Consider Hybrid-Cloud Solutions

Cloud

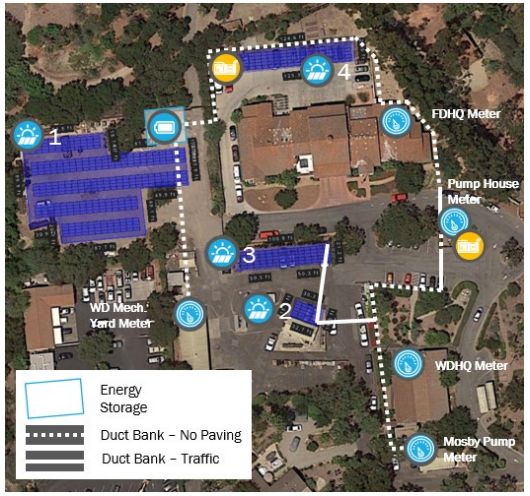
- Powerful Operational Insights
- Secure Directed Communication
- Forecasts & Intelligence
- Secure web-based customer portal
- Robust Utility Tariff Library
- Automated 24/7 Monitoring with Alarms and Alerts
- Savings Based Economic Dispatch
- Microgrid Performance Reports
- Infinitely Scalable Cloud Resources
- Robust Microservice Architecture

Increasing Applicability with Economics

Defense

Commercial Industrial

Who, What, and How?



Municipality

- Successful Past Experience with DER
- Innovation and Sustainability Minded
- In Seek of Strong Past Experience

Analytics & Feasibility → Engineering & Grid Development → Financing of Energy Asset → Intelligent Equipment & Control → Asset Management

Thank You and Please Come Speak With Us About Your Goals

Bryan Huber
Chief Innovation Officer
CLEANSPARK
c | 619.204.6877
e | bhuber@cleanspark.com