



Camp Pendleton FractalGrid Demonstration (PIR-12-033)

Community Scale Renewable Energy Development, Deployment and Integration

December 2014

Michael E. Firenze, MAS, LEED AP
CEO, CleanSpark

Principle Investigator, Harper Construction





Camp Pendleton FractalGrid Demonstration –



1.1MW Community Scale Microgrid

- SCADA

- Distributed/Hybrid and Cloud-based Approach to Monitoring and Control (Flex Power System Microgrid Software & Controls)
- Rapid SCADA (ms response time, vice multi-second)
- Localized

- Data Storage and Network

- Predictive Analytics (Optional: Solar Forecasting)
- Redundancy

First to implement CleanSpark's innovative FractalGrid Architecture

First to use DoD driven storage solution

First to be OpenADR 2.0b certified

First military microgrid to participate in the open market

Planned: First microgrid with DIACAP C&A

- Power Generation

- SolFocus SF-1136x Concentrating Photovoltaic (CPV) Arrays – 225kW
- Flat Panel High Efficiency Photovoltaic System (PV) – 300kW
- Diesel Generator – 200kW

- Power network

- Model-based engineering, including simulation

- Energy Storage

- Quantum AES system - 240kWh
- Deep Cycle Batteries (GEL) – 60kWh
- Electric Vehicle (EV) with Vehicle to Grid (V2G) for additional storage

- Economic

- Energy markets
- OpenADR 2.0B

STAGE – FINAL TESTING & PERFORMANCE MONITORING



Key Players



Partner/Host



General-Contractor

CLEAN SPARK

Designer/Integrator/Installer



AES Partner

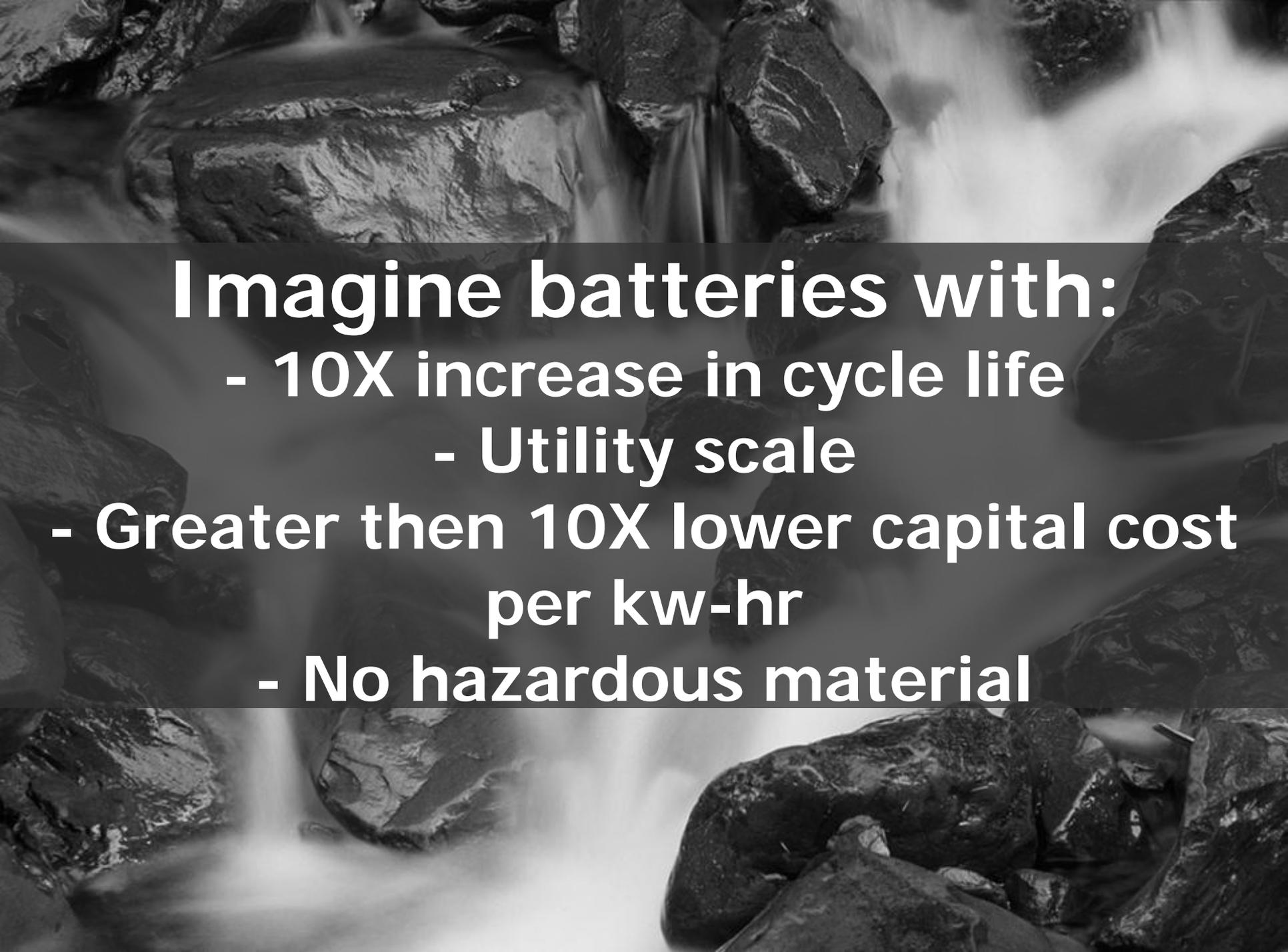


Advanced Energy Storage Focus

Goal – integrate ‘best-of-breed’ advanced energy storage technology

Key Criteria:

- 1 – Flexibility – solution must provide instantaneous variable reactive power able to sustain critical loads in a ‘blinkless’ manner in the event of a outage or disruption
- 2 – Longevity – solution shall offer life span of 25 years+, with a minimum full charge/discharge cycle life of 25,000 cycles
- 3 – Affordability – solution shall be cost competitive with all current alternative technologies



Imagine batteries with:

- 10X increase in cycle life**
- Utility scale**
- Greater than 10X lower capital cost per kw-hr**
- No hazardous material**

Imagine



energy storage without the battery



Company Overview

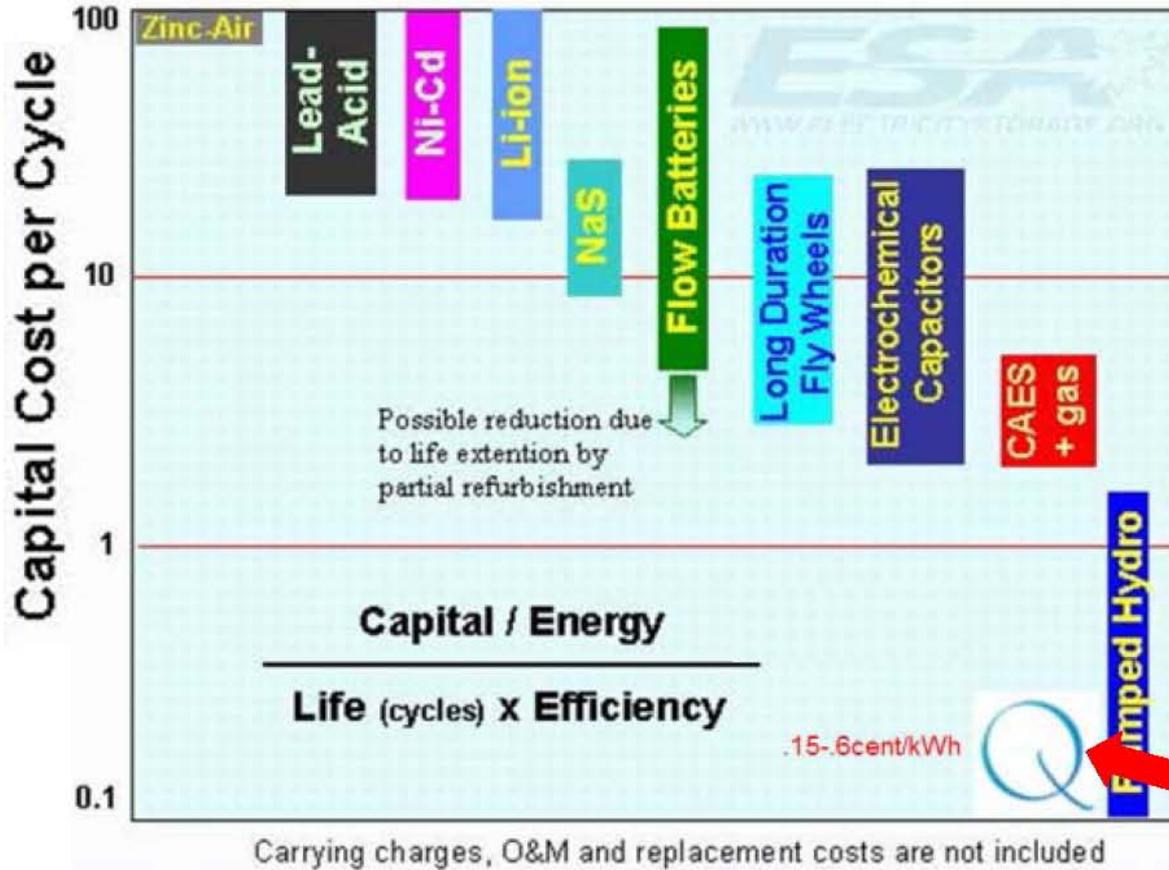
FOUNDERS

- Tien Nguyen – Founder & CEO
 - On-Ramp Wireless, Chief Strategy Officer, smart building efficiency
 - CommASIC, Founder & CEO – acquired by Freescale
 - QUALCOMM, NextWave, Connexant – senior management
- Hari Dharan Ph.D. – Founder & CTO
 - Professor of Mechanical Engineering, Univ of CA – Berkeley
 - Founder, Composite Science Corporation
 - Founder, UC Berkeley Composites Laboratory
 - World expert in design, material science and manufacturing of metallic and composite structures



Clean Storage

- Environmental Friendly
 - Manufactured from recycled materials
 - 100% recyclable
 - No hazardous materials
- High Capacity
 - 100 kWh per unit; 1 MWh with 10-unit system
 - 50,000 minimum full charge/discharge cycles
 - No storage degradation over time
- Benefits
 - Fast deployment
 - Low maintenance
 - Full software control and data monitoring

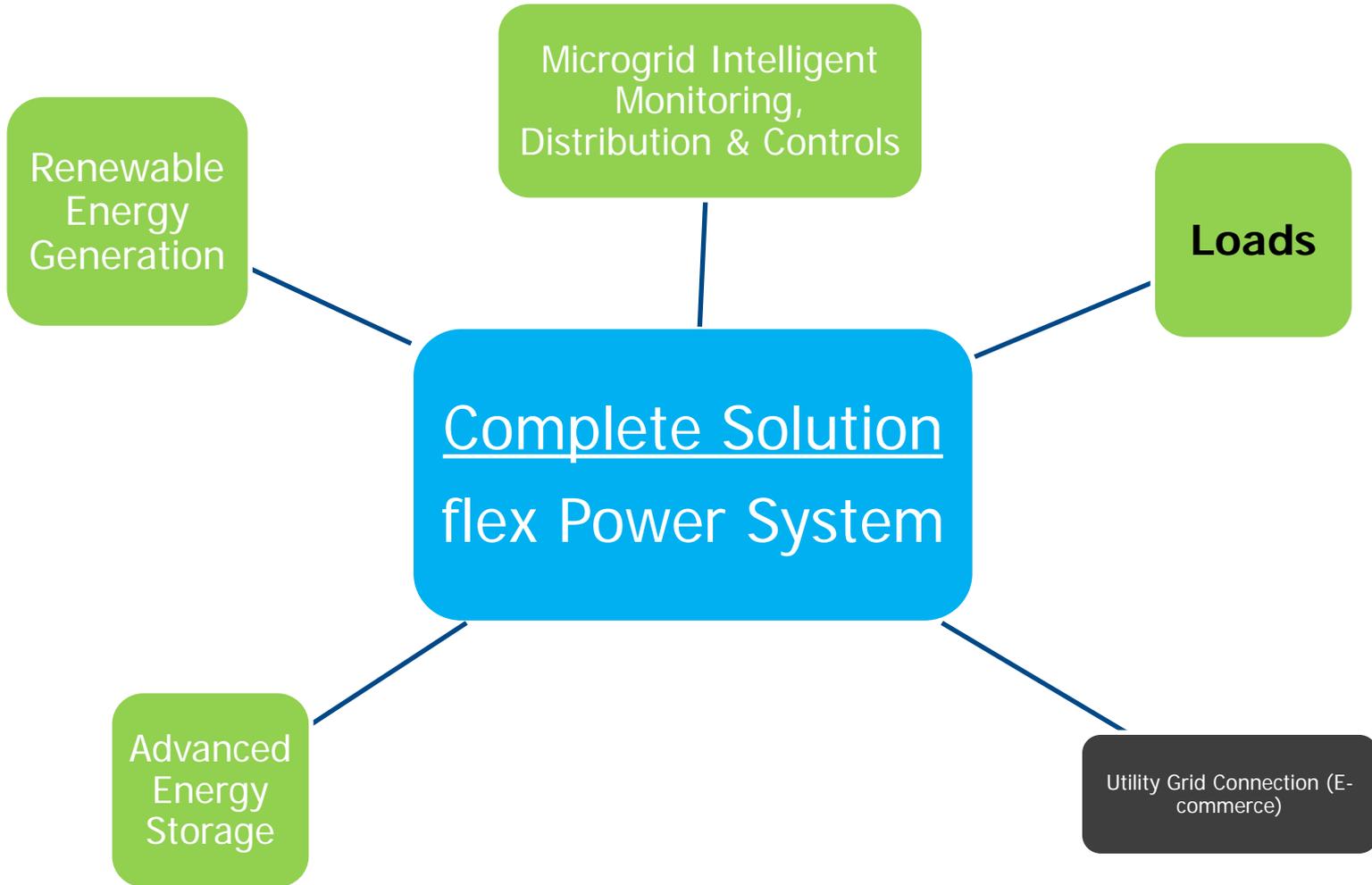


QES – Significant CAPEX advantage



CLEAN SPARK

flex Power System





PIER Program Contribution

- Support R&D into implementation techniques
- Identify optimized configurations
- Enable demonstration grounds for commercially ready technologies
- Assist with regulatory insight and aid in bringing stakeholders together to further widespread deployment of critical technologies



CEC Next Steps

- Regulatory Hurdles
- Communication/Collaboration with Utilities
- Ratepayer engagement



PIER Program Contribution

Thank You to California Energy Commission

AN ACCOMPLISHMENT BECAUSE OF YOU



CLEAN SPARK



