



Ultracapacitor EnergyBridge™ UPS for Palmdale Water District

**EESAT 2005
October 19, 2005**

Northern Power



- ◆ **Engineering Energy Solutions since 1974**
- ◆ **3 Divisions: Systems, Products, and Services**
- ◆ **Over 900 projects in more than 50 countries**
- ◆ **180+ people (50% engineers)**
- ◆ **HQ and manufacturing in Vermont**
- ◆ **Regional offices in NY, TX, CA**

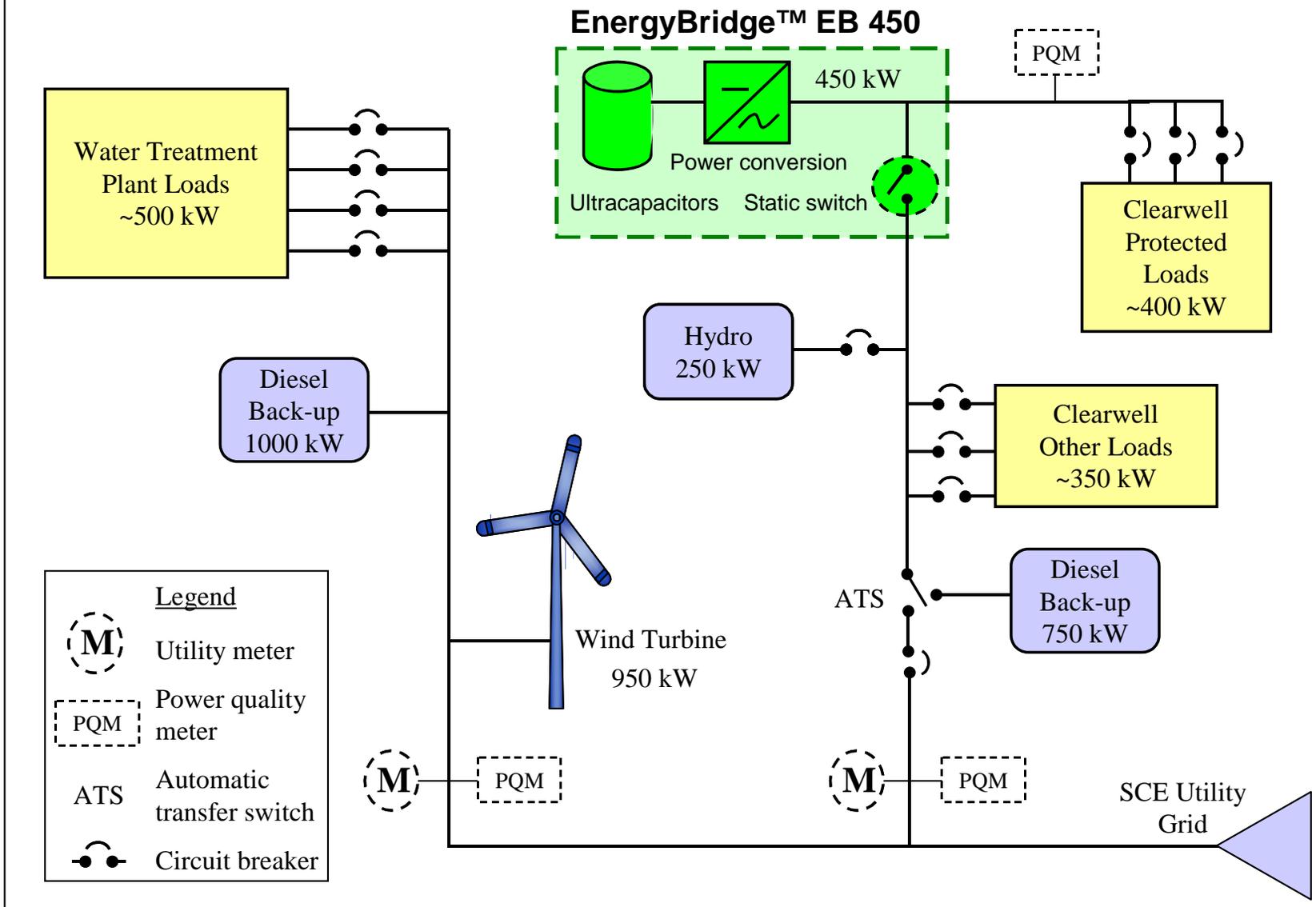


Project Overview

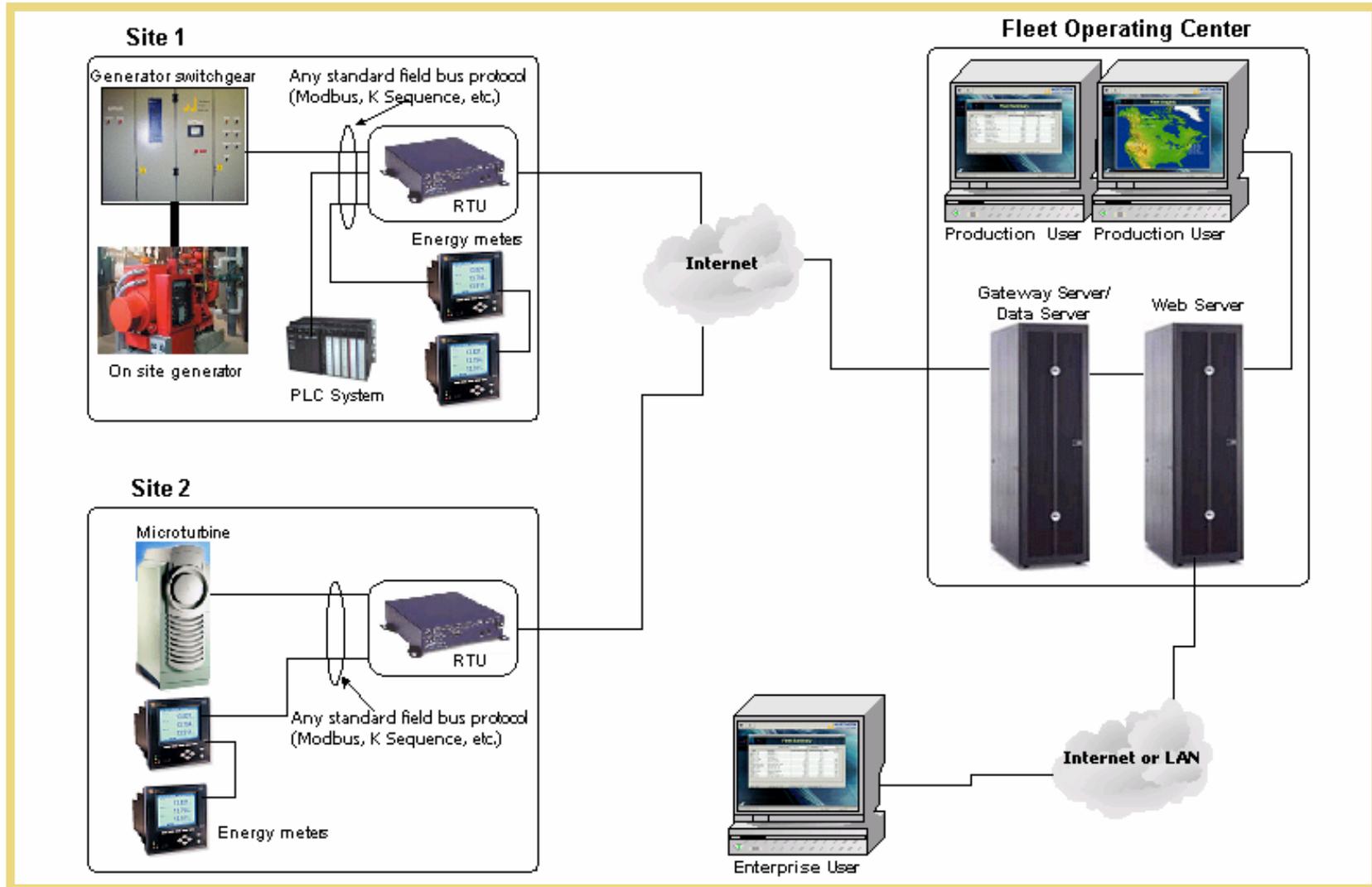


- ◆ **CEC – California Energy Commission**
 - ◆ Funding agency
- ◆ **Palmdale Water District**
 - ◆ Award recipient, host site
- ◆ **Northern Power**
 - ◆ Technology provider
- ◆ **Black & Veatch**
 - ◆ Owner's engineer
- ◆ **Maxwell Technologies**
 - ◆ Ultracapacitor supplier
- ◆ **Sandia Labs and EPRI**
 - ◆ Performance review and data analysis

Palmdale Water District Power System



SmartView® SCADA System



EnergyBridge™ UPS Specifications

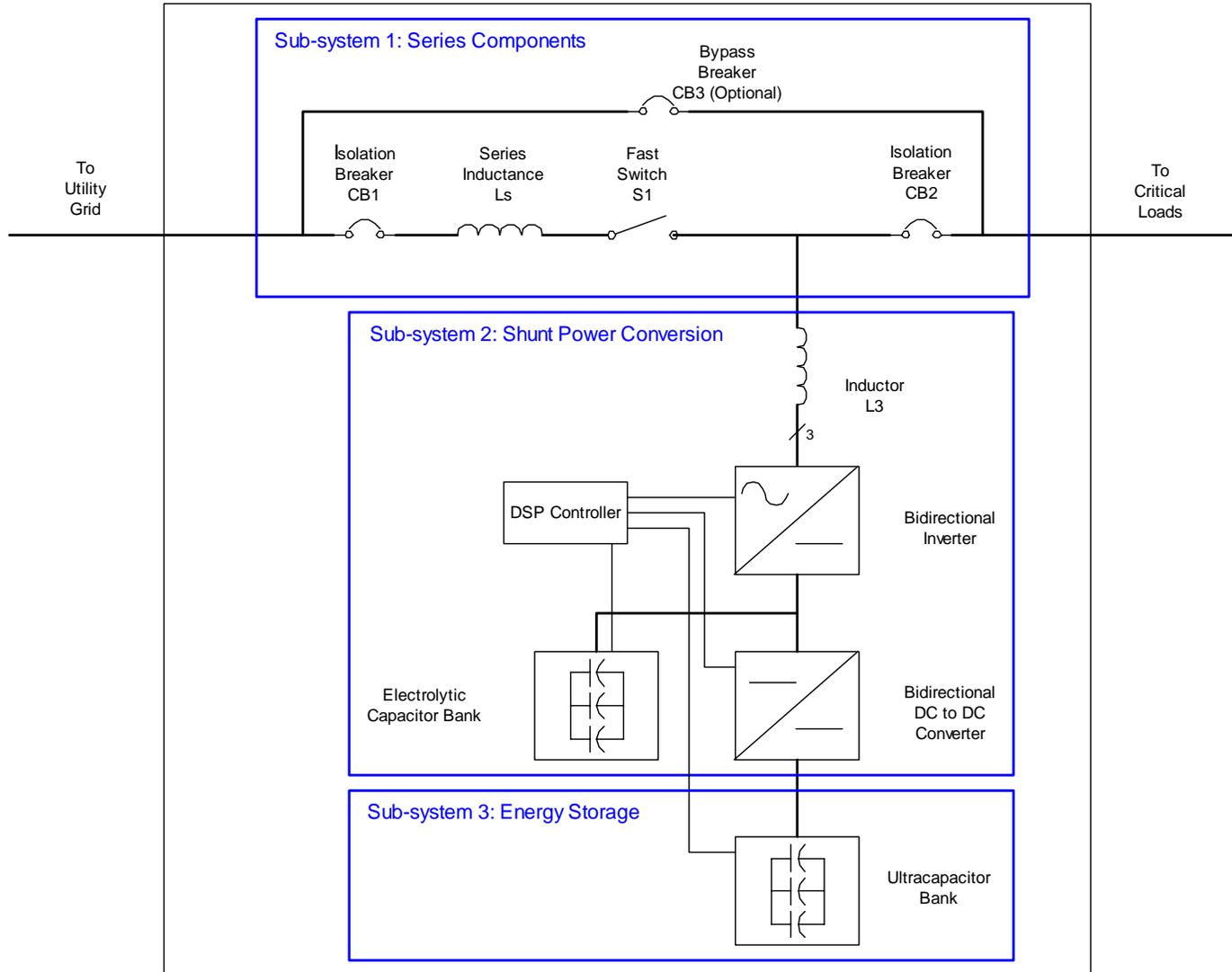


Rated power	450kW @ 0.8 pf
Back up time	30 sec.
Circuit voltage & type	480 Vac, 3 Phase wye, 3 or 4 wire
System efficiency	99% at rated load
Critical Bus Voltage	480 Vac +/- 2.5%
Critical Bus Voltage THD	<2% per harmonic, <3% total THD
Enclosure Dimensions	3'x20'x7' (DxWxH)
Operating temperature	0-40°C, de-rated above 40°C
Applicable Standards	IEEE 1547 & 519, UL1778, CBEMA

One Line Diagram



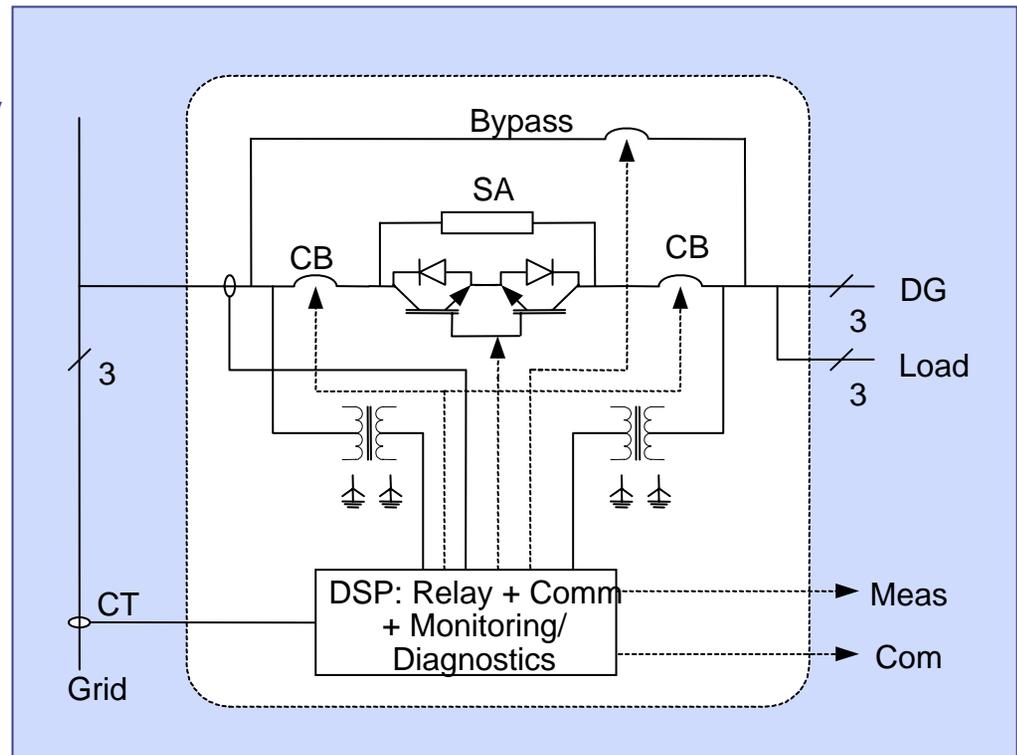
EnergyBridge™ UPS - One-line Diagram



DER Utility Interface Switch



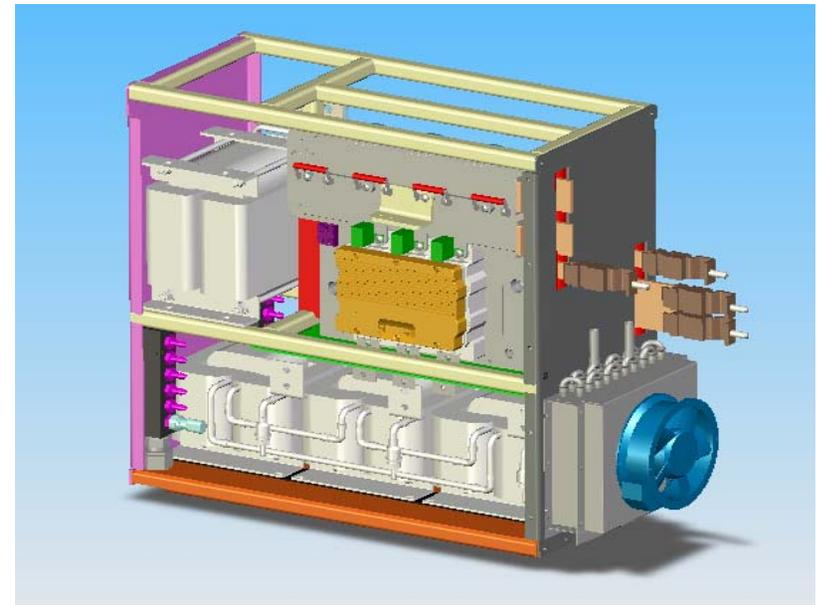
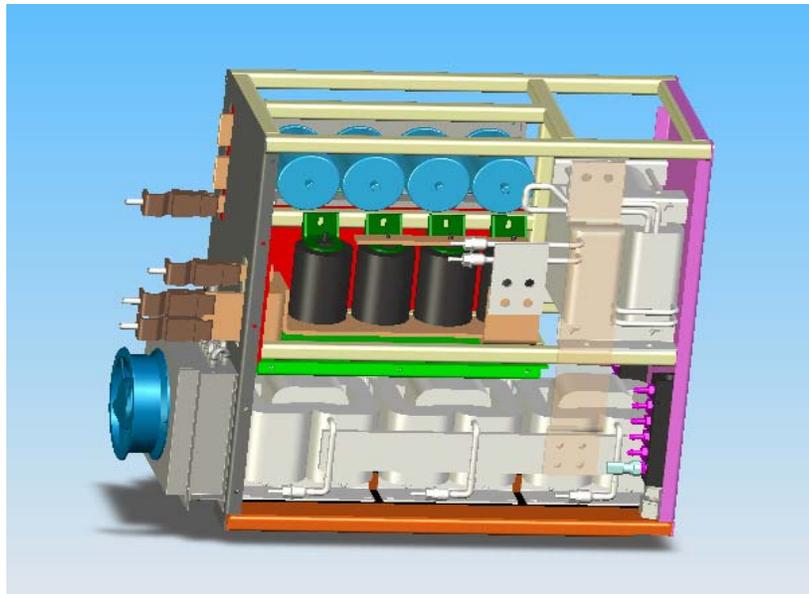
- ◆ Flexible, universal interface for connecting DER systems
- ◆ Proprietary Northern controls may be applied to CB, SCR, or IGBT
- ◆ Enables
 - ◆ Critical load support
 - ◆ Intentional islanding
 - ◆ Enhanced power quality
 - ◆ Fault current protection
 - ◆ Anti-islanding protection



Power Conversion



- ◆ Northern's Power Converter Platform
- ◆ FlexPhase™ power modules
- ◆ PowerRouter® controls



Energy Storage



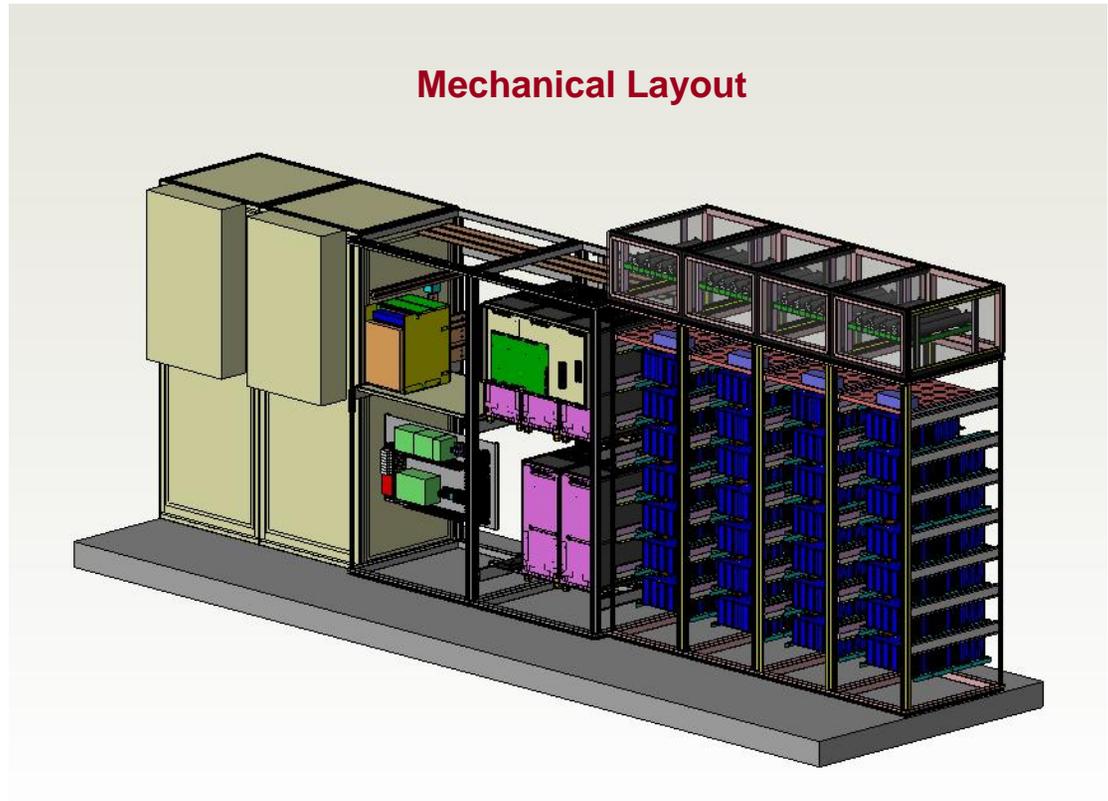
- ◆ **Maxwell Technologies ultracapacitors**
- ◆ **48 V module**
 - ◆ 18 x 2600 Farad, 2.7 Volt cells
- ◆ **EnergyBridge™ system consists of 4 banks with 20 modules per bank**



Advantages



- ◆ Efficiency
- ◆ Footprint
- ◆ Life-time cost
- ◆ Environmental impact



Next Steps



- ◆ **Fabrication – Spring 2006**
- ◆ **Installation – Summer 2006**
- ◆ **Follow-on projects**
- ◆ **Commercialization**

For for information contact:

**Chris McKay
Product Manager
Northern Power
Waitsfield, VT**

**Phone: 802-583-7270
cmckay@northernpower.com
www.northernpower.com**