Storage for Simultaneous Voltage Smoothing and Energy Shifting

Presentation by Brian Arellano

PNM Prosperity Energy Storage

Project Description

- First of 16 DOE Smart Grid Storage Demonstration Projects to go online – Sept 2011
- Designed to both smooth PV intermittency and shift PV energy for on-peak delivery
- Successfully demonstrating true Storage/PV integration to Utility operations

Equipment

- 500 kW PV (fixed C-Si panels) – not DOE funded
- Ecoult/East Penn - Advanced Lead Acid Battery system for “shifting” – 1MWh
- Ecoult/East Penn - “Ultra” Battery system for “smoothing” - 500kW

Cyber Secure, High Resolution Data Acquisition and Control System
1 second and 30 samples per second data capture
PV Smoothing Demonstration

Smoothing Results

- Variety of control inputs – PV Meter, Irradiance Sensors (average, individual)
- Variety of gains on input – tests different capacities of battery use
- Question is: how much smoothing is enough? Requires optimization analysis

4/17-4/19/12
2 Clear Days & 1 Cloudy Day

4/19/12
Cloudy Day

4/19/12
4 Hour Window

4/19/12
15 Minute Window

Key:
- Yellow = Battery Output
- Red = System Output
- Blue = PV Output
Combined PV Smoothing and Shifting Storage

Entire day of cloudy PV production needed to charge battery for evening peak Firming
Overall Examples/Capabilities

Stacked Benefits – Which do we pick?

**Internal Optimization Required**

- Allows prioritization of Applications
- Reliability is top Priority - Peak Shaving
- Further Optimization Determines value of Firming vs Peak Shaving vs Arbitrage
- Life of Battery and Energy Throughput also a consideration
- Next generation of Batteries will do all as well as smoothing with same technology
Prioritized operations
(all Applications)

Charge due to RT price
Emergency Peak Shaving
Charge due to SoC
Winter Evening Firming