

Energy Storage for Distribution Systems with Variable Resources

Smart Grid Demo Project Reviews Workshop
December 10, 2010
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APS Interest in Energy Storage

- Distribution Substation
 - Peaking
 - Frequency/ Voltage control
 - Defer feeder/ asset upgrades
- Distribution System Variability
 - Loads
 - Large penetration renewables
 - Utility PV
 - Small wind
 - Distributed PV

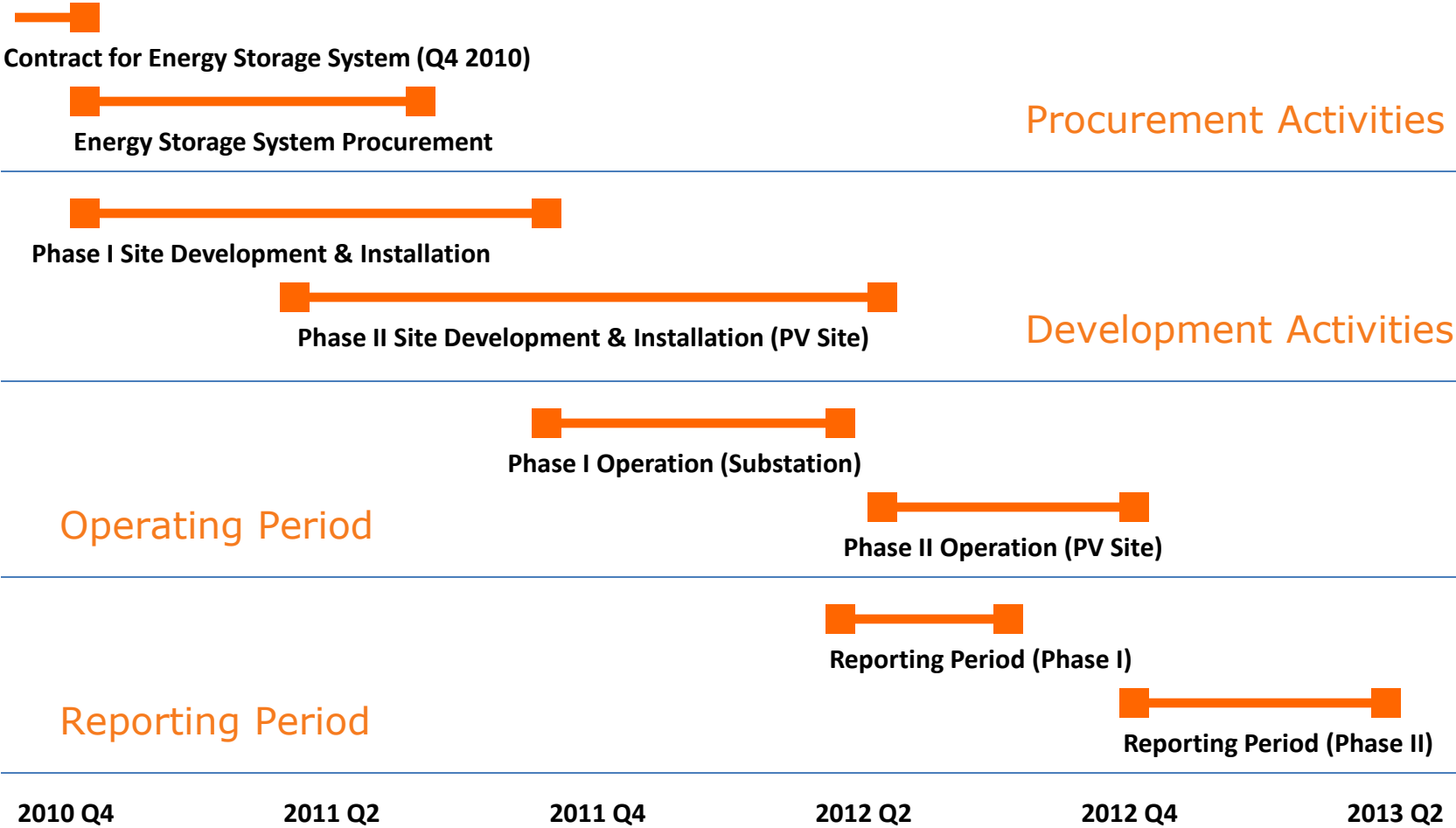
Desired Attributes of Energy Storage for the Testing

- About 500 Kw of Peak Power
- About 1 to 1.5 Mwh of Energy
- Fast Response
- High turnaround efficiency
- Charge/ discharge cycles
- Compatibility with utility systems
 - Interconnect
 - “SCADA”
- Maintenance and operation

Desired Attributes of Energy Storage for the Testing

- “Portability”
 - Relative ease of setup
 - Fit within substations selected
- Safety
 - For personnel maintaining
 - For surrounding environment
- Pricing
- Good technical support/ parts availability
- Supplier participation in testing

Energy Storage- Proposed Schedule

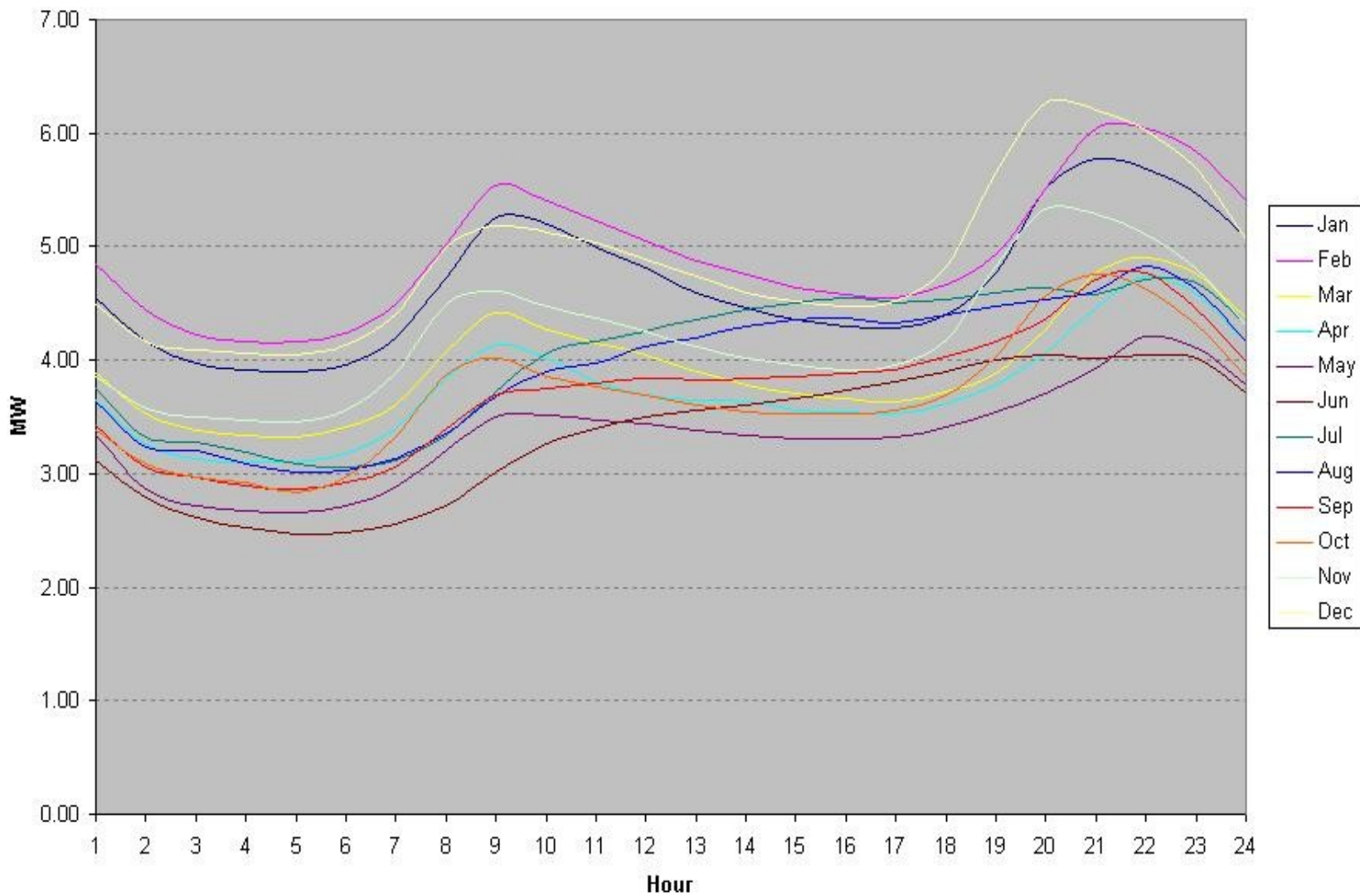


Phase I Testing

- Locate in a Flagstaff, AZ substation
- Start testing Fall 2011
- Test control and communication interfaces
- Learn system operating characteristics
- Dispatchability
- Peak shift testing
- Test frequency/ voltage control capabilities



SV04 2008 Average Hourly Loads by Month



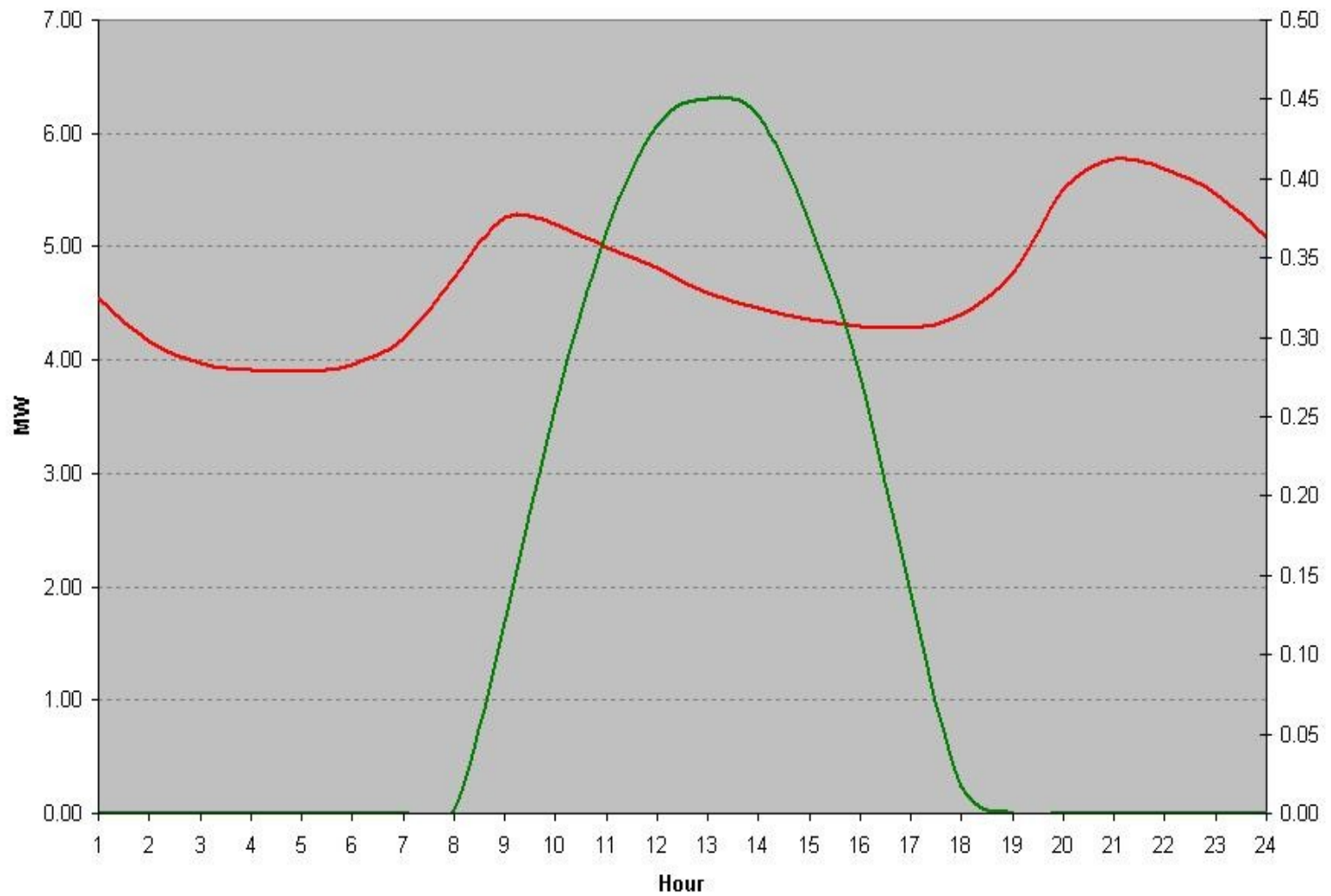
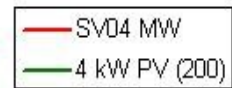
Phase II Testing

- Performed with Flagstaff Community Power Project though separate
- Interconnect at Doney Park complex
- Test peak shifting characteristics
- Test under different configurations of variable resource conditions and capability to reduce variability

Doney Park Area

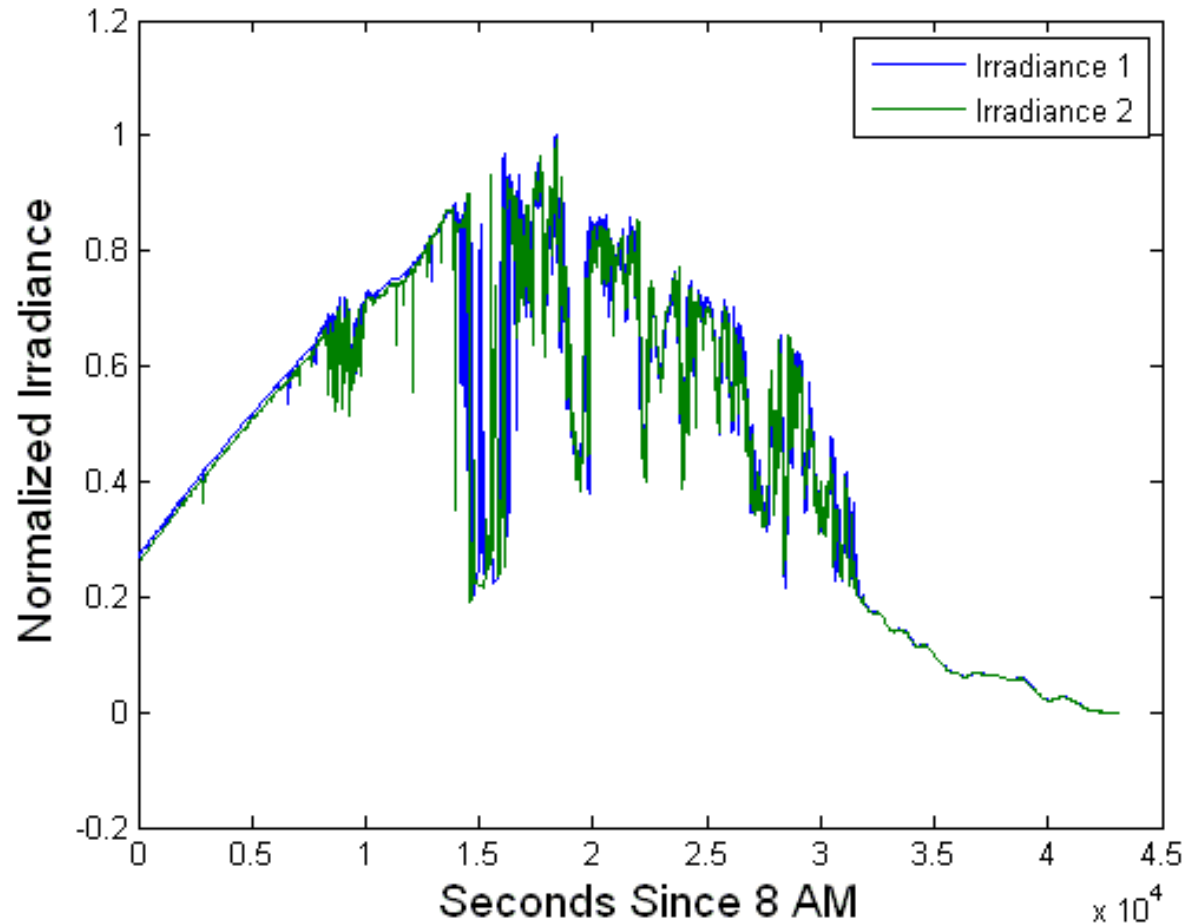


SV04 2008 Average Hourly Load & PV - January



Partially Cloudy Day

June 15: Irradiance Measurements



Source:



Selection Status

- RFP finalists evaluated
- Selection and notification made
- Funding approved
- Final negotiations for contract in progress
- No Notice to Proceed necessary, schedule for delivery within project schedule