



Distributed Energy Markets Growing and Transforming

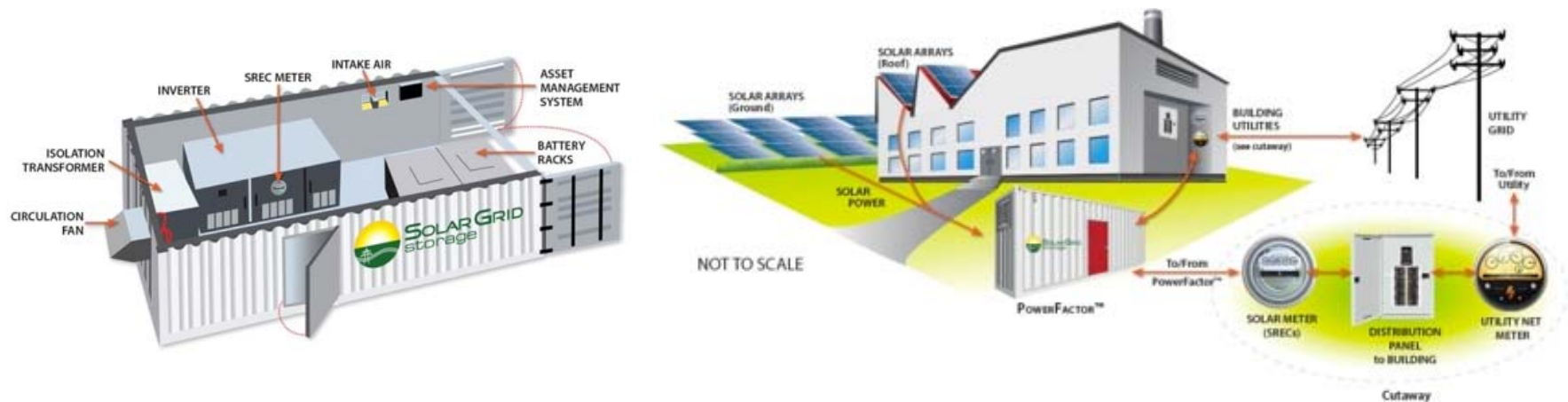
National Symposium on Market Transformation

April 2015

SGS Breakthrough in Delivering Affordable Storage

Solar Grid Storage has developed a business model that enables storage to be added to solar projects cost effectively

We build, finance, and operate energy storage systems (PowerFactor™)



“If you want to see the future of renewable energy in the U.S., you should check out the large container sitting next to a nondescript office building off the I-95 corridor in Maryland.”

Business Insider, November 2, 2013



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Deploying Storage in Markets - theory

SGS focuses on commercial customers looking for solar **AND storage:**

- A major driver of our business is backup power – allowing on-site solar to function during grid outages
- Solar + storage will be the standard when storage costs drop
- Storage is also very valuable for grid services:
 - FR
 - Freq. Response
 - Spinning reserve
 - Blackstart
 - VAR support
 - Peak power reduction (competitive with gas peakers)
 - Bulk power time shift (need very low cost storage)
 - Local circuit voltage optimization (10% savings on energy??)
 - Inrush current limitation



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Actually Deploying Storage in Markets

SGS idea is to make storage cost effective and provide storage as a service:

- Turnkey PowerFactor™ system in a shipping container – includes inverter and battery to be installed alongside solar energy systems. Li-ion battery systems
- Solar Grid Storage finances PowerFactor™ system separately from the PV system
- Solar Grid Storage maintains and operates the PowerFactor™ systems for 10 years
- We pay for most of the cost of the system from ITC & revenues from ISO grid ancillary services also:
 - Small developer fee – about ½ the cost they would pay for inverter
 - Backup power fee



*PowerFactor 500
500kW + 250kWh*



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Markets for our Grid Services

FERC Order 755 opened grid ancillary services markets in ISOs for “fast responding” technologies

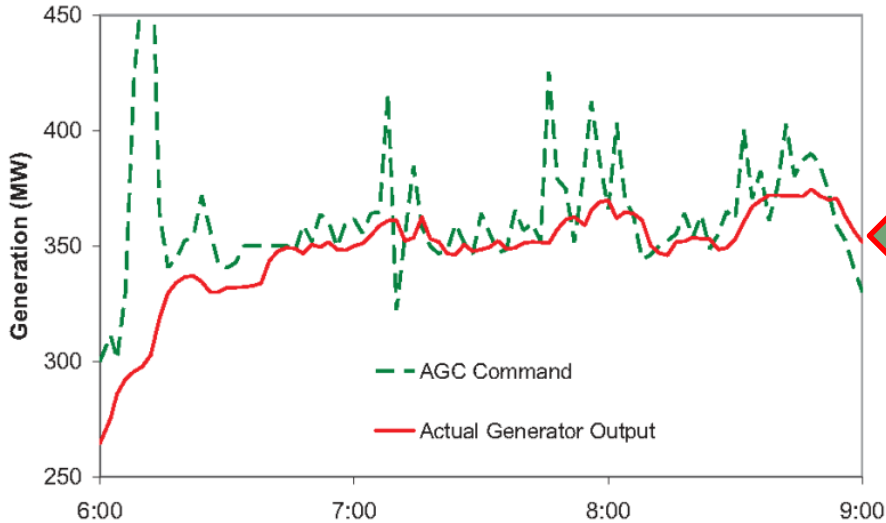
1. Fast responding technologies better at real time power balancing than traditional resources
2. Needed to fix the historic slow standard based on legacy power plants to allow new technologies like batteries and flywheels to develop
3. PJM ISO (Mid-Atlantic) is only fully functioning market
 1. Five minute historic standard reduced to 2 second response time
 2. Fast technologies paid a mileage fee.



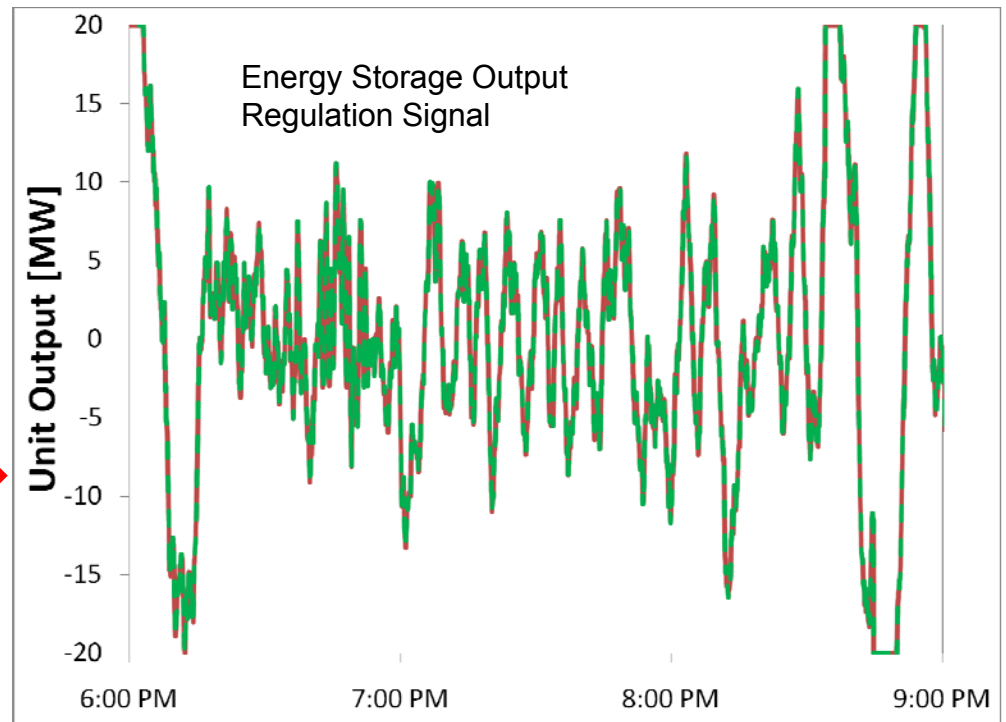
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Regulation and Frequency Regulation: Performance Matters...



A fossil plant following a regulation command signal



Energy Storage accurately following a regulation command signal

Key Market structures

- **Allow Customer load and customer sited systems to participate**
- **Allow small systems**
 - PJM 100kW minimum limit but aggregation allowed
- **CUSTOMER SITED STORAGE CAN PROVIDE ALMOST ALL Grid services and provides the major added benefit of customer backup power (also DC bus service for computers and A/C)**
- **Market barrier: no customer sited storage; random selection of resources (SPP)**



Storage Future

- Much in storage today looks like PV solar 15 years ago
- Cost reductions up to 75% are realistic
- If EV market ever becomes a major auto market, storage costs need to be $\frac{1}{4}$ of current costs
- Power conditioning (inverter costs) for solar + storage should drop rapidly



Why Regulators Should Like It

- Storage will help regulators meet renewable energy mandates at lower cost than direct solar incentives
- Backup power for customers will make grid more resilient and inevitable grid outages more tolerable – customers willing to pay more!
- One of the few areas of real grid innovation



Completed Projects

Penn State GridSTAR Center
Philadelphia Navy Yard – 150kW



Konterra Headquarters
Laurel, MD – 500kW



WP Properties
Hackettstown, NJ – 250kW



WP Properties
Denville, NJ – 200kW



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