Flexible Resources for Grid Stability

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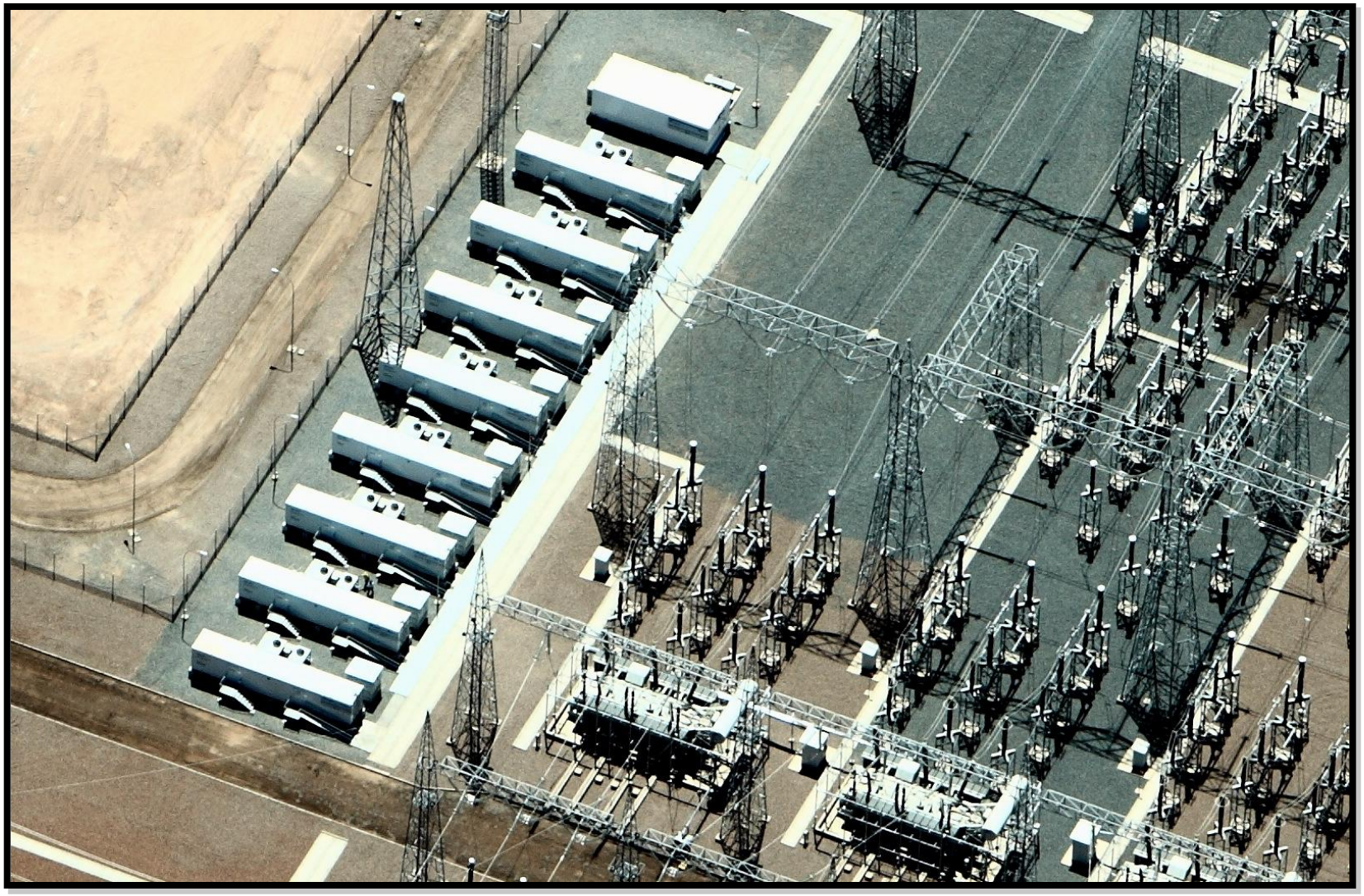
AES develops, owns, and operates fast response grid stability projects, such as this 12 MW installation in Chile.



Largest Lithium-ion battery in service on the power grid.

The AES portfolio of assets and broad market footprint provide the market insight and capability to create a grid services business.

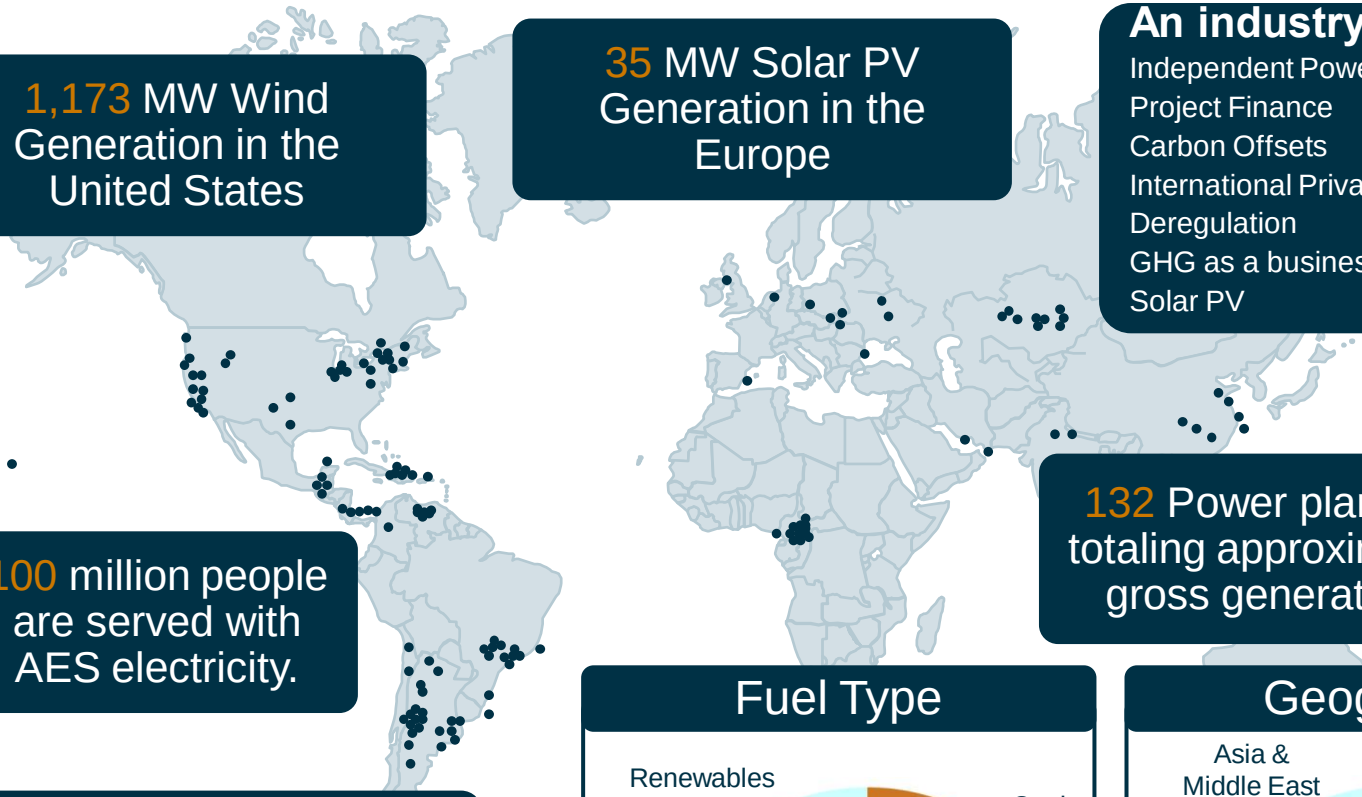
AES Energy Storage

1,173 MW Wind Generation in the United States

35 MW Solar PV Generation in the Europe

An industry leader in…

- Independent Power Production
- Project Finance
- Carbon Offsets
- International Privatizations
- Deregulation
- GHG as a business
- Solar PV

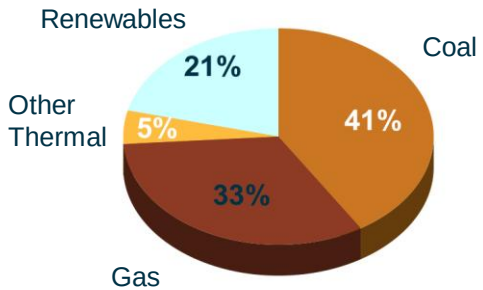


132 Power plants worldwide totaling approximately 43 GW gross generation capacity

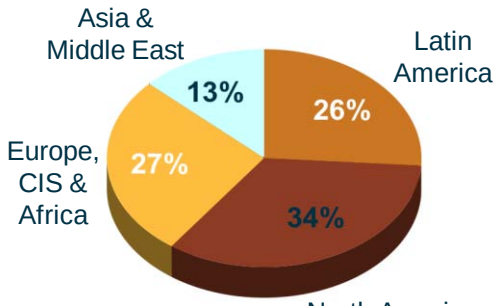
100 million people are served with AES electricity.

14 Utilities worldwide, serving 11 million customers, with sales of 77,000 GWh

Fuel Type



Geography



Batteries on the grid? Yes. (example from one supplier)

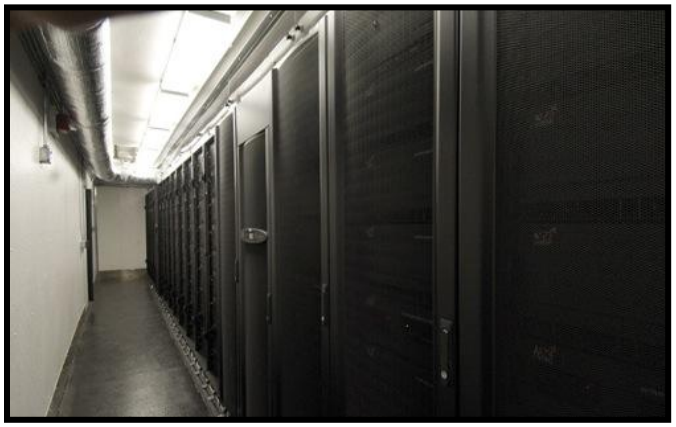
AES Energy Storage

Cells

Modules

Trays

Racks



2 MW Grid Units

Our Energy Storage Business

AES Energy Storage

AES Energy Storage – Grid Stability & Efficiency Services

- Develop, install & operate grid-scale storage resources serving markets and utilities.
- Manage solution development, projects, and lifecycle technology risks.
- 15MW in service, 100MW in near-term development.
- A part of The AES Corporation; extensive experience working with utilities and system operators in 29 countries.

Key Value:

Improve the Grid Today

- Reduce system operating costs
- Improve efficiency and reliability
- Reduce environmental footprint

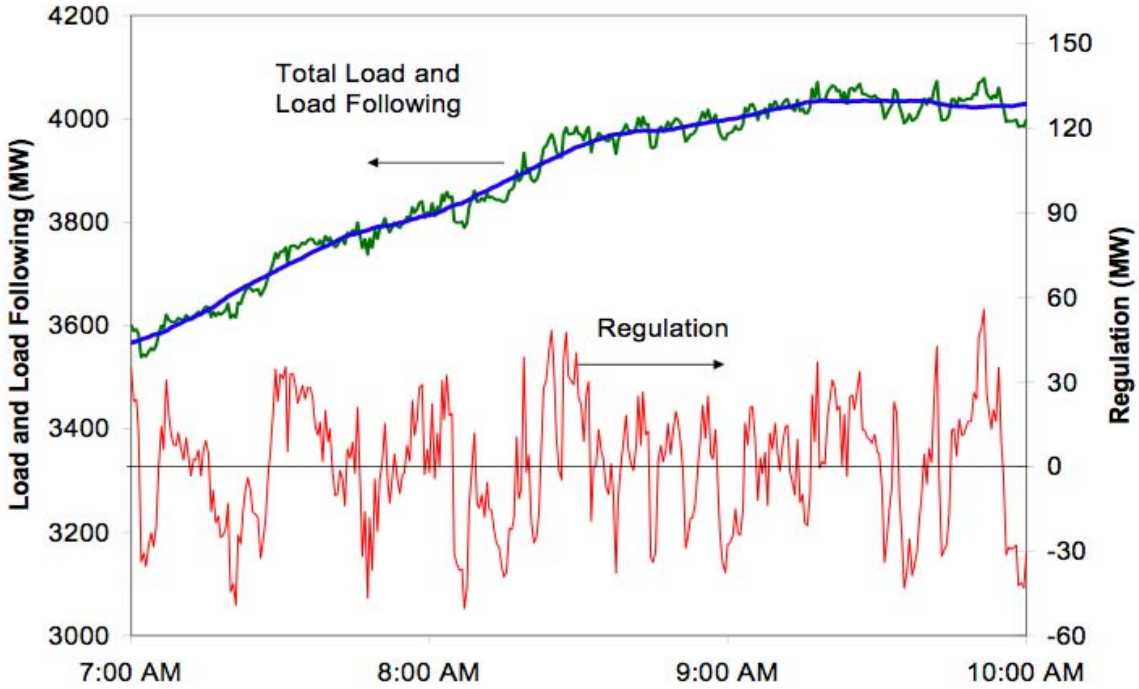
Enable the Future

- Provide fast response capabilities to support renewables
- Deploy granular smart grid control capabilities

Grid stability is maintained through the balancing of load and supply (throttling power plants up and down).

AES Energy Storage

Regulation is a near zero-energy service compensating for minute-to-minute fluctuations in total system load and uncontrolled generation.



2004 Oak Ridge National Labs:

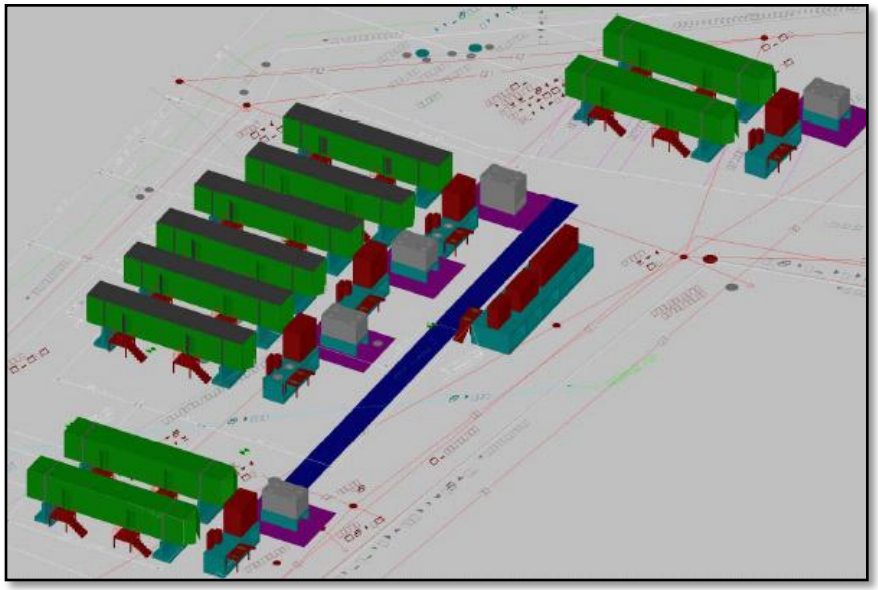
"Regulation is a zero-energy service, making it an ideal candidate for supply by storage….Once regulation markets mature, the almost perfect control exhibited by storage devices should command higher prices than the poor control exhibited by large thermal power plants."

Market Integration: 1 MW in PJM Market

- 1 MW unit online Dec 2008
- Passed PJM regulation certification test to become qualified market participant
- Following PJM regulation signal
- Revenue-earning market participant

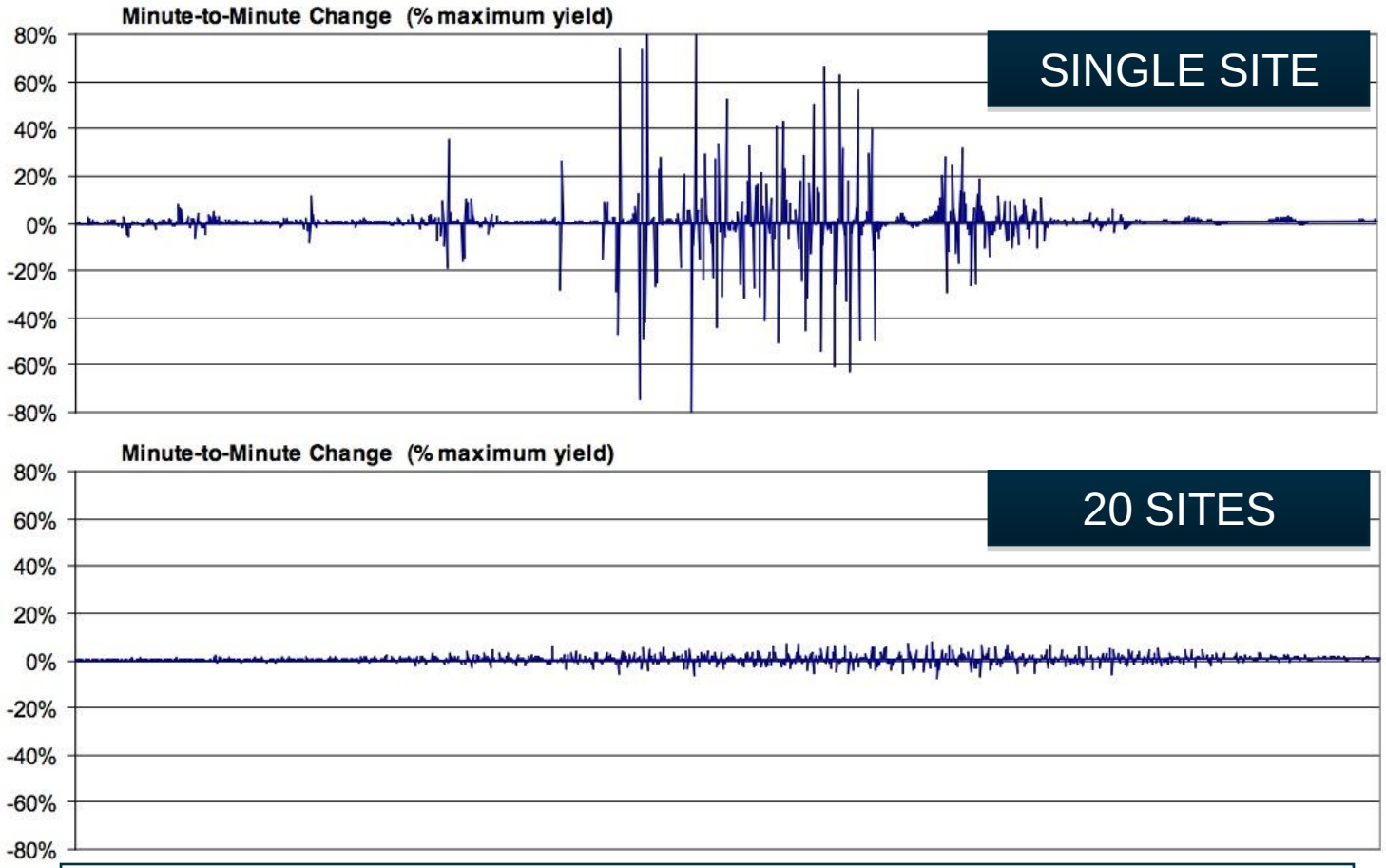
Project under development: 8/20 MW at AES Westover in NY

Project Area at Westover



- Project will supply Regulation to NYISO using fast response grid stability system
- Available for automatic dispatch with <1 second response time
- April 2010: FERC granted Exempt Wholesale Generator status
- April 2010: NY PSC approved construction

Geographic dispersion reduces the expected variability of renewables, making mandated point solutions inefficient.

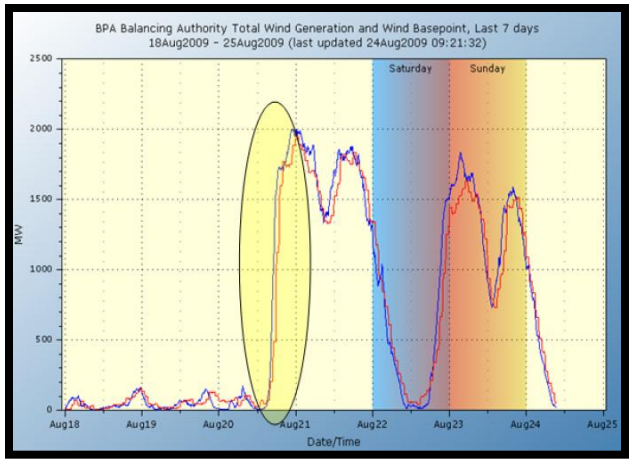


" Whereas the minute-to-minute variability reaches 80 percent of maximum yield in the case of a single site, the variability is considerably reduced and barely exceeds 5 percent when 20 sites are bundled."

Photovoltaic Capacity Valuation Methods. SEPA Report #02-08. Tom Hoff, Richard Perez, JP Ross, Mike Taylor

Renewables can be considered negative load. (R = -L)

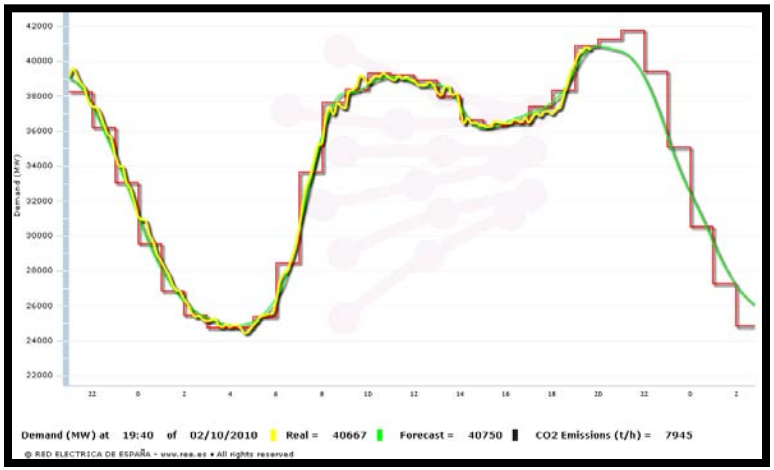
Wind - BPA



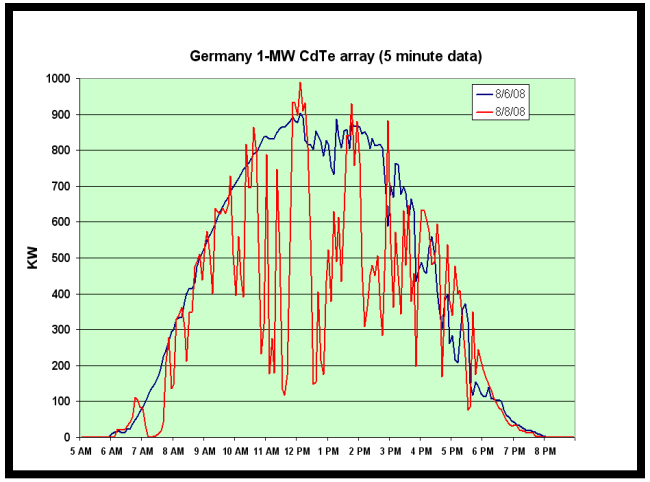
Hourly

Changes

Load Curve - Spain



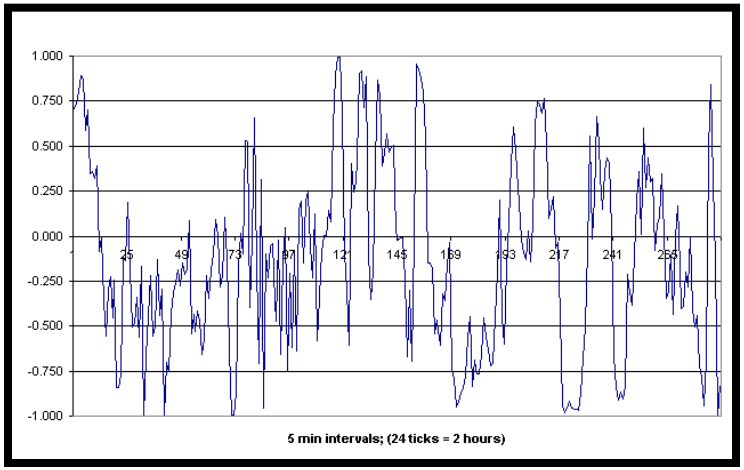
Solar - Germany



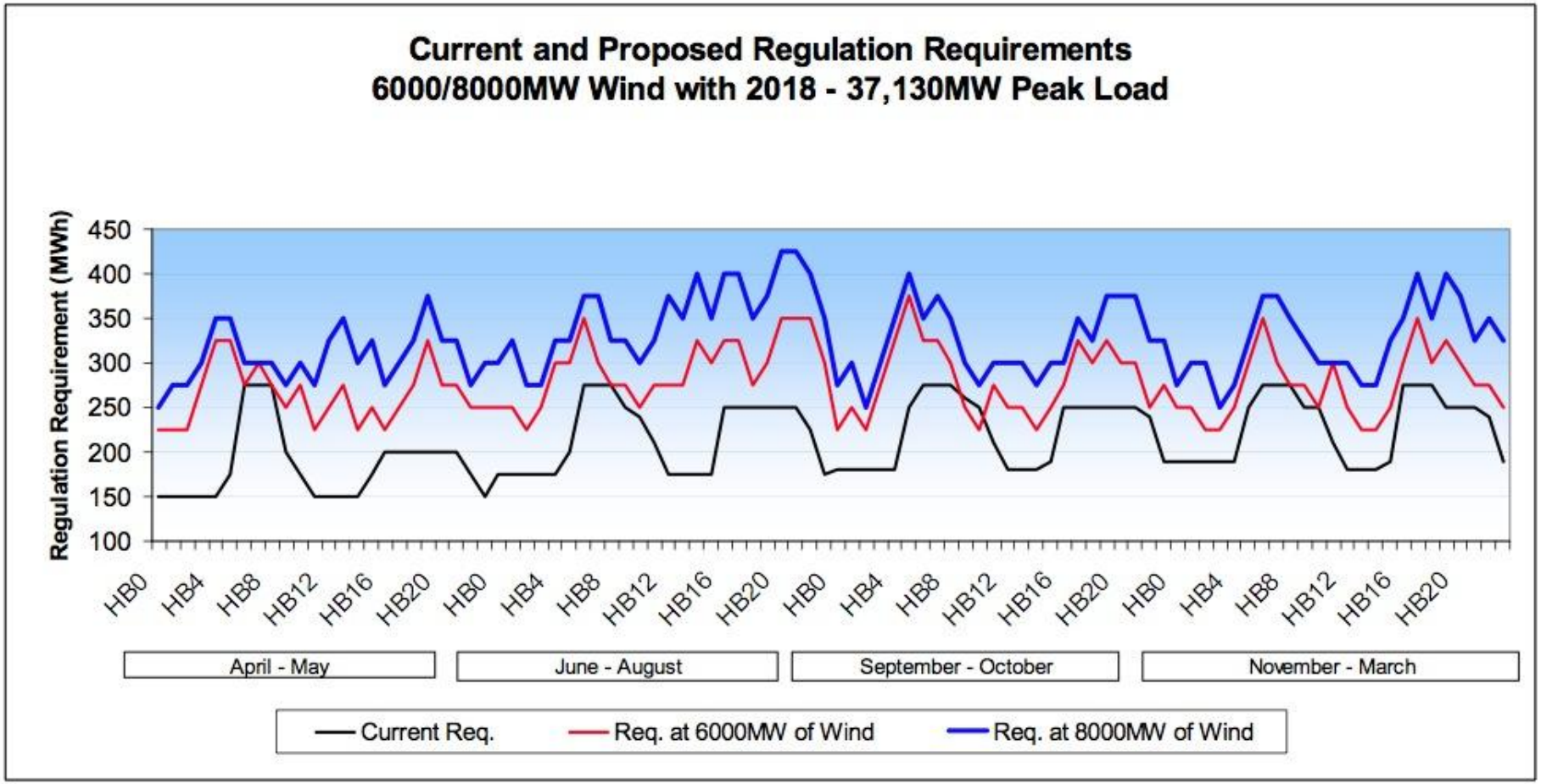
Minute

Changes

Load Imbalance - PJM



Grid operators are identifying the need and beginning to address it with a call for storage and other solutions.



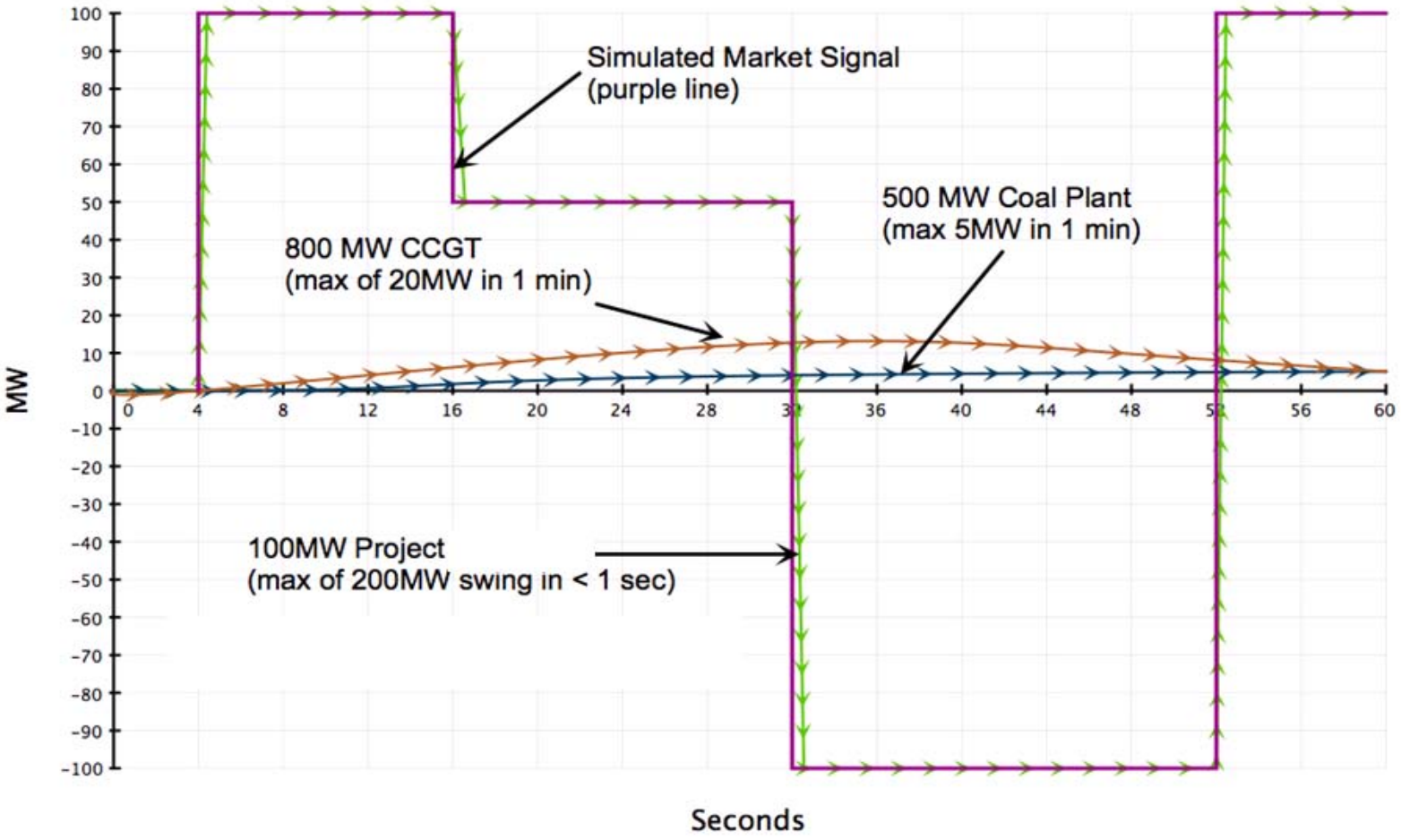
Source: NYISO Wind Integration Study: Regulation Requirements, October 2009

Five, 20 MW energy storage units can match a given dispatch with near digital response while traditional sources of Regulation are technically limited.

AES Energy Storage

"Ideal regulation capacity is 2.7 times more efficient than the average combustion turbine capacity."

Makarov, Y.V. Assessing the value of Regulation Resources Based on Their Time Response Characteristics.
http://certs.lbl.gov/pdf/task-2-4-regulation-resources.pdf



AES Energy Storage solutions, such as this project in Chile, are ideal tools for managing rapid up and down variability of power systems.

- Fast response of <1 sec to full power charge or discharge
- Reduce emissions and fuel consumption vs. fossil solutions
- Release generation holdback for operating reserve
- Frequency responsive, automated operation

Site: 12 MW, Los Andes substation, Atacama Desert

Digital response (programmed)

Frequency drops below 50 Hz

Deployments of energy storage can be accelerated by coordinated policy that motivates risk capital

- Early energy storage investment will be by IPPs
  - Utility-owned (rate base) energy storage places technology performance risk on the ratepayer
- Pay-for-performance (FERC, ISO/RTO)
  - Energy storage resources would be compensated for speed/accuracy of regulation response
- Project finance will be supported by forward sales
  - Ability to sell ancillary services forward in multi-year contracts
  - Regulatory incentives for utilities to procure via sign contract-for-services structures with third-party energy storage owners (PUCs)
- Tax credits on par with wind and solar for renewable-enabling energy storage (Congress)
  - Investment tax credit has been introduced in the House and Senate