Integration of Distributed Resources in the Dispatch

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Who’s Viridity Energy?

The Name

vi·rid·i·ty (v-r d-t) n.
1. a. The quality or condition of being green; greenness.
   b. The green color of vegetation or leaves.
2. Innocence or inexperience

• The Company
  • Founded in 2009 by former PJM executives
  • Headquartered in Philadelphia, with offices in San Diego and Seattle
  • ~50 employees and contractors
  • 24 MUSD outside investment + over 12 MUSD in DOE and State Grants
  • Investors: AltEnergy, Braemer Energy, Intel Capital and Novus Development

• What we do
  • Leverage Viridity’s proprietary VPowertm platform to perform security constrained optimal dispatch of distributed resources, including buildings, distributed generation and distributed storage
  • Optimize and manage, through our Philadelphia based NOC, customer “behind-the-meter” distributed assets, and monetize the resulting virtual generation on the wholesale energy and ancillary markets
  • Over 120 MW under management by end of 2011
  • Major customers include Drexel University, UC San Diego, University of Massachusetts, South East Philadelphia Transit Authority, Jefferson Hospital, Con Edison and NYC buildings, Fort Meade, Brandywine (37 buildings)
The Power Grid of the Future requires advanced tools to coordinate distributed energy resources.

Global proliferation of distributed energy resources:
- Distributed generation
- Distributed storage
- Controllable load

Clusters of these distributed resources organized in microgrids

The Power Grid becomes a network of microgrids capable of:
- Self-healing
- Self-coordination
- Self-scheduling

Viridity’s vision is to enable the seamless integration of distributed resources into the dispatch.

Source: iTeres
The Path to “Perfect Power”*

Classic Demand Response

- Primarily peak shaving
- Events driven
- Traditional CSPs (e.g. Enernoc, Comverge, ECI,...)

Distributed Resources Management/Optimization

- Price responsive virtual generation, fully integrated into the dispatch (both day-ahead and real-time)
- Co-optimizes participation in energy and ancillary services markets

Microgrid Management/Optimization

- Security constrained economic optimization of the distributed resources on the microgrid
- Self-scheduled
- Self-healing
- Cyber secured
- Appears as a virtual generator to the utility

* “Perfect Power”, McGraw-Hill, Robert Galvin and Kurt Yeager
Microgrids require a “central nervous system” to direct the operations of distributed resources within their zone.

- Distributed resources need to be combined and optimized.
- The resources must appear to the system operators as a “virtual generator” that is integrated into the dispatch.
The Microgrid Coordinator function becomes mission-critical as the smart grid is deployed system-wide.
Role of the Microgrid Operator

- Energy and Ancillary Markets
- Demand Response
- Virtual Generation

- Reliability
- Delayed Capital Investments
- DR, Emissions Goals

Utilities
- Distr. Utilities
- Investor Owned Utilities
- Municipals/Coops

RTOs/ISOs

End Users
- Microgrids
- Distributed Generators
- Campuses

- Commercial and Government Buildings
- Industrials
- Military Bases

Microgrid Coordinator

Forecasting
Scheduling
Dispatch

Market Coupling
Power Analytics
Optimize

Monitor & Control

Settlement Services
Congestion Services
Microgrid Development: University of California San Diego RESCO Demonstration Project

UC San Diego operates a 42 MW microgrid with a widely diverse portfolio of distributed energy resources

- With a daily population of over 45,000, UC San Diego is the size and complexity of a small city
- 11 million sq. ft. of buildings, $250M/yr of building growth
- Self generates 82% of annual demand
- 30 MW Natural Gas Cogeneration plant
- 2.8 MW of Fuel Cells contracted
- 1.2 MW of Photovoltaic Solar panels installed, additional 2 MW planned
- Twice the energy density of commercial buildings
The goal of the Con Edison DOE Smart grid project is to deploy smart grid technology within New York City and demonstrate its ability to integrate and optimize distributed energy resources to enhance efficiency, reliability and economic savings for the Utility and End Users alike.

- Viridity Energy’s Network Operations Center serves as the Microgrid Coordinator for ConEdison’s smart grid deployment.

- As additional buildings and campuses are enrolled in the program, Viridity is the distributed resource management hub that ensures proper integration of demand and distribution.
SEPTA is the nation’s sixth-largest public transportation system, and the fifth-largest electricity user in the Philadelphia, PA metro region

- SEPTA installing advanced battery storage system to recapture and deploy power from trains’ regenerative braking

- Viridity to optimize SEPTA’s power and voltage quality and use the excess stored energy as a resource that provides energy service and reliability benefits to PJM and PECO

- Creates a replicable, scalable model for energy savings and power optimization that may be deployed nationally

Projected savings from system-wide deployment:
- $1,664,833 / yr
- 46,080 tons CO2 emissions / yr
The Future Power Grid vision is achievable

- The exponential increase of “Behind-the-meter” resources creates reliability and power quality challenges at the microgrid and at the grid level
- But intelligent coordination of multi-tiered microgrids will fortify—rather than compromise—electricity grid integrity

- The costs of renewable generation and energy storage, taken individually, often result in prohibitive returns on the investment
- But with the proper incentives and market rules, those returns can be increased two to three-fold

- Key to smart grid success is coordination and optimization at all layers of the power system, including the customer side of the meter
- But to achieve it, we need “Smart Regulation”