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The Premier Energy Training Workshop and Trade Show for Federal Agencies

A River of Energy Solutions

Energy Security vs Energy Reliability

Audrey Zibelman, President, CEO Viridity Energy

Viridity Energy Overview

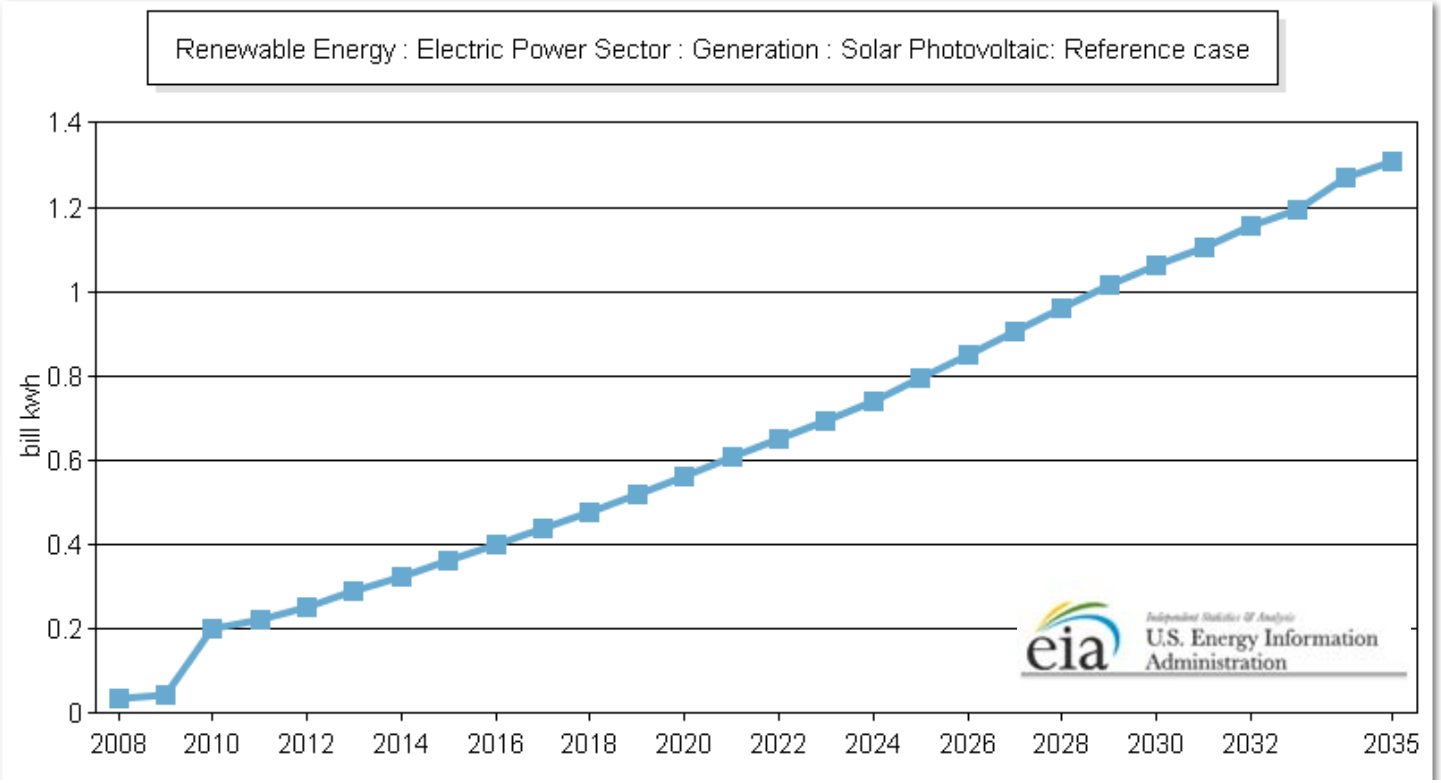
- **The Company**
  - Founded in 2008 by former PJM executives, 50 employees and contractors
  - Headquartered in Philadelphia, with offices in San Diego and Seattle
  - Recipient of over 12M USD in DOE and State Grants
  - DLA – Energy approved Curtailment Service Provider for US DOD and federal facilities

- **What we do**
  - Viridity Energy enables large energy consumers, such as hospitals, universities, data centers, military bases and industrials, with decision tools that generate new revenue streams from energy assets, lower energy costs, and achieve greater reliability and sustainability goals.

  - Leverage Viridity's proprietary VPower™ platform to provide full spectrum DR via security constrained optimal dispatch of distributed resources, including buildings, distributed generation and distributed storage

  - Major projects include Drexel University, UC San Diego, University of Massachusetts, South East Philadelphia Transit Authority, Jefferson Hospital, Con Edison and NYC buildings, Fort Meade, Brandywine Realty (37 buildings)

Less Energy Security Risk → Greater Energy Reliability Risk



"With more research and incentives, we can break our dependence on oil with bio fuels, and become the first country to have a million electric vehicles on the road by 2015" President B. Obama, 2011 State of the Union

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USA Electric Vehicles Deployment

New effort launched to support EVs adoption through:

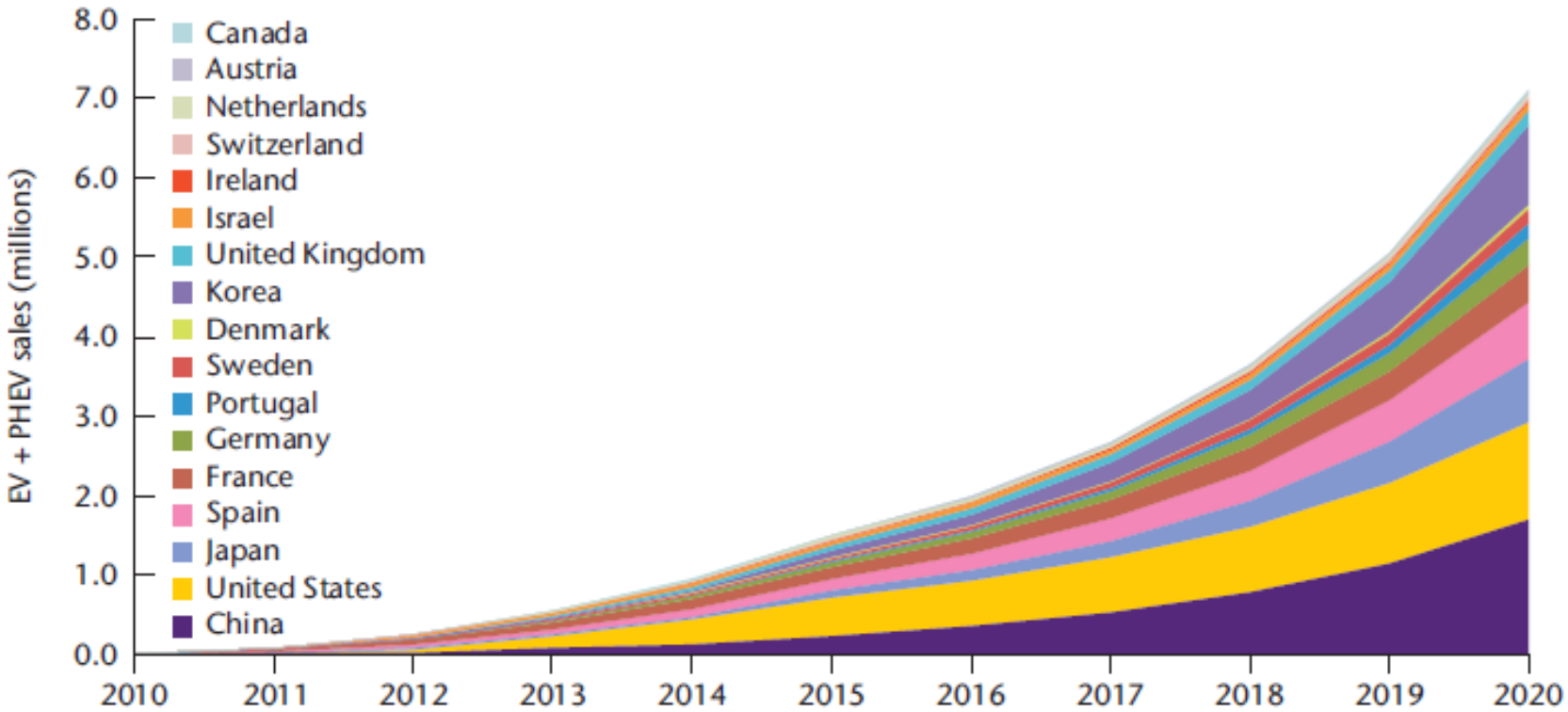
- improvements to tax credits in current law
- investments in R&D
- competitive programs to encourage communities to invest in infrastructure supporting EVs

New generations of EV were introduced in 2010:

- General Motors - the Chevrolet Volt
- GM announced plans to build 15,000 Chevy Volts in 2011 and 45,000 in 2012
- In late 2010, Nissan introduced the Leaf, a 100-mile range all-electric vehicle

International: IEA Technology Roadmap - Electric and Plug-in Hybrid Electric Vehicles (6/11)

Figure 6: National EV/PHEV sales targets if national target year growth rates extend to 2020



Source: IEA data.

KEY POINT: *National EV/PHEV targets are consistent with IEA BLUE map targets through 2020.*

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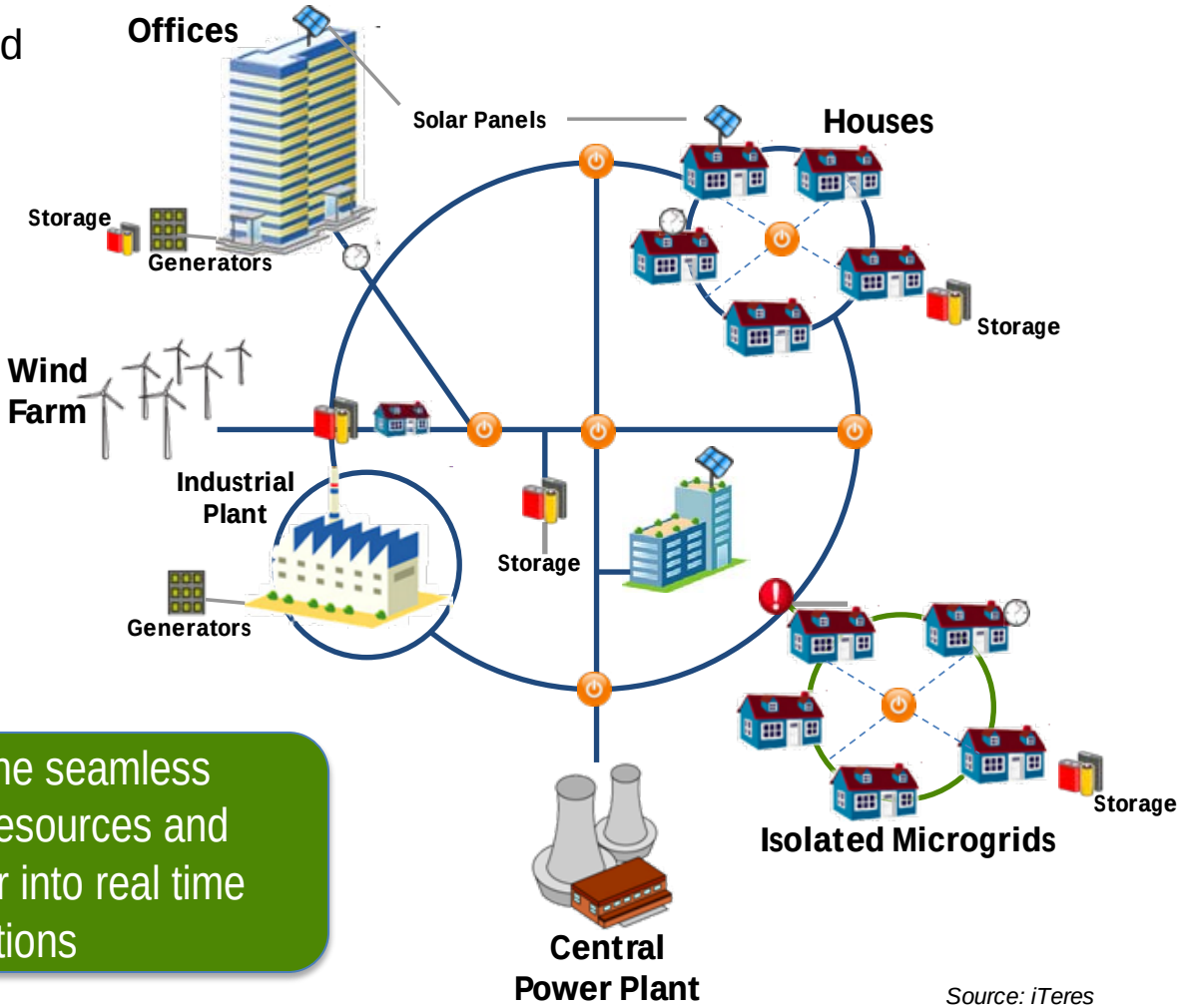
Customer load and energy resources provide *maximum security and reliability* when integrated and aligned with real time power grid operations

Global proliferation of distributed energy resources:

- Distributed generation
- Distributed storage
- Controllable load

The Smart Power Grid is a real time a network of distributed systems and microgrids capable of:

- Self-healing
- Self-coordination
- Self-scheduling



Source: iTeres

Viridity Energy enables the seamless integration of distributed resources and microgrids as Virtual Power into real time power grid operations

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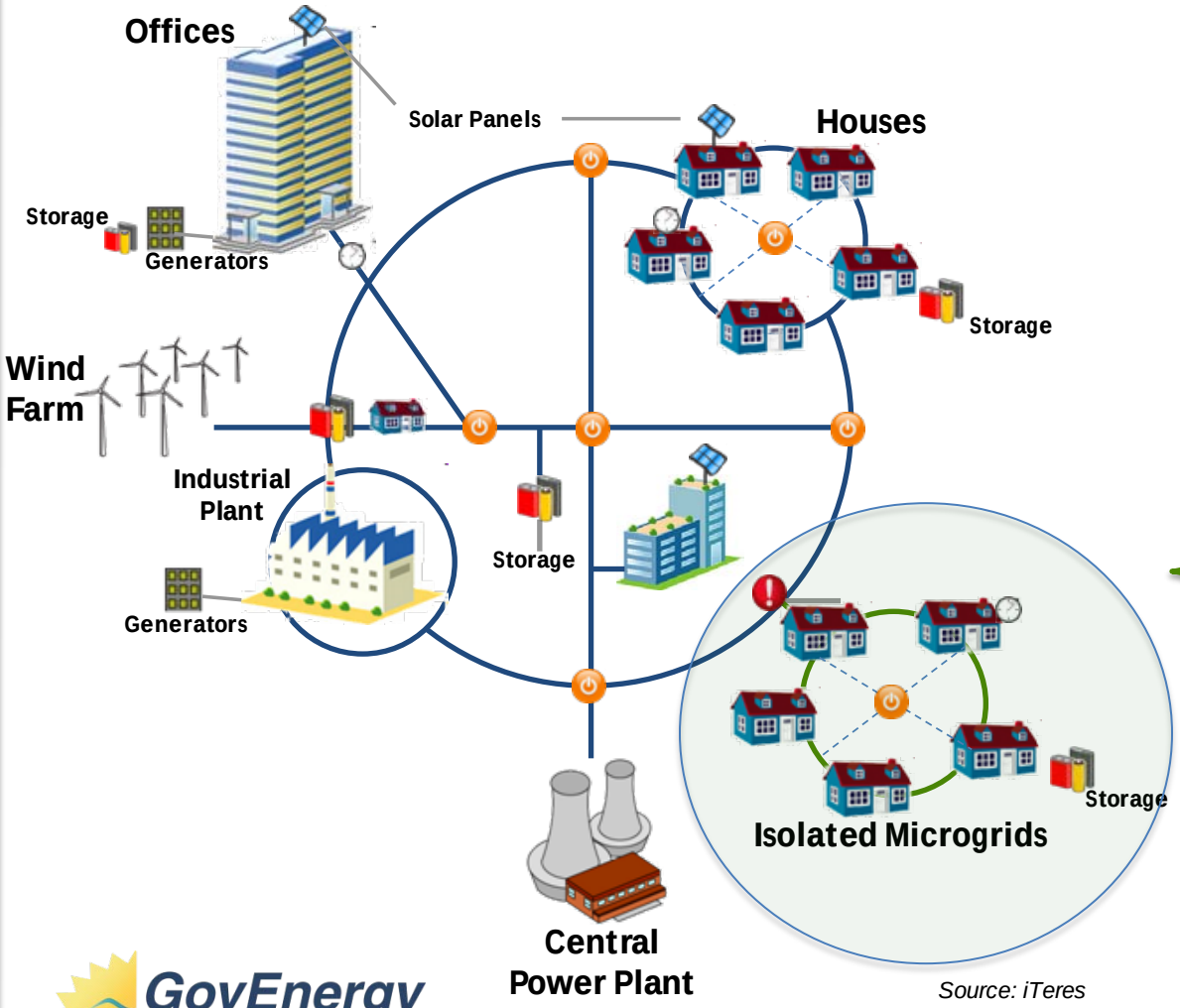
Microgrids will transform power distribution, enabling new levels of system reliability and efficiency

Focus on: Microgrid Intelligence



Source: iTeres

Self-healing

- Responds to system disturbances automatically
- Capable of operating as an “island” off of the regional grid

Self-coordination

- Coordinates real-time demands of energy users, distributed resources, microgrid operations and distribution system integrity

Self-scheduling

- Schedules dispatch of distributed energy resources using decisioning tools to optimize overall grid operational performance

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Full Spectrum DR: The Path to Microgrids

Classic Demand Response

- Traditional Curtailment Service Provider
- Primarily peak shaving and Capacity Market participation

Distributed Resources Management/ Optimization

- Automated, price responsive virtual generation, fully integrated into the dispatch (both day-ahead and real-time markets)
- Co-optimizes participation in Energy and Ancillary Services markets

Microgrid Management/ Optimization

- Security constrained economic optimization of existing and planned distributed resources (renewable generation, storage, etc) on the microgrid
- Appears as a virtual generator to the utility

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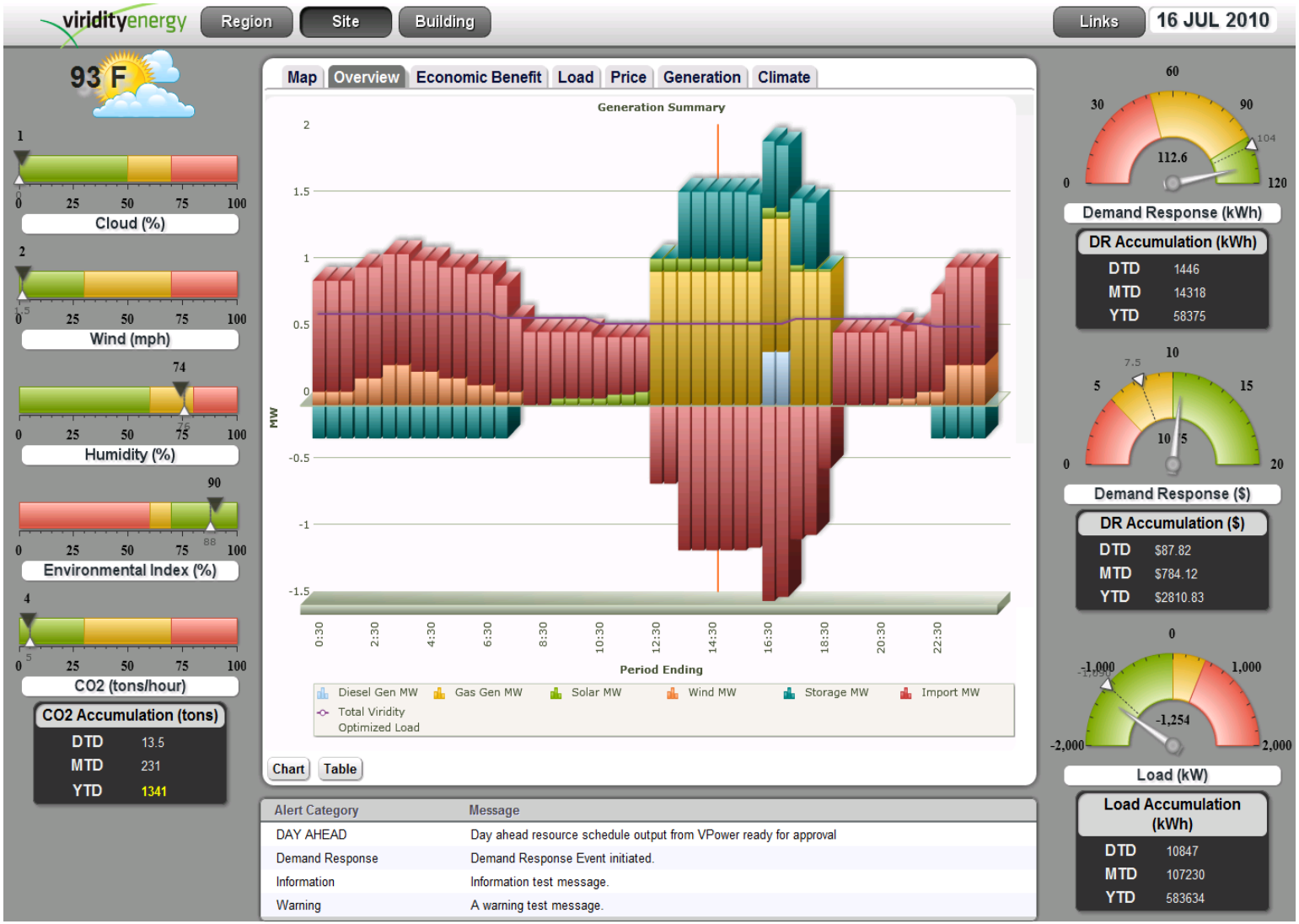
Virtual Power Generation: From Consumer to Pro-Sumer



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Fort George G. Meade

The Fort Meade installation has the fourth largest workforce of any army installation in the United States, and with over 42,000 personnel, is Maryland's largest employer. Fort Meade has 85 tenant units, covers 5,067 acres and has 1,517 buildings.

- 10 site locations on track to increase through out the year. Buildings include:
  - Medical Center
  - DINFOS
  - Waste Water and Water Filtration plants
- Partnership with Directorate of Public Works, Engineering and REM, Tony Karwoski of Sain Engineering anthony.karwoski@us.army.mil
- Partnership has led to two microgrid proposals:
  - Microgrid master plan via IMCOM
  - ESTCP microgrid proposal - chosen to advance to next level

Fort George G Meade, MD

Project via Master Agreement with DLA-Energy that enables Viridity Energy to provide DR services to any U.S. military base or federal facility.

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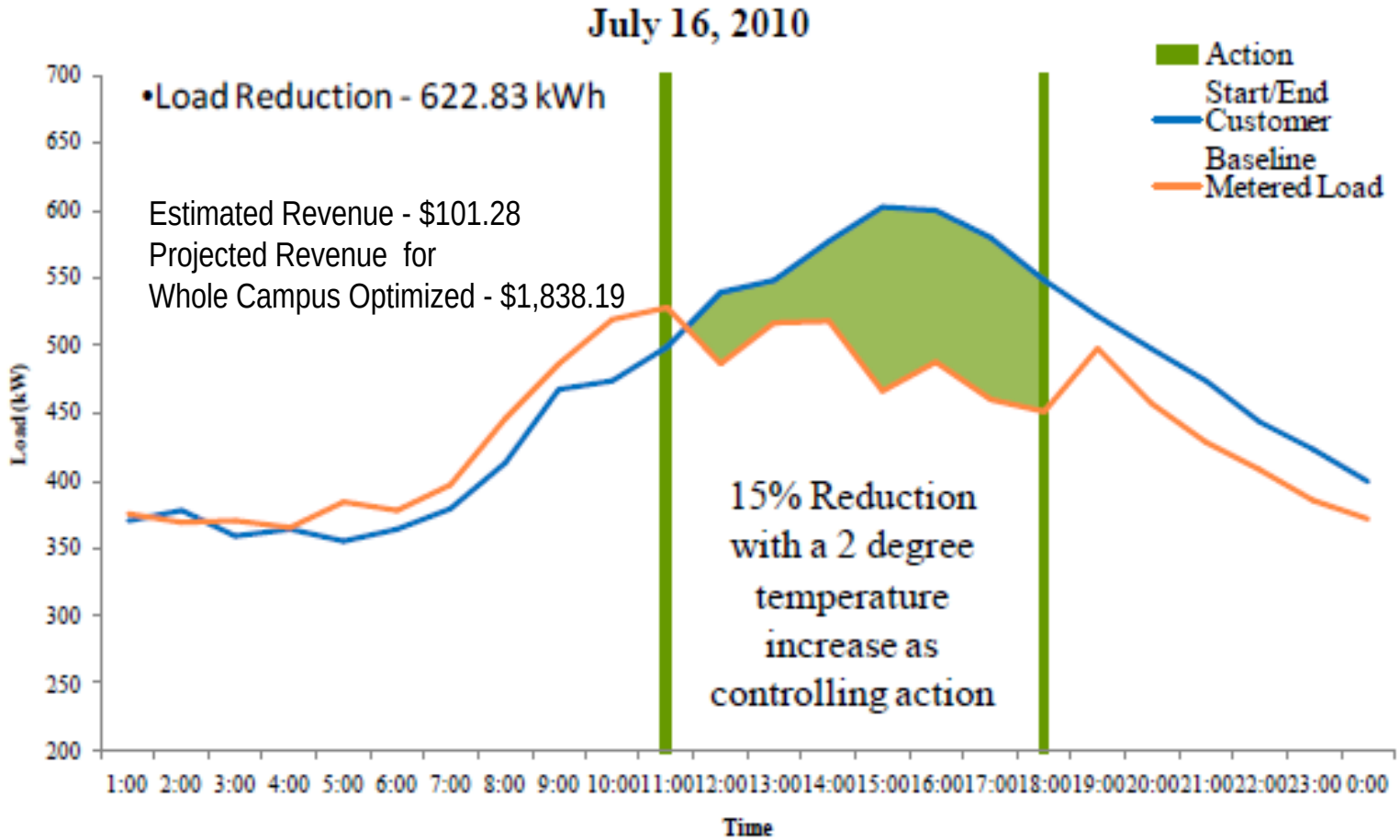
PHILADELPHIA (June 29, 2009)

Drexel University Becomes First US Institution to Adopt Viridity Smart Grid Technology

Value of Optimized Load in Real Time Wholesale Market

One Day in July: How Viridity Optimizes Distributed Resource Economic Value



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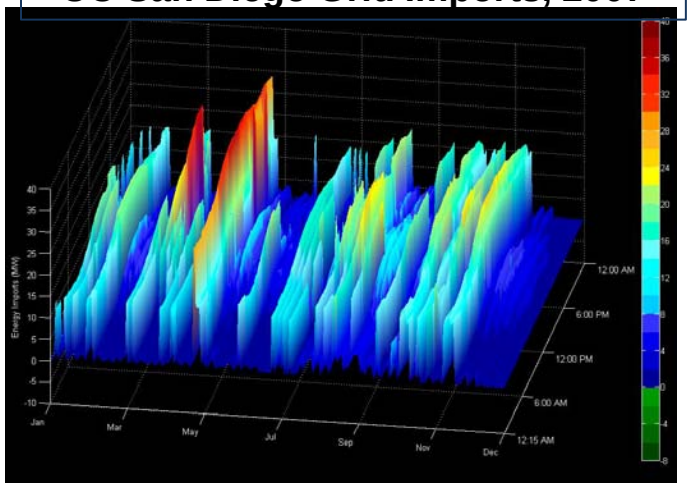
Microgrid Development: University of CA, San Diego

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

UC San Diego Campus

UC San Diego Grid Imports, 2007



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Next Step: From Consumer to Pro-sumer

"An institution that takes an enlightened, proactive approach to its energy use, by:

a) Utilizing real-time pricing information to manage energy consumption;

b) Integrating distributed generation and storage onsite when deemed economical;

c) Interfacing with the wholesale power markets on a continuous basis to provide virtual power;

d) Making its own energy *choices* rather than acting as a passive bill-payer."

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