



The benefits of smart grid
technology for buildings, Cities
and sustainability

Overview and Insights



- Garrison has reinforced the mind-city-building connection
- Smart Grid and other technologies provide opportunities for more efficient buildings
- Direct economic incentives exist - can you imagine getting paid to take transit?
- Despite technical innovation in the energy sector.....
People matter - human behavior is more important than ever
Energy sector - needs better public education and communication

If I don't illuminate these issues please ask

Where We Are Today?



Just like IT and telecom, our energy network is on the cusp of a paradigm shift - led by advanced technology, networked devices, and informed consumer choice.



Information Technology



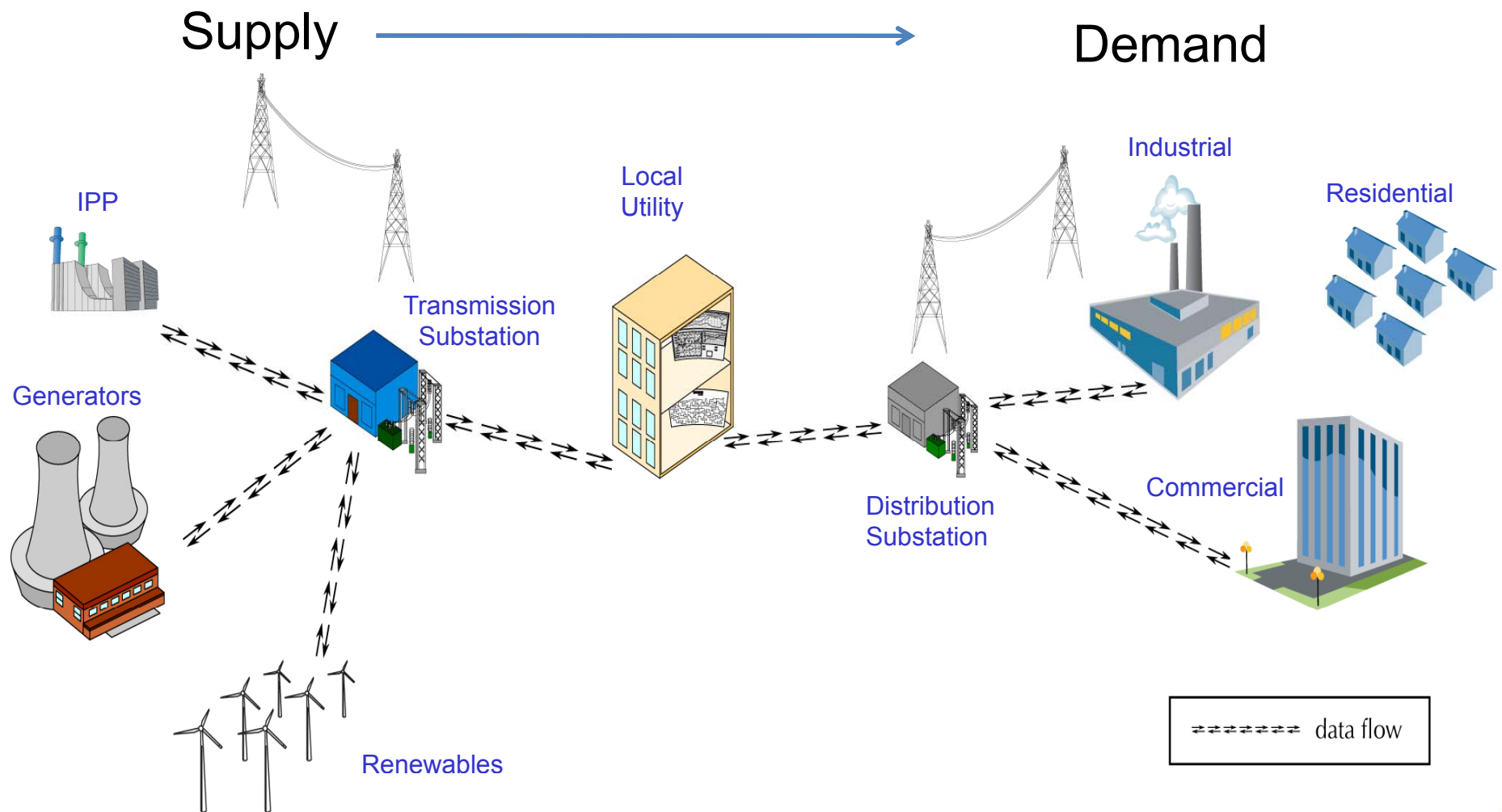
Telecommunications



Power Grid

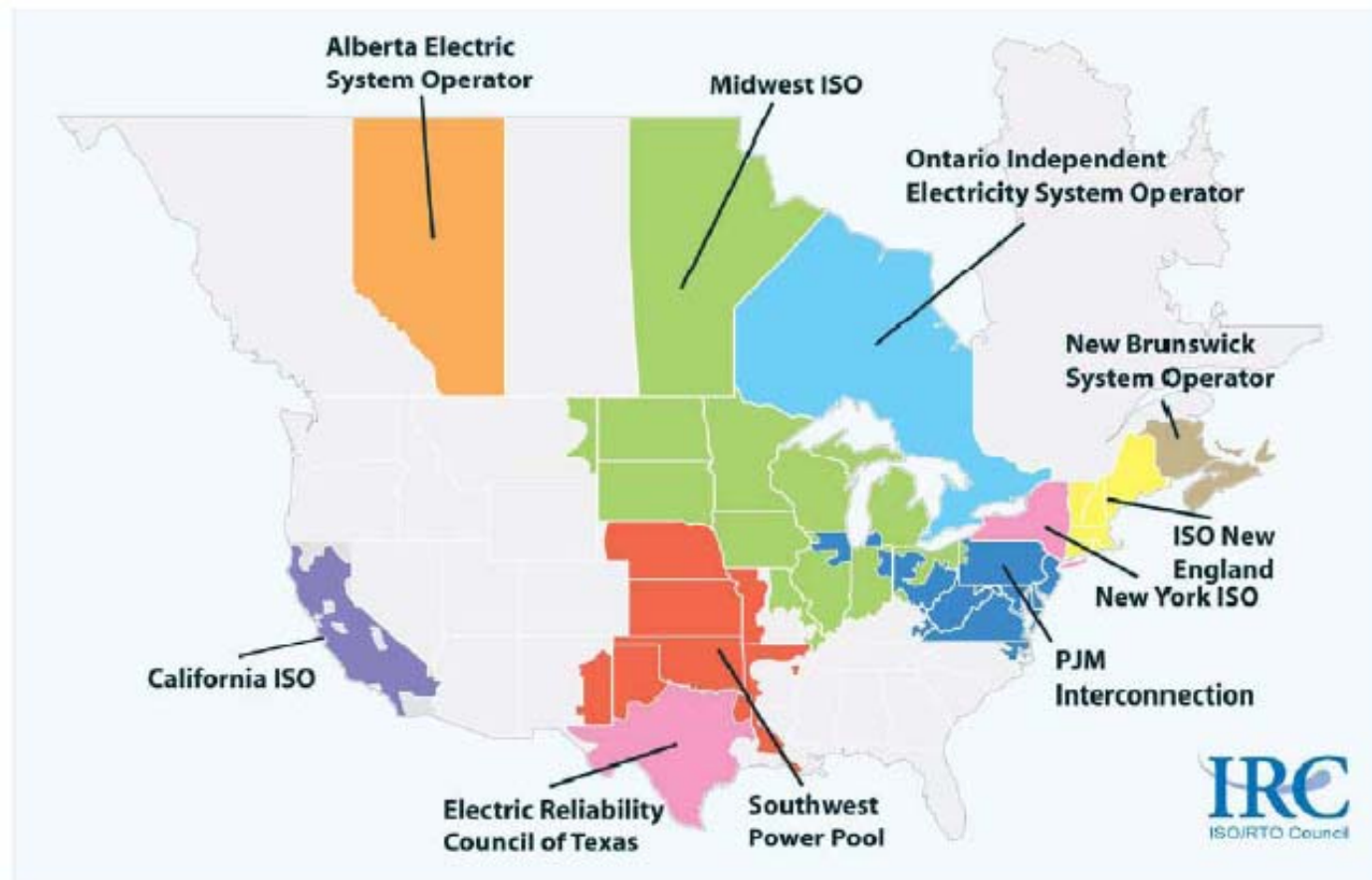
- Viridity founded to give new info and technology to consumers
- March 2011 FERC ruling: a MW generated is financially equivalent to a MW conserved **NEGAWATT = MEGAWATT**
- Consumer-led demand reductions lead to lower power prices—interesting politics

The Existing Grid is a “one-way street”

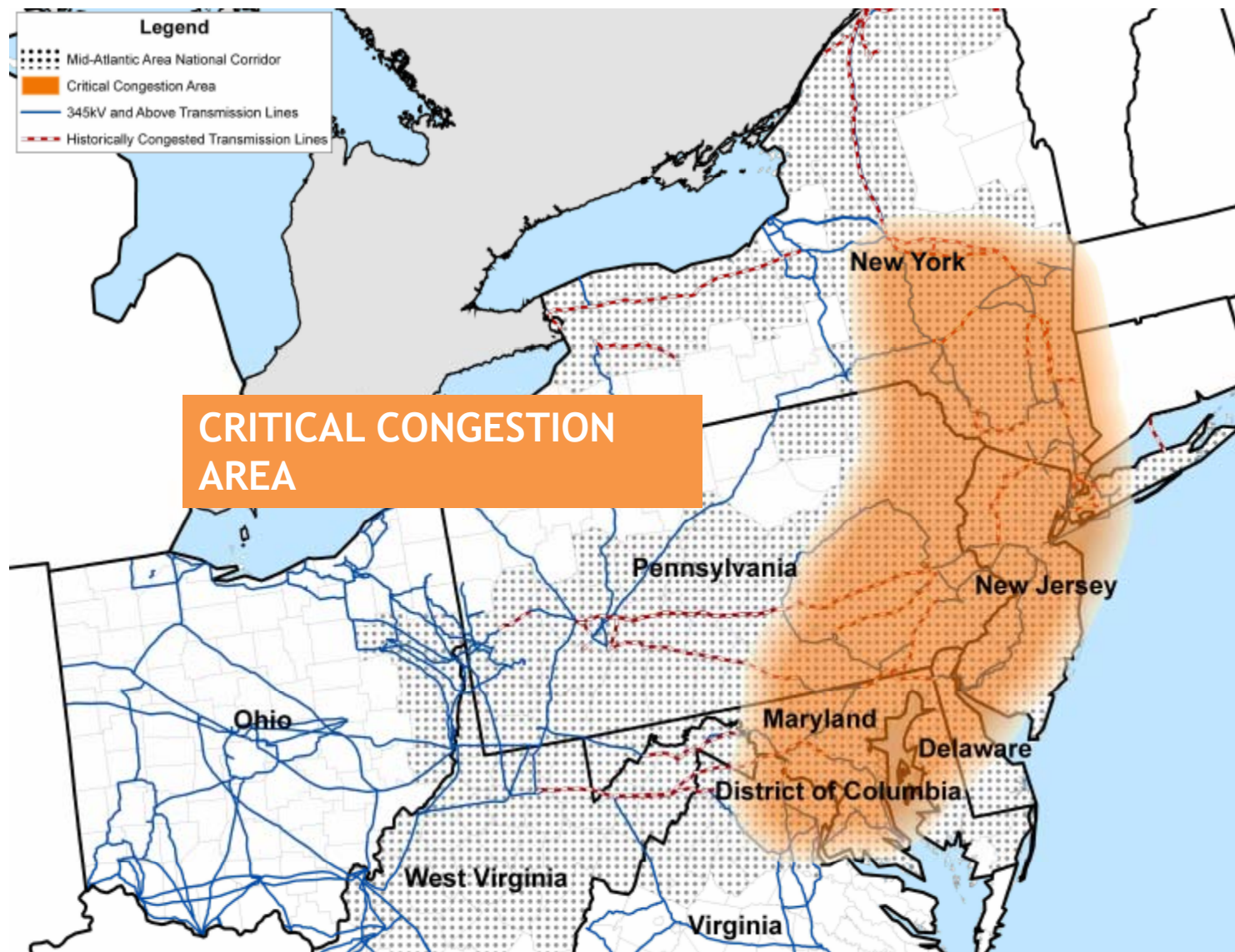


The grid must continuously balance production and consumption

RTO/ISO Markets Serve in Excess of 80% of North American Power Customers



Congestion, Grid Reliability



The Power Grid of the Future requires advanced tools to coordinate distributed energy resources

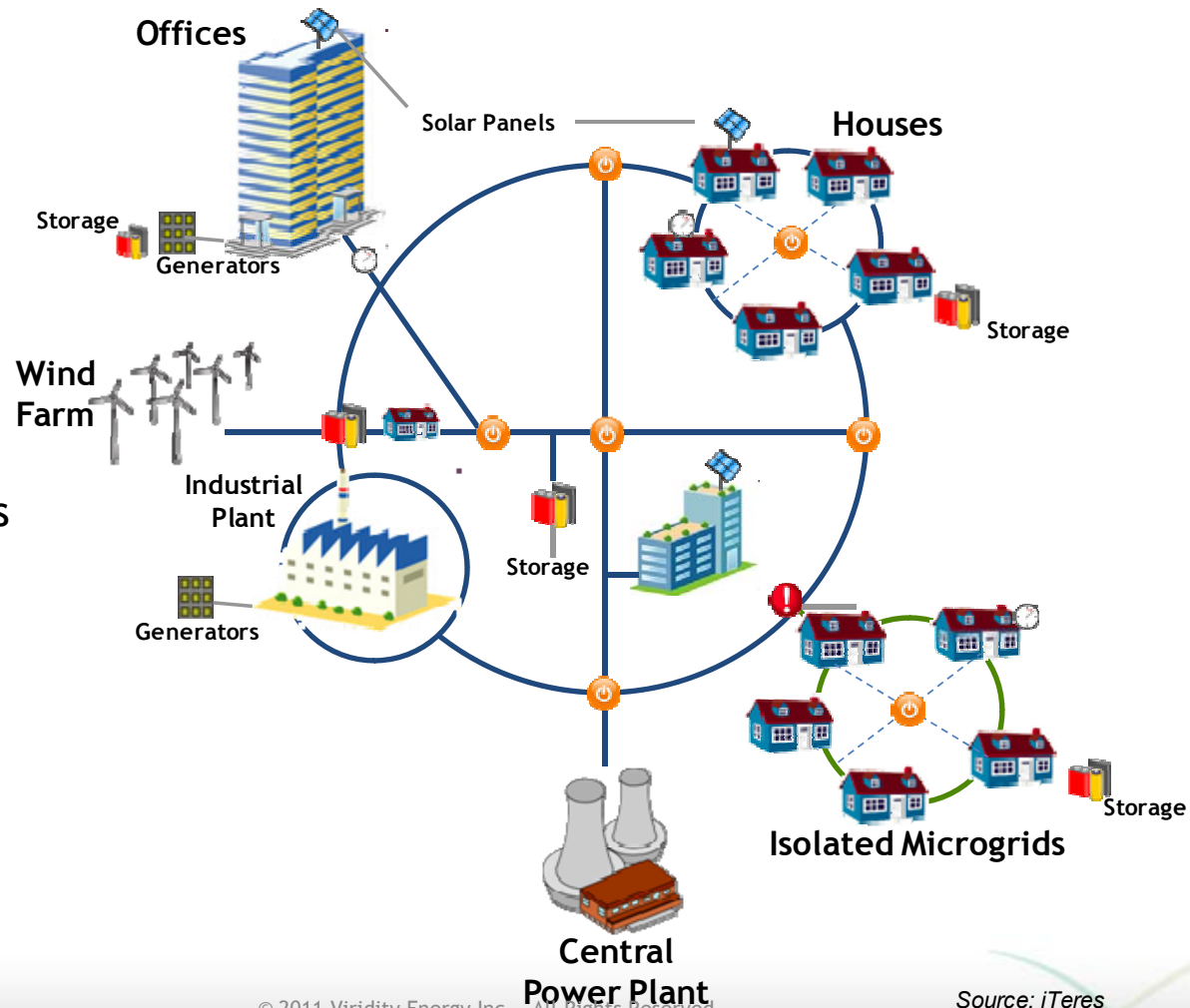


The Smart Grid is a Two Way Street

Global proliferation of distributed energy resources:

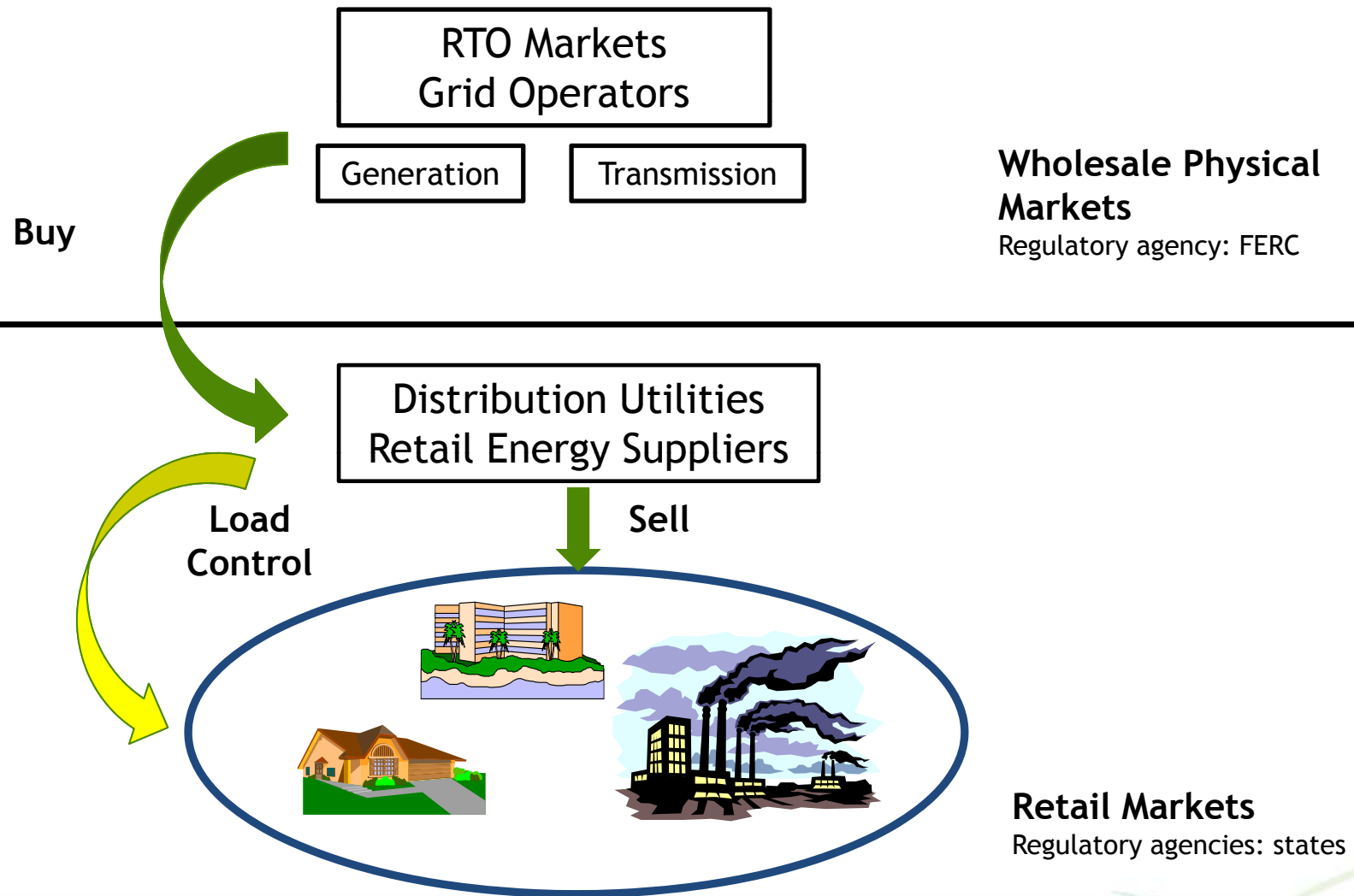
- Distributed generation
- Distributed storage
- Controllable load

Clusters of these distributed resources organized in microgrids

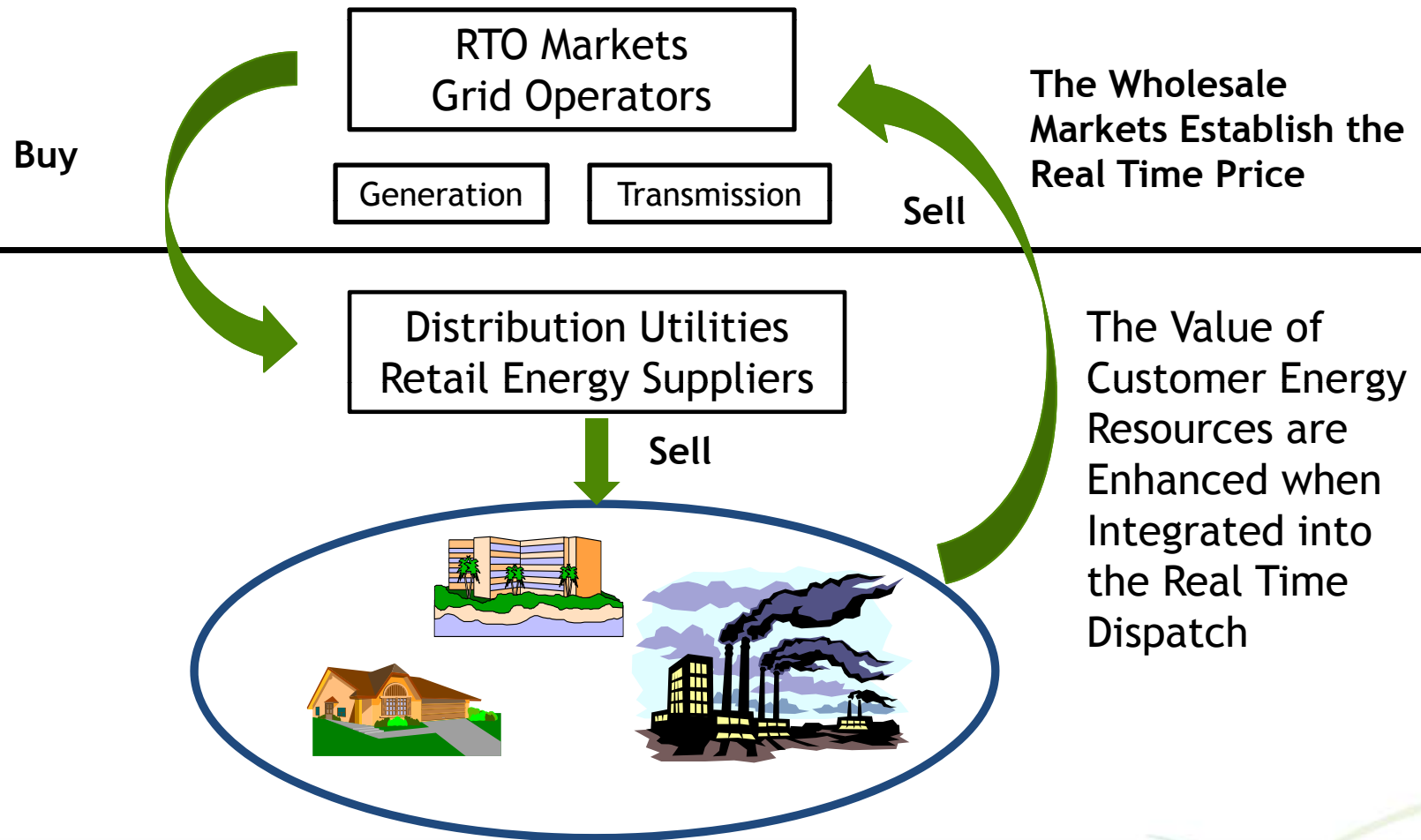


Traditional Demand Response is a Directed Action to Minimize Stress on the Grid

viridityenergy



Viridity Energy's Demand Optimization (vs. Traditional Demand Response) integrates controlled load into real time market operations as a virtual power resource (a closed loop system)





Leveraging a Building for Energy Savings and Revenues



Efficiency - Reduction of KW consumption per square foot over all hours

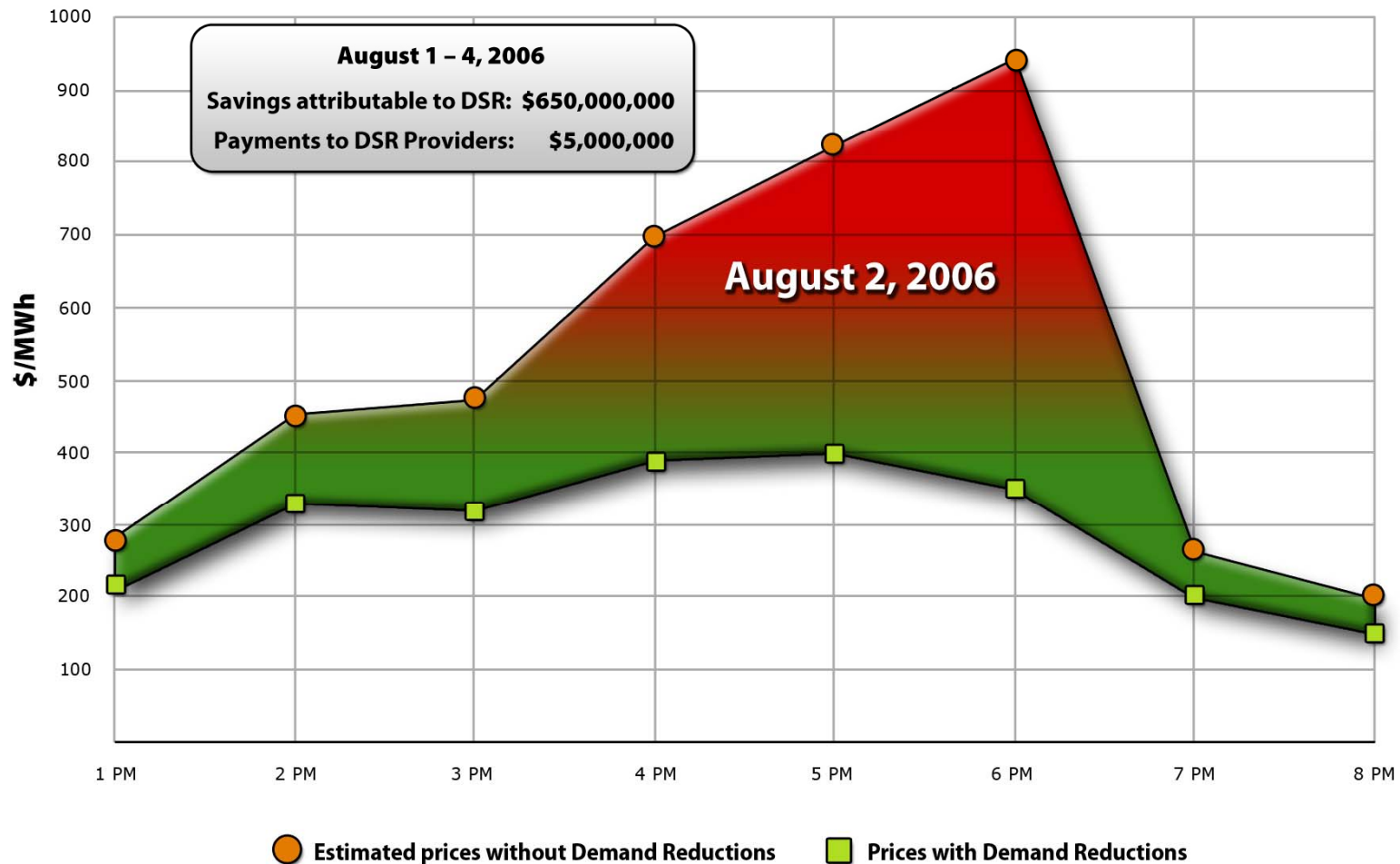
Demand Response - The ability to reduce consumption in response to a utility request

Dynamic Demand Optimization - The automated and continuous active management of building load from the power grid in reaction to real time prices while ensuring that tenant comfort, sustainability and productivity concerns are addressed.

Economic Value to the Market



PJM – Impact of Demand Response on Prices



Benefits of DR to PJM Customers

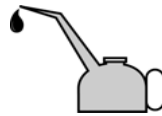
Quantity of fuel displaced by voluntary load reduction during peak usage periods 1 August 2006 through 4 August 2006

- Coal



1,367 Tons

- Heavy Oil



15,855 Barrels

- Natural Gas



227,965 MCF

\$5 million = direct payout to DSR instead of additional generation dispatched at higher price.

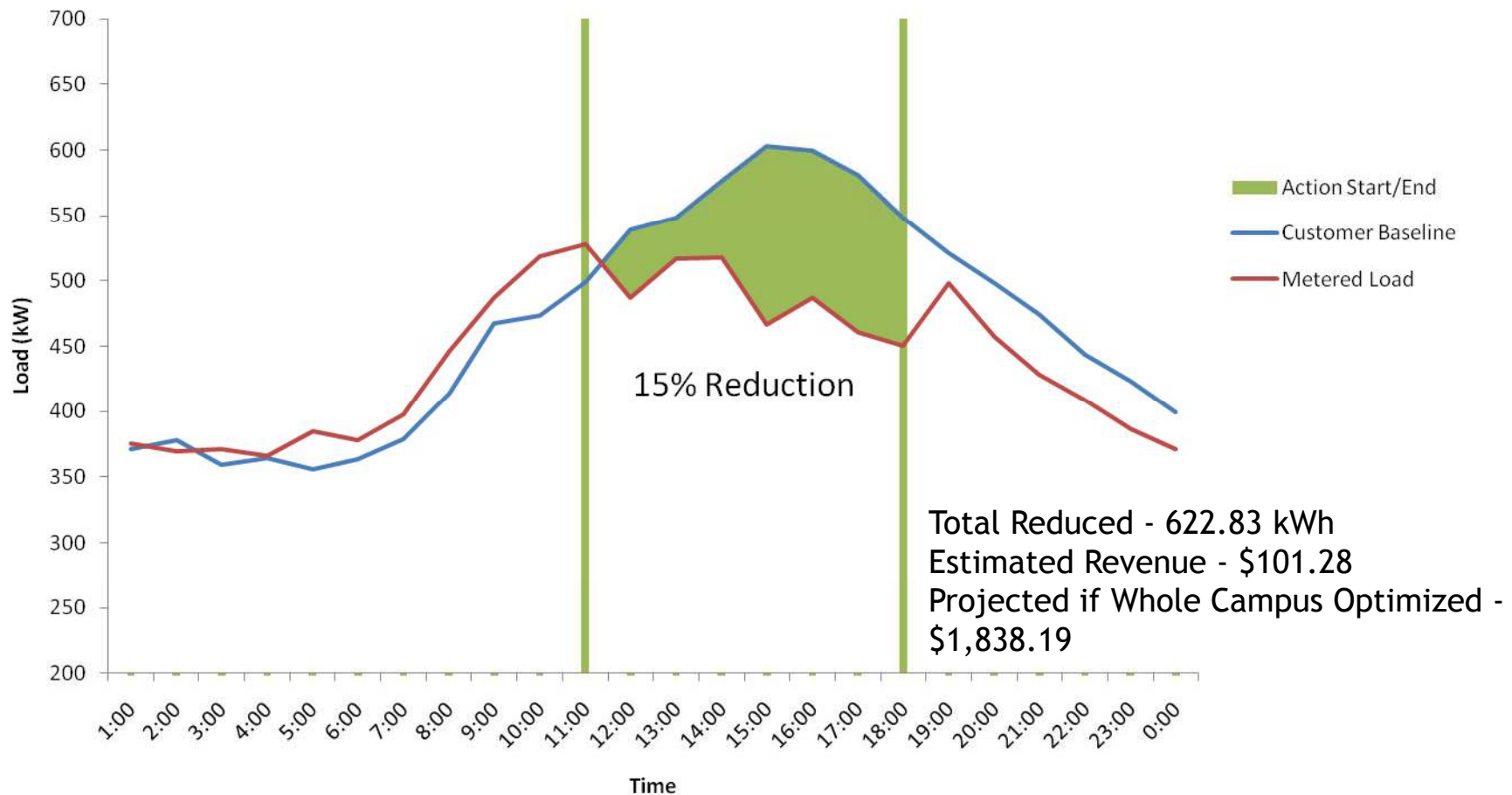
\$650 million = indirect savings per day to system during the week from DSR through lower marginal clearing prices

Drexel University

Hagerty Library, Law Library, Law School (6% of Whole Campus Load)



July 16, 2010* Actions



*This is a representative weekday during the operational period of June-July 2010. Reduction was achieved with a two-degree change.

Viridity/NYC Smart Grid

6 Identified Buildings, 4 TBD



conEdison

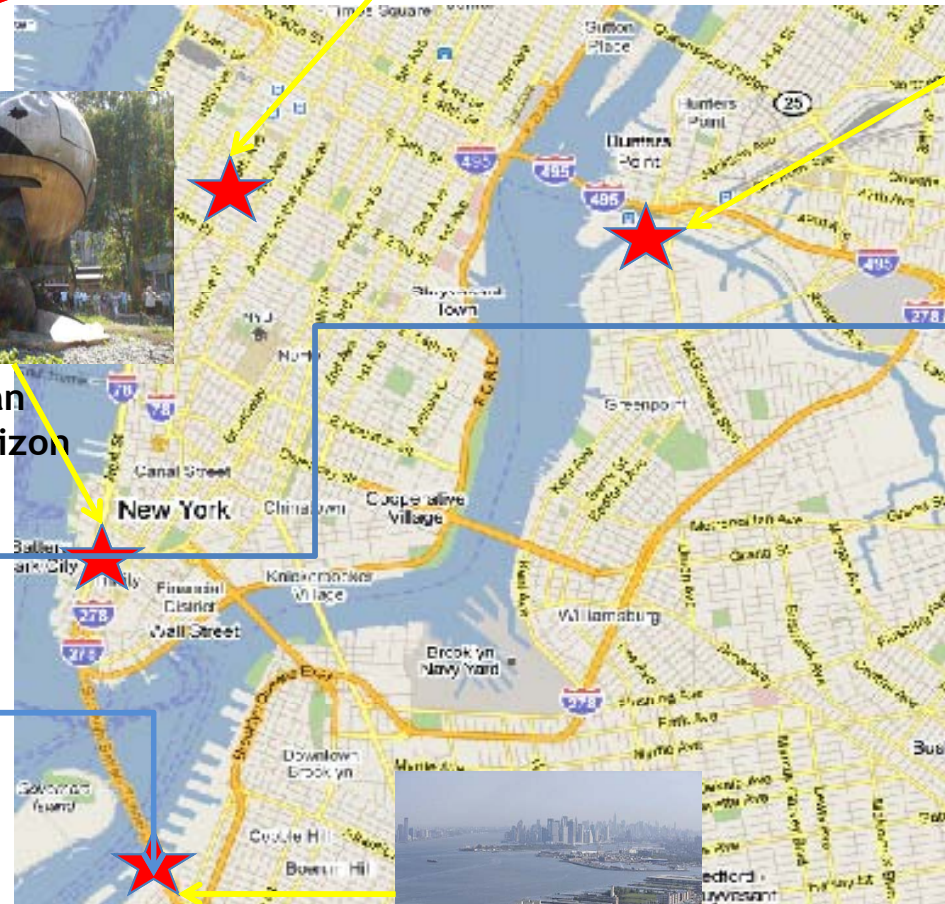
Control Center



Viridity Energy's
Network Operations Center
Conshohocken, PA



Lower Manhattan
2 Rudin & 1 Verizon



2 Buildings in
Long Island City
CitiGroup
La Guardia
Community College



New York ISO
Control Center

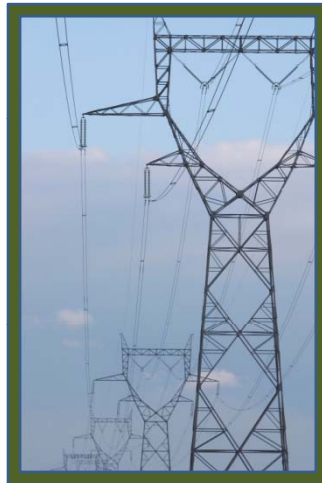
NYCEDC 3 Bldgs
Brooklyn Cruise Terminal,
Brooklyn Army Terminal,
Brooklyn Meat Terminal



SEPTA Recycled Energy & Optimization Project

- 1 Regenerative brake power charges battery
- 2 Viridity optimizes battery charge and discharge
- 3 Viridity integrates battery operation with PECO distribution system and PJM wholesale power market

PECO Power Grid



PJM Power Market

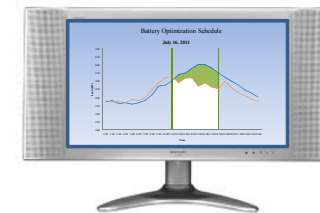


Battery Storage System



2

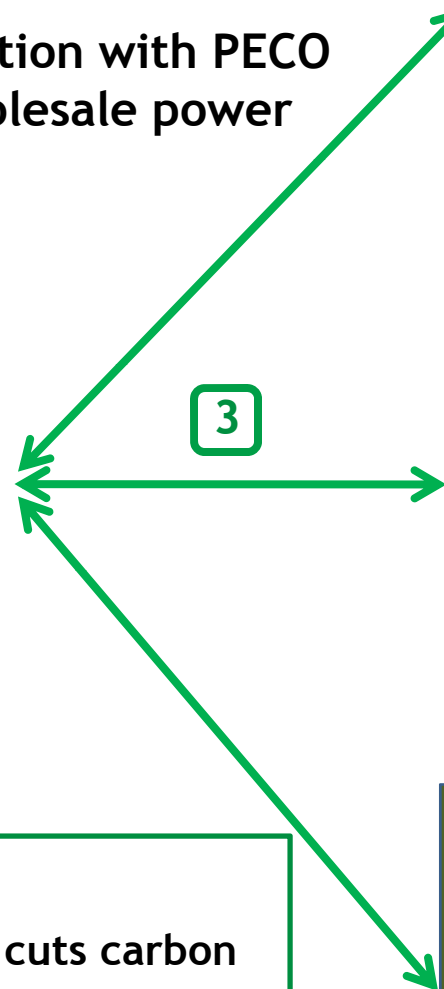
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Train Station



Benefits

- ✓ SEPTA improves quality, saves money, cuts carbon
- ✓ SEPTA generates new income
- ✓ Region's power grid more reliable, efficient, green

Place-Based 'Smart City' Efforts - Cities are where Climate policy will be achieved



- Austin Pecan Street Project *neighborhood smart grid*
- Ft. Collins FortZed *net zero energy district*
- Chicago/Charlotte Virtual Microgrid *smart grid aggregation
of commercial buildings*

Philadelphia's assets:

- Greenworks Philadelphia
- ARRA EnergyWorks Program
- PECO Smart Grid/Act 129
- GPIC

New York's assets:

- PlaNYC
- Greater Green Buildings Plan
- NYSEEC
- NYSERDA
- ConED



Thank You.