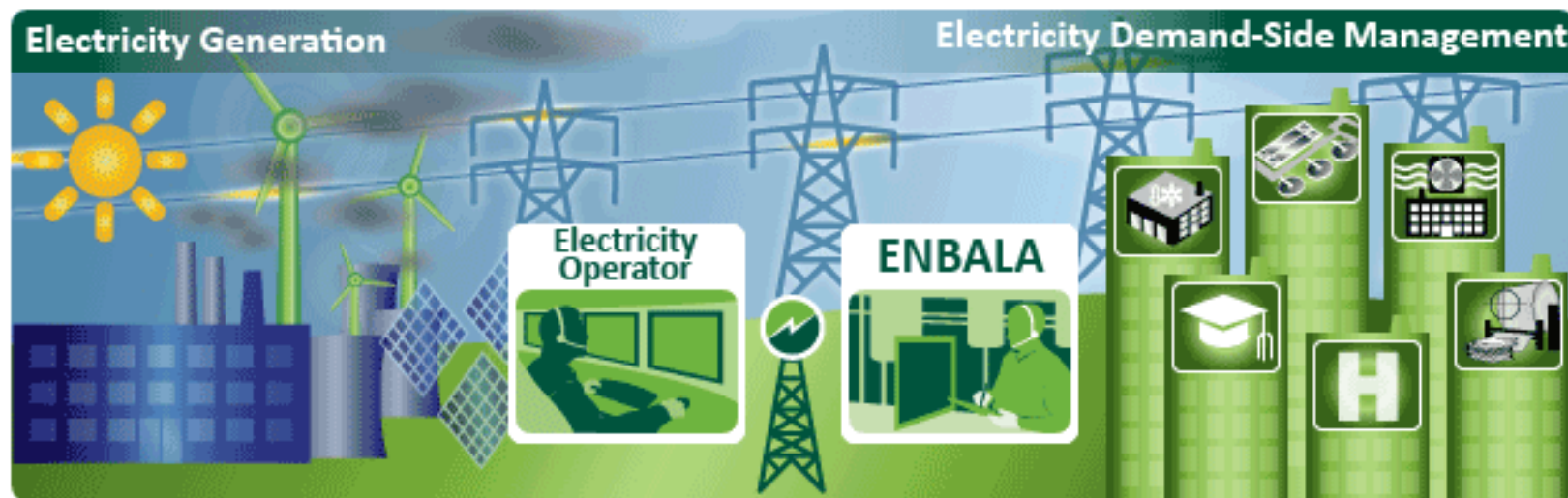


Revenue Generating Smart Grid Technology – A Pennsylvania American Water Case Study



ENBALA Introduction



ENBALA Power Networks pays Industrial, Commercial and Institutional Electricity users to help balance the electricity grid.



ENBALA captures and then intelligently aggregates process storage available in end user loads to respond to the real-time needs of the power system.

The Need for Flexibility

Continuous delivery
of electricity



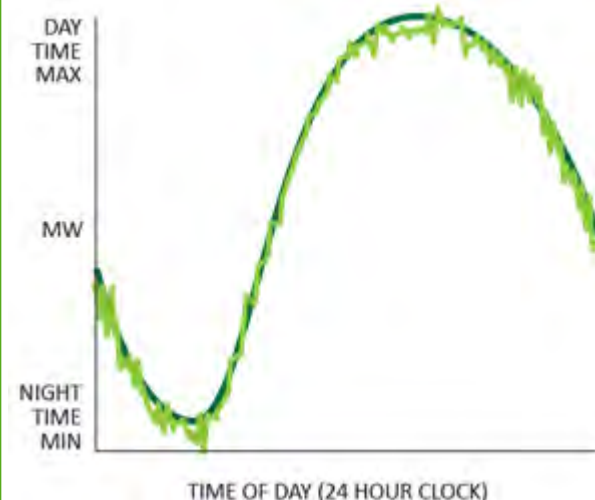
ENERGY

Ability to meet
peak requirement



CAPACITY

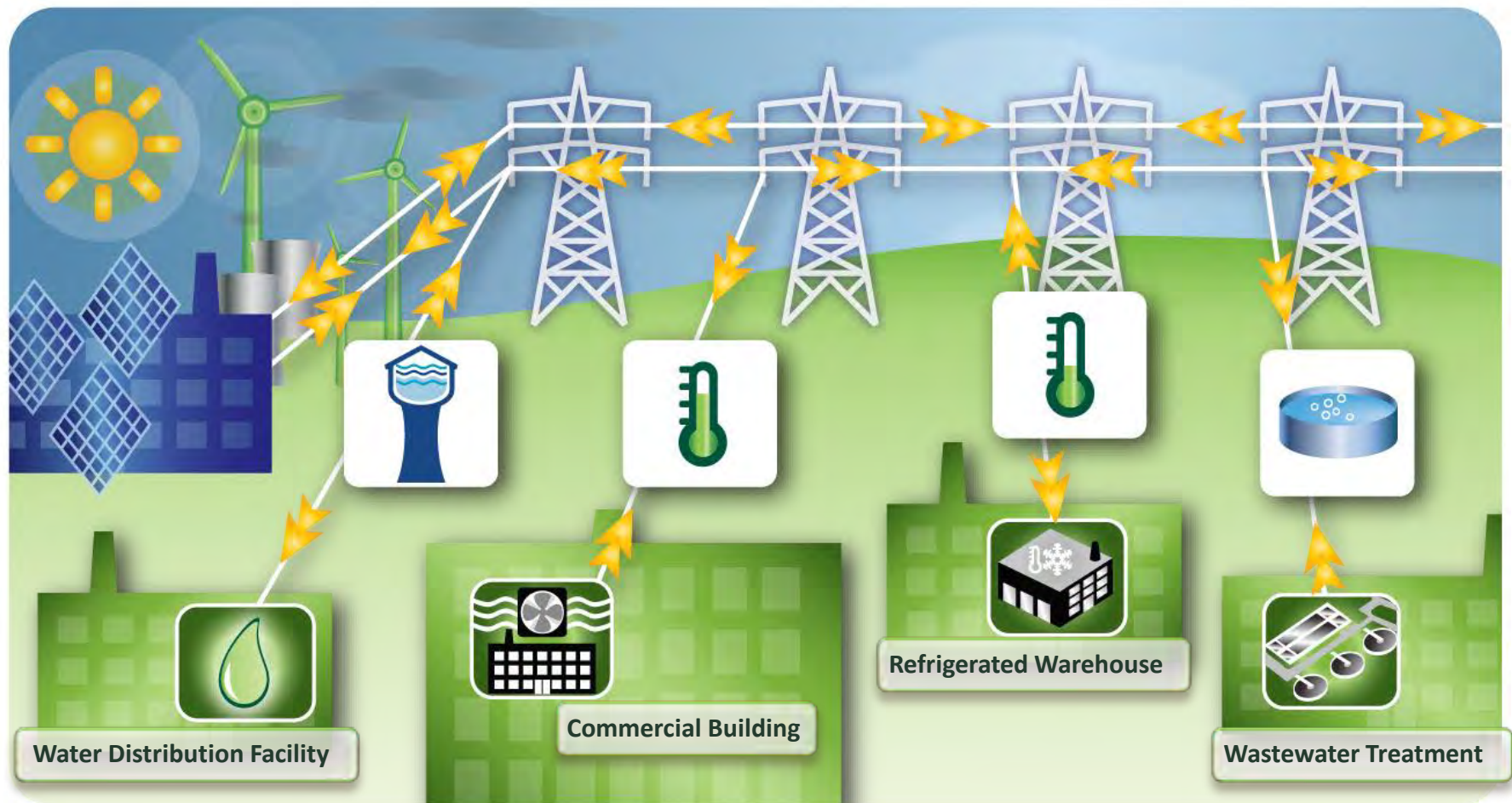
Ability to continuously
match supply & demand
(& manage intermittent
generation)



FLEXIBILITY



Inherent Flexibility in Existing Assets



1

Storage already exists in the power system

2

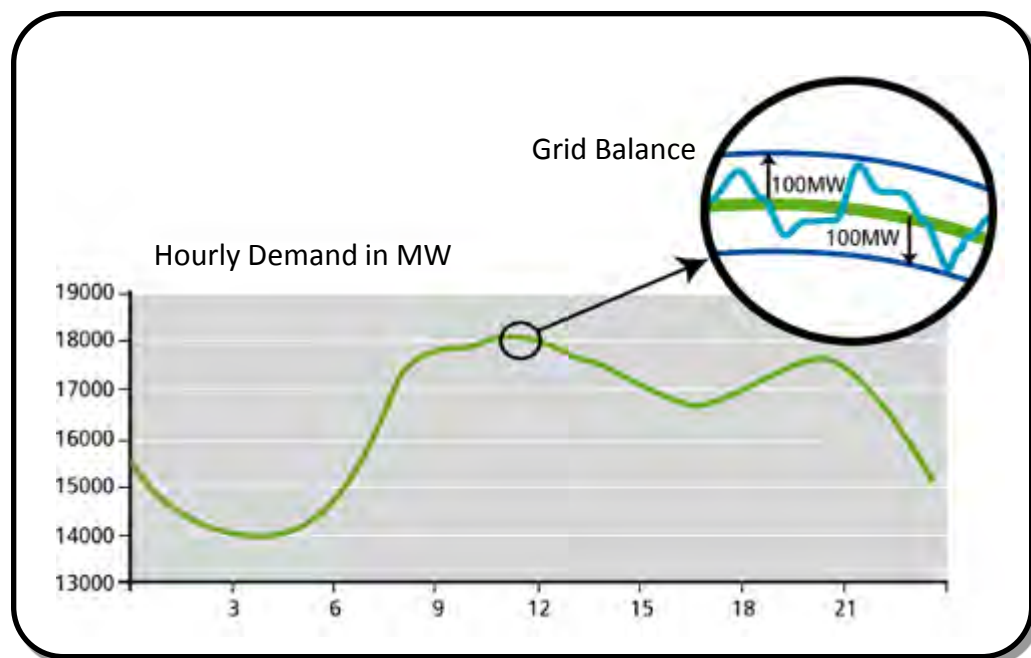
Storage in industrial systems and processes provides flexibility in consumption

3

We only have to connect and manage this storage

Grid Balance® Program

Grid Balance (also known as Regulation Service) is the second-by-second balancing of supply and demand to maintain the grid's frequency balance (near 60 Hertz).



“Think of regulation service as a cruise control for the electric system.” To go a steady 60 mph, your cruise control imperceptibly adjusts gas and brakes to keep your speed constant. “Regulation services do the same thing, adding or reducing power on the grid to keep its frequency in balance”.

Scott Baker, Analyst
PJM Interconnection

Benefits to Participate in Grid Balance

- ⚡ New revenue stream from existing assets
- ⚡ Benefits efficiency & reliability of electricity grid
- ⚡ Environmental stewardship



How Do You Get Paid?



Grid Operators must:

- Maintain balance on the grid
- Ensure a reliable and efficient electricity system

Load Owners:

- Get paid by monetizing the inherent flexibility in their processes
- Reduce net energy cost

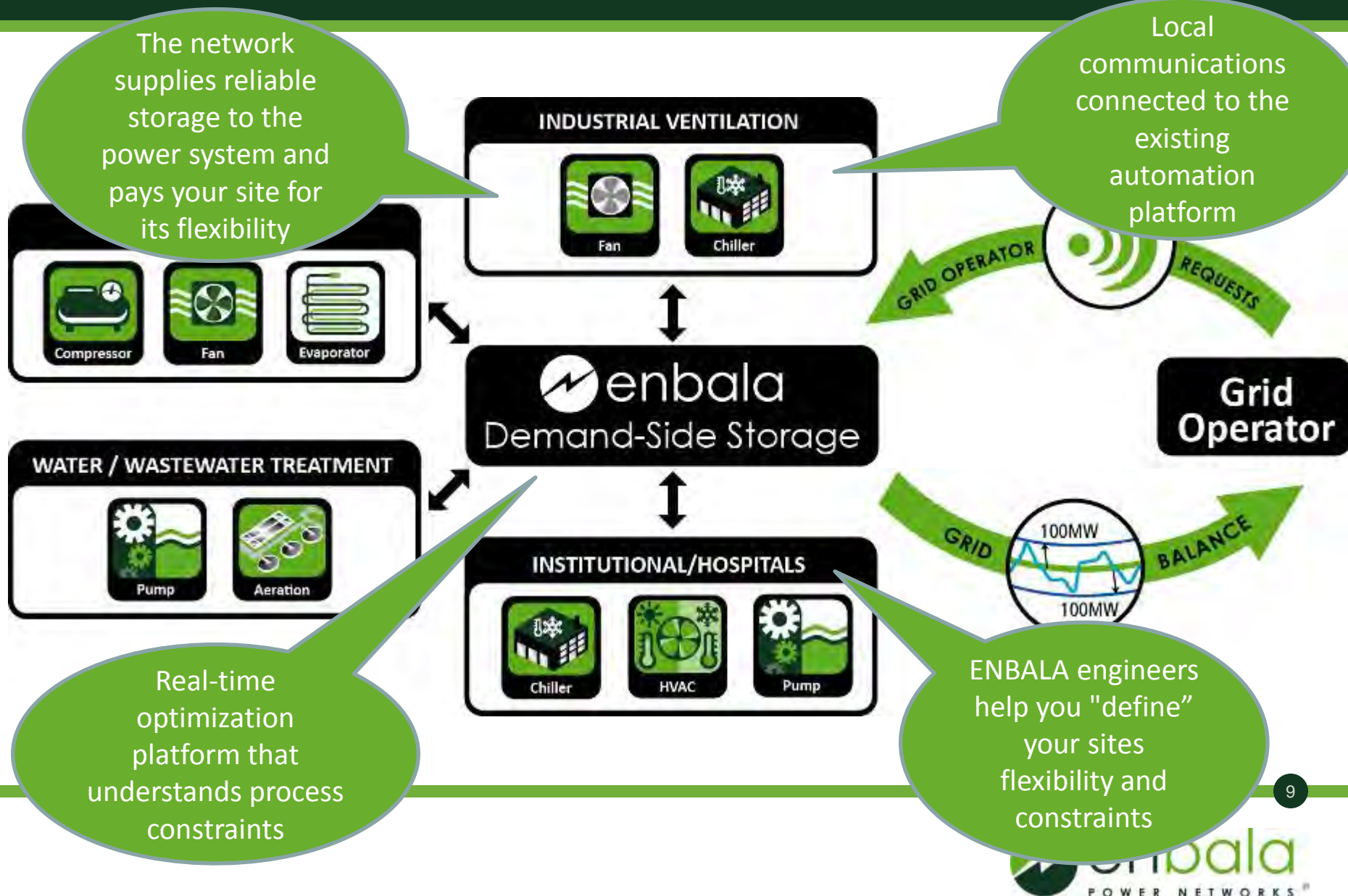
Environmental Stewardship

For every 100 MW of Grid Balance

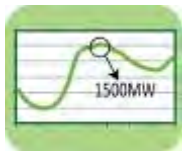


Source: Impact Quantification Report, published by BLOOM

How Can You Participate in Grid Balance?



General Profile of Ideal Facilities



Min 1500KW Peak Demand (@ < 80% Load Factor)



Main loads automated & centrally controlled



Some flexibility on load control parameters



Engaged in energy cost reduction initiatives



PJM and Ontario locations

Easy to Adopt and Pilot



Get paid to help balance the Electric Grid



Start with one asset at a time



Set your own parameters



No capital cost to get started



Works in conjunction with other energy programs

Pennsylvania American Water Connects to the Smart Grid



Who is American Water

We are the largest publicly traded water and wastewater service provider in the United States.

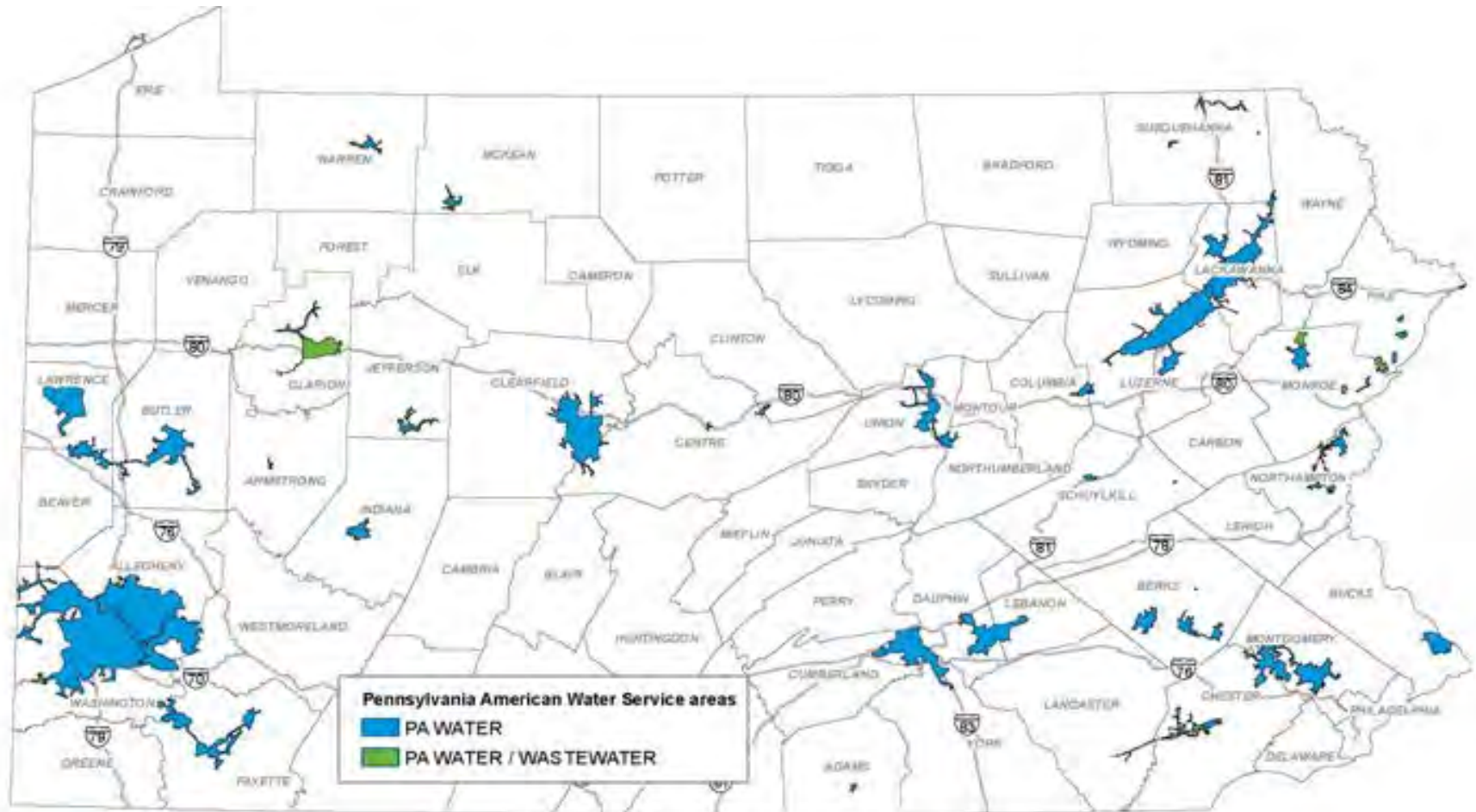
- Serves a broad national footprint and a strong local presence
- Provides services to approx. 14 million people in more than 1,500 communities in more than 30 states and parts of Canada
- Employs more than 6,700 dedicated and active employees
- Treats and delivers more than one billion gallons of water daily



Pennsylvania American Water

- Subsidiary of American Water Works Co. Inc.
- Roots date back to early 1800s, Incorporated in 1904
- Largest regulated water and wastewater service provider in PA
- Serving approximately 2.2 million people in 36 counties
- More than 1,000 employees
- Customer base:
 - 640,000 water customers
 - 92% residential
 - 7% commercial
 - 1% industrial/other
 - 17,000 wastewater customers

Pennsylvania American Water Service Area



Our Pennsylvania Infrastructure

Source of Supply

- 92% surface water
- 7% groundwater
- 1% purchased water
- 54 regulated dams
- 121 groundwater well sources

Treatment Facilities

- 36 surface water plants
 - 32 facilities received Directors Award from Partnership for Safe Water
- 6 wastewater plants

Storage & Transmission

- 279 water storage tanks
- 253 booster pumping stations

Distribution System

- 10,115 miles of water and sewer pipe

Water Capacity

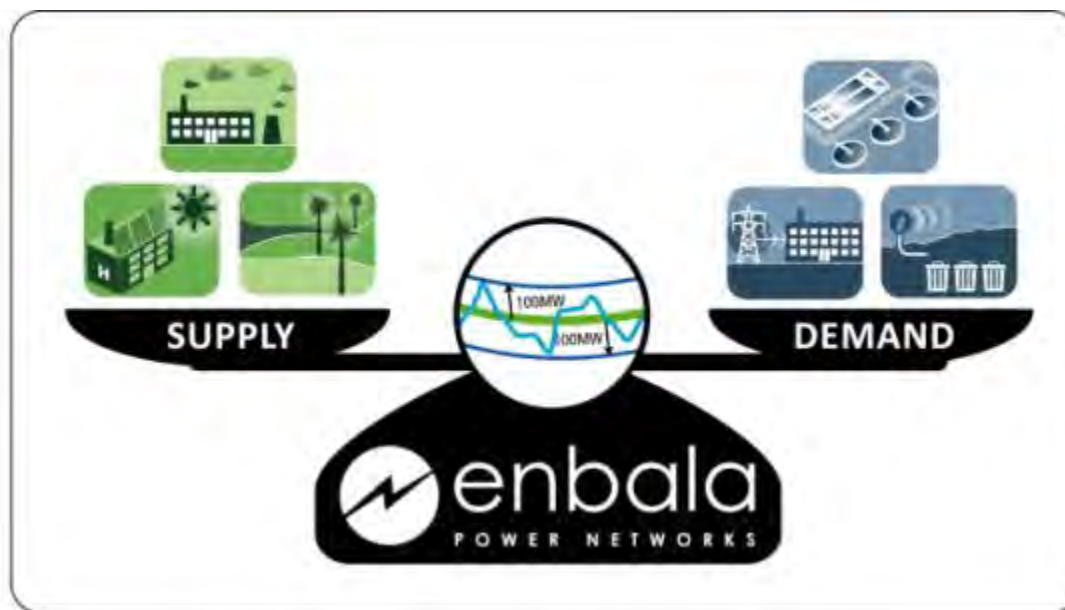
- 193 MGD average daily delivery

Wastewater Capacity

- 11.2 MGD permitted

The Opportunity

- Potential to offset electricity costs
- Deliver Grid Balance® to the regional electricity system operator (PJM)
- Increase the efficiency and reliability of the electric power system



The Challenge

- Find innovative ways to operate at the lowest possible cost for the benefit of the company and its customers
- Annual electricity expenditures
 - **\$14.5 million**
 - **>95%** of electricity usage associated with pumping water



Demonstration Project

- Identify candidate site based on power use characteristics
- Measure Grid Balance range and cost-benefit potential for the site
- Exhibit the request-and-response functionality of the ENBALA Power Network
- Demonstrate that participation doesn't impact equipment and plant operations
- Meet all security requirements and keep data and assets safe at all times
- Prepare for roll-out across other American Water subsidiaries



E.H. Aldrich WTP - Case Study

Plant Production

- 50 MGD capacity
- 35 MGD average
- 5 MG clearwell

High Service Pumping

- Three 10 MGD HS pumps
- Two 20 MGD HS pumps
- No VFDs
- Pump to 10 MG Shire Oaks tanks



Shire Oaks Relay Pumping

- Three 10 MGD HS pumps
- Two 20 MGD HS pumps
- One VFD (10 MGD)
- Pump to 16 MG main service tanks

Shire Oaks Relay Demonstration

- **Shire Oaks Pump Station**

- Uses an average of 1,100,000 KWh per month
- Peak demand of 1,650 kW

- **Implementation**

- Connected one 10 MGD pump
- 85 to 100% of VFD speed
- Provided 180 to 200 kW operating range
- Tank level constraints programmed into the ENBALA Power Network
- Added to a network of existing assets
- Responded to Grid Balance requests upon availability
- Demo ran for 120 hours



Shire Oaks Relay Demonstration

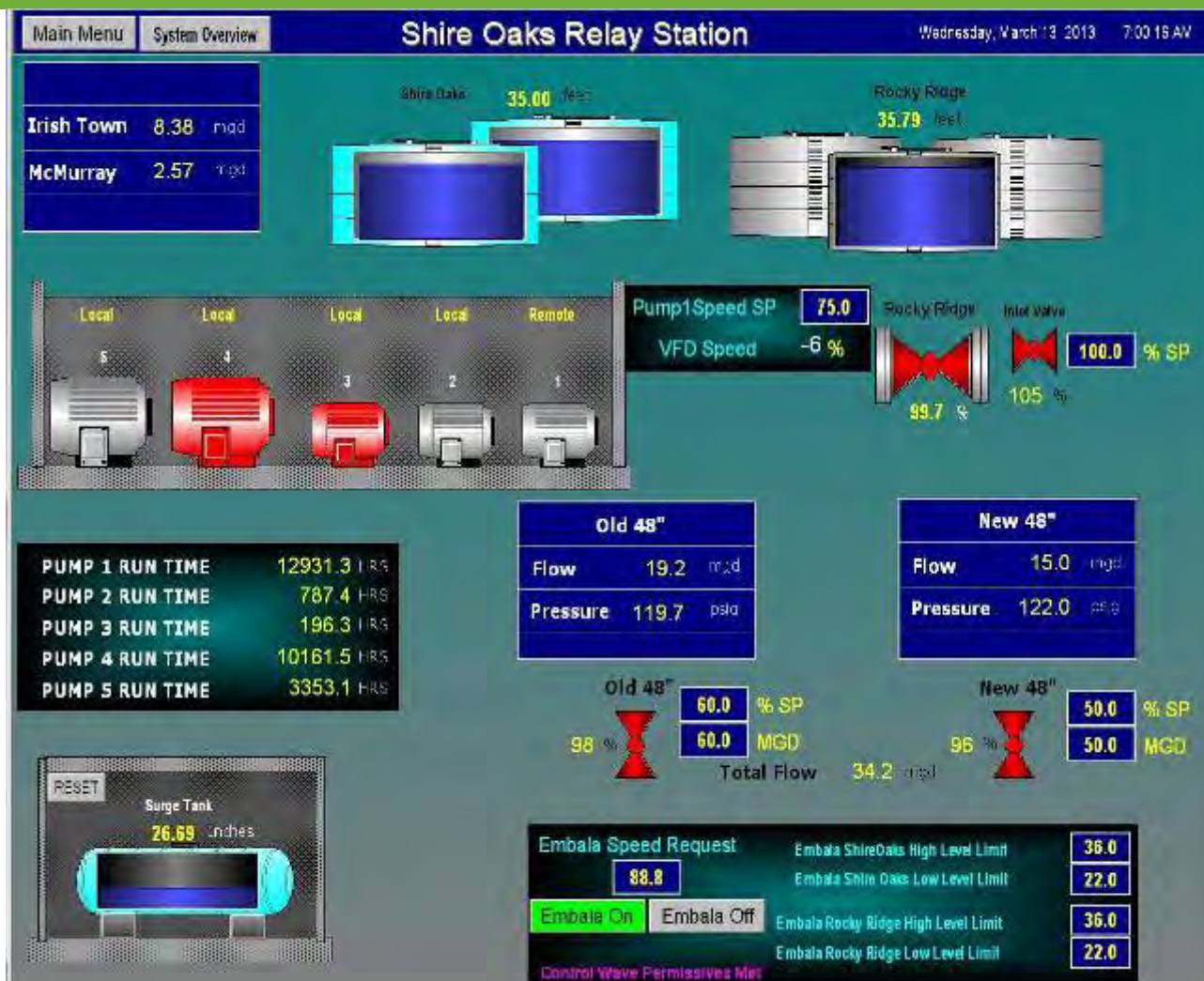


10 MGD PUMP



Variable Frequency Drive

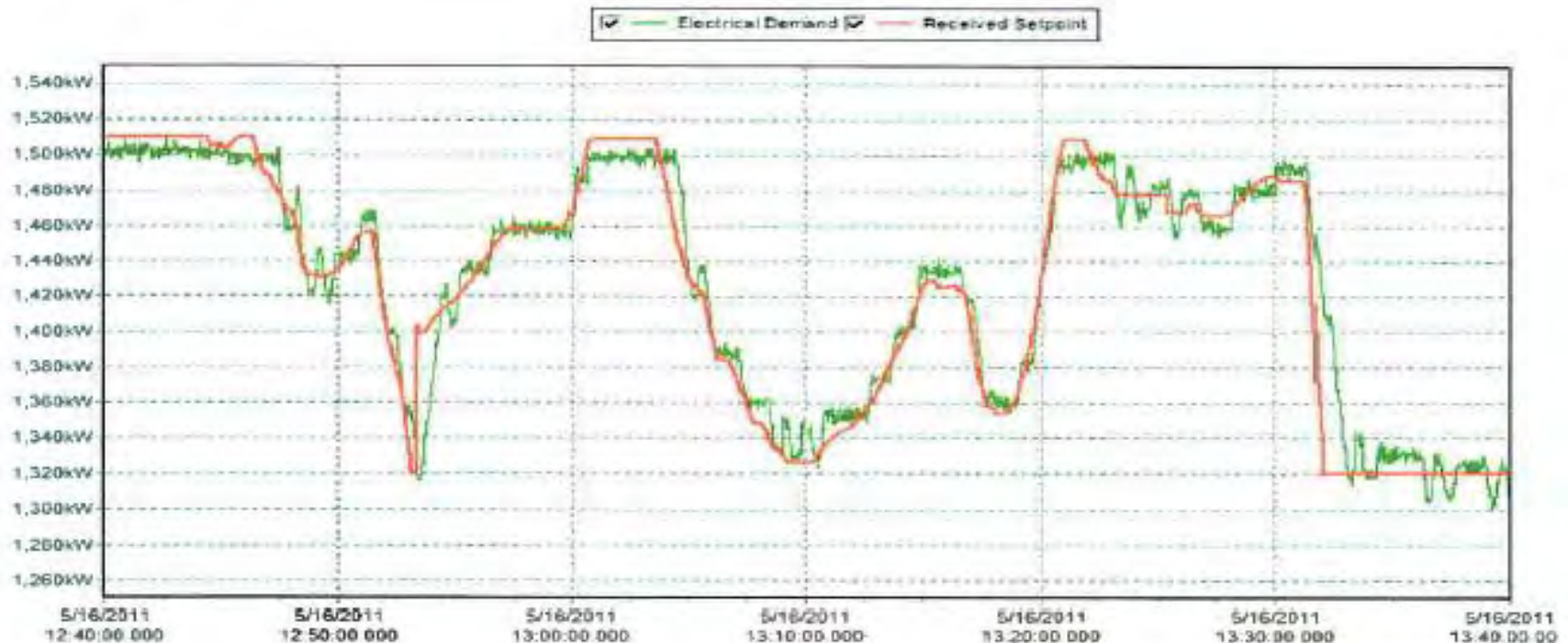
Shire Oaks Relay Demonstration



Results

- Relay pump successfully responded to Grid Balance request
- Movements stayed within parameters set by the plant

High frequency period



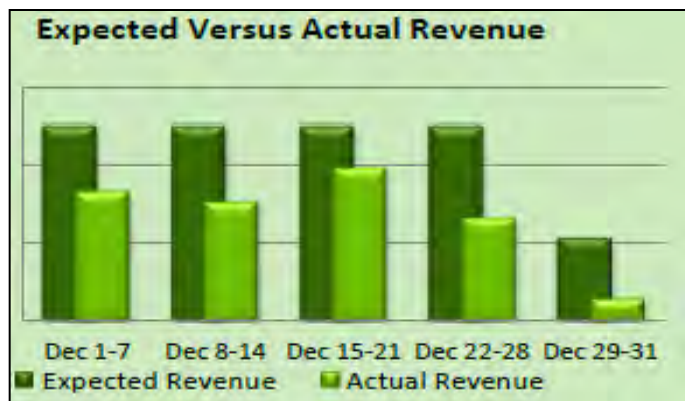
Results

- The data pulled from the LCP between 3:09pm on March 30th to 7:03 pm on June 27th 2011, shows that energy consumption and cost remained neutral throughout that time period.

	Relay Pump 1 ON EPN Control	Relay Pump 1 OFF EPN Control
Volume of Water Pumped	325.8 MG	2,618.6 MG
Electricity Consumption	318,160 kWh	2,564,000 kWh
Energy Needed for Pumping	976.55 kWh/MG	979.15 kWh/MG

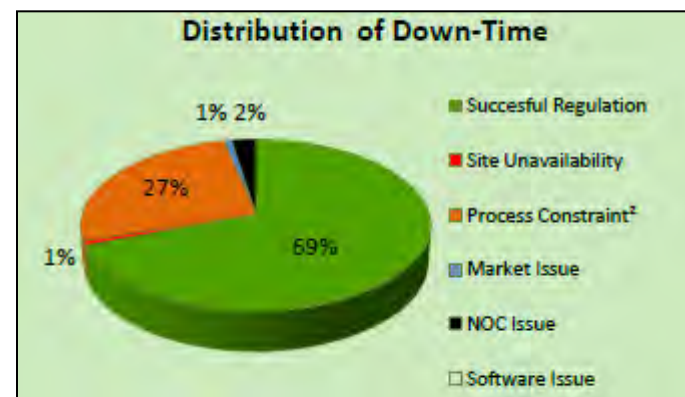
Results

- Shire Oaks bid into the live PJM market in Fall 2011
- Supporting the PJM region in balancing real-time supply and demand
- Planning to relocate a VFD to second 10 MGD pump
- Potential to offset 2-3% of the site's total energy bill by Grid Balance
- Typical payment range of ~\$35,000-\$50,000¹ per MW
- American Water is now connecting additional facilities throughout the US



Percent Hours in Market

Nov. 2012	Dec. 2012
58%	69%



1 – Rate of pay is based on historical market pricing.

Conclusion

Cost free, revenue generating program utilizing existing electricity consumption.

“We’re always looking for ways to increase the cost-effectiveness of our operations and provide added value to our customers, and ENBALA enables us to do both without compromising the high level of quality and service our customers expect.”

Kathy Pape
President of Pennsylvania American Water

Questions?

Dan Hufton, Senior Director, Production, Pennsylvania American Water

Eric Read, Director Business Development, ENBALA Power Networks

www.pennsylvaniaamwater.com

www.enbala.com