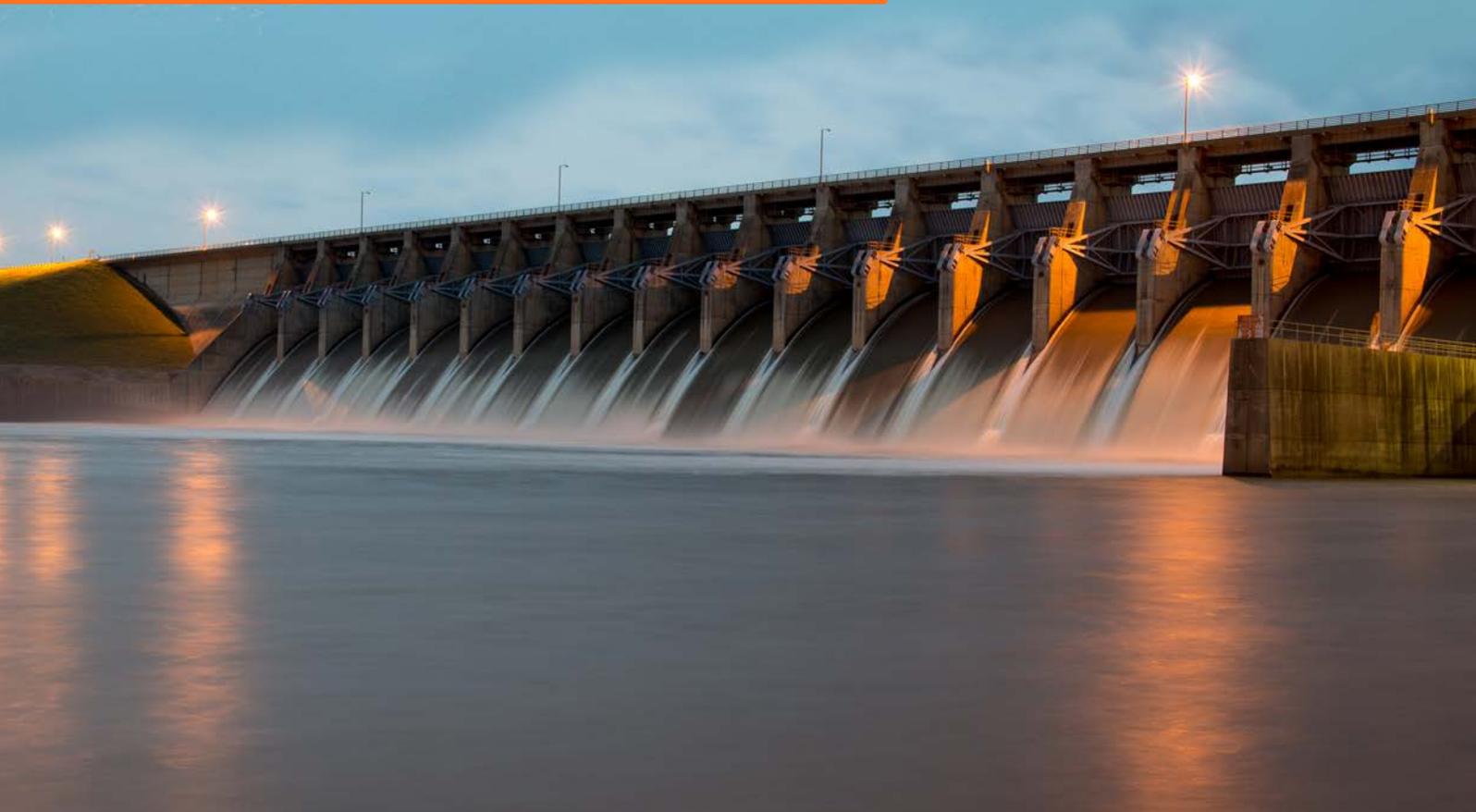


Something Old, Something New America Electric Power

CASE STUDY



Software proves to be AEP's perfect partner

For 113-year-old American Electric Power (AEP), age is just a number. Proving their commitment to value and innovation for more than a century, AEP joined forces with Wärtsilä to install a 4 MW / 4 MWh energy storage system into the Buck and Byllesby hydroelectric power plants located on the New River in Carroll County, Virginia, USA. This integration of advanced energy storage and software with hydroelectric generation is seen to be one of the world's first hybridised systems of its kind to provide ancillary services. Often, pairing the old with the new can result in something groundbreaking.

"The advent and growth of hybridised power, enabled by the integration of intelligent energy storage, has always been a key part of our technology vision. Although we've delivered numerous gridscale energy storage systems to the PJM market, this innovative hybrid project will see AEP raise the standard for hydroelectric use cases globally. And the potential for hybridisation is massive as hydroelectricity represents over 1,000 gigawatts of generation globally, roughly a sixth of the world's total."

*Andy Tang, Vice President,
Energy Storage and Optimisation*

KEY DATA

CUSTOMER: American Electric Power (AEP)
SITE SIZE: 4 MW / 4 MWh
SITE LOCATION: New River, Carroll County, Virginia, USA
APPLICATIONS: Grid reliability, frequency regulation
SCOPE OF SERVICES: Turnkey
DELIVERY: 2017

Buck and Byllesby are operated by Appalachian Power, a utility subsidiary of AEP. Situated about four miles apart, the Byllesby reservoir is approximately three miles long, while the dam at Buck forms a reservoir about one mile long. The Byllesby Plant is capable of generating 20 MW while Buck can generate 10 MW. Energy storage helps maintain a constant flow of power when the wind isn't blowing and at night or on cloudy days when the sun isn't shining. Storage technology also supports local power reliability for customers and can be integrated into distribution and resource planning processes.

The concept of energy storage is not new, but the need for reliable, cost effective solutions has never been more critical. As the energy landscape transitions to more distributed and intermittent resources, hybrid energy solutions provide the options to store the energy from such resources. Energy storage is a flexible solution that can be mobilised and, in some cases, even relocated if it is needed elsewhere on the system.

A BATTERY OF RESOURCES

The project serves both of Pennsylvania, New Jersey, Maryland's (PJM) frequency regulation markets, including traditional regulation known as RegA and dynamic regulation known as RegD. The battery brings incremental frequency regulation revenue to the hydroelectric facility. The sizing of the energy storage project is a one-hour 4 MW system, which allows AEP to better utilise their existing hydroelectric interconnection to the grid.

Wärtsilä's sophisticated energy management platform, GEMS, is built upon a foundation of "connectors" to physical assets. These connectors enable GEMS to control and acquire data from batteries, inverters, and numerous other sources, such as hydroelectric and other generation plants, loads, and SCADA signals from an independent system operator.

For this system, GEMS is used to control the energy storage in parallel with the hydroelectric dam to maximise the frequency regulation revenue of the whole hybrid system. This is accomplished by optimising energy storage system operation for the whole lifetime of the system, taking into consideration load sharing with the hydro within the hydro operating constraints.

REVENUE AND RAPIDITY

The energy storage system and hydroelectric dam optimally operate together. The storage system is fast responding so it enables the hybrid facility to bid into the PJM RegD Frequency Regulation market, which pays based on both total power provided as well as fast and accurate response on a second-by-second basis.

Without energy storage, Buck and Byllesby would not otherwise be able to participate in the RegD market, nor in any regulation market at the higher power levels enabled today. Storage and GEMS deliver long-term and incremental revenue to the customer.

THE CHALLENGE	WÄRTSILÄ'S SOLUTION	BENEFITS
Integrate storage into existing hydroelectric power plant	System sizing and management to enable customer to utilise their existing hydroelectric interconnection to the grid	First hybrid system of its kind to provide ancillary services and create new value streams
Participate in PJM frequency regulation markets	Frequency regulation via GEMS' advanced control and optimisation capabilities	Improved operational efficiency and enhanced system reliability via GEMS
Optimise multiple renewable assets to provide fast-responding regulation	Intelligent and lifetime optimisation of a hybrid system	Participation in PJM's frequency regulation markets, including traditional regulation "RegA" and dynamic regulation "RegD"

