

One of the words overused a lot today is 'change'. As the theme of the last US Presidential election, change was used to draw a distinction between opposing factions. But in reality, a lot of 'change' will take place in the world over the next few decades. Building a new more intelligent electricity system will require many changes, one of which is mastering the storage of electric power throughout the grid.

Text **Brad Roberts**

# Mastering the storage

Storage is the key economic ingredient in all energy delivery systems whether it be natural gas, water or coal: holding a measured amount of reserve at different points of the system insure reliability of supply and mitigate price volatility to a certain degree. Not being able to store alternating current (AC) power has been a challenge for the last 100 years. As utility grids grew, planners saw the potential for using power, off peak, to pump large amounts of water up to higher level reservoirs and capture that potential energy for later use by driving turbine generators similar to ones used in hydro-electric dams. The concept proved extremely valuable in the late 20th century with over 100 gigawatts of power made available in pumped hydro plants around the world. Initially constructed to mostly provide night-time (off peak) loads for nuclear power plants, the value of this energy storage resource is increasing as more variable renewable energy sources (wind and solar) are added to grids at a rapid pace. For many years utilities could control the available generating sources with great accuracy and closely predict the daily load demands of their customers. Today new tools available to customers will give them greater flexibility in controlling their loads in response to

changing energy prices. These new 'smart grid' capabilities, coupled with greater penetration of variable sources, open the door to greater use of energy storage devices as a 'balancing tool' for better grid control.

## Smarter power grids

Understanding the role energy storage will play in the design of smarter power grids has prompted many more formal assessments of what is needed in terms of energy storage and what market control mechanisms need adjustment. In 2007 CIGRE (International Council on Large Electric Systems) formed Working Group C6.15 to examine electric energy storage and its role in the integration of wide-scale renewable resources. This group is preparing a report that will be presented at a special joint session of CIGRE and the IEEE Power & Energy Society (PES) during the PES annual meeting in Calgary, Canada in July 2009. The Electricity Storage Association (ESA) has worked for almost 20 years to raise awareness of the value of energy storage in utility grids. In Europe the International Renewable Energy Storage (IRES) conference is providing a forum for discussion of products and services targeted at maximizing the use of renewable resources.

In the United States of America the US Department of Energy, the Sandia National Laboratories and the ESA have hosted the most successful technical meeting in this arena. The bi-annual Electrical Energy Storage Applications and Technologies (EESAT) conference has emerged as the leading international technical venue for storage.

## Stimulus

All parties concerned with the future of energy storage will be closely watching the ambitious efforts of the US Federal government to launch major activities in Smart Grid technologies, accelerate energy storage in the grid, and advance the adoption of plug-in hybrid vehicles. The multi-billion dollar effort includes over \$200 million dollars of direct funding targeted at grid storage demonstrations. Will these efforts provide the stimulus to launch a sustained activity for energy storage in the grid? If coupled with price incentives for energy storage in electricity markets, the answer, most likely, will be yes.

## Better understanding

KEMA research and analysis efforts like the recent report on the 'Benefits of Fast-Response



# of electricity

## Brad Roberts

Brad Roberts is the Power Quality Systems Director for the Power Quality Products Division of S&C Electric Company, which specializes in low- and medium-voltage power protection systems. Mr. Roberts has over 35 years experience in the design and operation of critical power systems, ranging from single phase UPS systems to medium voltage applications. He is a senior member of IEEE and has published over 40 technical papers and journal articles on critical power system design and energy storage technology. He is chairman of the Board of Directors for the Electricity Storage Association. Mr. Roberts is a member of the US Department of Energy Electricity Advisory Committee and chairman of the Energy Storage Sub-committee.



**“Having major industry consultants work in this area is vital for storage programs to move forward”**

Storage Devices for System Regulation in ISO Markets’ are essential contributions to a better understanding of the economics of storage systems and the role they will play in a smart grid. Having major industry consultants like KEMA work in this area is vital for storage programs to move forward.

Mastering the use of energy storage at all points in the electric grid will provide real value

as storage does in all other energy delivery systems. The real benefit will come from optimizing the value of wind and solar resources by capturing even more megawatt hours of clean energy to power the world’s ever expanding electric grids. <<

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