



By John  
D. McDonald

## Setting Grid Priorities

■ ■ ■ *At the moment*, the impact of the hydrogen economy on the future of electricity is still unclear. Many groups are evaluating what a hydrogen-based economy would look like, the technologies behind it, and what impact it would have on our society. Experts are focusing on hydrogen production, its delivery infrastructure, power generation technologies, system interface issues, case studies from North America, Europe and Japan, and how hydrogen fuel will impact the future delivery of electric energy. As Robert Walker, former chairman of the U.S. House Committee on Science said, "I look at the next decade as being as one during which fuel cells and hydrogen applications will become part of our way of life."

With 6,740 megawatts of utility-scale wind installations presently installed — and another 2,000 megawatts of new capacity likely to be added this year — wind power is another viable energy alternative. By the end of 2009, there may be 15,000 megawatts of wind power capacity installed. Experts predict that more than half a billion cubic feet of natural gas per day will be saved in 2006 by wind farms in place by the end of this year. In 2004 seven states and the District of Columbia passed renewable portfolio standard (RPS) legislation requiring utilities to provide a certain minimum amount of power from renewable resources such as wind and solar. More than 500 utilities in 34 states now offer green programs with more than 1,500 megawatts of wind power now in place to serve the green power market.

Beyond renewables, other technological issues confront the power industry.

Prior to the tragic events of September 11, there was little concern for cyber security vulnerabilities in electric utility systems, including IT and automation systems. Today, electric utilities are much more conscious of the need for improved infrastructure security. As a result, they're developing security policies and reassessing the vulnerabilities of their communications and power systems. In the past, electric utilities used point-to-point serial communications links with proprietary protocols. These days, the trend is to use network communications with industry standard protocols, making the utility communications systems much more vulnerable to cyber attacks. Utilities must enhance cyber security by installation and utilization of anti-virus software, deployment of intrusion detection systems, and

implementation of strict and enforceable password discipline. Cyber attacks and electronic sabotage targeted against power grid vulnerabilities can induce power system fluctuations that can lead to cascading blackouts over large geographic areas that can lead to loss of manufacturing production and vital services.

Broadband over power line (BPL) is a potentially disruptive new technology that could transform the electric utility business. High-speed communication over existing medium- and low-voltage distribution circuits has been an industry goal for decades. Today's low-cost digital technology makes this goal a reality. Communications over power lines has always been attractive to electric utilities because they own the power lines. However, there are technological, regulatory, business and societal considerations of BPL to take into account. One of the greatest considerations is the lack of industry standards.

The advent of microprocessor-based intelligent electronic devices (IEDs) — and their widespread implementation by all electric utilities — has created several value propositions for electric utilities, all resulting in better information for, and control of, the power grid. The first value proposition within the substation is the integration of the IEDs to extract the operational and non-operational data that has value to the electric utility. This data is concentrated at the substation level, in a local data mart or historian, for use in the substation, providing information back to the utility enterprise. The second value proposition is the creation of a virtual data mart on the corporate network, populated by IED data as well as data from other sources. With more extensive and timely data available to the utility users, numerous business processes can provide significant benefits to the utility, such as condition-based inspection, condition-based maintenance, dynamic equipment ratings, intelligent substation alarming, congestion cost reduction, etc. By bringing IED integration, substation automation, virtual data marts, business processes, and an enhanced communications infrastructure together, the utility will be able to realize much greater benefits from their assets and power system grid.

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