

an expanded role

renewables need to reach their full potential

RENEWABLE AND ALTERNATIVE fuel sources play an important role in today's electric power industry. They help the industry to diversify its mix of fuel sources for generating electricity. This can help to reduce costs, improve reliability, and fuel security. And renewable energy sources help the industry to reduce its air emissions.

The chorus urging that renewables take on a larger role in generating electricity is strong and growing. As an example, until this past summer, Texas oil and gas executive T. Boone Pickens and former vice president Al Gore probably had never agreed on anything, but both men have now come out with plans to greatly expand the use of renewables for generating electricity.

Electric utilities, working with their state regulators and legislators, are encouraging the development of renewable energy resources, based on their own unique circumstances and availability. As of July 2008, 27 states and the District of Columbia have created renewable portfolio standards, which require that a certain percentage of their electricity be generated from renewables. Five other states have voluntary programs.

"Green" pricing programs, which charge a premium for electricity generated from renewable energy sources, are also growing in popularity. More than 50 electric companies in 40 states have now implemented or

announced green pricing programs to support investment in renewable energy technologies. And according to the U.S. National Renewable Energy Laboratory, customer participation in green pricing programs in 2007 increased by 20% over 2006.

At the same time, the growing use of renewable energy sources raises some key challenges that will need to be addressed if renewable energy sources are to reach their full potential.

Renewable Energy Sources

Hydropower is by far the most prevalent renewable resource. In service since the industry's founding over 125 years ago, hydropower plants produced 6% of the total U.S. electricity supply in 2007 and 71% of all U.S. renewable energy resources. The total U.S. hydropower capacity—including pumped storage facilities—stands at about 98,000 MW today.

Power plants using biomass material, including trees, grasses, agricultural crops, the organic component of municipal and industrial wastes, or other biological material, generated the second largest source of renewable energy last year. With a total capacity of over 12 GW, biomass

power plants produced about 16% of all U.S. renewable energy resources and 1.3% of the country's total electric output.

Wind power has become the fastest growing renewable energy source in the United States and around the world, as newer, state-of-the-art facilities greatly decrease their cost per kilowatt-hour. Wind generating capacity has been growing at an average annual rate of almost 35% since 2000. And since 2005, the nation's installed capacity has almost tripled. Today, wind farms operate in 35 states with over 21 GW of operating capacity. Wind energy produces about 9% of the all the

electricity generated by U.S. renewable energy resources, and almost 1% of the country's total electric generation.

Geothermal energy systems produced about 4% of all U.S. renewable energy resources in 2007. Their overall share, however, has practically remained unchanged for the past ten years. In the United States, most geothermal reservoirs are located in the western states, Alaska, and Hawaii, where mile-or-more-deep wells tap their steam and very hot water for heat and for power generation.

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Solar is already widely used in many parts of the country and produced about 0.2% of all U.S. renewable energy resources in 2007. Although its share in the electric output and capacity of the nation's electric system remains quite small, solar energy has been growing at a rapid pace in recent years. In 2007, solar generation grew by 20% compared to 2006.

Ocean/tidal energy sources produce no electricity yet in the United States. But project announcements amounting to over 6 GW have been made recently, which makes the vast power of the waves a potentially promising resource.

Public Policy Issues

Although renewable energy sources are growing in the United States, at the same time, their use has raised challenging public policy issues, including:

- ✓ the need to expand the country's transmission system to deliver the power they generate
- ✓ sustaining the federal funding, tax incentives and support nec-

essary to encourage capital investment

- ✓ ensuring the integrity and reliability of the transmission grid.

Transmission Siting

Renewable energy facilities, especially wind turbines, are typically located in remote areas, far from the population centers where their electricity is needed. New high-voltage transmission lines often must be built to connect the two locations. These transmission expansions can cost approximately US\$1–\$3 million per mile to build and often take years to complete due to red-tape delays (especially when involving federal lands, which are particularly common in western states) and “Not In My Back Yard” (NIMBY) public concerns. The adequacy, siting, financing, and construction of transmission infrastructure have proven to be among the most significant challenges to promoting growth in renewable generation across the country.

To address these and other siting issues, the Energy Policy Act of 2005 (EPAct 2005) authorized the U.S. Department of Energy to designate National Interest Electric Transmission Corridors. A corridor is a geographic area where congestion in the electricity grid is raising the cost of electricity to consumers or jeopardizing reliable service and for which resolution is in the national interest. If states within a designated corridor lack authority to act or have failed to act in a timely manner to resolve congestion issues, then the Federal Energy Regulatory Commission can issue permits to site transmission projects in the corridor.

Although this authority was the result of a carefully balanced federal-state framework for addressing the reality of today's changing electric transmission grid, there have been votes in Congress on numerous amendments to try to overturn this authority. We will continue to voice our support and engage the help of businesses and industries to retain the EPAct 2005 siting provisions.

Federal Tax Credits

We are also strongly supporting tax credits that support renewable energy development. Specifically, our tax proposals include extending the placed-in-service date for the renewable production tax credit (PTC) on a long-term basis while retaining the full value of the credit, and extending the 30% investment tax credit (ITC) for solar property and removing the utility exclusion for solar and geothermal property.

Created under the Energy Policy Act of 1992, both the PTC and the ITC are scheduled to expire on 31 December 2008. The short-term, start-and-stop nature of these tax credits deters utilities, developers, manufacturers and investors from maximizing the vast potential of renewable technologies. We are working with a variety of coalitions to gain a long-term extension of these tax credits. Addressing

letters to the editor

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reimbursed for their stranded investments? Raise taxes?

Solar power in the deserts of New Mexico cannot power the Northeast on a hot summer day. Nuclear generation does not appear to be part of Mr. Gore's plan. Interestingly, at the Power Gen conference in New Orleans last fall, I heard one of the original founders of Greenpeace state that a large-scale reduction of greenhouse gases cannot be accomplished without nuclear added to the generation fleet. This fellow was one of the original “greens” when he rode along side an oil rig in a Zodiac over 30 years ago.

While attending a recent IEEE Power & Energy Society conference, I took an informal poll of the brightest and most knowledgeable people in the elec-

tric business. These people are working hard to incorporate renewables into the generation, transmission, and distribution mix. I found many were dismissing Mr. Gore's ideas. Without the cooperation of our energy generation and transmission professionals, little progress will be made.

Certainly Mr. Gore's efforts are bringing more attention to critical issues, but by proposing an unrealistic plan, and tying it to the controversial subject of global warming, we will begin to lose focus on the important problems. Why not try to come up with a more realistic plan that focuses on the reduction of pollution and dependence on foreign oil, points everyone can agree on.

—Darren LePage



these issues will enable renewables to continue to grow and supply more of the country's electricity.

Full Portfolio

As we work to overcome the barriers to expanding renewable energy sources, we are also developing and deploying a full portfolio of advanced technologies. These technologies include energy efficiency for both supply and demand, advanced coal technologies integrated with carbon capture and storage, new nuclear power plants, and plug-in hybrid electric vehicles. All will be essential for moving to a low-carbon future—while maintaining a reliable and affordable electricity supply.

Energy efficiency is a critical tool for reducing the industry's greenhouse gas emissions. Advanced appliances and technologies are delivering greater energy savings and environmental

protections, without compromising comfort or lifestyle. And in the not-so-distant future, electric companies have a vision for technology to create a new smart grid.

A smart grid using digital meters and two-way communication technology will also enable real-time communication between the consumer and electric utility. When coupled with dynamic pricing, in which retail prices reflect wholesale hourly prices, the door will be open for consumers to make automated energy choices based on their own individual priorities. The result will be a more reliable system that allows us to manage energy demand more effectively with

the energy resources available. Both electricity customers and utilities will benefit from lower costs.

A smart grid can also help to address the integration of renewables as well. Small-scale wind and photovoltaic systems create the potential for adding thousands of generating sources to the distribution system. This would change fundamental engineering calculations about load flows, etc. Also, variable power has the potential to over or under-load the grid.

A smart grid will have the ability to better sense when a part of its system is overloaded and reroute power to help reduce that overload and possibly prevent a potential outage situation.

The need for reliable, affordable, and environmentally sound electricity grows more vital every year.

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Electric Vehicles

A smart grid will also create the potential for great synergies between the electricity system and the transportation system. The U.S. electric power industry is a firm believer that the time for alternative fuel vehicles, particularly plug-in hybrid electric vehicles (PHEVs), has come. PHEVs are similar to today's hybrid car. Their key differences are that they have a larger battery, and that battery can be recharged by plugging into a standard, 110-V home outlet.

Through vehicle-to-grid technology, plug-in hybrids could become essentially a fleet of batteries that electric utilities could draw upon during hot afternoons, when power supplies

are tight, sending their excess power back into the grid. This buffering effect can help to improve the overall reliability and efficiency of the nation's electric grid.

U.S. electric companies are committed to the commercialization and sales of PHEVs. We have a dedicated group of electric utilities who are addressing a number of issues including infrastructure, charging rates, safety, and consumer education. And this past July, the Electric Power Research Institute, General Motors Corp. and a group of 34 U.S. and Canadian electric utilities announced they have agreed to collaborate on research and development on how to best prepare for the large-scale integration of plug-

in hybrid electric vehicles into the electric grid.

Conclusion

The need for reliable, affordable, and environmentally sound electricity grows more vital every year. With the support of the public, the federal government, and the states, renewable energy sources will play a larger role in fulfilling these goals. Renewables, along with the full range of other climate-friendly technologies—including nuclear, energy efficiency, clean coal, carbon capture and storage, and plug-in electric hybrids—must all be a part of the electric power industry's long-term future.



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Correction

In the "History" column of September/October issue of *IEEE Power & Energy Magazine* ("25 Hz at Bethlehem Steel" by Thomas J. Blalock, pp. 66–78), Figure 7 was incorrectly cropped during the production process. The correct figure appears below. The IEEE apologizes for this mistake.

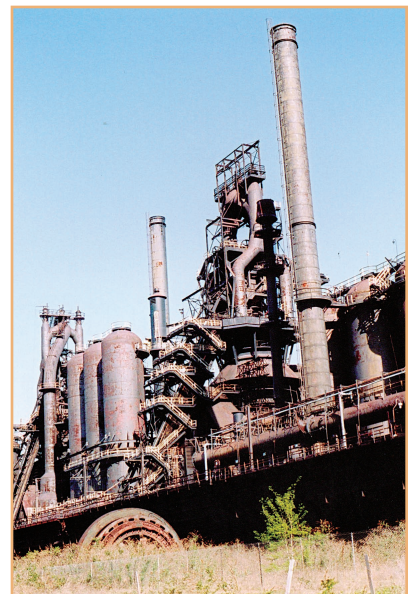


figure 7. Abandoned 25-Hz alternator and flywheel shown in the foreground, 2004. (Photo courtesy of Thomas Blalock.)

Digital Object Identifier 10.1109/MPE.2008.930070