

ABOUT THIS TOPIC

Nuclear power represents close to 14 percent of the electricity generated throughout the world, and global nuclear generation capacity is increasing steadily. At present, more than 60 reactors are under construction in 14 countries. Here in the United States, nuclear remains an important part of the mix, too—about 20 percent of the electricity generated domestically.

“ Small modular nuclear reactors have gained considerable attention in the U.S., in part because of their ability to offer CO₂-free power. ”

Many American utilities have committed to the concept of a diversified generation mix, so they can proactively manage related uncertainties to environmental regulations and generation fuel costs. Nuclear plays an important role in supplying carbon-free base load capacity.

Still, the aggressive U.S. nuclear renaissance that was in progress a few years ago has been tempered by several factors—the March 2011 events at Fukushima, Japan, as well as historically low natural gas prices and loss of load growth due to poor economic conditions. Unless economic factors shift to their favor, many U.S. utilities currently seeking combined construction operating license applications for new, large units likely would not build these in the near term.

Existing U.S. plants are continuing to seek license extensions/renewals—extending their lifetime to 60 years—with consideration and research under way today looking at possibilities to extend even longer. Currently, 72 of the 104 operating U.S. nuclear plants have successfully undergone the license renewal process.

Ameren Missouri’s Callaway Energy Center has submitted for license renewal, and the Nuclear Regulatory Commission (NRC) review process is ongoing (scheduled for completion in December 2013).

Meanwhile, small modular nuclear reactors (SMRs) have gained considerable attention in the United States because of their ability to offer base load, CO₂-free electricity at a lower absolute investment cost, as compared to large-scale nuclear reactors. Recent funding support for SMRs by the U.S. Department of Energy (DOE) has spurred much interest in this design concept.

In March 2012, the DOE issued a Funding Opportunity Announcement to advance the development of American-made SMRs, calling this technology “an important element” of the president’s energy strategy. About \$450 million was made available in cost-share funding to support “first-of-its-kind” engineering, design certification and NRC licensing for up to two SMR technologies. In April 2012, Ameren Missouri supported Westinghouse in its application for SMR investment funds, identifying this as a unique opportunity to help secure our state’s energy future. The agreement represented an unprecedented alliance of Missouri’s cooperative, municipal and investor-owned electric service providers.



OUR POINT OF VIEW

We believe that small modular reactors will be the favored choice for future new nuclear units. With their smaller size, passive safety system and production efficiencies (unlike traditional reactors, SMRs would be assembled at a factory and shipped to a site as nearly complete units), SMRs offer lower capital costs and much shorter construction schedules.

Our partnership with Westinghouse reflects our commitment to addressing Missouri’s long-term energy needs. We believe nuclear power should continue to be preserved as a generation option, in light of aging infrastructure and significant environmental regulatory uncertainties.

SMR development could position Missouri for future economic development opportunities, as well. At present, SMRs remain a decade away from commercial deployment—assuming design, licensing and commercial development go as planned—and they will need to compete in the global energy marketplace. But the federal SMR program is encouraging American industry to compete by removing various barriers to reactor deployment and by accelerating development. The DOE anticipates that NRC design certification will result in a

competitive advantage over designs being developed in other countries.

Ameren’s view is that, within 20 years, several SMRs will be developed across the nation. These could include those that Ameren Missouri and the state’s electric-service provider alliance may have constructed at our Callaway Nuclear Energy Center, which could be licensed for multiple units. Callaway would be a good location for multiple SMR units, from a plant-siting perspective.

Additionally, over the next two decades, it’s likely that SMR deployment will have been authorized for use at critical U.S. Department of Defense installations that require secure, long-term electrical energy supplies.

(For more information on SMR technology, see Page 24.)

Regarding large nuclear units, our view is that six to eight units will be built in the United States over the next 20 years. However, this view is contingent on the success of four units currently under construction in the Southeastern United States, as well as federal production tax credits available for new units commissioned for commercial operation by 2021.



RENEWABLE ENERGY

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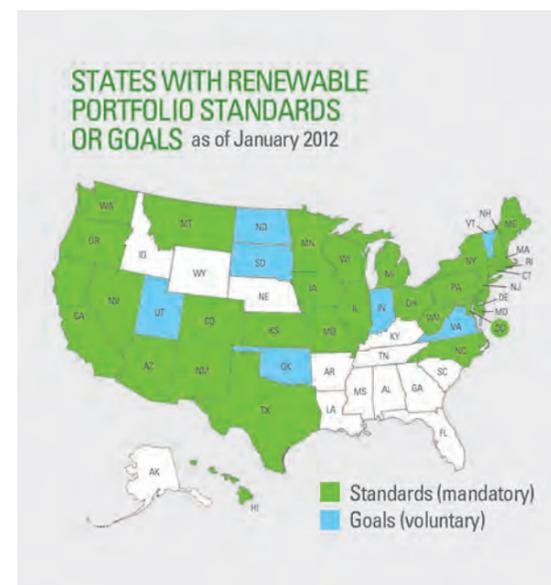
ABOUT THIS TOPIC

Renewable resources are generally thought of as those that naturally replenish themselves, are not exhausted and are better for the environment. They include wind, solar, geothermal and biomass. Hydroelectric power is generally considered to be a form of renewable energy.

Ameren has a long history of incorporating renewable resources into our generation portfolio—starting a century ago with our Keokuk Energy Center, and most recently with our Maryland Heights Renewable Energy Center. This latest generation facility opened in summer 2012 and uses methane gas from a local landfill to efficiently produce enough power for 10,000 homes.

Currently, demand for renewable energy is largely driven by requirements for utilities in states with a Renewable Portfolio Standard (RPS). At this time, 29 states plus the District of Columbia have some type of compulsory RPS. Seven other states have non-binding goals.

(See map, "States with Renewable Portfolio Standards or Goals.")



Absent such mandates—and/or incentives and subsidies—renewable energy resources would not be an economic generation choice for utilities in most regions of the country. High fixed capital costs make these resources marginal in value. (In the case of solar and wind, so do their intermittent, unpredictable output and low ratio of energy output to capacity rating.)

To incent construction of renewable resources, several mechanisms have been put in place, including:

- A production tax credit in excess of \$21 per megawatt-hour (due to expire at the end of 2012)
- Accelerated depreciation for tax purposes
- Investment tax credits and Renewable Energy Credits

In addition, many public or regulated entities that must comply with various RPS programs are incented to enter into long-term contracts. This is often done on a cost-plus basis, giving potential developers certain revenue streams and the ability to secure financing.

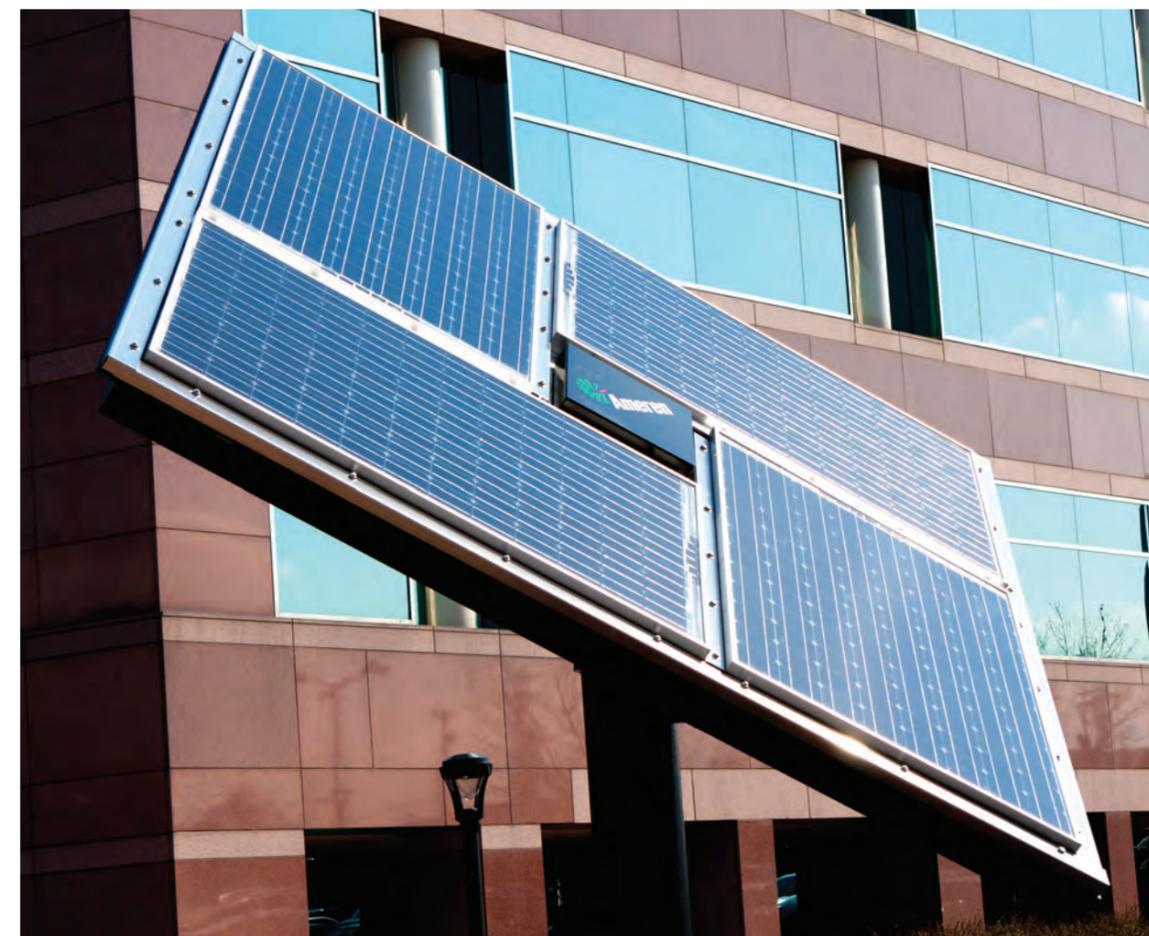
Ameren's Point of View with regard to large-scale renewable energy project growth is primarily based on such state RPS requirements. We also examined a build-out in transmission, advancements in technology, and energy storage capabilities in developing our view—which addresses distributed generation, as well.

OUR POINT OF VIEW

The adoption rate of renewable energy as a viable, long-term resource is expected to increase over the next 20 years, but will continue to be very regional in regards to depth of market penetration. Both wind and solar photovoltaics (PV) will be the primary sources for utility-scale generation from renewable energy sources.

Meanwhile, solar PV most likely will be the primary choice for residential and commercial generation. Within 20 years, we can see solar PV rooftop installations becoming cost competitive in Ameren's service territories—thanks to technology advancements that improve performance and reduce costs. Our view is that adoption of renewables for distributed generation will increase over time.

At Ameren, we're constantly looking for innovative ways to keep our commitment to renewable energy and to our customers. Our goal is to provide information, data and resources to help people make informed energy decisions. At the same time, we're committed to seeking constructive, modern regulatory frameworks that enable us to partner with customers amid a shifting energy landscape.



RENEWABLE PORTFOLIO STANDARDS

Renewable Portfolio Standards most likely will remain at a state level. In some states, RPS will provide an opportunity for hydroelectricity to be included as a compliance resource. (This is the case in Missouri.) Although there is the potential for a federal clean energy standard—requiring that a certain amount of energy be produced from “clean resources,” including natural gas—we do not see a federal RPS being implemented. This is due to the lack of renewable resources in large sections of the country.

Currently, Missouri and Illinois each require increasing levels of electricity from renewables as a percentage of electricity sales, with Missouri requiring at least 15 percent beginning in 2021, and Illinois requiring 25 percent in 2026.

Longer term, our view is that market forces will drive renewables as policy drivers fade, as present state-level RPS requirements atrophy, and as no new national clean energy policy emerges. For new electricity generation capacity, renewables will be competing with coal, natural gas, distributed generation technologies (such as fuel cells) and, potentially, small modular nuclear reactors.

TRANSMISSION

The best U.S. wind resource is located from the Dakotas south to west Texas. In order to harness this resource and deliver the power to large population centers, a build-out in transmission is necessary. While our view is that future transmission expansion will be tied more to addressing reliability/congestion issues than to supporting wind generation, a push to add transmission capacity could nonetheless encourage development of new, large-scale wind projects.

Still, when it comes to wind development, Missouri can be expected to continue lagging behind Illinois, Iowa and Minnesota; these states have greater wind resources and greater capacity factors. Additionally, Missouri faces an electricity rate cap limitation in the state’s current RPS. Absent any additional legislative action, this cap limits the potential for wind development.

TECHNOLOGY

Over the next 20 years, we believe that renewables penetration will increase as a result of improved efficiencies and lower costs of solar PV, wind and energy storage. This applies to both large, utility-scale wind and solar projects and to distributed generation.

- **In order for renewables to have a meaningful impact** on future utility generation supply, at scale, it will be critical to install energy storage or quick-start generation to manage the intermittency of wind and solar. Over the long term, the ability to store power in significant quantities when it’s generated (during lower-demand, off-peak hours) and deliver it later (during higher-demand, on-peak hours) will be key.

(For more on energy storage technology, see Page 26.)

- **We expect technology advances to fuel growth** in home and business solar PV. Again, this would be regionally based, depending on local electric rates and the installed cost of customer-scale generation and/or storage. Commercial customers have the greatest potential to economically increase their use of solar PV, in part due to certain tax and depreciation incentives. Significant developments may occur related to distributed solar PV such that erosion to central station generation could take place during our planning horizon. In Missouri, utility programs are limited to 5 percent of peak load, but customers in Missouri and Illinois would be able to increase adoption of PV or other smaller-scale generation in accordance with their needs and desires.

(For more on solar technology, see Page 25.)





TRANSMISSION

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