

## First Person—Nuclear Power and the Climate Equation



### The Story in Brief

“The climate math simply does not work without nuclear energy,” says Marv Fertel, president and chief executive officer of the Nuclear Energy Institute. Fertel speaks with *EPRI Journal* about insights from his 35-year career in the nuclear industry, nuclear power’s future role in U.S. and global electric power, the importance of nuclear in decarbonization, and critical research and development (R&D) needs.

**EJ:** *You’ve worked in the nuclear industry for more than three decades. What are the top three insights from your career that can inform industry priorities for the next decade?*

**Fertel:** First, beyond the technologies, the strength of our industry is the women and men who operate and support the operations of our facilities. We have the best operating plants in the world and the strongest, most effective safety culture. This includes the broad nuclear community—academia, operating companies, suppliers, regulators, and others. We need to ensure current and future pipelines for our people and recognize that the millennial generation is motivated by factors—such as varied career paths and digital technology interactions—that differ from the key motivators of my generation or even those of the Gen X-ers. Our industry is already committed to the workforce as a priority, and that’s good.

My second insight: Let’s focus on getting more prepared for the future, which I believe is very good. Our nation and the world will need more clean electricity, potable water, and other services and products that nuclear technologies can provide. We need to develop the best business models for continued deployment of large advanced light water reactors, small modular reactors, and advanced Generation IV reactors. New business



Marv Fertel

models should include appropriate and defensible financing mechanisms. We will also need efficient, effective, appropriate regulatory licensing processes, and support from policymakers, opinion leaders, energy and environmental thought leaders, and business leaders.

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My third insight is that this industry has always made a significant commitment to necessary research and development, whether for new technologies or for addressing aging and other challenges with existing technologies. We also invest heavily and appropriately in developing our people and providing them with the support they need to perform at exceptional levels. We work cooperatively and effectively to address significant topics such as the Fukushima accident and other technical and regulatory issues. Where we may need more resource commitment is in our public advocacy programs. This is an area that NEI has been working on and that my successor will take to a new and more effective level. I encourage industry leaders to advance advocacy campaigns that achieve the policy outcomes to support our existing plants and provide the foundation for the future.

***EJ: What role do you envision nuclear power playing in the U.S. generation portfolio and power system over the next decade? What’s your vision for its global role?***

**Fertel:** Nuclear energy facilities will remain the key component of our nation’s low-carbon electricity portfolio for many years to come—the next decade at a bare minimum. Nuclear power plants operating in 30 states generate more than 60% of the carbon-free electricity supply in the United States, and the overwhelming majority of them hold renewed operating licenses from the U.S. Nuclear Regulatory Commission that will allow them to continue generating electricity beyond 2030. Globally, more than 60 reactors are under construction. Global interest in nuclear energy will continue to grow as nations strive to expand their economies, provide electricity to increasing populations—including the more than one billion people who don’t currently have electricity—and do this with a commitment to reduce greenhouse gas emissions. Any nation committed to a credible carbon emissions reduction program cannot succeed without nuclear energy.

***EJ: Dominion Virginia Power recently announced its intent for a second nuclear license renewal, and other U.S. nuclear operators are likely to follow with similar announcements. Why is extended nuclear operations beyond 60 years important for the U.S. power sector?***

**Fertel:** Yes, others will follow. Both Surry and Peach Bottom are the lead plants for obtaining a second license renewal to operate up to 80 years. Based on the experience of the 83 reactors that already have achieved license renewal to operate to 60 years, the U.S. Nuclear Regulatory Commission made the decision in 2015 that no change to its existing regulations was necessary to renew the licenses to 80 years. We expect that the licensing process can be achieved in 18 months.

Moving forward with second license renewals for up to an additional 20 years is important because by 2040, half of the nation’s nuclear power plants will have operated for 60 years. By 2030, the United States could experience electricity shortages if a significant number of nuclear plants are retired in a short period. Also, meeting our greenhouse gas reduction targets without the continued operation of a large portion of the current fleet will be impossible. EPRI and the U.S. Department of Energy have conducted scientific research to understand the technical issues associated with long-term operation of nuclear power plants. This research shows that there are no generic technical issues that would prevent a well-maintained nuclear plant from operating safely during the second license renewal period.

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***EJ: What role do you expect small modular reactors to play in the nuclear industry in the United States and globally over the next decade?***

**Fertel:** Given the very low electricity demand growth in the United States, increasing penetration of intermittent renewable technologies, and growing global demand for clean energy generation sources, small modular light water reactors have become a very important complement to our larger advanced light water reactors. They are designed to capitalize on the benefits of modular construction, ease of transportation, and reduced financing, making them a good option for areas where large reactors are not needed. Thinking globally, because of their small size—300 megawatts or less compared to a typical nuclear plant of 1,000 megawatts—they can generate electricity in remote locations where there is little or no access to the main power grid or provide process heat to industrial applications. Progress is being made to deploy the first wave of small modular reactors, which are anticipated to begin operating around 2025. These reactors will benefit from the industry’s history of incremental safety improvements through design. The short-term challenge is to solidify and expand the public-private partnerships that can accelerate their commercial development and to establish a Nuclear Regulatory Commission licensing regime that is appropriate to the safety enhancements that these new reactors will boast.

***EJ: How can nuclear plants cut operating costs to make them more competitive without jeopardizing safety?***

**Fertel:** Last year, the industry—working with EPRI, Institute of Nuclear Power Operations, NEI, and organized labor—initiated the program we call [Delivering the Nuclear Promise](#). This is an industrywide, multi-year initiative to identify efficiency measures and adopt best practices and technology to improve operations, reduce electric generating costs, and help prevent premature reactor closures. Industry teams led by chief nuclear officers are identifying improvements to programs such as work management, security, and engineering to achieve efficiencies while either maintaining or enhancing our commitment to excellence in safety. To date, this initiative has yielded about 30 separate “efficiency bulletins” sent to plant sites for implementation. For example, a recent bulletin focuses on timely, cost-effective processing of all workers by standardizing key training modules across the nuclear fleet. This eliminates the need for repeat trainings when workers move from one site to another, saving the industry as much as \$30 million to \$60 million annually.

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***EJ: Why is nuclear generation needed in addition to wind and solar to achieve domestic and international climate goals? What unique attributes and services does it provide?***

**Fertel:** The climate math simply does not work without nuclear energy. More specifically, without the nuclear energy facilities that operate in 30 states, carbon emissions from the U.S. electric sector would be approximately 25% higher. Meanwhile, the U.S. Energy Information Administration reports that worldwide emissions of carbon dioxide will roughly double between 1990 and 2040. Renewables, hydropower, shifting from coal to gas generation, and existing and new nuclear are all essential to meet the nation’s goal of an 80% reduction in carbon by 2050. Because nuclear energy is the only unlimited deployable baseload electricity source that

doesn't emit greenhouse gases, continued operations of existing nuclear facilities and construction of new plants are essential to achieve that target. Our nuclear plants provide electricity 24/7 safely and reliably, with price stability, electric grid support in the form of voltage support and frequency response, and carbon reduction and compliance for all other criteria air pollutants.

***EJ: What do you see as the most effective policy pathways in the United States to expand nuclear's role in decarbonization?***

**Fertel:** There is no single pathway. Many states should move quickly to address policy challenges before more nuclear plants shut down prematurely, as we saw recently with the adoption of a Clean Energy Standard in New York to help upstate nuclear plants continue operations. States can evolve their renewable portfolio standards into clean energy and carbon-free standards that rely on nuclear and hydropower in addition to other non-emitting sources, making them more economical for customers and more effective for carbon reduction. We need the Federal Energy Regulatory Commission (FERC) and the regional transmission organizations to demonstrate a greater sense of urgency and consider all the factors that constitute a robust, resilient, sustainable market. For markets to function effectively long term and yield the optimum mix of electric generating resources, practices that distort price signals or suppress energy market prices must be corrected. We also need FERC to complete the work on price formation that started about two years ago and has languished for no apparent reason. Congress can exercise more oversight over FERC to achieve greater transparency in its deliberations and ensure some semblance of discipline with respect to rulemaking schedules. The Executive Branch can do more as well via executive orders and presidential memoranda instructing federal agencies on procurement of carbon-free energy.

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***EJ: What R&D is needed to support safe, reliable nuclear power globally?***

**Fertel:** R&D has been and will continue to be a cornerstone of nuclear power development. In addition, it is essential to demonstrate and commercialize new technologies. One important R&D area is ongoing work to support extension of operating licenses from 60 to 80 years, with a focus on material aging issues. Also significant is research done in collaboration with industry, EPRI, and the Department of Energy on extended storage of high-burnup used fuel. Another key area is enhanced accident tolerant fuel designs that could increase the time available to mitigate a loss-of-coolant accident before significant reactor damage occurs. These designs could also eliminate the potential for hydrogen generation resulting from oxidation of the zirconium cladding of fuel rods. I would also like to highlight the Generation IV reactors. There are a number of private companies and national laboratories doing research in support of new designs, including pebble bed high-temperature gas reactors, liquid metal fast reactors, and molten salt reactors. Experimental work is ongoing to analyze material properties and design and qualify fuel for future non-light water reactors. Finally, important research occurs on a daily basis at nuclear plants to identify new, innovative tools and techniques that support more efficient operations. These and other efforts by industry, EPRI, and the Department of Energy are essential to the continued viability and advancement of nuclear power generation.