IEEE-USA

POSITION STATEMENT

Commercial Nuclear Energy and Technology Leadership

Approved by the IEEE-USA Board of Directors (24 June 2022)

IEEE-USA calls on the U.S. government to take actions that will maintain and strengthen the U.S. nuclear power industry. Nuclear energy provides an increasingly important and secure low-carbon energy source for electric power and for competitive advanced manufacturing and service industries.

Consistent with the economic and competitive shifts required for low-emissions economic activity and with national security objectives, a strong domestic nuclear power industry will:

- Strengthen U.S. competitiveness in an increasingly competitive international marketplace.
- Preserve a secure supply chain to meet the requirements of the civilian nuclear power industry and the U.S. Department of Defense.
- Help the U.S. retain its leadership in nuclear safety, security, and nonproliferation.
- Reduce carbon emissions from electric energy and from industrial energy uses such as process heating, while meeting national electricity demand and non-electric energy requirements; and
- Help to enable grid reliability as renewable energy production expands by providing a proven source of base load energy and capacity.

Toward these goals, IEEE-USA recommends:

1. Climate, Export and Manufacturing Policy Modernization:

Recognizing that demands for low-emissions service and manufacturing are reshaping a broad cross-section of global markets, the U.S. should develop a multi-agency team to assess resultant competitive opportunities and related risks; how to attain a U.S. competitive edge with a nuclear-derived "carbon advantage"; what international partnerships are required to compete; and what policy modernization is needed to enable the competitive edge. Specifically, Congress should revise the Atomic Energy Act to remove or ameliorate export restrictions that limit U.S. technology from competition in world markets.

2. Nuclear Energy Innovation:

Government and industry should accelerate public-private efforts to commercialize next-generation advanced nuclear energy systems, including the establishment of a versatile fast neutron test facility; advanced reactor demonstration projects; and efforts to establish a reliable domestic supply of high-assay, low-enriched uranium (HALEU) fuel needed for many next-generation reactors. The Nuclear Regulatory Commission should accelerate efforts to reduce regulatory review times without compromising safety.

3. Small Modular Reactors and Microreactors:

DOE should prioritize support for development, licensing, and deployment of small modular reactors (SMR)[1] and other advanced nuclear reactors, including microreactors. Development and licensing of SMRs will help keep U.S. technology current with the state of the art. Demonstration of microreactors needs to be accelerated broadly, particularly for communities in developing countries transitioning to clean energy, for power industrial applications, and for leveraging federal facilities.

4. Spent Fuel, Reprocessing, Management and Storage:

DOE should continue to conduct R&D on spent fuel reprocessing systems to reduce waste volume and storage time, especially emphasizing efforts in support of nonproliferation that minimize risks of diversion. DOE should further develop improved transportation and storage systems for fuel and used fuel. DOE should propose, and Congress should enact, a comprehensive spent nuclear fuel management program to establish an integrated nuclear waste management system and develop a disposal facility as mandated by the Nuclear Waste Policy Act of 1982.

5. Nuclear Energy Applications:

Government and industrial support should prioritize the research and development of other applications of nuclear energy for broad industry decarbonization, such as nuclear hybrid systems, (i.e., reactors used in combination with conventional or renewable sources), remote heat/power applications, emergency response power, and applications of nuclear energy to other processes such as production of hydrogen. Where appropriate, grants to U.S. universities or consortia for such research and development (R&D) are recommended to assist in maintaining knowledge bases for continuing nuclear capability.

6. Global Commercial Supply Chain:

DOE should commission a study to identify key elements of the global commercial nuclear energy supply chain that would provide greatest competitive advantage and national security benefit for the U.S. The intent of this study is to articulate actions that would strengthen the U.S. position, or partnerships that would enhance key advantages. This should include the domestic supply chain and development of manufacturing expertise for factory production of modular advanced reactors.

Additionally, in response to the Department of Commerce's investigation of over-reliance on foreign sources of uranium[5] DOE should implement the funding already authorized by Congress to promote domestic uranium production and related services for the federal uranium reserve program.

7. International Markets and Collaboration:

Diplomatic efforts should be focused on cultivating potential international customers for U.S. nuclear technology, including establishment of the necessary agreements to allow for U.S. technology exports. The Export-Import Bank and other export finance agencies should use their full authority to strengthen support for U.S. exporters in the global competition with the state-owned nuclear energy companies of Russia and China. This will build the market for U.S. nuclear technology and expanded civilian nuclear energy applications, and will help combat underbidding and utilization of stolen intellectual property by offshore vendors.

8. Education Partnerships:

Government and industry should provide funding for and support the development of partnerships within the education, labor, industry and government sectors to develop new training programs and to enhance STEM curricula, including secondary and post-secondary energy sector workforce training programs, apprenticeships, and best practices. DOE should assist and support training within nuclear communities to improve regulatory familiarity, related workforce skills, and community engagement where new reactors may be considered.

9. Research and Development Infrastructure:

DOE must modernize its nuclear energy research and development infrastructure, including construction of the proposed Versatile Test Reactor (VTR) to accelerate the development of transformational nuclear energy technologies to support the existing fleet and U.S. developers of advanced reactor concepts and technologies. Such facilities will play a crucial role in helping the U.S. reach net-zero carbon emissions by 2050.

Background

The United States is losing its leadership in nuclear technology because of ongoing reduction in nuclear power generating capacity, the resulting erosion of domestic nuclear R & D infrastructure and design and manufacturing capabilities and strengthening competition from abroad. If the U.S. continues to lose such leadership, it will be unable to maintain leadership in nuclear nonproliferation and will lose the strategic and economic benefits of a domestic supply chain. The U.S. could ultimately lose most of its leadership role in setting global standards for nuclear energy safety, security, and nonproliferation.

As has been documented by a multi-agency Working Group, the US is also overly dependent on offshore sources of uranium, which has resulted in loss of US mining and conversion facilities.

The global market for nuclear technology—now almost all offshore—has been estimated at about $8 trillion over the next two decades, but the growing influence for other suppliers, notably those in Russia and China, raises the risk that the U.S. will not share significantly in that growth. This presents national security implications. The U.S. Department of Defense, for example, requires a robust and secure domestic nuclear energy supply chain.

The ability for our nuclear industry to compete internationally has been significantly hampered by outdated U.S. export restrictions. Under the regulations of the Department of Energy's 10 Code of Federal Regulations Part 810, the time required to obtain authorization is lengthy and the outcome unpredictable. This, along with the uncertainty of obtaining NRC design certification, has caused the development and demonstration of some U.S. designs to move abroad.

The export restrictions just mentioned are embedded in the Atomic Energy Act and were intended to assure nonproliferation. The Act gives control to three separate agencies (depending on the technology involved): NRC, DOE's National Nuclear Security Administration (NNSA), and the Department of Commerce (DOC). The export restrictions are cumbersome, duplicative, and impede America's ability to compete abroad. Foreign competitors are able to react much faster because they are not subject to such overlapping restrictions.

Recent studies show that countries that have received U.S. nuclear technology are significantly less likely to get involved in activities that raise proliferation concerns, such as enrichment or reprocessing of special nuclear material (SNM); but the U.S. is not likely to have much influence in countries that purchase reactors from foreign vendors.

Currently, spent nuclear fuel is stored safely at commercial nuclear power reactor sites (including former sites) in 35 states, awaiting development of a centralized permanent-disposal facility. Many of these facilities use above ground dry cask storage. There are no permanent-disposal facilities or geologic repositories for commercial nuclear fuel in the U.S. at the present time.[2] A disposal facility as mandated by the Nuclear Waste Policy Act of 1982 must be developed in the near future to provide a long-term solution to the storage issue and to maintain the viability of future deployment of nuclear technologies.

Since the 1960s, U.S. nuclear energy leadership has been fueled by world-class nuclear R & D infrastructure at our national laboratories and universities. While still important, these thermal-neutron installations cannot provide testing conditions corresponding to the accelerated testing needed by advanced reactors. The Versatile Test Reactor (VTR) is critically needed to identify what works and what doesn't; to allow adjustments that yield the kinds of innovations expected from U.S. leadership; and to allow development of safer and more economical nuclear power.

The U.S. academic base, particularly as regards university programs for nuclear-related science and engineering disciplines, recently has seen a small increase in number of students[3], after a long period of decline in the number of such programs. But the declining number of existing nuclear power plants, and the at-best glacial progress of building new ones—particularly complex or transformational plants[4] — may prove deleterious to the quality of the energy sector workforce in the medium to long term.

This statement was developed by the IEEE-USA Energy Policy Committee and represents the considered judgment of *a group of U.S. IEEE members with expertise in this subject field. IEEE-USA advances the public good and promotes the careers and public policy interests of the nearly 150,000 engineering, computing and allied professionals who are U.S. members of IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE, or its other organizational units.*

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[1] "Small Modular Reactors: Opportunities for the US Supply Chain", Nuclear Insider white paper, p. 2.

[2] USDOE "Transforming the Nation's Electricity System: The Second Installment of the QER", January 2017, "Summary for Policymakers", page S10.

[3]Nuclear Engineering Enrolment and Degree Survey, 2019 data: https://orise.orau.gov_>_ne-brief-82-2019-data

[4]The American Energy Infrastructure, "How to Build Nuclear Plants", by Edward C. Shyloski Jr., enr.com, May 15/22, 2017, Engineering News Record, page 115.

[5] "Restoring America's Competitive Nuclear Energy Advantage", US Department of Commerce, report of multi-agency working group, July 2019.