The Nuclear Energy Advisory Committee

January 16, 2025

Dear Secretary Granholm,

As the current term of the Nuclear Energy Advisory Committee (NEAC) comes to a close, its members congratulate the Department of Energy for the impressive progress it has made over the last decade in supporting the emergence of a new nuclear energy era. The programs and activities conducted by DOE have had a very substantive impact in the United States and around the world and have contributed substantially to bringing nuclear energy from the sidelines of national and global planning to the center. In particular, programs such as the Advanced Reactor Demonstration Program and ongoing support for Generation III+ and small modular reactor technologies have been significant.

However, the changes underway in both the geopolitical and technological outlook make this moment in history one that is of incredible significance and opportunity. If the U.S. is to seize this moment and lead, the U.S. government must lead in a way it has rarely done since the *Atoms for Peace* era. By any measure, the time has come for action to be taken in a comprehensive and effective manner to ensure that nuclear energy is available to play a major role in providing the United States with the long-term, reliable, and cost-effective energy it will need in an era of dramatic increases in demand and technological change, and to assure U.S. global leadership in this new era of strategic competition and uncertainty.

In this respect, NEAC has engaged with DOE officials and leaders from other agencies to develop independent advice to the Department regarding areas on which we believe it, and the U.S. Government as a whole, should focus to ensure success. This letter provides recommendations and observations that we hope will be helpful as the Department continues its important work in the years to come.

Infrastructure and New Build

First, we note that the Department has advanced an ambitious goal of achieving 300GWe of U.S. nuclear energy capacity by 2050. Such a goal will require a significant acceleration of commercial deployment and as such, DOE should focus on strategies to shorten the timescales for nuclear projects, including applying lessons learned from recent large-scale nuclear build-out, as well as facilitating the application of a performance-based paradigm for material qualification and licensing processes—including developing the technical basis to enable the Nuclear Regulatory Commission to expand the application, where appropriate, of commercial-standard equipment in new nuclear plants.

U.S. nuclear power commercial deployment is primarily a private sector activity, but government support should be applied judiciously to meet national objectives. Federal support for dealing with the project costs and risks are currently being considered by Congress and it is clear that deployment at scale will require such incentives. Moreover, DOE, through national laboratory-university-private sector collaborations, can play an important role in the development and sharing of tools such as state-of-the

art digital engineering, artificial intelligence-based platforms, experimental testing capabilities for irradiations of fuels and materials, post-irradiation examinations, reactors components in coolant environments, thermofluid dynamics, and advanced materials, and integral effects testing capabilities. Importantly, the U.S. lacks a full suite of experimental facilities to advance nuclear technology, and significant new investment is essential—such as providing for fast neutron irradiation. Where appropriate, DOE should enhance its global leadership by developing international collaborations to jointly develop and share facilities and infrastructure with like-minded countries.

Similarly, DOE should enable market-commercialization of a broad range of fuel cycle options. This is of relevance both nationally and globally. Continued development of accident tolerant or high burnup fuels for light water reactors and HALEU for near-term Generation IV SMRs should be conducted alongside with development of separation and recycling technology for multiple types of fuels and fuel cycles. We note also an opportunity for synergy with medical isotopes production, which is a growing need.

Success in developing the needed fuel cycle technology will require investment in national infrastructure such as hot cells, fuel fabrication with recycled materials, test rectors and irradiation facilities for recycled fuel development and qualification. A strategic approach for refurbishing what we have and adding facilities that allow maximum flexibility for future decision is critical, while considering international facility sharing with like-minded countries. In addition, the U.S. Government needs to assure that it is of one mind regarding the policies related to nuclear fuel recycling technology. Too much time—years if not decades—has been lost in circular discussions among different arms of the Federal government while global competitors advance their technologies and programs.

Infrastructure that enables training the global workforce in advanced fuel cycles is an important element for the U.S. to maintain leadership in nuclear energy technology. This matter can be approached jointly by NNSA and DOE-NE. The existing Nuclear Science User Facilities (NSUF) program successfully manages access to existing capabilities, but it is only a beginning. The creation of avenues through which investment in new capabilities is possible by partnerships between the private sector, national laboratories and universities, and therefore should be a major strategic goal toward enhancing U.S. global leadership in advanced nuclear fuel cycle and nuclear energy technology. Without the appropriate, advanced technology infrastructure, such leadership is illusionary.

The role of the DOE Loan Program Office is important in providing project funding options for private nuclear power plant developers.

Nuclear Workforce for the Future

NEAC applauds the focus DOE has provided to the development of the future nuclear energy workforce. However, more needs to be done in this area. The Department has noted that the U.S. nuclear energy workforce will need to increase by 375,000 additional trained workers to research, design, build, maintain, and operate new reactors, while maintaining the existing fleet. It will not be possible to close this gap without further federal intervention.

Fortunately, the Department has the tools and approaches at hand to take the necessary steps. In past years, when the nuclear education programs in the U.S. were in decline, the DOE stepped forward and established a strong record of accomplishment by working with academia in providing substantial research grants and by collaborating with universities to build and improve academic programs. DOE's role in this area is essential and it is again time for such action. No other element of the government is equipped to support U.S. education and training in the nuclear sciences and technology.

NEAC believes that there is an important opportunity to work more closely with U.S. universities to strengthen existing undergraduate and graduate programs and provide more opportunities to modernize nuclear technology education and to make the discipline available to a more diverse range of students. This will require the type of direct engagement and leadership DOE exhibited in the early 2000s and an investment in supporting new professorships and curriculum development. There is also a need to bring more focus to essential but oft-neglected disciplines such as health physics and nuclear chemistry. In addition, DOE should lead in assuring that the nuclear sector leverages the best minds available and establishes a more diverse and gender=balanced workforce than exists today.

These enhanced efforts should include engagement with community colleges, trade school programs, and support for non-traditional students and career-changers through certificate programs, mentorship, and Union apprenticeship programs; building and expanding networks with faculty, community, and tribal colleges; and actively encouraging innovation in curricula. Training of new nuclear experts should reflect the lessons learned from the past and support the direction taken by some leading institutions to expand training beyond the technical. This means committing a percentage of funding to social sciences and humanities training, and building a comprehensive perspective on nuclear energy, covering a broader range of environmental, societal, and legal issues. Doing so will contribute to greater success in the deployment of nuclear facilities in the future.

Industry, academia, and government should combine forces to create comprehensive data collection tools on workforce trends, needs, and gaps. In addition to traditional issues such as readiness for new technologies, or preparing for a retiring generation of experts, there is a pressing need for better data on workforce diversity, the availability of skilled tradespeople, and the demand for transient nuclear workers (similar to what we're seeing in the healthcare industry). A centralized database should be considered to monitor and track workforce developments, ensuring data transparency and alignment with long-term workforce requirements, community needs, and fluctuations in required competencies.

U.S. universities are a powerful lever of U.S. leadership and they should be used to the maximum extent possible to achieve national goals. International exchanges and collaborations should be encouraged with countries that have successful nuclear training programs. Efforts to demonstrate attractive career opportunities in the US, while also supporting workforce mobility could include inviting foreign students to train in U.S. nuclear programs, or sending American students abroad to learn best practices, or both.

We note that our strategic competitors are gaining significant advantages in establishing markets for their technologies by training hundreds of overseas students in nuclear disciplines. Their investments will pay large dividends in the future. It was the U.S. that created this practice in the past but in recent decades has not been a significant player. NEAC believes this should change immediately and the U.S. should actively support the training of overseas students—particularly from the Global South—to assure

U.S. leadership and market access. Success of U.S. industry will depend on access to the broadest possible market and the opportunities overseas are vast—as are the national security implications of U.S. inaction.

Global Competitiveness and Engagement

As a general matter, NEAC is concerned that the U.S. is falling behind its primary competitors, particularly Russia and China. While the different arms of the Government appear, for the most part, to have a common high-level understanding about U.S. goals, it is our observation that these elements may have relatively parochial views of what it means to re-establish U.S. leadership, with exclusive focus on the mission of a specific agency or office.

As a result, it is not clear if there is a comprehensive definition of what "U.S. leadership" means including all the contributing elements such as commercial, technological, intellectual, diplomatic, and policy regarding the safety and security protocols. We believe it would be tremendously beneficial to develop a comprehensive definition and understanding—and to clearly understand where well-informed differences exist and to bring them to resolution. While structural enhancements to national decision-making in the nuclear policy arena should be considered, we believe there would be benefit to a formal and outcome-focused policy-level deliberation among the relevant government agencies aimed at addressing these specific questions:

1. What is the comprehensive definition of U.S leadership in nuclear energy technologies and what is the role of each agency in achieving the overarching leadership goals? How are/should success and progress be coordinated and evaluated across agencies?

2. How is "U.S. leadership" articulated to our allies/like-minded countries (such as France, U.K., Japan, S. Korea) and how is progress coordinated in collaboration with these countries? What is the role of fair and friendly competition in our posture?

3. The approach by government-backed enterprises from Russia and China provide significant advantages in achieving overseas sales compared to U.S. private sector companies. While recognizing the important progress made by the Federal government in advancing one recent overseas project in Central Europe, it is apparent that this example was a challenging exception rather than a clear pattern for the future. How should the lessons from this example be used to create a framework that can better support emerging overseas opportunities? How can U.S. governmental bureaucracy and decision-making regarding exports of nuclear technology be streamlined to allow industry to compete?

Back-end of the Fuel Cycle

As noted above, NEAC believes that the U.S. should decide quickly and firmly what policies should be applied to the use of nuclear fuel recycling technology in the U.S. and in cooperation with like-minded allied countries. Clarifying this policy area will have benefits across all the areas discussed above.

Clarifying this area will also be essential in future planning for the disposal of high-level radioactive wastes. Much has been said about the lack of progress toward establishing a deep geologic repository, but NEAC notes that while this matter must be resolved eventually, it is not a crisis and there is time to formulate the policies most beneficial to U.S. economic, security, health and safety, and environmental interests.

Whatever steps are eventually taken in establishing waste management and disposal facilities, NEAC believes that consent-based siting processes must be applied. These approaches have proven to be successful in Europe and Canada and many important lessons have been learned in their implementation. DOE's participation in groups such as the Forum on Stakeholder Confidence has provided a strong knowledge base that can be readily applied to programs in the U.S. Looking forward, NEAC recommends that DOE take the following under consideration as it considers the future of its current efforts:

1. Acknowledge that the Consent-Based Siting (CBS) Process requires iteration. DOE should move at the "speed of trust" solely determined by stakeholders. DOE should therefore remove time constraints from its original CBS process plans, and recognize that iterations of previous phases may become necessary.
2. DOE should allocate resources for continued community and stakeholder engagement. Where DOE has begun establishing partnerships, it should advocate expanded timelines, scope, and funding as needed.
3. DOE should advocate for expanded engagement from and with civil society organizations that represent marginalized communities. DOE must facilitate availability and access to expertise upon request and as needed.
4. DOE should expedite publication of an integrated waste management strategy. Common community awareness of DOE's integration plans for storage, transportation, and geologic disposal is a foundation for public understanding.

Longer term, NEAC encourages the Department to review approaches to creating a new, independent organization to manage its high-level waste disposal responsibilities that has access to the funds needed to carry out CBS, establish partnerships with local, state, and regional organizations; and other functions.

Conclusion

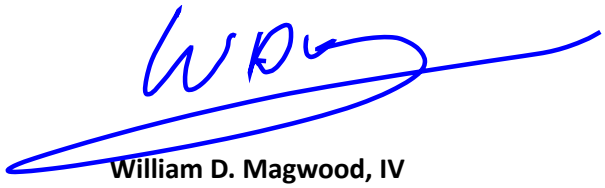
Finally, we make observations regarding NEAC itself. Federal Advisory Committees can be a powerful tool for agencies to draw upon the expertise of experienced individuals outside the government. Over the years, NEAC and its immediate predecessor, the Nuclear Energy Research Advisory Committee (NERAC) have proven successful in bringing a wide range of experts into the conversation to the benefit of public policy and programs at the DOE.

However, as currently implemented, NEAC is limited in the support and assistance it is able to provide to the Department. Unlike NERAC, which was much more integrated with the programs and staff of DOE-NE and well-positioned to provide detailed and substantive reports and recommendations, NEAC can provide only very high-level recommendations. A return to the NERAC model would be very beneficial.

That said, we thank the Department for the opportunity to serve and provide our views on its vital activities. We thank the leadership of the Office of Nuclear Energy for the considerable time it has invested in NEAC and for the support it has provided for our activities. We also greatly appreciate the diligent work of the DOE staff members who have helped coordinate NEAC activities, particularly Robert Rova and Krystal Milam.

We stand ready to discuss these recommendations at your convenience.

Best regards and on behalf of all NEAC members,



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