June 24th, 2024

U.S. Department of Energy

Washington, DC 20585

Subject: Request for Information on Transforming Industry: Strategies for Decarbonization (DE-FOA-0003363)

Background:

The Nuclear Innovation Alliance (NIA) is a non-profit “think-and-do” tank working to enable advanced nuclear energy as a solution to mitigate climate change. Through policy analysis, research, outreach, and education, NIA is catalyzing the next era of nuclear energy. We focus on federal policy and regulatory reform to support advanced reactor development and deployment while meeting national environmental and energy security goals.

Advanced nuclear reactors can accelerate industrial decarbonization, by offering dispatchable high-temperature heat, high-pressure steam, and electricity. These capabilities are crucial for decarbonizing carbon-intensive processes including chemical production, industrial manufacturing, data center loads, and methane reforming. Advanced nuclear energy may be a critical solution to meet industrial energy demands while mitigating climate impacts

The first applications of advanced nuclear energy for industrial decarbonization are already underway. For example, X-energy has partnered with Dow Chemical to integrate an advanced nuclear reactor with a commercial industrial production facility. This first-of-its-kind project will deploy X-energy’s “Xe-100” reactor at Dow’s facility in Seadrift, Texas by the end of the decade. The investment by Dow in an advanced nuclear reactor demonstrates the real-world commercial interest in nuclear-enabled industrial decarbonization.

To fully harness nuclear energy’s decarbonization potential in the "hard-to-reach" industrial sector, it is essential to explore a wide array of industrial use cases, project needs, and financing mechanisms, and to develop strategies to accelerate the adoption of advanced nuclear technologies by industrial users.

RFI Questions and Responses:

Note: NIA has chosen not to respond to the questions in the RFI that are not listed below.

1A.2 Which barriers do you feel are most important to address first?
Advanced nuclear energy has a large potential to contribute to industrial decarbonization. However, several barriers to advanced reactor deployment exist. These barriers, for this discussion, include nuclear energy licensing and regulation, and securing private investment.

Modernization at the Nuclear Regulatory Commission (NRC) is critical to enabling deployment of advanced nuclear energy for industrial decarbonization and more broadly. The NRC's current regulatory framework has been optimized for the regulation of existing nuclear reactors and presents obstacles to the timely licensing and deployment of advanced nuclear reactors.

Advanced reactor developers are increasingly attracting private investment for technology development, but much more investment will be needed to deploy new advanced nuclear reactors at scale. A key factor inhibiting potential investment in advanced nuclear energy projects is concern about the ability to license and build new reactors on-time and on-budget. Strategies and policies to mitigate risk for project developers and off-takers are needed. Provided enough capital and risk sharing, new nuclear energy development can accelerate to assist in industrial decarbonization.

1A.3 How would you recommend government engage to address these (or other) industrial decarbonization barriers?

NRC Modernization: The NRC must modernize its regulatory approach to ensure effective, efficient, and predictable licensing. More specifically, the NRC should prioritize short-term process improvements to increase licensing efficiency under existing regulatory frameworks for near-term deployment, support medium-term development of new modern regulation for advanced reactors, and explore long-term strategies for successfully licensing large numbers of advanced reactors needed to meet climate and energy security goals.

Private Investment: One strategy to spur private investment into advanced nuclear energy deployment is to share the risk of increased project completion cost among multiple commercial partners. The U.S. Government could help catalyze private investment in first-mover projects by participating in risk sharing programs, including through the DOE's Loan Program Office (LPO) or other DOE programs. Federal programs that address project cost and completion risks would require significant private-sector contributions, limit the government's exposure to cost increases, and require the implementation of best management practices to maximize the

likelihood of project completion on-time and on-budget. Stakeholders including advanced reactor project developers and potential customers are currently exploring options. The availability of private and public cost-sharing mechanisms would address a key area of uncertainty for private investors, and potentially accelerate investment in new advanced nuclear energy projects.

1A.5 What are the blind spots or unknowns when transferring technology from the bench scale to commercial scale?

Individual advanced reactor developers must eventually standardize their designs to ensure licensing activities are able to be streamlined (i.e., the NRC does not have to license new and novel designs with subsequent deployments) and so they can optimize the construction and operations of their reactors. With each subsequent reactor of the same design that is deployed, developers can capitalize on "learning by doing" to reduce cost of the project and streamline the development processes. A real-world example of this is the cost reduction associated with the deployment of Vogtle unit 4, with respect to Vogtle unit 3.

1A.6 What are the current and future gaps/barriers in workforce needs and availability?

The administration has called for tripling nuclear energy capacity. To do this, we must develop the next generation nuclear workforce and ensure we have enough engineers, tradesmen, and workers to build and operate a newly expanded nuclear fleet. Implementing trade school programs for nuclear energy workers and strengthening nuclear engineering programs at U.S. universities are just two avenues that should be pursued to prepare for large demand of nuclear sector workers that is coming. Finally, there is a large interest in repurposing fossil fuel sites and their workforce for new nuclear reactors. Considerations of how to train such a workforce, what programs are needed, and more, should be thought through to maximize the potential to reuse skilled workers who worked at these retired or soon to retire fossil fuel facilities.

1A.7 What are the differences in workforces across industries/across the country related to the availability of skillsets, staff, training, etc.?

Many of the jobs needed at a nuclear power plant are ones that are seen across the energy sector, in particular fossil fuel sites. For example, pipe fitters, welders, project managers, and electricians are positions that are needed in both fossil fuel and nuclear power plants. There exist many groups interested in nuclear energy development, for example those in the Appalachian region, which have a rich history of blue-collar work in the energy sector. These groups should be considered when thinking through how to best deploy new clean energy technologies, including new nuclear energy technologies, for industrial decarbonization purposes.

4G.1 Which part(s) of the "rest of industry" do you expect to grow or shrink in production and/or demand by 2050 and why?

Data centers are expected to grow significantly in the coming years, driving an increased demand for reliable and continuous energy. This growth underscores the necessity for sustainable and efficient energy solutions to meet the needs of these energy-intensive facilities. Advanced nuclear energy, with its ability to provide clean, firm power, is well-positioned to play a crucial role in supporting the expansion of data centers. By offering a dependable source of carbon-free electricity, advanced nuclear technologies can help ensure that the burgeoning data center industry operates sustainably, while also contributing to broader efforts to reduce greenhouse gas emissions and combat climate change

Additionally, increased industrial demand for energy is expected to surge, particularly in sectors like manufacturing, chemical processing, and heavy industry, which rely heavily on high-temperature heat and high-quality steam. Advanced nuclear energy is ideally positioned to meet these requirements, offering a scalable and sustainable solution to decarbonize industrial operations. By supplying clean, efficient power, advanced nuclear reactors can help industries reduce their carbon footprint while maintaining productivity and competitiveness.

4G.3 What technical and/or technology solutions does any specific "rest of industry" subsector need that are not currently available?

One critical need for many industrial subsectors is on-site power generation that is both reliable and clean. Current solutions often rely on intermittent renewable energy sources or fossil fuels, neither of which fully meet the demand for consistent, firm power. This is especially true for data centers, which require a substantial and sustained energy supply to ensure continuous operation and support future expansion.

Advanced nuclear energy can address this gap. Advanced nuclear reactors offer a dependable source of clean, firm power, capable of generating many megawatts of electricity continuously. These technologies can significantly benefit data centers by providing the stable and scalable energy needed to power their operations while also aligning with sustainability goals. In this way, advanced nuclear reactors are well-suited to meet the growing energy demands of data centers and other energy-intensive industries.

Sincerely,

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