UNITED STATES NUCLEAR INFRASTRUCTURE COUNCIL
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March 17, 2017

The Honorable John Barrasso, Chairman
The Honorable Thomas R. Carper, Ranking Member
Senate Committee on Environment and Public Works
Washington DC 20510

Dear Chairman Barrasso and Ranking Member Carper:

The U.S. Nuclear Infrastructure Council is writing to applaud the Committee's bipartisan support for advanced nuclear energy progress and development as manifested by the Nuclear Energy Innovation and Modernization Act (S. 512).

As the leading American business consortium advocate for nuclear energy and the promotion of the U.S. supply chain globally, we believe that trailblazing the advance of nuclear energy technology including Gen 3+, Small Modular Reactors, Non-Light Water Reactor (LWR) Advanced Reactors and Fusion Reactors is one of the key imperatives for U.S. market competitiveness and is pivotal to maintaining the U.S. lead in technology innovation, jobs, exports, energy independence and Made-in-America clean energy leadership.

As reflected in the Council's April 21, 2016 testimony to the Committee and *Framework for Advanced Reactor Licensing Modernization* white paper, we commend the focus of S. 512 on reforms addressing structural issues with the U.S. Nuclear Regulatory Commission's (NRC) budget and fee recovery authorities to promote long-warranted transparency and accountability. We also embrace the directive to establish performance benchmarks and reporting to Congress to improve transparency and surety in the decision-making timelines by the NRC.

As a consortium representing 14 leading nuclear energy developers pioneering next-generation nuclear energy technology, we, in particular, welcome the legislation's focus on modernization of the NRC's regulatory framework to provide the regulatory clarity and predictability for advanced reactor license applicants. We strongly support provisions to reduce up-front regulatory costs through the development of a cost-share program to nurture vital pre-licensing engagement and measures incentivizing the NRC to develop a modern, technology neutral framework that allows for the phased and expedited licensing of advanced reactor technologies. This legislation follows a number of the key recommendations that were included in the *Advanced Reactor White Paper* that the Council issued on February 22, 2016.

It is our hope that as the Committee moves toward mark-up it will look at strengthening the pre-licensing engagement where enhancing the development of phased licensing objectives by incorporating a requirement for an upfront vendor design review modeled after the Canadian nuclear regulatory authority's process allowing pre-licensing regulatory feedback on the designs in a defined period of time and under a defined cost.

The Canadian process, which is attracting U.S. developer interest, allows the applicant to understand the licensability of the design – prior to seeking a full-blown design review. The "licensability" determination provides additional certainty for investors who may wish to invest in these designs.

We also wish to echo the need for consideration of a High Assay LEU (HLEU) amendment advocated by ClearPath to establish a HLEU reserve for advanced reactor use as proposed by the Council in a September 19, 2016 letter to the U.S. Department of Energy. With a specified stockpile of adequate size for fuel supply for next generation reactors, the future will be much clearer for innovators.

Finally, be advised that the Council is fully supportive of the NRC's current FY2017 request for $5 million in off-the-fee-base funding to support the development of NRC licensing capabilities for advanced reactors. It is our recommendation that this funding be at least doubled in FY2018.

We salute the Committee for quickly moving forward on this legislation and we appreciate the opportunity to have testified on NRC reform and modernization.

Please note that while these views represent the consensus of the U.S. Nuclear Infrastructure Council, they do not necessarily represent the views of individual member companies.

Again, many thanks for the work of the EPW Committee and staff on this vital legislative measure. We look forward to continuing to work with you and the Committee on these matters.

Sincerely,

The Honorable Jeffrey S. Merrifield (NRC Commissioner 1998-2007)
Partner, Pillsbury Winthrop Shaw Pittman, LLP
Chairman, Nuclear Infrastructure Council – Advanced Reactor Task Force

CC: Senator Sheldon Whitehouse
Senator Corey A. Booker
Senator Mike Crapo

Attachments:
NIC Senate EPW Testimony (April 21, 2016)
NIC Advanced Reactor White Paper
NIC Letter to DOE on creation of HLEU Reserve for AR Developers

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U.S. Nuclear Infrastructure Council
Advanced Reactors Task Force

Issue Brief on
The Framework for Advanced Reactor Licensing Modernization

The Honorable Jeffrey S. Merrifield
Commissioner, U.S. Nuclear Regulatory Commission (1998-2007)
Partner, Pillsbury Winthrop Shaw Pittman
&
Chairman, USNIC Advanced Reactors Task Force

February 23, 2016

ISSUE

A confluence of environmental, energy security and competitiveness considerations are accelerating the need for the expedited development of Advanced Nuclear Reactors in the United States and worldwide. These Advanced Reactors can be used globally to provide economical, carbon-free electricity and industrial heat generation while providing a new option for the looming replacement of America's nuclear energy fleet as existing nuclear reactors reach the end of their licensing life beginning as early as 2030. Ranging widely in size from micro-reactors of a few megawatts electric (MWe) to large gigawatt ("GW") -size reactors of 1000 MWe, these non-light water Advanced Reactors embrace enhanced passive safety features as well as the prospect for improved nuclear energy economics and competitiveness with other energy sources including natural gas for baseload supply. These Advanced Reactors also bring with them significant interest from the financial community which is seeking gateway technologies to invest in this arena. In addition to funding and infrastructure, a modern licensing framework is needed to enable development and deployment of Advanced Reactor technology in the U.S. and to extend U.S. nuclear energy technology leadership that has featured progressive light water reactor designs including passive Generation III+ designs currently being deployed in Georgia and South Carolina – and small, modular, light water nuclear reactors now headed toward deployment.

BACKGROUND

Today, U.S. nuclear energy plants provide almost 20 percent of the nation's electricity and over 60 percent of America's carbon emissions-free electricity. The U.S. fleet is comprised of approximately 100 units that are based and adapted on light-water reactor ("LWR") technology directly developed by the U.S. Navy propulsion program. Utilities and the nuclear industry have improved upon and optimized the LWR technology and the current fleet is now operating at world-class high levels of safety and reliability. The U.S. fleet turned in another record setting

year of excellent operating performance, achieving a fleet-wide capacity factor of 91.9 percent in 2015.

However, the existing U.S. nuclear energy fleet is among the oldest in the world with over a third of the current plants being over 40 years old. Many of the reactors could be retired beginning around the 2030 timeframe, although there is a strong basis for extending their life to 80 years through a second license renewal.

With the worldwide impetus to reduce global carbon emissions -- along with a significant increase in electricity demand -- the U.S has a compelling need to develop and deploy the next generation of Advanced Reactors. Deployment of this new generation of reactors will require a new model, one that is more dynamic and capable of forming private-public partnerships in support of private-sector innovation driven initially by private-sector investment. Already in the U.S., there are a number of Advanced Reactor designs that have progressed to the design and engineering stage and are supported by meaningful investments from the private sector.

While there is wide recognition regarding global climate change and the vital role that nuclear energy plays in meeting carbon reduction targets, the current level of government investment in nuclear technologies is markedly insufficient. According to the Energy Information Agency, with tax incentives, the U.S. government "spent" over $15 billion on renewable and biomass programs in 2015 – but "spent" $1.66 billion for nuclear energy in the same period.

Additionally, the current framework of U.S. government policy, legislation, regulation and requirements, research and development support, and fee-based licensing is more aligned with the past development efforts than what is needed for the future to commercialize a new generation of Advanced Reactors.

This is particularly true of the U.S. Nuclear Regulatory Commission (NRC) licensing process, which presents one of the largest risk factors confronting private developers of Advanced Reactors as it does not accommodate a staged investment approach as the technology development and licensing risks are addressed and resolved.

Revitalizing the U.S. Advanced Reactor Development Mission

Currently, the DOE and NRC share responsibilities for supporting and overseeing the U.S. nuclear energy program under the Atomic Energy Act ("AEA") and the Energy Reorganization Act ("ERA"). This later Congressional Act assigned the promotional and development responsibilities to the U.S. Department of Energy (DOE – the successor agency to the Energy Research and Development Agency ("ERDA"), and a companion agency, the NRC, was assigned the responsibilities for assuring public health and safety and carrying out the regulatory and licensing program.

Over the course of time, DOE increasingly focused on basic and applied research, while the NRC moved to focus exclusively on its primary mission of safety oversight and regulation. Today this framework is struggling to foster the private capital formation required to advance promising private-sector nuclear innovation, as those companies are isolated from the types of

support that has been offered historically and, in a contemporary setting, support that is offered to other innovative but non-nuclear energy technology companies.

If the U.S. is to be successful in developing and deploying a new Advanced Reactor fleet as early as 2030, Congress should consider significant policy changes. It should provide additional resources to both agencies as well as direct them to focus and mobilize their resources and expertise on the goal of expanding nuclear energy options with Advanced Reactors.

Both the DOE and NRC must be proactive in developing their capabilities and engaging with the Advanced Reactor community. Today, the NRC interprets its mission as an exclusive safety mission with a caveat that that its processes and activities must not place an undue burden on the industry. The NRC typically awaits applications and only reviews design certification applications that are full and complete. While the NRC has long recognized that its paramount goal is to ensure public health and safety, the ERA also requires that the Agency enable the use of nuclear technologies for safe, beneficial uses. The unique features being trail blazed by Advanced Reactors justify an updated and modernized NRC design review and licensing process.

Congress should reinforce and support the NRC's efforts to enable the use of Advanced Reactors by setting appropriate deadlines for design reviews and licensing activities, engaging in active oversight of the NRC's review of these technologies and providing sufficient funding to allow the agency to execute accordingly.

Recommendations:

1. Congress should engage in proactive oversight of the NRC's Advanced Reactor design review and licensing process;

2. Congress must provide sufficient resources to create an efficient and robust Advanced Reactor licensing program at the NRC;

3. Congress must set a specific expectation that the NRC conduct Advanced Reactor licensing reviews in no longer than thirty-six months;

4. Congress should direct the NRC to identify any impediments that may hinder its ability to accelerate the design review and licensing activities of Advanced Reactors; and

5. Congress should direct the NRC and DOE to submit an annual report that identifies the key milestones, activities and resources required to develop, deploy and regulate Advanced Reactors.

Advanced Reactor Regulatory Capabilities

The NRC currently lacks sufficient capabilities for the licensing of non-light water reactors. In order to develop the appropriate regulatory basis to regulate Advanced Reactors, the NRC needs to better understand how these technologies work, how they can be regulated and how

unnecessary regulatory conservatism can be avoided in the oversight of these designs. Because of the current funding formula wherein the NRC must recover 90 percent of its costs through fees, the resources for these activities must be borne principally by U.S. nuclear utilities – which are understandably concerned about the regulatory burden currently faced by the U.S. nuclear energy fleet. Given that Advanced Reactor companies primarily rely on private funding, this NRC funding paradigm poses an extremely difficult challenge for this new industry's design advancement.

The requirement to be a fee-based agency resulted from the Omnibus Reconciliation Act of 1990 ("OBRA"). Prior to that time, the cost of the Agency's review activities were borne by all taxpayers through the use of general revenues. Thus, the current nuclear fleet was, for the most part, licensed and deployed under a framework that did not require the imposition of user fees. Today, with both the Congress and the nuclear industry encouraging the NRC to reduce its budget -- as well as related utility plant licensing fees -- and in the absence of new sources of funding, the NRC is hard pressed to request the needed funding for Advanced Reactor activities. In order to accomplish the goal of enabling the development of Advanced Reactor technologies, Congress should provide dedicated general revenue monies targeted to developing the needed Advanced Reactor regulatory infrastructure, including the establishment and deployment of a design review and licensing framework with the dedicated staff and expertise appropriate to evaluate the safety basis of Advanced Reactor technologies.

Recommendation:

1. Congress should authorize and appropriate dedicated general revenue funds (beginning with $5 million requested by the NRC for fiscal year 2017 and growing to $15 million or more, if necessary for regulatory infrastructure and staffing to review and approve Advanced Reactor technology designs.

Advanced Reactor Pre-Application Conceptual Design Licensing Review

A scaled and proportionate license fee burden

While the NRC is not a promoter of nuclear technologies, it is appropriate for the Commission to engage in early and enhanced communications and dialog with Advanced Reactor developers to allow new market entrants to fully understand what is needed to successfully prepare and undertake design review and licensing. Currently, the NRC has very limited dialog with Advanced Reactor technology developers, and when it does, it must charge hourly review fees ($270+ per hour/per NRC staff member) to these companies. As members of the Advanced Reactor community are early stage and entrepreneurially driven private companies, they lack the traditional resources to finance what can be very expensive regulatory fees; additional sources of revenue must be identified. As it would not be appropriate to pass these costs on to the existing nuclear utility fleet, dedicated general revenues should be set aside to allow the NRC staff to engage with Advanced Reactor developers without passing these significant costs onto highly resource-constrained users.

A graduated licensing model congruent with graduated private capital commitment

Additionally, in order to align with the staged private investment model of step-wise investment based on project de-risking, the NRC needs to develop a staged conceptual design review process for the review of Advanced Reactor designs similar to that developed by the Canadian Nuclear Safety Commission ("CNSC").

The CNSC process is robust and graduated. It requires vendors to reach discrete milestones that allow investors to assess the technology's licensablity and identify any potentially significant issues. It features an upfront Vendor Design Review to provide an early verdict on the licensing feasibility of potential designs for less than $5 million (US).

The early phases of this program would provide interim indications to allow the investment community to understand the licensablity of the design without having to wait until the end of the licensing process, which can take 8 to10 years. The current process lacks transparency in cost and time, requiring potentially hundreds of millions in dollars of up-front investment while strongly discouraging private capital commitment.

The CNSC's graduated process has the potential to enhance the ability of Advanced Reactor designers to attract vital sources of capital because it allows them to build confidence along the way that the design has the potential to be licensed. In order to foster a new generation of Advanced Reactor technologies, this is precisely the type of phased design review and licensing process that needs to be adopted by the NRC.

The use of either Part 50 (separate construction permit and operating license) or Part 52 (combined construction/operating license), which are the traditional licensing approaches utilized for light water reactors, is not fully compatible with the needs of Advanced Reactor developers. The NRC, with the assistance of DOE and others, should identify methods to modify the current regulatory requirements to more appropriately tailor the design review and licensing framework while maintaining the NRC's safety mission. The NRC should also seek to utilize concepts and frameworks from other peer regulators in addition to the Canadian Nuclear Safety Commission, such as the United Kingdom Office for Nuclear Regulation, which have phased design review and licensing processes, to craft a review program that is more adaptable to this emerging industry.

Government funding support for Advanced Reactors that is proportionate to nuclear energy's climate and economic potential.

In order to address global climate concerns, it is fully appropriate that the federal government make a similar significant investment in carbon-free Advanced Reactors by creating a design review and licensing process that would not be borne entirely by Advanced Reactor developers.

Recommendations:

1. Congress should provide general revenue funding to allow the NRC to engage in technology specific (molten salt, gas cooled, etc.) and vendor specific workshops and

meetings that take place prior to design review and licensing activities, as well as interagency and intergovernmental meetings and regulatory development activities needed to create common review standards for Advanced Reactors;

2. Congress should provide general revenue funding to allow the NRC to waive the fees for the review of Advanced Reactors through their final design approval; and

3. Congress should require the NRC to establish a phased design review and licensing process that would provide intermediate milestones towards a design certification that would include an early determination of licensability to enable continued development of these designs without requiring a complete design to be submitted upfront.

Advanced Reactor Licensing Framework

Currently, the NRC's expectation is that it will determine the design-specific changes and exceptions that it would make for Advanced Reactor designs, after they are submitted to the NRC for review. This expectation places Advanced Reactor developers in a difficult and expensive position where they are expected to anticipate what the NRC may potentially find acceptable as they are in the midst of preparing their designs – only to be at significant investment risk if the NRC later determines that these design choices are not acceptable. This potential "Catch 22" could be avoided if the Commission identified policy issues that could be addressed generically – perhaps by groups of design (molten salt, gas reactors and etc.) – in order to avoid cost and reduce unnecessary burden.

Recommendations:

1. The NRC Commissioners should instruct their staff to bring to conclusion, within two years, the following policy issues as they relate to Advanced Reactors:
   a. Reduced Emergency Planning Zone ("EPZ") requirements for Advanced Reactors based on source term;
   b. Reduced security requirements based on source term;
   c. Reduced control room staffing requirements for passively-cooled non-light water reactors;
   d. Lack of need for traditional containment based on source term; and
   e. Establishment of non-LWR generic design criteria

Timeliness of NRC Review Process

As an independent federal agency, the Nuclear Regulatory Commission is invested, under the Atomic Energy Act, with the responsibility to license new reactor designs that it determines meet a standard of "adequate protection" of public health, the environment and common defense and security. While Congress cannot dictate a specific outcome in this license review process, it is eminently reasonable that Congress can set an expectation that these determinations shall be made in an efficient and timely manner. Based on its previously demonstrated ability to relicense large 1200+ MWe reactors in less than 36 months, the NRC should be capable of licensing small

modular (200 MWe and less) and Advanced Reactors – with significantly smaller source terms – in the same time frame of within 36 months.

Recommendation:

1. The NRC should develop a risk informed licensing process for Advanced Reactors that recognizes their reduced source term risk and avoids the unnecessary implementation of regulatory requirements that are more appropriate for large light water reactor technologies.

Conclusion

It is time to make dramatic changes in the way we pursue, support and license Advanced Reactor technologies to achieve the full measure of their promise and the success the nation needs for the future. While this will require a sustained focus and investment of resources by government, the return on investment will be pivotal in ensuring the U.S. maintains its technological leadership in nuclear energy's vital and carbon-free source of clean energy while providing jobs, economic competitiveness and energy security while improving our nation's environment and health.

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The USNIC Advanced Reactors Working Group is a project of the U.S. Nuclear Infrastructure Council (www.usnic.org), the leading business consortium for new nuclear energy and promotion of the U.S. supply chain globally. The views above represent a consensus of the USNIC's Advanced Reactors Task Force and the Council, but do not necessarily represent the specific views of individual member companies and organizations.

For further information contact: Jarret Adams, 202-815-9234 or jadams@fullon.com.

UNITED STATES NUCLEAR INFRASTRUCTURE COUNCIL
www.usnic.org

September 19, 2017

The Honorable Ernest Moniz
Secretary of Energy
The Forrestal Building
Washington DC 20585

By email: RFI-UraniumTransfers@hq.doe.gov

Re: U.S. Department of Energy ("DOE") Request for Information for a Potential New Secretarial Determination Covering Down-Blending of High-Enriched Uranium to Low-Enriched Uranium ("LEU")

Dear Mr. Secretary:

We are writing to advise you of a common ground concern, which if left unaddressed, could have potentially significant negative implications for emerging U.S. advanced nuclear energy reactors given a lack of special uranium that will be used as fuel.

As you are aware, Advanced Reactors have every promise of providing enhanced efficiency, flexibility and safety while producing carbon-free electricity at lower costs than current reactor technology. This continued advancement of American nuclear energy technology – including Gen 3+, Small Modular Reactors and Advanced Reactors – is pivotal to maintaining America's market leadership globally in the $2.8 trillion market worldwide and certainly to environmental progress.

Due to the increased efficiency of advanced nuclear technologies, many Advanced Reactors will require enrichments of the U235 isotope ranging from 6% to as much as 19.75%. (20% enrichment is the threshold of highly enriched uranium ["HEU"]) as opposed to current reactors that typically require uranium enriched to approximately 5%.

Presently, there is no readily available domestic supply of civilian uranium in excess of 5%, which presents a significant challenge for the development of U.S. Advanced Reactors. While there is a potential future domestic supplier for higher enrichments of LEU, this capability will not likely be available in the private sector until the early 2020s under a best case scenario. Without a readily available domestic supply of higher enriched LEU in the U.S, it will be extremely difficult to conduct research on Advanced Reactors potentially driving American innovators overseas. In short, it is in America's economic, environmental and energy security interests to maintain a domestic supply of LEU at levels up to 19.75%.

The most cost-effective way to generate these higher enrichments of LEU in the short term is by down-blending (diluting) HEU with additional LEU. The Department of Energy's current plans

are to down-blend its excess HEU for use in commercial nuclear reactors for national security requirements or clean-up cost offsets with additional amounts earmarked for high-assay LEU to foreign and domestic research reactors or for space based nuclear powered reactors.

Completely down-blending the remaining inventory – which is projected to be fully subscribed -- would be a strategic mistake. In the interest of advancing nuclear energy technology, maintaining a small domestic strategic reserve of 19.75% LEU should be a federal priority and we urge you to consider augmenting the Secretarial Determination to this end. While we are in the process of inventorying enrichment requirements and projected needs by Advanced Reactor developers over the next five years, we believe the adverse material impact on the domestic mining, conversion, or enrichment industry will be negligible.

This action will serve to bridge a crucial gap for developers until a commercial option becomes available to produce higher enrichments. Creating a stockpile of 19.75% uranium that could form a strategic reserve of readily available higher enriched LEU will be a catalyst for facilitating U.S. Advanced Reactor technologies. This will discourage the migration of these emerging technologies offshore, and will obviate an increased dependence on China and Russia to supply these needed fuel supplies.

We appreciate that the Department's awareness of the need for this crucial fuel and exploration of potential solutions. Supporting American entrepreneurs in their mission of developing the next generation of nuclear power is an economic, strategic, and environmental imperative. We are encouraged by the Department's attention to the development of Advanced Reactor technologies and wish to reinforce the necessity of an appropriate domestic reserve of higher enriched LEU.

We appreciate your consideration of this issue in the forthcoming Secretarial Determination for the Sale or Transfer of Uranium.

Sincerely,

David Blee

David Blee
Executive Director

Copy To:
Mr. Raymond Furstenau, Associate Principal Deputy Assistant Secretary, USDOE
Ms. Cheryl Moss Herman, Office of Nuclear Energy, USDOE
Hon. Jeffrey Merrifield, Chairman, USNIC Advanced Reactors Task Force