



**U.S. House of Representatives’ Subcommittee on Energy and Power  
Hearing on Enabling Advanced Reactors and a Legislative Hearing on  
“H.R. 4979, the Advanced Nuclear Technology Development Act of 2016 and  
H.R. \_\_\_\_, Nuclear Utilization of Keynote Energy Policies Act”**

**The Honorable Jeffrey S. Merrifield Commissioner, U.S. Nuclear Regulatory Commission  
(1998-2007)  
Partner, Pillsbury Winthrop Shaw Pittman &  
Chairman, USNIC Advanced Reactors Task Force  
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Chairman Whitfield, Ranking Member Rush and members of the Subcommittee, it is indeed a pleasure to testify before a Committee that I had the opportunity to testify before on many occasions during the time I served as a Commissioner of the U.S. Nuclear Regulatory Commission (NRC). I am appearing here today in my role as Chairman of the U.S. Nuclear Infrastructure Council (NIC) Advanced Reactors Task Force, although my full time occupation is as a Partner in the nuclear energy practice group of Pillsbury Law Firm.

Before I begin my testimony, I want to make it clear that, while I am testifying on behalf of NIC, the consensus views I am presenting do not necessarily reflect the specific opinions of all of the members of NIC, nor those of the law firm on which I am a partner. Further, I would provide the disclaimer that our firm represents a diversity of nuclear suppliers and utilities, and I personally serve as outside counsel for two Advanced Reactor developers.

Today, my testimony will reflect on the Agency at which I had the pleasure of serving, the provisions in H.R. 4979 on Advanced Reactors as well as the changes to the NRC procedures that are the subject of the discussion draft offered by Congressman Kinzinger. NIC salutes the Subcommittee’s focus and support for Advanced Reactors included in H.R. 4979 as well as the NRC budget reform provisions in Section 7 that provide funding for the Agency to develop a modernized nuclear licensing framework for advanced nuclear technologies. For its part, NIC issued a Framework for Advanced Reactor Licensing Modernization White Paper on February 22, 2016, which embraces many of the elements contained in H.R. 4979 as they relate to Advanced Reactors. There are a few additional areas that the bills did not address, which we believe would further strengthen the legislation. While I will outline these areas later in my testimony, I wish to assure the Subcommittee we stand committed to work with the Committee and its staff to move forward expeditiously with H.R. 4979 as well as Congressman Adam Kinzinger’s discussion draft.

## **Status of Advanced Reactors**

Over the last several years, NIC has framed a confluence of environmental, energy security and competitiveness considerations that 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 as well as small, modular, light water nuclear reactors now headed toward deployment.

## **U.S. Nuclear Energy in Context**

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

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-led innovation driven initially by private-sector investment. Already in the U.S., there are a number of Advanced Reactors 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, research and development support, and fee-based licensing is more aligned with the past than what is needed for the future to commercialize a new generation of Advanced Reactors.

This is particularly true of the NRC licensing process, which presents one of the largest risk factors confronting private developers of Advanced Reactors. It does not easily 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 latter 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”). 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 Advanced Reactor development companies are isolated from the types of direct government 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 in the late 2020s and early 2030s, 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. Accordingly, 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 non-light water reactor design criteria as well as a NRC design review and licensing process which is consistent with H.R. 4979.

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

### **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 setting the design criteria of these advanced non-light water reactor 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 in a highly competitive marketplace. 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.

We believe the language in Section 6 of H.R. 4979 will allow the Agency to conduct the activities needed to create a modern, risk informed, technology neutral framework which will enable the development of appropriate Advanced Reactor Regulations, without passing these regulatory development costs to the existing utilities or the Advanced Reactor developers who are not in a position to bear these costs. We believe this change is consistent with the approach proposed in the NIC Framework for Advanced Reactor Licensing Modernization White Paper issued in February.

### **A Graduated Licensing Model Congruent with Graduated Private Capital Commitment**

In order to align with the staged private investment model of step-wise investment based on project de-risking, NIC believes that H.R. 4979 should be strengthened by requiring the NRC to develop a specific pre-licensing 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 licensability and identify any potentially significant issues. It features an upfront Vendor Design Review to provide an early regulatory signal 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 licensability of the design without having to wait until the end of the licensing process, which can take eight to ten years. The current NRC process lacks transparency in cost and time, requiring potentially hundreds of millions in dollars of up-front investment while strongly discouraging private capital commitment.

A 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.

While Section 6(a)(6) calls for the NRC to evaluate "options to allow applicants to use phased review processes", we believe the language should be strengthened to require the NRC to establish specific stages in the commercial Advanced Nuclear Reactor licensing process, including a pre-licensing design review that was recommended in the NIC White Paper. A clear articulation by the Commission about the areas where specific designs do and do not need additional work would enable Advanced Reactor developers and investors to have a clearer picture of where they stand in the NRC process and in meeting NRC safety requirements. In turn, this would give greater transparency about the licensability, or lack of licensability of a given design, and would provide more efficient use of Agency and developer resources.

Finally, while we support the licensing reforms undertaken in Section 6, we would emphasize the importance of the NRC in establishing risk-informed, performance criteria applicable for Advanced Reactors. While licensing process reforms are needed, Advanced Reactor technical performance criteria are critically required for developers to proceed with designs. To assist this effort, the NRC needs to finalize advanced generic design criteria, source term, emergency planning requirements, etc.

## **NRC Fee Policies and Overhead**

When I first became a Commissioner in 1998, the Agency, much as is the case today, was hearing calls that a number of nuclear reactors may shut down in the near future and Congress was "encouraging" the Agency to reduce the size of its budget and staff. Through the oversight efforts of this Committee and its Senate counterparts, the NRC was encouraged to work diligently to "right size" its staff consistent with the NRC's mission of protecting people and the environment while also increasing the efficiency of inspection and licensing activities. In 1998, the Agency had approximately 3,400 employees and within the next few years we were able to reduce that down to about 2,800 – principally through attrition.

As we know, in the early 2000s the size of the NRC began to expand, and with the subsequent events of September 11 and Fukushima, the Agency has not had the opportunity since the late 1990s to fully reassess the size of its staff or budget. I applaud the Agency for undertaking Project AIM and believe it will contribute to meaningful reductions in the size of the NRC.

That said, I understand and sympathize with the concerns previously voiced by members of this Committee regarding the size of the Agency, the decrease in efficiency of the Agency's licensing actions and a view that the overhead activities at the Agency have grown to a level which is not commensurate with the number of licensees currently under the purview of the NRC. As it relates to the size of the Agency, it is my view that this Committee is appropriately focused on further encouraging the NRC to "right size" its staffing below the level initially envisioned in Project AIM. Consistent with the activities taken by the Commission in the late 1990's, I believe that it is possible to appropriately reduce the size of the NRC, while at the same time, effectively maintaining safety, inspection activities and improving the timeliness of licensing actions.

We commend the Committee for continuing to encourage the Agency to focus on providing more timely and risk informed decision-making. Consistent with this focus, we support the provisions in Section 6 of Representative Kinzinger's discussion draft which would create specific timelines for the Agency to conduct environmental reviews, safety analysis reports and public licensing hearings. As a Commissioner, I led a task force that looked at many of these same issues, and I concur with the recommended changes that are included in the discussion draft.

Section 2 of the discussion draft, which is intended to place more fair and equitable provisions on the Agency's fee based programs, is an appropriate measure for the consideration of this Committee. As was the case when I appeared before this Committee over 15 years ago, I believe the amount of fees placed on individual licensees is not appropriate and should not cover inherent government functions and overhead. At that time, this Committee supported an increase in the ratio of fee based to non-fee based costs from 95/5 to the current level of 90/10. By eliminating the ratio, and articulating the specific areas that will be borne by general revenues, the discussion draft provides the appropriate balance between user fees, which should be borne by individual companies, and those overhead activities which are more appropriately covered by the federal government.

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 (approximately \$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.

NIC believes that the discussion draft would be strengthened by providing that the early stage engagement between an Advanced Reactor developer and the NRC should be conducted at no

or limited cost to the developer, with an appropriate cost share – perhaps 50/50 for latter stages of the licensing process. There are a variety of ways this could be funded, either through the use of general revenues or by creating a DOE grant program. However, whatever mechanism the Committee decides to utilize, it should be done in a way that avoids the DOE and NRC picking “winners and losers” within the Advanced Reactor community. In our view, the private sector, not a federal department or agency, is better placed to identify and promote innovation and the NRC licensing fees should not hinder these entrepreneurial efforts.

Further, and consistent with my earlier testimony, I believe that this Committee, and Congress, should review and reassess the amount of funding dedicated to nuclear energy research, development and deployment. Nationwide, we continue to invest huge sums of government funding toward renewable technologies. Given the enormous amounts of clean, carbon free energy provided by nuclear energy, Advanced Nuclear Reactor technologies deserve equal treatment at a minimum.

Finally, I would like to comment on a number of the other reforms that are included in Congressman Kinzinger’s discussion draft.

### **Section 3 – Foreign Ownership**

First, as it relates to the study on elimination of Foreign Licensing Restrictions of Sections 103(d) and 104(d) of the Atomic Energy Act, I would recommend that Congress simply eliminate the foreign ownership requirement as an antiquated artifact of the Cold War. When I was on the Commission during the early 2000s, I and my colleagues testified in favor of the elimination of this provision as today we live in a world in which the United States is but one of 32 countries that operate civilian nuclear reactors.

Currently, Section 103(d) contains a two-part test, the first of which prohibits the issuance of a license to an individual or company that is “owned, controlled or dominated by an alien, a foreign corporation or a foreign government.” The second test allows the Commission to prohibit issuing a license if in its view, “the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public.” In my view, as long as the second test is maintained, the blanket prohibition on foreign ownership is unnecessary, stifles innovation and is inconsistent with free trade.

### **Mandatory Hearings – Section 4**

As mentioned previously, as an NRC Commissioner, I led a task force that looked at how to make the NRC new reactor licensing process more efficient. Among the recommendations that were included in this report was a proposal to eliminate the mandatory hearing requirements related to the issuance of power reactor licenses under Part 50 and Part 52. This was based on the view that when originally promulgated, Congress required mandatory hearings because in

the early days of the Atomic Energy Commission, the AEC approved several power reactors behind closed doors with virtually no notice or public input.

Today, with the subsequent requirements of the Administrative Procedure Act and the National Environmental Policy Act, combined with the very open and inclusive public process that has been established by the NRC, stakeholders have numerous and fulsome opportunities to comment on proposed new reactors. Additionally, with the contested hearing process available to concerned individuals and groups, legitimate and legally supported safety concerns will obtain a full public hearing under existing NRC procedures, notwithstanding the elimination of the mandatory hearing requirement. Finally, in order to prepare for the current mandatory hearing process, even if uncontested, the NRC staff and the Commission spend large amounts of time and money preparing for these proceedings – costs that are ultimately borne by licensees - with virtually nothing to be gained. For these reasons, I would recommend that this Committee repeal this antiquated provision.

### **Time to Make Dramatic and Significant Changes to Modernize and Spur Innovation**

It is time to make dramatic and significant changes to reform the NRC as well as modernize the licensing process to spur innovation and enable Advanced Reactor technologies to achieve the full measure of their promise and the success that the nation needs to meet its future energy and environmental goals. This will require a sustained focus and investment of resources by the Federal government in support of private innovation and ingenuity. The return on investment will be crucial in ensuring that the U.S. maintains its technological leadership in nuclear energy so as to ensure and foster nuclear energy's contribution as a vital and carbon-free source of clean energy while providing jobs, economic competitiveness and energy security while improving our nation's environment and health.

Thank you very much for allowing me to testify today.

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*The USNIC Advanced Reactors Task Force is a project of the U.S. Nuclear Infrastructure Council ([www.usnic.org](http://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.*