Testimony of Christina Back, Ph.D.
V.P., Nuclear Technologies and Materials, General Atomics
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Chairman Barrasso and Ranking Member Carper, thank you for your invitation to appear before you today. I am pleased to discuss our perspective on NRC's approach to Accident Tolerant Fuel licensing issues.

We think it is extremely important that the NRC be prepared to license these innovative new fuels and claddings in the most timely way, while also ensuring that public safety is not undermined in the process of doing so. If we want to capture the benefits of these new technologies, and help stop the premature shutdown of existing reactors, there is literally no time to waste.

In response to the Fukushima accident of March 2011, Congress in FY12 appropriated funding for the Accident Tolerant Fuels (or ATF) program within the Department of Energy to support the development of a new breed of nuclear fuels and claddings. These were to be designed to offer significantly enhanced safety margins to avoid fuel meltdown in the low likelihood of a nuclear accident.

In the six years since then, significant progress has been achieved in the design, engineering and initial testing of several ATF concepts being developed by three separate industry teams supported by DOE. The Westinghouse-General Atomics team is one of those.

The Westinghouse-General Atomics team is pursuing a highly innovative and promising ATF technology. Not only is it designed to offer markedly enhanced safety features, it also should significantly improve the overall economics of operating the existing fleet of nuclear reactors. It will do so by creating the capability to operate at higher power and for longer periods of time, thus increasing fuel utilization, reducing waste, and making possible refueling cycles of as long as 2 years, compared to the 18 months now possible. Higher efficiency, and less maintenance down-time, mean a more economically competitive reactor.

With the financial challenges that have led to the premature shutdown of several reactors, such enhanced performance could significantly improve the economic competitiveness of the current fleet. Consequently, many utilities have been strongly supportive of the development and expeditious deployment of these advanced accident tolerant fuels.

At General Atomics we are developing the cladding material, made from a novel form of an advanced ceramic composite of silicon carbide, that will house the Westinghouse uranium-based fuel pellets.

GA has been investing in the development of this advanced silicon carbide composite material since well before the Fukushima accident. This material, which we call SiGA™, was initially developed for our innovative Energy Multiplier Module, EM^2, an advanced high temperature gas-cooled fast small modular reactor concept.

We believe the future of nuclear energy depends heavily on developing the new materials that will survive much higher temperatures, and be much less chemically reactive than those we have today. That's why we've invested significantly in silicon carbide composites that safely can withstand temperatures of 1800 degrees Celsius compared to metal claddings, such as the current zircaloy, that start to fail around 800 degrees.

I am holding an example of the rodlet that will be inserted into the Advanced Test Reactor (ATR) at the Idaho National Lab in March of next year, 6 months from now. It will undergo an irradiation test that will provide valuable data on the cladding performance in realistic reactor conditions.

Incredibly, we make our cladding tubes starting from silicon carbide thread. This process creates a kind of rebar into our material, transforming it from a brittle ceramic into an extremely fracture-tough material. Our results have been promising so far. If they hold up, we could truly revolutionize this industry.

Ultimately, the same technology can be used in advanced reactors, such as gas-cooled, or molten salt reactors. For instance, at GA, a slightly different cladding configuration would be used with uranium carbide fuel to be the fuel rod in EM^2. And molten salt reactors need materials, such as our SiGA™ ceramic composite, that will not corrode as most metals do.

Whether accident tolerant fuel, or advanced reactors, we must modernize our licensing processes before more reactors are shut down. I view the ATF licensing as a key first step toward licensing new technology advanced reactors. We must look to new and accelerated NRC activities and processes to license highly innovative fuels, and the advanced materials, **<u>without compromising the NRC's high safety standards. And we must do this quickly.</u>**

For example, GA is developing a new methodology that we call Accelerated Fuel Qualification, or AFQ^{TM} for short, which we hope will help accelerate the licensing of advanced fuels. The idea is to leverage computer modeling and simulation to reduce the amount of data needed for licensing.

Regardless of whether this methodology, or any other existing licensing path is implemented, early and sustained NRC involvement is key. Since I last appeared before this committee, I am pleased to see the recent NRC draft Project Plan for ATF. It recognizes that the past licensing path, which relies primarily on empirical data of fuel rod performance, cannot be the way of the future.

Good progress on licensing has been made for "near-term" technologies, such as coated metal claddings. But, we also have to achieve the same progress for what are called the "longer-term" technologies: these are the more innovative technologies that will require different assessments and risk-informed, performance-based regulations.

For example, a great benefit of the silicon carbide composite is the fact that it will withstand temperatures more than twice as high as those of today's metal claddings. Those claddings will fail at those higher temperatures, even if the metal is coated with materials that reduce hydrogen generation.

But our silicon carbide cladding is a ceramic, not a metal, so this revolutionary technology will be delayed until the NRC develops technical acceptance criteria. Given the premature shutdowns of existing LWRs, there simply is no time to waste. The good news is that these "longer-term" technologies may be available only 2-3 years after the "near-term" ones if the NRC moves promptly on them.

We welcome engagement with the NRC so we can assist them in fully understanding these materials quickly enough so they can develop their own validation plan for the modeling, and the data they will need, to license them in the most timely and safe fashion.

We have been using technologies in the nuclear industry that are, in many cases, in excess of 60 years old. It is time we adopt new technologies, particularly from the materials sciences, not because they would be nice to have, but because they are needed for our industry's survival. It is particularly important for the NRC and the

DOE to work closely together to introduce these new technologies into the marketplace. American industry also stands ready to cooperate with them. If we do this, we will find new ways to produce nuclear energy safely, cleanly and at much lower cost.

We hope this Committee will use its oversight and legislative powers to ensure that the NRC can, and will, continue to design the new procedures it needs to facilitate the introduction of the new technologies required to support an ever more robust nuclear power industry.

Please find the time to visit us in San Diego, I would be honored to give you a tour of our lab facilities. Seeing the actual fabrication in action will bring home to you a clear example of how ingenuity can transform the nuclear industry.

Thank you for your interest and support. I would be happy to answer any questions.