WRITTEN STATEMENT
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UNITED STATES NUCLEAR REGULATORY COMMISSION
TO THE
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
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Good morning, Chairman Barrasso, Ranking Member Carper, and distinguished members of the Committee. My name is Raymond Furstenau, and I serve as Director of Nuclear Regulatory Research at the U.S. Nuclear Regulatory Commission (NRC). I am pleased to report to you on the status of our preparations to license the safe use of accident tolerant fuel.

The NRC is an independent Federal agency established to regulate commercial nuclear power plants; research, test, and training reactors; nuclear fuel cycle facilities; and radioactive materials used in medicine, in academia, and for industrial purposes. I would like to start by highlighting the NRC's commitment to enhancing our regulatory infrastructure to facilitate the safe use of new technologies. An example of success in this area is the recent licensing of new facilities using novel technologies for the production of medical isotopes, an issue of national interest due to periodic shortages of material used in diagnostic medical procedures for millions of Americans every year.

Accident Tolerant Fuel, or ATF, is another area of new technology, which has the potential to enhance safety at U.S. nuclear power plants. ATF is a category of new fuels for nuclear reactors that are expected to perform better than currently licensed fuels under transient and accident scenarios. The fuel in use today at U.S. nuclear reactors is comprised of uranium dioxide fuel pellets, encased in a metallic cladding fabricated from a zirconium-based alloy, and has remained largely the same over the past several decades. We expect that near-term ATF designs, which are the concepts that industry is pursuing for deployment by the mid-2020s, will

have relatively small departures from today's nuclear fuel designs. These departures include specially designed additives to standard fuel pellets and robust coatings applied to the outside diameter of standard claddings intended to reduce corrosion, increase wear resistance, and reduce the production of hydrogen under high temperature (accident) conditions. Nuclear fuel designs with an iron-based alloy cladding, also offering improved corrosion resistance, will likely be submitted for NRC review shortly following these near-term designs.

In the longer term, we expect ATF concepts to be submitted for NRC review that utilize new fuel pellet materials that operate at lower temperatures than current uranium dioxide fuel pellets, and ceramic silicon carbide cladding, which offers significantly improved performance under high temperature conditions. We also expect solid-metallic fuel ATF concepts, which offer lower operating temperatures and decreased consequences of cladding breaches, to be submitted for NRC review in the years ahead.

To varying degrees, each of these ATF designs is expected to offer power plant operators more flexibility in how they operate their plants and provide more robust performance during normal operations and under potential accident conditions. Most notably, ATF designs will enhance the ability to mitigate accidents due to the additional time available to plant operators prior to the onset of potential fuel-damaging conditions. ATF designs also have the ability to reduce the amount of high-level waste produced by operating reactors by permitting extended operation of fuel assemblies in the reactor core.

While the NRC can license these new fuels under the current regulatory structure, we are taking steps to make our processes more efficient and effective. To that end, the NRC has developed a project plan to prepare for both near-term and longer-term ATF designs. We began the development of this project plan within the current regulatory framework in order to optimize

timing and resources and with the confidence that our regulations provide the appropriate starting point and flexibility to accommodate accident tolerant fuel designs. We believe the existing regulatory framework is largely compatible with the current near-term accident tolerant fuel concepts. For example, Southern Nuclear's Hatch reactor in Georgia has recently loaded a limited number of testing samples of a near-term ATF design under its current operating license and the NRC's existing regulatory framework. Consistent with our Principles of Good Regulation and based on our interactions with Southern Nuclear throughout that process, the NRC has decided to more clearly document our regulatory positions on this practice to offer enhanced regulatory stability as industry seeks to obtain operating experience with ATF designs. The industry has safely used these types of targeted programs for decades, and the NRC recognizes that fuel performance data collected in commercial reactors through this testing plays an important role in making the safety case for new fuel designs.

The NRC's ATF project plan addresses the complete fuel cycle, including consideration of fuel fabrication, fresh fuel transport, in-reactor requirements, and spent fuel storage and transportation. The plan also includes an acknowledgement of the consideration for operational flexibilities that licensees may seek based upon the additional safety margin provided by ATF designs. Throughout the development of the plan, we have had extensive engagement with our stakeholders, including licensees, nuclear fuel vendors, industry groups, non-governmental organizations, and our international counterparts.

The plan outlines a new regulatory approach to fuel licensing, in which the NRC is seeking engagement with potential ATF applicants much earlier in the research and development phase than it has in the past. This early engagement is designed to identify potential safety issues as early as possible so they can be addressed and the overall safety conclusions can be reached within the planned licensing timeline. Data sharing and engagement during the research and

development phase facilitates efficiency in the later licensing phase. The NRC will also be refining its regulatory infrastructure, informed by significant communication with our stakeholders such that transparency is maintained and regulatory expectations are clearly communicated to the applicant as early as possible in the process.

Throughout our preparations, we are monitoring the Department of Energy's (DOE's) efforts to advance the technical basis for ATF, both experimentally and computationally. We have added ATF-specific addenda to our memorandum of understanding with the DOE, which allows us to engage with the department on planned testing of accident tolerant fuel designs under normal operations and accident conditions, as well as efforts to develop and validate the appropriate data required to model accident tolerant fuel. This close coordination is allowing the NRC and DOE to make progress despite the closure of an internationally funded nuclear fuel and materials research facility, the Halden Reactor in Norway. Additionally, the NRC staff is closely following a DOE-led effort to assess and make recommendations for irradiation testing for ATF at alternate facilities such that the timeline for ATF deployment is not impacted.

The NRC and DOE staffs are also working on ways to leverage DOE's computational tools for use in reaching our safety findings for ATF designs. Based on the information we have so far, we believe that for near-term ATF concepts, it will be most efficient and effective for staff to use existing NRC computational tools, which can be modified with minimal effort and for which the staff have extensive experience and confidence. For longer-term concepts, which require greater effort to adapt existing NRC computational tools, DOE's unique and advanced modeling capabilities are being evaluated for NRC use.

In conclusion, with the issuance of the staff's ATF project plan and the heightened engagement with nuclear fuel vendors, DOE, and licensees, I believe the agency has positioned itself well to license the safe use of ATF in an efficient manner.