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Joint Minerals, Business & Economic Development Interim Committee  
68<sup>th</sup> Legislature, State of Wyoming  
Legislative Service Office  
200 W. 24th Street  
Cheyenne, Wyoming 82002

Re: Senate File No. SF0186, "Advanced nuclear reactor manufacturers-fuel storage" – SUPPORT

Dear Senators and Representatives:

I write to express my support for Senate File No. SF0186, which proposes to permit an advanced nuclear reactor manufacturing facility sited in the State of Wyoming to temporarily and safely store used fuel and other materials associated with the reactor manufacturing and refurbishment process. This bill enables innovative developers to deploy advanced nuclear reactors (ANRs) to meet growing energy demands in Wyoming and across the Nation. The proposed bill also supports new nuclear projects in the State of Wyoming, including the TerraPower project that broke ground in Kemmerer on July 24, 2024.

In full disclosure, I was retained by Radiant Industries, Inc, in July 2023 to advise the company in navigating the regulatory and licensing process (requirements, policies and practices) governed by the United States Nuclear Regulatory Commission (NRC). I am a qualified, experienced NRC inspector with 30 years of regulatory experience and possess expert knowledge of commercial reactor safety. As such, I offer this testimony as an expert witness.

### **Nuclear Energy is Safe**

As a preliminary matter, it is important to note that no fatality has been attributed to radiation exposure from commercial nuclear power generation in the US since its inception in 1958 under President Dwight D. Eisenhower's Atoms for Peace program. When I was a resident inspector at the Catawba Nuclear Station (1995-2001), I occasionally inspected the dry cask interim spent fuel storage installation (ISFSI) at the site to verify its safety and security. However, the radiological risk posed by the ISFSI was so very low that routine inspections were deemed unnecessary. The NRC's regulations ensure that used nuclear fuel can be safely and securely stored in ISFSIs until such time as a permanent repository is available to receive it.

Aside from my own personal and professional experience, a vast reservoir of documented regulatory precedence supports this bill. In its Draft Generic Environmental Impact Statement (GEIS) for Advanced Nuclear Reactors (ANRs)<sup>1</sup>, the NRC evaluated the impacts of waste storage from ANRs (like the Kaleidos microreactor being designed by Radiant), including the continued storage of spent (i.e., used) nuclear fuel.

### **Used Nuclear Fuel Storage is Safe Today**

In its evaluation of onsite used nuclear fuel and high-level waste management, the NRC staff considered the risks and impacts posed by used fuel from ANRs to be bounded by those posed by used fuel from currently operating commercial light-water reactors (LWRs):

*Because an ANR is assumed to generate less spent nuclear fuel [SNF] than currently operating reactors in the United States (i.e., due to smaller cores and longer core lifetimes), the NRC staff assumes that the impacts of onsite spent nuclear fuel management at ANR facilities would be bounded by the impacts of spent nuclear fuel storage at current nuclear power plants.<sup>2</sup>*

The NRC staff then recounted its regulatory basis for concluding that the risks associated with used fuel transportation from, and storage at, currently operating commercial LWRs are very low, and the environmental impacts are small:

*For the transportation of SNF and for public and occupational health, the staff concluded in NUREG-2157 that the radiological doses would be expected to continue to remain below the regulatory dose limits during continued storage and all of the related activities would have small environmental impacts (NRC 2014-TN4117).*

*...*

*The concerns about severe accidents within an ISFSI, whether involving at-reactor or away-from-reactor storage, were analyzed in NUREG-2157 (NRC 2014-TN4117). The lowest consequences events with any radiological release involved dropping a cask. The highest consequences were associated with an impact on the storage cask followed by a fire, such as could occur after an aircraft impact. In all cases, the staff determined the likelihood of the event would be very low and the environmental risk of an accident would be small.<sup>3</sup>*

In characterizing the risks as very low and environmental impacts as small, the NRC also considered the security of special nuclear material (SNM) stored in ISFSIs installed at currently operating reactor sites:

*An assessment of the risks that could potentially result from acts of terrorism or radiological sabotage was also provided in NUREG-2157 (NRC 2014-TN4117). The assessment was based, in part, on the analysis provided in the licensing of the Diablo Canyon ISFSI and accounted for the security and protective measures required by NRC regulations (see Section 4.19 of NUREG-2157). The staff determined that the potential for theft or diversion of LWR spent fuel from the ISFSI with the intent of using the contained SNM for nuclear explosives is not considered credible because of the following:*

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<sup>1</sup> <https://www.nrc.gov/docs/ML2122/ML21222A044.html>

<sup>2</sup> <https://www.nrc.gov/docs/ML2122/ML21222A055.pdf>, p. 3-133

<sup>3</sup> <https://www.nrc.gov/docs/ML2122/ML21222A055.pdf>, p. 3-173

- the inherent protection afforded by the massive reinforced concrete storage module and the steel storage canister;
- the unattractive form of the contained SNM, which is not readily separable from the radioactive fission products; and
- the immediate hazard posed by the high radiation levels of the spent fuel to persons not provided with radiation protection.

The staff concluded in NUREG-2157 (NRC 2014-TN4117) that for acts of terrorism, even though the environmental consequences of a successful attack could be large, the very low probability of a successful attack ensures that the environmental risk would be small for operational ISFSIs... during continued storage.<sup>4</sup>

The NRC's in-depth analysis and conclusions on the low risks and small environmental impacts of used fuel storage are authoritative.<sup>5</sup> Other more relatable stakeholders have similarly debunked misguided notions that storage of used fuel in dry casks today is somehow dangerous.<sup>6</sup> The nuclear industry's management, and NRC's oversight, of used fuel management provides two robust barriers against undetected container leakage of radioactive waste into the environment. Concerns that used fuel storage poses radiological risk to human and/or environmental harms are simply unfounded.

### **Onsite Storage of Used Fuel from ANRs is Deemed Safe**

Based on its review of nuclear fuel from ANRs, the NRC characterized the environmental impact of used fuel storage as small:

*Based on its review of the available, general information, the staff believes that ANR fuel cycles will have SMALL environmental impacts (i.e., impacts that are less than or comparable to those of current LWRs and those discussed in Table S-3), particularly for once-through fuel cycle options. The lower fuel cycle impacts are the result of improved fuel cycle technologies (reduced environmental impact), improved reactor technologies, and waste and spent fuel inventories that are not significantly different from what has been considered for LWR evaluations (e.g., as in Continued Storage Rulemaking) with respect to hazardous radionuclides.*

*An ANR applicant would have to demonstrate in its [environmental report] that the impacts of its fuel cycle fall within the values and assumptions of the [plant perimeter envelop] for the Category 1 issues above (see Section 1.4.1 of this GEIS). The NRC staff expects the ANR applicants to describe their planned fuel cycle designs, plans, and activities. The applicant's analysis needs to discuss and analyze any new processes (ones not considered in [this] GEIS) that will be part of their fuel cycle.<sup>7</sup>*

Any applicant (including Radiant) for a license to store used fuel at its facility (including a manufacturing facility) would be subject to NRC's safety and security regulations as well as some level of environmental review, which could involve categorical exclusions based on very low radiological risks and small environmental impacts.

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<sup>4</sup> <https://www.nrc.gov/docs/ML2122/ML21222A055.pdf>, p. 3-174

<sup>5</sup> <https://www.nrc.gov/waste/spent-fuel-storage.html>

<sup>6</sup> <https://www.weplanet.org/whatawaste>

<sup>7</sup> <https://www.nrc.gov/docs/ML2122/ML21222A055.pdf>, p. 3-177

In light of the passive and inherently safe design features of ANRs, and advances in ANR fuel technology, the NRC is considering alternative pathways to demonstrating compliance with existing regulations. For example, an applicant has the option of choosing an alternative to demonstrating compliance with longstanding physical security requirements intended for currently operating LWRs “provide[d] that activities involving SNM are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.”<sup>8</sup> As such, an applicant (like Radiant) may not need to rely as much on physical security as long as risk of radiological exposure and theft and diversion of SNM is demonstrably as low as NRC expects it to be.

### **Nuclear Energy is Versatile, Dense and Reliable**

In its Draft EIS for ANRs, the NRC explained that nuclear energy provides power generation and other benefits:

#### Need for Power

*The Atomic Energy Act requires the social and environmental consequences of the civilian use of nuclear materials be weighed against the benefits that their use would provide. Historically, the primary benefit of nuclear power generation projects has been to provide electrical power to the grid... ANRs may also provide power to the grid, and... some ANRs may be built for other purposes (e.g., to generate process heat, to desalinate water, or as a research and demonstration project).<sup>9</sup>*

In addition to these benefits, nuclear fuel is extremely dense (i.e., small quantities of fuel are capable of generating massive energy output)<sup>10</sup>, which translates to significantly less volumetric reserves of used fuel than other forms of energy. Nuclear also provides reliable baseload electricity. In its Draft EIS for ANRs, the NRC explained that intermittent sources of energy (i.e., wind and solar) do not meet the need for baseload generation:

#### Energy Alternatives

*A reasonable alternative must meet the purpose and need for the project [including] the purpose and need... to supply baseload power. [A]lternatives such as coal, natural gas, and mixtures of natural gas and renewable energy sources... could supply baseload power. Energy sources such as wind and solar by themselves were not considered reasonable alternatives because they could not supply baseload power.<sup>11</sup>*

In its Final EIS for the Kairos “Hermes” demonstration reactor, the NRC found:

*... the long-term benefits from implementation of the Hermes project could be substantial... with less reliance on more land-intensive energy generation processes, such as large complexes of solar photovoltaic cells or wind turbines, that require larger commitments of land and have a greater potential for aesthetic impact on landscapes and seascapes and physical injury to terrestrial or aquatic wildlife.<sup>12</sup>*

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<sup>8</sup> 10 CFR Part 53: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors, Federal Register Notice, p. 86976 (<https://www.regulations.gov/docket/NRC-2019-0062>)

<sup>9</sup> <https://www.nrc.gov/docs/ML2122/ML21222A055.pdf>, p. 1-11

<sup>10</sup> [https://energyeducation.ca/encyclopedia/Energy\\_density](https://energyeducation.ca/encyclopedia/Energy_density)

<sup>11</sup> <https://www.nrc.gov/docs/ML2122/ML21222A055.pdf>, pp. 1-12 to 1-13

<sup>12</sup> <https://www.nrc.gov/docs/ML2321/ML23214A269.pdf>, p. 5-9

## Support for Nuclear Energy is Strong

On August 4, 2024, the Pew Research Center released a report indicating that surveys of American adults show a continuing trend toward increased support for nuclear energy with 56% favoring more nuclear power plants to generate electricity.<sup>13</sup> Similarly, nuclear energy enjoys strong bipartisan support in the US Congress. The near unanimous approval of nuclear bills signed into law under the Trump<sup>14</sup> and Biden<sup>15</sup> administrations is truly remarkable in this era of divisive politics. These new mandates are intended to drive regulatory reforms necessary to enable scalable deployment of new and advanced reactor technologies for the benefit of society.

### Summary

If innovative U.S. companies like Radiant are to succeed, they must think through the nuclear fuel cycle and temporary storage of used fuel. Siting of an ISFSI is an important component of Radiant's comprehensive licensing strategy. That storage can be done safely and securely. The proposed provisions of SF0186 create a pathway for effectively securing enterprise objectives – from new reactor development to manufacturing to deployment and operation to back-end management of used fuel. The State of Wyoming is poised to support American manufacturing, create jobs for highly-skilled workers, and maintain US leadership in developing safe, clean and reliable nuclear technologies for peaceful, civilian use.

In closing, I appreciate the opportunity to testify on these matters and respectfully request that this letter of support be included in the legislative record.

Sincerely,



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<sup>13</sup> <https://www.pewresearch.org/short-reads/2024/08/05/majority-of-americans-support-more-nuclear-power-in-the-country/>

<sup>14</sup> <https://www.epw.senate.gov/public/index.cfm/2019/1/president-trump-signs-bipartisan-nuclear-energy-legislation-into-law>

<sup>15</sup> <https://www.world-nuclear-news.org/articles/president-biden-signs-advance-act-into-law>