

# SHEPHERD POWER

February 14, 2024

Robert Taylor  
Deputy Director for New Reactors  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738

**Delivered via Electronic Mail**

Dear Mr. Taylor,

On behalf of Shepherd Power, an NOV company, I would like to thank the U.S. Nuclear Regulatory Commission (“NRC”) staff for an engaging initial discussion on developing a commercially viable licensing pathway for microreactors. As we explained during our recent meeting, Shepherd Power intends to own and operate microreactors supplying clean heat and power to support our industry’s goal of reducing greenhouse gas (“GHG”) emissions. We expect initial deployments of microreactors to be operating in the field by 2030, with a sharp ramp up thereafter to several hundred.

Our industry is seeing remarkable growth in electricity demand. In the Permian Basin<sup>1</sup> alone, electrical demand is expected to jump from 4 GWe in 2022 to over 17 GWe in 2032, driven by electrification of oil and gas operations to reduce emissions.<sup>2</sup> We led an in-depth evaluation, with participation from several major oil and gas companies, that identified a substantial number of potential upstream power and heat applications that can be served by microreactors, including water treatment, hydrogen production, and enhanced carbon capture and storage. These applications were selected because microreactor present the best technical option for achieving their decarbonization, and aggregated together, imply a very large and immediate domestic market. We believe the size and importance of this opportunity to use microreactors for significant decarbonization cannot be overstated.

Microreactors will be able to play a significant role in lowering emissions in difficult to abate industries, *but only if they can be licensed and deployed in a manner that meets commercial needs*—that is, quickly, cost-competitively, efficiently, and at the volume necessary to meet both demand and decarbonization

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<sup>1</sup> The Permian Basin is an oil-and-gas-producing area located in West Texas and southeastern New Mexico.

<sup>2</sup> S&P Global, Commodity Insights, “Electrifying the Permian Basin” (Mar. 22, 2023) at p.18, available at <https://www.ercot.com/files/docs/2023/03/17/Presentation%20to%20ERCOT%20planning.pdf>.



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objectives. If this commercially viable licensing pathway cannot be demonstrated, the industry will pursue other alternatives, none of which are as well-suited to meet their decarbonization objectives and projected increase in energy use. Importantly, from a timing perspective, many companies in the our industry have ambitions to achieve net zero emissions targets by the middle of this century, with ambitious interim goals. These companies are now faced with *substantial investment decisions in the coming months and years to address these challenges*. The impact of this endeavor is significant. We are therefore at a critical point where the industry and regulator need to de-risk a path forward, within the year, that meets both commercial needs for affordable, quickly deployed clean energy *and* the regulator's oversight responsibilities. Success is instrumental not only for the oil and gas industry, but for a wide range of customers interested in deploying manufactured nuclear reactors to support U.S. economic development, innovation, competitiveness, energy security, and clean energy.

We appreciate that to achieve these goals, both the commercial sector and NRC will need to think innovatively about how to enable this deployment. We are ready to do that. After our recent meeting, we are optimistic that the NRC staff is prepared to do that too.

We provide additional information below about our company, near-term goals, and initial thinking on regulatory considerations for further discussions with the NRC staff. We look forward to continuing our dialogue and engagement to support the development of this regulatory pathway.

## A. Company Overview and Purpose

Shepherd Power is a newly established business under NOV, a global leader in manufacturing and delivering engineered equipment and technology solutions to upstream oil and gas, renewables, and other heavy industry sectors of the global economy. NOV partners with companies to design technologies that improve efficiency, safety, and sustainability across the entire value chain and has over 100 manufacturing facilities across the globe, deploying some of the largest and most complex equipment used in the industry today.<sup>3</sup>

Based on customer feedback, and our experience as a trusted manufacturer and supplier for the oil and gas industry, Shepherd Power was formed to develop and deploy microreactors to support the dispatchable power needs and decarbonization efforts of our industry. We believe our efforts have the potential to transform the energy industry at large. Our goal is to partner with a reactor developer, secure commitments from offtakers, build the supply chain infrastructure to construct a fleet of microreactors that we would own and operate, and deliver emissions-free baseload power and heat to our industrial customers.

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<sup>3</sup> For further information, please see NOV's website, available at [www.nov.com](http://www.nov.com).



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## B. The Challenge to Lower Emissions and Meet Growing Energy Demand

Our industry has set ambitious targets to reduce GHG emissions and is looking at a range of technologies to achieve those targets. It has identified that nuclear energy can play a unique role in these efforts due to its ability to provide safe, scalable, and clean power and process heat. Microreactors present a particularly promising solution for their ability to operate reliably in remote locations without requiring connection to the grid, while providing 100% emissions-free power.

## C. Enabling a Commercially Viable Licensing Path for Microreactors in the Near Term

To meet the timeline necessary for facilitating the operation of the initial fleet of microreactors by 2030, followed by a swift and substantial scale-up, several critical decisions must be made. One of the most important of these is whether a regulatory path forward exists that aligns with our customers' decarbonization goals and energy needs. For us to move forward, our customers need to know that microreactors can be expeditiously deployed to identified sites with efficient licensing approval timelines and costs. Microreactor licensing is therefore key to determining the commercial viability of this technology in the sector.

We intend to use a manufacturing license framework to build a substantial number of units. The microreactors will be factory made and ready for deployment and immediate operations. **For the markets we aim to serve, a commercially viable microreactor licensing path is one that takes no more than 180 days from the date a precise location is identified for a microreactor to the time it is deployed and operating. Moreover, the overall licensing and ongoing oversight costs need to be less than 1% of the total cost of manufacture and operations.** Given the enhanced safety profile of microreactors, and their factory manufacturing under an NRC license, we envision that the NRC should be able to review a bounding plant parameter envelope to evaluate safety and environmental matters, issue a manufacturing license that also potentially encompasses other required authorizations, such as a license to operate.

We believe in a licensing process that reflects the fundamentally lower risks associated with microreactors (e.g., small source terms, the use of accident tolerant fuels, inherent and passive safety features, etc.), without compromising safety and environmental reviews. We believe that there is a path forward using the manufacturing licensing process and innovative regulatory tools to enable the NRC to meet its oversight responsibilities under the Atomic Energy Act.

Shepherd Power is grateful for the efforts of both the staff and the Commission in exploring how microreactors and other advanced reactor technologies might be licensed through the existing regulatory frameworks for new power reactors, as well as through new pathways being developed. We



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are also highly encouraged by the staff's and the Commission's numerous forward-looking approaches, as demonstrated in various white papers, public presentations, and guidance documents.<sup>4</sup> These efforts outline specific policy strategies for licensing microreactors that promise to significantly enhance regulatory efficiency without compromising the safety and environmental goals of the Commission. Importantly, the staff recognizes that “[a] key aspect of factory-fabricated micro-reactor deployment models is the ability to move a factory-fabricated module from the factory to the deployment site and place it into operation as a nuclear power plant in a much shorter time...” and that “[f]actory-fabricated micro-reactors that are of a ‘self-contained’ design ... would likely require only simple construction activities at the deployment site (e.g., pouring a small concrete pad on which to place the container housing the reactor).”<sup>5</sup> Moreover, the staff further recognizes that “[d]evelopers have suggested that self-contained micro-reactors might be ready for operation within *days to weeks* of beginning construction at the deployment site.”<sup>6</sup>

We also appreciate that we serve a unique role as an intended near-term applicant looking to manufacture and deploy microreactors, similar to those used at universities for R&D, in a novel way. We are eager to collaborate with you on establishing a path that satisfies both commercial imperatives and the NRC's regulatory responsibilities.

Following our January meeting, we wish to further discuss some of the concepts introduced by the Commission and staff, including the issues we have been evaluating as part of our review of regulatory matters, such as:

- Shifting the bulk of the NRC reactor licensing process into the manufacturing license (including potentially combining with other licensing authorities, as necessary), to ensure an upfront NRC licensing review of the microreactor such that site-specific deployment within the boundaries of the manufacturing license can be accomplished quickly and efficiently.
- Developing a supplement to the Advanced Nuclear Reactor Generic Environmental Impact Statement, specific for microreactor deployment to generically disposition additional categories with little to no anticipated impact on the environment.

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<sup>4</sup> See, e.g., SECY-24-0008, NRC Policy Issue (Notation Vote), “Micro-reactor Licensing and Deployment Considerations” (Jan. 24, 2024) (ML23207A250) and enclosure, “Technical, Licensing, and Policy Considerations for Factory-Fabricated Micro-Reactors” (ML23207A251) (“SECY-24-0008, Enclosure”); SECY-20-0093, NRC Policy Issue (Information), “Policy and Licensing Considerations Related to Micro-Reactors” (Oct. 6, 2020) (ML20129J985) and associated enclosures; “NRC Staff Prepared White Paper - ‘Micro-Reactor Licensing and Deployment Considerations: Fuel Loading and Operational Testing at a Factory – Released to Support ACRS Interaction’” (Sept. 27, 2023) (ML23264A802) and enclosure, “Fuel Loading and Operational Testing at a Factory – Released to Support ACRS Interaction” (ML23264A803); NRC White Paper, “Micro-reactors Licensing Strategies” (Sept. 2021) (ML21235A418).

<sup>5</sup> SECY-24-0008, Enclosure at 1.

<sup>6</sup> Id. (emphasis added).



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- Evaluating the use of remote and autonomous operations for microreactors as discussed in SECY-20-0093.
- Identifying licensing activities that support a “nuclear island” model that ensures reactor safety while allowing for configurable downstream applications.
- Coordinating efforts with the Canadian Nuclear Safety Commission, in accordance with signed Memorandum of Cooperation,<sup>7</sup> to enable a similar licensing and deployment profile for operating in Canada.

These are some of the initial licensing actions that Shepherd Power has been evaluating, as we look forward to fully developing a licensing path, informed by our selected technology, in future discussions with the NRC staff.

Thank you again for the innovative spirit that you brought to our initial meeting, and we look forward to continued engagement moving forward.

If you have any questions, please do not hesitate to contact me.

Sincerely,

DocuSigned by:  
*Timothy Williamson*  
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Tim Williamson  
Director, Regulatory & Public Affairs  
Shepherd Power, an NOV Company

CC Chair Hansen  
Commissioner Caputo  
Commission Wright  
Commissioner Crowell  
Raymond V. Furstenuau, Acting Executive Director of Operations  
Andrea Vale, Director, Office of Nuclear Reactor Regulation

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<sup>7</sup> “Memorandum of Cooperation on Advanced Reactor and Small Modular Reactor Technologies between the United States Nuclear Regulatory Commission and the Canadian Nuclear Safety Commission” (Aug. 15, 2019), available at <https://www.nrc.gov/docs/ML1927/ML19275D578.pdf>.

