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Energy Subcommittee
The Future of Nuclear Energy

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Thank you Chairman Lummis, Ranking Member Swalwell, and members of the Committee. I greatly appreciate the opportunity to be here and talk with you today about the future of nuclear energy, the regulatory challenges for private investment and development of new reactor concepts in the United States, and the best ways for our country to retain its superiority in nuclear reactor technology. It's a pleasure to be here, and truly an honor.

I am the co-founder and CEO of Transatomic Power, a nuclear reactor design startup based in Cambridge, Massachusetts. We're developing a new type of nuclear reactor that can run entirely on nuclear waste. It consumes the waste, reducing its radioactive lifetime while generating enormous amounts of electricity.

In addition to Transatomic, there's a flourishing of other advanced nuclear reactor designs in this country – coming from industry, academia, and national laboratories – that can safely produce enormous amounts of carbon-free electricity with minimal waste.

This new nuclear technology has a great deal of potential to help the country, but only if we can find a way to develop and commercialize it. Currently, the largest barriers are the following: (1) the lack of a clear regulatory pathway for advanced reactor development in the United States, and (2) lack of facilities for prototyping advanced reactor designs. We need to develop solutions to these problems if we want to take advantage of the immense benefits of advanced reactors in the United States. I'll speak first about the regulatory pathway.

<u>Regulatory Pathway</u>

The commercial nuclear regulatory structure in the United States is currently set up only for light water reactors, 100 of which are operating in this country. The regulatory system works well for light water reactors, but it needs to be broadened to successfully encompass advanced reactors as well, so that the U.S. can start taking advantage of the benefits of these new designs. Right now, there is no viable pathway for bringing advanced nuclear reactor designs beyond laboratory-scale development.

Informal estimates discussed at a recent advanced reactor meeting in Washington, D.C. suggest that it would take approximately 20 years – at a minimum – before such a regulatory pathway would be available in the United States. This is a major delay. Furthermore, there's a great deal of uncertainty in

how much regulatory approval will cost the company commercializing the design. Estimates for licensing just a prototype facility through the Nuclear Regulatory Commission range from $200 million to $500 million. A commercial license would cost significantly more, and there are no good estimates for what the commercial licensing cost would be for an advanced reactor.

This high cost and long timeline – and furthermore, the uncertainty in the estimates of cost and timeline – effectively blocks large-scale private investment in new nuclear reactor designs. Investors of course won't put their money into a project without good numbers for how long it will take and how much it will cost.

The current system incentivizes reactor designers to develop their first products outside of the US. In fact, this has already happened: some existing nuclear reactor design companies are planning on building their first power plants overseas – in Canada, China, or the Philippines – because they do not think it will be possible to build an advanced reactor in the US under the current regulatory system.

Talking with other advanced reactor developers in the US, we all want to be able to build our reactors this country, and license them under the NRC – NRC licensing is known as the gold standard worldwide. We'd like to find a way to adapt the system so that the NRC's high standards can be used to regulate advanced reactors as well. A good path forward would be to move to a set of technology-agnostic guidelines based on functional criteria, such as maximum radiation at the site boundary during an accident. A similar set of functional regulations were recently adopted in Canada to govern their reactor licensing processes, and is driving significant advanced reactor progress in that country. Ideally, these guidelines could be developed in a coordinated effort by the Nuclear Regulatory Commission and the Department of Energy, to effectively combine the NRC's licensing experience and the DOE's advanced reactor experience.

Test-Bed Facility

Regulatory issues are closely tied to the ability to build prototype nuclear reactors. Data from an operating prototype reactor is necessary to get a reactor licensed. Regulatory approval is necessary to build a prototype facility. Even though there are a specific subset of the NRC regulations addressing prototype facilities, there are very few data points for using these regulations for advanced nuclear reactors, and, as mentioned previously, there is a great deal of uncertainty in the cost and timeline for licensing a demonstration-scale facility. It's a chicken and egg problem that is effectively blocking new reactor development.

A clear way to solve this problem would be to establish a national test-bed facility to make it easier to build demonstration-scale advanced reactors in the US. This solution would require clarifying the existing rules that say it is possible to build and operate demo-scale advanced reactors at national laboratory sites under the auspices of DOE without requiring an explicit license from the NRC.

Under such a system, it would be possible to build a demonstration-scale reactor – not a facility that produces electric power, but simply a facility demonstrating the nuclear components of the system – at a national lab, such as the Idaho National Lab, under the auspices of DOE. NRC staffers could potentially

be stationed at the site, so that they could observe the construction and operation of the facility. As they do this, the NRC staffers would be building up the necessary expertise to license commercial-scale plants in the future.

Such a plan would require only clarification of the existing regulations, and it would make a universe of difference for advanced reactor designers. It could significantly reduce the cost and timeline of licensing an advanced reactor and give greater certainty to these numbers, making it much more straightforward to raise private capital to fund them. In turn, the operating prototype facility would produce the mechanical, materials, and neutronics data necessary to license a commercial-scale facility under NRC guidelines.

Developing a better regulatory pathway for advanced nuclear reactor is vital for this country. The United States currently has the best nuclear technology in the world, but I worry that will not always be the case, especially if the most advanced reactor technology is forced to go overseas to be prototyped, licensed, and commercialized. A regulatory pathway for advanced reactors, coupled with the ability to more readily demonstrate reactor prototypes at national laboratories, will enable greater private investment in the suite of new nuclear reactor design currently being developed in this country, and allow the US to retain the extraordinary benefits of this new nuclear technology. Thank you very much. I'm very glad to have had the opportunity to testify here today, and I'm looking forward to answering your questions.