Jose's Testimony– NuScale Part 1: Nuclear Technology Today

Chair Vega Pederson, members of the committee, my name is Jose Reyes. I am the Chief Technology Officer and co-founder of NuScale Power LLC, located in Corvallis, Oregon.

I am here today to testify in favor of House Bill 3445 and to share with the committee information regarding the state-of-the-art in nuclear power generation.

It is time to reconsider nuclear power in Oregon. Nuclear power technology and operations have changed tremendously since the time that the Trojan Nuclear Power Plant was designed and constructed more than 40 years ago. Nuclear plants in the 1970s were still evolving rapidly and were plagued by persistent engineering issues that translated to the generally poor performance of many plants and yielded an overall capacity factor of roughly 50% for the national nuclear fleet. Today, the average capacity factor for the US nuclear fleet consistently exceeds 90%--the highest of any electricity generating source. Nuclear plants also have an impeccable safety record surpassing virtually all other industrial sectors. And of special importance today, nuclear plants produce abundant energy, on demand, with no greenhouse gas emissions.

The new AP-1000 reactor units being built in Georgia and South Carolina represent a new class of designs that evolved during the 1990s and makes significant use of what we call "passive safety systems." Passive safety systems use fundamental laws of nature to operate rather than relying on human actions and electrical power. This approach adds resilience to the plant because the natural forces such as gravity and heat conduction are always present, even during abnormal and unexpected events. With increased use of passive systems also comes plant simplification, which has the added advantages of improving plant reliability and economics.

I am especially excited to share with you an even newer class of reactor designs, referred to as "small modular reactors," or SMRs for short. There is now substantial interest in SMRs throughout the world. One of the leading global designs was born out of Oregon State University and is being commercialized by NuScale Power in Corvallis. I was personally responsible for the research project that conceived of the NuScale SMR concept 15 years ago, which was premised on achieving an unparalleled level of safety and resilience in a nuclear power plant. I serve as Chief Technology Officer of this rapidly expanding company that now employs over 500 engineers and supporting staff.

The key to the NuScale SMR technology is design simplicity—the kind of simplicity that can only be achieved through the use of small reactor modules. By breaking up the enormous power contained in a large reactor into many smaller units, it is possible to incorporate design features that ensure removal of excess heat from a shutdown reactor under virtually any conceivable situation. We do this by designing each reactor module as basically a large thermos bottle operated below ground and immersed in a large pool of cooling water. We also take maximum advantage of passive circulation. In fact, our reactor is cooled using gravity-driven, natural circulation of the coolant even during full power operation. The result is a highly simplified design with extraordinary robustness. We believe that our plant can survive even extreme events, such as the event that damaged the Fukushima plants in Japan, for an unlimited period of time without requiring any operator action, without providing electricity to the plant, and without providing any makeup cooling water. We call this the "triple crown" of nuclear plant safety.

In addition to adding exceptional safety to nuclear power, our small modular reactor adds affordability and scalability to an industry that has become dominated by extremely large and capital intensive plants. In contrast, a first-of-a-kind NuScale plant will cost roughly $5000/kw of installed capacity for a 12 module plant and will become even more affordable with mass production of modules. The multi-module nature of our plant allows utilities to scale the plant output according to the electrical demand.

Another innovation enabled by the small module size is that the modules can be fully fabricated in a factory rather than “stick built” on the plant site. This improves the quality and reduces the cost of the fabrication while increasing schedule certainty. At the same time, the NuScale design is based on light-water reactor technology, for which there is enormous engineering and operational experience worldwide. This broad experience and the extensive testing that we are conducting provides a high level of confidence that even the first NuScale plants will perform safely and reliably.

Last October, the Utah Associated Municipal Power Systems announced their intent to build the first NuScale plant in Idaho and are proceeding with efforts to secure a construction and operating license. They are excited about the NuScale design because of its high level of safety and also because of the scalable nature of the plant, which facilitates direct replacement of their retiring coal plants. Also, design features of the NuScale modules allow for flexible power operations in order to integrate with variable-output wind generation in their service area. We recently completed a study with UAMPS and Energy Northwest to demonstrate the synergistic integration of the Idaho NuScale plant with the Horse Butte wind farm near Idaho Falls.

The small, multi-module nature of the NuScale plant provides the flexibilities to integrate not only with renewable sources, but also integration with process heat applications such as water desalination, oil refining, and coal repurposing processes. We have conducted a number of studies in collaboration with specialists in those fields to evaluate the coupling of our plant with those applications and would be pleased to provide those papers to the committee if desired.

In summary, the NuScale design is not your father’s nuclear power plant. It incorporates four decades of experience in the engineering, construction, and operations of nuclear power. It also brings a new level of innovation to the nuclear industry to achieve unparalleled safety, affordability, and flexibility to nuclear power. And best of all, it was invented right here in the beautiful state of Oregon.

House Bill 3445 is a major step forward in helping to define a clean and reliable energy future for our state and we stand ready to support you in your efforts.

We have submitted written comments as well that contain more detail and illustrations of the points summarized here. Thank you for the opportunity to testify before you today. I would be happy to answer any questions.