Statement of Edwin S. Lyman, PhD
Director of Nuclear Power Safety
Union of Concerned Scientists
September 2, 2020

Good afternoon. Today I would like to discuss some of my concerns related to the safety and security of the NuScale small modular reactor design and the problematic way in which the Nuclear Regulatory Commission (NRC) has dealt with emerging safety issues.

The Union of Concerned Scientists is neither pro- nor anti-nuclear power, and we don't have a position on the UAMPS NuScale proposal per se. However, we believe that if new nuclear plants are built, they should have clear and significant safety improvements compared to the current generation—that is, the one that brought the world Fukushima. We also believe that the NRC should license and regulate new nuclear reactors in a manner than ensures the risks they pose to public health and safety will be substantially lower than the risks of today's plants. Unfortunately, by those standards, I think that both the NuScale design and the NRC's approach to licensing it deserve failing grades.

NuScale has built a public relations campaign around the idea that its reactor achieves a "paradigm shift" in nuclear power safety and that it "safety shuts down and self-cools, indefinitely, with no operator action …," as stated on its web site. Although there was reason to be skeptical about these claims from the outset, we now know, after revelations of fundamental design flaws that have come to light only in the last few months, that they are extremely misleading and possibly false.

Compare NuScale's claim with the following conclusion of Dr. Shanlai Lu, a senior nuclear engineer in the Office of Nuclear Reactor Regulation at the NRC, in a July 6, 2020 report entitled "Evaluation of NuScale Post ECCS [Emergency Core Cooling System] Actuation Boron Dilution Events":

> "It is the author's view that the [NuScale] reactor could reach fuel failure and prompt criticality condition for a wide range of initial conditions. … Based on event analysis and the identified modeling deficiencies, the author believes that the NuScale reactor will most likely experience core damage … even in the case without operator actions ….additional design changes are needed from NuScale to avoid … catastrophic core damage … and improve the safety margin."

To translate, "prompt criticality" means that the shutdown reactor could not only start operating again but also experience a rapid power increase. This is pretty much the exact opposite of passive safety. Although this event wouldn't be as bad as the power excursion that blew the Chernobyl reactor apart, Dr. Lu does conclude that the outcome could be "catastrophic."

Dr. Lu wrote this report to support his dissent (known as a non-concurrence) from the NRC staff's decision to approve NuScale's Final Safety Analysis Report (FSAR)—a significant milestone in NRC certification of the design. And he isn't alone. Members of the NRC's independent advisory committee have expressed similar concerns. Yet despite the serious nature of Dr. Lu's objections, the NRC staff overrode them and approved the NuScale FSAR on August 28. Dr. Lu continues to non-concur with this decision.

The dangers to the public posed by the NuScale reactor that Dr. Lu highlighted are compounded by the fact that NuScale has sought a large number of exemptions from the NRC's safety rules and standards, justifying most of them with the assertion that the design is so much safer than current reactors that it doesn't have to play by the same rules—and the NRC for the most part is going along.

For example, NuScale says that the containment of its reactor doesn't need to meet the same standards as current reactors. It argues that a 12-unit plant with a single control room can be run safely with the same number of operators as the NRC currently requires for a 3-unit plant. And perhaps most irresponsibly, NuScale claims that its reactor would not require any off-site radiological emergency planning to protect the public in the event of an accident. These exemptions may be critical for NuScale's business case because they enable reductions in the reactor's capital and operating costs. Needless to say, however, if the design turns out to be not as safe as NuScale claims, then the technical basis for many of these exemptions will be called into question.

The main problem with NuScale's approach is that it violates the fundamental safety philosophy of "defense-in-depth"—that is, nuclear reactors should have multiple independent layers of safety in case that something happens that was not expected to happen. It makes no sense to reduce defense-in-depth because of overconfidence about the inherent safety of a design that has not yet been built, tested, and operated. Customers considering buying a NuScale plant, either at home or abroad, should not trust the NRC's design certification process as a guarantee of the reactor's safety and security. They need to take a hard look under the hood themselves.

Thank you. I'll be happy to take any questions.