NuScale SMR Design Certification

NuScale Power, LLC (NuScale), a company headquartered in Portland, Oregon, is the first company in the United States to develop a design for Small Modular Nuclear Reactor (SMR) that is under review by the Nuclear Regulatory Commission (NRC). NuScale submitted a Design Certification Application (DCA) in December 2016. NuScale has received Department of Energy (DOE) funding and anticipates siting of their reactors at Idaho National Lab, other western states, and internationally.

Before the DCA submission, NuScale held numerous pre-application meetings with the NRC and submitted Topical Reports on various aspects of the design. NuScale submitted Revisions to the DCA in 2017, 2018, and 2019 and numerous responses to NRC requests for additional information (RAIs). The NRC has held over 160 meetings with NuScale to discuss the DCA.

The NuScale design under review by the NRC is for a 12-module reactor that would place the modules underground in a flooded containment, which will also house the irradiated fuel that is removed from the modules for cooling and storage. The system will rely on passive cooling, with no reliance on an outside power source during the first 72 hours of a reactor shut down. This is a first-of-a-kind design with new challenges. It is not at all as “simple” as NuScale would lead people to believe.

The Advisory Committee on Reactor Safeguards (ACRS) and its NuScale Subcommittee are reviewing the DCA and NRC staff’s documentation of their DCA review. The ACRS submits its findings in reports to the NRC Commission. The reports and meeting transcripts are publicly available.

The NRC anticipates the approval of the NuScale DCA in 2020 and the commence the Rulemaking process, which includes an opportunity for public comment. Once approved, an application for the construction and operation of a NuScale design reactor can reference the DCA Rule.

Power Output

According to the DCA, each module is rated at 160 megawatt thermal (MWt) (1,920 MWt, total) and approximately 50 megawatt energy (MWe) (600 MWe, total) output. Considering house loads, the total net output is approximately 570 MWe for a 12-module facility. NuScale now plans to gain NRC approval of a power output increase through the NRC Standard Design Approval process.
NuScale plans to use the NRC Design Approval (SDA) application and review process to update their SMR design. NuScale anticipates a power uprate (to 200 MWt per module), cost optimization, and other changes. NuScale held a pre-application meeting with the NRC on September 25, 2019, to discuss NuScale’s “Standard Design Approval Regulatory Strategy Overview.”

During the past year NuScale and the Utah Associated Municipal Power Systems (UAMPS), the utility that plans to site a NuScale design SMR at Idaho National Lab, have been stating that the SMR module could produce 60 MWe (720 MWe, total). It was unclear how NuScale would gain approval of the power uprate, until they started discussions with the NRC about the submittal of an SDA. It is still unclear what design changes will be relied upon to increase the reactor power. It appears that NuScale is looking into new fuel designs.

Dockets:
NuScale DCA Pre-application documents: Docket No. PROJ0769
NuScale DCA: Docket No. 05200048
NuScale SDA pre-application documents: Docket No. 99902078

Links:
NuScale: https://www.nuscalepower.com/
NRC DCA Review: https://www.nrc.gov/reactors/new-reactors/design-cert/nuscale.html
NRC ADAMS System: https://adams.nrc.gov/wba/
NRC Meeting Schedule: https://www.nrc.gov/pmns/mtg
ACRS Meeting Schedule and Meeting Transcripts: https://www.nrc.gov/reading-rm/doc-collections/acrs/agenda/
"Standard Design Approval Regulatory Strategy Overview” (15 MB) (NRC Accession No. ML19254A792, Docket No. 99902078)
https://uraniumwatch.org/NuScaleSDA/NS_SDA_overview_slides_090619.pdf
UAMPS: https://www.uamps.com/

NuScale Misleading Information

1. “Carbon Free Power”: NuScale, UAMPS, and the DOE claim that NuScale will be a “Carbon Free Power Project.” Conveniently, they leave out the carbon emissions associated with the fabrication and construction of the reactor, the long term safe storage of the irradiated fuel on-site, transportation of the fuel to a permanent repository, transportation of low and high level waste and the dismantled reactor to a disposal site, and other aspects of the construction, operation, and dismantling of a nuclear reactor. They neglect to mention the carbon emissions associated with uranium mining and milling, uranium conversion and enrichment, and fuel fabrication.

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It is ridiculous to claim that nuclear power is “Carbon Free,” yet that is becoming the mantra of the global nuclear industry.

2. “Clean as wind and solar”: NuScale claims that their SMR is as “clean as wind and solar.” NuScale neglects the radioactive and non-radioactive releases to the atmosphere from the reactor complex during normal operations and the potential for highly radioactive releases during unplanned releases and accidents. They neglect to mention the potential release of contaminated water during reactor operation. NuScale does not discuss the hazards associated with the indefinite storage of the irradiated fuel on-site, nor the potential for accidents during the transport of irradiated fuel in inadequately designed and fabricated canisters and casks to a permanent repository.

3. Cost of Energy: Thus far, there are no firm numbers associated with the costs of the licensing, construction, operation, and reclamation of this first-of-a-kind reactor design. NuScale has made claims about the levelized cost of energy for the first 12-module reactor, but that is only an average over the life of the reactor. There is no information on how much a UAMPS members will be required to pay each month throughout the life of the reactor for construction, operation, reclamation, interest on the necessary bonds and loans, and other costs.

DOE Support

The US DOE has provided NuScale with over $226 million in grants for the development and certification of their SMR design. The DOE awarded a $33.2 million cost share award to NuScale for site selection, characterization and the preparation of a combined construction and operating license application (COLA), to be developed by UAMPS. The DOE is also providing funding for a NuScale reactor plant simulator at each of Oregon State University, Texas A&M University-College Station and the University of Idaho.

Looking Forward

- Deployment of NuScale SMRs will not affect climate change.
- The NuScale SMR will produce more irradiated fuel per megawatt than conventional reactors. Continued production of this waste is irresponsible.
- There is no permanent repository for irradiated nuclear fuel in the US, and none anticipated in the near future. There is little guarantee that such a repository, or repositories, with be available at the end of the life of the proposed NuScale reactor.
- The first-of-a-kind NuScale design has inherent risks and high costs.
- The NuScale design has the same hazards that are associated with the operation and accident potential as conventional reactors.
- Reduction of emergency planning zones and local emergency plans are opposed by the Federal Emergency Management Agency and are unacceptable.