April 24, 2009

MEMORANDUM TO: William D. Reckley, Branch Chief
Project Management and Technical Review Branch
Advanced Reactor Program
Office of New Reactors

FROM: Thomas J. Kenyon, Senior Project Manager ***/RA/***
Project Management and Technical Review Branch
Advanced Reactor Program
Office of New Reactors

SUBJECT: SUMMARY OF PRE-APPLICATION MEETING WITH NUSCALE POWER INC. TO DISCUSS DIGITAL INSTRUMENTATION AND CONTROLS DESIGN, HUMAN FACTORS, AND REFUELING PLANS FOR THE NUSCALE REACTOR DESIGN

On April 2, 2009, staff from the U.S. Nuclear Regulatory Commission (NRC) met with representatives from NuScale Power, Inc. (NuScale) to discuss the digital instrumentation and controls (I&C) design, human factors, and refueling plans for the NuScale reactor design. Enclosures 1 and 2 are the meeting agendas followed during the meeting and attendees, respectively.

The meeting opened with a brief presentation on the NuScale Power reactor design. In its letter dated March 17, 2009, NuScale submitted both non-proprietary and proprietary versions of a white paper on refueling and the slide presentations to support this meeting. Non-proprietary versions of NuScale's slide presentations can be obtained from the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. They are also available electronically from the Public Electronic Reading Room found on the Internet at the following web address: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents in the Publicly Available Records (PARS) component of ADAMS. The ADAMS accession numbers for the non-proprietary versions of the white paper on refueling and slide presentations are ML090850080, ML090850082, ML090850079, and ML090850077. The non-publicly available proprietary white paper on refueling and proprietary slide presentations can be found at ML090850081 and ML090850088.

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NuScale stated that the NuScale Power reactor is a small light-water reactor in which each reactor module employs natural circulation to develop the heat source for producing about 40 MWe using a turbine-generator for each module. The design consists of a self-contained assembly with the reactor core and steam generators located in a common containment vessel that is immersed in a large pool of water. The pool could be designed to accommodate multiple power generating modules (the example shown in NuScale's slide presentation was for 12 modules, but that number can be expanded or reduced). The pre-applicant then briefly described other unique features of the facility, such as a 72-hour capacity in the pool to handle the decay heat of a single module without boiling.

NuScale then discussed the human factors and control room design issues. Although NuScale believes that their design complies with most of the regulatory review guidance of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," March 2007, and NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, February 2004, the pre-applicant indicated that there were areas of deviation that resulted from their proposed multi-unit operation. The pre-applicant stated that they envisioned that a 12 module facility would operate with three control clusters consisting of four modules in each cluster justified, in part, by the stable operation of each module. The designer then discussed potential exemptions (and associated supporting bases) from current NRC regulations. NuScale then discussed its conceptual digital I&C system, diversity and independence issues with the design, and issues raised by the multi-module operation of the facility. The staff discussed its concerns with a complete load-rejection during which all modules would be affected, overall load balancing, and potential common-cause failure of the battery system.

NuScale then discussed the unique refueling process for their facility. The designer expected to employ a 24-month refueling cycle, taking about 14 days to conduct the refueling operations. Although the owner-operator would determine the refueling schedule of the facility, NuScale expected that refueling of the different modules would be staggered so refueling operations would have the least impact during critical periods. NuScale then provided a step-by-step description of the refueling process, as follows: After the module is shut down, the primary system will be borated and cooled using steam generators. The containment will be flooded and the decay heat removal system will be placed into service. Then the bio-shield will be removed and the module will be moved to the dedicated refueling area of the pool. NuScale described how the module would be refueled, and then returned to its operating location and reassembled, following the reverse procedure of disassembly. The designer indicated that they intended to use a dedicated refueling panel in the control room.

At the close of the meeting, it was agreed that additional interactions between NuScale and the NRC may be appropriate to discuss questions arising from the pre-applicant's evaluation efforts. Potential future discussions that were identified during the meeting included discussions on the results of the NuScale's human factors and digital I&C evaluations.

Enclosures:
As stated

Project No. 0769

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Revised Meeting Agenda
Closed Pre-Application Meeting on Refueling,
Digital I&C, and Human Factors Issues
NuScale Reactor Design

Thursday, April 2, 2009
8:30 a.m. – 12:00 p.m.
NRC Headquarters (Room T-08 A01)

TIME	**TOPIC**	**LEAD**
8:30 – 8:40 a.m.	Introduction and opening remarks	NRC/NuScale
8:40 – 8:50 a.m.	Introduction to NuScale Design	NuScale
8:50 – 9:45 a.m.	Human Factors & Control Room Issues - Control Room Deign - Operator Staffing - Potential Exemptions	NuScale
9:45 – 10:15 a.m.	I&C Design Overview	NuScale
10:15 – 10:30 a.m.	Break	
10:30 – 11:45 a.m.	NuScale Module Refueling - Sequence of Events - Unique Challenges - Facility Design	NuScale
11:45 – 12:00 pm	Closing Statements	NRC/NuScale
12:00 p.m.		Adjourn

Enclosure 1

Meeting Attendees
Pre-Application Meeting on Codes
NuScale Reactor Design
April 2, 2009

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