



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 19, 2018

Mr. Thomas Bergman, Vice President,
Regulatory Affairs
NuScale Power LLC
1100 NE Circle Blvd., Suite 200
Corvallis, OR 97330

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT OF ARES
CORPORATION INSPECTION REPORT NO. 05200048/2018-201

Dear Mr. Bergman:

On October 1 through October 5, 2018, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the ARES Corporation (ARES) facilities in Walnut Creek, California. The purpose of this technically focused NRC inspection was to verify that NuScale Power LLC (NuScale) effectively implemented quality assurance (QA) processes and procedures for design and analysis activities performed in support of the NuScale design certification application. The inspection focused on assessing compliance with the provisions of selected portions of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities" and 10 CFR Part 21, "Reporting of Defects and Noncompliance."

The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall QA and 10 CFR Part 21, "Reporting of Defects and Noncompliance," programs. Within the scope of this inspection, no violations were identified during this inspection.

Sincerely,

/RA Yamir Diaz-Castillo for/
Kerri A. Kavanagh, Chief
Quality Assurance Vendor Inspection Branch-2
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Enclosure: Inspection Report No. 05200048/2018-201
and Attachment
EPID I-2018-201-0053

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CORPORATION INSPECTION REPORT NO. 05200048/2018-201
Dated: November 19, 2018

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NRO-002

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NAME	JOrtega-Luciano	GGalletti	CWu (TLupold for)
DATE	11/14/2018	11/15/2018	11/16/2018
OFFICE	NRO/DEI/MEB	NRO/DCIP/QVIB-2	
NAME	TLupold	KKavanagh (YDiaz-Castillo for)	
DATE	11/16/2018	11/19/2018	

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**U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND
OPERATIONAL PROGRAMS
DESIGN CERTIFICATION TESTING INSPECTION REPORT**

Report No.: 05200048/2018-201

Applicant: NuScale Power LLC
1100 NE Circle Blvd., Suite 200
Corvallis, OR 97330

Applicant Contact: Mr. Cyrus Afshar
Supervisor, Regulatory Affairs
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Nuclear Industry Activity: NuScale contracted the services of ARES Corporation, which procured and developed computer programs to perform the safety analyses in accordance with the requirements of the American Society for Mechanical Engineers (ASME) Boiler & Pressure Vessel (B&PV) Code Section III and Appendix B to 10 CFR Part 50. The computer programs are used to generate the loads that are used in the design and analysis of ASME B&PV Code Class 1, 2, and 3 components and component support structures.

Inspection Dates: October 1 - 5, 2018

Inspectors: Jonathan Ortega-Luciano NRO/DCIP/QVIB-2 Team Leader
Greg Galletti NRO/DCIP/QVIB-1
Cheng-Ih Wu NRO/DEI/MEB

Approved by: Kerri A. Kavanagh, Chief
Quality Assurance Vendor Inspection Branch-2
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Enclosure

EXECUTIVE SUMMARY

NuScale Power LLC
Inspection Report No. 05200048/2018-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this inspection to verify that NuScale Power, LLC, (hereafter referred to as NuScale), and ARES Corporation (hereafter referred to as ARES) implemented an adequate quality assurance (QA) program in support of computer programs used for static, dynamic, and hydraulic transient analyses as they relate to NuScale's components and component supports, that comply with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." In addition, the NRC inspection team also verified that ARES implemented a program that meets the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance." The NRC inspection team conducted the inspection at the ARES facility in Walnut Creek, California, from October 1 to October 5, 2018.

In January 2008, NuScale notified the NRC of its intent to begin the pre-application review process for its advanced reactor design. NuScale is developing and testing computer code design analysis software to support the design certification of its advanced light water reactor design. For evaluation of the NuScale power module (NPM) response to earthquake events and loss of coolant accidents, NuScale plans to use the SASSI2010, ANSYS, SAP2000, SHAKE2000, and RSPMatch computer codes, which were developed to evaluate the Soil-Structure interaction and Fluid-Structure interaction environment dynamic characteristics. Therefore, NuScale contracted the services of ARES to perform seismic analysis for obtaining appropriate structural responses accounting for interacting with water and soil during the seismic events. NuScale plans to use the seismic analysis results of the safe shutdown earthquake (SSE) conditions in the design of NPM and buildings. As such, benchmarking the computer codes against certified solutions ensures the quality and adequacy of the computer codes for use in the design and analysis of the NuScale Seismic Category I and Category II structures, systems and components.

Appendix B to 10 CFR Part 50 and 10 CFR Part 21 served as the bases for the NRC inspection. The NRC inspection team used Inspection Procedure (IP) 35017, "Quality Assurance Implementation Inspection," dated July 29, 2008; IP 35710, "Quality Assurance Inspection of Softwares Used in Nuclear Applications," dated January 30, 2018, IP43004, "Inspection of Commercial-Grade Dedication Programs," dated January 27, 2017; and IP 36100, "Inspection of 10 CFR Part 21 Programs for Reporting Defects and Nonconformance," dated February 13, 2012.

The NRC inspection team concluded that NuScale's and ARES's QA policies and procedures complied with the applicable requirements in Appendix B to 10 CFR Part 50 and 10 CFR Part 21. The NRC inspection team also concluded that ARES's personnel were implementing these policies and procedures effectively in support of NuScale's design and analysis calculation activities. The results of this inspection are summarized below.

10 CFR Part 21 Program

The NRC inspection team concluded that the implementation of ARES's 10 CFR Part 21 program was consistent with the regulatory requirements. Based on its review, the NRC inspection team determined that ARES was adequately implementing its policies and

procedures in support of NuScale's design and analysis of Seismic Category I and Category II structures, systems and components. No findings of significance were identified.

Oversight of Contracted Activities

The NRC inspection team concluded that NuScale invoked appropriate procurement requirements for dynamic analysis activities, and maintained adequate oversight of contracted activities. The NRC inspection team also concluded that the implementation of NuScale's control of purchased material, equipment, and services program was consistent with the regulatory requirements of Criterion VII, "Control of Purchased Equipment, Material and Services," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Design Control

The NRC inspection team concluded that the implementation of NuScale's design control program was consistent with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

The NRC inspection team concluded that the implementation of ARES's design control program was consistent with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. Based on its review the NRC inspection team determined that ARES was adequately implementing its policies and procedures in support of NuScale's design and analysis of Seismic Category I and Category II structures, systems and components. Finally, the NRC inspection team concluded that the design requirements were appropriately incorporated into the test specifications, with respect to the computer codes. No findings of significance were identified.

Commercial-Grade Dedication

The NRC inspection team concluded that the implementation of ARES's commercial-grade dedication program was consistent with the regulatory requirements of Criterion III and Criterion VII of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Corrective Actions and Nonconformances

The NRC inspection team concluded that ARES's program requirements and implementation of nonconformance and corrective action programs were consistent with the requirements of Criterion XV, "Nonconforming Material, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

REPORT DETAILS

1. 10 CFR Part 21 Program

a. Inspection Scope

The NRC inspection team reviewed ARES's policies and implementing procedures that govern ARES's 10 CFR Part 21, "Reporting of Defects and Noncompliance," program to determine compliance with the regulatory requirements. The NRC inspection team observed that ARES's nonconformance and corrective action procedures provide a link to the 10 CFR Part 21 program.

The NRC inspection team also reviewed the purchase orders (POs) issued by NuScale to ARES related to the design and analysis of the NuScale Seismic Category I and Category II structures, systems and components (SSCs) to verify that procurement documents include the design requirements, qualification parameters, acceptance criteria, and applicability of 10 CFR Part 21.

The NRC inspection team reviewed ARES's procedures that describe the 10 CFR Part 21 evaluations process to determine if it addresses the requirements for evaluating deviations and failures to comply. The NRC inspection team reviewed only the procedures because at the time of the inspection ARES had not performed any evaluations under 10 CFR Part 21.

The NRC inspection team also discussed the 10 CFR Part 21 program with ARES's management. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team concluded that the implementation of ARES's 10 CFR Part 21 program was consistent with the regulatory requirements. Based on its review, the NRC inspection team determined that ARES was adequately implementing its policies and procedures in support of NuScale's design and analysis of Seismic Category I and Category II SSCs. No findings of significance were identified.

2. Oversight of Contracted Activities

a. Inspection Scope

The NRC inspection team reviewed the implementation of NuScale's QA program for control of purchased material, equipment, and services in support of NuScale's design and analysis of Seismic Category I and Category II SSCs to verify that it met the regulatory requirements of Criterion VII, "Control of Purchased Equipment, Material and Services," of Appendix B to 10 CFR Part 50. Specifically, the NRC inspection team reviewed the PO documents from NuScale to ARES. The NRC inspection team also reviewed the associated project quality plan to verify that it appropriately stated the

objectives of the test plans for developing data necessary for design certification. Finally the NRC inspection team verified that the PO appropriately required that the engineering and testing services be provided in accordance with ARES's QA program and project quality plan.

The NRC inspection team reviewed the external audits and surveillances of ARES, performed by NuScale, to ensure that the appropriate quality controls were in place to conduct the testing. In addition, the NRC inspection team reviewed NuScale procedure EP-0703-1417, "Owner Acceptance Reviews and Approval," Revision 10, dated June 1, 2018, which provides requirements for performance of receipt inspections of sub-supplier products including design analyses and reports. The procedure provided detailed actions required to complete the Supplier Deliverable Review Form (SDRF) that includes a technical acceptance checklist, required rationale for unmet checklist criteria, and documentation of any required comment resolutions. The NRC inspection team reviewed a sample of NuScale receipt inspections documented on the SDRF for a sample of structural analyses performed by ARES, as well as a sample of Software Verification and Validation Summary Reports associated with ANSYS, SAP2000, and SASSI. The SDRF contained basic information cross-referencing between the ARES and NuScale documents, as well as a technical acceptance checklist, and associated comment fields. Criteria such as design inputs and output, applicable codes and standards, assumptions, design analysis methodologies, and documented results of the incoming technical reports are evaluated in accordance with the checklist. The NRC inspection team confirmed that for the sample reviewed, the documented comments were recorded consistent with the procedural requirements and did not preclude acceptance of the products.

The NRC inspection team also discussed the oversight of contracted activities program with ARES's management and staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team concluded that NuScale invoked appropriate procurement requirements and maintained adequate oversight of contracted activities. The NRC inspection team also concluded that the implementation of NuScale's control of purchased material, equipment, and services program was consistent with the regulatory requirements of Criterion VII of Appendix B to 10 CFR Part 50. No findings of significance were identified.

3. Design Control

a. Inspection Scope

The NRC inspection team reviewed the implementation of NuScale's and ARES's policies and implementing procedures that govern the design control program as it relates to the control of computer codes to determine its compliance with the applicable regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50.

The NRC inspection team evaluated ARES's design test control processes applied to the software and reviewed objective evidence to confirm adequate implementation of those processes. Specifically, the NRC inspection team evaluated the software and sampled a variety of change requests, deficiency reports, and verification and validation reports to confirm that ARES was implementing their programs consistent with the procedures as approved by NuScale.

The NRC inspection team discussed the design control program with ARES's management and staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

On March 23, 2017, NRC accepted the design certification application for docketing the NuScale Standard Plant Design Certification (DC) Application for a small module reactor (SMR) design submitted by NuScale.

During March 20 through April 27, 2018, the NRC staff performed a regulatory audit of the computer codes in support of its reviews of Section 3.9.1, "Special Topics for Mechanical Components," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants." Based on the review, the NRC staff identified that there was no description of the computer programs in the DC document used to generate loads that are used in the design and analysis of the American Society for Mechanical Engineers (ASME) Boiler & Pressure Vessel (B&PV) Code Section III Class 1, 2, and 3 components and component supports structures.

An audit of verification and validation (V&V) packages of the computer codes was performed to support the NRC staff safety determination. In addition, the staff has identified a need to audit supporting documents to the response to a request for additional information (RAI) 182-9039, Question 03.09.01-5. During the regulatory audit the NRC staff was not able to review the necessary documents to support the results of the V&V. NuScale was not able to provide access to the specific V&V documents requested by the NRC staff because the documents were proprietary to ARES. To support the review of the DC document the NRC staff requested to perform an inspection at ARES.

b.1 Software Design Control Process

The NRC inspection team reviewed and evaluated the planning, preparation, and execution of Section 19.0, "Computer Software Quality Assurance," of ARES QA Program Manual, which established the ARES computer software QA

requirements for software development and use, and is applicable to acquisition, development, operation, maintenance, and retirement of software used to perform work under the ARES QA program.

In addition, the NRC inspection team reviewed implementing procedures 19.4, "Software Verification and Control," and 19.5, "Safety Software Management and Control," which describes software management activities for controlling acquisition of software, application of standards and other work practices and control of support software used to develop, operate, and maintain computer programs. The guidance also provides for test case evaluation as part of software validation, development of a safety software hazards analysis, and software configuration and management controls.

The NRC inspection team also reviewed Desk Instruction, DI-DS-20, "Safety Software Hazards Analysis," and associated Report No. QA-HA-01, "Safety Software Risk Management Evaluation for Acquired Software, classified as Level B." QA-HA-01 provides the software risk management evaluation for commercial off the shelf (COT) software products. The NRC inspection team confirmed that ARES's evaluations contained an adequate review of factors including identification, analysis, mitigation, recovery, measurable or observable risk metrics, and contingency actions that may be required.

The NRC inspection team also reviewed DI-DS-23, "Security Updates and Minor Changes to Analytical Computers," which provides requirements for release and installation of minor patches and security updates to computer operating environments. The NRC inspection team confirmed that all releases are adequately documented and all updates are tested by ARES's information technology personnel using non-analysis machines prior to release on analysis machines.

b.2 Software Change Request

The NRC inspection team reviewed the software change process and sampled software change request (SCR), "SCR SAP2000," associated with an upgrade to the SAP2000 program Version 20.0.0, and SCR "SCR ANSYS (Mechanical)," associated with an upgrade to the ANSYS program Version 18.2 to confirm ARES was implementing its management and change control processes adequately. The change requests documented the evaluation of various software program verification activities including, the SSQPE, CGSDP, CGSDR, Hazard Analysis Report, and software V&V report, and adequately identified those activities affected by the upgraded version of the software to be deployed.

b.3 Software Deficiency Reports

The NRC inspection team reviewed a sample of deficiency reports (DRs) generated by ARES for software programs to confirm adequate implementation of its management and control processes. No DRs were identified for the SASSI, ANSYS, or SAP2000 programs. The NRC inspection team evaluated DR-12-11, "Various Projects supported by SolidWorks Software," that documents the evaluation of a software program, SolidWorks Simulation 2011 SP 4.0, which performs Finite Element Analysis. The NRC inspection team verified that the DR

identified the software and version impacted, how the error impacts projects that use the program, proposed disposition and corrective action, notification to affected users, and any follow-up actions necessary to resolve and close the DR, consistent with the requirements in ARES's policies and procedures.

b.4 Software Master List

The NRC inspection team reviewed ARES's Controlled Verified Software Master List, which is used to document configuration control of the released software programs and implements Software Verification and Control. The NRC inspection team confirmed that the three analysis programs, ANSYS, SASSI, and SAP2000 were adequately addressed in the master list. Version/revision, classification level, error reporting frequency, Senior Technical Lead, and software acceptance date were identified and consistent with the requirements of ARES's Procedure 19.4 and with the information provided in the commercial grade software dedication plan (CGSDP) for these three programs. In addition, for each program, all computer assets were identified which had been verified for use as part of the program verification effort. Future in-use test due dates were also recorded. The NRC inspection team selected a sample of these computer assets for ANSYS, SAP2000, and SASSI to verify they were being controlled consistent with the master list. No discrepancies were identified.

b.5 Software Verification Report Review

The NRC inspection team reviewed the technical adequacy of the test setup. This included comparing output of computer codes against (1) analytical solution obtained by hand or manual calculations based on well-known closed form solution, (2) analytical solution from published literature, and (3) results from the verified computer codes.

The NRC inspection team evaluated the V&V performed for SASSI2010, which includes 30 test cases developed from nine different problems to verify the capabilities of SASSI2010. Problems 1 through 6 were from previous revision. Problems 7 through 9 were developed using published literature. The NRC inspection team reviewed ARES File 17WC0202, "Review of SASSI2010 Verification Test Cases," and seven attachments to the nine problems. In each attachment, there follows the corresponding published literature. It shows that the results obtained from the SASSI analysis compared well with results of the published corresponding literature. Thus, this provides reasonable assurance that the capability of SASSI2010 will generate adequate results.

The problems utilized by ARES are designed to check the program's capabilities under various conditions in addition to showing the accurate performance of the SASSI2010 methodologies. These problems provide reasonable assurance that a certified user (i.e., qualified engineer who possesses an understanding of soil-structure interaction) can apply SASSI2010 over the intended range of use identified in CGSDR-22-001, "Commercial Grade Software Dedication Report for SASSI2010."

The NRC inspection team also reviewed Document VV-17-22-026, "Verification and Validation of SASSI2010." Table 2-1 through Table 2-9 of the report provide

a list of verification test cases. The NRC inspection team reviewed a sample of these cases and noted that all cases passed, and were in compliance with the acceptance criteria of ARES Procedure 19.4.

SAP2000

The NRC inspection team reviewed document 13RL11088, "Review of SAP2000 Verification Test Cases Analyses," which included calculation of deflections, forces, and stresses on structures constructed with Frames, Shells, Plane, A-solid, Solid, Link, Cable test cases using SAP2000 finite element program compared to the more rigorous text book approach. The NRC inspection team reviewed sample problems in each of the seven attachments. As a result, the NRC inspection team noted that the SAP2000 results always converge to the hand calculated values for each case chosen of the example problems and therefore concluded that SAP2000 is adequate for use in generating accurate results. The NRC inspection team also reviewed document VV-18-03-242, "Verification and Validation of SAP2000." Table 2-1 summarizes verification results from Problems 1-2 through 7-003 for a total of 86 test cases. The differences between SAP2000 results and the hand calculated results are zero assuming the use of very fine mesh as seen in the test for SAP2000 except for two cases: (1)1-027, which was not performed because the work was out of the scope of the license; and (2) 6-011, because of a non-linear cumulative. As such, the NRC inspection team concluded that the V&V is complete to demonstrate the adequacy for use of SAP2000 in analysis of safety-related structures.

ANSYS

The NRC inspection team reviewed the V&V verification test cases in ARES document VV-18-02-068, "Verification and Validation for ANSYS," for a total of 776 cases in three attachments. There is one failure out of 524 cases in Attachment 1, and two errors out of 214 cases in Attachment 2. There are no errors in Attachment 3. Based on ARES's analysis, the error was due to running time out. The original failure case (vm84) was determined to be insignificant and was removed from the table. The NRC inspection team also reviewed ARES document 13RL10109, "Review of ANSYS Verification Test Cases," where detailed calculation results are compared with the ANSYS results. The NRC inspection team found the calculation results mostly identical. The maximum percent difference is within 5 percent which was considered to be acceptable. As such, the NRC inspection team concludes that the V&V is completed to demonstrate the adequacy for use of the ANSYS program.

SHAKE2000

The NRC inspection team reviewed a set of six verification test cases that were developed comparing to closed form solutions such as analytical solution obtained by hand or the manual calculations based on well-known closed form solution, analytical solution from published literature, and solution from verified programs. The NRC inspection team noted that the results for the test cases validated the capabilities of the SHAKE2000 program as the comparison shows that the SHAK2000 outputs are almost identical to the closed form solutions.

The NRC inspection team concludes that the V&V is completed to demonstrate the adequacy for use of the SHAKE2000 program.

RSPMATCH

The RSPMATCH program generates an acceleration time history which is made to be compatible with a user specified target spectrum. The NRC inspection team reviewed the report, which documents benchmark problems and validation for RSPMATCH, and found that the generated acceleration time histories would be able to make the corresponding response spectra with minimum differences. As a result, the NRC inspection team concluded that the verification results are validated for RSPMATCH program.

c. Conclusions

The NRC inspection team concluded that the implementation of NuScale's and ARES's design control program was consistent with the regulatory requirements of Criterion III of Appendix B to 10 CFR Part 50. No findings of significance were identified.

4. Commercial-Grade Dedication

a. Inspection Scope

The NRC inspection team reviewed ARES's commercial-grade software dedication program guidance and sampled several software program dedication packages used to support the design and analysis of the NuScale plant, to confirm adequate implementation of the ARES program consistent with their guidance and the requirements of Criterion III and Criterion VII of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed CGSDP-22-001, "Commercial Grade Software Dedication Plan for SASSI2010," CGSDP-03-001, "Commercial Grade Software Dedication Plan for SAP2000," and CGSDP-02-002, "Commercial Grade Software Dedication Plan for ANSYS," to verify that the plans described the various attributes including identification of safety functions analyzed, evaluated, monitored or controlled by the engineering analysis software, the functional modes, the potential failure modes and their potential effects on the safety function. Also documented are any limitations or range of use, if applicable.

The NRC inspection team confirmed that the dedication plans contained the intended range of use for the software, a failure analysis that identified the software as having a passive safety function associated with demonstrating the safety-related components evaluated exhibited structural integrity by meeting various industry codes and standards required for such.

The NRC inspection team confirmed that the dedication plans identified potential failure modes for the software including incorrect modeling, incorrect loads or analysis methods, and incompatible computing environments/hardware. These issues were further identified as critical characteristics (CCs) to assure dedication activities prescribed measures to evaluate for such potential failures.

In addition, the plans identified performance characteristics requiring special tests and inspections (Method 1) to assure accuracy of the proposed Soil-Structure Interaction (SSI) methods, over the input loading analysis range, using the specific modules of the programs intended for this project. For each of these CC's the plan identified acceptance criteria and acceptance methods to be applied. The commercial-grade dedication plans included a matrix of verification problems consisting of different tests comprised of a number of test cases. These test cases bounded the possible uses of the modules identified as applicable to the NuScale scope of work.

The NRC inspection team reviewed commercial grade software dedication reports for CGSDR-22-001, "Commercial Grade Software Dedication Report for SASSI2010 Version 1," CGSDR-03-008, "Commercial Grade Software Dedication Report for SAP2000," and CGSDR-02-005, "Commercial Grade Software Dedication Report for ANSYS (Mechanical) Version 18.2," to verify that the reports described the scope of the dedication activities, the critical characteristics, acceptance criteria, and verification methods. The NRC inspection team confirmed the information was consistent with the software program dedication plans, the documented test case analysis reports, and ARES's implementing procedures governing software dedication activities.

The NRC inspection team discussed the commercial-grade dedication program with ARES's management and staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team concluded that the implementation of ARES's commercial-grade dedication program was consistent with the regulatory requirements of Criterion III and Criterion VII of Appendix B to 10 CFR Part 50. No findings of significance were identified.

5. Corrective Actions and Nonconformances

a. Inspection Scope

The NRC inspection team reviewed policies, and procedures that govern the implementation of ARES's corrective action and nonconformance programs, to ensure compliance with the requirements of Criterion XV and Criterion XVI of Appendix B to 10 CFR Part 50.

The NRC inspection team reviewed a sample of DRs associated with the testing services provided by ARES to assess the effectiveness of the corrective action program. Also, the NRC inspection team reviewed NuScale's corrective actions generated as a result of its evaluation of ARES's deliverables.

The NRC inspection team discussed the corrective action program with ARES's management and staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team concluded that NuScale's and ARES's program requirements and implementation of nonconformance and corrective action programs were consistent with the requirements of Criterion XV and Criterion XVI of Appendix B to 10 CFR Part 50. No findings of significance were identified.

6. Entrance and Exit Meeting

On October 1, 2018, the NRC inspection team discussed the scope of the inspection with Larry Shipley, President, Energy Services Division of ARES Corporation, Cyrus Afshar, Licensing Supervisor of NuScale, and other members of ARES and NuScale management and technical staff. On October 5, 2018, the NRC inspection team presented the inspection results and observations during an exit meeting with Larry Shipley and Tom Bergman, Vice President Regulatory Affairs of NuScale, and other members of ARES and NuScale management and technical staff. The attachment to this report lists the attendees of the entrance and exit meetings, as well as those individuals whom the NRC inspection team interviewed.

1. PERSONS CONTACTED

Name	Title	Affiliation	Entrance	Exit	Interviewed
Jonathan Ortega-Luciano	Inspector, Team Lead	NRC	X	X	
Greg Galletti	Inspector	NRC	X	X	
Cheng-Ih Wu	Technical Reviewer	NRC	X	X	
Carolyn Monaco	Quality Assurance Director	NuScale	X	X	X
Mohsin Khan	Manager Structural Analysis Design	ARES	X	X	X
Liliana Rincón	Sr. Administrative Specialist	ARES	X	X	
Cyrus Afshar	Licensing Supervisor	NuScale	X	X	X
Kevin Stovall	Quality Assurance Manager	ARES	X	X	X
Kathy Warnock	Quality Assurance Specialist	NuScale	X	X	X
Larry Shipley*	President Energy Services Division	ARES	X	X	
Tom Bergman*	Vice President Regulatory Affairs	NuScale		X	
Robert Gamble*	Vice President of Engineering	NuScale		X	
Stanley Lynch*	Sr. Vice President	ARES		X	
Kyra Perkins	Licensing Specialist	NuScale		X	

* participated by conference call

2. DOCUMENTS REVIEWED

Quality Manuals and Plans

“ARES Project-Specific Quality Plan for NuScale Task Order 24 and 25,” Revision 0, dated August 25, 2017

“ARES Holding Corporation Quality Assurance Program Manual,” Revision 17, dated October 1, 2017

“ARES Holding Corporation Quality Assurance Procedure Manual,” Revision 32, dated October 1, 2017

EP-0703-1417, “Owner Acceptance Reviews and Approval,” Revision 10, dated June 1, 2018

19.4, "Software Verification and Control," Revision 16, dated October 1, 2017

19.5, "Safety Software Management and Control," Revision 10, dated October 10, 2017

Audit Report Documents

NP-A2-0713-3977, "NuScale audit of ARES Corporation," dated September 17, 2013

NuScale Lead Auditor Qualification Record related to Audit # NP-A2-0713-3977

A2-0716-50296, "NuScale Triennial Supplier Qualification Audit," dated September 28, 2016

NuScale Lead Auditor Qualification Record related to Audit # A2-0716-50296

16RL10104, "Response to NuScale Audit Report A2-0716-50296," dated October 14, 2016

NP-LO-0114-5707, "Closure of NP-A2-07-19-3997 ARES Audit Findings," dated January 16, 2014

13RL10001, "ARES Response to NuScale Audit Findings for Audit Report NP-A2-0713-397 and Corrective Action Request NP-CA-0713-4239," dated October 1, 2013

13RL12102, "ARES Closure for NuScale Audit Findings for Audit Report NP-A2-0713-3977 and Associated ARES Deficiencies Reports," dated December 13, 2013

QS-08-17-55532, "Annual Supplier Evaluation," dated August 31, 2017

QS-0818-61190, "Annual Supplier Evaluation," dated September 7, 2018

LO-0916-51402, "NuScale Power, LLC, Audit of ARES Corporation," dated September 30, 2016

ARES Deficiencies Report (DR) Documents

Deficiency Report (DR)-12-11, "Various Projects supported by SolidWorks Software," dated July 2, 2012

DR-18-004, "The ARES PQP for NuScale Subsequent to Task Order 24 and 25 was not updated and Submitted to NuScale for Approval Prior to Initiation of Work," dated September 25, 2018

DR-13-006, "NuScale Restriction on ARES as a Result of Audit CORP-AE-11-14," dated October 1, 2013

DR-13-003, "Dedication of ANSYS Does not Include the Limits of the Dedicated Capabilities in Either the Dedication Plan or in the Instructions for the Users," dated December 13, 2013

DR-13-004, "Test Case Used to Dedicate SAP200 Were not Properly Independently Verified," dated December 13, 2013

DR-13-005, "ARES QA Program Allows Minor Changes to Software Configuration with Ensuring That all Changes to Software Receive the Required Evaluation as Required by NQA-1," dated November 27, 2013

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CGSDP-22-001, "Commercial Grade Software Dedication Plan for SASSI2010," Revision 3, dated September 26, 2018

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NuScale Supplier Deliverable Review Form (SDRF), "Structural Analysis for the NuScale Reactor Building Using SAP2000," dated June 1, 2018

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SAP2000 example 1-024, "Frame – Response Spectrum Analysis of a Three-Dimensional Moment Frame"

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