



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

SAFETY EVALUATION BY THE OFFICE OF NEW REACTORS
RELATED TO REQUEST FOR ALTERNATE REQUIREMENTS
FOR PRESERVICE TESTING OF EXPLOSIVELY ACTUATED VALVES
(VEGP 3&4-PST-ALT-1)
SOUTHERN NUCLEAR OPERATING COMPANY, INC.
GEORGIA POWER COMPANY
OGLETHORPE POWER CORPORATION
MEAG POWER SPVM, LLC
MEAG POWER SPVJ, LLC
MEAG POWER SPVP, LLC
CITY OF DALTON, GEORGIA
VOGTLE ELECTRIC GENERATING PLANT UNITS 3 AND 4
DOCKET NOS. 52-025 AND 52-026

1.0 INTRODUCTION

By letter dated November 29, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18333A356), Southern Nuclear Operating Company, Inc. (SNC), requested the U.S. Nuclear Regulatory Commission (NRC) approval of an alternative, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), to the requirements of the American Society of Mechanical Engineers (ASME) Operation and Maintenance of Nuclear Power Plants, Division 1, OM Code: Section IST (OM Code) associated with preservice testing (PST) of pyrotechnic-actuated (squib) valves at the Vogtle Electric Generating Plant (VEGP) Units 3 and 4. In particular, SNC requested to implement a proposed alternative to specific provisions of the ASME OM Code as incorporated by reference in 10 CFR 50.55a in request PST-Alt-01 on the basis that the alternative provides an acceptable level of quality and safety pursuant to subparagraph (1), "Acceptable level of quality and safety," in paragraph (z), "Alternatives to codes and standards requirements," of 10 CFR 50.55a.

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.55a(f)(4) "Inservice testing standards requirement for operating plants," state, in part, that throughout the service life of a boiling or pressurized water-cooled nuclear power facility, pumps and valves that are within the scope of the ASME OM Code must meet the inservice testing (IST) requirements (except design and access provisions) set forth in

the ASME OM Code and Addenda that become effective subsequent to Editions and Addenda specified in paragraphs (f)(2) and (3) of 10 CFR 50.55a and that are incorporated by reference in paragraph (a)(1)(iv) of 10 CFR 50.55a, to the extent practical within the limitations of design, geometry, and materials of construction of the components.

The NRC regulations in 10 CFR 50.55a(z) state, in part, that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a may be used, when authorized by the NRC, if SNC demonstrates (1) the proposed alternative would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The staff notes that the combined licenses (COLs) for VEGP Units 3 and 4 include License Condition 10, which requires the SNC to implement a surveillance program for squib valves that includes specific provisions in addition to the requirements in the ASME OM Code as incorporated by reference in 10 CFR 50.55a. For example, the license condition includes PST requirements for the squib valves in VEGP Units 3 and 4 that are similar to the PST requirements for squib valves for post-2000 plants in the 2012 Edition of the ASME OM Code. VEGP Units 3 and 4 are post-2000 plants as defined in paragraph ISTA-2000, "Definitions," in Subsection ISTA, "General Requirements," of the ASME OM Code. The COLs stated that this license condition shall expire upon (1) incorporation of the specified surveillance provisions for squib valves into the VEGP Units 3 and 4 IST program; or (2) incorporation of the IST requirements for squib valves for new reactors (post-2000 plants) to be specified in the ASME OM Code as incorporated by reference in 10 CFR 50.55a, including any conditions imposed by the NRC, into the IST program at VEGP Units 3 and 4. In that SNC has specified the 2012 Edition of the ASME OM Code as its OM Code of record for its IST program, the staff considers the license condition to have been incorporated into the IST program for VEGP Units 3 and 4 such that SNC may submit its alternative request PST-Alt-01 to the PST requirements for squib valves in the ASME OM Code in accordance with 10 CFR 50.55a(z)(1).

Based on the above, and subject to the following technical evaluation, the staff finds that regulatory authority exists for SNC to request and the Commission to authorize the alternative requested by SNC to specific provisions of the ASME OM Code as incorporated by reference in 10 CFR 50.55a.

3.0 TECHNICAL EVALUATION

3.1 SNC's Alternative

SNC requested an alternative to the PST requirements for squib valves in the 2012 Edition of the ASME OM Code.

Subparagraph (d) to paragraph ISTC-3100, "Preservice Testing," in Subsection ISTC, "Inservice Testing of Valves in Light-Water Reactor Nuclear Power Plants," of the ASME OM Code states that for post-2000 plants, Category D explosively actuated valves shall be preservice tested as specified in subparagraphs (1), (2), and (3). Subparagraph (d)(2) states the following:

Select a sample of at least 20% of the pyrotechnic charges in all valves to be tested. Test each selected charge either in the valve or a qualified test fixture to confirm the capability of each sampled charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping. The sampling must include at least one explosively actuated valve from each redundant safety train.

As noted above, VEGP Units 3 and 4 are post-2000 plants as defined in paragraph ISTA-2000 of Subsection ISTA of the ASME OM Code Paragraph ISTC-1300, "Valve Categories," in Subsection ISTC defines Category D valves as valves that are actuated by an energy source capable of only one operation, such as squib valves.

Reason for Request

SNC provided the following reason for the alternative request:

Based on the ASME OM Code definition of preservice test, which states "test performed after completion of construction activities related to the component...", and the statement in ISTC-3100(d)(2) that "Pyrotechnic charges in all valves," it is implied that the charges must be installed in the valves, and the valves be installed in the system, prior to selection of the charges for testing. Handling of explosive charges exposes personnel to significant risks. Since the charges are fabricated and shipped separately, and the testing will be done by the vendor or another offsite test facility, the current requirements would involve shipping of the charges to the site, installation of the charges in the valves (which would be installed in the piping, in containment), removal of the charges, and shipment of the charges back to the vendor or other test facility. To minimize handling and transportation of explosive charges, it is proposed to select the charges after fabrication and retain for testing at the vendor, or in the worst case, ship them from the vendor to a separate facility for testing.

Proposed Alternative

SNC submitted the following proposed alternative:

In lieu of the requirements of ISTC-3100(d)(2), perform the following:

Select a sample of pyrotechnic charges, following fabrication for testing; this may include charges used for qualification of the batch. The sample shall include a quantity of charges equal to at least 20% of the number of charges of each size installed in the plant and shall include at least one from each manufacturer batch. A description of SNC's planned testing relative to the Code requirements is shown in Table 1 below. Each selected charge shall be tested in a qualified test fixture to confirm the capability of each sampled charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping.

Table 1: VEGP Units 3 and 4 Planned Explosively Actuated Valve Charge Testing per Purchase Specification

Batch	Charge size	Number in plants (number per unit x units)	IST (20%)	IST (1/train)	Number to be Tested	Number Fabricated
A	14" valves	8 (4 x 2)	2	4	8	16
B	8" valves - high	12 (6 x 2)	3	6	8	20
C	8" valves – low	4 (2 x 2)	1	2	8	12

Notes:

1. Each charge size is a single batch.
2. There are two sizes of charges for the 8" explosively actuated valves, high energy and low energy.

Basis for Use

SNC provided the following basis for the use of its proposed alternative:

The proposed alternative provides an equivalent level of safety as it ensures the charges are tested to the same criteria, and that the charges are tested from each batch (manufacturer, lot and size). The allowance of crediting the qualification samples is equivalent to or better than ISTC-5260(d), which only requires test firing of one charge per batch prior to installation as a replacement charge. The requirement regarding inclusion of one test sample from each train is not applicable, because the charges are selected for testing prior to installation in the valve. However, the selection of charges for installation in valves of each train is random; therefore, the level of testing is equivalent. The proposed alternative provides improved personnel safety by minimizing the transportation and handling of explosive charges. Because the proposed alternative tests an equivalent number of pyrotechnic charges to the same criteria, this proposed alternative provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(z)(1).

Duration of Proposed Alternative

SNC stated that the PST alternative would be conducted prior to commercial operation of VEGP Units 3 and 4.

3.2 Staff Evaluation

The 14-inch squib valves in the Automatic Depressurization System (ADS) in VEGP Units 3 and 4 perform safety-related functions to open as part of the phased depressurization of the reactor coolant system in AP1000 reactors to allow the gravity-driven Passive Core Cooling System (PXS) to provide cooling of the reactor core. The 8-inch PXS squib valves in VEGP Units 3 and 4 perform safety-related functions to open (1) to allow cooling water to be supplied to the reactor core from the in-containment refueling water storage tank; and (2) to allow recirculation of water from the containment sump to the reactor vessel for long-term core

cooling. These safety-related squib valves are included in the PST and IST program at VEGP Units 3 and 4.

In alternative request PST-Alt-01, SNC states that the ASME OM Code of record for VEGP Units 3 and 4 is the 2012 Edition as incorporated by reference in 10 CFR 50.55a. As of this date, the 2012 Edition of the ASME OM Code is the most recent OM Code edition incorporated by reference in 10 CFR 50.55a. In accordance with 10 CFR 50.55a(f)(4)(i), "Applicable IST Code: Initial 120-month interval," SNC is required to update the OM Code of record to the most recent edition of the ASME OM Code incorporated by reference in 10 CFR 50.55a at a specific time period prior to initial fuel load at VEGP Units 3 and 4. This safety evaluation assumes that the ASME OM Code of record for VEGP Units 3 and 4 is the 2012 Edition of the ASME OM Code. SNC will need to address the update requirement in 10 CFR 50.55a(f)(4)(i) regarding the ASME OM Code of record for the initial 120-month IST interval prior to initial fuel load for VEGP Units 3 and 4. The NRC has issued a proposed rule to incorporate by reference the 2015 and 2017 Editions of the ASME OM Code in 10 CFR 50.55a. The staff notes that subparagraph (d)(2) of ISTC-3100 in the 2015 and 2017 Editions of the ASME OM Code is the same as specified in the 2012 Edition of the ASME OM Code.

Therefore, there will be no impact on this safety evaluation if SNC updates its Code of record to the 2017 Edition of the ASME OM Code as the most recent edition of the ASME OM Code for its initial 120-month IST interval as required by 10 CFR 50.55a(f)(4)(i) based on the initial fuel load date for VEGP Units 3 and 4.

Paragraph (d) in ISTC-3100 of the OM Code specifies the PST requirements for squib valves in post-2000 plants, including (1) verification of the operational readiness of the actuation logic and associated electrical circuits for each valve; (2) selection of a sample of pyrotechnic charges in all valves to be tested to confirm the capability of each sampled charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping; and (3) resolution of any deficiencies identified in the operational readiness logic or associated electrical circuits, or the capability of a pyrotechnic charge with specific corrective action requirements. These PST requirements, together with the other PST and IST requirements in the ASME OM Code as incorporated by reference in 10 CFR 50.55a, provide reasonable assurance of the operational readiness of the safety-related squib valves in VEGP Units 3 and 4.

The specific PST requirements for squib valves in post-2000 plants in paragraph ISTC-3100(d)(2) of the OM Code include the following: (a) select a sample of at least 20 percent of the pyrotechnic charges in all valves to be tested; (b) test each selected charge either in the valve or a qualified test fixture to confirm the capability of each sampled charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping; and (c) the sampling must include at least one explosively actuated valve from each redundant safety train. SNC proposed alternative PST requirements for its squib valves as follows: (a) select a sample of pyrotechnic charges, following fabrication for testing; this may include charges used for qualification of the batch; (b) the sample shall include a quantity of charges equal to at least 20 percent of the number of charges of each size installed in the plant and shall include at least one from each manufacturer batch as described in its table provided with the alternative request; and (c) each selected charge shall be tested in a qualified test fixture to confirm the capability of each sampled charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping. As discussed below, the staff compared the paragraph ISTC-

3100(d)(2) of the OM Code provisions to SNC's proposed alternative to determine whether the 10 CFR 50.55a(z)(1) requirements are satisfied.

With respect to the provision in paragraph ISTC-3100(d)(2) of the OM Code for pyrotechnic charge sampling, SNC's alternative identified three batches of pyrotechnic charges: one batch for each of the three sizes of the pyrotechnic charges specified as the 14-inch squib valve, 8-inch squib valve - high energy, and 8-inch squib valve - low energy. SNC states that the number of charges to be tested from each of the three batches will exceed the number that would be required based on provisions paragraph ISTC-3100(d)(2) of the OM Code for 20 percent sampling and redundant safety trains. In particular, SNC will test half of the pyrotechnic charges in Batch A (14-inch squib valves), almost half of the pyrotechnic charges in Batch B (8-inch squib valves – high energy), and more than half of the pyrotechnic charges in Batch C (8-inch squib valves – low energy).

SNC's proposal to take credit for the charges tested as part of the qualification process for each batch is reasonable because there is only one batch for each size of the pyrotechnic charges. The staff considers SNC's proposed alternative to provide an acceptable approach for sampling the total number of pyrotechnic charges in the squib valves in VEGP Units 3 and 4.

With respect to the provision in paragraph ISTC-3100(d)(2) of the OM Code for pyrotechnic charge capability, SNC will test each selected charge in a qualified test fixture to confirm the capability of the sampled charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping. The staff considers SNC's proposed alternative to be acceptable as consistent with the provisions for pyrotechnic charge capability in paragraph ISTC-3100(d)(2) of the OM code.

With respect to the paragraph ISTC-3100(d)(2) of the OM Code provision for sampling redundant safety trains, SNC notes that it is not able to identify the selection of the pyrotechnic charges that will be installed in squib valves in the redundant safety trains because the testing will be performed prior to installation of the charges in specific squib valves. In comparison to paragraph ISTC-3100(d)(2) of the OM Code provisions, SNC will perform significant percentage test sampling (equal to or greater than 40 percent) of the total charges in the specific batch for each squib valve charge size. Based on the significant percentage of sample testing of the pyrotechnic charges, the staff considers SNC's proposed alternative to provide an acceptable level of sample testing of the pyrotechnic charges for squib valves in the ADS and PXS safety trains.

Based on its review, the staff finds that the SNC's proposed alternative to the PST provisions for squib valves in paragraph ISTC-3100(d)(2) of the OM Code combined with the squib valve PST provisions specified in paragraphs ISTC-3100(d)(1) and (d)(3) of the OM Code and the other provisions in the ASME OM Code (2012 Edition), such as the squib valve IST provisions in paragraph ISTC-5260, "Explosively Actuated Valves," as incorporated by reference in 10 CFR 50.55a, will provide reasonable assurance of the operational readiness of the squib valves in VEGP Units 3 and 4.

4.0 CONCLUSION

Based on the above evaluation, the staff concludes that SNC's proposed alternative, PST-Alt-01, provides an acceptable level of quality and safety. Therefore, the staff authorizes the use of the alternative request PST-Alt-01 for the PST of the squib valves during the initial 120-month IST program interval for VEGP Units 3 and 4. All other ASME OM Code requirements as incorporated by reference in 10 CFR 50.55a for which relief from, or an alternative to, was not specifically requested approved in this subject request remain applicable.

5.0 REFERENCES

1. VEGP 3&4-PSI/ISI-ALT-1, "Request for Alternative Requirements for Preservice Testing of Explosively Activated Valves," dated November 29, 2018 (ADAMS Accession No. ML18333A356).
2. Vogtle Electric Generating Plant, Units 3 and 4, Updated Final Safety Analysis Report, dated August 11, 2017 (ADAMS Accession No. ML17172A218).
3. American Society of Mechanical Engineers (ASME) Operation and Maintenance of Nuclear Power Plants, Division 1, OM Code: Section IST (OM Code)