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

April 29, 2009

Mr. Adam C. Heflin
Senior Vice President and
Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT, UNIT 1 – REQUEST FOR RELIEF REGARDING CLASSIFICATION OF PRESSURIZER UPPER LEVEL INSTRUMENT AND OTHER LINES AND ASSOCIATED COMPONENTS (TAC NO. MD8551)

Dear Mr. Heflin:

By letter dated April 18, 2008, as supplemented by electronic mail dated February 3, 2009, Union Electric Company (the licensee) submitted to the U.S. Nuclear Regulatory Commission (NRC), a proposed alternative to the design requirements for Class I components as specified in the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section III, applicable to portions of the reactor coolant pressure boundary (RCPB) connected to the upper portion (vapor space) of the pressurizer at the Callaway Plant, Unit 1. The licensee requested the proposed alternative for the remaining life of the plant.

Paragraph 50.55a(c) of Title 10 of the *Code of Federal Regulations* (10 CFR) requires that RCPB components meet ASME Code, Section III, for Class 1 components. The licensee proposed to retain the design of certain RCPB components which were originally designed and fabricated to ASME Code Class 2 requirements, but were subsequently reclassified as ASME Code Class 1 components.

Based on the enclosed safety evaluation, the licensee has demonstrated that compliance with ASME Code, Section III, Class 1 requirements for the lines and associated components described in the alternative would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff has determined that the licensee's proposed alternative provides reasonable assurance that the pressurizer upper level instrument and other lines and associated components, as designed and constructed, will perform their intended safety function. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the proposed alternative is authorized for Callaway Plant, Unit 1, for the remaining life of the plant.

All other ASME Code, Section III, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

The NRC staff's safety evaluation is enclosed.

Sincerely,

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure:
Safety Evaluation

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UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO REQUEST FOR ALTERNATIVE TO ASME CODE, SECTION III,

CLASS 1 REQUIREMENTS FOR ITEMS CONNECTED TO THE

UPPER PORTION (VAPOR SPACE) OF THE PRESSURIZER

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By letter dated April 18, 2008, as supplemented by electronic mail dated February 3, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML081150512 and ML090830645, respectively), Union Electric Company (the licensee), submitted to the U.S. Nuclear Regulatory Commission (NRC), a proposed alternative to the design requirements for Class I components as specified in Section III of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), applicable to portions of the reactor coolant pressure boundary (RCPB) connected to the upper portion (vapor space) of the pressurizer at the Callaway Plant, Unit 1. The licensee requested approval, pursuant to paragraph 50.55a(3)(ii) of Title 10 of the *Code of Federal Regulations* (10 CFR) to allow certain piping and instrument lines, valves and supports to remain as currently designed and constructed to ASME Code Class 2 requirements in lieu of upgrading the current design and/or replacing these items with items designed and constructed to ASME Code Class 1 requirements.

2.0 REGULATORY REQUIREMENTS

The regulations in 10 CFR 50.55a require that components which are part of the RCPB meet the requirements for ASME Code Class 1 components, except where alternatives have been authorized by the Commission, pursuant to paragraphs (a)(3)(i) or (a)(3)(ii) of 10 CFR 50.55a. In proposing alternatives, the licensee must demonstrate that (1) the proposed alternatives provide an acceptable level of quality and safety, or (2) compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Section 50.55a allows the Commission to authorize alternatives upon making the necessary findings. In addition, 10 CFR 50.55a(c), "Reactor coolant pressure boundary," states, in part:

> (1) Components which are part of the reactor coolant pressure boundary must meet the requirements for Class 1 components in Section III of the ASME Boiler and Pressure Vessel Code, except as provided in paragraphs (c)(2), (c)(3), and (c)(4) of this section.
>
> (2) Components which are connected to the reactor coolant system and are part of the reactor coolant pressure boundary as defined in § 50.2 need not meet the requirements of paragraph (c)(1) of this section, provided:
>
> (i) In the event of postulated failure of the component during normal reactor operation, the reactor can be shut down and cooled down in an orderly manner, assuming makeup is provided by the reactor coolant makeup system . . .

By letter dated April 3, 2000, Westinghouse Electric Company issued its Nuclear Safety Advisory Letter, "NSAL-00-006: Pressurizer Upper Level Instrument Safety Classification" (ADAMS Accession No. ML091190189). This letter identified an issue where a break in the instrument lines for the upper (steam side) pressurizer level instruments may result in a rapid depressurization of the reactor coolant system (RCS) sufficient to cause an emergency core cooling system actuation and, therefore, these instrument lines should be reclassified as ASME Code Class 1. Because such a break could preclude the ability to shut down and cool down "in an orderly manner," the licensee determined that the existing ASME Code Class 2 instrument and other lines and associated components connected to the pressurizer steam space are not in compliance with 10 CFR 50.55a(c) and should be reclassified as ASME Code Class 1, in accordance with 10 CFR 50.55a(c). However, pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee proposes to allow these lines and valves to remain as designed and constructed to ASME Code Class 2 requirements.

3.0 TECHNICAL EVALUATION

3.1 Items for Which Relief is Requested

The request is for ASME Code Class 2 portions of the RCS and the Nuclear Sampling System, including piping, instrument lines valves and supports, connected to the pressurizer above its normal water level (vapor space). These piping and instrument lines are shown on Piping and Instrument Drawing (P&ID) M-22BB02, (Final Safety Analysis Report (FSAR) Figure 5.1-1, Sheet 2), for the RCS, and on P&ID M-22SJ01 (FSAR Figure 9.3-2, Sheet 1) for the Nuclear Sampling System. The affected lines include: (1) several hundred feet of small bore piping and instrument tubing, (2) over 100 piping and tubing supports, and (3) over 20 valves. The instruments connected beyond the instrument manifold valves are not within the scope of the ASME Code, Section III rules, as specified in paragraph NA-1130(c) and, therefore, are not included in the scope of the requested relief.

In its submittal dated April 18, 2008, the licensee provided a description of the affected piping and instrument lines as follows:

> Piping from the three pressurizer upper instrumentation taps to the root valves, boundary valves, and tubing downstream to the instrument manifold valves. (M-22BB02, Location D-7, C-7, C-6) The pressurizer safety valve loop seal drain lines up to each boundary valve. (M-22BB02, Location G-7, G-6, G-5) The piping from the tap in the pressurizer relief line BB-082-BCA-6", to the boundary valve in the pressurizer high point vent line (M-22BB02, Location E-7), and line BB-083-BCB-3/4" to pressurizer fill and vent valve BBV0085 (M-22BB02, Location F-7). It also includes the branch from BB-083-BCB-3/4" to the Nuclear Sampling System shown on drawing M-22SJ01 at location G-7. This branch line extends to and includes the containment isolation valves for the pressurizer steam space sample line.

3.2 Code Requirement

The regulations in 10 CFR 50.55a(c) require that components which are part of the reactor coolant pressure boundary meet the requirements of Class 1 components in Section III of the ASME Code.

3.3 Proposed Alternative

The licensee stated that the piping, tubing, and valves identified in the request were constructed using the ASME Code Class 2 requirements. The supports for the subject piping and tubing lines were constructed in accordance with the rules of ASME Section III, Subsection NF for Class 2 supports. Construction as used in ASME Section III, Division 1, included requirements for materials, design, fabrication, examination, testing, inspection, and certification required in the manufacture and installation of items.

Paragraph 50.55a(c) of 10 CFR requires that components which are part of the RCPB meet the requirements for ASME Code Class 1 components. The piping, tubing, valves and supports identified above were designed, constructed and installed to various editions and addenda of the ASME Code Class 2 requirements, ranging from the 1974 Edition with Winter 1974 Addenda through the 1977 Edition. The proposed alternative would allow the piping and instrument lines, valves and supports to remain as designed and constructed to ASME Code Class 2 requirements in lieu of upgrading the current design configuration and replacing these items with items constructed to ASME Code Class 1 requirements.

3.4 Basis for Relief

The licensee stated that replacing the affected components to meet ASME Code Class 1 requirements would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety, because the scope of the change would require substantial time and resources. Additionally, a modification of this type would be costly in time, materials, personnel radiation exposure, and radioactive waste, and would not result in a compensating increase in the level of quality or safety. Based on similarly designed Westinghouse

pressurized-water reactor (PWR) plants, the estimated time for the potential removal and re-installation of several hundred feet of small bore piping and instrument tubing, associated valves, and over 100 piping and tubing supports would be approximately 11,000 man-hours. This does not include the considerable material cost associated with replacing ASME Class 2 components and materials with ASME Class 1 components and materials nor the additional radiation exposure that would be experienced during this process. It also does not consider the additional engineering man-hours required (estimated as 1500) for upgrading the design configuration and issuing design change packages. In its submittal dated April 18, 2008, the licensee stated that:

> Although the items listed in Part 1 [the components identified in the requested alternative] do meet most of the [ASME Code] Section III requirements for Class 1 items, they do not meet all Section III requirements for Class 1 items. Because compliance with 10 CFR 50.55a(c)(1) would require that the items meet all the requirements, the items cannot be upgraded to Class 1 as-is. For example, the valves do not meet the component certification requirements of Section III, which require that a valve be stamped by an appropriate ASME Certificate Holder with the Class 1 identification mark and be certified by an appropriate ASME Certificate Holder on the Section III Code Data Report (Form NPV-1) as being in full compliance with Class 1 requirements.
>
> To justify the proposed alternative, a comparison was made between the [ASME Code] Section III requirements in Subsection NB for Class 1 and Subsection NC for Class 2 for the applicable editions and addenda [of the ASME Code]. The comparison looked at each Article of Subsections NB and NC (covering the areas of materials, design, fabrication and installation, examination, testing, protecting against overpressure, and nameplates, stamping and reports) and determined whether the differences were technical, quality, or administrative requirements. Differences in Section III administrative requirements, such as certification and stamping, furnishing of a Stress Report, marking of items, etc., although affecting literal compliance, were determined to not reduce the quality or safety of the items. There were few differences in quality requirements between Class 1 and Class 2 because most quality requirements are contained in the General Requirements Subsection NA and are equally applicable to both Class 1 and Class 2. No differences in quality requirements were identified that would reduce the quality or safety of the items.
>
> For the items identified in [...] this request, there were some differences in technical requirements between Class 1 and Class 2 in the areas of piping and tubing material examination (NB/NC-2510), valve design (NB/NC-3500), piping design (NB/NC-3600), examination of circumferential piping butt welds (NB/NC-5220), and examination of springs in Class 1 component standard supports (NF-5410). However, replacing the affected items would provide a minimal increase in quality and safety as demonstrated [in the following paragraphs discussing the technical requirement differences].

3.4.1 Material Examination and Piping Design

In its letter dated April 18, 2008, the licensee stated:

> For piping and tubing material examination, the later provisions of NB-2510(a) in the Summer 1983 Addenda exempted 1 [inch] and less seamless pipe, tubes and fittings from the examination requirements of NB-2500, thus making the Class 1 rules the same as Class 2 and eliminating the technical difference [between Class 1 and Class 2].
>
> For piping design, there are considerable differences between Class 1 and Class 2 requirements but these differences were eliminated by the Summer 1975 Addenda change to NB-3630(d). This change allowed 1 [inch] and smaller Class 1 piping to be designed to NC-3600, thus making the Class 1 design rules the same as Class 2 and eliminating the technical differences. The NRC in 10 CFR 50.55a accepted the Summer 1983 Addenda containing these material examination provisions, and the Summer 1975 Addenda containing these piping design provisions. If the design and construction had taken place at a later point in time, thus using the later NRC accepted addenda, the current Class 2 installed configuration would meet present-day Class 1 material examination and piping design requirements. No increase in quality or safety would be realized by updating these Design Specifications or in upgrading the design and replacing piping and tubing.

3.4.2 Valve Design

In its letter dated April 18, 2008, the licensee stated:

> In the area of valve design, the requirements in NB-3500 are considerably different than the requirements in NC-3500. However, the small valves [that are affected] have been evaluated to the applicable requirements in NB-3500 and all the valves were found to meet the technical requirements of NB-3500 applicable to small valves. Therefore, there are no technical differences between the installed Class 2 valves and the requirements for Class 1 valves that would reduce the assurance that the valves will perform their intended safety function. No increases in quality and safety would be realized by replacing the valves with valves constructed to Class 1 requirements.

3.4.3 Examination of Circumferential Piping Butt Welds

In its letter dated April 18, 2008, the licensee stated:

> In the area of examination of circumferential piping butt welds, NB-5220 requires radiograph and surface examination of circumferential piping butt welds. NC-5222 requires radiograph only of these welds. The radiographs and surface exams in Class 1 assure volumetric quality of the welds and surface quality of the welds. Surface quality of the welds in Class 1 is to be verified because of

> Class 1 fatigue considerations and the design by analysis approach in Class 1 that reduces the design factor from 4 to 3. Class 2 does not require the additional surface examinations of these welds because of its design by rule approach, which does not have specific fatigue requirements. Because NB-3630(d) allows 1 [inch] and less Class 1 piping and tubing to be designed to Class 2 rules, the reduced design factor of 3 is not used, fatigue evaluation is not required, and special concern with surface quality in addition to volumetric quality is essentially eliminated. Therefore, the Class 1 requirement for surface examination of these welds will provide minimal increase in quality and safety. The use of Class 2 piping examination rules provides adequate assurance that these welds will perform their intended safety function of passive pressure boundary integrity.

3.4.4 Examination of Springs in Class 1 Supports

In its letter dated April 18, 2008, the licensee stated:

> In the area of examination of springs in component standard supports, NF-5410 states that springs in Class 1 component standard supports shall be examined by a surface examination. No such examination requirement exists for Class 2 springs in component standard supports. For branch line BB-098-BCB-3/4" to the Nuclear Sampling System tubing before valve BB-V0086, there is a Subsection NF Class 2 constant support (BB13-H510) containing a spring. As a Class 2 support, this spring did not receive a surface examination. This is a technical difference between the installed Class 2 support and the Class 1 requirements. However, the maximum load on this constant support during any loading condition is only 42 pounds, while the constant support was load-rated by the manufacturer at 60-85 pounds for Callaway's design conditions in accordance with Subsection NF requirements. This provides considerable margin in the function of the support. Not having received the surface examination may result in a minimal reduction in the quality of the constant support; however, the support can be expected to perform its intended safety function based on the margin in available loading.

3.5 NRC Staff Evaluation

The piping, tubing, valves, and supports identified in the relief request were designed, constructed and installed in accordance with the Class 2 requirements of the ASME Code, Section III, 1974 Edition with the Winter 1974 Addendum. Unlike later versions of the Code, this edition and addendum does not have a specific provision allowing Class 2 rules to be used for Class 1 design for piping less than or equal to 1 inch in size. This provision was added in the Summer 1975 Addendum to the 1974 Edition in subparagraph NB-3630(d). This provision would not be directly applicable to components designed and constructed to requirements through the Winter 1974 Addenda. However, with this provision incorporated into the 1975 Addendum, the current Class 2 installation would meet Class 1 requirements if the design and construction had simply taken place at a later date and the later addendum had been referenced. In addition, the NRC incorporated by reference the Summer 1975 Addenda

(43 FR 17337) in 10 CFR 50.55a(b) without any modifications or limitation in the use of this particular provision. Therefore, the NRC staff concludes that the design rules used for the affected Class 2 piping provide a level of safety equivalent to that of the Class 1 design requirements in later ASME Code editions and addenda.

Based on the preceding discussions, the NRC staff concludes that for the piping, tubing, and valves identified in this request, including the supports, the differences between the requirements for Class 1 and Class 2 construction will be insignificant to the structural integrity of the components. Therefore, authorizing this alternative to allow continued operation with the current design configuration will not adversely impact the health and safety of the public or the environment.

Furthermore, the NRC staff concludes that the licensee has demonstrated that compliance with ASME Code, Section III, Class 1 requirements for the lines and associated components described in the alternative would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety because the scope of the change would require substantial time, resources, and radiation exposure to upgrade the current design configuration.

4.0 CONCLUSION

Based on the above evaluation, the NRC staff concludes that the proposed alternative to the requirements of 10 CFR 50.55a(c) is acceptable for Callaway Plant, Unit 1, on the basis that compliance with the ASME Code, Section III design requirements for Class 1 components would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff has determined that the licensee's proposed alternative provides reasonable assurance that the pressurizer upper level instrument and other lines and associated components, as designed and constructed, will perform their intended safety function. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the proposed alternative is authorized for Callaway Plant, Unit 1, for the remaining life of the plant.

All other ASME Code, Section III, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: M. Hartzman

Date: April 29, 2009

All other ASME Code, Section III, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

The NRC staff's safety evaluation is enclosed.

Sincerely,

/RA/

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure:
Safety Evaluation

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