July 21, 2004

Mr. Michael R. Kansler, President
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - RELIEF REQUEST NO. 30 FOR THIRD 10-YEAR INSERVICE INSPECTION (ISI) PROGRAM INTERVAL (TAC NO. MC0293)

Dear Mr. Kansler:

By letter dated August 4, 2003 (ADAMS Accession No. ML032270044), as supplemented on December 30, 2003 (ADAMS Accession No. ML040070104), Entergy Nuclear Operations, Inc. (Entergy) submitted Relief Request No. 30 from the requirements for performing an augmented reactor pressure vessel (RPV) examination at the James A. FitzPatrick Nuclear Power Plant. Pursuant to 10 CFR 50.55a(g)(6)(ii)(A)(2), the RPV examinations are to be augmented for the shell welds in item B1.10, Category B-A, in Table IWB-2500-1 of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI. On February 29, 2000, the Nuclear Regulatory Commission (NRC) approved Relief Request No. 18 (ADAMS Accession No. ML003687310), authorizing Entergy an alternative to defer performing the required augmented inspection to allow Entergy time to evaluate new methods that would allow accessibility to cover over 90 percent of the vertical RPV shell welds in the beltline region. However, Entergy currently estimates that the new methods, although providing improved results, will not completely satisfy the augmented RPV weld examination requirements. Therefore, Entergy has proposed, pursuant to 10 CFR 50.55a(g)(6)(i), an alternative plan for performing the RPV augmented examination of 10 CFR 50.55a(g)(6)(ii)(A)(2) and meeting the coverage during volumetric examinations for the third 10-year ISI interval.

The NRC staff has reviewed and evaluated the information regarding Relief Request No. 30. The results are provided in the enclosed safety evaluation.

The staff concludes that the proposed alternative to the augmented RPV examination coverage specified in 10 CFR 50.55a(g)(6)(ii)(A) provides an acceptable level of quality and safety. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(g)(6)(ii)(A)(5) for the remainder of the third 10-year ISI interval.

In addition, the staff finds that the licensee's compliance with the ASME Code requirements for volumetric examination of the RPV shell welds are impractical and that the licensee's proposed alternative provides reasonable assurance of structural integrity of the RPV. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval. The staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

Richard J. Laufer, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: Safety Evaluation

cc w/encl: See next page

All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

Richard J. Laufer, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: Safety Evaluation

cc w/encl: See next page

DISTRIBUTION:
PUBLIC
PDI-1 R/F
C. Holden
R. Laufer
S. Little
P. Milano
M. Mitchell
T. McLellan
J. Jolicoeur, OEDO
G. Hill (2 copies)
OGC
ACRS

ACCESSION NUMBER: ML042030157

OFFICE	PDI-1/PM	PDI-1/LA	EMCB/SC	OGC	PDI-1/SC
NAME	PMilano	SLittle	MMitchell	JMcGurren	RLaufer
DATE	07/12/04	07/12/04	07/17/04	06/21/04	07/20 /04

OFFICIAL RECORD COPY

FitzPatrick Nuclear Power Plant

cc:

Mr. Gary J. Taylor
Chief Executive Officer
Entergy Operations, Inc.
1340 Echelon Parkway
Jackson, MS 39213

Mr. John T. Herron
Sr. VP and Chief Operating Officer
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

Mr. Theodore A. Sullivan
Site Vice President
Entergy Nuclear Operations, Inc.
James A. FitzPatrick Nuclear Power Plant
P.O. Box 110
Lycoming, NY 13093

Mr. Kevin J. Mulligan
General Manager, Plant Operations
Entergy Nuclear Operations, Inc.
James A. FitzPatrick Nuclear Power Plant
P.O. Box 110
Lycoming, NY 13093

Mr. Danny L. Pace
Vice President, Engineering
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

Mr. Brian O'Grady
Vice President, Operations Support
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

Mr. John F. McCann
Director, Nuclear Safety Assurance
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

Resident Inspector's Office
James A. FitzPatrick Nuclear Power Plant
U. S. Nuclear Regulatory Commission
P.O. Box 136
Lycoming, NY 13093

Ms. Charlene D. Faison
Manager, Licensing
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

Mr. Michael J. Colomb
Director of Oversight
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

Mr. William Maquire
Director, Nuclear Safety Assurance
Entergy Nuclear Operations, Inc.
James A. FitzPatrick Nuclear Power Plant
P.O. Box 110
Lycoming, NY 13093

Mr. Andrew Halliday
Manager, Regulatory Compliance
Entergy Nuclear Operations, Inc.
James A. FitzPatrick Nuclear Power Plant
P.O. Box 110
Lycoming, NY 13093

Supervisor
Town of Scriba
Route 8, Box 382
Oswego, NY 13126

Mr. Charles Donaldson, Esquire
Assistant Attorney General
New York Department of Law
120 Broadway
New York, NY 10271

FitzPatrick Nuclear Power Plant

cc:

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Oswego County Administrator
Mr. Steven Lyman
46 East Bridge Street
Oswego, NY 13126

Mr. Peter R. Smith, President
New York State Energy, Research,
and Development Authority
17 Columbia Circle
Albany, NY 12203-6399

Mr. Paul Eddy
New York State Dept. of Public Service
3 Empire State Plaza
Albany, NY 12223-1350

Mr. John M. Fulton
Assistant General Counsel
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

Mr. Ken L. Graesser
BWR SRC Consultant
38832 N. Ashley Drive
Lake Villa, IL 60046

Mr. Jim Sniezek
Nuclear Management Consultant
5486 Nithsdale Drive
Salisbury, MD 21801

Mr. Ron Toole
BWR SRC Consultant
1282 Valley of Lakes
Box R-10
Hazelton, PA 18202

Ms. Stacey Lousteau
Treasury Department
Entergy Services, Inc.
639 Loyola Avenue
Mail Stop L-ENT-15E
New Orleans, LA 70113

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

RELIEF REQUEST NO. 30

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

ENTERGY NUCLEAR OPERATIONS, INC.

DOCKET NUMBER 50-333

1.0 INTRODUCTION

By letter dated February 29, 2000 (ADAMS Accession No. ML003687310), the Nuclear Regulatory Commission (NRC) authorized, by Relief Request No. 18, the New York Power Authority (NYPA, the former licensee) an alternative to the augmented reactor pressure vessel (RPV) examinations for the James A. FitzPatrick Nuclear Power Plant (JAF). This relief request authorized NYPA to defer performing the augmented RPV examination required in 10 CFR 50.55a(g)(6)(ii)(A)(2) to allow the licensee time to evaluate new methods that would allow accessibility to cover over 90percent of the vertical RPV shell welds in the beltline region. On November 21, 2000, the facility operating license for JAF was transferred to Entergy Nuclear Operations, Inc. (Entergy or the licensee).

Subsequently, in a letter dated August 4, 2003 (ADAMS Accession No. ML032270044), as supplemented on December 30, 2003 (ADAMS Accession No. ML040070104), Entergy submitted Relief Request No. 30 from the requirements for performing an augmented RPV examination at JAF. Pursuant to 10 CFR 50.55a(g)(6)(ii)(A)(2), the RPV examinations are required to be augmented for the shell welds in item B1.10, Category B-A, in Table IWB-2500-1 of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI. Entergy submitted Relief Request No. 30 for the third 10-year inservice inspection (ISI) program interval at JAF. The NRC staff has reviewed the information supporting this request and provides the discussion below.

2.0 REGULATORY REQUIREMENTS

The ISI of the ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable Code of record for the third 10-year ISI for JAF is the 1989 Edition of the ASME Code, Section XI. The third 10-year interval started September 26, 1997, and will end on September 27, 2006[1].

10 CFR 50.55a(g)(6)(ii)(A)(2) states that all licensees shall augment their reactor vessel examinations by implementing the examination requirements for RPV shell welds specified in item B 1.10 of Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," in Table IWB-2500-1 of Subsection IWB of the 1989 Edition of Section XI, Division 1, of the ASME Code, subject to the conditions specified in 50.55a(g)(6)(ii)(A)(3) and (4). As stated in 10 CFR 50.55a(g)(6)(ii)(A)(2), for the purposes of this augmented examination, essentially 100 percent as used in Table IWB-2500-1 means more than 90 percent of the examination volume for each weld. Additionally, 10 CFR 50.55a(g)(6)(ii)(A)(5) requires licensees that are unable to completely satisfy the augmented RPV shell weld examination requirements to submit information to the NRC to support the determination, and propose an alternative to the examination requirements that would provide an acceptable level of quality and safety.

3.0 TECHNICAL EVALUATION

The NRC staff evaluation is divided into two parts. First is the evaluation of the licensee's proposed alternative to the RPV augmented examination requirements of 10 CFR 50.55a(g)(6)(ii)(A)(2). Under the rule for the RPV augmented examination requirements, a licensee may elect to credit the augmented examination results to the ASME Code, Section XI examination requirements for the RPV examinations. The licensee selected this option. Therefore, the second part of this review is the licensee's relief from the ASME Code, Section XI requirements pursuant to 10CFR50.55a(g)(6)(i) for welds where less than essentially 100 percent coverage was obtained.

The licensee's basis for both the alternative to the RPV augmented examination rule and the ASME Code, Section XI relief is all inclusive in one relief as stated below:

Licensee's Code Relief Request (As stated):

> The purpose of this letter is to request approval, pursuant to provisions contained in 10CFR50.55a(g)(6)(i) based on the code requirements being impractical, an alternative plan for performing the reactor pressure vessel (RPV)

[1]The licensee extended the second 10-year interval a year per the ASME Code, Section XI, IWA-2430 and was required to shorten the third 10-year interval by a year.

> augmented examination requirements of 10CFR50.55a(g)(6)(ii)(A)(2) for the James A. FitzPatrick Nuclear Power Plant (JAF).

During refueling outage 15 (RFO 15) in the fourth quarter of the year 2002, Entergy completed Phase I of the inspection plan utilizing the outside diameter (OD) inspection tooling. Entergy will complete Phase II of the inspection plan utilizing the inside diameter (ID) inspection tooling during RFO 16. All axial RPV shell welds will be examined to the maximum extent possible. For all axial welds, where less than 90 percent total coverage is achieved Entergy requests additional relief.

At JAF, the licensee is unable to obtain essentially 100 percent of each vertical weld without disassembly or removal of internal interferences, removal of the permanently installed bio-shield, or spending additional efforts and personnel radiation exposure in pursuing further examinations from the vessel OD as in RFO 15, which would result in hardship and unusual difficulty without a compensating increase in the level of quality and safety. The licensee intends to continue the review and evaluation of methods to allow accessibility to greater than 90 percent of each of the vertical RPV shell welds in the beltline region. However, welds nos. VV-3A and VV-3C, previously planned to be accessed for inspection from vessel OD, will now be accessed from the ID side only. The ID access to these welds will be partially limited by the core spray and feedwater headers, the guide bar attachment bracket, and the core spray downcomers. The alternative plan, per allowances of 10 CFR 50.55a(g)(6)(ii)(A)(5), would be a best-effort examination expected to yield total beltline and total axial weld coverage close to or exceeding the coverage obtained by most plants within the domestic boiling-water reactor (BWR) fleet.

<u>Licensee's Basis for Relief Request</u> (As stated):

> The alternative plan would complete Phase II examination in RO16 of the vertical shell welds from vessel ID. This will complement the coverage obtained in RO15 from vessel OD. The combined ID/OD access coverage is expected to meet or to exceed the coverage obtained by most domestic plants within the BWR Combustion Engineering (CE) manufactured Reactor Vessel fleet. RO16 is currently scheduled for fourth quarter 2004. There are a large number of RPV internal obstructions/interferences which prevent achieving the "essentially 100%" coverage requirements of 10CFR50.55a(g)(6)(ii)(A) "Augmented Examination of Reactor Vessel". The estimated coverage with use of conventional tooling was in the range of 51% to 64% for all vertical welds and 33% to 52% for belt-line region vertical welds. Industry average for the BWR CE Fleet is approximately 60% of total weld length and belt-line (Reference 1[2]). However, with the use of "new generation" tooling (Reference 3[3]) JAF expects to obtain belt-line region axial weld coverage of approximately 63%, and total

---

[2]Reference 1 on the licensee's cover letter refers to NYPA letter to USNRC dated August 5, 1999, in licensee's submittal dated August 4, 2003, and is not included in this safety evaluation (SE).

[3]Reference 3 on the licensee's cover letter refers to Entergy letter to USNRC dated December 20, 2001, in licensee's submittal dated August 4, 2003, and is not included in this SE.

> axial weld coverage of approximately 75%, results higher than the industry average, (see Attachment 2[4]).

The NRC staff, in a telephone conversation on December 10, 2003, requested the licensee to provide additional details of previous inspection results and state whether the RPV is a weld limited vessel. In its December 30, 2003, letter, the licensee responded by stating that:

> ... the FitzPatrick RPV is a weld-limited vessel. The lower shell axial welds contain the material most susceptible to radiation-induced embrittlement in RPV (i.e., the limiting material in vessel). These welds, designated 2-233 A,B,C on vessel drawings and VV-4A, VV-4B, and VV-4C on ISI documents, contain heat 27204/12008 (reference 2[5]) and have a RT_{NDT} @ End of Life (EOL)= 127.9°F (Reference 3[6] and 4[7]).
>
> Welds VV-4A and VV-4B were examined in RO15 (Phase I from the vessel OD side with 73% of total weld length coverage, including 91% in the beltline region (Reference 1). A review of the ultrasonic examination data acquired on these welds revealed no recordable indications.
>
> Lower shell weld VV-4C will be examined in RO16 (Phase II) from vessel ID side, also with 73% of total projected weld length coverage, and 100% in the beltline region (Reference 1).
>
> Lower intermediate shell axial welds 1-233 A,B,C (heat 13253/12008, (Reference 2), and RT_{NDT} @EOL=119.9°F) (Reference 3 and 4) corresponding to welds VV-3A, VV-3B, and VV-3C will be examined in RO16 (Phase II) from vessel ID side, with 41%, 86% and 41% of total projected weld length coverage, respectively. These welds are less susceptible to radiation-induced embrittlement then are the limiting welds in the lower shell region of the vessel."

<u>Licensee's Proposed Alternative Examination</u> (As stated):

> JAF is unable to meet the greater than 90% coverage requirement for each weld due to internal interference of the reactor vessel components. The alternative plan with the new improved tooling technology, will enable scanning of welds in confined areas not accessible by conventional tooling.

---

[4]Attachment 2 refers to Tables 2.1 and 2.2 RPV shell weld examination coverages and are reproduced in this SE.

[5]Attachment 2 refers to GE Report DRF B11-00732-02, "Resolution of Comments for Report GE-NE- B1100732-01, Rev. 1, Plant FitzPatrick RPV Surveillance Materials Testing and Analysis of 120 degree F Capsule at 13 EFPY" is referenced in the licensee's letter dated December 30, 2003, and is not included in this SE.

[6]Reference 3 refers to NYPA Letter (JPN-99-035) to NRC, "Comments on the Reactor Vessel Integrity Database," dated October 15, 1999, reference in the licensee's letter dated December 30, 2003, is not included in this SE.

[7]Reference 4 is contained in the licensee's letter dated December 30, 2003, refers to Interface Control Document No. JAF-ICD-RPV-03439, "Reactor Vessel Integrity Database (RVID) Comments and Corrections in Response to NRC Request dated July 6, 1999," dated October 8, 1999, referenced in the licensee's letter dated December 30, 2003, and is not included in this SE.

The industry basis document, BWRVIP-05 (Reference 4[8]), considered several issues related to BWR RPV integrity to provide a basis for eliminating the requirement to perform circumferential weld exams and the performance of only 50% of the vertical RPV shell weld exams. These issues include fabrication practices, in-service inspection data, operational issues, degradation mechanics, and probabilistic fracture mechanics analysis results. As stated in the report "Results of the evaluation performed in this report clearly demonstrate the inherent safety and integrity of BWR reactor pressure vessels." The following basis provides plant specific data to justify weld coverage lower than the required "essentially 100%."

Previous Shell Weld Examinations

During the fabrication process of the RPV, the shell welds were thoroughly examined using several examination methods as required by the original construction code. Additionally, all of the shell welds received volumetric examination prior to initial plant operations, as prescribed by ASME Code, Section XI pre-service inspection requirements.

A search of original construction records (i.e., weld travelers) identified among other items, a Report of Ultrasonic Testing for Vessel Assembly dated April 10, 1971, stating "UT of Pressure Boundary Welds, No Indications Reportable;" and a Shop Quality Control, Inspection and Document Record document (by Stone and Webster), with a listing of performed and checked tests, dated September 16, 1970. All shell weld original radiographs have been digitized per latest Electric Power Research Institute (EPRI) guidelines. The digitized radiographs, for the vertical welds in the beltline region, were reviewed by a JAF Quality Assurance Level III inspector. The review identified minor inclusions/slag/porosity randomly oriented throughout the welds. These indications are considered minor, with no safety significance. These radiographs were accepted during original vessel fabrication.

Selected shell welds have received OD volumetric examinations during the first and second ISI interval in accordance with ASME Code, Section XI ISI requirements. The OD examination totaled 28 percent of total vertical length of shell welds, with 12 percent at beltline vertical welds. Most of the intersecting welds (10 of 15 welds) were inspected. Some welds only received partial coverage (i.e., one-sided examination coverage only). The OD examinations resulted in only four recorded spot indications, with no measurable length or width. These indications were found acceptable for operation.

Two welds were examined in RFO 15 (Phase I) from vessel OD with coverage in weld length as follows:

Weld Designation No:	Total % Coverage	Belt-Line % Coverage
VV-4A	73	91
VV-4B	73	91

[8]Reference 4 is contained in the licensee's letter dated August 4, 2003, and refers to BWRVIP-05, "BWR RPV Shell Weld Inspection Recommendations," September 1995. This document is not included in this SE.

The intent of the Phase I inspection was to increase beltline coverage to "close to or exceed 90%." Phase I inspection plans were to examine four axial welds (VV4A, VV4B, VV-3A, and VV-3C) by ultrasonic testing (UT) method with access from the vessel OD. However, limited tooling access through biological shield wall openings, high dose rates, and personnel radiation exposure allowed only two axial welds (VV-4A, VV-4B) to be examined. These particular welds were not accessible from the ID either by conventional tooling or state-of-the art tooling (i.e., other methods would result in zero coverage). To allow the OD exams and to develop the necessary OD UT tooling, required significant resources and personnel radiation exposure in RFO 14 (measurements for tooling development) and RFO 15 (actual OD Phase I, ISI exams). Actual total personnel radiation exposure received to support these two weld exams was 14.23 radiation equivalent man (REM). Based on this, Entergy determined that performing additional exams from the OD presents hardship and unnecessary personnel radiation exposure. Unlike the two inspected welds (VV-4A, VV-4B), VV-3A and VV-3C are accessible from the ID and have been added to the Phase II exams. This will result in less total coverage and less belt-line coverage, but will result in a significant personnel radiation dose exposure savings of at least 5.9 REM.

(Note: In an NRC SE dated January 7, 2000, the licensee received approval for its proposed alternative to perform vertical weld examinations and incidental examinations of 2 to 3 percent of the intersecting circumferential shell welds to the maximum extent possible based on accessibility. The alternative allowed the licensee to defer examination of the circumferential welds until expiration of the plants current operating license.)

Industry Results of Past Examinations

As identified in Reference 1 of the August 4 submittal, a substantial amount of examinations have been performed on the BWR fleet that verify the integrity of BWR vessels. Only a negligible number of construction related indications have been detected as a result of these inspections with no service-related defects.

RPV Internal Obstructions/Interferences

Typical vertical weld coverage achieved on BWRs using RPVs fabricated by Combustion Engineering (CE) is approximately 60 percent average for beltline and non-beltline welds. The low coverage is attributed to RPV internal obstructions. No domestic plant has removed these obstructions to increase weld inspection coverage.

The internal obstructions/interferences at JAF are listed below:

1. Jet pump assemblies, support plates and gussets restrict access to at least three vertical welds;
2. Some of the core shroud repair tie-rods restrict access to at least two vertical welds; (JAF has installed a 10 tie-rod system);
3. Feedwater sparger and core spray piping restrict significant coverage to at least three vertical welds;
4. Guide rod at 180° restricts access to two vertical welds located at the same azimuth;
5. Steam dryer brackets obstruct local access for two welds; and others such as the surveillance specimen holder, etc.

Removal of obstructions/vessel internals would involve substantial risk and possible damage to the vessel inside wall, and would create the potential for loose parts (i.e., metal shavings that could cause fuel damage). Such removal would involve a significant amount of person-hours of direct labor with severe impact to the outage schedule, an economic impact, and a substantial increase in personnel radiation exposure, without a compensating increase in safety.

The licensee stated that, based on (a) the documentation in the BWRVIP-05 Report, (b) the lower neutron fluence than the leading plants, (c) the less challenging design and operational loading for BWRs, (e) the quality of the original vessel fabrication, (f) the lack of significant degradation mechanisms, and (g) the results of the previous vessel examinations (including RFO 15), it believes that the inspections already performed at JAF, including the Phase II inspections planned for RFO 16, provides an acceptable level of quality and safety. Further, the licensee considers the Phase I inspection (OD inspection) completed in RFO 15, and the Phase II inspection (ID inspections) planned for RFO 16, which will be completed to the maximum extent practical, will meet the underlying objective of Relief Request No. 18. The licensee indicated that maximum coverage of the axial welds will be completed with "new generation" tooling. This will result in improved inspection results than could be achieved with conventional tooling.

EXAMINATION OF ALL REACTOR VESSEL AXIAL WELDS

Weld Number ID	**Total Weld Length (in)**	**Projected ID (unless noted) Examination Total Length (in)**	**% of Total weld Length to be Examined (1)**
VV-1A	150	141	94%
VV-1B	150	141	94%
VV-1C	150	150	100%
VV-2A	150	114.5	76%
VV-2B	150	103.5	69%
VV-2C	150	114.5	76%
VV-3A	150	61.5	41%
VV-3B	150	129	86%
VV-3C	150	61.5	41%
VV-4A	150	109 (3)	73%
VV-4B	150	109 (3)	73%
VV-4C	150	109.5	73%
Total	1800	1344	74.7 (2)

(1) Limitations due to physical obstructions were discussed in detail in Entergy's letter dated December 20, 2001, which is not included in this SE.
(2) With conventional tooling projected total exam coverage was 50.8 percent
(3) VV-4A and VV-4B coverage is from OD only.

PROJECTED EXAMINATION COVERAGE OF RPV BELTLINE REGION AXIAL WELDS

Weld Number ID	Weld Length in Beltline Region (in)	Projected ID Examination (unless noted) Length in Beltline (in)	% of Weld Length in Beltline to be Examined
VV-3A	112	23.5	21% (1)
VV-3B	112	112	100% (1)
VV-3C	112	23.5	21% (1)
VV-4A	56	51 (2)	91% (2)
VV-4B	56	51 (2)	91% (2)
VV-4C	56	56	100% (2)
TOTAL	504 in	317 in	62.9%

(1) Estimated coverage based on access evaluation by WEDYNE to be completed during RFO 16. (fall 2004) (Phase II ID exams).
(2) Actual exam results completed during RFO15. (fall 2002) (Phase I OD exams)

Staff Evaluation

Part 1: Alternative to 10 CFR 50.55a(g)(6)(ii)(A)(2) Augmented RPV Examination

10 CFR 50.55a(g)(6)(ii)(A)(2) states that all licensees shall augment their RPV examinations by implementing the examination requirements for RPV shell welds specified in item B1.10 of Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel," in Table IWB-2500-1 of Subsection IWB of the 1989 Edition of Section XI, Division 1, of the ASME Code, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(A)(3) and (4). As stated in 10 CFR 50.55a(g)(6)(ii)(A)(2), for the purposes of this augmented examination, essentially 100 percent as used in Table IWB-2500-1 means more than 90 percent of the examination volume for each weld. In an NRC SE dated February 29, 2000, the licensee received authorization to defer the augmented reactor vessel examinations to RFO 15 and RFO 16 in order to develop new generation tooling to increase examination coverage.

The licensee proposed an alternative for all axial welds, where less than essentially 100 percent total coverage will be achieved, because it is unable to perform the required examination coverage of the reactor vessel axial shell welds due to obstructions. The licensee proposed that the limited coverage that was obtained in its Phase I (RFO 15) examinations and the limited examination coverage that it will obtain in its Phase II examinations in RFO 16 of the subject welds be authorized as an alternative to the RPV augmented examination requirements of 10 CFR 50.55a(g)(6)(ii)(A)(2). The licensee will use its "new generation" tooling to examine beltline region axial welds VV-3A and VV-3C from the RPV ID and expects to obtain a total beltline region axial weld length coverage of approximately 63 percent. The licensee will also be examining the lower shell weld VV-4C in RFO 16 from the vessel ID side, with a projected 73 percent total weld length coverage of all the axial welds and 100 percent weld length coverage in the beltline region of weld VV-4C. In addition, in RFO 16, the licensee will be examining the lower intermediate shell axial welds VV-3A, VV-3B, and VV3C from the vessel ID side with a total projected total weld length coverage of 41 percent, 86 percent, and 41percent, respectively. This alternative plan will complete Phase II examinations of the vertical shell welds from vessel ID and will complement the coverage obtained in RFO 15 from vessel OD.

The licensee stated in its cover letter dated August 4, 2003, that it will provide additional NRC notification after completion of RFO16, if any examination coverage is significantly different from these estimates.

In its December 30, 2003, letter, the licensee noted that the JAF RPV is a weld-limited vessel and that the lower shell axial welds contain the material most susceptible to radiation-induced embrittlement in the RPV. These welds, are designated as VV-4A, VV-4B, and VV-4C on ISI documents, contain heat 27204/12008, and have an RT_{NDT} @ End of Life (EOL) = 127.9 °F. Welds VV-4A, and VV-4B were examined in RFO 15 from vessel OD side with 73 percent of total weld length coverage including 91percent in the beltline region of the welds. The licensee found no recordable indications during these examinations. Weld VV-4C will be examined from the ID in RFO 16 and the licensee expects to obtain 100 percent coverage of the beltline region of weld VV-4C.

The NRC staff determined that, since the licensee will obtain 91 percent, 91 percent, and 100 percent, for the most susceptible RPV beltline region axial welds VV-4A, VV-4B, and VV-4C, respectively, with a total coverage of 73 percent any degradation of the RPV welds should be detected. Therefore, based on the examination coverage on the most susceptible welds to radiation-induced embrittlement, the examination coverage expected to be obtained in Phase II inspections, and the examination coverage obtained in Phase I and when compared to the industry average for the BWR CE Fleet of approximately 60 percent of total weld length and beltline, the staff determined that the licensee's proposed alternative provides reasonable assurance of quality and safety.

Part 2: Relief from ASME Code, Section XI for the RPV Axial Shell Welds

The ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1989 Edition, Table IWA-2500-1, Category B-A, Item B1.10, "Reactor Vessel Longitudinal Shell Welds," requires essentially 100 percent volumetric examination of the weld length.

The licensee has requested relief for all axial welds, where less than "essentially 100 percent" total coverage is achieved, because the ASME Code required examinations are impractical to perform. The licensee is unable to meet the Code required essentially 100 percent volumetric examination of the weld length for the axial welds due to internal interference of the reactor vessel components. In order for the licensee to obtain the Code required volumetric coverage, it would be required to remove obstructions which would involve substantial risk and possible damage to the vessel inside wall, and would create the potential for loose parts. For example, some of the internal obstructions/interferences are: jet pump assemblies; support plates and gussets restrict access to at least three vertical welds; some of the core shroud repair tie-rods restrict access to at least two vertical welds; feedwater sparger and core spray piping restrict significant coverage to at least three vertical welds; guide rod at 180° restricts access to two vertical welds located at the same azimuth; steam dryer brackets obstruct local access for two welds; and the surveillance specimen holder, etc. Therefore, the NRC staff determined that the Code requirements are impractical based on the interferences, as described in the licensee's basis for relief, and the licensee would be required to redesign the RPV in order to perform the Code required examinations, which would place a significant burden on the licensee.

The licensee has proposed, as an alternative to the ASME Code, Section XI requirements, the use of its limited examination coverage that was obtained in its Phase I (RFO 15) examinations and the limited examination coverage that will obtained in its Phase II examinations in RFO 16. The licensee expects to obtain a total beltline region axial weld coverage of approximately 63 percent. As noted above, the JAF RPV is a weld-limited vessel and the licensee has obtained a significant examination coverage of the subject welds in RFO 15 and a significant examination coverage will be obtained in RFO 16 of the welds most susceptible to radiation-induced embrittlement. Therefore, any service-induced degradation of the RPV welds should have been or will be detected. The licensee expects that the total axial weld coverage from Phase I and Phase II examinations to be approximately 75 percent and a total of 63 percent of the beltline region of the over all weld length (as compared to the industry average for the BWR CE fleet of approximately 60 percent of total weld length and beltline). Therefore, the licensee's proposed alternative provides reasonable assurance of structural integrity of the JAF RPV.

4.0 CONCLUSIONS

The NRC staff finds that the licensee's proposed alternative for the augmented reactor vessel examination as required per 10 CFR 50.55a(g)(6)(ii)(A)(3) and (4) provides an acceptable level of quality and safety. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(g)(6)(ii)(A)(5) for the third 10-year ISI interval.

The staff finds, for relief from the ASME Code, Section XI, that the Code requirements for volumetric examination of the RPV shell welds are impractical and that the licensee's proposed alternative provides reasonable assurance of structural integrity of the RPV. Therefore, the relief request is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval. The staff has determined that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: T. McLellan

Date: July 21, 2004