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

DOCKETED
USNRC

November 20, 1996

'96 NOV 20 P4:57

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Ms. Anne D. Burt
Corresponding Secretary
Friends of the Coast - Opposing Nuclear Pollution
Post Office Box 98
Edgecomb, Maine 04556

Dear Ms. Burt:

I am responding to the petition you filed on January 20, 1996 (the Petition), on behalf of the Friends of the Coast - Opposing Nuclear Pollution (Petitioner), in regard to the Maine Yankee Atomic Power Station (Maine Yankee), operated by the Maine Yankee Atomic Power Company (the licensee). Your petition was considered pursuant to Title 10 of the Code of Federal Regulations, Section 2.206 (10 CFR 2.206). The Petition requests that the Commission take expedited action to (1) suspend the operating license of Maine Yankee pending resolution of the Petition; (2) examine and test by plug sampling — or other methods approved by the American Society of Mechanical Engineers — all large piping welds that may have been susceptible to micro-fissures at the time of construction; (3) reanalyze the Maine Yankee containment as one located in an area where seismic risk is not "low"; (4) reduce the licensed operating capacity of Maine Yankee to a level consistent with a flawed containment and/or flawed reactor coolant piping welds; (5) hold an informal public hearing in the area of the plant regarding the Petition; and (6) place the Petitioner on service and mailing lists relevant to the group's interests in safety at Maine Yankee and intention to participate in all public forums opened by the Nuclear Regulatory Commission (NRC).

By letter dated May 13, 1996, Mr. William Russell, Director, Office of Nuclear Reactor Regulation, acknowledged the NRC's receipt of your Petition, and, for the reasons stated in the letter, denied your request for immediate action suspending the operating license or reducing the licensed operating capacity of Maine Yankee (Requests 1 and, in part, 4.). In addition, for reasons stated in the May 13, 1996, letter, Mr. Russell denied your request for an informal hearing (Request 5). Mr. Russell also stated in the May 13, 1996, letter that your request that the NRC place you on service and mailing lists relevant to your interests in safety at Maine Yankee and your intention to participate in all public forums opened by the NRC (Request 6) was moot, as your attorney had already been added to the Maine Yankee service list.

The remaining specific issues that you raised that were the basis for Requests 2, 3, and 4 of your Petition dated January 20, 1996 (identified above), are fully addressed in the enclosed Director Decision (DD-96-20).

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For the reasons given in the enclosed Director's Decision under 10 CFR 2.206, your remaining requests for NRC action have been denied. A copy of the decision will be filed with the Secretary of the Commission for the Commission's review in accordance with 10 CFR 2.206(c). As provided by this regulation, the decision will constitute the final action of the Commission 25 days after the date of issuance of the decision unless the Commission, on its own motion, institutes a review of the decision within that time.

I have also enclosed a copy of the notice of "Issuance of Director's Decision Under 10 CFR 2.206." This notice includes the complete text of DD-96-20 and is being filed with the Office of the Federal Register for publication.

Sincerely,

Frank J. Miraglia

Frank J. Miraglia, Acting Director
Office of Nuclear Reactor Regulation

Docket No. 50-309 (2.206)

Enclosures: 1. Director's Decision DD-96-20
2. Notice

cc w/enclosures:
See next page

cc:

Mr. Charles B. Brinkman
Manager - Washington Nuclear
Operations
ABB Combustion Engineering
12300 Twinbrook Parkway, Suite 330
Rockville, MD 20852

Thomas G. Dignan, Jr., Esquire
Ropes & Gray
One International Place
Boston, MA 02110-2624

Mr. Uldis Vanags
State Nuclear Safety Advisor
State Planning Office
State House Station #38
Augusta, ME 04333

Mr. P. L. Anderson, Project Manager
Yankee Atomic Electric Company
580 Main Street
Bolton, MA 01740-1398

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

First Selectman of Wiscasset
Municipal Building
U.S. Route 1
Wiscasset, ME 04578

Mr. J. T. Yerokun
Senior Resident Inspector
Maine Yankee Atomic Power Station
U.S. Nuclear Regulatory Commission
P.O. Box E
Wiscasset, ME 04578

Mr. James R. Hebert, Manager
Nuclear Engineering and Licensing
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329 Bath Road
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Attorney at Law
P.O. Box 566
Putney, VT 05346-0566

Mr. Charles D. Frizzle, President
Maine Yankee Atomic Power Company
329 Bath Road
Brunswick, ME 04011

FRIENDS of the COAST - *OPPOSING NUCLEAR POLLUTION*
Post Office Box 98, Edgecomb, Maine 04556 **phone/ fax - 207-882 - 6000**

DOCKETED
USNRC

'96 NOV 20 P4:57

January 20, 1996

William T. Russell, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555 - 0001

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Dear Mr. Russell,

Pursuant to the provisions of 10 CFR 2.206 , Friends of the Coast - Opposing Nuclear Pollution, a non-profit organization incorporated in the State of Maine, petitions prompt and thorough consideration of the following unresolved or insufficiently considered safety-related issues pertaining to Maine Yankee Nuclear Power Station (MYAPS):

1. Containment is inadequate for power operation in excess of original license and may be inadequate for original power operation limits based on insupportable original design acceptance criteria. The containment at MYAPS was designed and constructed without diagonal reinforcement rod. Upon our best information and belief, the Atomic Energy Commission staff recommended to the commission that a license amendment permitting this type of construction be allowed, '...for this plant and this plant only due to low seismic risk.' Early in 1979 the MYAPS was shaken by an earthquake of 4.2 magnitude and epicentered less than ten miles from plant site. The NRC then ordered the shutdown of five nuclear power stations including MYAPS until piping and piping supports could be seismicly qualified. Upon our best information and belief, there is no public record that NRC did a second evaluation of MYAPS marginally acceptable containment design, nor can we find any record of reevaluation prior to any subsequent granting of license amendments to operate at increased power. Enclosed are sample pages from 1968 and 1971 MYAPS/ AEC correspondence files indicating the situation. It is petitioner's belief that MYAPS unique containment design is first mentioned in construction license amendments one and two. Complete files are, of course, at your disposal

2. MYAPS Emergency Core Cooling System, Primary Coolant Piping, and other large piping has not be adequately analyzed for materials degradation to ensure integrity at power operation in excess of original license limits or under accident conditions. Such analysis could prove that piping integrity is inadequate for continued operation at original limits. A review of MYAPS construction license amendment 30 will show that the Atomic Energy Commission was concerned enough with the appearance of " micro-fissures " in reactor coolant system welds to appoint a "task force". In 1971 the AEC's concern prompted studies and reports by Battelle Columbus Laboratories, Stone and Webster Engineering, and consultant Dr. Ernest Nipes of Renssalaer Polytechnic Institute which generally concluded that the micro-fissures would not propagate or grow under foreseeable conditions.

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However, petitioners maintain concern for the micro-fissures was dismissed prior to a heightened awareness of embrittlement phenomena in reactor vessel walls and welds. Of particular concern to petitioners are those large pipe welds attaching to, or next to, the reactor vessel which have endured 23 years of corrosion, stress, vibration, and radiation and which may fail initiating a Loss of Coolant Accident or which may be subject to thermal shock failure initiated by use of the ECCS.

Enclosed are sample pages from the AEC/ MYAPS 1971 correspondence file which supply references to the issue microfissures in welds on the MYAPS reactor coolant system.

Pursuant to the conditions of 10 CFR 2.206, petitioners request the following actions be undertaken by NRC:

1. Suspend the operating license of Maine Yankee Atomic Power Station until the above issues are thoroughly examined and resolved. 2 Examine and test by plug sampling or other ASME approved methods all large piping welds which may have been susceptible to micro-fissures at the time of construction. Reanalyze MYAPS containment as one located in an area where seismic risk is not "low". 2

2. Failing suspension of license, or should license be restored following examination of the above issues, reduce the license operating capacity of MYAPS to levels consistent with a flawed containment and or flawed reactor coolant piping welds.

3. Provide an informal public hearing regarding this petition in the plant area.

4. Act on this petition in an expedited manner due to what the petitioners believe are the serious implications of the concerns raised.

5. Place Friends of the Coast on such service and/or mailing lists as may be relevant to our interest in safety at MYAPS and our intention to participate in all public forums opened by NRC.

Thank you for your Attention. Please address all correspondence to :

Anne D. Burt

Anne D. Burt
Corresponding Secretary,
Friends of the Coast - Opposing Nuclear Pollution
Post Office Box 98, Edgecomb, Maine 04556

Enclosure one · containment - 50-309.

ATTACHMENT (1)

January 15, 1968

MYB-168

United States Atomic Energy Commission
Washington, D. C. 20545

Attention: Director, Division of Reactor Licensing

Dear Sir:

DOCKET 50-309
STRUCTURAL DESIGN REPORT

We hereby submit, as requested, a report prepared by Hansen, Holley and Biggs dated December 29, 1967. This report entitled "Recommended Provisions for Resistance to Tangential Shear Forces Associated With Earthquake Loading" documents the material presented by Professor Myle J. Holley, Jr. at a meeting with the Atomic Energy Commission staff and Drs. Newmark and Hall on December 14, 1967. The report is submitted to substantiate designing the reactor containment using only circumferential and vertical rebars to provide the membrane strength.

Respectfully submitted,

MAINE YANKEE ATOMIC POWER COMPANY

Bruce B. Beckley

Bruce B. Beckley
Project Engineer

BBB:bs

Att.

ACKNOWLEDGED

ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

TO:

o. 50-309 JAN 3 1 1968

Surgeon General, U. S. Public Health Service
Department of Health, Education, and Welfare
Attention: Nuclear Facility Analysis Section
1901 Chapman Avenue
Rockville, Maryland 20852

Gentlemen:

In accordance with the understandings reached August 1, 1961, between the Atomic Energy Commission and the Department of Health, Education, and Welfare, attached for your information are the following documents:

MAINE YANKEE ATOMIC POWER COMPANY

1. Amendment Nos. 1 and 2 dated January 15, 1968 to the license application for the Maine Yankee Atomic Power Station.

2. Transmittal letter dated January 15, 1968 from Maine Yankee Atomic Power Company and report dated December 29, 1967 from Hansen, Holly and Biggs Consulting Engineers entitled "Recommended Provisions for Resistance to Tangential Shear Forces Associated with Earthquake Loading - Containment Shell of Maine Yankee Nuclear Power Plant."

Sincerely yours,

Roger S. Boyd

Roger S. Boyd, Assistant Director
for Reactor Projects
Division of Reactor Licensing

Enclosures:
As stated above

A [illegible]

Docket No. 50-309

JAN 2 2 1971

Mr. William H. Dunham, President
Maine Yankee Atomic Power Company
9 Green Street
Augusta, Maine [illegible]

Gentlemen:

Our letter of [illegible] 1970 [illegible] additional information needed to complete our evaluation of your application for an operating license for the [illegible]. [illegible] with your representatives [illegible] have [illegible] for further information [illegible] not covered by our previous letter. The information required is listed in the enclosure.

We recognize that [illegible] the information requested may be available in the public record [illegible] our regulatory review of similar features of other facilities. If this is the case, you may wish to incorporate the information by reference in your application.

Please contact us if you desire any discussion or clarification of the material requested by this letter.

Sincerely,

Original Signed By
Peter A. Morris

Peter A. Morris, Director
Division of Reactor Licensing

Enclosure:
Additional Information Required

cc: Lawrence E. Minnick
Vice-President - Engineering
20 Turnpike Road
Westboro, Massachusetts 01581

John A. Ritsher, Esq.
Ropes & Gray
225 Franklin Street
Boston, Massachusetts 02110

d

5.0 STRUCTURES

5.1 Why do you state (page 5-5(a) of the FSAR) that ACI Special Publication 17 will be used in the design of the primary shield wall where the ACI 318-63 code is not applicable, since ACI Special Publication 17 is a detailed expansion of the ACI 318-63 Code?

5.2 Indicate the stress and/or strain criteria that have been applied to the design of the large openings in the containment and the methods used to verify the adequacy of these large openings. [illegible]

5.3 For the interior structures, indicate the bases for the loads given in Section 5.1.5.2.1 of the FSAR and the load combinations, stress and/or strain criteria, and method of design. List which stresses are critical and state their levels.

5.4 Describe the design of the radial shear ladders (described on page 5-20 of the FSAR) in the containment wall, including the extent of concrete presumed to act with these ladders.

5.5 Since no diagonal reinforcing has been provided in the containment wall for seismic shears, indicate, for comparison, the maximum seismic shear stress in the concrete and liner, and the normal and shear stresses in the radial reinforcing assuming (a) that all the load is carried by the concrete without liner participation, and (b) that all the load is carried by the liner.

5.6 Specify and describe the design of the neutron shield tank including criteria, codes, design methods, and applicable quality control provisions. Include sufficient details of the reactor supports on this tank to permit an evaluation of the design adequacy.

5.7 Define the frequency with which 12 inch lengths of reinforcing bars have been tested by an independent laboratory as a check on the acceptability of the heats of 50,000 psi yield point steel used in construction. Also, state whether full size samples have been tested to verify compliance with the design strengths.

5.8 Describe where the Prepakt method of placing concrete was used and the checks that have been made on the quality and penetration of in-situ Prepakt concrete, including the results of these checks.

5.9 Describe any deviations from specified dimensional tolerances for the liner erection, the corrective measures taken where required, and whether the erected liner meets the required dimensional criteria.

5.10 State whether arc welding has been used on reinforcing bars for either strength or tack welds, and list the acceptance criteria used for such welding. Also, describe the criteria used for bond and anchorage of reinforcing bars in concrete that is in tension (such as the concrete in the dome and discontinuity zones).

5.11 Describe the quality control measures employed to assure that 5000 psi concrete was placed, as required, in highly stressed areas of the containment, instead of the 3,000 psi concrete used in other areas.

5.12 Describe the permanent in-place instrumentation which will be available to record containment operating, accident and post-accident pressures and temperatures.

5.13 State whether the containment has been designed to permit testing to the calculated peak accident pressure at anytime during plant lifetime.

5.14 State whether the containment integrated leak rate test will be performed with the penetrations and associated piping systems fully installed. If the penetrations are to be blanked off for this test, justify the validity of conducting such a test by comparison with conditions which may prevail following completion of installation of the piping systems.

5.15 Describe the seismograph installation that will be used, including the location and maintenance program for the installation. State the criteria with respect to assessments to be made and plant operation to be permitted in the event of instrument readings in the range of the Operating Basis Earthquake and the Design Basis Earthquake.

5.16 Provide a discussion of the performance characteristics of protective coatings and paints used within the containment to withstand accident conditions, including consideration of spray washdown, steam environment, and jet impingement effects. Also, include an evaluation of the potential impairment of the performance capabilities of engineered safety features, due to flow blockage, fouling of heat transfer surfaces, or other events that might result from failure of the protective coatings and paints.

Enclosure Two - Micro-fissures in pipe welds.

September 21, 1971

United States Atomic Energy Commission
Washington, D. C. 20545

Attention: Director, Division of Reactor Licensing

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SEP 22 1971

Dear Sirs:

AMENDMENT NO. 30 to LICENSE APPLICATION
dated September 26, 1967 (Docket No. 50-309)

Pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's Rules and Regulations issued thereunder, MAINE YANKEE ATOMIC POWER COMPANY hereby amends its license application by submitting the attached information.

1. Fifty copies of a report prepared for Maine Yankee by the Battelle Columbus Laboratories entitled "Laboratory Studies of Type 316 Stainless Steel Weld Metal From Maine Yankee Reactor Coolant System" dated September 17, 1971.

2. Fifty copies of a report by Dr. Ernest F. Nippes of Rensselaer Polytechnic Institute entitled "Analysis of Stainless Steel Weldments at Maine Yankee Atomic Power Station" dated 9/21/71.

3. Fifty copies of Stone & Webster Engineering Corporation letter MYS-4819 dated September 14, 1971.

4. Eighty copies of revised FSAR page 13-6 dated 9/71.

5. In response to questions asked by the task force investigating reactor coolant system welds the following information in pipe and vessel insulation is submitted:

Rensselaer Polytechnic

RESEARCH DIVISION
Director — Dr. E. F. Nippes

TROY, NEW YORK 12181

Telephone
518-270-6281

September 21, 1971

RECEIVED
SEP 22 1971
U.S. ATOMIC ENERGY COMMISSION
Regulatory
Mail Section

Maine Yankee Atomic Power Company
Engineering Office
Turnpike Road (Route 9)
Westboro, Mass. 01581

Attention: Mr. R. B. Beckley, Project Engineer

Subject : Analysis of Stainless Steel Weldments at Maine Yankee Atomic Power Station

References:

(1) Final Report "Laboratory Studies of Type 316 Stainless Steel Weld Metal from Maine Yankee Reactor Coolant System," Battelle Columbus Laboratories. September 17, 1971

(2) Letter from N. R. Gilbert, Project Engineer, Stone and Webster Engineering Corporation to B. B. Beckley, Project Engineer, Main Yankee Atomic Power Company, dated September 14, 1971. Subject: "Microfissured Welds Maine Yankee Atomic Power Station."

Dear Mr. Beckley:

The following summarizes my analysis of the Type 316 stainless steel weldments in the reactor piping systems of the Maine Yankee Atomic Power Station:

BACKGROUND

Weld metal microfissures have been discovered in a variety of steels, stainless steels, and other alloys. These microfissures are intergranular separations which are usually found only by metallographic techniques because they are short in length, generally in the range from 2 to 80 mils, and very narrow.

Microfissures in austenitic stainless steels are generally not found in as-deposited weld metal; they usually occur in the heat-affected zones of weld beads which have been reheated by a subsequent weld pass. Thus, microfissuring is thought to involve a hot-tearing mechanism in which contraction stresses rupture austenitic grain boundaries which have been liquated by reheating.

[illegible]ately 2 to 3% of ferrite was required to reduce the tendency for [illegible] formation. When elevated-temperature service of the order of 1100° F to 1200° [illegible] was expected, an upper limit of 10% ferrite was set in order to minimize sigma-phase embrittlement which occurs at these temperatures. As a result of engineering experience, the ferrite content is often specified to be in the range of .5 to 10%. The upper limit can be set higher, if the service temperature is less than 1100° F.

The mechanism by which ferrite minimizes microfissuring is not definitely known at present. One of the more recent postulates involves the lower interfacial energy of an austenite-ferrite boundary compared to an austenite-austenite boundary. Thus, when liquation occurs, an austenite-austenite boundary would be wet by the liquid, whereas an austenite-ferrite boundary would not be. A boundary wet by liquid is not able to sustain the imposed contraction stresses and therefore ruptures, forming an intergranular separation.

Although the occurrence of microfissures in stainless welds has been recognized for many years, the effect of microfissures on mechanical properties has not been extensively reported in the open literature. The most important contribution has been recently made by Yeniscavich who reported the effect of fissures on the fatigue strength of nickel-base alloys containing chromium and iron. In tests performed at room temperature and 550° F, he concluded that fissures with effective diameters up to 70 mils would have no measurable effect on fatigue life in large components. In addition, local fissure densities as high as 70 per square inch had no measurable effect on fatigue life and these fissures did not propagate during fatigue testing to such an extent as to interconnect. The effect of fissures in lowering the fatigue strength was smaller in low-cycle than in high-cycle fatigue; this effect can be explained on the basis that the repeated plastic deformation accompanying low-cycle fatigue reduces the stress concentrations associated with defects in ductile materials. Examination of fatigue samples after failure showed that although some fissures had initiated fatigue cracks, others had not, and that the initiation of fatigue cracks was not a function of fissure size.

MAIN YANKEE

The reactor coolant system large-diameter piping is stainless steel-clad carbon steel piping. After heat treatment of the carbon steel piping, safe ends of Type 316 stainless steel, with a ferrite content in excess of 5%, were joined to this piping for subsequent site welding to other Type 316 stainless steel components, which contained in excess of 10% ferrite. The only joints welded with Type 316 stainless steel are those welds involving stainless steel components, i. e., pipe-to-valve, pipe-to-pump, and valve-to-pump, for a total of 15 welds, nine of which were completed with low-ferrite electrodes. The remaining six welds have been or will be completed using 316 ELC electrodes containing a minimum of 5% ferrite and which therefore will not be considered or evaluated in this analysis.

So like Inconel 600.

DD-96-20

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Frank J. Miraglia, Acting Director

In the Matter of	)	
	)	
MAINE YANKEE ATOMIC POWER COMPANY	)	Docket No. 50-309
	)	
(Maine Yankee Atomic Power Station)	)	(10 CFR 2.206)
	)	

DIRECTOR'S DECISION UNDER 10 CFR 2.206

I. INTRODUCTION

By letter dated January 20, 1996, Ms. Anne D. Burt filed a Petition with the U.S. Nuclear Regulatory Commission (NRC), pursuant to 10 CFR 2.206, on behalf of the Friends of the Coast - Opposing Nuclear Pollution (the Petitioner) requesting that actions be taken regarding the Maine Yankee Atomic Power Station (Maine Yankee), operated by the Maine Yankee Atomic Power Company (the licensee). The Petition requests that the Commission take expedited action to (1) suspend the operating license of Maine Yankee pending resolution of the Petition; (2) examine and test by plug sampling — or other methods approved by the American Society of Mechanical Engineers — all large piping welds that may have been susceptible to micro-fissures at the time of construction; (3) reanalyze the Maine Yankee containment as one located in an area where seismic risk is not "low"; (4) reduce the licensed operating capacity of Maine Yankee to a level consistent with a flawed containment and/or flawed reactor coolant piping welds; (5) hold an informal public hearing in the area of the plant regarding the Petition; and (6) place the Petitioner on service and mailing lists relevant to the group's interests in safety at Maine Yankee and intention to participate in all public forums opened by the NRC.

By letter dated May 13, 1996, the Director, Office of Nuclear Reactor Regulation (NRR), NRC, acknowledged the NRC's receipt of the Petition, and, for the reasons stated in the letter, denied Petitioner's request for immediate action suspending the operating license or reducing the licensed operating capacity of Maine Yankee (Requests 1 and, in part, 4). In addition, for reasons stated in the May 13, 1996, letter, the Director denied the Petitioner's request for an informal hearing (Request 5). The Director also stated in the May 13, 1996, letter that the request that the NRC place Petitioner on service and mailing lists relevant to its interests in safety at Maine Yankee and its intention to participate in all public forums opened by the NRC (Request 6) was moot, as Petitioner's attorney had already been added to the Maine Yankee service list. In addition, the Petitioner was informed that NRC would review the Petition in accordance with 10 CFR 2.206 and issue a final decision within a reasonable time.

The remaining specific requests for NRC action in the Petition dated January 20, 1996, i.e., Requests 2, 3, and 4 identified above, and the issues that Petitioner raised as their bases, are addressed in this decision. For the reasons set forth below, Petitioner's remaining requests for action pursuant to 10 CFR 2.206 are denied.

II. DISCUSSION

The NRC staff has conducted a thorough evaluation of each of the two safety-related issues raised in the Petition regarding the adequacy of the containment and reactor coolant welds. Each of the issues is addressed below.

a. Adequacy of Containment Design at or Above Originally Authorized Power Level

The Petitioner asserts that the containment is inadequate for operation at any power in excess of that authorized in the original license, and may be inadequate for the originally licensed power level because of insupportable original design acceptance criteria in that the Maine Yankee containment was designed and constructed without diagonal rods. The Petitioner states that

> "the Atomic Energy Commission staff recommended to the commission that a license amendment permitting this type of construction be allowed, '...for this plant and this plant only due to low seismic risk.' Early in 1979 the MYAPS was shaken by an earthquake of 4.2 magnitude and epicentered less than ten miles from the plant site. The NRC then ordered the shutdown of five nuclear power stations including MYAPS until piping and piping supports could be seismically qualified..."

The Petitioner also states that there is no public record, however, that NRC reevaluated what Petitioner asserts is a marginally acceptable containment design at Maine Yankee before it granted license amendments to operate at increased power.

The Maine Yankee containment is a reinforced concrete structure. The original NRC operating license review determined that the seismic and thermal-hydraulic design of Maine Yankee's containment structure is adequate. (The construction permit for Maine Yankee was issued on October 21, 1968, and the operating license was issued on September 15, 1972.) With its Petition of January 20, 1996, the Petitioner enclosed an NRC letter of January 22, 1971, in which the staff asked the licensee to submit additional information related to seismic shear stress, given that there are no diagonal seismic shear reinforcements in the containment wall. Low seismicity of the site was not a factor in the staff's acceptance of the Maine Yankee containment design

without diagonal seismic reinforcement bars. As described below, acceptance by the staff of the adequacy of the seismic design was based on the results of stress analyses.

The earthquake for which Maine Yankee was originally designed — termed a Safe Shutdown Earthquake (SSE) — is based on a Housner design response spectrum with a zero period peak horizontal ground acceleration of 0.10g. The five plant shutdown that was ordered on March 13, 1979, was triggered by a finding of an error in a piping computer program, which led to the issuance of IE Bulletin No. 79-07, "Piping Stress Analysis of Safety-Related Piping" on April 14, 1979. The earthquakes that occurred near the plant site starting on April 18, 1979, at 02 hours and 34 minutes universal time, were not a factor in the five plant shutdown that was ordered on March 13, 1979. As a consequence of the sequence of earthquakes that occurred near the plant in April 1979 and the occurrence of the January 9, 1982, magnitude 5 3/4 earthquake in New Brunswick, Canada, the licensee undertook a seismic analysis program. This program included analyses and upgrading of certain plant components and a reevaluation of the seismic hazard. Thus, the results from the seismic analyses and upgrading program were instrumental in the staff's conclusion that the existing seismic design for Maine Yankee remained adequate. However, following its review of the seismic hazard reevaluation, the NRC staff determined that the appropriate characterization of the ground motion for any future analysis of the plant is a high-frequency peak ground acceleration of 0.18 g anchoring the response spectrum obtained from NUREG/CR-0098, "Development of Criteria for Seismic Review of Selected Nuclear Power Plants," using the 50th percentile amplification factors.

Subsequently, in 1986, the Maine Yankee Plant underwent a seismic margin assessment program. The review-level earthquake used in the seismic margin assessment had a peak ground acceleration of 0.3g, which is much greater than the peak ground acceleration of the SSE. The seismic safety margin program included a review of the entire plant including analysis and upgrading of certain plant components, such as Main Control Board, Control Room Auxiliary Cabinets, Service Water Piping Support and others. As a result of this reassessment, it was established that, with the upgrades implemented at the plant, the Maine Yankee Plant can be safely shut down during an earthquake with a peak ground acceleration of 0.27g.

In its report "Seismic Margin Review of the Maine Yankee Atomic Power Station" (NUREG/CR-4826, Vol. 2, dated March 1987), the NRC staff also concluded that the overall seismic margin of the plant, including the containment, was well above the 0.18g value and, therefore, no upgrading of the seismic design was considered necessary. Further, in the staff report "An Approach to the Quantification of Seismic Margins in Nuclear Power Plants" (NUREG/CR-4334, dated August 1985), it is also noted that prestressed and reinforced concrete containment structures have a large seismic margin above the SSE level earthquake.

Additionally, numerous tests and studies conducted since the operating license review of the Maine Yankee Plant, specifically on shear stress in biaxially cracked reinforced concrete without diagonal reinforcement bars, have led to the acceptance of specified allowable shear stress by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section III, Division 2, CC-3421.5, for reinforced-concrete containment structures. An analysis of the Maine Yankee containment structure was

conducted in December 1984 by the licensee and submitted on the Docket as an attachment to letter MN-85-27, dated February 5, 1985. The results of the study indicate that the controlling peak ground acceleration value is 0.39g for the ASME Code allowable tangential shear stress caused by the SSE loading in combination with design-basis internal pressure and dead loads. This provides additional confidence on the ruggedness of the Maine Yankee containment.

Based on the above, with regard to the Petitioner's concern about the adequacy of the Maine Yankee containment structural design for earthquakes (seismic), the staff concludes that the Maine Yankee containment is satisfactory and has adequate margin. The NRC staff has determined that the design of the Maine Yankee containment structure without diagonal reinforcement bars is supported by analysis and poses no undue risk to public health and safety. Accordingly, Petitioner's requests for NRC action based on the seismic design of the containment are denied.

b. Microfissuring of Low-Ferrite Stainless Steel Weldments

The Petitioner asserts that the Maine Yankee emergency core cooling system (ECCS), reactor coolant piping, and other large piping have not been adequately analyzed for materials degradation to ensure integrity at power operation in excess of the originally licensed power level or under accident conditions. The Petitioner states further that the Atomic Energy Commission's concern with "micro-fissures" in reactor coolant system welds led to the appointment of a task force, and prompted studies and reports in 1971 (before heightened awareness of embrittlement phenomena) that concluded that the microfissures would not propagate or grow under foreseeable conditions. The

Petitioner asserts that large pipe welds next to the reactor vessel have endured 23 years of corrosion, stress, vibration, and radiation and may fail, initiating a loss-of-coolant accident, or may be subject to thermal shock failure initiated by use of the ECCS.

In a safety evaluation dated February 25, 1972, the NRC staff concluded that the low-ferrite stainless steel weldments in large piping at Maine Yankee are acceptable because the micro-fissures of the type and density found in the low-ferrite stainless steel weldments of the Maine Yankee facility do not significantly impair the strength and capability of the welds, and that removal of the welds and rewelding could introduce other problems of greater safety significance than those resulting from the presence of microfissures. This evaluation was based on information provided by Battelle Columbus Laboratories, Stone and Webster Engineering Corporation, and Dr. Ernest F. Nippes of Rensselaer Polytechnic Institute. Furthermore, the Maine Yankee reactor vessel meets the requirements of 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock." In addition the large diameter pipe welds attached to, or next to, the reactor vessel do not receive sufficient radiation to cause embrittlement. Finally, Type 316 stainless steel weld material, in which the microfissures were discovered, is resistant to corrosion in a PWR coolant environment, and the vibratory loads are insufficient to be a concern for large diameter piping.

In a letter to the Petitioner dated May 13, 1996, the staff stated that in order to determine if there is any long-term safety significance of the microfissures, the staff will review the inservice inspection results for the welds identified as being susceptible to microfissures. The staff has now completed its review of the inservice inspection tests results for welds

susceptible to microfissures. The staff's review confirmed that no unacceptable indications have been observed during inservice inspection. In addition, pressure tests have not identified any leakage. These tests indicate that 23 years of plant operation have not caused the microfissures to grow to a size detectable by inservice inspection or through-wall leakage. Plug sample testing was performed by Battelle, Columbus Laboratories, on the primary coolant system low-ferrite welds (Reference: Battelle's report dated September 17, 1971, which was transmitted by the licensee to the NRC by letter dated September 21, 1971). As part of the inservice inspection program in accordance with 10 CFR 50.55a(g), the licensee has been performing and continues to perform ASME Code inspections of large piping welds that may have been susceptible to microfissures at the time of construction. Additional plug sample testing would not yield any pertinent additional information and is not needed.

On the basis of the above analyses, inservice inspection, and pressure test results, microfissures are not considered a long-term safety-significant issue for Maine Yankee. Accordingly, the Petitioner's remaining requests for NRC action based on asserted microfissures in large piping welds is denied.

III. CONCLUSION

As explained above, and as requested by the Petitioner, the staff examined the adequacy of containment design and susceptibility of welds to microfissures. For the reasons stated above, no basis exists for taking any further action in response to the Petition. Accordingly, no action pursuant to 10 CFR 2.206 is being taken in this matter.

A copy of this Director's Decision will be filed with the Sec.etary of the Commission for Commission review in accordance with 10 CFR 2.206(c) of the Commission's regulations. As provided by this regulation, this Director's Decision will constitute the final action of the Commission 25 days after issuance, unless the Commission, on its own motion, institutes a review of the Decision within that time.

FOR THE NUCLEAR REGULATORY COMMISSION

Frank J. Miraglia

Frank J. Miraglia, Acting Director
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland
this 20th day of November 1996

RDCR, UKP2
4/3

Zwolinski
~~Traglia~~
ACTION

EDO Principal Correspondence Control

FROM: DUE: 04/23/96 EDO CONTROL: GT96181
DOC DT: 01/20/96
FINAL REPLY:

Anne D. Burt
Friends of the Coast - Opposing Nuclear Pollution

TO:

William Russell, NRR

FOR SIGNATURE OF : ** GRN ** CRC NO:

DESC: ROUTING:

2.206 PETITION TO SUSPEND OPERATING LICENSE OF MAINE YANKEE

Taylor
Milhoan
Thompson
Blaha
Russell, NRR
Lieberman, OE
TTMartin, RI

DATE: 03/26/96

ASSIGNED TO: DRPE ~~OGC~~ CONTACT: Varga ~~Cyr~~

SPECIAL INSTRUCTIONS OR REMARKS:

NRR RECEIVED: APRIL 3, 1996
NRR ACTION: DRPE:VARGA

NRR ROUTING: RUSSELL
MIRAGLIA
THADANI
ZIMMERMAN
CRUTCHFIELD
BOHRER

ACTION

DUE TO NRR DIRECTOR'S OFFI[illegible]

BY April 18, '96

OGC-96- 001364