

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.

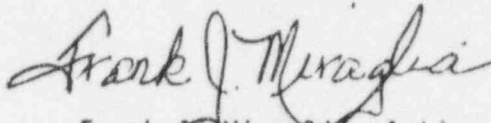
### III. CONCLUSION

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 Secretary 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

A handwritten signature in cursive script, reading "Frank J. Miraglia".

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

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