NRC STAFF ACTIONS TO ADDRESS CU-29 ISOLATION VALVE ISSUE

CASE NO. 96-06S 9/3/96

OFFICE OF THE INSPECTOR GENERAL
EVENT INQUIRY

NRC STAFF ACTIONS TO ADDRESS CU-29
ISOLATION VALVE ISSUE

CASE NO. 96-06S

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CHRONOLOGY OF SIGNIFICANT EVENTS

Date	Event
10/7/70	NRC issues a Provisional Operating License for Millstone Unit 1.
2/14/73	NRC issues Appendix J to 10 CFR Part 50.
8/7/75	NRC forwards letter to NU requesting information about Appendix J compliance.
11/14/75	NU forwards letter to the NRC about the status of Appendix J compliance. Status of CU-29 is mentioned.
9/20/78	NU forwards letter to the NRC about the status of Appendix J compliance. Status of CU-29 is mentioned.
11/6/80	NU forwards letter informing the NRC of its schedule to complete modifications to permit Appendix J testing of several containment isolation valves. Status of CU-29 is mentioned.
11/15/84	NRC issues Federal Register notice about the Integrated Safety Assessment Program (ISAP).
7/31/85	NRC forwards letter to NU regarding ISAP for Millstone Unit 1. Enclosure 2 to this correspondence identifies Appendix J modifications as a project to be included in ISAP.
10/16/85	NU advises the NRC of its plans to include Appendix J issues as part of ISAP Topic 1.14.
3/3/86	NRC Safety Evaluation concurs with NU's use of ISAP to address compliance with Appendix J.
7/31/86	NU provides the final ISAP report to the NRC.
10/31/86	NRC issues a Full-Term Operating License for Millstone Unit 1.
11/19/86	NU advises the NRC of the status of Millstone Unit 1 compliance with Appendix J. NU includes information that it planned to prepare a request for exemption from Appendix J testing of CU-29.
4/2/87	NRC issues its draft ISAP report for Millstone Unit 1.

4/29/88	NU submits an Appendix J exemption request to the NRC seeking an exemption from Appendix J, Type C, testing of CU-29.
11/8/90	NU responses to a verbal request for information from the NRC in answer to the Appendix J exemption request, dated April 29, 1988.
4/9/91-8/14/91	Millstone Unit 1 shut down for refueling outage 13.
6/5/91	NRC denies NU's request to exempt CU-29 from Appendix J testing.
2/26/92	NRC issues Amendment No. 56 to the Millstone Unit 1 operating license adding a license condition to maintain and implement ISAP.
10/23/92	NU submits an ISAP update report informing the NRC that CU-29 would be modified during refueling outage 15.
12/30/92	NRC concurs with NU's plans to modify CU-29 during refueling outage 15.
6/18/93	NU submits an ISAP update report to the NRC indicating that CU-29 would be modified to permit Appendix J testing during refueling outage 15.
1/24/94-5/21/94	Millstone Unit 1 shut down for refueling outage 14.
4/20/94	NU submits an ISAP update report informing the NRC that a test connection would be installed to CU-29 during refueling outage 15 to allow Appendix J, Type C testing of the valve.
4/26/95	NRC issues inspection report 50-245/95-07 and the corresponding Notice of Violation (NOV) for NU's failure to test CU-29 from June 5, 1991 to April 20, 1994.
6/12/95	NU forwards letter to the NRC responding to the violation.
9/1/95	NRC issues inspection report 50-245/95-28 which addresses the CU-29 issue.
11/3/95	Millstone Unit 1 shuts down for refueling outage 15 and to date remains shut down.
12/15/95	NU submits Licensee Event Report 95-29 (LER 95-29) to report indications of flaws in RWCU system welds located on either side of penetration X-15.
3/7/96	NU submits Licensee Event Report 96-012 (LER 96-12) to the NRC reporting

that excessive leakage from CU-29 was identified as a result of a local leak rate test performed while the plant was shutdown for refueling outage 15. NU reports this event as a violation of the Millstone Unit 1 Technical Specifications.

7/3/96 NRC issues a report addressing the Millstone Unit 1 ISAP.

EXECUTIVE SUMMARY

The Office of the Inspector General (OIG), U.S. Nuclear Regulatory Commission (NRC) initiated this inquiry to address an allegation that the NRC allowed Northeast Utilities System (NU) to operate the Millstone Nuclear Power Station (Millstone), Unit 1 without conducting leak rate testing of containment isolation check valve CU-29. This testing is required by 10 Code of Federal Regulations (CFR) Part 50, Appendix J, Section III.C. This requirement pertains to certain containment penetrations and is intended to measure containment isolation valve leakage rates. Containment isolation valves, such as CU-29, close only upon reverse fluid flow and provide an essentially leak tight barrier against the uncontrolled release of fission products from the reactor vessel to the environment in the event of an accident.

In addressing this allegation, OIG reviewed how the NRC implemented regulatory compliance with respect to 10 CFR Part 50, Appendix J testing requirements at Millstone Unit 1 of containment isolation valve CU-29.

The OIG learned that in February 1973, the NRC issued Appendix J "Primary Reactor Containment Leakage Testing For Water-Cooled Power Reactors", which became a requirement for all licensed nuclear power reactors. Specifically, Appendix J requires that all operating licensees for water-cooled power reactors test the leak-tight integrity of the primary reactor containment, systems and components, including containment isolation valves. Appendix J tests are required to be performed during each reactor shutdown for refueling but in no case at intervals greater than two years.

In August 1975, NRC requested NU to determine whether Millstone Unit 1 was in full compliance with Appendix J and if not, to identify planned actions and to prepare a schedule to achieve compliance. NRC advised NU that possible courses of action included modifications to design features to permit conformance with the testing requirements as well as requests for exemptions from Appendix J requirements. In November 1975, in response to the NRC's request, NU provided a summary of containment isolation valves and identified tests conducted to that point. NU also identified valves which would require exemption from Appendix J requirements. Between 1975 and 1984, the NRC staff and NU exchanged correspondence regarding the status of NU's compliance with Appendix J.

In November 1984, NRC initiated the Integrated Safety Assessment Program (ISAP) to conduct integrated assessments for operating nuclear power reactors. The ISAP was intended to address plant-specific evaluations of licensing actions, plant improvements and unresolved generic safety issues. Millstone Unit 1 was one of two operating plants selected by the NRC to participate in the ISAP pilot program.

As part of the ISAP process, in April 1988, NU requested exemptions relating to Appendix J for certain containment penetrations, including containment isolation check valve CU-29. NU requested an exemption from testing requirements for check valve CU-29 because design features of the check valve did not permit testing unless certain modifications were made. In June 1991, the NRC denied this exemption request. Millstone Unit 1 was shut down for

refueling outage 13 when NRC denied the exemption request; however, at the end of outage 13 the licensee resumed plant operations without testing valve CU-29.

Between October 1992 and June 1995, NRC reviewed and concurred on several of NU's ISAP reports which outlined plans to modify and test valve CU-29 in accordance with Appendix J during refueling outage 15. Ultimately, when tested during refueling outage 15, NU determined that valve CU-29 leaked excessively and may not have been capable of performing its intended containment isolation function.

When issued by the NRC in 1973, Appendix J to 10 CFR Part 50 became a requirement for all licensees of water-cooled power reactors. OIG determined that although Appendix J required that NU test and establish the leak-tight integrity of containment isolation valves, the NRC did not obtain Appendix J compliance with respect to valve CU-29 until 1995. Additionally, Appendix J became a condition of NU's operating license for Millstone Unit 1 in October 1986.

In June 1991, while Millstone Unit 1 was shutdown for refueling outage 13, the NRC denied NU's 1988 request to exempt valve CU-29 from the testing requirements of Appendix J. However, after denying this request the NRC did not achieve Appendix J compliance with respect to valve CU-29 until 1995, during refueling outage 15.

BASIS

The Office of the Inspector General (OIG), U.S. Nuclear Regulatory Commission (NRC), initiated this inquiry after receiving an allegation that the NRC allowed Northeast Utilities System (NU) to operate Millstone Nuclear Power Station (Millstone), Unit 1 without conducting leak rate tests of containment isolation check valve CU-29. This testing is required by 10 Code of Federal Regulations (CFR) Part 50, Appendix J Section III.C. In February 1973, NRC issued 10 CFR Part 50, Appendix J which, in part, required licensees to periodically perform leak rate tests for certain containment isolation valves in order to verify the leak tightness of the primary containment. Appendix J Section III.C, (Type C) tests are required to be performed during each reactor shutdown for refueling but in no case at intervals greater than 2 years. Accordingly, NU was required to comply with Appendix J testing requirements or obtain an exemption from the requirements by 1975. In addition, this requirement became a license condition in October 1986, when NU received a full-term operating license for Millstone Unit 1.

SCOPE

OIG reviewed the regulatory actions taken by NRC staff with respect to the Millstone Unit 1 containment isolation check valve CU-29. Specifically, OIG reviewed the staff's actions in achieving NU's compliance in conducting leak testing of check valve CU-29 in accordance with the February 1973 requirements contained in 10 CFR Part 50, Appendix J.

In April 1988, NU requested an exemption from conducting a leak test of check valve CU-29 as required by Appendix J. In June 1991, the NRC denied NU's exemption request. OIG reviewed the NRC staff's actions prior to NU's request to exempt valve CU-29 from the testing requirements of Appendix J. Additionally, OIG reviewed why the NRC, after denying NU's exemption request did not achieve Appendix J compliance with respect to valve CU-29 until December 1995.

In reviewing NRC's regulatory actions regarding valve CU-29, OIG interviewed pertinent NRC Region I and Office of Nuclear Reactor Regulation (NRR) staff members. OIG also reviewed the following documents:

* Pertinent NRC inspection reports;

* The Millstone Updated Final Safety Analysis Report;

* The Draft NRC Integrated Safety Assessment Program (ISAP) report;

* NU ISAP update reports and NRC responses;

* 10 CFR Part 50, Appendix J;

* The Millstone Unit 1 Full-Term Operating License;

* Millstone Unit 1 License Amendment No. 56; and

* Licensee Event Reports pertinent to this issue.

BACKGROUND

The Millstone Nuclear Power Station (Millstone) Unit 1 is a General Electric designed boiling water reactor located in New London County, Connecticut. The licensee is the Northeast Nuclear Energy Company (NNECO), a subsidiary of Northeast Utilities System (NU). The provisional operating license for Millstone Unit 1 was issued on October 26, 1970. NU received a full-term operating license for Millstone Unit 1 on October 31, 1986. The full-term operating license required NU to operate Millstone Unit 1 in accordance with NRC regulations contained in 10 CFR Part 50.54(o), which pertain to license conditions for all nuclear power plants. In part, these regulations required NU to comply with requirements set forth in 10 CFR Part 50 Appendix J.

The NRC issued 10 CFR Part 50 Appendix J on February 14, 1973, which became a requirement for all water-cooled power reactors. Appendix J requires licensees to perform periodic tests to verify the "leak-tight integrity of the primary reactor containment, and systems and components which penetrate containment of water-cooled power reactors..." Appendix J, Section III.C pertains to Type C Tests which are intended to measure containment isolation valve leakage rates. The purpose of the testing is to ensure that leakage through these valves will not result in an unacceptable release of air from inside containment during, or following, a design basis accident. Licensees are required to perform Type C tests during each reactor shutdown for refueling but in no case at intervals greater than two years.

Appendix J does not discuss modifications to systems and components which penetrate containment, such as containment isolation valves, in the event they are needed to comply with testing requirements. However, 10 CFR Part 50 Section 50.12 contains standards for issuance of specific exemptions from NRC rules, including Appendix J. The NRC may grant an exemption from a regulation if "special circumstances" are present and the exemptions are "authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security." Also, NRC may grant an exemption if "Compliance would result in undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted."

CU-29 is a containment isolation check valve located within a primary containment penetration of the Reactor Water Cleanup (RWCU) system return line. This particular containment penetration was identified as X-15. A containment penetration is an assembly, such as the RWCU system return line, which allows fluid lines or electrical circuits to pass through an opening in the reactor containment. The return line of the RWCU system discharges through two containment isolation valves, CU-28 and CU-29, before entering the reactor vessel. CU-28, a motor operated valve located outside containment penetration X-15, could be leak tested in accordance with Appendix J, while CU-29, a check valve located inside penetration X-15, could not be leak tested unless certain design features were modified.

Because 10 CFR Part 50, Appendix J was issued in 1973, after many nuclear plants had either received an operating license or their containments had reached advanced stages of design or construction, the NRC recognized that certain plants would not be in compliance with Appendix

J by 1975. Accordingly, in August 1975, NRC requested NU to determine areas of non-compliance with Appendix J and to identify planned actions and to prepare a schedule to achieve compliance. NRC advised NU that possible options to achieve compliance included implementing design modifications necessary to perform leak testing; amending technical specifications which conflicted with the requirements; or requesting exemptions from leak testing requirements pursuant to 10 CFR Part 50, Section 50.12.

In November 1984, the NRC established the Integrated Safety Assessment Program (ISAP) to conduct integrated assessments for operating nuclear power reactors. An NRC Policy Statement for ISAP was published in the Federal Register (Vol. 49, No. 222) on November 15, 1984. According to this Policy Statement, ISAP was developed to "address significant regulatory requirements which have evolved since the plant was originally licensed and pending licensing actions which have evolved from a variety of other sources." More specifically, ISAP was intended to evaluate and resolve all outstanding licensing issues, plant-specific resolutions to unresolved generic/safety issues, and licensee-initiated plant improvement projects. Licensees had to implement schedules for resolving these issues as well as establish procedures for updating schedules for licensing issues that could arise in the future. In 1985, the NRC initiated a pilot program to implement the ISAP. Millstone Unit 1 was one of two plants selected to participate in the ISAP pilot program.

In October 1986, NU advised NRC that it would evaluate the status of Millstone Unit 1 compliance with Appendix J requirements as part of the ISAP process and develop schedules to achieve full compliance with the requirements. Subsequently, in April 1988, NU submitted an exemption request for certain containment isolation valves at Millstone Unit 1, including valve CU-29. In June 1991, the NRC denied NU's exemption request for valve CU-29.

DETAILS

Review of Documents

OIG reviewed correspondence between the NRC staff and NU after NRC issued 10 CFR Part 50 Appendix J in February 1973. In a letter dated August 7, 1975, the NRC requested that NU determine if it was in full compliance with the containment leak rate testing requirements of Appendix J. The NRC requested that NU identify any design features that did not permit compliance with Appendix J and identify any existing technical specifications which conflicted with Appendix J. In addition, NRC requested that NU outline their planned actions and prepare a schedule to attain conformance with Appendix J. NRC advised NU that possible options to achieve compliance included implementing design modifications necessary to perform leak rate testing and requesting exemptions from leak testing requirements pursuant to 10 CFR Part 50, Section 50.12.

NU responded to the NRC's request in a November 14, 1975, letter. NU advised the NRC that Type C tests of containment isolation valves were being conducted in accordance with the testing requirements of Appendix J. An attachment to the letter provided a list of containment isolation valves in the plant, a summary of tests conducted to that point in time, and a list of valves which required exemptions. The attachment indicated that CU-29 could not be tested in accordance with Appendix J because of its "piping and valve arrangement". The attachment did not identify any actions NU intended to take to meet Appendix J requirements for valve CU-29.

In a letter to the NRC, dated September 20, 1978, NU provided additional information regarding Appendix J compliance. However, NU provided no new information with respect to Appendix J testing of valve CU-29.

On November 6, 1980, NU submitted to the NRC a schedule of modifications to several containment isolation valves so that these valves could be tested in accordance with Appendix J. Although CU-29 was not specifically referenced in this letter, an attachment indicated that CU-29 could not be tested in accordance with Appendix J due to its configuration.

In a July 31, 1985, letter to NU, the NRC identified modifications to facilitate Appendix J testing of containment isolation valves as a project that should be evaluated within the framework of ISAP.

On July 31, 1986, NU submitted its final ISAP report for Millstone Unit 1 to the NRC. One of the topics included in the report, Topic 1.14, indicated that NU was in the process of evaluating the overall status of the plant for compliance with the requirements of Appendix J. NU added that, "Pending the results of this evaluation, [NU] will identify modifications necessary to bring the plant into compliance with Appendix J and/or submit exemption requests where necessary."

On November 19, 1986, NU provided a "Status of Millstone Unit 1 Appendix J Compliance" to the NRC. In this report, NU advised the NRC of the status of Appendix J testing and identified

remaining areas of noncompliance for primary containment penetrations. With respect to valve CU-29, NU indicated that it complied with Appendix J "to the maximum degree possible with the existing piping configuration." NU added that it planned to prepare an Appendix J exemption request for valve CU-29. NU also explained that it was not possible for containment leakage to occur past valve CU-29 during a design basis accident or a loss of normal power. [NOTE: A design basis accident is a postulated accident that a nuclear facility must be designed and built to withstand without loss to the systems, structures and components necessary to assure the public health and safety.]

On April 2, 1987, the NRC issued a draft ISAP report for Millstone Unit 1. The report included 85 topics which had been reviewed by the staff and selected for inclusion in the ISAP process. The report prioritized ISAP topics and assigned them rankings of high, medium and low. The report indicated that medium topics "are those which represent desirable improvements in safety and/or economic benefit but can be implemented over a longer period of time."

Topic 1.14 of the draft ISAP report addressed modifications to permit Appendix J testing at Millstone Unit 1. The report indicated that NU "was requested to identify any design features that do not permit conformance to the requirements and to identify existing technical specifications which are in conflict with Appendix J." The NRC assigned Appendix J modifications a medium priority.

On April 29, 1988, NU submitted a request to the NRC to exempt certain containment isolation valves at Millstone Unit 1 from the testing requirements of 10 CFR Part 50 Appendix J. One of the exemptions requested by NU was for valve CU-29. The letter indicated that NU was requesting the exemption for valve CU-29 based, in part, on the cost and personnel exposure limits associated with modifications needed to permit the leak testing. NU also indicated that an internal probabilistic risk assessment disclosed there was essentially no chance of any measurable public exposure due to leakage through valve CU-29.

On June 5, 1991, the NRC issued a Safety Evaluation Report (SER) in response to NU's request to exempt certain containment isolation valves from the leak rate testing requirements of Appendix J. In the SER, the NRC denied NU's request to exempt valve CU-29 from Appendix J testing requirements. In the SER, the staff wrote that NU did not have sufficient special circumstances to exempt valve CU-29 from the leak rate testing. Millstone Unit 1 was shutdown for refueling outage 13 at the time this exemption request was denied. On August 14, 1991, NU resumed operations at Millstone Unit 1 without testing valve CU-29.

On February 26, 1992, the NRC issued License Amendment No. 56 for Millstone Unit 1. As a result, NU's operating license was amended to include a condition that NU "implement and maintain in effect the Integrated Implementation Schedule Program Plan (the Program Plan) to be followed for scheduling of plant modifications and engineering studies." The corresponding NRC Safety Evaluation reflected that the implementation schedule would be updated semi-annually. The staff's evaluation also reflected that medium ranked topics should be scheduled to be accomplished within two or three refueling cycles.

On October 23, 1992, NU submitted an ISAP update to the NRC. NU advised NRC that it

planned to install the appropriate modifications to valve CU-29 during refueling outage 15 in order to meet the requirements of Appendix J. NU added that, "This project received a very low overall ranking due to the small public safety benefit and negative personnel safety and personnel productivity benefit." Subsequently, on December 30, 1992, the NRC concurred with NU's plan to install the appropriate Appendix J test connections to valve CU-29 during refueling outage 15.

Between June 1993 and June 1995, NU periodically updated their ISAP reports to the NRC. These reports essentially reiterated that modifications to valve CU-29 would be made during refueling outage 15 so that the valve could be leak rate tested in accordance with Appendix J. Throughout this period, NRC concurred with NU's plan to modify and test valve CU-29 during refueling outage 15.

On April 26, 1995, NRC Region I issued Inspection Report number 50-245/95-07. This report identified a Severity Level V Violation for failing to "adequately leak test 5 containment isolation valves at [Millstone] Unit 1." One of these containment isolation valves was valve CU-29. The NRC Notice of Violation reflected that, from June 5, 1991 to April 20, 1994, NU did not perform Type C leak rate tests of valve CU-29 as required by 10 CFR Part 50.54(o) and Appendix J. Further, it reflected that these regulations require containment isolation valves to be leak rate tested in accordance with Appendix J to verify the leak tightness of the primary containment.

In a letter dated June 12, 1995, NU responded to the NRC's Notice of Violation and acknowledged that compliance with Appendix J should have been achieved sooner. In the letter, NU stated that, "It is our understanding that our noncompliance with Appendix J was cited at this time due to the length of time this issue has been outstanding and that during the identified period, no formal relief to justify continued plant operation was requested."

On September 1, 1995, NRC Region I issued Inspection Report number 50-245/95-28. This report also addressed Appendix J testing of valve CU-29. This inspection report concluded that there was uncertainty as to whether valve CU-29 would have performed its intended safety function. The inspection report questioned whether containment would have been maintained during a design basis accident combined with a failure of CU-28, the redundant containment isolation valve for CU-29. In addition, this report reflected that NU had conducted several internal operability assessments of valve CU-29, and that NU had declared the valve inoperable in May 1995.

On December 15, 1995, in Licensee Event Report (LER) 95-29, NU reported to the NRC that a Reactor Water Cleanup (RWCU) system had a number of welds which contained indications of flaws that resulted in the system being inoperable. Millstone Unit 1 was shutdown for refueling outage 15 at the time of this event. Two of the RWCU system welds that were found to contain flaw indications, CUBJ-17 and CUBJ-18, were located on either side of containment penetration X-15. With respect to weld CUBJ-18, NU reported that operability may not have been maintained in the event of a design basis seismic event. NU added that, "In the worst case, and the weld [CUBJ-18] had failed, leakage from the reactor would have been limited by check valve [CU-29]."

Subsequently, on March 7, 1996, NU submitted LER 96-12 to the NRC which reported that valve CU-29 exceeded its maximum allowable leakage rate while it was in operation. NU reported that this information was determined during a local leak rate test (LLRT) conducted on December 3, 1995, after valve CU-29 had been removed from service. At the time of the test, Millstone Unit 1 was shutdown for refueling outage 15. NU added that valve CU-29 had been replaced because it could not be tested according to the requirements of Appendix J. Additionally, NU reported that leakage from valve CU-29 was in excess of allowable limits and a violation of the plant's Technical Specifications, Section 4.7.A.3.e.(1)(a).

In LER 96-12, NU reported the following:

> "There were no safety consequences as a result of the event, since containment isolation would have been maintained via valve 1-CU-28...The implication of this event, however, is that the failure of a containment isolation check valve to successfully pass a LLRT means that the valve is incapable of performing its containment isolation function. A system which contains a leaking isolation valve may not be able to adequately mitigate the consequences of an accident by failing to perform its intended safety function."

NU also reported that valve CU-29 would not have performed its containment isolation function had there been a single active failure to CU-28, the motor-operated valve located outside penetration X-15.

NRC Staff Interviews

OIG interviewed an engineer with the Containment Systems and Severe Accident Branch, Office of Nuclear Reactor Regulation (NRR). This individual advised that he has been involved with Appendix J testing issues since approximately 1978. The engineer stated that he has been considered NRR's expert on Appendix J for some time, and he was recently involved in the October 1995 revision of Appendix J.

The engineer maintained that the purpose of performing Appendix J leakage tests is to verify that containment isolation valves do not leak in excess of allowable limits. He explained that licensees are required to perform Appendix J, Type C tests of containment isolation valves with pressurized air or nitrogen. The pressure is designed to represent conditions that would exist during a loss of coolant accident (LOCA).

In addition, the engineer explained that licensees are required to test containment isolation valves with air or nitrogen because, in the event of an accident, radioactive air from the reactor could be released into the environment. He stressed that Appendix J is concerned with the leakage of air, as opposed to water, through containment penetrations.

According to the engineer, all NRC licensees were required to comply with Appendix J after it was issued in 1973. He said that technically, NU should have complied with Appendix J by leak

rate testing valve CU-29. However, he noted that during this time period, NRR addressed Appendix J issues in a "non-urgent" way, and that the NRC did not strictly enforce the requirements of Appendix J at all nuclear plants, including Millstone Unit 1. The engineer added that when Appendix J was issued, NRR depended on licensee's to identify and correct any areas of Appendix J noncompliance.

The engineer stated that typically an NRR technical reviewer's involvement in an Appendix J exemption request is limited to whether the exemption should be granted or denied. He said he assumed, however, that once an exemption for a containment isolation valve was denied, licensees would be required to conduct the applicable test in accordance with the requirements.

With respect to valve CU-29, the engineer told OIG that he would have expected NU to modify the containment isolation valve relatively soon after the exemption was denied so it could be tested according to Appendix J. According to the engineer, NU's testing of valve CU-29 four years after their exemption request was denied was not timely. He said he was not surprised that the NRC concurred with NU's placement of valve CU-29 modifications in ISAP after denying the exemption request in June 1991. He explained that Appendix J modifications had been included in the Millstone Unit 1 ISAP when it was developed. However, he did not think it was appropriate to include CU-29 modifications in the ISAP after NU's exemption was denied.

The engineer also told OIG that valve CU-29 would not have performed its intended containment isolation function in the event of an accident. He said if valve CU-28 had failed during an accident, there could have been a credible release path for contamination to escape outside primary containment. He explained that a RWCU system line break involving a failure of valve CU-28 would have resulted in the inability to isolate a LOCA. According to the engineer, excessive leakage from valve CU-29 was a significant safety problem.

OIG interviewed the NRC Region I resident inspector (RI) assigned to Millstone Unit 1 who reviewed the issues surrounding valve CU-29, documented in NRC Inspection Report 50-245/95-07, dated April 26, 1995. The RI advised OIG that he did not believe ISAP was an appropriate way to handle the leak rate testing requirement for valve CU-29. According to the RI, ISAP did not relieve NU of meeting the Appendix J requirement to test valve CU-29. He said that this was the essence of the violation cited by him in the NRC inspection report. The RI stated that once the exemption request was denied, NU should not have restarted the plant before resolving the valve CU-29 testing requirement.

OIG interviewed another Region I inspector who reviewed a number of technical issues involving Millstone Unit 1, including valve CU-29, which he documented in Region I Inspection Report 50-245/95-28. This inspector advised OIG that while ISAP was designed to provide an integrated living schedule for power plants, the program was ineffective. According to the inspector, ISAP was designed to guide licensees into a position where they would accept emerging issues and upgrade their plants. However, he said that he believed that ISAP should not have been used by licensees as a method for avoiding compliance with a regulation, as was

the case with valve CU-29.

This Region I inspector also told OIG that after the exemption request was denied in June 1991, NU should have complied with Appendix J or shut the plant down. He said that he did not believe that valve CU-29 should have been placed back in ISAP. He explained that after the exemption was denied, NU could have isolated valve CU-29 and aligned the RWCU system to an alternate clean-up route, as was done in May 1995 when NU finally declared valve CU-29 inoperable.

A Millstone Unit 1 Senior Resident Inspector (SRI) advised OIG that the NRC issued a violation to NU in April 1995 for not meeting Appendix J testing requirements for valve CU-29. The SRI explained that this put NU on notice that regulatory compliance had to be addressed.

The SRI said that he was unaware of any provision within ISAP that provided licensees an exemption from meeting NRC regulations. The SRI said that in his view, once NRC denied NU's request for an exemption to leak test valve CU-29, NU was required to schedule the test and perform the modifications necessary to conduct the test. The SRI said that the NRC, in turn, should have required NU to submit a schedule for complying with Appendix J.

According to the SRI, it was appropriate to include Appendix J issues within the ISAP process. He added, however, that NU was not exempt from complying with Appendix J testing requirements because valve CU-29 was included in ISAP. He noted that ISAP was concerned primarily with prioritizing and scheduling modifications to older nuclear plants.

The SRI told OIG that he did not believe there was any safety significance in not testing valve CU-29 until refueling outage 15. He explained that multiple failures would have had to occur to have a release of contamination outside primary containment. However, he added that the failure to test valve CU-29 was significant, not because of the possible safety consequence to the public, but because of NU's failure to meet a regulatory requirement.

A Region I Division of Reactor Projects (DRP) Branch Chief advised OIG that in April 1995, the NRC issued a violation to NU because the licensee failed to conduct leakage tests of valve CU-29 in accordance with Appendix J and they did not have an exemption from the requirement. He explained that although Millstone Unit 1 was licensed before Appendix J was issued, NU was still required to comply with the requirement.

The Branch Chief added that ISAP allowed NU to prioritize modifications to valve CU-29 so that it could be tested in accordance with Appendix J. According to the Branch Chief, this sent a message to NU that they did not need to quickly comply with Appendix J requirements.

A DRP Director in NRR advised OIG that the valve CU-29 testing issue "should have been handled differently" once NU's exemption request was denied. He said a better approach would have been to require NU to take a specific course of action once the exemption was denied, such as imposing a time requirement for modifying valve CU-29 so that it could be tested in accordance with Appendix J.

The DRP Director said the safety significance of not testing CU-29 until December 1995 was low to moderate. He added that there are a combination of sequences that would have to be considered before raising the safety significance of the failure of valve CU-29. The Director explained that if both containment isolation valves for penetration X-15 (CU-28 and CU-29) failed, and there was a break in the RWCU system line outside primary containment, there would have been a viable release path for contamination to escape outside primary containment.

The Region I Deputy Director of DRP advised OIG that after the NRC denied the exemption request for valve CU-29 in June 1991, the NRC should not have allowed NU to restart following refueling outage 13 unless they could demonstrate that it was safe to do so. He acknowledged that the NRC did not take any regulatory action against NU until issuing a violation in April 1995 for failure to test valve CU-29. He said that in hindsight, he questioned how NU could have restarted Millstone Unit 1 following refueling outage 13 without complying with Appendix J. In addition, the Deputy Director stated that because NU failed to test valve CU-29 in accordance with Appendix J, they failed to meet that condition of their operating license. With respect to the safety implications of not testing valve CU-29, the Deputy Director said that NU degraded the safety margins for ensuring public health and safety by operating the plant with a degraded containment isolation valve.

The Deputy Director said that the NRC has recently determined that motor-operated valve CU-28 is not environmentally qualified to perform its containment isolation function under adverse conditions. He noted that cracks were recently identified that rendered penetration X-15 inoperable. He added that under certain circumstances, involving a single failure of valve CU-28 in conjunction with a break in the RWCU system line downstream of valve CU-29, there could have been a direct pathway for contamination to be released outside containment.

A Branch Chief in the Technical Specifications Branch of NRR advised OIG that after NRC denied the exemption request for valve CU-29, the staff should have required NU to come into compliance with Appendix J. He said ideally, after a licensee's exemption request is denied, the NRC should order concurrently that the licensee comply with the requirements within a fixed period of time. Generally, this would be within one refueling cycle. The Branch Chief said that in his view, the NRC was remiss in its handling of the exemption denial. According to the Branch Chief, once the exemption request for valve CU-29 was denied, NU was in violation of Appendix J and their operating license.

The Branch Chief told OIG that the NRC needs to strengthen the fundamental concept regarding literal compliance. He commented that in the aftermath of Three Mile Island, the NRC has struggled with the problem of having to schedule actions while not being overly burdensome on the licensees it regulates. He added that the NRC contributed to NU's complacency with respect to valve CU-29 because there was no demand for affirmative action included in the June 1991 exemption denial.

The Director, Division of Reactor Projects I/II, NRR, told OIG that once 10 CFR Part 50 Appendix J was issued in 1973, NU should have complied with the regulation and conducted a leak rate test of valve CU-29. He could not provide an answer as to why the NRC did not require NU to comply with the Appendix J testing requirement for valve CU-29.

The Director said that the NRC assumes that when an exemption request is denied the licensee will take whatever action is necessary to come into compliance with the regulation. He noted that the act of denying an exemption request puts the licensee on notice that something has to be done. The Director acknowledged that the NRC is responsible when licensees do not take the appropriate action.

The Director stated that after NU's exemption request for valve CU-29 was denied, the NRC missed some opportunities to require Appendix J compliance. He added that there was "probably a little lack of diligence on the part of NRR...and that some people were using ISAP as a magic word...and letting them [NU] off the hook." He acknowledged that by concurring on NU's ISAP update reports after the exemption was denied, NRR allowed NU to avoid meeting the requirements of Appendix J for valve CU-29. He said Region I and NRR were responsible for ensuring that NU complied with Appendix J.

OIG interviewed the Director and Deputy Director of the NRC's Office of Enforcement (OE). The Director stated that licensees are required to comply with NRC regulations even after they submit an exemption request. However, the Director stated that it was not clear whether NU violated Appendix J after the exemption request for valve CU-29 was denied. He explained that because Appendix J testing was part of ISAP, in his view, the NRC had in effect excused NU from complying with Appendix J.

The Director told OIG that when an exemption request is received, the NRC should advise the licensee what is required of them while the request is being processed. Also, if an exemption is denied, the NRC should inform licensees of the consequences of the denial. This Director said that it was his belief that the NRC should have been rigorous with NU when they first submitted their exemption request. The Director opined that NRC staff should have informed NU that while the staff was reviewing the exemption request, NU was responsible for complying with Appendix J. The Director, reiterated that the mere filing of a request for relief from NRC requirements did not release the licensee from the obligation to meet those requirements.

The OE Deputy Director stated that ISAP topics receiving a medium ranking, such as valve CU-29, were expected to be addressed within two to three refueling cycles. Therefore, in accordance with ISAP, NU would have been required to comply with Appendix J within the applicable timeframe. He noted that because ISAP identified Appendix J compliance as a medium priority, this probably sent the message to the licensee that NRC did not believe compliance was very important.

On July 3, 1996, the NRC issued a report which reviewed the implementation of the ISAP at Millstone Unit 1. This report reflected that ISAP "allowed the licensee to prioritize projects in a manner which might not have been in accordance with the original NRC expectations associated with the program." The NRC concluded that its process for reviewing ISAP submittals was inadequate to determine if NU had properly prioritized the necessary modifications. While the report stated that the ISAP process had been conducted in a manner that was generally consistent with the NRC approved ISAP plan, it concluded that the NRC's organizational structure and lack of dedicated resources did not "ensure effective monitoring and oversight of the ISAP process."

FINDINGS

1. When issued by the NRC in 1973, Appendix J to 10 CFR Part 50 became a requirement for all licensees of water-cooled power reactors. OIG determined that although Appendix J required that NU test and establish the leak-tight integrity of containment isolation valves, the NRC did not obtain Appendix J compliance with respect to valve CU-29 until 1995. Additionally, Appendix J became a condition of NU's operating license for Millstone Unit 1 in October 1986.

2. In June 1991, while Millstone Unit 1 was shutdown for refueling outage 13, the NRC denied NU's 1988 request to exempt valve CU-29 from the testing requirements of Appendix J. However, after denying this request the NRC did not achieve Appendix J compliance with respect to valve CU-29 until 1995, during refueling outage 15.