December 7, 2000

Mr. Thomas F. Plunkett
President - Nuclear Division
Florida Power and Light Company
P.O. Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: ST. LUCIE NUCLEAR PLANT, UNITS 1 AND 2 - SAFETY EVALUATION OF RELIEF REQUESTS FOR THE THIRD 10-YEAR INTERVAL INSERVICE TEST PROGRAM FOR PUMPS AND VALVES (TAC NOS. MA8598 AND MA8599)

Dear Mr. Plunkett:

By letter dated January 12, 1998, as supplemented by letters dated September 21, October 9 and November 30, 1998, Florida Power and Light Company (FPL) submitted its Third 10-year interval Inservice Test (IST) Program for Pumps and Valves for the St. Lucie Plant, Units 1 and 2. The U.S. Nuclear Regulatory Commission (NRC) staff, with the technical assistance from Brookhaven National Laboratory, evaluated the submittals and identified 30 action items as discussed in a safety evaluation (SE) dated March 16, 1999. The staff's SE requested that FPL address the action items within 1 year from the date of the SE. By letter dated March 15, 2000, FPL provided responses to the action items.

Pursuant to Title 10, *Code of Federal Regulations* (10 CFR), Section 50.55a, the staff reviewed FPL's responses against the requirements of the 1989 Edition of American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (the Code), Section XI, Subsections IWP and IWV. The staff finds that FPL's responses to all of the action items are acceptable. However, the adequacy of the IST program continues to be the subject of NRC inspection.

Also included in FPL's March 15, 2000, submittal are two new relief requests, PR-13 and VR-08, and revised relief requests, PR-07, VR-05, VR-06, VR-17, and VR-19. The staff has reviewed the proposed relief requests against the requirements of the Code .

The staff finds that the proposed alternatives to the Code requirements described in PR-13, VR-05, VR-06, and VR-19 may be authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the Third 10-year interval because the alternatives proposed by the licensee provides an acceptable level of quality and safety.

Also, the staff finds that the proposed alternatives to the Code requirements described in PR-07 and VR-17 may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the Third 10-year interval. Compliance with the specified requirements of these sections would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

In addition, the staff finds that the proposed alternative to the Code requirements described in VR-08 may be authorized pursuant to 10 CFR 50.55a(f)(4)(iv). This alternative meets the requirements of the 1995 OM Code, paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

The results of the staff review are provided in the enclosed SE. This completes the staff actions for TAC Numbers MA8598 and MA8599. If you have any comments, please contact St. Lucie Project Manager Kahtan Jabbour at (301) 415-1496.

Sincerely,

/RA/

Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-335 and 50-389

Enclosure: Safety Evaluation

cc w/Encl.: See next page

In addition, the staff finds that the proposed alternative to the Code requirements described in VR-08 may be authorized pursuant to 10 CFR 50.55a(f)(4)(iv). This alternative meets the requirements of the 1995 OM Code, paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

The results of the staff review are provided in the enclosed SE. This completes the staff actions for TAC Numbers MA8598 and MA8599. If you have any comments, please contact St. Lucie Project Manager Kahtan Jabbour at (301) 415-1496.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE THIRD 10-YEAR INSERVICE TESTING PROGRAM

FLORIDA POWER & LIGHT COMPANY

ST. LUCIE UNITS 1 AND 2

DOCKET NUMBERS 50-335 AND 50-389

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME *Boiler and Pressure Vessel Code* (the Code) and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. Subject to Commission approval, pursuant to 10 CFR 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda incorporated by reference into 10 CFR 50.55a. Portions of editions or addenda may be used provided that all related requirements are met. Section 50.55a authorizes the U.S. Nuclear Regulatory Commission (NRC) to approve alternatives and to grant relief from ASME code requirements upon making the necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, “Guidance on Developing Acceptable Inservice Testing Programs,” provides alternatives to the Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants.”

In a letter dated March 15, 2000, Florida Power & Light Company (FPL), licensee for St. Lucie, Units 1 and 2, submitted two new relief requests for the third 10-year interval of the IST program, PR-13 and VR-08, and revised existing relief requests, PR-07, VR-05, VR-06, VR-17, and VR-19.

The third 10-year IST interval for St. Lucie, Units 1 and 2 began February 11, 1998, and is scheduled to end February 10, 2008. The IST program was developed in accordance with the requirements of the 1989 Edition of the ASME Code by implementation of the 1987 ASME/ANSI [American National Standards Institute] *Operations and Maintenance (OM) Standards* Part 1, Part 6, and Part 10 (OM-1, OM-6, and OM-10) for IST of safety and relief devices, pumps, and valves.

The NRC’s findings with respect to authorizing alternatives and granting or denying the IST program relief requests are given below.

ENCLOSURE

2.0 PUMP RELIEF REQUESTS

2.1 Relief Request PR-07

The licensee requests relief from the requirements of OM-6, paragraph 4.6.1.6, which states that the frequency response range of the vibration measuring transducers and their readout system shall be from one-third minimum pump shaft rotational speed to at least 1000 Hz, for the reactor coolant charging pumps 1A, 1B, and 1C, and 2A, 2B, and 2C.

Relief was authorized for an interim period of 1 year in the NRC staff's March 16, 1999, safety evaluation (SE). The interim period was provided to allow the licensee to either procure new equipment that meets the Code requirements or revise and resubmit the relief request to address the specific hardship and how the proposed alternative provides an acceptable level of safety. The licensee provided its response in the March 15, 2000, submittal.

2.1.1 Licensee's Basis for Requesting Relief

The licensee states:

> The reactor coolant charging pumps operate at approximately 205-210 rpm which equates to a rotational frequency of 3.41 Hz. The one-third minimum speed frequency response required for the vibration instrumentation correlates to 1.13 Hz (68 cpm).
>
> The vibration instrumentation used at St. Lucie are the Computational Systems Inc. (CSI) model 2120 Machinery Analyzer with Wilcoxon model 793 accelerometer probes. The CSI 2120 Machinery Analyzer integrator frequency response is essentially flat down to DC. Wilcoxon model 793 accelerometer probe frequency response range meets the Code accuracy range requirement of +/-5% down to 1.5 Hz. The probes rated accuracy drops to only +/-10% down to a frequency of 1 Hz. This...instrumentation capability meets the Code frequency specifications for one-half pump running speed but has a frequency response accuracy specification of less than +/-5% for the one-third minimum speed. Actual vibration frequency response accuracy for the instrumentation will be better than the nominal minimum ratings specified by the manufacturer for the probes.
>
> Additionally, the calibration of the instrumentation will be to a minimum frequency of only 2 Hz. The provider of the calibration services for PSL [Plant St. Lucie] is unable to qualify calibration to frequencies less than 2 Hz. This is due to the unavailability of suitable vibration measurement standards for performing the calibration. The NIST [National Institute of Standards and Technology] Calibration Service Users Guide lists the lowest frequency NIST standard pickup (24010C) available is calibrated at 2 Hz. FPL Quality Assurance Program requires this instrumentation to be calibrated and traceable to NIST standards. Again, actual vibration frequency response capability for the instrumentation will be better than the qualified calibration requirements specified above.
>
> This frequency response range of this instrumentation adequately envelops all potential noise contributors that could indicate degradation of the charging pumps. The instrumentation adequately envelops all potential noise contributors that could indicate

degradation of the charging pumps. The instrumentation is fully qualified to measure synchronous vibration levels. Additionally, it is capable of and will be used for measuring vibration frequencies at one-half and one-third running speed. Qualification of the accuracy of the readings at these frequencies is considered unnecessary and would impose undue hardship. This is considered acceptable since there are virtually NO mechanical degradation scenarios where only a sub-synchronous vibration component would develop on the charging pumps. For example:

1. Oil whirl (0.38X - 0.48X) is NOT applicable to a horizontal, triplex, reciprocating pumps.

2. A light rub/impact could generate 0.5X (102.5 cpm) vibration components, but would also usually generate a sequence of integer and half-integer running speed components. A heavy rub generates increased integer values of multiple running speed components, as well as processing the 1X phase measurement. In either case the overall vibration level would still show an increase from both the attenuated sub-synchronous and 1X vibration components as well as the higher harmonic vibration components.

3. Looseness in the power train would likely be indicated by increasing 1X and 2X vibration components.

Based on the above information, the use of Computational systems Inc. (CSI) model 2120 Machinery Analyzer with Wilcoxon model 793 accelerometer probes provides sufficiently reliable data to identify changes from baseline readings to indicate possible problems with the pumps.

2.1.2 Alternative Testing

The licensee proposes:

> During testing of these pumps, the vibration instrumentation used will be the of [sic] Computational Systems Inc. (CSI) model 2120 Machinery analyzer with Wilcoxon model 793 accelerometer probes, or equivalent. Calibration of the instrumentation will be qualified to a minimum frequency of only 2 Hz.

2.1.3 Evaluation

In its third 10-year IST program, the licensee requested an alternative to the requirements of OM-6 paragraph 4.6.1.6 to use vibration measuring instrumentation with a lower frequency limit of 4.5 Hz. The staff's SE dated March 16, 1999, authorized the alternative for an interim period of 1 year. This period was provided to allow the licensee to either procure new equipment that meets the Code requirements or revise and resubmit the relief request to address the specific hardship and how the proposed alternative provides an acceptable level of safety. The licensee provided its response in the March 15, 2000, submittal.

In the interim period, the licensee acquired new vibration instrumentation and has revised and resubmitted the relief request. The licensee requests relief from the requirements of OM-6, paragraph 4.6.1.6, which states that the frequency response range of the vibration measuring transducers and their readout system shall be from one-third minimum pump shaft rotational speed to at least 1000 Hz. The reactor coolant charging pumps, 1A, 1B, and 1C, and 2A, 2B, and 2C, operate at a rotational frequency of 3.41 Hz. The one-third minimum speed frequency response required for vibration instrumentation correlates to 1.13 Hz. The licensee proposes to use instrumentation which measures the frequency response range of 2 to 1000 Hz. The licensee states that its calibration service provider is unable to qualify calibration to frequencies less than 2 Hz due to the unavailability of suitable vibration measurement standards. Imposition of the Code requirements would create an unnecessary burden because the licensee would need to qualify the accuracy of the instrumentation at frequencies below 2 Hz.

The frequency spectrum of the signals generated is characteristic of each pump and constitutes a unique pattern. Analysis of the pattern allows identification of vibration sources, and monitoring of the change over time permits evaluation of the mechanical condition of the pump. In order to identify sources of noise and vibration, the peaks of the measured frequency spectra are correlated with data pertaining to the possible vibration source component in the pump. For reciprocating pumps, the sources of vibration from unbalances forces generally give rise to vibrations at the running speed or higher. Vibrations below pump shaft rotational speed may indicate oil whirl in journal bearings. This is the primary failure mode that causes vibration at speeds below shaft rotational speed. The licensee has indicated that the charging pump bearings are not susceptible to oil whirl and this failure mode.

It is the licensee’s experience that the possible failure modes, such as looseness in the power train and mechanical rubs, cause vibration at or above the pump speed. The pump is not susceptible to degradation mechanisms that would manifest themselves in the unmonitored range (1.13 to 2 Hz) but not in the monitored range (2-1000 Hz). Therefore, the licensee’s current instrumentation is sufficient to identify pump problems which produce high frequency vibrations.

2.1.4 Conclusion

The alternative to the requirements of OM-6 paragraph 4.6.1.6 for the reactor coolant charging pump vibration instrumentation is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the remainder of the third 10-year interval. Compliance with the Code requirements would result in a hardship without a compensating increase in the level of quality and safety.

2.2 Relief Request PR-13

The licensee requests relief from OM-6 paragraph 4.6.1.2(a) for the low pressure safety injection pumps’ discharge pressure measuring instruments. The Code states that the full-scale range of each analog instrument shall not be greater than three times the reference value. The licensee proposes to use the installed instrumentation.

2.2.1 Licensee's Basis for Requesting Relief

The licensee states:

> Part 6, Table 1 requires the accuracy of instruments used to measure differential pressure to be equal to or better than ±2 percent based on full-scale reading of the instrument. This means that the accuracy of the actual measurement can vary as much as ±6 percent, assuming the range of the instrument is extended to the maximum allowed deviation (3 times the reference value).
>
> An example of calculating indicated instrument accuracy is as follows (from NUREG-1482, Paragraph 5.5.1):
>
>> This example uses a reference pressure value of 20 psig and an analog pressure gauge with full scale range of 60 psig that is calibrated to ±2% of full scale.
>>
>> Code Requirement:
>>
>>> Reference value = 20 psig
>>> 3 x reference value = 60 psig
>>> Instrument tolerance = 1.2 psig (±2% x 60 psig)
>>
>> Indicated accuracy:
>>
>>> Instrument tolerance / Reference value x 100 = Indicated accuracy
>>>
>>> ± 1.2 psig / 20 psig x 100 = ±6%
>
> Following the methodology used in NUREG-1482 and the example above, the indicated instrument accuracy can be calculated for each pressure instrument in this relief request. The following table provides the calculated indicated instrument accuracies:

Table 1: Calculated Instrument Accuracies for Selected Pressure Instruments

Pump ID	Instr Number	Param.	Ref Value	Instr Range	Instr Accuracy	Instr Tol	Ind Accuracy
1A LPSI*	PI-3314	Disch. Pressure	200 psig	0-600 psig	± 0.5%	± 3 psig	± 1.5%
1B LPSI	PI-3315	Disch. Pressure	195 psig	0-600 psig	± 0.5%	± 3 psig	± 1.5%
2A LPSI	PI-3314	Disch. Pressure	190 psig	0-600 psig	± 0.5%	± 3 psig	± 1.6%
2B LPSI	PI-3315	Disch. Pressure	185 psig	0-600 psig	± 0.5%	± 3 psig	± 1.6%

[*low-pressure safety injection]

Where:

Ref Value	= reference value established by the procedure
Instr Accuracy	= accuracy to which instrument is calibrated
Instr Tol	= maximum Instr Range times Instr Accuracy
Ind Accuracy	= Instr Tol divided by Ref Value times 100

As shown on Table 1, the indicted accuracy for all the instruments is less than ±6% of the reference value. These accuracy's [sic] are the same or better than those allowed by the Code. Therefore, there is no overall impact on the capability to detect and monitor degradation during pump tests based on use of these instruments. Continued use of the existing installed instruments is supported by NUREG-1482, Paragraph 5.5.1 which states that when the range of an installed analog instrument is greater than 3 times the reference value but the accuracy of the instrument is more conservative than the Code, NRC staff will grant relief when the combination of the range and accuracy yields a reading at least equivalent to the reading achieved from instruments that meet the Code requirements (i.e., up to ±6%).

2.2.2 Alternative Testing

The licensee proposes:

> Since the indicated accuracy of each permanently installed [instrument] is less than the ±6 percent allowed tolerance, FPL requests approval for continued use of the instruments listed in this relief request.

2.2.3 Evaluation

The licensee requests relief from OM-6 paragraph 4.6.1.2(a) for the low pressure safety injection pumps' discharge pressure measuring instruments. The Code states that the full-scale range of each analog instrument shall not be greater than three times the reference value. The licensee proposes to use instrumentation which does not meet this Code requirement.

OM-6 Table 1 requires the instrument accuracy to be within 2% of full-scale, while OM-6 paragraph 4.6.1.2(a) requires the full-scale range of each instrument be no greater than three times the reference value. The combination of these two requirements results in an effective accuracy requirement of ±6% of the reference value.

The accuracies of the LPSI pump pressure instruments are ±0.5% and the full-scale ranges are between 3.0 and 3.2 times the reference values. The pressure instruments, therefore, have effective accuracies of within 1.5 to 1.6% of the reference values. These instruments yield readings at least equivalent to the readings achieved from instruments that meet Code requirements (i.e., up to ±6%) and, thus, provide an acceptable level of quality and safety.

2.2.4 Conclusion

The proposed alternative to the full-scale range requirements of OM-6 paragraph 4.6.1.2(a) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. This alternative is authorized for the third 10-year interval.

3.0 VALVE RELIEF REQUESTS

3.1 Relief Request VR-05

The licensee requests relief from the requirements of OM-10 paragraph 4.3.2.2(a) for four safety injection tank discharge check valves. The licensee proposes a sampling program to non-intrusively verify obturator travel to the full open position.

Relief was denied in the staff's March 16, 1999, SE because the licensee proposed to use check valve disassembly and inspection interchangeably with non-intrusive testing. The licensee revised and resubmitted the relief request. The revised relief request is evaluated below.

3.1.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are simple check valves with no external means of exercising or for determining disc position. Consequently, the only practical method for stroke testing of the SIT [safety injection tanks] discharge check valves is to discharge the contents of the SITs to the RCS [reactor coolant system]. Performing a full flow test of the SIT discharge check valves during any plant operating mode is impractical because the maximum flowrates attainable by discharging the contents of the SIT to the RCS cannot meet the valves' maximum required accident condition flowrate as required by Generic Letter 89-04, Position 1. The maximum flowrate achievable during an SIT discharge test is restricted by the long stroke time of the SIT discharge isolation valves - motor-operated valves with a nominal stroke time of 52 seconds and limitations on SIT pressure during testing. Under large break LOCA [loss-of-coolant accident] accident conditions, the maximum (peak) flowrate through these valves would be approximately 20,000 gpm as compared to typical test values of approximately 8,000 gpm.
>
> Although the flowrate attained during these SIT discharge tests does not qualify as "full flow," it is sufficient to fully stroke the check valve discs to their fully open position. Verification of this is possible using non-intrusive testing techniques. Due to system configuration, however, full-stroke exercising of the SIT discharge check valves cannot be performed in any plant operating mode other than refueling when the reactor vessel head is removed.
>
> The SIT discharge check valves are identical with respect to size and design and they are installed in essentially identical orientations exposed to similar operating conditions. Each has been disassembled and inspected several times during previous refueling outages with no abnormal wear or deterioration noted. Additionally, FPL has reviewed

> the operating and maintenance history of similar valves used throughout the industry under comparable conditions. Based on these reviews and inspections, there has been no evidence of valve degradation with respect to their ability to open and satisfactorily pass the required flow needed to fulfill their safety function. This along with the observation that the SIT flowrate and pressure drop traces obtained during the 1994 refueling outage testing are nearly identical, indicate that this baseline data was taken with each valve was in good working condition.
>
> Partial-stroke (open) of these valves requires discharging from the SITs to either the RCS or the SIT drain header and RWT [refueling water tank]. Flow directed to the RCS during normal plant operation is impossible since the pressure in the SIT cannot overcome RCS pressure to establish flow. Verification of flow via the drain lines to the RWT requires opening two manual containment isolation valves for Unit 1 and an outside manual containment isolation valve and an inside solenoid-operated containment isolation valve for Unit 2. In both cases the potential risk of the loss [of] containment integrity in the event of an accident due to single active failure or dependence on operator action makes this unacceptable and impractical. (Reference NUREG-1482, Paragraph 3.1.1)

3.1.2 <u>Alternative Testing</u>

The licensee proposes:

> Each SIT discharge check valve will be partial-stoke exercised at cold shutdown and full-stroked in the open direction during refueling outage[s] by discharging all four SIT to the reactor vessel.
>
> Each SIT discharge check valve will be verified closed and leakrate tested in accordance with Relief Request VR-04. During each refueling outage, under a sampling program on a rotating schedule, at least one of the check valves will be non-intrusively tested to verify its disc fully strokes to its backstop.
>
> Should a valve be found to be inoperable and incapable of performing its function to open, then the remaining three valves will be non-intrusively tested during the same outage, after which the rotational inspection schedule will be reinitiated.
>
> This alternative testing as outlined is consistent with the requirements and recommendations of NRC Generic Letter 89-04, Position 1 and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants,” Paragraph 4.1.2.

3.1.3 <u>Evaluation</u>

The licensee requests relief from the requirements of OM-10 paragraph 4.3.2.2(a) for four safety injection tank discharge check valves. These valves open to provide flowpaths from the safety injection tanks to the RCS and close to isolate the tanks from the high pressure of the RCS and the safety injection headers. The licensee proposes to part-stroke the valves during cold shutdowns, full-stroke the valves during refueling outages, and non-intrusively verify obturator travel to the full open position using a sampling program.

The Code requires check valves to be exercised to the position(s) required to fulfill their safety function(s). To verify the disc position of check valves which do not have external position indication, the Code allows the use of indirect evidence or other positive means such as non-intrusive techniques. NUREG-1482 Section 4.1.2 discusses the practice of exercising check valves with flow and non-intrusive techniques.

When using non-intrusive testing techniques in a sampling plan, the licensee may implement a program such that similar valves in the same service conditions are grouped for testing purposes. The size of the group should not exceed four valves. GL 89-04 indicates that valves in the group be of the same size, model, and have the same system function. Under a sampling program for check valves, one valve would typically be non-intrusively tested on a rotating schedule. The remaining valves in the group would be flow tested. If problems are found with the sample valve that are determined to affect its operational readiness, all valves in the group must be tested using non-intrusive techniques during the same outage.

The licensee's proposed alternative is consistent with the guidance in NUREG-1482 and provides an acceptable means of assuring the operational readiness of the safety injection tank discharge check valves.

3.1.4 Conclusion

The proposed alternative to the exercise requirements of OM-10 paragraph 4.3.2.2(a) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. This alternative is authorized for the third 10-year interval.

3.2 Relief Request VR-06

The licensee requests relief from the requirements of OM-10 paragraph 4.3.2.2(a) for four safety injection header check valves. The licensee proposes a sampling program to non-intrusively verify obturator travel to the full open position.

Relief was denied in the staff's March 16, 1999, SE because the licensee proposed to use check valve disassembly and inspection interchangeably with non-intrusive testing. The licensee revised and resubmitted the relief request. The revised relief request is evaluated below.

3.2.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are simple check valves with no external means of exercising nor determining disc position. Consequently, the only practical method for stroke testing of these check valves is by injection via the safety injection pumps or discharging the contents of the safety injection (SIT) to the RCS.
>
> During plant operations at power, partial flow exercising these valves is not practical because neither the SITs nor the safety injection pumps are capable of overcoming RCS pressure.

Performing a full-flow test of these check valves by SIT discharge is impractical because the maximum flowrates attained by discharging the contents of the SITs to the RCS does not meet the valves' maximum required accident condition flow as required by Generic Letter 89-04, Position 1. The maximum flowrate achievable during an SIT discharge test is restricted by the long stroke time of the SIT discharge isolation valve. This is based on the motor-operated valves nominal stroke time of 52 seconds and limitations on SIT pressure during testing.

Under large break LOCA accident conditions, the maximum (peak) flowrate through these valves would be approximately 20,000 gpm as compared to test values of approximately 8,000 gpm. Note also that normal shutdown cooling system flow is incapable of full stroking these valves based on the requirements of Generic Letter 89-04.

Although the flowrate attained during these SIT discharge tests does not qualify as "full flow," it is sufficient to fully stroke the check valve discs to the fully open position and verification of this is practical using non-intrusive testing techniques. Due to system configuration, however, full-stroke exercising of the SIT discharge check valves cannot be performed in any plant mode other than refueling shutdown when the reactor vessel head is removed.

The safety injection header check valves are identical with respect to size and design and they are installed in essentially identical orientations exposed to similar operating conditions. Each has been disassembled and inspected several times during previous refueling outages with no abnormal wear or deterioration noted. FPL has additionally reviewed the operating and maintenance history of similar valves used throughout the industry under comparable conditions. Based on these reviews and inspections, there has been no evidence of valve degradation with respect to their ability to open and satisfactorily pass the required flow needed to fulfill their safety function. This, along with the observation that the SIT flowrate and pressure drop traces obtained during the 1994 refueling outage testing are nearly identical, indicate that this baseline data was taken when each valve was in similar good working condition.

In addition to flow testing, each valve is confirmed to be closed under cold shutdown conditions and is subjected to periodic leakage tests. Note that, for this type of valve, leakage testing is especially sensitive to internal valve degradation.

3.2.2 Alternative Testing

The licensee proposes:

Each safety injection header check valve will be partial-stroke exercised at cold shutdown and full-stroked in the open direction during refueling outages by discharging all four SITs to the reactor vessel.

Each safety injection header check valve [will] be verified closed and leakrate tested in accordance with Relief Request VR-04. During each refueling outage, under a sampling

program on a rotating schedule, at least one of the check valves, will be non-intrusively tested to verify its disc fully strokes to its backstop.

Should a valve be found to be inoperable and incapable of performing its function to open, then the remaining three valves will be non-intrusively tested during the same outage, after which the rotational inspection schedule will be reinitiated.

This alternative testing as outlined is consistent with the requirements and recommendations of NRC Generic Letter 89-04, Position 1 and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants,” Paragraph 4.1.2.

3.2.3 Evaluation

The licensee requests relief from the requirements of OM-10 paragraph 4.3.2.2(a) for four safety injection header check valves. These valves open to provide flowpaths from the safety injection headers to the RCS and close to isolate the headers from the high pressure of the RCS. The licensee proposes to part-stroke the valves during cold shutdowns, full-stroke the valves during refueling outages, and non-intrusively verify obturator travel to the full open position using a sampling program.

The Code requires check valves to be exercised to the position(s) required to fulfill their safety function(s). To verify the disc position of check valves which do not have external position indication, the Code allows the use of indirect evidence or other positive means such as non-intrusive techniques. NUREG-1482 section 4.1.2 discusses the practice of exercising check valves with flow and non-intrusive techniques.

When using non-intrusive testing techniques in a sampling plan, the licensee may implement a program such that similar valves in the same service conditions are grouped for testing purposes. The size of the group should not exceed four valves. GL 89-04 indicates that valves in the group be of the same size, model, and have the same system function. Under a sampling program for check valves, one valve would typically be non-intrusively tested on a rotating schedule. The remaining valves in the group would be flow tested. If problems are found with the sample valve that are determined to affect its operational readiness, all valves in the group must be tested using non-intrusive techniques during the same outage.

The licensee’s proposed alternative is consistent with the guidance in NUREG-1482 and provides an acceptable means of assuring the operational readiness of the safety injection header check valves.

3.2.4 Conclusion

The proposed alternative to the exercise requirements of OM-10 paragraph 4.3.2.2(a) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. This alternative is authorized for the third 10-year interval.

3.3 Relief Request VR-08

The licensee requests relief from the testing requirements of OM-10 paragraph 4.3.2.4(c). The Code requires that each check valve be disassembled every refueling outage. The licensee proposes a sample disassembly and inspection program for four check valves in the main steam system (2 valves per unit).

3.3.1 Licensee's Basis for Requesting Relief

The licensee states:

> These are simple check valves with no external means of exercising or determining obturator position. Verifying closure of these valves during plant operation at normal operating pressures would require isolating the associated steam generator from the steam supply lines and venting the piping between the closed isolation valve and the check valve. It is considered to be imprudent to isolate a steam supply to the AFW [auxiliary feedwater] pumps during operation and, in addition, it is undesirable to subject plant personnel to the hazards associated with venting live steam at these operating conditions. Furthermore, it is likely that testing in this manner would provide inconclusive results.
>
> The physical configuration of piping and valves in the steam supply line differs between Unit 1 and Unit 2.
>
> For Unit 1, an isolation valve and vent/drain valve is available so that backflow testing of one of the steam supply check valves is possible. In this case, the other steam supply check valve must be disassembled to provide a connection for a dedicated air compressor for the backflow test. As a result, testing during normal operation or cold shutdown is not practicable. NUREG-1482, Section 4.1.4 states, "...The NRC has determined that the need to setup test equipment is adequate justification to defer backflow testing until a refueling outage..."
>
> For Unit 2, piping immediately upstream of the steam supply check valves has no telltale vent or drain with sufficient vent path capacity to adequately test the valve for closure without imposing overly restrictive leakage limits on the valve well below those required by any safety analyses. To expand the tested system boundary upstream of the valve to encompass a telltale vent or drain with sufficient vent path capacity would impose an undue hardship for the utility. This testing would require all maintenance activities associated with the pressure boundary of the steam generators and significant portions of main steam and feedwater piping to be stopped and the system secured to safely perform the testing. Since this test should only be performed during a refueling outage, much of these systems are undergoing maintenance. As a result, this test could significantly increase outage scope, cost and duration. This is considered an undue burden to the utility when disassembly and inspection of the valves would involve considerable less resources and is an approved alternative in accordance with the guidelines of NRC Generic Letter 89-04, Position 2.

3.3.2 Alternative Testing

The licensee proposes:

Unit 1

During each reactor refueling outage one of the Unit 1 valves will be verified to close while the other will be disassembled and inspected and manually stroked to verify operability in accordance with OM Part 10, Paragraph 4.3.2.4(c). Following valve reassembly forward flow operation of the valve will be observed during ensuring [sic] startup.

Unit 2

During each reactor refueling outage, at least one of these valves will be disassembled, inspected and manually stroked to verify operability. Should a valve under inspection be found to be inoperable, then the other valve in that unit will be inspected during the same outage, after which the rotational inspection schedule will be reinitiated. During activities associated with valve disassembly and inspection and prior to system closure, appropriate precautions will be applied and inspection performed to ensure internal cleanliness standards are maintained and foreign materials are excluded from valve and system internals. These measures may include creating controlled work areas, maintaining a tool and equipment accounting system, installation of covers during non-working periods and final close-out inspections. Following re-assembly, each valve will be partial-flow exercised to verify operability.

3.3.3 Evaluation

The valves for which relief is requested open to provide flowpaths for steam from the steam generators to auxiliary feedwater pumps 1C and 2C turbine drivers. The valves close under accident conditions to isolate the unaffected steam generator and prevent the uncontrolled blowdown of both steam generators. The Code, OM-10 paragraph 4.3.2, requires that check valves be exercised nominally every 3 months. As an alternative to demonstrating valve obturator movement, the Code allows disassembly every refueling outage to determine operability of the valves (OM-10 paragraph 4.3.2.4(c)). The licensee proposes a sample disassembly and inspection program for these valves. There will be two valve groups, valves (V08130 and V08163) in Unit 1 and valves (V08130 and V08163) in Unit 2. The licensee will test alternate valves in each group every refueling outage in accordance with Position 2 of GL 89-04.

The staff Position 2 of GL 89-04 allows for the employment of a sample disassembly and inspection plan for groups of identical valves in similar applications. The sample disassembly and inspection plan involves grouping similar valves and testing one valve in each group during each refueling outage. Guidelines for this plan are stated in Appendix A of NUREG-1482. The sampling technique requires that each valve in the group be the same design and have the same service conditions including valve orientation. Additionally, at each disassembly, the licensee must verify that the disassembled valve is capable of full-stroking and that the internals

of the valve are structurally sound. Also, if the disassembly is to verify the full-stroke capability of the valve, the disc should be manually exercised.

A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage, until the entire group has been tested. If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage. Once this is complete, the sequence of disassembly must be repeated.

The 1995 ASME OM Code, paragraph ISTC 4.5.4(c), allows for a sample disassembly examination program to be used to verify valve obturator movement. The sample disassembly examination program shall group check valves of similar design, application, and service condition and require a periodic examination of one valve from each group.

The licensee's proposed alternative is consistent with Position 2 of GL 89-04 and paragraph ISTC 4.5.4(c) of the 1995 ASME OM Code, which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370), and therefore, provides an acceptable level of quality and safety. The regulation at 10 CFR 50.55a(f)(4)(iv) allows the use of requirements in subsequent editions of the Code (i.e., for St. Lucie Units 1 and 2 third 10-year interval, editions after the 1989 edition of the Code) that have been incorporated by reference into 10 CFR 50.55a, with NRC staff approval.

3.3.4 Conclusion

The proposed alternative to the requirements of OM-10 paragraph 4.3.2.4(c), is approved pursuant to 10 CFR 50.55a(f)(4)(iv). This alternative meets the requirements of the 1995 OM Code, paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

3.4 Relief Request VR-17

This relief request was evaluated in the staff's SE dated March 16, 1999, and authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year interval. The licensee revised the relief request to indicate that partial flow exercising of the valves will be performed following disassembly and inspection, and resubmitted the alternative for NRC approval. The staff evaluated the relief request and determined that the addition of partial flow exercising following disassembly and inspection does not alter the staff's decision, as reflected in the March 16, 1999 SE, to authorize the alternative pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year interval.

3.5 Relief Request VR-19

The licensee requests relief from the operability test frequency requirements of OM-1 paragraph 1.3.4.3 for two containment vacuum relief valves. The licensee proposes to test the valves during cold shutdowns and leak test the valves in accordance with its Appendix J program.

Relief was denied in the staff's March 16, 1999, SE because the licensee did not provide sufficient information to support the basis for impracticality. The revised relief request is evaluated below.

3.5.1 <u>Licensee's Basis for Requesting Relief</u>

The licensee states:

> These check valves are tested in such a way that immediate access to each valve is required. Since these valves are located inside the primary containment building, routine access during power operation is considered to be impractical. At 100% power, the dose rates at the 62' reactor containment building in the vicinity of the vacuum relief valves are 42 mrem/hour gamma and 300 mrem/hour neutron. These dose rates are documented at floor level and the vacuum relief valves are located 11 feet off the floor at the 73' elevation. The source of radiation streaming in this area is the gap between the 6 foot high bio-wall and the reactor head missile shield which would suggest that dose rates would be slightly higher at the actual vacuum relief valve location. Thus, operational testing can only be performed during cold shutdown conditions. Leakrate testing of these valves is performed in accordance with the St. Lucie Containment Leakage Rate Testing Program (Technical Specification, Paragraph 6.8.4 h). This Program allows extension of leakrate testing beyond the 2-year interval based on 10 CFR 50 Appendix J, Option B. There is no overriding justification nor engineering issue that demands more frequent testing than that required by Appendix J and the St. Lucie Containment Leakrate Testing Program.

3.5.2 <u>Alternative Testing</u>

The licensee proposes:

> Each of these valves will be subjected to an operability test (opened and closed) during plant cold shutdown periods. Testing during cold shutdowns will be on a frequency determined by intervals between shutdowns as follows:
>
> - For cold shutdown periods occurring at intervals of 6 months or longer - each shutdown.
> - For cold shutdown periods occurring at intervals of less than 6 months - testing is not required unless 6 months have passed since the last cold shutdown test.
>
> Cold shutdown testing of pumps and valves will commence within 48 hours of entering cold shutdown and continue until testing of all pumps and valves designated for cold shutdown testing during the outage is complete or the unit is ready to return to power. For extended outages, testing need not be commenced within 48 hours provided all required testing is completed prior to startup. If pump and valve testing is not begun within the 48-hour period then both of these valves will be tested prior to startup. Where plant conditions or other circumstances arise that preclude testing of a valve, a unit will not be retained in Mode 3 for the sole purpose of completing testing.
>
> Leakrate testing will be performed on a schedule as set forth in the St. Lucie Containment Isolation Valve Leakrate Testing Program.

3.5.3 Evaluation

The valves for which the licensee requests relief, V-25-20 and V-25-21, open to limit containment internal vacuum and close for containment isolation. The licensee refers to these valves as check valves; however, valves that are capacity certified, as are most containment vacuum relief valves, are required to be tested in accordance with OM-1. The Code, OM-1 paragraph 1.3.4.3, requires that operability tests of primary containment vacuum relief valves be performed every 6 months unless historical data indicates a requirement for more frequent testing. Additionally, leak tests shall be performed every 2 years unless historical data indicates a requirement for more frequent testing. As an alternative to these requirements, the licensee proposes to perform an operability test on the valves during cold shutdown periods, and to leak test the valves on a interval based on its 10 CFR Part 50, Appendix J, Option B program.

On September 22, 1999, the staff's endorsement of the 1995 Edition of the ASME Code up to and including the 1996 Addenda was published in the *Federal Register* (64 FR 51370). In this Code edition and addenda, the test frequency requirement for containment vacuum relief valves is contained in paragraph I 1.3.7. It states that tests shall be performed each refueling outage or every 2 years, whichever is sooner, unless historical data requires more frequent testing. The licensee's proposed alternative is consistent with this Code requirement and therefore, provides an acceptable level of quality and safety.

As stated in the staff's March 16, 1999, SE, the 1999 Addenda of the OM Code, paragraph I 1.3.7(b), was revised to clarify that leak test frequency shall be in accordance with paragraph 4.2.2. Paragraph 4.2.2 requires containment isolation valves to be tested in accordance with 10 CFR Part 50, Appendix J. No additional leak tests are required since these valves are not RCS pressure isolation valves, nor do they have leakage requirements based on other functions. The guidance in NUREG-1482, Section 4.3.9, states that the use of code clarifications in OM-1 may be used if they are determined to be clarifications only and are documented in the IST program. Therefore, the licensee's proposed alternative to leak test the valves in accordance with Appendix J is acceptable.

3.5.4 Conclusion

The proposed alternative to the requirements of OM-1 paragraph 1.3.4.3 is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. This alternative is authorized for the third 10-year interval.

4.0 CONCLUSION

The proposed alternatives to the Code requirements described in PR-13, VR-05, VR-06, and VR-19 are authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternatives providing an acceptable level of quality and safety. The alternatives are authorized for the third 10-year interval.

The proposed alternatives to the Code requirements described in PR-07 and VR-17 are authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year interval. Compliance with the specified requirements of these sections would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The proposed alternative to the Code requirements described in VR-08 is approved pursuant to 10 CFR 50.55a(f)(4)(iv). This alternative meets the requirements of the 1995 OM Code, paragraph ISTC 4.5.4(c), which has been incorporated by reference into 10 CFR 50.55a (64 FR 51370).

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