September 25, 2008

Mr. J. A. Stall
Senior Vice President, Nuclear and
Chief Nuclear Officer
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 FOURTH 10-YEAR PUMP AND VALVE INSERVICE TESTING PROGRAM (TAC NOS. MD7741, MD7742, MD7743, MD7744, MD7745, MD7746, MD7747, MD7748, MD7749, MD7750, MD7751, AND MD7752)

Dear Mr. Stall:

By letter dated September 11, 2007, Florida Power & Light Company, the licensee, submitted Relief Requests PR-01, PR-02, PR-03, PR-04, PR-05, and PR-06 for the fourth 10-year interval inservice testing program at St. Lucie Plant Units 1 and 2. Relief Requests PR-02 and PR-03 are only applicable to St. Lucie Unit 2. The licensee requested relief from certain inservice testing requirements of the American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants.

The Nuclear Regulatory Commission staff has reviewed the licensee's proposed alternative and has concluded that the licensee's proposed alternative as specified in Relief requests PR-04, PR-05, and PR-06 may be authorized pursuant to Title 10 of the Code of Federal Regulations (10 CFR) Section 50.55a(a)(3)(i) on the basis that it provides an acceptable level of quality and safety. For Relief Request PR-01, the relief may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii) based on the determination that compliance with the specified requirements results in hardship without compensating increase in the level of quality and safety. For Relief Requests PR-02 and PR-03, the relief is granted pursuant to10 CFR 50.55a(f)(6)(i) based on the determination that it is impractical for the licensee to comply with the specified requirement.

Further details on the bases for the NRC staff's conclusions are contained in the enclosed safety evaluation. If you have any questions regarding this issue, please feel free to contact Brenda Mozafari at (301) 415-2020.

Sincerely,

/RA/

Thomas H. Boyce, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-335 and 50-389

Enclosure: Safety Evaluation

cc: See next page

Further details on the bases for the NRC staff's conclusions are contained in the enclosed safety evaluation. If you have any questions regarding this issue, please feel free to contact Brenda Mozafari at (301) 415-2020.

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cc:
Mr. Mano Nazar
Senior Vice President
and Nuclear Chief Operating Officer
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408

Senior Resident Inspector
St. Lucie Plant
U.S. Nuclear Regulatory Commission
P.O. Box 6090
Jensen Beach, Florida 34957

Craig Fugate, Director
Division of Emergency Preparedness
Department of Community Affairs
2740 Centerview Drive
Tallahassee, Florida 32399-2100

M. S. Ross, Managing Attorney
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Marjan Mashhadi, Senior Attorney
Florida Power & Light Company
801 Pennsylvania Avenue, NW.
Suite 220
Washington, DC 20004

Mr. Douglas Anderson
County Administrator
St. Lucie County
2300 Virginia Avenue
Fort Pierce, Florida 34982

Mr. William A. Passetti, Chief
Department of Health
Bureau of Radiation Control
2020 Capital Circle, SE, Bin #C21
Tallahassee, Florida 32399-1741

Mr. Gordon L. Johnston
Site Vice President
St. Lucie Nuclear Plant
6351 South Ocean Drive
Jensen Beach, Florida 34957-2000

Mr. Christopher R. Costanzo
Plant General Manager
St. Lucie Nuclear Plant
6351 South Ocean Drive
Jensen Beach, Florida 34957

Mr. Terry Patterson
Licensing Manager
St. Lucie Nuclear Plant
6351 South Ocean Drive
Jensen Beach, Florida 34957

Don E. Grissette
Vice President, Nuclear Operations,
South Region
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Mr. Abdy Khanpour
Vice President – Engineering Support
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Mr. J. Kammel
Radiological Emergency
Planning Administrator
Department of Public Safety
6000 Southeast Tower Drive
Stuart, Florida 34997

Mark E. Warner
Vice President, Nuclear Plant support
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Peter Wells, Acting VP, Nuclear
Training and Performance Improvement
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Mr. Michael Page
Acting Operations Manager
St. Lucie Nuclear Plant
6351 South Ocean Drive
Jensen Beach, Florida 34957-2000

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM, FOURTH 10-YEAR INTERVAL

FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT UNITS 1 AND 2

DOCKET NOS. 50-335 AND 50-389

1.0 INTRODUCTION

By letter dated September 11, 2007, Florida Power & Light Company (FPL), the licensee, submitted relief requests for the fourth 10-year interval inservice testing (IST) program at St. Lucie Plant Units 1 and 2. The licensee requested relief from certain IST requirements of the 2001 Edition through 2003 Addenda of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). The St. Lucie fourth 10-year IST interval began on February 11, 2008, and is scheduled to end on February 10, 2018. In response to the staff's request for additional information (RAI), the licensee submitted additional information to the Nuclear Regulatory Commission (NRC) in a letter dated August 5, 2008. NRC evaluation of pump relief requests PR-01, PR-02, PR-03, PR-04, PR-05, and PR-06 are contained herein. Relief requests PR-02 and PR-03 are only applicable to St. Lucie Unit 2.

2.0 REGULATORY EVALUATION

Title 10 of the Code of Federal Regulations (10 CFR) Section 50.55a, requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed at 120-month (10-year) IST program intervals in accordance with the specified ASME Code and applicable addenda incorporated by reference in the regulations, except where alternatives have been authorized or relief has been requested by the licensee and granted by the NRC pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In accordance with 10 CFR 50.55a(f)(4)(ii), licensees are required to comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in the regulations 12 months prior to the start of each 120-month IST program interval. In accordance with 10 CFR 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to NRC approval. Portions of editions or addenda may be used, provided that all related requirements of the respective editions and addenda are met.

In proposing alternatives or requesting relief, the licensee must demonstrate that: (i) the proposed alternatives provide an acceptable level of quality and safety; (ii) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (iii) conformance is impractical for the facility. Section 50.55a authorizes the NRC

ENCLOSURE

to approve alternatives and to grant relief from ASME OM Code requirements upon making necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, “Guidance on Developing Acceptable Inservice Testing Programs,” provides alternatives to ASME Code requirements that are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482 Revision 1, “Guidance for Inservice Testing at Nuclear Power Plants.”

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

3.0 TECHNICAL EVALUATION

3.1 Pump Relief Request PR-01

3.1.1 Code Requirements

ASME OM Code, ISTB-3510(e) requires 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 hertz (Hz).

3.1.2 Component Identification

The components affected by this relief request are reactor coolant charging pumps as identified in Table 1.

Table 1

St. Lucie Unit	Pump Number	Description	Class	OM Code Category
1	1CHG1A	Reactor Coolant Charging Pump 1A	2	Group A
1	1CHG1B	Reactor Coolant Charging Pump 1B	2	Group A
1	1CHG1C	Reactor Coolant Charging Pump 1C	2	Group A
2	2CHG2A	Reactor Coolant Charging Pump 2A	2	Group A
2	2CHG2B	Reactor Coolant Charging Pump 2B	2	Group A
2	2CHG2C	Reactor Coolant Charging Pump 2C	2	Group A

3.1.3 Licensee’s Basis for Requesting Relief

The reactor coolant charging pumps are positive displacement pumps. The reactor coolant charging pumps operate at approximately 205-210 revolutions per minute (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 cycles per minute (cpm)).

The vibration instrumentation used at St. Lucie is 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 Direct Current. Wilcoxon model 793 accelerometer probe frequency response range meets the Code accuracy range requirement of plus or minus (±) 5% from 1.5 - 5,000 Hz. The probes rated accuracy drops to only ± 10% for frequencies between 1.0 - 1.5 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 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 National Institute of Standard and Technology (NIST) 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:

a. Oil whirl, which presents itself at frequencies below the rotational frequency of the pump (0.38X - 0.48X, where X equals the rotational frequency of the pump), is not applicable to a horizontal, triplex, reciprocating pumps.

b. A light rub/impact could generate a vibrational component at a frequency below the pumps rotational frequency (e.g., 0.5X (102.5 cpm)), but would also usually generate a harmonic vibrational components that would present as either integer or half-integer multiple of the running speed of the pump. (e.g. a light rub vibration occurring at 0.5X, where X equals the rotational frequency of the pump, could also produce a vibrational component that could be measured at integer multiples of the original frequency (i.e., 1X, 1.5X, 2X, etc.)), and would, thus, be identified in the calibrated range of the equipment.

c. 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.

d. Looseness in the power train would likely be identified through the measurement of a vibrational component(s) found at frequencies that are multiples of the pumps rotational frequency. (i. e., 1X and 2X, where X equals the rotational frequency of the pump).

Based on the above information, the use of 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.

3.1.4 Licensee's Proposed Alternative Testing

The licensee states that during testing of reactor coolant charging pumps, the vibration instrumentation used will be of 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.

3.1.5 Evaluation of Pump Relief Request PR-01

ISTB-3510(e) requires the frequency response range of the vibration-measuring transducers and their readout system be from one-third minimum pump shaft rotational speed to 1000 Hz.

The reactor coolant charging pumps 1A, 1B, and 1C, and 2A, 2B, and 2C, operate at 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 Code required frequency response range for the reactor coolant charging pumps is 1.13 Hz to 1000 Hz. The licensee proposes to use instrumentation that measures the frequency response range of 2 Hz 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. The NIST 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. Imposition of the Code requirements would create an unnecessary hardship and burden without compensating increase in safety or quality 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 unbalanced 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.

The NRC staff agrees with the licensee's statement 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 Hz -1000 Hz). Therefore, the licensee's current instrumentation is sufficient to identify pump problems that produce high-frequency vibrations.

3.1.6 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternative to the requirements of ISTB-3510(e) for the reactor coolant charging pump vibration instrumentation is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the Code requirements results in hardship or unusual difficulty without a compensating increase in the level of quality and safety unsupported in body. The alternative is authorized for the St. Lucie Units 1 and 2 fourth 10-year IST Interval.

3.2 Pump Relief Request PR-02

3.2.1 Code Requirements

The licensee requested relief from the Code requirements of ISTB-5323(d) and (e) related to comprehensive pump testing. Paragraph ISTB-5323(d) states that vibration (displacement or velocity) shall be determined and compared with the corresponding reference values. Vibration measurements are to be broad band (unfiltered). If velocity measurements are used, they shall be peak. If displacement amplitudes are used, they shall be peak-to-peak.

Paragraph ISTB-5323(e) states that all deviations from the reference values shall be compared with the ranges of Table ISTB-5300-1 or Table ISTB-5300-2, as applicable, and corrective action taken as specified in ISTB-6200. For reciprocating positive displacement pumps, vibration measurements shall be compared to the relative criteria shown in the alert and required action ranges of Table ISTB-5300-1 or Table ISTB-5300-2.

3.2.2 Component Identification

The components affected by this relief request are hydrazine pumps as identified in Table 2.

Table 2

St. Lucie Unit	Pump Number	Description	Class	OM Code Category
2	2HYD2A	Hydrazine Pump 2A	2	Group B
2	2HYD2B	Hydrazine Pump 2B	2	Group B

3.2.3 Licensee’s Basis for Requesting Relief

The hydrazine pumps are reciprocating positive displacement pumps, which are characterized as metering pumps. These pumps operate at extremely slow speed (2HYD 2A at 39 rpm and 2HYD 2B at 37 rpm), which equates to a rotational frequency of 0.65 Hz. In accordance with the Code, the required low limit of the frequency response for the vibration instruments would be one third of this or 0.21 Hz. Portable instruments satisfying this requirement are commercially unavailable. The low frequency vibration instrumentation presently in use at St. Lucie is the CSI model 2120 Machinery Analyzer with Wilcoxon model 793 accelerometer probes.

While the Wiicoxon model 793 accelerometer probe frequency response range meets the Code accuracy range requirement of ± 5.0% in the range from 1.5 Hz - 5000 Hz, the frequency response drops to only ± 10% for frequencies between 1.0 Hz - 1.5 Hz. Below 1.0 Hz, the frequency response is not provided by the vendor. For this reason, vibration readings taken, even with the low frequency probe, are essentially meaningless and of no value in identifying degradation of these pumps. Furthermore, the classical analysis of rotating components upon which the Code is based is not readily adaptable to slow moving components such as these positive displacement pumps.

These pumps are classified as Group B pumps per ISTB-2000. While these pumps are designed and built for continuous operation, they are only operated 1 to 2 hours per year. That calculates to less than 5000 cycles between comprehensive testing when the measurement of the pumps vibration is called for. The mechanisms of wear and degradation of rotating machinery are time and cycle dependant and, in this case, the number of repetitive wearing actions (cycles) is small both in frequency and absolute numbers. As a result, little degradation is expected with respect to vibration performance between testing periods. Thus, the probability of any significant pump deterioration over the plant's lifetime is extremely small.

The performance of vibrational testing with the equipment currently commercially available is not capable of measuring the pumps vibrational response to accuracies as required by the Code. Vibrational testing at the available accuracy limits with the currently commercially available equipment would not be expected to detect pump degradation of these pumps. These pumps, classified as Group B pumps, operate so infrequently that wear due to operation is not expected during the plant’s life time, making the effort of taking vibrational measurement effectively meaningless.

3.2.4 Licensee’s Proposed Alternative Testing

In lieu of measuring pump vibration on a comprehensive biennial frequency, these hydrazine pumps will be maintained and inspected in accordance with the St. Lucie Preventive Maintenance Program (PMP) that reflects the recommendations of the pump's manufacturer (Union Pump Co.). Preventive Maintenance, at a minimum, includes the periodic changing of the crankcase lubricating oil and oil analyses to identify significant wearing of internals, disassembly and inspection as well as the verification of bolting torque. This program is adequate for determining pump degradation that could impact operability and reliability.

3.2.5 Evaluation of Pump Relief Request PR-02

The licensee requests relief from the Code requirements of ISTB-5323(d) and (e) related to comprehensive pump testing. Paragraph ISTB-5323(d) states that vibration (displacement or velocity) shall be determined and compared with the corresponding reference values. Vibration measurements are to be broad band (unfiltered). If velocity measurements are used, they shall be peak. If displacement amplitudes are used, they shall be peak-to-peak.

Paragraph ISTB-5323(e) states that all deviation from the reference values shall be compared with the ranges of Table ISTB-5300-1 or Table ISTB-5300-2, as applicable, and corrective action taken as specified in ISTB-6200. For reciprocating positive displacement pumps, vibration measurements shall be compared to the relative criteria shown in the alert and required action ranges of Table ISTB-5300-1 or Table ISTB-5300-2.

The hydrazine pumps operate at very low speeds. Paragraph ISTB-3510(e) requires that pump vibration be measured with the frequency response range of the vibration measuring transducers and their readout system to be from one-third minimum pump speed to at least 1000 Hz. The lower limit of the range is to allow for detection of problems such as bearing oil whirl and looseness of bearings. The commercially available and installed vibration instrumentation at St. Lucie cannot measure subharmonics or the first to seventh harmonic. The pumps operate at 0.65 Hz and the Code required low limit of the frequency response for the vibration instruments would be one third of this or 0.21 Hz. Based on lack of commercially available vibration instrumentation with an adequate frequency response range low enough to detect pump degradation, it is impractical to comply with the Code requirements. Also, the NIST Calibration Service Users Guide lists the lowest frequency NIST standard pickup available is calibrated at 2 Hz. NRC confirmed that there are a few commercially available transducers of lower range, but they cannot be calibrated below 2 Hz, and that the Code requirements cannot be met with the available existing technology. Therefore, it is impractical for the licensee to comply with the specified Code requirements.

The licensee has proposed that in lieu of measuring pump vibration on a comprehensive biennial frequency, the pumps would be maintained and inspected in accordance with the licensee's PMP that reflects the recommendation of the pump's manufacturer (Union Pump Co.). The preventive maintenance, at a minimum, includes the periodic changing of the crankcase lubrication oil and oil analysis to identify significant wearing of internals, disassembly and inspections as well as the verification of bolting torque. An effective PMP could be adequate for determining bearing and pump degradation that could impact the pumps' operation readiness.

3.2.6 Conclusion

Based on the above evaluation, the relief related to the Code vibration requirements of ISTB is granted on the basis that it is impractical for the licensee to comply with the specified requirement. Granting relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the components. The alternative is authorized for the St. Lucie Unit 2 fourth 10-year IST Interval.

3.3 Pump Relief Request PR-03

3.3.1 Code Requirements

The licensee requested relief from the Code requirements of ISTB-5322(b) related to Group B pump testing. Paragraph ISTB-5322(b) states that the flow rate shall be determined and compared to its reference value.

3.3.2 Component Identification

The components affected by this relief request are hydrazine pumps as identified in Table 3.

Table 3

St. Lucie Unit	Pump Number	Description	Class	OM Code Category
2	2HYD2A	Hydrazine Pump 2A	2	Group B
2	2HYD2B	Hydrazine Pump 2B	2	Group B

3.3.3 Licensee's Basis for Relief

The hydrazine pumps are reciprocating positive displacement pumps with variable speed control. They are classified as metering pumps and are designed to accurately displace a predetermined volume of liquid in a specific period of time. The pump has a single plunger and makes only one suction and one discharge stroke during each cycle (shaft rotation). The hydrazine pumps operate at a very slow speed (2HYD2A is tested at 39 cpm and 2HYD2B is tested at 37 cpm) to supply the Technical Specification (TS) required hydrazine flowrate of 0.71 to 0.82 gallons per minute (gpm) (TS Surveillance Requirement 4.6.2.2). Due to the simplified design of these pumps, flow is continuously accelerating and decelerating - following an oscillating waveform. Each cycle of the pump is approximately 1.6 seconds in duration with no flow produced during the pumps' 0.8 second suction stroke. The installed flowrate instrumentation utilizes a differential pressure orifice located in the suction line common to both pumps. Due to the characteristic oscillating flowrate, flow through this orifice pulsates sharply with each pump stroke resulting in erratic flowrate readings. The flow orifice also senses pressure feedback during each pump stroke cycle because of echoes of the pressure pulsation produced by the pump stroke, which are reflected back to the flow element by the system piping and valves. The characteristic oscillating flowrate also makes it impractical to dampen using standard dampening devices.

Attempts to use various techniques in averaging the indicated flowrate readings were proven to be inconsistent and inaccurate when compared to actual flow. It

> was therefore determined that as a result of the pumps' flow characteristics combined with the design limitation of the installed flow instrumentation, flow measurements to the requirements of ISTB-5322 can not be obtained under the current configuration. As an alternative to the use of the installed instrumentation, the flowrates of the pumps can be determined through collection of pump output in a container of known volume over a measured period of time. This method has been verified accurate through a comparison of the measured results to the correlation between pump speed and piston displacement.
>
> While the method of verifying the pumps' flowrate through the time dependent collection of pump discharge into a container of known volume is proven to be accurate, it is undesirable to perform this measurement on the Group B quarterly frequency based on the personnel hazards associated with testing. Hydrazine is a hazardous, highly flammable liquid with cumulative toxic effects when absorbed through the skin, inhaled or ingested. It has also been identified as a known carcinogen.

Based on the above reason, the licensee proposed to only perform the IST acceptable measurement of flow during the comprehensive pump test that is performed on a biennial frequency, during refueling outages. Measuring the flowrate during each refueling outage in conjunction with the site's application of its PMP that reflects the recommendations of the pump's manufacturer (Union Pump Co.) dated May 24, 1999. The preventive maintenance performed on these pumps per the manufacturer's recommendations consists of, at a minimum, the periodic changing of the crankcase lubrication oil and oil analyses to identify significant wearing of internals, disassembly and inspection as well as the verification of bolting torque. Application of these preventive maintenance requirements along with the biennial measurement of the pumps flowrate, differential pressure and speed is appropriate and adequate for detecting any significant pump degradation and ensuring the continued operability and reliability of these pumps.

Quarterly pump tests will consist of the verification of each pump's discharge pressure when operated at rated speed. The basis for the acceptability of this proposed alternative test is that these pumps are standby pumps that only operate 1-2 hours per year and are only energized for testing, thus, service-related degradation with respect to hydraulic performance between testing periods is unlikely. The quarterly verification of the pumps' developed head at rated speed will ensure continued operability and availability for accident mitigation.

3.3.4 Licensee Proposed Alternative Testing

The licensee proposed to only perform the IST acceptable measurement of flow during the comprehensive pump test, which is performed on a biennial frequency, during refueling outages. Quarterly testing will consist of verification of pump developed head at rated speed.

3.3.5 Evaluation of Pump Relief Request PR-03

Paragraph ISTB-5322(b) requires the flow rate shall be determined and compared to its reference value, and Table ISTB-3400-1 requires that Group B tests be performed on a quarterly basis. Table ISTB-3000-1, Note 1, states that for positive displacement pumps flow rate shall be measured or determined.

The hydrazine pumps are reciprocating positive displacement pumps with variable speed control. They are classified as metering pumps and are designed to accurately displace a predetermined volume of liquid in a specific period of time. These pumps are standby pumps that remain idle during most plant operation except for the testing period; therefore they are categorized as Group B pumps.

The hydrazine pumps have installed instrumentation, however based on the oscillating flow rate of these positive displacement reciprocating pumps, the flow rate measurement is erratic. The licensee states that this oscillating flow rate makes it impractical to dampen using standard dampening devices. Therefore, it is impossible to use the installed flow instrumentation for inservice testing purposes.

The licensee measures flow rate by collecting the pump’s output in a container of known volume over a measured period of time and calculating the flow rate. Since hydrazine is a hazardous, highly flammable, carcinogenic liquid, the licensee proposes to measure the pump flow only during the comprehensive pump test, which is performed on a biennial frequency during refueling outages. In GL 89-04, Position 9, the staff determined that in cases where flow can only be established through a non-instrumented minimum flow path during quarterly pump testing and a path exists at cold shutdowns or refueling outage to perform a test of the pump under full or substantial flow conditions, the increased interval is an acceptable alternative to the Code requirements. While this situation does not involve a non-instrumented recirculation path, the unavailability of reliable flow indicator in the suction line poses a similar limitation on testing, thereby justifying an increased interval for flow testing. Furthermore, the licensee states that the quarterly pump tests will consist of the verification of each pump’s discharge pressure when operated at rated speed. The quarterly verification of the pumps’ developed head at rated speed will ensure continued operability and availability for accident mitigation. These pumps are standby pumps that only operate 1-2 hours per year and are only energized for testing, thus, service-related degradation with respect to hydraulic performance between testing periods is unlikely. The measurement of the flowrate during each refueling outage in conjunction with the site’s application of its PMP reflects the recommendations of the pump's manufacturer (Union Pump Co.). The preventive maintenance performed on these pumps per the manufacturer’s recommendations consists of, at a minimum, the periodic changing of the crankcase lubrication oil and oil analyses to identify significant wearing of internals, disassembly and inspection as well as the verification of bolting torque. Application of these preventive maintenance requirements along with the biennial measurement of the pumps’ flowrate, discharge pressure and speed is appropriate and adequate for detecting any significant pump degradation and the licensee’s proposed alternative provides reasonable assurance of the operational readiness of the pumps.

3.3.6 Conclusion

Based on the above evaluation, the staff concludes that the licensee’s request for relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical. The staff further concludes that granting the relief will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The licensee’s proposed alternative provides reasonable assurance of the operational readiness of the identified pumps. The relief request is authorized for the St. Lucie Unit 2 fourth 10-year IST Interval.

3.4 Pump Relief Request PR-04

3.4.1 Code Requirements

The licensee requested relief from the Code requirements of ISTB-1300 and ISTB-1400(b). Paragraph ISTB-1300, Pump Categories, requires "all pumps within the scope of ISTA-1100 and ISTB-1100 shall be categorized as either Group A or Group B pump.

ISTB-1400(b) requires each pump to be tested be identified in accordance with the rules of this Subsection and categorized as either a Group A or Group B pump and list the pumps in the plant records (see ISTB-9000). A pump that meets both Group A and Group B definitions shall be categorized as a Group A Pump.

3.4.2 Component Identification

The components affected by this relief request are low pressure safety injection pumps (LPSI) pumps as identified in Table 4.

Table 4

St. Lucie Unit	Pump Number	Description	Class	OM Code Category
1	1LPSI 1A	Low Pressure Safety Injection Pump 1A	2	Group A/B
1	1LPSI 1B	Low Pressure Safety Injection Pump 1B	2	Group A/B
2	2LPSI 2A	Low Pressure Safety Injection Pump 2A	2	Group A/B
2	2LPSI 2B	Low Pressure Safety Injection Pump 2B	2	Group A/B

3.4.3 Licensee's Basis for Relief

At St. Lucie, the LPSI are pumps that are used during cold shutdown and refueling conditions in order to provide cooling flow through the reactor, each individually providing approximately 3000 gpm of flow. During normal power operation, these pumps are unable to develop sufficient head to overcome the pressure necessary to inject into the reactor coolant system (RCS), and thus are only able to operate through their minimum flow lines, recirculating flow back to the Refueling Water Tank (RWT) at only 40 gpm for Unit 1 and 100 gpm for Unit 2.

Operation of these high capacity pumps under these low flow conditions results in the generation of vibrational levels greater than those measured during pump full flow operation. The low flow vibrational level for St. Lucie Unit 1 LPSI pumps 1A and 1B, have been known to exceed the vibrational alert levels as prescribed by Table ISTB-5100-1 of 0.325 inches per second (in/sec).

Prior to the issuance of the 1995 edition of the OM Code, where the ISTB Group A and Group B concept was introduced, St. Lucie addressed the Unit 1 pumps normal generation of excess vibration during low flow quarterly testing through the submittal of a Relief Request to increase the Codes alert limits from 0.325

in/sec to 0.500 in/sec. This request was made under the rules of 10 CFR 50.55a(a)(3)(ii), "Hardship or Unusual Difficulty without Compensating Increase in Level of Quality or Safety," and was approved by the NRC by Safety Evaluation and Letter dated March 16, 1998 (St. Lucie third Interval relief Request PR-13).

In addition to the vibration concern with the Unit 1 LPSI pumps, St. Lucie has previously requested and been granted relief from measuring flow during normal operation of both Unit 1 and Unit 2 LPSI pumps. The reason for this request was that during operation, these high flow, low head pumps were incapable of developing sufficient head to overcome RCS pressure, thus leaving only the minimum flow recirculation flow path available, which is not equipped with flow measurement instrumentation. Relief was granted via NRC Safety Evaluation and Letter dated March 16, 1999 under the rules of 10 CFR 50.55a(f)(6)(i), "Inservice Testing Impracticality" (St. Lucie third Interval Relief Request PR-06). This relief essentially categorized these pumps as Group B during normal plant operation, and Group A during refueling operation.

It was also pointed out in the St. Lucie third Interval Relief Request PR-06 that the elimination of flowrate measurement through the minimum flow line was consistent with the philosophy and intent of NRC GL 89-04, Position 9, provided flow testing is performed under substantial flow conditions that are present during either cold shutdown or refueling conditions.

The concept of ISTB Group A and Group B was developed recognizing that pumps that operate in a standby role (i.e., Group B) are not subjected to the same wear and fatigue mechanisms as those pumps that operate either continuously or routinely. With this realization, it was recognized that it was not necessary to perform the same level of testing on a Group B pump as it was on a Group A pump, because of the Group B pump’s standby nature. The mechanisms that contribute to possible degradation are simply not present. Without a wear mechanism to produce degradation, there would be no need to inspect for signs of degradation as a result of wear.

In addition, as is the case with these LPSI pumps, prolonged operation under minimum flow conditions can be detrimental to the long-term health of the pump. During low flow conditions, vibration velocity levels of five and ten times the running speed frequency (5X/10X), are significantly greater due to elevated vane pass vibration caused by the velocity vector not striking the volute at an optimal angle. In order to maintain the long term health of these pumps, it is the operational goal to keep to a minimum the amount of time that each pump is run in a minimum flow configuration. Recognizing that most Group B pumps share the same minimum flow configuration, which can result in increased levels of vibrations that could contribute to a reduction in the pumps health, the OM Code has even removed the minimum 2 minute run time requirement for Group B testing [ISTB-5100(a)(2), ISTB-5200(a)(2) and ISTB-5300(a)(2)].

This proposed relief will result in a lower potential for pump degradation due to pump wear, while still being capable of measuring/determining pump performance. The basis for this relief request shows that the proposed alternative would provide an acceptable level of quality and safety.

The LPSI pumps meet the categorization requirements of Group A pumps in that they are operated routinely during plant shutdowns and refueling outages. However, these pumps also meet the criteria of Group B pumps, in that during normal operation (reactor critical) they are not operated except for testing.

Classifying these pumps as Group B during power operation minimizes the time required to perform quarterly testing. The OM Code Edition 2001 with addenda 2003 testing requirements eliminated the 2-minute minimum pump run-time for quarterly Group B pump testing. Eliminating the minimum pump run-time requirement and the requirement to record vibration levels is expected to reduce the length of time that each pump is run quarterly. As these pumps are only called upon to operate during normal plant operation in support of either their own or in support of a required surveillance, there is no time or wear related degradation mechanism that would warrant performing more than Group B quarterly testing.

NUREG/CP-0137, Vol. 1, Proceedings of the Third NRC/ASME Symposium on Valve and Pump Testing, includes a paper entitled, “Description of Comprehensive Pump Test Change to ASME Code, Subsection ISTB.” This paper details the philosophy of classifying pumps as Group A or Group B. According to the author, the intent of having different test requirements for different pump groups is to relate the requirements for the amount and degree of quarterly performance monitoring to the amount of degradation expected based on pump operation. Testing the LPSI pumps quarterly as Group A pumps during power operation is contrary to the philosophy elucidated by this referenced paper. Quarterly Group A testing during normal operation on minimum flow recirculation would subject these pumps to an increased potential for degradation due to pump wear (caused by low-flow operation) than would the quarterly performance of a Group B battery of tests. Group A testing during power operation may be more detrimental to the long-term health of these components than Group B testing.

In addition, the quarterly performance of the required Group A vibration monitoring could result in the placement of the Unit 1 pumps into an Alert category, resulting in the doubling of their testing frequency, since these pumps have a natural tendency, to exhibit higher than permitted amplitudes than allowed in the Code when operated under a low flow condition. Doubling of these pumps’ testing frequency would only result in these pumps being subjected to more potentially detrimental damage.

It is believed that the proposed alternate testing is adequate and appropriate, and is capable of properly monitoring pump operability as intended by the Code. It should be recognized that extended operation of these pumps under minimum flow conditions for no justifiable reason does not add to plant safety and could have a significant negative impact on pump and system operability and reliability.

In response to the NRC staff's RAI, the licensee submitted additional information to the NRC in a letter dated August 5, 2008. The licensee provided background information related to vibration observed during IST of the St. Lucie Unit 1 LPSI pumps at low flow conditions. Highlights of the licensee response are as follows:

1. For the past 15 years, the Unit 1 LPSI pumps have been tested quarterly at minimum recirculation flow, and vibration levels have been ≤ 0.5 in/sec. During cold shutdown and refueling outages, the vibration levels at design flow (full flow) have been below the 0.325 in/sec Alert limit of the Code.

2. The Unit 1 LPSI pumps are included in the plant predictive maintenance (PDM) monitoring program, which provides trendable spectral analysis and vibration values. The licensee will continue to use PDM monitoring program for LPSI pumps.

3. The spectral analyses have consistently confirmed the major contributor to the "high" overall vibration readings occurs at the "blade pass frequency" for each LPSI pump and is not indicative of bearing degradation.

4. The long-term vibration trend during quarterly testing of the Unit 1 LPSI pumps using the minimum recirculation flow path shows consistent results and stable performance with no unexplainable significant changes.

5. St. Lucie did not perform any corrective maintenance related to LPSI pump vibration.

3.4.4 Licensee Proposed Alternative Testing

The licensee proposed that the LPSI pumps be tested as standby pumps (Group B) during power operation and as continuously operating pumps (Group A) during cold shutdown and refueling operations.

3.4.5 Evaluation of Pump Relief Request PR-04

The ASME Code, paragraph ISTB-2000, defines Group A pumps as "pumps that are operated continuously or routinely during normal operation, cold shutdown, or refueling operations"; and Group B pumps as "pumps in standby systems that are not operated routinely except for testing." Based on these definitions, the LPSI pumps clearly meet the definition of Group B pumps during normal power operation (Modes 1-4). During refueling operation (Modes 5-6), the LPSI pumps meet the definition of Group A pumps. Paragraph ISTB-1400(b) states: "A pump that meets both Group A and Group B pump definitions shall be categorized as a Group A pump." This would normally cause the LPSI pumps to be classified as Group A. However, because of the inability to develop a substantial head to overcome the required pressure to inject into the RCS during the normal power operation, it is not possible to conduct a Group A test (using minimum flow lines) that would provide very much meaningful data to detect degradation. Additionally, the LPSI pumps are standby pumps during normal power operation and little degradation is expected with respect to hydraulic performance during the operational period when the pumps are idle. Therefore, a Group B test would provide adequate assurance of the operational readiness of the LPSI pumps.

The NRC GL 89-04, Position 9 states that in cases where flow can only be established through a non-instrumented minimum flow path during quarterly pump testing and a path exists at cold shutdown or refueling outages to perform a test of the pump full or substantial flow conditions, the increased interval is an acceptable alternative to the Code requirements. During the deferred test, pump differential pressure, flow rate, and bearing vibration measurements must be taken, and during the quarterly testing at least pump differential pressure and vibration must be measured. Therefore, the proposed alternative testing of the LPSI pumps as Group B during normal power operation and as Group A during refueling operation is consistent with GL 89-04, Position 9, and provides reasonable assurance of operational readiness of the LPSI pumps.

The licensee states that the current quarterly Group A pump test being performed under the third 10-year IST interval program at St. Lucie requires pump vibration measurements. The overall vibration readings recorded during quarterly low-flow testing of Unit 1 LPSI pumps have always been relatively “high” when compared to the Code acceptance values. These Unit 1 vibration measurements are higher than the Code allowed value of 0.325 in/sec, but lower than 0.5 in/sec. These vibration readings have been subject to spectral analysis under St. Lucie PDM monitoring program, which is separate from the IST Program. The spectral analyses have consistently confirmed the major contributor to the “high” overall vibration readings occurs at the “blade pass frequency” for each LPSI pump and is not indicative of bearing degradation. The long-term vibration trend (past 15 years) during quarterly testing of the Unit 1 LPSI pumps using the minimum recirculation flow path shows consistent results and stable performance with no unexplainable significant changes. The licensee will continue to perform spectral analysis under St. Lucie PDM monitoring program, which is above and beyond the Code requirements. The St. Lucie Unit 1 LPSI pump vibration levels at design flow (full flow) have been well below the 0.325 in/sec Alert limit and stable. The vibration level of the St. Lucie Unit 2 LPSI pumps have always been below the Code limits, even at low-flow tests. Therefore, the operational readiness of the LPSI pumps during the proposed Group B pump test (Mode 1-4) is reasonably assured without requiring quarterly vibration measurements, which are not required by the Code for Group B pumps. In a clarification, the licensee stated that comprehensive pump test will be performed on each LPSI pump during each refueling outage as required by the Code.

As stated above, the LPSI pumps will be tested as Group B pumps during normal power operation (Modes1-4), and Group A pumps during cold shutdown and refueling outage (Modes 5-6). The quarterly Group B test will be performed using the minimum recirculation flow path under low-flow conditions and only flow will be measured. The LPSI pumps’ full flow Group A tests will be performed during cold shutdown or refueling outage.

3.4.6 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee’s proposed alternative testing of the LPSI pumps as Group B during normal power operation mode, and as Group A during refueling operation or cold shutdown mode is authorized pursuant to 10 CFR 50.55a(a)(3)(i), based on the alternative providing an acceptable level of quality and safety. The alternative is authorized for the St. Lucie Units 1 and 2 fourth 10-year IST Interval.

3.5 Pump Relief Request PR-05

3.5.1 Code Requirements

The licensee requested relief from the Code requirements of ISTB-3510(b)(1). Paragraph ISTB-3510(b)(1) requires that the full-scale range of each analog instrument shall not be greater than three times the reference value. Relief is requested for Group A and Group B testing of the LPSI pumps.

3.5.2 Component Identification

The components affected by this relief request are LPSI pumps as identified in Table 5.

Table 5

St. Lucie Unit	Pump Number	Description	Class	Category
1	1LPSI 1A	Low Pressure Safety Injection Pump 1A	2	Group A/B
1	1LPSI 1B	Low Pressure Safety Injection Pump 1B	2	Group A/B
2	2LPSI 2A	Low Pressure Safety Injection Pump 2A	2	Group A/B
2	2LPSI 2B	Low Pressure Safety Injection Pump 2B	2	Group A/B

3.5.3 Licensee's Basis for Relief

Table ISTB-3500-1, requires the accuracy of instruments used to measure differential pressure for Group A and B tests 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 follows (from NUREG-1482, Revision 1, 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 5-1
Calculated Instrument Accuracies for Selected Pressure Instruments

Pump ID	Instrument Number	Parameter	Reference Value	Instrument Range	Instrument Accuracy	Instrument Tolerance	Indicated Accuracy
1A LPSI	PI-3314	Discharge Pressure	200 psig	0-600 psig	± 0.5%	± 3 psig	± 1.5%
1B LPSI	PI-3315	Discharge Pressure	195 psig	0-600 psig	± 0.5%	± 3 psig	± 1.5%
2A LPSI	PI-3314	Discharge Pressure	190 psig	0-600 psig	± 0.5%	± 3 psig	± 1.6%
2B LPSI	PI-3315	Discharge Pressure	185 psig	0-600 psig	± 0.5%	± 3 psig	± 1.6%

Where:
Reference Value = reference value established by the procedure
Instrument Accuracy = accuracy to which instrument is calibrated
Instrument Tolerance = maximum Instrument Range times Instrument Accuracy
Indicated Accuracy = Instrument Tolerance divided by Reference Value times 100

As shown in the above Table 5-1, the indicted accuracy for all the instruments is less than or equal to ± 1.6% of the reference value. These accuracies are 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, the NRC staff may 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% for Group A and Group B tests).

3.5.4 Licensee Proposed Alternative Testing

The licensee proposed to use existing permanently installed instrument and states that the indicated accuracy of each permanently installed instrument is less than the ± 6 percent allowed tolerance.

3.5.5 Evaluation of Pump Relief Request PR-05

The licensee requests relief from ASME OM Code paragraph ISTB-3510(b)(1) 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 exiting instrumentation which does not meet this Code requirement.

Table ISTB-3500-1 requires the instrument accuracy to be within ± 2% of full-scale, while paragraph ISTB-3510(b)(1) 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.

3.5.6 Conclusion

Based on the above evaluation, the staff concludes that the licensee's proposed alternative to the full-scale range requirements of paragraph ISTB-3510(b)(1) is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. The alternative is authorized for the St. Lucie Units 1 and 2 fourth 10-year IST Interval.

3.6 Pump Relief Request PR-06

3.6.1 Code Requirements

The licensee requested relief from the Code requirements of paragraph ISTB-5121(b). Paragraph ISTB-5121(b) requires that the resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

3.6.2 Component Identification

The components affected by this relief request are boric acid makeup (BAM) pumps as identified in Table 6.

Table 6

St. Lucie Unit	Pump Number	Description	Class	Category
1	1BAM1A	Boric Acid Makeup Pump 1A	2	Group A
1	1BAM1B	Boric Acid Makeup Pump 1B	2	Group A
2	2BAM2A	Boric Acid Makeup Pump 2A	2	Group A
2	2BAM2B	Boric Acid Makeup Pump 2B	2	Group A

3.6.3 Licensee's Basis for Relief

There are four flowpaths available for performing inservice testing of the BAM pumps. These include the primary flow path to the charging pump suction header, a recirculation line leading back to the RWT, a line leading to the volume control tank (VCT) and the BAM tank recirculation line. For reasons stated below, none of these flow paths are either available or equipped to support pump Group A testing during plant operation or cold shutdown:

a. Operating of the BAM Pumps aligned to discharge into the charging pump suction header will result in the introduction of highly concentrated boric acid solution from the boric acid makeup tanks into the suction of the charging pumps. During plant operation this would result in the addition of excess boron to the RCS. This rapid insertion of negative reactivity would result in RCS cooldown and de-pressurization. A large enough boron addition could result in an unscheduled plant trip and a possible safety injection system actuation. During cold shutdown, the introduction of excess quantities of boric acid into the RCS via this flowpath is also undesirable from the aspect of maintaining proper plant chemistry and the inherent difficulties that may be encountered during the subsequent startup due to the over-boration of the RCS. In addition, the waste management system would be overburdened by the large amounts of RCS coolant that would then require processing to reduce boron concentration.

b. Another alternate flowpath would involve the operation of a BAM pump aligned to recirculate water to the RWT. This alignment would result in depletion of the associated BAM tank inventory. During normal operation TS requires a combination of one or both BAM tanks be maintained with a certain volume and concentration of boric acid. The transfer of borated water from either one or both of the BAM tanks could result not only the loss of a required boration source as defined by TS, but in the case of St. Lucie Unit 2, could result in an increase of boron concentration above the RWT concentration limit. St. Lucie Unit 2 RWT boron concentration is required to be between 1720 and 2100 parts per million. In addition, this flow path is not equipped with flow measurement instrumentation, so flow could not be readily determined.

c. Alignment of a BAM pump to the VCT will also result in the same issues as described in (b) above in regards to the depletion of the associated BAM tank of its inventory. In this case, not only could the transfer of borated water from either one or both of the BAM tanks result in a loss of the required boration sources as defined by TS, but injecting the highly borated water into the VCT would introduce this highly borated water to the suction of the charging pumps, resulting in the addition of negative reactivity into the RCS, with the possible same results as described in (a) above. This flow path is also not equipped with flow measuring instrumentation.

It is noted that in options (b) and (c) above, transference of the contents of a BAM tank, a fixed and limited amount of volume, will result in the reduction of suction pressure to the BAM pump over the course of the test, with the result of producing a variable flow rate which could not be easily compared/trended to previous flow measurements (i.e., repeatability).

d. Alignment of a BAM pump to recirculate flow back to the BAM tank is accomplished through a fixed resistance circuit, which is essentially the pumps' minimum flow test line, the same flowpath which is also utilized to periodically mix the contents of each tank to prevent stratification of the highly borated water. While operation of the BAM pumps can be accomplished without the introduction of highly borated water to the RCS or affecting the limits associated with the maintenance of the required number of borated water sources, there is no flowrate measuring instrumentation installed in these lines.

3.6.4 Licensee's Proposed Alternative

The licensee proposes to accomplish the quarterly Group A testing of the BAM pumps by utilizing the fixed-resistance BAM tank recirculation line. Pump differential pressure and vibration will be measured and compared to their respective reference values per ISTB-5121(c) and (d).

3.6.5 Evaluation of Pump Relief Request PR-06

For Group A pumps, ASME OM Subsection ISTB, paragraphs ISTB-3400, ISTB-3500 and ISTB-5120 require that pressure, flow rate, and vibration be determined and compared with the corresponding reference values quarterly (for Group A test) and biennially (for comprehensive test).

The licensee states that the Code required quarterly Group A tests cannot be performed due to the following:

The BAM pumps normally take suction from BAM tanks which contain highly concentrated boric acid. The licensee states that there are three available flow paths to test the BAM pumps. One is the primary flow path to the charging pump suction header. This flow path contains flow instrumentation. However, during normal plant operation, it is impractical to pump highly concentrated boric acid solution from the boric acid makeup tanks to the suction of the charging pumps since this would result in the addition of excess boron to the RCS. The rapid insertion of negative reactivity would cause RCS cooldown and depressurization. In sufficient quantities, boron addition could cause a reactor trip and a safety injection actuation. During cold shutdown, the introduction of excess quantities of boric acid into the RCS through this flow path could delay plant startup.

The second flow path takes suction from BAM tanks and recirculates water from the discharge of the BAM pumps to RWT or VCT. The licensee states that these flow paths do not contain flow instrumentation, and during normal plant operation, one of the two BAM tanks must be maintained at the required TS level while the other is used as required for plant operation and boron shim. The TS limits the variation in the BAM tank levels to only 100 to 200 gallons, so that even a small reduction in tank inventory is unacceptable. Therefore, using this test configuration to perform pump testing is not feasible to perform quarterly or at cold shutdowns.

The third flow path is the BAM pump discharge recirculation flow back to the BAM tank for each of the two trains. The licensee states that the BAM tank recirculation flow paths are fixed resistance circuits (1-inch pipe) containing a limiting orifice. There is no flow rate instrumentation installed in these lines.

The licensee proposes to measure BAM pump differential pressure and vibration quarterly through the fixed resistance BAM tank recirculation lines. The differential pressure and vibration will be measured and compared quarterly to their respective reference values per ISTB-5121(c) and (d). During testing performed at refueling, the primary flow path to the charging pump suction header will be used to record and evaluate BAM pump differential pressure, flow rate, and vibration per ISTB-5121(c) and (d). The full flow testing will continue to be performed on a comprehensive test frequency, during refueling conditions.

The NRC GL 89-04, Position 9 states that in cases where flow can only be established through a non-instrumented minimum flow path during quarterly pump testing and a path exists at cold shut down or refueling outages to perform a test of the pump full or substantial flow conditions, the increased interval is an acceptable alternative to the Code requirements. During the deferred test, pump differential pressure, flow rate, and bearing vibration measurements must be taken; and, during the quarterly testing, at least pump differential pressure and vibration must be measured. The licensee's proposed alternative testing is consistent with GL 89-04.

3.6.6 Conclusion

Based on the above evaluations, the NRC staff concludes that the licensee's proposed alternative for BAM pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety. The proposed alternative provides reasonable assurance of the operational readiness of the pumps. The alternative is authorized for the St. Lucie Units 1 and 2 fourth 10-year IST Interval.

4.0 REFERENCES

Code of Federal Regulations, Domestic Licensing of Production and Utilization Facilities," Part 50, Chapter I, Title 10, "Energy," Section 50.55a, Codes and standards.

American Society of Mechanical Engineers Operation and Maintenance Code, Inservice Testing of Nuclear Power Plant Components.

U.S. Nuclear Regulatory Commission, "Guidance on Developing Acceptable Inservice Testing Programs, " Generic Letter 89-04, through Supplement 1, April 4, 1995.

U.S. Nuclear Regulatory Commission, "Guidance for Inservice Testing at Nuclear Power Plants," NUREG-1482, Revision 1.

U.S. Nuclear Regulatory Commission, "Examples, Clarifications, and Guidance on Preparing Requests for Relief from Pump and Valve Inservice Testing Requirements, NUREG/CR-6396.

Letter, Gordon L. Johnston, Florida Power & Light Company to NRC, "St. Lucie Nuclear Plant, Units 1 and 2; Docket Nos. 50-335 and 50-389; Fourth 10-year Interval Inservice Testing Program Submittal," dated September 11, 2007 (TAC Nos. MD7741 thru MD7752).

Letter, Gordon L. Johnston, Florida Power & Light Company to NRC, "St. Lucie Nuclear Plant, Units 1 and 2; Docket Nos. 50-335 and 50-389; Fourth 10-year Interval Inservice Testing Program Submittal, RAI Reply to Relief Request PR-04 (TAC No. MD7748)" dated August 5, 2008.

Principal Contributor: Gurjendra S. Bedi

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