OCT 0 6 2017

L-2017-183
10 CFR 50.55a

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington D C 20555-0001

RE: St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389
Renewed Facility Operating Licenses DPR-67 and NPF-16
Fifth 10-Year Inservice Testing (IST) Program Interval Relief Requests PR-01 through PR-06, and PR-09

Pursuant to 10 CFR 50.55a(f)(5)(iii) and 10 CFR 50.55a(z), Florida Power & Light Company (FPL) hereby submits on behalf of St. Lucie Nuclear Plant Unit 1 and Unit 2, seven requests for relief from the requirements of the American Society of Mechanical Engineers Code of Operation and Maintenance of Nuclear Power Plants (ASME OM Code). The relief requests are applicable to the St. Lucie Unit 1 and 2, Fifth Ten-Year Inservice Testing (IST) Program Interval which will begin February 11, 2018 and end February 10, 2028. The relief requests are submitted on the bases that compliance would result in hardship or unusual difficultly without a compensating increase in the level of quality and safety, or that the proposed alternative provides an acceptable level of quality and safety, or on inservice testing impracticality. The applicable Code of record is the ASME OM Code 2004 Edition through 2006 Addenda.

The enclosure to this letter provides IST pump relief requests PR-01 through PR-06, and PR-09.

This letter contains no new regulatory commitments.

Should you have any questions regarding this submittal, please contact Mr. Ken Frehafer, St. Lucie Licensing, at (772) 467-7748.

Sincerely,

Michael J. Snyder
Licensing Manager
St. Lucie Plant

Enclosure - Relief Requests PR-01 through PR-06 and PR-09

MJS/JAM

cc: USNRC Regional Administrator, Region II
USNRC Project Manager, St. Lucie Nuclear Plant, Units 1 and 2
USNRC Senior Resident Inspector, St. Lucie Nuclear Plant, Units 1 and 2

St. Lucie Unit 1 and 2, Fifth 10-Year IST Program Interval
Relief Requests PR-01 through PR-06, and PR-09

Relief Request	Page
PR-01, Charging Pump Vibration Frequency Response Range…….....……	2
PR-02, Hydrazine Pump Vibration Frequency Response Range……..…	5
PR-03, Hydrazine Pump Flow Testing……..……..	8
PR-04, Low Pressure Safety Injection Pump Group Classification……..…	11
PR-05, LPSI Pressure Instrumentation……..…..	15
PR-06, Boric Acid Makeup (BAM) Pumps Quarterly Flow Test…….……..…....	18
PR-09, Relief from Comprehensive Pump Testing for Intake Cooling Water Pumps…..……	21

Pump Relief Request - PR-01
Charging Pump Vibration Frequency Response Range
(Page 1 of 3)

Proposed Alternative in Accordance with 10 CFR 50.55a(z)(2)
Hardship or Unusual Difficulty without Compensating Increase in Level of Quality or Safety

1. ASME Code Component(s) Affected

Pump	Description	Class	Category	Unit
CHG 1A	Reactor Coolant Charging Pump 1A	2	Group A	1
CHG 1B	Reactor Coolant Charging Pump 1B	2	Group A	1
CHG 1C	Reactor Coolant Charging Pump 1C	2	Group A	1
CHG 2A	Reactor Coolant Charging Pump 2A	2	Group A	2
CHG 2B	Reactor Coolant Charging Pump 2B	2	Group A	2
CHG 2C	Reactor Coolant Charging Pump 2C	2	Group A	2

2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

3. Applicable Code Requirement

ISTB-3510(e), Frequency Response Range - 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.

4. Reason for Request

The Reactor Coolant Charging Pumps are positive displacement pumps that operate at approximately 200 rpm, which equates to a rotational frequency of 3.41 Hz. The one-third minimum speed frequency response required by ISTB-3510(e) for the vibration instrumentation correlates to 1.13 Hz (68 cpm).

The equipment currently being used to measure vibration at St. Lucie is the Computational Systems Inc. (CSI) model 2120 Machinery Analyzer with Wilcoxon model 793 accelerometer probes. St. Lucie is in the process of upgrading to the CSI 2140 Machinery Health Analyzer and the Emerson model A0760GP accelerometer probes. The CSI 2120 Machinery Analyzer integrator frequency response is essentially flat down to DC[(1)], and the CSI 2140 response is flat to DC for non-integrated and DC-coupled signals. While the Wilcoxon model 793 accelerometer probe frequency response range meets the Code accuracy range requirement of ± 5.0% (i.e. sensitivity) in the range from 1.5 - 5,000 Hz, the frequency response drops to only +/-10% for frequencies between 1.0 - 1.5 Hz. The Emerson model A0760GP also has a sensitivity of ± 5.0%, but has a broader frequency range from 0.5 - 10,000 Hz.

Pump Relief Request - PR-01
Charging Pump Vibration Frequency Response Range
(Page 2 of 3)

This means that the CSI 2120 and Wilcoxon accelerometer, which is currently being utilized, meets all of the Code accuracy requirements down to 1.5 Hz, but does not meet the frequency response accuracy of less than +/-5.0% for between 1.13 and 1.5 Hz, which is the low end of the one-third minimum speed requirement of ISTB-3510(e).

The provider of vibrational calibration services for St. Lucie is unable to calibrate to less than 2 Hz using standards traceable to NIST, meaning that neither the CSI-2120 and Wilcoxon accelerometer nor the CSI-2140 and Emerson accelerometer can be calibrated to the required lower range. While NIST is capable of providing a traceable calibration standard for frequencies as low as 1.0 Hz, the process of finding a qualified calibration supplier has not been completed and is not expected to be completed by the start of the Fifth 10-Year IST Interval.

The FPL Quality Assurance Program requires this instrumentation to be calibrated and traceable to NIST standards.

Though the frequency response range of the CSI-2120 and Wilcoxon accelerometer does not meet the extreme low end of the readout requirements of ISTB-3510(e), it adequately envelops all potential noise contributors that could indicate degradation of the Charging Pumps. The instrumentation is fully qualified to measure all expected synchronous vibration levels. 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 (i.e. 0.38X - 0.48X, where X equals the rotational frequency of the pump) is not applicable to a horizontal, triplex, reciprocating pump.

b) A light rub / impact could generate a vibrational component at a frequency below the pump's rotational frequency (e.g. 0.5X or 102.5 cycles per minute), but can generate a harmonic vibrational component that would be integer and half-integer multiples of the running speed of the pump. For example, a light rub (vibrations occurring at 0.5X) 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.

Pump Relief Request - PR-01
Charging Pump Vibration Frequency Response Range
(Page 3 of 3)

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

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 these pumps.

5. Proposed Alternative and Basis for Use

The measurement of the vibration associated with the Reactor Coolant Charging Pumps 1A, 1B, 1C, 2A, 2B, and 2C will continue to be taken utilizing the Computational Systems Inc. (CSI) model 2120 Machinery Analyzer with Wilcoxon model 793 accelerometer probes until the use of the CSI-2140 and Emerson accelerometers have been fully incorporated into the St. Lucie vibration measurement program. Calibration of the CSI-2120 and Wilcoxon instrumentation will be qualified to a minimum frequency of only 2 Hz.

As a result of their design, the Charging Pumps are not susceptible to degradation mechanisms that would only manifest themselves in the unmonitored/non-calibrated range (1.13 to 2 Hz) without also becoming prevalent in the monitored range (2-1000 Hz)

6. Duration of Proposed Alternative

The proposed alternative will be utilized until the CSI-2140 Machinery Health Analyzer and Emerson accelerometer have been fully incorporated into the St. Lucie vibration measurement program, not to exceed the duration of the Fifth 10-Year IST Interval.

7. Precedents

The alternative testing with respect to the CSI-2120 Machinery Analyzer and Wilcoxon model 793 accelerometer was previously requested for the Fourth 10-Year IST Interval as Pump Relief Request PR-01. The request was approved in NRC Safety Evaluation Report dated September 25, 2008 [ADAMS Accession No. ML082470089].

8. References

(1) DC - 'Direct Current', relates to the description of the CSI 2120 and CSI 2140 integrator frequency. When there is no vibration, there is no sinusoidal component to the generated electrical signal, which is what would be found with the measurement of direct current.

Pump Relief Request - PR-02
Hydrazine Pump Vibration Frequency Response Range
(Page 1 of 3)

Proposed Alternative in Accordance with 10 CFR 50.55a(f)(5)(iii)
Inservice Testing Impracticality

1. ASME Code Component(s) Affected

Pump	Description	Class	Category	Unit
IRS HYDRZN P 2A	Hydrazine Pump 2A	2	Group B	2
IRS HYDRZN P 2B	Hydrazine Pump 2B	2	Group B	2

2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

3. Applicable Code Requirement

ISTB-5323(d) and (e) - Comprehensive Test Procedure

> ISTB-5323(d) - Vibration (displacement or velocity) shall be determined and compared with 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.
>
> ISTB-5323(e) - All deviations from the reference values shall be compared with the ranges of Table ISTB-5321-1 or Table ISTB-5321-2, 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-5321-1 [2]. For all other positive displacement pumps, vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5321-2 [1]. For example, if vibration exceeds either $6V_r$ or 0.7 in./sec (1.7 cm/sec), the pump is in the required action range.

4. Impracticality of Compliance

The Hydrazine Pumps are reciprocating positive displacement pumps which are characterized as metering pumps. These pump operate at extremely slow speed (IRS HYDRZN P 2B at 39 rpm and IRS HYDRZN P 2B at 37 rpm), which equates to a rotational frequency of 0.62-0.65 Hz. In accordance with the Code, the required low limit of the frequency response for the vibration instruments would be one third the pump rotational frequency or 0.21 Hz. Portable instruments satisfying this requirement are commercially unavailable.

Pump Relief Request - PR-02
Hydrazine Pump Vibration Frequency Response Range
(Page 2 of 3)

The low frequency vibration instrumentation presently in use at St. Lucie are the Computational Systems Inc. (CSI) model 2120 Machinery Analyzer with the Wilcoxon model 793 accelerometer and the CSI model 2140 Machinery Health Analyzer with the Emerson model A0760GP probes.

While the Wilcoxon model 793 accelerometer probe frequency response range meets the Code accuracy range requirement of ± 5.0% in the range from 1.5 - 5,000 Hz, the frequency response drops to only +/-10% for frequencies between 1.0 - 1.5 Hz. Below 1.0 Hz, the frequency response is not provided by the vendor. The Emerson model A0760GP accelerometers have a lower frequency response of 0.5 Hz, which is still greater than the Code required 0.21 Hz. For these reasons, 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. These pumps are designed and built for continuous operation, but are only operated 1 to 2 hours per year. This calculates to less than 5000 cycles between successive comprehensive inservice testing, when the measurement of pump vibration is required. The mechanisms of wear and degradation of rotating machinery are time and cycle dependent 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 comprehensive inservice testing periods. Thus, the probability of any significant pump deterioration over the plant's lifetime is extremely small.

5. Burden Caused by Compliance

The performance of vibrational testing with the equipment currently commercially available is not capable of measuring the pumps vibrational response to accuracies 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 infrequently. Wear due to operation is not expected during the plant's life time, making the effort of taking vibrational measurement effectively meaningless.

6. Proposed Alternative and Basis for Use

In lieu of measuring pump vibration on a comprehensive biennial frequency, these pumps will be maintained and inspected in accordance with the St. Lucie Preventative Maintenance Program, which reflects the pump manufacturer's (Union Pump Co.) recommendation dated May 24, 1999. Preventative Maintenance, at a minimum, includes the periodic changing of the crankcase lubricating oil, oil analyses to identify significant wearing of the

Pump Relief Request - PR-02
Hydrazine Pump Vibration Frequency Response Range
(Page 3 of 3)

internals, disassembly and inspection, and verification of the bolting torque. This program is adequate for determining pump degradation that could impact operability and reliability.

7. Duration of Proposed Alternative

The proposed alternative will be applicable to the Fifth 10-Year IST Interval.

8. Precedents

The alternative testing was previously requested for the Fourth 10-Year IST Interval as Pump Relief Request PR-02. The request was approved in NRC Safety Evaluation Report dated September 25, 2008 [ADAMS Accession No. ML082470089].

Pump Relief Request - PR-03
Hydrazine Pump Flow Testing
(Page 1 of 3)

Proposed Alternative in Accordance with 10 CFR 50.55a(f)(5)(iii)
Inservice Testing Impracticality

1. ASME Code Component(s) Affected

Pump	Description	Class	Category	Unit
IRS HYDRZN P 2A	Hydrazine Pump 2A	2	Group B	2
IRS HYDRZN P 2B	Hydrazine Pump 2B	2	Group B	2

2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

3. Applicable Code Requirement

ISTB-5322, Group B Test Procedure, Sub paragraph (b) - The flow rate shall be determined and compared to its reference value.

4. Impracticality of Compliance

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 pumps each have a single plunger and complete only one suction and one discharge stroke during each cycle (shaft rotation).

The Hydrazine Pumps operate at a very slow speed (IRS HYDRZN P 2B is tested at 37 rpm) in order to supply the Technical Specification (TS) 4.6.2.2 specified hydrazine flowrate of 0.71 to 0.82 gpm. Due to the simplified design of these pumps, instantaneous flow is continuously accelerating and decelerating, following an oscillating waveform. Each pump cycle is approximately 1.6 seconds in duration with no flow produced during the pump's 0.8 second suction stroke. The installed flowrate instrumentation utilizes a differential pressure orifice located in the suction line common to both Hydrazine 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 as a result 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.

Pump Relief Request - PR-03
Hydrazine Pump Flow Testing
(Page 2 of 3)

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 cannot be obtained under the current configuration.

As an alternative to the use of the installed instrumentation, the flowrates of the Hydrazine Pumps can be determined through collection of the pumps' 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.

5. Burden Caused by Compliance

While the method of verifying the pumps flowrate through the time dependent collection of the Hydrazine Pumps' 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.

6. Proposed Alternative and Basis for Use

Hydrazine Pump flow will only be measured during the comprehensive inservice pump test, which is performed during refueling outages. Measuring the flowrate by the time dependent collection of the pump discharge into a container of known volume will be conducted each refueling outage in conjunction with a Preventative Maintenance Program that reflects the pump manufacturer's (Union Pump Co.) recommendation dated May 24, 1999. The preventative maintenance for these pumps consists of the periodic changing of the crankcase lubrication oil, oil analyses to identify significant wearing of internals, disassembly and inspection, and verification of bolting torque. Application of these preventative maintenance requirements along with the biennial measurement of the pumps' flowrate, differential pressure and speed is adequate for detecting any significant pump degradation and ensuring the continued operability and reliability of these pumps.

Quarterly pump testing will consist of the verification of each Hydrazine 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.

Pump Relief Request - PR-03
Hydrazine Pump Flow Testing
(Page 3 of 3)

7. Duration of Proposed Alternative

The proposed alternative will be applicable to the Fifth 10-Year IST Interval.

8. Precedents

The alternative testing was previously requested for the Fourth 10-Year IST Interval as Pump Relief Request PR-03. The request was approved in NRC Safety Evaluation Report dated September 25, 2008 [ADAMS Accession No. ML082470089].

Pump Relief Request - PR-04
Low Pressure Safety Injection Pump Group Classification
(Page 1 of 4)

Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Alternative Provides Acceptable Level of Quality and Safety

1. ASME Code Component(s) Affected

Pump	Description	Class	Category	Unit
LPSI 1A	Low Pressure Safety Injection Pump 1A	2	A/B	1
LPSI 1B	Low Pressure Safety Injection Pump 1B	2	A/B	1
LPSI 2A	Low Pressure Safety Injection Pump 2A	2	A/B	2
LPSI 2B	Low Pressure Safety Injection Pump 2B	2	A/B	2

2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

3. Applicable Code Requirement

ISTB-1300 - All pumps within the scope of ISTA-1100 and ISTB-1100 shall be categorized as either a Group A or Group B pump.

ISTB-1400(b) - Identify each pump to be tested in accordance with the rules of this Subsection and categorize it 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.

4. Reason for Request

The Low Pressure Safety Injection (LPSI) Pumps are used during cold shutdown and refueling conditions and can each provide approximately 3000 gpm of cooling flow through the reactor. 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). During this time, the pumps can only recirculate flow of approximately 40 gpm for Unit 1 and 100 gpm for Unit 2 back to the Refueling Water Tank (RWT) through minimum flow lines. Operation of these high capacity pumps under minimum flow conditions results in the generation of vibrational levels greater than measured during pump full flow operation. For LPSI Pumps 1A and 1B, the low flow vibrational levels have been known to exceed the Group A vibration alert levels of 0.325 inches/sec, as specified in Table ISTB-5121-1.

Prior to the issuance of the 1995 edition of the OM Code, which introduced ISTB Group A, Group B and comprehensive testing, St. Lucie addressed the LPSI 1A and 1B Pumps' vibration levels during low flow quarterly testing through the submittal of a relief request which increased the vibration alert levels from 0.325 inches/sec to 0.500 inches/sec. The

Pump Relief Request - PR-04
Low Pressure Safety Injection Pump Group Classification
(Page 2 of 4)

request was submitted for the Third 10-Year IST Interval as PR-12 under the existing 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 in Safety Evaluation dated March 16, 1999.

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 the relief request was that during power operation, the pumps are 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. The request was submitted for the Third 10-Year IST Interval as PR-06 and was granted in NRC safety evaluation dated March 16, 1999 under the existing rules of 10 CFR 50.55a(f)(6)(i), Inservice Testing Impracticality. The safety evaluation categorized the LPSI pumps as Group B during normal plant operation, and Group A during refueling outages.

It was also noted in Third 10-Year IST Interval relief request PR-06, that relief from measuring the flowrate through the minimum flow line is consistent with NRC Generic Letter 89-04, Position 9, provided the flow measurement is obtained under substantial flow conditions that are present during either cold shutdown or refueling conditions.

The concept of Group A and Group B inservice testing was developed recognizing that pumps that operate in a standby role (i.e. Group B) are not subject to the same wear and fatigue mechanism as pumps that operate continuously or routinely. It was recognized that it was not necessary to perform the same level of testing on Group B pumps as a result of their standby nature. The mechanisms which 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 the 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. [(1)] 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 in the 1995 Edition purposefully did not include a minimum two-minute run time requirement for Group B testing. [ISTB-5100(a)(2), ISTB-5200(a)(2) and ISTB-5300(a)(2)].

Pump Relief Request - PR-04
Low Pressure Safety Injection Pump Group Classification
(Page 3 of 4)

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 of this relief request will show that the proposed alternative would provide an acceptable level of quality and safety.

The LPSI pumps meet the categorization requirements of a Group A pumps in that they are operated routinely during plant shutdowns and refueling outages. However, these pumps also meet the criteria of a Group B pump, 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 2004/2006a OM Code testing requirements do not require a two-minute minimum pump run-time for quarterly Group B pump testing. Removing 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 power 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/American Society of Mechanical Engineers (ASME) Symposium on Valve and Pump Testing, includes a paper entitled, "Description of Comprehensive Pump Test Change to ASME Code, Subsection ISTB." [(2)] This paper details the philosophy of classifying pumps as Group A or Group B. According to NUREG/CP-0137, Vol. 1, 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 under minimum flow conditions would subject the pumps to an increased potential for degradation due to pump wear than would the shorter duration Group B quarterly testing. In addition, the quarterly performance of the required Group A vibration monitoring under low flow conditions would result in the unnecessary placement of the Unit 1 LPSI pumps into an Alert category, resulting in the doubling of their quarterly testing frequency due to the higher than permitted vibration amplitudes. Doubling the pump testing frequency would potentially result in more detrimental damage.

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.

Pump Relief Request - PR-04
Low Pressure Safety Injection Pump Group Classification
(Page 4 of 4)

5. Proposed Alternative and Basis for Use

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

Using the provisions of this relief request as an alternative to the specific requirements of ISTB-1300 and ISTB-1400(b) identified above will provide adequate indication of pump performance and continue to provide an acceptable level of quality and safety.

6. Duration of Proposed Alternative

The proposed alternative will be applicable to the Fifth 10-Year IST Interval.

7. Precedents

The alternative testing was previously requested for the Fourth 10-Year IST Interval as Pump Relief Request PR-04. The request was approved in NRC Safety Evaluation Report dated September 25, 2008 [ADAMS Accession No. ML082470089].

8. References

(1) J. Stall, FPL, to USNRC, "Inservice Test Program, Relief Request PR-12 Supplement," L-98-264, October 9, 1998

(2) R. Scott Hartley "Description of Comprehensive Pump Test Change to ASME Code, Subsection ISTB," July, 1994, as presented at the Third NRC/ASME Symposium on Valves and Pump Testing, and published in NUREG/CP-0137, Vol. 2.

Pump Relief Request - PR-05
LPSI Pressure Instrumentation
(Page 1 of 3)

Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Alternative Provides Acceptable Level of Quality and Safety

1. ASME Code Component(s) Affected

Pump	Description	Class	Category	Unit
LPSI 1A	Low Press. Safety Inj. Pump 1A	2	A/B	1
LPSI 1B	Low Press. Safety Inj. Pump 1B	2	A/B	1
LPSI 2A	Low Press. Safety Inj. Pump 2A	2	A/B	2
LPSI 2B	Low Press. Safety Inj. Pump 2B	2	A/B	2

2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

3. Applicable Code Requirement

ISTB-3510(b)(1), Range - The full scale range of each analog instrument shall be not greater than three times the reference value.

4. Reason for Request

Table ISTB-3510-1 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 for Group A and B tests, 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 for Group A and B test follows using the logic taken from NUREG-1482, Rev. 2, 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 (± 2.0% x 60 psig)

Pump Relief Request - PR-05
LPSI Pressure Instrumentation
(Page 2 of 3)

Indicated accuracy:

Instrument tolerance / Reference value x 100 = Indicated accuracy

[± 1.2 psig / 20 psig] x 100 = ± 6%

Following the methodology described by 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	PARAMETER	REF VALUE	INSTR RANGE	INSTR ACCUR	INSTR TOL	IND ACCUR
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:

REF VALUE = reference value established by the procedure

INSTR ACCUR = accuracy to which instrument is calibrated

INSTR TOL = maximum INSTR RANGE times INSTR ACCUR

IND ACCUR = INSTR TOL divided by REF VALUE times 100

As shown on Table 1, the indicated accuracy for all the instruments is less than or equal to 1.6% of the reference value. The accuracy's are better than those allowed by the Code for both Group A and B testing. 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, Rev. 2, 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 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 B testing).

Pump Relief Request - PR-05
LPSI Pressure Instrumentation
(Page 3 of 3)

5. Proposed Alternative and Basis for Use

Since the indicated accuracy of each permanently installed instrument is less than the allowed tolerance, St. Lucie requests approval for continued use of the instruments listed in this relief request.

6. Duration of Proposed Alternative

This proposed alternative will be applicable to the Fifth 10-Year IST Interval.

7. Precedents

The alternative testing was previously requested for the Fourth 10- Year IST Interval as Pump Relief Request PR-05. The request was approved in NRC Safety Evaluation Report dated September 25, 2008 [ADAMS Accession No. ML082470089].

Pump Relief Request - PR-06
Boric Acid Makeup (BAM) Pumps Quarterly Flow Test
(Page 1 of 3)

Proposed Alternative in Accordance with 10 CFR 50.55a(f)(5)(iii)
Inservice Testing Impracticality

1. ASME Code Component(s) Affected

Pump	Description	Class	Category	Unit
BAM 1A	Boric Acid Makeup Pump 1A	2	Group A	1
BAM 1B	Boric Acid Makeup Pump 1B	2	Group A	1
BAM 2A	Boric Acid Makeup Pump 2A	2	Group A	2
BAM 2B	Boric Acid Makeup Pump 2B	2	Group A	2

2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

3. Applicable Code Requirement

ISTB-5121(b) - 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.

4. Reason for Request

The Boric Acid Makeup (BAM) pumps have four available flowpaths for inservice testing. These are the primary flow path to the Charging Pumps' suction header, the Refueling Water Tank (RWT) recirculation line, the Volume Control Tank (VCT) flowpath line and the BAM Tank recirculation line. The flow paths are neither available nor equipped to support Group A testing during power operation or cold shutdowns for the reasons stated below:

a) Operating the BAM Pumps when aligned to discharge to the Charging Pumps' suction header will result in the introduction of highly concentrated boric acid from the Boric Acid Makeup Tanks into the Charging Pumps' suction. During plant operation this would result in the addition of excess boron into the RCS. The rapid insertion of negative reactivity would result in RCS cooldown and de-pressurization and could result in an unscheduled plant trip and possible Safety Injection System actuation. During cold shutdowns, the introduction of excess quantities of boric acid into the RCS via this flowpath is also undesirable for the maintenance of proper plant chemistry and the inherent difficulties that may be encountered during the subsequent startup due to the over-boration. In addition, the waste management system would be overburdened by the large amounts of RCS coolant that would require processing to reduce boron concentration.

Pump Relief Request - PR-06
Boric Acid Makeup (BAM) Pumps Quarterly Flow Test
(Page 2 of 3)

b) Operation of a BAM Pump aligned to recirculate water to the RWT would result in depletion of the associated BAM Tank inventory. During normal operation, the Technical Specifications require the BAM Tanks to be maintained with a specified volume and concentration of boric acid. The transfer of borated water from either one or both of the BAM Tanks could result in not only the loss of a required boration source as required by the Technical Specifications, but in the case of St. Lucie Unit 2, could result in an increase of boron concentration above the RWT concentration limit (the Unit 2 RWT boron concentration is required to be between 1900 and 2200 ppm). In addition the 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 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 specified by the Technical Specifications, but injecting the highly borated water into the VCT would introduce highly borated water into 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. Furthermore, while the flow path does contain a flow element, the attached instrumentation is not suitable for inservice testing measurements because the calibration consists of only a zero check.

It is noted that in justifications (b) and (c) above, transference of the BAM Tank's contents, a fixed and limited amount of volume, will result in the reduction of the pump's suction pressure over the course of the test with the result of producing a variable flowrate which could not be easily compared and trended to previous flow measurements (i.e. poor repeatability). The BAM Tanks' level typically varies from test to test by as much as 15% to 20%.

d) Alignment of a BAM Pump to recirculate flow back to the BAM Tanks is accomplished through a fixed resistance circuit, which is essentially the pumps' minimum flow test line. This is the same flowpath utilized to periodically mix the contents of each BAM Tank in order 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.

Pump Relief Request - PR-06
Boric Acid Makeup (BAM) Pumps Quarterly Flow Test
(Page 3 of 3)

5. Proposed Alternative and Basis for Use

Quarterly Group A testing of the BAM Pumps will be accomplished 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).

The removal of quarterly flow testing of these pumps has been deemed acceptable per NRC Generic Letter 89-04, Position 9, which allows elimination of minimum flow test line flowrate measurements provided inservice tests are performed during cold shutdowns or refueling periods under full or substantial flow conditions and pump flowrate is recorded and evaluated. The proposed alternative testing is consistent with the philosophy and intent of Generic Letter 89-04, Position 9.

Full flow testing will continue to be performed on a comprehensive test frequency, during refueling outages.

6. Duration of Proposed Alternative

The proposed alternative will be applicable to the Fifth 10-Year IST Interval.

7. Precedents

The alternative testing was previously requested for the Fourth 10-Year IST Interval as Pump Relief Request PR-06. The request was approved in NRC Safety Evaluation Report dated September 25, 2008 [ADAMS Accession No. ML082470089].

Pump Relief Request - PR-09
Relief from Comprehensive Pump Testing for Intake Cooling Water Pumps
(Page 1 of 2)

Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1)
Alternative Provides Acceptable Level of Quality and Safety

1. ASME Code Component(s) Affected

Pump	Description	Class	Category	Unit
ICW PP 1A	Intake Cooling Water Pump 1A	3	Group A	1
ICW PP 1B	Intake Cooling Water Pump 1B	3	Group A	1
ICW PP 1C	Intake Cooling Water Pump 1C	3	Group A	1
ICW PP 2A	Intake Cooling Water Pump 2A	3	Group A	2
ICW PP 2B	Intake Cooling Water Pump 2B	3	Group A	2
ICW PP 2C	Intake Cooling Water Pump 2C	3	Group A	2

2. Applicable Code Edition and Addenda

ASME OM Code 2004 Edition through 2006 Addenda

3. Applicable Code Requirement

Table ISTB-3400-1, Inservice Test Frequency, which specifies that a Group A test be performed quarterly for Group A pumps and a comprehensive test be performed biennially for Group A and Group B Pumps.

ISTB-5221, Group A Test Procedure, which provides the specific requirements for the Group A test for vertical line shaft pumps.

ISTB-5223, Comprehensive Test Procedure, which provides the specific requirements for the comprehensive test for vertical line shaft pumps.

4. Reason for Request

Pursuant to 10 CFR 50.55a, Codes and Standards, paragraph (z)(1), relief is requested from the requirements of ASME OM Code ISTB-5221, ISTB-5223, and Table ISTB-3400-1, for Intake Cooling Water (ICW) pumps, 1A, 1B, 1C, 2A, 2B, and 2C. The basis for the relief is that the proposed alternative would provide an acceptable level of quality and safety.

The ICW pumps are classified as Group A pumps and are tested quarterly at flow conditions which also meet the biennial comprehensive pump test flow conditions of +/- 20% of design flow. The only differences in the quarterly Group A versus the comprehensive test for these pumps are the required accuracy of the pressure gauges being used per Table ISTB-3510-1 and the high side Acceptable Range and Required Action Range listed in Table ISTB-5221-1 for flow (Q) and differential-pressure (dP).

Pump Relief Request - PR-09
Relief from Comprehensive Pump Testing for Intake Cooling Water Pumps
(Page 2 of 2)

In 1994, Section ISTB of the ASME OM Code was revised to include comprehensive pump testing in order to address the circumstance of testing Group A pumps quarterly under mini-flow recirculation conditions. At St. Lucie however, the ICW pumps were tested quarterly under full flow conditions which also satisfied the +/- 20% design flow criteria for comprehensive testing. However, trending the quarterly Group A test data with the refueling outage comprehensive test data created problems since the comprehensive test data was obtained using more accurate instrumentation required by the Code.

5. Proposed Alternative and Basis for Use

St. Lucie will perform modified Group A testing using the alternative rules specified in ASME Code Case OMN-18, Alternate Testing Requirements for Pumps Tested Quarterly Within +/- 20% Design Flow, in lieu of the Code-required comprehensive testing. ASME Code Case OMN-18 was approved by the ASME OM ISTB Code Committee in the 2009 Edition of the ASME OM Code. While this Code case has yet to be incorporated by reference into 10 CFR50.55a or incorporated into RG 1.192, the NRC staff has stated that they have no concerns with its use provided that the Acceptable Range upper end values for Q and dP are $1.06Q_r$ and $1.06dP_r$ respectively, and the Required Action Range high end values for Q and dP are greater than $1.06Q_r$ and $1.06\Delta P_r$ respectively (where Q_r and dP_r are the pump reference values for Q and dP, respectively). Noteworthy is that the $1.06Q_r$ and $1.06dP_r$ criteria are more conservative than the $1.10Q_r$ and $1.10dP_r$ criteria specified in the ASME OM Code 2006 Addenda but are the same criteria specified in the ASME OM Code 2011 addenda for comprehensive pump testing. Inservice testing with more accurate instrumentation and tighter acceptance criteria will provide for better trending of pump performance. Vibration testing will also be performed per the Group A requirements as presented in Table ISB-5221-1.

Using the provisions of ASME Code Case OMN-18 as an alternative to the requirements of ISTB-5221 and ISTB-5223 will provide adequate indication of pump performance, permit detection of component degradation, and continue to provide an acceptable level of quality and safety.

6. Duration of Proposed Alternative

The proposed alternative will be applicable to the Fifth 10-Year IST Interval.

7. Precedents

The alternative testing was previously requested for the Fourth 10-Year IST Interval as Pump Relief Request PR-09. The request was approved in NRC Safety Evaluation Report dated July 1, 2011 [ADAMS Accession No. ML11143A077].